

for Automotive Electronics

SPECIFICATIONS

Customer	
Product Name	Assembled Wire Wound SMD Power Inductor for Automotive Electronics
Sunlord Part Number	AMWPQ2815 Series
Customer Part Number	
Weight	33.4 g/pcs Typ.

New Released, Revised] **SPEC No.:** AMWPQ09220000

【This SPEC is total 11 pages.】

【RoHS Compliant Parts.】

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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	Jinying Zhou	Yubo Su	Yubo Su

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
5	Test and Measurement Procedures	5~6
6	Structure and material list	6
7	Product Marking	7
8	Reliability Test	7~8
9	Packaging and Storage	9
10	Visual inspection standard of product	10
11	Recommended Soldering Technologies	11
12	Precautions	11

1 Scope

1.1 Scope of parts

This specification applies to the AMWPQ2815 Series 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 in automotive applications.

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

1.4 MSL: level1.

2 Product Description and Identification (Part Number)

1) Description:

AMWPQ2815 series of assembled wire wound SMD power inductor for Automotive Electronics.

2) Product Identification (Part Number)

AMWPQ	2815	L	220	K	P	□□□
①	②	③	④	⑤	⑥	⑦

① Product Type	AMWPQ: Assembled SMD Power Inductor
② External Dimensions (L×W×H) [mm]	2815: 28×28×15 mm
③ Feature type	L : L Type material
④ Nominal Inductance	1R5:1.5 uH,2R2:2.2uH,3R3:3.3uH, 4R7:4.7uH, 6R8:6.8uH,100:10uH, 150:15uH, 220:22uH, 330:33uH
⑤ Inductance Tolerance	K: ±10%, M: ±20%
⑥ Packing	T--Taping, P--Pallet, B--Bulk
⑦ Special Process code	Standard product is blank

3 Shape and Dimensions

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

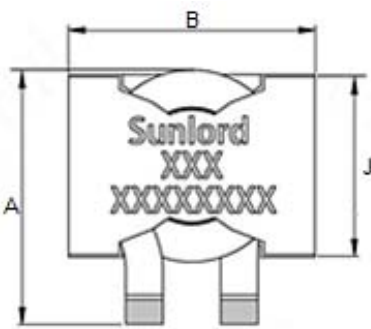


Fig.3-1

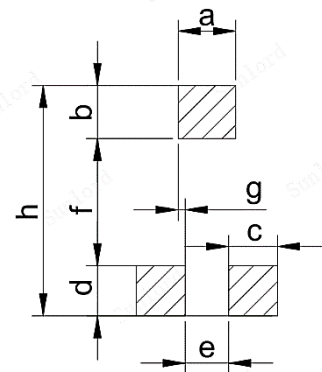
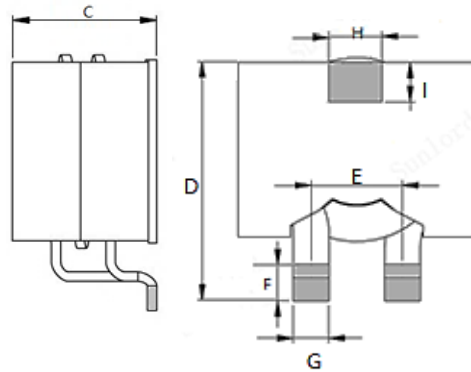


Fig.3-2 Recommended pattern

[Table 3-1] (Unit:mm)

Series	A	B	C	D	E	F	G	H	I
AMWPQ2815	25.5±1.0	27.0±1.0	15.5±0.5	24.4±0.5	10.4±0.3	3.8±0.5	4.0±0.3	5.0±0.3	4.4±0.3
Series	J	a	b	c	d	e	f	g	h
AMWPQ2815	19.5±1.0	6.5 ref	6.0 ref	5.8 ref	5.7 ref	4.6 ref	14.4 ref	0.95 ref	26.1 ref

4 Electrical Characteristics

Part Number	Inductance	DCR		Saturation Current		Heat Rating Current		Marking
	100KHz/0.1V	Max.	Typ.	Max.	Typ.	Max.	Typ.	
Units	μH	$\text{m}\Omega$		A		A		
Symbol	L	DCR		Isat(-30%)		Irms		-
AMWPQ2815L1R5KP	$1.5 \pm 10\%$	1.90	1.60	100	>100	34	42	Refer to Item 7
AMWPQ2815L2R2KP	$2.2 \pm 10\%$	1.90	1.60	82	85	34	42	
AMWPQ2815L3R3KP	$3.3 \pm 10\%$	1.90	1.60	48	57	34	42	
AMWPQ2815L4R7KP	$4.7 \pm 10\%$	1.90	1.60	33	39	34	42	
AMWPQ2815L6R8KP	$6.8 \pm 10\%$	1.90	1.60	22	28	34	42	
AMWPQ2815L100KP	$10 \pm 10\%$	1.90	1.60	13	17.6	34	42	
AMWPQ2815L150KP	$15 \pm 10\%$	1.90	1.60	7.5	11	34	42	
AMWPQ2815L220KP	$22 \pm 10\%$	1.90	1.60	4.5	6.8	34	42	
AMWPQ2815L330KP	$33 \pm 10\%$	1.90	1.60	2.0	3.3	34	42	

Note:※1 : Rated current: Isat or Irms, 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 the temperature rise (ΔT) from 20°C ambient;

For Typ. Value, ΔT is approximate 40°C.

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: Visual inspection.

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 (ΔT) from ambient temperature.

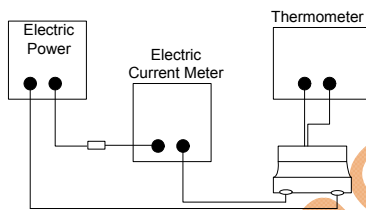


Fig. 5.3.4-1

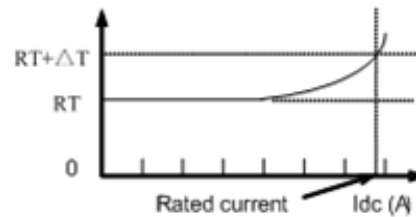


Fig. 5.3.4-2

5.3.5 Self-resonant frequency (SRF)

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

6 Structure and material list

The structure and material list of AMWPQ2815 products, please refer to Fig.6-1 and Table 6-1.

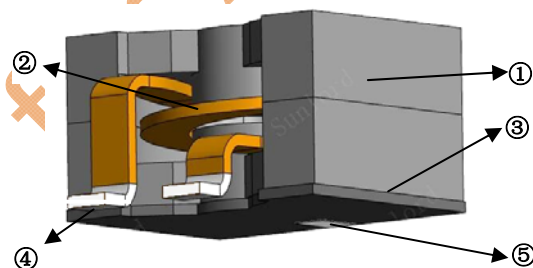


Fig.6-1

No.	Components	Material
①	Core	Mn-Zn ferrite core
②	coil	Flat Wire, Polyurethane system enameled copper wire
③	Binder	Epoxy resin
④	Terminal	Cu/Sn alloy
⑤	Base	Bakelite

[Table.6-1]

7 Product Marking

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

Sunlord: Manufacturer

XXX: Inductance of the products

XXXXXXXX: Trace code

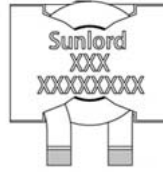


Fig.7-1

8 Reliability Test

No.	Test Item	Test Method(According to AEC-Q200)	Requirements
1	Terminal Strength	Reflow 3 times, 17.7N, X, Y direction, 60±1s.	No visible mechanical damage.
2	Resistance to Flexure	Reflow 3 times, 2mm, 60(+5)s.	No visible mechanical damage.
3	Temp. Characteristics	+25°C/15(+3)min → -40°C/15(+3)min → +125°C/15(+3)min.	Inductance change should be within ±10% of reference value measuring at 25°C
4	Solderability	Method A: ① pretreatment: 155°C, 4h; ② 235°C, 5(-0.5, +0)s; ③ Solder: Sn/3.0Ag/0.5Cu. Method B: ① Steam aging: 8h; ② 235°C, 5(-0.5, +0)s; ③ Solder: Sn/3.0Ag/0.5Cu. Method C: ① Steam aging: 8h; ② 260°C, 7(-0.5, +0.5)s; ③ Solder: Sn/3.0Ag/0.5Cu.	(1) No visible mechanical damage; (2) Wetting shall be exceeded 95% Coverage.
5	Resistance to Soldering Heat	Reflow: Max. 260°C/10s, 3 times; Solder: Sn/3.0Ag/0.5Cu.	
6	High Frequency Vibration	10~2000~10Hz, 5g, 20min/Cycle, 4 hours in each 3 mutually perpendicular directions (total of 12 hours).	
7	Mechanical Shock	Half sine shock pulse, 100g, 6ms, 6 shocks in each 3 mutually perpendicular directions (total of 18 shocks).	
8	Loading Under High temperature	Reflow 3 times, 85±2°C, 1000(+24) hours, rated current.	
9	Thermal Shock	Reflow 3 times, -40°C/ (30±3min), +125°C/(30±3min), transforming interval: 20s, 1000 cycles.	
10	Resistance to Low Temperature	Reflow 3 times, -40°C±2°C, 1000(+24) hours.	(1) No visible mechanical damage;
11	Resistance to High Temperature	Reflow 3 times, 125°C±2°C, 1000(+24) hours.	(2) Inductance change: Within ±10%.
12	Moisture Resistance	Reflow 3 times: ① 25±2°C → 65±2°C, 90%~100%RH, 2.5h; ② 65±2°C, 90%~100%RH, 3h; ③ 65±2°C → 25 (+10, -2) °C, 80%~100%RH, 2.5h; ④ 25°C → 65±2°C, 90%~100%RH, 2.5h; ⑤ 65±2°C, 90%~100%RH, 3h; ⑥ 65±2°C → 25±2°C, 80%~100%RH, 2.5h; ⑦ 25±2°C, 90%~100%RH, 8h, 24 hours of 1 cycle (total of 240 hours).	

13	Biased Humidity	Reflow 3 times,85°C, 85%RH,1000(+24) h.	(1) No visible mechanical damage; (2) Inductance change: Within $\pm 10\%$.
14	MSL	Team A: ①Pre- and Post- Stress Electrical and Visual Test ; ②High temperature Bake:125+5/-0°C,24 h; ③Temperature& Humidity Soak:85°C,85%RH,168 h; ④Ref low:MAX.260°C/10 s, 3 times.	(1) No visible mechanical damage (2) Inductance change: Within $\pm 10\%$
15	Flammability	Refer to MIL-STD-202 Method 111、 Refer to UL94.	① t1 or t2: $\leq 10s$; ② t1 plus t2 for the 5 specimens: $\leq 50s$; ③ t2+t3 for each specimen: $\leq 30s$; ④No after-flame or after-glow of any specimen up to the holding clamp; ⑤No 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 $\pm 10\%$ (3) DCR: Satisfy electrical characteristic.
17	Solvent resistance	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 Packaging

Outer case (see Fig. 9.1.1):
Size: 380*260*200mm

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.

30 pcs in each pallet.
120pcs in each outer case.

9.2.3 Marking

1) Marking label information on pallet includes (see Fig. 9.2.3-1):

Fig.10.2.3-1: 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'.

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

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

9.2.4 The allowable number of empty chip cavities

No chip cavities missing product may exist in a pallet.

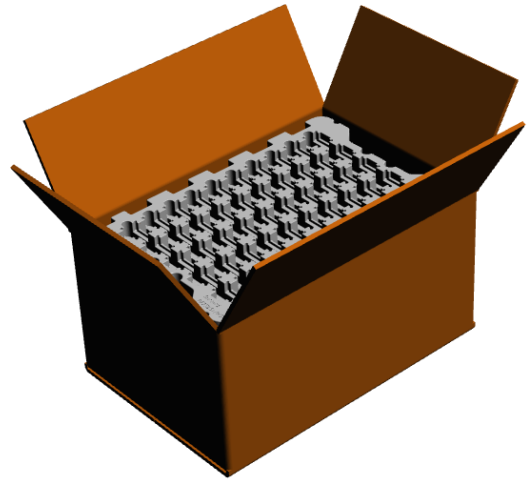


Fig.9.1.1(Outer case)

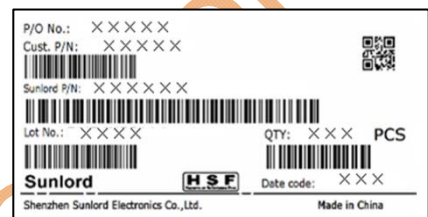


Fig.9.2.3-1

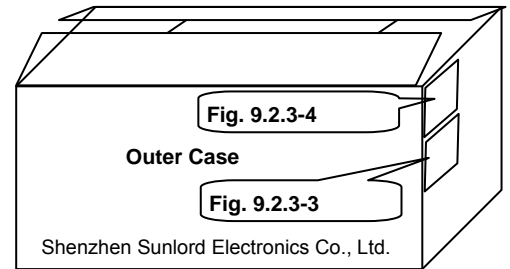


Fig. 9.2.3-2

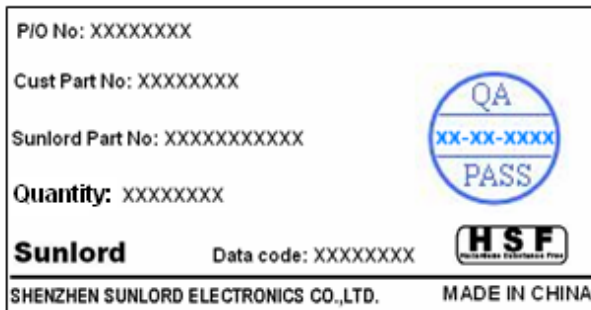


Fig.9.2.3-3

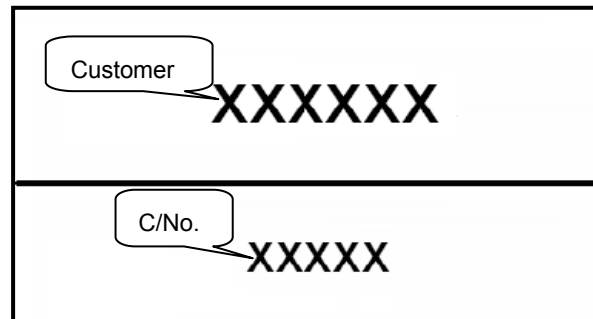
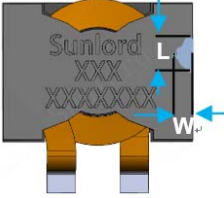
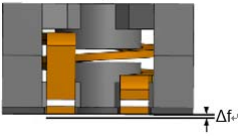


Fig.9.2.3-4

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 and width (L and W) more than 3mm, NG.	AQL=0.065
2	Electrode uneven		The clearance Δf is more than 0.15 mm, NG.	AQL=0.065

for Automotive Electronics

11 Recommended Soldering Technologies**11.1 Re-flowing Profile:**

- △ Preheat condition: 150 ~200°C/60~180sec.
 - △ Allowed time above 217°C: 60~150sec.
 - △ Allowed time above 255°C: 30sec. ref.
 - △ 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.]

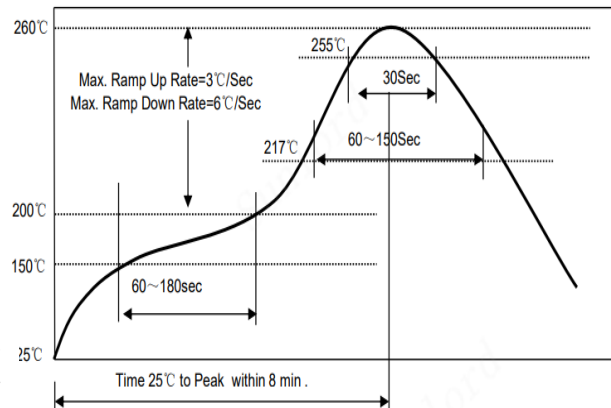


Fig. 11.1-1

11.2 Iron Soldering Profile

- △ Iron soldering power: Max. 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**.

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

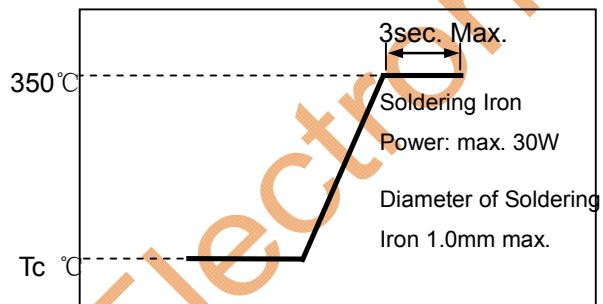


Fig. 11.2-1

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.