

# 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  $\mu$ H to 22  $\mu$ 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



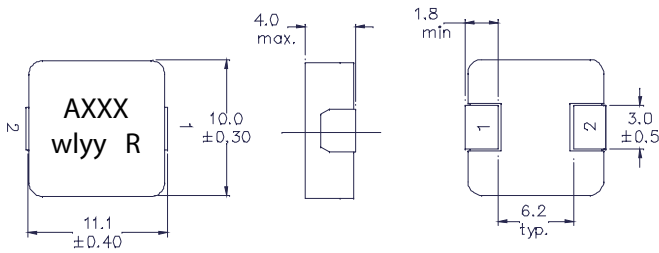
**Product Specifications**

Part Number <sup>7</sup>	OCL <sup>1</sup> ( $\mu\text{H}$ ) $\pm 20\%$	FLL <sup>2</sup> ( $\mu\text{H}$ ) minimum	$I_{\text{rms}}^3$ (A)	$I_{\text{sat}}^{4,5}$ (A)	DCR (m $\Omega$ ) typical @ +20 °C	DCR (m $\Omega$ ) maximum @ +20 °C	K-factor <sup>6</sup>
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

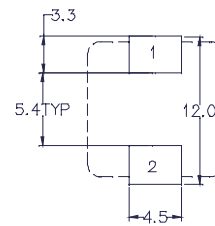
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 Vrms, 0.0 Adc, @ +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 Vrms, @  $I_{\text{sat}}$ , @ +25 °C
- $I_{\text{sat}}$ : DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary 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.
- $I_{\text{sat}}$ : Peak current for approximately 20% rolloff @ +25 °C- HCM1104-R20-R to HCM1104-R90-R

- $I_{\text{sat}}$ : 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  $\mu\text{H}$ ),  $\Delta I$  (Peak to peak ripple current in Amps).
- Part Number Definition: HCM1104-xxx-R  
HCM1104 = 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

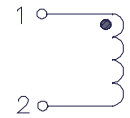
**Dimensions (mm)**



**Recommended pad layout**



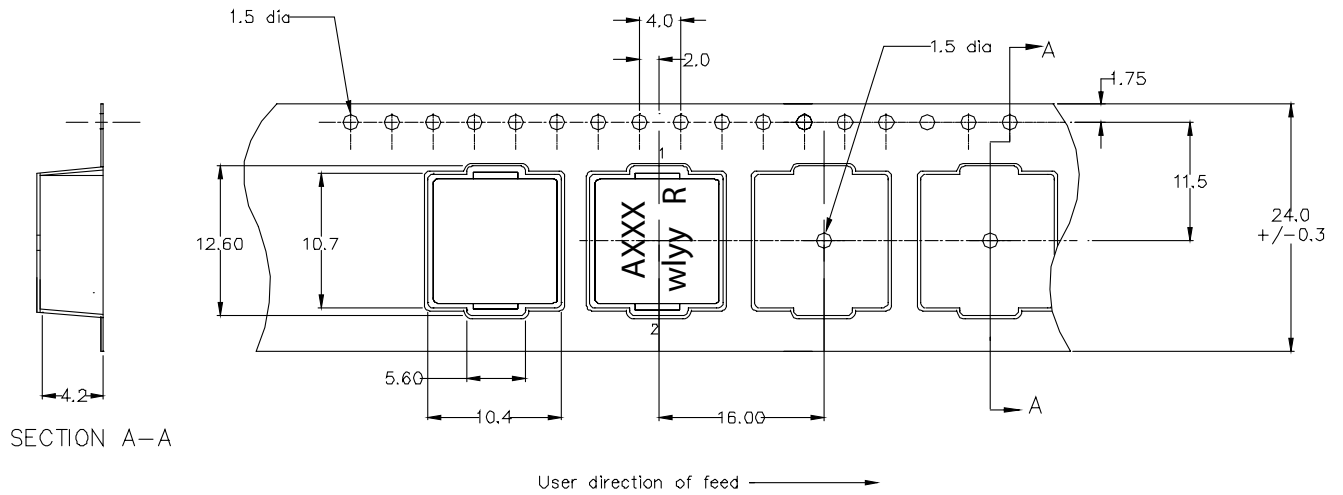
**Schematic**



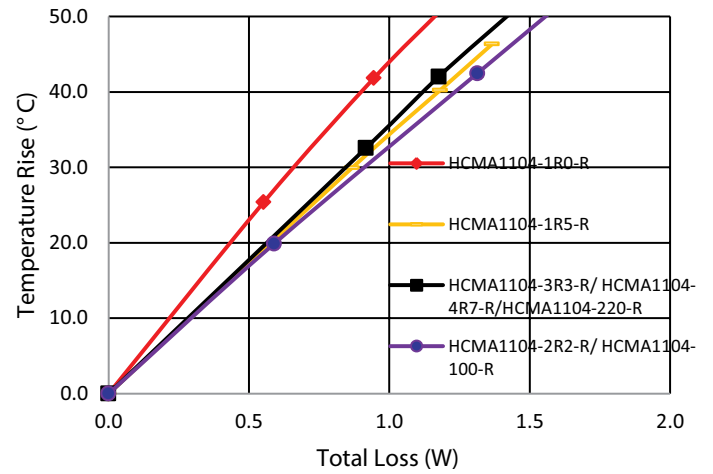
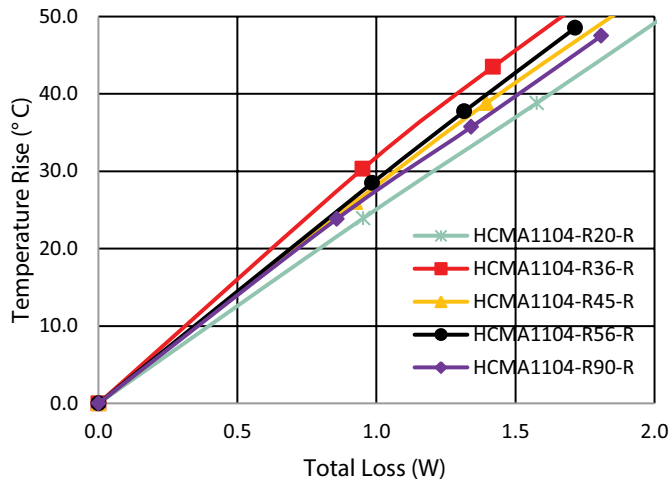
Part marking: A=automotive grade, xxx=inductance value in  $\mu\text{H}$ , R= decimal point. If no R is present then last character equals number of zeros.  
wlyy=date code, R=revision level  
All soldering surfaces to be coplanar within 0.1 millimeters  
Tolerances are  $\pm 0.3$  millimeters unless 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

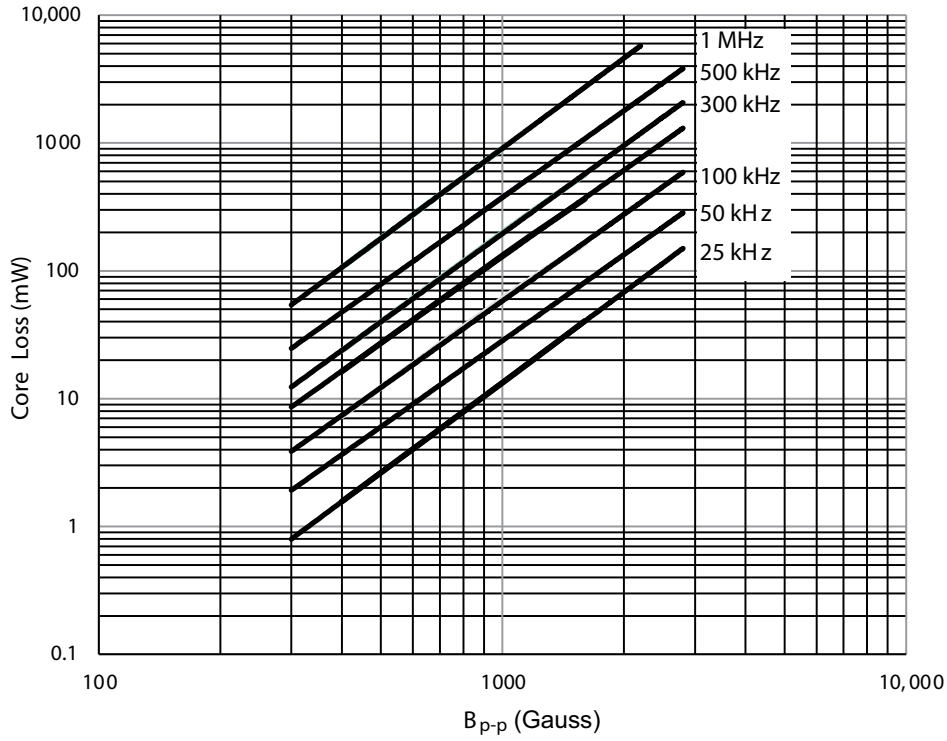


**Temperature rise vs. total loss**

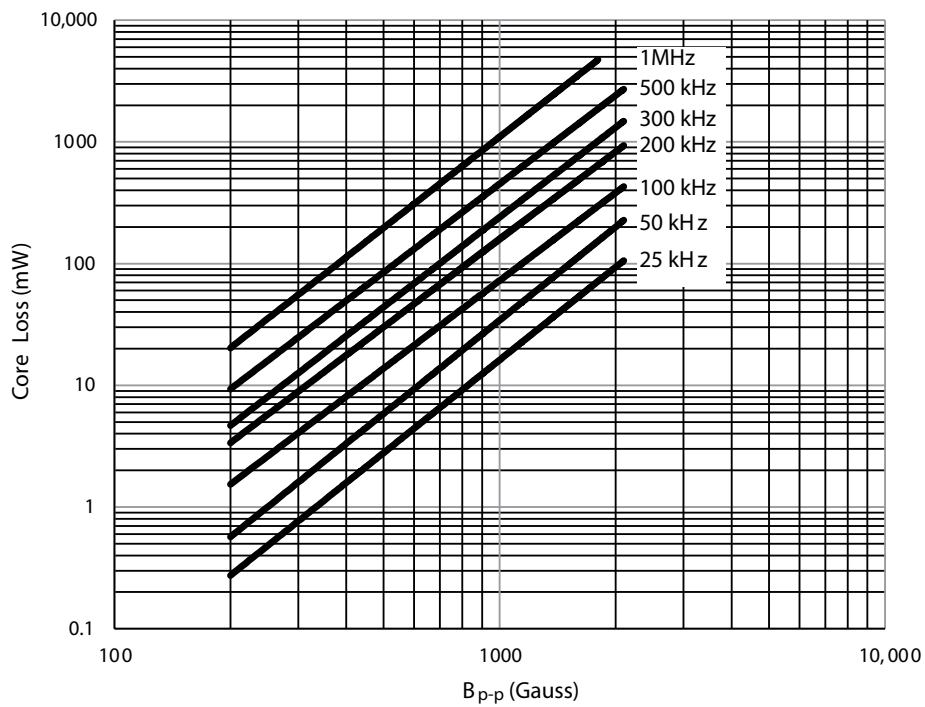


Core loss vs.  $B_{p-p}$

HCMA1104-R20-R to HCMA1104-R90-R

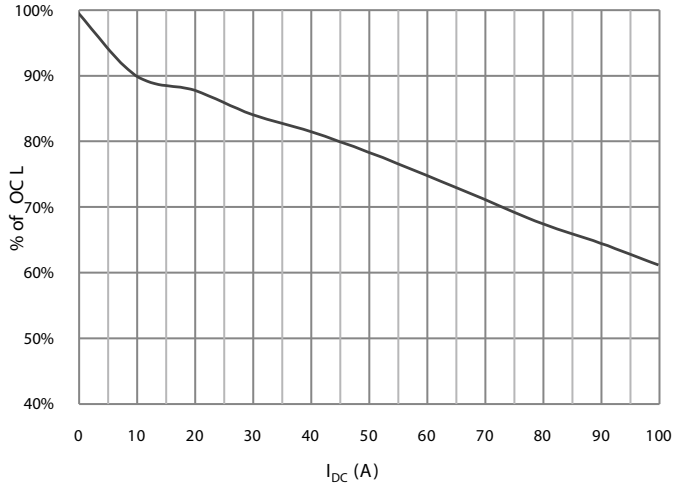


HCMA1104-1R0-R to HCMA1104-220-R

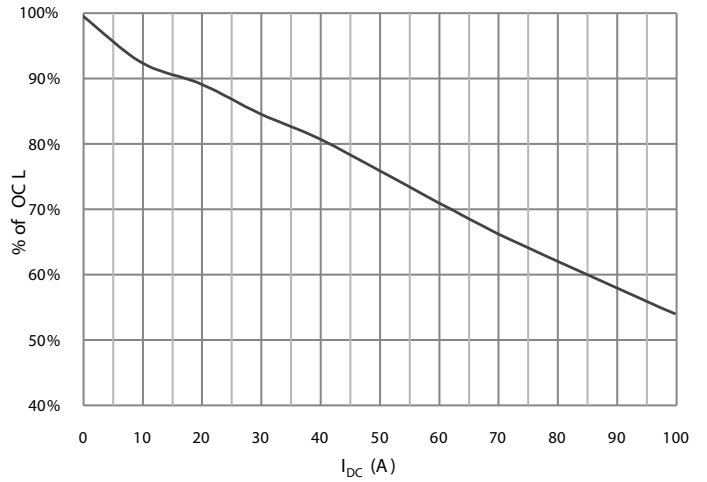


Inductance characteristics

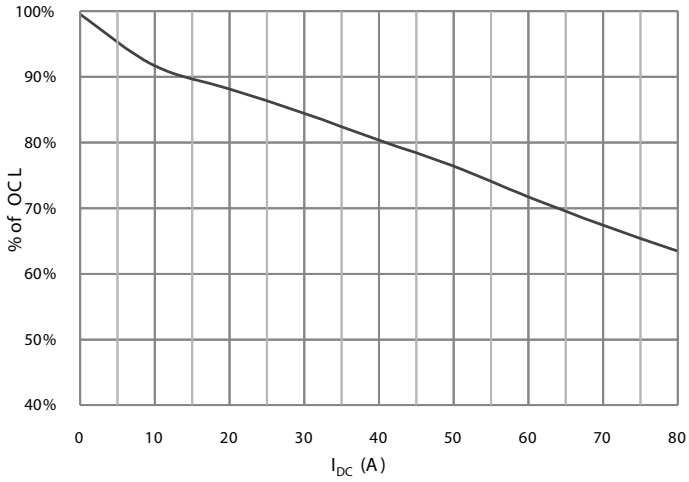
HCMA1104-R20-R



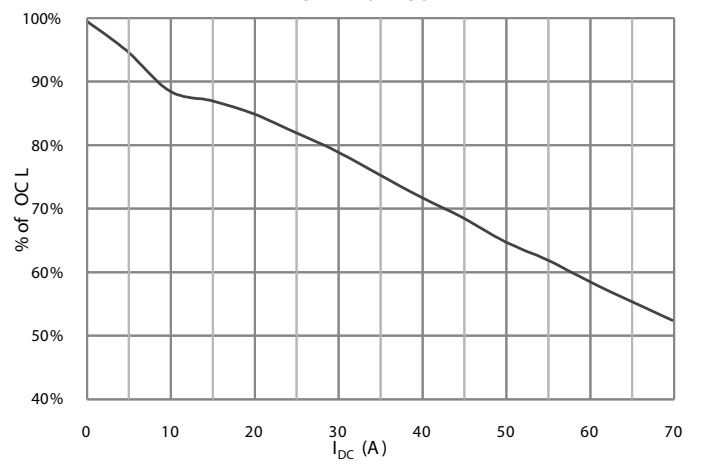
HCMA1104-R36-R



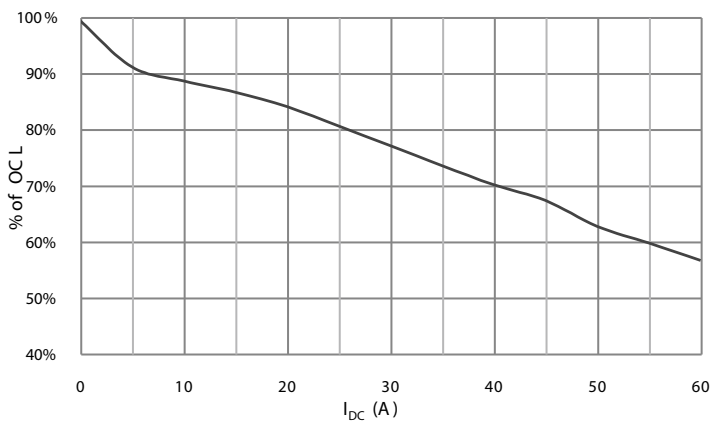
HCMA1104-R45-R



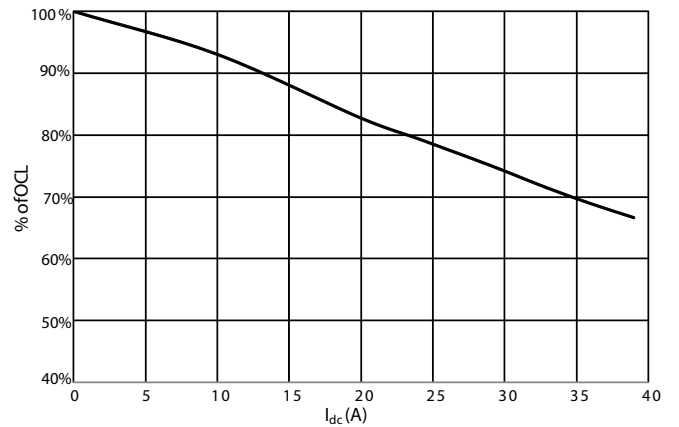
HCMA1104-R56-R



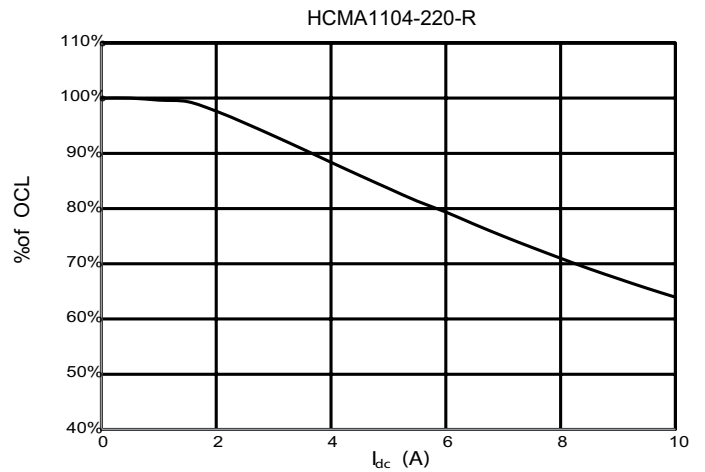
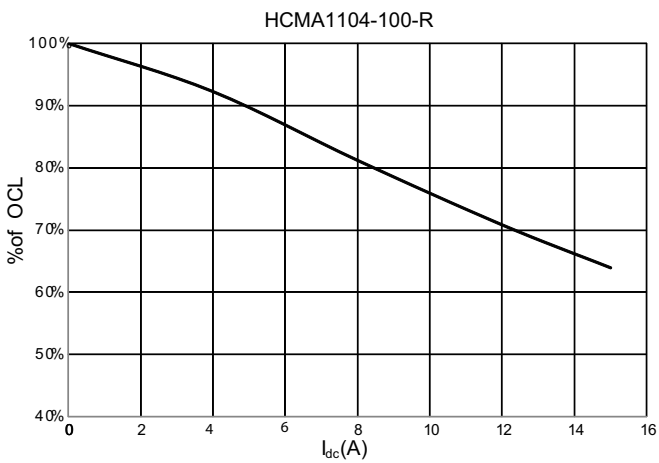
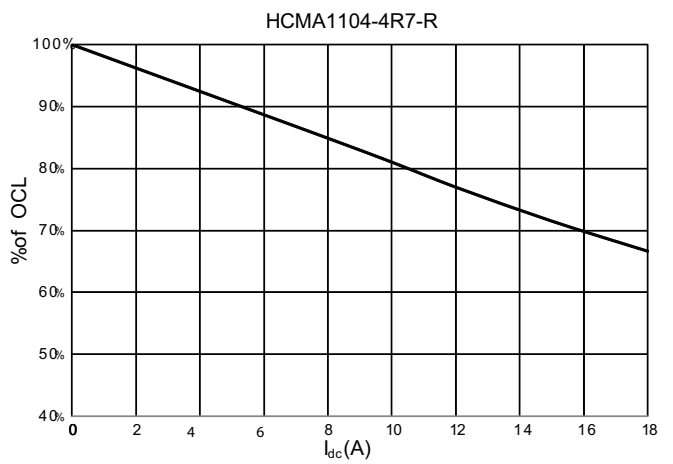
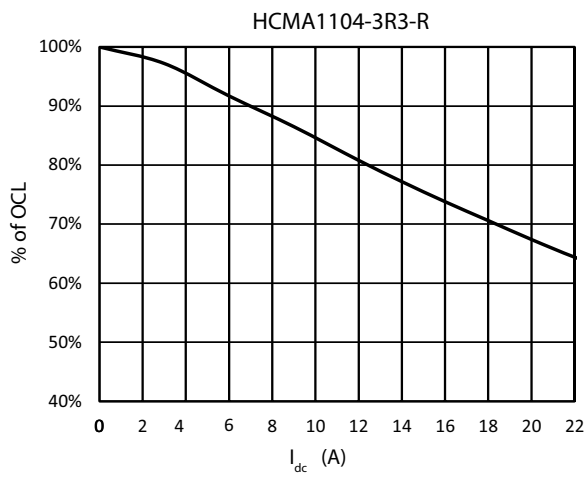
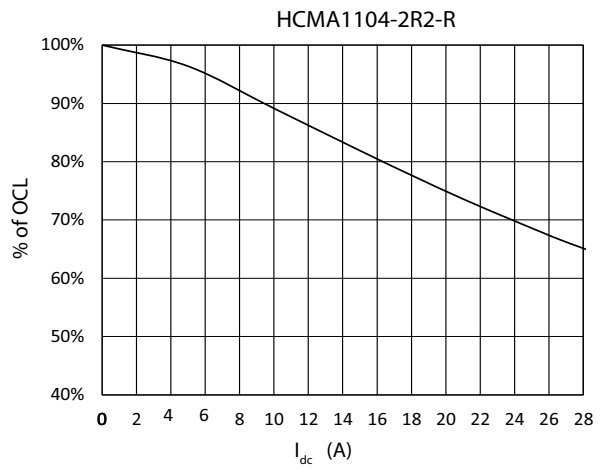
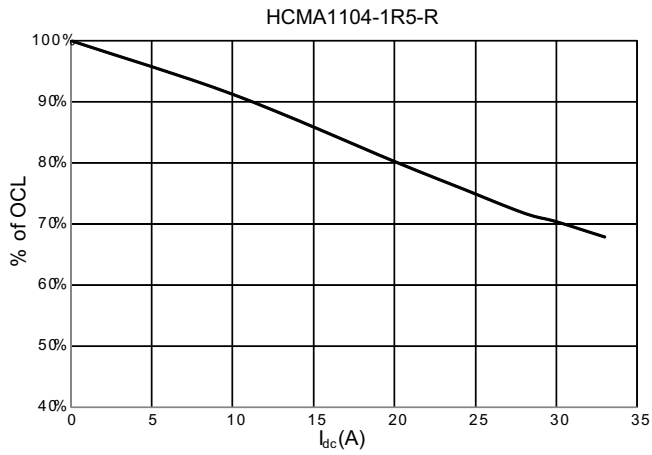
HCMA1104-R90-R



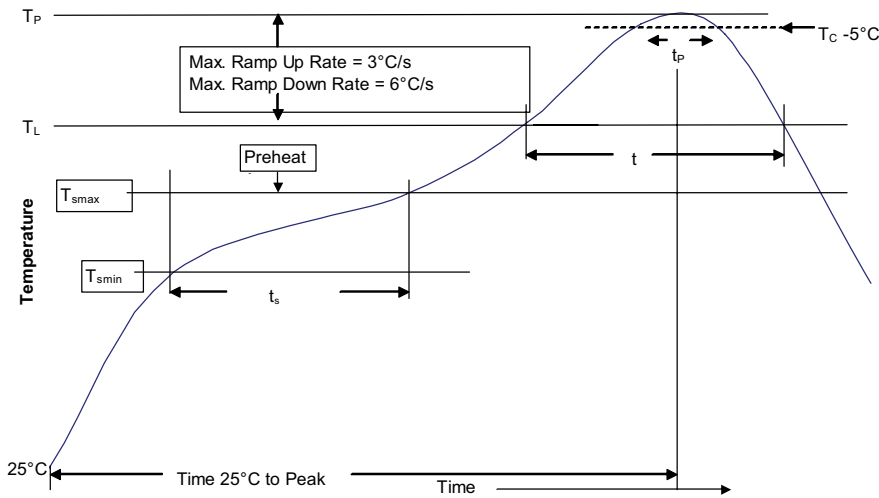
HCMA1104-1R0-R



Inductance characteristics



**Solder reflow profile**



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

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5mm)	235°C	220°C
≥2.5mm	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
<1.6mm	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 JEDEC J-STD-020**

Profile Feature	Standard SnPb Solder	Lead (Pb) Free Solder
Preheat and Soak	<ul style="list-style-type: none"> <li>Temperature min. (T<sub>smin</sub>)</li> <li>Temperature max. (T<sub>smax</sub>)</li> <li>Time (T<sub>smin</sub> to T<sub>smax</sub>) (t<sub>s</sub>)</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 <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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