

## Features

- ESD Protect for 2 Lines with Unidirectional
- ESD Protect for 1 Line with Bidirectional
- Provide ESD protection for a line to  
**IEC 61000-4-2 (ESD)  $\pm 26\text{kV}$  (air)**  
**IEC 61000-4-2 (ESD)  $\pm 20\text{kV}$  (contact)**  
**IEC 61000-4-4 (EFT) 60A (5/50ns)**
- Suitable for, **12V and below**, operating voltage applications
- Fast turn-on and Low clamping voltage
- Array of ESD rated equivalent TVS diodes
- Small package saves board space
- Solid-state silicon-avalanche and active circuit triggering technology
- **Green part**

## Applications

- Battery Contacts
- Power Manager System
- PDA's
- Portable Devices
- Digital Cameras
- Digital Frames
- Cellular Handsets and Accessories
- Notebooks, desktops, and servers
- Microprocessor-based equipment
- Peripherals

## Description

AZ4012-02S is a design which includes ESD rated clamping cell arrays to protect the power lines or control lines in an electronic systems. The AZ4012-02S has been specifically designed to protect sensitive components which are connected to power and control lines from over-voltage caused by Electrostatic Discharging (ESD), Electrical Fast Transients (EFT), and Cable Discharge

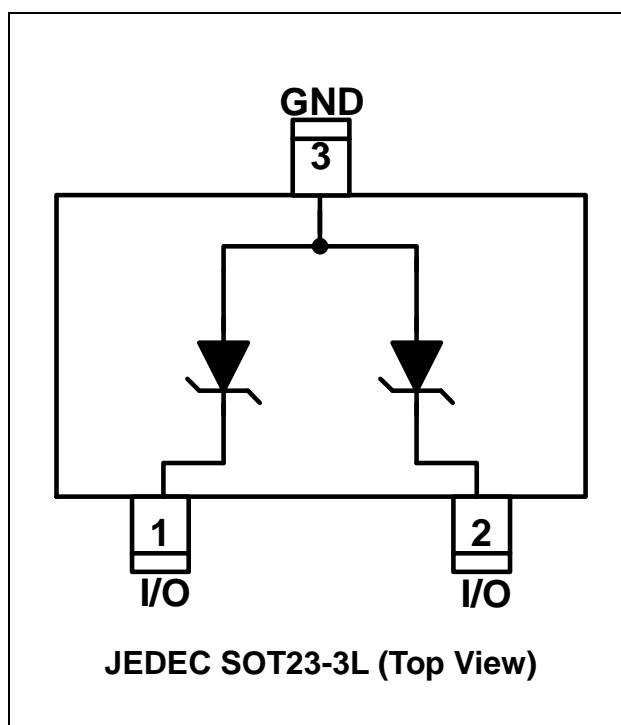
Event (CDE).

AZ4012-02S is a unique design which includes proprietary clamping cells in a single package.

During transient conditions, the proprietary clamping cells prevent over-voltage on the power lines or control lines, protecting any downstream components.

AZ4012-02S 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



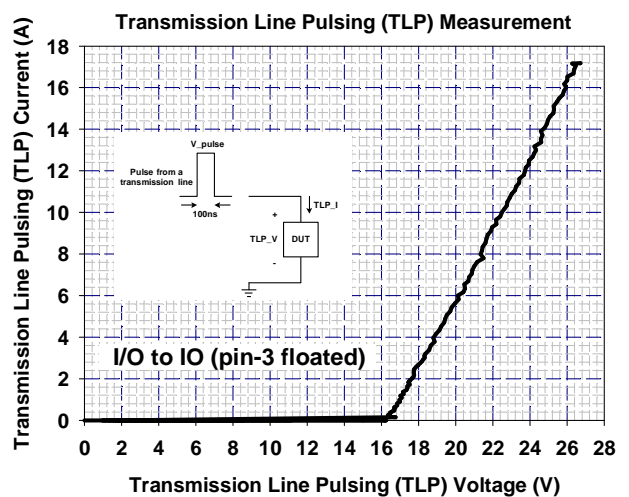
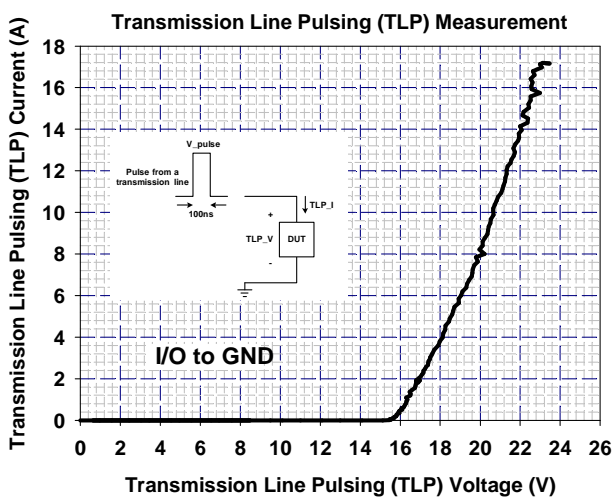
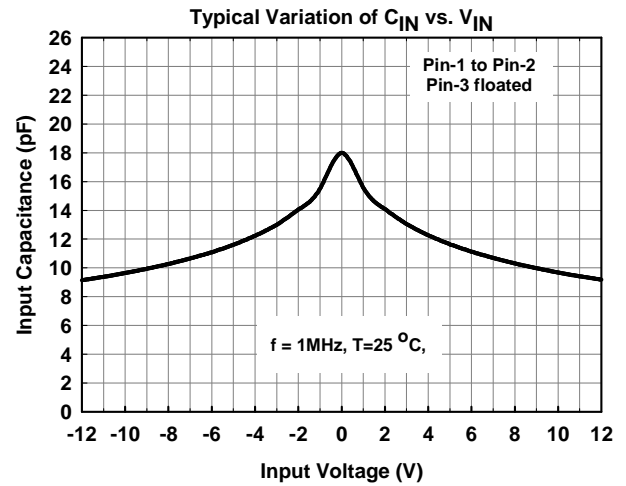
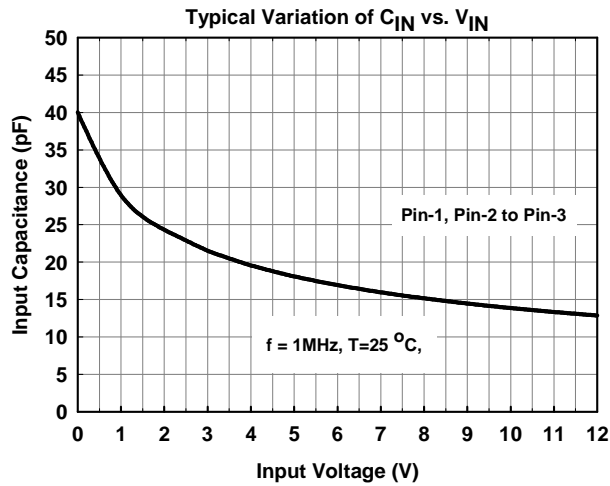
## SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS			
PARAMETER	PARAMETER	RATING	UNITS
Operating Supply Voltage (pin-1, -2 to pin-3)	$V_{DC}$	13	V
pin-1, -2 to pin-3 ESD per IEC 61000-4-2 (Air)	$V_{ESD-1}$	$\pm 26$	kV
pin-1, -2 to pin-3 ESD per IEC 61000-4-2 (Contact)	$V_{ESD-2}$	$\pm 20$	kV
Lead Soldering Temperature	$T_{SOL}$	260 (10 sec.)	$^{\circ}C$
Operating Temperature	$T_{OP}$	-55 to +125	$^{\circ}C$
Storage Temperature	$T_{STO}$	-55 to +150	$^{\circ}C$

ELECTRICAL CHARACTERISTICS						
PARAMETER	SYMBOL	CONDITIONS	MINI	TYP	MAX	UNITS
Reverse Stand-Off Voltage	$V_{RWM}$	pin-1-to-pin-3, or pin-2-to-pin-3, $T=25^{\circ}C$ .			12	V
Reverse Leakage Current	$I_{Leak}$	$V_{RWM} = 7V$ , $T=25^{\circ}C$ , pin-1-to-pin-3, or pin-2-to-pin-3.			0.1	$\mu A$
Reverse Breakdown Voltage	$V_{BV}$	$I_{BV} = 1mA$ , $T=25^{\circ}C$ , pin-1-to-pin-3, or pin-2-to-pin-3.	13.5		18	V
Forward Voltage	$V_F$	$I_F = 15mA$ , $T=25^{\circ}C$ , pin-3 to pin-1 or pin-3 to pin-2.	0.6	0.8	1	V
ESD Clamping Voltage-1	$V_{clamp-1}$	IEC 61000-4-2 0~+6kV, $T=25^{\circ}C$ , Contact mode, pin-1, -2, to pin-3.		23		V
ESD Clamping Voltage-2	$V_{clamp-2}$	IEC 61000-4-2 0~+6kV, $T=25^{\circ}C$ , Contact mode, pin-1-to-pin-2, while pin-3 is floated.		26		V
ESD Dynamic Turn-on Resistance-1	$R_{dynamic-1}$	IEC 61000-4-2 0~+6kV, $T=25^{\circ}C$ , Contact mode, pin-1, -2, to pin-3.		0.4		$\Omega$
ESD Dynamic Turn-on Resistance-2	$R_{dynamic-2}$	IEC 61000-4-2 0~+6kV, $T=25^{\circ}C$ , Contact mode, pin-1-to-pin-2, while pin-3 is floated.		0.6		$\Omega$
Channel Input Capacitance	$C_{IN}$	$V_R = 0V$ , $f = 1MHz$ , $T=25^{\circ}C$ , pin-1-to-pin-3, or pin-2-to-pin-3.		40	50	pF
Channel to Channel Input Capacitance	$C_{CROSS}$	$V_R = 0V$ , $f = 1MHz$ , pin-3 floated, $T=25^{\circ}C$ , between pin-1 and pin-2.		20	25	pF



## Typical Characteristics





## Applications Information

The AZ4012-02S is designed to protect two lines against System ESD/EFT/CDE pulses by clamping them to an acceptable reference.

The usage of the AZ4012-02S is shown in Fig. 1. Protected lines, such as data lines, control lines, or power lines, are connected at pin 1 and 2. The pin 3 should be connected directly to a ground plane on the board. All path lengths connected to the pins of AZ4012-02S should be kept as short as possible to minimize parasitic inductance in the board traces.

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 AZ4012-02S.
- Place the AZ4012-02S 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 transient easily injects to.

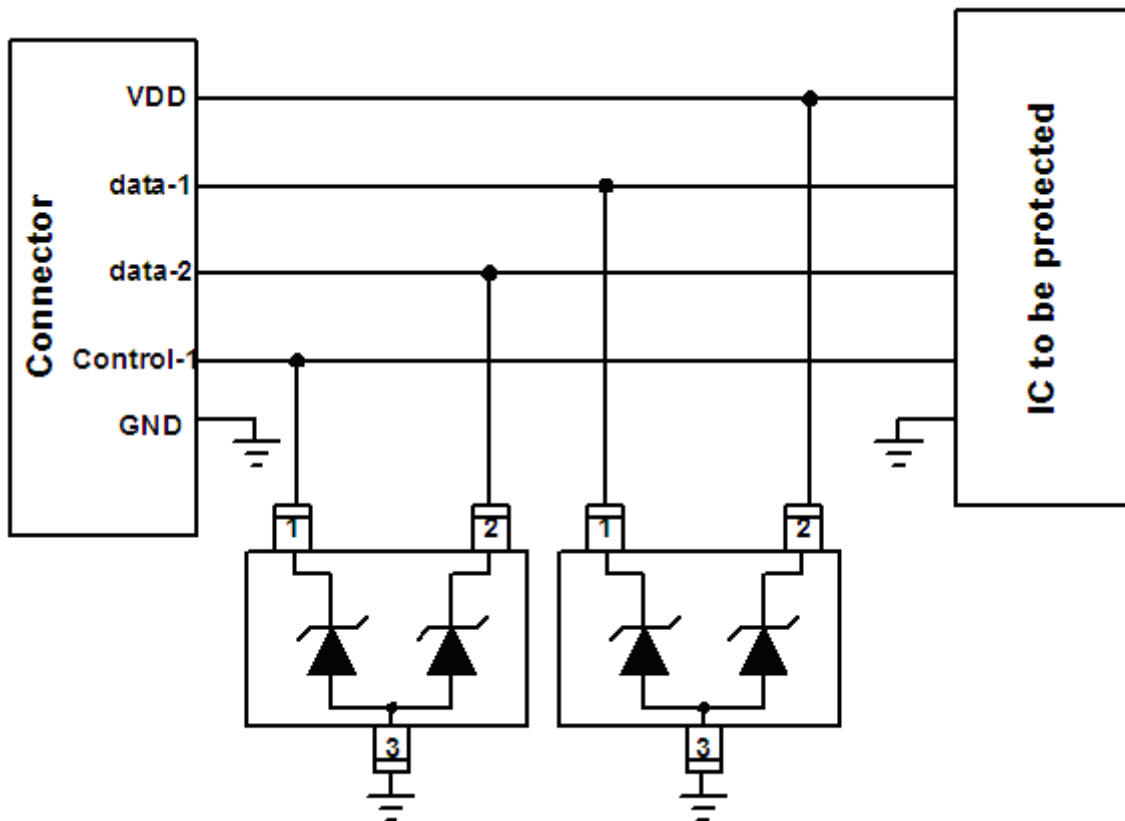
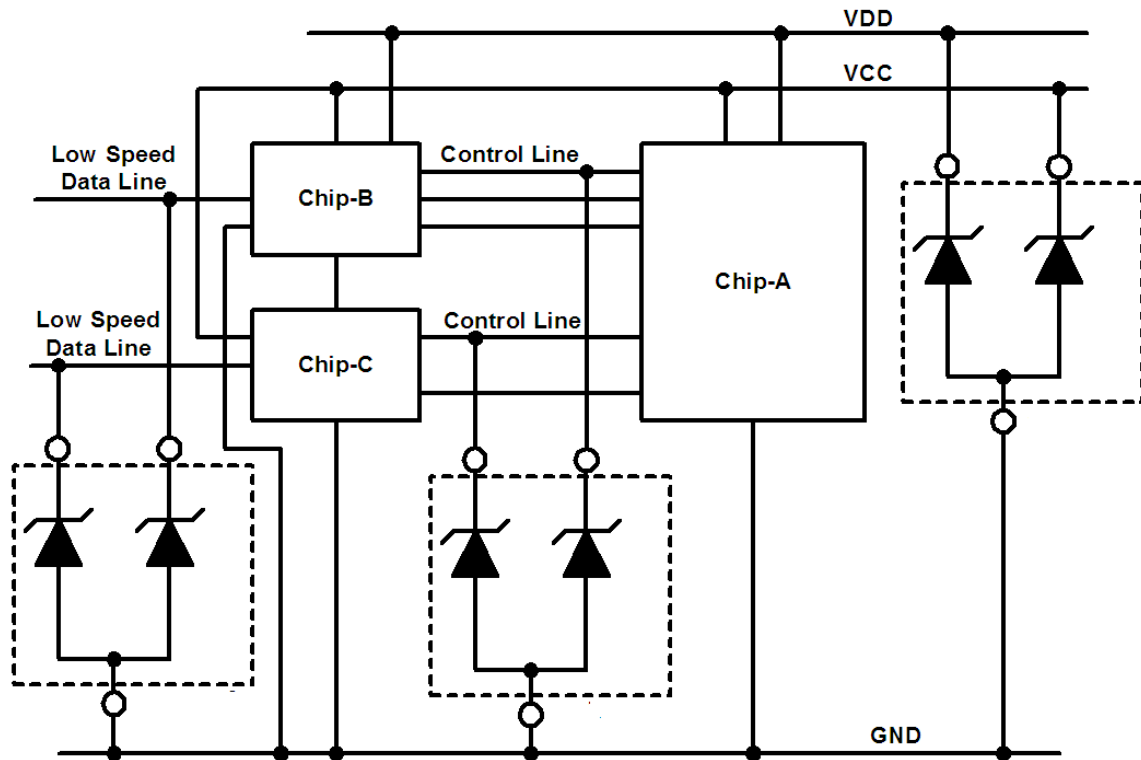


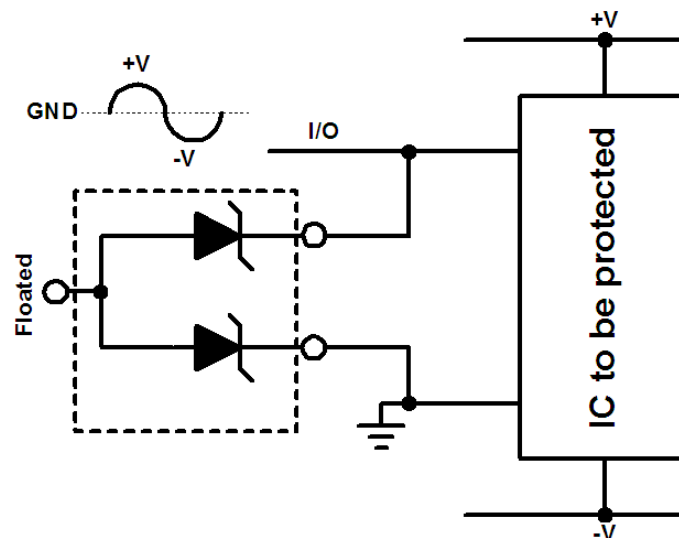
Fig. 1



Fig. 2 shows another simplified example of using AZ4012-02S to protect the control lines, low speed data lines, and power lines from ESD transient stress.



**Fig. 2**

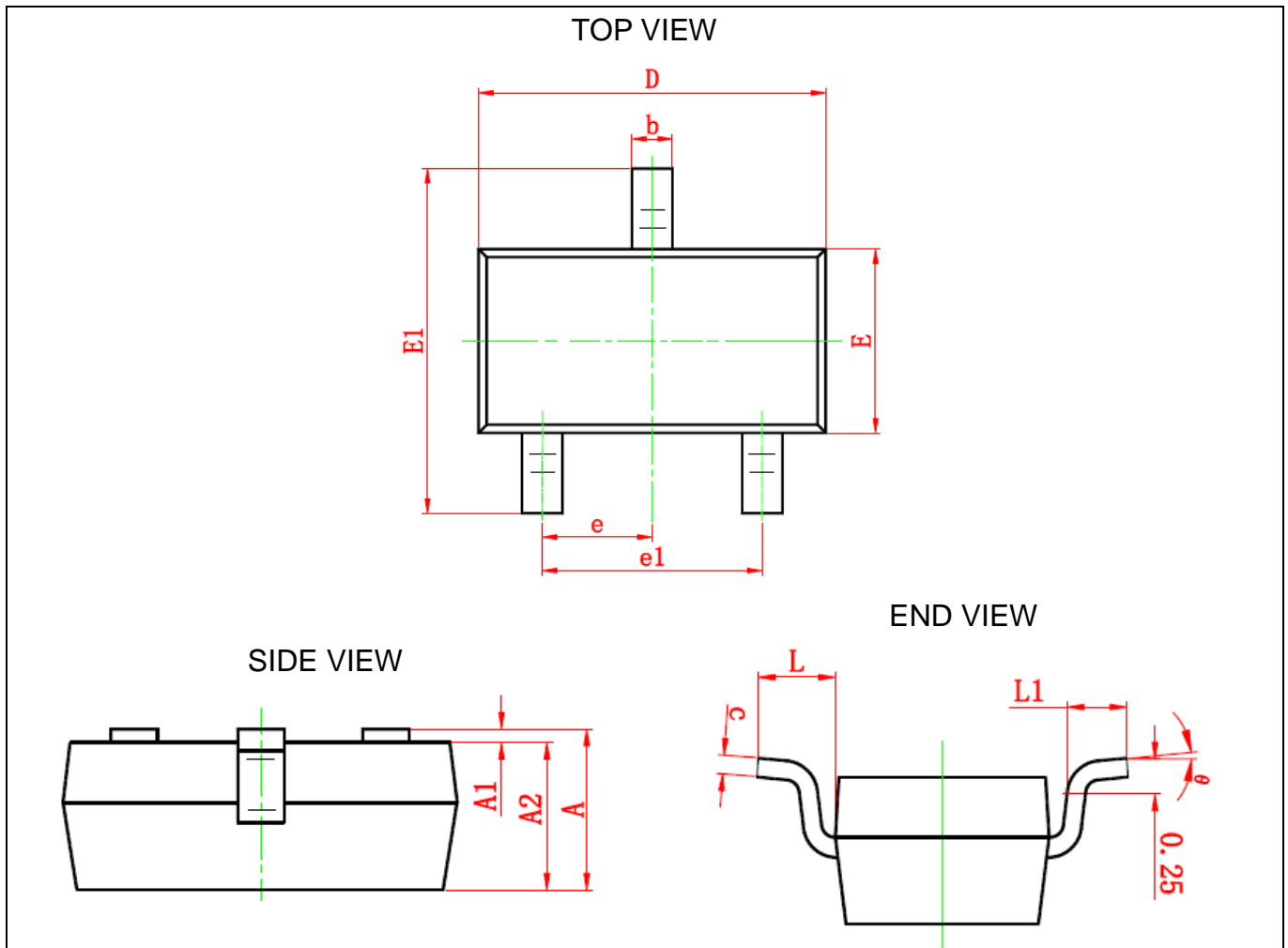


**Fig. 3 Bidirectional Protection**



## Mechanical Details

### SOT23-3L PACKAGE DIAGRAMS

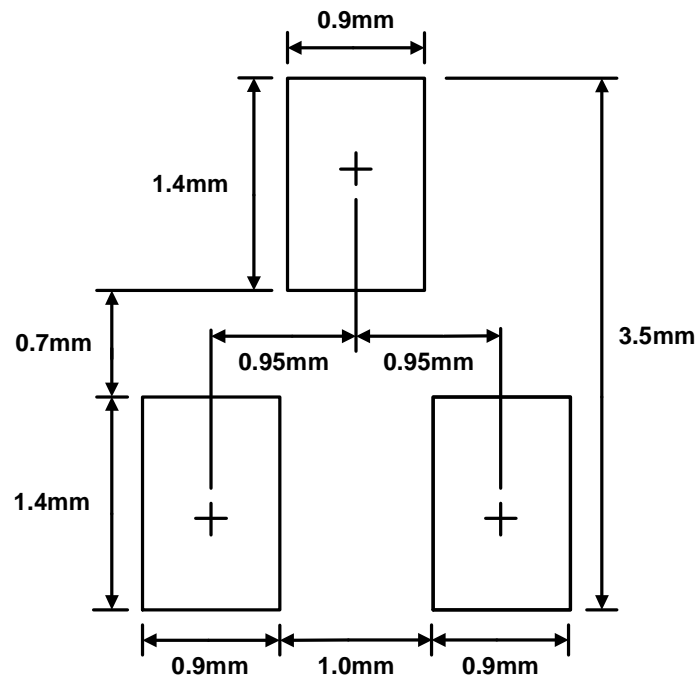


### PACKAGE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
$\theta$	0°	8°	0°	6°



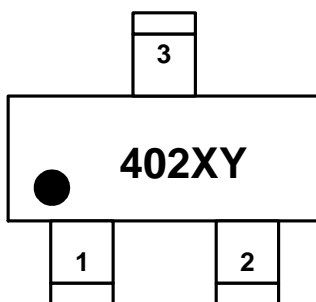
## LAND LAYOUT



Notes:

This LAND LAYOUT is for reference purposes only. Please consult your manufacturing partners to ensure your company's PCB design guidelines are met.

## MARKING CODE



402 = Device Code  
X = Date Code  
Y = Control Code

Part Number	Marking Code
AZ4012-02S (Green part)	402XY

## Ordering Information

PN#	Material	Type	Reel size	MOQ/internal box	MOQ/carton
AZ4012-02S.R7G	Green	T/R	7 inch	4 reel=12,000/box	6 box=72,000/carton

## Revision History

Revision	Modification Description
Revision 2009/09/17	Formal Release.
Revision 2010/11/23	<ol style="list-style-type: none"> <li>1. Update the EFT spec from 80A to be 60A.</li> <li>2. Update the ESD Clamping Voltage-1 typical value from 20V to be 23V.</li> <li>3. Update the ESD Clamping Voltage-1 typical value from 23V to be 26V.</li> <li>4. Update the ESD Dynamic Turn-on Resistance-1 typical value from 0.23Ω to 0.4 Ω.</li> <li>5. Update the ESD Dynamic Turn-on Resistance-2 typical value from 0.33Ω to 0.6 Ω.</li> <li>6. Update the Channel Input Capacitance (TYP, MAX) values from (28pF, 34pF) to (40pF, 50pF).</li> <li>7. Update the Channel to Channel Input Capacitance (TYP, MAX) values from (14pF, 17pF) to (20pF, 25pF).</li> </ol>
Revision 2011/07/28	<ol style="list-style-type: none"> <li>1. Update the Company Logo.</li> <li>2. Add the Ordering Information.</li> </ol>