



## Features

- ESD protection for two lines with bi-direction
- Provide transient protection for each line to  
**IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (air),  $\pm 30\text{kV}$  (contact)**  
**IEC 61000-4-4 (EFT) 80A (5/50ns)**  
**IEC 61000-4-5 (Lightning) 20A (8/20 $\mu\text{s}$ )**
- **0402 small DFN** package saves board space
- Protect two I/O lines or two power lines
- Fast turn-on and low clamping voltage
- Suitable for, **6.3V and below**, operating voltage applications
- Solid-state silicon-avalanche and active circuit triggering technology
- **Green part**

## Applications

- Power supply protection
- Data and I/O lines protection
- Panels
- Portable devices
- Consumer electronics
- Notebooks, desktops, and servers
- Peripherals

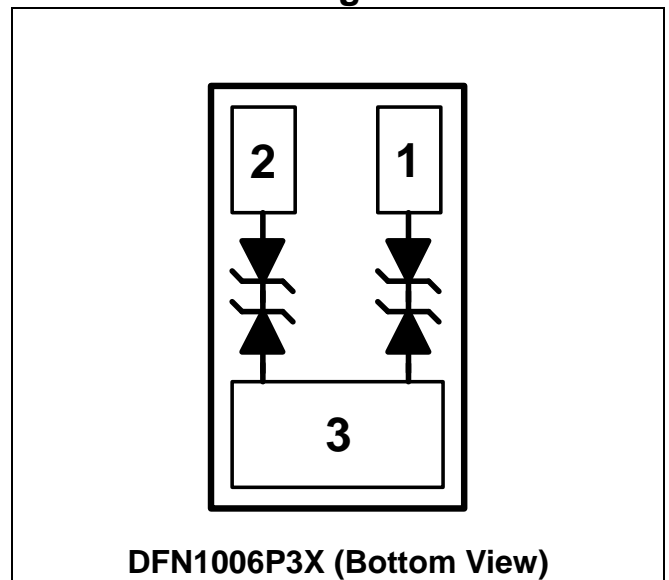
## Description

AZ5946-02F is a design which includes two bi-directional ESD rated clamping cells to protect two power lines, or two control lines, or two low-speed data lines in an electronic system. The AZ5946-02F has been specifically designed to protect sensitive components which are connected to power and control lines from over-voltage damage caused by Electrostatic Discharging (ESD), Electrical Fast Transients (EFT), and Lightning.

AZ5946-02F is a unique design which includes proprietary clamping cells in a single package. During transient conditions, the proprietary clamping cells prevent over-voltage on the power lines, control lines or data lines, protecting any downstream components.

AZ5946-02F 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 ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)			
Parameter	Symbol	Rating	Unit
Peak Pulse Current ( $t_p = 8/20\mu\text{s}$ )	$I_{PP}$ (Note 1)	20	A
Operating Voltage (Pin-1, -2 to pin-3)	$V_{DC}$	$\pm 6.5$	V
ESD per IEC 61000-4-2 (Air)	$V_{ESD-1}$	$\pm 30$	kV
ESD per IEC 61000-4-2 (Contact)	$V_{ESD-2}$	$\pm 30$	
Lead Soldering Temperature	$T_{SOL}$	260 (10 sec.)	$^\circ\text{C}$
Operating Temperature	$T_{OP}$	-55 to +125	$^\circ\text{C}$
Storage Temperature	$T_{STO}$	-55 to +150	$^\circ\text{C}$

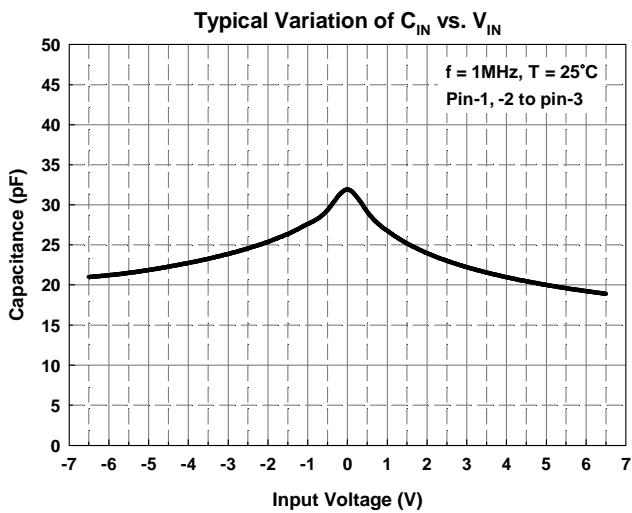
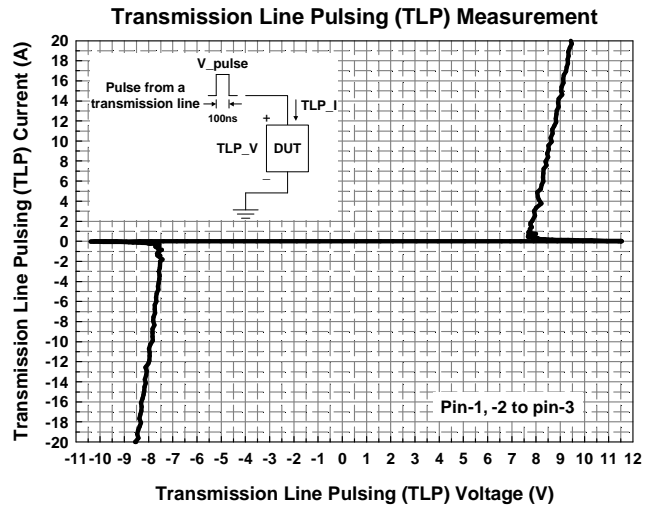
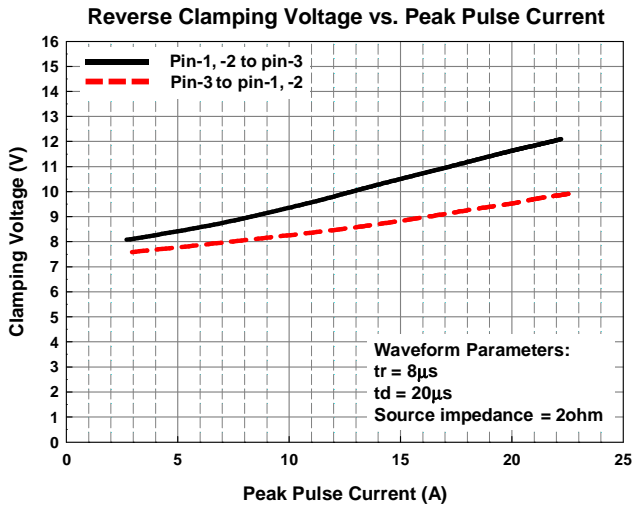
Electrical Characteristics						
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Reverse Stand-Off Voltage	$V_{RWM}$	$T = 25^\circ\text{C}$ .	-6.3		6.3	V
Reverse Leakage Current	$I_{Leak}$	$V_{RWM} = \pm 6.3\text{V}$ , $T = 25^\circ\text{C}$ .			1	$\mu\text{A}$
Reverse Breakdown Voltage	$V_{BV}$	$I_{BV} = 1\text{mA}$ , $T = 25^\circ\text{C}$ .	6.6		9	V
Surge Clamping Voltage (Note 1)	$V_{CL-surge}$	$I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$ , pin-1, -2 to pin-3, $T = 25^\circ\text{C}$ .		8.4		V
		$I_{PP} = 20\text{A}$ , $t_p = 8/20\mu\text{s}$ , pin-1, -2 to pin-3, $T = 25^\circ\text{C}$ .		11.5		V
ESD Clamping Voltage (Note 2)	$V_{CL-ESD}$	IEC 61000-4-2 +8kV ( $I_{TLP} = 16\text{A}$ ), contact mode, pin-1, -2 to pin-3, $T = 25^\circ\text{C}$ .		9		V
ESD Dynamic Turn-on Resistance	$R_{dynamic}$	IEC 61000-4-2 0~+8kV, contact mode, pin-1, -2 to pin-3, $T = 25^\circ\text{C}$ .		0.09		$\Omega$
Channel Input Capacitance	$C_{IN}$	$V_R = 0\text{V}$ , $f = 1\text{MHz}$ , pin-1, -2 to pin-3, $T = 25^\circ\text{C}$ .		35	45	pF

Note 1: The Peak Pulse Current measured conditions:  $t_p = 8/20\mu\text{s}$ , 20ohm source impedance.

Note 2: ESD Clamping Voltage was measured by Transmission Line Pulsing (TLP) System.

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

## Typical Characteristics





## Application Information

The AZ5946-02F is designed to protect two lines against system ESD/EFT/Lightning pulses by clamping it to an acceptable reference. It provides bi-directional protection.

The usage of the AZ5946-02F is shown in Fig. 1. Protected lines, such as data lines, control lines, or power lines, are connected at pin-1 and pin-2, respectively. The pin-3 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 AZ5946-02F should be kept as short as possible.

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

- Minimize the path length between the protected lines and the AZ5946-02F.
- Place the AZ5946-02F 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.

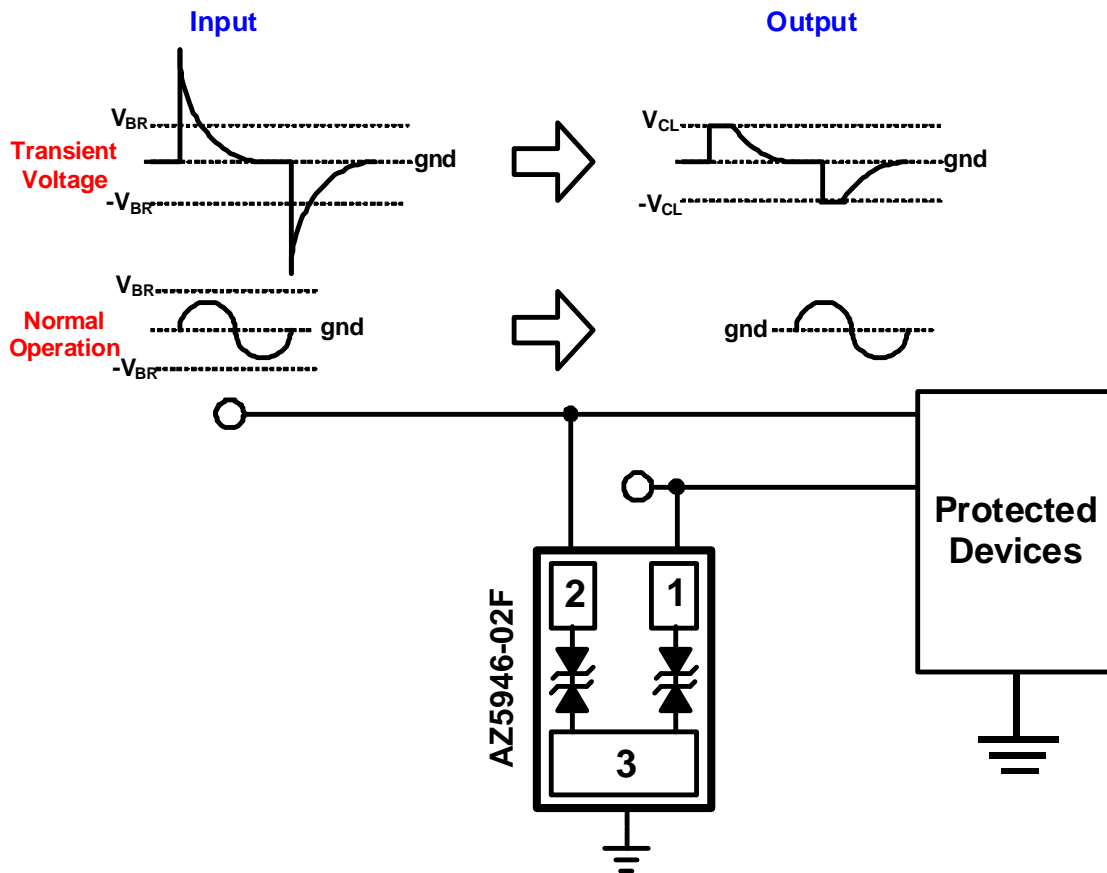
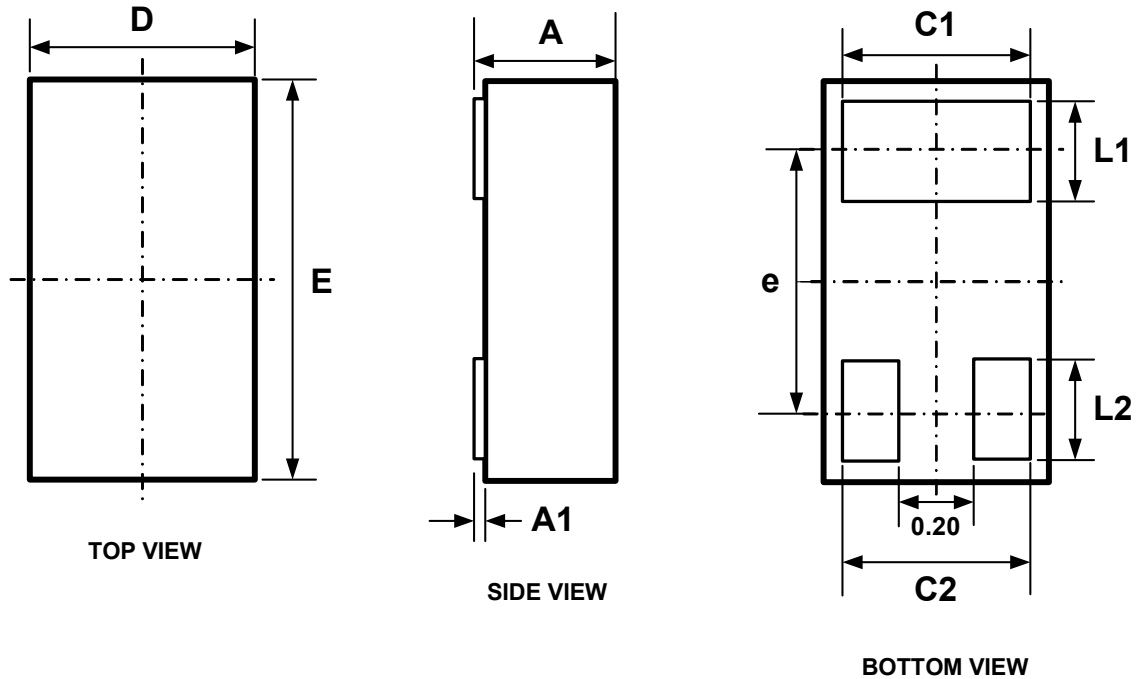


Fig. 1



## Mechanical Details

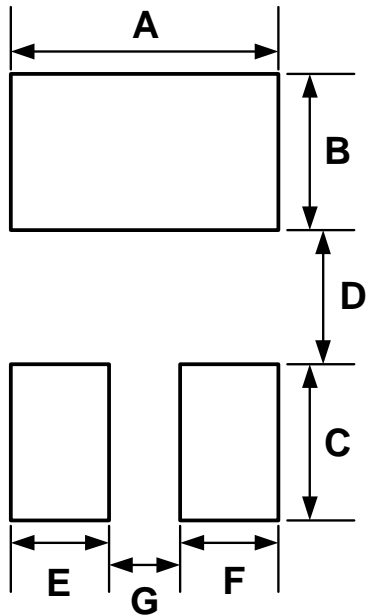
### DFN1006P3X Package Diagrams



### Package Dimensions

Symbol	Millimeters			Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
<b>E</b>	0.95	1.00	1.05	0.037	0.039	0.041
<b>D</b>	0.55	0.60	0.65	0.022	0.024	0.026
<b>A</b>	0.45	0.50	0.55	0.018	0.020	0.022
<b>A1</b>	0.00	0.02	0.05	0.000	0.001	0.002
<b>C1</b>	0.45	0.50	0.55	0.018	0.020	0.022
<b>C2</b>	0.45	0.50	0.55	0.018	0.020	0.022
<b>L1</b>	0.20	0.25	0.30	0.008	0.010	0.012
<b>L2</b>	0.20	0.25	0.30	0.008	0.010	0.012
<b>e</b>	0.65 BSC			0.026BSC		

## Land Layout

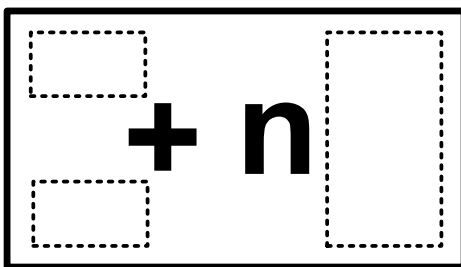


Dimensions		
Index	Millimeter	Inches
A	0.600	0.024
B	0.350	0.014
C	0.350	0.014
D	0.300	0.012
E	0.225	0.009
F	0.225	0.009
G	0.150	0.006

### 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**

n= device code

Part Number	Marking Code
AZ5946-02F.R7GR (Green part)	n

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



### Ordering Information

PN#	Material	Type	Reel size	MOQ	MOQ/internal box	MOQ/carton
AZ5946-02F.R7GR	Green	T/R	7 inch	12,000/reel	4 reels=48,000/box	6 boxes=288,000/carton

### Revision History

Revision	Modification Description
Revision 2019/11/05	Formal Release.