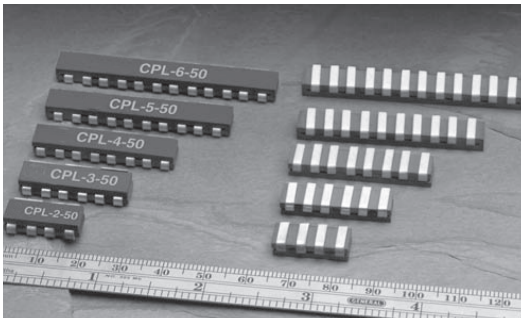
# THE DATASHEET OF

# CPL-2-50TR-R

# CPL,CPLA, and CPLE

## Multi-phase power inductors




### Product description

- High current multi-phase inductor applications
- 50nH per phase coupled inductor
- CPLA Family features acoustic noise dampening properties
- CPLE Family features optimized core material for enhanced light load efficiency
- Ferrite core material
- Frequency range up to 2MHz
- Patents pending
- Halogen free, lead free and RoHS compliant

### Applications

- For exclusive use with Volterra® or Maxim® VPR-Devices

### 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

Pb HALOGEN HF FREE RoHS

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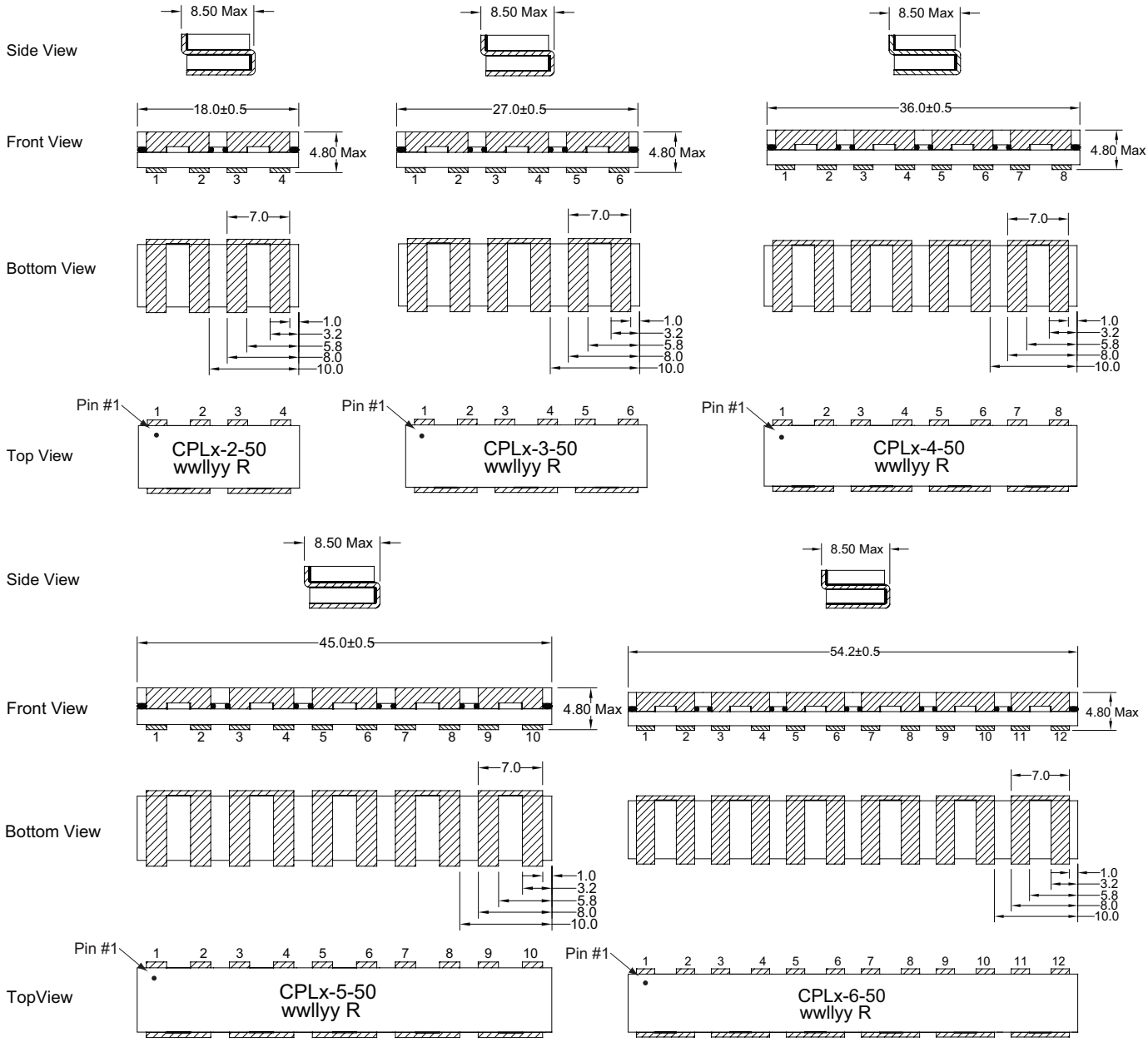
## Product Specifications

| | Function Specifications | | | | | Test Specifications | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Part Number[4,5]** | **Inductor phases** | **DCR (Ω) Nom. @25°C** | **DCR (Ω) Max. @25°C** | **Rated Inductance per Phase[3] (nH)** | **I Rated per Phase[3] (ADC)** | **Pin numbers** | **OCL[1,2] (nH)** | **Pin numbers** | **OCL[1,2] (nH)** | **Magnetizing Inductance[2] (nH) @ 5ADC (25°C)** |
| **CPL Family—Standard** | | | | | | | | | | |
| CPL-2-50TR-R | 2 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (1-2) | 365 ±18% | (3-4) | 365 ±18% | 300 |
| CPL-3-50TR-R | 3 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4) | 490 ±20% | (1-2), (5-6) | 365 ±18% | 400 |
| CPL-4-50TR-R | 4 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6) | 490 ±20% | (1-2), (7-8) | 365 ±18% | 400 |
| CPL-5-50TR-R | 5 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6), (7-8) | 490 ±20% | (1-2), (9-10) | 365 ±18% | 400 |
| CPL-6-50TR-R | 6 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6), (7-8), (9-10) | 490 ±20% | (1-2), (11-12) | 365 ±18% | 400 |
| **CPLA Family—Acoustic Noise Dampening** | | | | | | | | | | |
| CPLA-2-50TR-R | 2 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (1-2) | 365 ±18% | (3-4) | 365 ±18% | 300 |
| CPLA-3-50TR-R | 3 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4) | 490 ±20% | (1-2), (5-6) | 365 ±18% | 400 |
| CPLA-4-50TR-R | 4 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6) | 490 ±20% | (1-2), (7-8) | 365 ±18% | 400 |
| CPLA-5-50TR-R | 5 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6), (7-8) | 490 ±20% | (1-2), (9-10) | 365 ±18% | 400 |
| **CPLE Family—Low Core Loss for Light Load Efficiency** | | | | | | | | | | |
| CPLE-2-50TR-R | 2 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (1-2) | 365 ±18% | (3-4) | 365 ±18% | 300 |
| CPLE-3-50TR-R | 3 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4) | 490 ±20% | (1-2), (5-6) | 365 ±18% | 400 |
| CPLE-4-50TR-R | 4 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6) | 490 ±20% | (1-2), (7-8) | 365 ±18% | 400 |
| CPLE-5-50TR-R | 5 | 0.0005 | 0.0006 | 50 ± 20% | 40 | (3-4), (5-6), (7-8) | 490 ±20% | (1-2), (9-10) | 365 ±18% | 400 |

1. OCL (Open Circuit Inductance)
2. Test parameters: 1MHz, 0.1Vrms, 0.0Adc. @25°C
3. The rated current and rated inductance per phase is determined by Volterra's testing and circuit design. Additional information can be provided by contacting Volterra.
4. Part Number Definition: CPLx-y-50TR-R-50TR-R
   - CPLx= Product code and size - CPL (standard)/CPLA (acoustic dampening)/CPLE (low core loss)
   - -y= number of phases • -50 = rated inductance value per phase in nH
   - TR= Tape and reel • -R suffix= RoHS compliant
5. This device is licensed for use only when incorporated within a voltage regulator employing power regulating devices manufactured by Volterra Semiconductor, LLC or Maxim Integrated Devices, Inc. No license is granted expressly or by implication to use this device with power regulating devices manufactured by any company other than Volterra or Maxim.

**Dimensions (mm)**

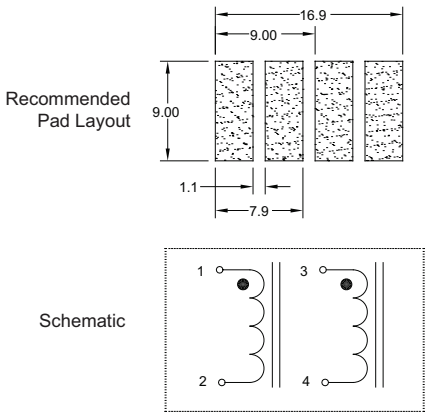



Part marking: Pin 1 dot, CPL/CPLA/CPLE= (product code and size), -2,-3,-4,-5, -6= (number of phases), -50 = (inductance value per phase in nH)
wwllyy = date code, R = revision level
Tolerances are ±0.20 millimeters unless stated otherwise
All soldering surfaces to be coplanar within 0.15 millimeter
Do not route traces or vias underneath the inductor

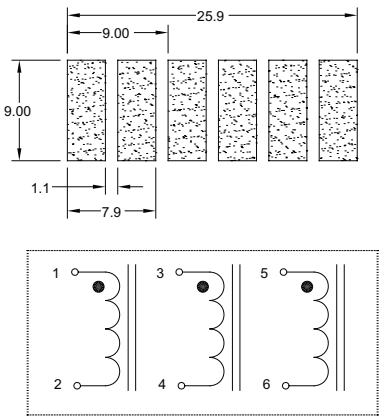
**Pad layouts & schematics (mm)**

Tolerances are ±0.2mm unless otherwise specified.

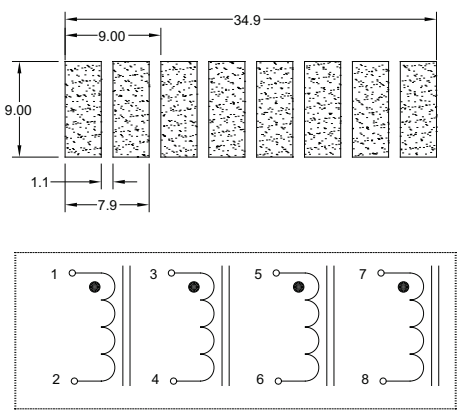
CPLx-2-50-R



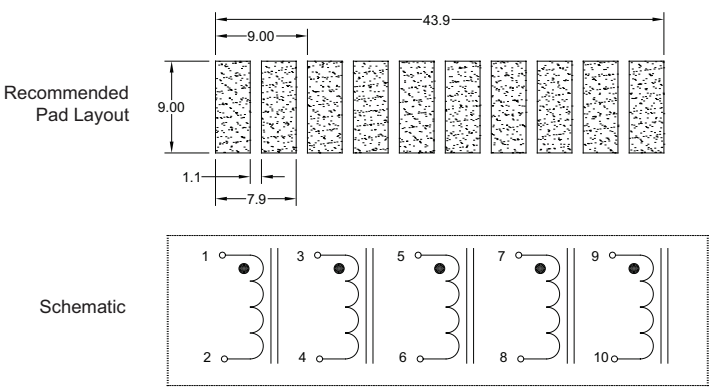

CPLx-3-50-R



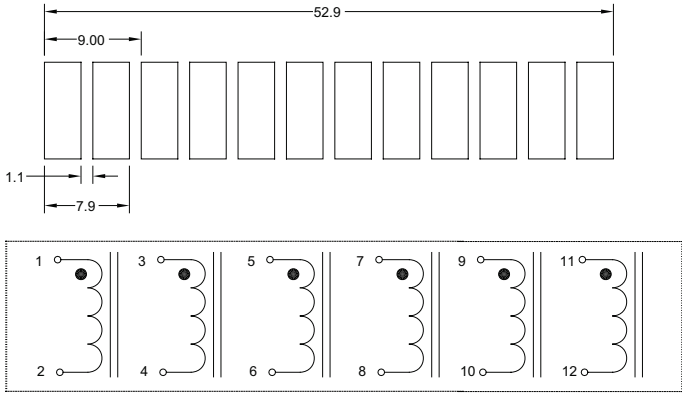

CPLx-4-50-R




CPLx-5-50-R



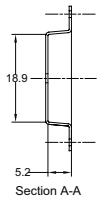

CPLx-6-50-R

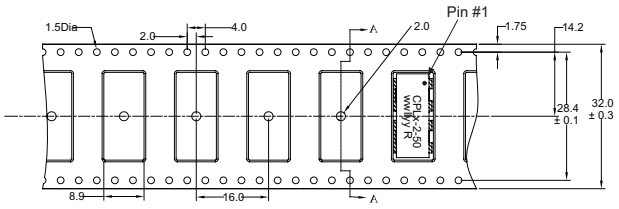


**Packaging Information (mm)**

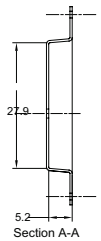
Supplied in tape-and-reel packaging, 750 parts per reel, 13" diameter reel.

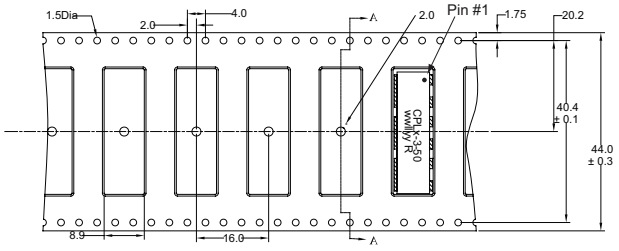
CPLx-2-50



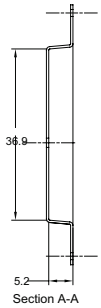



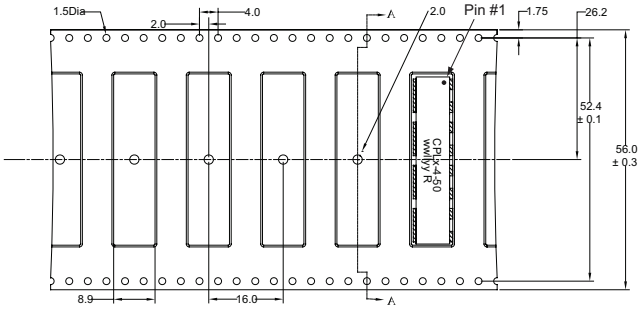

CPLx-3-50



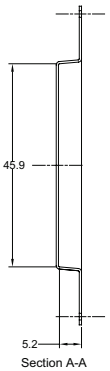



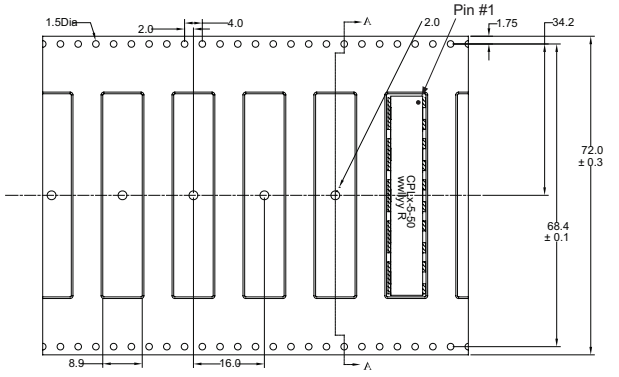

CPLx-4-50



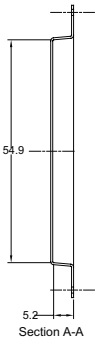



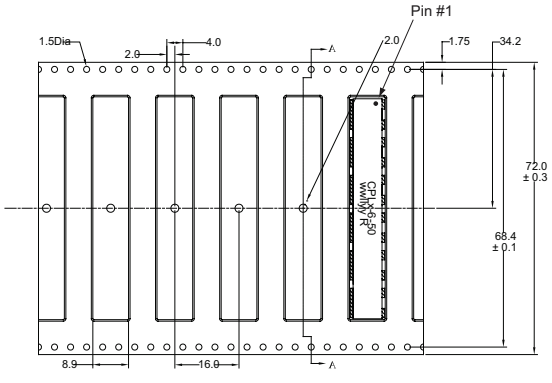

CPLx-5-50




CPLx-6-50




User direction of feed

## Solder reflow profile

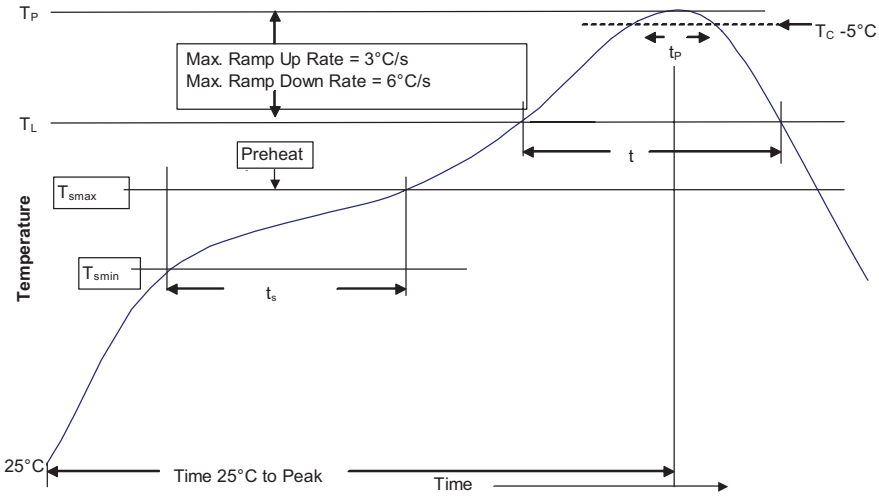



**Table 1 - Standard SnPb Solder ($T_C$)**

| Package Thickness | Volume mm3 <350 | Volume mm3 ≥350 |
|---|---|---|
| <2.5mm) | 235°C | 220°C |
| ≥2.5mm | 220°C | 220°C |

**Table 2 - Lead (Pb) Free Solder ($T_C$)**

| Package Thickness | Volume $mm^3$ <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 ($T_L$)<br>Time at liquidous ($t_L$) | | 183°C<br>60-150 Seconds | 217°C<br>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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