

## Features

- ESD protection for four lines with bi-directional
- 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) 5A (8/20 $\mu\text{s}$ )
- For operating voltage of 24V and below
- Fast turn-on and ultra-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

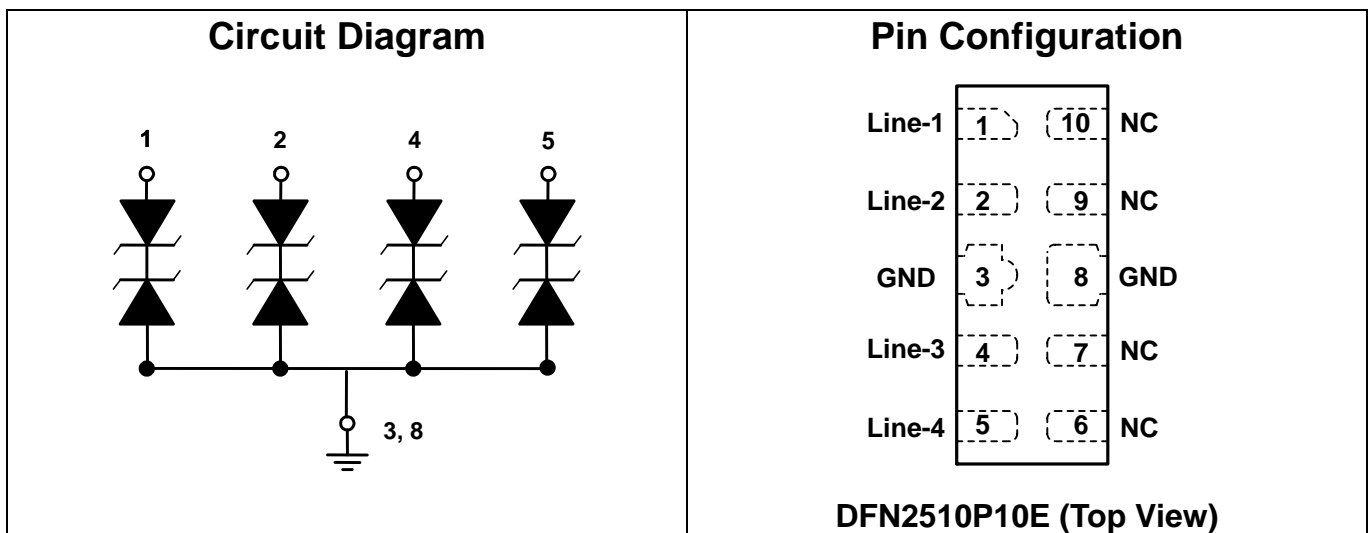
- Mini LED / Micro LED
- Power line protection
- Low speed data line protection
- Portable devices
- Peripheral products

## Description

AZ4224-04F is a design which includes four bi-directional ESD rated clamping cells to protect power line, control line, or low speed data line in an electronic system. The AZ4224-04F 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.

AZ4224-04F is a unique design which includes ESD rated and a unique design of clamping cell which is an equivalent TVS diode in a single package. During transient conditions, the proprietary clamping cell prevents over-voltage on the power line or control/data lines, protecting any downstream components.

AZ4224-04F 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).



## Specifications

| Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ , unless otherwise specified) |                         |               |                  |
|---|-------------------------|---------------|------------------|
| Parameter   | Symbol                  | Rating        | Unit             |
| Peak Pulse Current ( $t_p = 8/20\mu\text{s}$ )                                    | $I_{PP}(\text{Note 1})$ | 5             | A                |
| Operating Voltage   | $V_{DC}$                | $\pm 26$      | 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       | $V_{RWM}$      | Pin-1,-2,-4,-5 to pin-3,-8, $T = 25^\circ\text{C}$ .  | -24  |      | 24  | V             |
| Channel Leakage Current         | $I_{CH-Leak}$  | $V_{Pin-1,-2,-4,-5} = \pm 24\text{V}$ , $V_{Pin-3,-8} = 0\text{V}$ ,<br>$T = 25^\circ\text{C}$ .                        |      |      | 0.2 | $\mu\text{A}$ |
| Reverse Breakdown Voltage       | $V_{BV}$       | $I_{BV} = 10\text{mA}$ , pin-1,-2,-4,-5 to<br>pin-3,-8, $T = 25^\circ\text{C}$ .  | 26.5 |      | 36  | V             |
| Surge Clamping Voltage (Note 1) | $V_{CL-surge}$ | $I_{PP} = 5\text{A}$ , $T = 25^\circ\text{C}$ , any I/O pin to<br>GND.  |      | 40   |     | V             |
| ESD Clamping Voltage (Note 2)   | $V_{CL-ESD}$   | IEC 61000-4-2 +8kV ( $I_{TLP} = 16\text{A}$ ),<br>contact mode, any I/O pin to GND,<br>$T = 25^\circ\text{C}$ .         |      | 35   |     | V             |
| ESD Dynamic Turn-on Resistance  | $R_{dynamic}$  | IEC 61000-4-2, 0~+8kV, $T = 25^\circ\text{C}$ ,<br>contact mode, any I/O pin to GND.                                    |      | 0.35 |     | $\Omega$      |
| Channel Input Capacitance       | $C_{IN}$       | $V_{pin-3,-8} = 0\text{V}$ , $V_{IN} = 0\text{V}$ , $f = 1\text{MHz}$ , any<br>I/O pin to GND, $T = 25^\circ\text{C}$ . |      | 15   | 20  | pF            |

Note 1: The Peak Pulse Current measured conditions:  $t_p = 8/20\mu\text{s}$ ,  $2\Omega$  source impedance.

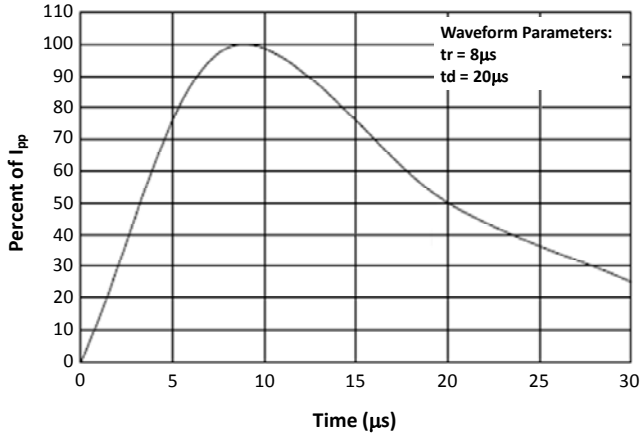
Note 2: ESD Clamping Voltage was measured by Transmission Line Pulsing (TLP) System.

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

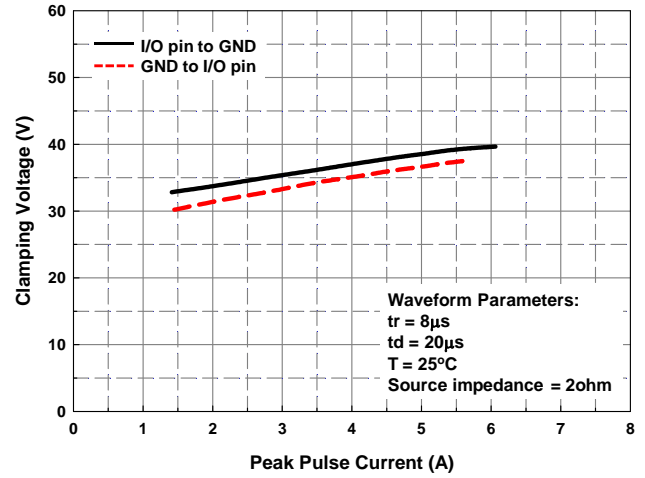


## Typical Characteristics

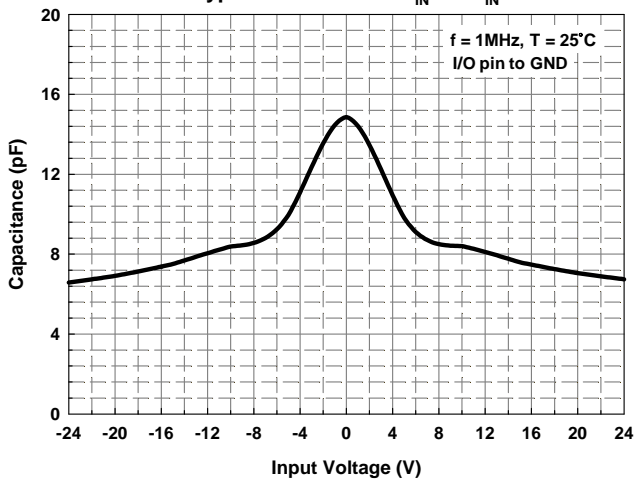
Pulse Waveform



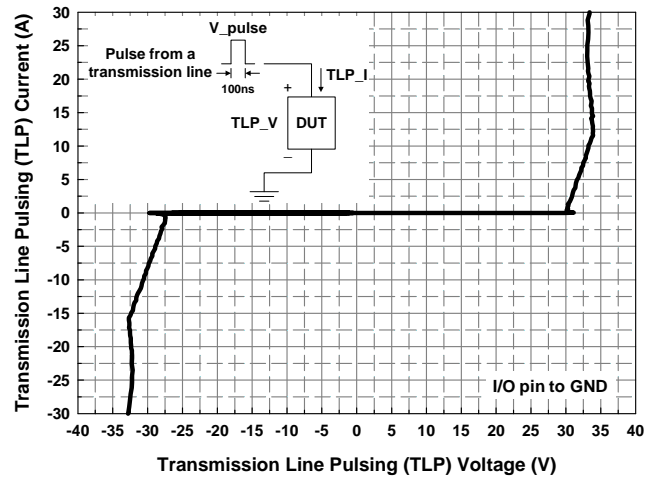
Clamping Voltage vs. Peak Pulse Current



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



Transmission Line Pulsing (TLP) Measurement



## Application Information

The AZ4224-04F is designed to protect four data lines from transient over-voltage (such as ESD stress pulse). The device connection of AZ4224-04F 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 AZ4224-04F. The ground pins (pin3 and pin8) of AZ4224-04F 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 be kept as short as possible.

AZ4224-04F can provide ESD protection for four I/O signal lines simultaneously. If the number of I/O signal lines is less than four, the unused I/O pins can be simply left as NC pins.

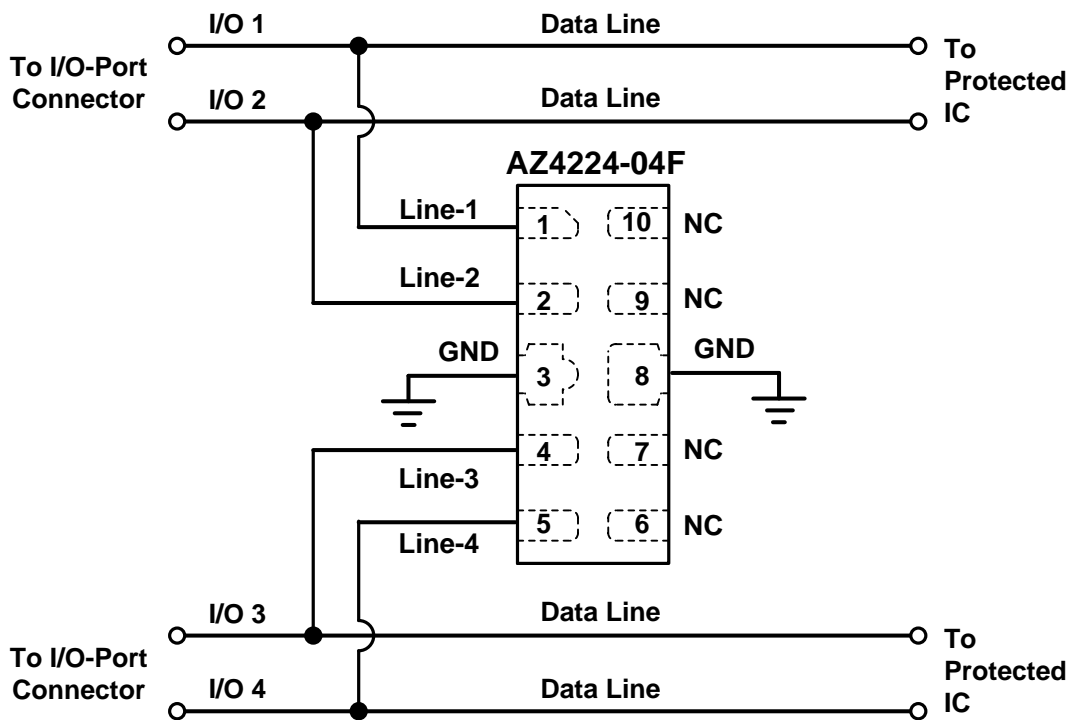
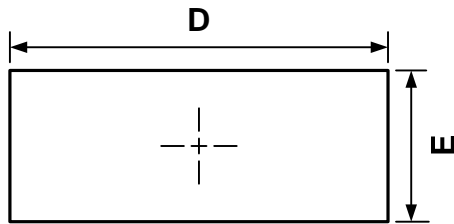


Fig. 1 Data lines connection of AZ4224-04F.

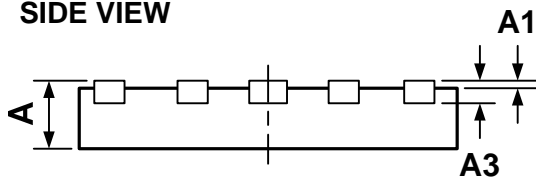
## Mechanical Details

### DFN2510P10E Package Diagrams

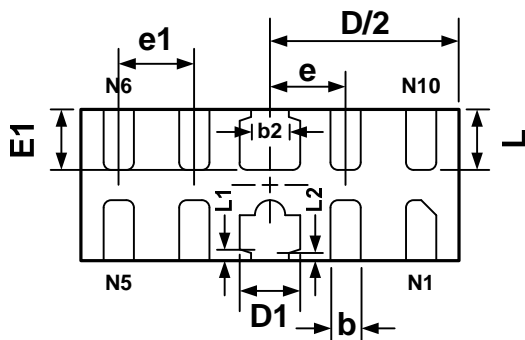
TOP VIEW



SIDE VIEW



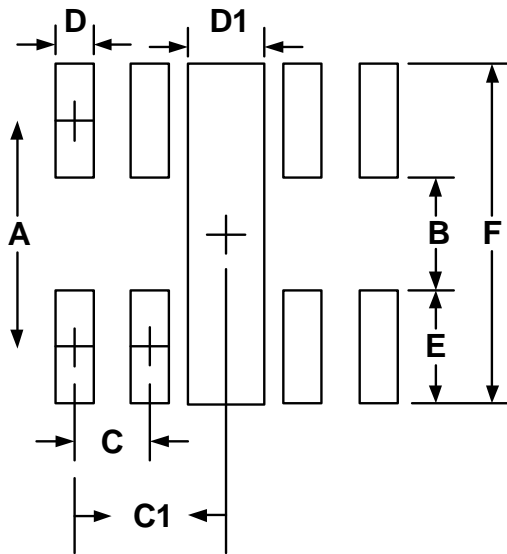
BOTTOM VIEW



### Package Dimensions

| SYMBOL | MILLIMETERS |       |
|--------|-------------|-------|
|        | MIN.        | MAX.  |
| A      | 0.400       | 0.550 |
| A1     | -           | 0.050 |
| A3     | 0.152REF    |       |
| D      | 2.450       | 2.550 |
| E      | 0.950       | 1.050 |
| D1     | 0.350       | 0.450 |
| E1     | 0.350       | 0.450 |
| b      | 0.150       | 0.250 |
| e      | 0.500 BSC   |       |
| e1     | 0.500 BSC   |       |
| L1     | 0.075 REF   |       |
| L2     | 0.050 REF   |       |
| b2     | 0.200       | 0.300 |
| L      | 0.350       | 0.450 |

## Land Layout

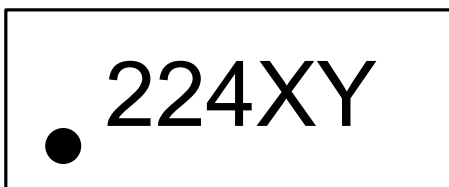


| Dimensions |            |        |
|------------|------------|--------|
| Index      | Millimeter | Inches |
| A          | 0.875      | 0.034  |
| B          | 0.20       | 0.008  |
| C          | 0.50       | 0.02   |
| C1         | 1.00       | 0.039  |
| D          | 0.25       | 0.01   |
| D1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

### 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



224 = Device Code  
X = Date Code  
Y = Control Code

| Part Number                    | Marking Code |
|--------------------------------|--------------|
| AZ4224-04F.R7G<br>(Green Part) | 224XY        |

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

## Ordering Information

| PN#            | Material | Type | Reel size | MOQ        | MOQ/internal box   | MOQ/carton            |
|----------------|----------|------|-----------|------------|--------------------|-----------------------|
| AZ4224-04F.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 2023/10/02 | Preliminary Release.     |
| Revision 2023/11/09 | Formal Release.          |
|                     |                          |
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|                     |                          |
|                     |                          |