

HCMA1 104

Automotive grade High current power inductors



Product features

- AEC-Q200 qualified
- High current carrying capacity
- Magnetically shielded, low EMI
- Frequency range up to 5 MHz
- Inductance range from 0.2 μ H to 22 μ H
- Current range from 5 A to 45 A
- 11.5 mm x 10.3 mm footprint surface mount package in a 4.0 mm height
- Iron powder core material

Applications

- Body electronics
 - Central body control module
 - Vehicle access control system
 - Headlamps, tail lamps and interior 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 Voltage Regulator Module (VRM)

Environmental data

- Storage temperature range (Component): -55 °C to +125 °C
- Operating temperature range: -55 °C to +125 °C (ambient + self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



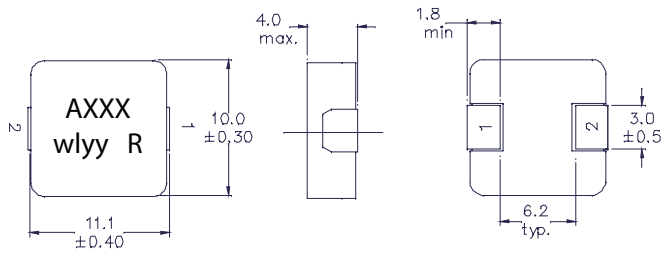
Product Specifications

| Part Number ⁷ | OCL ¹ (μH) $\pm 20\%$ | FLL ² (μH) minimum | I_{rms}^3 (A) | $I_{\text{sat}}^{4,5}$ (A) | DCR (m Ω) typical @ +20 °C | DCR (m Ω) maximum @ +20 °C | K-factor ⁶ |
|--------------------------|--|---|---------------------------|-------------------------------|--|--|-----------------------|
| HCMA1104-R20-R | 0.20 | 0.13 | 32 | 45 | 0.63 | 0.72 | 411 |
| HCMA1104-R36-R | 0.36 | 0.23 | 30 | 42 | 1.04 | 1.20 | 269 |
| HCMA1104-R45-R | 0.45 | 0.29 | 29 | 36 | 1.07 | 1.23 | 219 |
| HCMA1104-R56-R | 0.56 | 0.36 | 25 | 32 | 1.56 | 1.80 | 230 |
| HCMA1104-R90-R | 0.90 | 0.58 | 22 | 28 | 2.17 | 2.50 | 236 |
| HCMA1104-1R0-R | 1.0 | 0.56 | 18 | 28 | 3.0 | 3.3 | 378 |
| HCMA1104-1R5-R | 1.5 | 0.84 | 16 | 32 | 3.8 | 4.2 | 310 |
| HCMA1104-2R2-R | 2.2 | 1.23 | 12 | 18 | 6.0 | 7.0 | 253 |
| HCMA1104-3R3-R | 3.3 | 1.85 | 10 | 16 | 10.8 | 11.8 | 220 |
| HCMA1104-4R7-R | 4.7 | 2.63 | 8.5 | 15 | 17 | 20 | 175 |
| HCMA1104-100-R | 10 | 5.60 | 7.5 | 8.5 | 27 | 30 | 116 |
| HCMA1104-220-R | 22 | 12.3 | 5.0 | 5.5 | 60 | 66 | 92 |

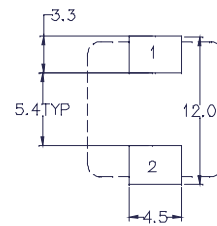
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 Vrms, 0.0 Adc, @ +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 Vrms, @ I_{sat} , @ +25 °C
- I_{sat} : DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents. PCB 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 +125 °C under worst case operating conditions verified in the end application.
- I_{sat} : Peak current for approximately 20% rolloff @ +25 °C- HCM1104-R20-R to HCM1104-R90-R

- I_{sat} : Peak current for approximately 30% rolloff @ +25 °C HCM1104-1R0-R to HCM1104-220-R
- K-factor: Used to determine B_{50} for core loss (see graph). $B_{p-p} = K * L * \Delta I$. B_{p-p} : (Gauss), K: (K-factor from table), L: (Inductance in μH), ΔI (Peak to peak ripple current in Amps).
- Part Number Definition: HCM1104-xxx-R
 HCM1104 = 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

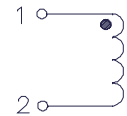
Dimensions (mm)



Recommended pad layout



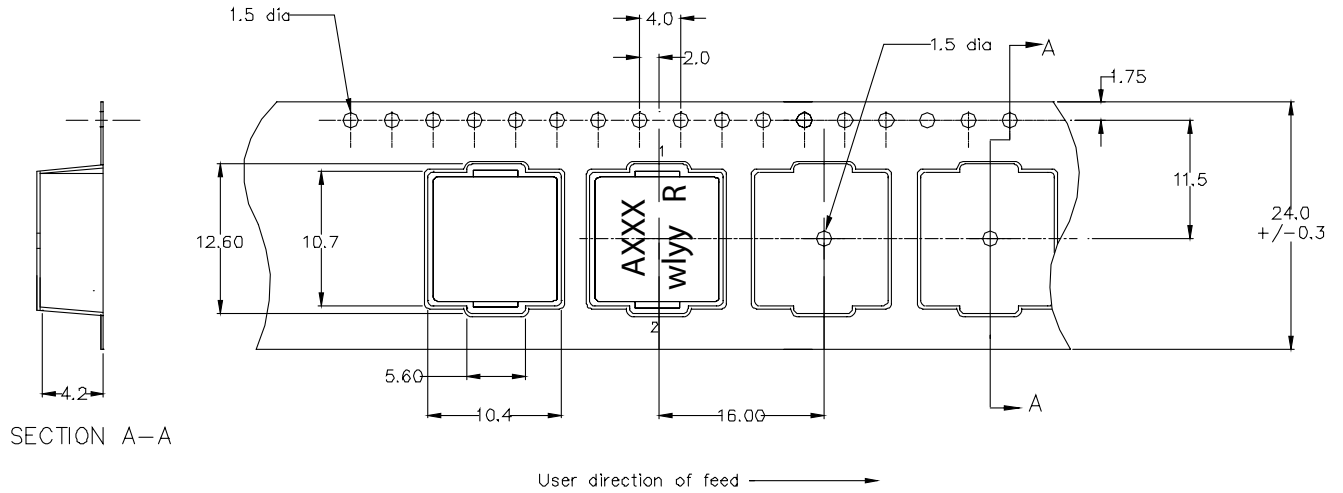
Schematic



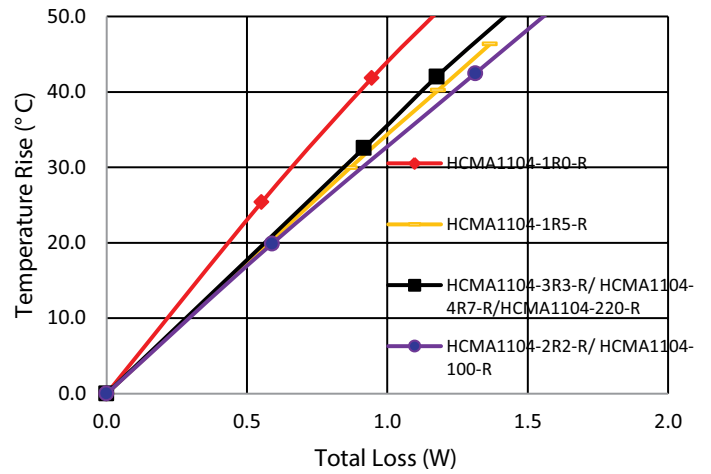
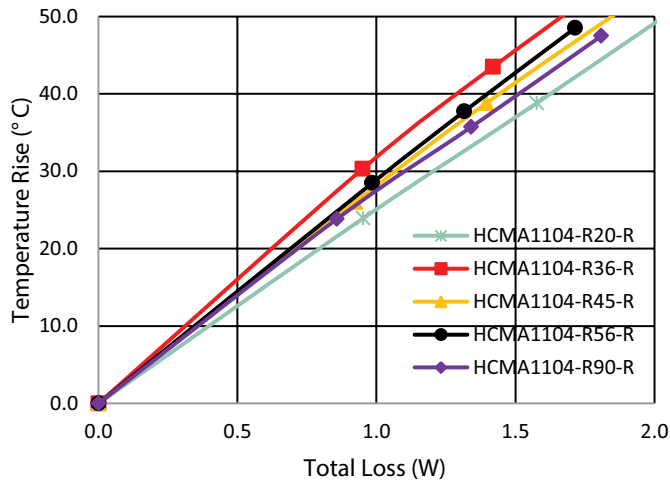
Part marking: A=automotive grade, xxx=inductance value in μH , R= decimal point. If no R is present then last character equals number of zeros.
 wlyy=date code, R=revision level
 All soldering surfaces to be coplanar within 0.1 millimeters
 Tolerances are ± 0.3 millimeters unless stated otherwise
 Color: Grey
 Do not route traces or vias underneath the inductor

Packaging information (mm)

Supplied in tape and reel packaging, 850parts per 13" diameter reel

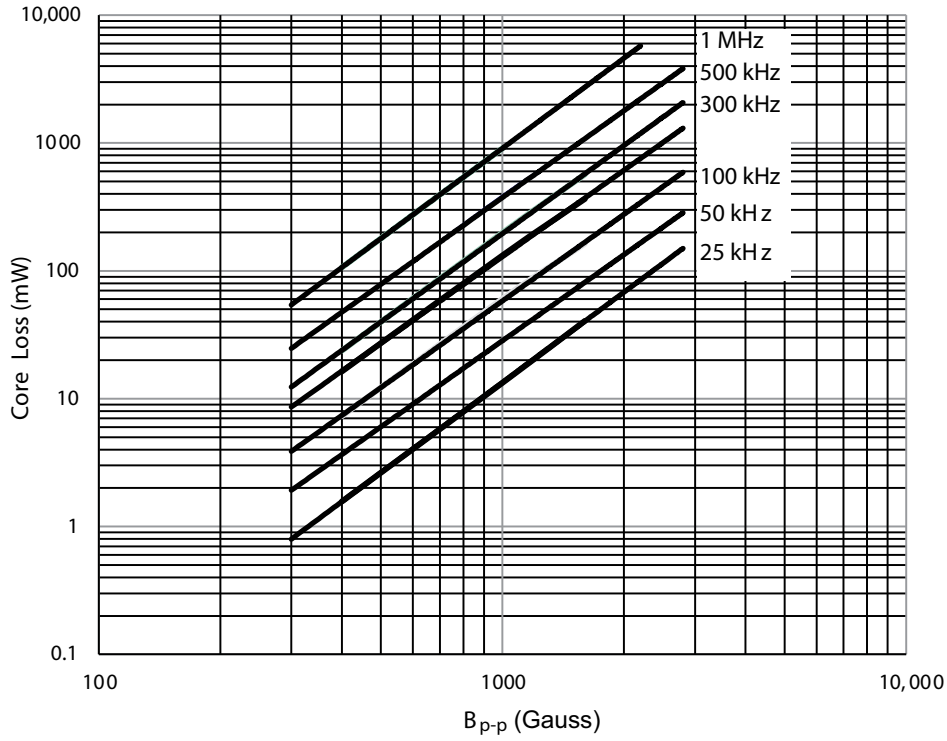


Temperature rise vs. total loss

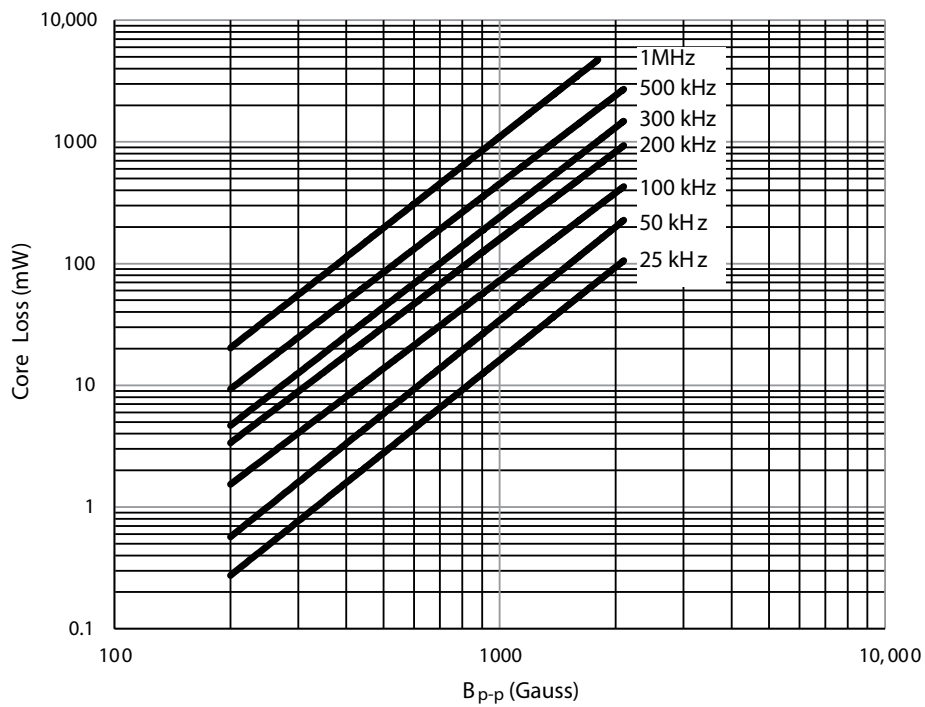


Core loss vs. B_{p-p}

HCMA1104-R20-R to HCMA1104-R90-R

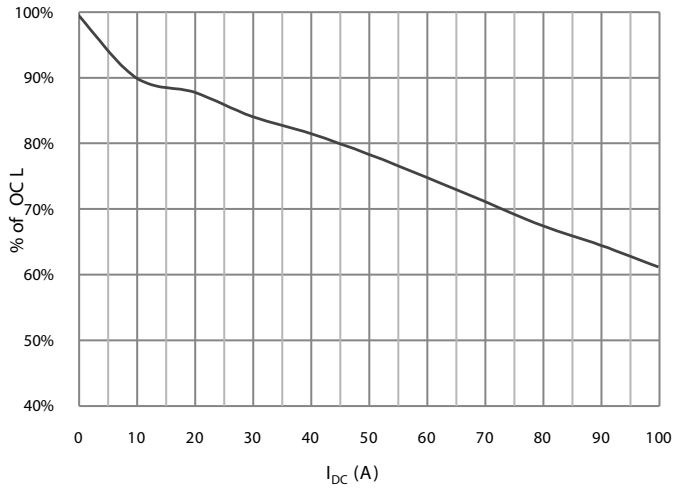


HCMA1104-1R0-R to HCMA1104-220-R

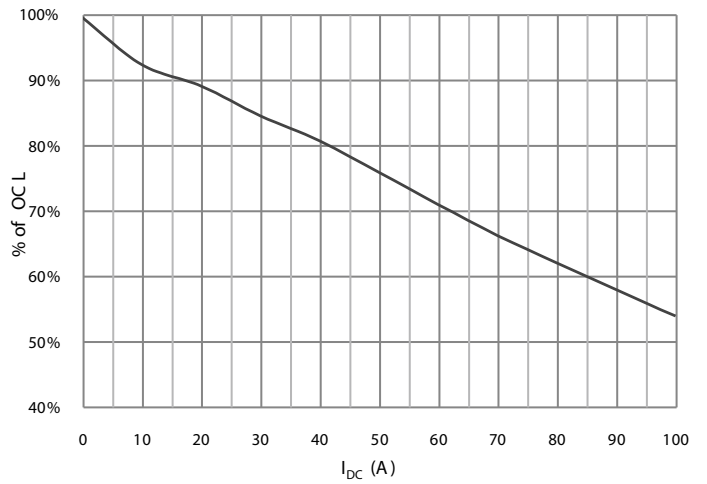


Inductance characteristics

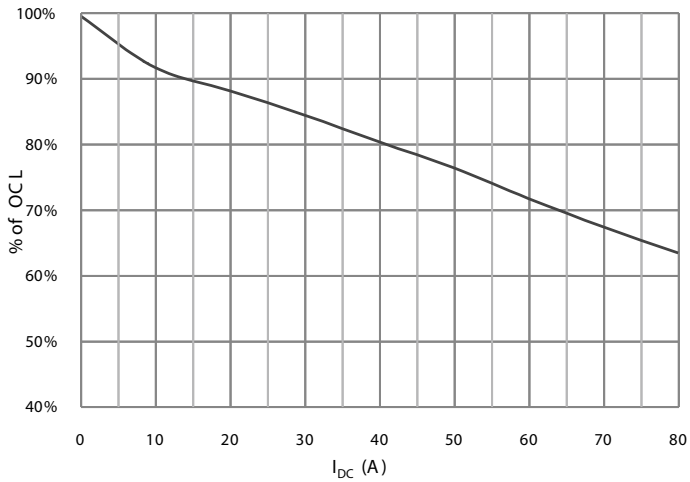
HCMA1104-R20-R



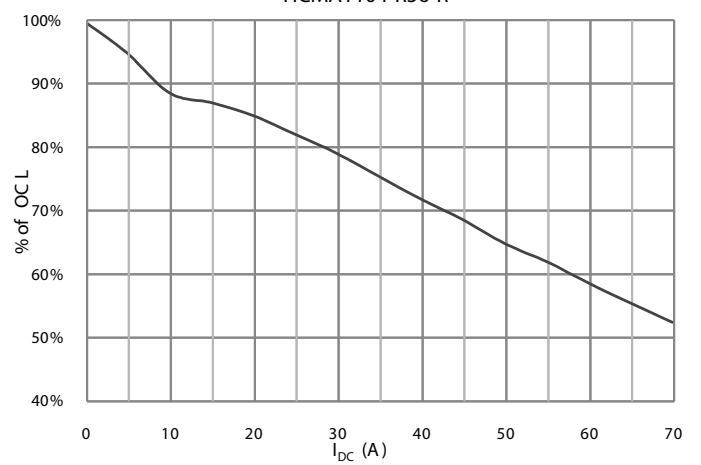
HCMA1104-R36-R



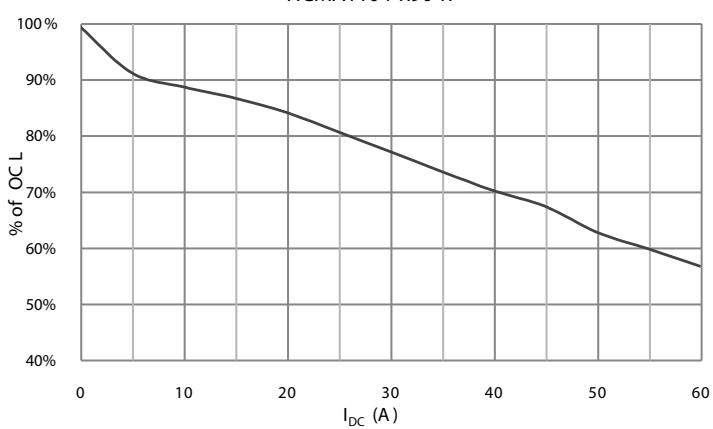
HCMA1104-R45-R



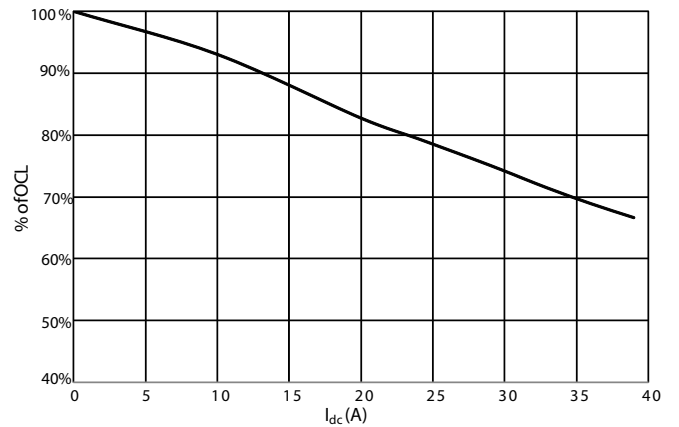
HCMA1104-R56-R



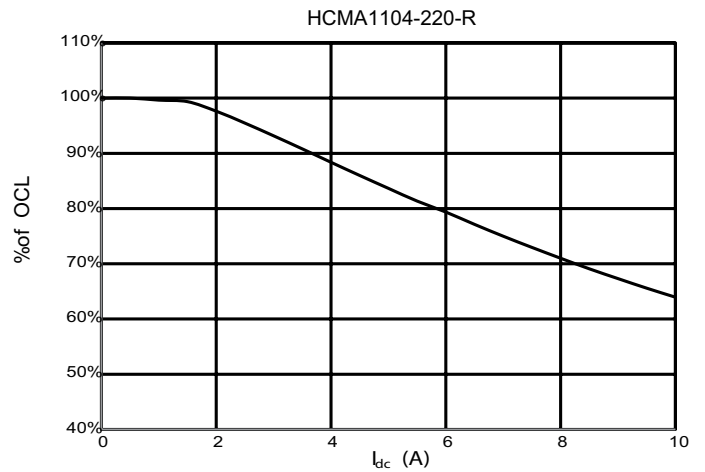
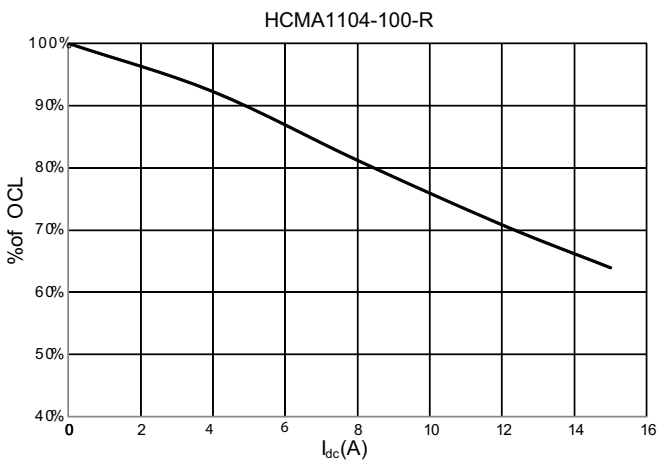
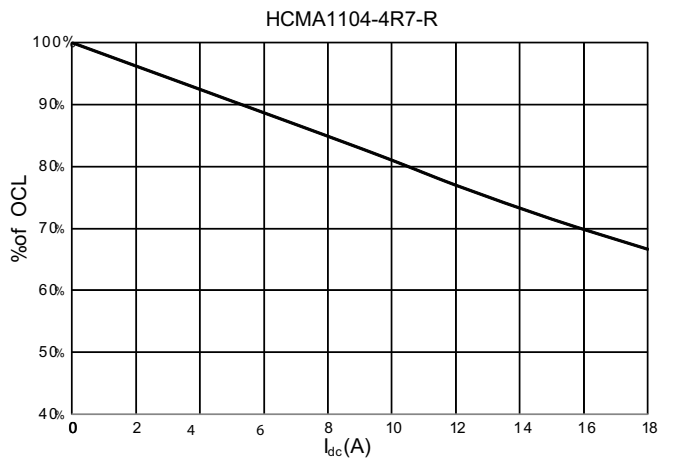
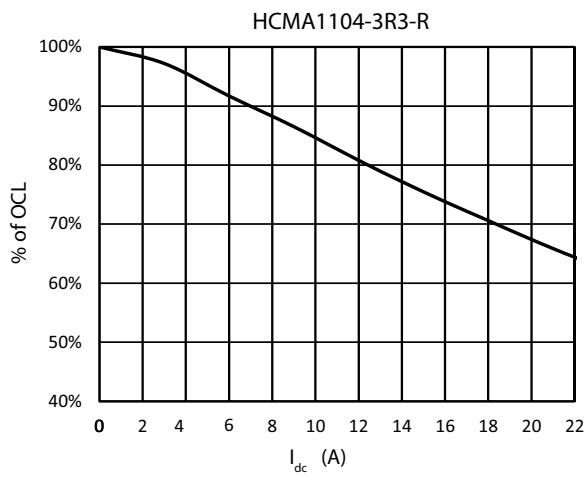
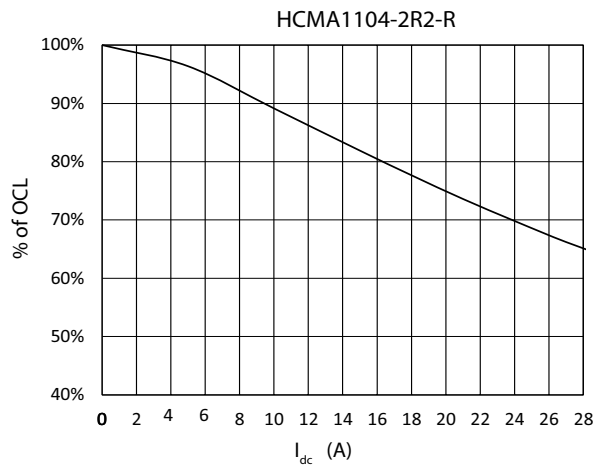
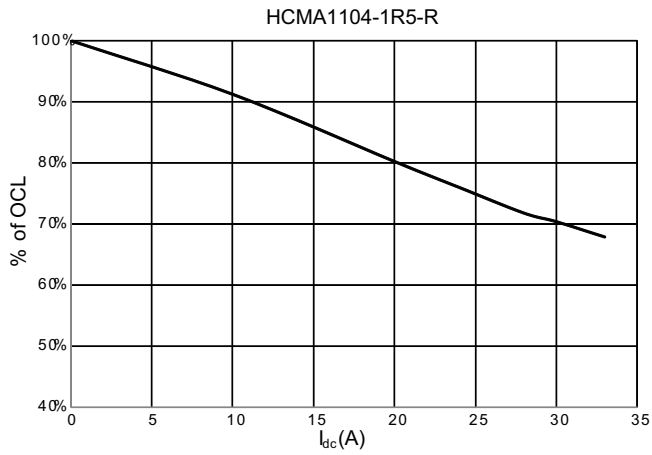
HCMA1104-R90-R



HCMA1104-1R0-R



Inductance characteristics



Solder reflow profile

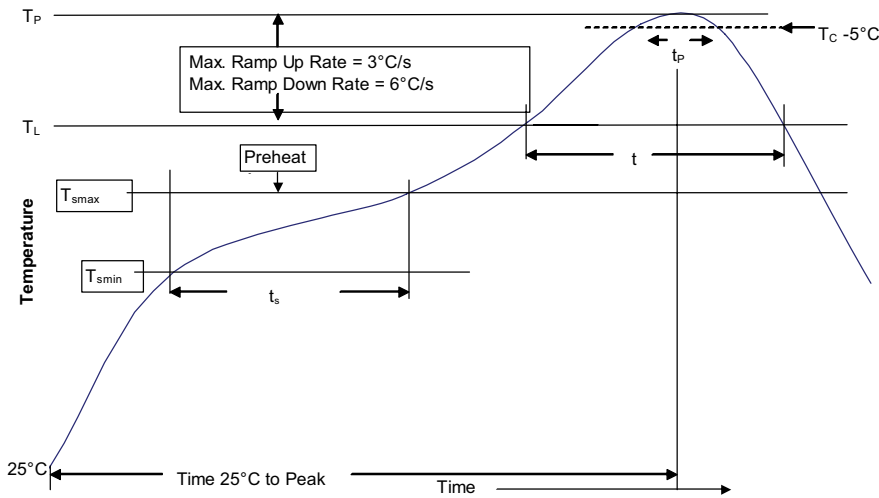


Table 1 - Standard SnPb Solder (T_c)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5mm) | 235°C | 220°C |
| ≥2.5mm | 220°C | 220°C |

Table 2 - Lead (Pb) Free Solder (T_c)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ 350 - 2000 | Volume mm ³ >2000 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6mm | 260°C | 260°C | 260°C |
| 1.6 – 2.5mm | 260°C | 250°C | 245°C |
| >2.5mm | 250°C | 245°C | 245°C |

Reference JDEC J-STD-020

| Profile Feature | Standard SnPb Solder | Lead (Pb) Free Solder |
|--|--|--|
| Preheat and Soak | <ul style="list-style-type: none"> Temperature min. (T_{smin}) Temperature max. (T_{smax}) Time (T_{smin} to T_{smax}) (t_s) | <ul style="list-style-type: none"> 100°C 150°C 60-120 Seconds |
| 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) | 183°C 60-150 Seconds | 217°C 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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