

# HCM1A1307

## Automotive grade High current power inductors



### Product features

- AEC-Q200 Grade 1 qualified
- High current carrying capacity
- Magnetically shielded, low EMI
- Frequency range up to 1 MHz
- Inductance range from 0.22  $\mu$ H to 56  $\mu$ H
- Current range from 4.6 A to 100 A
- 13.7 mm x 13.0 mm footprint surface mount-package in a 6.5 mm height
- Moisture Sensitivity Level (MSL): 1
- Alloy powder core material
- Halogen free, lead free, RoHS compliant

### Applications

- Body electronics
  - Central body control module
  - Headlamps, tail lamps and interior lighting
  - Heating ventilation and air conditioning controllers (HVAC)
  - Doors, window lift and seat control
- Advanced driver assistance systems
  - Adaptive cruise control (ACC)
  - Automatic parking control
  - Collision avoidance system/ Car black box system
- Infotainment and cluster electronics
  - Audio subsystem: head unit and trunk amp
  - Digital instrument cluster
  - In-vehicle infotainment (IVI) and navigation
- Chassis and safety electronics
  - Airbag control unit
  - Electronic stability control system (ESC)
  - Electric parking brake
  - Electronic Power Steering (EPS)
- Engine and Powertrain Systems
  - Electric pumps, motor control and auxiliaries
  - Powertrain control module (PCU)/Engine Control unit (ECU)
  - Transmission Control Unit (TCU)

### Environmental Data

- Storage temperature range (Component): -55 °C to +155 °C
- Operating temperature range: -55 °C to +155 °C (ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020 (latest revision) compliant



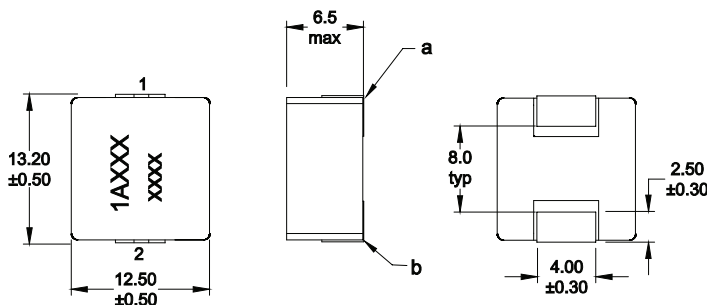
Product Specifications

Part Number <sup>6</sup>	OCL <sup>1</sup> ( $\mu\text{H}$ ) $\pm 20\%$	FLL <sup>2</sup> ( $\mu\text{H}$ ) minimum	$I_{\text{rms}}^3$ (A)	$I_{\text{sat}}^4$ (A)	DCR (m $\Omega$ ) typical @ +20 °C	DCR (m $\Omega$ ) maximum @ +20 °C	K-factor <sup>5</sup>
HCM1A1307-R22-R	0.22	0.14	48	100	0.58	0.70	261
HCM1A1307-R33-R	0.33	0.21	44	72	0.83	0.92	222
HCM1A1307-R47-R	0.47	0.30	36.5	72	0.90	1.05	237
HCM1A1307-1R0-R	1.0	0.64	28	30	1.65	1.77	139
HCM1A1307-1R2-R	1.2	0.76	21.8	28	1.98	2.12	116
HCM1A1307-1R5-R	1.5	0.96	20.5	26	2.1	2.35	123
HCM1A1307-1R8-R	1.8	1.15	19.1	25	2.75	2.94	95
HCM1A1307-2R2-R	2.2	1.4	17.6	22	2.96	3.3	97
HCM1A1307-3R3-R	3.3	2.11	15.6	20	3.7	4.3	99
HCM1A1307-4R7-R	4.7	3.00	11	15	6.7	7.5	78
HCM1A1307-5R6-R	5.6	3.58	10	17	7.5	9.0	65
HCM1A1307-6R8-R	6.8	4.35	9.0	20	10	11.5	48
HCM1A1307-7R8-R	7.8	4.99	8.8	16	10	11.5	52
HCM1A1307-8R2-R	8.2	5.25	8.2	13	11.5	13	47
HCM1A1307-100-R	10	6.40	6.3	12	15.5	17.5	40
HCM1A1307-120-R	12	7.68	6.1	11	17	19	39
HCM1A1307-150-R	15	9.60	5.5	10	22	25	36
HCM1A1307-220-R	22	14.1	4.8	8.0	31.3	35	29
HCM1A1307-330-R	33	21.0	4.7	6.0	42	45	24
HCM1A1307-560-R	56	35.8	4.6	4.6	55	65	18

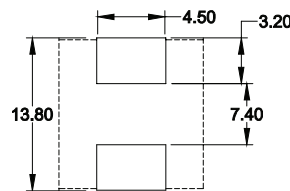
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 V<sub>rms</sub>, 0.0 Adc, +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 V<sub>rms</sub>, I<sub>sat</sub>, +25 °C
- I<sub>sat</sub>: DC current for an approximate temperature rise of 30 °C without core loss. Derating is 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.

- I<sub>sat</sub>: Peak current for approximately 20% rolloff @ +25 °C
- K-factor: Used to determine B<sub>pp</sub> for core loss (see graph). B<sub>p-p</sub> = K \* L \*  $\Delta I$ . B<sub>p-p</sub>: (Gauss), K: (K-factor from table), L: (Inductance in  $\mu\text{H}$ ),  $\Delta I$  (Peak to peak ripple current in Amps).
- Part Number Definition: HCM1A1307-xxx-R  
HCM1A1307 = 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

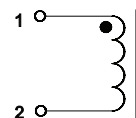
Dimensions (mm)



Recommended Pad Layout



Schematic

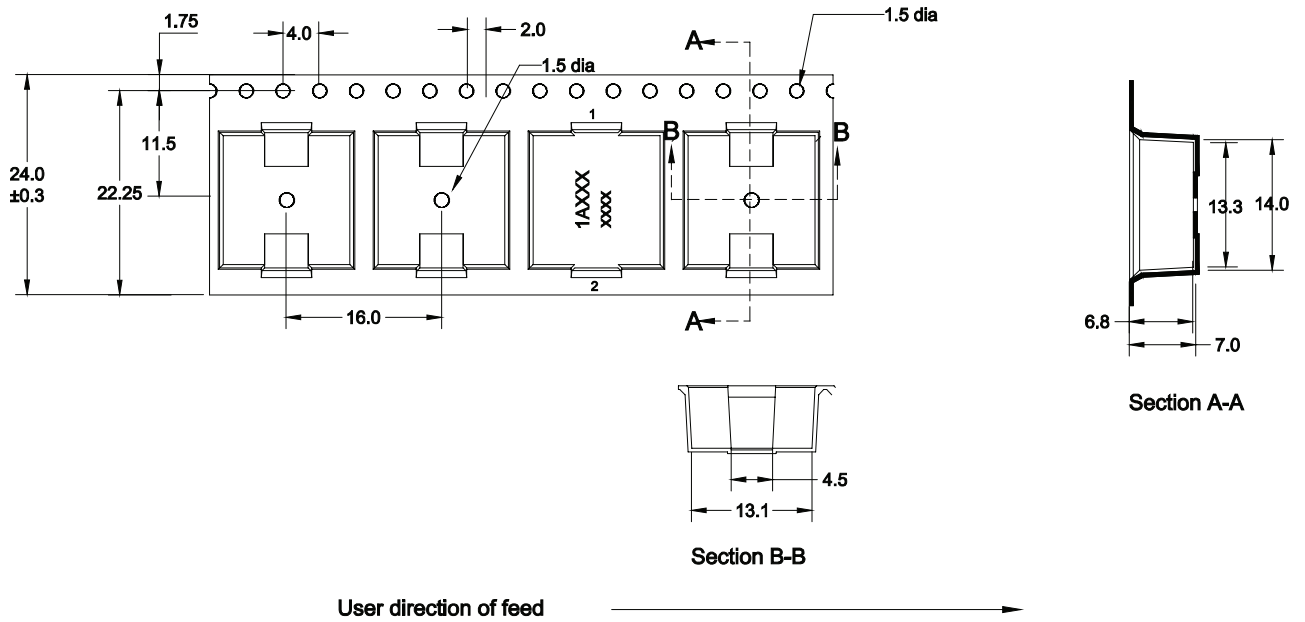


Part marking: 1AXXX=automotive grade, XXX=inductance value in  $\mu\text{H}$ , R=decimal point. If no R is present then last character equals number of zeros.  
 xxxx=Lot code  
 All soldering surfaces to be coplanar within 0.1 millimeters  
 Tolerances are  $\pm 0.3$  millimeters unless stated otherwise  
 DCR measured from point "a" to point "b"  
 Color: Grey  
 Do not route traces or vias underneath the inductor

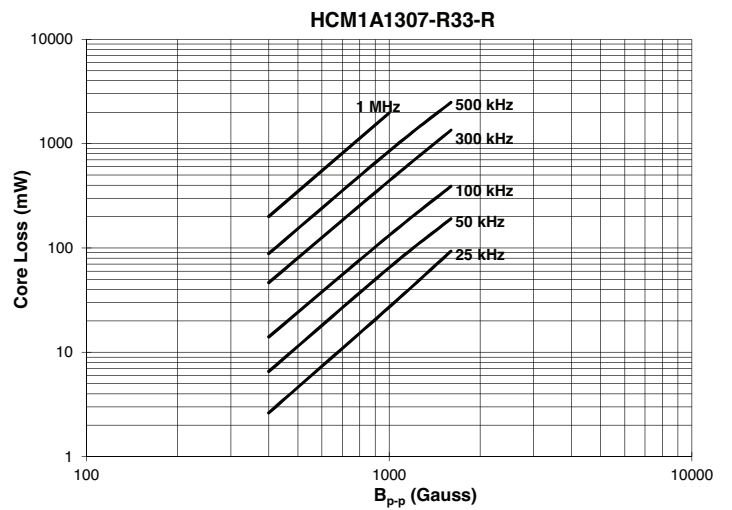
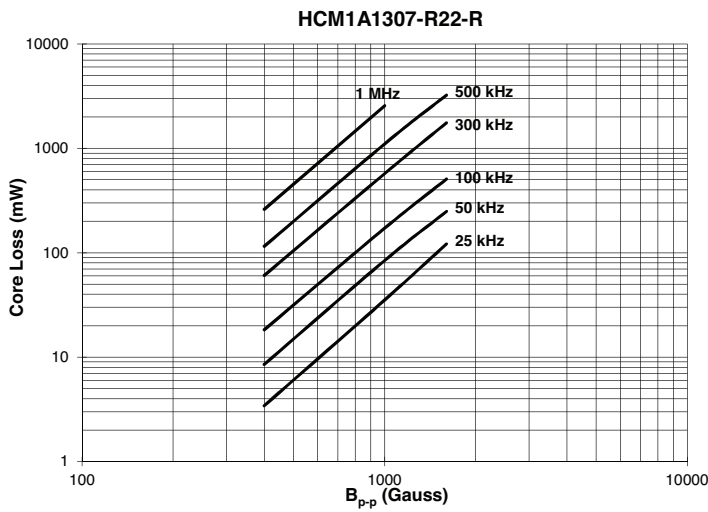
**Packaging information (mm)**

Drawing not to scale

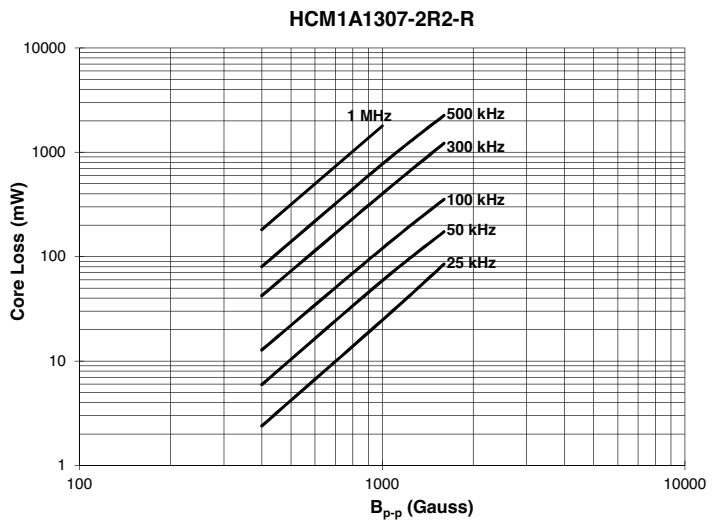
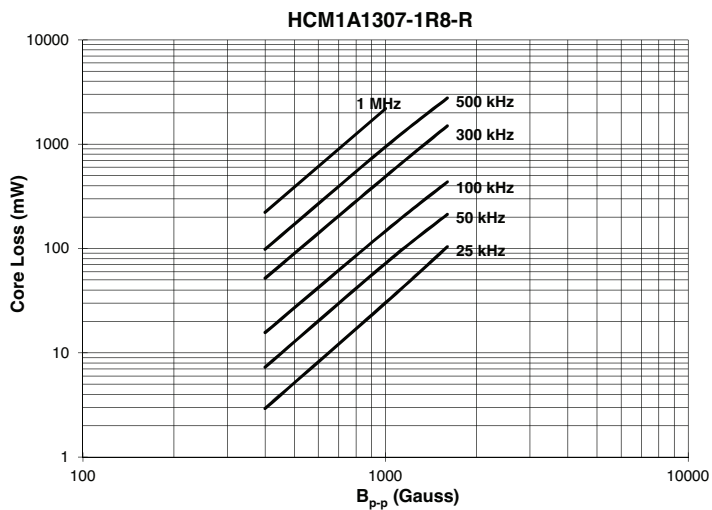
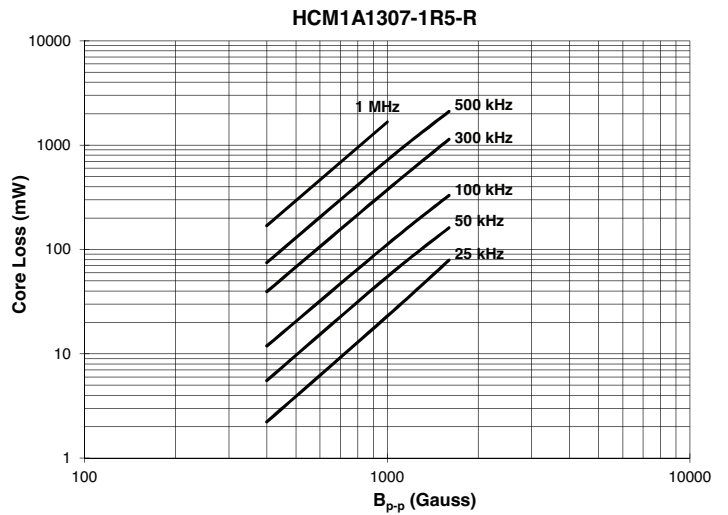
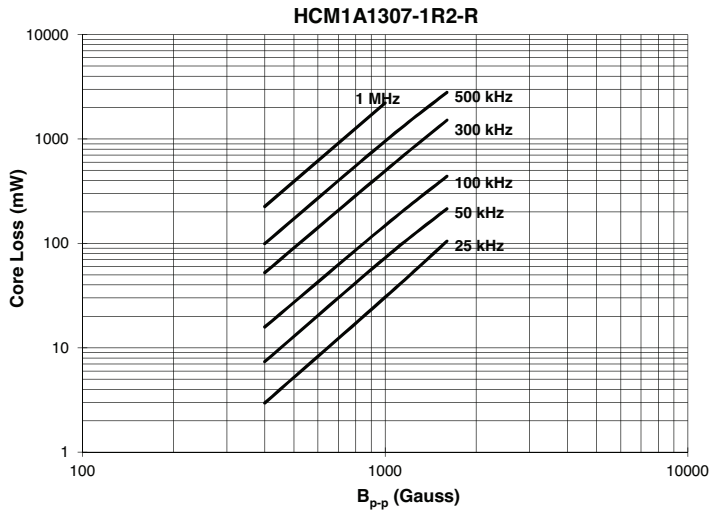
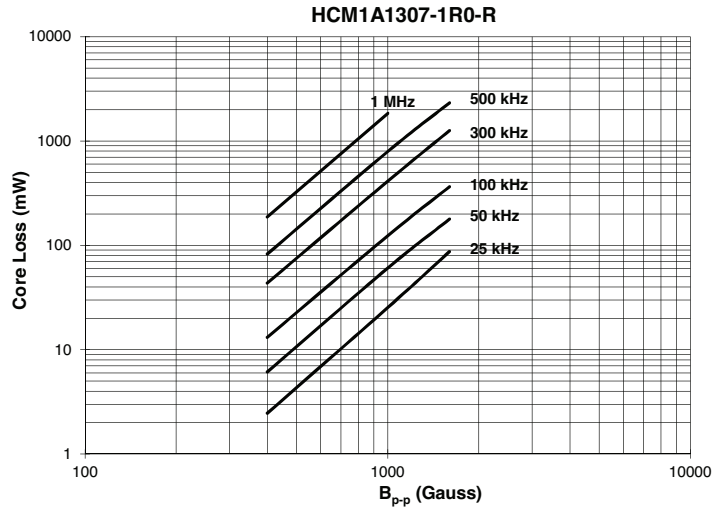
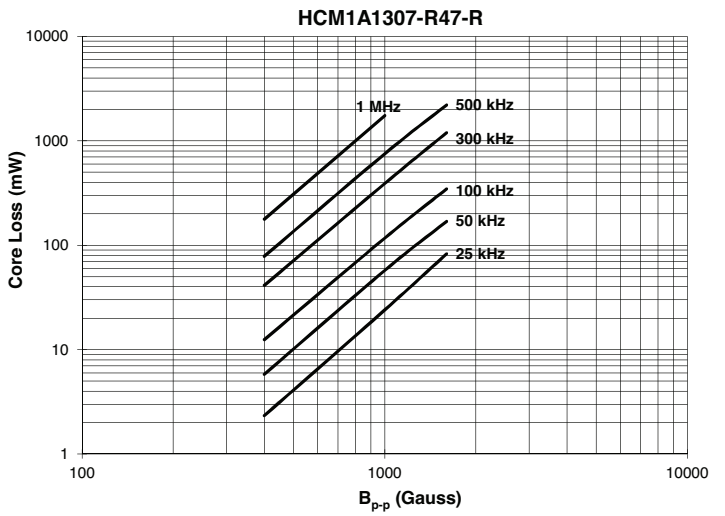
Supplied in tape and reel packaging, 250 parts per 13" diameter reel



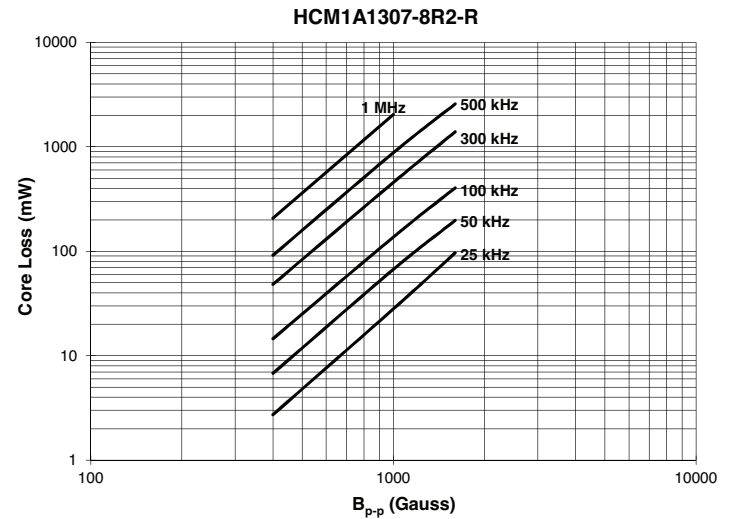
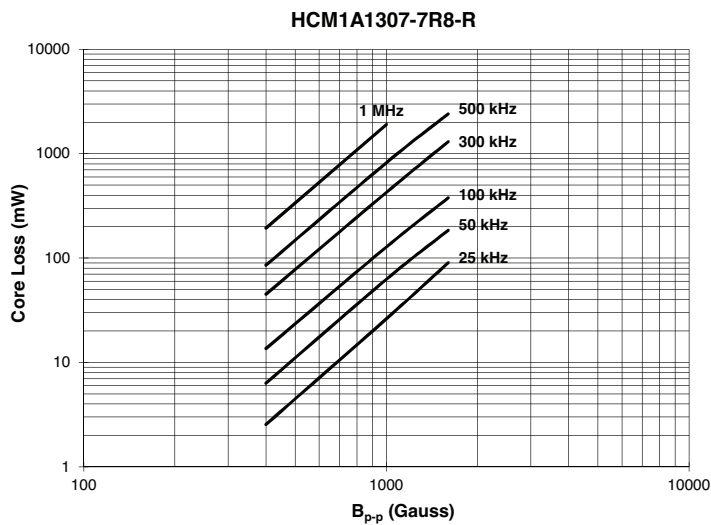
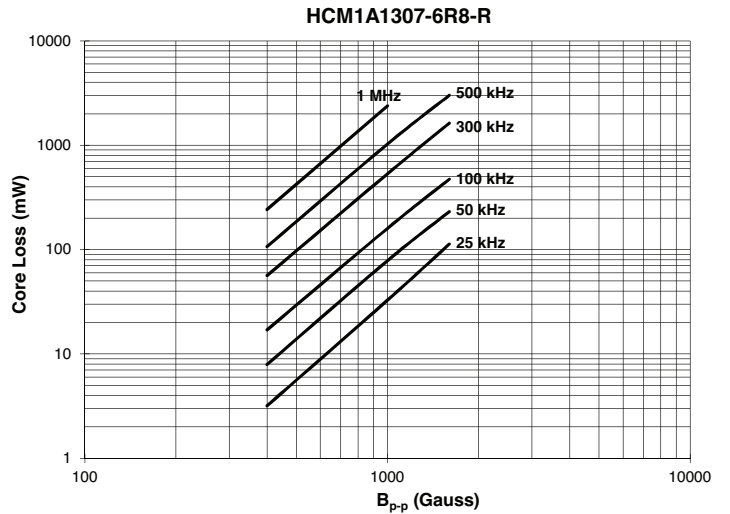
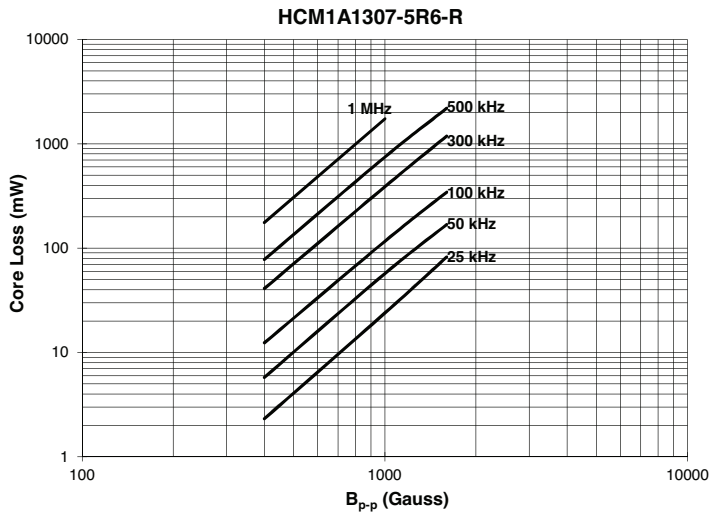
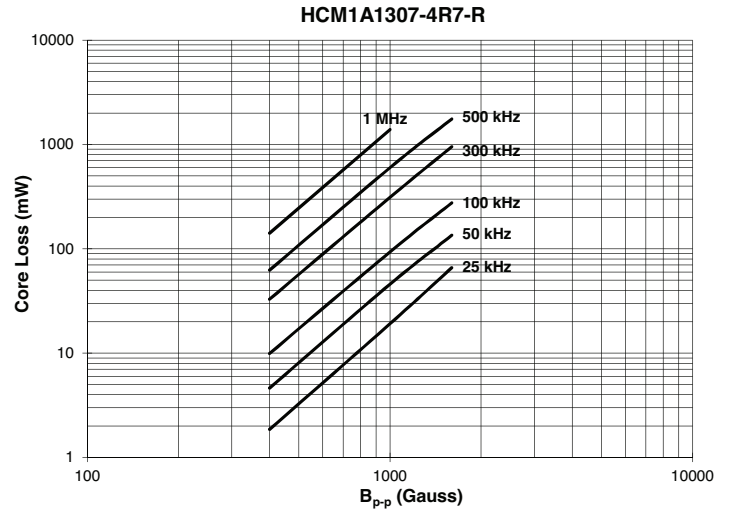
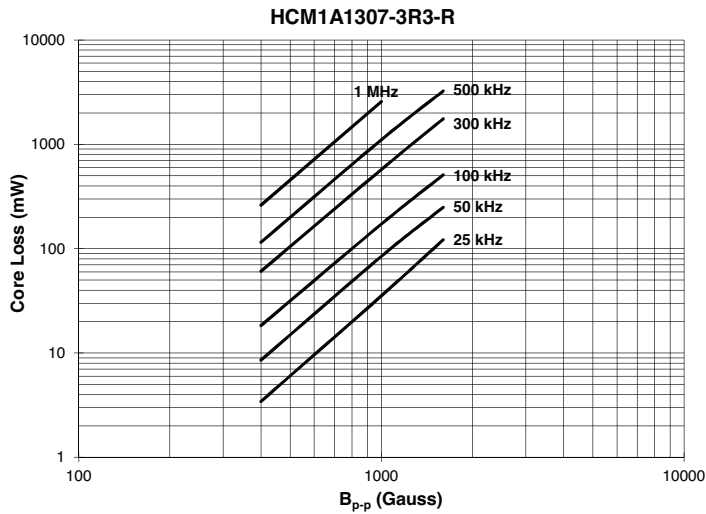
**Core loss vs  $B_{p-p}$**



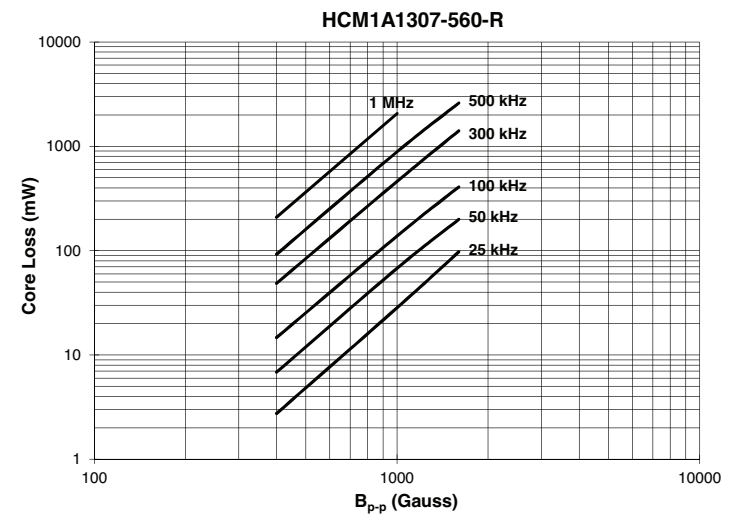
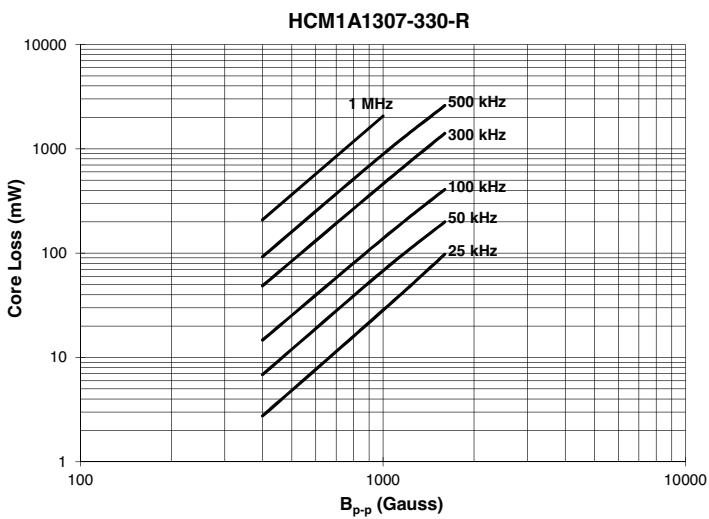
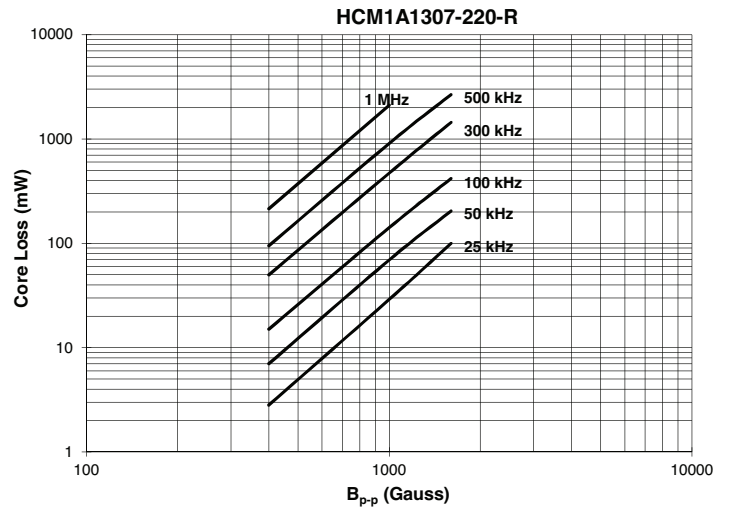
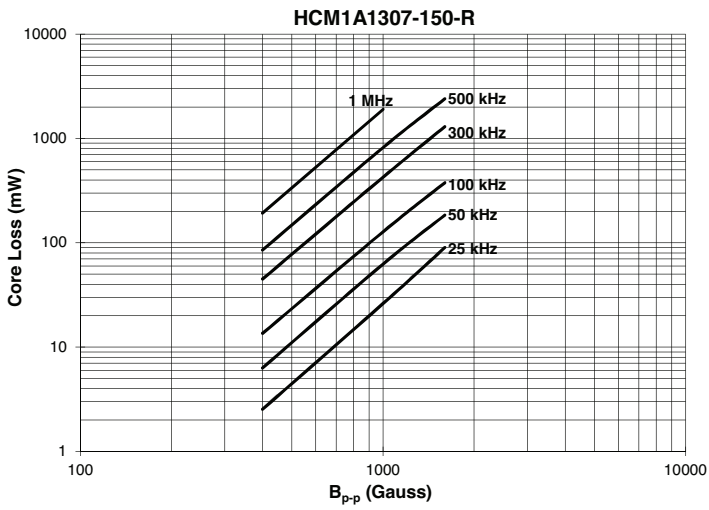
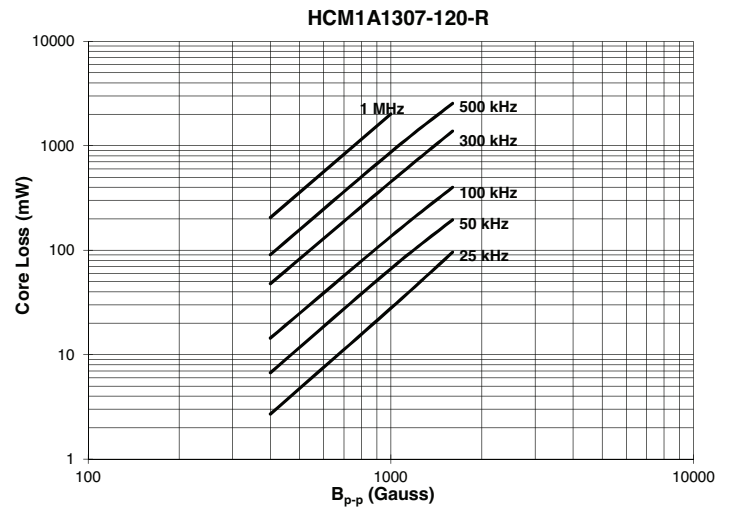
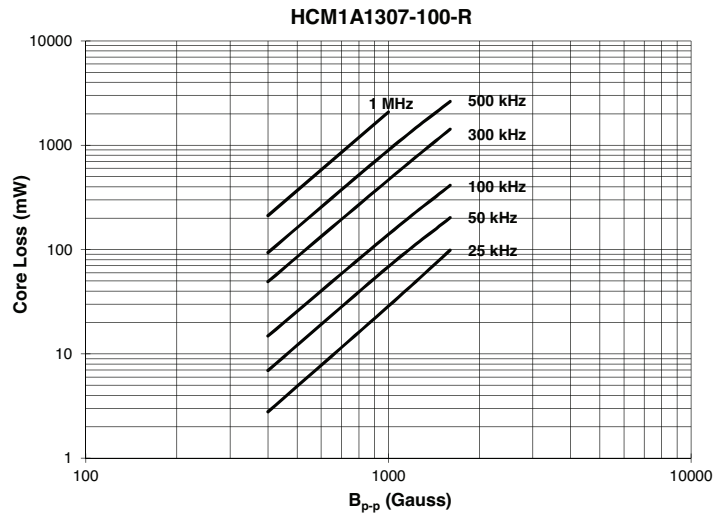
Core loss vs  $B_{p-p}$



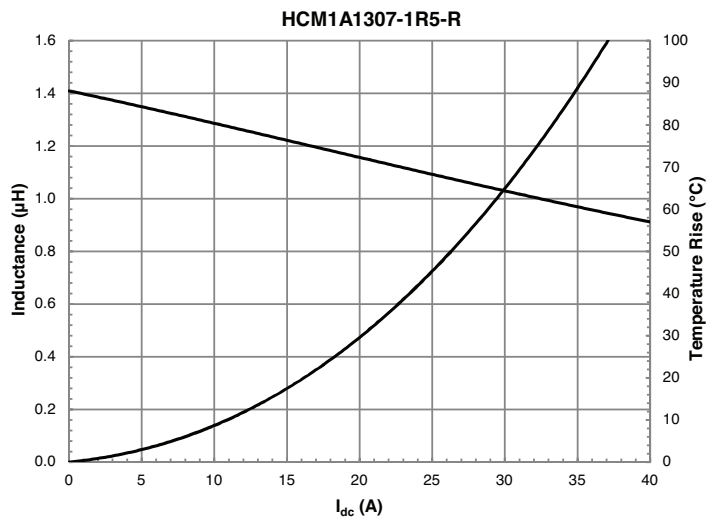
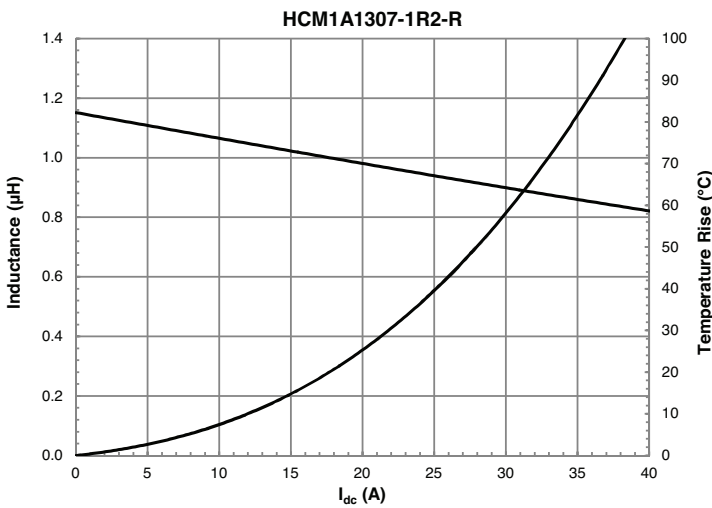
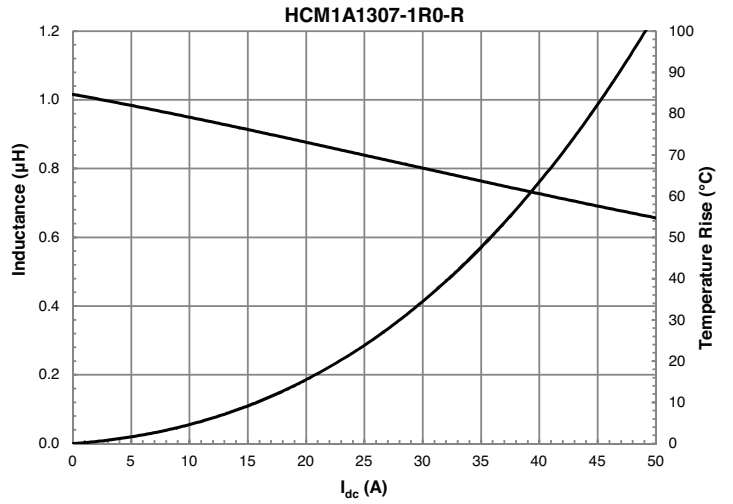
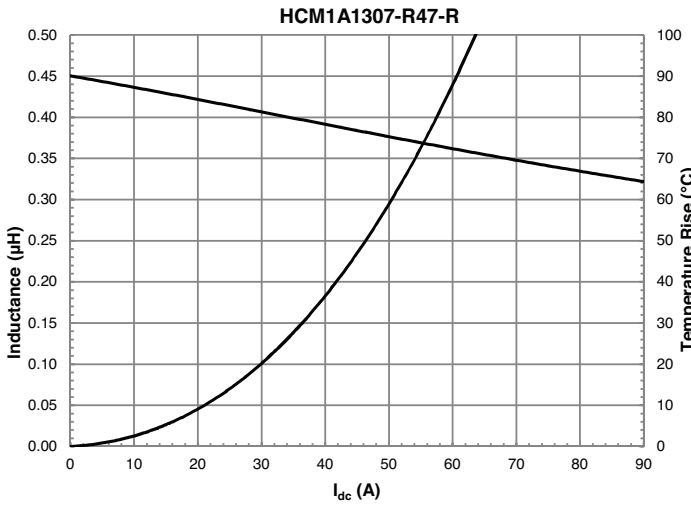
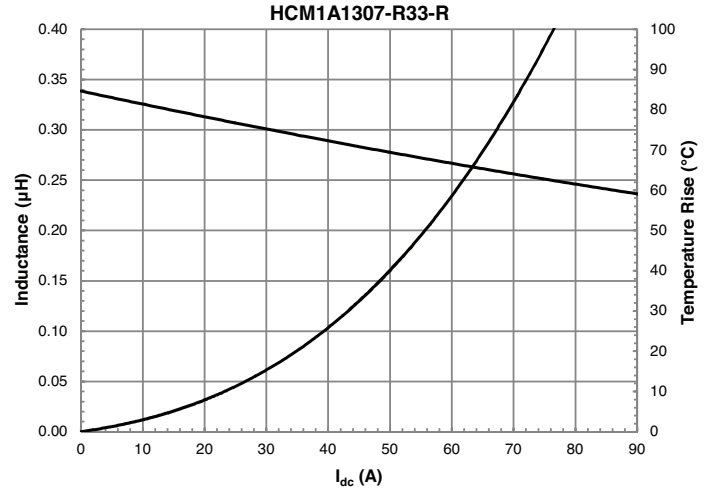
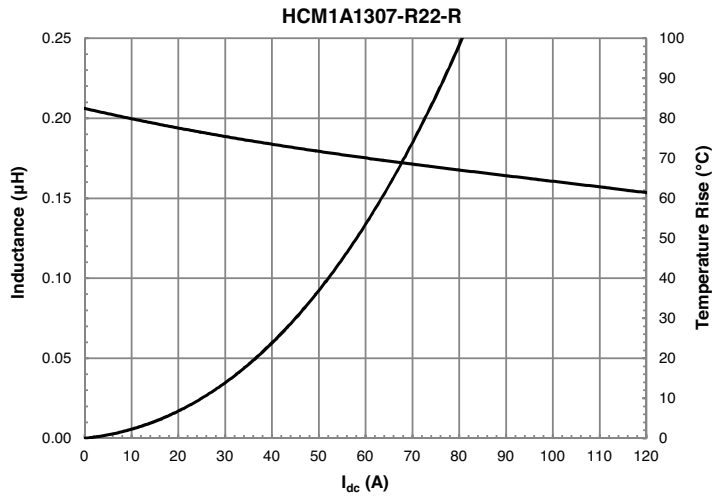
Core loss vs  $B_{p-p}$



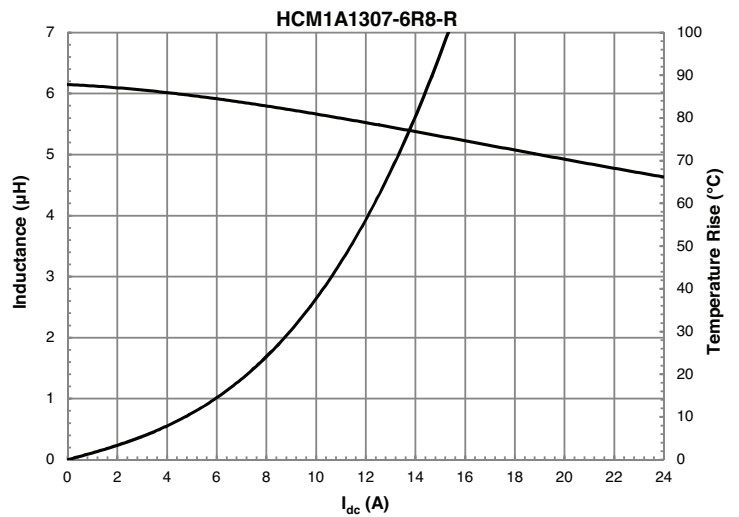
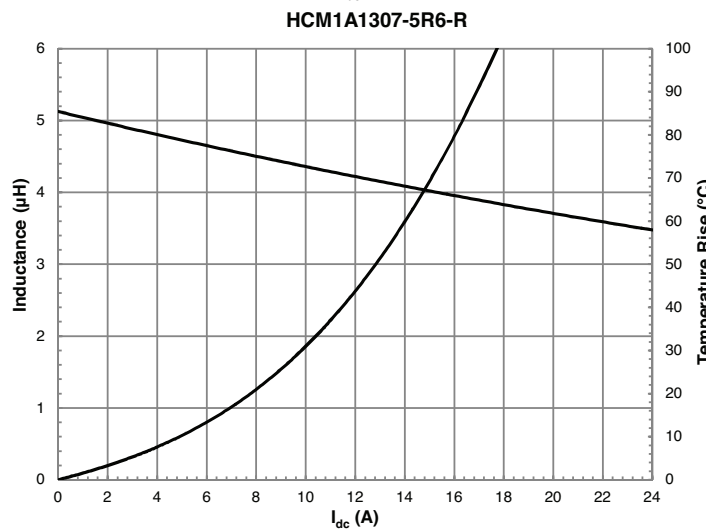
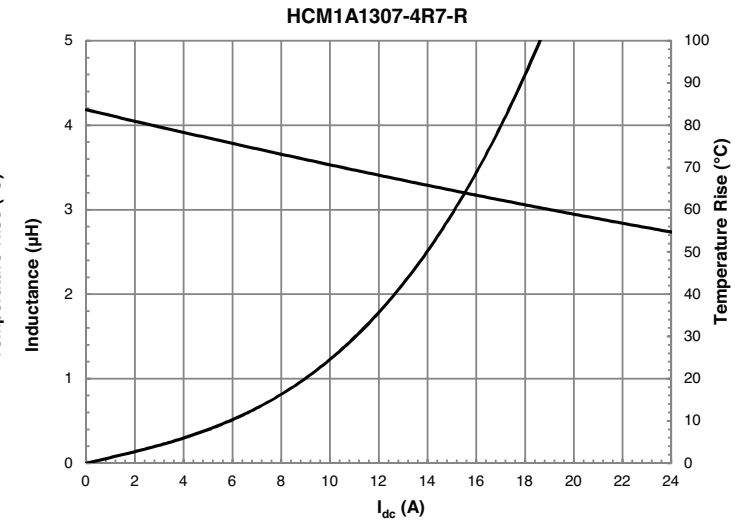
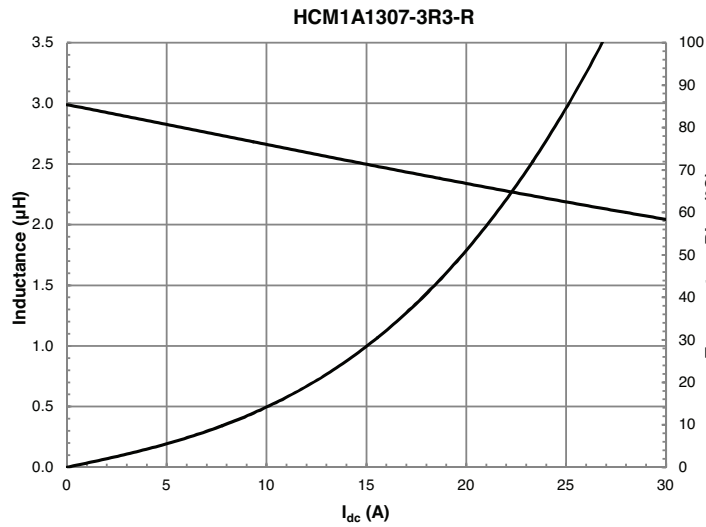
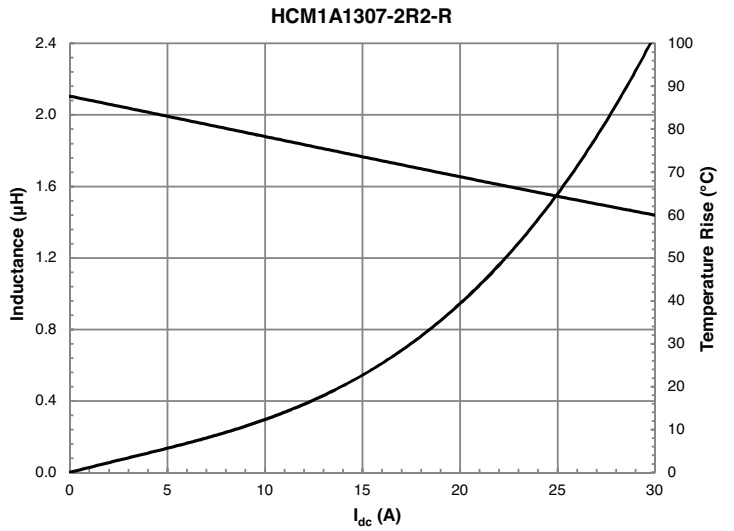
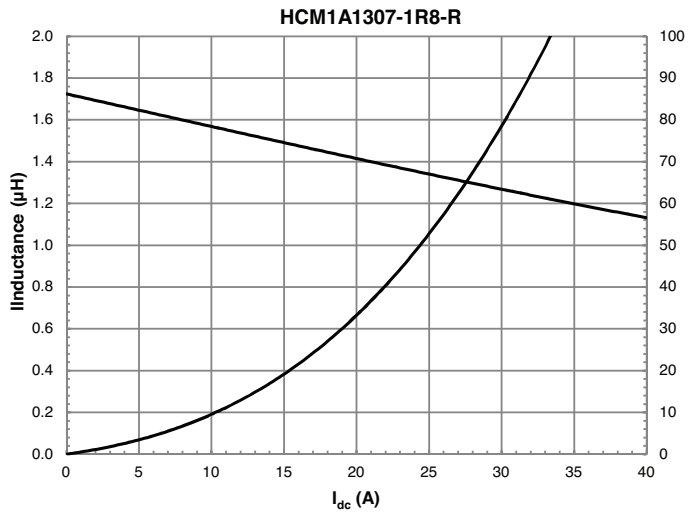
Core loss vs  $B_{p-p}$



Inductance and temperature rise vs. current

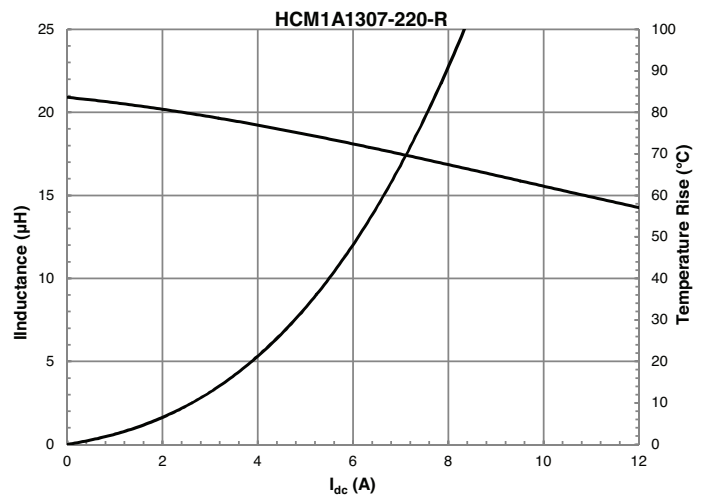
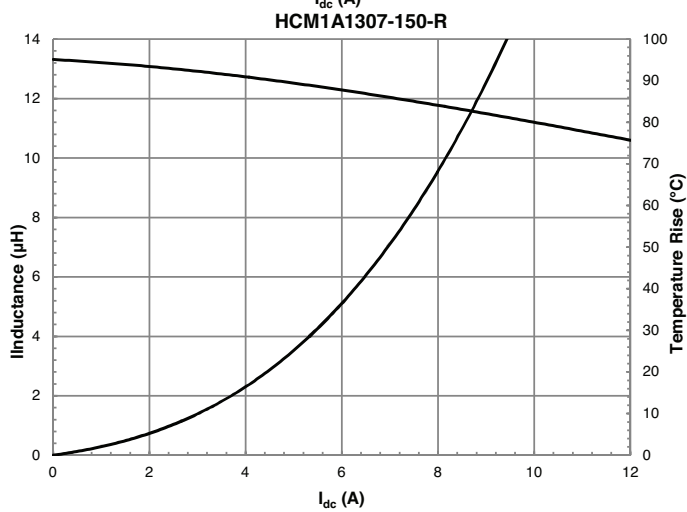
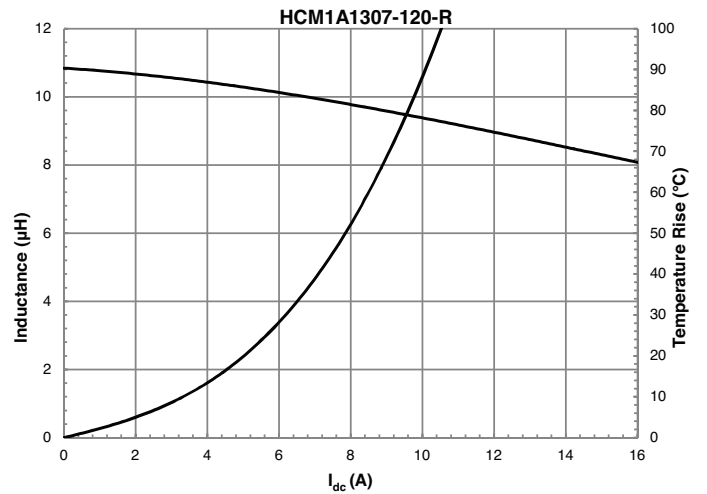
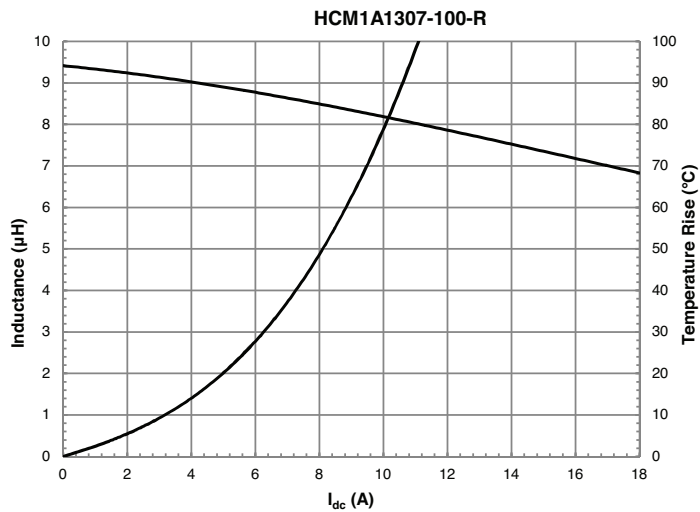
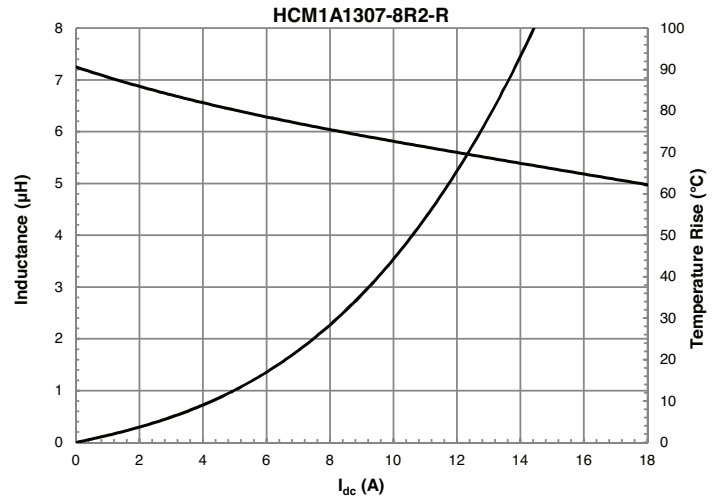
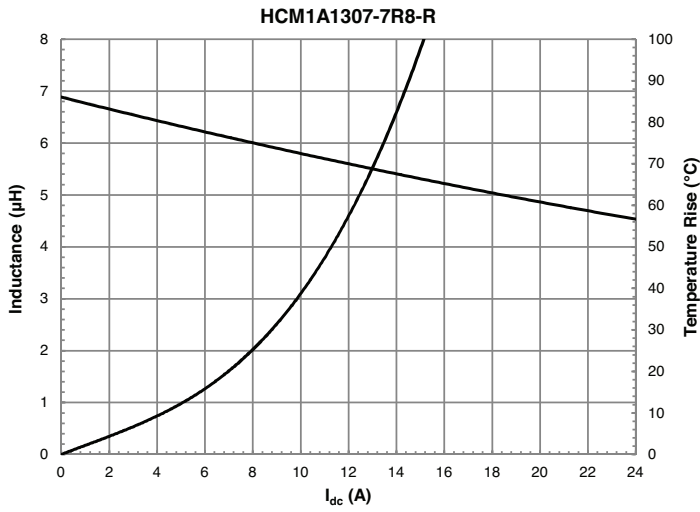


Inductance and temperature rise vs. current

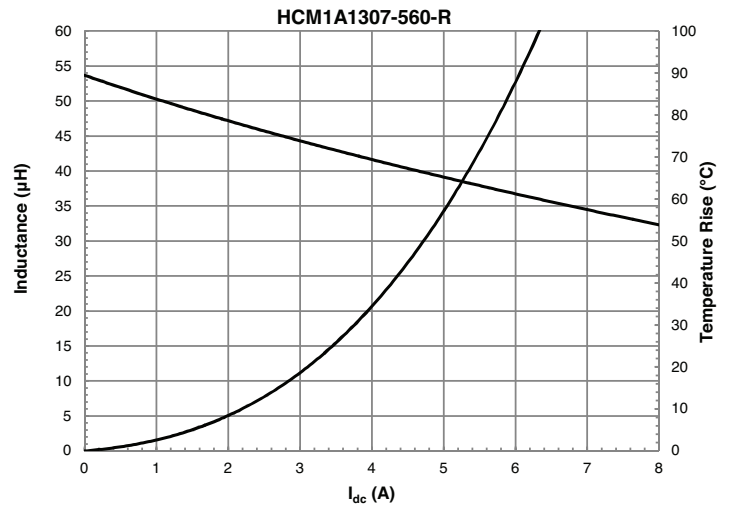
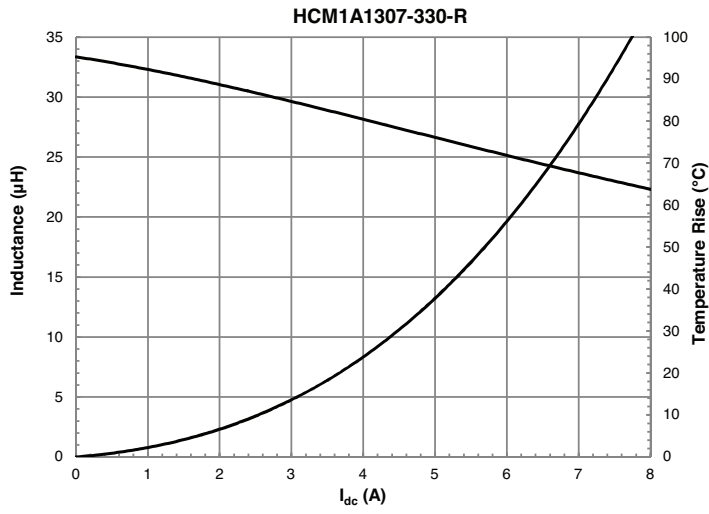




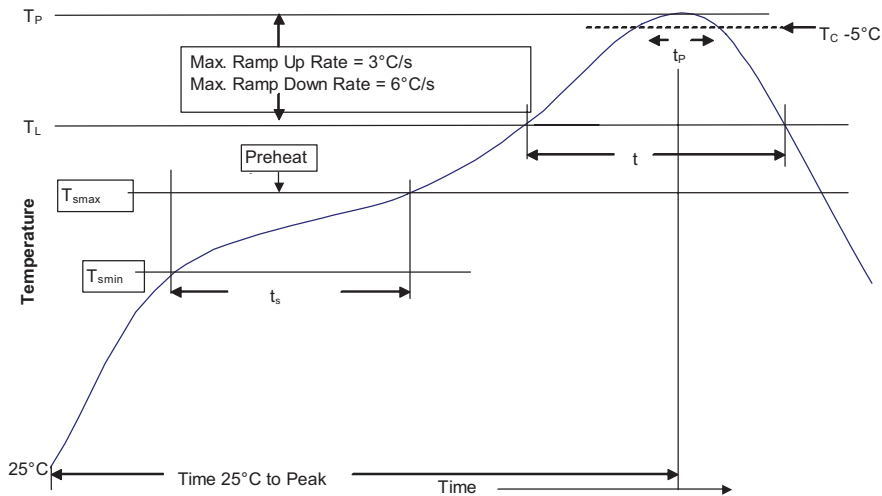
Inductance and temperature rise vs. current



Inductance and temperature rise vs. current



**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 JDEC 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
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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**Eaton**  
Electronics Division  
1000 Eaton Boulevard  
Cleveland, OH 44122  
United States  
www.eaton.com/electronics

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Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А