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[Eaton \(formerly Cooper Bussmann\)](#)
[HCMA0503-100-R](#)

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sales@integrated-circuit.com

Technical Data **10248**

Effective June 2016
Supersedes June 2015

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 μ H to 22 μ 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



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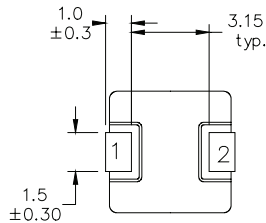
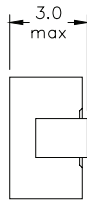
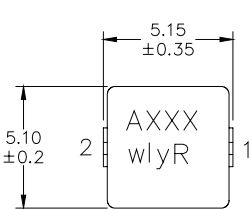
Product Specifications

| Part Number ⁶ | OCL ¹ (μ H) \pm 20% | FLL ² (μ H) minimum | I _{rms} ³ (A) | I _{sat} ⁴ (A) | DCR (m Ω) typical @ 20°C | DCR (m Ω) maximum @ 20°C | K-factor ⁵ |
|--------------------------|--|--|--------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|-----------------------|
| 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 |

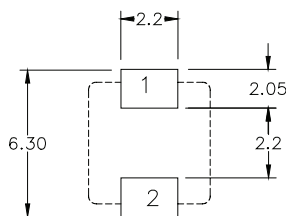
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 Vrms, 0.0 Adc, +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 Vrms, Isat, +25 °C
- I_{DC}: DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents.
 PCB layout, 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
- K-factor: Used to determine B_{p-p} for core loss (see graph). B_{p-p} = K * L * Δ I. B_{p-p} (Gauss), K: (K-factor from table), L: (Inductance in μ H), Δ I (Peak to peak ripple current in Amps).
- Part Number Definition: HCMA0503-xxx-R
 HCMA0503 = Product code and size
 xxx= inductance value in μ H, R= decimal point.
 If no R is present then last character equals number of zeros
 -R suffix = RoHS compliant

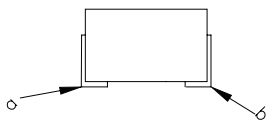
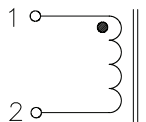
Dimensions (mm)



Recommended Pad Layout



Schematic



Part marking: AXXX A=automotive, XXX=inductance value in μ 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 0.10 millimeters

Tolerances are \pm 0.2 millimeters unless stated otherwise

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

Color: Grey

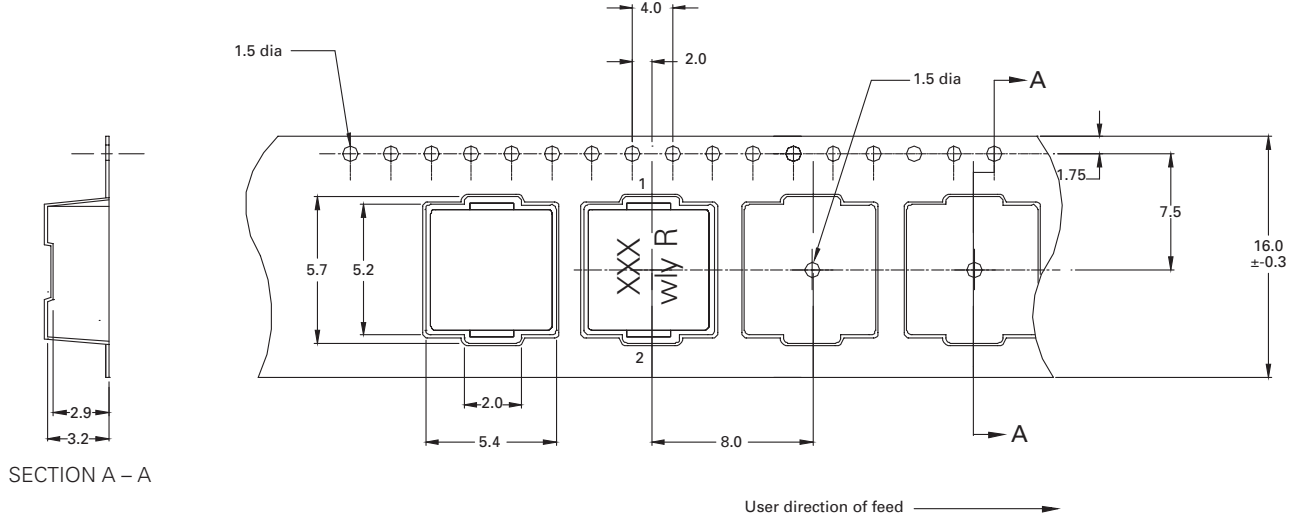
Do not route traces or vias underneath the inductor

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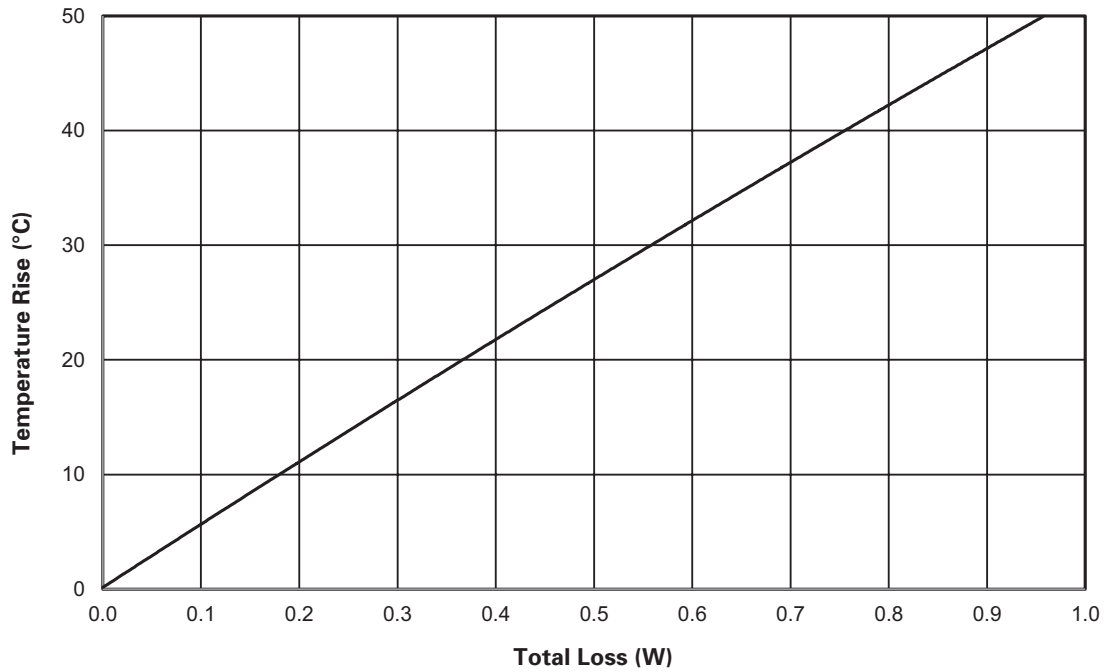
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Packaging information (mm)

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



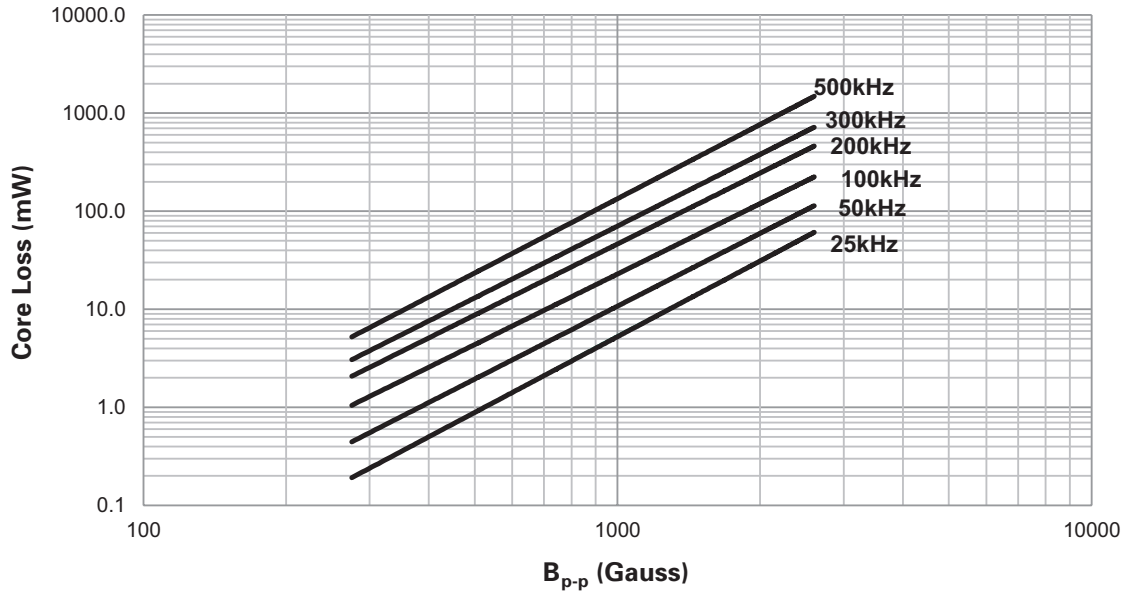
Temperature rise vs. total loss



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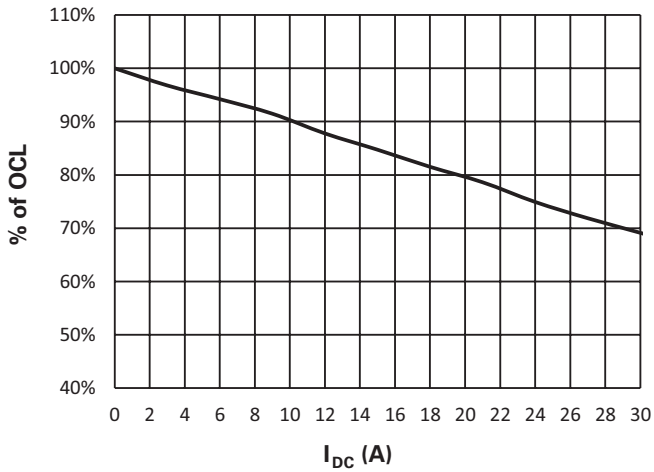
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Core loss vs. B_{p-p}

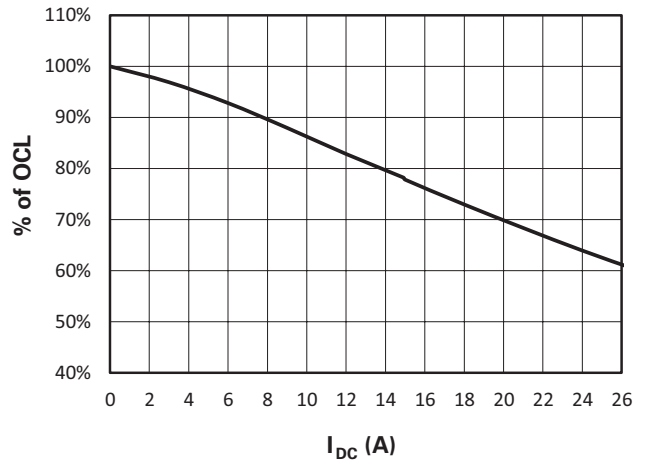


Inductance characteristics

HCMA0503-R20-R



HCMA0503-R35-R

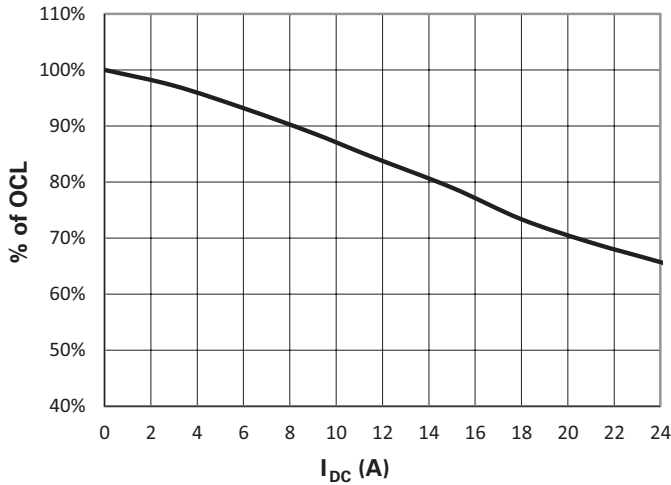


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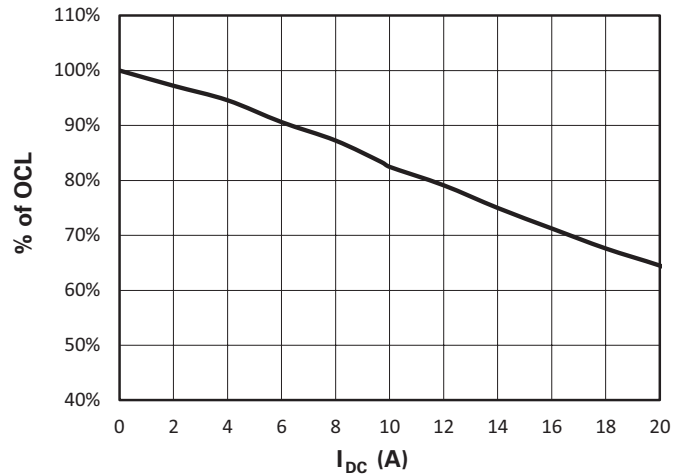
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Inductance characteristics

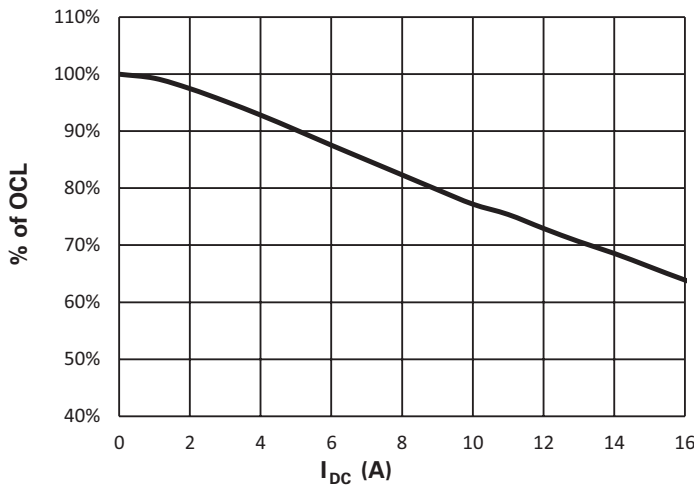
HCMA0503-R47-R



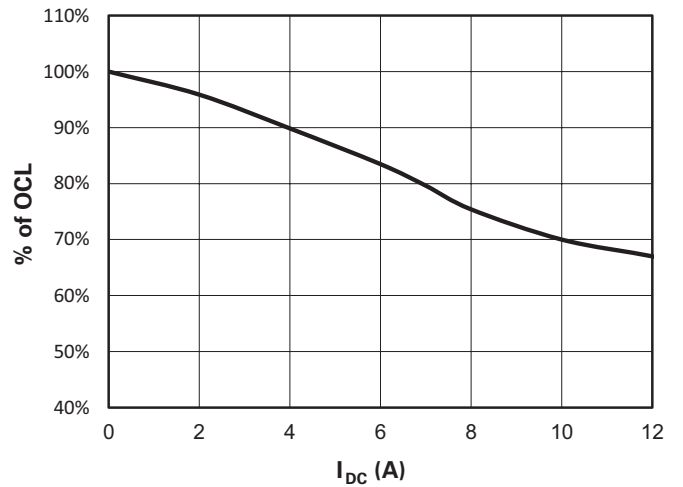
HCMA0503-R75-R



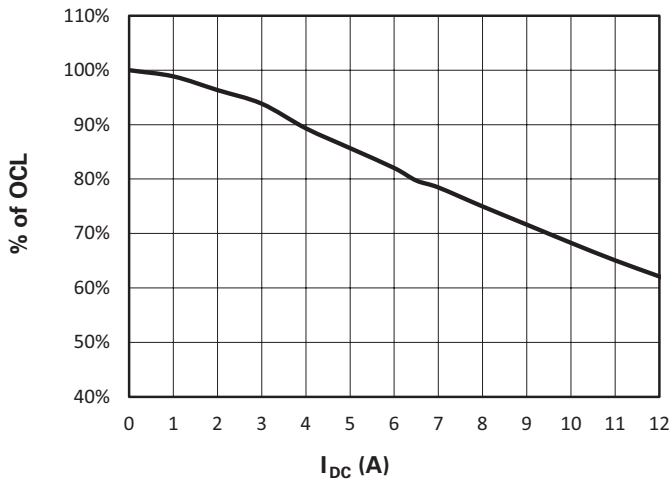
HCMA0503-1R0-R



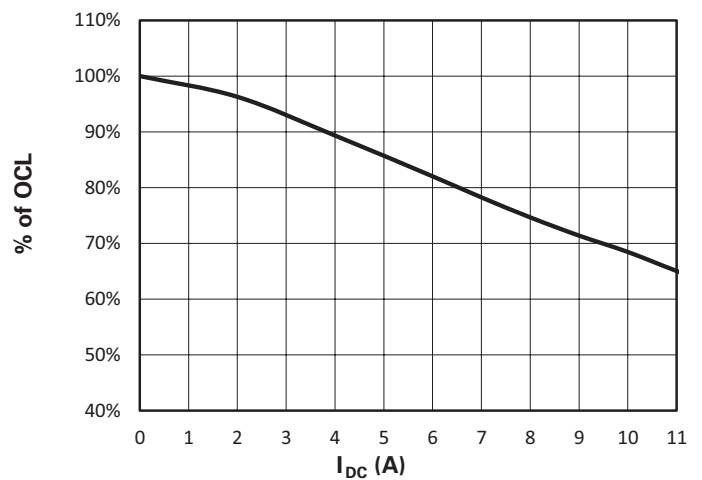
HCMA0503-1R5-R



HCMA0503-2R2-R

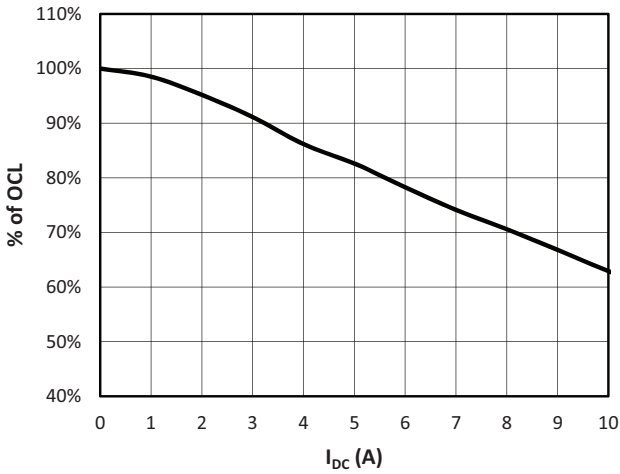


HCMA0503-3R3-R

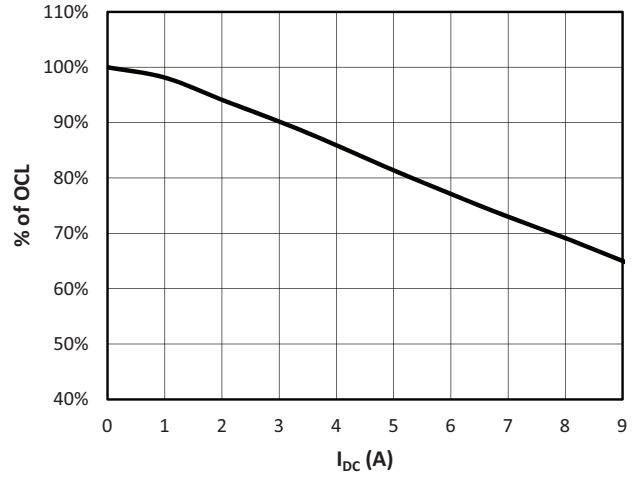


Inductance characteristics

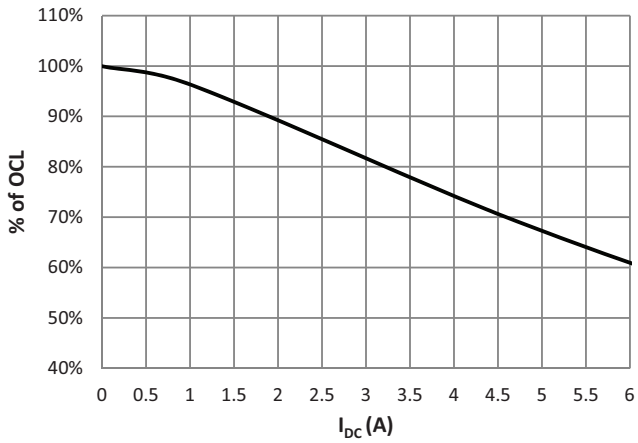
HCMA0503-4R7-R



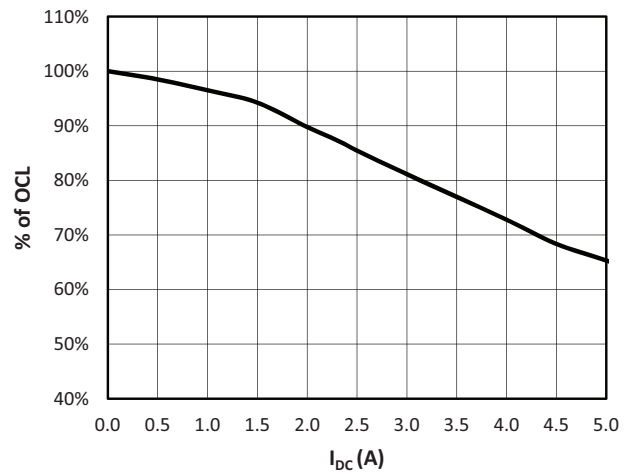
HCMA0503-5R6-R



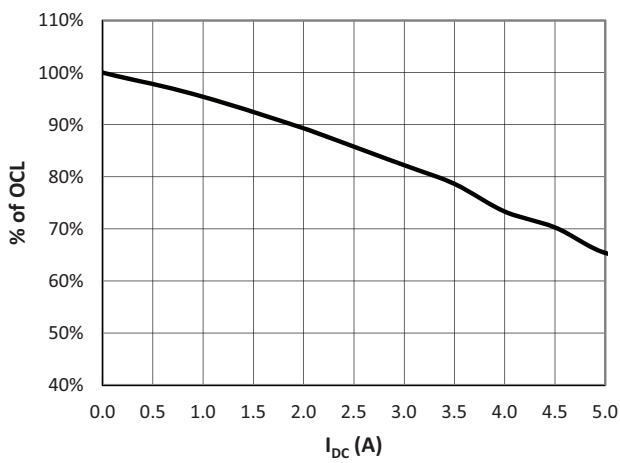
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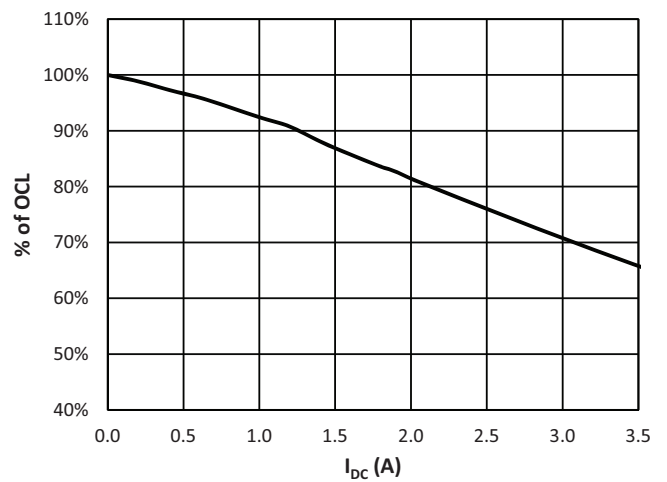
HCMA0503-100-R



HCMA0503-150-R



HCMA0503-220-R



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Solder reflow profile

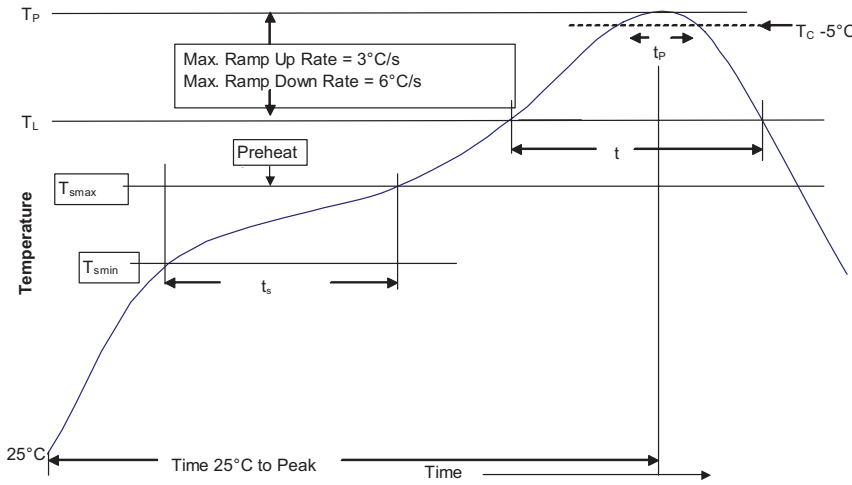


Table 1 - Standard SnPb Solder (T_C)

| 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-020D

| Profile Feature | Standard SnPb Solder | Lead (Pb) Free Solder |
|--|--|-----------------------|
| Preheat and Soak | • Temperature min. (T _{Smin}) | 100°C |
| | • Temperature max. (T _{Smax}) | 150°C |
| | • Time (T _{Smin} to T _{Smax}) (t _s) | 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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