

# HCM1A0703

## 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 0.1  $\mu$ H to 33  $\mu$ H
- Current range from 1.6 A to 36 A
- 7.4 mm x 7.0 mm footprint surface mount package in a 3.0 mm height
- Alloy powder core material
- Moisture Sensitivity Level (MSL): 1
- 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 system
  - 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
  - Electronic stability control system (ESC)
- 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



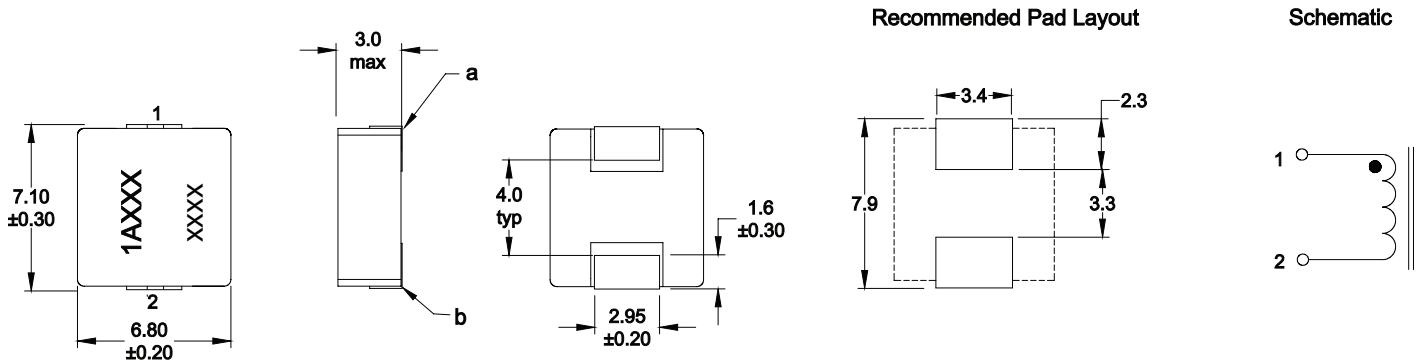
Product Specifications

| Part Number <sup>6</sup> | OCL <sup>1</sup><br>( $\mu\text{H}$ ) $\pm 20\%$ | FLL <sup>2</sup> ( $\mu\text{H}$ )<br>minimum | $I_{\text{rms}}^3$<br>(A) | $I_{\text{sat}}^4$<br>(A) | DCR (m $\Omega$ )<br>typical @ +20 °C | DCR (m $\Omega$ )<br>maximum @ +20 °C | K-factor <sup>5</sup> |
|--------------------------|--|---|---------------------------|---------------------------|---------------------------------------|---------------------------------------|-----------------------|
| HCM1A0703-R10-R          | 0.10   | 0.06  | 22                        | 28                        | 1.2                                   | 1.4                                   | 2737                  |
| HCM1A0703-R15-R          | 0.15   | 0.09  | 18.5                      | 36                        | 1.5                                   | 1.8                                   | 1358                  |
| HCM1A0703-R22-R          | 0.22   | 0.13  | 17                        | 24                        | 2.3                                   | 2.7                                   | 1386                  |
| HCM1A0703-R33-R          | 0.33   | 0.21  | 14                        | 19                        | 3.5                                   | 4.0                                   | 907                   |
| HCM1A0703-R47-R          | 0.47   | 0.30  | 12                        | 17                        | 3.7                                   | 4.2                                   | 818                   |
| HCM1A0703-R56-R          | 0.56   | 0.35  | 10.3                      | 14                        | 4.7                                   | 5.2                                   | 740                   |
| HCM1A0703-R68-R          | 0.68   | 0.43  | 10                        | 15                        | 5.0                                   | 5.5                                   | 574                   |
| HCM1A0703-R82-R          | 0.82   | 0.52  | 8.5                       | 14                        | 6.7                                   | 8.0                                   | 482                   |
| HCM1A0703-1R0-R          | 1.0  | 0.64  | 7.9                       | 13                        | 9.0                                   | 10                                    | 450                   |
| HCM1A0703-1R2-R          | 1.2  | 0.76  | 7.8                       | 11                        | 9.3                                   | 10.2                                  | 446                   |
| HCM1A0703-1R5-R          | 1.5  | 1.0   | 6.6                       | 11                        | 14                                    | 15.5                                  | 353                   |
| HCM1A0703-2R2-R          | 2.2  | 1.4   | 5.7                       | 10                        | 18                                    | 20                                    | 309                   |
| HCM1A0703-3R3-R          | 3.3  | 2.1   | 4.9                       | 9.0                       | 28                                    | 30                                    | 262                   |
| HCM1A0703-4R7-R          | 4.7  | 3.0   | 4.1                       | 8.8                       | 37                                    | 40                                    | 235                   |
| HCM1A0703-6R8-R          | 6.8  | 4.3   | 3.5                       | 6.4                       | 54                                    | 60                                    | 177                   |
| HCM1A0703-8R2-R          | 8.2  | 5.2   | 3.1                       | 5.6                       | 64                                    | 68                                    | 159                   |
| HCM1A0703-100-R          | 10   | 6.4   | 3.0                       | 4.4                       | 71                                    | 77.6                                  | 153                   |
| HCM1A0703-150-R          | 15   | 9.6   | 2.2                       | 4.0                       | 118                                   | 127                                   | 127                   |
| HCM1A0703-220-R          | 22   | 14.1  | 2.0                       | 3.4                       | 135                                   | 149                                   | 121                   |
| HCM1A0703-330-R          | 33   | 19.8  | 1.6                       | 2.3                       | 220                                   | 242                                   | 81                    |

- 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>rms</sub>, +25 °C
- I<sub>rms</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: HCM1A0703-xxx-R  
HCM1A0703 = 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)

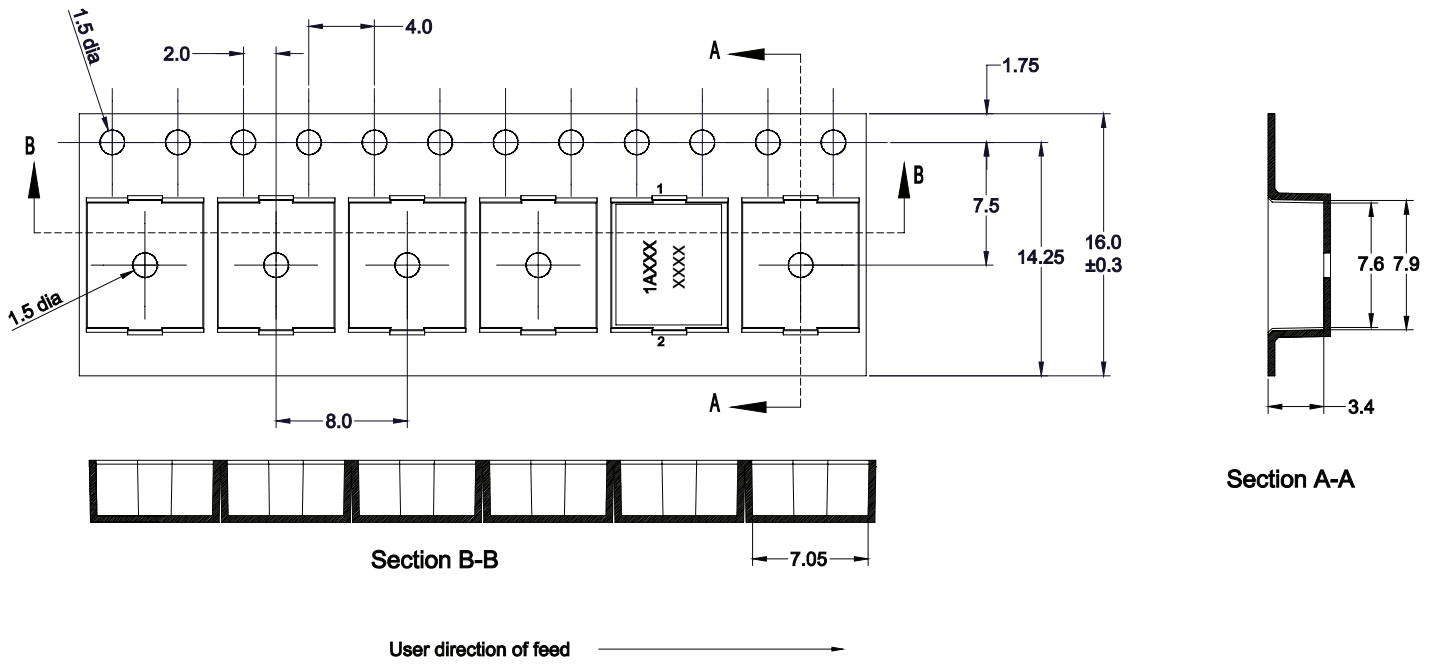


Part marking: 1AXXX=automotive grade, XXX=inductance value in  $\mu\text{H}$ , R=decimal point. If no R is present then last character equals number of zeros. xxxx= Lot code  
All soldering surfaces to be coplanar within 0.1 millimeters  
Tolerances are  $\pm 0.3$  millimeters unless stated otherwise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

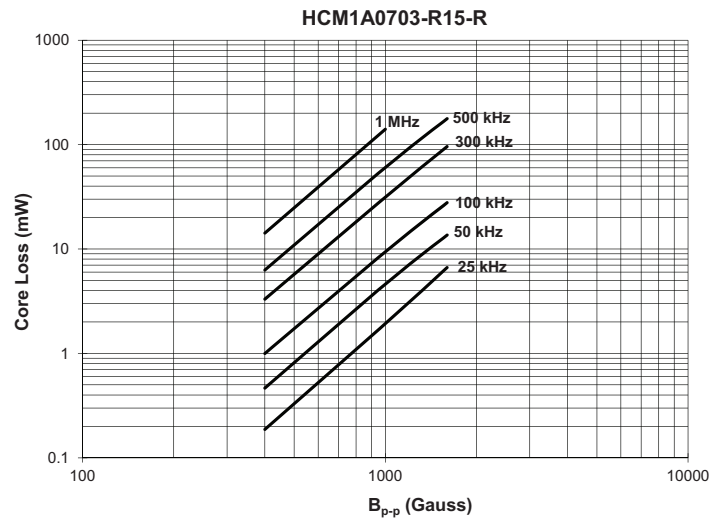
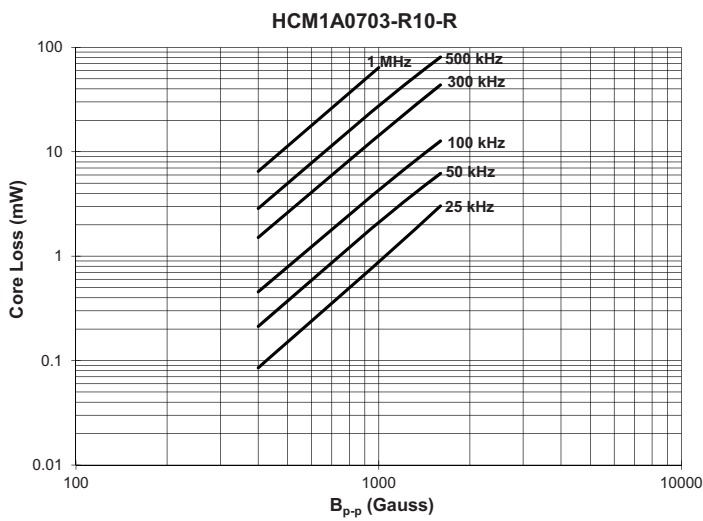
**Packaging information (mm)**

Drawing not to scale

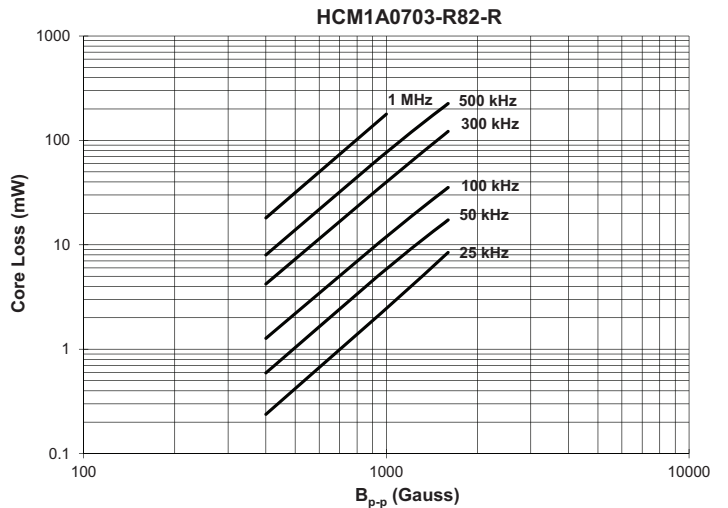
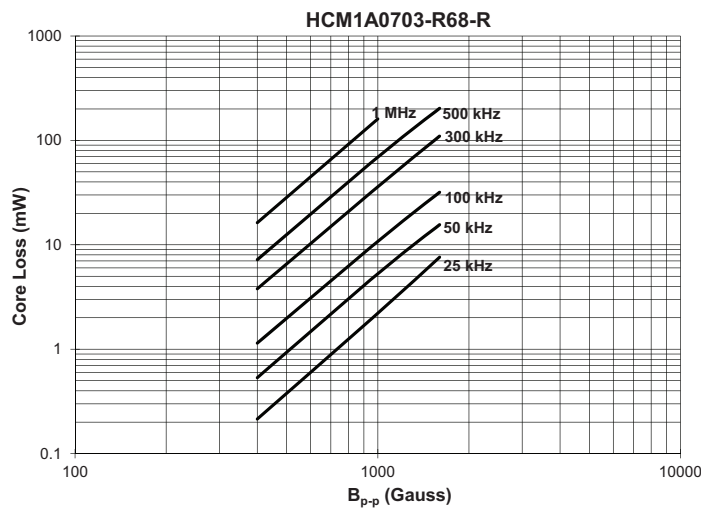
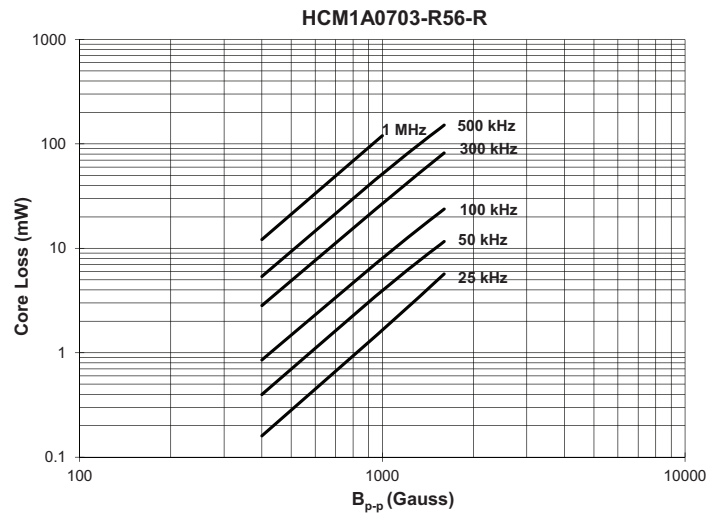
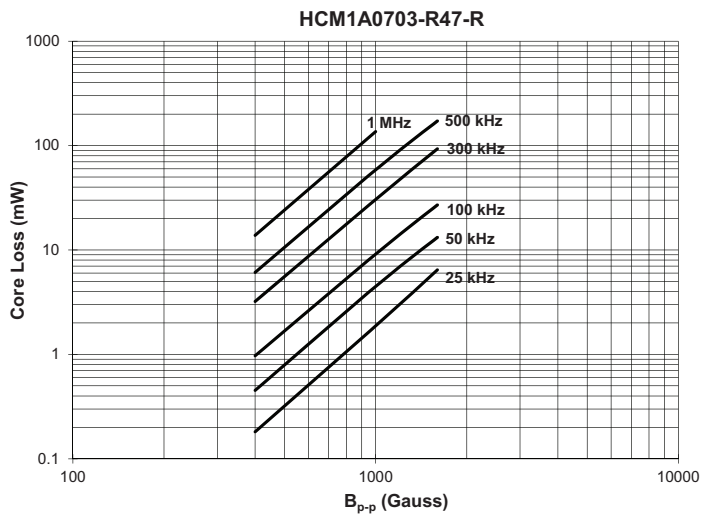
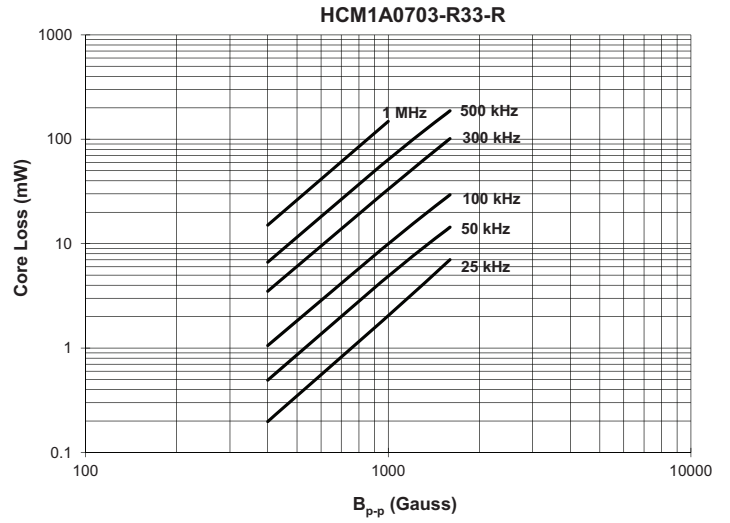
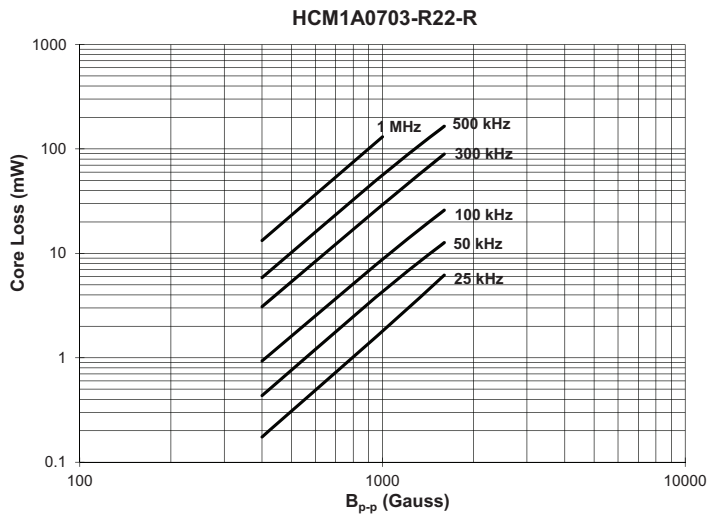
Supplied in tape and reel packaging, 2,000 parts per 13" diameter reel



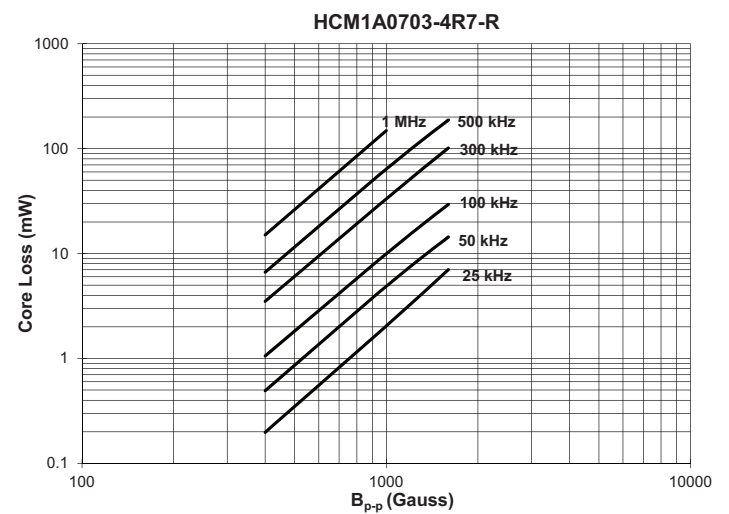
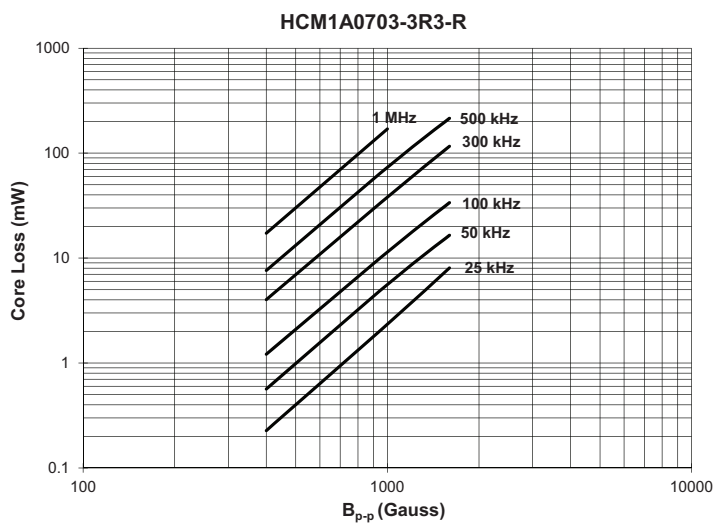
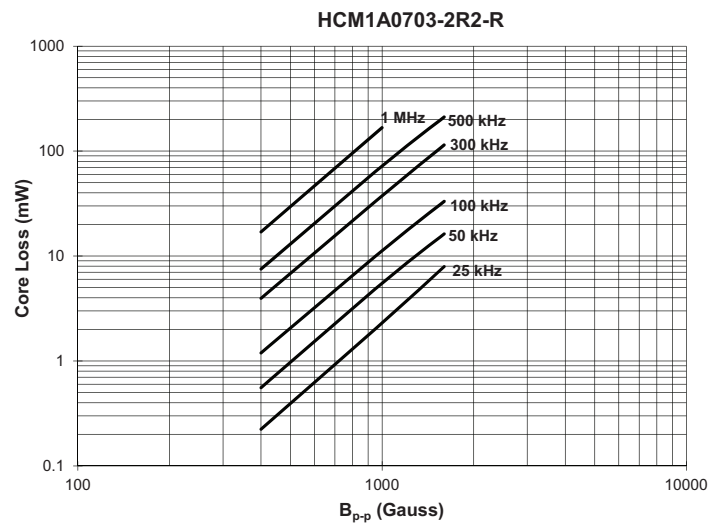
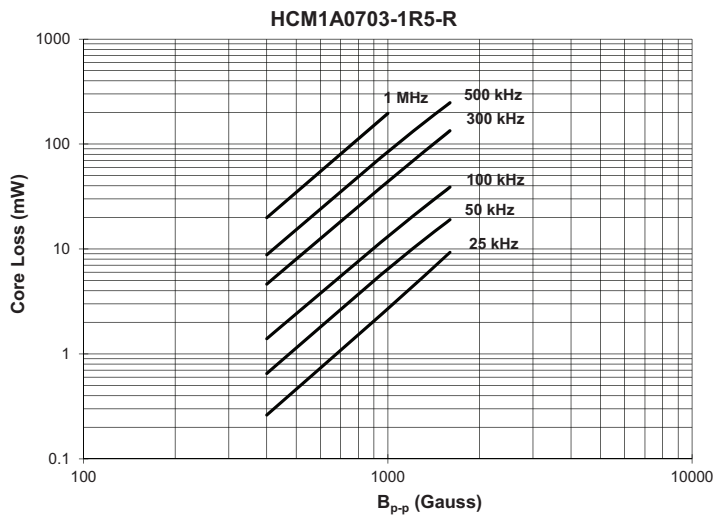
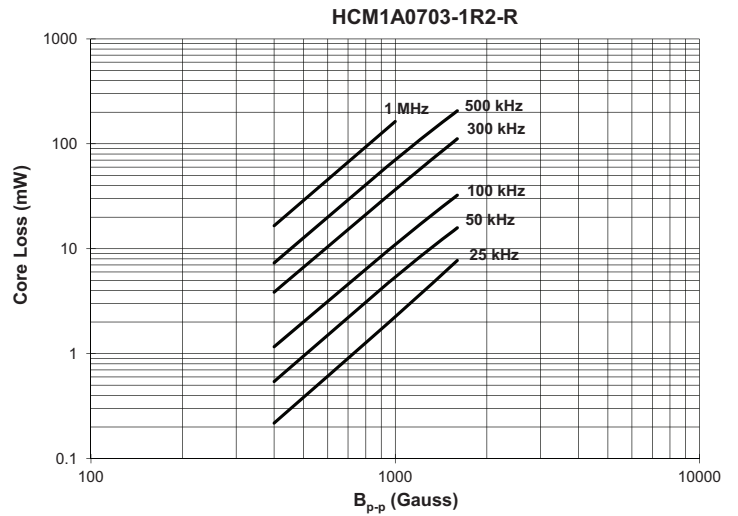
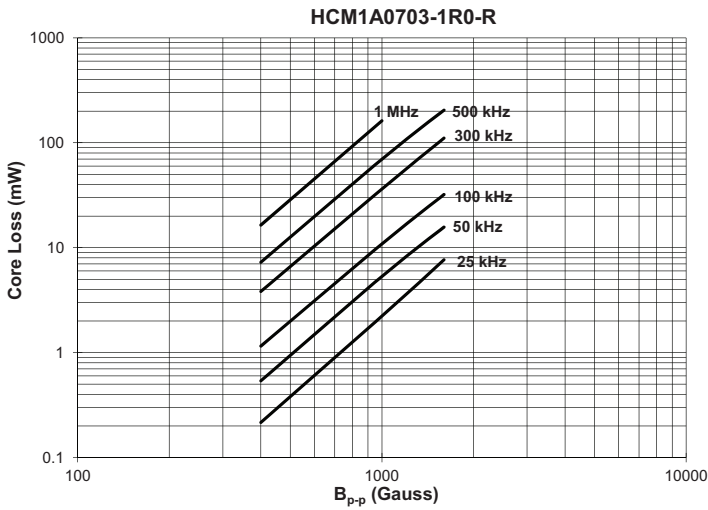
**Core loss vs Bp-p**



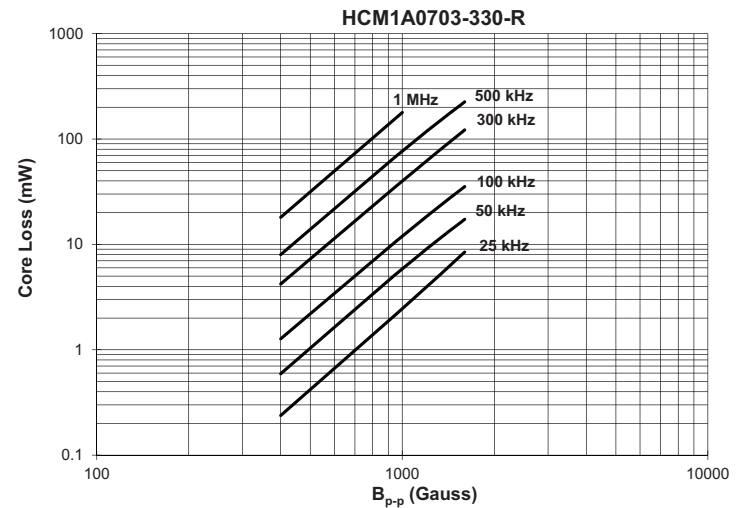
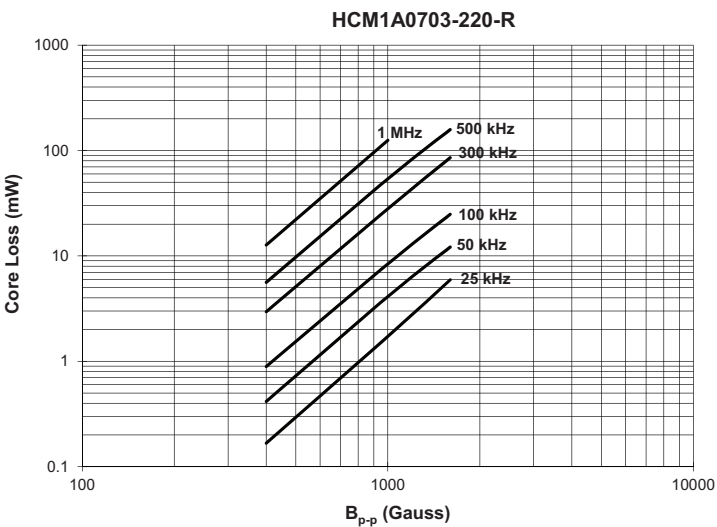
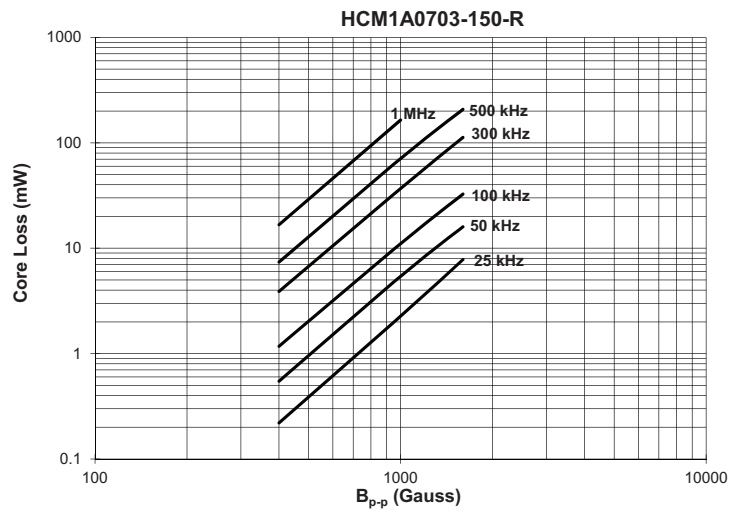
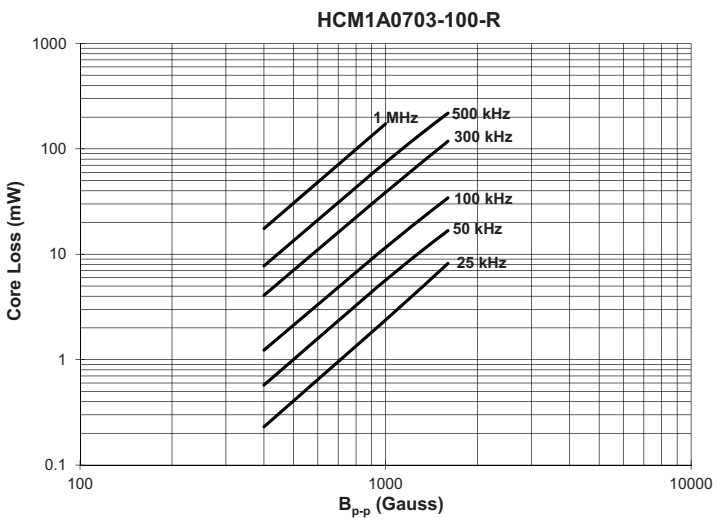
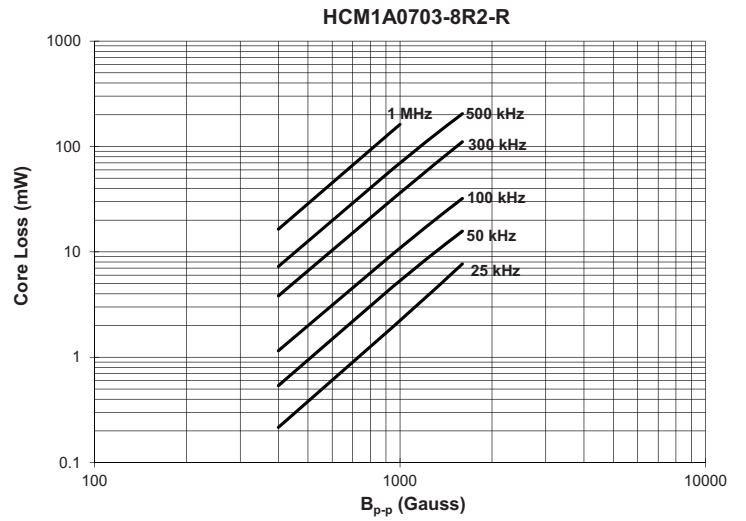
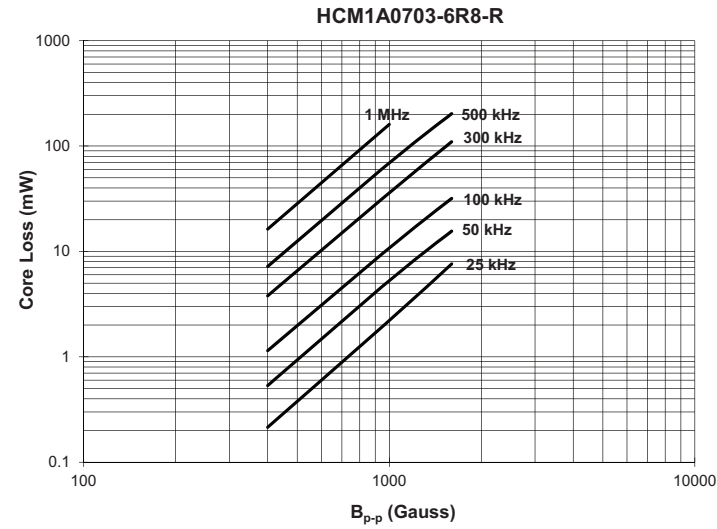
Core loss vs Bp-p



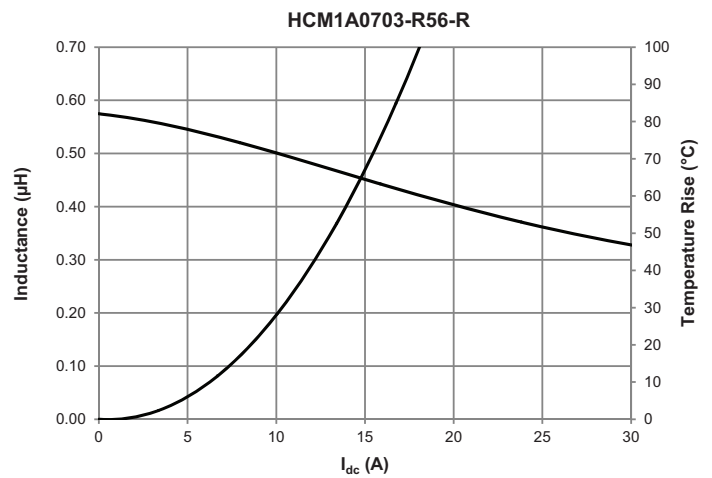
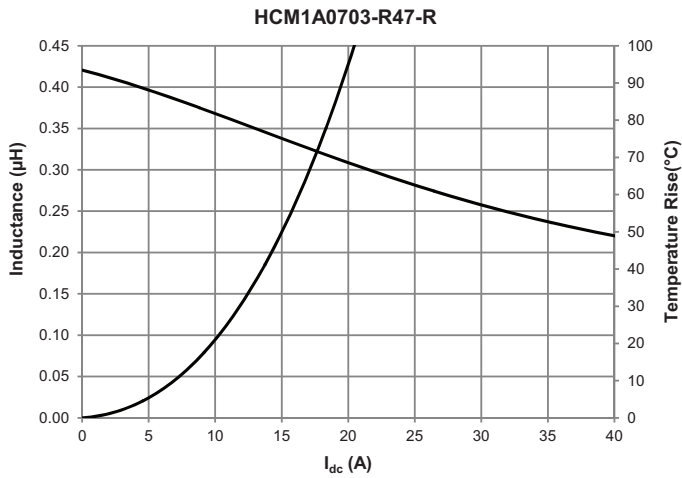
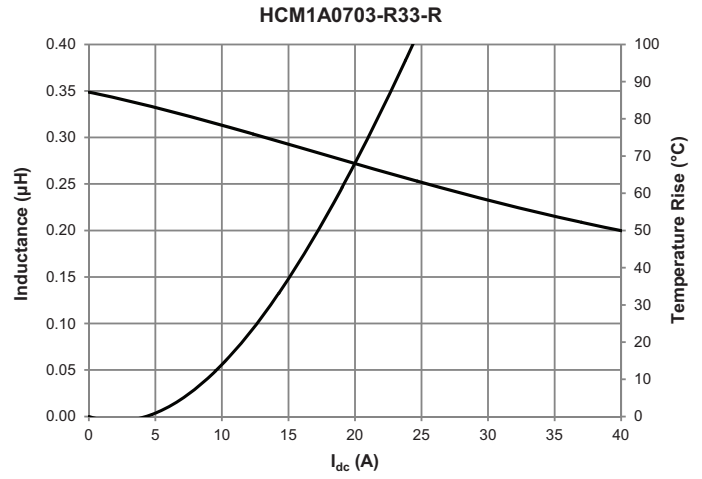
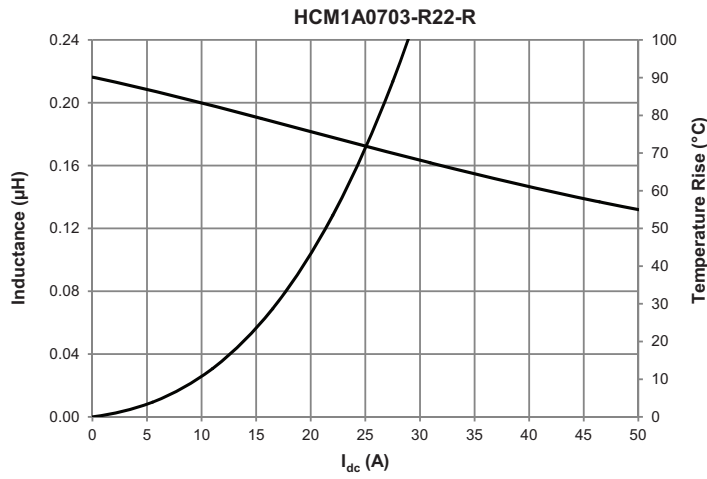
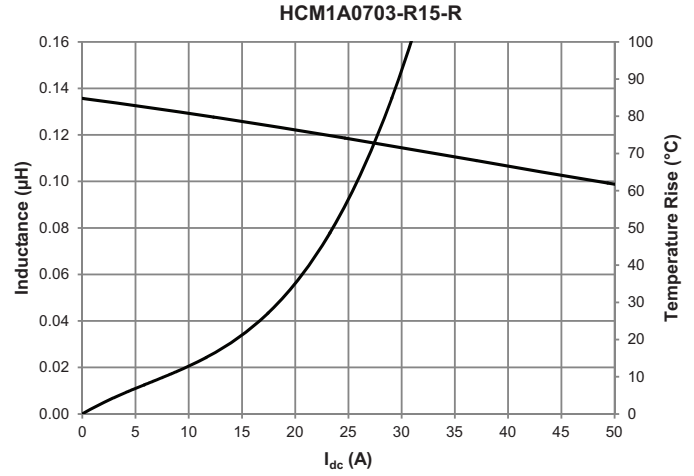
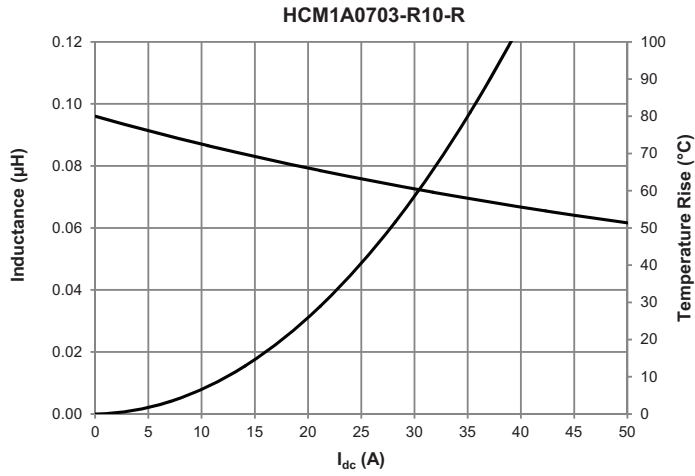
Core loss vs Bp-p



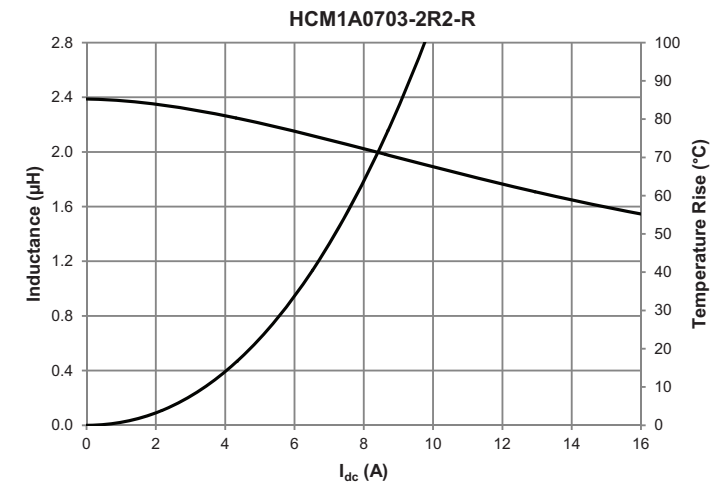
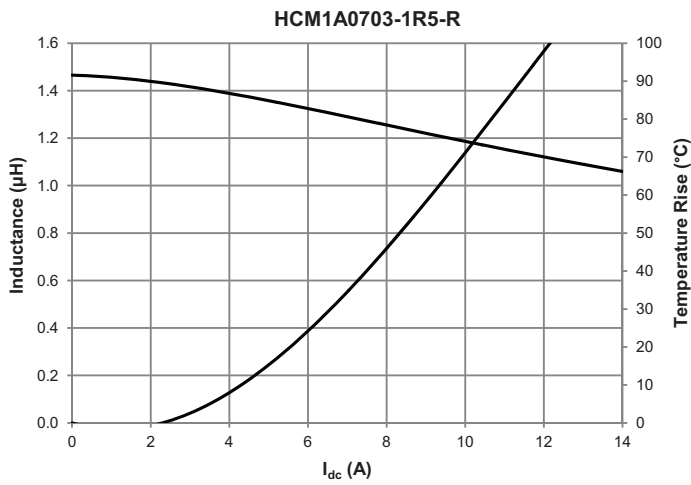
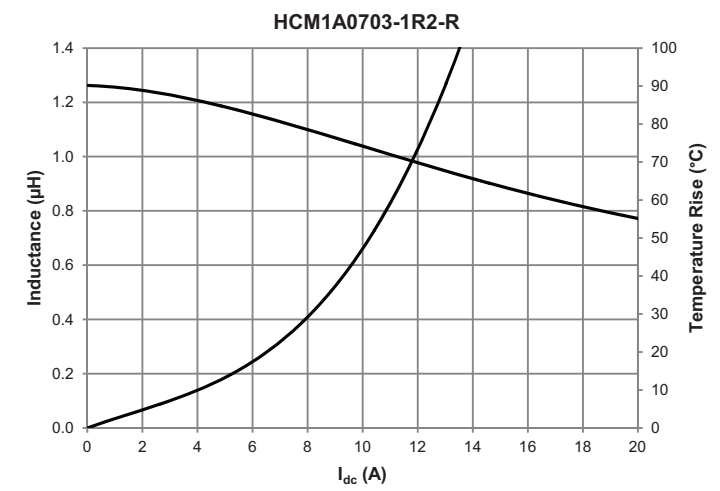
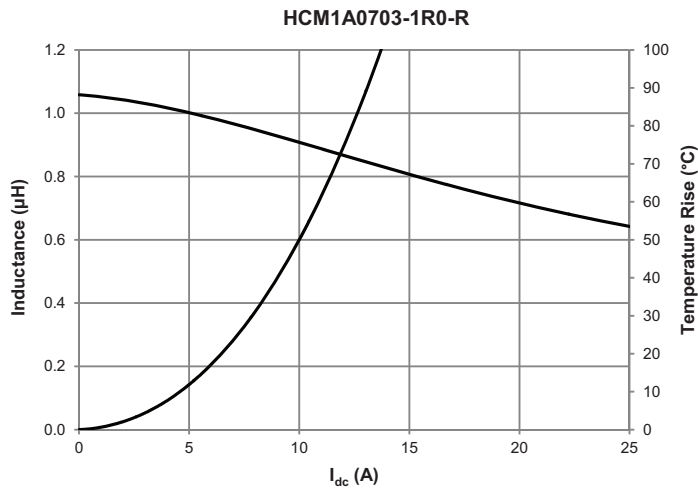
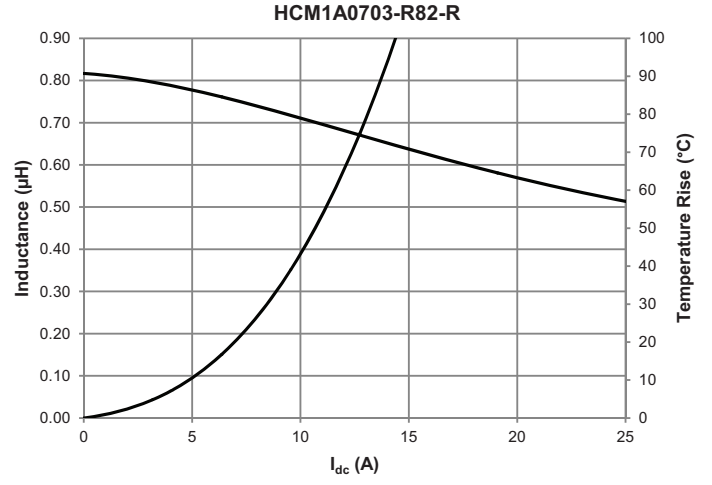
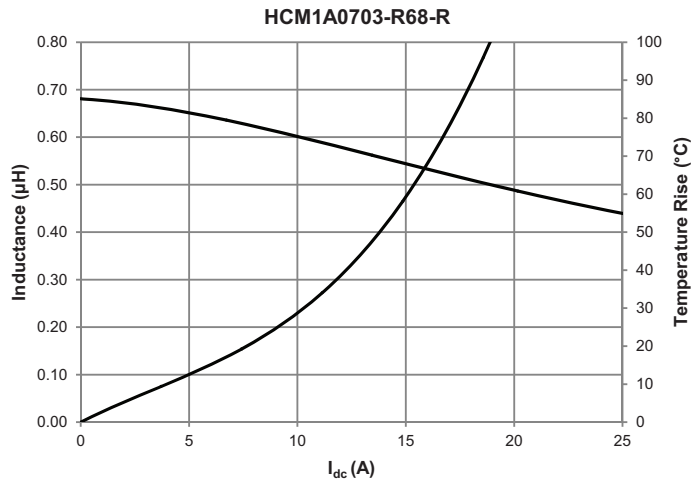
Core loss vs Bp-p



Inductance and temperature rise vs. current

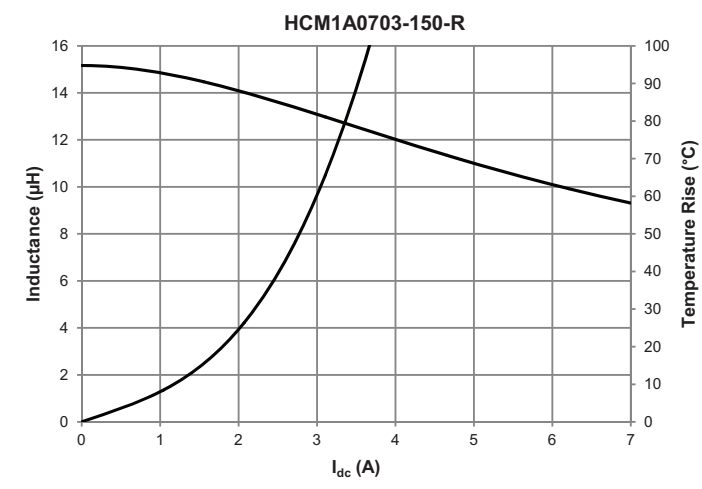
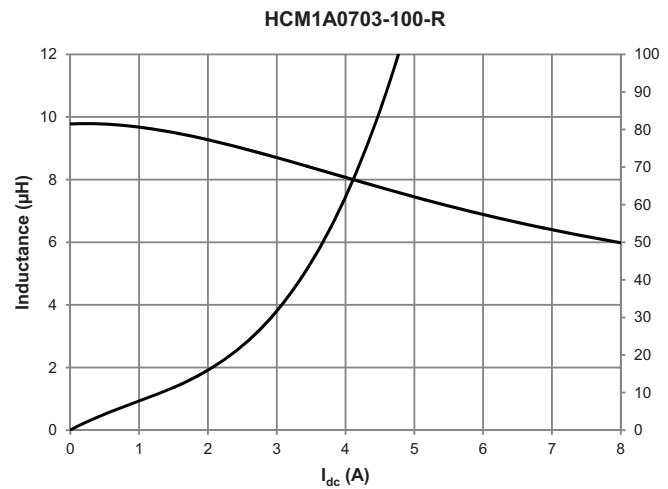
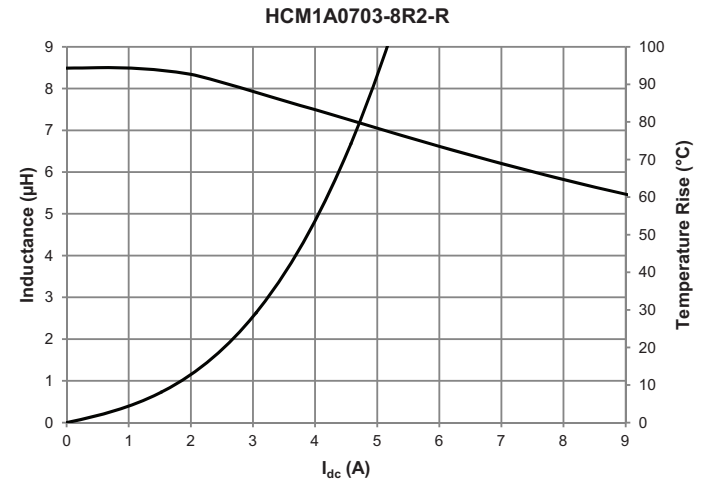
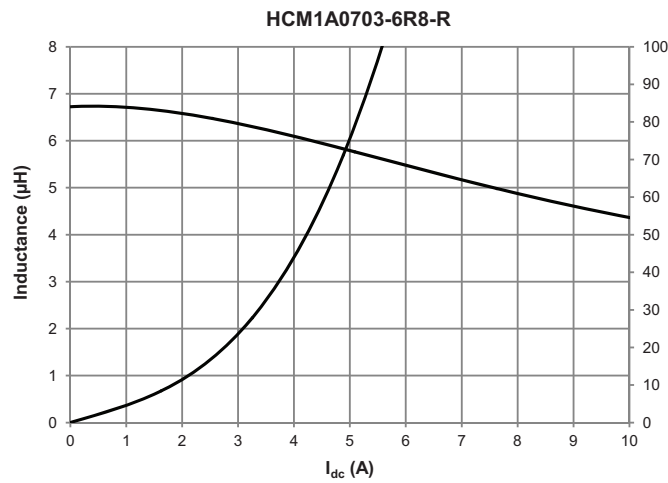
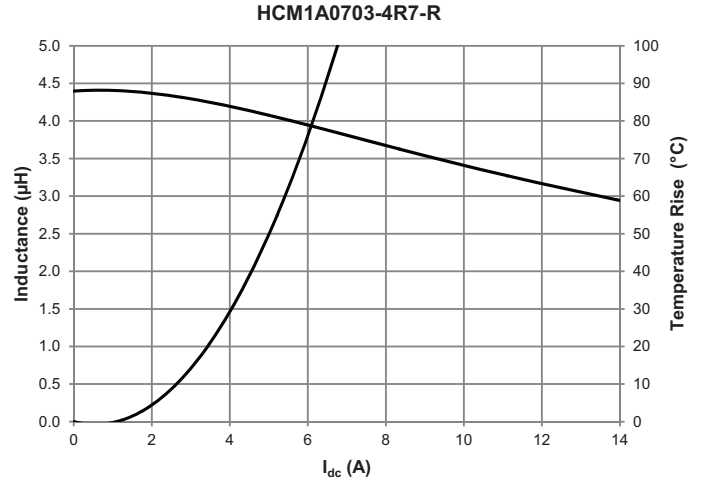
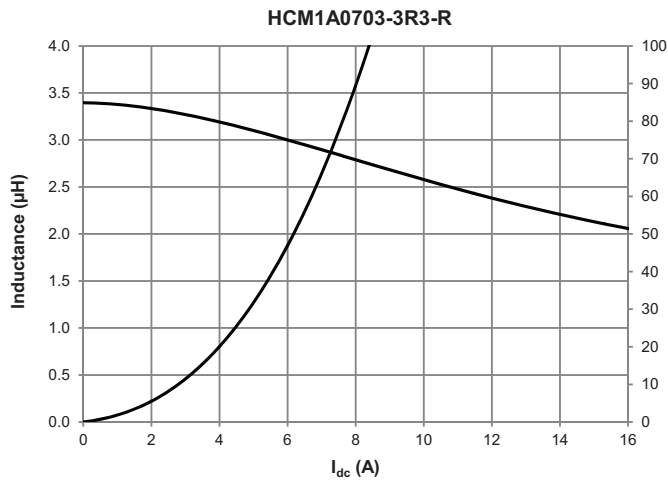


Inductance and temperature rise vs. current

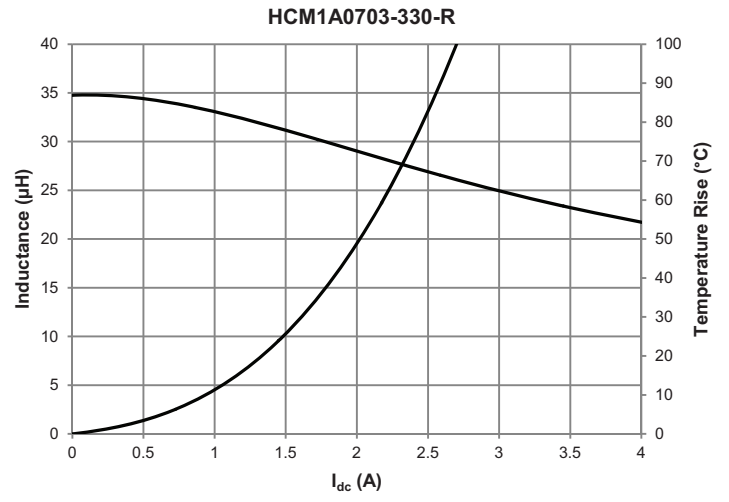
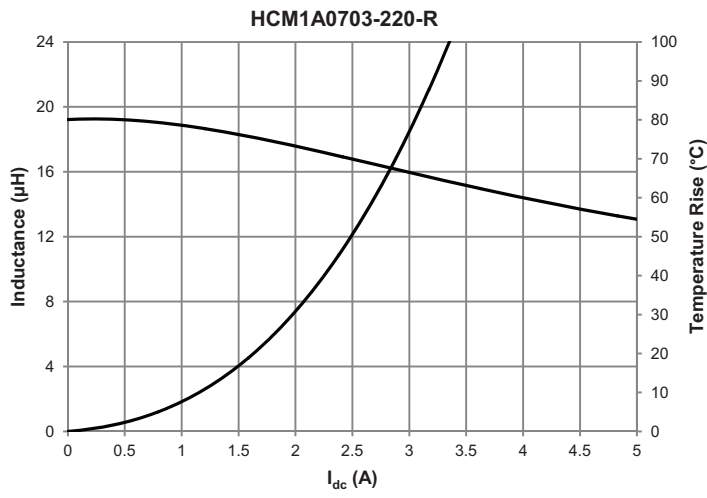




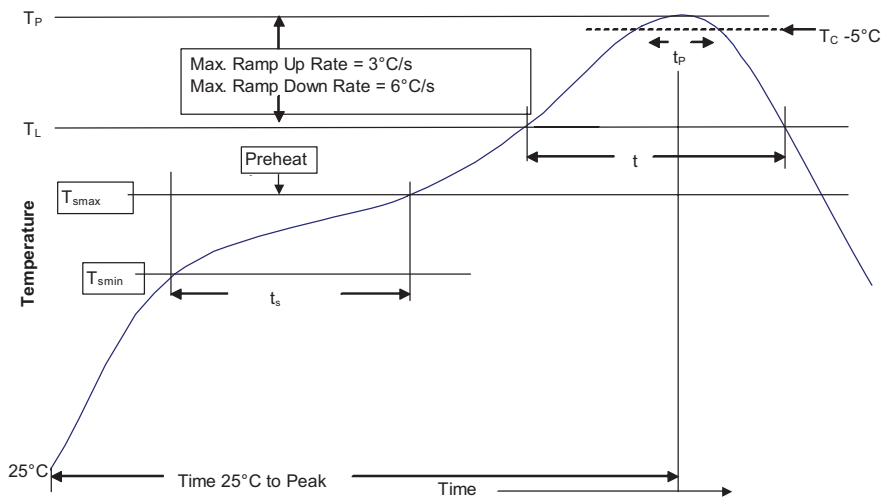
Inductance and temperature rise vs. current



**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 JEDEC 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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