Features

● Transient Protection for High-Speed Data Lines-to-GND and Lines-to-Lines.

● Provide Transient Protection for the Protected Lines to
   IEC 61000-4-2 (ESD) ±25kV (air), ±15kV (contact)
   IEC 61000-4-4 (EFT) 40A (5/50ns)
   IEC 61000-4-5 (Lightning) 25A (8/20μs)
   Cable Discharge Event (CDE)

● DFN2525P10E (2.5x2.5mm) Package.

● Specific Pin Out For Easy Board Layout.

● Fast Turn-On and Low Clamping Voltage.

● Low Capacitance (<5pF) for High Speed Interfaces.

● Low Operating Voltage: 3.3V.

● Low Leakage Current

● Solid-State Silicon-Avalanche and Active Circuit Triggering Technology.

● *Green Part*

Applications

● WAN/LAN Device

● 10/100/1000 Ethernet

● Switching Systems

● Computers

● Instruments

Description

AZ3033-04F is a design which includes surge rated diode arrays to protect high speed data interfaces in an electronic systems. The AZ3033-04F has been specifically designed to protect sensitive components which are connected to data and transmission lines from over-voltage damage and latch-up caused by Electrostatic Discharging (ESD), Electrical Fast Transients (EFT), Lightning, and Cable Discharge Event (CDE).

AZ3033-04F is a unique design which includes

surge rated, low capacitance steering diodes and a unique design of clamping cell which is an equivalent TVS diode in a single package. During transient conditions, the steering diodes direct the transient to either the power line or to the ground line. The internal unique design of clamping cell prevents over-voltage on the power line, protecting any downstream components.

AZ3033-04F may be used to meet the ESD immunity requirements of IEC 61000-4-2, Level 4 (±15kV air, ±8kV contact discharge).

Circuit Diagram
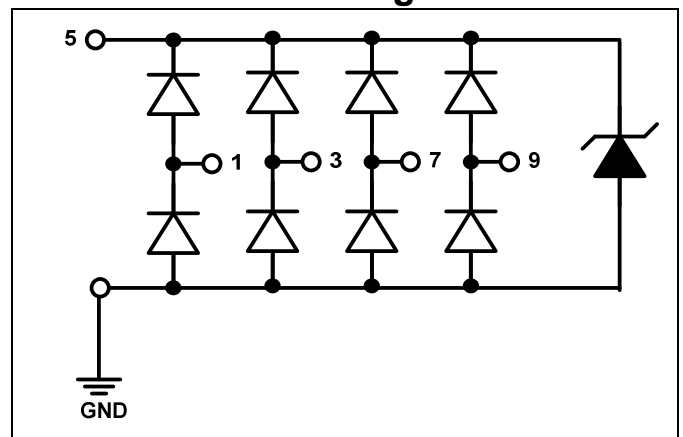
Pin Configuration
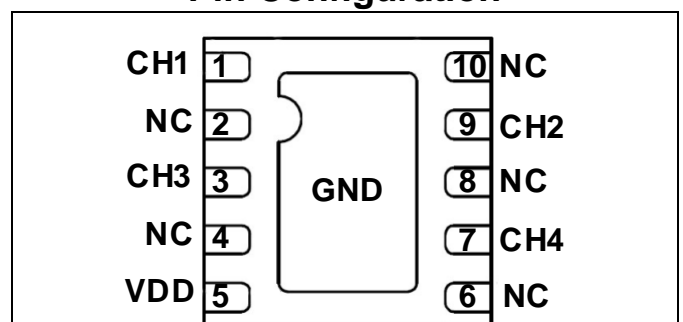
DFN2525P10E (2.5x2.5mm) (Top View)

Pin Number	Description
1, 3, 7, 9	Input / Output Lines
2, 4, 6, 8, 10	No Connection
5	VDD
Center Tab	Ground

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS			
PARAMETER	PARAMETER	RATING	UNITS
Peak Pulse Current (tp =8/20us)	I_{PP}	25	A
ESD per IEC 61000-4-2 (Air/Contact)	V_{ESD}	±30	kV
Operating Temperature	T_{OP}	-55 to +125	^{o}C
Storage Temperature	T_{STO}	-55 to +150	^{o}C

ELECTRICAL CHARACTERISTICS						
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Reverse Stand-Off Voltage	V_{RWM}	Pin-5 to GND, T=125 ^{o}C.			3.3	V
Reverse Leakage Current	I_{Leak}	V_{RWM} = 3.3V, T=25 ^{o}C, Pin-5 to GND.			1	μA
Channel Leakage Current	I_{CH_Leak}	V_{RWM} = 3.3V, T=25 ^{o}C, Pin-1, -3, -7, -9 to GND.			1	μA
Reverse Breakdown Voltage	V_{BV}	I_{BV} = 1mA, T=25 ^{o}C, Pin-5 to GND.	3.9		8	V
Clamping Voltage	V_{CL}	I_{PP}=5A, tp=8/20us, T=25 ^{o}C. (Any I/O Pin to GND)		13	15	V
		I_{PP}=15A, tp=8/20us, T=25 ^{o}C. (Any I/O Pin to GND)		16	18	V
		I_{PP}=20A, tp=8/20us, T=25 ^{o}C. (Any I/O Pin to GND)		18	20	V
Channel Input Capacitance	C_{IN}	VDD = 3.3V, V_R = 0V, f = 1MHz, T=25 ^{o}C. (Any I/O Pin to GND)			5	pF
		VDD = 3.3V, V_R = 2.5zV, f = 1MHz, T=25 ^{o}C. (Any I/O Pin to GND)		3.2	4	pF
		VDD = 3.3V, V_R = 0V, f = 1MHz, T=25 ^{o}C. (Between I/O Pins)		1.5	2.5	pF

Note 1: I/O pins are pin1, pin3, pin7 and pin9.

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Typical Characteristics

Pulse Waveform
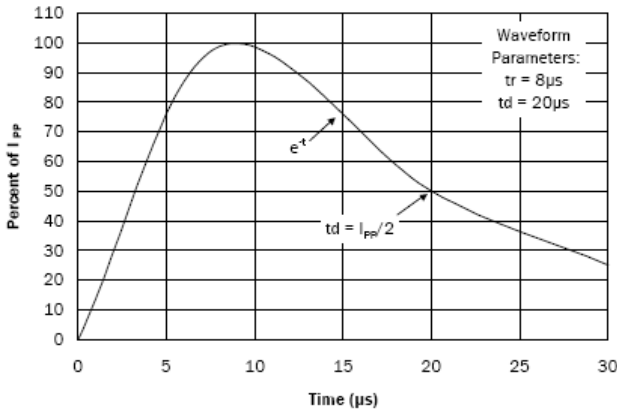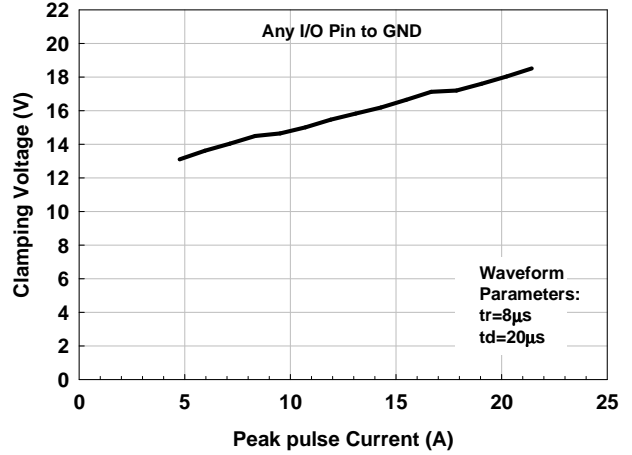
Waveform
Parameters:
tr = 8μs
td = 20μs

Percent of I_{PP}

e^{-t}

td = I_{PP}/2

Time (μs)

Clamping Voltage vs. Peak Pulse Current

Any I/O Pin to GND

Clamping Voltage (V)

Waveform
Parameters:
tr=8μs
td=20μs

Peak pulse Current (A)

Clamping Voltage vs. Peak Pulse Current

Any I/O Pin to Another I/O Pin

Clamping Voltage (V)

Waveform
Parameters:
tr=8μs
td=20μs

Peak pulse Current (A)

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

Input Capacitance (pF)

Any I/O to GND

VDD=3V, GND=0V
f = 1MHz, T=25 °C

Input Voltage (V)

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

Input Capacitance (pF)

I/O to I/O

VDD=3V, GND=0V
f = 1MHz, T=25 °C

Input Voltage (V)
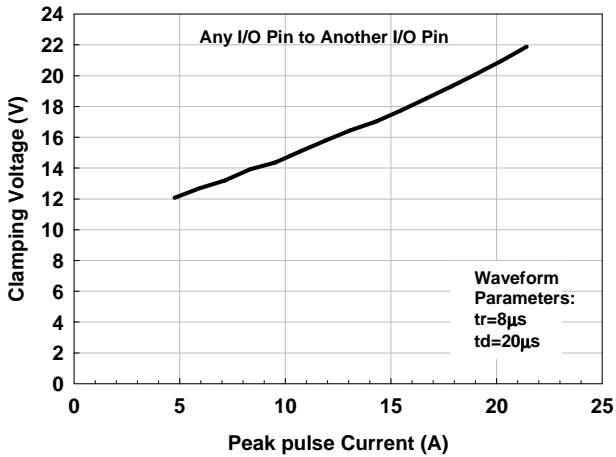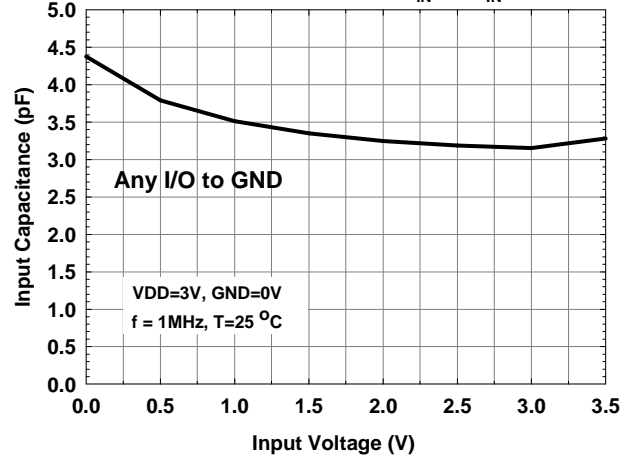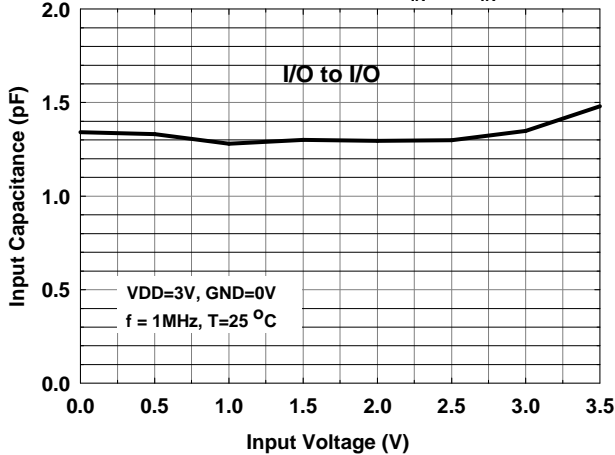
Applications Information

The AZ3033-04F is designed to protect four high speed data lines operating at 3.3 volts to against system ESD/EFT/Lightning pulses by clamping them to an acceptable reference.

The usage of the AZ3033-04F is shown in Fig. 1. Four protected data lines are connected to the ESD protection pins (pin1, pin3, pin7 and pin9) of AZ3033-04F. The center tab of AZ3033-04F can be connected directly to a ground plane for lines-to-ground and lines-to-lines protection or floating for lines-to-lines protection only. To get minimum parasitic inductance, the path length should keep as short as possible. In addition, the power pin (pin5) of AZ3033-04F can be directly connected to VDD rail of PCB (Printed Circuit Board) or floating. Pin2, pin4, pin6, pin8, and pin10 of AZ3033-04F are not connected. Fig. 2 shows a typical Gigabit Ethernet protection circuit with AZ3033-04F including lines-to-lines and lines-to-GND protection. Fig. 3 shows another Gigabit Ethernet protection circuit with AZ3033-04F to sustain higher lines-to-lines surge current.

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 AZ3033-04F.
- Place the AZ3033-04F 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 transience easily injects to.
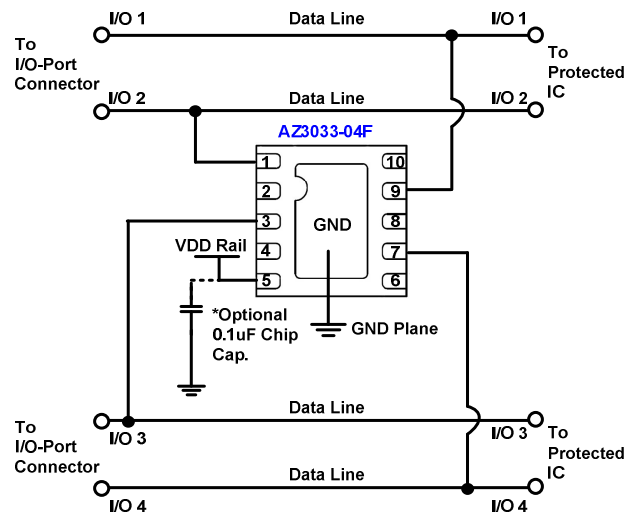
Fig. 1
Data lines and power rails connection of AZ3033-04F.
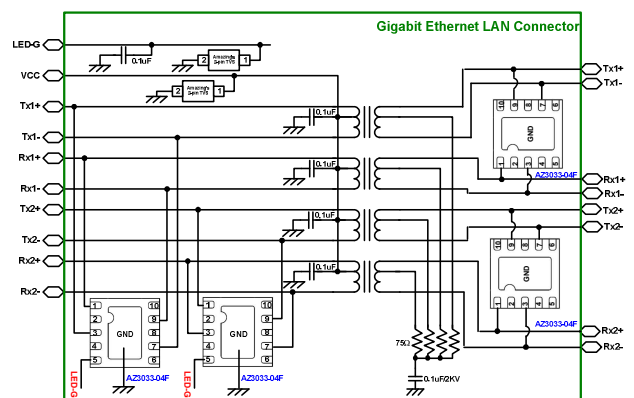
Fig. 2
Gigabit Ethernet lines-to-lines and lines-to-GND surge protection circuit with AZ3033-04F.
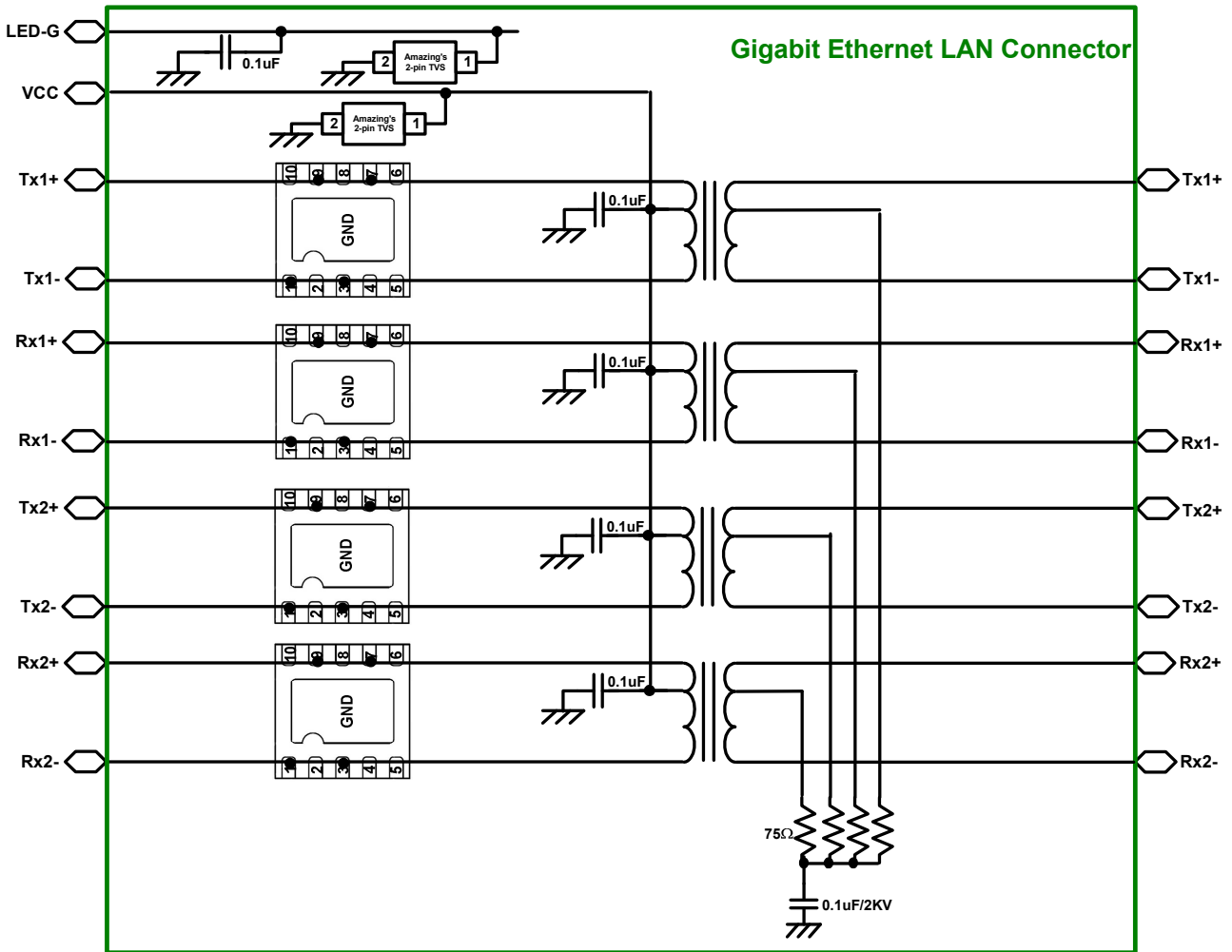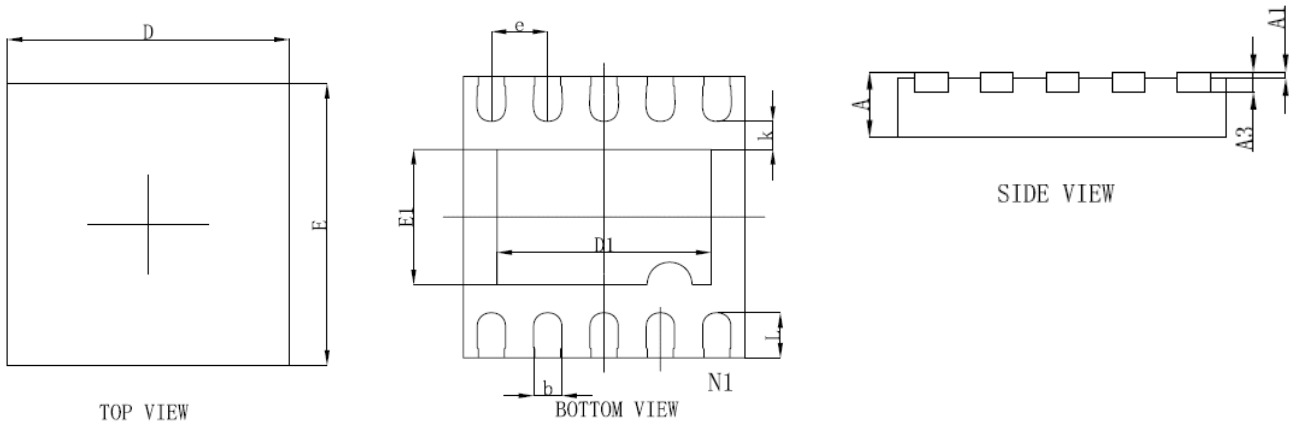
Fig. 3
**Gigabit Ethernet lines-to-lines surge protection circuit with AZ3033-04F.**

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Mechanical Details

DFN2525P10E (2.5x2.5mm)
PACKAGE DIAGRAMS

TOP VIEW

BOTTOM VIEW

SIDE VIEW

Symbol	Millimeters		Inches	
	min	max	min	max
A	0.45	0.60	0.018	0.024
A1	0.00	0.05	0.000	0.002
A3	0.152REF.		0.006 BSC	
D	2.45	2.55	0.096	0.100
E	2.45	2.55	0.096	0.100
D1	1.80	2.00	0.071	0.079
E1	1.10	1.30	0.043	0.051
b	0.20	0.30	0.008	0.012
e	0.5 BSC		0.019 BSC	
L	0.35	0.45	0.014	0.018

Land Layout
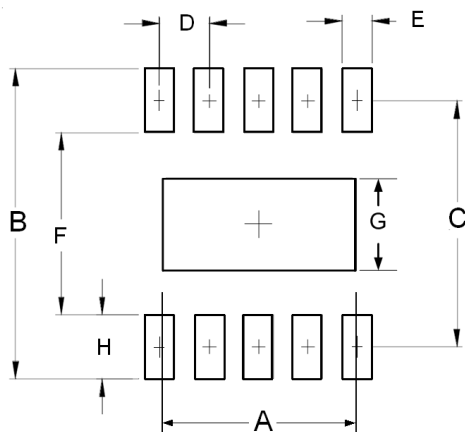
DIMENSIONS		
DIM	MILLIMETERS	INCHES
A	1.90	.075
B	3.10	.122
C	2.45	.096
D	0.50	.020
E	0.30	.012
F	1.80	.071
G	0.60	.024
H	0.65	.025

MARKING CODE

```
3033F
YWXXG
●
```
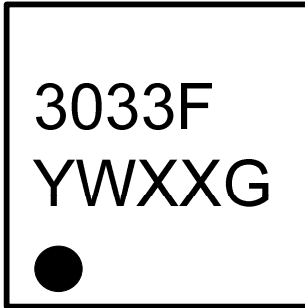
Part Number	Marking Code
AZ3033-04F **(Green Part)**	**3033F** **YWXXG**

3033F = Device Code
YWXXG = Date Code

Ordering Information

PN#	Material	Type	Reel size	MOQ/interal box	MOQ/carton
AZ3033-04F.R7G	Green	T/R	7 inch	4 reel=12,000/box	6 box=72,000/carton

Revision History

Revision	Modification Description
Revision 2010/08/16	Formal Release.
Revision 2010/09/15	Update the PACKAGE DIMENSIONS.
Revision 2011/06/19	1. Update the Company Logo. 2. Add the Ordering Information.