

# FP1 1 10V

## High frequency, high current power inductors



### Description

- Vertical design utilizes less board space
- Controlled DCR for sensing circuits
- Inductance Range from 195 nH to 320nH
- Current range from 42 to 70 amps
- 10.7 x 7.5mm and 10.5 x 6.2mm footprint surface mount package in a 9.5mm height
- Ferrite core material
- Halogen free, lead free, RoHS compliant

### Applications

- Servers
- Multi-phase and Vcore regulators
- Voltage Regulator Modules (VRMs)
- Desktop VRMs and EVRDs
- Data networking and storage systems
- Point-of-Load modules
- DCR Sensing circuits

### Environmental Data

- Storage temperature range (Component): -40°C to +125°C
- Operating temperature range: -40°C to +125°C (ambient + self-temperature rise)
- Solder reflow temperature: J-STD-020D compliant



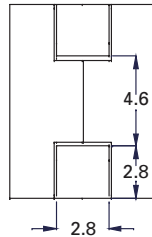
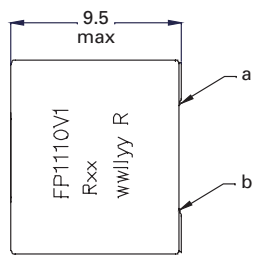
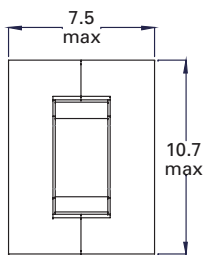
Product specifications

| Part Number <sup>7</sup>     | OCL <sup>1</sup><br>(nH) ±10% | FLL <sup>2</sup><br>minimum (nH) | I <sub>rms</sub> <sup>3</sup><br>(amps) | I <sub>sat1</sub> <sup>4</sup><br>(amps) | I <sub>sat2</sub> <sup>5</sup><br>(amps) | DCR (mΩ)<br>±5% @ +20°C | K-factor <sup>6</sup> |
|------------------------------|-------------------------------|----------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|-------------------------|-----------------------|
| <b>V1-10.7 x 7.5 x 9.5mm</b> |                               |                                  |                                         |                                          |                                          |                         |                       |
| FP1110V1-R20-R               | 195                           | 140                              | 61                                      | 70                                       | 58                                       | 0.23                    | 278                   |
| FP1110V1-R22-R               | 220                           | 158                              | 61                                      | 64                                       | 51                                       | 0.23                    | 278                   |
| FP1110V1-R27-R               | 270                           | 173                              | 61                                      | 55                                       | 44                                       | 0.23                    | 278                   |
| FP1110V1-R32-R               | 320                           | 230                              | 61                                      | 42                                       | 34                                       | 0.23                    | 278                   |
| <b>V2-10.5 x 6.2 x 9.5mm</b> |                               |                                  |                                         |                                          |                                          |                         |                       |
| FP1110V2-R200-R              | 200                           | 144                              | 61                                      | 65                                       | 52                                       | 0.18                    | 328                   |

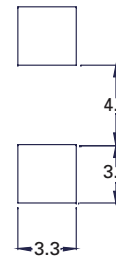
- Open Circuit Inductance (OCL) Test Parameters: 100kHz, 0.1Vrms, 0.0Aac, +25°C
- Full Load Inductance (FLL) Test Parameters: 100kHz, 0.1Vrms, @ I<sub>sat1</sub>, @ +25°C
- I<sub>rms</sub>: DC current for an approximate temperature rise of 40°C without core loss. Derating is necessary for AC currents. 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 +125°C under worst case operating conditions verified in the end application.
- I<sub>sat1</sub>: Peak current for approximately 20% rolloff @ +25°C

- I<sub>sat</sub>: Peak current for approximately 20% rolloff @ +100°C
- K-factor: Used to determine B<sub>ps</sub> for core loss (see graph).  $B_{ps} = K * L * \Delta I * 10^{-3}$ .  
B<sub>ps</sub>:(Gauss), K: (K-factor from table), L: (Inductance in nH), ΔI (Peak to peak ripple current in Amps).
- Part Number Definition: FP1110Vx-Rxx(x)-R  
FP1110V = Product code  
x= DCR indicator  
Rxx(x)= Inductance value in uH, R= decimal point  
-R suffix = RoHS compliant

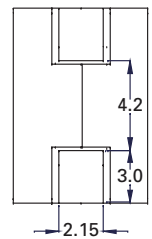
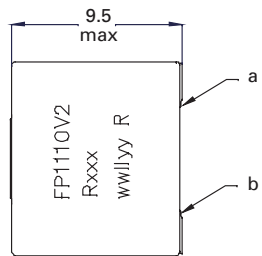
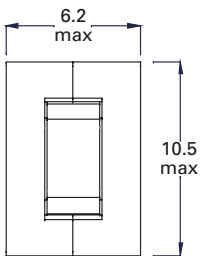
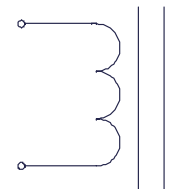
Dimensions (mm)



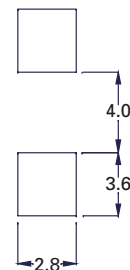
Recommended Pad Layout



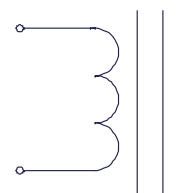
Schematic



Recommended Pad Layout



Schematic



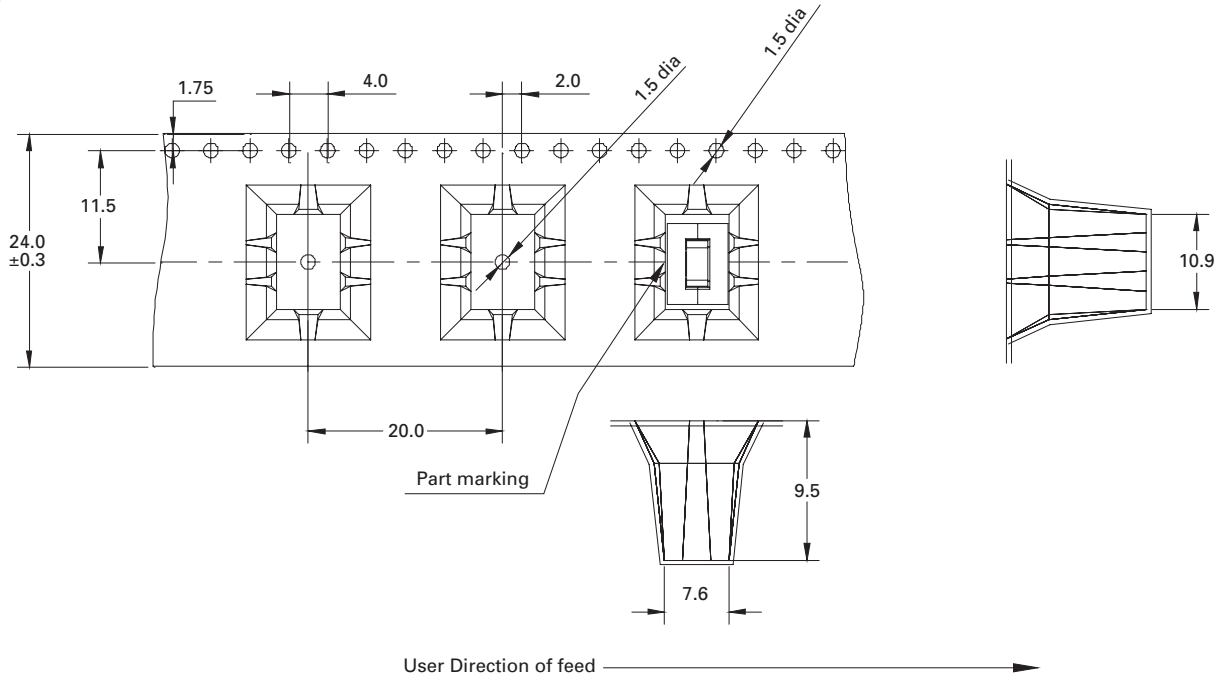
Part marking: FP1110V1 or V2, Rxx(x)=inductance value in μH, R=decimal point  
wwllyy= date code, R=revision level  
DCR measured from point "a" to point "b"  
Soldering surfaces to be coplanar within 0.10 millimeters  
Do not route traces or vias underneath the inductor.

**Packaging information (mm)**

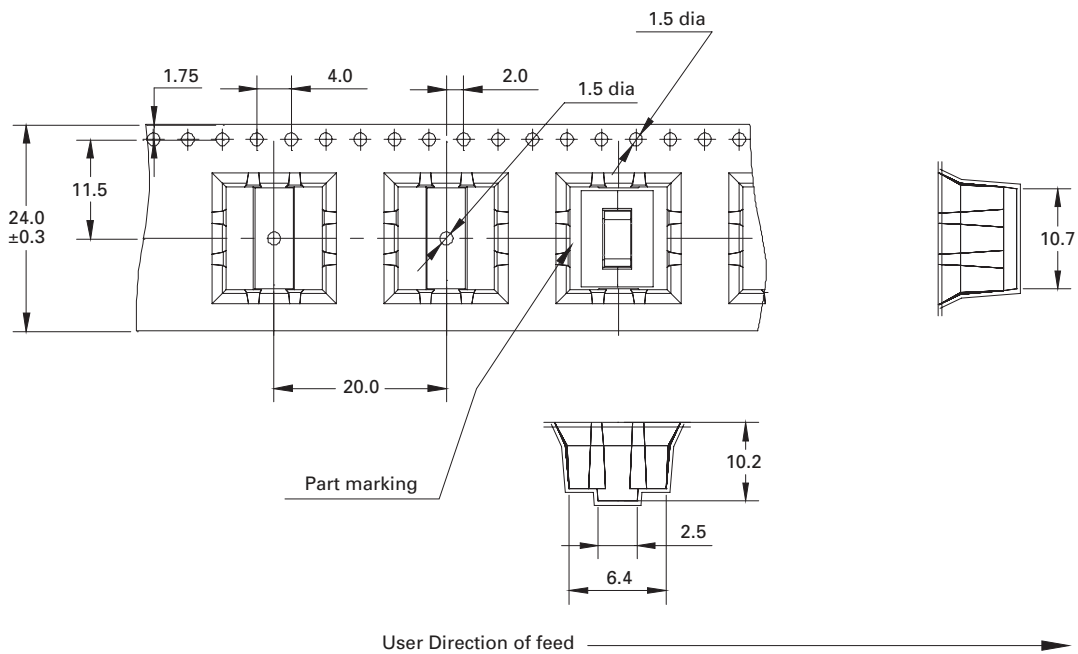
(Drawing not to scale)

(Supplied in tape and reel packaging, 300 parts per 13" diameter reel)

**FP1110V1**

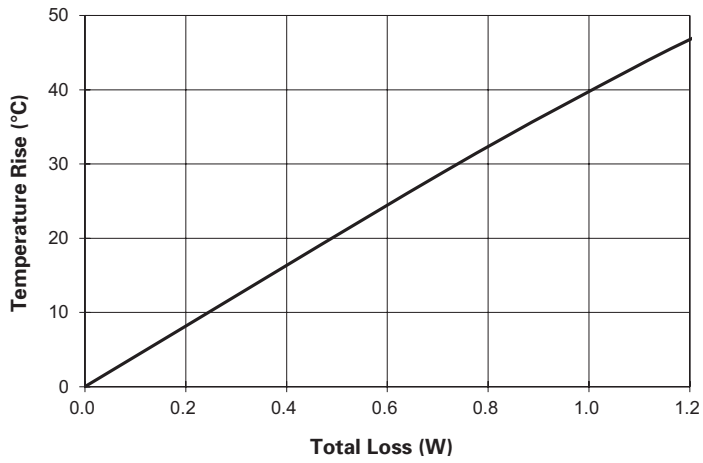


**FP1110V2**



Temperature rise vs. total loss

FP1110V1

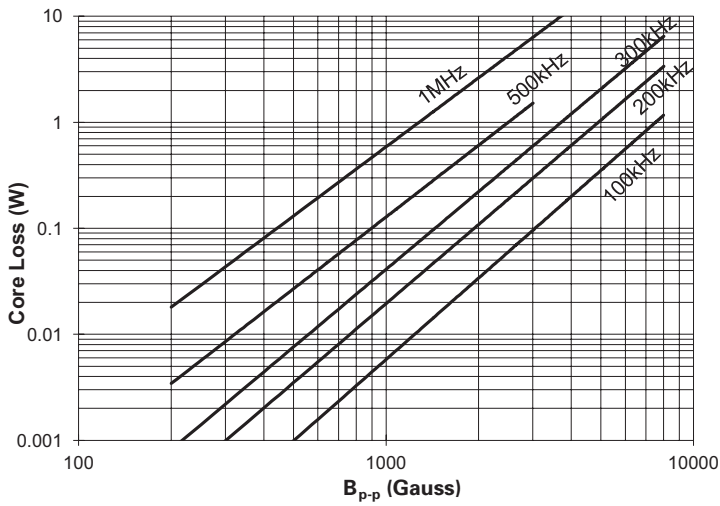


FP1110V2

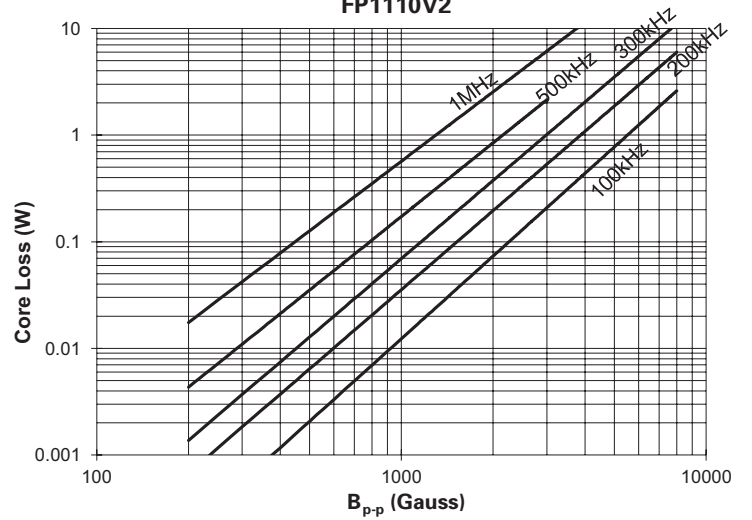


Core loss vs.  $B_{p-p}$

FP1110V1

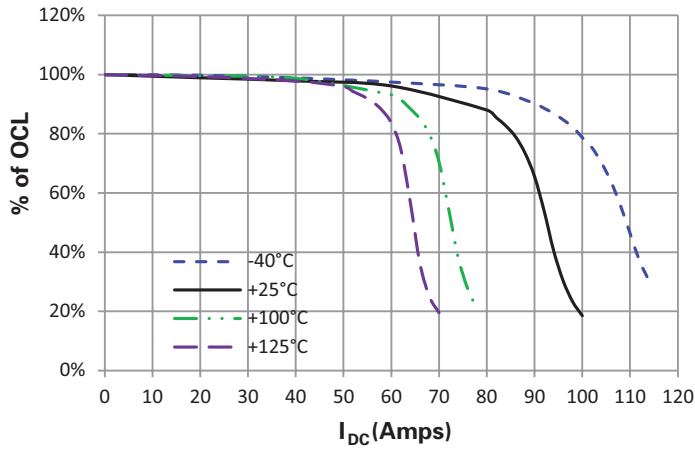


FP1110V2

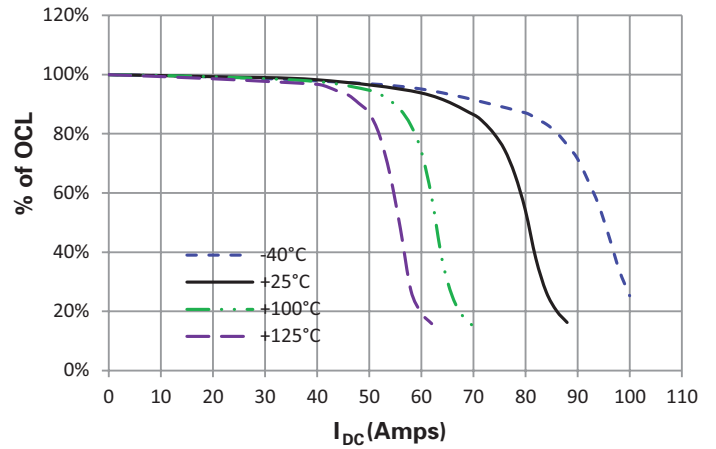


Inductance characteristics

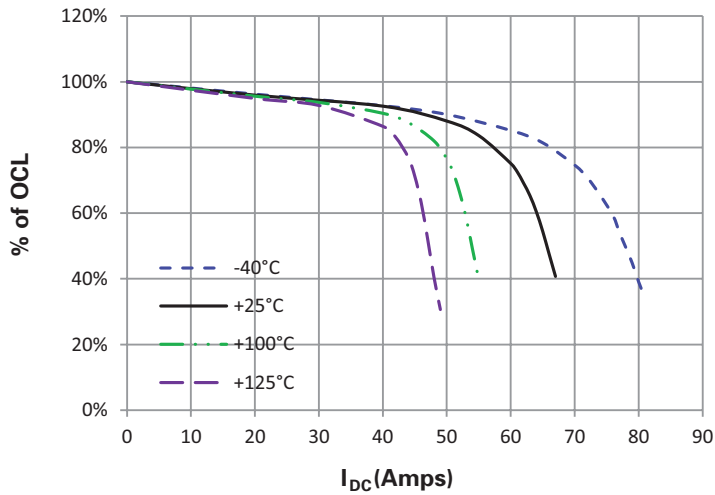
FP1110V1-R20-R



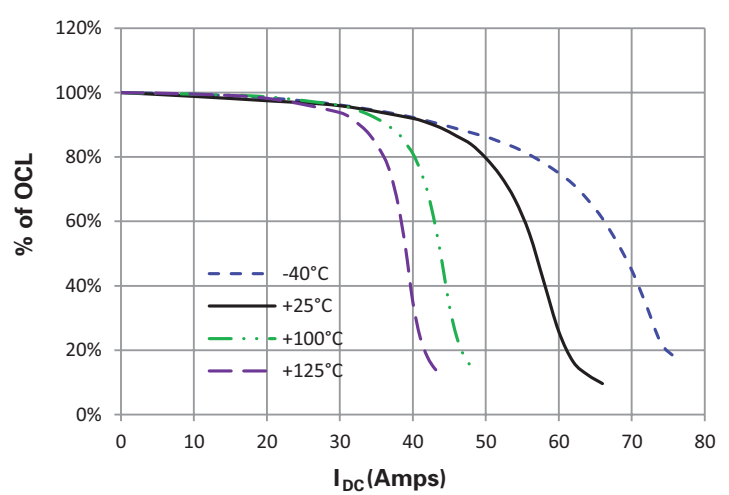
FP1110V1-R22-R



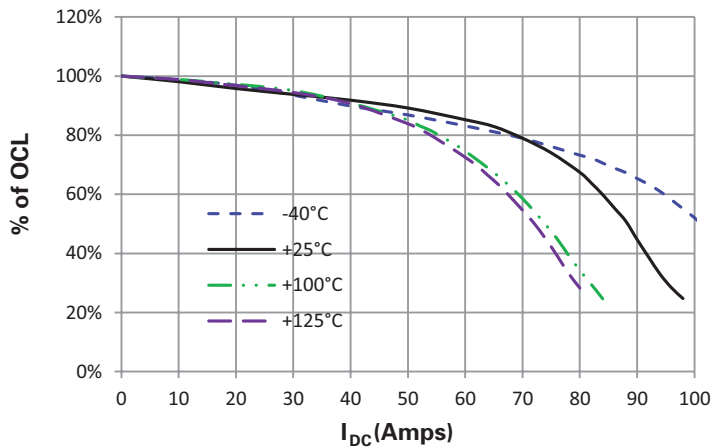
FP1110V1-R27-R



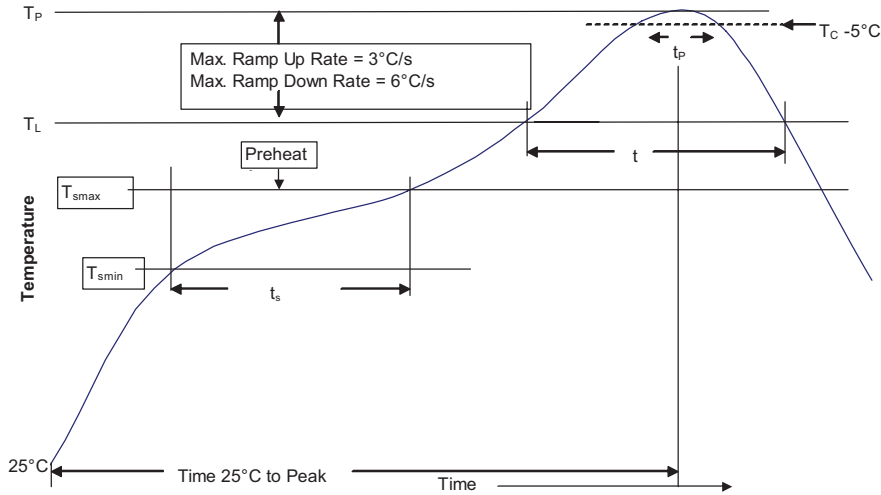
FP1110V1-R32-R



FP1110V2-R200-R



**Solder reflow profile**



**Table 1 - Standard SnPb Solder (T<sub>C</sub>)**

| 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<sub>C</sub>)**

| 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-020D**

| Profile Feature                                                                                    | Standard SnPb Solder | Lead (Pb) Free Solder |
|----------------------------------------------------------------------------------------------------|----------------------|-----------------------|
| Preheat and Soak                                                                                   |                      |                       |
| • Temperature min. (T <sub>smin</sub> )                                                            | 100°C                | 150°C                 |
| • Temperature max. (T <sub>smax</sub> )                                                            | 150°C                | 200°C                 |
| • Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )                                 | 60-120 Seconds       | 60-120 Seconds        |
| Average ramp up rate T <sub>smax</sub> to T <sub>p</sub>                                           | 3°C/ Second Max.     | 3°C/ Second Max.      |
| Liquidous temperature (T <sub>L</sub> )                                                            | 183°C                | 217°C                 |
| Time at liquidous (t <sub>L</sub> )                                                                | 60-150 Seconds       | 60-150 Seconds        |
| Peak package body temperature (T <sub>p</sub> )*                                                   | Table 1              | Table 2               |
| Time (t <sub>p</sub> )** within 5 °C of the specified classification temperature (T <sub>C</sub> ) | 20 Seconds**         | 30 Seconds**          |
| Average ramp-down rate (T <sub>p</sub> to T <sub>smax</sub> )                                      | 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<sub>p</sub>) is defined as a supplier minimum and a user maximum.

\*\* Tolerance for time at peak profile temperature (t<sub>p</sub>) is defined as a supplier minimum and a user maximum.

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