

Power Inductor SMD Low Profile, High Current AEC-Q200

PIW-4012M65

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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
- AEC-Q200 Compliant



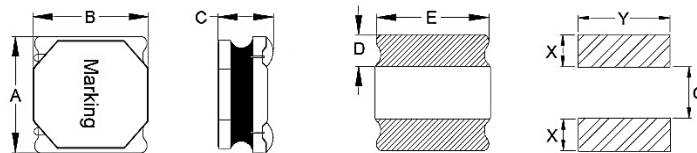
ELECTRICAL CHARACTERISTICS

Part Number	Inductance (μH)	Tolerance (%)	Test Frequency (Hz)	DCR (mΩ)		I _{SAT} (A)		I _{RMS} (A)	
				Typ.	Max.	Typ.	Max.	Typ.	Max.
PIWR47M4012M65	0.47	±20%	1V/100K	25.0	30.0	5.00	4.50	5.50	5.00
PIWR68M4012M65	0.68	±20%	1V/100K	36.0	43.0	4.60	4.30	5.00	4.60
PIW1R0M4012M65	1.00	±20%	1V/100K	43.0	52.0	4.00	3.60	4.40	4.20
PIW1R2M4012M65	1.20	±20%	1V/100K	44.0	53.0	3.80	3.40	4.20	4.00
PIW1R5M4012M65	1.50	±20%	1V/100K	52.0	62.4	3.30	3.00	3.90	3.60
PIW2R2M4012M65	2.20	±20%	1V/100K	66.0	79.2	2.50	2.30	3.30	3.00
PIW3R3M4012M65	3.30	±20%	1V/100K	81.6	98.0	1.90	1.70	2.80	2.60
PIW4R7M4012M65	4.70	±20%	1V/100K	112	134	1.60	1.40	2.50	2.30
PIW5R6M4012M65	5.60	±20%	1V/100K	135	162	1.40	1.30	2.10	1.90
PIW6R8M4012M65	6.80	±20%	1V/100K	165	198	1.25	1.15	1.80	1.60
PIW100M4012M65	10.0	±20%	1V/100K	230	276	1.00	0.90	1.40	1.20
PIW150M4012M65	15.0	±20%	1V/100K	320	384	0.90	0.80	1.20	1.10
PIW220M4012M65	22.0	±20%	1V/100K	470	564	0.70	0.60	1.00	0.90
PIW330M4012M65	33.0	±20%	1V/100K	850	1020	0.60	0.55	0.80	0.70
PIW470M4012M65	47.0	±20%	1V/100K	1100	1320	0.48	0.43	0.65	0.55

Notes:

1. All test data referenced to 25°C ambient.
2. Saturation Current (I_{sat}) based on inductance drop ($\Delta L/L_0 \leq 30\%$) approximately
3. Heat Rated Current (I_{rms}) based on temperature rise ($\Delta T: 40^\circ\text{C}$) approximately
4. Operating Temperature: -55°C ~ +125°C (Including Self-temperature rise)

DIMENSIONS



Size Code	A	B	C	D	E	X	Y	G
4012	4.0 ±0.2	4.0 ±0.2	1.0 ±0.2	1.2 ±0.3	3.5 ±0.3	1.5	4.5	1.5

Unit: mm

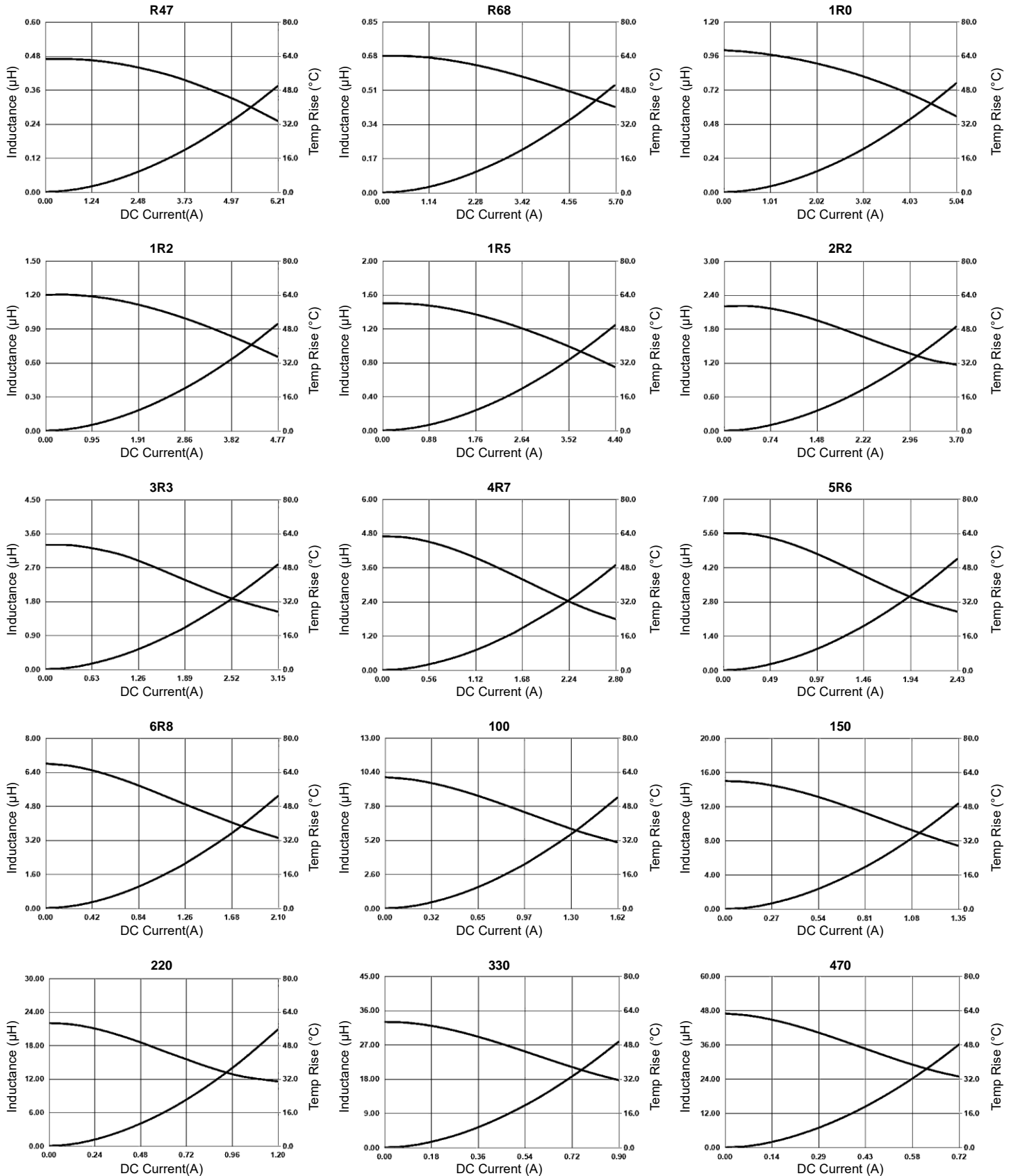
Notes: 1. The above PCB layout reference only. 2. Recommend solder paste thickness at 0.15mm and above.

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CHARACTERISTIC CURVES- PIW-4012M65 series

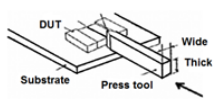
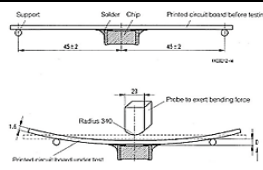


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RELIABILITY TEST CONDITON AND REQUIREMENT

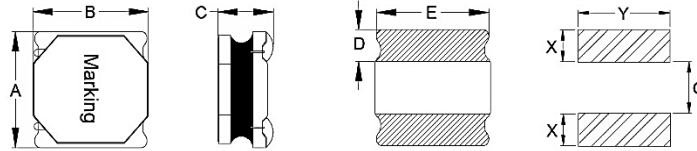
Item	Test Standards / Conditions / Equipment	Requirement															
Inductance	HP4284A, CH11025, CH3302, CH1320, CH1320S, LCR Meter	Refer to specification															
DC Resistance	CH16502, Agilent33420A Micro-Ohm Meter	Refer to specification															
Mechanical Shock	<table border="1"> <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>100</td> <td>6</td> <td>Half-sine</td> <td>12.3</td> </tr> <tr> <td>Lead</td> <td>100</td> <td>6</td> <td>Half-sine</td> <td>12.3</td> </tr> </tbody> </table>	Type	Peak value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi) ft/sec	SMD	100	6	Half-sine	12.3	Lead	100	6	Half-sine	12.3	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	100	6	Half-sine	12.3												
Lead	100	6	Half-sine	12.3													
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 ± 6 mm/s. Completely cover the termination.	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															
Vibration	Oscillation Frequency: 10~2K~10 Hz for 20 minutes Equipment : Vibration checker Total Amplitude: 1.52mm $\pm 10\%$ Testing Time: 12 hours (20 minutes, 12 cycles each of 3 orientations)																
High Temperature Exposure	Temperature: 125 $\pm 2^\circ\text{C}$ Duration 1000Hrs Min Measured at room temperature after placing for 24 ± 2 hrs																
Biased Humidity	Humidity: 85 $\pm 3\%$ R.H. Temperature: 85°C $\pm 2^\circ\text{C}$ Duration: 1000Hrs Min Measured at Room Temperature after placing for 24 ± 2 hrs	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															
High Temperature Operational Life	Temperature: 125 $\pm 2^\circ\text{C}$ Duration: 1000Hrs Min. with 100% rated current Measured at Room Temperature after placing for 24 ± 2 Hrs																
Temperature Cycling	<table border="1"> <thead> <tr> <th>Step</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Temperature</td> <td>-55 $\pm 2^\circ\text{C}$</td> <td>125 $\pm 2^\circ\text{C}$</td> <td>125 $\pm 2^\circ\text{C}$</td> <td>Low Temp</td> </tr> <tr> <td>Duration</td> <td>30min Min</td> <td>1 min Max</td> <td>30 min Min</td> <td>1 min Max</td> </tr> </tbody> </table> Number of Cycle: 1000 Measured at room temperature after placing for 24 ± 2 hrs		Step	1	2	3	4	Temperature	-55 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	Low Temp	Duration	30min Min	1 min Max	30 min Min	1 min Max
Step	1	2	3	4													
Temperature	-55 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	Low Temp													
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Step	1	2	3														
Temperature	-55 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$	125 $\pm 2^\circ\text{C}$														
Duration	15 ± 1 min	20sec	15 ± 1 min														
ESD	AEC-Q200-002 HBM ESD, Contact Discharge Level: 4KV (Level 2)	Appearance: No damage															
Resistance to Solvents	Add aqueous wash chemical - OKEM clean or equivalent.	Appearance : No damage															
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.																
Board Flex	Place the 100x40mm board into a fixture with the component facing down. Apply a force which will bend the board (D) x = 2mm minimum. Duration: 60 (+5) seconds. The Force is to be applied only once to the board																
Flammability	Electrical Test not Required	V-0 or V-1 are acceptable.															

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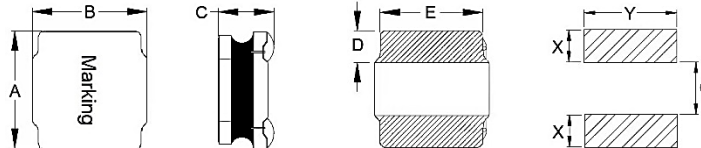
DIMENSIONS- PIW-M65 series



Unit: mm

Size Code	A	B	C	D	E	X	Y	G
3612	3.6 ±0.2	3.6 ±0.2	1.0 ±0.2	1.2 ±0.3	3.2 ±0.3	0.9	3.7	2.0
4010	4.0 ±0.2	4.0 ±0.2	0.9 ±0.1	1.2 ±0.3	3.5 ±0.3	1.5	4.5	1.5
4012	4.0 ±0.2	4.0 ±0.2	1.0 ±0.2	1.2 ±0.3	3.5 ±0.3	1.5	4.5	1.5
4018	4.0 ±0.2	4.0 ±0.2	1.6 ±0.2	1.1 ±0.2	3.5 ±0.3	1.5	4.5	1.5
4020	4.0 ±0.2	4.0 ±0.2	1.8 ±0.2	1.2 ±0.3	3.4 ±0.3	1.5	4.5	1.5
4030	4.0 ±0.2	4.0 ±0.2	3.0 Max.	1.35 ±0.3	3.4 ±0.4	1.5	3.7	1.3
5010	5.0 ±0.2	5.0 ±0.2	0.9 ±0.1	1.5 ±0.3	4.0 ±0.3	1.85	5.5	1.8
5012	5.0 ±0.2	5.0 ±0.2	1.0 ±0.2	1.5 ±0.3	4.0 ±0.3	1.85	5.5	1.8
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
5030	5.0 ±0.2	5.0 ±0.2	2.8 ±0.2	1.3 ±0.2	4.7 ±0.3	1.85	5.5	1.8
5040 (≤ 10 μH)	4.95 ±0.2	4.95 ±0.2	3.9 ±0.2	1.3 ±0.2	4.2 ±0.2	1.5	4.2	2.1
5040 (> 10 μH)	4.95 ±0.2	4.95 ±0.2	3.8 ±0.2	1.3 ±0.2	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

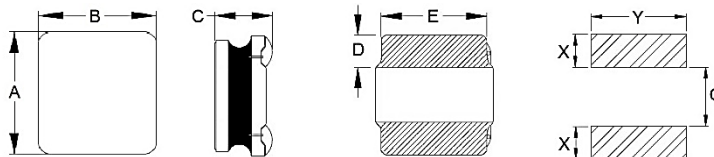
Notes: 1. The above PCB layout reference only. 2. Recommend solder paste thickness at 0.15mm and above.



Unit: mm

Size Code	A	B	C	D	E	X	Y	G
3010	3.0 ±0.2	3.0 ±0.2	0.9 ±0.1	0.9 ±0.3	2.7 ±0.3	1.25	3.5	0.9
3012	3.0 ±0.2	3.0 ±0.2	1.0 ±0.2	0.9 ±0.3	2.7 ±0.3	1.25	3.5	0.9
3015	3.0 ±0.2	3.0 ±0.2	1.3 ±0.2	0.9 ±0.3	2.7 ±0.3	1.25	3.5	0.9
6045	6.0 ±0.3	6.0 ±0.3	4.2 ±0.3	1.9 ±0.3	4.8 ±0.3	3.0	6.3	5.5
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
2016A	2.0 ±0.2	1.6 ±0.2	0.7 ±0.1	0.7 ±0.3	1.8 ±0.2	1.0	2.1	0.5
2016B	2.0 ±0.2	1.6 ±0.2	0.9 ±0.1	0.7 ±0.3	1.6 ±0.2	1.0	2.1	0.5
2016C	2.0 ±0.2	1.6 ±0.2	1.0 ±0.2	0.7 ±0.3	1.6 ±0.2	1.0	2.1	0.5
2520A	2.5 ±0.2	2.0 ±0.2	0.7 ±0.1	0.9 ±0.3	2.0 ±0.2	1.15	2.5	0.7
2520B	2.5 ±0.2	2.0 ±0.2	0.9 ±0.1	0.9 ±0.3	2.0 ±0.2	1.15	2.5	0.7
2520C	2.5 ±0.2	2.0 ±0.2	1.0 ±0.2	0.9 ±0.3	2.0 ±0.2	1.15	2.5	0.7
3225C	3.2 ±0.2	2.5 ±0.2	1.0 ±0.2	1.0 ±0.3	2.5 ±0.2	1.25	3.0	1.0

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

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PART NUMBERING SYSTEM

PIW **470M** **4012** **M65**
(1) (2) (3) (4)

No	Item	Code	Description
(1)	Product Code	PIW	Power Inductor series, Wire Wound type
(2)	Inductance	470M	47.0 μ H \pm 20%(M) First two digits: significant, Third: multiplier
(3)	Size Code	4012	4.0x4.0x1.0 mm Length x Width x Thickness (mm)
(4)	Series Code	M65	Surface Mount Shielded, Low Profile, High Current series, AEC-Q200 Compliant

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

Peak Temperature (T_P)			
Volume	< 350mm ³	350-2000mm ³	> 2000mm ³
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

