

Features

- ESD protect for 2 high-speed I/O channels
- Provide transient protection for each channel 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) 11A (8/20 μs)
- **Ultra-low capacitance: 0.9pF typical**
- For low operating voltage applications: **3.3V**
- **0402 small DFN package** saves board space
- Fast turn-on and low clamping voltage
- Solid-state silicon-avalanche and active circuit triggering technology
- **Green part**

Applications

- USB 2.0 D+ / D- pins
- USB Type-C interface
- Hand held portable applications
- Desktop and notebooks PCs
- Data and I/O lines protection
- Analog input lines protection
- Consumer electronics

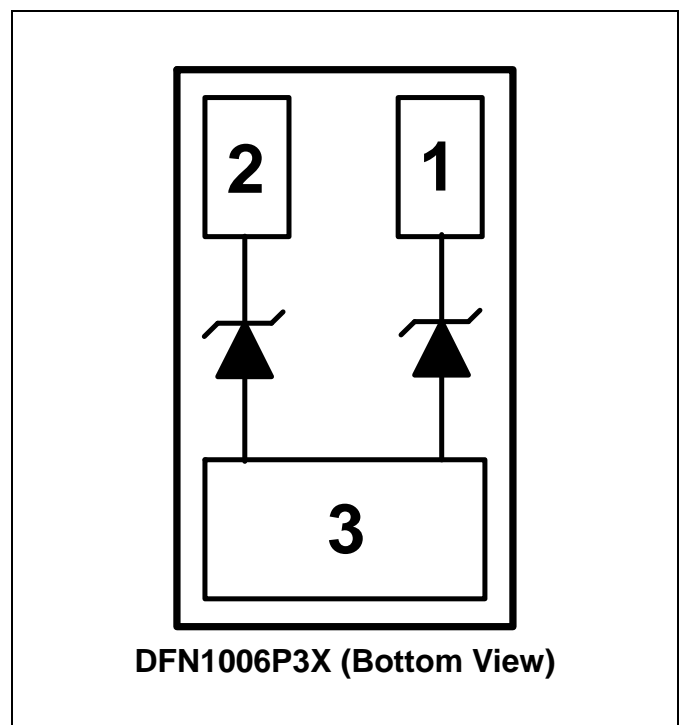
Description

AZ5513-02F is a design which includes two uni-directional ESD rated clamping cells to protect high-speed data interfaces. The AZ5513-02F 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).

AZ5513-02F is a unique design which includes proprietary clamping cells in a small package. During transient conditions, the proprietary clamping cells prevent over-voltage on the control/data lines, protecting any downstream components.

AZ5513-02F 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°C, unless otherwise specified)			
Parameter	Symbol	Rating	Unit
Peak Pulse Current (t _p = 8/20μs)	I _{PP} (Note 1)	11	A
Operating Voltage (pin-1, -2 to pin-3)	V _{DC}	3.6	V
ESD per IEC 61000-4-2 (Air)	V _{ESD-1}	±30	kV
ESD per IEC 61000-4-2 (Contact)	V _{ESD-2}	±30	kV
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	Condition	Min	Typ	Max	Unit
Reverse Stand-Off Voltage	V _{RWM}	Pin-1, -2 to pin-3, T = 25 °C.			3.3	V
Reverse Leakage Current	I _{CH-Leak}	V _{Pin-1,-2} = 3.3V, V _{Pin-3} = 0V, T = 25 °C.			0.5	μA
Reverse Breakdown Voltage	V _{BV}	I _{BV} = 1mA, T = 25 °C, pin-1, -2 to pin-3.	4.5		7.5	V
Forward Voltage	V _F	I _F = 15mA, T = 25 °C, pin-3 to pin-1, -2.		0.8	1.2	V
Surge Clamping Voltage (Note 1)	V _{CL-surge}	I _{PP} = 5A, t _p = 8/20μs, T = 25 °C, any I/O pin to GND.		5		V
		I _{PP} = 11A, t _p = 8/20μs, T = 25 °C, any I/O pin to GND.		6.5		V
ESD Clamping Voltage (Note 2)	V _{CL-ESD}	IEC 61000-4-2 +8kV (I _{TLP} = 16A), T = 25 °C, contact mode, any I/O pin to GND.		7		V
ESD Dynamic Turn-on Resistance	R _{dynamic}	IEC 61000-4-2, 0~+8kV, contact mode, T = 25 °C, any I/O pin to GND.		0.19		Ω
Channel Input Capacitance	C _{IN}	V _{Pin-3} = 0V, V _{IN} = 1.65V, f = 1MHz, T = 25 °C, any I/O pin to GND.		0.9	1.1	pF
Channel to Channel Input Capacitance	C _{IO-to-IO}	V _{Pin-3} = 0V, V _{IN} = 1.65V, f = 1MHz, T = 25 °C, between I/O pins.		0.1	0.2	pF

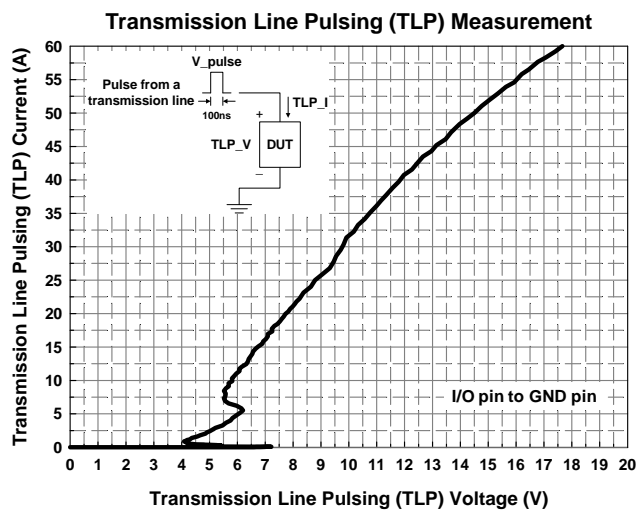
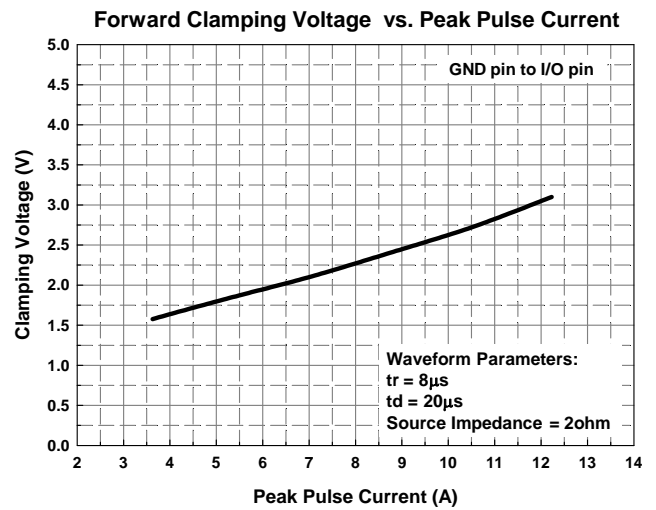
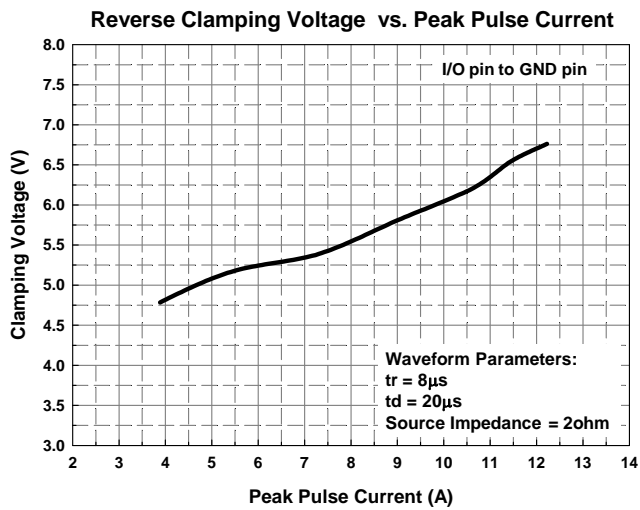
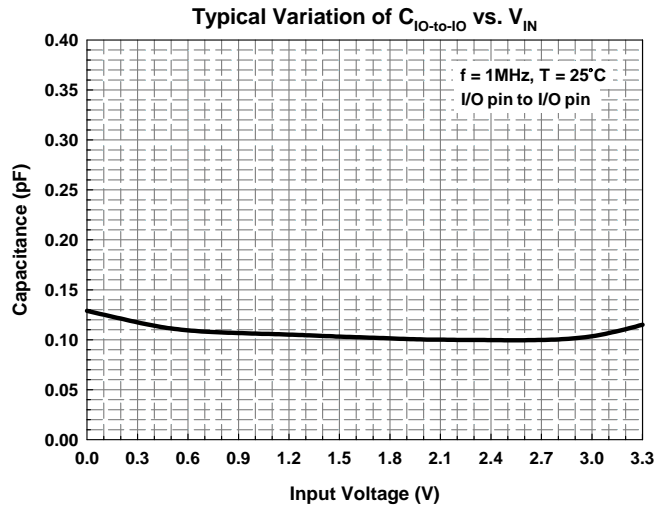
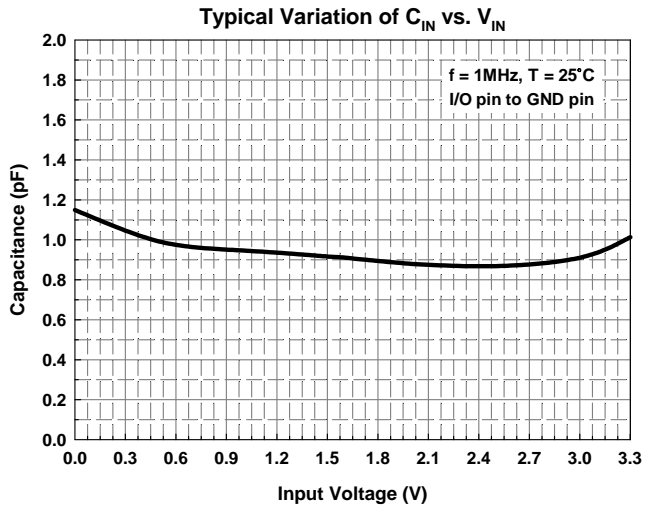
Note 1: The Peak Pulse Current measured conditions: t_p = 8/20μs, 2Ω source impedance.

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

TLP conditions: Z₀ = 50Ω, t_p = 100ns, t_r = 1ns.



Typical Characteristics



Applications Information

A. Device Connection

The AZ5513-02F is designed to protect two data lines from transient over-voltage (such as ESD stress pulse). The device connection of AZ5513-02F is shown in the Fig. 1. In Fig. 1, the two protected data lines are connected to the ESD protection pins (pin 1, pin 2) of AZ5513-02F. The ground pin (pin 3) of AZ5513-02F is a negative reference pin. This pin should be directly connected to the GND rail of PCB (Printed Circuit Board). To get minimum parasitic inductance, the path length should be kept as short as possible.

AZ5513-02F can provide protection for 2 I/O signal lines simultaneously. If the number of I/O signal lines is less than 2, the unused I/O pin can be simply left as NC pin.

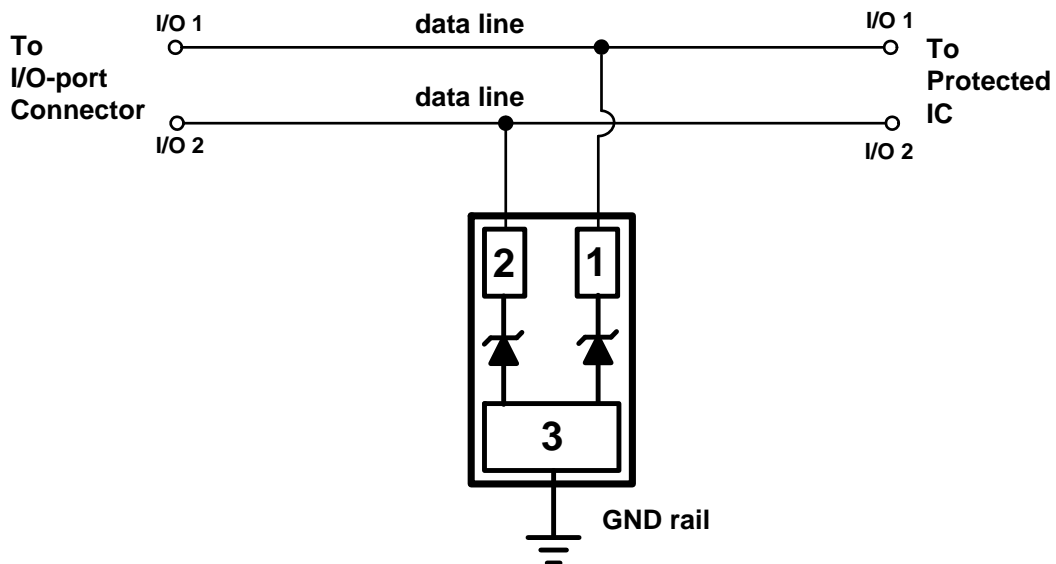
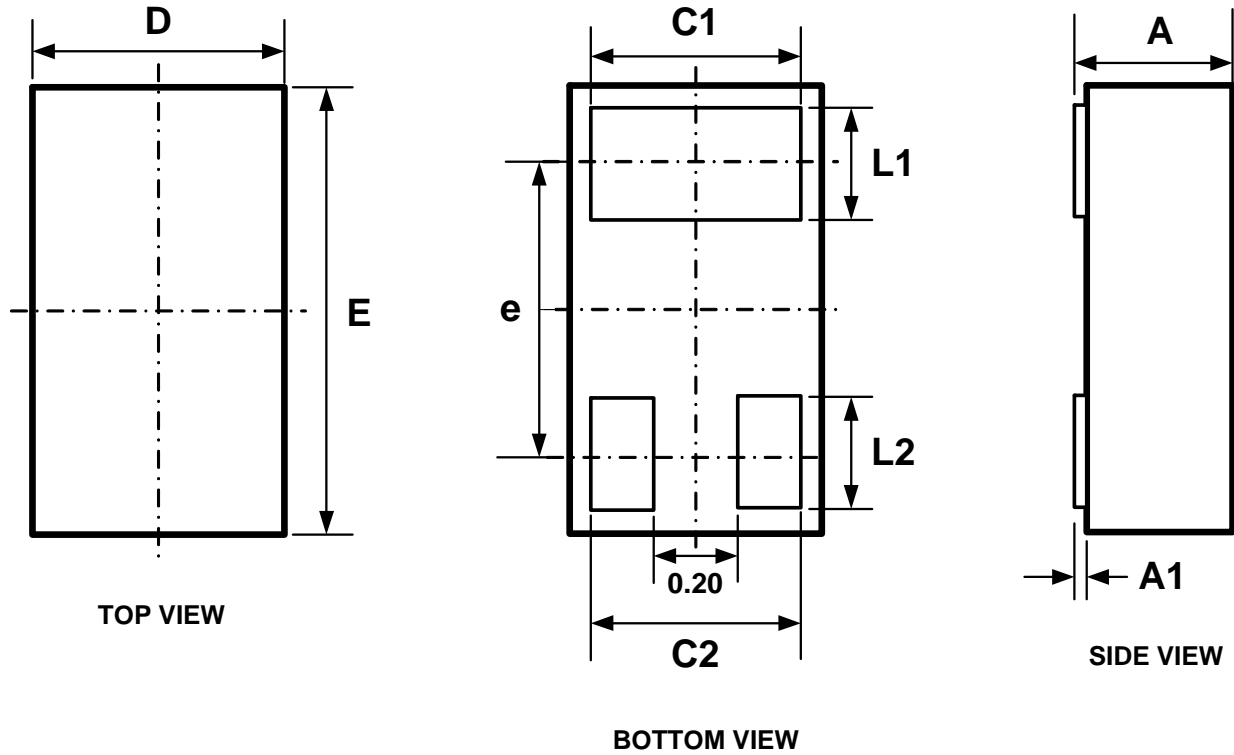


Fig. 1 Data lines connection of AZ5513-02F.

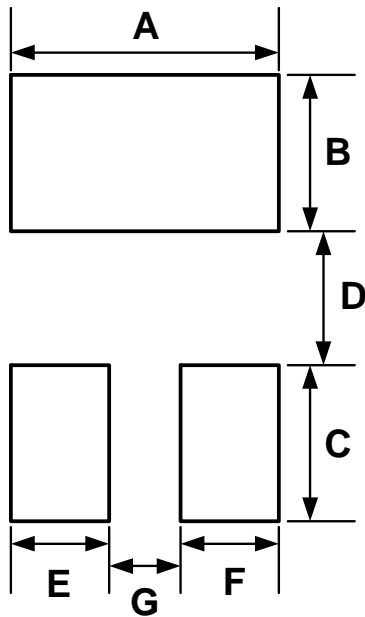
Mechanical Details

DFN1006P3X Package Diagrams and Dimensions



SYMBOL	MILLIMETERS		
	MIN.	NOM.	MAX.
E	0.95	1.00	1.05
D	0.55	0.60	0.65
A	0.45	0.50	0.55
A1	0.00	0.02	0.05
C1	0.45	0.50	0.55
C2	0.45	0.50	0.55
L1	0.20	0.25	0.30
L2	0.20	0.25	0.30
e	0.65 BSC		

Land Layout

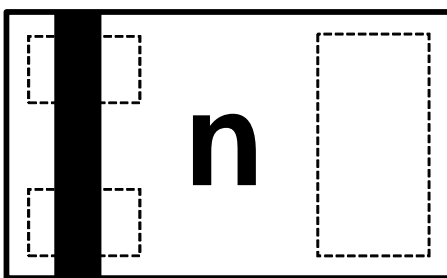


Dimensions		
Index	Millimeter	Inches
A	0.600	0.024
B	0.350	0.014
C	0.350	0.014
D	0.300	0.012
E	0.225	0.009
F	0.225	0.009
G	0.150	0.006

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
AZ5513-02F.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
AZ5513-02F.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 2023/08/10	Formal Release.