

for Automotive Electronics

SPECIFICATIONS

Customer	
Product Name	Wire Wound SMD Power Inductor
Sunlord Part Number	AMWPH3015S Series
Customer Part Number	
Weight	54mg/pcs Typ.

New Released, Revised

SPEC No.: **AMWPH0104200000**

【This SPEC is total 16 pages.】

【 RoHS, Halogen-Free and SVHC Compliant Parts】

Approved By	Checked By	Issued By

Shenzhen Sunlord Electronics Co., Ltd.

Address: Sunlord Industrial Park, Dafuyuan Industrial Zone, Guanlan, Shenzhen, China 518110
 Tel: 0086-755-29832333 Fax: 0086-755-82269029 E-Mail: sunlord@sunlordinc.com

【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	/	Yixin Wang	Haigen He	Haigen He

for Automotive Electronics

〈Content〉

No.	Item	Page
1	Scope	4
2	Product Description and Identification (Part Number)	4
3	Shape and Dimensions	4
4	Electrical Characteristics	5~7
5	Test and Measurement Procedures	8
6	Structure	9
7	Product Marking	9
8	Reliability Test	10~11
9	Packaging and Storage	12~14
10	Visual inspection standard of product	15
11	Recommended Soldering Technologies	16
12	Precautions	16

for Automotive Electronics

1 Scope

1.1 Scope of parts

This specification applies to the AMWPH3015S Series of wire wound SMD power inductor for automotive electronics based on AEC-Q200D G1.

1.2 Scope of application

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

- (1) Multimedia system.
- (2) Prohibit using in Engine Control System.

1.3 Operating and storage temperature

The part temperature (ambient + temp. rise) should not exceed 125°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):-40°C ~ +125°C (including self-heating)..
- 2) Storage temperature range (packaging conditions): -10°C~+40°C and RH 70% (Max.)
- 3) MSL: Level 1

2 Product Description and Identification (Part Number)

1) Description:

AMWPH3015S Series of Wire wound SMD power inductor.

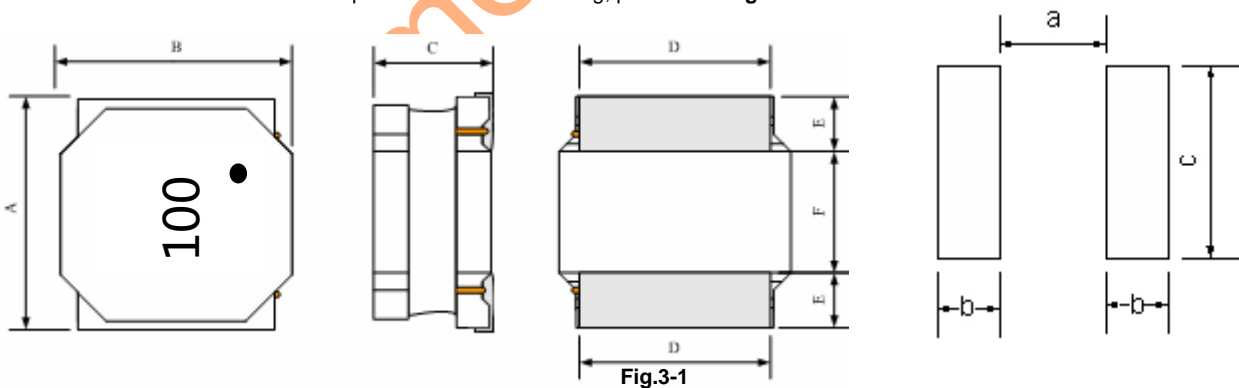
2) Product Identification (Part Number)

A	MWPH	3015	S	1R0	M	T	Y01
①	②	③	④	⑤	⑥	⑦	⑧

①Feature Code	A: for Automotive
②Product Type	MWPH: Wire wound SMD power inductor
③External Dimensions(LxWxH) [mm]	3015: 3.0x3.0x1.5
④Feature type	S:Standard Type
⑤Nominal Inductance	1R0=1.0uH,100=10uH,101=100uH
⑥Inductance Tolerance	M: ±20%,N: ±30%
⑦Packing Code	T: Tape Carrier Package
⑧Special Process code	Standard product is blank

3 Shape and Dimensions

Dimensions and recommended PCB pattern for reflow soldering, please see Fig.3-1 and Table3-1.



[Table 3-1] (Unit: mm)

Series	A	B	C	D	E	a	b	c
AMWPH3015S	3.0±0.2	3.0±0.2	1.50±0.15	2.5±0.2	0.9±0.2	1.0Typ.	1.4Typ.	2.7Typ.

4 Electrical Characteristics

Customer P/N	Part Number	Inductance 1MHz/1V	Min. Self-resonant frequency	DC Resistance		Saturation Current		Heat Rating Current		Marking
				Max.	Typ.	Max.	Typ.	Max.	Typ.	
	Units	μH	MHz	Ω	Ω	A	A	A	A	
	Symbol	L	SRF	DCR		Isat		Irms		-
	AMWPH3015S1R0NT	1.0 \pm 30%	107	0.043	0.036	2.40	2.75	2.00	2.40	1R0
	AMWPH3015S1R5NT	1.5 \pm 30%	84	0.052	0.043	1.90	2.20	1.93	2.22	1R5
	AMWPH3015S2R2MT	2.2 \pm 20%	64	0.068	0.057	1.50	1.70	1.68	1.92	2R2
	AMWPH3015S3R3MT	3.3 \pm 20%	48	0.098	0.082	1.30	1.50	1.35	1.55	3R3
	AMWPH3015S4R7MT	4.7 \pm 20%	39	0.120	0.100	1.00	1.15	1.27	1.47	4R7
	AMWPH3015S6R8MT	6.8 \pm 20%	30	0.180	0.150	0.87	1.00	1.05	1.20	6R8
	AMWPH3015S100MT	10 \pm 20%	25	0.288	0.240	0.70	0.80	0.82	0.95	100
	AMWPH3015S150MT	15 \pm 20%	20	0.360	0.300	0.60	0.70	0.73	0.84	150
	AMWPH3015S220MT	22 \pm 20%	16	0.552	0.460	0.50	0.56	0.60	0.70	220
	AMWPH3015S330MT	33 \pm 20%	13	1.092	0.910	0.42	0.48	0.45	0.50	330
	AMWPH3015S470MT	47 \pm 20%	11	1.248	1.040	0.30	0.35	0.42	0.48	470
	AMWPH3015S101MT	100 \pm 20%	6.8	2.880	2.400	0.20	0.25	0.26	0.30	101

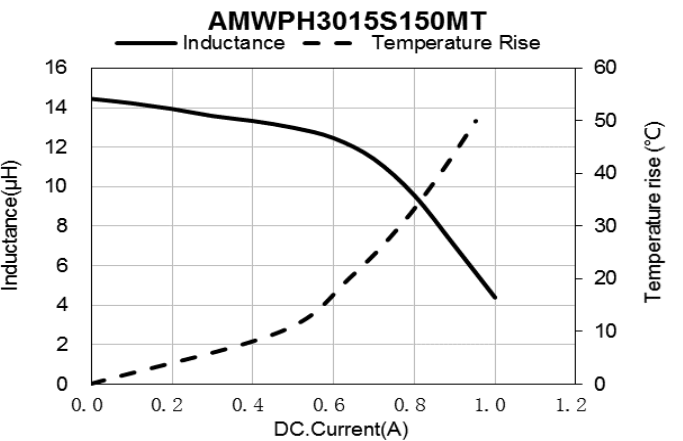
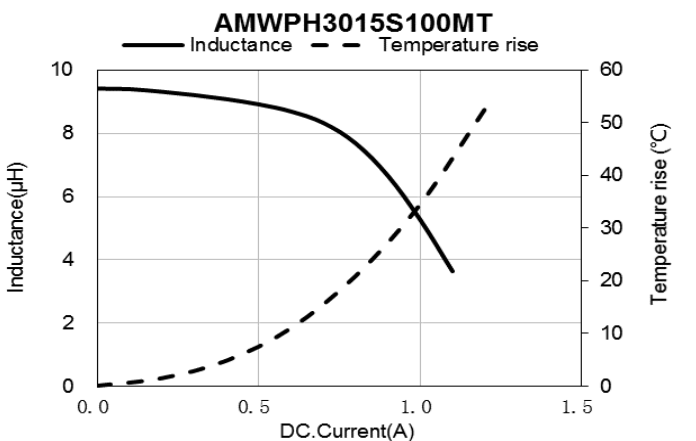
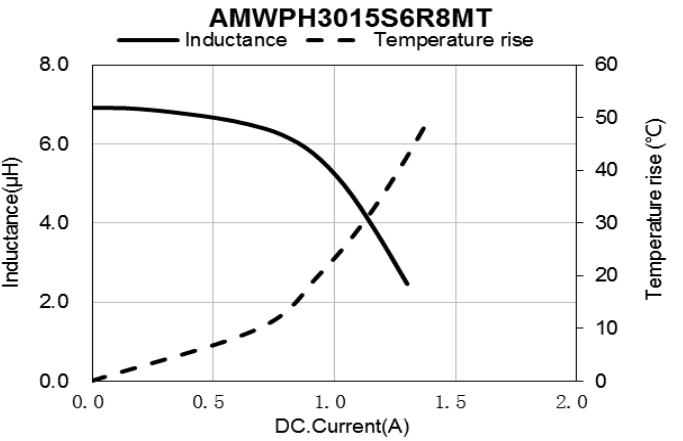
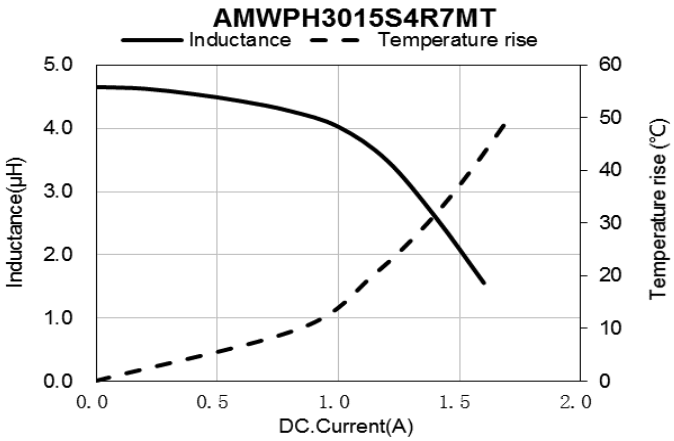
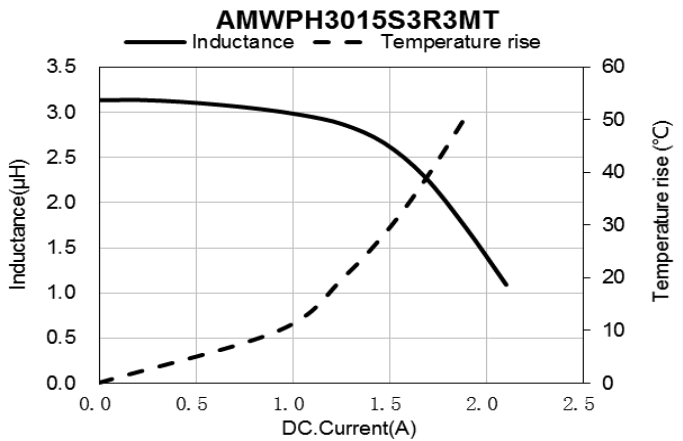
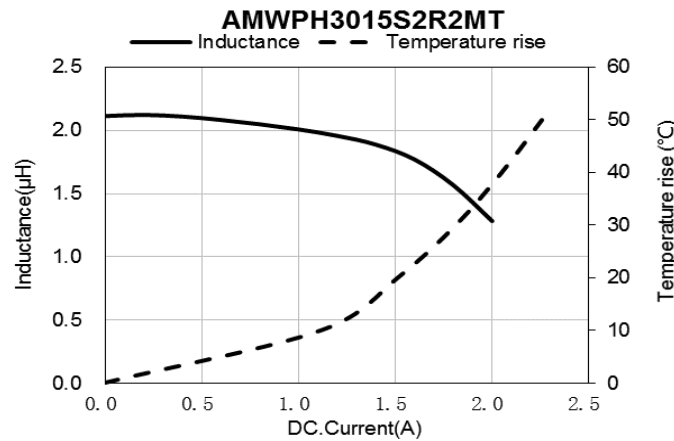
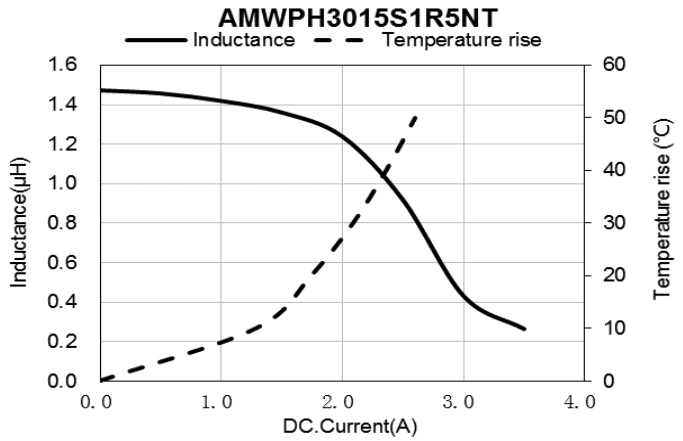
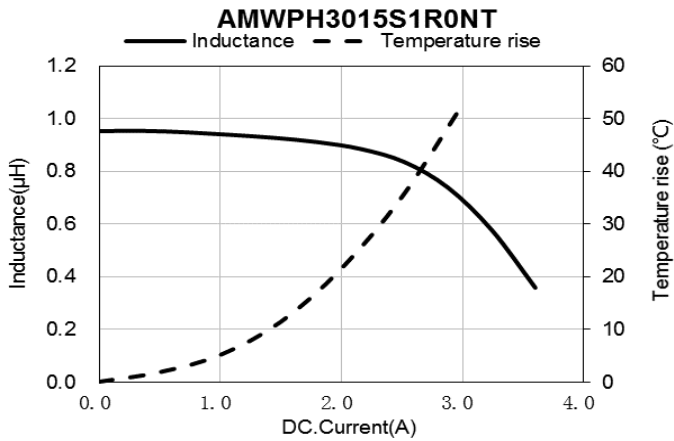
Note: ※ 1: Rated current: Isat (max.) or Irms (max.), whichever is smaller;

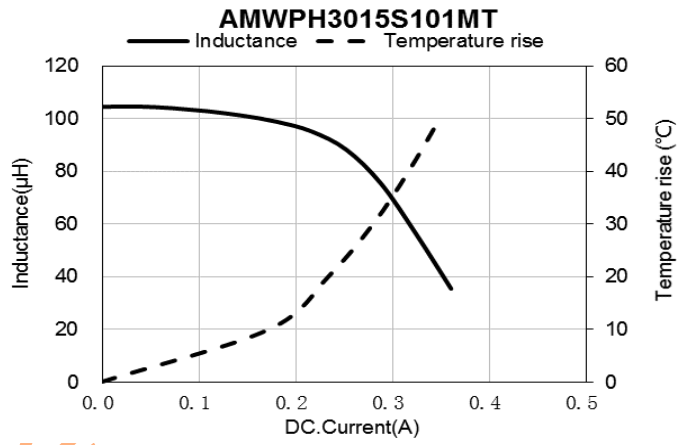
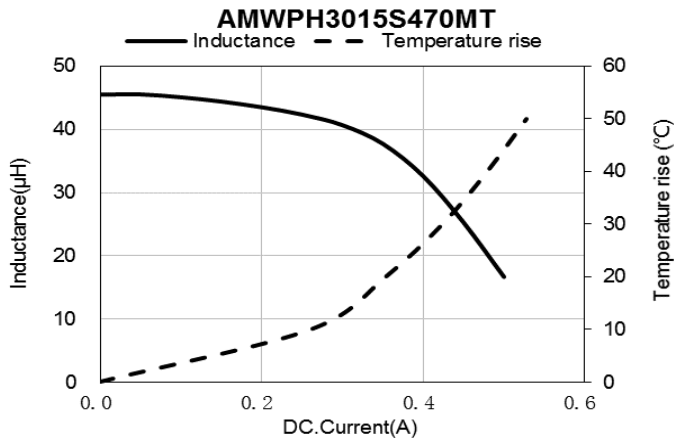
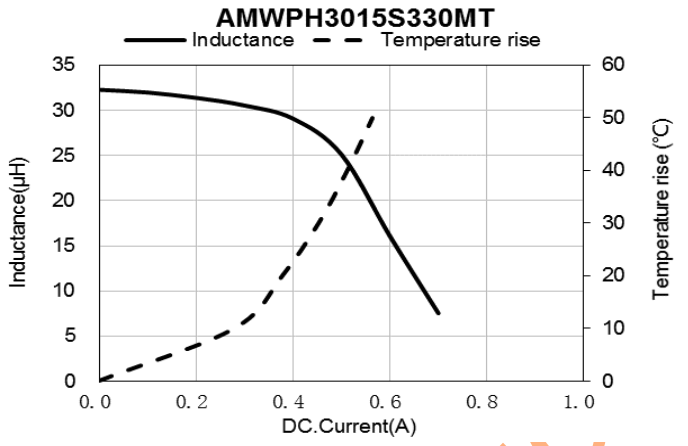
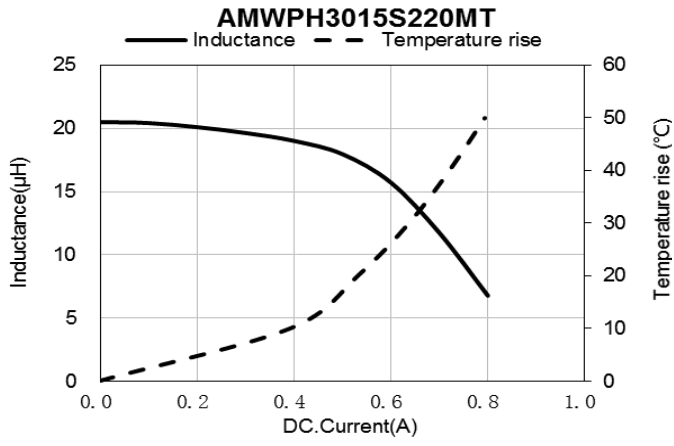
※ 2: Saturation Current: Max. Value, DC current at which the inductance drops less than 30% from its value without current;
Typ. Value, DC current at which the inductance drops approximate 30% from its value without current;

※ 3: Irms: DC current that causes the temperature rise (ΔT) from 20°C ambient.

For Max. Value, $\Delta T < 40^\circ\text{C}$; For Typ. Value, ΔT is approximate 40°C.

Appendix: Typical Electrical Characteristics





for Automotive

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.

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 (I_{rms})

- 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 (ΔT) from ambient temperature.

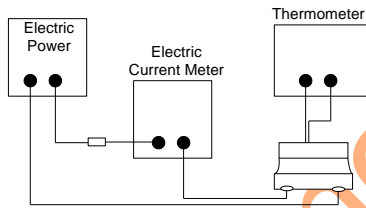


Fig. 5.3.4-1

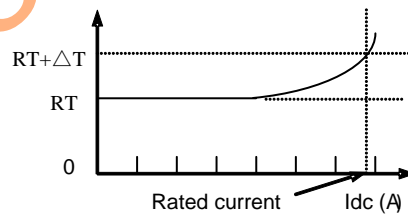


Fig. 5.3.4-2

5.3.5 Self-resonant frequency (SRF)

- a. Refer to **Item 4**.
- b. Test equipment: Agilent E4991A+16197 or equivalent

5.4 Schematic Diagram



6 Structure

1) The structure of AMWPH3015S product, please refer to Fig.6-1 and Table 6-1.

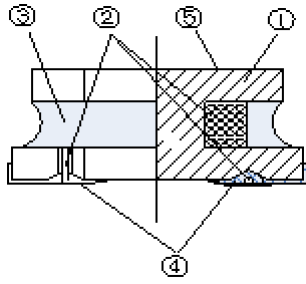


Fig. 6-1

[Table 6-1]

No.	Components	Material
①	Ferrite Core	NiZn Ferrite
②	Wire	Polyurethane system enameled copper wire
③	Magnetic Glue	Epoxy resin and magnetic powder
④	Electrodes	Ag/Ni/Sn+Cu +Sn Alloy
⑤	Marking	Laser Marking

7 Product Marking

Please refer to Fig. 7-1.

Marking method: laser

○: polarity pointd

100: Inductance, refer to specifications

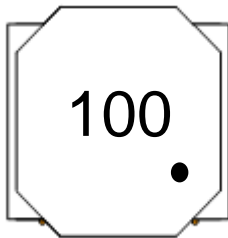


Fig. 7-1



for Automotive Electronics

8 Reliability Test

No.	Test Items	Test Methods	Requirements
1	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 $\pm 10\%$
2	External Visual	Appearance of the components	(1)No visible mechanical damage
3	Physical Dimension	Dimensions of the components	(1) meet the specifications
4	Electrical Characterization	Ambient temperature 25°C(15+3min) → ambient temperature -40°C(15+3min) → ambient temperature +125°C(15+3min).	(1)Inductance change should be within $\pm 10\%$ of reference value measuring at 25°C
5	Flammability	Refer to MIL-STD-202 Method 111、UL-94	① t1 or t2: $\leq 10s$; ② t1 plus t2 for the 5 specimens: $\leq 50s$; ③ t2+t3 for each specimen: $\leq 30s$; 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.
6	Terminal Strength	1.Precondition: 3 reflow cycles; 2.Test condition: 17.7N,X,Ydirect, 60(+5)s, Speed: 1.0mm/s.	(1)No visible mechanical damage
7	Board Flex	1.Precondition: 3 reflow cycles; 2.Test condition: 2mm,60(+5)s.	(1)No visible mechanical damage
8	Solder ability	Method 1: ①pretreatment; 155°C, 4h ②235°C, 5(-0.5,+0)s, 25 \pm 6 mm/s; ③Solder: Sn/3.0Ag/0.5Cu Method 2: ①Steam aging: 8h \pm 15min; ②235°C, 5(-0.5,+0)s, 25 \pm 6 mm/s; ③Solder: Sn/3.0Ag/0.5Cu Method 3: ①Steam aging: 8h \pm 15min; ②260°C, 7(-0.5,+0.5)s, 25 \pm 6 mm/s; ③Solder: Sn/3.0Ag/0.5Cu	(1)Wetting shall be exceeded 95% coverage
9	Resistance to Soldering Heat	Method 1: Max 260°C/10s, 3 times.Solder: Sn/3.0Ag/0.5Cu.	(1) No visible mechanical damage
10	High Frequency Vibration	Reflow 3 times, 10~2000Hz, 5g, 20min/Cycle, 4 hours in each 3 mutually perpendicular directions (total of 12 hours) .	(2) Inductance change: Within $\pm 10\%$ (3) DCR: Satisfy electrical characteristic.

11	Mechanical Shock	Reflow 3 times, Half sine shock pulse, 100g, 6ms, 6 shocks in each 3 mutually perpendicular directions (total of 18 shocks).	
12	ESD test	HBM ESD discharge waveform, 8KV, each 1 time of +/- polarity.	
13	Temperature cycling Test	Reflow 3 times, ambient temperature -40°C/(30min), ambient temperature+125°C/(30min), transforming interval:20s,1000 cycles. ①Read-outs at 500,1000 cycles	
14	low temperature Storage test	Reflow 3 times, ambient temperature -40°C,1000 (+24) hours. ①Read-outs at 500h.	
15	High temperature Storage test	Reflow 3 times, ambient temperature +125°C,1000 hours. ①Read-outs at 500h.	(1) No visible mechanical damage (2) Inductance change: Within ±10% (3) DCR: Satisfy electrical characteristic.
16	High Temperature And High Humidity Storage Test	(unpowered) Reflow 3 times, ambient temperature 85°C,85%RH,1000 hours. ①Read-outs at 500h.	
17	High temperature over lifetime	Reflow 3 times, ambient temperature85±2°C,1000(+24)hours, rated current. Note: ① product surface temperature ≤ 125°C. ② Inspect the product temperature at once a week. ③ Note:Read-outs at 500h,1000h.	
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, Storage and Transportation

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.

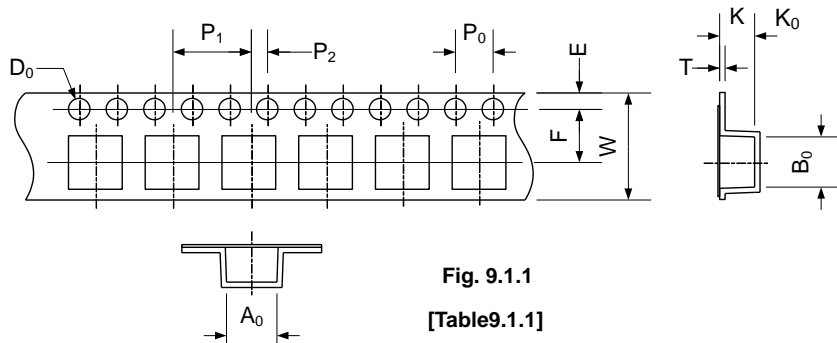


Fig. 9.1.1
[Table 9.1.1]

Series	A ₀	B ₀	W	E	F	P ₀	P ₁	P ₂	D ₀	T	K ₀
AMWPH3015S	3.3±0.1	3.3±0.1	8.0±0.3	1.75±0.1	3.5±0.1	4.0±0.1	4.0±0.1	2.0±0.1	1.5+0.1/-0.0	0.25±0.05	1.9±0.1

9.1.2 Direction of rolling

Please refer to Fig. 9.1.2

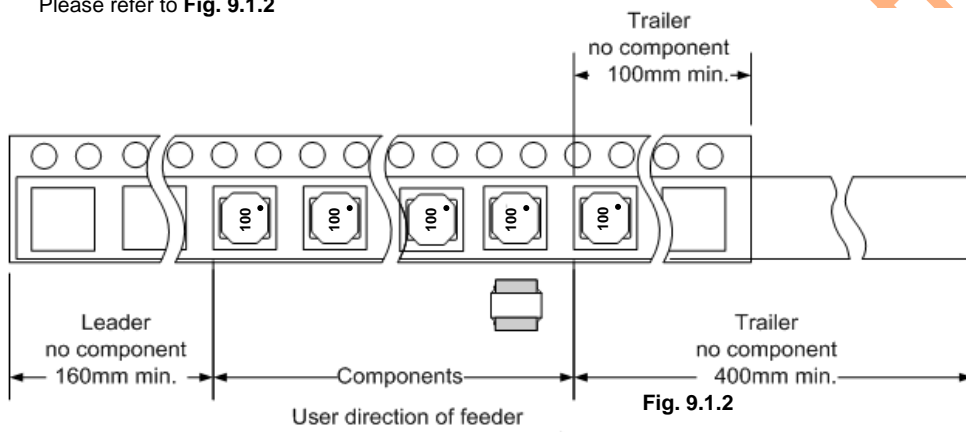


Fig. 9.1.2

9.1.3 Reel Dimensions (Unit: mm)

Please refer to Fig. 9.1.3.

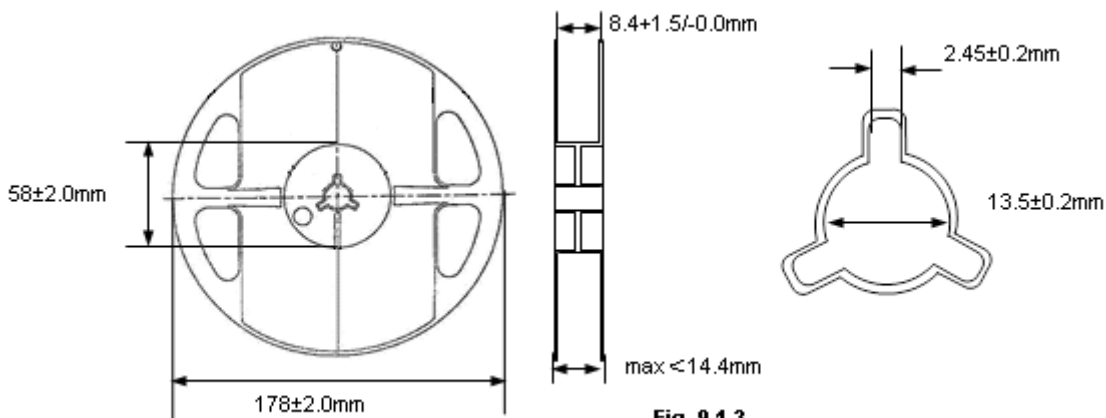


Fig. 9.1.3

9.1.4 Top tape strength

Peel-off strength: 10~100gf.

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

Peel-off speed: 300mm/min.

9.1.5 The number of components

A tape & reel package contains 2000 inductors.

9.1.6 The allowable number of empty chip cavities

Maximum two (2) chip cavities missing product may exist in a reel but they may not be consecutive two cavities.

9.1.7 Reel material: Polystyrene Compound.

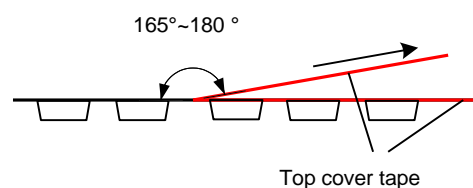


Fig. 9.1.4

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.

- 1) Inner Box: 10 reel in each box.
- 2) Outer Box: 4 or 8 inner boxes in each outer case.
- 3) 40 or 80 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.9.2.3-2b: 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

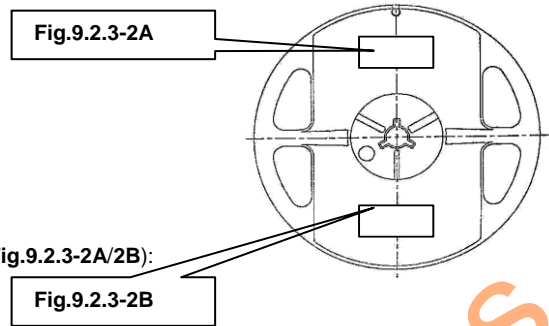


Fig.9.2.3-1

[Table 9.2.3-1]

Packaging type	A(mm)	B(mm)	C(mm)
Inner box	180	120	180

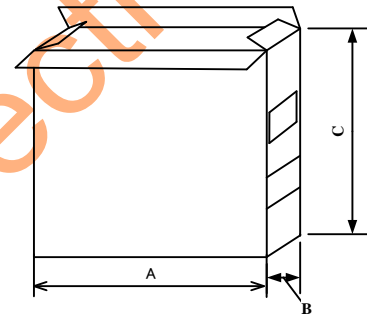


Fig.9.2.3-3

[Table 9.2.3-2]

Packaging type	L(mm)	W(mm)	H(mm)
TYP1	505	378	200
TYP2	380	260	200

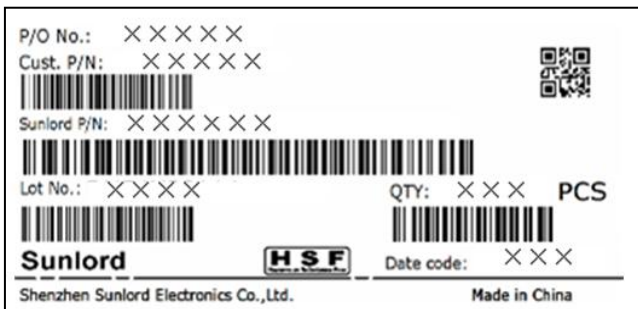


Fig.9.2.3-2a

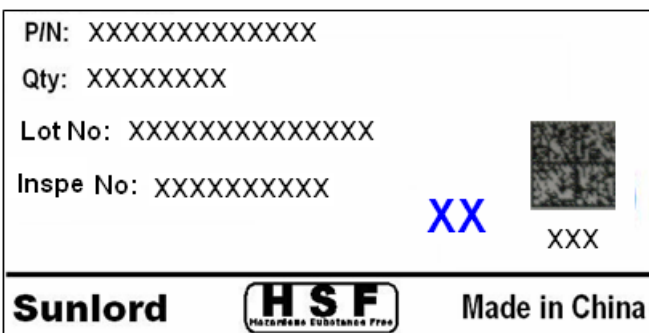


Fig.9.2.3-2b

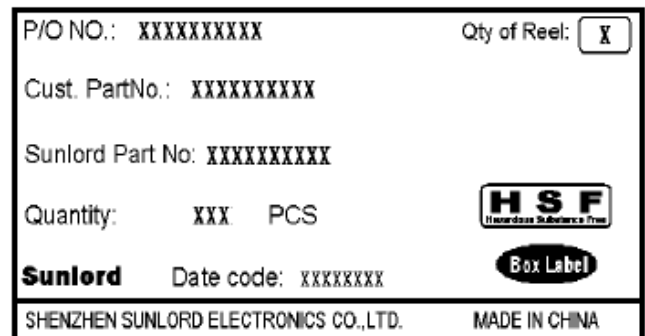


Fig.9.2.3-4

2) Marking label information on inner box

- a). Inner box please refers to Fig.9.2.3-3 and Table 9.2.3-1.
- b). Marking Label on inner box (see Fig.9.2.3-4).

3) Marking on outer case (see Fig.9.2.3-5~7):

Out case size please refers to Table 9.2.3-2.

- a). Manufacturer: Sunlord ID: "Shenzhen Sunlord Electronics Co., Ltd."
- b). Packing label include the following:

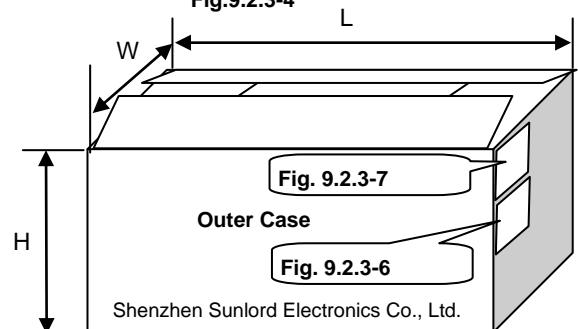


Fig. 9.2.3-5

- 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.

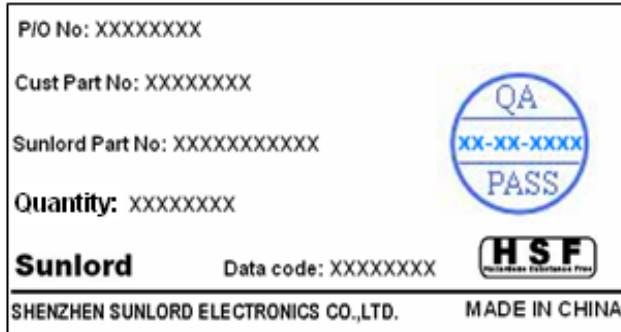


Fig.9.2.3-6

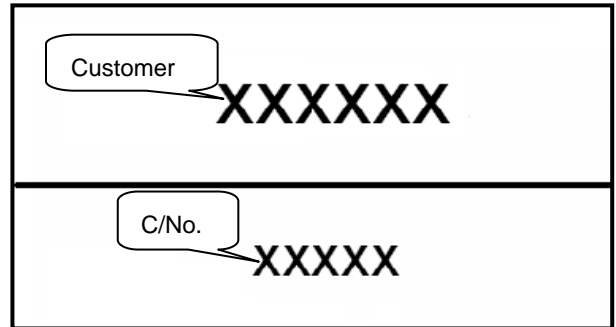
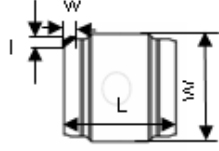

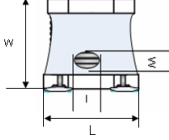
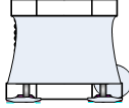
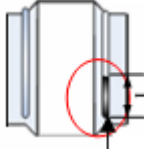
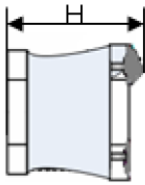
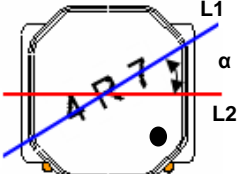


Fig.9.2.3-7

for Automotive Electrical

10 Visual inspection standard of product

File No:		Applied to Wire Wound SMD Power Inductor Series		REV:01
Effective date:				
No.	Defect Item	Graphic	Rejection identification	Acceptance
1	Core defect		The defect length/width (l and w) more than $L/6$ and $W/6$, NG.	AQL=0.065
2	Core crack		Visual cracks, NG.	AQL=0.065
3	Starvation		Resin starved length, l , more than $L/2$, NG. ① IF $W > 2\text{mm}$, resin starved width, w , more than $W/2$, NG. ② IF $W \leq 2\text{mm}$, resin starved width, w , don't control.	AQL=0.065
4	Excessive glue		The length, width or height of product beyond specified value, NG.	AQL=0.065
5	Cold solder		Cold solders l more than 1mm, NG.	AQL=0.065
6	Solder icicle		The height H of product beyond specified value, NG;	AQL=0.065
7	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: 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.]

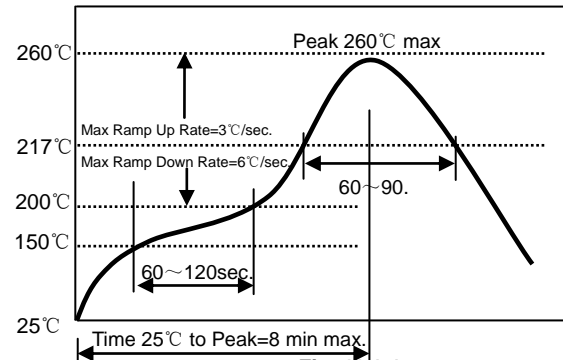


Fig. 11.1-1.

11.2 Iron Soldering Profile:

- △ Iron soldering power: Max. 300W
- △ Pre-heating: 150°C/60sec.
- △ Soldering Tip temperature: 390°C ~410°C
- △ 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.]

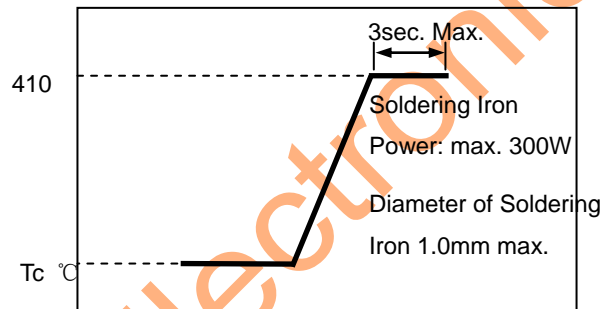


Fig. 11.2-1.

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°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.