

# HC9

## High current power inductors



### Applications

- Multi-phase regulators
- Voltage Regulator Modules (VRMs)
- Distributed power systems DC-DC converters
- Desktop and server VRMs and EVRDs
- Point-of-Load (POL) modules
- Field Programmable Gate Array (FPGA) DC-DC converters
- Battery power systems
- High current power supplies
- Data networking and storage systems

### Product description

- Surface mount inductors designed for higher speed switch mode applications requiring lower inductance, low voltage and high current
- Design utilizes high temperature powder iron material with a non-organic binder to eliminate thermal aging
- Inductance Range from 0.2 $\mu$ H to 47.0 $\mu$ H
- Current Range from 3.65 amps to 95.0 amps
- Frequency Range 1kHz to 500kHz

### Environmental data

- Storage temperature range (component): -40°C to +155°C
- Operating temperature range: -40°C to +155°C (Ambient plus self-temperature rise)
- Solder reflow temperature: J-STD-020D compliant



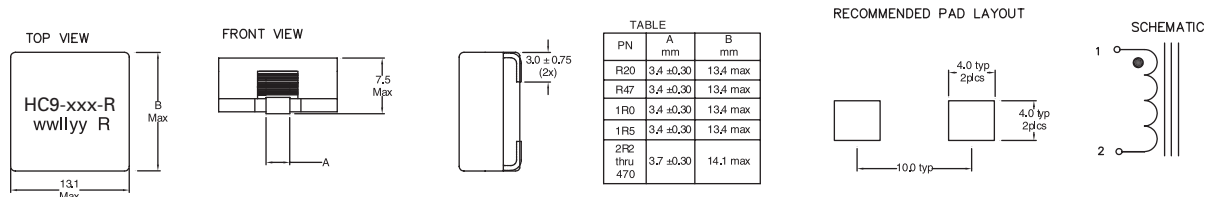
## Product specifications

| Part number <sup>6</sup> | OCL <sup>1</sup> (μH) ±15% | I <sub>rms</sub> <sup>2</sup> (amps) | I <sub>sat</sub> <sup>3</sup> (amps) 20% rolloff | I <sub>sat</sub> <sup>4</sup> (amps) 30% rolloff | DCR (mΩ) maximum @ 20°C | Volt-μsec <sup>5</sup> (V-μs) |
|--------------------------|----------------------------|--------------------------------------|--------------------------------------------------|--------------------------------------------------|-------------------------|-------------------------------|
| HC9-R20-R                | 0.218                      | 46.7                                 | 65                                               | 95                                               | 0.50                    | 2.87                          |
| HC9-R47-R                | 0.544                      | 33.7                                 | 40                                               | 57                                               | 0.88                    | 4.78                          |
| HC9-1R0-R                | 1.04                       | 23.7                                 | 28                                               | 41                                               | 1.87                    | 6.70                          |
| HC9-1R5-R                | 1.70                       | 21.0                                 | 22                                               | 32                                               | 2.27                    | 8.46                          |
| HC9-2R2-R                | 2.53                       | 17.2                                 | 18                                               | 26                                               | 3.37                    | 10.4                          |
| HC9-3R3-R                | 3.52                       | 14.3                                 | 15                                               | 22                                               | 4.87                    | 12.4                          |
| HC9-4R3-R                | 4.67                       | 13.0                                 | 13.2                                             | 19.1                                             | 5.90                    | 14.4                          |
| HC9-6R8-R                | 7.45                       | 10.3                                 | 11.4                                             | 15.1                                             | 9.40                    | 18.1                          |
| HC9-100-R                | 10.9                       | 8.50                                 | 8.6                                              | 12.5                                             | 14.0                    | 22.0                          |
| HC9-220-R                | 22.4                       | 6.30                                 | 6.0                                              | 8.7                                              | 25.7                    | 31.5                          |
| HC9-330-R                | 34.5                       | 4.42                                 | 4.8                                              | 7.0                                              | 48.8                    | 37.3                          |
| HC9-470-R                | 49.2                       | 3.65                                 | 3.9                                              | 5.7                                              | 72.3                    | 44.8                          |

1. Open Circuit Inductance (OCL) Test Parameters: 100kHz, 1.0Vrms, 0.0A<sub>dc</sub>, @ +25°C
2. Irms: DC current for an approximately ΔT of 40°C without core loss. Derating is necessary for AC currents. Pad layout, trace thickness and width, airflow, 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 conditions verified in the end application.
3. Peak current for approximately 20% rolloff @20°C
4. Peak current for approximately 30% rolloff @20°C
5. Applied Volt-Time product (V-μs) across the inductor. This value represents the applied V-μs at operating frequency necessary to generate additional core loss which contributes to the 40°C temperature rise. De-rating of the I<sub>rms</sub> is required to prevent excessive temperature rise. The 100% V<sub>ps</sub> rating is equivalent to a ripple current I<sub>p-p</sub> of 20% of Isat (30% rolloff option).

6. Part number definition: HC9-xxx-R  
HC9= Product code and size  
xxx = Inductance in μH. R = decimal point. If no R is present last character equals number of zeros.  
-R suffix = RoHS compliant

## Dimensions—mm



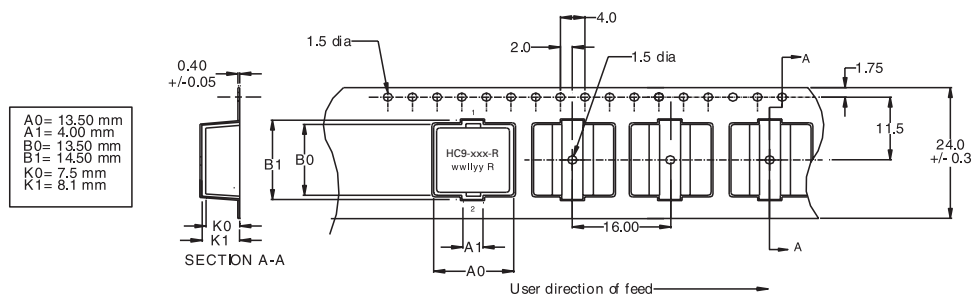
Part marking: HC9= (Product code and size)-xxx=(inductance value in uH, R= decimal point. If no R is present then last character equals number of zeros. wwlyly=date code, R=revision level

Tolerances are ±0.2 millimeters unless stated otherwise

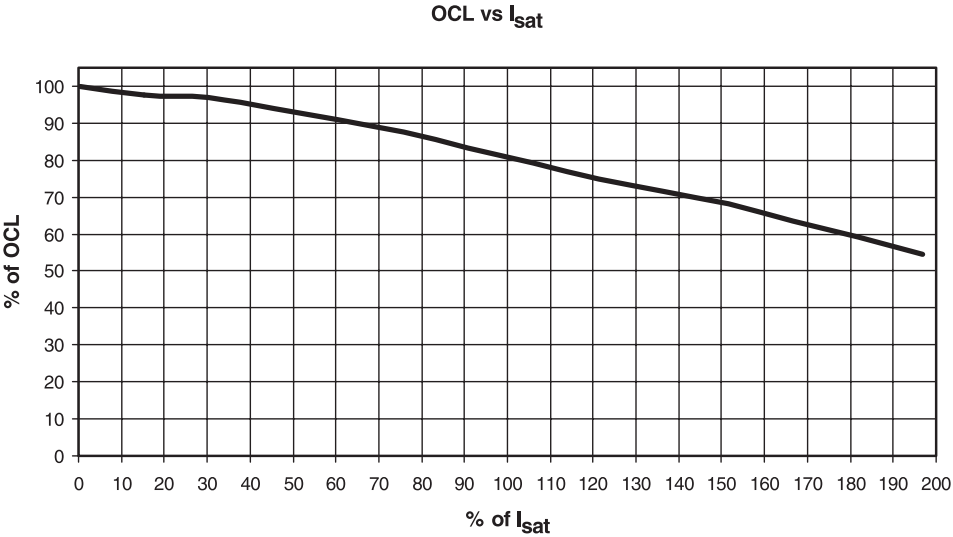
Do not route traces or vias underneath the inductor

## Packaging information—mm

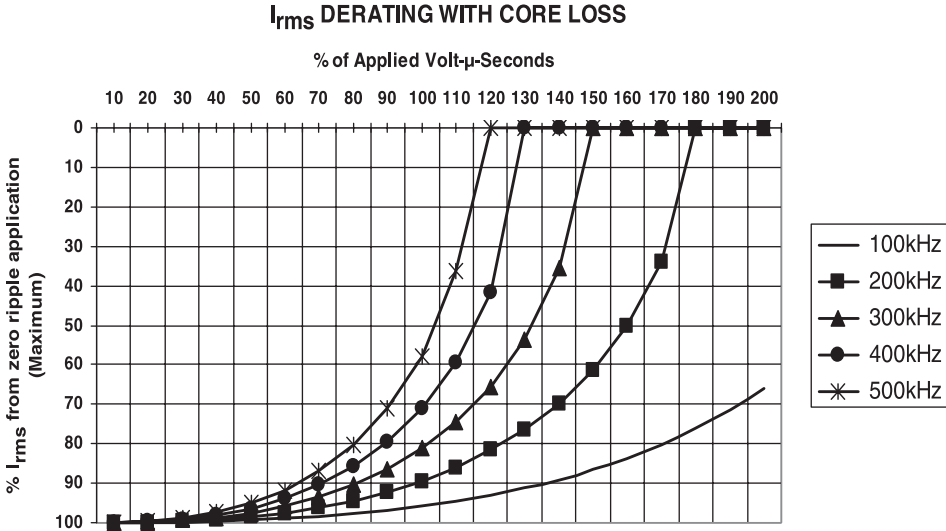
Supplied in tape and reel packaging, 450 parts per reel, 13" diameter reel.



Rolloff



Core loss



## Solder reflow profile

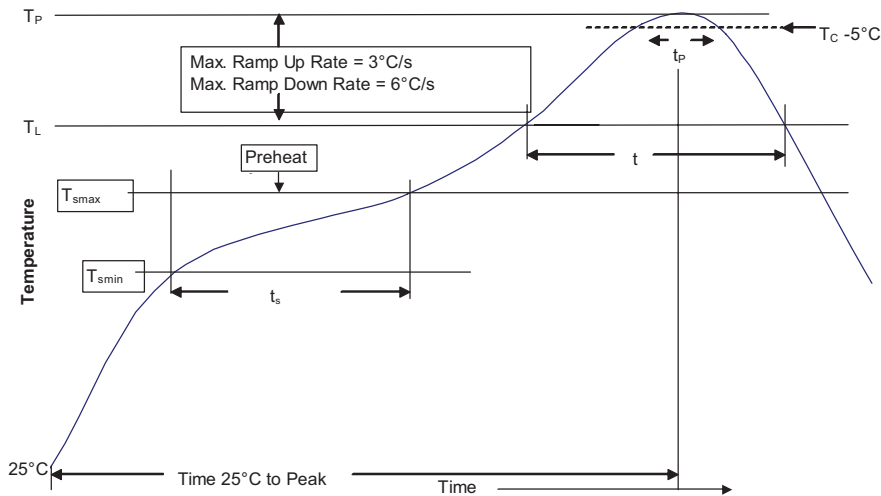


Table 1 - Standard SnPb Solder ( $T_C$ )

| 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-020D

| 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/elx

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.