

HCM1A0503V3

Automotive grade high current power inductor



Photo is representative

Product features

- AEC-Q200
- High current carrying capacity
- Magnetically shielded, low EMI
- DC-DC converter applications up to 1 MHz
- Filtering applications up to Self resonant frequency (SRF) [See product specification table]
- Inductance range from 0.20 μ H to 10 μ H
- Current range from 2.3 A to 20.5 A
- 5.7 mm x 5.4 mm footprint surface mount package in a 3.0 mm height
- Alloy powder core material
- Moisture sensitivity level (MSL): 1

Applications

- Body electronics
 - Central body control module
 - Vehicle access control system
 - Headlamps, tail lamps and interior lighting and LED lighting
 - Heating ventilation and air conditioning controllers (HVAC)
 - Doors, window lift and seat control
- Advanced driver assistance systems
 - 77 GHz radar system
 - 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
 - Port power/USB HUB for front and rear passengers
- Chassis and safety electronics
 - Airbag control unit
- Engine and powertrain systems
 - Electric pumps, motor control and auxiliaries
 - Powertrain control module (PCU)/ Engine control unit (ECU)
 - Transmission Control Unit (TCU)

Environmental compliance and general specifications

- Storage temperature (component): -55 °C to +155 °C
- Operating temperature range: -55 °C to +155 °C (ambient plus self-temperature rise)



Powering Business Worldwide



Product specifications

Part number ⁶	OCL ¹ (μH) ±20%	FLL ² (μH) minimum	I _{rms} ³ (A)	I _{sat} ⁴ (A)	DCR (mΩ) typical @ +20 °C	DCR (mΩ) maximum @ +20 °C	SRF (MHz) typical	K-factor ⁵
HCM1A0503V3-R20-R	0.20	0.128	20.5	20	1.6	2.0	160	1413
HCM1A0503V3-R22-R	0.22	0.141	15.8	23	2.1	2.3	150	1188
HCM1A0503V3-R33-R	0.33	0.211	14	16	2.9	3.4	120	1119
HCM1A0503V3-R35-R	0.35	0.224	14	15	2.9	3.4	110	1119
HCM1A0503V3-R47-R	0.47	0.300	11	12	5.3	6.1	80	1007
HCM1A0503V3-R68-R	0.68	0.435	10	12	6.9	8.0	70	687
HCM1A0503V3-R75-R	0.75	0.480	10	11.5	7.0	8.1	57	687
HCM1A0503V3-1R0-R	1.0	0.64	8.4	8.5	10	11.4	53	603
HCM1A0503V3-1R5-R	1.5	0.96	6.2	8.5	15.4	17.7	40	418
HCM1A0503V3-2R2-R	2.2	1.4	5.5	6.4	20	23	33	371
HCM1A0503V3-3R3-R	3.3	2.1	4.7	6.5	32	38	25	308
HCM1A0503V3-4R7-R	4.7	3.0	4.1	6.0	41	47	22	337
HCM1A0503V3-5R6-R	5.6	3.6	3.6	4.5	51	59	19	242
HCM1A0503V3-6R8-R	6.8	4.35	3.3	4.0	61	70	16	219
HCM1A0503V3-100-R	10	6.4	2.8	2.3	90	108	13	188

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. Irms: DC current for an approximate temperature rise of 30 °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 +155 °C under worst case operating conditions verified in the end application.

4. Isat: Peak current for approximately 20% rolloff @ +25 °C

5. K-factor: Used to determine Bp-p for core loss (see graph). Bp-p = K * L * ΔI. Bp-p: (Gauss), K: (K-factor from table), L: (Inductance in μH), ΔI (Peak to peak ripple current in Amps).

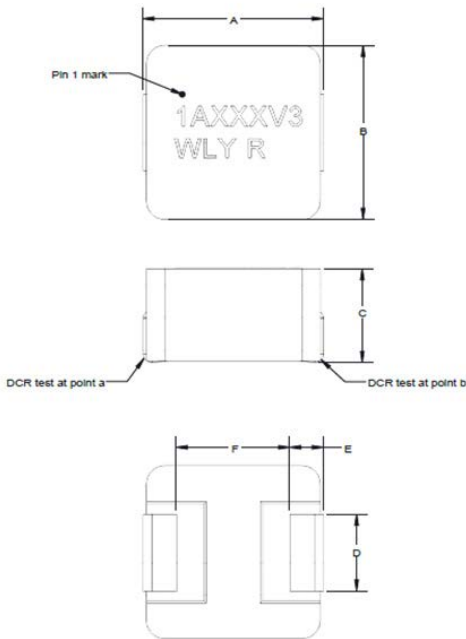
6. Part Number Definition: HCM1A0503V3-xxx-R

HCM1A0503V3= Product code and size

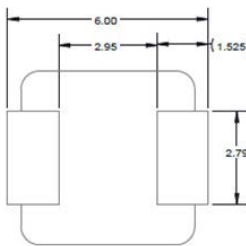
xxx= Inductance value in μH, R= decimal point, if no R is present last digit indicates number of zeros

-R = RoHS compliant

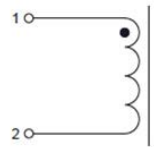
Dimensions- (mm)



Recommended pad layout



Schematic



Part number	A	B	C	D	E	F
HCM1A0503V3-R	5.4 ±0.3	5.2 ±0.2	2.8 ±0.2	1.5 ±0.2 (R22,R33,R35) 2.3 ±0.2 (R20, R47 to 100)	1.0 ±0.2	3.4 typ.

Part marking: Pin 1 indicator dot, 1AxxxV3 xxx= inductance value in μH, R= decimal point, if no R is present

then last digit is the number of zeros, wly R= Lot code

All soldering surfaces to be coplanar within 0.1 millimeters

Tolerances are ±0.3 millimeters unless stated otherwise

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

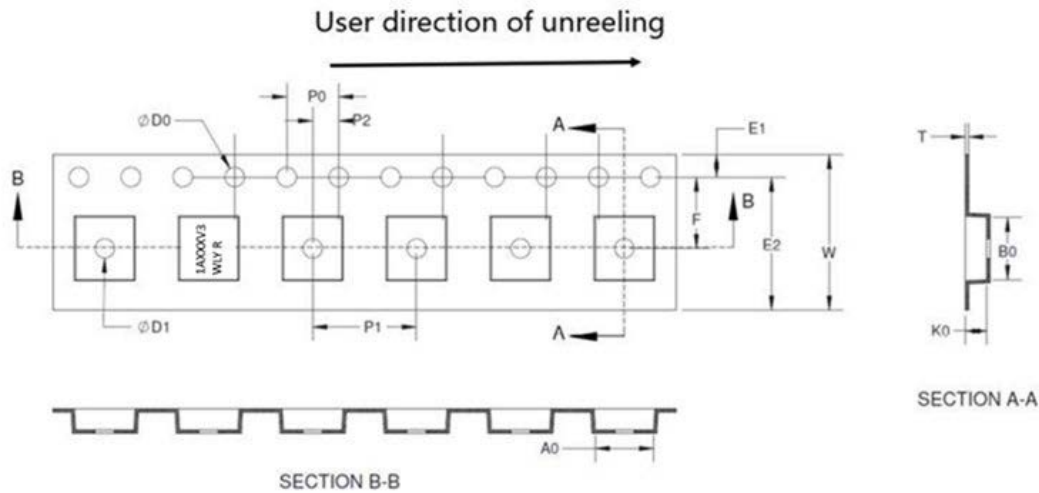
Color: Grey

Traces or vias underneath the inductor is not recommended

Packaging information (mm)

Drawing not to scale

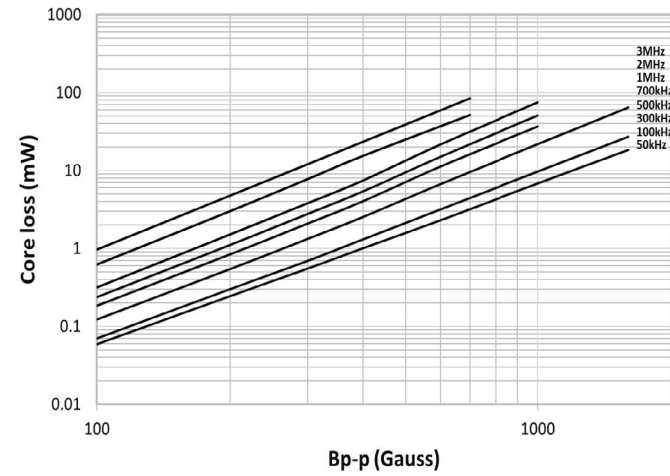
Supplied in tape and reel packaging, 2000 parts per 13" diameter reel



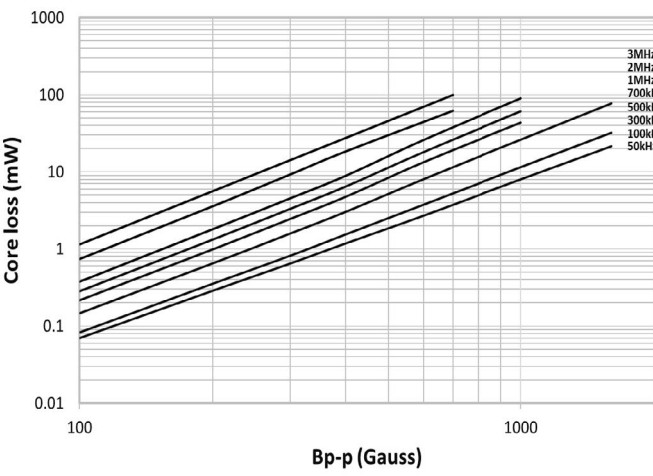
Dimension	Value
W ± 0.30	12.0
F ± 0.10	5.5
E1 ± 0.10	1.75
E2 Min	10.25
P0 ± 0.10	4.0
P1 ± 0.10	8.0
P2 ± 0.05	2.0
D0 $+0.10/-0$	1.5
D1 $+0.10/-0$	1.5
A0	5.70 ± 0.10
B0	5.9 ± 0.10
K0	3.30 ± 0.15
T	0.35 ± 0.05

Core loss vs. Bp-p

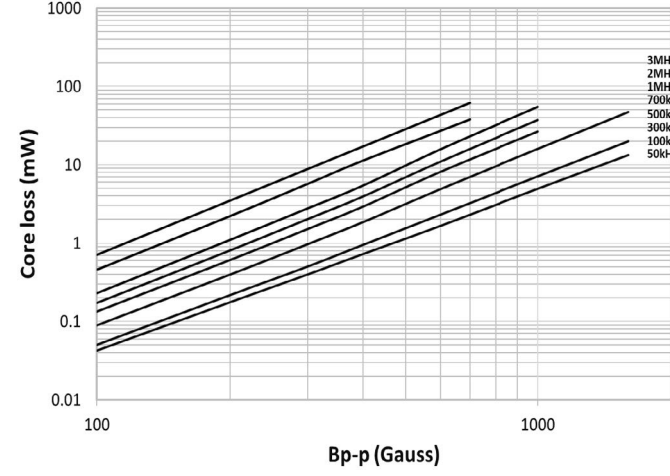
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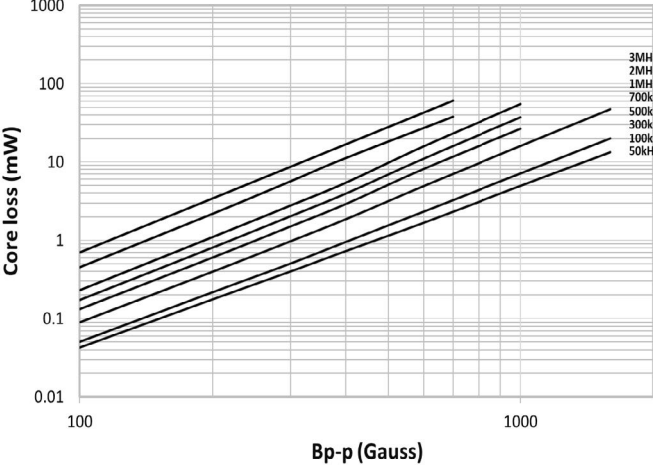
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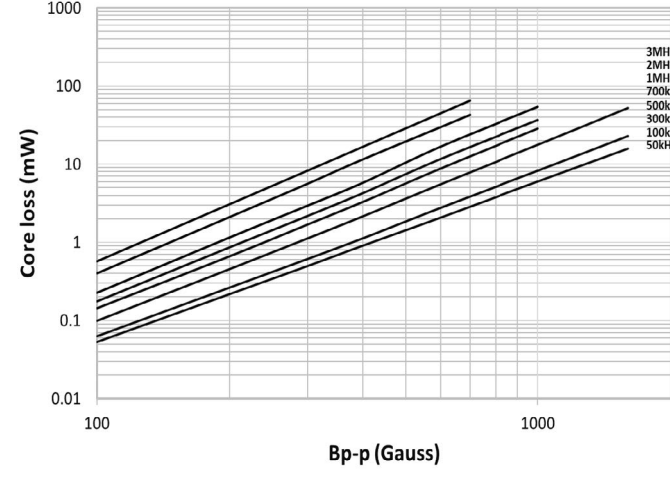
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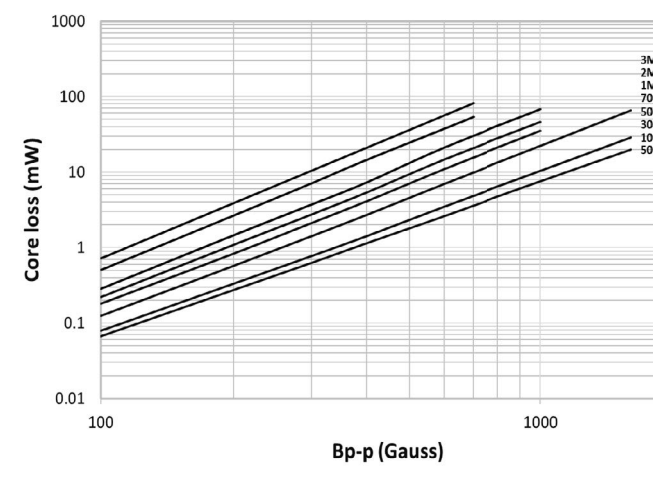
HCM1A0503V3-R35-R



HCM1A0503V3-R47-R

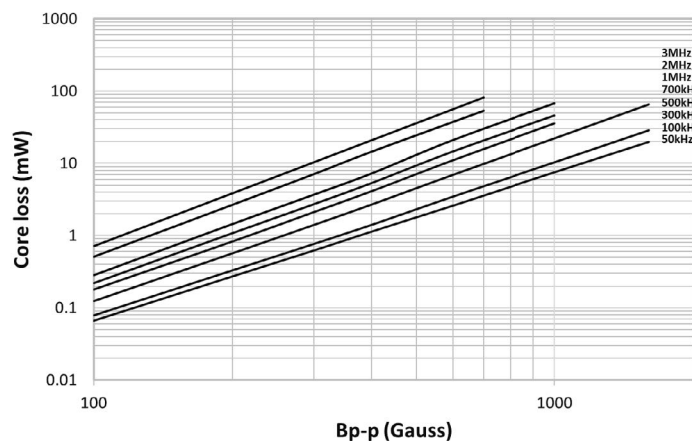


HCM1A0503V3-R68-R

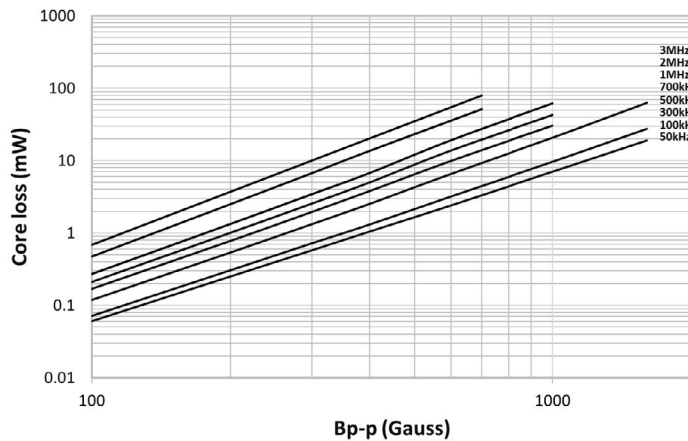


Core loss vs. Bp-p

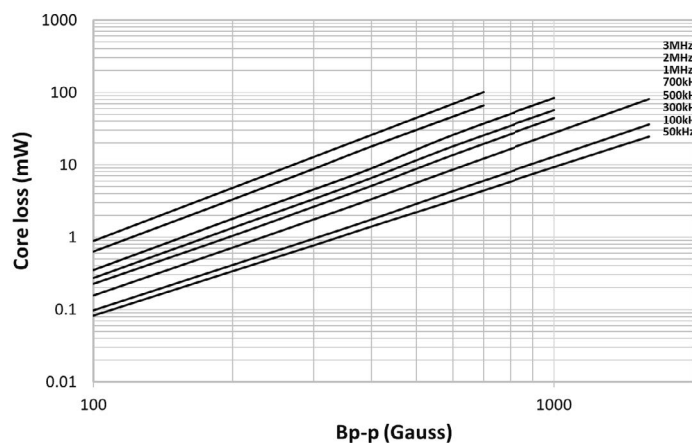
HCM1A0503V3-R75-R



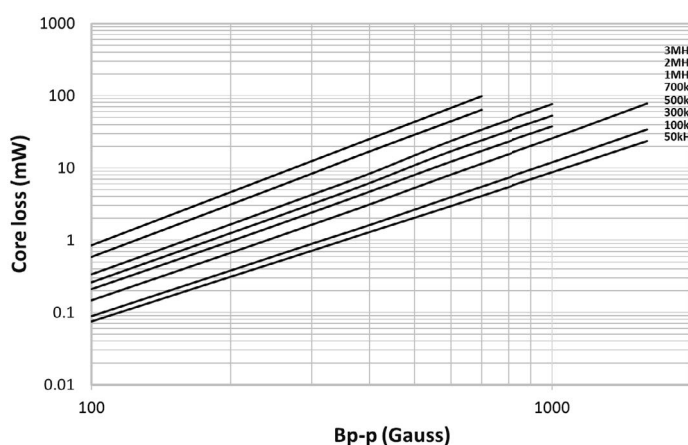
HCM1A0503V3-1R0-R



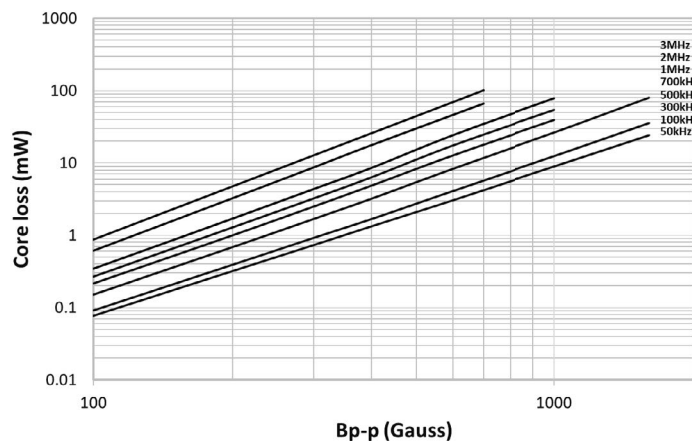
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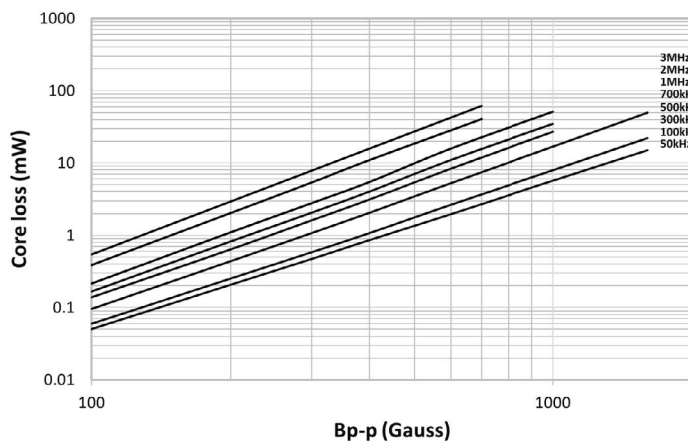
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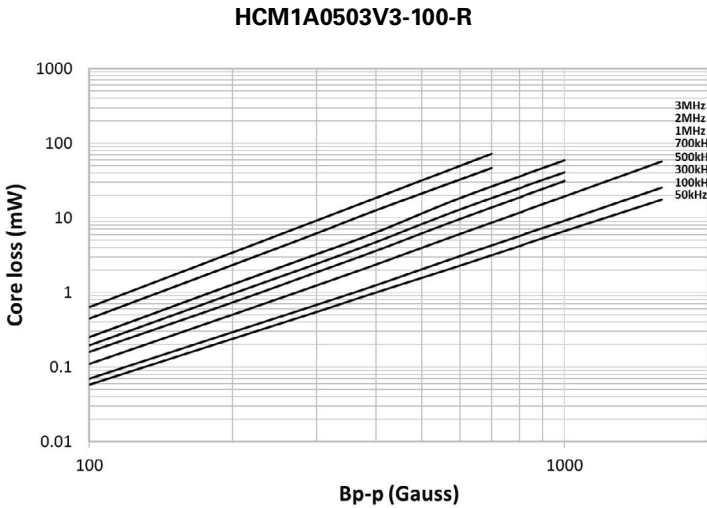
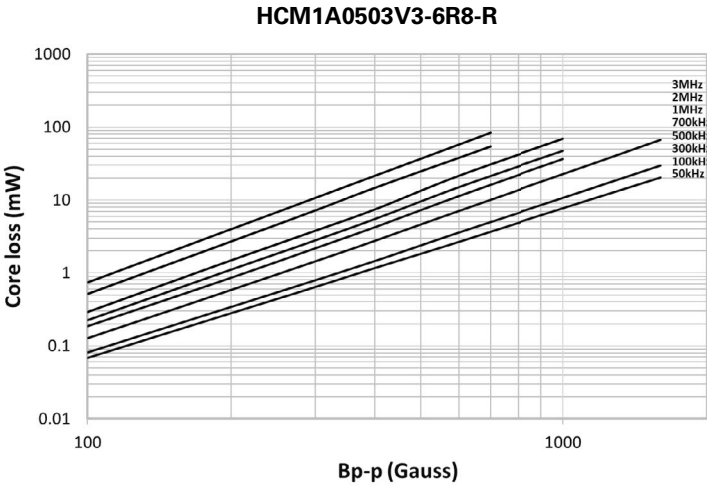
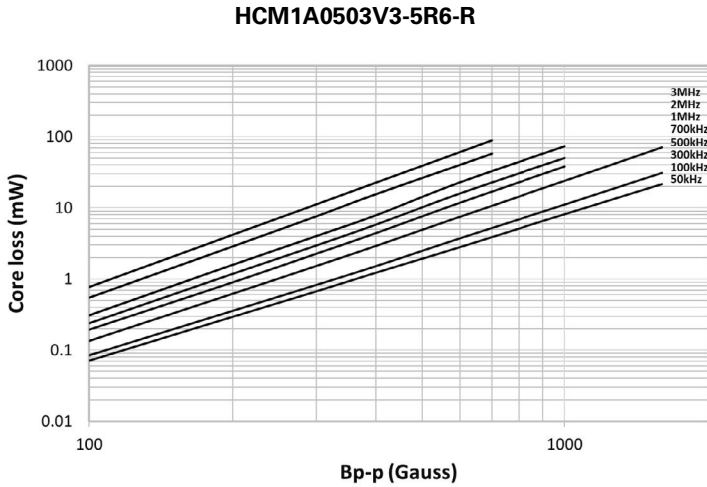
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HCM1A0503V3-4R7-R

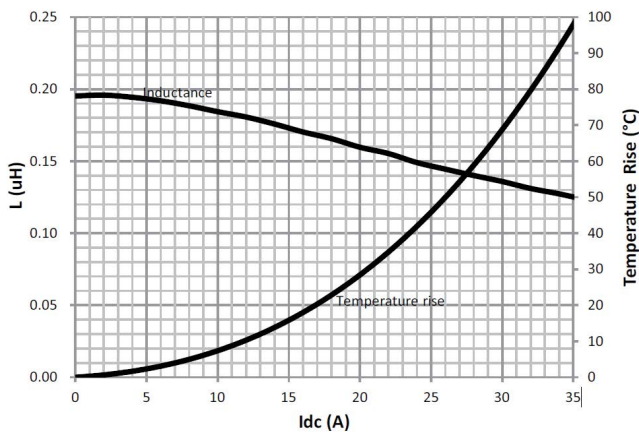


Core loss vs. Bp-p

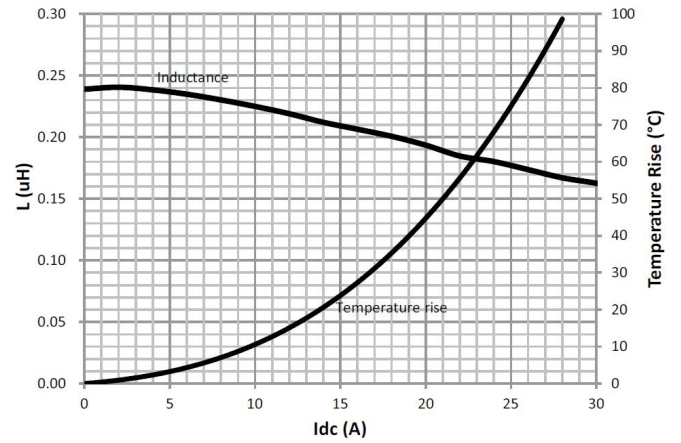


Inductance and temperature rise vs. I_{dc}

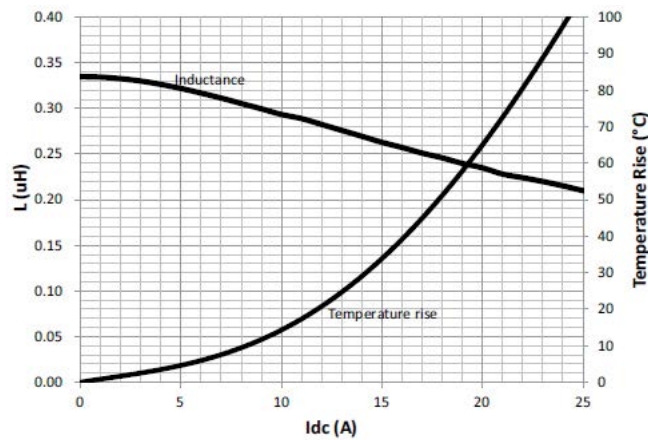
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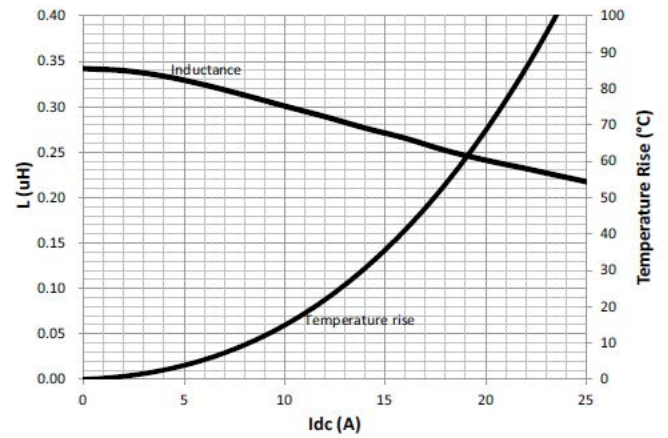
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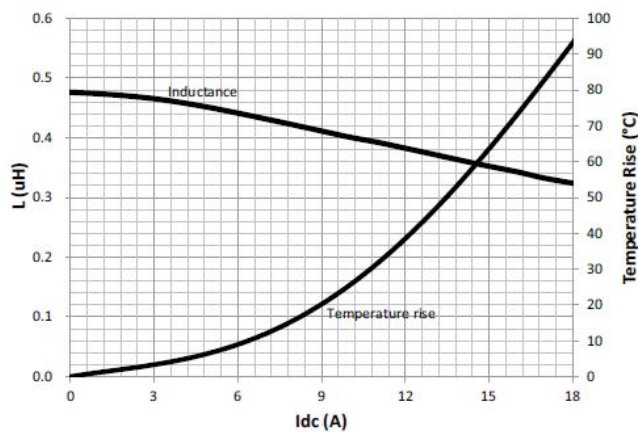
HCM1A0503V3-R33-R



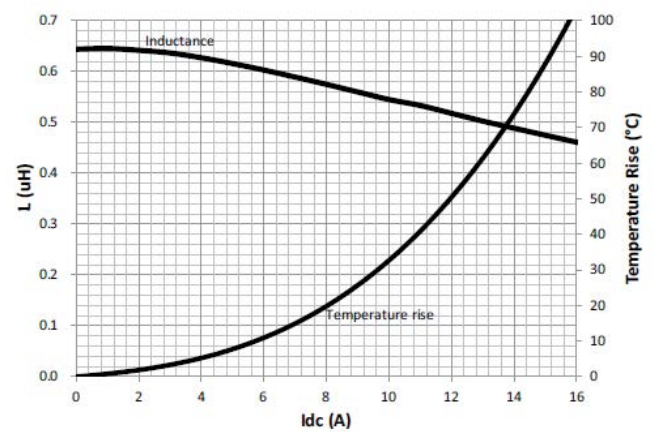
HCM1A0503V3-R35-R



HCM1A0503V3-R47-R

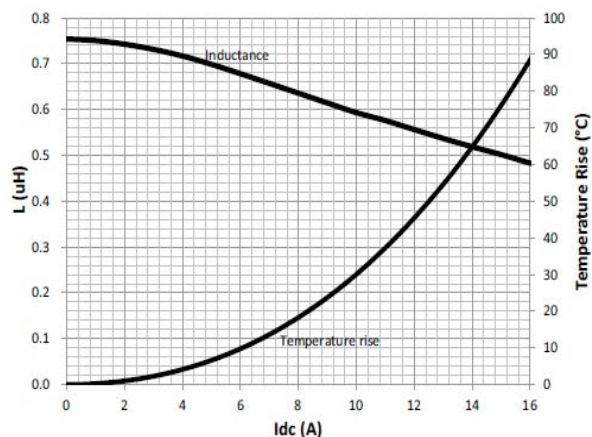


HCM1A0503V3-R68-R

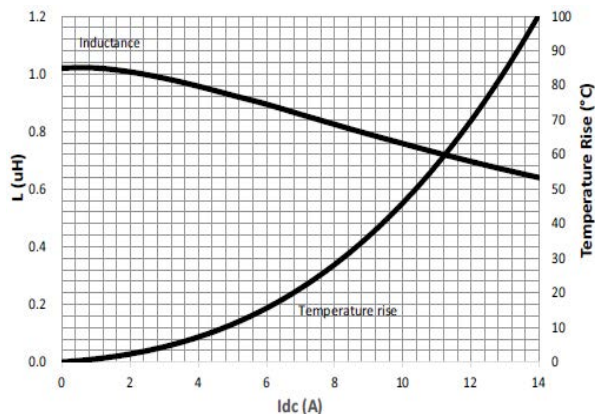


Inductance and temperature rise vs. I_{dc}

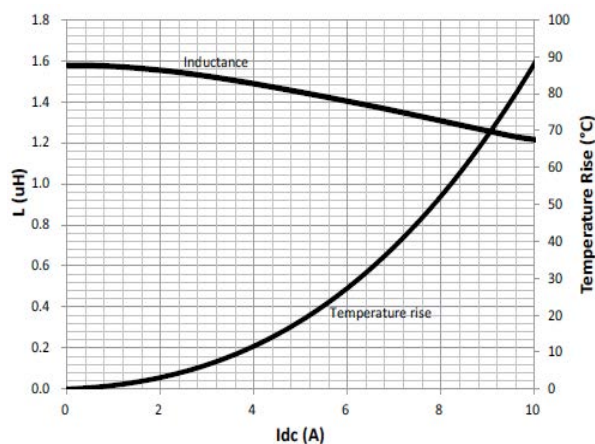
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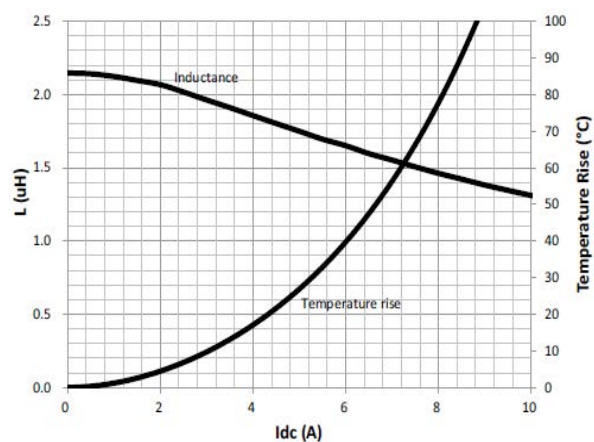
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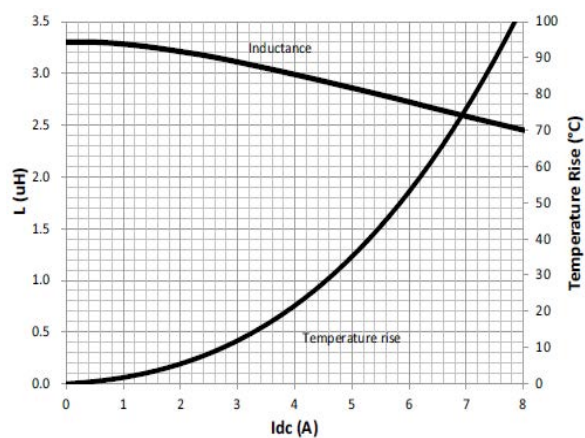
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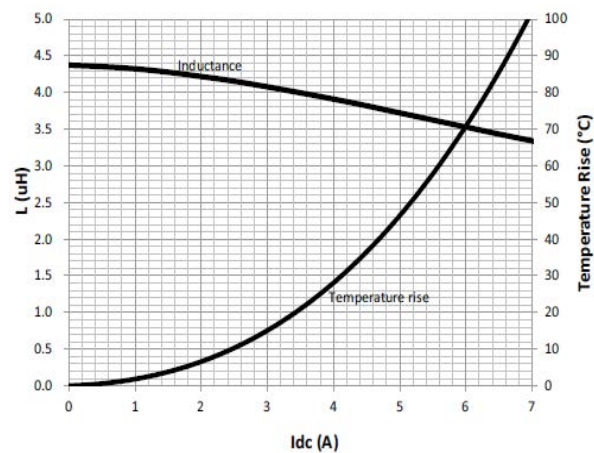
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HCM1A0503V3-3R3-R

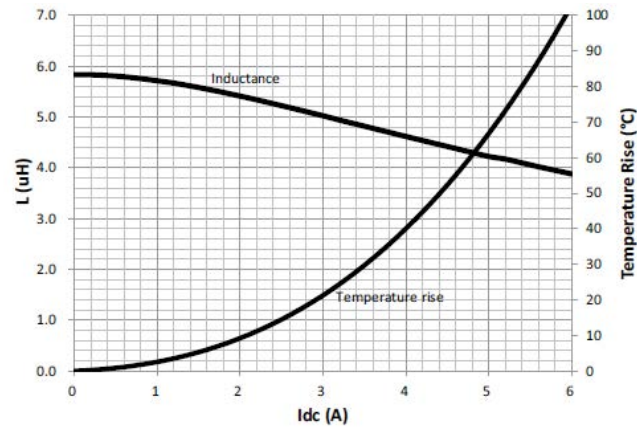


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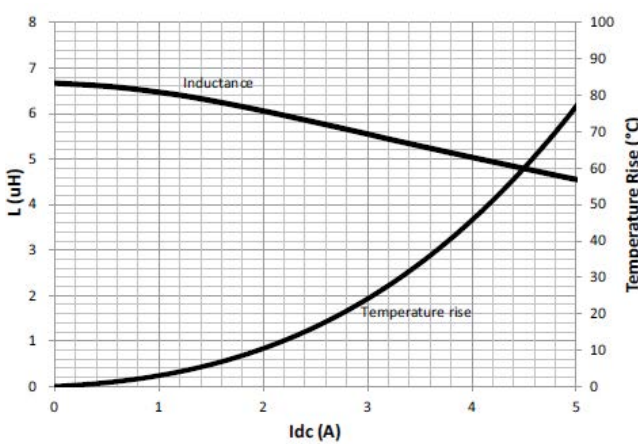


Inductance and temperature rise vs. Idc

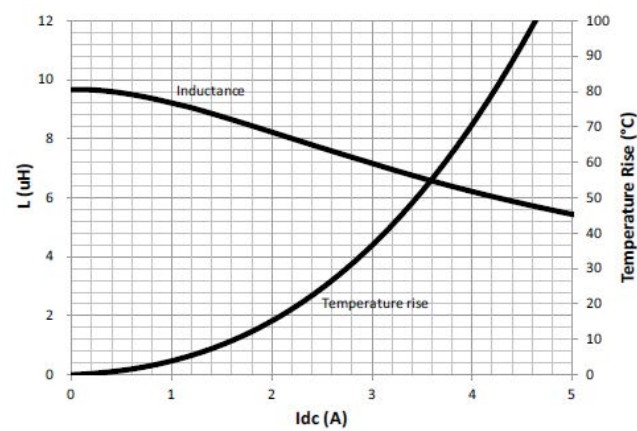
HCM1A0503V3-5R6-R



HCM1A0503V3-6R8-R

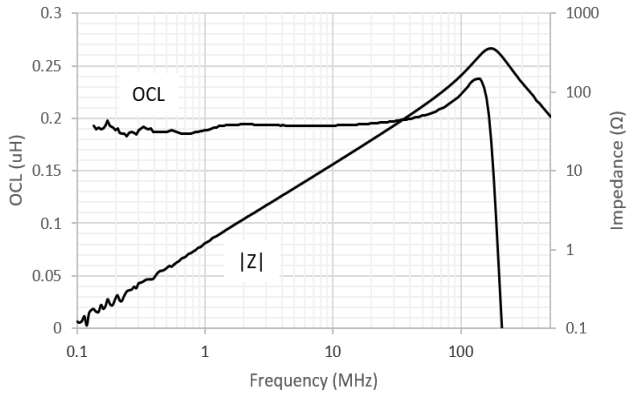


HCM1A0503V3-100-R

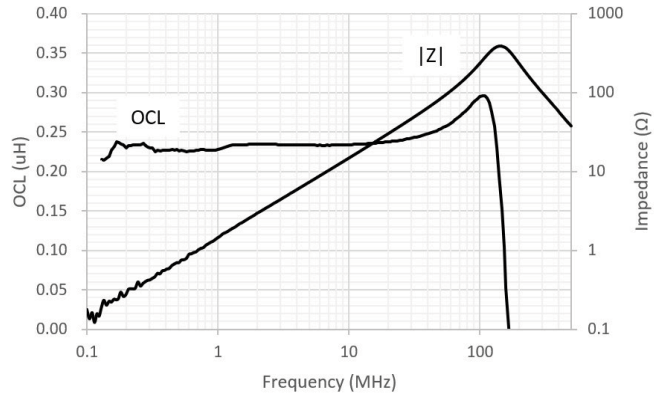


Inductance and impedance vs. frequency

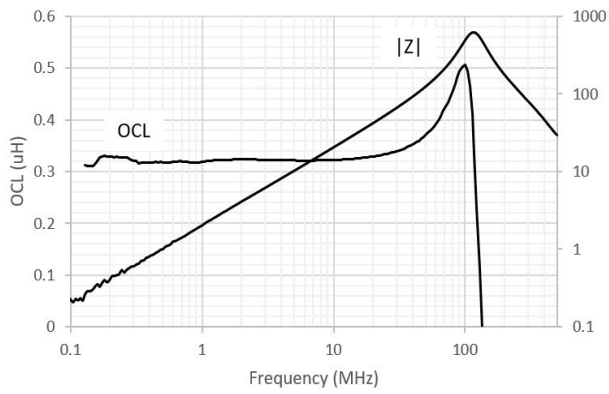
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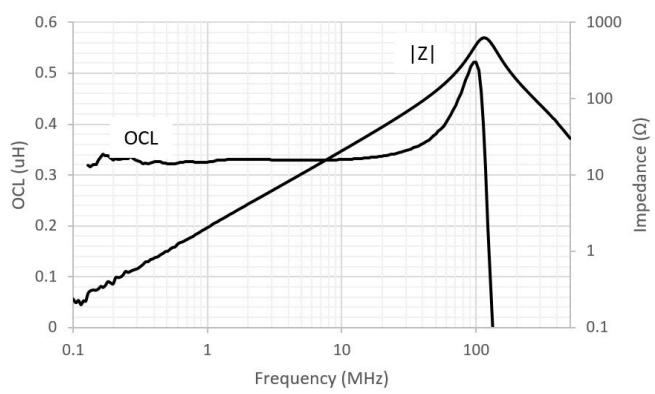
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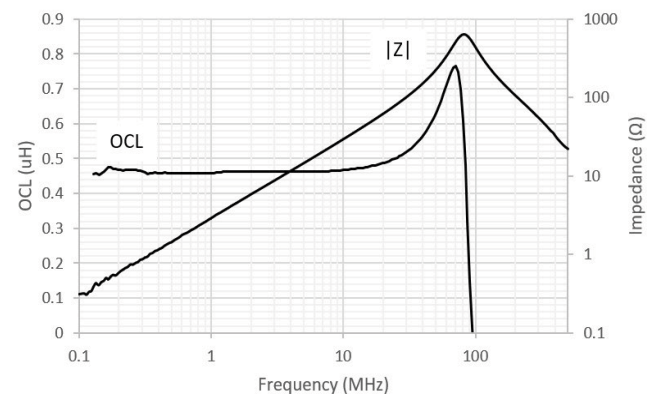
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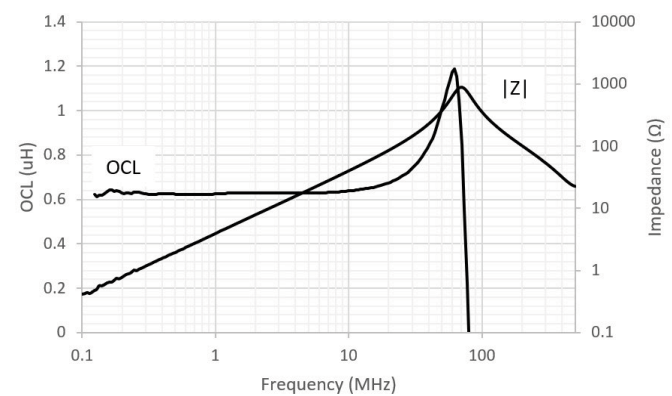
HCM1A0503V3-R35-R



HCM1A0503V3-R47-R

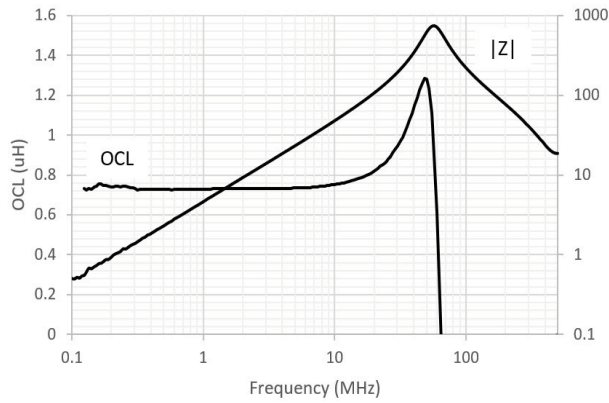


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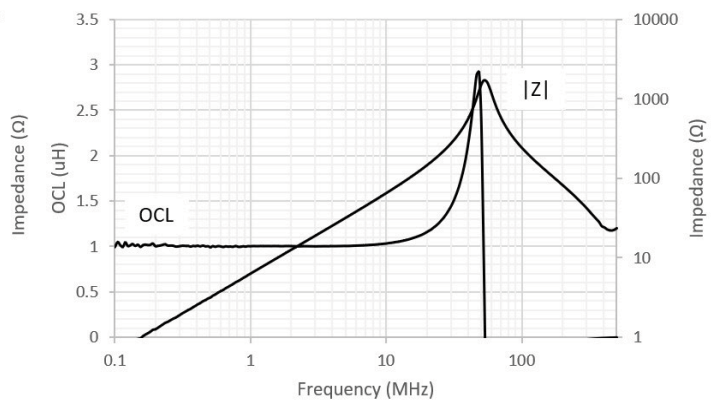


Inductance and impedance vs. frequency

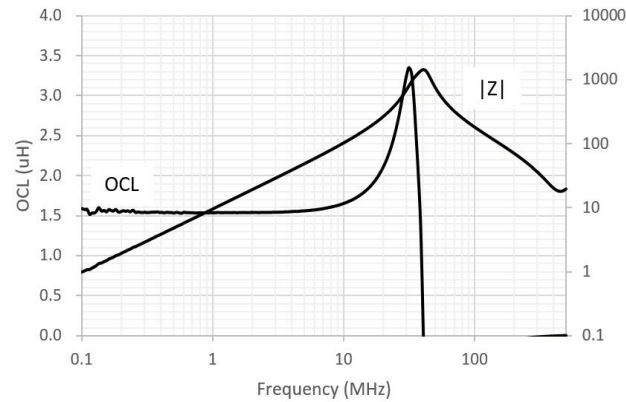
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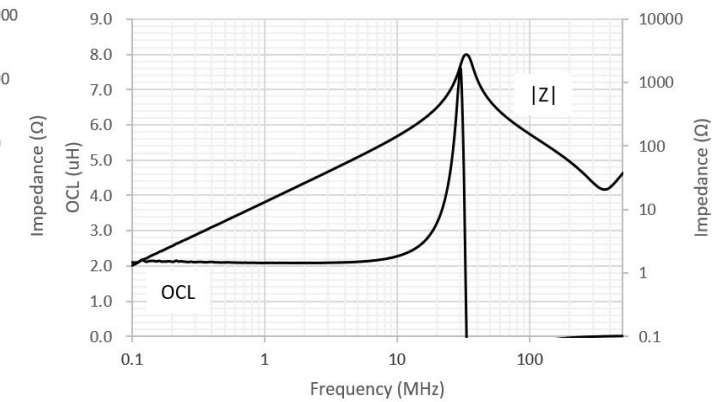
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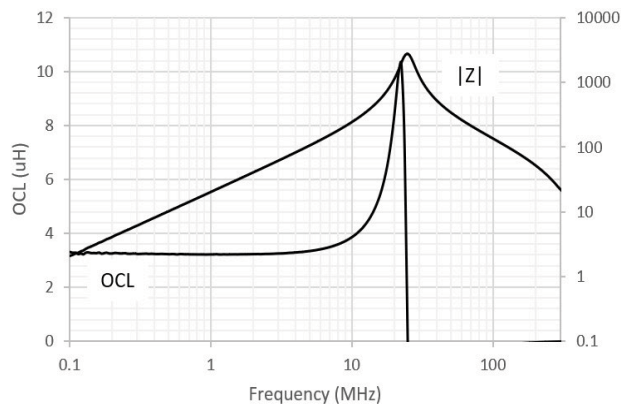
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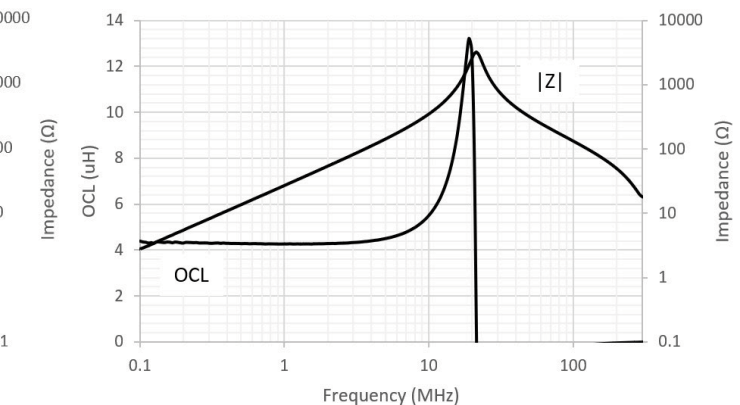
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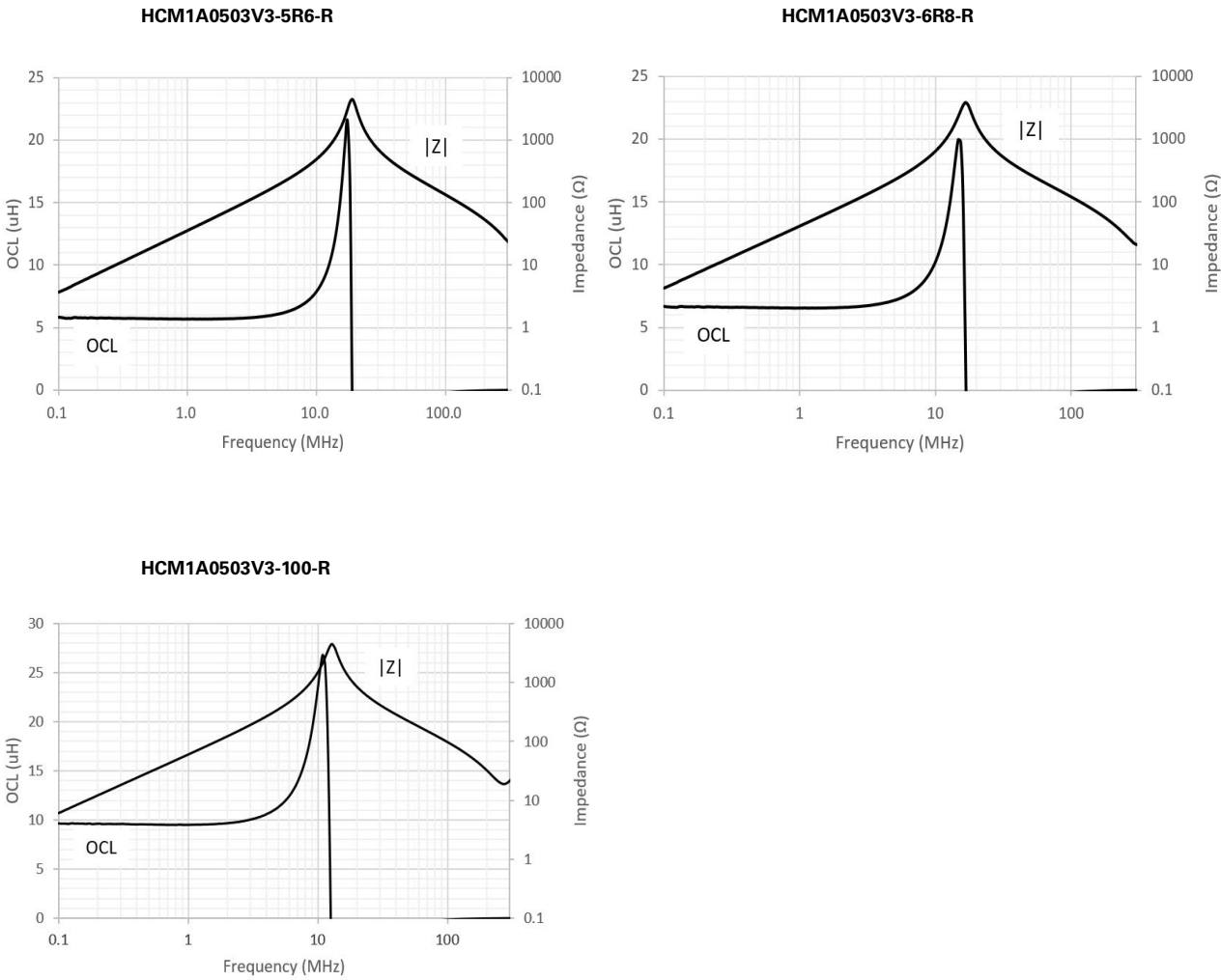
HCM1A0503V3-3R3-R



HCM1A0503V3-4R7-R



Inductance and impedance vs. frequency



Solder reflow profile

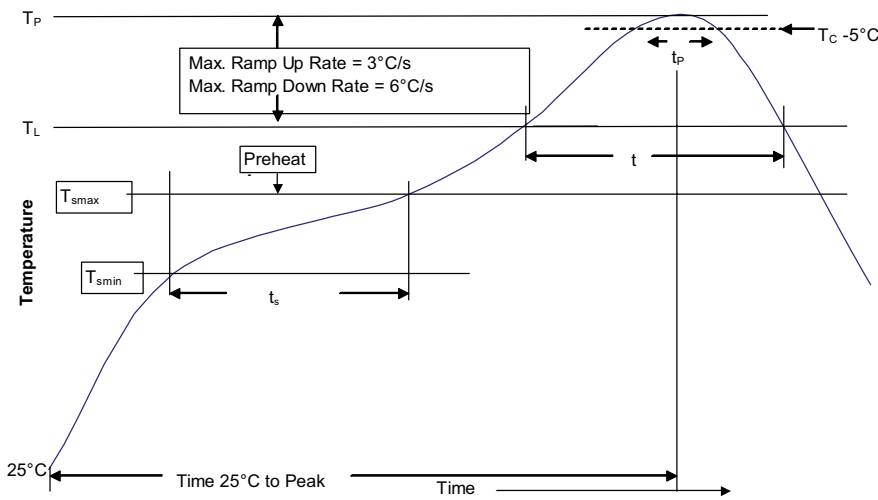


Table 1 - Standard SnPb solder (T_C)

Package thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	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
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Reference J-STD-020

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
Ramp up rate T_L to T_p	3 °C/ second max.	3 °C/ second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time (t_L) maintained above 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*
Ramp-down rate (T_p to T_L)	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.

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