DATA SHEET

PRODUCT	Molding Power Inductors
SERIES	**WPA201610S L Series**
PART NO.	**WPA201610S L Series**
DESCRIPTION	EIAJ 2016
ISSUE DATE	2025/01
REVISION DATE	2025/01
REFERENCE NO.	A4

Halogen Free

RoHS COMPLIANCE ITEM

1. Scope

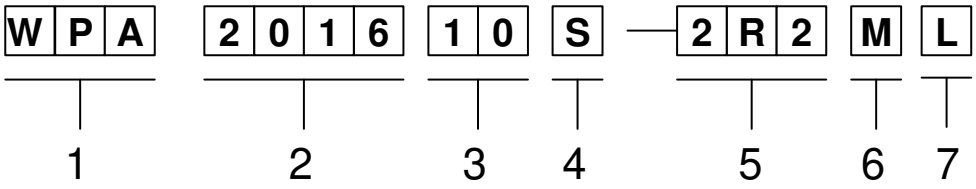
Feature

- IATF 16949 management system
- AEC-Q200 compliance
- High saturation current realized by material properties and structure design
- Low DC resistance to achieve high conversion efficiency and lower temperature rising
- Low Profile: 2.0 mm × 1.6 mm × 1.0 mm.
- Magnetically shielded structure to accomplish high resolution in EMC protection.
- Halogen free, Lead Free, RoHS Compliance.
- Surface marking：None.
- The moisture sensitivity level (MSL) of products is level 1.

Applications

- Automotive industry
- DC/DC converter
- Thin-type power supply module,

2. Explanation of Part Number



1 : Series Name: Wire-wound type power inductor
2 : Size Code: The first two digitals: length(mm), The last two digitals: width(mm)
3 : Thickness in mm
4：Type code
5：Initial inductance value: 2R2 = 2.2 μH
6：Model code, Tolerance of Inductance ±20%.
7：Electrode type.

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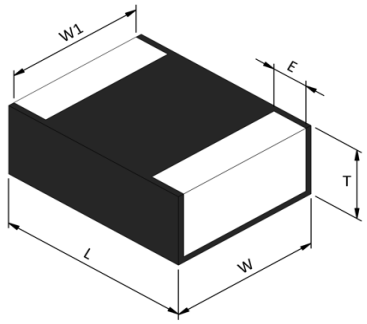
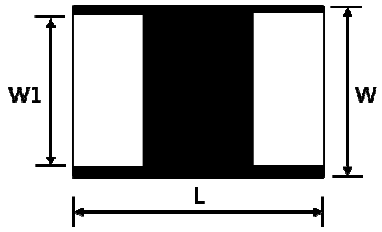
3. Construction & Dimensions

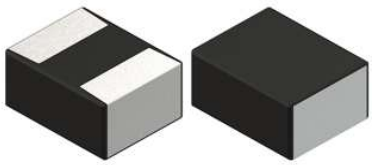
3.1. End termination: Cu/Ni/Sn

3.2. Construction & Dimensions:

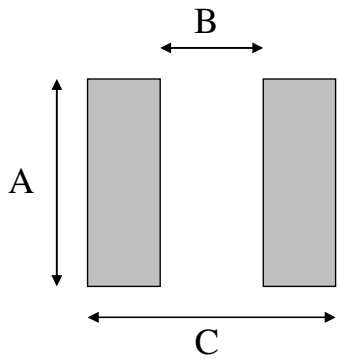


L [mm]	W [mm]	W1 [mm]	T [mm]	E [mm]
2.0±0.2	1.6±0.2	1.4±0.2	1.0 max.	0.5±0.3





3.3. Recommend Land Pattern Dimensions:



A [mm]	B [mm]	C [mm]
1.6	0.9	2.3

4. General specifications

4.1. Temperature Specifications

Operating Temperature range : - 40℃ to +145℃ (including self-temperature rising)

Storage Temperature range : - 50°C to +125°C (After assembly)

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5. Performance Characteristics

5.1. Specifications

INPAQ Part Number	Li [μH] Initial inductance	RDC [mΩ] DC Resistance		Isat [A] Saturation Current		Irms [A] Heat Rating Current		SRF [MHz]	Quality Factor
		Typ.	Max.	Typ.	Max.	Typ.	Max.	Typ.	Typ.
WPA201610S-R10ML	0.10	10	12	9.0	8.1	6.6	6.0	>120	30
WPA201610S-R15ML	0.15	10	16	10.0	9.0	7.5	7.0	>120	30
WPA201610S-R22ML	0.22	15	19	7.9	7.0	6.0	5.4	>120	30
WPA201610S-R24ML	0.24	17	20	6.8	6.3	5.8	5.3	>120	30
WPA201610S-R33ML	0.33	21	26	6.1	5.5	4.7	4.3	>120	30
WPA201610S-R47ML	0.47	27	33	5.4	4.8	4.5	4.1	>120	30
WPA201610S-R68ML	0.68	40	47	4.7	4.2	4.0	3.5	>120	30
WPA201610S-1R0ML	1.0	56	65	3.3	3.0	3.2	3.0	90	30
WPA201610S-1R5ML	1.5	86	99	3.1	2.8	2.4	2.2	80	30
WPA201610S-2R2ML	2.2	117	140	2.4	2.2	2.2	2.0	60	30
WPA201610S-3R3ML	3.3	200	220	1.9	1.6	1.8	1.5	40	30
WPA201610S-4R7ML	4.7	240	288	1.8	1.6	1.3	1.1	40	30

Notes

1. Customized design is available, please contact us.
2. All test referenced to 25℃ ambient.
3. Inductance tolerance +/- 20%.
4. Inductance is measured with Agilent® LCR meter 4285A (or equivalent) at 1MHz/1V.
5. DC resistance is measured with HIOKI® micro-ohm meter RM3542 or equivalent.
6. Isat：DC current (A) that will cause Li to drop approximately 30%.
7. Irms：DC current (A) that will cause an approximate △T of 40℃.
8. The rated current value is following either Isat (max.) or Irms (max), which value is lower one.
9. The part temperature (ambient + temp rise) should not exceed 145°C under worst case operating conditions. PCB land pattern, trace size - thick, circuit design and proximity to other components are all the factors will affect the temperature performance of the device. Therefore, it should be approved in application conditions and end product.
10. Rated voltage：20V DC (max.)

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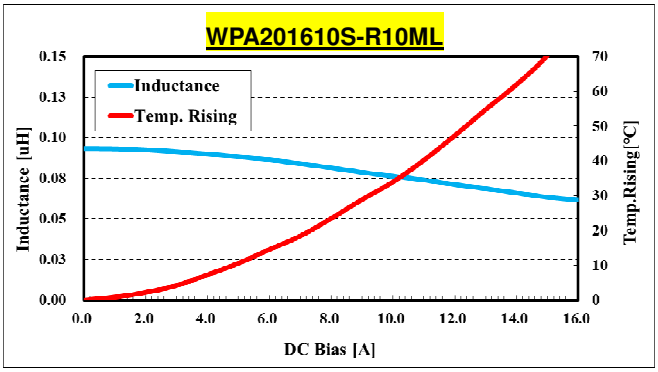
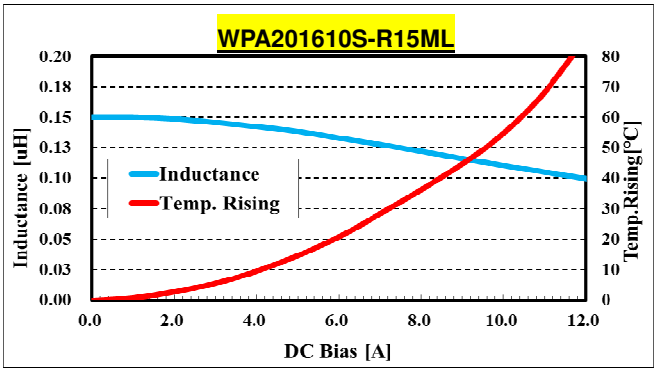
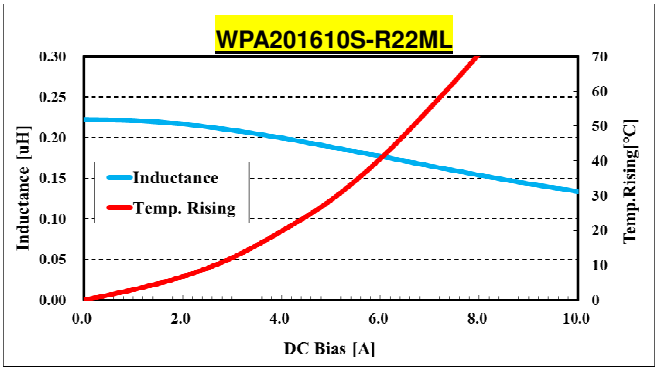
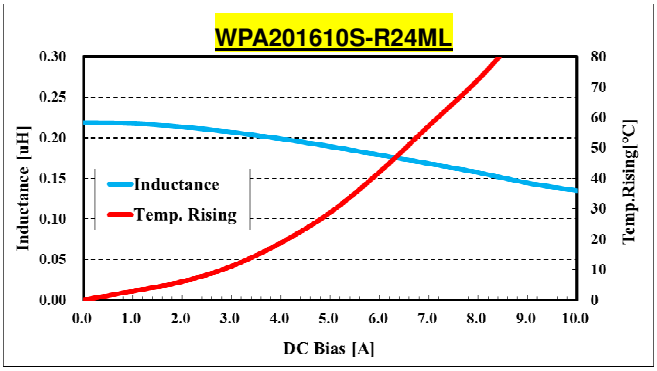
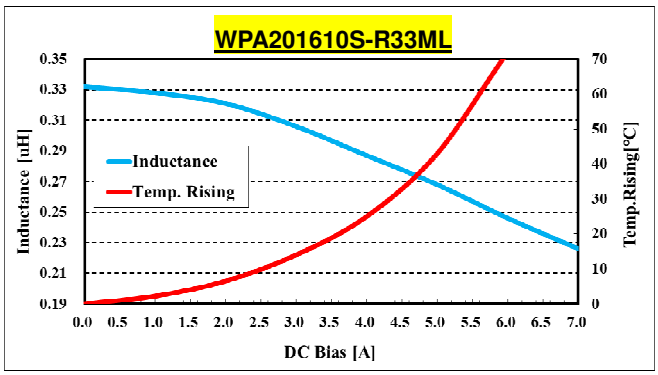
5.2. Current Characteristic

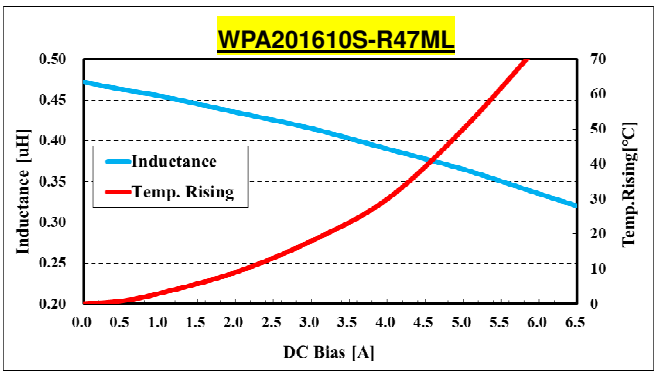


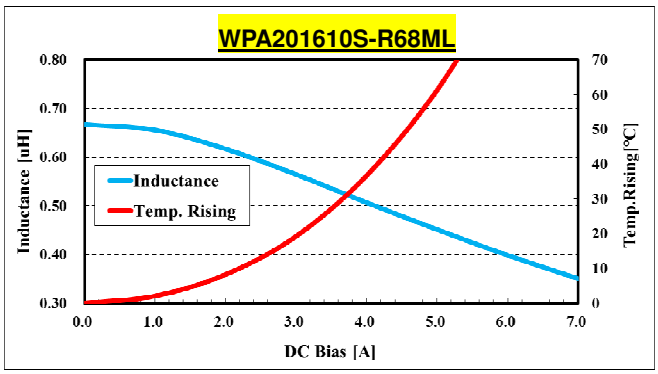


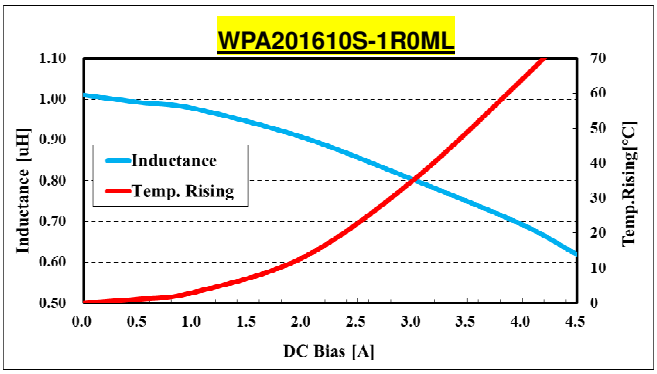












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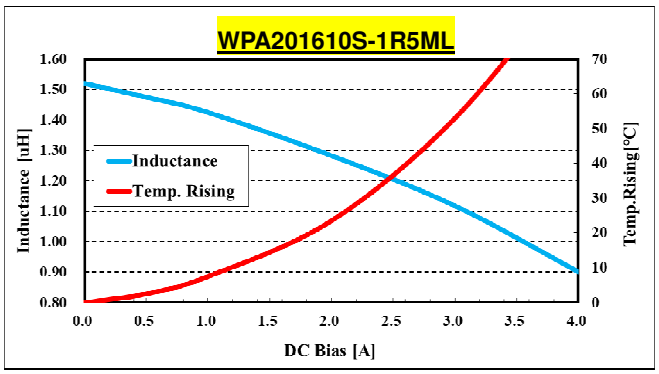
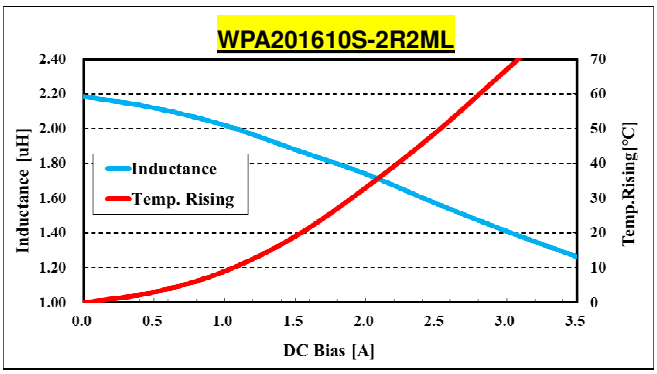
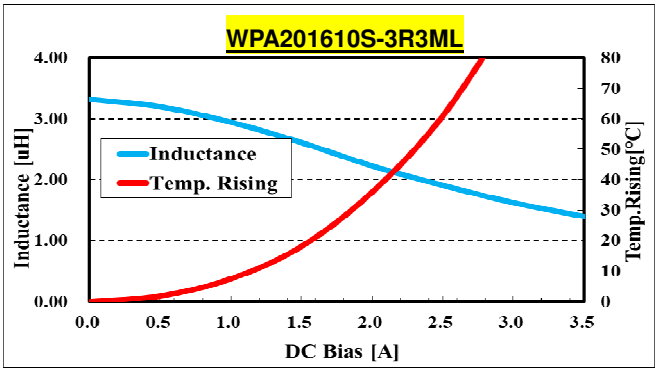
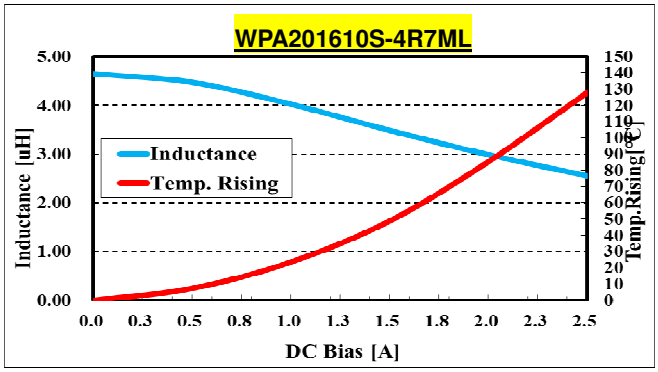


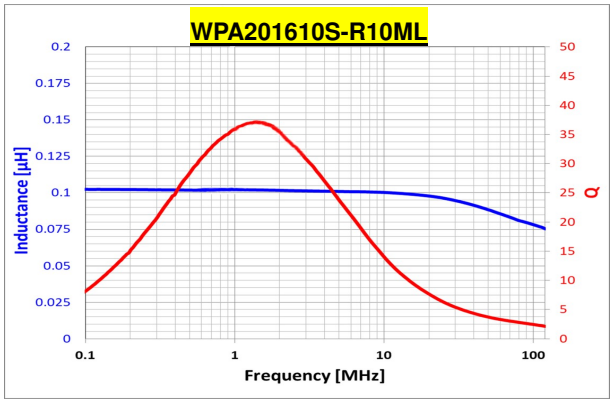


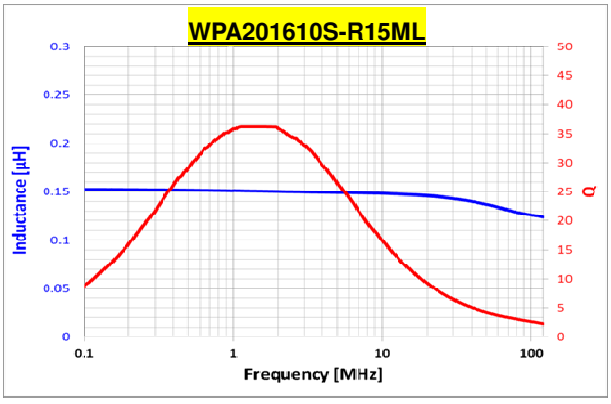


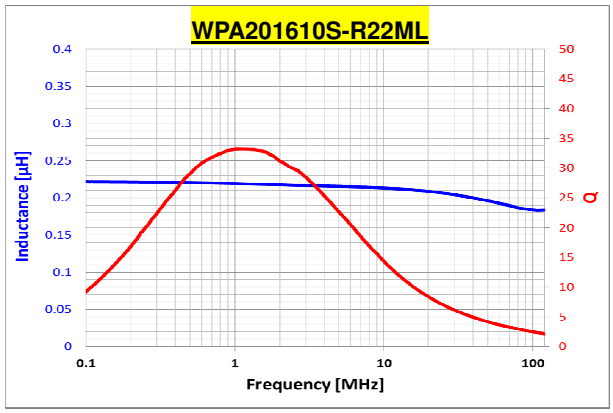


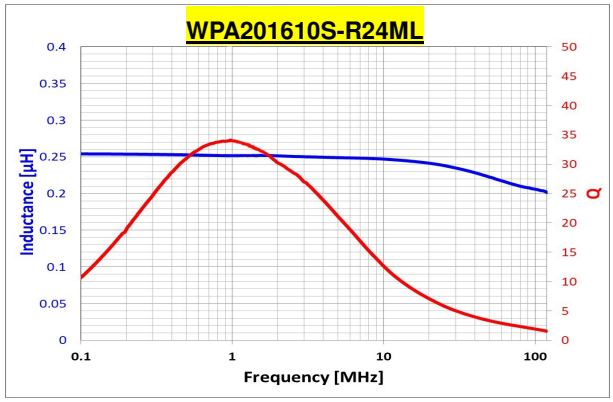
5.3. Frequency Characteristic

5.3.1 Inductance & Q factor – Frequency Curve









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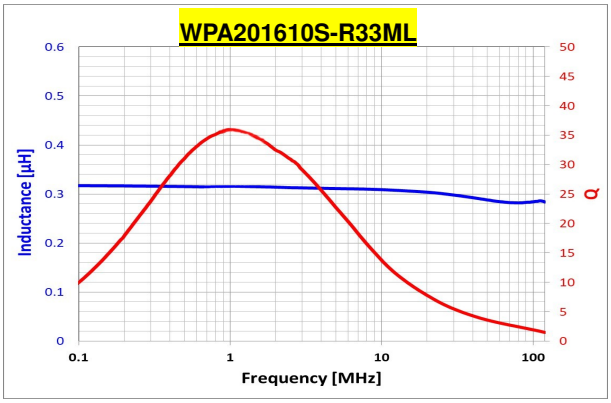
WPA201610S-R33ML



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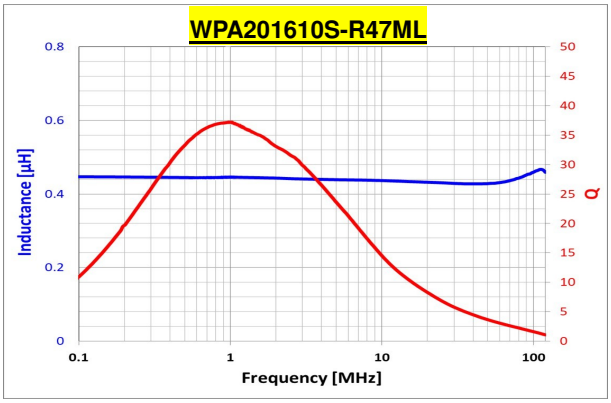

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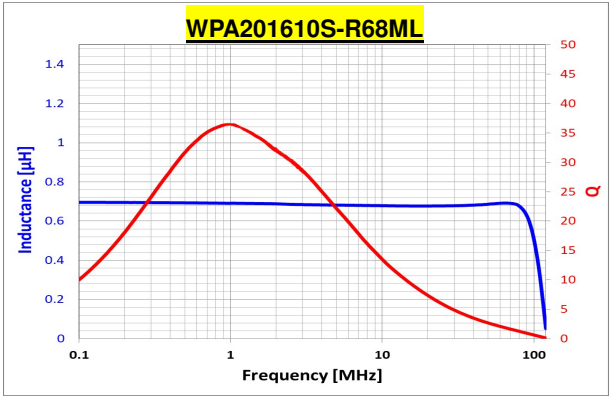
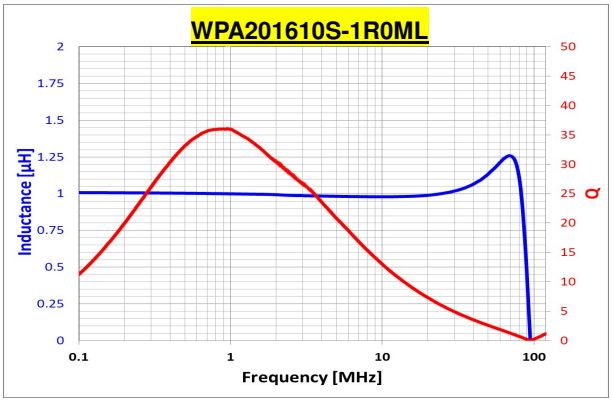
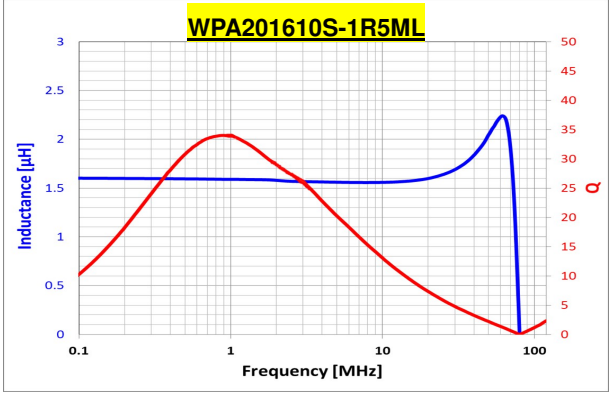


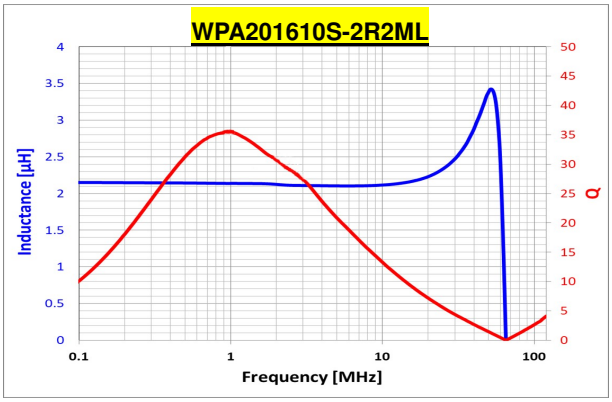
WPA201610S-1R0ML



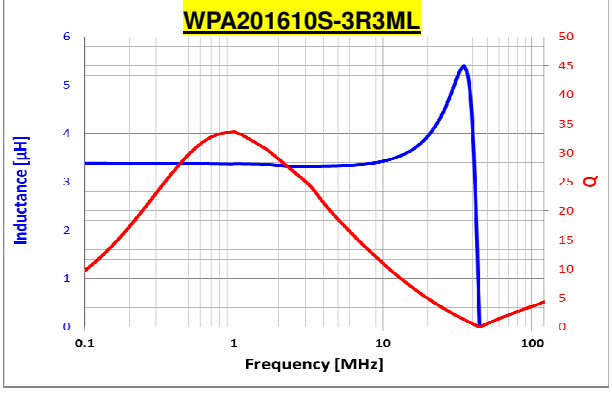
WPA201610S-1R5ML



WPA201610S-2R2ML



WPA201610S-3R3ML



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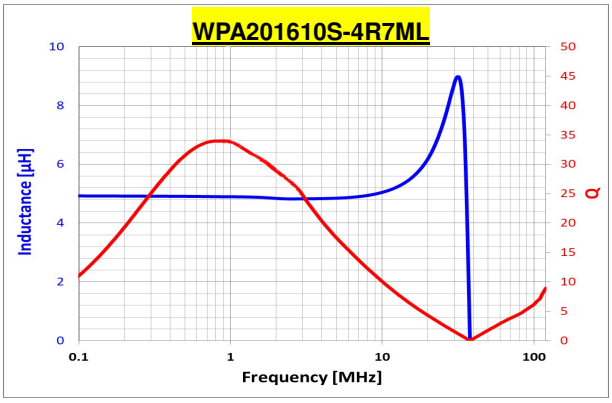

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6. Reliability and Test Condition

Test item	Test condition	Criteria
Temperature Cycle	1. Temperature: - 55 ~ 125°C for 30 minutes at each temperature extreme. 2. Cycle: 1000 cycles. 3. Measurement: At ambient. temperature 24± 4 hours after test completion.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Operational Life	1. Apply rated current at 105±3°C ，1000 hours. 2. Measurement: At ambient. temperature 24± 4 hours after test completion.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
High Temperature Exposure (Storage)	1. At 125°C storage for 1000 hours. 2. Measurement: At ambient temperature 24± 4 hours after test completion.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Biased Humidity	1. At 85°C 85%RH storage for 1000 hours. 2. Measurement: At ambient temperature 24± 4 hours after test completion.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Resistance to Solder Heat	Put the sample on board by tape. Brush flux and put the board into solder bath 260±5°C , 10±1 sec.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage. 3. The termination area should be covered by solder over 95% and won't come off.
Terminal Strength	Weld testing sample on the testing board, pushing it with 17.7 N (1.8 Kg), 60±1sec.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Solderability Test	1. 8 hours ± 15 min. steam conditioning. 2. Put the sample on board by tape. 3. Brush flux and put the board into older bath 245±5°C , 5±1 sec.	The termination area should be covered by solder over 95% and won't come off.
Test item	**Test condition**	**Criteria**

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ESD Test	1. VcPer IEC 61000-4-2,@500V, clamp measurement made 30 ns after initiation of pulse, all test in contact discharge mode. 2. ESD pulse : 10 hits.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Resistance to Solvent	Refer to MIL-STD-202-215 test Solvent IPA.	Appearance without damage.
Board Flex	1. Testing sample should be welding on board. 2. Press the center of sample in the rate 1.0mm/sec until it is bend to 3mm for 60sec.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Mechanical Shock	1. Pulse shape：Half-sine waveform. 2. Impact acceleration：100g. 3. Pulse duration：6 ms. 4. Number of shocks：18 shocks (3 shocks for each face). 5. Orientation：Bottom, top, left, right, front and rear faces.	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Vibration	1. Vibration waveform：Sine waveform. 2. Vibration frequency / Displacement：10 to 40 Hz / 1.52 mm. 3. Vibration frequency/ Acceleration：40 to 2000 Hz / 5 g. 4. Cycle time：20 minute. 5. Number of cycles：12 cycles for each axis. 6. Vibration axes：X, Y and Z (Rotating each axis on vertical vibration table).	1. Inductance value should be within ± 20 % of the initial value. 2. Appearance without damage.
Flammability Test	Flammability, 50W (20mm) Vertical Burning Test	V-0 or V-1 Acceptable
Physical Dimension	Microscope 10X	Appearance without damage

*The reliability test conditions are only briefly described, and the actual content is in accordance with the AEC-Q200.

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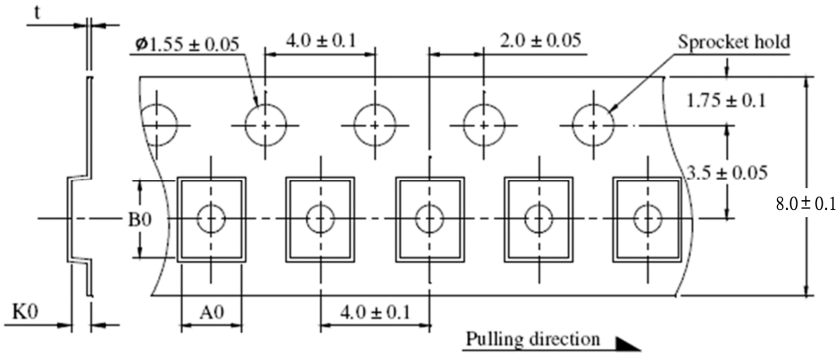
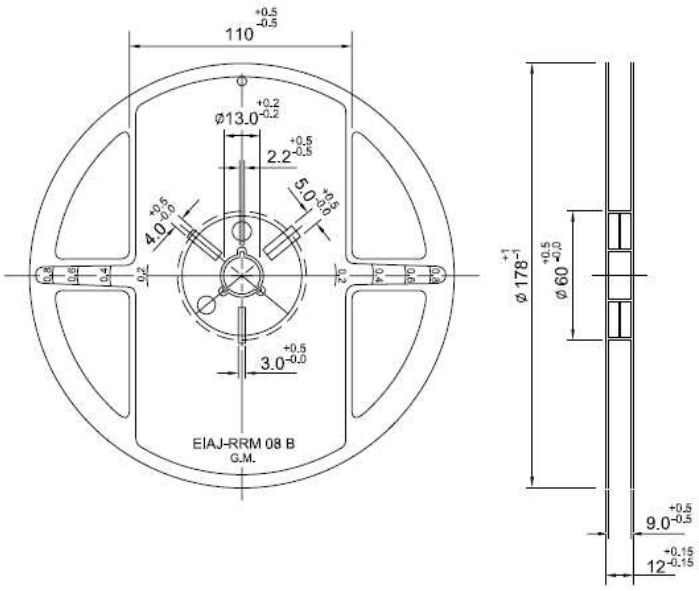
7. Taping Package and Label Marking

7.1. Carrier tape dimensions (Plastic tape)



	A0	B0	K0	t
mm	1.90±0.10	2.25±0.1	1.10±0.10	0.22±0.05

7.2. Taping reel dimensions



PART SIZE (EIA SIZE)	**2016**
Qty.(pcs)	3,000
BOX	5 reels / inner box

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7.3. Taping specifications

There shall be the portion having no product in both the head and the end of taping, and there shall be the cover tape in the head of taping.

7.4. Label Marking

The label specified as follows shall be put on the side of reel.

(1) Part No.

(2) Quantity

(3) Lot No.

* Part No. And Quantity shall be marked on outer packaging.

7.5. Quantity of products in the taping package

(1) Standard quantity：3000pcs/Reel

(2) Shipping quantity is a multiple of standard quantity.

8. Precautions for Handling

8.1. Precaution for handling of substrate

Do not exceed to bend the board after soldering this product extremely.
(reference examples)

- Mounting place must be as far as possible from the position, which is close to the break line of board, or on the line of large holes of board.
- Do not bend extremely the board, in mounting another components.
  If necessary, use back-up pin (support pin) to prevent from bending extremely.
- Do not break the board by hand. We recommend to use the machine or the jig to break it.

8.2. Precaution for soldering

Note that this product will be easily damaged by rapid heating, rapid cooling or local heating.

Do not give heat shock over 100°C in the process of soldering. We recommend to take preheating and gradual cooling.

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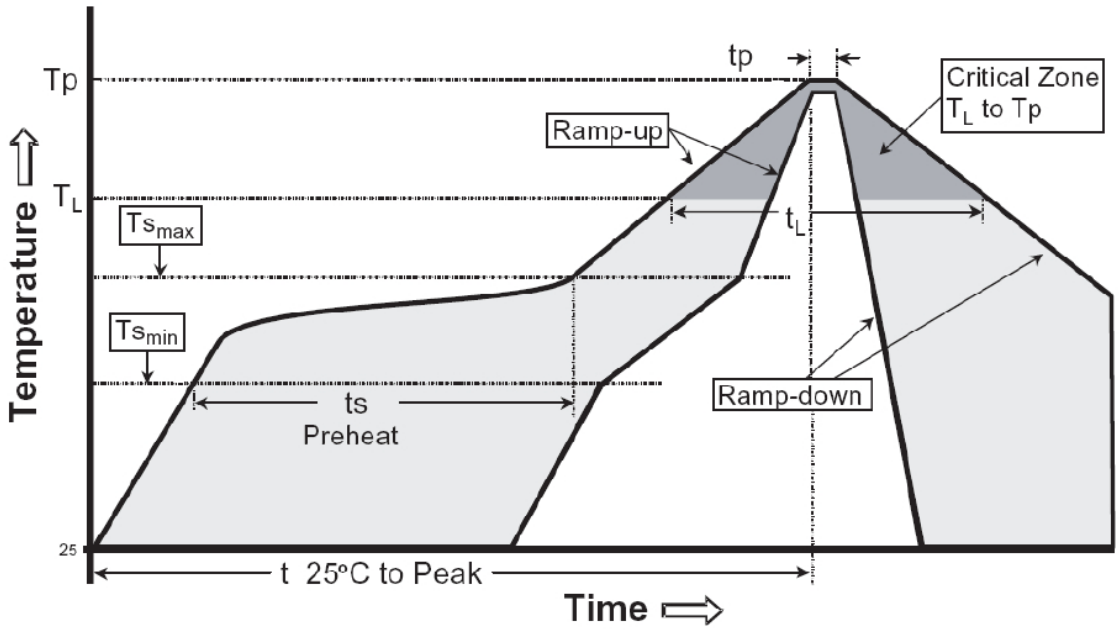
8.3. Recommendable reflow soldering



Reference IPC-020c-5-1

Profile Feature	Pb free Assembly
Average Ramp Rate (Ts max to Tp)	3 ℃/second max
Preheat - Temperature Min (Ts_{min}) - Temperature Min (Ts_{max}) - Time(ts_{min} to ts_{min})	 150℃ 200℃ 60-180 seconds
Time maintained above: - Temperature (TL) - Time (tL)	 217℃ 60-150 seconds
Peak Temperature (T_p)	260℃ +0/-5 ℃
Time within 5 ℃ of actual Peak Temperature (T_p)	20-40 seconds
Ramp-Down Rate	6 ℃/second max.
Time 25℃ to Peak Temperature	8 minutes max

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8.4. Soldering gun procedure

Note the follows, in case of using solder gun for replacement.

(1) The tip temperature must be less than 280°C for the period within 3 seconds by using soldering gun under 30 W.

(2) The soldering gun tip shall not touch this product directly.

8.5. Soldering volume

Note that excess of soldering volume will easily get crack the body of this product.

8.6. Taping Package Storage Condition

Storage Temperature : 5 to 40°C

Relative Humidity: < 65%RH

Storage Time : 12 months max

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