

# HCMA0503

## Automotive grade High current power inductors



### Description

- AEC-Q200 Grade 3 qualified
- High current carrying capacity
- Low core losses
- Magnetically shielded, low EMI
- Frequency range up to 1 MHz
- Inductance range from 0.2  $\mu$ H to 22  $\mu$ H
- Current range from 1.9 A to 22 A
- 5.5 mm x 5.3 mm footprint surface mount package in a 3.0 mm height
- Iron powder core material
- Halogen free, lead free, RoHS compliant

### 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
  - 77 GHz radar systems
  - Basic and smart surround, and rear and front view camera
  - Adaptive cruise control (ACC)
  - Automatic parking control
  - Collision avoidance system
  - Car black box system
- Infotainment and cluster electronics
  - Active noise cancellation (ANC)
  - Audio subsystem: head unit and trunk amp - Digital instrument cluster
  - In-vehicle infotainment (IVI) and navigation
- Chassis and safety electronics
  - Airbag control unit

### 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-020D compliant



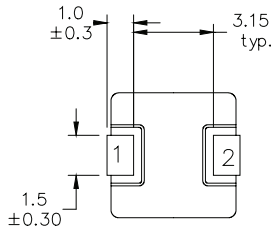
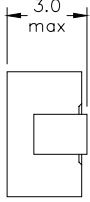
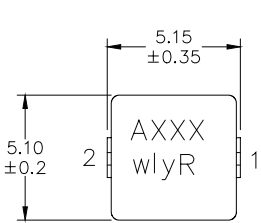
Product Specifications

Part Number <sup>6</sup>	OCL <sup>1</sup> ( $\mu\text{H}$ ) $\pm 20\%$	FLL <sup>2</sup> ( $\mu\text{H}$ ) minimum	$I_{\text{rms}}$ <sup>3</sup> (A)	$I_{\text{sat}}$ <sup>4</sup> (A)	DCR ( $\text{m}\Omega$ ) typical @ 20°C	DCR ( $\text{m}\Omega$ ) maximum @ 20°C	K-factor <sup>5</sup>
HCMA0503-R20-R	0.20	0.13	22.2	21.0	2.1	2.31	1764
HCMA0503-R35-R	0.35	0.22	16.6	14.9	3.9	4.29	1259
HCMA0503-R47-R	0.47	0.30	12.0	11.5	6.5	7.15	820
HCMA0503-R75-R	0.75	0.48	11.3	9.7	8.5	9.35	801
HCMA0503-1R0-R	1.0	0.64	10.1	8.5	10.4	11.4	588
HCMA0503-1R5-R	1.5	0.96	7.5	7.0	17.1	18.5	393
HCMA0503-2R2-R	2.2	1.4	6.8	6.5	22.5	25	325
HCMA0503-3R3-R	3.3	2.1	5.5	6.0	36.4	40.4	273
HCMA0503-4R7-R	4.7	3.0	4.5	5.5	54	60	226
HCMA0503-5R6-R	5.6	3.6	4.25	3.5	63	70.6	206
HCMA0503-6R8-R	6.8	4.4	2.60	3.8	91	99	172
HCMA0503-100-R	10	6.4	2.75	2.3	122	132	158
HCMA0503-150-R	15	9.6	2.4	2.1	138	166	127
HCMA0503-220-R	22	14	1.9	1.9	260	270	106

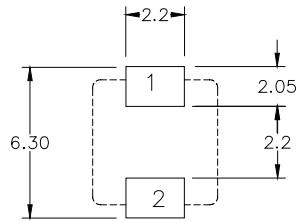
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 Vrms, 0.0 Adc, +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 Vrms, Isat, +25 °C
- $I_{\text{rms}}$ : DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents. PCB 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 @ +25 °C
- K-factor: Used to determine  $B_{\text{pp}}$  for core loss (see graph).  $B_{\text{p-p}} = K * L * \Delta I$ .  $B_{\text{p-p}}$ : (Gauss), K: (K-factor from table), L: (Inductance in  $\mu\text{H}$ ),  $\Delta I$  (Peak to peak ripple current in Amps).
- Part Number Definition: HCMA0503-xxx-R  
HCMA0503 = 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

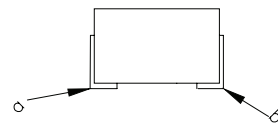
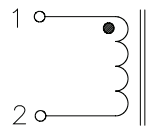
Dimensions (mm)



Recommended Pad Layout



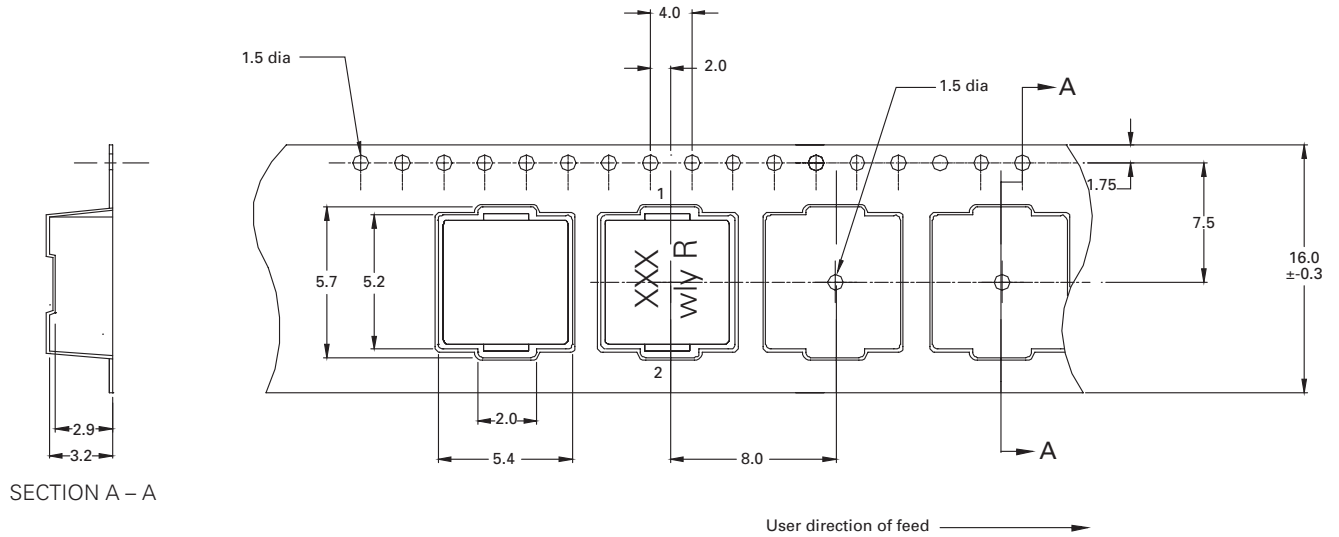
Schematic



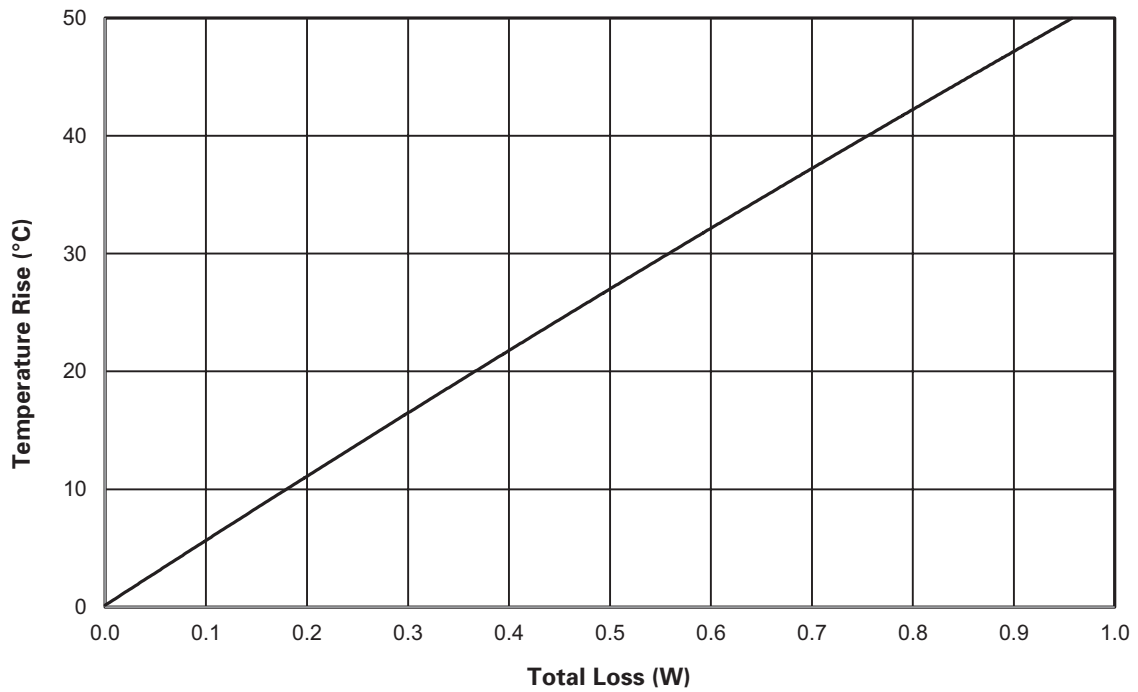
Part marking: AXXX A=automotive, XXX=inductance value in uH, R= decimal point. If no R is present then last character equals number of zeros.  
wly=date code, R=revision level  
All soldering surfaces to be coplanar within 0.10 millimeters  
Tolerances are  $\pm 0.2$  millimeters unless stated otherwise  
DCR measured from point "a" to point "b"  
Color: Grey  
Do not route traces or vias underneath the inductor

**Packaging information (mm)**

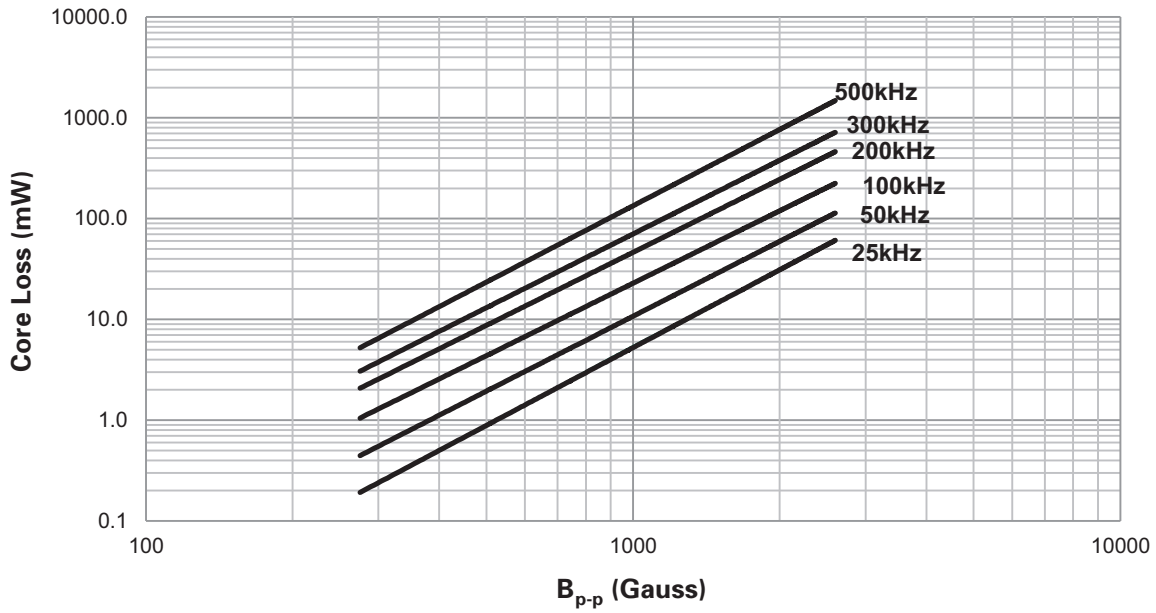
Supplied in tape and reel packaging, 2,000 parts per 13" diameter reel



**Temperature rise vs. total loss**

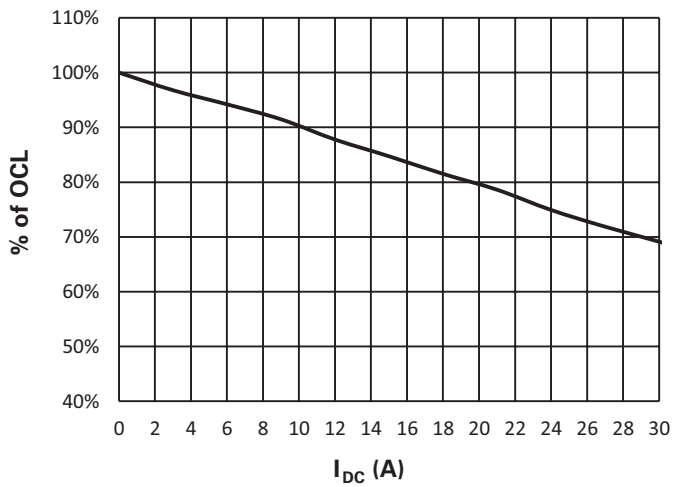


Core loss vs.  $B_{p-p}$

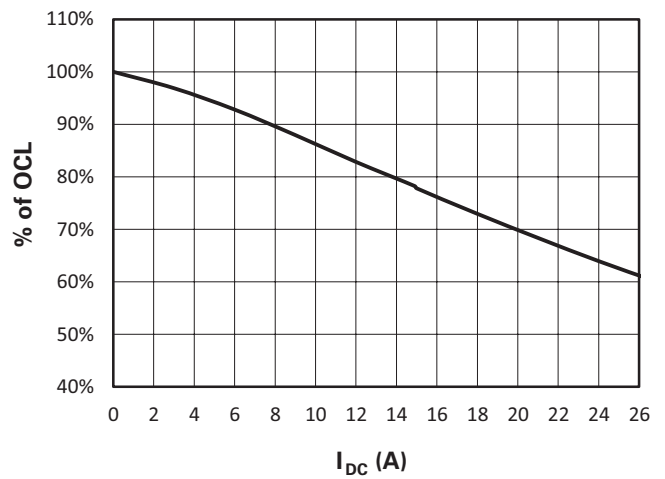


Inductance characteristics

HCMA0503-R20-R

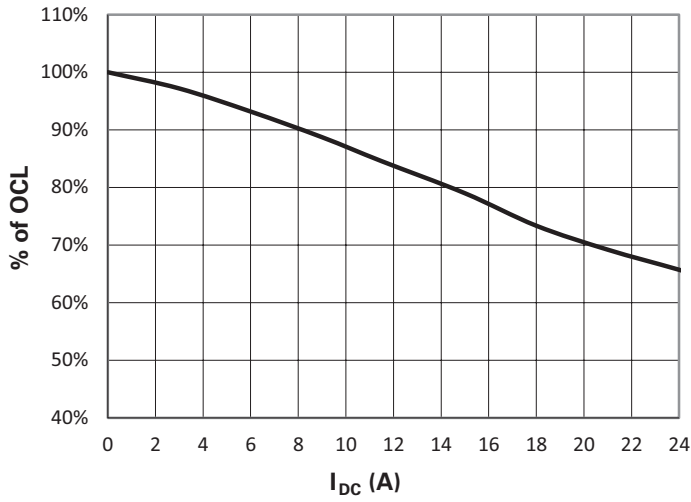


HCMA0503-R35-R

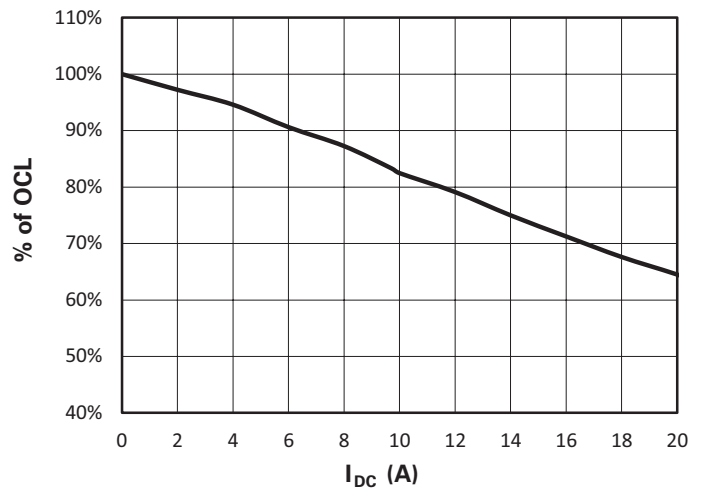


Inductance characteristics

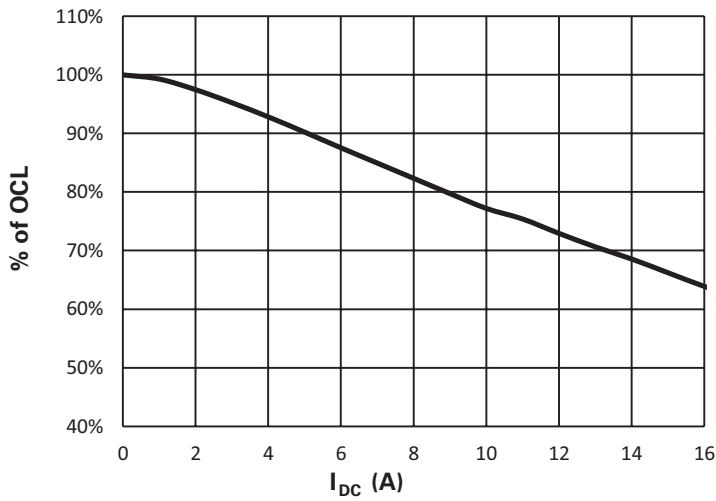
HCMA0503-R47-R



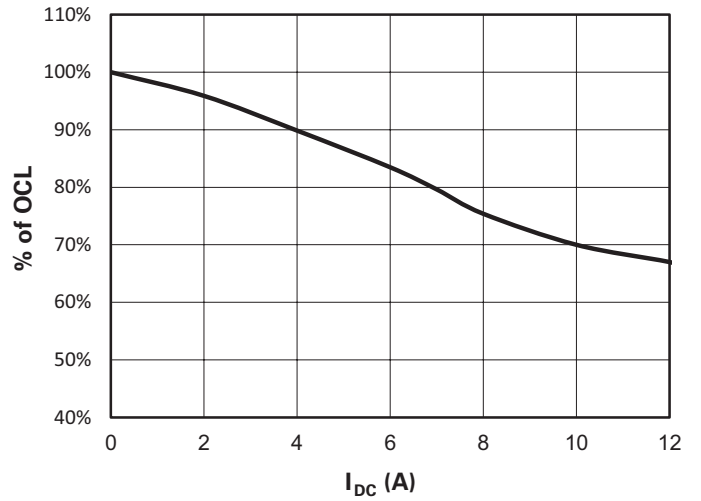
HCMA0503-R75-R



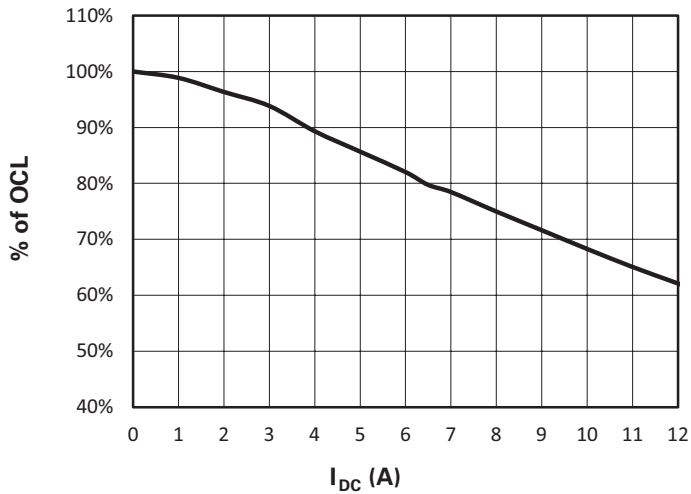
HCMA0503-1R0-R



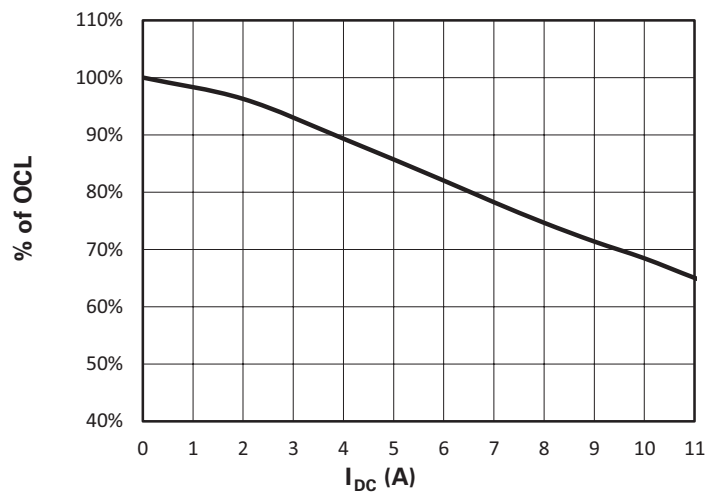
HCMA0503-1R5-R



HCMA0503-2R2-R

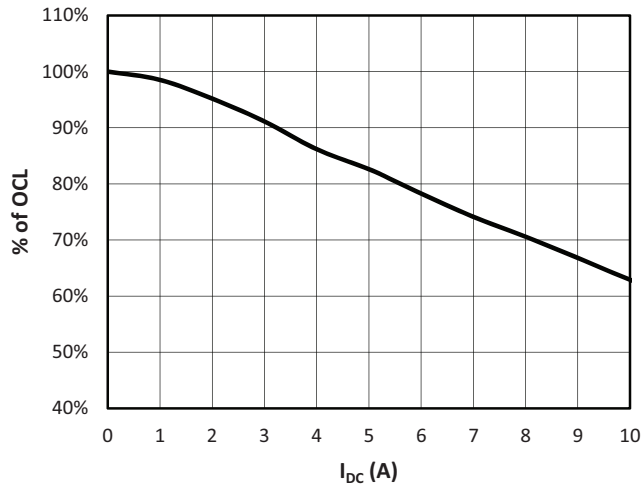


HCMA0503-3R3-R

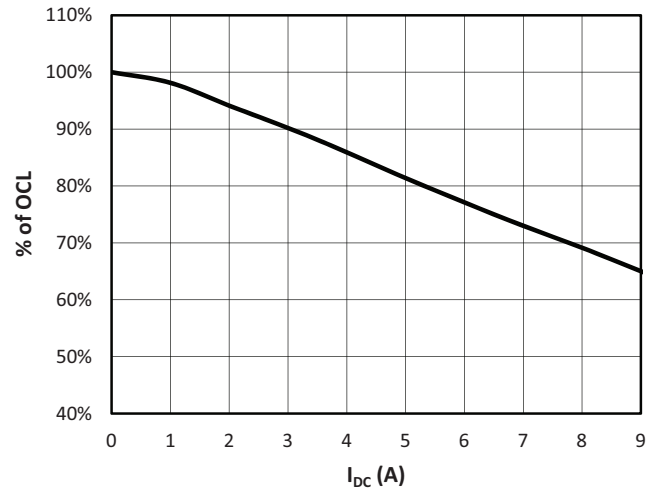


Inductance characteristics

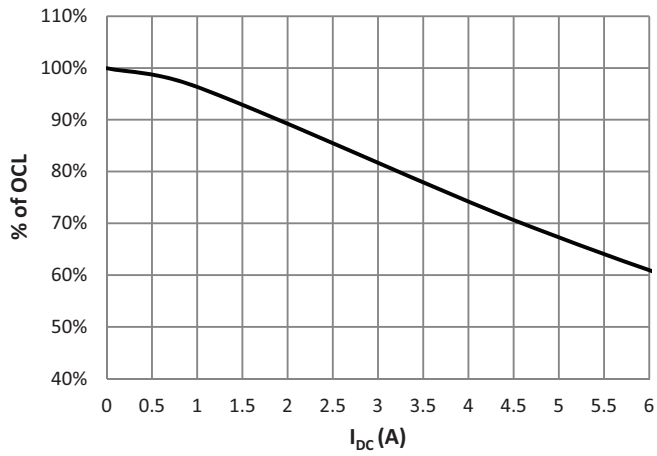
HCMA0503-4R7-R



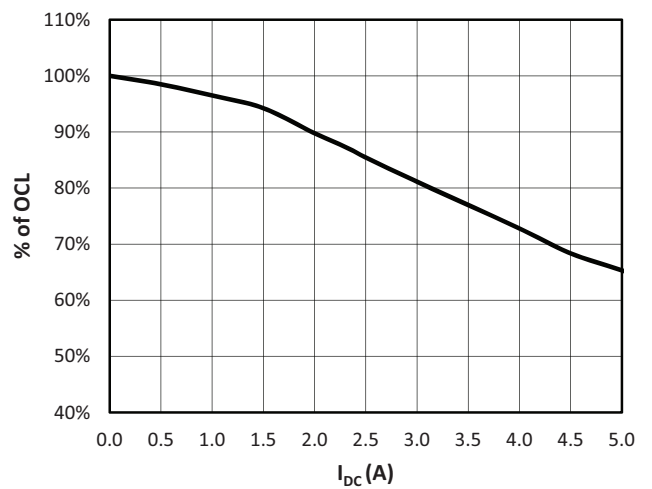
HCMA0503-5R6-R



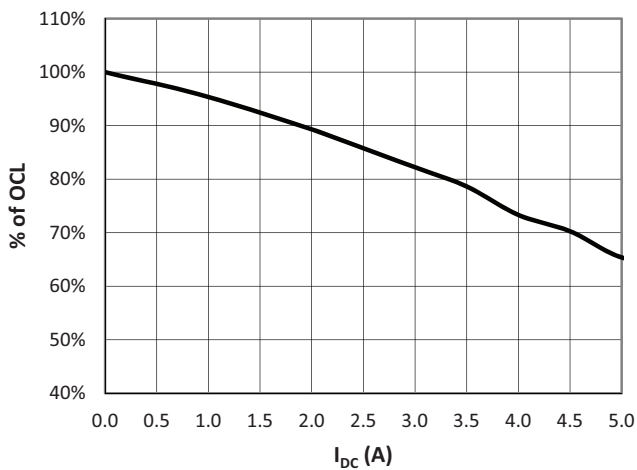
HCMA0503-6R8-R



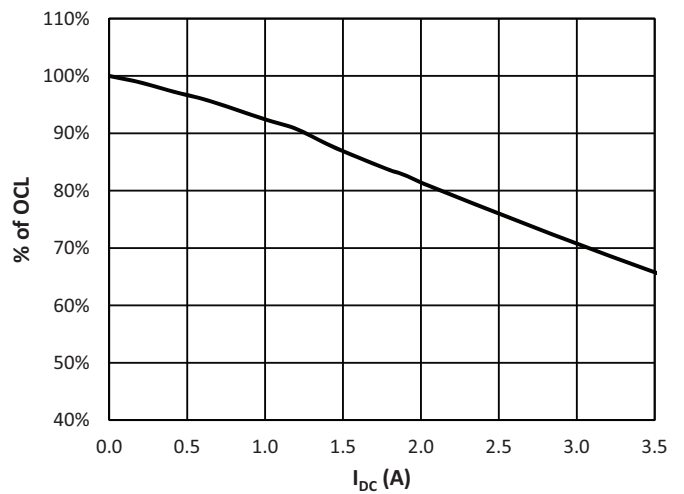
HCMA0503-100-R



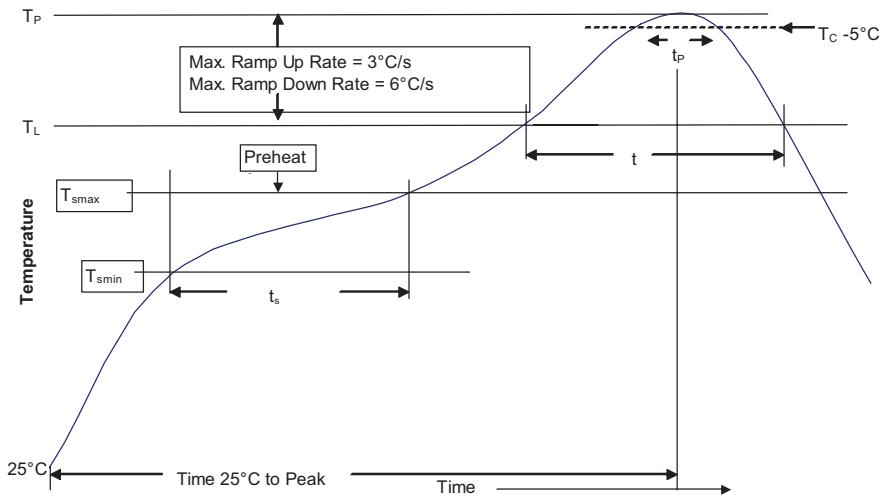
HCMA0503-150-R



HCMA0503-220-R



**Solder reflow profile**



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

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 ( $T_C$ )**

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 JDEC J-STD-020D**

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 ( $T_L$ )	183°C	217°C
Time at liquidous ( $t_L$ )	60-150 Seconds	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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[HCMA0503-4R7-R](#) [HCMA0503-1R0-R](#) [HCMA0503-R75-R](#) [HCMA0503-R35-R](#) [HCMA0503-1R5-R](#) [HCMA0503-2R2-R](#) [HCMA0503-6R8-R](#) [HCMA0503-220-R](#)