# 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 µH to 68 µH
- 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

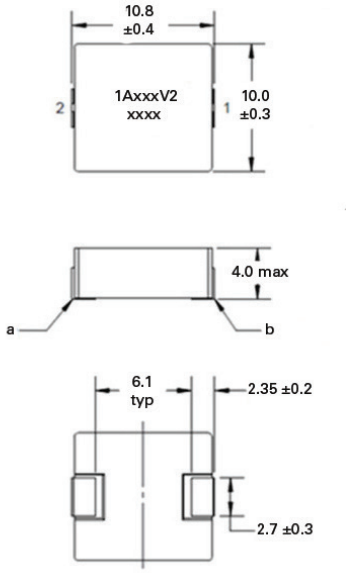
Powering Business Worldwide

## Product specifications

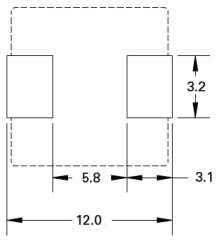
| Part number[6] | OCL[1] (µH) ± 20% | FLL[2] (µH) minimum | $I_{rms}$[3] (A) | $I_{sat}$[4] (A) | DCR (mΩ) typical @ +20 °C | DCR (mΩ) maximum @ +20 °C | SRF (MHz) typical | K-factor[5] |
|---|---|---|---|---|---|---|---|---|
| HCM1A1104V2-R20-R | 0.20 | 0.13 | 43 | 60 | 0.63 | 0.72 | 150 | 726 |
| 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 $V_{rms}$, 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: HCM1A1104V2-xxx-R
   HCM1A1104V2 = 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

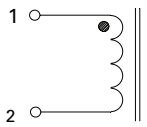
## Dimensions (mm)




Recommended pad layout




Schematic

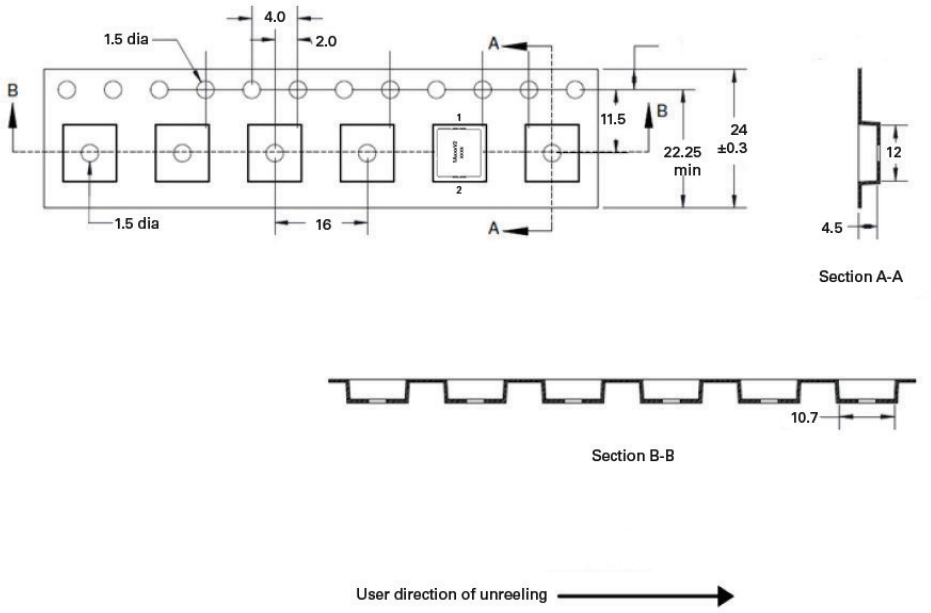



Part marking: 1AxxxV2, xxx=inductance value in uH, R=decimal point. If no R is present then last character equals number of zeros. xxxx=Lot code
All soldering surfaces to be coplanar within 0.1 millimeters
Tolerances are ±0.3 millimeters unless stated otherwise
Pad layout tolerances are ±0.1 millimeters unless stated otherwise
DCR measured from point "a" to point "b"
Do not route traces or vias underneath the inductor

### Packaging information (mm)

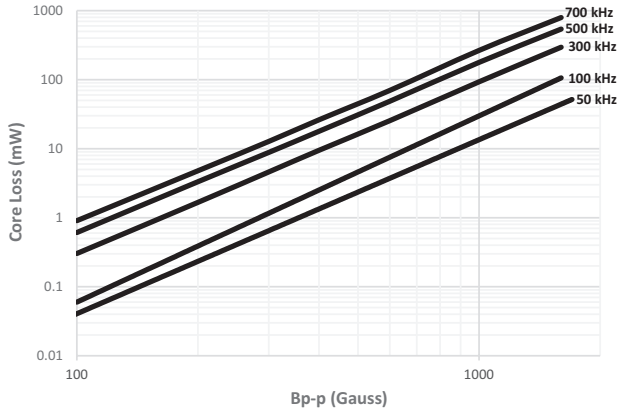
Drawing not to scale

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




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

**HCM1A1104V2-R20-R**

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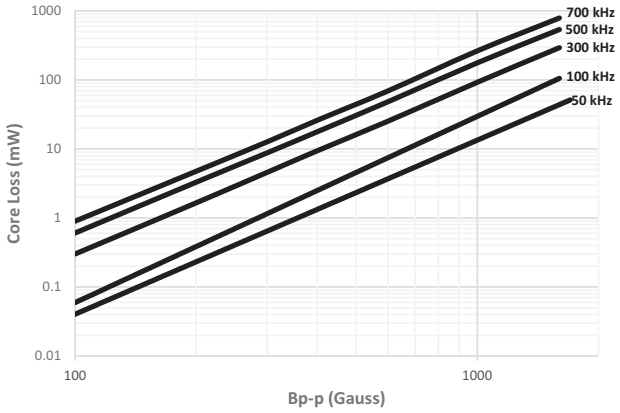


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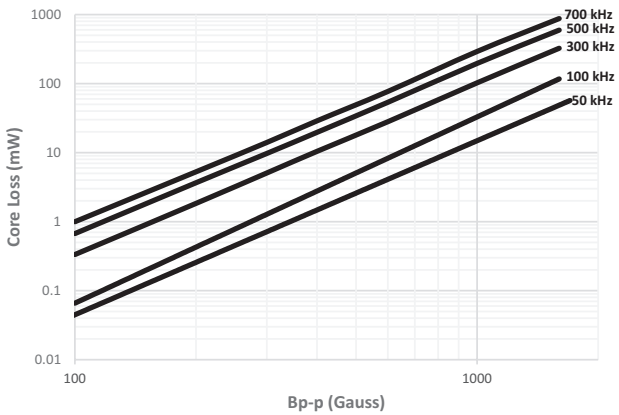


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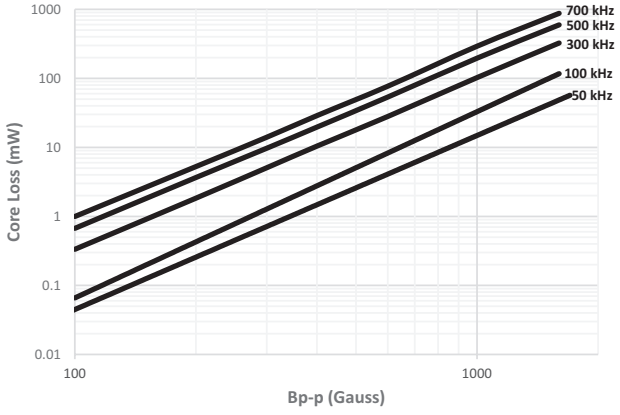
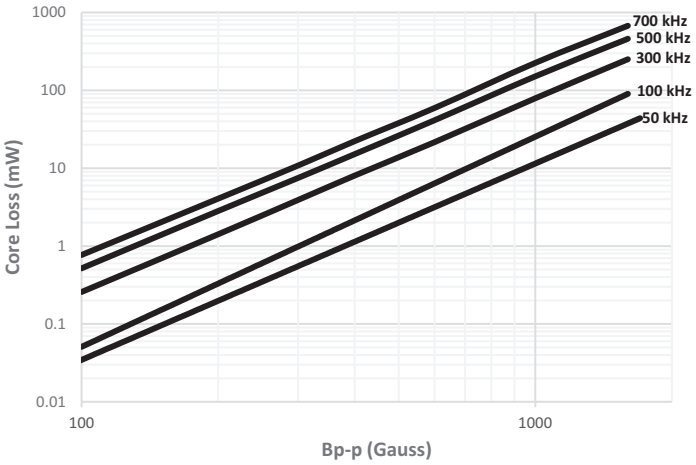


**Core loss vs $B_{p-p}$**

**HCM1A1104V2-R56-R**

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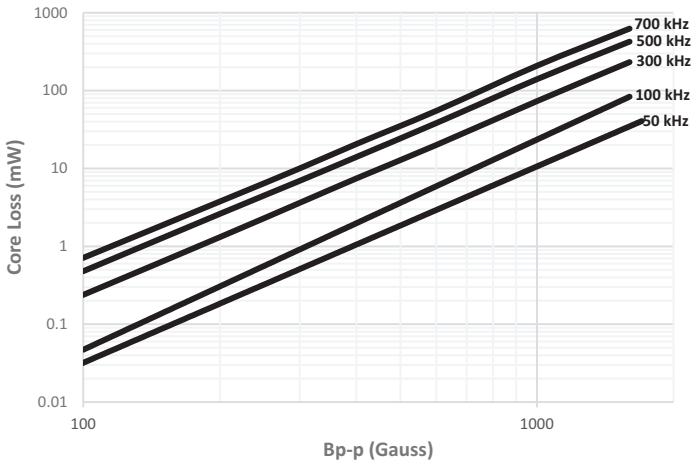


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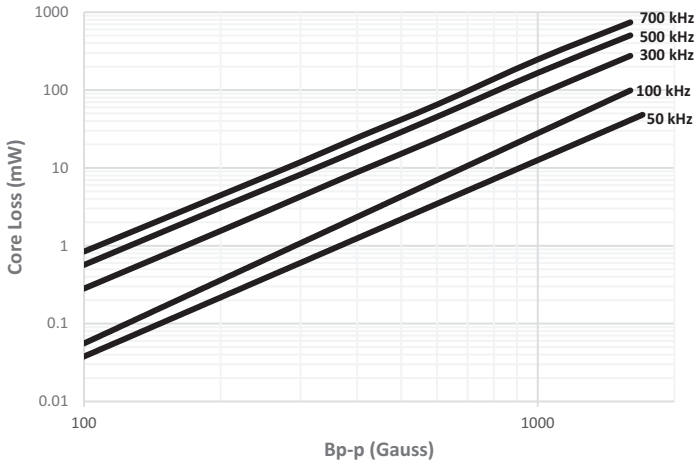


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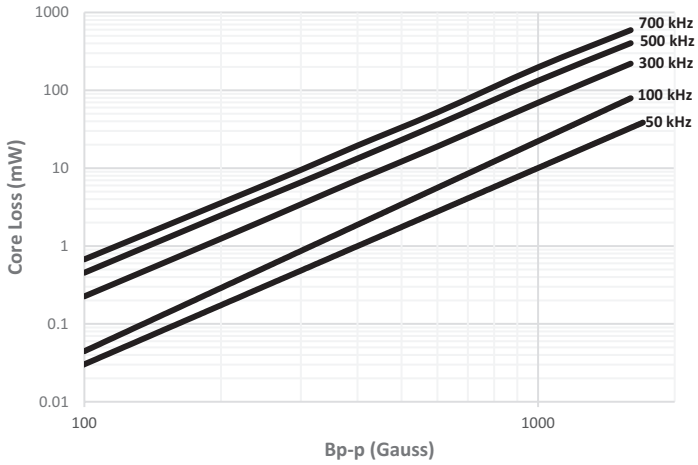


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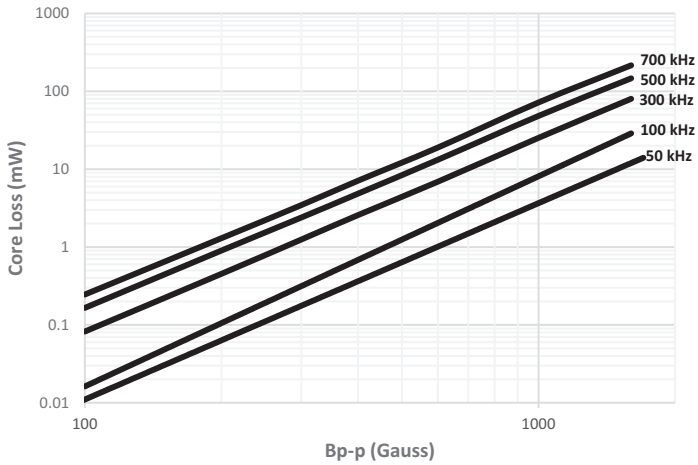


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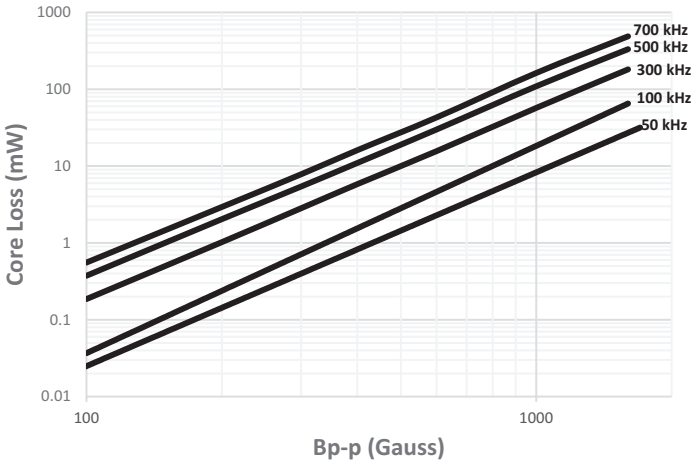
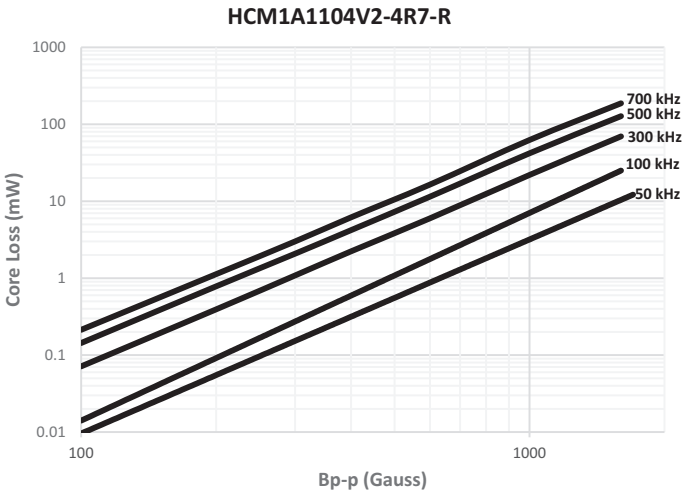
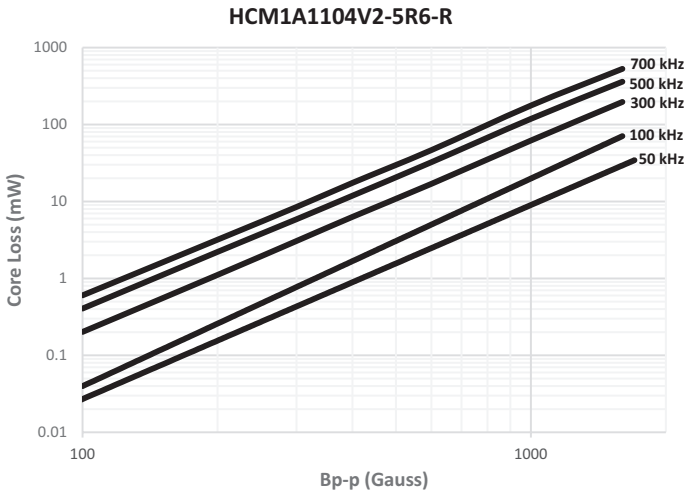
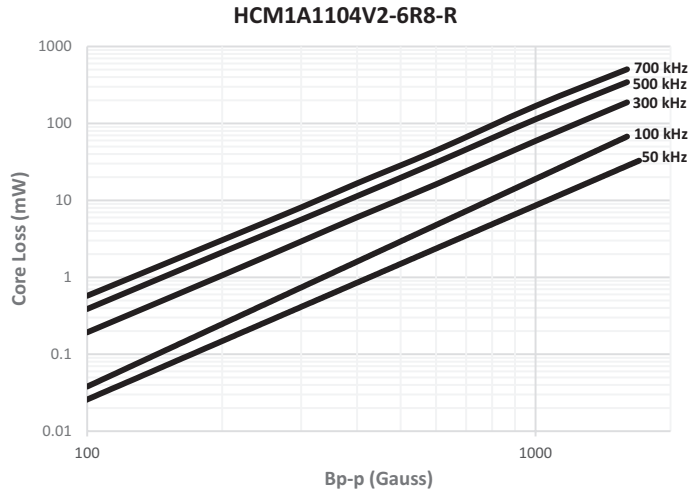
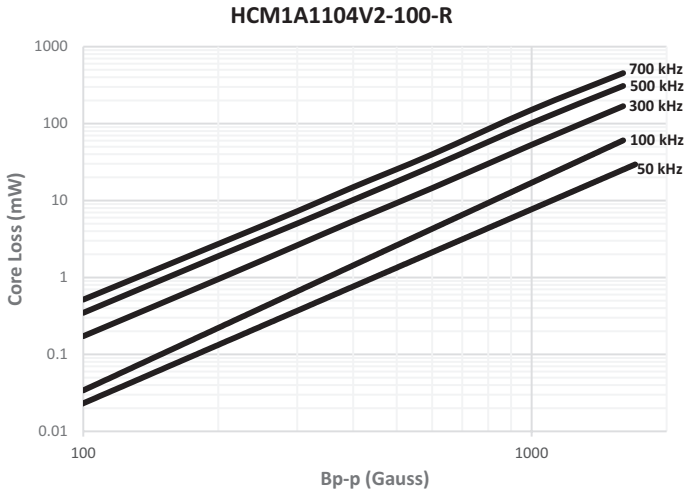


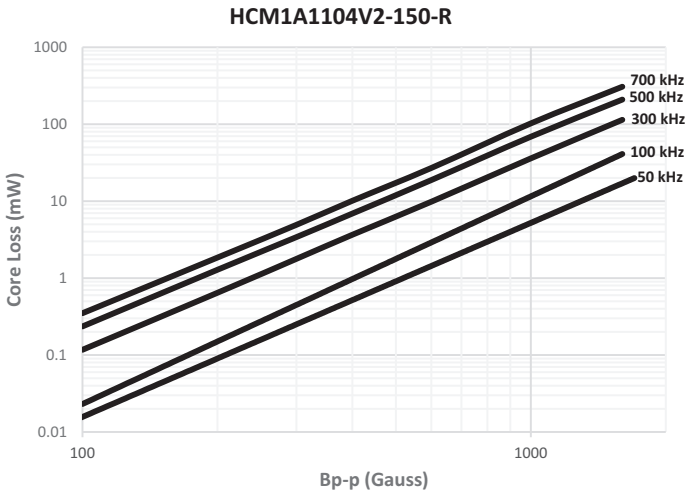
**Core loss vs $B_{p-p}$**

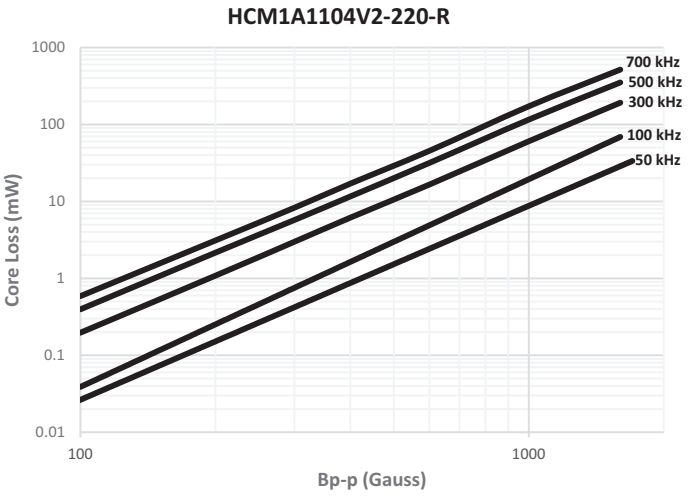


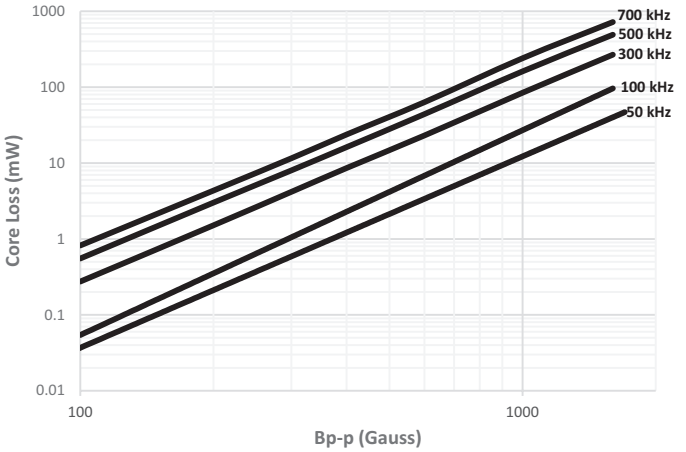



**Core loss vs $B_{p-p}$**

HC1A1104V2-330-R

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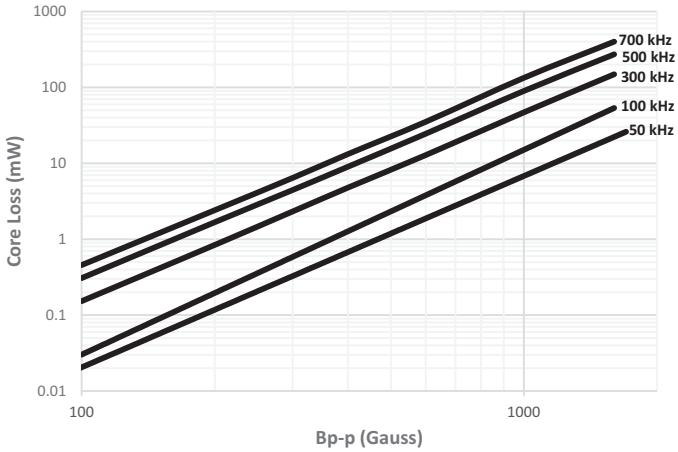


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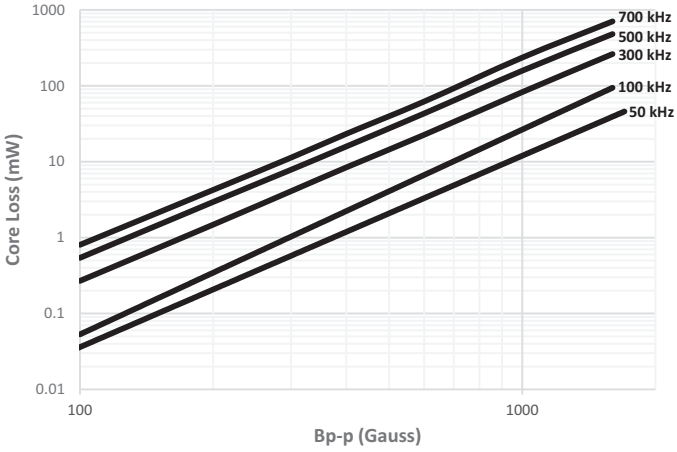
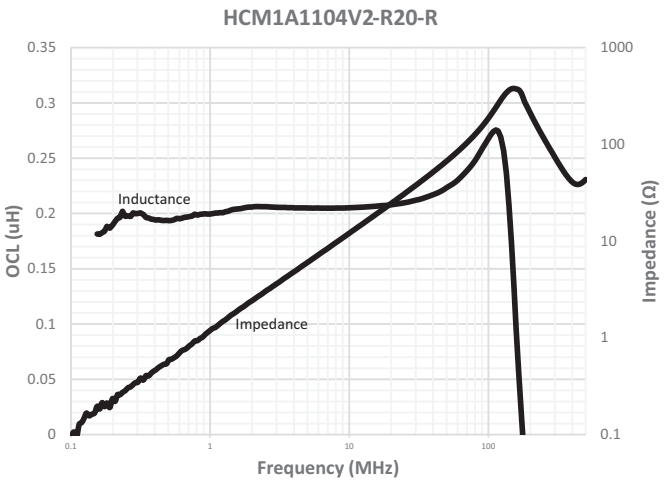
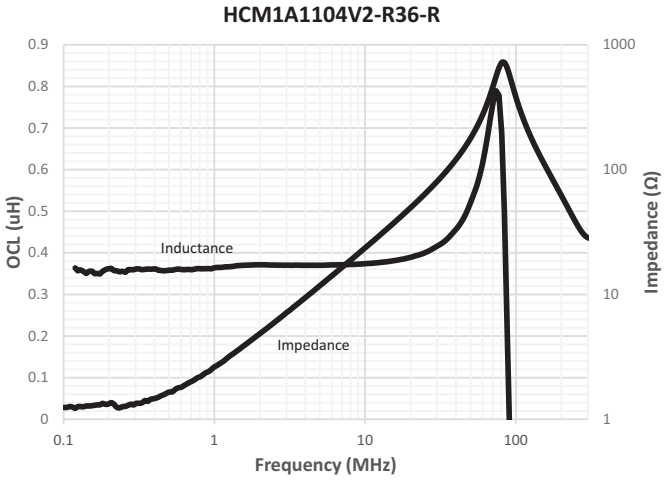
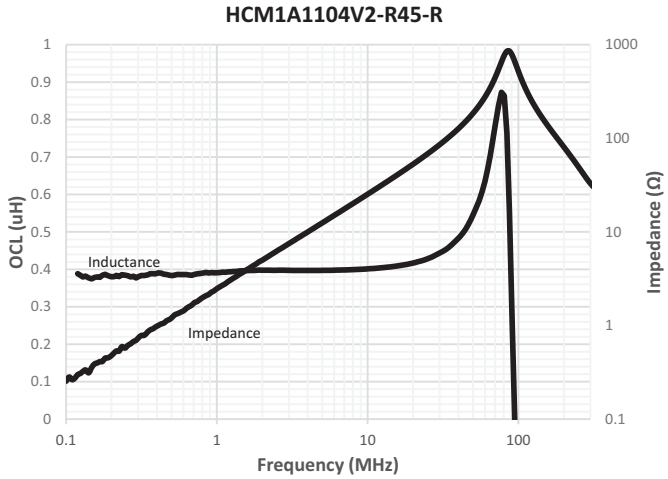
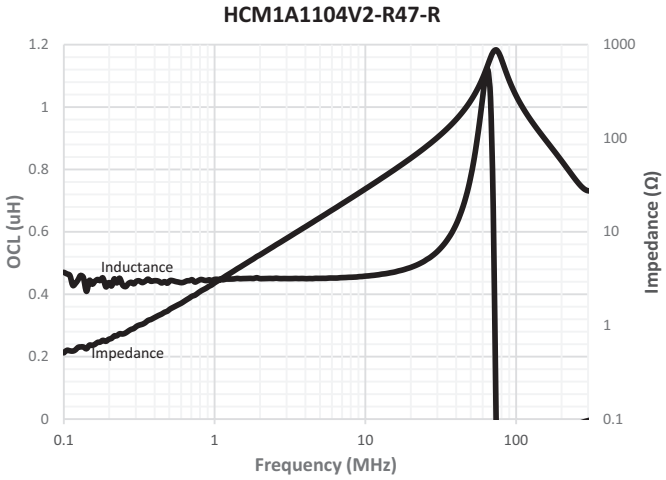


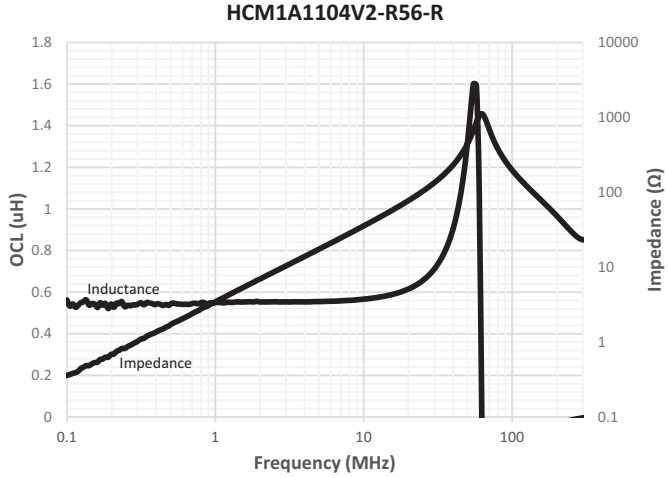
**Inductance and impedance vs. frequency**

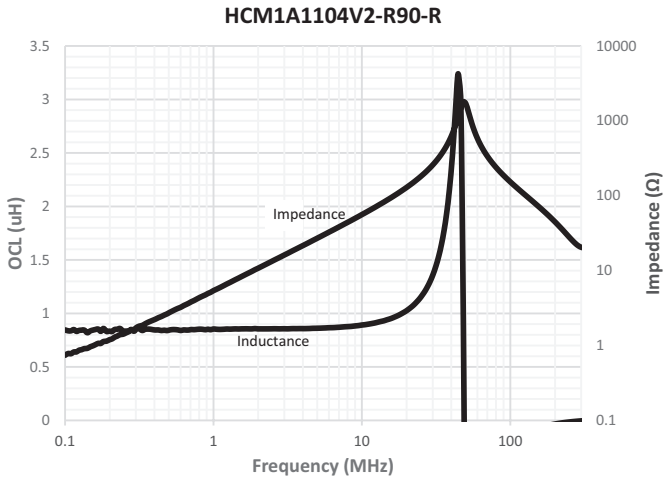


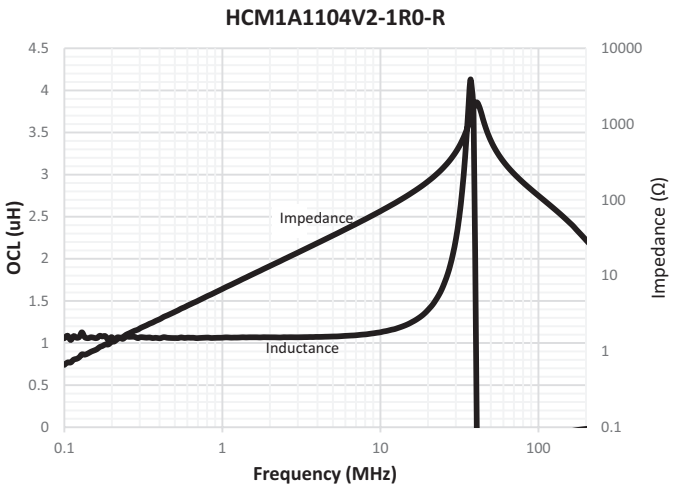



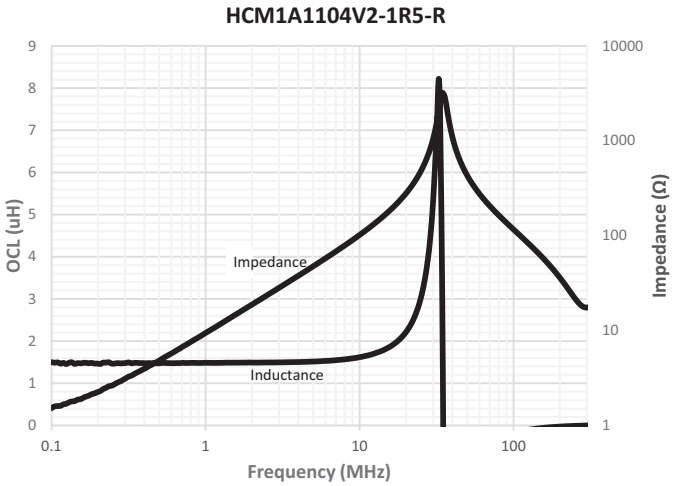



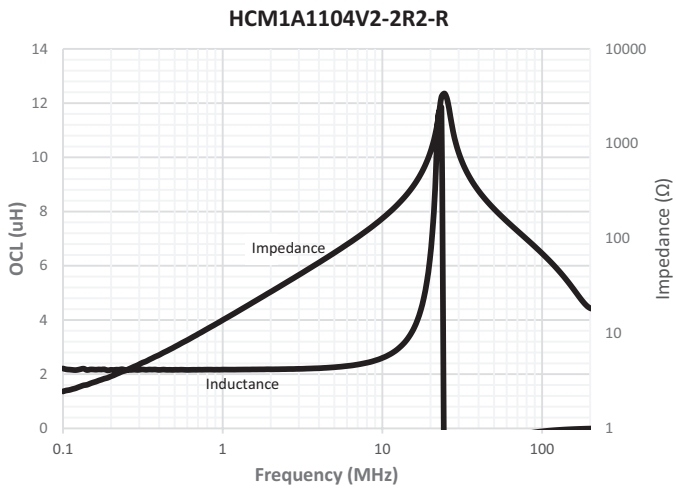



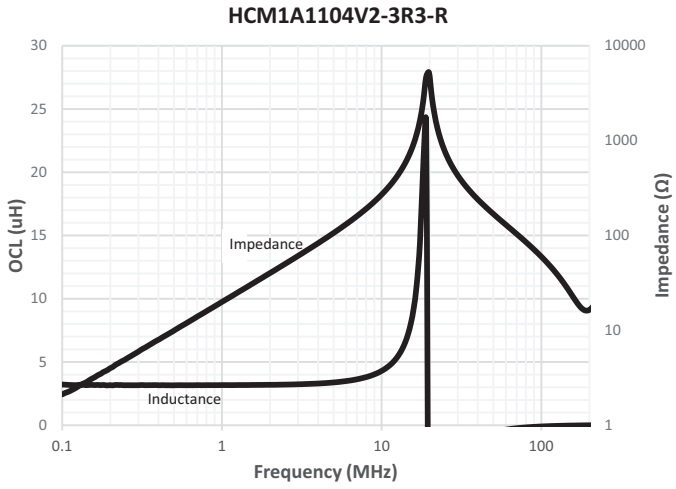



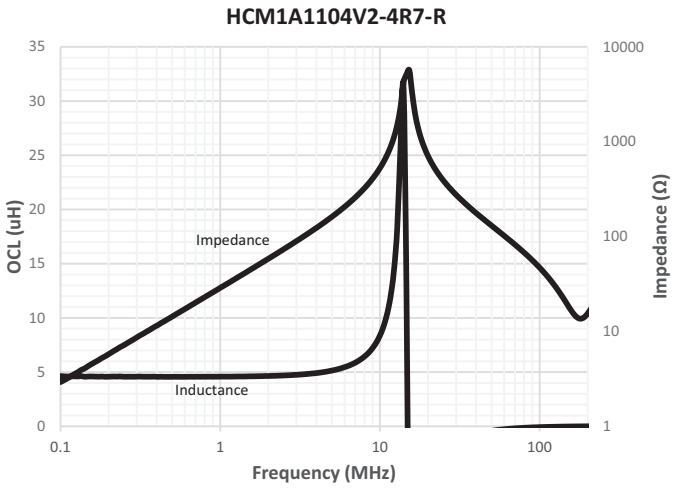
**Inductance and impedance vs. frequency**

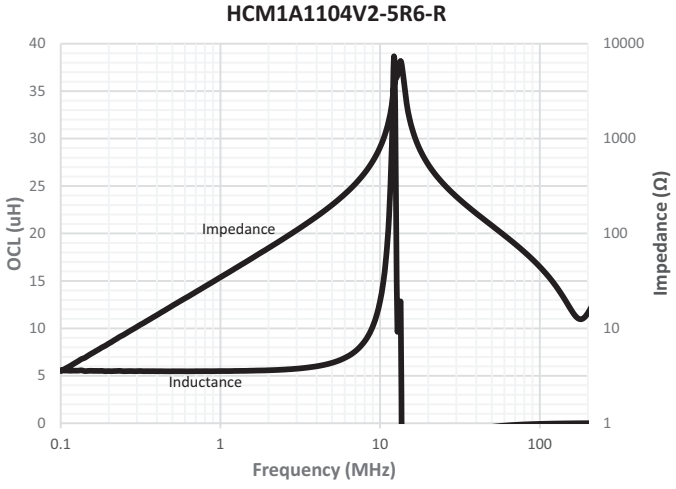


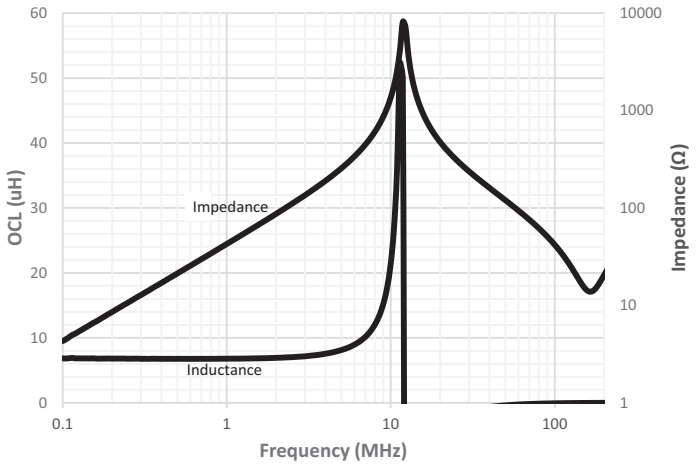



**Inductance and impedance vs. frequency**

**HCM1A1104V2-6R8-R**

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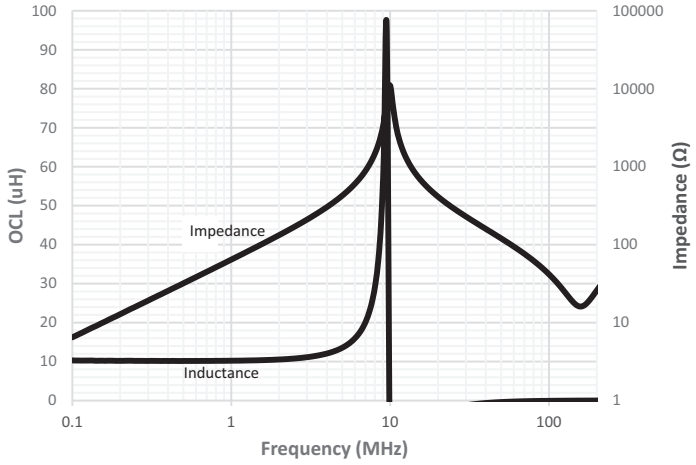


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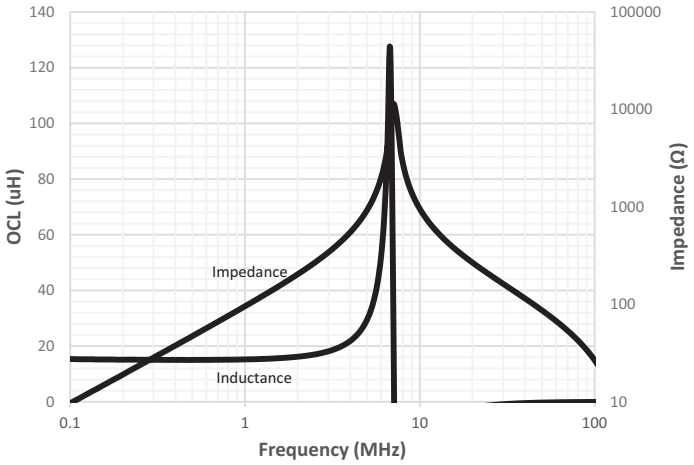


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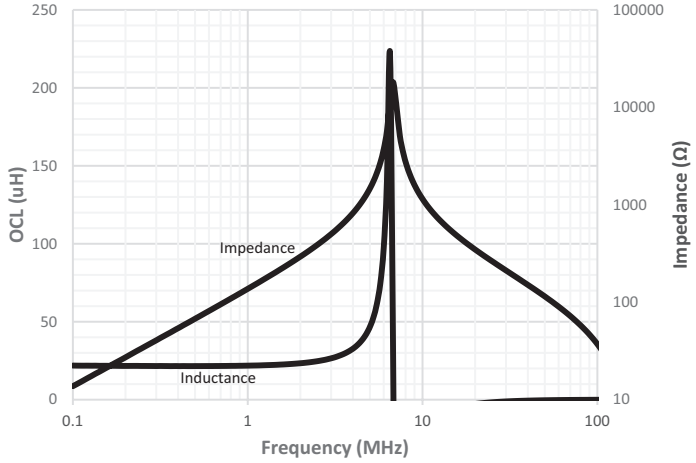


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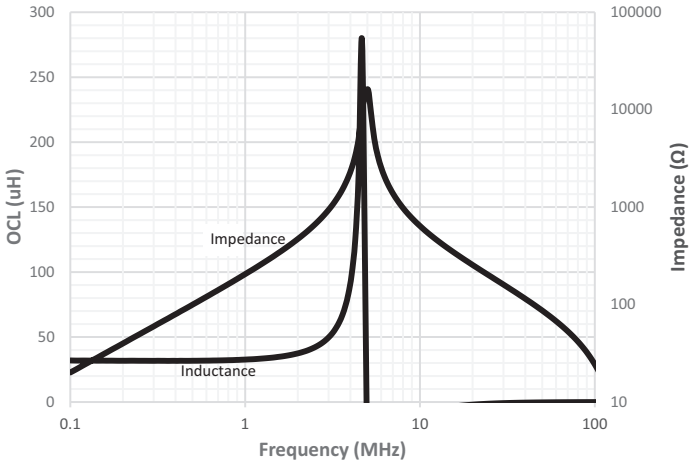


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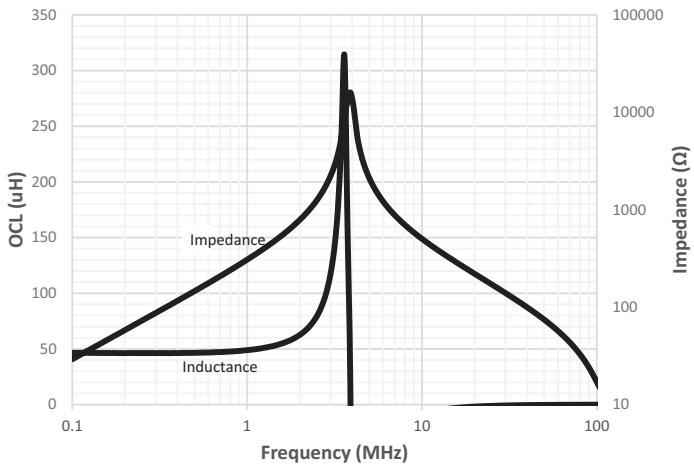
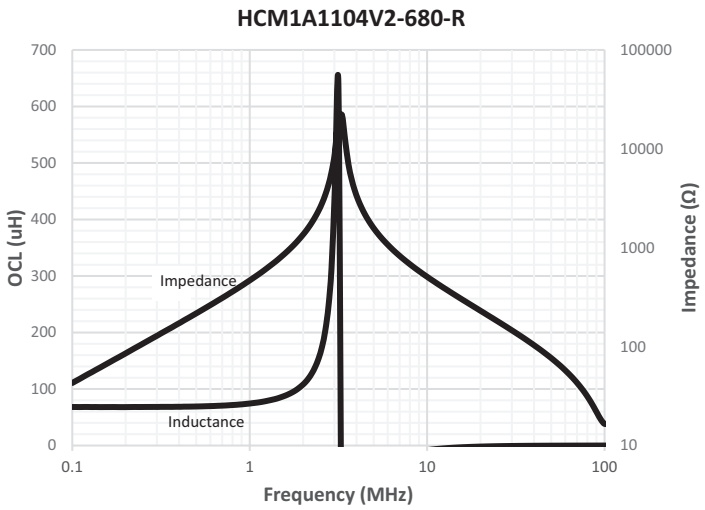
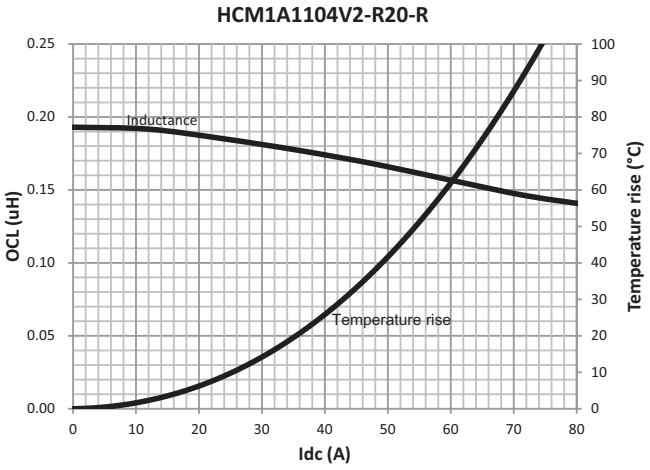
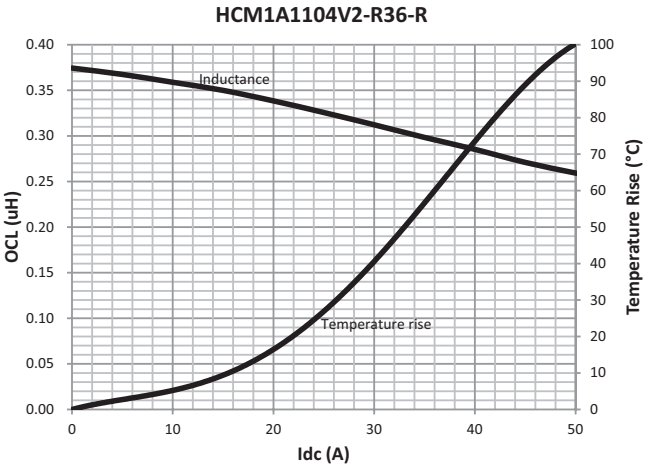


**Inductance and impedance vs. frequency**



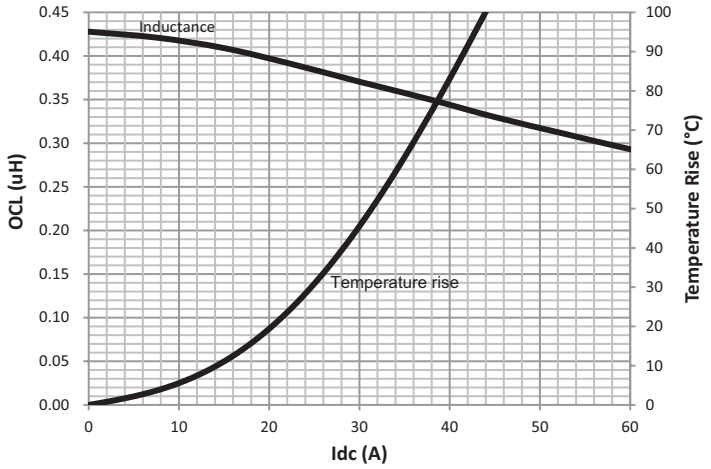

**Inductance and temperature rise vs. current**



**Inductance and temperature rise vs. current**

**HCM1A1104V2-R45-R**

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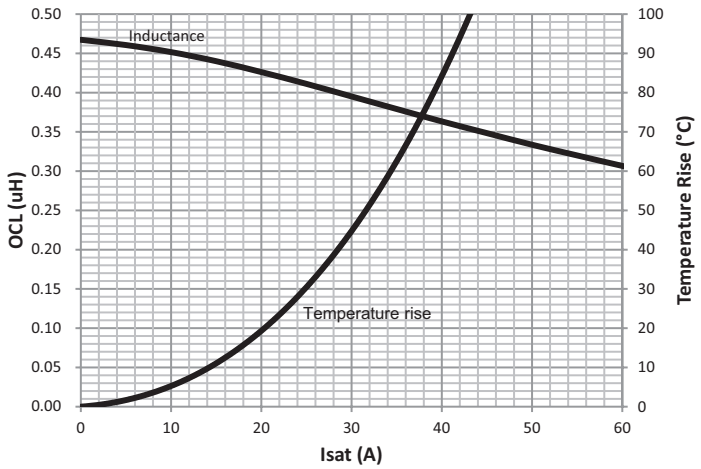


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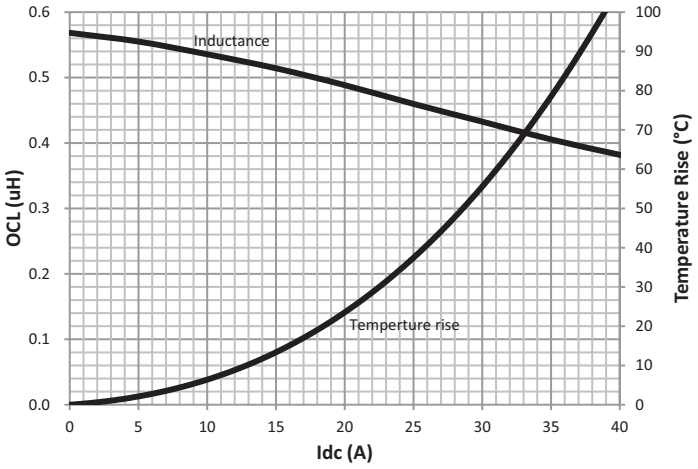


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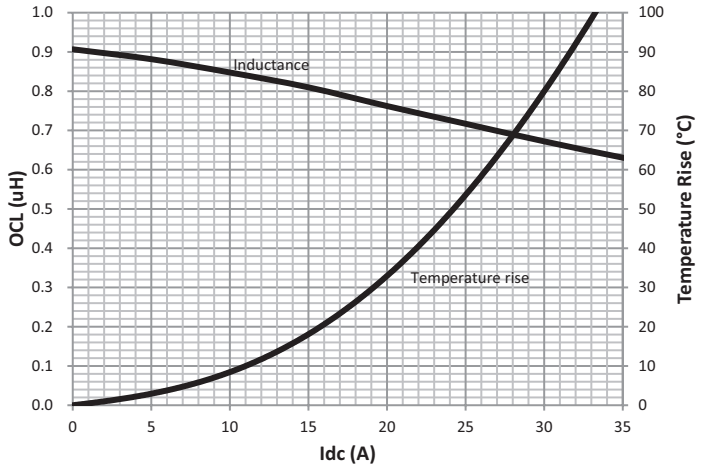
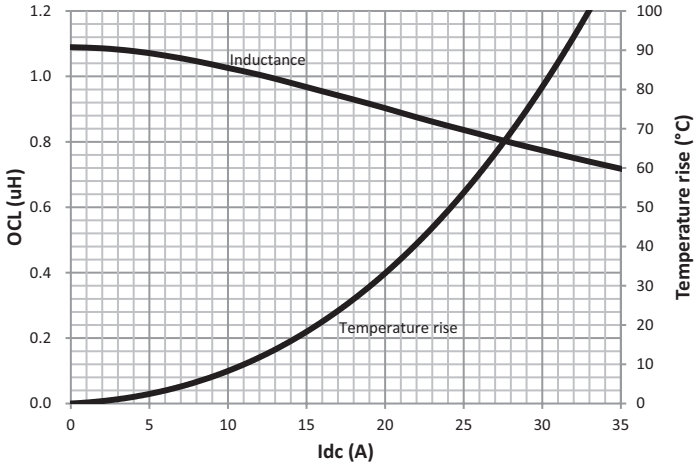
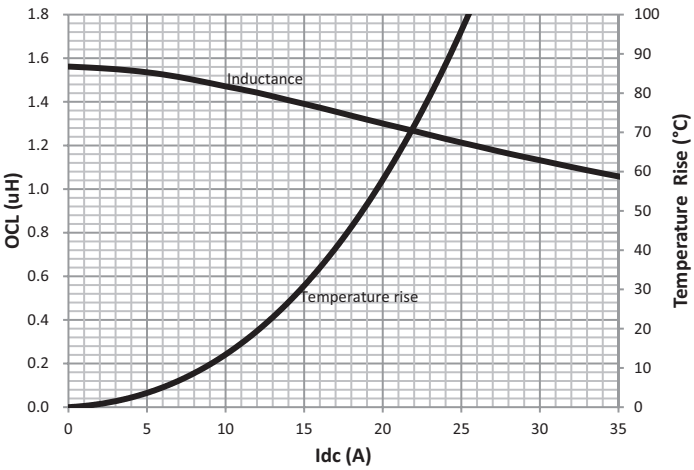


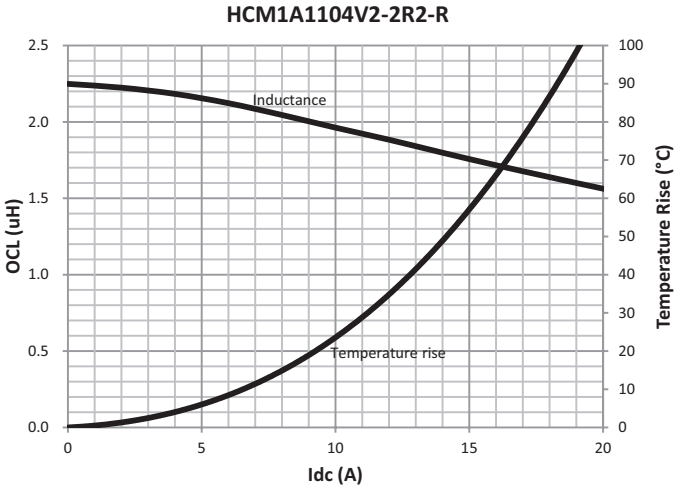

**HCM1A1104V2-1R0-R**

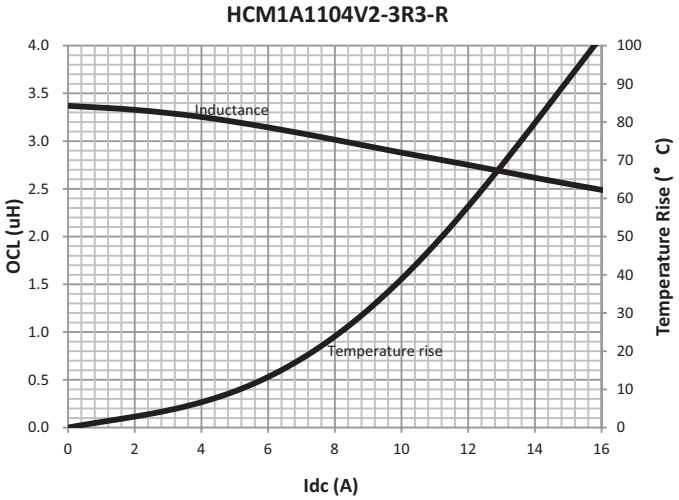


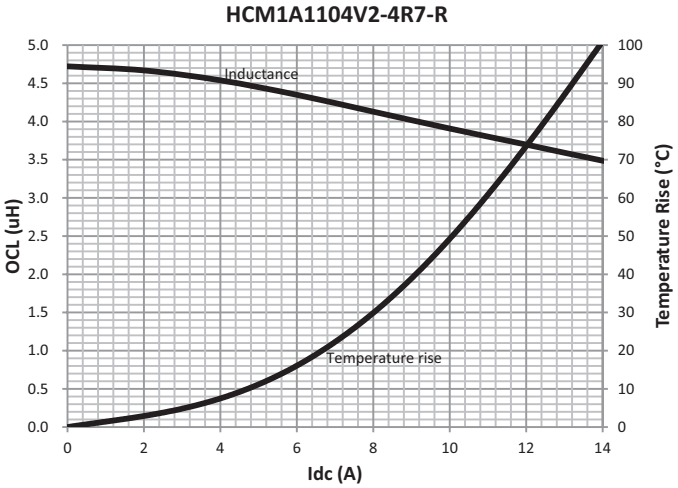

**HCM1A1104V2-1R5-R**

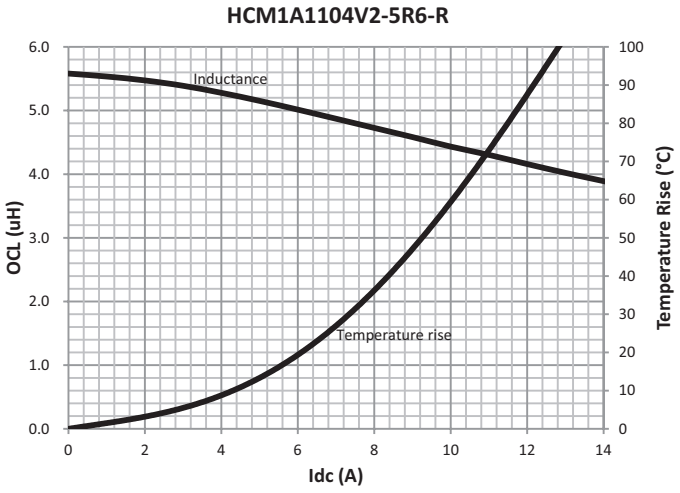


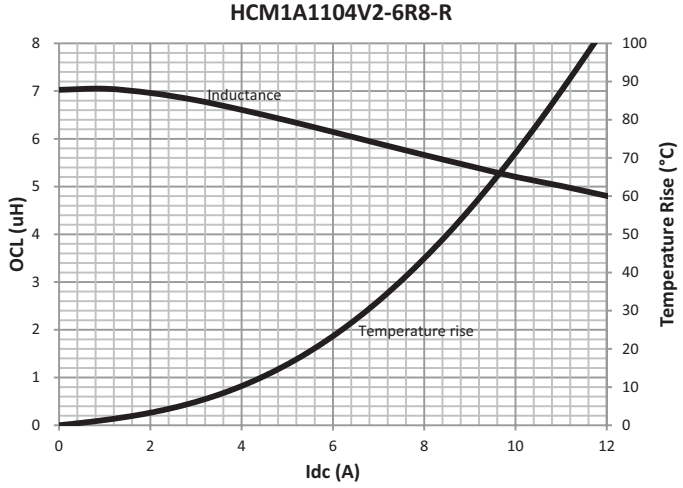
**Inductance and temperature rise vs. current**

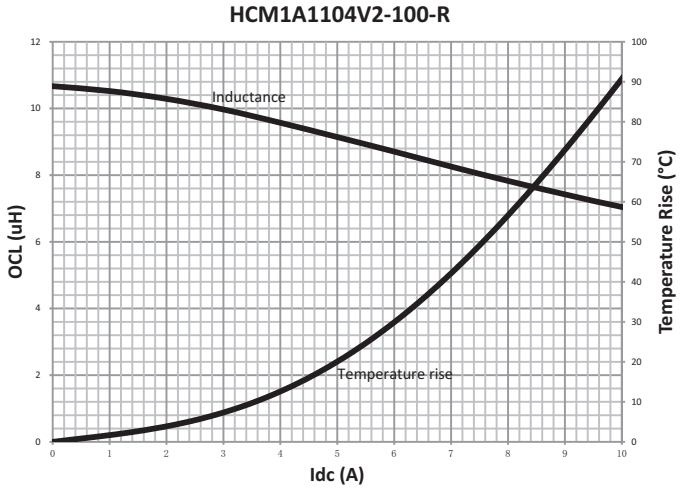


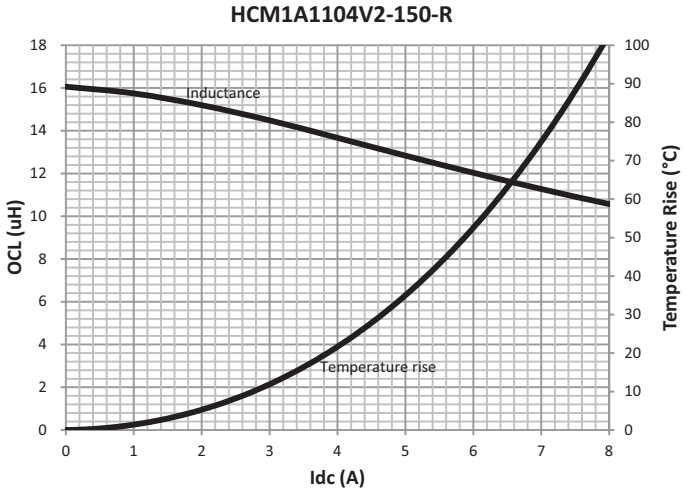



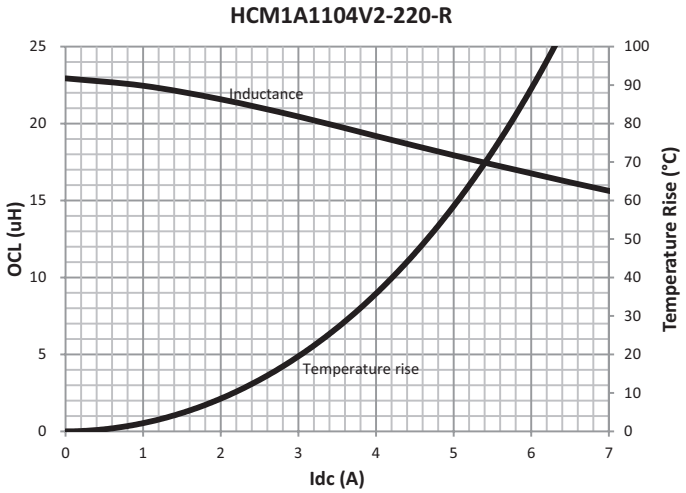



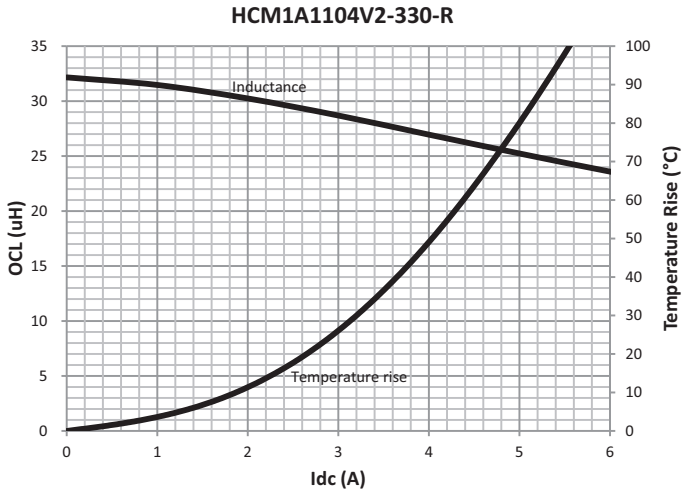



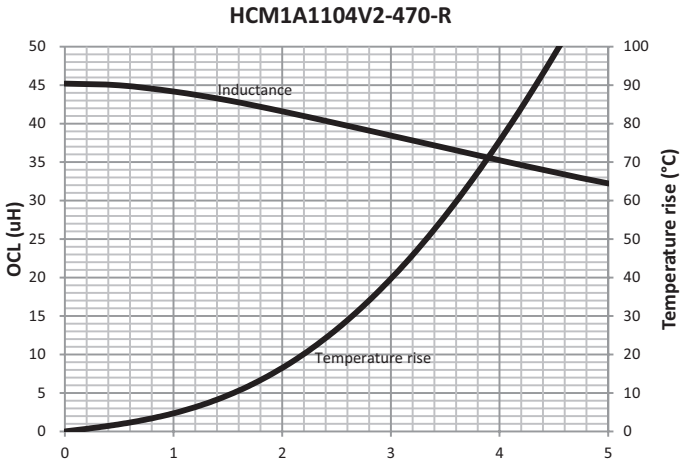



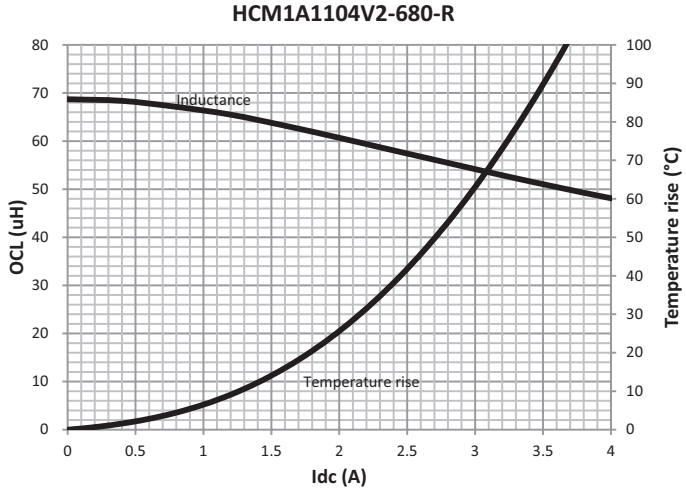
**Inductance and temperature rise vs. current**



## Solder reflow profile

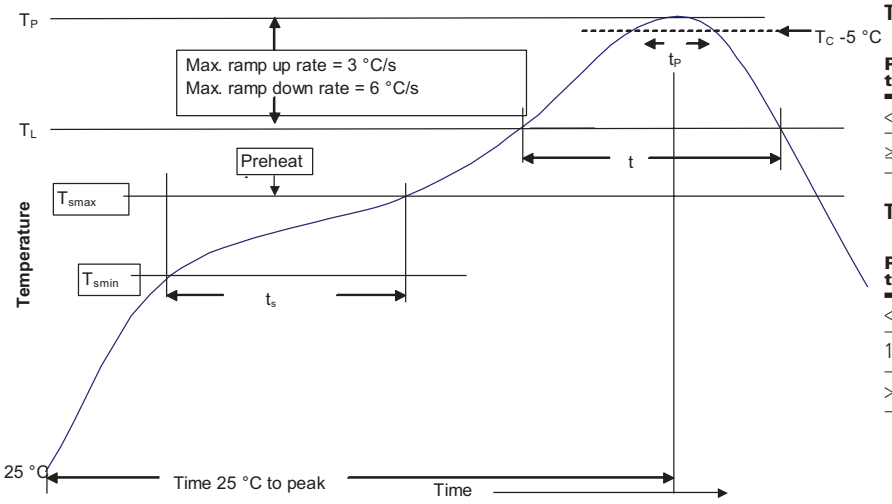



**Table 1 - Standard SnPb solder ($T_C$)**

| Package thickness | Volume mm3 <350 | Volume mm3 ≥350 |
|---|---|---|
| <2.5 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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