

# for Automotive Electronics

# SPECIFICATIONS


<b>Customer</b>	
<b>Product Name</b>	Assembled Wire Wound SMD Power Inductor for Automotive Electronics
<b>Sunlord Part Number</b>	<b>AWPE101006H Series</b>
<b>Customer Part Number</b>	
<b>Weight</b>	3.3g/pcs Typ.

New Released,  Revised

**SPEC No.:** **AWPE210000**

【This SPEC is total 13 pages.】

【RoHS, Halogen-Free and SVHC Compliant Parts】

Approved By	Checked By	Issued By
		

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【For Customer approval Only】 Date:

Qualification Status:  Full  Restricted  Rejected

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Comments:

**Version Change History**

Rev.	Date	Item	Changed Contents	Change Reasons	Drawing	Check	Approval
01	/	/	/	New release	Yubo Su	Haigen He	Jingxin Huang

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**〈Content〉**

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1 Scope

1.1 Scope of parts

This specification applies to the AWPE101006H Series of assembled wire wound SMD power inductor for Automotive Electronics based on AECQ200.

1.2 Scope of application

Product numbers recorded in this specification are used for automotive applications and prohibited using in Engine Control System and automotive suspension system.

1.3 Operating and storage temperature

The part temperature (ambient + temp. rise) should not exceed 150 °C under worst case operating conditions. Circuit design, component placement, PCB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application.

- 1) Operating and storage temperature range (individual chip without packing): -55°C ~ +150°C.
- 2) Storage temperature range (packaging conditions): -10°C~+40°C and RH 70% (Max.).

2 Product Description and Identification (Part Number)

Description:

AWPE101006H Series of assembled wire wound SMD power inductor for Automotive Electronics.

1) Product Identification (Part Number)

AWPE	101006	H	2R2	M	T	□□□
①	②	③	④	⑤	⑥	⑦
①	Product Type		A:Automotive; W:wire; P:power inductor; E:EI structure			
②	External Dimensions(LxWxH) [mm]		101006:10.0x10.0x6.0 mm			
③	Feature type		H: H type material			
④	Nominal Inductance		2R2: 2.2μH			
⑤	Inductance Tolerance		M:±20%;N:±30%;			
⑥	Packing		Tape & Reel			
⑦	Special Process code		blank: flat wire			

3 Shape and Dimensions

Dimensions and recommended PCB pattern for reflow soldering, please see Fig.3-1, Table 3-1.

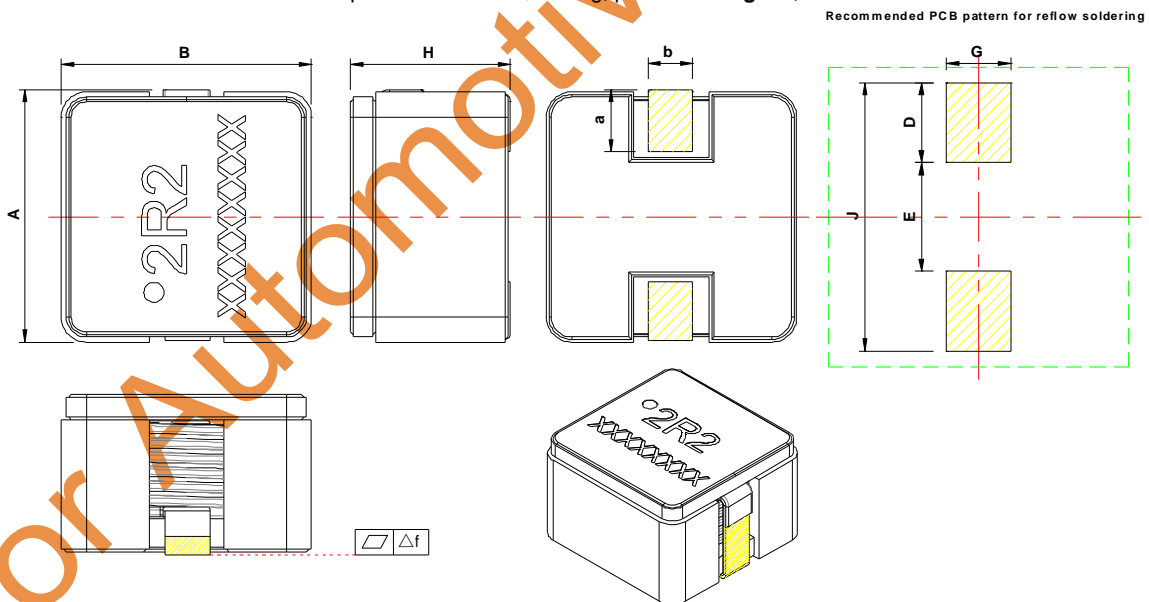


Fig.3-1

[Table 3-1] Unit:mm

Item	A	B	H	Δf	a	b
SPEC	10.2±0.5	10.0±0.5	6.2±0.5	0.1Max	2.2±0.3	1.8±0.2
Item	D	E	G	J		
SPEC	3.2Typ	4.8Typ	2.6Typ	11.2 Typ		

Δf: Clearance between terminal and the surface of plate must be 0.1mm max when coil is placed on a flat plate.

4 Electrical Characteristics

AWPE101006H Series

Part Number	Inductance	DC Resistance (20°C)		Saturation Current	Heat Rating Current	Withstanding Voltage	Marking
	100KHz/1V	Max.	Typ.	Typ.	Typ.		
Units	µH	mΩ		A	A	V	
Symbol	L	DCR		Isat	Irms	-	-
AWPE101006H1R0MT	1.0±20%	2.8	2.3	25.6	22.0	300Min	1R0
AWPE101006H1R5MT	1.5±20%	3.4	2.8	21.6	20.0		1R5
AWPE101006H2R2MT	2.2±20%	4.0	3.3	19.2	18.0		2R2
AWPE101006H3R3MT	3.3±20%	6.1	5.1	13.2	15.5		3R3
AWPE101006H4R7MT	4.7±20%	7.7	6.4	12.0	14.0		4R7
AWPE101006H5R6MT	5.6±20%	12.7	10.6	11.2	10.5		5R6
AWPE101006H6R8MT	6.8±20%	13.9	11.6	10.8	10.0		6R8
AWPE101006H8R2MT	8.2±20%	15.1	12.6	8.4	9.0		8R2

Note:

- ※1 : Rated current: Isat or Irms, whichever is smaller;
- ※2 : Saturation Current: DC current at which the inductance drops no more than 30% from its value without current;
- ※3 : Heat Rating Current: DC current that causes the temperature rise (ΔT is no more than 40 °C) from 25°C ambient.

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5 Test and Measurement Procedures

5.1 Test Conditions

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

- a. Ambient Temperature:  $20 \pm 15^{\circ}\text{C}$ .
- b. Relative Humidity:  $65 \pm 20\%$ .
- c. Air Pressure: 86kPa to 106kPa.

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

- a. Ambient Temperature:  $20 \pm 2^{\circ}\text{C}$ .
- b. Relative Humidity:  $65 \pm 5\%$ .
- c. Air Pressure: 86kPa to 106kPa.

5.2 Visual Examination

Inspection Equipment: Visual or CCD.

5.3 Electrical Test

5.3.1 Inductance (L)

- a. Refer to **Item 4**. Test equipment: WK3260B LCR meter or equivalent.
- b. Test Frequency and Voltage: refers to **Item 4**.

5.3.2 Direct Current Resistance (DCR)

- a. Refer to **Item 4**.
- b. Test equipment: HIOKI 3540 or equivalent.

5.3.3 Saturation Current (Isat)

- a. Refer to **Item 4**.
- b. Test equipment: WK3260B LCR meter or equivalent.

5.3.4 Temperature rise current (Irms)

- a. Refer to **Item 4**.
- b. Test equipment (see Fig. 5.3.4-1, Fig.5.3.4-2): Electric Power, Electric current meter, Thermometer.
- c. Measurement method:
  1. Set test current to be 0 mA.
  2. Measure initial temperature of choke surface.
  3. Gradually increase current and measure choke temperature for corresponding current.
  4. Definition of Temperature rise current: DC current that causes the temperature rise ( $\Delta T$ ) from  $25^{\circ}\text{C}$ .

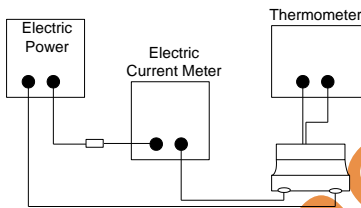


Fig. 5.3.4-1

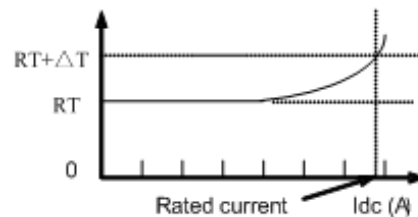


Fig. 5.3.4-2

6 Structure and material list

The structure and material list of AWPE101006H products, please refer to Fig.6-1 and Table 6-1.

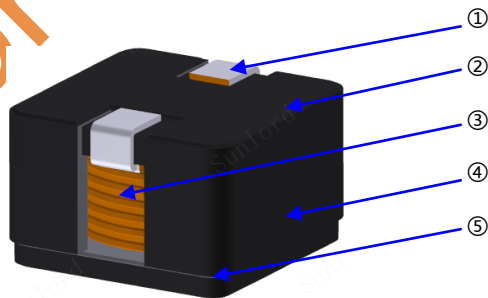


Fig.6-1

[ Table.6-1 ]

No.	Components	Material
①	Electrode	Flat wire and Tin
②	Core	Fe-based Metal
③	Coil	Flat wire and Tin
④	Insulation layer	Epoxy
⑤	Binder	Epoxy

**7 Product Marking**

Please refer to Fig. 7-1.

○: polarity point

2R2: Inductance of the products.

XXXXXXXX: Trace code



Fig. 7-1.

**8 Reliability Test**

No.	Test Items	Test Methods	Requirements
1	Pre-and Post -Stress Electrical Test	Inductance of the components	(1)The electrical values before the test meet the specifications (2)The electrical values after the test meet the rate of change requirements; Inductance change:Within ±20%
		DC resistance of the components	(1)The electrical values before the test meet the specifications (2)The electrical values after the test meet the rate of change requirements; Inductance change:Within ±20%
2	Physical Dimension	Dimensions of the components	(1) meet the specifications
3	Terminal Strength	Reflow 2 times,17.7N,X、 Y direct,60s	(1)No visible mechanical damage
4	Resistance to Flexure	Reflow 2 times,2mm,60(+5)S	(1)No visible mechanical damage
5	Temp. Characteristics	25°C(15+3min) → -55°C(15+3min) → +150°C(15+3min).	(1)Inductance change should be within ±20% of reference value measuring at 25°C
6	Solderability	Method 1: ①pretreatment;155°C , 4h ②235°C,5(-0.5,+0)s ③Solder: Sn/3.0Ag/0.5Cu	(1)Wetting shall be exceeded 95% coverage
		Method 2: ①Steam aging:8h ②235°C,5(-0.5,+0)s ③Solder:Sn/3.0Ag/0.5Cu	(1)Wetting shall be exceeded 95% coverage
		Method 3: ①Steam aging:8h ②215°C,5(-0.5,+0.5)s ③Solder:Sn63/Pb37	(1)Wetting shall be exceeded 95% coverage

		Method 4: ① Steam aging: 8h ② 260°C, 7(-0.5, +0.5)s ③ Solder: Sn/3.0Ag/0.5Cu	(1) Wetting shall be exceeded 95% coverage
7	Resistance to Soldering Heat	Reflow: Max. 260°C/10s, 3 times.	
8	High Frequency Vibration	10~2000Hz, 5g, 20min/Cycle, 4 hours in each 3 mutually perpendicular directions (total of 12 hours).	
9	Mechanical Shock	Half sine shock pulse, 100g, 6ms, 6 shocks in each 3 mutually perpendicular directions (total of 18 shocks).	
10	ESD Test	HBM ESD discharge waveform, 8KV, each 1 time of +/- polarity.	
11	Thermal Shock	Reflow 2 times, -55°C/(30min), +150°C/(30min), transforming interval: 20s, 1000 cycles.	(1) No visible mechanical damage (2) Inductance change: Within ±20% (3) The DCR value complies with the specifications of the specifications (4) The test was completed within 24-4/+24h hours after the end of the test
12	Resistance to Low Temperature	Reflow 2 times, -55°C, 1000 hours.	
13	Resistance to High Temperature	Reflow 2 times, +150°C, 1000 hours.	
14	Moisture Resistance	Reflow 2 times, ① 25°C → 65°C, 90%~100%RH, 2.5h ② 65°C, 90%~100%RH, 3h ③ 65°C → 25°C, 80%~100%RH, 2.5h ④ 25°C → 65°C, 90%~100%RH, 2.5h ⑤ 65°C, 90%~100%RH, 3h ⑥ 65°C → 25°C, 80%~100%RH, 2.5h, ⑦ 25°C, 90%~100%RH, 8h, 24 hours of 1 cycle (total of 240 hours)	
15	Biased Humidity	Reflow 2 times, 85°C, 85%RH, 1000 hours.	
16	Operational Life	Reflow 2 times, +125°C, 1000 hours, rated current.	



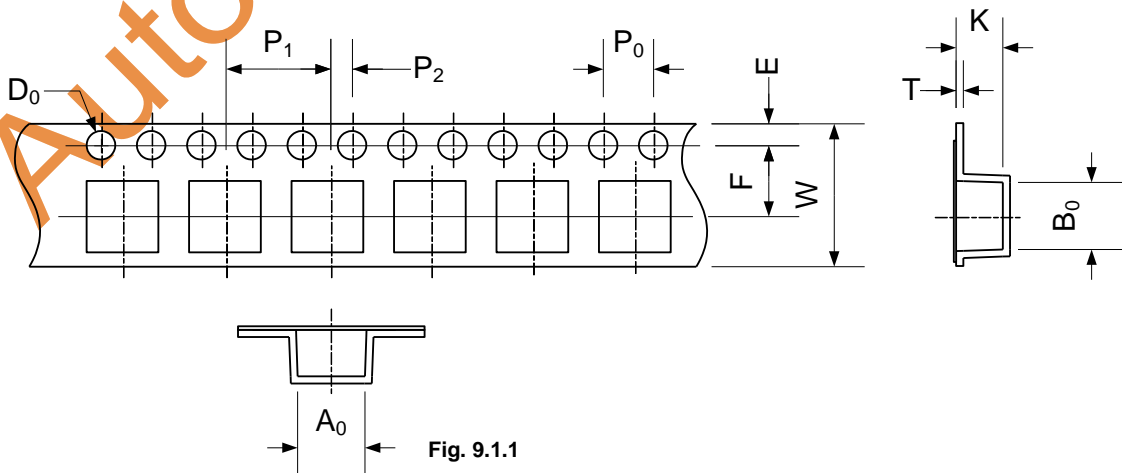
17	solvent resistance	Method A: one part isopropyl alcohol and three part mineral spirits, 25±0.5°C, 3min(+0.5, -0), brushed with normal hand pressure for ten strokes after each cycle of 3cycles	No visible mechanical damage.
		Method B: 90 percent d-limonene and 10 percent surfactant, 25±0.5°C, 3min(+0.5, -0), brushed with normal hand pressure for ten strokes after each cycle of 3cycles	
		Method C: two part water, one part propylene glycol monomethyl and one part monoethanolamine, 63°C to 70°C, 3min(+0.5, -0), brushed with normal hand pressure for ten strokes after each cycle of 3cycles	
18	Flammability	Refer to MIL-STD-202 Method 111, UL94	Remark: Requirements: 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

9 Packaging and Storage

9.1 Tape and Reel Packaging Dimensions

9.1.1 Taping Dimensions (Unit: mm)

Please refer to Fig. 9.1.1 and Table 9.1.1.



[Table9.1.1] Unit: mm

Series	$A_0$	$B_0$	$W$	$E$	$F$	$P_0$	$P_1$	$P_2$	$D_0$	$T$	$K_0$
AWPE101006H	10.6Typ	11.0 Typ	24 Typ	1.75 Typ	11.5 Typ	4 Typ	16 Typ	2 Typ	1.5 Typ	0.5 Typ	6.7 Typ

9.1.2 Direction of rolling

Please refer to Fig. 9.1.2

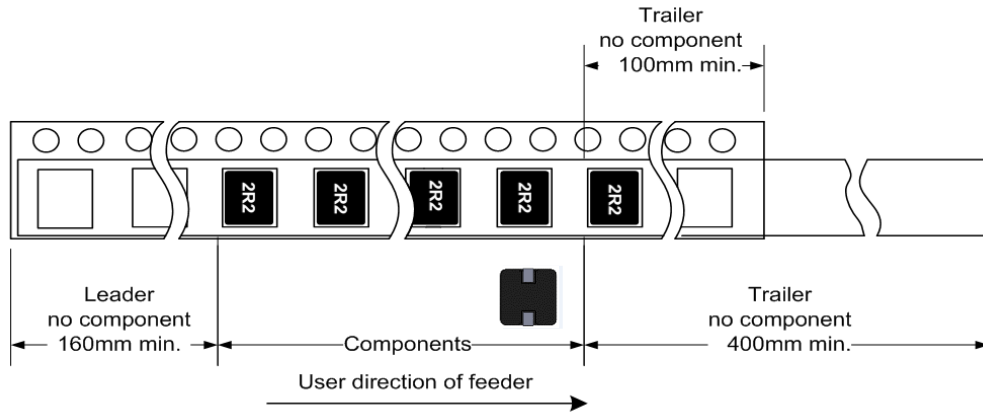


Fig. 9.1.2

9.1.3 Reel Dimensions (Unit: mm)

Please refer to Fig. 9.1.3.

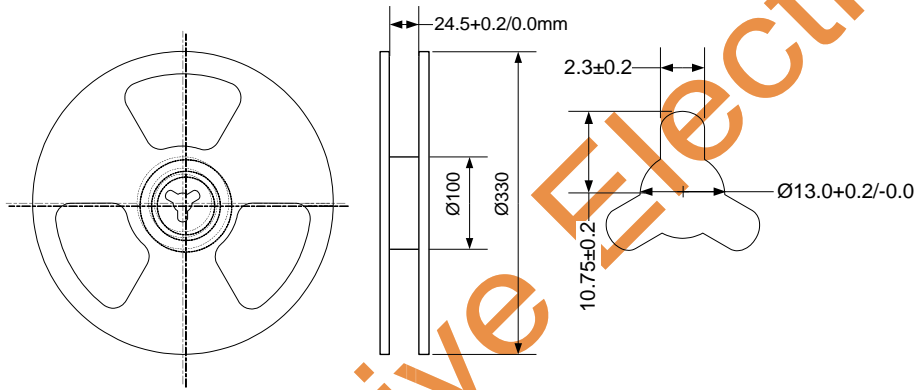


Fig.9.1.3

9.1.4 Top tape strength

Peel-off strength: 10~150gf.

Peel-off angle: 165°~180°, refers to Fig. 9.1.4.

Peel-off speed: 300mm/min.

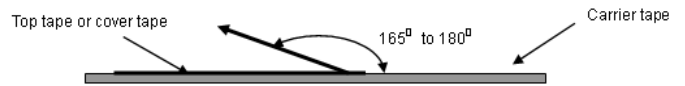


Fig. 9.1.4

9.1.5 The number of components

A tape & reel package contains 500 inductors.

9.1.6 The allowable number of empty chip cavities: 0 chip.

9.2 Packing Documents and Marking

9.2.1 Packing Documents

Packing documents include the following:

- 1) Packaging list;
- 2) Certificate of compliance (COC).

9.2.2 Packing QTY.

4 or 6 reels in each outer case.

9.2.3 Marking

1) Marking label information on reels includes (see Fig. 9.2.3-1, Fig. 9.2.3-2a/2b):

Fig.9.2.3-2a: Shipping labels

- a). P/O No.
- b). Customer Part No.
- c). Sunlord Part No.
- d). Quantity.
- e). Lot No.
- f). Date code.
- g). Inspection stamp.
- h). MFG address as 'Made In China'.

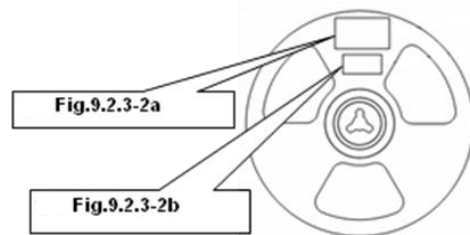


Fig.9.2.3-1

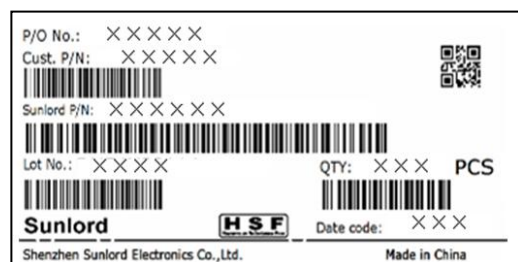


Fig.9.2.3-2a

Fig.9.2.3-2b: Production labels

- a). P/O No.
- b). Quantity.
- c). Lot No.
- d). Inspe No.
- e). Inspection stamp.
- f). MFG address as 'Made In China'.
- g). Sequence number.

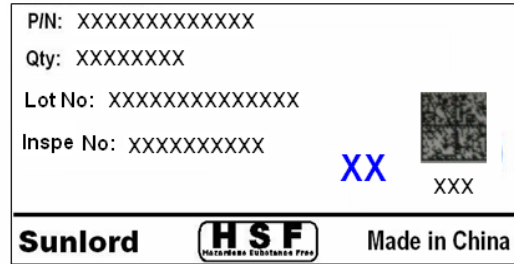


Fig.9.2.3-2b

2) Marking on outer case (see Fig.9.2.3-3-5):

Out case size please refers to Table 9.2.3-1.

- a). Manufacturer: Sunlord ID:  
 "Shenzhen Sunlord Electronics Co., Ltd."
- b). Packing label include the following:
  - i) Customer.
  - ii) Manufacturer.
  - iii) Date code.
  - iv) C/No.

Example: "1/10" means that this case is the 1st one of total 10 cases.

- v) P/O No.
- vi) Customer Part No.
- vii) Sunlord Part No.
- viii) Quantity.
- ix) Inspection Stamp.

[ Tab. 9.2.3-1 ]

Packaging type	L(mm)	W(mm)	H(mm)
TPY1	380	380	250
TPY2	380	380	190

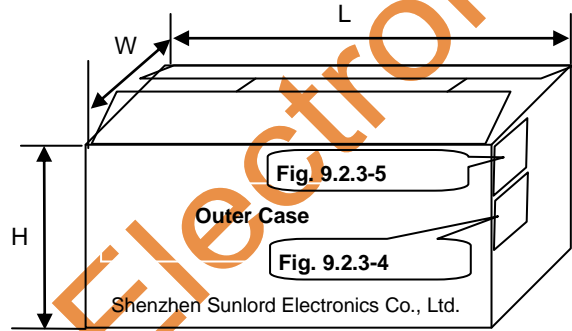


Fig. 9.2.3-3

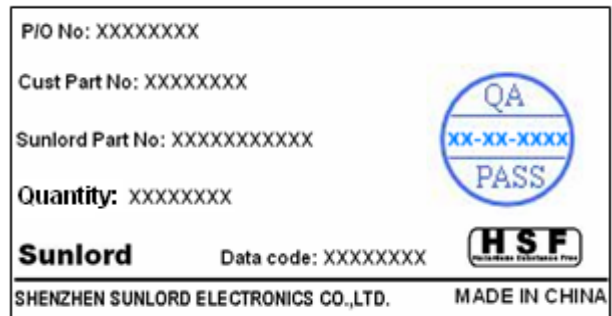


Fig.9.2.3-4

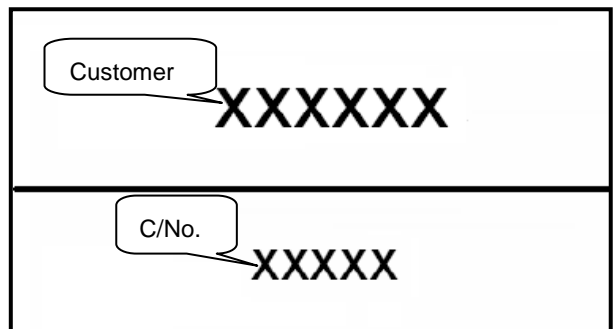
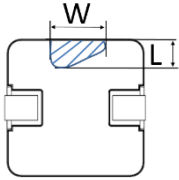
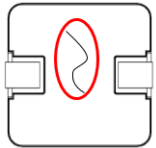
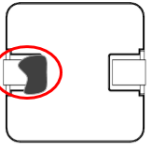
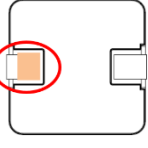
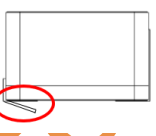
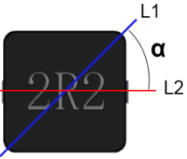


Fig.9.2.3-5

for Automotive Electronics

10 Visual inspection standard of product

File No:		Applied to Assembled Wire Wound SMD Power Inductor for Automotive Electronics		REV:01
Effective date:				
No.	Defect Item	Graphic	Rejection identification	Acceptance
1	Core defect		The defect length/width (L and W) more than 2 mm, NG.	AQL=0.065
2	Core crack		Visual cracks, NG.	AQL=0.065
3	Electrode surface glue		Glue can be seen on the electrode surface by eyes, NG.	AQL=0.065
4	Copper exposure		Copper on electrode surface can be seen by eyes, NG.	AQL=0.065
5	Warped electrode		Electrode warped, and the height is out of SPEC. value, NG.	AQL=0.065
6	Marking defect		① The content of marking 1) is indistinct, 2) disagrees with current product P/N requirements, NG; ② Intersection angle by L1 and L2 more than 45°, NG.	AQL=0.065

11 Recommended Soldering Technologies

11.1 Re-flowing Profile:

- △ Preheat condition: 150 ~200°C/60~120sec.
  - △ Allowed time above 217°C: 60~90sec.
  - △ Max temp: 260°C.
  - △ Max time at max temp: 5sec.
- Solder paste: Sn/3.0Ag/0.5Cu.
- △ Allowed Reflow time: 2x max:  
Please refer to Fig. 11.1-1.

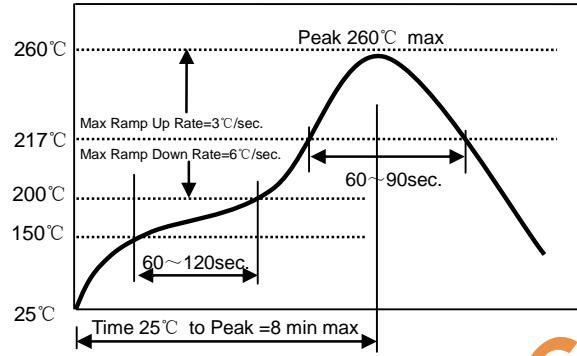


Fig. 11.1-1

[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.]

11.2 Iron Soldering Profile

- △ Iron soldering power: Max. 30W.
- △ Pre-heating: 150°C/60sec.
- △ Soldering Tip temperature: 350°C Max.
- △ Soldering time: 3sec. Max.
- △ Solder paste: Sn/3.0Ag/0.5Cu.
- △ Max.1 times for iron soldering:  
Please refer to Fig. 11.2-1.

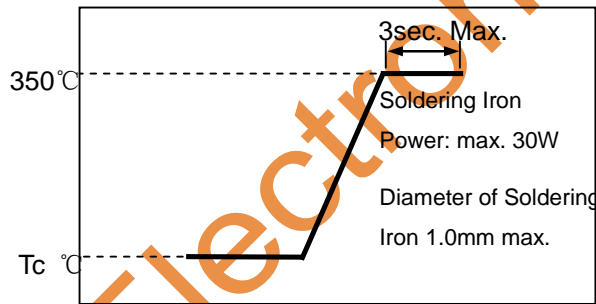


Fig. 11.2-1

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

12 Precautions

12.1 Surface mounting

- Mounting and soldering condition should be checked beforehand.
- Applicable soldering process to this product is reflow soldering only.
- Recommended conditions for repair by soldering iron:  
Preheat the circuit board with product to repair at 150°C for about 1 minute.  
Put soldering iron on the land-pattern.  
Soldering iron's temperature: 350°C maximum/Duration: 3 seconds maximum/1 time for each terminal.  
The soldering iron should not directly touch the inductor.  
Product once removes from the circuit board may not be used again.

12.2 Handling

- Keep the products away from all magnets and magnetic objects.
- Be careful not to subject the products to excessive mechanical shocks.
- Please avoid applying impact to the products after mounted on pc board.
- Avoid ultrasonic cleaning.

12.3 Storage

- To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.
- Recommended conditions: -10°C~40°C, 70%RH (Max.).
- Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, product should be used with one year from the time of delivery.
- In case of storage over 6 months, solderability shall be checked before actual usage.

12.4 Regarding Regulations

- Any Class- I or Class- II ozone-depleting substance (ODS) listed in the Clean Air Act in US for regulation is not included in the products or applied to the products at any stage of whose manufacturing processes.
- Certain brominated flame retardants (PBBs,PBDEs) are not used at all.
- The products of this specification are not subject to the Export Trade Control Order in China or the Export Administration Regulations in US.

12.5 Guarantee

- The guaranteed operating conditions of the products are in accordance with the conditions specified in this specification.
- Please note that Sunlord takes no responsibility for any failure and/or abnormality which is caused by use under other than the aforesaid operating conditions.

12.6 Please make sure to record the lot number on the label when using Sunlord's products in order for good traceability.