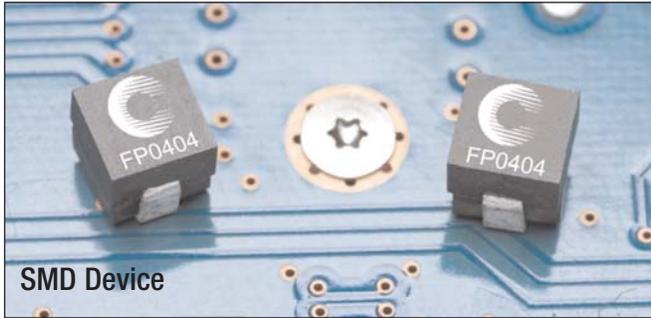


# High Current, High Frequency Power Inductors

## Flat-Pac™ FP0404 Series



### Description

- Halogen free
- 125°C maximum total temperature operation
- 4.0 x 4.0 x 4.0mm maximum surface mount package
- Ferrite core material
- High current carrying capacity, Low core losses
- Controlled DCR tolerance for sensing circuits
- Frequency range up to 2MHz
- RoHS compliant

### Applications

- Multi-phase regulators
- Voltage Regulator Module (VRM)
- Desktop and server VRMs and EVRDs
- Data networking and storage systems
- Notebook regulators
- Graphics cards and battery power systems
- Point-of-load modules
- DCR sensing

### Environmental Data

- Storage temperature range: -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

### Packaging

- Supplied in tape and reel packaging, 1800 parts per 13" reel

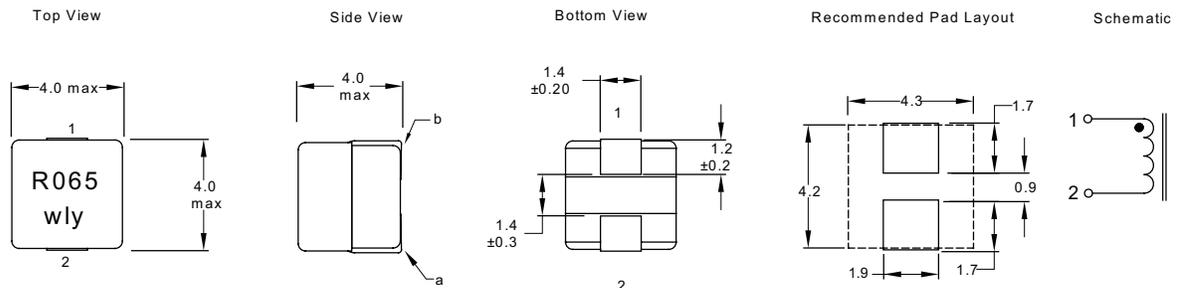
### Product Specifications

Part Number <sup>6</sup>	OCL <sup>1</sup> ± 15% (nH)	FLL <sup>2</sup> Min (nH)	I <sub>rms</sub> <sup>3</sup> (Amps)	I <sub>sat</sub> 1 <sup>4</sup> @25°C (Amps)	I <sub>sat</sub> 2 <sup>5</sup> @125°C (Amps)	DCR (mΩ) @20°C
R1 Version						
FP0404R1-R065-R	65	44	19	24	20	0.32 ± 25%

1. Open Circuit Inductance (OCL) Test Parameters: 100kHz, 0.10V<sub>rms</sub>, 0.0Adc
2. Full Load Inductance (FLL) Test Parameters: 100kHz, 0.1V<sub>rms</sub>, I<sub>sat</sub>1
3. 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.

4. I<sub>sat</sub>1: Peak current for approximately 20% rolloff at +25°C.
5. I<sub>sat</sub>2: Peak current for approximately 20% rolloff at +125°C.
6. Part Number Definition: FP0404Rx-Rxx-R
  - FP0404 = Product code and size
  - Rx is the DCR indicator
  - Rxx= Inductance value in uH, R = decimal point
  - "-R" suffix = RoHS compliant

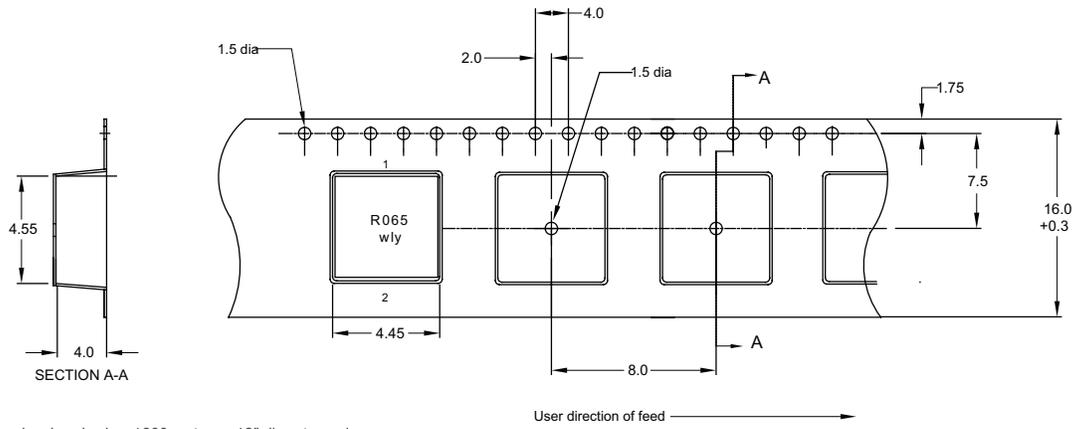
### Dimensions - mm



The nominal DCR is measured from point "a" to point "b"

Part marking: R065 (=inductance value in uH) (R=decimal point) wly= date code

### Packaging Information - mm



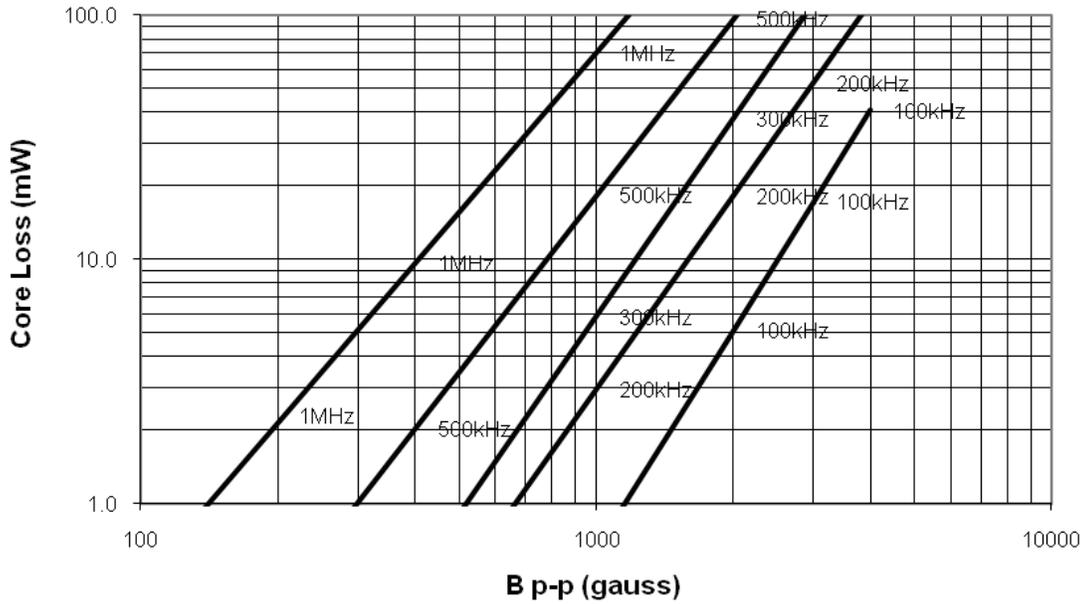
Supplied in tape and reel packaging, 1800 parts per 13" diameter reel.

### Temperature Rise vs. Total Loss



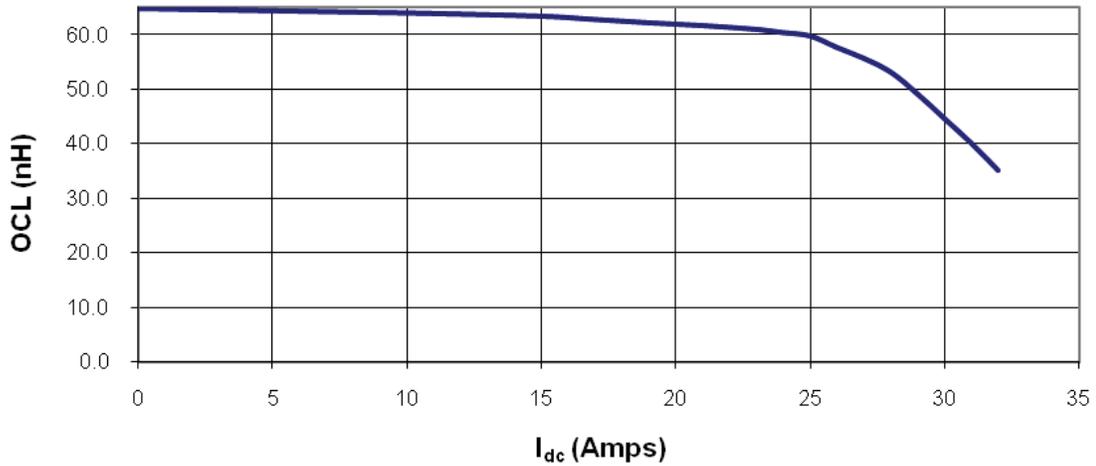
**Core Loss vs B p-p at 100 °C  
FP0404R1-R065-R**

**$B_{p-p}(\text{Gauss}) = 143 \cdot \Delta I$  ( $\Delta I$ : Peak-Peak Ripple Current in Amps)**



**Inductance Characteristics**

**OCL vs.  $I_{dc}$   
FP0404R1-R065-R**



## Solder Reflow Profile

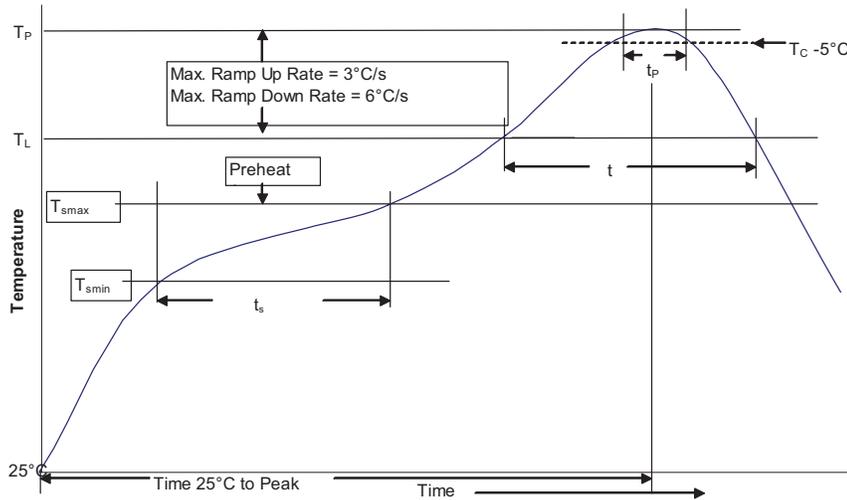


Table 1 - Standard SnPb Solder ( $T_c$ )

Package Thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ $\geq 350$
<2.5mm	235°C	220°C
$\geq 2.5\text{mm}$	220°C	220°C

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

Package Thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ 350 - 2000	Volume $\text{mm}^3$ >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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