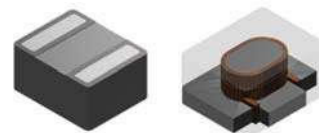


1. Scope

This specification applies to the HDFM series of SMD power inductors.

2. Feature

- Large current and low DCR.
- Small size, Low profile.
- Magnetic shield construction.
- SMT type.



3. Application

Smartphones, tablet terminals, digital cameras, camcorders, hard disks, power modules, etc; for DC-DC conversion circuits in mobile phones, wearable devices, DVCs, HDDs, etc.

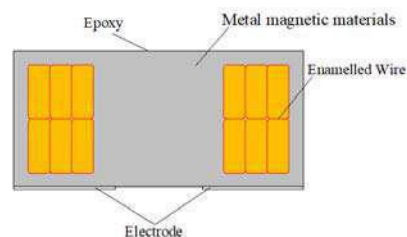
4. Product Identification

HDFM 201610 – 2R2 MT - LF
① ② ③ ④ ⑤

- ① Series name
- ② Product dimensions
- ③ Inductance Value: (1R0: 1.0uH 100: 10uH;)
- ④ Inductance Tolerance: (K: 10% ; M: 20% ; N: 30%)
- ⑤ Lead free products.

5. Product Structure

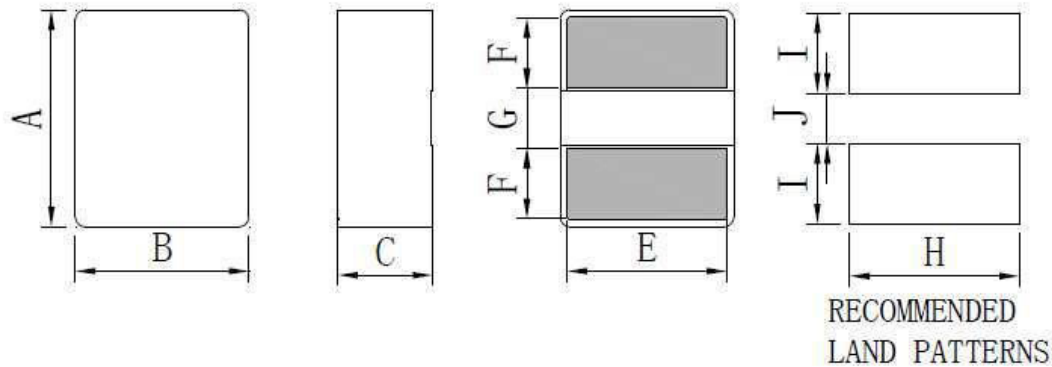
No.	Component	Material
①	Body	Metal magnetic materials
②	Winding	Enamelled wire
③	Shield	Epoxy
④	Electrode	Base plating—Cu Base plating—Ni Base plating—Sn



6. Dimension

Unit:mm

Part No.	A	B	C MAX	E Typical	F Typical	G Typical	H Typical	I Typical	J Typical
141208	1.4±0.2	1.2±0.2	0.80	1.20	0.50	0.45	1.30	0.60	0.40
160808	1.6±0.2	0.8±0.2	0.80	0.80	0.55	0.50	0.90	0.65	0.40
201208	2.0±0.2	1.2±0.2	0.80	1.20	0.65	0.60	1.40	0.80	0.50
201608	2.0±0.2	1.6±0.2	0.80	1.60	0.65	0.60	1.80	0.80	0.50
201610	2.0±0.2	1.6±0.2	1.00	1.60	0.65	0.60	1.80	0.80	0.50
252008	2.5±0.2	2.0±0.2	0.80	2.00	0.90	0.70	2.10	1.00	0.60
252010	2.5±0.2	2.0±0.2	1.00	2.00	0.90	0.70	2.10	1.00	0.60
252012	2.5±0.2	2.0±0.2	1.20	2.00	0.90	0.70	2.10	1.00	0.60
322512	3.2±0.2	2.5±0.2	1.20	2.50	1.15	0.90	2.60	1.30	0.90



7. Operating Temperature Range

Operating Temperature Range(Including self-heating) : (-40~+125) °C.

8. Testing Conditions

Unless otherwise specifie

Temperature : Ordinary Temperature	(20±15)°C
Humidity: Ordinary Humidity	(65±20) %RH

In case of doubt

Temperature	(20±2)°C
Humidity	(65±5)% RH
Atmospheric Pressure	(86~106)kPa

9. Electrical Characteristics

141208 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM141208-R24MT-LF	0.24	±20%	27	22	5.70	6.00	3.70	4.10
HDFM141208-R33MT-LF	0.33	±20%	28	23	5.00	5.30	3.50	4.00
HDFM141208-R47MT-LF	0.47	±20%	35	29	4.20	4.60	3.30	3.80

160808 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM160808-R22MT-LF	0.22	±20%	40	28	5.00	5.50	3.00	3.40
HDFM160808-R47MT-LF	0.47	±20%	100	80	3.70	4.10	2.30	2.60
HDFM160808-R56MT-LF	0.56	±20%	110	85	3.50	4.00	1.90	2.20
HDFM160808-R68MT-LF	0.68	±20%	130	110	3.00	3.30	1.90	2.10
HDFM160808-1R0MT-LF	1.00	±20%	200	180	2.60	3.00	1.80	2.10

201208 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM201208-R24MT-LF	0.24	±20%	23	18	6.00	6.50	5.90	6.50
HDFM201208-R33MT-LF	0.33	±20%	45	33	4.80	5.20	4.00	4.30
HDFM201208-R47MT-LF	0.47	±20%	50	32	4.60	5.00	3.30	3.50
HDFM201208-R68MT-LF	0.68	±20%	60	50	3.70	4.20	3.30	3.70
HDFM201208-1R0MT-LF	1.00	±20%	70	55	3.50	4.00	2.40	3.30
HDFM201208-1R5MT-LF	1.50	±20%	135	118	2.50	3.00	1.90	2.20
HDFM201208-2R2MT-LF	2.20	±20%	185	160	2.30	2.60	1.80	2.20

201608 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM201608-R22MT-LF	0.22	±20%	18	14	5.70	6.20	6.00	6.60
HDFM201608-R24MT-LF	0.24	±20%	19	14	5.60	6.10	5.90	6.50
HDFM201608-R33MT-LF	0.33	±20%	24	18	5.40	5.90	4.80	5.50
HDFM201608-R47MT-LF	0.47	±20%	27	24	5.10	5.60	4.40	4.60
HDFM201608-R68MT-LF	0.68	±20%	43	38	4.30	4.80	3.50	3.80
HDFM201608-1R0MT-LF	1.00	±20%	52	45	3.60	4.10	3.30	3.60
HDFM201608-1R5MT-LF	1.50	±20%	85	72	2.90	3.30	2.80	3.10
HDFM201608-2R2MT-LF	2.20	±20%	140	123	2.35	2.80	2.00	2.20
HDFM201608-3R3MT-LF	3.30	±20%	220	200	1.85	1.30	1.50	1.80
HDFM201608-4R7MT-LF	4.70	±20%	290	245	1.55	1.80	1.40	1.60
HDFM201608-6R8MT-LF	6.80	±20%	468	390	1.10	1.55	1.00	1.30
HDFM201608-100MT-LF	10.00	±20%	800	690	1.00	1.35	0.90	1.00

201610 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM201610-R15MT-LF	0.15	±20%	13	7.8	8.20	8.90	7.10	7.60
HDFM201610-R22MT-LF	0.22	±20%	18	11	7.50	8.20	6.30	6.90
HDFM201610-R24MT-LF	0.24	±20%	19	12	7.40	8.00	6.20	6.80
HDFM201610-R33MT-LF	0.33	±20%	22	17	6.50	7.00	5.30	5.70
HDFM201610-R47MT-LF	0.47	±20%	25	22	5.50	6.30	5.00	5.50
HDFM201610-R68MT-LF	0.68	±20%	32	25	4.70	5.20	4.30	4.60
HDFM201610-1R0MT-LF	1.00	±20%	43	35	4.20	4.60	4.10	4.50
HDFM201610-1R5MT-LF	1.50	±20%	100	80	2.90	3.20	2.30	2.60
HDFM201610-2R2MT-LF	2.20	±20%	130	120	2.80	3.00	2.10	2.50
HDFM201610-3R3MT-LF	3.30	±20%	170	140	2.00	2.30	1.50	1.70
HDFM201610-4R7MT-LF	4.70	±20%	220	190	1.80	2.00	1.40	1.60
HDFM201610-6R8MT-LF	6.80	±20%	418	363	1.30	1.70	1.10	1.45
HDFM201610-100MT-LF	10.00	±20%	580	483	1.10	1.40	0.70	1.00



252008 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM252008-R22MT-LF	0.22	±20%	19	12	6.70	7.60	6.10	6.80
HDFM252008-R24MT-LF	0.24	±20%	20	13	6.60	7.50	6.00	6.70
HDFM252008-R33MT-LF	0.33	±20%	23	17	6.00	6.60	5.60	6.30
HDFM252008-R47MT-LF	0.47	±20%	27	22	5.60	6.20	5.20	6.00
HDFM252008-R68MT-LF	0.68	±20%	33	27	4.50	5.20	4.30	5.20
HDFM252008-1R0MT-LF	1.00	±20%	40	34	4.00	4.50	4.00	4.30
HDFM252008-1R5MT-LF	1.50	±20%	74	64	3.10	3.60	3.00	3.40
HDFM252008-2R2MT-LF	2.20	±20%	77	69	2.60	3.00	2.60	3.00
HDFM252008-3R3MT-LF	3.30	±20%	175	140	2.10	2.50	2.10	2.50
HDFM252008-4R7MT-LF	4.70	±20%	215	180	1.50	1.90	1.50	2.00
HDFM252008-6R8MT-LF	6.80	±20%	380	310	1.30	1.70	1.20	1.70
HDFM252008-100MT-LF	10.00	±20%	570	500	1.20	1.50	0.95	1.10

252010 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM252010-R22MT-LF	0.22	±20%	17.0	11.0	8.00	8.70	6.50	6.90
HDFM252010-R24MT-LF	0.24	±20%	17.5	12.0	7.80	8.50	6.40	6.70
HDFM252010-R33MT-LF	0.33	±20%	19.0	13.0	7.20	7.60	6.20	6.50
HDFM252010-R47MT-LF	0.47	±20%	22.0	15.0	6.50	6.90	5.60	6.10
HDFM252010-R68MT-LF	0.68	±20%	27.0	23.0	5.50	5.90	5.00	5.60
HDFM252010-1R0MT-LF	1.00	±20%	30.0	25.0	4.80	5.30	4.10	4.50
HDFM252010-1R5MT-LF	1.50	±20%	55.0	45.0	3.90	4.30	3.00	3.40
HDFM252010-2R2MT-LF	2.20	±20%	70.0	62.0	3.00	3.30	2.10	2.40
HDFM252010-3R3MT-LF	3.30	±20%	100.0	86.0	2.50	2.80	2.10	2.50
HDFM252010-4R7MT-LF	4.70	±20%	180.0	160.0	2.00	2.60	1.60	2.00
HDFM252010-6R8MT-LF	6.80	±20%	320.0	270.0	1.90	2.40	1.40	1.60
HDFM252010-100MT-LF	10.00	±20%	560.0	500.0	1.40	1.55	0.95	1.05

252012 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM252012-R22MT-LF	0.22	±20%	14	9	9.00	9.60	7.60	8.20
HDFM252012-R24MT-LF	0.24	±20%	15	10	8.80	9.30	7.50	8.00
HDFM252012-R33MT-LF	0.33	±20%	17	11	7.80	8.30	6.40	6.80
HDFM252012-R47MT-LF	0.47	±20%	19	13	7.00	7.50	6.00	6.50
HDFM252012-R68MT-LF	0.68	±20%	23	17	6.00	6.50	5.50	6.30
HDFM252012-1R0MT-LF	1.00	±20%	42	35	5.00	5.60	3.60	4.00
HDFM252012-1R5MT-LF	1.50	±20%	50	44	4.10	4.50	3.20	3.70
HDFM252012-2R2MT-LF	2.20	±20%	65	55	3.30	3.80	2.70	3.00
HDFM252012-3R3MT-LF	3.30	±20%	97	80	2.70	3.00	1.80	2.30
HDFM252012-4R7MT-LF	4.70	±20%	170	150	2.10	2.40	1.50	1.80
HDFM252012-6R8MT-LF	6.80	±20%	270	245	1.70	2.00	1.40	1.60
HDFM252012-100MT-LF	10.00	±20%	400	330	1.45	1.60	1.05	1.20

322512 Series

Part No.	Ls(μH)		RDC (mΩ)		Isat (A)		Irms (A)	
	Nominal	Tol.	Max.	Typ.	Max.	Typ.	Max.	Typ.
HDFM322512-R10MT-LF	0.10	±20%	8.0	6.0	16.50	18.00	11.00	12.00
HDFM322512-R22MT-LF	0.22	±20%	10	6.6	11.00	11.50	8.70	9.20
HDFM322512-R24MT-LF	0.24	±20%	12	7	10.50	11.00	8.50	9.00
HDFM322512-R33MT-LF	0.33	±20%	14	9	9.50	10.00	8.10	8.40
HDFM322512-R47MT-LF	0.47	±20%	19	14	8.20	8.60	7.20	7.50
HDFM322512-R68MT-LF	0.68	±20%	23	18	7.70	8.10	6.80	7.30
HDFM322512-1R0MT-LF	1.00	±20%	30	26	5.80	6.60	4.80	5.30
HDFM322512-1R5MT-LF	1.50	±20%	44	37	4.70	5.10	4.30	4.70
HDFM322512-2R2MT-LF	2.20	±20%	70	58	4.20	4.60	3.00	3.60
HDFM322512-2R2MT-LF	2.20	±20%	50	42	4.50	5.60	3.50	3.80
HDFM322512-3R3MT-LF	3.30	±20%	95	75	3.20	3.70	2.50	2.90
HDFM322512-4R7MT-LF	4.70	±20%	135	115	2.60	2.90	2.00	2.30
HDFM322512-6R8MT-LF	6.80	±20%	210	177	2.40	2.80	1.90	2.10
HDFM322512-100MT-LF	10.00	±20%	230	210	1.90	2.30	1.80	2.00

Note: Customized products can be made according to customer needs.

Isat: The DC current at which the inductance drops approximate 30% from its value without current,

Load current time within 1 s.

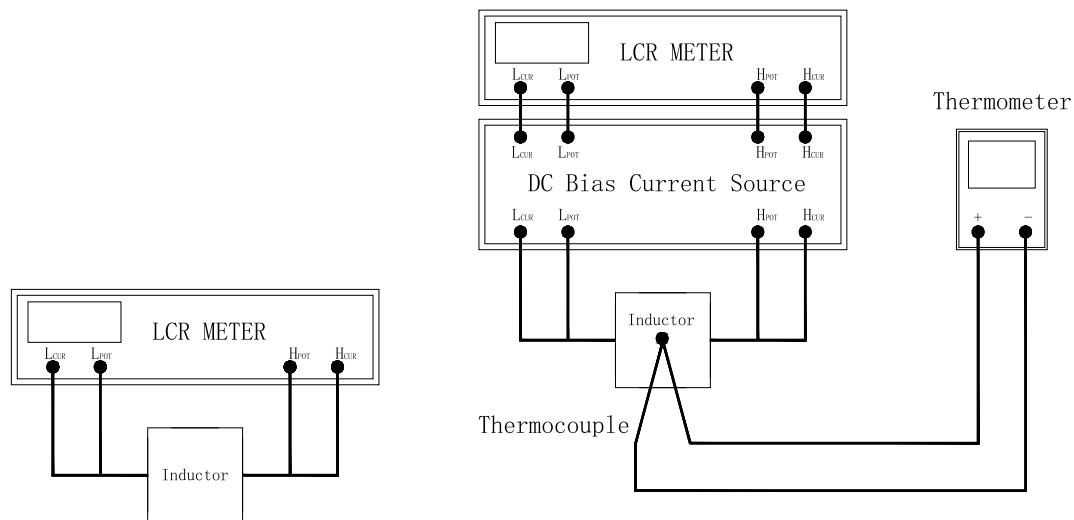
Irms: The DC current is inductor surface temperature to rise by 40°C.

Rated Voltage: DC 20V Max.

10. Test Condition & Equipment :

Symbols	Item	Test condition	Test equipment
Ls	Inductance	1MHz/1V	HIOKI IM3536 LCR METER or equivalent
RDC	Direct Current Resistance	Direct-Current	HIOKI RM3545 RESISTANCE METER or equivalent
Isat	Saturation Current	1MHz/1V	Wayne Kerr 3260B & 3265B or equivalent
Irms	Temperature Rise Current	/	Wayne Kerr 3260B & 3265B or equivalent

10.1 Test Schematic Diagram.



Ls & RDC test schematic diagram

Isat & Irms test schematic diagram

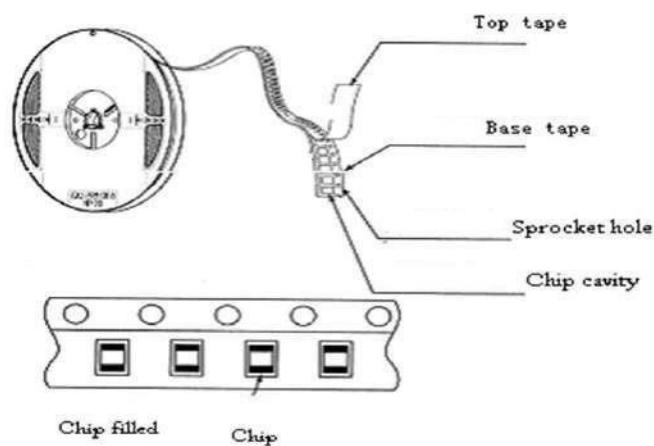
11. Reliability Test Method

No.	Items	Requirements	Test Methods and Remarks														
1	Insulation Resistance	≥100MΩ	100 V DC applied between the inductor coil and the middle of the top surface of the body for 60 seconds.														
2	Solderability	90% or more of electrode area shall be coated by new solder.	Dip pads in flux and dip in solder pot(96.5Sn/3.0Ag/0.5Cu)at (245±5) °C for (5±1) seconds.														
3	Resistance to Soldering Heat	No visible mechanical damage. Inductance change: Within ±10%	Reflow soldering peak temperature (260 ± 5) °C time (15 ± 5) s, twice cycling, test after being kept at room temperature for 1 hour.														
4	Adhesion of terminal electrode	Strong bond between the pad and the core, without dropping	Inductors shall be soldered to board. And then apply a force perpendicular to the direction of the electrode surface using a metallurgical tool for (10 ± 1) seconds <table><tr><th>Size</th><th>Force(N)</th></tr><tr><td>141208</td><td>5</td></tr><tr><td>160808</td><td>5</td></tr><tr><td>201208</td><td>8</td></tr><tr><td>201608/201610</td><td>10</td></tr><tr><td>252008/252010/252012</td><td>10</td></tr><tr><td>322512</td><td>25</td></tr></table>	Size	Force(N)	141208	5	160808	5	201208	8	201608/201610	10	252008/252010/252012	10	322512	25
Size	Force(N)																
141208	5																
160808	5																
201208	8																
201608/201610	10																
252008/252010/252012	10																
322512	25																
5	High temperature Exposure	No visible mechanical damage. Inductance change: Within ±10%	Temperature is (+125±2)℃ and keep (1000±24) hours.														
6	Low Temperature Exposure	No visible mechanical damage. Inductance change: Within ±10%	Temperature is (-40±2)℃ andkeep (1000±24) hours.														

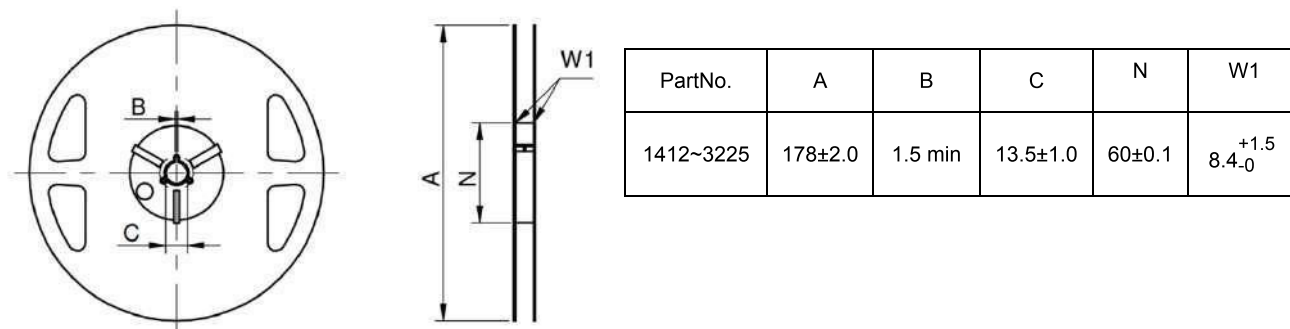
No.	Items	Requirements	Test Methods and Remarks
7	Thermal shock	No visible mechanical damage. Inductance change: Within $\pm 10\%$	The test sample shall be placed at $(-40\pm 3)^{\circ}\text{C}$ for (30 ± 3) min and convert to $(125\pm 2)^{\circ}\text{C}$ for (30 ± 3) min, the conversion time is ≤ 3 minutes. The temperature cycle shall be repeated 1000 cycles. Placed at room temperature for 2 hours, within 48 hours of testing.
8	Static Humidity	No visible mechanical damage. Inductance change: Within $\pm 10\%$	Inductors shall be subjected to $(90\sim 95)\% \text{RH}$. at $(60\pm 2)^{\circ}\text{C}$ for (1000 ± 24) h .Placed at room temperature for 2 hours, within 48 hours of testing.
9	Life	No visible mechanical damage. Inductance change: Within $\pm 10\%$	Inductors shall be store at $(85\pm 2)^{\circ}\text{C}$ for (1000 ± 24) hours with Irms applied. Placed at room temperature for 2 hours, within 48 hours of testing. Note: If the surface temperature of the part over 125°C when the current is loaded, the current need to reduce until the surface temperature of the part less than 125°C .
Note: When there are questions concerning, measurement shall be made after 24hrs of recovery under the standard condition.			

12. Packaging

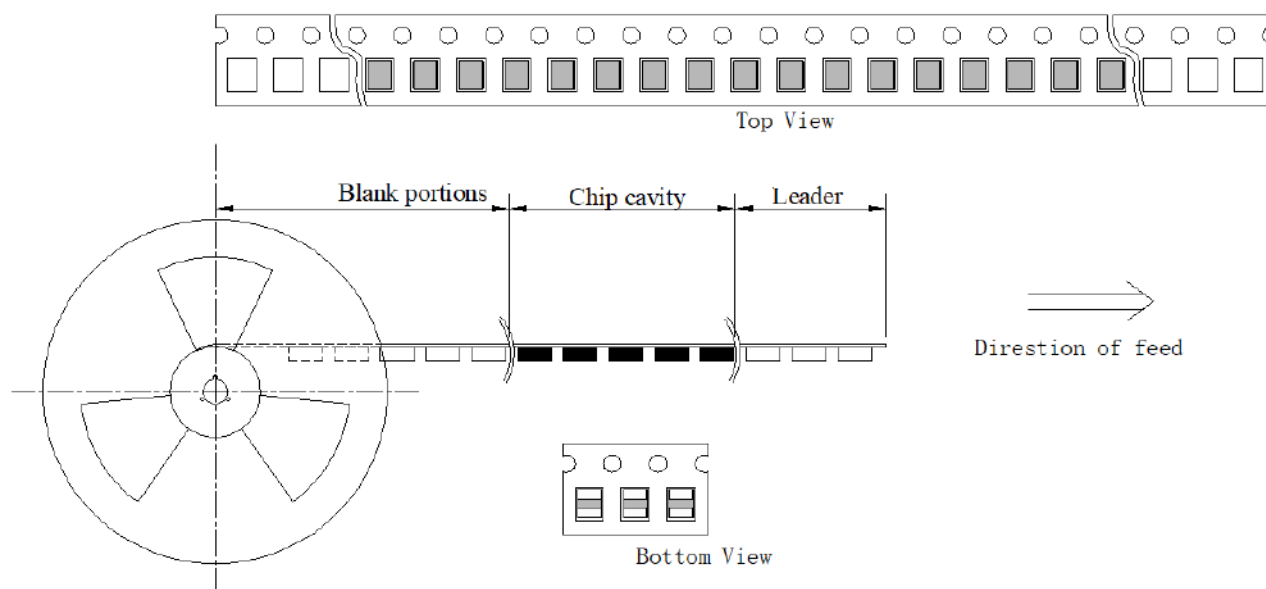
12.1 Taping drawings



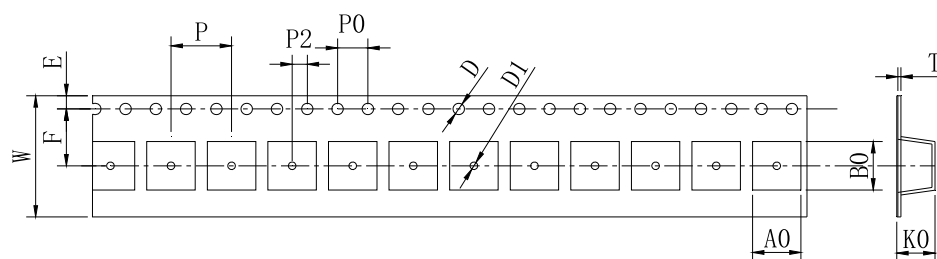
12.2 Reel dimensions (Unit:mm)



12.3 Leader and blank portion

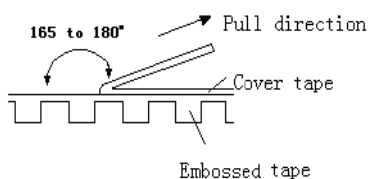


12.4 Taping dimensions (Unit: mm)



Size	W	A0	B0	D	D1	E	F	K0	P0	P2	P	T
141208	8±0.3	1.5±0.1	1.7±0.1	1.5 ±0.1	1.0MIN	1.75 ±0.1	3.5 ±0.1	1.00±0.1	4.0 ±0.3	2.0 ±0.3	4.0 ±0.3	0.23±0.05
160808		1.05±0.1	1.85±0.1					1.00±0.1				0.25±0.05
201208		1.50±0.1	2.30±0.1					1.00±0.1				
201608		1.90±0.1	2.35±0.1					1.00±0.1				
201610		1.90±0.1	2.35±0.1					1.15±0.1				
252008		2.35±0.1	2.8±0.1					1.00±0.1				
252010		2.35±0.1	2.8±0.1					1.15±0.1				
252012		2.35±0.1	2.8±0.1					1.35±0.1				
322512		2.9±0.1	3.5±0.1					1.34±0.1				0.23±0.05

12.5 Peeling off force



Peeling required(10~130) g

Test condition

Speed of peeling off :300mm/min±10%

Angle of peeling off: 165°~180°

12.6 Packaging number (Unit: Pcs)

Reel	3000	
Box	15,000	30,000
Case	150,000	180,000

13. Recommended Soldering Conditions

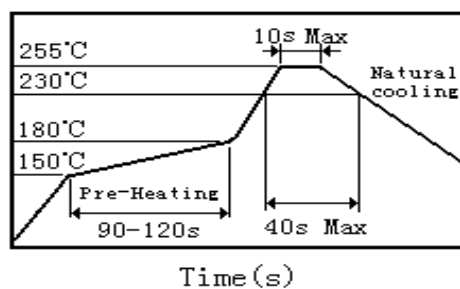
Applicable soldering process to the products is reflow soldering.

Soldering Materials

Solder: Sn-3.0Ag-0.5Cu

Flux: Use rosin-based flux, but prohibition of use acidic flux and water-soluble flux(with chlorine exceeding 0.2 wt%).

13.1 Soldering Profile



13.2 Soldering Iron

Reworking with electric soldering iron must preheating at 150°C for 1 minute is required, and do not directly touch the core with the tip of the soldering iron. The reworking soldering conditions are as follows:

Temperature of soldering iron tip: 350°C;

Soldering iron power output: ≤30W;

Diameter of soldering iron end: ≤1.0mm;

Soldering time: <3 s



14. Storage Methods

14.1 Storage Period

To maintain the solderability of terminal electrodes and keep the packing material in good condition, product should be used within 1 year since the manufacturing date. The solderability of products electrodes may decrease as time passes, so in case of storage period over 1 year, solderability shall be checked before actual use.

14.2 Storage Conditions

The warehouse must meet with the following condition:

Temperature: Inductors (product with taping) : (-10 ~ +40) °C; Inductors body: (-40 ~ +85) °C.

Humidity: (30~70) %RH.

Do not make the products suffering rapid changes in temperature and humidity.

Do not store the products in chemical atmosphere such as one containing sulfurous acid gas or alkaline gas, that will causes poor solderability and corrosion of inductors.

Do not store products in bulk packaging to prevent collision among inductors which causes core chipping and wire breakage.

Store products on pallets to protect from humidity, dust, etc.

Avoid heat shock, vibration, direct sunlight, etc.

Products should be stored under the airtight packaged condition.

15. Precautions For Use

Our products are designed and promoted for use in general electronic devices such as AV equipment, OA equipment household appliance and information service.

In case of using the product for the purpose other than general electronics devices, we shall not be held liable for any dysfunctions in or damage to the equipment with which the product is used.

Our specification limits the quality of the component as a single unit. Please ensure the component is thoroughly evaluated in your application circuit.

Do not apply excessive vibration or mechanical shock to products.

Do not touch wire with sharp objects such as tweezers to prevent wire breakage.

Do not apply excessive stress to products mounted on boards to prevent core breakage.