for Automotive Electronics

SPECIFICATIONS

Customer	
Product Name	Wire Wound Chip Ceramic Inductor
Sunlord Part Number	AWL1005C□□□□STFM81
Customer Part Number	

[☒New Released, □Revised] SPEC No.: AWL0603230000

【 This SPEC is total 17 pages. 】

【 RoHS Compliant Parts 】

Approved By	Checked By	Issued By

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【For Customer approval Only】 Date:_____

Qualification Status: □Full □Restricted □Rejected

Approved By	Verified By	Re-checked By	Checked By

Comments:

_____

Version Change History							
Rev.	Date	Item	Changed Contents	Change Reasons	Drawing	Check	Approval
01	/	/	New release	/	Huie Gao	Jinnan Liu	Jinbo Cai

‹Content›

【Precautions】

1. Magnetic materials shall be far away from parts to avoid impacts on their electrical characteristics.
2. Parts could be damaged by external mechanical pressure or stacked heavy objects, as well as strong shaking & dropping.
3. Please do not store parts in bulk to prevent coils and parts being damaged.
4. Oversized external force to parts on PCB may lead to parts being damaged or slipped off.
5. Please do not use parts on edge or top of PCB board in your design to avoid parts being damaged during PCB is moved.
6. Please use flux contained with resin since the highly acidic (Chlorine content more than 0.2 wt%) or water-soluble one could damage the insulation film of wires, then causing short circuit of parts.
7. Please do not use the brush to clean product or its surroundings. If you use the brush to clean product or its surroundings on PCB,copper wire may be broke, causing the product open .

1. Scope

1.1 Scope of parts

This specification applies to the AWL1005C□□□□STFM81 Serise of Wire Wound Chip Ceramic Inductor for automotive electronics based on AEC-Q200.

1.2 Scope of application

Product numbers recorded in this specification are limited to applications with the following modules:

(1) Prohibit using in Engine Control System.

(2) Other applications please consult Sunlord.

2. Product Description and Identification (Part Number)

1) Description

Wire Wound Chip Ceramic Inductor, 1005, XXX nH ± X% @XXXMHz, XXXΩ, XXX mA

2) Product Identification (Part Number)

AWL	1005	C	□□□	□	S	T	F	M81
①	②	③	④	⑤	⑥	⑦	⑧	⑨

① Type	
AWL	Wire Wound Chip Inductor for Automotive

② External Dimensions [L X W] (mm)	
1005	1.0 X 0.5

③ Material Code	
C	Ceramic

④ Nominal Inductance (nH)	
Example	Nominal Value
1N0	1.0
10N	10
R10	100

⑤ Inductance Tolerance	
B	±0.1nH
C	±0.2nH
S	±0.3nH
D	±0.5nH
G	±2%
H	±3%
J	±5%
K	±10%

⑥ Product Classification Code	
S	Sn Plating One-faces Coating

⑧ HSF Products
Hazardous Substance Free Products

⑦ Packing	
T	Tape & Reel

⑨ Internal Code	
M81	Low DCR & Large Current

3. Electrical Characteristics

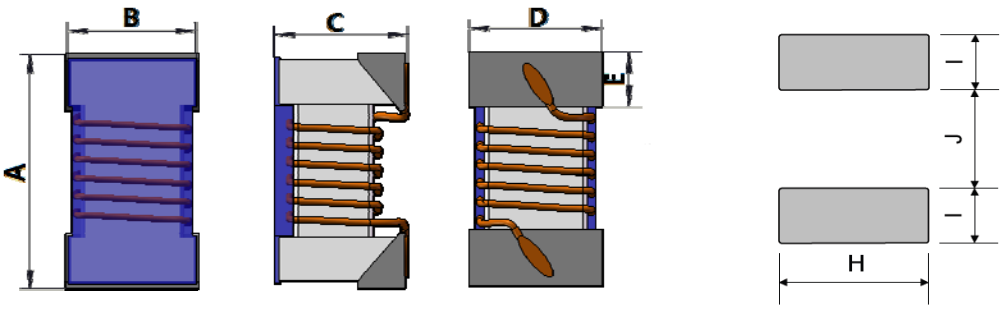
Please refer to **Item 5**.

1) Operating and storage temperature range (individual chip without packing): -40℃ to +125℃

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

4. Shape and Dimensions

1) Dimensions: See the following.

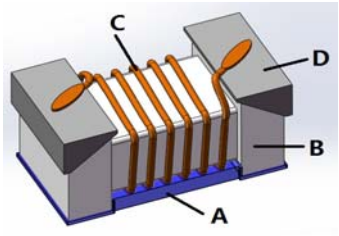


A	B	C	D	E	H REF.	I REF.	J REF.
1.1±0.1	0.55±0.1	0.6±0.1	0.5±0.1	0.2±0.1	0.65	0.35	0.50

Unite：mm

2) Electrode Coplanarity:0.1mm Max.

3) Structure: See the following.



No.	Components	Material
A	Coating	Ultraviolet epoxy resin
B	Core	Ceramic
C	Wire	Polyurethane system enameled copper wire
D	Electrodes	Ag/Ag-Pd/Mo-Mn with Ni and Sn plating

5. Electrical Characteristics

I. AWL1005C□□□□STFM81

Part Number	Inductance	Tolerance	Min. Quality Factor	L,Q Test Freq.	Max. DC Resistance	Max. Rated Current *	Min. Self-resonant Frequency
Units	nH	-	-	MHz	Ω	mA	GHz
Symbol	L	-	Q	Freq.	DCR	Ir	S.R.F
AWL1005C1N3□STFM81	1.3	C,D	20.0	100/250	0.012	3150	18.0
AWL1005C1N5□STFM81	1.5	B,C,D	20.0	100/250	0.028	2100	18.0
AWL1005C1N6□STFM81	1.6	B,C,D	20.0	100/250	0.045	1450	18.0
AWL1005C1N7□STFM81	1.7	B,C,D	20.0	100/250	0.065	1150	18.0
AWL1005C2N2□STFM81	2.2	C,D	30.0	100/250	0.022	2530	15.5
AWL1005C2N3□STFM81	2.3	B,C,D	30.0	100/250	0.022	2530	15.5
AWL1005C2N4□STFM81	2.4	B,C,D	30.0	100/250	0.022	2530	15.5
AWL1005C2N5□STFM81	2.5	B,C,D	30.0	100/250	0.030	2100	15.5
AWL1005C2N6□STFM81	2.6	B,C,D	30.0	100/250	0.035	1950	14.5
AWL1005C2N7□STFM81	2.7	B,C,D	28.0	100/250	0.047	1500	14.0
AWL1005C2N8□STFM81	2.8	B,C,D	27.0	100/250	0.047	1500	13.5
AWL1005C2N9□STFM81	2.9	B,C,D	25.0	100/250	0.047	1500	12.5
AWL1005C3N0□STFM81	3.0	C,D	20.0	100/250	0.063	1350	12.5
AWL1005C3N3□STFM81	3.3	C,D	30.0	100/250	0.030	2000	14.0
AWL1005C3N4□STFM81	3.4	B,C,D	30.0	100/250	0.030	1950	10.0
AWL1005C3N5□STFM81	3.5	B,C,D	30.0	100/250	0.030	1950	10.0
AWL1005C3N6□STFM81	3.6	B,C,D	30.0	100/250	0.030	1950	10.0
AWL1005C3N7□STFM81	3.7	B,C,D	35.0	100/250	0.030	1950	10.0
AWL1005C3N8□STFM81	3.8	B,C,D	35.0	100/250	0.030	1950	10.0
AWL1005C3N9□STFM81	3.9	B,C,D	35.0	100/250	0.030	1950	10.0
AWL1005C4N0□STFM81	4.0	B,C,D	30.0	100/250	0.030	1950	10.0
AWL1005C4N1□STFM81	4.1	B,C,D	30.0	100/250	0.044	1800	9.6

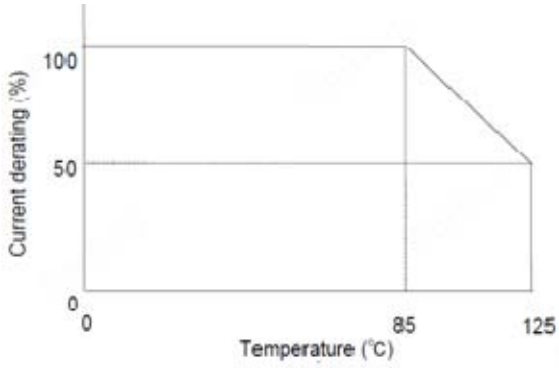
Part Number	Inductance	Tolerance	Min. Quality Factor	L,Q Test Freq.	Max. DC Resistance	Max. Rated Current *	Min. Self-resonant Frequency
Units	nH	-	-	MHz	Ω	mA	GHz
Symbol	L	-	Q	Freq.	DCR	Ir	S.R.F
AWL1005C4N2□STFM81	4.2	B,C,D	30.0	100/250	0.044	1800	9.6
AWL1005C4N3□STFM81	4.3	B,C,D	32.0	100/250	0.044	1800	9.6
AWL1005C4N4□STFM81	4.4	B,C,D	34.0	100/250	0.052	1600	9.6
AWL1005C4N5□STFM81	4.5	B,C,D	34.0	100/250	0.060	1450	9.6
AWL1005C4N6□STFM81	4.6	B,C,D	32.0	100/250	0.060	1450	9.6
AWL1005C4N7□STFM81	4.7	B,C,D	31.0	100/250	0.071	1200	8.0
AWL1005C4N8□STFM81	4.8	B,C,D	30.0	100/250	0.071	1200	8.0
AWL1005C4N9□STFM81	4.9	B,C,D	27.0	100/250	0.071	1200	8.0
AWL1005C5N0□STFM81	5.0	B,C,D	32.0	100/250	0.040	1770	10.0
AWL1005C5N1□STFM81	5.1	B,C,D	35.0	100/250	0.040	1770	8.0
AWL1005C5N2□STFM81	5.2	B,C,D	35.0	100/250	0.040	1770	8.0
AWL1005C5N3□STFM81	5.3	B,C,D	35.0	100/250	0.040	1770	8.0
AWL1005C5N4□STFM81	5.4	B,C,D	35.0	100/250	0.040	1770	8.0
AWL1005C5N5□STFM81	5.5	B,C,D	35.0	100/250	0.040	1770	8.0
AWL1005C5N6□STFM81	5.6	B,C,D	35.0	100/250	0.040	1770	8.0
AWL1005C5N7□STFM81	5.7	B,C,D	30.0	100/250	0.040	1770	8.0
AWL1005C5N8□STFM81	5.8	B,C,D	30.0	100/250	0.040	1770	8.0
AWL1005C5N9□STFM81	5.9	B,C,D	30.0	100/250	0.040	1770	8.0
AWL1005C6N0□STFM81	6.0	B,C,D	32.0	100/250	0.056	1600	8.0
AWL1005C6N1□STFM81	6.1	B,C,D	32.0	100/250	0.056	1600	8.0
AWL1005C6N2□STFM81	6.2	B,C,D	33.0	100/250	0.056	1600	8.0
AWL1005C6N3□STFM81	6.3	G,H,J,K	32.0	100/250	0.057	1600	7.8
AWL1005C6N4□STFM81	6.4	G,H,J,K	33.0	100/250	0.065	1380	7.0
AWL1005C6N5□STFM81	6.5	G,H,J,K	32.0	100/250	0.065	1380	7.0
AWL1005C6N6□STFM81	6.6	G,H,J,K	30.0	100/250	0.078	1280	7.0
AWL1005C6N7□STFM81	6.7	G,H,J,K	30.0	100/250	0.078	1280	7.0
AWL1005C6N8□STFM81	6.8	G,H,J,K	30.0	100/250	0.068	1450	7.0
AWL1005C6N9□STFM81	6.9	G,H,J,K	32.0	100/250	0.069	1420	8.5
AWL1005C7N0□STFM81	7.0	G,H,J,K	33.0	100/250	0.069	1420	8.0
AWL1005C7N1□STFM81	7.1	G,H,J,K	32.0	100/250	0.069	1420	7.0
AWL1005C7N2□STFM81	7.2	G,H,J,K	32.0	100/250	0.050	1700	7.0
AWL1005C7N3□STFM81	7.3	G,H,J,K	32.0	100/250	0.050	1700	7.0
AWL1005C7N4□STFM81	7.4	G,H,J,K	30.0	100/250	0.050	1700	7.0
AWL1005C7N5□STFM81	7.5	G,H,J,K	35.0	100/250	0.050	1700	7.0
AWL1005C7N6□STFM81	7.6	G,H,J,K	30.0	100/250	0.050	1700	7.0
AWL1005C7N7□STFM81	7.7	G,H,J,K	30.0	100/250	0.050	1700	7.0
AWL1005C7N8□STFM81	7.8	G,H,J,K	30.0	100/250	0.050	1700	7.0
AWL1005C7N9□STFM81	7.9	G,H,J,K	30.0	100/250	0.050	1700	7.0
AWL1005C8N0□STFM81	8.0	G,H,J,K	30.0	100/250	0.050	1700	7.0
AWL1005C8N1□STFM81	8.1	G,H,J,K	32.0	100/250	0.069	1500	6.5
AWL1005C8N2□STFM81	8.2	G,H,J,K	32.0	100/250	0.069	1500	6.5
AWL1005C8N3□STFM81	8.3	G,H,J,K	32.0	100/250	0.069	1500	6.5

Part Number	Inductance	Tolerance	Min. Quality Factor	L,Q Test Freq.	Max. DC Resistance	Max. Rated Current *	Min. Self-resonant Frequency
Units	nH	-	-	MHz	Ω	mA	GHz
Symbol	L	-	Q	Freq.	DCR	Ir	S.R.F
AWL1005C8N4□STFM81	8.4	G,H,J,K	32.0	100/250	0.069	1500	6.5
AWL1005C8N5□STFM81	8.5	G,H,J,K	32.0	100/250	0.069	1500	6.5
AWL1005C8N6□STFM81	8.6	G,H,J,K	31.0	100/250	0.070	1420	6.5
AWL1005C8N7□STFM81	8.7	G,H,J,K	31.0	100/250	0.070	1420	6.5
AWL1005C8N8□STFM81	8.8	G,H,J,K	31.0	100/250	0.070	1420	6.5
AWL1005C8N9□STFM81	8.9	G,H,J,K	31.0	100/250	0.070	1420	6.5
AWL1005C9N0□STFM81	9.0	G,H,J,K	30.0	100/250	0.070	1420	6.5
AWL1005C9N1□STFM81	9.1	G,H,J,K	32.0	100/250	0.080	1400	6.5
AWL1005C9N2□STFM81	9.2	G,H,J,K	32.0	100/250	0.081	1400	6.0
AWL1005C9N3□STFM81	9.3	G,H,J,K	34.0	100/250	0.081	1400	6.0
AWL1005C9N4□STFM81	9.4	G,H,J,K	33.0	100/250	0.081	1400	6.0
AWL1005C9N5□STFM81	9.5	G,H,J,K	32.0	100/250	0.081	1400	6.0
AWL1005C9N6□STFM81	9.6	G,H,J,K	33.0	100/250	0.081	1400	6.0
AWL1005C9N7□STFM81	9.7	G,H,J,K	33.0	100/250	0.081	1400	6.0
AWL1005C9N8□STFM81	9.8	G,H,J,K	34.0	100/250	0.081	1400	6.0
AWL1005C9N9□STFM81	9.9	G,H,J,K	32.0	100/250	0.081	1400	6.0
AWL1005C10N□STFM81	10.0	G,H,J,K	31.0	100/250	0.081	1400	6.0
AWL1005C11N□STFM81	11.0	G,H,J,K	32.0	100/250	0.083	1400	6.2
AWL1005C12N□STFM81	12.0	G,H,J,K	30.0	100/250	0.093	1240	5.2
AWL1005C13N□STFM81	13.0	G,H,J,K	30.0	100/250	0.093	1240	5.2
AWL1005C14N□STFM81	14.0	G,H,J,K	31.0	100/250	0.111	1150	5.2
AWL1005C15N□STFM81	15.0	G,H,J,K	31.0	100/250	0.114	1150	5.5
AWL1005C16N□STFM81	16.0	G,H,J,K	31.0	100/250	0.126	1000	5.0
AWL1005C17N□STFM81	17.0	G,H,J,K	30.0	100/250	0.126	1000	5.0
AWL1005C18N□STFM81	18.0	G,H,J,K	30.0	100/250	0.130	1050	5.2
AWL1005C19N□STFM81	19.0	G,H,J,K	30.0	100/250	0.156	920	5.0
AWL1005C20N□STFM81	20.0	G,H,J,K	30.0	100/250	0.186	800	4.5
AWL1005C21N□STFM81	21.0	G,H,J,K	30.0	100/250	0.202	780	4.5
AWL1005C22N□STFM81	22.0	G,H,J,K	30.0	100/250	0.202	780	4.5
AWL1005C23N□STFM81	23.0	G,H,J,K	29.0	100/250	0.201	760	4.5
AWL1005C24N□STFM81	24.0	G,H,J,K	31.0	100/250	0.212	770	4.0
AWL1005C25N□STFM81	25.0	G,H,J,K	31.0	100/250	0.221	750	4.1
AWL1005C26N□STFM81	26.0	G,H,J,K	29.0	100/250	0.282	720	4.1
AWL1005C27N□STFM81	27.0	G,H,J,K	30.0	100/250	0.288	680	4.0
AWL1005C30N□STFM81	30.0	G,H,J,K	30.0	100/250	0.309	660	3.8
AWL1005C33N□STFM81	33.0	G,H,J,K	30.0	100/250	0.336	620	3.6
AWL1005C36N□STFM81	36.0	G,H,J,K	30.0	100/250	0.431	540	3.5
AWL1005C39N□STFM81	39.0	G,H,J,K	28.0	100/250	0.456	530	3.4
AWL1005C43N□STFM81	43.0	G,H,J,K	30.0	100/250	0.516	515	3.4
AWL1005C47N□STFM81	47.0	G,H,J,K	25.0	100/250	0.648	440	3.2
AWL1005C51N□STFM81	51.0	G,H,J,K	25.0	100/250	0.696	415	2.9

Part Number	Inductance	Tolerance	Min. Quality Factor	L,Q Test Freq.	Max. DC Resistance	Max. Rated Current *	Min. Self-resonant Frequency
Units	**nH**	**-**	**-**	**MHz**	**Ω**	**mA**	**GHz**
Symbol	**L**	**-**	**Q**	**Freq.**	**DCR**	**Ir**	**S.R.F**
AWL1005C53N□STFM81	53.0	G,H,J,K	25.0	100/200	0.696	415	2.9
AWL1005C56N□STFM81	56.0	G,H,J,K	25.0	100/200	0.996	340	2.9
AWL1005C68N□STFM81	68.0	G,H,J,K	25.0	100/200	1.128	320	2.5
AWL1005C75N□STFM81	75.0	G,H,J,K	25.0	100/200	1.224	320	2.4

(*) As for AWL type, Rated Current is derated as following figure depending on the operating temperature

Derating of Rated Current depend on Operating Temperature



6. Test and Measurement Procedures

6.1 Test Conditions

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

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

If 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 106 KPa

6.2 Visual Examination

a. Inspection Equipment: 30X magnifier

6.3 Electrical Test

6.3.1 DC Resistance (DCR)

a. Refer to **Item 5**.
b. Test equipment: HIOKI3544 or equivalent.

6.3.2 Inductance (L)

a. Refer to **Item 5**.
b. Test equipment: Agilent4287A+Agilent16197A or equivalent.
c. Test signal: -13dBm or 10mA
d. Test frequency refers to **Item 5**.

6.3.3 Q Factor (Q)

a. Refer to **Item 5**.
b. Test equipment: Agilent4287A+Agilent16197A or equivalent.
c. Test signal: -13dBm or 10mA
d. Test frequency refers to **Item 5**.

6.3.4 Self-Resonant Frequency (SRF)

a. Refer to **Item 5**.
b. Test equipment: Agilent E4991A+Agilent16197A and HP 8753E or equivalent.
c. Test signal: -20dBm or 50mV

6.3.5 Rated Current

a. Refer to **Item 5**.
b. Test equipment (see **Fig.6.3.5-1**): Electric Power, Electric current meter, Thermometer.

c. Measurement method (see **Fig. 6.3.5-1**):
   1. Set test current to be 0 mA.
   2. Measure initial temperature of chip surface.
   3. Gradually increase voltage and measure chip temperature for corresponding current.

d. Definition of Rated Current (Ir): Ir is direct electric current as chip surface temperature rose just 40℃ against chip initial surface temperature (Ta) (see **Fig. 6.3.5-2**).

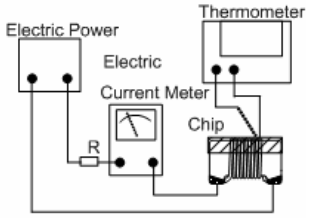


Fig. 6.3.5-1

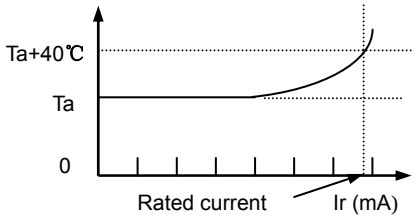
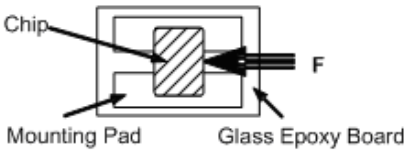
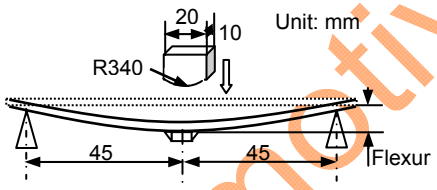
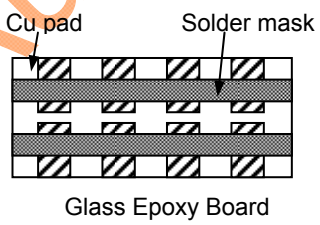
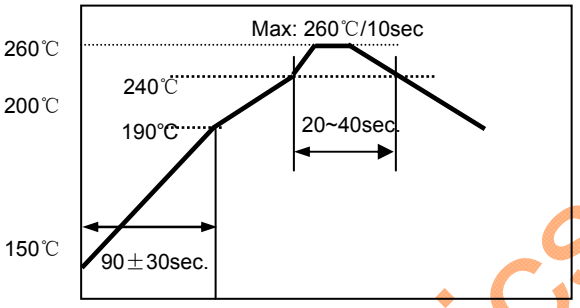
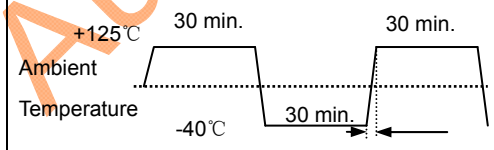


Fig. 6.3.5-2

7. Reliability Test

Items	Requirements	Test Method(According to AEC-Q200)
7.1 Terminal Strength	No removal or split of the termination or other defects shall occur. 	① Solder the chip to the testing jig (glass epoxy board) using eutectic solder. Then apply a force in the direction of the arrow. ② 4N force. ③ Keep time: 60(+1) sec. ④ Speed: 1.0 mm/s.
7.2 Board Flex	No visible mechanical damage. 	① Solder the chip to the test jig (glass epoxy board——1.6mm) using a eutectic solder. Then apply a force in the direction shown as left. ② Flexure: 2mm. ③ Pressurizing speed: 0.5mm/sec. ④ Keep time: 60(+5) sec.
7.3 Vibration	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic 	① Solder the chip to the testing jig (glass epoxy board) using eutectic solder. ② The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the vibration acceleration of 5g, the frequency being varied uniformly between the approximate limits of 10 and 2000 Hz. ③ The frequency range from 10 to 2000 Hz and return to 10 Hz shall be traversed in approximately 20 minute. This motion shall be applied for a period of 4 hours in each 3 mutually directions (total of 12 hours).
7.4 Mechanical Shock	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	① Half sinusoid, the peak acceleration: 100g. ② Pulse width: 6 ms. ③ This motion shall be applied for 6 times in each 3 mutually directions (total of 18 times).

Items	Requirements	Test Method(According to AEC-Q200)
7.5 Resistance to soldering heat	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	Re-flowing Profile: 
7.6 Solderability	① Wetting shall be exceeded 95% coverage except the solder joints	Method 1:① pretreatment:155℃,4h ② 245℃,5(-0.5,+0)s ③ Solder:Sn/3.0Ag/0.5Cu ④ Flux: 25% resin and 75% ethanol in weight.
		Method 2:① Steam aging:8h ② 245℃,5(-0.5,+0)s ③ Solder:Sn/3.0Ag/0.5Cu ④ Flux: 25% resin and 75% ethanol in weight.
		Method 3:① Steam aging:8h ② 260℃,7(-0.5,+0.5)s ③ Solder:Sn/3.0Ag/0.5Cu ④ Flux: 25% resin and 75% ethanol in weight.
7.7 Low Temperature Storage	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	① Temperature: -40±2℃ ② Duration: 1000^{+24} hours ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
7.8 High Temperature Exposure	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	① Temperature: 125±2℃ ② Duration: 1000^{+24} hours ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
7.9 Temperature Cycling	① No visible mechanical damage to Core、Wire and Electrodes; ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic  	① Temperature, Time: -40℃ for 30±3 min →+125℃ for 30±3min ② Transforming interval: 20 sec. (max.) ③ Tested cycle: 1000 cycles ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
7.10 Moisture Resistance	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor chan e: Within ±20%g ④ DCR :Satisfy electrical characteristic	① 25℃→65℃,90%~100%RH,2.5h. ② 65℃,90%~100%RH,3h. ③ 65℃→25℃,80%~100%RH,2.5h. ④ 25℃→65℃,90%~100%RH,2.5h. ⑤ 65℃,90%~100%RH,3h. ⑥ 65℃→25℃,80%~100%RH,2.5h. ⑦ 25℃,90%~100%RH,8h,24hours of 1cycle. ⑧ Tested cycle: 10 cycles ⑨ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

Items	Requirements	Test Method(According to AEC-Q200)
7.11 Operational Life	① No visible mechanical damage ② Inductance change: Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	① Temperature: 125±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.
7.12 Temperature Characteristics	① No visible mechanical damage ② Inductance change: +50±100ppm/℃	① Temperature range: -40℃~+125℃. ② Reference temperature: +20℃.
7.13 Flammability (External Flame)	① t1 or t2:≤10s. ② t1 plus t2 for the 5 specimens:≤50s. ③ t2+t3 for each specimen:≤30s. ④ no afterflame or afterglow of any specimen up to the holding clamp. ⑤ no cotton indicator ignited by flaming particles or drops.	MIL-STD-202 Method 111、 UL94
7.14 Resistance to Solvents	After test, the samples no fell off, fade, dim, transposition and others phenomenon.	MIL-STD-202 Method 215
7.15 ESD Test	① No visible mechanical damage ② Inductance change:Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	Contact discharge, 8 KV, twice, one in the positive polarity and the other in the negative polarity.
7.16 Biased Humidity	① No visible mechanical damage ② Inductance change:Within ±5% ③ Q factor change: Within ±20% ④ DCR :Satisfy electrical characteristic	① Temperature: 85±2℃. ② Humidity: 85% RH. ③ Duration: 1000^{+24} hours. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

8. Packaging and Storage

8.1 Packaging

There are two types of packaging for the chip inductors. Please specify the packing code when ordering.

Tape Carrier Packaging:

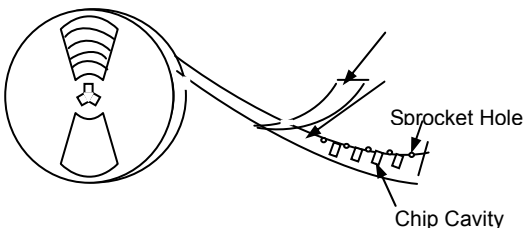
Packaging code: T

a. Tape carrier packaging are specified in attached figure **Fig.8.1-1~5**

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

Type	1005	
Tape	Paper Tape	
Quantity	Standard	**10K**

(1) Taping Drawings (Unit: mm)



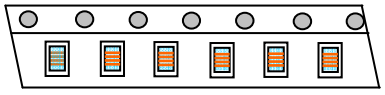


Fig. 8.1-1

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

(2) Taping Dimensions (Unit: mm)

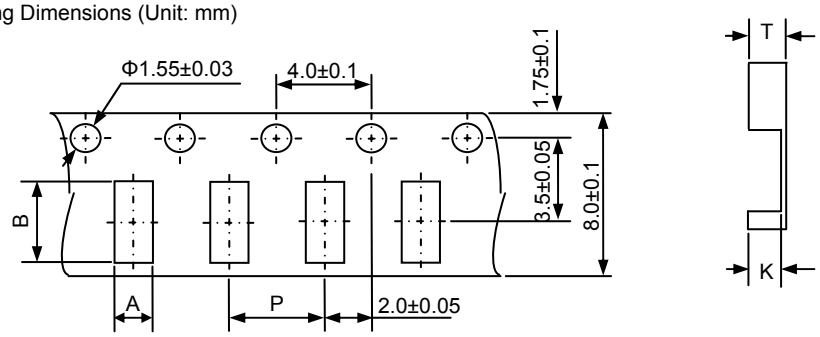


Fig.8.1-2

Type	A	B	P	K	T
1005	0.66±0.04	1.20±0.04	2.0±0.05	0.67±0.03	0.75±0.05

(3) Leader and blank portion

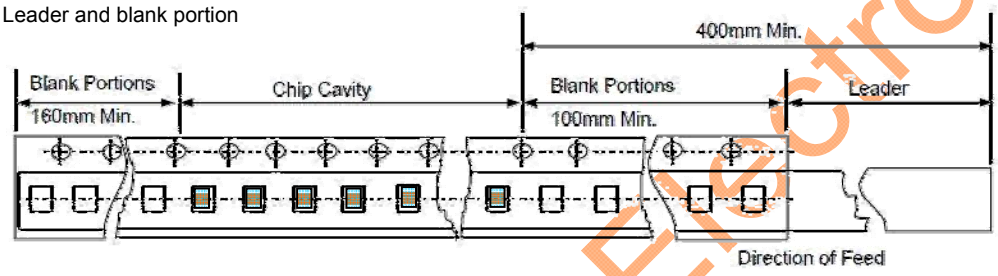


Fig. 8.1-3

(4) Reel Dimensions (Unit: mm)

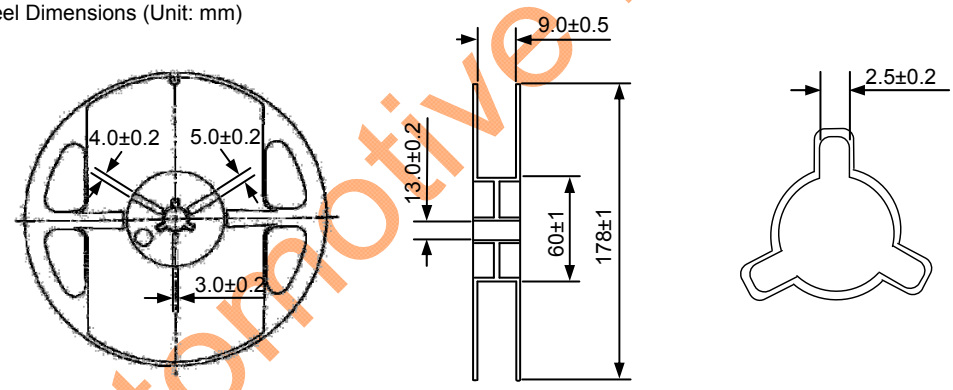


Fig. 8.1-4

(5) Peeling off force: 10gf to 70gf in the direction show below.

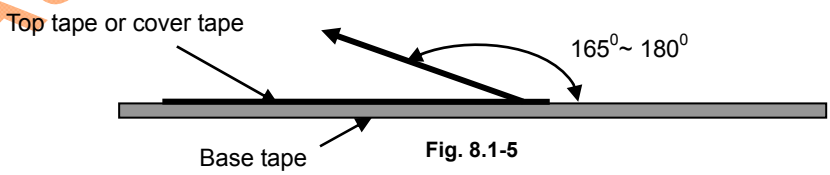


Fig. 8.1-5

8.2 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. Minimum packages, such as polyvinyl heat-seal packages shall not be opened until they are used. If opened, use the reels as soon as possible.

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

9. Warning and Attentions

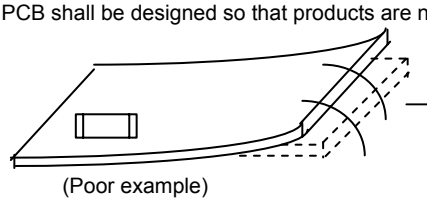
9.1 Precautions on Use

a. Always wear static control bands to protect against ESD.
b. Any devices used (soldering iron, measuring instruments) should be properly grounded.
c. Use non-magnetic tweezers when handing the chips.
d. Pre-heating when soldering, and refer to the recommended condition specified in specification.
e. Don't apply current in excess of the rated current value. It may cause damage to components due to over-current.
f. Keep clear of anything that may generate magnetic fields such as speakers, coils.
g. When soldering, the electrical characteristics may be varied due to hot energy and mechanical stress.
h. When coating products with resin, the relatively high resin curing stress may change the electrical characteristics and mechanical performance. For exterior coating, select resin carefully so that electrical and mechanical performance of the product is not affected. Before using, please evaluate reliability with the product mounted in your application set.
i. When mount chips with adhesive in preliminary assembly, do appropriate check before the soldering stage, i.e., the size of land pattern, type of adhesive, amount applied, hardening of the adhesive on proper usage and amounts of adhesive to use.
j. Mounting density: Add special attention to radiating heat of products when mounting other components nearby. The excessive heat by other products may cause deterioration at joint of this product with substrate.
k. Since some products are constructed like an open magnetic circuit, narrow spacing between components may cause magnetic coupling.
l. Please do not give the product any excessive mechanical shocks in transportation.
m. Please do not touch wires by sharp terminals such as tweezers to avoid causing any damage to wires.
n. Please do not add any shock and power to the soldered product to avoid causing any damage to chip body.
o. Please do not touch the electrodes by naked hand as the solderability of the external electrodes may deteriorate by grease or oil on the skin.

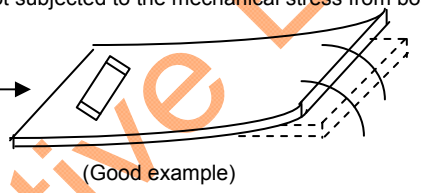
9.2 PCB Bending Design

The following shall be considered when designing and laying out PCB's.

a. PCB shall be designed so that products are not subjected to the mechanical stress from board warp or deflection.



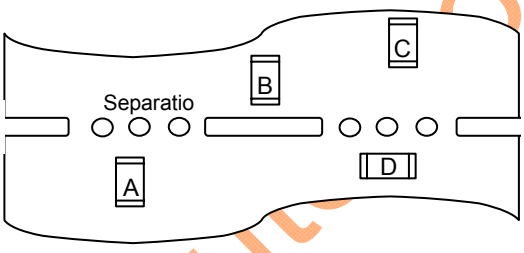
(Poor example)



(Good example)

Products shall be located in the sideways direction to the mechanical stress.

b. Products location on PCB separation.



Product shall be located carefully because they may be subjected to the mechanical stress in order of A>C=B>D.

c. When splitting the PCB board, or insert (remove) connector, or fasten thread after mounting components, care is required so as not to give any stress of deflection or twisting to the board. Because mechanical force may cause deterioration of the bonding strength of electrode and solder, even crack of product body. Board separation should not be done manually, but by using appropriate devices.

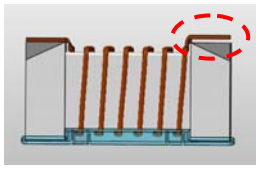
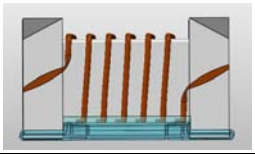
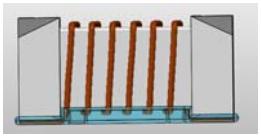
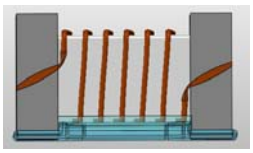
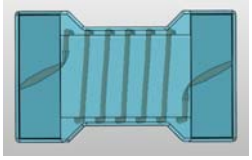
9.3 Recommended PCB Design for SMT Land-Patterns

When chips are mounted on a PCB, the amount of solder used (size of fillet) and the size of PCB Land-Patterns can directly affect chip performance (such as Q). And they can also cause other soldering question (such as offset and side lap). Therefore, the following items must be carefully considered in the design of solder land patterns.

a. Please use the PCB pad and solder paste we recommend, and contact us in advance if they need to be changed.
b. Please use flux contained with resin since the highly acidic (Chlorine content more than 0.2 wt%) or water-soluble one could damage the insulation film of wires, then causing short circuit of parts.
c. The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets.
d. When more than one part is jointly soldered onto the same land or pad, the pad must be designed that each component's soldering point is separated by solder-resist.

Recommended land dimensions please refer to product specification.

10. Visual inspection standard of product

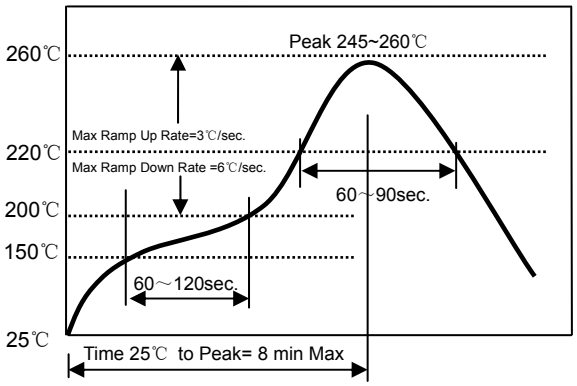
File No:		Applied to Wire Wound Ceramic Inductor Series	
Effective date:			
No.	**Defect Item Item**	**Graphic Schematic Drawing**	**Rejection identification Criteria**
1	Wire off/ Welding Spot Off		The solder joint Welding Spot of wire break away from electrodes, or over the electrodes.
2	Solder misplace	 	Solder joints are not at electrode side but at the coating side or flank.
3	Coating misplace		Coating at flank
			Coating at electrodes side

11. Recommended Soldering Technologies

This product is only for reflow soldering and iron soldering.

11.1 Re-flowing Profile

△ Preheat condition: 150~200℃/60~120sec.
△ Allowed time above 220C: 60~90sec.
△ Peak temp: 245~260℃
△ Max time at max temp: 10sec.
△ Solder paste: Sn/3.0Ag/0.5Cu
△ Allowed Reflow time: 3 times max.



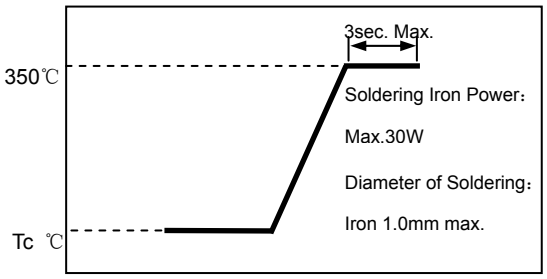
Note:

1. 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. otherwise, reflow verification should be carried out before using this chip.
2. After reflow soldering uv glue appearance have slight color change

11.2 Iron Soldering Profile

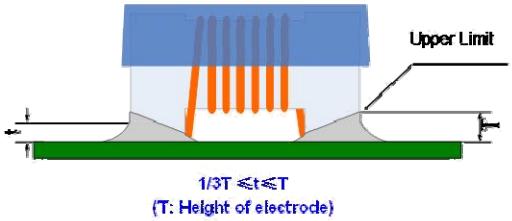
△ Iron soldering power: 30W Max.
△ Preheat condition: 150℃/60sec.
△ Soldering tip temperature: 350℃ Max.
△ Soldering time: 3sec. Max.
△ Solder paste: Sn/3.0Ag/0.5Cu
△ Iron Soldering time: 1 time max.

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



12. Solder Volume

Solder shall be used not to exceed as shown below.



Accordingly increasing the solder volume, the mech

a. anical stress to chip is also increased.Exceeding solder volume may cause the failure of mechanical or electrical performance.
b. Before soldering, please ensure that the solder should not adhere to the wire part of chip.
c. Please pay particular attention to whether there is flux remaining on surface of the wire part of chip after subjected to reflow soldering since this may causing short circuit of parts.

13. Cleaning

Products shall be cleaned on the following conditions:

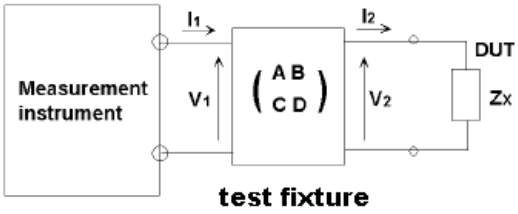
a. Cleaning temperature shall be limited to 60℃ Max. (40℃ Max. for fluoride and alcohol type cleaner.)
b. Ultrasonic cleaning shall comply with the following conditions, avoiding the resonance phenomenon at the mounted products and PCB.
   Power: 20W/l Max.
   Frequency: 28 KHz to 40 KHz
   Time: 5 minutes Max
c. Cleaner
   i. Alternative cleaner
      - Isopropyl alcohol (IPA)
      - HCFC-225

   ii. Aqueous agent
      - Surface Active Agent Type (Clean through-750H)
      - Hydrocarbon Type (Techno Cleaner-335)
      - Higher Alcohol Type (Pine Alpha ST-100S)
      - Alkali saponifier Type (※ Aqua Cleaner 240)

      ※ Alkali saponification shall be diluted to 20% volume with de-ionized water.
      ※ Please contact our technical service department before using other cleaner.
d. There shall be no residual flux and residual cleaner after cleaning. In the case of using aqueous agent, product shall be dried completely after rinse with de-ionized water in order to remove the cleaner.
e. Some products may become slightly whitened. However, product performance or usage is not affected.
f. Please take care of winding part while cleaning.
g. After cleaning, parts could be subjected to the next reflow soldering till the solvent remaining on surface of parts being volatilized.

14. Measuring Method of Inductance

a. Residual elements and stray elements of test fixture can be described by F-parameter as shown in the following:



test fixture

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} V_2 \\ I_2 \end{bmatrix}$$

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} AV_2 + BI_2 \\ CV_2 + DI_2 \end{bmatrix}$$

Measured open impedance: $Zom = \frac{A}{C}$

Measured short impedance: $Zsm = \frac{B}{D} \approx -Zsc$ (when uses short chip to short)

Measured short ship impedance: Zsc

Measured value: $Zxm=V_1/I_1$

Impedance of DUT: $Zx=V_2/I_2$

b. The relation between Zx and Zom, Zsm, Zxm is shown in the following:

$$Zx = \frac{V_2}{I_2} = \frac{D}{A} * \frac{\frac{V_1}{I_1} - \frac{B}{D}}{1 - \frac{V_1}{I_1} * \frac{C}{A}} = \frac{D}{A} * \frac{Zxm - \frac{B}{D}}{1 - Zxm * \frac{C}{A}} = \frac{D}{A} * \frac{Zxm - Zsm}{1 - Zxm / Zom}$$

c. Lx should be calculated with the following equation:

$$Lx = \frac{\mathrm{Im}(Zx)}{2\pi f} = \frac{\mathrm{Im}(Zxm + Zsc)}{2\pi f} = \frac{\mathrm{Im}(Zxm)}{2\pi f} + \frac{\mathrm{Im}(Zsc)}{2\pi f} = Lxm + Lsc$$

Lxm：measured chip inductor inductance

Lsc：measured short chip inductance

Lx：Inductance of chip inductor

d. Compensation Value（Lsc）of short chip

Series	Compensation Value
AWL1005C□□□□STFM81	0.68nH