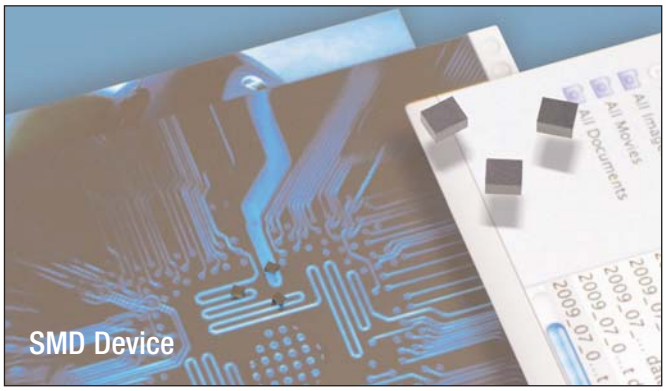
COILTRONICS®

High Frequency, High Current Miniature Power Inductors

MPI4040 Series



Description

- Halogen free, lead free, RoHS compliant
- 125°C maximum total temperature operation
- 4.7x4.31x1.2, 1.5, 1.85, 2.0mm maximum surface mount package
- Magnetically shielded
- Handles high transient inrush current spikes
- Rugged construction
- Inductance range from 0.09µH to 22µH
- Current range from 1.1A to 32.0A
- Frequency range 20kHz to 10MHz

Product Specifications - See page 2

Applications

- Handheld/mobile devices
- Portable media players
- GPS/PDAs
- MP3 Players
- Battery operated devices
- Notebook/netbook
- Tablets/smartbooks
- LCD Displays
- LED Drivers
- POL Converters

Environmental Data

- Storage temperature range: -40°C to +125°C
- Operating temperature range: -40°C to +125°C (Ambient plus self temperature rise)
- Solder reflow temperature: J-STD-020D compliant

Packaging

- Supplied in tape and reel packaging:
  - MPI4040R1 = 5500 parts per 13" diameter reel
  - MPI4040R2 = 4500 parts per 13" diameter reel
  - MPI4040R3 = 3500 parts per 13" diameter reel
  - MPI4040R4 = 3000 parts per 13" diameter reel

Product Specifications

Part Number[5]	OCL[1] ± 20% (µH)	Part Marking Designator	I_{rms}[2] (Amps)	I_{sat}[3] @ 25°C (Amps)	DCR (mΩ) ± 20% @ 20°C	K-factor[4]
R1 -- 1.2mm Height						
MPI4040R1-R10-R	0.09	A	8.00	32.0†	8.50	1401
MPI4040R1-R15-R	0.15	B	7.00	26.0†	11.0	989
MPI4040R1-R22-R	0.23	C	5.50	21.0	18.0	814
MPI4040R1-R33-R	0.33	D	4.40	17.0	28.0	659
MPI4040R1-R47-R	0.47	E	5.20	11.5	20.0	1295
MPI4040R1-R68-R	0.68	F	3.30	9.00	51.0	461
MPI4040R1-1R0-R	1.0	G	3.70	7.70	40.0	990
MPI4040R1-1R5-R	1.5	H	3.00	6.50	60.0	732
MPI4040R1-2R2-R	2.2	I	2.60	5.90	80.0	623
MPI4040R1-3R3-R	3.3	J	2.20	5.10	115	481
MPI4040R1-4R7-R	4.7	K	1.80	3.80	180	411
MPI4040R1-6R8-R††	6.8	L	1.50	3.20	250	344
MPI4040R1-100-R††	10	M	1.20	2.80	370	276
R2 -- 1.5mm Height						
MPI4040R2-R47-R	0.47	A	6.40	12.2	13.0	1403
MPI4040R2-1R0-R	1.0	B	4.60	8.90	25.0	935
MPI4040R2-1R5-R	1.5	C	3.80	7.60	37.0	701
MPI4040R2-2R2-R	2.2	D	3.20	5.70	58.0	647
MPI4040R2-3R3-R	3.3	E	2.60	5.40	76.0	495
MPI4040R2-4R7-R	4.7	F	2.20	4.30	105	421
MPI4040R2-6R8-R	6.8	G	1.80	3.40	158	351
MPI4040R2-100-R††	10.0	H	1.50	3.10	240	271
R3 -- 1.85mm Height						
MPI4040R3-R22-R	0.22	A	8.00	20.0	5.8	1870
MPI4040R3-R47-R	0.47	B	5.80	17.0	10.3	1530
MPI4040R3-1R2-R	1.2	C	4.00	9.40	32.0	732
MPI4040R3-1R5-R	1.5	D	3.80	8.20	36.0	673
MPI4040R3-2R2-R	2.2	E	3.40	7.90	48.0	543
MPI4040R3-3R3-R	3.3	F	3.00	6.60	60.0	432
MPI4040R3-4R7-R	4.7	G	2.30	4.80	92.0	374
MPI4040R3-6R8-R	6.8	H	2.00	4.50	120	306
MPI4040R3-100-R	10.0	I	1.50	3.80	213	251
MPI4040R3-150-R	15.0	J	1.30	3.00	285	213
MPI4040R3-220-R††	22.0	K	1.10	2.20	408	174
R4 -- 2.0mm Height						
MPI4040R4-R22-R	0.22	A	10.1	15.0	5.3	2405
MPI4040R4-R33-R	0.33	B	9.50	12.8	6.0	1870
MPI4040R4-R47-R	0.45	C	8.10	11.5	8.2	1530
MPI4040R4-1R0-R	1.0	D	5.70	8.20	17.0	990
MPI4040R4-1R5-R	1.5	E	4.90	6.90	23.0	802
MPI4040R4-2R2-R	2.2	F	3.90	5.70	35.0	673
MPI4040R4-3R3-R††	3.3	G	3.30	4.50	49.0	510
MPI4040R4-4R7-R††	4.7	H	2.90	3.90	67.0	455
MPI4040R4-6R8-R††	6.8	I	2.40	3.20	91.0	374
MPI4040R4-100-R††	10.0	J	1.90	2.60	148	306
MPI4040R4-220-R††	22.0	K	1.30	1.80	316	203

1 Open Circuit Inductance (OCL) Test Parameters: 100kHz, 0.10V_{rms}, 0.0Adc

2 I_{rms}: DC current for an approximate temperature rise of 40°C without core loss. De-rating is necessary for AC currents. Temperature rise is dependent upon several factors, including the PCB pad layout, trace thickness and width, air-flow and proximity to other heat generating components. It is recommended the part temperature not exceed 125°C under worst case operating conditions and therefore, the temperature rise should be verified in the end use application. I_{rms} testing was performed on a 19.05mm long x 6.35mm wide x 0.070mm thick copper trace in still air.

3 I_{sat}: Peak current for approximately 30% rolloff at +25°C.

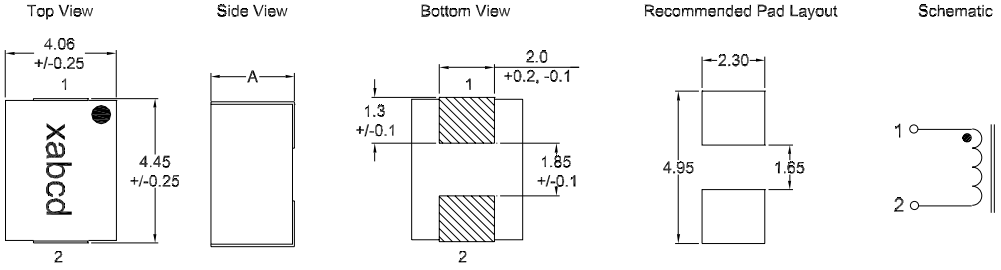
4 K-factor: Used to determine B_{p-p} for core loss (see graph). $B_{p-p} = K * L * \Delta I$. B_{p-p} : (Gauss), K: (K-factor from table), L: (inductance in µH), ΔI (peak-to-peak ripple current in amps).

5 Part Number Definition: MPI4040RX-XXX-R
- MPI4040X = product code and size
- XXX = inductance value in all, "R" = decimal point
  - If no "R" is present, then third digit equals the number of zeros
- "-R" suffix = RoHS compliant

† Transient pulse not to exceed 1 millisecond.

†† Maximum operating frequency less than 10MHz, consult factory for application specific values.

Dimensions - mm

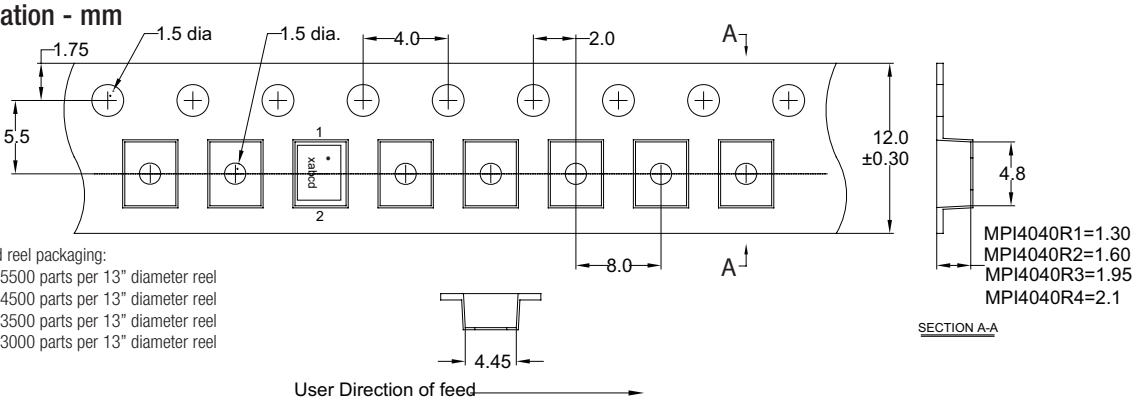


Part #	A Max
MPI4040R1-xxx-R	1.2
MPI4040R2-xxx R	1.5
MPI4040R3-xxx-R	1.8
MPI4040-R4-xxx-R	2.0

Part Marking : xabcd
x = height: 1 = R1 (1.2mm), 2 = R2 (1.5mm), 3 = R3 (1.85mm), 4 = R4 (2.0mm)
a = inductance value per the "Part Marking Designator?letter code in table above
b = Bi-weekly date code
c = Last digit of year manufactured
d = Revision level

Soldering surfaces to be coplanar within 0.1016 millimeters
PCB tolerances +/-0.1mm unless otherwise specified

Packaging Information - mm



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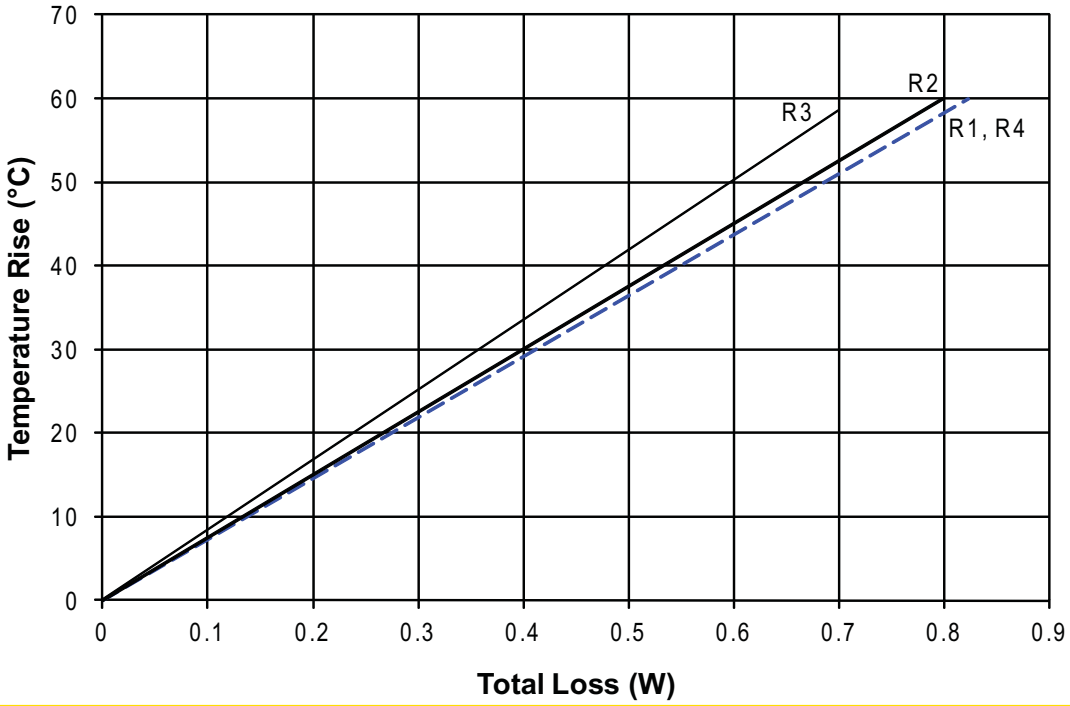
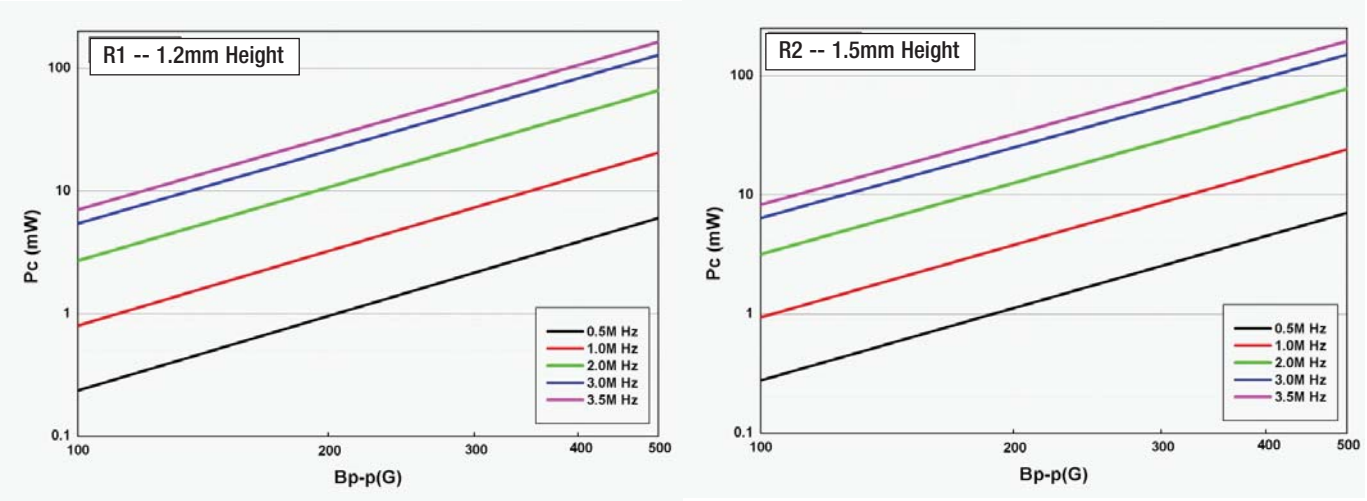
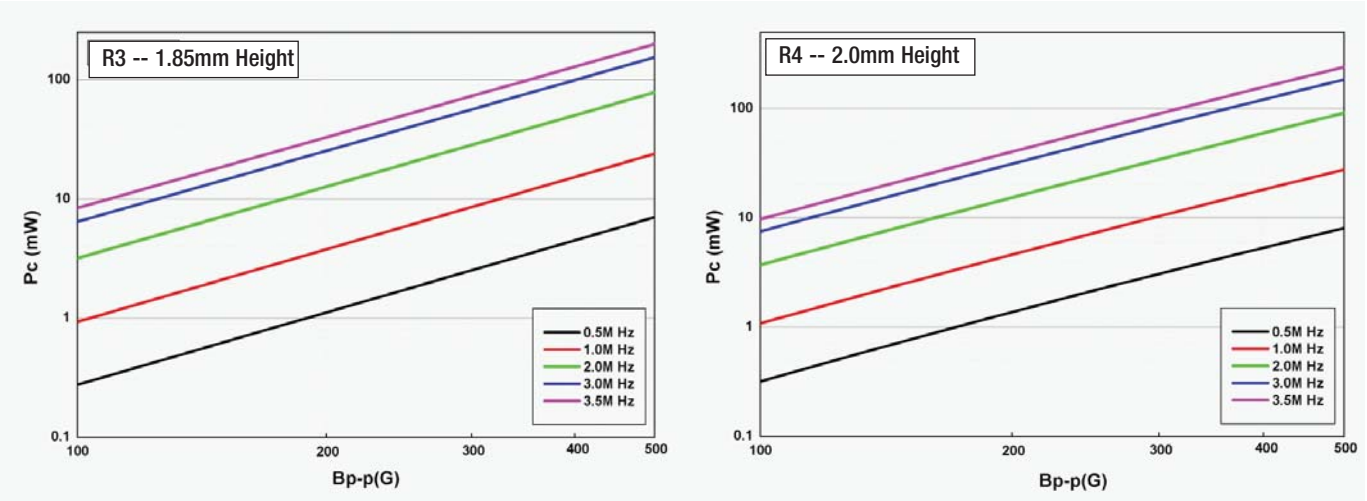
Temperature Rise vs. Total Loss



Core Loss


R1 -- 1.2mm Height
Pc (mW)
Bp-p(G)
0.5M Hz
1.0M Hz
2.0M Hz
3.0M Hz
3.5M Hz

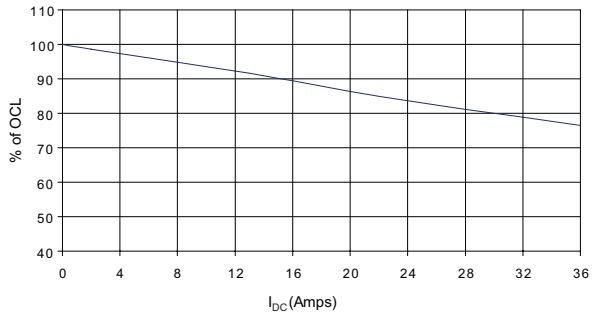
R2 -- 1.5mm Height
Pc (mW)
Bp-p(G)
0.5M Hz
1.0M Hz
2.0M Hz
3.0M Hz
3.5M Hz


R3 -- 1.85mm Height
Pc (mW)
Bp-p(G)
0.5M Hz
1.0M Hz
2.0M Hz
3.0M Hz
3.5M Hz

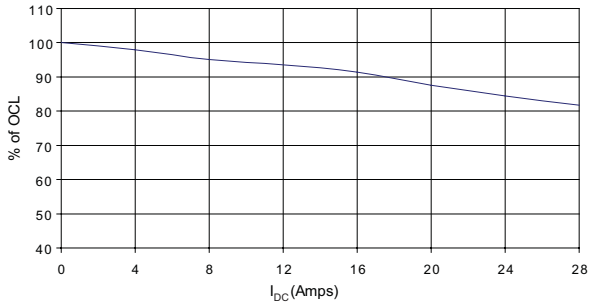
R4 -- 2.0mm Height
Pc (mW)
Bp-p(G)
0.5M Hz
1.0M Hz
2.0M Hz
3.0M Hz
3.5M Hz

Inductance Characteristics - % of OCL vs. I_{DC} - R1 -- 1.2mm Height

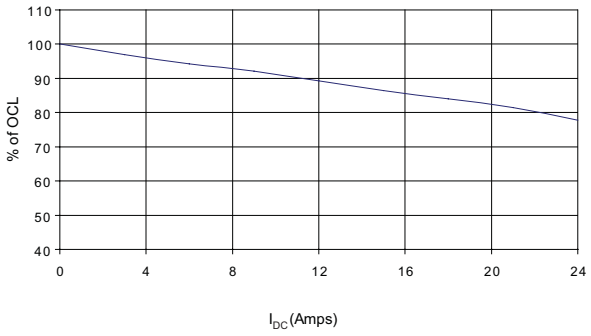
MPI4040R1-R10-R



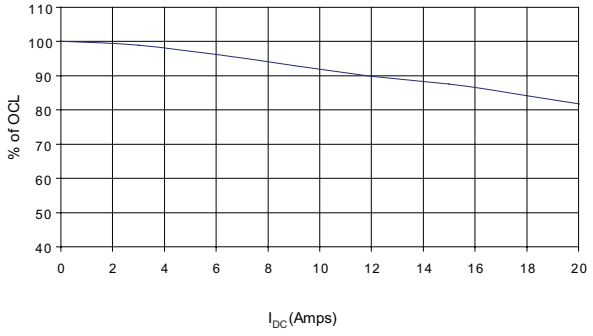
MPI4040R1-R15-R



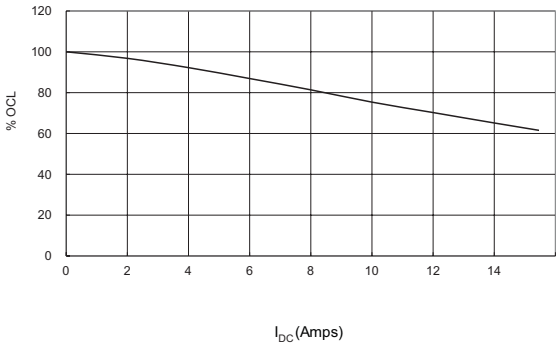
MPI4040R1-R22-R



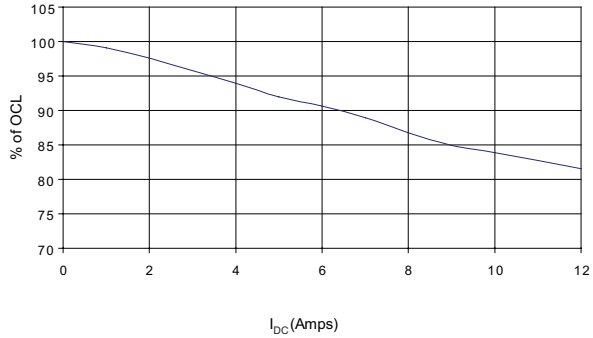
MPI4040R1-R33-R



MPI4040R1-R47-R

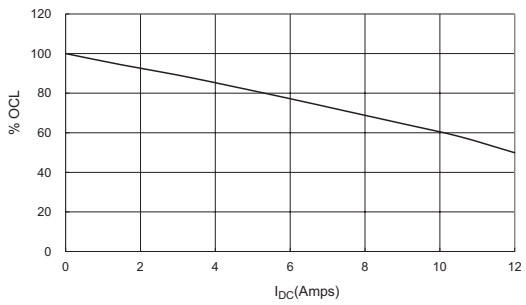


MPI4040R1-R68-R

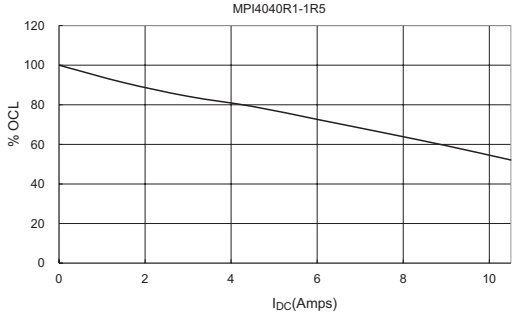


Inductance Characteristics - % of OCL vs. I_{DC} - R1 -- 1.2mm Height

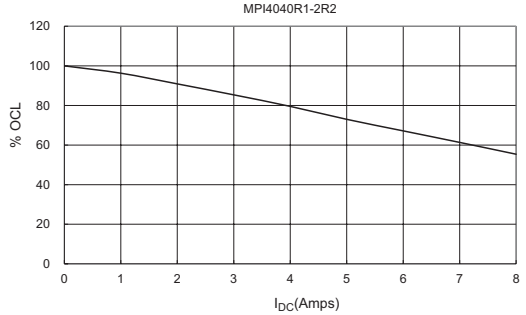
MPI4040R1-1R0



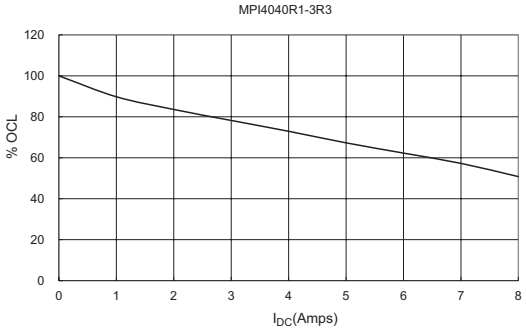
MPI4040R1-1R5



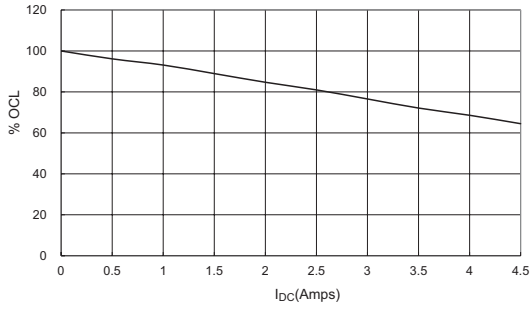
MPI4040R1-2R2



MPI4040R1-3R3



MPI4040R1-4R7



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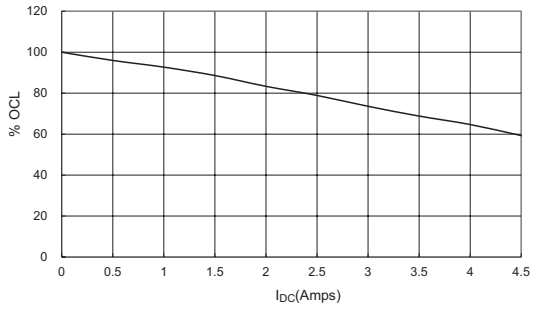

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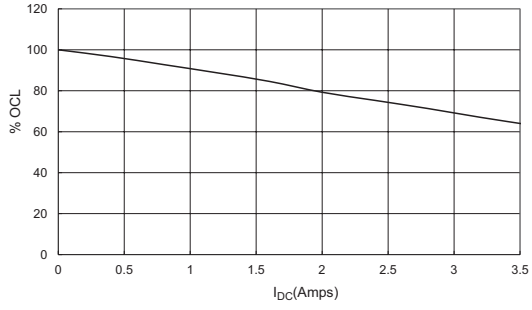
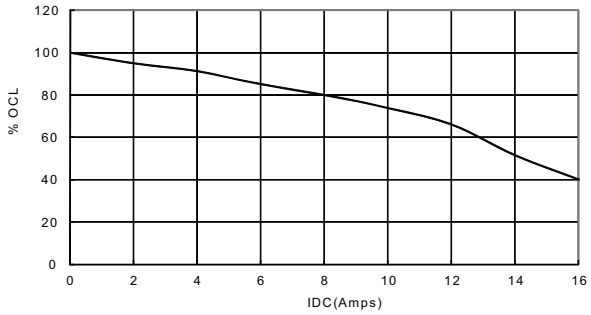
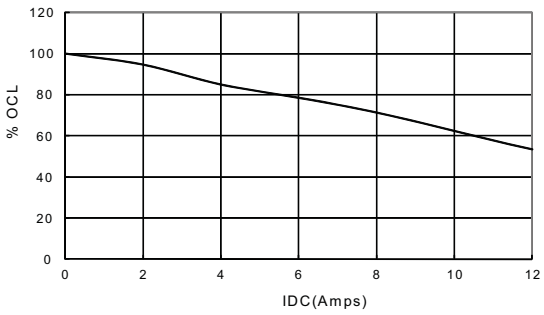


Inductance Characteristics - % of OCL vs. I_{DC} - R2 -- 1.5mm Height

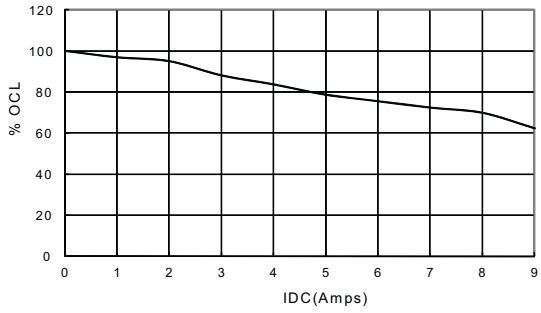
MPI4040R2-R47



MPI4040R2-1R0



MPI4040R2-1R5



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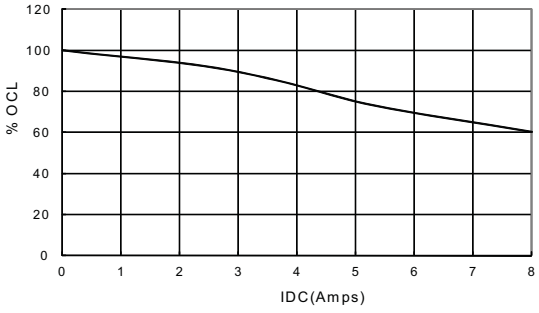

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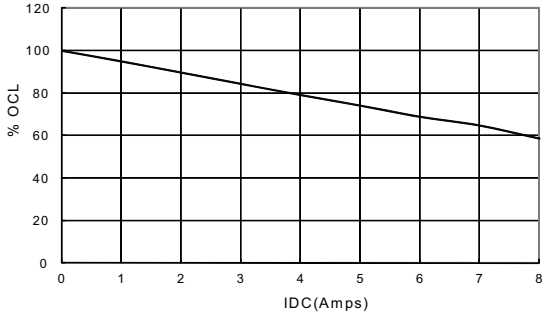

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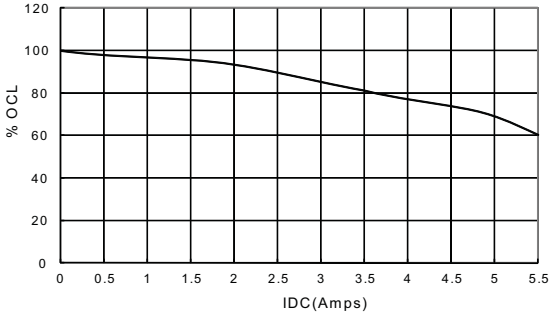

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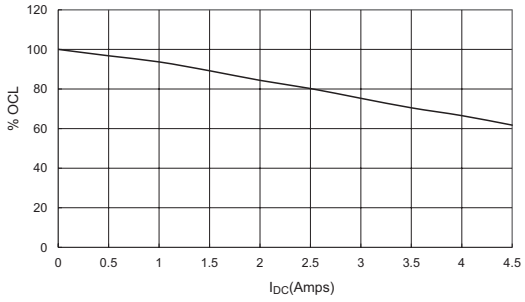

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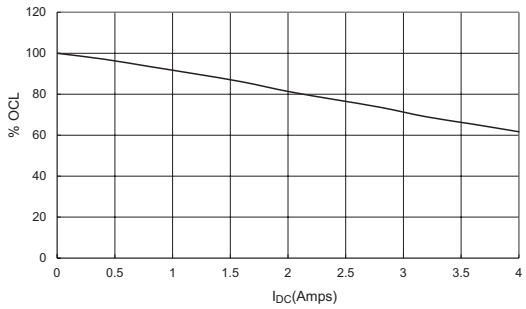
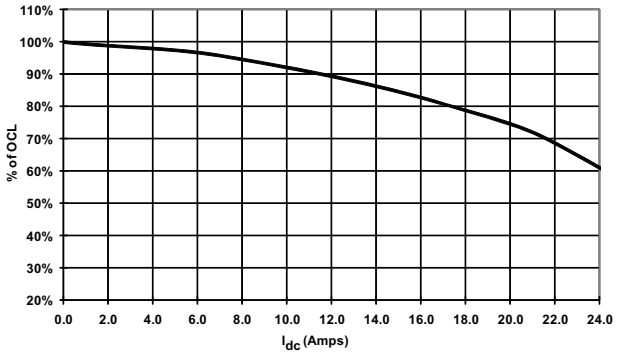
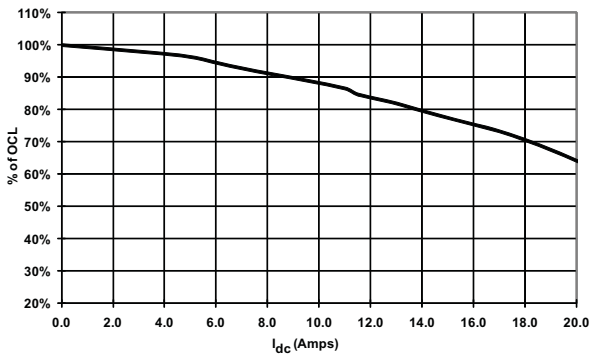


Inductance Characteristics - % of OCL vs. I_{DC} - R3 -- 1.85mm Height

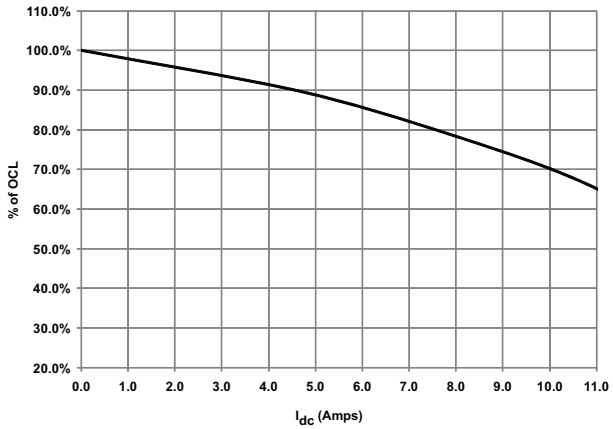
MPI4040R3-R22-R



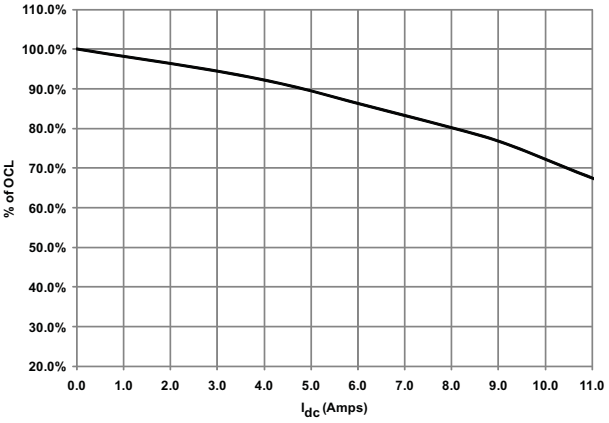
MPI4040R3-R47-R



MPI4040R3-1R2-R



MPI4040R3-1R5-R



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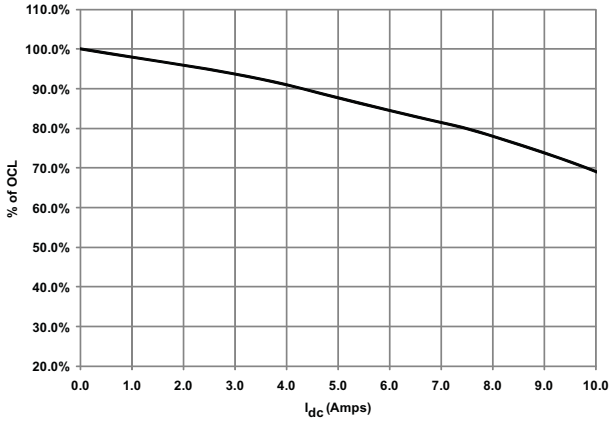

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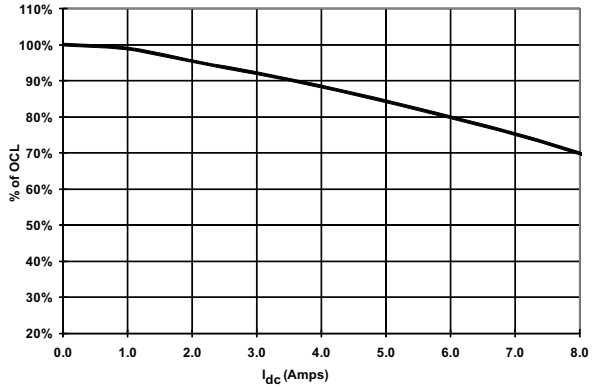
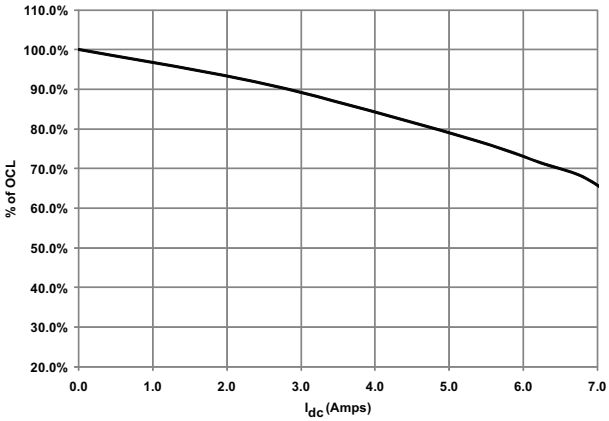
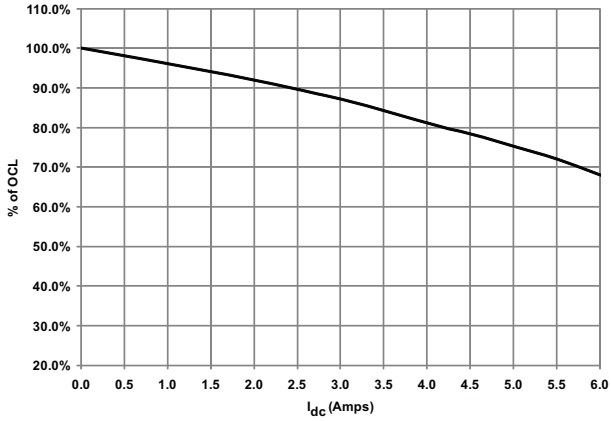


Inductance Characteristics - % of OCL vs. I_{DC} - R3 -- 1.85mm Height

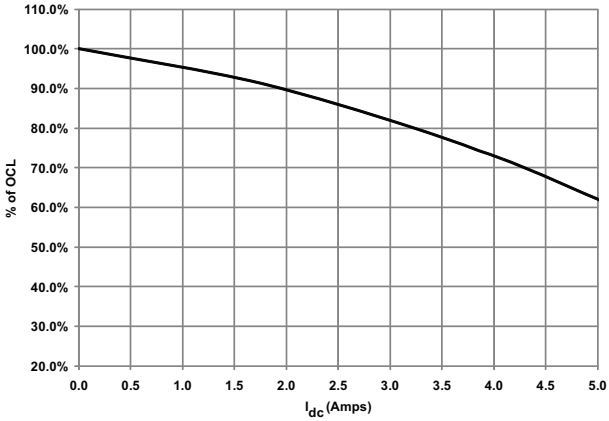
MPI4040R3-4R7-R



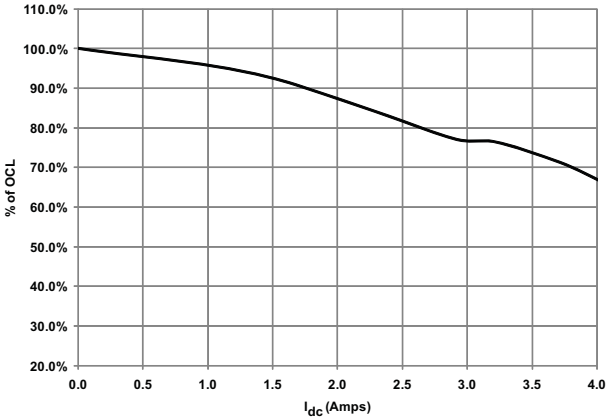
MPI4040R3-6R8-R



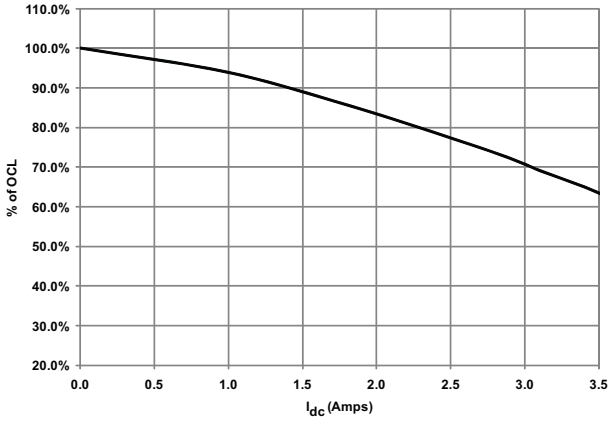
MPI4040R3-100-R



MPI4040R3-150-R

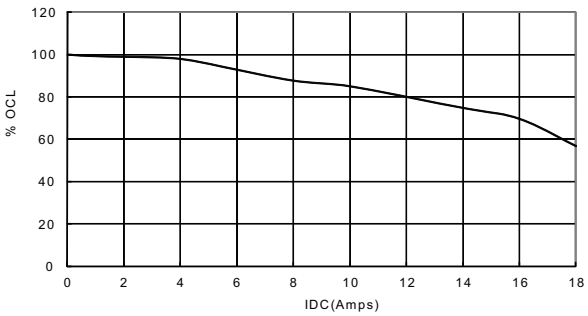


MPI4040R3-220-R



Inductance Characteristics - % of OCL vs. I_{DC} - R4 -- 2.0mm Height

MPI4040R4-R22



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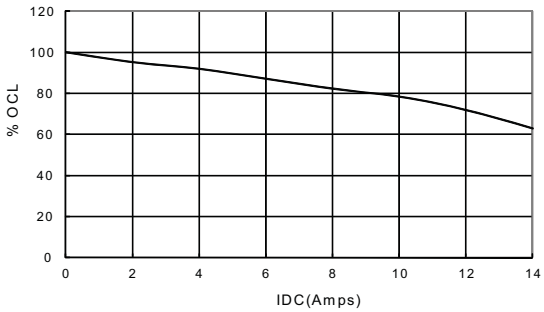

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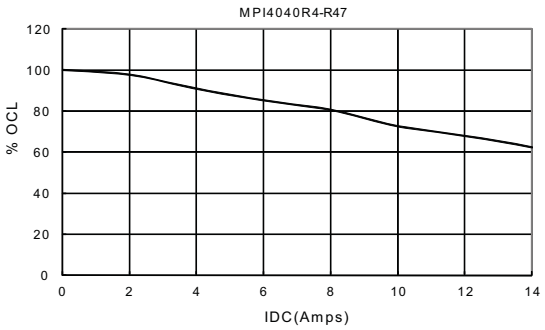

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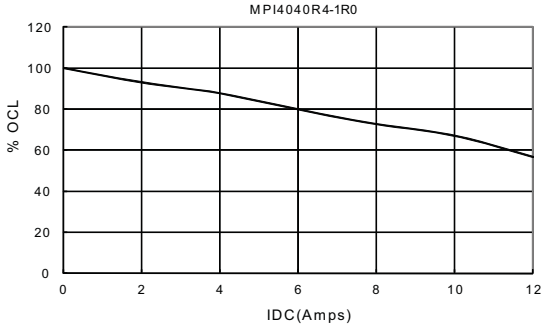

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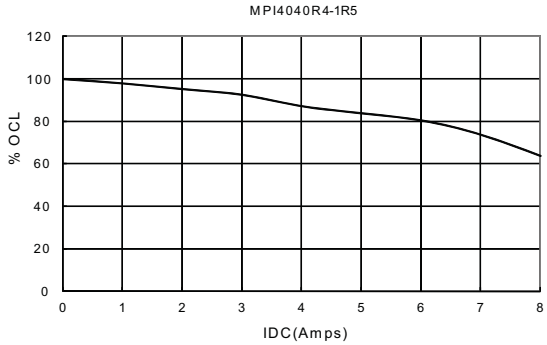

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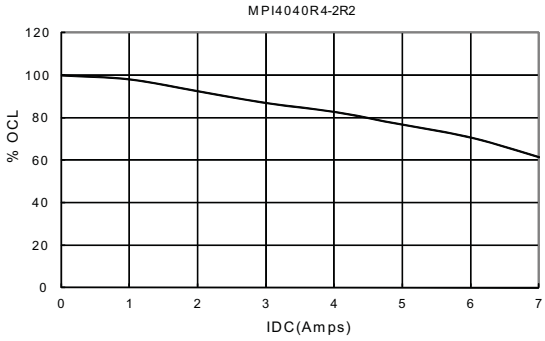

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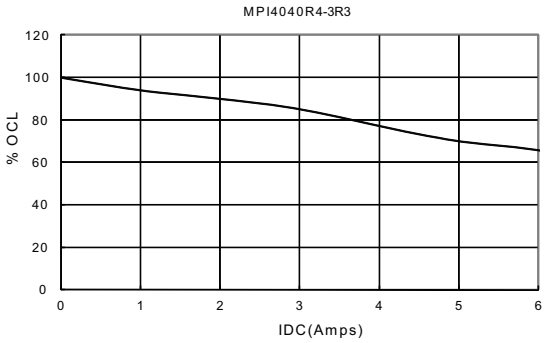

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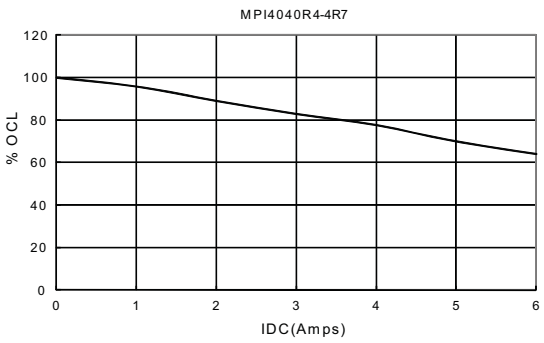
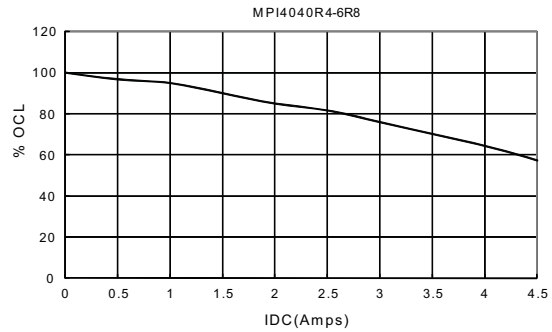
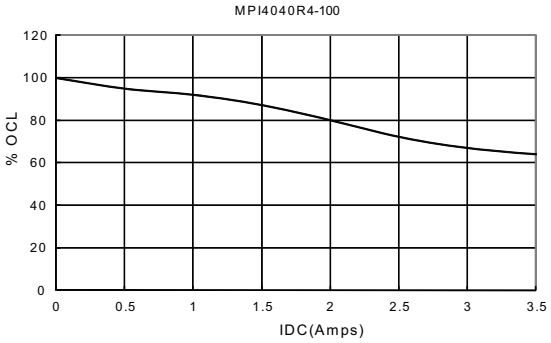
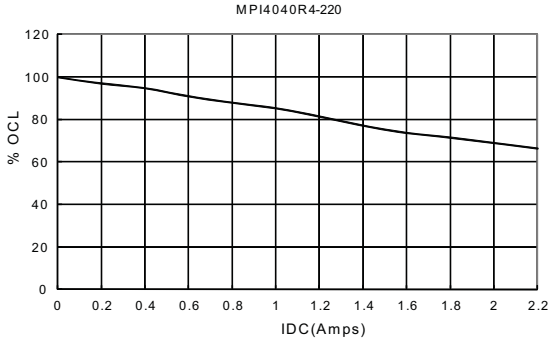


Inductance Characteristics - % of OCL vs. I_{DC} - R4 -- 2.0mm Height







Solder Reflow Profile

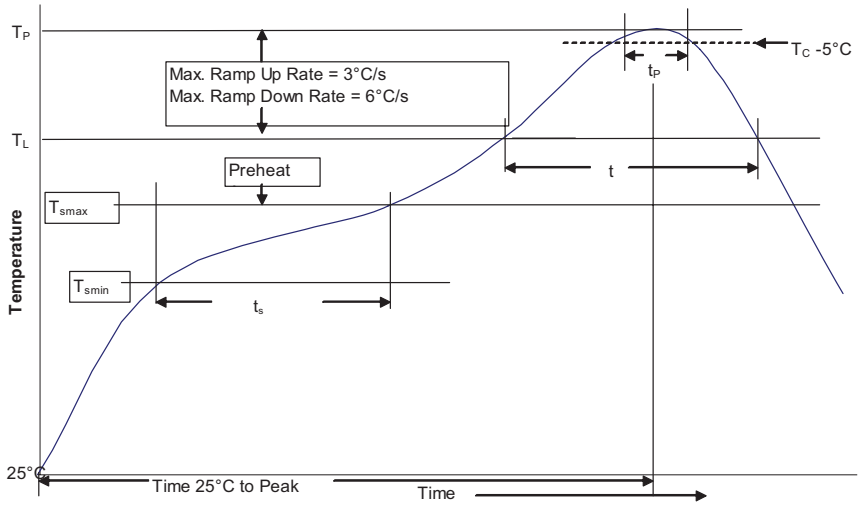


Table 1 - Standard SnPb Solder (T_C)

Package Thickness	Volume mm³ <350	Volume mm³ ≥350
<2.5mm	235°C	220°C
≥2.5mm	220°C	220°C

Table 2 - Lead (Pb) Free Solder (T_C)

Package Thickness	Volume mm³ <350	Volume mm³ 350 - 2000	Volume mm³ >2000
<1.6mm	260°C	260°C	260°C
1.6 – 2.5mm	260°C	250°C	245°C
>2.5mm	250°C	245°C	245°C

Reference JDEC J-STD-020D

Profile Feature		Standard SnPb Solder	Lead (Pb) Free Solder
Preheat and Soak	• Temperature min. (T_{smin})	100°C	150°C
	• Temperature max. (T_{smax})	150°C	200°C
	• Time (T_{smin} to T_{smax}) (t_s)	60-120 Seconds	60-120 Seconds
Average ramp up rate T_{smax} to T_p		3°C/ Second Max.	3°C/ Second Max.
Liquidous temperature (T_L) Time at liquidous (t_L)		183°C 60-150 Seconds	217°C 60-150 Seconds
Peak package body temperature (T_P)*		Table 1	Table 2
Time (t_p)** within 5 °C of the specified classification temperature (T_C)		20 Seconds**	30 Seconds**
Average ramp-down rate (T_p to T_{smax})		6°C/ Second Max.	6°C/ Second Max.
Time 25°C to Peak Temperature		6 Minutes Max.	8 Minutes Max.

* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.

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