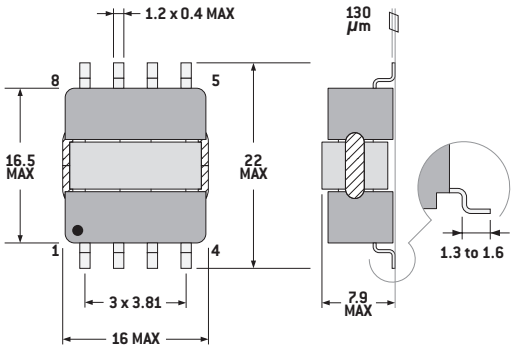
Common Mode Chokes for DC/DC Embedded Applications - CMC 15 xxx 2WR Series

- Based on **EXXELIA**'s «SESI15 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, DO-160
- esa 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

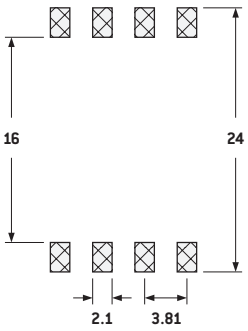
Electrical Data

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_{DC} (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

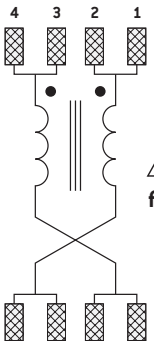
Typical Dimensions
(mm, top view)



PCB Layout
(suggested)



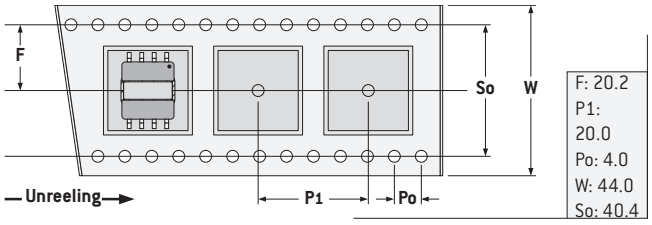
Connections
(top view)



⚠ internal crossing for correct connection

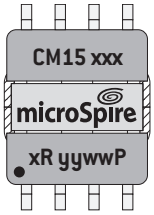
Packaging

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



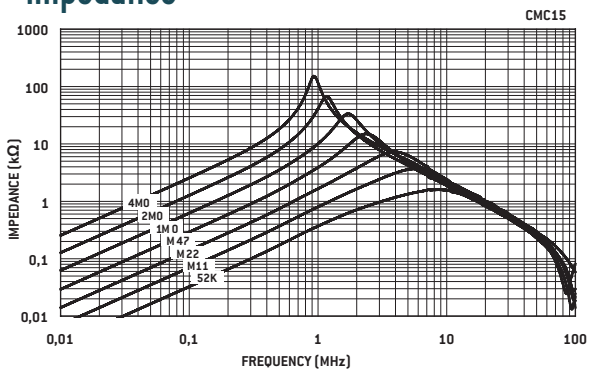
F: 20.2
P1: 20.0
Po: 4.0
W: 44.0
So: 40.4

Marking



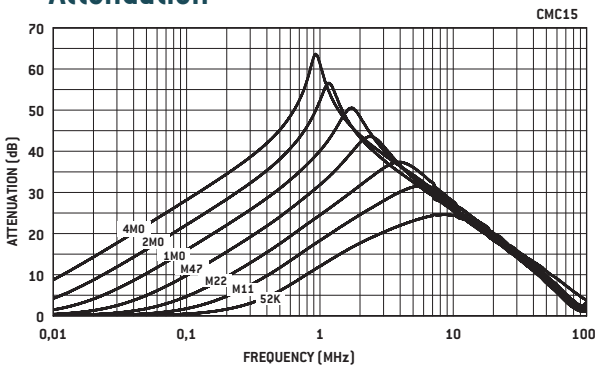
yyww:
Date code

Impedance



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

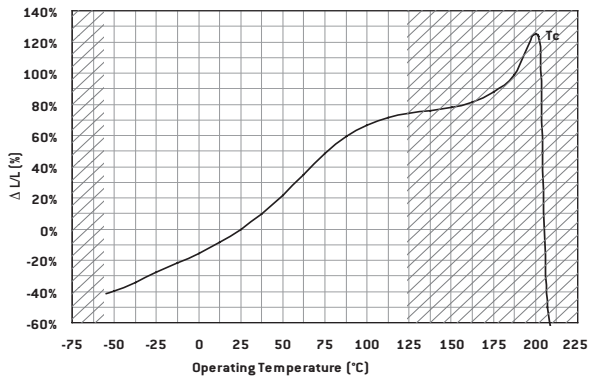
Attenuation



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

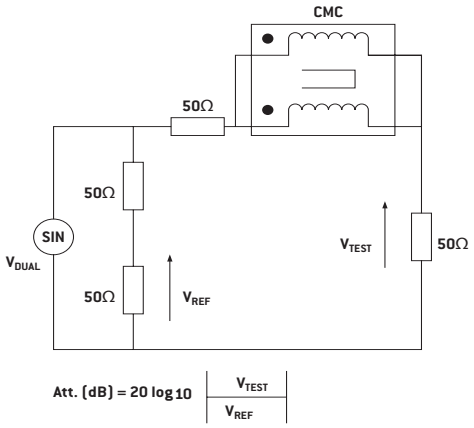
Common Mode Chokes for DC/DC Embedded Applications - CMC 15 xxx 2WR Series

Variation vs Temperature



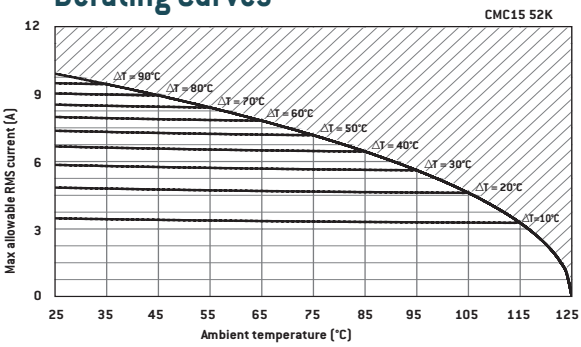
Change in inductance value (< 1 mT at 10 kHz)

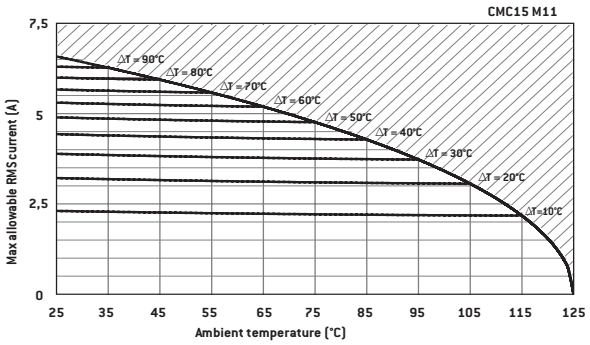
Attenuation Measurement Circuit

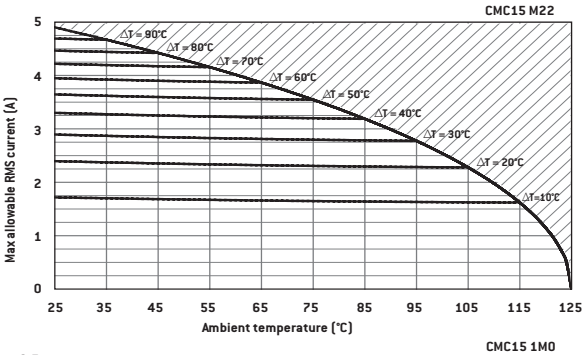


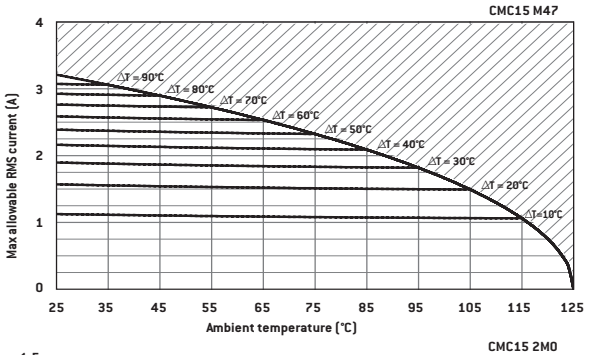
$$Att.\ (dB) = 20 \log_{10} \frac{V_{TEST}}{V_{REF}}$$

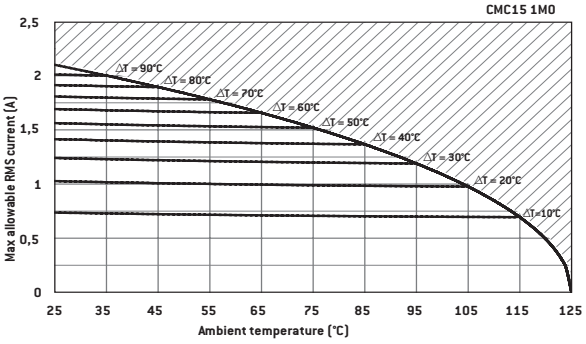
Derating Curves

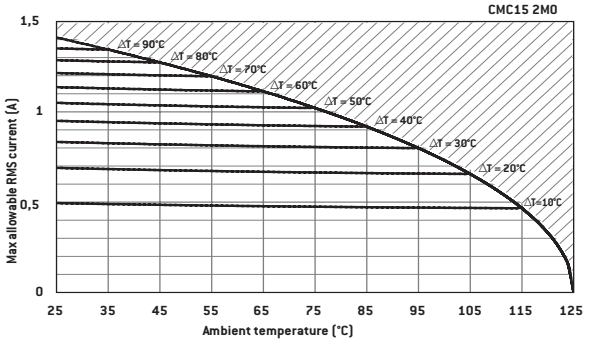


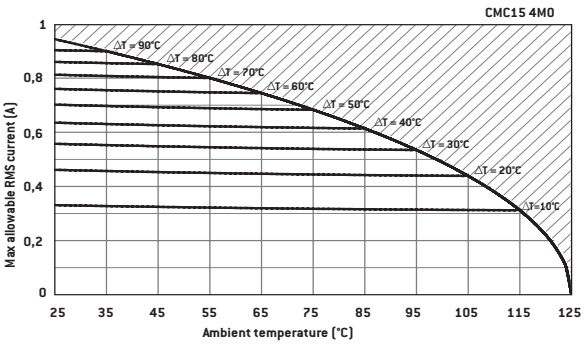












All thermal measurements under atmospheric conditions with component mounted on 1 dm² PCB without cooling device.

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.

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

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- Low-profile SMD package (2 x 4 pins)
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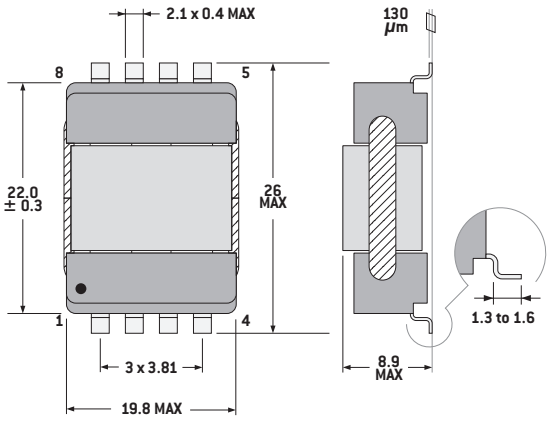
- esa ESCC 3201/010 version upon request
- RMS current range: from 0.9 A to 9.9 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 300 kHz to 45 MHz
- Dielectric strength test up to 500 V (50 Hz - 1 min)
- Materials meet UL94-V0 rating
- Thermal index according to IEC85: H (180°C)
- Operating/storage temperature range: –55°C to +125°C
- Approximative weight: 10 grams

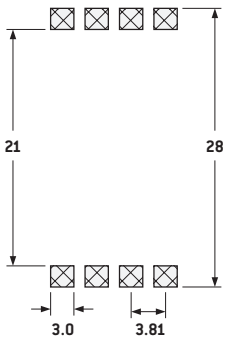
Electrical Data

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_{DC} (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

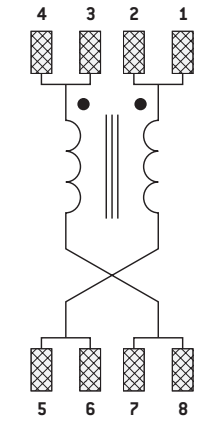
Typical Dimensions
(mm, top view)



PCB Layout
(suggested)



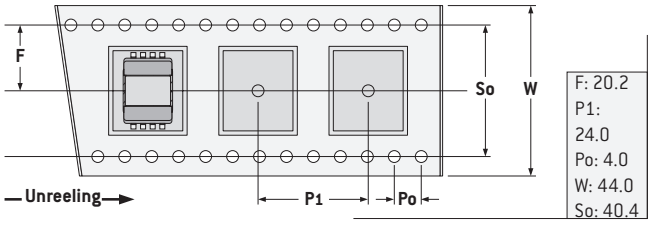
Connections
(top view)



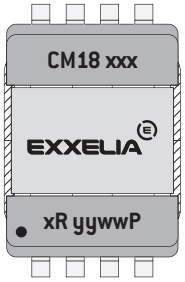
⚠ internal crossing

Packaging

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



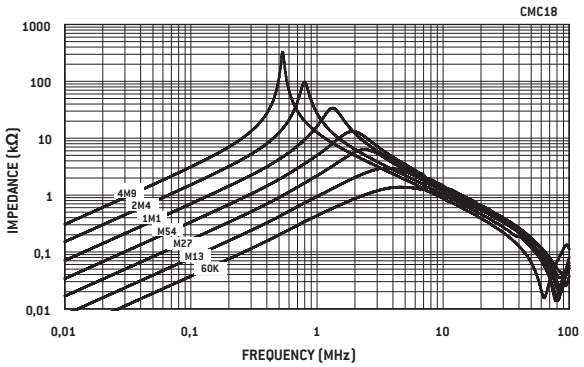
Marking



yyww:
Date code

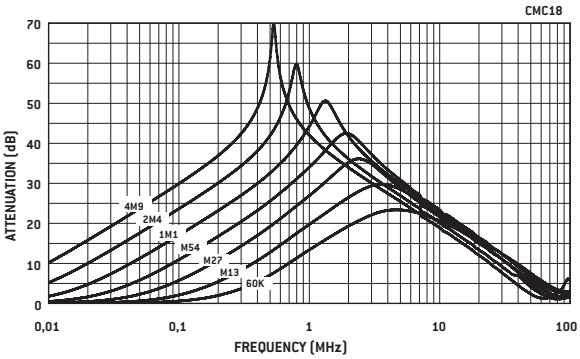
Common Mode Chokes for DC/DC Embedded Applications - CMC 18 xxx 2WR Series

Impedance



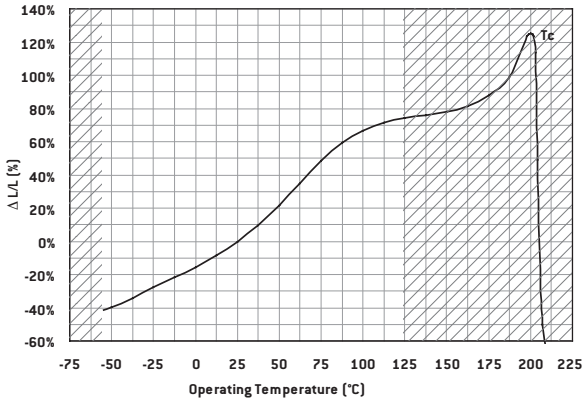
Typical values at 25°C with 1 mT at 10 kHz

Attenuation



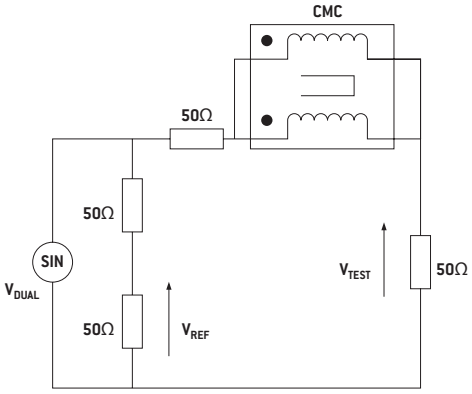
Typical values (Z = 50 Ω) at 25°C with 1 mT at 10 kHz

Variation vs Temperature



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

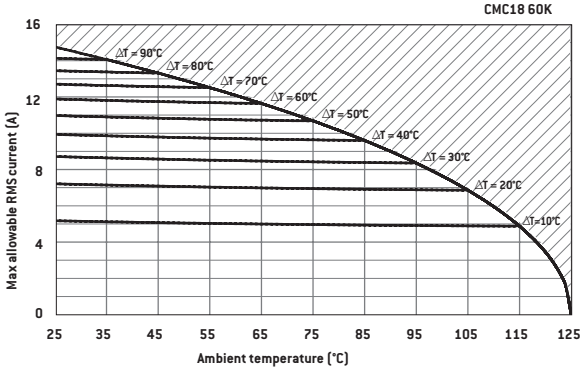
Attenuation Measurement Circuit

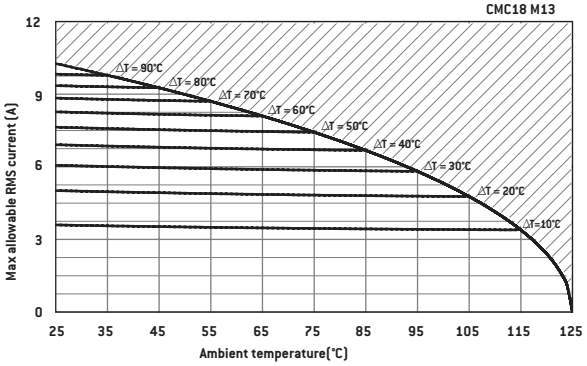


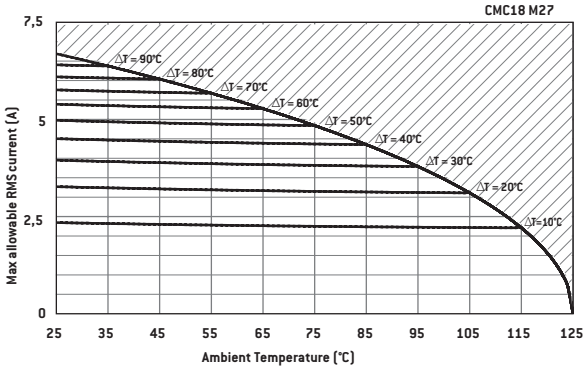
$$\text{Att. (dB)} = 20 \log_{10} \frac{V_{TEST}}{V_{REF}}$$

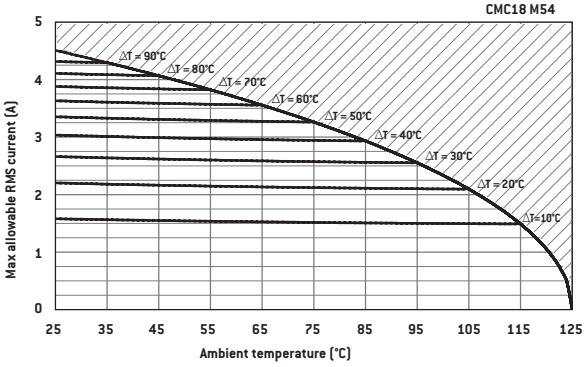
Common Mode Chokes for DC/DC Embedded Applications - CMC 18 xxx 2WR Series

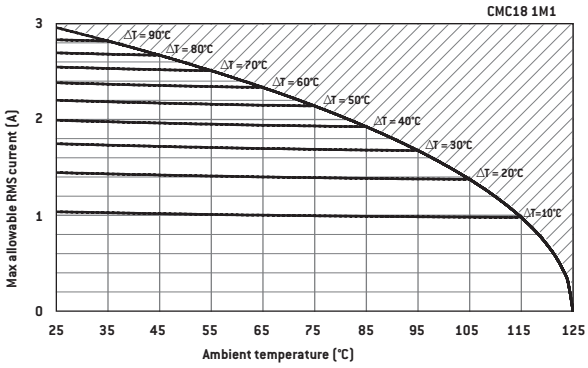
Derating Curves

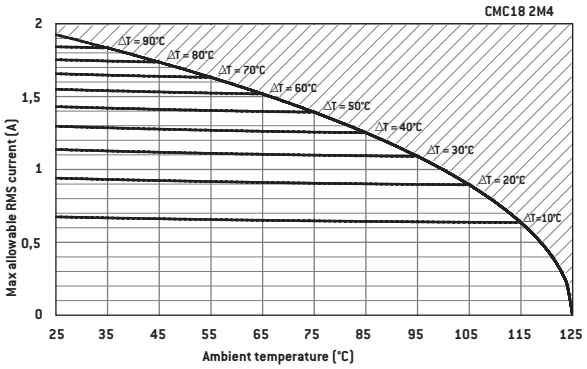


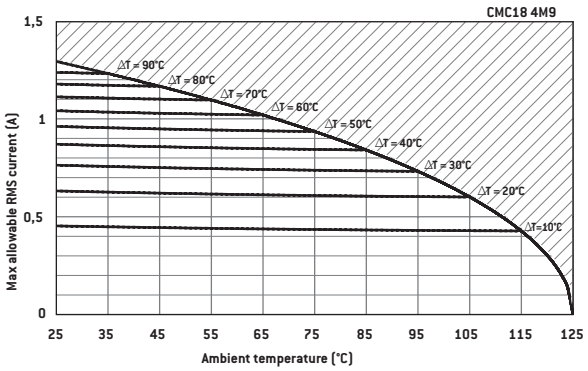












All thermal measurements under atmospheric conditions with component mounted on 1 dm^2 PCB without cooling device.

All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined ΔT.

Maximum operating temperature is +125°C.

Example:

CMC18 60K for application with Tamb = +85°C max. current allowed is < 9.6 Arms with ΔT < 40°C.

If temp increase allowed in application is limited to ΔT < 20°C, current must be reduced to 7 Arms.

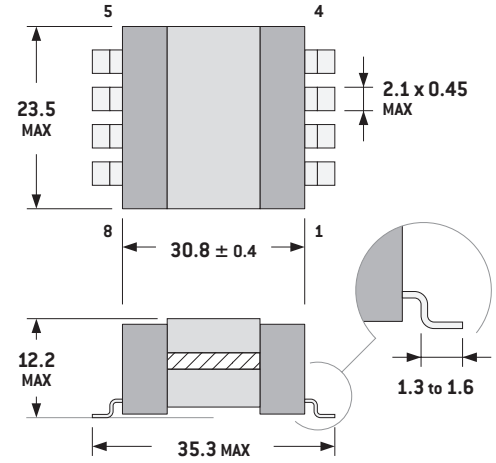
Common Mode Chokes for DC/DC Embedded Applications
CMC 22 xxx 2WR Series

- Based on **EXXELIA**'s «SESI22 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, DO-160
- esa 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

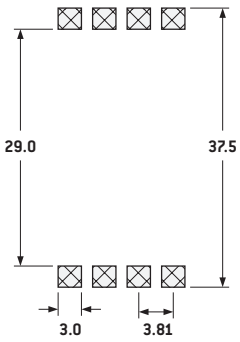
Electrical Data

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_{DC} (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

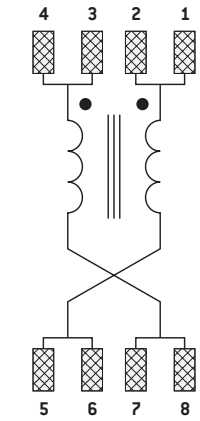
Typical Dimensions
(mm, top view)



PCB Layout
(suggested)



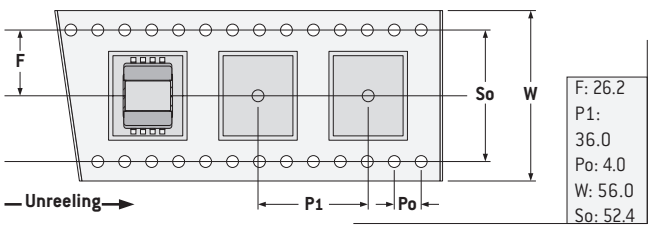
Connections
(top view)



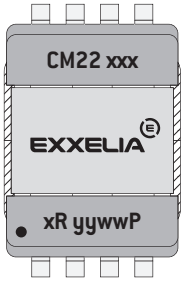
internal crossing

Packaging

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



Marking

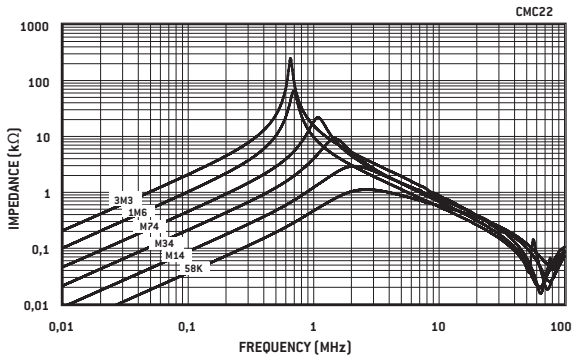


yyww:
Date code

HIGH GRADE PRODUCTS

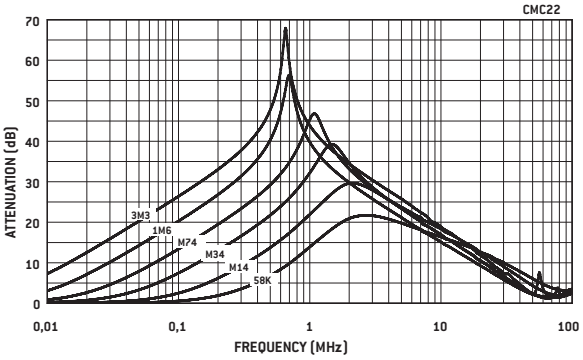
Common Mode Chokes for DC/DC Embedded Applications
CMC 22 xxx 2WR Series

Impedance



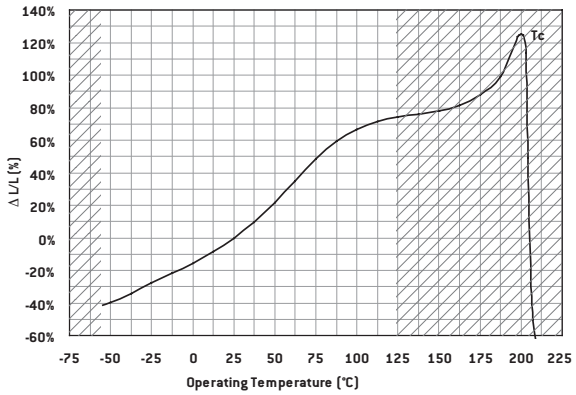
Typical values at 25°C with 1 mT at 10 kHz

Attenuation



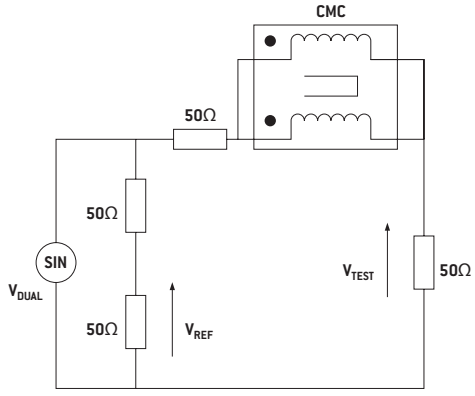
Typical values (Z = 50 Ω) at 25°C with 1 mT at 10 kHz

Variation vs Temperature



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

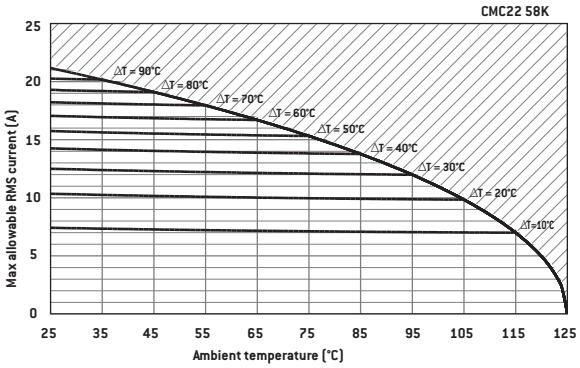
Attenuation Measurement Circuit

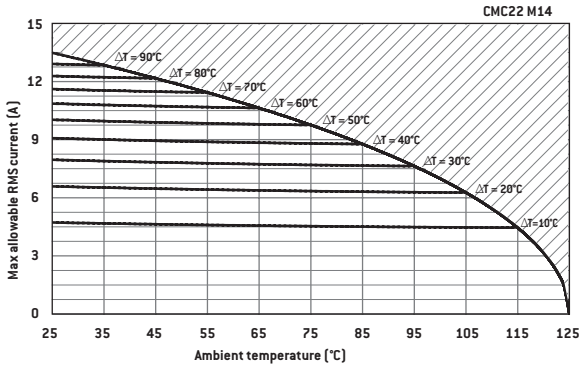


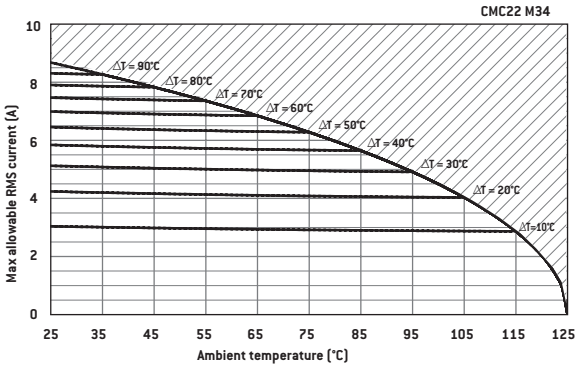
$$\text{Att. (dB)} = 20 \log 10 \frac{V_{TEST}}{V_{REF}}$$

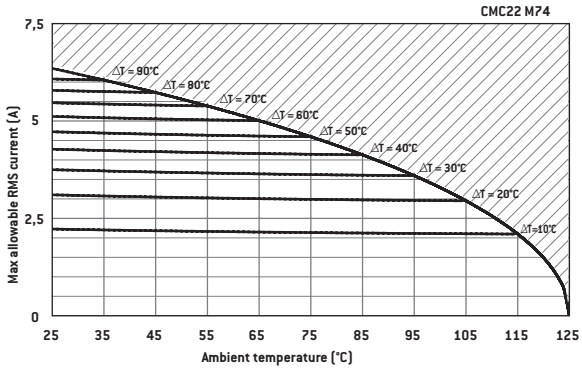
Common Mode Chokes for DC/DC Embedded Applications
CMC 22 xxx 2WR Series

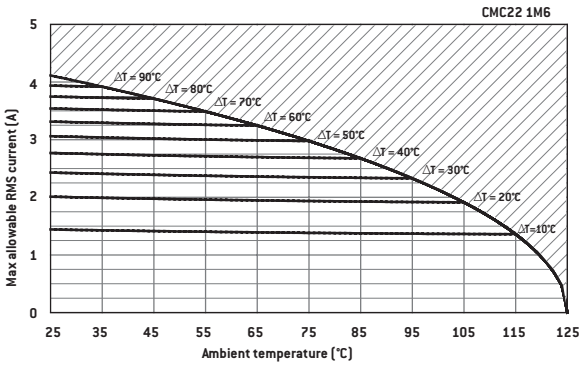
Derating Curves

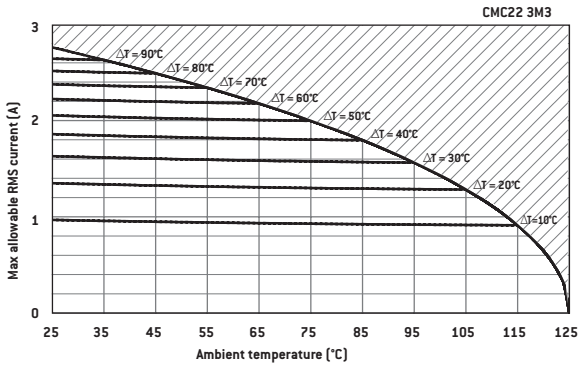












All thermal measurements under atmospheric conditions with component mounted on 1 dm^2 PCB without cooling device. All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined ΔT. Maximum operating temperature is +125°C.

Example:
CMC22 58K for application with Tamb = +85°C. max. current allowed is < 14 Arms with ΔT < 40°C.
If temp increase allowed in application is limited to ΔT < 20°C, current must be reduced to 10 Arms.

HIGH GRADE PRODUCTS

SMD Power Inductors
CMC 15WR - 18WR - 22WR

esa QPL Components

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 μm 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: ±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, DO-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

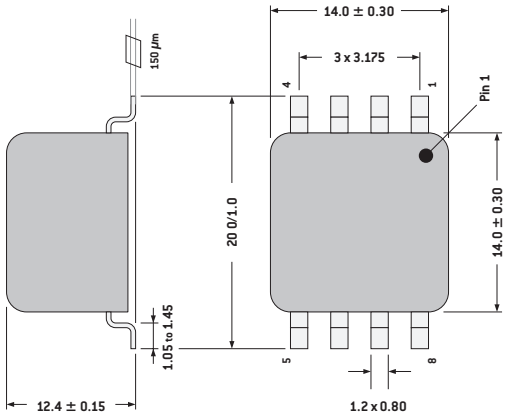
ID Code	Inductance Value at 25°C (-40/+35%)	max. RMS Current for ΔT = 40°C	max. R_{DC} (25°C)
CMC14 M14 xWR	140 µH	7.2 A	3.0 mΩ
CMC14 M25 xWR	248 µH	6.4 A	3.5 mΩ
CMC14 M39 xWR	387 µH	5.7 A	4.4 mΩ
CMC14 M56 xWR	558 µH	5.4 A	5.0 mΩ
CMC14 M76 xWR	760 µH	4.5 A	7.0 mΩ
CMC14 M99 xWR	992 µH	3.8 A	10.0 mΩ
CMC14 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

To Order

CMC 14 ### xWR

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

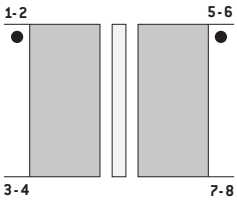
Typical Dimensions
(mm, top view)



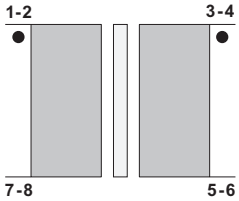
Notes

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

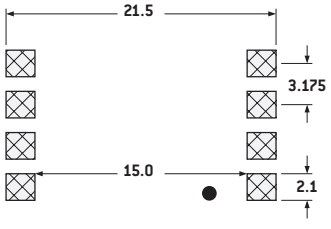
Connection 2



Connection 3

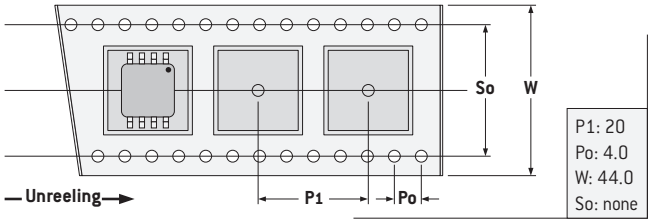


PCB Layout
(suggested)



Packaging

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



Marking

yyww:
Date code

HIGH GRADE PRODUCTS

Common Mode Chokes
CMC 17 Series

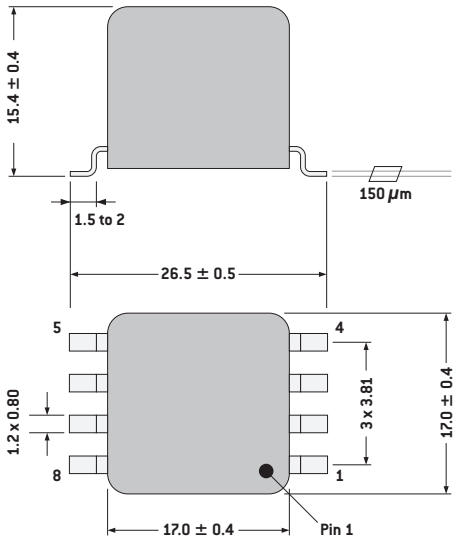
High-Grade - Improved Temperature Stability

- 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, DO-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_{DC} (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

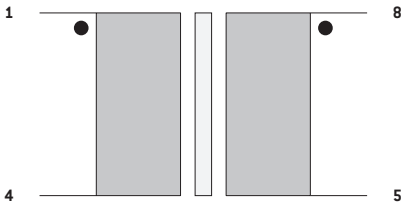
Typical Dimensions
(mm, top view)



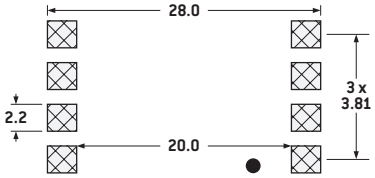
Notes

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

Connections

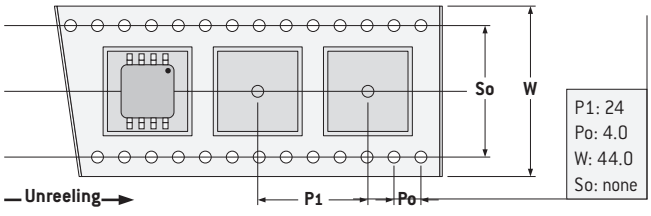


PCB Layout (suggested)



Packaging

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



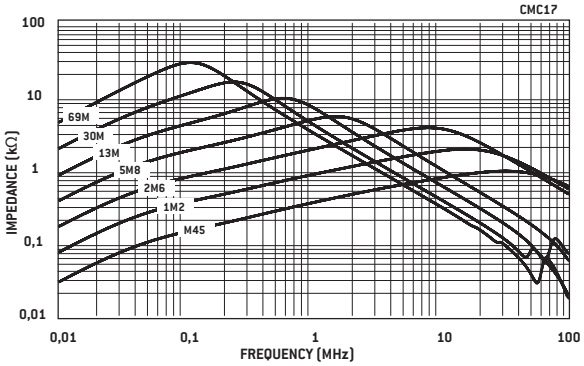
Marking

yyww:
Date code

Common Mode Chokes
CMC 17 Series

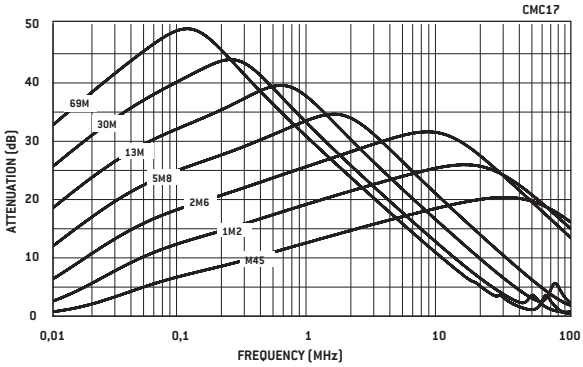
High-Grade - Improved Temperature Stability

Impedance



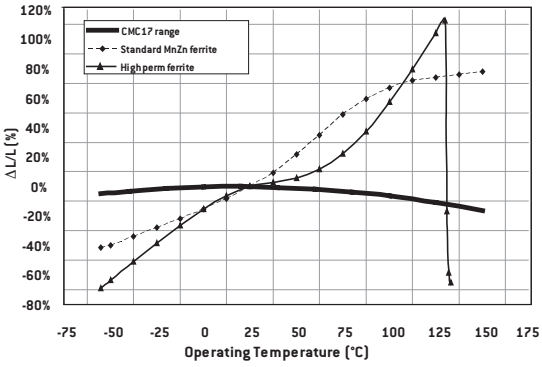
Typical values at 25°C with 1 mT at 10 kHz

Attenuation



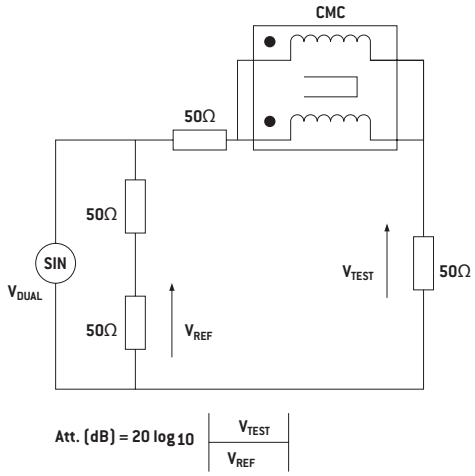
Typical values (Z = 50 Ω) at 25°C with 1 mT at 10 kHz

Variation vs Temperature



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

Attenuation Measurement Circuit



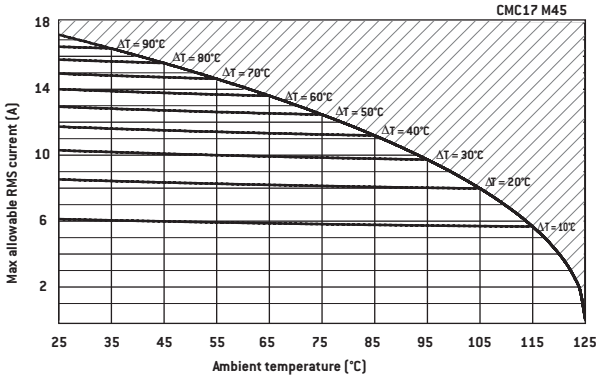
CMC17 range uses very high performance materials and therefore, offers remarkable temperature stability figures compared to standard or high-perm ferrite cores.

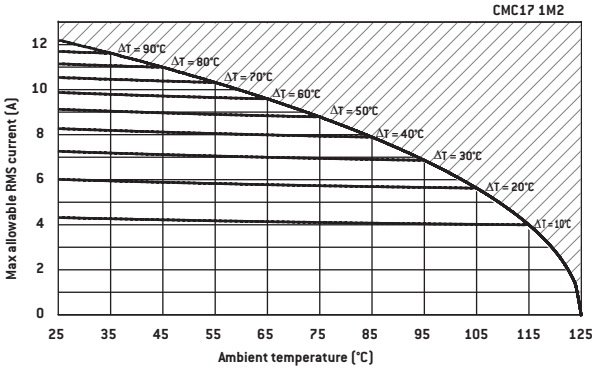
HIGH GRADE PRODUCTS

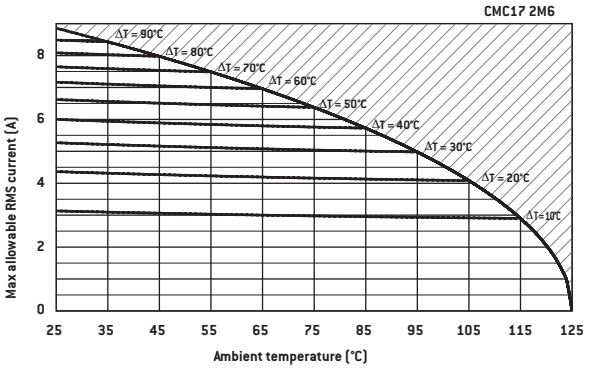
Common Mode Chokes
CMC 17 Series

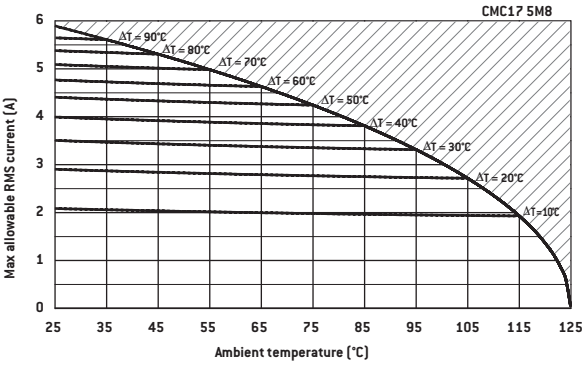
High-Grade - Improved Temperature Stability

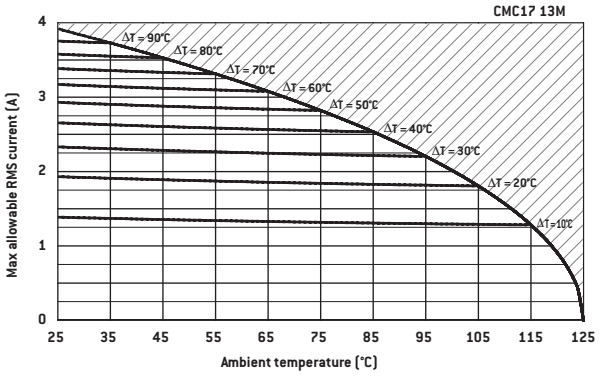
Derating Curves

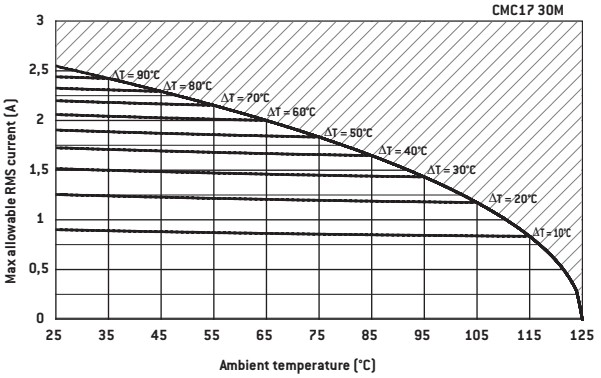


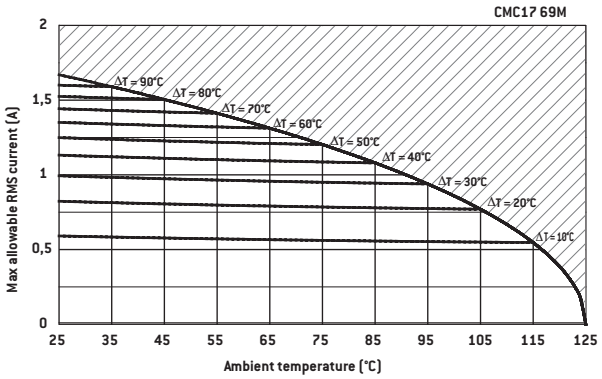












All thermal measurements under atmospheric conditions with component mounted on 1 dm² PCB without cooling device.

All above graphs indicate maximum RMS current allowed through component v. ambient temperature for a defined ΔT.

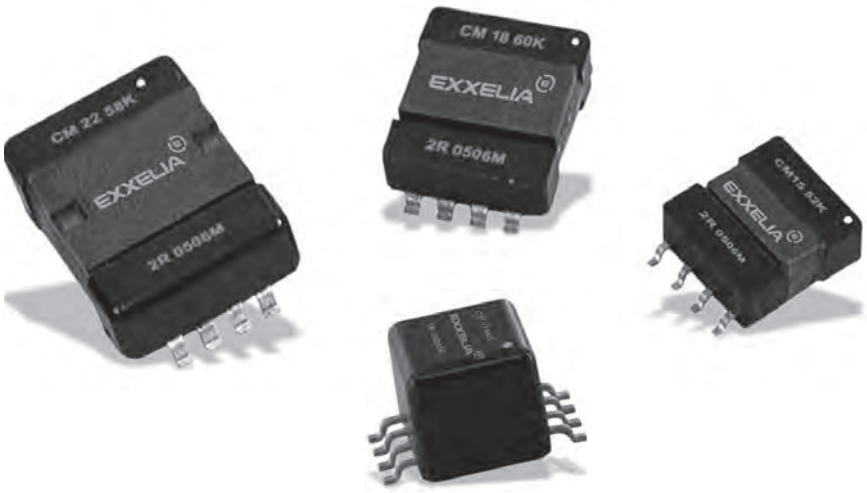
Maximum operating temperature is +125°C.

Example:

CMC17 M45 for application with Tamb = +85°C max. current allowed is < 11 Arms with ΔT < 40°C.

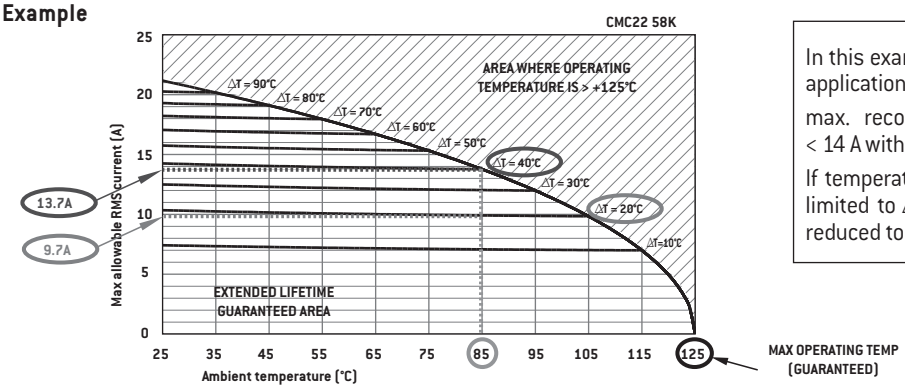
If temp increase allowed in application is limited to ΔT < 20°C, current must be reduced to 8 Arms.

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° range is –55°C +125°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° 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 (Tc > 200°C).
- Typical values for admissible current at +25°C ambient for a 40°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 Tamb = +85°C.

max. recommended RMS current is then < 14 A with ΔT < 40°C.

If temperature increase in the application is limited to ΔT < 20°C. current value must be reduced to < 10 A.

- With the above data, it is clear that the « theoretical » maximum possible current reaches zero for +125°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°C but in this case, extended lifetime for the product is not guaranteed any longer.
- Heating values versus current above +125°C operating temperature can still be calculated upon request.