

# HCMA1104

## Automotive grade High current power inductors



### Product features

- AEC-Q200 qualified
- High current carrying capacity, low core losses
- Magnetically shielded, low EMI
- Frequency range up to 5 MHz
- Inductance range from 0.20  $\mu$ H to 10  $\mu$ H
- Current range from 7.5 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

### Environmental Data

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



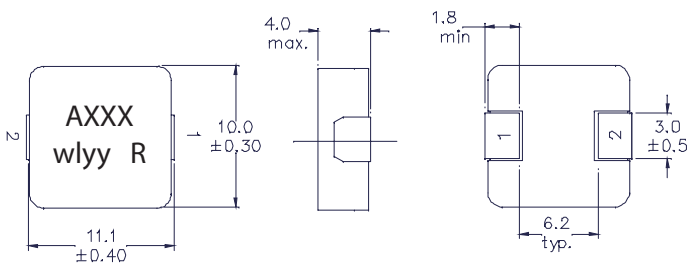
**Product Specifications**

Part Number <sup>7</sup>	OCL <sup>1</sup> ( $\mu\text{H}$ ) $\pm 20\%$	FLL <sup>2</sup> Min. ( $\mu\text{H}$ )	$I_{\text{rms}}^3$ (A)	$I_{\text{sat}}^{4,5}$ (A)	DCR (m $\Omega$ ) @ +20 °C typical	DCR (m $\Omega$ ) @ +20 °C maximum	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	3.00	3.30	378
HCMA1104-1R5-R	1.5	0.84	16	32	3.80	4.20	310
HCMA1104-2R2-R	2.2	1.23	12	18	6.00	7.00	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	17.0	20.0	175
HCMA1104-100-R	10	5.60	7.5	8.5	27.0	30.0	116

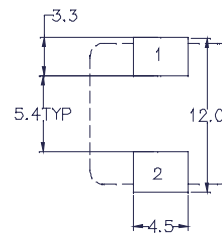
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25  $V_{\text{rms}}$ , 0.0 A dc, +25 °C.
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25  $V_{\text{rms}}$ ,  $I_{\text{sat}}$  @ +25 °C.
- $I_{\text{rms}}$ : DC current for an approximate temperature rise of 40 °C without core loss. 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 at +25 °C- HCMA1104-R20-R to HCMA1104-R90-R.

- $I_{\text{sat}}$ : Peak current for approximately 30% rolloff at +25 °C- HCMA1104-1R0-R to HCMA1104-100-R.
- K-factor: Used to determine  $B_{\text{pp}}$  for core loss (see graph).  $B_{\text{pp}} = K * L * \Delta I$ .  $B_{\text{pp}}$ : (Gauss), K: (K-factor from table), L: (Inductance in  $\mu\text{H}$ ),  $\Delta I$  (Peak to peak ripple current in amps).
- Part Number Definition: HCMA1104-yyy-R  
 - HCMA1104 = Product code and size  
 yyy= Inductance value in  $\mu\text{H}$ , R = decimal point,  
 if no R is present then third character equals number of zeros.  
 "-R" suffix = RoHS compliant

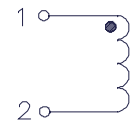
**Dimensions (mm)**



**Recommended pad layout**



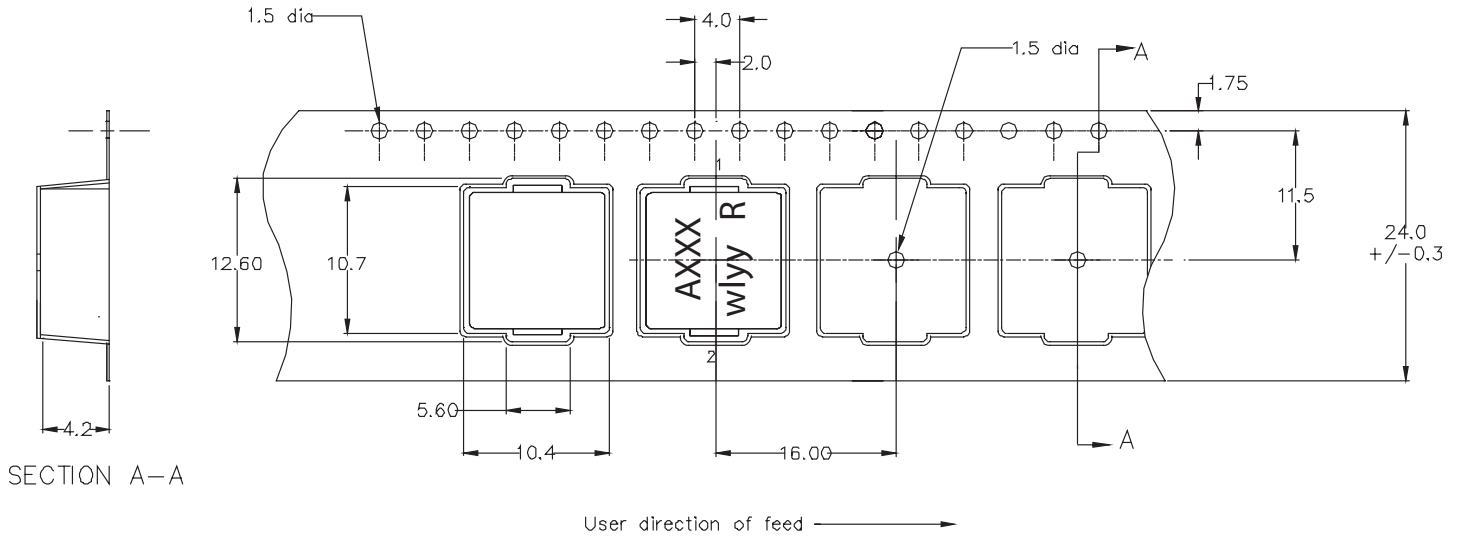
**Schematic**



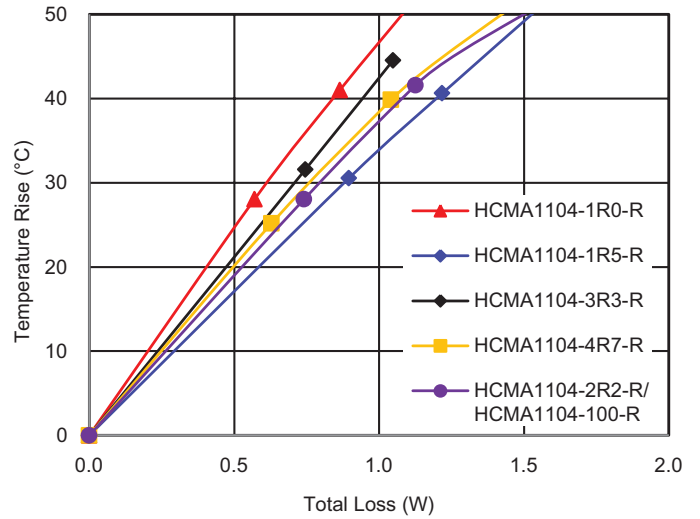
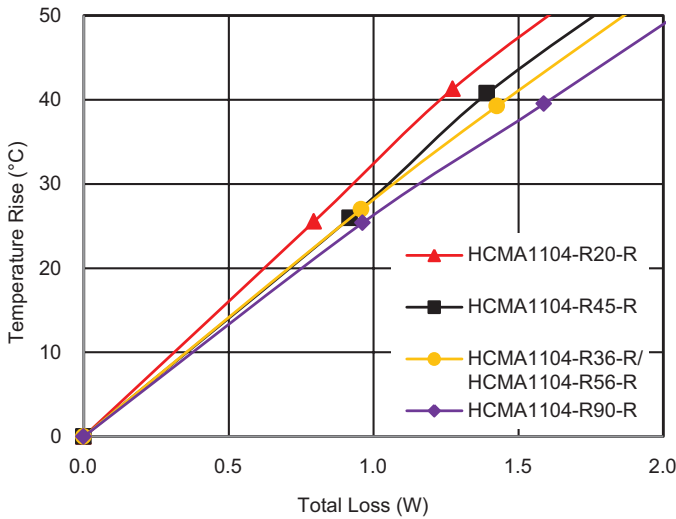
Part marking: A = automotive grade, xxx = inductance value in  $\mu\text{H}$ , R = decimal point, if no R is present, third character equals number of zeros, wlyy = date code, R = revision level All soldering surfaces to be coplanar within 0.10 millimeters  
 Tolerances are  $\pm 0.3$  millimeters unless stated otherwise  
 Color: Grey  
 Do not route traces or vias underneath the inductor

**Packaging information (mm)**

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

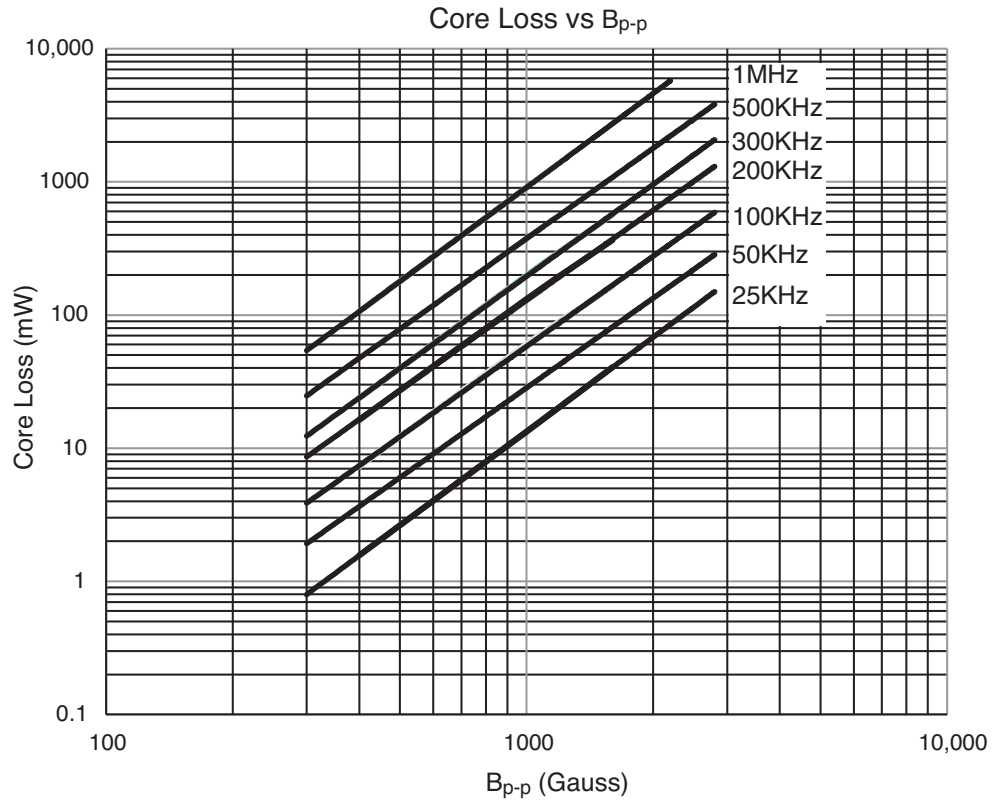


**Temperature rise vs. total loss**

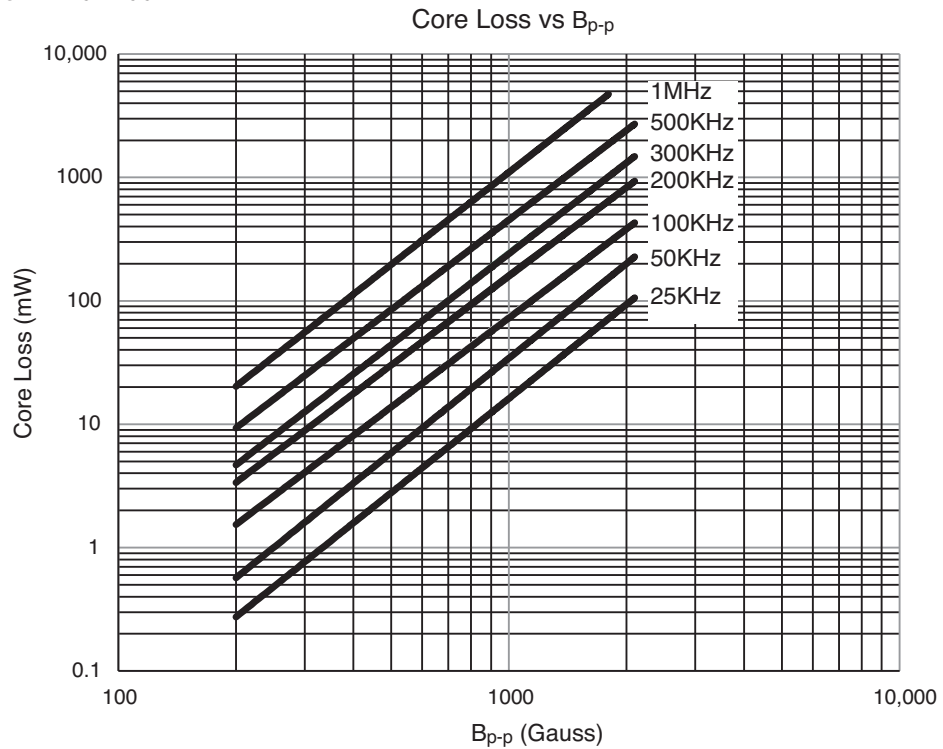


Core loss vs.  $B_{p-p}$

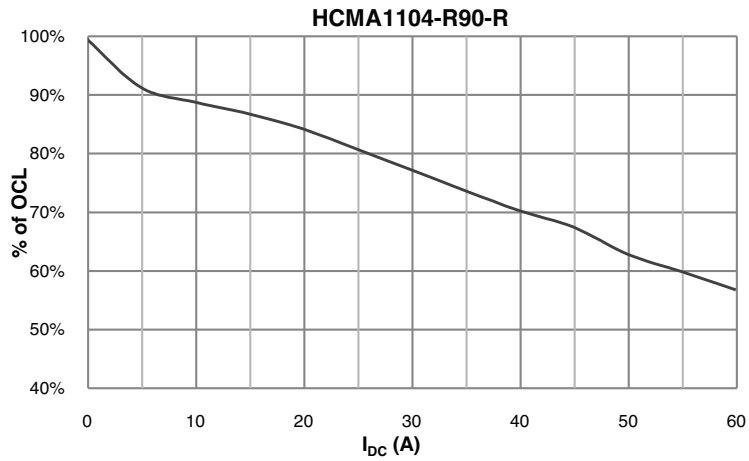
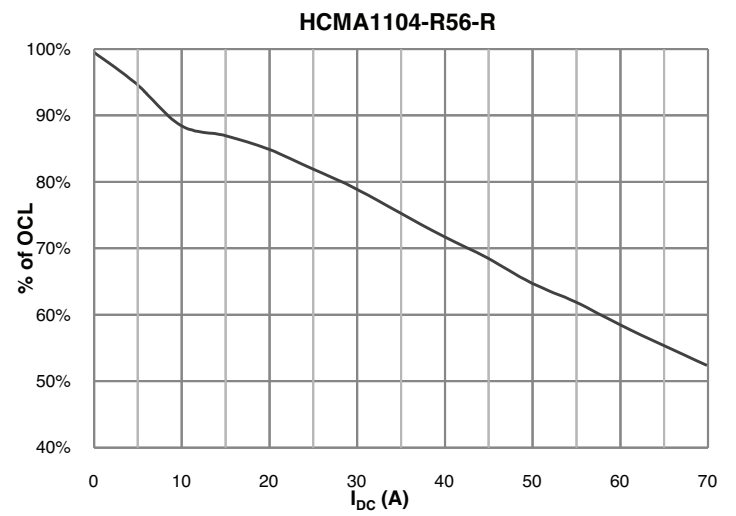
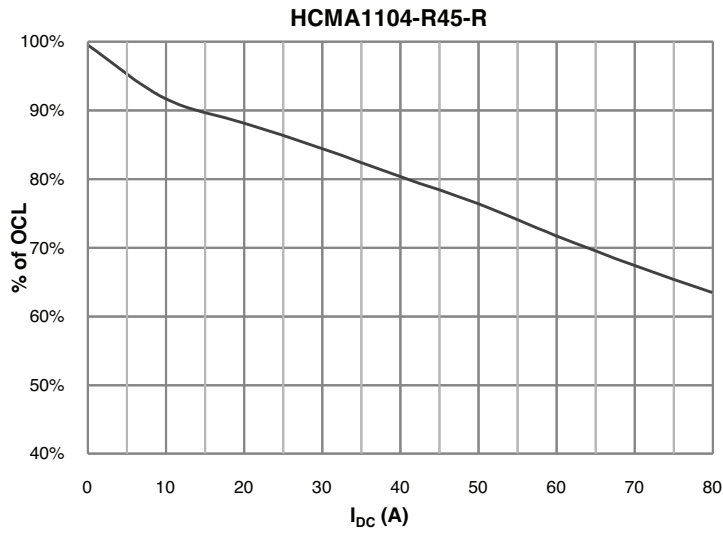
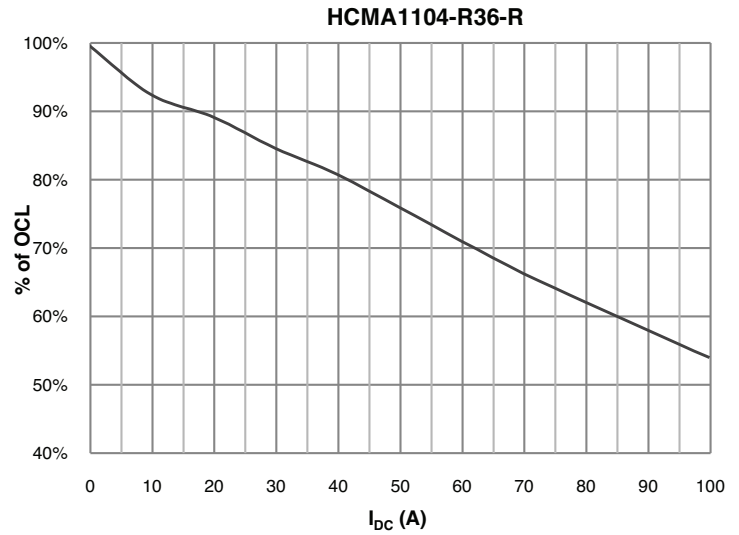
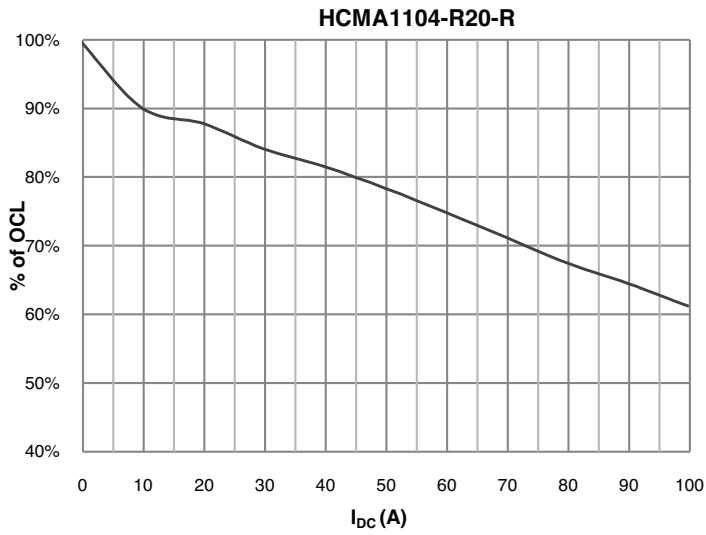
HCMA1104-R20-R to HCMA1104-R90-R



HCMA1104-1R0-R to HCMA1104-100-R

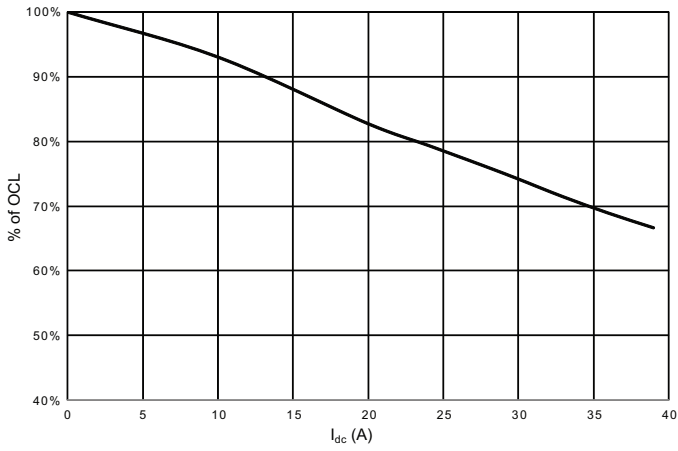


Inductance characteristics

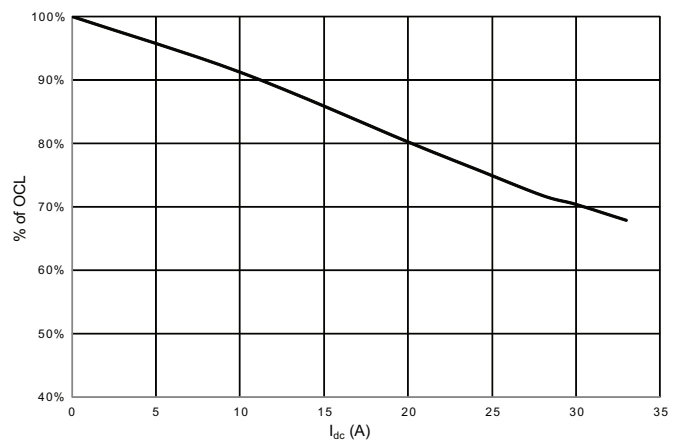


Inductance characteristics

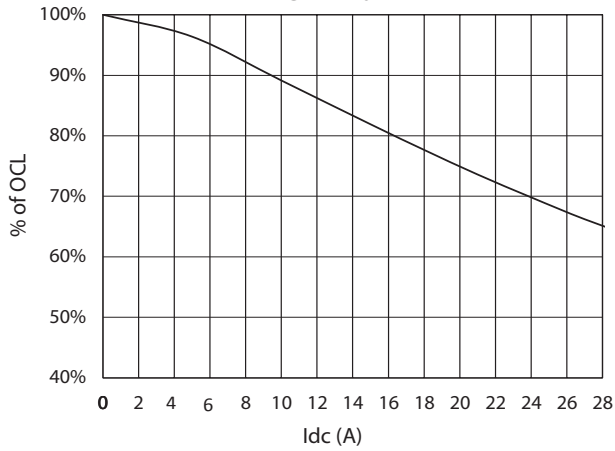
HCMA1104-1R0-R



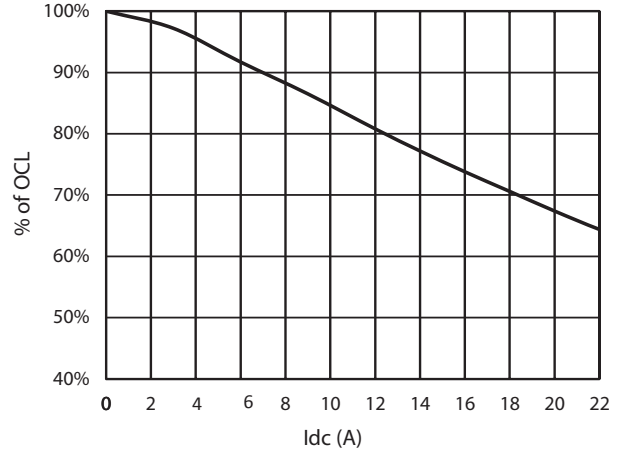
HCMA1104-1R5-R



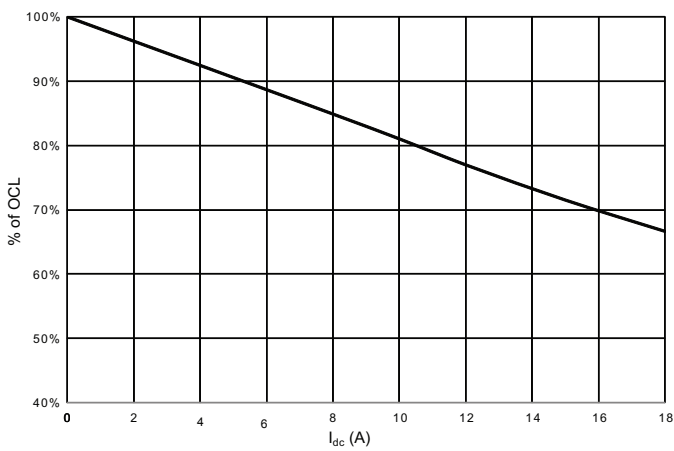
HCMA1104-2R2-R



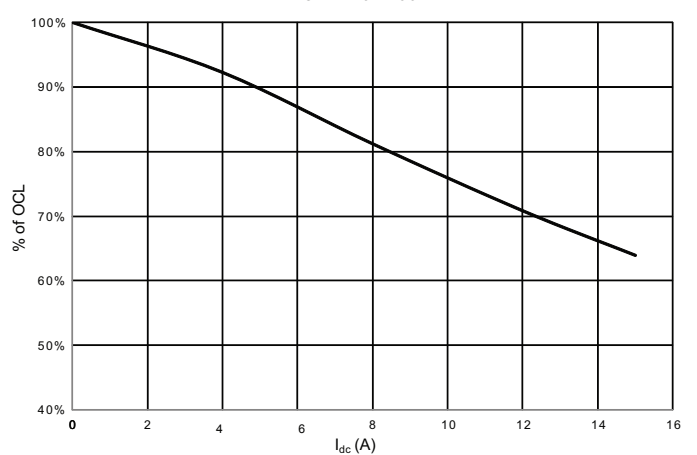
HCMA1104-3R3-R



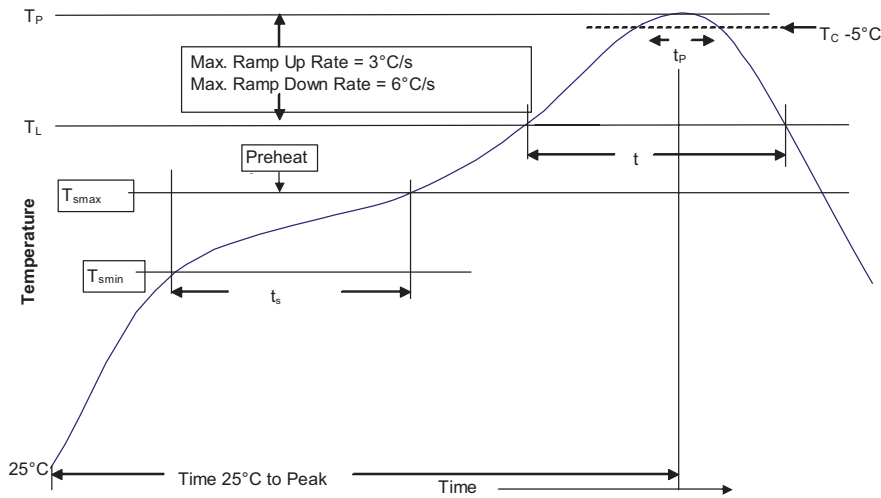
HCMA1104-4R7-R



HCMA1104-100-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
<2.5mm)	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		
• 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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