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## Features

- RoHS compliant*
- ESD protection >25 kV
- Low capacitance <0.5 pF
- Low leakage current <50 nA

## Applications

- HDMI 1.4
- Digital Visual Interface (DVI)
- USB 3.0 / USB OTG
- Memory protection
- SIM card ports

# ChipGuard® MLC Series - ESD Protectors

### General Information

The ChipGuard® MLC Series has been specifically designed to protect sensitive electronic components from electrostatic discharge damage. The MLC family has been designed to protect equipment to IEC61000-4-2, Level 4 (±8 kV Contact / ±15 kV Air Discharge) ESD specifications targeted for high speed USB 3.0/USB OTG, HDMI 1.4, DVI or IEEE1394 applications.

The ChipGuard® MLC Series has been manufactured to provide low 0.5 pF capacitance and leakage currents less than 5 nA with excellent clamp qualities, making the family almost transparent under normal working conditions.

### Additional Information

Click these links for more information:

PRODUCT SELECTOR | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

### Device Symbol




### Electrical Characteristics @ 25 °C (unless otherwise noted)

| Parameter | Symbol | CG0402MLC- | | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 3.3LG | 05LG | 12LG | 24LG | 3.3LGA | 05LGA | 12LGA | 24LGA | |
| Typical Continuous Operating Voltage | $V_{DC}$ | 3.3 | 5 | 12 | 24 | 3.3 | 5 | 12 | 24 | V |
| Typical Clamping Voltage (Note 1) | $V_C$ | 25 | | | | | | | | V |
| Maximum Capacitance @ 1 VRMS 1 MHz | $C_O$ | 0.5 | | | | | | | | pF |
| Maximum Leakage Current @ Max. VDC | $I_L$ | 5 | | | | | | | | nA |
| Typical Trigger Voltage (Note 2) | $V_T$ | 250 | | | | | | | | V |
| Maximum Response Time | $R_T$ | 1 | | | | | | | | ns |
| ESD Protection:<br>Per IEC 61000-4-2 Level 4<br>Min. Contact Discharge<br>Min. Air Discharge<br>Min. Air Discharge | | <br><br>±8<br>±15 (Note 3)<br>±25 | | | | | | | | <br><br>kV<br>kV<br>kV |
| Operating Temperature | $T_{OPR}$ | -40 to +85 | | | | -40 to +125 | | | | °C |
| Storage Temperature | $T_{STG}$ | -55 to +150 | | | | | | | | °C |

| Parameter | Symbol | CG0603MLC- | | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 3.3LE | 05LE | 12LE | 24LE | 3.3LEA | 05LEA | 12LEA | 24LEA | |
| Typical Continuous Operating Voltage | $V_{DC}$ | 3.3 | 5 | 12 | 24 | 3.3 | 5 | 12 | 24 | V |
| Typical Clamping Voltage (Note 1) | $V_C$ | 25 | 25 | 25 | | | | | | V |
| Maximum Capacitance @ 1 VRMS 1 MHz | $C_O$ | 0.5 | | | | | | | | pF |
| Maximum Leakage Current @ Max. VDC | $I_L$ | 5 | 5 | 5 | | | | | | nA |
| Typical Trigger Voltage (Note 2) | $V_T$ | 250 | 250 | 250 | | | | | | V |
| Maximum Response Time | $R_T$ | 1 | | | | | | | | ns |
| ESD Protection:<br>Per IEC 61000-4-2 Level 4<br>Min. Contact Discharge<br>Min. Air Discharge<br>Min. Air Discharge | | <br><br>±8<br>±15 (Note 3)<br>±25 | | | | | | | | <br><br>kV<br>kV<br>kV |
| Operating Temperature | $T_{OPR}$ | -40 to +85 | | | | -40 to +125 | | | | °C |
| Storage Temperature | $T_{STG}$ | -55 to +150 | | | | | | | | °C |

Notes: 1. Per IEC 61000-4-2, Level 4 8 kV Contact Discharge. Measurement 30 ns after initiation of pulse.
2. Per IEC 61000-4-2, Level 4 8 kV Contact Discharge. Measurement at maximum pulse voltage.
3. IEC 61000-4-2 ESD Performance will meet minimum 1000 reps without degradation in performance.

**WARNING**
**Cancer and Reproductive Harm -**
www.P65Warnings.ca.gov

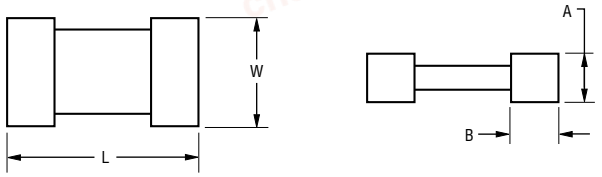
*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
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# ChipGuard® MLC Series - ESD Protectors

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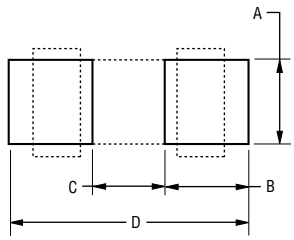
## Product Dimensions




DIMENSIONS: MM / (INCHES)

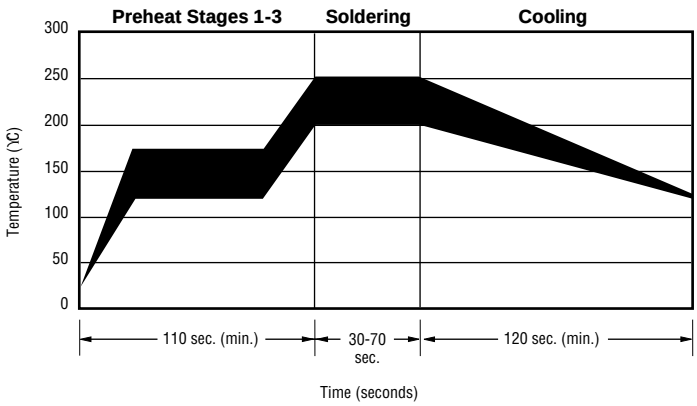
| Dimension | CG0402 Series | CG0603 Series |
|---|---|---|
| L | 1.00 ± 0.15 (0.04 ± 0.006) | 1.60 ± 0.20 (0.064 ± 0.008) |
| W | 0.50 ± 0.10 (0.02 ± 0.004) | 0.80 ± 0.20 (0.032 ± 0.008) |
| A | 0.36 ± 0.05 (0.014 ± 0.002) | 0.45 ± 0.10 (0.018 ± 0.004) |
| B | 0.25 ± 0.15 (0.10 ± 0.006) | 0.30 ± 0.20 (0.012 ± 0.008) |

## Recommended Pad Layout




| Dim. | CG0402 Series | CG0603 Series |
|---|---|---|
| A | 0.51 (0.020) | 0.76 (0.030) |
| B | 0.61 (0.024) | 1.02 (0.040) |
| C | 0.51 (0.020) | 0.50 (0.020) |
| D | 1.70 (0.067) | 2.54 (0.100) |

## Solder Reflow Recommendations




| | | | |
|---|---|---|---|
| A | Stage 1 Preheat | Ambient to Preheating Temperature | 30 s to 60 s |
| B | Stage 2 Preheat | 140 °C to 160 °C | 60 s to 120 s |
| C | Stage 3 Preheat | Preheat to 200 °C | 20 s to 40 s |
| D | Main Heating | 200 °C<br>210 °C<br>220 °C<br>230 °C<br>240 °C<br>250 °C to 255 °C | 60 s to 70s<br>55 s to 65 s<br>50 s to 60 s<br>40 s to 50 s<br>30 s to 40 s<br>5 s |
| E | Cooling | 200 °C to 100 °C | 1 °C/s to 4 °C/s |

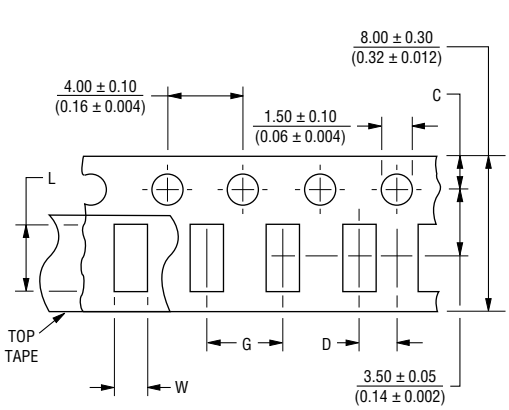
- This product can be damaged by rapid heating, cooling or localized heating.
- Heat shocks should be avoided. Preheating and gradual cooling recommended.
- Excessive solder can damage the device. Print solder thickness of 150 to 200 um recommended.
- Solder gun tip temperature should be kept below 280 °C and should not touch the device directly. Contact should be less than 3 seconds. A solder gun under 30 watts is recommended.

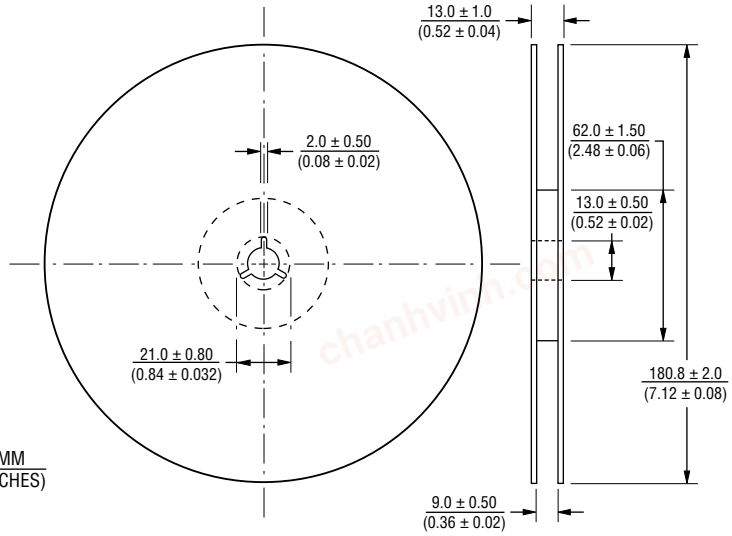
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## Packaging Dimensions




NOTES: TAPE MATERIAL IS PAPER.
TAPE THICKNESS IS $\frac{0.48 \pm 0.03}{(0.019 \pm 0.0012)}$
COVER TAPE ADHESION IS 40 ± 15 GRAMS.

DIMENSIONS: $\frac{\text{MM}}{(\text{INCHES})}$

| Dimension | CG0402 Series | CG0603 Series |
|---|---|---|
| C | $\frac{1.75 \pm 0.05}{(0.04 \pm 0.002)}$ | $\frac{1.75 \pm 0.10}{(0.04 \pm 0.004)}$ |
| D | $\frac{2.00 \pm 0.02}{(0.08 \pm 0.0008)}$ | $\frac{2.00 \pm 0.05}{(0.08 \pm 0.002)}$ |
| L | $\frac{1.12 \pm 0.03}{(0.045 \pm 0.012)}$ | $\frac{1.80 \pm 0.20}{(0.072 \pm 0.008)}$ |
| W | $\frac{0.62 \pm 0.03}{(0.025 \pm 0.012)}$ | $\frac{0.90 \pm 0.20}{(0.036 \pm 0.008)}$ |
| G | $\frac{2.0 \pm 0.05}{(0.08 \pm 0.002)}$ | $\frac{4.0 \pm 0.05}{(0.16 \pm 0.002)}$ |

## How to Order

**CG 0n0n MLC - n.n x x x**

ChipGuard® Product Designator

Package Option
- 0402 = 0402 Package
- 0603 = 0603 Package

Multilayer Series Designator

Operating Voltage**
- 3.3 = 3.3 V
- 05 = 5 V
- 12 = 12 V
- 24 = 24 V

Low Leakage Current Option
- L = Low Leakage Current
- Blank = Standard Product

Tape & Reel Packaging
- E = 5,000 pcs. per reel (0603 Package)
- G = 10,000 pcs. per reel (0402 Package)

Operating Temperature Option
- A = Higher +125 °C Operating Temperature
- Blank = Standard Product

** Only models lower than 10 volts require decimal point.

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