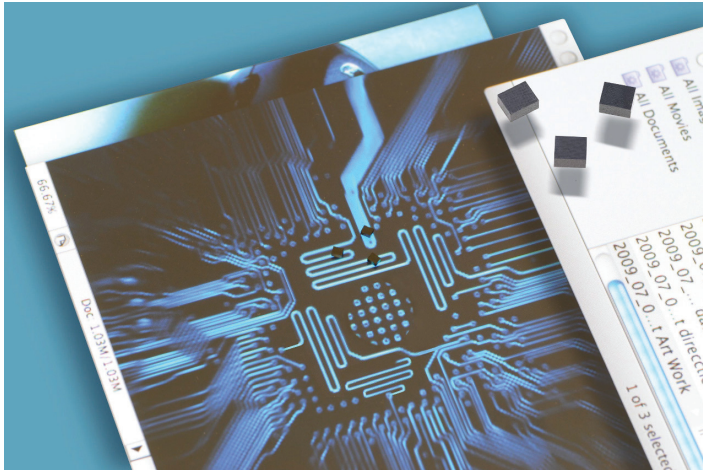


# Coiltronics MPI4040

## High Current, High Frequency, Miniature Power Inductors



### Product description:

- Handles high transient inrush current spikes
- Magnetically shielded
- Frequency range 20kHz to 10MHz
- Inductance range from 0.09µH to 22µH
- Current range from 1.1A to 32.0A
- 4.7 x 4.31 footprint surface mount package in 1.2, 1.5, 1.85 or 2.0mm heights
- Rugged construction
- Halogen free, lead free, RoHS compliant

### 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



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 <sup>5</sup>	OCL <sup>1</sup> ± 20% (µH)	Part Marking Designator	I <sub>rms</sub> <sup>2</sup> (Amps)	@ 25°C <sup>3</sup> (Amps)	DCR (mΩ) ± 20% @ 20°C	K-factor <sup>4</sup>
<b>R1 -- 1.2mm Height</b>						
MPI4040R1-R10-R	0.09	A	8.00	32.0 <sup>†</sup>	8.50	1401
MPI4040R1-R15-R	0.15	B	7.00	26.0 <sup>†</sup>	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 <sup>††</sup>	6.8	L	1.50	3.20	250	344
MPI4040R1-100-R <sup>††</sup>	10	M	1.20	2.80	370	276
<b>R2 -- 1.5mm Height</b>						
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 <sup>††</sup>	10.0	H	1.50	3.10	240	271

1 Open Circuit Inductance (OCL) Test Parameters: 100kHz, 0.10V<sub>rms</sub>, 0.0A<sub>dc</sub>

2 I<sub>rms</sub>: 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<sub>sat</sub>: Peak current for approximately 30% rolloff at +25°C.

4 K-factor: Used to determine B<sub>p-p</sub> for core loss (see graph). B<sub>p-p</sub> = K \* L \* DI. B<sub>p-p</sub>: (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 <sup>5</sup>	OCL <sup>1</sup> ± 20% (µH)	Part Marking Designator	I <sub>rms</sub> <sup>2</sup> (Amps)	I <sub>sat</sub> <sup>3</sup> @ 25°C (Amps)	DCR (mΩ) ± 20% @ 20°C	K-factor <sup>4</sup>
<b>R3 -- 1.85mm Height</b>						
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
<b>R4 -- 2.0mm Height</b>						
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<sub>rms</sub>, 0.0A<sub>dc</sub>

2 I<sub>rms</sub>: 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<sub>sat</sub>: Peak current for approximately 30% rolloff at +25°C.

4 K-factor: Used to determine B<sub>p-p</sub> for core loss (see graph). B<sub>p-p</sub> = K \* L \* DI. B<sub>p-p</sub> (Gauss), K: (K-factor from table), L: (inductance in µH), DI (peak-to-peak ripple current in amps).

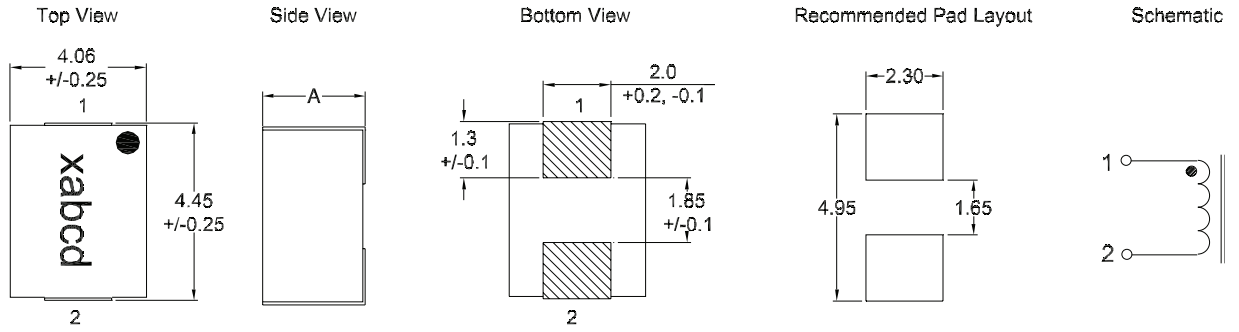
5 Part Number Definition: MPI4040RX-XXX-R

- 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.

**Dimensions - mm**

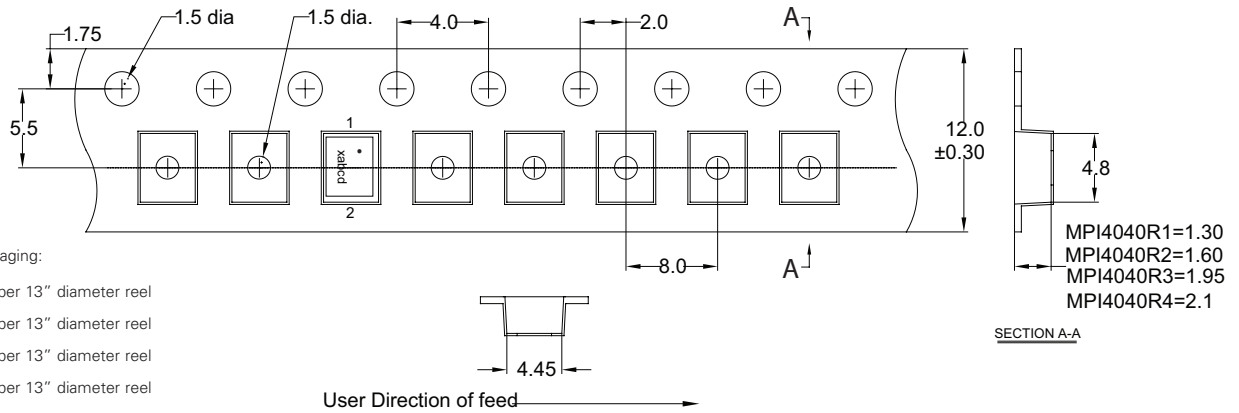


Part #	A Max
MPI4040R1-xxx-R	1.2
MPI4040R2-xxx-R	1.5
MPI4040R3-xxx-R	1.8
MPI4040R4-xxx-R	2.0

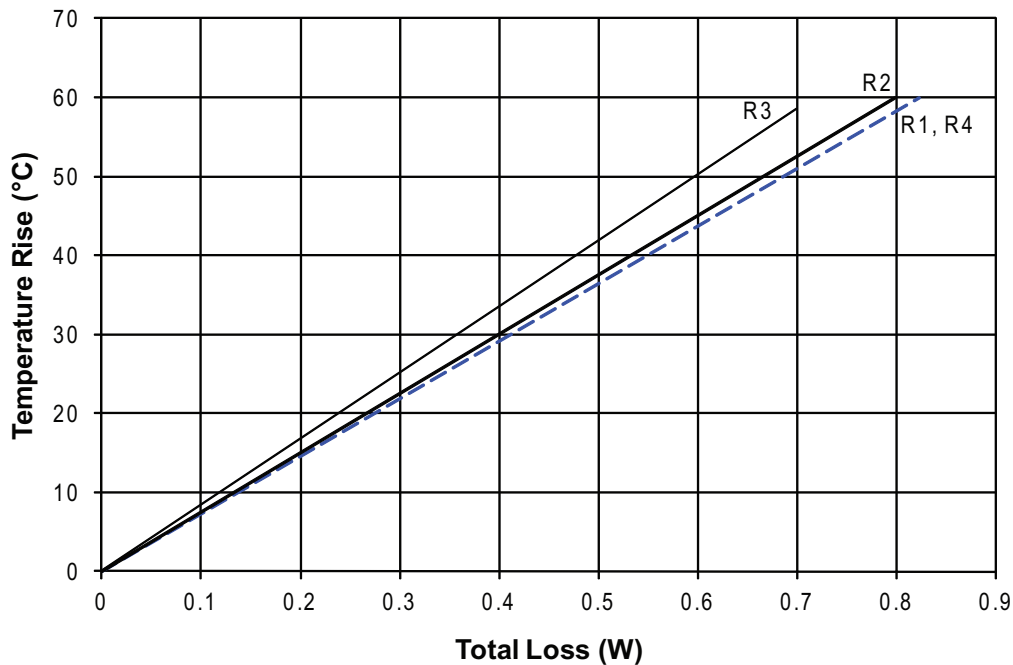
Part Marking : xabcd  
 x = height: 1 = R1 (1.2mm), 2 = R2 (1.5mm), 3 = R3 (1.85mm), 4 = R4 (2.0mm)  
 a = inductance value per the "Part Marking Designator" letter code in table above  
 b = Bi-weekly date code  
 c = Last digit of year manufactured  
 d = Revision level

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

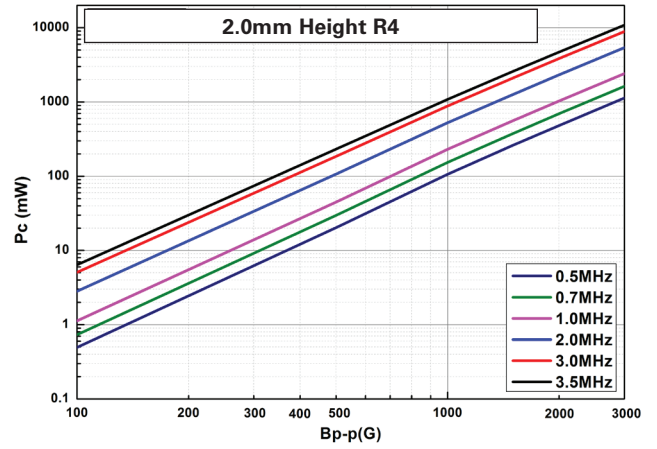
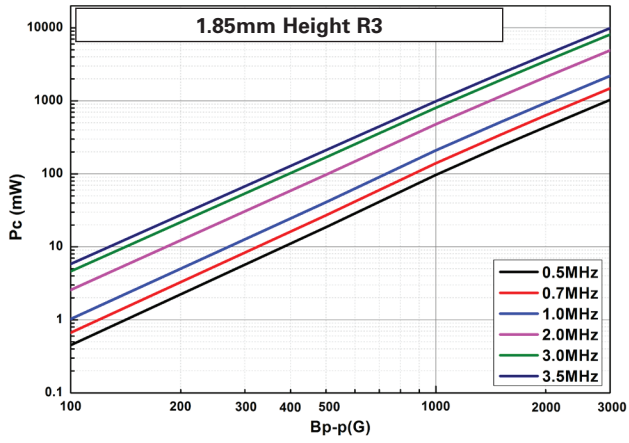
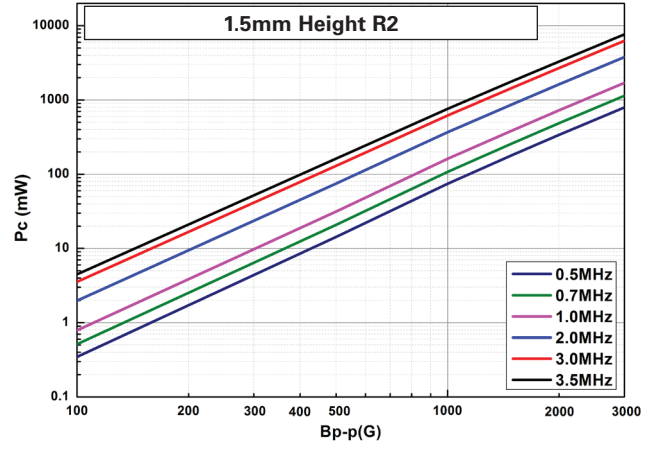
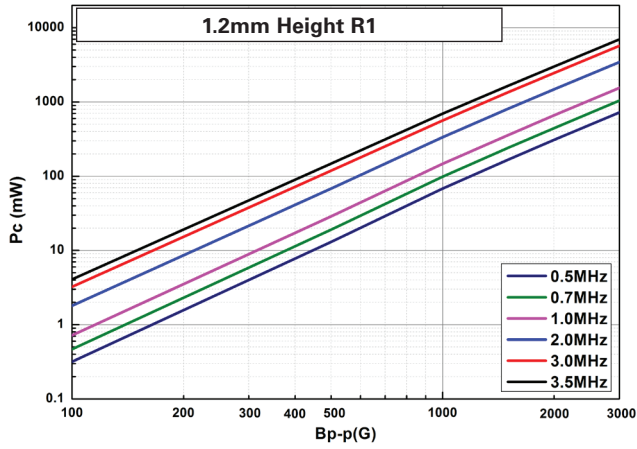
**Packaging information - mm**



**Temperature rise vs. total loss**

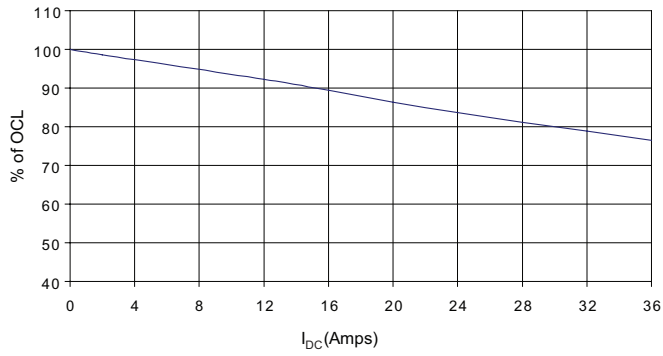


Core loss

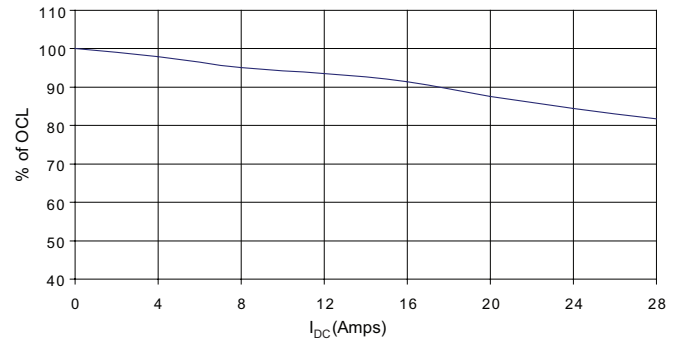


1.2mm Height R1 inductance characteristics — % of OCL vs.  $I_{DC}$

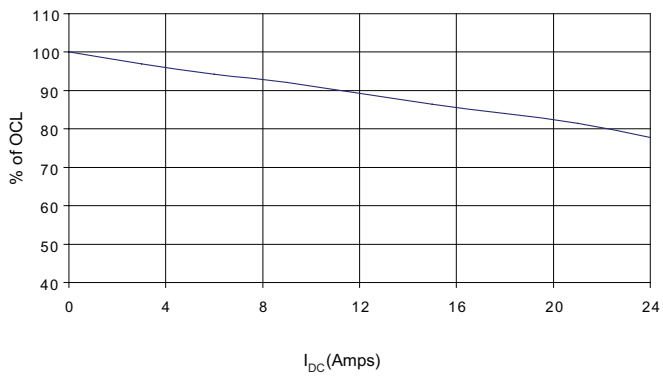
MPI4040R1-R10-R



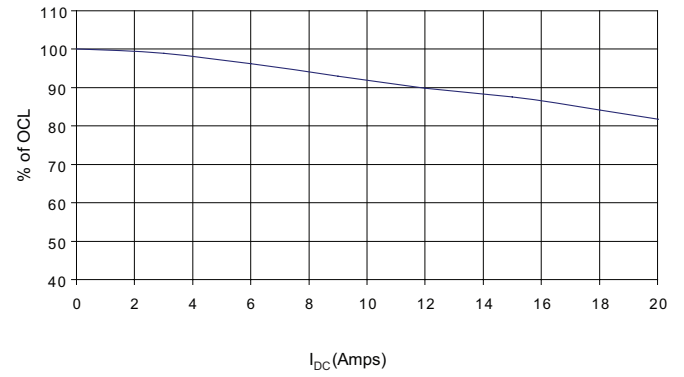
MPI4040R1-R15-R



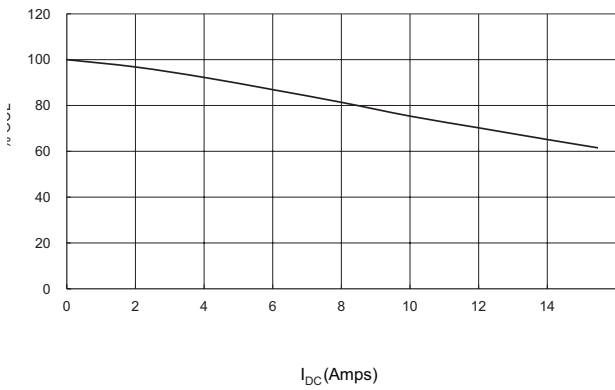
MPI4040R1-R22-R



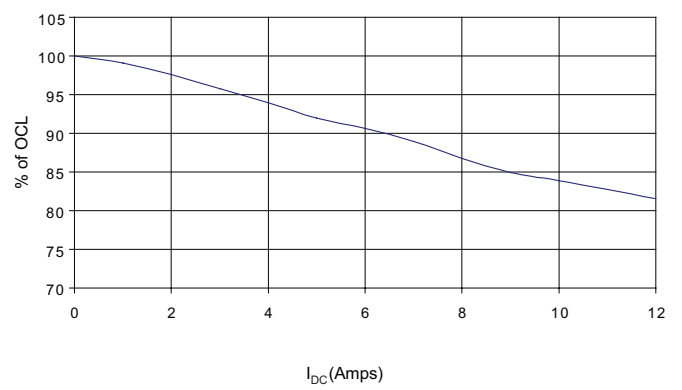
MPI4040R1-R33-R



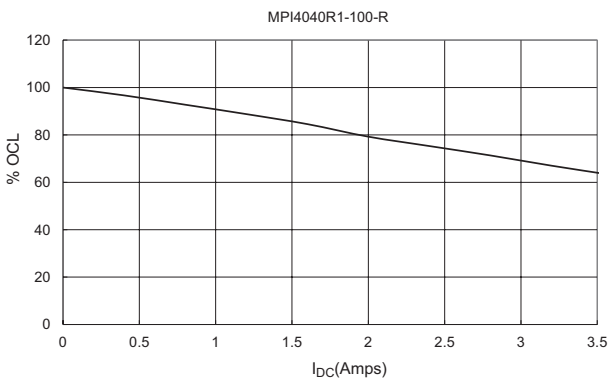
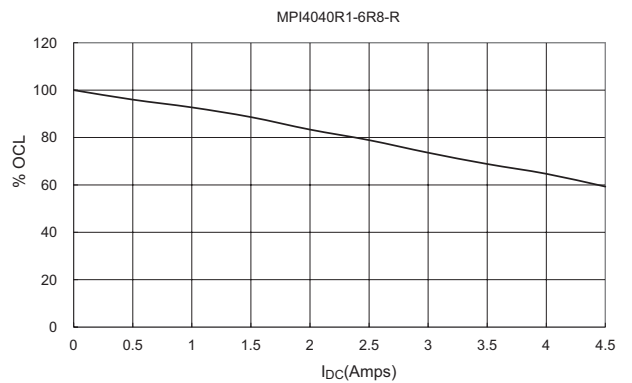
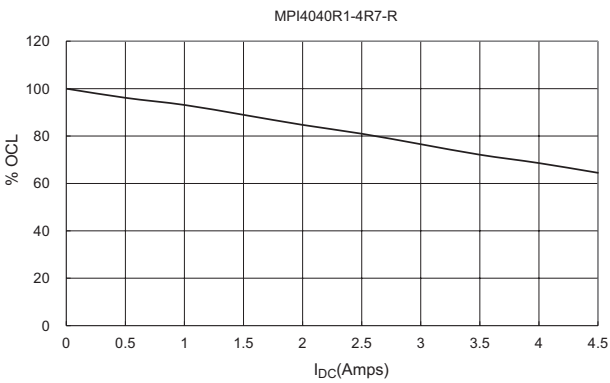
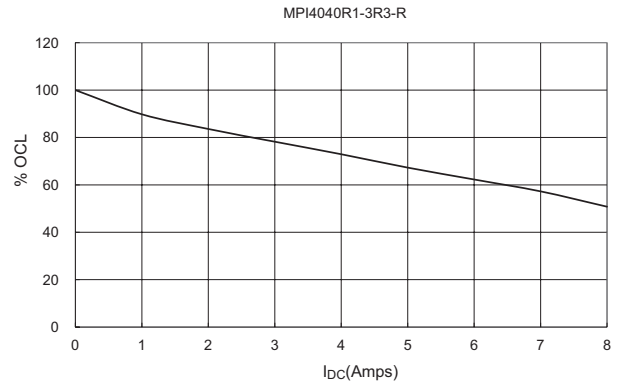
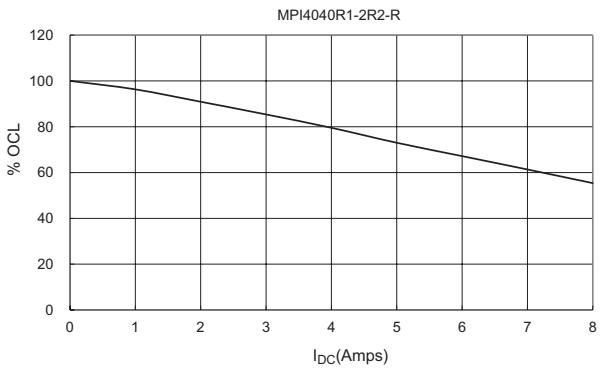
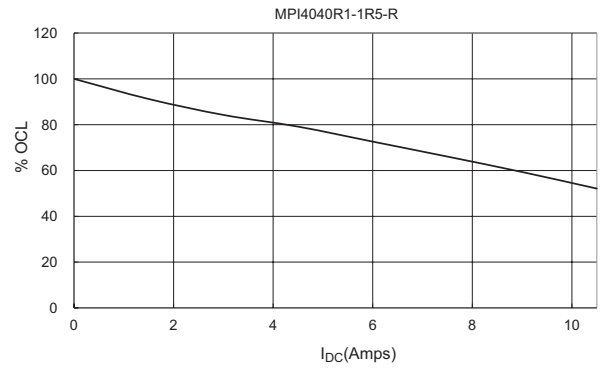
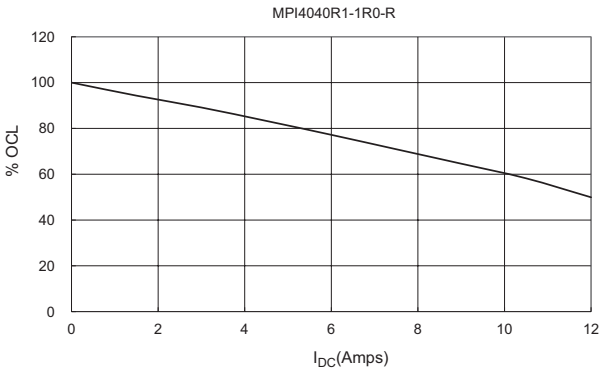
MPI4040R1-R47-R



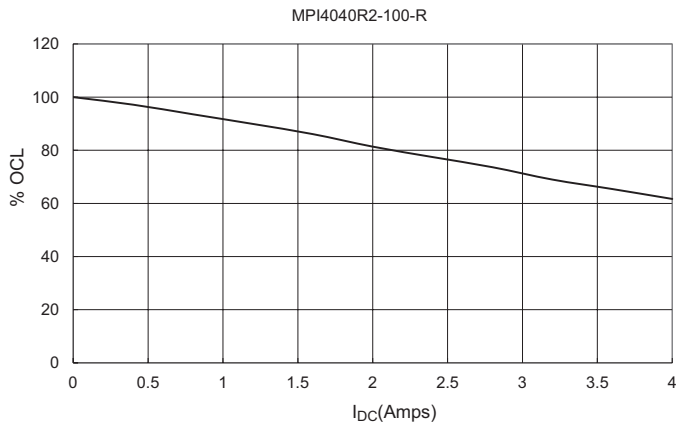
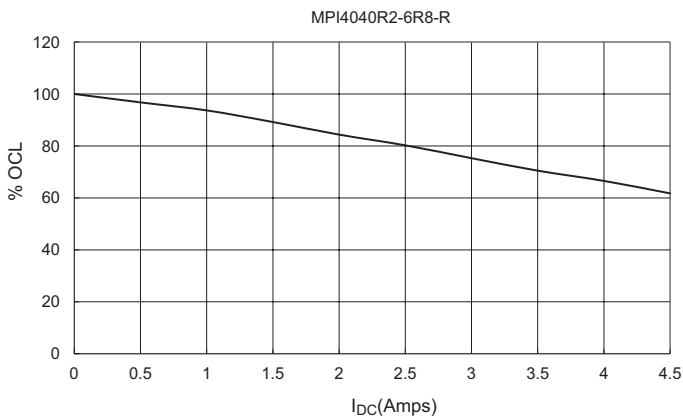
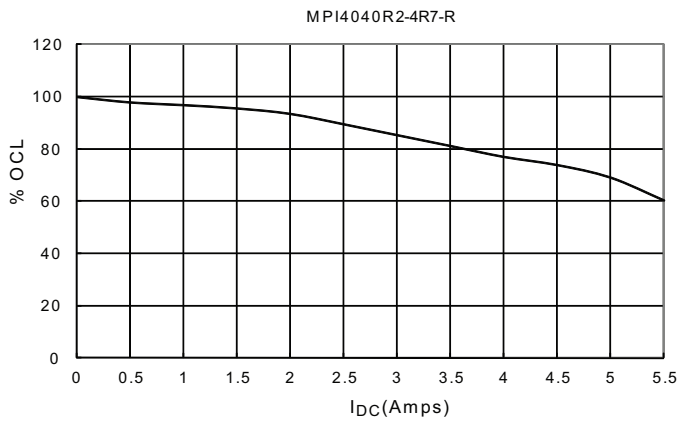
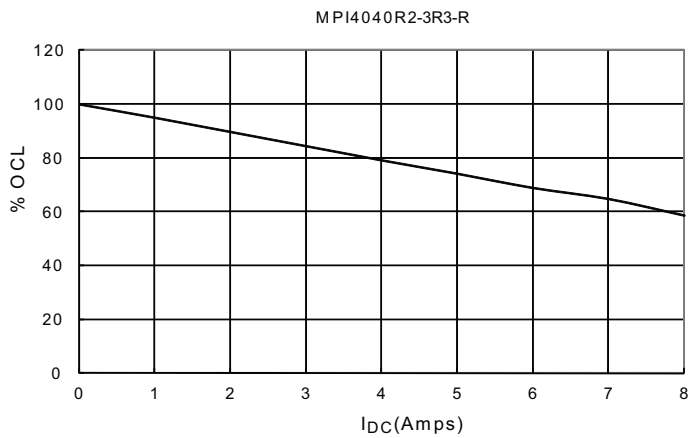
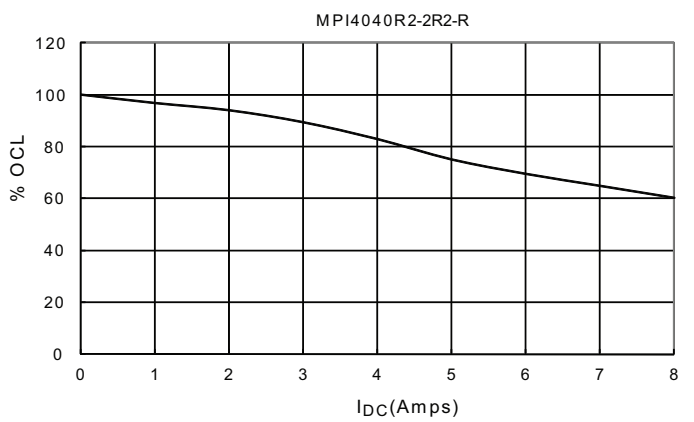
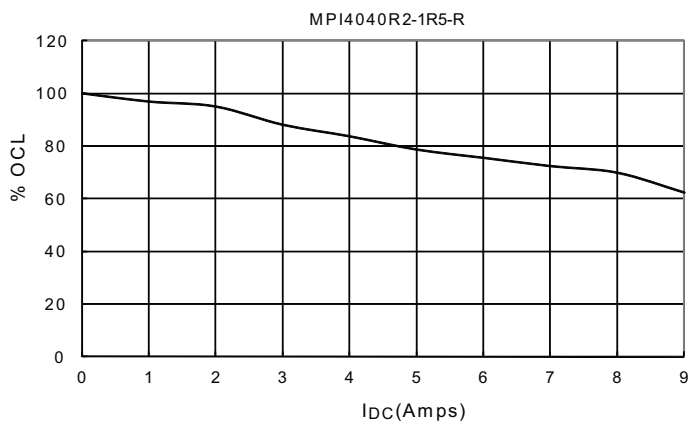
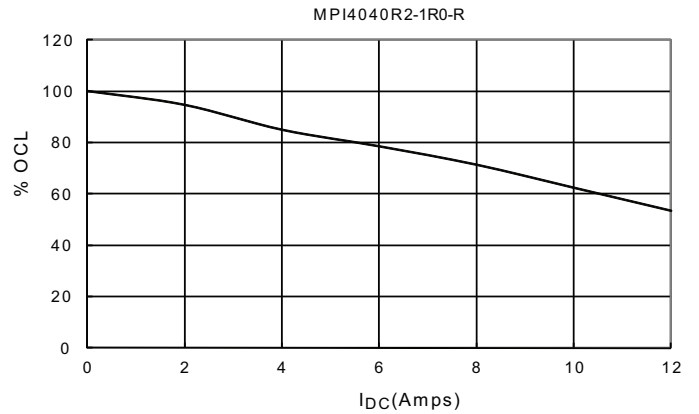
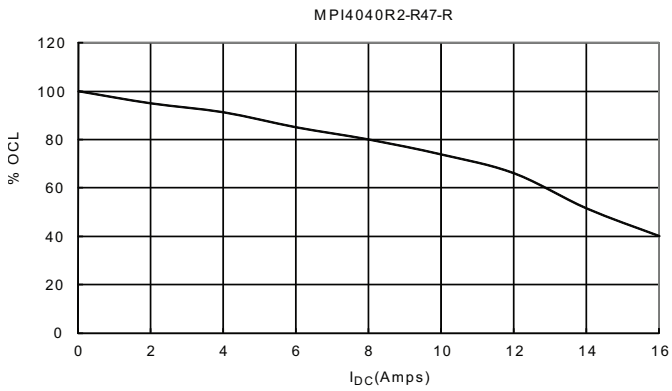
MPI4040R1-R68-R



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



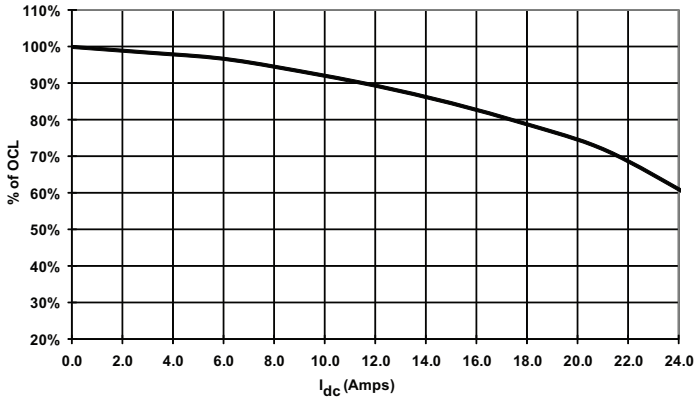
**1.5mm Height R2 inductance characteristics — % of OCL vs.  $I_{DC}$**



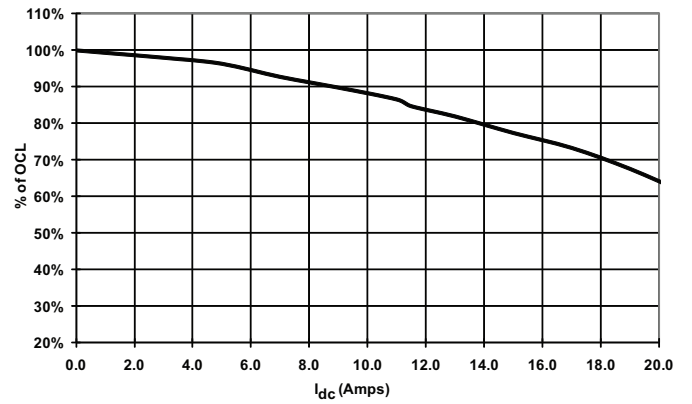


1.85mm Height R3 inductance characteristics — % of OCL vs.  $I_{DC}$

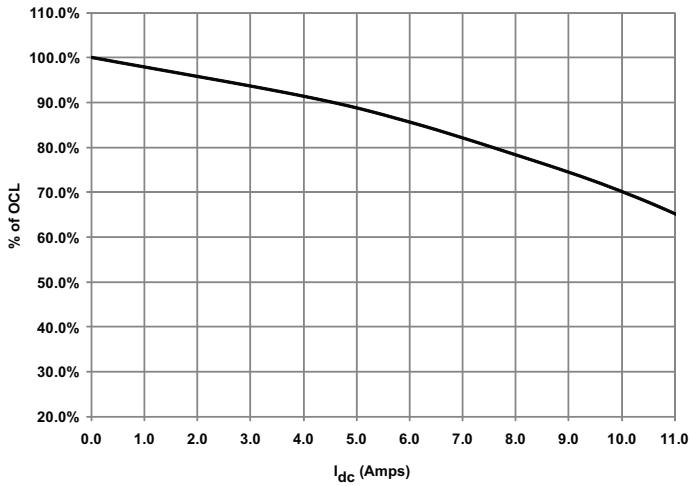
MPI4040R3-R22-R



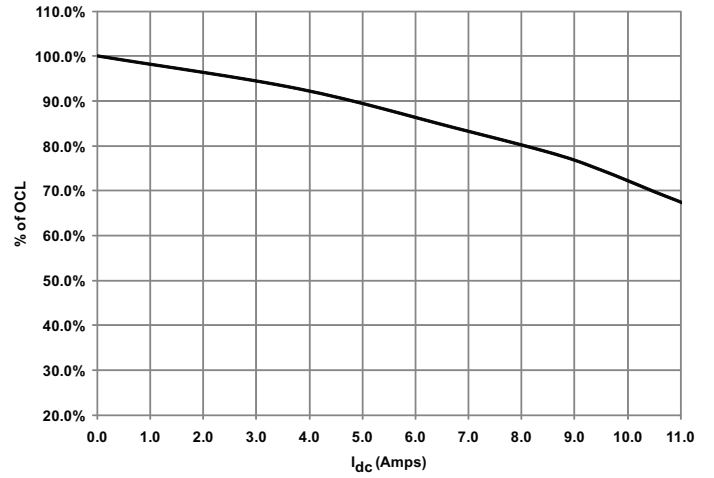
MPI4040R3-R47-R



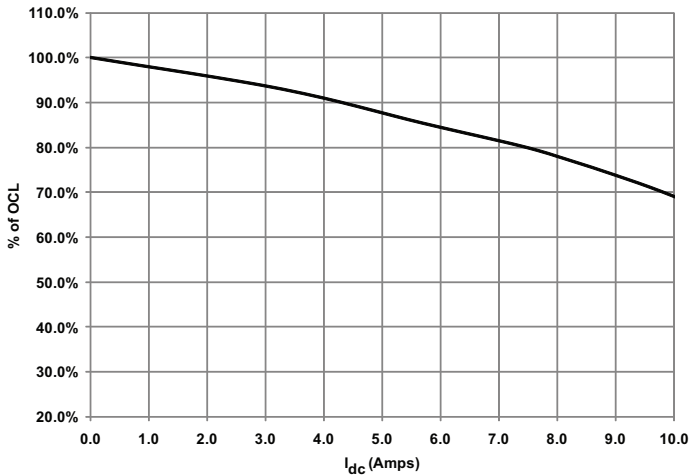
MPI4040R3-1R2-R



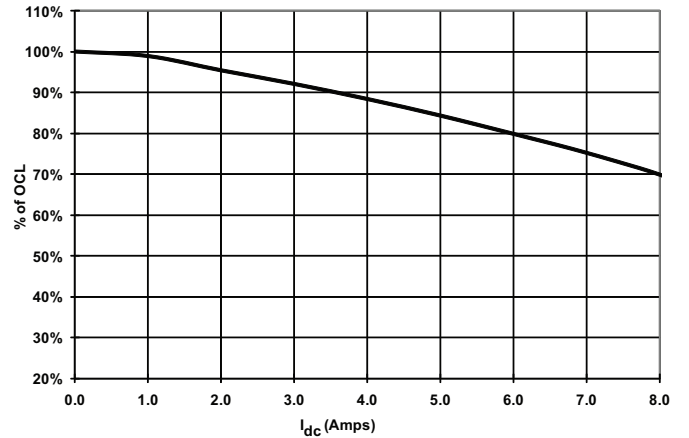
MPI4040R3-1R5-R



MPI4040R3-2R2-R

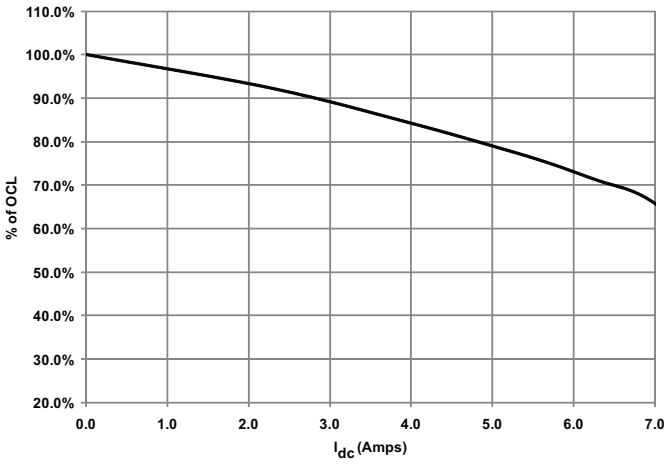


MPI4040R3-3R3-R

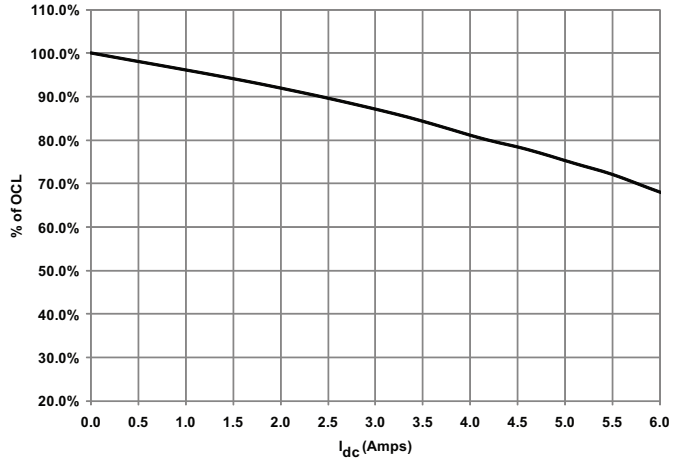


1.85mm Height R3 inductance characteristics — % of OCL vs.  $I_{DC}$

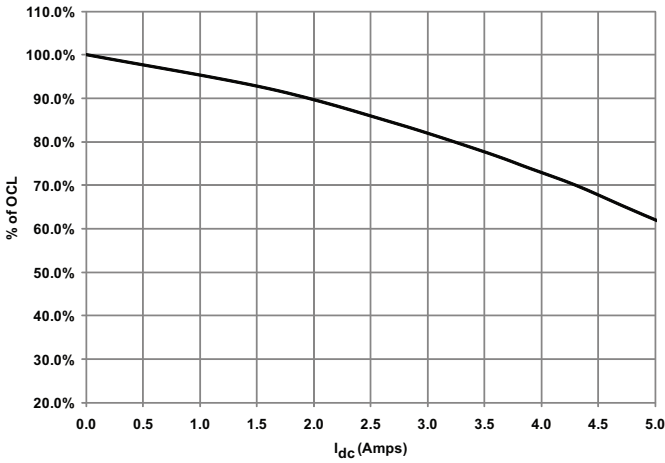
MPI4040R3-4R7-R



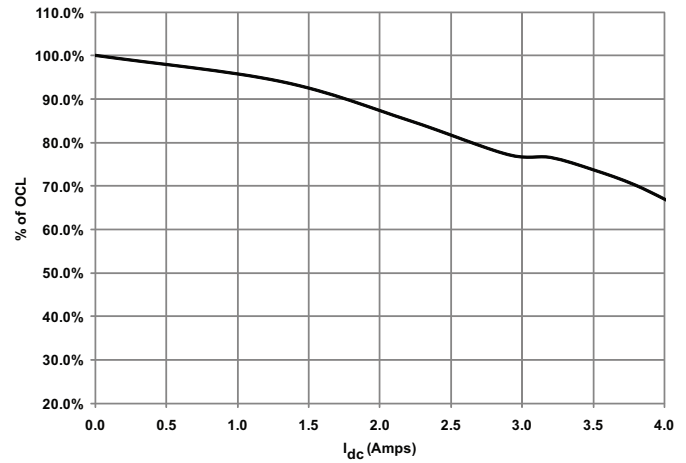
MPI4040R3-6R8-R



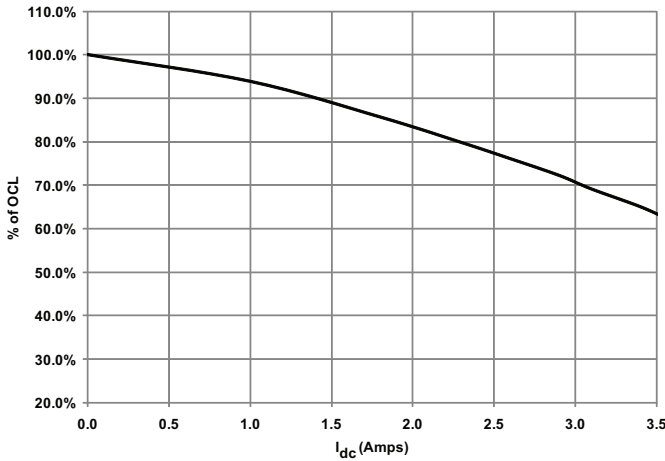
MPI4040R3-100-R



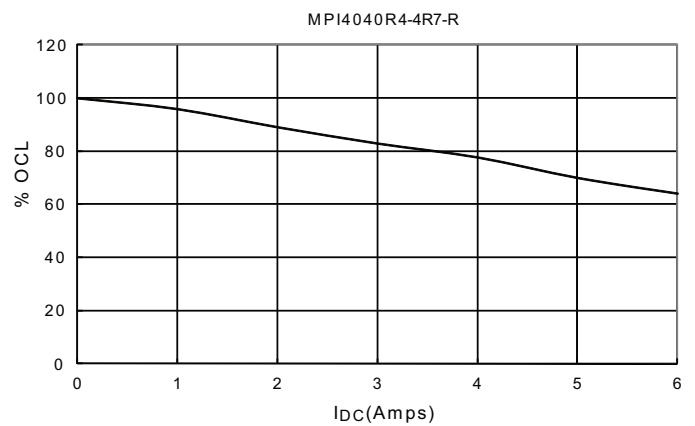
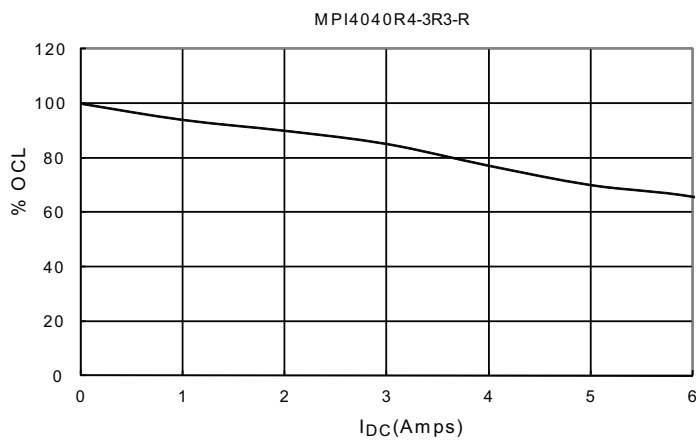
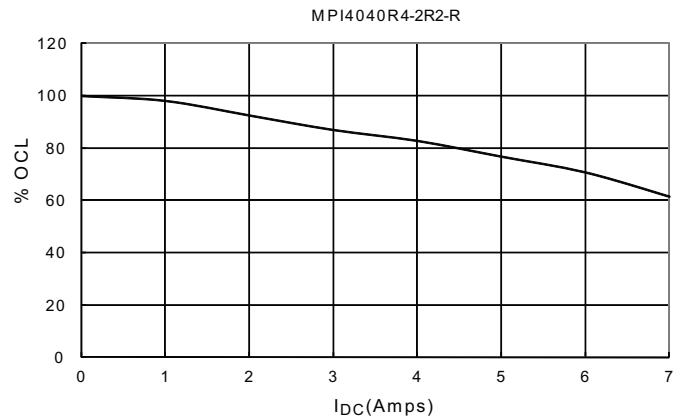
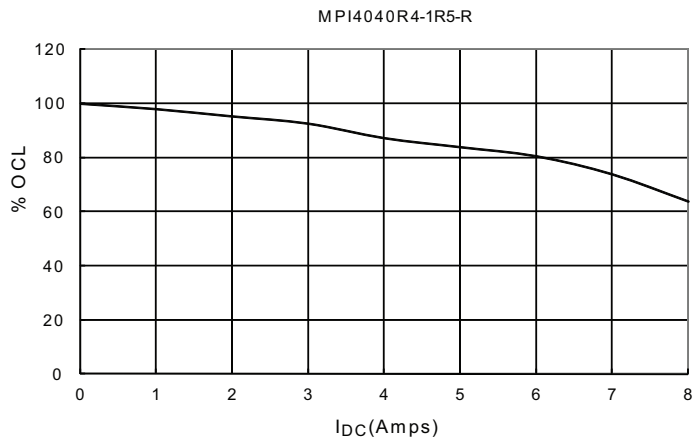
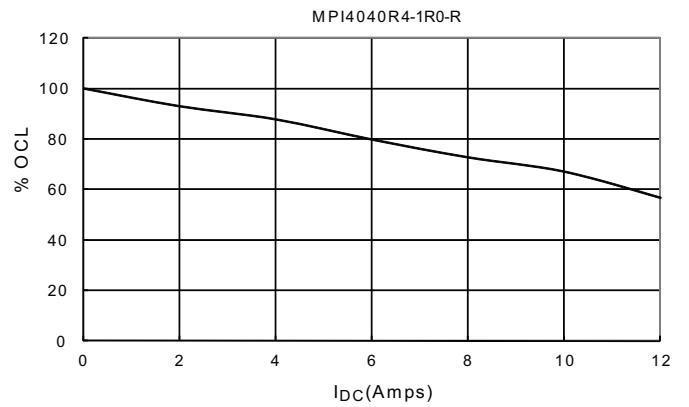
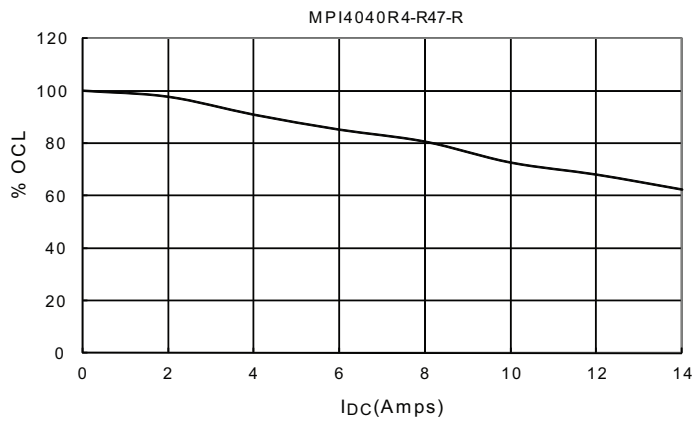
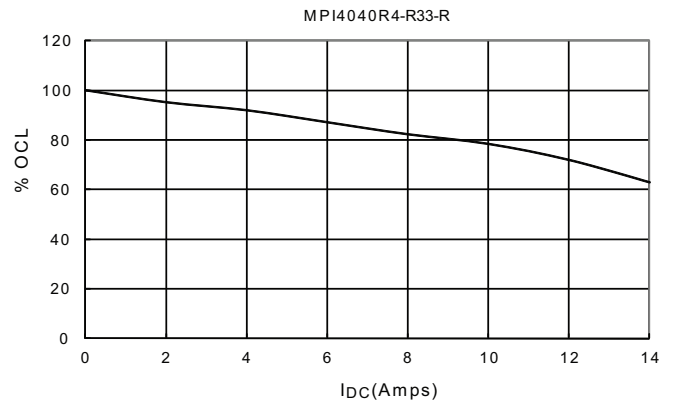
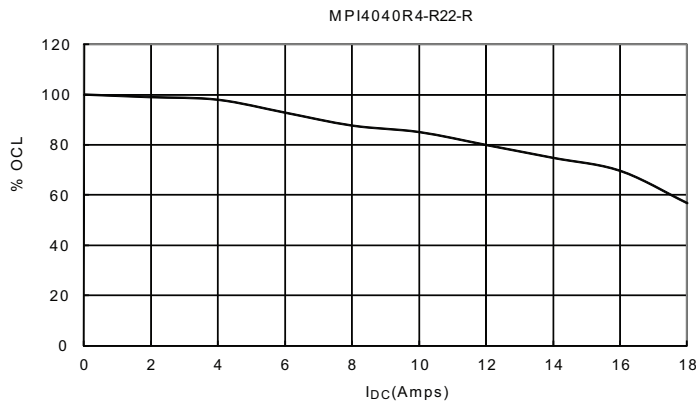
MPI4040R3-150-R



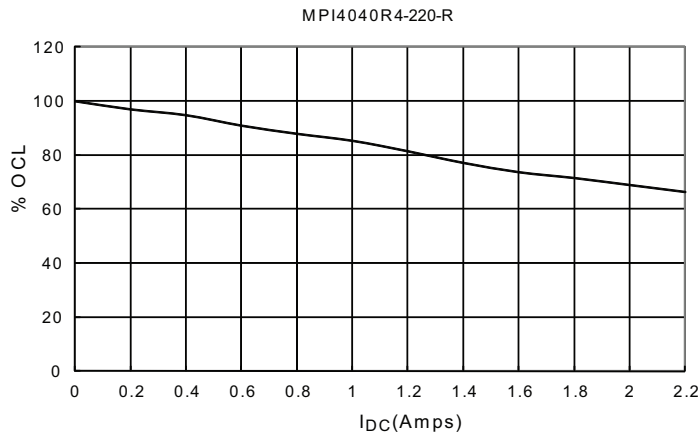
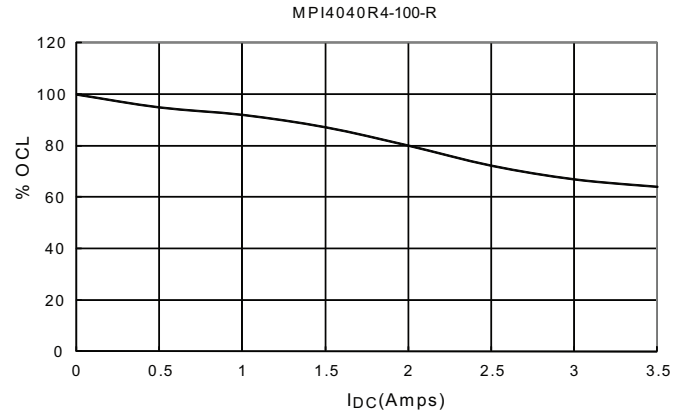
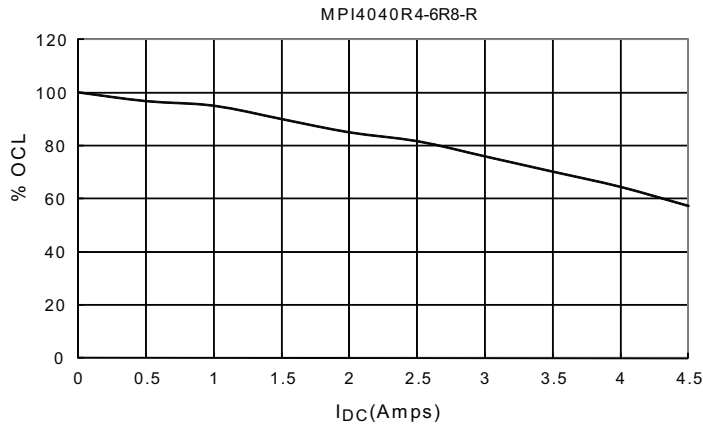
MPI4040R3-220-R



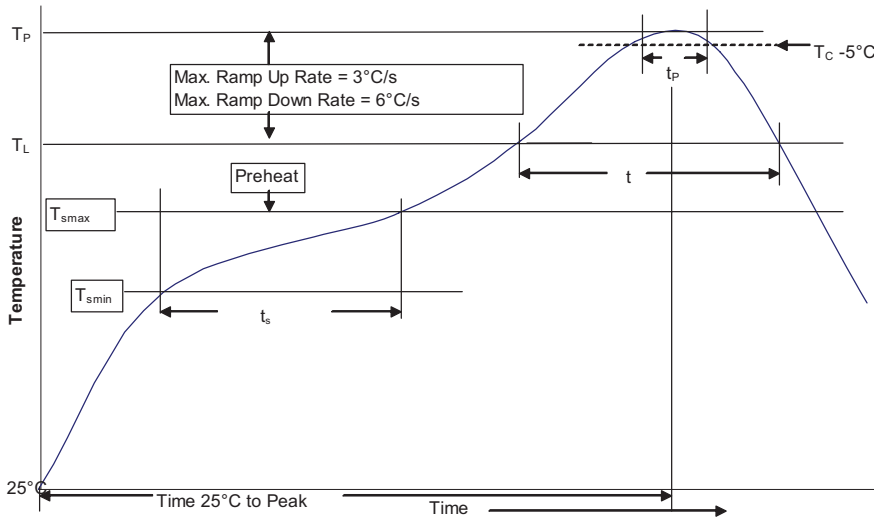
**2.0mm Height R4 inductance characteristics — % of OCL vs.  $I_{DC}$**



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



**Solder reflow profile**



**Table 1 - Standard SnPb Solder (T<sub>c</sub>)**

Package Thickness	Volume <350 mm <sup>3</sup>	Volume ≥350 mm <sup>3</sup>
<2.5mm	235°C	220°C
≥2.5mm	220°C	220°C

**Table 2 - Lead (Pb) Free Solder (T<sub>c</sub>)**

Package Thickness	Volume <350 mm <sup>3</sup>	Volume 350 - 2000 mm <sup>3</sup>	Volume >2000 mm <sup>3</sup>
<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	100°C	150°C
• Temperature min. (T <sub>smin</sub> )	150°C	200°C
• Temperature max. (T <sub>smax</sub> )	60-120 Seconds	60-120 Seconds
• Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )	3°C/ Second Max.	3°C/ Second Max.
Average ramp up rate T <sub>smax</sub> to T <sub>p</sub>	183°C	217°C
Liquidous temperature (T <sub>L</sub> )	60-150 Seconds	60-150 Seconds
Time at liquidous (t <sub>L</sub> )	Table 1	Table 2
Peak package body temperature (T <sub>p</sub> )*	20 Seconds**	30 Seconds**
Time (t <sub>p</sub> )** within 5 °C of the specified classification temperature (T <sub>c</sub> )	6°C/ Second Max.	6°C/ Second Max.
Average ramp-down rate (T <sub>p</sub> to T <sub>smax</sub> )	6 Minutes Max.	8 Minutes Max.
Time 25°C to Peak Temperature		

\* Tolerance for peak profile temperature (T<sub>p</sub>) is defined as a supplier minimum and a user maximum.

\*\* Tolerance for time at peak profile temperature (t<sub>p</sub>) is defined as a supplier minimum and a user maximum.

**North America**

Eaton's Electrical Group  
Electronics Division  
1225 Broken Sound Parkway NW  
Suite F  
Boca Raton, FL 33487-3533  
Tel: 1-561-998-4100  
Fax: 1-561-241-6640  
Toll Free: 1-888-414-2645

Eaton's Electrical Group  
Electronics Division  
P.O. Box 14460  
St. Louis, MO 63178-4460  
Tel: 1-636-394-2877  
Fax: 1-636-527-1607

**Europe**

Eaton's Electrical Group  
Electronics Division  
Burton-on-the-Wolds  
Leicestershire, LE 12 5th UK  
Phone: +44 (0) 1509 882 600  
Fax: +44 (0) 1509 882 786

Eaton's Electrical Group  
Electronics Division  
Avda Santa Eulalia, 290  
Terrassa, Barcelona 08223 Spain  
Phone: +34-93-736-2813  
Fax: +34-93-783-5055

**Asia Pacific**

Eaton's Electrical Group  
Electronics Division  
No.2, #06-01  
Serangoon North Avenue 5  
Singapore 554911  
Tel: +65 6645 9888  
Fax: +65 6728 3155

The only controlled copy of this Data Sheet is the electronic read-only version located on the Bussmann Network Drive. All other copies of this document are by definition uncontrolled. This bulletin is intended to clearly present comprehensive product data and provide technical information that will help the end user with design applications. Bussmann reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Bussmann also reserves the right to change or update, without notice, any technical information contained in this bulletin. Once a product has been selected, it should be tested by the user in all possible applications.

Life Support Policy: Bussmann does not authorize the use of any of its products for use in life support devices or systems without the express written approval of an officer of the Company. Life support systems are devices which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

**Eaton's Electrical Group  
Electronics Division**  
114 Old State Road  
Ellisville, MO 63021  
United States  
www.eaton.com/elx



Powering Business Worldwide

© 2014 Eaton  
All Rights Reserved  
Publication No. 4086 — BU-SB14232  
April 2014

Eaton is a registered trademark.

All other trademarks are property of their respective owners.

www.eaton.com/elx