

FP1012V

High frequency, high current power inductors



Product features

- Vertical design utilizes less board space
- High current carrying capacity
- Operating frequency up to 3 MHz
- Inductance range from 70 nH to 470 nH
- Current range 22 A to 190 A
- 10.0 mm x 6.0 mm footprint surface mount package in 12 mm height
- Moisture sensitivity level (MSL): 1
- Ferrite core material
- Weight: 3.1 grams typical

Applications

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

Environmental compliance and general specifications

- 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-020 (latest revision) compliant



Product specifications

| Part number ⁸ | OCL ¹ (nH) ±10% | FLL ² (nH) minimum | I _{avg} ³ (A) | I _{pk} ¹ ⁴ (A) | I _{pk} ² ⁵ (A) | I _{pk} ³ ⁶ (A) | DCR (mΩ) @ +20 °C ±10% | K-factor ⁷ |
|--------------------------|-------------------------------|----------------------------------|--------------------------------------|--|--|--|------------------------------|-----------------------|
| V2 version | | | | | | | | |
| FP1012V2-R070-R | 70 | 50 | 84 | 130+ | 130+ | 130+ | 0.125 | 305 |
| FP1012V2-R080-R | 80 | 57 | 84 | 130+ | 130+ | 125 | 0.125 | 305 |
| FP1012V2-R090-R | 90 | 64 | 84 | 130+ | 117 | 110 | 0.125 | 305 |
| FP1012V2-R100-R | 100 | 72 | 84 | 125 | 105 | 100 | 0.125 | 305 |
| FP1012V2-R120-R | 120 | 86 | 84 | 105 | 88 | 81 | 0.125 | 305 |
| FP1012V2-R150-R | 150 | 108 | 84 | 83 | 70 | 66 | 0.125 | 305 |
| FP1012V2-R330-R | 330 | 231 | 84 | 36 | 28 | 26 | 0.125 | 305 |
| FP1012V2-R470-R | 470 (±15%) | 329 | 84 | 22 | 19 | 18 | 0.125 | 305 |
| V3 version | | | | | | | | |
| FP1012V3-R070-R | 70 | 50 | 84 | 190 | 172 | 160 | 0.125 | 305 |
| FP1012V3-R080-R | 80 | 57 | 84 | 170 | 146 | 132 | 0.125 | 305 |
| FP1012V3-R090-R | 90 | 64 | 84 | 150 | 128 | 121 | 0.125 | 305 |
| FP1012V3-R100-R | 100 | 72 | 84 | 138 | 115 | 110 | 0.125 | 305 |
| FP1012V3-R120-R | 120 | 86 | 84 | 116 | 96 | 89 | 0.125 | 305 |
| FP1012V3-R150-R | 150 | 108 | 84 | 91 | 77 | 72 | 0.125 | 305 |
| FP1012V3-R240-R | 240 | 168 | 84 | 56 | 48 | 45 | 0.125 | 305 |
| FP1012V3-R330-R | 330 | 231 | 84 | 40 | 32 | 30 | 0.125 | 305 |

1. Open circuit inductance (OCL) test parameters: 100 kHz, 0.1 Vrms, 0.0 Adc, +25 °C

2. Full load inductance (FLL) test parameters: 100 kHz, 0.1 Vrms, I_{avg}¹, +25 °C

3. I_{avg}³: 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_{pk}¹: Peak current for approximately 20% rolloff @ +25 °C

5. I_{pk}²: Peak current for approximately 20% rolloff @ +100 °C

6. I_{pk}³: Peak current for approximately 20% rolloff @ +125 °C

7. K-factor: Used to determine Bp-p for core loss (see graph). Bp-p = K * L * ΔI * 10⁻³. Bp-p:(Gauss), K: (K-factor from table), L: (Inductance in nH), ΔI (Peak to peak ripple current in Amps).

8. Part number definition: FP1012Vx-Rxxx-R

FP1012 = Product code and size

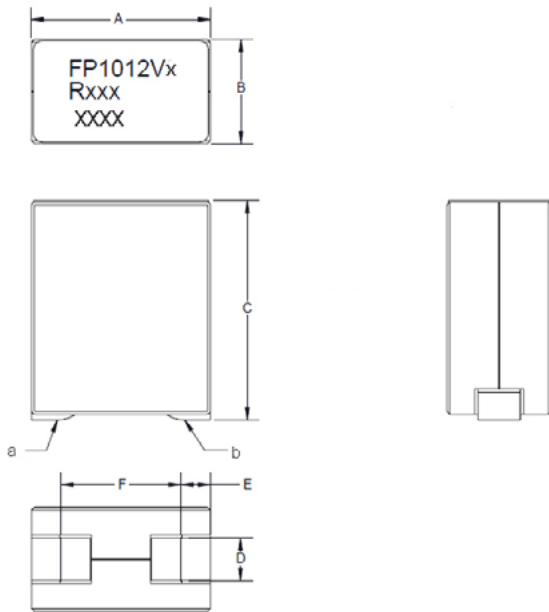
Vx= Version indicator

Rxxx=Inductance value in μH, R=decimal point

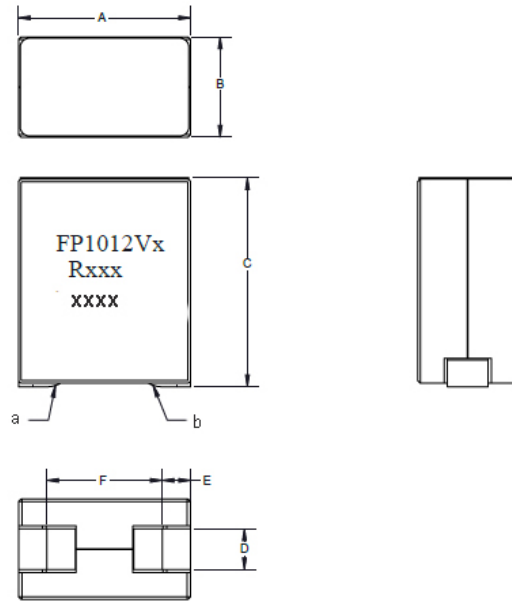
-R suffix = RoHS compliant

Dimensions-mm

FP1012V2

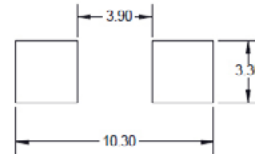


FP1012V3

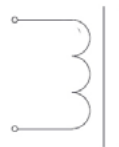


| Dimension | FP1012V2/V3 |
|-----------|---------------|
| A | 10 maximum |
| B | 6.0 maximum |
| C | 12 maximum |
| D | 2.3 nominal |
| E | 1.6 reference |
| F | 6.5 reference |

Recommended pad layout FP1012V2/V3



Schematic FP1012V2/V3

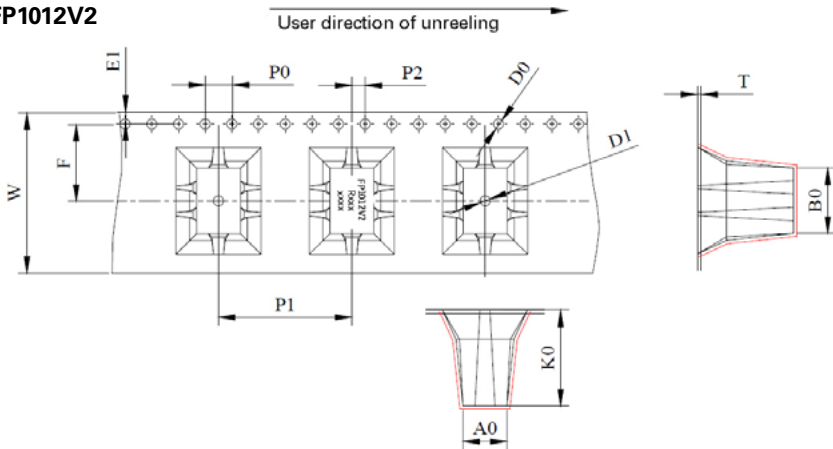


Part marking: FP1012=Product code and size, Vx=Version indicator, Rxxx= inductance value in uH, R=decimal point, xxxx= lot code
Tolerances are ± 0.15 millimeters unless stated otherwise
All soldering surfaces to be coplanar within 0.1 millimeters
Pad layout tolerances are ± 0.1 millimeters unless stated otherwise
DCR is measured from point "a" to point "b"
Traces or vias underneath the inductor is not recommended

Packaging information- mm

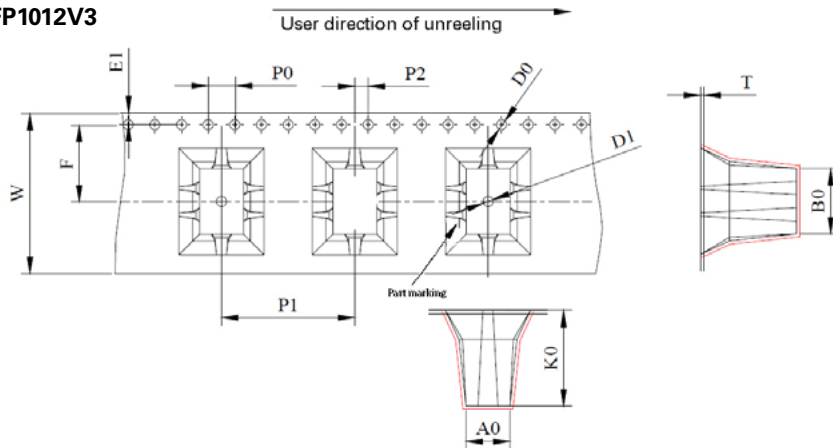
Supplied in tape and reel packaging, 250 parts per 13" diameter reel (EIA-481 compliant)

FP1012V2



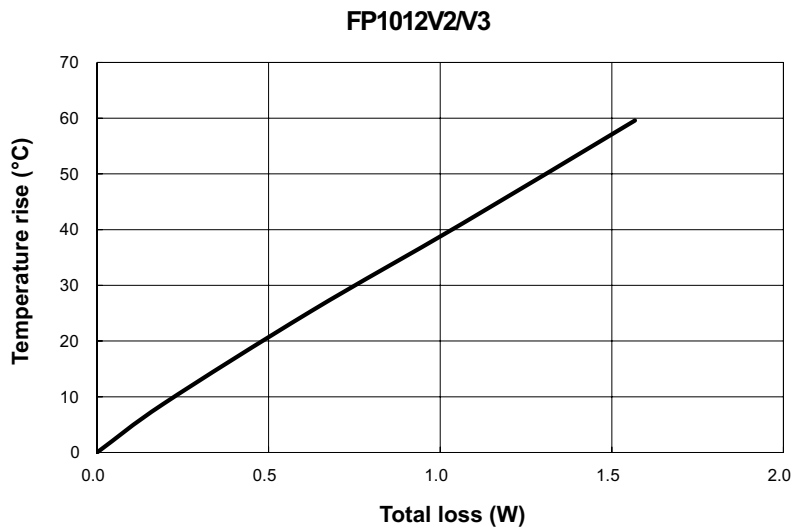
| | |
|-------------|------------|
| W ±0.3 | 24.00 |
| F ±0.1 | 11.50 |
| E1 ±0.10 | 1.75 |
| P0 ±0.10 | 4.00 |
| P1 ±0.10 | 20.00 |
| P2 ±0.1 | 2.00 |
| D0 +0.10/-0 | 1.50 |
| D1 +0.10/-0 | 1.50 |
| A0 | 6.2 ±0.10 |
| B0 | 10.2 ±0.10 |
| K0 | 12.2 ±0.10 |
| T ±0.05 | 0.5 |

FP1012V3

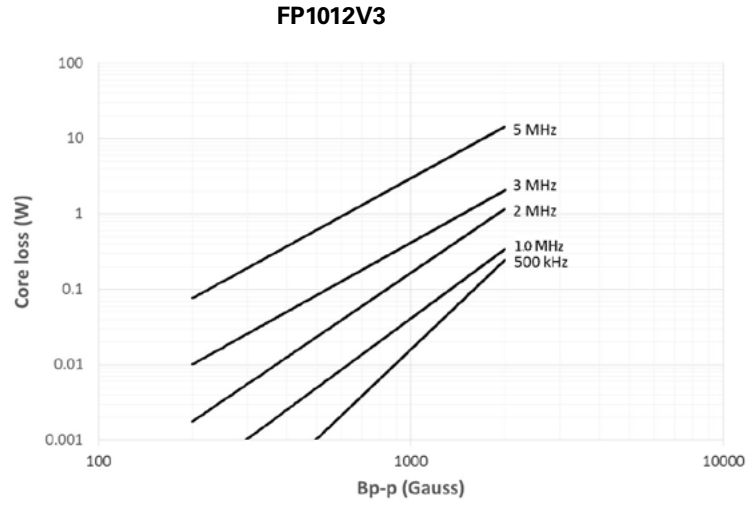
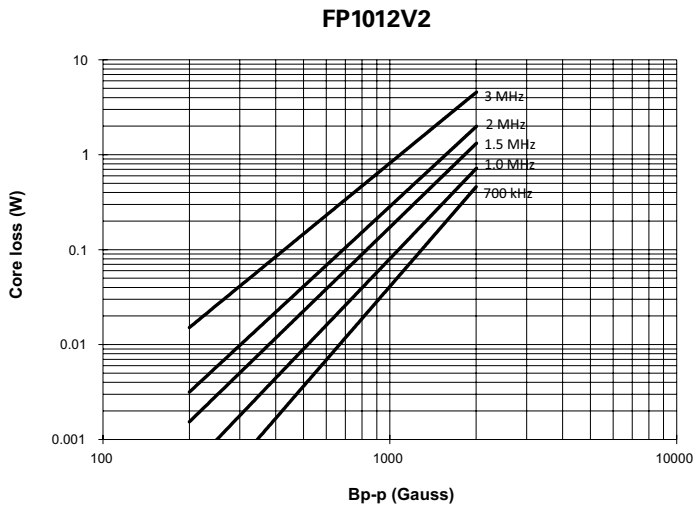


| | |
|-------------|------------|
| W ±0.3 | 24.00 |
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| E1 ±0.10 | 1.75 |
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| P1 ±0.10 | 20.00 |
| P2 ±0.1 | 2.00 |
| D0 +0.10/-0 | 1.50 |
| D1 +0.10/-0 | 1.50 |
| A0 | 6.2 ±0.10 |
| B0 | 10.2 ±0.10 |
| K0 | 12.2 ±0.10 |
| T ±0.05 | 0.5 |

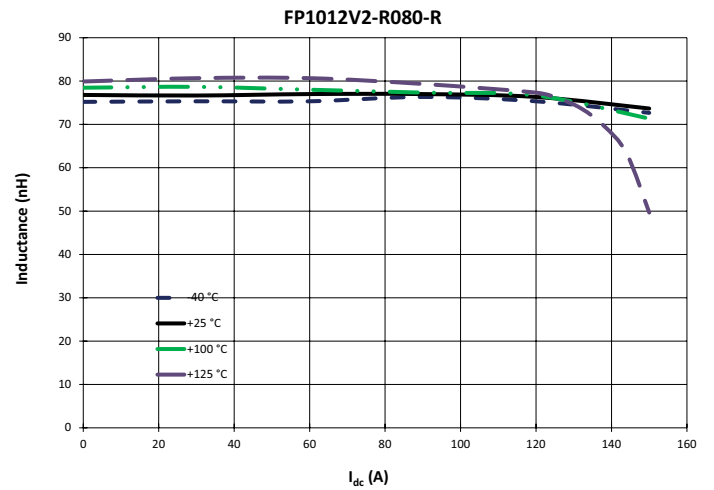
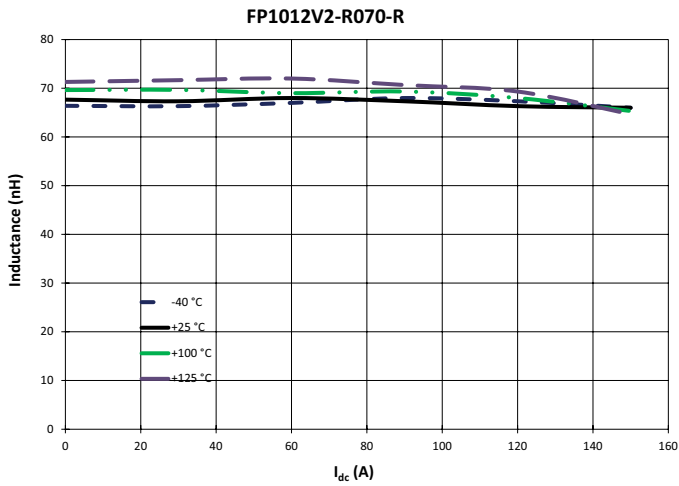
Temperature rise vs. total loss



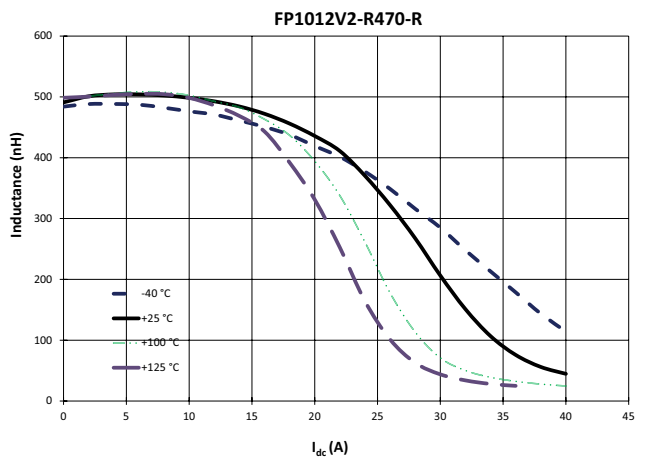
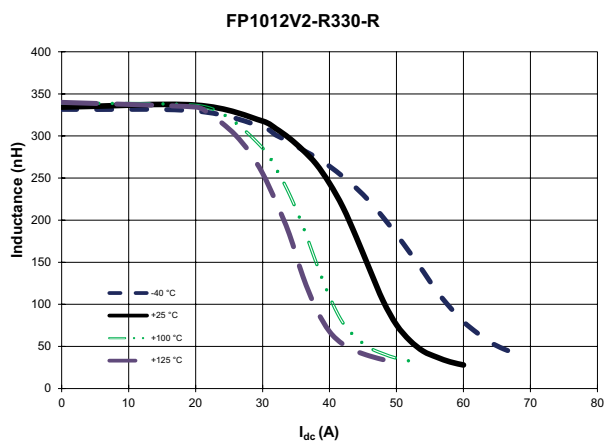
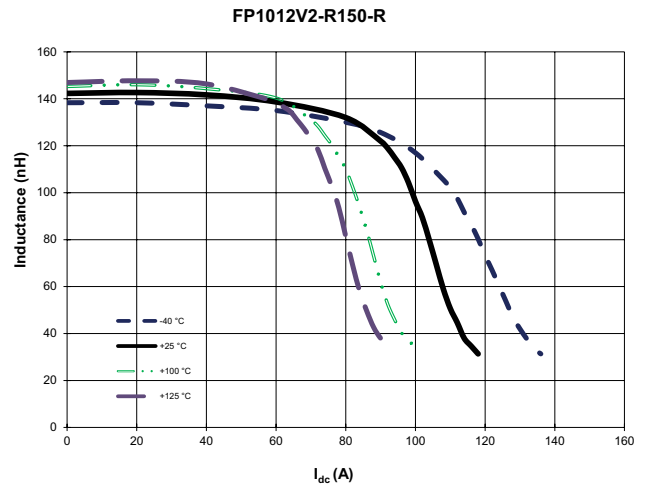
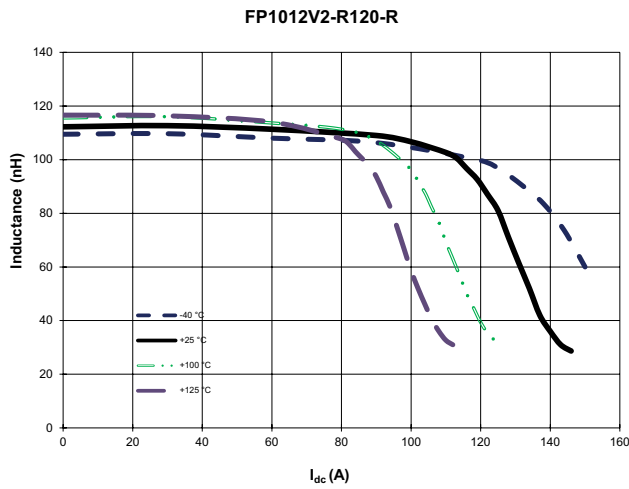
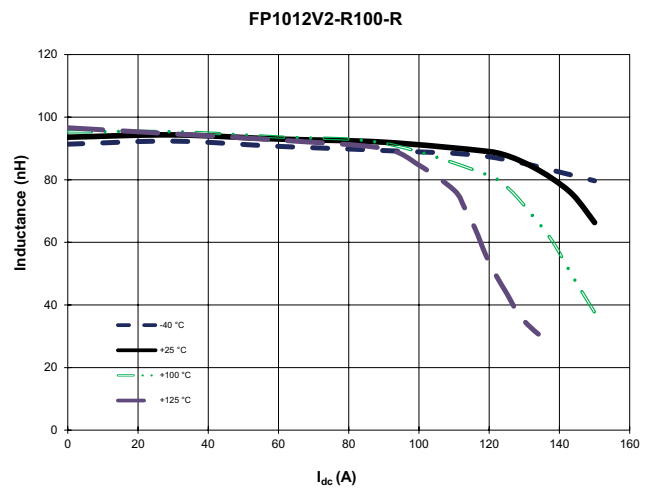
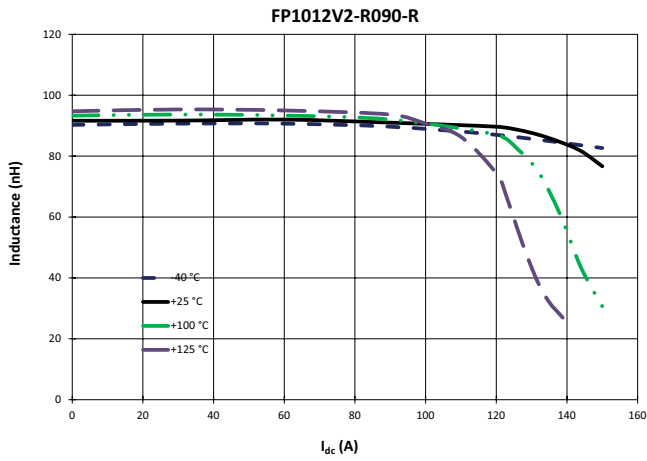
Core loss vs Bp-p



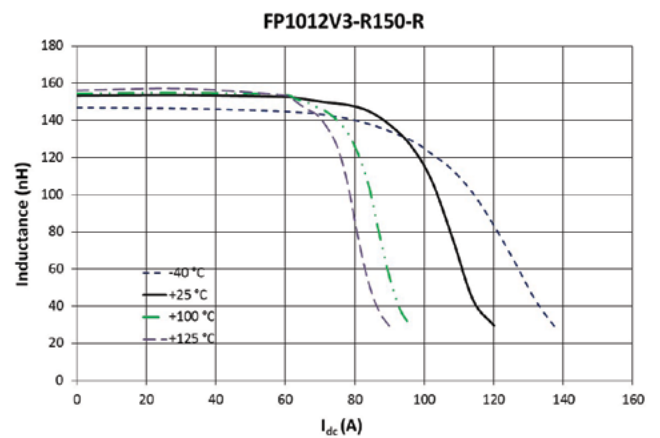
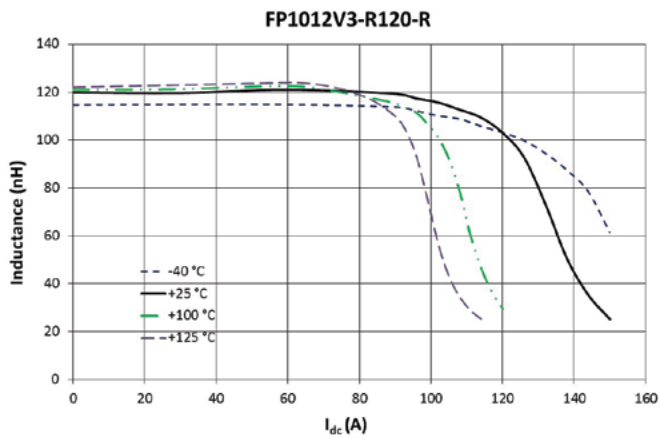
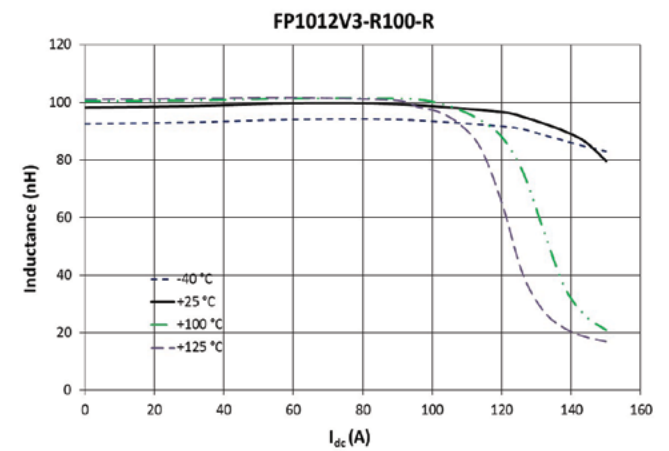
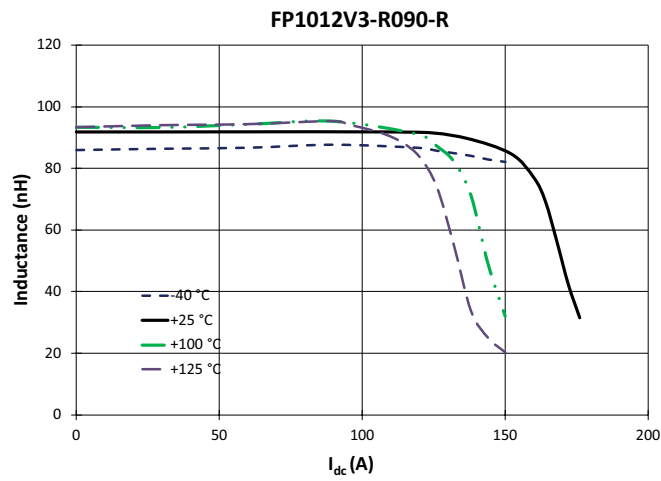
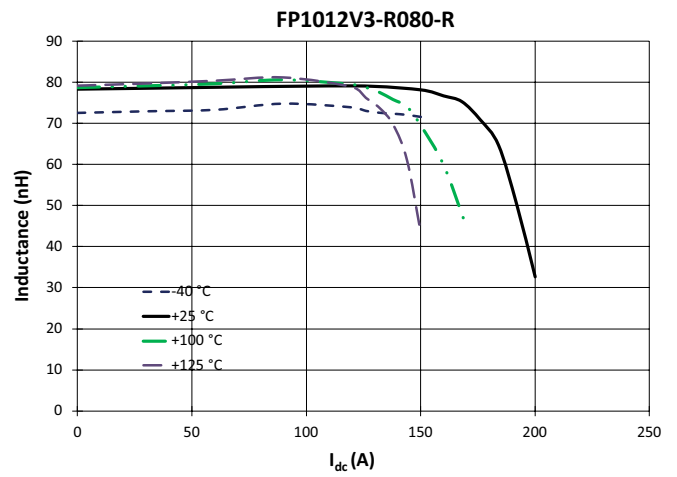
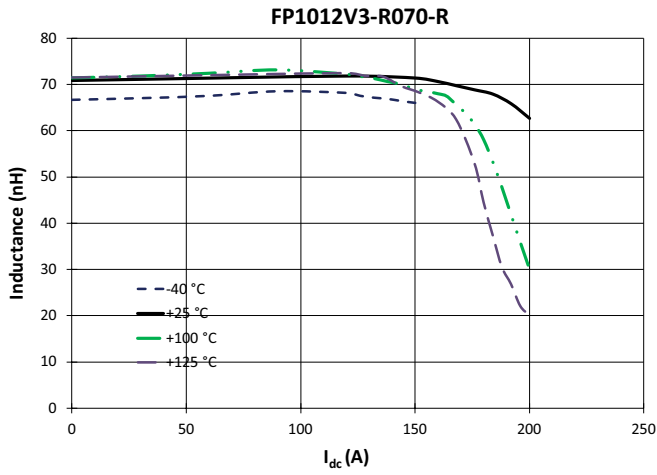
Inductance characteristics



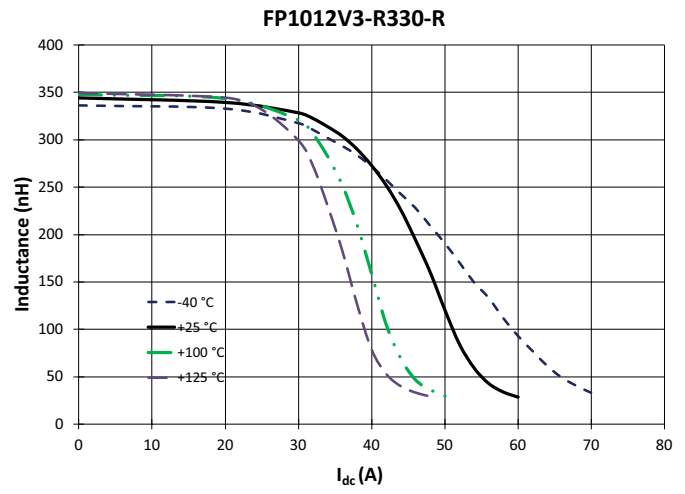
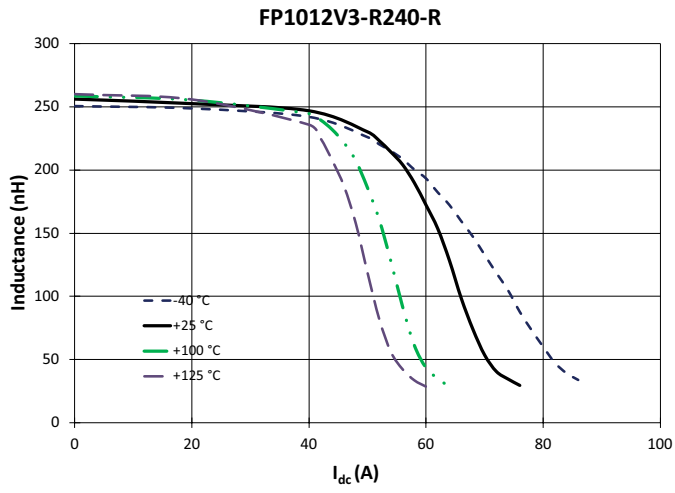
Inductance characteristics



Inductance characteristics



Inductance characteristics



Solder reflow profile

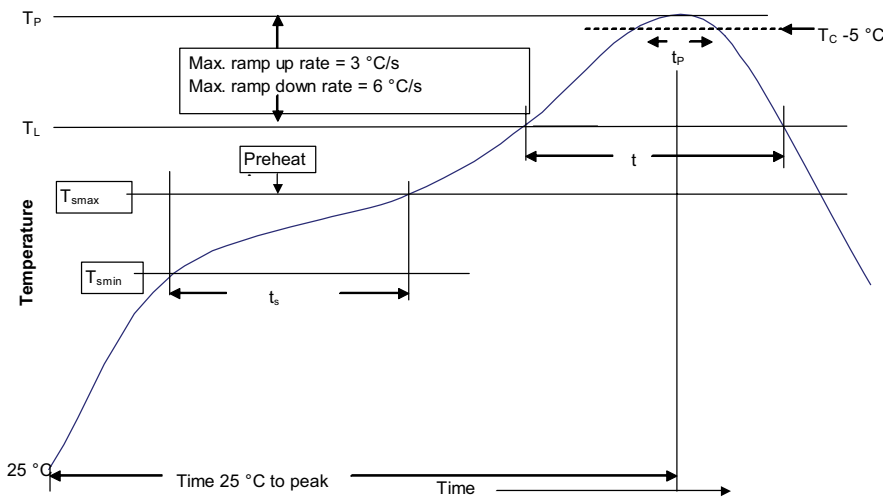


Table 1 - Standard SnPb solder (T_C)

| Package thickness | Volume mm ³ <350 | Volume mm ³ ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5 mm | 235 °C | 220 °C |
| ≥2.5 mm | 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 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6 mm | 260 °C | 260 °C | 260 °C |
| 1.6 – 2.5 mm | 260 °C | 250 °C | 245 °C |
| >2.5 mm | 250 °C | 245 °C | 245 °C |

Reference J-STD-020

| 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 |
| Ramp up rate T_L to T_p | 3 °C/ second max. | 3 °C/ second max. |
| Liquidous temperature (T_L) | 183 °C | 217 °C |
| Time (t_L) maintained above 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* |
| Ramp-down rate (T_p to T_L) | 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.

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