

# HCM1A1 105V2

## 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 0.68  $\mu$ H to 68  $\mu$ H
- Current range from 2.3 A to 30 A
- 11.2 mm x 10.3 mm footprint surface mount package in a 5.0 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
  - 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



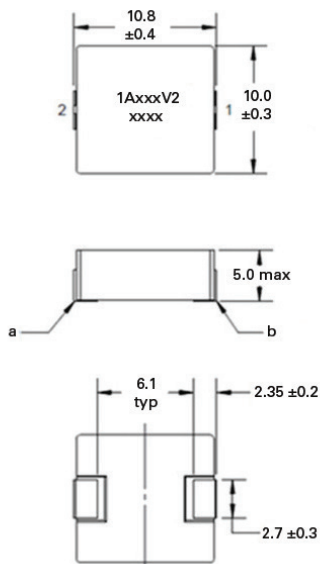
Product specifications

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>
HCM1A1105V2-R68-R	0.68	0.44	24.5	30	1.65	1.93	57	283
HCM1A1105V2-R72-R	0.72	0.46	23	24	1.55	1.71	54	298
HCM1A1105V2-R90-R	0.90	0.58	22	23	1.74	2.02	42	262
HCM1A1105V2-1R0-R	1.0	0.64	20	24	2.10	2.40	44	218
HCM1A1105V2-1R2-R	1.2	0.77	21	21	2.10	2.40	37	222
HCM1A1105V2-1R5-R	1.5	0.96	16.5	20	2.90	3.34	31	232
HCM1A1105V2-2R2-R	2.2	1.41	14.5	19	3.90	4.49	24	161
HCM1A1105V2-2R8-R	2.8	1.79	12	18	5.20	6.00	21	122
HCM1A1105V2-3R3-R	3.3	2.11	9.5	16	9.23	10.7	18	96
HCM1A1105V2-4R7-R	4.7	3.01	8.5	13	11.7	13.5	14	90
HCM1A1105V2-5R6-R	5.6	3.58	8.0	12	14.0	16.5	13	98
HCM1A1105V2-6R8-R	6.8	4.35	7.0	10	17.1	20.0	11	70
HCM1A1105V2-100-R	10	6.40	6.2	7.0	22.0	27.0	9	74
HCM1A1105V2-120-R	12	7.68	5.0	8.0	31.2	35.9	9	56
HCM1A1105V2-150-R	15	9.60	4.7	7.0	34.7	40.3	7	65
HCM1A1105V2-220-R	22	14.1	4.0	6.0	52.3	61.0	5	42
HCM1A1105V2-330-R	33	21.1	3.5	3.5	70.0	84.0	4	44
HCM1A1105V2-470-R	47	30.1	3.0	3.0	97.6	117	3	35
HCM1A1105V2-680-R	68	43.5	2.3	4.0	160	211	3	25

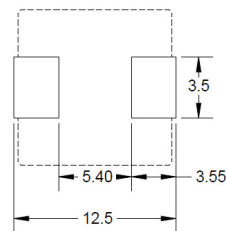
1. Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 V<sub>rms</sub>, 0.0 Adc, +25 °C
2. Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 V<sub>rms</sub>, I<sub>sat</sub>, +25 °C
3. I<sub>rms</sub>: DC current for an approximate temperature rise of 30 °C without core loss. Derating 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: HCM1A1105V2-xxx-R  
HCM1A1105V2 = 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

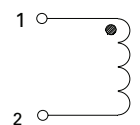
Dimensions (mm)



Recommended pad layout



Schematic

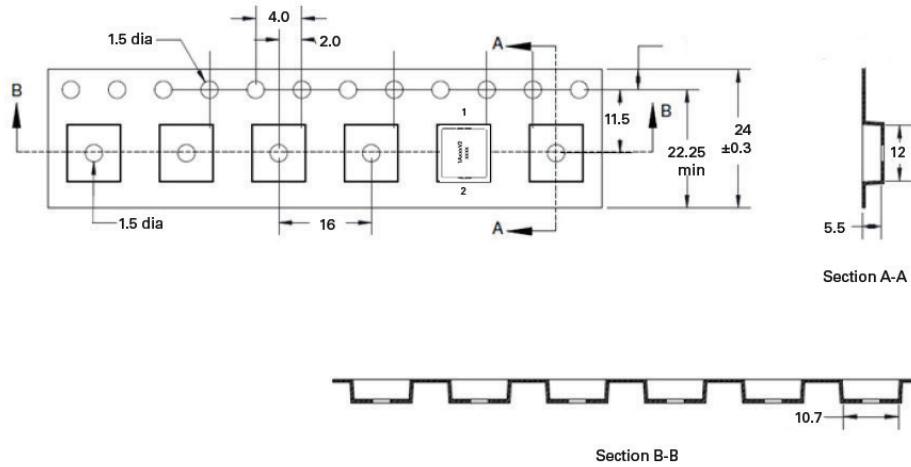


Part marking: 1AxxxV2, xxx=inductance value in  $\mu\text{H}$ , R=decimal point. If no R is present then last character equals number of zeros.  
 xxxx=Lot code  
 All soldering surfaces to be coplanar within 0.1 millimeters  
 Tolerances are  $\pm 0.3$  millimeters unless stated otherwise  
 Pad layout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

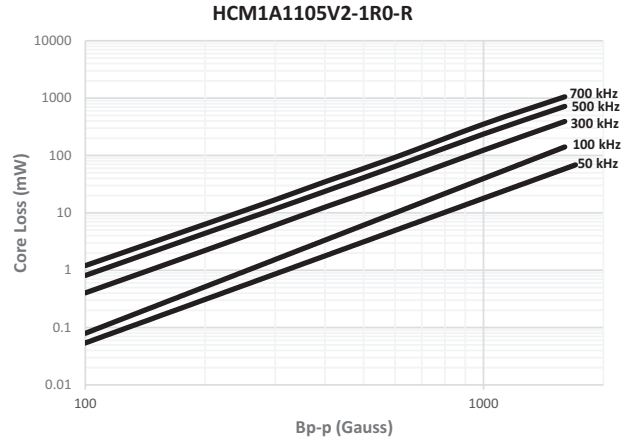
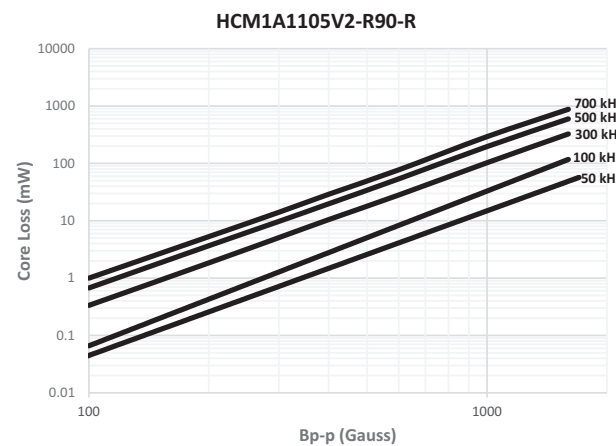
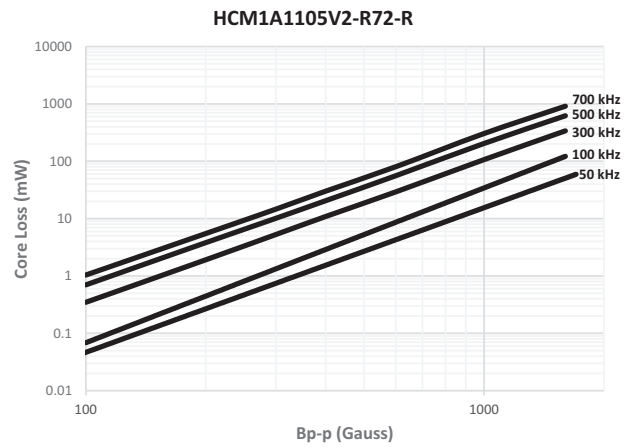
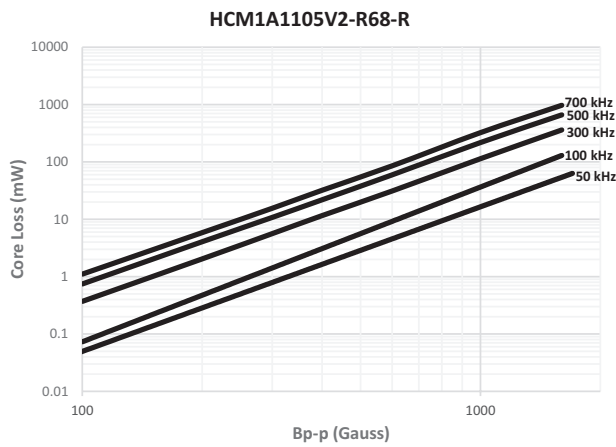
**Packaging information (mm)**

Drawing not to scale

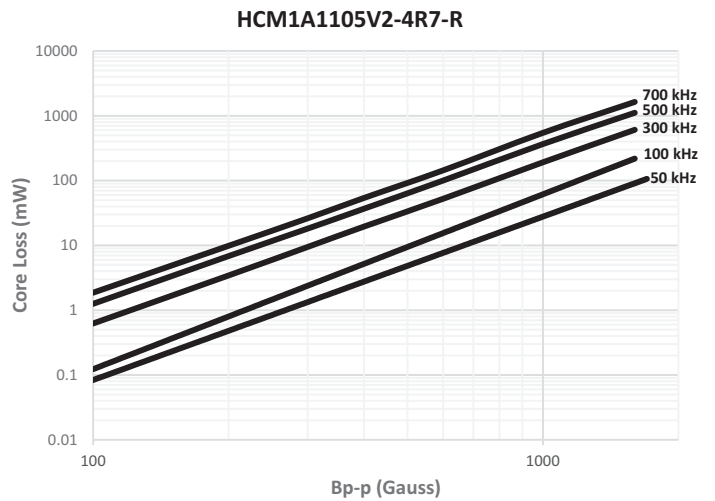
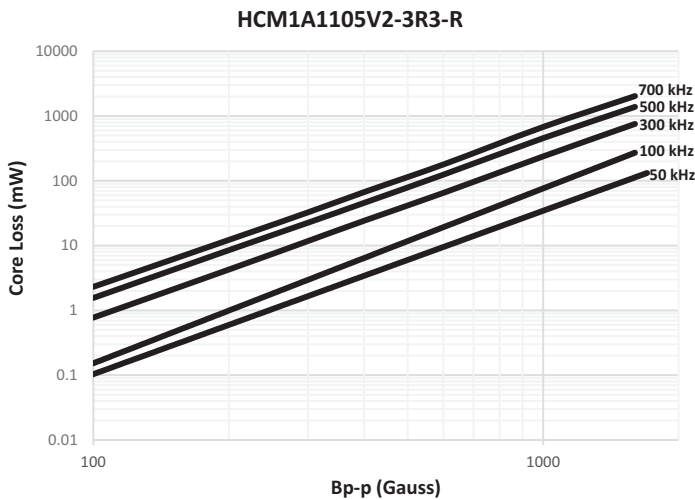
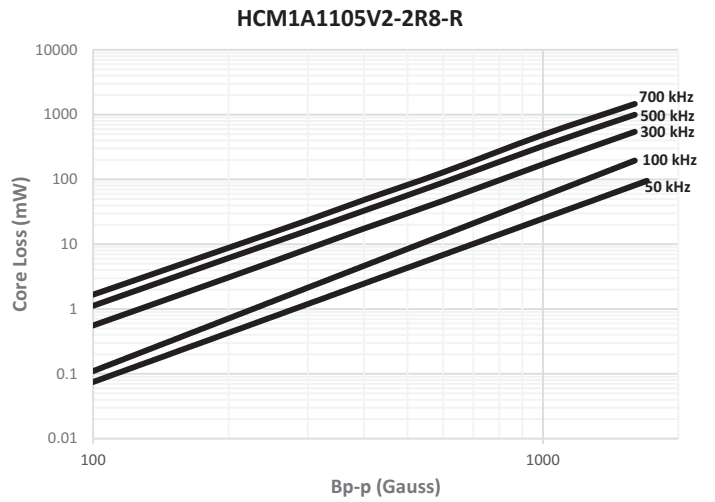
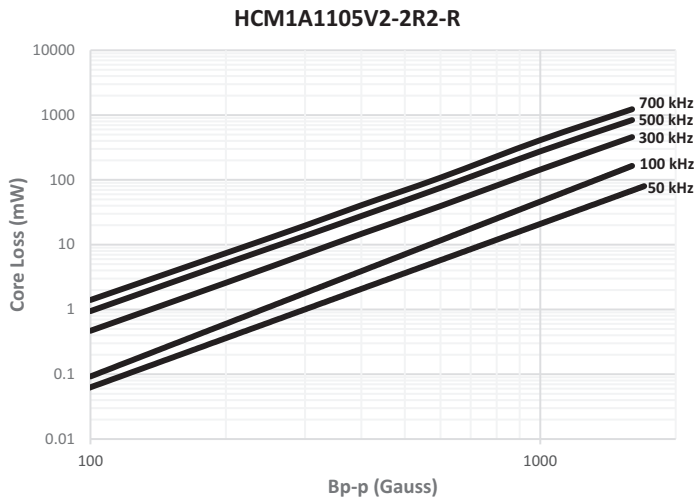
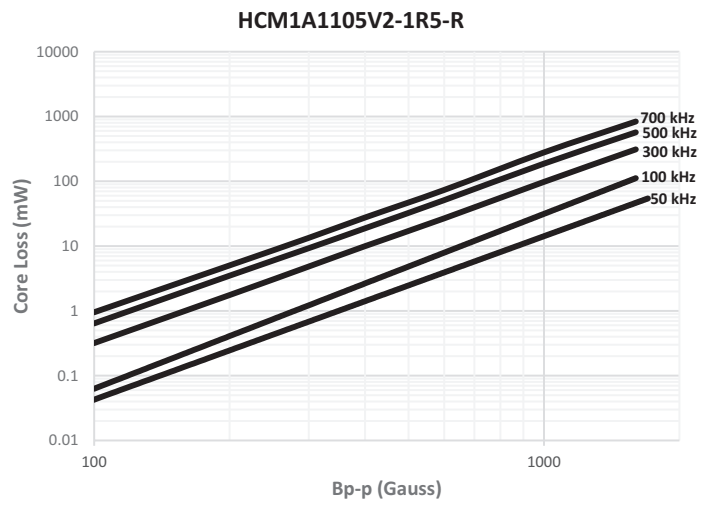
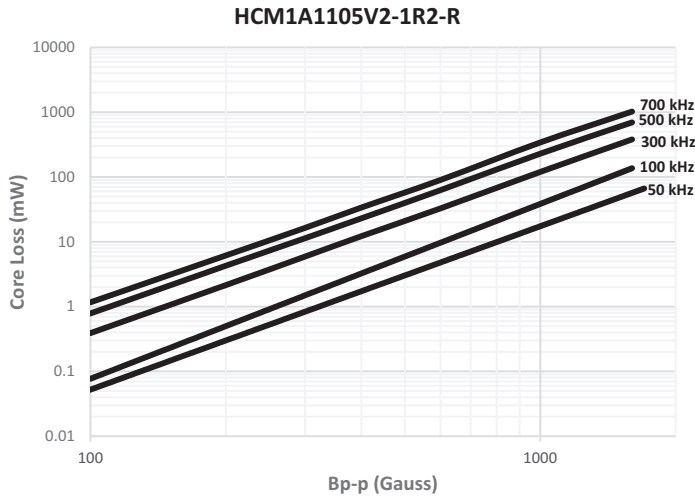
Supplied in tape and reel packaging, 500 parts per 13" diameter reel



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

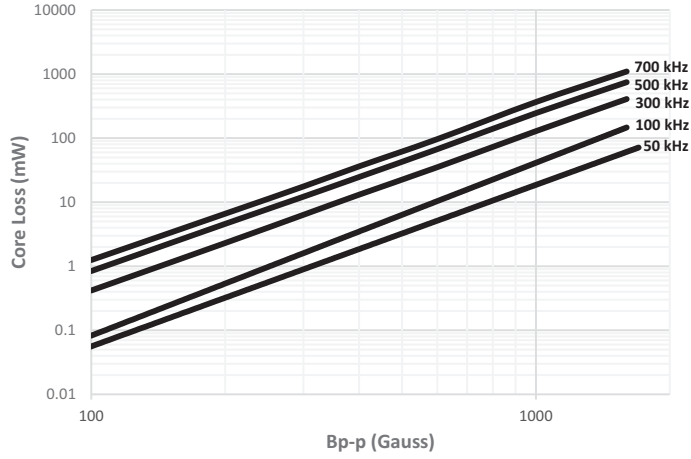


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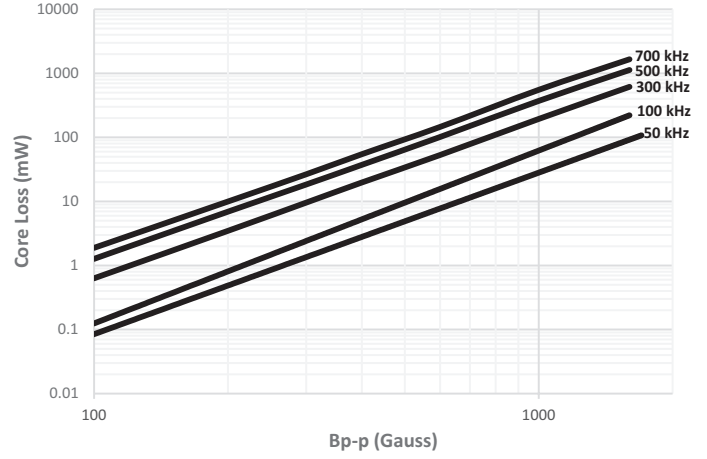


Core loss vs  $B_{p-p}$

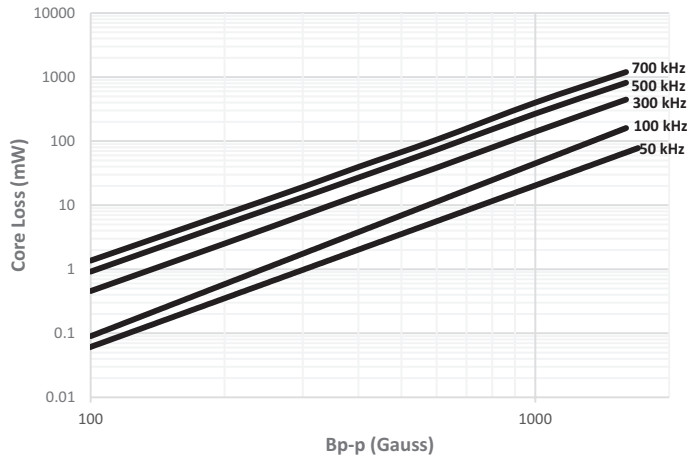
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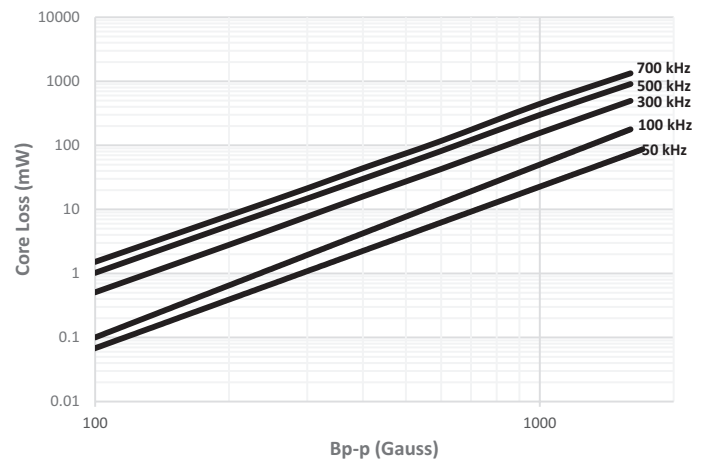
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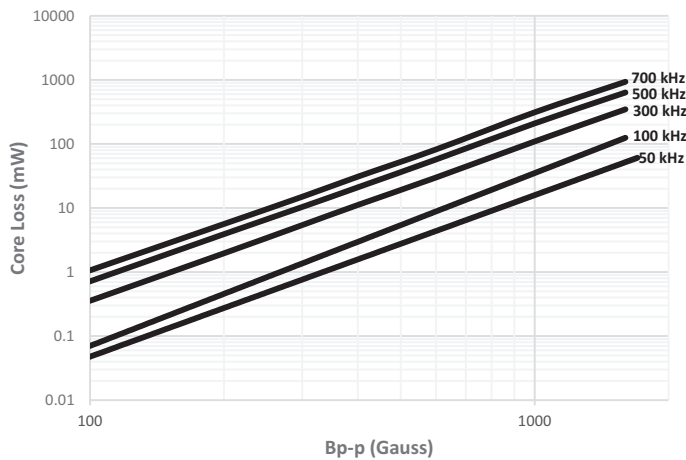
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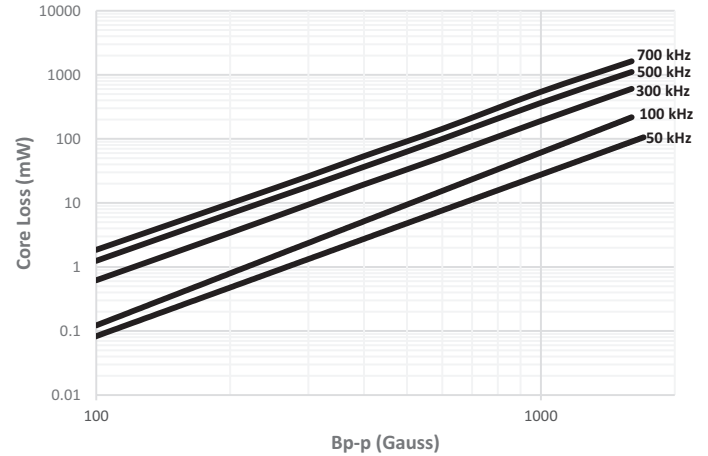
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HCM1A1105V2-150-R

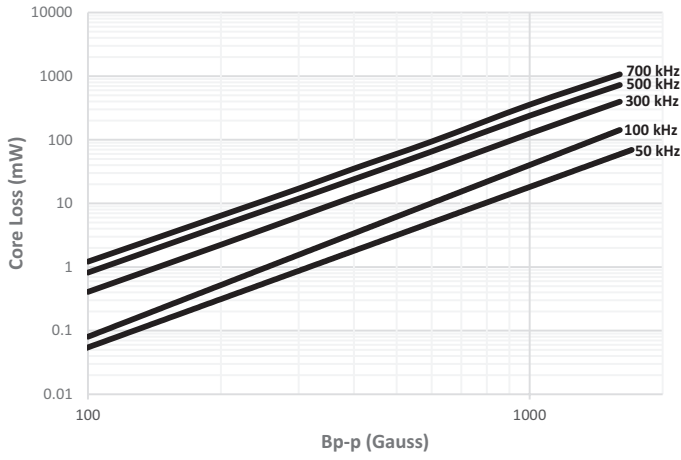


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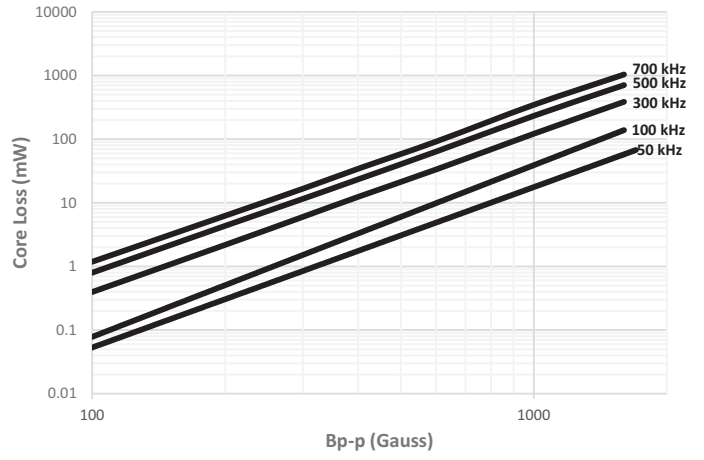


Core loss vs  $B_{p-p}$

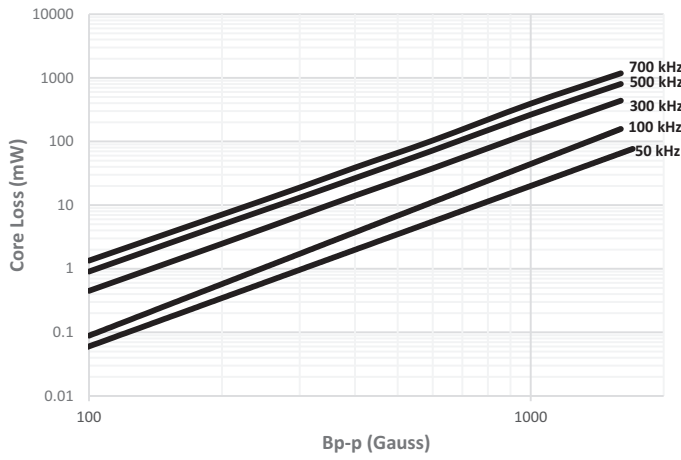
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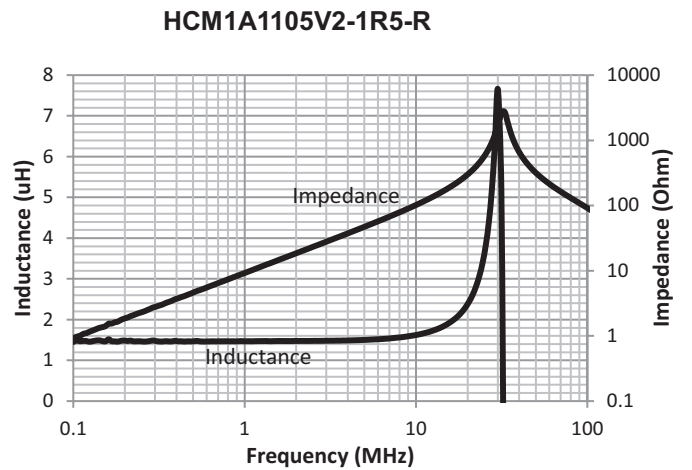
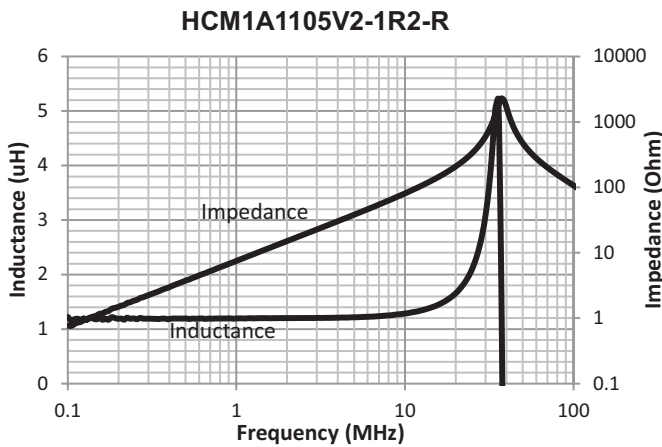
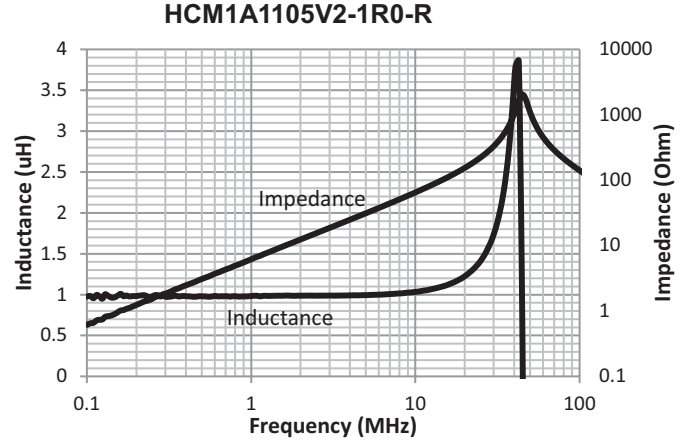
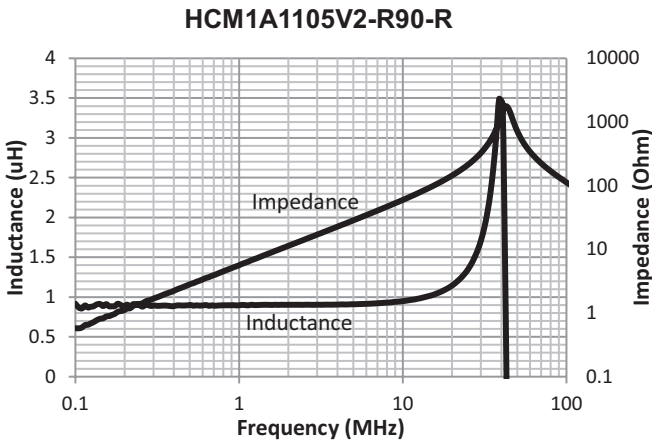
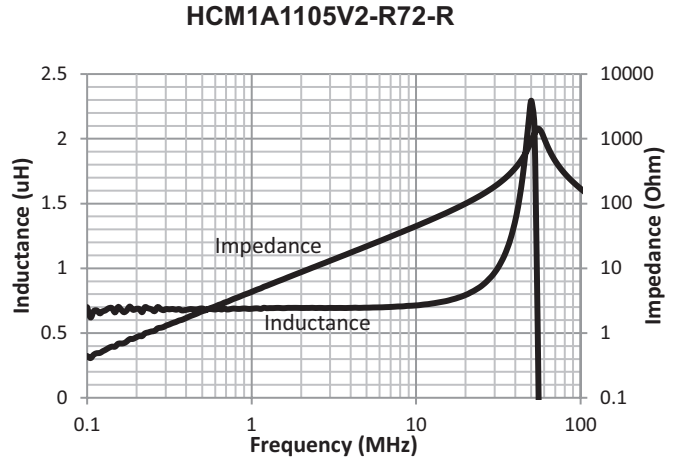
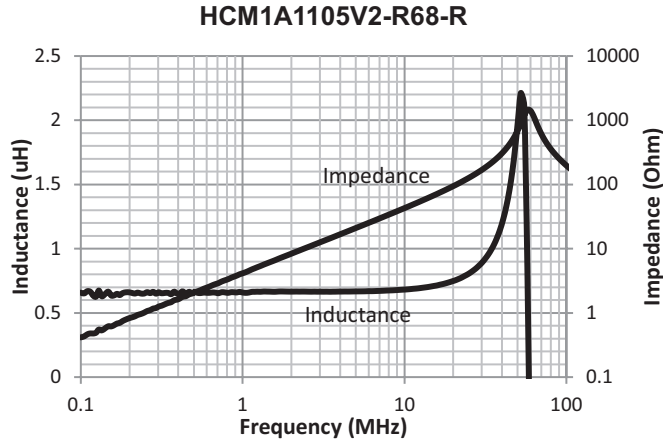
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HCM1A1105V2-680-R

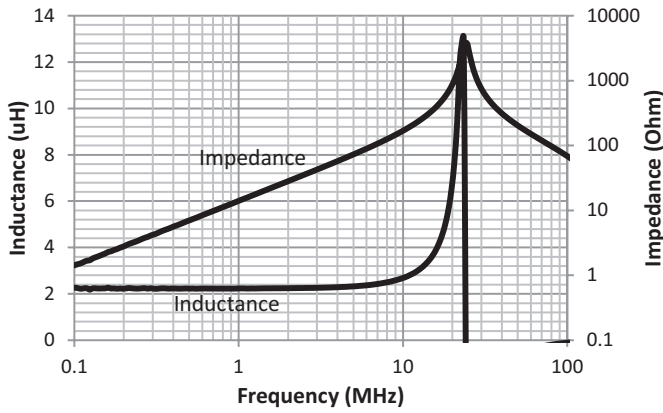


Inductance and impedance vs. frequency

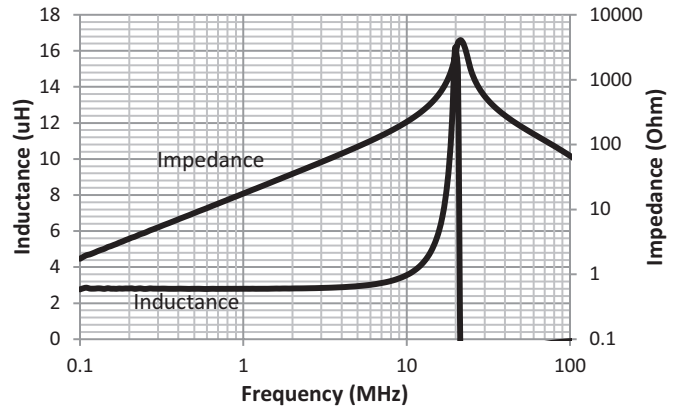


Inductance and impedance vs. frequency

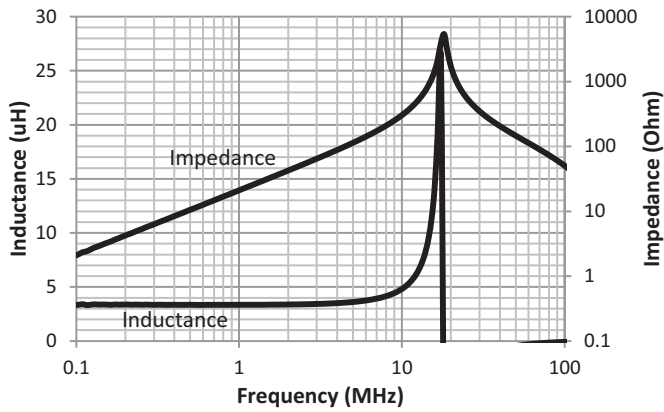
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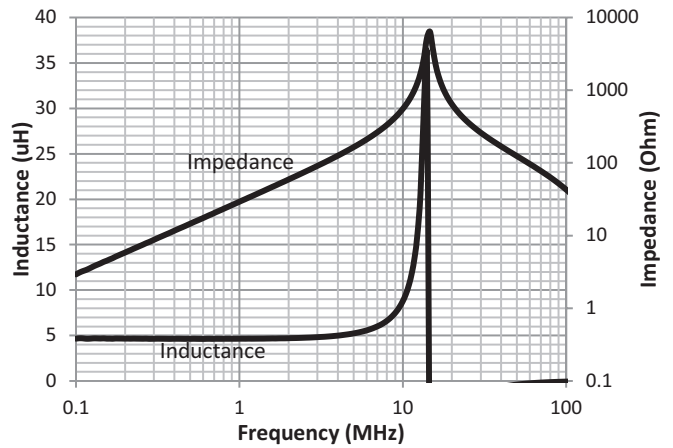
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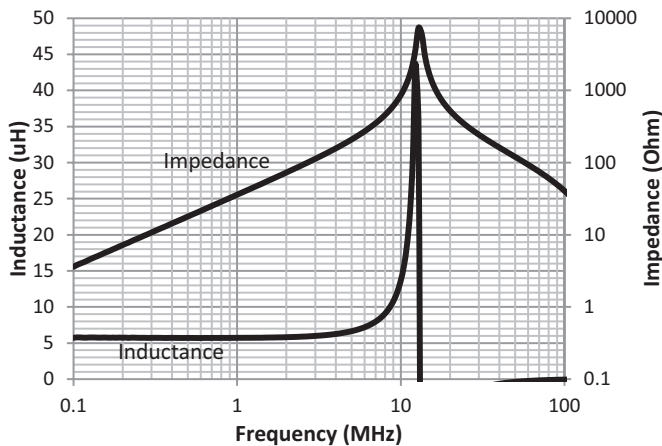
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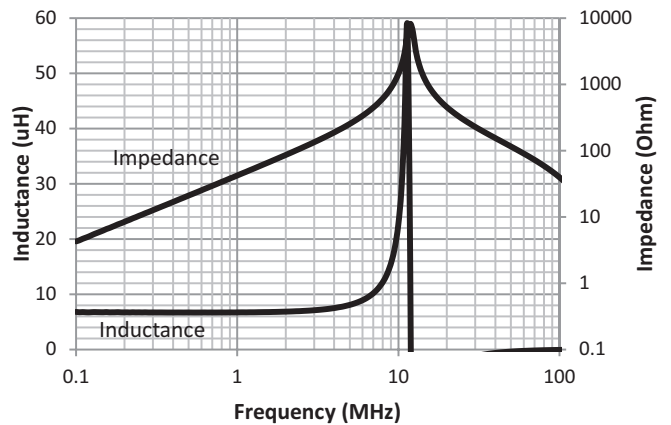
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HCM1A1105V2-5R6-R



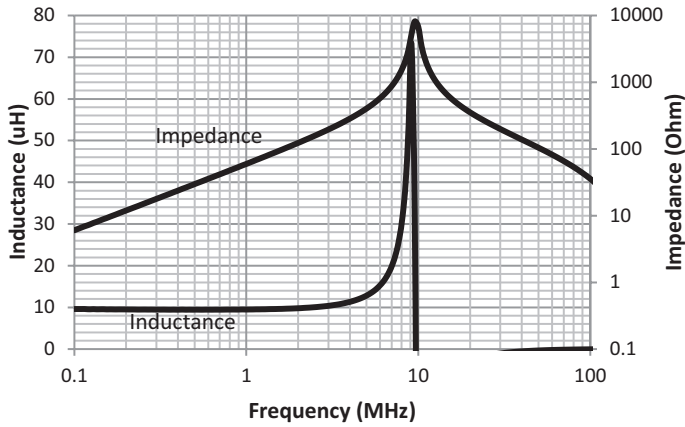
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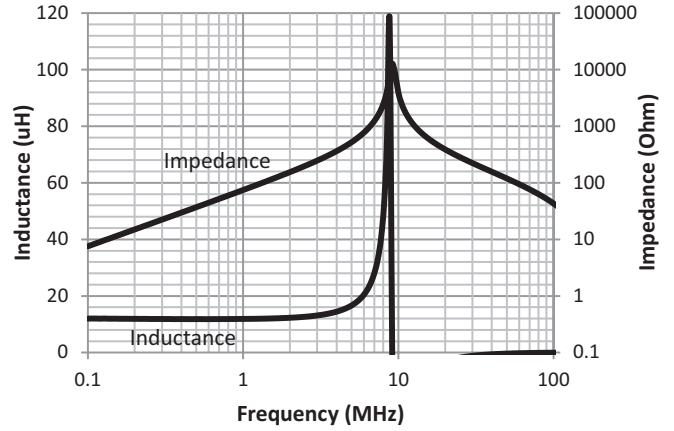


Inductance and impedance vs. frequency

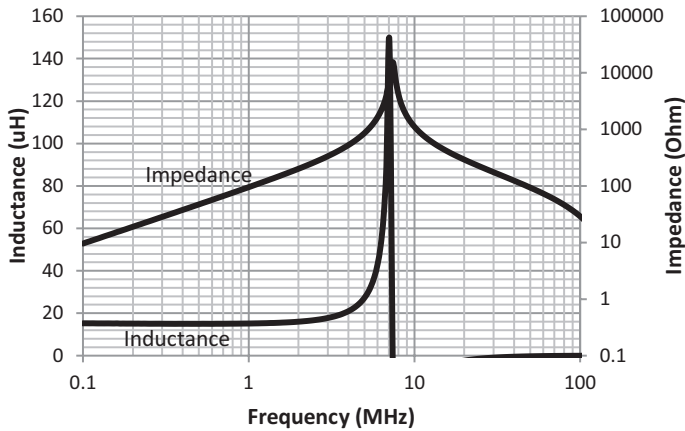
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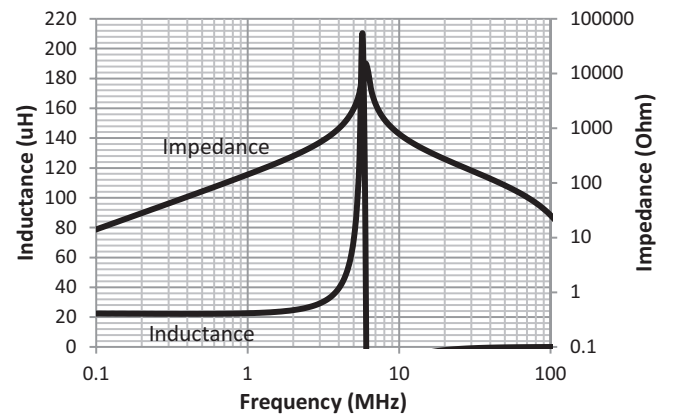
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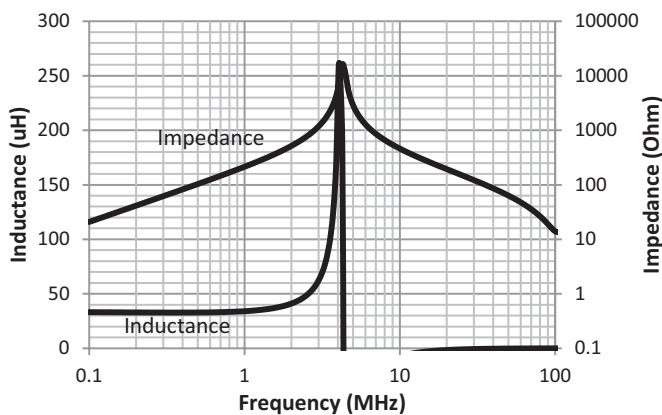
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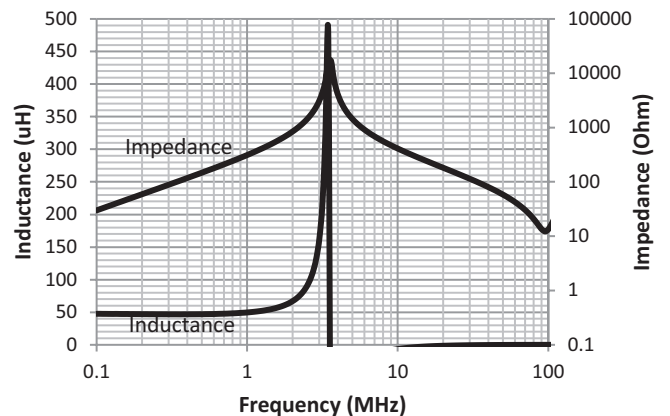
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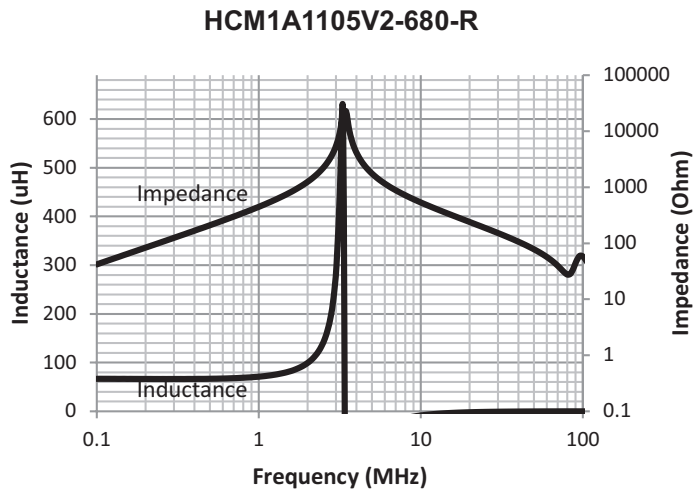
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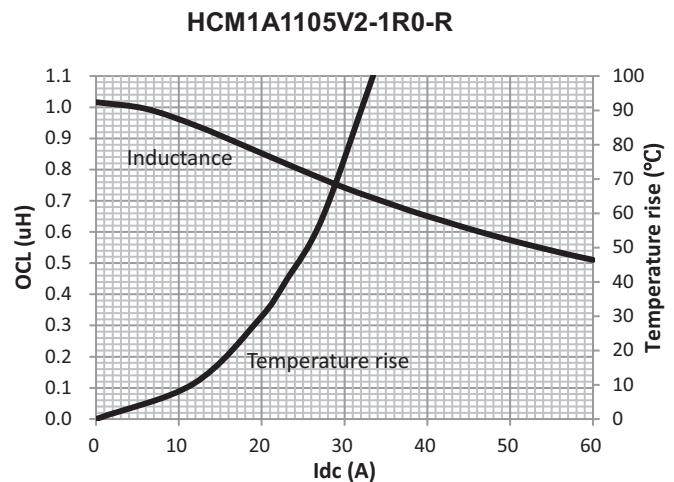
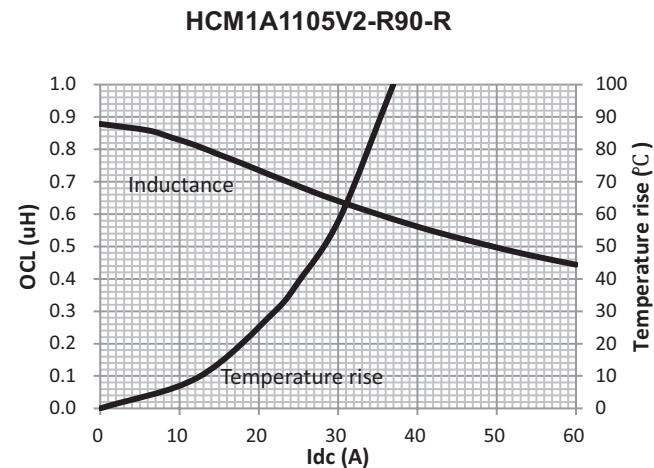
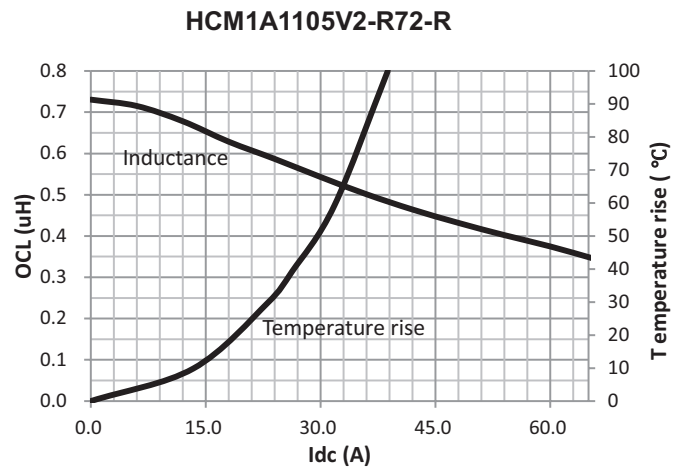
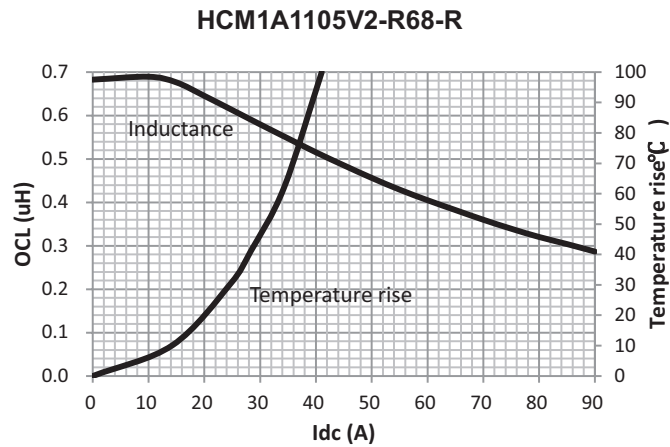
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Inductance and impedance vs. frequency

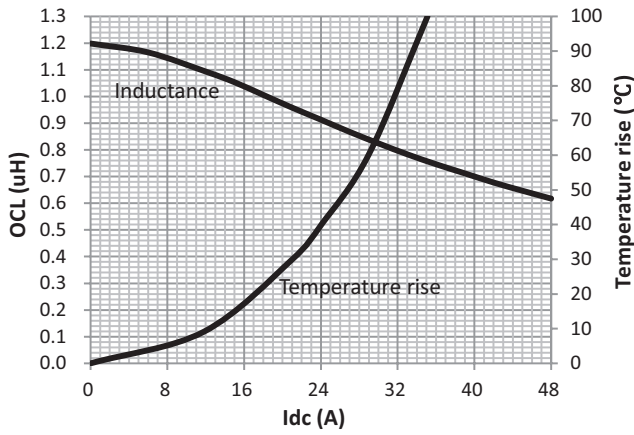


Inductance and temperature rise vs. current

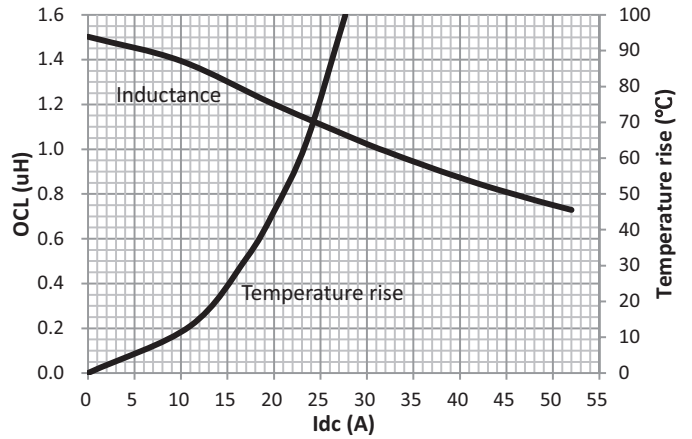


Inductance and temperature rise vs. current

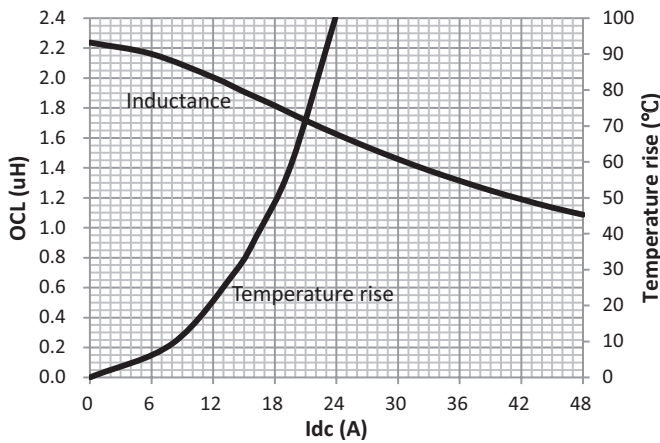
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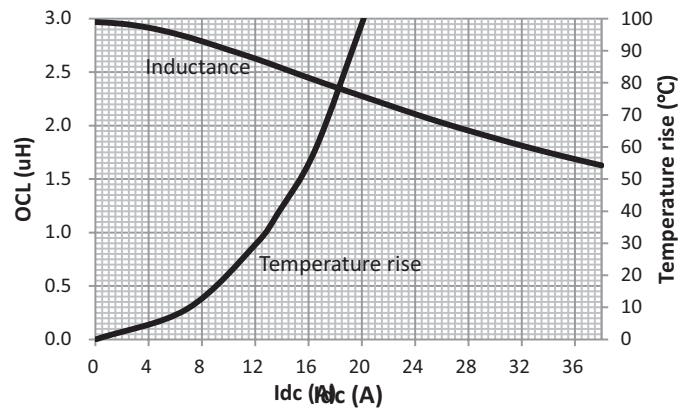
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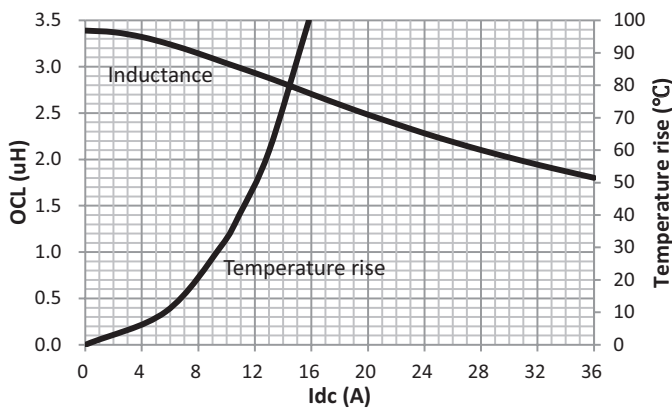
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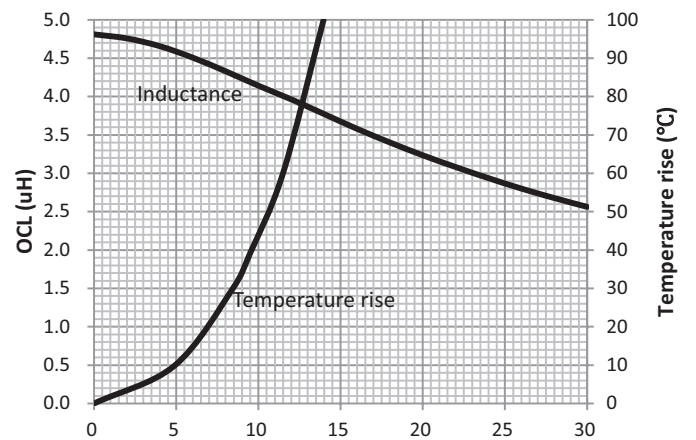
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HCM1A1105V2-3R3-R

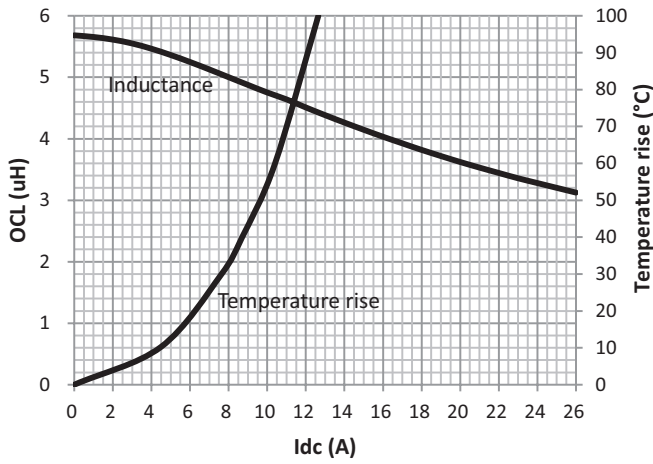


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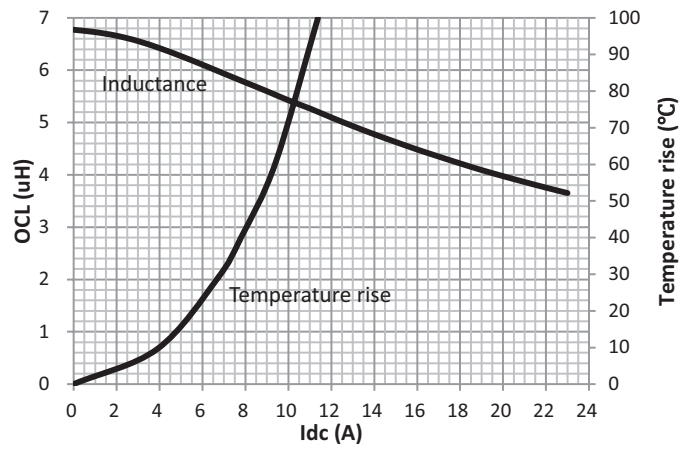


Inductance and temperature rise vs. current

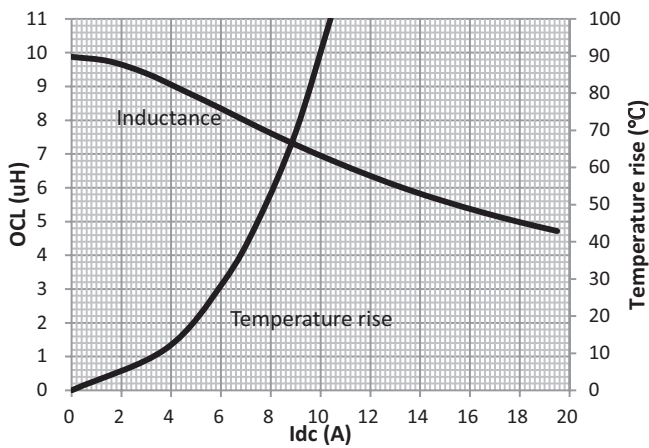
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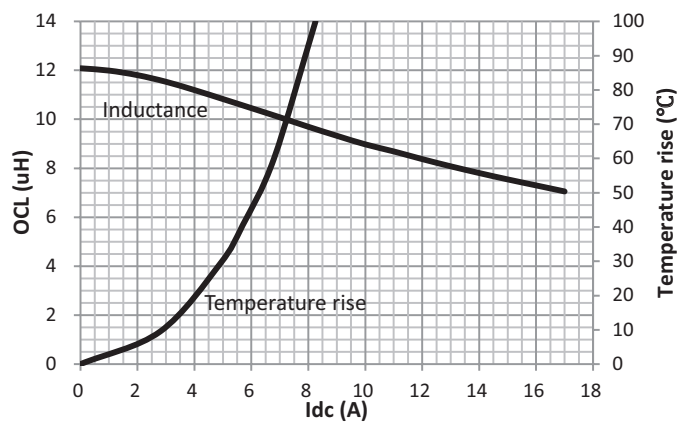
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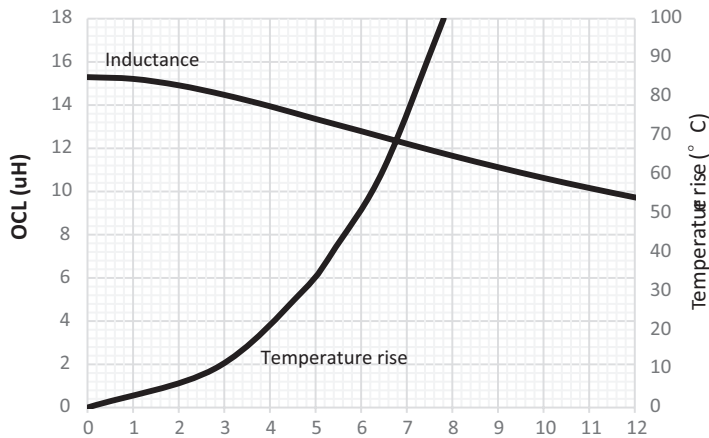
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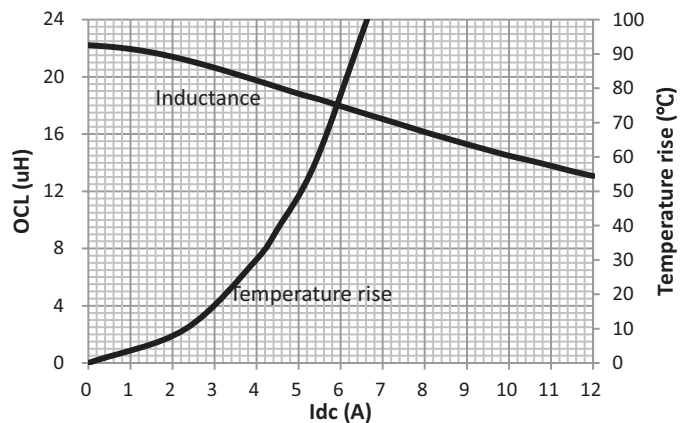
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HCM1A1105V2-150-R

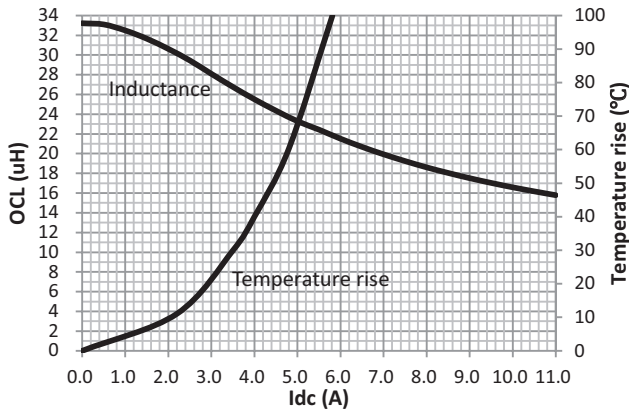


HCM1A1105V2-220-R

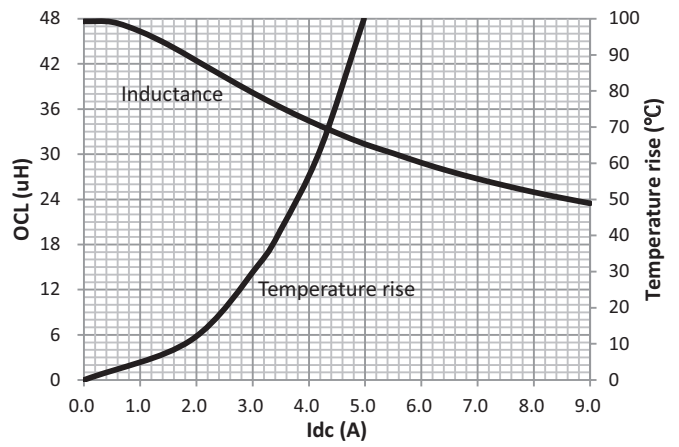


Inductance and temperature rise vs. current

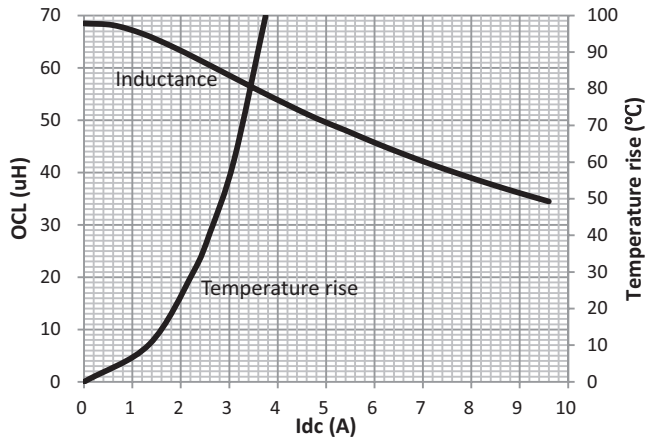
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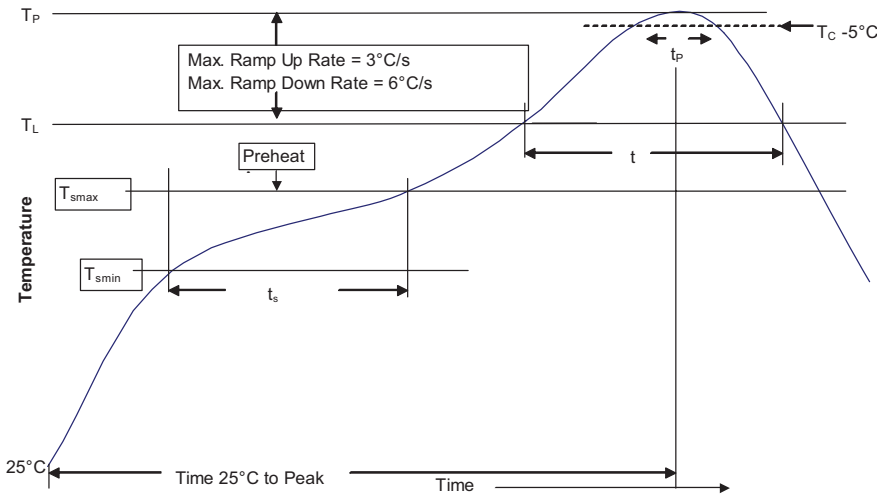
HCM1A1105V2-470-R



HCM1A1105V2-680-R



**Solder reflow profile**



**Table 1 - Standard SnPb solder (T<sub>C</sub>)**

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<sub>C</sub>)**

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 J-STD-020**

Profile feature	Standard SnPb solder	Lead (Pb) free solder
Preheat and Soak		
• Temperature min. (T <sub>smin</sub> )	100 °C	150 °C
• Temperature max. (T <sub>smax</sub> )	150 °C	200 °C
• Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )	60-120 seconds	60-120 seconds
Average ramp up rate T <sub>smax</sub> to T <sub>p</sub>	3 °C/ second max.	3 °C/ second max.
Liquidous temperature (T <sub>L</sub> )	183 °C	217 °C
Time at liquidous (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak package body temperature (T <sub>p</sub> )*	Table 1	Table 2
Time (t <sub>p</sub> )** within 5 °C of the specified classification temperature (T <sub>C</sub> )	20 seconds**	30 seconds**
Average ramp-down rate (T <sub>p</sub> to T <sub>smax</sub> )	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<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.

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