

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



Product Specifications

Part Number ⁶	OCL ¹ (μH) $\pm 20\%$	FLL ² (μH) minimum	I_{rms}^3 (A)	I_{sat}^4 (A)	DCR ($\text{m}\Omega$) typical @ 20°C	DCR ($\text{m}\Omega$) 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

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

2. Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 Vrms, Isat, +25 °C

3. I_{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_{sat} : Peak current for approximately 20% rolloff @ +25 °C

5. K-factor: Used to determine B_{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 μH), ΔI (Peak to peak ripple current in Amps).

6. Part Number Definition: HCMA0503-xxx-R

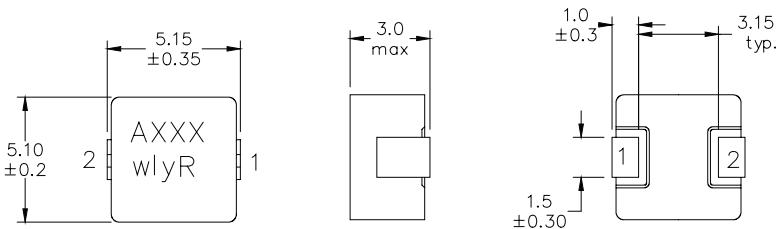
HCMA0503 = Product code and size

xxx= inductance value in μH , R= decimal point,

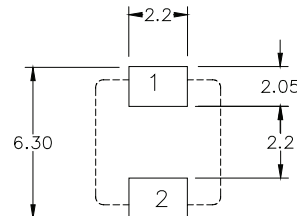
If no R is present then last character equals number of zeros

-R suffix = RoHS compliant

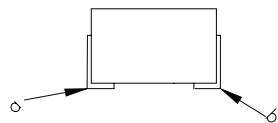
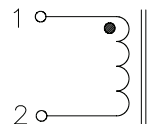
Dimensions (mm)



Recommended Pad Layout



Schematic



Part marking: A=automotive, XXX=inductance value in μH , 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 ± 0.2 millimeters unless stated otherwise

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

Color: Grey

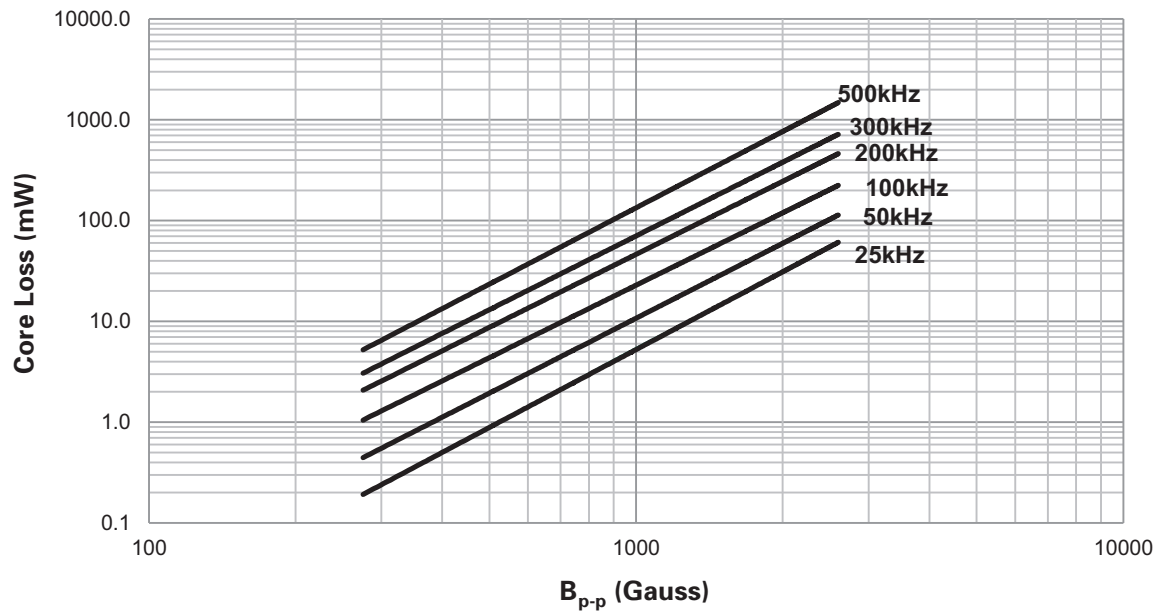
Do not route traces or vias underneath the inductor

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



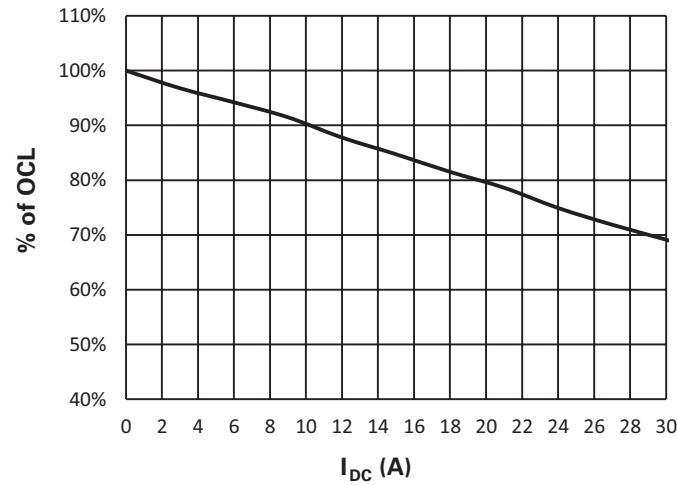
Total Loss (W)	Temperature Rise (°C)
0.0	0
0.1	5
0.2	10
0.3	15
0.4	20
0.5	25
0.6	30
0.7	35
0.8	40
0.9	45
1.0	50

Core loss vs. B_{p-p}

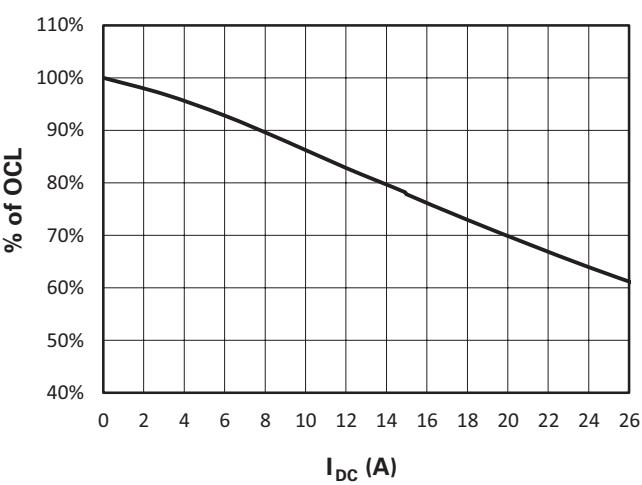


Inductance characteristics

HCMA0503-R20-R

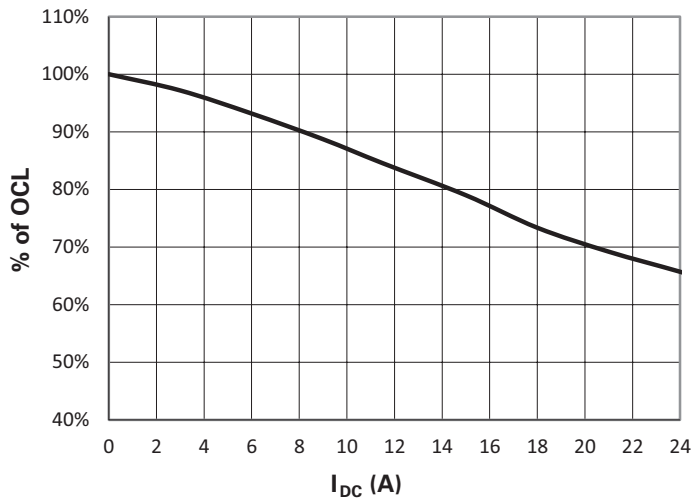


HCMA0503-R35-R

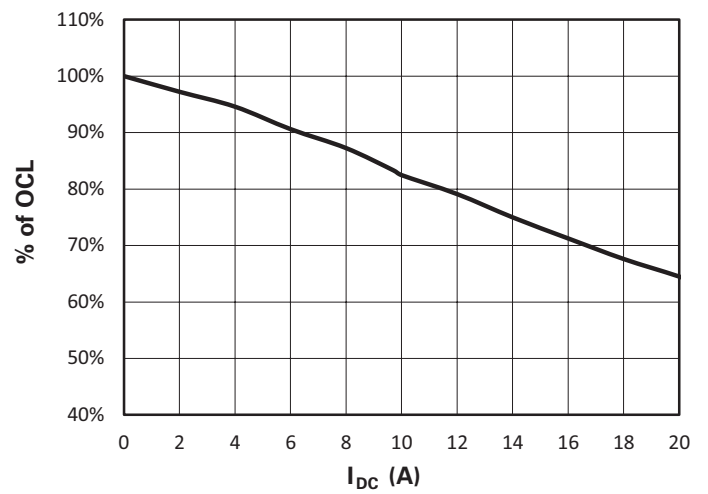


Inductance characteristics

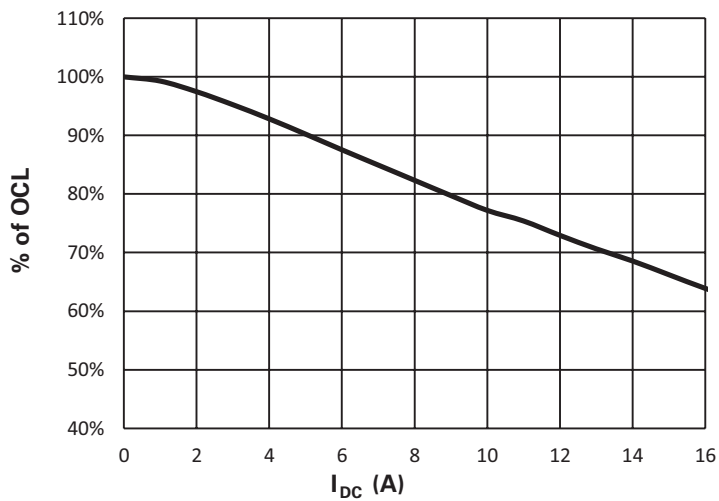
HCMA0503-R47-R



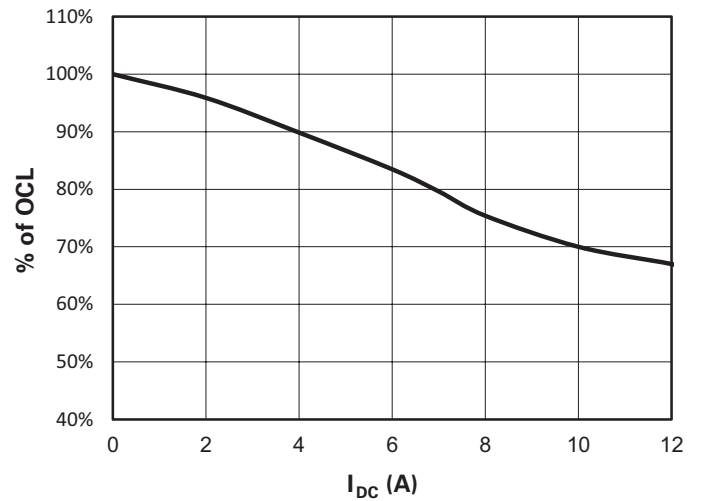
HCMA0503-R75-R



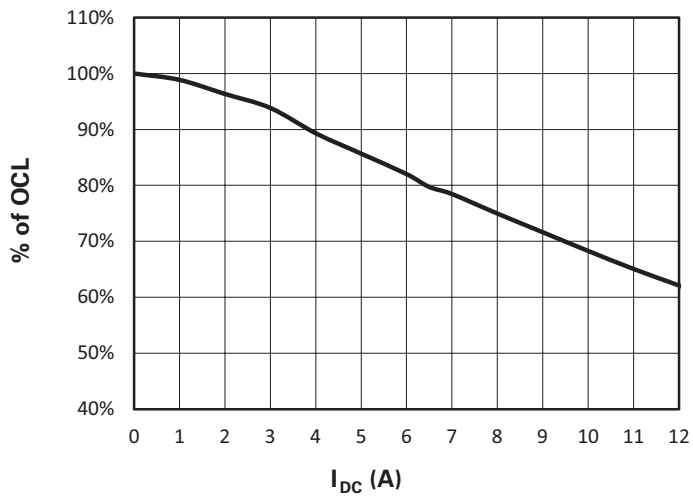
HCMA0503-1R0-R



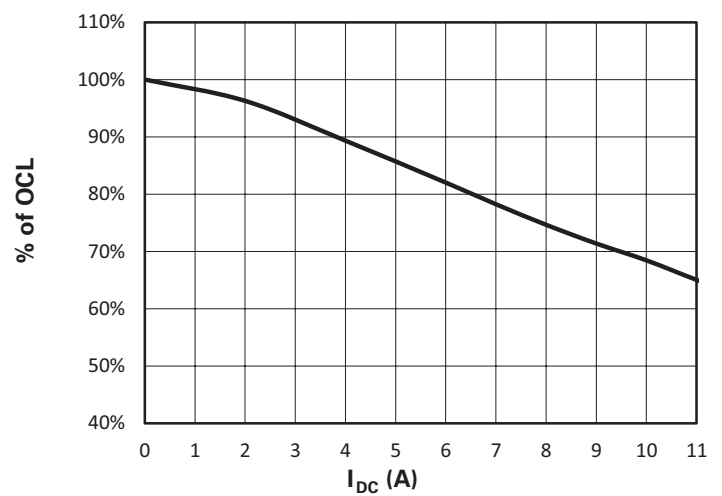
HCMA0503-1R5-R



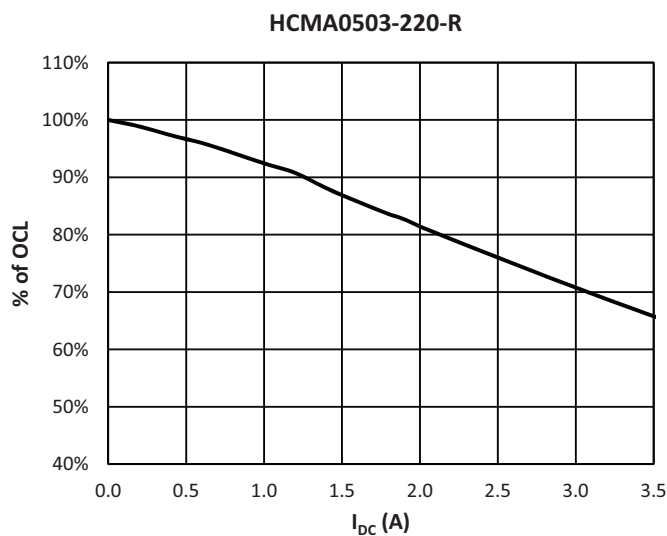
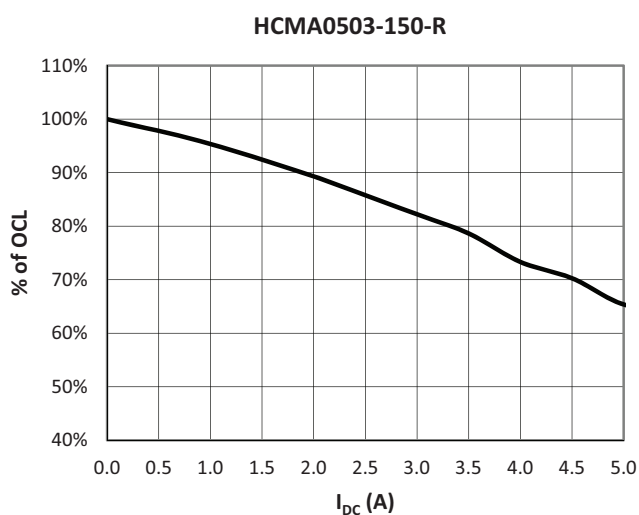
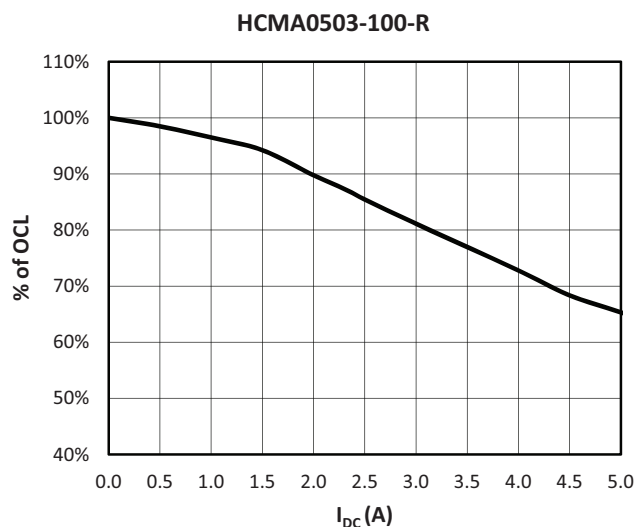
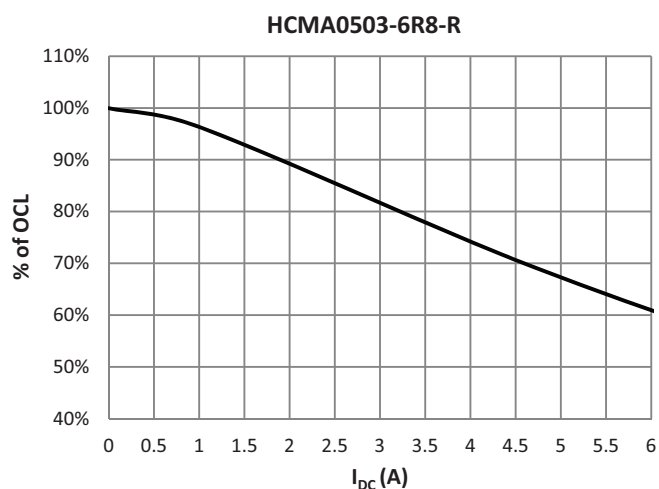
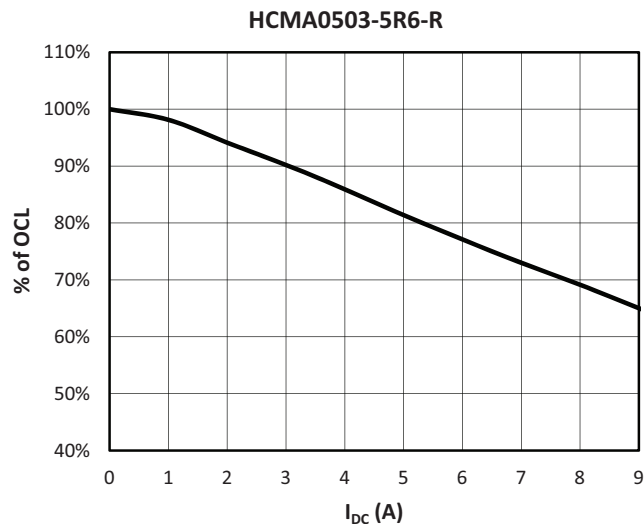
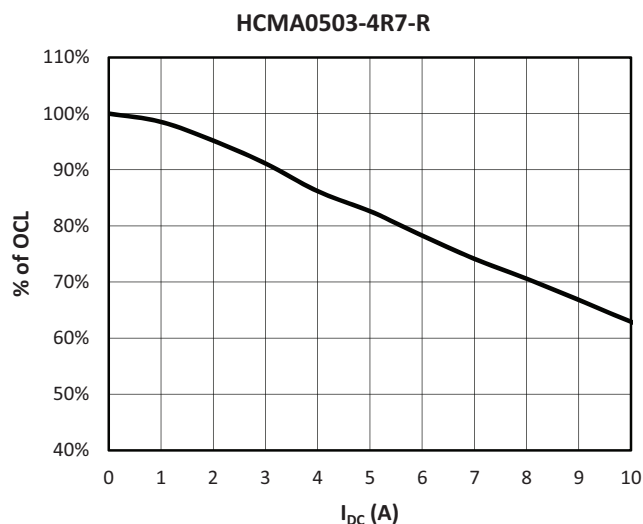
HCMA0503-2R2-R



HCMA0503-3R3-R



Inductance characteristics



Solder reflow profile

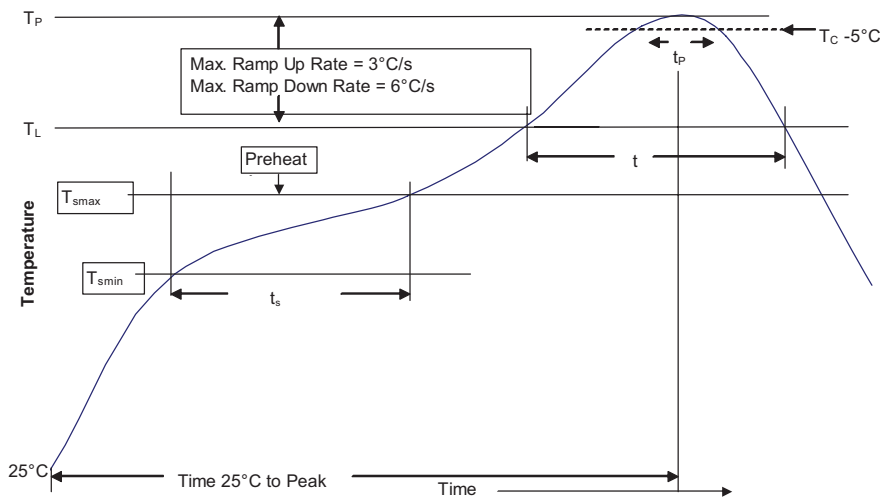


Table 1 - Standard SnPb Solder (T_C)

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 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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