

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

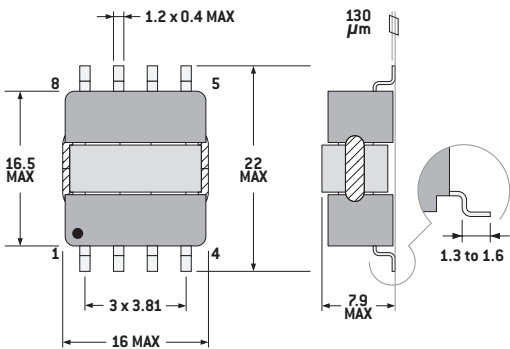


- Based on EXXELIA's «SESI15 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
- EESA ESCC 3201/010 version upon request
- RMS current range: from 0.6 A to 6.7 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 300 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

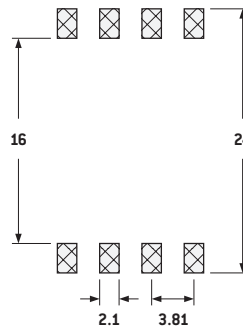
Electrical Data

| 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 _{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 |

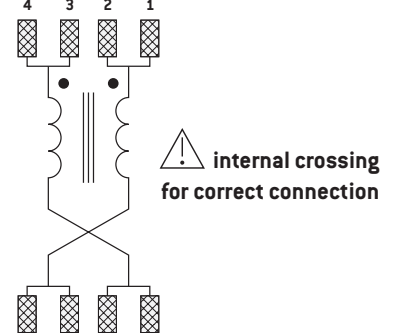
Typical Dimensions (mm, top view)



PCB Layout (suggested)

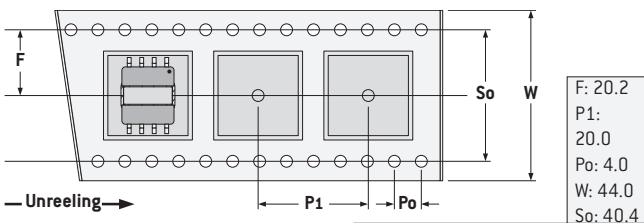


Connections (top view)

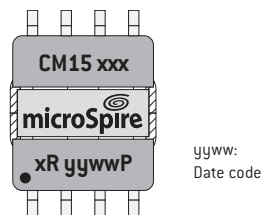


Packaging

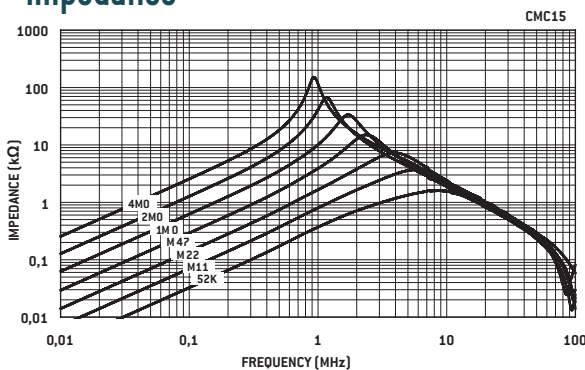
Tape and Reel:
400 units per reel of diameter 330 mm



Marking

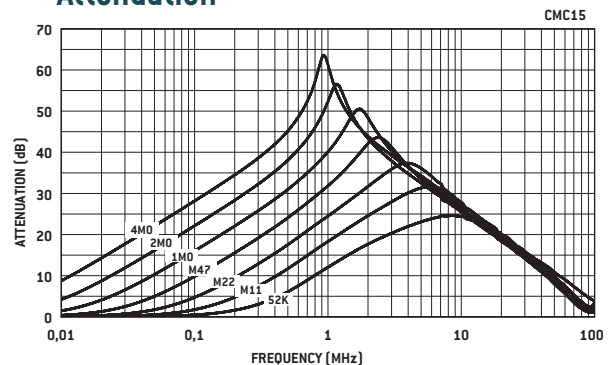


Impedance



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

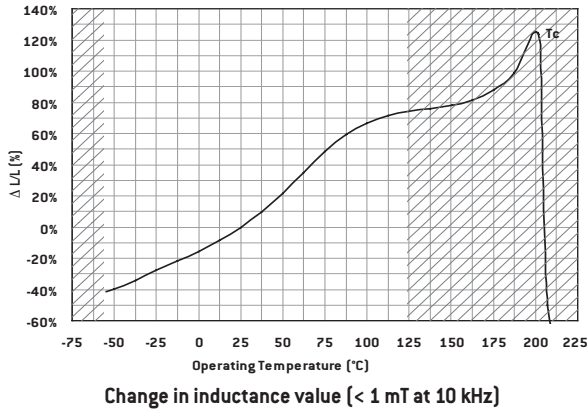
Attenuation



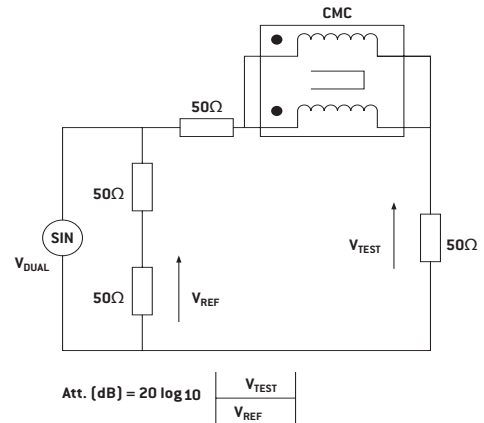
Typical values (Z = 50 Ω) at 25°C with 1 mT at 10 kHz

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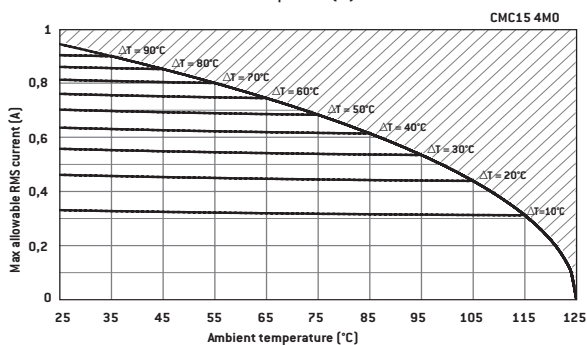
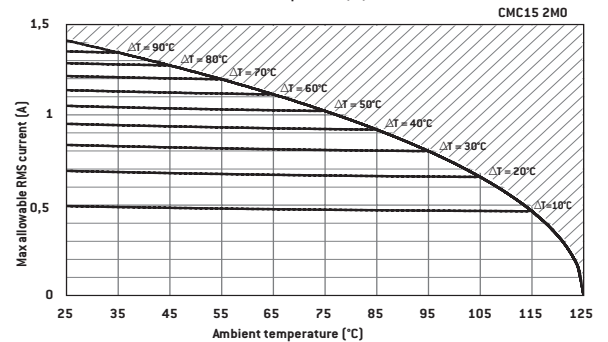
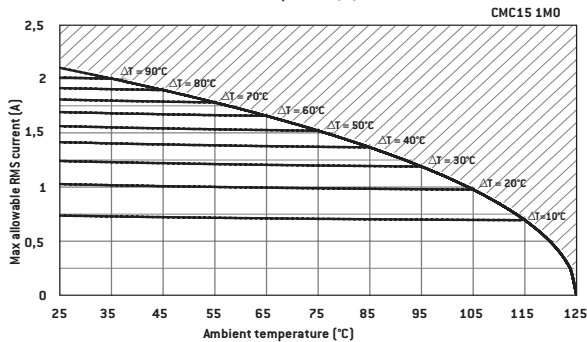
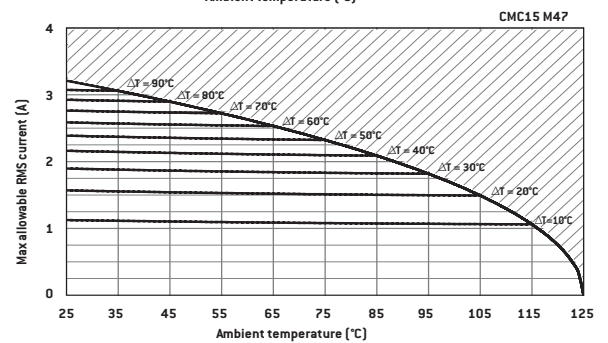
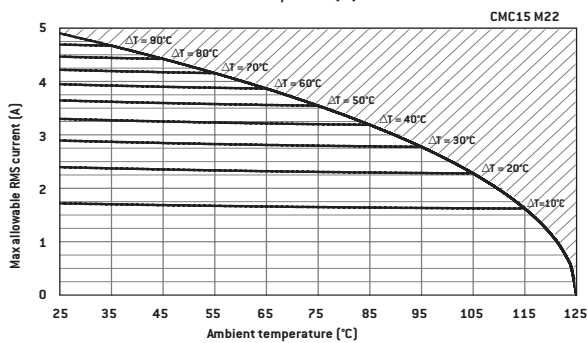
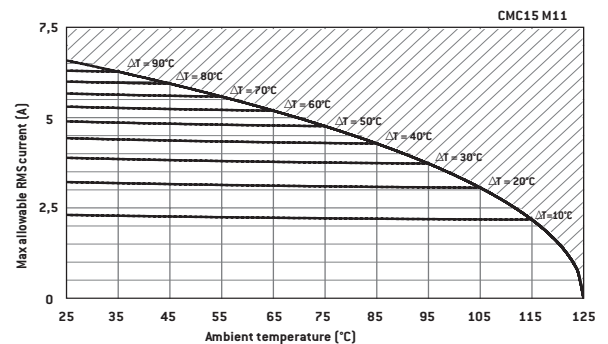
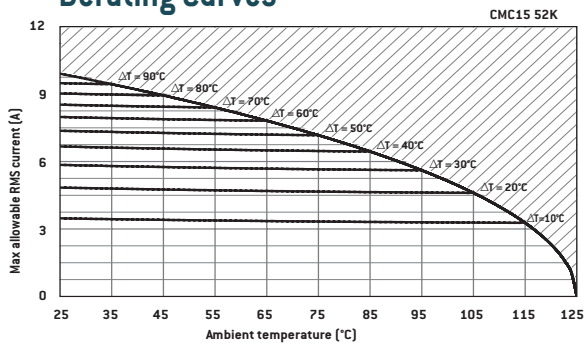
Variation vs Temperature



Attenuation Measurement Circuit



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

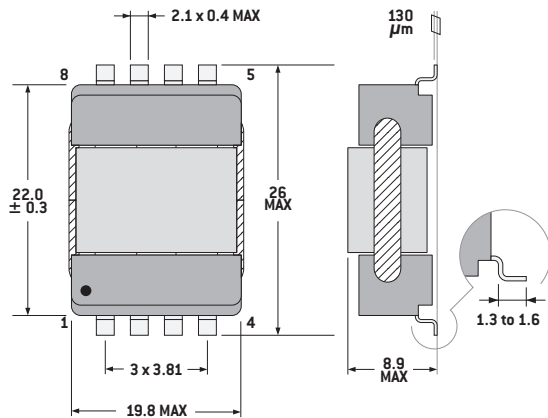


- Based on EXXELIA's «SESI18 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
- ESCC 3201/010 version upon request
- RMS current range: from 0.9 A to 9.9 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 300 kHz 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

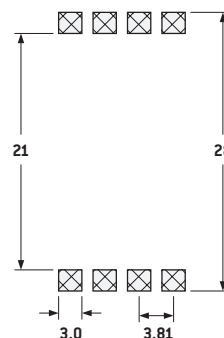
Electrical Data

| 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 _{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 |

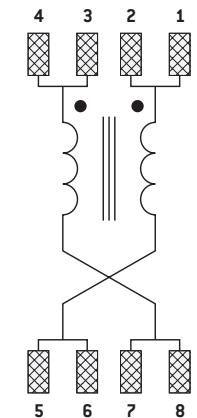
Typical Dimensions (mm, top view)



PCB Layout (suggested)



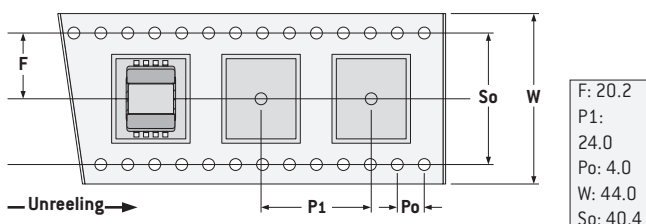
Connections (top view)



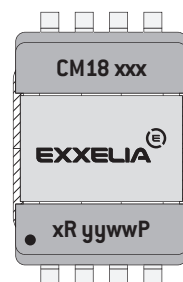
internal crossing

Packaging

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



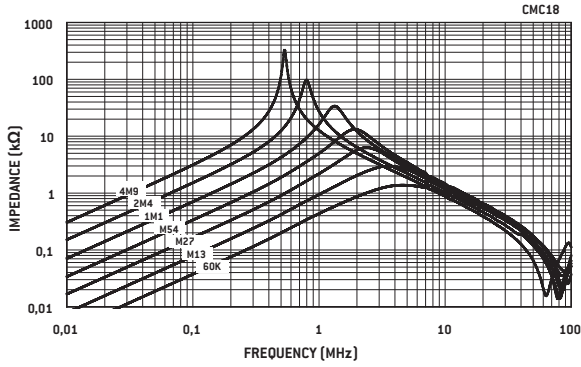
Marking



yyww:
Date code

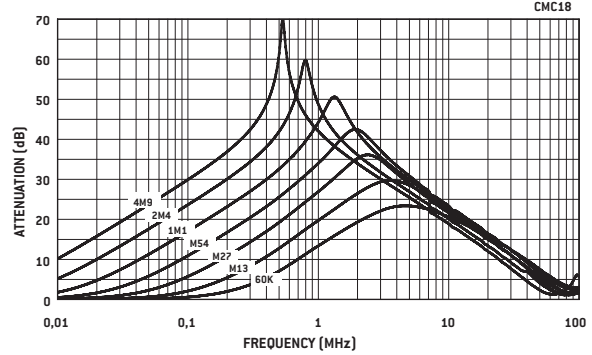
Common Mode Chokes for DC/DC Embedded Applications - CMC 18 xxx 2WR Series

Impedance



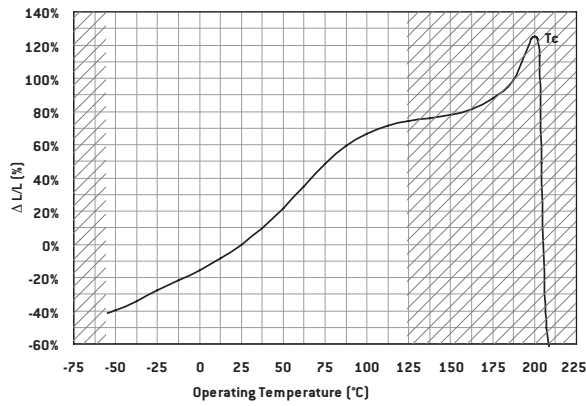
Typical values at 25°C with 1 mT at 10 kHz

Attenuation



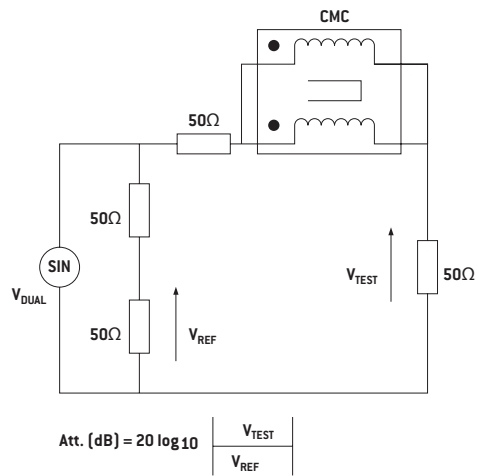
Typical values ($Z = 50 \Omega$) at 25°C with 1 mT at 10 kHz

Variation vs Temperature



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

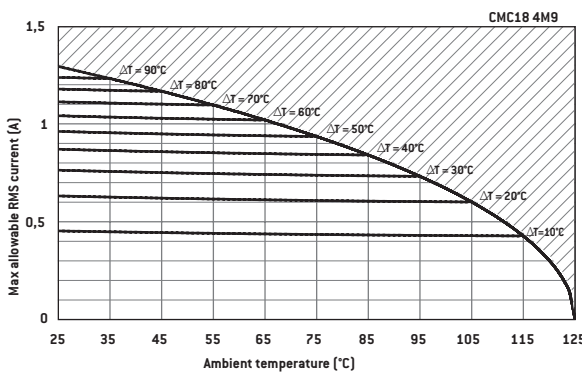
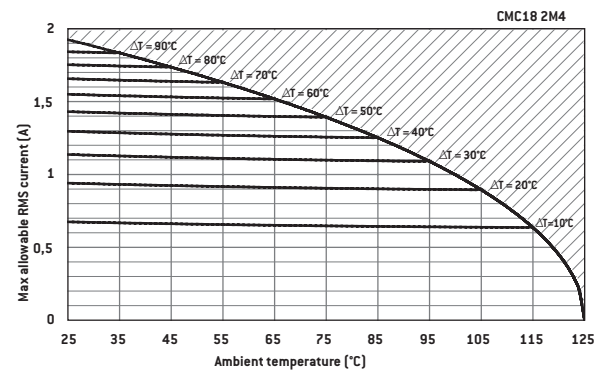
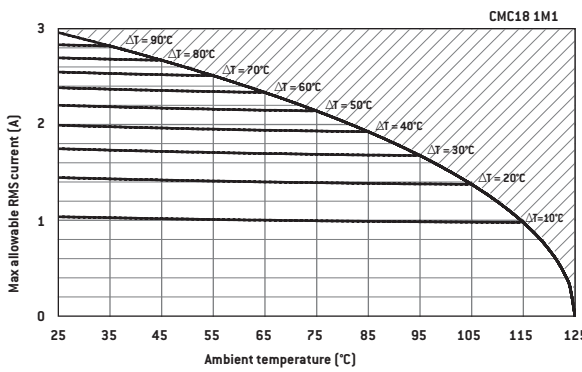
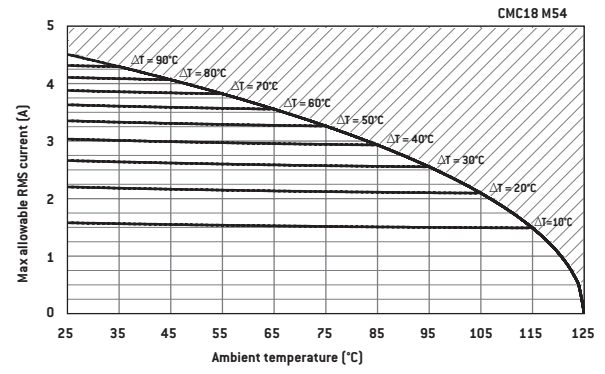
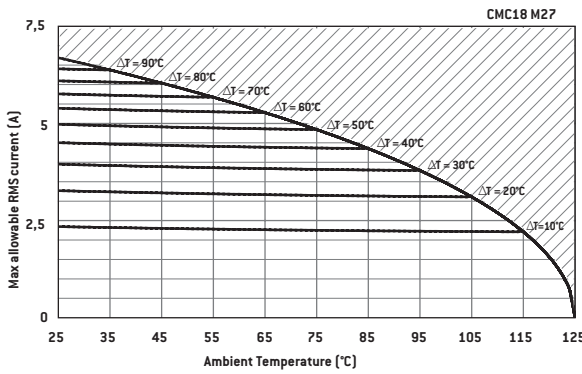
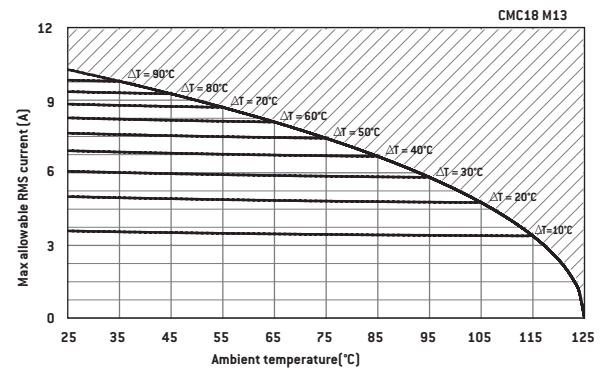
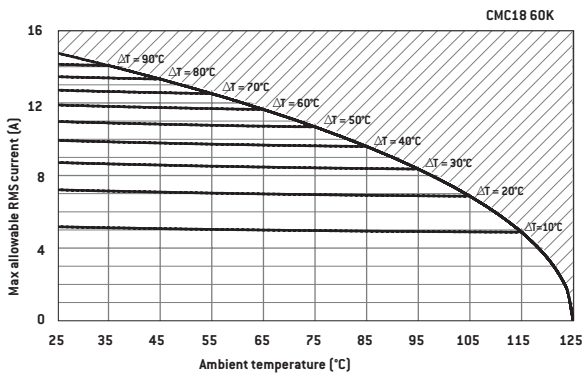
Attenuation Measurement Circuit



HIGH GRADE PRODUCTS

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 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:

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

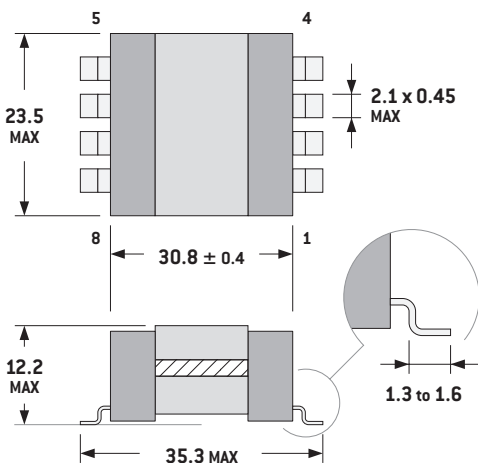


- Based on EXXELIA's «SESI22 Planar Technology»
- Low-profile SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-70-02, D0-160
- eesa ESCC 3201/010 version upon request
- RMS current range: from 1.9 A to 14.3 A for 40°C heating above 25°C
- Excellent impedance attenuation > 100 Ω from 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

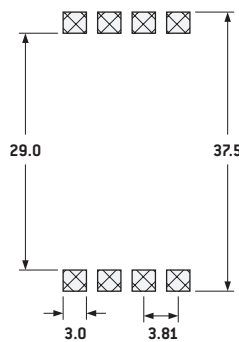
Electrical Data

| 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 _{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 |

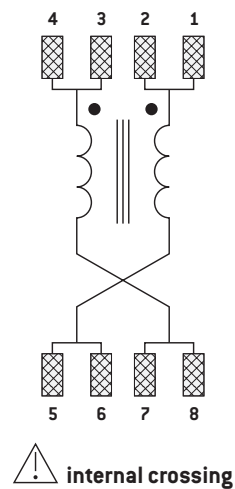
Typical Dimensions (mm, top view)



PCB Layout (suggested)

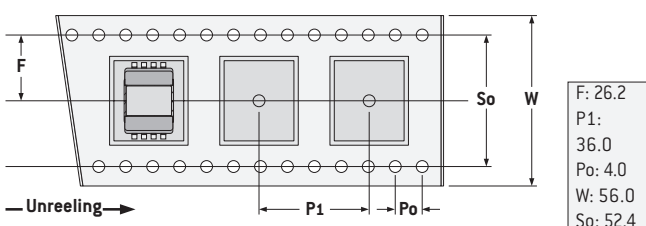


Connections (top view)

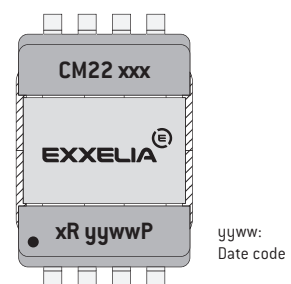


Packaging

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



Marking

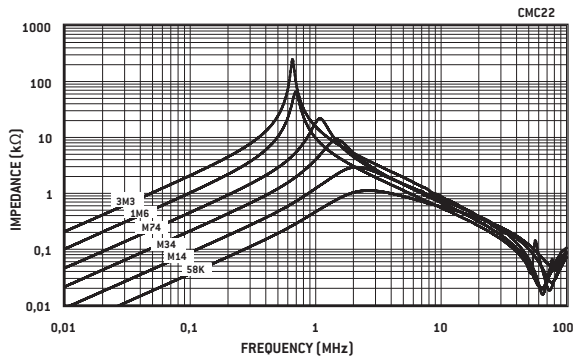


HIGH GRADE PRODUCTS

Common Mode Chokes for DC/DC Embedded Applications

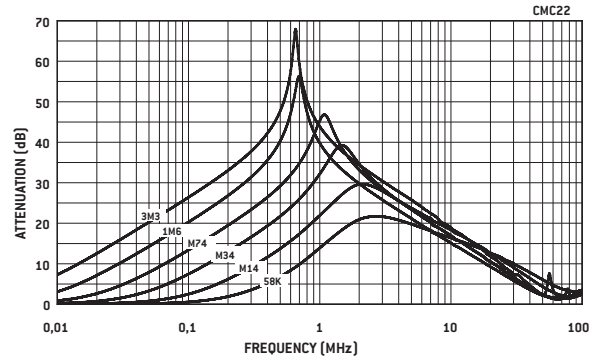
CMC 22 xxx 2WR Series

Impedance



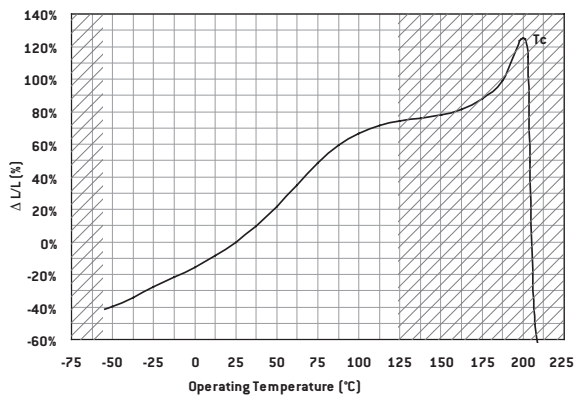
Typical values at 25°C with 1 mT at 10 kHz

Attenuation



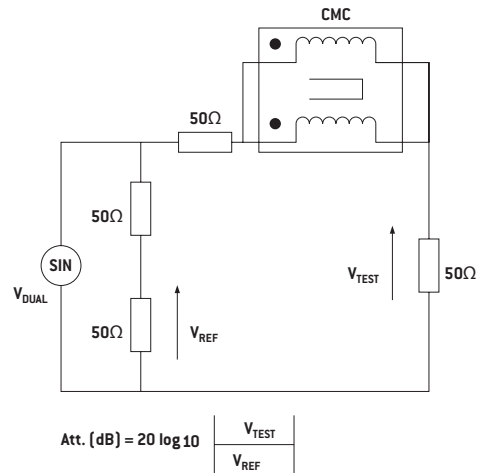
Typical values ($Z = 50 \Omega$) at 25°C with 1 mT at 10 kHz

Variation vs Temperature



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

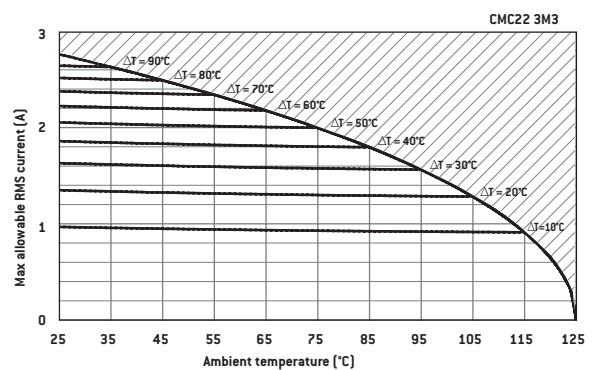
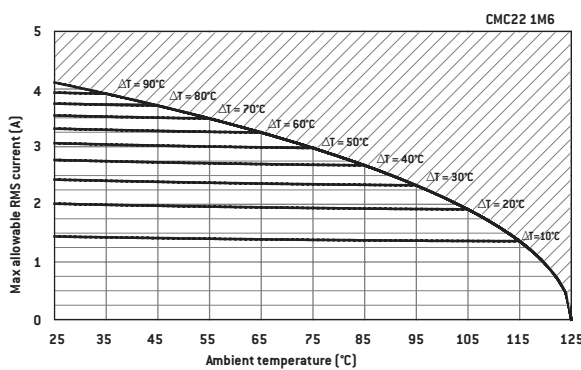
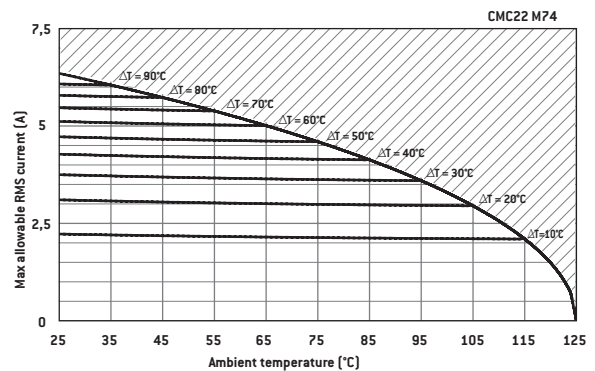
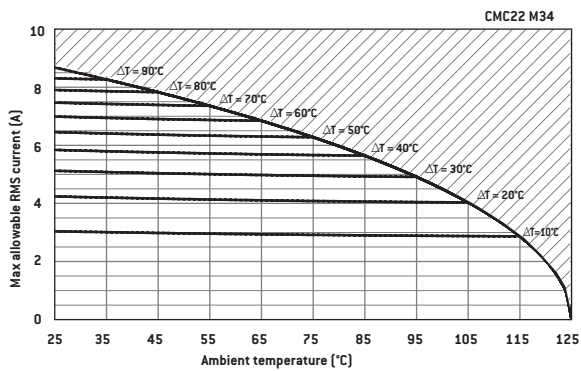
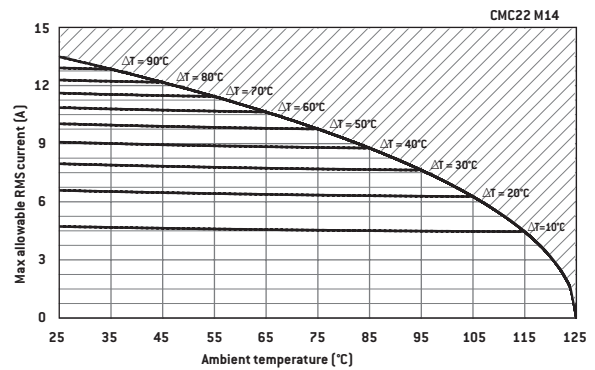
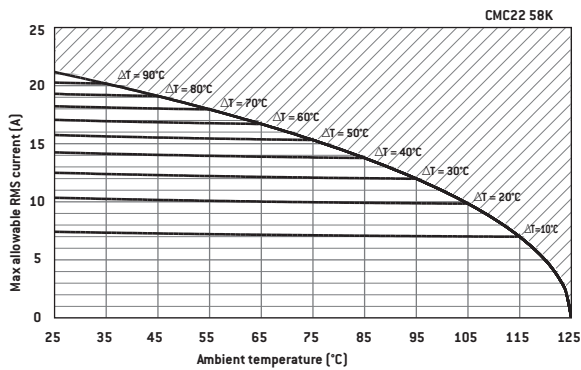
Attenuation Measurement Circuit



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 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:
 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 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: $\pm 40\%$

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 _{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 |

Notes

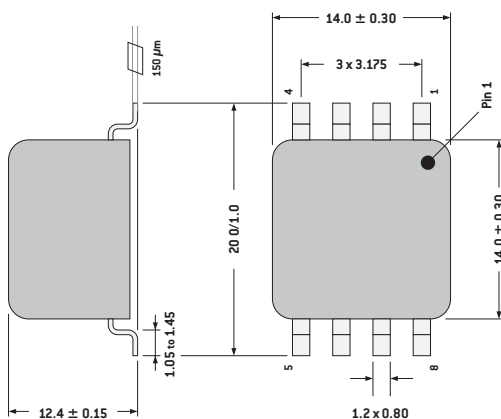
1. Dielectric strength test: 500v (50Hz - 1min)
2. max. power dissipation at +125°C: 400mW
3. Heat increase at max. current ≤ 25°C
4. 1:1 ratio (sector wound construction)
5. Interwinding capacitances < 15 pF
6. Variation of «L» values over the working temperature range ≤ 15 %
7. Admissible temp. during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

To Order

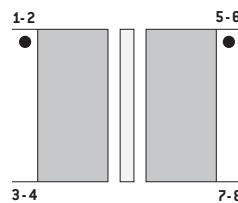
CMC 14 ### xWR

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

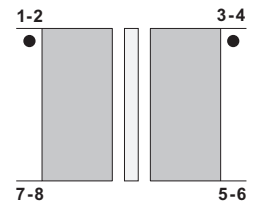
Typical Dimensions (mm, top view)



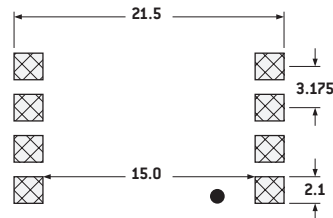
Connection 2



Connection 3

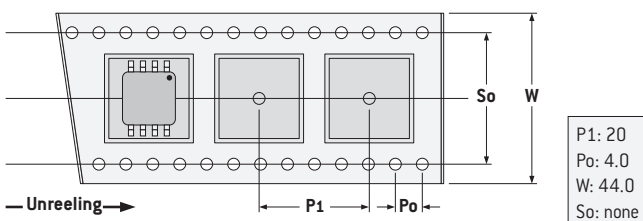


PCB Layout (suggested)



Packaging

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



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

Marking



yyww:
Date code

Common Mode Chokes CMC 17 Series

High-Grade - Improved Temperature Stability

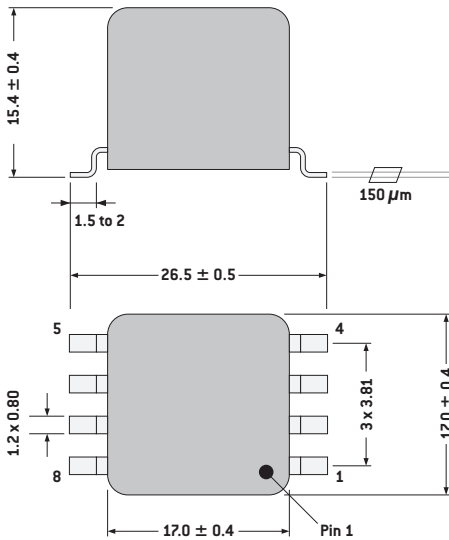


- Less than 20 % performance variations versus temperature (−55°C / +125°C)
- Minimum impedance attenuation: 100 Ω from 100 kHz to 30 MHz
- Compact SMD package (2 x 4 pins)
- Applied standards: MIL-STD-202, ECSS-Q-ST-70-02C, D0-160 and ESCC 3201 generic specification for space products
- RMS current 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 _{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 |

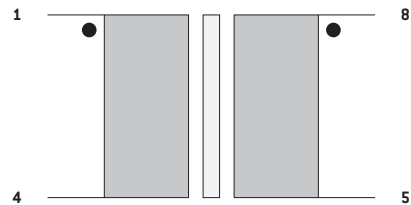
Typical Dimensions (mm, top view)



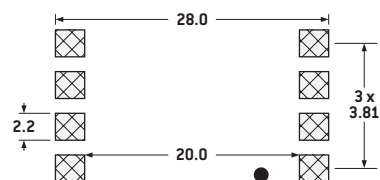
Notes

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

Connections

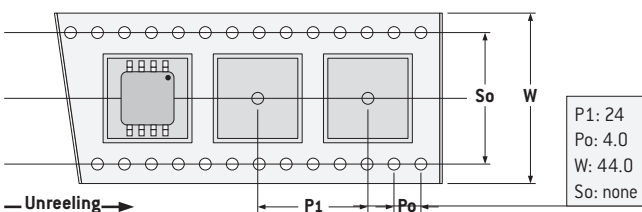


PCB Layout (suggested)

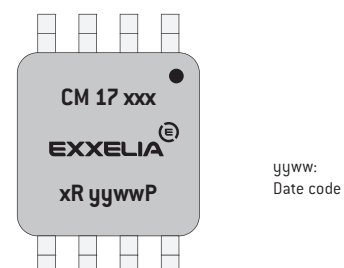


Packaging

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



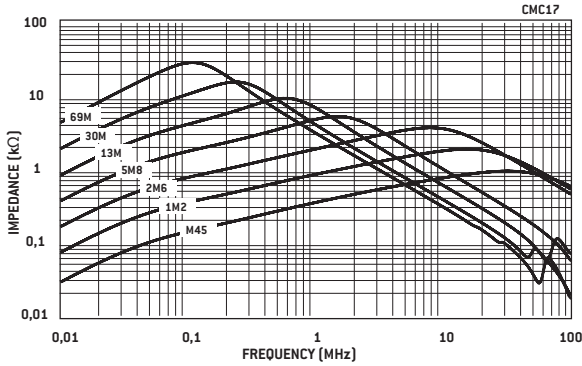
Marking



Common Mode Chokes CMC 17 Series

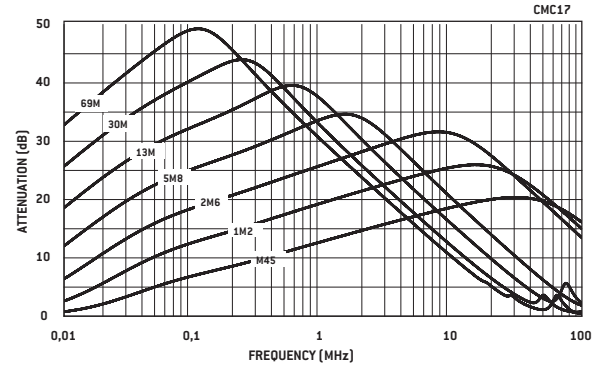
High-Grade - Improved Temperature Stability

Impedance



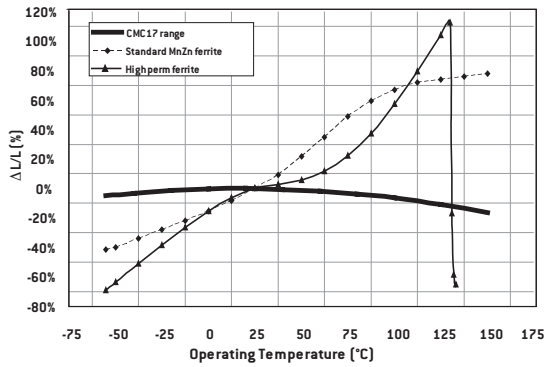
Typical values at 25°C with 1 mT at 10 kHz

Attenuation



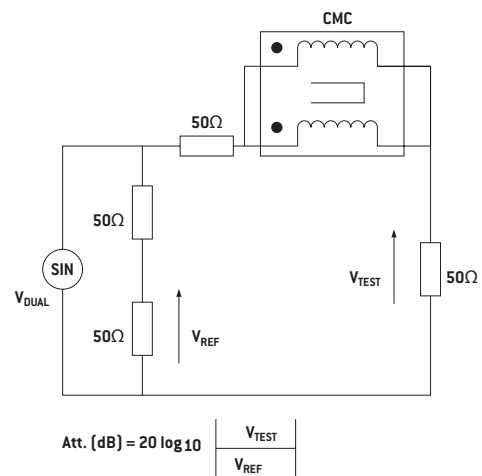
Typical values ($Z = 50 \Omega$) at 25°C with 1 mT at 10 kHz

Variation vs Temperature



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

Attenuation Measurement Circuit



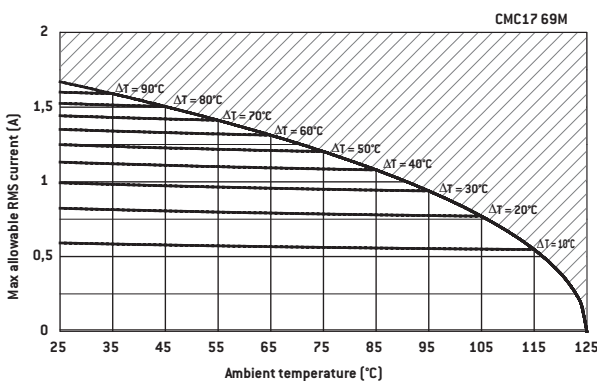
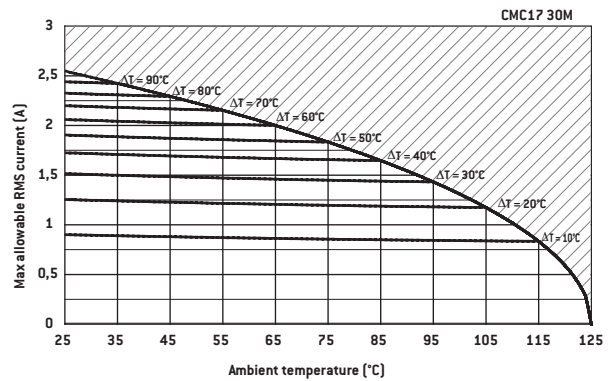
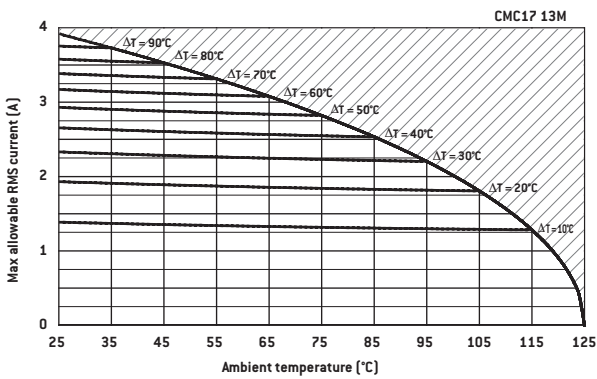
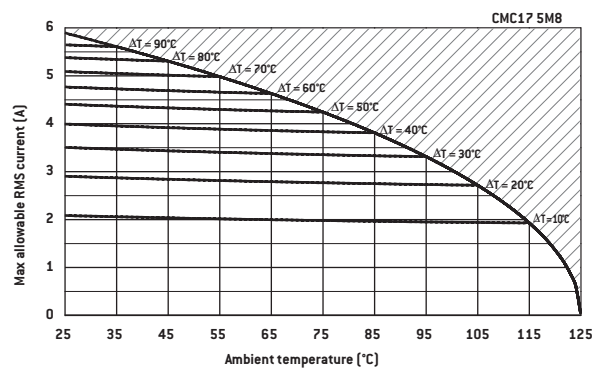
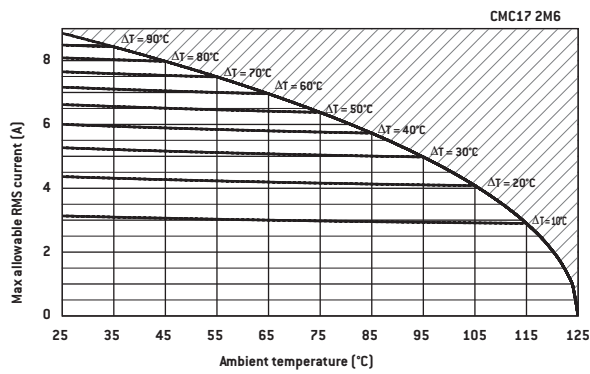
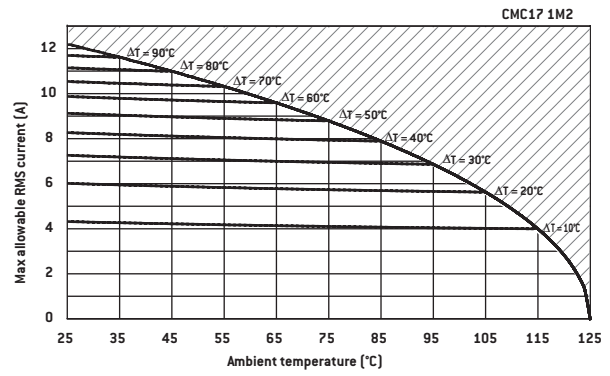
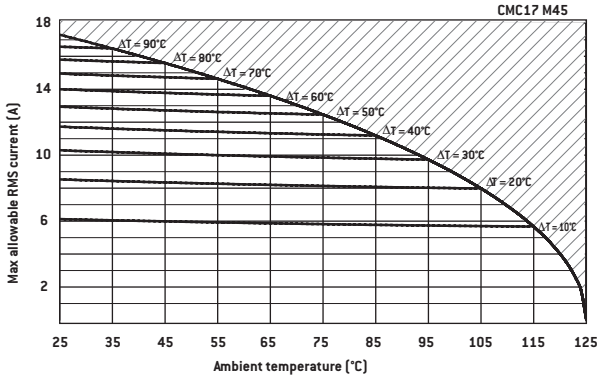
$$\text{Att. (dB)} = 20 \log_{10} \left| \frac{V_{\text{TEST}}}{V_{\text{REF}}} \right|$$

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

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.

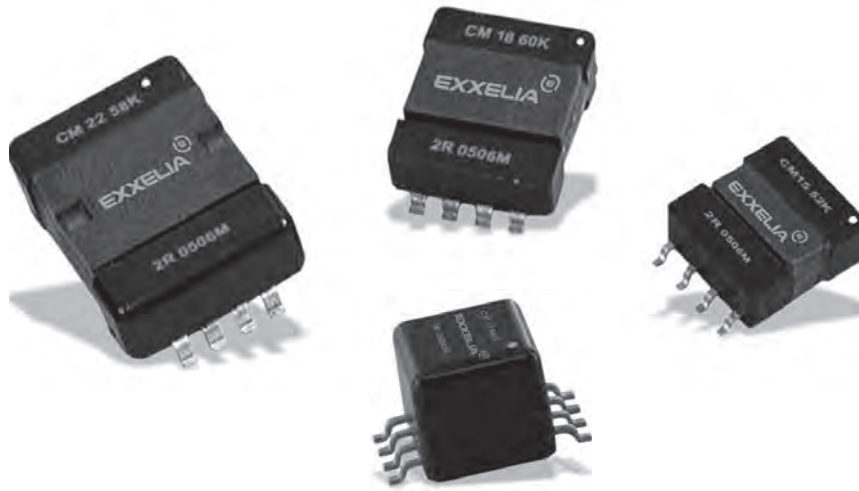
Example:

CMC17 M45 for application with T_{amb} = +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.

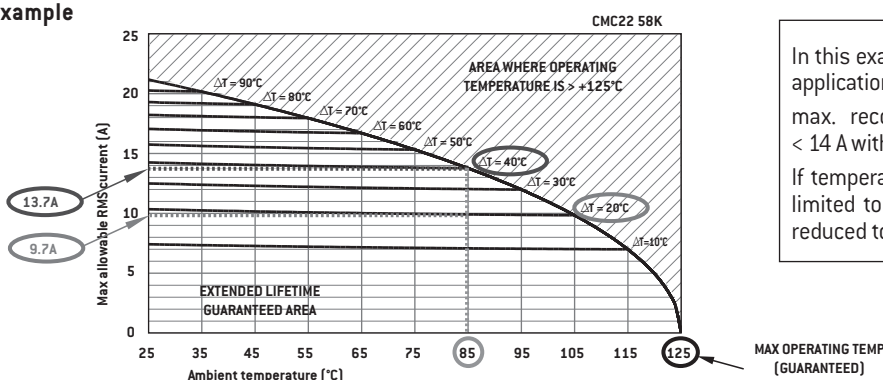
Technical note - Appendix

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 $+125^{\circ}\text{C}$ 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° 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°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.