TVS Diodes

Transient Voltage Suppression Diodes

SACB Series



Description

SACB series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Applications

- Communication Equipment
- Security & Protection
- Industrial Control Equipment
- Power Supply
- Automotive Electronics
- New Energy
- Surge Protection

Features

- 500 W peak pulse capability at 10/1000 μs waveform, repetition rate (duty cycles):0.01%
- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30 kV (Air), 30 kV (Contact)
- ESD protection of data lines in accordance with IEC 61000 -4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- V_{BR} @ T_J= V_{BR}@25 °C x (1+αT x (T_J - 25)) (αT:Temperature Coefficient, typical value is 0.1%)
- Glass passivated chip junction
- Fast response time: typically less than 1.0 PS from 0 V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- High temperature reflow soldering guaranteed: 260 °C / 40 sec
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Meet MSL level1, per J-STD-020
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

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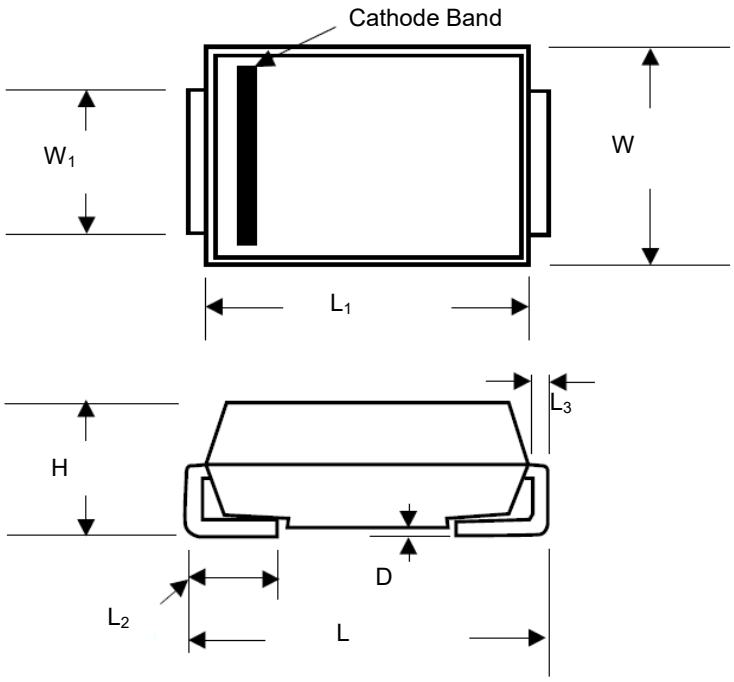
Package Outline Dimensions (DO-214AA)



DO-214AA (SMB J-Bend)

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
W_1	1.95	2.20	0.077	0.086
L_1	4.06	4.57	0.160	0.180
W	3.30	3.94	0.130	0.155
H	2.13	2.44	0.084	0.096
L_2	0.76	1.52	0.030	0.060
D	-	0.203	-	0.008
L	5.21	5.59	0.205	0.220
L_3	0.152	0.305	0.006	0.012

Maximum Ratings and Characteristics

(T_A = 25 °C unless otherwise specified.)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at T_L=25 °C by 10/1000 μs Waveform (fig.1)(Note 1)	P_{PPM}	500	W
Power Dissipation on Infinite Heat Sink at T_L=50 °C	P_D	3.0	W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150	°C

Notes
1. Non-repetitive current pulse, per Fig. 3 and derated above T_J(initial)=25 °C per Fig. 2.

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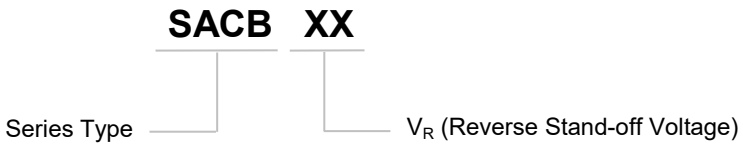
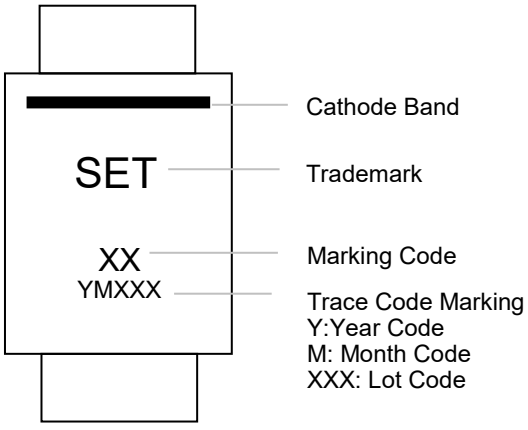
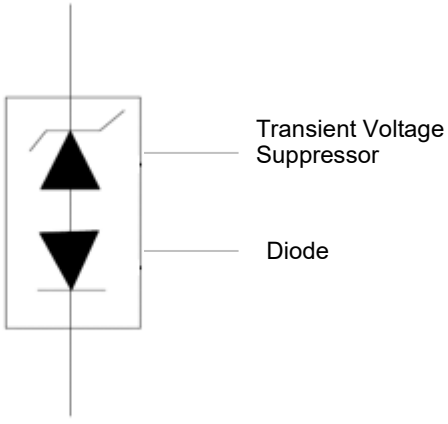
Part Numbering System



Marking



Functional Diagram



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Electrical Characteristics (T_A=25 °C unless otherwise noted)

Part Number	Device Marking Code	Min. Breakdown Voltage at I_T=1 mA V_{BR}	Reverse Stand-off Voltage V_R	Max. Reverse Leakage I_R@V_R	Max. Peak Pulse Current I_{PPM}	Max. Clamping Voltage at V_C@I_{PPM}	Max. Junction Capacitance @0 Volts	Working Inverse Blocking Voltage V_{WIB}	Inverse Blocking Leakage Current at I_{IB} @ V_{WIB}	Peak Inverse Blocking Voltage V_{PIB}
Uni	Uni	(V)	(V)	(μA)	(A)	(V	(pF)	(V)	(mA)	(V)
SACB5.0	SKE	7.60	5.00	300.00	44.00	10.00	45	75	1.0	100
SACB6.0	SKG	7.90	6.00	300.00	41.00	11.20	45	75	1.0	100
SACB7.0	SKM	8.33	7.00	300.00	38.00	12.60	45	75	1.0	100
SACB8.0	SKR	8.89	8.00	100.00	36.00	13.40	45	75	1.0	100
SACB8.5	SKT	9.44	8.50	50.00	34.00	14.00	45	75	1.0	100
SACB10	SKX	11.10	10.00	5.00	29.00	16.30	45	75	1.0	100
SACB12	SLE	13.30	12.00	5.00	25.00	19.00	45	75	1.0	100
SACB15	SLM	16.70	15.00	5.00	20.00	23.60	45	75	1.0	100
SACB18	SLT	20.00	18.00	5.00	15.00	28.80	45	75	1.0	100
SACB22	SLX	24.40	22.00	5.00	14.00	35.40	45	75	1.0	100
SACB26	SME	28.90	26.00	5.00	11.10	42.30	45	75	1.0	100
SACB30	SMK	33.30	30.00	5.00	10.00	48.60	45	75	1.0	100
SACB36	SMP	40.00	36.00	5.00	8.60	60.00	45	75	1.0	100
SACB45	SMV	50.00	45.00	5.00	6.80	77.00	45	150	1.0	200
SACB50	SMZ	55.50	50.00	5.00	5.80	88.00	45	150	1.0	200

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Performance Curve for Reference (T_A=25 °C unless otherwise noted)

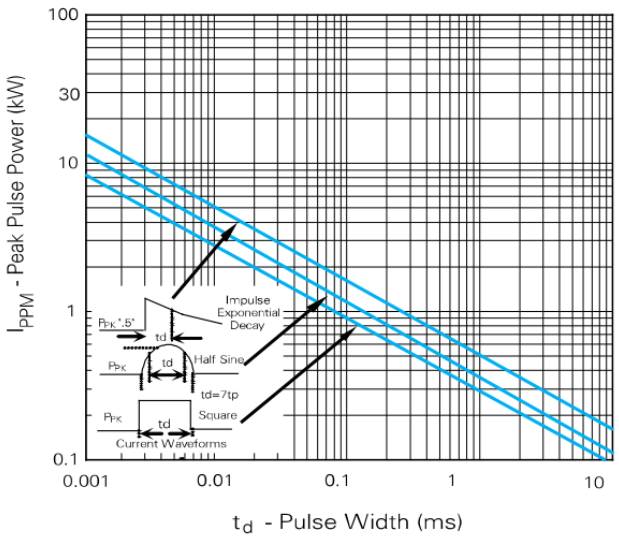


FIGURE 1 Peak Pulse Power Rating Curve

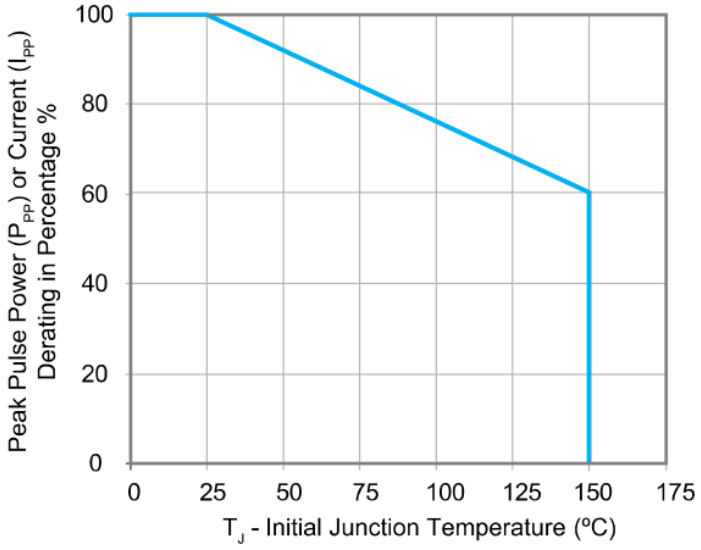


FIGURE 2 Peak Pulse Power Derating Curve

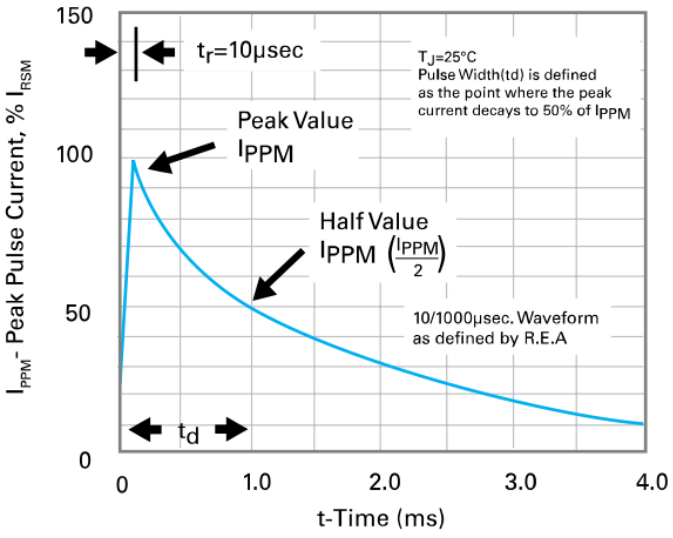
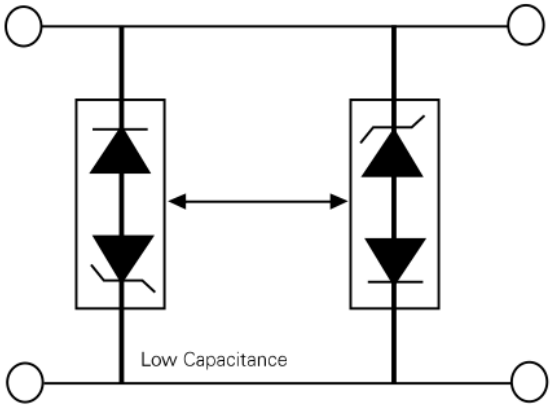


FIGURE 3 Pulse Waveform



Application Note: Device must be used with two units in parallel, opposite in polarity as shown in circuit for AC signal line protection.

FIGURE 4 AC Line Protection Application

Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22-A111

Physical Specifications

Weight	0.003 oz., 0.093 g
Case	JEDEC DO-214AA molded plastic body over glass passivated junction.
Polarity	Color band denotes cathode except Bidirectional
Terminal	Matte Tin-plated leads. Solderable per JESD22-B102.

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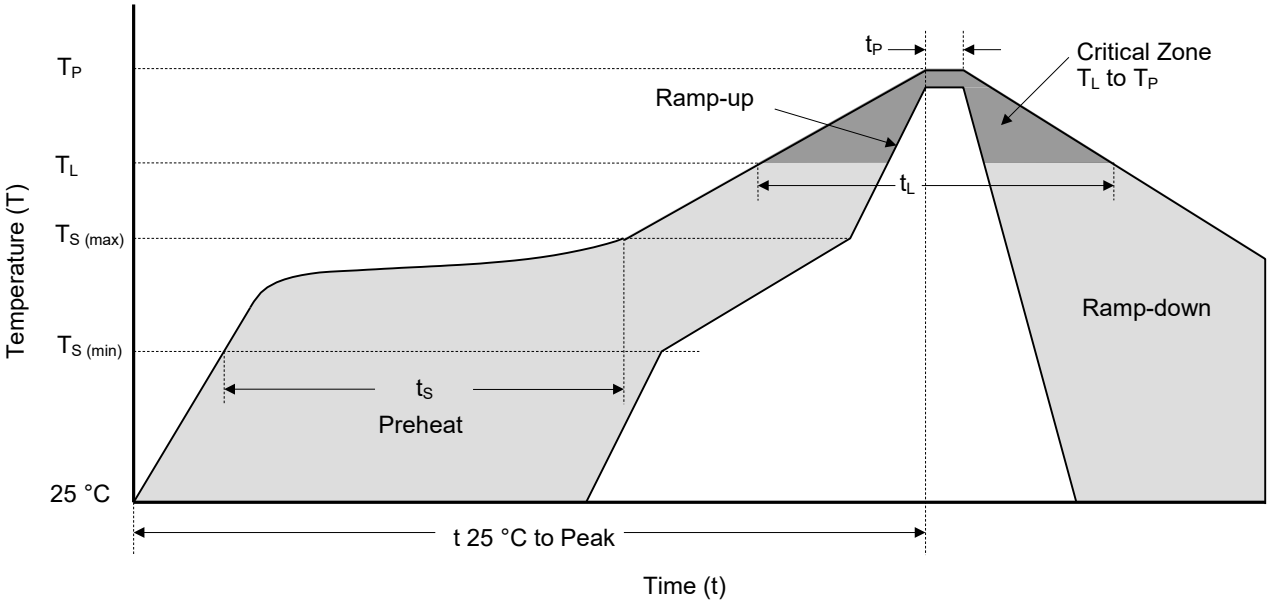
Soldering Parameters



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 (TL) to Peak		3 °C / second max.
T_S (max) to T_L Ramp-up Rate		3 °C / second max.
Reflow	Temperature (T_L) (Liquidus)	217 °C
	Time (min to max) (t_L)	60 ~ 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time of within 5 °C of Actual Peak Temperature (t_P)		20 ~ 40 seconds
Ramp-down Rate		6 °C / second max.
Time from 25 °C to Peak Temperature		8 Minutes max.
Do Not Exceed		260 °C

Flow/Wave Soldering (Solder Dipping)

Peak Temperature	260 °C+0 /- 5 °C
Dipping Time	10 seconds
Soldering Number	1 time

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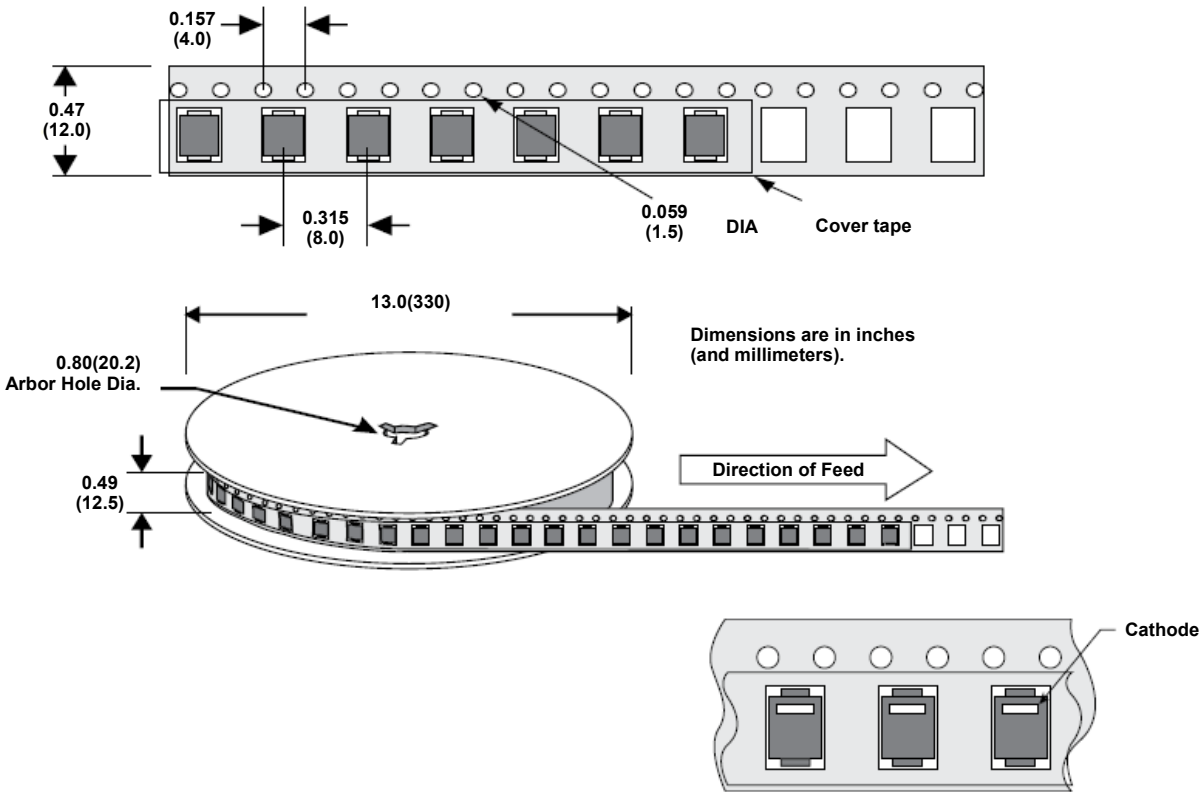
Packaging Information



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

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Glossary

Item	Description
V_C	**Clamping Voltage** Voltage across TVS in a region of low differential resistance that serves to limit the voltage across the device terminals.
V_R	**Reverse Stand-off Voltage** Maximum voltage that can be applied to the TVS without operation. NOTE : It is also shown as V_{WM} (maximum working voltage (maximum d.c. voltage)) and known as rated stand-off voltage (V_{so}).
I_R	**Reverse Leakage Current** Current measured at V_R. NOTE : Also shown as I_D for stand-by current.
V_{BR}	**Breakdown Voltage** Voltage across TVS at a specified current I_T in the breakdown region.
I_{PPM}	**Rated Random Recurring Peak Impulse Current** Maximum-rated value of random recurring peak impulse current that may be applied to a device.
$P_{M(AV)}$	**Rated Average Power Dissipation** Maximum-rated value of power dissipation resulting from all sources, including transients and standby current, averaged over a short period of time.
P_{PPM}	**Rated Random Recurring Peak Impulse Power Dissipation** Maximum-rated value of the product of rated random recurring peak impulse current (I_{PPM}) multiplies by specified maximum clamping voltage (V_C).
C_J	**Capacitance** Capacitance across the TVS measured at a specified frequency and voltage.
V_{FS}	**Peak Forward Surge Voltage** Peak voltage across an TVS for a specified forward surge current (I_{FS}) and time duration. NOTE : Also shown as V_F.
I_{FS}	**Forward Surge Current** Pulsed current through TVS in the forward conducting region. NOTE : Also shown as I_F.
$\alpha_{V(BR)}$	**Temperature Coefficient of Breakdown Voltage** The change of breakdown voltage divided by the change of temperature.
I_{PP}	**Peak pulse Current** Peak pulse current value applied across the TVS to determine the clamping voltage V_C for a specified wave shape.
I_T	**Pulsed D.C. Test Current** Test current for measurement of the breakdown voltage V_{BR}. This is defined by the manufacturer and usually given in milliamperes with a pulse duration of less than 40 ms. NOTE : Also shown as I_{BR}.

—(GB-T 18802.321 / IEC 61643-321 / JESD210A)

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ATTENTION

Usage

1. TVS must be operated in the specified ambient temp.
2. Do not clean the TVS 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 TVS, to avoid element cracking.

Replacement

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

Storage

1. Storage Temp. Range: (-55 to 150) °C.
2. Do not store the TVS 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. TVS should not be exposed to the open air, nor direct sunshine.
2. TVS should avoid rain, water vapor or other condition of high temp. and high humidity.
3. TVS should avoid sand dust, salt mist, or other harmful gases.

Max. Typical Capacitance of TVS

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

Installation Mechanical Stress

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

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