

EXL1V0705

High current molded inductor



Product features

- High current carrying capacity
- Low DCR, high efficiency
- Magnetically shielded, low EMI
- Soft saturation
- Inductance range from 2.2 μ H to 5.6 μ H
- Current range from 10 A to 17 A
- 8.7 mm x 8.3 mm footprint surface mount package in a 5.0 mm height
- Alloy powder core material
- Moisture Sensitivity Level (MSL) 1

Applications

- Voltage Regulator Module (VRM)
- Multi-phase regulators
- Point-of-load (POL) converters
- Desktop and server VRMs and EVRDs
- Base station equipment
- Battery power systems
- Graphics cards
- Data networking and storage system

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



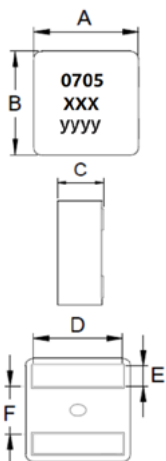
Product specifications

| Part number ⁵ | OCL ¹ (μH) \pm 20% | FLL ² (μH) minimum | I_{rms} ³ (A) typical | | I_{sat} ⁴ (A) | DCR (m Ω) typical @ +25 °C | DCR (m Ω) maximum @ +25 °C | SRF (MHz) typical |
|--------------------------|---|---|---|-------------|--------------------------------------|---------------------------------------|---------------------------------------|----------------------|
| | | | +20 °C rise | +40 °C rise | | | | |
| EXL1V0705-2R2-R | 2.2 | 1.23 | 11 | 14 | 17 | 5.8 | 6.4 | 27 |
| EXL1V0705-3R3-R | 3.3 | 1.84 | 10 | 13 | 14 | 10.4 | 11.44 | 20 |
| EXL1V0705-4R7-R | 4.7 | 2.63 | 8.5 | 11 | 13 | 14 | 15.4 | 17 |
| EXL1V0705-5R6-R | 5.6 | 3.13 | 7 | 10 | 11 | 15.6 | 17.2 | 15 |

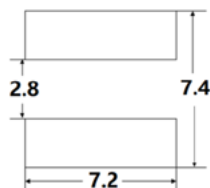
- Open circuit inductance (OCL) Test parameters: 100 kHz, 0.1 V_{rms}, 0.0 Adc, +25 °C
- Full load inductance (FLL) Test parameters: 100 kHz, 0.1 V_{rms}, I_{sat}, +25 °C
- I_{rms}: Heat rated current (I_{rms}) will cause the part temperature rise approximately ΔT of 40 °C. Circuit design, component, PCB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application. The part temperature (ambient + temp rise) should not exceed +125 °C under worst case operating conditions.

- I_{sat}: Peak current for approximately 30% rolloff @ +25 °C
- Part number definition: EXL1V0705-xxx-R
EXL1V0705 = Product code and size
xxx= inductance value in μH , R= decimal point,
If no R is present then third digit equals the number of zeros
-R suffix = RoHS compliant
- Rated operating voltage: 40 V typical

Mechanical parameters, schematic, pad layout (mm)



Recommended pad layout



Schematic

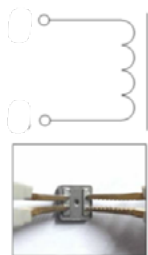


Figure 1. DCR test

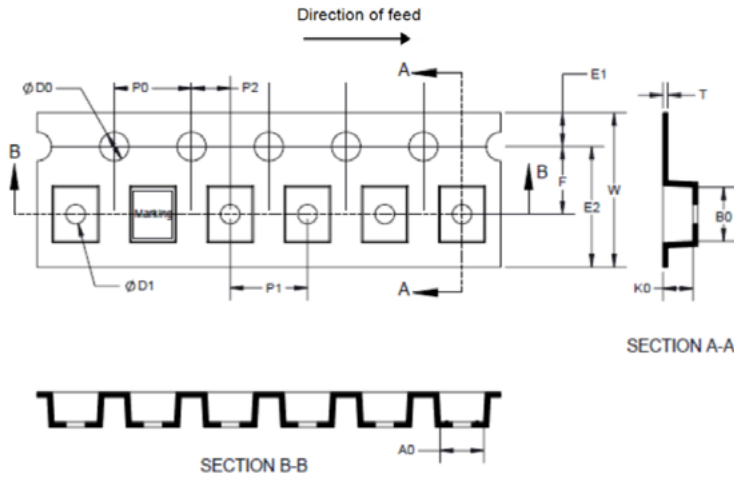
| Part number | A | B | C | D | E | F |
|-----------------|---------------|---------------|---------------|---------------|----------------|-----------------|
| EXL1V0705-xxx-R | 8.4 \pm 0.3 | 8.0 \pm 0.3 | 4.8 \pm 0.2 | 6.2 \pm 0.3 | 1.75 \pm 0.2 | 3.15 \pm 0.25 |

Part marking: 0705, xxx= Inductance value in μH (R= Decimal point, if no R is present then last digit equals number of zeros), yyyy= Lot code
All soldering surfaces to be coplanar within 0.1 millimeters
Tolerances are \pm 0.3 millimeters unless stated otherwise
Dimensions of recommended PCB layout are reference only.
Pad layout tolerances are \pm 0.1 millimeters unless stated otherwise
Four terminal kelvin-clip recommended for DCR testing as shown in Figure 1.
Traces or vias underneath the inductor is not recommended.

Packaging information (mm)

Drawing not to scale

Supplied in tape and reel packaging, 800 parts per 13" diameter reel (EIA-481 compliant)

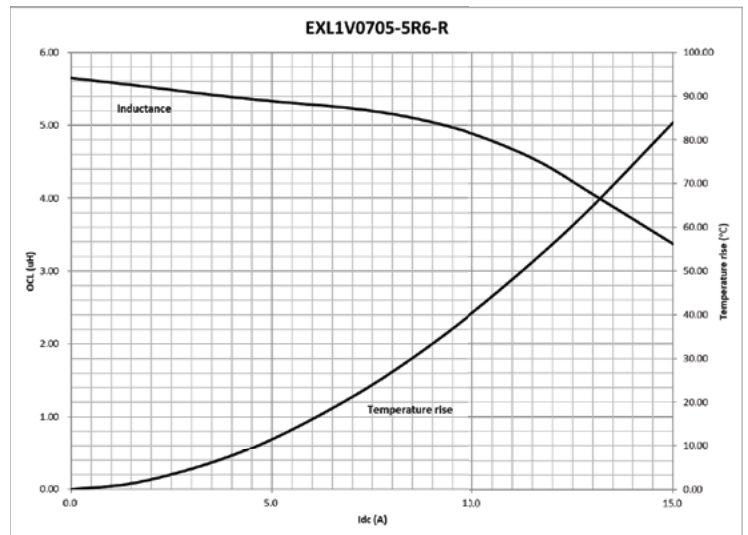
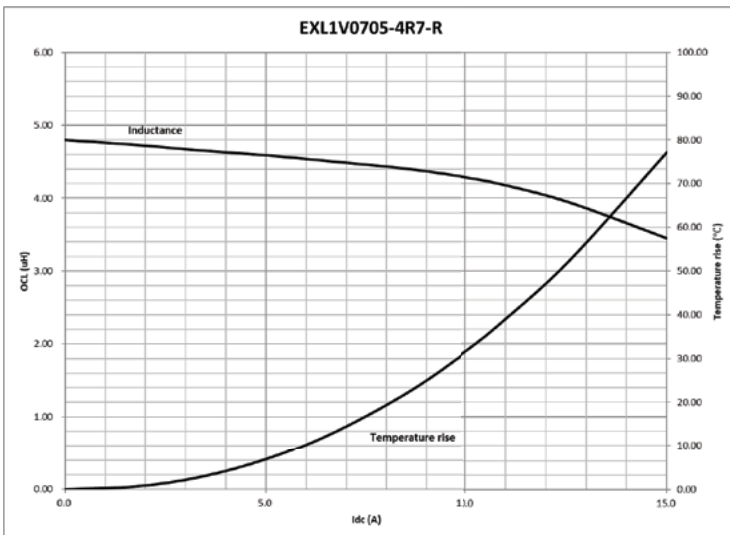
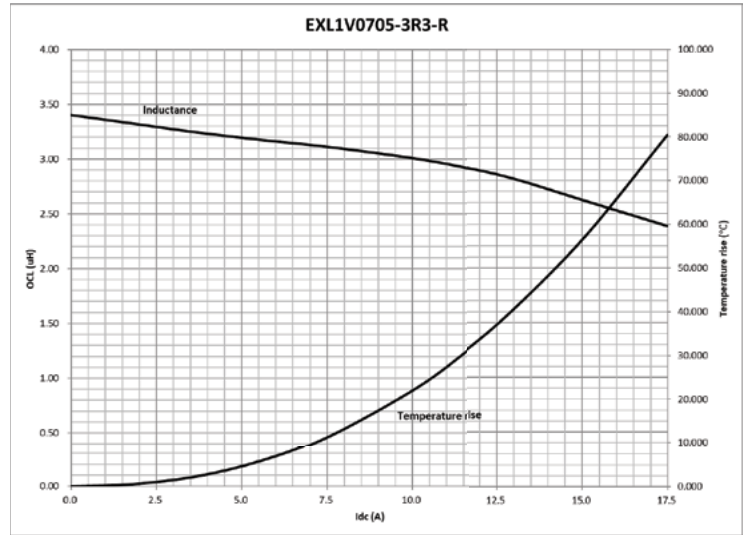
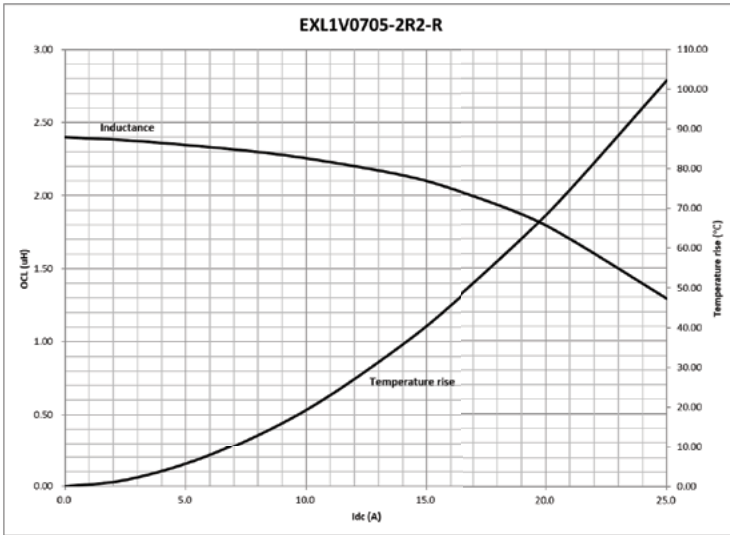


| | |
|---------------|------|
| W ± 0.30 | 16 |
| F ± 0.1 | 75 |
| E1 ± 0.1 | 1.75 |
| P0 ± 0.1 | 4.0 |
| P1 ± 0.1 | 12 |
| P2 ± 0.1 | 2.0 |
| D0 + 0.1/-0 | 1.5 |
| D1 + 0.1/-0 | 1.5 |
| A0 ± 0.1 | 8.8 |
| B0 ± 0.1 | 8.4 |
| K0 ± 0.1 | 5.3 |
| T ± 0.05 | 0.4 |
| P0 X 10 ± 0.2 | 40 |

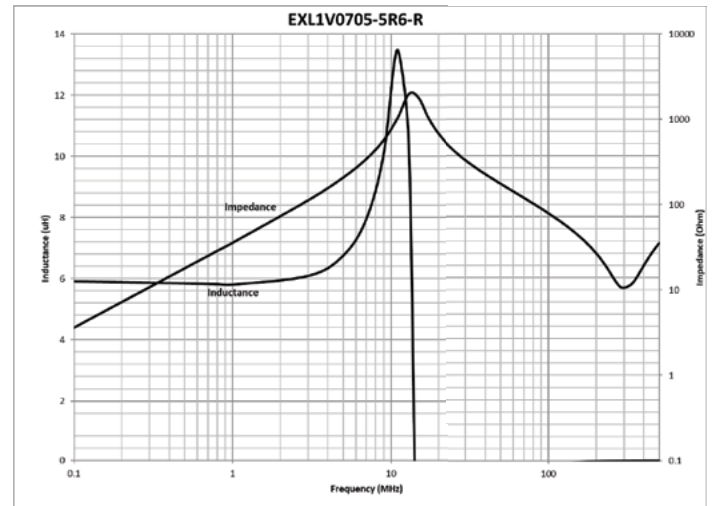
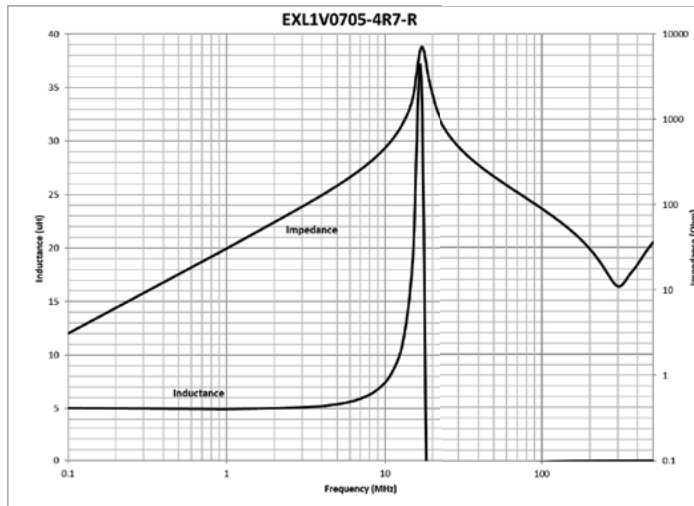
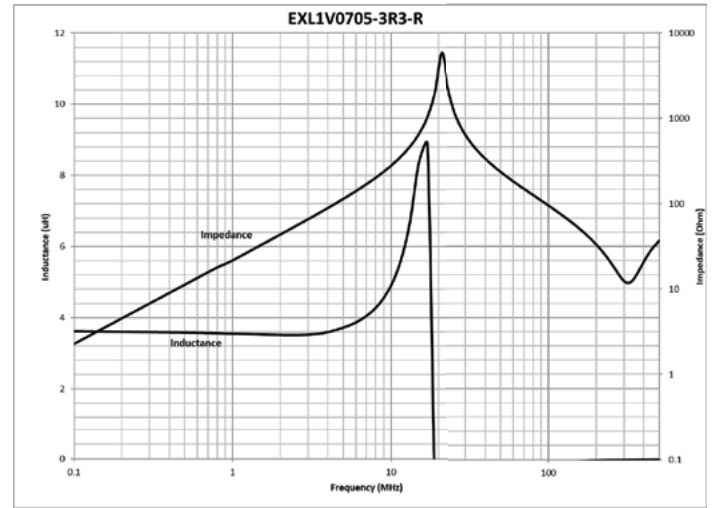
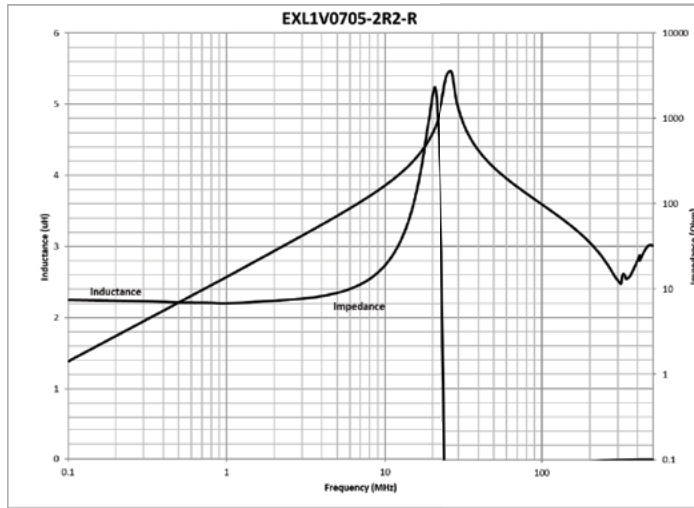
Qualification testing

| No. | Test item | Reference standards | Test condition | Acceptable value/range |
|-----|------------------------------|------------------------|--|---|
| 1 | Life | MIL-STD-202 Method 108 | +125 °C + I _{rms} for 1000 hours | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 2 | Load humidity | MIL-STD-202 Method 103 | +85 °C/85% RH + I _{rms} for 1000 hours | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 3 | Moisture resistance | MIL-STD-202 Method 106 | 7a & 7b included | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 4 | Thermal shock | MIL-STD-202 Method 107 | Step 1: -40 ± 2 °C 30 ± 5 minutes Step 2: 25 ± 2 °C ≤ 0.5 minutes Step 3: 125 ± 2 °C 30 ± 5 minutes Number of cycles: 500 | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 5 | Vibration | MIL-STD-202 Method 204 | 10 g, 12 hours (10 Hz ~ 2 kHz ~ 10 Hz for 20 minutes, 12 cycles each of 3 orientations) | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 6 | Shock | MIL-STD-202 Method 213 | Half-sine 50 g's, 11 ms | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 7 | Bending | IEC 68-2-21 | 1.2 mm for 10 s | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 8 | Solderability | J-STD-002D Method B | Preheat: +150 °C, 60 sec. 245 ± 5, Dip time: 4 ± 1 sec. Depth: completely cover the termination | ≥ 95% of the terminal covered with solder |
| 9 | Resistance to soldering heat | MIL-STD-202 Method 210 | +260 ± 5 °C; 10 ± 1 s | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |
| 10 | Terminal strength | AEC-Q200-006 | 1 kg for 60 + 1 s | a. Appearance b. ΔL/L<±10% d. ΔR/R<±15% |

Inductance and temperature rise vs. current



Inductance and impedance vs. frequency curve



Solder reflow profile

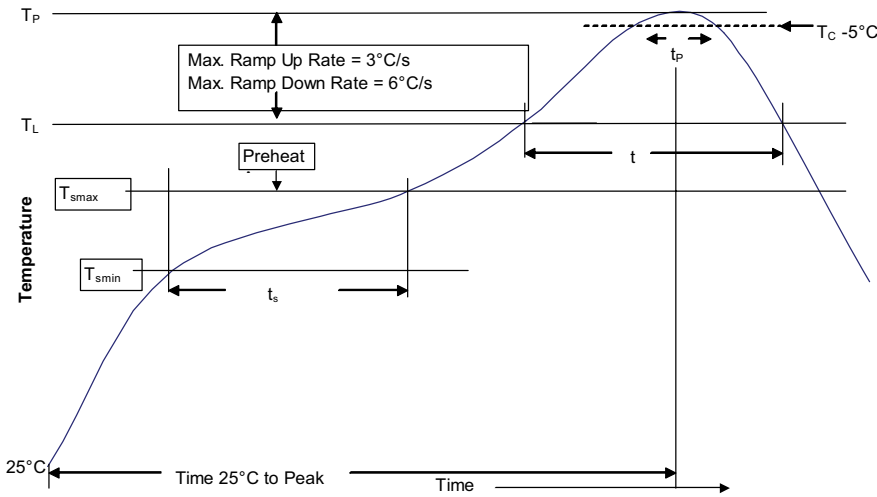


Table 1 - Standard SnPb solder (T_c)

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