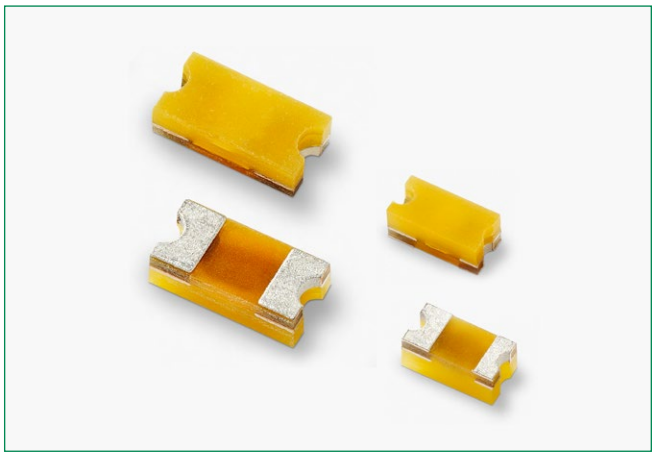
Littelfuse
Expertise Applied | Answers Delivered

# Xtreme-Guard™ ESD Suppressors

## Surface Mount Polymeric Electrostatic Discharge Suppressors

## XGD Series

Pb HF RoHS



## Description

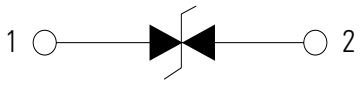
XTREME-GUARD™ ESD Suppressors protect sensitive electronic equipment against extreme ESD conditions, in very small 0402 and 0603 footprints. This series product is specifically designed to suppress fast-rising ESD transients up to 30kV while adding virtually no capacitance to the circuit, which helps preserve signal integrity and minimize data loss. It is a RoHS compliant, halogen free, and Pb free ESD Suppressor.

## Features

- High ESD Rating up to 30kV Contact/Air Discharge
- RoHS compliant, lead-free and halogen-free
- Ultra-low capacitance
- Low leakage current
- Fast response time
- Bi-directional
- Withstands multiple ESD strikes
- Compatible with pick-and-place processes
- Available in 1000, 5000, and 10000 piece reels (EIA-RS481)
- High rated voltage up to 32V maximum
- High operating temperature at 125°C

## Equivalent Circuits

**0402 & 0603 Devices**




Life Support Note:

**Not Intended for Use in Life Support or Life Saving Applications**
The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

## Product Characteristics

| Part Number | Lines Protected | Component Package | Available as Halogen-Free |
|---|---|---|---|
| XGD10402 | 1 | 0402 | Yes |
| XGD10603 | 1 | 0603 | Yes |

## Applications

- Wearable Devices
- Notebooks/Laptops/PCs
- Gaming Consoles
- Smart TVs
- Smart Phones
- Tablets
- Set Top Boxes
- Networking and Wireless Hardware
- Stationary and Portable Medical Devices

## Electrical Characteristics

| Specification | XGD10402 | XGD10603 | Notes |
|---|---|---|---|
| ESD Capability:<br>IEC 61000-4-2 Contact Discharge (typical)<br>IEC 61000-4-2 Air Discharge (typical) | <br>30kV<br>30kV | <br>30kV<br>30kV | The ESD capability measured by direct and air discharge method is subject to testing equipment and conditions. Numerous factors could affect the reliability and reproducibility of the direct and air discharge test results. |
| Trigger Voltage (typical)<br>Clamping Voltage (typical) | 250V<br>40V | 400V<br>40V | Measured per IEC 61000-4-2<br>8kV Direct Discharge Method |
| Trigger Voltage (typical)<br>Clamping Voltage (typical) | 150V<br>40V | 300V<br>28V | Measured using 500V TLP Direct Discharge Method |
| Rated Voltage (maximum) | 24V max | 32V max | |
| Capacitance (typical) | 0.04 pF | 0.09 pF | Measured at 250MHz |
| Response Time | <1nS | <1nS | |
| Leakage Current (typical) | <1nA @24V | <1nA @24V | |
| ESD Pulse Withstand | 1000 pulses min | 1000 pulses min | Some shifting in characteristics may occur when tested over multiple pulses at a very rapid rate |

**Note:** Testing performed on Littelfuse test setup as described in Typical Test Setup Section on page 4 of this document.

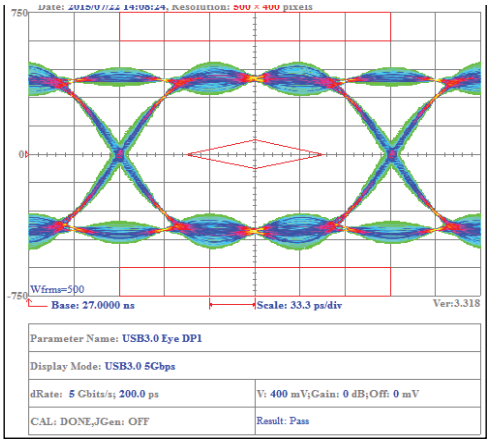

Revised: 03/31/20

# Xtreme-Guard™ ESD Suppressors

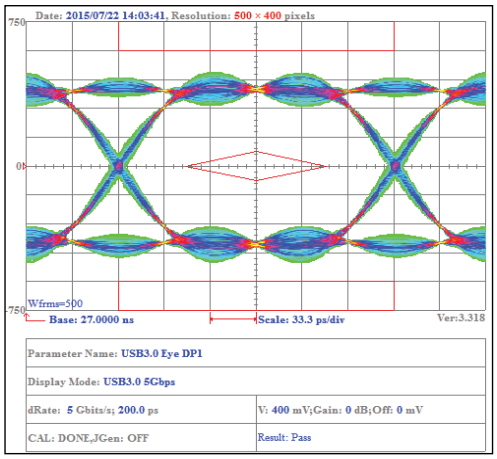
## Surface Mount Polymeric Electrostatic Discharge Suppressors

## Signal Integrity: USB3.0 5Gbps

### Without XGD Device

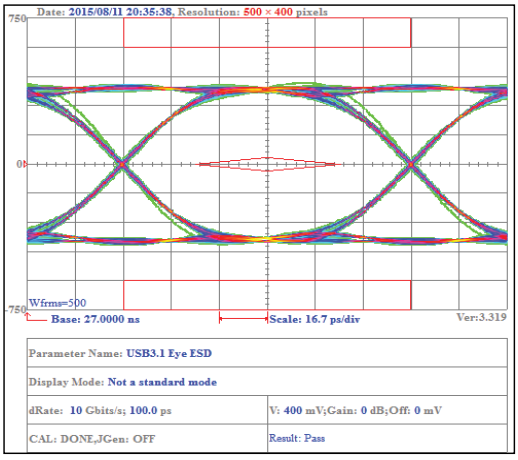



### With XGD Device

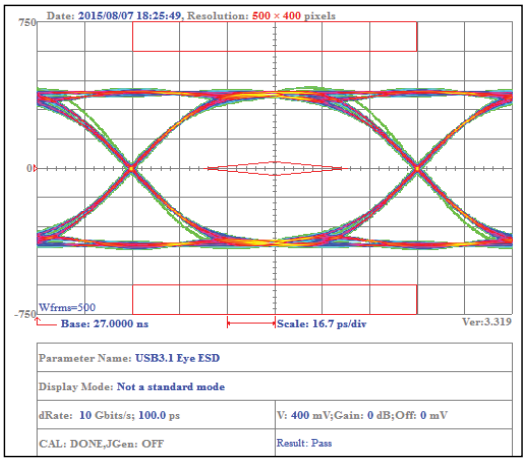



## Signal Integrity: USB3.1 10Gbps

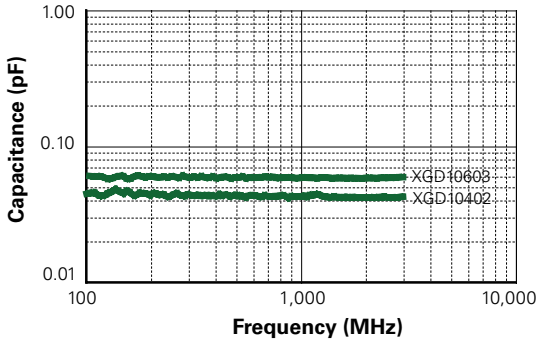
### Without XGD Device



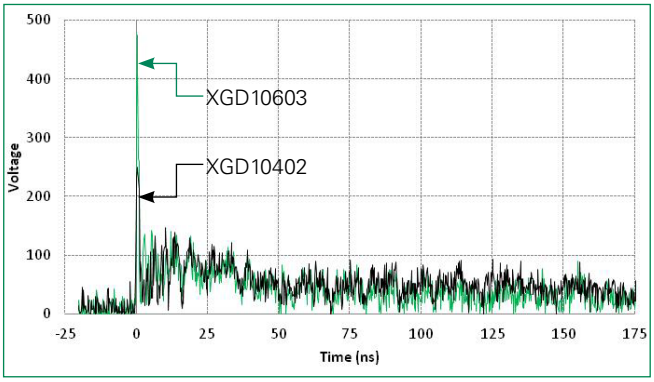

### With XGD Device




## Typical Device Capacitance




## Typical ESD Response





Revised: 03/31/20

# Xtreme-Guard™ ESD Suppressors

## Surface Mount Polymeric Electrostatic Discharge Suppressors

## Physical Specifications

| | |
|---|---|
| **Materials** | Body: Glass Epoxy<br>Terminations: Copper/Nickel/Tin |
| **Solderability** | MIL-STD-202, Method 208 |
| **Soldering Parameters** | Wave solder - 260°C, 10 seconds maximum Reflow solder - 260°C, 30 seconds maximum |

## Environmental Specifications

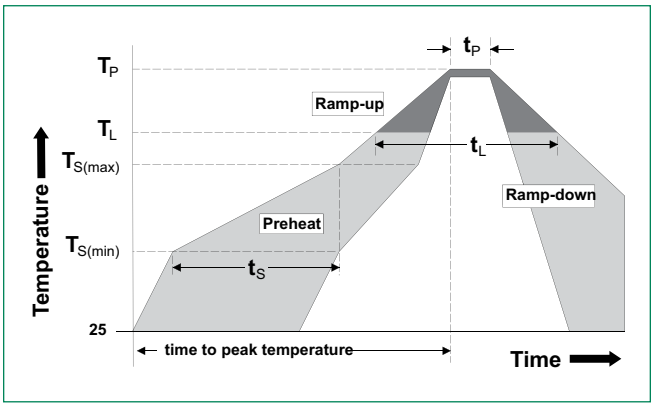
| | |
|---|---|
| **Operating and Storage Temperature** | -65°C to +125°C |
| **Moisture Resistance** | 0402 and 0603 series:<br>85°C, 85% RH, 1000 hours<br>40°C, 95% RH, 1000 hours |
| **Thermal Shock** | MIL-STD-202, Method 107,<br>-65°C to 125°C, 30 min. cycle,<br>10 cycles |
| **Vibration** | MIL-STD-202, Method 201, (10 to 55 to 10 Hz, 1 min. cycle, 2 hrs each in X-Y-Z) |
| **Chemical Resistance** | MIL-STD-202, Method 215 |

## Design Consideration

Because of the fast rise-time of the ESD transient, proper placement of XTREME-GUARD™ suppressors are a key design consideration to achieving optimal ESD suppression. The devices should be placed on the circuit board as close to the source of the ESD transient as possible. Install XTREME-GUARD™ suppressors (connected from signal/data line to ground) directly behind the connector so that they are the first board-level circuit component encountered by the ESD transient.

## Soldering Parameters

| | | |
|---|---|---|
| **Reflow Condition** | | Pb – Free assembly |
| **Pre Heat** | **- Temperature Min ($T_{s(min)}$)** | 150°C |
| | **- Temperature Max ($T_{s(max)}$)** | 200°C |
| | **- Time (min to max) ($t_s$)** | 60 – 180 seconds |
| **Average ramp up rate (Liquidus Temp ($T_L$) to peak** | | 3°C/second max |
| **$T_{S(max)}$ to $T_L$ - Ramp-up Rate** | | 3°C/second max |
| **Reflow** | **- Temperature ($T_L$) (Liquidus)** | 217°C |
| | **- Temperature ($t_L$)** | 60 – 150 seconds |
| **Peak Temperature ($T_P$)** | | 260°C |
| **Time within 5°C of actual peak Temperature ($t_p$)** | | 10 – 30 seconds |
| **Ramp-down Rate** | | 6°C/second max |
| **Time 25°C to peak Temperature ($T_P$)** | | 8 minutes max |




Based on IPC/JEDEC J-STD-020

## Packaging

| Part Number | Quantity & Packaging Code | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| XGD10402 | KR | 10000 | Tape & Reel (7" reel) | EIA RS-481-1 (IEC 286, part 3) |
| XGD10603 | MR | 1000 | Tape & Reel (7" reel) | EIA RS-481-1 (IEC 286, part 3) |
| XGD10603 | NR | 5000 | Tape & Reel (7" reel) | EIA RS-481-1 (IEC 286, part 3) |


Revised: 03/31/20

# Xtreme-Guard™ ESD Suppressors

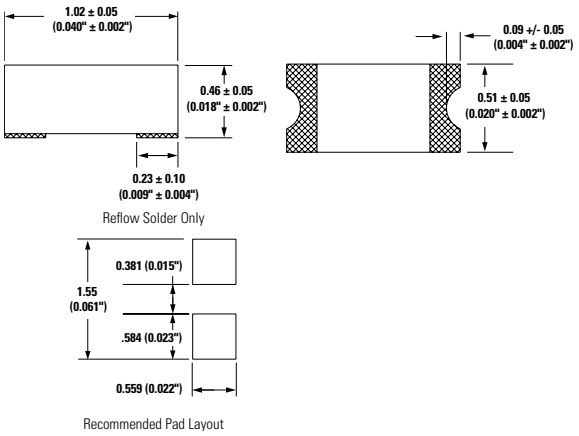
## Surface Mount Polymeric Electrostatic Discharge Suppressors

## Dimensions

### 0402 Device

Reference Dimensions:

Dimensions: mm (inch)




Reflow Solder Only

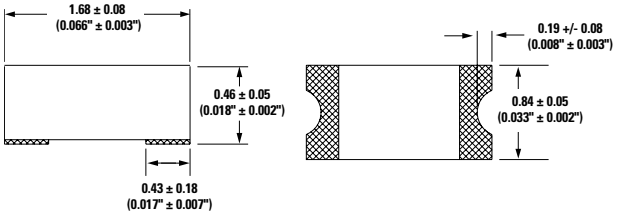



Recommended Pad Layout

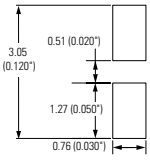
### 0603 Device

Reference Dimensions:

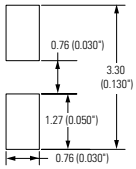
Dimensions: mm (inch)



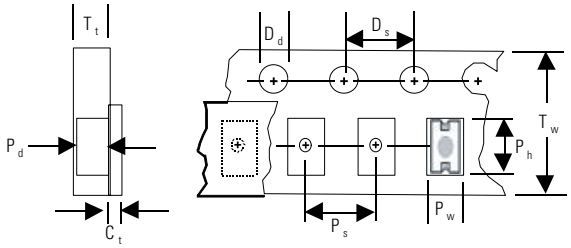

Reflow Solder




Wave Solder

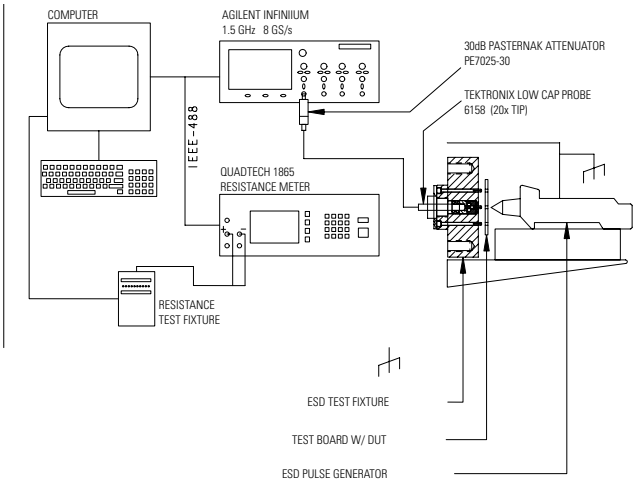



## Tape and Reel Specifications




| Description | 0402 Series (mm) | 0603 Series (mm) |
|---|---|---|
| $C_t$ - Cover tape thickness | 0.05 | 0.05 |
| $D_d$ - Drive hole diameter | 1.50 | 1.50 |
| $D_s$ - Drive hole spacing | 4.00 | 4.00 |
| $P_d$ - Pocket depth | 0.56 | 0.58 |
| $P_h$ - Pocket height | 1.14 | 1.85 |
| $P_s$ - Pocket spacing | 2.00 | 4.00 |
| $P_w$ - Pocket width | 0.62 | 1.02 |
| $T_t$ - Carrier tape thickness | 0.65 | 0.65 |
| $T_w$ - Carrier tape width | 8.00 | 8.00 |

## Typical Test Setup




## Part Numbering System

**XGD 1 0603 NR**

**LEAD-FREE XTREME-GUARD™ ESD SUPPRESSORS**

**LINES PROTECTED:**
1 = 1 line

**DEVICE SIZE CODE:**
0402 = 0402 (1005)

**QUANTITY & PACKAGING CODE:**
MR = 1000 pieces, tape & reel
NR = 5000 pieces, tape & reel
KR = 10,000 pieces, tape & reel