for Automotive Electronics

SPECIFICATIONS

Customer	
Product Name	Automotive SMD Power Inductor
Sunlord Part Number	**AMWPB6045S Series**
Customer Part Number	
Weight/MPQ	0.45g/pcs Typ., 1000pcs/reel

[☒New Released, ☐Revised] **SPEC No.: AMWPB0302210000**

【This SPEC is total 12 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	Jianliang Wei	Yubo Su	Yubo Su

‹Content›

1 Scope

1.1 Scope of parts

This specification applies to the AMWPB6045S Series of Automotive SMD power inductor based on AEC-Q200.

1.2 Scope of application

Product numbers recorded in this specification are used for automotive applications.

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℃ ~ +150℃(including self-heating).
2) Storage temperature range (packaging conditions): -10℃~+40℃ and RH 70% (Max.).

1.4 MSL:level1.

2 Product Description and Identification (Part Number)

1） Description:

AMWPB6045S series of Automotive SMD power inductor.

2） Product Identification (Part Number)

AMWPB	6045	S	3R3	M	T	□□□
①	②	③	④	⑤	⑥	⑦

① Product Type	A:Automotive; M:magnetic component; W:wire; P:power inductor; B: Structure Type
② External Dimensions(L×W×H)[mm]	6045:6.5×6.0×4.5 mm
③ Feature type	B: Structure Type
④ Nominal Inductance	3R3: 3.3μH, 4R7: 4.7μH, 6R8: 6.8μH, 100: 10.0μH
⑤ Inductance Tolerance	M:±20%;N:±30%
⑥ Packing	Tape & Reel
⑦ Special Process code	Blank: standard process

3 Shape and Dimensions

Dimensions and recommended PCB pattern for reflow soldering, please see **Fig.3-1, Fig. 3-2**and **Table 3-1.**

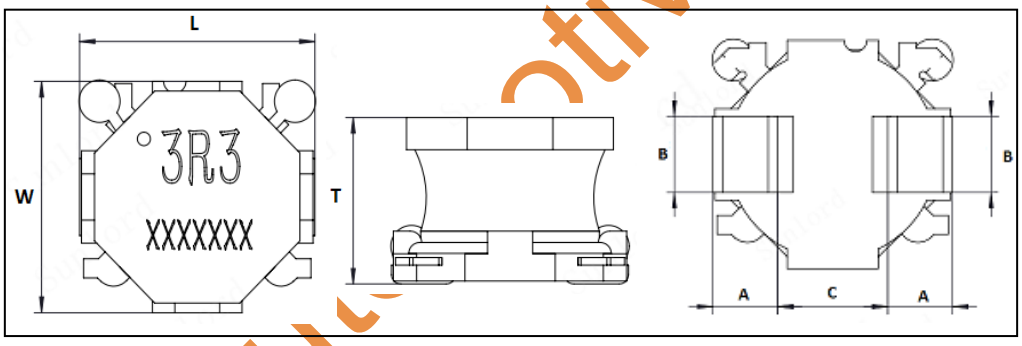


Fig.3-1 Dimensions

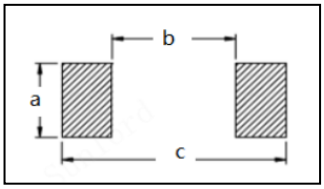


Fig.3-2 Recommend Land Pattern

[Table 3-1] (Unit: mm)

Series	L	W	T	A	B	C	a	b	c
AMWPB6045S	6.5±0.3	6.0±0.3	4.5±0.3	1.7±0.1	2.0±0.1	2.9 Typ.	2.2ref.	2.8ref.	7.0ref.

4 Electrical Characteristics

Part Number	Inductance		DC Resistance		Saturation Current		Heat Rating Current	Marking
	-	Test condition	Typ.	Max.	Typ.	Max.	Typ.	
Units	μH		mΩ		A		A	
Symbol	L		DCR		Isat		Irms	
AMWPB6045S1R0MT	1.0±20%	100KHz/1V	13	16	9.3	8.2	5.9	1R0
AMWPB6045S1R5MT	1.5±20%	100KHz/1V	15	18	7.2	6.6	5.5	1R5
AMWPB6045S2R2MT	2.2±20%	100KHz/1V	21	25	5.8	5.3	4.6	2R2
AMWPB6045S3R3MT	3.3±20%	100KHz/1V	27	33	5.5	5.0	4.1	3R3
AMWPB6045S4R7MT	4.7±20%	100KHz/1V	29	35	4.1	3.7	3.8	4R7
AMWPB6045S5R6MT	5.6±20%	100KHz/1V	32	37	3.6	3.2	3.6	5R6
AMWPB6045S6R8MT	6.8±20%	100KHz/1V	42	50	3.6	3.1	3.3	6R8
AMWPB6045S8R2MT	8.2±20%	100KHz/1V	50	60	3.1	2.7	3.0	8R2
AMWPB6045S100MT	10±20%	100KHz/1V	56	73	3.0	2.6	2.7	100

Note: ※1 : Rated current: Isat (Max.) or Irms(Typ.), whichever is smaller;
※2 : Saturation Current: Typ. Value, DC current at which the inductance drops 30% from its value without current;
※3 : Heat Rating Current: DC current that causes an approximate ΔT of 40°C from 20°C ambient.

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±15℃.
b. Relative Humidity: 65±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±2℃.
b. Relative Humidity: 65±5%.
c. Air Pressure: 86kPa to 106kPa.

5.2 Visual Examination

Inspection Equipment: visual.

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 (△T) from ambient temperature.

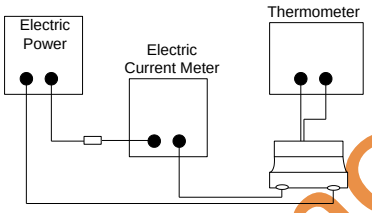


Fig. 5.3.4-1

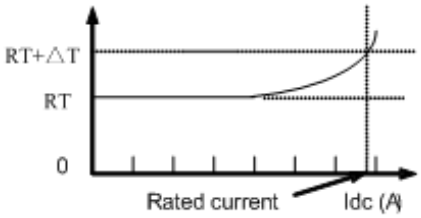


Fig. 5.3.4-2

6 Structure and material list

The structure and material list of AMWPB6045S Series products please refer to **Fig.6-1** and **Table 6-1**.

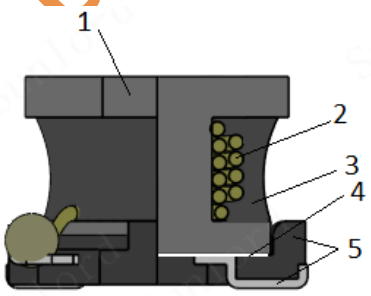


Fig.6-1

[Table. 6-1]

No.	Components	Material
1	Core	Ni-Zn Ferrite
2	Coil	Copper Wire
3	Magnetic Glue	Epoxy resin and Magnetic powder
4	Glue	Epoxy resin
5	Base	LCP+Cu/Ni/Sn
-	Marking	Laser

7 Product Marking

The product marking, please refer to **Fig.7-1.**

3R3: Inductance, refer to specifications

xxxxxxx: trace code

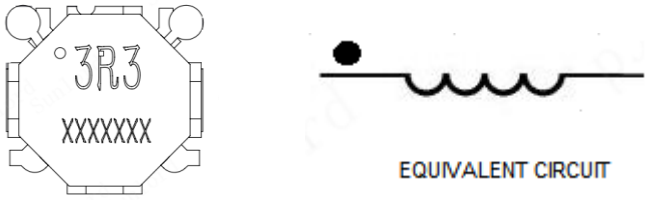


Fig.7-1

8 Reliability Test

No.	Test Items	Test Methods	Requirements
1	Visual	Inspect the appearance at least 10X.	No visible mechanical damage
2	Physical Dimension	length, width, thickness of the components.	meet the specifications
3	Pre-and Post -Stress Electrical Test	Inductance of the components 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 ±10%
4	Terminal strength	①Precondition: 3 reflow cycles; ②Test condition:17.7N,X,Y direct, 60(+5)s,Speed:1.0mm/s.	No removal or split of the termination or other defects shall occur
5	Board Flex	①Precondition: 3 reflow cycles; ②Test condition: 2mm,60(＋5)s.	No visible mechanical damage
6	Solder ability	Method 1: ①pretreatment:155℃,4h ; ②235℃,5(-0.5,+0)s ,25 ± 6 mm/s; ③Solder:Sn/3.0Ag/0.5Cu.	Wetting shall be exceeded 95% coverage
		Method 2: ①Steam aging:8h ±15min; ②235℃,5(-0.5,+0.5)s,25 ± 6 mm/s; ③Solder:Sn/3.0Ag/0.5Cu.	
		Method 3: ①Steam aging:8h ±15min; ②260℃,7(-0.5,+0.5)s ,25 ± 6 mm/s; ③Solder:Sn/3.0Ag/0.5Cu.	No more than 5% of the solderable termination exhibits exposed underlying, nonwettable base metal or metallization layers or portions of the ceramic substrate after exposure to molten solder
7	Resistance to Soldering Heat	Method 1: Max 260℃/10s, 3 times.Solder:Sn/3.0Ag/0.5Cu. Note: Reflow Profile refer to reflow profile 1	(1)No visible mechanical damage (2) Inductance change: Within ±10% (3) DCR: Satisfy electrical characteristic.
8	High Frequency Vibration	Reflow 3 times,10~2000Hz,5g,20min/Cycle,4 hours in each 3 mutually perpendicular directions (total of 12 hours) .	

9	Mechanical Shock	Reflow 3 times,Half sine shock pulse,100g,6ms,6 shocks in each 3 mutually perpendicular directions (total of 18 shocks).	(1) No visible mechanical damage (2) Inductance change: Within ±10% (3) DCR: Satisfy electrical characteristic.
10	Temperature Cycling	Reflow 3 times, ambient temperature -55℃/(30min), ambient temperature + 150℃/(30min), transforming interval:20s,1000 cycles. ①Read-outs at 500,1000cycles	
11	Low Temperature Exposure (Storage)	①Precondition: 3 reflow cycles; ②Test condition : ambient temperature -55±2℃,1000(+24)hours. Note:Read-outs at 500h,1000h	
12	High Temperature Exposure (Storage)	①Precondition: 3 reflow cycles; ②Test condition : ambient temperature 150±2℃,1000(+24)hours. Note:Read-outs at 500h,1000h	
13	Biased Humidity	Reflow 3 times, ambient temperature85℃,85%RH, 1000 hours. Note:Read-outs at 500h,1000h	
14	Operational Life	Reflow 3 times,ambient temperature 125±2℃,1000(+24)hours, rated current. Note: ①product surface temperature ≥150℃. ②Note:Read-outs at 500h,1000h	
15	Flammability	Refer to MIL-STD-202 Method 111、UL-94	① t1 or t2:≤10s; ② t1 plus t2 for the 5 specimens:≤50s; ③ t2+t3 for each specimen:≤30s; ④ No after-flame or after-glow of any specimen up to the holding clamp; ⑤ No cotton indicator ignited by flaming particles or drops.
16	ESD Test	HBM ESD discharge waveform, 8KV,each 1 time of +/- polarity.	(1) No visible mechanical damage (2) Inductance change: Within ±10% (3) DCR: Satisfy electrical characteristic.
17	Electrical characteristics	ambient temperature 25℃(15+3min) →ambient temperature -55℃(15+3min) →ambient temperature +150℃(15+3min).	Inductance change should be within ±10% of reference value measuring at 25℃
18	solvent resistance test	Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents.	① No specified markings which are missing in whole or in part, faded, smeared, blurred, or shifted (dislodged) to the extent ; ② No specimen shall have cracks, separations, crazing, swelling, softening, and degradation of body material, end caps and seals if present.

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**.

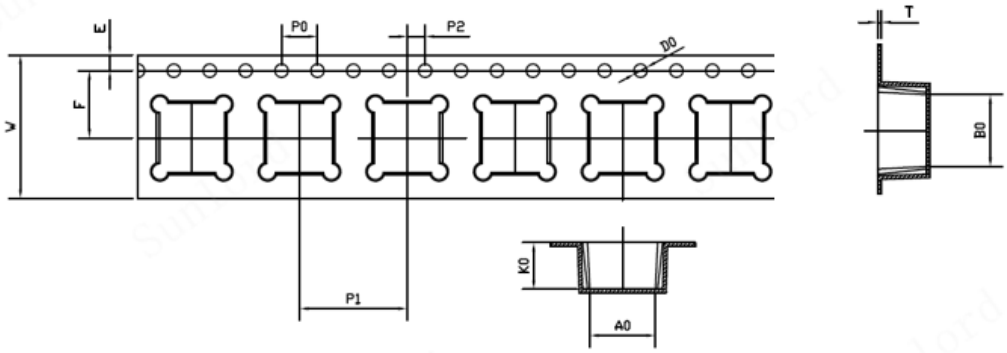


Fig. 9.1.1

[Table9.1.1] Unit：mm

Series	A_0	B_0	W	E	F	P_0	P_1
AMWPB6045S	6.6±0.10	6.3±0.10	16.0±0.30	1.75±0.10	7.5±0.10	4.0±0.10	12.0±0.10
Series	P2	D0	T	K	/	/	/
AMWPB6045S	2.0±0.10	1.5(+0.1/0)	0.4±0..05	4.9±0.10	/	/	/

9.1.2 Direction of rolling

Please refer to **Fig. 9.1.2**

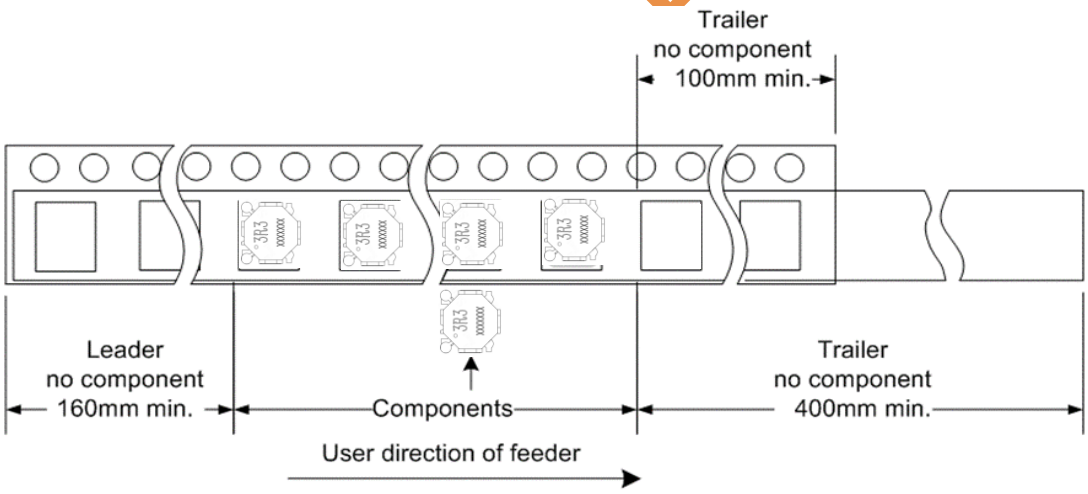


Fig. 9.1.2

9.1.3 Reel Dimensions (Unit: mm)

Please refer to **Fig. 9.1.3**.

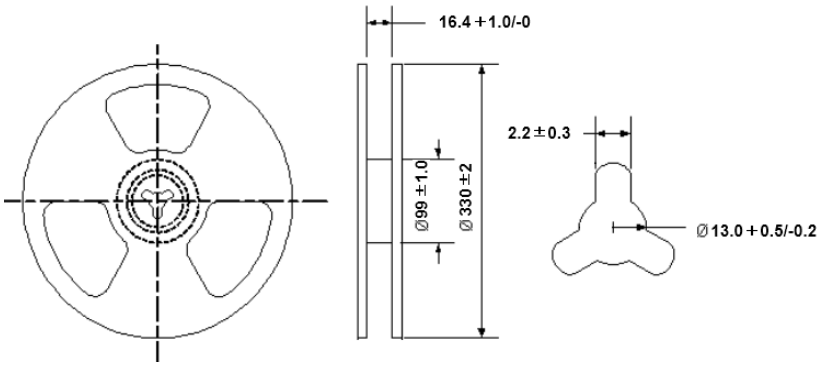


Fig.9.1.3

9.1.4 Top tape strength

Peel-off strength: 10~150gf.

Peel-off angle: 165°~180°, refers to **Fig. 9.1.3.**

Peel-off speed: 300mm/min.

9.1.5 The number of components

A tape & reel package contains 1000 inductors.

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

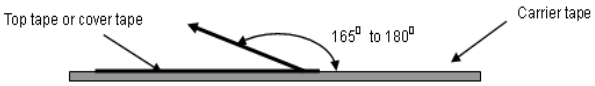


Fig. 9.1.3

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**):

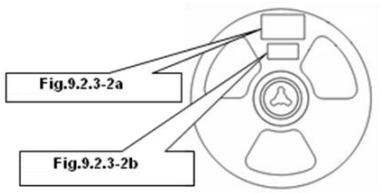


Fig.9.2.3-1

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'.

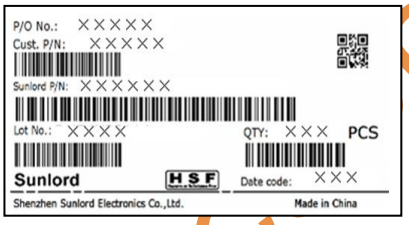


Fig.9.2.3-2a

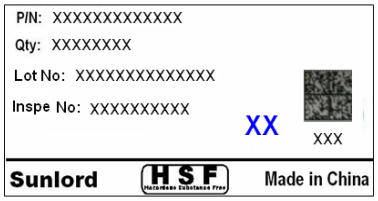


Fig.9.2.3-2b

Fig.9.2.3-2b: Production labels

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

2) Marking on outer case (see**Fig.9.2.3-3-4**):

Out case size pleases reefers to **Table 9.2.3-1**.

a). Manufacturer: Sunlord ID:
"Shenzhen Sunlord Electronics Co., Ltd."
b). Packing label include the following:
i) BoxID.
ii) S/PN.
iii) P/N.
iv) D/C.
v) Count.
vi) QTY.
vii) QR code.

[Tab. 9.2.3-1]

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

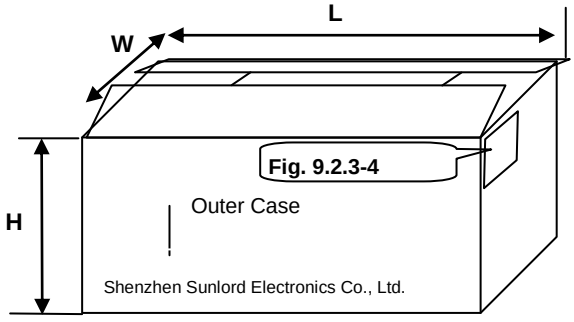


Fig. 9.2.3-3

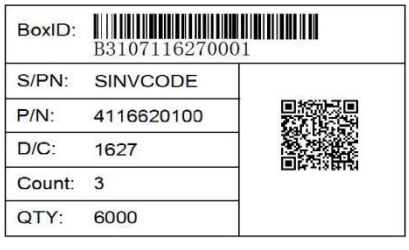
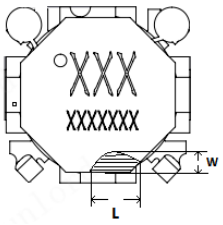
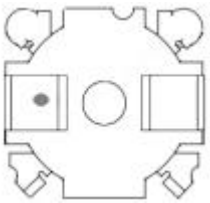
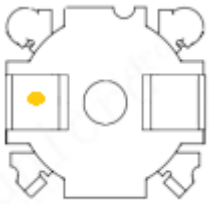


Fig. 9.2.3-4

10 Visual inspection standard of product

File No:		Applied to Wire Wound SMD Power Inductor for Automotive Electronics		REV:02
Effective date:				
No.	**Defect Item**	**Graphic**	**Rejection identification**	**Acceptance**
1	Core defect		The defect length and width (L and *W*) more than 2mm, NG.	AQL=0.065
2	Core crack		Visual cracks, NG.	AQL=0.065
3	Electrode surface dirt		*Dirt* 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	Marking defect		The content of marking is indistinct, NG;	AQL=0.065

11 Recommended Soldering Technologies

11.1Re-flowing Profile:

△ Preheat condition: 150 ~200℃/60~*180*sec.
△ Allowed time above 217℃: 60~*150*sec.
△ *Allowed time above 255 ℃: 30sec. ref.*
△ Max temp: 260℃.
△ Max time at max temp: 5sec.
Solder paste: Sn/3.0Ag/0.5Cu.
△ Allowed Reflow time: 3x max:
Please refer to 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.]

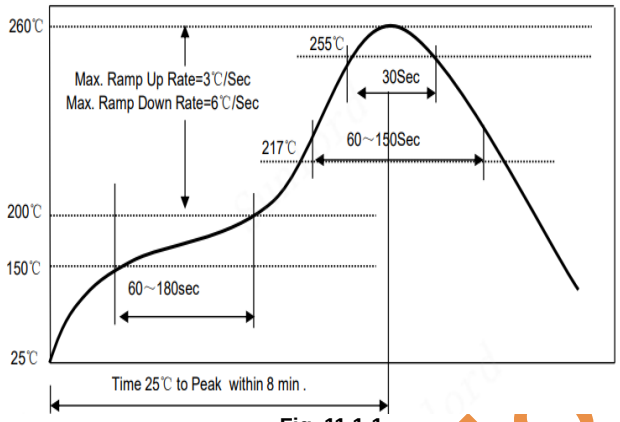


Fig. 11.1-1

11.2 Iron Soldering Profile

△ Iron soldering power: Max. 30W.
△ Pre-heating: 150℃/60sec.
△ Soldering Tip temperature: 350℃ 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.**

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

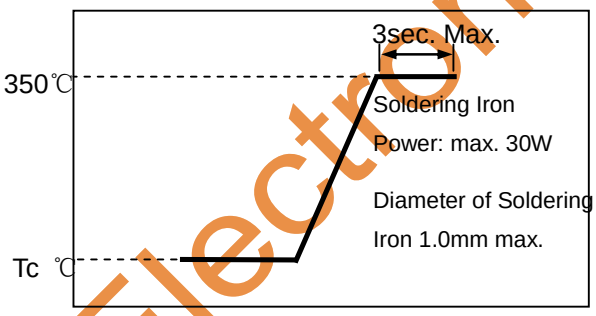


Fig. 11.2-1

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℃ for about 1 minute.
  Put soldering iron on the land-pattern.
  Soldering iron's temperature: 350℃ 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 Handing

- 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℃~40℃, 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.