



## Features

- ESD/Surge Protection for 1 Line with Bidirectional.
- Provide ESD protection for each line to **IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (air / contact)**  
**IEC 61000-4-4 (EFT) 80A (5/50ns)**  
**IEC 61000-4-5 (Lightning) 20A (8/20 $\mu\text{s}$ )**
- Suitable for, **3.3V** and below, operating voltage applications
- Low capacitance : **2.0pF typical**
- High surge protection
- Fast turn-on and low clamping voltage
- Solid-state silicon-avalanche and active circuit triggering technology
- **Green Part**

## Applications

- xDSL Line Protection
- WAN/LAN Device
- 10/100/1000 Ethernet
- Power Supply Protection
- USB Interface Protection
- RF Interface Protection
- Peripherals

## Description

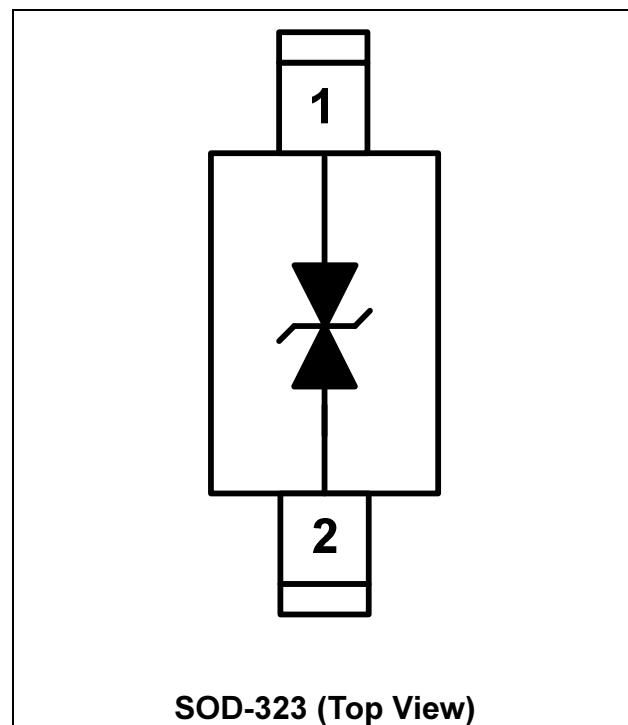
AZ1603-01L is a design which includes a bi-directional ESD rated clamping cell to protect one power line, or one control line, or one high speed data line in an electronic system. The AZ1603-01L has been specifically designed to protect sensitive components which are connected to data and transmission lines from

over-voltage caused by Electrostatic Discharging (ESD), Electrical Fast Transients (EFT), Lightning, and Cable Discharge Event (CDE).

AZ1603-01L is a unique design which includes proprietary clamping cell in a single package. During transient conditions, the proprietary clamping cell prevents over-voltage on the power line or control/data lines, protecting any downstream components.

AZ1603-01L may be used to meet the ESD immunity requirements of IEC 61000-4-2, Level 4 ( $\pm 15\text{kV}$  air,  $\pm 8\text{kV}$  contact discharge).

## Circuit Diagram / Pin Configuration





## SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS			
PARAMETER	SYMBOL	RATING	UNITS
Peak Pulse Current ( $t_p=8/20\mu s$ )	$I_{PP}$	20	A
Operating Supply Voltage	$V_{DC}$	$\pm 3.6$	V
ESD per IEC 61000-4-2 (Air)	$V_{ESD}$	$\pm 30$	kV
ESD per IEC 61000-4-2 (Contact)		$\pm 30$	
Lead Soldering Temperature	$T_{SOL}$	260 (10 sec.)	°C
Operating Temperature	$T_{OP}$	-55 to +125	°C
Storage Temperature	$T_{STO}$	-55 to +150	°C

ELECTRICAL CHARACTERISTICS						
PARAMETER	SYMBOL	CONDITIONS	MINI	TYP	MAX	UNITS
Reverse Stand-Off Voltage	$V_{RWM}$	$T=25\text{ }^{\circ}\text{C}$	-3.3		3.3	V
Reverse Leakage Current	$I_{Leak}$	$V_{RWM} = \pm 3.3\text{V}, T=25\text{ }^{\circ}\text{C}$			1	$\mu\text{A}$
Reverse Breakdown Voltage	$V_{BV}$	$I_{BV} = 1\text{mA}, T=25\text{ }^{\circ}\text{C}$	4		8	V
Surge Clamping Voltage	$V_{CL-surge}$	$I_{PP}= 5\text{A}, t_p=8/20\mu\text{s}, T=25\text{ }^{\circ}\text{C}$		9		V
		$I_{PP}= 20\text{A}, t_p=8/20\mu\text{s}, T=25\text{ }^{\circ}\text{C}$		15.5		
ESD Clamping Voltage (Note 1)	$V_{clamp}$	IEC 61000-4-2, +8kV ( $I_{TLP} = 16\text{A}$ ), Contact mode, $T=25\text{ }^{\circ}\text{C}$		12		V
ESD Dynamic Turn-on Resistance	$R_{dynamic}$	IEC 61000-4-2, 0~+8kV, $T=25\text{ }^{\circ}\text{C}$ , Contact mode		0.26		$\Omega$
Channel Input Capacitance	$C_{IN}$	$V_R = 0\text{V}, f = 1\text{MHz}, T=25\text{ }^{\circ}\text{C}$		2.0	2.5	pF

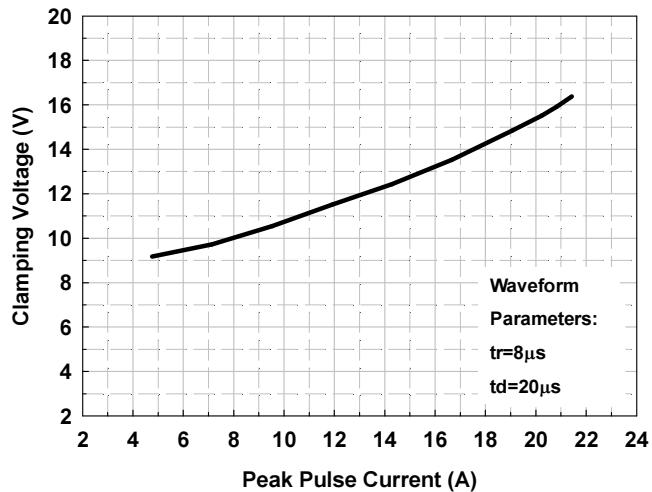
Note 1: ESD Clamping Voltage was measured by Transmission Line Pulsing (TLP) System.

TLP conditions:  $Z_0 = 50\Omega$ ,  $t_p = 100\text{ns}$ ,  $t_f = 1\text{ns}$ .

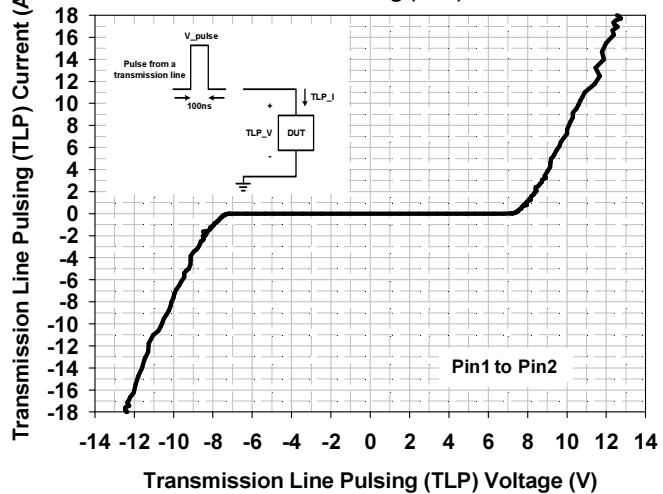


## Typical Characteristics

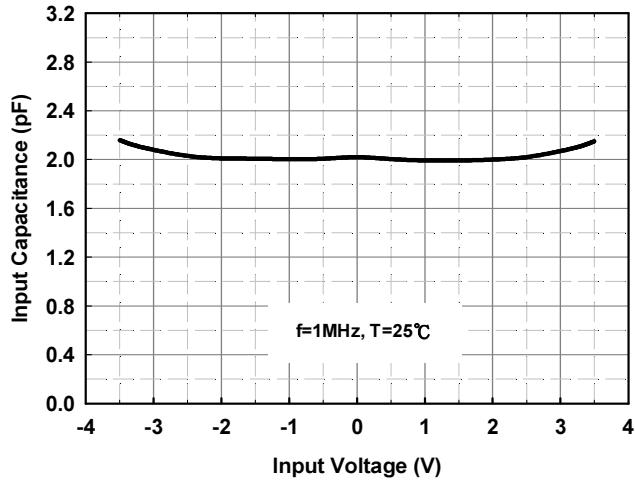
Reverse Clamping Voltage vs. Peak Pulse Current



Transmission Line Pulsing (TLP) Measurement



Typical Variation of  $C_{IN}$  vs.  $V_{IN}$





## Applications Information

The AZ1603-01L is designed to protect one line against System ESD/EFT/Lightning pulses by clamping it to an acceptable reference. It provides bidirectional protection.

The usage of the AZ1603-01L is shown in Fig. 1. Protected line, such as data line, control line, or power line, is connected at pin 1. The pin 2 is connected to a ground plane on the board. In order to minimize parasitic inductance in the board traces, all path lengths connected to the pins of AZ1603-01L should be kept as short as possible.

In order to obtain enough suppression of ESD induced transient, good circuit board is critical. Thus, the following guidelines are recommended:

- Minimize the path length between the protected lines and the AZ1603-01L.
- Place the AZ1603-01L near the input terminals or connectors to restrict transient coupling.
- The ESD current return path to ground should be kept as short as possible.
- Use ground planes whenever possible.
- NEVER route critical signals near board edges and near the lines which the ESD transient easily injects to.

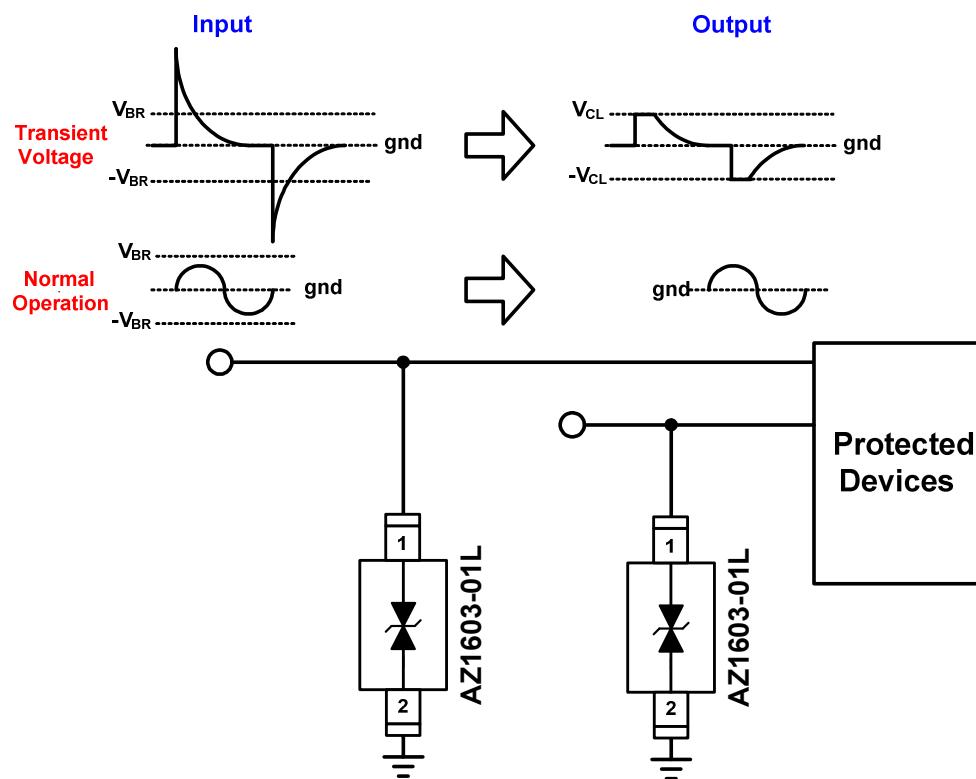


Fig. 1



Fig. 2 shows another simplified example of using AZ1603-01L to protect the control line, high

speed data line, and power line from ESD transient stress.

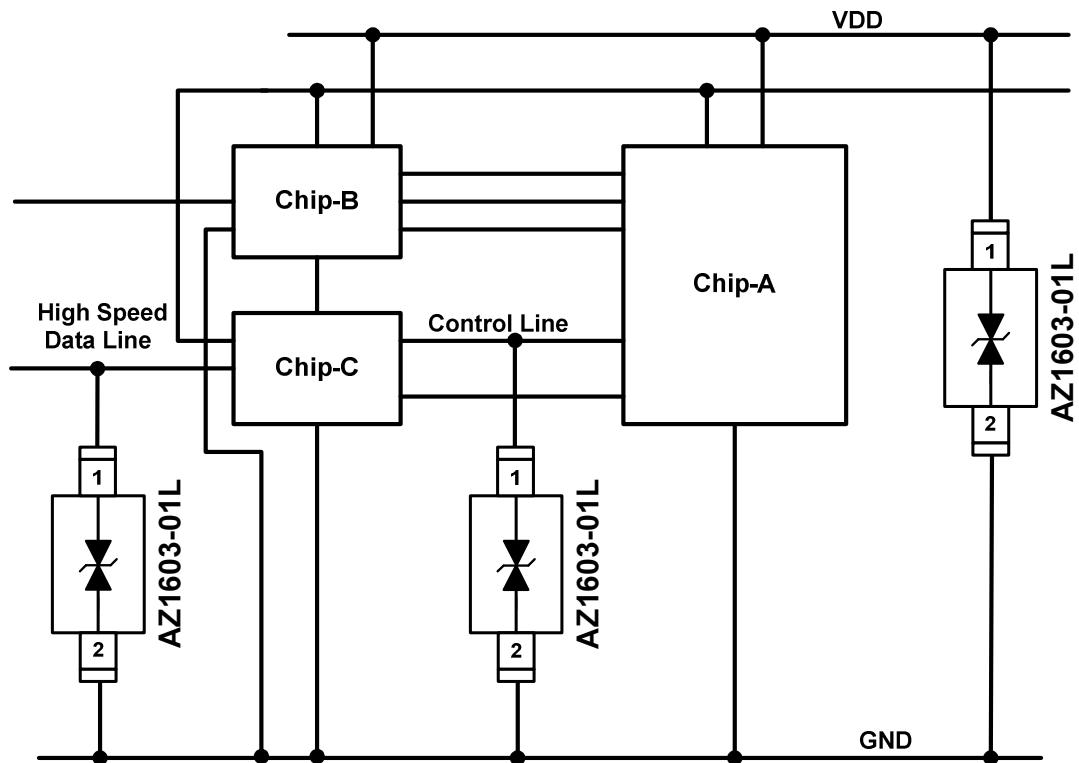


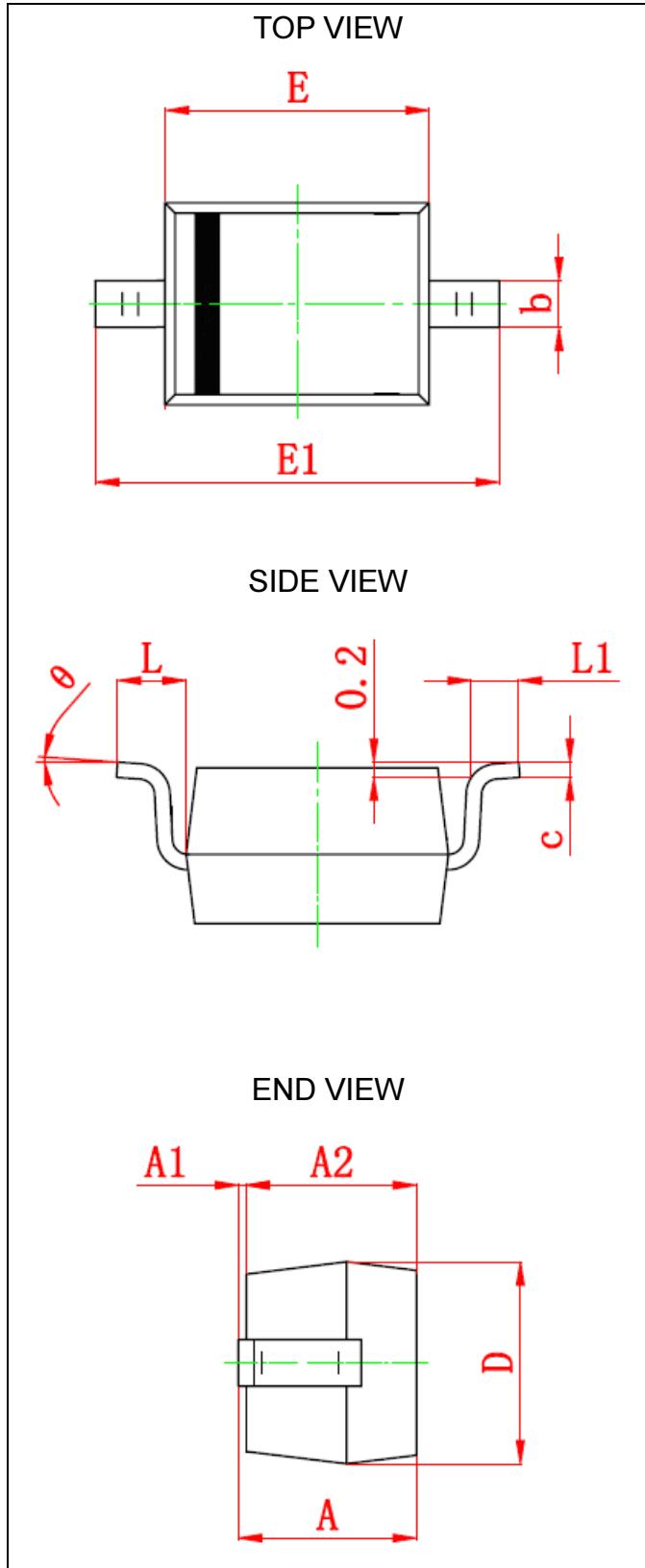
Fig. 2



## Mechanical Details

SOD-323

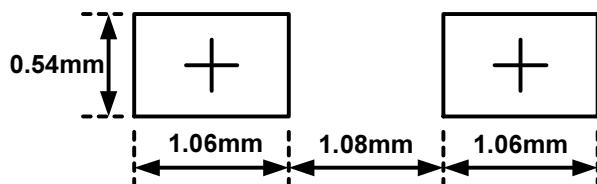
### PACKAGE DIAGRAMS



### PACKAGE DIMENSIONS

Symbol	Millimeters		Inches	
	MIN.	MAX.	MIN.	MAX.
<b>A</b>	0.8	1.0	0.031	0.039
<b>A1</b>	0	0.1	0.000	0.004
<b>A2</b>	0.8	0.9	0.031	0.035
<b>b</b>	0.25	0.35	0.010	0.014
<b>C</b>	0.08	0.15	0.003	0.006
<b>D</b>	1.2	1.4	0.047	0.055
<b>E</b>	1.6	1.8	0.063	0.071
<b>E1</b>	2.5	2.7	0.098	0.106
<b>L</b>	0.475REF		0.019 REF	
<b>L1</b>	0.25	0.4	0.010	0.016
<b>θ</b>	0°	8°	0°	8°

### LAND LAYOUT

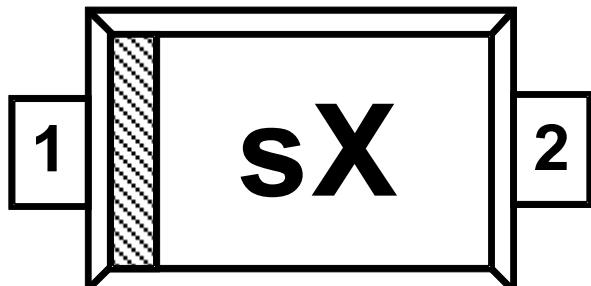


### Notes:

This LAND LAYOUT is for reference purposes only. Please consult your manufacturing partners to ensure your company's PCB design guidelines are met.



## MARKING CODE



Top View

s = Device Code  
X = Date Code

Part Number	Marking Code
AZ1603-01L.R7G (Green Part)	sX

Note. Green means Pb-free, RoHS, and Halogen free compliant.

## Ordering Information

PN#	Material	Type	Reel size	MOQ	MOQ/internal box	MOQ/carton
AZ1603-01L.R7G	Green	T/R	7 inch	3,000/reel	4 reels= 12,000/box	6 boxes =72,000/carton

## Revision History

Revision	Modification Description
Revision 2015/08/20	Preliminary Release.
Revision 2017/05/11	Formal Release.