HCM1A4020V3

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 0.10 µH to 15 µH
- Current range from 1.4 A to 22 A
- 4.75 mm x 4.45 mm footprint surface mount package in a 2.0 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)

RoHS HALOGEN HF FREE Pb

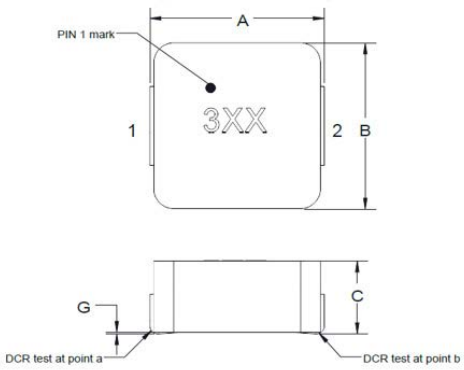
Powering Business Worldwide

Product specifications

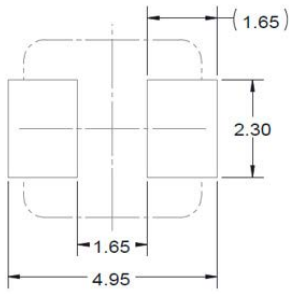
Part number[6]	Part marking designator	OCL[1] (µH) ±20%	FLL[2] (µH) minimum	I_{rms}[3] (A)	I_{sat}[4] (A)	DCR (mΩ) typical @ +20 °C	DCR (mΩ) maximum @ +20 °C	SRF (MHz) typical	K-factor[5]
HCM1A4020V3-R10-R	A	0.10	0.056	16	22	3.1	4.0	310	3140
HCM1A4020V3-R22-R	B	0.22	0.123	11	17	5.5	6.6	200	1993
HCM1A4020V3-R33-R	C	0.33	0.185	8.5	12	7.5	9.0	130	2102
HCM1A4020V3-R47-R	D	0.47	0.263	7.3	11	10.5	13	105	1665
HCM1A4020V3-R56-R	E	0.56	0.314	7.3	10	12	15	95	2007
HCM1A4020V3-R68-R	F	0.68	0.381	6.7	9.0	12.5	16	85	2021
HCM1A4020V3-1R0-R	G	1.0	0.56	6.1	7.0	20	24	67	1378
HCM1A4020V3-1R2-R	H	1.2	0.67	5.3	6.8	23	28	60	1730
HCM1A4020V3-1R5-R	I	1.5	0.84	4.5	6.0	25	30	48	1408
HCM1A4020V3-2R2-R	J	2.2	1.23	4.6	5.0	40	48	40	1337
HCM1A4020V3-3R3-R	K	3.3	1.85	3.1	4.0	71	85	35	803
HCM1A4020V3-4R7-R	L	4.7	2.63	2.5	3.2	98	118	27	966
HCM1A4020V3-6R8-R	M	6.8	3.8	1.7	2.6	167	192	23	771
HCM1A4020V3-100-R	N	10	5.6	1.6	2.2	245	281	20	363
HCM1A4020V3-150-R	O	15	8.4	1.4	1.8	320	384	14	449

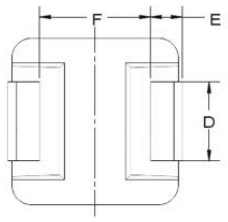
1. Open circuit inductance (OCL) test parameters: 100 kHz, 1.0 Vrms, 0.0 Adc, +25 °C
2. Full load inductance (FLL) test parameters: 100 kHz, 1.0 Vrms, Isat, , +25 °C
3. Irms: DC current for an approximate temperature rise of 30 °C without core loss. Derating is necessary for AC currents. PCB layout, 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 30% 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: HCM1A4020V3-xxx-R
   HCM1A4020V3= 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)

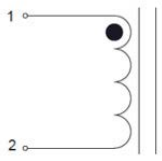


Recommended pad layout





Schematic



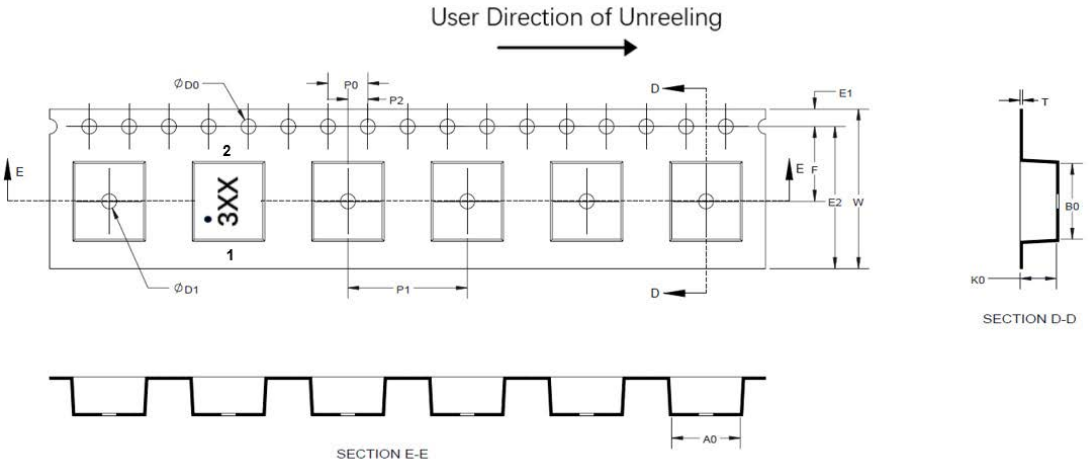
Part number	A	B	C	D	E	F	G
HCM1A4020V3-R	4.40 ±0.35	4.20 ±0.25	1.80 ±0.20	2.0 ±0.20	0.8 ±0.30	2.8 TYP.	0 to 0.15

Part marking: Pin 1 indicator dot, 3XX; 3= V3 version, first X= inductance value per part marking designator, second X= bi-weekly lot code
All soldering surfaces to be coplanar within 0.1 millimeters
Tolerances are ±0.15 millimeters unless stated otherwise
Pad layout tolerances are ±0.1 millimeters unless stated otherwise
DCR measured from point "a" to point "b"
Traces or vias underneath the inductor is not recommended

Packaging information (mm)

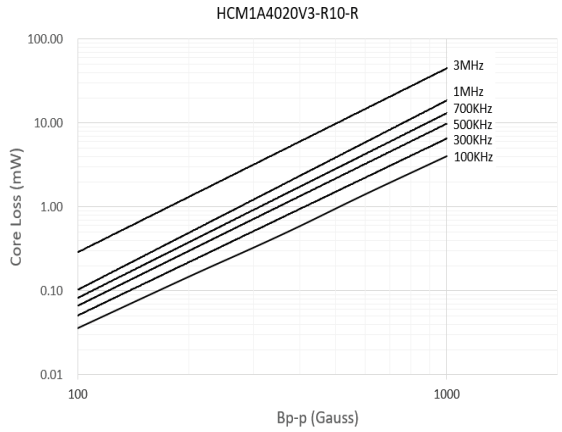
Drawing not to scale

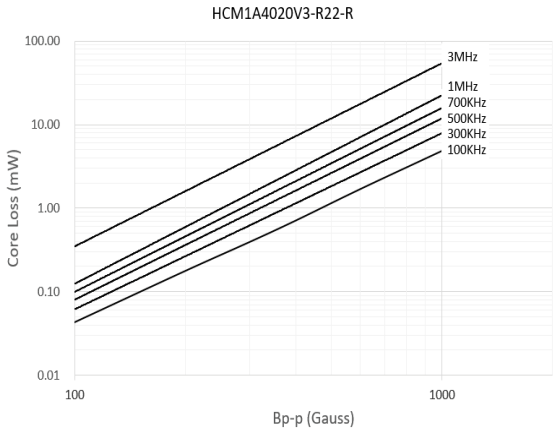
Supplied in tape and reel packaging, 3000 parts per 13" diameter reel

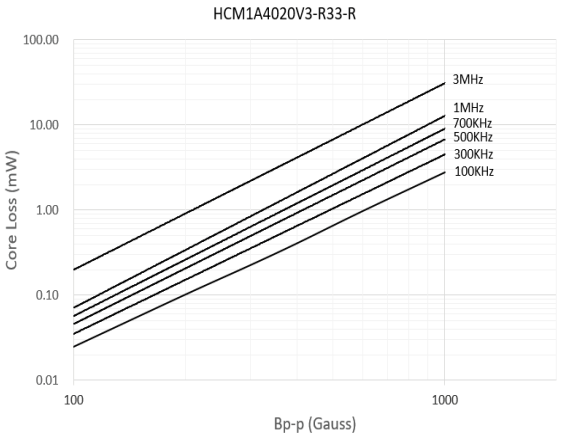


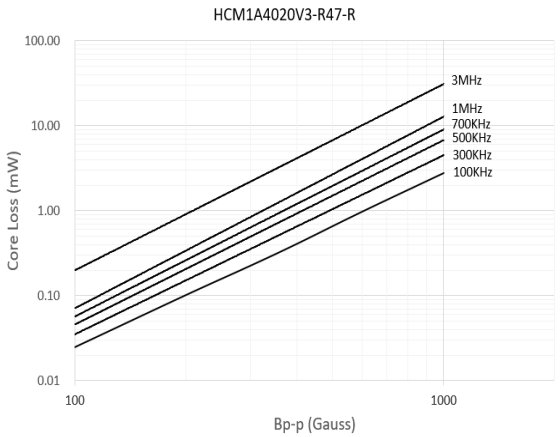
Dimension	Value
W ±0.30	12.0
F ±0.10	5.5
E1 ±0.10	1.75
E2 Min	10.25
P0 ±0.10	4.0
P1 ±0.10	8.0
P2 ±0.05	2.0
D0 +0.10/-0	1.5
D1 +0.10/-0	1.5
A0	4.50 ±0.10
B0	4.8 ±0.10
K0	2.50 ±0.15
T	0.35 ±0.05

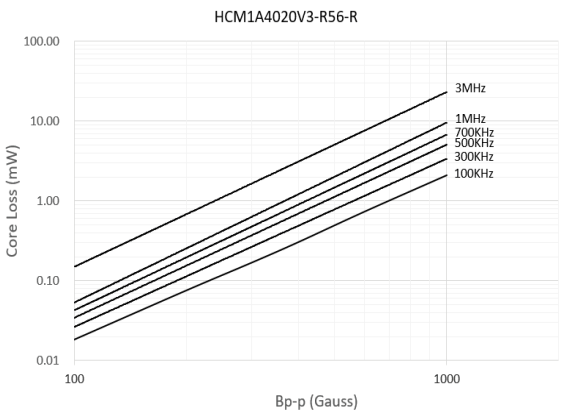
Core loss vs. Bp-p

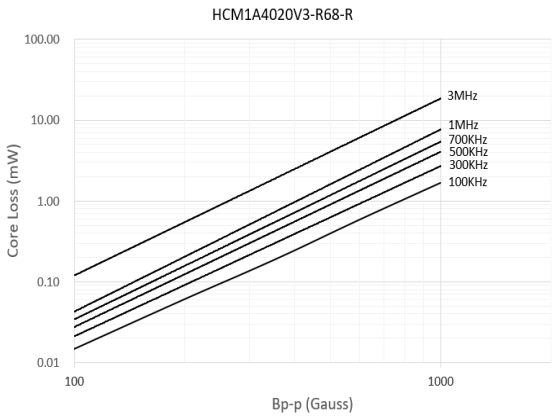






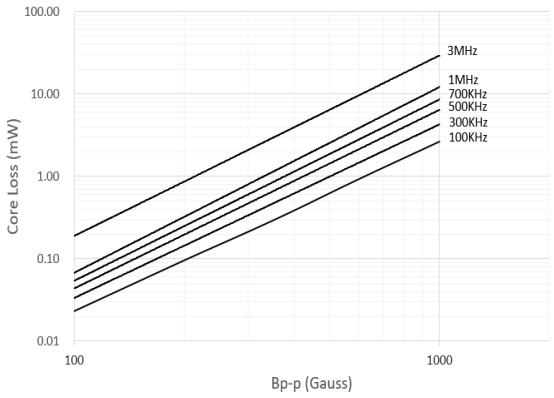




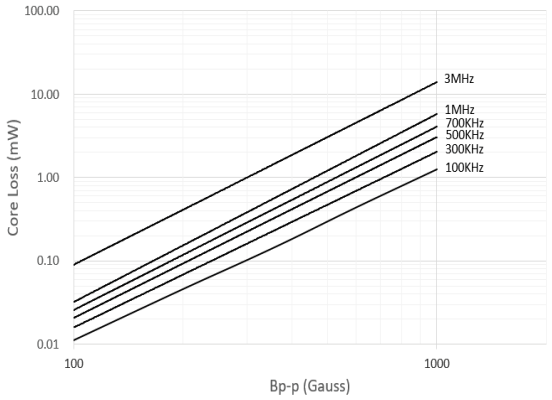


Core loss vs. Bp-p

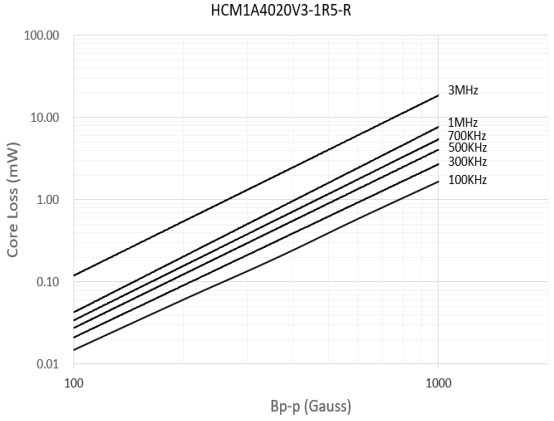
HCM1A4020V3-1R0-R



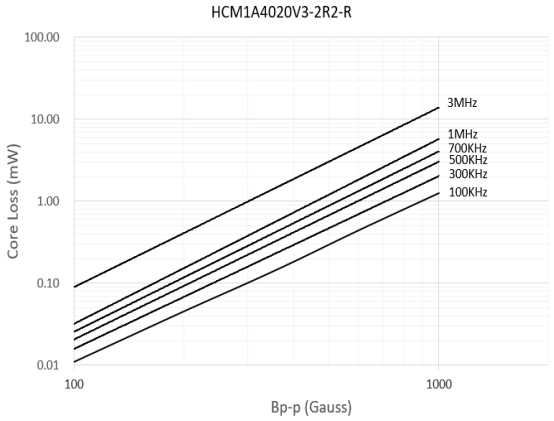
HCM1A4020V3-1R2-R



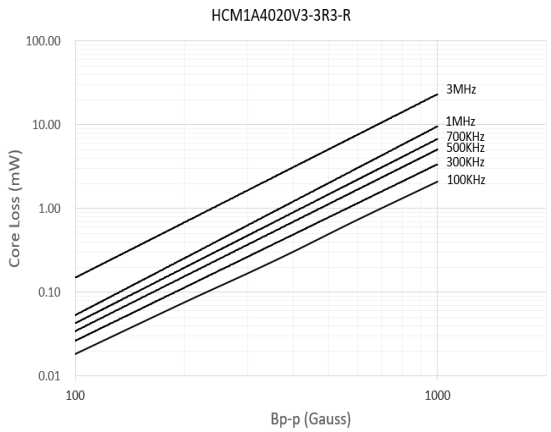
HCM1A4020V3-1R5-R



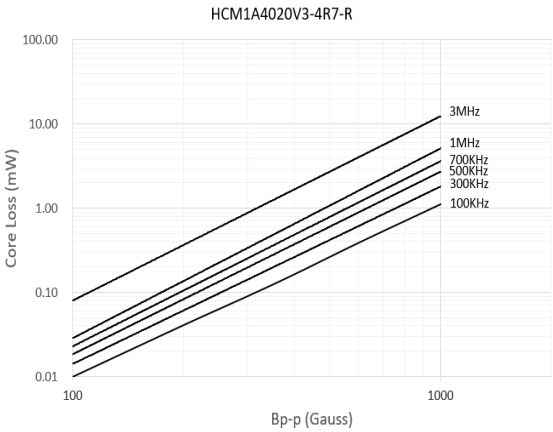
HCM1A4020V3-2R2-R



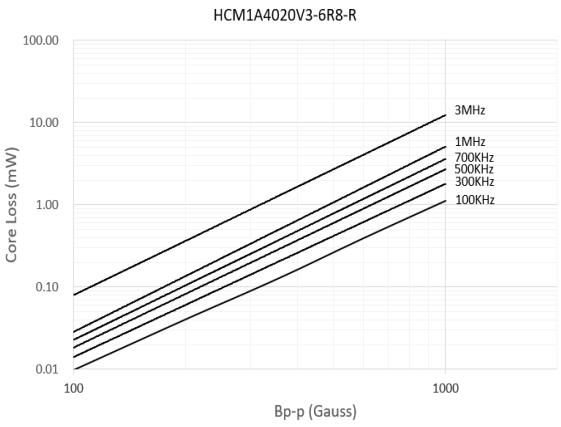
HCM1A4020V3-3R3-R

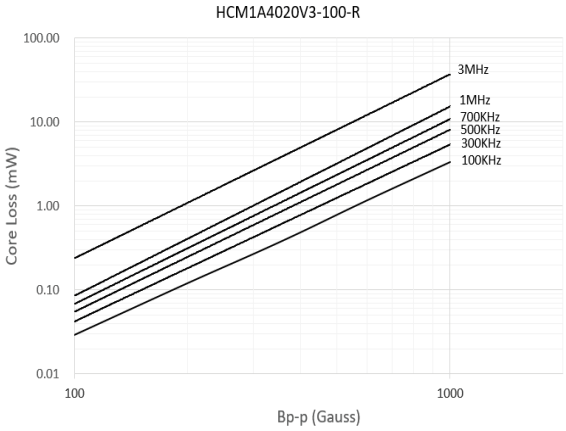


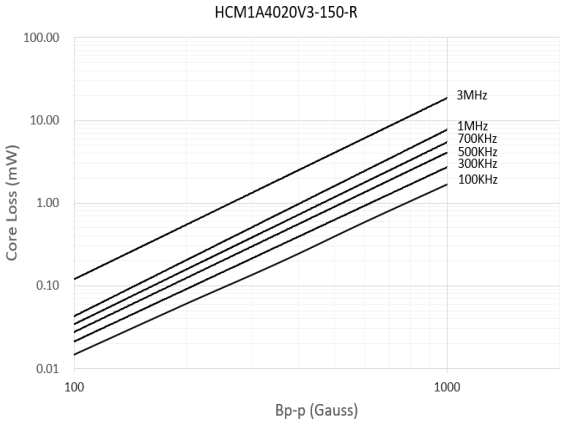
HCM1A4020V3-4R7-R



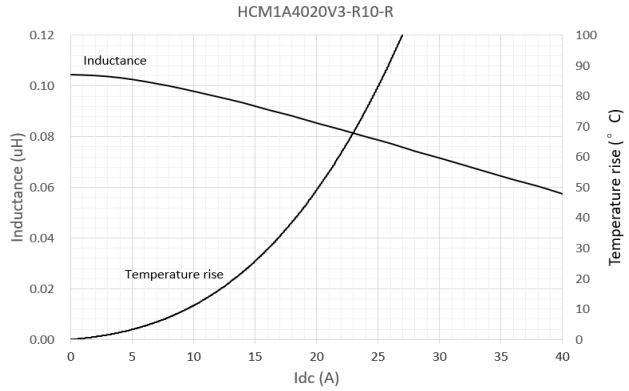
Core loss vs. Bp-p

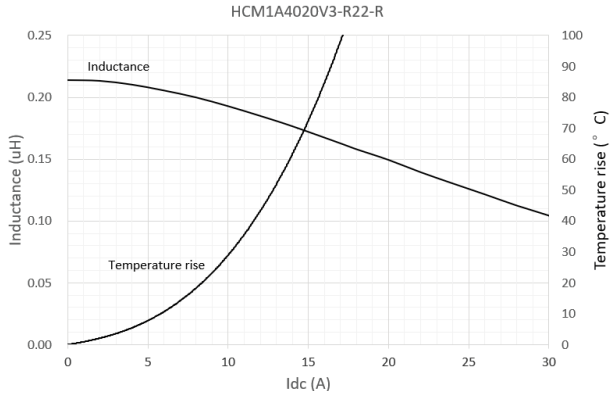


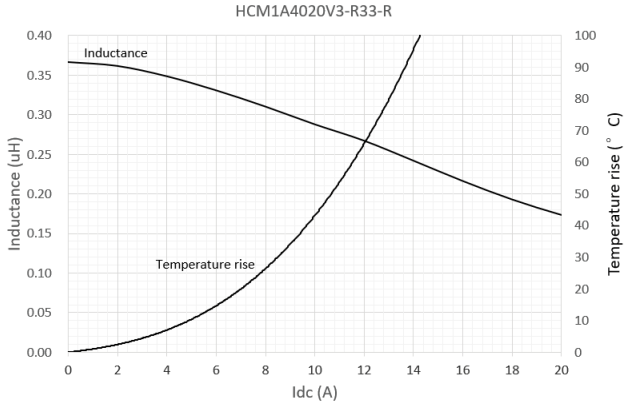


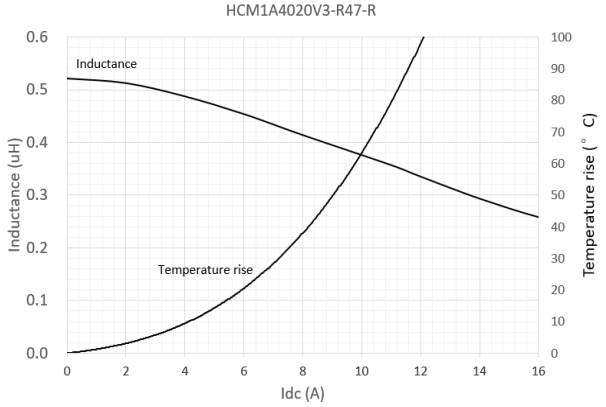


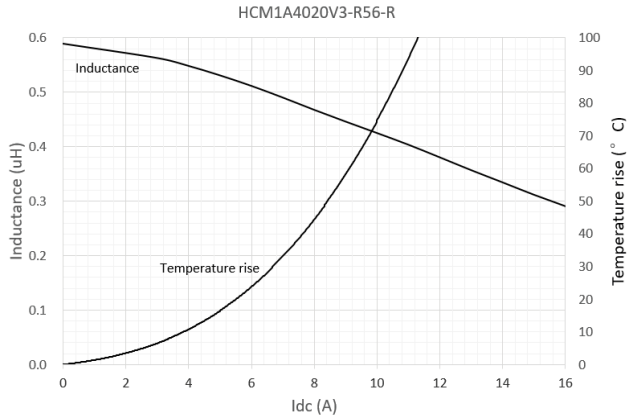
Inductance and temperature rise vs. Idc

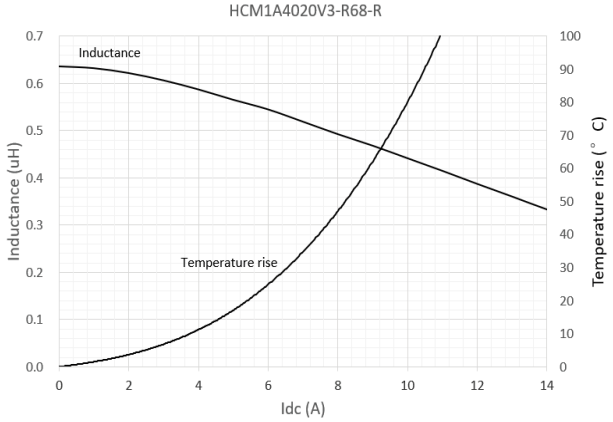




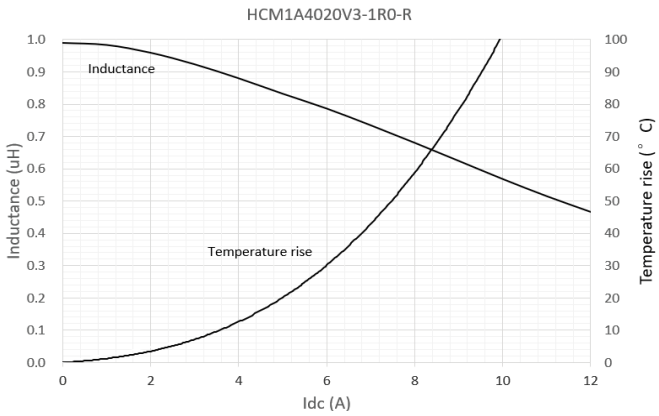


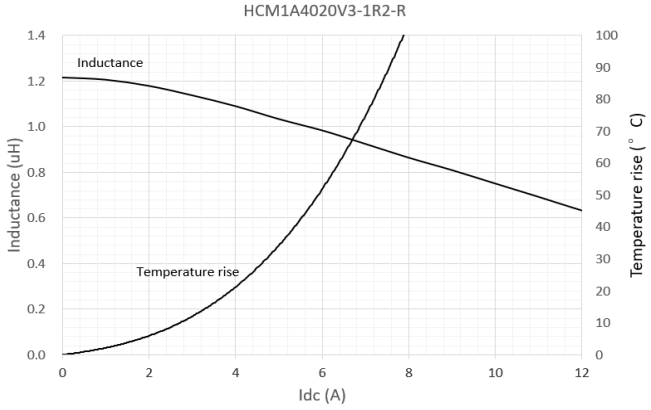


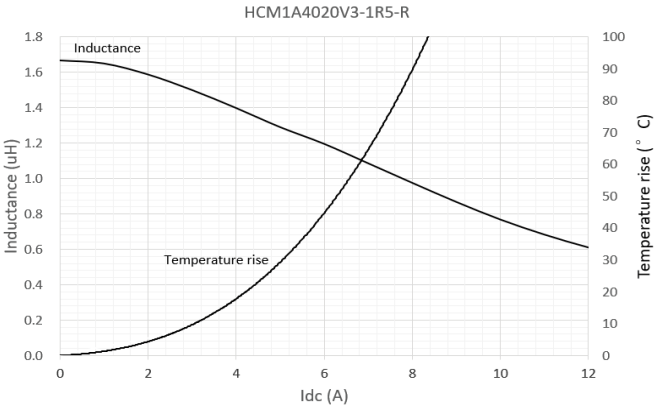


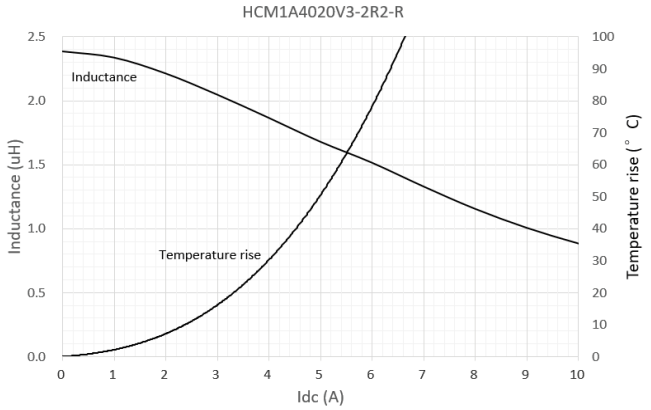


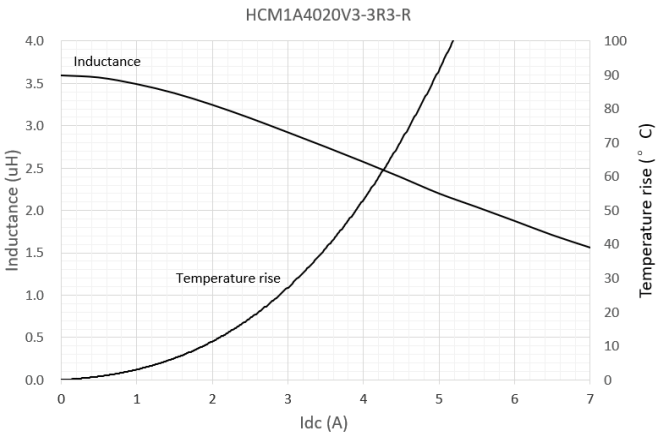
Inductance and temperature rise vs. Idc

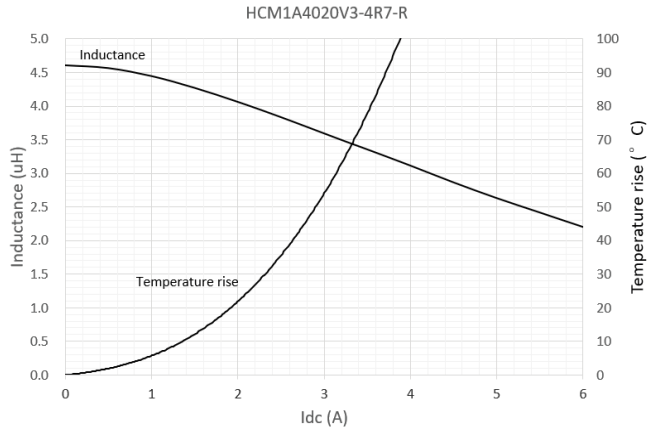




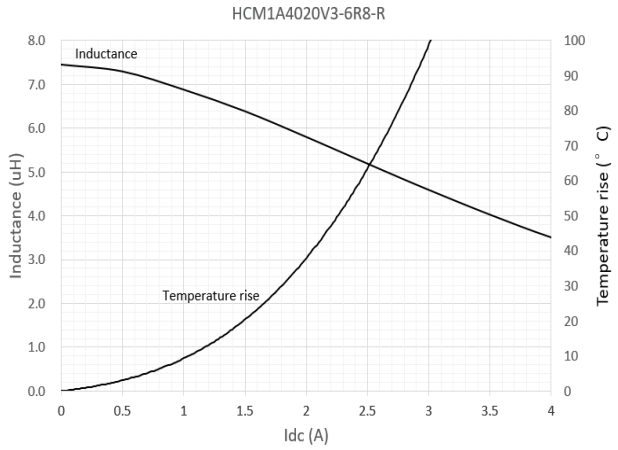


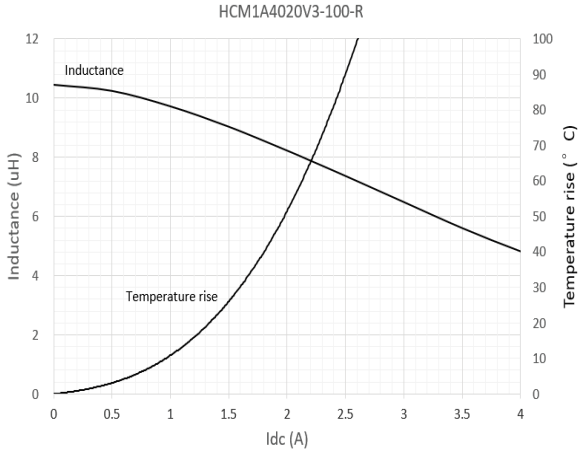


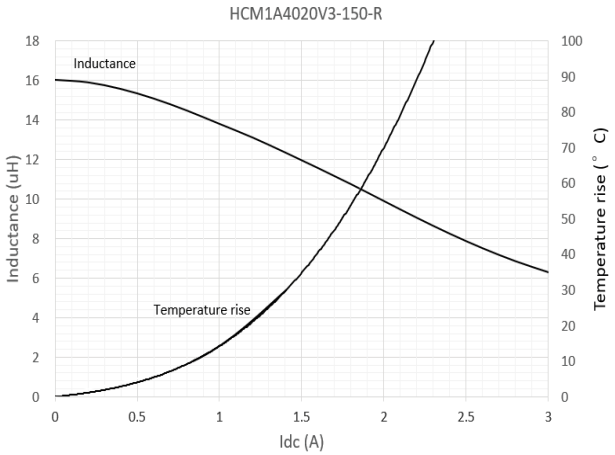




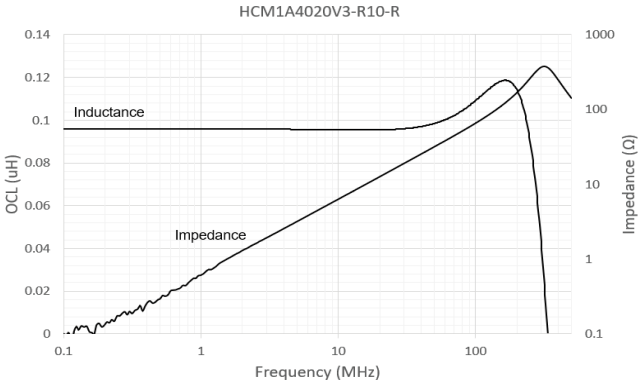
Inductance and temperature rise vs. Idc

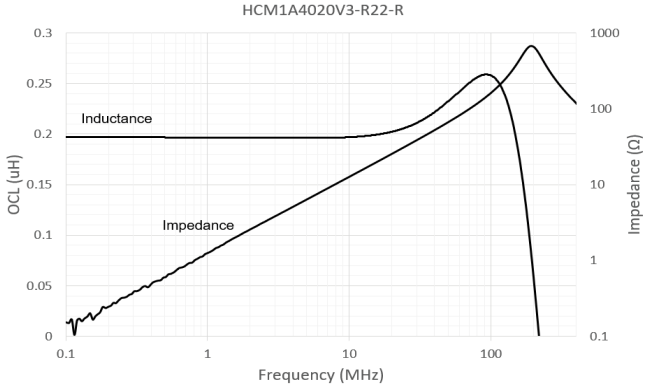


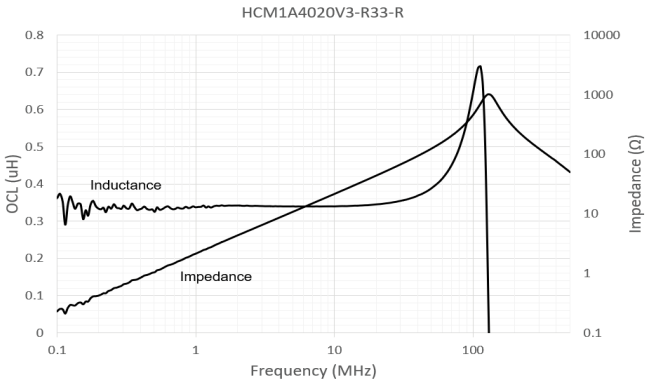


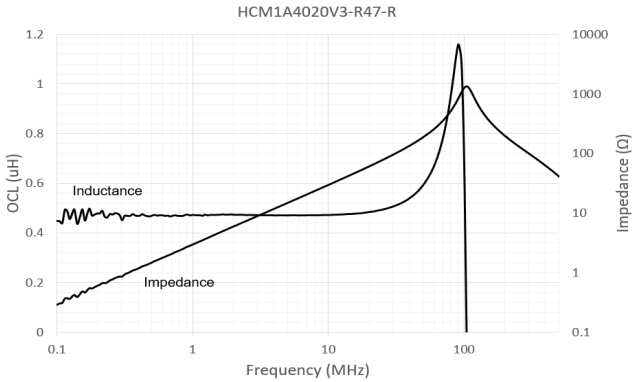


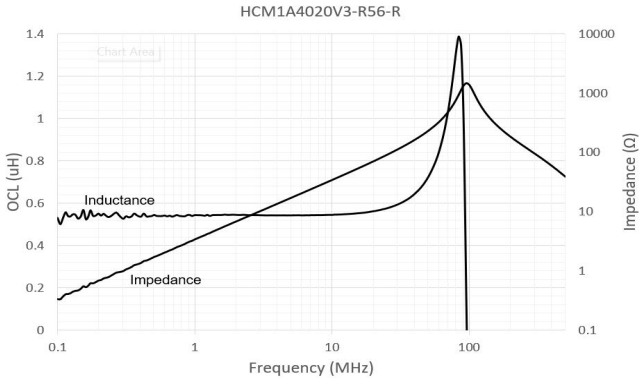
Inductance and impedance vs. frequency

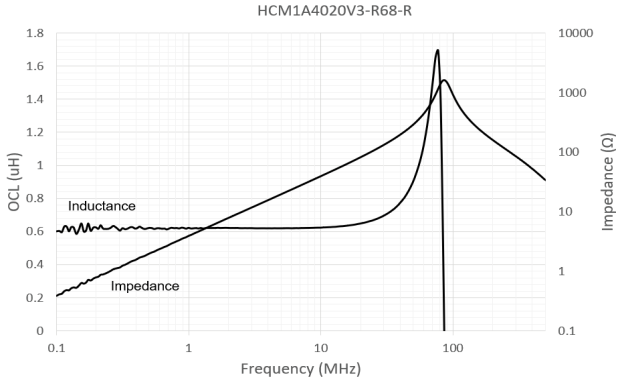




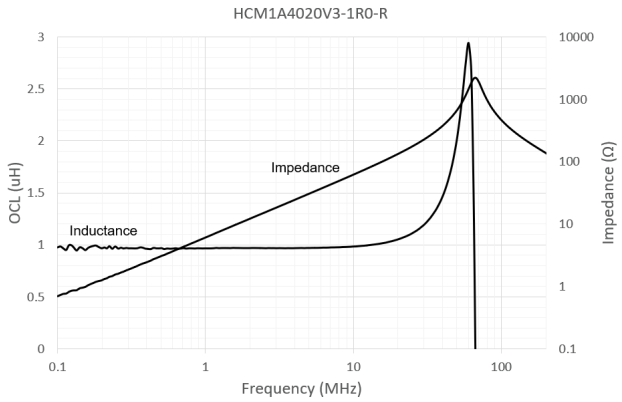


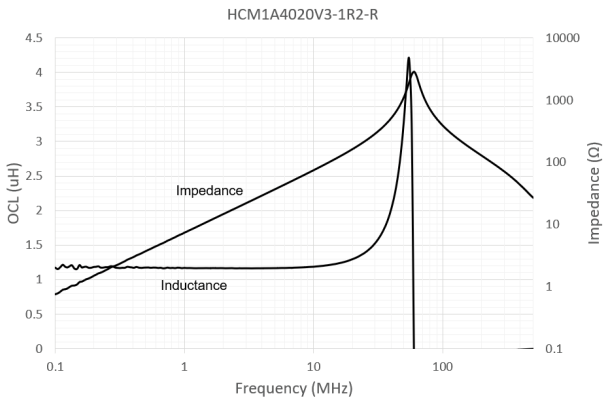


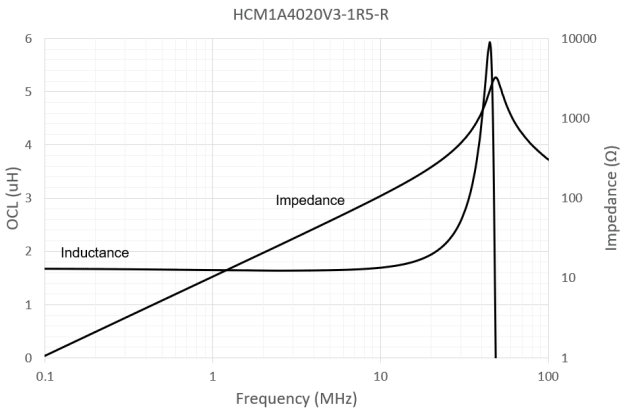


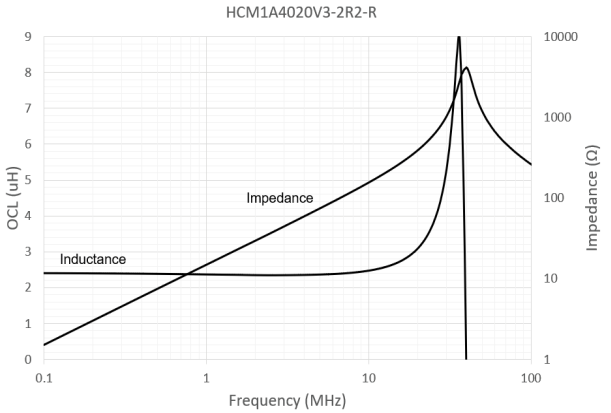


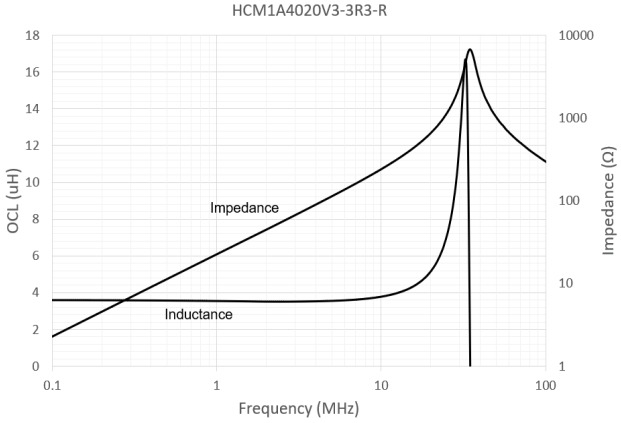
Inductance and impedance vs. frequency

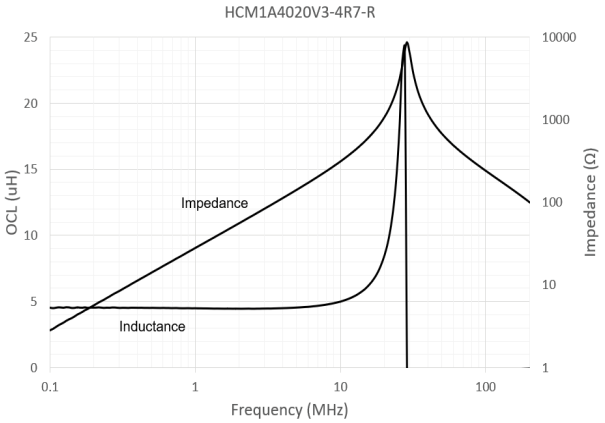




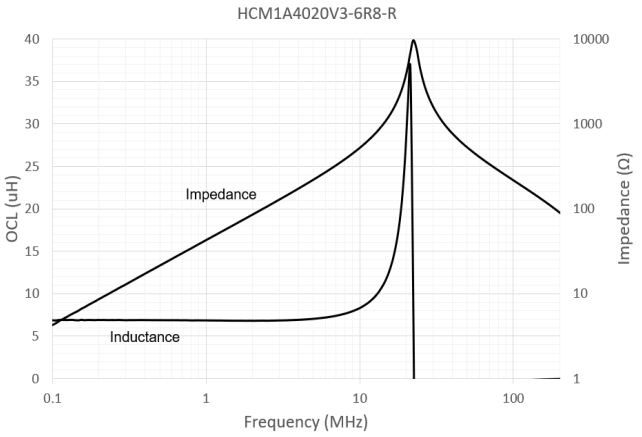


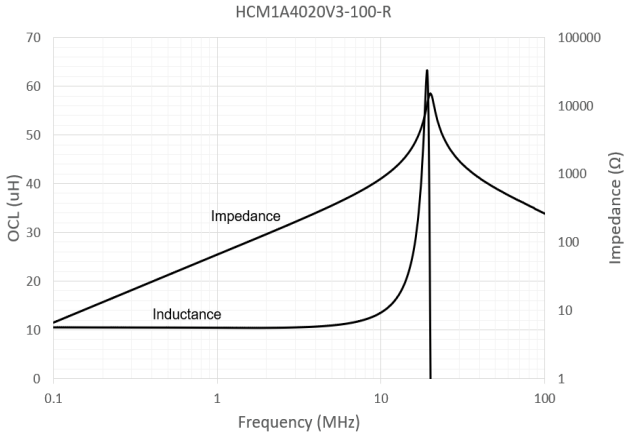


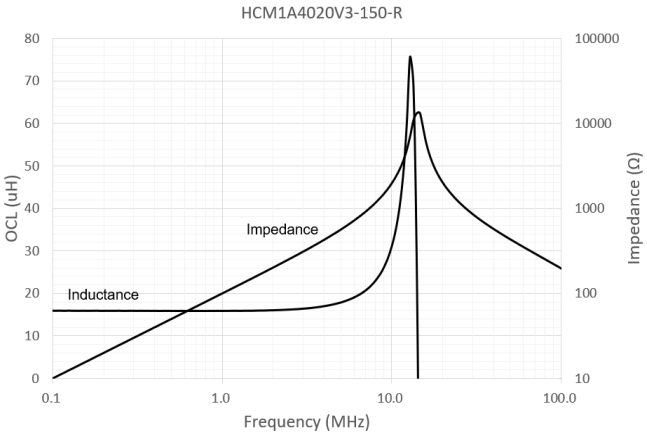




Inductance and impedance vs. frequency







Solder reflow profile

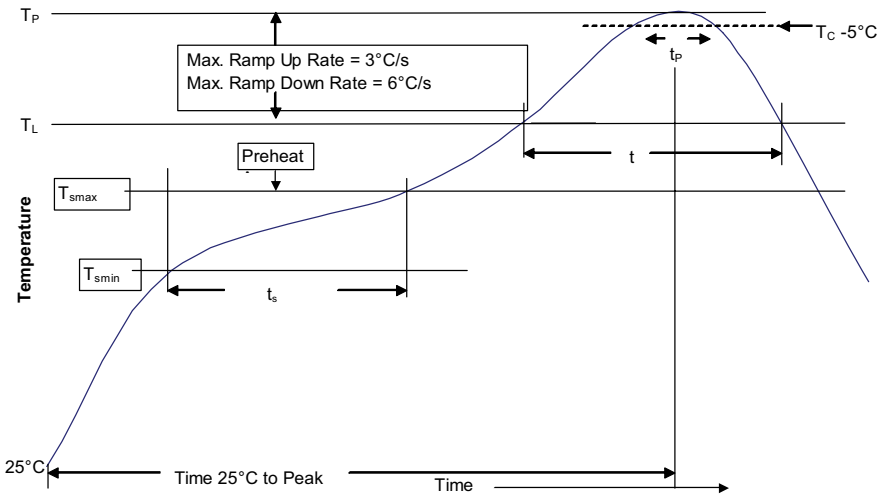


Table 1 - Standard SnPb solder (T_C)

Package thickness	Volume mm3 <350	Volume mm3 ≥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 mm³ <350	Volume mm³ 350 - 2000	Volume mm³ >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) Time (t_L) maintained above T_L		183 °C 60-150 seconds	217 °C 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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Printed in USA
Publication No. ELX1495 BU-ELX22387
January 2025