

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



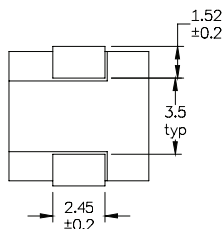
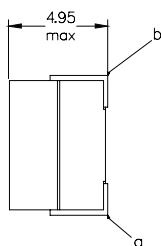
Product specifications

| Part Number ⁷ | OCL ¹ (nH) ±10% | FLL ² (nH) minimum | I _{rms} ³ (A) | I _{sat} 1 ⁴ (A) | I _{sat} 2 ⁵ (A) | DCR (mΩ) @ 20°C | K-factor ⁶ |
|--------------------------|-------------------------------|----------------------------------|--------------------------------------|--|--|--------------------|-----------------------|
| R1 version | | | | | | | |
| 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 |
| R2 version | | | | | | | |
| 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 |
| R3 version | | | | | | | |
| 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 |

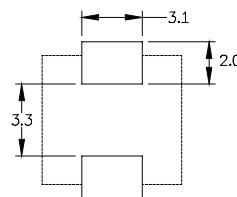
- Open Circuit Inductance (OCL) Test Parameters: 100 kHz, 0.1 Vrms, 0.0 Adc, +25 °C
- Full Load Inductance (FLL) Test Parameters: 100 kHz, 0.1 Vrms, I_{sat}1, +25 °C
- I_{rms}: DC current for an approximate temperature rise of 40 °C without core loss. Derating is necessary for AC currents. PCB layout,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

- K-factor: Used to determine B_{pp} for core loss (see graph).
B_{pp} = K * L * ΔI * 10⁻³. B_{pp} (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

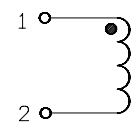
Dimensions (mm)



Recommended Pad Layout



Schematic



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

Tolerances are ±0.25 millimeters unless stated otherwise

PCB tolerances are ±0.1 millimeters unless stated otherwise

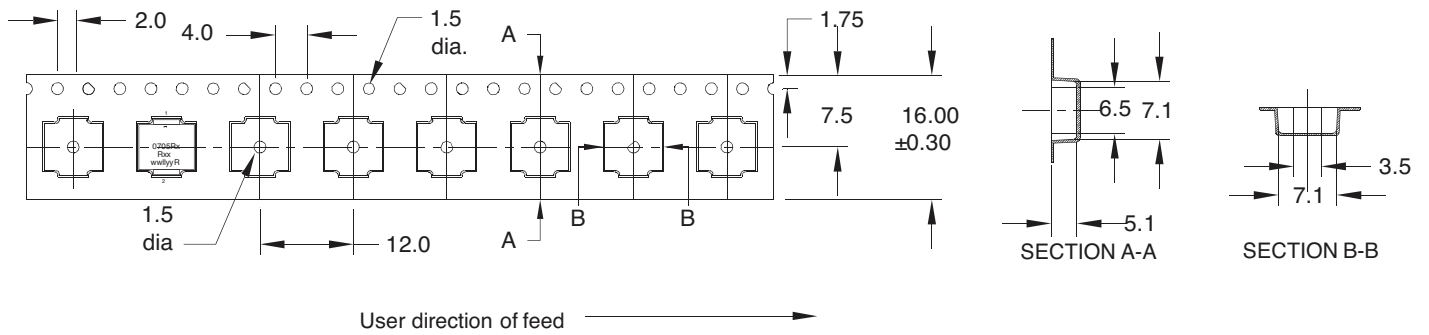
All soldering surface to be coplanar within 0.1016 millimeters

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^3 <350 | Volume mm^3 \geq 350 |
|-------------------|---------------------------|---------------------------------|
| <2.5mm) | 235°C | 220°C |
| \geq 2.5mm | 220°C | 220°C |

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

| Package Thickness | Volume mm^3 <350 | Volume mm^3 350 - 2000 | Volume mm^3 >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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 Printed in USA
 Publication No. 4325 BU-SB08210
 January 2016



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