

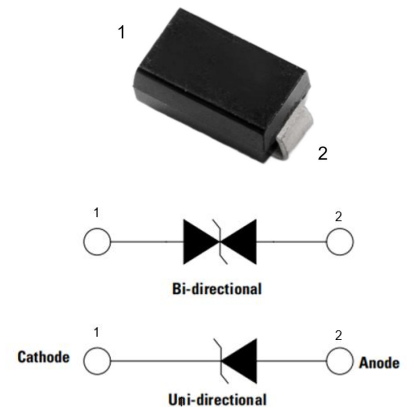


TVS Diodes P6SMAJ Series

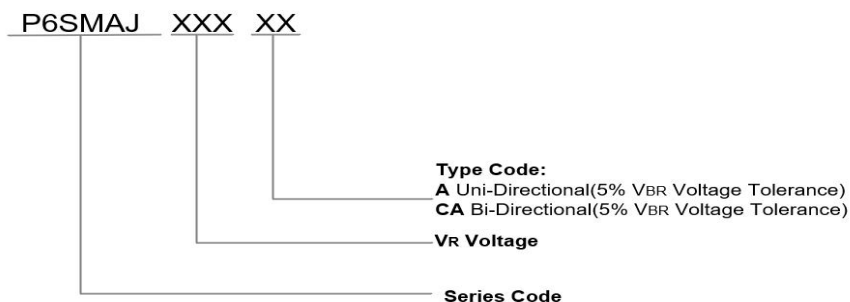
Transient Voltage Suppressors

Features

- ◆ 600W peak pulse power capability at 10/1000 μ s Waveform, repetition rate (duty cycle): 0.01%
- ◆ For surface mounted applications to optimize board space
- ◆ Low incremental surge impedance
- ◆ Excellent clamping capability
- ◆ Typical I_R less than 1 μ A when V_{BR} min > 12V.
- ◆ High Temperature soldering guaranteed: 260 $^{\circ}$ C/30 seconds at terminals
- ◆ Plastic package has underwriters laboratory flammability 94V-0
- ◆ Meets MSL level 1, per J-STD-020
- ◆ Meet Halogen free and RoHS compliant
- ◆ IEC-61000-4-2 ESD 30kV(Air), 30kV (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



Part Number Coding System



Mechanical Data

- ◆ Case:SMA
- ◆ Polarity: Color band denotes positive end(cathode) except bi-directional models

Applications

- ◆ I/O interface
- ◆ AC/DC power supply
- ◆ Low frequency signal transmission line(RS232,RS485,etc.)

Dimensions (SMA)

Ref.	Millimeters		Inches	
	Min	Max	Min.	Max.
A	1.250	1.650	0.049	0.065
B	3.990	4.600	0.157	0.181
C	2.400	2.790	0.095	0.110
D	1.900	2.290	0.075	0.090
E	0.780	1.520	0.030	0.060
F	-	0.203	-	0.008
G	4.800	5.280	0.189	0.208
H	0.152	0.305	0.006	0.012
I	1.800	-	0.070	-
J	2.100	-	0.082	-
K	-	2.300	-	0.090

Maximum Rating and Characteristics

Parameters at 25°C ambient temperature unless otherwise Noted.

Rating	Symbol	Value	Unit
Peak Pulse power Dissipation at 10/1000μs Waveform (Note1, Note2,)	P_{PPM}	Minimum 600	W
Peak pulse current of at 10/1000μs waveform (Note 1, Fig.2)	I_{PPM}	See Table	A
Steady state power dissipation at $T_A=50^{\circ}\text{C}$	$P_{M(AV)}$	5.0	W
Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only (Note 4)	V_F	3.5/5.0	V
Peak forward surge current, 8.3ms single half sine-wave superimposed On rated load,(JEDEC Method)(Note3, Fig.5)	I_{FSM}	100	A
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.2 and derated above $T_A=25^{\circ}\text{C}$ per Fig.1.
2. Mounted on 5.0mm×5.0mm (0.03mm thick) copper pads to each terminal.
3. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.
4. $V_F<3.5\text{V}$ for $V_{BR}\leq 200\text{V}$ and $V_F<5.0\text{V}$ for $V_{BR}\geq 201\text{V}$.

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Part Number		Reverse Stand-Off Voltage	Breakdown Voltage @ I_T	Test Current	Maximum Clamping Voltage @ I_{PP}	Peak Pulse Current	Reverse Leakage @ V_{RWM}
Unidirectional	Bidirectional	$V_{RWM}(V)$	$V_{BR}(V)$	$I_T(mA)$	$V_C(V)$	$I_{PP}(A)$	$I_R(\mu A)$
P6SMAJ5.0A	P6SMAJ5.0CA	5.0	6.40~7.00	10	9.2	65.3	800
P6SMAJ6.0A	P6SMAJ6.0CA	6.0	6.67~7.37	10	10.3	58.3	800
P6SMAJ6.5A	P6SMAJ6.5CA	6.5	7.22~7.98	10	11.2	53.6	500
P6SMAJ7.0A	P6SMAJ7.0CA	7.0	7.78~8.60	10	12.0	50.0	200
P6SMAJ7.5A	P6SMAJ7.5CA	7.5	8.33~9.21	1	12.9	46.6	100
P6SMAJ8.0A	P6SMAJ8.0CA	8.0	8.89~9.83	1	13.6	44.2	50
P6SMAJ8.5A	P6SMAJ8.5CA	8.5	9.44~10.40	1	14.4	41.7	20
P6SMAJ9.0A	P6SMAJ9.0CA	9.0	10.00~11.10	1	15.4	39.0	10
P6SMAJ10A	P6SMAJ10CA	10.0	11.10~12.30	1	17.0	35.3	5
P6SMAJ11A	P6SMAJ11CA	11.0	12.20~13.50	1	18.2	33.0	1
P6SMAJ12A	P6SMAJ12CA	12.0	13.30~14.70	1	19.9	30.2	1
P6SMAJ13A	P6SMAJ13CA	13.0	14.40~15.90	1	21.5	28.0	1
P6SMAJ14A	P6SMAJ14CA	14.0	15.60~17.20	1	23.2	25.9	1
P6SMAJ15A	P6SMAJ15CA	15.0	16.70~18.50	1	24.4	24.6	1
P6SMAJ16A	P6SMAJ16CA	16.0	17.80~19.70	1	26.0	23.1	1
P6SMAJ17A	P6SMAJ17CA	17.0	18.90~20.90	1	27.6	21.8	1
P6SMAJ18A	P6SMAJ18CA	18.0	20.00~22.10	1	29.2	20.6	1
P6SMAJ20A	P6SMAJ20CA	20.0	22.20~24.50	1	32.4	18.6	1
P6SMAJ22A	P6SMAJ22CA	22.0	24.40~26.90	1	35.5	16.9	1
P6SMAJ24A	P6SMAJ24CA	24.0	26.70~29.50	1	38.9	15.5	1
P6SMAJ26A	P6SMAJ26CA	26.0	28.90~31.90	1	42.1	14.3	1
P6SMAJ28A	P6SMAJ28CA	28.0	31.10~34.40	1	45.4	13.3	1
P6SMAJ30A	P6SMAJ30CA	30.0	33.30~36.80	1	48.4	12.4	1
P6SMAJ33A	P6SMAJ33CA	33.0	36.70~40.60	1	53.3	11.3	1
P6SMAJ36A	P6SMAJ36CA	36.0	40.00~44.20	1	58.1	10.4	1
P6SMAJ40A	P6SMAJ40CA	40.0	44.40~49.10	1	64.5	9.3	1
P6SMAJ43A	P6SMAJ43CA	43.0	47.80~52.80	1	69.4	8.7	1
P6SMAJ45A	P6SMAJ45CA	45.0	50.00~55.30	1	72.7	8.3	1
P6SMAJ48A	P6SMAJ48CA	48.0	53.30~58.90	1	77.4	7.8	1
P6SMAJ51A	P6SMAJ51CA	51.0	56.70~62.70	1	82.4	7.3	1
P6SMAJ54A	P6SMAJ54CA	54.0	60.00~66.30	1	87.1	6.9	1
P6SMAJ58A	P6SMAJ58CA	58.0	64.40~71.20	1	93.6	6.5	1
P6SMAJ60A	P6SMAJ60CA	60.0	66.70~73.70	1	96.8	6.2	1
P6SMAJ64A	P6SMAJ64CA	64.0	71.10~78.60	1	103.0	5.9	1
P6SMAJ70A	P6SMAJ70CA	70.0	77.80~86.00	1	113.0	5.3	1
P6SMAJ75A	P6SMAJ75CA	75.0	83.30~92.10	1	121.0	5.0	1
P6SMAJ78A	P6SMAJ78CA	78.0	86.70~95.80	1	126.0	4.8	1

Part Number		Reverse Stand-Off Voltage	Breakdown Voltage @ I_T	Test Current	Maximum Clamping Voltage @ I_{PP}	Peak Pulse Current	Reverse Leakage @ V_{RWM}
Unidirectional	Bidirectional	$V_{RWM}(V)$	$V_{BR}(V)$	$I_T(mA)$	$V_C(V)$	$I_{PP}(A)$	$I_R(\mu A)$
P6SMAJ85A	P6SMAJ85CA	85.0	94.40~104.00	1	137.0	4.4	1
P6SMAJ90A	P6SMAJ90CA	90.0	100.00~111.00	1	146.0	4.1	1
P6SMAJ100A	P6SMAJ100CA	100.0	111.00~123.00	1	162.0	3.7	1
P6SMAJ110A	P6SMAJ110CA	110.0	122.00~135.00	1	177.0	3.4	1
P6SMAJ120A	P6SMAJ120CA	120.0	133.00~147.00	1	193.0	3.1	1
P6SMAJ130A	P6SMAJ130CA	130.0	144.00~159.00	1	209.0	2.9	1
P6SMAJ150A	P6SMAJ150CA	150.0	167.00~185.00	1	243.0	2.5	1
P6SMAJ160A	P6SMAJ160CA	160.0	178.00~197.00	1	259.0	2.3	1
P6SMAJ170A	P6SMAJ170CA	170.0	189.00~209.00	1	275.0	2.2	1
P6SMAJ180A	P6SMAJ180CA	180.0	201.00~222.00	1	292.0	2.1	1
P6SMAJ188A	P6SMAJ188CA	188.0	209.00~231.00	1	304.0	2.0	1
P6SMAJ190A	P6SMAJ190CA	190.0	211.00~233.00	1	308.0	2.0	1
P6SMAJ200A	P6SMAJ200CA	200.0	224.00~247.00	1	324.0	1.9	1
P6SMAJ210A	P6SMAJ210CA	210.0	237.00~263.00	1	340.0	1.8	1
P6SMAJ220A	P6SMAJ220CA	220.0	246.00~272.00	1	356.0	1.7	1
P6SMAJ250A	P6SMAJ250CA	250.0	279.00~309.00	1	405.0	1.5	1
P6SMAJ300A*	P6SMAJ300CA*	300.0	335.00~371.00	1	486.0	1.7	1
P6SMAJ350A*	P6SMAJ350CA*	350.0	391.00~432.00	1	567.0	1.5	1
P6SMAJ400A*	P6SMAJ400CA*	400.0	447.00~494.00	1	648.0	1.3	1
P6SMAJ440A*	P6SMAJ440CA*	440.0	492.00~543.00	1	713.0	1.1	1

Notes: 1.For bidirectional type having V_{RWM} of 10V and less, the I_R limit is double.

2.For stack-die parts, use * to label the part number.

Ratings and Characteristic Curves ($T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1. Peak Pulse Power Derating Curve

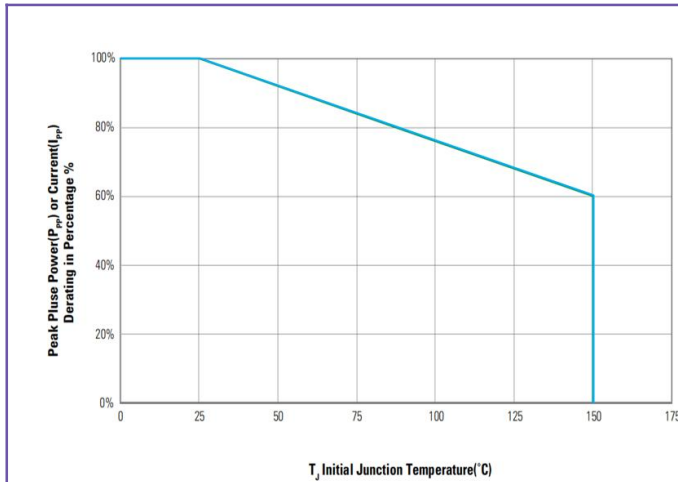


Figure 2. Pulse Waveform

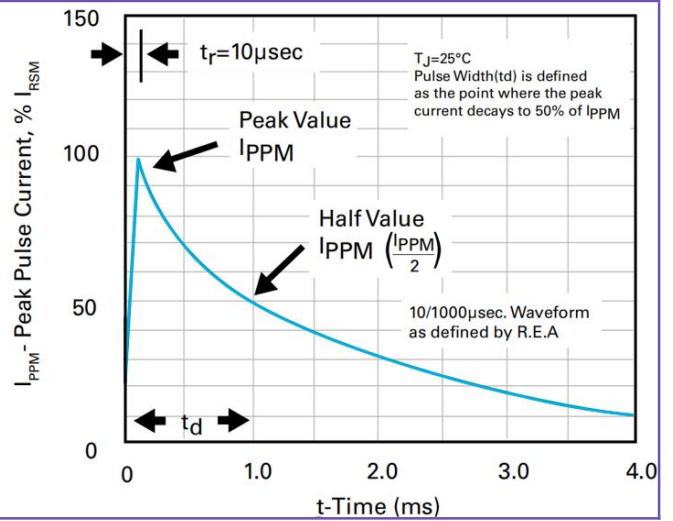


Figure 3. Typical Junction Capacitance

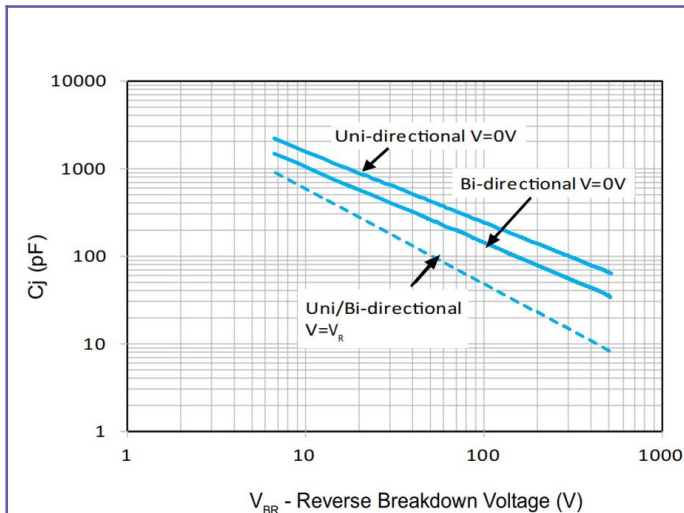


Figure 4. Typical Transient Thermal Impedance

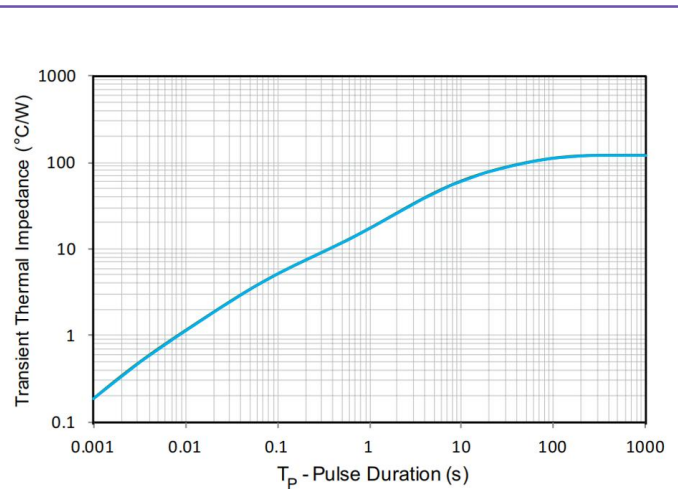


Figure 5. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

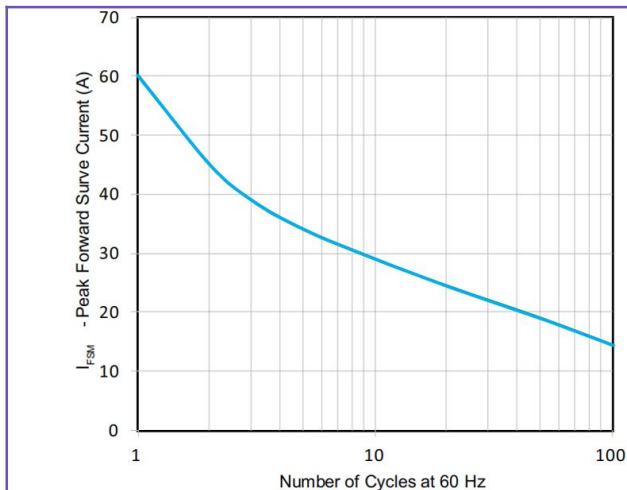
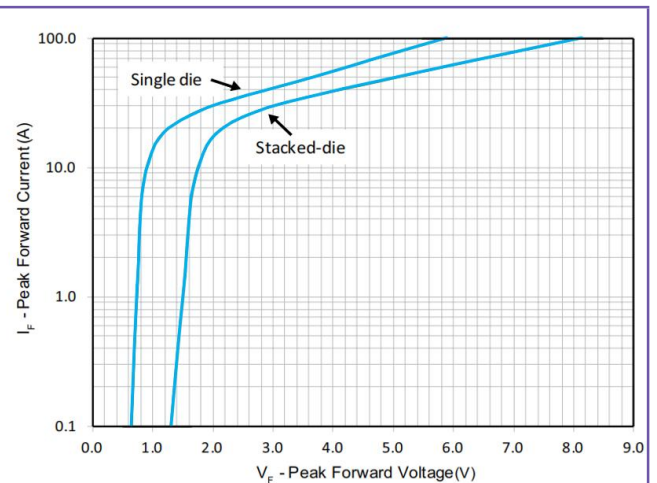
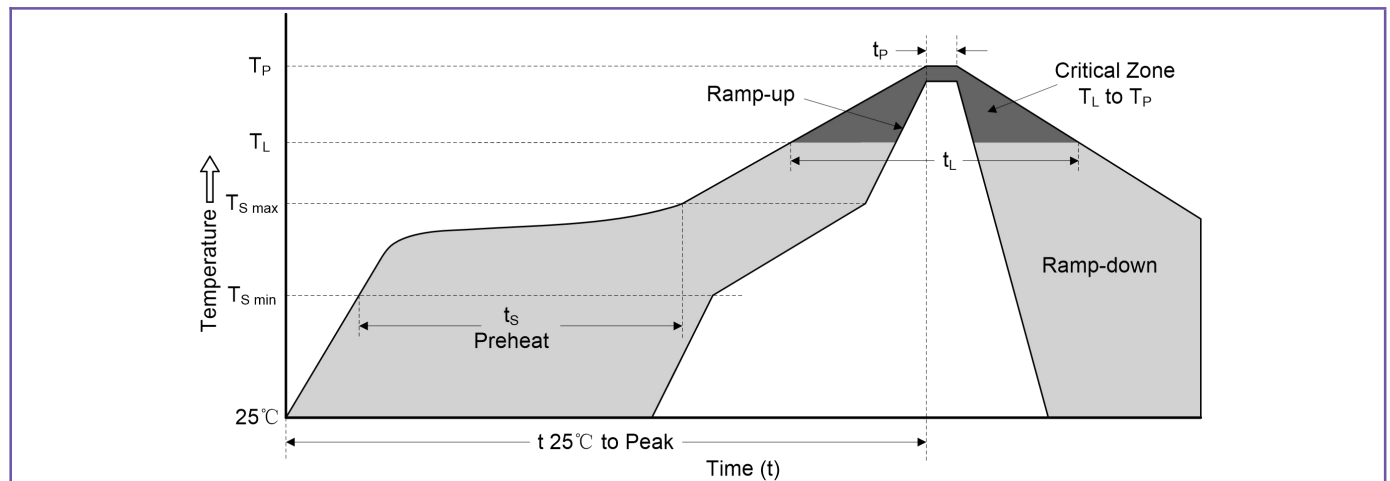


Figure 6. Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



Reflow Soldering Parameters



Reflow Condition		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 (T_L to T_P)		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_s)	60-150 seconds
Peak Temperature (T_P)		260(+0/-5)°C
Time within 5°C of actual Peak Temperature (t_p)		30 seconds
Ramp-down Rate		6°C/second max.
Time 25°C to Peak Temperature(T_P)		8 minutes max.
Do not exceed		260°C

Reliability

Items	Standards
Terminal strength	MIL-STD-750 Method 2036
Mechanical shock	JESD22-B104
Vibration	JESD22-B103
High Temp Storage	JESD22-A103
High Temp Reverse Bias	JESD22-A108
Temperature Cycling	JESD22-A104
High Temp High Humidity Reverse Bias	JESD22-A101
Resistance to solder heat	JESD22-A111(SMD)