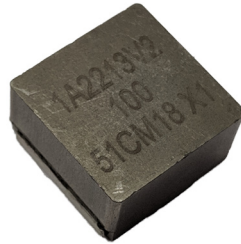


# HCM1A2213V2

## Automotive grade high current power inductors



### Product features

- AEC-Q200 qualified
- High current carrying capacity
- Magnetically shielded, low EMI
- DC-DC converter applications up to 1 MHz
- Filtering applications up to Self Resonant Frequency (SRF) [See product specification table]
- Inductance range from 0.47  $\mu$ H to 100  $\mu$ H
- Current range from 6.4 A to 100 A
- 22.78 mm x 22.30 mm footprint surface mount package in a 13.0 mm height
- Moisture Sensitivity Level (MSL): 1
- Alloy powder core material

### Applications

- Body electronics
  - Central body control module
  - Headlamps, tail lamps and interior lighting and LED lighting
  - Heating ventilation and air conditioning controllers (HVAC)
  - Doors, window lift and seat control
- Advanced driver assistance systems
  - Adaptive cruise control (ACC)
  - Automatic parking control
  - Collision avoidance system/ Car black box system
- Infotainment and cluster electronics
  - Audio subsystem: head unit and trunk amp
  - Digital instrument cluster
  - In-vehicle infotainment (IVI) and navigation
- Chassis and safety electronics
  - Airbag control unit
  - Electronic stability control system (ESC)
  - Electric parking brake
  - Electronic power steering (EPS)/ Anti-locking braking system (ABS)
- Engine and Powertrain Systems
  - Electric pumps, motor control and auxiliaries
  - Powertrain control module (PCU)/ Engine Control unit (ECU)
  - Transmission Control Unit (TCU)

### Environmental data

- Storage temperature range (Component): -55 °C to +155 °C
- Operating temperature range: -55 °C to +155 °C (ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



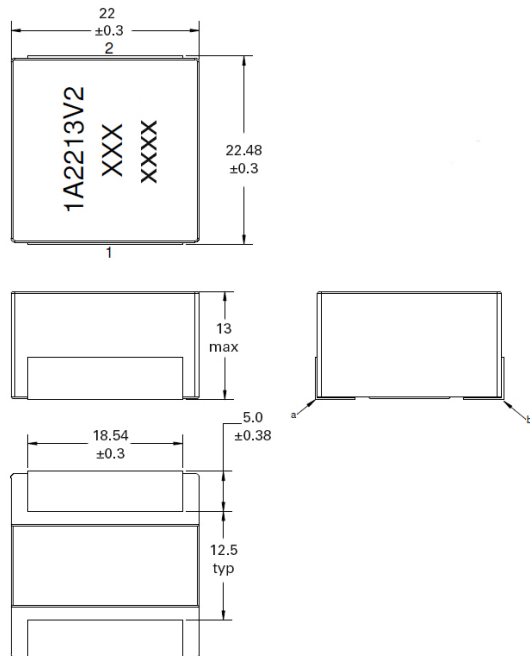
**Product specifications**

Part number <sup>6</sup>	OCL <sup>1</sup> ( $\mu\text{H}$ ) $\pm 20\%$	FLL <sup>2</sup> ( $\mu\text{H}$ ) minimum	$I_{\text{rms}}^3$ (A)	$I_{\text{sat}}^4$ (A)	DCR (m $\Omega$ ) typical @ +20 °C	DCR (m $\Omega$ ) maximum @ +20 °C	SRF (MHz) typical	K-factor <sup>5</sup>
HCM1A2213V2-R47-R	0.47	0.30	66	100	0.40	0.50	52	111
HCM1A2213V2-1R0-R	1.0	0.64	50	71	0.67	0.84	34	53
HCM1A2213V2-2R2-R	2.2	1.41	42.5	48	1.05	1.25	17	33
HCM1A2213V2-3R3-R	3.3	2.11	34	41	1.6	1.77	12	26
HCM1A2213V2-4R7-R	4.7	3.0	33	37	1.68	1.85	10	28
HCM1A2213V2-6R8-R	6.8	4.35	26.5	36	2.5	3.0	9	20
HCM1A2213V2-100-R	10	6.4	20	32.5	3.7	4.1	7	17
HCM1A2213V2-150-R	15	9.6	17	24	4.92	6.0	5	15
HCM1A2213V2-220-R	22	14.1	13.5	16	8.1	10	4	12
HCM1A2213V2-330-R	33	21.1	11	16	13.2	15.5	3	9
HCM1A2213V2-470-R	47	30.1	10	15	15.2	17.7	2	9
HCM1A2213V2-750-R	75	48.0	7.5	10	27.6	32.5	2	6
HCM1A2213V2-820-R	82	52.5	7.0	9.5	29.9	34.3	2	5
HCM1A2213V2-101-R	100	64.0	6.4	8.0	36.0	39.5	1.9	5

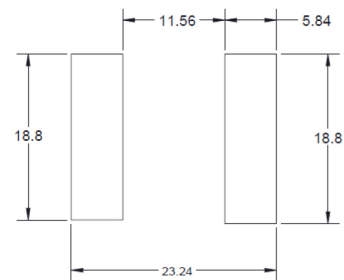
1. Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 V<sub>rms</sub>, 0.0 Adc, +25 °C
2. Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 V<sub>rms</sub>, I<sub>sat</sub>, +25 °C
3. I<sub>rms</sub>: DC current for an approximate temperature rise of 30 °C without core loss. Derating 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 +155 °C under worst case operating conditions verified in the end application.

4. I<sub>sat</sub>: Peak current for approximately 20% rolloff @ +25 °C
5. K-factor: Used to determine B<sub>pp</sub> for core loss (see graph). B<sub>p-p</sub> = K \* L \*  $\Delta I$ . B<sub>pp</sub>: (Gauss), K: (K-factor from table), L: (Inductance in  $\mu\text{H}$ ),  $\Delta I$  (Peak to peak ripple current in Amps).
6. Part Number Definition: HCM1A2213V2-xxx-R  
 HCM1A2213V2 = Product code and size  
 xxx= inductance value in  $\mu\text{H}$ , R= decimal point,  
 If no R is present then last character equals number of zeros  
 -R suffix = RoHS compliant

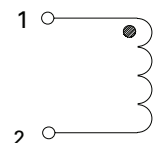
**Dimensions (mm)**



**Recommended pad layout**



**Schematic**

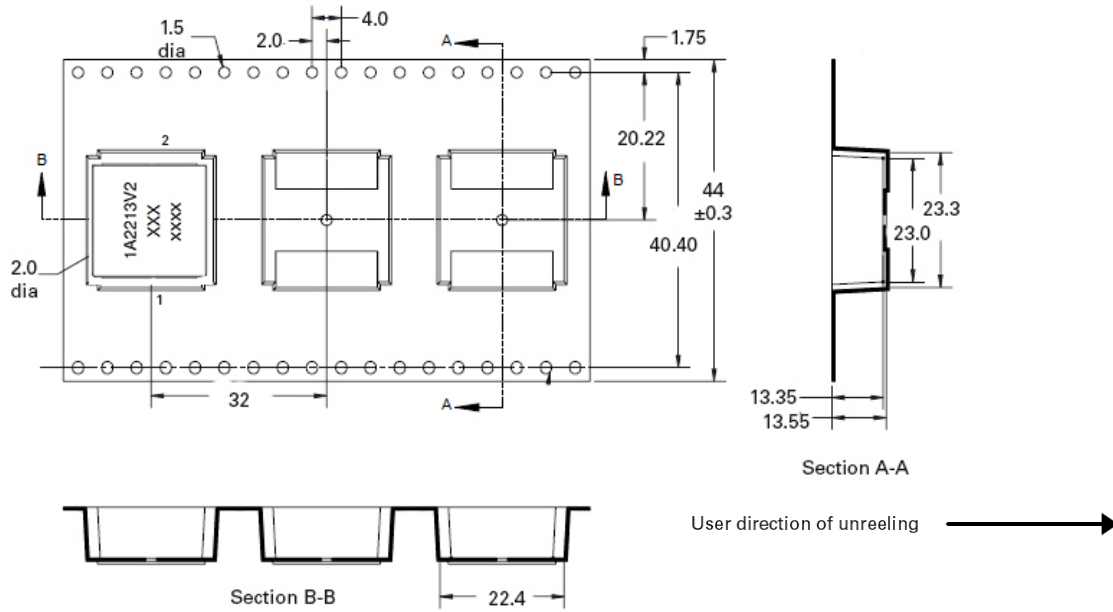


Part marking: 1A2213V2, xxx=inductance value in uH, R=decimal point. If no R is present then last character equals number of zeros. xxxx=Lot code  
 All soldering surfaces to be coplanar within 0.1 millimeters  
 Tolerances are  $\pm 0.3$  millimeters unless stated otherwise  
 Pad layout tolerances are  $\pm 0.1$  millimeters unless stated otherwise  
 DCR measured from point "a" to point "b"  
 Do not route traces or vias underneath the inductor

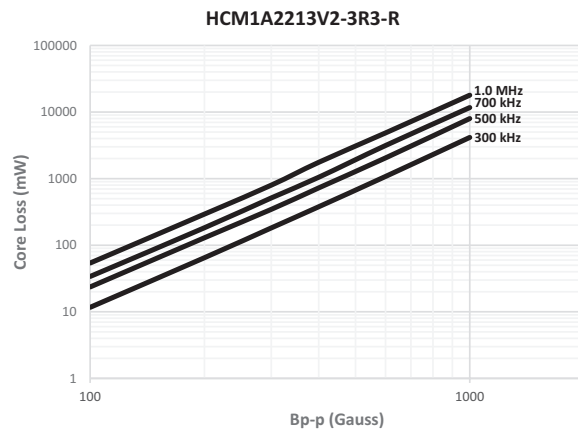
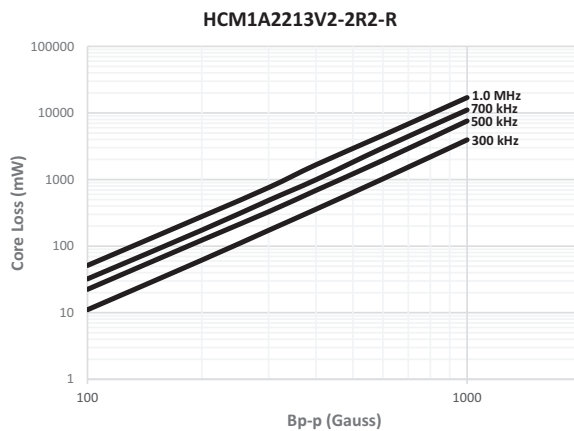
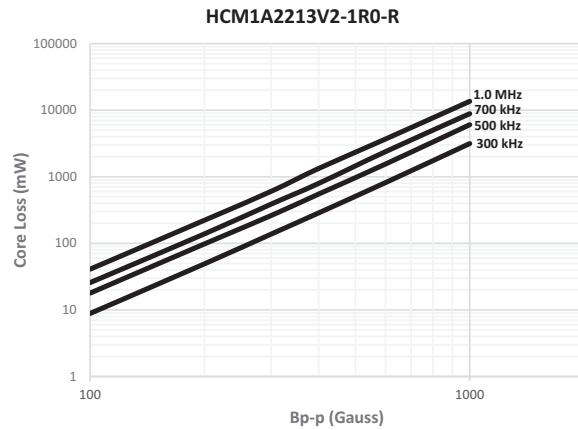
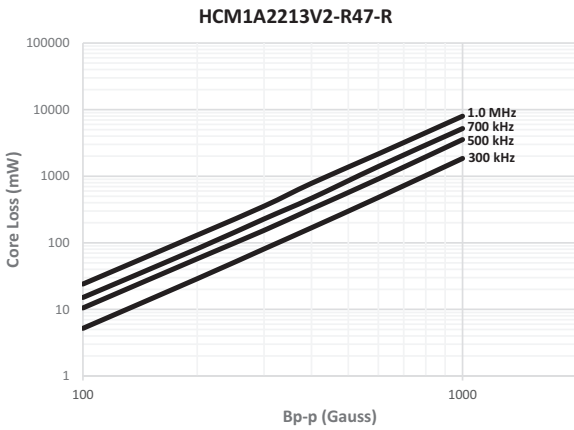
**Packaging information (mm)**

Drawing not to scale

Supplied in tape and reel packaging, 100 parts per 13" diameter reel

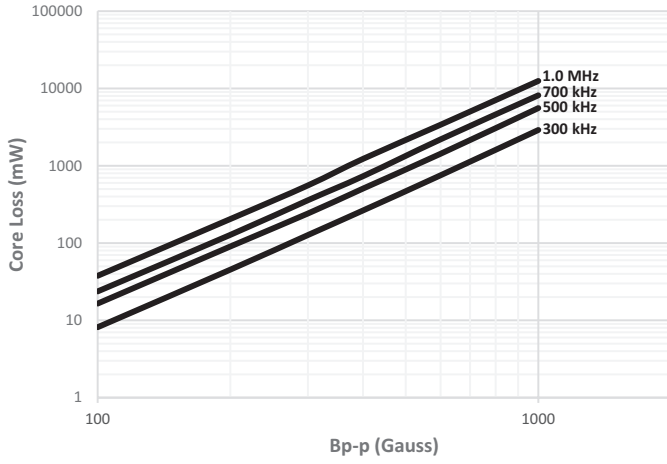


**Core loss vs  $B_{p-p}$**

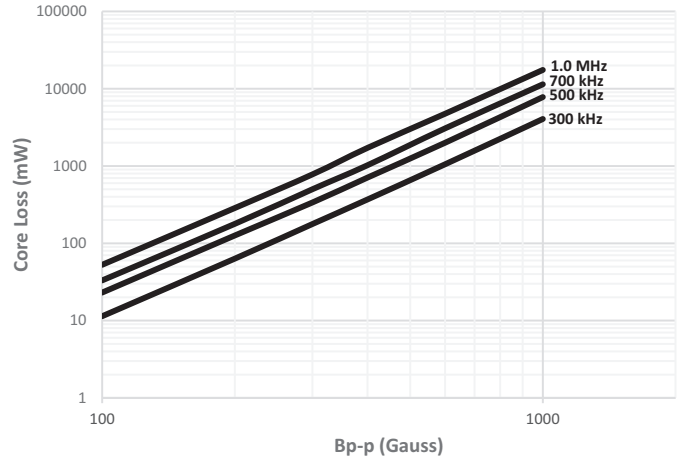


Core loss vs  $B_{p-p}$

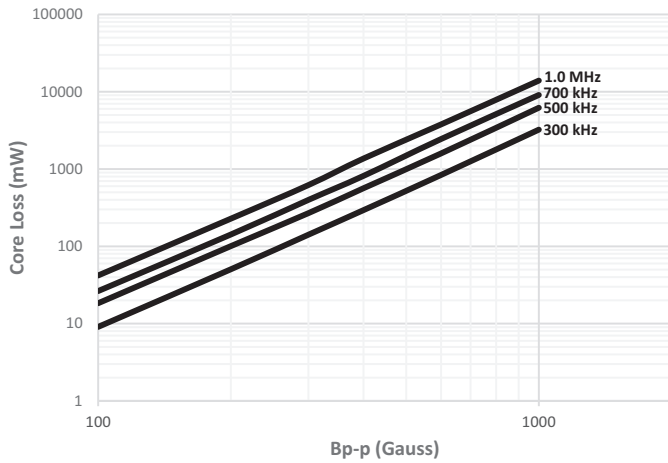
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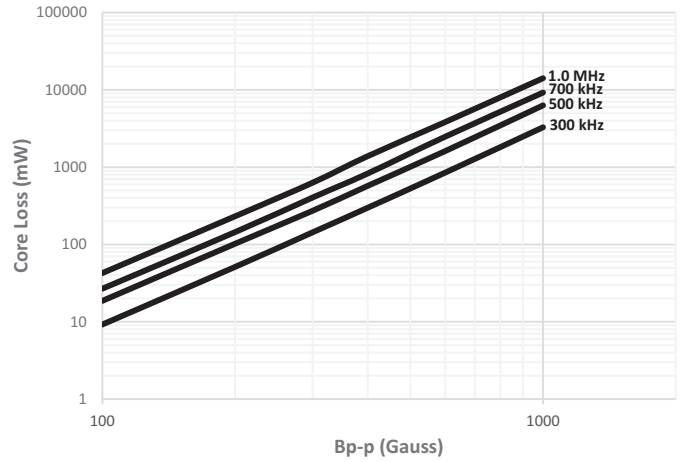
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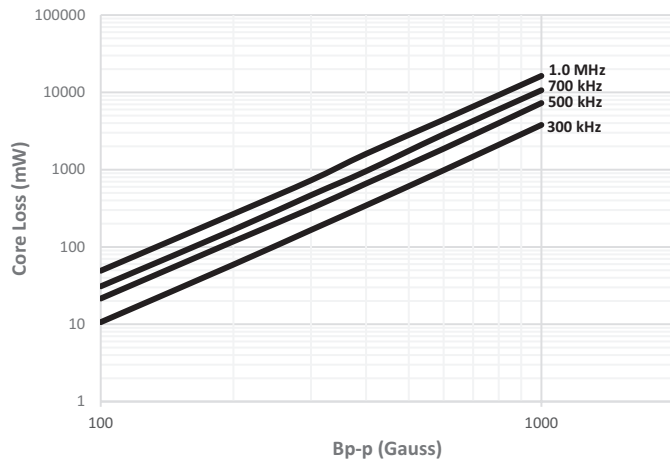
HCM1A2213V2-100-R



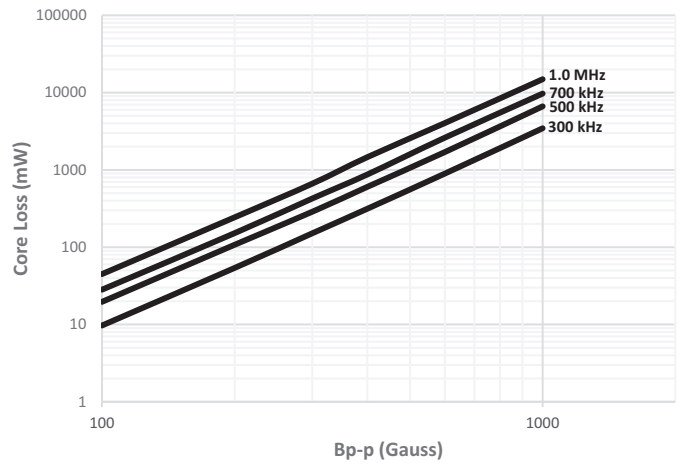
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HCM1A2213V2-220-R

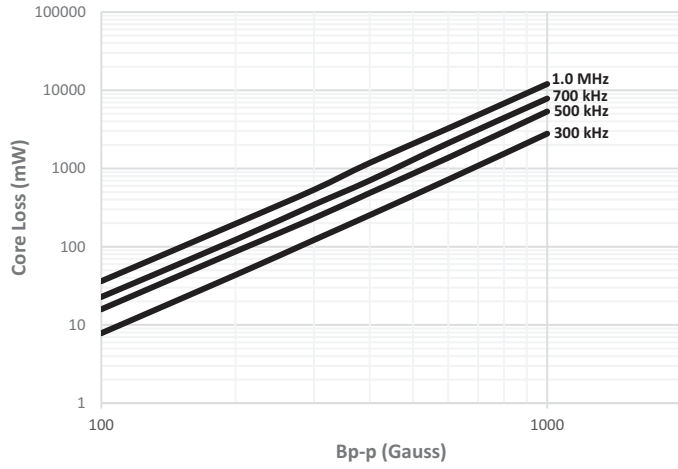


HCM1A2213V2-330-R

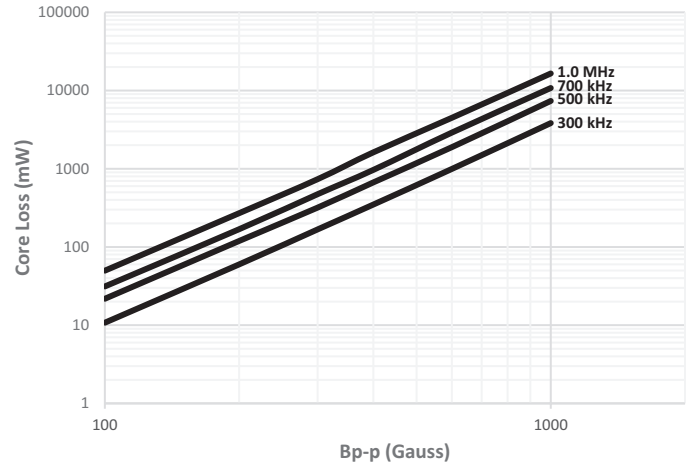


Core loss vs  $B_{p-p}$

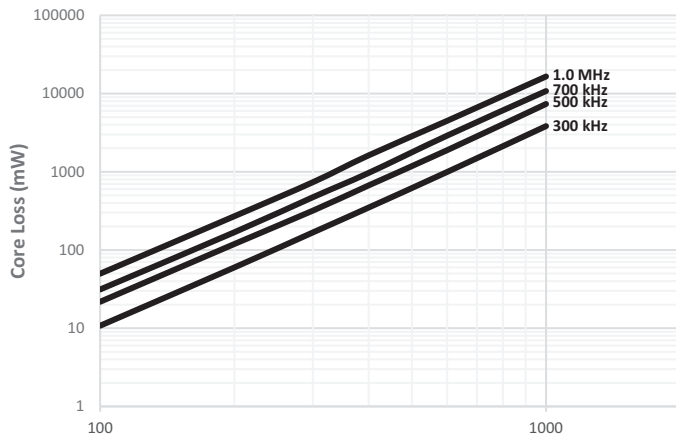
HCM1A2213V2-470-R



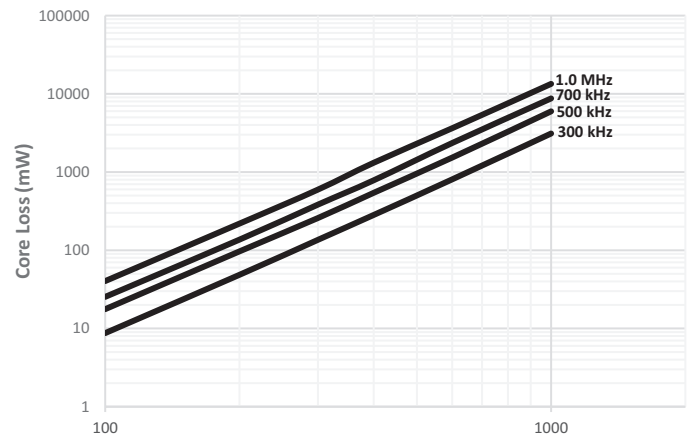
HCM1A2213V2-750-R



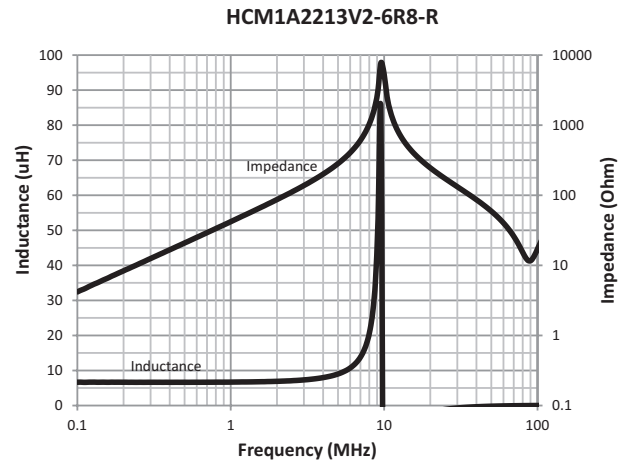
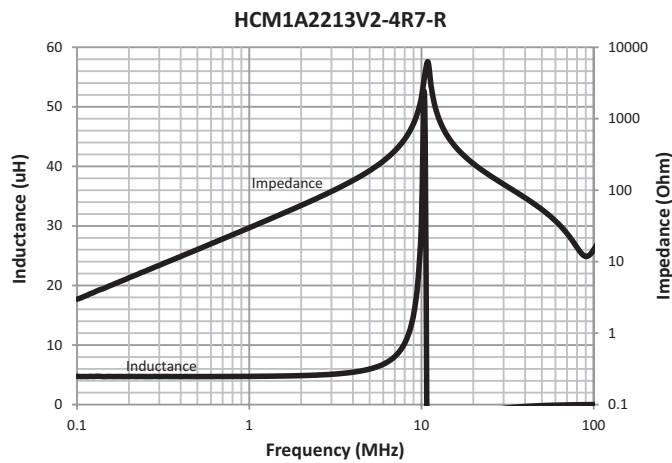
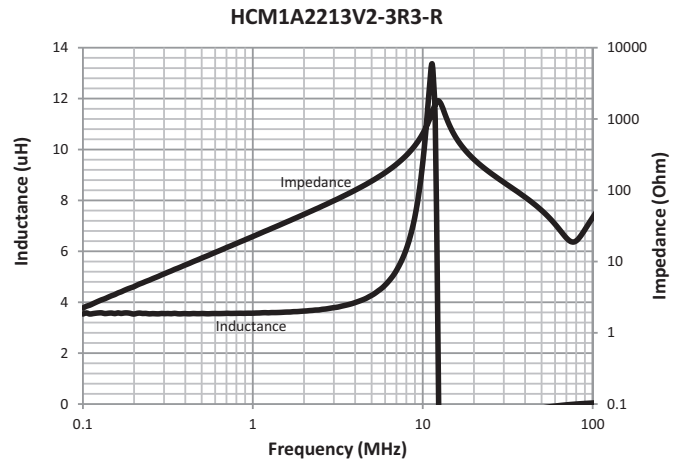
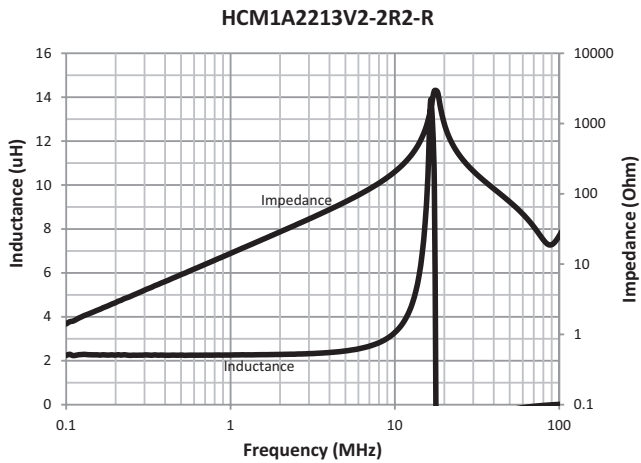
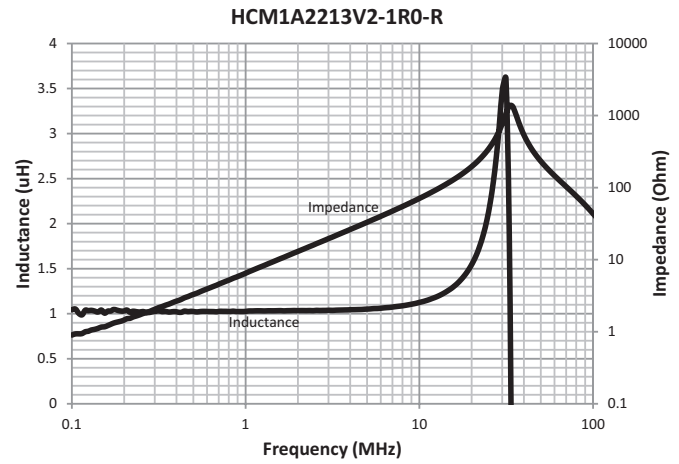
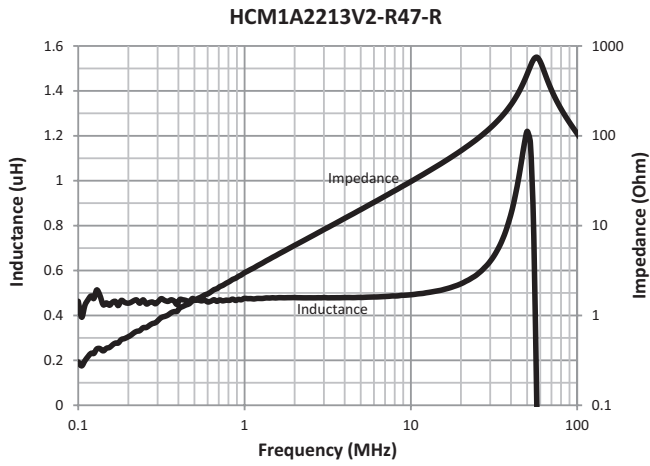
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HCM1A2213V2-101-R

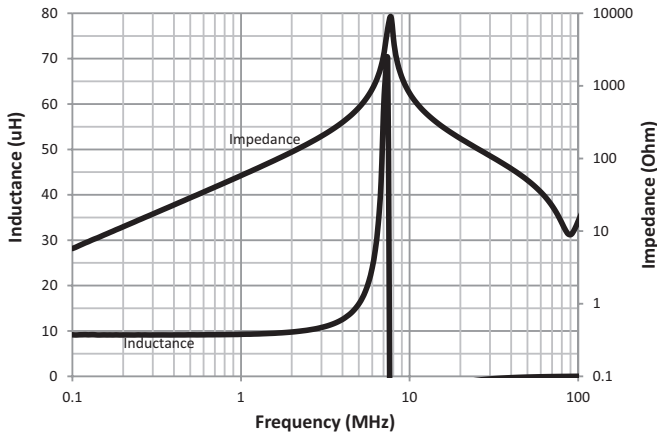


Inductance and impedance vs. frequency

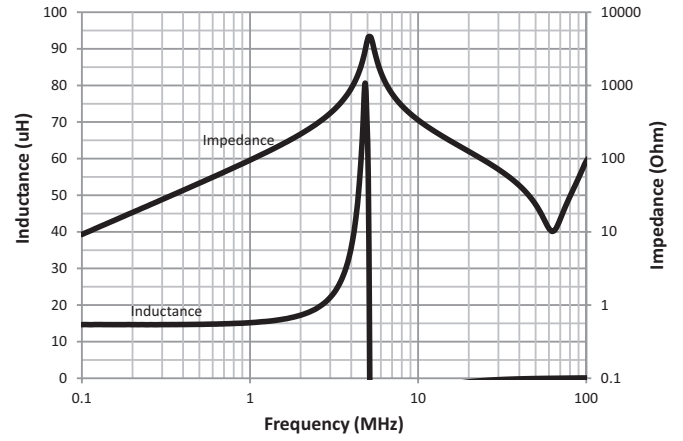


Inductance and impedance vs. frequency

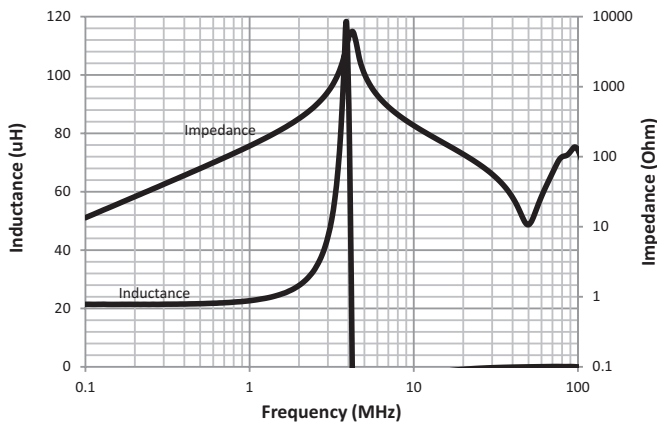
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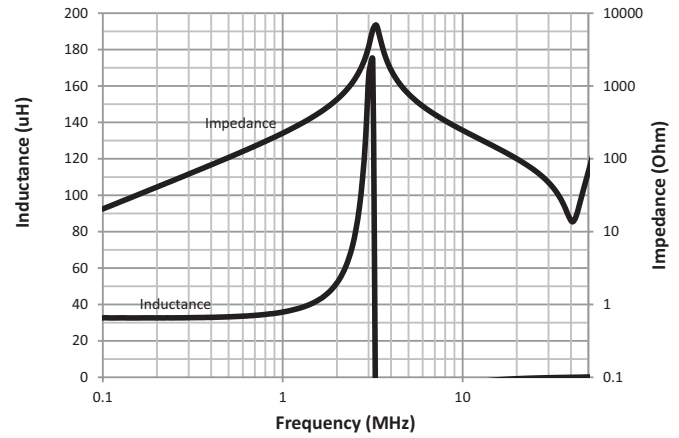
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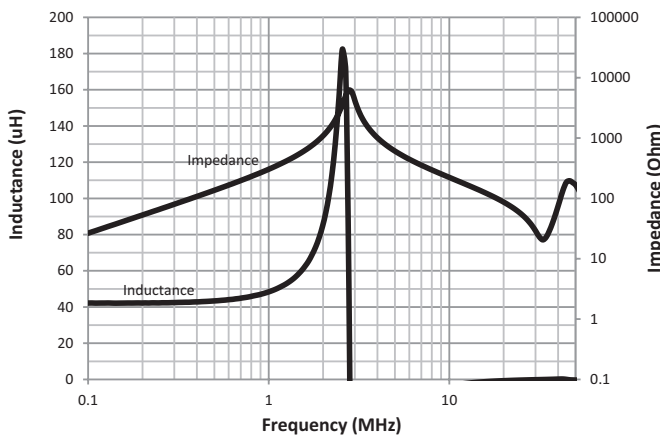
HCM1A2213V2-220-R



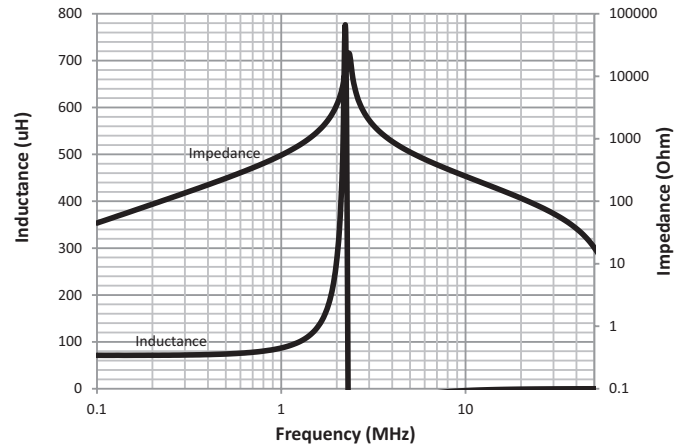
HCM1A2213V2-330-R



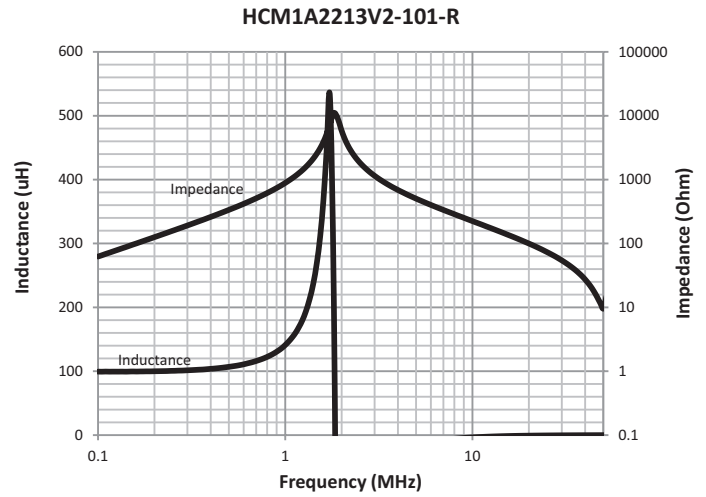
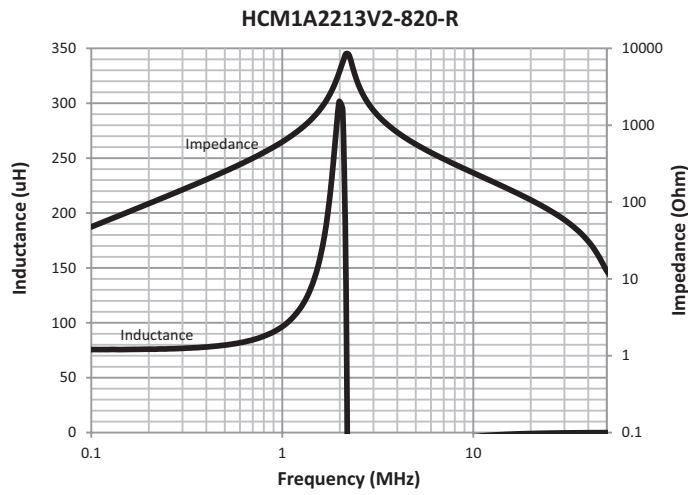
HCM1A2213V2-470-R



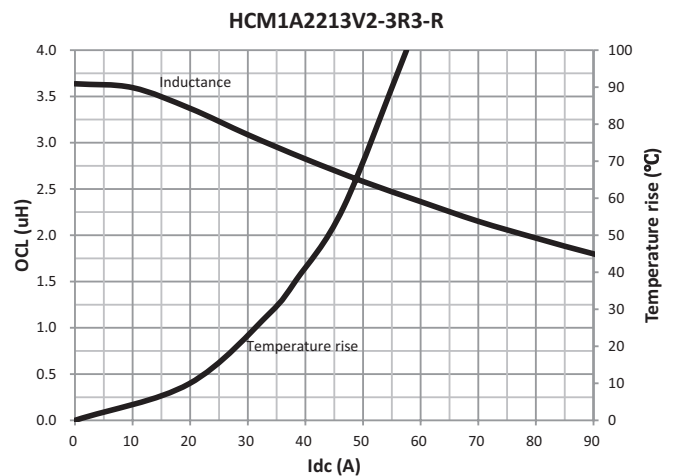
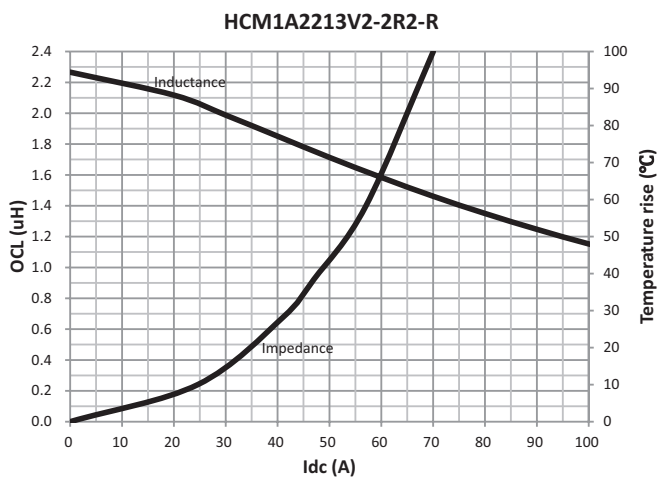
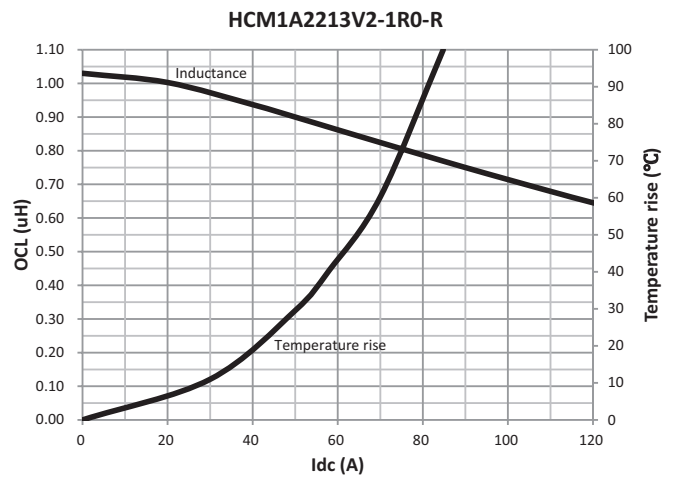
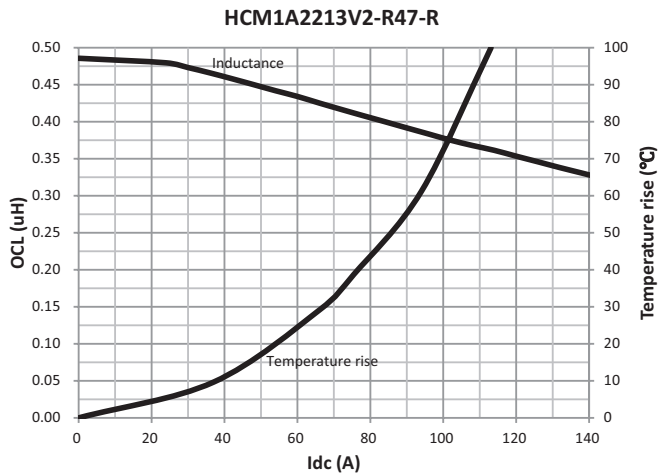
HCM1A2213V2-750-R



Inductance and impedance vs. frequency

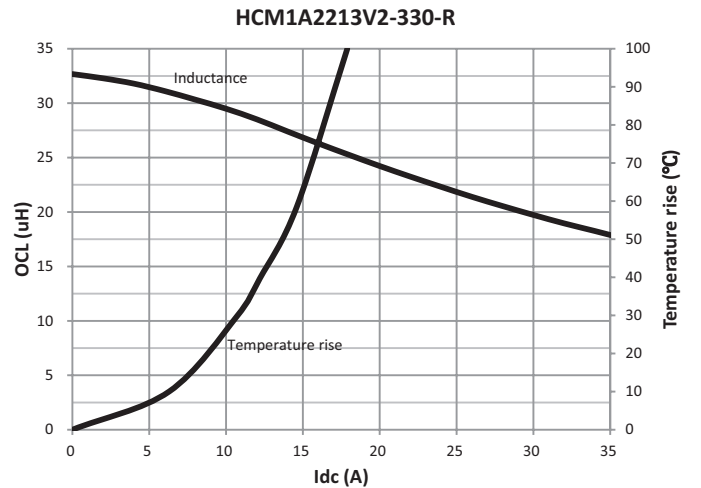
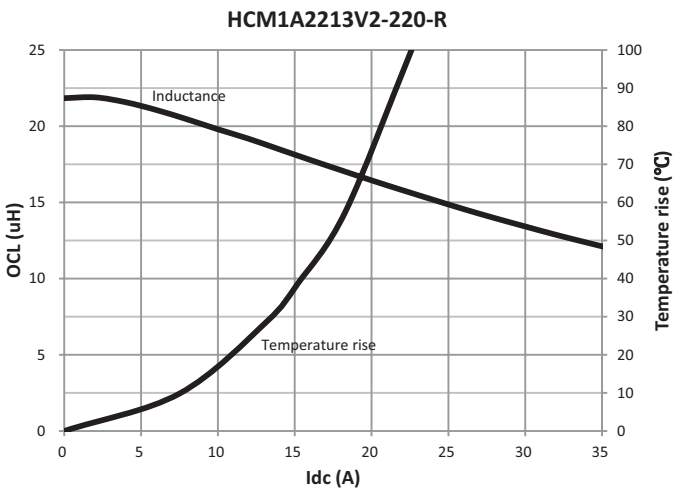
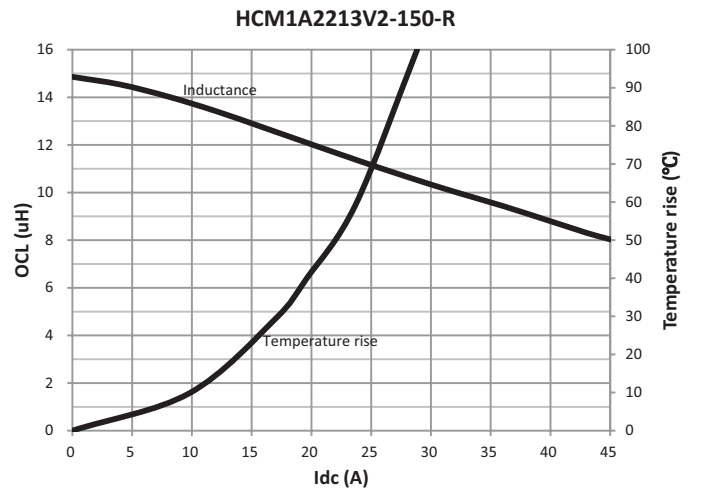
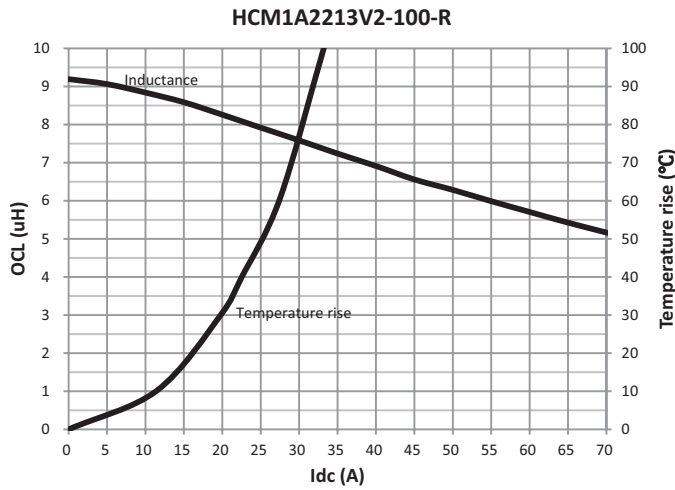
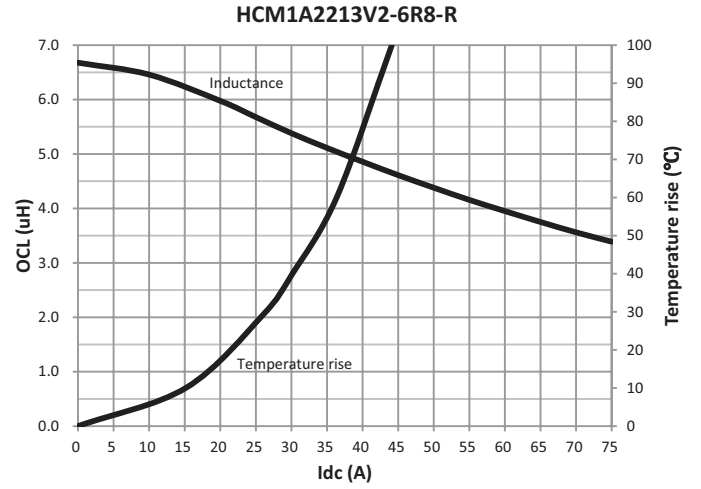
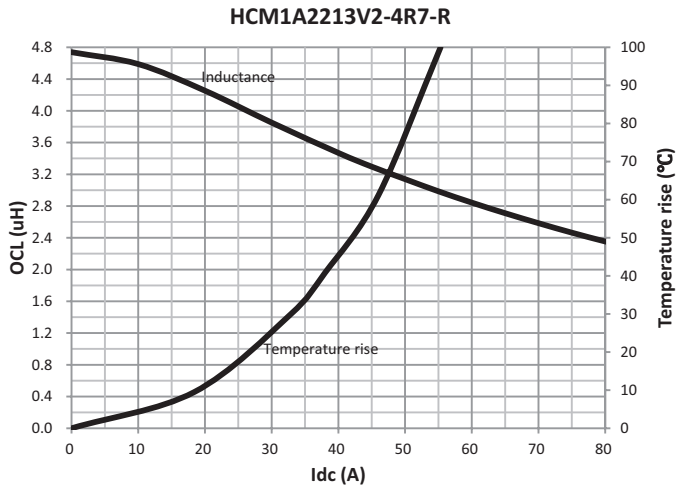


Inductance and temperature rise vs. current

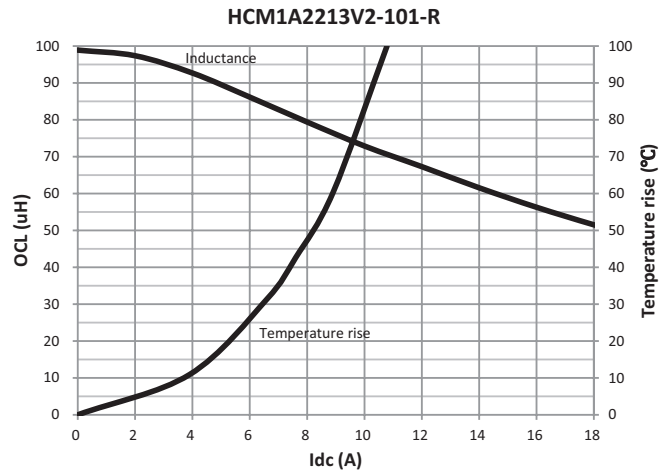
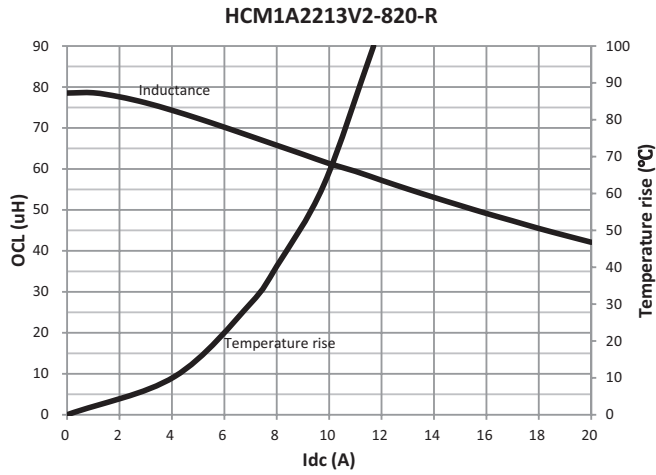
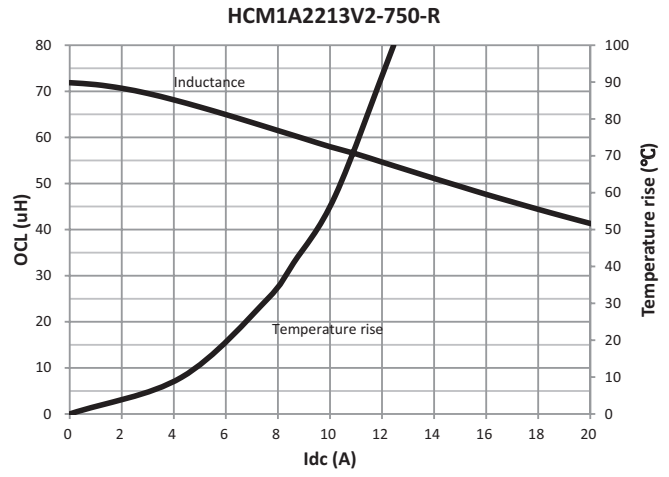
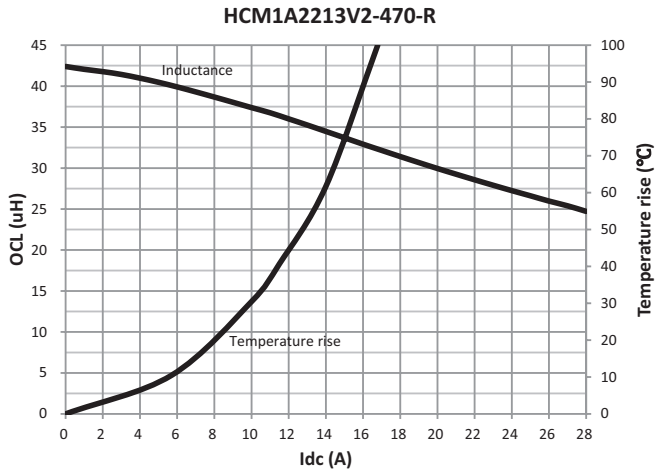




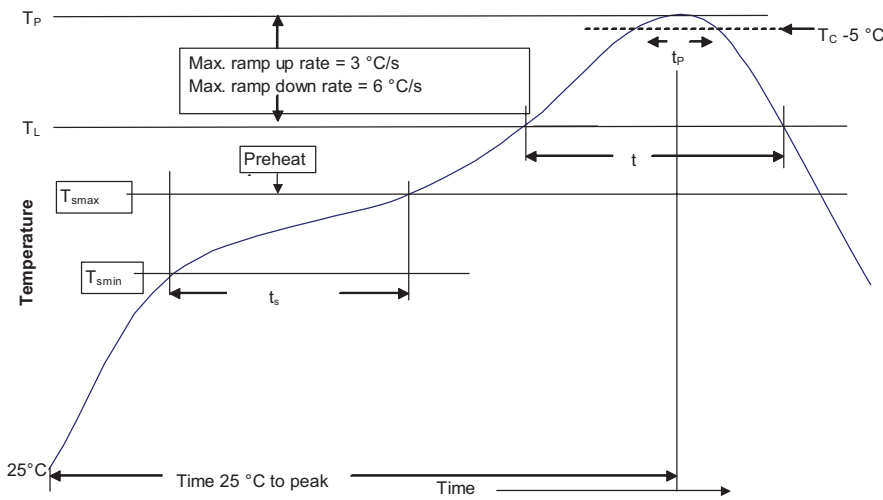
Inductance and temperature rise vs. current



Inductance and temperature rise vs. current



**Solder reflow profile**



**Table 1 - Standard SnPb solder ( $T_C$ )**

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

**Table 2 - Lead (Pb) free solder ( $T_C$ )**

Package thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350 - 2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	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 ( $T_L$ )	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.

Life Support Policy: Eaton 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.

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