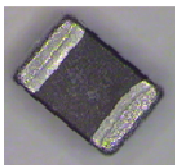




Multi-Layer Power Inductors (IP Series)



■ Feature

1. Small and light weight
2. Low DC resistance

■ Application

DC/DC converter for the Mobile equipment; Mobile Phone, DSC, WLAN

■ Ordering Code

IP 2012 1R0 M P S 9

PRODUCT CODE

IP : Multilayer Power Inductor (Lead Free)

DIMENSION (L X W)

Code	Dimension	EIA
1608	1.6 x 0.80 mm	0603
2012	2.0 X 1.25 mm	0805
2016	2.0 X 1.6 mm	0806
2520	2.5 X 2.0 mm	1008

INDUCTANCE CODE

Code	R47	1R0	1R5	2R2	3R3	4R7
Inductance (uH)	0.47	1.0	1.5	2.2	3.3	4.7

TOLERANCE CODE

M: ±20%

PACKAGING CODE

T: Paper tape reel
P: Embossed reel

SPECIFICATION CODE

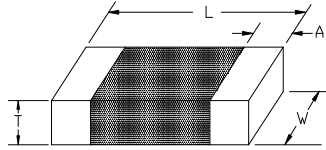
S: Standard
L: Light loading current

THICKNESS CODE

Code	5	7	8	9	B
Thickness (mm)	0.5	0.7	0.8	0.9	1.2



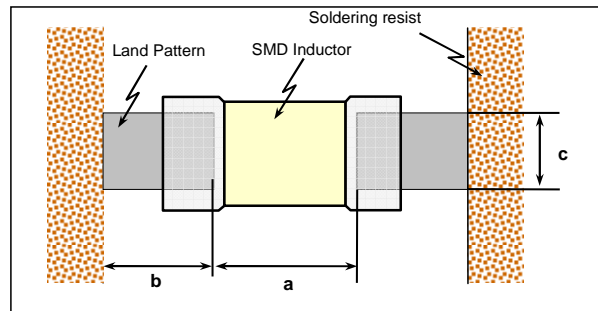
■ **Standard External Dimensions**



Unit: mm/(inch)

Series	L	W	T	A (Min/Max)	Packing Quantity (pcs/reel)	
					Paper Tape	Embossed Tape
IP1608 (0603)	1.6±0.15 (0.063±0.006)	0.8±0.15 (0.031±0.006)	0.95 max (0.037max)	0.1/0.5 (0.008/0.032)	4,000	----
IP2012 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	0.55 max (0.021max)	0.20/0.80 (0.008/0.032)	4,000	----
IP2012 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	1.0 max (0.039max)	0.20/0.80 (0.008/0.032)	----	3,000
IP2016 (0806)	2.0±0.2 (0.079±0.008)	1.6±0.2 (0.063±0.008)	1.0 max (0.039max)	0.20/0.80 (0.008/0.032)	----	3,000
IP2520 (1008)	2.5±0.2 (0.098±0.008)	2.0±0.2 (0.079±0.008)	1.0 max (0.039max)	0.20/0.80 (0.008/0.032)	----	3,000

Recommended Pad Dimensions



Size mm (EIA)	L x W (mm)	a (mm)	b (mm)	c (mm)
1608 (0603)	1.6 x 0.8	0.8 to 1.0	0.6 to 0.8	0.6 to 0.8
2012 (0805)	2.0 x 1.25	0.8 to 1.2	0.8 to 1.2	0.9 to 1.6
2016 (0806)	2.0 x 1.6	0.8 to 1.2	0.8 to 1.2	0.9 to 1.6
2520 (1008)	2.5 x 2.0	1.0 to 1.4	0.6 to 1.0	1.8 to 2.2

Unit: mm/(inch)


Part Numbers & Characteristic
● IP1608 (0603)

Ordering Code	Inductance [uH]	Inductance Tolerance	Measuring frequency [MHz]	DC Resistance [Ω]	Rated Current [A] (max.)	Thickness [mm] (max.)
IP1608R33MTS8	0.33	±20%	1	0.27±25%	0.35	0.95
IP1608R50MTS8	0.50			0.12±25%	0.90	
IP16081R0MTS8	1.00			0.17±25%	0.75	
IP16082R2MTS8	2.20			0.27±25%	0.65	

● IP2012 (EIA 0805)

Ordering Code	Inductance [uH]	Inductance Tolerance	Measuring frequency [MHz]	DC Resistance [Ω]	Rated Current [A] (max.)	Saturation Current [A] (max.)	Thickness [mm] (max.)
IP2012R47MTS5	0.47	±20%	1	0.12±25%	1.10	0.90	0.55
IP20121R0MTS5	1.00			0.19±25%	0.90	0.70	
IP20122R2MTS5	2.20			0.34±25%	0.60	0.35	
IP2012R47MPS9	0.47	±20%	1	0.09±25%	1.20	1.20	1.0
IP20121R0MPS9	1.00			0.11±25%	1.00	1.10	
IP20121R5MPS9	1.50			0.13±25%	0.95	0.90	
IP20122R2MPS9	2.20			0.17±25%	0.95	0.55	
IP20123R3MPS9	3.30			0.19±25%	0.80	0.30	
IP20124R7MPS9	4.70			0.23±25%	0.80	0.18	
IP20124R7MPL9	4.70	±20%	1	0.25±25%	0.80	--	1.0
IP2012100MPL9	10.0		2	0.60±25%	0.50	--	

● IP2016 (EIA 0806)

Ordering Code	Inductance [uH]	Inductance Tolerance	Measuring frequency [MHz]	DC Resistance [Ω]	Rated Current [A] (max.)	Thickness [mm] (max.)
IP2016R47MPS9	0.47	±20%	1	0.07±25%	1.60	1.0
IP20161R0MPS9	1.00			0.11±25%	1.30	
IP20161R5MPS9	1.50			0.12±25%	1.20	
IP20162R2MPS9	2.20			0.13±25%	1.20	
IP20163R3MPS9	3.30			0.15±25%	1.10	
IP20164R7MPS9	4.70			0.18±25%	0.90	



● IP2520 (EIA 1008)

Ordering Code	Inductance [uH]	Inductance Tolerance	Measuring frequency [MHz]	DC Resistance [Ω]	Rated Current [A] (max.)	Saturation Current [A] (max.)	Thickness [mm] (max.)
IP25201R0MPS9	1.00	±20%	1	0.06±25%	1.60	0.90	1.0
IP25201R5MPS9	1.50			0.07±25%	1.50	0.70	
IP25202R2MPS9	2.20			0.09±25%	1.30	0.60	
IP25204R7MPS9	4.70			0.13±25%	1.10	0.25	

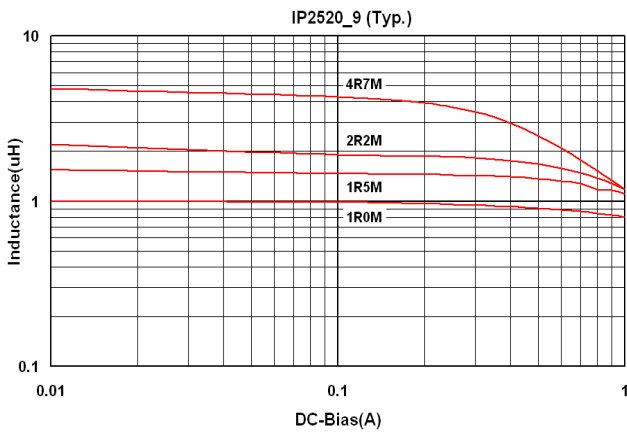
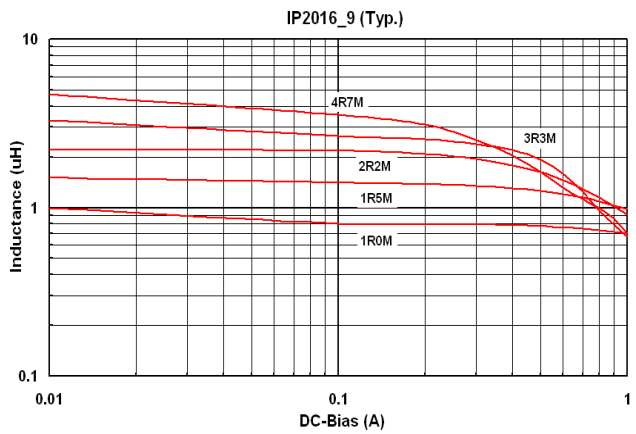
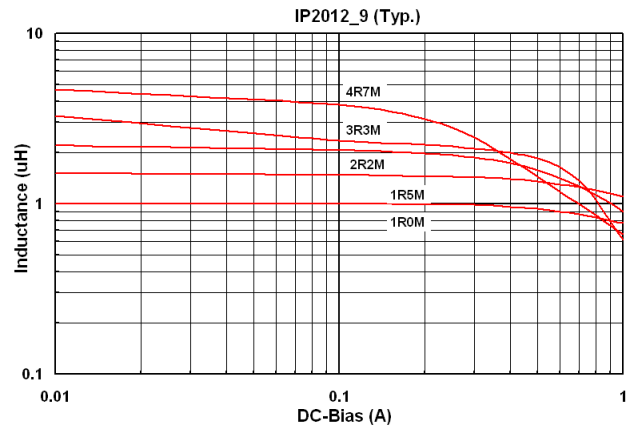
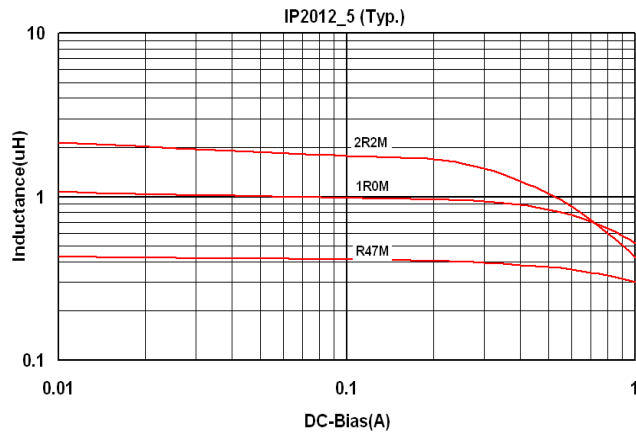
※Rated current specifies that self-heat generation is below 40°C during DC loaded (at 20°C)

※Saturated current specifies that inductance drop is below 30% during DC loaded (at 20°C)

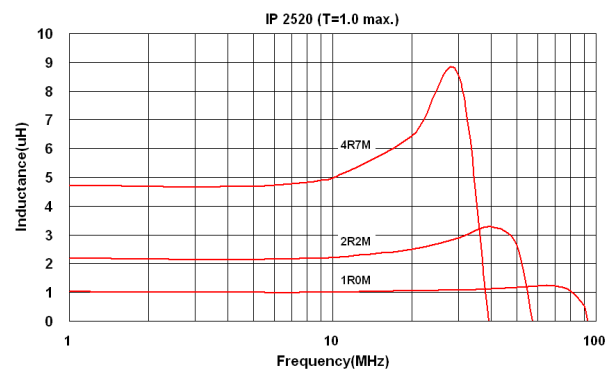
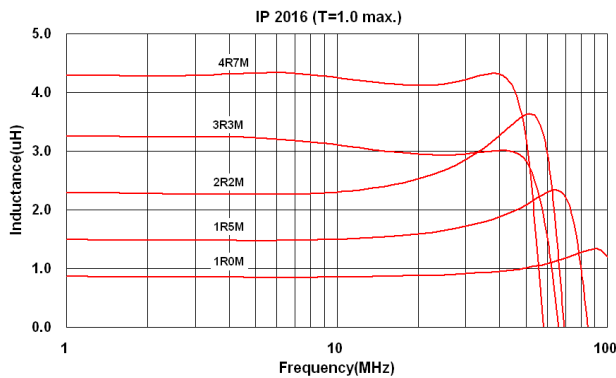
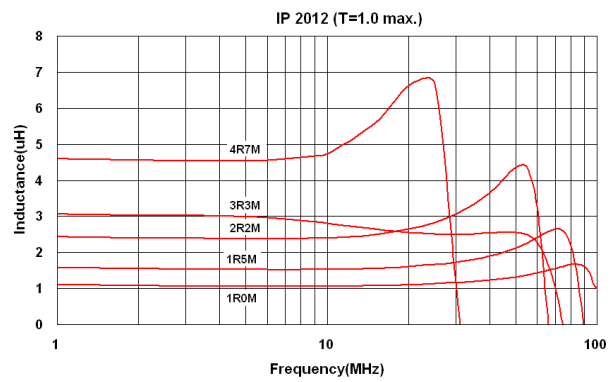
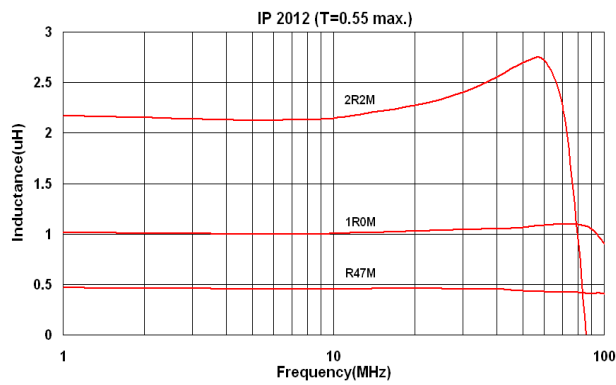
※Operating temperature range from -55°C to 125°C.



Electric Properties
DC Bias characteristics

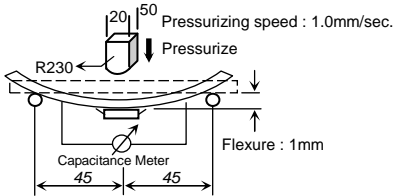


Inductance vs Frequency





■ Testing Condition & Requirements

No.	Item	Test Condition	Requirements
1	Appearance	Inductors shall be visually inspected for visible evidence of defect.	No harmful defect for piratical use.
2	Inductance	a. Temperature: 25+/- 3°C b. Relative Humidity: 45 to 75%RH c. Measuring equipment: HP4286A 、HP4287A Measuring Jig: HP42851-61100	Within specified tolerance.
3	DC Resistance	Measuring instrument: HP4338B 、HIOKI IM-3570	In accordance with electrical specification.
4	Dimension	Dimension shall be measured with caliper or micrometer	In accordance with dimension specification.
5	Solder-ability	Immerse a test sample into a methanol solution containing rosin and immerse into SAC305(Sn96.5Ag3.0Cu0.5) solder of 245±5°C for 3±1 seconds.	90% of the termination is to be soldered evenly and continuously.
6	Resistance to Soldering Heat	Immerse a test sample into a methanol solution containing resin, preheat it at 150 to 180°C for 2~3 minutes and immerse into molten solder of 260+/-5°C for 10+/-1 second so that both terminal electrodes are completely submerged. After this test samples shall be taken out and measured after kept at room temperature for 2 to 3 hours.	No visible damage Remained terminal electrode : 70% min. Inductance variation within 30%
7	Bending Strength	Solder the chip to test jig then apply a force in the direction shown in below. The soldering shall be done with the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. 	No mechanical damage shall be observed.
8	Thermal Shock	Solder a test sample to printed circuit board, and conduct 5 cycles of test under the conditions shown as below. Condition for 1 cycle Step1:-55+0 / -2°C 30±3 min. Step2: Room temperature within 2 to 3 min. Step3:+125 +2 / -0°C 30±3 min. Measured at room temperature after placing for 2 to 3 hrs.	No visible damage Inductance variation within 30%

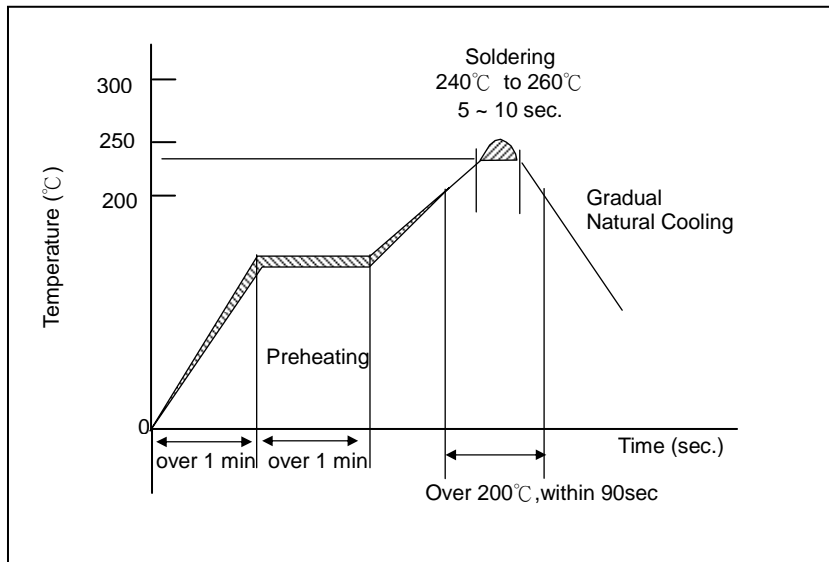


No.	Item	Test Condition	Requirements
9	High Humidity State Life Test	<p>Keep a test sample in an atmosphere with a temperature of $40\pm 2^{\circ}\text{C}$, 90~95%RH for 500 +24/-0 hours.</p> <p>After the removal from test chamber, 2 to 3 hours of recovery under standard condition, and measurement shall be made after 24 ± 2 hrs of recovery under standard condition.</p>	<p>No visible damage. Inductance variation within 30%.</p>
10	High Humidity Load Life Test	<p>Solder a test sample to printed circuit board then keep the test sample in an atmosphere with a temperature of $40\pm 2^{\circ}\text{C}$, 90~95%RH for 500+24/-0 hours while supplying the rated current.</p> <p>After the removal from test chamber, 2 to 3 hours of recovery under standard condition, and measurement shall be made after 24 ± 2 hrs of recovery under standard condition.</p>	<p>No visible damage. Inductance variation within 30%.</p>
11	High Temperature State Life Test	<p>Keep a test sample in an atmosphere with a temperature of $85\pm 2^{\circ}\text{C}$ for 500+24/-0 hours. After the removal from test chamber, 2 to 3 hours of recovery under standard condition, and measurement shall be made after 24 ± 2 hrs of recovery under standard condition.</p>	<p>No visible damage. Inductance variation within 30%.</p>
12	High Temperature Load	<p>Solder a test sample to printed circuit board then keep the test sample in an atmosphere with a temperature of $85\pm 2^{\circ}\text{C}$ for 500+24/-0 hours while supplying the rated current.</p> <p>After the removal from test chamber, 2 to 3 hours of recovery under standard condition, and measurement shall be made after 24 ± 2 hrs of recovery under standard condition.</p>	<p>No visible damage. Inductance variation within 30%.</p>

Reflow Profile Chart (Reference)

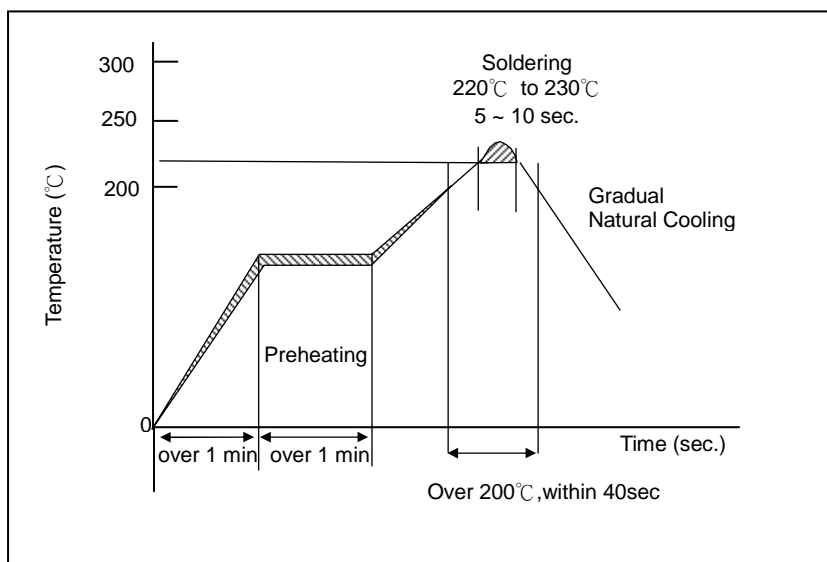
● Soldering Profile for SMT Process with Lead Free Solder Paste.

The rate of preheat should not exceed 4°C/sec and a target of 2°C/sec is preferred. Ceramic chip components should be preheated to within 100 to 130 °C of the soldering.



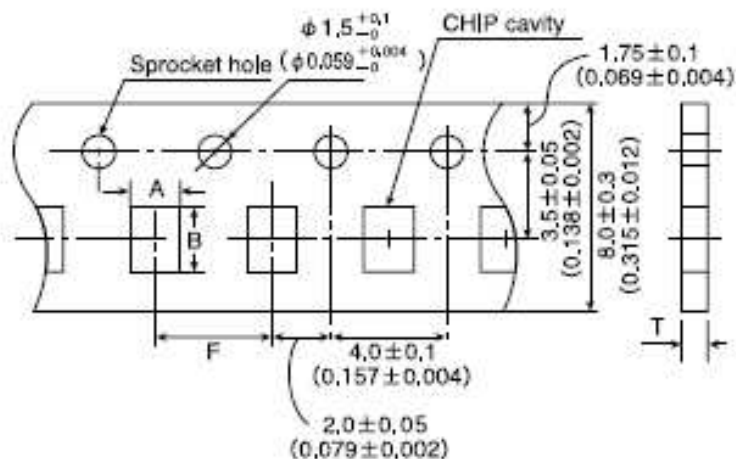
● Soldering Profile for SMT Process with SnPb Solder Paste.

The rate of preheat should not exceed 4°C/sec and a target of 2°C/sec is preferred. Ceramic chip components should be preheated to within 100 to 130 °C of the soldering.



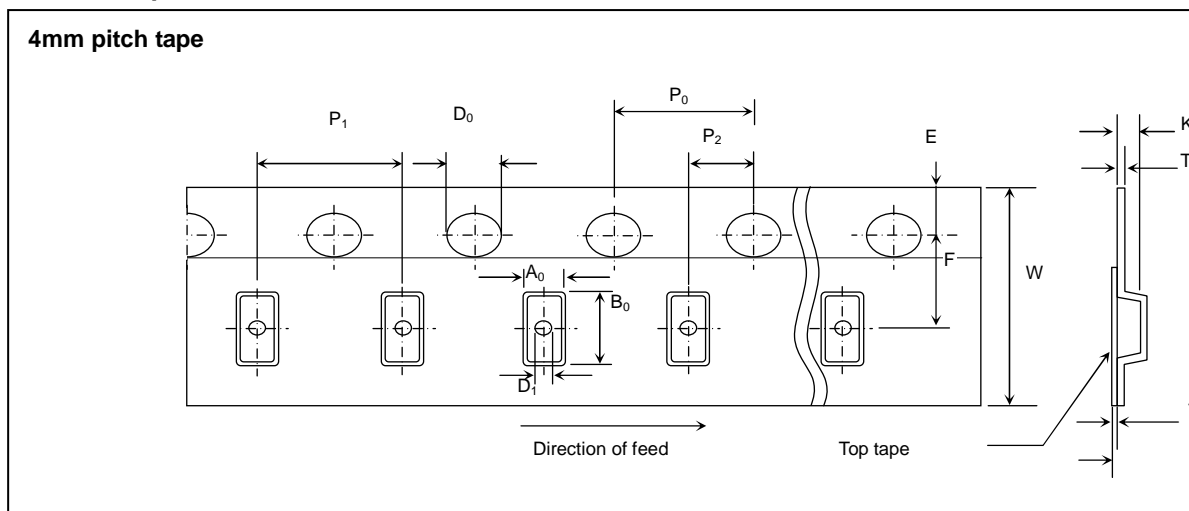
Packaging Specification

- Paper Tape



	Symbol	Product Size Code			
		0603(0201)	1005(0402)	1608(0603)	2012(0805)
		(mm)	(mm)	(mm)	(mm)
Chip cavity	A	0.38±0.02	0.62±0.03	1.0 ±0.2	1.5 ±0.2
	B	0.68±0.02	1.12±0.03	1.8 ±0.2	2.3 ±0.2
Insertion Pitch	F	2±0.1	2±0.1	4.0 ±0.1	4.0 ±0.1
Tape Thickness	T	1.1 max	1.1 max	1.1 max	0.8 max

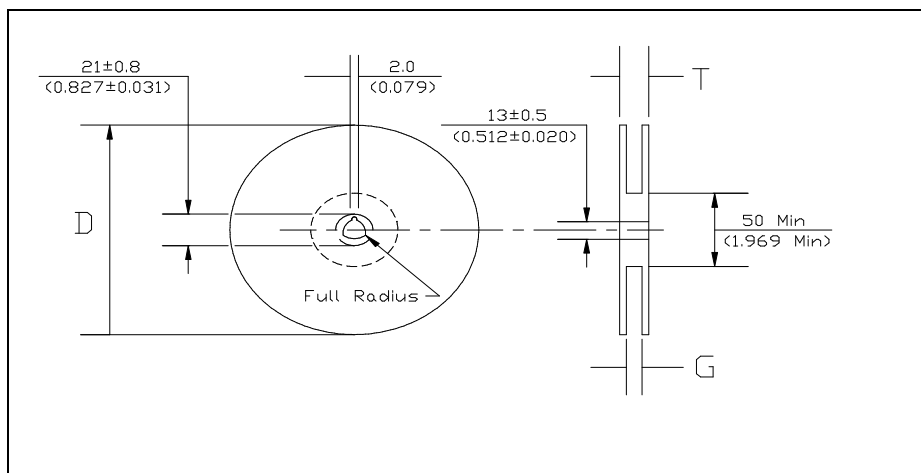
● Embossed Tape



Symbol	2012 (0805)	2016 (0806)	2520 (1008)
P_1	4 ± 0.1	4 ± 0.1	4 ± 0.1
P_0	4 ± 0.1	4 ± 0.1	4 ± 0.1
P_2	2 ± 0.05	2 ± 0.05	2 ± 0.05
A_0	1.55 ± 0.2	1.8 ± 0.1	2.3 ± 0.1
B_0	2.3 ± 0.2	2.2 ± 0.1	2.8 ± 0.1
K_0	1.3 ± 0.1	1.3 ± 0.1	1.4 ± 0.1
W	8 ± 0.3	8 ± 0.3	8 ± 0.3
E	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1
F	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05
D_0	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)
T	0.3 max	0.3 max	0.3 max

Unit: mm/(inch)

● Reel Specifications

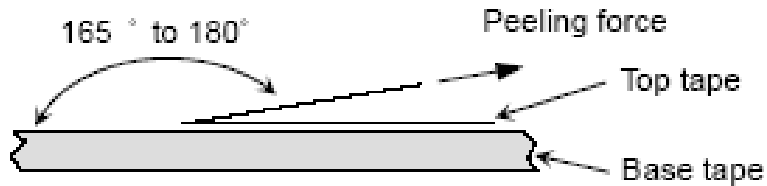


Tape Width (mm)	G (mm)	T max.(mm)	D (mm)
8	10.0 ± 1.5	14.5	178 ± 2.0

- **Peel Strength of Top Cover Tape**

The peel speed shall be about 300 mm/min.

The peel strength of top cover tape shall be between 0.1 to 1.0N.



Cautions

- **Storage**

1. The inductor shall be packaged in carrier tapes.
2. To keep storage place temperature from +5 to 35°C, humidity from 45 to 70% RH.
3. The storage atmosphere must be free of gas containing sulfur and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminals will oxidize and solderability will be affected.
4. The solder ability is assured for 12 months from our final inspection date if the above storage condition is followed.

- **Handling**

Inductor should be handled with care to avoid contamination or damage. The use of vacuum pick-up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.