# ESDAxxL

## DUAL TRANSIL ARRAY FOR ESD PROTECTION

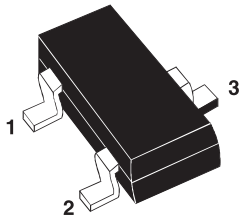
Application Specific Discretes
A.S.D.

### APPLICATIONS

Where transient overvoltage protection in ESD sensitive equipment is required, such as :

- COMPUTERS
- PRINTERS
- COMMUNICATION SYSTEMS

It is particulary recommended for the RS232 I/O port protection where the line interface withstands only with 2kV ESD surges.




**SOT23**

### FEATURES

- 2 UNIDIRECTIONAL TRANSIL FUNCTIONS.
- LOW LEAKAGE CURRENT : $I_R$ max. < 20µA at $V_{BR}$.
- 300 W PEAK PULSE POWER (8/20µs)

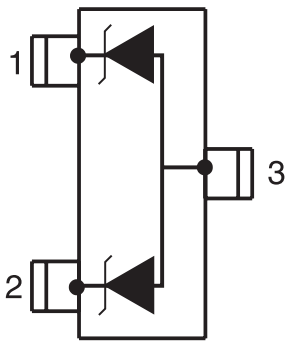
### DESCRIPTION

The ESDAxxL is a dual monolithic voltage suppressor designed to protect components which are connected to data and transmission lines against ESD.

It clamps the voltage just above the logic level supply for positive transients, and to a diode drop below ground for negative transients.

It can also work as bidirectionnal suppressor by connecting only pin1 and 2.

### FUNCTIONAL DIAGRAM




### BENEFITS

High ESD protection level : up to 25 kV.

High integration.

Suitable for high density boards.

### COMPLIES WITH THE FOLLOWING STANDARDS :

IEC61000-4-2 level 4

MIL STD 883C-Method 3015-6 : class 3.
(human body model)

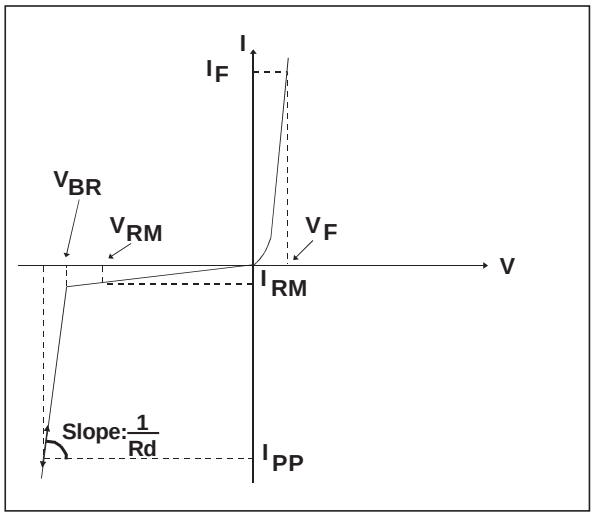
## ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25°C)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{PP}$ | Electrostatic discharge<br>MIL STD 883C - Method 3015-6<br>IEC61000-4-2 air discharge<br>IEC61000-4-2 contact discharge | <br>25<br>16<br>9 | kV |
| $P_{PP}$ | Peak pulse power (8/20 µs) | 300 | W |
| $T_{stg}$<br>$T_j$ | Storage temperature range<br>Maximum junction temperature | - 55 to + 150<br>150 | °C<br>°C |
| $T_L$ | Maximum lead temperature for soldering during 10s | 260 | °C |
| $T_{op}$ | Operating temperature range | - 40 to + 125 | °C |

**note 1**: Evolution of functional parameters is given by curves.

## ELECTRICAL CHARACTERISTICS ($T_{amb}$ = 25°C)

| Symbol | Parameter |
|---|---|
| $V_{RM}$ | Stand-off voltage |
| $V_{BR}$ | Breakdown voltage |
| $V_{CL}$ | Clamping voltage |
| $I_{RM}$ | Leakage current |
| $I_{PP}$ | Peak pulse current |
| $\alpha T$ | Voltage temperature coefficient |
| C | Capacitance |
| Rd | Dynamic resistance |
| $V_F$ | Forward voltage drop |




| Types | $V_{BR}$ @ $I_R$ | | | $I_{RM}$ @ $V_{RM}$ | | Rd | αT | C | $V_F$ @ $I_F$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | min. | max. | | max. | | typ.<br>note 1 | max.<br>note 2 | typ.<br>0V bias | max. | |
| | V | V | mA | µA | V | mΩ | $10^{-4}/\supset C$ | pF | V | mA |
| ESDA5V3L | 5.3 | 5.9 | 1 | 2 | 3 | 280 | 5 | 220 | 1.25 | 200 |
| ESDA6V1L | 6.1 | 7.2 | 1 | 20 | 5.25 | 350 | 6 | 140 | 1.25 | 200 |
| ESDA14V2L | 14.2 | 15.8 | 1 | 5 | 12 | 650 | 10 | 90 | 1.25 | 200 |
| ESDA25L | 25 | 30 | 1 | 1 | 24 | 1000 | 10 | 50 | 1.2 | 10 |

note 1 : Square pulse Ipp = 15A, tp=2.5µs.
**note 2** : $\Delta V_{BR} = \alpha T^* (Tamb -25°C) * V_{BR} (25°C)$

## CALCULATION OF THE CLAMPING VOLTAGE

### USE OF THE DYNAMIC RESISTANCE

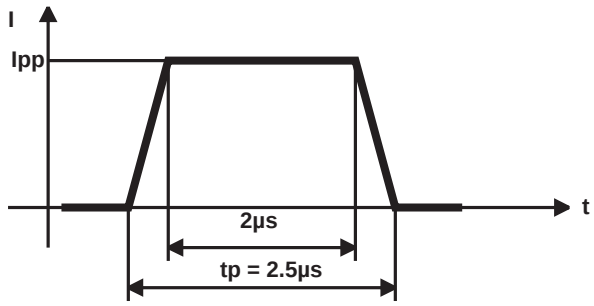
The ESDA family has been designed to clamp fast spikes like ESD. Generally the PCB designers need to calculate easily the clamping voltage $V_{CL}$. This is why we give the dynamic resistance in addition to the classical parameters. The voltage across the protection cell can be calculated with the following formula:

$$V_{CL} = V_{BR} + Rd\ I_{PP}$$

Where Ipp is the peak current through the ESDA cell.

### DYNAMIC RESISTANCE MEASUREMENT

The short duration of the ESD has led us to prefer a more adapted test wave, as below defined, to the classical 8/20µs and 10/1000µs surges.




2.5µs duration measurement wave.

As the value of the dynamic resistance remains stable for a surge duration lower than 20µs, the 2.5µs rectangular surge is well adapted. In addition both rise and fall times are optimized to avoid any parasitic phenomenon during the measurement of Rd.

**Fig. 1:** Peak power dissipation versus initial junction temperature.

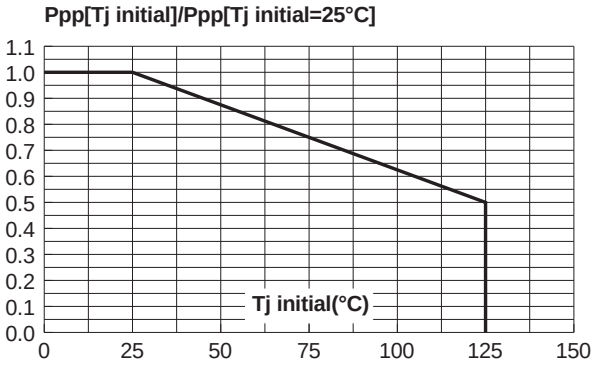



**Fig. 2:** Peak pulse power versus exponential pulse duration (Tj initial = 25 °C).

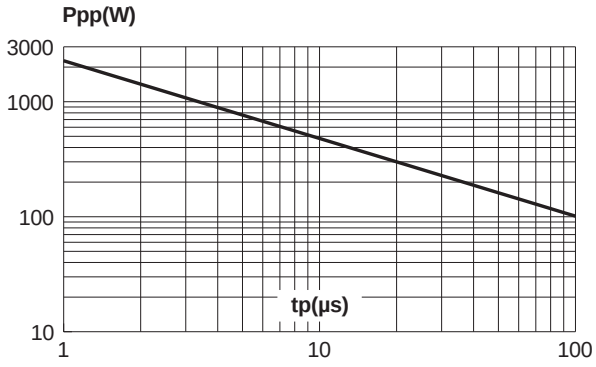



**Fig. 3:** Clamping voltage versus peak pulse current (Tj initial = 25 °C).
Rectangular waveform tp = 2.5 µs.

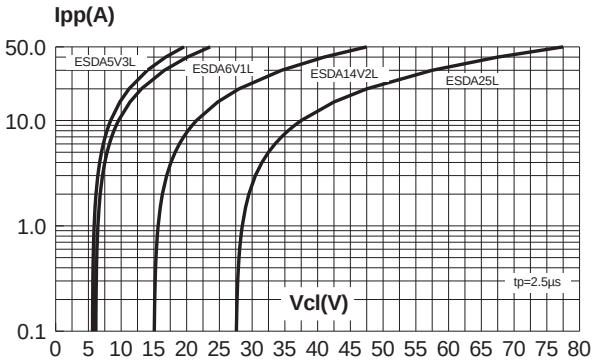



**Fig. 4:** Capacitance versus reverse applied voltage (typical values).

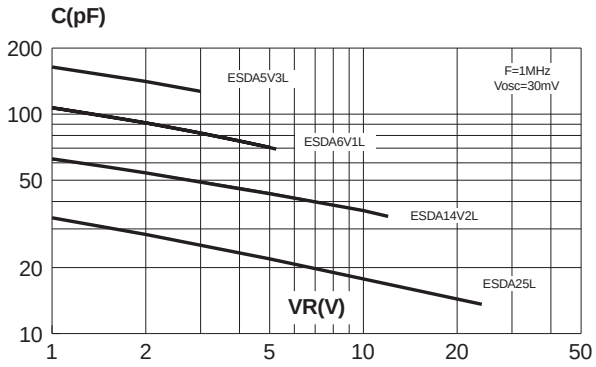



**Fig. 5:** Relative variation of leakage current versus junction temperature (typical values).

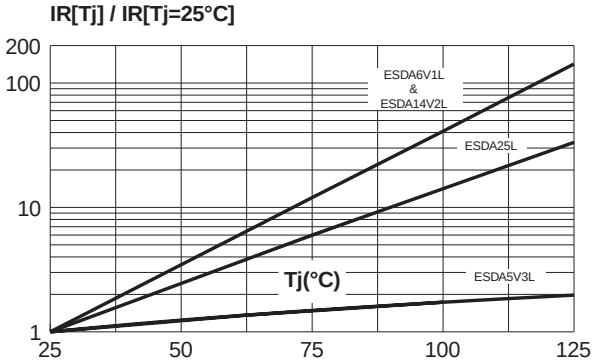
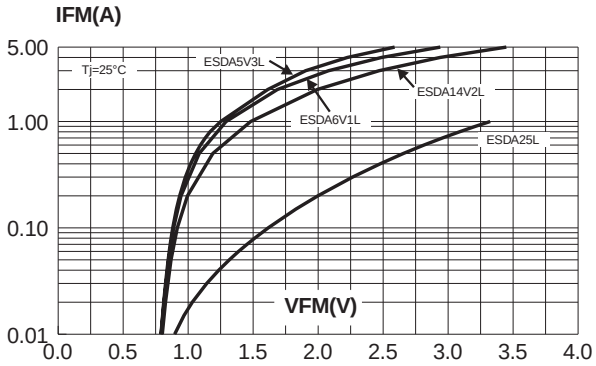



**Fig. 6:** Peak forward voltage drop versus peak forward current (typical values).



## 1. ESD protection by the ESDAxxL

Electrostatic discharge (ESD) is a major cause of failure in electronic systems.

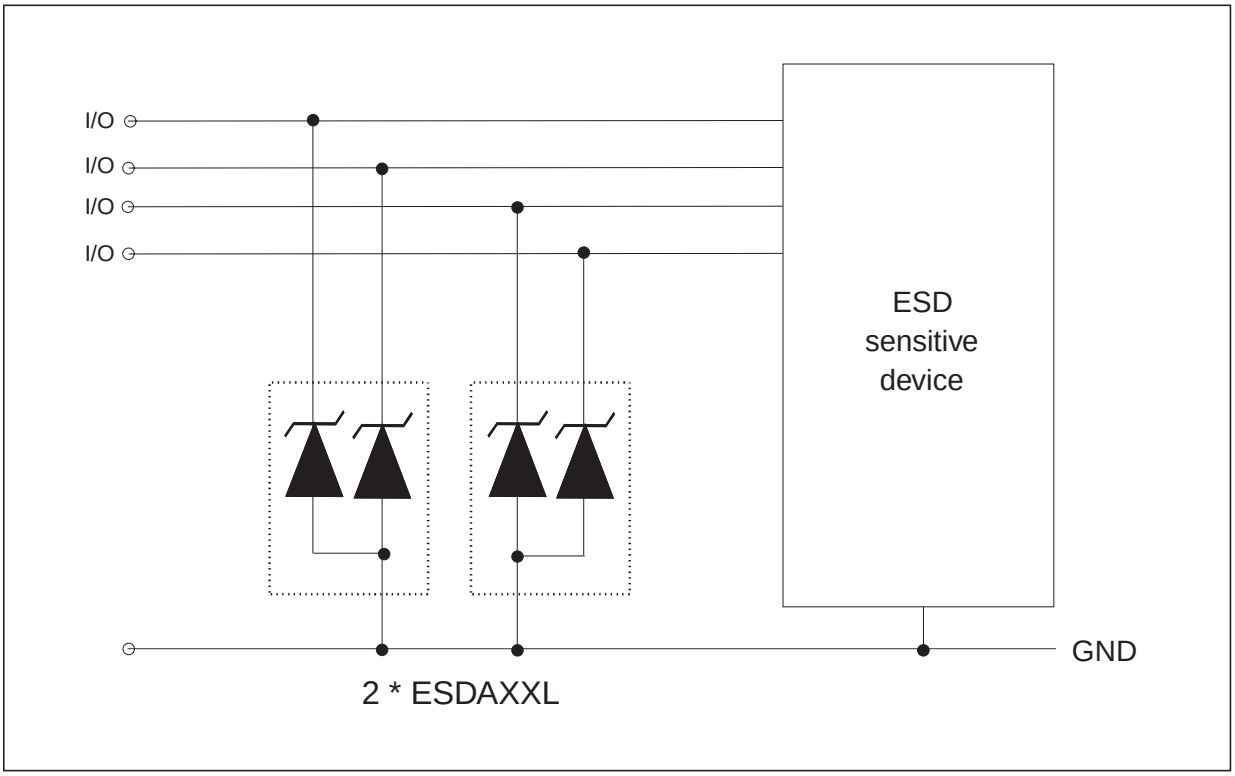
Transient Voltage Suppressors (TVS) are an ideal choice for ESD protection. They are capable of clamping the incoming transient to a low enough level such that damage to the protected semiconductor is prevented.

Surface mount TVS arrays offer the best choice for minimal lead inductance.

They serve as parallel protection elements, connected between the signal line to ground. As the transient rises above the operating voltage of the device, the TVS array becomes a low impedance path diverting the transient current to ground.

The ESDAxxL array is the ideal board level protection of ESD sensitive semiconductor components.

The tiny SOT23 package allows design flexibility in the design of high density boards where the space saving is at a premium. This enables to shorten the routing and contributes to hardening againt ESD.

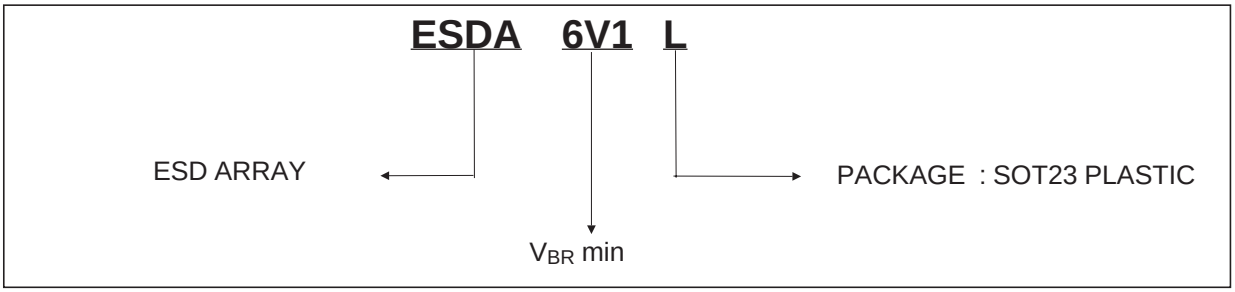



## 2. Circuit Board Layout

Circuit board layout is a critical design step in the suppression of ESD induced transients. The following guidelines are recommended :

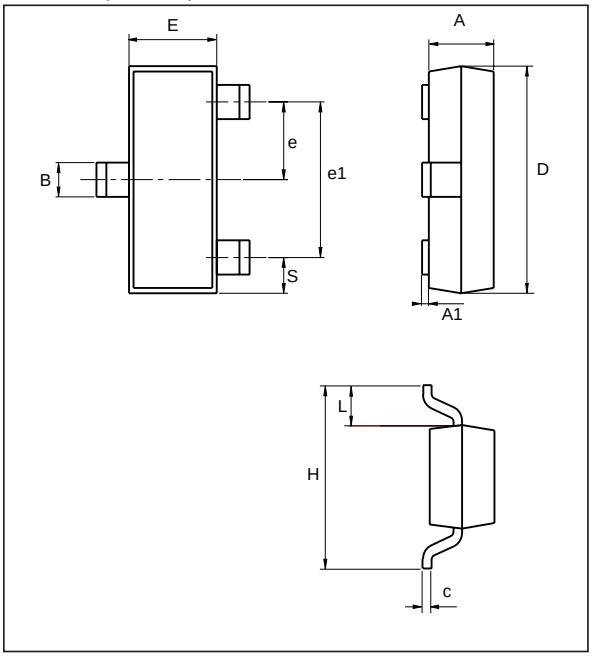
- The ESDAxxL should be placed as close as possible to the input terminals or connectors.
- The path length between the ESD suppressor and the protected line should be minimized
- All conductive loops, including power and ground loops should be minimized
- The ESD transient return path to ground should be kept as short as possible.
- Ground planes should be used whenever possible.

## ORDER CODE



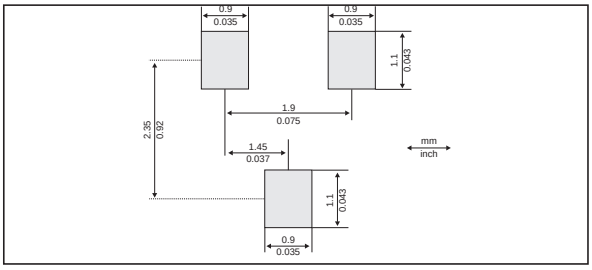

## PACKAGE MECHANICAL DATA

SOT23 (Plastic)




| REF. | DIMENSIONS | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 0.89 | 1.4 | 0.035 | 0.055 |
| A1 | 0 | 0.1 | 0 | 0.004 |
| B | 0.3 | 0.51 | 0.012 | 0.02 |
| c | 0.085 | 0.18 | 0.003 | 0.007 |
| D | 2.75 | 3.04 | 0.108 | 0.12 |
| e | 0.85 | 1.05 | 0.033 | 0.041 |
| e1 | 1.7 | 2.1 | 0.067 | 0.083 |
| E | 1.2 | 1.6 | 0.047 | 0.063 |
| H | 2.1 | 2.75 | 0.083 | 0.108 |
| L | 0.6 typ. | | 0.024 typ. | |
| S | 0.35 | 0.65 | 0.014 | 0.026 |

**FOOT PRINT** (in millimeters)




## MARKING

| TYPE | MARKING |
|---|---|
| ESDA5V3L | EL53 |
| ESDA6V1L | EL61 |
| ESDA14V2L | EL15 |
| ESDA25L | EL25 |

Packaging: Standard packaging is tape and reel.

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