

# Wound Magnetics Technologies



Design to  
Production



EXXELIA 



# Wound Magnetics Technologies



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# About Exxelia

Exxelia is a manufacturer of complex passive components and precision sub-systems focusing on highly demanding end-markets, applications and functions. Exxelia product portfolio includes wide ranges of capacitors, inductors, transformers, resistors, filters, position sensors, slip rings and high-precision mechanical parts serving numerous leading industrial areas such as aerospace, defense, medical, rail, energy and telecommunications.

Thanks to extensive design capabilities and a robust development process, Exxelia is recognized for its ability to quickly evaluate application specific engineering challenges and provide cost-effective and efficient solutions. For requirements that cannot be met by our catalog products, we offer custom configurations: upgraded performance, custom geometries, robust packaging.

EXXELIA Magnetics business unit has more than 40 years experience in the design, industrialization and manufacturing of magnetics for Space, Civil Aviation, Defense, Oil & Gas, Medical, Railway and Industrial niche markets.

EXXELIA actively works in partnership with the customer from prototype phase to production series.

EXXELIA has several production sites including low cost factories. All Magnetics sites are EN/AS9100 qualified. EXXELIA can therefore offer the most competitive solution to the customer.

EXXELIA offers PCB mounted components, ruggedized medium power magnetics subassemblies as well as stators & rotor and actuators. EXXELIA has a large technology portfolio including High-Grade platforms for demanding market and a strong manufacturing heritage.

The customer benefits from EXXELIA design expertise and know-how for their design to specifications and built-to-print requests. Both catalog and custom products are available. The qualification of technological innovation and the definition of the related design rules allow EXXELIA to offer cost effective optimized solutions.

## Customer benefits

- **Time to market:**  
Available qualified technologies for harsh environment  
Strong heritage in Space
- **Optimised solutions:**  
Co-design through partnership with technical teams  
High expertise in complex designs  
Knowledge of the applications  
Industrialisation know how
- **Cost effective solutions:**  
Reduced Non recurrent Cost, Low Cost Country Sites
- **Obsolescence management**

## NEW SPACE, Constellation, SPACE 4.0:

EXXELIA is the right choice due to strong space heritage, qualified technologies and multiple choice of manufacturing locations: USA, Asia, North Africa, Europe.

## Quality System & Validation Capabilities

EXXELIA masters, fully implements and maintains all the main international and customer standards, specifications, regulations and requirements for the design, manufacture, inspection and testing of magnetic components and for EHS and quality management:

### Space magnetics:

- Europe:** ESA: ESCC 3201 family of specifications, ESCC 20400, ESCC 20500, ESCC 23500
- QPL series:** ESCC32/008, ESCC3201/009 & ESCC3201/010
- NEW QML Technology Flow:** ESCC3201/011 & ESCC3201/012
- CNES:** RNC-CNES-Q-ST-60102, RNC-CNES-Q-60103
- USA - Japan:** MIL-STD-981, MIL-PRF-27

### Aeronautics and Military magnetics:

- USA:** MIL-STD-981, MIL-PRF-27, MIL-HDBK-1553, MIL-PRF-15305, MIL-PRF-21038, MIL-PRF-39010, MIL-PRF-83446.

### Environmental conditions and tests:

- Europe:** EUROCAE ED-14, ,
- USA:** RTCA DO-160, MIL-STD-202.

### Environment, health and safety:

- EC 1907/2006 (REACH), 2002/95/EC (RoHS)

EXXELIA is manufacturing RoHS products by default. Non RoHS should be specifically requested.

EXXELIA maintains a comprehensive and up to date data base of all chemicals to closely follow the REACH status.

### Quality management:

- EN/AS9100 and 1509001 family of standards

Major aerospace customers standards.

## How Exxelia supports the key processes ?

### Cleaning procedure

The cleaning of the PCB boards is evolving from solvent (as isopropyl alcohol,...) to highly alkaline water based cleaning medium.

EXXELIA has performed an extensive study to offer robust technologies to withstand these current cleaning processes. The qualification procedure has included thermal shock, burn in and mechanical testings.

EXXELIA has defined gluing, marking, varnishing processes that allow the products to go through more than 5 cleaning cycles and operating up to 180°C.

Processes compliant to ESA and NASA outgassing standards have also been defined for products specified up to 140°C.

### Wire integrity

EXXELIA has qualified specific processes to ensure wire integrity for better insulation. The wire undergoes mechanical, chemical and thermal stresses during the winding and cabling process steps. EXXELIA has set up a dedicated process to reduce the impact of these manufacturing steps and improve the overall reliability of the wires and products.

### Finishing

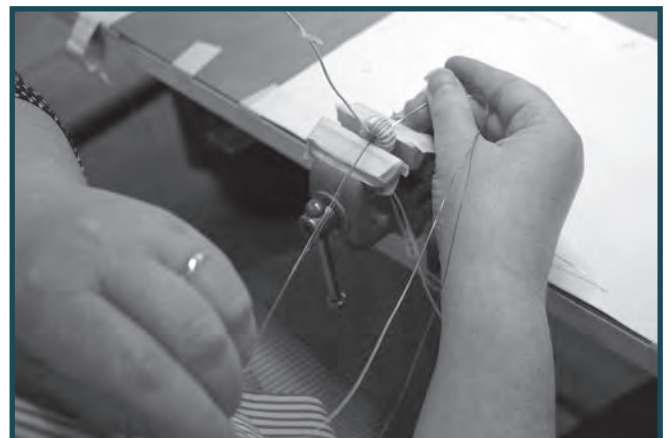
EXXELIA offers several types of components: Surface Mounted Device, Through Hole or lead terminations products, system integrated components.

### Packaging

Products are available on trays and, upon request, on reels for easy pick and place, ESD compliant

EXXELIA products offer components compliant to IPC/JEDEC standard J-STD-020 with TP = 260°C and tP = 30 seconds.

ENGINEERING SUPPORT	Pages
360-800 Hz Rotor & Stator Electromagnets High Voltage	10 to 12
TECHNOLOGIES	Pages
<b>PCB mounted products</b> High-Grade Technologies: SESI, CCM, TT Standard technologies Mass production High Temperature	14 to 20 38 to 42
<b>Magnetics ruggedized subassemblies: Medium power products</b> Custom Ferrite Assemblies Nanocrystalline Assemblies C Core Water cooling	22 to 36
<b>Bobbins</b> <b>Stators/Rotors</b>	118 to 119
SERIES	Pages
MPCI, SESI, CMC, CCM, ...	46 to 116








# Selection Guide

Design and manufacturing capabilities per application	Key Characteristics	Selection	Pages
<b>Switch Mode Power Supply</b> including Multi Outputs Flyback, New topologies Dual Active Bridge, Weinberg, Resonant	0-500 VA	High-Grade Technologies, SESI, CCM, TO Ruggedized Standards Technologies Planar PCB	<b>14-19</b> <b>38-41</b> <b>22</b>
	> 500VA , 20 kVA (10KA for welding application)	Ruggedized Magnetics SubAssemblies Quasi planar technology Custom Ferrite Assembly (E shape, ...) Flat Helical Winding	<b>22</b> <b>25-27</b> <b>24</b>
	> 20kVA , up to 300 kVA /1000A (10KA for welding application)	Ruggedized Magnetics SubAssemblies Custom Ferrite Assembly (U shape, ...) Flat Helical Winding	<b>25-27</b> <b>24</b>
<b>Inductor</b> Filtering choke Differential Mode Choke PFC (Power Factor Correction) choke	< 25 A	SESI, TO, TT, CCM technologies Ruggedized standard technologies SESI series, CCM series, ESI 01, ESI 07 Differential Mode choke page	<b>14-20</b> <b>38-41</b> <b>68-69 / 77-88</b> <b>89</b>
	> 25 A - up to 1000A	Magnetics Subassemblies U shape EI, EII Edge winding/High current winding Aluminum foil C Core"	<b>25-27</b> <b>32</b> <b>23</b> <b>30-31</b>
<b>Common Mode Choke</b>	< 25 A	CMC series, CCM, SESI, TT Technologies	<b>90-103</b>
	> 25 A - up to 1000A	Subassemblies Nanocrystalline EI, U Lamination assemblies	<b>28-29</b> <b>32</b>
<b>360-800 Hz Power supply</b> Monophase & Triphase Multipulse (12-18,...) Interphase inductor	Up to 200kVA	<b>Ruggedized Magnetics subassemblies</b> EI,U, laminations Assemblies Standards Ruggedized technologies (Toroid, ..) Aluminum & Copper Foil C-Core assemblies <b>Engineering support: design optimisation</b>	<b>32</b> <b>23</b> <b>30-31</b>
<b>50 Hz Power Supply for Niche Market</b> Transformer Choke"	up to 150 kVA	<b>Ruggedized magnetics subassemblies</b> EI, U Lamination assemblies C Core Assemblies	<b>32</b> <b>30-31</b>
<b>Current/voltage measurement</b>	Accuracy down to 0,1% (Openable technology available)	CT series, Current Transformer Voltage transformer	<b>104-108</b> <b>34</b> <b>35</b>
<b>Pulse transformer (data, GDT,...)</b> Gate Drive Data Bus"		GDT series DBIT	<b>109-110</b> <b>58-64</b>
<b>RF products</b>		MPCI/MSCI WRFT	<b>44-49</b> <b>54</b>
<b>Sonar transformer</b>			<b>25-29</b>
<b>Electromagnet, Actuators, Sensors</b>			<b>9-12</b>
<b>Rotor/stator</b>			<b>9-12</b>
<b>High Temperature</b>		High Temperature	<b>20</b>
<b>High Voltage</b> including ignition, triggering application	Up to 30 kV rated voltage Up to 100 kV insulation voltage Maximum partial discharges voltage: 100 kV	<b>Engineering support</b> High Voltage	<b>11-12</b>
<b>Thermal Management</b> Modelling Water Cooling		<b>Engineering Support</b> <b>Water Cooling</b>	<b>9-12</b> <b>33</b>

# Selection Guide








EXXELIA designs and manufactures magnetic components including wound magnetics, inductors, transformers, motors, sensors and actuators for high voltage, high temperature and power applications.

Products are optimized to meet the most demanding applications requirement thanks to a strong design expertise, EXXELIA masters High-Grade technologies: Chameleon Concept Magnetics (CCM), standard linear and toroidal, toroidal transfer molded technology (TT), SESI planar / Low-profile and aluminum foil winding.

	Technologies	Note	Page
HIGH-GRADE TECHNOLOGIES	Custom Design Technologies 	Hybrid Magnetics Transfer-Molded Components	14
	CCM Technology 	ESA ESCC Technology Flow Certificate for Custom CCM Components ESCC 3201011	15
	SESI Custom Technologies 	Custom transformers and inductors in the standard SESI 9, 15, 18, 22 and 32 packages	17
	Custom Packages with Additional Terminations 	Shielded versions of SESI	19
	Toroidal Transfer Custom Magnetics TT and TO Toroidal 	Custom SMD toroids – ESCC 3201/012	20

	Technologies	Frequency	Power/Current	Temperature range	Molding	Page	
HIGH-POWER TECHNOLOGIES	High-Grade Custom Planar Magnetics 	50 kHz to 1MHz	Up to 10 kWatts	-40°C to +125°C	–	22	
	Aluminium and Copper Foil Technologies 	Medium power custom magnetic components with the Aluminium or Copper Foil technologies					23
	Winding flat wire on range 	–	–	–	–	24	
	U Shaped Ferrite assembly (inductors) 	Up to 1 GHz	Up to 300 kVA	Up to 240°C	–	25	
	U Shaped Ferrite assembly (transformers) 	Up to 1 GHz	Up to 300 kVA	Up to 240°C	–	26	
	Overmolded U Cores Assembly 	Up to 1 GHz	Up to 300 kVA	Up to 200°C	Epoxy, Polyurethane	27	
	Nanocrystalline Toroidal Cores Assembly 	Up to 10 MHz	Up to 500 A	-30°C to +140°C	Epoxy, Polyurethane	28	
	Overmolded Nanocrystalline Toroids 	Up to 10 MHz	Up to 125 A	Up to 200°C	Epoxy, Polyurethane	29	
	C-Cores Assemblies (inductors) 	Up to some kHz	Up to 60 A	Up to 240°C	Epoxy, Polyurethane	30	
	C-Cores Assemblies (transformers) 	Up to some kHz	Up to 1500 A	Up to 240°C	Epoxy, Polyurethane	31	
	EI, U, ... Lamination assemblies 	16 Hz 2/3 - 50 Hz Up some kHz	Up to 200 kVA	Insulation class F, H or C	–	32	
	Water Cooling 	See tables					33
	Sensor: Current transformer 	See tables					34
	Sensor: Voltage transformer 	16 Hz <sup>2/3</sup> - 50 Hz - 400 Hz Up to 800 Hz	Up to 500 kVA	Up to 240°C	Molded or not	35	
	Integrated subassemblies 	Up to 4 kHz	Up to 2 x 125 kWatts	–	–	36	

# Selection Guide




	Technologies	Inductor Range	Transformer for SMPS	Temperature Range	Notes	Page
STANDARD TECHNOLOGIES	Toroidal Magnetic Core Platform 				Power conversion in electronic applications	38
	RM Platform 	17 mH/50 mA to 20 $\mu$ H/20 A	Up to 150 W	-40°C to +100°C	Power Transformers and Inductors in SMP power supplies	39
	ETD Platform 		Up to 450 W	-40°C to +100°C	Transformers in forward and push-pull SMPS	40
	EQ Platform 	175 mH/30 mA to 2.5 $\mu$ H/20 A	Up to 130 W	-55°C to +125°C	Power transformers in SMP power supplies	41
	Custom Power Magnetics 				Powerful magnetics for a wide range of applications	42
	TT and TO Toroidal 				Design know how and manufacturing capabilities	43
	High Temperature Inductors and Transformers 				Design know how and manufacturing capabilities	44



	Series	Current	Inductance	Temperature Range	Frequency	Notes	Page	
HIGH-GRADE PRODUCTS	Chips Inductors	MPCI/MSCI 10000, 12000, 20000 	15 mA to 1 000 mA	0.010 $\mu$ H to 1 000 $\mu$ H	-55°C to +125°C	7.9 MHz to 500 MHz	QPL, Space Qualified	44 to 49
		MPCI / MSCI H01 	100 mA to 1 500 mA	0.38 $\mu$ H to 100 $\mu$ H	-55°C to +125°C	-	QPL, Space Qualified	50 51
		MPCI 233 	25 mA to 114 mA	18 $\mu$ H to 1 000 $\mu$ H	Up to +175°C	-	High Temperature	52
		MPCI 233 H01 	100 mA to 1 500 mA	0.38 $\mu$ H to 100 $\mu$ H	Up to +175°C	-	High Temperature	53
	Wide Band RF	WRFT 4x 			-55°C to +125°C	Bandwidth 100 kHz to 400 MHz	Generic specification ECSS, ESCC, MIL for Space	54
	C. Mode Choke	HCECSC 	0.4 A to 2.5 A	15 $\mu$ H to 470 $\mu$ H	-55°C to +125°C	Up to 100 MHz	Generic specification ECSS, ESCC, MIL for Space	55
	Data Line Filters	DLEF 42 	Up to 100 mA	5 $\mu$ H at 15 MHz	-55°C to +100°C	15 MHz to 300 MHz	Generic specification ECSS, ESCC, MIL for Space	56
	Line-Matching	MTLM 1234 MIL 		Up to 5.5 $\mu$ H	-55°C to +125°C	100 Hz to 10 kHz		57
	Current Transformer	DBIT / SBIT 	MIL-STD-1553 Data Bus Transformer		-55°C to +125°C	75 kHz to 1 MHz	Aerospace, ESA / EPPL	58 to 66
	Ethernet Transformer	2 ways digital block 						67



# Selection Guide

		Series	Current	Inductance	Temperature Range	Frequency	Notes	Page
HIGH-GRADE PRODUCTS	SMD Power Inductors	ESI 01 - ESI 7 	0.26 A to 2.1 A	0.42 $\mu$ H to 106.45 $\mu$ H	-55°C to +125°C	Up to 1 MHz	Generic specification ECSS, ESCC, MIL for Space	68 69
		CCM 4, CCM 5, CCM 6 	–	–	-55°C to +125°C	Up to 1 MHz	High Reliability Compliant ESA, ECSS, MIL	70 to 72
		CCM 20 	–	–	-55°C to +125°C	Up to 1 MHz	High Reliability Compliant ESA, ECSS, MIL	73
		CCM 25 	–	–	-55°C to +125°C	Up to 1 MHz	High Reliability Compliant ESA, ECSS, MIL	74
		Custom SMPS Transformers CCM Technology 	–	20 $\mu$ H to 1 270 $\mu$ H	-55°C to +125°C	65 kHz to 600 kHz	Space, New Space, Avionic, VTOL and UAV, Defense, Railway, Oil Drilling	75 76
		SESI 9.1 	0.045 A to 6 A	1 $\mu$ H to 6 800 $\mu$ H	-55°C to +125°C	Up to 1 MHz	QPL, Space Qualified	77
		SESI 14, 15 	0.28 A to 14 A	1.5 $\mu$ H to 2 290 $\mu$ H	-55°C to +125°C	Up to 1 MHz	QPL, Space Qualified	78 to 80
		SESI 18, SESI 22, SESI 32 	0.8 A to 24 A	4.9 $\mu$ H to 4 709 $\mu$ H	-55°C to +125°C	Up to 1 MHz	QPL, Space Qualified	81 to 85
		HTSE xx WR/SR 	0,36 A to 16.4 A @ 25°C 0,2 A to 10,2 A @ 155°C	3 to 2041,3 $\mu$ H no load 2,7 to 1837,2 $\mu$ H @ 155°C	-55°C to +180°C	Up to 1 MHz	High Temperature QPL, Space Qualified	86 87
	HTSE 47 SR 	1 A to 20 A @ 25°C 0,6 A to 12 A @ 155°C	1.3 to 5593,2 $\mu$ H no load 1.2 to 5033,9 $\mu$ H @ 155°C	-55°C to +180°C	Up to 1 MHz	High Temperature QPL, Space Qualified	88	
	Common Mode Choke	DMC 22 xxx 1WR 	4 A	25 $\mu$ H @ 25°C	-55°C to +125°C	–		89
		CMC 15, CMC 18, CMC 22 	0.55 A to 14.3 A	60 $\mu$ H to 4 900 $\mu$ H	-55°C to +125°C	–	QPL, Space Qualified	90 to 98
		CMC 14, CMC 17 Improved Temperature Stability 	1.1 A to 11.7 A	140 $\mu$ H to 69 200 $\mu$ H	-55°C to +125°C	–	ESA Generic Specification	99 to 102
	Current sense Transformers	Current sense Transformer CT 10 						104
		CT 01 100 261 x 		3.9 $\mu$ H	-55°C to +125°C	10 kHz to 250 kHz	Aeronautic, Space	105
		CT 08 200 221 PR 				100 kHz to 200 kHz	Aeronautic, Space	106
CT 91 xxx 231 WR 		10 A pk max. Turn ratio 1:50/1:200	0.4 $\mu$ H to 6.4 $\mu$ H	-55°C to +125°C	6 kHz to 500 kHz	Aeronautic, Space	107	
CT 15 200 231 WR 			6.4 $\mu$ H	-55°C to +125°C	6 kHz to 100 kHz	Aeronautic, Space	108	
Gate drive transformers	GDT 15 	ET: 60/80 V $\mu$ s Turn ratio 1:1.52/1:1.1	–	-55°C to +125°C	Up to 500 kHz	Aeronautic, Space	109	
	GDT 91 	ET: 50/135 V $\mu$ s Turn ratio 1:1/1:1.1	–	-55°C to +125°C	Up to 500 kHz	Aeronautic, Space	110	

		Series	Inductor Range	Current	Inductance	R <sub>DC</sub> Typ.	Temperature Range	Notes	Page
STANDARD PRODUCTS	Common Mode Chokes	TCM Series 	12 mH/0.3 mA to 20 $\mu$ H/20 A	0.3 A to 4 A	0,7 mH to 47 mH	0.15 m $\Omega$ to 1750 m $\Omega$	-55°C to +125°C	Aeronautic, Industry, Defense, Railway	112 to 114
		CMESC 17 		1.1 A to 11.7 A	0.45 mH to 69.2 mH	5 m $\Omega$ to 500 m $\Omega$	-40°C to +125°C		115
	Current transfo.	CT 05 xxx 231 W 				1.2 mH to 540 mH	6 m $\Omega$ (A-B) 1 m $\Omega$ to 9.6 m $\Omega$ {1-3}	-40°C to +100°C	

		Technologies	Notes	Page
BUILT-TO-PRINT	Bobbins 		For Actuators, Antennas & Sensors	118
	Rotors & Stators 		Stators diameter from 10 to 500 mm and weight up to 250 kg Up to high temperature 220°C products:	119

# Engineering Support

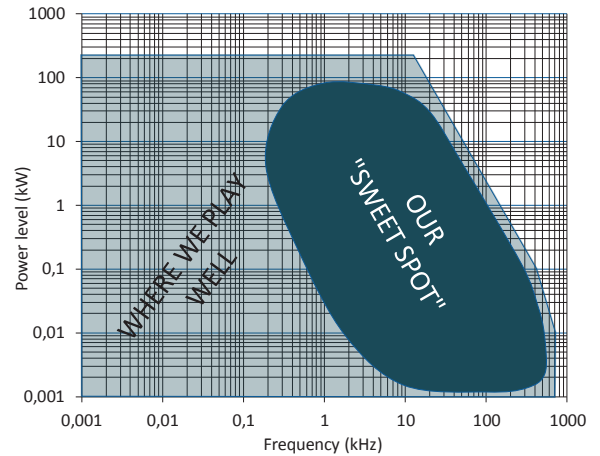
## DESIGN CAPABILITIES

Exxelia designs magnetics for most applications:

- Switch-mode power supply including new and unusual architectures
- 360-800Hz Power supply (single and multipulse)
- 50 Hz power supply
- Current and Voltage measurement
- Lighting - Ignition
- Pulse transformer (gate drive, data)
- Micro inductor
- Audio-frequency
- Electromagnets etc.

Exxelia designs magnetics up to:

- 200kV dielectric strength
  - 20kV operating voltage ...
  - 240°C operating temperature
- According to the main aerospace standards
- ESA ESCC 3201
  - MIL-STD-981
  - MIL-PRF-27
  - DO-160 etc



## SWITCHED MODE POWE SUPPLY

### Cross regulation in multi output Flyback converters

Exxelia has been working on this subject in order to understand the phenomenon, identify the cause(s) and find solutions to avoid the use of linear regulators consuming energy

The identification of a relevant magnetostatic model of the transformer and its electronic environment are necessary for analysis of the phenomenon into circuit simulation software like PSIM or PSPICE. This allows to evaluate the influence of the model parameters and the other components of the converter on the variability of output voltages.

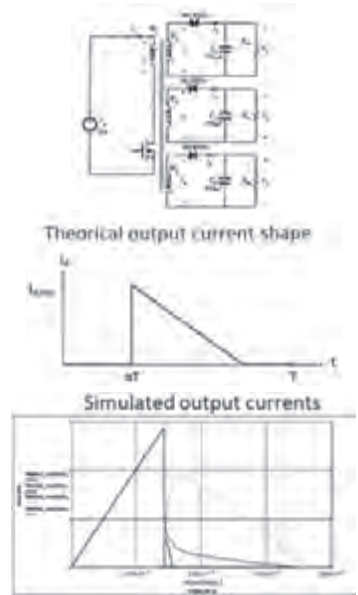
The key point is then to link the product manufacturing technology to the parameters of the model, in order to reduce cross regulation thanks to the optimization of windings arrangement.

The work on this topic allows a precise control of the output voltages on the most sensitive windings.

### Dual Active Bridge, small size & high efficiency

The dual active bridge is a topology more and more used to supply batteries because it allows bidirectional energy transfer with the network.

Exxelia is developing high reproducibility technology to integrate inductors in the transformer:



### Example

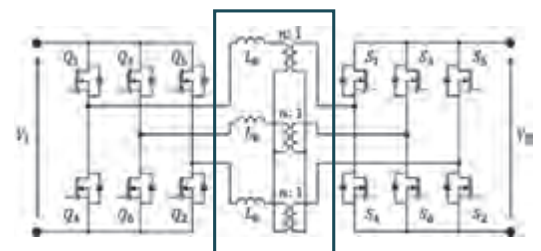
3 Transformers in each power supply

Each transformer incorporates virtual inductance Lk

15 kW combined output @ 100 kHz switching

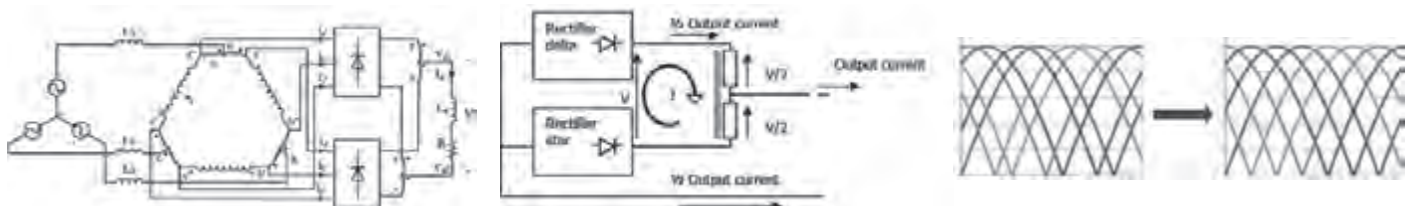
Taps provide flexibility for 350 V / 700 V input & 28 V or 56 V output (up to 430 A)

Exxelia value proposition: Small size, high efficiency, competitive cost despite multiple high current outputs and integrated inductors.



## 360-800Hz MULTI PULSE

Exxelia developed a specific knowledge to optimize the design of single and multi-pulse magnetics for 360 – 800 Hz power network.



Global Optimization of the magnetics in the power supply Transformer/Autotransformer and Interphase Inductor

Consideration of limit operation conditions

Harmonic reduction thanks to losses management

## ACCURATE MEASUREMENT TRANSFORMERS (0.1%) FOR CRITICAL APPLICATIONS

Real-time, detailed knowledge of the voltages and currents is becoming increasingly important to ensure the proper operation of electrical networks. This is as true for the aeronautics market as it is for the industrial market.

Measurement transformers, whether current or voltage, are sensors. They must faithfully transmit a signal level in a highly variable environment (excitation, frequency, temperature) which influences their characteristics.

Exxelia developed a designing method that takes into account all environmental conditions. The behavior of the sensor is modeled by a transfer function that depends on transformer characteristics and on the load resistance.

Depending on the application and the targeted accuracy, Exxelia defines the best operating point of the sensor by calculating the worst case errors with respect to the variability of the model parameters.

Exxelia designs sensors with an accuracy of up to 0.1%.

## THERMAL MANAGEMENT, A PATH TO MINIATURIZATION

For Exxelia, better thermal management translates into miniaturization of the component.

Indeed, thanks to an accurate calculation of the maximum operating temperature, Exxelia can design the smallest component able to transfer a given power.

The calculation of this temperature requires the knowledge of the heating sources (core and copper losses) and the component thermal behavior.

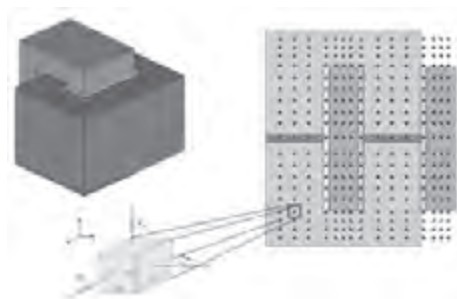
Exxelia uses a calculation method to do the best use of core losses data and improve them by developing partnership with core manufacturer

The copper losses due to Eddy current are taken into account by Exxelia through the identification of the overriding causes and the use of the most relevant analytical approaches to evaluate them.

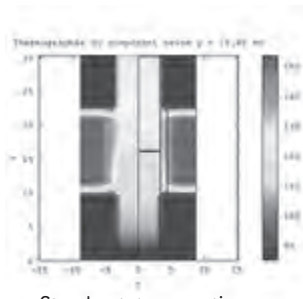
The calculation of the operating temperature from the losses requires to determine the thermal resistance, which varies according to the ambient temperature, the power dissipated and the exchange conditions with the environment.

Exxelia performs measurement campaigns to determine the thermal resistances and their variation for its qualified technologies and for most of the standard ferrite shapes. In particular, the influence of natural convection is taken into account to address products for Space.

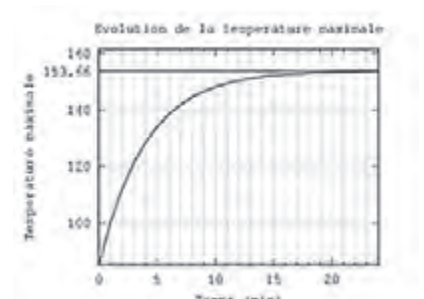
When more detailed analysis is required, Exxelia has developed a unique thermal simulation software, based on finite element calculation and dedicated to magnetic components to make its use easier and faster.



Finite element analysis



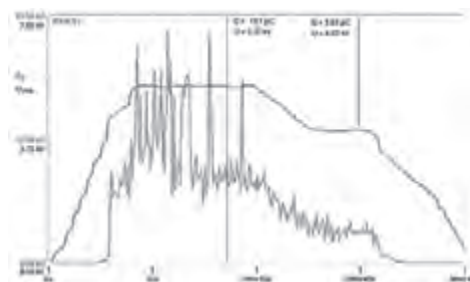
Steady state operating temperature calculation



Transient

## HIGH VOLTAGE AND ELECTRIC FIELD CALCULATION

Exxelia developed specific design skills to anticipate voltage increase requested for aircraft and space embedded application. High voltage topic is mastered with both dedicated test equipment (up to 100kV) and electric field calculation knowhow.



Partial discharge equipment available up to 100kV

# Engineering Support

**Electric Field mitigation:** In high voltage applications, local high electric field  $E$  [kV/mm] can lead to a premature aging of insulating parts or insulators? (Partial discharge) and finally to an electric failure.

Simulation in the design phase, using finite element calculations with a 2D or 3D electrostatic software allows Exxelia to reduce high field areas and increase lifetime.

**Example:** Electric Field, Iso-Voltage values



Custom High Voltage Transformer

## ELECTROMECHANICAL DEVICES

Exxelia engineers use advanced finite-elements simulation software to model and analyse electromagnetic behaviour.

EXXELIA can provide a high added-value support for electromechanical devices optimization through electromagnetic and thermal calculations (weight reduction, torque increase, losses reduction, etc...):

- 2D and 3D calculations:
  - Magnetostatic:  $B$  [T],  $J$  [A/mm<sup>2</sup>], L matrix (function of current)
  - Electrostatic:  $E$  [kV/mm], C matrix
  - Eddy current (AC) in magneto-harmonic
  - 2D transient coupled multiphysics (electric + magnetic + circuit)
- Specific analysis:
  - Optimization under constraints
  - Parametric analysis
  - Sensitivity analysis

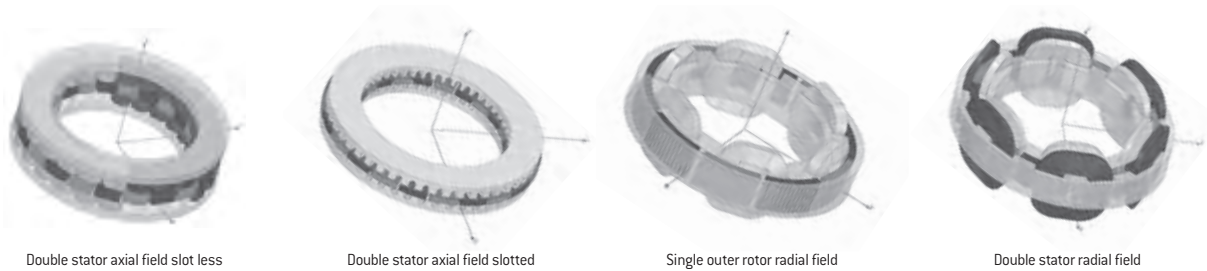


CAD geometry and circuit import/export (step, Catia, Spice, ...)

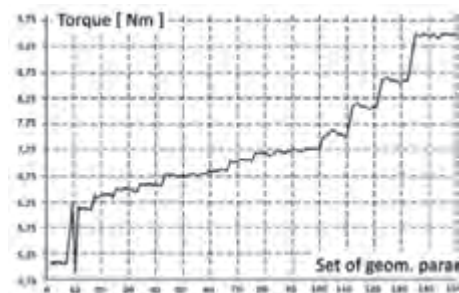
Some calculations: Torque [N.m], Force [N], Resistance [ $\Omega$ ], Losses[W], L matrix [H], C matrix [F]

Some applications: linear or angular electric motor, electromagnet, linear or angular actuator, proportional valves, position sensor, etc... Proportional Hydraulic Valve

**Topology analysis:** Based on an extensive experience, Exxelia can offer the best topology dedicated to an application or look for the best performance within a given space:



### Torque, field and geometrical optimization



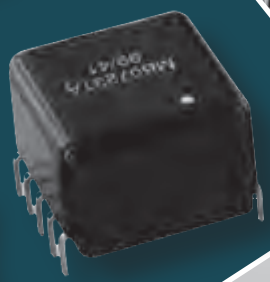
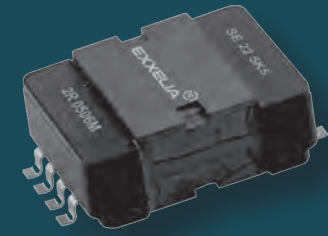
# High-Grade Technologies

Custom Design Technologies ..... 14

CCM Technology ..... 15

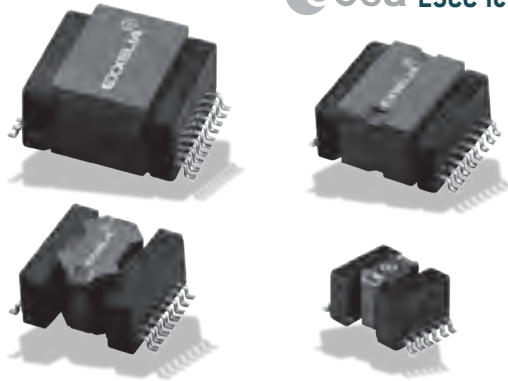
SESI Custom Technologies ..... 17

Toroidal Transfer Custom Magnetics ..... 20



# CCM Technology

## • esa ESCC Technology Flow Certificate for Custom CCM Components ESCC 3201011



### Features

- Designed to withstand severe environment as space, avionics, New Space applications
- Bobbin winding Technology using standard profiles (RM, EQ,..)
- Epoxy Transfer molding technology
- SMD package
- Multiple pins with multi-wire connections possibilities
- Ferrite core External assembly
- Optimized heat transfer to pins and PCB

- Applied standards: MIL-STD202, ECSS-Q-70, D0-160D,
- Pick and place compatible
- Materials meet UL94-V0 rating
- Temperature range: -55°C +125°C
- RoHS by default, non RoHS upon request
- Meets solderability tests per MIL-STD 202-Method 208
- Optional tape and reel packaging
- • esa qualified technology ESCC 3201/011

### Benefits

- Withstand high shocks and vibration (MIL STD 202 Method 213 & 204)
- Good repeatability of electrical characteristics, allow good regulation of multiple outputs power supply
- Higher power density up to +20% compared to standard package
- Easy to pick and place (tape and reel or tray)
- Flexibility of use
- No stress on the Ferrite
- New Space applications compatible

### Indicative Electrical Data

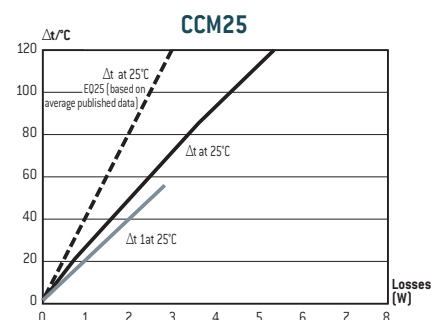
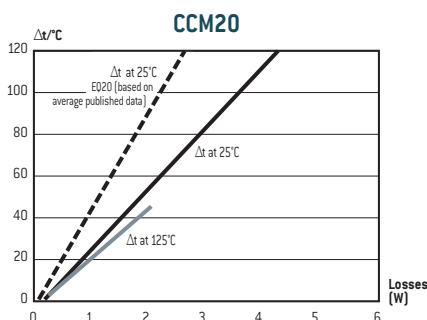
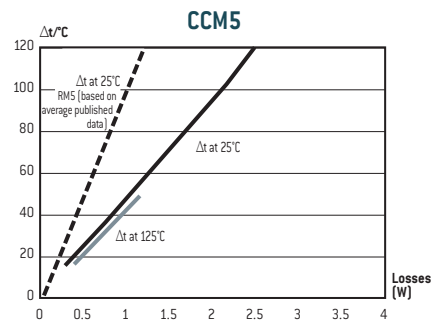
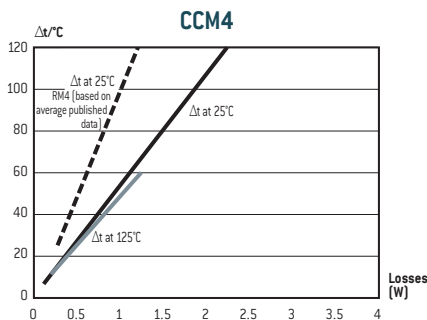
Platform	Inductor Range (I <sub>DC</sub> +20% ripple)	Transformer for SMPS *	Indicative Weight (grammes)
CCM4	18mH/50mA → 3μH/6A	Up to 18W	5.1
CCM5	29mH/80mA → 4.2μH/8A	Up to 30W	7.4
CCM6	120mH/30mA → 3μH/10A	Up to 40W	12.1
CCM20	240mH/30mA → 2.6μH/21A	Up to 120W	21.4
CCM25	480mH/40mA → 4μH/25A	Up to 200W	44.2

\* Based on a push pull architecture, at f = 200 kHz @85°C without cooling

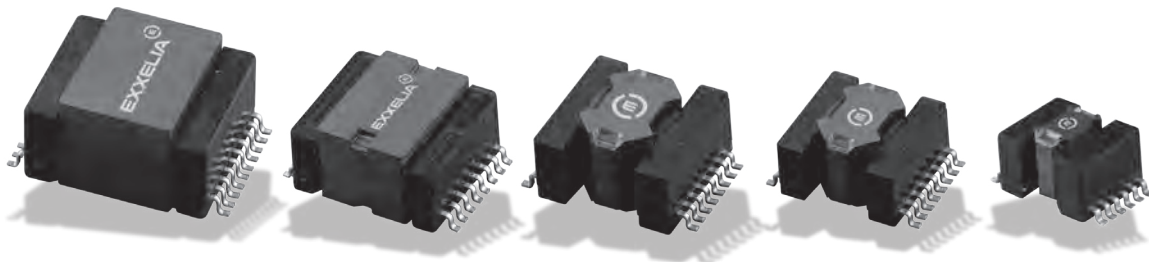
### Overview of custom Electrical functions in this technology

- Common mode chokes
- PFC chokes
- Gate Drive transformers
- SMD filtering chokes
- Current transformers
- Flyback transformers
- Forward transformers
- Push-Pull transformers
- ...

Temperature elevation (Δt) compare between Industrial and High Grade technologies



# CCM Technology



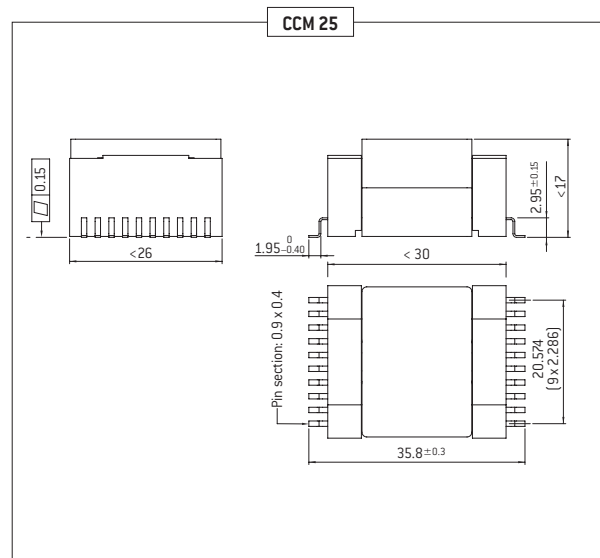
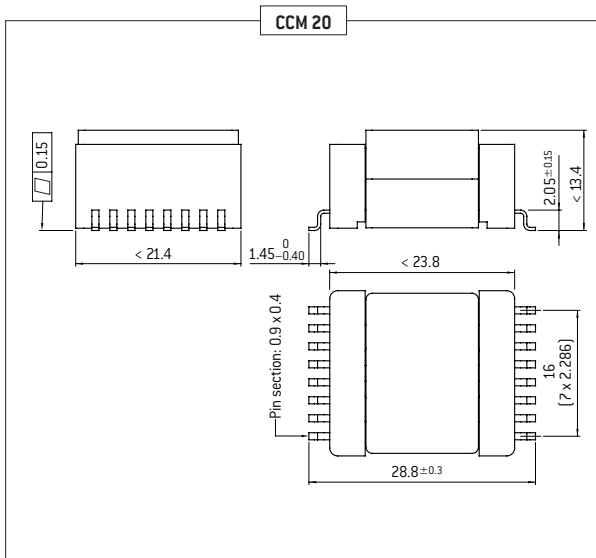
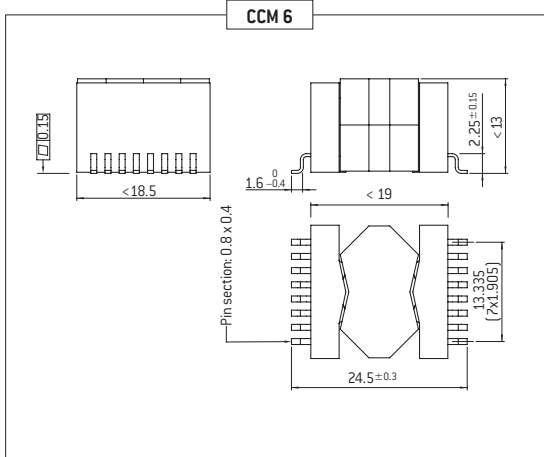
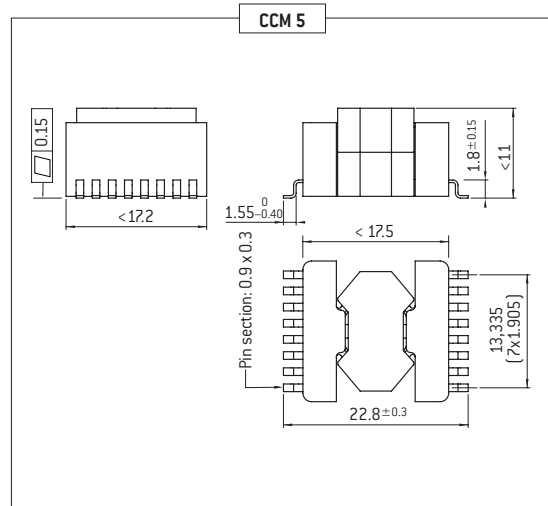
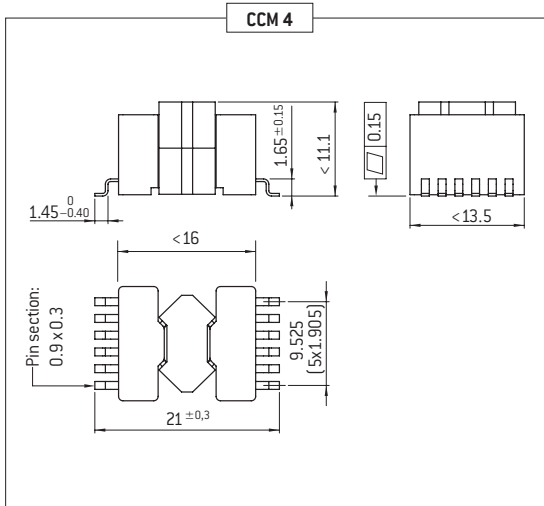
CCM 25

CCM 20

CCM 6

CCM 5

CCM 4



HIGH GRADE TECHNOLOGY

# SESI Custom Technologies

Upon request our Engineers can design custom transformers and inductors in the standard SESI 9, 15, 18, 22 and 32 packages. These magnetics can be either surface mount or through-hole and can have up to 8 windings in the SESI 32 package.

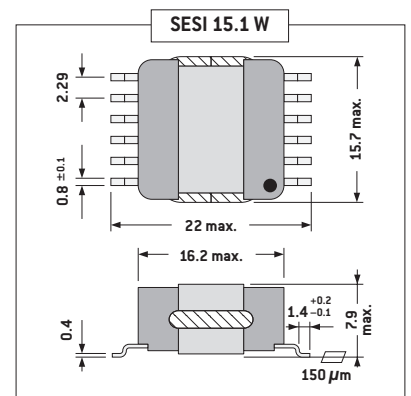
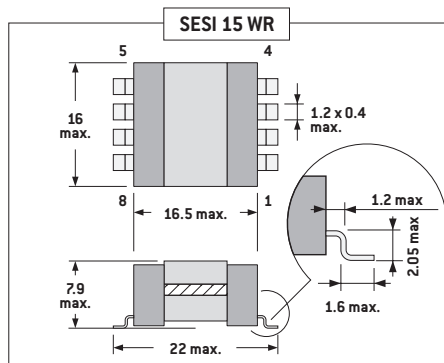
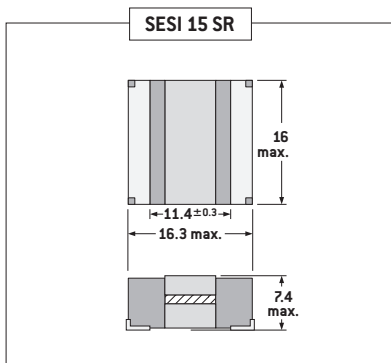
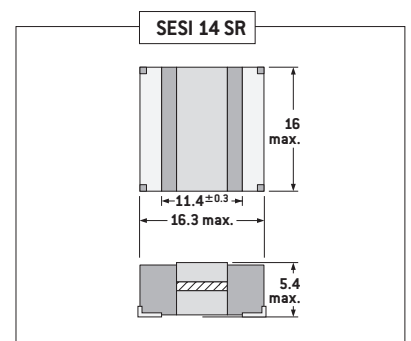
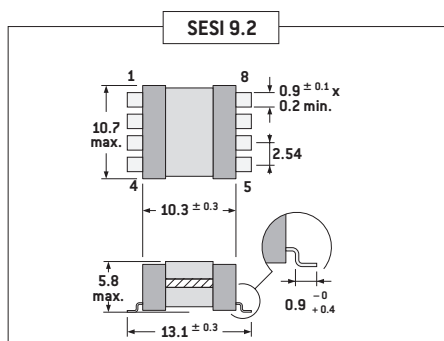
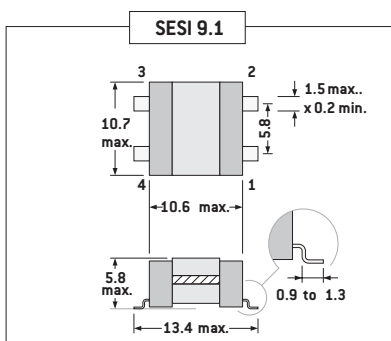
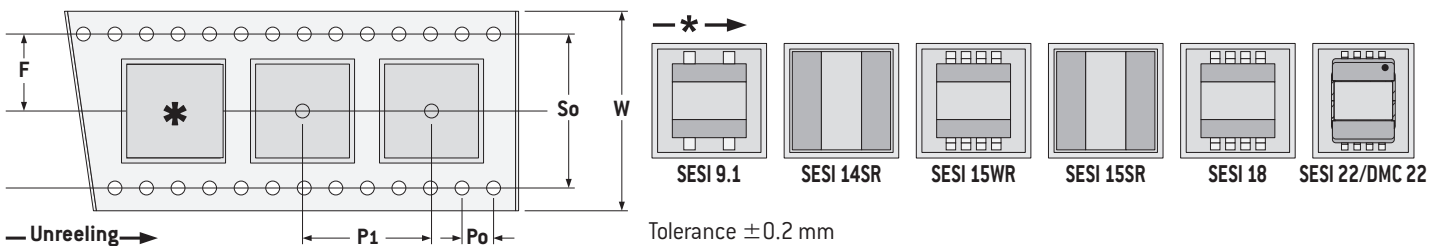
This design approach offers faster response, no tooling cost and competitive prices because of low materials costs obtained from high-volume standard parts production.



## Tape and Reel Dimensions

Platform	F (mm)	P1 (mm)	Po (mm)	W (mm)	So (mm)	Rel Ø (mm)	N° pieces
SESI 9.1 / 9.2	11.5	16.0	4.0	24	none	330	700
SESI 14SR	11.5	20.0	4.0	24	none	330	400
SESI 15SR	11.5	20.0	4.0	24	none	330	400
SESI 15WR	20.2	20.0	4.0	44.0	40.4	330	400
SESI 18	20.2	24.0	4.0	44.0	40.4	330	300
SESI 22	26.2	36.0	4.0	56.0	52.4	330	100

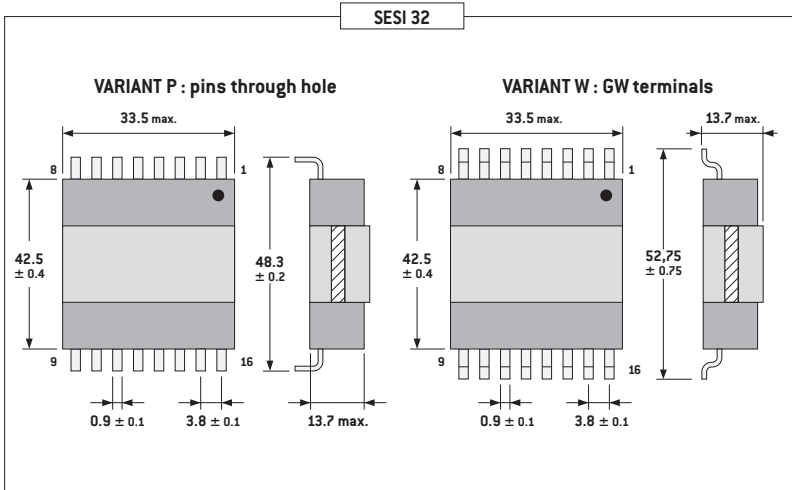
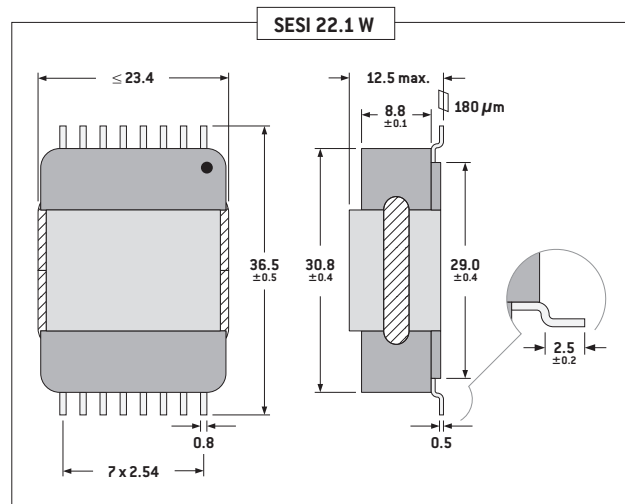
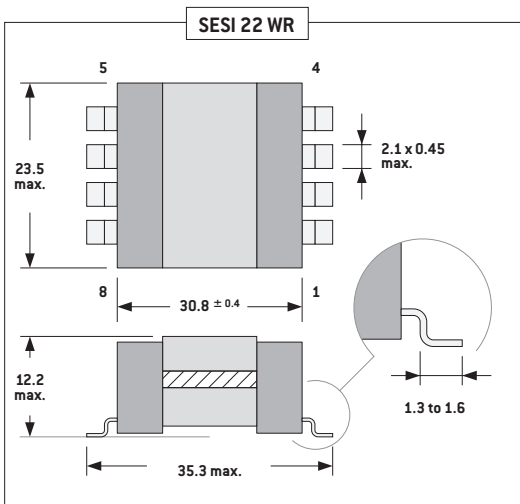
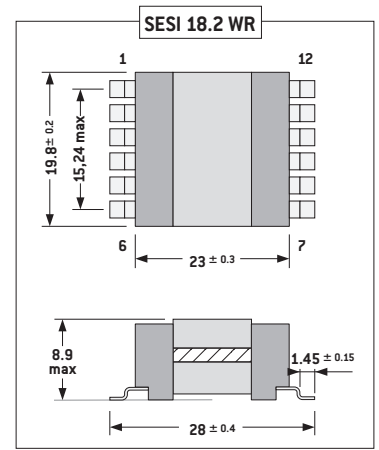
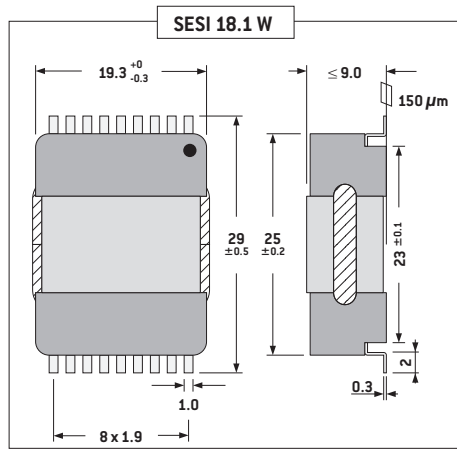
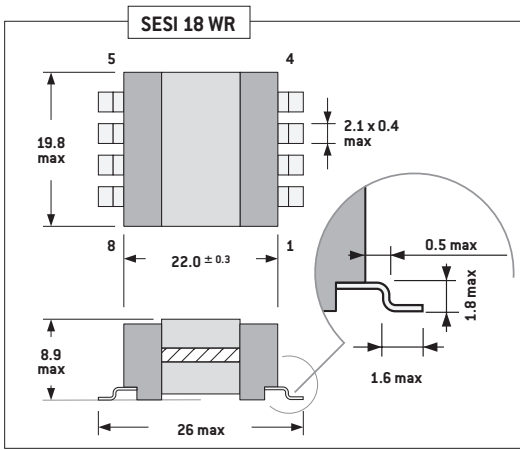
## Packaging





# SESI Custom Technologies

HIGH GRADE TECHNOLOGY



## Shielded versions



SESI 15 WE



SESI 18.1 WE



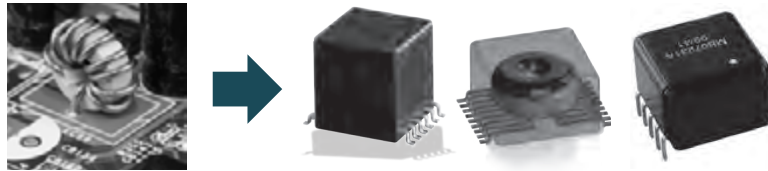
SESI 22 WE



SESI 22.1 WE

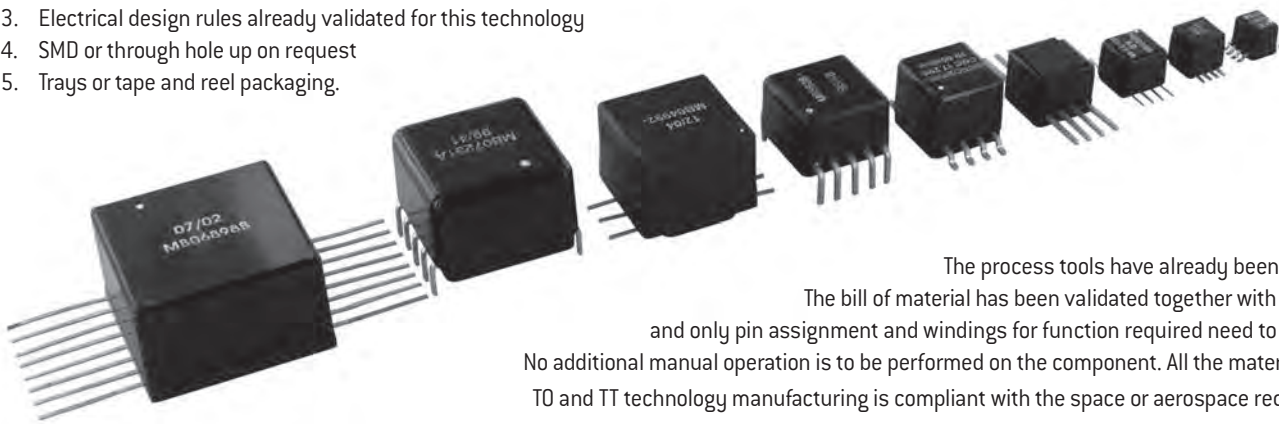
# Toroidal Transfer Custom Magnetics

Pick and place custom toroidal magnetic components  
From leaded toroids to pick and place components



Toroidal Transfer, the short time answer to your custom design with technology already qualified, without Non Recurrent Cost

1. Strong space and aerospace history
2. Better thermal dissipation than standard toroidal magnetics mounted on baseplate
3. Electrical design rules already validated for this technology
4. SMD or through hole up on request
5. Trays or tape and reel packaging.



The process tools have already been developed.  
The bill of material has been validated together with our design,  
and only pin assignment and windings for function required need to be defined.  
No additional manual operation is to be performed on the component. All the material used for  
TO and TT technology manufacturing is compliant with the space or aerospace requirements.

All these packages have been undergoing to EXXELIA test programs:

1. Thermal shock, life tests, overload ;
2. Vibration and shock tests.




Other casings available upon request.

## Technology characteristics

- Operating / storage temperature:  $-55^{\circ}\text{C} / +125^{\circ}\text{C}$
- Soldering temperature:  $260^{\circ}\text{C}$  (10s max)
- Burn-in:  $+125^{\circ}\text{C}$  (+0 /  $-3^{\circ}\text{C}$ ) during 168 h
- Life test:  $+125^{\circ}\text{C}$  (+0 /  $3^{\circ}\text{C}$ ) during 1000-2000 h
- Thermal shocks:  
25-100 cycles  $-55^{\circ}\text{C} / +125^{\circ}\text{C}$  with 15 min / stage
- Moisture resistance: > in accordance to MIL-STD-202 method 106
- Applied standards: ESCC 3201 generic specification for space products
- Withstand high shocks and vibrations

# TT and TO Toroidal

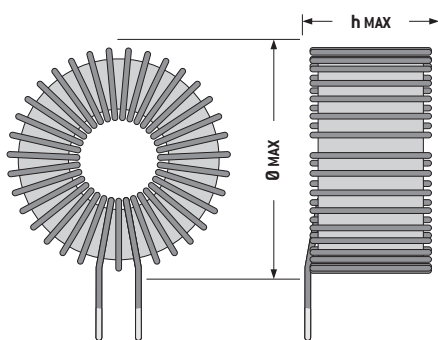
TO is  qualified detailed specifications ESCC 3201/012  
 TT to come soon

## Dimensions max. (mm) and characteristics

Platform	L	L2	H	e	X	Co x W x th	Pins	* Approx. Wound core dimensions (max) Ø x h
TO10	10.5	17.0	11.5	10.5	2.032	2.0 x 0.7 x 0.3	2 x 5 SMD	6.3 x 4.6
TO12	12.5	19.0	13.8	12.5	2.54	2.0 x 0.9 x 0.3	2 x 5 SMD	8.3 x 6.9
TO16	16.0	22.5	17.6	16.0	2.54	2.0 x 0.9 x 0.3	2 x 6 SMD	11.8 x 10.7
TO20	20.0	26.5	21.0	20.0	2.54	2.0 x 1.0 x 0.3	2 x 7 SMD	15.8 x 14.1
TO25	25.4	32.4	25.4	25.4	2.54	2.0 x 1.0 x 0.4	2 x 9 SMD	21.2 x 18.5
TO30	30.0	37.0	30.0	30.0	2.54	2.0 x 1.2 x 0.4	2 x 11 SMD	25.8 x 23.1
TO36	36.0	43.0	36.0	36.0	2.54	2.0 x 1.2 x 0.4	2 x 12 SMD	31.8 x 29.1
TT05	5.7	10.4	4.7	5.7	1.78	1.65 x 0.7 x 0.3	2 x 3 SMD	4.1 x 2.3
TT07	7.7	13.0	7.8	8.6	1.778	1.8 x 0.7 x 0.3	2 x 4 J/SMD	5.6 x 5.3
TT08	15.2	19.2	16.2	8.7	3.81	2.0 x 0.8 x 0.4	2 x 2 SMD/Through-Hole	13.8 x 6.3
TT09	9.8	16.3	7.8	9.8	1.27	1.5 x 0.4 x 0.2	2 x 6 SMD	6.9 x 4.7
TT12	12.3	14.5	7.2	12.3	2.54	1.25 x 0.8 x 0.4	2 x 4 SMD	9.35 x 4.9
TT14	14.3	20.5	12.8	14.3	3.175	2.5 x 1.2 x 0.8	2 x 4 SMD	11.3 x 8.9
TT17	17.4	27.0	15.8	17.4	3.81	2.0 x 1.2 x 0.8	2 x 4 SMD	14.2 x 11.6
TT19	20.1	23.8	14.3	19.3	3.81	1.8 x 2.0 x 0.35	2 x 4 SMD	16.3 x 11.1
TT20	20.5	26.5	14.8	20.5	2.286	2.5 x 0.8 x 0.4	2 x 8 SMD	16.5 x 11.1
TT25	25.2	28.1	13.8	25.2	2.54	1.3 x 0.9 x 0.3	2 x 8 SMD	21.8 x 10.2
TT26	25.2	26.8	26.8	25.2	3.81	0.9 x 0.4*	2 x 6 Through-Hole	21.8 x 23
TT29	29.3	29.3	19.0	29.3	5.08	1.2 x 0.8*	2 x 5 SMD Through-Hole	23.8 x 13.9

Other casings available upon request

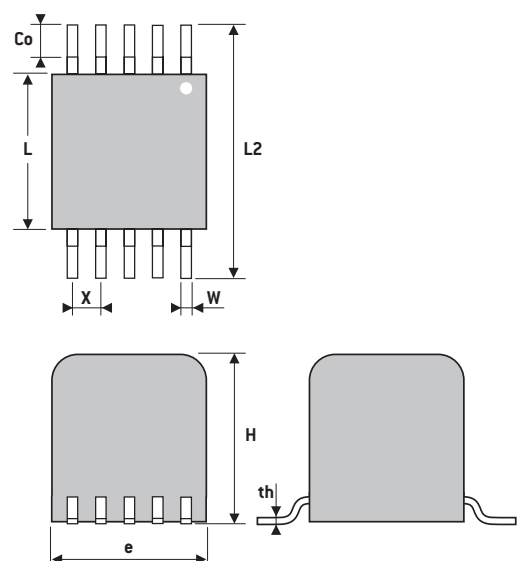
\* Approximative maximal dimension of customer wound toroid to integrate into TT or TO technologies.



Ø max. and h max.

Maximal dimension of customer wound toroid to integrated into TT or TO technologies.

## Typical Dimensions (mm)



# High Temperature Inductors and Transformers

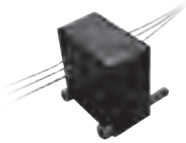

EXXELIA has a long heritage in manufacturing High Temperature (HT) products withstanding up to 230°C.

The expertise in design and technologies was primarily developed for down hole applications which require high temperature and mechanically

robust components. Products are withstanding high temperature, shocks and vibration.

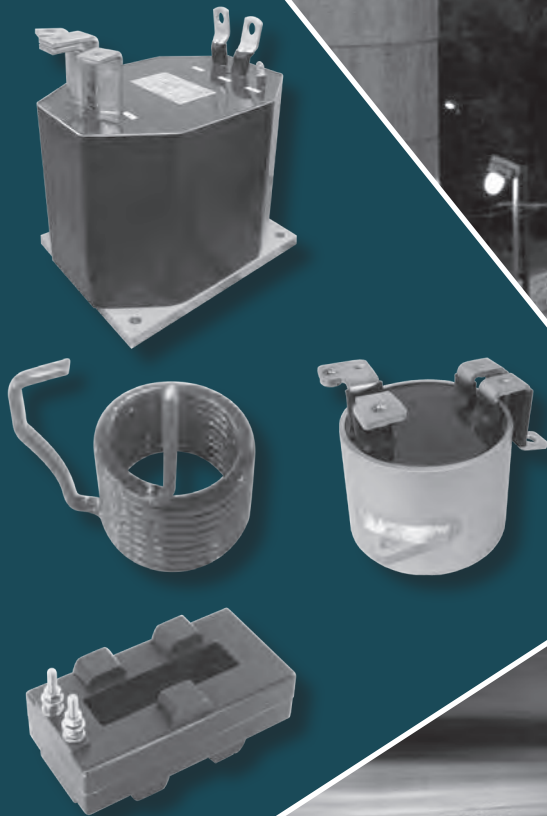
- Continuous Operating Temperature up to 230°C.

## Overview of High Temperature

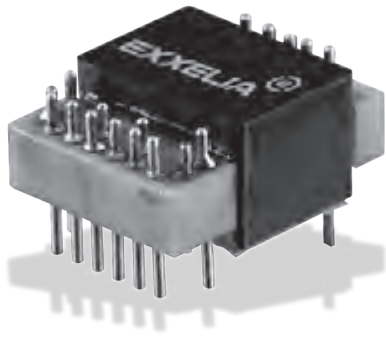
Models	Technology / Casing Platform	Applications	Operating Temperature Range (component temperature)	Examples of EXXELIA Heritage
	MPCI 233 MPCI 233 H01	RF Inductors Filtering inductors	-55°C +175°C	For details see page 40 and 56
	Toroidal Transfer Moulded	Inductors & Transformers	-55°C +200°C	Common Mode Choke 16 µH - 0.25 A, ...
	HT SESI	Inductors & Transformers	-55°C +175°C	Filtering Inductors: 2 mH - 0.125 A 100 µH - 1.1 A ... Gate Drive Transformer,
	Impregnated Bare Toroid	Inductors & Transformers	-40°C +200°C	Flyback up to 200 kHz with low iron losses, Forward, Current Sense Transformer, ...
	Potted Toroid	Inductors & Transformers	-40°C +200°C	Transformers, ...
	Metallic Bobbin	SMPS transformers	-40°C +190°C	Push Pull Transformers
	Ceramics -HTCC	Inductors & Transformers	-55°C +230°C	Flyback, Filtering inductors Benefits: No pollution: chloride and sulfur free
	Cut core technology	Inductors & Transformers	-40°C +175°C	50/60 Hz transformers, inductors 100 H - 25 mA, ...

# High Power Technologies

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# High-Grade Custom Planar Magnetics



## Electrical Data

Transformers and inductors designed and manufactured for all types of SMPS within these characteristics:

- Power rating : up to 10 kWatts
- Input voltage : 12 V<sub>DC</sub> to 240 –400 V<sub>DC</sub>
- Output voltage : 3 V<sub>DC</sub> to 60 V<sub>DC</sub>
- Frequency range : 50 kHz to 1 MHz
- Typical efficiency : 96 - 99 %
- Temperature range: –40°C to +125°C
- Dielectric strength : up to 4000 VRMS

## SMPS Topologies

- Transformers: Full-bridge, Half bridge, Push-pull, Forward, Flyback,
- Buck, Boost, output filtering inductors.

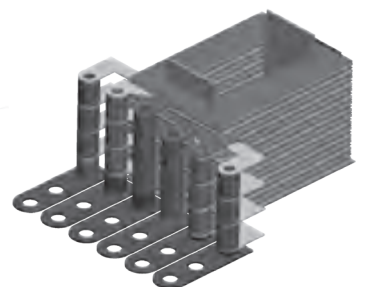
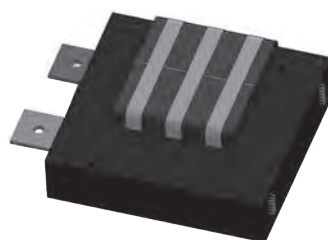
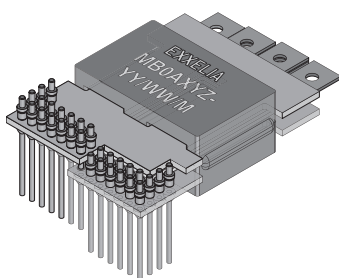
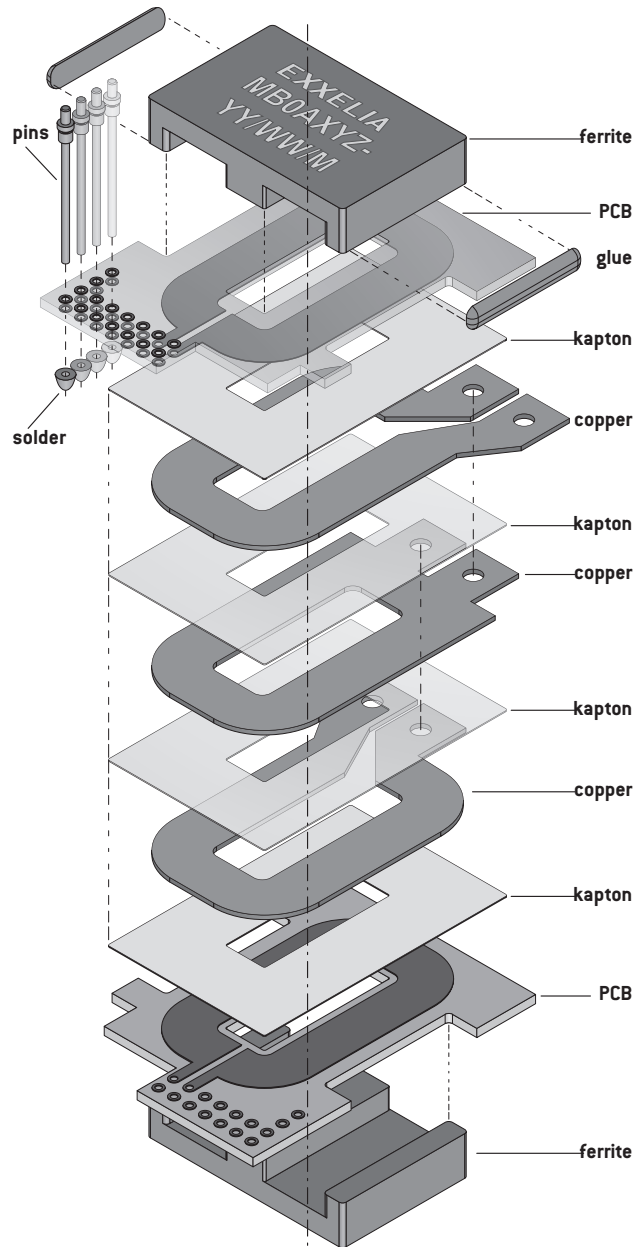
## Construction

- Electrical circuit : Flat copper foil or spirals
- Multi-layer : up to 24 layers
- Multi-PCB : up to 5 boards
- Insulation : Kapton® or Mylar®
- Planar Core : E14 to E64 [E-E combination] ferrite  
PLT14 to PLT64 [E-PLT combination] ferrite  
RM4 / ILP to RM14 / ILP
- Cooling : heatsink or thermal pad
- Overmolding : epoxy resin
- Mechanical fixture : molded inserts

## Mounting, Connections

Through-hole, SMD, strips for cable ties, eyelet sleeved leads.

- Low-profile construction
- Best repeatability of electric parameters
- Low leakage inductance
- Easy to cool with heatsink
- Multiple Topologies
- High efficiency and reliability
- High insulation between windings
- Excellent thermal characteristics
- Dimensional accuracy
- Customized pin positions



# Anodized Aluminium Foil Technologies

EXXELIA has developed competencies and set-up production means to design and manufacture medium power custom magnetic components with Aluminium or Copper Foil technologies.



## Key Benefits

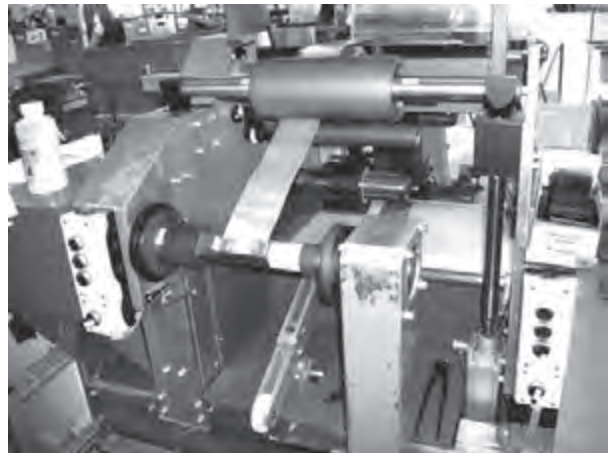
- Space savings
- Weight savings

Design and manufacture of:

- Interphase Inductance and twelve pulse transformers,
- filtering chokes up to 400 A
- Active or Passive Power Factor Correction chokes
- Power Transformers up to several kW for standard SMPS and specific architectures.

## Materials and processing

- Anodized aluminium foil winding
- Cold Press Welding
- Vacuum and Pressure Impregnation from 10 mbar up to 5 bar
- Soldering
- Connections
- Low weight
- No need for insulator, dielectric isolation between turns, up to 100 V
- Good heat transfer
- Quick processing
- High Electrical Insulation
- Mechanical strength
- Varnish withstanding up to 200°C
- High Mechanical strength
- Choice between several options:  
crimped nut, drilled copper bar, braid and lug



## Winding process

Material	EXXELIA Experience			Machine capability
	Thickness (mm)	Width (mm)	Section (mm <sup>2</sup> )	Section (mm <sup>2</sup> )
Anodized Copper foil	1	100	100	200



# Flat Helical Windings

## Key Benefits

- Custom shaping and connections
- Ideal for high current
- Good reproducibility

## Winding with several conductors

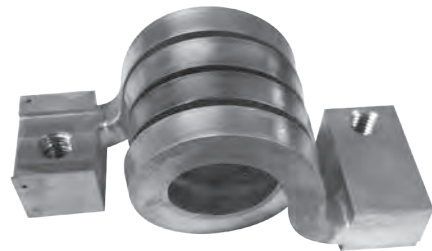
- Flat enamel copper wire with different thickness and width
- Copper conductors with rectangular section and without enamel
- Aluminium conductors with rectangular section and with or without enamel

## Examples

### Cylindrical



Enamel copper  
Section 4x2,5mm  
Diam 35mm, Ht 27mm without outputs



Copper without enamel  
Section 10x10 mm  
Diam 53mm, Ht 54mm without outputs

### Oval



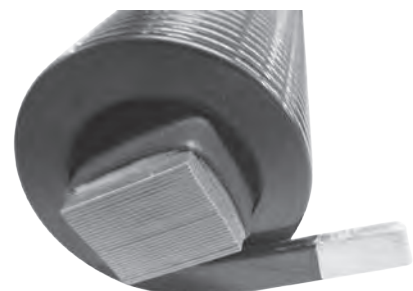
Enamel copper  
Section 9 x 1,8 mm  
50 x 110 x 65 mm



### Glued with the magnetic core



Enamel copper  
Section 8 x 2,5 mm  
Diam. 40 Lg 95 mm





# Shaped Ferrite assembly (inductors)

Allow to reduce the mass and volume of magnetic components for medium to high frequency. Different solutions for assembling U-shaped ferrites and E-shaped ferrites to meet the power requirements of transformers and filter chokes.



(1)

## Technical characteristics

Frequency	Up to 1 MHz
Power	Up to 300 kVA
Insulation class	Up to 240°C

## Examples of Inductors

Main current (A <sub>NC</sub> )	Inductance (μH)	AC Current (App)	Weight (kg)	L x W x H* (mm)	Specific features
270	5	3.6 Arms @ 16 kHz	1.5	90 x 70 x 95	Time operating: 10min/24h High Current
150	10	10 Apkpk @ 100 kHz	1.5	70 x 95 x 85	Smoothing inductor for smart battery control system (2)
145	20	20 Apkpk @ 40 kHz	3	65 x 150 x 105	Low temperature rise, thermal sensor (1)
-	180	10 Arms @ 600 Hz	1.4	65 x 67 x 75	Outputs with wire crimped lug, induction heating application
200	5	20 Arms @ 40 kHz	1.5	67 x 130 x 94	Bus bar, High Current
-	44	65 Arms @ 600 Hz	2	66 x 130 x 80	outputs with wire crimped lug, Linearity <2% induction heating application (3)
-	20 000	4 Arms @ 7 kHz	2.2	70 x 140 x 91	Time operating: 10%, Anti flash finish, submarine environment
80	110	8 Apkpk @ 100 kHz	3	70 x 150 x 75	High frequency ripple, Anti flash finish
60	600	6 Apkpk @ 20 kHz	10	225 x 150 x 160	Anti flash finish, marine environment
120	25	-	3	120 x 120 x 150	Anti flash finish, Bus bar Railway (4)
200	200	30 Ae <sub>eff</sub> @ 5 kHz	28	325 x 150 x 220	Anti flash finish, marine environment
5 Ae <sub>eff</sub> @ 3-10 kHz	50 000	-	8	260 x 150 x 150	Forced air cooling, Time operating: 10%. HT outputs on insulators. Sonar application (5)

\* L = Lengths - W = Width - H = Height

## Key Benefits

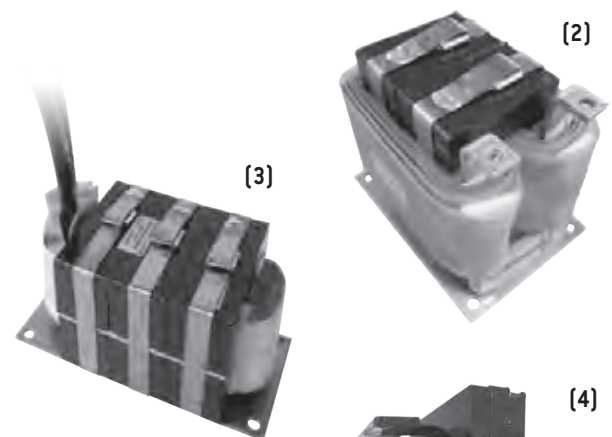
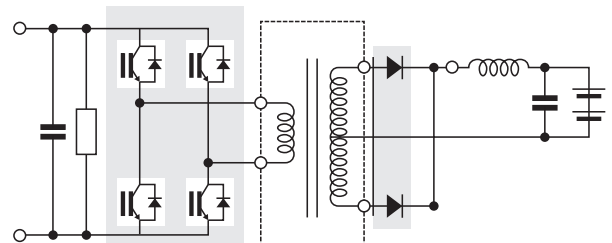
- Space and weight savings
- Easy to mount: turnkey solution including: winding + mechanics + multiple connections (isolator, bus bar, cable lug, terminal block, connector)

## Typical applications

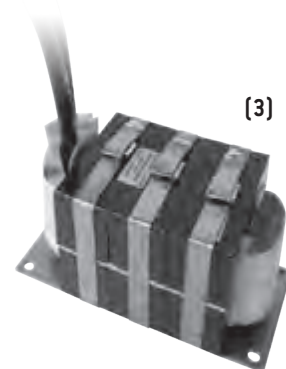
- SMPS: Full-bridge, Half Bridge, Push-pull, ...
- Test bench

## Electric schematic examples

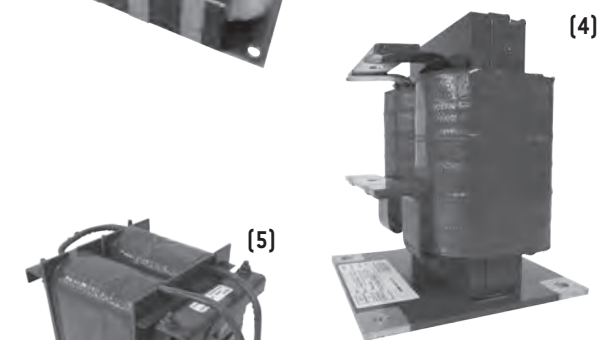
Full-bridge transformers with filtering inductor, ...



(2)



(3)



(4)



(5)

# Shaped Ferrite assembly (transformers)

Allows for the reduction of the mass and volume of magnetic components for medium to high-frequency. Different solutions for assembling U-shaped ferrites and E-shaped ferrites to meet power requirements of transformers and filter chokes.



## Technical characteristics

Frequency	Up to 1 MHz
Power	Up to 300 kVA
Insulation class	Up to 240°C

## Examples of Transformers

Power (kW)	Frequency (kHz)	Prim/sec voltage (V)	Weight (kg)	L x W x H* (mm)	Specific features
6	50	375/375	1.8	66 x 118 x 88	Electric vehicle application, Bus bar <b>[1]</b>
4	25	500/50	3	72 x 255 x 74	Outputs with wire crimped lug, UL product
12	25	400/200	6	95 x 200 x 125	Outputs with wire crimped lug, UL product <b>[2]</b>
3 x 9	20	180/45	5	150 x 430 x 160	Thermal switch, Assembly of 3 transformers
5	20	100/800	4	150x430x160	Half Bridge application, standing assembly <b>[3]</b>
18	2.7 7.5	125/2500	11	267 x 150 x 180	Variable frequency sine. Time operating: 10%. Hood. Outputs on isolators and connectors <b>[4]</b>
30	25	350 2 x 750	12	254 x 125 x 200	Outputs on wire with lug, Research center for HV Power Electronic <b>[5]</b>
60	12	450/740	23	250 x 220 x 275	Forced air cooling, Time operating: 80%, Railway
66	20	2500/750	70	245 x 200 x 410	High-voltage. Partial discharge withstand. Insulation at 40kV. Advanced electric vehicle charging station
100	20	540 2 x 360	35	260 x 350 x 410	Outputs on isolators Lifting ring Research center for particle accelerator <b>[6]</b>
150	20	3 x 540 3 x 540	36	450 x 190 x 430	HF Three-phase. Research center for energy conversion

\* L = Lengths – W = Width – H = Height

## Key Benefits

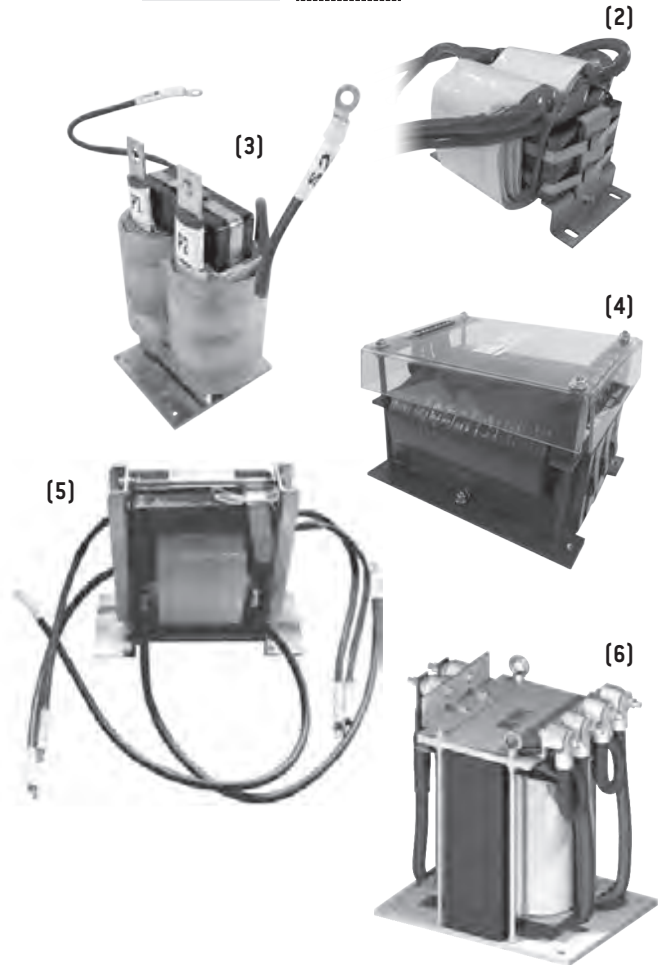
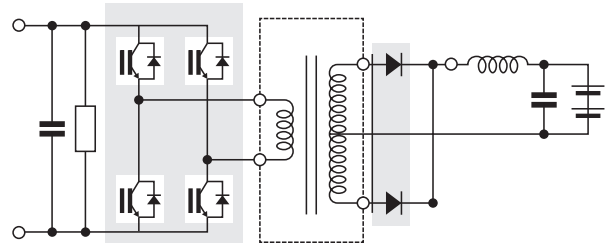
- Space and weight savings
- Easy to mount: turnkey solution including: winding + mechanics + multiple connections (isolator, bus bar, cable lug, terminal block, connector)

## Typical applications

- SMPS: Full-bridge, Half Bridge, Push-pull, ...
- Test bench

## Electric schematic examples

Full-bridge transformers with filtering inductor, ...

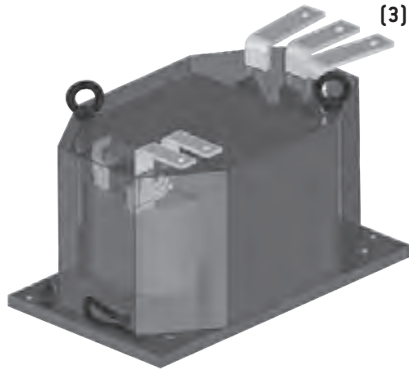


# Overmolded Shaped Ferrite Assembly

Ferrite cores assembly, can be overmolded with or without casin. This technology for power components fits to electrical, thermal, environmental and mechanical requirements: dissipation, humidity, salt mist, conductive dust, shock, vibrations and insulation. This technology is a perfect fit for embedded products and Railway applications (Battery chargers, ...).

## Key Benefits

- Longer life (low partial discharges level)
- Resistance to harsh environment
- Volume saving due to thermal dissipation improvement



## Technical characteristics

Molding	Epoxy, Polyurethane, Silicone
Standards	Fire and smoke requirements (EN45545, ...) <ul style="list-style-type: none"> <li>UL</li> <li>Shock and Vibration</li> <li>Temperature &amp; Changes</li> <li>Protection rating IP</li> <li>Relative humidity</li> <li>Environmental and salt mist test</li> </ul>

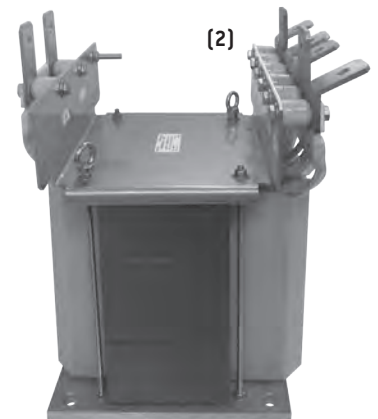
## Example of Inductor

Main current (A <sub>DC</sub> )	Inductance (μH)	AC Current (A <sub>pp</sub> )	Weight (kg)	L x W x H* (mm)
316	30	90A pkpk @12 kHz	18	160 x 180 x 320

## Examples of Transformers

Power (kVA)	Frequency (kHz)	Voltage (In out ,V)	Weight (kg)	L x W x H* (mm)
50	10	336/224	22	220 x 200 x 175 <b>(1)</b>
60	6	500-650 100-130	47	245 x 200 x 410 <b>(2)</b>
60	10	285/128	28	250 x 200 x 185
70	7.8	540/2 x 380	30	290 x 230 x 220
90	10	500-650/125	32	340 x 200 x 175 <b>(3)</b>

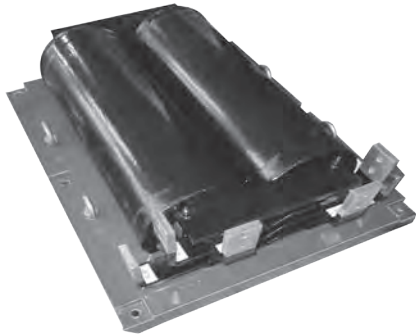
\* L = Lengths – W = Width – H = Height



HIGH POWER TECHNOLOGY

# Nanocrystalline Toroidal Cores Assembly

Nanocrystalline toroidal cores assembly technology is partially molded with baseplate for power Common Mode Chokes and Output Filtering Inductors. This design is characterized by its extreme reliability due to its magnetic circuit, chosen to guarantee a stable inductance value across the temperature range -40°C to +150°C.



## Key Benefits

- Volume and weight savings vs ferrites and silicon iron cores
- Stability of inductance across the temperature range -40°C to 150°C
- Very low losses

## Technical characteristics

Materials meet UL V0 rating	
Frequency	Up to 10 MHz
Insulation class	Up to 200°C
DC current	Up to 500 A
Molding	Epoxy, Polyurethane

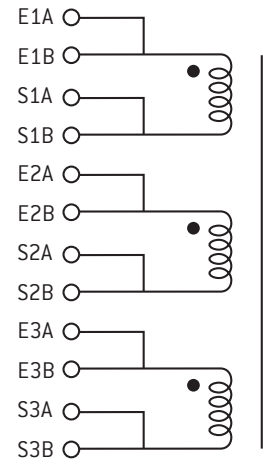
## Examples of Inductors

Functionality	Inductance (mH)	Current (A)	Common mode Current	Weight (kg)	L x W x H* (mm)
CMC	2 x 0,55	110	-	3	205 x 140 x 80 (1)
CMC	3 x 11 to 22	290/1.8 mΩ to 145/3 mΩ	-	25 to 32	350 x 350 x 140
CMC	3 x 5,5	508/0.15 mΩ	2.7 ApK (9 kHz)	52	520 x 360 x 210 (2)

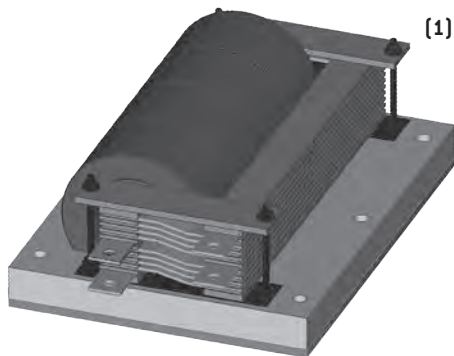
\* L = Lengths - W = Width - H = Height

## Electric schematic example

Common Mode Chokes (CMC)

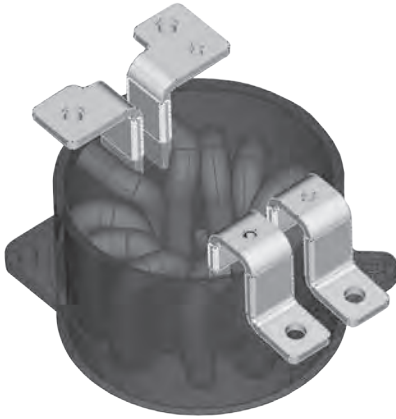


## Other design examples



# Overmolded Nanocrystalline Toroids

Overmolded Nanocrystalline toroid in an aluminium casing with fixed lugs for power common mode chokes and inductors. Ideal for embedded application: Marine, Aeronautics, VTOL, Automotive. Capabilities to integrate filtering capacitors inside.



## Key Benefits

- Easy to mount: turnkey solution including: winding + mechanics + multiple connections ( bus bar, cable lug, terminal block, connector)
- Volume and weight savings vs ferrites and silicon iron cores
- Stability of inductance across the temperature range -40°C to 150°C
- Very low losses

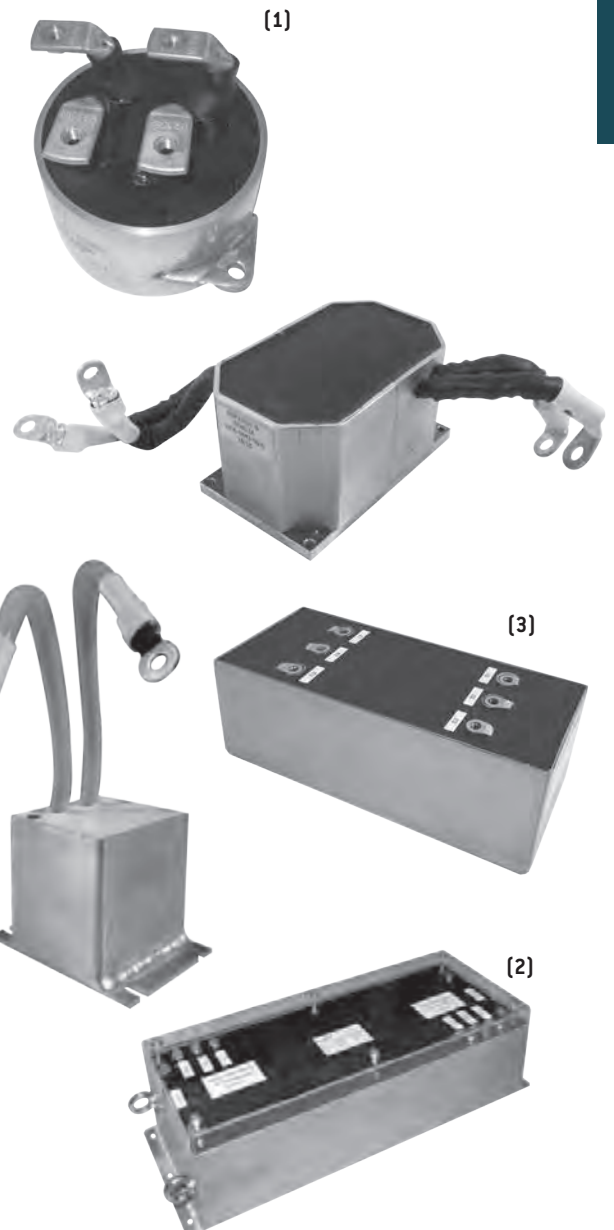
## Technical characteristics

Frequency	Up to 10 MHz
Insulation class	Up to 200°C
Molding	Epoxy, Polyurethane

## Examples of Inductors

Functionality	Inductance	Current (A)	Harmonic	Com. mode current	Weight (kg)	L x W x H* (mm)	Specific features
CMC	2 x 330 μH	125	0,8 A @ 10 kHz 0,1 A @ 100 kHz	-	1	Ø90 x H71	High current, automotive application [1]
DMC	350 μH	40	12 Apk @ 32 kHz	-	3	Ø95 x H92	Full-bridge converter application, marine environment
CMC	2 x 5 mH	70	-	-	1.5	100 x 100 x 62	High current, marine environment for engine room
DMC	2 x 1.5 μH	100	-	-	0.7	80 x 80 x 45	Filtering for civil aviation application
CMC	3 x 200 mH	48	-	0.2 A @ 10 kHz	25	150 x 520 x 155	Filtering integrated with capacitors, Sonar application [2]
CMC	3 x 30 mH	67.6 A @ 60Hz/16s +9 A @ 60Hz/112s	-	0.06 A @ 9 kHz	6.4	90 x 230 x 100	Short time operating, Sonar application [3]

\* L = Lengths - W = Width - H = Height



HIGH POWER TECHNOLOGY

# C-Cores Assemblies (inductors)

C-Cores assembly, for power applications... This technology applies to harsh environment, vibration and isolation requirements.



## Technical characteristics

Frequency	Up to several kHz
Insulation class	Up to 240°C
Molding	Epoxy, Polyurethane

## Examples of Inductors

Current (A)	Frequency (Hz)	Inductance	AC Current (App)	Material	Weight (kg)	L x W x H* (mm)	Specific features
5	400	600 μH	4 Apkpk @ 32 kHz	–	260g	60 x 40 x 30	Cold plate mounting [2]
2	400	4.8 mH	–	–	200g	50 x 40 x 30	Interphase inductor for civil aviation [3]
11	50-60	3 x 1 mH	0,8 A @ 20 kHz	Tri FeSi	2	100 x 74 x 80	Air forced cooling, Components UL, Antiflash finish
240	400	3 x 13 μH	60 A @ 8 kHz	Amorphous	4	160 x 150 x 65	High current
100	400	2 x 6 mH	–	Fe Co	5.5	200 x 180 x 80	
140	500	200 μH	28 Apk @ 500 Hz	Fe Si	7	150 x 132 x 175	Molded Smoothing choke, marine environment for engine room
90	50	3 x 90 μH	8.5 A @ 15 kHz	Amorphous	8	190 x 175 x 75	Waterproof for railway rollingstock
12	300	3 x 20 mH	0.25 A @ 10 kHz	Tri FeSi	13	263 x 108 x 182	Antiflash finish [1]
115	50-60	3 x 0.25 mH	19 A @ 24 kHz	Tri FeSi	46	410 x 135 x 300	Antiflash finish, Marine environment for engine room

\* L = Lengths – W = Width – H = Height

## Key Benefits

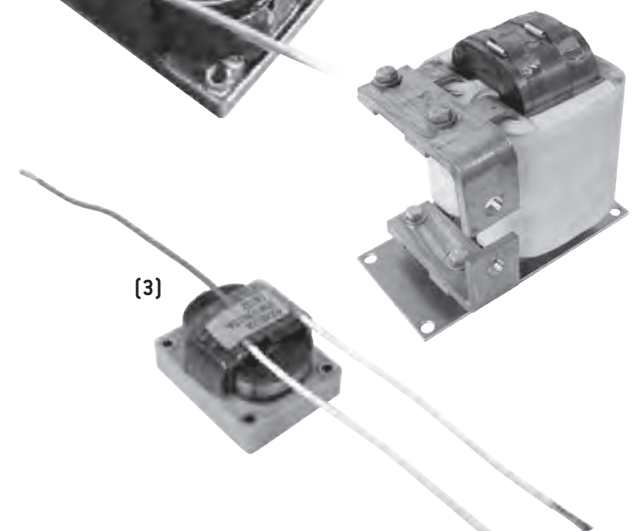
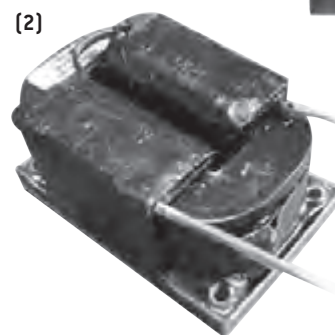
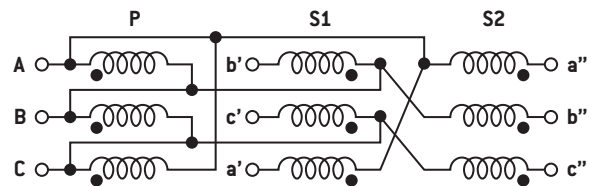
- Low losses

## Typical application

- Filtering inductors, interphase inductors...

## Electric schematic examples

Autotransformer 12 pulses:



# C-Cores Assemblies (transformers)

C-Cores assembly, for power applications... This technology applies to harsh environment, vibration and isolation requirements.



## Key Benefits

- Low losses

## Typical application

- Filtering inductors, interphase inductors, autotransformers, multi-pulse transformers...

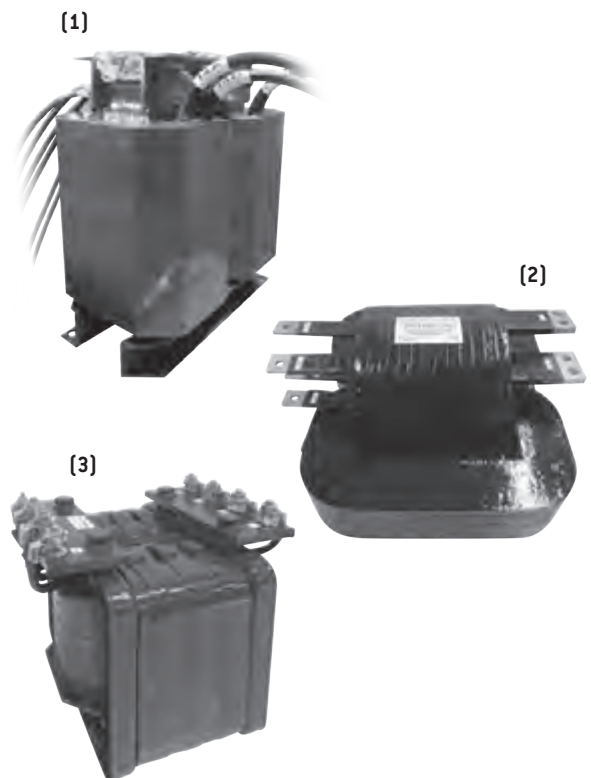
## Technical characteristics

Frequency	Up to several kHz
Insulation class	Up to 240°C
Molding	Epoxy, Polyurethane

## Examples of Transformers

Power (kVA)	Frequency (Hz)	Voltage (In out ,V)	Output current (A)	Material	Weight (kg)	L x W x H* (mm)	Specific features
80	1500	480/48	80/120	Amorphous	153	260 x 400 x 470	Molded Coils, Anti flash finish, Railway application <b>(1)</b>
15	50	100/10	1500	FeSi	140	420 x 305 x 385	High Current, Anti flash finish, <b>(2)</b>
5	400	3 x 360 3 x 96	30	FeSi	3	100 x 80 x 100	Autotransfo. 12 pulses, molded for cooling and mechanical fixture, aviation application
2,5	2000	2 x 75/170	14.7	FeSi	9	152 x 131 x 163	Anti flash finish, energy application <b>(3)</b>
2	400	3 x 200 3 x 400	3	FeSi	2.5	125 x 70 x 90	Autotransformer 12 pulses, military aviation application

\* L = Lengths – W = Width – H = Height



# EI, U,... Lamination assemblies

Different solutions for assembling EI & UI SiFe laminated to meet the power requirements for transformers and chokes. Possibility of integrating filtering.



## Technical characteristics

Frequency	16 Hz 2/3 50 Hz - Up to 5 kHz
Power	Up to 200 kVA
Insulation class	Up to 200°C
Weight	Up to 500 kg

## Examples of Inductors

Main current (A <sub>DC</sub> )	Inductance (μH)	AC Current (App)	Weight (kg)	L x W x H* (mm)	Specific features
155	2 x 27μH 2 x Diff. mode choke	30 Apk @ 400 Hz	7.4	150 x 128 x 125	marine environment, differential with 2 branches [1]
7.5	10 mH	7,5 A @ 100 Hz	21	245 x 140 x 185	Resonant inductor for railway application
75	3 x 450 μH	6 A @ 5,5 kHz	23	270 x 160 x 240	Molded Coils, high resistance to conductive pollution, Railway application
174	2 mH	80 A @ 3 kHz	75	380 x 240 x 300	Salt mist [2]

## Examples of Transformers

Power (kW)	Frequency (Hz)	Prim/sec voltage (V)	Weight (kg)	L x W x H* (mm)	Specific features
6	50	3 x 400 3 x 60.6	53	300 x 170 x 270	Protective cover, anti flash finition, railway application [4]
25	60	158/235	150	320 x 240 x 480	Stainless steel mechanical assembly, marine environment [3]
22	50	3 x 400 3 x 376	210	740 x 530 x 430	Integrated filter, controlled noise, auxiliary power supply of railway cars [5]
115	50	3 x 1458 3 x 400	520	594 x 407 x 1025	three phase inverter output transformer with intergrated inductor for railway, Air forced ventilation

\* L = Lengths - W = Width - H = Height

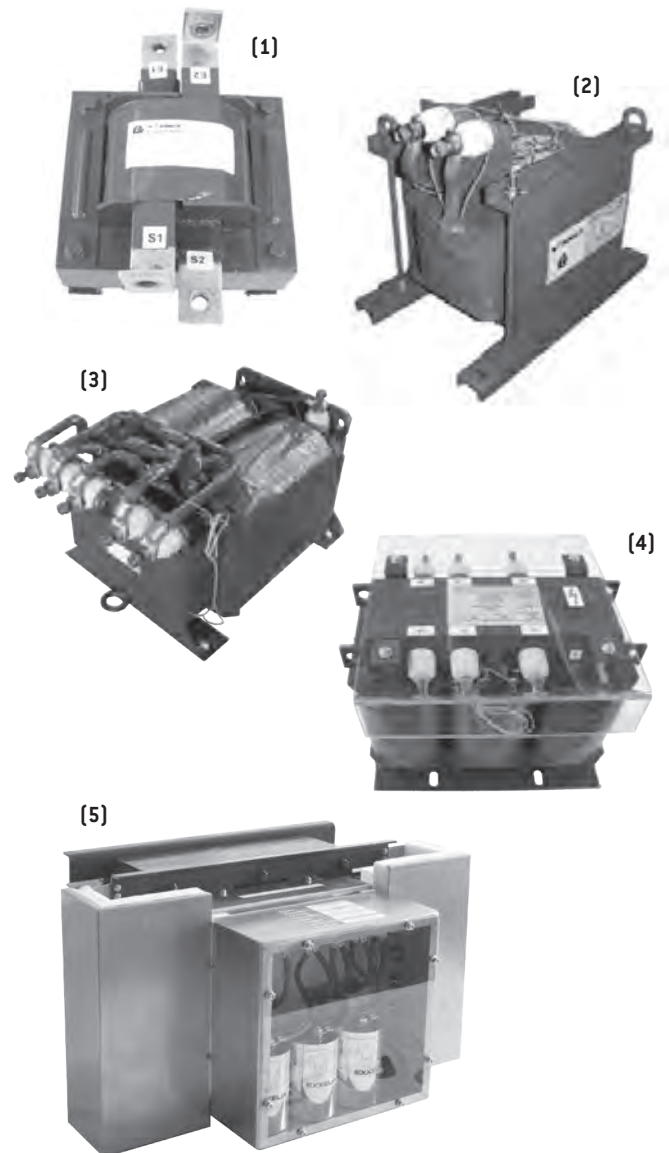
## Key Benefits

- Optimized design to cost: copper or aluminum conductor (Weight vs Cost)
- Easy to mount: turnkey solution including: winding + mechanics + multiple connections ( bus bar, cable lug, terminal block, connector)

## Technologies

- Connection through isolators, bus bar,...
- Vacuum Impregnations
- Anti flash finish
- Overmolding
- Water cooling
- Air forced cooling
- Integrated filter

## Other design examples





# Water Cooling

Volume and weight reduction, and improved heat dissipation using direct and indirect fluid cooling, or cold plate.

- + Flow measurements
- + Waterproof test until pressure 12 Bars

## Key Benefits

- Volume and weight savings thanks thermal dissipation improvement

## Example direct water cooling

The pipe of cooling is the conductor Overmolded or not part



### Material

Copper Tubing winding  
SiFe Lamination

Inductor	L1+L2 = 1,5 mH
Nominal current	220 Adc
Frequency	300 Hz
Dimensions L x W x H (mm)	400 x 260 x 400
Weight	55 kg

## Example direct water cooling

The pipe of cooling is the conductor Overmolded or not part



### Material

Copper Tubing winding  
Ferrite U126 Core

Power	532.8 kVA
Primary	1200 Veff
Secondary	1200 Veff
Frequency	25 kHz –40 kHz
Dimensions L x W x H (mm)	350 x 260 x 440
Weight	70 kg

## Example indirect water cooling

The pipe of cooling is around the conductor and the magnetic core



### Material

Flat enamel wires  
Amorphous core

Inductor	160 μH
Nominal current	220 Adc @ 60 Hz
Frequency	35 App @ 12 kHz
Dimensions L x W x H (mm)	250 x 255 x 225
Weight	33 kg

\* L = Lengths –W = Width –H = Height

## Example cold plate

The overmolded part is cooled by the plate below



### Material

Cu Band Winding  
Amorphous core

Inductor	2 x 180 μH
Nominal current	265 Adc
Peak current	51 App
Frequency	12 kHz
Dimensions L x W x H (mm)	160 x 400 x 340
Weight	48 kg

# Sensor: Current transformers

Current transformer for measurement or circuit protection. Current measurement via the transformation ratio

## Technical characteristics

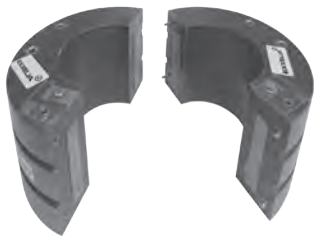
Primary Current	Up to 30 kA
Frequency	16 Hz <sup>2/3</sup> - 50 Hz - 400 Hz –up to 800 Hz
Power	Up to 500 VA
Accuracy class	Down to 0.2%
Insulation class	Up to 240°C
Resin	Molded or not The molding protects against the external environment
Mountability	Openable or not

## Key Benefits

- High Accuracy down to 0.2%
- Easy to install when openable
- Reliability

**+** Electrical tool for current transformer testing, calibration and assessment:  
Automatic measurement of all current transformer parameters and comparison of results with the selected standards.

## Example of openable transformer



Power	10 VA
Primary	320 A
Secondary	Ratio Is/Ip: 1/100
Dimensions (mm)	Ø150 x H200
Weight	10 kg

## Example of transformer with waterproof terminals



Power	2 x 2.5 VA
Primary	300 A
Secondary 1	1 A class 5P5
Secondary 2	0.5 A FS10
Weight	16 kg

## Example of transformer with rectangular primary



Frequency	50 Hz
Secondary	Ratio Is/Ip: 1/100
Class	F
Accuracy	5%
Dimensions L x W x H (mm)	55 x 80 x 160
Weight	1.2 kg

## Example of small CT for aircraft



Power	0.05 W
Primary	173 Aeff
Secondary 1	0.23 Aeff
Frequency	350 to 720 Hz
Class	H
Accuracy	1%
Dimensions (mm)	Ø36 x H10
Weight	14 g

\* L = Lengths –W = Width –H = Height

# Sensor: Voltage transformers

Voltage transformer measurement for single phase and multiphase transformers. Voltage measurement via transformation ratio.

## Technical characteristics

Frequency	16 Hz <sup>2/3</sup> - 50 Hz - 400 Hz –up to 800 Hz
Power	Up to 500 VA
Accuracy class	Down to 0.2%
Insulation class	Up to 240°C
Resin	Molded or not. The molding protects against the external environment

## Key Benefits

- High Accuracy down to 0.2%
- Reliability

**+** Electrical tool with high accuracy for measurement phase shift and amplitude

## Example of overmolded transformer with casing



Frequency	50 Hz
Primary	100 V
Secondary	5 V
Accuracy	0.2%
Weight	0.43 kg

## Example of molded transformer for railway



Frequency	50 Hz
Primary	100 V
Secondary	100 V
Accuracy	0.5%
Weight	1.85 kg

## Example of three phase measurement transformer



Frequency	50 Hz
Primary	3 x 495 V
Secondary	3 x 13.5 V
Accuracy	1%
Weight	12 kg

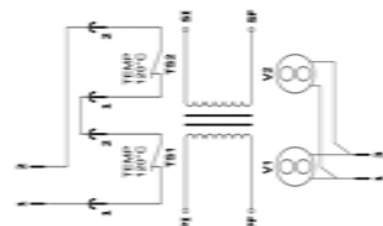
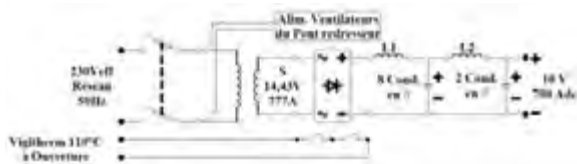
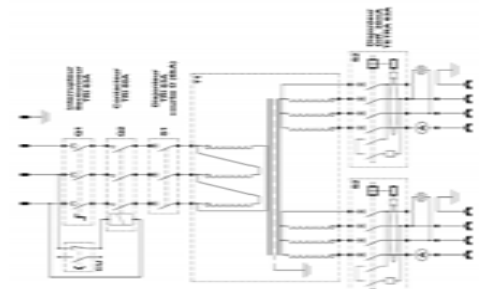
# Integrated subassemblies

## Examples

Power (kW)	Frequency (Hz)	Prim/sec voltage (V)	Weight (kg)	L x W x H* (mm)	Specific features
2 x 125	4000	500 V 940 V	190	1132 x 348 x 500 F11044	Forced ventilation, shock and vibration, embedded product for railway application
40	50	3 x 400 3 x 230	255	677 x 813 x 860 F11300	IP65, differential protection, circuit breaker, galvanometer
7	50	230 V 10 V	300	800 x 900 x 1436 F11297	DC power supply, LC double filtering

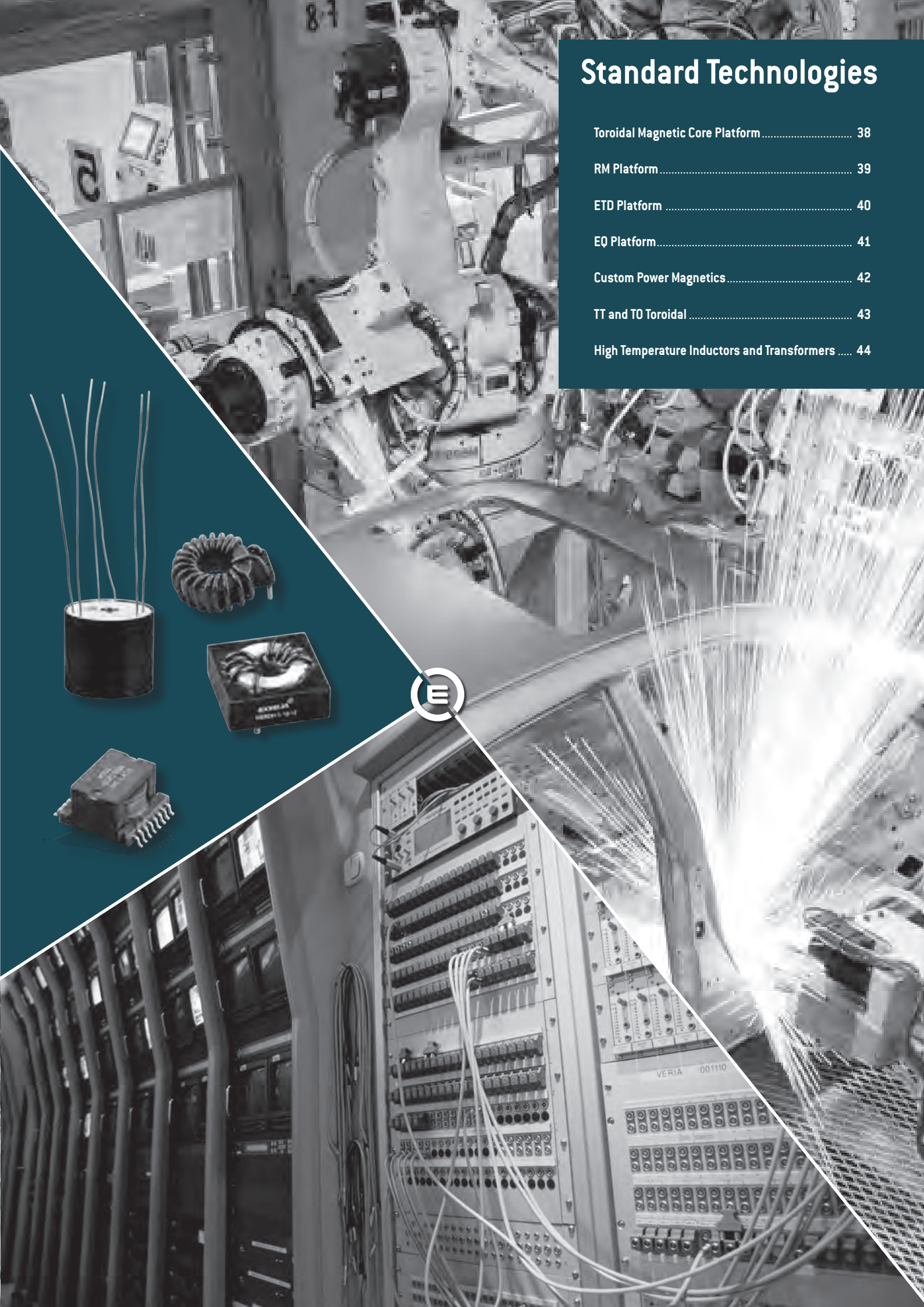
## Turnkey solution with product integrated

- Easy to install
- Protection rating IP up to IP65
- Air cooling
- Electrical protections for safety
- Filtering



# Standard Technologies

Toroidal Magnetic Core Platform .....	38
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# Toroidal Magnetic Core Platform



Toroidal magnetic core primary purpose is power conversion in electronic applications as inductors, common modes chokes, power transformers, current or voltage measurement transformers, gate drive transformers, ...

There are three types of soft magnetic cores: powder cores, ferrite cores, and tape wound cores.

## Powder Core:

- Distributed air gap cores with high resistivity, low hysteresis and eddy current losses, excellent inductance stability DC and AC current
- Primarily used in power inductor applications, differential inductors, boost inductors, buck inductors, and flyback transformers.
- Main materials used: Molypermalloy (MPP), High Flux, Kool M $\mu$ <sup>®</sup>,...

## Ferrite cores:

- Low losses at high frequencies,
- Low cost and wide variety of available shapes and sizes
- Extensively used in switched-mode power supply (SMPS) and radio frequency (RF) transformers, inductors and common mode chokes.
- Uncoated, epoxy or parylene coated
- All available materials are used

## Tape wound cores

- Higher B (saturation flux density)
- Design can be smaller
- Primarily used for common-mode chokes, current measurement transformers, power transformer,...
- Materials: nickel-iron alloys, grain oriented silicon steel, amorphous materials or nanocrystalline,...

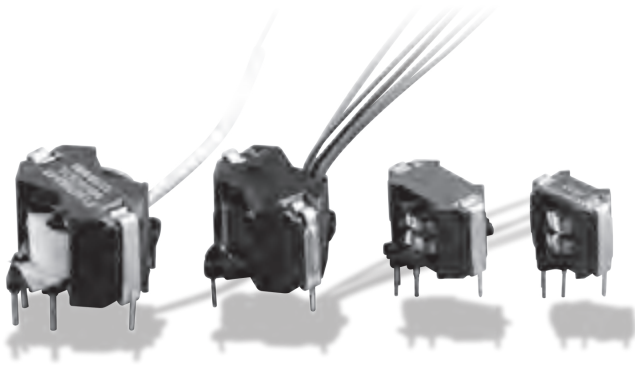
## Mounting and packaging technologies

- Header for positioning the direct connection winding to the PCB.
- Horizontal or vertical toroid mount with terminal as an intermediate connection to the PCB
- Molded casing with direct connection through the casing to the PCB
- Leaded molded casing with blind rivet nuts, brass inserts or hexagonal threaded spacers.
- Custom high temperature technology
- Under pressure and vacuum varnish impregnation



# RM Platform

Based on standard RM magnetic cores, EXXELIA manufactures a full range of built-to- print or custom design products



- Compact and well suited for PCB mounting
- They are used as filters in resonant circuits, as interface and matching transformers, as power transformers and inductors in SMP power supplies
- Possible terminations: SMD, Through Hole, on plate..
- Meet Solderability test MIL STD-202 Method 208
- RoHS by default, non RoHS upon request
- Compatible with Vigon cleaning
- Typical Operating Temperature  $-40^{\circ}\text{C}$   $+100^{\circ}\text{C}$  ( $-55^{\circ}\text{C}$   $+125^{\circ}\text{C}$  upon request)

## Indicative Electrical Data (25°C)

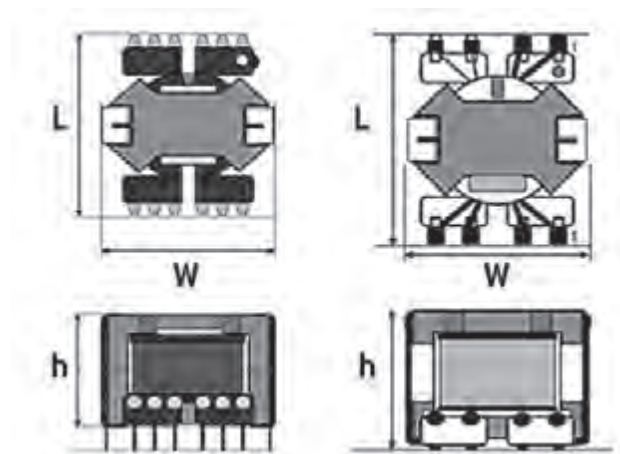
Examples	Inductor Range ( $I_{DC}$ +20% ripple)	Transformer for SMPS*
RM4	17mH/50mA $\Rightarrow$ 5 $\mu$ H/4A	Up to 12W
RM5	60mH / 40mA $\Rightarrow$ 8 $\mu$ H / 4A	Up to 25W
RM6	300mH / 20mA $\Rightarrow$ 5 $\mu$ H / 6A	Up to 35W
RM8	500mH / 30mA $\Rightarrow$ 5 $\mu$ H / 10A	Up to 45W
RM10	900mH / 30mA $\Rightarrow$ 10 $\mu$ H / 12A	Up to 60W
RM12	2H / 30mA $\Rightarrow$ 15 $\mu$ H / 16A	Up to 100W
RM14	7H / 20mA $\Rightarrow$ 20 $\mu$ H / 20A	Up to 150W

\* Based on a push pull architecture, at  $f = 200\text{kHz}$  @85°C without cooling

## Some Typical Dimensions (mm)

Examples	TH			SMD		
	W* max (mm)	h max (mm)	L max (mm)	W* max (mm)	h max (mm)	L max (mm)
RM4	11	10.5	15			
RM5	14.9	10.5	17	14.9	11.1	18.9
RM6	17.9	12.5	25	17.9	13.2	21.5
RM8	23.2	16.5	30.5			
RM10	28.5	18.7	41			
RM12	37.4	24.6	45.2			
RM14	42.2	30.2	48.4			

\* Without clamp (+2 mm if clamps)



# ETD Platform



- E cores have the advantages of easy winding, easy assembly, compactness and wide opening on each side
- ETD cores have the additional benefit of an almost constant cross section along the magnetic path
- ETD cores are suitable for designing transformers in forward and push-pull SMPS.
- Typical Operating Temperature  $-40^{\circ}\text{C} + 100^{\circ}\text{C}$   
( $-55^{\circ}\text{C} + 125^{\circ}\text{C}$  upon request)

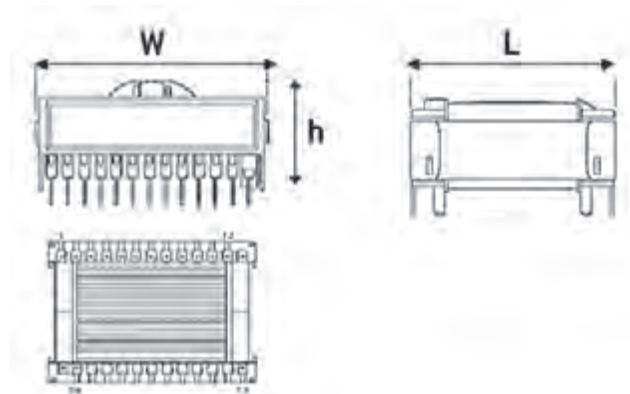
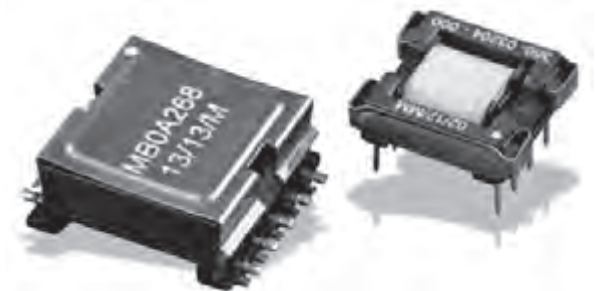
## Indicative Electrical Data

Examples	Transformer for SMPS*
ETD 29	Up to 65W
ETD 44	Up to 150W
ETD 59	Up to 450W

\* Based on a push pull architecture, at  $f = 200\text{kHz}$  @  $85^{\circ}\text{C}$  without cooling

## Some Typical Dimensions (mm)

Examples	W max (mm)	h max (mm)	L max (mm)
ETD 29	35.5	25.5	35.5
ETD 44	49.6	38.1	52.2
ETD 59	66.9	49.4	66.4



# EFD Platform

- EFD cores with their optimized cross section are used to design compact transformers for DC-DC converters, isolation and pulse application
- Meet solderability test MIL STD-202 Method 208
- RoHS by default, non RoHS upon request
- Surface Mount or Through Hole package
- Operating temperature  $-55^{\circ}\text{C} + 125^{\circ}\text{C}$

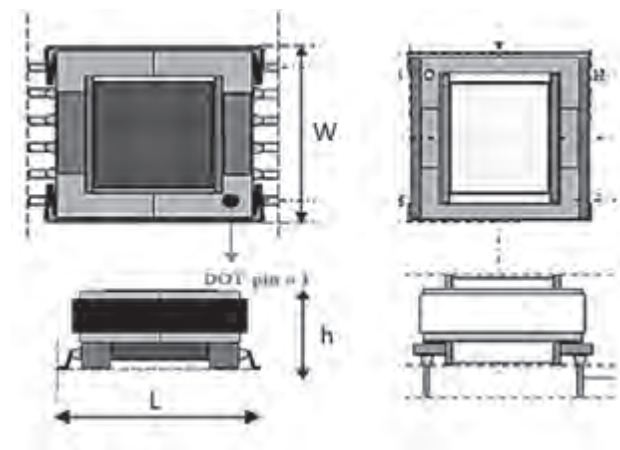
## Indicative Electrical Data

Examples	Transformer for SMPS*
EFD 15	Up to 20W
EFD 20	Up to 40W
EFD 25	Up to 60W
EFD 30	Up to 100W

\* Based on a fly-back architecture, at  $f = 200\text{kHz}$  @  $85^{\circ}\text{C}$  without cooling

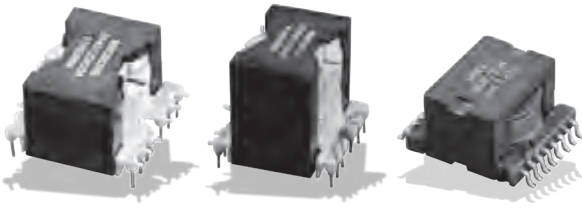
## Some Typical Dimensions (mm)

Examples	W max (mm)	h max (mm)	L max (mm)
EFD 15 SMD	16.7	9.3	23
EFD 20 SMD	21.8	12.5	28
EFD 25 SMD	30	14	32
EFD 30 SMD	32	17	34





# EQ Platform



- Compact package
- They are used as power transformers in SMP power supplies
- Solderability MIL STD-202 Method 208
- Typical Operating Temperature  $-40^{\circ}\text{C} + 100^{\circ}\text{C}$  ( $-55^{\circ}\text{C} + 125^{\circ}\text{C}$  upon request)
- Surface Mount Device (SMD)

## Indicative Electrical Data (25°C)

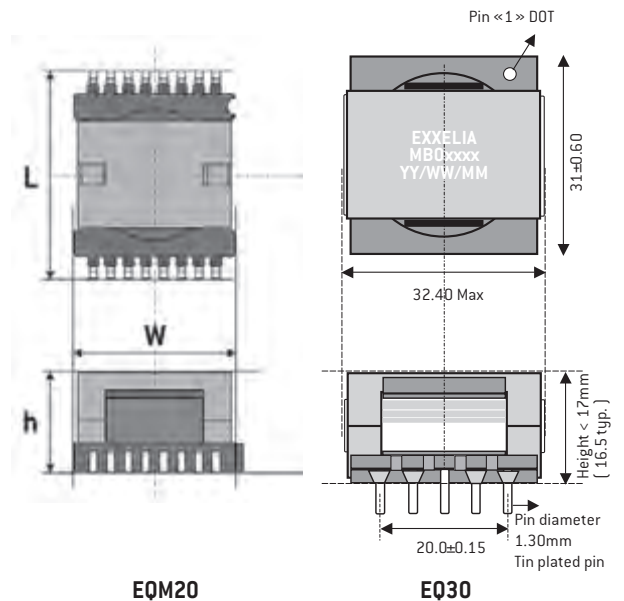
Examples	Inductor Range ( $I_{DC} + 20\%$ ripple)	Transformer for SMPS*	Operating temperature
EQM20	175mH/30mA to 2.5 $\mu$ H/20A	Up to 100W	$-55^{\circ}\text{C} + 125^{\circ}\text{C}$
EQ30		Up to 130W	$-40^{\circ}\text{C} + 100^{\circ}\text{C}$

\* Based on a push pull architecture, at  $f = 200\text{ kHz}$  @  $85^{\circ}\text{C}$  without cooling

## Some Typical Dimensions (mm)

Examples	W max (mm)	h max (mm)	L max (mm)
EQM20	21.2	13.5	27.5
EQ30	32.4	17	31.6

These are only examples. EXXELIA has design know how and manufacturing capabilities for other EFD, EQ but also EP, PQ and ER packages.



STANDARD TECHNOLOGIES

## ER and EP Platform

These are only examples. EXXELIA has design know how and manufacturing capabilities for other but also EP and ER platforms.



# Custom Power Magnetics

EXXELIA design optimized powerful magnetics for a wide range of applications:

- All designs up to 10 kV<sub>A</sub>
- All designs up to 1 kHz
- All designs up to 500 A peak



220A

96A

74A

46A

EXXELIA manufacture custom power magnetics using all materials and available technologies:

- Copper wire, flat, foil
- EI, EE, UI and C-cores



# High-Grade Products

## Miniature Chip Inductors

MPCI /MSCI Series .....	44 to 49
MPCI H01 Series - Fixed .....	50
MSCI H01 Series - Fixed .....	51
MPCI 233 Series - High Temperature .....	52
MPCI 233 H01 Series - Fixed .....	53

## Wide Band RF Transformers

WRFT 4x Series .....	54
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## Common Mode Choke

HCESC Series .....	55
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## Data Line EMI Filters

DLEF 42 Series .....	56
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## Line-Matching Transformers

MTLM 1234 MIL .....	57
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## MIL-STD 1553 Interface Transformers

DBIT Series .....	58 to 64
SBIT Series .....	65 to 66

Ethernet Transformer 2 ways digital box .....	67
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## SMD Power Inductors

ESI Series .....	68 to 69
CCM Series - High Reliability .....	70 to 74
Custom SMPS Transformers - CCM Technology .....	75
SESI Series - High Reliability .....	77 to 85
HTSE Series - High Temperature .....	86 to 88

## Differential Mode Chokes for DC/DC

DMC Series .....	89
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## Common Mode Chokes for DC/DC

CMC Series .....	90 to 103
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## Current sense Transformer up to 10 Apk

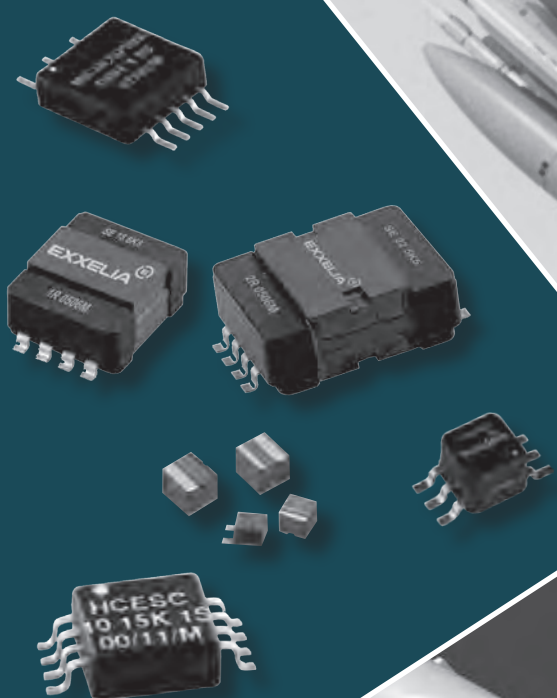
CT10 .....	104
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## Current sense Transformer

CT Series .....	105 to 108
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## Gate Drive Transformer

GDT Series .....	109
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# Miniature Chip Inductors MPCI 10000 Series



## Electrical Data (25°C)

ID Code	Induct.* μH	Q Min.	Q Typ.	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. Ω	DC Curr. mA max	Tol** %
MPCI 10 000 010	0.010	50	55	150	2000	0.025	750	10
MPCI 10 000 012	0.012	50	55	150	2000	0.025	750	
MPCI 10 000 015	0.015	50	55	150	1800	0.040	750	
MPCI 10 000 018	0.018	50	55	150	1500	0.040	750	
MPCI 10 000 022	0.022	45	50	100	1400	0.040	750	
MPCI 10 000 027	0.027	45	50	100	1200	0.040	750	
MPCI 10 000 033	0.033	47	55	100	1200	0.050	640	
MPCI 10 000 039	0.039	47	55	100	1200	0.070	600	
MPCI 10 000 047	0.047	47	55	100	1000	0.080	550	
MPCI 10 000 056	0.056	47	55	100	900	0.090	520	
MPCI 10 000 068	0.068	47	55	100	900	0.10	480	
MPCI 10 000 082	0.082	47	55	100	750	0.11	470	
MPCI 10 000 100	0.100	47	55	50	700	0.11	470	
MPCI 10 000 120	0.120	47	55	50	600	0.11	470	
MPCI 10 000 150	0.150	47	55	50	500	0.12	450	
MPCI 10 000 180	0.180	51	60	50	450	0.14	430	
MPCI 10 000 220	0.220	51	60	50	420	0.20	350	
MPCI 10 000 270	0.270	51	60	50	400	0.25	310	
MPCI 10 000 330	0.330	51	60	50	320	0.30	280	
MPCI 10 000 390	0.390	47	55	50	270	0.45	240	
MPCI 10 000 470	0.470	47	55	25	250	0.50	230	
MPCI 10 000 560	0.560	52	60	25	200	0.55	220	

- eesa qualified 3201/008 and in accordance to Mil Spec M83446/5
- Excellent Q values even at high frequencies
- Very high self-resonant frequencies (SFRs)
- Extremely stable inductance values from -55°C to +125°C
- With or without tab terminations
- Tin / lead (non RoHS) or gold plated (RoHS) terminations
- Frequency range: 7.9 MHz to 500 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 0.07 gram
- MSL level: 1

ID Code	Induct.* μH	Q Min	Q Typ.	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. Ω	DC Curr. mA max	Tol** %
MPCI 10 000 680	0.680	52	60	25	180	0.58	210	5-10
MPCI 10 000 820	0.820	52	60	25	150	0.60	200	
MPCI 10 001 000	1.00	52	60	25	120	0.65	190	2
MPCI 10 001 200	1.20	42	50	7.90	110	0.75	180	
MPCI 10 001 500	1.50	42	50	7.90	100	1.10	160	
MPCI 10 001 800	1.80	48	55	7.90	95	1.20	150	
MPCI 10 002 200	2.20	48	55	7.90	90	1.30	140	
MPCI 10 002 700	2.70	48	55	7.90	65	1.50	130	
MPCI 10 003 300	3.30	48	55	7.90	55	1.80	120	
MPCI 10 003 900	3.90	48	55	7.90	45	2.00	110	
MPCI 10 004 700	4.70	48	55	7.90	43	2.30	100	
MPCI 10 005 600	5.60	48	55	7.90	40	2.50	100	
MPCI 10 006 800	6.80	46	53	7.90	38	2.60	98	
MPCI 10 008 200	8.20	46	53	7.90	35	2.80	95	
MPCI 10 010 000	10.0	46	53	7.90	33	3.30	87	

\* Standard inductance tolerance: ± 10 %

\*\* Available tolerances.

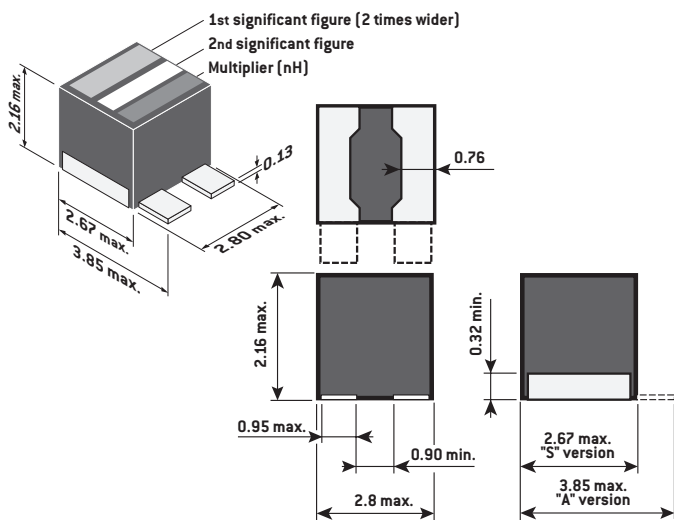
Other inductance values on request.

Inductance variation: 35 PPM/°C max. in the range 0.01 to 12 H  
80 PPM/°C max. in the range 1.5 to 10 μH

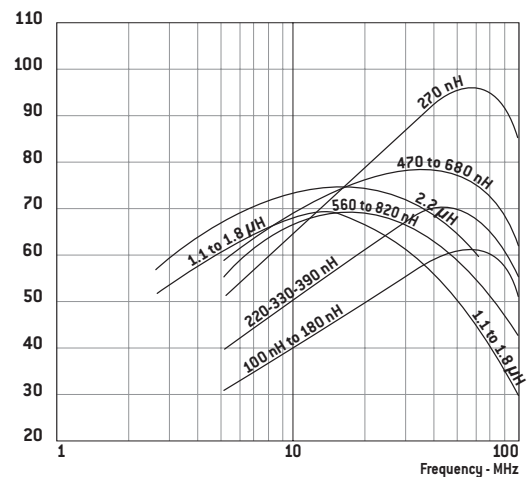
## Packaging

Tape and Reel (with or without tab): 100 pieces min. up to 500 pieces or Tray: 81 pieces without tab, 49 pieces with tab

## Typical Dimensions (mm)



## Q vs frequency



# Miniature Chip Inductors MSCI 10000 Series



MPCI 10000 series are usually installed on Military applications and breadboards for Space applications.

Since January 2003, EXXELIA has been manufacturing Radio Frequency Fixed Coils, MPCI 10000 series fulfilling ESA ESCC Generic specification N° 3201 and detail specification N° 3201/008.

This range is named MSCI (S for space applications).

This qualification approval includes final production tests Chart F2, burn-in and electrical measurements to testing Chart F3 and qualification testing Chart F4.

For procurement, different quality levels are offered:

- Final production tests Chart F2
- Burn-in and electrical measurements Chart F3
- Lot acceptance testing Chart F4 if required

Components delivered through this specification need to be processed and inspected in accordance with the EXXELIA Process Identification Document (P.I.D.).

Each component delivered is traceable to its production lot. max. 500 pieces per lot.

## Cross reference chart

EXXELIA Non - QPL ID Code	EXXELIA QPL ID Code	ESA SCC Component Part Number	In accordance to MIL-PRX-83446 Part Number	
			* Tin lead (F) or * Gold lead (A) with tab	* Tin lead (F) or * Gold lead (A) without tab
MPCI 10 000 010 x y 10	MSCI 10 000 010 x y 10	3201008 aa L010 K	M83446/5-01*	M83446/5-38*
MPCI 10 000 012 x y 10	MSCI 10 000 012 x y 10	3201008 aa L012 K	M83446/5-02*	M83446/5-39*
MPCI 10 000 015 x y 10	MSCI 10 000 015 x y 10	3201008 aa L015 K	M83446/5-03*	M83446/5-40*
MPCI 10 000 018 x y 10	MSCI 10 000 018 x y 10	3201008 aa L018 K	M83446/5-04*	M83446/5-41*
MPCI 10 000 022 x y 10/5	MSCI 10 000 022 x y 10/5	3201008 aa L022 K/J	M83446/5-05*	M83446/5-42*
MPCI 10 000 027 x y 10/5	MSCI 10 000 027 x y 10/5	3201008 aa L027 K/J	M83446/5-06*	M83446/5-43*
MPCI 10 000 033 x y 10/5	MSCI 10 000 033 x y 10/5	3201008 aa L033 K/J	M83446/5-07*	M83446/5-44*
MPCI 10 000 039 x y 10/5	MSCI 10 000 039 x y 10/5	3201008 aa L039 K/J	M83446/5-08*	M83446/5-45*
MPCI 10 000 047 x y 10/5	MSCI 10 000 047 x y 10/5	3201008 aa L047 K/J	M83446/5-09*	M83446/5-46*
MPCI 10 000 056 x y 10/5	MSCI 10 000 056 x y 10/5	3201008 aa L056 K/J	M83446/5-10*	M83446/5-47*
MPCI 10 000 068 x y 10/5	MSCI 10 000 068 x y 10/5	3201008 aa L068 K/J	M83446/5-11*	M83446/5-48*
MPCI 10 000 082 x y 10/5	MSCI 10 000 082 x y 10/5	3201008 aa L082 K/J	M83446/5-12*	M83446/5-49*
MPCI 10 000 100 x y 10	MSCI 10 000 100 x y 10	3201008 aa L10 K	M83446/5-13*	M83446/5-50*
MPCI 10 000 120 x y 10	MSCI 10 000 120 x y 10	3201008 aa L12 K	M83446/5-14*	M83446/5-51*
MPCI 10 000 150 x y 10	MSCI 10 000 150 x y 10	3201008 aa L15 K	M83446/5-15*	M83446/5-52*
MPCI 10 000 180 x y 10	MSCI 10 000 180 x y 10	3201008 aa L18 K	M83446/5-16*	M83446/5-53*
MPCI 10 000 220 x y 10	MSCI 10 000 220 x y 10	3201008 aa L22 K	M83446/5-17*	M83446/5-54*
MPCI 10 000 270 x y 10	MSCI 10 000 270 x y 10	3201008 aa L27 K	M83446/5-18*	M83446/5-55*
MPCI 10 000 330 x y 10	MSCI 10 000 330 x y 10	3201008 aa L33 K	M83446/5-19*	M83446/5-56*
MPCI 10 000 390 x y 10	MSCI 10 000 390 x y 10	3201008 aa L39 K	M83446/5-20*	M83446/5-57*
MPCI 10 000 470 x y 10/5	MSCI 10 000 470 x y 10/5	3201008 aa L47 K/J	M83446/5-21*	M83446/5-58*
MPCI 10 000 560 x y 10/5	MSCI 10 000 560 x y 10/5	3201008 aa L56 K/J	M83446/5-22*	M83446/5-59*
MPCI 10 000 680 x y 10/5	MSCI 10 000 680 x y 10/5	3201008 aa L68 K/J	M83446/5-23*	M83446/5-60*
MPCI 10 000 820 x y 10/5	MSCI 10 000 820 x y 10/5	3201008 aa L82 K/J	M83446/5-24*	M83446/5-61*
MPCI 10 001 000 x y 10/5	MSCI 10 001 000 x y 10/5	3201008 aa 1L0 K/J	M83446/5-25*	M83446/5-62*
MPCI 10 001 200 x y 10/5/2	MSCI 10 001 200 x y 10/5/2	3201008 aa 1L2 K/J/G	M83446/5-26*	M83446/5-63*
MPCI 10 001 500 x y 10/5/2	MSCI 10 001 500 x y 10/5/2	3201008 aa 1L5 K/J/G	M83446/5-27*	M83446/5-64*
MPCI 10 001 800 x y 10/5/2	MSCI 10 001 800 x y 10/5/2	3201008 aa 1L8 K/J/G	M83446/5-28*	M83446/5-65*
MPCI 10 002 200 x y 10/5/2	MSCI 10 002 200 x y 10/5/2	3201008 aa 2L2 K/J/G	M83446/5-29*	M83446/5-66*
MPCI 10 002 700 x y 10/5/2	MSCI 10 002 700 x y 10/5/2	3201008 aa 2L7 K/J/G	M83446/5-30*	M83446/5-67*
MPCI 10 003 300 x y 10/5/2	MSCI 10 003 300 x y 10/5/2	3201008 aa 3L3 K/J/G	M83446/5-31*	M83446/5-68*
MPCI 10 003 900 x y 10/5/2	MSCI 10 003 900 x y 10/5/2	3201008 aa 3L9 K/J/G	M83446/5-32*	M83446/5-69*
MPCI 10 004 700 x y 10/5/2	MSCI 10 004 700 x y 10/5/2	3201008 aa 4L7 K/J/G	M83446/5-33*	M83446/5-70*
MPCI 10 005 600 x y 10/5/2	MSCI 10 005 600 x y 10/5/2	3201008 aa 5L6 K/J/G	M83446/5-34*	M83446/5-71*
MPCI 10 006 800 x y 10/5/2	MSCI 10 006 800 x y 10/5/2	3201008 aa 6L8 K/J/G	M83446/5-35*	M83446/5-72*
MPCI 10 008 200 x y 10/5/2	MSCI 10 008 200 x y 10/5/2	3201008 aa 8L2 K/J/G	M83446/5-36*	M83446/5-73*
MPCI 10 010 000 x y 10/5/2	MSCI 10 010 000 x y 10/5/2	3201008 aa 100 K/J/G	M83446/5-37*	M83446/5-74*

aa = 01 for Au Termination  
aa = 02 for SnPb Termination

## To Order

MPCI	10	####	x	y	z
Radio Frequency Fixed Coils	Size	Inductance Value [nH] from 000 010 to 010 000	Terminations x = G for Gold x = T for SnPb	Terminations shape y = S without tab y = A with tab (Not valid for space use)	Tolerance: z = 10 ±10% z = 5 ±5% z = 2 ±2%

MPCI 10 ### ## x y z

# Miniature Chip Inductors MPCI 12000 Series



- eesa qualified 3201/008 and in accordance to Mil Spec M83446/6
- Excellent Q values even at high frequencies
- Very high self-resonant frequencies (SFRs)
- Extremely stable inductance values from -55°C to +125°C
- With or without tab terminations
- Tin / lead or gold plated terminations
- Frequency range: 790 kHz to 30 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 0.07 gram
- MSL level: 1

## Electrical Data (25°C)

ID Code	Inductance* $\mu\text{H}$	Q Min	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. $\Omega$	DC Current mA max	Tol** %
MPCI 12 012 000	12	42	2.5	26	2.0	110	2 5-10
MPCI 12 015 000	15	44	2.5	24	2.2	105	
MPCI 12 018 000	18	44	2.5	21	2.8	100	
MPCI 12 022 000	22	48	2.5	20	3.5	85	
MPCI 12 027 000	27	49	2.5	19	4.3	75	
MPCI 12 033 000	33	50	2.5	14	5.5	68	
MPCI 12 039 000	39	52	2.5	12	6.5	61	
MPCI 12 047 000	47	53	2.5	11	8.5	54	
MPCI 12 056 000	56	56	2.5	10	12	46	
MPCI 12 068 000	68	53	2.5	9.0	13	42	
MPCI 12 082 000	82	49	2.5	8.0	15	40	
MPCI 12 100 000	100	49	2.5	7.0	18	36	
MPCI 12 120 000	120	37	0.79	6.0	21	34	
MPCI 12 150 000	150	30	0.79	5.0	26	31	
MPCI 12 180 000	180	30	0.79	5.0	28	29	
MPCI 12 220 000	220	26	0.79	4.5	32	29	

ID Code	Induct.* $\mu\text{H}$	Q Min	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. $\Omega$	DC Current mA max	Tol** %
MPCI 12 270 000	270	26	0.79	4.0	36	26	5-10
MPCI 12 330 000	330	24	0.79	3.7	42	24	
MPCI 12 390 000	390	24	0.79	3.5	46	23	
MPCI 12 470 000	470	24	0.79	3.0	68	19	
MPCI 12 560 000	560	22	0.79	2.8	77	18	
MPCI 12 680 000	680	20	0.79	2.5	85	17	
MPCI 12 820 000	820	16	0.79	2.0	100	16	
MPCI 12 1000 000	1000	12	0.79	1.5	120	15	

\* Standard inductance tolerance:  $\pm 10\%$

\*\* Available tolerances.

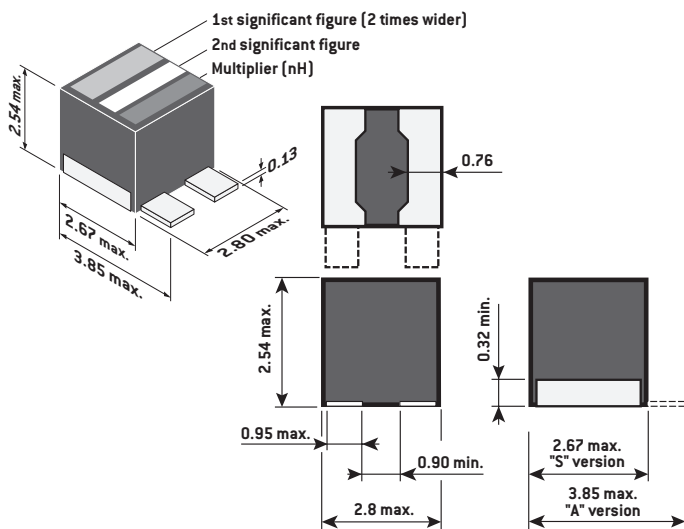
Other inductance values on request.

Inductance variation: 80 PPM /°C max. in the range 12 to 100  $\mu\text{H}$   
35 PPM /°C max. in the range 120 to 1000  $\mu\text{H}$

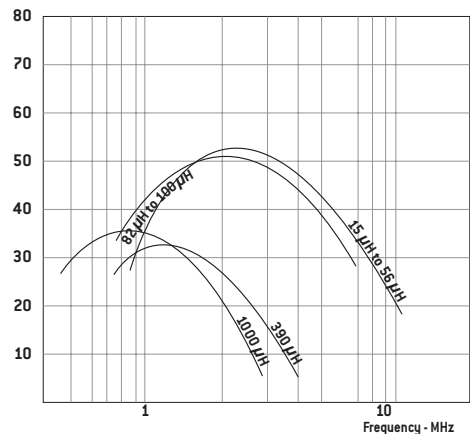
## Packaging

Tape and Reel (with or without tab): 100 pieces min. up to 500 pieces  
or Tray: 81 pieces without tab, 49 pieces with tab

## Typical Dimensions (mm)



## Q vs frequency



# Miniature Chip Inductors MSCI 12000 Series



MPCI 12000 series are usually installed on Military applications and breadboards for Space applications.

Since January 2003, EXXELIA has been manufacturing Radio Frequency Fixed Coils, MPCI 12000 series fulfilling ESA ESCC Generic specification N° 3201 and detail specification N° 3201/008.

This range is named MSCI (S for space applications and without tab).

This qualification approval includes final production tests Chart F2, burn-in and electrical measurements to testing Chart F3 and qualification testing Chart F4.

For procurement, different quality levels are offered:

- Final production tests Chart F2
- Burn-in and electrical measurements Chart F3
- Lot acceptance testing Chart F4 if required

Components delivered through this specification need to be processed and inspected in accordance with the EXXELIA Process Identification Document (P.I.D.).

Each component delivered is traceable to its production lot.

## Cross reference chart

EXXELIA Non-QPL ID Code	EXXELIA QPL ID Code	ESA SCC Component Part Number	In accordance to MIL Spec M 83446/6 Part Number	
			Dash number With tabs	Dash number Without tab
MPCI 12 012 000 x y 10/5/2	MSCI 12 012 000 x y 10/5/2	3201008 aa 120 K/J/G	M83446/06-01	M83446/06-25
MPCI 12 015 000 x y 10/5/2	MSCI 12 015 000 x y 10/5/2	3201008 aa 150 K/J/G	M83446/06-02	M83446/06-26
MPCI 12 018 000 x y 10/5/2	MSCI 12 018 000 x y 10/5/2	3201008 aa 180 K/J/G	M83446/06-03	M83446/06-27
MPCI 12 022 000 x y 10/5/2	MSCI 12 022 000 x y 10/5/2	3201008 aa 220 K/J/G	M83446/06-04	M83446/06-28
MPCI 12 027 000 x y 10/5/2	MSCI 12 027 000 x y 10/5/2	3201008 aa 270 K/J/G	M83446/06-05	M83446/06-29
MPCI 12 033 000 x y 10/5/2	MSCI 12 033 000 x y 10/5/2	3201008 aa 330 K/J/G	M83446/06-06	M83446/06-30
MPCI 12 039 000 x y 10/5/2	MSCI 12 039 000 x y 10/5/2	3201008 aa 390 K/J/G	M83446/06-07	M83446/06-31
MPCI 12 047 000 x y 10/5/2	MSCI 12 047 000 x y 10/5/2	3201008 aa 470 K/J/G	M83446/06-08	M83446/06-32
MPCI 12 056 000 x y 10/5/2	MSCI 12 056 000 x y 10/5/2	3201008 aa 560 K/J/G	M83446/06-09	M83446/06-33
MPCI 12 068 000 x y 10/5/2	MSCI 12 068 000 x y 10/5/2	3201008 aa 680 K/J/G	M83446/06-10	M83446/06-34
MPCI 12 082 000 x y 10/5/2	MSCI 12 082 000 x y 10/5/2	3201008 aa 820 K/J/G	M83446/06-11	M83446/06-35
MPCI 12 100 000 x y 10/5/2	MSCI 12 100 000 x y 10/5/2	3201008 aa 101 K/J/G	M83446/06-12	M83446/06-36
MPCI 12 120 000 x y 10/5	MSCI 12 120 000 x y 10/5	3201008 aa 121 K/J/G	M83446/06-13	M83446/06-37
MPCI 12 150 000 x y 10/5	MSCI 12 150 000 x y 10/5	3201008 aa 151 K/J/G	M83446/06-14	M83446/06-38
MPCI 12 180 000 x y 10/5	MSCI 12 180 000 x y 10/5	3201008 aa 181 K/J/G	M83446/06-15	M83446/06-39
MPCI 12 220 000 x y 10/5	MSCI 12 220 000 x y 10/5	3201008 aa 221 K/J/G	M83446/06-16	M83446/06-40
MPCI 12 270 000 x y 10/5	MSCI 12 270 000 x y 10/5	3201008 aa 271 K/J/G	M83446/06-17	M83446/06-41
MPCI 12 330 000 x y 10/5	MSCI 12 330 000 x y 10/5	3201008 aa 331 K/J/G	M83446/06-18	M83446/06-42
MPCI 12 390 000 x y 10/5	MSCI 12 390 000 x y 10/5	3201008 aa 391 K/J/G	M83446/06-19	M83446/06-43
MPCI 12 470 000 x y 10/5	MSCI 12 470 000 x y 10/5	3201008 aa 471 K/J/G	M83446/06-20	M83446/06-44
MPCI 12 560 000 x y 10/5	MSCI 12 560 000 x y 10/5	3201008 aa 561 K/J/G	M83446/06-21	M83446/06-45
MPCI 12 680 000 x y 10/5	MSCI 12 680 000 x y 10/5	3201008 aa 681 K/J/G	M83446/06-22	M83446/06-46
MPCI 12 820 000 x y 10/5	MSCI 12 820 000 x y 10/5	3201008 aa 821 K/J/G	M83446/06-23	M83446/06-47
MPCI 12 1000 000 x y 10/5	MSCI 12 1000 000 x y 10/5	3201008 aa 102 K/J/G	M83446/06-24	M83446/06-48
aa	K/J/G (tolerance)			
aa = 01 for Au Termination	K for ± 10%			
aa = 02 for SnPb Termination	J for ± 5%			
	G for ± 2%			

HIGH GRADE PRODUCTS

## To Order

MPCI 12 ### ## x y z

MPCI	12	#####	x	y	z
Radio Frequency Fixed Coils	Size	Inductance Value [nH] from 012 000 to 1000 000	Terminations x = G for Gold x = T for SnPb	Terminations shape y = S without tab y = A with tab (Not valid for space use)	Tolerance: z = 10 for ± 10% z = 5 for ± 5% z = 2 for ± 2%

# Miniature Chip Inductors MPCI 20000 Series



## Electrical Data (25°C)

ID Code	Induct. $\mu\text{H}$	Q Min	Q Typ.	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. $\Omega$	DC Curr. mA max	Tol %
MPCI 20 000 010	0.010	60	65	150	2000	0.04	1000	
MPCI 20 000 012	0.012	70	82	150	1800	0.04	1000	
MPCI 20 000 015	0.015	75	87	150	1500	0.04	1000	
MPCI 20 000 018	0.018	75	87	150	1500	0.04	1000	
MPCI 20 000 022	0.022	60	65	100	1300	0.05	1000	
MPCI 20 000 027	0.027	60	70	100	1300	0.05	1000	
MPCI 20 000 033	0.033	60	70	100	1000	0.05	1000	
MPCI 20 000 039	0.039	60	70	100	1000	0.06	900	
MPCI 20 000 047	0.047	65	75	100	800	0.06	900	
MPCI 20 000 056	0.056	65	75	100	760	0.06	900	
MPCI 20 000 068	0.068	65	75	100	700	0.07	840	
MPCI 20 000 082	0.082	65	75	100	650	0.07	840	
MPCI 20 000 100	0.100	65	77	50	570	0.07	840	
MPCI 20 000 120	0.120	65	77	50	520	0.07	840	
MPCI 20 000 150	0.150	75	87	50	400	0.08	790	
MPCI 20 000 180	0.180	75	87	50	360	0.08	790	
MPCI 20 000 220	0.220	70	80	50	320	0.08	790	
MPCI 20 000 270	0.270	70	80	50	270	0.10	700	
MPCI 20 000 330	0.330	70	80	50	240	0.10	700	
MPCI 20 000 390	0.390	70	80	50	220	0.10	700	
MPCI 20 000 470	0.470	70	80	25	190	0.14	590	
MPCI 20 000 560	0.560	70	82	25	170	0.19	510	
MPCI 20 000 680	0.680	70	83	25	160	0.26	430	
MPCI 20 000 820	0.820	75	84	25	150	0.30	400	
MPCI 20 001 000	1.00	75	87	25	130	0.34	380	
MPCI 20 001 200	1.20	65	73	7.9	120	0.45	330	
MPCI 20 001 500	1.50	65	73	7.9	110	0.57	290	
MPCI 20 001 800	1.80	65	73	7.9	100	0.72	260	
MPCI 20 002 200	2.20	65	73	7.9	80	0.9	230	
MPCI 20 002 700	2.70	65	73	7.9	60	1.1	210	
MPCI 20 003 300	3.30	60	70	7.9	50	1.2	200	
MPCI 20 003 900	3.90	60	70	7.9	45	1.4	180	
MPCI 20 004 700	4.70	60	70	7.9	42	1.6	170	
MPCI 20 005 600	5.60	65	75	7.9	40	1.8	160	
MPCI 20 006 800	6.80	65	75	7.9	37	2.4	140	

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- Cesa qualified 3201/008 and in accordance to Mil Spec M83446/10
- Excellent Q values even at high frequencies
- Very high self-resonant frequencies (SFRs)
- Extremely stable inductance values from -55°C to +125°C
- With or without tab terminations
- Tin / lead or gold plated terminations
- Frequency range: 790 kHz to 500 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 0.15 gram • MSL level: 1

ID Code	Induct. $\mu\text{H}$	Q Min	Q Typ.	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. $\Omega$	DC Curr. mA max	Tol % Min
MPCI 20 008	8.20	65	75	7.9	34	3.0	130	
MPCI 20 010 000	10.0	65	75	7.9	29	3.5	120	
MPCI 20 012 000	12.0	60	70	2.5	27	3.6	118	
MPCI 20 015 000	15.0	60	70	2.5	22	3.7	115	
MPCI 20 018 000	18.0	60	72	2.5	17	3.8	114	
MPCI 20 022 000	22.0	60	72	2.5	16	3.9	113	
MPCI 20 027 000	27.0	65	75	2.5	15	4.0	110	
MPCI 20 033 000	33.0	65	75	2.5	14	5.0	100	
MPCI 20 039 000	39.0	65	75	2.5	13	7.0	84	
MPCI 20 047 000	47.0	70	78	2.5	12	8.0	79	
MPCI 20 056 000	56.0	70	78	2.5	11	10.0	70	
MPCI 20 068 000	68.0	65	75	2.5	10	11.0	67	
MPCI 20 082 000	82.0	60	72	2.5	9	12.0	64	
MPCI 20 100 000	100.0	60	70	2.5	8	13.0	62	
MPCI 20 120 000	120.0	40	48	0.79	7	14.0	59	
MPCI 20 150 000	150.0	40	48	0.79	6	16.0	56	
MPCI 20 180 000	180.0	40	48	0.79	5	18.0	52	
MPCI 20 220 000	220.0	40	48	0.79	4	24.0	45	
MPCI 20 270 000	270.0	40	48	0.79	3.3	25.0	44	
MPCI 20 330 000	330.0	40	48	0.79	3.1	29.0	41	
MPCI 20 390 000	390.0	40	48	0.79	2.9	32.0	39	
MPCI 20 470 000	470.0	35	45	0.79	2.4	35.0	37	
MPCI 20 560 000	560.0	35	45	0.79	2.1	45.0	33	
MPCI 20 680 000	680.0	35	40	0.79	1.9	55.0	30	
MPCI 20 820 000	820.0	30	36	0.79	1.8	70.0	26	
MPCI 20 1000 000	1000.0	30	36	0.79	1.7	80.0	25	

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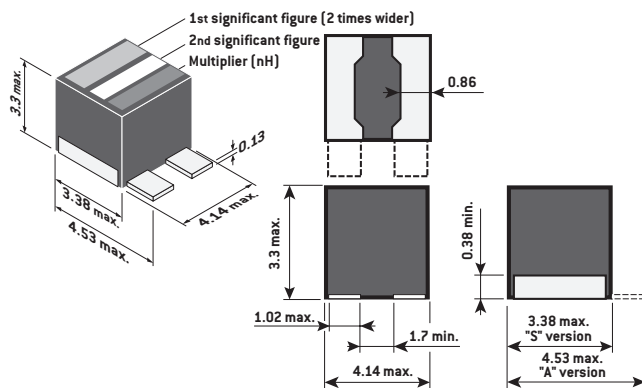
Other inductance values on request.

Inductance variation: 60 PPM /°C max. in the range 0.01 to 1  $\mu\text{H}$   
 80 PPM /°C max. in the range 1.2 to 10  $\mu\text{H}$   
 150 PPM /°C max. in the range 12 to 100  $\mu\text{H}$   
 300 PPM /°C max. in the range 120 to 1000  $\mu\text{H}$

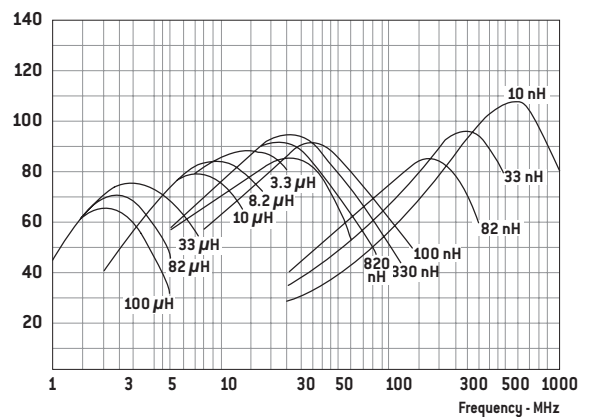
## Packaging

Tape and Reel (with or without tab): 100 to 500 pieces or Tray: 49 pieces

## Typical Dimensions (mm)



## Q vs frequency





# Miniature Chip Inductors MSCI 20000 Series



MPCI 20000 series are usually installed on Military applications and breadboards for Space applications.

Since January 2003, EXXELIA has been manufacturing Radio Frequency Fixed Coils, MPCI 20000 series fulfilling ESA ESCC Generic specification N° 3201 and detail specification N° 3201/008.

This range is named MSCI (S for space applications).

This qualification approval includes final production tests Chart F2, burn-in and electrical measurements to testing Chart F3 and qualification testing Chart F4.

For procurement, different quality levels are offered:

- Final production tests Chart F2
- Burn-in and electrical measurements Chart F3
- Lot acceptance testing Chart F4 if required

Components delivered through this specification need to be processed and inspected in accordance with the EXXELIA Process Identification Document (P.I.D.).

Each component delivered is traceable to its production lot.

## Cross reference chart

EXXELIA ID Code *MPCI (Non-QPL) * MSCI (QPL)	ESA SCC Component Part Number	In accordance to MIL-PRF-83446 Part Number	
		** Tin lead (F) or ** Gold lead (A) with tab	** Tin lead (F) or ** Gold lead (A) without tab
* 20 000 010 x y 10	3201008 aa L010 K	M83446/10-01**	M83446/10-62**
* 20 000 012 x y 10	3201008 aa L012 K	M83446/10-02**	M83446/10-63**
* 20 000 015 x y 10	3201008 aa L015 K	M83446/10-03**	M83446/10-64**
* 20 000 018 x y 10	3201008 aa L018 K	M83446/10-04**	M83446/10-65**
* 20 000 022 x y 10	3201008 aa L022 K	M83446/10-05**	M83446/10-66**
* 20 000 027 x y 10	3201008 aa L027 K	M83446/10-06**	M83446/10-67**
* 20 000 033 x y 10	3201008 aa L033 K	M83446/10-07**	M83446/10-68**
* 20 000 039 x y 10	3201008 aa L039 K	M83446/10-08**	M83446/10-69**
* 20 000 047 x y 10	3201008 aa L047 K	M83446/10-09**	M83446/10-70**
* 20 000 056 x y 10	3201008 aa L056 K	M83446/10-10**	M83446/10-71**
* 20 000 068 x y 10	3201008 aa L068 K	M83446/10-11**	M83446/10-72**
* 20 000 082 x y 10	3201008 aa L082 K	M83446/10-12**	M83446/10-73**
* 20 000 100 x y 10	3201008 aa L10 K	M83446/10-13**	M83446/10-74**
* 20 000 120 x y 10	3201008 aa L12 K	M83446/10-14**	M83446/10-75**
* 20 000 150 x y 10	3201008 aa L15 K	M83446/10-15**	M83446/10-76**
* 20 000 180 x y 10	3201008 aa L18 K	M83446/10-16**	M83446/10-77**
* 20 000 220 x y 10	3201008 aa L22 K	M83446/10-17**	M83446/10-78**
* 20 000 270 x y 10	3201008 aa L27 K	M83446/10-18**	M83446/10-79**
* 20 000 330 x y 10	3201008 aa L33 K	M83446/10-19**	M83446/10-80**
* 20 000 390 x y 10	3201008 aa L39 K	M83446/10-20**	M83446/10-81**
* 20 000 470 x y 10	3201008 aa L47 K	M83446/10-21**	M83446/10-82**
* 20 000 560 x y 10	3201008 aa L56 K	M83446/10-22**	M83446/10-83**
* 20 000 680 x y 10	3201008 aa L68 K	M83446/10-23**	M83446/10-84**
* 20 000 820 x y 10	3201008 aa L82 K	M83446/10-24**	M83446/10-85**
* 20 001 000 x y 10	3201008 aa 1L0 K	M83446/10-25**	M83446/10-86**
* 20 001 200 x y 10	3201008 aa 1L2 K	M83446/10-26**	M83446/10-87**
* 20 001 500 x y 10	3201008 aa 1L5 K	M83446/10-27**	M83446/10-88**
* 20 001 800 x y 10	3201008 aa 1L8 K	M83446/10-28**	M83446/10-89**
* 20 002 200 x y 10	3201008 aa 2L2 K	M83446/10-29**	M83446/10-90**
* 20 002 700 x y 10	3201008 aa 2L7 K	M83446/10-30**	M83446/10-91**
* 20 003 300 x y 10	3201008 aa 3L3 K	M83446/10-31**	M83446/10-92**
* 20 003 900 x y 10	3201008 aa 3L9 K	M83446/10-32**	M83446/10-93**
* 20 004 700 x y 10	3201008 aa 4L7 K	M83446/10-33**	M83446/10-94**

EXXELIA ID Code *MPCI (Non-QPL) *MPCI (QPL)	ESA SCC Component Part Number	In accordance to MIL-PRF-83446 Part Number	
		** Tin lead (F) or ** Gold lead (A) with tab	** Tin lead (F) or ** Gold lead (A) without tab
* 20 005 600 x y 10	3201008 aa 5L6 K	M83446/10-34**	M83446/10-95**
* 20 006 800 x y 10	3201008 aa 6L8 K	M83446/10-35**	M83446/10-96**
* 20 008 200 x y 10	3201008 aa 8L2 K	M83446/10-36**	M83446/10-97**
* 20 010 000 x y 10	3201008 aa 100 K	M83446/10-37**	M83446/10-98**
* 20 012 000 x y 10	3201008 aa 120 K	M83446/10-38**	M83446/10-99**
* 20 015 000 x y 10	3201008 aa 150 K	M83446/10-39**	M83446/10-100**
* 20 018 000 x y 10	3201008 aa 180 K	M83446/10-40**	M83446/10-101**
* 20 022 000 x y 10	3201008 aa 220 K	M83446/10-41**	M83446/10-102**
* 20 027 000 x y 10	3201008 aa 270 K	M83446/10-42**	M83446/10-103**
* 20 033 000 x y 10	3201008 aa 330 K	M83446/10-43**	M83446/10-104**
* 20 039 000 x y 10	3201008 aa 390 K	M83446/10-44**	M83446/10-105**
* 20 047 000 x y 10	3201008 aa 470 K	M83446/10-45**	M83446/10-106**
* 20 056 000 x y 10	3201008 aa 560 K	M83446/10-46**	M83446/10-107**
* 20 068 000 x y 10	3201008 aa 680 K	M83446/10-47**	M83446/10-108**
* 20 082 000 x y 10	3201008 aa 820 K	M83446/10-48**	M83446/10-109**
* 20 100 000 x y 10	3201008 aa 101 K	M83446/10-49**	M83446/10-110**
* 20 120 000 x y 10	3201008 aa 121 K	M83446/10-50**	M83446/10-111**
* 20 150 000 x y 10	3201008 aa 151 K	M83446/10-51**	M83446/10-112**
* 20 180 000 x y 10	3201008 aa 181 K	M83446/10-52**	M83446/10-113**
* 20 220 000 x y 10	3201008 aa 221 K	M83446/10-53**	M83446/10-114**
* 20 270 000 x y 10	3201008 aa 271 K	M83446/10-54**	M83446/10-115**
* 20 330 000 x y 10	3201008 aa 331 K	M83446/10-55**	M83446/10-116**
* 20 390 000 x y 10	3201008 aa 391 K	M83446/10-56**	M83446/10-117**
* 20 470 000 x y 10	3201008 aa 471 K	M83446/10-57**	M83446/10-118**
* 20 560 000 x y 10	3201008 aa 561 K	M83446/10-58**	M83446/10-119**
* 20 680 000 x y 10	3201008 aa 681 K	M83446/10-59**	M83446/10-120**
* 20 820 000 x y 10	3201008 aa 821 K	M83446/10-60**	M83446/10-121**
* 20 1000 000 x y 10	3201008 aa 102 K	M83446/10-61**	M83446/10-122**

aa	K/J/G (tolerance)
aa = 03	K for ±10%
for Au Termination	J for ±5%
aa = 04	G for ±2%
for SnPb Termination	

HIGH GRADE PRODUCTS

## To Order

MPCI	20	#####	x	y	z
Radio Frequency Fixed Coils	Size	Inductance Value (nH) from 000 010 to 010 000	Terminations x = T for SnPb x = G for Gold	Terminations shape y = S without tab y = A with tab (Not valid for space use)	Tolerance: 10 for ±10%

MPCI 20 ### ## x y 10

# Miniature Fixed Chip Inductors MPCI H01 Series



- AEC-Q200 qualified 3201/008
- With or without tab terminations
- Terminations with tin-lead coating
- Q factor  $\geq 30$  at 1 MHz
- SRF  $\geq 8$  MHz
- $\Delta L/L \pm 1000$  ppm/°C
- Materials meet UL94-V0 rating
- Operating temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Weight: 0.12 gram

## Electrical Data (25°C)

ID Code	Inductance ( $\mu\text{H}$ ) $\pm 15\%$	$I_{DC}^*$ (A)	$R_{DC}$ (m $\Omega$ ) $\pm 15\%$
MPCI H01 K38 1xy	0.38	1.5	29
MPCI H01 K67 1xy	0.67	1.25	39
MPCI H01 1K0 1xy	1.0	1.0	54
MPCI H01 1K5 1xy	1.5	0.85	73
MPCI H01 2K0 1xy	2.0	0.70	100
MPCI H01 2K7 1xy	2.7	0.62	120
MPCI H01 3K4 1xy	3.4	0.55	150
MPCI H01 4K6 1xy	4.6	0.49	190
MPCI H01 5K6 1xy	5.6	0.44	230
MPCI H01 7K1 1xy	7.1	0.41	270
MPCI H01 10K 1xy	10.0	0.34	390
MPCI H01 12K 1xy	12.0	0.29	530
MPCI H01 27K 1xy	27.0	0.20	1040
MPCI H01 M10 1xy	100.0	0.10	3800

\* max. permanent DC current at  $+125^{\circ}\text{C}$ .

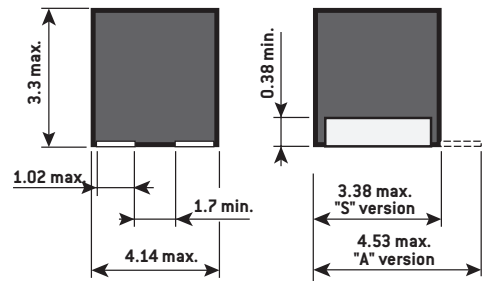
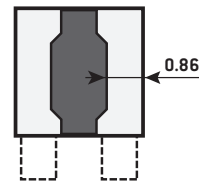
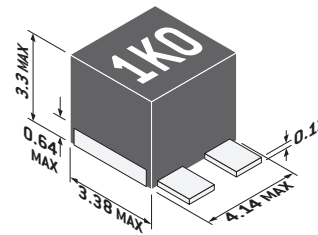
Operating temperature:  $-55^{\circ}\text{C}/+125^{\circ}\text{C}$

Storage temperature:  $-55^{\circ}\text{C}/+140^{\circ}\text{C}$

## Application

Output filtering in low power DC / DC conversion

## Typical Dimensions (mm)



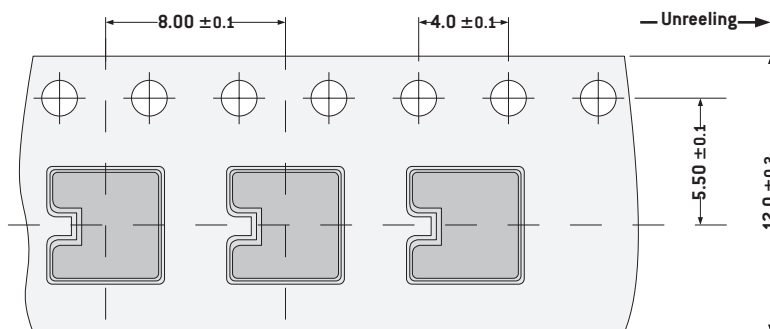
## To Order

MPCI H01 ### 1xy

MPCI H01	###	1	x	y
Range	Inductance value	Version	Terminations x = G for Gold x = T for Tinned	y = S without tab y = A with tab

## Packaging

Tape and Reel (without tab):  
500 pieces ; or Tray: 49 pieces



# Miniature Fixed Chip Inductors

## MSCI H01 Series



MPCI H01 series are usually installed on Military applications and breadboards for Space applications.

Since January 2003, EXXELIA has been manufacturing Filtering Inductor, MPCI H01 series fulfilling ESA ESCC Generic specification N° 3201 and detail specification N° 3201/008.

This range is named MSCI (S for space applications).

This qualification approval includes final production tests Chart F2, burn-in and electrical measurements to testing Chart F3 and qualification testing Chart F4.

For procurement, different quality levels are offered:

- Final production tests Chart F2
- Burn-in and electrical measurements Chart F3
- Lot acceptance testing Chart F4 if required

Components delivered through this specification need to be processed and inspected in accordance with the EXXELIA Process Identification Document (P.I.D.).

Each component delivered is traceable to its production lot.

EXXELIA Non-QPL ID Code	EXXELIA QPL ID Code	ESA SCC Component Part Number
MPCI H01 K38 1TS 15	MSCI H01 K38 1TS 15	3201008 05 L38 L
MPCI H01 K67 1TS 15	MSCI H01 K67 1TS 15	3201008 05 L67 L
MPCI H01 1K0 1TS 15	MSCI H01 1K0 1TS 15	3201008 05 1L0 L
MPCI H01 1K5 1TS 15	MSCI H01 1K5 1TS 15	3201008 05 1L5 L
MPCI H01 2K0 1TS 15	MSCI H01 2K0 1TS 15	3201008 05 2L0 L
MPCI H01 2K7 1TS 15	MSCI H01 2K7 1TS 15	3201008 05 2L7 L
MPCI H01 3K4 1TS 15	MSCI H01 3K4 1TS 15	3201008 05 3L4 L
MPCI H01 4K6 1TS 15	MSCI H01 4K6 1TS 15	3201008 05 4L6 L
MPCI H01 5K6 1TS 15	MSCI H01 5K6 1TS 15	3201008 05 5L6 L
MPCI H01 7K1 1TS 15	MSCI H01 7K1 1TS 15	3201008 05 7L1 L
MPCI H01 10K 1TS 15	MSCI H01 10K 1TS 15	3201008 05 100 L
MPCI H01 12K 1TS 15	MSCI H01 12K 1TS 15	3201008 05 120 L
MPCI H01 27K 1TS 15	MSCI H01 27K 1TS 15	3201008 05 270 L
MPCI H01 M10 1TS 15	MSCI H01 M10 1TS 15	3201008 05 101 L
<b>05</b>	<b>b</b>	<b>L (tolerance)</b>
<b>05 for SnPb Termination</b>		<b>L for ±15%</b>

# Miniature High Temperature Chip Inductors

## MPCI 233 Series



- High temp. RF inductances
- Excellent Q values even at high frequencies
- Very high self-resonant frequencies (SFRs)
- Tinned or gold plated terminations
- Frequency range: 790 kHz to 500 MHz
- Operating temperature range: -55°C to +175°C
- Weight: 0.15 gram
- MSL level: 1

### Electrical Data (25°C)

ID Code	Inductance $\mu\text{H}$	Q Min	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. $\Omega$	DC Current mA max	Tol %
MPCI 233 000 010	0.010	60	150	1000	0.04	1000	10
MPCI 233 000 012	0.012	70	150	1000	0.04	1000	
MPCI 233 000 015	0.015	75	150	1000	0.04	1000	
MPCI 233 000 018	0.018	75	150	1000	0.04	1000	
MPCI 233 000 022	0.022	60	100	1000	0.05	1000	
MPCI 233 000 027	0.027	60	100	1000	0.05	1000	
MPCI 233 000 033	0.033	60	100	1000	0.05	1000	
MPCI 233 000 039	0.039	60	100	1000	0.06	900	
MPCI 233 000 047	0.047	65	100	800	0.06	900	
MPCI 233 000 056	0.056	65	100	760	0.06	900	
MPCI 233 000 068	0.068	65	100	700	0.07	840	
MPCI 233 000 082	0.082	65	100	650	0.07	840	
MPCI 233 000 100	0.100	65	50	570	0.07	840	
MPCI 233 000 120	0.120	65	50	520	0.07	840	
MPCI 233 000 150	0.150	75	50	400	0.08	790	
MPCI 233 000 180	0.180	75	50	360	0.08	790	
MPCI 233 000 220	0.220	70	50	320	0.08	790	
MPCI 233 000 270	0.270	70	50	270	0.10	700	
MPCI 233 000 330	0.330	70	50	240	0.10	700	
MPCI 233 000 390	0.390	70	50	220	0.10	700	
MPCI 233 000 470	0.470	70	25	190	0.14	590	
MPCI 233 000 560	0.560	70	25	170	0.19	510	
MPCI 233 000 680	0.680	70	25	160	0.26	430	
MPCI 233 000 820	0.820	75	25	150	0.30	400	
MPCI 233 001 000	1.00	75	25	130	0.34	380	
MPCI 233 001 200	1.20	65	7.9	120	0.45	330	
MPCI 233 001 500	1.50	65	7.9	110	0.57	290	
MPCI 233 001 800	1.80	65	7.9	100	0.72	260	
MPCI 233 002 200	2.20	65	7.9	80	0.90	230	
MPCI 233 002 700	2.70	65	7.9	60	1.10	210	
MPCI 233 003 300	3.30	60	7.9	50	1.20	200	
MPCI 233 003 900	3.90	60	7.9	45	1.40	180	
MPCI 233 004 700	4.70	60	7.9	42	1.60	170	
MPCI 233 005 600	5.60	65	7.9	40	1.80	160	
MPCI 233 006 800	6.80	65	7.9	37	2.40	140	
MPCI 233 008 200	8.20	65	7.9	34	3.00	130	
MPCI 233 010 000	10.0	65	7.9	29	3.50	120	
MPCI 233 012 000	12.0	60	2.5	27	3.60	118	
MPCI 233 015 000	15.0	60	2.5	22	3.70	115	

ID Code	Inductance $\mu\text{H}$	Q Min	Test Freq. MHz	SFR Min. MHz	R <sub>DC</sub> max. $\Omega$	DC Current mA max	Tol %
MPCI 233 018 000	18.0	60	2.5	17	3.80	114	10
MPCI 233 022 000	22.0	60	2.5	16	3.90	113	
MPCI 233 027 000	27.0	65	2.5	15	4.00	110	
MPCI 233 033 000	33.0	65	2.5	14	5.00	100	
MPCI 233 039 000	39.0	65	2.5	13	7.00	84	
MPCI 233 047 000	47.0	70	2.5	12	8.00	79	
MPCI 233 056 000	56.0	70	2.5	11	10.0	70	
MPCI 233 068 000	68.0	65	2.5	10	11.0	67	
MPCI 233 082 000	82.0	60	2.5	9	12.0	64	
MPCI 233 100 000	100	60	2.5	8	13.0	62	
MPCI 233 120 000	120	40	0.79	7	14.0	59	
MPCI 233 150 000	150	40	0.79	6	16.0	56	
MPCI 233 180 000	180	40	0.79	5	18.0	52	
MPCI 233 220 000	220	40	0.79	4	24.0	45	
MPCI 233 270 000	270	40	0.79	3.3	25.0	44	
MPCI 233 330 000	330	40	0.79	3;1	29.0	41	
MPCI 233 390 000	390	40	0.79	2.9	32.0	39	
MPCI 233 470 000	470	35	0.79	2.4	35.0	37	
MPCI 233 560 000	560	35	0.79	2.1	45.0	33	
MPCI 233 680 000	680	35	0.79	1.9	55.0	30	
MPCI 233 820 000	820	30	0.79	1.8	70.0	26	
MPCI 233 1000 000	1000	30	0.79	1.7	80.0	25	

Other inductance values on request.

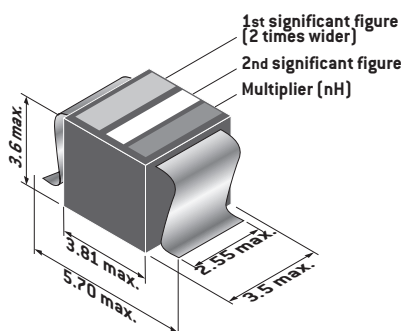
Inductance variation: 60 PPM /°C max. in the range 0.01 to 1  $\mu\text{H}$   
 80 PPM /°C max. in the range 1.2 to 10  $\mu\text{H}$   
 150 PPM /°C max. in the range 12 to 100  $\mu\text{H}$   
 300 PPM /°C max. in the range 120 to 1000  $\mu\text{H}$

### To Order

MPCI 233 ### ## x10

MPCI 233	### ##	x	y
Range	Inductance Value	Terminations x = G for Gold x = T for Tinned	Tolerance: 10 for $\pm 10\%$

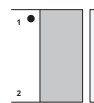
### Typical Dimensions (mm)



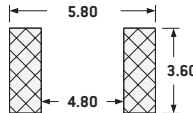
### Packaging

Tray: 24 pieces / tray  
 Upon request: tape (lot 150 pieces)  
 or tape & reel

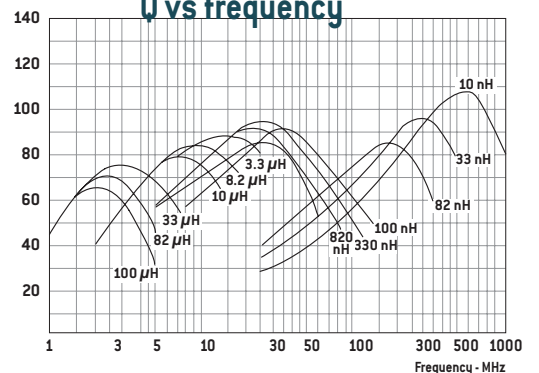
### Connections



### PCB Layout (suggested)



### Q vs frequency



# Miniature Fixed Chip Inductors MPCI 233 H01 Series



- With or without tab terminations
- Terminations with tin-lead coating
- Q factor ≥ 30 at 1 MHz
- SRF ≥ 8 MHz
- ΔL/L ± 1000 ppm/°C
- Materials meet UL94-V0 rating
- Operating temperature range: -55°C to +175°C
- Weight: 0.12 gram
- RoHS

## Electrical Data (25°C)

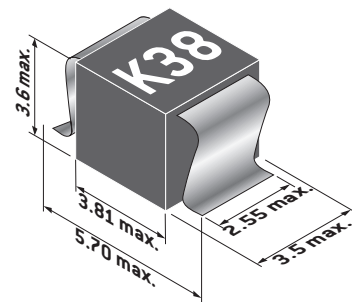
ID Code	Inductance (μH) ±15%	I <sub>DC</sub> * (A)	R <sub>DC</sub> (mΩ) ±15%
MPCI 233 K38 H01 1x	0.38	1.5	16.0
MPCI 233 K67 H01 1x	0.67	1.25	25.0
MPCI 233 1K0 H01 1x	1.0	1.0	38.0
MPCI 233 1K5 H01 1x	1.5	0.85	54.0
MPCI 233 2K0 H01 1x	2.0	0.70	79.0
MPCI 233 2K7 H01 1x	2.7	0.62	100
MPCI 233 3K4 H01 1x	3.4	0.55	129
MPCI 233 4K6 H01 1x	4.6	0.49	160
MPCI 233 5K6 H01 1x	5.6	0.44	200
MPCI 233 7K1 H01 1x	7.1	0.41	228
MPCI 233 10K H01 1x	10.0	0.34	335
MPCI 233 12K H01 1x	12.0	0.29	460
MPCI 233 27K H01 1x	27.0	0.20	900
MPCI 233 M10 H01 1x	100.0	0.10	3300

\* max. permanent DC current at +125°C.

Operating temperature: -55°C/+175°C

Storage temperature: -55°C/+200°C

## Typical Dimensions (mm)

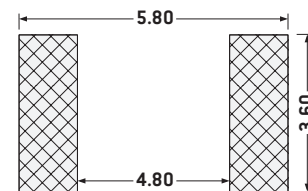


## To Order

MPCI 233 ### H01 1x

MPCI 233	###	H01	1	x
Range	Inductance value	Technology	Version	Terminations x = G for Gold x = T or S for Tinned

## PCB Layout (suggested)



## Application

Output filtering in low power DC / DC conversion

## Packaging

Tray

# Wide Band RF Transformers WRFT 4x Series

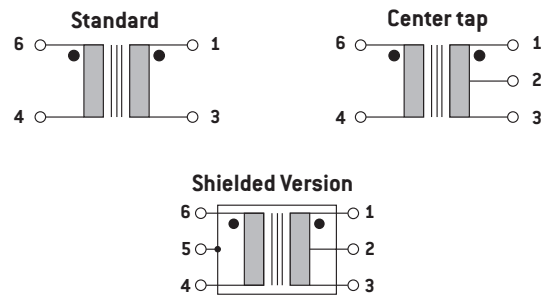


- Applied standards: ECSS-Q-ST-70-02C, MIL-STD-202, DO-160 and ESCC 3201 generic specification for space products
- Power input max. 250 mW
- Isolation prim. to sec. 500 V<sub>DC</sub> minimum
- Suitable for I<sub>R</sub> and vapor reflow soldering
- SMD or through-hole cases
- Bandwidth: 100 kHz to 400 MHz
- Operating temperature –55°C to +125°C
- Weight: 1 gram
- Shielded version upon request

## Electrical Data (25°C)

ID Code	Impedance ratio (Ω)	Bandwidth [MHz]		
		3 dB	2 dB	1 dB
WRFT41 1R0 1X	50: 50	0.35 - 400	0.35 - 200	2 - 50
WRFT41 2R0 1X	50: 100	0.30 - 300	0.5 - 250	2 - 230
WRFT42 2R0 1X	50: 100 center tap	0.10 - 200	0.5 - 100	2 - 50
WRFT41 2R5 1X	50: 125	0.10 - 100	0.1 - 50	0.1 - 20
WRFT41 4R0 1X	50: 200	0.20 - 350	0.35 - 300	2 - 100
WRFT42 5R0 1X	50: 250 center tap	0.30 - 300	0.6 - 200	0.5 - 100
WRFT42 8R0 1X	50: 400 center tap	0.10 - 140	0.1 - 90	1 - 60
WRFT41 12R 1X	50: 600	0.20 - 110	0.5 - 80	1 - 50
WRFT41 13R 1X	50: 650	0.30 - 130	0.4 - 85	1 - 65
WRFT42 13R 1X	50: 650 center tap	0.30 - 120	0.7 - 80	5 - 20
WRFT41 16R 1X	50: 800	0.30 - 120	0.7 - 80	5 - 20
WRFT42 16R 1X	50: 800 center tap	0.10 - 75	0.2 - 30	0.3 - 20

## Connections

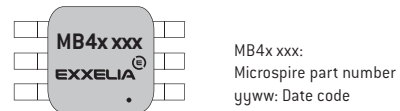


## To Order

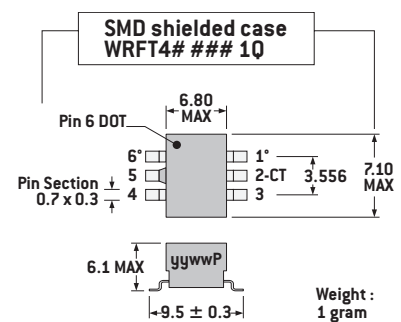
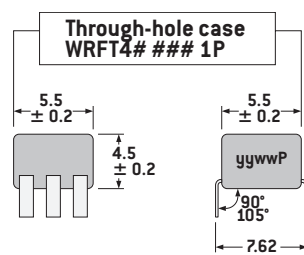
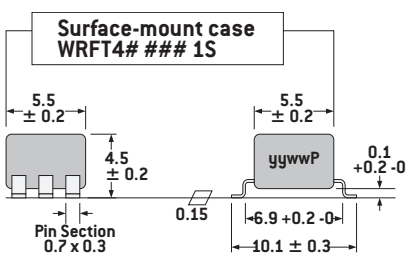
WRFT4	#	###	1	x
Range	1 = without center tap 2 = with center tap	Impedance ratio	Version	x = S surface mount x = P through hole x = Q Shielded

WRFT4# ### 1x

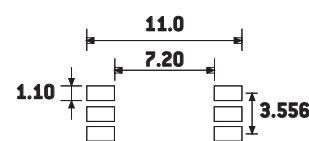
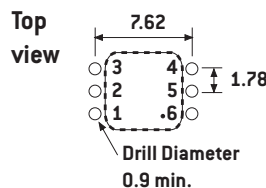
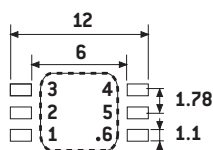
## Marking



## Typical Dimensions (mm)



## PCB Layout (suggested)



## Applications

Impedance matching, DC isolation, balanced-unbalanced mixing, power splitting, coupling and signal inversion

## Packaging

Individually packed in a 160 x 137 x 55 cardboard box. 40 parts on 2 layers

# Common-Mode Chokes HCESC Series



These common-mode chokes provide excellent attenuation of asymmetric EMI on signal lines as well as in DC-DC converters, switch-mode power supplies and other high frequency applications

- Applied standards: ECSS-Q-ST-70-02C, MIL-STD-202, D0-160 and ESCC 3201 generic specification for space products
- Surface-mount and through-hole packages
- Suited for  $I_R$  and vapor reflow soldering
- Frequency range up to 100 MHz
- Operation temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Weight: 0.7 gram

## Electrical Data (25°C)

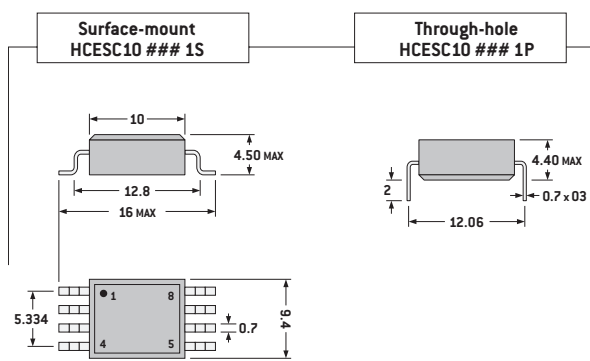
ID Code	Inductance (at 100 kHz) $\mu\text{H}$	Rdc Max (at 80°C) $\text{m}\Omega$	Impedance (at 100 kHz) $\Omega$	Rated Current max. A	Isolation between windings $\text{V}_{\text{rms}}$	max. attenuation on 50 $\Omega$ dB
HCESC10 15K 1x	15	15	115	2.5	1500	7 (10 MHz)
HCESC10 56K 1x	56	50	350	1	1500	15 (8 MHz)
HCESC10 M47 1x	470	400	440	0.4	1500	33 (5 MHz)

## To Order

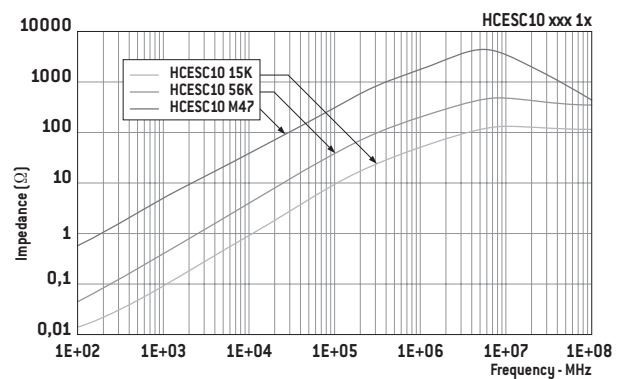
HCESC10 ### 1x

HCESC10	###	1	x
Range	Inductance Value	Version	x = SR for Surface mount x = PR for through hole

## Typical Dimensions (mm)

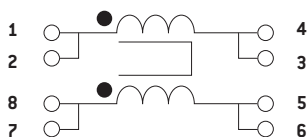


## Response Curves



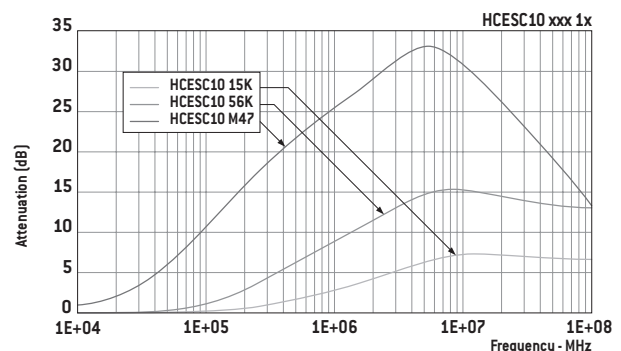
Typical Impedance versus Frequency (@100 mV)

## Connections



## Packaging

Individually packed in a 160 x 137 x 55 mm cardboard box.  
40 parts on 2 layers



Typical Attenuation versus Frequency on 50 Ohms (@100 mV)

HIGH GRADE PRODUCTS

# Data Line EMI Filters DLEF 42 Series



These filters virtually eliminate conducted EMI in data lines. They provide excellent common-mode noise attenuation from 15 MHz to 300 MHz whilst passing data signals below 300 MHz without attenuation.

- Applied standards: ECSS-Q-ST-70-02C, MIL-STD-202, D0-160 and ESCC 3201 generic specification for space products
- Suited for  $I_R$  and vapor reflow soldering
- Materials meet UL94-V0 rating
- Operation temperature range:  $-55^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$
- Weight: 1.5 gram

## Electrical Data (typical values)

ID Code	Number of lines	max. Current (mA)	L/winding ( $\mu\text{H}$ )	RDC max ( $\text{m}\Omega$ )	Isolation (Vrms)
DLEF42 020 1S	2	100	5*	235	250

\* at 15 MHz

## To Order

To Order			DLEF42 020 1S
DLEF42	020	1	S
Range	Number of windings	Version	S = for surface mount

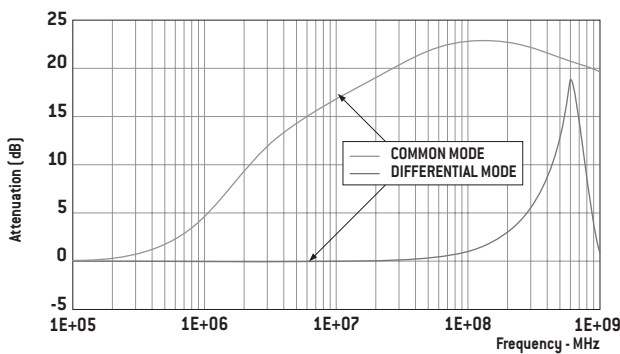
## Application

Digital video signal filtering for CCD acquisition

## Packaging

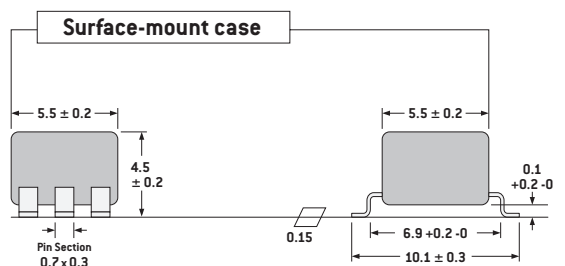
Individually packed in a 160 x 137 x 55 mm cardboard box. 40 parts on 2 layers

## Response Curves



Typical Attenuation versus Frequency on 5 Ohms (@100 mV)

## Typical Dimensions (mm)

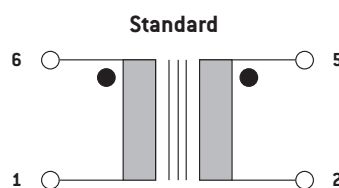


## Marking

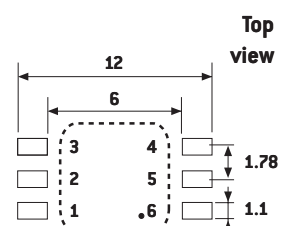


DL42 02 01:  
EXXELIA part number  
yyww: Date code

## Connections



## PCB Layout (suggested)





# Line-Matching Transformer MTLM 1234 MIL



- Line isolation and impedance matching
- Transfer-moulded encapsulation
- Materials meet UL94-V0 rating
- Surface-mount package
- Frequency range 100 Hz to 10 kHz
- Operating temperature range: -55°C to +125°C
- Weight: 2.5 grams

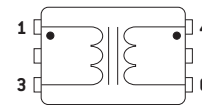
## Electrical Data (25°C)

Parameter	Value
Primary Impedance (pins 1 - 3)	600Ω
Secondary Impedance (pins 4 - 6)	600Ω
Turns Ratio at 1 kHz	1/1 ± 1%
Shunt Inductance at 200Hz, 0.15V	≥ 2.2 H
Shunt Resistance at 200Hz, 0.15V	≥ 4700Ω
Leakage Inductance (1kHz)	≤ 5.5mH
Primary Winding Resistance	115Ω ± 15%
Secondary Winding Resistance	115Ω ± 15%
Insertion Loss (at 1kHz; 600Ω)	1.75 dB ± 0.25
Frequency Response (0.1 - 4kHz)	± 0.25dB
Return Loss (0.2 - 4kHz)	≥ 24dB
Distortions (600Hz; 10 dBm; 600Ω)	- 82dBm
Dielectric Strength (2s)	1.5kVrms
Isolation	1.5kVdc
Operating Temperature Range	-55°C to +125°C
Storage Temperature Range	-55°C to +125°C

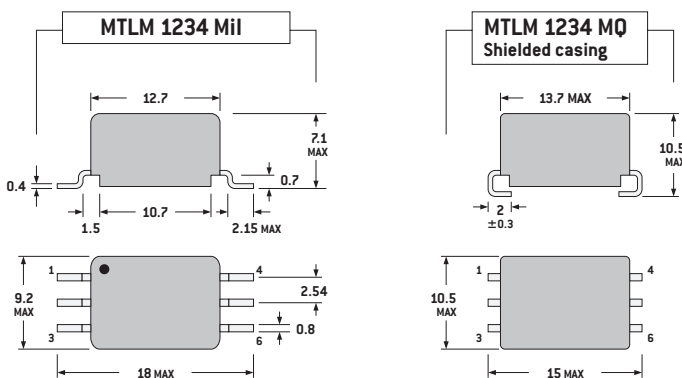
## Application

Line isolation and impedance matching

## Connections

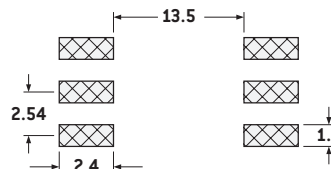


## Typical Dimensions (mm)

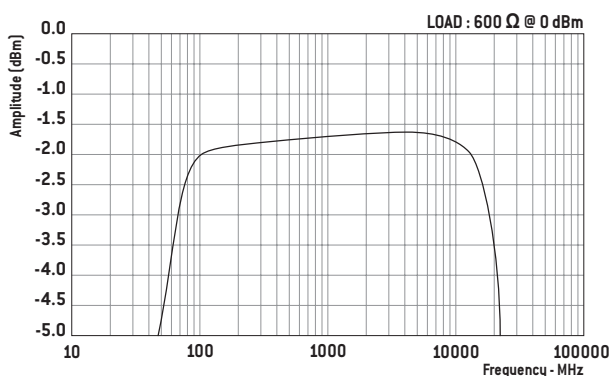


## PCB Layout

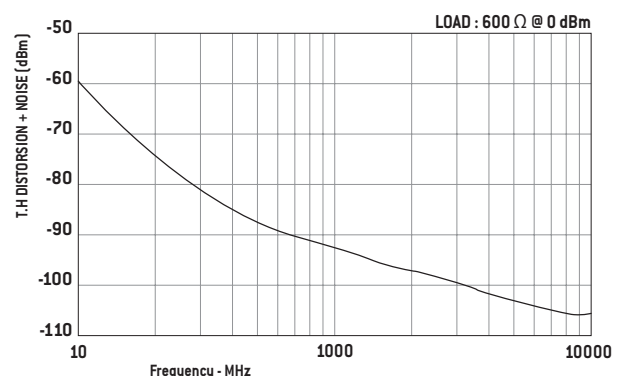
(suggested - only MTLM 1234 Mil)



## Frequency Response



## Distortion



# MIL-STD 1553 Interface Transformers

## DBIT x 3 S



- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Qualified EPPL issue 22 2012-12-17
- Open-circuit impedance greater than 3 kΩ (4 kΩ typical value) from 75 kHz to 1 MHz
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 3 to 3.5 grams

### Electrical Data (25°C)

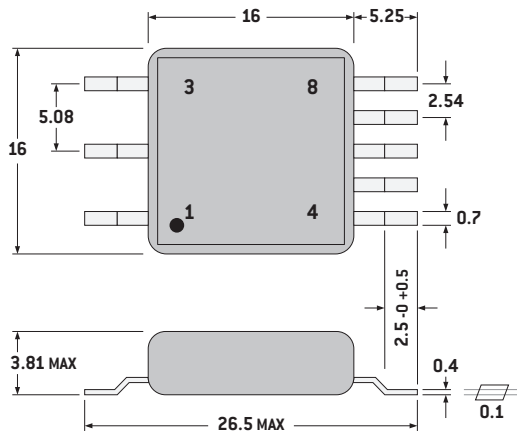
ID Code	Turn ratio 1-3: 4-8	Turn ratio 1-3: 5-7	R <sub>DC</sub> max. (Ω) [1-3]	R <sub>DC</sub> max. (Ω) [4-8]	Primary Inductance (mH) min at 75 kHz-1V
DBIT 1 3S	1.4: 1	2: 1	3	2.3	Lp (1-3) ?
DBIT 2 3S	1: 1	1: 0.707	3	3.3	Lp (1-3) ?
DBIT 3 3S	1.2: 1	1.67: 1	3	2.7	Lp (1-3) ?
DBIT 4 3S	1: 2.5	1: 1.74	1.5	3.5	Lp (4-8) ?
DBIT 5 3S	1: 2.5	1: 1.79	1.5	3.5	Lp (4-8) ?
DBIT 6 3S	2.3: 1	3.2: 1	3	1.5	Lp (1-3) ?
DBIT 7 3S	1.25: 1	1.66: 1	3	3.3	Lp (1-3) ?
DBIT 8 3S	1: 2.12	1: 1.5	1.8	3.5	Lp (4-8) ?

### To Order

DBIT	#	3	S
Range	Transceiver type	Case height 3	SSMD

DBIT # 3S

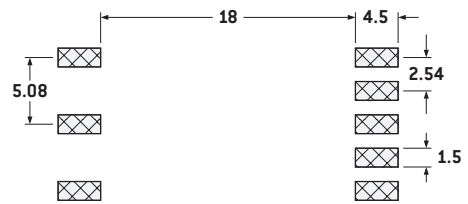
### Typical Dimensions (mm, top view)



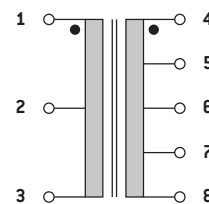
### Notes

- Common mode rejection: 45 dB min.
- Dielectric withstanding voltage: 100 V<sub>RMS</sub>.
- Insulation resistance: 1000 MΩ min.
- Tolerance ratio ± 3 %.

### PCB Layout (suggested)

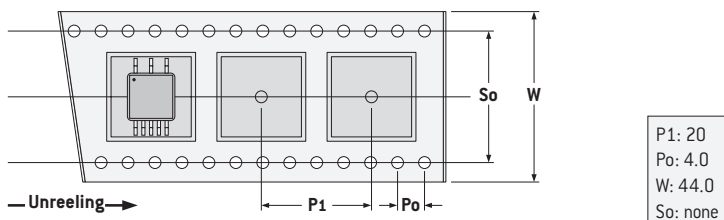


### Connections

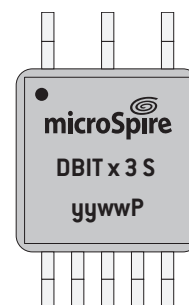


### Packaging

Individually packed: 32 parts on 2 layers.  
Tape and Reel:  
700 units per reel of diameter 330 mm



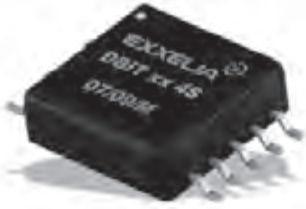
### Marking



yyww:  
Date code

# MIL-STD 1553 Interface Transformers

## DBIT xx 4 S



- Miniature package, less board space
- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Applied standards: ESCC 3201 generic specification for space products
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 1.5 grams

### Electrical Data (25°C)

ID Code	Turns ratio (±3%) P : S	Connections	R <sub>DC</sub> max. {1-3}(Ω)	R <sub>DC</sub> max. {4-8}(Ω)	R <sub>DC</sub> max. {5-7}(Ω)	Output Rise Time ns (max.)	Impedance Ω (min.) 75 kHz to 249 kHz	Impedance Ω (min.) 250 kHz to 1 MHz
DBIT 91 4S	1 : 3.75	A	0.25	3.00	-	250 ns	{4-8} 4000	{4-8} 4000
DBIT 50 4S	1 : 2.50	A	1.5	3.5	-	250 ns	{4-8} 3000	{4-8} 4000
DBIT 70 4S	1.25 : 1	A	2.4	2.1	-	150 ns	{1-3} 3000	{1-3} 4000
DBIT 12 4S	1.41 : 1	A	2.7	2.2	-	150 ns	{1-3} 5000	{1-3} 7200
DBIT 90 4S	1 : 2.70	B	0.25	-	2.00	250 ns	{5-7} 2000	{5-7} 3000
DBIT 51 4S	1 : 1.79	B	1.5	-	2.5	150 ns	{5-7} 2000	{5-7} 4000
DBIT 71 4S	1.66 : 1	B	2.4	-	1.5	150 ns	{1-3} 3000	{1-3} 4000
DBIT 11 4S	2.00 : 1	B	2.6	-	1.3	150 ns	{1-3} 5000	{1-3} 7200

### To Order

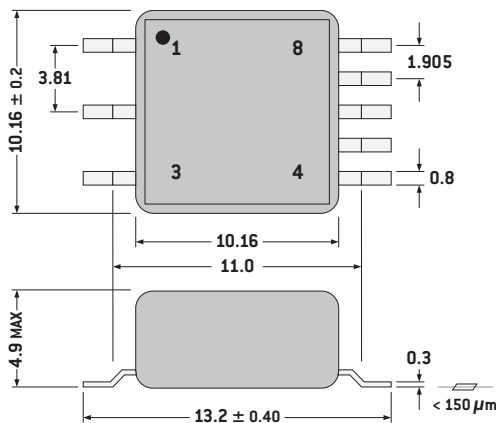
DBIT	##	4	S
Range	Code Turn Ratio	Case height 4.7	S SMD

### DBIT ## 4S

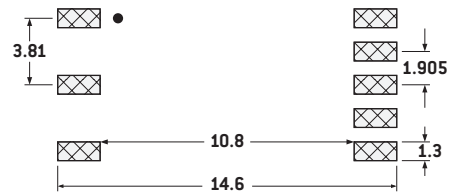
### Notes

Common mode rejection: 45 dB min.  
Dielectric withstanding voltage: 100 V<sub>RMS</sub>.  
Insulation resistance: 1000 MΩ min.

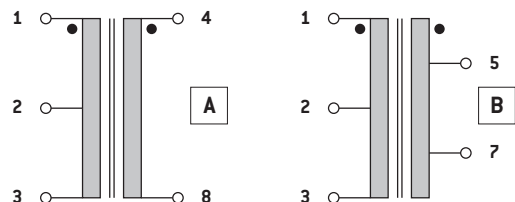
### Typical Dimensions (mm, top view)



### PCB Layout (suggested)

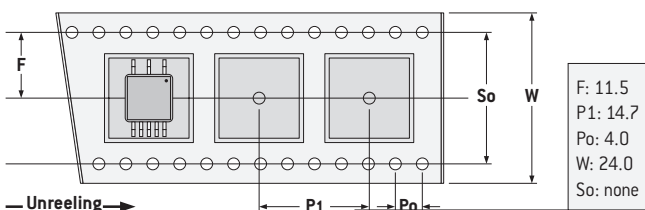


### Connections

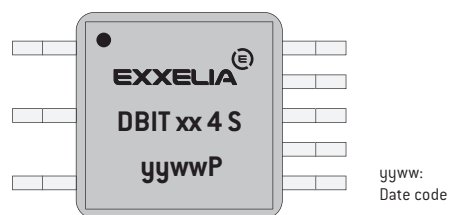


### Packaging

Individually packed: 32 parts on 2 layers.  
Tape and Reel:  
700 units per reel of diameter 330 mm



### Marking



# MIL-STD 1553 Interface Transformers

## DBIT x 5 S(A)



- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Qualified EPPL
- Open-circuit impedance greater than 4 kΩ over 75 kHz to 1 MHz working frequency
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C up to +150°C (for 5SA only)
- Weight: 3 to 3.5 grams

### Electrical Data (25°C)

ID Code	Turn ratio 1-3: 4-8	Turn ratio 1-3: 5-7	R <sub>DC</sub> max. (Ω) 1-3	R <sub>DC</sub> max. (Ω) 4-8	Primary Inductance (mH) min at 75 kHz-1V	Open Circuit Impedance Min (kΩ)	Operating Temperature range
DBIT 1 5S*	1,4:1	2:1	2,2	1,2	7 (1-3)	3	-55°C +125°C
DBIT 2 5S*	1:1	1:0,707	2,2	2,4	7 (1-3)	3	-55°C +125°C
DBIT 3 5S*	1,2:1	1,67:1	2,2	2	7 (1-3)	3	-55°C +125°C
DBIT 4 5S*	1,2:5	1,1,74	1,2	2,7	7 (4-8)	3	-55°C +125°C
DBIT 5 5S*	1:2,5	1:1,79	1,2	2,7	7 (4-8)	3	-55°C +125°C
DBIT 6 5S*	2,3:1	3,2:1	2,2	1,2	7 (1-3)	3	-55°C +125°C
DBIT 7 5S*	1,25:1	1,66:1	2,2	2	7 (1-3)	3	-55°C +125°C
DBIT 8 5S*	1:2,12	1:1,5	1,2	2,7	7 (4-8)	3	-55°C +125°C
DBIT 1 5SA	1,4:1	2:1	1,23	1,1	7 (1-3)	4	-55°C +150°C
DBIT 2 5SA	1:1	1:0,707	1,23	1,6	7 (1-3)	4	-55°C +150°C
DBIT 3 5SA	1,2:1	1,67:1	1,23	1,4	7 (1-3)	4	-55°C +150°C
DBIT 5 5SA	1:2,5	1:1,79	0,6	1,4	7 (4-8)	4	-55°C +150°C
DBIT 6 5SA	2,3:1	3,2:1	1,23	0,8	7 (1-3)	4	-55°C +150°C
DBIT 7 5SA	1,25:1	1,66:1	1,23	1,25	7 (1-3)	4	-55°C +150°C
DBIT 8 5SA	1:2,12	1:1,5	0,7	1,4	7 (4-8)	4	-55°C +150°C

\* EPPL products - Detail Specifications MSP003

### Notes

- Common mode rejection : 45 dB min.
- Dielectric withstanding voltage : 500 V<sub>RMS</sub>.
- Insulation resistance : 1,3 - 4,8 500 V<sub>DC</sub> >1000 MΩ
- Tolerance ratio ± 3 %.

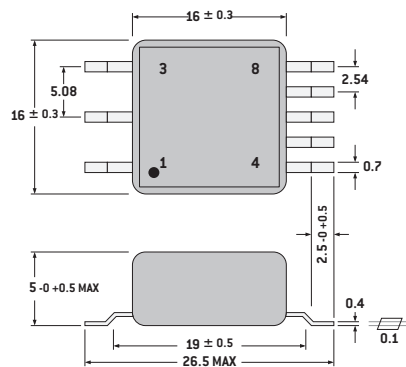
### To Order

DBIT	#	5	S	A
Range	Part 1 to 8	Case height 5	S SMD	New version

DBIT # 5SA

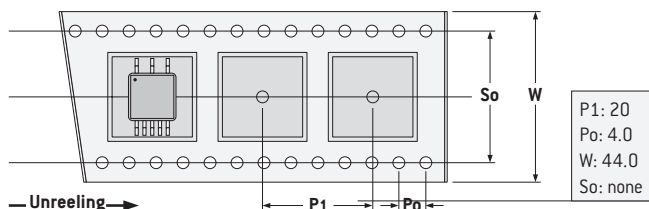
### Typical Dimensions

(mm, top view)



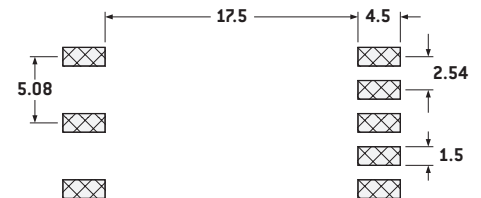
### Packaging

Individually packed: 32 parts on 2 layers.  
Tape and Reel:  
200 units per reel of diameter 330 mm

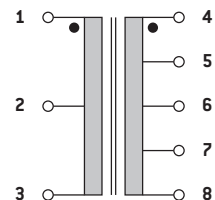


P1: 20  
P0: 4.0  
W: 44.0  
So: none

### PCB Layout (suggested)



### Connections



### Marking



yyww: Date code

# MIL-STD 1553 Interface Transformers

## DBIT x 7 P(A)



- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Qualified EPPL
- Open-circuit impedance greater than 4 kΩ over 75 kHz to 1 MHz working frequency
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C up to +150°C (for 7PA only)
- Weight: < 5 grams

### Electrical Data (25°C)

ID Code	Turn ratio 1-3: 4-8	Turn ratio 1-3: 5-7	R <sub>DC</sub> max. (Ω) 1-3	R <sub>DC</sub> max. (Ω) 4-8	Primary Inductance (mH) min at 75 kHz-1V	Open Circuit Impedance Min (kΩ)	Operating Temperature range
DBIT 1 7P*	1,4:1	2:1	2	1,6	7 (1-3)	3	-55°C +125°C
DBIT 2 7P*	1:1	1:0,707	2	2,2	7 (1-3)	3	-55°C +125°C
DBIT 3 7P*	1,2:1	1,67:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 4 7P*	1:2,5	1:1,74	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 5 7P*	1:2,5	1:1,79	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 6 7P*	2,3:1	3,2:1	2	1	7 (1-3)	3	-55°C +125°C
DBIT 7 7P*	1,25:1	1,66:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 8 7P*	1:2,12	1:1,5	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 1 7PA	1,4:1	2:1	1,23	1,1	7 (1-3)	4	-55°C +150°C
DBIT 2 7PA	1:1	1:0,707	1,23	1,6	7 (1-3)	4	-55°C +150°C
DBIT 3 7PA	1,2:1	1,67:1	1,23	1,4	7 (1-3)	4	-55°C +150°C
DBIT 5 7PA	1:2,5	1:1,79	0,6	1,4	7 (4-8)	4	-55°C +150°C
DBIT 6 7PA	2,3:1	3,2:1	1,23	0,8	7 (1-3)	4	-55°C +150°C
DBIT 7 7PA	1,25:1	1,66:1	1,23	1,25	7 (1-3)	4	-55°C +150°C
DBIT 8 7PA	1:2,12	1:1,5	0,7	1,4	7 (4-8)	4	-55°C +150°C

\* EPPL products - Detail Specifications MSP003

### To Order

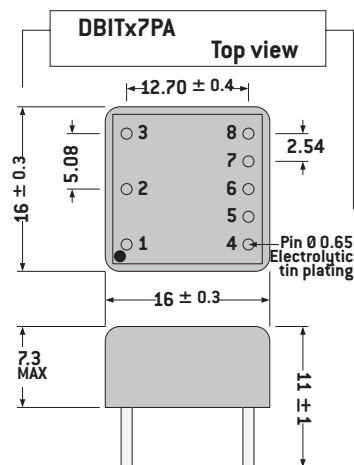
DBIT # 7PA

DBIT	#	7	P	A
Range	Part 1 to 8	Case height 7	x = P Pins	New version

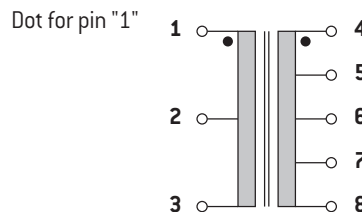
### Notes

- Common mode rejection: 45 dB min.
- Dielectric withstanding voltage: 500 V<sub>RMS</sub>.
- Insulation resistance: 1,3 - 4,8 500 V<sub>DC</sub> >1000 MΩ
- Tolerance ratio ± 3 %.

### Typical Dimensions (mm)



### Connections



### Marking



yyww:  
Date code

# MIL-STD 1553 Interface Transformers

## DBIT x 7 P10(A)



- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Qualified EPPL
- Open-circuit impedance greater than 4 kΩ over 75 kHz to 1 MHz working frequency
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C up to +150°C (for 7P10A only)
- Weight: < 5 grams

### Electrical Data (25°C)

ID Code	Turn ratio 1-3: 4-8	Turn ratio 1-3: 5-7	R <sub>DC</sub> max. (Ω) 1-3	R <sub>DC</sub> max. (Ω) 4-8	Primary Inductance (mH) min at 75 kHz-1V	Open Circuit Impedance Min (kΩ)	Operating Temperature range
DBIT 1 7P10*	1,4:1	2:1	2	1,6	7 (1-3)	3	-55°C +125°C
DBIT 2 7P10*	1:1	1:0,707	2	2,2	7 (1-3)	3	-55°C +125°C
DBIT 3 7P10*	1,2:1	1,67:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 4 7P10*	1:2,5	1:1,74	1	2	7 (4-8)	3	-55°C +125°C
DBIT 5 7P10*	1:2,5	1:1,79	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 6 7P10*	2,3:1	3,2:1	2	1	7 (1-3)	3	-55°C +125°C
DBIT 7 7P10*	1,25:1	1,66:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 8 7P10*	1:2,12	1:1,5	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 9 7P10*	1:2,38	1:1,666	1	2,2	7 (1-3)	3	-55°C +125°C
DBIT 10 7P10*	1:3,0	1:2,14	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 1 7P10A	1,4:1	2:1	1,23	1,1	7 (1-3)	4	-55°C +150°C
DBIT 2 7P10A	1:1	1:0,707	1,23	1,6	7 (1-3)	4	-55°C +150°C
DBIT 3 7P10A	1,2:1	1,67:1	1,23	1,4	7 (1-3)	4	-55°C +150°C
DBIT 5 7P10A	1:2,5	1:1,79	0,6	1,4	7 (4-8)	4	-55°C +150°C
DBIT 6 7P10A	2,3:1	3,2:1	1,23	0,8	7 (1-3)	4	-55°C +150°C
DBIT 7 7P10A	1,25:1	1,66:1	1,23	1,25	7 (1-3)	4	-55°C +150°C
DBIT 8 7P10A	1:2,12	1:1,5	0,7	1,4	7 (4-8)	4	-55°C +150°C

\* EPPL products - Detail Specifications MSP003

### To Order

DBIT # 7 P10A

DBIT	#	7	P10	A
Range	Part 1 to 10	Case height 7	x = P10 Pins (10 mm)	New version

### Notes

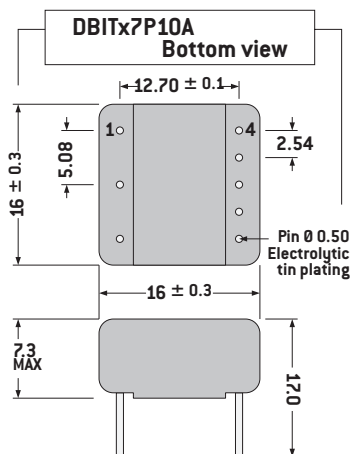
Common mode rejection: 45 dB min.

Dielectric withstanding voltage: 500 V<sub>RMS</sub>.

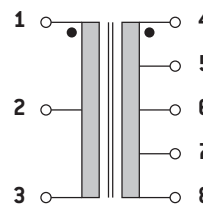
Insulation resistance: 1,3 - 4,8 500 V<sub>DC</sub> > 1000 MΩ

Tolerance ratio ± 3 %.

### Typical Dimensions (mm)



### Connections



### Marking



yyww:  
Date code

# MIL-STD 1553 Interface Transformers

## DBIT x 7 S(A)



- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Qualified EPPL
- Open-circuit impedance greater than 4 kΩ over 75 kHz to 1 MHz working frequency
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C up to +150°C (for 7SA only)
- Weight: < 5 grams

### Electrical Data (25°C)

ID Code	Turn ratio 1-3: 4-8	Turn ratio 1-3: 5-7	R <sub>DC</sub> max (Ω) 1-3	R <sub>DC</sub> max (Ω) 4-8	Primary Inductance (mH) min 75 kHz-1V	Open Circuit Impedance min (kΩ)	Operating Temperature range
DBIT 1 7S*	1,4:1	2:1	2	1,6	7 (1-3)	3	-55°C +125°C
DBIT 2 7S*	1:1	1:0,707	2	2,2	7 (1-3)	3	-55°C +125°C
DBIT 3 7S*	1,2:1	1,67:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 4 7S*	1,2:5	1,67:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 5 7S*	1,2:5	1,1,74	1	2	7 (4-8)	3	-55°C +125°C
DBIT 6 7S*	2,3:1	3,2:1	2	1	7 (1-3)	3	-55°C +125°C
DBIT 7 7S*	1,25:1	1,66:1	2	2	7 (1-3)	3	-55°C +125°C
DBIT 8 7S*	1,2,12	1:1,5	1	2,2	7 (4-8)	3	-55°C +125°C
DBIT 1 7SA	1,4:1	2:1	1,23	1,1	7 (1-3)	4	-55°C +150°C
DBIT 2 7SA	1:1	1:0,707	1,23	1,6	7 (1-3)	4	-55°C +150°C
DBIT 3 7SA	1,2:1	1,67:1	1,23	1,4	7 (1-3)	4	-55°C +150°C
DBIT 5 7SA	1,2:5	1,1,74	0,6	1,4	7 (4-8)	4	-55°C +150°C
DBIT 6 7SA	2,3:1	3,2:1	1,23	0,8	7 (1-3)	4	-55°C +150°C
DBIT 7 7SA	1,25:1	1,66:1	1,23	1,25	7 (1-3)	4	-55°C +150°C
DBIT 8 7SA	1,2,12	1:1,5	0,7	1,4	7 (4-8)	4	-55°C +150°C

\* EPPL products - Detail Specifications MSP003

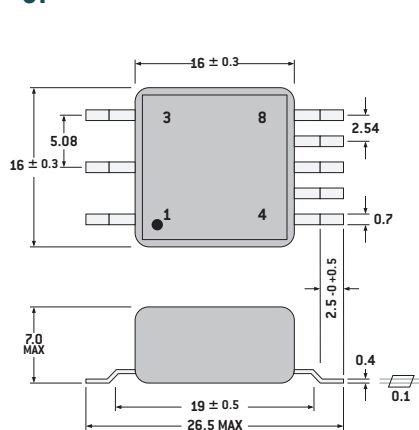
### Notes

- Common mode rejection : 45 dB min.
- Dielectric withstanding voltage : 100 V<sub>RMS</sub>.
- Insulation resistance : 1,3 - 4,8 500 V<sub>DC</sub> >1000 MΩ
- Tolerance ratio ± 3 %.

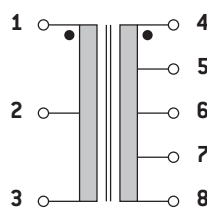
### To Order

DBIT	#	7	x	DBIT # 7 SA	A
Range	Part 1 to 8	Case height 7	x = S SMD		New version

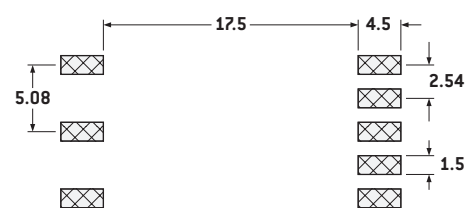
### Typical Dimensions (mm)



### Connections



### PCB Layout (suggested, DBIT x 7 S)



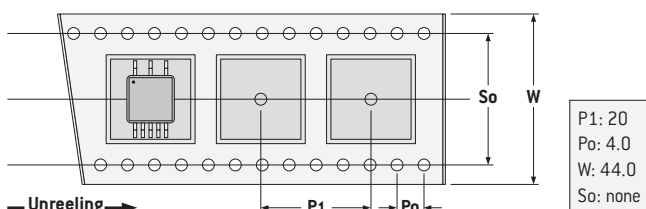
### Marking



yyww:  
Date code

### Packaging

Individually packed: 32 parts on 2 layers.  
Tape and Reel (DBIT x 7S):  
300 units per reel of diameter 330 mm



# MIL-STD 1553 Interface Transformers

## DBIT 5 7 x 400



- In accordance to MIL-STD 1553 A & B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Waveform integrity: 27 V<sub>ptop</sub> level at 250 kHz - droop < 20 % into the lowest turn's wdg
- Encapsulated in accordance with MIL-T-21038 (DAP box)
- Applied standards: ESCC 3201 generic specification for space products
- Open-circuit impedance greater than 4 kΩ from 75 kHz to 1 MHz
- Operating temperature range: -40°C to +125°C
- Weight: 3 to 3.5 grams

### Electrical Data (25°C)

ID Code	Turn ratio 1-3: 4-8	Turn ratio 1-3: 5-7	R <sub>DC</sub> max. (Ω) [1-3]	R <sub>DC</sub> max. (Ω) [4-8]	Primary Inductance (mH) min at 75 kHz-1V
DBIT 5 7x400	1: 2.5	1: 1.79	1	3.5	L <sub>p</sub> (4-8) 8.5

### Notes

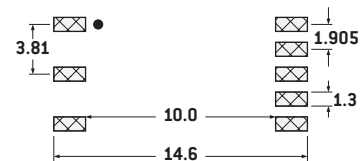
Common mode rejection: 45 dB min.  
 Dielectric withstanding voltage: 500 V<sub>RMS</sub>.  
 Insulation resistance: 1000 MΩ min - 500 V<sub>DC</sub>  
 Tolerance ratio ± 2 %.

### To Order

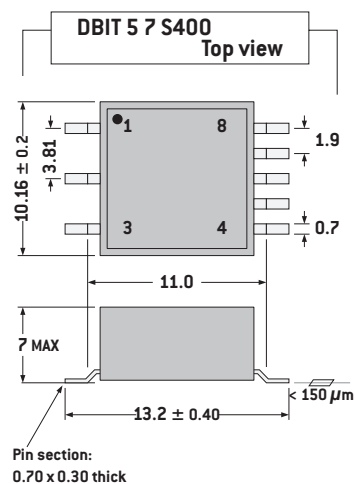
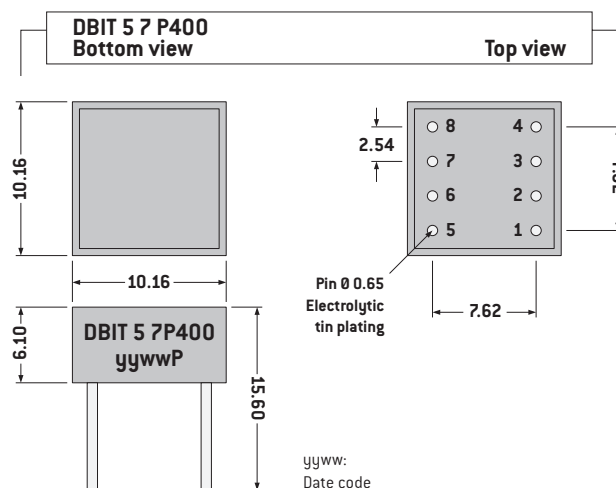
DBIT			DBIT 5 7x400	
DBIT	5	7	P400	
Range	Code turn ratio	Case height 7	x = P for Pin through hole x = S for SMD	

### PCB Layout

(suggested, DBIT 5 7 S400)

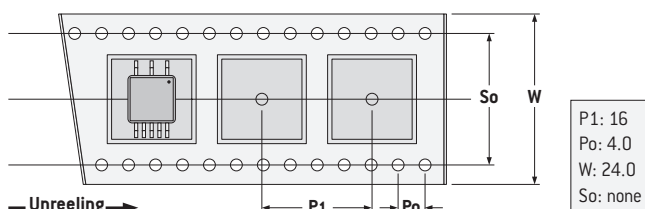


### Typical Dimensions (mm)

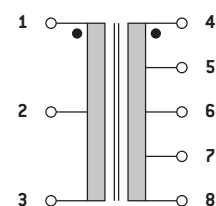


### Packaging

Individually packed: 32 parts on 2 layers.  
 Tape and Reel (DBIT 5 7 S400):  
 400 units per reel of diameter 330 mm



### Connections





# Dual staked MIL-STD 1553 Interface Transformers

## SBIT x 7.5S



- In accordance to MIL-STD 1553 B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Applied standards: ESCC 3201 generic specification for space products
- Open-circuit impedance greater than 3 kΩ [ 4 kΩ typical value ] from 75 kHz to 1 MHz
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: < 5 grams

### Electrical Data (25°C)

Parameter	Unit	SBIT 1 7.5S	SBIT 2 7.5S	SBIT 3 7.5S	SBIT 4 7.5S	SBIT 5 7.5S	SBIT 6 7.5S	SBIT 7 7.5S	SBIT 8 7.5S
<b>Frequency Response</b>									
Operating Range	kHz	75 to 1000	75 to 1000	75 to 1000	75 to 1000	75 to 1000	75 to 1000	75 to 1000	75 to 1000
<b>Common-Mode Rejection (min)</b>									
	dB	45	45	45	45	45	45	45	45
<b>Electrical Requirements</b>									
Terminal Winding Resistance Rdc									
• 1-3 / (11-13) (max)	Ω	3.5	3	1.9	1	1	1.2	3.2	1
• 4-8 / (14-18) (max)	Ω	3	3	1.9	3	3	3	3	3
Interwinding Capacitance (max)	pF	70	30	70	45	45	70	70	70
Winding Inductance									
• LM (min)	mH	7.5	7.5	7.5	6.0	6.0	8.0	8.0	6.0
• LL (max)	μH	6.0	6.0	6.0	8.0	6.0	8.0	6.0	7.0
<b>Peak-to-Peak Voltage (max)</b>									
Terminals 1-3 primary	Vpp	60	60	60	38	38	39	60	44
<b>Droop (max)</b>									
3 ms Pulse Duration									
140 Ω Load Across Terminals 4-8	%	10	10	10	10	10	10	10	10
<b>Decay Time (max)</b>									
140 Ω Load Across Terminals 4-8	ns	25	25	25	25	25	25	25	25
<b>Backswing</b>									
140 Ω Load Across Terminals 4-8	%	none	none	none	none	none	none	none	none
<b>Turns Ratios</b>									
Terminals									
• 1-3: 4-8 / 11-13: 14-18		1.4: 1	1: 1	1.20: 1	1: 3.2	1: 2.5	1: 2.5	1.25: 1	1: 2.12
• 1-3: 5-7 / 11-13: 15-13		2: 1	1: 0.707	1.67: 1	1: 2.3	1: 1.79	1: 1.75	1.66: 1	1: 1.5

### To Order

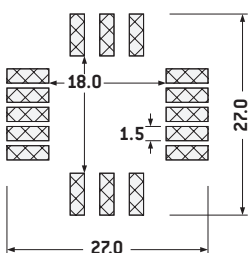
SBIT # 7.5S

SBIT	#	7.5	S
Range	Part 1 to 8	Case height 7.5	SSMD

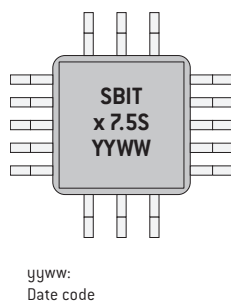
### Notes

Interwinding insulation: 500 V<sub>RMS</sub> - 500 Hz.  
Flammability compliance: UL94V0.

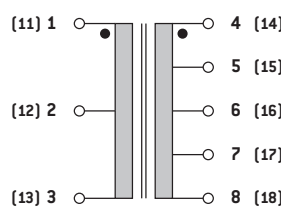
### PCB Layout (suggested)



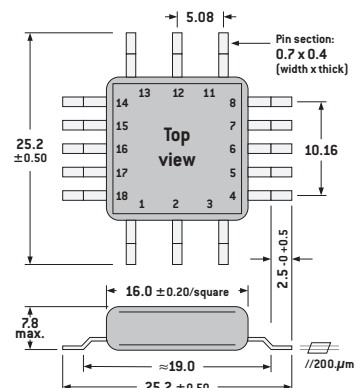
### Marking



### Connections

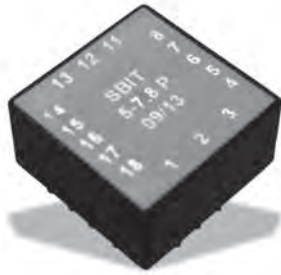


### Typical Dimensions (mm)



# Dual staked MIL-STD 1553 Interface Transformers

## SBIT x 7.8P



- In accordance to MIL-STD 1553 B
- Meet all the electrical requirements of Manchester II serial bi-phase data transmission, 1 MHz operation
- Epoxy molding in accordance with outgassing requirements of ECSS-Q-70-02, MILT 21038
- Open-circuit impedance greater than 3 kΩ (4 kΩ typical value) from 75 kHz to 1 MHz
- Frequency range 75 kHz to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: < 5 grams

### Electrical Data (25°C)

Parameter	Unit	SBIT 1 7.8P	SBIT 2 7.8P	SBIT 3 7.8P	SBIT 5 7.8P	SBIT 7 7.8P	SBIT 8 7.8P
<b>Frequency Response</b>							
Operating Range	kHz	75 to 1000	75 to 1000	75 to 1000	75 to 1000	75 to 1000	75 to 1000
<b>Common-Mode Rejection (min)</b>							
	dB	45	45	45	45	45	45
<b>Electrical Requirements</b>							
Terminal Winding Resistance Rdc							
• 1-3 (max)	Ω	2.8	2.8	2.8	2	2.8	2.2
• 4-8 (max)	Ω	3	3.5	3	3.5	3	3.5
Interwinding Capacitance (max)							
	pF	50	50	50	50	50	50
Winding Inductance							
• LM (min) (1-3)	mH	7.0	7.0	7.0	7.0 (4-8)	8.0	7.0 (4-8)
• LL (max)	μH	6.0	6.0	6.0	6.0	6.0	6.0
<b>Turns Ratios</b>							
Terminals							
•	1:3: 4-8	1.4: 1	1: 1	1.20: 1	1: 2.5	1.25: 1	1: 2.12
•	1:3: 5-7	2: 1	1: 0.707	1.67: 1	1: 1.79	1.66: 1	1: 1.5

### To Order

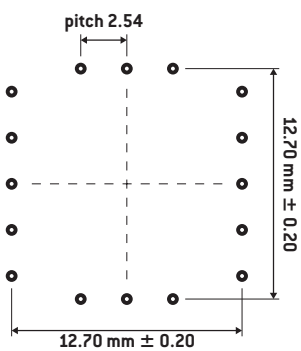
#### SBIT # 7.8P

SBIT	#	7.8	P
Range	Part 1 to 8 except 4 and 6	Case height 7.8	P pins through hole

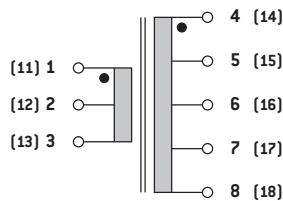
### Notes

Interwinding insulation: 500 V<sub>RMS</sub> - 500 Hz.  
Flammability compliance: UL94V0

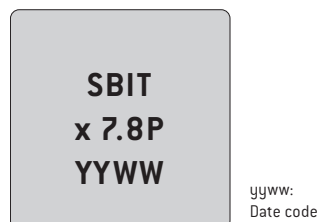
### PCB Layout (suggested)



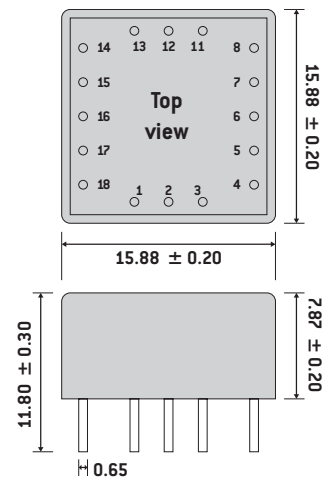
### Connections



### Marking



### Typical Dimensions (mm)



# Ethernet Transformer 2 ways digital block POE-LAN72 M35 1P



- Epoxy molding in accordance with outgassing requirements of ECSS-Q-ST-70-02C
- Design to handle very harsh environment (vibration & temperature)
- Specially designed for mechanical withstanding
- Operating temperature : -40°C to +125°C
- Storage temperature : up to 200°C
- Rohs finishing

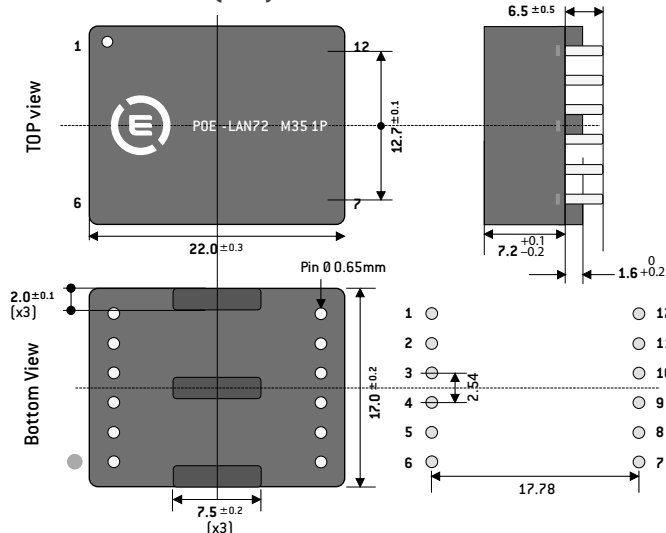
## Data on each WAY @ Room Temperature (+20°C / +26°C)

Characteristics	Symbol	Test Condition	Limits		
			Min	Typical	Max
Primary inductance	2-3 5-6	100kHz/ 0.1Vrms	450 μH	600 μH	750 μH
Primary inductance with DC bias	2-3 5-6	100kHz/ 0.1Vrms with 24mADC imbalanced current	350	-	-
DCR	1-2 = 1-3	MGR10 ohmmeter	-	-	100 mΩ
	4-5 = 4-6		-	-	300 mΩ
	12-11 = 12-10		-	-	300 mΩ
	9-8 = 9-7		-	-	300 mΩ
Turn ratio	1-2/1-3 = 4-5/4-6 1-2/S1S2	100kHz/ 0.1Vrms	-	1/1 ±2%	-
Leakage inductance	Lk2-3 = Lk5-6	100kHz/ 0.1Vrms (w10-11-12 shorted)	-	-	420 nH
Capacitance Cp/s	C2-3/11-10 = C5-6/8-7	100kHz / 0.1Vrms	-	-	40 pF
Dielectric withstanding voltage	D.W.V	2-3 / 11-10	-	-	100 μA
		5-6 / 8-7	-	-	100 μA
		Test voltage : 1000 V <sub>AC</sub> -50Hz-1mn			
Isolation Resistance	IR	2-3 / 11-10	1.0 Ω	-	-
		5-6 / 8-7	E09	-	-
		Test voltage : 500 V <sub>DC</sub>			

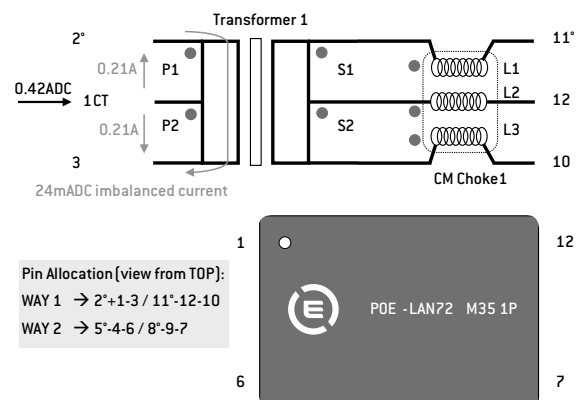
## Insertion/Return losses, Rejection, Crosstalk (+20°C / +26°C)

	Test conditions	Value
Insertion loss	1Mhz-100Mhz	-1,0 dB max.
Return loss	1Mhz-30Mhz	-18 dB min.
	30Mhz-60Mhz	-14 dB min.
	60Mhz-80Mhz	-12 dB min.
	80Mhz-100Mhz	-10 dB min.
Common to Common Mode Rejection	1Mhz-30Mhz	-40 dB min.
	30Mhz-60Mhz	-35 dB min.
	60Mhz-100Mhz	-30 dB min.
Crosstalk	1Mhz-60Mhz	-35 dB min.
	60Mhz-100Mhz	-30 dB min.

## Dimensions (mm)



## Connections



HIGH GRADE PRODUCTS

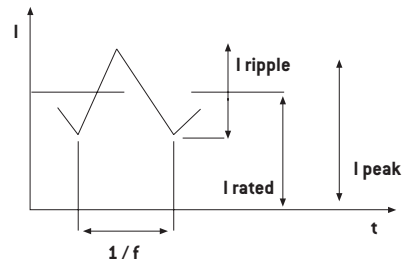
# SMD Power Inductors ESI 01



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-ST-70-02C, MIL-STD-202, D0-160 and ESCC 3201 generic specification for space products
- Materials meet UL94-V0 rating
- Suited for  $I_R$  and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Weight: < 2 grams

## Electrical Data (25°C)

ID Code	Inductance no load ( $\mu\text{H}$ )	Tol. (%)	Rated current ( $A_{DC}$ )	Inductance at rated current ( $\mu\text{H}$ )	DCR at 25°C ( $m\Omega$ )
ESI 01 2K7 1x	2.69	20	2.10	1.72	$24 \pm 12\%$
ESI 01 4K2 1x	4.20		1.70	2.69	$26 \pm 15\%$
ESI 01 7K1 1x	7.10		1.20	4.54	$51 \pm 12\%$
ESI 01 12K 1x	12.10	17	1.10	7.77	96 max.
ESI 01 17K 1x	16.8		0.93	11.15	$124 \pm 12\%$
ESI 01 22K 1x	22.2		0.76	14.75	$142 \pm 12\%$
ESI 01 31K 1x	30.62	15	0.63	20.33	$200 \pm 10\%$
ESI 01 48K 1x	48.56		0.49	33.02	492 max.
ESI 01 64K 1x	63.90		0.41	43.44	$630 \pm 12\%$
ESI 01 81K 1x	81.30	12	0.39	55.29	$710 \pm 12\%$
ESI 01 M10 1x	100.85		0.33	71	$1000 \pm 12\%$
ESI 01 M15 1x	151.20		0.26	106.45	1300 max.

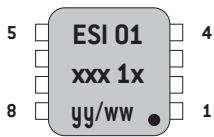


## To Order

ESI01	###	1	x
SMD Energy Storage Inductor	Value code 2K7 = 2,7 $\mu\text{H}$ M10 = 100 $\mu\text{H}$	Version	x = J J leaded x = WW Terminals

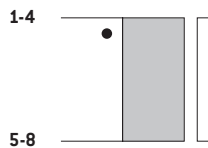
ESI01 ### 1x

## Marking

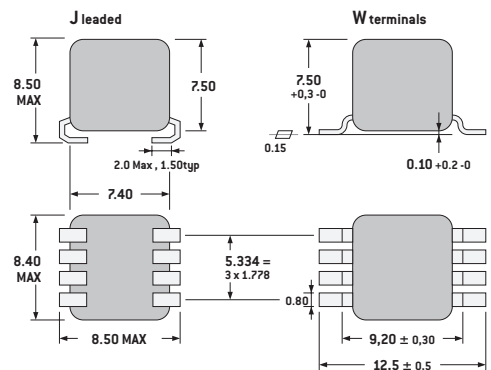


yyww:  
Date code

## Connections



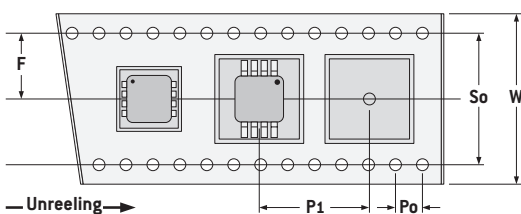
## Dimensions (mm)



## Packaging

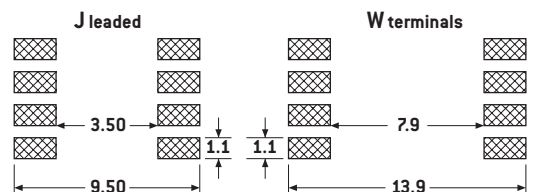
Tape and Reel:

J leaded - 600 units per reel of diameter 330 mm  
W terminals - 400 units per reel of diameter 330 mm



J leaded	W terminals
F: 11.5	F: 11.5
P1: 12	P1: 18
Po: 4.0	Po: 4.0
W: 24.0	W: 24.0
So: none	So: none

## PCB Layout (suggested)



# SMD Power Inductors

## ESI 7



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-ST-70-02C, MIL-STD-202, D0-160 and ESCC 3201 generic specification for space products
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: ≤ 0.5 grams

### Electrical Data (25°C)

ID Code	Inductance (μH)	permanent (A <sub>DC</sub> )	I <sub>peak</sub> A	R <sub>DC</sub> max. at 25°C (mΩ)	Tol. (%)
ESI 7 K42 1S	0.42	2.9	6.0	7.5	20
ESI 7 K65 1S	0.65	2.4	5.0	11.5	
ESI 7 1K2 1S	1.27	1.6	3.6	20.7	
ESI 7 2K1 1S	2.10	1.3	2.8	39	
ESI 7 3K7 1S	3.74	1.0	2.0	64	
ESI 7 5K0 1S	5.09	0.78	1.8	115	
ESI 7 8K4 1S	8.42	0.60	1.4	187	

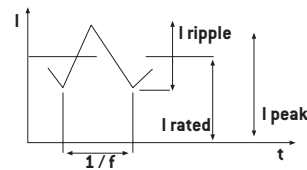
### To Order

ESI 7 ### 1S

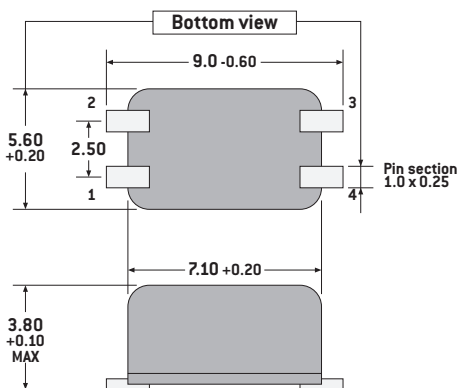
ESI7	###	1	S
SMD Energy Storage Inductor	Value code K42 = 0,42 μH 2K1 = 2.1 μH	Version	SMD Terminals

### Notes

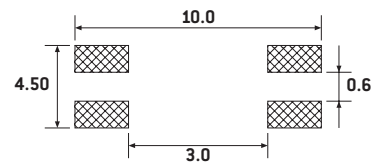
1. Inductance at 10 mV, 10 kHz with WK 3260B impedance analyzer
2. Typical inductance value at recommended full load
3. I<sub>peak</sub> max = maximum peak value of current at +125°C ; L value not guaranteed
4. 10 % admissible I ripple over I<sub>rated</sub> at f = 200 kHz
5. Isolation voltage 150 V<sub>DC</sub>  
- 1 min - R<sub>i</sub> > 100 MΩ between winding and magnetic core



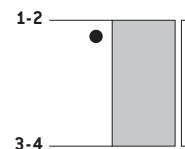
### Dimensions (mm)



### PCB Layout (suggested)

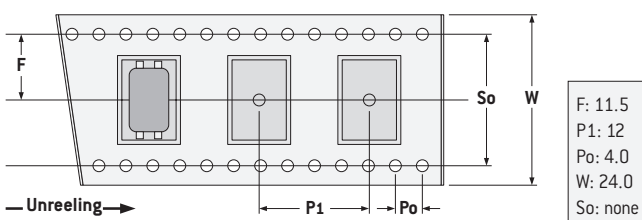


### Connections

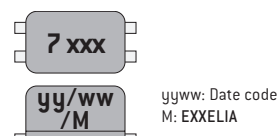


### Packaging

Tape and Reel:  
1300 units per reel of diameter 330 mm



### Marking



# SMD Power Inductors

## CCM 4 1W High Reliability Applications



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- Compliant with ESCC 3201/011
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 5 grams

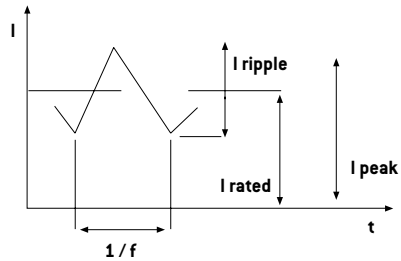
### Electrical Data (25°C)

ID Code	L <sup>1</sup> no load ±5% [μH]	I <sup>2</sup> rated max (A)	I <sup>3</sup> peak max (A)	L <sup>4</sup> at I peak ±10% (μH)	R <sub>dc</sub> ±10% (mΩ)
CCM 4 1K0 1W	1.01	8,8	11	0,958	4,58
CCM 4 1K6 1W	1.58	7,3	9,12	1,50	6,62
CCM 4 2K3 1W	2.27	6,2	7,75	2,15	9,23
CCM 4 3K3 1W	3.28	5,8	7,25	3,12	9,2
CCM 4 4K8 1W	4.78	4,4	5,5	4,54	18
CCM 4 6K7 1W	6.70	3,7	4,62	6,37	24
CCM 4 10K 1W	9.97	3,2	4	9,47	37
CCM 4 15K 1W	15.1	2,7	3,37	14,3	42
CCM 4 23K 1W	22.7	2	2,5	21,6	82
CCM 4 33K 1W	33.3	1,87	2,34	31,7	95
CCM 4 46K 1W	45.9	1,51	1,89	43,6	148
CCM 4 69K 1W	68.6	1,28	1,6	65,2	200
CCM 4 M10 1W	101	1,04	1,3	95,8	302
CCM 4 M15 1W	149	0,81	1,01	141	540
CCM 4 M22 1W	219	0,69	0,862	208	700
CCM 4 M33 1W	327	0,59	0,737	310	932
CCM 4 M47 1W	466	0,46	0,575	443	1600
CCM 4 M68 1W	681	0,39	0,487	647	2172
CCM 4 M10 1W	1000	0,33	0,412	950	3015

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) without heatsink
3. I peak = I rated + I ripple = 150% I rated  
I ripple = 50% I rated at F=500 kHz
4. I peak defined at T env = +85°C and T internal max < +125°C

Iron losses calculated with converter duty cycle α = 0.25  
Dielectric withstanding 500 Vrms (winding/magnetic core)  
Isolation resistance > 1 GΩ (winding/magnetic core)

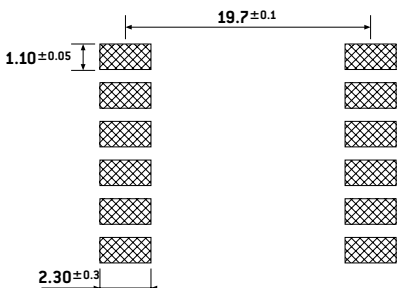


### To Order

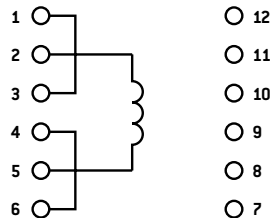
CCM 6 ### #W

CCM	4	###	#	W
SMD Energy Storage Inductor	Size	Value code 1K0 = 1 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals

### PCB Layout (suggested)

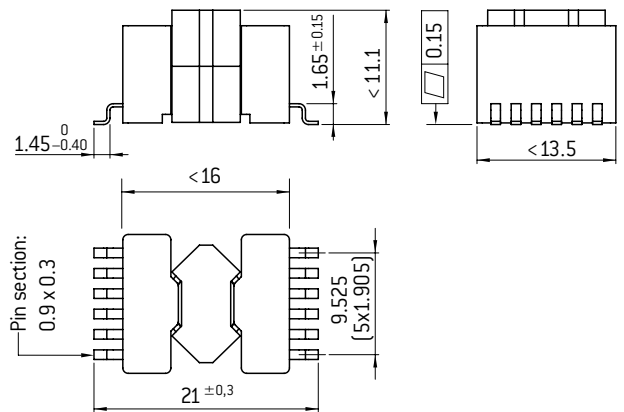


### Connections



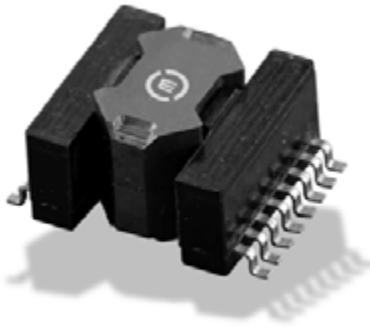
### Dimensions

(mm, top view)



# SMD Power Inductors

## CCM 5 1W High Reliability Applications



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- Compliant with ESCC 3201/011
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 7.5 grams

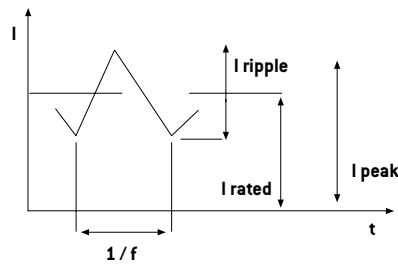
### Electrical Data (25°C)

ID Code	L <sup>1</sup> no load ±5% (μH)	I <sup>2</sup> rated max (A)	I <sup>3</sup> peak max (A)	L <sup>4</sup> at I peak ±10% (μH)	Rdc ±10% (mΩ)
CCM 5 1K5 1W	1,50	10,4	13	1,4288	3,46
CCM 5 2K2 1W	2,20	8,9	11,1	2,09	4,66
CCM 5 3K4 1W	3,38	7,6	9,5	3,2148	5,84
CCM 5 4K6 1W	4,61	6,7	8,37	4,3757	7,45
CCM 5 6K8 1W	6,78	5,5	6,87	6,4448	10
CCM 5 10K 1W	10	4,3	5,37	9,5	15
CCM 5 14K 1W	14,4	3,6	4,5	13,68	22
CCM 5 22K 1W	22,5	2,9	3,62	21,375	37
CCM 5 32K 1W	32,4	2,4	3	30,78	50
CCM 5 48K 1W	48,4	1,97	2,46	45,98	69
CCM 5 68K 1W	67,6	1,64	2,05	64,22	101
CCM 5 M10 1W	102	1,35	1,69	97,28	137
CCM 5 M15 1W	152	1,1	1,37	144,495	233
CCM 5 M22 1W	221	0,92	1,15	209,855	348
CCM 5 M33 1W	325	0,76	0,95	308,655	432
CCM 5 M48 1W	476	0,62	0,775	452,295	715
CCM 5 M67 1W	672	0,52	0,650	638,78	966
CCM 5 1M0 1W	1000	0,43	0,537	950	1404
CCM 5 1M5 1W	1490	0,35	0,437	1413,98	2226

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) without heatsink
3. I peak = I rated + I ripple = 150% I rated  
I ripple = 50% I rated at F=500 kHz
4. I peak defined at T env = +85°C and T internal max < +125°C

Iron losses calculated with converter duty cycle  $\alpha = 0.25$   
 Dielectric withstanding 500 Vrms (winding/magnetic core)  
 Isolation resistance > 1 GΩ (winding/magnetic core)

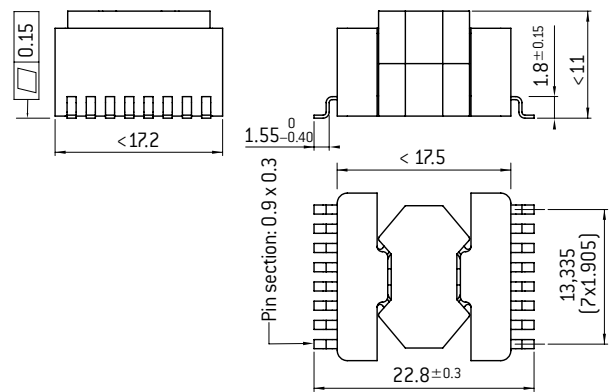


### To Order

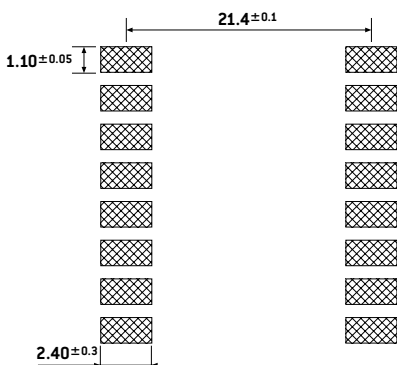
CCM 20 ### #W

CCM	5	###	#	W
SMD Energy Storage Inductor	Size	Value code 1K5 = 1.5 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals

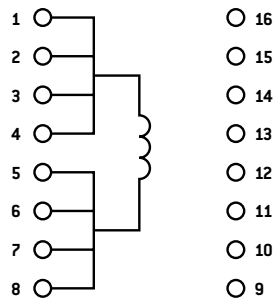
### Dimensions (mm, top view)



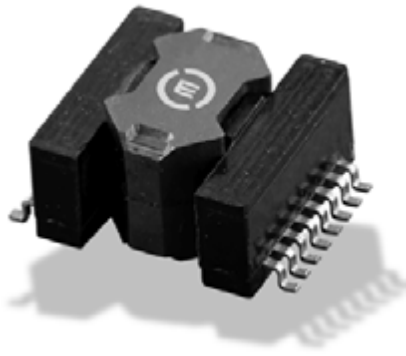
### PCB Layout (suggested)



### Connections



# SMD Power Inductors CCM 6 1W High Reliability Applications



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- Compliant with EESA ESCC 3201/011
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 12 grams

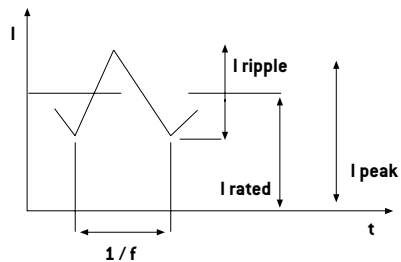
## Electrical Data (25°C)

ID Code	L <sup>1</sup> no load ±5% [μH]	I <sup>2</sup> rated max [A]	I <sup>3</sup> peak max [A]	L <sup>4</sup> at I <sup>3</sup> ±10% [μH]	R <sub>dc</sub> ±10% [mΩ]
CCM 6 2K2 1W	2,18	10,9	13,6	2,07	2,98
CCM 6 3K4 1W	3,40	8,9	11,1	3,23	4,27
CCM 6 4K7 1W	4,70	7,7	9,63	4,47	4,27
CCM 6 6K7 1W	6,66	6,9	8,63	6,33	6,36
CCM 6 10K 1W	10,2	5,4	6,75	9,73	9,62
CCM 6 15K 1W	15,2	4,3	5,38	14,4	16
CCM 6 22K 1W	21,9	3,7	4,63	20,8	21
CCM 6 33K 1W	32,9	3	3,75	31,3	27
CCM 6 47K 1W	46,2	2,6	3,25	43,9	38
CCM 6 68K 1W	67,0	2,1	2,63	63,7	63
CCM 6 M10 1W	100	1,72	2,15	95,0	97
CCM 6 M15 1W	154	1,42	1,78	146	137
CCM 6 M22 1W	219	1,21	1,51	208	181
CCM 6 M33 1W	324	0,96	1,20	308	307
CCM 6 M47 1W	467	0,83	1,04	443	379
CCM 6 M68 1W	676	0,68	0,850	642	564
CCM 6 1M0 1W	999	0,56	0,700	949	827
CCM 6 1M5 1W	1505	0,45	0,563	1430	1401
CCM 6 2M2 1W	2190	0,38	0,475	2081	1759

## Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) without heatsink
3. I peak = I rated + I ripple = 150% I rated  
I ripple = 50% I rated at F=500 kHz
4. I peak defined at T env = +85°C and T internal max < +125°C

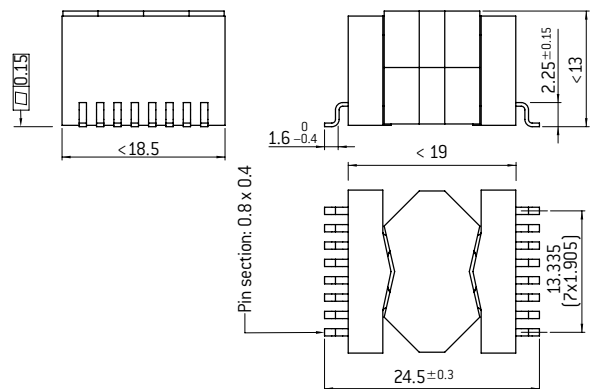
Iron losses calculated with converter duty cycle α = 0.25  
Dielectric withstanding 500 Vrms (winding/magnetic core)  
Isolation resistance > 1 GΩ (winding/magnetic core)



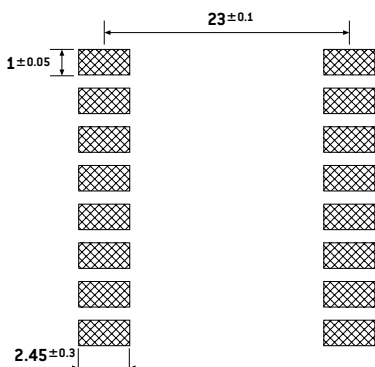
## To Order

CCM	6	###	#	CCM 6 ### #W
SMD Energy Storage Inductor	Size	Value code 4K9 = 4,9 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals

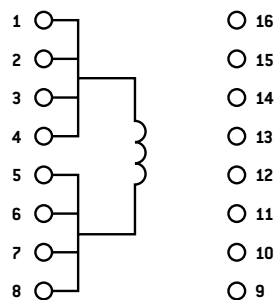
## Dimensions (mm, top view)



## PCB Layout (suggested)



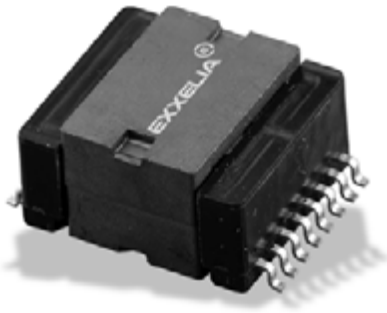
## Connections





# SMD Power Inductors

## CCM 20 1W High Reliability Applications



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- Compliant with EESA ESCC 3201/011
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 21 grams

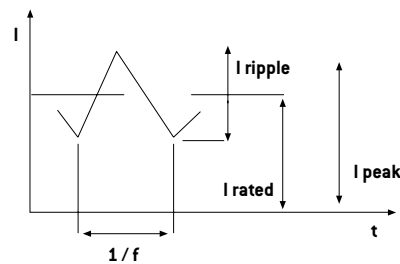
### Electrical Data (25°C)

ID Code	L <sup>1</sup> no load ±5% (μH)	I <sup>2</sup> rated max (A)	I <sup>3</sup> peak max (A)	L <sup>4</sup> at I <sup>3</sup> peak ±10% (μH)	R <sub>dc</sub> ±10% (mΩ)
CCM 20 3K3 1W	3.28	15.1	18.9	3.11	2.6
CCM 20 4K7 1W	4.72	12.4	15.5	4.48	3.9
CCM 20 6K8 1W	6.76	11.2	14.0	6.42	4.7
CCM 20 10K 1W	10.24	8.6	10.8	9.73	6.7
CCM 20 15K 1W	15.0	7.4	9.25	14.3	9.1
CCM 20 23K 1W	23.0	5.9	7.38	21.9	13
CCM 20 33K 1W	32.9	4.9	6.13	31.3	18
CCM 20 46K 1W	46.2	4.2	5.25	43.9	26
CCM 20 71K 1W	70.6	3.3	4.13	67.0	41
CCM 20 M10 1W	100	2.8	3.50	95.0	58
CCM 20 M15 1W	154	2.3	2.88	146	83
CCM 20 M22 1W	219	1.93	2.41	208	126
CCM 20 M32 1W	324	1.6	2.00	308	172
CCM 20 M47 1W	467	1.34	1.68	443	244
CCM 20 M68 1W	676	1.09	1.36	642	385
CCM 20 1M0 1W	999	0.9	1.13	949	592
CCM 20 1M5 1W	1505	0.74	0.925	1430	815
CCM 20 2M2 1W	2190	0.61	0.763	2081	1224
CCM 20 3M3 1W	3318	0.49	0.613	3152	1927

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) without heatsink
3. I peak = I rated + I ripple = 150% I rated  
I ripple = 50% I rated at F=500 kHz
4. I peak defined at T<sub>env</sub> = +85°C and T<sub>internal max</sub> < +125°C

Iron losses calculated with converter duty cycle α = 0.25  
Dielectric withstanding 500 V<sub>rms</sub> (winding/magnetic core)  
Isolation resistance > 1 GΩ (winding/magnetic core)

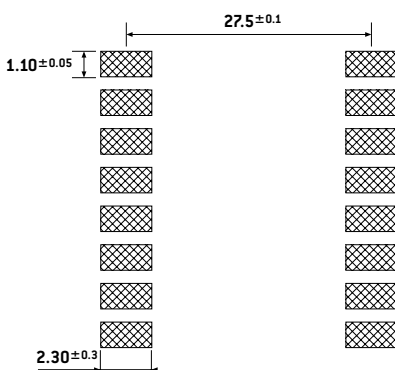


### To Order

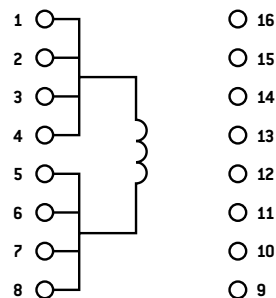
CCM 20 ### #W

CCM	20	###	#	W
SMD Energy Storage Inductor	Size	Value code 3K3 = 3.3 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals

### PCB Layout (suggested)

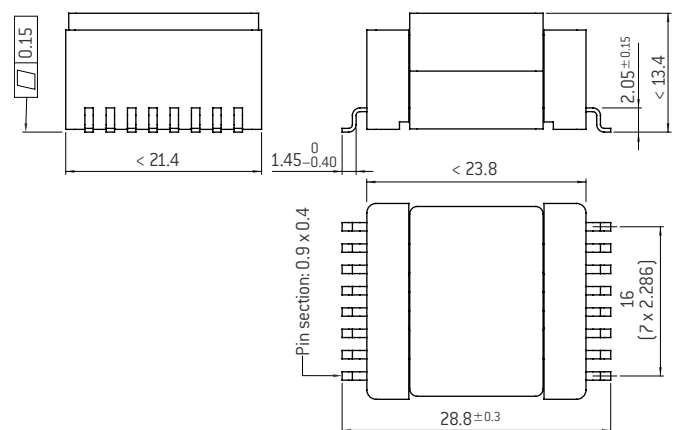


### Connections



### Dimensions

(mm, top view)



HIGH GRADE PRODUCTS

# SMD Power Inductors CCM 25 1W High Reliability Applications



- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- Compliant with ESCC 3201/011
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 21 grams

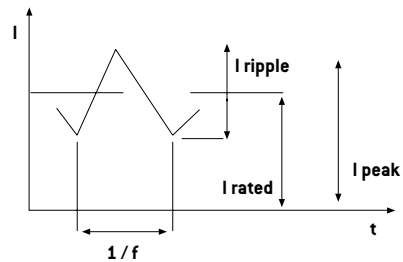
## Electrical Data (25°C)

ID Code	L <sup>1</sup> no load ±5% [μH]	I <sup>2</sup> rated max (A)	I <sup>3</sup> peak max (A)	L <sup>4</sup> at I peak ±10% [μH]	Rdc ±10% (mΩ)
CCM25 4K7 1W	4.70	12.7	22.1	4.47	1.9
CCM25 6K8 1W	6.77	14.9	18.6	6.43	2.7
CCM25 10K 1W	10.2	12.6	15.8	9.73	4.0
CCM25 15K 1W	15.3	10.3	12.9	14.5	6.3
CCM25 22K 1W	22.0	8.6	10.8	20.9	8.8
CCM25 33K 1W	32.9	6.9	8.63	31.3	13
CCM25 46K 1W	46.2	5.9	7.38	43.9	18
CCM25 68K 1W	67.5	4.8	6.00	64.1	30
CCM25 M10 1W	100	4.1	5.13	95.0	44
CCM25 M15 1W	147	3.3	4.13	140	57
CCM25 M22 1W	219	2.8	3.50	208	77
CCM25 M32 1W	324	2.2	2.75	308	130
CCM25 M47 1W	467	1.9	2.38	443	175
CCM25 M68 1W	676	1.6	2.00	642	236
CCM25 M10 1W	999	1.3	1.625	949	366
CCM25 M15 1W	1505	1.06	1.325	1430	554
CCM25 M22 1W	2190	0.87	1.088	2081	844
CCM25 M33 1W	3318	0.7	0.875	3152	1318
CCM25 M47 1W	4679	0.6	0.750	4445	1755

## Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) without heatsink
3. I peak = I rated + I ripple = 150% I rated  
I ripple = 50% I rated at F=500 kHz
4. I peak defined at T env = +85°C and T internal max < +125°C

Iron losses calculated with converter duty cycle α = 0.25  
Dielectric withstanding 500 Vrms (winding/magnetic core)  
Isolation resistance > 1 GΩ (winding/magnetic core)



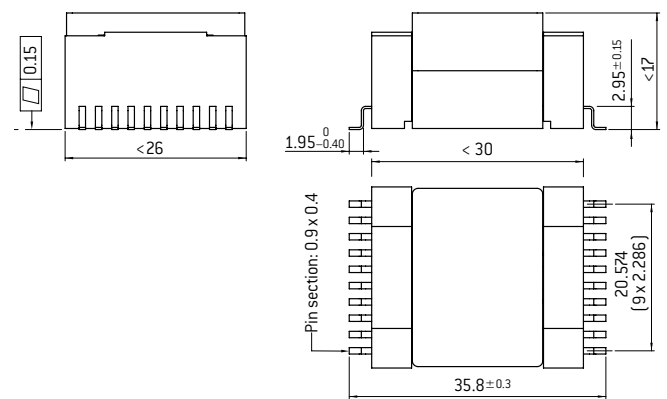
## To Order

CCM	25	###	#	W
SMD Energy Storage Inductor	Size	Value code 4K7 = 4,7 μH M10 = 100 μH M10 = 1000 μH	Version	GW Terminals

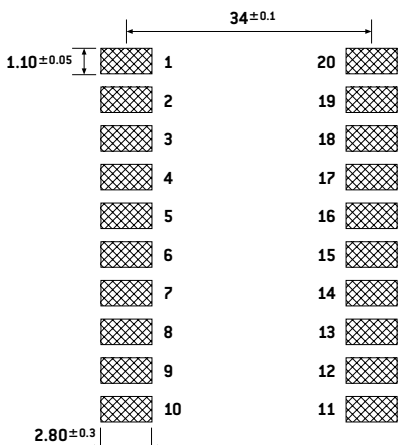
CCM 6 ### #W

## Dimensions

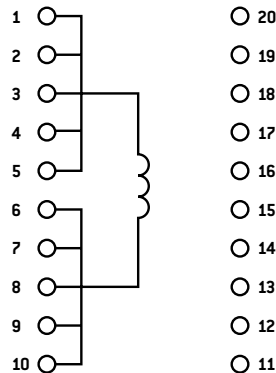
(mm, top view)



## PCB Layout (suggested)



## Connections



# Custom SMPS Transformers CCM Technology

## esa ESCC Technology Flow Certificate for Custom CCM Components ESCC 3201011



- Applied standards: MIL-STD202, ECSS-Q-70, D0-160D,
- Pick and place compatible
- Materials meet UL94-V0 rating
- Temperature range: -55°C +125°C
- RoHS by default, non RoHS upon request
- Meets solderability tests per MIL-STD 202-Method 208
- Jedec Tray
- Alkaline cleaning compatible

### Addressed Markets:

- Space, New Space, Avionic, VTOL and UAV, Defense, Railway, Oil Drilling,
- all harsh environments.

The Reference Design show examples of functions that can be designed in each CCM casing, they are design examples. For each custom design, losses and temperature elevation are optimized depending of the chosen CCM casing.

Each transformer meets the specific customer requirements and is the result of a partnership between the engineering teams.

## Forward Transformers- CCM Technology

Ref design	DC Input Voltage Range (Vdc)	Output Power (W)	Lp (μH)	DC Outputs (V/I)	Working Frequency (KHz)	Casing / Platform
FW-C6-18-1200	60-115	18	1200	12/1,3-12/0,1	250	CCM6
FW-C20-18-224	20-55	18,5	224	12,8/1,3-12,8/0,1	250	CCM20
FW-C20-13-503	32	13	503	15/0,6-1,9/1,1-13,3/0,19-5,4/0,11	180	CCM20
FWAC-C25-82-80	22-35	82	80	8,4/9,4-13,7/0,045	300/600	CCM25
FW-C25-20-4260	50-115	20	4260	13/1,3-13/0,15	250	CCM25
FW-C25-20-989	20-65	20	989	13/1,3-13/0,1	250	CCM25
FW-C25-110-91	22-38	110	91	24/4,4-5/0,1	200-600	CCM25

FW forward Transformer, FWAC Active Clamp Forward Transformer

## Push-Pull Transformers- CCM Technology

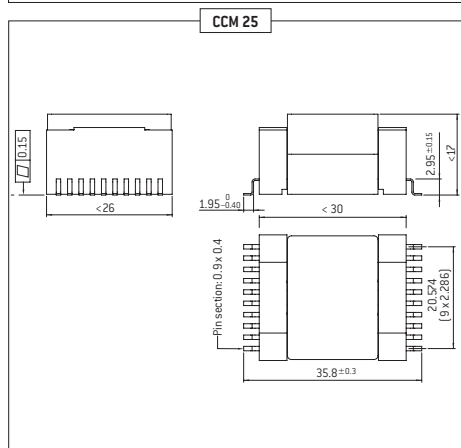
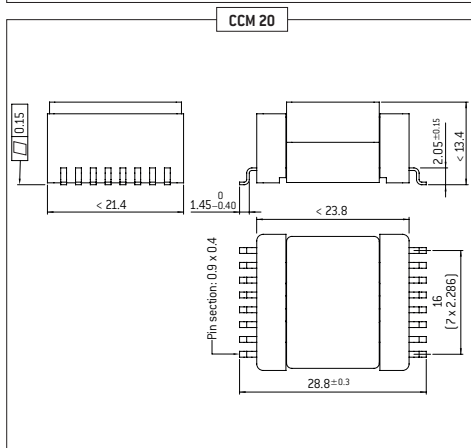
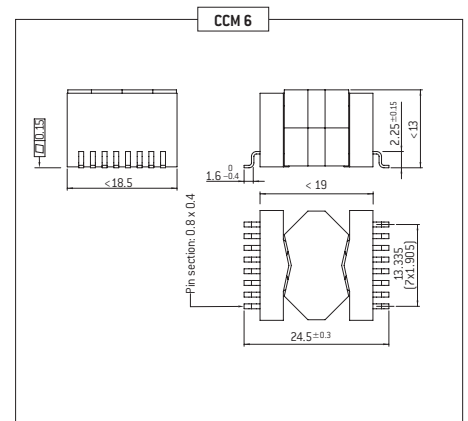
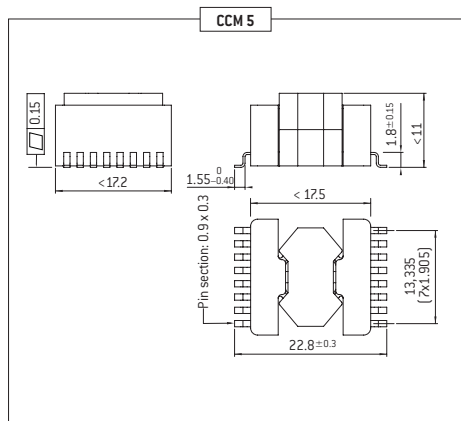
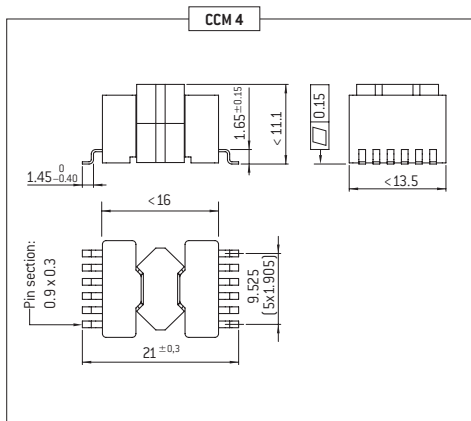
Ref design	DC Input Voltage Range (Vdc)	Output Power (W)	Lp (μH)	DC Outputs (V/I)	Working Frequency (KHz)	Casing / Platform
PP-C4-9-1270	40-68	9,3	1270	3,35/2-12,55/0,05-13,5/0,05	65	CCM4
PPCDR-C20-35-565	19-38	35	565	2*3,3/5-4* 6,3 or 12,5/0,03	250	CCM20
DIPPA-C20-20	*	*	20	2*20μH/2,5+0,5 to 250KHz-12,6/0,04	250	CCM20
PP-C20-32-266	26	31,8	266	15/0,75-6/0,4-4,5/0,45-12/0,9-4,5/0,2	250	CCM20
PP-C20-18-3610	90-110	18,5	3610	5/1,4-5/0,15-5/0,05-45/0,001-12/0,03		CCM20
PP-C20-17-599	19-42	17,2	599	3,3/2-5/1,75-4* 6,3 or 12/0,03		CCM20
DIPPA-C20-91/139	*	*	91/139	91μH/1-139μH/0,87+0,13App@250KHz-12,5/0,04		CCM20
PP-C20-104-37	17-42	104	37	20/5 to 30/3,3	250	CCM20
DIPPA-C20-2x180	*	*	2x180	2x180μH+0,12App250KHz	250	CCM20

PP Push-Pull Transformer, PPCDR Push-Pull Transformer with Current Doubler Rectifier,  
\*DIPPA Double Inductor for push-pull transformer and auxillary winding

# Custom SMPS Transformers CCM Technology

## Flyback Transformers- CCM Technology

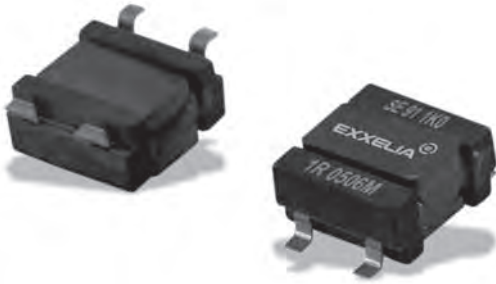
Ref design	DC Input Voltage Range (Vdc)	Output Power (W)	Lp (µH)	DC Outputs (V/I)	Working Frequency (KHz)	Casing / Platform
FC/D-C4-5-52	25-110	5,2	52	9/0,55	400	CCM4
FC-C4-6-52	17-42	5,8	52	12/0,25-12/0,03-6/0,15-6/0,15	250	CCM4
FD-C5-3-25,6	15-80	3,5	25,6	2*3,3/0,07-2*5,2/0,07-12,1/0,01	250	CCM5
FC-C5-10-46	26-29	10	46	7,45/0,9-7,5/0,35-7,25/0,005	175	CCM5
FD-C6-6-60	84-110	6,1	60	6,8/0,9-12,7/0,08-12,9/0,02		CCM6
FD-C6-16-25,6	24-30	15,7	25,6	3,3/1,3-6,9/0,4-12/0,4-6,9/0,15	125	CCM6
FD-C6-20-3844	250-310	20	3844	26/0,01-38/0,5	83	CCM6
FC-C6-8-454	40-60	8,1	454	12/0,05-4,5/0,6-7,5/0,035	300	CCM6
FD-C20-36-160	65-200	36	160	15/0,58-15/0,12-15/0,18-4,5/0,35	150	CCM20
FD-C20-14-100	84-110	14,4	100	6,8/2-12,6/0,1-12,6/0,025	100	CCM20
FD-C20-31-25	35-100	31,4	25	2,5/3,3-4,5/1,5-4*15/0,1-	150	CCM20
FD-C20-33-41	94-110	33,4	41	4,5/3,1-2*12,5/0,6-3*11,5/0,2	130	CCM20
FC-C20-22-180	45-110	22,4	180	6,6/2,6-15,9/0,1-17,1/0,12-12,5/0,03	120	CCM20
FD-C20-22,71-89	45-110	22,7	89	6,74/1,7-6,74/0,3-5,04/1,7-11,8/0,03-15,22/0,02	120	CCM20
FC-C25-94-25	46-65	94	25	3,35/0,91-7,2/0,1-7,1/0,95-7,1/0,25-2*12,9/2,5-14,8/0,7	130	CCM25
FDC-C25-48-16	20-45	48	16	7,3/2,1-15,2/0,83-18,4/3,2-3*18/0,05	130	CCM25
FC-C25-40-64	26-29	40	64	2*4/2,6-11,8/0,04-13,5/0,15-12,7/0,04-25,2/0,5	175	CCM25
FC-C25-17-56	26-29	16,9	56	2*4,5/0,56-2*11,8/0,02-2*14/0,1	175	CCM25
FC-C25-27-81	26-29	27	81	4/1,1-5,75/0,22-2*11,8/0,02-15,3/0,005-20,7/0,9	175	CCM25
FC-C25-33-64	26-29	33,1	64	2*3,93/3,3-11,8/0,04-13,3/0,1-2*13,3/0,04	175	CCM25
FC-C25-90-10	22-37	90	10	30/1,9-7,5/1,4-5/2,5-15/2,5-15/0,56	130	CCM25
FC-C25-71-25-	39-65	71	25	12/0,02-14,5/0,025-29,3/2,3-14,5/0,005	130	CCM25



Platform	Weight (g)	Height max. (mm)
CCM4	5	11,1
CCM5	7,5	11
CCM6	12	13
CCM20	21	13,4
CCM25	21	17

# SMD Power Inductors

## SESI 9.1WR High Reliability Applications



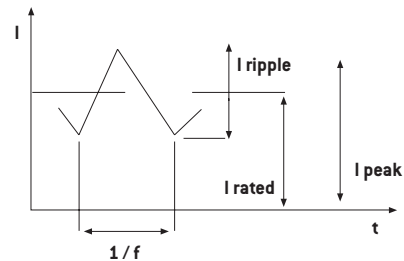
- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- ESCC 3201/009 versions upon request
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 2 grams

### Electrical Data (25°C)

ID Code	L <sup>1</sup> no load μH	l <sup>2,4</sup> rated A	L <sup>3</sup> at rated I μH	I <sup>4,5</sup> peak max A	R <sub>dc</sub> at 25°C mΩ Max	Tol.
SESI 9.1 1K0 1WR	1.0	6.0	0.6	11.0	8.5	30
SESI 9.1 1K5 1WR	1.5	5.4	0.9	9.5	11.5	
SESI 9.1 2K0 2WR	2.0	4.3	1.4	8.2	17	
SESI 9.1 2K6 2WR	2.6	3.6	1.8	7.0	23	20
SESI 9.1 3K4 2WR	3.4	3.0	2.4	6.2	35	
SESI 9.1 4K3 2WR	4.3	2.8	3.0	5.5	40	
SESI 9.1 6K2 2WR	6.2	2.3	4.3	4.3	59	
SESI 9.1 8K5 2WR	8.5	1.9	6.0	3.7	87	
SESI 9.1 10K 2WR	10	1.85	7.0	3.4	93	
SESI 9.1 15K 2WR	15	1.5	10.5	2.8	140	10
SESI 9.1 18K 2WR	18	1.27	12.6	2.5	192	
SESI 9.1 22K 2WR	22	1.21	15.4	2.3	215	
SESI 9.1 26K 2WR	26	1.03	18.2	2.14	290	
SESI 9.1 33K 2WR	33	0.92	23.1	1.9	350	
SESI 9.1 47K 2WR	47	0.8	32.9	1.6	470	
SESI 9.1 66K 2WR	66	0.73	46.2	1.3	565	
SESI 9.1 81K 2WR	81	0.63	56.7	1.21	745	
SESI 9.1 M10 2WR	100	0.6	70	1.1	795	
SESI 9.1 M15 1WR	150	0.53	105	0.8	750	
SESI 9.1 M22 1WR	220	0.43	154	0.7	1165	
SESI 9.1 M33 1WR	330	0.36	231	0.6	1475	
SESI 9.1 M47 1WR	470	0.3	329	0.5	2220	
SESI 9.1 M68 1WR	680	0.25	477	0.4	3255	
SESI 9.1 M10 1WR	1000	0.2	700	0.34	5865	
SESI 9.1 M68 1WR	6800	0.045	5440	0.067	28000	

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at +125°C ; L value not guaranteed
5. 10 % admissible I ripple over I rated at f = 200 kHz
6. Isolation voltage 150 V<sub>DC</sub>  
- 1 min - R<sub>i</sub> > 100 MΩ between winding and magnetic core



### To Order

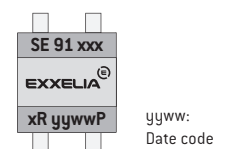
SESI 9.1 ### #WR

SESI	9.1	###	#	W	R
SMD Energy Storage Inductor	Size	Value code 4K3 = 4,3 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals	High reliability

### Connections

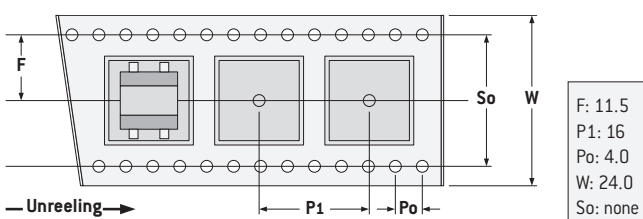


### Marking



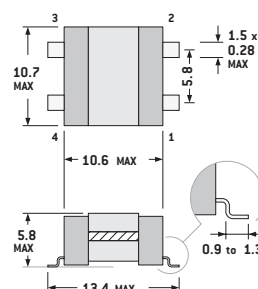
### Packaging

Tape and Reel:  
700 pieces per reel of diameter 330 mm



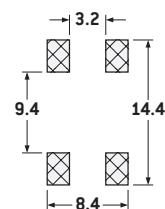
### Dimensions

(mm, top view)



### PCB Layout

(suggested)



# SMD Power Inductors SESI 14SR High Reliability Applications



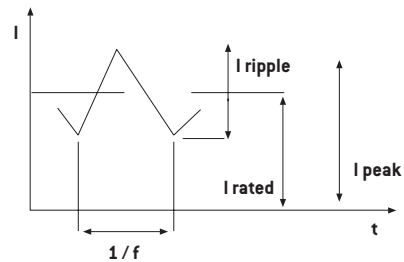
- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- Eesa ESCC 3201/009 versions upon request
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 3.2 grams

## Electrical Data (25°C)

ID Code	L <sup>1</sup> no load μH	I <sup>2.4</sup> rated A	L <sup>3</sup> at rated I μH	I <sup>4.5</sup> peak max A	R <sub>dc</sub> at 25°C mΩ Max	Tol.
SESI 14 3K3 1SR	3.3	5.8	2.3	8.0	15.0	20
SESI 14 4K7 1SR	4.7	5.4	3.3	6.9	17.5	
SESI 14 6K0 1SR	6.0	4.3	4.2	5.7	26.5	
SESI 14 8K2 1SR	8.2	3.7	5.7	5.2	42	
SESI 14 10K 1SR	10	3.3	7.0	4.6	47	
SESI 14 15K 1SR	15	2.7	10.5	3.8	90	
SESI 14 22K 1SR	22	2.2	15.4	3.0	110	
SESI 14 33K 1SR	33	1.8	23.1	2.5	170	
SESI 14 47K 1SR	47	1.6	32.9	2.1	200	
SESI 14 56K 1SR	56	1.5	39.2	1.9	240	
SESI 14 68K 1SR	68	1.3	47.6	1.7	290	
SESI 14 82K 1SR	82	1.2	57.4	1.5	315	
SESI 14 M10 1SR	100	1.1	70	1.4	440	10
SESI 14 M12 1SR	120	1.0	84	1.3	500	
SESI 14 M15 1SR	150	0.9	105	1.1	645	
SESI 14 M18 1SR	180	0.83	126	1.0	740	
SESI 14 M22 1SR	220	0.72	154	1.0	980	
SESI 14 M33 1SR	330	0.57	231	0.8	1575	

## Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at +125°C ; L value not guaranteed
5. 40 % admissible I ripple over I rated at f = 200 kHz
6. Isolation voltage 500 V<sub>DC</sub>  
- 1 min - R<sub>i</sub> > 1 GΩ between winding and magnetic core



## To Order

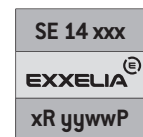
SESI	14	###	1	S	R
SMD Energy Storage Inductor	Size	Value code 4K7 = 4,7 μH M10 = 100 μH 1M0 = 1000 μH	Version	SMD Terminals	High reliability

SESI 14 ### 1SR

## Connections



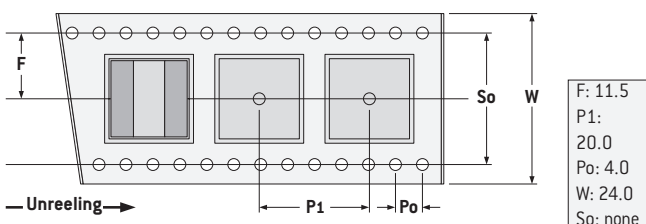
## Marking



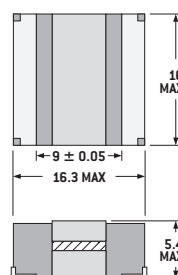
yyww:  
Date code

## Packaging

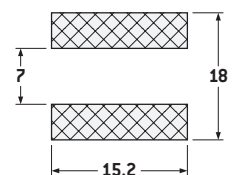
Tape and Reel:  
400 pieces per reel of diameter 330 mm



## Dimensions (mm, bottom view)

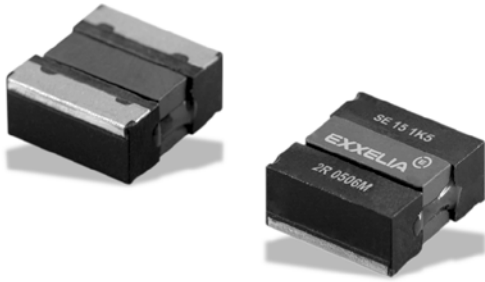


## PCB Layout (suggested)



# SMD Power Inductors

## SESI 15SR High Reliability Applications



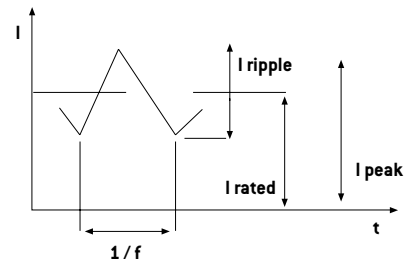
- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- ESCC 3201/009 versions upon request
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 5 grams

### Electrical Data (25°C)

ID Code	L <sup>1</sup> no load μH	I <sup>2,4</sup> rated A	L <sup>3</sup> at rated I μH	I <sup>4,5</sup> peak max A	R <sub>dc</sub> at 25°C mΩ Max	Tol.
SESI 15 1K5 2SR	1.5	14	0.9	19	5.0	30
SESI 15 1K8 1SR	1.8	10	1.05	14	5.0	
SESI 15 2K7 1SR	2.7	8.2	1.9	11.5	6.5	
SESI 15 4K9 1SR	4.9	6.0	3.4	8.5	11	20
SESI 15 6K4 1SR	6.4	5.3	4.5	7.5	12	
SESI 15 8K0 1SR	8.0	4.8	5.6	6.5	16	
SESI 15 12K 1SR	12	4.0	8.4	5.5	23	
SESI 15 16K 1SR	16	3.4	11.2	4.5	27	
SESI 15 18K 1SR	18	3.1	12.6	4.2	29	
SESI 15 21K 1SR	21	2.9	14.7	4.0	36	10
SESI 15 27K 1SR	27	2.6	18.9	3.5	44	
SESI 15 29K 2SR	30	2.6	20	3.5	72	
SESI 15 33K 1SR	33	2.3	23	3.2	59	
SESI 15 48K 1SR	48	1.9	33	2.7	72	
SESI 15 56K 1SR	56	1.8	39	2.5	82	
SESI 15 68K 1SR	68	1.6	47	2.2	110	
SESI 15 82K 1SR	82	1.5	57	2.1	120	
SESI 15 M10 1SR	100	1.35	70	1.9	155	
SESI 15 M12 1SR	120	1.2	84	1.7	180	
SESI 15 M15 1SR	150	1.1	105	1.5	230	
SESI 15 M22 1SR	220	0.9	154	1.3	355	
SESI 15 M33 1SR	330	0.74	231	1.0	630	
SESI 15 1M0 1SR	1000	0.38	800	0.5	2130	
SESI 15 2M3 1SR	2290	0.28	1900	0.36	4400	

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at +125°C ; L value not guaranteed
5. 40 % admissible I ripple over I rated at f = 200 kHz
6. Isolation voltage 500 V<sub>DC</sub>  
- 1 min - Ri > 1 GΩ between winding and magnetic core



### To Order

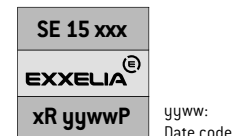
SESI		15	###	#	S	R
SMD Energy Storage Inductor	Size	Value code	Version	SMD Terminals	High reliability	
		4K9 = 4,9 μH				
		M10 = 100 μH				
		1M0 = 1000 μH				

SESI 15 ### #SR

### Connections

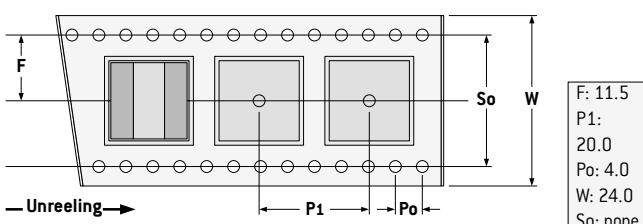


### Marking

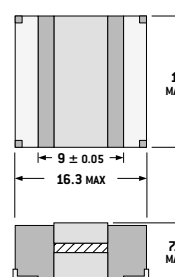


### Packaging

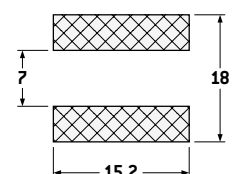
Tape and Reel:  
400 pieces per reel of diameter 330 mm



### Dimensions (mm, bottom view)



### PCB Layout (suggested)



# SMD Power Inductors SESI 15WR High Reliability Applications



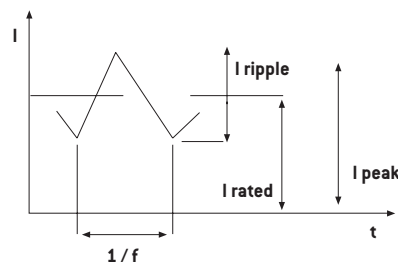
- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- EESA ESCC 3201/009 versions upon request
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 5 grams
- Shielded version upon request

## Electrical Data (25°C)

ID Code	L <sup>1</sup> no load μH	I <sup>2,4</sup> rated A	L <sup>3</sup> at rated I μH	I <sup>4,5</sup> peak max A	R <sub>dc</sub> at 25°C mΩ Max	Tol.
SESI 15 1K5 2WR	1.5	14	0.9	19	5.0	30
SESI 15 1K8 1WR	1.8	10	1.05	14	5.0	
SESI 15 2K7 1WR	2.7	8.2	1.9	11.5	6.5	
SESI 15 4K9 1WR	4.9	6.0	3.4	8.5	11	
SESI 15 6K4 1WR	6.4	5.3	4.5	7.5	12	
SESI 15 8K0 1WR	8.0	4.8	5.6	6.5	16	
SESI 15 12K 1WR	12	4.0	8.4	5.5	23	20
SESI 15 16K 1WR	16	3.4	11.2	4.5	27	
SESI 15 18K 1WR	18	3.1	12.6	4.2	29	
SESI 15 21K 1WR	21	2.9	14.7	4.0	36	
SESI 15 27K 1WR	27	2.6	18.9	3.5	44	
SESI 15 29K 2WR	30	2.6	20	3.5	72	
SESI 15 33K 1WR	33	2.3	23	3.2	59	10
SESI 15 48K 1WR	48	1.9	33	2.7	72	
SESI 15 56K 1WR	56	1.8	39	2.5	82	
SESI 15 68K 1WR	68	1.6	47	2.2	110	
SESI 15 82K 1WR	82	1.5	57	2.1	120	
SESI 15 M10 1WR	100	1.35	70	1.9	155	
SESI 15 M12 1WR	120	1.2	84	1.7	180	
SESI 15 M15 1WR	150	1.1	105	1.5	230	
SESI 15 M22 1WR	220	0.9	154	1.3	355	
SESI 15 M33 1WR	330	0.74	231	1.0	630	
SESI 15 1M0 1WR	1000	0.38	800	0.5	2130	
SESI 15 2M3 1WR	2290	0.28	1900	0.36	4400	

## Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at +125°C ; L value not guaranteed
5. 40 % admissible I ripple over I rated at f = 200 kHz
6. Isolation voltage 500 V<sub>DC</sub>  
- 1 min - R<sub>i</sub> > 1 GΩ between winding and magnetic core



## To Order

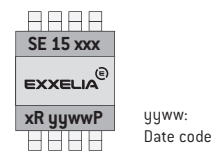
SESI	15	###	-	W	R
SMD Energy Storage Inductor	Size	Value code 4K9 = 4,9 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals	High reliability

SESI 15 ### #WR

## Connections

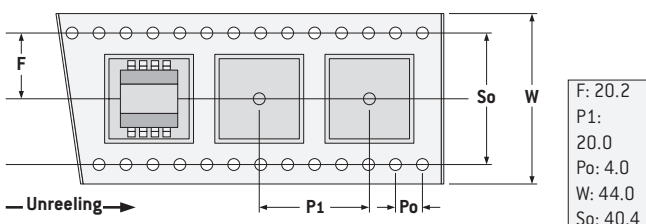


## Marking



## Packaging

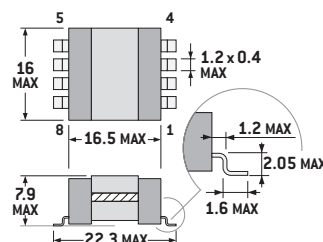
Tape and Reel:  
400 pieces per reel of diameter 330 mm



F: 20.2  
P1: 20.0  
P0: 4.0  
W: 44.0  
So: 40.4

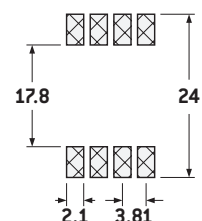
## Dimensions

(mm, top view)



## PCB Layout

(suggested)





# SMD Power Inductors

## SESI 18WR High Reliability Applications



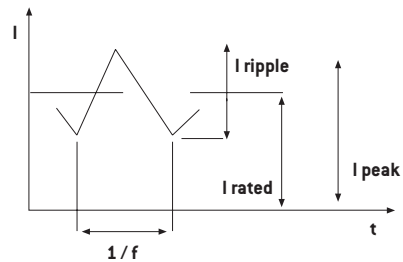
- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- EESA ESCC 3201/009 versions upon request
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 10 grams
- Shielded version upon request

### Electrical Data (25°C)

ID Code	L <sup>1</sup> no load μH	I <sup>2,4</sup> rated A	L <sup>3</sup> at rated I μH	I <sup>4,5</sup> peak max A	R <sub>dc</sub> at 25°C mΩ Max	Tol.
SESI 18 6K8 1WR	6.8	9.8	4.2	13.6	7.5	20
SESI 18 8K2 1WR	8.6	8.3	5.7	11.5	9.0	
SESI 18 11K 1WR	11	7.2	7.7	10	12	
SESI 18 15K 1WR	15	6.35	10.5	8.9	15	
SESI 18 18K 1WR	18	5.7	12.6	7.9	17	
SESI 18 22K 1WR	22	5.1	15.4	7.2	20	
SESI 18 22K 2WR	22.2	5.6	15.4	7.3	33	
SESI 18 27K 1WR	27	4.7	18.9	6.5	25	
SESI 18 37K 1WR	37	4.0	25.9	5.6	29	
SESI 18 49K 1WR	49	3.5	34.3	4.8	45	
SESI 18 56K 1WR	56	3.3	39	4.6	48	
SESI 18 70K 1WR	70	2.9	49	4.1	65	
SESI 18 86K 1WR	86	2.6	60	3.7	72	
SESI 18 M10 1WR	100	2.4	70	3.3	75	
SESI 18 M12 1WR	120	2.2	84	3.1	115	
SESI 18 M15 1WR	150	1.95	105	2.7	125	
SESI 18 M18 1WR	180	1.8	126	2.6	175	
SESI 18 M22 1WR	220	1.6	154	2.3	210	
SESI 18 M33 1WR	330	1.34	231	1.9	250	
SESI 18 M47 1WR	470	0.9	376	1.35	600	
						10

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at +125°C ; L value not guaranteed
5. 40 % admissible I ripple over I rated at f = 200 kHz
6. Isolation voltage 500 V<sub>DC</sub>  
- 1 min - R<sub>i</sub> > 1 GΩ between winding and magnetic core

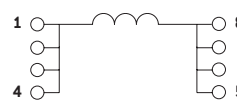


### To Order

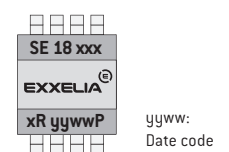
SESI	18	###	#	W	R
SMD Energy Storage Inductor	Size	Value code 4K9 = 4,9 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals	High reliability

SESI 18 ### #WR

### Connections

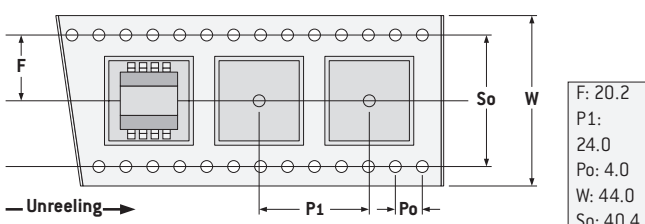


### Marking



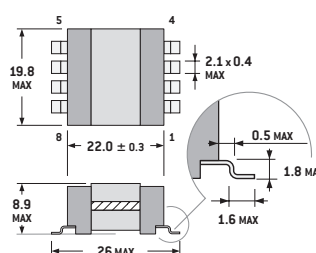
### Packaging

Tape and Reel:  
300 pieces per reel of diameter 330 mm



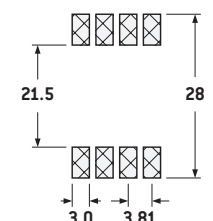
### Dimensions

(mm, top view)



### PCB Layout

(suggested)



# SMD Power Inductors SESI 22WR High Reliability Applications



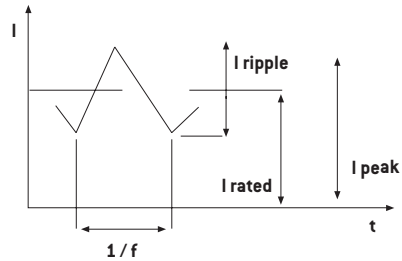
- Energy storage, smoothing, filtering
- Applied standards: ECSS-Q-70-02, MIL-STD-202, D0-160
- **esa** ESCC 3201/009 version upon request
- Materials meet UL94-V0 rating
- Suited for I<sub>R</sub> and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range: -55°C to +125°C
- Weight: 26 grams
- Shielded version upon request

## Electrical Data (25°C)

ID Code	L1 no load μH	I <sup>2-4</sup> rated A	L <sup>3</sup> at rated I μH	I <sup>4-5</sup> peak max A	R <sub>dc</sub> at 25°C mΩ Max	Tol.
SESI 22 7K0 2WR	7	18.9	3.8	24.0	5.0	20
SESI 22 7K7 2WR	7.7	16.0	5.4	20.0	4.5	
SESI 22 10K 2WR	10.0	13.8	7.0	17.7	5.5	
SESI 22 13K 2WR	13.0	12.0	9.1	15.6	7.0	
SESI 22 19K 2WR	19.2	10.9	11.5	14.0	11	
SESI 22 24K 2WR	24.0	8.4	16.8	11.5	13	
SESI 22 33K 2WR	33.0	7.7	23.0	9.8	20	10
SESI 22 47K 1WR	47.0	5.7	37.6	8.0	16	
SESI 22 64K 1WR	64.0	5.0	51.2	7.0	21	
SESI 22 82K 1WR	82.0	4.3	65.6	6.1	24	
SESI 22 M10 1WR	100	3.9	80	5.5	30	
SESI 22 M15 1WR	150	3.2	120	4.7	44	
SESI 22 M21 1WR	210	2.7	168	3.8	70	
SESI 22 M34 1WR	340	2.1	272	3.0	120	
SESI 22 M47 1WR	470	1.8	376	2.5	180	
SESI 22 M68 1WR	680	1.5	544	2.1	220	
SESI 22 M82 1WR	820	1.4	656	2.0	300	
SESI 22 M10 1WR	1000	1.2	800	1.8	330	
SESI 22 M15 1WR	1500	1.1	1200	1.4	500	
SESI 22 M22 1WR	2200	0.8	1760	1.2	760	

## Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at +125°C ; L value not guaranteed
5. 35 % admissible I ripple over I rated at f = 200 kHz
6. Isolation voltage 500 V<sub>DC</sub> - 1 min - R<sub>i</sub> > 1 GΩ between winding and magnetic core

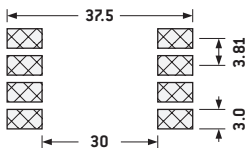


## To Order

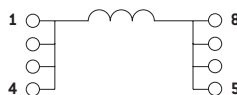
SESI 22 ### #WR

SESI	22	###	#	W	R
SMD Energy Storage Inductor	Size	Value code 7K7 = 7,7 μH M10 = 100 μH 1M0 = 1000 μH	Version	GW Terminals	High reliability

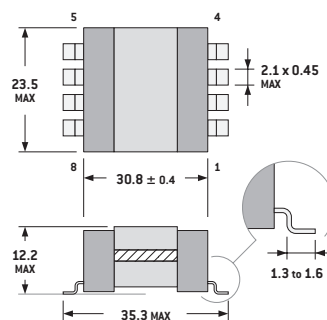
## PCB Layout (suggested)



## Connections

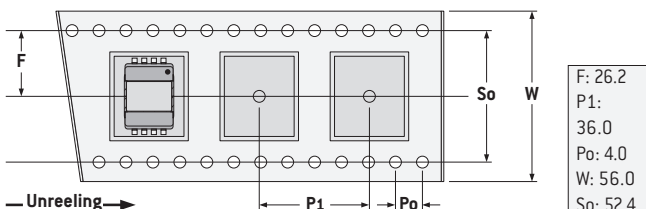


## Dimensions (mm, top view)

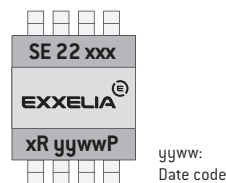


## Packaging

Tape and Reel:  
100 units per reel of diameter 330 mm



## Marking



# SMD Power Inductors

## SESI 32W/PR High Reliability Applications



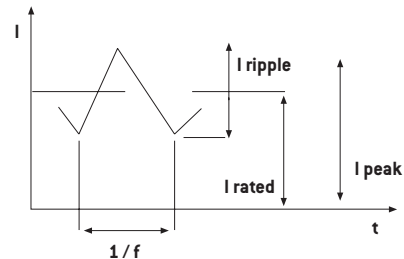
- **eesa** ESCC 3201/009 version upon request
- Inductance values: 4.7  $\mu\text{H}$  to 4700  $\mu\text{H}$
- Current up to 27 Arms and 38 A peak
- Through-hole design
- Materials meet UL94-V0 rating
- Suited for IR and vapor reflow soldering
- Frequency range up to 1 MHz
- Operating temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Weight: 56 grams
- Shielded version upon request

### Electrical Data (25°C)

ID Code	L1 no load $\mu\text{H}$	I <sup>2.4</sup> rated A	L <sup>3</sup> at rated I $\mu\text{H}$	I <sup>4.5</sup> peak max A	R <sub>dc</sub> at 25°C m $\Omega$ Max	Tol.
SESI 32 4K9 1#R	4.9	24.0	3.0	27.6	1.9	30
SESI 32 12K 1#R	12.1	15.5	7.3	17.8	4.4	
SESI 32 22K 1#R	22.5	11.5	13.5	13.2	7.8	
SESI 32 36K 1#R	36.1	9.2	21.75	10.6	13	20
SESI 32 53K 1#R	52.9	7.6	34.2	8.7	18	
SESI 32 73K 1#R	72.9	6.5	47.2	7.5	25	10
SESI 32 84K 1#R	84.1	6.0	68.0	6.9	29	
SESI 32 M11 1#R	109	5.3	88.0	6.1	38.5	
SESI 32 M15 1#R	152	4.5	123	5.2	54.5	
SESI 32 M20 1#R	202	3.9	163	4.5	70	
SESI 32 M26 1#R	260	3.4	210	3.9	89.5	
SESI 32 M35 1#R	348	3.0	281	3.4	117.5	
SESI 32 M45 1#R	476	2.5	385	2.9	160	
SESI 32 M62 1#R	624	2.2	505	2.5	221	
SESI 32 M83 1#R	828	1.9	670	2.2	254	
SESI 32 1M0 1#R	1020	1.7	826	2.0	353	
SESI 32 2M0 1#R	2045	1.2	1650	1.4	665	
SESI 32 4M7 1#R	4709	0.8	3760	0.92	1300	

### Notes

1. Inductance at 0.25 V, 100 kHz
2. I rated (permanent DC) can be increased on request depending on customer heat transfer
3. Typical inductance value at recommended full load
4. I peak max = maximum peak value of current at  $+85^{\circ}\text{C}$ ; L value not guaranteed
5. 35 % admissible I ripple over I rated at  $f = 200$  kHz
6. Isolation voltage 500 V<sub>DC</sub> - 1 min - Ri > 1 G $\Omega$  between winding and magnetic core

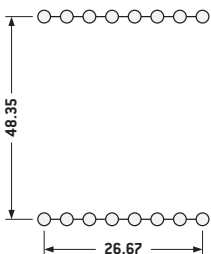


### To Order

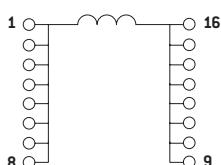
SESI 32 ### 1#R

SESI	32	###	1	#	R
SMD Energy Storage Inductor	Size	Value code 35K = 35 $\mu\text{H}$	Version	P: Pins through hole W: GW terminals	High reliability

### PCB Layout (suggested)



### Connections



### Marking



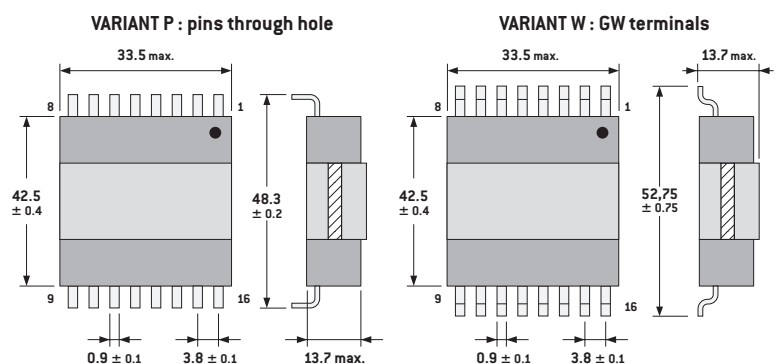
### Packaging

Individually packed 20 parts on 2 layers.

### Applications

Energy storage, smoothing, filtering.

### Dimensions (mm)



# SMD Power Inductors

## SESI xx



SESI series are usually installed on Military applications and breadboards for Space applications.

Since January 2003, EXXELIA has been manufacturing Radio Frequency Fixed Coils, SESI series fulfilling ESA ESCC Generic specification N° 3201 and detail specification N° 3201/009.

This qualification approval includes final production tests Chart F2, burn-in and electrical measurements to testing Chart F3 and qualification testing Chart F4.

For procurement, different quality levels are offered:

- Final production tests Chart F2
- Burn-in and electrical measurements Chart F3
- Lot acceptance testing Chart F4 if required

Components delivered through this specification need to be processed and inspected in accordance with the EXXELIA Process Identification Document (P.I.D.).

Each component delivered is traceable to its production lot. The finish will be Sn60Pb40.

### Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 9.1 1K0 1WR	3201009 05 1L0 N
SESI 9.1 1K5 1WR	3201009 05 1L5 N
SESI 9.1 2K0 2WR	3201009 05 2L0 N
SESI 9.1 2K6 2WR	3201009 05 2L6 M
SESI 9.1 3K4 2WR	3201009 05 3L4 M
SESI 9.1 4K3 2WR	3201009 05 4L3 M
SESI 9.1 6K2 2WR	3201009 05 6L2 M
SESI 9.1 8K5 2WR	3201009 05 8L5 M
SESI 9.1 10K 2WR	3201009 05 100 M
SESI 9.1 15K 2WR	3201009 05 150 M
SESI 9.1 18K 2WR	3201009 05 180 M
SESI 9.1 22K 2WR	3201009 05 220 M
SESI 9.1 26K 2WR	3201009 05 260 M
SESI 9.1 33K 2WR	3201009 05 330 K
SESI 9.1 47K 2WR	3201009 05 470 K
SESI 9.1 66K 2WR	3201009 05 660 K
SESI 9.1 81K 2WR	3201009 05 810 K
SESI 9.1 M10 2WR	3201009 05 101 K
SESI 9.1 M15 1WR	3201009 05 151 K
SESI 9.1 M22 1WR	3201009 05 221 K
SESI 9.1 M33 1WR	3201009 05 331 K
SESI 9.1 M47 1WR	3201009 05 471 K
SESI 9.1 M68 1WR	3201009 05 681 K
SESI 9.1 M10 1WR	3201009 05 102 K
<b>3201009 05 ### y</b>	
Tolerance: y = N for ±30% y = M for ±20% y = K for ±10%	

### Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 14 3K3 1SR	3201009 01 3L3 M
SESI 14 4K7 1SR	3201009 01 4L7 M
SESI 14 6K0 1SR	3201009 01 6L0 M
SESI 14 8K2 1SR	3201009 01 8L2 M
SESI 14 10K 1SR	3201009 01 100 M
SESI 14 15K 1SR	3201009 01 150 M
SESI 14 22K 1SR	3201009 01 220 M
SESI 14 33K 1SR	3201009 01 330 M
SESI 14 47K 1SR	3201009 01 470 K
SESI 14 56K 1SR	3201009 01 560 K
SESI 14 68K 1SR	3201009 01 680 K
SESI 14 82K 1SR	3201009 01 820 K
SESI 14 M10 1SR	3201009 01 101 K
SESI 14 M12 1SR	3201009 01 121 K
SESI 14 M15 1SR	3201009 01 151 K
SESI 14 M18 1SR	3201009 01 181 K
SESI 14 M22 1SR	3201009 01 221 K
SESI 14 M33 1SR	3201009 01 331 K
<b>3201009 01 ### y</b>	
Tolerance: y = M for ±20% y = K for ±10%	

### Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 15 1K5 2SR	3201009 02 1L5 N
SESI 15 1K8 1SR	3201009 02 1L8 N
SESI 15 2K7 1SR	3201009 02 2L7 M
SESI 15 4K9 1SR	3201009 02 4L9 M
SESI 15 6K4 1SR	3201009 02 6L4 M
SESI 15 8K0 1SR	3201009 02 8L0 M
SESI 15 12K 1SR	3201009 02 120 M
SESI 15 16K 1SR	3201009 02 160 M
SESI 15 18K 1SR	3201009 02 180 M
SESI 15 21K 1SR	3201009 02 210 M
SESI 15 27K 1SR	3201009 02 270 M
SESI 15 33K 1SR	3201009 02 330 M
SESI 15 48K 1SR	3201009 02 480 K
SESI 15 56K 1SR	3201009 02 560 K
SESI 15 68K 1SR	3201009 02 680 K
SESI 15 82K 1SR	3201009 02 820 K
SESI 15 M10 1SR	3201009 02 101 K
SESI 15 M12 1SR	3201009 02 121 K
SESI 15 M15 1SR	3201009 02 151 K
SESI 15 M22 1SR	3201009 02 221 K
SESI 15 M33 1SR	3201009 02 331 K
SESI 15 M10 1SR	3201009 02 102 K
SESI 15 2M3 1SR	3201009 02 232 K
<b>3201009 02 ### y</b>	
Tolerance: y = N for ±30% y = M for ±20% y = K for ±10%	

# SMD Power Inductors SESI xx



## Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 15 1K5 2WR	3201009 03 1L5 N
SESI 15 1K8 1WR	3201009 03 1L8 N
SESI 15 2K7 1WR	3201009 03 2L7 M
SESI 15 4K9 1WR	3201009 03 4L9 M
SESI 15 6K4 1WR	3201009 03 6L4 M
SESI 15 8K0 1WR	3201009 03 8L0 M
SESI 15 12K 1WR	3201009 03 120 M
SESI 15 16K 1WR	3201009 03 160 M
SESI 15 18K 1WR	3201009 03 180 M
SESI 15 21K 1WR	3201009 03 210 M
SESI 15 27K 1WR	3201009 03 270 M
SESI 15 33K 1WR	3201009 03 330 M
SESI 15 48K 1WR	3201009 03 480 K
SESI 15 56K 1WR	3201009 03 560 K
SESI 15 68K 1WR	3201009 03 680 K
SESI 15 82K 1WR	3201009 03 820 K
SESI 15 M10 1WR	3201009 03 101 K
SESI 15 M12 1WR	3201009 03 121 K
SESI 15 M15 1WR	3201009 03 151 K
SESI 15 M22 1WR	3201009 03 221 K
SESI 15 M33 1WR	3201009 03 331 K
SESI 15 1M0 1WR	3201009 03 102 K
SESI 15 2M3 1WR	3201009 03 232 K

3201009 03 ### y

Tolerance:  
y = N for ±30%  
y = M for ±20%  
y = K for ±10%

## Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 18 6K8 1WR	3201009 04 6L8 M
SESI 18 8K2 1WR	3201009 04 8L2 M
SESI 18 11K 1WR	3201009 04 110 M
SESI 18 15K 1WR	3201009 04 150 M
SESI 18 18K 1WR	3201009 04 180 M
SESI 18 22K 1WR	3201009 04 220 M
SESI 18 27K 1WR	3201009 04 270 M
SESI 18 37K 1WR	3201009 04 370 K
SESI 18 49K 1WR	3201009 04 490 K
SESI 18 56K 1WR	3201009 04 560 K
SESI 18 70K 1WR	3201009 04 700 K
SESI 18 86K 1WR	3201009 04 860 K
SESI 18 M10 1WR	3201009 04 101 K
SESI 18 M12 1WR	3201009 04 121 K
SESI 18 M15 1WR	3201009 04 151 K
SESI 18 M18 1WR	3201009 04 181 K
SESI 18 M22 1WR	3201009 04 221 K
SESI 18 M33 1WR	3201009 04 331 K

3201009 04 ### y

Tolerance:  
y = M for ±20%  
y = K for ±10%

## Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 22 7K0 2WR	3201009 06 7L0 M
SESI 22 7K7 2WR	3201009 06 7L7 M
SESI 22 10K 2WR	3201009 06 100 M
SESI 22 13K 2WR	3201009 06 130 M
SESI 22 19K 2WR	3201009 06 190 M
SESI 22 24K 2WR	3201009 06 240 M
SESI 22 33K 2WR	3201009 06 330 M
SESI 22 47K 1WR	3201009 06 470 K
SESI 22 64K 1WR	3201009 06 640 K
SESI 22 82K 1WR	3201009 06 820 K
SESI 22 M10 1WR	3201009 06 101 K
SESI 22 M15 1WR	3201009 06 151 K
SESI 22 M21 1WR	3201009 06 211 K
SESI 22 M34 1WR	3201009 06 341 K
SESI 22 M47 1WR	3201009 06 471 K
SESI 22 M68 1WR	3201009 06 681 K
SESI 22 M82 1WR	3201009 06 821 K
SESI 22 1M0 1WR	3201009 06 102 K
SESI 22 1M5 1WR	3201009 06 152 K
SESI 22 2M2 1WR	3201009 06 222 K

3201009 06 ### y

Tolerance:  
y = M for ±20%  
y = K for ±10%

## Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 32 4K9 1WR	3201009 07 4L9 N
SESI 32 12K 1WR	3201009 07 120 N
SESI 32 22K 1WR	3201009 07 220 N
SESI 32 36K 1WR	3201009 07 360 M
SESI 32 53K 1WR	3201009 07 530 M
SESI 32 73K 1WR	3201009 07 730 K
SESI 32 84K 1WR	3201009 07 840 K
SESI 32 M11 1WR	3201009 07 111 K
SESI 32 M15 1WR	3201009 07 151 K
SESI 32 M20 1WR	3201009 07 201 K
SESI 32 M26 1WR	3201009 07 261 K
SESI 32 M35 1WR	3201009 07 351 K
SESI 32 M45 1WR	3201009 07 451 K
SESI 32 M62 1WR	3201009 07 621 K
SESI 32 M83 1WR	3201009 07 831 K
SESI 32 1M0 1WR	3201009 07 102 K
SESI 32 2M0 1WR	3201009 07 202 K
SESI 32 4M7 1WR	3201009 07 472 K

3201009 07 ### y

Tolerance:  
y = M for ±20%  
y = K for ±10%  
y = N for ±30%

## Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
SESI 32 4K9 1PR	3201009 08 4L9 N
SESI 32 12K 1PR	3201009 08 120 N
SESI 32 22K 1PR	3201009 08 220 N
SESI 32 36K 1PR	3201009 08 360 M
SESI 32 53K 1PR	3201009 08 530 M
SESI 32 73K 1PR	3201009 08 730 K
SESI 32 84K 1PR	3201009 08 840 K
SESI 32 M11 1PR	3201009 08 111 K
SESI 32 M15 1PR	3201009 08 151 K
SESI 32 M20 1PR	3201009 08 201 K
SESI 32 M26 1PR	3201009 08 261 K
SESI 32 M35 1PR	3201009 08 351 K
SESI 32 M45 1PR	3201009 08 451 K
SESI 32 M62 1PR	3201009 08 621 K
SESI 32 M83 1PR	3201009 08 831 K
SESI 32 1M0 1PR	3201009 08 102 K
SESI 32 2M0 1PR	3201009 08 202 K
SESI 32 4M7 1PR	3201009 08 472 K

3201009 07 ### y

Tolerance:  
y = M for ±20%  
y = K for ±10%  
y = N for ±30%

HIGH GRADE PRODUCTS

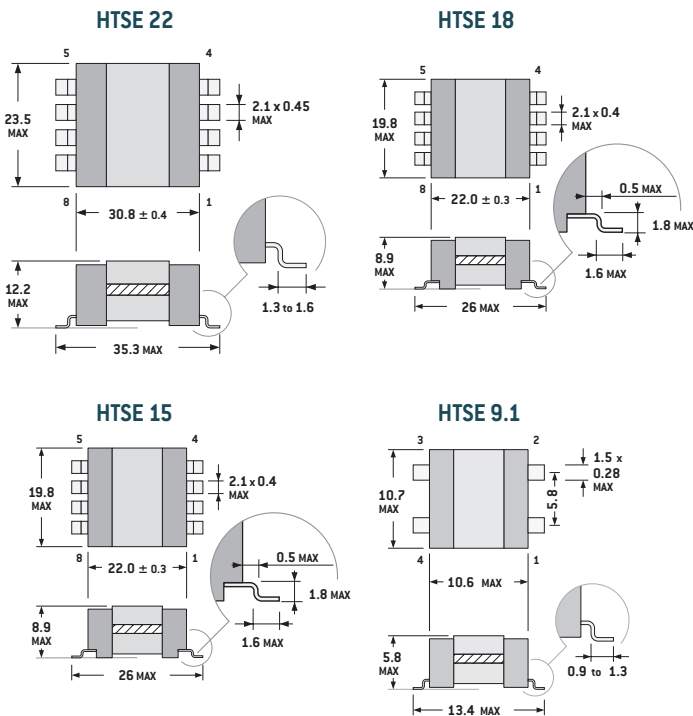
# High Temperature SMD power Inductors HTSE xx WR/SR

**EXXELIA develops a new range of high temperature SESI power inductors.**  
The new product HTSE are under development, full qualification is under progress

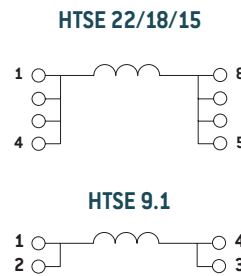


- HTSE 9.1/15/18/20 same packaging as SESI 9.1/15/18/22 (see catalogue pages 64 to 69)
- RoHS compliant
- Suited for  $I_R$  and vapor reflow soldering
- Operation temperature range:  $-55^{\circ}\text{C}$  to  $+180^{\circ}\text{C}$  with an ambient from  $-55^{\circ}\text{C}$  to  $+155^{\circ}\text{C}$
- Thermal index of component:  $+215^{\circ}\text{C}$
- Frequency range depends on current ripple value: 500 kHz max with I ripple max 15% (peak-peak value) of I rated
- Stable inductance value over the whole range of operating temperature  $-55$  to  $180^{\circ}\text{C}$

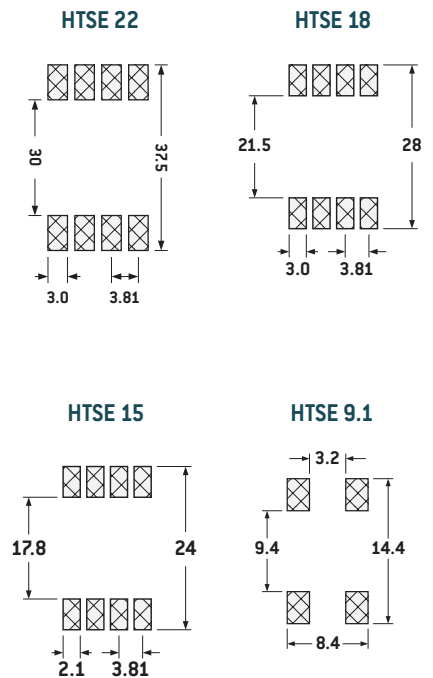
## Dimensions (mm, top view)



## Connections

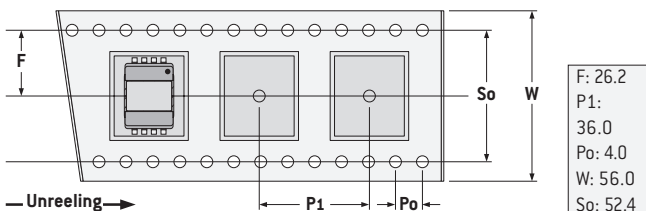


## PCB Layout (suggested)



## Packaging

Tape and Reel:  
100 units per reel of diameter 330 mm



## Marking



# High Temperature SMD power Inductors

## HTSE xx WR/SR

### Electrical Data

ID Code	L <sup>1</sup> no load μH	Rdc <sup>2</sup> at 25°C mΩ	I rated <sup>3</sup> at 25°C A	I rated <sup>3</sup> at 155°C A	I peak <sup>4</sup> at 155°C A	L at I peak at 155°C μH	* Tol. ± %
HTSE22-9K0-1WR	9.5	4.2	16.4	10.2	11.7	8.6	20
HTSE22-17K-1WR	17.7	8	12.0	7.5	8.6	15.9	
HTSE22-22K-1WR	22.8	9	10.6	6.6	7.6	20.5	15
HTSE22-35K-1WR	34.7	15.4	8.6	5.3	6.1	31.3	
HTSE22-49K-1WR	49.2	22.4	7.2	4.5	5.2	44.3	12
HTSE22-66K-1WR	66.2	26	6.2	3.9	4.4	59.6	
HTSE22-97K-1WR	96.5	40	5.1	3.2	3.7	86.8	10
HTSE22-M15-1WR	145.6	61.3	4.2	2.6	3.0	131.0	
HTSE22-M22-1WR	221.2	95.6	3.4	2.1	2.4	199.1	
HTSE22-M33-1WR	332.7	148	2.8	1.7	2.0	299.4	
HTSE22-M57-1WR	569.0	242.4	2.1	1.3	1.5	512.1	
HTSE22-M71-1WR	710.7	334	1.9	1.2	1.4	639.6	
HTSE22-1M0-1WR	1005.6	397	1.6	1.0	1.14	905.0	
HTSE22-1M5-1WR	1521.5	617	1.3	0.8	0.93	1369.4	
HTSE22-2M0-1WR	2041.3	907	1.12	0.7	0.8	1837.2	

HTSE18-7K6-1WR	7.6	6.2	10.0	5.6	6.5	6.8	20
HTSE18-14K-1WR	14.1	10.2	7.3	4.1	4.8	12.7	
HTSE18-22K-1WR	22.6	16.2	5.8	3.3	3.8	20.3	15
HTSE18-33K-1WR	33.1	24.7	4.8	2.7	3.1	29.8	
HTSE18-60K-1WR	60.1	41.9	3.5	2.0	2.3	54.1	12
HTSE18-85K-1WR	85.6	63	3.0	1.7	1.9	77.0	
HTSE18-M11-1WR	115.6	91.6	2.6	1.4	1.7	104.0	10
HTSE18-M16-1WR	162.6	133.7	2.2	1.2	1.4	146.3	
HTSE18-M22-1WR	217.6	154.4	1.9	1.05	1.21	195.8	
HTSE18-M28-1WR	280.6	221	1.64	0.93	1.06	252.5	
HTSE18-M35-1WR	351.6	228	1.47	0.83	0.95	316.4	
HTSE18-M45-1WR	451.6	356	1.3	0.73	0.84	406.4	
HTSE18-M59-1WR	588.1	515	1.13	0.64	0.74	529.3	
HTSE18-M71-1WR	715.6	568	1.03	0.58	0.67	644.0	
HTSE18-1M0-1WR	1008.1	851	0.87	0.50	0.56	907.3	

\* Tolerance on loaded an no load inductances

### Electrical Data

ID Code	L <sup>1</sup> no load μH	Rdc <sup>2</sup> at 25°C mΩ	I rated <sup>3</sup> at 25°C A	I rated <sup>3</sup> at 155°C A	I peak <sup>4</sup> at 155°C A	L at I peak at 155°C μH	* Tol. ± %
HTSE15-5K6-1WR/SR	5.6	8.7	6.7	4.0	4.6	5.1	20
HTSE15-7K2-1WR/SR	7.2	12.4	5.9	3.5	4.1	6.5	
HTSE15-11K-1WR/SR	11.0	19.3	4.8	2.9	3.3	9.9	15
HTSE15-18K-1WR/SR	18.2	31	3.7	2.2	2.6	16.4	
HTSE15-27K-1WR/SR	27.2	47.3	3.0	1.8	2.1	24.5	12
HTSE15-38K-1WR/SR	38.0	68.7	2.6	1.5	1.8	34.2	
HTSE15-50K-1WR/SR	50.6	79	2.2	1.3	1.5	45.6	10
HTSE15-65K-1WR/SR	65.0	113	2.0	1.2	1.4	58.5	
HTSE15-81K-1WR/SR	81.2	126	1.8	1.1	1.2	73.1	
HTSE15-M10-1WR/SR	105.6	182.2	1.5	0.9	1.1	95.1	
HTSE15-M15-1WR/SR	148.2	273.5	1.3	0.78	0.9	133.4	
HTSE15-M20-1WR/SR	207.0	408	1.1	0.66	0.76	186.3	
HTSE15-M30-1WR/SR	308.0	497.2	0.9	0.54	0.62	277.2	
HTSE15-M47-1WR/SR	469.2	957.5	0.73	0.44	0.5	422.3	
HTSE15-1M0-1WR/SR	1010.0	1758	0.5	0.3	0.34	909.0	

HTSE91-3K0-1WR	3.0	14	5.4	3.1	3.5	2.7	20
HTSE91-7K2-1WR	7.2	34	3.7	2.1	2.4	5.7	
HTSE91-11K-1WR	11.0	52	2.8	1.6	1.8	9.8	15
HTSE91-18K-1WR	18.2	83	2.3	1.3	1.5	15.1	
HTSE91-27K-1WR	27.2	126	1.8	1.0	1.2	24.0	12
HTSE91-38K-1WR	38.0	186	1.6	0.9	1.0	31.9	
HTSE91-50K-1WR	50.6	213	1.32	0.75	0.87	44.2	10
HTSE91-65K-1WR	65.0	298	1.15	0.66	0.75	58.6	
HTSE91-81K-1WR	81.2	332	1.0	0.58	0.67	75.0	
HTSE91-M10-1WR	105.6	478	0.9	0.52	0.6	93.4	
HTSE91-M15-1WR	148.2	737	0.75	0.43	0.49	136.2	
HTSE91-M21-1WR	207.0	869	0.63	0.36	0.4	194.1	
HTSE91-M31-1WR	308.0	1328	0.5	0.29	0.34	295.6	
HTSE91-M47-1WR	469.2	2038	0.43	0.25	0.28	418.5	
HTSE91-1M0-1WR	1010.0	4618	0.36	0.2	0.23	611.2	

\* Tolerance on loaded an no load inductances

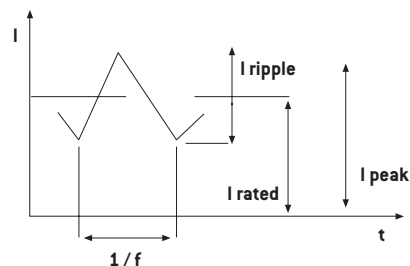
### To Order

HTSE	##	###	#	#	R
SMD Energy Storage Inductor	Size	Value code 3K0 = 3 μH 65K = 65 μH 1M0 = 1000 μH	Version	S: SMD terminals W: GW terminals	High reliability

HTSE## ### ##R

### Notes

1. Inductance measured @ 150 Gauss
2. Tolerance on DC resistance ± 12%
3. I rated (permanent DC) without heatsink depends on the operating temperature
4. Peak current defined with 15% of ripple at 500 kHz. Some other current waveforms (combination of DC + ripple amplitude/frequency) are possible on request to Exxelia Technical team



# High Temperature SMD power Inductors HTSE 47 SR

**EXXELIA develops a new range of high temperature SESI power inductors.**  
The new product HTSE are under development, full qualification is under-progress



- HTSE 9.1/15/18/20 same packaging as SESI 9.1/15/18/22 (see catalogue pages 64 to 69)
- RoHS compliant
- Suited for I<sub>R</sub> and vapor reflow soldering
- Operation temperature range: -55°C to +180°C with an ambient from -55°C to +155°C
- Thermal index of component: +215°C
- Frequency range depends on current ripple value: 500 kHz max with I ripple max 15% (peak-peak value) of I rated
- Stable inductance value over the whole range of operating temperature -55°C to +180°C

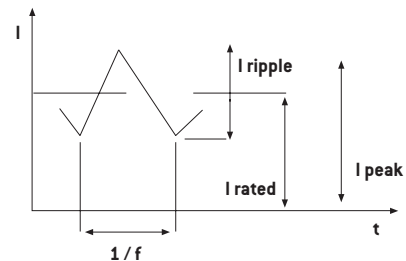
## Electrical Data

ID Code	L <sup>1</sup> no load μH	Rdc <sup>2</sup> at 25°C mΩ	I <sub>rated</sub> <sup>3</sup> at 25°C A	I <sub>rated</sub> <sup>3</sup> at 155°C A	I <sub>peak</sub> <sup>4</sup> at 155°C A	L at I <sub>peak</sub> at 155°C μH	* Tol. ± %
HTSE47-M57-10SR	570.0	533	1.0	0.6	0.7	513.0	10
HTSE47-1M0-10SR	1010.0	1125	0.75	0.45	0.51	909.0	
HTSE47-1M5-10SR	1500.6	1707	0.6	0.37	0.42	1350.6	
HTSE47-1M8-10SR	1809.0	1874	0.56	0.33	0.38	1628.1	
HTSE47-2M3-10SR	2295.2	2646	0.50	0.30	0.34	2065.7	
HTSE47-4M7-10SR	4687.2	4664	0.35	0.21	0.24	4218.5	
HTSE47-5M6-10SR	5593.2	6447	0.32	0.19	0.22	5033.9	
HTSE47-1K3-6SR	1.3	2.1	20.0	12.0	13.8	1.2	30
HTSE47-2K7-6SR	2.7	3.8	13.8	8.3	9.6	2.5	25
HTSE47-4K7-6SR	4.7	6.2	10.6	6.4	7.3	4.2	20
HTSE47-7K2-6SR	7.2	9.5	8.6	5.1	5.9	6.4	
HTSE47-10K-6SR	10.2	15	7.2	4.3	5.0	9.1	15
HTSE47-15K-6SR	15.6	22	5.8	3.5	4.0	14.1	
HTSE47-22K-6SR	22.2	33	4.9	2.9	3.4	20.0	
HTSE47-27K-6SR	27.3	37	4.4	2.6	3.0	24.6	

\* Tolerance on loaded and no load inductances

## Notes

1. Inductance measured @ 150 Gauss
2. Tolerance on DC resistance ± 12%
3. I<sub>rated</sub> (permanent DC) without heatsink depends on the operating temperature
4. Peak current defined with 15% of ripple at 500 kHz. Some other current waveforms (combination of DC + ripple amplitude/frequency) are possible on request to Exxelia Technical team



## To Order

HTSE	47	###	#	S	R
SMD Energy Storage Inductor	Size	Value code M57 = 570 μH 1K3 = 1.3 μH 27K = 27.3 μH	Version	S: SMD terminals	High reliability

HTSE47 ### #SR

## Connections

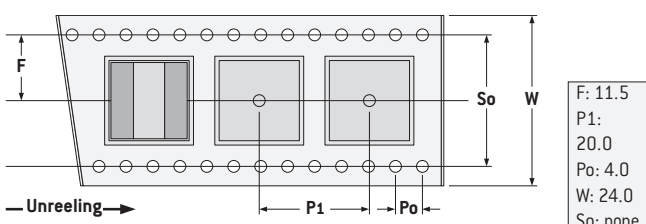


## Marking

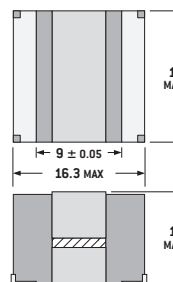
HTSE47 xxx		yyww: Date code
EXXELIA		
xR yywwP		

## Packaging

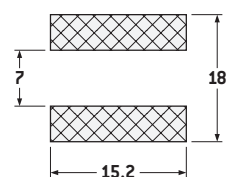
Tape and Reel:  
400 pieces per reel of diameter 330 mm



## Dimensions (mm, bottom view)



## PCB Layout (suggested)





# Differential Mode Chokes for DC/DC Embedded Applications - DMC 22 xxx 1WR Series

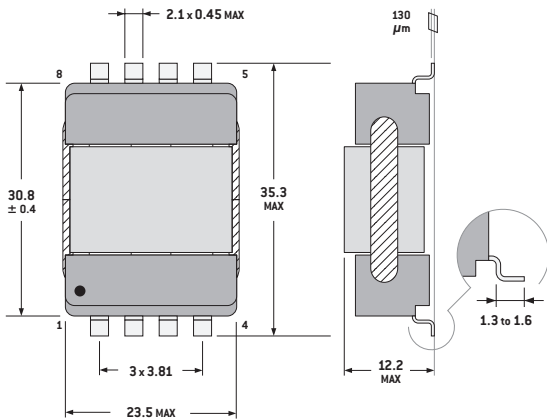


- Based on EXXELIA's «SESI22 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
- Dielectric strength test up to 500 V (50 Hz - 1 min)
- Materials meet UL94-V0 rating
- Thermal index according to IEC85: H (180°C)
- Operating/storage temperature range: -55°C to +125°C
- Approximative weight: 26 grams

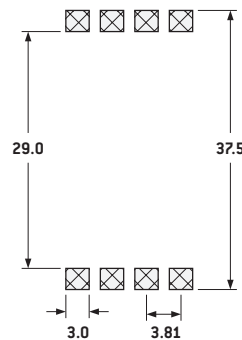
## Electrical Data

ID Code	Inductance Value at 25°C (±40%) L <sub>1-3</sub> = L <sub>5-7</sub>	DC Current max.	max. RMS Current for ΔT = 40°C Heating	max. R <sub>DC</sub> (25°C)	Dielectric Strength (50Hz - 1min)
DMC22 M25 1WR	25 μH	4 A	1 A	60 mΩ	500 Vrms

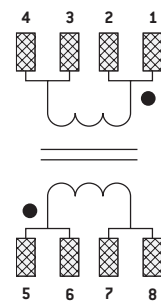
## Typical Dimensions (mm, top view)



## PCB Layout (suggested)

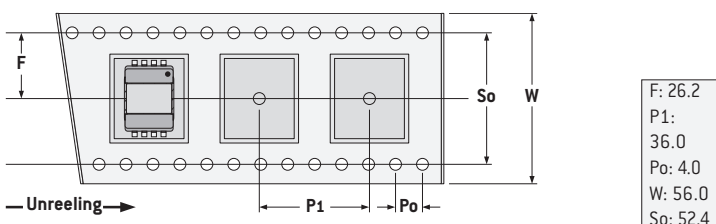


## Connections (Top view)

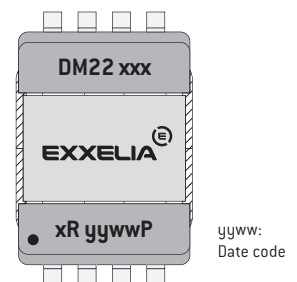


## Packaging

Tape and Reel:  
100 units per reel of diameter 330 mm



## Marking



HIGH GRADE PRODUCTS

# Common Mode Chokes for DC/DC Embedded Applications - CMC 15 xxx 2WR Series

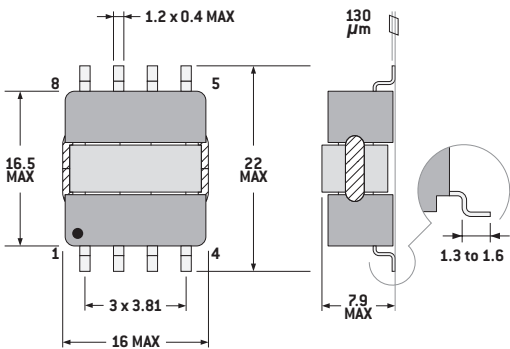


- Based on EXXELIA's «SESI15 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
- **eesa** ESCC 3201/010 version upon request
- RMS current range: from 0.6 A to 6.7 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 300 kHz to 65 MHz
- Dielectric strength test up to 500 V (50 Hz - 1 min)
- Materials meet UL94-V0 rating
- Thermal index according to IEC85: H (180°C)
- Operating/storage temperature range: -55°C to +125°C
- Approximative weight: 5 grams

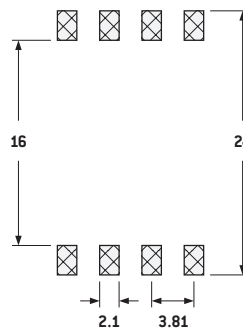
## Electrical Data

ID Code	Inductance Value at 25°C (±40%)	Typical SRF	max. Impedance (Typical)	max. Attenuation (Z = 50Ω)	max. RMS Current for ΔT = 40°C	max. R <sub>DC</sub> (25°C)	Dielectric Strength (50Hz - 1min)
CMC15 52K 2WR	0.05 mH	7.3 MHz	1.6 kΩ	25 dB	6.7 A	15 mΩ	500 Vrms
CMC15 M11 2WR	0.11 mH	5.8 MHz	3.7 kΩ	32 dB	4.4 A	35 mΩ	500 Vrms
CMC15 M22 2WR	0.22 mH	3.9 MHz	7.3 kΩ	37 dB	3.3 A	65 mΩ	500 Vrms
CMC15 M47 2WR	0.47 mH	2.4 MHz	15 kΩ	44 dB	2.2 A	150 mΩ	500 Vrms
CMC15 1M0 2WR	1.0 mH	1.8 MHz	33.5 kΩ	51 dB	1.4 A	350 mΩ	500 Vrms
CMC15 2M0 2WR	2.0 mH	1.2 MHz	66.9 kΩ	57 dB	0.95 A	770 mΩ	500 Vrms
CMC15 4M0 2WR	4.0 mH	0.9 MHz	151 kΩ	64 dB	0.55 A	1750 mΩ	500 Vrms

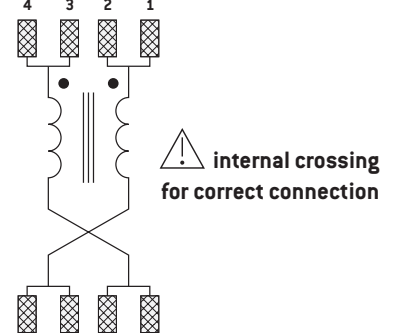
## Typical Dimensions (mm, top view)



## PCB Layout (suggested)

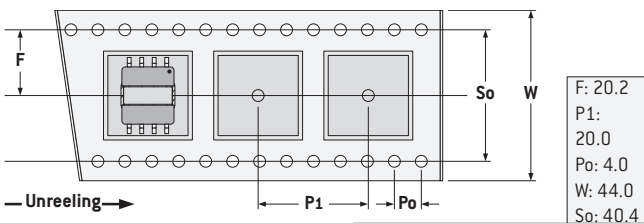


## Connections (top view)

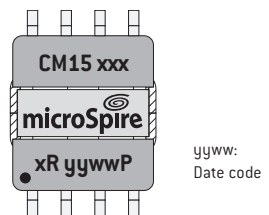


## Packaging

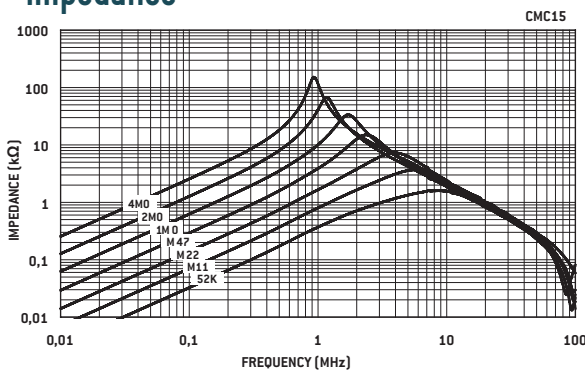
Tape and Reel:  
400 units per reel of diameter 330 mm



## Marking

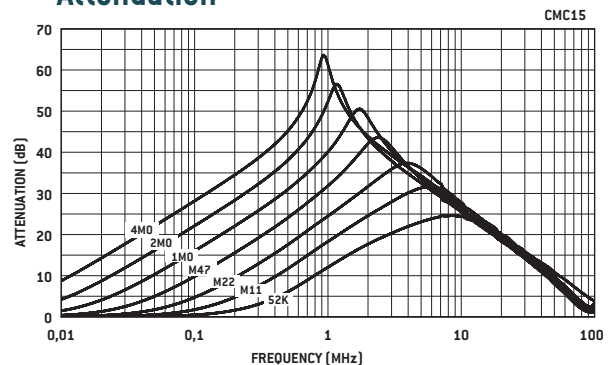


## Impedance



Typical values at 25°C with 1 mT at 10 kHz

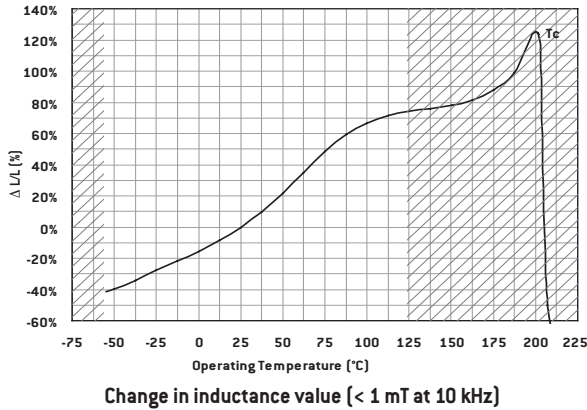
## Attenuation



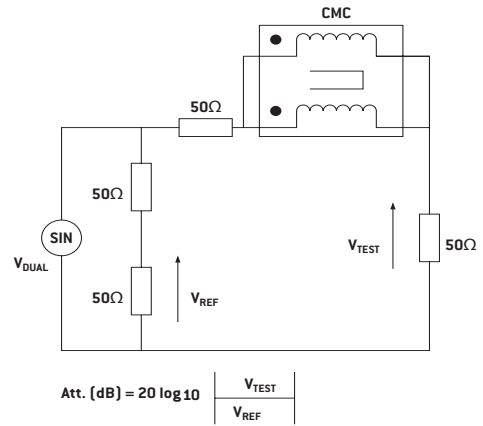
Typical values (Z = 50 Ω) at 25°C with 1 mT at 10 kHz

# Common Mode Chokes for DC/DC Embedded Applications - CMC 15 xxx 2WR Series

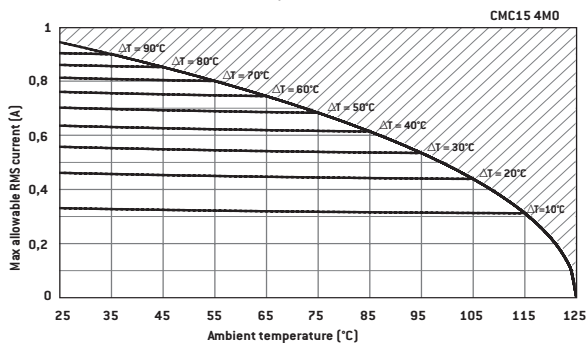
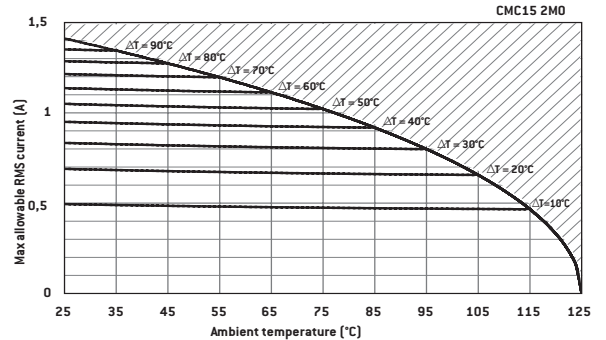
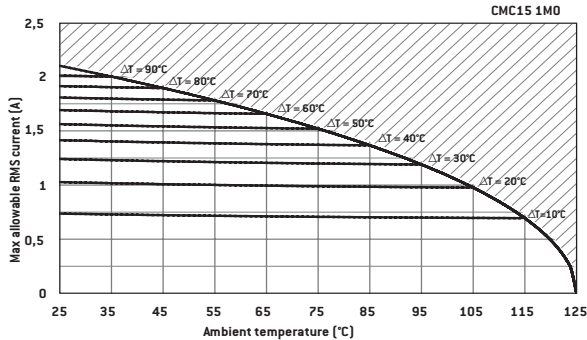
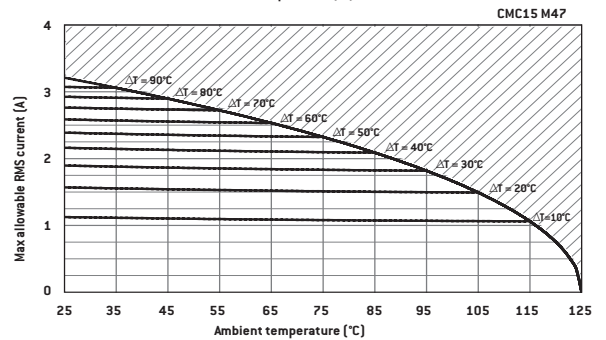
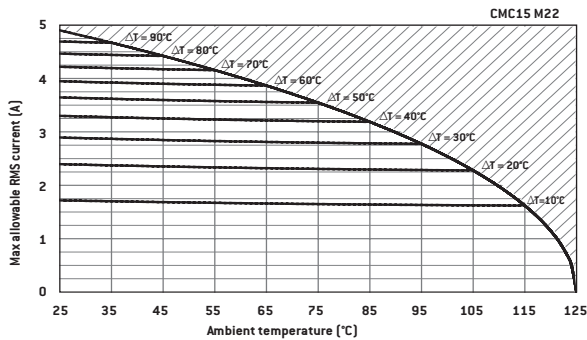
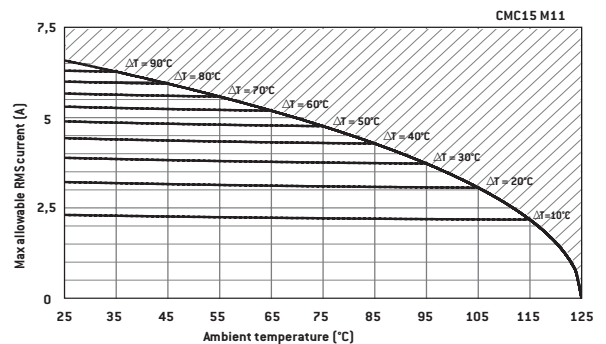
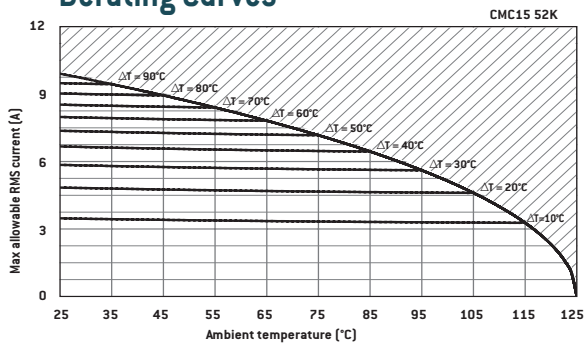
## Variation vs Temperature



## Attenuation Measurement Circuit



## Derating Curves



All thermal measurements under atmospheric conditions with component mounted on 1 dm<sup>2</sup> PCB without cooling device. All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined ΔT. Maximum operating temperature is +125°C.


### Example:

CMC15 52K for application with Tamb = +85°C max. current allowed is < 6.5 Arms with ΔT < 40°C. If temp increase allowed in application is limited to ΔT < 20°C, current must be reduced to 4.5 Arms.

HIGH GRADE PRODUCTS

# Common Mode Chokes for DC/DC Embedded Applications - CMC 18 xxx 2WR Series

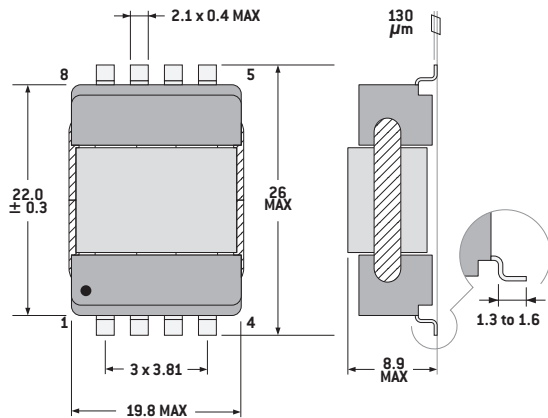


- Based on EXXELIA's «SESI18 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
-  ESCC 3201/010 version upon request
- RMS current range: from 0.9 A to 9.9 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 300 kHz to 45 MHz
- Dielectric strength test up to 500 V (50 Hz - 1 min)
- Materials meet UL94-V0 rating
- Thermal index according to IEC85: H (180°C)
- Operating/storage temperature range: -55°C to +125°C
- Approximative weight: 10 grams

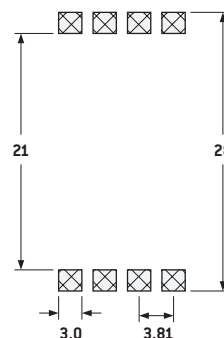
## Electrical Data

ID Code	Inductance Value at 25°C (±40%)	Typical SRF	max. Impedance [Typical]	max. Attenuation [Z = 50Ω]	max. RMS Current for ΔT = 40°C	max. R <sub>DC</sub> [25°C]	Dielectric Strength [50Hz - 1min]
CMC18 60K 2WR	0.06 mH	4.5 MHz	1.4 kΩ	23 dB	9.9 A	7 mΩ	500 Vrms
CMC18 M13 2WR	0.13 mH	3.7 MHz	3 kΩ	30 dB	6.9 A	15 mΩ	500 Vrms
CMC18 M27 2WR	0.27 mH	2.5 MHz	6.3 kΩ	36 dB	4.5 A	35 mΩ	500 Vrms
CMC18 M54 2WR	0.54 mH	2 MHz	13.2 kΩ	42 dB	3 A	75 mΩ	500 Vrms
CMC18 1M1 2WR	1.1 mH	1.4 MHz	33.7 kΩ	51 dB	2 A	175 mΩ	500 Vrms
CMC18 2M4 2WR	2.4 mH	0.8 MHz	96.8 kΩ	60 dB	1.3 A	415 mΩ	500 Vrms
CMC18 4M9 2WR	4.9 mH	0.55 MHz	325 kΩ	70 dB	0.9 A	920 mΩ	500 Vrms

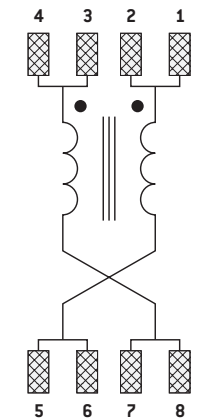
## Typical Dimensions (mm, top view)



## PCB Layout (suggested)



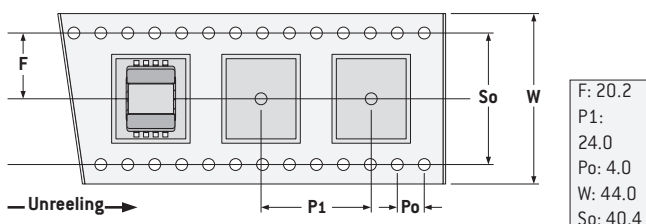
## Connections (top view)



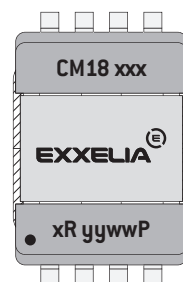
 internal crossing

## Packaging

Tape and Reel:  
300 pieces per reel of diameter 330 mm



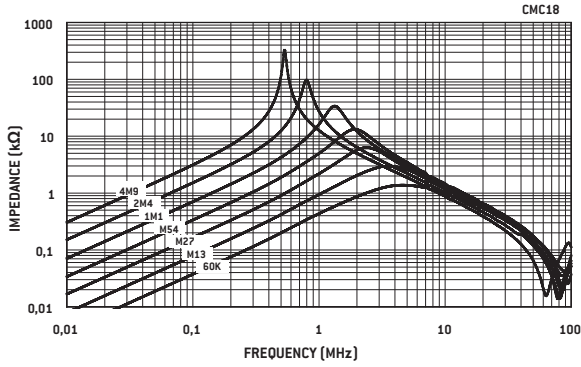
## Marking



yyww:  
Date code

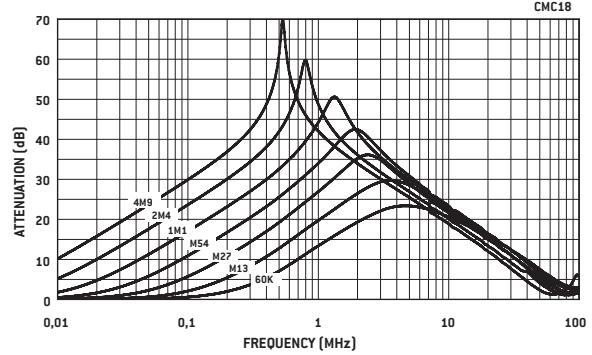
# Common Mode Chokes for DC/DC Embedded Applications - CMC 18 xxx 2WR Series

## Impedance



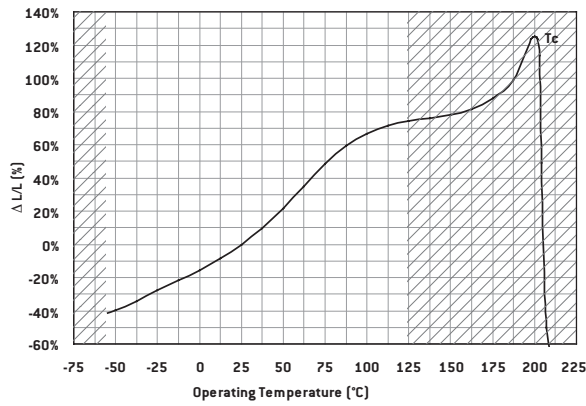
Typical values at 25°C with 1 mT at 10 kHz

## Attenuation



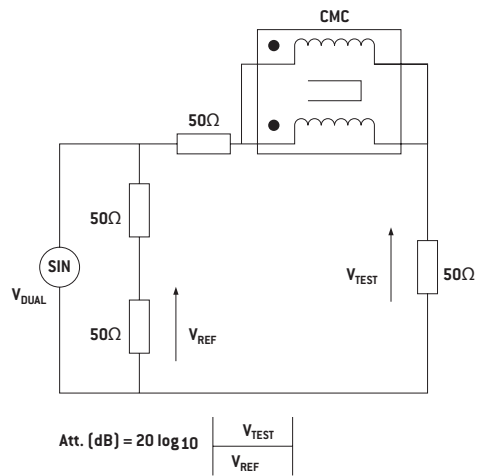
Typical values ( $Z = 50 \Omega$ ) at 25°C with 1 mT at 10 kHz

## Variation vs Temperature



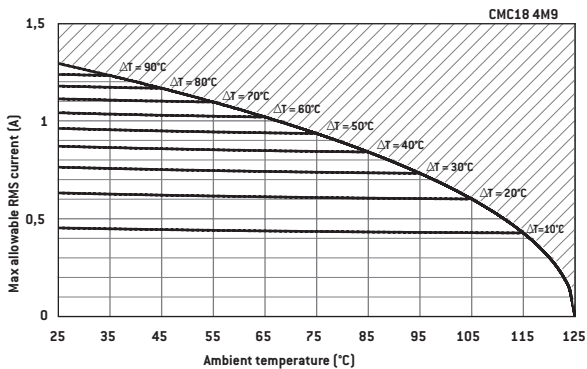
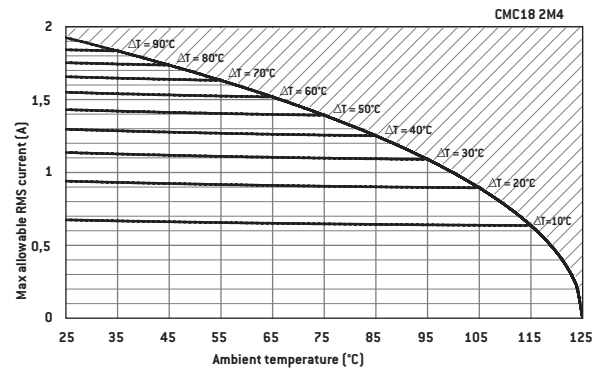
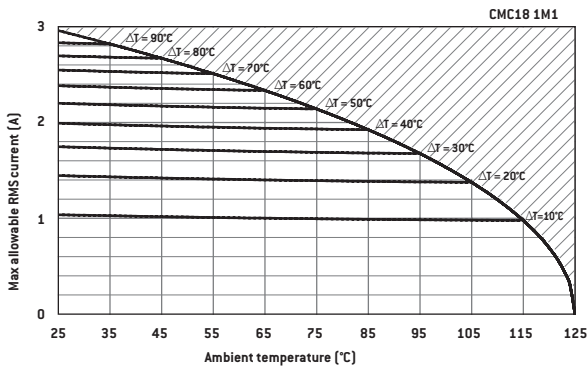
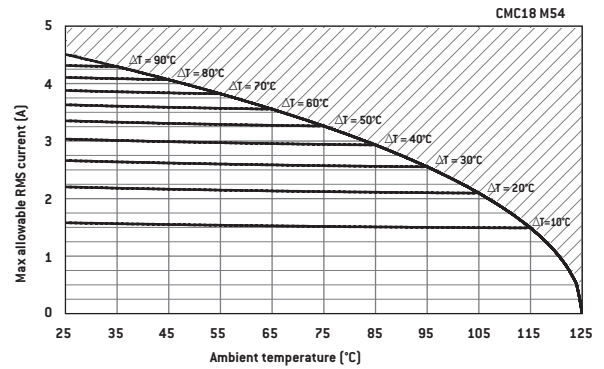
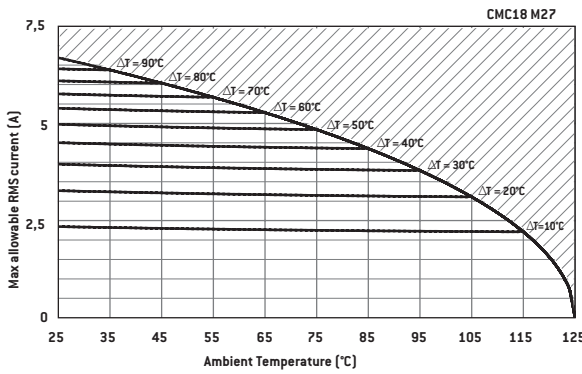
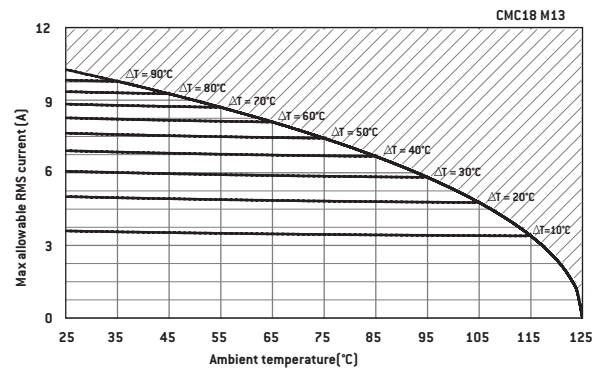
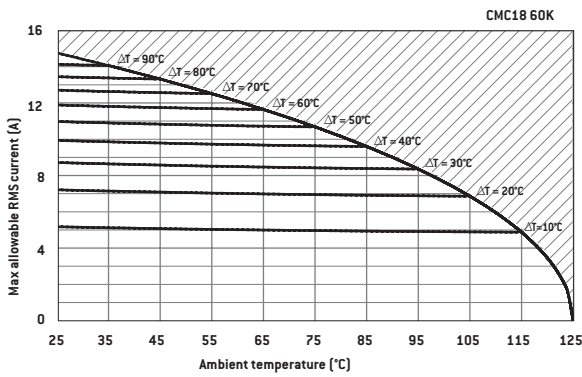
Change in inductance value (< 1 mT at 10 kHz)

## Attenuation Measurement Circuit



# Common Mode Chokes for DC/DC Embedded Applications - CMC 18 xxx 2WR Series

## Derating Curves



All thermal measurements under atmospheric conditions with component mounted on 1 dm<sup>2</sup> PCB without cooling device. All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined  $\Delta T$ . Maximum operating temperature is +125°C.

**Example:**

CMC18 60K for application with  $T_{amb} = +85^\circ\text{C}$  max. current allowed is < 9.6 Arms with  $\Delta T < 40^\circ\text{C}$ .

If temp increase allowed in application is limited to  $\Delta T < 20^\circ\text{C}$ , current must be reduced to 7 Arms.

# Common Mode Chokes for DC/DC Embedded Applications

## CMC 22 xxx 2WR Series

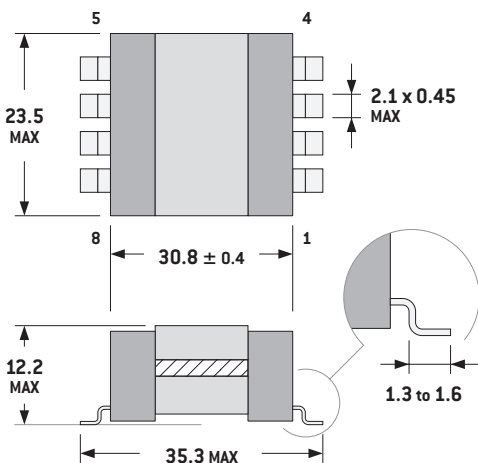


- Based on EXXELIA's «SESI22 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
- **eesa** ESCC 3201/010 version upon request
- RMS current range: from 1.9 A to 14.3 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 300 kHz to 35 MHz
- Dielectric strength test up to 500 V (50 Hz - 1 min)
- Materials meet UL94-V0 rating
- Thermal index according to IEC85: H (180°C)
- Operating/storage temperature range: -55°C to +125°C
- Approximative weight: 26 grams

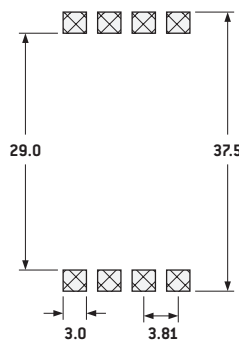
### Electrical Data

ID Code	Inductance Value at 25°C (±40%)	Typical SRF	max. Impedance [Typical]	max. Attenuation [Z = 50Ω]	max. RMS Current for ΔT = 40°C Heating	max. R <sub>DC</sub> (25°C)	Dielectric Strength (50Hz - 1min)
CMC22 60K 2WR	0.06 mH	3 MHz	1.1 kΩ	22 dB	14.3 A	5 mΩ	500 Vrms
CMC22 M14 2WR	0.14 mH	2 MHz	2.9 kΩ	30 dB	9.1 A	10 mΩ	500 Vrms
CMC22 M34 2WR	0.34 mH	1.5 MHz	9.1 kΩ	39 dB	5.8 A	20 mΩ	500 Vrms
CMC22 M74 2WR	0.74 mH	1.1 MHz	21.8 kΩ	47 dB	4.3 A	40 mΩ	500 Vrms
CMC22 1M6 2WR	1.6 mH	0.7 MHz	64.6 kΩ	56 dB	2.8 A	95 mΩ	500 Vrms
CMC22 3M3 2WR	3.3 mH	0.65 MHz	250 kΩ	68 dB	1.9 A	205 mΩ	500 Vrms

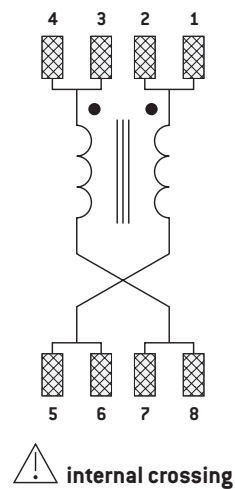
### Typical Dimensions (mm, top view)



### PCB Layout (suggested)

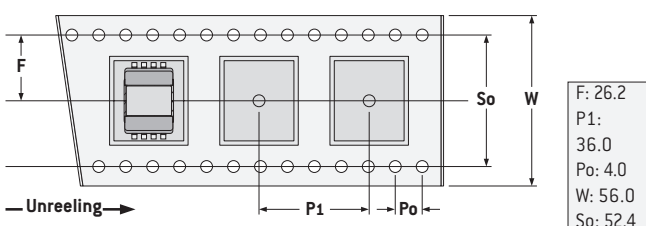


### Connections (top view)

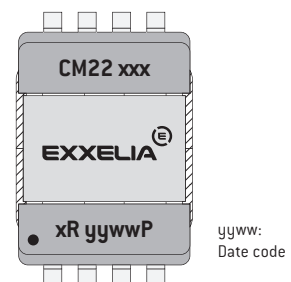


### Packaging

Tape and Reel:  
100 units per reel of diameter 330 mm



### Marking

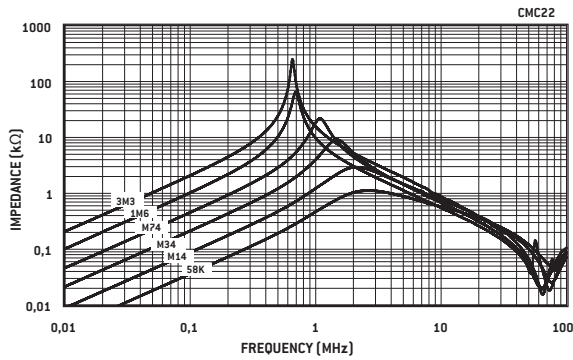


HIGH GRADE PRODUCTS

# Common Mode Chokes for DC/DC Embedded Applications

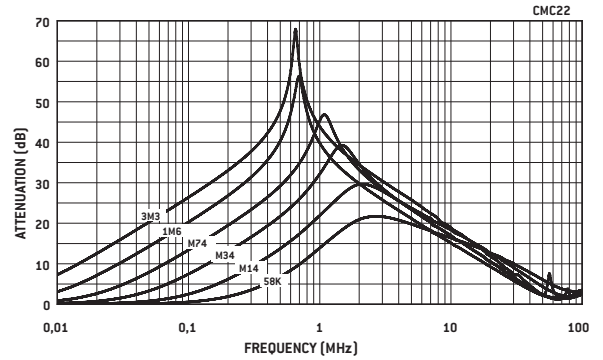
## CMC 22 xxx 2WR Series

### Impedance



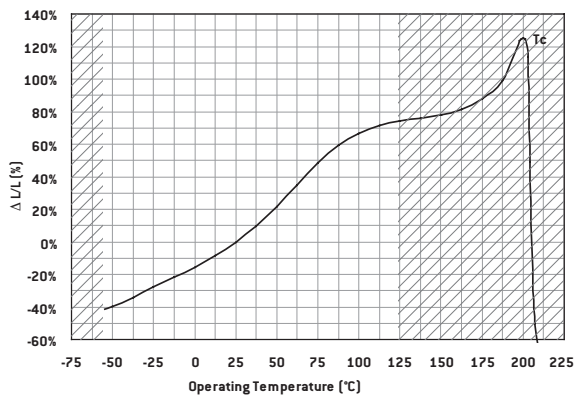
Typical values at 25°C with 1 mT at 10 kHz

### Attenuation



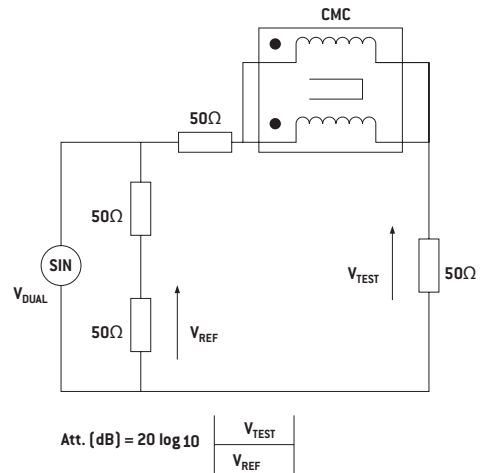
Typical values ( $Z = 50 \Omega$ ) at 25°C with 1 mT at 10 kHz

### Variation vs Temperature



Change in inductance value (< 1 mT at 10 kHz)

### Attenuation Measurement Circuit

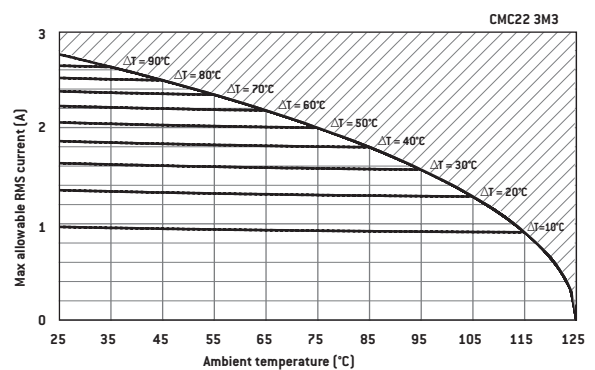
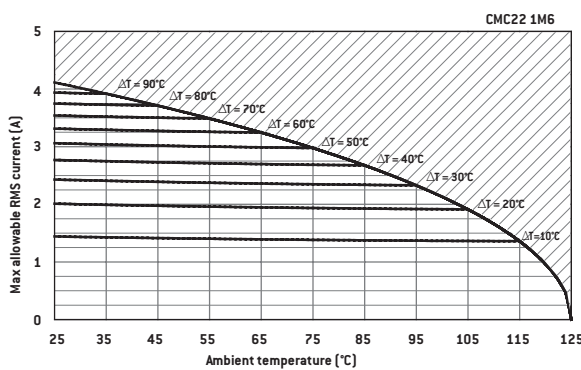
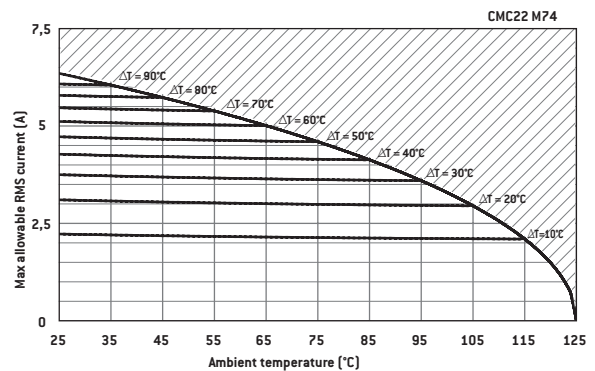
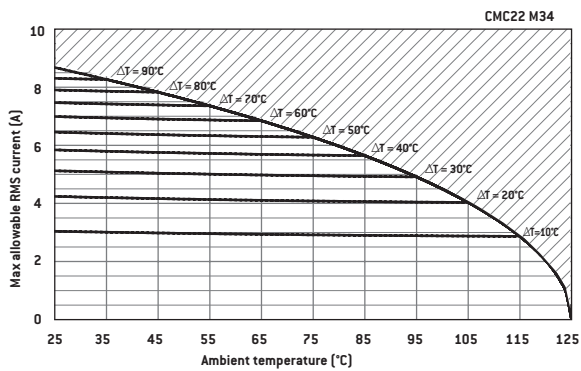
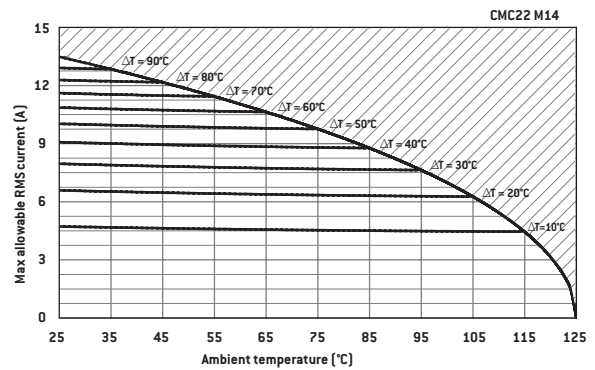
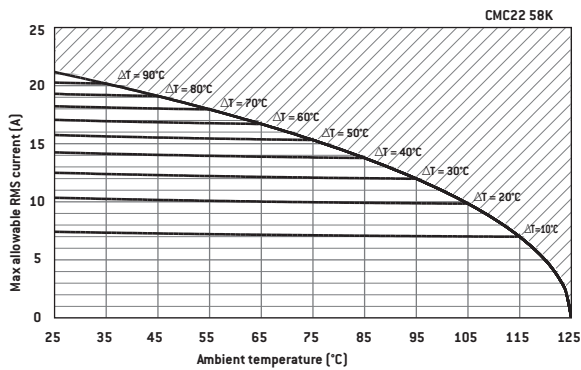




# Common Mode Chokes for DC/DC Embedded Applications

## CMC 22 xxx 2WR Series

### Derating Curves



All thermal measurements under atmospheric conditions with component mounted on 1 dm<sup>2</sup> PCB without cooling device. All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined  $\Delta T$ . Maximum operating temperature is +125°C.

**Example:**  
 CMC22 58K for application with  $T_{amb} = +85^\circ\text{C}$ . max. current allowed is < 14 Arms with  $\Delta T < 40^\circ\text{C}$ .  
 If temp increase allowed in application is limited to  $\Delta T < 20^\circ\text{C}$ , current must be reduced to 10 Arms.

HIGH GRADE PRODUCTS

# SMD Power Inductors

## CMC 15WR - 18WR - 22WR



Since 2013, EXXELIA has been manufacturing Common Mode Chokes, CMC15/18/22 WR series fulfilling ESA ESCC Generic specification N° 3201 and detail specification N° 3201/010.

This qualification approval includes final production tests Chart F2, burn-in and electrical measurements Chart F3 and qualification testing Chart F4.

For procurement, different quality levels are offered:

- Final production tests Chart F2
- Burn-in and electrical measurements Chart F3
- Lot acceptance testing Chart F4 if required

Components delivered through this specification need to be processed and inspected in accordance with the EXXELIA Process Identification Document (P.I.D.).

Each component delivered is traceable to its production lot.

The terminal material and finish shall be brass, plated with 2 to 4  $\mu\text{m}$  of Nickel, the finish shall be either Sn60Pb40 or Sn90Pb10.

### Cross reference chart

EXXELIA Non-QPL ID Code	ESA SCC Component Part Number
CMC 15 52K 2WR	3201010 01 520
CMC 15 M11 2WR	3201010 01 111
CMC 15 M22 2WR	3201010 01 221
CMC 15 M47 2WR	3201010 01 471
CMC 15 1M0 2WR	3201010 01 102
CMC 15 2M0 2WR	3201010 01 202
CMC 15 4M0 2WR	3201010 01 402
CMC 18 60K 2WR	3201010 03 600
CMC 18 M13 2WR	3201010 03 131
CMC 18 M27 2WR	3201010 03 271
CMC 18 M54 2WR	3201010 03 541
CMC 18 1M1 2WR	3201010 03 112
CMC 18 2M4 2WR	3201010 03 242
CMC 18 4M9 2WR	3201010 03 492
CMC 22 60K 2WR	3201010 05 580
CMC 22 M14 2WR	3201010 05 141
CMC 22 M34 2WR	3201010 05 341
CMC 22 M74 2WR	3201010 05 741
CMC 22 1M6 2WR	3201010 05 162
CMC 22 3M3 2WR	3201010 05 332

3201010 0 ### y

Tolerance:  $\pm 40\%$

# Common Mode Chokes CMC 14 Series

High-Grade - Improved Temperature Stability



- Less than 20 % performance variations versus temperature [-55°C / +125°C]
- Minimum impedance attenuation: 100 Ω from 100 kHz to 30 MHz
- Compact SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-ST-70-02C, D0-160 and ESCC 3201 generic specification for space products
- Materials meet UL94-V0 rating
- Operating/storage temperature range: -55°C to +125°C
- Approximative weight: 5 grams

## Electrical Data

ID Code	Inductance Value at 25°C (-40/+35%)	max. RMS Current for ΔT = 40°C	max. R <sub>DC</sub> (25°C)
CMC14 M14 xWR	140 μH	7.2 A	3.0 mΩ
CMC14 M25 xWR	248 μH	6.4 A	3.5 mΩ
CMC14 M39 xWR	387 μH	5.7 A	4.4 mΩ
CMC14 M56 xWR	558 μH	5.4 A	5.0 mΩ
CMC14 M76 xWR	760 μH	4.5 A	7.0 mΩ
CMC14 M99 xWR	992 μH	3.8 A	10.0 mΩ
CMC14 1M2 xWR	1255 μH	3.2 A	14.0 mΩ
CMC14 1M5 xWR	1550 μH	2.6 A	20.0 mΩ
CMC14 2M2 xWR	2232 μH	2.2 A	29.0 mΩ

## Notes

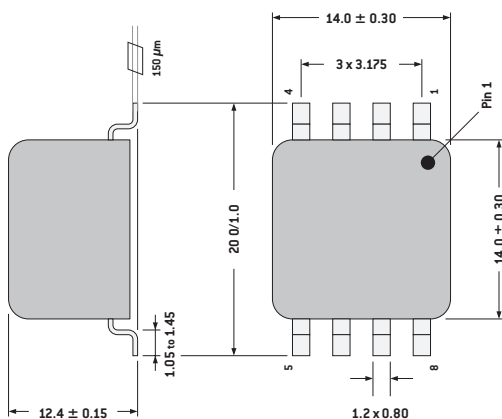
1. Dielectric strength test: 500v (50Hz - 1min)
2. max. power dissipation at +125°C: 400mW
3. Heat increase at max. current ≤ 25°C
4. 1:1 ratio (sector wound construction)
5. Interwinding capacitances < 15 pF
6. Variation of «L» values over the working temperature range ≤ 15 %
7. Admissible temp. during reflow soldering: +260°C / 30 seconds

## To Order

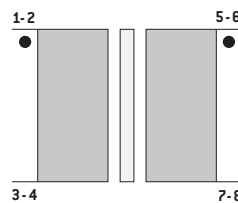
CMC 14 ### xWR

CMC 14	###	x
Range	Inductance value	Connections x = 2 connection 2 x = 3 connection 3

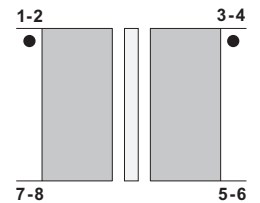
## Typical Dimensions (mm, top view)



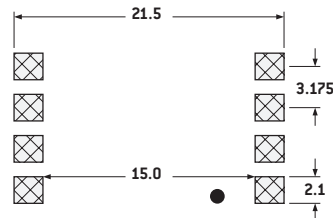
## Connection 2



## Connection 3

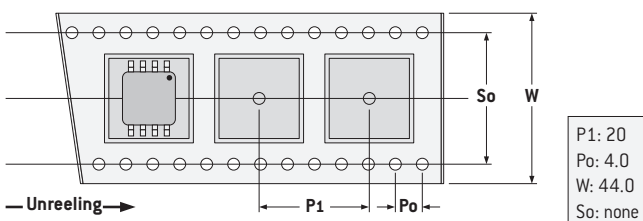


## PCB Layout (suggested)



## Packaging

Tape and Reel:  
200 units per reel of diameter 330 mm



P1: 20  
P0: 4.0  
W: 44.0  
So: none

## Marking



yyww:  
Date code

# Common Mode Chokes CMC 17 Series

## High-Grade - Improved Temperature Stability

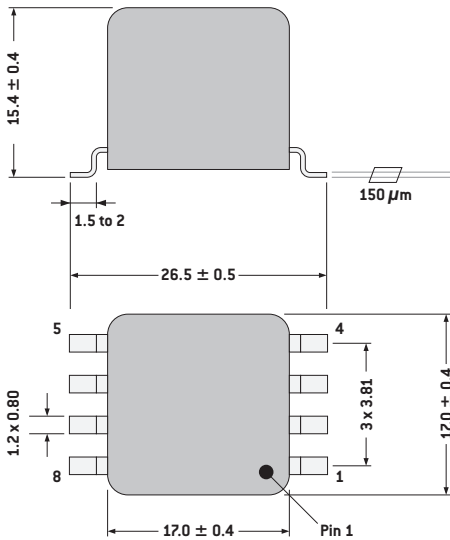


- Less than 20 % performance variations versus temperature (-55°C / +125°C)
- Minimum impedance attenuation: 100 Ω from 100 kHz to 30 MHz
- Compact SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-ST-70-02C, D0-160 and ESCC 3201 generic specification for space products
- RMS current range: from 1.1 A to 11.7 A for 40°C heating above 25°C
- Materials meet UL94-V0 rating
- Operating/storage temperature range: -55°C to +125°C
- Approximative weight: 10 grams

### Electrical Data

ID Code	Inductance Value at 25°C (-40/+70%)	Typical SRF	max. Impedance (Typical)	max. Attenuation (Z = 50Ω)	max. RMS Current for ΔT = 40°C	max. R <sub>DC</sub> (25°C)	Typical Leakage Inductance (100kHz)
CMC17 M45 1WR	0.45 mH	32 MHz	1 kΩ	20 dB	11.7 A	5 mΩ	0.5 μH
CMC17 1M2 1WR	1.15 mH	15 MHz	1.9 kΩ	26 dB	8.3 A	10 mΩ	1.1 μH
CMC17 2M6 1WR	2.59 mH	8 MHz	3.7 kΩ	32 dB	6 A	18 mΩ	2.3 μH
CMC17 5M8 1WR	5.83 mH	1.5 MHz	5.3 kΩ	35 dB	4 A	40 mΩ	6.3 μH
CMC17 13M 1WR	13.1 mH	0.6 MHz	9.4 kΩ	40 dB	2.7 A	90 mΩ	13.4 μH
CMC17 30M 1WR	30.3 mH	0.3 MHz	15.8 kΩ	44 dB	1.7 A	220 mΩ	32 μH
CMC17 69M 1WR	69.2 mH	0.1 MHz	29 kΩ	49 dB	1.1 A	500 mΩ	70 μH

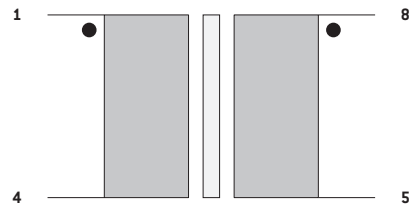
### Typical Dimensions (mm, top view)



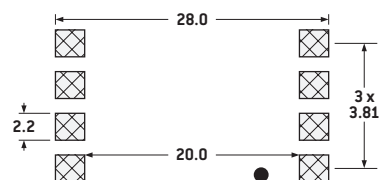
### Notes

1. Dielectric strength test: 500 V (50 Hz - 1 min)
2. 1:1 ratio (sector wound construction)

### Connections

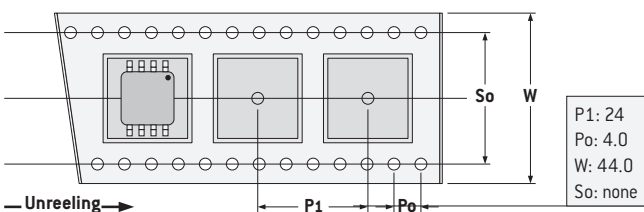


### PCB Layout (suggested)

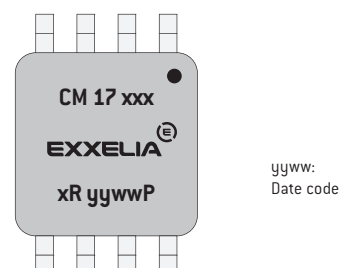


### Packaging

Tape and Reel:  
150 units per reel of diameter 330 mm



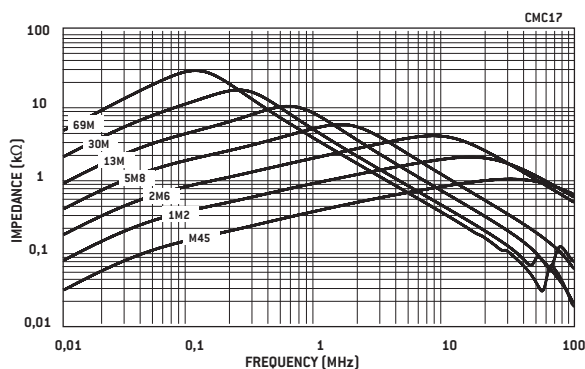
### Marking



# Common Mode Chokes CMC 17 Series

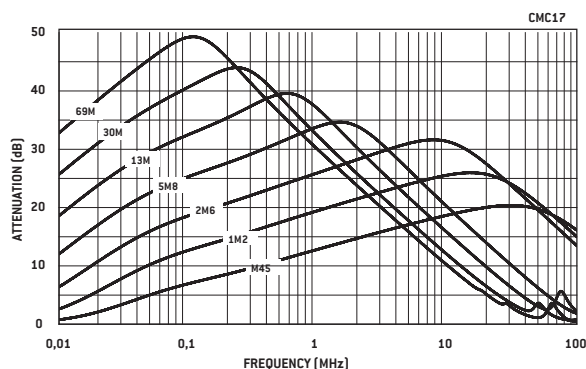
## High-Grade - Improved Temperature Stability

### Impedance



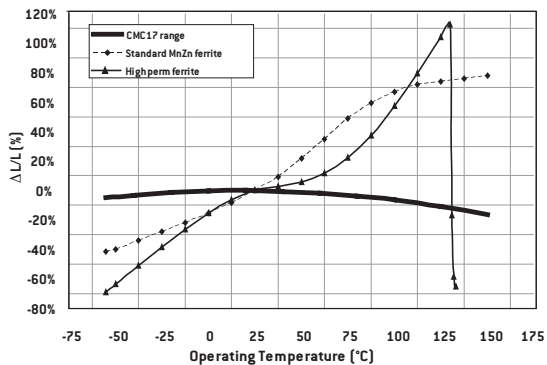
Typical values at 25°C with 1 mT at 10 kHz

### Attenuation



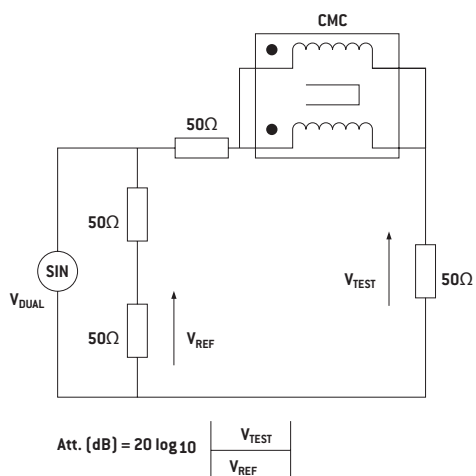
Typical values ( $Z = 50 \Omega$ ) at 25°C with 1 mT at 10 kHz

### Variation vs Temperature



Change in inductance value (< 1 mT at 10 kHz)

### Attenuation Measurement Circuit



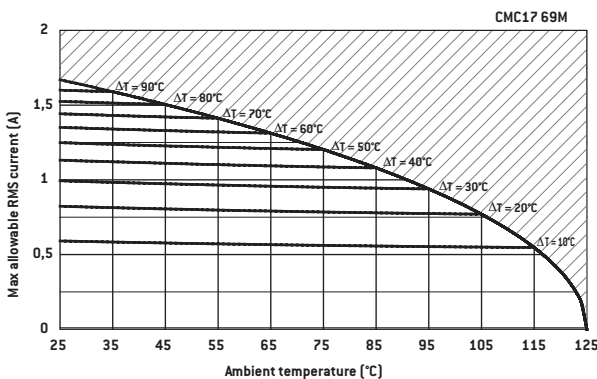
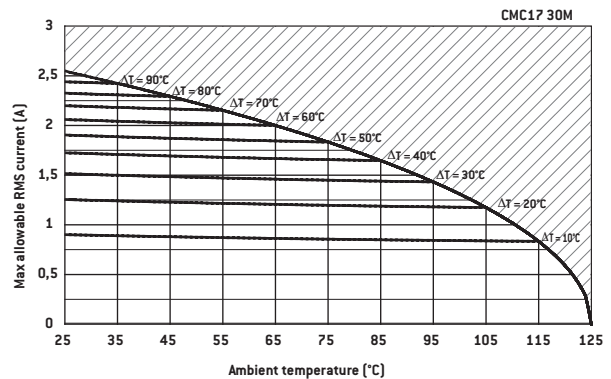
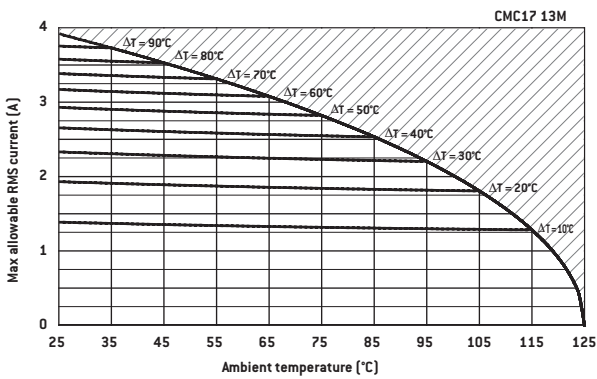
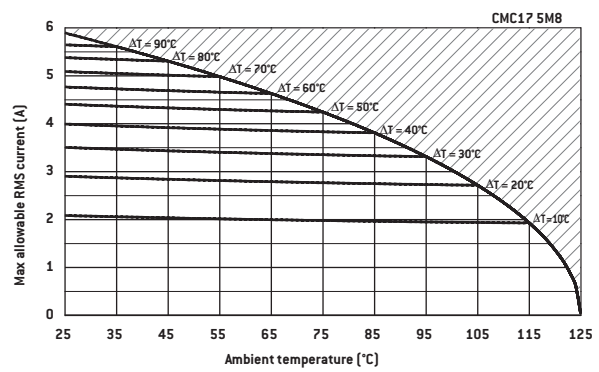
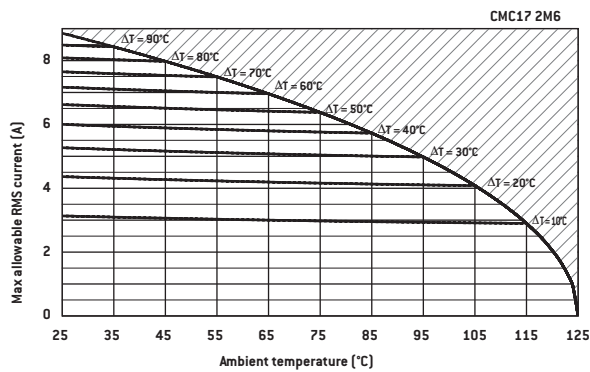
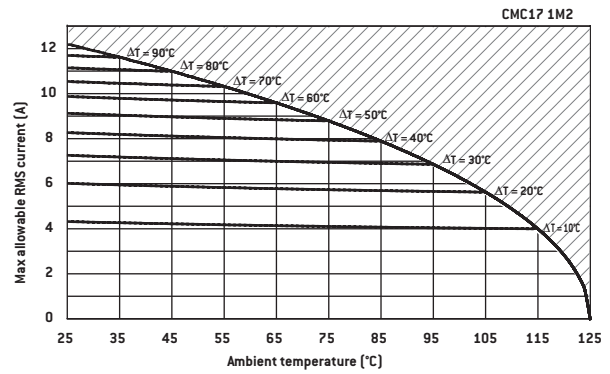
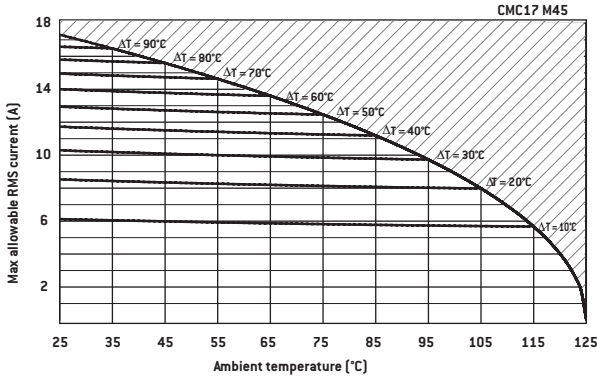
CMC17 range uses very high performance materials and therefore, offers remarkable temperature stability figures compared to standard or high-perm ferrite cores.

HIGH GRADE PRODUCTS

# Common Mode Chokes CMC 17 Series

High-Grade - Improved Temperature Stability

## Derating Curves



All thermal measurements under atmospheric conditions with component mounted on 1 dm<sup>2</sup> PCB without cooling device. All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined  $\Delta T$ . Maximum operating temperature is +125°C.

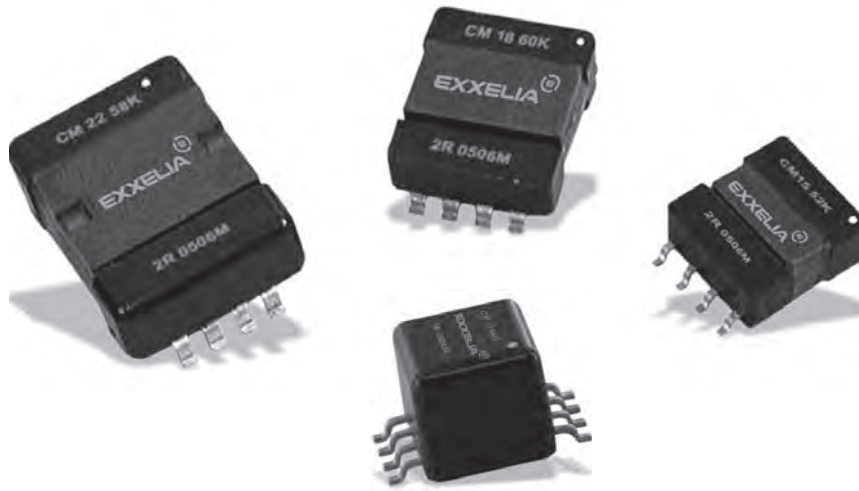
**Example:**

CMC17 M45 for application with  $T_{amb} = +85^\circ C$  max. current allowed is < 11 Arms with  $\Delta T < 40^\circ C$ .

If temp increase allowed in application is limited to  $\Delta T < 20^\circ C$ , current must be reduced to 8 Arms.

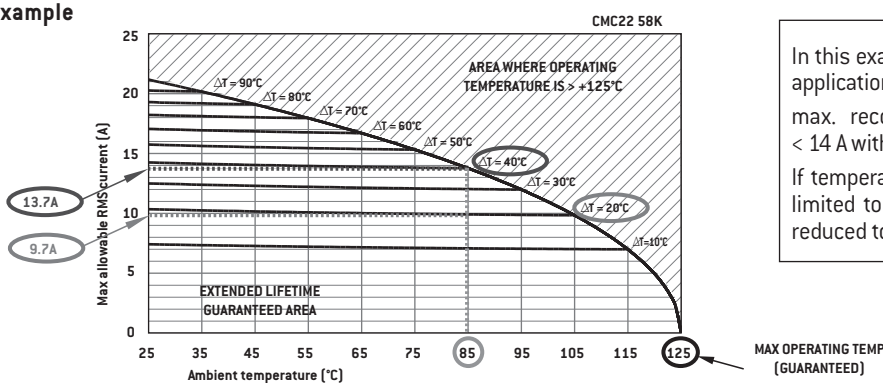
# Technical note - Appendix

## CMC 15 - 18 - 22 & CMC 17 Temperature Application



- The operating temperature announced in the datasheets takes into account maximum ambient temperature around the component +its self heating temperature in operation.
- Typical  $T^{\circ}$  range is  $-55^{\circ}\text{C}$   $+125^{\circ}\text{C}$  for usual embedded applications (avionics, defence, space...) in order to ensure a good ageing of the products.
- EXXELIA guarantees an extended lifetime in this operational  $T^{\circ}$  range, because only high temperature class materials are used and offer sufficient safety margin: all plastic materials used are H class according to IEC85 standard (180°C during 20.000 hours) and magnetic cores show a high Curie temperature value ( $T_c > 200^{\circ}\text{C}$ ).
- Typical values for admissible current at  $+25^{\circ}\text{C}$  ambient for a  $40^{\circ}\text{C}$  nominal temperature increase are defined without any heats ink in our literature.
- When using an appropriate cooling device, these values can be slightly increased
- The associated derating curves allow to check maximum current possible in the component versus acceptable temperature increase above ambient temperature of the application.

### Example



In this example, CMC22 58K is chosen for an application at  $T_{\text{amb}} = +85^{\circ}\text{C}$ .

max. recommended RMS current is then  $< 14\text{ A}$  with  $\Delta T < 40^{\circ}\text{C}$ .

If temperature increase in the application is limited to  $\Delta T < 20^{\circ}\text{C}$ , current value must be reduced to  $< 10\text{ A}$ .

- With the above data, it is clear that the « theoretical » maximum possible current reaches zero for  $+125^{\circ}\text{C}$  ambient temperature (because heating above is not recommended) !
- However, it still remains possible to load the component with current leading to operating temperature greater than  $+125^{\circ}\text{C}$  but in this case, extended lifetime for the product is not guaranteed any longer.
- Heating values versus current above  $+125^{\circ}\text{C}$  operating temperature can still be calculated upon request.

# Current sense Transformer up to 10 Apk CT10



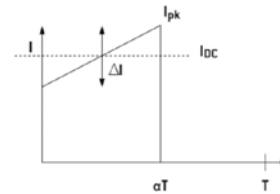
## Electrical properties

Inductance 0,1 V / 100 kHz  (mH min.)	DC Resistance (typical)	
	Primaries (mΩ)	Secondaries (Ω)
2	0,7	4,3

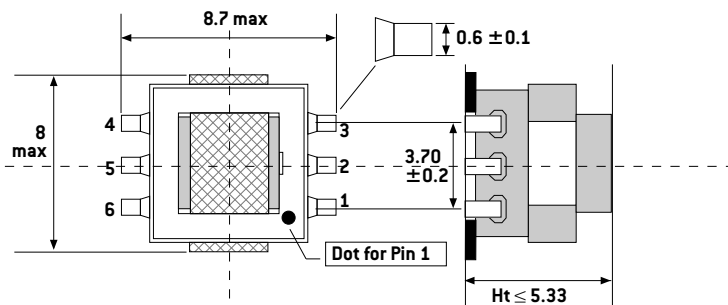
- Compliant with ESCC3201 generic
- Low outgassing in accordance with ECSS-Q-ST-70-02C
- Ratio : 1/100
- Operating temperature : -55/+125°C
- Rohs or Tin-lead finishing
- Volt time admissible without saturation 53 Vμs from secondary
- Dielectric withstanding : 500Vrms
- Thermal class : H 180°C
- Weight < 0,5gr

## Application

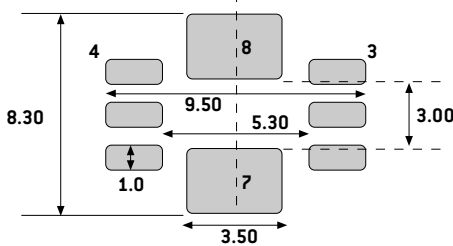
Current detection/measurement for PWM control (Isense) in High-Rel. SMPS



## Dimensions (mm)

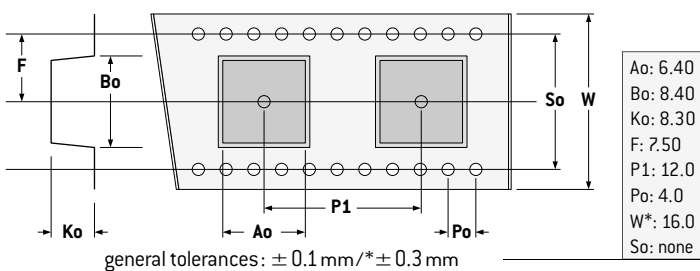


## PCB Layout (suggested)

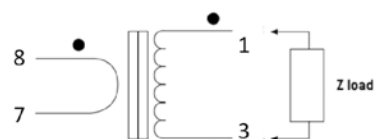


## Packaging

Tape and Reel: 750 pieces per reel



## Connections





# Current sense Transformer CT01 100 261 x



- Materials meet UL94V-0 rating
- Global accuracy  $\pm 10\%$
- Applied standards:  
ESCC-3201 generic (including MIL-STD-202) / ECSS-Q-ST-70-02C and ESCC 3201 generic specification for space products
- Frequency range 10 kHz to 250 kHz
- Operating temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Suited for  $I_R$  and vapor reflow soldering
- Weight: < 2 grams

## Electrical Data (25°C)

ID Code	DCR <sub>1-3/2-4</sub> mΩ $\pm 15\%$	DCR <sub>5-7/6-8</sub> Ω $\pm 15\%$	L <sub>1/1-3</sub> μH $\pm 40\%$	Insulation 500 V <sub>DC</sub>
CT01 100 261 x	2.5	1	3.9	>16Ω

Turn ratio	Schematic	I <sub>p</sub>	I <sub>s</sub> (vs=1V)	Z load
1/100		3,5 A	35 mA	33 Ω
1/50		3,5 A	70 mA	15 Ω

## Notes

Typical performances at +25°C  
Storage Temperature  $-55^{\circ}\text{C}$  to  $+170^{\circ}\text{C}$  - 10 mn Max

## Application

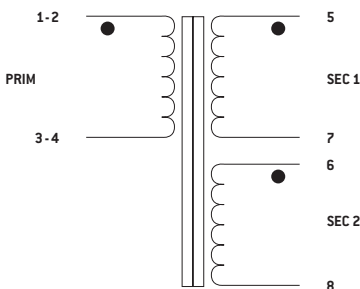
Current detection/measurement for PWM control (I<sub>sense</sub>) in High-Rel. SMPS

## To Order

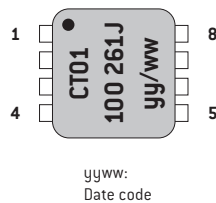
CT01 100	261	x
Range	Range	x = J J leaded x = W W Terminals

CT01 100 261 x

## Connections



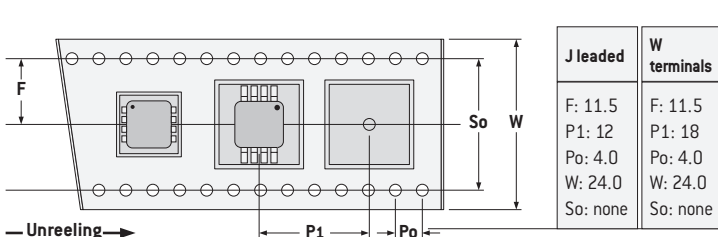
## Marking



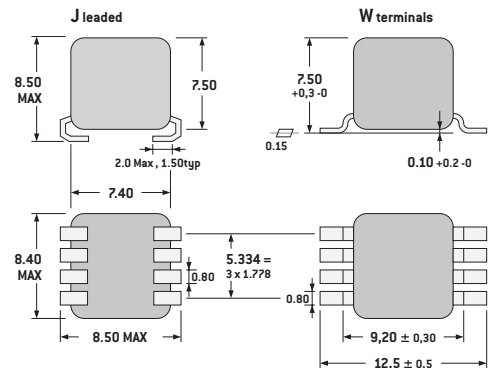
## Packaging

Tape and Reel:

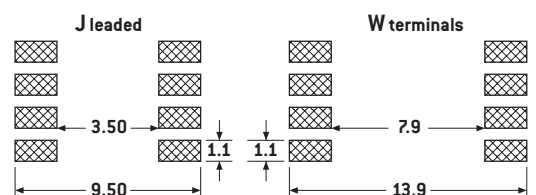
J leaded - 600 units per reel of diameter 330 mm  
W terminals - 400 units per reel of diameter 330 mm



## Dimensions (mm)

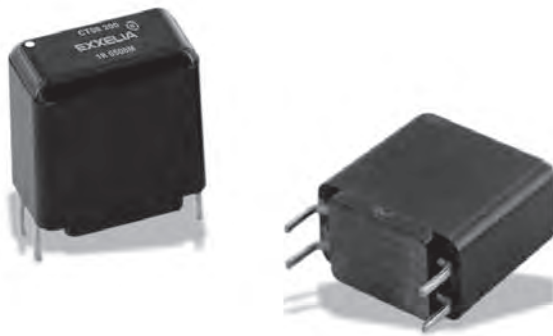


## PCB Layout (mm)



HIGH GRADE PRODUCTS

# Current Transformer for DC/DC Applications CT08 200 221 PR

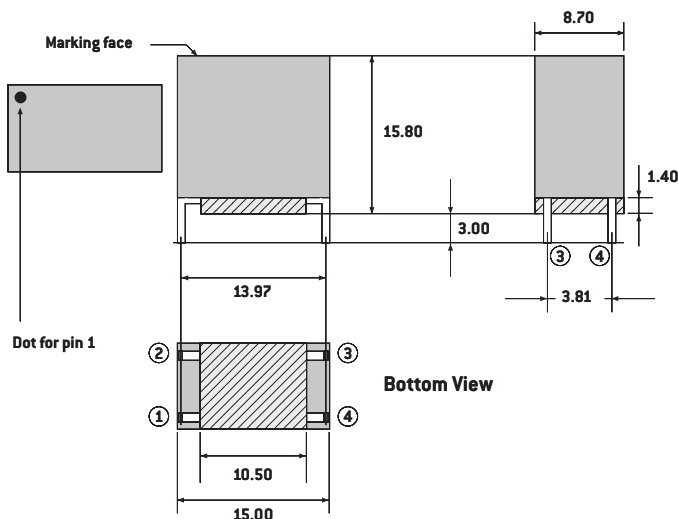


- Designed for DC/DC Converter Applications
- Measurement up to 5.4 A<sub>RMS</sub> (8 A<sub>PEAK</sub> - 3.6 max.) from 100 to 200 kHz with 2 % Accuracy
- Applied standards:  
MIL-STD-202, ECSS-Q-70-02  
ESCC-3201, D0-160

## Electrical Data (25°C)

ID Code	Accuracy (-40°C / +110°C)	Transformer ratio	Secondary Inductance	Secondary DC Resistance	Insulation
CT08 200 221R	< 2% with R <sub>L</sub> = 113Ω theoretical < 2% with R <sub>L</sub> = 113Ω at 1% (E96)	V <sub>OUT</sub> / I <sub>IN</sub> = 0.56 (N <sub>p</sub> / N <sub>s</sub> = 1: 200)	L <sub>3-4</sub> = 11.0 mH (± 25%) (100 kHz - 1V <sub>RMS</sub> )	R <sub>3-4</sub> = 5.8 Ω (± 10%)	500 V <sub>DC</sub> - 1 min (R <sub>I</sub> ≥ 100 MΩ) between windings

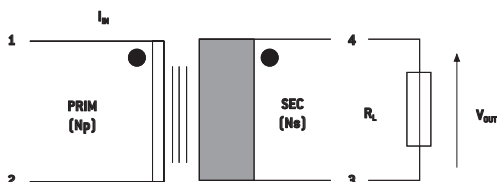
## Typical Dimensions (mm)



## Notes

- The component is dedicated to measure RMS current up to I<sub>IN</sub> = 5.4 A<sub>RMS</sub> (8 A<sub>PEAK</sub> and 3.6 max.) for a waveform of working frequency from 100 to 200 kHz. Image of this current is the voltage (V<sub>OUT</sub> = 3 V<sub>RMS</sub> max.) picked on a resistive load R<sub>L</sub> = 113 Ω at 1 % (E96 series).
- The component can also make the measurement keeping the same accuracy but with a ratio V<sub>OUT</sub> / I<sub>IN</sub> = 1.00. In this case, image of the current is the voltage (vs = 5.4 V<sub>RMS</sub> max.) picked on a resistive load R<sub>L</sub> = 200 Ω at 1 % (E96 series).
- Flammability compliance: UL94V0
- Insulation class (windings): H (180°C)
- Operating temperature: -40°C to +110°C
- Storage temperature: -55°C to +125°C

## Connections

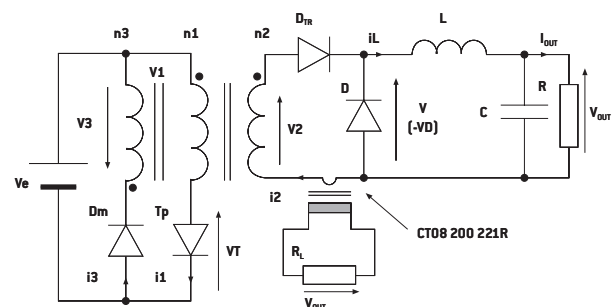


## Marking



yyww:  
Date code

## Application Schema



CT08 200 221R can be used for measurement of secondary current (i<sub>2</sub>) of a DC/DC forward converter (3.3 V / 8 A output and 100 kHz working frequency example) for regulation and surveillance operations.

# Current sense Transformer, up to 10Apk CT91 xxx 231 WR



- $V_{out}/I_{pk}$  ratio: 1 V / 8 A
- Global accuracy  $\pm 5\%$  on E96 series load resistor
- Low-profile and light
- Materials meet UL94V-0 rating
- Applied standards: ESCC-3201 generic (including MIL-STD-202) / ECSS-Q-70-02
- Frequency range 6 kHz to 500 kHz triangle wave
- Operating temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Suited for  $I_R$  and vapor reflow soldering
- Weight: 2 grams

## Electrical Data (25°C)

ID Code	Turn ratio	$DCR_{1-2}$ m $\Omega$	$DCR_{3-4}$ $\Omega \pm 15\%$	$L_{3-4}$ mH $\pm 15\%$	Frequency range triangle wave	$I_{pk} = I_{DC} + \Delta I / 2$ max	Z Load 1% $\Delta W$	Insulation 500 V <sub>DC</sub>
CT91 050 231 WR	1/50	<2	0.95	0.4	22kHz to 500 kHz	10	6.81 $\Omega$	>16 $\Omega$
CT91 075 231 WR	1/75	<2	2.15	0.9	15kHz to 300kHz	10	10.2 $\Omega$	>16 $\Omega$
CT91 100 231 WR	1/100	<2	3.70	1.6	9kHz to 200kHz	10	13.7 $\Omega$	>16 $\Omega$
CT91 200 231 WR	1/200	<2	14.6	6.4	6kHz to 70kHz	10	274 $\Omega$	>16 $\Omega$

## To Order

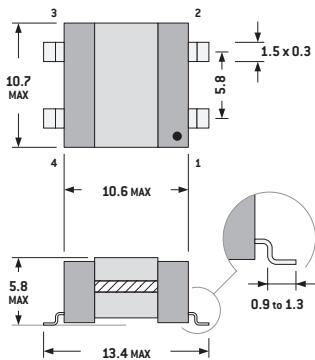
CT91 ### 231 WR

CT91	###	231	WR
Range	Turn ratio	Range	Gull wing highrel

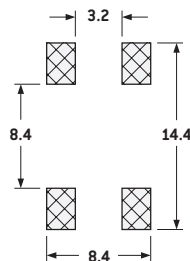
## Notes

Typical performances at +25°C  
Storage Temperature  $-55^{\circ}\text{C}$  to  $+140^{\circ}\text{C}$

## Dimensions (mm, top view)

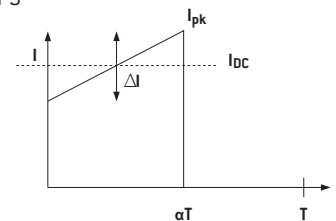


## PCB Layout (suggested)

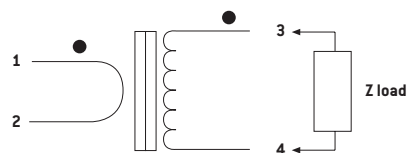


## Application

Current detection/measurement for PWM control (Isense) in High-Rel. SMPS

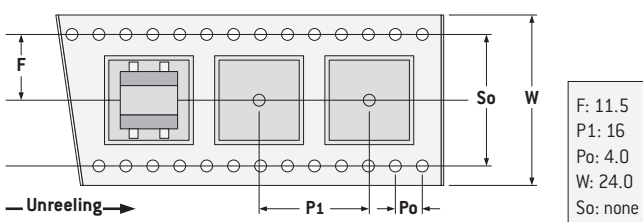


## Connections

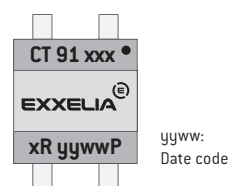


## Packaging

Tape and Reel:  
700 units per reel of diameter 330 mm



## Marking



HIGH GRADE PRODUCTS

# Current sense Transformer, 1/200/200 up to 17Apk CT15 200 231 WR



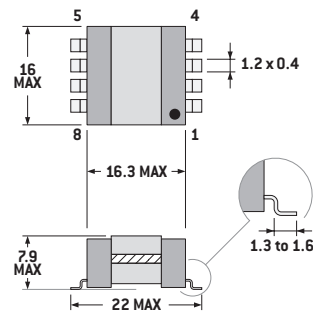
- Global accuracy  $\pm 5\%$
- Low-profile and light
- Materials meet UL94V-0 rating
- Applied standards: ESCC-3201 generic (including MIL-STD-202) / ECSS-Q-70-02
- Frequency range 6 kHz to 100 kHz triangle wave
- Operating temperature range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Suited for  $I_R$  and vapor reflow soldering
- Weight: 6 grams

## Electrical Data (25°C)

ID Code	DCR <sub>1-2</sub> mΩ	DCR <sub>5-6/7-8</sub> Ω ±15%	L <sub>5-6/7-8</sub> mH ±10%	Insulation 500 V <sub>DC</sub>
CT15 200 231 WR	1.1	21.8	6.4	>16Ω

Turn ratio	Schematic	I <sub>p</sub>	I <sub>s</sub>	Z load
1/400		17 A	42.5 mA	27 Ω
1/200		17 A	85 mA	15 Ω

## Dimensions (mm, top view)



## Notes

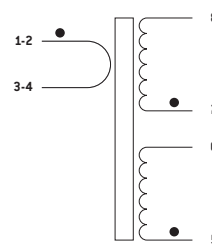
Typical performances at +25°C  
Storage Temperature:  $-55^{\circ}\text{C}$  to  $+140^{\circ}\text{C}$   
Thermal index: 180°C

## To Order

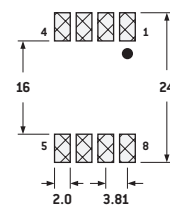
CT15 200 231 WR

CT15	200	231	WR
Range	Turn ratio	Range	Gull wing highrel

## Connections

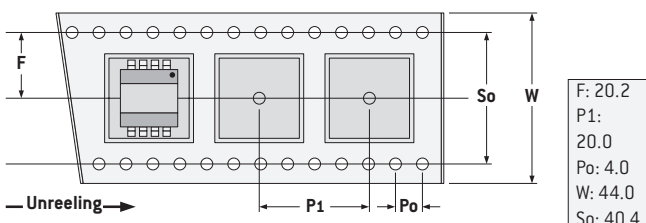


## PCB Layout (suggested)

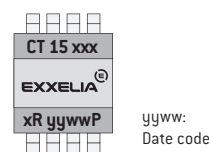


## Packaging

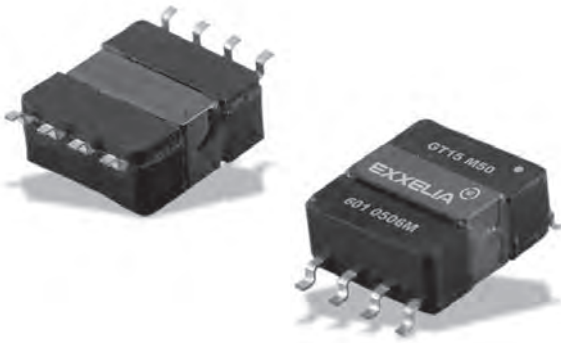
Tape and Reel:  
700 units per reel of diameter 330 mm



## Marking



# Gate Drive Transformer GDT 15 Series

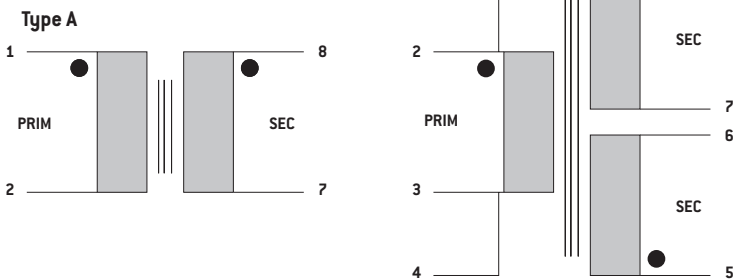


- Excellent performances in Low-profile package
- Suited for Avionics and Space applications
- Frequency range: 50 kHz - 500 kHz
- Applied standards: ECSS-Q-70-71 / ESCC-3201 screening flow applied / ABD-0100 / DO-160
- Materials meet UL94-V0 rating
- Approx. weight: 5 grams

## Electrical Data (25°C)

ID Code	ET (V $\mu$ s)	Primary Inductance Max	Turn ratio $\pm 1\%$	DC Resistances $\pm 15\%$ (m $\Omega$ )	Leakage Inductance	Interwinding Capacitance	Connection Type
GDT15 M50 60 1WR	60	L <sub>1-4</sub> > 500 $\mu$ H (10kHz - 1V <sub>RMS</sub> )	N <sub>7-6</sub> / N <sub>1-4</sub> = 1.52	R <sub>1-4</sub> = 170 R <sub>6-7</sub> = 400	L <sub>f1-4</sub> < 2.0 $\mu$ H (6-7 in short circuit)	C <sub>1-4/6-7</sub> < 150 pF	A
GDT15 M85 80 2WR	80	L <sub>1-4</sub> > 850 $\mu$ H (10kHz - 1V <sub>RMS</sub> )	1/1/1	R <sub>1-3</sub> = 400 R <sub>8-7</sub> = 400 R <sub>6-5</sub> = 400	L <sub>f1-2/3-4</sub> < 25 $\mu$ H	C <sub>1-4/6-7</sub> < 150 pF	B

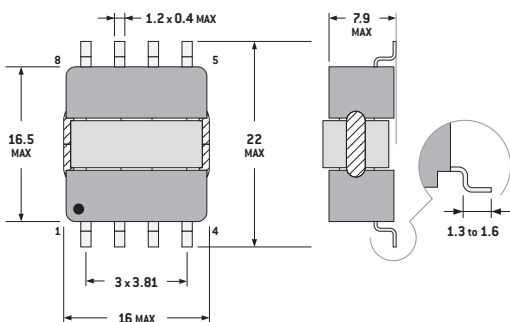
## Connections



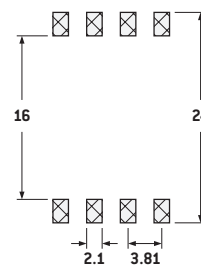
## Notes

- Insulation class (windings): Classe H
- Operating temperature: -55°C to +125°C
- Storage temperature: -55°C to +140°C
- Dielectric Strength: 500 V<sub>RMS</sub> - 50 Hz
- Isolation Voltage: 500 V<sub>DC</sub> - 50 min (R<sub>i</sub>  $\geq$  100M $\Omega$ )

## Dimensions (mm, top view)

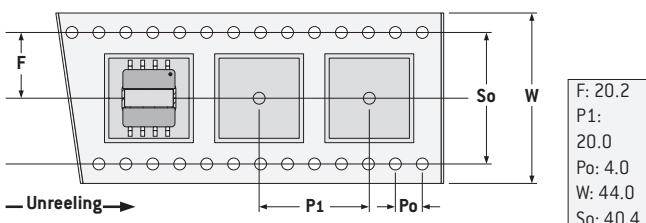


## PCB Layout (suggested)

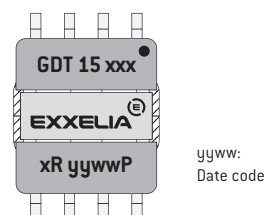


## Packaging

Tape and Reel:  
400 units per reel of diameter 330 mm



## Marking



# Gate Drive Transformer GDT 91 Series



- Excellent performances in Low-profile package
- Suited for Avionics and Space applications
- Working frequency (duty cycle 50%): up to 500 kHz max.
- Applied standards: ECSS-Q-70-02 / ESCC-3201 screening flow applied / MIL-STD-202
- Materials meet UL94V-0 rating
- Weight: 2 grams

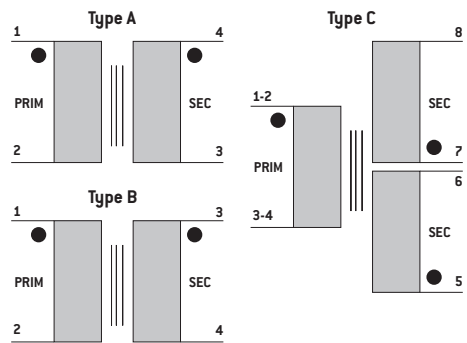
## Electrical Data (25°C)

ID Code	ET (V $\mu$ s)	Primary Inductance max.	Turn ratio $\pm 0,5\%$	DC Resistances	Admissible current	Leakage Inductance	Working frequency (duty cycle 50%)	Withstanding voltage P/S	Connection Type
GDT91 M50 50 1WR	50	$L_{1-2} > 500\mu\text{H}$ (10kHz - 1V <sub>RMS</sub> )	$N_{1-2} / N_{4-3} = 1$	$R_{1-2} R_{4-3} \leq 1.25 \Omega$	150 mA	$L_{f1-2} < 1\mu\text{H}$ (3.4 in short circuit)	500 kHz	500 V <sub>RMS</sub> 50 Hz 3 sec.	A
GDT91 6M0 135 1WR	135	$L_{1-2} > 6 \text{ mH}$	$N_{1-2} / N_{4-3} = 1$	$R_{1-2} R_{3-4} \leq 10.5 \Omega$	15 mA	$L_{f1-2} < 20\mu\text{H}$ (3.4 in short circuit)	100 kHz	500 V <sub>RMS</sub> 50 Hz 3 sec.	B
GDT91 M90 50 2WR	50	$L_{1-2,3-4} > 600\mu\text{H}$	$1/1/1 \pm 2\%$	$R_{1-2,3-4} < 900 \text{ m}\Omega$ $R_{5-6,7-8} < 1900 \text{ m}\Omega$	$I_p = 100 \text{ mA}$ $I_s = 50 \text{ mA}$	$L_{f1-2,3-4} < 2\mu\text{H}$ (secondaries in short circuit)	500 kHz	250 V <sub>RMS</sub>	C

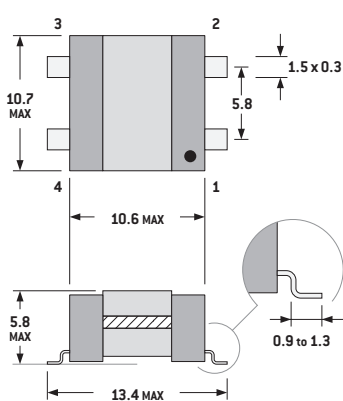
## Notes

- CuZn36 terminations with Ni+Sn for RoHS variant and Cu+SnPb60/40 for space variant.
- Operating temperature: -55°C to +125°C
- Storage temperature: -55°C to +140°C
- Reflow soldering oven compliant +260°C -10 sec. admissible peak temperature
- Dielectric withstanding voltage P/S: 500 V<sub>RMS</sub> 50 Hz 3 sec.
- R<sub>th</sub>@ 125°C: 62°C/W
- Thermal index: +155°C

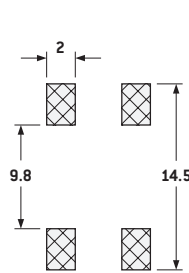
## Connections



## Dimensions (mm, top view)

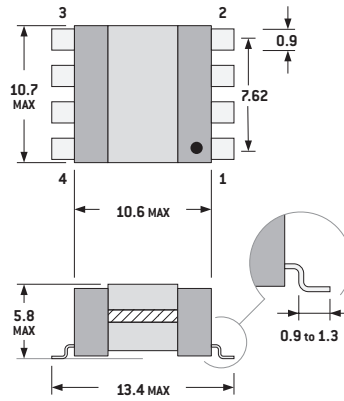


## PCB Layout (suggested)

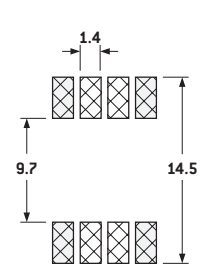


Type A & B

## Dimensions (mm, top view)



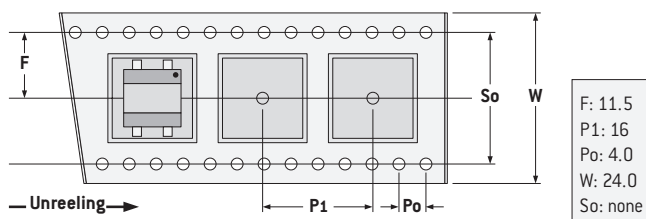
## PCB Layout (suggested)



Type C

## Packaging

Tape and Reel:  
700 pieces per reel of diameter 330 mm



F: 11.5  
P1: 16  
Po: 4.0  
W: 24.0  
So: none

## Marking



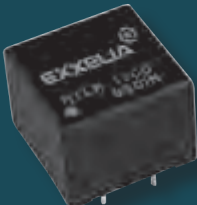
yyww:  
Date code

# Standard Products

Common-Mode Chokes  
TCM Series ..... 112

Common-Mode Chokes  
CMESC 17 ..... 115

Current sense Transformer up to 2.2 A  
CT Series ..... 116



# Common-Mode Chokes TCM Series



## TCM range

ID Code	Inductor Range ( $I_{dc}$ +20% ripple)
TCM14 xxx H	0.3A/12mH $\Rightarrow$ 2A/1.1mH
TCM17 xxx H	0.4A/39mH $\Rightarrow$ 4A/0.7mH
TCM22 xxx H	0.3A/47mH $\Rightarrow$ 4A/1.5mH
TCM28 xxx H	0.6A/47mH $\Rightarrow$ 2.5A/3.3mH
TCM18 xxx V	0.3A/12mH $\Rightarrow$ 2A/1.1mH
TCM19 xxx V	0.4A/39mH $\Rightarrow$ 4A/0.7mH
TCM23 xxx V	0.3A/47mH $\Rightarrow$ 4A/1.5mH

## TCM 14

ID Code	Current (A)	Inductance value (mH)	Rdc Typ (m $\Omega$ )
TCM14 12M H	0.3	12	1275
TCM14 4M4 H	0.6	4,4	385
TCM14 3M0 H	1	3	205
TCM14 1M6 H	1.5	1.6	100
TCM14 1M1 H	2	1.1	70
TCM19 xxx V	0.8	10	0.20
TCM23 xxx V	1.2	6,8	0.15

## TCM 17

ID Code	$I_n$ (A)	Inductance value (mH)	Rdc Typ (m $\Omega$ )
TCM17 39M H	0,4	39	1460
TCM17 27M H	0,5	27	1250
TCM17 15M H	0,6	15	465
TCM17 10M H	0,8	10	370
TCM17 6M8 H	1,2	6,8	245
TCM17 3M3 H	1,5	3,3	135
TCM17 1M8 H	2	1,8	75
TCM17 M70 H	4	0,7	27

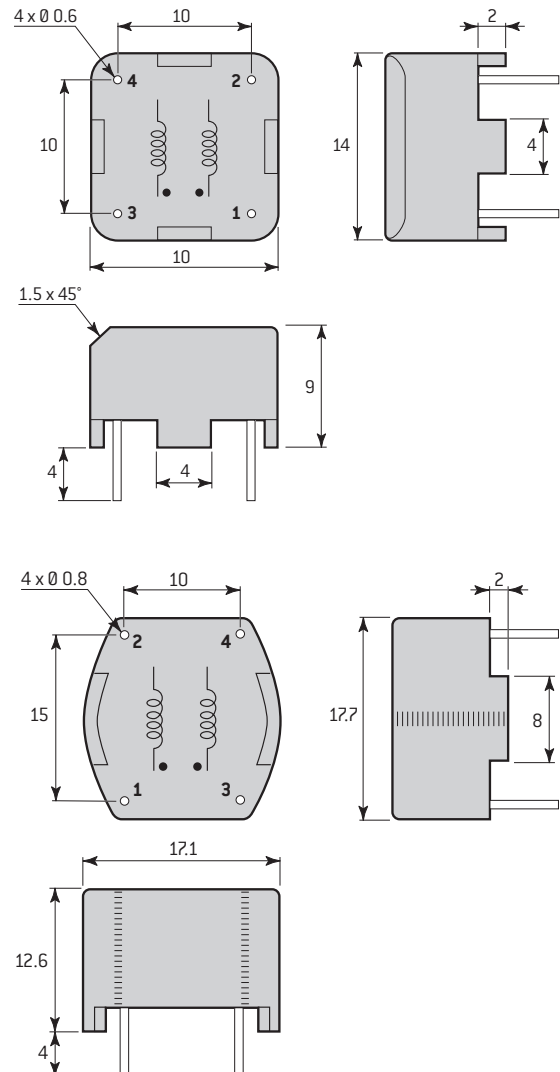
## Benefits

- Designed and qualified for aerospace
- Through Hole package
- RMS current range from 0.3 A to 4 A
- Dielectric withstanding strength 1500 V<sub>AC</sub>
- Materials meet UL94-V0 rating
- Operating temperature range: -55°C +125°C
- High mechanical resistance

## Applications

Aeronautic, Industry, Defense, Railway

## Typical Dimensions (mm)



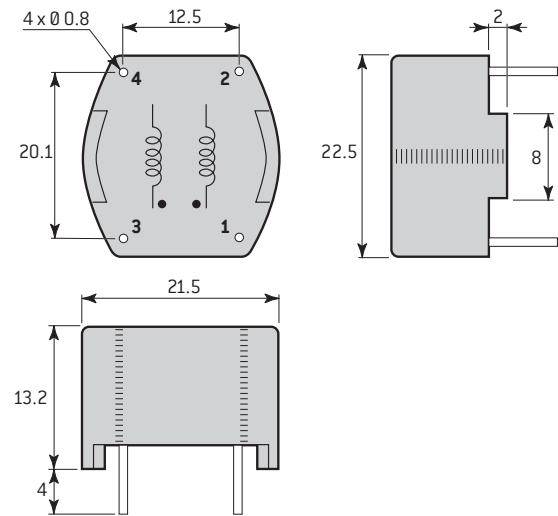


# Common-Mode Chokes TCM Series

## Typical Dimensions (mm)

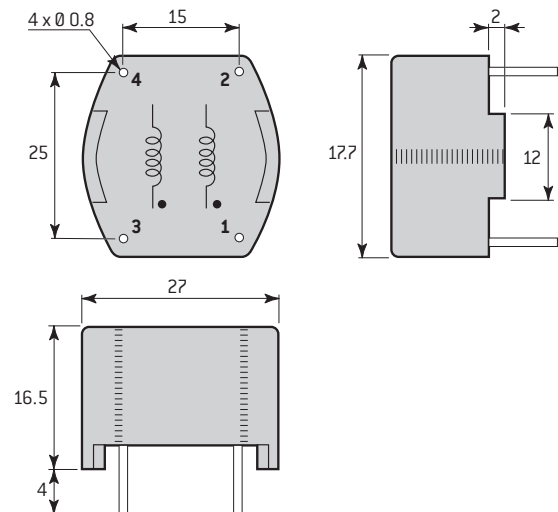
### TCM 22

ID Code	In (A)	Inductance value (mH)	Rdc Typ (mΩ)
TCM22 47M H	0.3	47	1750
TCM22 39M H	0.5	39	810
TCM22 27M H	0.8	27	500
TCM22 15M H	1	15	375
TCM22 10M H	1.2	10	200
TCM22 6M8 H	1.5	6.8	130
TCM22 4M2 H	2	4.2	102
TCM22 3M3 H	2.5	3.3	72
TCM22 2M0 H	3	2	55
TCM22 1M5 H	4	1.5	35



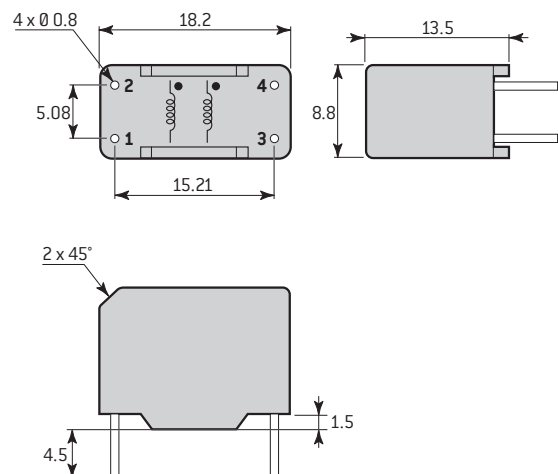
### TCM 28

ID Code	In (A)	Inductance value (mH)	Rdc Typ (mΩ)
TCM28 47M H	0.6	47	1180
TCM28 39M H	0.8	39	1000
TCM28 18M H	1	18	610
TCM28 10M H	1.5	10	220
TCM28 6M8 H	2	6.8	147
TCM28 5M6 H	2.5	5.6	105
TCM28 4M5 H	3	4.5	80
TCM28 3M3 H	4	3.3	45



### TCM 18

ID Code	In (A)	Inductance value (mH)	Rdc Typ (mΩ)
TCM18 12M V	0.3	12	1275
TCM18 4M4 V	0.6	4.4	385
TCM18 3M0 V	1	3	205
TCM18 1M6 V	1.5	1.6	100
TCM18 1M1 V	2	1.1	70



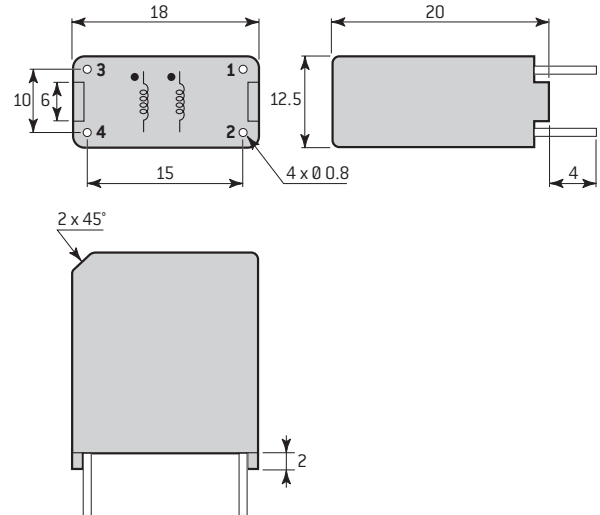
STANDARD PRODUCTS

# Common-Mode Chokes TCM Series

## Typical Dimensions (mm)

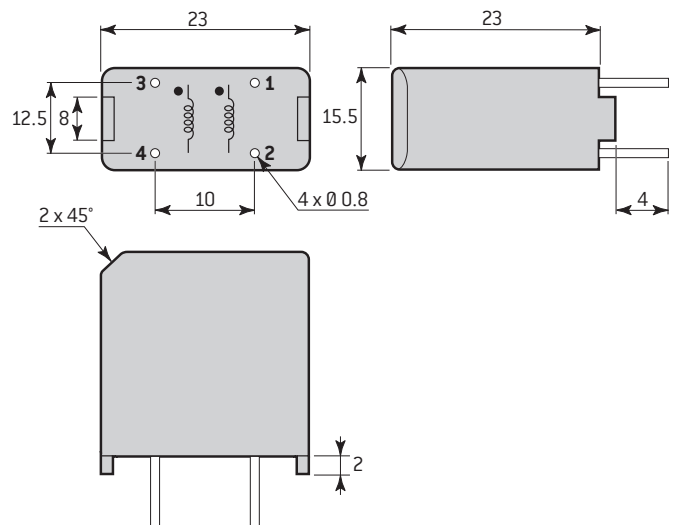
### TCM 19

ID Code	In (A)	Inductance value (mH)	Rdc Typ (mΩ)
TCM19 39M V	0.4	39	1460
TCM19 27M V	0.5	27	1250
TCM19 15M V	0.6	15	465
TCM19 10M V	0.8	10	370
TCM19 6M8 V	1.2	6.8	245
TCM19 3M3 V	1.5	3.3	135
TCM19 1M8 V	2	1.8	75
TCM19 0M7 V	4	0.7	27



### TCM 23

ID Code	In (A)	Inductance value (mH)	Rdc Typ (mΩ)
TCM23 47M V	0.3	47	1750
TCM23 39M V	0.5	39	810
TCM23 27M V	0.8	27	500
TCM23 15M V	1	15	375
TCM23 10M V	1.2	10	200
TCM23 6M8 V	1.5	6.8	130
TCM23 4M2 V	2	4.2	102
TCM23 3M3 V	2.5	3.3	72
TCM23 2M0 V	3	2	55
TCM23 1M5 V	4	1.5	35



# Common-Mode Chokes CMESC 17



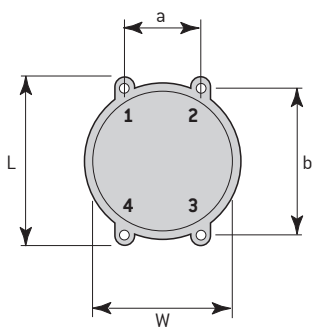
- Less than 20 % performance variations versus temperature (-40°C / +125°C)
- Minimum impedance attenuation: 100 Ω from 100 kHz to 30 MHz
- RMS current range: from 1.1 A to 11.7 A for 40°C heating above 25°C
- All plastics used meet UL94V-0 rating
- Operating/storage temperature range: -40°C to +125°C
- Approximative weight: 10 grams

## Electrical Data

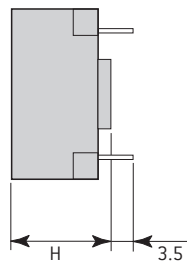
ID Code	Inductance Value at 25°C (-40/+35%)	Typical SRF	max. Impedance (Typical)	max. Attenuation (Z = 50Ω)	max. RMS Current for ΔT = 40°C	max. R <sub>DC</sub> (25°C)	Typical Leakage Inductance (100kHz)
CMESC17 69M 1H	69.2 mH	0.1 MHz	29 kΩ	49 dB	1.1 A	500 mΩ	70 μH
CMESC17 30M 2H	30.3 mH	0.3 MHz	15.8 kΩ	44 dB	1.7 A	220 mΩ	32 μH
CMESC17 13M 1H	13.1 mH	0.6 MHz	9.4 kΩ	40 dB	2.7 A	90 mΩ	13.4 μH
CMESC17 5M8 1H	5.83 mH	1.5 MHz	5.3 kΩ	35 dB	4 A	40 mΩ	6.3 μH
CMESC17 2M6 1H	2.59 mH	8 MHz	3.7 kΩ	32 dB	6 A	18 mΩ	2.3 μH
CMESC17 1M2 1H	1.15 mH	15 MHz	1.9 kΩ	26 dB	8.3 A	10 mΩ	1.1 μH
CMESC17 M45 1H	0.45 mH	32 MHz	1 kΩ	20 dB	11.7 A	5 mΩ	0.5 μH

Dielectric strength test: 500 V (50 Hz - 1 min)

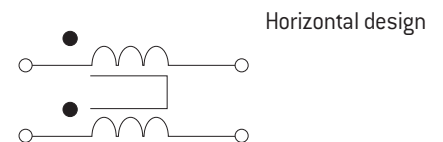
## Typical Dimensions (mm)



Horizontal design CMESC1x xxx xH



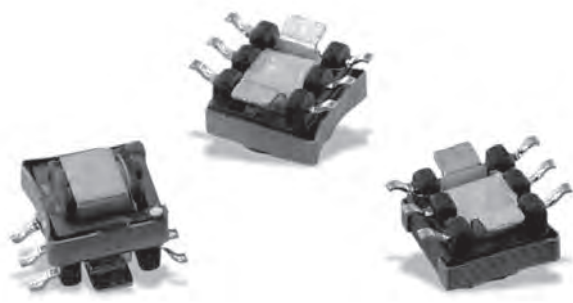
## Connections



ID Code	L	H	W	A	B	pins
CMESC17 xxx xH	17.5	12.5	17	10	15	0.9 x 0.6

# Current sense Transformer up to 2.2A

## CT05 xxx 231 W

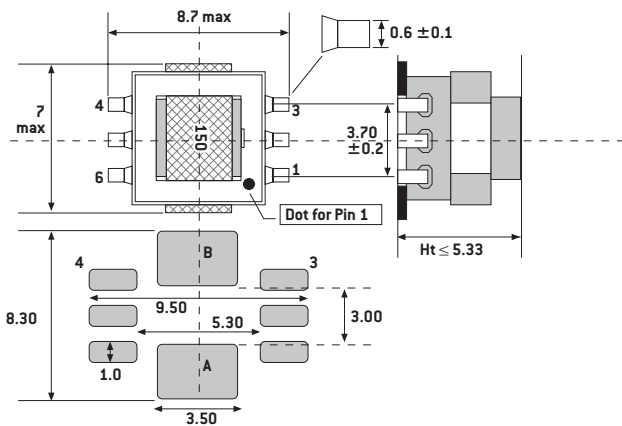


- Materials meet UL94-V0 rating
- Thermal index: classe B
- max. admissible current through primary winding: 2.2 A (1.5 A TYP)
- Insulation:  $R_i > 100 \text{ M}\Omega$  between A-B / 1-3 at 200 V<sub>DC</sub>
- Dielectric strength: 150 V<sub>RMS</sub> - 50 Hz between A-B / 1-3
- Operating temperature range: -40°C to +100°C
- Suited for I<sub>R</sub> and vapor reflow soldering
- Weight: 1 gram

### Electrical Data (25°C)

ID Code	Turn ratio $\pm 1\%$ (A-B / 1-3)	DCR (A-B) m $\Omega$ $\pm 15\%$	DCR (1-3) $\Omega$ $\pm 15\%$	L1-3
CT05 150 231W	1: 150	6	9.6	$\geq 4.8 \text{ mH}$
CT05 100 231W	1: 100	6	4	$\geq 2 \text{ mH}$
CT05 075 231W	1: 75	6	2.8	$\geq 1.2 \text{ mH}$
CT05 050 231W	1: 50	6	1	$\geq 540 \mu\text{H}$

### Typical Dimensions (mm)

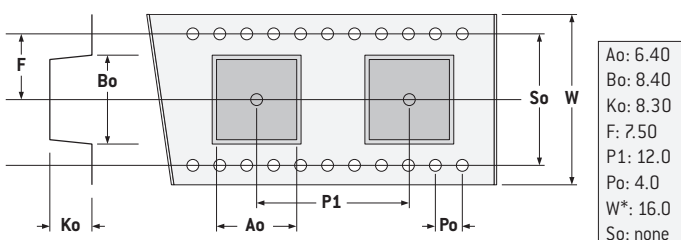


### Notes

Typical performances at +25°C  
Storage Temperature -40°C to +85°C

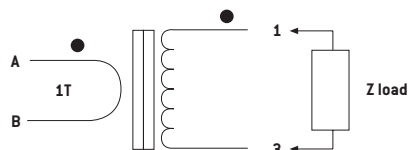
### Packaging

Tape and Reel: 750 pieces per reel



general tolerances:  $\pm 0.1 \text{ mm} / * \pm 0.3 \text{ mm}$

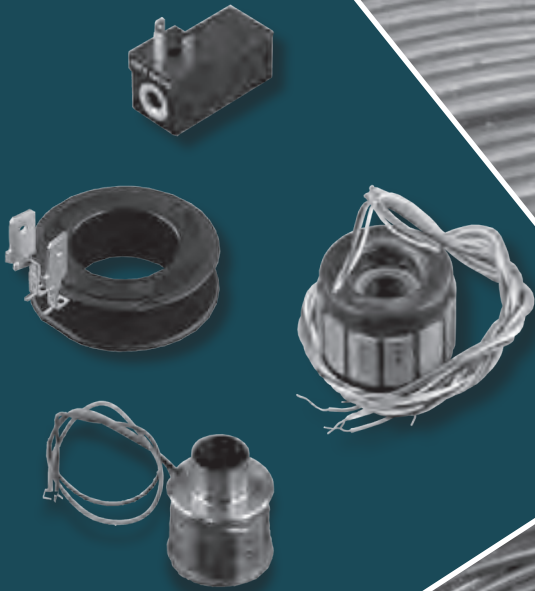
### Connections



# Built-to-Print

Bobbins for Actuators,  
Antennas & Sensors..... 118

Rotors and Stators  
manufacturing ..... 119



# Built-to-Print Bobbins for Actuators, Antennas & Sensors



You design the best bobbins, EXXELIA industrializes and manufactures them.

EXXELIA Built-to-Print capabilities coupled with its engineering experience, its winding, magnetics, moulding expertise and its manufacturing core competencies will be key to offer you optimized solutions at the right quality and the right cost.

EXXELIA has more than 20 years heritage in Built- to-Print bobbins.

EXXELIA can support your project, from the design phase to mass production

EXXELIA has an existing panel of automated production lines to cover 1000 to 3 millions pieces quantities .

Our experience in high volumes manufacturing enables us to adapt automated lines and to develop tooling for leads insertion, terminations forming over moulding, soldering, testing and marking.

## Our expertise includes:

### Right choice of the critical raw materials as:

- Terminals,
- Bobbin core: PBT, PP, PET,  
or for high temperature DAP, PPS, LCP, LCP or PEEK
- Overmoulding resins: Epoxy or polyamide,
- Magnet wire.

### Bobbin definition:

- Press fit terminal shape,
- Terminal positioning on the flange, bending possibility,
- Insulated start slots,
- Flange shape design for a robust product.

### Processes optimization as:

- Overmolding: Epoxy transfer, plastic injection...
- Mold definition,
- Assembly, thin wire (down to 20 $\mu$ m) processing,
- Fast Mockup with stereo lithography and pre series mould-machining, prototypes manufacturing, release, test equipment, production launching, First Article Inspection (FAI)...

## High-Grade application

For severe environments (shocks, vibration, temperature up to 240°C, good chemical resistance...), EXXELIA uses specific technologies as:

- Molded-in terminals for better terminal integrity by custom lead frame design and optimized process for terminal insertion
- Metal bobbin and specific dielectric insulation process
- Epoxy transfer moulding,
- Pressure and vacuum impregnation

# Built-to-print Rotors and Stators manufacturing

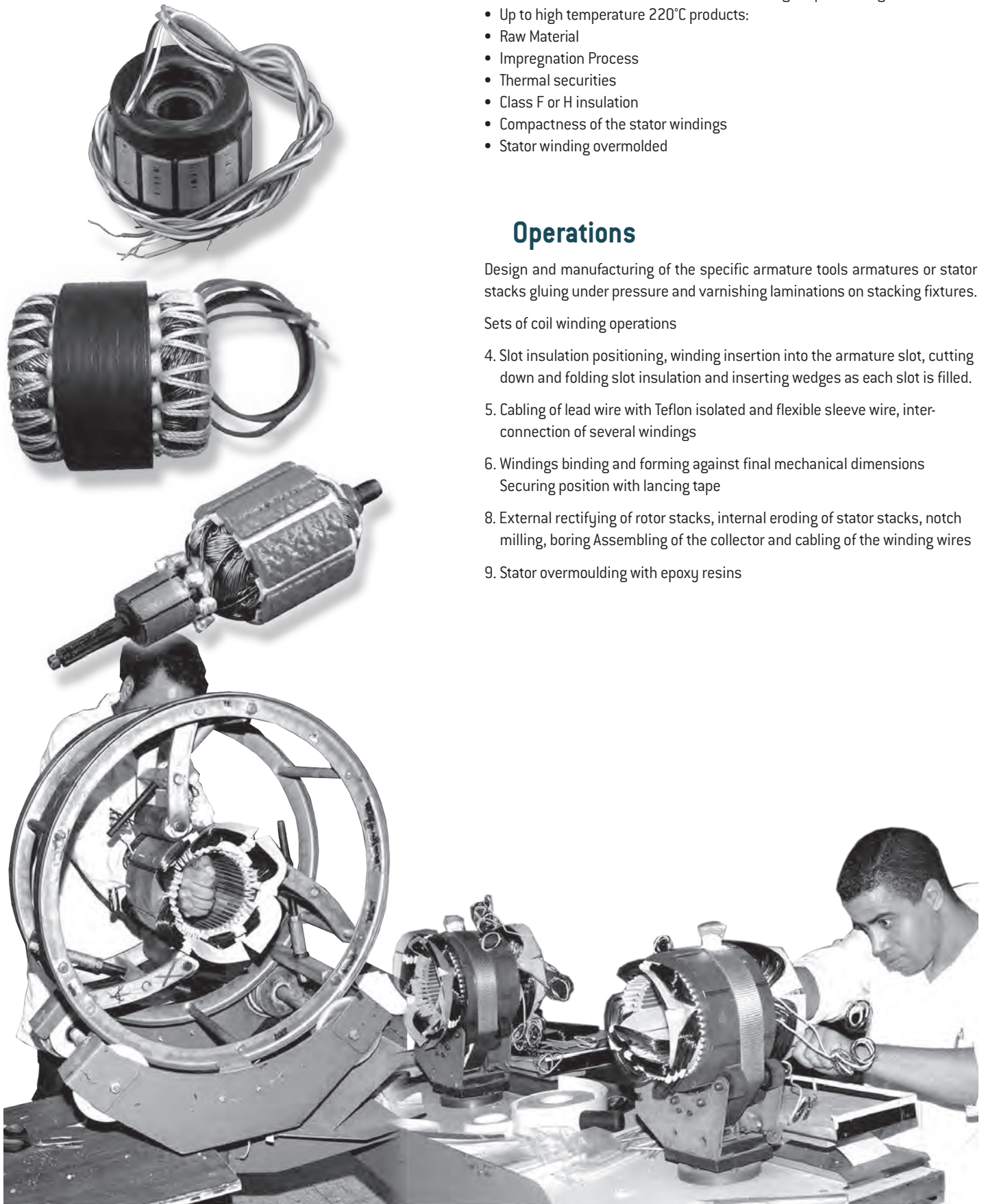
- Stators diameter from 10 to 500 mm and weight up to 250 kg
- Up to high temperature 220°C products:
- Raw Material
- Impregnation Process
- Thermal securities
- Class F or H insulation
- Compactness of the stator windings
- Stator winding overmolded

## Operations

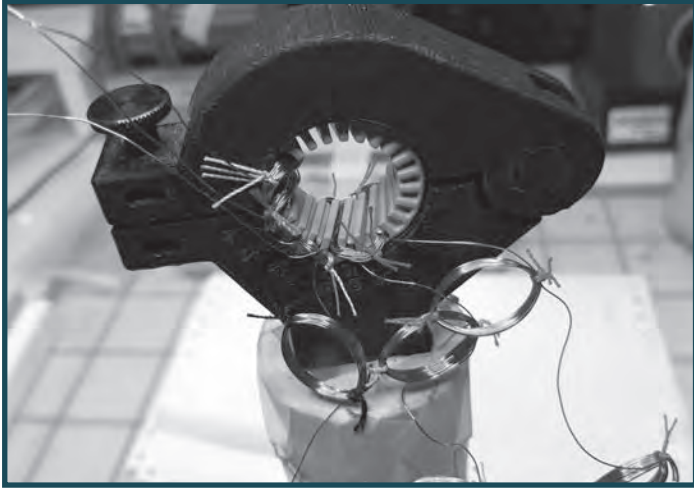
Design and manufacturing of the specific armature tools armatures or stator stacks gluing under pressure and varnishing laminations on stacking fixtures.

Sets of coil winding operations

4. Slot insulation positioning, winding insertion into the armature slot, cutting down and folding slot insulation and inserting wedges as each slot is filled.
5. Cabling of lead wire with Teflon isolated and flexible sleeve wire, inter-connection of several windings
6. Windings binding and forming against final mechanical dimensions  
Securing position with lancing tape
8. External rectifying of rotor stacks, internal eroding of stator stacks, notch milling, boring Assembling of the collector and cabling of the winding wires
9. Stator overmoulding with epoxy resins



# Rotors and Stators manufacturing



Insertion



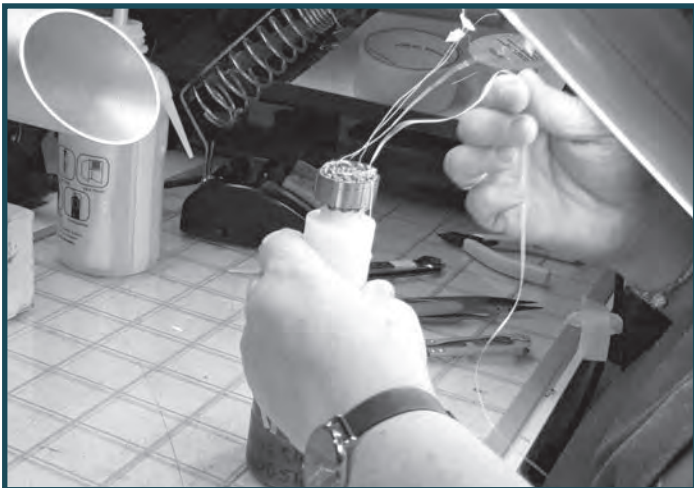
Mounting



Binocular mounting



Insertion Obis



Hooping



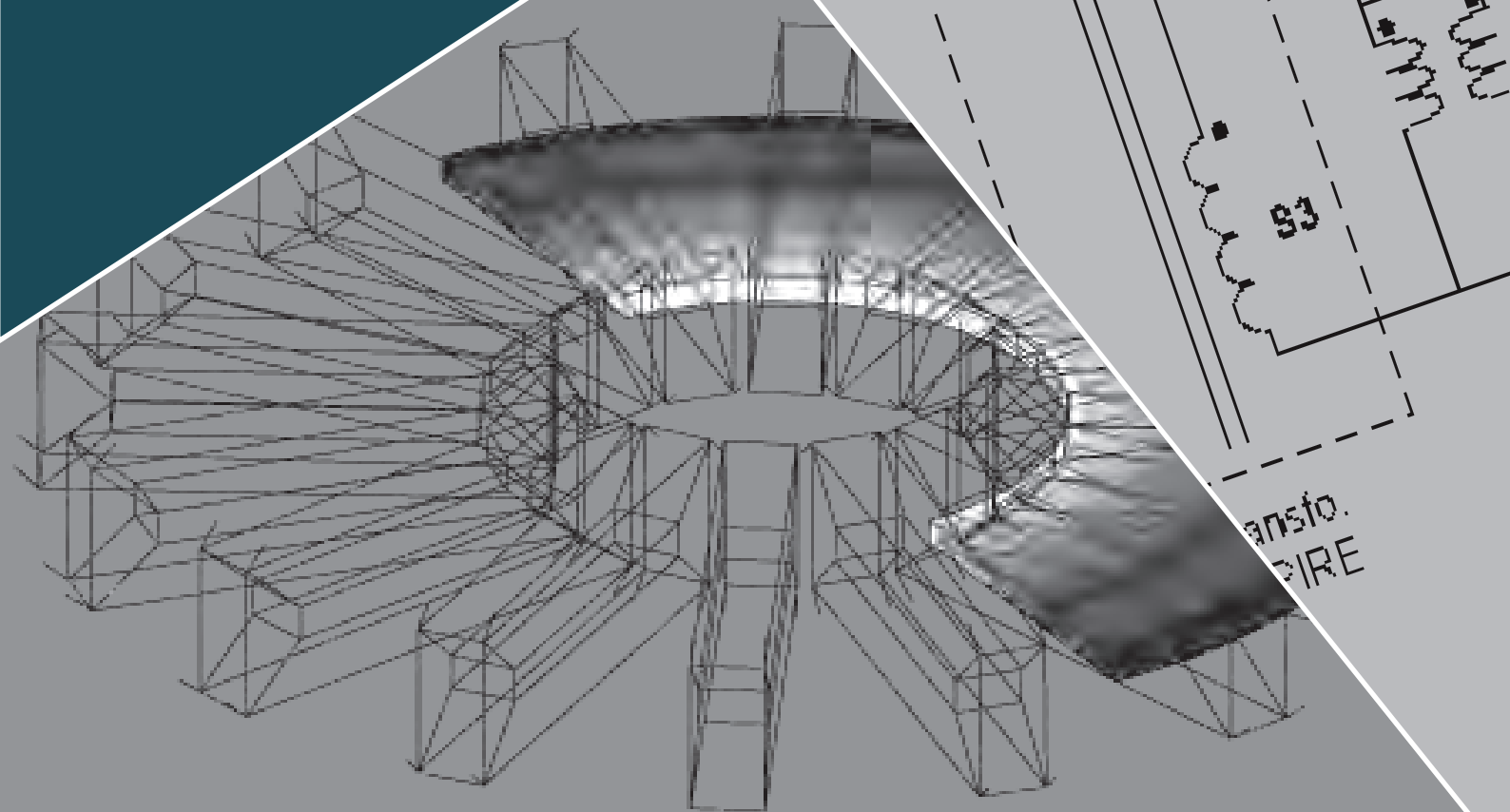
Sticking



en régime permanent

# Design Specification Form

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Pulse Transformers.....	125
Current Measurement Transformers/Sensors .....	126
Flyback Transformers.....	127
SMPS Transformers .....	128
Sensors / Electromagnet.....	129
Motor .....	130



ansto.  
PIRE



## DESIGN SPECIFICATION FORM

Date : ..... / ..... / .....

Page N° : ..... / .....

### GENERAL INPUTS REQUIRED FOR A CUSTOM REQUEST

**Company :** Project : .....

**Address :** .....

**Sales Contact :**

Ms/Mr. .... **Tel. :** ..... **Email :** .....

**Technical Contact :**

Ms/Mr. .... **Tel. :** ..... **Email :** .....

- MARKET :**    SPACE                       COMMERCIAL AVIONICS                       MILITARY AVIONICS                       DEFENSE
- DOWNHOLE                       RAILWAYS                       INDUSTRY                       MEDICAL

**Applied Standards** (ESA, Mil, ...) : .....

**RoHS Statuses :**    Non RoHS                       RoHS

**Outgassing Satus :** .....

**Environmental Constraints :** .....

**Ambient Temperature Range (°C) :** Min. : ..... Max. : .....

**Storage Temperature (°C) :** Min. : ..... Max. : .....

**VRT-Thermal shocks :** .....

**Moisture :** .....

**Salt Spray Resistance :** .....

**Fungi Resistance :** .....

**Other** (specify) : .....

**MECHANICAL CONSTRAINTS :**    Shocks                       Vibration                       Robustness of connections

**Partial Discharge :** ..... [pC]    @: ..... [kV]

**MOUNTING :**    SMD                       TH                       Wire

Other (specify) : .....

**PACKING :**    Individual package    ESD :  Yes                       No

Tray

Reel

Other (specify) : .....





# DESIGN SPECIFICATION FORM

Date : ..... / ..... / .....

Page N° : ..... / .....

## SIGNAL TRANSFORMERS

**Company name :** ..... **Project :** .....

**Product reference :** ..... **Yearly Quantities :** .....

**APPLICATION :**      Audio transformer  
                            Other (*specify*) : .....

**PRIMARY VOLTAGE :** ..... [Vrms] Min.     ..... [Vrms] Max.

**SECONDARY CHARACTERISTICS :**

**Output power range :** ..... [W]    THN+N : ..... dB    Working frequency : ..... [Hz]    Bandwidth : .....

**Output voltage (V<sub>AC</sub> RMS) :** ..... Vs 1 : ..... Vs 2 : ..... Vs 3 : ..... Vs 4 : .....

**Output current (A<sub>AC</sub> RMS) :** ..... Is 1 : ..... Is 2 : ..... Is 3 : ..... Is 4 : .....

**SHIELD :**            Prim./Sec. : ..... [V]    Sec./Sec. : ..... [V]

**Insulation resistance :** Prim./Sec. : ..... [Ω]    Sec./Sec. : ..... [Ω]

                          Winding/Shields : ..... [V]    Winding/Ground : ..... [V]

**MAXIMUM DIMENSION :**    Length : ..... [mm]    Width : ..... [mm]    Height : ..... [mm]

**Finishing :**    Case            Molding  
                            None            Impregnation

**MARKING :** ..... **WEIGHT :** ..... [g]

**MECHANICAL DRAWING**

**LAYOUT**

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# DESIGN SPECIFICATION FORM

Date : ..... / ..... / .....

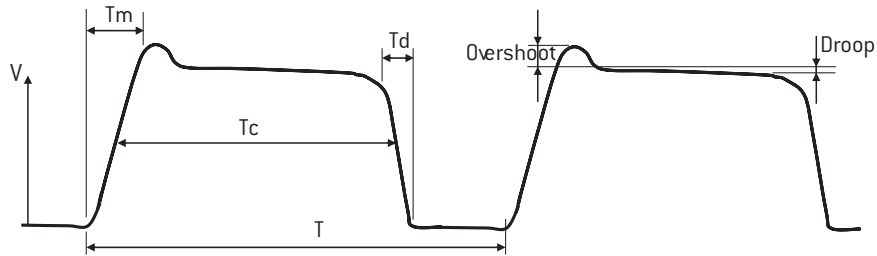
Page N° : ..... / .....

## PULSE TRANSFORMERS (suitable for Gate Drive Transformer, Data Bus Transformers...)

Company name : ..... Project : .....

Product reference : ..... Yearly Quantities : .....

**Pulse Drawing :**



**PULSE DESCRIPTION :** Conduction time ( $T_c$ ) : ..... ( $\mu A$ ) Rise time ( $T_m$ ) : ..... ( $\mu s$ )

Falling time ( $T_d$ ) : ..... ( $\mu s$ ) Droop : ..... (V) Overshoot : ..... (V)

Volt time constant ET : ..... ( $V\mu s$ ) Pulse repetition Rate (Max.) / Frequency (Min.) : ..... ( $\mu s/Hz$ )

**MAGNETISING INDUCTANCE :**

Secondary load Impedance : ..... ( $\Omega$ ) Max. acceptable interwinding capacitance : ..... (pF)

Input Voltage : ..... (V) Secondary Voltage : ..... (V) Turn ratio : .....

**DIELECTRIC WITHSTANDING VOLTAGE :** Prim./Sec. : ..... (V) Sec./Sec. : ..... (V)

Insulation resistance : Prim./Sec. : ..... ( $\Omega$ ) Sec./Sec. : ..... ( $\Omega$ )

Winding/Shields : ..... Winding/Ground : .....

**MAXIMUM DIMENSION :** Length : ..... (mm) Width : ..... (mm) Height : ..... (mm)

- Finishing :**  Case  Molding  
 None  Impregnation

**MARKING :** ..... **WEIGHT :** ..... (g)

**MECHANICAL DRAWING**

**LAYOUT**

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# DESIGN SPECIFICATION FORM

Date : ..... / ..... / .....

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## FLYBACK TRANSFORMERS

**Company name :** ..... **Project :** .....

**Product reference :** ..... **Yearly Quantities :** .....

**MODE :**      CONTINUOUS      DISCONTINUOUS      OTHERS      CRITICAL

**Power value for switching from discontinuous to continuous mode :** ..... (W)

**Switching frequency :** ..... (Hz)     **Max. peak primary current :** ..... (Ap)

**Magnetizing Inductance :** ..... (μH)

**Vp Max. Primary voltage :** ..... (V)     **Vp Min. :** ..... (V)

**Duty cycle Max. :** ..... (%)     **Duty cycle Min. :** ..... (%)     **Chip duty cycle Max. :** ..... (%)

**RECTIFIED VOLTAGE (V<sub>DC</sub>) :** Vs 1 : ..... Vs 2 : ..... Vs 3 : ..... Vs 4 : ..... Vs 5 : .....

**CURRENT (I<sub>DC</sub>) :** Is 1 : ..... Is 2 : ..... Is 3 : ..... Is 4 : ..... Is 5 : .....

**Diode voltage drop :** ..... (V)

**DIELECTRIC WITHSTANDING VOLTAGE :** Prim./Sec. : ..... (V)     Sec./Sec. : ..... (V)  
Indicate if RMS or DC

**Insulation resistance :** Prim./Sec. : ..... (Ω)     Sec./Sec. : ..... (Ω)

Winding/Shields : ..... (V)     Winding/Ground : ..... (V)

**MAXIMUM DIMENSION :** Length : ..... (mm)     Width : ..... (mm)     Height : ..... (mm)

**Finishing :**      Case      Molding  
                    None      Impregnation

**MARKING :** .....     **WEIGHT :** ..... (g)

**MECHANICAL DRAWING**

**LAYOUT**

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# DESIGN SPECIFICATION FORM

Date : ..... / ..... / .....

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## MOTOR

**Company name :** ..... **Project :** .....

**Product reference :** ..... **Yearly Quantities :** .....

**MOTOR :**

U in :	..... (V)	<input type="checkbox"/> AC	Rated speed :..... (rpm)
Hall sensors :	<input type="checkbox"/> Phases.....	<input type="checkbox"/> DC	Max. speed :..... (rpm)
I stall :	..... (A)		Stall Torque :..... (Nm)
I cont :	..... (A)		Cont Torque :..... (Nm)
I peak :	..... (A)		Peak Torque :..... (Nm)
Ki :	..... (Nm/A <sub>rms</sub> )	Ku :.....	Km :..... (Nm/√W)
R :	..... (Ω)	L :.....	Power loss :..... (W)

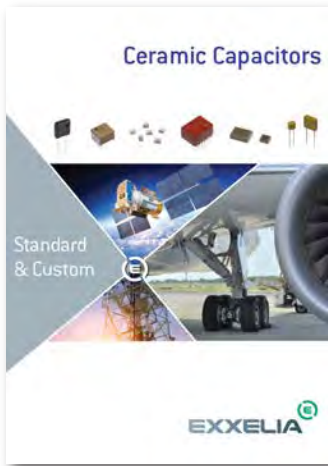
**DIMENSIONS: Size** X:..... (mm)    Y:..... (mm)    Z:..... (mm)  
Diam.:..... (mm)

### MECHANICAL DRAWING

### LAYOUT

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# EXXELIA Components Portfolio





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