SPECIFICATIONS

Customer	
Product Name	**Multi-layer Chip Inductor for Choke**
Sunlord Part Number	**MCL2012 Series**
Customer Part Number	

[☒New Released, ☐Revised] **SPEC No.: MCL0706210000**

【This SPEC is total 9 pages including specifications and appendix.】

【ROHS, Halogen-Free and SVHC Compliant Parts】

Approved By	Checked By	Issued By

Shenzhen Sunlord Electronics Co., Ltd.

Address: Sunlord Industrial Park, Dafu Industrial Zone, Baoan, Shenzhen, China 518110

Tel: 0086-755-29832333 Fax: 0086-755-82269029 E-Mail: sunlord@sunlordinc.com

【For Customer approval Only】 Date:_____

Qualification Status: ☐ Full ☐ Restricted ☐ Rejected

Approved By	Verified By	Re-checked By	Checked By

Comments:

_____

【Version change history】

Rev.	Effective Date	Changed Contents	Change reasons	Approved By
01	/	New release	/	Hai Guo

Caution

All products listed in this specification are developed, designed and intended for use in general electronics equipment. The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require especially high reliability, or whose failure, malfunction or trouble might directly cause damage to society, person, or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below. Please contact us for more details if you intend to use our products in the following applications.

1. Aircraft equipment
2. Aerospace equipment
3. Undersea equipment
4. nuclear control equipment
5. military equipment
6. Power plant equipment
7. Medical equipment
8. Transportation equipment (automobiles, trains, ships,etc.)
9. Traffic signal equipment
10. Disaster prevention / crime prevention equipment
11. Data-processing equipment
12. Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

1. Scope

This specification applies to MCL2012 Series of multi-layer chip inductors for choke.

2. Product Description and Identification (Part Number)

1) Description

MCL2012 Series of multi-layer chip inductors for choke.

2) Product Identification (Part Number)

MCL 2012 ○ XXX □ ◎

① ② ③ ④ ⑤ ⑥

① Type	
MCL	Chip Inductor for choke

② External Dimensions (L x W) (mm)	
2012 [0805]	2.0 X 1.25

③ Feature Type	
S	Standard
H	IDC-Improved

④ Nominal Inductance	
Example	Nominal Value
1R0	1.0μH
100	10μH

⑤ Inductance Tolerance	
M	±20%
N	±30%

⑥ Packing	
T	Tape Carrier Package

3. Electrical Characteristics

Please refer to **Appendix A** (Page 9).

1) Operating and storage temperature range (individual chip without packing): *-55℃ ~ +125℃ (Including Self-heating)*

2) Storage temperature range (packaging conditions): -10℃~+40℃ and RH 70% (Max.)

4. Shape and Dimensions

1) Dimensions and recommended PCB pattern for reflow soldering: See **Fig.4-1**, **Fig.4-2** and **Table 4-1.**

2) Structure: See **Fig. 4-3** and **Fig. 4-4**.

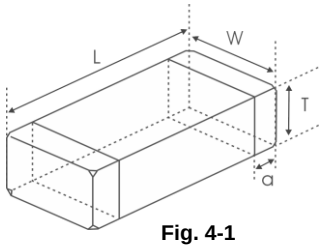


Fig. 4-1

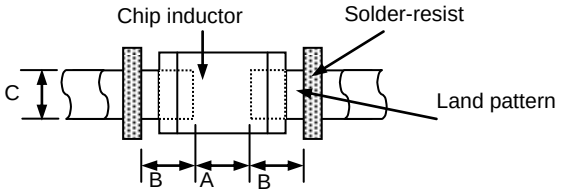


Fig. 4-2

[Table 4-1] Unit: mm [inch]

Type	L	W	T	a	A	B	C
2012 [0805]	2.0 (+0.3, -0.1) [0.079 (+0.012, -0.004)]	1.25±0.2 [0.049±0.008]	0.85±0.2[0.033±0.008]	0.5±0.3 [0.020±0.012]	0.80~1.20	0.80~1.20	0.90~1.60
			1.25±0.2[0.049±0.008]				

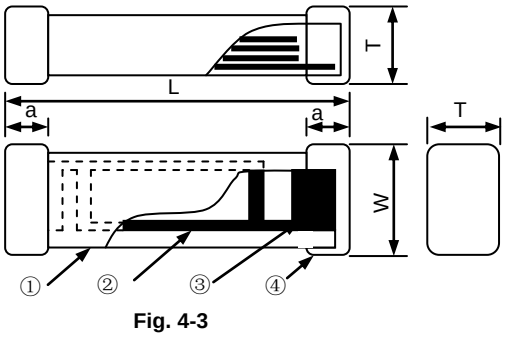


Fig. 4-3

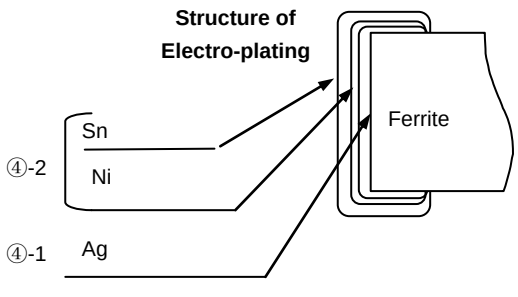


Fig. 4-4

① Ferrite for MCL Series

② Internal electrode (Ag)

③ Pull out electrode(Ag)

④-1 Terminal electrode: Inside (Ag)

④-2 Outside (Electro-plating Ni-Sn)

3) Material Information: See **Table 4-2**.

[Table 4-2]

Code	Part Name	Material Name
①	Ferrite Body	Ferrite Powder
②	Inner Coils	Silver Paste
③	Pull-out Electrode (Ag)	Silver Paste
④-1	Terminal Electrode: Inside Ag	Termination Silver Composition
④-2	Electro-Plating: Ni/Sn plating	Plating Chemicals

5. Test and Measurement Procedures

5.1 Test Conditions

5.1.1Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

a. Ambient Temperature: 20±15℃
b. Relative Humidity: 65±20%
c. Air Pressure: 86kPa to 106kPa

5.1.2If any doubt on the results, measurements/tests should be made within the following limits:

a. Ambient Temperature: 20±2℃
b. Relative Humidity: 65±5%
c. Air Pressure: 86kPa to 106kPa

5.2 Visual Examination

a. Inspection Equipment: 20× magnifier

5.3 Electrical Test

5.3.1 DC Resistance (DCR)

a. Refer to **Appendix A**.
b. Test equipment (Analyzer): High Accuracy Milliohmmeter-HP4338B or equivalent.

5.3.2 Inductance (L)

a. Refer to **Appendix A**.
b. Test equipment: High Accuracy RF Impedance /Material Analyzer-E4991A +HP16192A or equivalent.
c. Test signal: -20dBm or 50mV.
d. Test frequency refers to **Appendix A.**

5.3.3 Self-Resonant Frequency (SRF)

a. Refer to **Appendix A**.
b. Test equipment: High Accuracy RF Impedance/Material Analyzer-E4991A +HP16192A or equivalent.
c. Test signal: -20dBm or 50 mV.

5.3.4 Rated Current

a. Refer to **Appendix A**.
b. Test equipment: HP6632B system DC power supply, -E4991A +HP16192A+HP16200A or equivalent.
c. Measurement method:

1. Measurement conditions of initial inductance L: Measuring Frequency: 1MHz.
   Test Current: 1.0μH~4.7μH, 1mA; 10μH, 0.1mA.
2. Raising the voltage of the DC power supply, measure the inductance at the various current.
   The rated current is the value of DC current at which the inductance will be 50% down compared with the initial inductance value.
   Note: In the period of raising voltage, voltage cannot be reduced.

d. Definition of Rated Current (Ir): Ir is the value of DC current as inductance L (μH) decreased just 50% against initial value (see **Fig. 5.3.4-1)**.

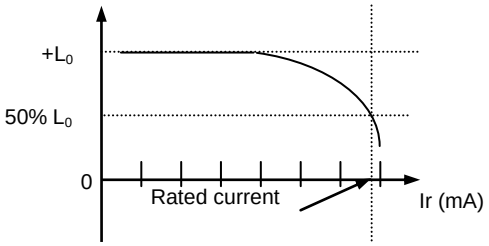
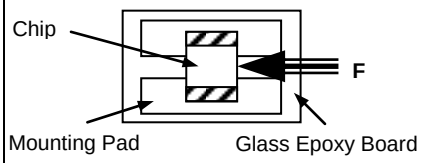
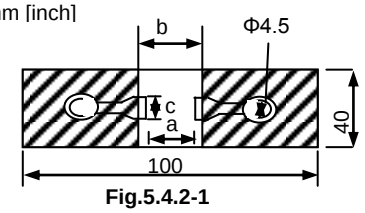
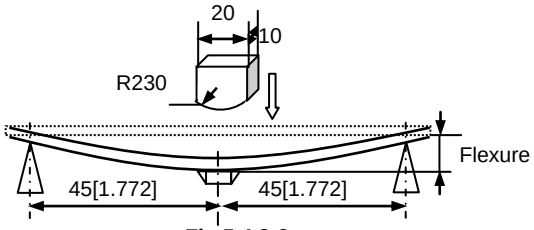
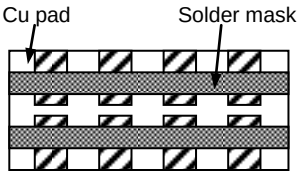
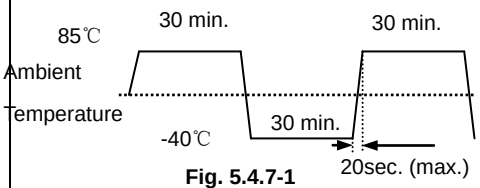


Fig. 5.3.4-1

5.4 Reliability Test

Items	Requirements	Test Methods and Remarks
5.4.1 Terminal Strength	No removal or split of the termination or other defects shall occur.  **Fig.5.4.1-1**	① Solder the inductor to the testing jig (glass epoxy board shown in **Fig.5.4.1-1**) using leadfree solder. Then apply a 10N force in the direction of the arrow. ② Keep time: 10±1s. ③ Speed: 1.0mm/s.
5.4.2 Resistance to Flexure	No visible mechanical damage. Type / a / b / c: 2012[0805] / 1.2 / 4.0 / 1.65 Unit: mm [inch]  **Fig.5.4.2-1**	① Solder the inductor to the test jig (glass epoxy board shown in **Fig.5.4.2-1**) Using a leadfree solder. Then apply a force in the direction shown **Fig. 5.4.2-2.** ② Flexure: 2mm. ③ Pressurizing Speed: 0.5mm/sec. ④ Keep time: 30 sec.  **Fig.5.4.2-2**
5.4.3 Vibration	No visible mechanical damage.  **Fig. 5.4.3-1**	① Solder the inductor to the testing jig (glass epoxy board shown in **Fig.5.4.3-1**) using leadfree solder. ② The inductor shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. ③ The frequency range from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3mutually perpendicular directions (total of 6 hours).
5.4.4 Temperature	Inductance change should be within ±20% of initial value measuring at 20℃.	Temperature range: -40℃~ +85℃ Reference temperature: +20℃
5.4.5 Solderability	① No visible mechanical damage. ② Wetting shall exceed 95% coverage.	① Solder temperature: 240±2℃ ② Duration: 3sec. ③ Solder: Sn/3.0Ag/0.5Cu. ④ Flux: 25% Resin and 75% ethanol in weight.
5.4.6 Resistance to Soldering Heat	① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ Inductance change: Within ±20%.	① Solder temperature: 260±3℃. ② Duration: 5sec. ③ Solder: Sn/3.0Ag/0.5Cu. ④ Flux: 25% Resin and 75% ethanol in weight. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.7 Thermal Shock	① No mechanical damage. ② Inductance change: Within ±20%.  **Fig. 5.4.7-1**	① Temperature, Time: (See **Fig.5.4.7-1**) -40℃ for 30±3 min→ 85℃ for 30±3min. ② Transforming interval: 20sec.(max.). ③ Tested cycle: 100 cycles. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

5.4.8 Resistance to Low Temperature	① No mechanical damage. ② Inductance change: Within ±20%.	① Temperature: -40±2℃ ② Duration: 1000^{+24} hours. ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.9 Loading Under Damp Heat	① No visible mechanical damage. ② Inductance change: within ±20%.	① Temperature: 60±2℃ ② Humidity: 90% to 95% RH. ③ Duration: 1000^{+24} hours. ④ Applied current: Rated current. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.10 Loading at High Temperature (Life Test)	① No visible mechanical damage. ② Inductance change: within ±20%.	① Temperature: 85±2℃ ② Duration: 1000^{+24} hours. ③ Applied current: Rated current. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

6. Packaging, Storage

6.1 Packaging

Tape Carrier Packaging:

Packaging code: T

a. Tape carrier packaging are specified in attached figure **Fig.6.1-1~4**

b. Tape carrier packaging quantity please see the following table:

Type	2012[0805]	
T(mm)	0.85±0.2	1.25±0.2
Tape	Paper Tape	Embossed Tape
Quantity	4K	3K

(1) Taping Drawings (Unit: mm)

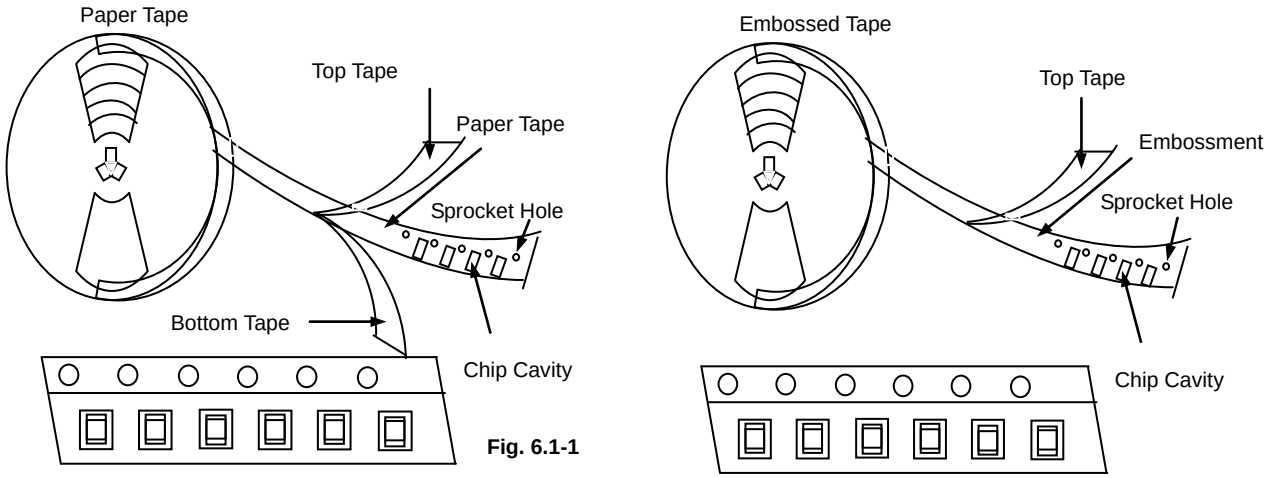
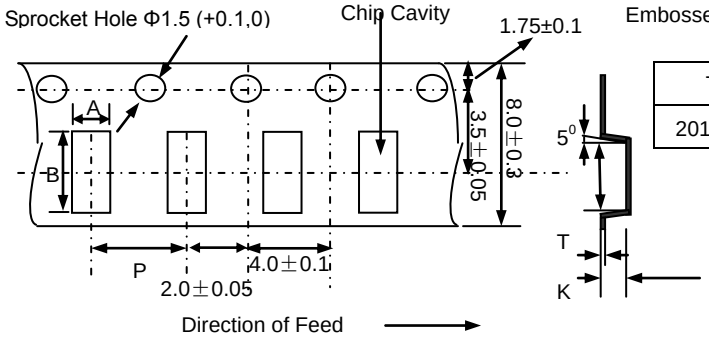


Fig. 6.1-1

Remark: The sprocket holes are to the right as the tape is pulled toward the user.

(2) Taping Dimensions (Unit: mm)



Type	A	B	P	Kmax	Tmax
2012[0805]	1.55±0.2	2.25±0.2	4.0±0.1	1.45	0.3

Fig. 6.1-2

Paper Tape

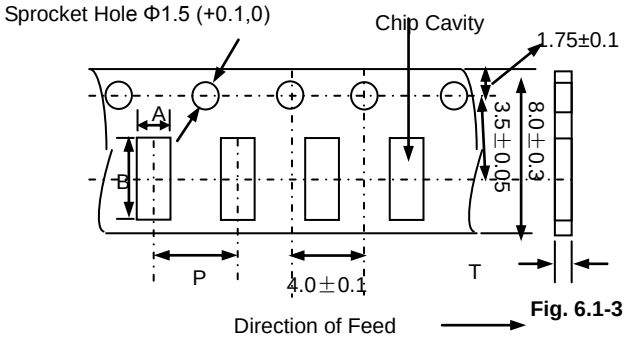


Fig. 6.1-3

Type	A	B	P	T max
2012[0805]	1.5±0.2	2.3±0.2	4.0±0.1	1.1

(3) Reel Dimensions (Unit: mm)

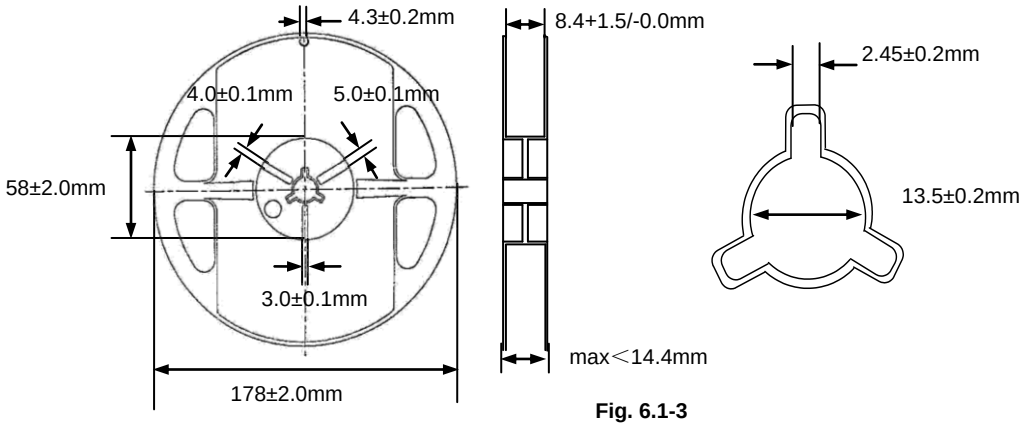


Fig. 6.1-3

6.2 Storage

a. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to high humidity. Package must be stored at 40℃ or less and 70% RH or less.

b. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust of harmful gas (e.g. HCl, sulfurous gas of H_2S).

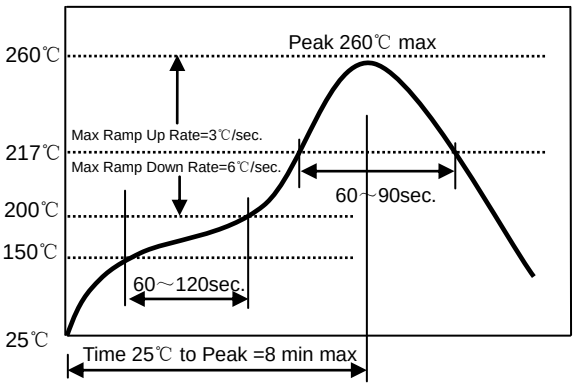
c. Packaging material may be deformed if package are stored where they are exposed to heat of direct sunlight.

d. Solderability specified in **Clause 5.4.6** shall be guaranteed for 12months from the date of delivery on condition that they are stored at the environment specified in **Clause 3** .For those parts, which passed more than 12 months shall be checked solder-ability before use.

7. Recommended Soldering Technologies

7.1 Re-flowing Profile:

△ Preheat condition: 150 ~200℃/60~120sec.
△ Allowed time above 217℃: 60~90sec.
△ Max temp: 260℃
△ Max time at max temp: 10sec.
△ Solder paste: Sn/3.0Ag/0.5Cu
△ Allowed Reflow time: 2x max

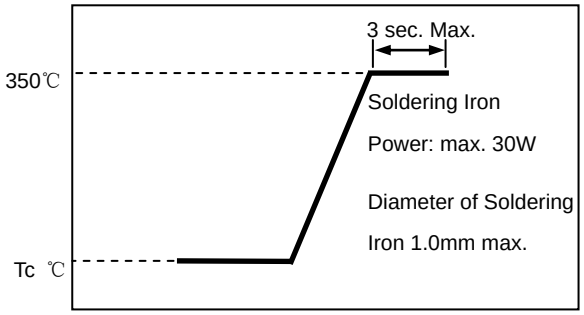


[Note: The reflow profile in the above table is only for qualification and is not meant to specify board assembly profiles. Actual board assembly profiles must be based on the customer's specific board design, solder paste and process, and should not exceed the parameters as the Reflow profile shows.]

7.2 Iron Soldering Profile.

△ Iron soldering power: Max.30W.
△ Pre-heating: 150 ℃ / 60 sec.
△ Soldering Tip temperature: 350℃Max.
△ Soldering time: 3sec Max.
△ Solder paste: Sn/3.0Ag/0.5Cu.
△ Max.1 times for iron soldering.

[Note: Take care not to apply the tip of the soldering iron to the terminal electrodes.]



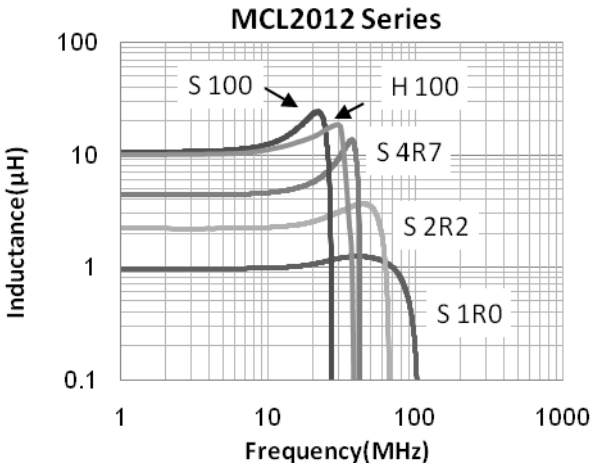
Appendix A: Electrical Characteristics

Part Number	L (μH)	L Test Freq. (MHz)	S.R.F Min. (MHz)	*DCR (Ω)*		Ir Max. (mA)	Thickness (mm) [inch]
				(Typ.)	*(Max.)*		
MCL2012SR10□T	0.1	1	235	*0.070*	*0.091*	1000	0.85±0.2 [.033±.008]
MCL2012SR22□T	0.22	1	170	*0.130*	*0.169*	800	
MCL2012SR47□T	0.47	1	125	*0.180*	*0.234*	550	
MCL2012S1R0□T	1.0	1	75	*0.200*	*0.260*	300	
MCL2012S2R2□T	2.2	1	50	*0.280*	*0.364*	220	
MCL2012S4R7□T	4.7	1	25	*0.300*	*0.390*	180	
MCL2012S100□T	10	1	15	*0.500*	*0.650*	60	1.25±0.2 [.049±.008]
MCL2012H100□T	10	1	20	*0.500*	*0.650*	100	

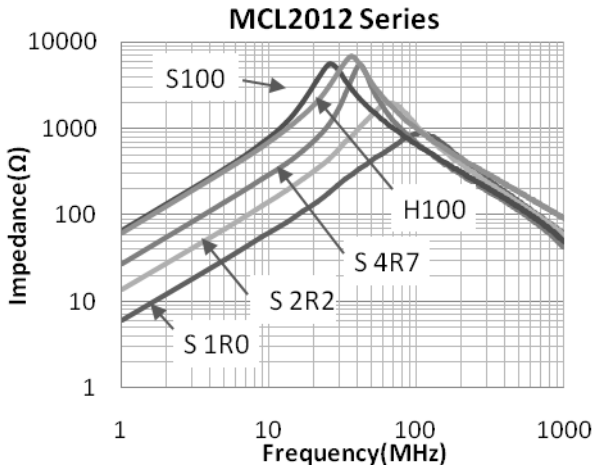
※□: Please specify the inductance tolerance code (M=±20%, N=±30%).

Typical Electrical Characteristics

Inductance vs. Frequency Characteristics



Impedance vs. Frequency Characteristics



Inductance vs. DC Current Characteristics