Schematic Symbol

Description

SPxxxxSB series is a type of semiconductor protection thyristor with surface mount package solution.It is designed to protect baseband equipment from damaging overvoltage transients, such as modems, telephones, line cards, answering machines, FAX machines, T1/E1, xDSL and more.

Features

- Lower capacitance
- Low profile package
- Low on-state voltage
- Max Surge capability 10×700 μS @40 Ω: 4 kV
- Excellent capability of absorbing transient surge
- Quick response to surge voltage (ns Level)
- Eliminates overvoltage caused by fast rising transients
- Moisture sensitivity level: Level 1
- Non degenerative
- Flammability Rating: UL 94 V-0
- Halogen free and RoHS compliant

Order Information (Example)

Type	Package	Marking Code	Delivery Form	Delivery Quantity
SP2300SB	DO214AA(SMB)	P23B	13” T&R	3000 PCS

Limiting Values

(T_A = 25 °C, unless otherwise specified)

Symbol	Parameter	Conditions	Min	Max	Unit
I_{PP}	Repetitive peak pulse current	10 / 1000 μs	80	-	A
T_J	Operating Temperature Range	-	-40	125	℃
T_{stg}	Storage Temperature Range	-	-55	150	℃

Surge Rating	I_{PP} (A) min				
	2 / 10 μs[1]	8 / 20 μs[1]	10 / 360 μs[1]	10 / 700 μs[2]	10 / 1000 μs[1]
B	250	250	125	100	80

Notes

1. Current waveform in μs[1] .
2. Voltage waveform in μs[2] .

Electrical Characteristics

(T_A = 25 °C, unless otherwise specified)

Part Number	IDRM@VDRM		V_S [1]@I_S		V_T@ I_T		I_H	Capacitance [2]	Marking Code
	μA	V	V	mA	V	A	mA	pF	
	max		max	max	max	max	min	max	
SP0080SB	1	6	15	800	4	2.2	50	30	P8BC
SP0220SB	1	18	30	800	4	2.2	30	50	P22B
SP0300SB	1	25	40	800	4	2.2	30	50	P03B
SP0640SB	1	58	77	800	4	2.2	120	40	P06B
SP0720SB	1	66	87	800	4	2.2	120	40	P07B
SP0900SB	1	75	98	800	4	2.2	120	40	P09B
SP1100SB	1	90	130	800	4	2.2	120	35	P11B
SP1300SB	1	120	160	800	4	2.2	120	35	P13B
SP1500SB	1	140	180	800	4	2.2	120	35	P15B
SP1800SB	1	170	220	800	4	2.2	120	35	P18B
SP2300SB	1	190	260	800	4	2.2	120	30	P23B
SP2600SB	1	220	300	800	4	2.2	120	30	P26B
SP3100SB	1	275	350	800	4	2.2	120	25	P31B
SP3500SB	1	320	400	800	4	2.2	120	25	P35B
SP3800SB	1	340	450	800	4	2.2	120	25	P38B
SP4200SB	1	400	520	800	4	2.2	100	35	P42B

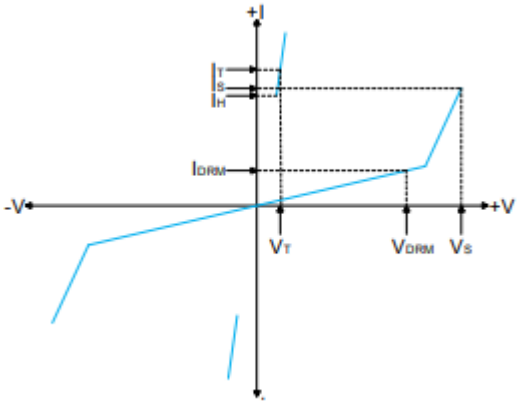
Notes

1. Vs is measured at 100 kV / S.
2. Off-state capacitance is measured in VDC=2 V, VRMS=1 V, f=1 MHz.

Electrical Characteristics

(T_A = 25 °C, unless otherwise specified)

Symbol	Parameter
VDRM	Peak off-state voltage
IDRM	Off-state current
V_S	Switching voltage
I_S	Switching current
V_T	On-state voltage
I_T	On-state current
I_H	Holding current
C_O	Off-state capacitance



Performance Curve for Reference

(T_A=25 °C unless otherwise noted)

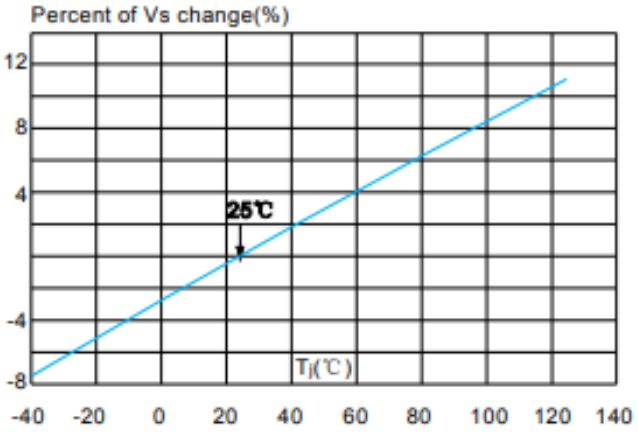


FIGURE 1
Normalized VS. Change VS. Junction Temperature

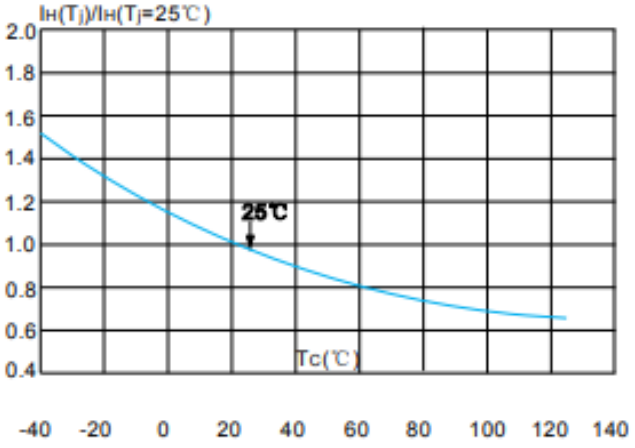


FIGURE 2
Normalized DC Holding Current VS. Case Temperature

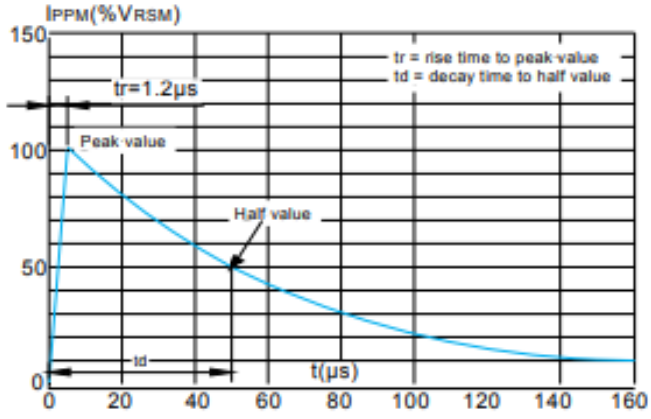
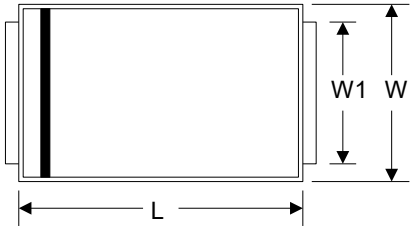
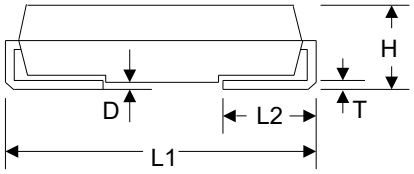
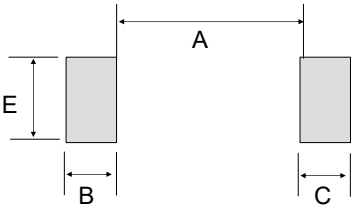


FIGURE 3
tr × td Pulse Waveform

Package Dimensions







(Mounting Pad Layout)

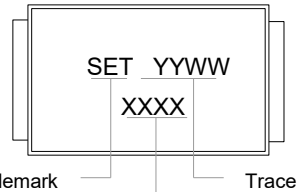
Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
L	4.060	4.750	0.160	0.187
W	3.300	3.940	0.130	0.155
W1	1.930	2.200	0.076	0.086
H	1.990	2.610	0.078	0.103
T	0.152	0.305	0.006	0.012
L1	5.210	5.590	0.205	0.220
L2	0.760	1.520	0.030	0.060
D	-	0.203	-	0.008
A	-	2.740	-	0.107
B	2.160	-	0.085	-
C	2.160	-	0.085	-
E	2.260	-	0.089	-

Part Numbering System (Example)

SP 230 0 S B

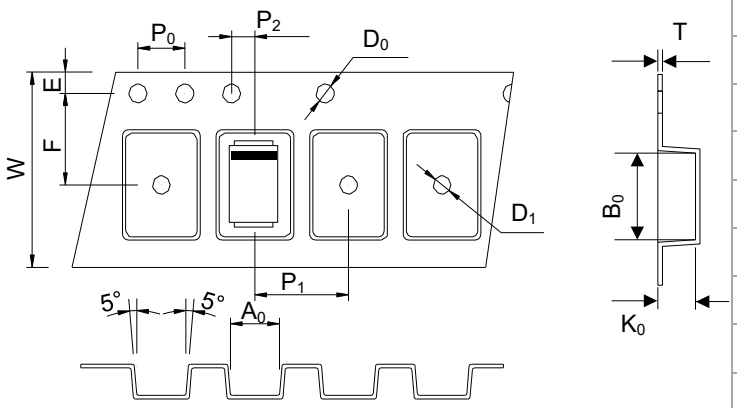
SP: Protection Thyristor
230: Median Voltage
0: Bi-directional
Package Type
B: Surge Rating 4 kV
(10 / 700 μs)

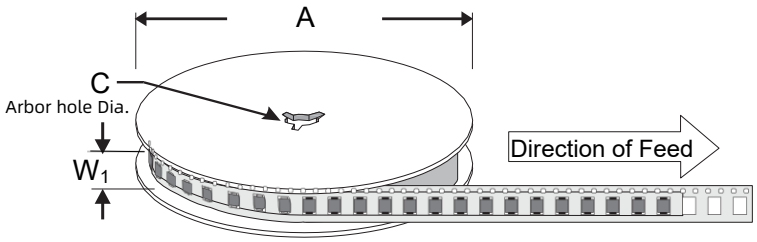
Marking



Trademark
Marking Code
Trace Code Marking
YY-Year Code: 19 denote 2019
WW-Week Code: 38 denote the 38th week of 2019

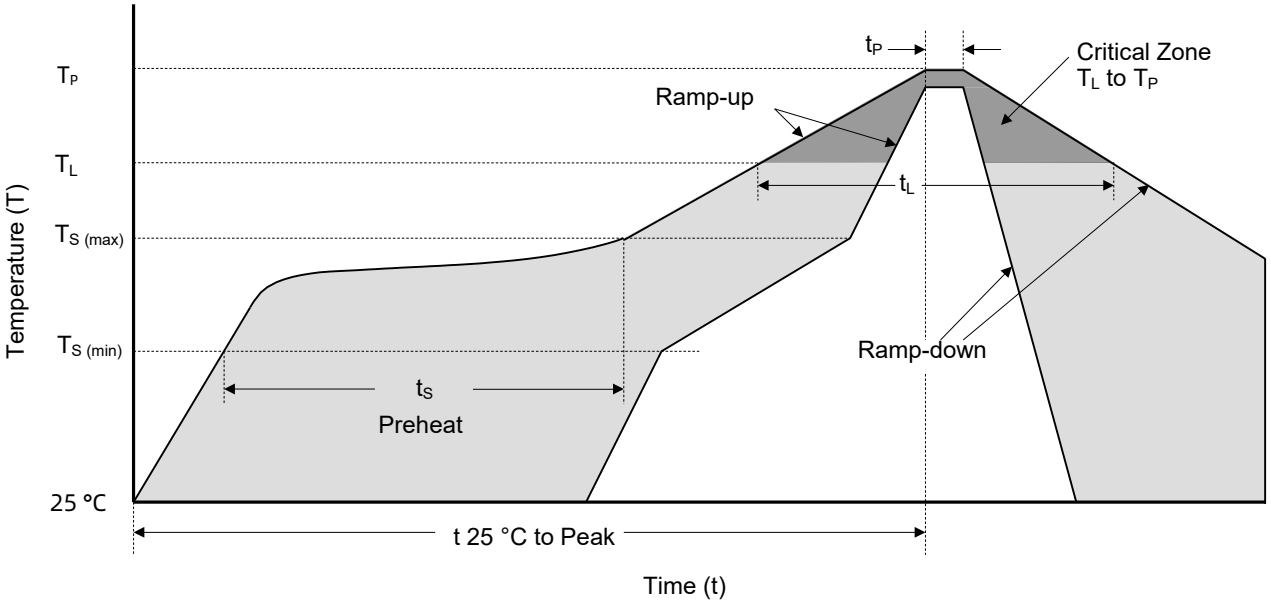
Packaging Information

Tape	Symbol	Dimension (mm)
	W	12.00+0.30/-0.10
	P_0	4.00±0.10
	P_1	8.00±0.10
	P_2	2.00±0.05
	D_0	1.55±0.05
	D_1	1.55±0.05
	E	1.75±0.1
	F	5.50±0.05
	A_0	3.78±0.10
	B_0	5.65±0.15
	K_0	2.70±0.10
	T	0.30±0.05

Reel Size	Symbol	Dimension (mm)
	A	330 mm
	C	13.2 mm
	W_1	12.5 mm

Part Number	Package	QTY's (Reel)	Packaging Option	Packaging Specification
SP2300SB	DO-214AA	3000 PCS	Tape & Reel – 12 mm tape / 13” reel	EIA STD RS-481

Soldering Parameters



Reflowing Condition

Reflow Soldering Parameters		Lead-Free Assembly
Pre-heat	Temperature Min ($T_{S\ (min)}$)	150 °C
	Temperature Max ($T_{S\ (max)}$)	200 °C
	Time (min to max) (t_s)	60 ~ 120 seconds
Average Ramp Up Rate (Liquidus Temp (T_L) to Peak Temp (T_P))		3 °C / second max.
T_S (max) to T_L-Ramp-up Rate		3 °C / second max.
Reflow	Temperature (T_L)	217 °C
	Time (t_L)	60 ~ 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time of within 5 °C of Actual Peak Temperature (t_P)		30 seconds
Ramp-down Rate		6 °C / second max.
Time From 25 °C to Peak Temperature		8 Minutes max.
Do Not Exceed		260 °C

ATTENTION

Usage

1. TSS must be operated in the specified ambient temp..
2. Do not clean the TSS with strong polar solvent such as ketone, esters, benzene and halogenated hydrocarbon, to avoid damaging the encapsulating layer.
3. Please do not apply severe vibration, shock or pressure to TSS, to avoid element cracking.

Replacement

1. If TSS is visually damaged, please replace it.
2. TSS is a non-repairable product. For safety sake, please use equivalent TSS for replacement.

Storage

1. Storage Temp. Range: (-55 to 150) °C.
2. Do not store the TSS at the high temp., high humidity or corrosive gas environment, to avoid influencing the solder- ability of the lead wires. The product shall be used up within 1 year after receiving the goods.

Environmental Conditions

1. TSS should not be exposed to the open air, nor direct sunshine.
2. TSS should avoid rain, water vapor or other condition of high temp. and high humidity.
3. TSS should avoid sand dust, salt mist, or other harmful gases.

Max. Typical Capacitance of TSS

1. The typical capacitance of TSS is listed in the specifications. Designers may refer to it when designing TSS in High frequency circuit.

Installation Mechanical Stress

1. Do not knock TSS when installing, to avoid mechanical damage.
2. Please do not apply severe vibration, shock or pressure to TSS, to avoid surface resin or element cracking.