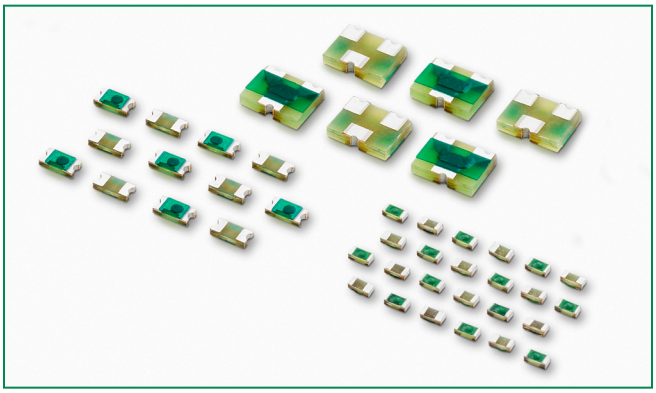
PULSE-GUARD® ESD Suppressors

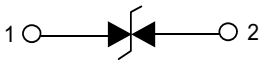
Surface Mount Polymeric Electrostatic Discharge Suppressors

PGB1 Series

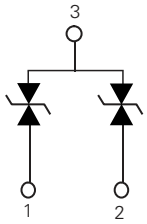


Equivalent Circuits

0402 and 0603 Devices



SOT23 Device



Description

PULSE-GUARD ESD Suppressors help protect sensitive electronic equipment against electrostatic discharge (ESD). They supplement the on-chip protection of integrated circuitry and are best suited for low-voltage, high-speed applications where low capacitance is important. Data ports utilizing such high-speed protocols as USB 2.0, IEEE1394, HDMI and DVI can benefit from this new technology.

PULSE-GUARD suppressors use polymer composite materials to suppress fast-rising ESD transients (as specified in IEC 61000-4-2), while adding virtually no capacitance to the circuit.

Features

- RoHS compliant, lead-free and available 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, 3000, 5000 and 10000 piece reels (EIA-RS481)

Applications

- HDTV Hardware
- Laptop/Desktop Computer
- Network Hardware
- Computer Peripherals
- Digital Camera
- External Storage
- Set-Top Box
- Antenna

Product Characteristics

Part Number	Lines Protected	Component Package	Available as Halogen-Free
PGB1010402	1	0402	No[1]
PGB1010603	1	0603	Yes
PGB102ST23	2	SOT23	Yes

Electrical Characteristics

Specification	PGB1010402	PGB1010603	PGB102ST23	Notes
ESD Capability: IEC 61000-4-2 Contact Discharge (typical) IEC 61000-4-2 Air Discharge (maximum)	 8kV 15kV	 8kV 15kV	 8kV 15kV	
Peak Voltage (typical)	1000V	500V	500V	Measured per IEC 61000-4-2 8kV Contact Discharge[2]
Clamping Voltage (typical)	250V	150V	150V	Measured per IEC 61000-4-2 8kV Contact Discharge[2], at 25 nsec.
Rated Voltage (maximum)	12VDC	24VDC	24VDC	
Capacitance (typical)	0.04 pF	0.06 pF	0.12 pF	Measured at 250 MHz
Response Time	<1nS	<1nS	<1nS	
Leakage Current (typical)	<1nA (12 VDC)	<1nA (6 VDC)	<1nA (6 VDC)	
ESD Pulse Withstand	100 pulses min	1000 pulses min	1000 pulses min	Some shifting in characteristics may occur when tested over multiple pulses at a very rapid rate

Notes: 1. PGB1 0402 product not offered as Halogen Free. See PGB2 series 0402 product instead (http://www.littelfuse.com/series/PGB2010402.html).
2. Testing performed on Littelfuse test setup as described in Typical Test Setup Section on page 4 of this document.

Revised: 12/26/13

Part Numbering System

PGB1 01 0603 MR

LEAD-FREE PULSE-GUARD® ESD SUPPRESSORS

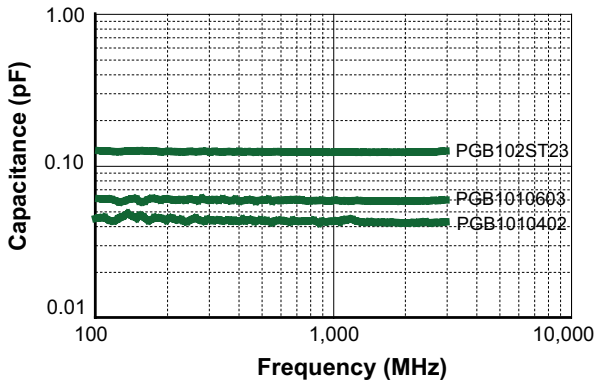
LINES PROTECTED:
- 01 = 1 line
- 02 = 2 lines

DEVICE SIZE CODE:
- 0402 = 0402 (1005)*
- 0603 = 0603 (1608)
- ST23 = SOT23

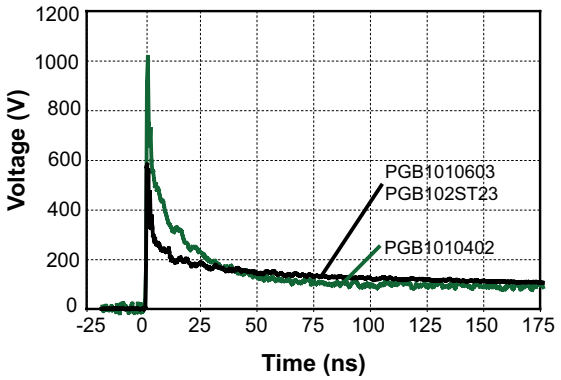
QUANTITY & PACKAGING CODE:
- MR = 1000 pieces, tape & reel
- WR = 3000 pieces, tape & reel
- NR = 5000 pieces, tape & reel
- KR = 10,000 pieces, tape & reel

*Note: PGB1 0402 product not available as Halogen Free item. See PGB2 0402 product instead, part number PGB2010402KRHF (http://www.littelfuse.com/series/PGB2010402.html).

Typical Device Capacitance



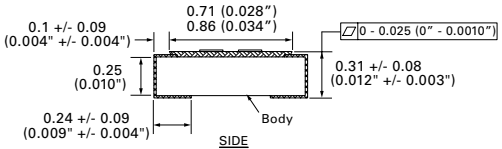
Typical ESD Response

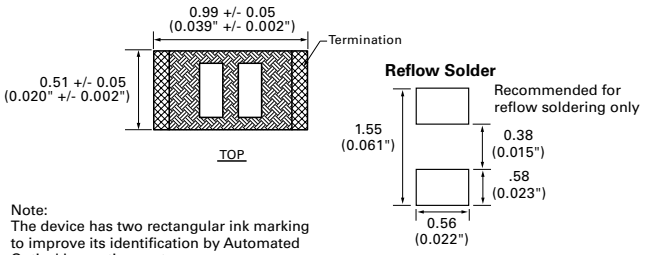


Dimensions

0402 Device

Dimensions: mm (inch)

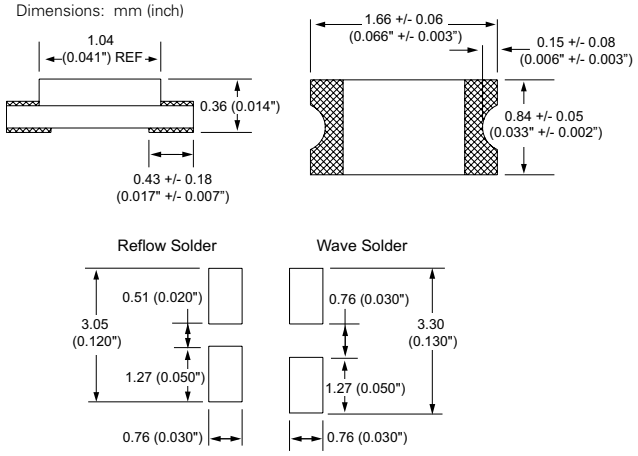




Note:
The device has two rectangular ink marking to improve its identification by Automated Optical Inspection systems

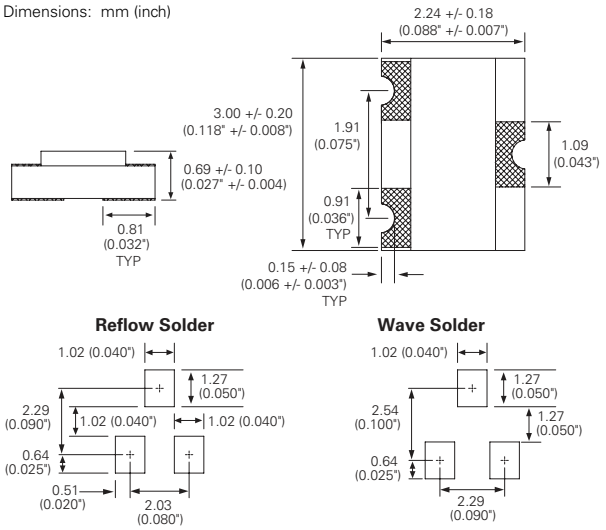
0603 Device

Dimensions: mm (inch)



SOT23 Device

Dimensions: mm (inch)



Revised: 12/26/13

Physical Specifications

Materials	Body: Glass Epoxy 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

Design Consideration

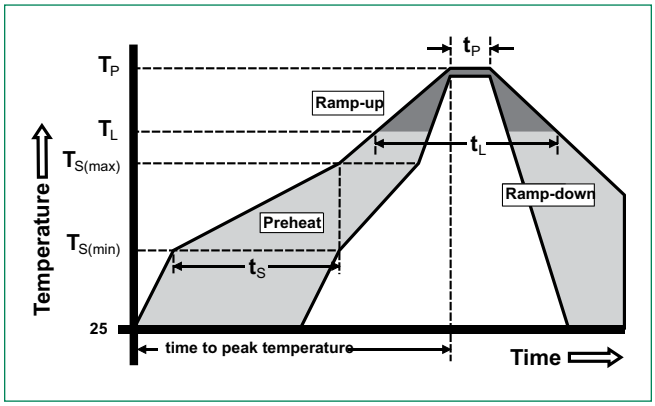
Because of the fast rise-time of the ESD transient, proper placement of PULSE-GUARD suppressors are a key design consideration to achieving optimal ESD suppression. The devices should be placed on the circuit board as close to the source of the ESD transient as possible. Install PULSE-GUARD suppressors (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.

Environmental Specifications

Operating Temperature	-65°C to +125°C
Moisture Resistance	0402 series: 40°C, 95% RH, 1000 hours 0603, ST23: 85°C, 85% RH, 1000 hours
Thermal Shock	MIL-STD-202, Method 107, -65°C to 125°C, 30 min. cycle, 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
Solder Leach Resistance and Terminal Adhesion	IPC/EIA J-STD-002

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

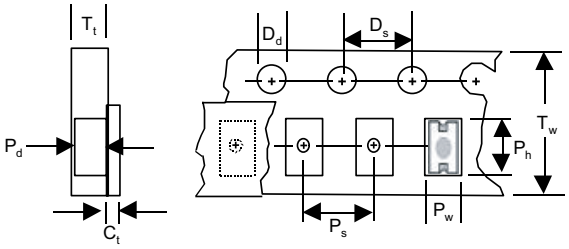


Based on IPC/JEDEC J-STD-020

Packaging

Part Number	Quantity & Packaging Code	Quantity	Packaging Option	Packaging Specification
PGB1010402	KR	10000	Tape & Reel (7" reel)	EIA RS-481-1 (IEC 286, part 3)
PGB1010603	MR	1000	Tape & Reel (7" reel)	EIA RS-481-1 (IEC 286, part 3)
PGB102ST23	WR	3000	Tape & Reel (7" reel)	EIA RS-481-1 (IEC 286, part 3)
PGB1010603	NR	5000	Tape & Reel (7" reel)	EIA RS-481-1 (IEC 286, part 3)

Tape and Reel Specifications



Description	0402 Series (mm)	0603 Series (mm)	SOT23 Series (mm)
C_t - Cover tape thickness	0.05	0.05	0.06
D_d - Drive hole diameter	1.50	1.50	1.50
D_s - Drive hole spacing	4.00	4.00	4.00
P_d - Pocket depth	0.41	0.58	1.02
P_h - Pocket height	1.12	1.85	3.23
P_s - Pocket spacing	2.00	4.00	4.00
P_w - Pocket width	0.62	1.02	2.46
T_t - Carrier tape thickness	0.61	0.65	1.77
T_w - Carrier tape width	8.00	8.00	8.00

Typical Test Setup