MPIA40-V2

Automotive grade

High current, low profile, miniature power inductors

Product features

- AEC-Q200 Grade 3 qualified
- High current carrying capacity
- Magnetically shielded, Low EMI
- Rugged flexible construction
- Self resonant frequency (SRF) greater than 9.5 MHz
- Inductance range from 0.1 µH to 22 µH
- Current range from 1.2 A to 22 A
- 4.75 mm x 4.45 mm footprint surface mount package in 1.2 mm, 1.5 mm, and 2.0 mm heights
- Moisture Sensitivity Level (MSL): 1

Applications

- Body electronics
  - Central body control module
  - Vehicle access control system
  - Headlamps, tail lamps and interior lighting
  - Doors, window lift and seat control
- Advanced driver assistance systems
  - 77 GHz radar system
  - Basic and smart surround, and rear and front view camera
  - Adaptive cruise control (ACC)
  - Automatic parking control
  - Car black box system
- Infotainment and cluster electronics
  - Active noise cancellation (ANC)
  - Audio subsystem: head unit and trunk amp
  - Digital instrument cluster
  - In-vehicle infotainment (IVI) and navigation
- Chassis and safety electronics
  - Airbag control unit

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-020 (latest revision) compliant
- Halogen free, lead free, RoHS compliant

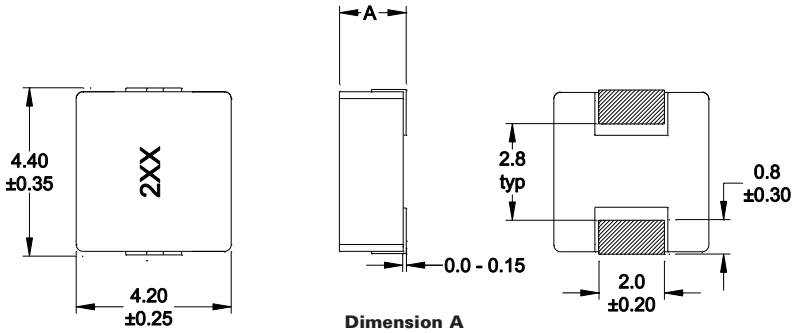
Powering Business Worldwide

Product specifications

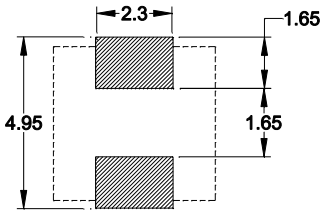
Part Number[5]	OCL[1] (µH) ±20%	Part marking designator	I_{rms}[2] (A)	I_{sat}[3] (A)	DCR (mΩ) typical @ +20 °C	DCR (mΩ) maximum @ +20 °C	SRF (MHz) typical	K-factor[4]
1.2 mm height								
MPIA4012V2-R33-R	0.33	A	7.5	11	11	13.5	128	2480
MPIA4012V2-R47-R	0.47	B	5.6	6.8	19	23	106	2470
MPIA4012V2-R68-R	0.68	C	4.5	6.7	28	33.5	98	2223
MPIA4012V2-1R0-R	1.0	D	4.3	6.5	38.5	46.5	64	1477
MPIA4012V2-1R5-R	1.5	E	3.3	4.3	55	66	63	1264
MPIA4012V2-2R2-R	2.2	F	2.9	4.2	75	90	35	1143
MPIA4012V2-4R7-R	4.7	G	1.8	2.8	175	210	29	890
1.5 mm height								
MPIA4015V2-R22-R	0.22	A	10.5	14	6.0	7.5	153	2649
MPIA4015V2-R33-R	0.33	B	9.5	11	7.0	8.5	120	2158
MPIA4015V2-R47-R	0.47	C	7.8	9.0	11	14	98	1991
MPIA4015V2-R56-R	0.56	D	7.5	8.3	12	14	84	1942
MPIA4015V2-R68-R	0.68	E	6.8	8.0	16	19	81	1437
MPIA4015V2-1R0-R	1.0	F	5.5	6.0	23	27	56	1382
MPIA4015V2-1R5-R	1.5	G	4.2	4.6	48	58	48	1468
MPIA4015V2-2R2-R	2.2	H	2.9	4.5	65	78	42	920
MPIA4015V2-3R3-R	3.3	I	3.0	3.2	77	92	31	854
MPIA4015V2-4R7-R	4.7	J	2.2	3.0	108	130	22	791
MPIA4015V2-6R8-R	6.8	K	2.0	2.3	172	207	21	609
MPIA4015V2-100-R	10	L	1.8	2.1	245	294	14	766
2.0 mm height								
MPIA4020V2-R10-R	0.10	A	16	22	3.5	4.5	343	2692
MPIA4020V2-R22-R	0.22	B	13	17	5.5	6.6	165	2036
MPIA4020V2-R33-R	0.33	C	9.5	12	7.5	9.0	113	1268
MPIA4020V2-R47-R	0.47	D	8.5	11	10.5	13	95	1219
MPIA4020V2-R56-R	0.56	E	8.0	10	12	15	87	1205
MPIA4020V2-R68-R	0.68	F	7.5	9.0	12.5	16	80	1201
MPIA4020V2-1R0-R	1.0	G	6.5	7.0	20	24	65	1168
MPIA4020V2-1R2-R	1.2	H	6.5	6.8	23	28	52	1110
MPIA4020V2-1R5-R	1.5	I	5.0	6.0	25	30	45	1038
MPIA4020V2-2R2-R	2.2	J	3.8	5.5	40	48	33	711
MPIA4020V2-3R3-R	3.3	K	3.3	4.0	71	85	25	643
MPIA4020V2-4R7-R	4.7	L	2.7	3.2	98	118	24	453
MPIA4020V2-6R8-R	6.8	M	2.0	2.6	167	192	23	482
MPIA4020V2-100-R	10	N	1.7	2.2	245	281	17	307
MPIA4020V2-150-R	15	O	1.5	1.8	320	384	13	257
MPIA4020V2-220-R	22	P	1.2	1.65	350	402	9.5	215

1. Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 1.0 Vrms, 0.0 Adc, +25 °C.
2. I_{rms}: DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents. PCB layout, trace thickness and width, air-flow, and proximity of other heat generating components will affect the temperature rise. It is recommended that the temperature of the part not exceed +125 °C under worst case operating conditions verified in the end application.
3. I_{sat} : Peak current for approximately 30% rolloff @ +25 °C.
4. K-factor: Used to determine Bp-p for core loss (see graph). Bp-p = K * L * ΔI. Bp-p :(Gauss), K: (K-factor from table), L: (Inductance in uH), ΔI (Peak to peak ripple current in Amps).
5. Part Number Definition: MPIA40xxV2-xxx-R
   MPIA40 = Product code
   xx= Height indicator
   V2=Version indicator
   xxx= inductance value in µH, R= decimal point,
   If no R is present then last character equals number of zeros
   -R suffix = RoHS compliant

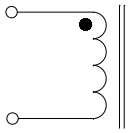
Dimensions (mm)



Recommended Pad Layout



Schematic



Dimension A	
MPIA4012V2	1.00 ±0.20
MPIA4015V2	1.30 ±0.20
MPIA4020V2	1.80 ±0.20

Part marking: 2xx (2 = version, x = inductance value per "Part marking designator" listed in Product specification table, x = bi-weekly date code)

All soldering surfaces to be coplanar within 0.10 millimeters

Tolerances are ±0.3 millimeters unless stated otherwise

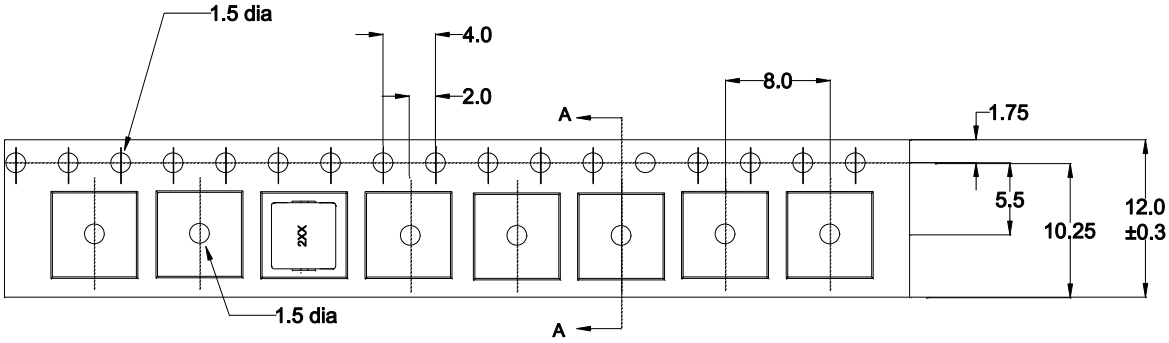
Pad layout tolerances are ±0.1 millimeters unless stated otherwise

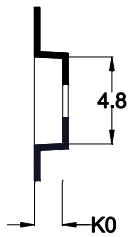
Do not route traces or vias underneath the inductor

Packaging information (mm)

Drawing not to scale

Supplied in tape and reel packaging , 3000 parts per 13" diameter reel

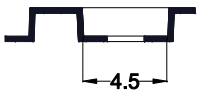




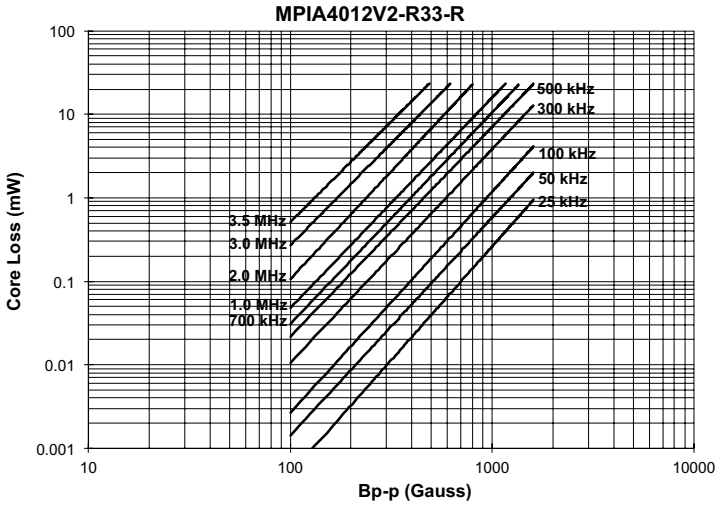
Section A-A

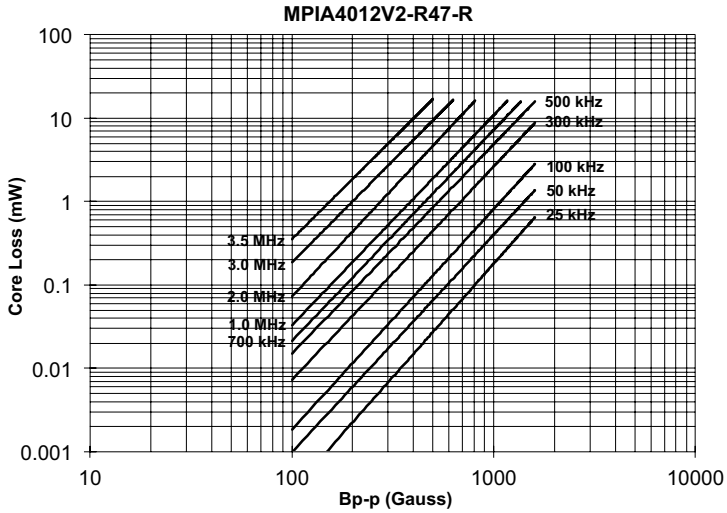
KO	
MPIA4012V2	1.4
MPIA4015V2	1.8
MPIA4020V2	2.5

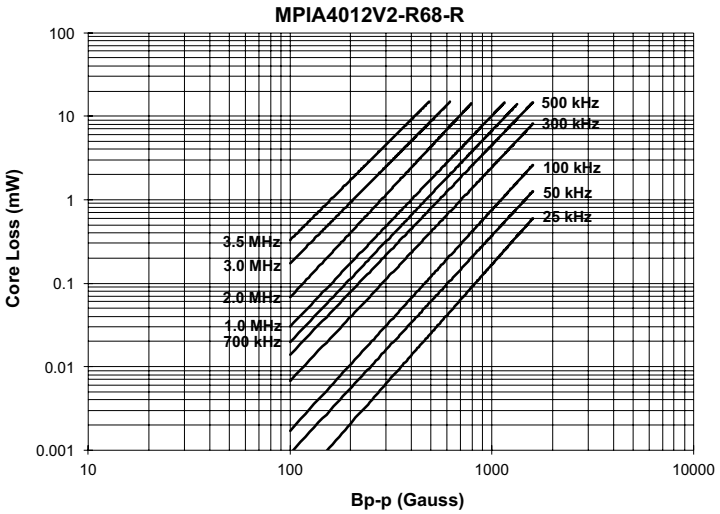
Direction of feed

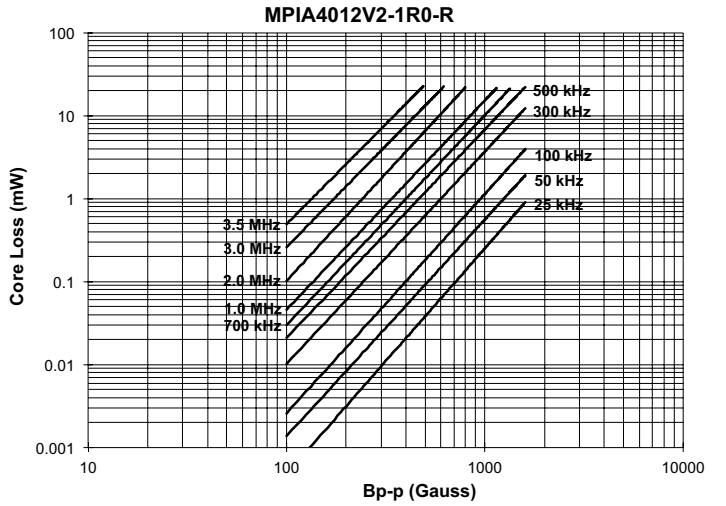


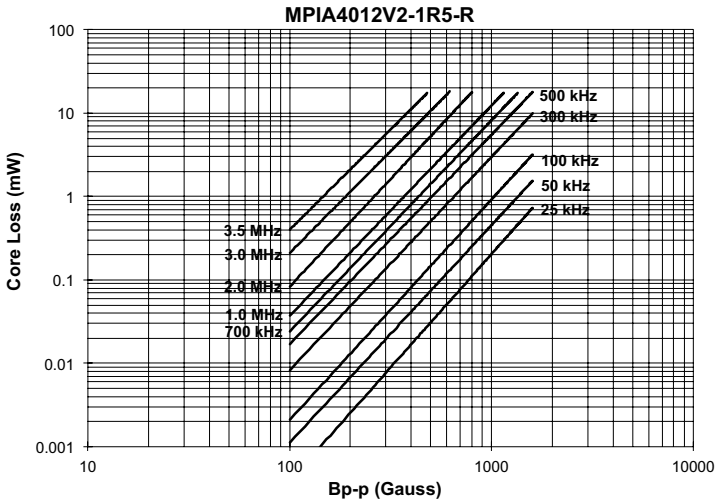
Core loss vs Bp-p

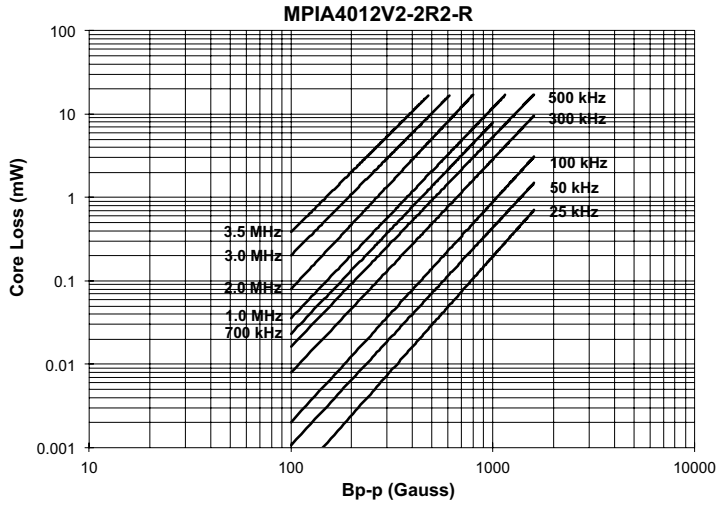












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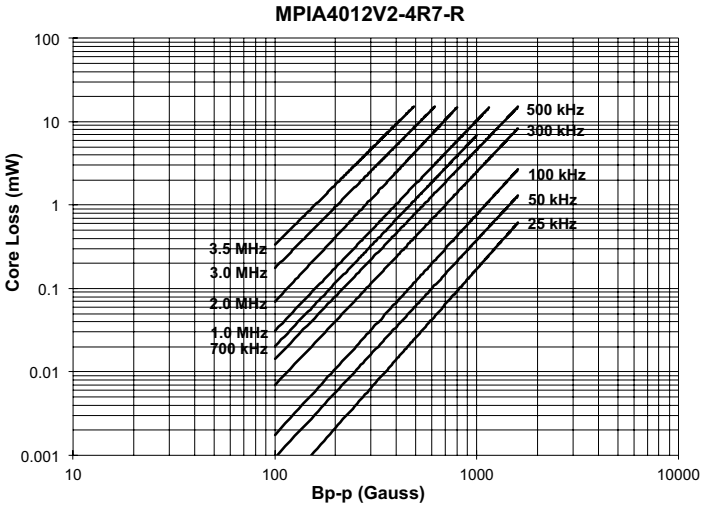

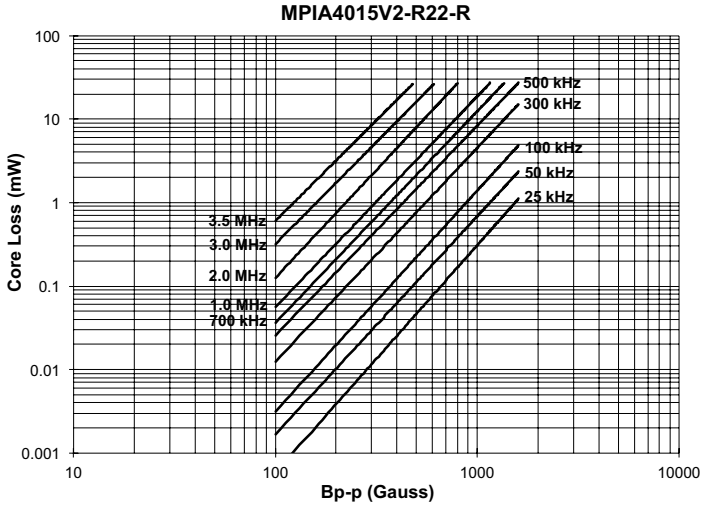

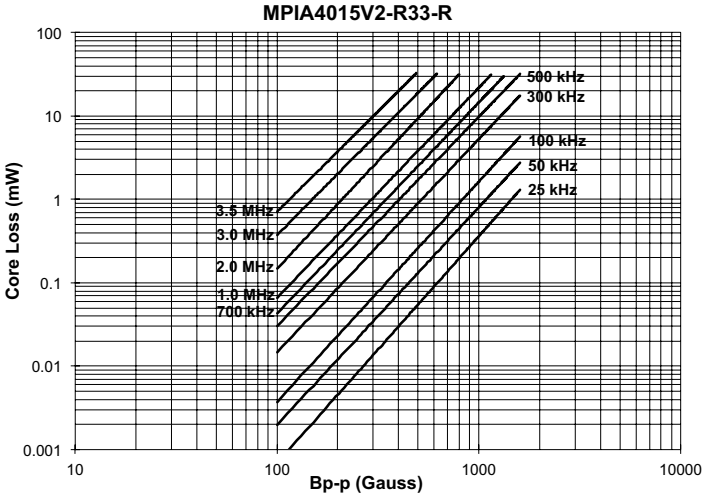

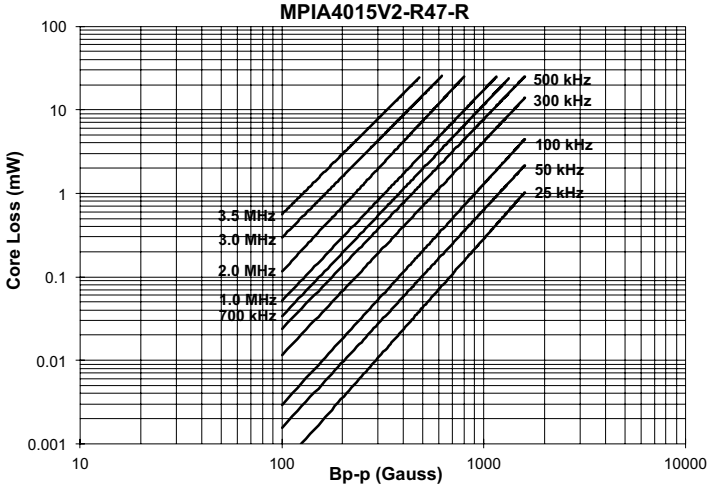

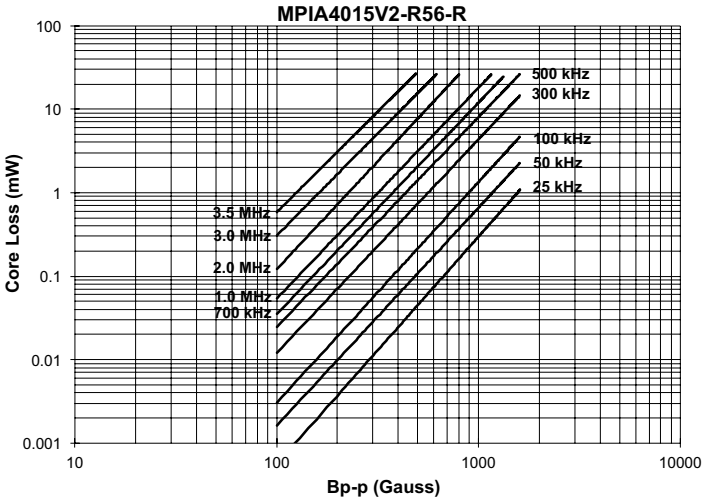

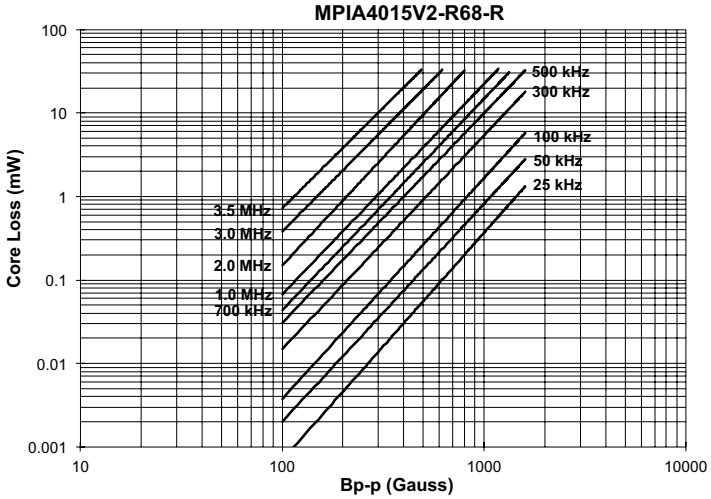

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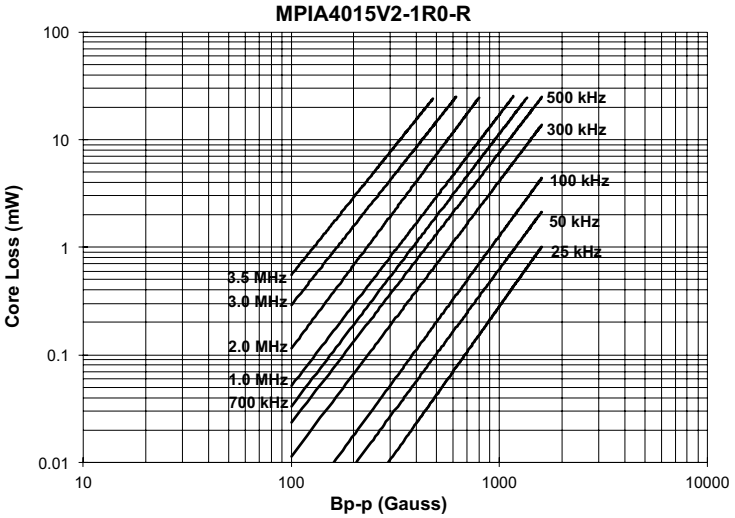

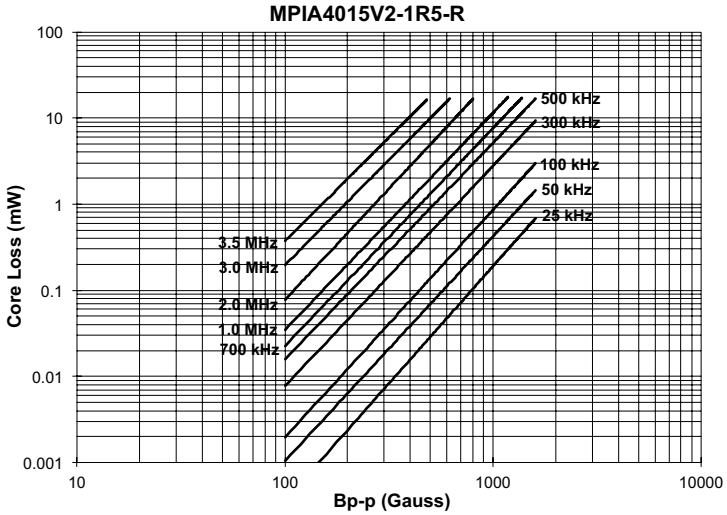

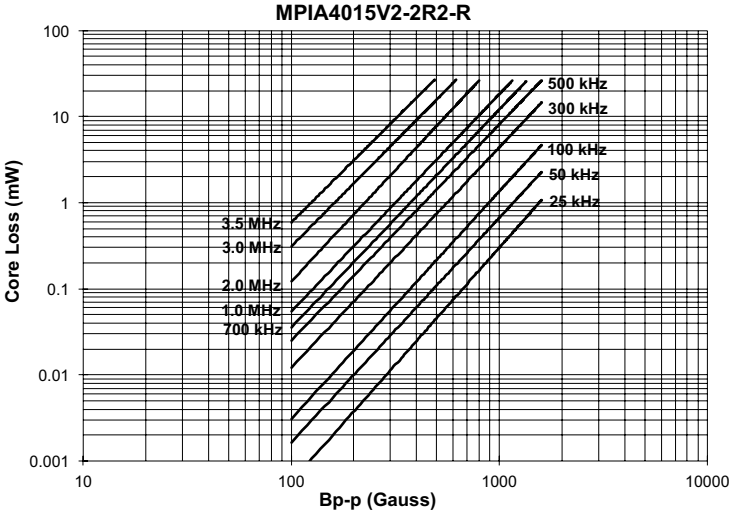

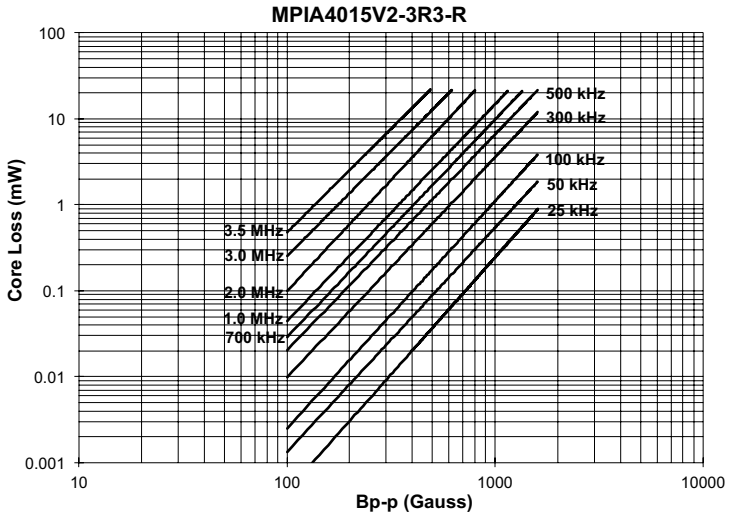

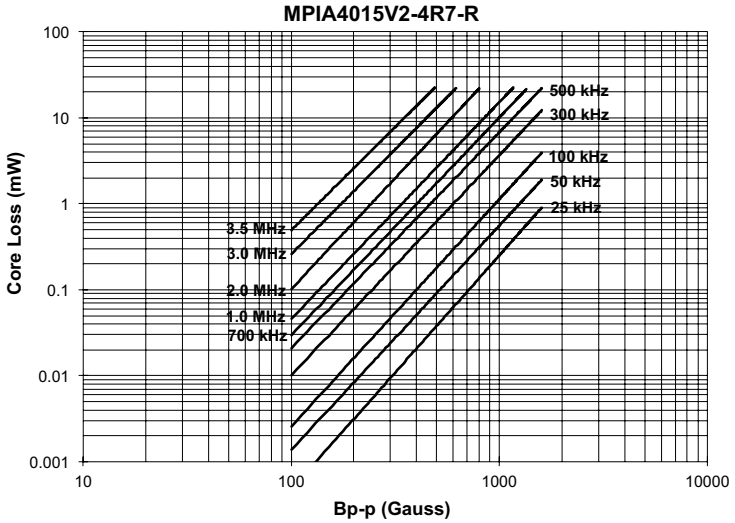

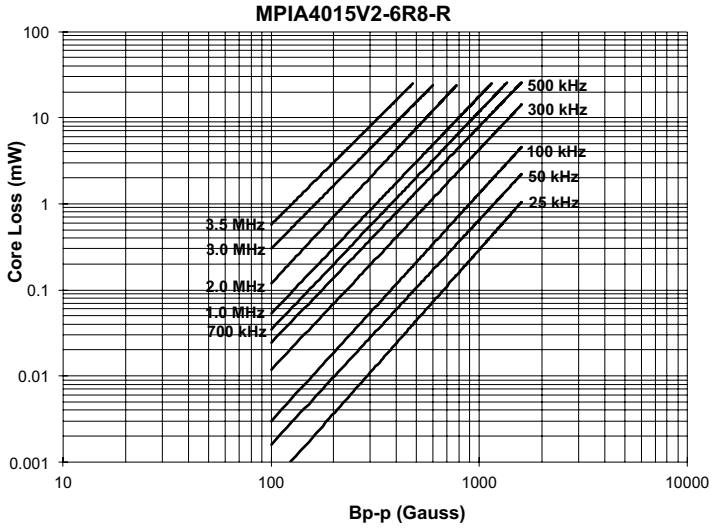

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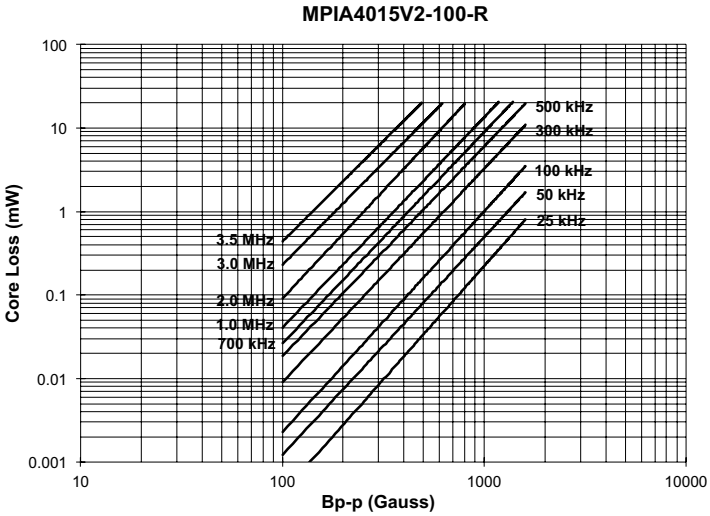
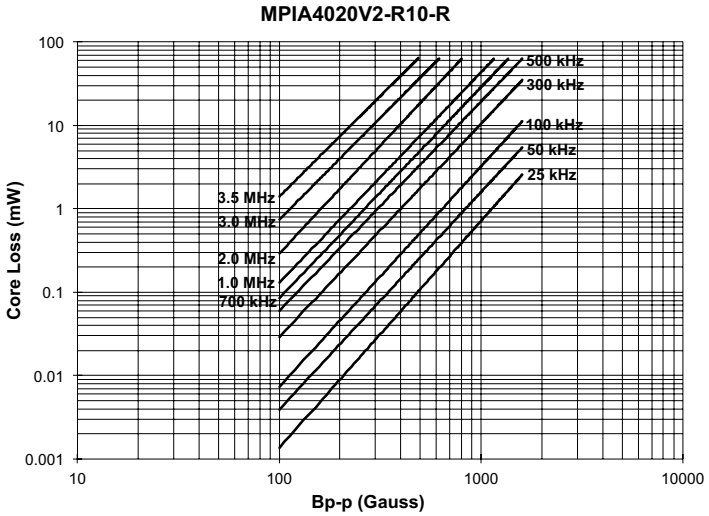
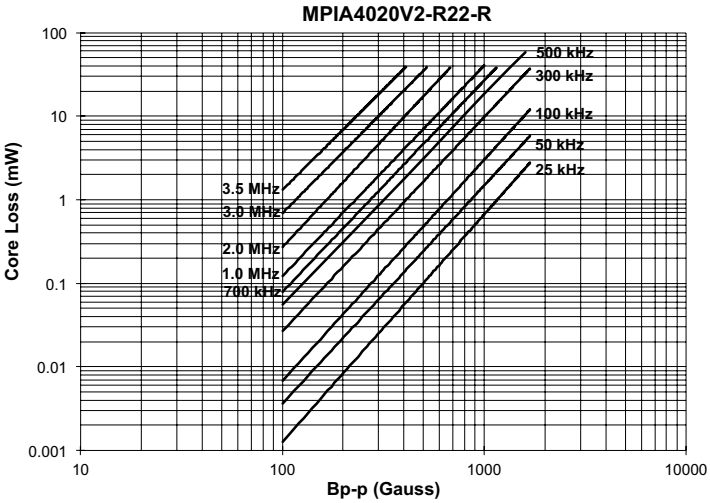
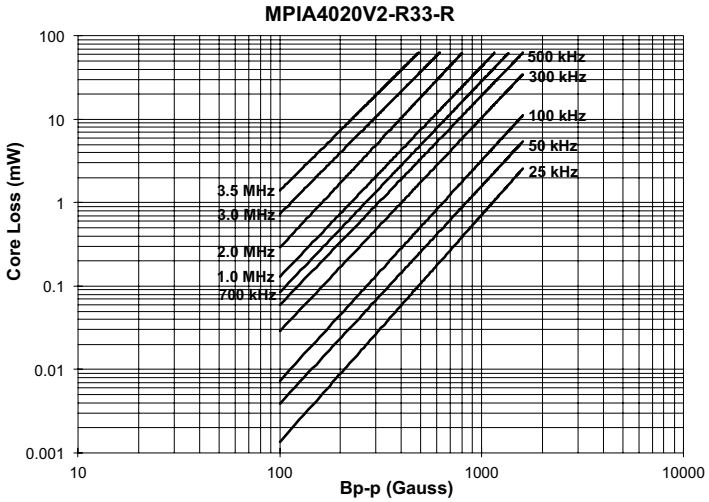
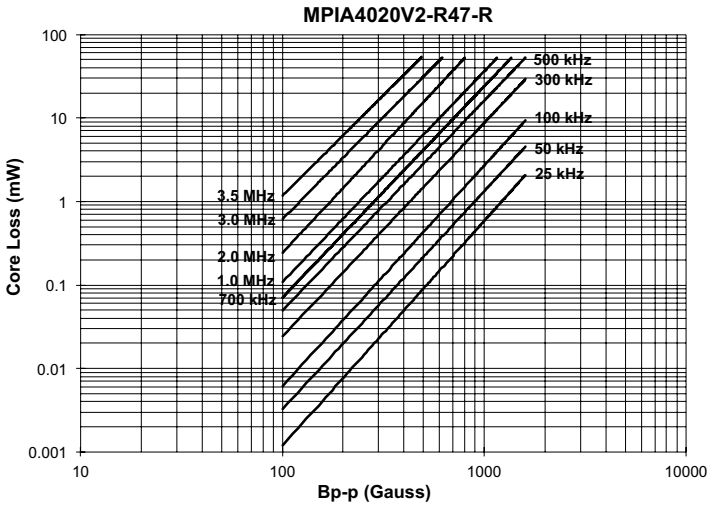
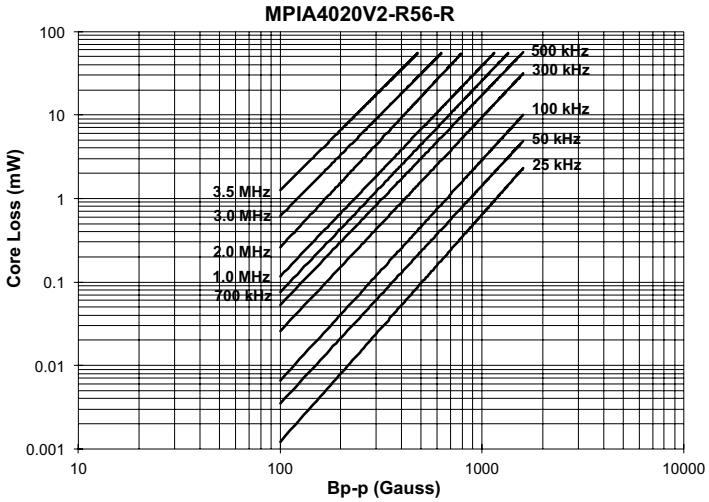




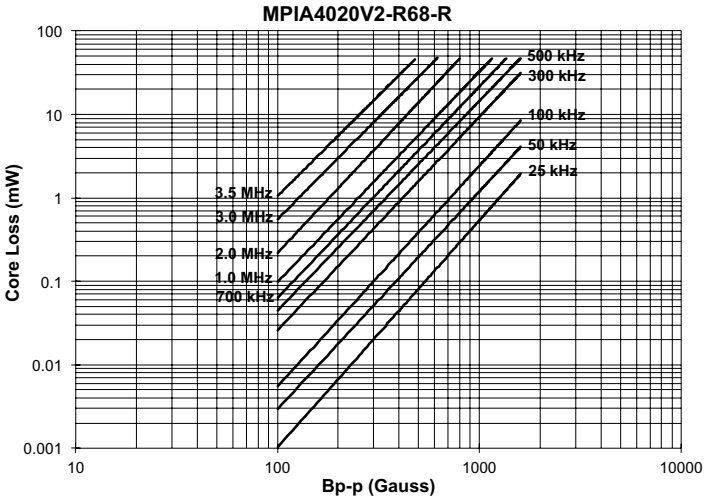


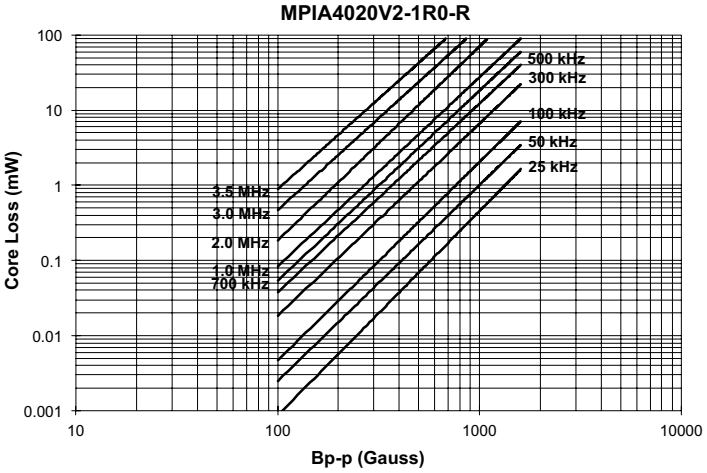


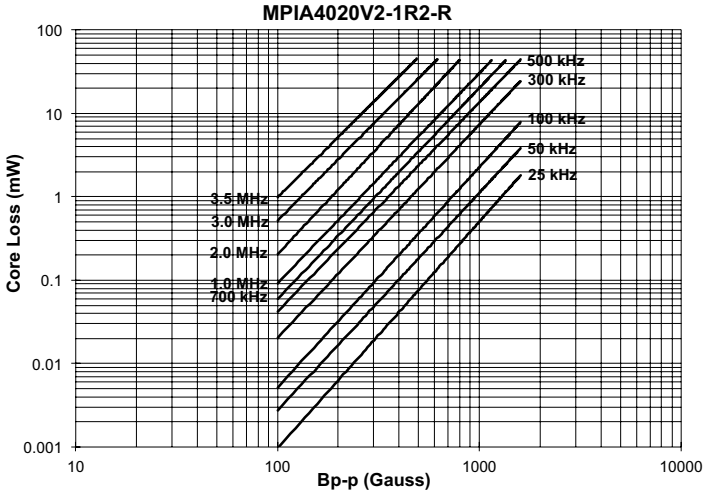


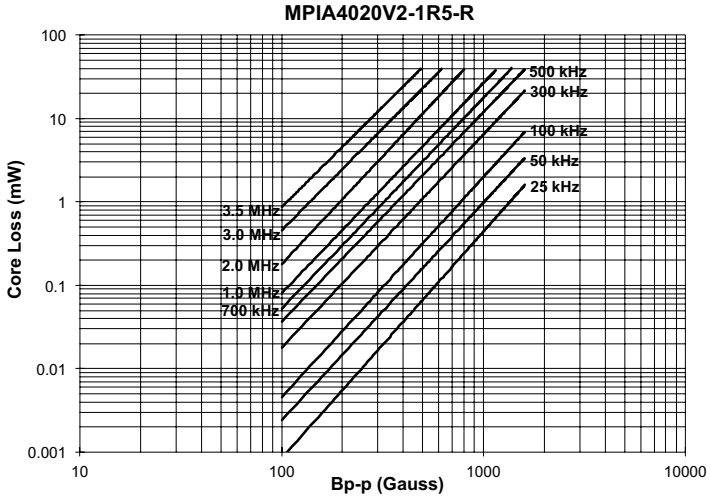


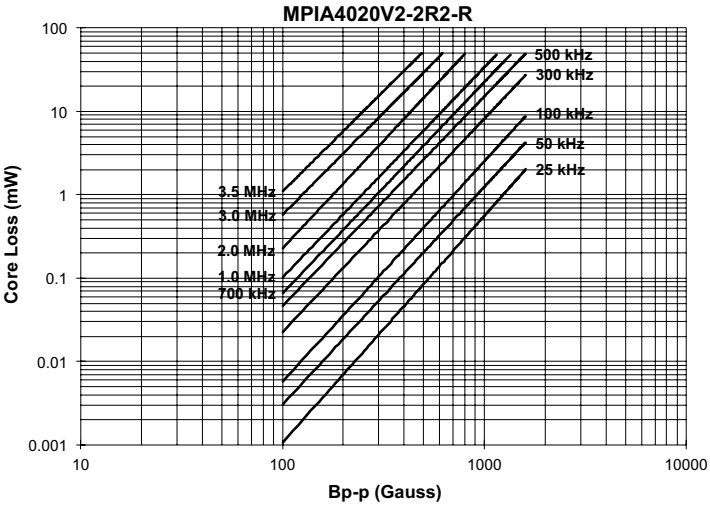
Core loss vs Bp-p

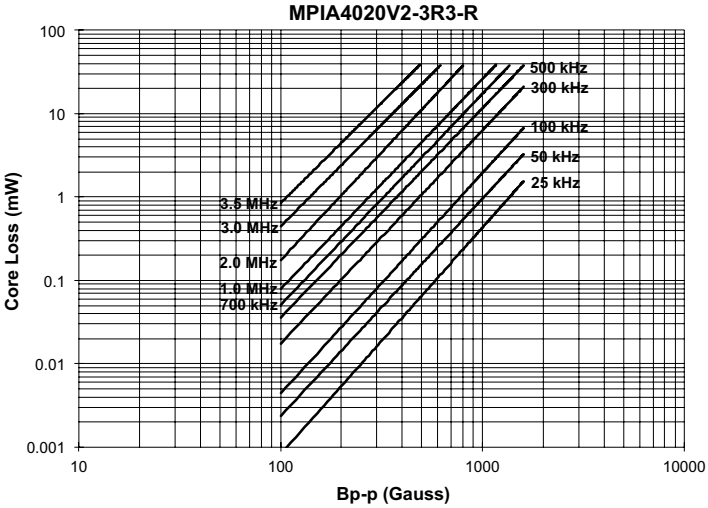




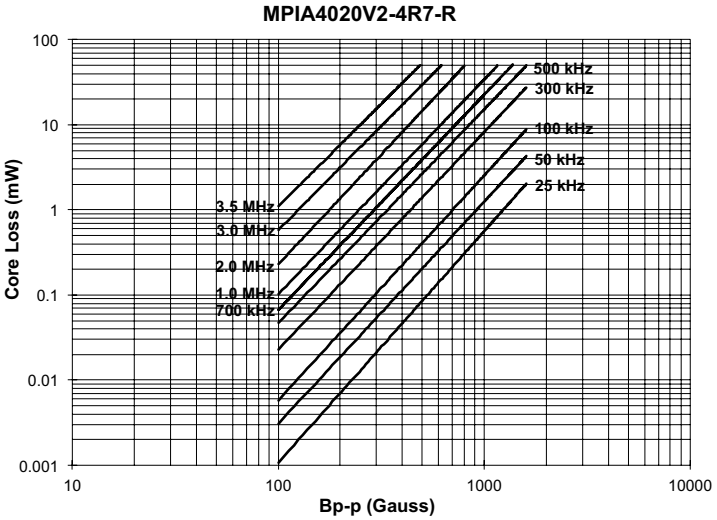


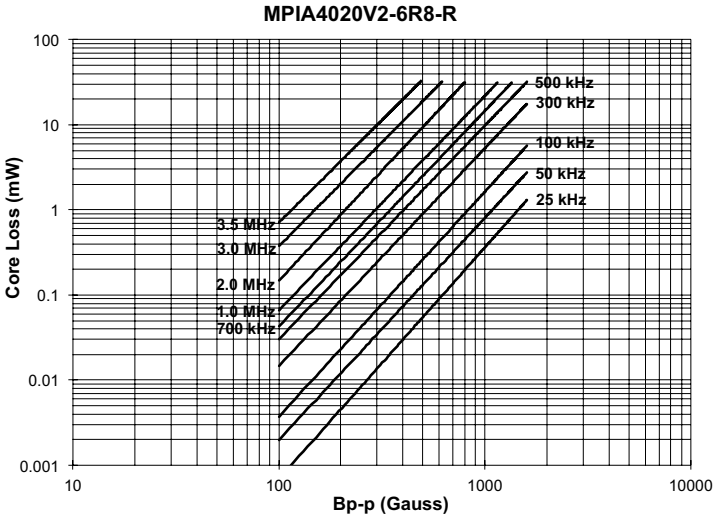


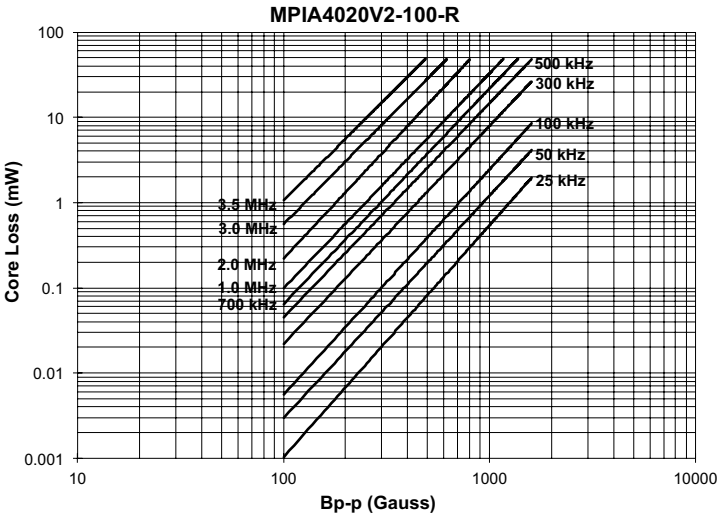


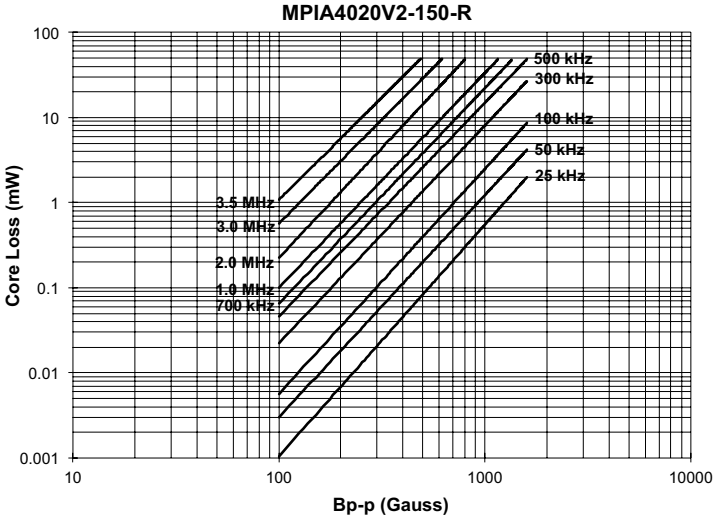


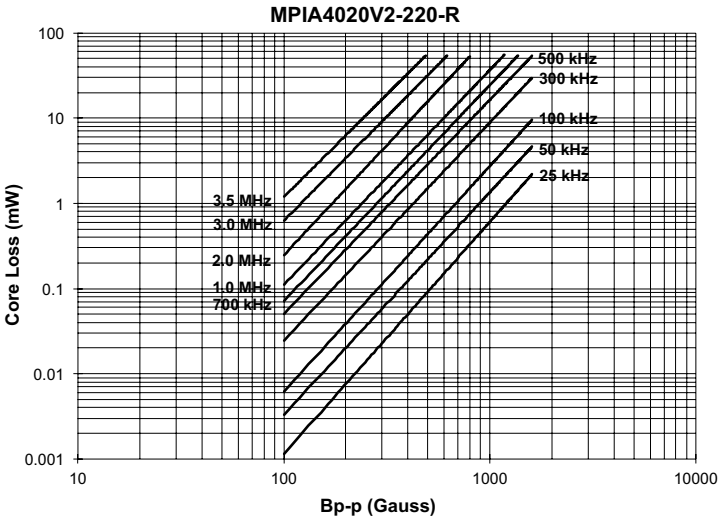
Core loss vs Bp-p



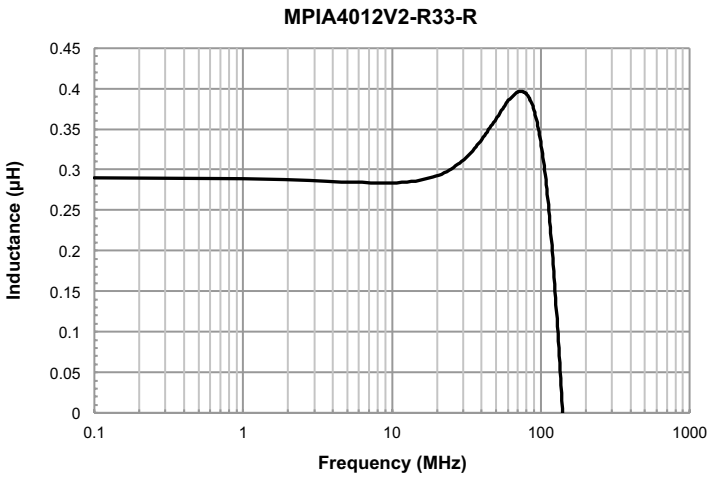


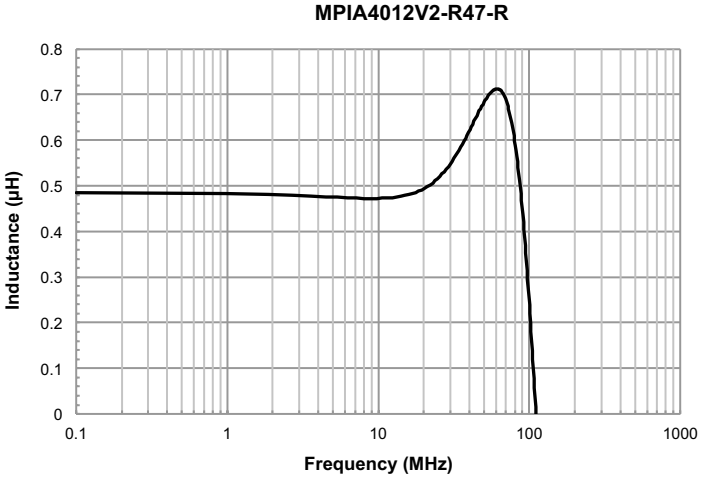


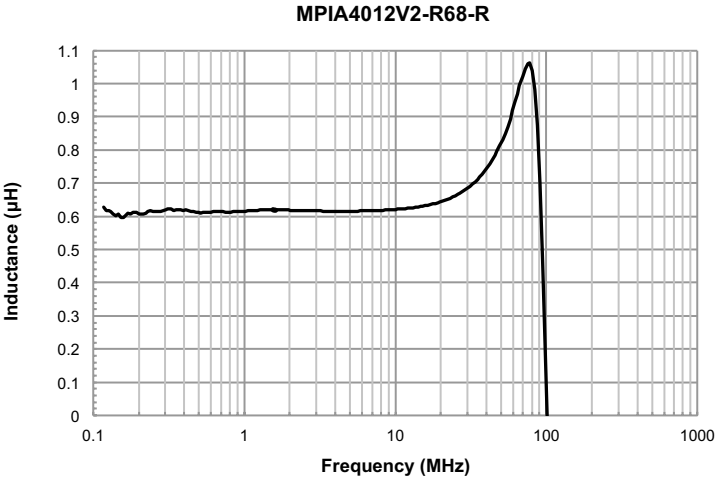


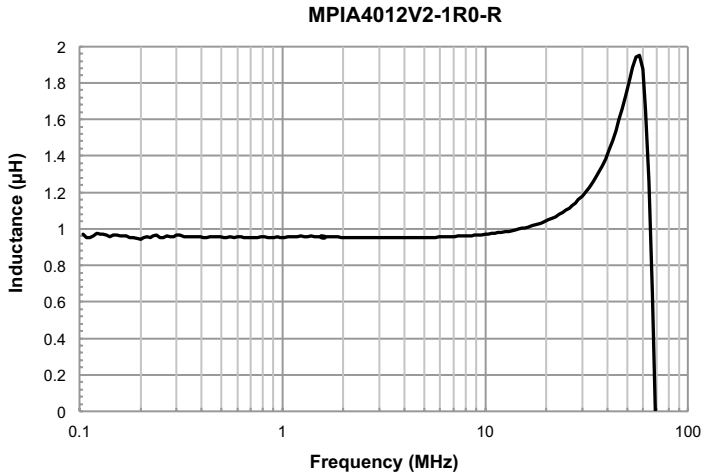


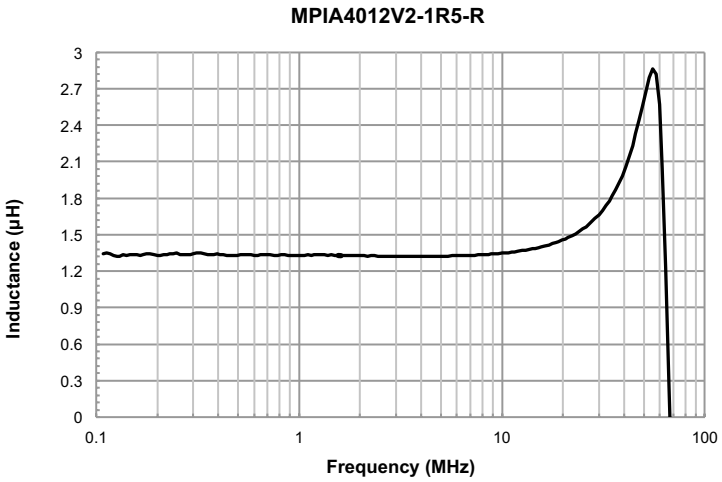
Inductance vs. Frequency

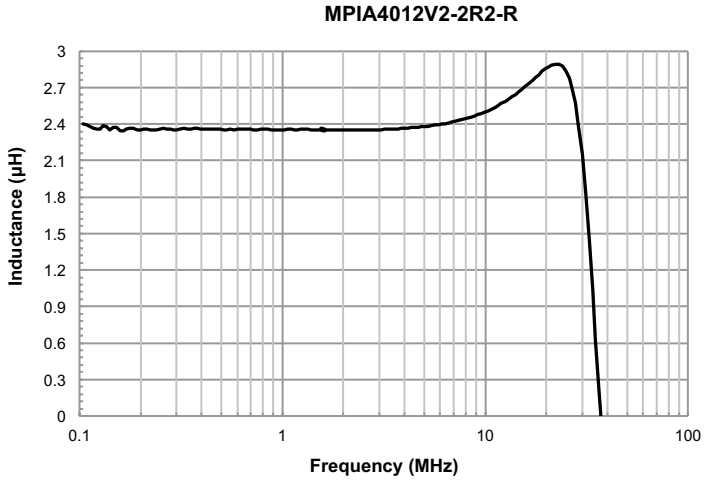






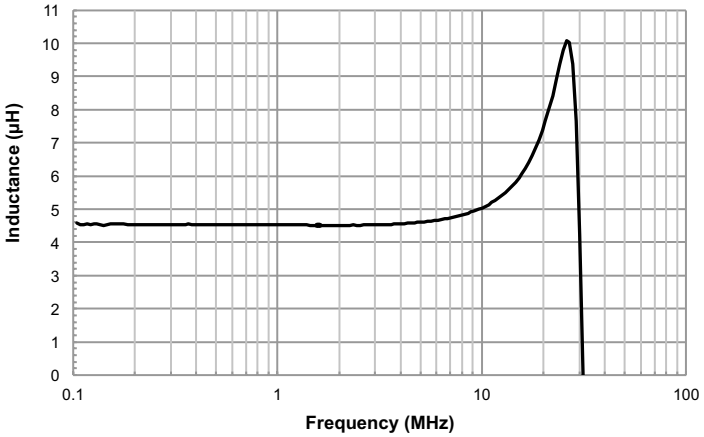




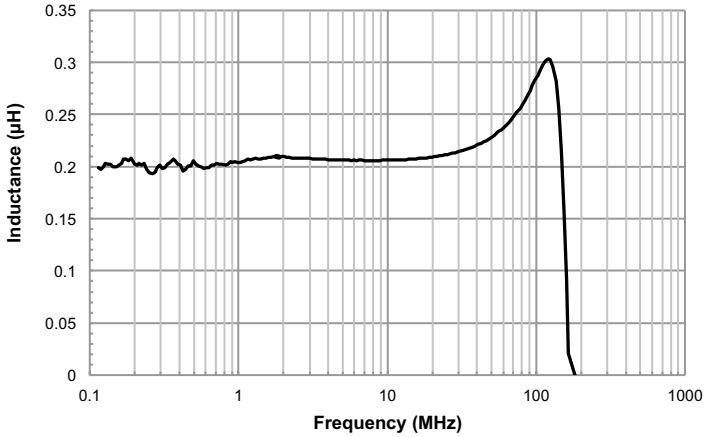


Inductance vs. Frequency

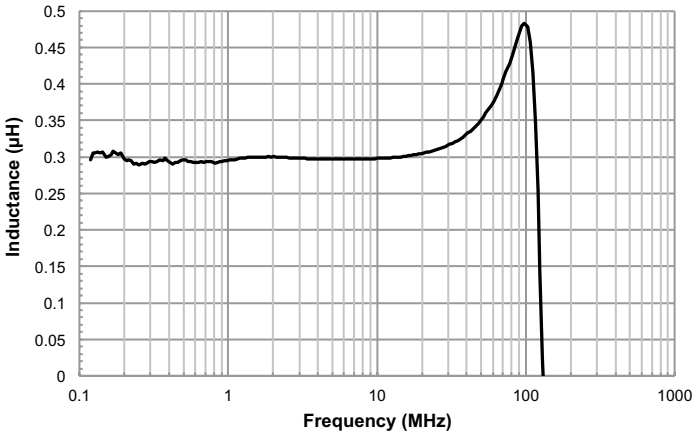
MPIA4012V2-4R7-R



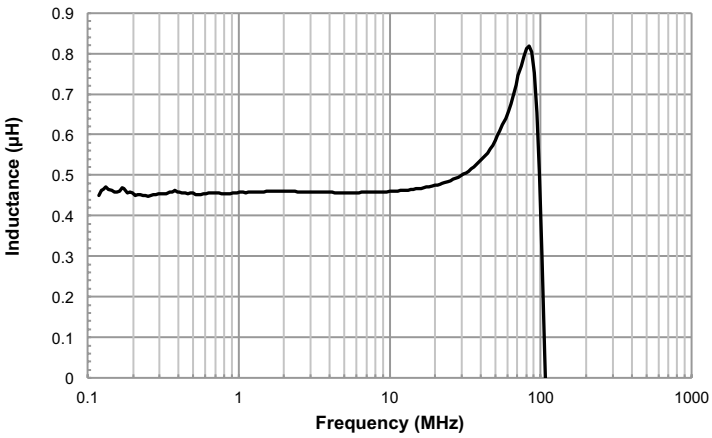
MPIA4015V2-R22-R



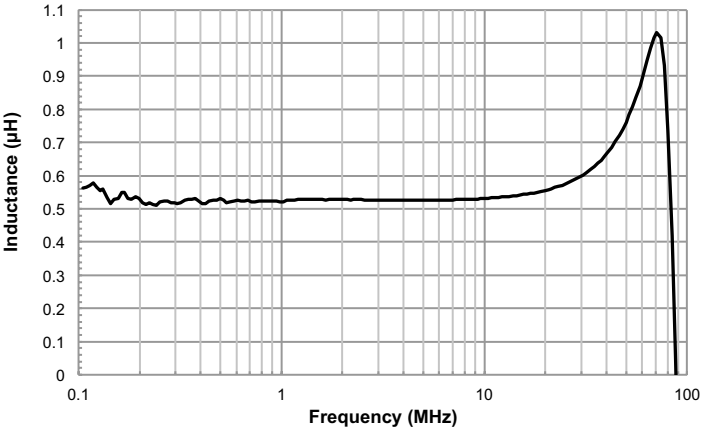
MPIA4015V2-R33-R



MPIA4015V2-R47-R



MPIA4015V2-R56-R



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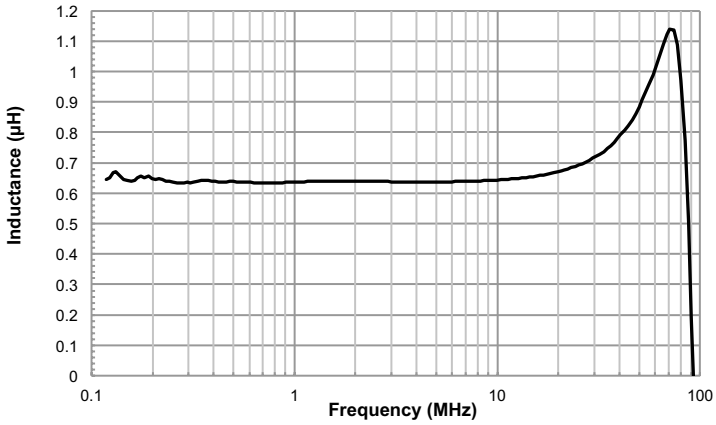
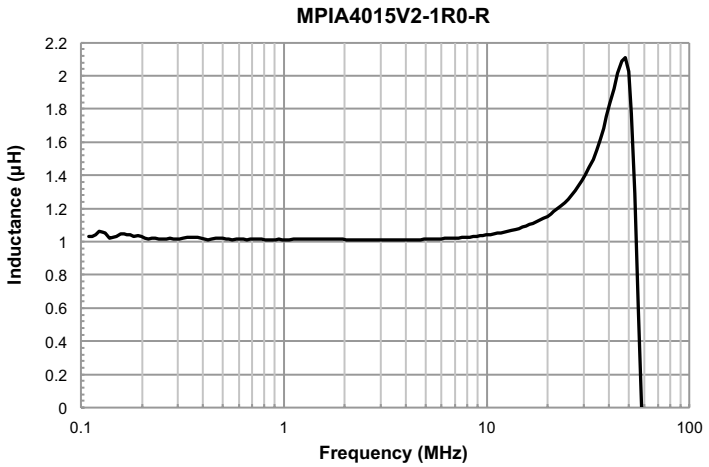
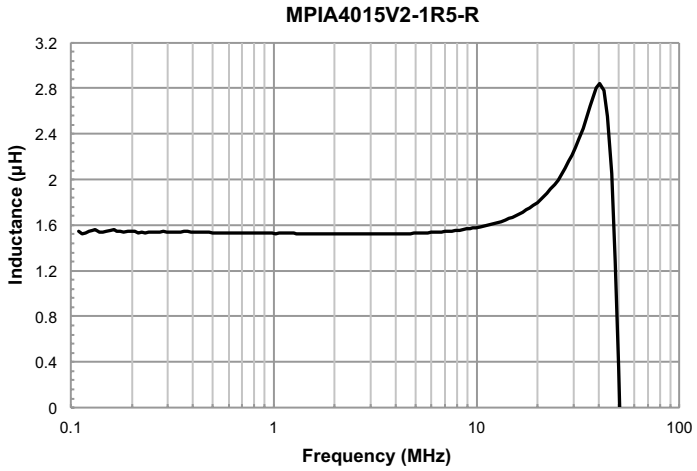
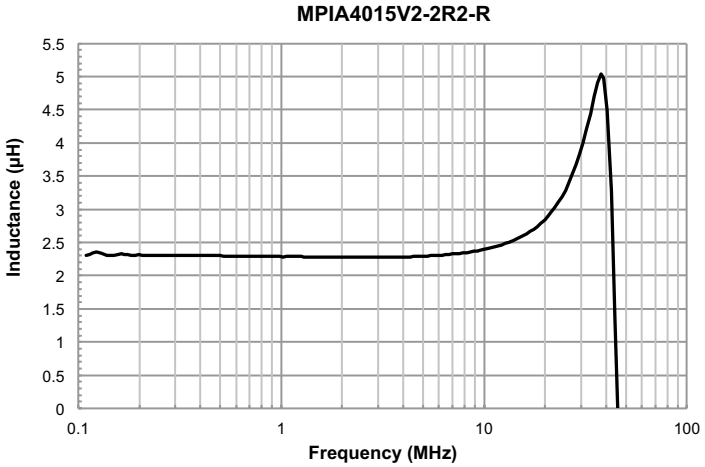
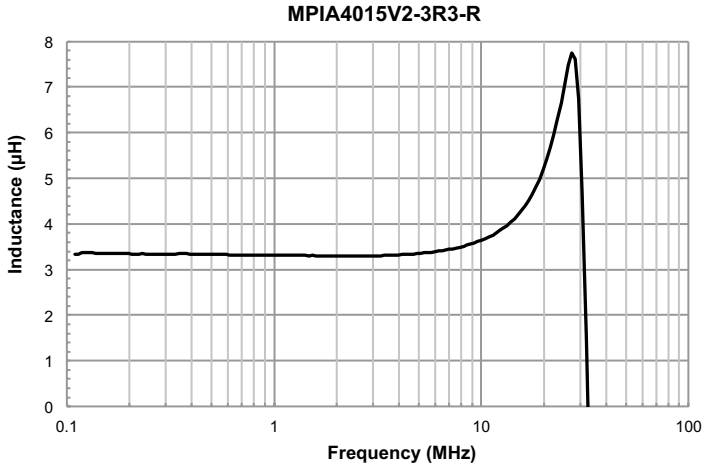


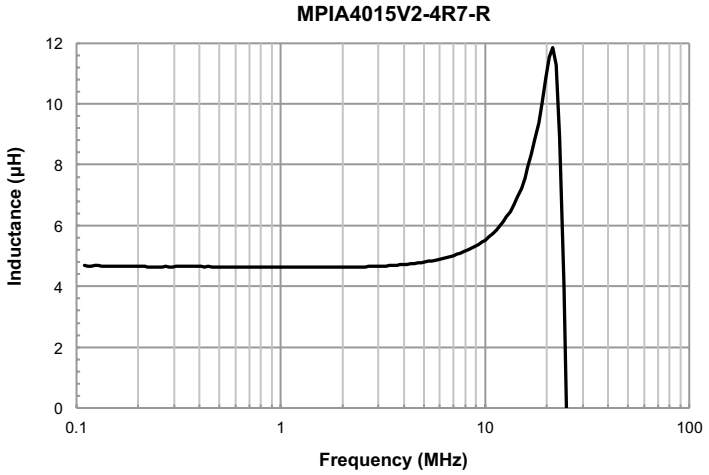
Inductance vs. Frequency

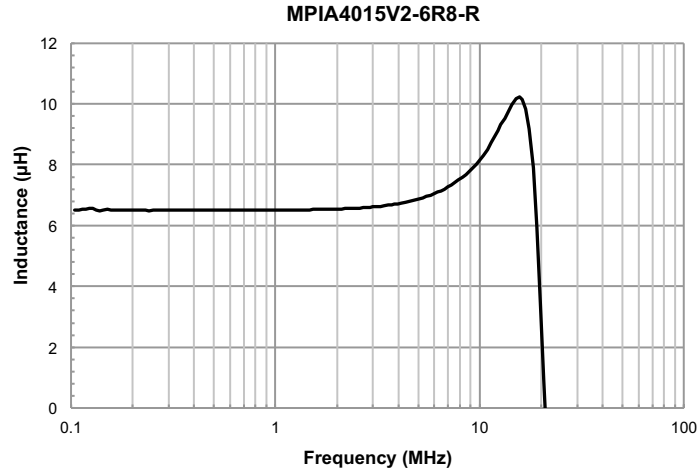






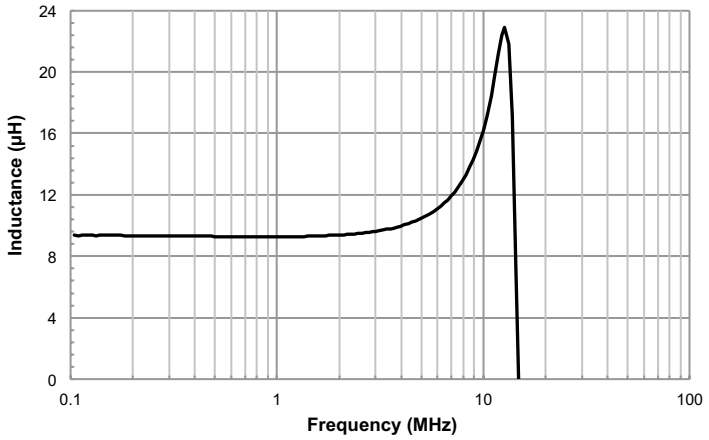




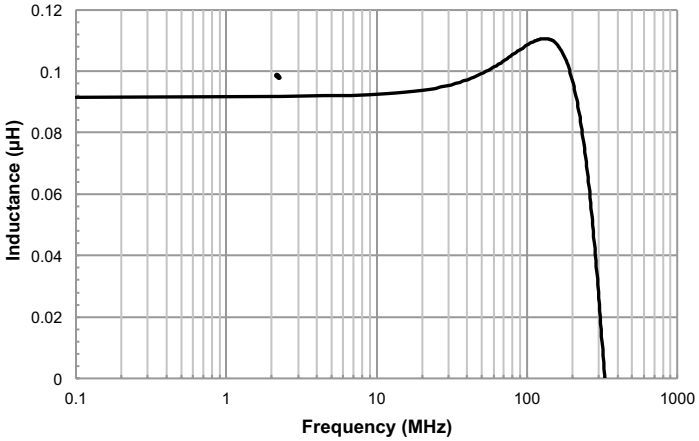


Inductance vs. Frequency

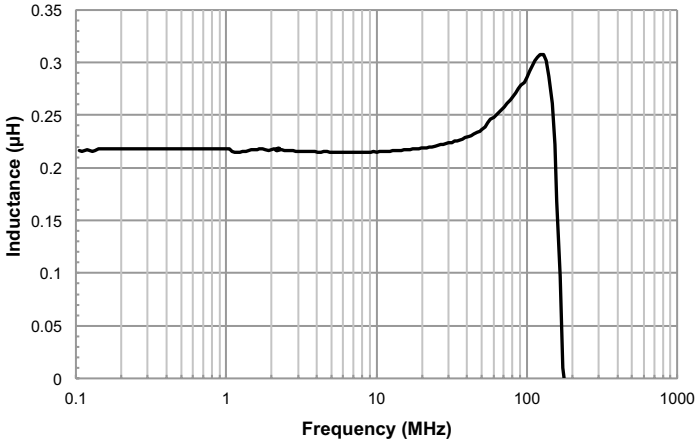
MPIA4015V2-100-R



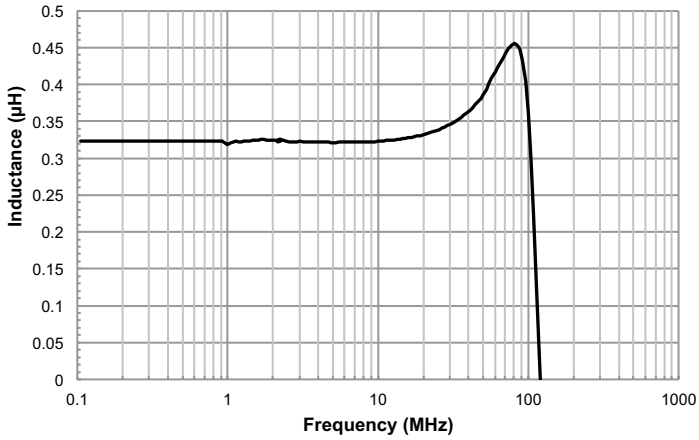
MPIA4020V2-R10-R



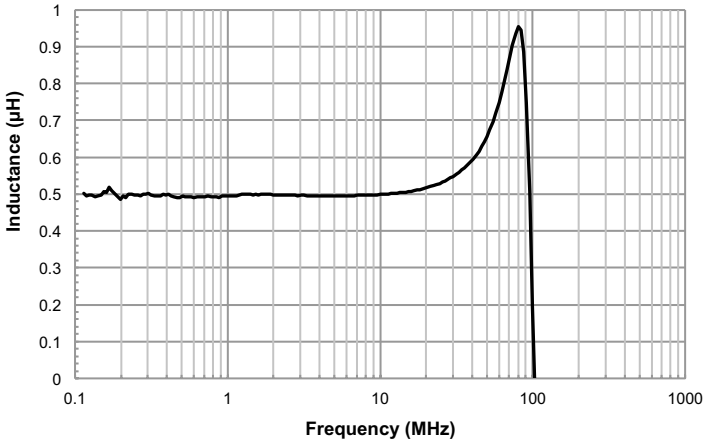
MPIA4020V2-R22-R



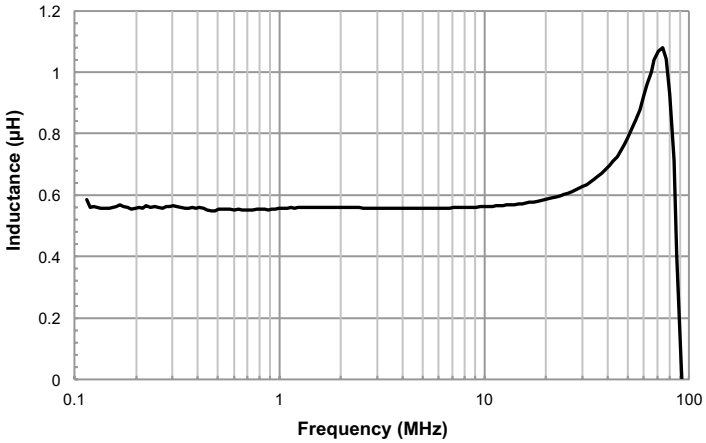
MPIA4020V2-R33-R



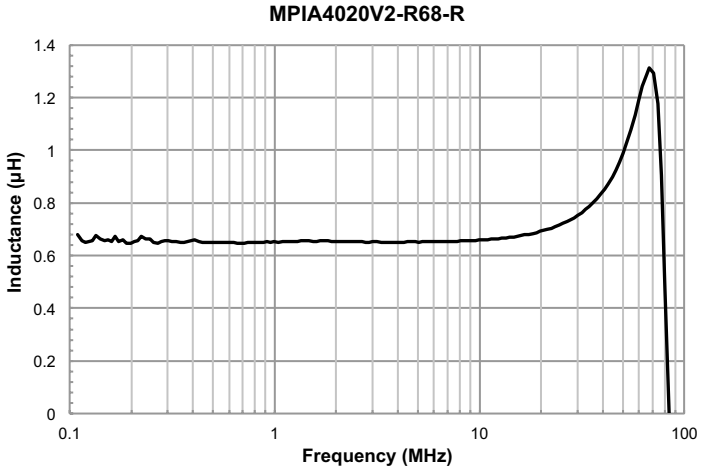
MPIA4020V2-R47-R

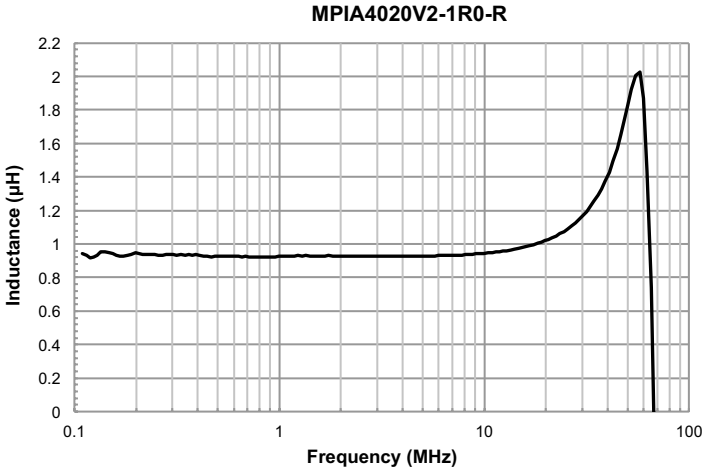


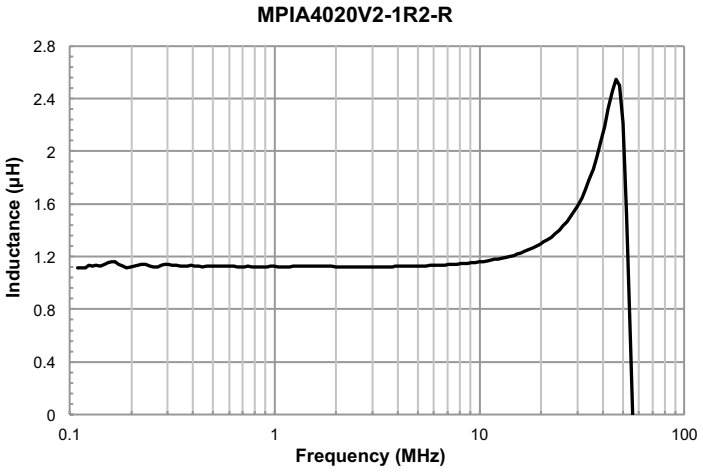
MPIA4020V2-R56-R

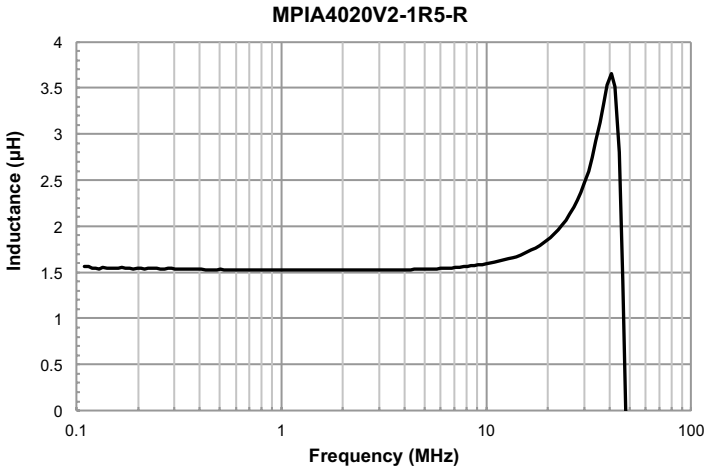


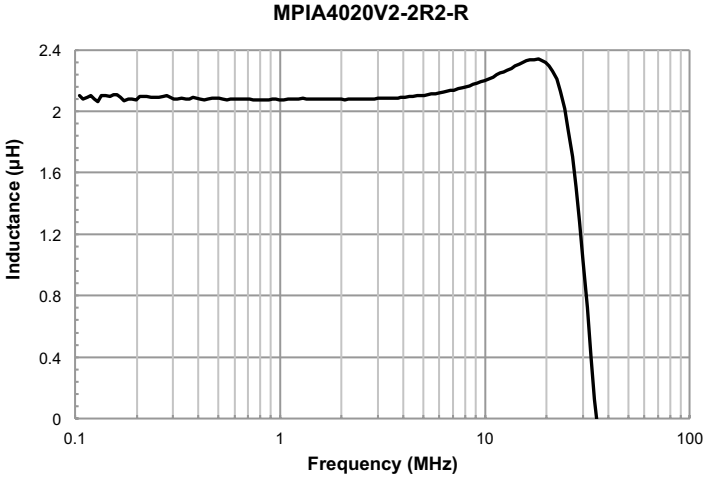
Inductance vs. Frequency

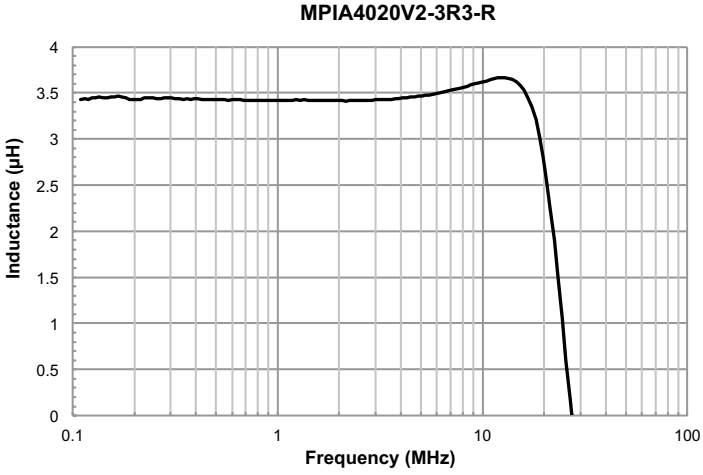




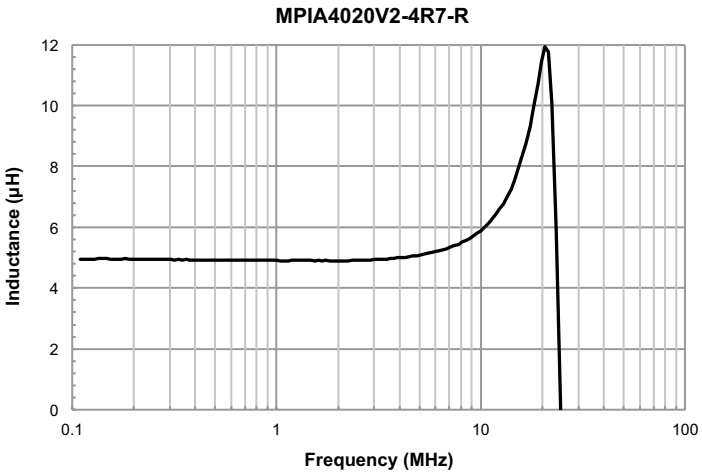


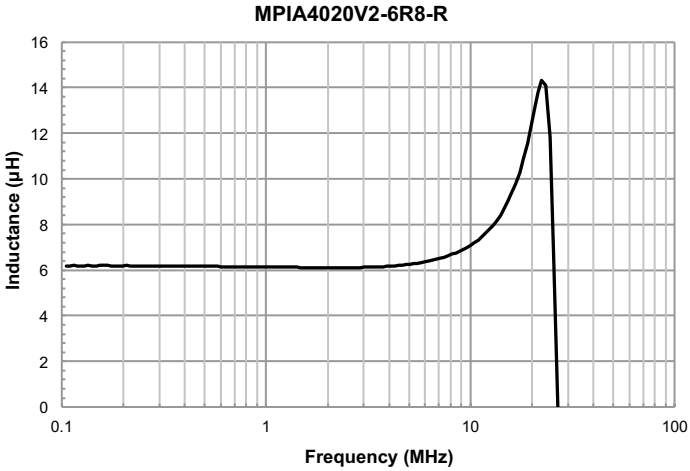


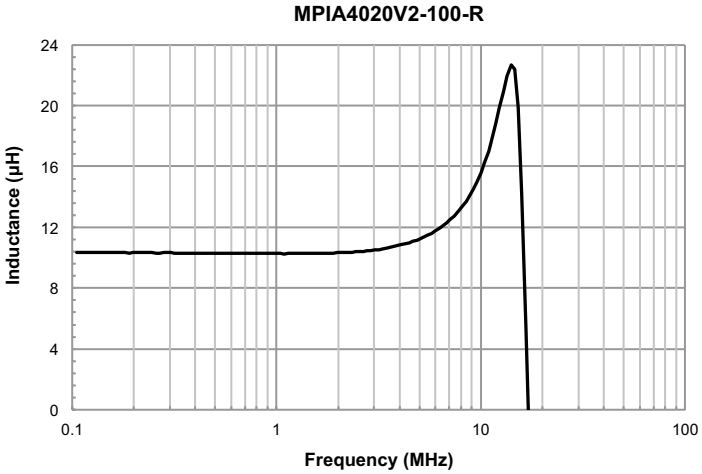


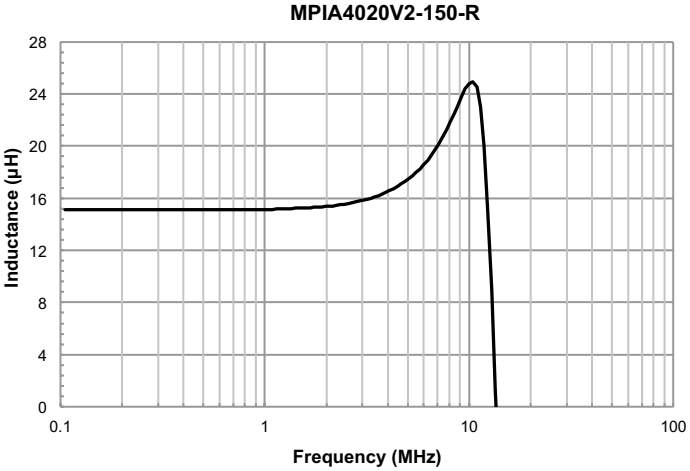


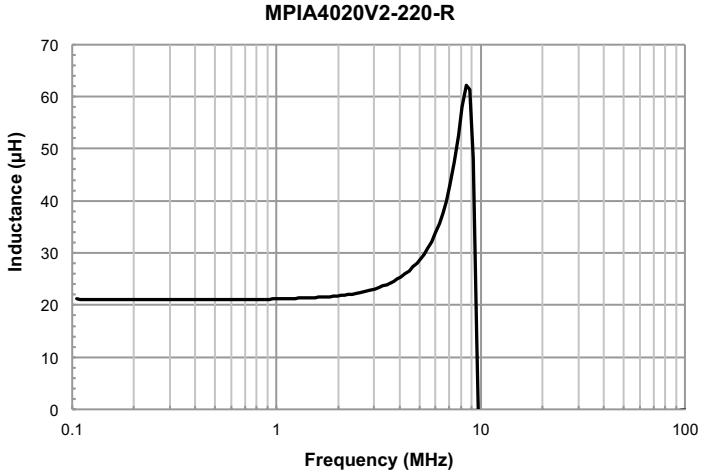
Inductance vs. Frequency



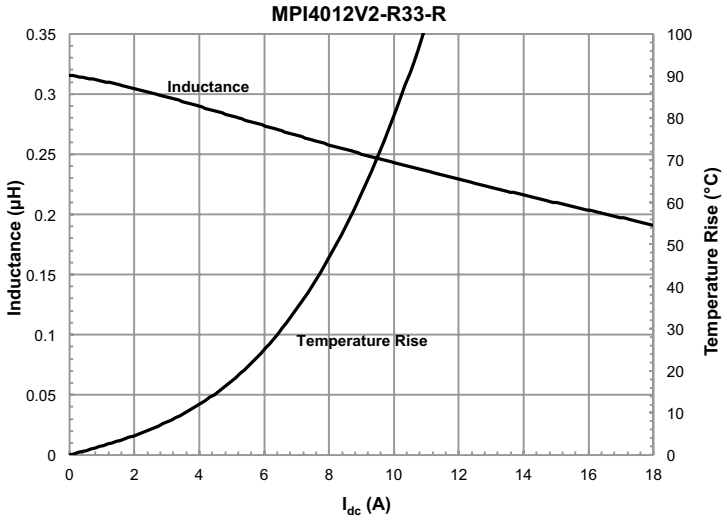


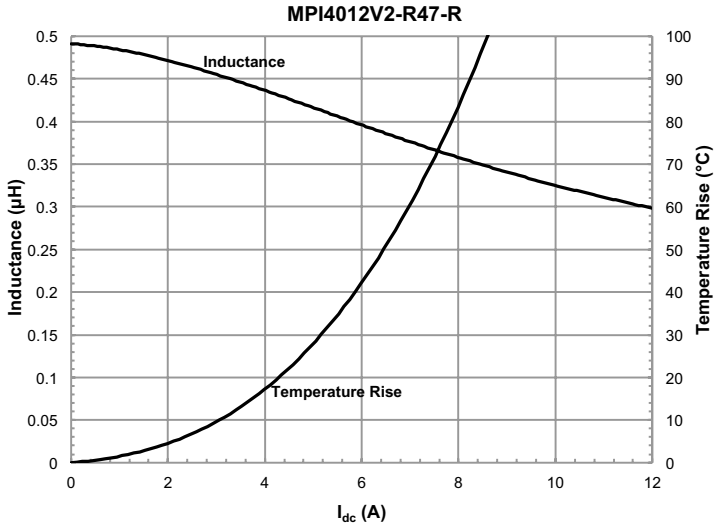


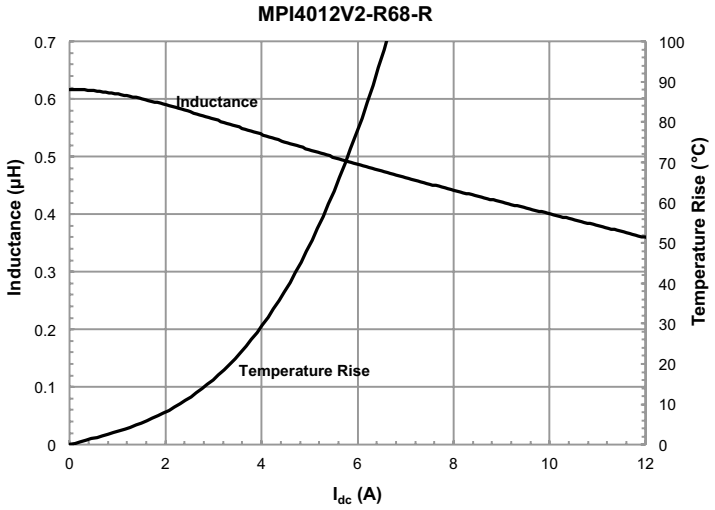


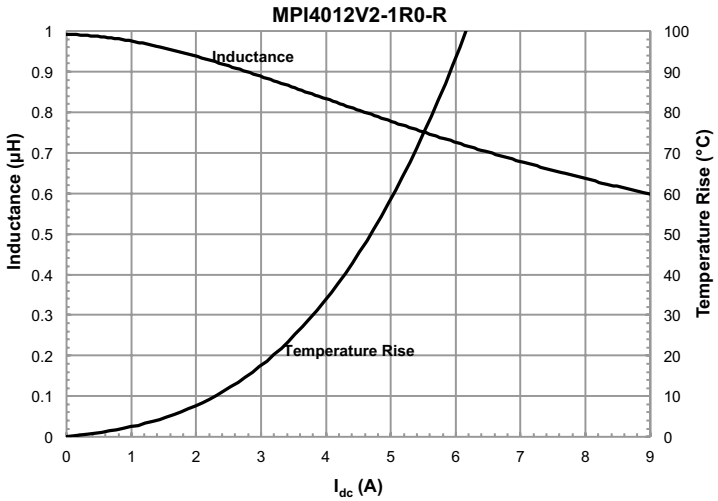


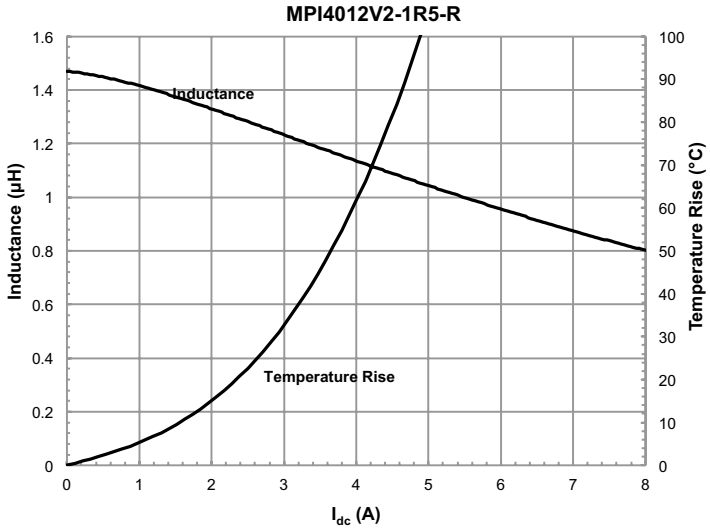
Inductance and temperature rise vs. Current

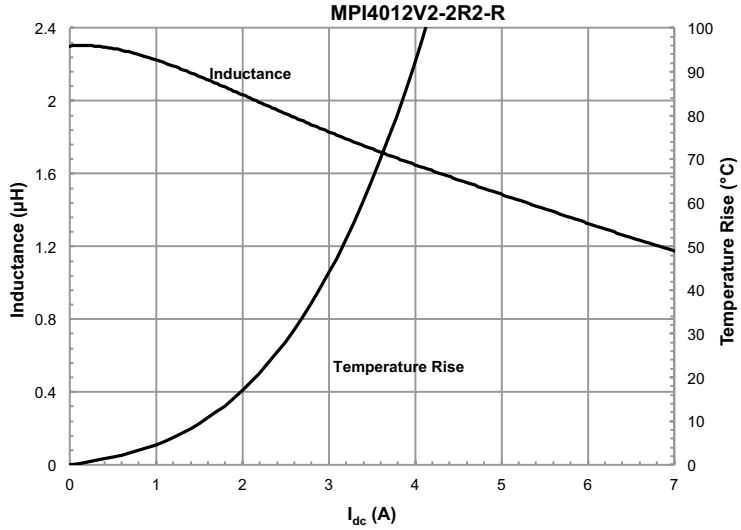




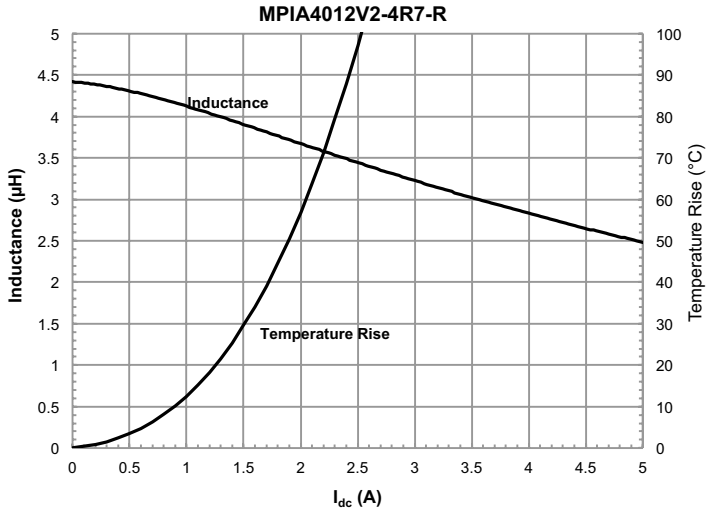


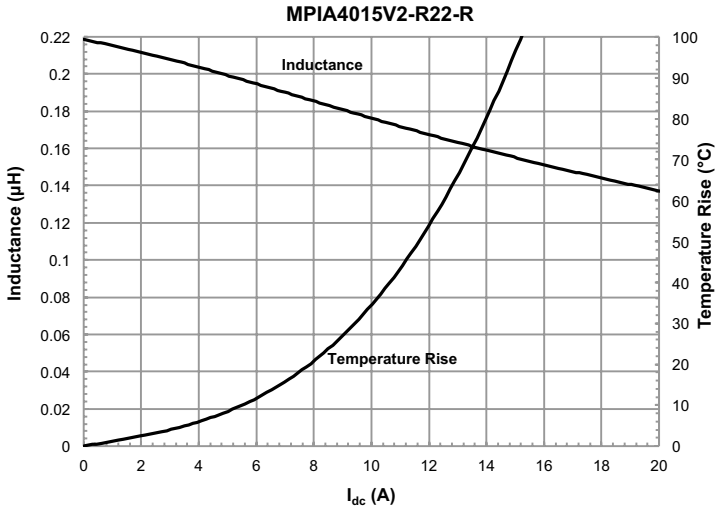


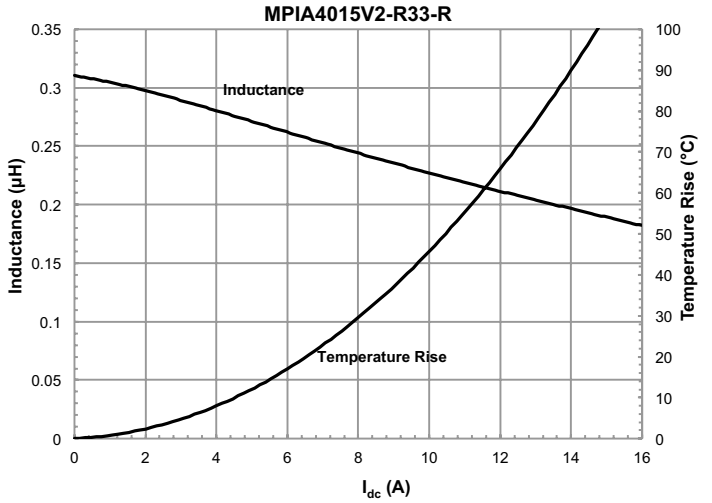


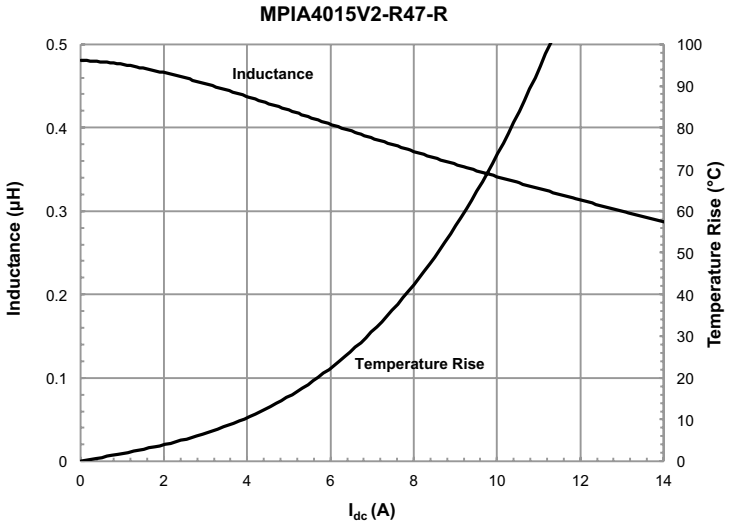


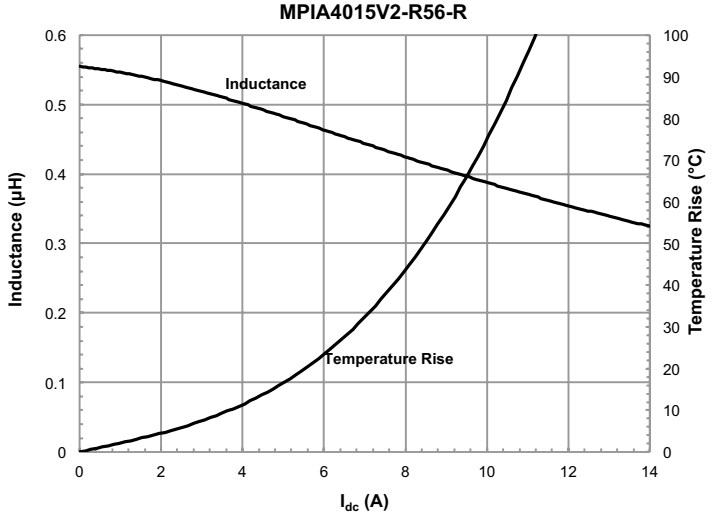
Inductance and temperature rise vs. Current

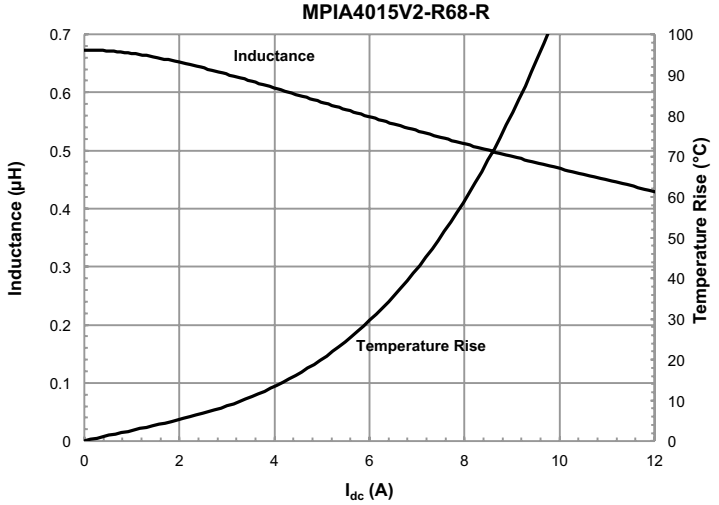




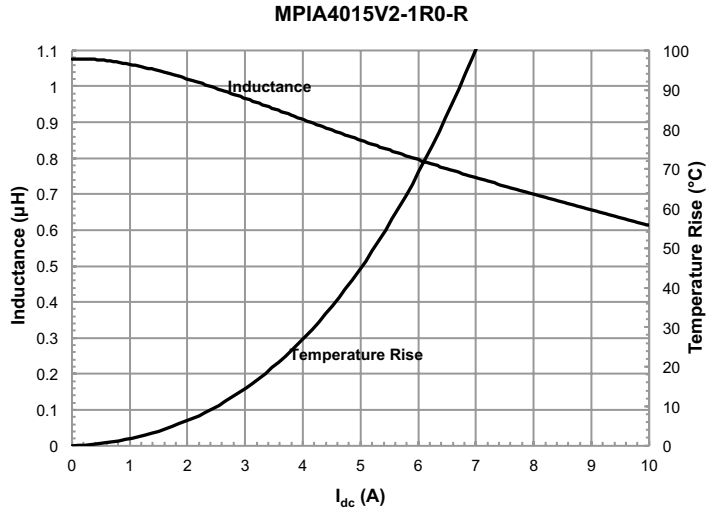


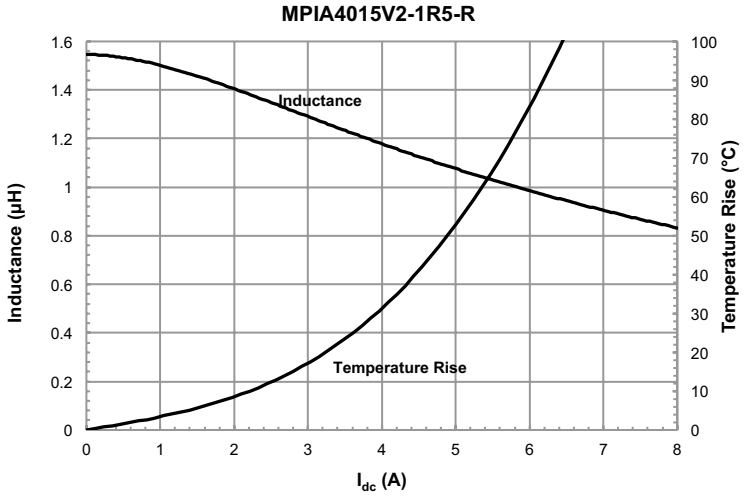


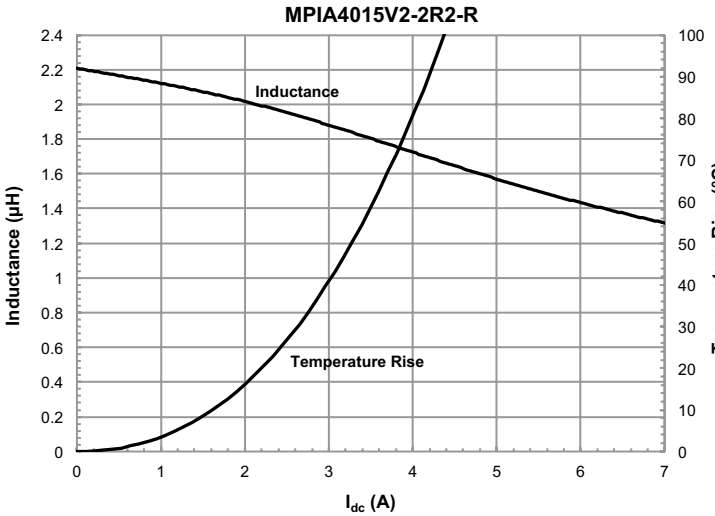


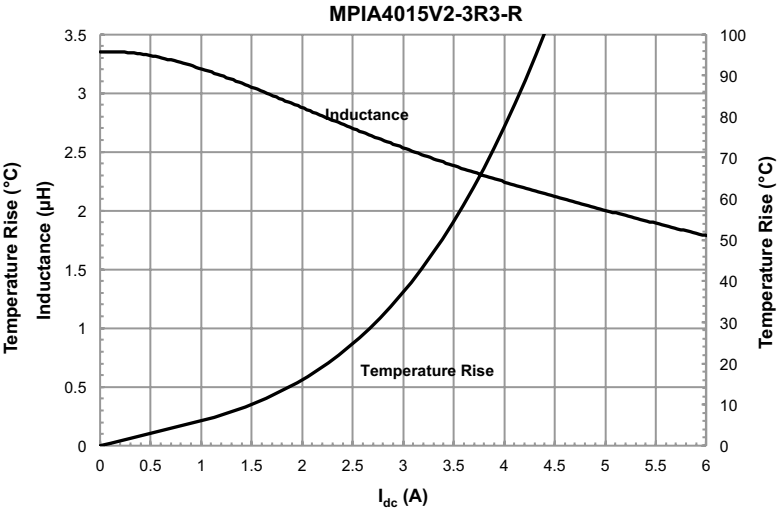


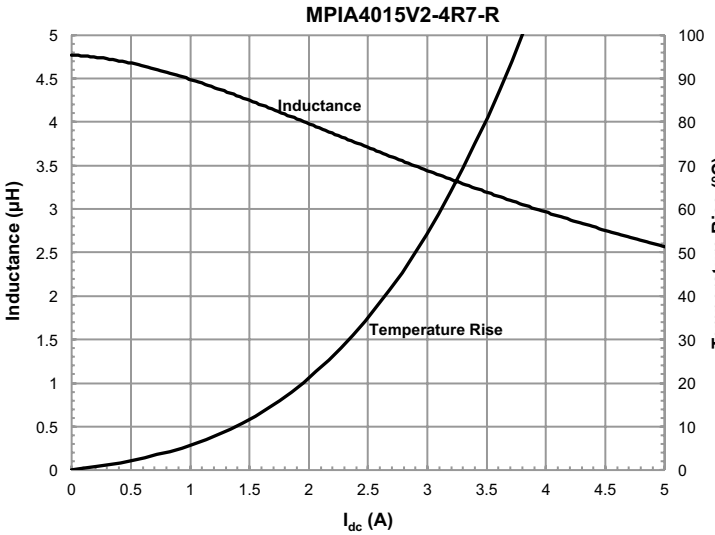
Inductance and temperature rise vs. Current

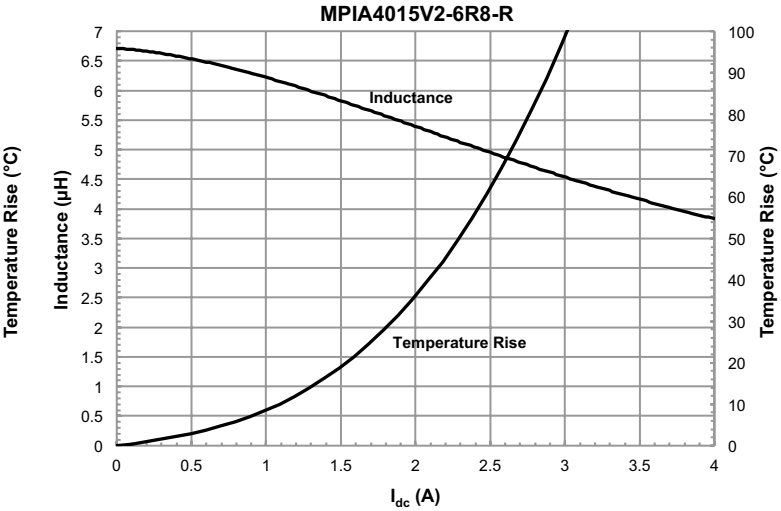




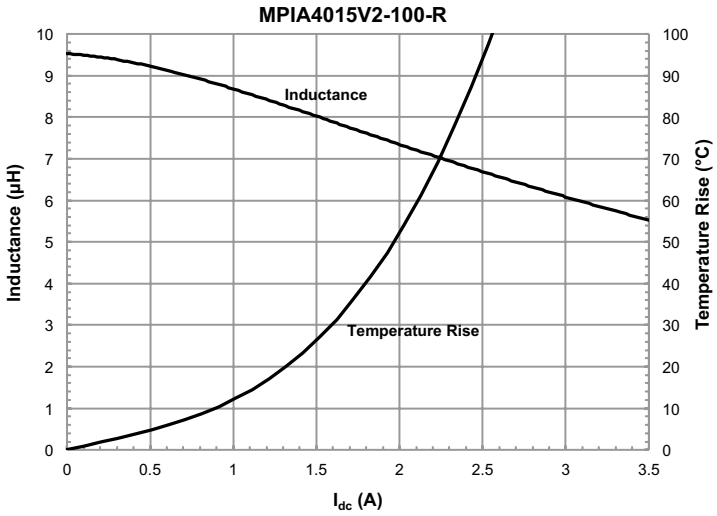


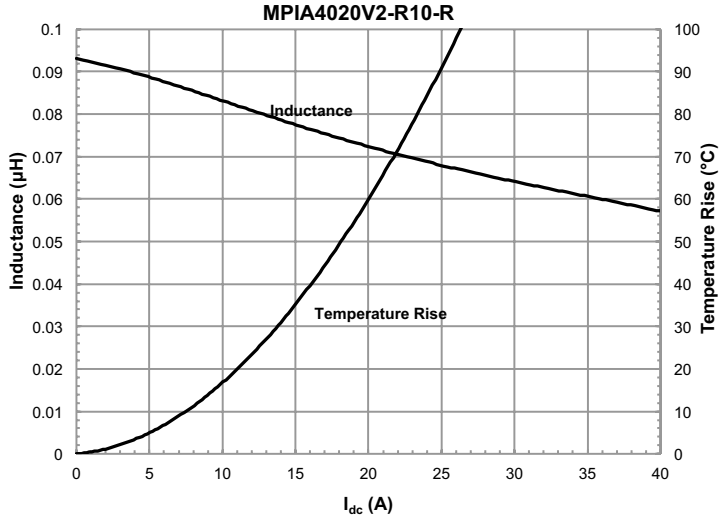


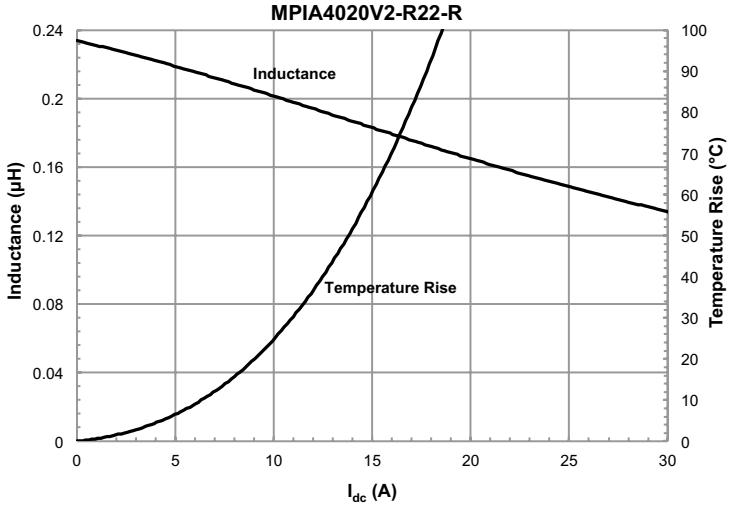


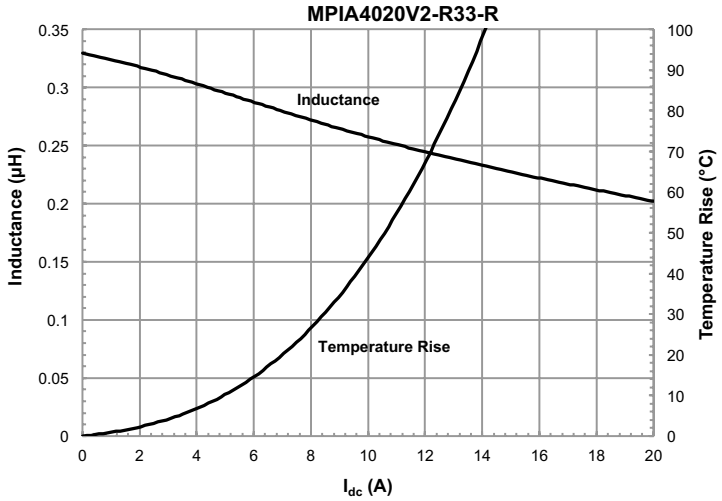


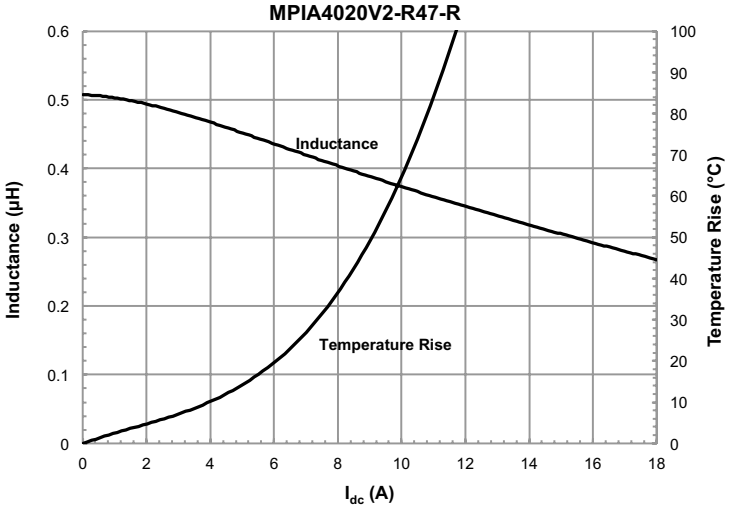
Inductance and temperature rise vs. Current

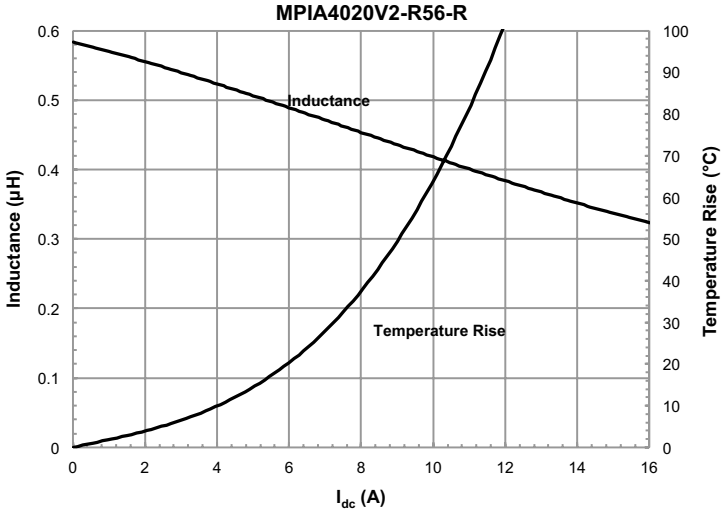




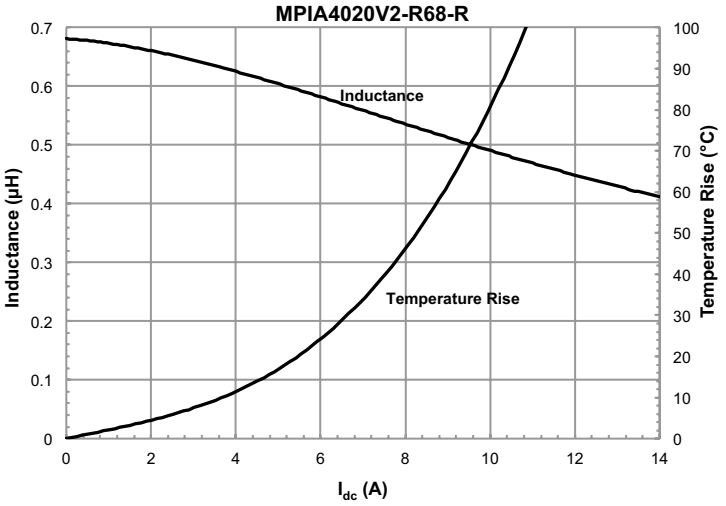


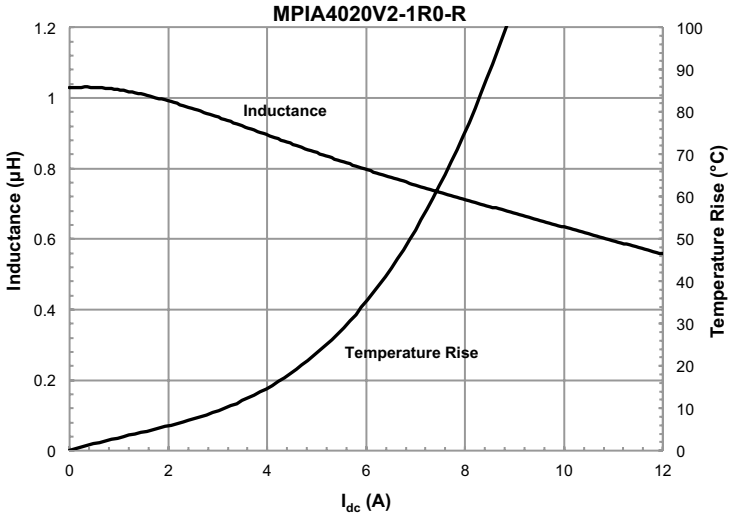


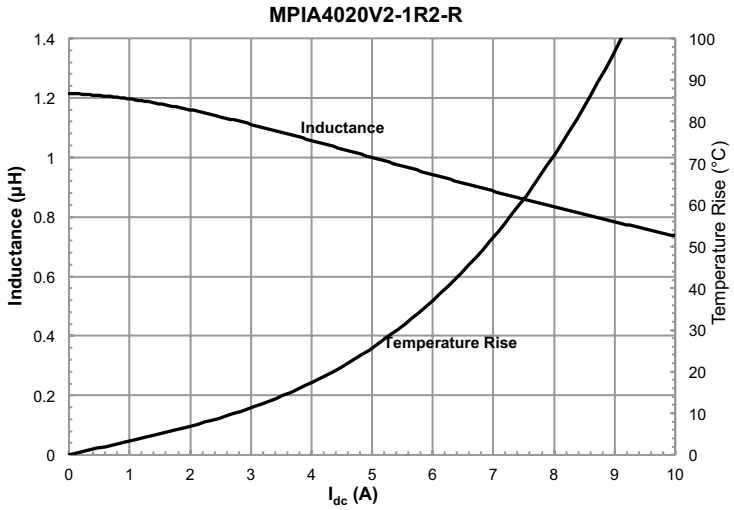


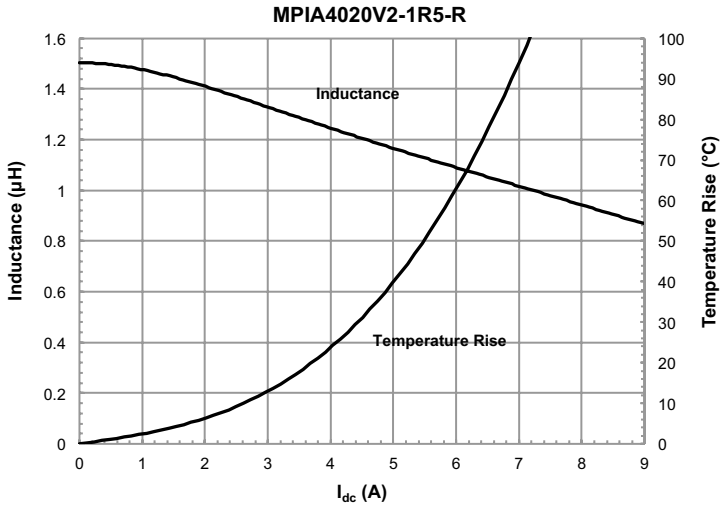


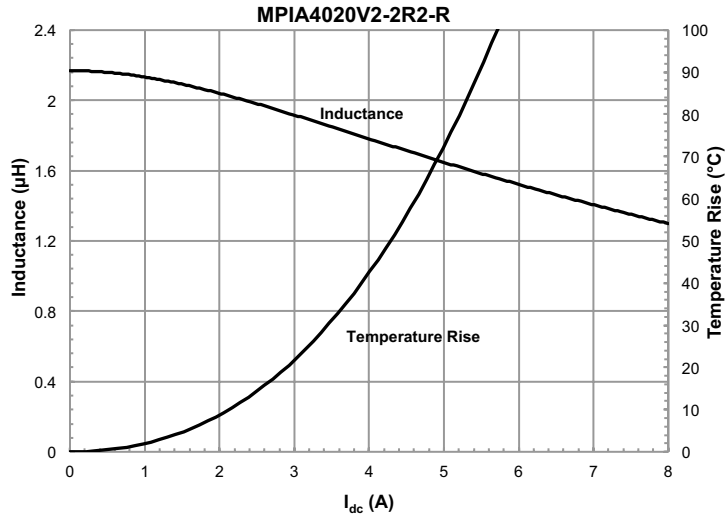
Inductance and temperature rise vs. Current

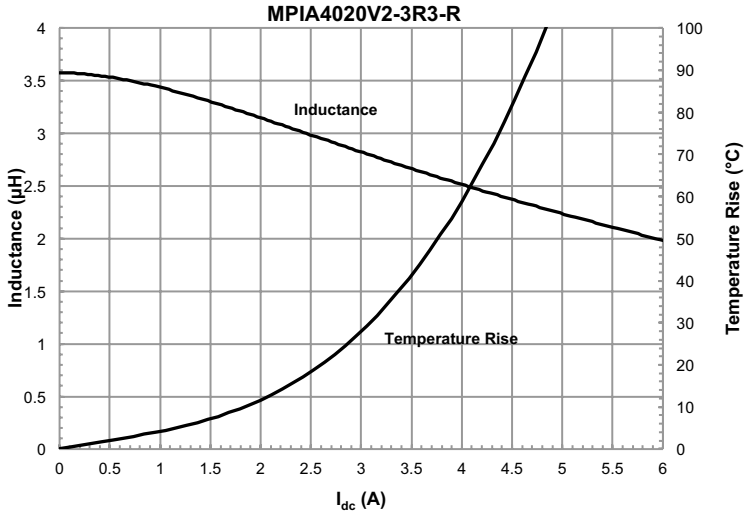




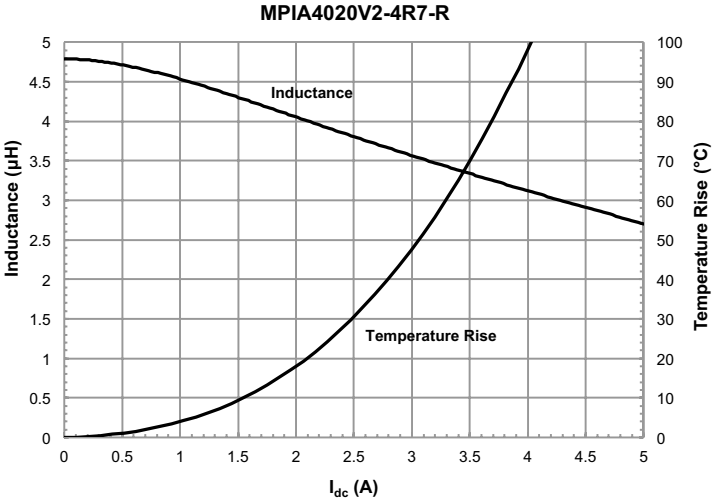


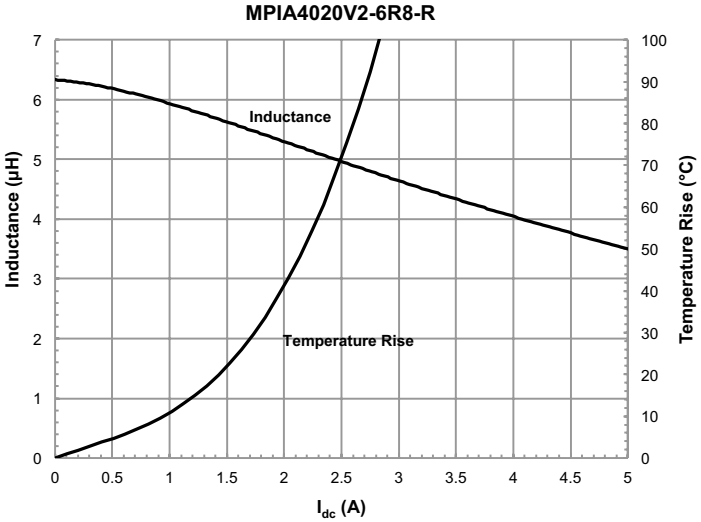


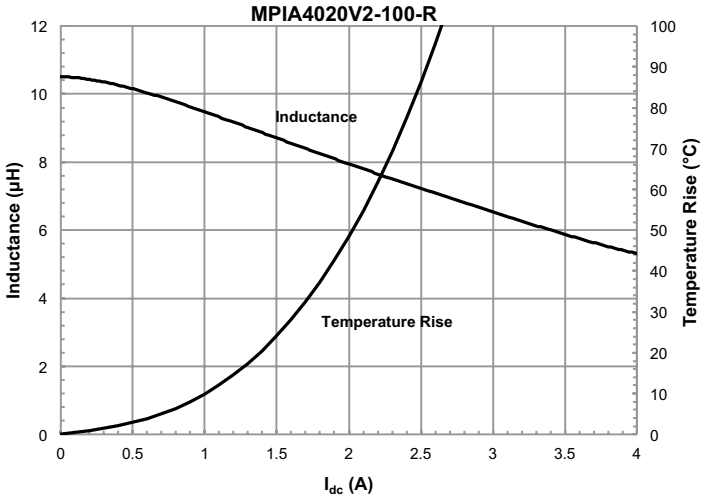


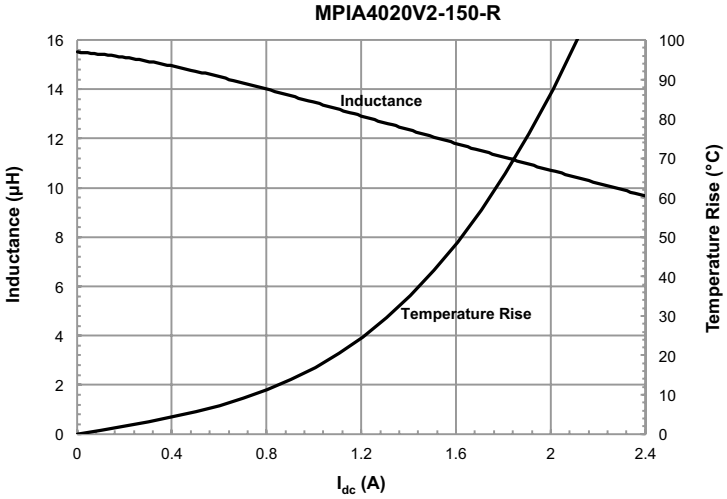


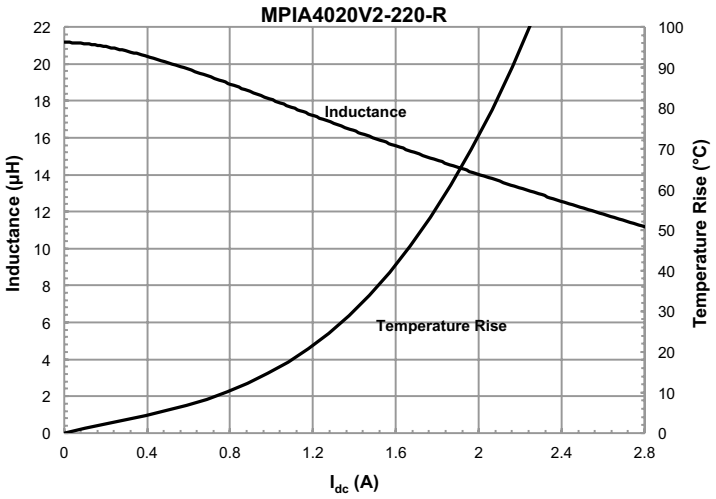
Inductance and temperature rise vs. Current











Solder reflow profile

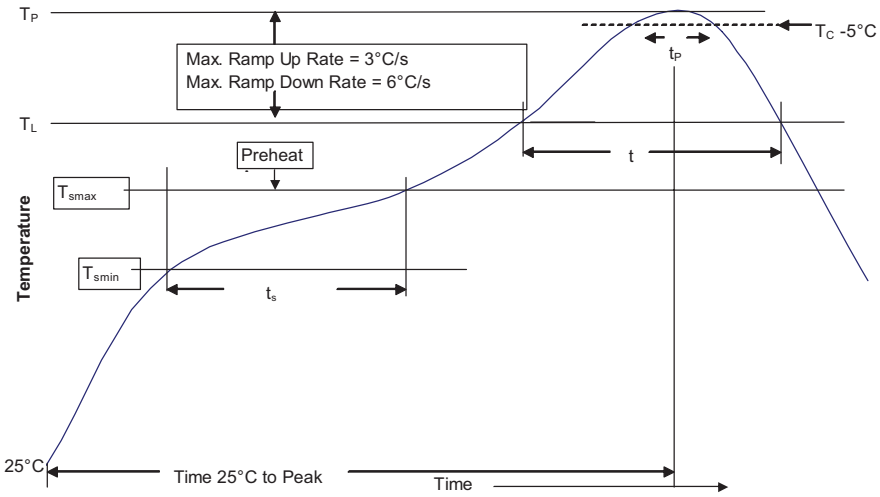


Table 1 - Standard SnPb Solder (T_C)

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-020

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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