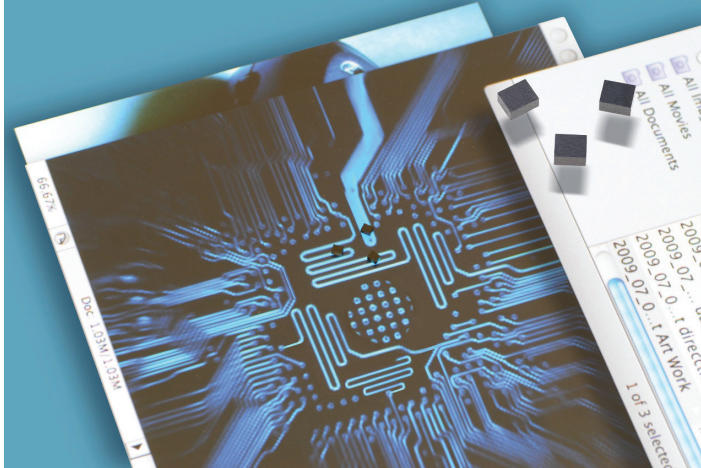


Coiltronics MPI4040

High Current, High Frequency, Miniature Power Inductors



Product description:

- Halogen free, lead free, RoHS compliant
- 125°C maximum total temperature operation
- 4.7 x 4.31 x 1.2, 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

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 (component): -55°C to +125°C
- Operating temperature range: -55°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



The Coiltronics brand of magnetics (formerly of the Bussmann Division of Cooper Industries) is now part of Eaton's Electrical Group, Electronics Division.

Coiltronics is now part of Eaton
Same great products plus even more.



Powering Business Worldwide

Product specifications

Part Number ⁵	OCL ¹ ± 20% (μH)	Part Marking Designator	I _{rms} ² (Amps)	@ 25°C ³ (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

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

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. Irms 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 * DI. Bp-p : (Gauss), K: (K-factor from table), L: (inductance in μH), DI (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.

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
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. Irms 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 * DI. Bp-p : (Gauss), K: (K-factor from table), L: (inductance in μH), DI (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.

Part #	A Max
MP14040R1-xxx-R	1.2
MP14040R2-xxx R	1.5
MP14040R3-xxx-R	1.8
MP14040-R4-xxx-R	2.0

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

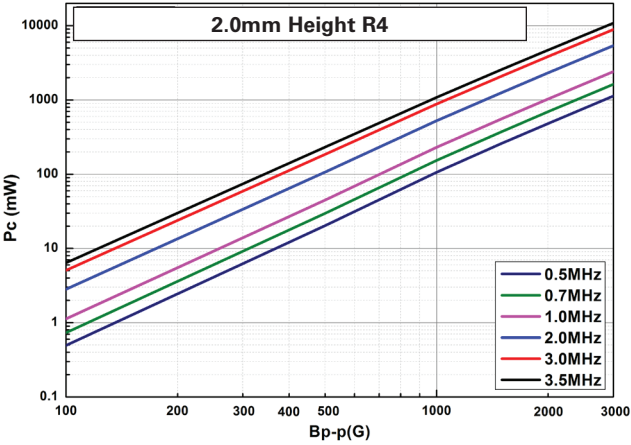
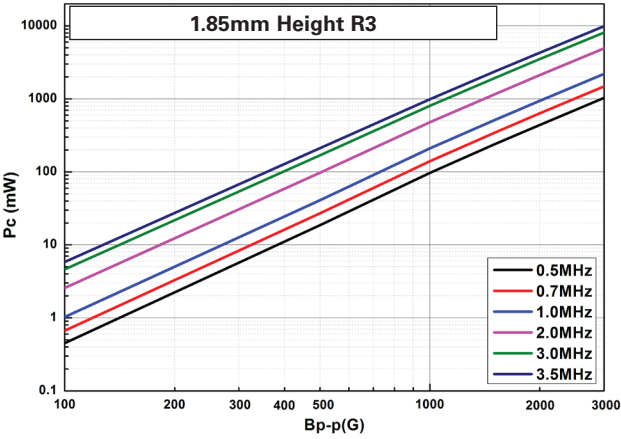
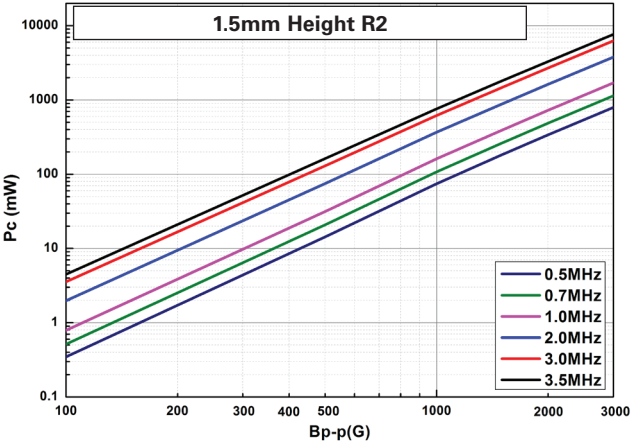
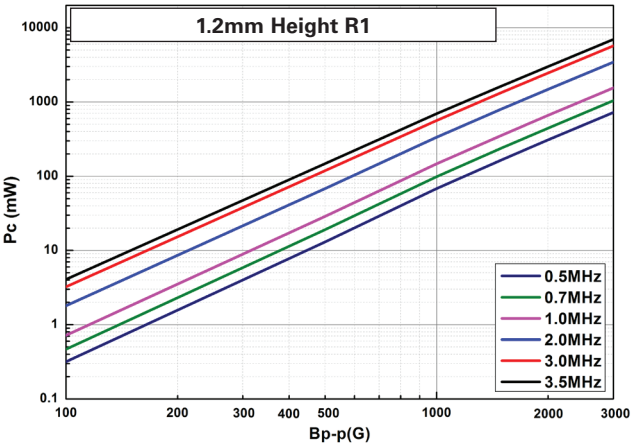
[illegible]

Figure 1 is a line graph showing Temperature Rise ($^{\circ}\text{C}$) on the Y-axis versus Total Loss (W) on the X-axis. The X-axis ranges from 0 to 0.9, and the Y-axis ranges from 0 to 70. Four lines are plotted, representing different thermal resistance scenarios:

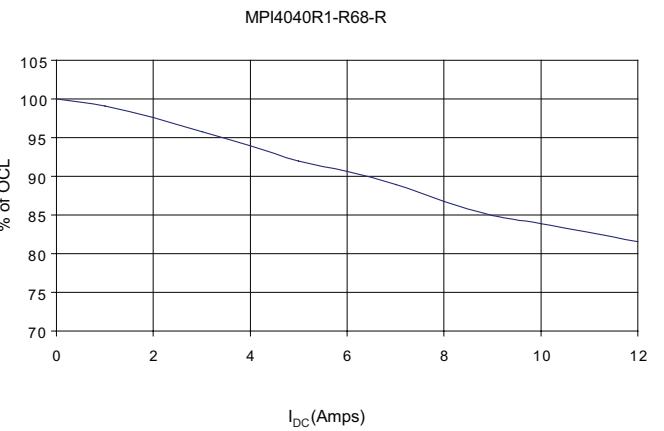
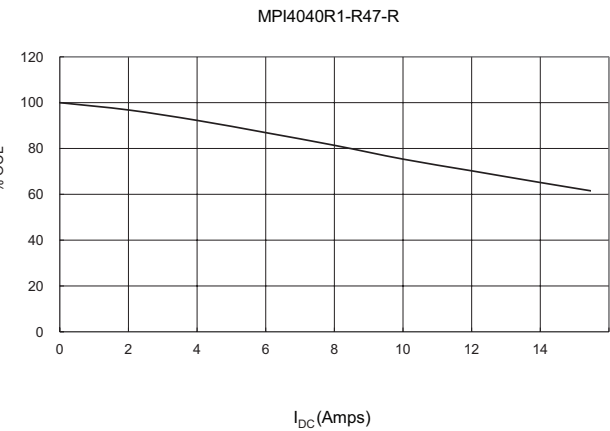
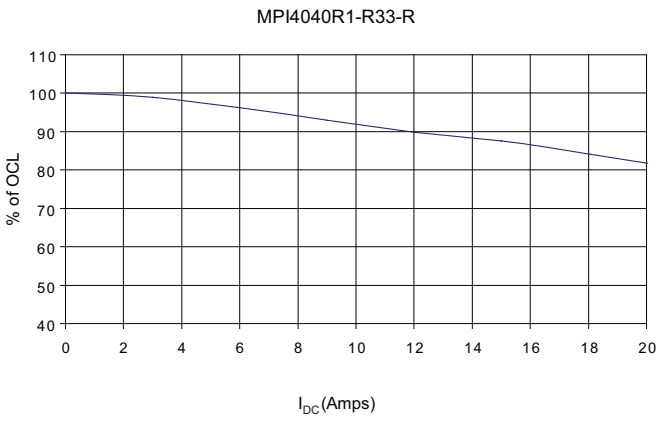
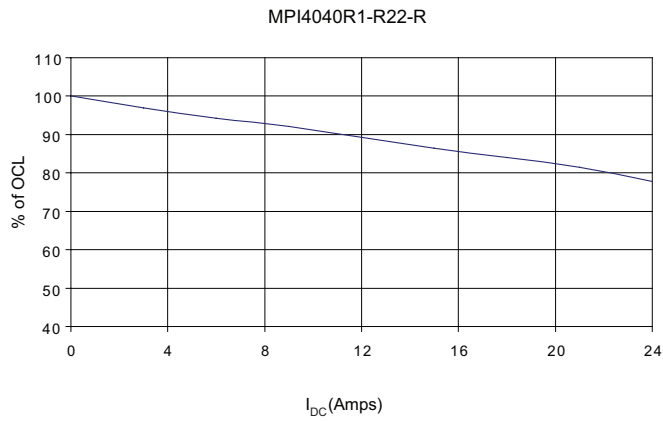
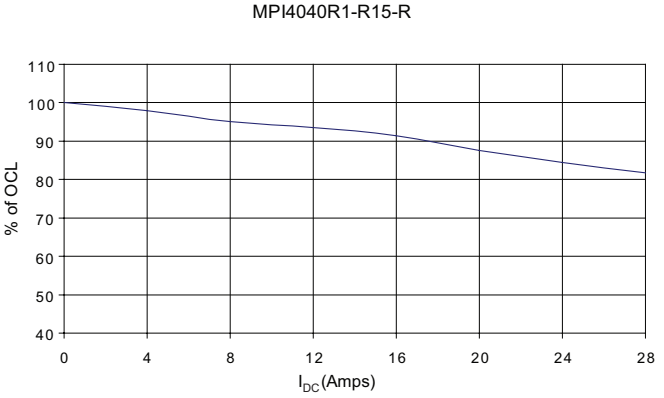
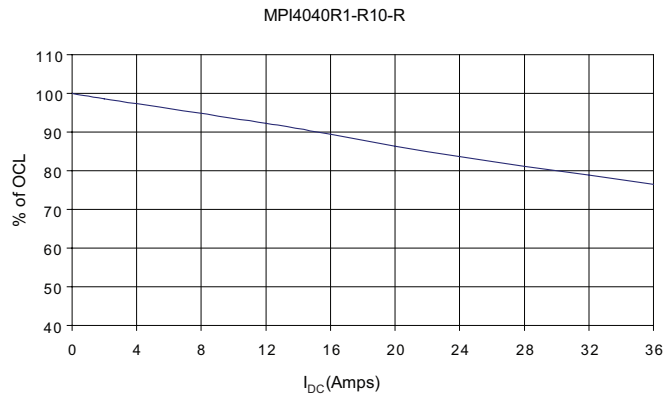
- R1, R4** (Dashed blue line): This line represents the lowest temperature rise for a given total loss, starting at (0,0) and ending at approximately (0.8, 60).
- R2** (Solid black line): This line starts at (0,0) and ends at approximately (0.8, 60), overlapping with R1 and R4.
- R3** (Solid black line): This line represents the highest temperature rise for a given total loss, starting at (0,0) and ending at approximately (0.7, 58).

The graph illustrates that for a given total loss, the temperature rise is highest for R3 and lowest for R1 and R4. The lines R1 and R4 are nearly identical, while R2 is slightly higher than them at higher total loss values.

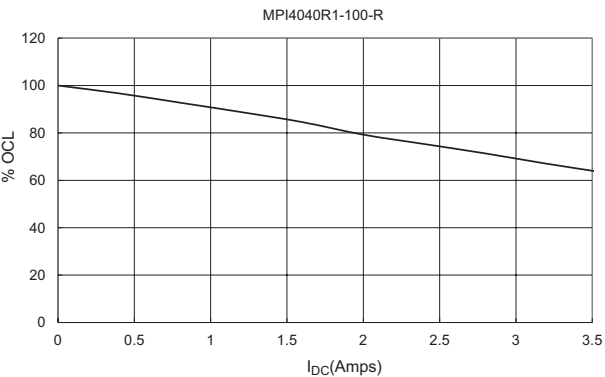
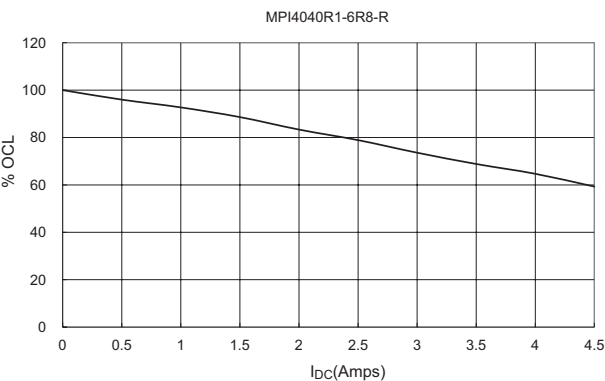
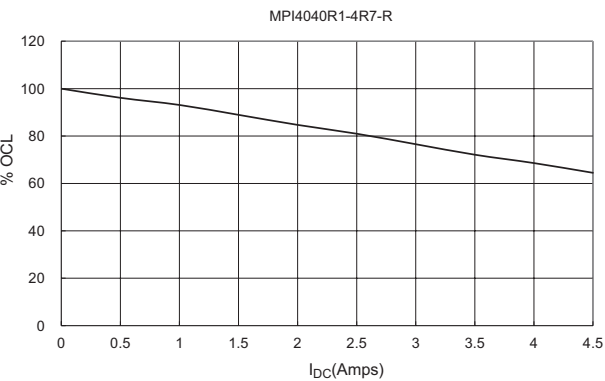
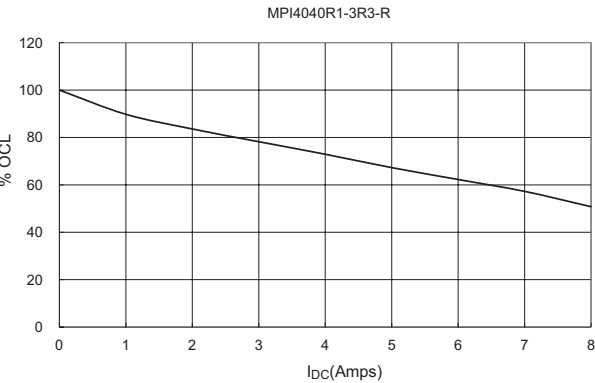
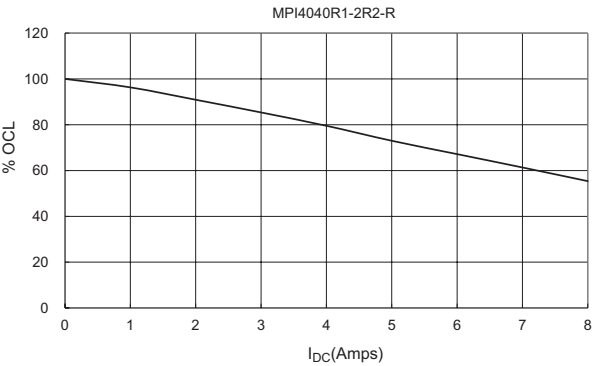
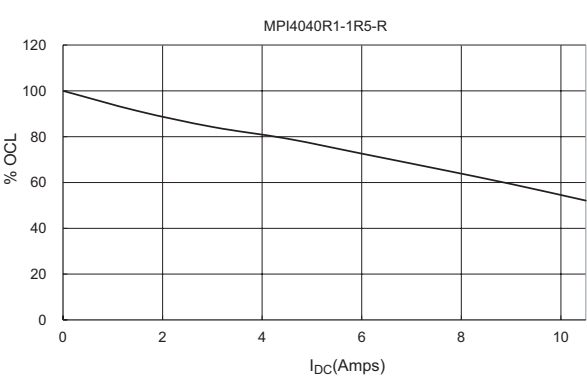
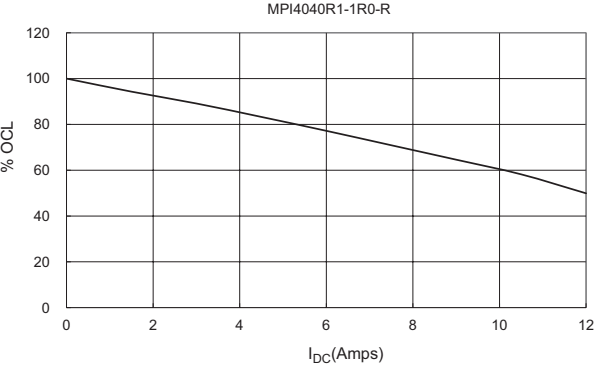
Core loss



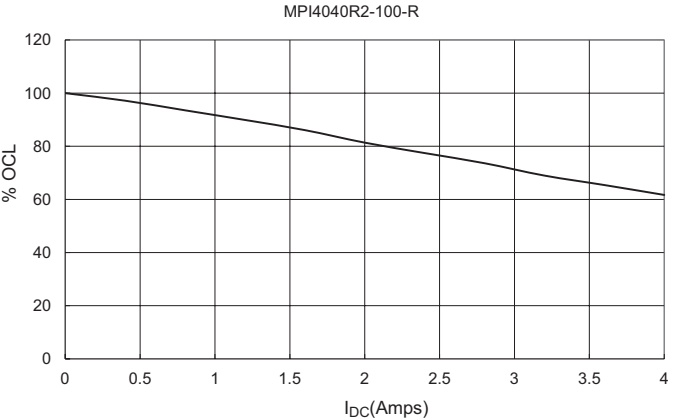
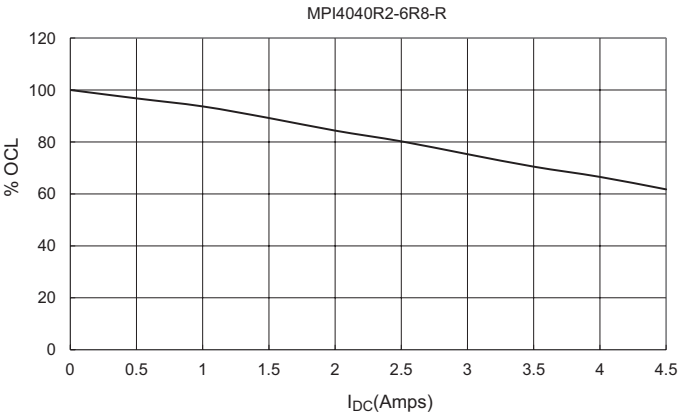
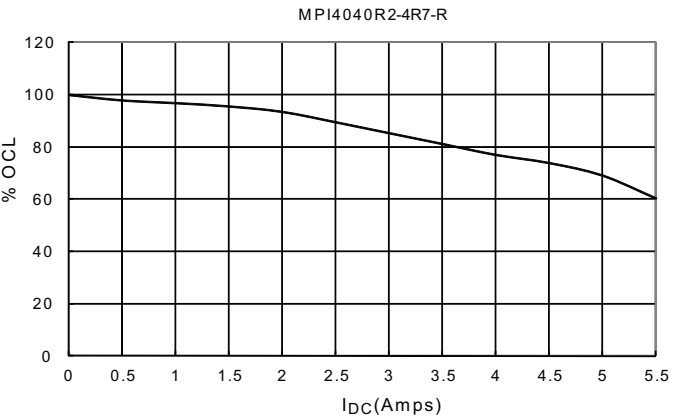
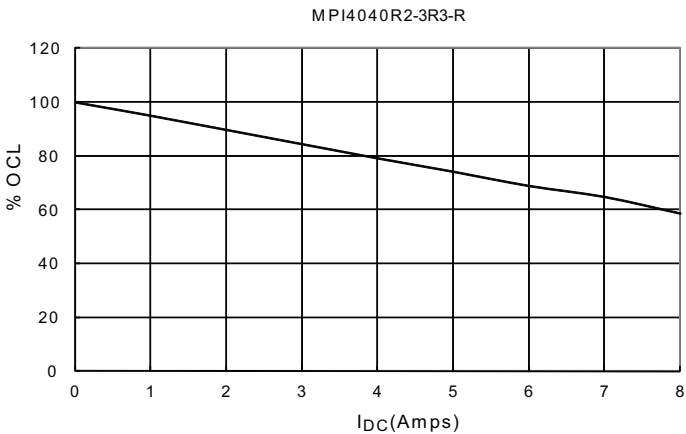
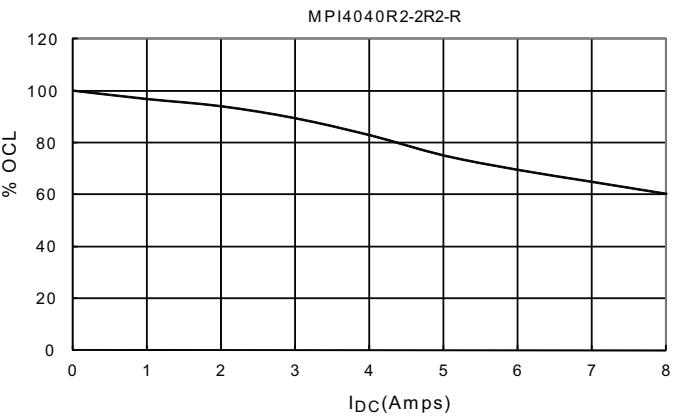
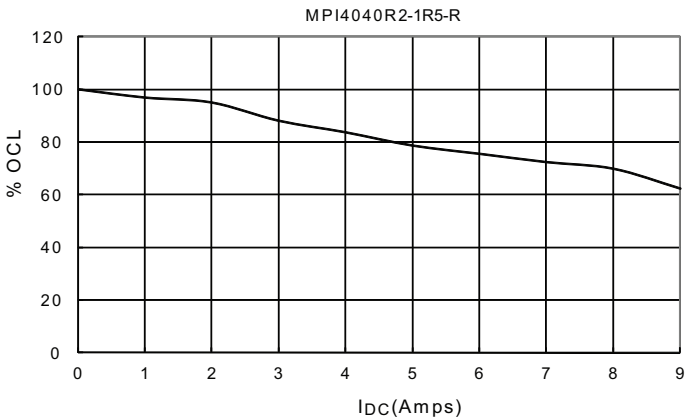
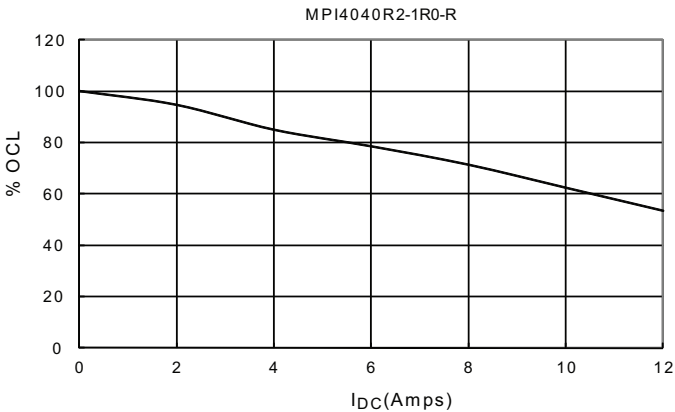
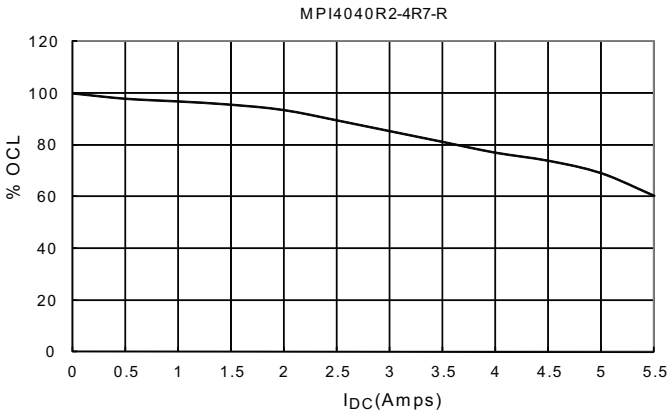
1.2mm Height R1 inductance characteristics — % of OCL vs. I_{DC}



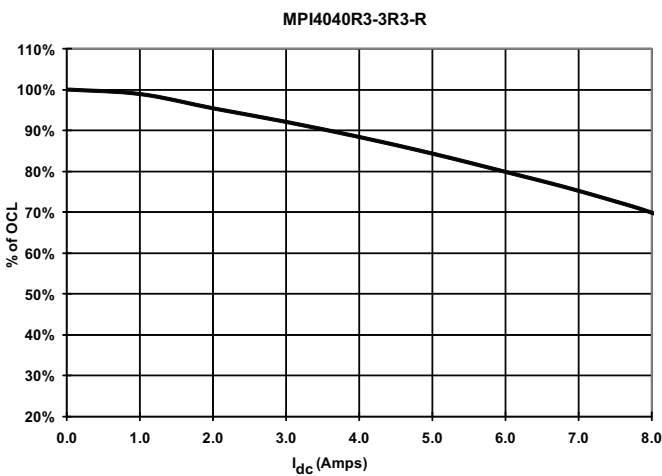
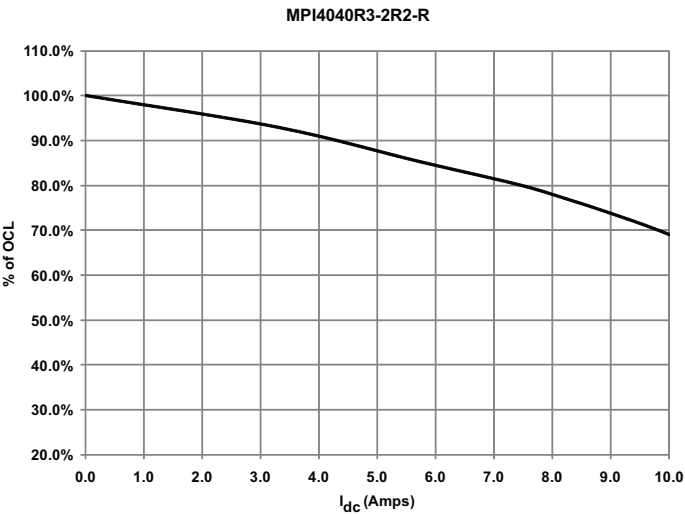
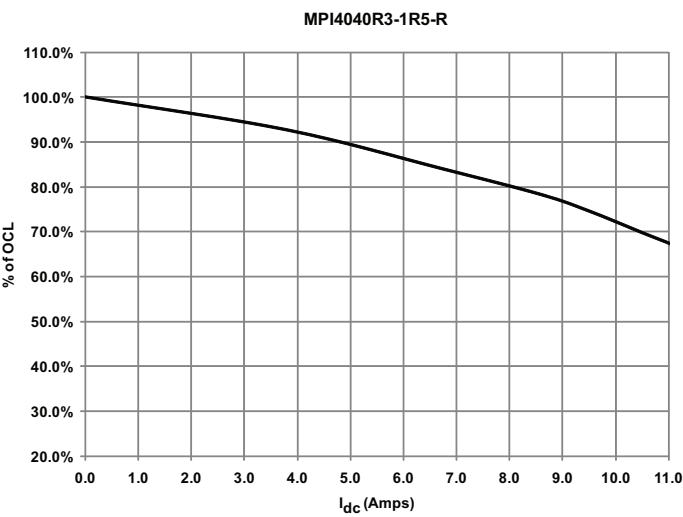
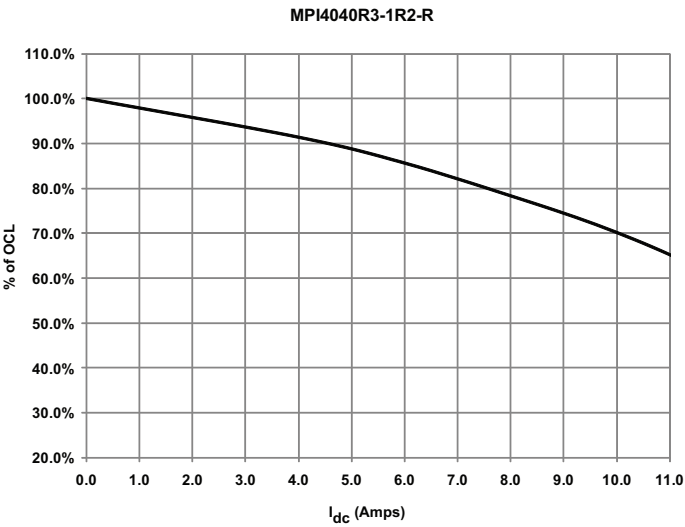
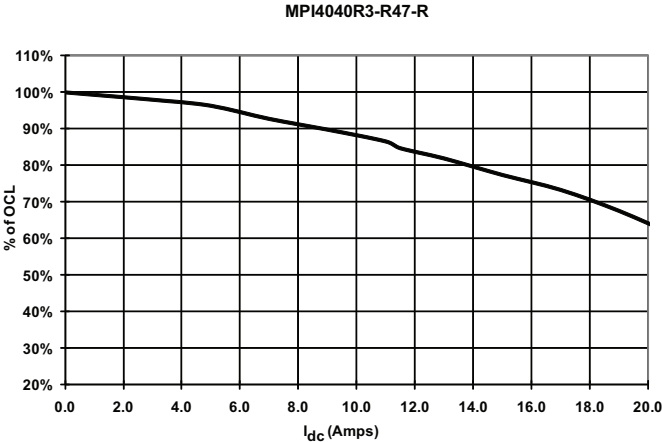
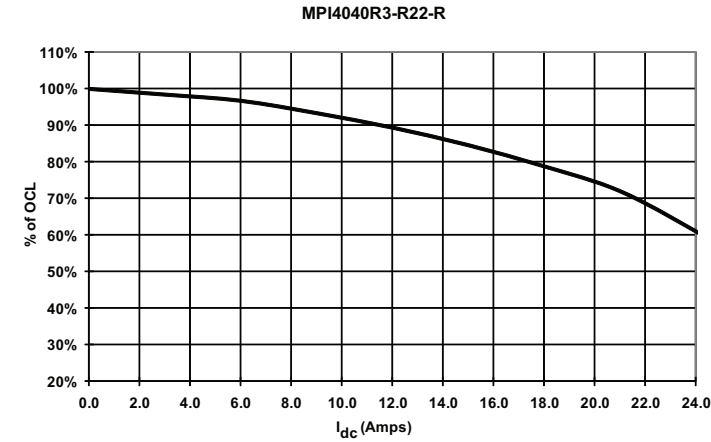
1.2mm Height R1 inductance characteristics — % of OCL vs. I_{DC}



1.5mm Height R2 inductance characteristics — % of OCL vs. I_{DC}

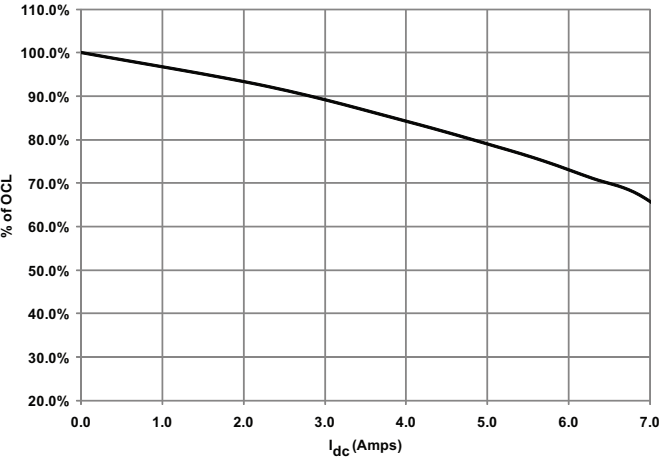


1.85mm Height R3 inductance characteristics — % of OCL vs. I_{DC}

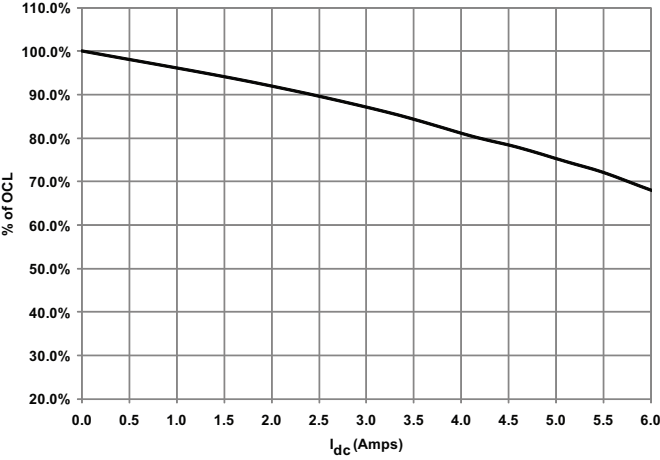


1.85mm Height R3 inductance characteristics — % of OCL vs. I_{DC}

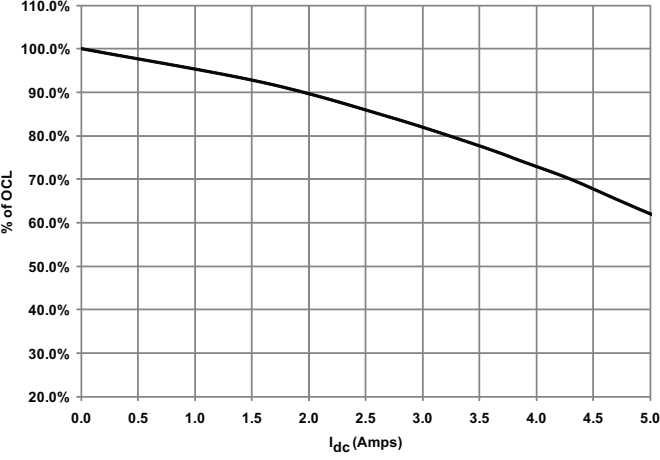
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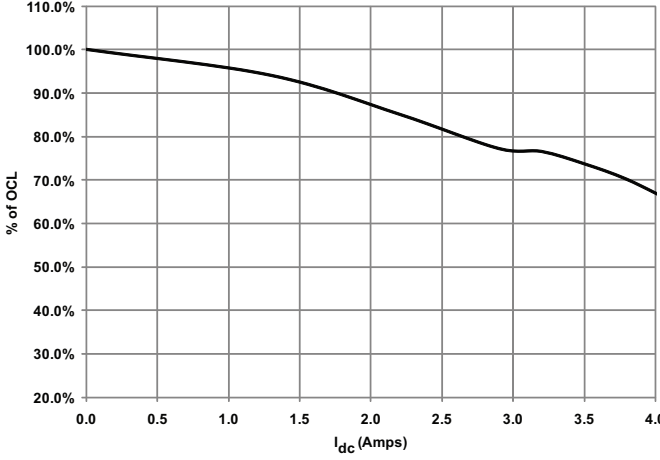
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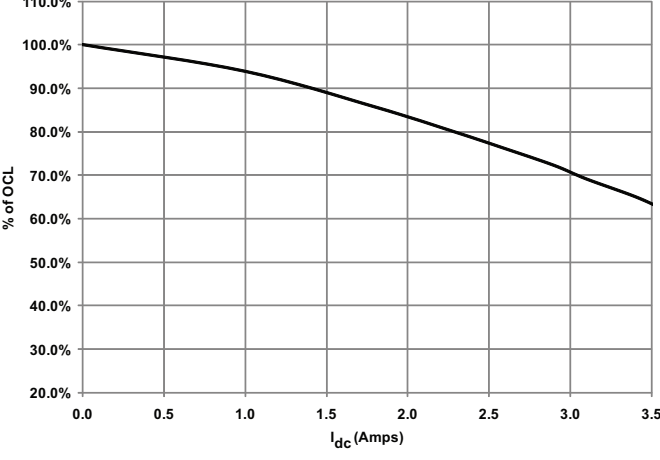
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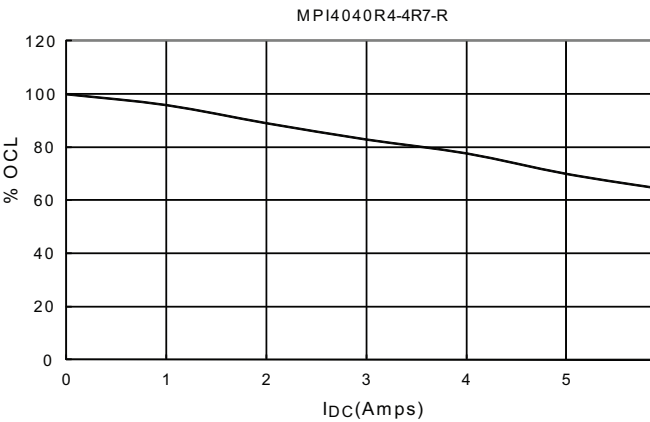
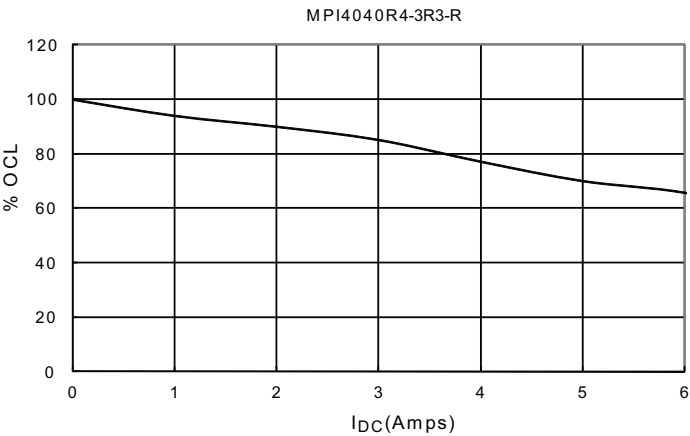
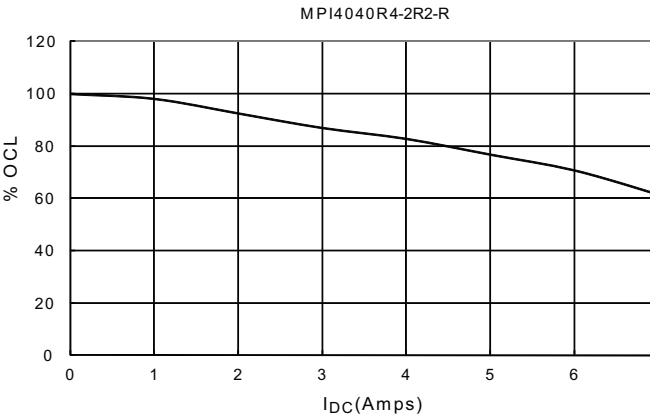
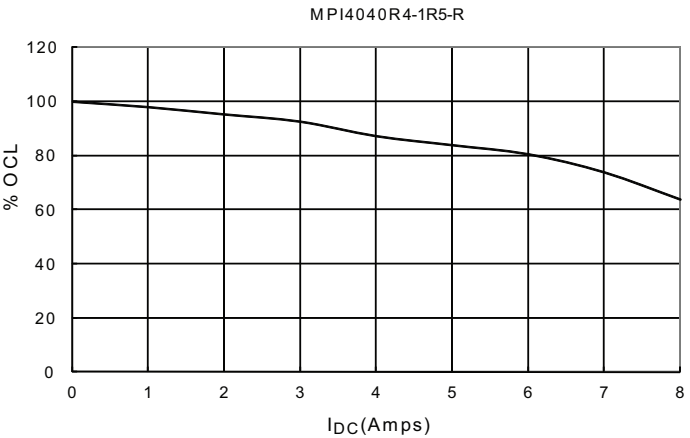
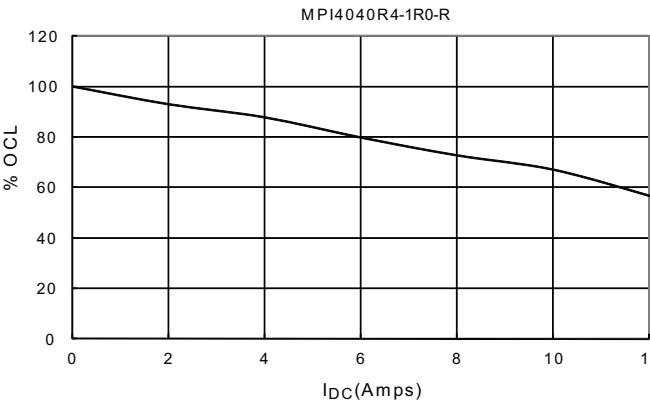
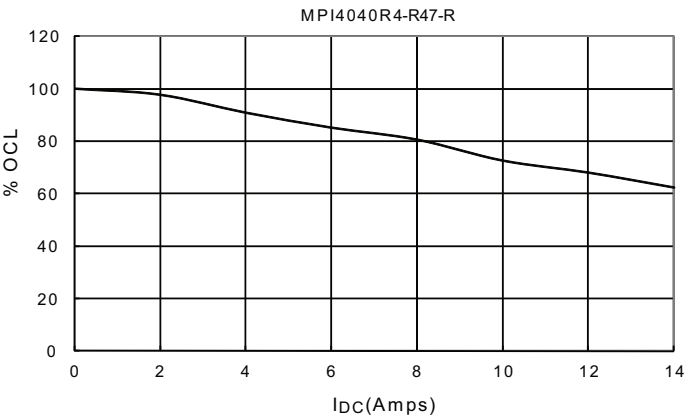
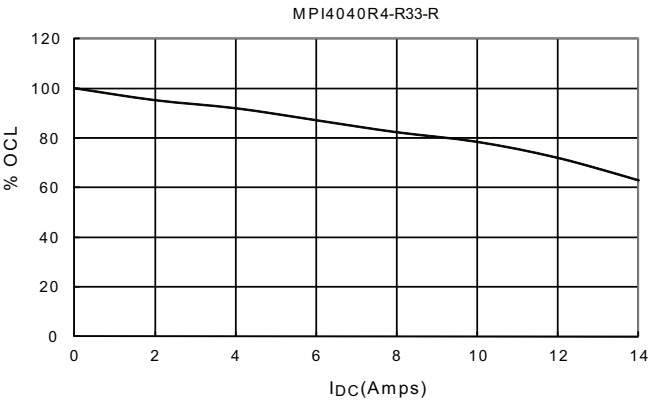
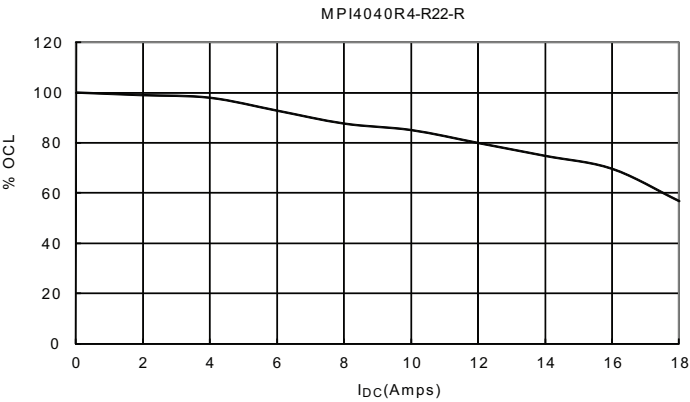
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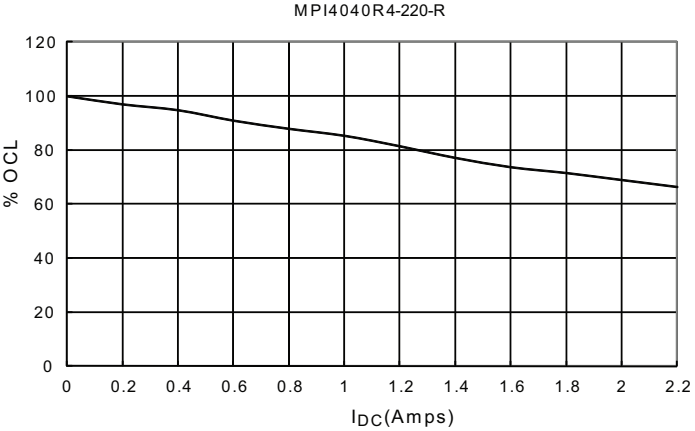
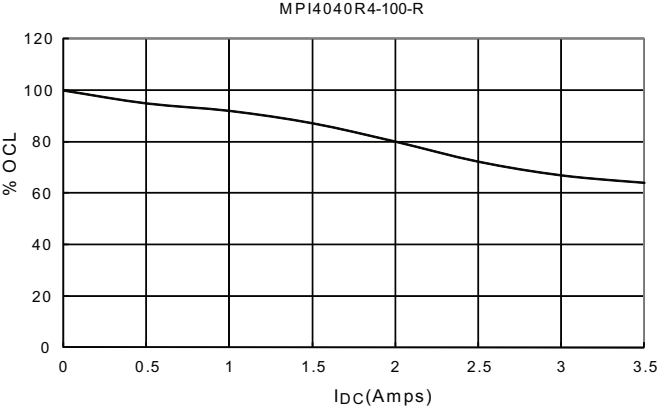
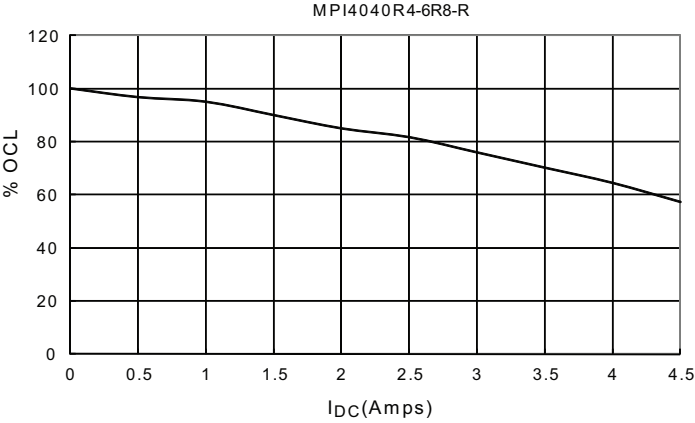
MPI4040R3-220-R



2.0mm Height R4 inductance characteristics — % of OCL vs. I_{DC}



2.0mm Height R4 inductance characteristics — % of OCL vs. I_{DC}



Solder reflow profile

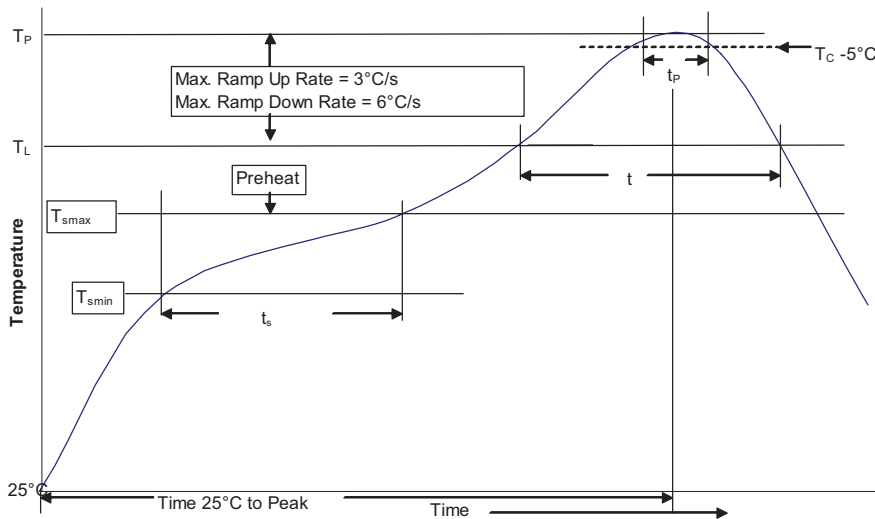


Table 1 - Standard SnPb Solder (T_c)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥ 350
<2.5mm	235°C	220°C
$\geq 2.5\text{mm}$	220°C	220°C

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

Package Thickness	Volume mm^3 <350	Volume mm^3 350 - 2000	Volume mm^3 >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 JEDEC 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)	183°C	217°C
Time at liquidous (t_L)	60-150 Seconds	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.

North America

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