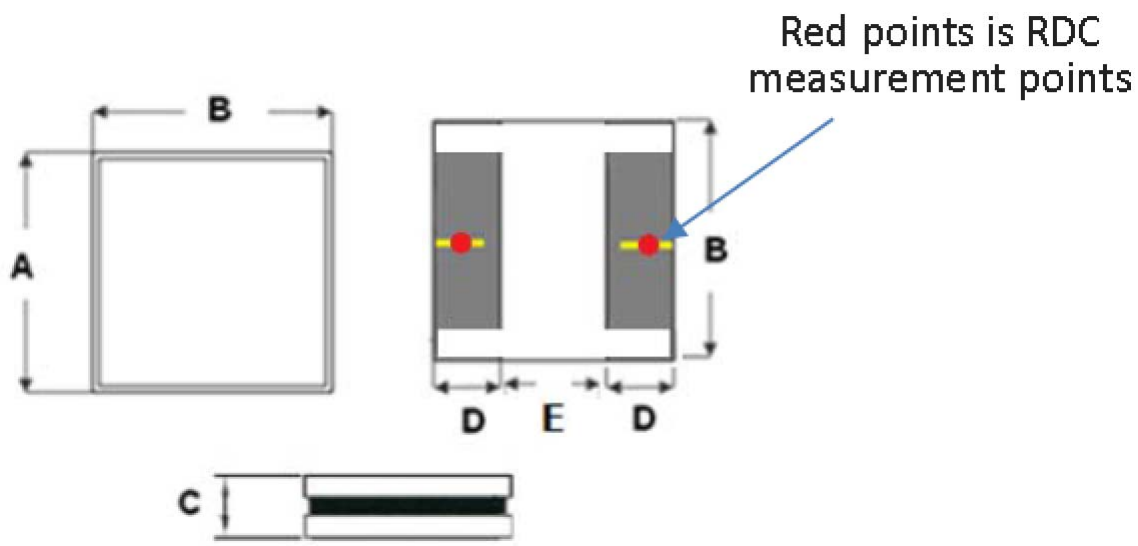
## FEATURES

- Low profile
- Low DCR
- Large Current Adaptable
- High Frequency(up to 1MHz)

## APPLICATIONS

- Laptop Computer / Notebook Computer
- Graphic Card/ VGA Module
- DC/DC converter or VRM applications
- Thin type on-board power supply module for exchanger
- Inductor for general purpose use

## CONFIGURATIONS & DIMENSIONS ( unit in mm )




| Series | A | B | C | D | E |
|---|---|---|---|---|---|
| HAP4020 | 4.0 ± 0.2 | 4.0 ± 0.2 | 1.8 ± 0.2 | 1.2 Ref | 1.6 Ref |

## Electrical characteristics

| Part Number | Inductance (uH) | Test Frequency (KHz) | DCR (mΩ) Max. | I sat (A) typ. | I rms (A) typ |
|---|---|---|---|---|---|
| HAP4020A-R33M | 0.33 | 100 | 10 | 14.0 | 7.0 |
| HAP4020A-R47M | 0.47 | 100 | 17 | 12.0 | 6.0 |
| HAP4020A-1R0M | 1.00 | 100 | 35 | 7.5 | 4.5 |
| HAP4020A-1R5M | 1.50 | 100 | 45 | 6.5 | 3.8 |
| HAP4020A-2R2M | 2.20 | 100 | 55 | 5.5 | 3.5 |
| HAP4020A-3R3M | 3.30 | 100 | 75 | 4.5 | 3.0 |
| HAP4020A-4R7M | 4.70 | 100 | 95 | 3.8 | 2.3 |
| HAP4020A-5R6M | 5.60 | 100 | 105 | 3.4 | 2.0 |
| HAP4020A-6R8M | 6.80 | 100 | 120 | 3.0 | 1.6 |
| HAP4020A-100M | 10.00 | 100 | 160 | 2.5 | 1.3 |

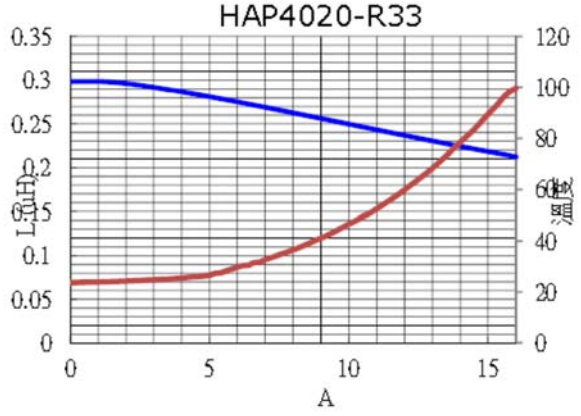
Inductance Tolerance (N = 30% , M = 20%)

Notes

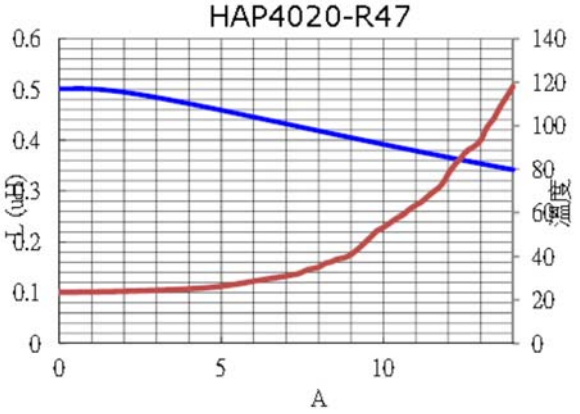
1.All test data is referenced to 25 °C ambient
2.Operating temperature range - 40 °C to + 125 °C
3.Idc(A):DC current (A) that will cause an approximate ΔT of 40 °C (reference ambient temperature is 25 °C)
4.Isat(A):DC current (A) that will cause L0 to drop approximately 30 %
5.If Use wave soldering is there will be some risk.(Crack、unwitting& Mark Shedding).
6.Re-flow soldering temperatures below 240 degrees,there will be unwitting risk.
7. When total area of exposed wire occurring to each sides is not greater than 75% of coating resin area, that is acceptable.

## CURRENT CHARACTERISTICS

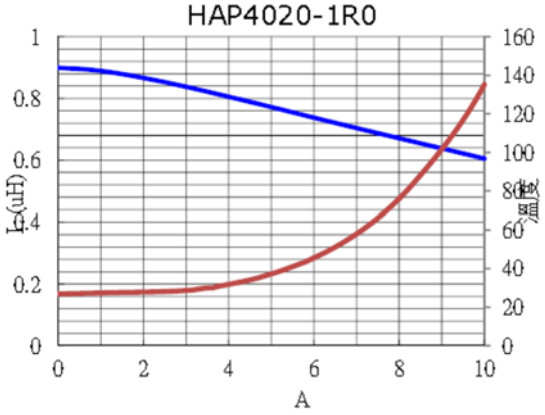
HAP4020-R33



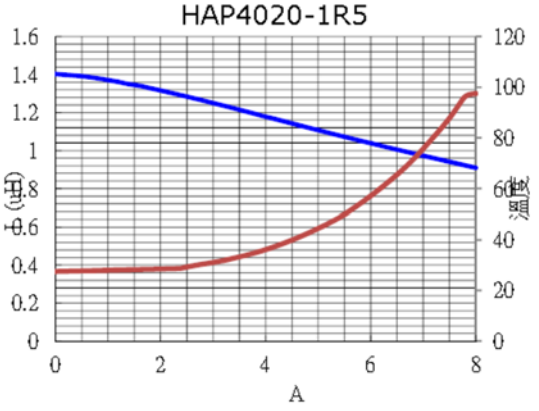

HAP4020-R47



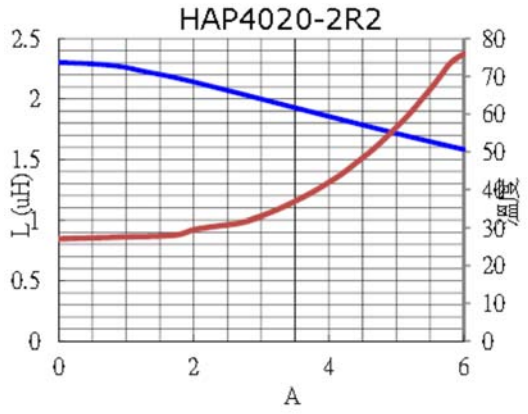

HAP4020-1R0



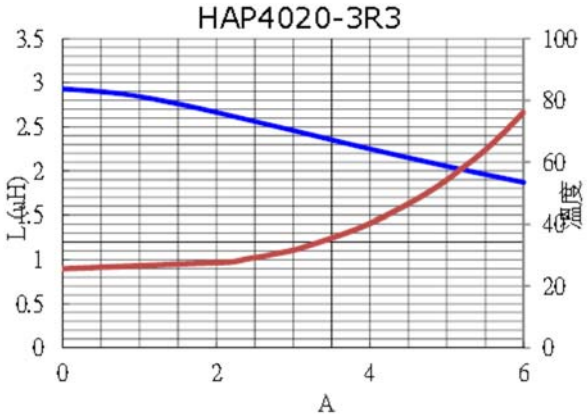

HAP4020-1R5



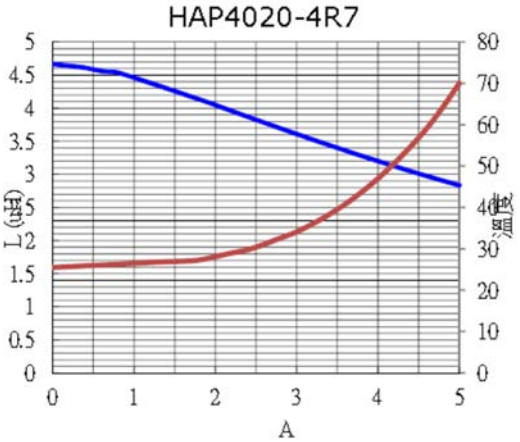

HAP4020-2R2



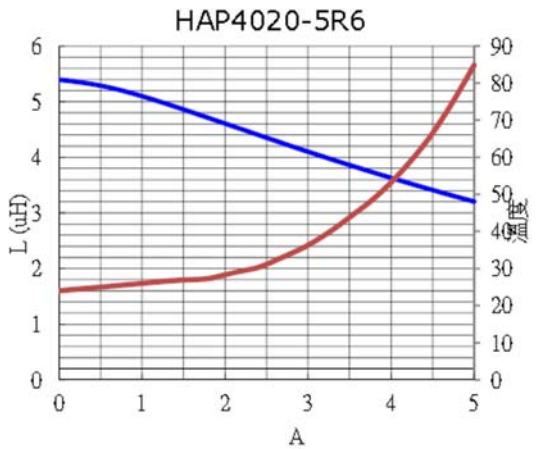

HAP4020-3R3

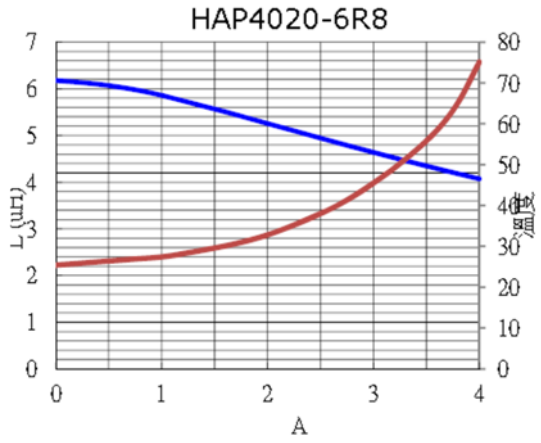


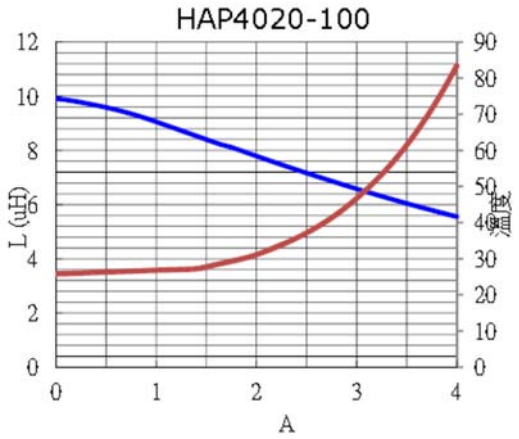

HAP4020-4R7




HAP4020-5R6





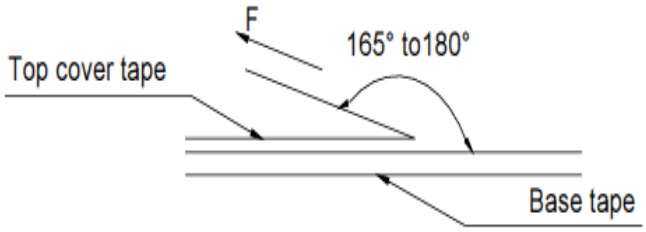




## Packaging Information

Packaging Quantity

| Chip size | Chip/Reel |
|---|---|
| HAP4020 | 2000 |

### Tearing Off Force




The force for tearing off cover tape is 15 to 80 grams in the arrow direction under the following conditions.

| Room Temp. (℃) | Room Humidity (%) | Room atm (hPa) | Tearing Speed mm/min |
|---|---|---|---|
| 5~35 | 45~85 | 860~1060 | 300 |

### Application Notice

- Storage Conditions

  To maintain the solderability of terminal electrodes:

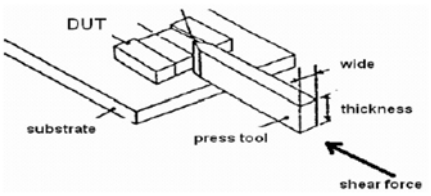
  1. products meet IPC/JEDEC J-STD-020D standard-MSL, level 1.
  2. Temperature and humidity conditions: Less than 40℃ and 60% RH.
  3. Recommended products should be used within 12 months form the time of delivery.
  4. The packaging material should be kept where no chlorine or sulfur exists in the air.

- Transportation

  1. Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
  2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
  3. Bulk handling should ensure that abrasion and mechanical shock are minimized.

# Reliability and Test Condition

<table>
<tr><th>Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>Operating temperature</td><td>-40~+105℃ (Including self - temperature rise)</td><td></td></tr>
<tr><td>Storage temperature</td><td>1. -10~+40℃,50~60%RH (Product with taping)<br>2. -40~+105℃(on board)</td><td></td></tr>
<tr><td colspan="3">Electrical Performance Test</td></tr>
<tr><td>Inductance</td><td rowspan="2">Refer to standard electrical characteristics list.</td><td>HP4284A,CH11025,CH3302,CH1320,CH1320S<br>LCR Meter.</td></tr>
<tr><td>DCR</td><td>CH16502,Agilent33420A Micro-Ohm Meter.</td></tr>
<tr><td>Saturation Current (Isat)</td><td>Approximately△L30%</td><td>Saturation DC Current (Isat) will cause L0<br>to drop △L(%)</td></tr>
<tr><td>Heat Rated Current (Irms)</td><td>Approximately △T40℃</td><td>Heat Rated Current (Irms) will cause the coil temperature rise △T(℃).<br>1.Applied the allowed DC current<br>2.Temperature measured by digital surface thermometer</td></tr>
<tr><td colspan="3">Reliability Test</td></tr>
<tr><td>Life Test</td><td rowspan="5">Appearance：No damage.<br>Inductance：within±10% of initial value<br>Q：Shall not exceed the specification value.<br>RDC：within ±15% of initial value and shall not exceed the specification value</td><td>Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020DClassification Reflow Profiles)<br>Temperature： 125±2℃(Inductor)<br>Applied current：rated current<br>Duration：1000±12hrs<br>Measured at room temperature after placing for 24±2 hrs</td></tr>
<tr><td>Load Humidity</td><td>Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020DClassification Reflow Profiles<br>Humidity：85±2 % R.H,<br>Temperature：85℃±2℃<br>Duration：1000hrs Min. with 100% rated current<br>Measured at room temperature after placing for 24±2 hrs</td></tr>
<tr><td>Moisture Resistance</td><td>Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020DClassification Reflow<br>Profiles<br>1. Baked at50℃ for 25hrs, measured at room temperature after placing for 4 hrs.<br>2. Raise temperature to 65±2℃ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25℃ in 2.5hrs.<br>3. Raise temperature to 65±2℃ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25℃ in<br>2.5hrs,keep at 25℃ for 2 hrs then keep at -10℃ for 3 hrs<br>4. Keep at 25℃ 80-100%RH for 15min and vibrate at the frequency of 10 to 55 Hz to 10 Hz, measure at<br>room temperature after placing for 1~2 hrs.</td></tr>
<tr><td>Thermal<br>shock</td><td>Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020DClassification<br>Reflow Profiles<br>Condition for 1 cycle<br>Step1：-40±2℃ 30±5min<br>Step2：25±2℃ ≦0.5min<br>Step3：125±2℃ 30±5min<br>Number of cycles： 500<br>Measured at room temperature after placing for 24±2 hrs</td></tr>
<tr><td>Vibration</td><td>Oscillation Frequency: 10 ~ 2K ~ 10Hz for 20 minutes<br>Equipment： Vibration checker<br>Total Amplitude:1.52mm±10%<br>Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations)。</td></tr>
<tr><td>Bending</td><td rowspan="2">Appearance：No damage.<br>Impedance：within±15% of initial value<br>Inductance：within±10% of initial value<br>Q：Shall not exceed the specification value.<br>RDC：within ±15% of initial value and shall not exceed the specification value</td><td>Shall be mounted on a FR4 substrate of the following dimensions: >=0805 inch(2012mm):40x100x1.2mm<br><0805 inch(2012mm):40x100x0.8mm<br>Bending depth: >=0805 inch(2012mm):1.2mm<br><0805 inch(2012mm):0.8mm<br>duration of 10 sec.</td></tr>
<tr><td>Shock</td><td>
<table>
<tr><th>Type</th><th>Peak value (g's)</th><th>Normal duration (D) (ms)</th><th>Wave form</th><th>Velocity change (Vi)ft/sec</th></tr>
<tr><td>SMD</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr>
<tr><td>Lead</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr>
</table>
</td></tr>
<tr><td>Solder ability</td><td>More than 95% of the terminal electrode should be covered with solder。</td><td>Preheat: 150℃,60sec.。<br>Solder: Sn96.5% Ag3% Cu0.5%<br>Temperature: 245±5℃。<br>Flux for lead free: Rosin. 9.5%。<br>Dip time: 4±1sec。<br>Depth: completely cover the termination</td></tr>
</table>

<table>
<tr>
<td>Resistance to Soldering Heat</td>
<td rowspan="2">Appearance：No damage.<br>Impedance：within±15% of initial value<br>Inductance：within±10% of initial value<br>Q：Shall not exceed the specification value.<br>RDC：within ±15% of initial value and shall not exceed the specification value e</td>
<td>Depth: completely cover the termination
<table>
<tr><th>Temperature(°C)</th><th>Time(s)</th><th>Temperature ramp/immersion and emersion rate</th><th>Number of heat cycles</th></tr>
<tr><td>260 ±5 (solder temp)</td><td>10 ±1</td><td>25mm/s ±6 mm/s</td><td>1</td></tr>
</table>
</td>
</tr>
<tr>
<td>Terminal Strength</td>
<td>Preconditioning: Run through IR reflow for 2 times.( IPC/JEDEC J-STD-020DClassification Reflow Profiles<br>With the component mounted on a PCB with the device to be tested, apply a force(>0805:1kg , <=0805:0.5kg)to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested.<br> 
</td>
</tr>
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Note : When there are questions concerning measurement result : measurement shall be made after 48 ± 2 hours of recovery under the standard condition.