

# CMS

## Common mode inductors, surface mount



### Product description

- Three sizes of surface mount toroidal common-mode inductors that provide 300Vdc isolation
- Inductance range from 5.5uH to 1600uH
- Current range up to 7.0 Amps
- Noise attenuation up to 44 dB
- Frequency range up to 100 MHz
- Meets UL94V-0 flammability standard
- Ferrite core material

### Applications

- EMI filters
- DC-DC brick power supplies
- Discrete output supplies
- Discrete and point-of-use power supplies (PUPS)

### Environmental data

- Storage temperature range: -40°C to +160°C
- Operating ambient temperature range: -40°C to +160°C (range is application specific)
- Solder reflow temperature:  
J-STD-020 (latest revision) compliant



Product specifications

| Part number | OCL (uH) minimum<br>(1-2) & (4-3) | I rms. Amperes<br>Max* | DCR (Ω) typ @<br>20°C (1-2) | DCR (Ω) typ @<br>20°C (4-3) | Leakage<br>Inductance (uH)<br>typ | Interwinding<br>Capacitance (pF) typ |
|-------------|-----------------------------------|------------------------|-----------------------------|-----------------------------|-----------------------------------|--------------------------------------|
| CMS1-1-R    | 4.5                               | 7.00                   | 0.0027                      | 0.0027                      | 0.05                              | 2.0                                  |
| CMS1-2-R    | 8                                 | 5.70                   | 0.0040                      | 0.0040                      | 0.09                              | 2.1                                  |
| CMS1-3-R    | 12.6                              | 4.10                   | 0.077                       | 0.077                       | 0.14                              | 2.2                                  |
| CMS1-4-R    | 18                                | 3.80                   | 0.0089                      | 0.0089                      | 0.20                              | 2.3                                  |
| CMS1-5-R    | 25                                | 3.60                   | 0.0100                      | 0.0100                      | 0.28                              | 2.4                                  |
| CMS1-6-R    | 32.8                              | 3.10                   | 0.0138                      | 0.0138                      | 0.36                              | 2.5                                  |
| CMS1-7-R    | 41.5                              | 2.60                   | 0.019                       | 0.019                       | 0.45                              | 2.6                                  |
| CMS1-8-R    | 51.2                              | 2.20                   | 0.026                       | 0.026                       | 0.056                             | 2.7                                  |
| CMS1-9-R    | 62                                | 1.90                   | 0.035                       | 0.035                       | 0.68                              | 2.7                                  |
| CMS1-10-R   | 73.7                              | 1.65                   | 0.048                       | 0.048                       | 0.81                              | 2.8                                  |
| CMS1-11-R   | 100                               | 1.35                   | 0.070                       | 0.070                       | 1.10                              | 3.9                                  |
| CMS1-12-R   | 131                               | 1.15                   | 0.100                       | 0.100                       | 1.45                              | 3.0                                  |
| CMS1-13-R   | 166                               | 1.00                   | 0.138                       | 0.138                       | 1.83                              | 3.1                                  |
| CMS1-14-R   | 205                               | 0.85                   | 0.186                       | 0.186                       | 2.25                              | 3.2                                  |
| CMS2-0-R    | 14                                | 6.00                   | 0.004                       | 0.004                       | 0.13                              | 1.7                                  |
| CMS2-1-R    | 25                                | 5.35                   | 0.005                       | 0.005                       | 0.22                              | 2.0                                  |
| CMS2-2-R    | 40                                | 4.40                   | 0.008                       | 0.008                       | 0.34                              | 2.3                                  |
| CMS2-3-R    | 57                                | 3.60                   | 0.012                       | 0.012                       | 0.47                              | 2.5                                  |
| CMS2-4-R    | 102                               | 2.80                   | 0.019                       | 0.019                       | 0.80                              | 2.8                                  |
| CMS2-5-R    | 160                               | 2.30                   | 0.029                       | 0.029                       | 1.25                              | 3.1                                  |
| CMS2-6-R    | 230                               | 1.85                   | 0.044                       | 0.044                       | 1.75                              | 3.4                                  |
| CMS2-7-R    | 270                               | 1.60                   | 0.060                       | 0.060                       | 2.00                              | 3.6                                  |
| CMS2-8-R    | 360                               | 1.35                   | 0.084                       | 0.084                       | 2.60                              | 3.9                                  |
| CMS2-9-R    | 460                               | 1.10                   | 0.120                       | 0.120                       | 3.30                              | 4.3                                  |
| CMS2-10-R   | 575                               | 0.94                   | 0.170                       | 0.170                       | 4.00                              | 4.3                                  |
| CMS2-11-R   | 700                               | 0.80                   | 0.230                       | 0.230                       | 5.00                              | 4.6                                  |
| CMS2-12-R   | 915                               | 0.67                   | 0.330                       | 0.330                       | 6.30                              | 4.9                                  |
| CMS2-13-R   | 1070                              | 0.58                   | 0.440                       | 0.440                       | 7.30                              | 5.1                                  |
| CMS2-14-R   | 1340                              | 0.50                   | 0.620                       | 0.620                       | 9.00                              | 5.4                                  |
| CMS3-1-R    | 28                                | 5.70                   | 0.005                       | 0.005                       | 0.31                              | 2.80                                 |
| CMS3-2-R    | 45                                | 5.10                   | 0.006                       | 0.006                       | 0.46                              | 3.05                                 |
| CMS3-3-R    | 64                                | 4.75                   | 0.007                       | 0.007                       | 0.64                              | 3.30                                 |
| CMS3-4-R    | 88                                | 3.95                   | 0.010                       | 0.010                       | 0.85                              | 3.50                                 |
| CMS3-5-R    | 146                               | 3.10                   | 0.017                       | 0.017                       | 1.30                              | 3.70                                 |
| CMS3-6-R    | 217                               | 2.85                   | 0.020                       | 0.020                       | 1.90                              | 3.90                                 |
| CMS3-7-R    | 258                               | 2.45                   | 0.027                       | 0.027                       | 2.20                              | 4.15                                 |
| CMS3-8-R    | 350                               | 2.00                   | 0.040                       | 0.040                       | 3.00                              | 4.40                                 |
| CMS3-9-R    | 400                               | 1.70                   | 0.053                       | 0.053                       | 3.30                              | 4.65                                 |
| CMS3-10-R   | 518                               | 1.45                   | 0.076                       | 0.076                       | 4.20                              | 4.85                                 |
| CMS3-11-R   | 648                               | 1.20                   | 0.107                       | 0.107                       | 5.10                              | 5.10                                 |
| CMS3-12-R   | 790                               | 1.05                   | 0.145                       | 0.145                       | 6.10                              | 5.35                                 |
| CMS3-13-R   | 1030                              | 0.88                   | 0.210                       | 0.210                       | 7.80                              | 5.55                                 |
| CMS3-14-R   | 1310                              | 0.75                   | 0.300                       | 0.300                       | 9.60                              | 5.80                                 |

Definitions:

OCL = Open Circuit Inductance

DCR = Direct Current Resistance

I<sub>rms</sub> = rms current for approx. a 40°C temperature rise at an ambient temperature of 85°C.

\*Operating Temperature: 160°C Max. Inductance values are sustained up to 160°C.

Electrical Characteristics:

OCL (1-2) 0.10Vrms, 100kHz, 0.0Adc: (See Chart)

OCL (4-3) 0.10Vrms, 100kHz, 0.0Adc: (See Chart)

DCR (1-2) typ @ 20°C: (See Chart)

DCR (4-3) typ @ 20°C: (See Chart)

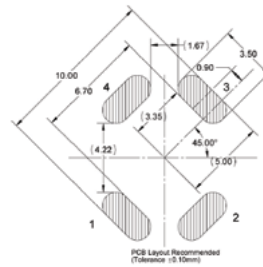
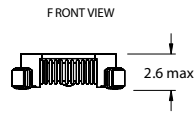
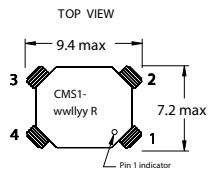
Hipot rating: winding to winding: 300Vdc min. for 1 second.

Turns Ratio: (1-2):(4-3) 1:1

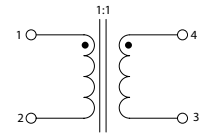
## Dimensions—mm

### CMS1

#### RECOMMENDED PCB LAYOUT

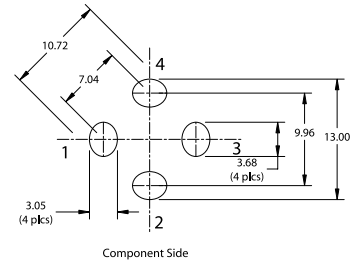
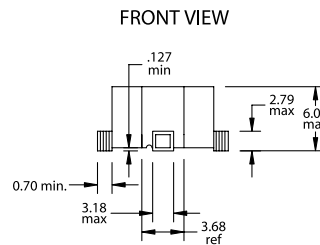
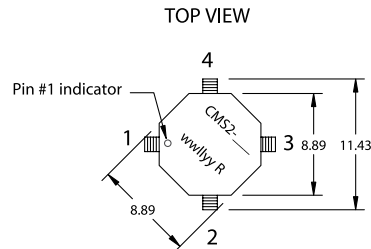


#### SCHEMATIC

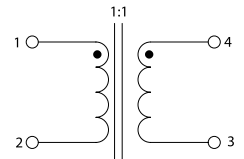


### CMS2

#### RECOMMENDED PCB LAYOUT

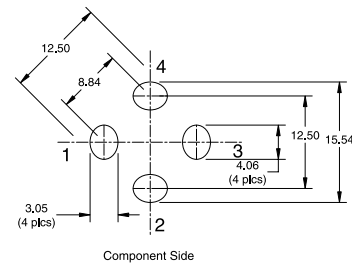
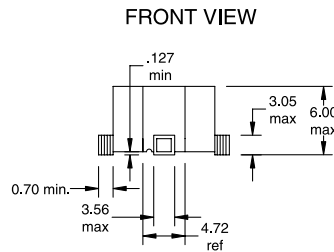
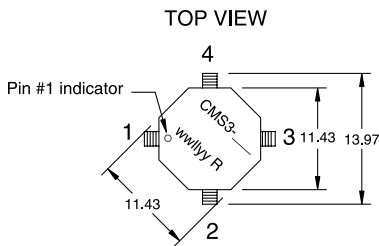


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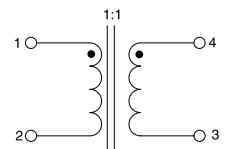


### CMS3

#### RECOMMENDED PCB LAYOUT



#### SCHEMATIC



wwllyy = Date code R = Revision level

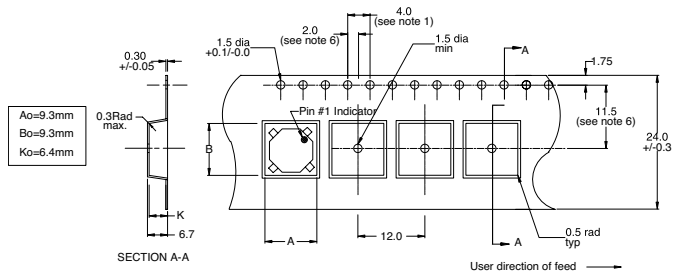
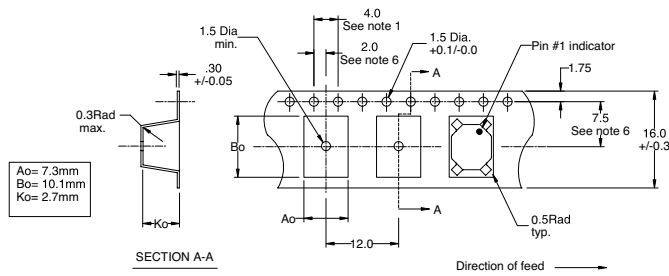
## Packaging Information

### CMS1

Supplied in tape and reel packaging, 2,000 parts per 13" diameter reel

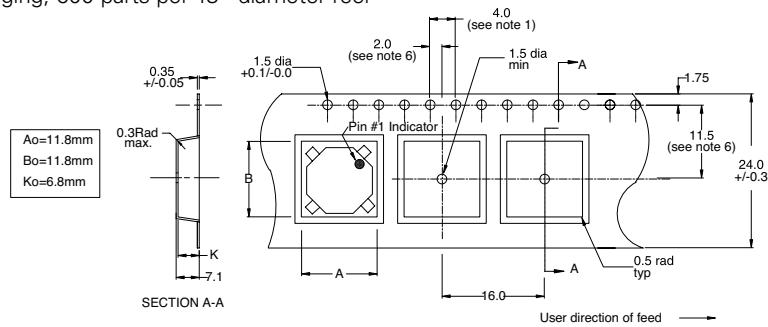
### CMS2

Supplied in tape and reel packaging, 800 parts per 13" diameter reel



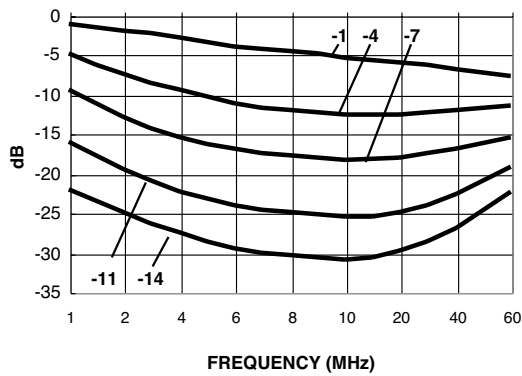
### CMS3

Supplied in tape and reel packaging, 600 parts per 13" diameter reel

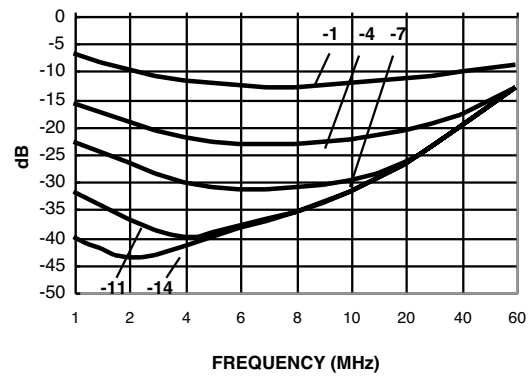


## Attenuation Curves

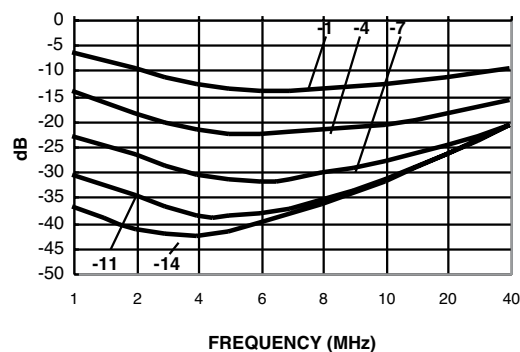
Attenuation CMS 1



Attenuation CMS 2

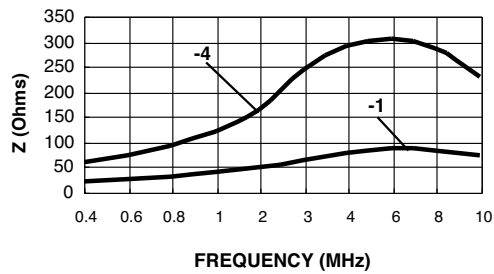


Attenuation CMS 3

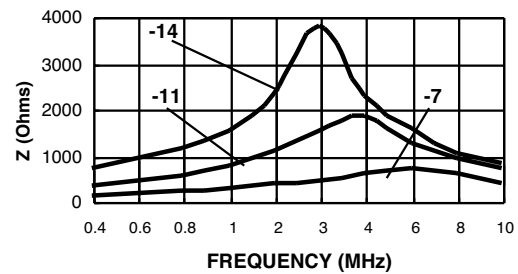


## Impedance Curves

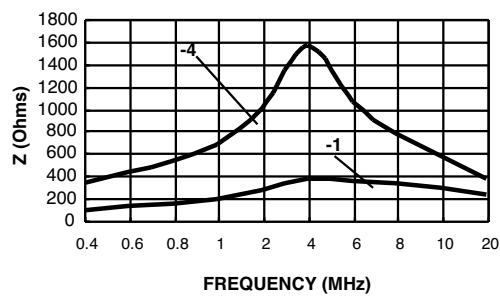
Impedance CMS1-1 & 4



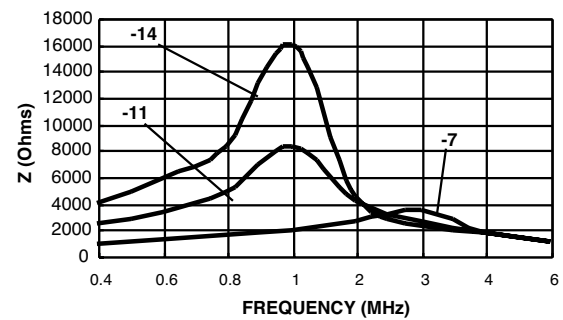
Impedance CMS1 - 7,11, & 14



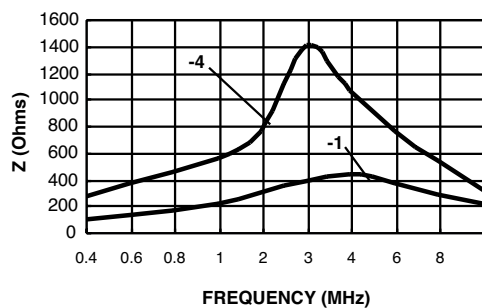
Impedance CMS2 - 1 & 4



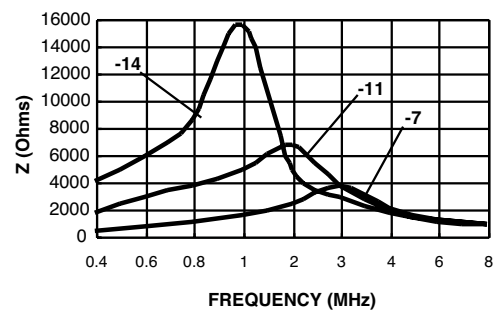
Impedance CMS2 - 7,11, & 14



Impedance CMS3 - 1 & 4



Impedance CMS3 - 7,11, & 14



## Solder reflow profile

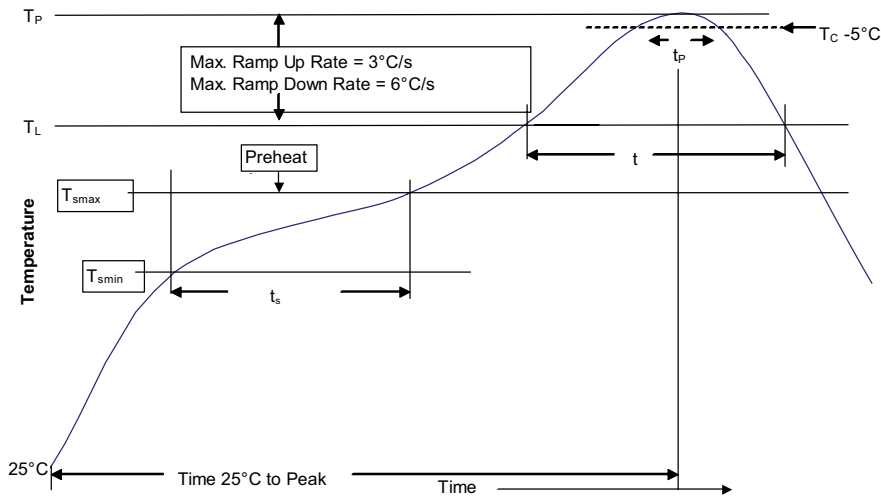


Table 1 - Standard SnPb solder ( $T_C$ )

| Package thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5mm)           | 235°C                       | 220°C                       |
| ≥2.5mm            | 220°C                       | 220°C                       |

Table 2 - Lead (Pb) free solder ( $T_C$ )

| Package thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> 350 - 2000 | Volume mm <sup>3</sup> >2000 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6mm            | 260°C                       | 260°C                             | 260°C                        |
| 1.6 – 2.5mm       | 260°C                       | 250°C                             | 245°C                        |
| >2.5mm            | 250°C                       | 245°C                             | 245°C                        |

## Reference J-STD-020

| Profile feature                                                                    | Standard SnPb solder | Lead (Pb) free solder |
|------------------------------------------------------------------------------------|----------------------|-----------------------|
| Preheat and soak                                                                   |                      |                       |
| • Temperature min. ( $T_{smin}$ )                                                  | 100 °C               | 150 °C                |
| • Temperature max. ( $T_{smax}$ )                                                  | 150 °C               | 200 °C                |
| • Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )                                      | 60-120 seconds       | 60-120 seconds        |
| Average ramp up rate $T_{smax}$ to $T_P$                                           | 3 °C/ second Max.    | 3 °C/ second Max.     |
| Liquidous temperature ( $T_L$ )                                                    | 183 °C               | 217 °C                |
| Time at liquidous ( $t_L$ )                                                        | 60-150 seconds       | 60-150 seconds        |
| Peak package body temperature ( $T_P$ )*                                           | Table 1              | Table 2               |
| Time ( $t_p$ )** within 5 °C of the specified classification temperature ( $T_C$ ) | 20 seconds**         | 30 seconds**          |
| Average ramp-down rate ( $T_P$ to $T_{smax}$ )                                     | 6 °C/ second max.    | 6 °C/ second max.     |
| Time 25 °C to peak temperature                                                     | 6 minutes max.       | 8 minutes max.        |

\* Tolerance for peak profile temperature ( $T_P$ ) is defined as a supplier minimum and a user maximum.

\*\* Tolerance for time at peak profile temperature ( $t_p$ ) is defined as a supplier minimum and a user maximum.

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Printed in USA  
Publication No. 4313 PCN18009  
September 2018