# HCM1A1307V2

## 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 0.22 µH to 56 µH
- Current range from 4.0 A to 100 A
- 13.8 mm x 12.9 mm footprint surface mount package in a 6.5 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)
- 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

Pb HALOGEN HF FREE RoHS

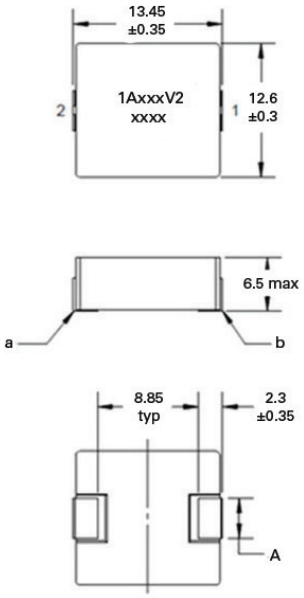
Powering Business Worldwide

## Product specifications

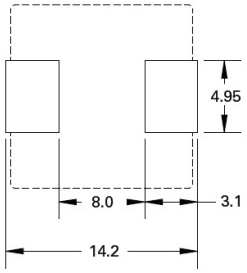
| Part number[6] | OCL[1] (µH) ± 20% | FLL[2] (µH) minimum | $I_{rms}$[3] (A) | $I_{sat}$[4] (A) | DCR (mΩ) typical @ +20 °C | DCR (mΩ) maximum @ +20 °C | SRF (MHz) typical | K-factor[5] |
|---|---|---|---|---|---|---|---|---|
| HCM1A1307V2-R22-R | 0.22 | 0.14 | 52 | 100 | 0.46 | 0.60 | 135 | 244 |
| HCM1A1307V2-R33-R | 0.33 | 0.21 | 47 | 70 | 0.58 | 0.69 | 80 | 219 |
| HCM1A1307V2-R47-R | 0.47 | 0.30 | 43 | 56 | 0.73 | 0.87 | 59 | 186 |
| HCM1A1307V2-1R0-R | 1.0 | 0.64 | 28 | 34 | 1.49 | 1.75 | 34 | 149 |
| HCM1A1307V2-1R2-R | 1.2 | 0.76 | 22.5 | 30 | 1.78 | 2.10 | 34 | 117 |
| HCM1A1307V2-1R5-R | 1.5 | 0.96 | 21 | 25 | 2.04 | 2.40 | 31 | 126 |
| HCM1A1307V2-1R8-R | 1.8 | 1.15 | 19 | 24 | 2.55 | 2.94 | 26 | 105 |
| HCM1A1307V2-2R2-R | 2.2 | 1.40 | 18.5 | 23 | 2.62 | 3.10 | 24 | 95 |
| HCM1A1307V2-3R3-R | 3.3 | 2.11 | 16.5 | 18 | 3.55 | 4.10 | 18 | 90 |
| HCM1A1307V2-4R7-R | 4.7 | 3.00 | 13 | 20 | 6.25 | 7.25 | 14 | 71 |
| HCM1A1307V2-5R6-R | 5.6 | 3.58 | 12 | 18 | 7.21 | 8.30 | 11 | 64 |
| HCM1A1307V2-6R8-R | 6.8 | 4.35 | 10 | 15 | 9.50 | 11.5 | 9 | 52 |
| HCM1A1307V2-7R8-R | 7.8 | 4.99 | 10 | 16 | 10.25 | 11.78 | 9 | 46 |
| HCM1A1307V2-8R2-R | 8.2 | 5.25 | 10 | 14 | 10.3 | 11.85 | 8 | 46 |
| HCM1A1307V2-100-R | 10 | 6.40 | 8.3 | 13.5 | 15.0 | 17.2 | 7 | 43 |
| HCM1A1307V2-120-R | 12 | 7.68 | 8.0 | 12.5 | 16.4 | 18.9 | 6 | 38 |
| HCM1A1307V2-150-R | 15 | 9.60 | 7.0 | 11 | 20.3 | 23.4 | 6 | 35 |
| HCM1A1307V2-220-R | 22 | 14.1 | 6.0 | 8 | 28.8 | 33.1 | 5 | 28 |
| HCM1A1307V2-330-R | 33 | 21.0 | 5.0 | 7.5 | 40.8 | 45.0 | 3 | 26 |
| HCM1A1307V2-560-R | 56 | 35.8 | 4.0 | 4.3 | 55.0 | 65.0 | 2 | 23 |

1. Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 $V_{rms}$, 0.0 Adc, +25 °C
2. Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 $V_{rms}$, $I_{sat}$, , +25 °C
3. $I_{rms}$: 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. $I_{sat}$: Peak current for approximately 20% rolloff @ +25 °C
5. K-factor: Used to determine $B_{p-p}$ for core loss (see graph). Bp-p = K * L * ΔI. $B_{p-p}$: (Gauss), K: (K-factor from table), L: (Inductance in µH), ΔI (Peak to peak ripple current in Amps).
6. Part Number Definition: HCM1A1307V2-xxx-R
   HCM1A1307V2 = Product code and size
   xxx= inductance value in µH, R= decimal point,
   If no R is present then last character equals number of zeros
   -R suffix = RoHS compliant

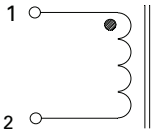
## Dimensions (mm)




Recommended pad layout




Schematic




**Dimension A**

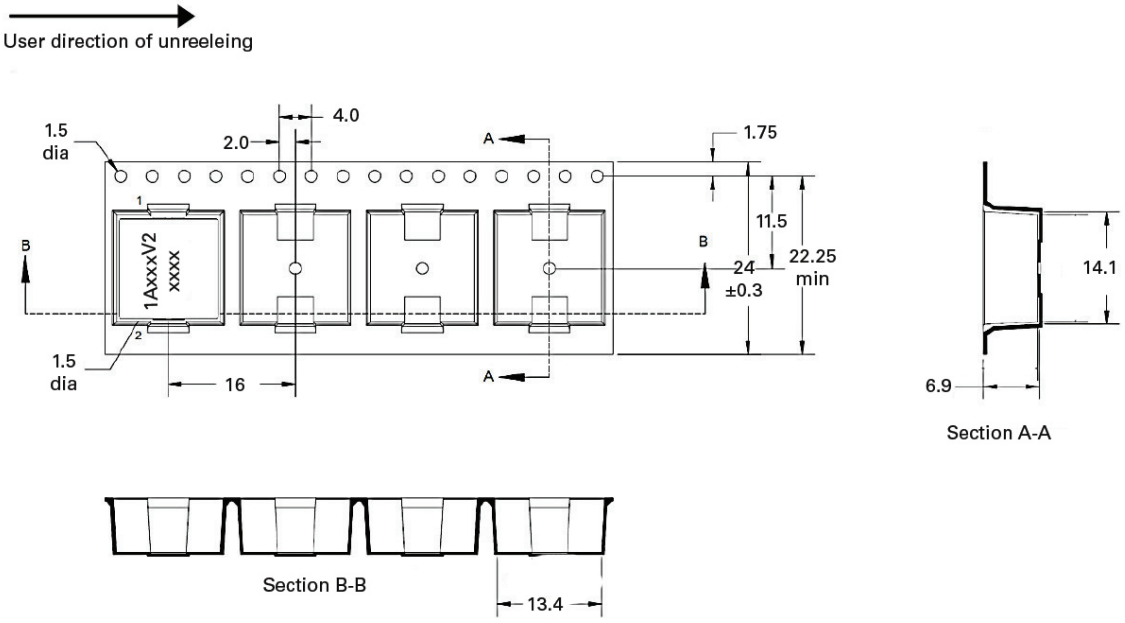
| HCM1A1307V2-R22 through R47-R, | HCM1A1307V2-1R0 through 3R3-R | HCM1A1307V2-4R7 through 560-R |
|---|---|---|
| 4.4 ±0.3 | 3.68 ±0.3 | 4.7 ±0.3 |

Part marking: 1AxxxV2, 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 ±0.3 millimeters unless stated otherwise
Pad layout tolerances are ±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)

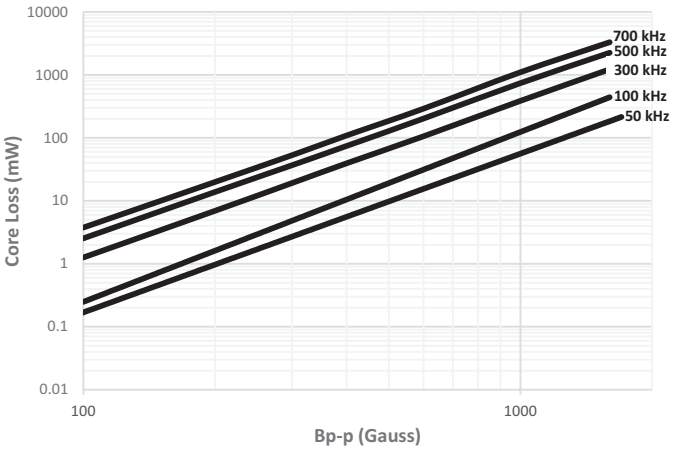
Drawing not to scale

Supplied in tape and reel packaging, 250 parts per 13" diameter reel

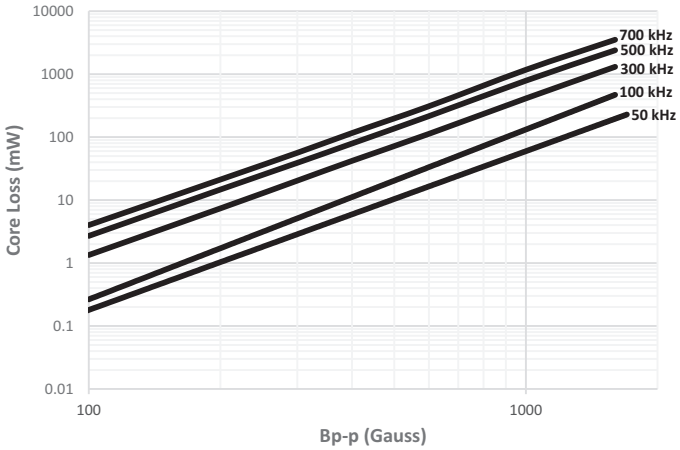


**Core loss vs $B_{p-p}$**

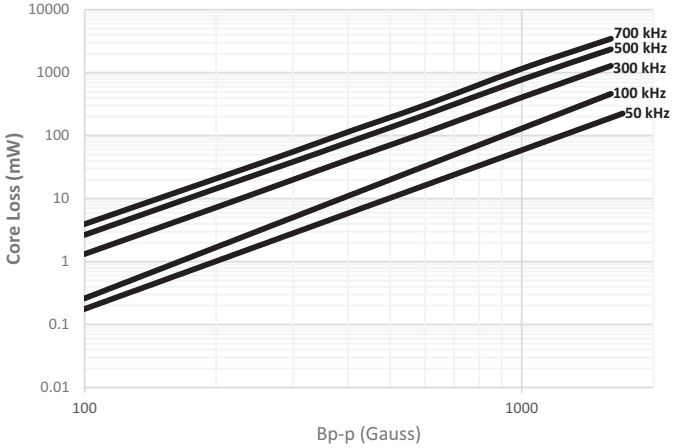
**HCM1A1307V2-R22-R**



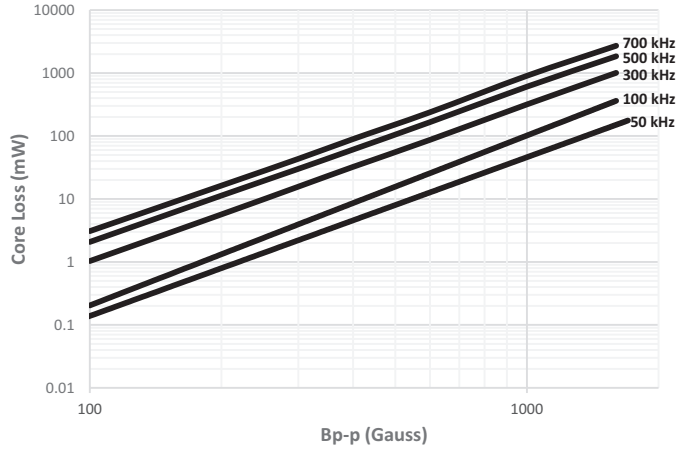

**HCM1A1307V2-R33-R**



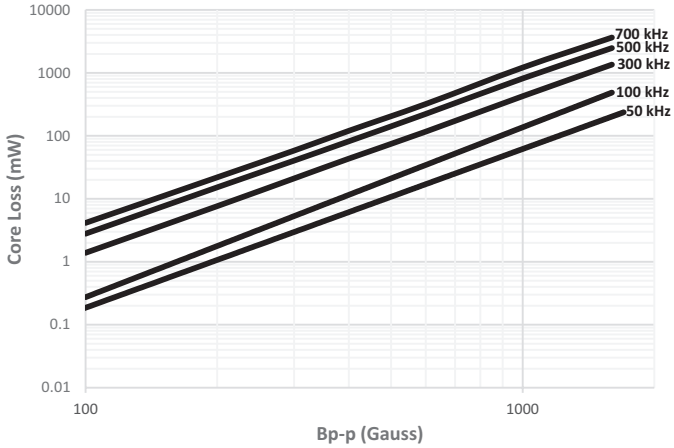

**HCM1A1307V2-R47-R**



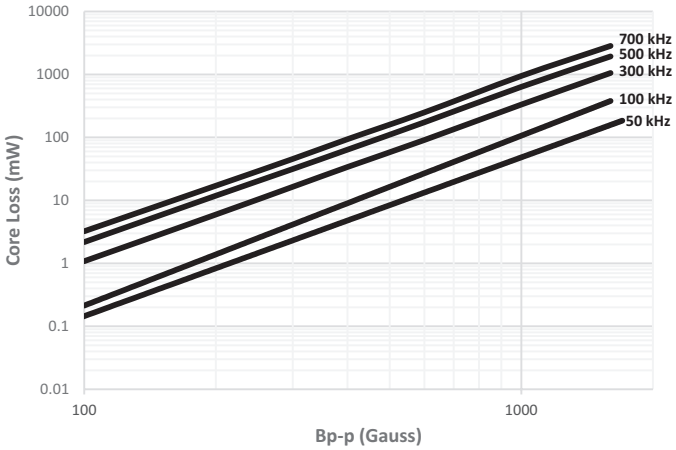

**HCM1A1307V2-1R0-R**




**HCM1A1307V2-1R2-R**

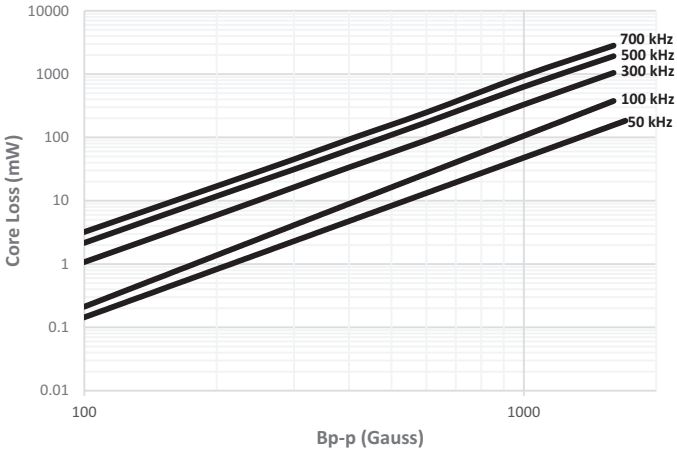



**HCM1A1307V2-1R5-R**

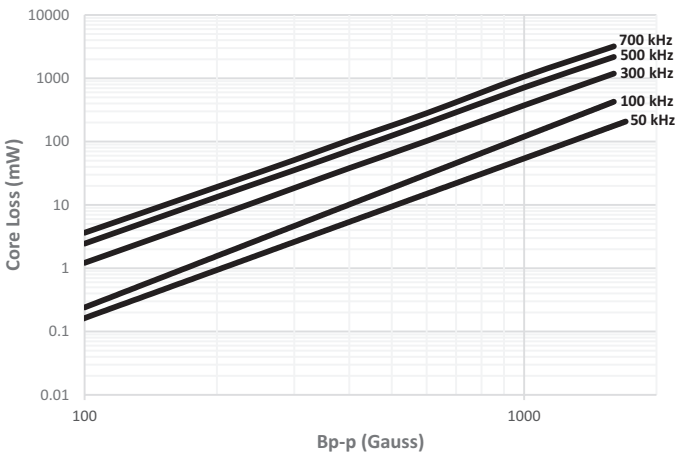


**Core loss vs $B_{p-p}$**

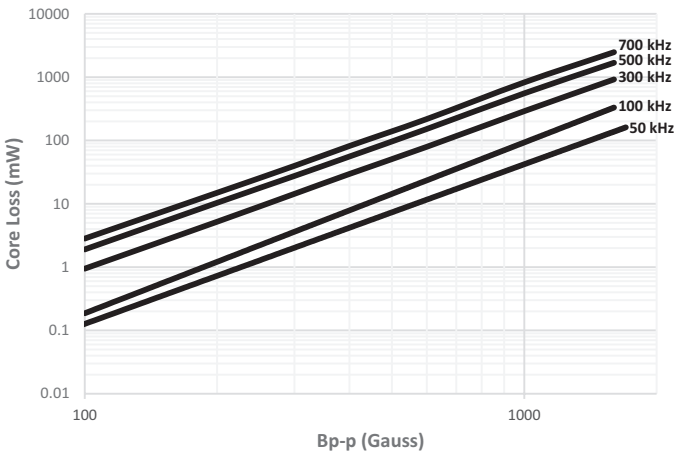
**HCM1A1307V2-1R8-R**



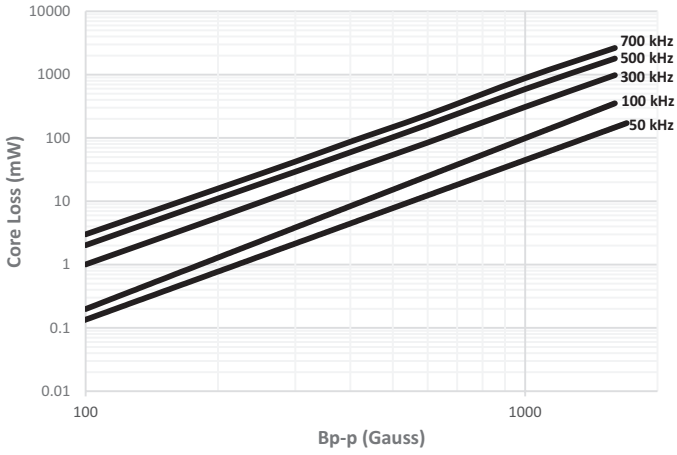

**HCM1A1307V2-2R2-R**



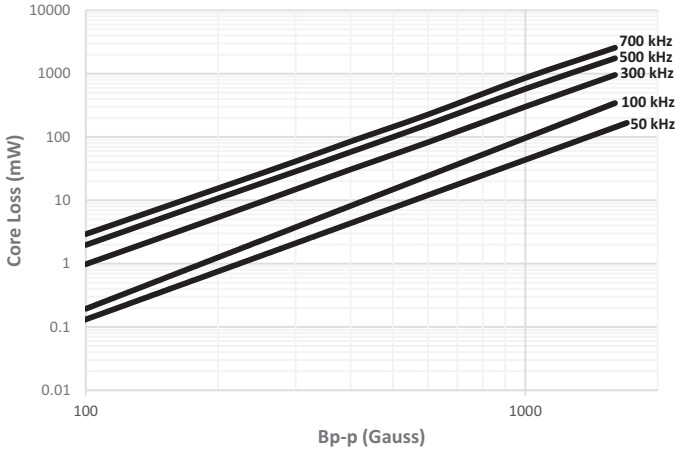

**HCM1A1307V2-3R3-R**



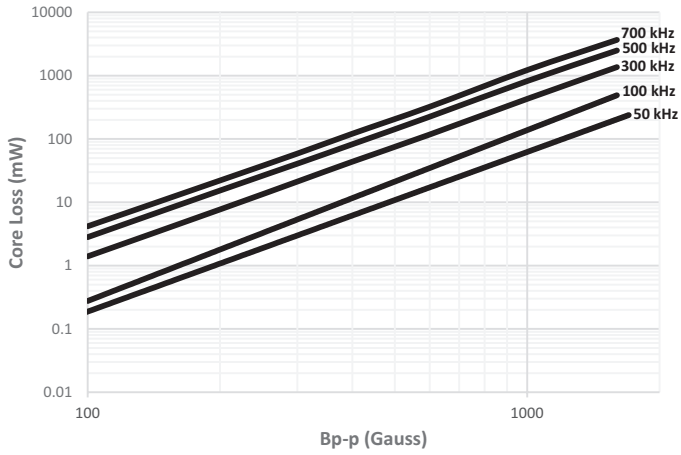

**HCM1A1307V2-4R7-R**




**HCM1A1307V2-5R6-R**

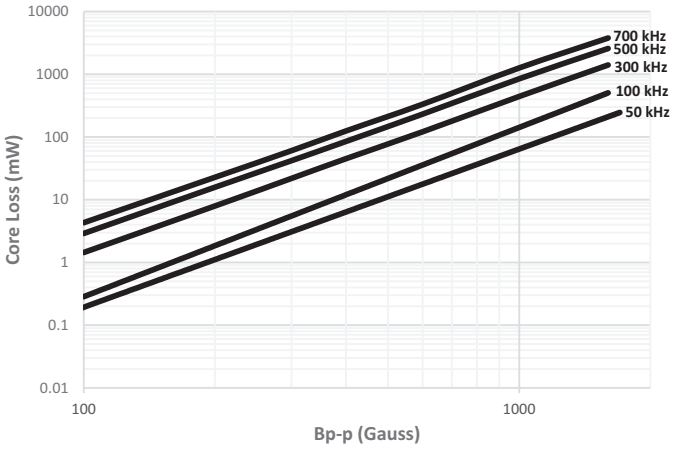



**HCM1A1307V2-6R8-R**

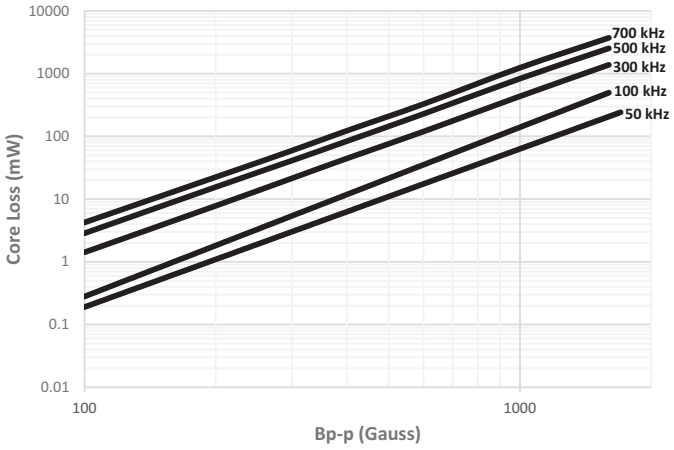


**Core loss vs $B_{p-p}$**

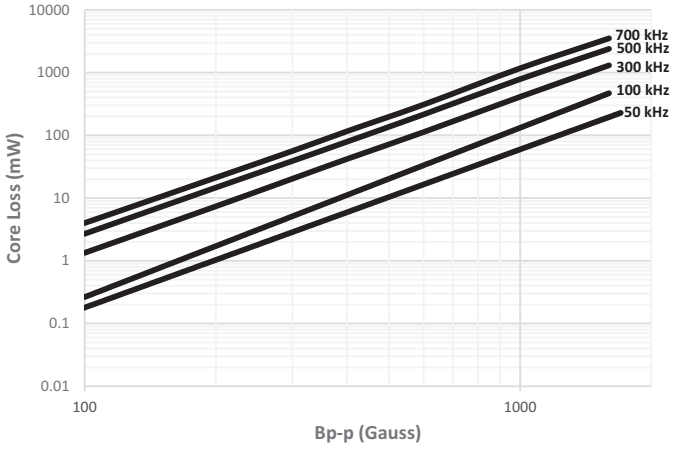
HCM1A1307V2-7R8-R



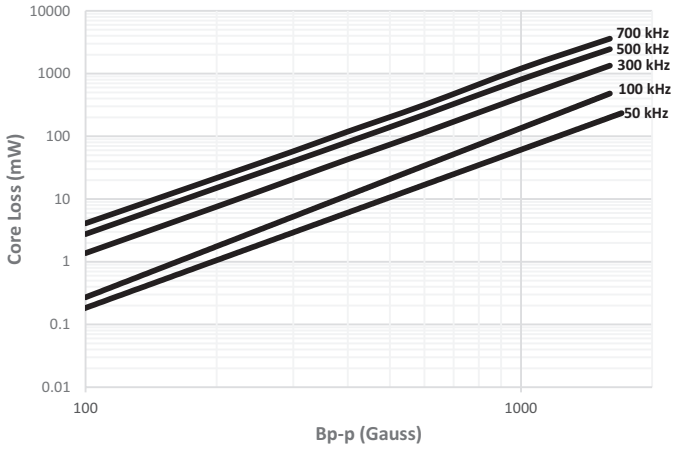

HCM1A1307V2-8R2-R



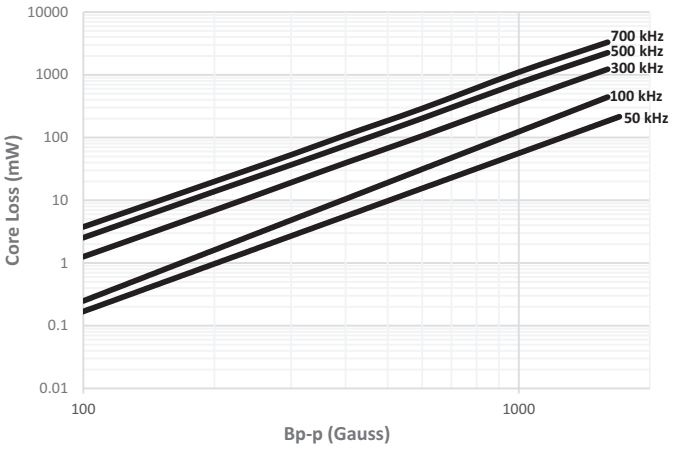

HCM1A1307V2-100-R




HCM1A1307V2-120-R




HCM1A1307V2-150-R

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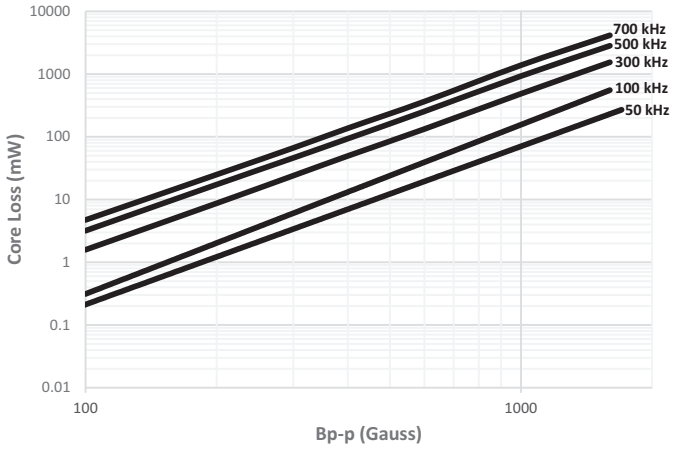
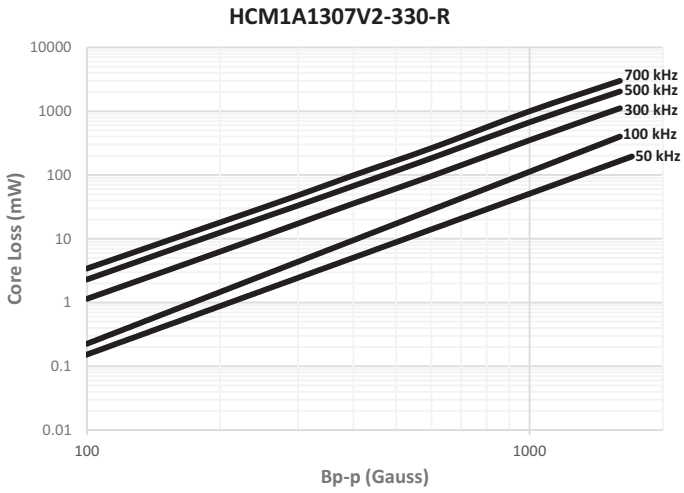
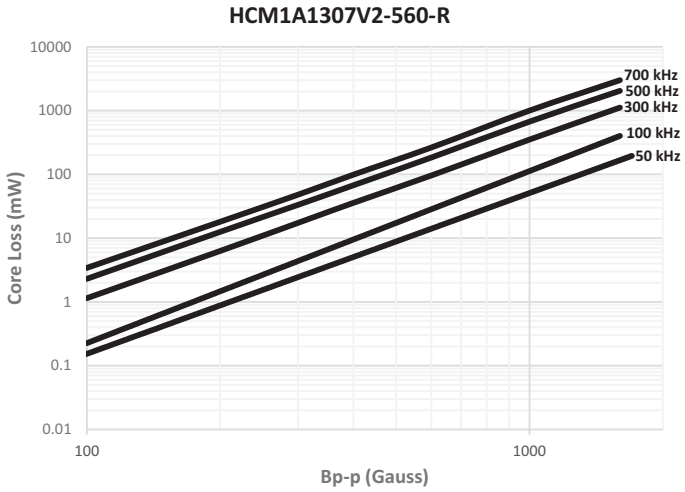
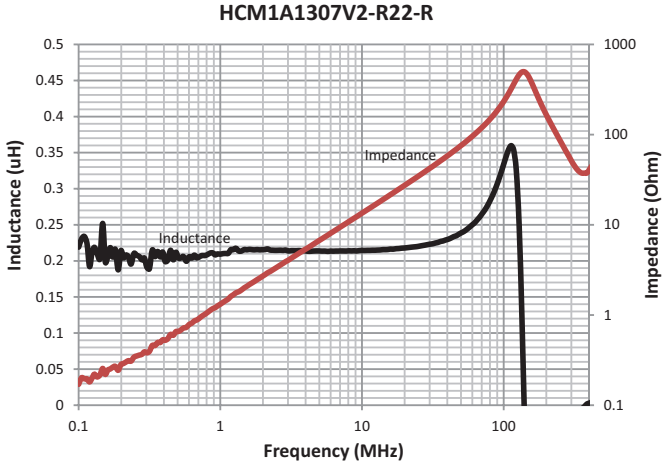


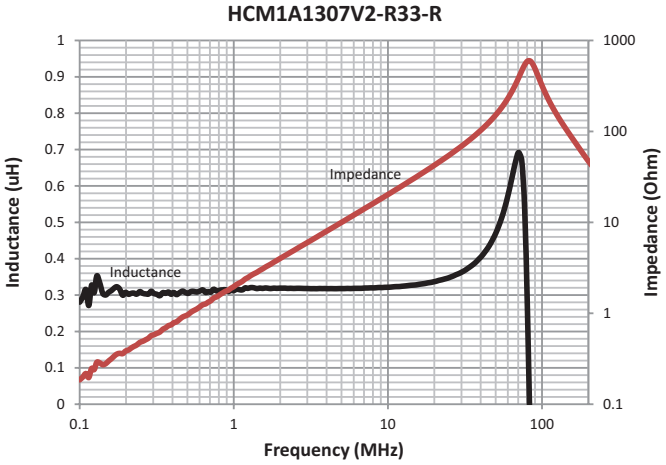
### Core loss vs $B_{p-p}$

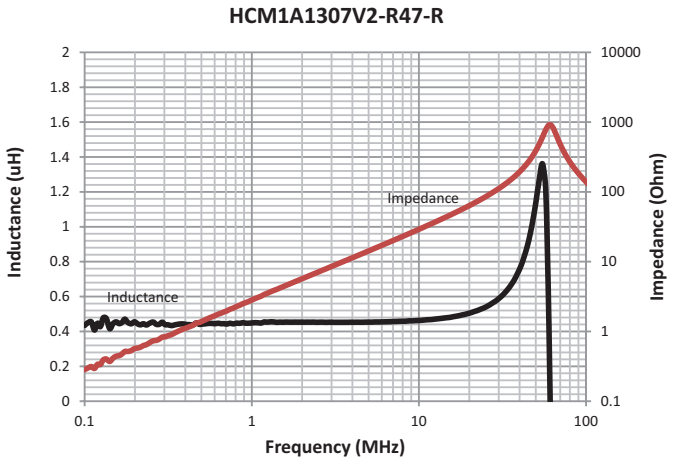


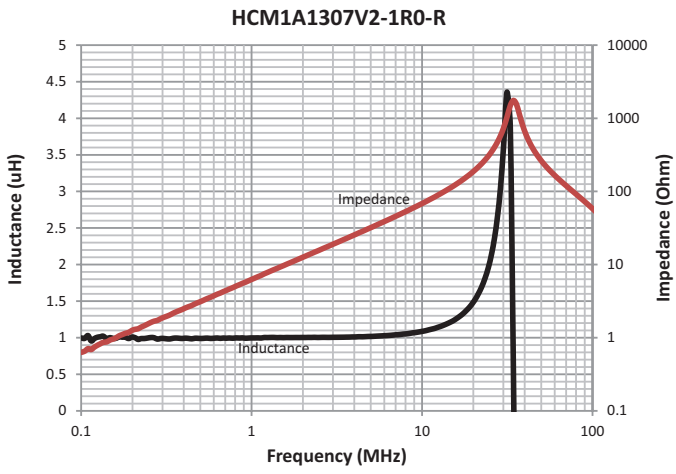




### Inductance and impedance vs. frequency

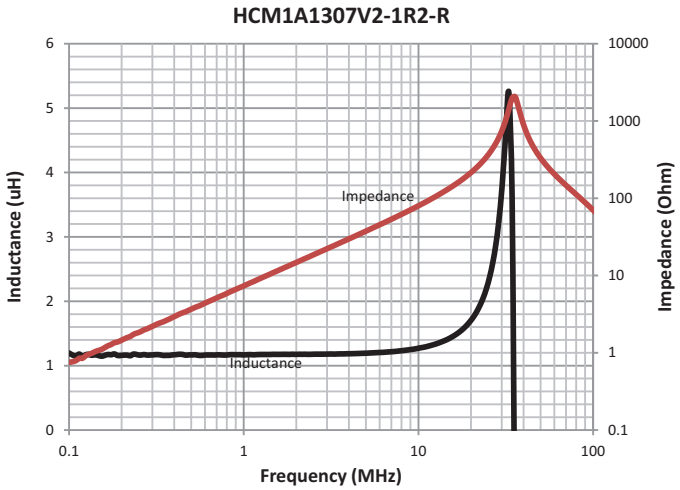


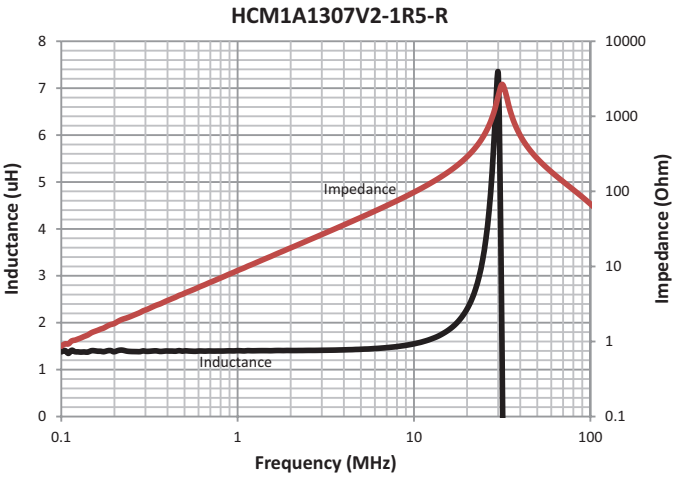



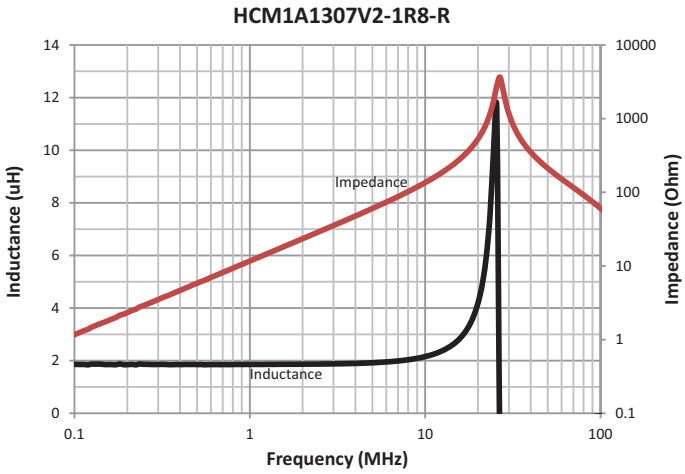



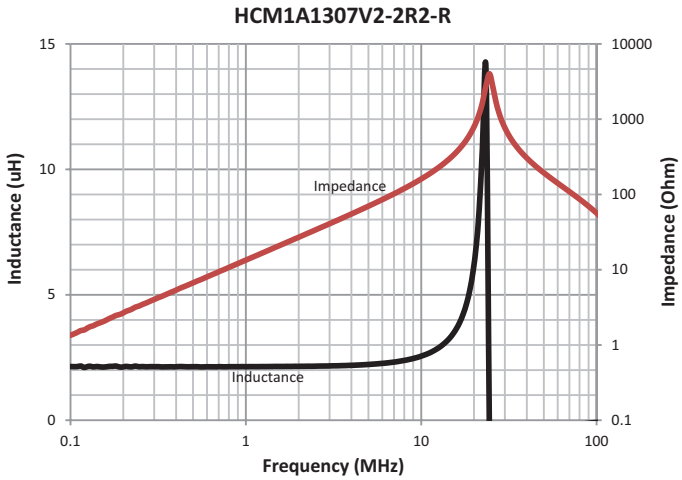



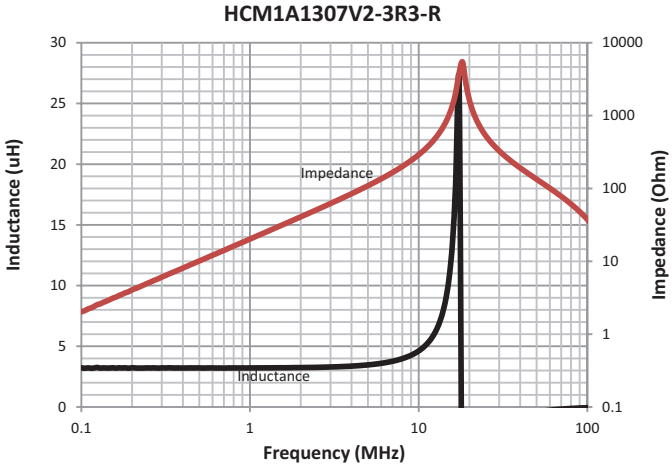
**Inductance and impedance vs. frequency**

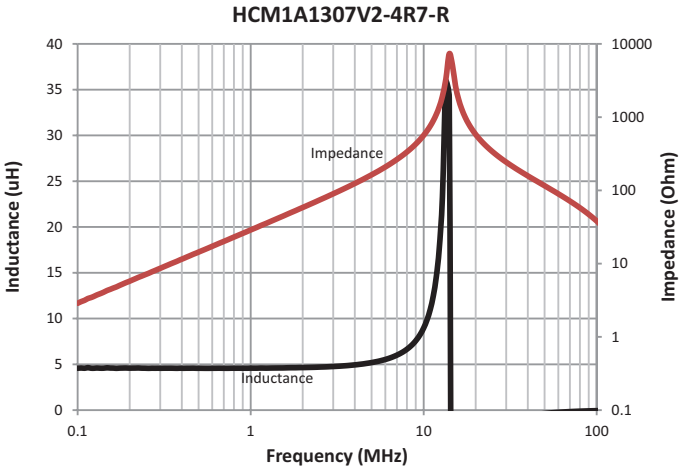


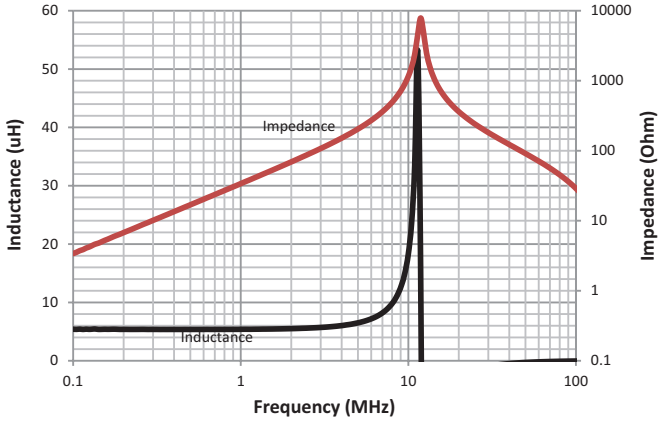



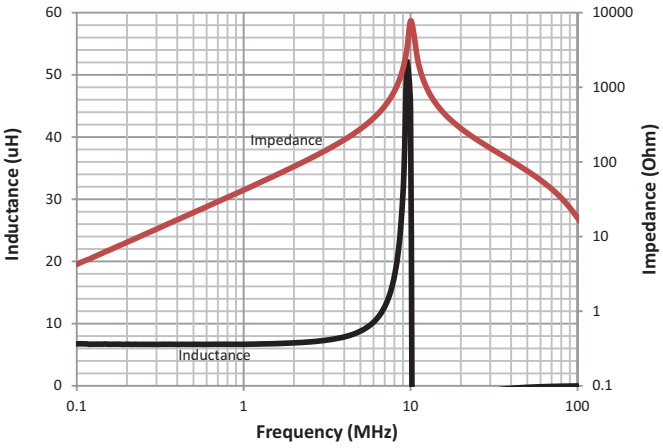



**Inductance and impedance vs. frequency**

HCM1A1307V2-5R6-R




HCM1A1307V2-6R8-R

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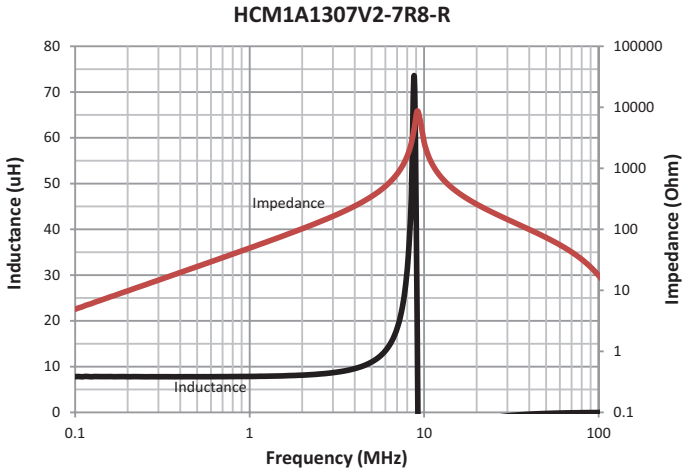
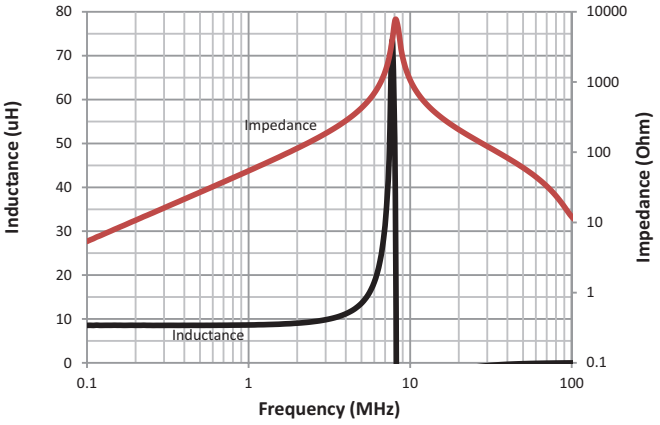
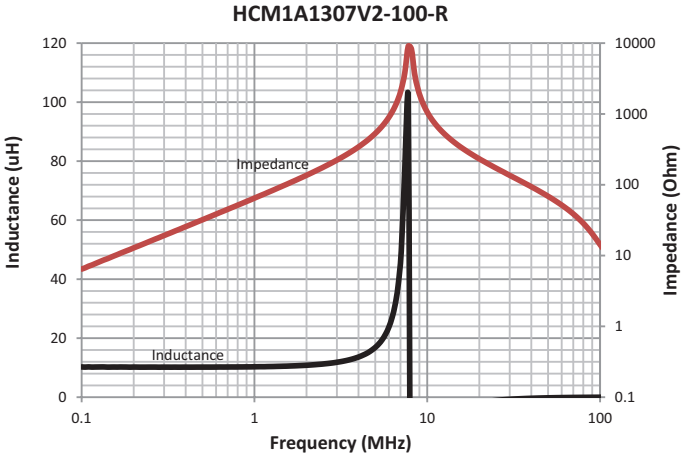



HCM1A1307V2-8R2-R




HCM1A1307V2-100-R

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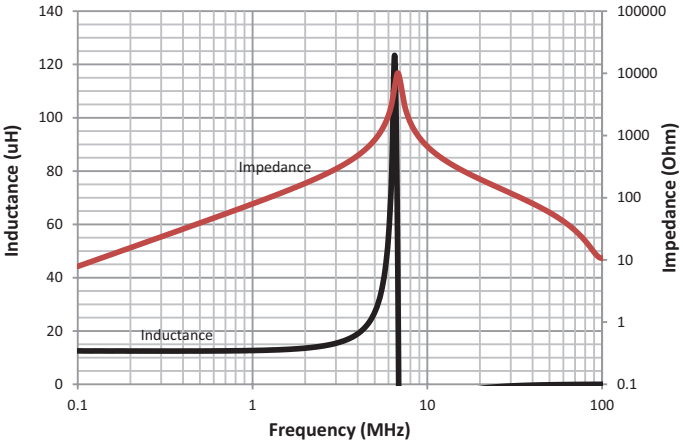
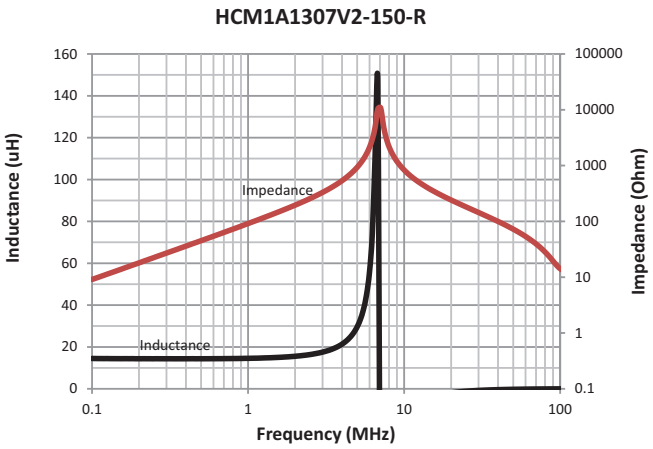
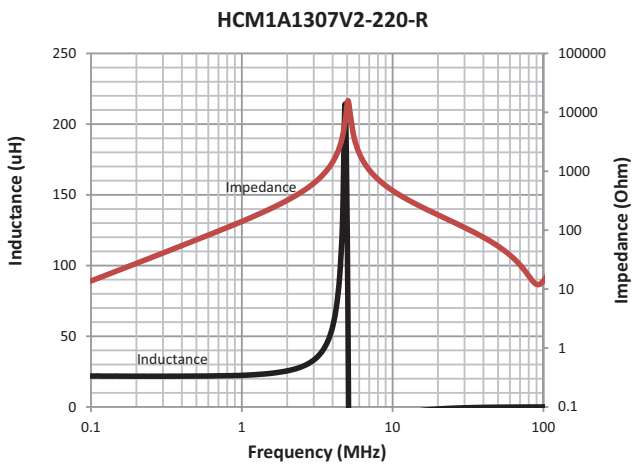
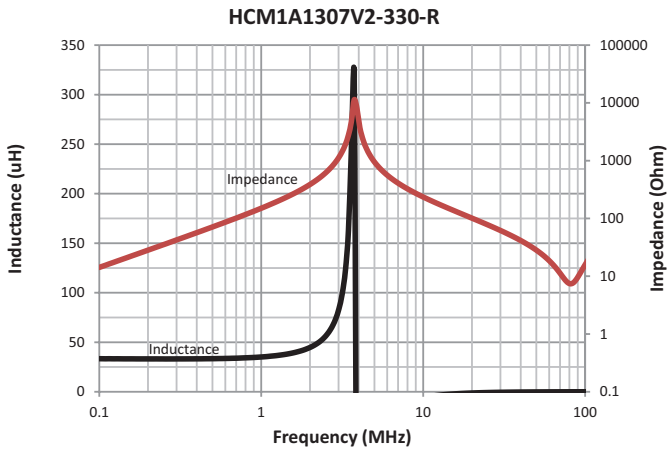
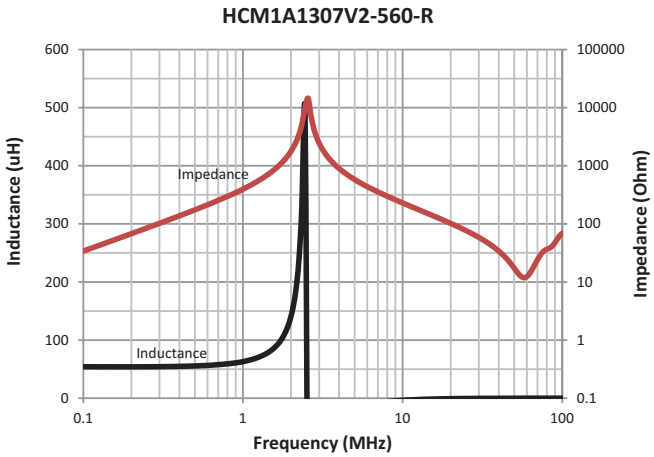


**Inductance and impedance vs. frequency**



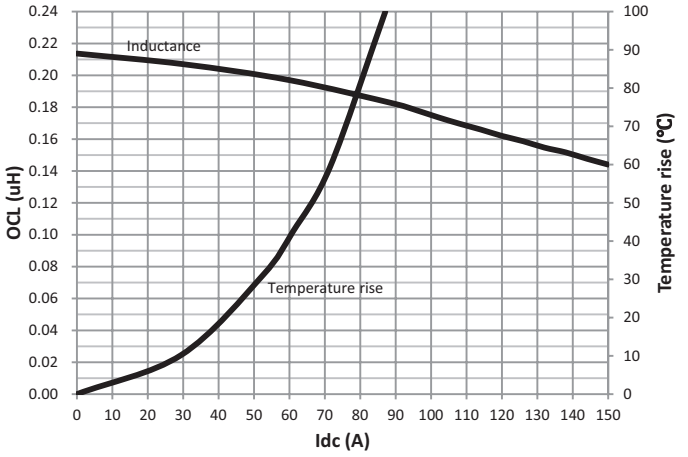



**Inductance and temperature rise vs. current**

**HCM1A1307V2-R22-R**

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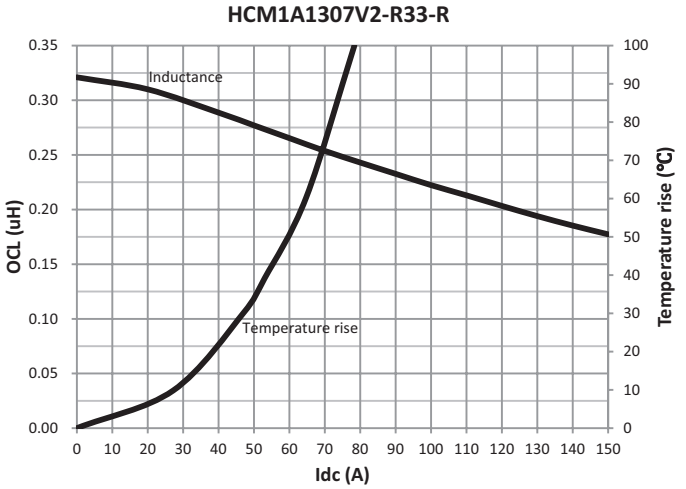
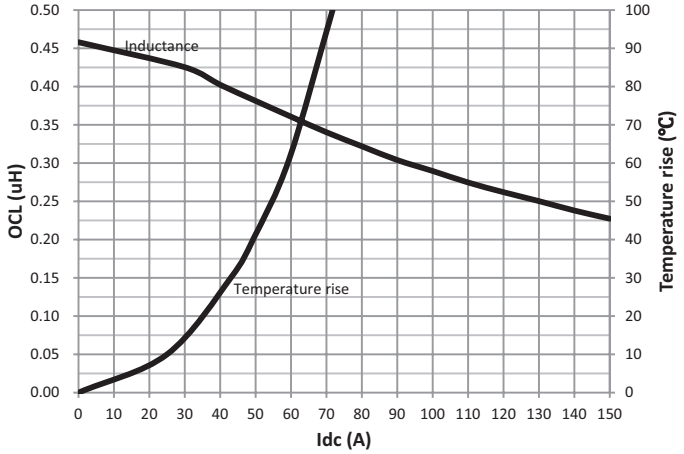
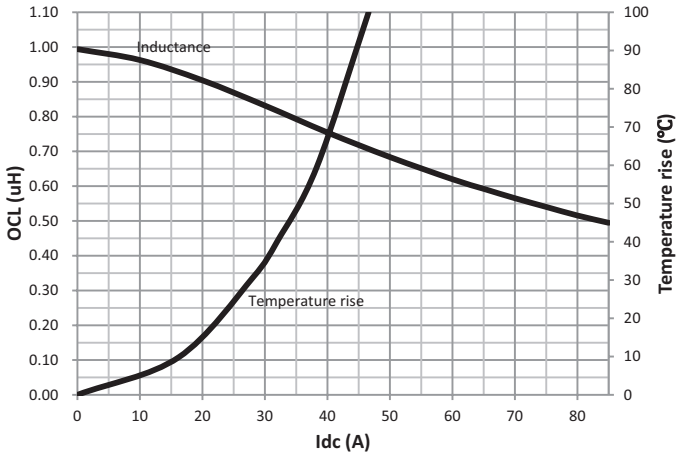



**HCM1A1307V2-R47-R**




**HCM1A1307V2-1R0-R**

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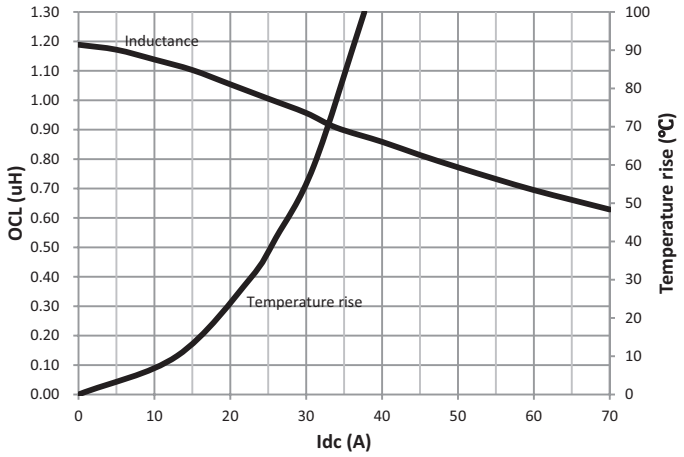
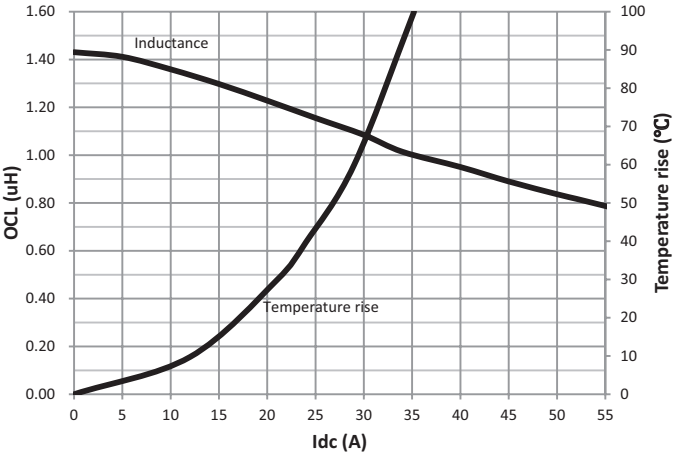
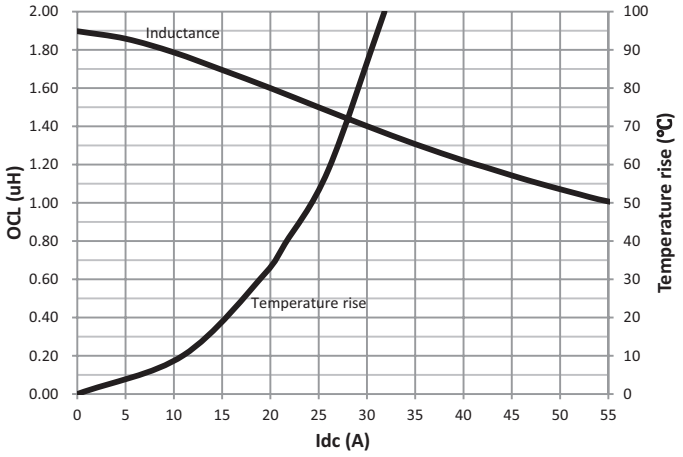



**HCM1A1307V2-1R5-R**

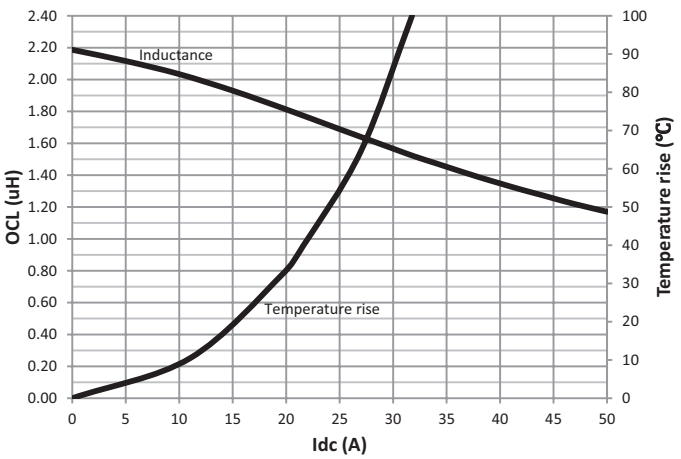


**Inductance and temperature rise vs. current**

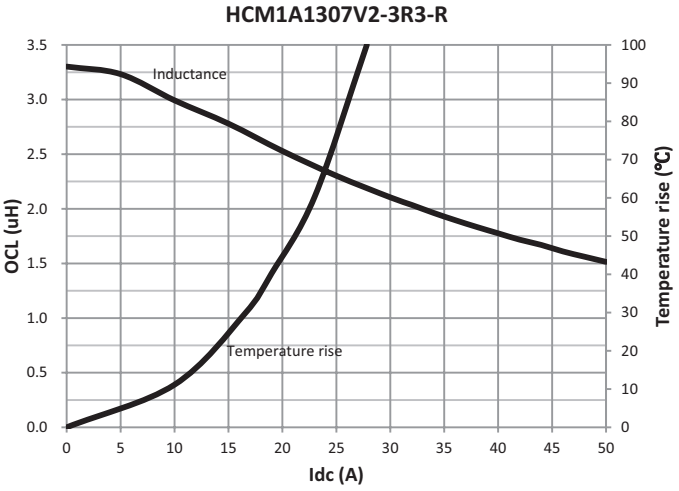
**HCM1A1307V2-1R8-R**



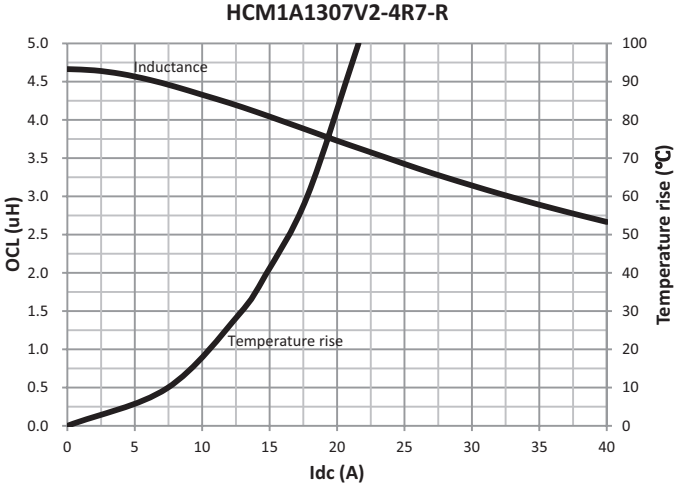

**HCM1A1307V2-2R2-R**



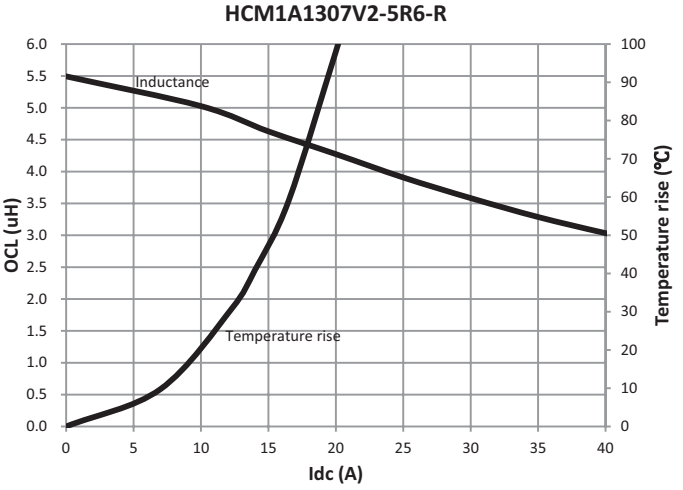

**HCM1A1307V2-3R3-R**



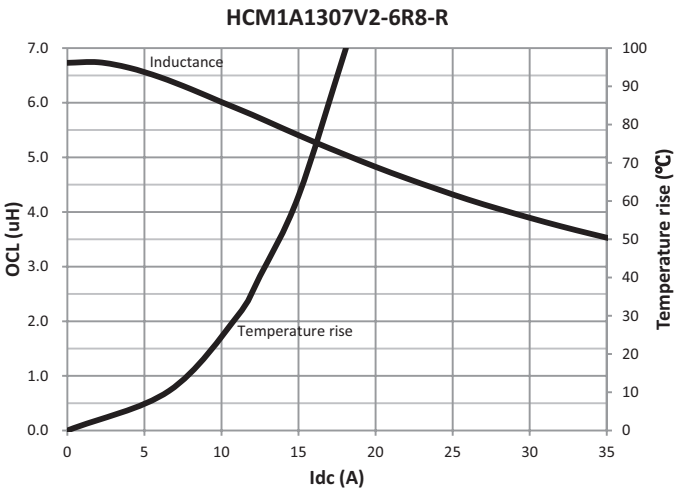

**HCM1A1307V2-4R7-R**




**HCM1A1307V2-5R6-R**

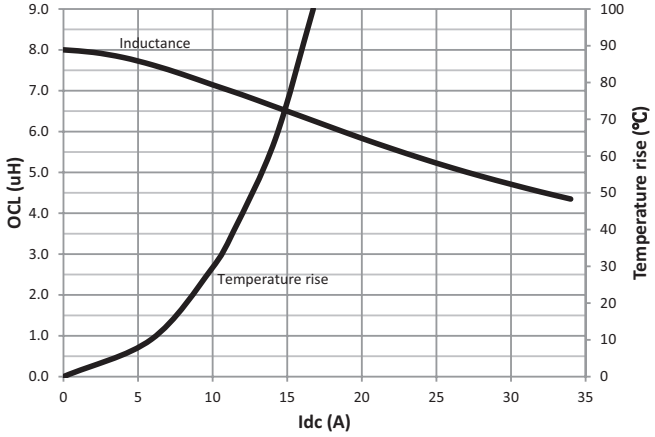



**HCM1A1307V2-6R8-R**

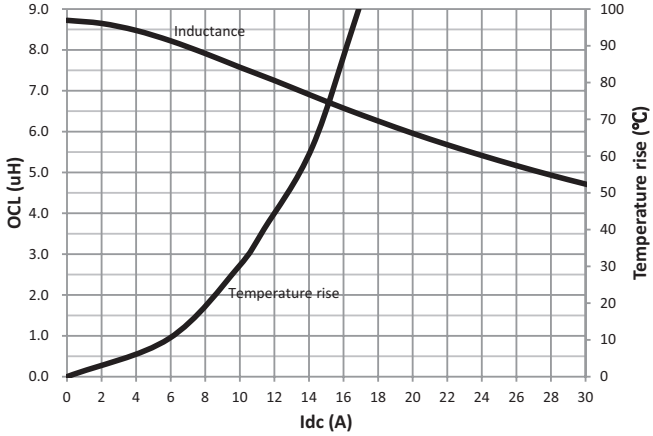


**Inductance and temperature rise vs. current**

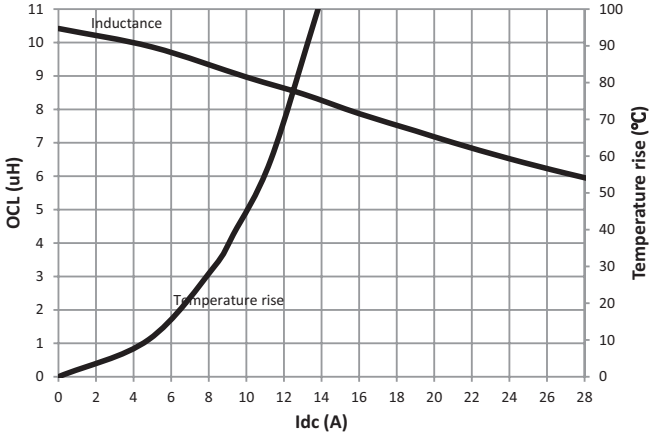
**HCM1A1307V2-7R8-R**



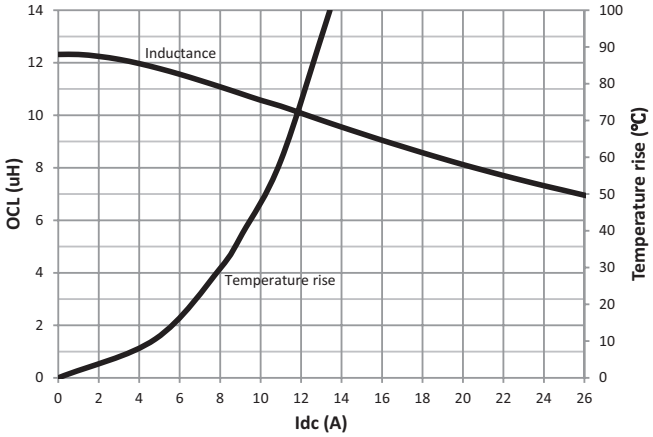

**HCM1A1307V2-8R2-R**



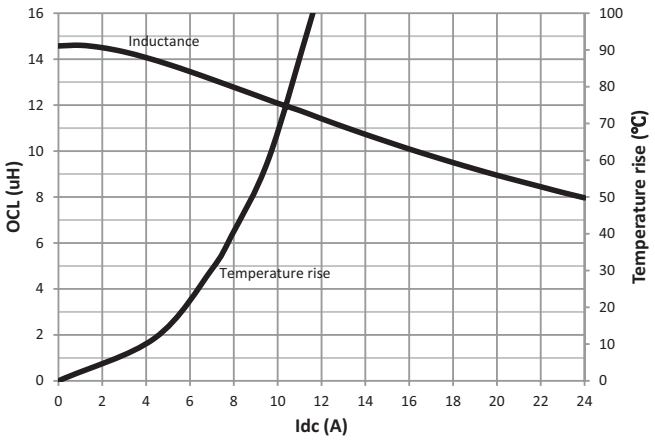

**HCM1A1307V2-100-R**



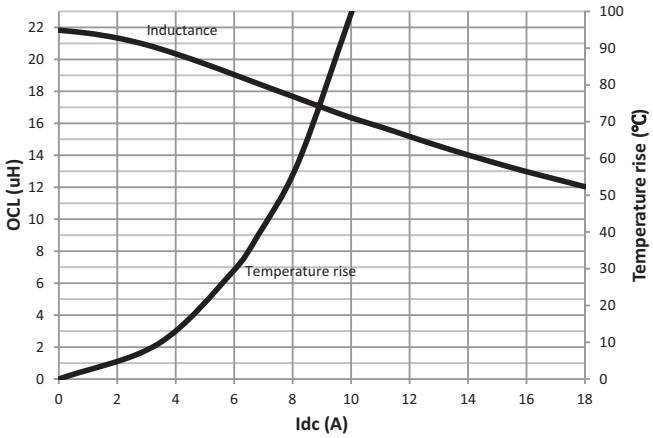

**HCM1A1307V2-120-R**



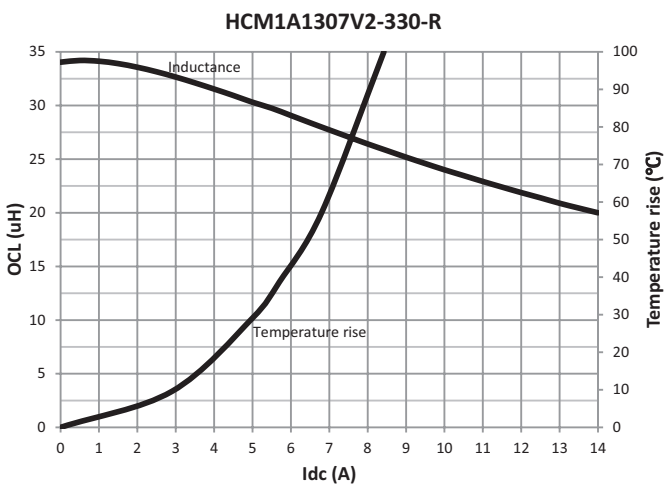

**HCM1A1307V2-150-R**

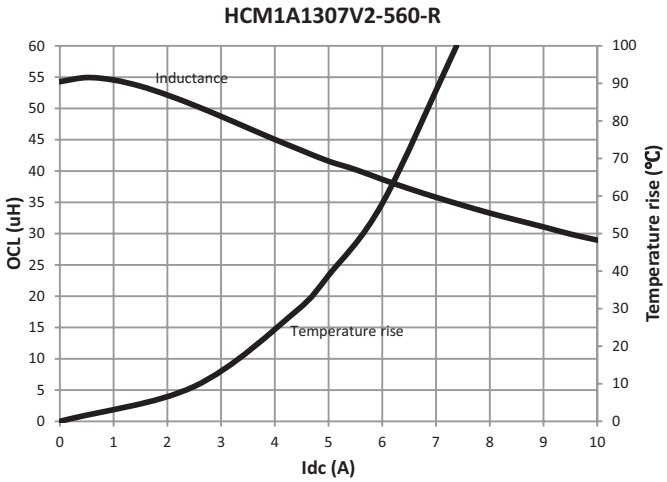



**HCM1A1307V2-220-R**



**Inductance and temperature rise vs. current**



## Solder reflow profile

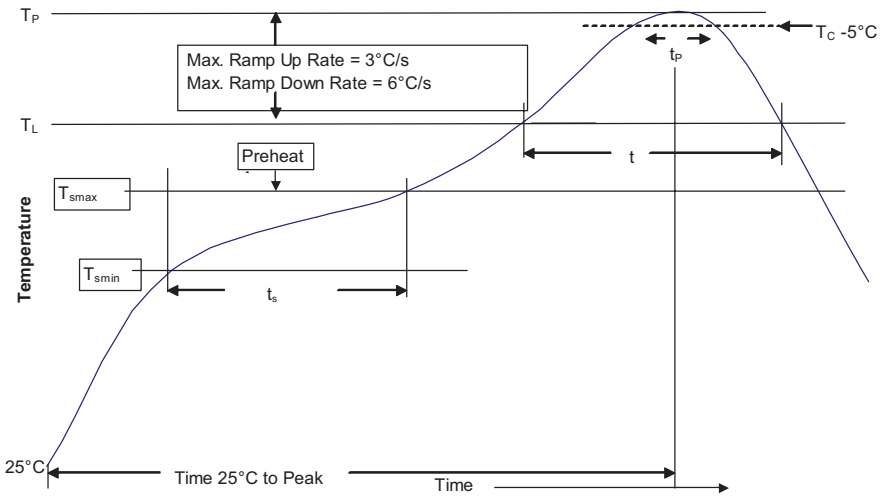



**Table 1 - Standard SnPb solder ($T_C$)**

| Package thickness | Volume mm3 <350 | Volume mm3 ≥350 |
|---|---|---|
| <2.5 mm) | 235 °C | 220 °C |
| ≥2.5 mm | 220 °C | 220 °C |

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

| Package thickness | Volume mm³ <350 | Volume mm³ 350 - 2000 | Volume mm³ >2000 |
|---|---|---|---|
| <1.6 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. ($T_{smin}$) | 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 ($T_L$)<br>Time at liquidous ($t_L$) | | 183 °C<br>60-150 seconds | 217 °C<br>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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