

# FP0705

## High frequency, high current power inductors



### Applications

- Multi-phase and Vcore regulators
- Voltage Regulator Modules (VRMs)
  - Server and desktop
  - Central processing unit (CPU)
  - Graphics processing unit (GPU)
  - Application specific integrated circuit (ASIC)
  - High power density
- Data networking and storage systems
- Graphics cards and battery power systems
- Portable electronics
- Point-of-Load modules

### Product description

- High current carrying capacity
- Low core loss
- Inductance Range from 72 nH to 220 nH
- Current range from 20 A to 65 A
- 7.0 mm x 7.0 mm footprint surface mount package in a 4.95 mm height
- Ferrite core material
- Halogen free, lead free, RoHS compliant

### Environmental data

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



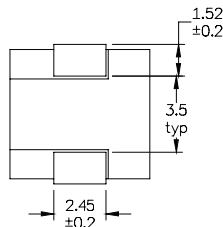
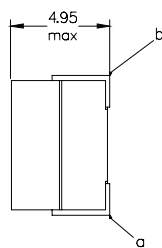
Product specifications

| Part Number <sup>7</sup> | OCL <sup>1</sup><br>(nH) ±10% | FLL <sup>2</sup><br>(nH) minimum | I <sub>rms</sub> <sup>3</sup><br>(A) | I <sub>sat</sub> 1 <sup>4</sup><br>(A) | I <sub>sat</sub> 2 <sup>5</sup><br>(A) | DCR (mΩ)<br>@ 20°C | K-factor <sup>6</sup> |
|--------------------------|-------------------------------|----------------------------------|--------------------------------------|--|--|--------------------|-----------------------|
| <b>R1 version</b>        |                               |                                  |                                      |  |  |                    |                       |
| FP0705R1-R07-R           | 72                            | 51                               | 43                                   | 65                                     | 50                                     | 0.25 ± 10%         | 826                   |
| FP0705R1-R10-R           | 105                           | 78                               | 43                                   | 44                                     | 34                                     | 0.25 ± 10%         | 826                   |
| FP0705R1-R12-R           | 120                           | 86                               | 43                                   | 37                                     | 30                                     | 0.25 ± 10%         | 826                   |
| FP0705R1-R15-R           | 150                           | 108                              | 43                                   | 30                                     | 24                                     | 0.25 ± 10%         | 826                   |
| FP0705R1-R18-R           | 180                           | 130                              | 43                                   | 25                                     | 20                                     | 0.25 ± 10%         | 826                   |
| FP0705R1-R22-R           | 226                           | 159                              | 43                                   | 20                                     | 16                                     | 0.25 ± 10%         | 826                   |
| <b>R2 version</b>        |                               |                                  |                                      |  |  |                    |                       |
| FP0705R2-R07-R           | 72                            | 51                               | 38                                   | 65                                     | 50                                     | 0.32 ± 9.4%        | 826                   |
| FP0705R2-R10-R           | 105                           | 78                               | 38                                   | 44                                     | 34                                     | 0.32 ± 9.4%        | 826                   |
| FP0705R2-R12-R           | 120                           | 86                               | 38                                   | 37                                     | 30                                     | 0.32 ± 9.4%        | 826                   |
| FP0705R2-R15-R           | 150                           | 108                              | 38                                   | 30                                     | 24                                     | 0.32 ± 9.4%        | 826                   |
| FP0705R2-R18-R           | 180                           | 130                              | 38                                   | 25                                     | 20                                     | 0.32 ± 9.4%        | 826                   |
| FP0705R2-R22-R           | 226                           | 159                              | 38                                   | 20                                     | 16                                     | 0.32 ± 9.4%        | 826                   |
| <b>R3 version</b>        |                               |                                  |                                      |  |  |                    |                       |
| FP0705R3-R07-R           | 72                            | 51                               | 32                                   | 65                                     | 50                                     | 0.46 ± 6.5%        | 826                   |
| FP0705R3-R10-R           | 105                           | 78                               | 32                                   | 44                                     | 34                                     | 0.46 ± 6.5%        | 826                   |
| FP0705R3-R12-R           | 120                           | 86                               | 32                                   | 37                                     | 30                                     | 0.46 ± 6.5%        | 826                   |
| FP0705R3-R15-R           | 150                           | 108                              | 32                                   | 30                                     | 24                                     | 0.46 ± 6.5%        | 826                   |
| FP0705R3-R18-R           | 180                           | 130                              | 32                                   | 25                                     | 20                                     | 0.46 ± 6.5%        | 826                   |
| FP0705R3-R22-R           | 226                           | 159                              | 32                                   | 20                                     | 16                                     | 0.46 ± 6.5%        | 826                   |

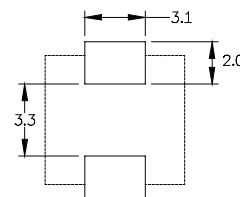
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.1 Vrms, 0.0 Adc, +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.1 Vrms, I<sub>sat</sub>1, +25 °C
- I<sub>rms</sub>: DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents. 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>sat</sub>1: Peak current for approximately 20% rolloff @ +25 °C
- I<sub>sat</sub>2: Peak current for approximately 20% rolloff @ +125 °C

- K-factor: Used to determine B<sub>pp</sub> for core loss (see graph).  
B<sub>pp</sub> = K \* L \* ΔI \* 10<sup>-3</sup>. B<sub>pp</sub> (Gauss), K: (K-factor from table),  
L: (Inductance in nH), ΔI (Peak to peak ripple current in Amps).
- Part Number Definition: FP0705Rx-Rxx-R  
FP0705= Product code and size  
Rx= Version indicator  
-Rxx= Inductance value in μH, R= decimal point  
-R suffix = RoHS compliant

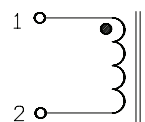
Dimensions (mm)



Recommended Pad Layout



Schematic



Part marking: 0705Rx (Rx = version indicator), Rxx = Inductance value in μH, R = decimal point, wwllly = date code, R = revision level

Tolerances are ±0.25 millimeters unless stated otherwise

PCB tolerances are ±0.1 millimeters unless stated otherwise

All soldering surface to be coplanar within 0.1016 millimeters

DCR measured between point "a" and point "b"

Do not route traces or vias underneath the inductor

**Packaging information (mm)**

Supplied in tape and reel packaging , 950 parts per 13" diameter reel



**Temperature rise vs. total loss**



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



Inductance characteristics



**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 JDEC 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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