

# MCL1608V1

## Multilayer chip inductor



### Product features

- 0603 (1608 metric) package
- Low DC resistance, high current
- Multilayer monolithic construction yields high reliability
- Suitable for wave and reflow soldering
- Inductance range from 0.047 uH to 12 uH
- Moisture sensitivity level (MSL): 1

### Applications

- Industrial connectivity (IoT)
- Wireless communications
  - Bluetooth
  - WiFi
  - Antenna
- Machine-to-machine (M2M)
- Mobile phones
- Wearable devices
- Wireless LAN
- Computing/gaming consoles
- Broadband components
- RF transceiver modules

### Environmental data

- Operating temperature range: -40 °C to +85 °C (ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



**Product specifications**

| Part number      | OCL (uH) ±20% | I Rated (mA) maximum | DCR (Ω) maximum @ +25°C | SRF (MHz) minimum | Test frequency (MHz) | Test voltage (mV) |
|------------------|---------------|----------------------|-------------------------|-------------------|----------------------|-------------------|
| MCL1608V1-R047-R | 0.047         | 150                  | 0.12                    | 260               | 1.0                  | 50                |
| MCL1608V1-R056-R | 0.056         | 150                  | 0.12                    | 260               | 1.0                  | 50                |
| MCL1608V1-R068-R | 0.068         | 150                  | 0.12                    | 250               | 1.0                  | 50                |
| MCL1608V1-R082-R | 0.082         | 150                  | 0.12                    | 245               | 1.0                  | 50                |
| MCL1608V1-R10-R  | 0.100         | 150                  | 0.15                    | 240               | 1.0                  | 50                |
| MCL1608V1-R12-R  | 0.120         | 150                  | 0.20                    | 205               | 1.0                  | 50                |
| MCL1608V1-R15-R  | 0.150         | 150                  | 0.20                    | 180               | 1.0                  | 50                |
| MCL1608V1-R18-R  | 0.180         | 150                  | 0.20                    | 165               | 1.0                  | 50                |
| MCL1608V1-R22-R  | 0.220         | 150                  | 0.25                    | 150               | 1.0                  | 50                |
| MCL1608V1-R27-R  | 0.270         | 100                  | 0.30                    | 136               | 1.0                  | 50                |
| MCL1608V1-R33-R  | 0.330         | 100                  | 0.30                    | 125               | 1.0                  | 50                |
| MCL1608V1-R39-R  | 0.390         | 100                  | 0.35                    | 110               | 1.0                  | 50                |
| MCL1608V1-R47-R  | 0.470         | 100                  | 0.45                    | 105               | 1.0                  | 50                |
| MCL1608V1-R56-R  | 0.560         | 100                  | 0.45                    | 95                | 1.0                  | 50                |
| MCL1608V1-R68-R  | 0.680         | 100                  | 0.55                    | 90                | 1.0                  | 50                |
| MCL1608V1-R82-R  | 0.820         | 100                  | 0.60                    | 85                | 1.0                  | 50                |
| MCL1608V1-1R0-R  | 1.0           | 150                  | 0.30                    | 75                | 1.0                  | 50                |
| MCL1608V1-1R2-R  | 1.2           | 150                  | 0.30                    | 65                | 1.0                  | 50                |
| MCL1608V1-1R5-R  | 1.5           | 120                  | 0.35                    | 60                | 1.0                  | 50                |
| MCL1608V1-1R8-R  | 1.8           | 120                  | 0.40                    | 55                | 1.0                  | 50                |
| MCL1608V1-2R2-R  | 2.2           | 120                  | 0.50                    | 50                | 1.0                  | 50                |
| MCL1608V1-2R7-R  | 2.7           | 100                  | 0.60                    | 45                | 1.0                  | 50                |
| MCL1608V1-3R3-R  | 3.3           | 100                  | 0.65                    | 40                | 1.0                  | 50                |
| MCL1608V1-3R9-R  | 3.9           | 80                   | 0.70                    | 35                | 1.0                  | 50                |
| MCL1608V1-4R7-R  | 4.7           | 80                   | 0.75                    | 33                | 1.0                  | 50                |
| MCL1608V1-5R6-R  | 5.6           | 60                   | 0.90                    | 22                | 1.0                  | 50                |
| MCL1608V1-6R8-R  | 6.8           | 60                   | 0.90                    | 20                | 1.0                  | 50                |
| MCL1608V1-8R2-R  | 8.2           | 60                   | 1.05                    | 18                | 1.0                  | 50                |
| MCL1608V1-100-R  | 10            | 60                   | 1.15                    | 17                | 1.0                  | 50                |
| MCL1608V1-120-R  | 12            | 60                   | 1.25                    | 15                | 1.0                  | 50                |

1. Test frequency and voltage at +25 °C
2. Resistance to soldering heat: +260 ±5 °C for 10 ± 1 second
3. At low temperature (-40 ±2°C) the inductance change is within ±10%
4. At high temperature (+85 ±2°C) the inductance change is within ±10%

5. Rated I: When rated I is applied to the product, self-temperature rise will be 40 °C or less.
6. Part Number Definition: MCL1608V1-xxx-R  
MCL1608 = Product code and size  
V1= Version indicator  
xxx= inductance value in uH, R= decimal point,  
If no R is present then last character equals number of zeros  
-R suffix = RoHS compliant

Dimensions (mm)



Schematic



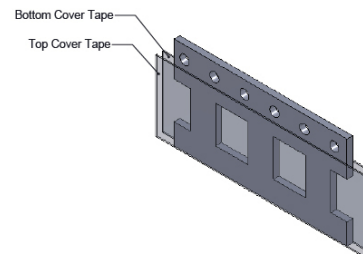
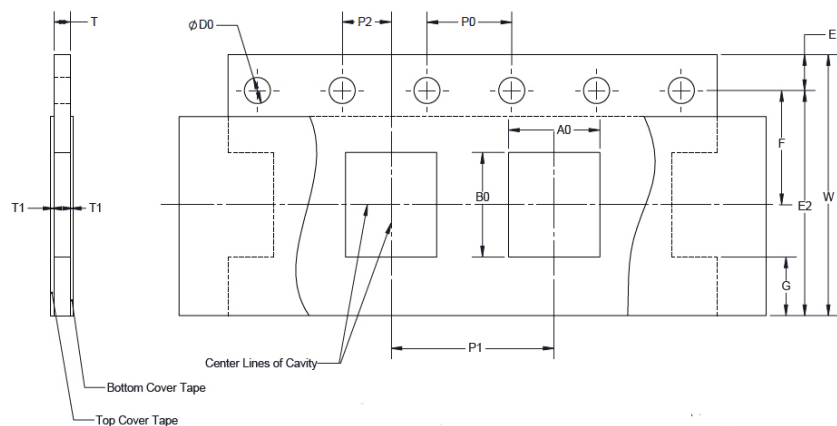
| Part Number     | L         | W          | T          | a          | A         | B         | C          |
|-----------------|-----------|------------|------------|------------|-----------|-----------|------------|
| MCL1608V1-xxx-R | 1.6 ±0.20 | 0.80 ±0.20 | 0.80 ±0.20 | 0.30 ±0.20 | 1.2 ±0.10 | 0.9 ±0.10 | 0.40 ±0.10 |

No part marking  
All soldering surfaces to be coplanar within 0.1 millimeters  
Tolerances are ±0.2 millimeters unless stated otherwise  
Pad layout tolerances are ±0.1 millimeters unless stated otherwise  
Do not route traces or vias underneath the inductor

Packaging information (mm)

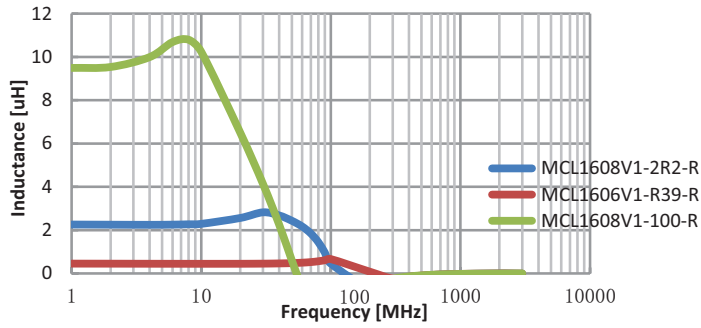
Drawing not to scale

Supplied in tape and reel packaging, 4000 parts per 7" diameter reel

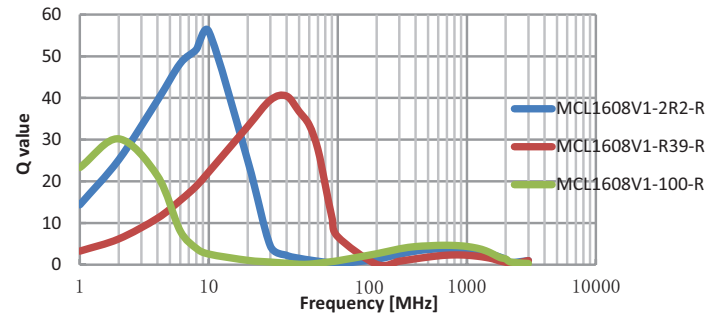


|             |           |
|-------------|-----------|
| W ±0.3      | 8.00      |
| F ±0.05     | 3.50      |
| E1 ±0.10    | 1.75      |
| E2 Min      | 6.25      |
| P0 ±0.10    | 4.00      |
| P1 ±0.20    | 4.00      |
| P2 ±0.1     | 2.00      |
| D0 +0.10/-0 | 1.50      |
| A0          | 1.1 ±0.20 |
| B0          | 1.9 ±0.20 |
| T Max       | 1.10      |
| T1 Max      | na        |

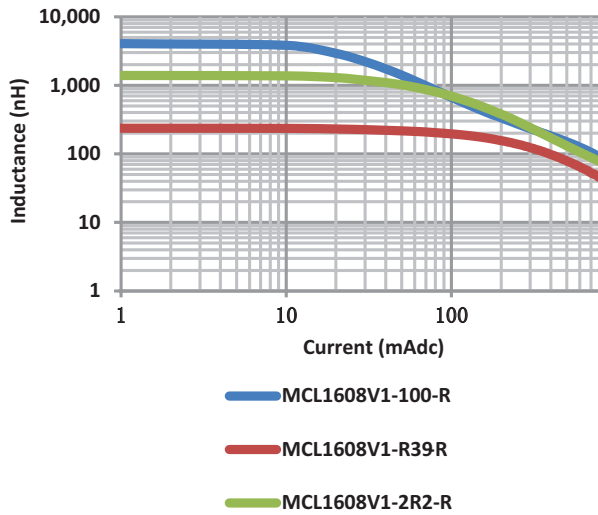
**Inductance vs frequency**



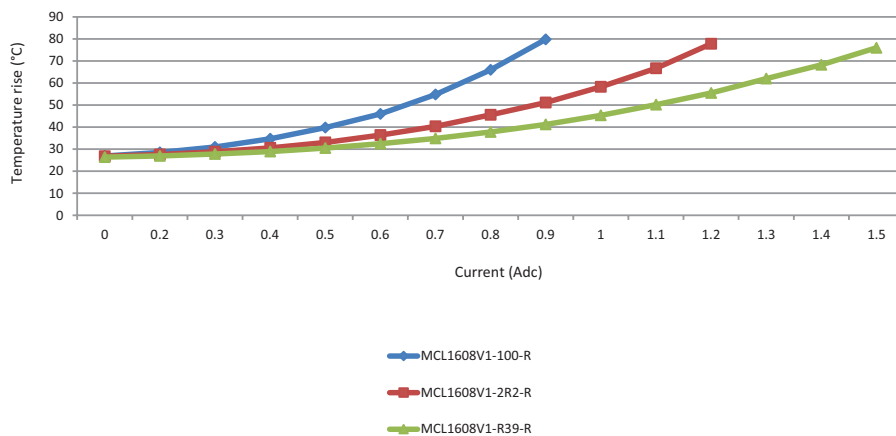
**Q vs frequency**



**Inductance vs current**



**Temperature rise vs current**



Solder reflow profile

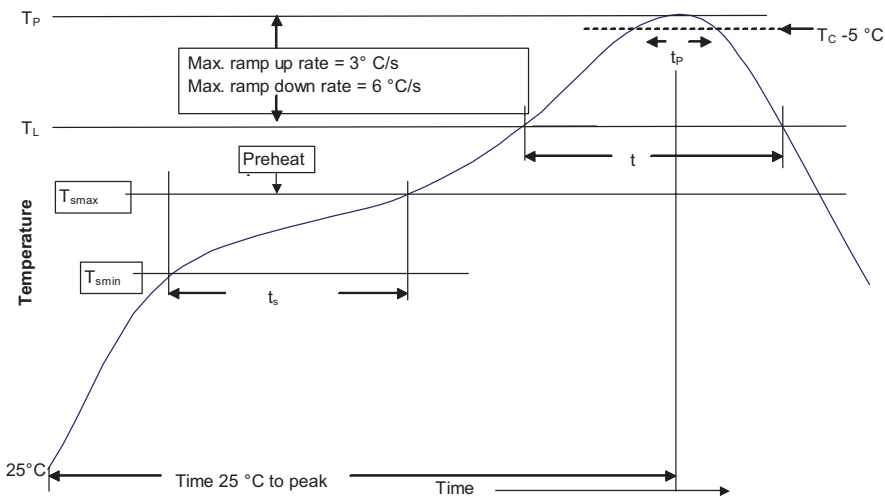


Table 1 - Standard SnPb solder ( $T_C$ )

| Package Thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5 mm)          | 235 °C                      | 220 °C                      |
| ≥2.5 mm           | 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 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6 mm           | 260 °C                      | 260 °C                            | 260 °C                       |
| 1.6 – 2.5 mm      | 260 °C                      | 250 °C                            | 245 °C                       |
| >2.5 mm           | 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 ( $T_C$ ) | 10 seconds**         | 10 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.

### Wave solder profile



### Reference EN 61760-1:2006

| Profile feature                               | Standard SnPb solder                      | Lead (Pb) free solder                     |
|---|---|---|
| Preheat                                       |   |   |
| • Temperature min. ( $T_{smin}$ )             | 100 °C                                    | 100 °C                                    |
| • Temperature typ. ( $T_{styp}$ )             | 120 °C                                    | 120 °C                                    |
| • Temperature max. ( $T_{smax}$ )             | 130 °C                                    | 130 °C                                    |
| • Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ ) | 70 seconds                                | 70 seconds                                |
| $\Delta$ preheat to max Temperature           | 150 °C max.                               | 150 °C max.                               |
| Peak temperature ( $T_p$ )*                   | 235 °C – 260 °C                           | 250 °C – 260 °C                           |
| Time at peak temperature ( $t_p$ )            | 10 seconds max<br>5 seconds max each wave | 10 seconds max<br>5 seconds max each wave |
| Ramp-down rate                                | ~ 2 K/s min<br>~3.5 K/s typ<br>~5 K/s max | ~ 2 K/s min<br>~3.5 K/s typ<br>~5 K/s max |
| Time 25 °C to 25 °C                           | 4 minutes                                 | 4 minutes                                 |

### Manual solder

+350 °C, 4-5 seconds. (by soldering iron), generally manual, hand soldering is not recommended.

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