HCM1A0703V2
Automotive grade high current power inductors

Product features
- AEC-Q200 qualified
- 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 33 μH
- Current range from 1.6 A to 54 A
- 7.3 mm x 6.8 mm footprint surface mount package in a 3.0 mm height
- Moisture Sensitivity Level (MSL): 1
- Alloy powder core material

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
  - 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

<table>
<thead>
<tr>
<th>Part number</th>
<th>OCL (μH) ± 20%</th>
<th>FLL (μH) minimum</th>
<th>I_{rms} (A)</th>
<th>I_{sat} (A)</th>
<th>DCR (mΩ) typical @ +20 °C</th>
<th>DCR (mΩ) maximum @ +20 °C</th>
<th>SRF (MHz) typical</th>
<th>K-factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCM1A0703V2-R10-R</td>
<td>0.10</td>
<td>0.064</td>
<td>29</td>
<td>54</td>
<td>0.63</td>
<td>0.8</td>
<td>350</td>
<td>1284</td>
</tr>
<tr>
<td>HCM1A0703V2-R15-R</td>
<td>0.15</td>
<td>0.090</td>
<td>24</td>
<td>30</td>
<td>1.03</td>
<td>1.3</td>
<td>195</td>
<td>1541</td>
</tr>
<tr>
<td>HCM1A0703V2-R22-R</td>
<td>0.22</td>
<td>0.130</td>
<td>18</td>
<td>32</td>
<td>1.8</td>
<td>2.3</td>
<td>150</td>
<td>1039</td>
</tr>
<tr>
<td>HCM1A0703V2-R33-R</td>
<td>0.33</td>
<td>0.210</td>
<td>15</td>
<td>19</td>
<td>2.9</td>
<td>3.5</td>
<td>95</td>
<td>823</td>
</tr>
<tr>
<td>HCM1A0703V2-R47-R</td>
<td>0.47</td>
<td>0.300</td>
<td>13</td>
<td>17</td>
<td>3.7</td>
<td>4.14</td>
<td>70</td>
<td>713</td>
</tr>
<tr>
<td>HCM1A0703V2-R56-R</td>
<td>0.56</td>
<td>0.350</td>
<td>13</td>
<td>12</td>
<td>3.8</td>
<td>4.5</td>
<td>60</td>
<td>805</td>
</tr>
<tr>
<td>HCM1A0703V2-R68-R</td>
<td>0.68</td>
<td>0.430</td>
<td>12</td>
<td>13</td>
<td>4.8</td>
<td>5.5</td>
<td>57</td>
<td>843</td>
</tr>
<tr>
<td>HCM1A0703V2-R82-R</td>
<td>0.82</td>
<td>0.520</td>
<td>10</td>
<td>14</td>
<td>5.7</td>
<td>6.6</td>
<td>55</td>
<td>608</td>
</tr>
<tr>
<td>HCM1A0703V2-1R0-R</td>
<td>1.00</td>
<td>0.64</td>
<td>10</td>
<td>9.0</td>
<td>6.5</td>
<td>7.8</td>
<td>48</td>
<td>627</td>
</tr>
<tr>
<td>HCM1A0703V2-1R2-R</td>
<td>1.2</td>
<td>0.76</td>
<td>9</td>
<td>12</td>
<td>8.6</td>
<td>9.9</td>
<td>35</td>
<td>434</td>
</tr>
<tr>
<td>HCM1A0703V2-1R5-R</td>
<td>1.5</td>
<td>0.96</td>
<td>8.5</td>
<td>10</td>
<td>9.5</td>
<td>11.5</td>
<td>35</td>
<td>445</td>
</tr>
<tr>
<td>HCM1A0703V2-2R2-R</td>
<td>2.2</td>
<td>1.40</td>
<td>7.0</td>
<td>8.5</td>
<td>12.5</td>
<td>15.5</td>
<td>29</td>
<td>532</td>
</tr>
<tr>
<td>HCM1A0703V2-3R3-R</td>
<td>3.3</td>
<td>2.10</td>
<td>5.0</td>
<td>7.5</td>
<td>24.5</td>
<td>28.5</td>
<td>25</td>
<td>281</td>
</tr>
<tr>
<td>HCM1A0703V2-4R7-R</td>
<td>4.7</td>
<td>3.00</td>
<td>4.0</td>
<td>8.8</td>
<td>40.3</td>
<td>46.5</td>
<td>20</td>
<td>227</td>
</tr>
<tr>
<td>HCM1A0703V2-6R8-R</td>
<td>6.8</td>
<td>4.30</td>
<td>3.6</td>
<td>5.6</td>
<td>54</td>
<td>65</td>
<td>16</td>
<td>276</td>
</tr>
<tr>
<td>HCM1A0703V2-8R2-R</td>
<td>8.2</td>
<td>5.20</td>
<td>3.5</td>
<td>4.8</td>
<td>53</td>
<td>64</td>
<td>14</td>
<td>173</td>
</tr>
<tr>
<td>HCM1A0703V2-100-R</td>
<td>10</td>
<td>6.40</td>
<td>3.3</td>
<td>4.4</td>
<td>65</td>
<td>75</td>
<td>12</td>
<td>177</td>
</tr>
<tr>
<td>HCM1A0703V2-150-R</td>
<td>15</td>
<td>9.60</td>
<td>2.6</td>
<td>3.6</td>
<td>96</td>
<td>110</td>
<td>9.5</td>
<td>147</td>
</tr>
<tr>
<td>HCM1A0703V2-220-R</td>
<td>22</td>
<td>14.1</td>
<td>2.0</td>
<td>2.9</td>
<td>135</td>
<td>149</td>
<td>7.0</td>
<td>134</td>
</tr>
<tr>
<td>HCM1A0703V2-330-R</td>
<td>33</td>
<td>19.8</td>
<td>1.6</td>
<td>2.3</td>
<td>200</td>
<td>242</td>
<td>6.5</td>
<td>92</td>
</tr>
</tbody>
</table>

1. Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.25 V_{rms}, 0.0 A_{dc}, +25 °C
2. Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.25 V_{rms}, I_{sat}, +25 °C
3. I_{rms}: DC current for an approximate temperature rise of 30 °C without core loss. Operating 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. I_{sat}: Peak current for approximately 20% rolloff @ +25 °C
5. K-factor: Used to determine B_{p-p} for core loss (see graph). B_{p-p} = K * L * ΔI
6. Part Number Definition: HCM1A0703V2-xxx-R
   - HCM1A0703V2 = 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)

![Dimensions Diagram](image)

### Recommended pad layout

![Recommended Pad Layout](image)

Part marking: 1AxxV2, xxx = inductance value in μH, 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 ±0.3 millimeters unless stated otherwise

Pad layout tolerances are ±0.1 millimeters unless stated otherwise

DCR measured from point “a” to point “b”

Do not route traces or vias underneath the inductor

www.eaton.com/electronics
HCM1A0703V2
Automotive grade high current power inductors

Packaging information (mm)
Drawing not to scale
Supplied in tape and reel packaging, 2000 parts per 13” diameter reel

Core loss vs $B_{p-p}$

HCM1A0703V2-R10-R

HCM1A0703V2-R15-R

HCM1A0703V2-R22-R

HCM1A0703V2-R33-R
Core loss vs $B_{p-p}$

- **HCM1A0703V2-R47-R**
- **HCM1A0703V2-R56-R**
- **HCM1A0703V2-R68-R**
- **HCM1A0703V2-R82-R**
- **HCM1A0703V2-1R0-R**
- **HCM1A0703V2-1R2-R**

www.eaton.com/electronics
Core loss vs $B_{pp}$

**HCM1A0703V2-1R5-R**

- 700 kHz
- 500 kHz
- 300 kHz
- 100 kHz
- 50 kHz

**HCM1A0703V2-2R2-R**

- 700 kHz
- 500 kHz
- 300 kHz
- 100 kHz
- 50 kHz

**HCM1A0703V2-3R3-R**

- 700 kHz
- 500 kHz
- 300 kHz
- 100 kHz
- 50 kHz

**HCM1A0703V2-4R7-R**

- 700 kHz
- 500 kHz
- 300 kHz
- 100 kHz
- 50 kHz

**HCM1A0703V2-6R8-R**

- 700 kHz
- 500 kHz
- 300 kHz
- 100 kHz
- 50 kHz

**HCM1A0703V2-8R2-R**

- 700 kHz
- 500 kHz
- 300 kHz
- 100 kHz
- 50 kHz
Core loss vs B_{p-p}
Inductance and impedance vs. frequency

HCM1A0703V2-R10-R

HCM1A0703V2-R15-R

HCM1A0703V2-R22-R

HCM1A0703V2-R33-R

HCM1A0703V2-R47-R

HCM1A0703V2-R56-R
Inductance and impedance vs. frequency
Technical Data 10911
Effective April 2019

HCM1A0703V2
Automotive grade high current power inductors

Inductance and impedance vs. frequency

Inductance and temperature rise vs. current
Inductance and temperature rise vs. current

![Graphs showing inductance and temperature rise vs. current for different models of HCM1A0703V2 inductors.](www.eaton.com/electronics)
Inductance and temperature rise vs. current

HCM1A0703V2-1R5-R

HCM1A0703V2-2R2-R

HCM1A0703V2-3R3-R

HCM1A0703V2-4R7-R

HCM1A0703V2-6R8-R

HCM1A0703V2-8R2-R
Inductance and temperature rise vs. current

HCM1A0703V2-100-R

HCM1A0703V2-150-R

HCM1A0703V2-220-R

HCM1A0703V2-330-R
Solder reflow profile

![Solder reflow profile diagram]

Table 1 - Standard SnPb Solder ($T_c$)

<table>
<thead>
<tr>
<th>Package Thickness</th>
<th>Volume $&lt;350$</th>
<th>Volume $\geq 350$</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.5 mm</td>
<td>235 °C</td>
<td>220 °C</td>
</tr>
<tr>
<td>≥2.5 mm</td>
<td>220 °C</td>
<td>220 °C</td>
</tr>
</tbody>
</table>

Table 2 - Lead (Pb) Free Solder ($T_c$)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1.6 mm</td>
<td>260 °C</td>
<td>260 °C</td>
<td>260 °C</td>
</tr>
<tr>
<td>1.6 – 2.5 mm</td>
<td>260 °C</td>
<td>250 °C</td>
<td>245 °C</td>
</tr>
<tr>
<td>≥2.5 mm</td>
<td>250 °C</td>
<td>245 °C</td>
<td>245 °C</td>
</tr>
</tbody>
</table>

Reference J-STD-020

<table>
<thead>
<tr>
<th>Profile Feature</th>
<th>Standard SnPb Solder</th>
<th>Lead (Pb) Free Solder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preheat and Soak</td>
<td>• Temperature min. ($T_{smin}$) 100 °C</td>
<td>• Temperature max. ($T_{smax}$) 150 °C</td>
</tr>
<tr>
<td></td>
<td>• Temperature max. ($T_{smax}$) 150 °C</td>
<td>• Temperature max. ($T_{smax}$) 200 °C</td>
</tr>
<tr>
<td></td>
<td>• Time ($T_{smin}$ to $T_{smax}$) (ts) 60-120 Seconds</td>
<td>• Time ($T_{smin}$ to $T_{smax}$) (ts) 60-120 Seconds</td>
</tr>
<tr>
<td></td>
<td>Average ramp up rate ($T_{smax}$ to $T_p$) 3°C/ Second Max.</td>
<td>Average ramp up rate ($T_{smax}$ to $T_p$) 3 °C/ Second Max.</td>
</tr>
<tr>
<td></td>
<td>Liquidous temperature ($T_L$) 183 °C</td>
<td>Liquidous temperature ($T_L$) 217 °C</td>
</tr>
<tr>
<td></td>
<td>Time at liquidous ($t_L$) 60-150 Seconds</td>
<td>Time at liquidous ($t_L$) 60-150 Seconds</td>
</tr>
<tr>
<td></td>
<td>Peak package body temperature ($T_p$)*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Table 1</td>
<td>Table 2</td>
</tr>
<tr>
<td></td>
<td>Time ($T_p$)** within 5 °C of the specified classification temperature ($T_c$) 20 Seconds**</td>
<td>Time ($T_p$)** within 5 °C of the specified classification temperature ($T_c$) 30 Seconds**</td>
</tr>
<tr>
<td></td>
<td>Average ramp-down rate ($T_p$ to $T_{smax}$) 6 °C/ Second Max.</td>
<td>Average ramp-down rate ($T_p$ to $T_{smax}$) 6 °C/ Second Max.</td>
</tr>
<tr>
<td></td>
<td>Time 25 °C to Peak Temperature 6 Minutes Max.</td>
<td>Time 25 °C to Peak Temperature 8 Minutes Max.</td>
</tr>
</tbody>
</table>

* 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.

Life Support Policy: Eaton does not authorize the use of any of its products for use in life support devices or systems without the express written approval of an officer of the Company. Life support systems are devices which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

Eaton reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Eaton also reserves the right to change or update, without notice, any technical information contained in this bulletin.

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

Follow us on social media to get the latest product and support information.

© 2019 Eaton
All Rights Reserved
Published in USA
Publication No. 10911 BL-MC19047
April 2019

Eaton is a registered trademark.
All other trademarks are property of their respective owners.