

# MCL1005

## Multilayer chip inductor



### Product features

- 0402 (1005 metric) package
- High self resonant frequency (SRF)
- Multilayer monolithic construction yields high reliability
- Suitable for wave and reflow soldering
- Inductance range from 1.0 nH to 360 nH
- 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: -55 °C to +125 °C (ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



**Product specifications**

Part number	OCL (nH) $\pm 5\%$	I Rated (mA) maximum	DCR ( $\Omega$ ) maximum @ +25°C	SRF (MHz) minimum	Q (minimum)	Test frequency (MHz)	Test voltage (mV)
MCL1005-1R0-R	1.0 $\pm 0.3$ nH	400	0.10	10000	8	100	50
MCL1005-1R1-R	1.1 $\pm 0.3$ nH	400	0.10	10000	8	100	50
MCL1005-1R2-R	1.2 $\pm 0.3$ nH	400	0.10	10000	8	100	50
MCL1005-1R3-R	1.3 $\pm 0.3$ nH	400	0.10	10000	8	100	50
MCL1005-1R5-R	1.5 $\pm 0.3$ nH	300	0.10	6000	8	100	50
MCL1005-1R6-R	1.6 $\pm 0.3$ nH	300	0.12	6000	8	100	50
MCL1005-1R8-R	1.8 $\pm 0.3$ nH	300	0.12	6000	8	100	50
MCL1005-2R0-R	2.0 $\pm 0.3$ nH	300	0.15	6000	8	100	50
MCL1005-2R2-R	2.2 $\pm 0.3$ nH	300	0.15	6000	8	100	50
MCL1005-2R4-R	2.4 $\pm 0.3$ nH	300	0.15	6000	8	100	50
MCL1005-2R7-R	2.7 $\pm 0.3$ nH	300	0.15	6000	8	100	50
MCL1005-3R0-R	3.0 $\pm 0.3$ nH	300	0.20	6000	8	100	50
MCL1005-3R3-R	3.3 $\pm 0.3$ nH	300	0.20	6000	8	100	50
MCL1005-3R6-R	3.6 $\pm 0.3$ nH	300	0.20	4000	8	100	50
MCL1005-3R9-R	3.9 $\pm 0.3$ nH	300	0.20	4000	8	100	50
MCL1005-4R3-R	4.3 $\pm 0.3$ nH	300	0.20	4000	8	100	50
MCL1005-4R7-R	4.7 $\pm 0.3$ nH	300	0.25	4000	8	100	50
MCL1005-5R1-R	5.1 $\pm 0.3$ nH	300	0.25	4000	8	100	50
MCL1005-5R6-R	5.6 $\pm 0.3$ nH	300	0.25	4000	8	100	50
MCL1005-6R2-R	6.2 $\pm 0.3$ nH	300	0.30	3900	8	100	50
MCL1005-6R8-R	6.8	300	0.30	3900	8	100	50
MCL1005-7R5-R	7.5	300	0.40	3700	8	100	50
MCL1005-8R2-R	8.2	300	0.40	3600	8	100	50
MCL1005-9R1-R	9.1	300	0.40	3400	8	100	50
MCL1005-100-R	10	300	0.40	3200	8	100	50
MCL1005-120-R	12	300	0.50	2700	8	100	50
MCL1005-150-R	15	300	0.50	2300	8	100	50
MCL1005-180-R	18	300	0.60	2100	8	100	50
MCL1005-200-R	20	300	0.60	2000	8	100	50
MCL1005-220-R	22	300	0.60	1900	8	100	50
MCL1005-270-R	27	300	0.70	1600	8	100	50
MCL1005-330-R	33	200	0.80	1300	8	100	50
MCL1005-390-R	39	200	1.00	1200	8	100	50
MCL1005-430-R	43	200	1.10	1100	8	100	50
MCL1005-470-R	47	200	1.10	1000	8	100	50
MCL1005-560-R	56	200	1.20	750	8	100	50
MCL1005-680-R	68	180	1.40	750	8	100	50
MCL1005-820-R	82	150	2.40	750	8	100	50
MCL1005-101-R	100	150	2.60	700	8	100	50

1. Test frequency and voltage are for OCL and Q at +25 °C
2. Resistance to soldering heat: +260  $\pm 5$  °C for 10  $\pm 1$  second
3. At low temperature resistance (-55  $\pm 2$ °C) the inductance change is within  $\pm 10\%$  and the Q within  $\pm 20\%$
4. At high temperature resistance (+125  $\pm 2$ °C) the inductance change is within  $\pm 10\%$  and the Q within  $\pm 20\%$

5. At high temperature load (+125  $\pm 2$ °C) the inductance change is within  $\pm 10\%$  and the Q within  $\pm 20\%$
6. Rated I: When rated I is applied to the product, self-temperature rise will be 40 °C or less.
7. Part Number Definition: MCL1005-xxx-R  
MCL1005 = Product code and size  
xxx= inductance value in nH, R= decimal point,  
If no R is present then last character equals number of zeros  
-R suffix = RoHS compliant

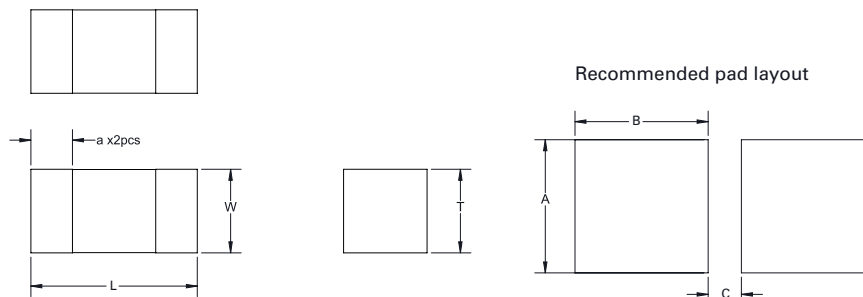
**Product specifications**

Part number	OCL (nH) ±5%	I Rated (mA) maximum	DCR (Ω) maximum @ +25°C	SRF (MHz) minimum	Q (minimum)	Test frequency (MHz)	Test voltage (mV)
MCL1005-121-R	120	150	2.80	600	8	100	50
MCL1005-151-R	150	100	3.20	550	8	100	50
MCL1005-181-R	180	100	3.70	500	8	100	50
MCL1005-221-R	220	100	4.00	450	8	100	50
MCL1005-271-R	270	100	4.50	400	8	100	50
MCL1005-331-R	330	50	7.00	350	6	50	50
MCL1005-361-R	360	50	7.50	300	6	50	50

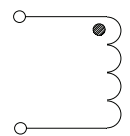
1. Test frequency and voltage are for OCL and Q at +25 °C
2. Resistance to soldering heat: +260 ±5 °C for 10 ± 1 second
3. At low temperature resistance (-55 ±2°C) the inductance change is within ±10% and the Q within ±20%
4. At high temperature resistance (+125 ±2°C) the inductance change is within ±10% and the Q within ±20%

5. At high temperature load (+125 ±2°C) the inductance change is within ±10% and the Q within ±20%
6. Rated I: When rated I is applied to the product, self-temperature rise will be 40 °C or less.
7. Part Number Definition: MCL1005-xxx-R  
 MCL1005 = Product code and size  
 xxx= inductance value in nH, R= decimal point,  
 If no R is present then last character equals number of zeros  
 -R suffix = RoHS compliant

**Dimensions (mm)**



**Schematic**



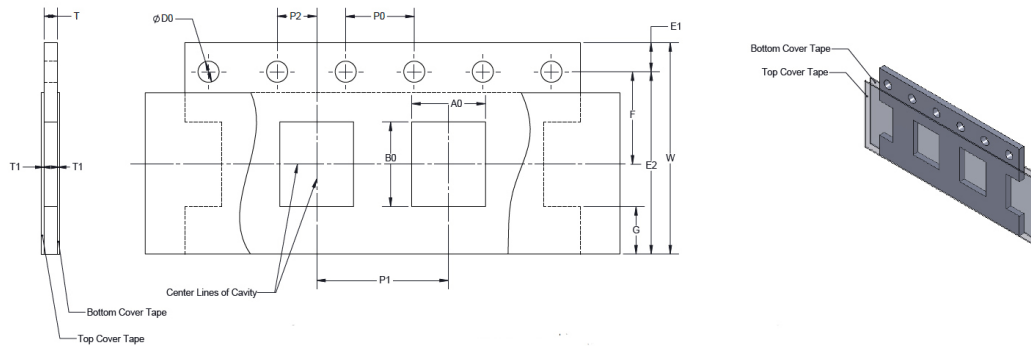
Part Number	L	W	T	a	A	B	C
MCL1005-xxx-R	1.0 ±0.15	0.50 ±0.15	0.50 ±0.15	0.25 ±0.10	0.85 ±0.10	0.8 ±0.10	0.2 ±0.10

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)**

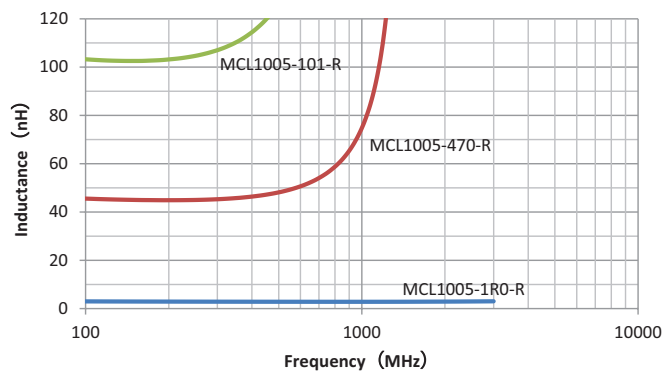
Drawing not to scale

Supplied in tape and reel packaging, 10000 parts per 7" diameter reel

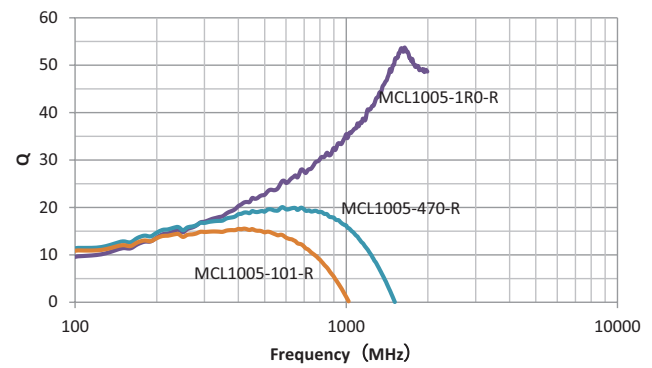


W ±0.3	8.00
F ±0.05	3.50
E1 ±0.10	1.75
E2 Min	6.25
P0 ±0.10	4.00
P1 ±0.05	2.00
P2 ±0.1	2.00
D0 +0.10/-0	1.50
A0	0.65 ±0.10
B0	1.15 ±0.10
T Max	0.8
T1 Max	na

**Inductance vs frequency**



**Q vs frequency**



Solder reflow profile

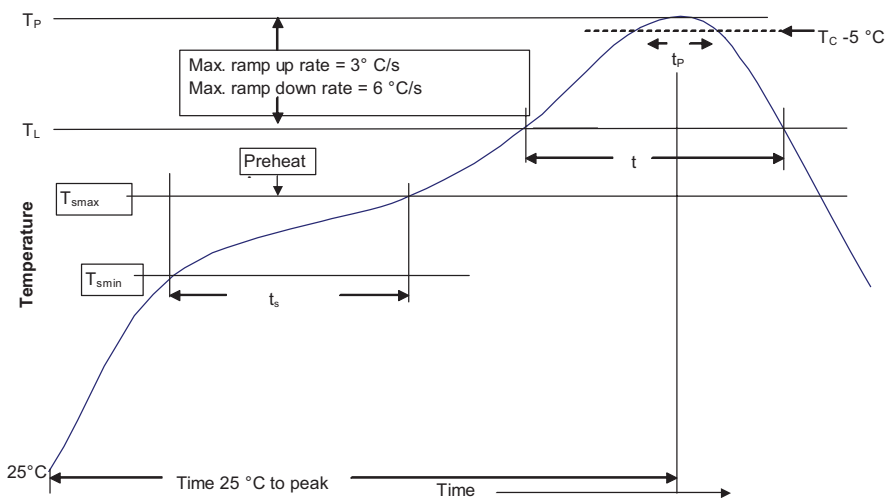


Table 1 - Standard SnPb solder ( $T_C$ )

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 5 seconds max each wave	10 seconds max 5 seconds max each wave
Ramp-down rate	~ 2 K/s min ~3.5 K/s typ ~5 K/s max	~ 2 K/s min ~3.5 K/s typ ~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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**Eaton**  
**Electronics Division**  
1000 Eaton Boulevard  
Cleveland, OH 44122  
United States  
[www.eaton.com/electronics](http://www.eaton.com/electronics)

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А