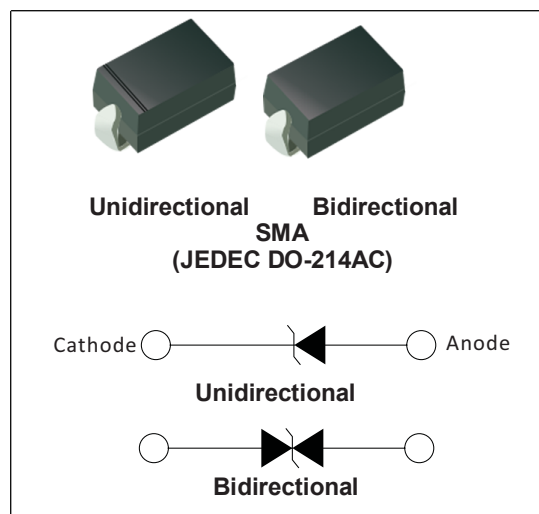


Description

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
- 400 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



Applications

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

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)-Signal Die Parts	P_{PPM}	400	W
Peak Power Dissipation on Infinite Heat Sink at $T_L=50$ °C	P_D	3.3	W
Peak Forward Surge Current, 8.3 ms single half sinewave superimposed on rated load (JEDEC Method) ⁽³⁾	I_{FSM}	60	A
Maximum Instantaneous Forward Voltage at 25 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	$R_{\theta JL}$	30	°C / W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	120	°C / W

Notes

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

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

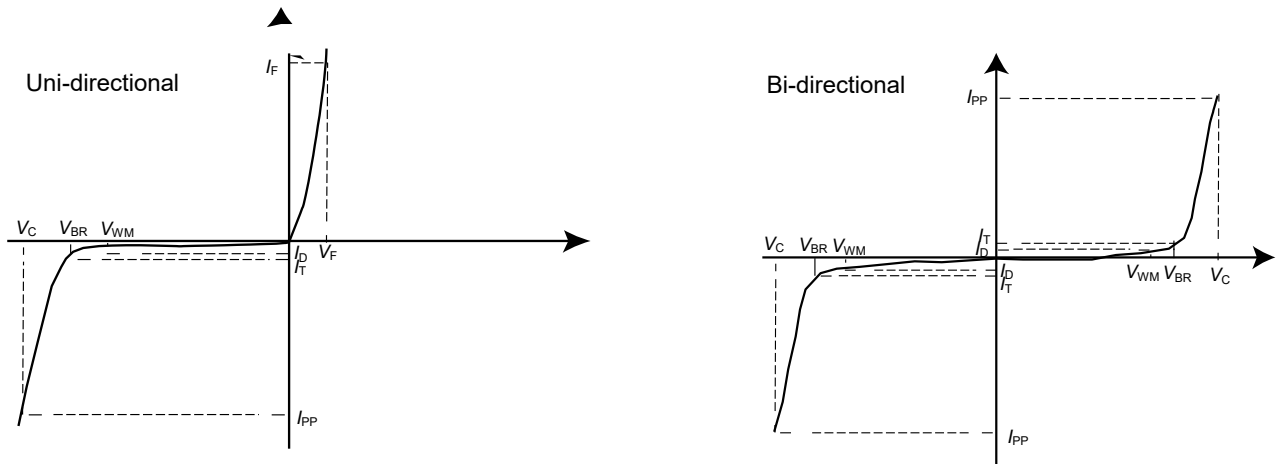
Part Number (Unidirectional)		Part Number (Bidirectional)		Reverse Stand-off Voltage	Breakdown Voltage Min.@IT	Breakdown Voltage Max.@IT	Test Current	Maximum Clamping Voltage @IPP	Peak Pulse Current	Reverse Leakage @VRWM
Mode	Marking	Mode	Marking	VRWM(V)	VBR (V)	VBR (B)	IT(mA)	VC (V)	IPP(A)	IR(uA)
SMA04J05V	A E	SMA04J05B	W E	5.0	6.40	7.00	10	9.2	43.5	800
SMA04J06V	A G	SMA04J06B	W G	6.0	6.67	7.37	10	10.3	38.8	800
SMA04J6V5V	A K	SMA04J6V5B	W K	6.5	7.22	7.98	10	11.2	35.7	500
SMA04J07V	A M	SMA04J07B	W M	7.0	7.78	8.60	10	12.0	33.3	200
SMA04J7V5V	A P	SMA04J7V5B	W P	7.5	8.33	9.21	1	12.9	31.0	100
SMA04J08V	A R	SMA04J08B	W R	8.0	8.89	9.83	1	13.6	29.4	50
SMA04J8V5V	A T	SMA04J8V5B	W T	8.5	9.44	10.40	1	14.4	27.8	20
SMA04J09V	A V	SMA04J09B	W V	9.0	10.00	11.10	1	15.4	26.0	10
SMA04J10V	A X	SMA04J10B	W X	10.0	11.10	12.30	1	17.0	23.5	5
SMA04J11V	A Z	SMA04J11B	W Z	11.0	12.20	13.50	1	18.2	22.0	1
SMA04J12V	B E	SMA04J12B	X E	12.0	13.30	14.70	1	19.9	20.1	1
SMA04J13V	B G	SMA04J13B	X G	13.0	14.40	15.90	1	21.5	18.6	1
SMA04J14V	B K	SMA04J14B	X K	14.0	15.60	17.20	1	23.2	17.2	1
SMA04J15V	B M	SMA04J15B	X M	15.0	16.70	18.50	1	24.4	16.4	1
SMA04J16V	B P	SMA04J16B	X P	16.0	17.80	19.70	1	26.0	15.4	1
SMA04J17V	B R	SMA04J17B	X R	17.0	18.90	20.90	1	27.6	14.5	1
SMA04J18V	B T	SMA04J18B	X T	18.0	20.00	22.10	1	29.2	13.7	1
SMA04J20V	B V	SMA04J20B	X V	20.0	22.20	24.50	1	32.4	12.3	1
SMA04J22V	B X	SMA04J22B	X X	22.0	24.40	26.90	1	35.5	11.3	1
SMA04J24V	B Z	SMA04J24B	X Z	24.0	26.70	29.50	1	38.9	10.3	1
SMA04J26V	C E	SMA04J26B	Y E	26.0	28.90	31.90	1	42.1	9.5	1
SMA04J28V	C G	SMA04J28B	Y G	28.0	31.10	34.40	1	45.4	8.8	1
SMA04J30V	C K	SMA04J30B	Y K	30.0	33.30	36.80	1	48.4	8.3	1
SMA04J33V	C M	SMA04J33B	Y M	33.0	36.70	40.60	1	53.3	7.5	1
SMA04J36V	C P	SMA04J36B	Y P	36.0	40.00	44.20	1	58.1	6.9	1
SMA04J40V	C R	SMA04J40B	Y R	40.0	44.40	49.10	1	64.5	6.2	1
SMA04J43V	C T	SMA04J43B	Y T	43.0	47.80	52.80	1	69.4	5.8	1
SMA04J45V	C V	SMA04J45B	Y V	45.0	50.00	55.30	1	72.7	5.5	1
SMA04J48V	C X	SMA04J48B	Y X	48.0	53.30	58.90	1	77.4	5.2	1
SMA04J51V	C Z	SMA04J51B	Y Z	51.0	56.70	62.70	1	82.4	4.9	1
SMA04J54V	R E	SMA04J54B	Z E	54.0	60.00	66.30	1	87.1	4.6	1

Part Number (Unidirectional)		Part Number (Bidirectional)		Reverse Stand-off Voltage	Breakdown Voltage Min.@IT	Breakdown Voltage Max.@IT	Test Current	Maximum Clamping Voltage @IPP	Peak Pulse Current	Reverse Leakage @VRWM
Mode	Marking	Mode	Marking	VRWM(V)	VBR (V)	VBR (B)	IT(mA)	VC(V)	IPP(A)	IR(uA)
SMA04J58V	R G	SMA04J58B	Z G	58	64.40	71.20	1	93.6	4.3	1
SMA04J60V	R K	SMA04J60B	Z K	60	66.70	73.70	1	96.8	4.1	1
SMA04J64V	R M	SMA04J64B	Z M	64	71.10	78.60	1	103.0	3.9	1
SMA04J70V	R P	SMA04J70B	Z P	70	77.80	86.00	1	113.0	3.5	1
SMA04J75V	R R	SMA04J75B	Z R	75	83.30	92.10	1	121.0	3.3	1
SMA04J78V	R T	SMA04J78B	Z T	78	86.70	95.80	1	126.0	3.2	1
SMA04J85V	R V	SMA04J85B	Z V	85	94.40	104.00	1	137.0	2.9	1
SMA04J90V	R X	SMA04J90B	Z X	90	100.00	111.00	1	146.0	2.7	1
SMA04J100V	R Z	SMA04J100B	Z Z	100	111.00	123.00	1	162.0	2.5	1
SMA04J110V	S E	SMA04J110B	V E	110	122.00	135.00	1	177.0	2.3	1
SMA04J120V	S G	SMA04J120B	V G	120	133.00	147.00	1	193.0	2.1	1
SMA04J130V	S K	SMA04J130B	V K	130	144.00	159.00	1	209.0	1.9	1
SMA04J150V	S M	SMA04J150B	V M	150	167.00	185.00	1	243.0	1.6	1
SMA04J160V	S P	SMA04J160B	V P	160	178.00	197.00	1	259.0	1.5	1
SMA04J170V	S R	SMA04J170B	V R	170	189.00	209.00	1	275.0	1.5	1
SMA04J180V	S T	SMA04J180B	V T	180	201.00	222.00	1	292.0	1.4	1
SMA04J200V	S V	SMA04J200B	V V	200	224.00	247.00	1	324.0	1.2	1
SMA04J220V	S X	SMA04J220B	V X	220	246.00	272.00	1	356.0	1.1	1
SMA04J250V	S Z	SMA04J250B	V Z	250	279.00	309.00	1	405.0	1.0	1
SMA04J300V	T E	SMA04J300B	U E	300	335.00	371.00	1	486.0	0.8	1
SMA04J350V	T G	SMA04J350B	U G	350	391.00	432.00	1	567.0	0.7	1
SMA04J400V	T K	SMA04J400B	U K	400	447.00	494.00	1	648.0	0.6	1
SMA04J440V	T M	SMA04J440B	U M	440	492.00	543.00	1	713.0	0.6	1

Notes:

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)

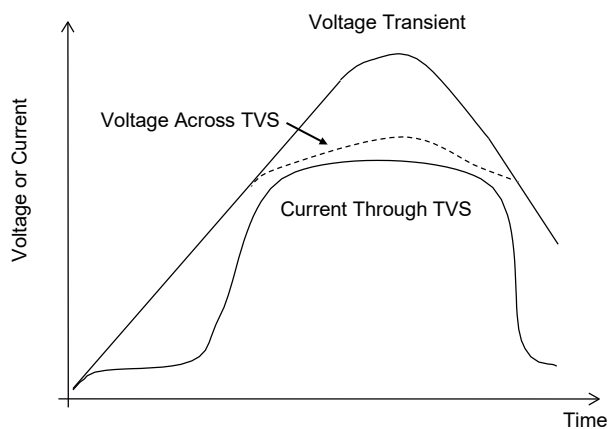


FIGURE 1 TVS Transients Clamping Waveform

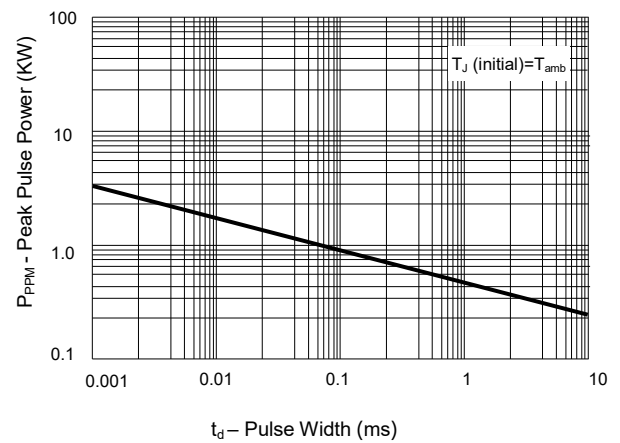


FIGURE 2 Peak Pulse Power Rating Curve

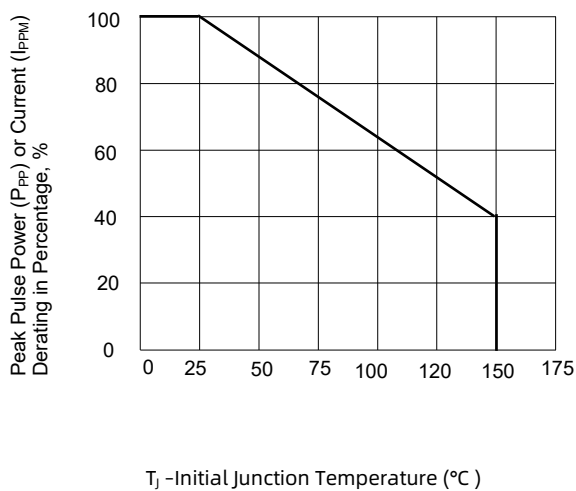


FIGURE 3 Peak Pulse Power Derating Curve

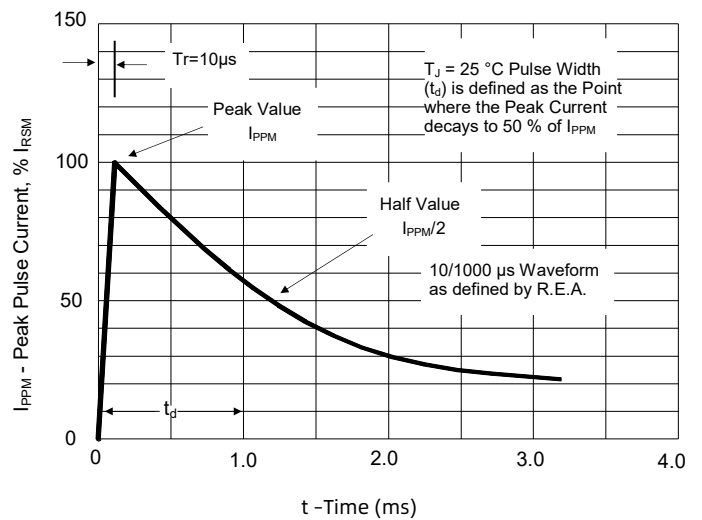
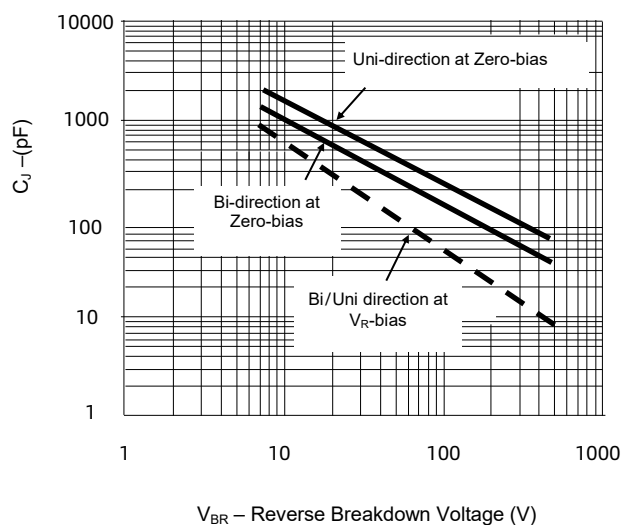
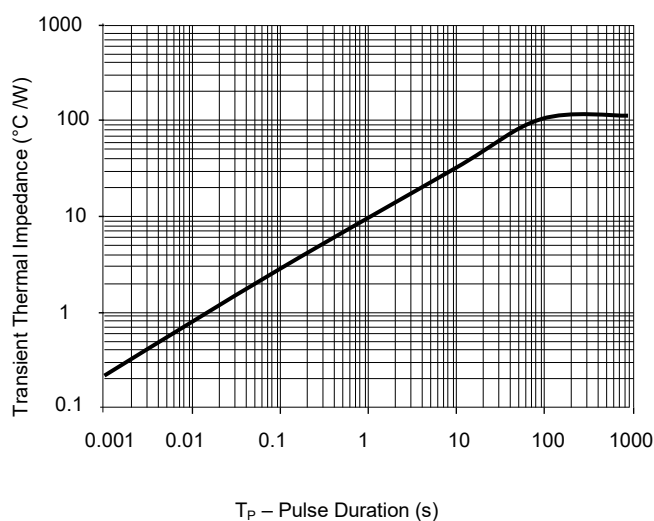
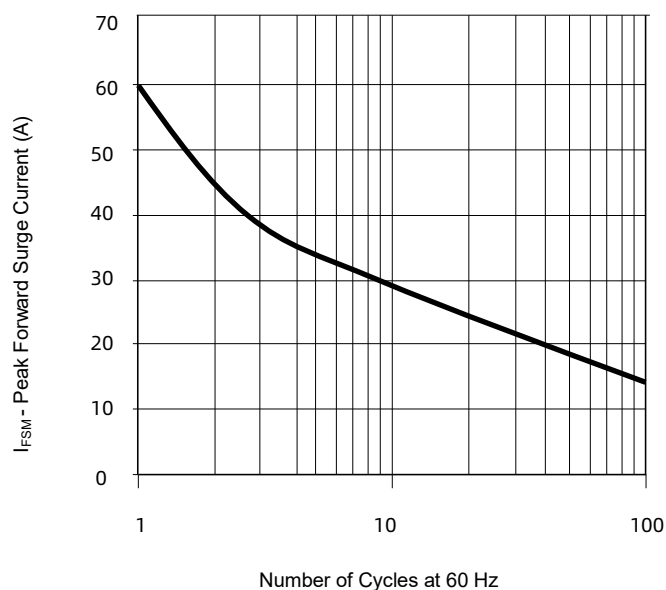
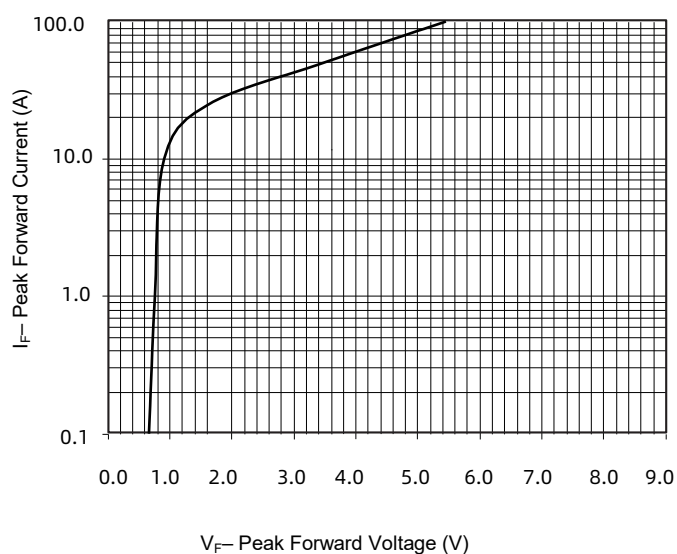
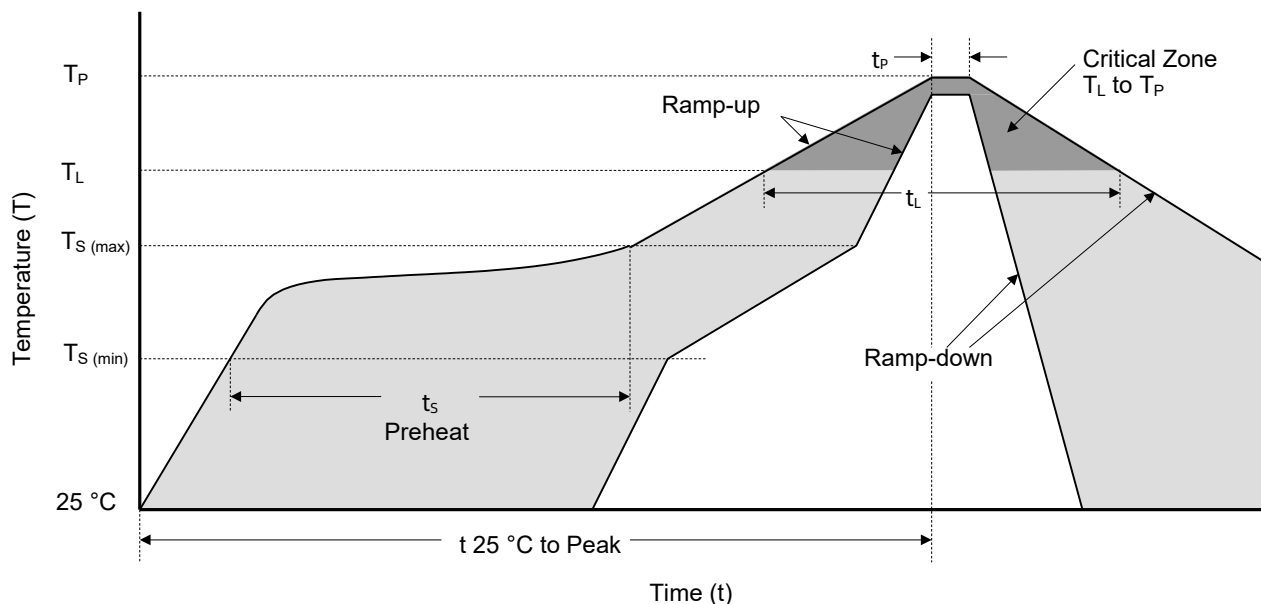


FIGURE 4 Pulse Waveform


FIGURE 5 Typical Junction Capacitance

FIGURE 6 Typical Transient Thermal Impedance

**FIGURE 7 Maximum Non-Repetitive Forward Surge Current
Uni-Directional only**

**FIGURE 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

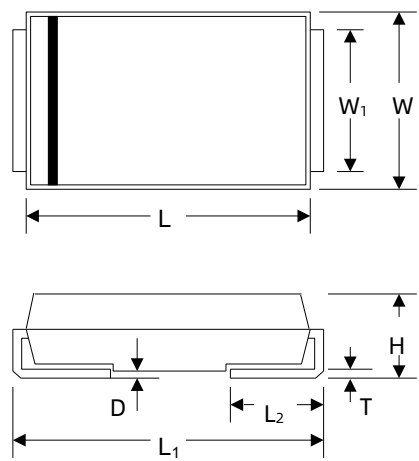
Packaging Information

Tape	Symbol	Dimension (mm)
	W	$12.00 \pm 0.30 / -0.10$
	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 ± 0.10
	F	5.50 ± 0.05
	A ₀	2.79 ± 0.10
	B ₀	5.33 ± 0.10
	K ₀	2.36 ± 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
SMA04J	DO-214AC	5000 PCS	Tape & Reel – 12 mm tape/13" reel	EIA STD RS-481

Package Outline Dimensions (DO-214AC)



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
L	3.990	4.600	0.157	0.181
W	2.300	2.790	0.095	0.110
W ₁	1.250	1.650	0.049	0.065
H	1.900	2.600	0.075	0.103
T	0.152	0.305	0.006	0.012
L ₁	4.800	5.280	0.189	0.208
L ₂	0.780	1.520	0.030	0.060
D	-	0.203	-	0.008

Recommended Mounting Pad Layout Unit:mm

