

# 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 1MHz
- Inductance range from 0.2μH to 22μH
- Current range from 1.9 to 22 amps
- 5.5 x 5.3mm footprint surface mount package in a 3.0mm 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
  - 77GHz 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	$I_{\text{rms}}^3$ (amps)	$I_{\text{sat}}^4$ (amps)	DCR ( $\text{m}\Omega$ ) typical	DCR ( $\text{m}\Omega$ ) maximum @ 20°C	K-factor <sup>5</sup>
HCMA0503-R20-R	0.20	0.13	22.2	21.0	2	2.3	1764
HCMA0503-R35-R	0.35	0.22	16.6	14.9	4	4.3	1259
HCMA0503-R47-R	0.47	0.30	12.0	11.5	6	7.2	820
HCMA0503-R75-R	0.75	0.48	11.3	9.7	8	9.4	801
HCMA0503-1R0-R	1.0	0.64	10.1	8.5	10	12	588
HCMA0503-1R5-R	1.5	0.96	7.5	7.0	17	19	393
HCMA0503-2R2-R	2.2	1.4	6.8	6.5	23	25	325
HCMA0503-3R3-R	3.3	2.1	5.5	6.0	36	40	273
HCMA0503-4R7-R	4.7	3.0	4.5	5.5	54	60	226
HCMA0503-5R6-R	5.6	3.6	4.3	3.5	63	71	206
HCMA0503-100-R	10	6.4	2.8	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

1. Open Circuit Inductance (OCL) Test Parameters: 100kHz, 0.25Vrms, 0.0Adc, @ +25°C

2. Full Load Inductance (FLL) Test Parameters: 100kHz, 0.25Vrms, @  $I_{\text{sat}}$ , @ +25°C

3.  $I_{\text{rms}}$ : 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.

4.  $I_{\text{sat}}$ : Peak current for approximately 20% rolloff @ +25°C

5. 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).

6. Part Number Definition: HCMA0503-xxx-R

HCMA0503 = Product code and size

xxx= inductance value in  $\mu\text{H}$ , R= decimal point,

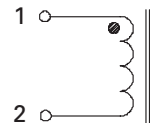
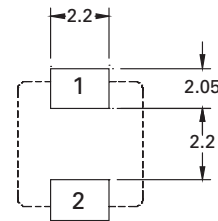
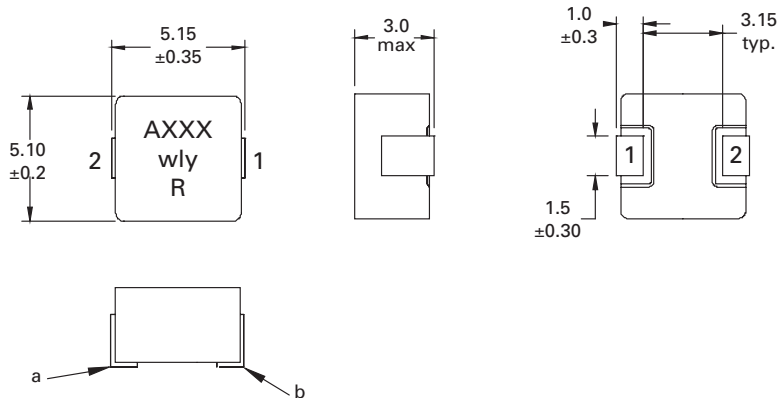
If no R is present then last character equals number of zeros

-R suffix = RoHS compliant

## Dimensions (mm)

### Recommended Pad Layout

### Schematic



Part marking: XXXX A=automotive, XXX=inductance value in  $\mu\text{H}$ , 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 0.1 millimeters

Tolerances are  $\pm 0.2$  millimeters unless stated otherwise

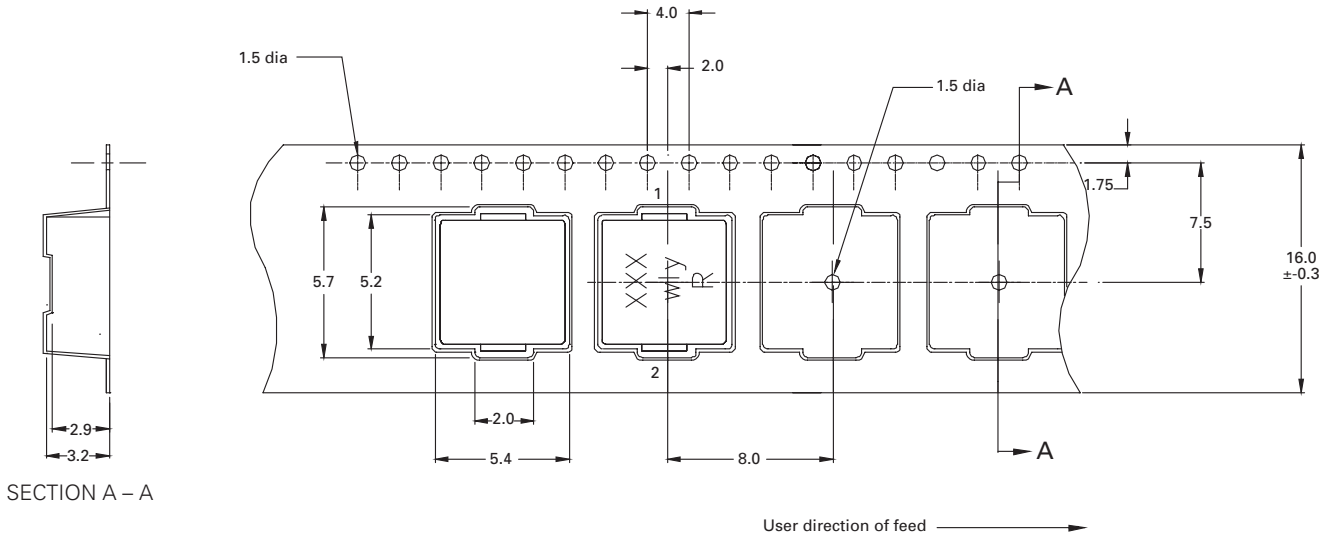
DCR measured from point "a" to point "b"

Color: Grey

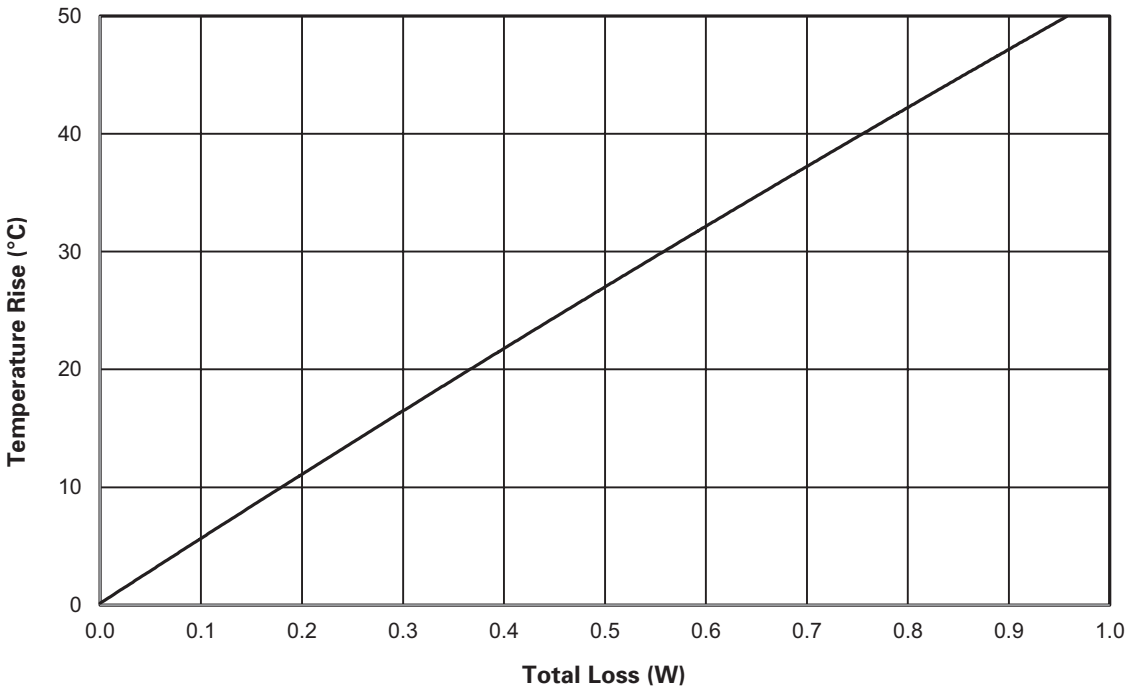
Do not route traces or vias underneath the inductor

Packaging information (mm)

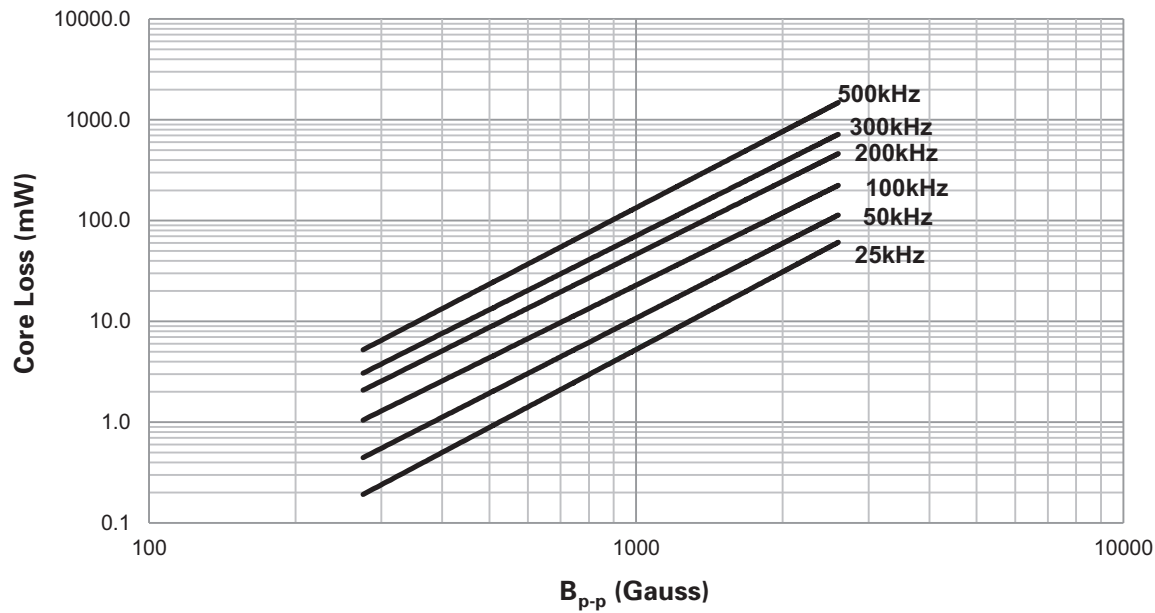
Supplied in tape and reel packaging, 2,000 parts per 13" diameter reel



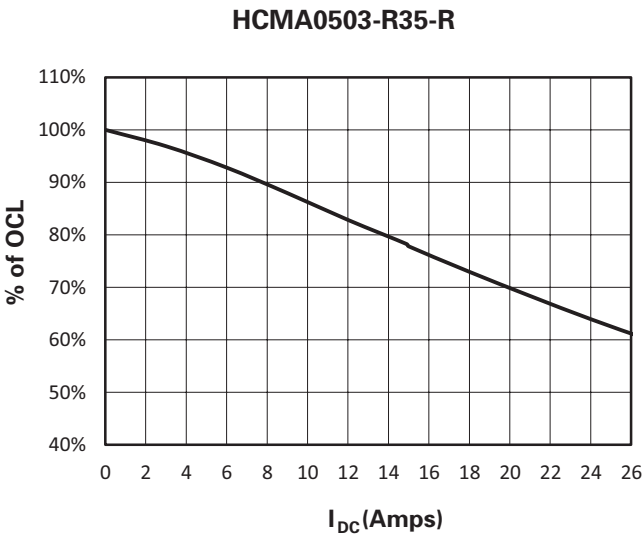
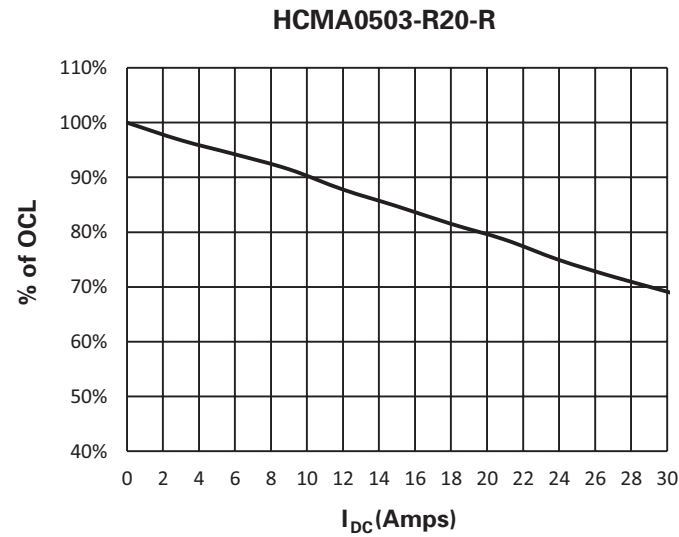
Temperature rise vs. total loss



Core loss vs. B<sub>p-p</sub>

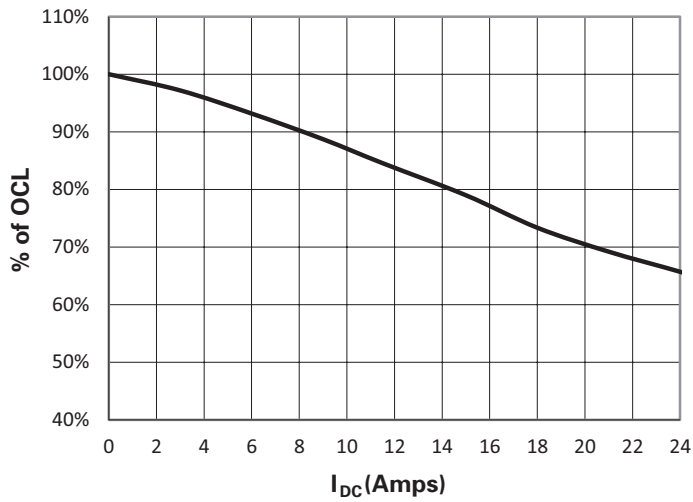


Inductance characteristics

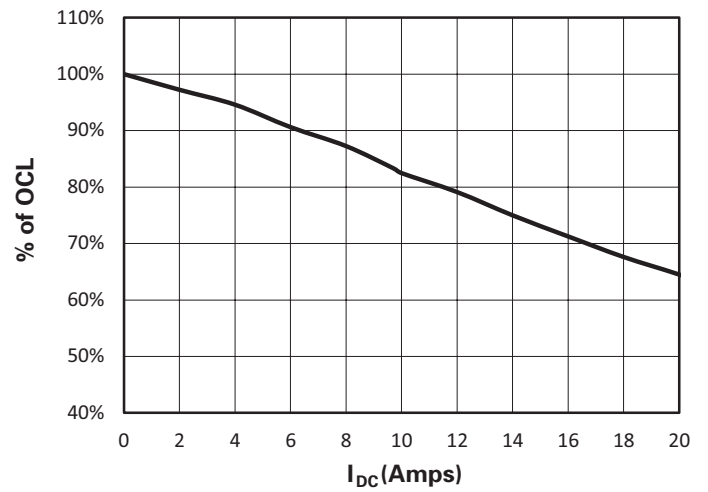


Inductance characteristics

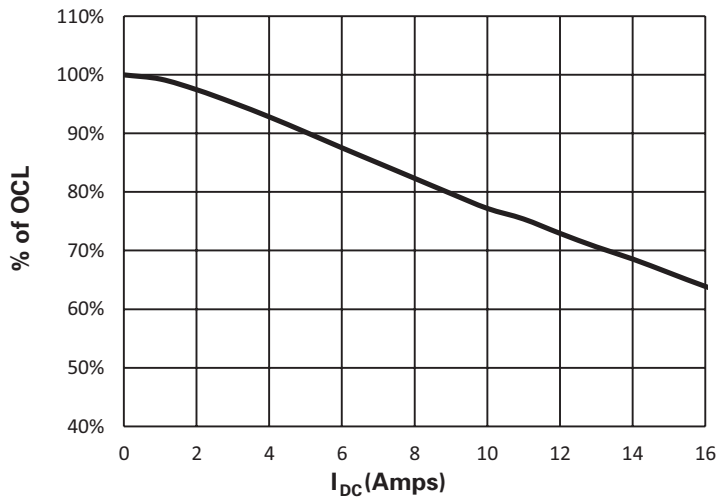
HCMA0503-R47-R



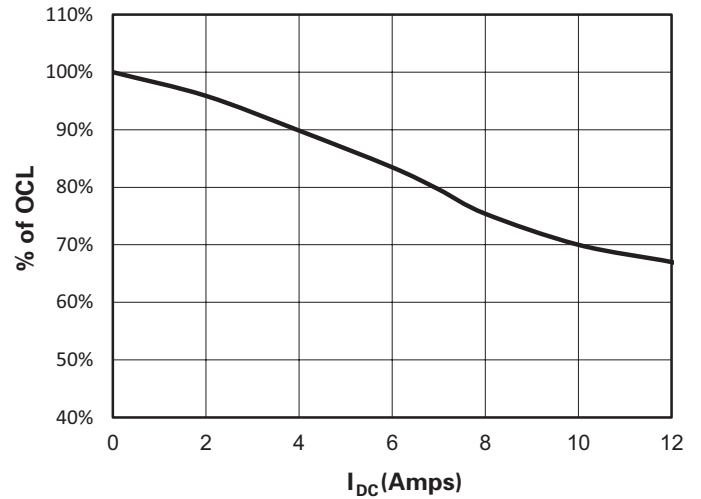
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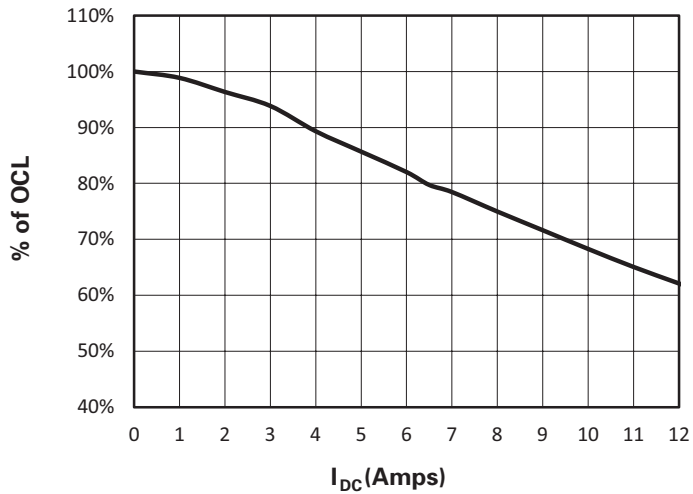
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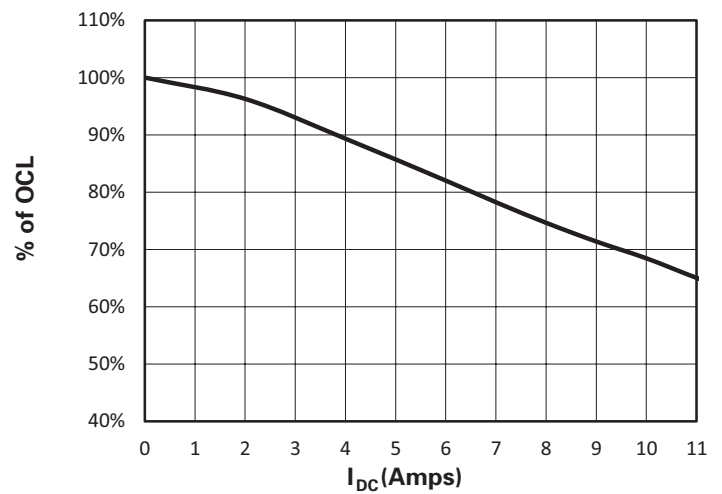
HCMA0503-1R5-R



HCMA0503-2R2-R

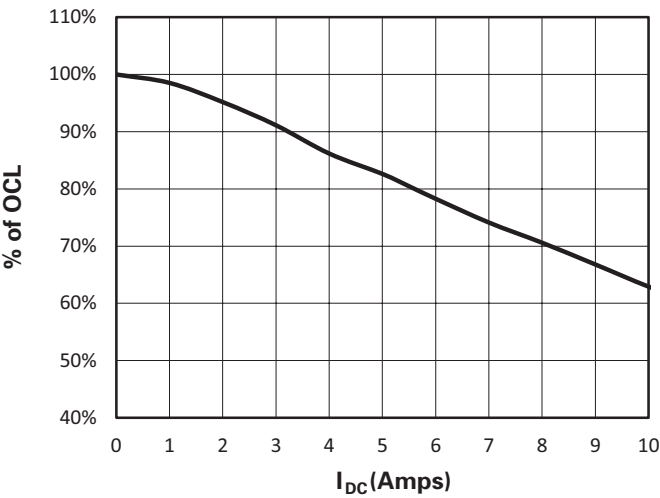


HCMA0503-3R3-R

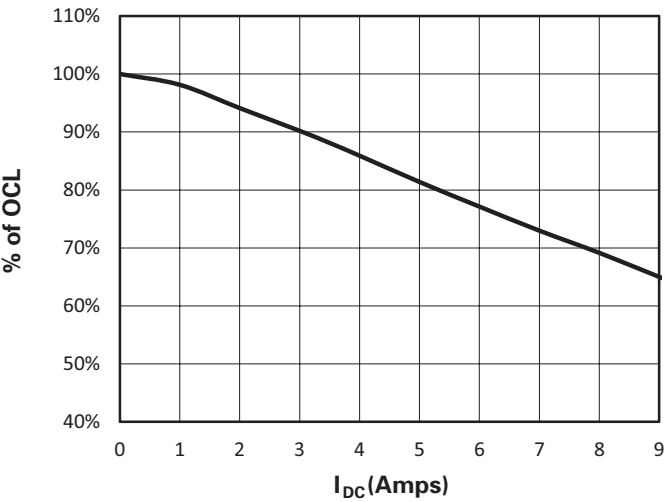


Inductance characteristics

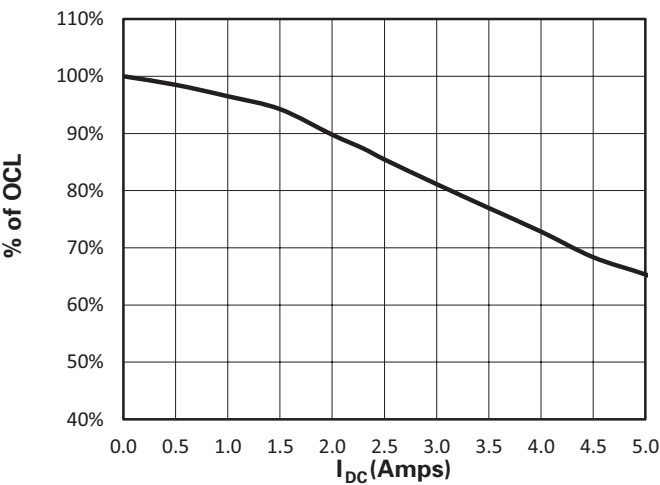
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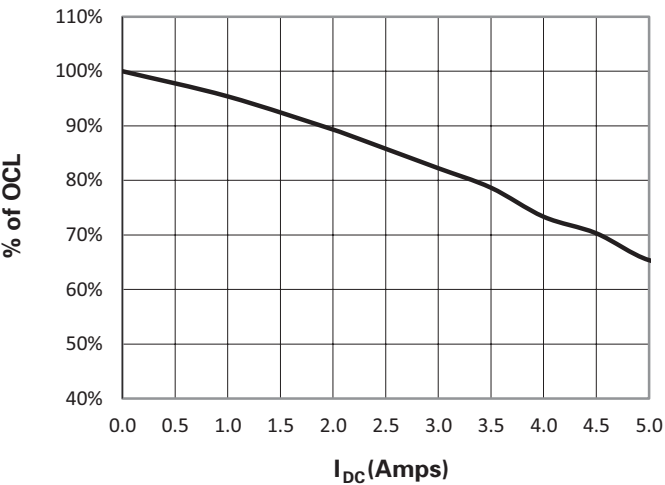
HCMA0503-5R6-R



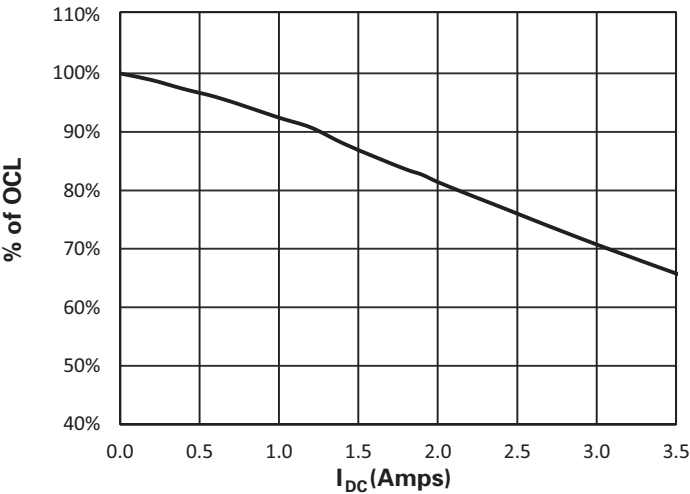
HCMA0503-100-R



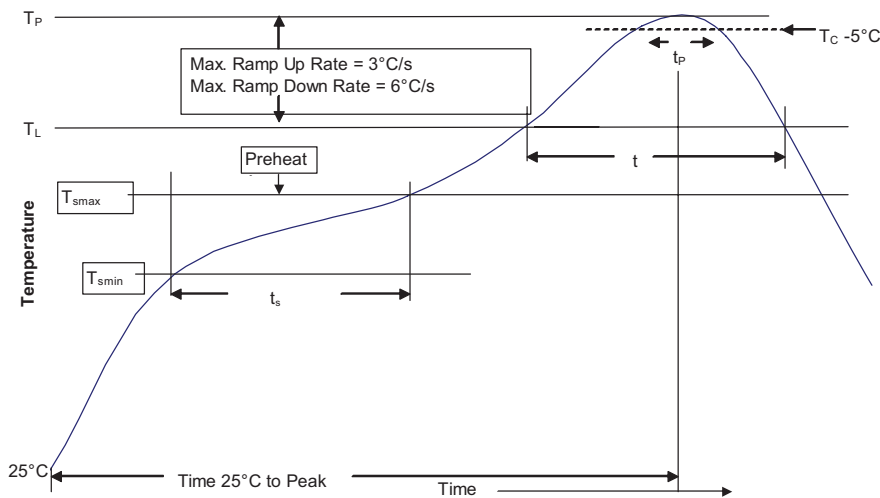
HCMA0503-150-R



HCMA0503-200-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 JEDEC 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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