ESDA25LY

Automotive dual Transil™ array for ESD protection

Features

- 2 Unidirectional Transil functions
- Low leakage current: 1 µA @ 24 V
- 300 W peak pulse power (8/20 µs)

Benefits

- High ESD protection level: up to 25 kV
- High integration
- Suitable for high density boards

Complies with the following standards

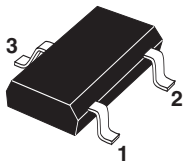
- IEC 61000-4-2 level 4
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883G - Method 3015-7 Class 3B
  - (human body model)

Applications

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

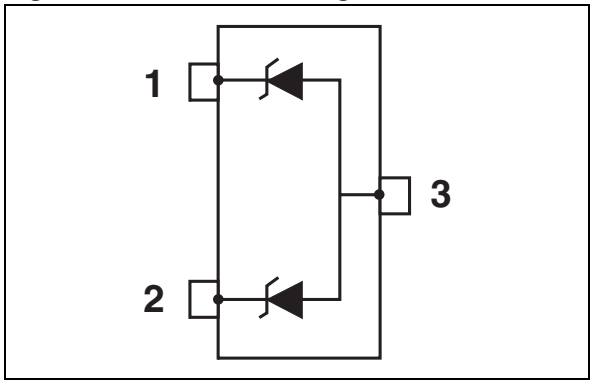
- Computers
- Printers
- Communication systems and cellular phones

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



SOT23-3L

Figure 1. Functional diagram



Description

The ESDA25LY 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.

TM: Transil is a trademark of STMicroelectronics.
A.S.D.™= Application Specific Discretes

1 Characteristics

Table 1. Absolute maximum ratings (T_{amb} = 25°C)

Symbol	Parameter		Value	Unit
V_{PP}	ESD discharge	MIL STD 883E-Method 3015-7 IEC 61000-4-2 air discharge IEC 61000-4-2 contact discharge	25 16 9	kV
P_{PP}	Peak pulse power (8/20 µs)		300	W
T_j	Junction temperature		150	°C
T_{stg}	Storage temperature range		-55 to +150	°C
T_L	Maximum lead temperature for soldering during 10 s at 5 mm for case		260	°C
T_{op}	Operating temperature range		-40 to +125	°C

Figure 2. Electrical characteristics (definitions)

Symbol		Parameter
V_{BR}	=	Breakdown voltage
V_{CL}	=	Clamping voltage
I_{RM}	=	Leakage current @ V_{RM}
V_{RM}	=	Stand-off voltage
I_F	=	Forward current
I_{PP}	=	Peak pulse current
I_R	=	Breakdown current
V_F	=	Forward voltage drop
R_d	=	Dynamic impedance
αT	=	Voltage temperature

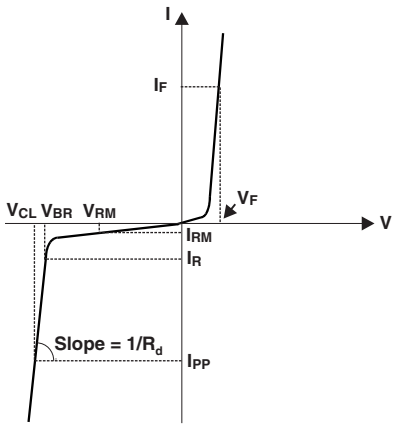


Table 2. Electrical characteristics (values, T_{amb} = 25 °C)

Order code	V_{BR} @ I_R			I_{RM} @ V_{RM}		V_F@ I_F		Rd	αT	C
	min.	max.		max.		max.		typ. note(1)	max. note(2)	typ. 0V bias
	V	V	mA	µA	V	V	mA	mΩ	10^{-4}/C	pF
ESDA25LY	25	30	1	1	24	1.2	10	1000	10	50

1. Square pulse, I_{pp} = 15 A, t_p = 2.5 µs.
2. $\Delta V_{BR} = \alpha T^* (T_{amb} - 25\ °C) * V_{BR}$ (25 °C)

Figure 3. Peak power dissipation versus initial junction temperature

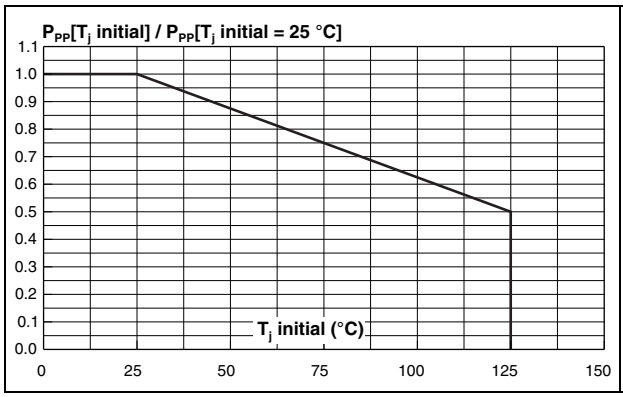


Figure 4. Peak pulse power versus exponential pulse duration (T_j initial = 25 °C)

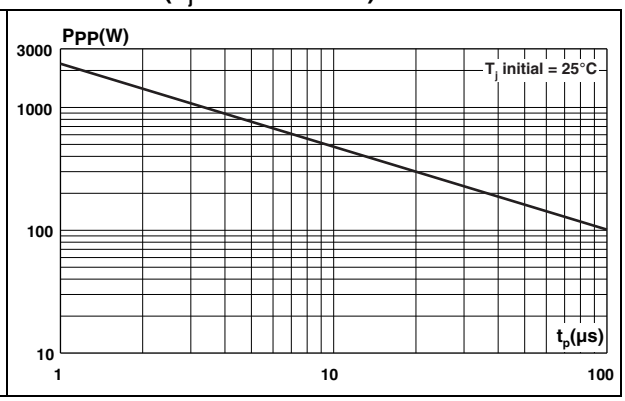


Figure 5. Clamping voltage versus peak pulse current (T_j initial = 25 °C, rectangular waveform, t_p = 2.5µs)

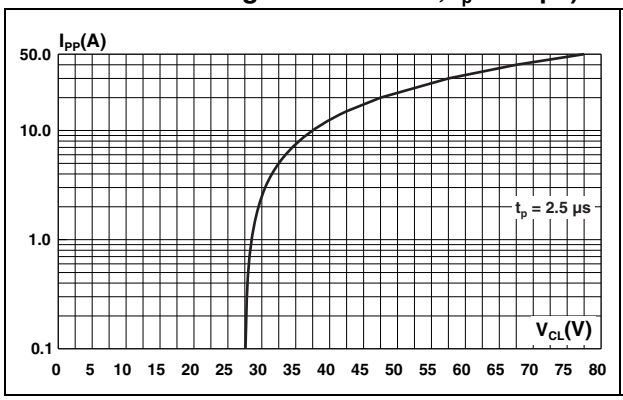


Figure 6. Capacitance versus reverse applied voltage (typical values)

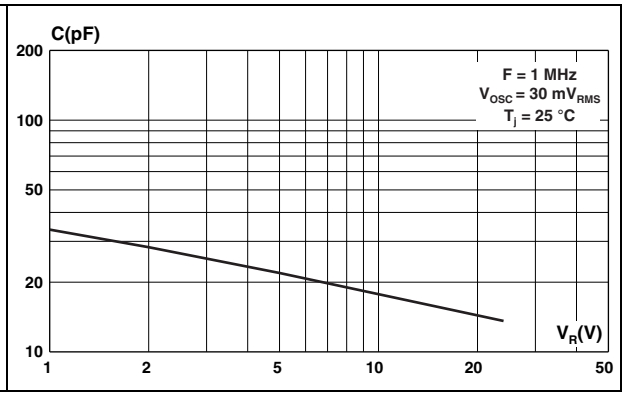


Figure 7. Relative variation of leakage current versus junction temperature (typical values)

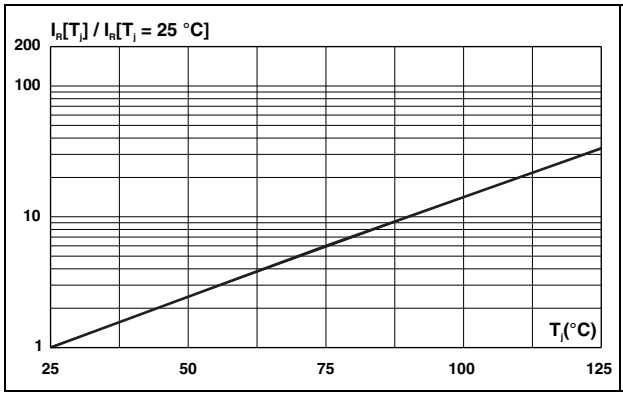
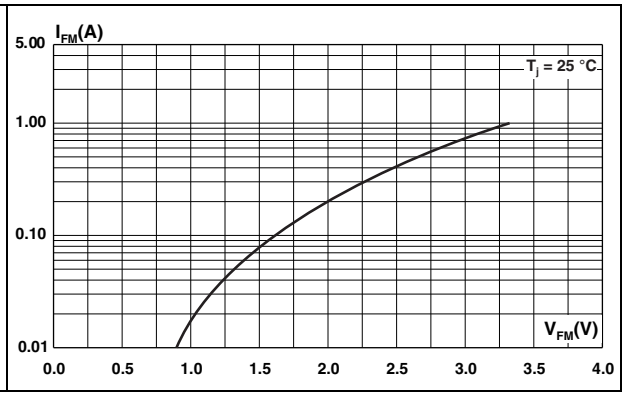


Figure 8. Peak forward voltage drop versus forward current (typical values)



2 Calculation of the clamping voltage

2.1 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:

$$V_{CL} = V_{BR} + R_d I_{PP}$$

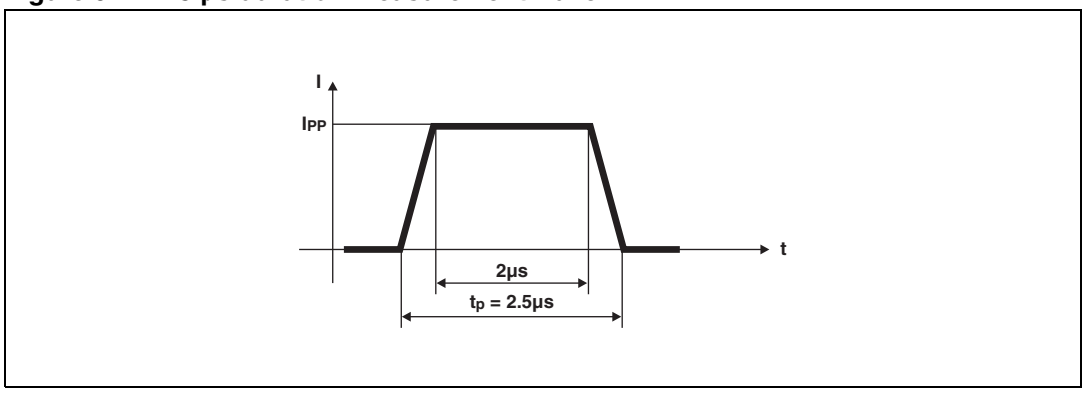
Where Ipp is the peak current through the ESDA cell.

3 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 8/20 µs and 10/1000 µs surges.

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

Figure 9. 2.5 µs duration measurement wave



4 ESD Protection by ESDA25LY

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.

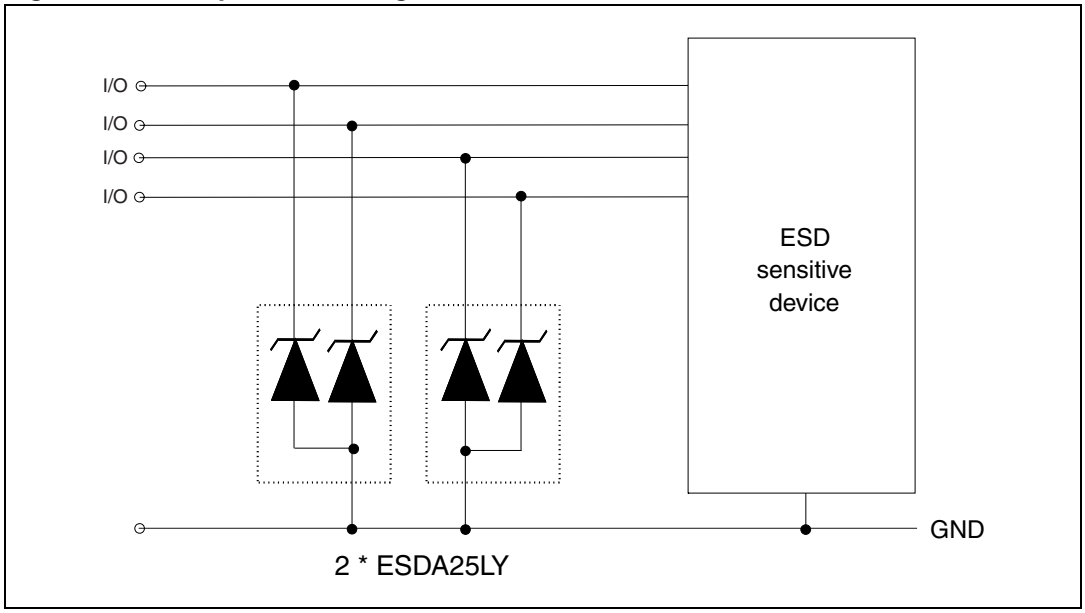
Surface mount TVS arrays offer the best choice for minimal lead inductance.

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 ESDA25LY 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.

Figure 10. ESD protection diagram



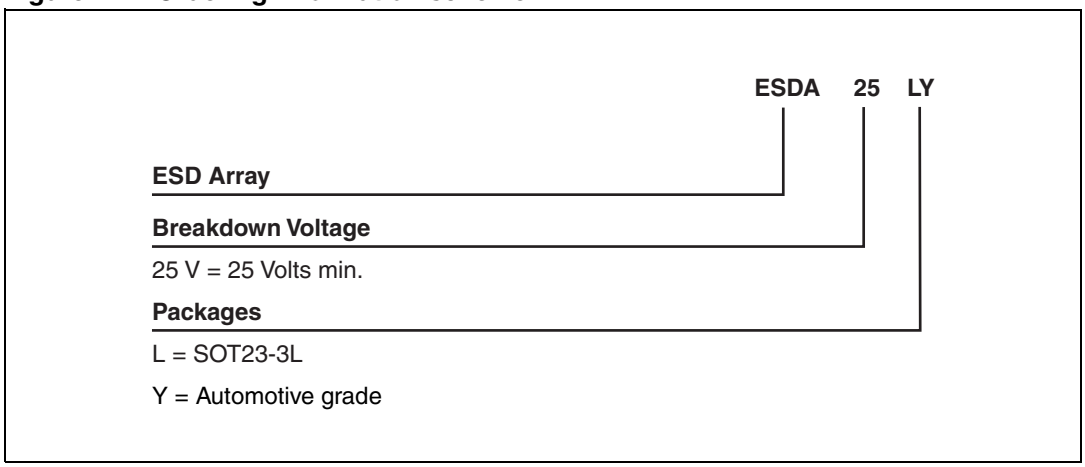
5 Circuit board layout

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

- The ESDA25LY 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.

6 Ordering information scheme

Figure 11. Ordering information scheme

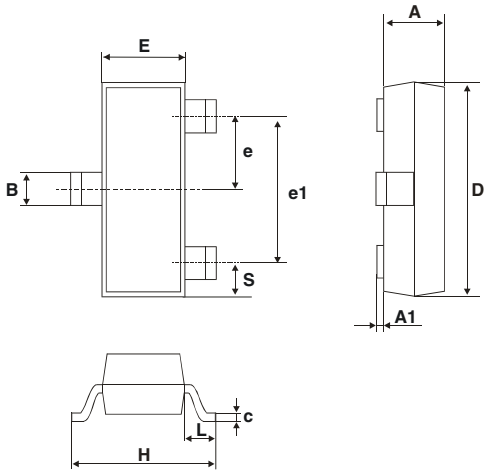


7 Package information

- Epoxy meets UL94, V0
- Lead-free packages

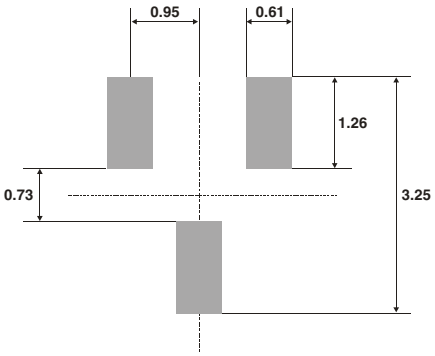
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 3. SOT23-3L dimensions



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

Figure 12. Footprint (dimensions in mm)



8 Ordering information

Table 4. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ESDA25LY	EL2Y	SO23-3L	0.01 g	3000	Tape and reel

9 Revision history

Table 5. Document revision history

Date	Revision	Changes
01-Feb-2010	1	First issue.

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