

FEATURES 特征

- large rated current and low direct-current resistance.
高额定电流，低内阻
- No cross coupling due to magnetic shield.
采用磁屏蔽设计，无交叉耦合问题
- Perfect shape for mounting with no directionality.
外形设计优化，安装无方向性限制
- Superior solderability and resistance to soldering heat ,suitable for reflow soldering.
优良的可焊性及耐热冲击性，适合回流焊
- Operating Temp : -40℃~+85℃(Including self heating)
工作温度范围:-40~+85℃(包括自身温度上升)



APPLICATIONS 用途

- Widely use in DC-DC conversion circuits in products such as communication equipment,wearable devices,DVCs,and HDDs.
广泛应用于通信设备、可穿戴设备、DVCs、HDDs等产品的DC-DC转换电路

PART NUMBERING 产品型号

APLE	1608	-	100	M	P	T	D7
①	②	③	④	⑤	⑥	⑦	

① Series Name	
APLE	Multilayer Chip Ferrite Power Inductors

③ Inductance	
Code (example)	Nominal inductance [μH]
47N	0.047
R47	0.47
4R7	4.7
100	10

⑤ Characteristics Code
L、P

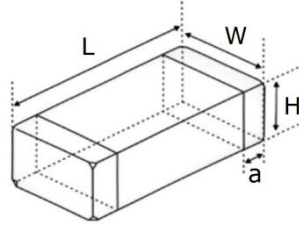
② External Dimensions [inch]	(L×W) (mm)
1608 [0603]	1.6×0.8
2012 [0805]	2.0×1.2
2520 [1008]	2.5×2.0
3216 [1206]	3.2×1.6

④ Inductance Tolerance	
M	±20%

⑥ Packaging	
T	Tape & Reel

⑦ Special Material Code
D7

■ DIMENSIONS 尺寸



Unit: mm [inch]

Dimensions				
Series	L	W	H	a
APPLE1608 [0603]	1.6± 0.20 [0.063± 0.008]	0.8± 0.20 [0.031± 0.008]	0.8± 0.20 [0.031± 0.008]	0.3± 0.2 [0.01± 0.008]
APPLE2012 [0805]	2.0± 0.20 [0.079± 0.008]	1.2± 0.20 [0.047± 0.008]	0.9± 0.20 [0.035± 0.008]	0.5± 0.3 [0.020± 0.012]
APPLE2520 [1008]	2.5± 0.20 [0.098± 0.008]	2.0± 0.20 [0.079± 0.008]	0.9± 0.20 [0.035± 0.008]	0.5± 0.3 [0.020± 0.012]
APPLE3216 [1206]	3.2± 0.20 [0.126± 0.008]	1.6± 0.20 [0.063± 0.008]	0.9± 0.20 [0.035± 0.008]	0.5± 0.3 [0.020± 0.012]

■ ELECTRICAL CHARACTERISTICS 电气特性

● APPLE1608 Series

Part Number	Inductance@1MHz (μ H)±20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE1608-47NMLTD7	0.047	0.12	155	260
APPLE1608-56NMLTD7	0.056	0.12	155	260
APPLE1608-68NMLTD7	0.068	0.12	155	250
APPLE1608-82NMLTD7	0.082	0.12	155	245
APPLE1608-R10MLTD7	0.1	0.15	155	240
APPLE1608-R12MLTD7	0.12	0.2	155	205
APPLE1608-R15MLTD7	0.15	0.2	155	180
APPLE1608-R18MLTD7	0.18	0.2	155	165
APPLE1608-R22MLTD7	0.22	0.25	155	150
APPLE1608-R27MLTD7	0.27	0.3	105	136
APPLE1608-R33MLTD7	0.33	0.3	105	125
APPLE1608-R39MLTD7	0.39	0.35	105	110
APPLE1608-R47MLTD7	0.47	0.45	105	105
APPLE1608-R56MLTD7	0.56	0.45	105	95
APPLE1608-R68MLTD7	0.68	0.55	105	90
APPLE1608-R82MLTD7	0.82	0.6	105	85
APPLE1608-1R0MLTD7	1	0.3	155	75
APPLE1608-1R2MLTD7	1.2	0.3	155	65
APPLE1608-1R5MLTD7	1.5	0.35	125	60

ELECTRICAL CHARACTERISTICS 电气特性

● APPLE1608 Series

Part Number	Inductance@1MHz (μ H) $\pm$ 20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE1608-1R8MLTD7	1.8	0.4	125	55
APPLE1608-2R2MLTD7	2.2	0.5	125	50
APPLE1608-2R7MLTD7	2.7	0.6	105	45
APPLE1608-3R3MLTD7	3.3	0.65	105	40
APPLE1608-3R9MLTD7	3.9	0.7	85	35
APPLE1608-4R7MLTD7	4.7	0.75	85	33
APPLE1608-5R6MLTD7	5.6	0.9	62	22
APPLE1608-6R8MLTD7	6.8	0.9	62	20
APPLE1608-8R2MLTD7	8.2	1.05	62	18
APPLE1608-100MLTD7	10	1.15	62	17
APPLE1608-120MLTD7	12	1.25	62	15

● APPLE2012 Series

Part Number	Inductance@1MHz (μ H) $\pm$ 20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE2012-47NMLTD7	0.047	0.15	360	320
APPLE2012-56NMLTD7	0.056	0.15	360	320
APPLE2012-68NMLTD7	0.068	0.2	360	280
APPLE2012-82NMLTD7	0.082	0.2	360	280
APPLE2012-R10MLTD7	0.1	0.2	360	235
APPLE2012-R12MLTD7	0.12	0.2	360	220
APPLE2012-R15MLTD7	0.15	0.2	360	200
APPLE2012-R18MLTD7	0.18	0.25	310	185
APPLE2012-R22MLTD7	0.22	0.25	310	170
APPLE2012-R27MLTD7	0.27	0.25	310	150
APPLE2012-R33MLTD7	0.33	0.25	310	145
APPLE2012-R39MLTD7	0.39	0.3	260	135
APPLE2012-R47MLTD7	0.47	0.3	260	125
APPLE2012-R56MLTD7	0.56	0.36	210	115
APPLE2012-R68MLTD7	0.68	0.36	210	105
APPLE2012-R82MLTD7	0.82	0.36	210	100
APPLE2012-1R0MLTD7	1	0.26	230	75
APPLE2012-1R2MLTD7	1.2	0.26	230	65
APPLE2012-1R5MLTD7	1.5	0.3	185	60
APPLE2012-1R8MLTD7	1.8	0.3	185	55
APPLE2012-2R2MLTD7	2.2	0.36	155	50
APPLE2012-2R7MLTD7	2.7	0.36	155	45
APPLE2012-3R3MLTD7	3.3	0.4	125	41
APPLE2012-3R9MLTD7	3.9	0.4	125	38
APPLE2012-4R7MLTD7	4.7	0.4	125	35

ELECTRICAL CHARACTERISTICS 电气特性

● APPLE2012 Series

Part Number	Inductance@1MHz (μ H) $\pm$ 20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE2012-5R6MLTD7	5.6	0.6	105	32
APPLE2012-6R8MLTD7	6.8	0.6	105	29
APPLE2012-8R2MLTD7	8.2	0.65	105	26
APPLE2012-100MLTD7	10	0.65	105	24
APPLE2012-120MLTD7	12	0.65	105	22
APPLE2012-150MLTD7	15	0.75	52	19
APPLE2012-180MLTD7	18	0.75	52	18
APPLE2012-220MLTD7	22	0.75	52	16
APPLE2012-47NMPTD7	0.047	0.1	1150	280
APPLE2012-56NMPTD7	0.056	0.1	1150	280
APPLE2012-68NMPTD7	0.068	0.15	1150	250
APPLE2012-82NMPTD7	0.082	0.15	1150	250
APPLE2012-R10MPTD7	0.1	0.15	1150	210
APPLE2012-R12MPTD7	0.12	0.15	1150	200
APPLE2012-R15MPTD7	0.15	0.15	1150	175
APPLE2012-R18MPTD7	0.18	0.15	1150	160
APPLE2012-R22MPTD7	0.22	0.15	1150	150
APPLE2012-R27MPTD7	0.27	0.15	1150	130
APPLE2012-R33MPTD7	0.33	0.15	1150	120
APPLE2012-R39MPTD7	0.39	0.15	1150	110
APPLE2012-R47MPTD7	0.47	0.15	1150	100
APPLE2012-R56MPTD7	0.56	0.36	830	100
APPLE2012-R68MPTD7	0.68	0.36	830	95
APPLE2012-R82MPTD7	0.82	0.36	830	90
APPLE2012-1R0MPTD7	1	0.24	830	75
APPLE2012-1R2MPTD7	1.2	0.24	830	65
APPLE2012-1R5MPTD7	1.5	0.3	730	60
APPLE2012-1R8MPTD7	1.8	0.36	620	55
APPLE2012-2R2MPTD7	2.2	0.36	620	50
APPLE2012-2R7MPTD7	2.7	0.36	620	45
APPLE2012-3R3MPTD7	3.3	0.4	360	41
APPLE2012-3R9MPTD7	3.9	0.4	360	38
APPLE2012-4R7MPTD7	4.7	0.4	360	35
APPLE2012-5R6MPTD7	5.6	0.5	260	32
APPLE2012-6R8MPTD7	6.8	0.5	260	29
APPLE2012-8R2MPTD7	8.2	0.56	260	26
APPLE2012-100MPTD7	10	0.56	260	24
APPLE2012-120MPTD7	12	0.56	260	22
APPLE2012-150MPTD7	15	0.65	105	19

ELECTRICAL CHARACTERISTICS 电气特性

● APPLE2520 Series

Part Number	Inductance@1MHz (μ H) $\pm$ 20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE2520-1R0MPTD7	1	0.12	1550	70
APPLE2520-1R2MPTD7	1.2	0.15	1550	50
APPLE2520-1R5MPTD7	1.5	0.15	1550	50
APPLE2520-1R8MPTD7	1.8	0.18	1030	40
APPLE2520-2R2MPTD7	2.2	0.18	1030	40
APPLE2520-2R7MPTD7	2.7	0.22	1030	30
APPLE2520-3R3MPTD7	3.3	0.22	1030	30
APPLE2520-3R9MPTD7	3.9	0.26	1030	25
APPLE2520-4R7MPTD7	4.7	0.26	1030	25

● APPLE3216 Series

Part Number	Inductance@1MHz (μ H) $\pm$ 20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE3216-47NMLTD7	0.047	0.15	470	320
APPLE3216-56NMLTD7	0.056	0.15	470	320
APPLE3216-68NMLTD7	0.068	0.2	470	280
APPLE3216-82NMLTD7	0.082	0.2	470	280
APPLE3216-R10MLTD7	0.1	0.2	360	235
APPLE3216-R12MLTD7	0.12	0.2	360	220
APPLE3216-R15MLTD7	0.15	0.2	360	200
APPLE3216-R18MLTD7	0.18	0.2	360	185
APPLE3216-R22MLTD7	0.22	0.2	360	170
APPLE3216-R27MLTD7	0.27	0.2	360	150
APPLE3216-R33MLTD7	0.33	0.2	360	145
APPLE3216-R39MLTD7	0.39	0.3	230	135
APPLE3216-R47MLTD7	0.47	0.3	230	125
APPLE3216-R56MLTD7	0.56	0.3	230	115
APPLE3216-R68MLTD7	0.68	0.3	230	105
APPLE3216-R82MLTD7	0.82	0.3	230	100
APPLE3216-1R0MLTD7	1	0.2	260	75
APPLE3216-1R2MLTD7	1.2	0.2	260	65
APPLE3216-1R5MLTD7	1.5	0.25	260	60
APPLE3216-1R8MLTD7	1.8	0.25	260	55
APPLE3216-2R2MLTD7	2.2	0.3	210	50
APPLE3216-2R7MLTD7	2.7	0.3	210	45
APPLE3216-3R3MLTD7	3.3	0.3	210	41
APPLE3216-3R9MLTD7	3.9	0.35	155	38
APPLE3216-4R7MLTD7	4.7	0.35	155	35
APPLE3216-5R6MLTD7	5.6	0.5	105	32
APPLE3216-6R8MLTD7	6.8	0.5	105	29
APPLE3216-8R2MLTD7	8.2	0.5	105	26

ELECTRICAL CHARACTERISTICS 电气特性

● APPLE3216 Series

Part Number	Inductance@1MHz (μ H) $\pm$ 20%	Max. DC Resistance (Ω)	Max. Rated Current (mA)	Min. SRF (MHz)
APPLE3216-100MLTD7	10	0.5	105	24
APPLE3216-120MLTD7	12	0.6	105	22
APPLE3216-150MLTD7	15	0.8	52	19
APPLE3216-180MLTD7	18	0.8	52	18
APPLE3216-220MLTD7	22	1	52	16
APPLE3216-270MLTD7	27	1	52	14
APPLE3216-1R0MPTD7	1	0.15	1250	60
APPLE3216-1R2MPTD7	1.2	0.15	1250	65
APPLE3216-1R5MPTD7	1.5	0.17	1030	60
APPLE3216-1R8MPTD7	1.8	0.24	930	55
APPLE3216-2R2MPTD7	2.2	0.24	930	50
APPLE3216-2R7MPTD7	2.7	0.3	830	45
APPLE3216-3R3MPTD7	3.3	0.3	830	41
APPLE3216-3R9MPTD7	3.9	0.38	730	38
APPLE3216-4R7MPTD7	4.7	0.38	730	35
APPLE3216-5R6MPTD7	5.6	0.45	520	32
APPLE3216-6R8MPTD7	6.8	0.45	520	29
APPLE3216-8R2MPTD7	8.2	0.55	310	26
APPLE3216-100MPTD7	10	0.55	310	24
APPLE3216-120MPTD7	12	0.55	310	22
APPLE3216-150MPTD7	15	0.65	105	19
APPLE3216-180MPTD7	18	0.65	105	18

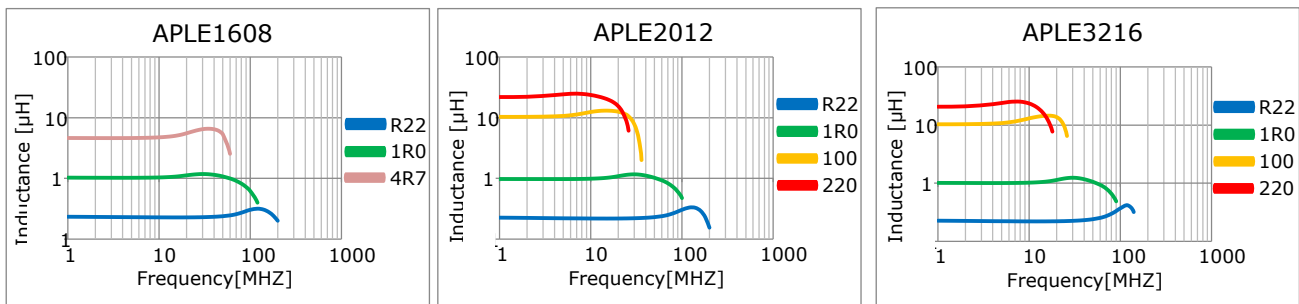
● Rated current:

Apply the rated current for Characteristics Code L series, and the Inductance drops shall not exceed 20%.
Apply the rated current for Characteristics Code P series, and the surface temperature rise of the product shall not exceed 40°C.

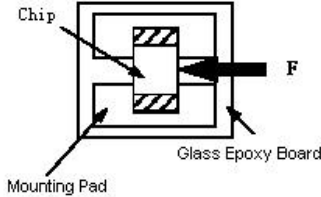
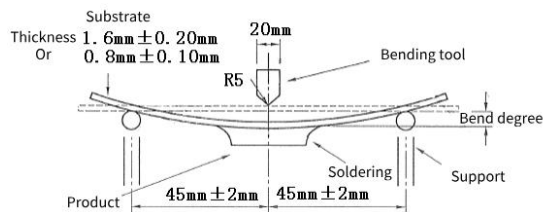
● Inductance testing conditions: E4982A or equivalent, test voltage 50mV $\pm$ 5mV, Temperature 15°C ~35°C, Humidity 25%~75%.

● RDC Testing conditions: RM3542A or equivalent, Temperature 15°C~35°C, Humidity 25%~75%.

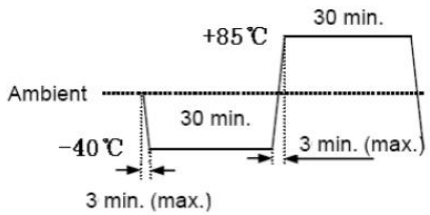
INDUCTANCE VS. FREQUENCY CHARACTERISTICS 感量-频率特性



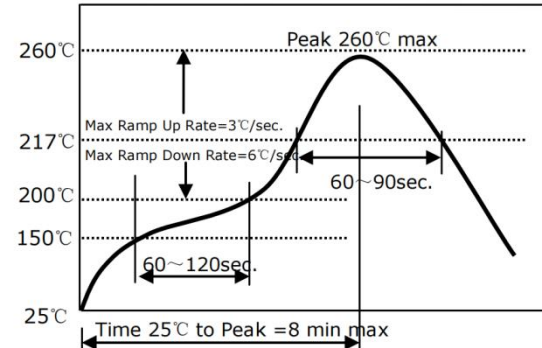
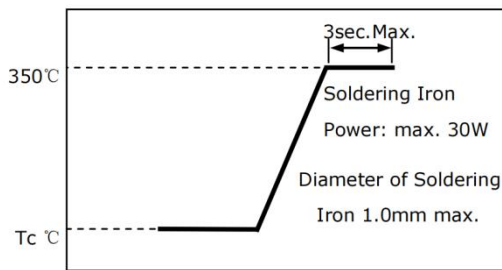
RELIABILITY TEST 可靠性测试

Items	Requirements	Test Methods and Remarks
1. Solder ability	No mechanical damage. 95% or more of electrode area shall be coated by new solder.	Preheating temperature: 120°C to 150°C Preheating time: 60s Solder 96.5%Sn/3.0%Ag/0.5%Cu of the Sn solder. Solder temperature: 245±3°C Immersion tin depth: 10mm Duration : 3±0.3s Dip performance to a flux of about: 3 ~ 5 s
2. Resistance to Soldering Heat	No mechanical damage. Inductance : change within ±30%	Preheating temperature: 120°C to 150°C Preheating time: 60s Solder 96.5%Sn/3.0%Ag/0.5%Cu of the Sn solder. Solder temperature: 260°C±5°C Immersion tin depth: 10mm Duration : 10±1s Dip performance to a flux of about: 3~5 s
3. Adhesion of electrode	The termination and body should be no damage.	Applied force: 7N force for 1608 series ; 10N force for 2012、2520、3216 series. Keep time : 10±1S 
4. Low temperature resistance	No mechanical damage. Inductance change: within ±10%	Temperature: -40±2°C Testing time: 1000 h (+24h)
5. Bending strength	No mechanical damage.	Testing board: glass epoxy-resin substrate For (1±0.5) mm/s compression speed, curvature: 2mm, hold time 20s±1s . 
6. Vibration	No mechanical damage. Inductance change: within ±20%	Amplitude modulation: 1.5mm Test time: A period of 2h in each of 3 mutually perpendicular directions. Frequency range: 10Hz to 55Hz to 10Hz for 1min.
7. High temperature resistance	No mechanical damage. Inductance change: within ±10%	Testing time: 1000 h (+24h) Temperature: 85±2°C
8. Static Humidity	No mechanical damage. Inductance change: within ±10%	Humidity: 90% to 95% RH Temperature: 60°C±2°C Testing time: 1000 h (+24h)

RELIABILITY TEST 可靠性测试

Items	Requirements	Test Methods and Remarks
9. High temperature load	No mechanical damage. Inductance change: within $\pm 10\%$	impose current: at room Testing time: 1000 h (+24h) Temperature: $85 \pm 2^\circ\text{C}$
10. Temperature Shock	No mechanical damage. Inductance change: within $\pm 10\%$	Temperature: -40°C for $30 \pm 3\text{min}$ $+85^\circ\text{C}$ for $30 \pm 3\text{min}$ Number of cycles: 32 
Note: When there are questions concerning, measurement shall be made after $24 \pm 2\text{hrs}$ of recovery under the standard condition.		

Recommended Soldering Technologies 回流焊建议

Reflowing Profile	
◆ Preheat condition: $150 \sim 200^\circ\text{C}/60 \sim 120\text{sec}$. ◆ Allowed time above 217°C: $60 \sim 90\text{sec}$. ◆ Max temp: 260°C ◆ 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.	
Iron Soldering Profile	
◆ Iron soldering power: Max.30W ◆ Pre-heating: $150^\circ\text{C} / 60\text{sec}$. ◆ Soldering Tip temperature: 350°C 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.	

■ Safety Reminders 注意事项

SAFETY REMINDERS

- The storage period is within 12 months. Be sure to follow the storage conditions (temperature: 15 to 35°C, humidity: 75% RH or less). If the storage period elapses, the soldering of the terminal electrodes may deteriorate.
- Do not use or store in locations where there are conditions such as gas corrosion (salt, acid, alkali, etc.).
- Soldering corrections after mounting should be within the range of the conditions determined in the specifications. If overheated, a short circuit, performance deterioration, or lifespan shortening may occur.
- When embedding a printed circuit board where a chip is mounted to a set, be sure that residual stress is not given to the chip due to the overall distortion of the printed circuit board and partial distortion such as at screw tightening portions.
- Self heating (temperature increase) occurs when the power is turned ON, so the tolerance should be sufficient for the set thermal design.
- This product is not designed for production processes involving ultrasonic welding, as high-frequency vibration may cause application issues such as product detachment and breakage.
- Carefully layout the coil for the circuit board design of the non-magnetic shield type. A malfunction may occur due to magnetic interference.
- Use a wrist band to discharge static electricity in your body through the grounding wire.
- Do not expose the products to magnets or magnetic fields.
- Do not use for a purpose outside of the contents regulated in the delivery specifications.
- The products listed on this catalog are intended for use in general electronic equipment, under a normal operation and use condition.

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) Aerospace/aviation equipment
- (2) Transportation equipment (cars, electric trains, ships, etc.)
- (3) Medical equipment
- (4) Power-generation control equipment
- (5) Atomic energy-related equipment
- (6) Seabed equipment
- (7) Transportation control equipment
- (8) Public information-processing equipment
- (9) Military equipment
- (10) Electric heating apparatus, burning equipment
- (11) Disaster prevention/crime prevention equipment
- (12) Safety equipment
- (13) Other applications that are not considered general-purpose applications

When designing your equipment even for general-purpose applications, you are kindly requested to take into consideration securing protection circuit/device or providing backup circuits in your equipment.