

# HCM1A1 104V2

## 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 0.20  $\mu$ H to 68  $\mu$ H
- Current range from 2.2 A to 60 A
- 11.2 mm x 10.3 mm footprint surface mount package in a 4.0 mm height
- Moisture Sensitivity Level (MSL): 1
- Alloy powder core material

### Applications

- Body electronics
  - Central body control module
  - Vehicle access control system
  - 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
  - Port power/USB HUB for front and rear passengers
- Chassis and safety electronics
  - Airbag control unit
  - Electronic stability control system (ESC)
  - Electric parking brake
- 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



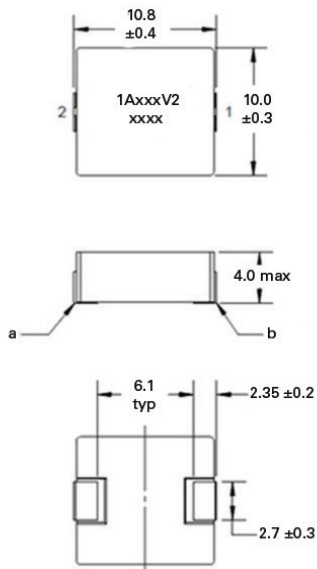
Product specifications

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>
HCM1A1104V2-R20-R	0.20	0.13	43	60	0.63	0.72	150	726
HCM1A1104V2-R36-R	0.36	0.23	26	33	1.04	1.20	80	493
HCM1A1104V2-R45-R	0.45	0.29	25	40	1.07	1.23	85	450
HCM1A1104V2-R47-R	0.47	0.30	25	35	1.10	1.27	73	450
HCM1A1104V2-R56-R	0.56	0.36	22.5	24	1.56	1.80	62	469
HCM1A1104V2-R90-R	0.90	0.58	20	22	2.17	2.5	49	361
HCM1A1104V2-1R0-R	1.0	0.64	19	25	2.7	3.1	38	303
HCM1A1104V2-1R5-R	1.5	0.96	14	22	3.8	4.2	33	281
HCM1A1104V2-2R2-R	2.2	1.41	10.5	16	6.0	7.0	25	432
HCM1A1104V2-3R3-R	3.3	2.11	8.2	11.5	9.9	11.4	19	215
HCM1A1104V2-4R7-R	4.7	3.01	8.0	10.8	13.2	15	15	309
HCM1A1104V2-5R6-R	5.6	3.58	7.5	9.0	14	17	14	160
HCM1A1104V2-6R8-R	6.8	4.35	6.4	9.0	16	19	12	149
HCM1A1104V2-100-R	10	6.40	6.0	6.0	27	30	10	131
HCM1A1104V2-150-R	15	9.60	4.7	4.6	40	45	6.8	132
HCM1A1104V2-220-R	22	14.1	3.8	4.6	58	65	6.5	77
HCM1A1104V2-330-R	33	21.1	3.3	4.6	89	102	5.0	55
HCM1A1104V2-470-R	47	30.1	2.7	3.6	147	165	3.9	63
HCM1A1104V2-680-R	68	43.5	2.2	3.0	190	210	3.1	39

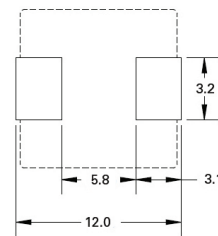
1. Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 V<sub>ac</sub>, 0.0 Adc, +25 °C
2. Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 V<sub>max</sub>, I<sub>sat</sub>, +25 °C
3. I<sub>rms</sub>: DC current for an approximate temperature rise of 30 °C without core loss. Derating 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>pp</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: HCM1A1104V2-xxx-R  
HCM1A1104V2 = 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

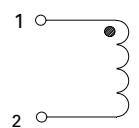
Dimensions (mm)



Recommended pad layout



Schematic

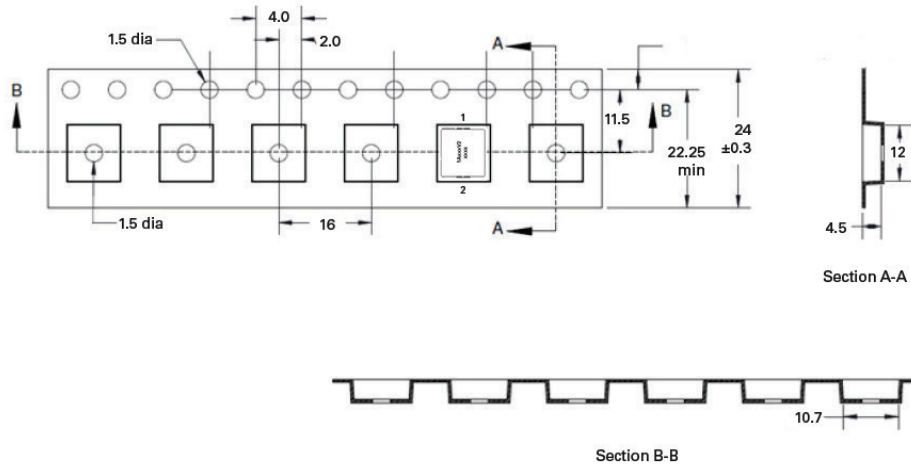


Part marking: 1AxxxV2, xxx=inductance value in  $\mu\text{H}$ , R=decimal point. If no R is present then last character equals number of zeros. xxxx=Lot code  
All soldering surfaces to be coplanar within 0.1 millimeters  
Tolerances are  $\pm 0.3$  millimeters unless stated otherwise  
Pad layout tolerances 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

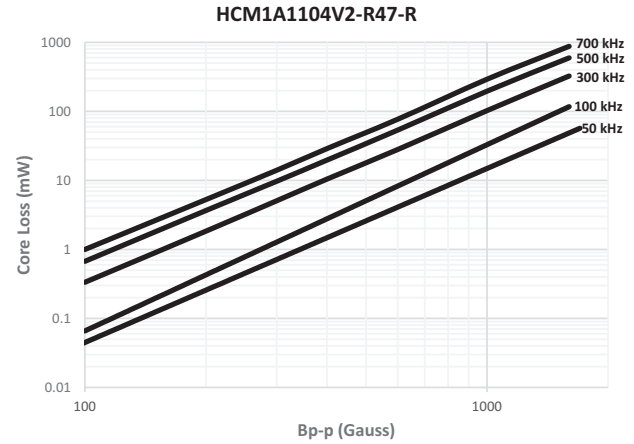
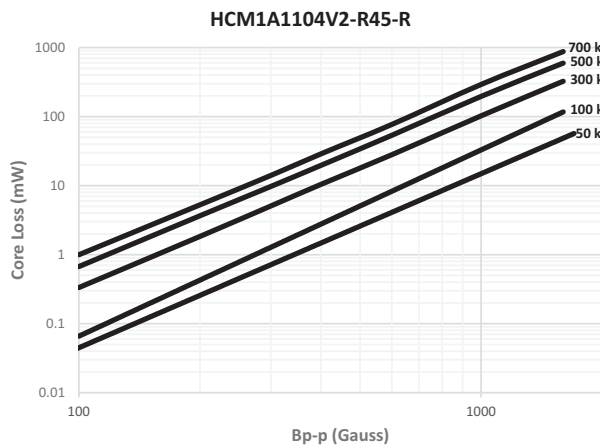
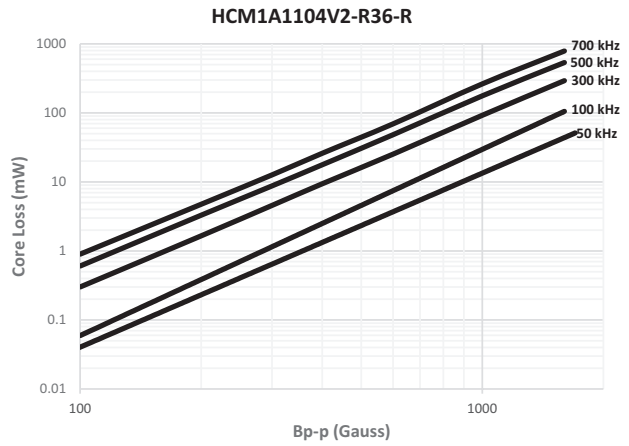
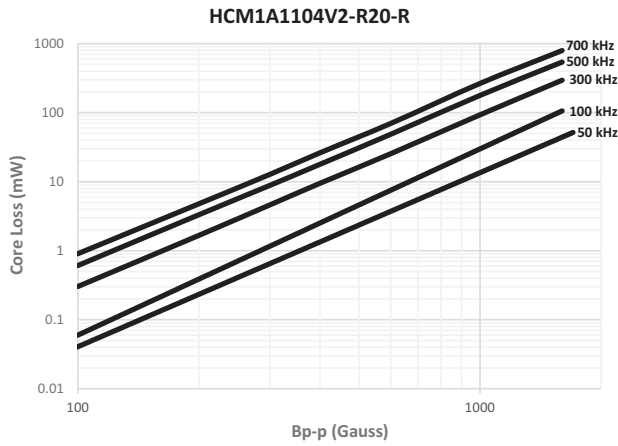
**Packaging information (mm)**

Drawing not to scale

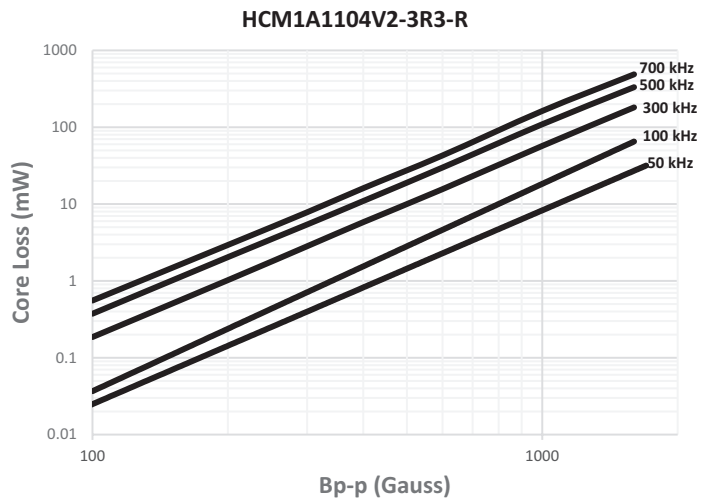
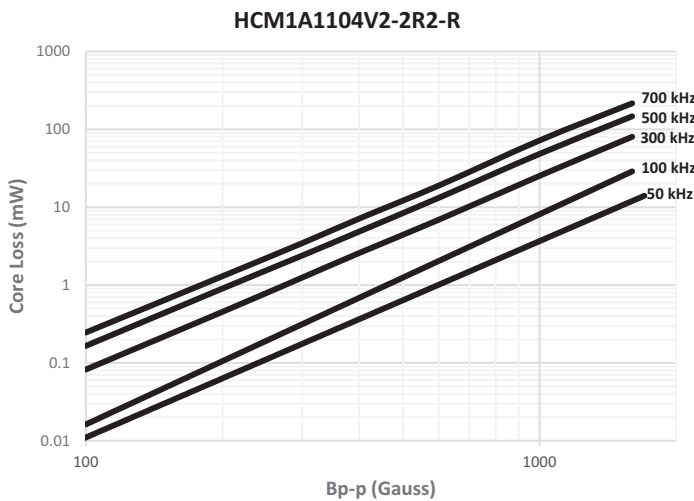
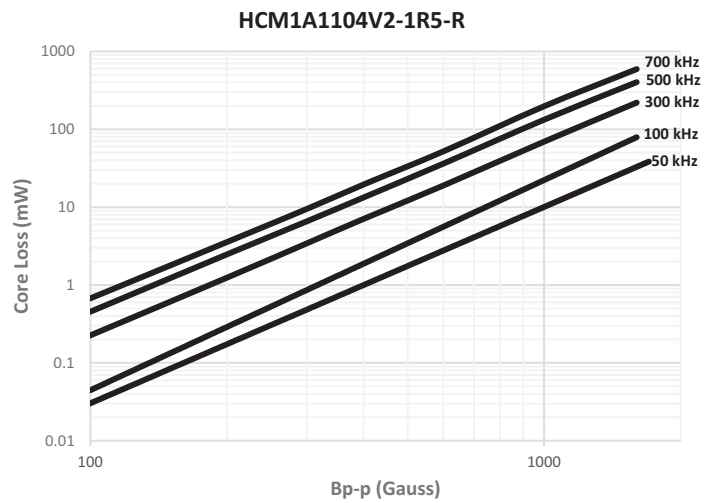
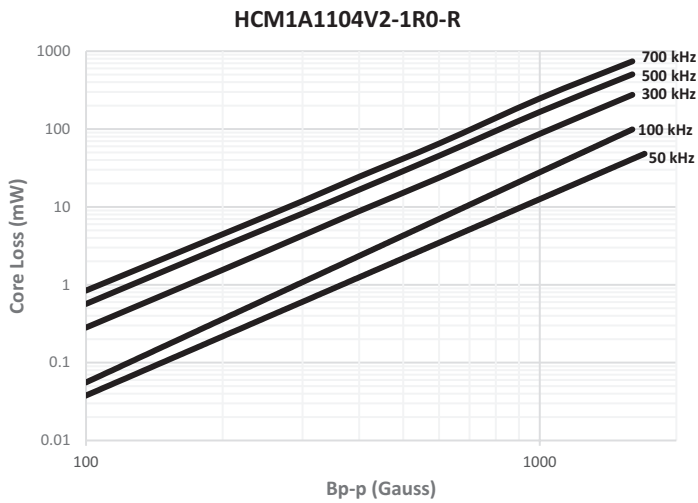
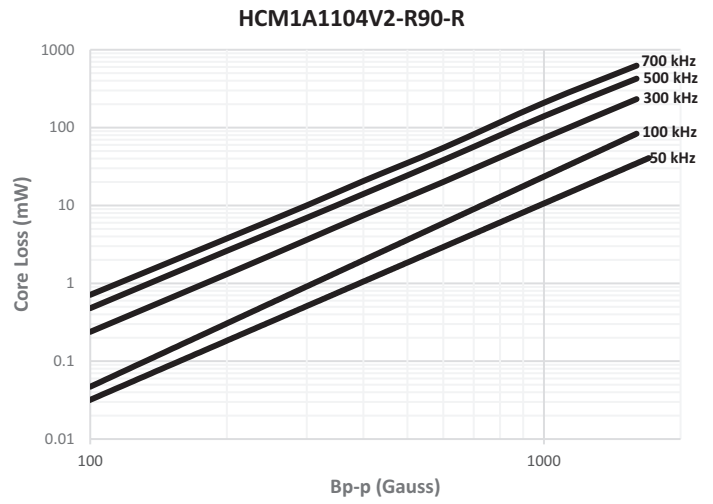
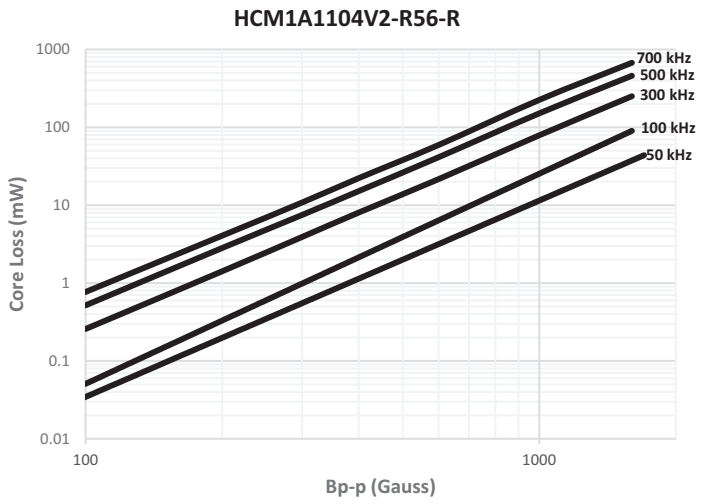
Supplied in tape and reel packaging, 500 parts per 13" diameter reel



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

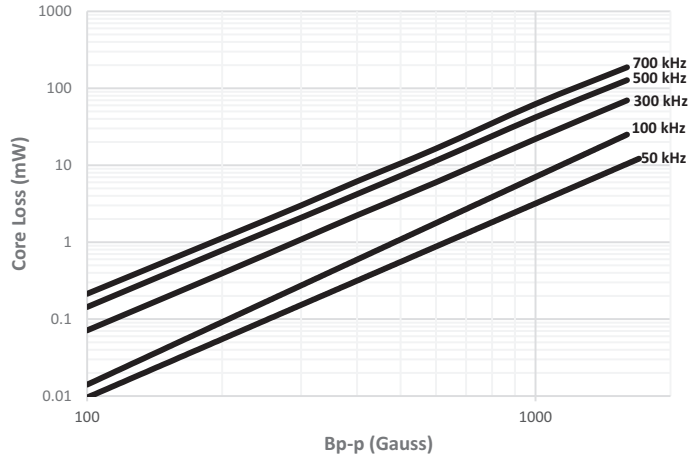


Core loss vs  $B_{p-p}$

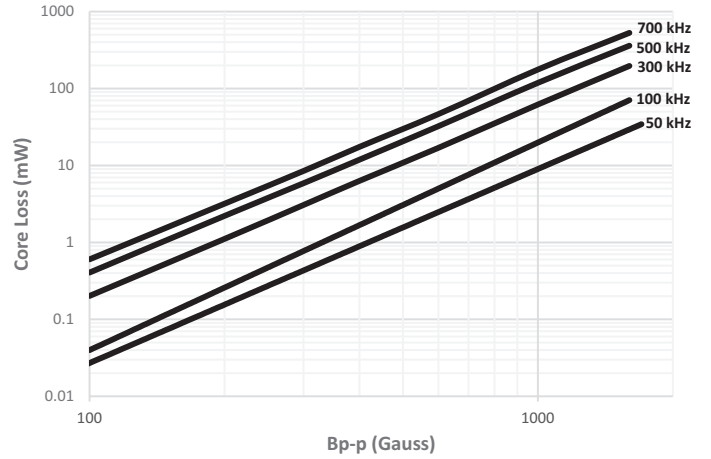


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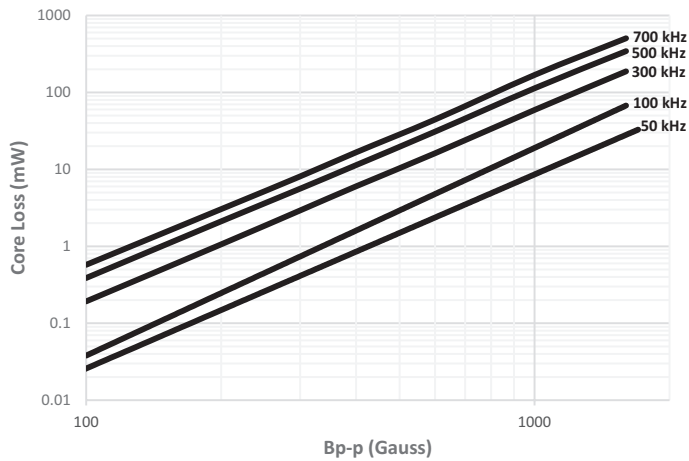
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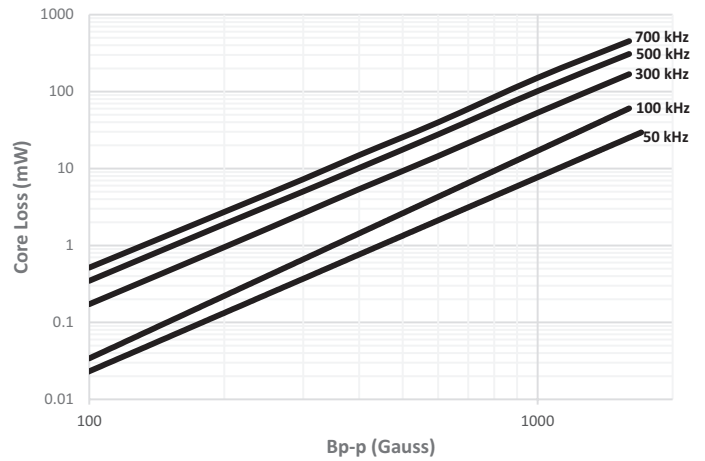
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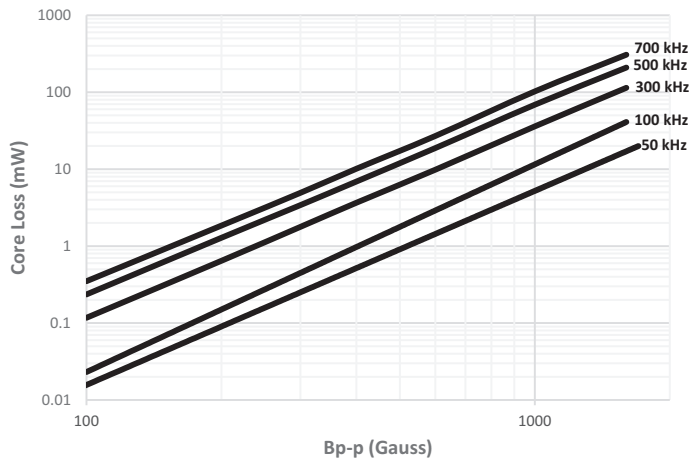
HCM1A1104V2-6R8-R



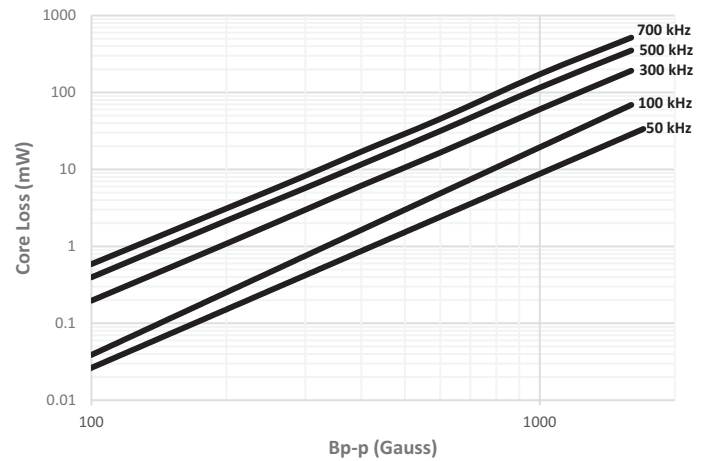
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HCM1A1104V2-150-R

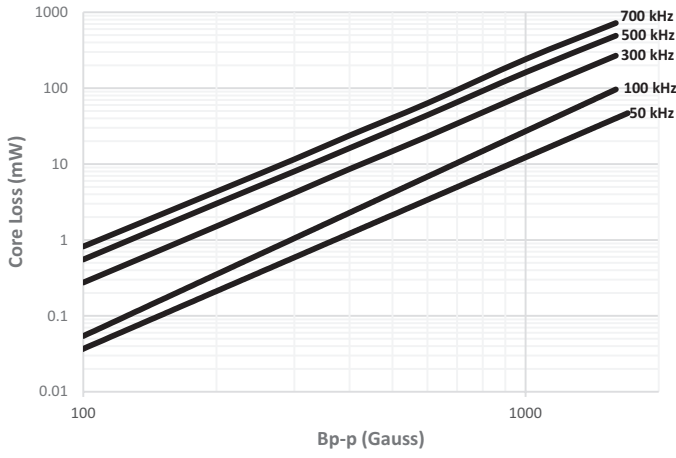


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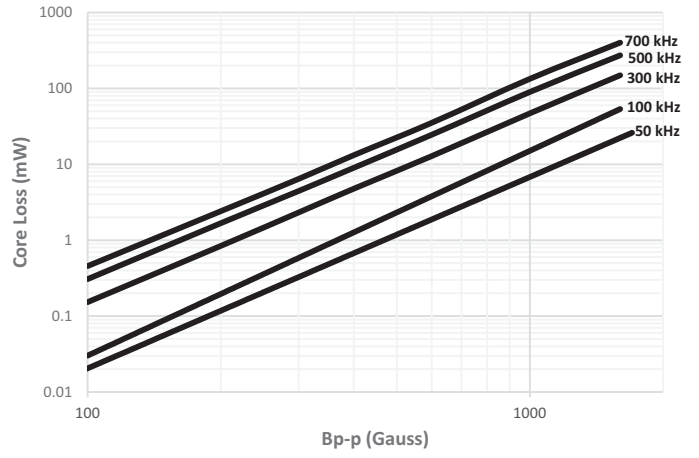


Core loss vs  $B_{p-p}$

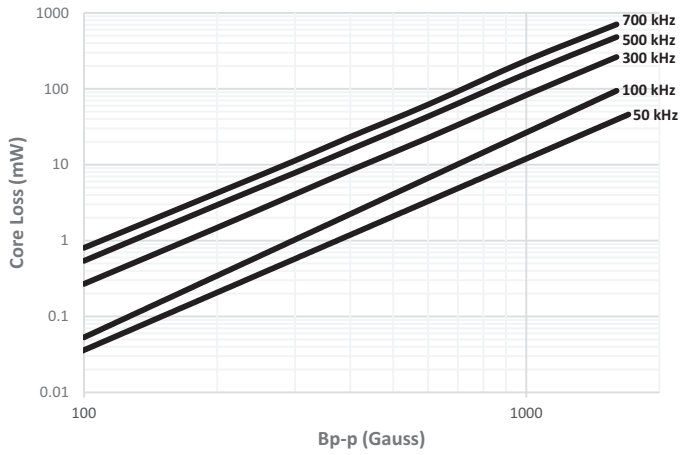
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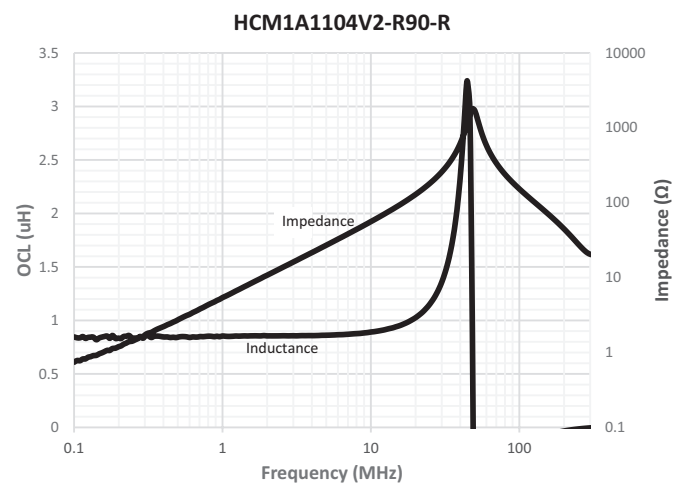
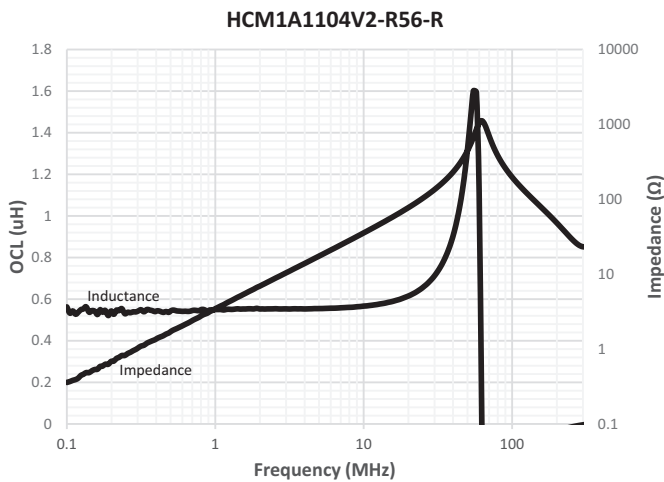
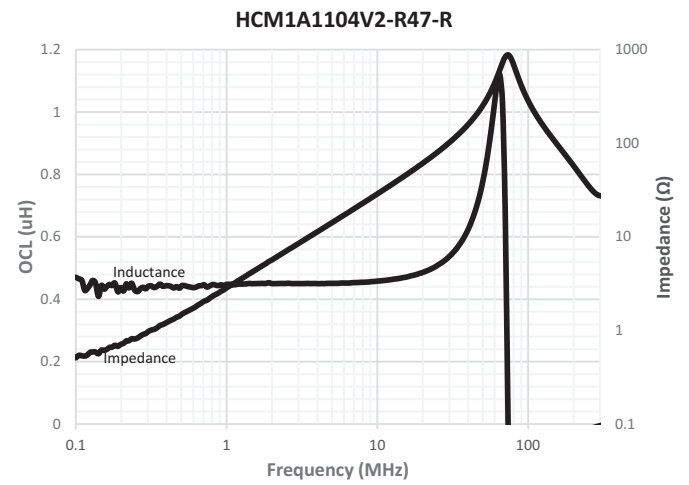
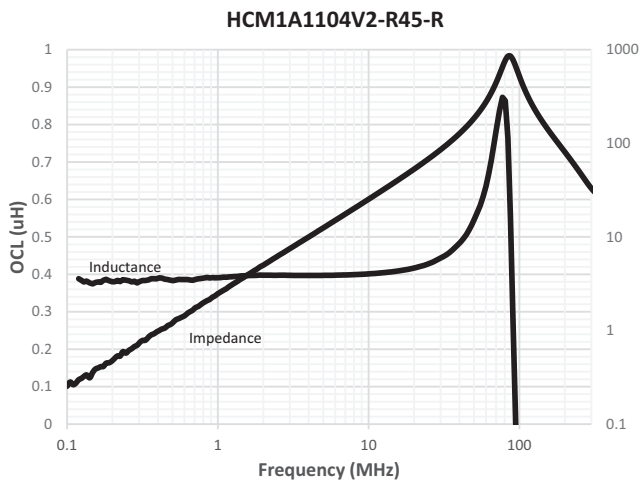
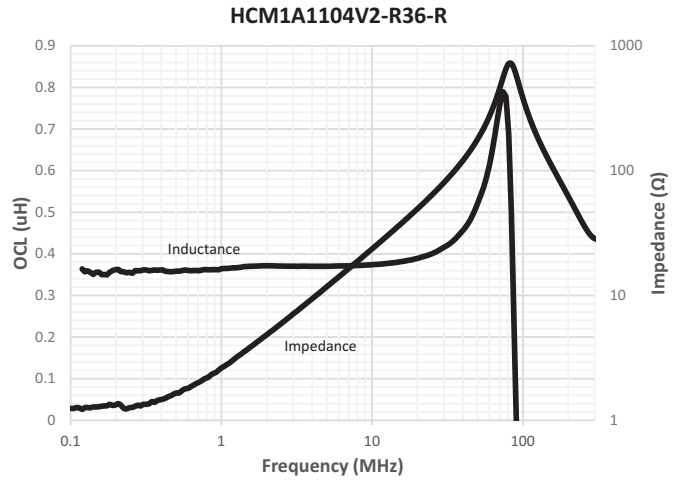
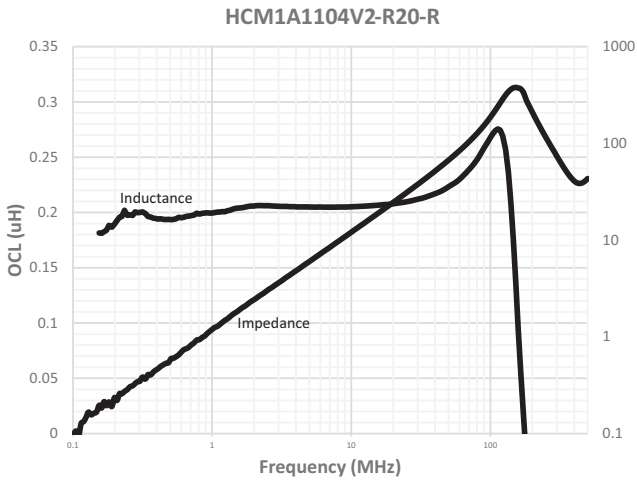
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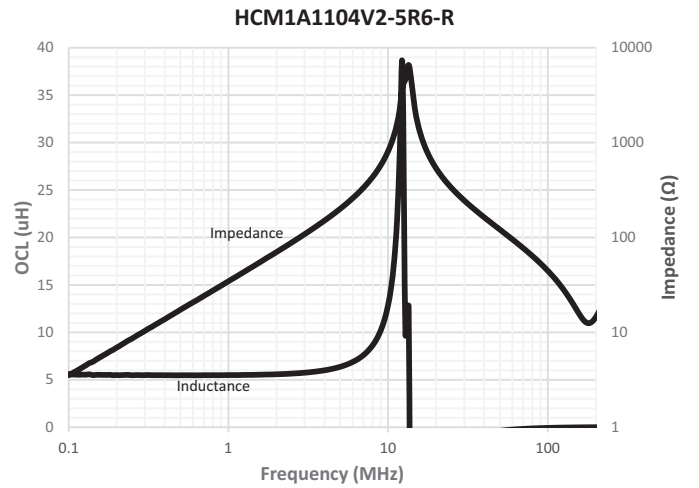
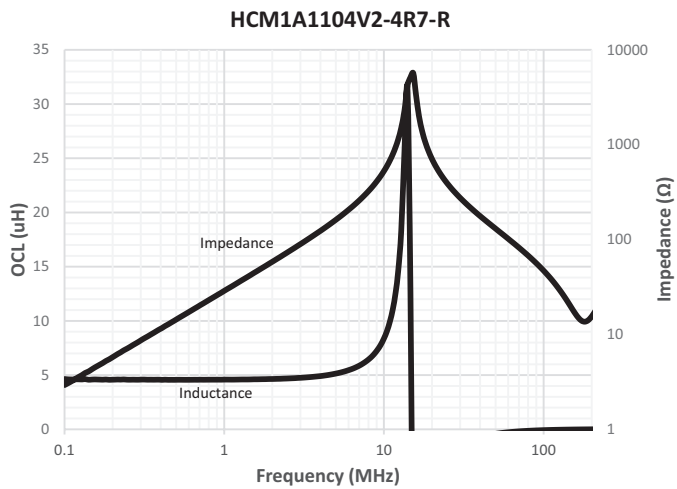
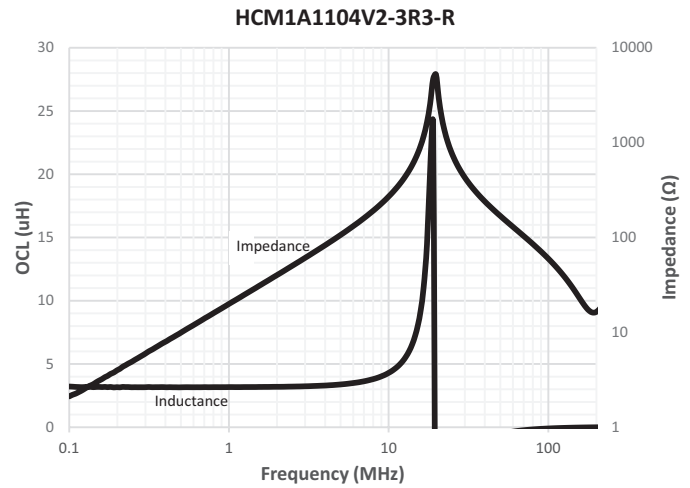
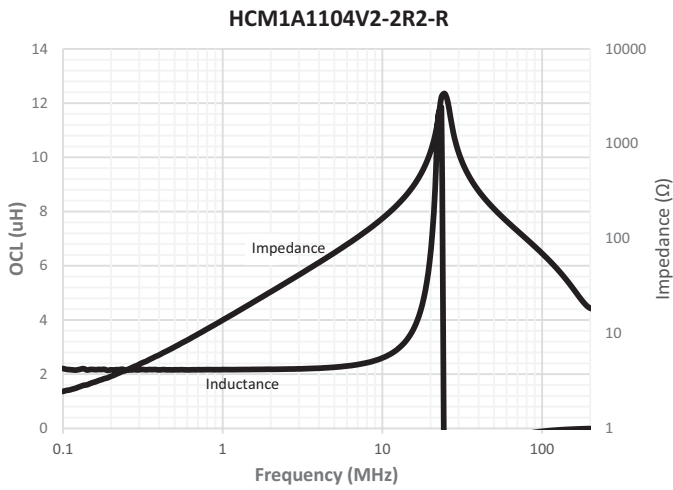
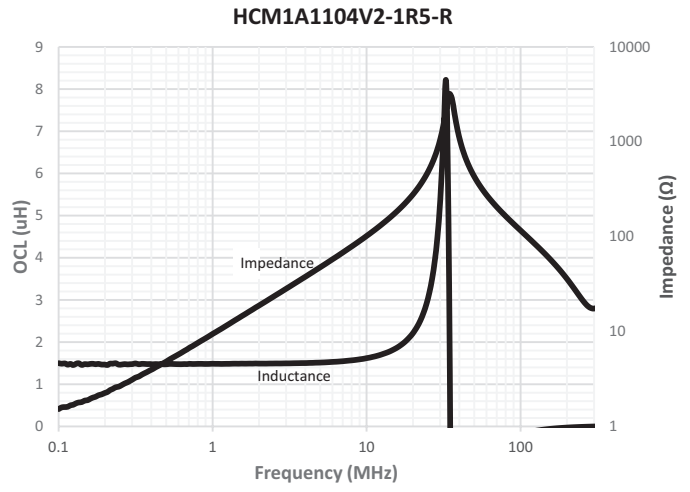
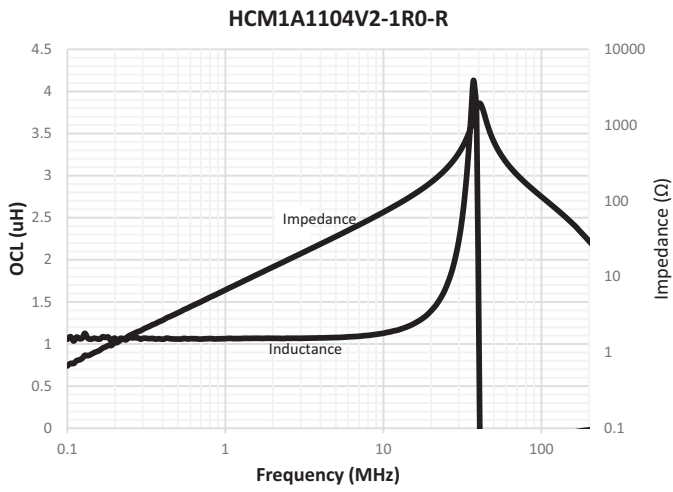
HCM1A1104V2-680-R



Inductance and impedance vs. frequency

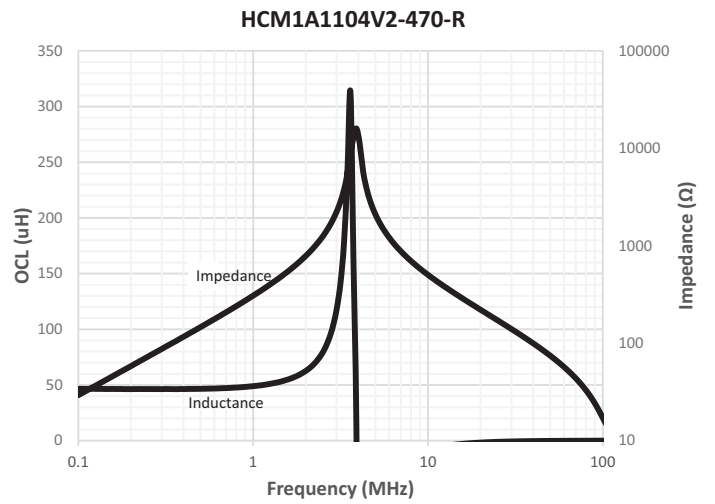
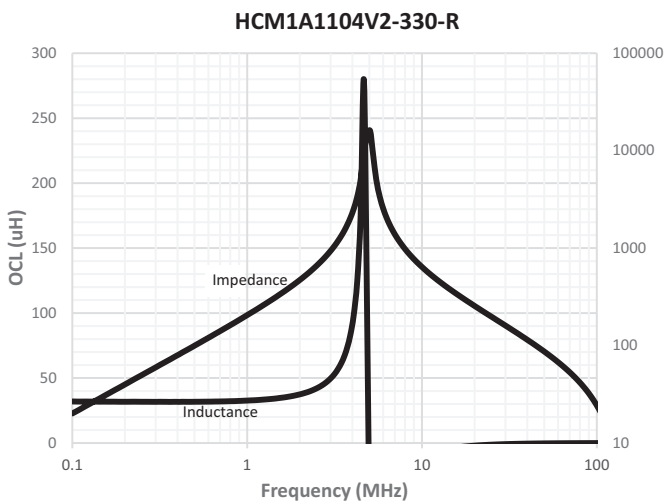
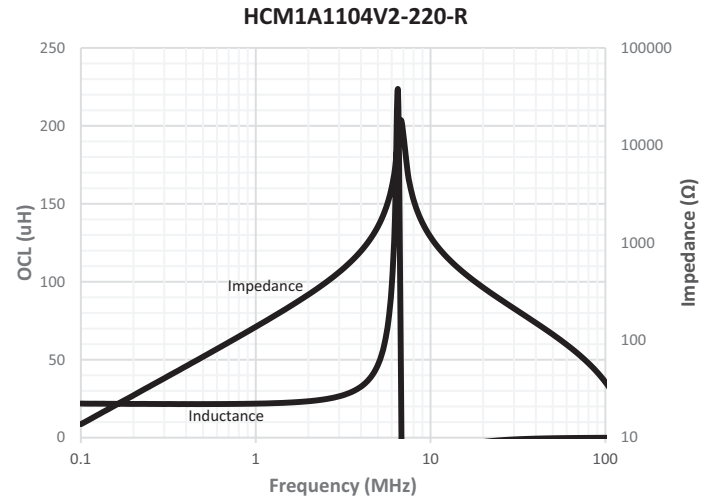
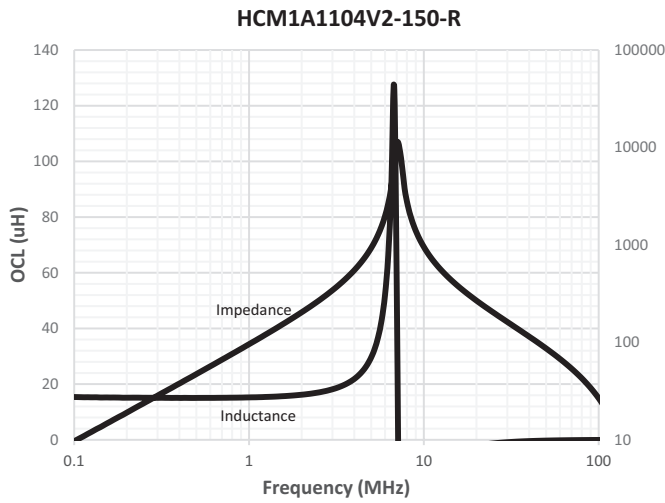
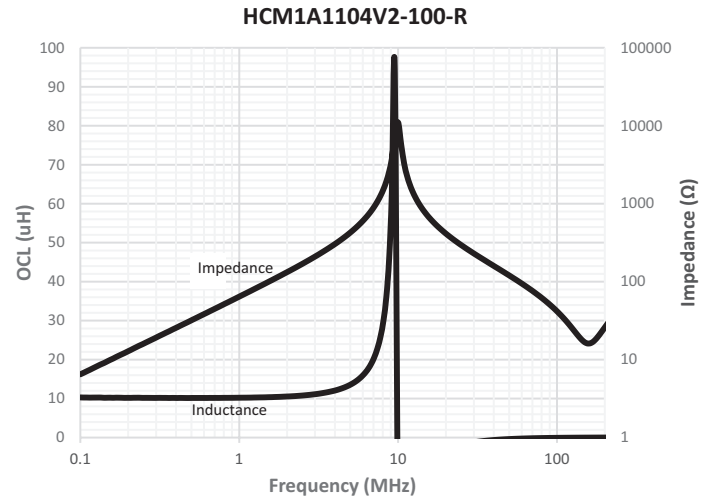
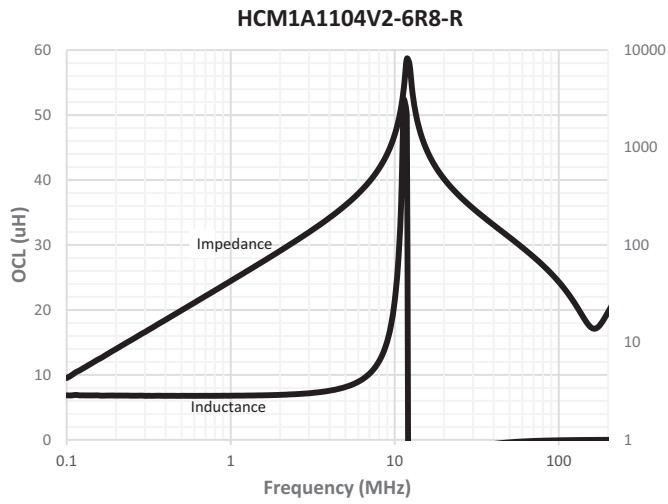


Inductance and impedance vs. frequency

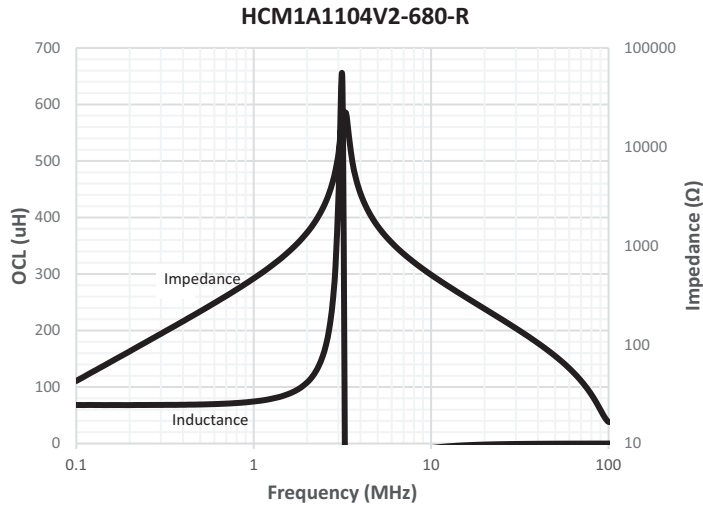




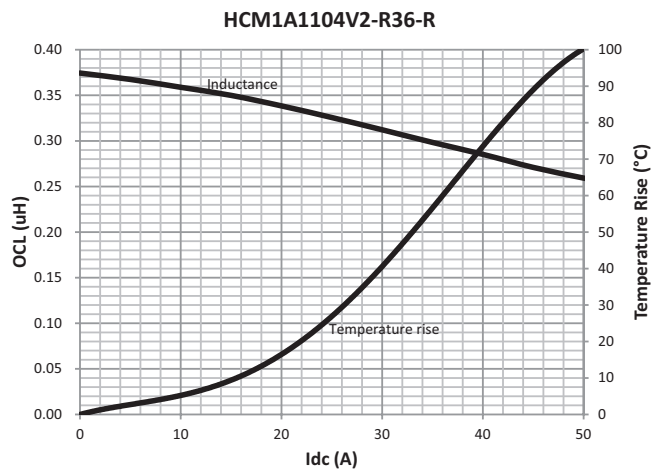
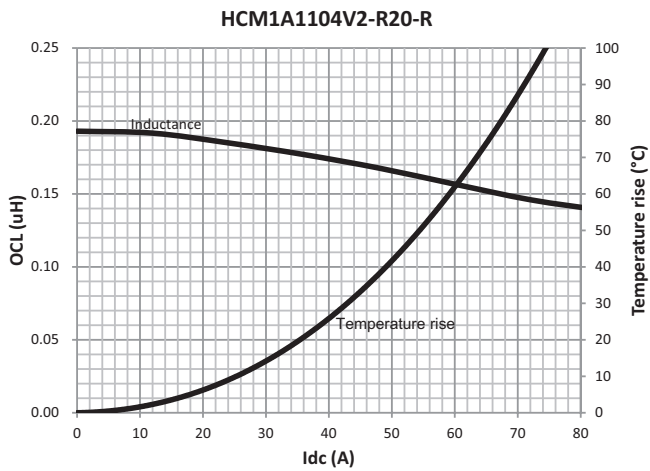
Inductance and impedance vs. frequency



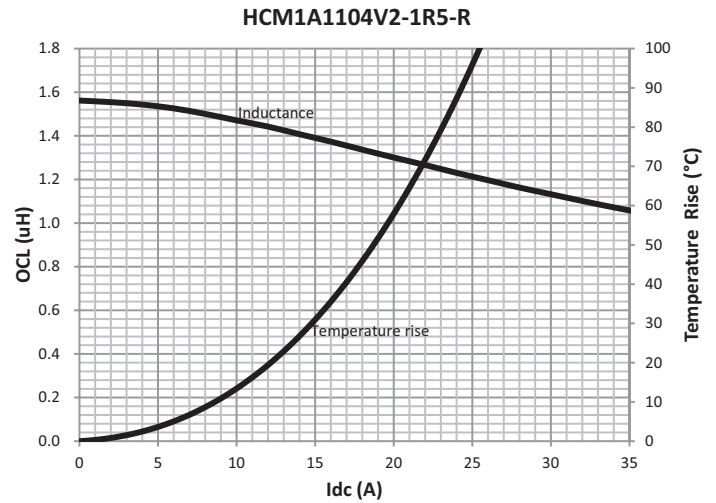
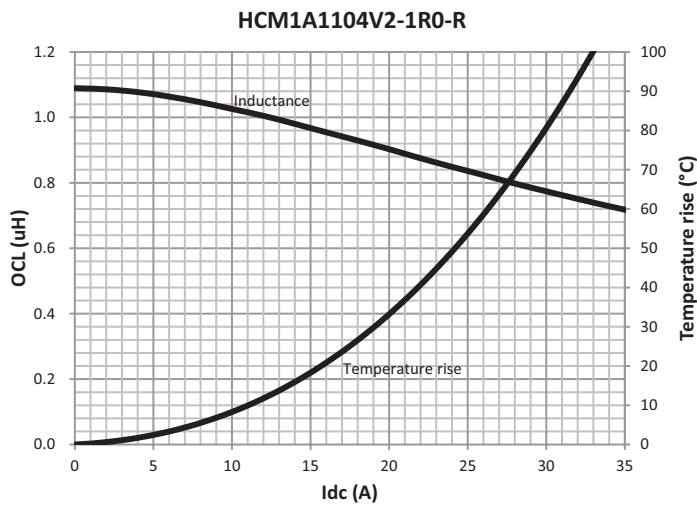
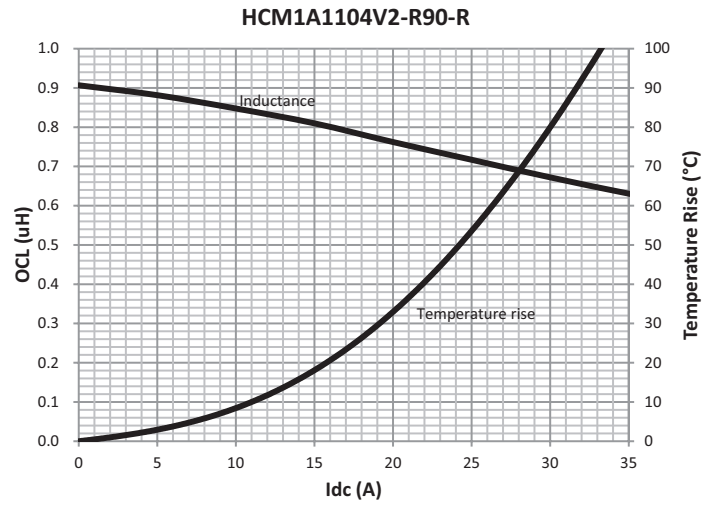
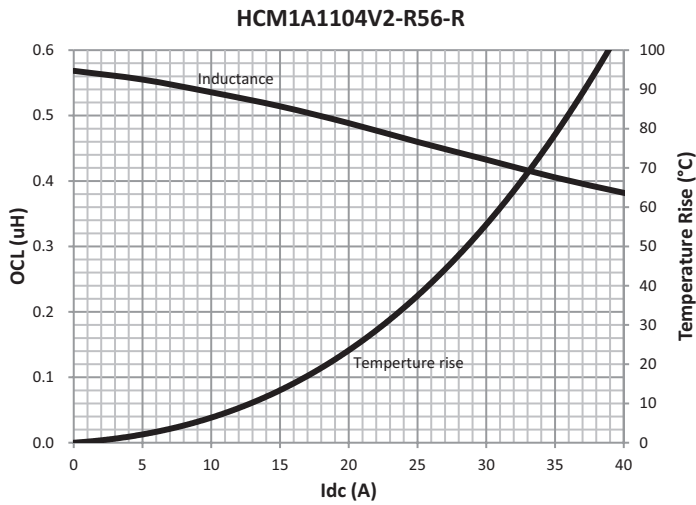
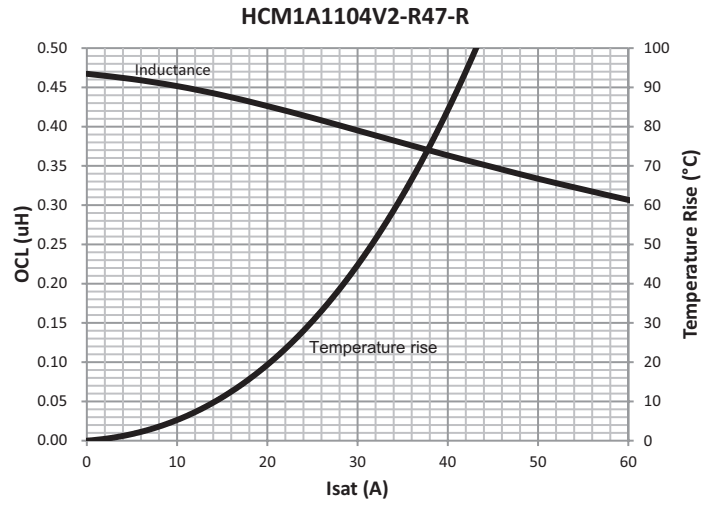
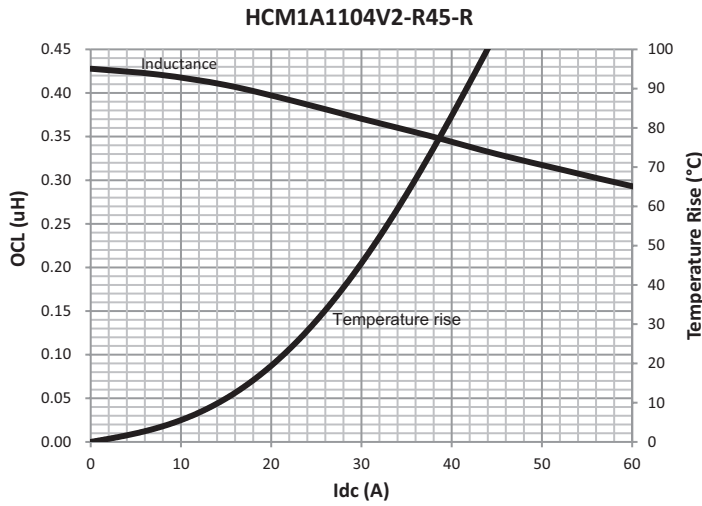
**Inductance and impedance vs. frequency**



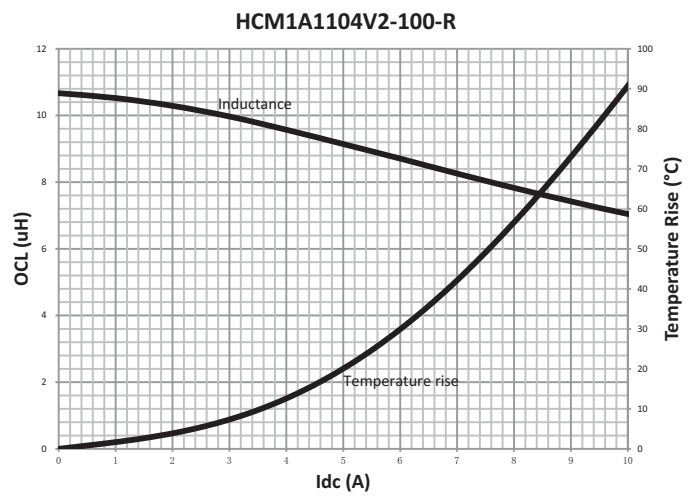
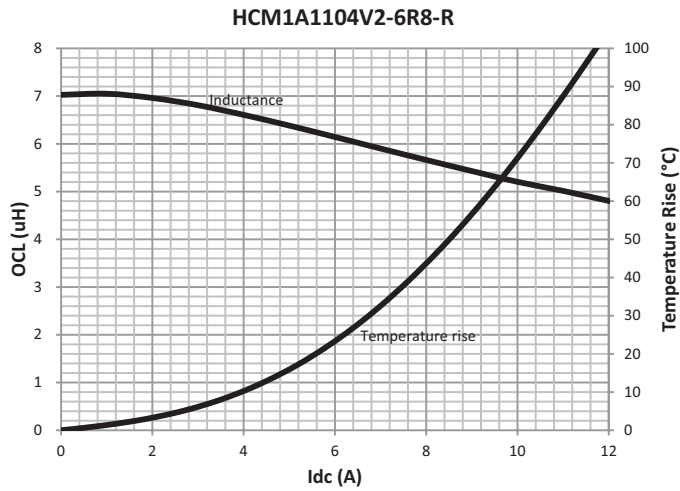
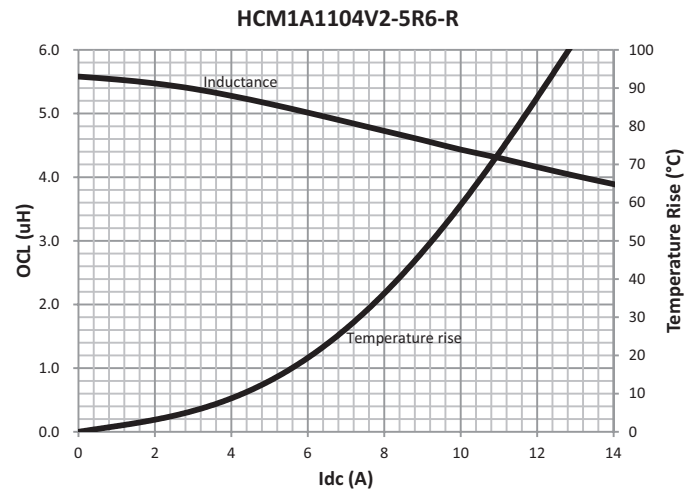
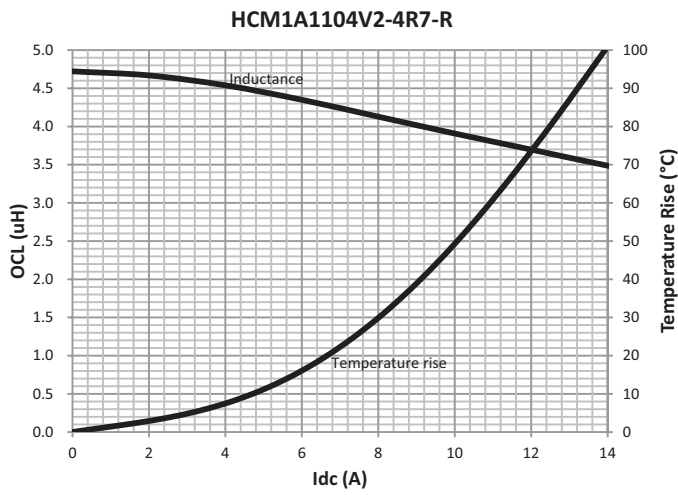
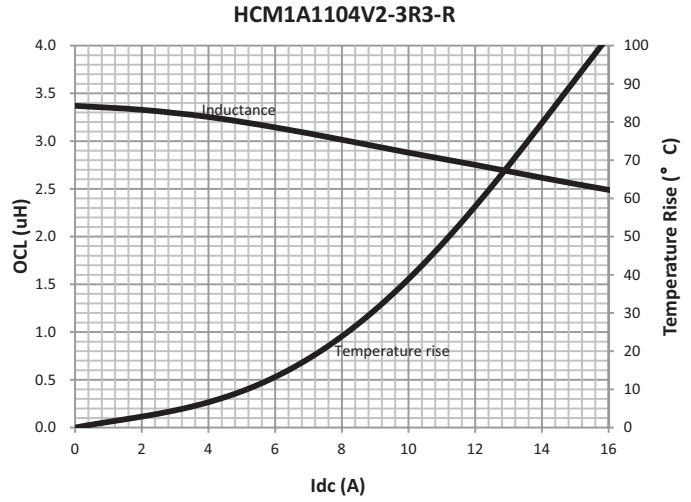
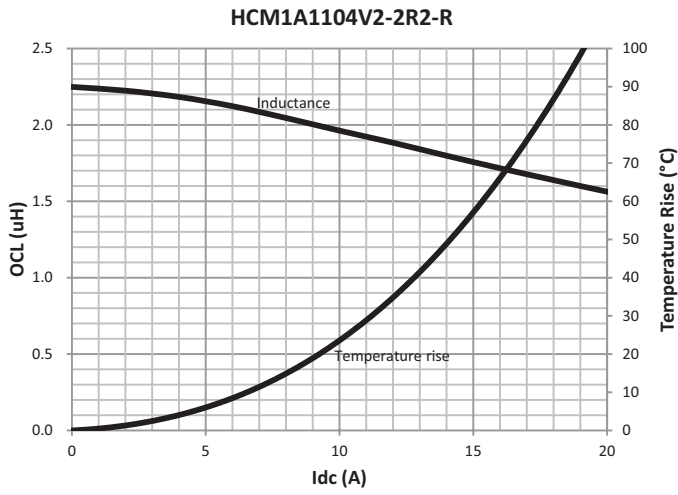
**Inductance and temperature rise vs. current**



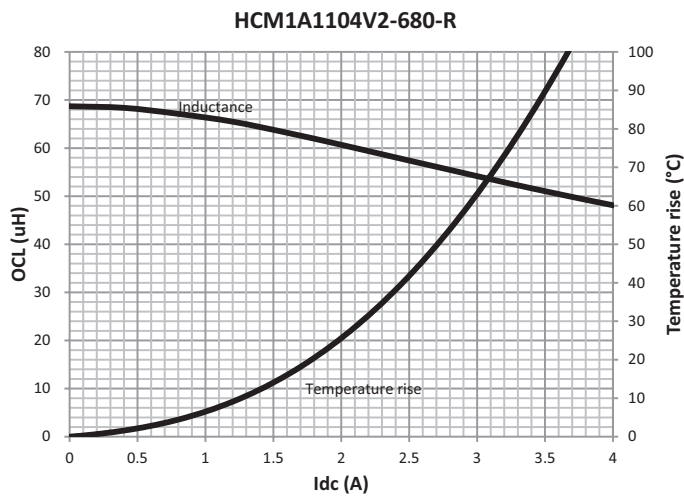
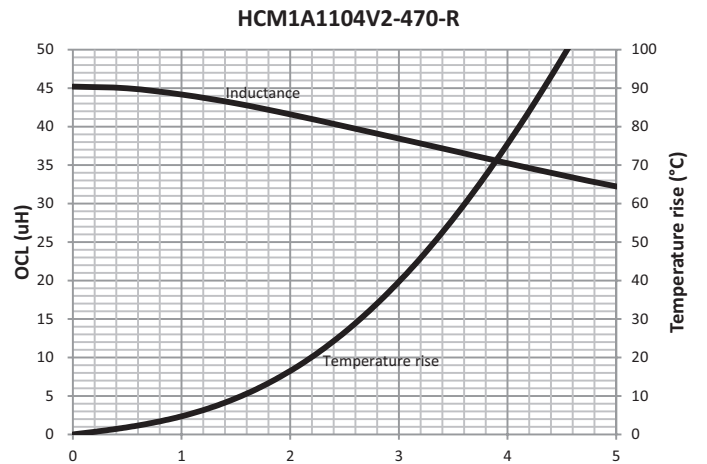
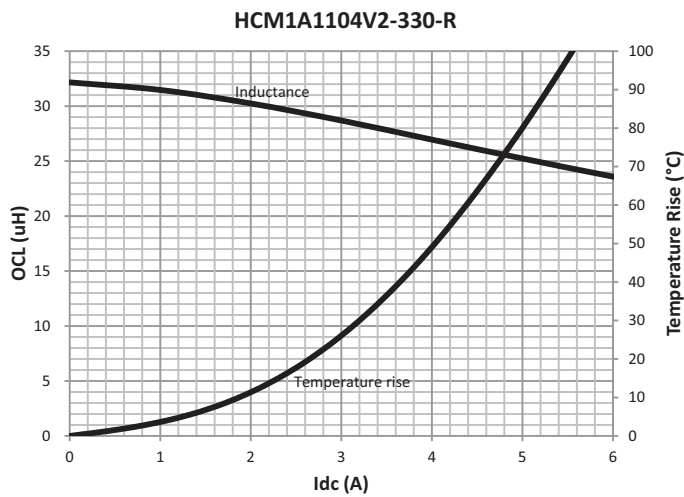
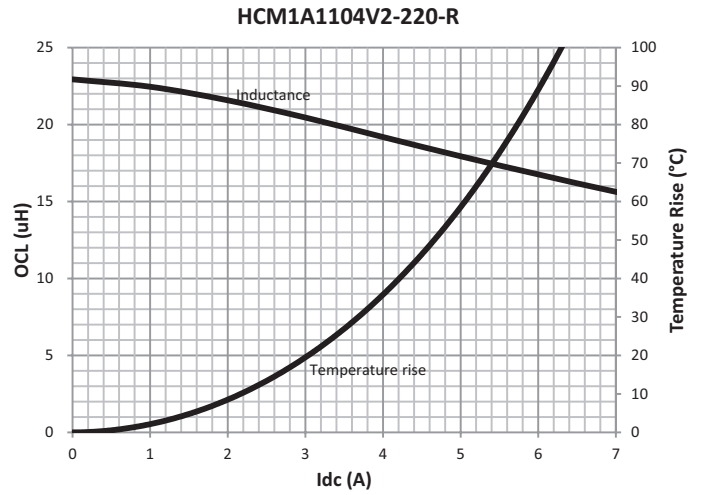
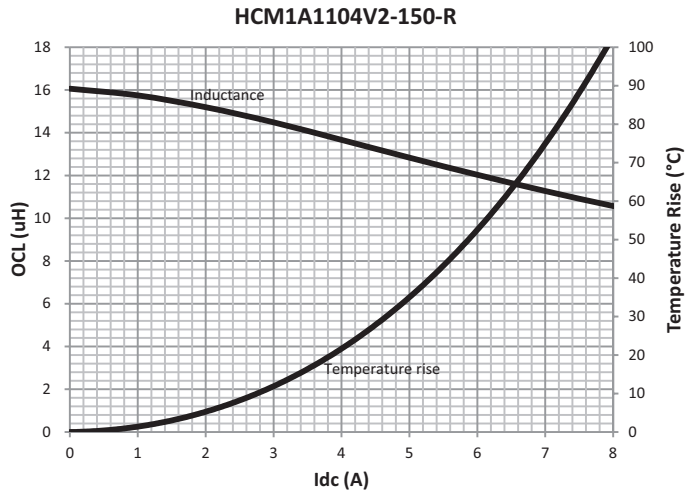
Inductance and temperature rise vs. current



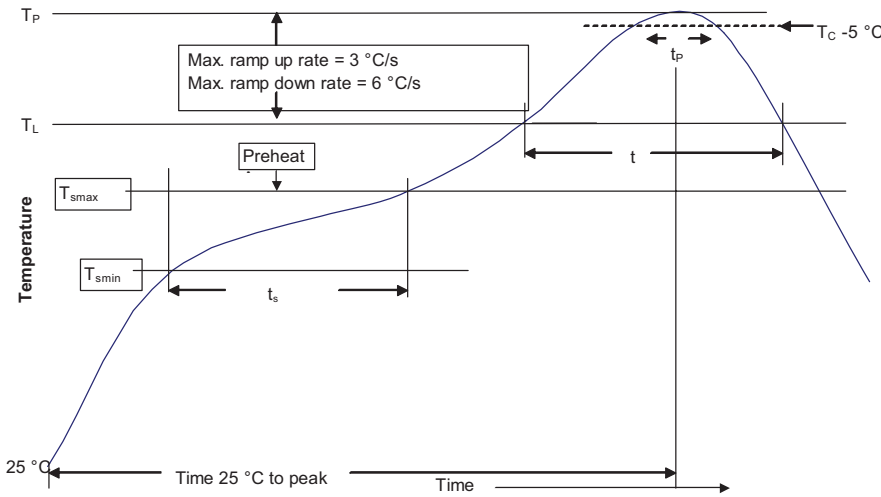
Inductance and temperature rise vs. current



Inductance and temperature rise vs. current



**Solder reflow profile**



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

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

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

Package thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ 350 - 2000	Volume $\text{mm}^3$ >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 J-STD-020**

Profile feature	Standard SnPb solder	Lead (Pb) free solder
Preheat and soak	<ul style="list-style-type: none"> <li>Temperature min. (<math>T_{smin}</math>)</li> <li>Temperature max. (<math>T_{smax}</math>)</li> <li>Time (<math>T_{smin}</math> to <math>T_{smax}</math>) (<math>t_s</math>)</li> </ul>	<ul style="list-style-type: none"> <li>100 °C</li> <li>150 °C</li> <li>60-120 seconds</li> </ul>
Average ramp up rate $T_{smax}$ to $T_p$	3 °C/ second max.	3 °C/ second max.
Liquidous temperature ( $T_L$ ) Time at liquidous ( $t_L$ )	<ul style="list-style-type: none"> <li>183 °C</li> <li>60-150 seconds</li> </ul>	<ul style="list-style-type: none"> <li>217 °C</li> <li>60-150 seconds</li> </ul>
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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