

## Features

- ESD Protect for Low-Voltage Differential Signaling (LVDS) channels
- Protects four I/O lines
- Provide ESD 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 $\mu\text{s}$ )
- For operating voltage of 3.3V and below
- Low capacitance: 2.1pF typical
- Fast turn-on and Low clamping voltage
- Array of ESD rated diodes with internal equivalent TVS (Transient Voltage Suppression) diode
- Solid-state silicon-avalanche and active circuit triggering technology
- **Green part**

## Applications

- LVDS Interface
- USB2.0 Data lines protection
- Control Signal Lines Protection
- SIM ports
- Monitors and Flat Panel Displays
- Notebook and PC Computers
- Ethernet port: 10/100/1000 Mb/s
- Consumer Electronics
- Set Top Box

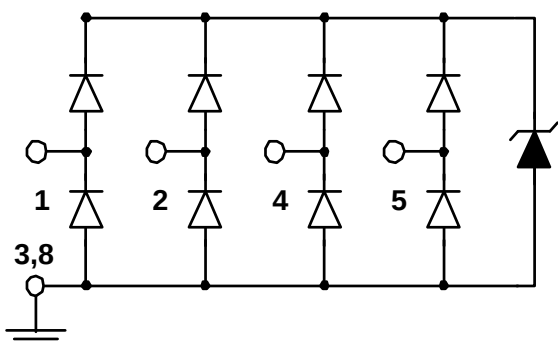
## Description

AZ1213-04F is a high-performance design which includes surge rated diode arrays to protect high-speed data interfaces. The AZ1213-04F 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), and Lightning.

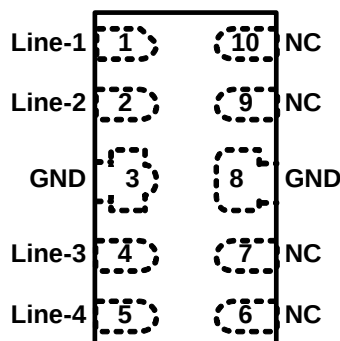
AZ1213-04F is a unique design which includes surge rated, low capacitance steering diodes and a unique design of clamping cell which is an equivalent TVS diode in a single package. During transient conditions, the steering diodes direct the transient to either the internal ESD line or to ground line. The internal unique design of clamping cell prevents over-voltage on the internal ESD line and on the I/O line, which is protecting any downstream components.

AZ1213-04F 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



DFN2510P10E (Top View)

## SPECIFICATIONS

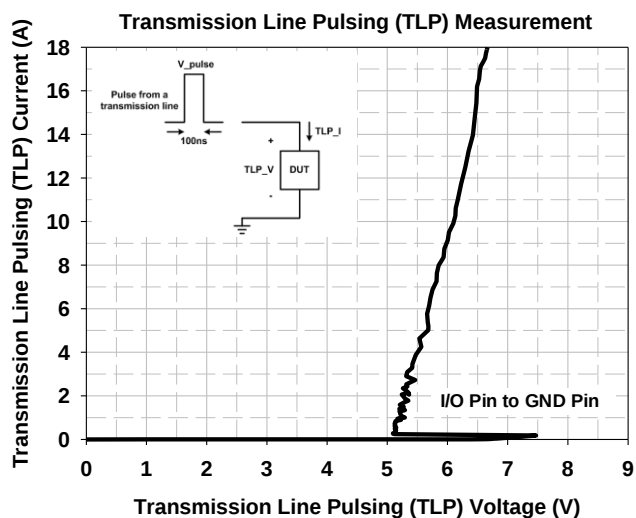
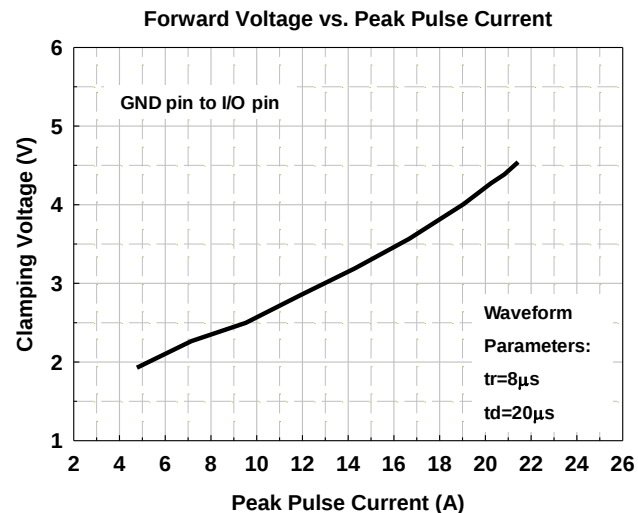
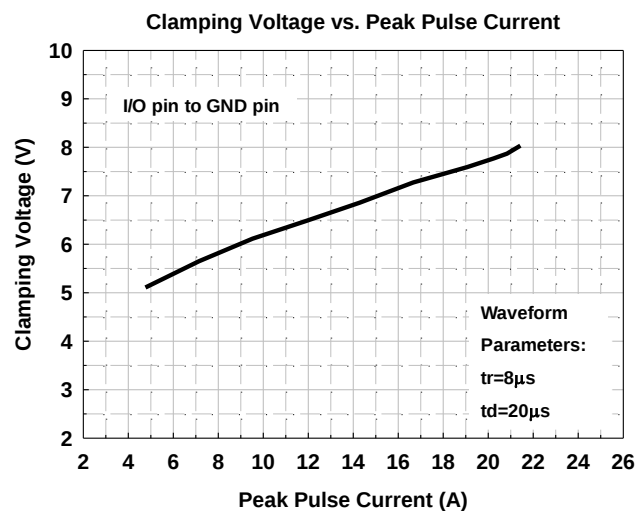
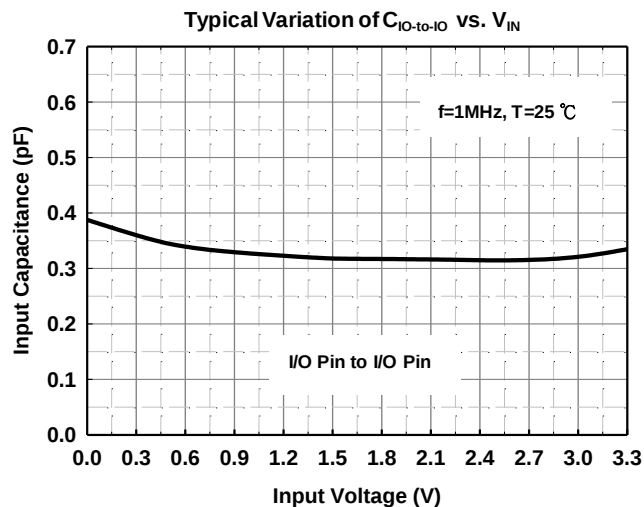
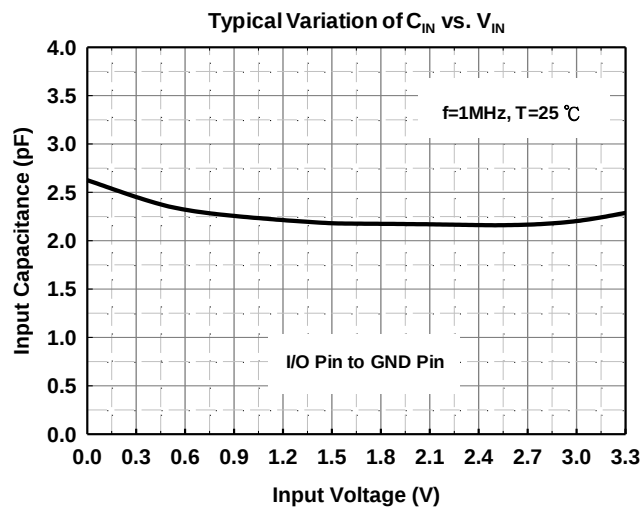
| ABSOLUTE MAXIMUM RATINGS        |                  |               |      |
|---------------------------------|------------------|---------------|------|
| PARAMETER                       | SYMBOL           | RATING        | UNIT |
| Peak Pulse Current (tp =8/20μs) | I <sub>PP</sub>  | 20            | A    |
| Operating Voltage (I/O pin-GND) | V <sub>DC</sub>  | 3.6           | V    |
| ESD per IEC 61000-4-2 (Air)     | V <sub>ESD</sub> | 30            | kV   |
| ESD per IEC 61000-4-2 (Contact) |                  | 30            |      |
| Lead Soldering Temperature      | T <sub>SOL</sub> | 260 (10 sec.) | °C   |
| Operating Temperature           | T <sub>OP</sub>  | -55 to +85    | °C   |
| Storage Temperature             | T <sub>STO</sub> | -55 to +150   | °C   |

| ELECTRICAL CHARACTERISTICS           |                       |                                                                                               |     |      |     |      |
|--------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------|-----|------|-----|------|
| PARAMETER                            | SYMBOL                | CONDITION                                                                                     | MIN | TYP  | MAX | UNIT |
| Reverse Stand-Off Voltage            | V <sub>RWM</sub>      | Pin-1,-2,-4,-5 to pin-3,-8, T=25 °C                                                           |     |      | 3.3 | V    |
| Channel Leakage Current              | I <sub>CH-Leak</sub>  | V <sub>Pin-1,-2,-4,-5</sub> = 3.3V, V <sub>Pin-3,-8</sub> = 0V, T=25 °C                       |     |      | 1   | μA   |
| Reverse Breakdown Voltage            | V <sub>BV</sub>       | I <sub>BV</sub> = 1mA, T=25 °C, Pin-1,-2,-4,-5 to pin-3,-8                                    | 5   |      | 7.5 | V    |
| Forward Voltage                      | V <sub>F</sub>        | I <sub>F</sub> = 15mA, T=25 °C, pin-3,-8 to pin-1,-2,-4,-5                                    |     | 0.9  | 1.2 | V    |
| ESD Clamping Voltage (Note 1)        | V <sub>clamp</sub>    | IEC 61000-4-2 +8kV (I <sub>TLP</sub> = 16A), Contact mode, T=25 °C, any I/O pin to Ground.    |     | 6.5  |     | V    |
| ESD Dynamic Turn-on Resistance       | R <sub>dynamic</sub>  | IEC 61000-4-2, 0~+8kV, T=25 °C, Contact mode, any I/O pin to Ground                           |     | 0.08 |     | Ω    |
| Surge Clamping Voltage               | V <sub>CL-surge</sub> | I <sub>PP</sub> =5A, tp=8/20μs, T=25 °C, Any I/O pin to Ground                                |     | 5.2  |     | V    |
|                                      |                       | I <sub>PP</sub> =20A, tp=8/20μs, T=25 °C, Any I/O pin to Ground                               |     | 7.5  |     |      |
| Channel Input Capacitance            | C <sub>IN</sub>       | V <sub>pin-3,-8</sub> = 0V, V <sub>IN</sub> = 1.65V, f = 1MHz, T=25 °C, any I/O pin to Ground |     | 2.1  | 2.5 | pF   |
| Channel to Channel Input Capacitance | C <sub>CROSS</sub>    | V <sub>pin-3,-8</sub> = 0V, V <sub>IN</sub> = 1.65V, f = 1MHz, T=25 °C, between I/O pins      |     | 0.3  | 0.5 | pF   |

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

TLP conditions: Z<sub>0</sub>= 50Ω, t<sub>p</sub>= 100ns, t<sub>r</sub>= 1ns.

## Typical Characteristics





## Application Information

The AZ1213-04F is designed to protect four data lines from transient over-voltage (such as ESD stress pulse). The device connection of AZ1213-04F is shown in the Fig. 1. In Fig. 1, the four protected data lines are connected to the ESD protection pins (pin1, pin2, pin4, and pin5) of AZ1213-04F. The ground pins (pin3 and pin8) of AZ1213-04F are the negative reference pins.

These pins should be directly connected to the GND rail of PCB (Printed Circuit Board). To get minimum parasitic inductance, the path length should keep as short as possible.

AZ1213-04F can provide ESD protection for 4 I/O signal lines simultaneously. If the number of I/O signal lines is less than 4, the unused I/O pins can be simply left as NC pins.

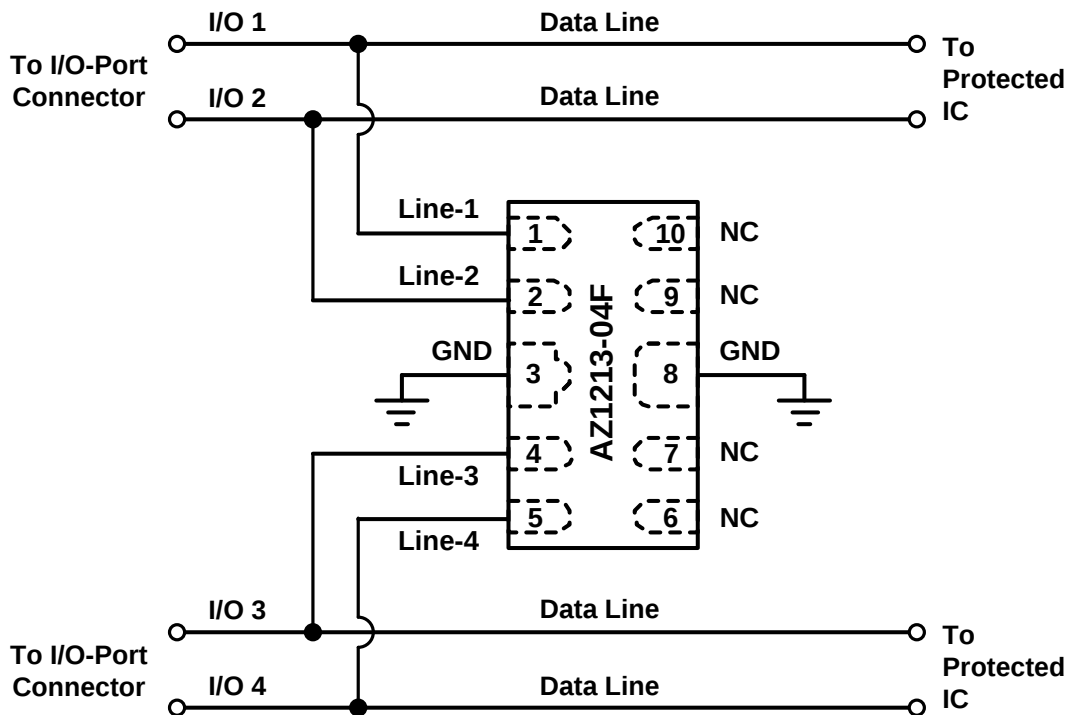
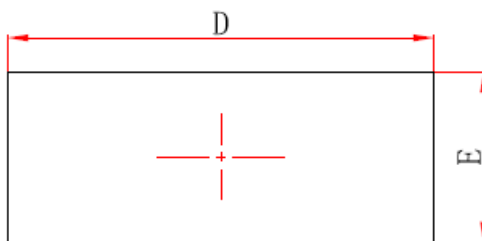
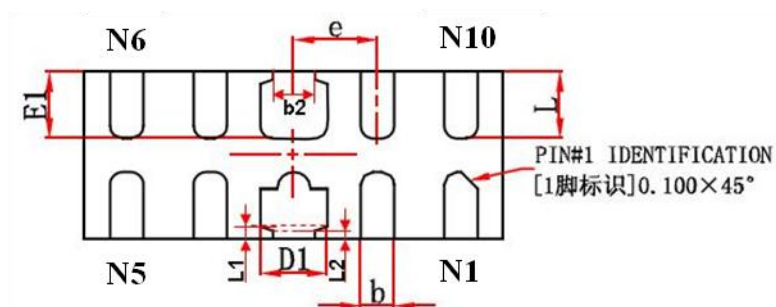


Fig. 1 Data lines connection of AZ1213-04F.

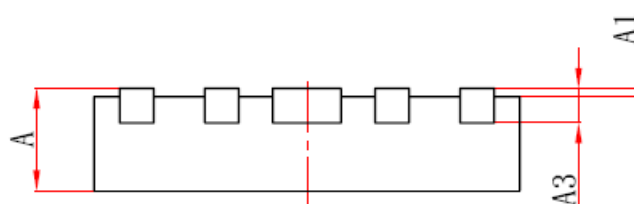
## PACKAGE OUTLINE (DFN2510P10E)



**TOP VIEW**



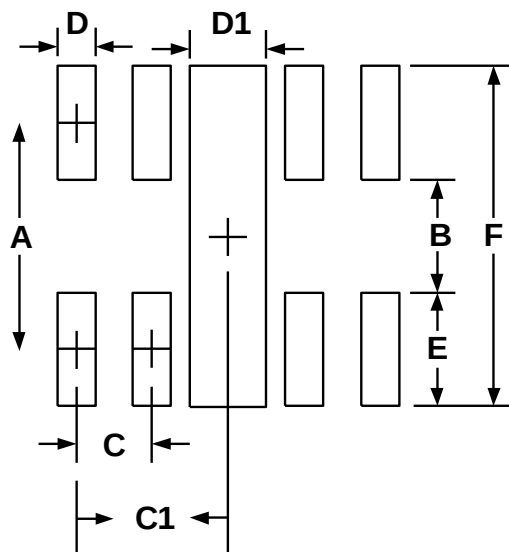
**BOTTOM VIEW**



**SIDE VIEW**

| Symbol | Millimeters |      | Inches     |       |
|--------|-------------|------|------------|-------|
|        | min         | max  | min        | max   |
| A      | 0.40        | 0.55 | 0.016      | 0.022 |
| 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      | 0.95        | 1.05 | 0.037      | 0.041 |
| D1     | 0.35        | 0.45 | 0.014      | 0.018 |
| E1     | 0.35        | 0.45 | 0.014      | 0.018 |
| b      | 0.15        | 0.25 | 0.006      | 0.010 |
| e      | 0.5 BSC     |      | 0.019 BSC  |       |
| L1     | 0.075 REF   |      | 0.0029 REF |       |
| L2     | 0.05 REF    |      | 0.0019 REF |       |
| b2     | 0.20        | 0.30 | 0.0079     | 0.012 |
| L      | 0.35        | 0.45 | 0.014      | 0.018 |

## 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.

| Dimensions |            |        |
|------------|------------|--------|
| Index      | Millimeter | Inches |
| <b>A</b>   | 0.875      | 0.034  |
| <b>B</b>   | 0.20       | 0.008  |
| <b>C</b>   | 0.50       | 0.02   |
| <b>C1</b>  | 1.00       | 0.039  |
| <b>D</b>   | 0.25       | 0.01   |
| <b>D1</b>  | 0.4        | 0.016  |
| <b>E</b>   | 0.675      | 0.027  |
| <b>F</b>   | 1.55       | 0.061  |

## MARKING CODE



213 = Device Code  
X = Date Code  
Y = Control Code

| Part Number                    | Marking Code |
|--------------------------------|--------------|
| AZ1213-04F.R7G<br>(Green Part) | 213XY        |

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

## Ordering Information

| PN#            | Material | Type | Reel size | MOQ        | MOQ/internal box   | MOQ/carton            |
|----------------|----------|------|-----------|------------|--------------------|-----------------------|
| AZ1213-04F.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 2016/08/04 | Preliminary Release.     |
| Revision 2018/05/23 | Formal Release.          |
|                     |                          |
|                     |                          |