

# STS23 2XXXBXXX

## TVS Diode array ESD suppressor



### Product features

- 350 Watts peak pulse power per line ( $t_p = 8/20 \mu s$ )
- Protects two I/O lines with uni-directional
- Low clamping voltage
- Low leakage current
- Meets moisture sensitivity level (MSL) 3
- Molding compound flammability rating: UL 94V-0
- Termination finish: Tin

### Applications

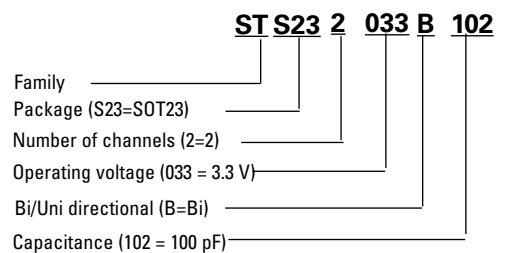
- RS-232, RS-422 & RS-485
- Servers, notebook, and desktop
- Cellular handsets and accessories
- Control & monitoring systems
- Portable electronics
- Wireless bus protection
- Set-top box

### Environmental compliance and general specifications

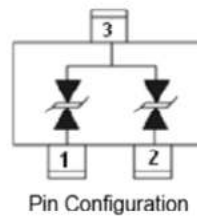
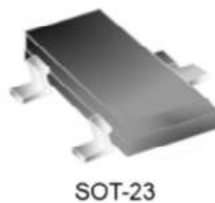
- IEC61000-4-2 (ESD)
  - Up to  $\pm 30$  kV (air)
  - Up to  $\pm 30$  kV (contact)
- IEC61000-4-5 (Lightning) Up to 20 A (8/20  $\mu s$ )



### Ordering part number



### Pin out/functional diagram



Powering Business Worldwide

### Absolute maximum ratings

(+25 °C, RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value	Unit
		STS232033B102, STS232050B751, STS232120B301, STS232150B251, STS232360B151	STS232240B151
Peak pulse power dissipation on 8/20 $\mu$ s waveform	$P_{pp}$	350	W
ESD per IEC 61000-4-2 (Air)	$V_{ESD}$	+/-15	kV
ESD per IEC 61000-4-2 (Contact)		+/-8	+/-30
Lead soldering temperature	$T_L$	+260 (10 seconds)	°C
Operating junction temperature range	$T_J$	-55 to +125	°C
Storage temperature range	$T_{STG}$	-55 to +150	°C

### Electrical characteristics

(+25 °C)

#### STS232033B102

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	3.3	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_r = 1$ mA	3.6	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 3.3$ V	-	-	1	$I_r$ ( $\mu$ A)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ $\mu$ s	-	-	8	$V_c$ (V)
		$I_{pp} = 20$ A, $t_p = 8/20$ $\mu$ s	-	-	26
Junction capacitance*	$V_{RWM} = 0$ V, $f = 1$ MHz	-	100	-	$C_J$ (pF)

#### STS232050B751

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	5.0	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_r = 1$ mA	5.5	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 5$ V	-	-	1	$I_r$ ( $\mu$ A)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ $\mu$ s	-	-	9.8	$V_c$ (V)
		$I_{pp} = 18$ A, $t_p = 8/20$ $\mu$ s	-	-	16.7
Junction capacitance*	$V_{RWM} = 0$ V, $f = 1$ MHz	-	75	-	$C_J$ (pF)

**STS232120B301**

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	12	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA	13.3	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 12$ V	-	-	1	$I_R$ ( $\mu$ A)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ $\mu$ s	-	-	19	$V_C$ (V)
	$I_{pp} = 12$ A, $t_p = 8/20$ $\mu$ s	-	-	25	$V_C$ (V)
Junction capacitance*	$V_{RWM} = 0$ V, $f = 1$ MHz	-	30	-	$C_J$ (pF)

**STS232150B251**

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	15	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA	16.7	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 15$ V	-	-	1	$I_R$ ( $\mu$ A)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ $\mu$ s	-	-	24	$V_C$ (V)
	$I_{pp} = 10$ A, $t_p = 8/20$ $\mu$ s	-	-	35	$V_C$ (V)
Junction capacitance*	$V_{RWM} = 0$ V, $f = 1$ MHz	-	25	-	$C_J$ (pF)

**STS232240B151**

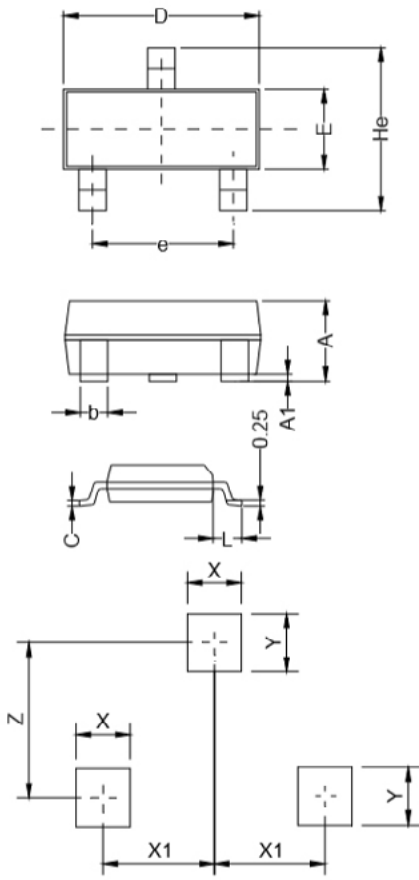
Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	24	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA	26.7	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 24$ V	-	-	1	$I_R$ ( $\mu$ A)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ $\mu$ s	-	-	43	$V_C$ (V)
	$I_{pp} = 6$ A, $t_p = 8/20$ $\mu$ s	-	-	60	$V_C$ (V)
Junction capacitance*	$V_{RWM} = 0$ V, $f = 1$ MHz	-	15	-	$C_J$ (pF)

**STS232360B151**

Parameter	Test condition	Minimum	Typical	Maximum	Symbol (Units)
Reverse working voltage	-	-	-	36	$V_{RWM}$ (V)
Reverse breakdown voltage	$I_T = 1$ mA	40	-	-	$V_{BR}$ (V)
Reverse leakage current	$V_{RWM} = 36$ V	-	-	1	$I_R$ ( $\mu$ A)
Clamping voltage	$I_{pp} = 1$ A, $t_p = 8/20$ $\mu$ s	-	-	60	$V_C$ (V)
	$I_{pp} = 6$ A, $t_p = 8/20$ $\mu$ s	-	-	90	$V_C$ (V)
Junction capacitance*	$V_{RWM} = 0$ V, $f = 1$ MHz	-	15	-	$C_J$ (pF)

\*  $C_J$  measured @  $V_{RWM}=0$  V,  $f = 1$  MHz (pin 1 to pin3, pin 2 to pin3)

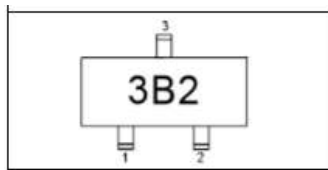
**Mechanical parameters, pad layout- mm/inches**



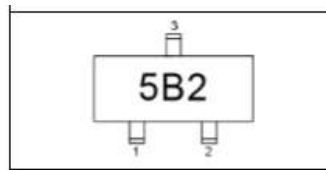
**Land Pattern**

Dimension	Millimeters		Inches	
	Minimum	Maximum	Minimum	Maximum
A	0.90	1.15	0.035	0.045
A1	0.00	0.10	0.000	0.004
b	0.25	0.325	0.010	0.013
C	0.22	0.25	0.009	0.010
D	2.80	3.00	0.110	0.118
e	1.80	1.90	0.071	0.075
E	1.20	1.40	0.047	0.055
L	0.30	0.50	0.012	0.020
He	2.25	2.55	0.089	0.100
X	0.80 Typ.		0.031 Typ.	
X1	0.95 Typ.		0.037 Typ.	
Y	0.80 Typ.		0.031 Typ.	
Z	2.02 Typ.		0.080 Typ.	

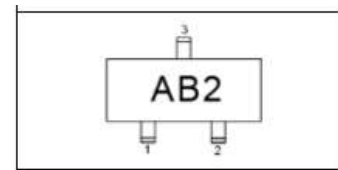
**Part marking**



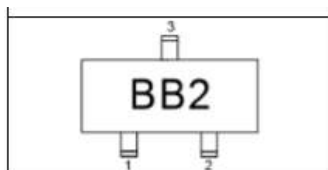
(STS232033B102)



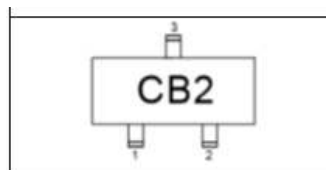
(STS232050B751)



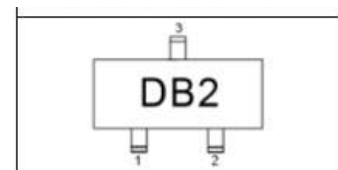
(STS232120B301)



(STS232150B251)



(STS232240B151)

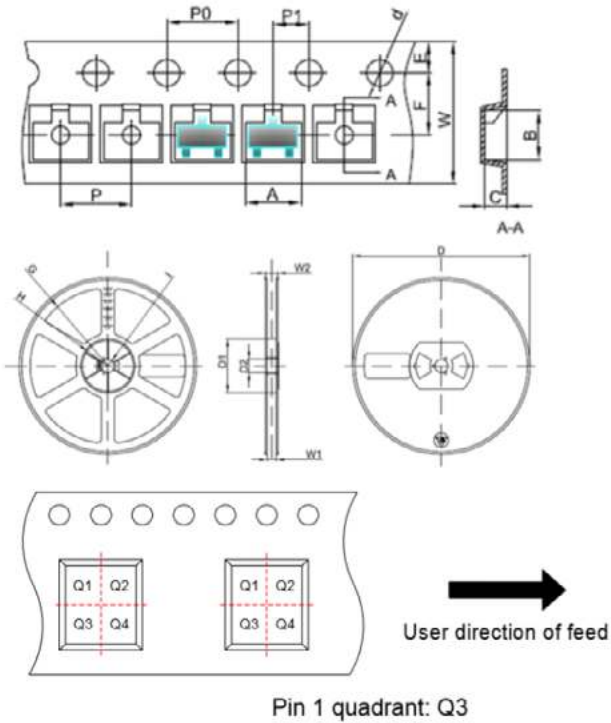


(STS232360B151)

**Packaging information mm/inches**

Drawing not to scale.

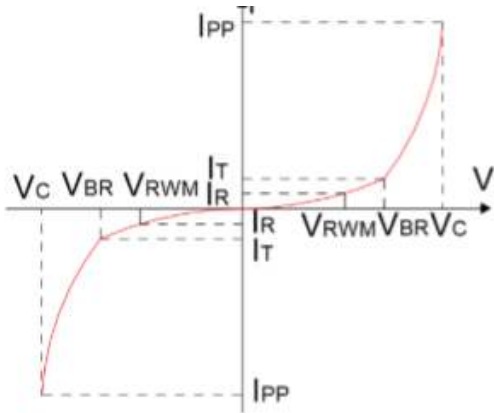
Supplied in tape and reel packaging, 3,000 parts per 7" diameter reel (EIA-481)



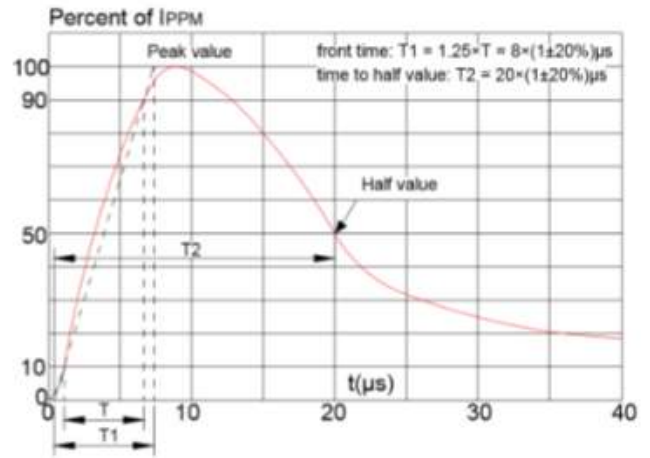
Symbol	Millimeters	Inches
	Typ.	Typ.
A	3.15	0.124
B	2.77	0.109
C	1.22	0.048
d	Φ1.50	Φ0.059
E	1.75	0.069
F	3.50	0.138
P0	4.00	0.157
P	4.00	0.157
P1	2.00	0.079
W	8.00	0.315
D	Φ178	Φ7.008
D1	54.40	2.142
D2	13.00	0.512
G	R78.00	R3.071
H	R25.60	R1.008
I	R6.50	R0.256
W1	9.50	0.374
W2	12.30	0.484

**Ratings and V-I characteristic curves** (+25 °C unless otherwise noted)

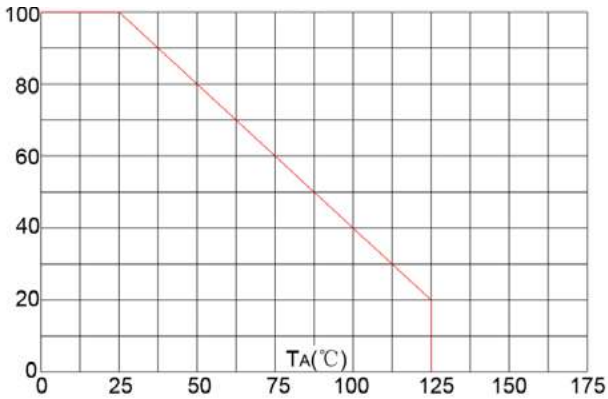
**V- I curve characteristics (Bi-directional)**



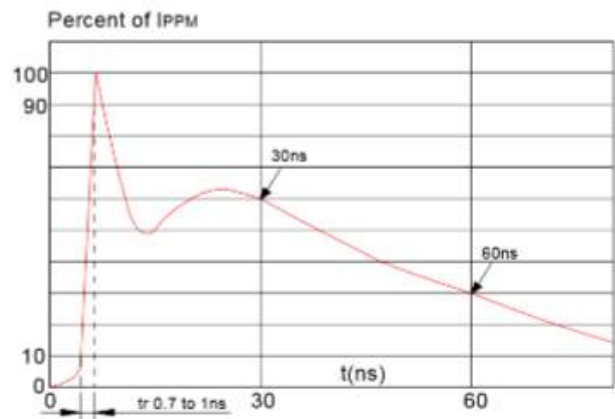
**Pulse waveform (8/20  $\mu$ s)**



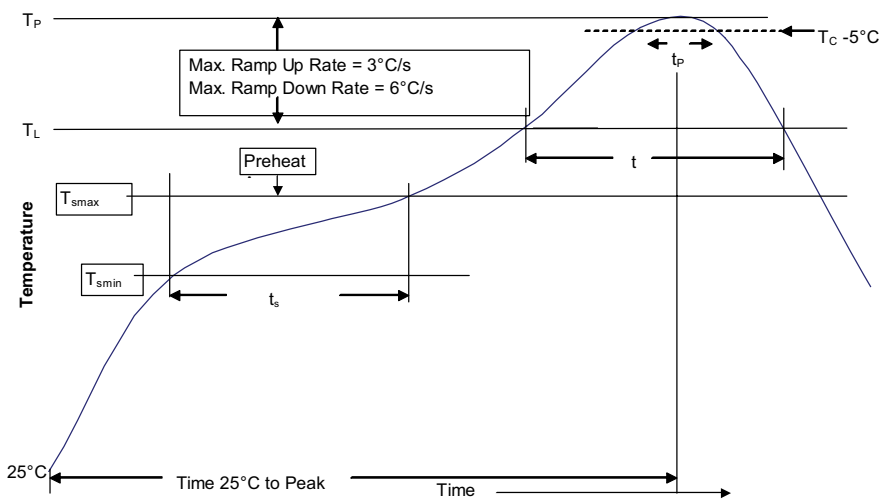
**Pulse derating curve**



**ESD waveform**



**Solder reflow profile**



**Table 1 - Standard SnPb solder (T<sub>C</sub>)**

Package thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

**Table 2 - Lead (Pb) free solder (T<sub>C</sub>)**

Package thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350 - 2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

**Reference J-STD-020**

Profile feature	Standard SnPb solder	Lead (Pb) free solder
Preheat and soak		
• Temperature min. (T <sub>smin</sub> )	100 °C	150 °C
• Temperature max. (T <sub>smax</sub> )	150 °C	200 °C
• Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )	60-120 seconds	60-120 seconds
Ramp up rate T <sub>L</sub> to T <sub>p</sub>	3 °C/ second max.	3 °C/ second max.
Liquidous temperature (T <sub>L</sub> )	183 °C	217 °C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	60-150 seconds	60-150 seconds
Peak package body temperature (T <sub>p</sub> )*	Table 1	Table 2
Time (t <sub>p</sub> )* within 5 °C of the specified classification temperature (T <sub>C</sub> )	20 seconds*	30 seconds*
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6 °C/ second max.	6 °C/ second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

\* Tolerance for peak profile temperature (T<sub>p</sub>) is defined as a supplier minimum and a user maximum.

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