## 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) ±30kV (air/contact)**
  **IEC 61000-4-4 (EFT) 80A (5/50ns)**
  **IEC 61000-4-5 (Lightning) 45A (8/20μs)**
  **Cable Discharge Event (CDE)**
- DFN3020P10E (3.0x2.0mm) Package.
- Specific Pin Out For Easy Board Layout.
- Fast Turn-On and Low Clamping Voltage.
- Low Capacitance 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
- LVDS Interfaces
- Switching Systems
- Computers
- Instruments

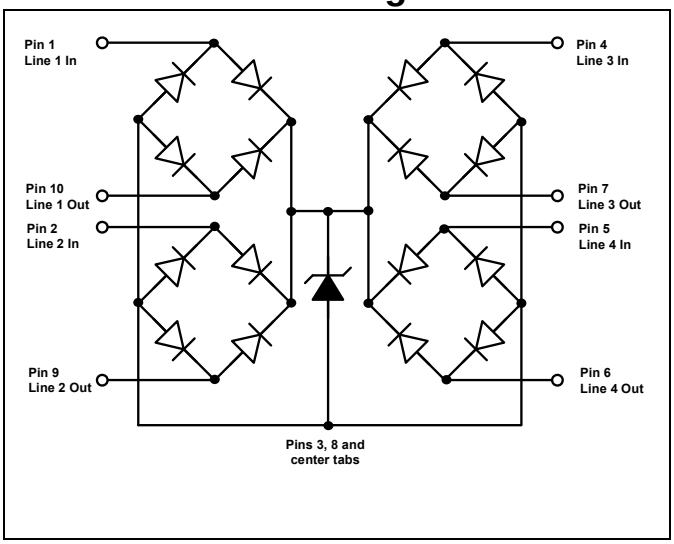
## Description

AZ3133-08F is a design which includes surge rated diode arrays to protect high speed data interfaces in an electronic systems. The AZ3133-08F 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).

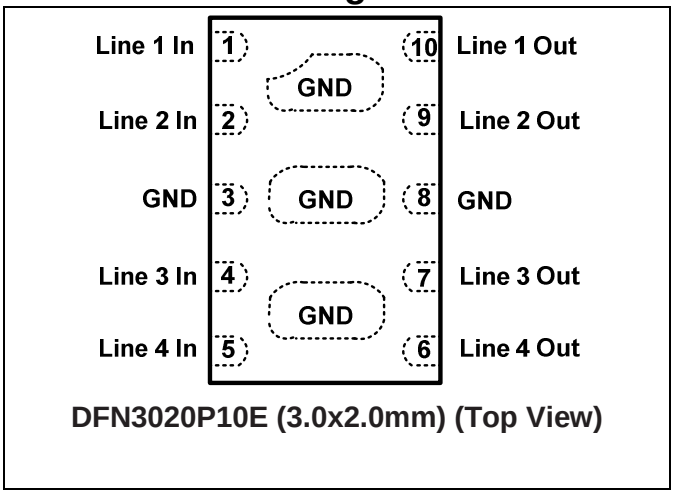
AZ3133-08F is a unique design which includes surge rated, low capacitance steering diodes and a unique design of clamping cell which is an equivalent TVS diode in a single package. During transient conditions, the steering diodes direct the transient to either the power line or to the ground line. The internal unique design of clamping cell prevents over-voltage on the power line, protecting any downstream components.

AZ3133-08F 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




**DFN3020P10E (3.0x2.0mm) (Top View)**

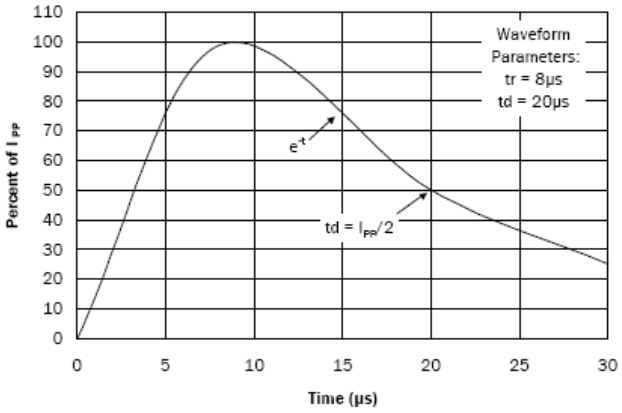
## SPECIFICATIONS

| ABSOLUTE MAXIMUM RATINGS | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **RATING** | **UNITS** |
| Peak Pulse Current (tp =8/20us) (Note 1) | $I_{PP}$ | 45 | A |
| ESD per IEC 61000-4-2 (Air/Contact) | $V_{ESD}$ | ±30 | kV |
| Lead Soldering Temperature | $T_{SOL}$ | 260 (10 sec.) | $^{o}$C |
| Operating Temperature | $T_{OP}$ | -55 to +125 | $^{o}$C |
| Storage Temperature | $T_{STO}$ | -55 to +150 | $^{o}$C |

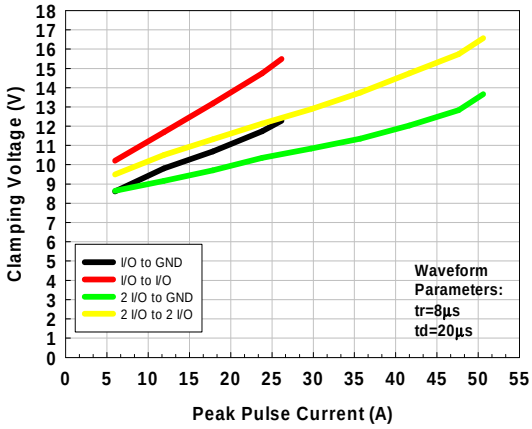
| ELECTRICAL CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **CONDITIONS** | **MIN** | **TYP** | **MAX** | **UNITS** |
| Reverse Stand-Off Voltage | $V_{RWM}$ | Any I/O Pin to GND, T=25 $^{o}$C. | | | 3.3 | V |
| Channel Leakage Current | $I_{Leak}$ | $V_{RWM}$ = 3.3V, T=25 $^{o}$C, Any I/O Pin to GND | | | 0.5 | µA |
| Reverse Breakdown Voltage | $V_{BV}$ | $I_{BV}$ = 1mA, T=25 $^{o}$C, Any I/O Pin to GND | 3.9 | | | V |
| Clamping Voltage | $V_{CL}$ | $I_{PP}$=5A, tp=8/20µs, T=25 $^{o}$C. Any I/O Pin to GND | | 9.0 | 11.0 | V |
| | | $I_{PP}$=15A, tp=8/20µs, T=25 $^{o}$C. Any I/O Pin to GND | | 10.5 | 12.5 | V |
| | | $I_{PP}$=25A, tp=8/20µs, T=25 $^{o}$C. Any I/O Pin to GND | | 12.0 | 14.0 | V |
| | | $I_{PP}$=45A, tp=8/20µs, T=25 $^{o}$C. Line-to-Line, two I/O pins connected together on each line (Note 1) | | 15.5 | 18.0 | V |
| Channel Input Capacitance | $C_{IN}$ | $V_R$ = 0V, f = 1MHz, T=25 $^{o}$C. Any I/O Pin to GND | | 3.6 | 5 | pF |
| | | $V_R$ = 0V, f = 1MHz, T=25 $^{o}$C. Between I/O Pins | | 1.7 | | pF |

Note 1: Ratings with 2 pins connected together per the recommended configuration (i.e. pin-1 connected to pin-10, pin-2 connected to pin-9, pin-4 connected to pin-7, and pin-5 connected to pin-6).

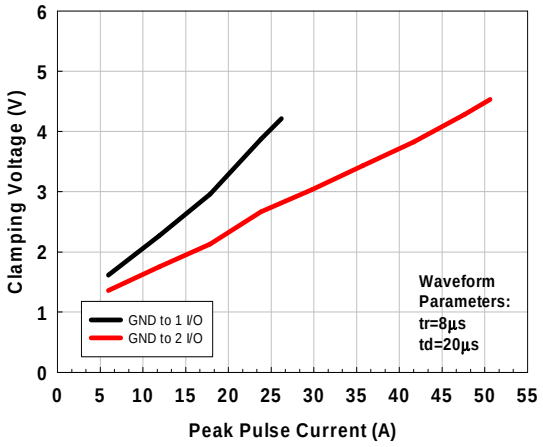
**Pulse Waveform**



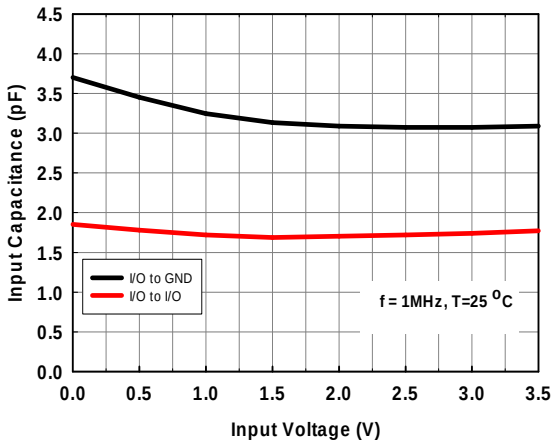

**Clamping Voltage vs. Peak Pulse Current**



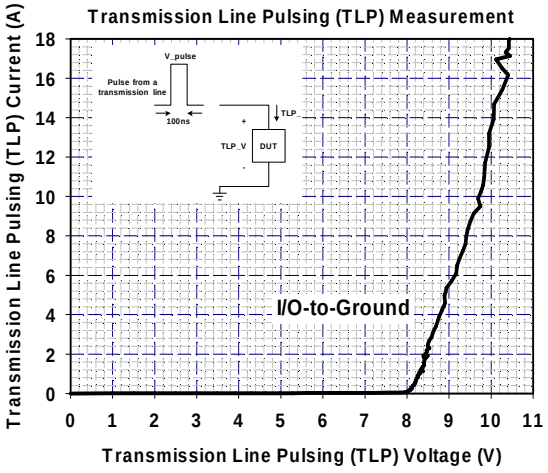

**Forward Clamping Voltage vs. Peak Pulse Current**



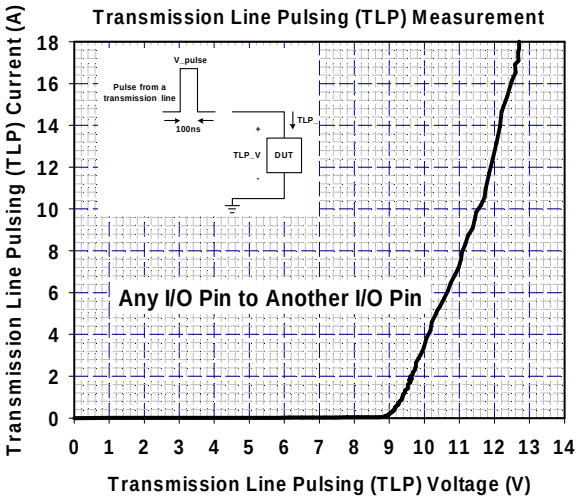

**Typical Variation of $C_{IN}$ vs. $V_{IN}$**




**Transmission Line Pulsing (TLP) Measurement**




**Transmission Line Pulsing (TLP) Measurement**



## Applications Information

The AZ3133-08F 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 AZ3133-08F designed with a flow through pin configuration is shown in Fig. 1. Fig. 2 shows a typical PCB layout example with AZ3133-08F for ESD/EFT/Lightning protection. In the Gigabit Ethernet application, pins 1, 2, 4, and 5 should be connected to pins 10, 9, 7, and 6 respectively. The traces should be unbroken and run under the device as shown. To get minimum parasitic inductance, the path length should keep as short as possible. Pins 3, 8 and the three center GND tabs are electrically connected, which should be left floating (i.e. not connected to ground) in the Ethernet application. Fig. 3 shows a typical Gigabit Ethernet protection circuit with AZ3133-08F.

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 AZ3133-08F.
- Place the AZ3133-08F 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.

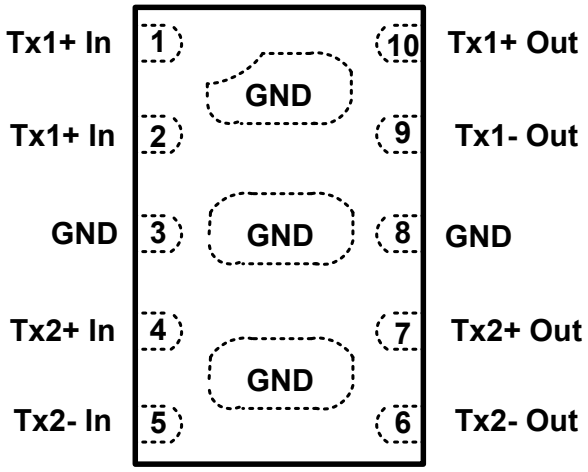



**Fig. 1 Pin configuration of AZ3133-08F.**

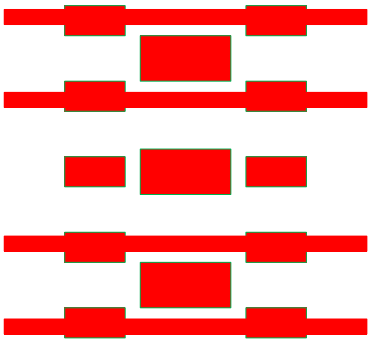


**Fig. 2 Layout example of AZ3133-08F.**

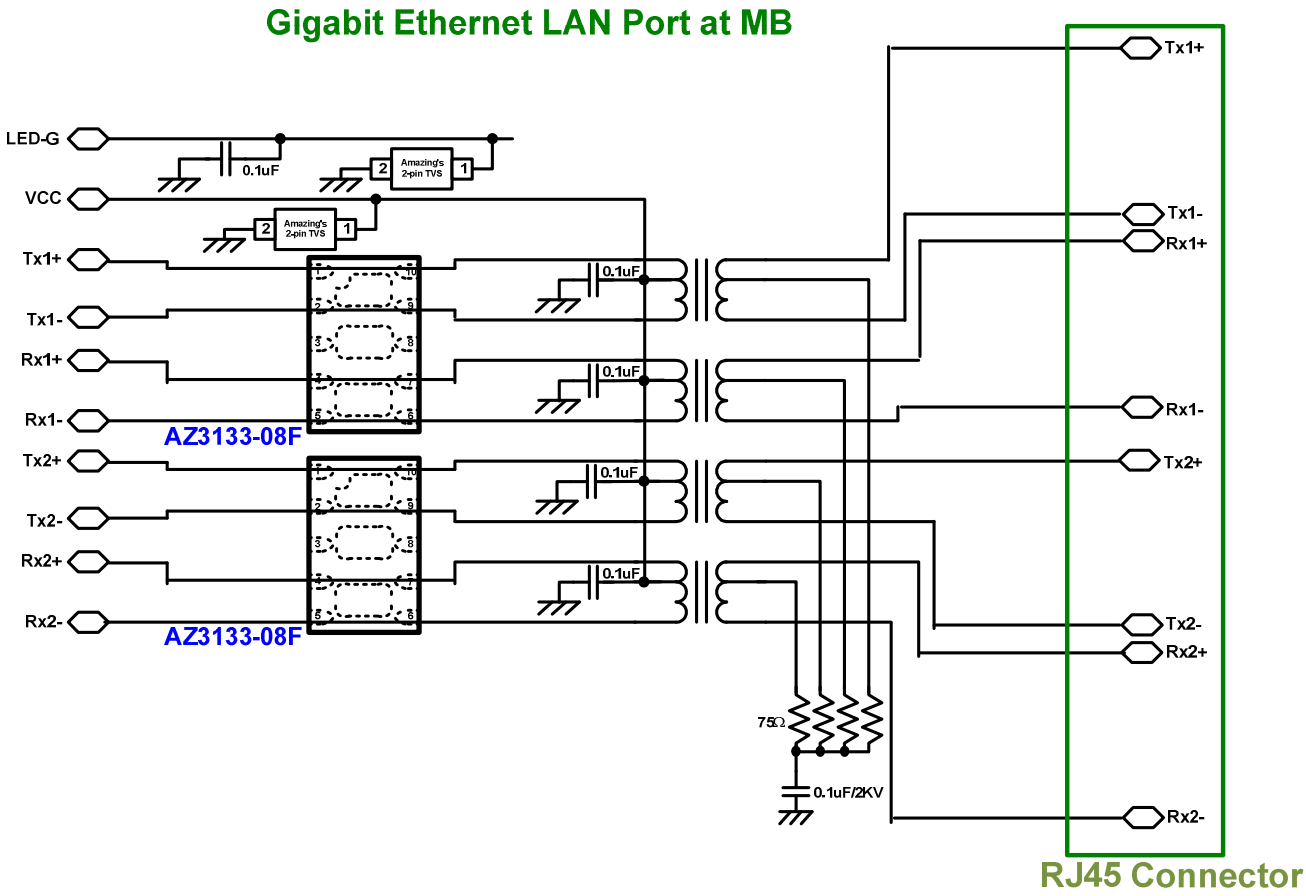
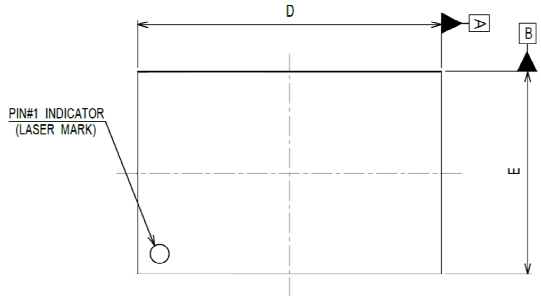



**Fig. 3**

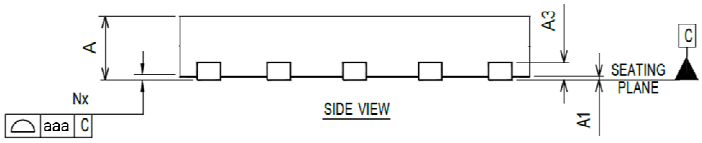
**Gigabit Ethernet surge protection circuit with AZ3133-08F.**

## Mechanical Details

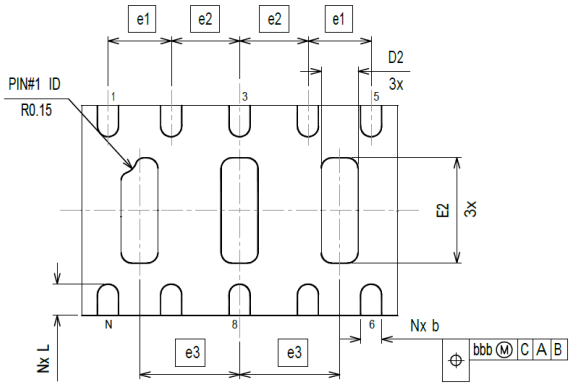
### DFN3020P10E (3.0x2.0mm)
### PACKAGE DIAGRAMS




TOP VIEW



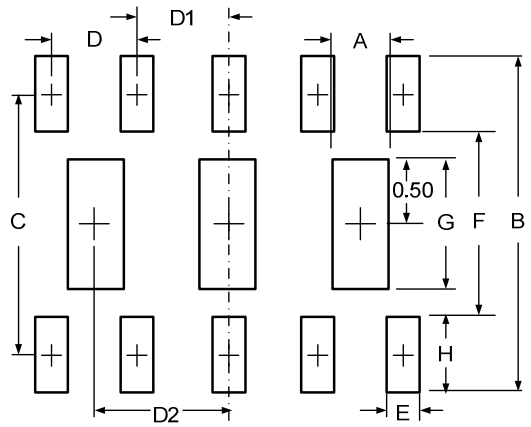

SIDE VIEW




BOTTOM VIEW

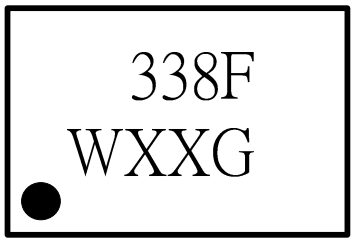
| Symbol | Millimeters | | |
|---|---|---|---|
| | min | nom | max |
| A | 0.51 | 0.55 | 0.60 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | | 0.153REF | |
| b | 0.15 | 0.20 | 0.25 |
| D | 2.90 | 3.00 | 3.10 |
| E | 1.90 | 2.00 | 2.10 |
| e1 | | 0.60BSC | |
| e2 | | 0.65BSC | |
| e3 | | 0.95BSC | |
| D2 | 0.25 | 0.35 | 0.45 |
| E2 | 0.95 | 1.00 | 1.05 |
| L | 0.25 | 0.30 | 0.35 |
| aaa | | 0.08 | |
| bbb | | 0.10 | |

## Land Layout




| DIMENSIONS | |
|---|---|
| DIM | MILLIMETERS |
| A | 0.40 |
| B | 2.56 |
| C | 1.98 |
| D | 0.60 |
| D1 | 0.65 |
| D2 | 0.95 |
| E | 0.25 |
| F | 1.40 |
| G | 1.00 |
| H | 0.58 |

## MARKING CODE




338F = Device Code
W = Date Code
XX = Control Code

| Part Number | Marking Code |
|---|---|
| AZ3133-08F<br>(Green Part) | 338F<br>WXXG |

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

## Ordering Information

| PN# | Material | Type | Reel size | MOQ | MOQ/internal box | MOQ/carton |
|---|---|---|---|---|---|---|
| AZ3133-08F.R7G | Green | T/R | 7 inch | 3,000/reel | 4 reel=12,000/box | 6 box=72,000/carton |

## Revision History

| Revision | Modification Description |
|---|---|
| Revision 2013/11/12 | Preliminary Release |
| Revision 2014/08/21 | Formal Release |
| | |
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| | |