

Description

Transient Voltage Suppressor (TVS) is a circuit protection component that either attenuates (reduces) or filters a transient voltage spike (overvoltage), TVS diodes provide critical protection by going into avalanche breakdown within no more than a few nanoseconds after a strike, clamping the transient voltage, and routing its current to the ground.

Features

- Low incremental surge resistance
- Excellent clamping capability
- Low profile package with built-in strain relief
- Typical I_R less than 1.0 μA above 12 V
- 600 W peak pulse power capability with a 10/1000 μs Waveform, repetition rate (duty cycle): 0.01%
- For surface mounted applications to optimize board space
- Typical failure mode is short from over-specified voltage or current
- IEC 61000-4-2 ESD 30 kV (Air), 30 kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Very fast response time

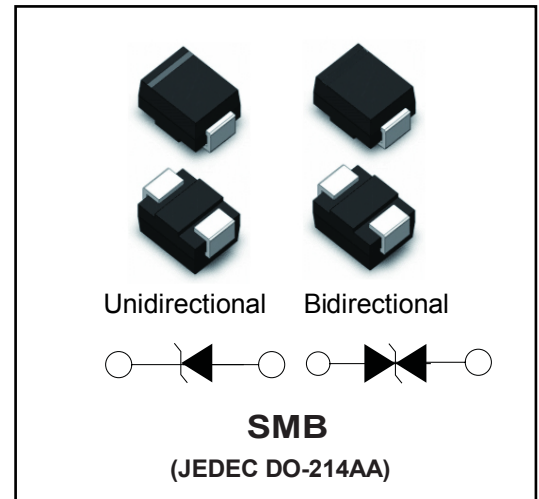
Maximum Ratings and Characteristics

(Ratings at 25°C ambient temperature unless otherwise specified.)

Parameter	Symbol	Value	Unit
Peak Power Dissipation (Fig2) with a 10/1000 μs waveform ⁽¹⁾⁽²⁾ (Fig4)-Single Die Parts	P_{PPM}	600	W
Peak Power Dissipation on Infinite Heat Sink at $T_L=50^\circ C$	P_D	5.0	W
Peak Forward Surge Current, 8.3ms single half sinewave superimposed on rated load (JEDEC Method) ⁽³⁾	I_{FSM}	100	A
Maximum Instantaneous Forward Voltage at 50 A for Unidirectional Only ⁽⁴⁾	V_F	3.5/5.0	V
Operating Temperature Range	T_J	-65 to 150	°C
Storage Temperature Range	T_{STG}	-65 to 175	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	20	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	100	°C/W

Notes

1. Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial)=25°C per Fig. 3
2. Mounted on 5.0mm² land areas
3. Measured of 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum
4. $V_F < 3.5V$ for single die parts and $V_F < 5.0V$ for stacked-die parts
5. For stacked die component details, please refer to part numbers labeled by * in Electrical Characteristics



Applications

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

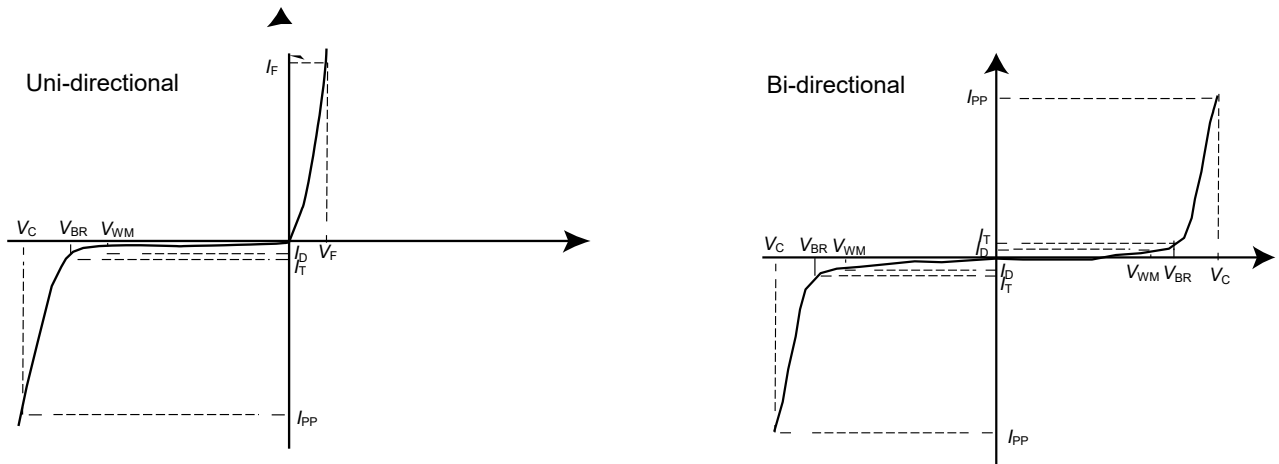
Electrical characteristics, parameter values ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Part Number		Device Marking Code		Reverse Stand-off Voltage	Breakdown Voltage Min.@Ir	Breakdown Voltage Max.@Ir	Test Current	Maximum Clamping Voltage @I _{PP}	Peak Pulse Current	Reverse Leakage @V _{RW M}
UNI	BI	UNI	BI	V _{RW M} (V)	V _{BR} (V)	V _{BR} (V)	I _r (mA)	V _c (V)	I _{PP} (A)	I _r (μ A)
SMB06J05V	SMB06J05B	KE	AE	5.0	6.40	7.00	10	9.2	65.3	800
SMB06J06V	SMB06J06B	KG	AG	6.0	6.67	7.37	10	10.3	58.3	800
SMB06J6V5V	SMB06J6V5B	KK	AK	6.5	7.22	7.98	10	11.2	53.6	500
SMB06J07V	SMB06J07B	KM	AM	7.0	7.78	8.60	10	12.0	50.0	200
SMB06J7V5V	SMB06J7V5B	KP	AP	7.5	8.33	9.21	1	12.9	46.6	100
SMB06J08V	SMB06J08B	KR	AR	8.0	8.89	9.83	1	13.6	44.2	50
SMB06J8V5V	SMB06J8V5B	KT	AT	8.5	9.44	10.40	1	14.4	41.7	20
SMB06J09V	SMB06J09B	KV	AV	9.0	10.00	11.10	1	15.4	39.0	10
SMB06J10V	SMB06J10B	KX	AX	10.0	11.10	12.30	1	17.0	35.3	5
SMB06J11V	SMB06J11B	KZ	AZ	11.0	12.20	13.50	1	18.2	33.0	1
SMB06J12V	SMB06J12B	LE	BE	12.0	13.30	14.70	1	19.9	30.2	1
SMB06J13V	SMB06J13B	LG	BG	13.0	14.40	15.90	1	21.5	28.0	1
SMB06J14V	SMB06J14B	LK	BK	14.0	15.60	17.20	1	23.2	25.9	1
SMB06J15V	SMB06J15B	LM	BM	15.0	16.70	18.50	1	24.4	24.6	1
SMB06J16V	SMB06J16B	LP	BP	16.0	17.80	19.70	1	26.0	23.1	1
SMB06J17V	SMB06J17B	LR	BR	17.0	18.90	20.90	1	27.6	21.8	1
SMB06J18V	SMB06J18B	LT	BT	18.0	20.00	22.10	1	29.2	20.6	1
SMB06J20V	SMB06J20B	LV	BV	20.0	22.20	24.50	1	32.4	18.6	1
SMB06J22V	SMB06J22B	LX	BX	22.0	24.40	26.90	1	35.5	16.9	1
SMB06J24V	SMB06J24B	LZ	BZ	24.0	26.70	29.50	1	38.9	15.5	1
SMB06J26V	SMB06J26B	ME	CE	26.0	28.90	31.90	1	42.1	14.3	1
SMB06J28V	SMB06J28B	MG	CG	28.0	31.10	34.40	1	45.4	13.3	1
SMB06J30V	SMB06J30B	MK	CK	30.0	33.30	36.80	1	48.4	12.4	1
SMB06J33V	SMB06J33B	MM	CM	33.0	36.70	40.60	1	53.3	11.3	1
SMB06J36V	SMB06J36B	MP	CP	36.0	40.00	44.20	1	58.1	10.4	1
SMB06J40V	SMB06J40B	MR	CR	40.0	44.40	49.10	1	64.5	9.3	1
SMB06J43V	SMB06J43B	MT	C T	43.0	47.80	52.80	1	69.4	8.7	1
SMB06J45V	SMB06J45B	MV	CV	45.0	50.00	55.30	1	72.7	8.3	1
SMB06J48V	SMB06J48B	MX	CX	48.0	53.30	58.90	1	77.4	7.8	1
SMB06J51V	SMB06J51B	MZ	CZ	51.0	56.70	62.70	1	82.4	7.3	1
SMB06J54V	SMB06J54B	NE	DE	54.0	60.00	66.30	1	87.1	6.9	1
SMB06J58V	SMB06J58B	NG	DG	58	64.40	71.20	1	93.6	6.5	1

Part Number		Device Marking Code		Reverse Stand-off Voltage	Breakdown Voltage Min.@Ir	Breakdown Voltage Max.@Ir	Test Current	Maximum Clamping Voltage @I _{PP}	Peak Pulse Current	Reverse Leakage @V _{RWM}
UNI	BI	UNI	BI	V _{RWM} (V)	V _{BR} (V)	V _{BR} (V)	I _T (mA)	V _C (V)	I _{PP} (A)	I _R (uA)
SMB06J60V	SMB06J60B	NK	DK	60	66.70	73.70	1	96.8	6.2	1
SMB06J64V	SMB06J64B	NM	DM	64	71.10	78.60	1	103.0	5.9	1
SMB06J70V	SMB06J70B	NP	DP	70	77.80	86.00	1	113.0	5.3	1
SMB06J75V	SMB06J75B	NR	DR	75	83.30	92.10	1	121.0	5.0	1
SMB06J78V	SMB06J78B	NT	DT	78	86.70	95.80	1	126.0	4.8	1
SMB06J85V	SMB06J85B	NV	DV	85	94.40	104.00	1	137.0	4.4	1
SMB06J90V	SMB06J90B	NX	DX	90	100.00	111.00	1	146.0	4.1	1
SMB06J100V	SMB06J100B	NZ	DZ	100	111.00	123.00	1	162.0	3.7	1
SMB06J110V	SMB06J110B	PE	EE	110	122.00	135.00	1	177.0	3.4	1
SMB06J120V	SMB06J120B	PG	EG	120	133.00	147.00	1	193.0	3.1	1
SMB06J130V	SMB06J130B	PK	EK	130	144.00	159.00	1	209.0	2.9	1
SMB06J150V	SMB06J150B	PM	EM	150	167.00	185.00	1	243.0	2.5	1
SMB06J160V	SMB06J160B	PP	EP	160	178.00	197.00	1	259.0	2.3	1
SMB06J170V	SMB06J170B	PR	ER	170	189.00	209.00	1	275.0	2.2	1
SMB06J180V	SMB06J180B	PT	ET	180	201.00	222.00	1	292.0	2.1	1
SMB06J200V	SMB06J200B	PV	EV	200	224.00	247.00	1	324.0	1.9	1
SMB06J220V	SMB06J220B	PX	EX	220	246.00	272.00	1	356.0	1.7	1
SMB06J250V	SMB06J250B	PZ	EZ	250	279.00	309.00	1	405.0	1.5	1
SMB06J300V	SMB06J300B	QE	FE	300	335.00	371.00	1	486.0	1.3	1
SMB06J350V	SMB06J350B	QG	FG	350	391.00	432.00	1	567.0	1.1	1
SMB06J400V	SMB06J400B	QK	FK	400	447.00	494.00	1	648.0	0.9	1
SMB06J440V	SMB06J440B	QM	FM	440	492.00	543.00	1	713.0	0.9	1

1. Pulse test: $t_p < 50$ ms
2. To calculate maximum clamping voltage at another surge level, use the following formula:
 $V_{CLmax} = V_{CL} - R_D \times (I_{PP} - I_{PPappli})$ where $I_{PPappli}$ is the surge current in the application.
3. To calculate V_{BR} or V_{CL} versus junction temperature, use the following formulas:
 $V_{BR} @ T_J = V_{BR} @ 25^\circ C \times (1 + \alpha T \times (T_J - 25))$
 $V_{CL} @ T_J = V_{CL} @ 25^\circ C \times (1 + \alpha T \times (T_J - 25))$
4. Surge capability given for both directions for unidirectional and bidirectional types.

I-V Curve Characteristics



Performance Curve for Reference ($T_A=25^\circ\text{C}$ unless otherwise noted)

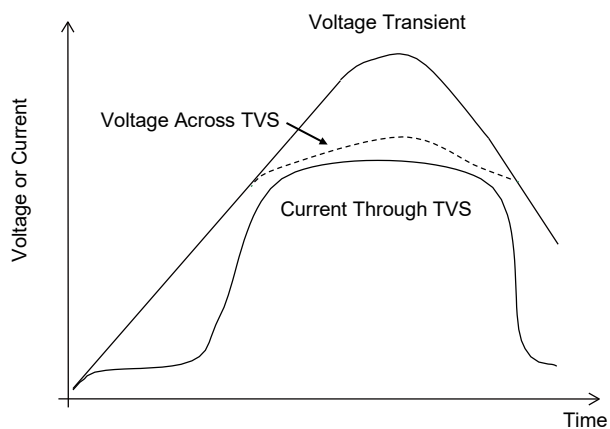


FIGURE 1 TVS Transients Clamping Waveform

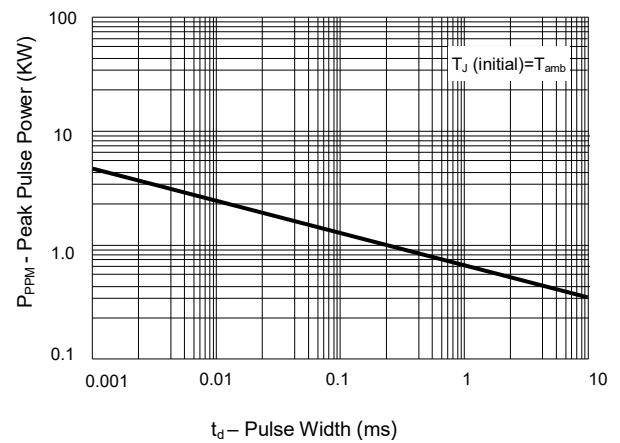


FIGURE 2 Peak Pulse Power Rating Curve

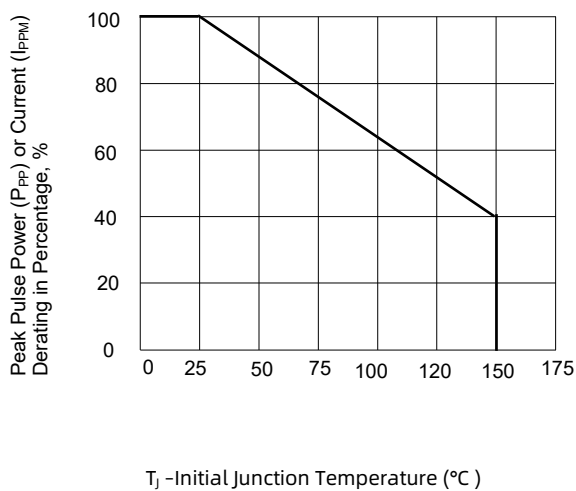


FIGURE 3 Peak Pulse Power Derating Curve

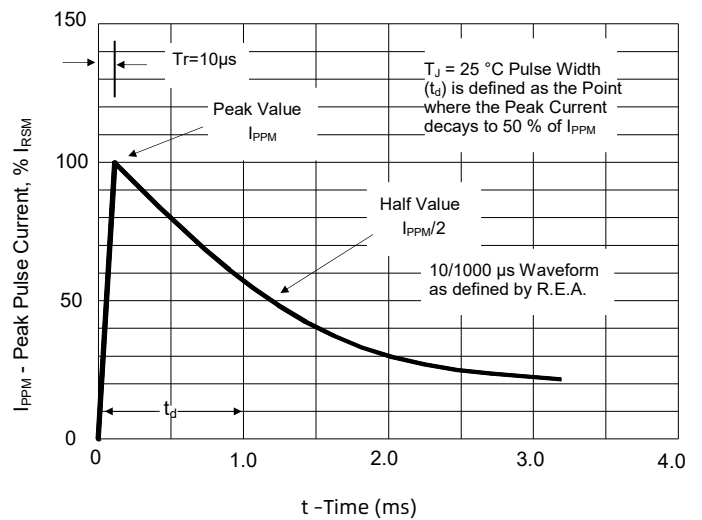


FIGURE 4 Pulse Waveform

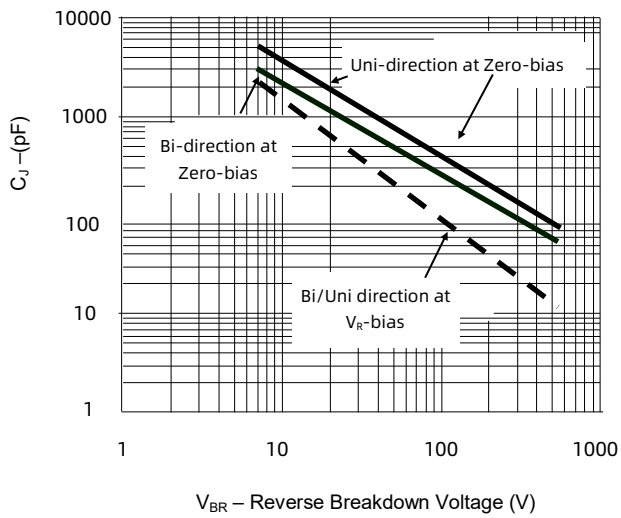


Fig.5 Typical Junction Capacitance

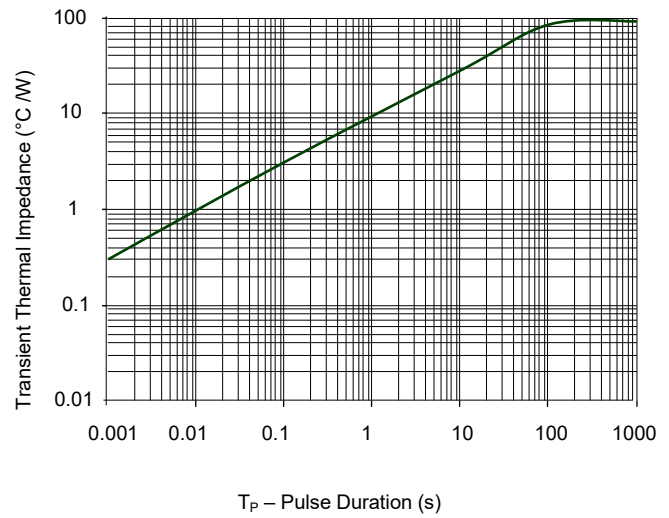


Fig.6 Typical Transient Thermal Impedance

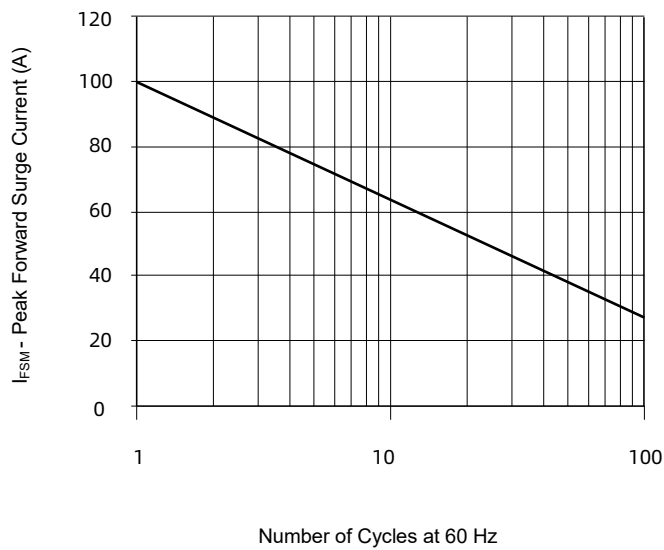


Fig.7 Maximum Non-Repetitive Forward Surge Current
Uni-Directional only

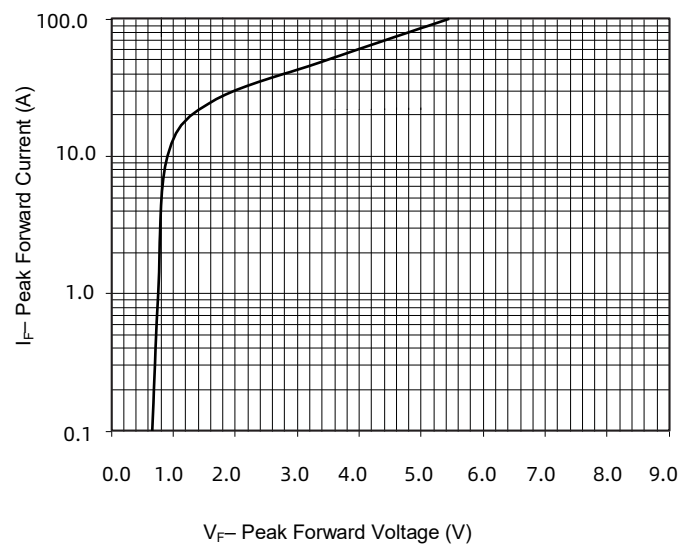
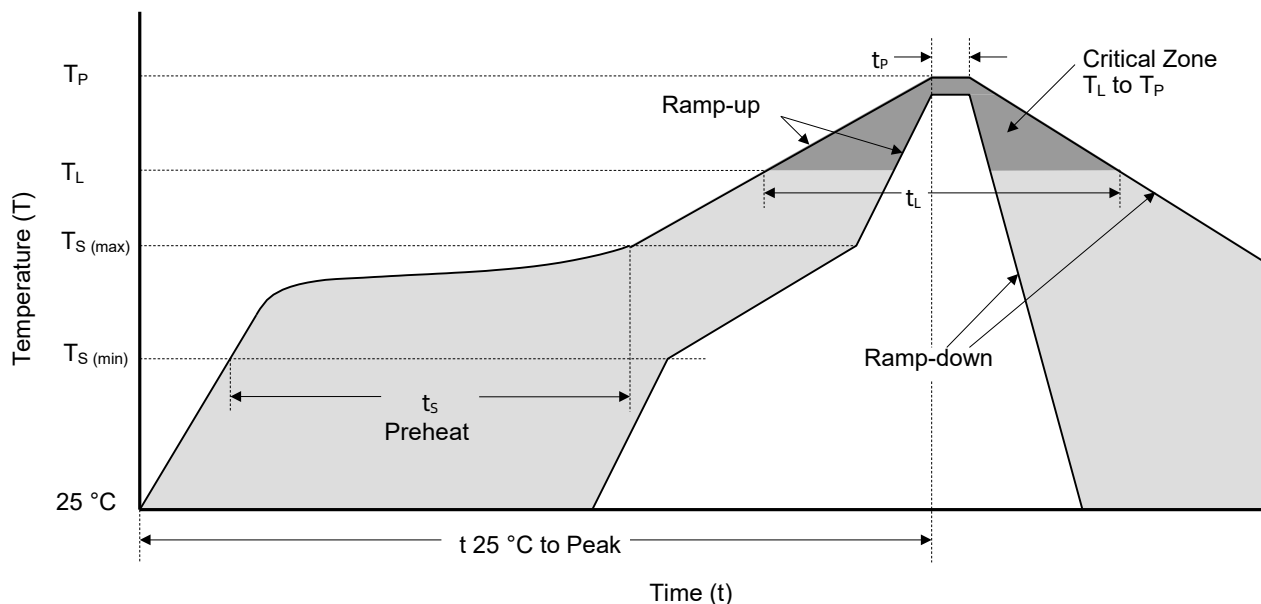


Fig.8 Peak Forward Drop vs Peak Forward Current
(Typical Values)

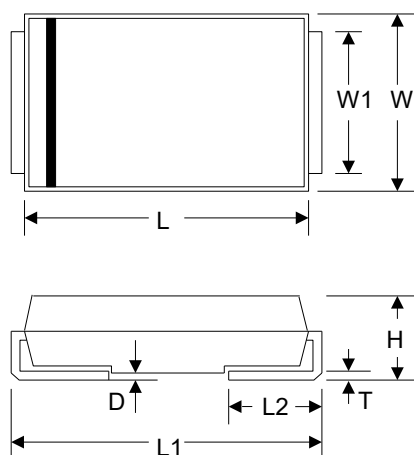
Soldering Parameters



Reflowing Condition

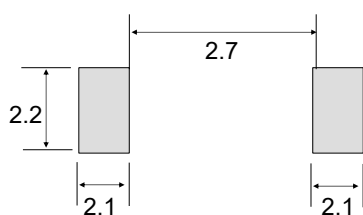
Reflow Soldering Parameters		Lead-Free Assembly
Pre-heat	Temperature Min ($T_{S(min)}$)	150 °C
	Temperature Max ($T_{S(max)}$)	200 °C
	Time (min to max) (t_s)	60 ~ 120 seconds
Average Ramp Up Rate (Liquidus Temp (T_L) to Peak		3 °C / second max.
$T_{S(max)}$ to T_L Ramp-up Rate		3 °C / second max.
Reflow	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

Package Outline Dimensions (DO-214AA)



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	5.000	5.590	0.196	0.220
L2	0.760	1.520	0.030	0.060
D	-	0.203	-	0.008

Recommended Mounting Pad Layout Unit:mm



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	13" Reel	
	A	330 mm
	C	13.2 mm
	W ₁	12.5 mm

Part Number	Package	QTY (Reel)	Packaging Option	Packaging Specification
SMB06J × × × -	SMB	3000 PCS	Tape & Reel – 12 mm tape/13" reel	EIA STD RS-481