

# SMD Power Inductor

## Low Profile, High Current Type

PIW-401865

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### FEATURE

- Magnetic Shield Construction for Power Circuit.
- Large Current and Low DC Resistance
- Low profile power inductors
- Application: DC/DC Converter, Battery Powered Devices, Low Profile High Current Power Supply, Notebook/Server



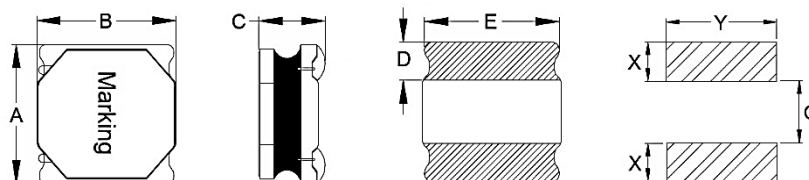
### ELECTRICAL CHARACTERISTICS

Part Number	Inductance (μH)	Tolerance (%)	Test Frequency (Hz)	DCR ±20% (mΩ)	I <sub>SAT</sub> (A)	I <sub>RMS</sub> (A)
PIW1R0M401865	1.0	±20%	1V/100K	0.027	4.00	3.70
PIW1R5M401865	1.5	±20%	1V/100K	0.032	3.30	3.30
PIW2R2M401865	2.2	±20%	1V/100K	0.042	3.00	2.90
PIW3R3M401865	3.3	±20%	1V/100K	0.055	2.30	2.30
PIW4R7M401865	4.7	±20%	1V/100K	0.070	2.00	2.00
PIW6R8M401865	6.8	±20%	1V/100K	0.098	1.70	1.70
PIW100M401865	10	±20%	1V/100K	0.150	1.50	1.50
PIW150M401865	15	±20%	1V/100K	0.190	1.10	1.10
PIW220M401865	22	±20%	1V/100K	0.290	0.90	0.90
PIW330M401865	33	±20%	1V/100K	0.405	0.75	0.75
PIW470M401865	47	±20%	1V/100K	0.550	0.60	0.60
PIW680M401865	68	±20%	1V/100K	0.890	0.55	0.55
PIW101M401865	100	±20%	1V/100K	1.380	0.45	0.45
PIW151M401865	150	±20%	1V/100K	1.970	0.35	0.35
PIW221M401865	220	±20%	1V/100K	3.000	0.30	0.30

Notes:

1. All test data referenced to 25°C ambient.
2. Saturation Current (I<sub>sat</sub>) based on inductance drop ( $\Delta L/L_0 \leq 30\%$ ) approximately
3. Heat Rated Current (I<sub>rms</sub>) based on temperature rise ( $\Delta T: 40^\circ\text{C}$ ) approximately
4. Operating Temperature: -40°C ~ +125°C (Including Self-temperature rise)

### DIMENSIONS

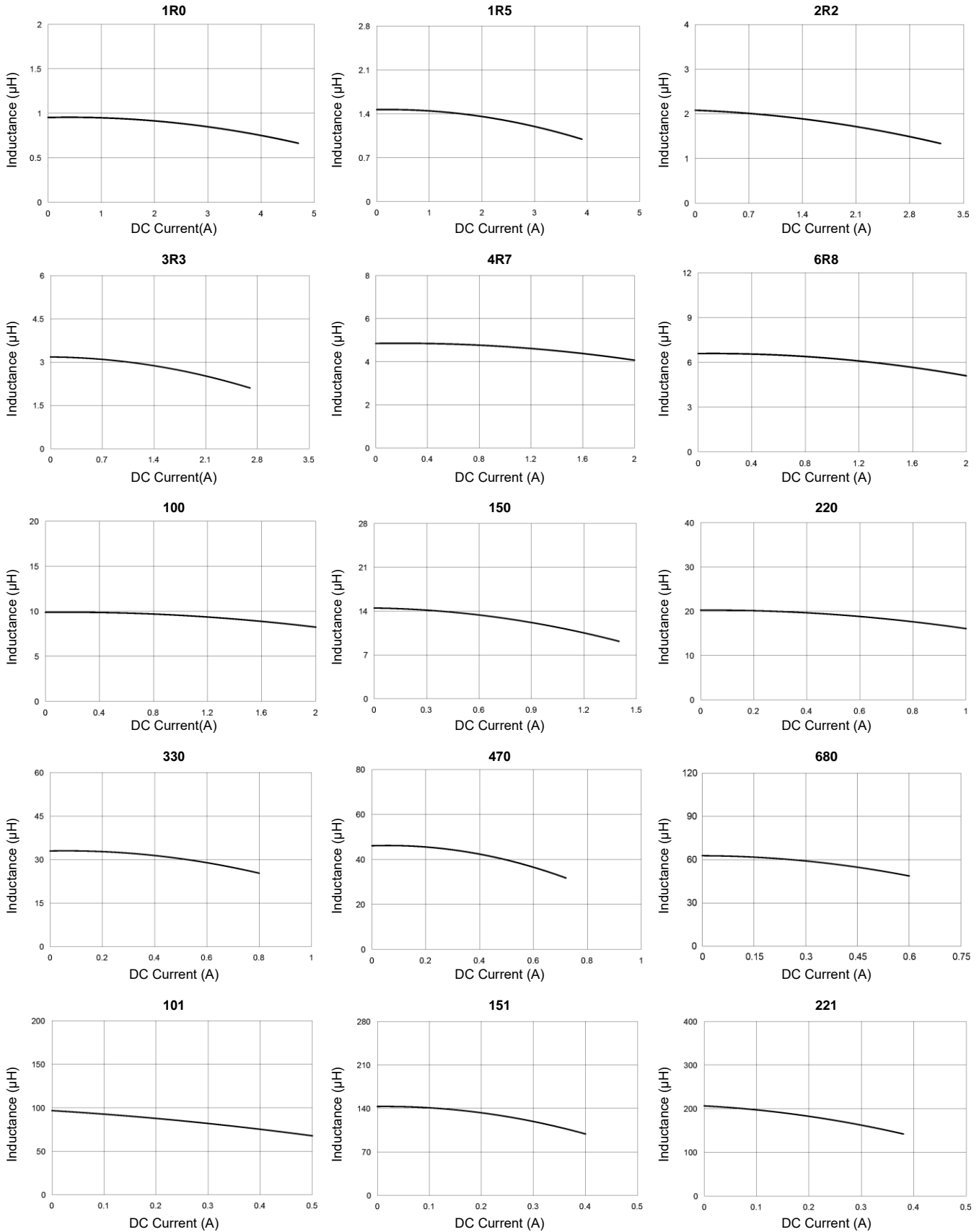


(Unit: mm)

Size Code	A	B	C	D	E	X	Y	G
4018	4.0 ± 0.2	4.0 ± 0.2	1.8 max	1.2 ref	--	1.2	3.7	1.6

Notes: 1. The above PCB layout reference only. 2. Recommend solder paste thickness at 0.15mm and above.

### CHARACTERISTIC CURVES- PIW-401865 series



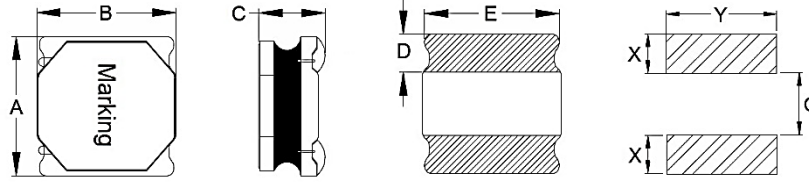
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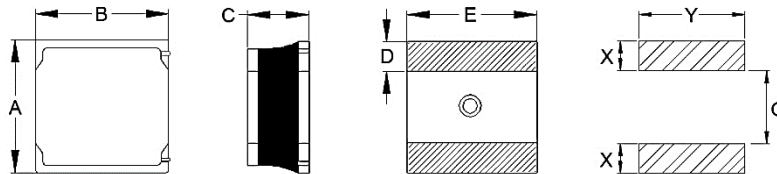
### DIMENSIONS- PIW-65 SERIES



(Unit: mm)

Size Code	A	B	C	D	E	X	Y	G
4018	4.0 ± 0.2	4.0 ± 0.2	1.8 max	1.2 ref	--	1.2	3.7	1.6
4018B	4.0 ± 0.2	4.0 ± 0.2	1.8 max	1.1 ± 0.2	--	1.2	3.7	1.6
5020	5.0 ± 0.2	5.0 ± 0.2	1.8 ± 0.2	1.3 ± 0.2	4.7 ± 0.2	1.5	4.7	2.1
5040 (≤10μH)	4.95 ± 0.2	4.95 ± 0.2	3.9 ± 0.2	1.3 ± 0.3	4.2 ± 0.2	1.5	4.2	2.1
5040 (>10μH)	4.95 ± 0.2	4.95 ± 0.2	3.8 ± 0.2	1.3 ± 0.3	4.2 ± 0.2	1.5	4.2	2.1
6020	6.0 ± 0.2	6.0 ± 0.2	1.8 ± 0.2	1.6 ± 0.3	5.8 ± 0.3	1.8	5.8	2.5
6028	6.0 ± 0.2	6.0 ± 0.2	2.6 ± 0.2	1.6 ± 0.3	5.8 ± 0.3	1.8	5.8	2.5
6045	6.0 ± 0.3	6.0 ± 0.3	4.2 ± 0.3	1.9 ± 0.3	4.8 ± 0.3	2.15	6.5	2.2
8040 (< 1.0 μH)	8.0 ± 0.3	8.0 ± 0.3	4.2 Max	2.4 ± 0.3	6.3 ± 0.3	2.85	6.6	2.8
8040 (≥ 1.0 μH)	8.0 ± 0.3	8.0 ± 0.3	3.7 ± 0.3	2.4 ± 0.3	6.3 ± 0.3	2.85	6.6	2.8

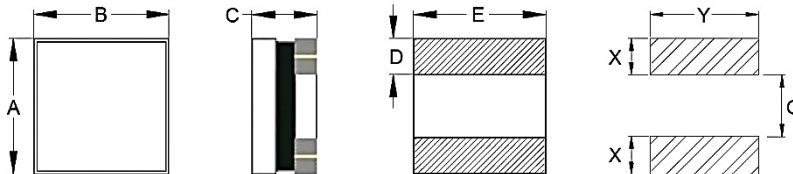
Notes: 1. The above PCB layout reference only. 2. Recommend solder paste thickness at 0.15mm and above.



(Unit: mm)

Size Code	A	B	C	D	E	X	Y	G
3010	3.0 ± 0.2	3.0 ± 0.2	1.0 max	1.0 ref	3.0 ± 0.2	1.25	3.5	0.9
3012	3.0 ± 0.2	3.0 ± 0.2	1.2 max	1.0 ref	3.0 ± 0.2	1.25	3.5	0.9
3015	3.0 ± 0.2	3.0 ± 0.2	1.5 max	1.0 ref	3.0 ± 0.2	1.25	3.5	0.9
4010	4.0 ± 0.2	4.0 ± 0.2	1.0 max	1.2 ref	4.0 ± 0.2	1.5	4.5	1.5
4012	4.0 ± 0.2	4.0 ± 0.2	1.2 max	1.2 ref	4.0 ± 0.2	1.5	4.5	1.5
4015	4.0 ± 0.2	4.0 ± 0.2	1.5 max	1.2 ref	4.0 ± 0.2	1.5	4.5	1.5

Notes: 1. The above PCB layout reference only. 2. Recommend solder paste thickness at 0.15mm and above.



(Unit: mm)

Size Code	A	B	C	D	E	X	Y	G
1608B	1.60 ± 0.15	0.90 ± 0.15	0.95 Max.	0.50 ref.	0.90 ± 0.15	0.75	1.15	0.6
2016B	2.0 -0.1/+0.2	1.6 -0.1/+0.2	1.0 max	0.60	1.6	1.0	2.1	0.5
2520A	2.50 -0.1/+0.3	2.0 -0.05/+0.35	0.80 max.	0.85	2.0	1.15	2.5	0.7
2520C	2.5 ± 0.2	2.0 ± 0.2	1.2Max	0.85	2.0	1.15	2.5	0.7

Notes: 1. The above PCB layout reference only. 2. Recommend solder paste thickness at 0.15mm and above.

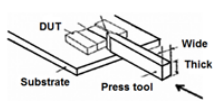
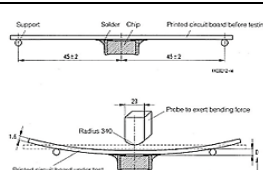
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### RELIABILITY TEST CONDITON AND REQUIREMENT

Item	Test Standards / Conditions / Equipment	Requirement															
Inductance	HP4284A, CH11025, CH3302, CH1320, CH1320S, LCR Meter	Refer to specification															
DC Resistance	CH16502, Agilent33420A Micro-Ohm Meter	Refer to specification															
Mechanical Shock	<table border="1"> <thead> <tr> <th>Type</th> <th>Peak value (g's)</th> <th>Normal duration (D) (ms)</th> <th>Wave form</th> <th>Velocity change (Vi) ft/sec</th> </tr> </thead> <tbody> <tr> <td>SMD</td> <td>50</td> <td>11</td> <td>Half-sine</td> <td>11.3</td> </tr> <tr> <td>Lead</td> <td>50</td> <td>11</td> <td>Half-sine</td> <td>11.3</td> </tr> </tbody> </table>	Type	Peak value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi) ft/sec	SMD	50	11	Half-sine	11.3	Lead	50	11	Half-sine	11.3	Appearance: No damage Inductance: within $\pm 10\%$ of initial value Q: Shall not exceed the specification value RDC: within $\pm 15\%$ of initial value and shall not exceed the specification value
	Type	Peak value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi) ft/sec												
	SMD	50	11	Half-sine	11.3												
Lead	50	11	Half-sine	11.3													
Solderability	Method B1, 4 Hrs at 155°C dry heat at 255°C $\pm 5^\circ\text{C}$ Test Time: 5 +0/-0.5 seconds. Method D category 3. (steam aging 8 hours $\pm 15\text{min}$ ) at 260°C $\pm 5^\circ\text{C}$ Test Time: 30+0/-0.5 seconds.	More than 95% of the terminal electrode should be covered with solder.															
Resistance to Soldering Heat	Solder temperature: 260 $\pm 5^\circ\text{C}$ for 10 seconds Temperature ramp/immersion and emersion rate 25mm/s $\pm 6$ mm/s. Completely cover the termination.																
Vibration	Oscillation Frequency: 10~2K~10 Hz for 20 minutes Equipment : Vibration checker Total Amplitude: 10g Testing Time: 12 hours (20 minutes, 12 cycles each of 3 orientations)	Appearance: No damage Inductance: within $\pm 10\%$ of initial value Q: Shall not exceed the specification value RDC: within $\pm 15\%$ of initial value and shall not exceed the specification value															
Load Humidity	Humidity: 85 $\pm 3\%$ R.H. Temperature: 85°C $\pm 2^\circ\text{C}$ Duration: 1000Hrs Min at 100% rated current Measured at Room Temperature after placing for 24 $\pm 2$ hrs																
Life Test	Temperature: 125 $\pm 2^\circ\text{C}$ Duration: 1000Hrs Min. with 100% rated current Measured at Room Temperature after placing for 24 $\pm 2$ Hrs																
Thermal Shock	Condition for 1 cycle <table border="1"> <thead> <tr> <th>Step</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>Temperature</td> <td>-40 <math>\pm 2^\circ\text{C}</math></td> <td>125 <math>\pm 2^\circ\text{C}</math></td> <td>125 <math>\pm 2^\circ\text{C}</math></td> </tr> <tr> <td>Duration</td> <td>30<math>\pm 5</math>min</td> <td><math>\leq 0.5</math>min</td> <td>30<math>\pm 5</math>min</td> </tr> </tbody> </table>	Step	1	2	3	Temperature	-40 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	Duration	30 $\pm 5$ min	$\leq 0.5$ min	30 $\pm 5$ min	Appearance: No damage Inductance: within $\pm 10\%$ of initial value Q: Shall not exceed the specification value RDC: within $\pm 15\%$ of initial value and shall not exceed the specification value			
	Step	1	2	3													
Temperature	-40 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$														
Duration	30 $\pm 5$ min	$\leq 0.5$ min	30 $\pm 5$ min														
	Number of cycles : 300 Measured at room temperature after placing for 24 $\pm 2$ hrs.																
Terminal Strength	Component mounted on a PCB apply a force 1.8kg to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to shock the component being tested. 	Appearance : No damage															
Board Flex	Place the 100x40mm board into a fixture with the component facing down. Apply a force which will bend the board: $\geq 0.805\text{in}$ (2012mm):1.2mm $< 0.805\text{in}$ (2012mm):0.8mm. Duration: 10 seconds. The Force is to be applied only once to the board 	Appearance : No damage															
Moisture Resistance	<ol style="list-style-type: none"> <li>Baked at 50°C for 25hrs, measured at room temperature after placing for 4hrs.</li> <li>Raise temperature to 65<math>\pm 2^\circ\text{C}</math> 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25°C in 2.5hrs.</li> <li>Raise temperature to 65<math>\pm 2^\circ\text{C}</math> 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25°C in 2.5hrs, keep at 25°C for 2hrs then keep at -10°C for 3hrs</li> <li>Keep at 25°C 80-100%RH for 15min and vibrate at the frequency of 10 to 55 Hz to 10 Hz, measure at room temperature after placing for 1~2 hrs.</li> </ol>	Appearance: No damage Inductance: within $\pm 10\%$ of initial value Q: Shall not exceed the specification value RDC: within $\pm 15\%$ of initial value and shall not exceed the specification value															

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### PART NUMBERING SYSTEM

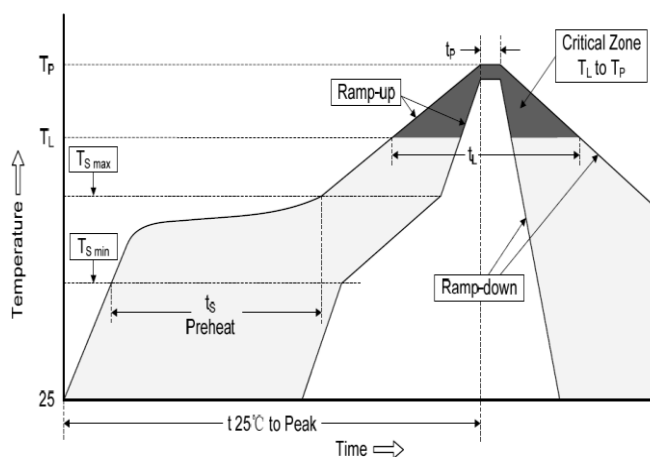
PIW    221M    4018    65  
 (1)        (2)        (3)        (4)

No	Item	Code	Description
(1)	Product Code	PIW	Power Inductor series, Wire wound type
(2)	Inductance	221M	220 $\mu$ H $\pm$ 20%(M)      First two digits: significant, Third: multiplier
(3)	Size Code	4018	4.0x4.0x1.8 mm      Length x Width x Thickness (mm)
(4)	Series Code	65	Surface Mount Shielded, Low Profile, High Current series

### RECOMMENDED SOLDERING PROFILES

Reflow Condition		
Pre Heat	Temp. Min $T_{s(min)}$	150°C
	Temp. Max $T_{s(max)}$	200°C
	Time (min. to max.) ( $t_s$ )	60 ~120 seconds
Average ramp up rate (Liquidus Temperature) ( $T_L$ ) to peak		3°C/second max
$T_{s(max)}$ to $T_L$ (Ramp-up rate)		3°C/second max
Reflow	Temp. ( $T_L$ )	217°C
	Time (min. to max.) ( $t_L$ )	60 ~150 seconds
Peak Temperature ( $T_P$ )		See table below
Time within 5°C of actual peak Temperature ( $t_p$ )		10 seconds max
Ramp-down Rate		6°C/second max
Reflow Times		3 times max

Volume	Peak Temperature ( $T_P$ )		
	< 350mm <sup>3</sup>	350-2000mm <sup>3</sup>	> 2000mm <sup>3</sup>
Thickness < 1.6mm	260°C	260°C	260°C
Thickness 1.6-2.5mm	260°C	250°C	245°C
Thickness $\geq$ 2.5mm	250°C	245°C	245°C



\*Specifications subject to change without notice