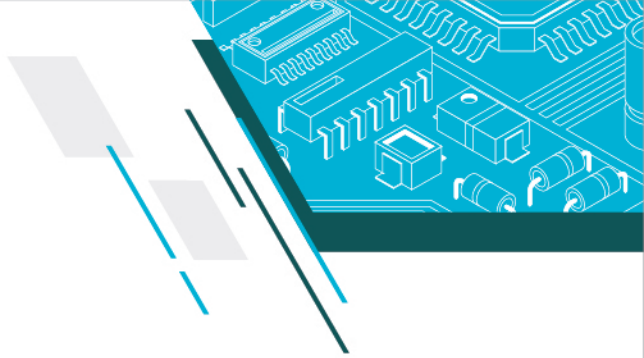


FUZETEC

TVS Products

Peak Pulse Power	Series Name	Package Type	Page
SMD Standard TVS			
400W	SMAJ	DO-214AC	P4
	P4SMA	DO-214AC	P10
600W	SMA6J	DO-214AC	P16
	SMBJ	DO-214AA	P22
	P6SMB	DO-214AA	P28
1500W	SMCJ	DO-214AB	P34
	1.5SMC	DO-214AB	P40
3000W	SMDJ	DO-214AB	P46
5000W	5.0SMDJ	DO-214AB	P52
Automotive SMD TVS			
3600W	SM5Z	DO-218AB	P59
4600W	SM6Z	DO-218AB	P63
6600W	SM8Z	DO-218AB	P67
8000W	SM8T	DO-218AB	P71
Axial Leaded High Power TVS			
15000W	15KP	R6/P600	P76
30000W	30KPA	R6/P600	P80
	AK3	Custom	P86

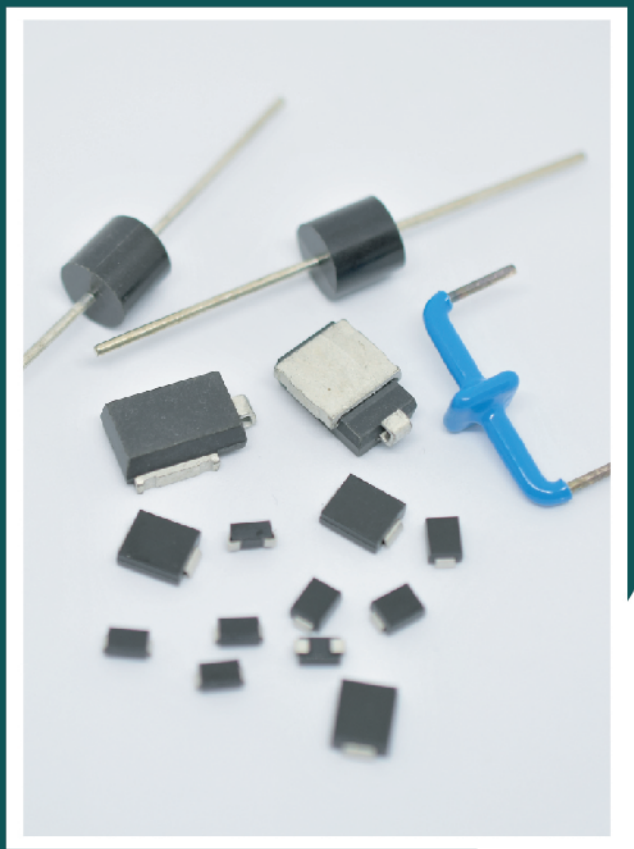
FUZETEC

Transient Surge Protection

Transient Surges

Transient surges are brief overvoltage spikes or disturbances on a power waveform that can damage, degrade, or destroy electronic equipment. Transient surges originate from a variety of electrical circuits and sources regardless of whether they operate from an AC or DC power supply as they are often generated within the circuit itself or transmitted into the circuit from external sources.

Transients within a circuit can increase the voltage to several thousand volts with a duration of less than a half-cycle of the normal voltage waveform, and it is these voltage spikes which must be prevented from appearing across delicate electronic circuits and components.



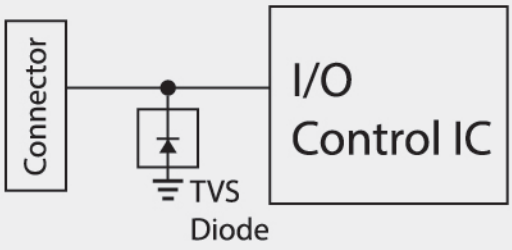
TVS Diodes

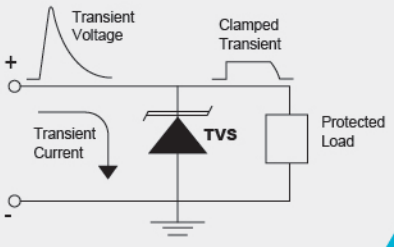
TVS Diodes are electronic components designed to protect sensitive electronics from high-voltage transients. They can respond to overvoltage events faster than most other types of circuit protection devices, and are offered in a variety of surface mount and through-hole circuit board mounting formats.

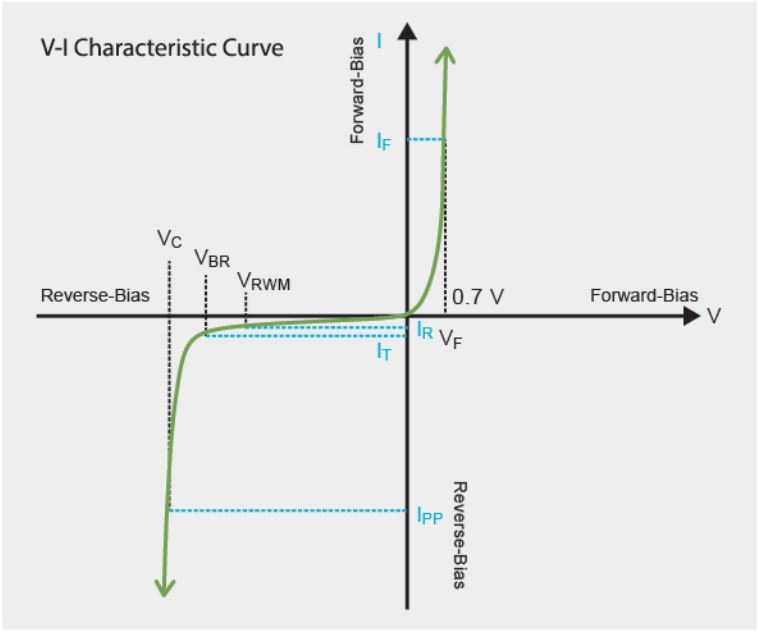
Fuzetec TVS Diodes can fit a wide range of circuit protection applications but were primarily designed to protect I/O interfaces in telecommunication and industrial equipment, computers and consumer electronics.

How a TVS Diode Work

TVS diodes function by limiting voltage to a certain level (referred to as a "clamping" device) with p-n junctions that have a larger cross-sectional area than those of a normal diode, allowing them to conduct large currents to ground without sustaining damage.







TVS Diode Characteristics

Symbol	Parameter
V_F	Forward Voltage @ I_F
V_{RWM}	Working Peak Reverse Voltage
V_{BR}	Breakdown Voltage @ I_T
V_C	Clamping Voltage @ I_{PP}
I_F	Forward Current
I_R	Maximum Reverse Leak Current @ V_{RWM}
I_T	Test Current
I_{PP}	Maximum Reverse Peak Pulse Current

SMAJ Series

400W

Operating Voltage: 3.3 to 600V
Peak Pulse Power: 400W

DO-214AC (SMA)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 400 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant
- Complies with following standards:
  IEC61000-4-2(ESD) ±30KV(air), ±30KV(contact)
  IEC61000-4-2(EFT) 40A(5/50ns)

Applications

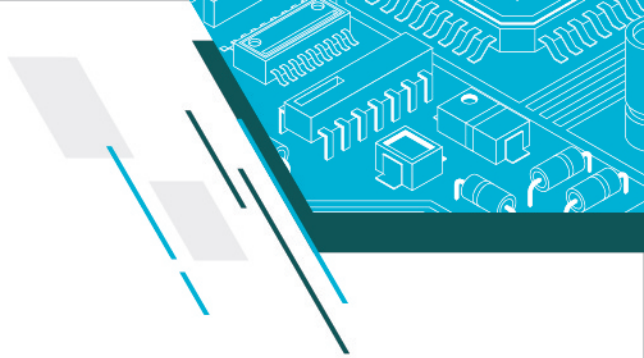
- Power supply protection
- Automotive application
- Industrial application
- Power management

ESD protection of data lines in accordance with IEC61000-4-2
EFT protection of data lines in accordance with IEC61000-4-4

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	400	W
Steady State Power Dissipation at T_L=75°C,Lead lengths.375"(9.5mm)(Note2)	P_D	3.3	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	120	°C/W

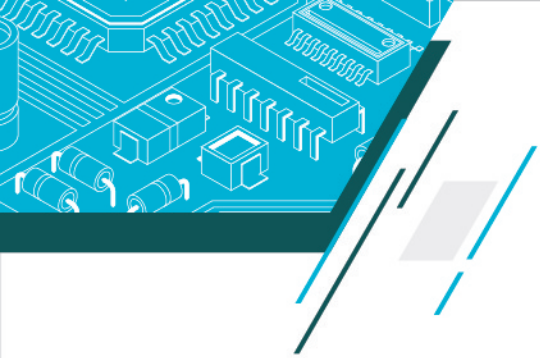
Notes : 1. Non-repetitive current pulse,T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMAJ3.3A	SMAJ3.3CA	3V3	3V3C	3.3	5.2	6.0	10	8.3	50.0	800
SMAJ5.0A	SMAJ5.0CA	AE	WE	5.0	6.4	7.0	10	9.2	43.5	800
SMAJ6.0A	SMAJ6.0CA	AG	WG	6.0	6.7	7.4	10	10.3	38.8	800
SMAJ6.5A	SMAJ6.5CA	AK	WK	6.5	7.2	8.0	10	11.2	35.7	500
SMAJ7.0A	SMAJ7.0CA	AM	WM	7.0	7.8	8.6	10	12.0	33.3	200
SMAJ7.5A	SMAJ7.5CA	AP	WP	7.5	8.3	9.2	1	12.9	31.0	100
SMAJ8.0A	SMAJ8.0CA	AR	WR	8.0	8.9	9.8	1	13.6	29.4	50
SMAJ8.5A	SMAJ8.5CA	AT	WT	8.5	9.4	10.4	1	14.4	27.8	20
SMAJ9.0A	SMAJ9.0CA	AV	WV	9.0	10.0	11.1	1	15.4	26.0	10
SMAJ10A	SMAJ10CA	AX	WX	10.0	11.1	12.3	1	17.0	23.5	5
SMAJ11A	SMAJ11CA	AZ	WZ	11.0	12.2	13.5	1	18.2	22.0	1
SMAJ12A	SMAJ12CA	BE	XE	12.0	13.3	14.7	1	19.9	20.1	1
SMAJ13A	SMAJ13CA	BG	XG	13.0	14.4	15.9	1	21.5	18.6	1
SMAJ14A	SMAJ14CA	BK	XK	14.0	15.6	17.2	1	23.2	17.2	1
SMAJ15A	SMAJ15CA	BM	XM	15.0	16.7	18.5	1	24.4	16.4	1
SMAJ16A	SMAJ16CA	BP	XP	16.0	17.8	19.7	1	26.0	15.4	1
SMAJ17A	SMAJ17CA	BR	XR	17.0	18.9	20.9	1	27.6	14.5	1
SMAJ18A	SMAJ18CA	BT	XT	18.0	20.0	22.1	1	29.2	13.7	1
SMAJ20A	SMAJ20CA	BV	XV	20.0	22.2	24.5	1	32.4	12.3	1
SMAJ22A	SMAJ22CA	BX	XX	22.0	24.4	26.9	1	35.5	11.3	1
SMAJ24A	SMAJ24CA	BZ	XZ	24.0	26.7	29.5	1	38.9	10.3	1
SMAJ26A	SMAJ26CA	CE	YE	26.0	28.9	31.9	1	42.1	9.5	1
SMAJ28A	SMAJ28CA	CG	YG	28.0	31.1	34.4	1	45.4	8.8	1
SMAJ30A	SMAJ30CA	CK	YK	30.0	33.3	36.8	1	48.4	8.3	1
SMAJ33A	SMAJ33CA	CM	YM	33.0	36.7	40.6	1	53.3	7.5	1
SMAJ36A	SMAJ36CA	CP	YP	36.0	40.0	44.2	1	58.1	6.9	1
SMAJ40A	SMAJ40CA	CR	YR	40.0	44.4	49.1	1	64.5	6.2	1
SMAJ43A	SMAJ43CA	CT	YT	43.0	47.8	52.8	1	69.4	5.8	1
SMAJ45A	SMAJ45CA	CV	YV	45.0	50.0	55.3	1	72.7	5.5	1
SMAJ48A	SMAJ48CA	CX	YX	48.0	53.3	58.9	1	77.4	5.2	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



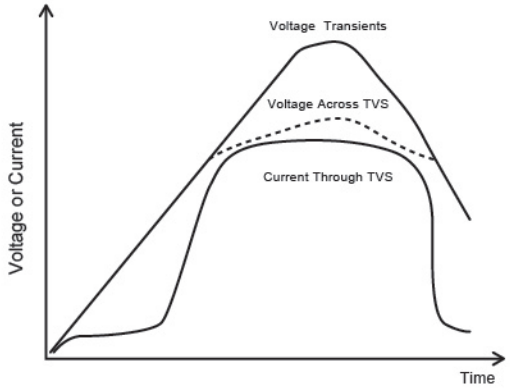
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMAJ51A	SMAJ51CA	CZ	YZ	51.0	56.7	62.7	1	82.4	4.9	1
SMAJ54A	SMAJ54CA	RE	ZE	54.0	60.0	66.3	1	87.1	4.6	1
SMAJ58A	SMAJ58CA	RG	ZG	58.0	64.4	71.2	1	93.6	4.3	1
SMAJ60A	SMAJ60CA	RK	ZK	60.0	66.7	73.7	1	96.8	4.1	1
SMAJ64A	SMAJ64CA	RM	ZM	64.0	71.1	78.6	1	103.0	3.9	1
SMAJ70A	SMAJ70CA	RP	ZP	70.0	77.8	86.0	1	113.0	3.5	1
SMAJ75A	SMAJ75CA	RR	ZR	75.0	83.3	92.1	1	121.0	3.3	1
SMAJ78A	SMAJ78CA	RT	ZT	78.0	86.7	95.8	1	126.0	3.2	1
SMAJ85A	SMAJ85CA	RV	ZV	85.0	94.4	104.0	1	137.0	2.9	1
SMAJ90A	SMAJ90CA	RX	ZX	90.0	100.0	111.0	1	146.0	2.7	1
SMAJ100A	SMAJ100CA	RZ	ZZ	100.0	111.0	123.0	1	162.0	2.5	1
SMAJ110A	SMAJ110CA	SE	VE	110.0	122.0	135.0	1	177.0	2.3	1
SMAJ120A	SMAJ120CA	SG	VG	120.0	133.0	147.0	1	193.0	2.1	1
SMAJ130A	SMAJ130CA	SK	VK	130.0	144.0	159.0	1	209.0	1.9	1
SMAJ150A	SMAJ150CA	SM	VM	150.0	167.0	185.0	1	243.0	1.6	1
SMAJ160A	SMAJ160CA	SP	VP	160.0	178.0	197.0	1	259.0	1.5	1
SMAJ170A	SMAJ170CA	SR	VR	170.0	189.0	209.0	1	275.0	1.5	1
SMAJ180A	SMAJ180CA	ST	VT	180.0	201.0	222.0	1	292.0	1.4	1
SMAJ200A	SMAJ200CA	SV	VV	200.0	224.0	247.0	1	324.0	1.2	1
SMAJ220A	SMAJ220CA	SX	VX	220.0	246.0	272.0	1	356.0	1.1	1
SMAJ250A	SMAJ250CA	SZ	VZ	250.0	279.0	309.0	1	405.0	1.0	1
SMAJ300A	SMAJ300CA	TE	UE	300.0	335.0	371.0	1	486.0	0.8	1
SMAJ350A	SMAJ350CA	TG	UG	350.0	391.0	432.0	1	567.0	0.7	1
SMAJ400A	SMAJ400CA	TK	UK	400.0	447.0	494.0	1	648.0	0.6	1
SMAJ440A	SMAJ440CA	TM	UM	440.0	492.0	543.0	1	713.0	0.6	1
SMAJ480A	SMAJ480CA	TP	UP	480.0	536.5	592.9	1	780.0	0.5	1
SMAJ500A	SMAJ500CA	TR	UR	500.0	558.0	618.0	1	810.0	0.5	1
SMAJ510A	SMAJ510CA	TT	UT	510.0	575.2	628.4	1	828.0	0.5	1
SMAJ550A	SMAJ550CA	TU	UU	550.0	614.0	680.0	1	891.0	0.5	1
SMAJ600A	SMAJ600CA	TV	UV	600.0	670.0	741.0	1	971.0	0.4	1

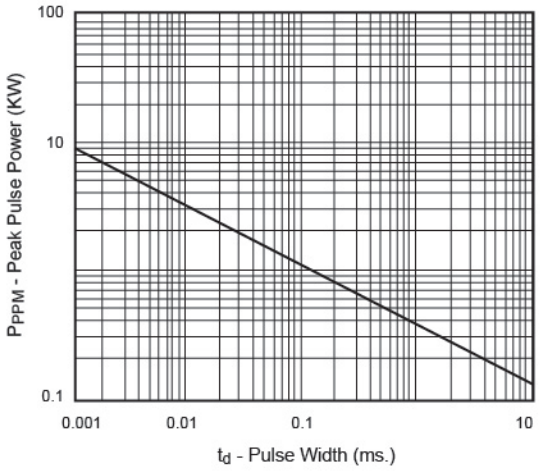
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

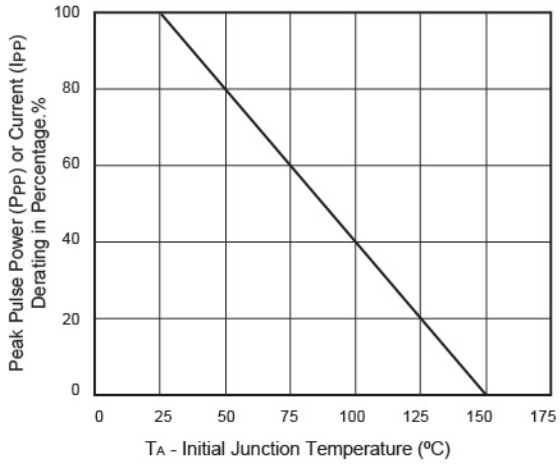
TVS Transients Clamping Waveform



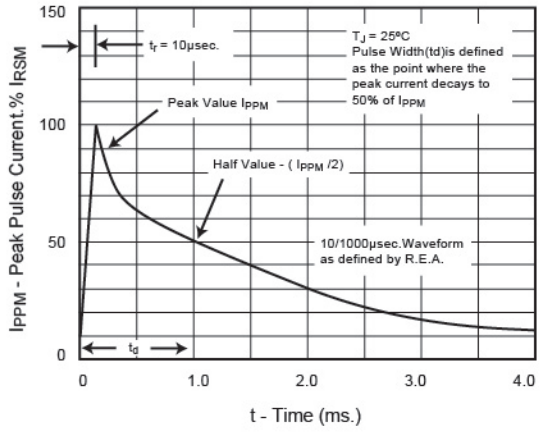
Peak Pulse Power Rating Curve



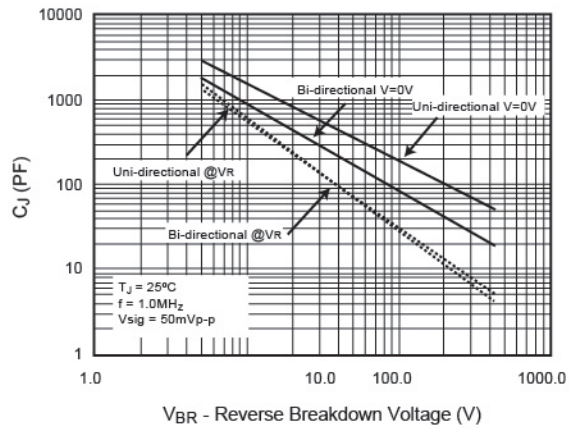
Pulse Derating Curve



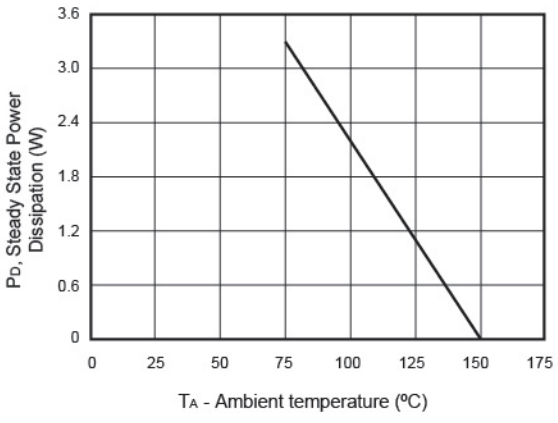
Pulse Waveform



Typical Junction Capacitance

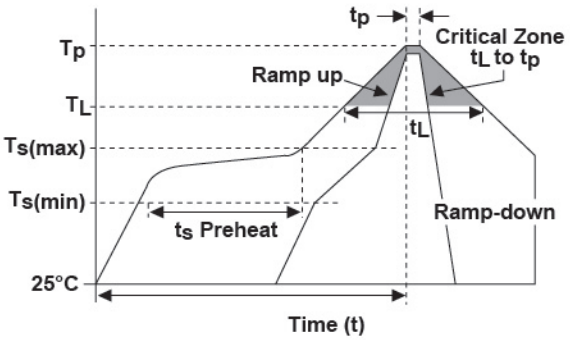


Steady State Power Dissipation Derating Curve

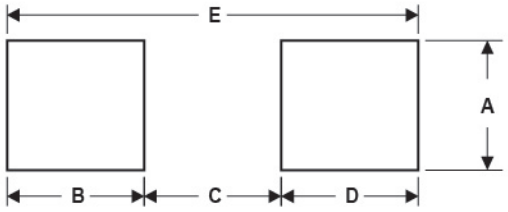


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



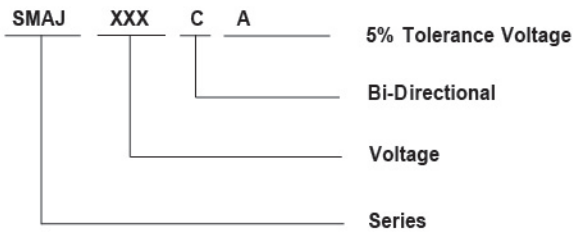
Recommended Pad Lay Out Dimensions



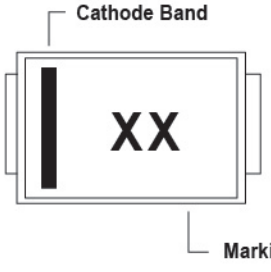
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.63	-	0.064	-
B	1.45	-	0.057	-
C	-	2.80	-	0.090
D	1.45	-	0.057	-
E	5.28 REF		0.208 REF	

Part Numbering and Marking System

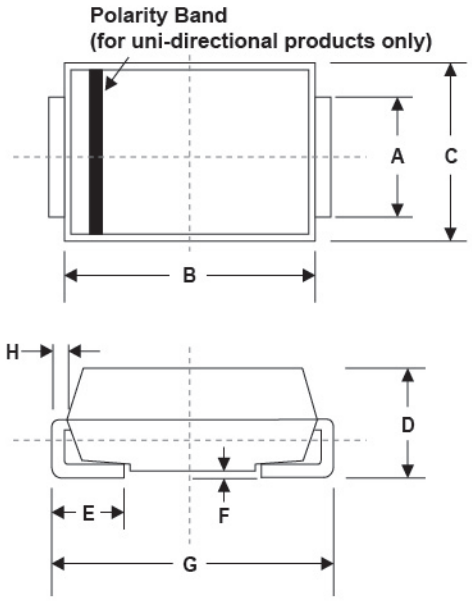
Part Numbering System



Marking System



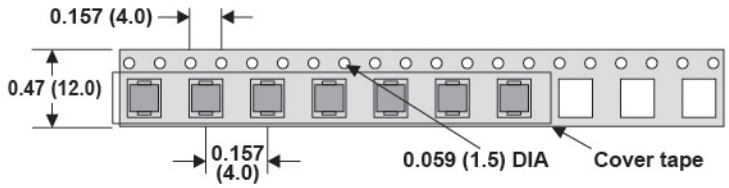
DO-214AC(SMA) Package Information

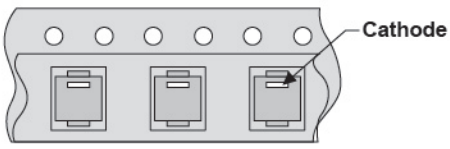


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.20	1.60	0.047	0.063
B	4.20	4.60	0.165	0.181
C	2.60	2.80	0.102	0.110
D	2.10	2.40	0.083	0.094
E	0.76	1.52	0.030	0.060
F	0.02	0.20	0.001	0.008
G	4.85	5.25	0.191	0.207
H	0.15	0.30	0.006	0.012

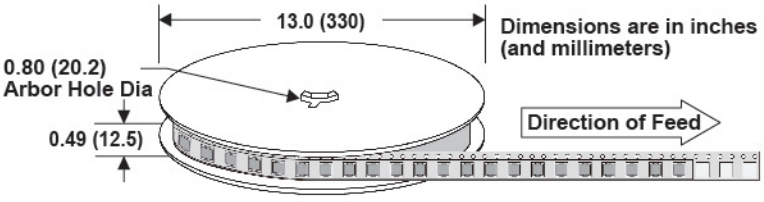
Packaging Specification

Part Number	Quantity	Reel Size
SMAJxx (CA)	5000	13" inch





Polarity Band is only applicable to the undirectional package



P4SMA Series

400W

Operating Voltage : 6.8 to 600V
Peak Pulse Power : 400W

DO-214AC (SMA)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 400 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

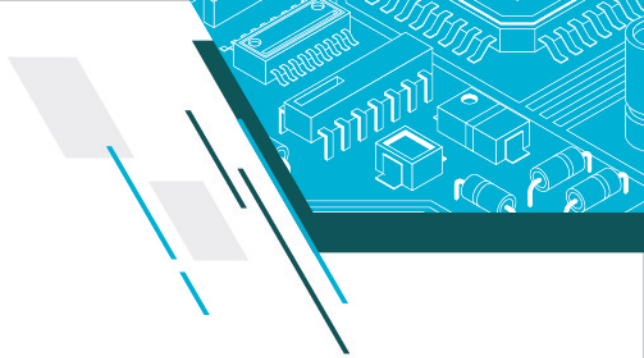
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	400	W
Steady State Power Dissipation at T_L=75°C,Lead lengths.375"(9.5mm)(Note2)	P_D	3.3	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	120	°C/W

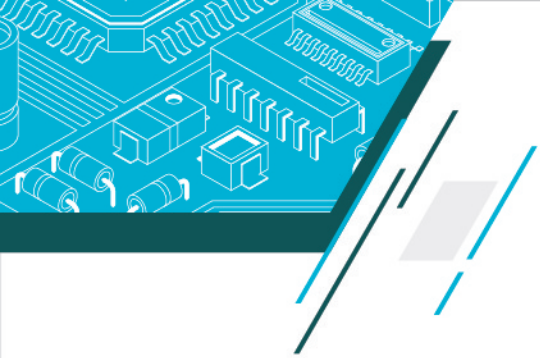
Notes : 1. Non-repetitive current pulse,T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
P4SMA6.8A	P4SMA6.8CA	6V8A	6V8C	5.8	6.5	7.1	10	10.5	39.0	1000
P4SMA7.5A	P4SMA7.5CA	7V5A	7V5C	6.4	7.1	7.9	10	11.3	36.3	500
P4SMA8.2A	P4SMA8.2CA	8V2A	8V2C	7.0	7.8	8.6	10	12.1	33.9	200
P4SMA9.1A	P4SMA9.1CA	9V1A	9V1C	7.8	8.7	9.6	1	13.4	30.6	50
P4SMA10A	P4SMA10CA	10A	10C	8.6	9.5	10.5	1	14.5	28.3	10
P4SMA11A	P4SMA11CA	11A	11C	9.4	10.5	11.6	1	15.6	26.3	5
P4SMA12A	P4SMA12CA	12A	12C	10.2	11.4	12.6	1	16.7	24.6	5
P4SMA13A	P4SMA13CA	13A	13C	11.1	12.4	13.7	1	18.2	22.5	1
P4SMA15A	P4SMA15CA	15A	15C	12.8	14.3	15.8	1	21.2	19.3	1
P4SMA16A	P4SMA16CA	16A	16C	13.6	15.2	16.8	1	22.5	18.2	1
P4SMA18A	P4SMA18CA	18A	18C	15.3	17.1	18.9	1	25.5	16.1	1
P4SMA20A	P4SMA20CA	20A	20C	17.1	19.0	21.0	1	27.7	14.8	1
P4SMA22A	P4SMA22CA	22A	22C	18.8	20.9	23.1	1	30.6	13.4	1
P4SMA24A	P4SMA24CA	24A	24C	20.5	22.8	25.2	1	33.2	12.3	1
P4SMA27A	P4SMA27CA	27A	27C	23.1	25.7	28.4	1	37.5	10.9	1
P4SMA30A	P4SMA30CA	30A	30C	25.6	28.5	31.5	1	41.4	9.9	1
P4SMA33A	P4SMA33CA	33A	33C	28.2	31.4	34.7	1	45.7	9.0	1
P4SMA36A	P4SMA36CA	36A	36C	30.8	34.2	37.8	1	49.9	8.2	1
P4SMA39A	P4SMA39CA	39A	39C	33.3	37.1	41.0	1	53.9	7.6	1
P4SMA43A	P4SMA43CA	43A	43C	36.8	40.9	45.2	1	59.3	6.9	1
P4SMA47A	P4SMA47CA	47A	47C	40.2	44.7	49.4	1	64.8	6.3	1
P4SMA51A	P4SMA51CA	51A	51C	43.6	48.5	53.6	1	70.1	5.8	1
P4SMA56A	P4SMA56CA	56A	56C	47.8	53.2	58.8	1	77.0	5.3	1
P4SMA62A	P4SMA62CA	62A	62C	53.0	58.9	65.1	1	85.0	4.8	1
P4SMA68A	P4SMA68CA	68A	68C	58.1	64.6	71.4	1	92.0	4.5	1
P4SMA75A	P4SMA75CA	75A	75C	64.1	71.3	78.8	1	103.0	4.0	1
P4SMA82A	P4SMA82CA	82A	82C	70.1	77.9	86.1	1	113.0	3.6	1
P4SMA91A	P4SMA91CA	91A	91C	77.8	86.5	95.5	1	125.0	3.3	1
P4SMA100A	P4SMA100CA	100A	100C	85.5	95.0	105.0	1	137.0	3.0	1
P4SMA110A	P4SMA110CA	110A	110C	94.0	105.0	116.0	1	152.0	2.7	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



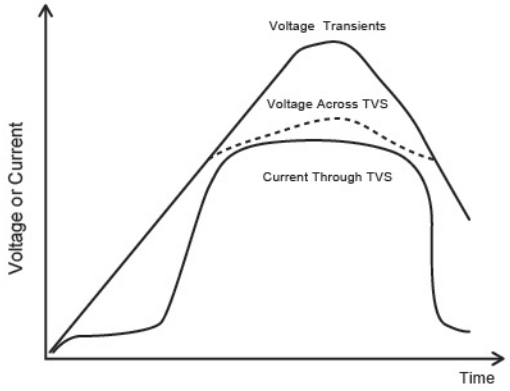
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
P4SMA120A	P4SMA120CA	120A	120C	102.0	114.0	126.0	1	165.0	2.5	1
P4SMA130A	P4SMA130CA	130A	130C	111.0	124.0	137.0	1	179.0	2.3	1
P4SMA150A	P4SMA150CA	150A	150C	128.0	143.0	158.0	1	207.0	2.0	1
P4SMA160A	P4SMA160CA	160A	160C	136.0	152.0	168.0	1	219.0	1.9	1
P4SMA170A	P4SMA170CA	170A	170C	145.0	162.0	179.0	1	234.0	1.8	1
P4SMA180A	P4SMA180CA	180A	180C	154.0	171.0	189.0	1	246.0	1.7	1
P4SMA200A	P4SMA200CA	200A	200C	171.0	190.0	210.0	1	274.0	1.5	1
P4SMA220A	P4SMA220CA	220A	220C	185.0	209.0	231.0	1	328.0	1.3	1
P4SMA250A	P4SMA250CA	250A	250C	214.0	237.0	263.0	1	344.0	1.2	1
P4SMA300A	P4SMA300CA	300A	300C	256.0	285.0	315.0	1	414.0	1.0	1
P4SMA350A	P4SMA350CA	350A	350C	300.0	332.0	368.0	1	482.0	0.9	1
P4SMA400A	P4SMA400CA	400A	400C	342.0	380.0	420.0	1	548.0	0.8	1
P4SMA440A	P4SMA440CA	440A	440C	376.0	418.0	462.0	1	602.0	0.7	1
P4SMA480A	P4SMA480CA	480A	480C	408.0	456.0	504.0	1	658.0	0.6	1
P4SMA510A	P4SMA510CA	510A	510C	434.0	485.0	535.0	1	698.0	0.6	1
P4SMA530A	P4SMA530CA	530A	530C	451.0	503.5	556.5	1	725.0	0.6	1
P4SMA540A	P4SMA540CA	540A	540C	459.0	513.0	567.0	1	740.0	0.5	1
P4SMA550A	P4SMA550CA	550A	550C	467.0	522.5	577.5	1	760.0	0.5	1
P4SMA600A	P4SMA600CA	600A	600C	510.0	570.0	630.0	1	828.0	0.5	1

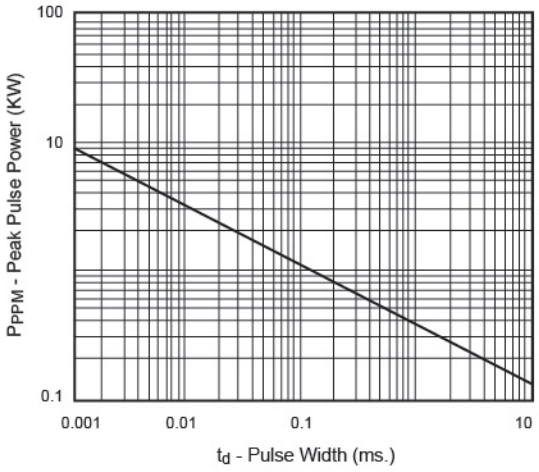
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

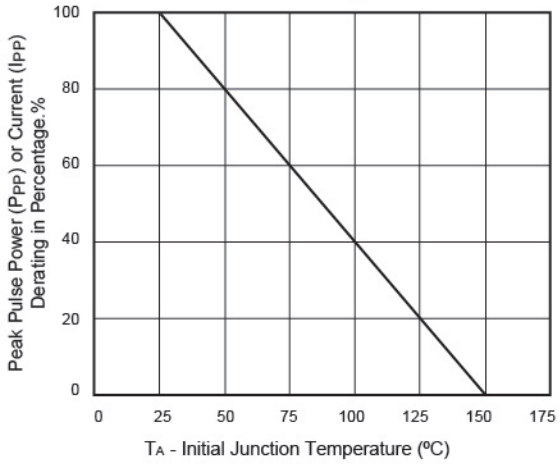
TVS Transients Clamping Waveform



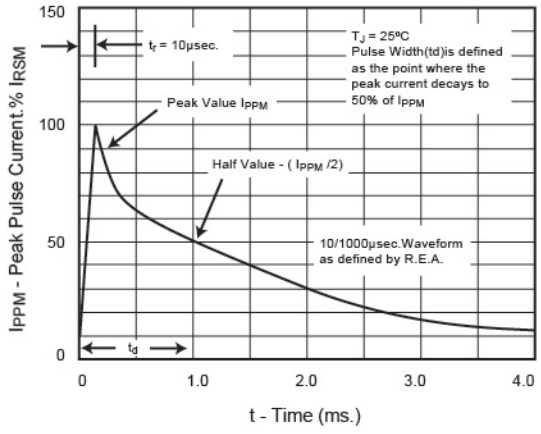
Peak Pulse Power Rating Curve



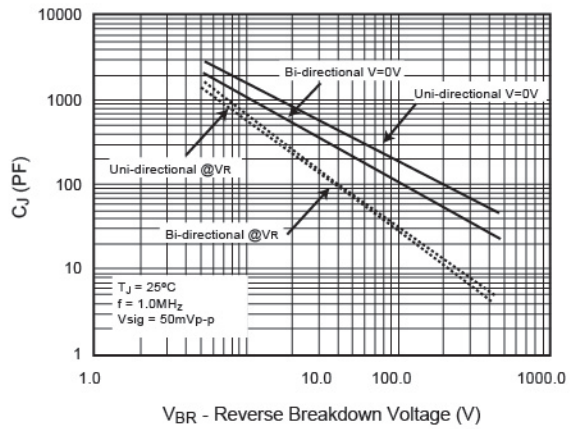
Pulse Derating Curve



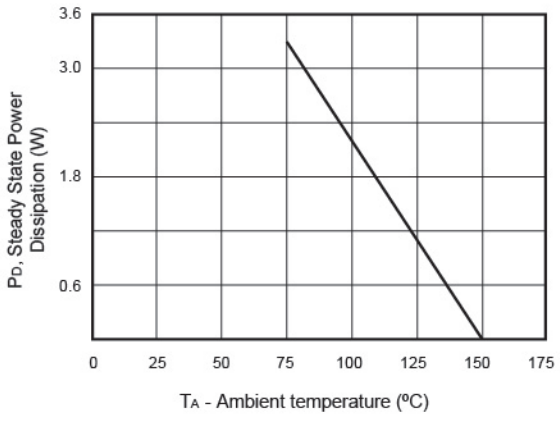
Pulse Waveform



Typical Junction Capacitance

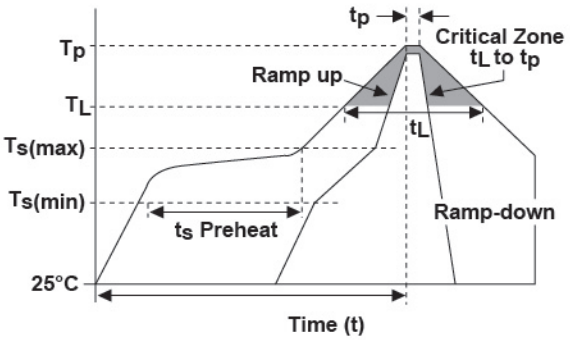


Steady State Power Dissipation Derating Curve

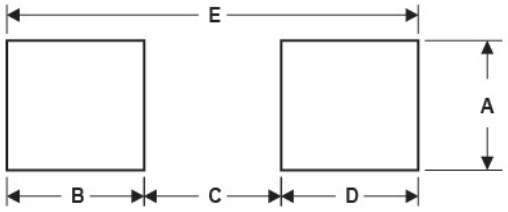


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



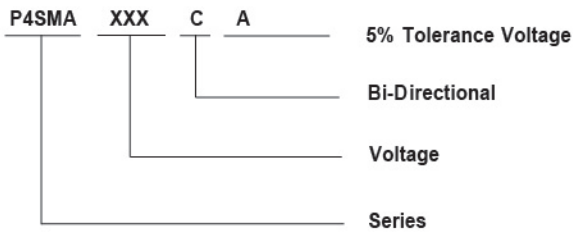
Recommended Pad Lay Out Dimensions



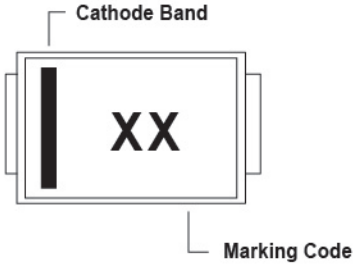
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.63	-	0.064	-
B	1.45	-	0.057	-
C	-	2.80	-	0.090
D	1.45	-	0.057	-
E	5.28 REF		0.208 REF	

Part Numbering and Marking System

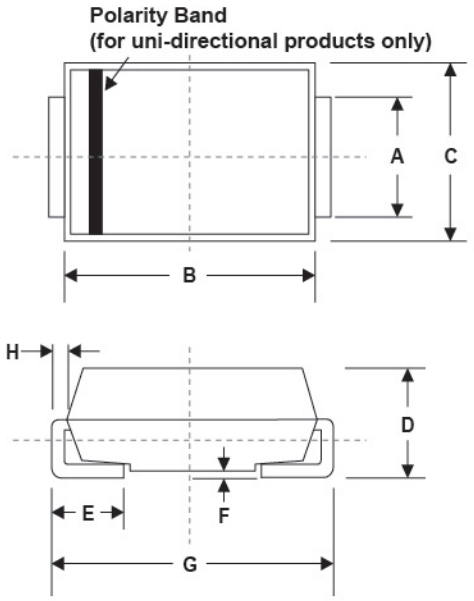
Part Numbering System



Marking System



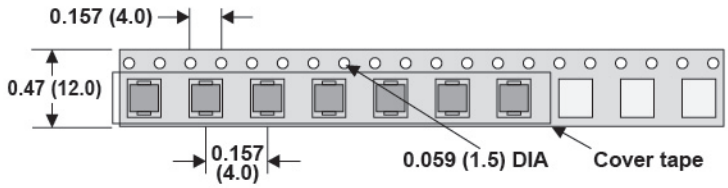
DO-214AC(SMA) Package Information

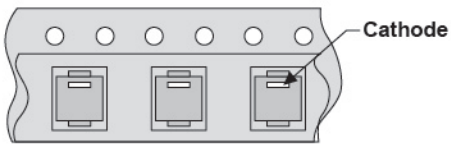


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.20	1.60	0.047	0.063
B	4.20	4.60	0.165	0.181
C	2.60	2.80	0.102	0.110
D	2.10	2.40	0.083	0.094
E	0.76	1.52	0.030	0.060
F	0.02	0.20	0.001	0.008
G	4.85	5.25	0.191	0.207
H	0.15	0.30	0.006	0.012

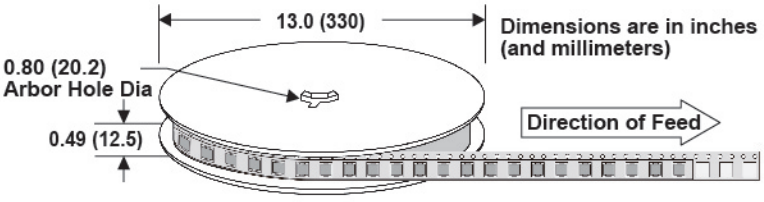
Packaging Specification

Part Number	Quantity	Reel Size
P4SMAxx (CA)	5000	13" inch





Polarity Band is only applicable to the undirectional package

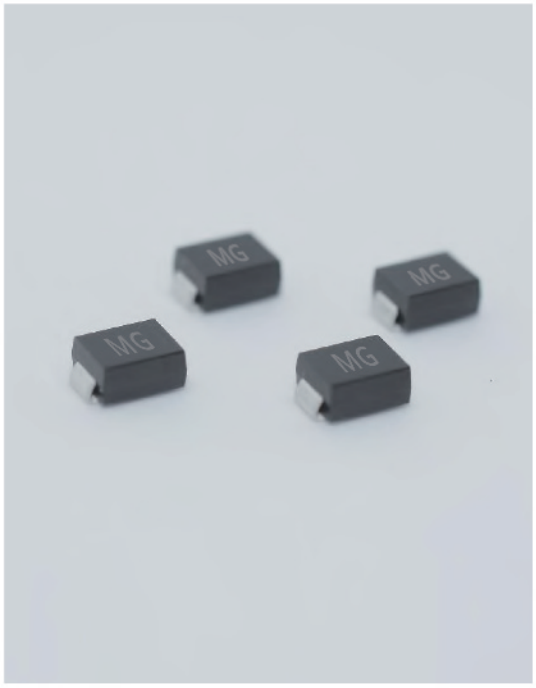


SMA6J Series

600W

Operating Voltage : 5.0 to 440V
Peak Pulse Power: 600W

DO-214AC (SMA)



RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 600 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

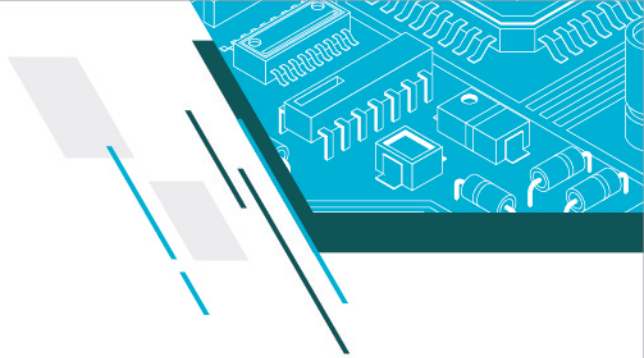
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	600	W
Steady State Power Dissipation at T_L=75°C,Lead lengths.375"(9.5mm)(Note2)	P_D	3.3	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	120	°C/W

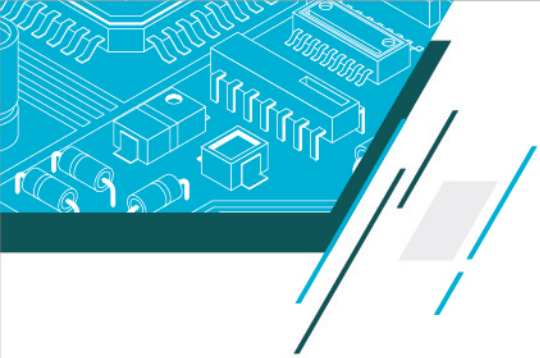
Notes : 1. Non-repetitive current pulse,T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMA6J5.0A	SMA6J5.0CA	6KE	6AE	5.0	6.4	7.0	10	9.2	65.3	800
SMA6J6.0A	SMA6J6.0CA	6KG	6AG	6.0	6.7	7.4	10	10.3	58.3	800
SMA6J6.5A	SMA6J6.5CA	6KK	6AK	6.5	7.2	8.0	10	11.2	53.6	500
SMA6J7.0A	SMA6J7.0CA	6KM	6AM	7.0	7.8	8.6	10	12.0	50.0	200
SMA6J7.5A	SMA6J7.5CA	6KP	6AP	7.5	8.3	9.2	1	12.9	46.6	100
SMA6J8.0A	SMA6J8.0CA	6KR	6AR	8.0	8.9	9.8	1	13.6	44.2	50
SMA6J8.5A	SMA6J8.5CA	6KT	6AT	8.5	9.4	10.4	1	14.4	41.7	20
SMA6J9.0A	SMA6J9.0CA	6KV	6AV	9.0	10.0	11.1	1	15.4	39.0	10
SMA6J10A	SMA6J10CA	6KX	6AX	10.0	11.1	12.3	1	17.0	35.3	5
SMA6J11A	SMA6J11CA	6KZ	6AZ	11.0	12.2	13.5	1	18.2	33.0	1
SMA6J12A	SMA6J12CA	6LE	6BE	12.0	13.3	14.7	1	19.9	30.2	1
SMA6J13A	SMA6J13CA	6LG	6BG	13.0	14.4	15.9	1	21.5	28.0	1
SMA6J14A	SMA6J14CA	6LK	6BK	14.0	15.6	17.2	1	23.2	25.9	1
SMA6J15A	SMA6J15CA	6LM	6BM	15.0	16.7	18.5	1	24.4	24.6	1
SMA6J16A	SMA6J16CA	6LP	6BP	16.0	17.8	19.7	1	26.0	23.1	1
SMA6J17A	SMA6J17CA	6LR	6BR	17.0	18.9	20.9	1	27.6	21.8	1
SMA6J18A	SMA6J18CA	6LT	6BT	18.0	20.0	22.1	1	29.2	20.6	1
SMA6J20A	SMA6J20CA	6LV	6BV	20.0	22.2	24.5	1	32.4	18.6	1
SMA6J22A	SMA6J22CA	6LX	6BX	22.0	24.4	26.9	1	35.5	16.9	1
SMA6J24A	SMA6J24CA	6LZ	6BZ	24.0	26.7	29.5	1	38.9	15.5	1
SMA6J26A	SMA6J26CA	6ME	6CE	26.0	28.9	31.9	1	42.1	14.3	1
SMA6J28A	SMA6J28CA	6MG	6CG	28.0	31.1	34.4	1	45.4	13.3	1
SMA6J30A	SMA6J30CA	6MK	6CK	30.0	33.3	36.8	1	48.4	12.4	1
SMA6J33A	SMA6J33CA	6MM	6CM	33.0	36.7	40.6	1	53.3	11.3	1
SMA6J36A	SMA6J36CA	6MP	6CP	36.0	40.0	44.2	1	58.1	10.4	1
SMA6J40A	SMA6J40CA	6MR	6CR	40.0	44.4	49.1	1	64.5	9.3	1
SMA6J43A	SMA6J43CA	6MT	6CT	43.0	47.8	52.8	1	69.4	8.7	1
SMA6J45A	SMA6J45CA	6MV	6CV	45.0	50.0	55.3	1	72.7	8.3	1
SMA6J48A	SMA6J48CA	6MX	6CX	48.0	53.3	58.9	1	77.4	7.8	1
SMA6J51A	SMA6J51CA	6MZ	6CZ	51.0	56.7	62.7	1	82.4	7.3	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



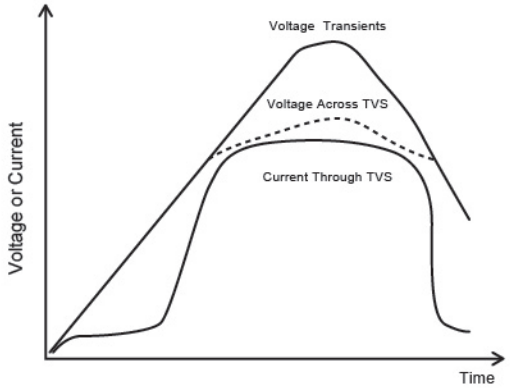
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMA6J54A	SMA6J54CA	6NE	6DE	54.0	60.0	66.3	1	87.1	6.9	1
SMA6J58A	SMA6J58CA	6NG	6DG	58.0	64.4	71.2	1	93.6	6.5	1
SMA6J60A	SMA6J60CA	6NK	6DK	60.0	66.7	73.7	1	96.8	6.2	1
SMA6J64A	SMA6J64CA	6NM	6DM	64.0	71.1	78.6	1	103.0	5.9	1
SMA6J70A	SMA6J70CA	6NP	6DP	70.0	77.8	86.0	1	113.0	5.3	1
SMA6J75A	SMA6J75CA	6NR	6DR	75.0	83.3	92.1	1	121.0	5.0	1
SMA6J78A	SMA6J78CA	6NT	6DT	78.0	86.7	95.8	1	126.0	4.8	1
SMA6J85A	SMA6J85CA	6NV	6DV	85.0	94.4	104.0	1	137.0	4.4	1
SMA6J90A	SMA6J90CA	6NX	6DX	90.0	100.0	111.0	1	146.0	4.1	1
SMA6J100A	SMA6J100CA	6NZ	6DZ	100.0	111.0	123.0	1	162.0	3.7	1
SMA6J110A	SMA6J110CA	6PE	6EE	110.0	122.0	135.0	1	177.0	3.4	1
SMA6J120A	SMA6J120CA	6PG	6EG	120.0	133.0	147.0	1	193.0	3.1	1
SMA6J130A	SMA6J130CA	6PK	6EK	130.0	144.0	159.0	1	209.0	2.9	1
SMA6J150A	SMA6J150CA	6PM	6EM	150.0	167.0	185.0	1	243.0	2.5	1
SMA6J160A	SMA6J160CA	6PP	6EP	160.0	178.0	197.0	1	259.0	2.3	1
SMA6J170A	SMA6J170CA	6PR	6ER	170.0	189.0	209.0	1	275.0	2.2	1
SMA6J180A	SMA6J180CA	6PT	6ET	180.0	201.0	222.0	1	292.0	2.1	1
SMA6J190A	SMA6J190CA	6PA	6EC	190.0	209.0	243.0	1	308.0	2.0	1
SMA6J200A	SMA6J200CA	6PV	6EV	200.0	224.0	247.0	1	324.0	1.9	1
SMA6J210A	SMA6J210CA	6PB	6ED	210.0	231.0	269.0	1	340.0	1.8	1
SMA6J220A	SMA6J220CA	6PX	6EX	220.0	246.0	272.0	1	356.0	1.7	1
SMA6J250A	SMA6J250CA	6PZ	6EZ	250.0	279.0	309.0	1	405.0	1.5	1
SMA6J300A	SMA6J300CA	6QE	6FE	300.0	335.0	371.0	1	486.0	1.3	1
SMA6J350A	SMA6J350CA	6QG	6FG	350.0	391.0	432.0	1	567.0	1.1	1
SMA6J400A	SMA6J400CA	6QK	6FK	400.0	447.0	494.0	1	648.0	0.9	1
SMA6J440A	SMA6J440CA	6QM	6FM	440.0	492.0	543.0	1	713.0	0.8	1

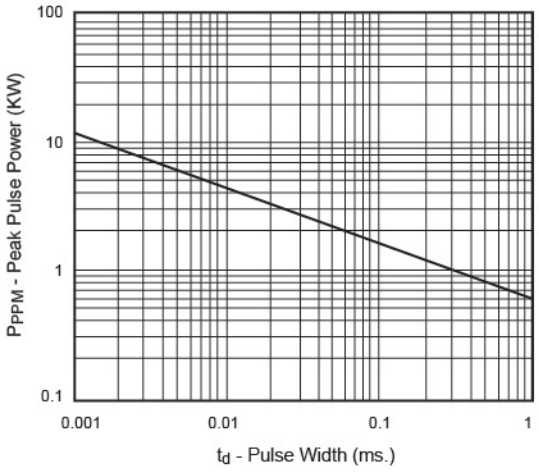
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

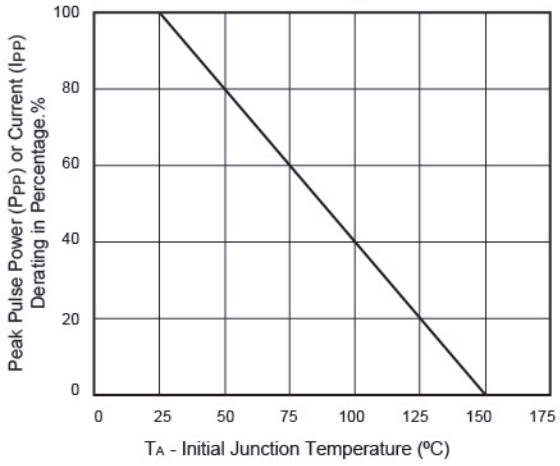
TVS Transients Clamping Waveform



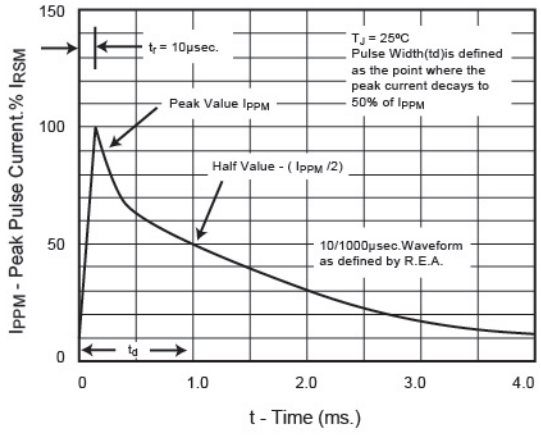
Peak Pulse Power Rating Curve



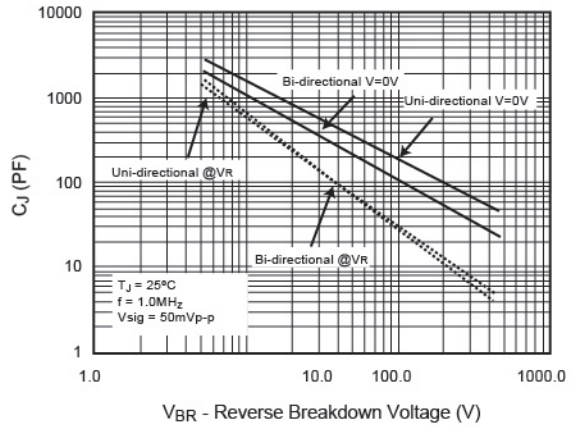
Pulse Derating Curve



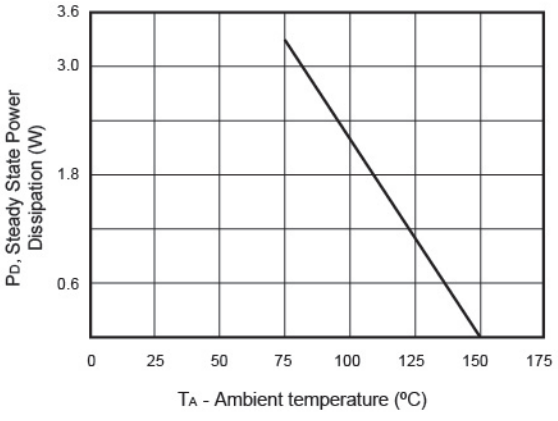
Pulse Waveform



Typical Junction Capacitance

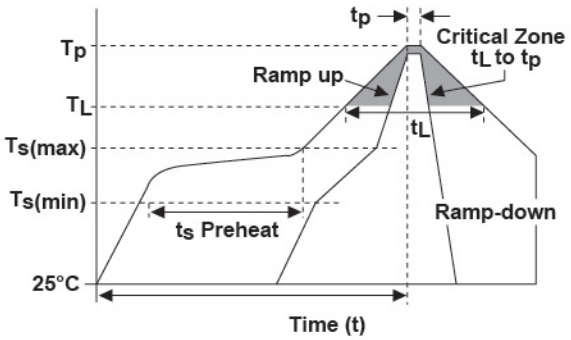


Steady State Power Dissipation Derating Curve

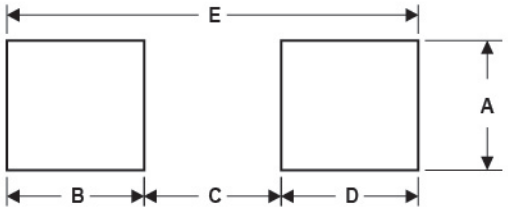


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



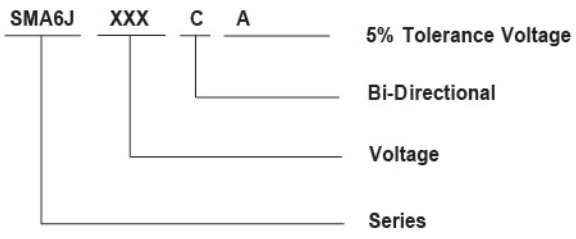
Recommended Pad Lay Out Dimensions



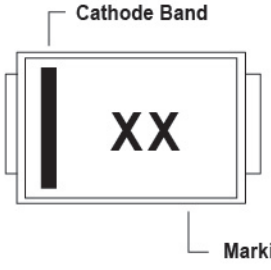
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.63	-	0.064	-
B	1.45	-	0.057	-
C	-	2.80	-	0.090
D	1.45	-	0.057	-
E	5.28 REF		0.208 REF	

Part Numbering and Marking System

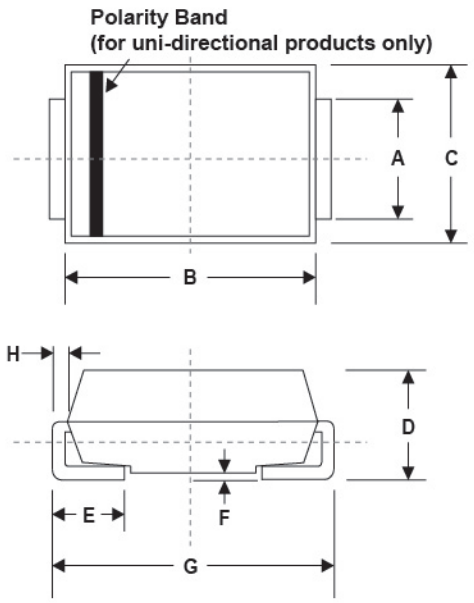
Part Numbering System



Marking System



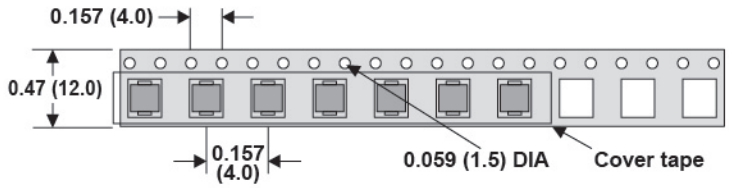
DO-214AC(SMA) Package Information

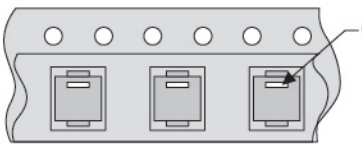


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.20	1.60	0.047	0.063
B	4.20	4.60	0.165	0.181
C	2.60	2.80	0.102	0.110
D	2.10	2.40	0.083	0.094
E	0.76	1.52	0.030	0.060
F	0.02	0.20	0.001	0.008
G	4.85	5.25	0.191	0.207
H	0.15	0.30	0.006	0.012

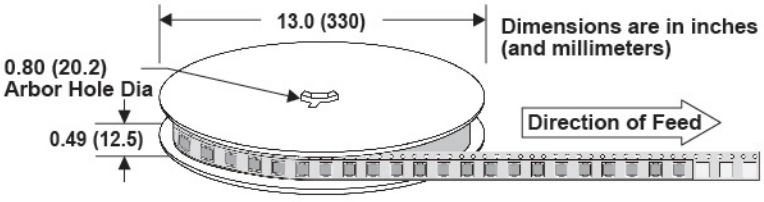
Packaging Specification

Part Number	Quantity	Reel Size
SMA6Jxx (CA)	5000	13" inch





Polarity Band is only applicable to the undirectional package

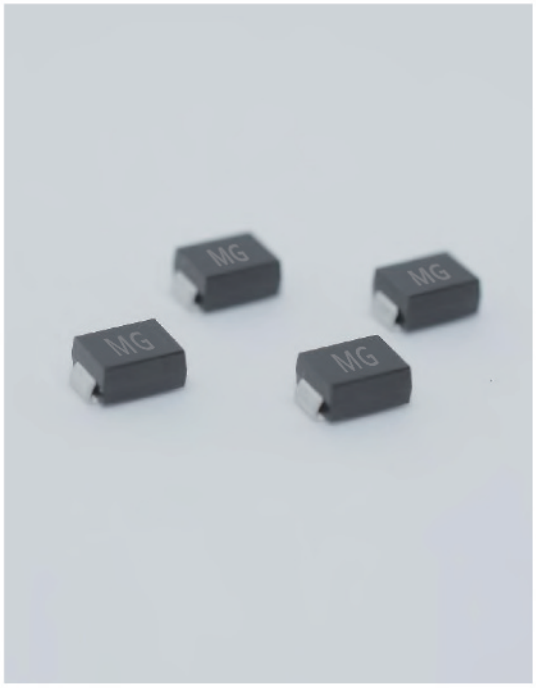


SMBJ Series

600W

Operating Voltage : 3.3 to 550V
Peak Pulse Power: 600W

DO-214AA (SMB)



RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 600 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

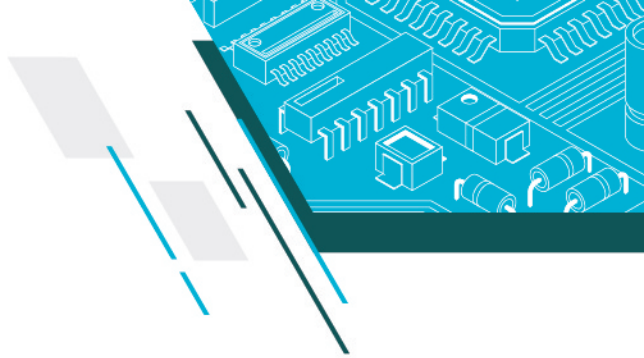
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	600	W
Steady State Power Dissipation at T_A=50°C(Note2)	P_D	5.0	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	90	°C/W

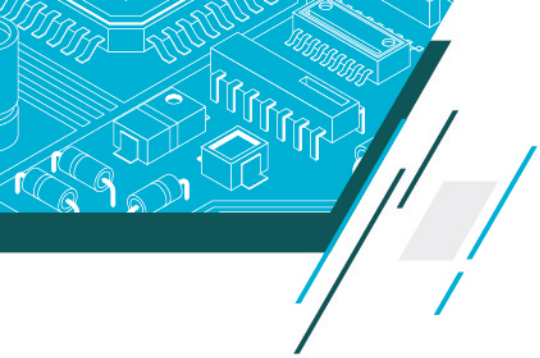
Notes : 1. Non-repetitive current pulse, T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMBJ3.3A	SMBJ3.3CA	3V3	3V3C	3.3	4.6	5.6	100	8.2	50.0	2000
SMBJ5.0A	SMBJ5.0CA	KE	AE	5.0	6.4	7.0	10	9.2	65.3	800
SMBJ6.0A	SMBJ6.0CA	KG	AG	6.0	6.7	7.4	10	10.3	58.3	800
SMBJ6.5A	SMBJ6.5CA	KK	AK	6.5	7.2	8.0	10	11.2	53.6	500
SMBJ7.0A	SMBJ7.0CA	KM	AM	7.0	7.8	8.6	10	12.0	50.0	200
SMBJ7.5A	SMBJ7.5CA	KP	AP	7.5	8.3	9.2	1	12.9	46.6	100
SMBJ8.0A	SMBJ8.0CA	KR	AR	8.0	8.9	9.8	1	13.6	44.2	50
SMBJ8.5A	SMBJ8.5CA	KT	AT	8.5	9.4	10.4	1	14.4	41.7	20
SMBJ9.0A	SMBJ9.0CA	KV	AV	9.0	10.0	11.1	1	15.4	39.0	10
SMBJ10A	SMBJ10CA	KX	AX	10.0	11.1	12.3	1	17.0	35.3	5
SMBJ11A	SMBJ11CA	KZ	AZ	11.0	12.2	13.5	1	18.2	33.0	1
SMBJ12A	SMBJ12CA	LE	BE	12.0	13.3	14.7	1	19.9	30.2	1
SMBJ13A	SMBJ13CA	LG	BG	13.0	14.4	15.9	1	21.5	28.0	1
SMBJ14A	SMBJ14CA	LK	BK	14.0	15.6	17.2	1	23.2	25.9	1
SMBJ15A	SMBJ15CA	LM	BM	15.0	16.7	18.5	1	24.4	24.6	1
SMBJ16A	SMBJ16CA	LP	BP	16.0	17.8	19.7	1	26.0	23.1	1
SMBJ17A	SMBJ17CA	LR	BR	17.0	18.9	20.9	1	27.6	21.8	1
SMBJ18A	SMBJ18CA	LT	BT	18.0	20.0	22.1	1	29.2	20.6	1
SMBJ20A	SMBJ20CA	LV	BV	20.0	22.2	24.5	1	32.4	18.6	1
SMBJ22A	SMBJ22CA	LX	BX	22.0	24.4	26.9	1	35.5	16.9	1
SMBJ24A	SMBJ24CA	LZ	BZ	24.0	26.7	29.5	1	38.9	15.5	1
SMBJ26A	SMBJ26CA	ME	CE	26.0	28.9	31.9	1	42.1	14.3	1
SMBJ28A	SMBJ28CA	MG	CG	28.0	31.1	34.4	1	45.4	13.3	1
SMBJ30A	SMBJ30CA	MK	CK	30.0	33.3	36.8	1	48.4	12.4	1
SMBJ33A	SMBJ33CA	MM	CM	33.0	36.7	40.6	1	53.3	11.3	1
SMBJ36A	SMBJ36CA	MP	CP	36.0	40.0	44.2	1	58.1	10.4	1
SMBJ40A	SMBJ40CA	MR	CR	40.0	44.4	49.1	1	64.5	9.3	1
SMBJ43A	SMBJ43CA	MT	CT	43.0	47.8	52.8	1	69.4	8.7	1
SMBJ45A	SMBJ45CA	MV	CV	45.0	50.0	55.3	1	72.7	8.3	1
SMBJ48A	SMBJ48CA	MX	CX	48.0	53.3	58.9	1	77.4	7.8	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



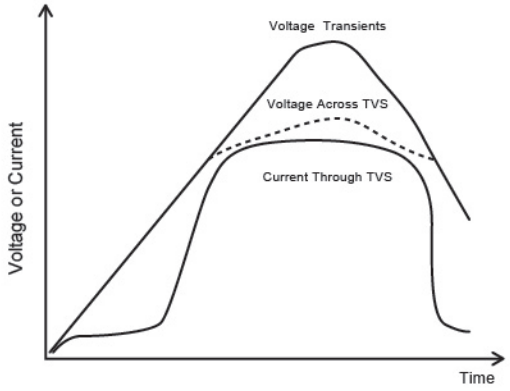
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMBJ51A	SMBJ51CA	MZ	CZ	51.0	56.7	62.7	1	82.4	7.3	1
SMBJ54A	SMBJ54CA	NE	DE	54.0	60.0	66.3	1	87.1	6.9	1
SMBJ58A	SMBJ58CA	NG	DG	58.0	64.4	71.2	1	93.6	6.5	1
SMBJ60A	SMBJ60CA	NK	DK	60.0	66.7	73.7	1	96.8	6.2	1
SMBJ64A	SMBJ64CA	NM	DM	64.0	71.1	78.6	1	103.0	5.9	1
SMBJ70A	SMBJ70CA	NP	DP	70.0	77.8	86.0	1	113.0	5.3	1
SMBJ75A	SMBJ75CA	NR	DR	75.0	83.3	92.1	1	121.0	5.0	1
SMBJ78A	SMBJ78CA	NT	DT	78.0	86.7	95.8	1	126.0	4.8	1
SMBJ85A	SMBJ85CA	NV	DV	85.0	94.4	104.0	1	137.0	4.4	1
SMBJ90A	SMBJ90CA	NX	DX	90.0	100.0	111.0	1	146.0	4.1	1
SMBJ100A	SMBJ100CA	NZ	DZ	100.0	111.0	123.0	1	162.0	3.7	1
SMBJ110A	SMBJ110CA	PE	EE	110.0	122.0	135.0	1	177.0	3.4	1
SMBJ120A	SMBJ120CA	PG	EG	120.0	133.0	147.0	1	193.0	3.1	1
SMBJ130A	SMBJ130CA	PK	EK	130.0	144.0	159.0	1	209.0	2.9	1
SMBJ150A	SMBJ150CA	PM	EM	150.0	167.0	185.0	1	243.0	2.5	1
SMBJ160A	SMBJ160CA	PP	EP	160.0	178.0	197.0	1	259.0	2.3	1
SMBJ170A	SMBJ170CA	PR	ER	170.0	189.0	209.0	1	275.0	2.2	1
SMBJ180A	SMBJ180CA	PT	ET	180.0	201.0	222.0	1	292.0	2.1	1
SMBJ200A	SMBJ200CA	PV	EV	200.0	224.0	247.0	1	324.0	1.9	1
SMBJ220A	SMBJ220CA	PX	EX	220.0	246.0	272.0	1	356.0	1.7	1
SMBJ250A	SMBJ250CA	PZ	EZ	250.0	279.0	309.0	1	405.0	1.5	1
SMBJ300A	SMBJ300CA	QE	FE	300.0	335.0	371.0	1	486.0	1.3	1
SMBJ350A	SMBJ350CA	QG	FG	350.0	391.0	432.0	1	567.0	1.1	1
SMBJ400A	SMBJ400CA	QK	FK	400.0	447.0	494.0	1	648.0	0.9	1
SMBJ440A	SMBJ440CA	QM	FM	440.0	492.0	543.0	1	713.0	0.9	1
SMBJ480A	SMBJ480CA	QP	FP	480.0	536.0	593.0	1	750.0	0.8	1
SMBJ500A	SMBJ500CA	QV	FV	500.0	558.0	618.0	1	762.0	0.8	1
SMBJ510A	SMBJ510CA	QX	FX	510.0	570.0	630.0	1	762.0	0.8	1
SMBJ520A	SMBJ520CA	QR	FR	520.0	578.0	640.0	1	762.0	0.8	1
SMBJ550A	SMBJ550CA	QT	FT	550.0	615.0	680.0	1	860.0	0.7	1

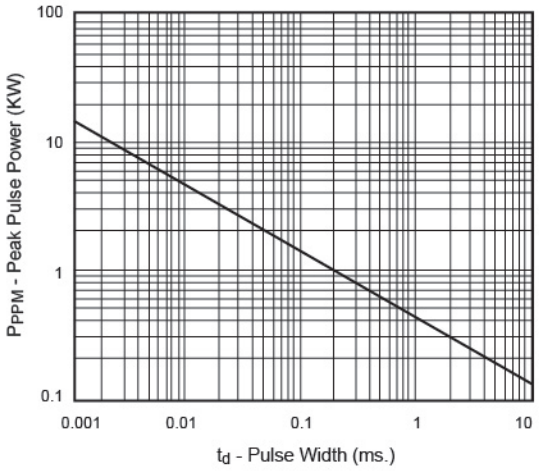
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

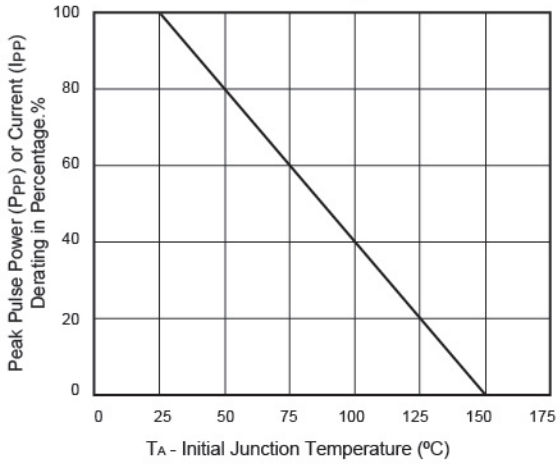
TVS Transients Clamping Waveform



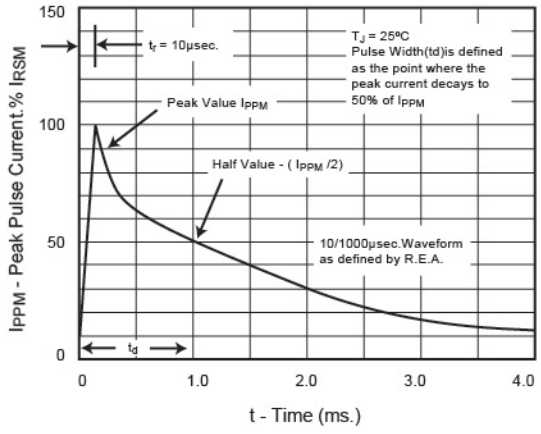
Peak Pulse Power Rating Curve



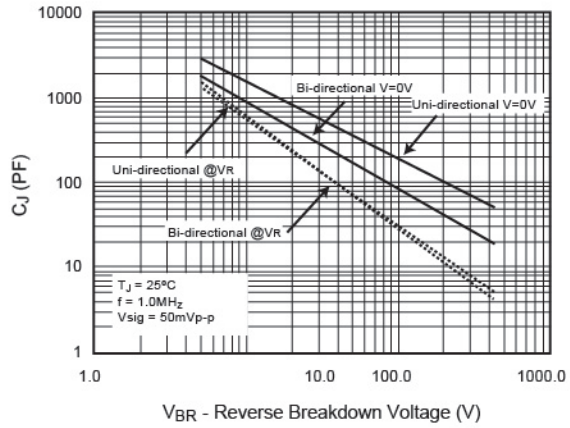
Pulse Derating Curve



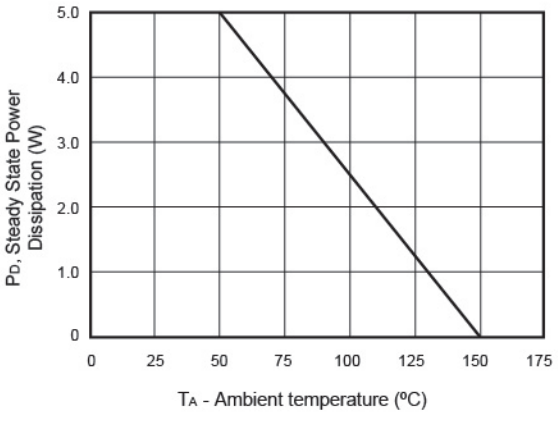
Pulse Waveform



Typical Junction Capacitance

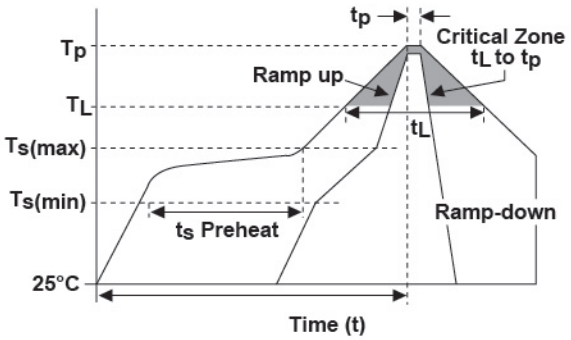


Steady State Power Dissipation Derating Curve

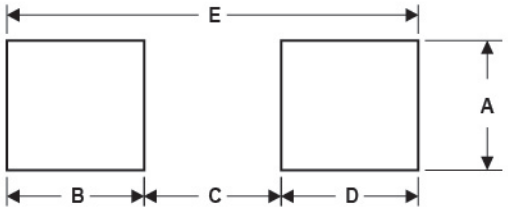


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



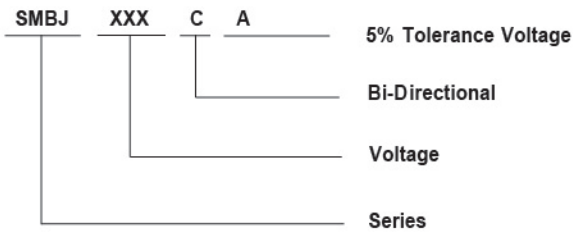
Recommended Pad Lay Out Dimensions



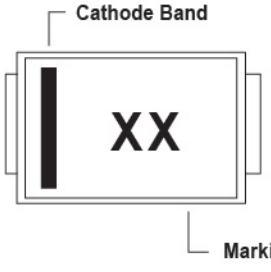
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	-	0.087	-
B	1.45	-	0.057	-
C	-	2.55	-	0.010
D	1.45	-	0.057	-
E	5.60 REF		0.220 REF	

Part Numbering and Marking System

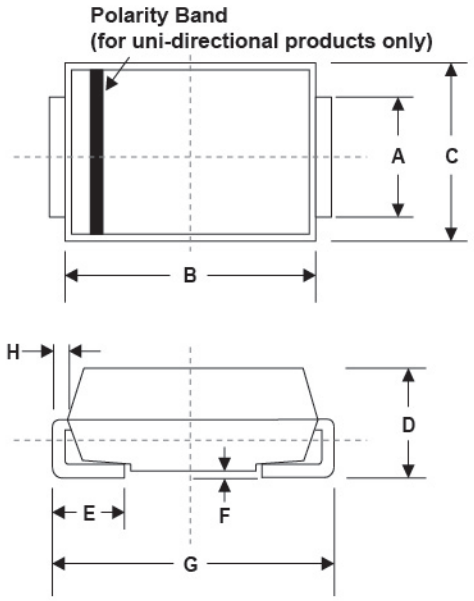
Part Numbering System



Marking System



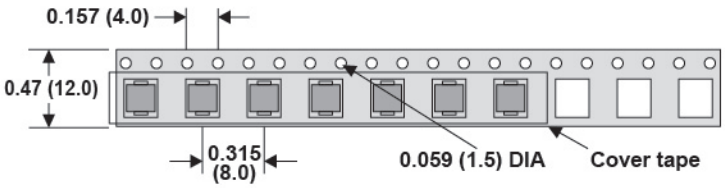
DO-214AA(SMB) Package Information

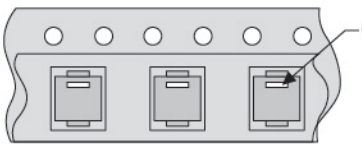


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.80	2.20	0.071	0.087
B	4.30	4.70	0.170	0.185
C	3.40	3.90	0.134	0.153
D	2.15	2.55	0.085	0.100
E	1.00	1.50	0.039	0.059
F	0.02	0.20	0.001	0.008
G	5.10	5.50	0.200	0.216
H	0.15	0.30	0.006	0.012

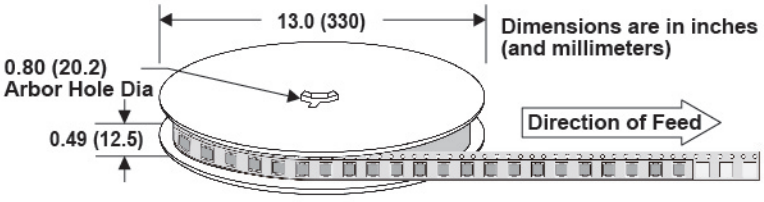
Packaging Specification

Part Number	Quantity	Reel Size
SMBJxx (CA)	3000	13" inch





Polarity Band is only applicable to the undirectional package



P6SMB Series

600W

Operating Voltage : 6.8 to 600V
Peak Pulse Power: 600W

DO-214AA (SMB)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 600 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

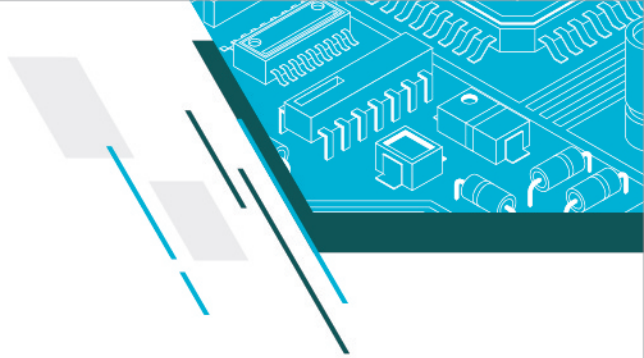
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	600	W
Steady State Power Dissipation at T_A=50°C(Note2)	P_D	5.0	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	90	°C/W

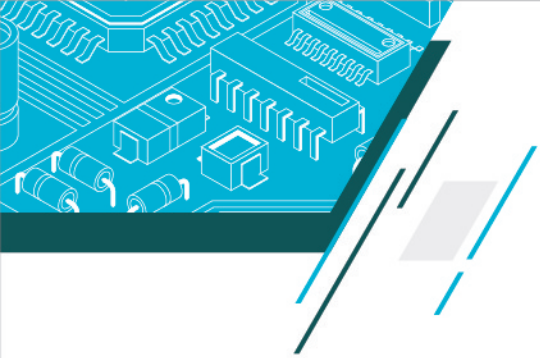
Notes : 1. Non-repetitive current pulse, T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
P6SMB6.8A	P6SMB6.8CA	6V8A	6V8C	5.8	6.5	7.1	10	10.5	58.1	1000
P6SMB7.5A	P6SMB7.5CA	7V5A	7V5C	6.4	7.1	7.9	10	11.3	54.0	500
P6SMB8.2A	P6SMB8.2CA	8V2A	8V2C	7.0	7.8	8.6	10	12.1	50.4	200
P6SMB9.1A	P6SMB9.1CA	9V1A	9V1C	7.8	8.7	9.6	1	13.4	45.5	50
P6SMB10A	P6SMB10CA	10A	10C	8.6	9.5	10.5	1	14.5	42.1	10
P6SMB11A	P6SMB11CA	11A	11C	9.4	10.5	11.6	1	15.6	39.1	5
P6SMB12A	P6SMB12CA	12A	12C	10.2	11.4	12.6	1	16.7	36.5	5
P6SMB13A	P6SMB13CA	13A	13C	11.1	12.4	13.7	1	18.2	33.5	1
P6SMB15A	P6SMB15CA	15A	15C	12.8	14.3	15.8	1	21.2	28.8	1
P6SMB16A	P6SMB16CA	16A	16C	13.6	15.2	16.8	1	22.5	27.1	1
P6SMB18A	P6SMB18CA	18A	18C	15.3	17.1	18.9	1	25.5	24.2	1
P6SMB20A	P6SMB20CA	20A	20C	17.1	19.0	21.0	1	27.7	22.0	1
P6SMB22A	P6SMB22CA	22A	22C	18.8	20.9	23.1	1	30.6	19.9	1
P6SMB24A	P6SMB24CA	24A	24C	20.5	22.8	25.2	1	33.2	18.4	1
P6SMB27A	P6SMB27CA	27A	27C	23.1	25.7	28.4	1	37.5	16.3	1
P6SMB30A	P6SMB30CA	30A	30C	25.6	28.5	31.5	1	41.4	14.7	1
P6SMB33A	P6SMB33CA	33A	33C	28.2	31.4	34.7	1	45.7	13.3	1
P6SMB36A	P6SMB36CA	36A	36C	30.8	34.2	37.8	1	49.9	12.2	1
P6SMB39A	P6SMB39CA	39A	39C	33.3	37.1	41.0	1	53.9	11.3	1
P6SMB43A	P6SMB43CA	43A	43C	36.8	40.9	45.2	1	59.3	10.3	1
P6SMB47A	P6SMB47CA	47A	47C	40.2	44.7	49.4	1	64.8	9.4	1
P6SMB51A	P6SMB51CA	51A	51C	43.6	48.5	53.6	1	70.1	8.7	1
P6SMB56A	P6SMB56CA	56A	56C	47.8	53.2	58.8	1	77.0	7.9	1
P6SMB62A	P6SMB62CA	62A	62C	53.0	58.9	65.1	1	85.0	7.2	1
P6SMB68A	P6SMB68CA	68A	68C	58.1	64.6	71.4	1	92.0	6.6	1
P6SMB75A	P6SMB75CA	75A	75C	64.1	71.3	78.8	1	103.0	5.9	1
P6SMB82A	P6SMB82CA	82A	82C	70.1	77.9	86.1	1	113.0	5.4	1
P6SMB91A	P6SMB91CA	91A	91C	77.8	86.5	95.5	1	125.0	4.9	1
P6SMB100A	P6SMB100CA	100A	100C	85.5	95.0	105.0	1	137.0	4.5	1
P6SMB110A	P6SMB110CA	110A	110C	94.0	105.0	116.0	1	152.0	4.0	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



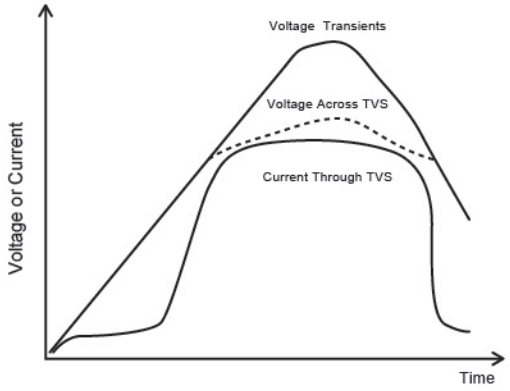
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
P6SMB120A	P6SMB120CA	120A	120C	102.0	114.0	126.0	1	165.0	3.7	1
P6SMB130A	P6SMB130CA	130A	130C	111.0	124.0	137.0	1	179.0	3.4	1
P6SMB150A	P6SMB150CA	150A	150C	128.0	143.0	158.0	1	207.0	2.9	1
P6SMB160A	P6SMB160CA	160A	160C	136.0	152.0	168.0	1	219.0	2.8	1
P6SMB170A	P6SMB170CA	170A	170C	145.0	162.0	179.0	1	234.0	2.6	1
P6SMB180A	P6SMB180CA	180A	180C	154.0	171.0	189.0	1	246.0	2.5	1
P6SMB200A	P6SMB200CA	200A	200C	171.0	190.0	210.0	1	274.0	2.2	1
P6SMB220A	P6SMB220CA	220A	220C	185.0	209.0	231.0	1	328.0	1.9	1
P6SMB250A	P6SMB250CA	250A	250C	214.0	237.0	263.0	1	344.0	1.8	1
P6SMB300A	P6SMB300CA	300A	300C	256.0	285.0	315.0	1	414.0	1.5	1
P6SMB350A	P6SMB350CA	350A	350C	300.0	332.0	368.0	1	482.0	1.3	1
P6SMB400A	P6SMB400CA	400A	400C	342.0	380.0	420.0	1	548.0	1.1	1
P6SMB440A	P6SMB440CA	440A	440C	376.0	418.0	462.0	1	602.0	1.0	1
P6SMB480A	P6SMB480CA	480A	480C	408.0	456.0	504.0	1	658.0	0.9	1
P6SMB510A	P6SMB510CA	510A	510C	434.0	485.0	535.0	1	698.0	0.9	1
P6SMB530A	P6SMB530CA	530A	530C	451.0	503.5	557.0	1	725.0	0.8	1
P6SMB540A	P6SMB540CA	540A	540C	459.0	513.0	567.0	1	740.0	0.8	1
P6SMB550A	P6SMB550CA	550A	550C	467.0	522.5	578.0	1	760.0	0.8	1
P6SMB600A	P6SMB600CA	600A	600C	510.0	570.0	630.0	1	828.0	0.8	1

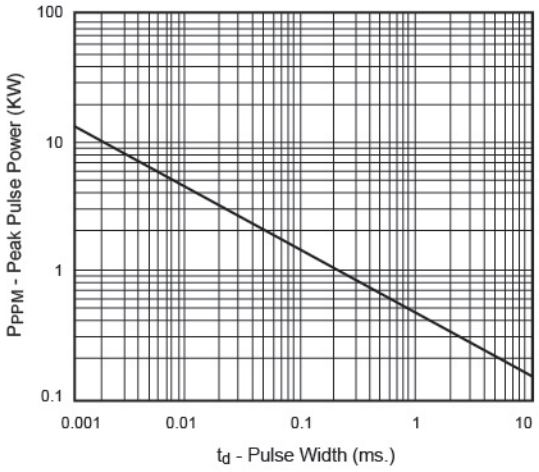
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

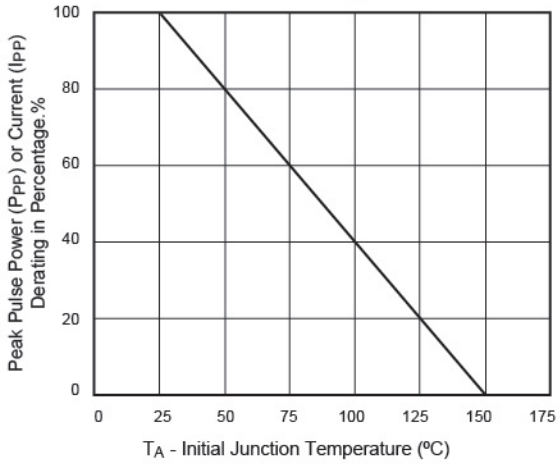
TVS Transients Clamping Waveform



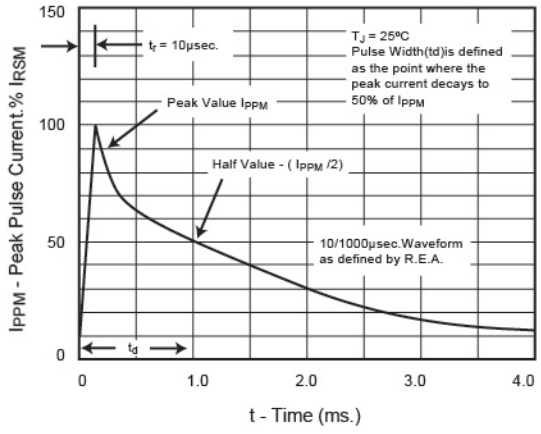
Peak Pulse Power Rating Curve



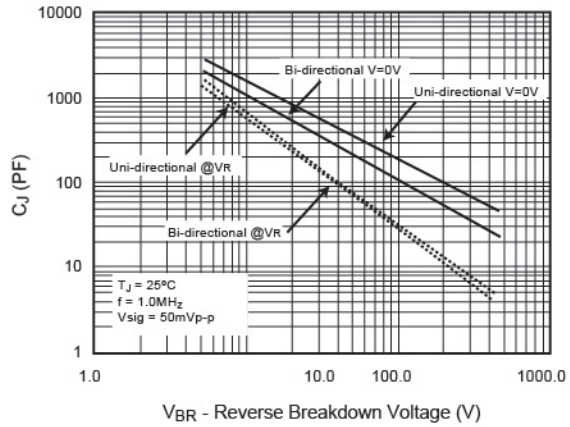
Pulse Derating Curve



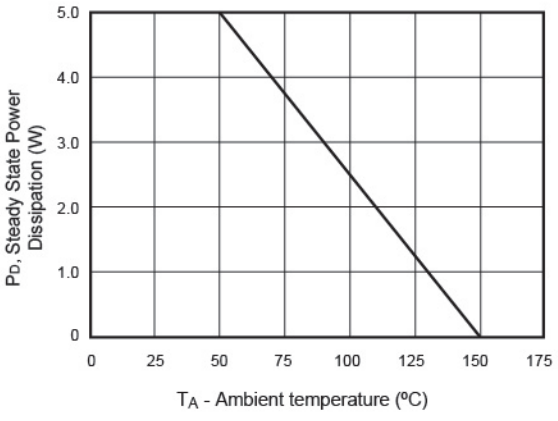
Pulse Waveform



Typical Junction Capacitance

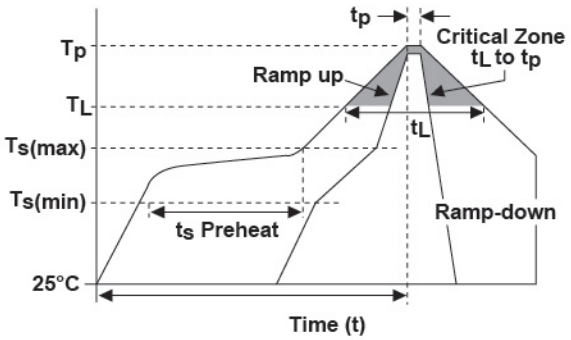


Steady State Power Dissipation Derating Curve

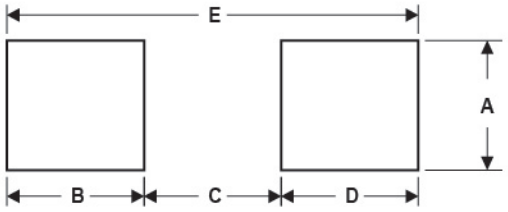


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



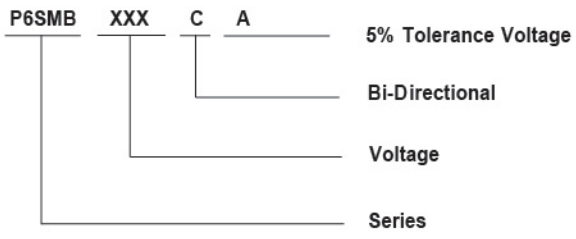
Recommended Pad Lay Out Dimensions



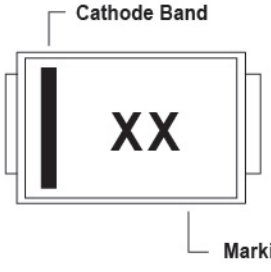
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	-	0.087	-
B	1.45	-	0.057	-
C	-	2.55	-	0.010
D	1.45	-	0.057	-
E	5.60 REF		0.220 REF	

Part Numbering and Marking System

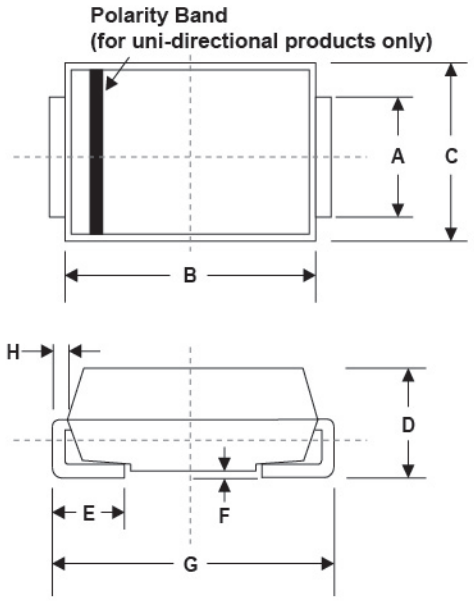
Part Numbering System



Marking System



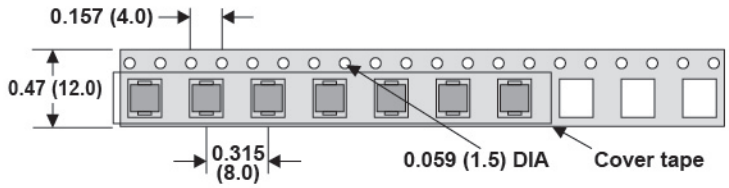
DO-214AA(SMB) Package Information

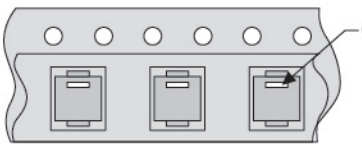


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.80	2.20	0.071	0.087
B	4.30	4.70	0.170	0.185
C	3.40	3.90	0.134	0.153
D	2.15	2.55	0.085	0.100
E	1.00	1.50	0.039	0.059
F	0.02	0.20	0.001	0.008
G	5.10	5.50	0.200	0.216
H	0.15	0.30	0.006	0.012

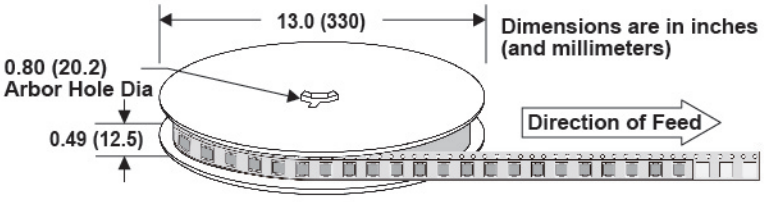
Packaging Specification

Part Number	Quantity	Reel Size
P6SMBxx (CA)	3000	13" inch





Polarity Band is only applicable to the undirectional package



SMCJ Series

1500W

Operating Voltage : 5.0 to 550V
Peak Pulse Power: 1500W

DO-214AB (SMC)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 1500 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant
- Complies with following standards：

  IEC61000-4-2 (ESD) ±30kV(air), ±30kV(contact)

  IEC61000-4-4 (EFT) 40A (5/50ns)

Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

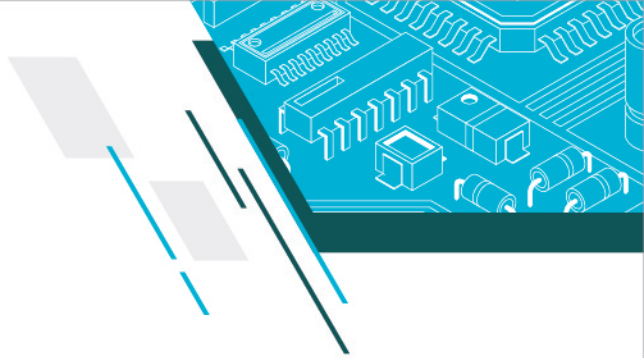
ESD protection of data lines in accordance with IEC61000-4-2

EFT protection of data lines in accordance with IEC61000-4-4

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	1500	W
Steady State Power Dissipation at T_L=50°C,Lead lengths.375”(9.5mm) (Note2)	P_D	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note3)	I_{FSM}	200	A
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	75	°C/W

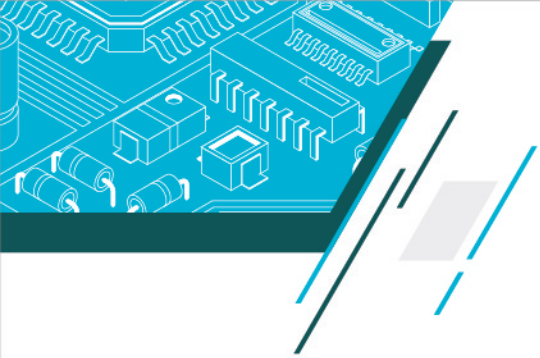
Notes : 1. Non-repetitive current pulse,T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMCJ5.0A	SMCJ5.0CA	GDE	BDE	5.0	6.4	7.0	10	9.2	163.0	800
SMCJ6.0A	SMCJ6.0CA	GDG	BDG	6.0	6.7	7.4	10	10.3	145.7	800
SMCJ6.5A	SMCJ6.5CA	GDK	BDK	6.5	7.2	8.0	10	11.2	134.0	500
SMCJ7.0A	SMCJ7.0CA	GDM	BDM	7.0	7.8	8.6	10	12.0	125.0	200
SMCJ7.5A	SMCJ7.5CA	GDP	BDP	7.5	8.3	9.2	1	12.9	116.3	100
SMCJ8.0A	SMCJ8.0CA	GDR	BDR	8.0	8.9	9.8	1	13.6	110.3	50
SMCJ8.5A	SMCJ8.5CA	GDT	BDT	8.5	9.4	10.4	1	14.4	104.2	20
SMCJ9.0A	SMCJ9.0CA	GDV	BDV	9.0	10.0	11.1	1	15.4	97.4	10
SMCJ10A	SMCJ10CA	GDX	BDX	10.0	11.1	12.3	1	17.0	88.3	5
SMCJ11A	SMCJ11CA	GDZ	BDZ	11.0	12.2	13.5	1	18.2	82.5	1
SMCJ12A	SMCJ12CA	GEE	BEE	12.0	13.3	14.7	1	19.9	75.4	1
SMCJ13A	SMCJ13CA	GEG	BEG	13.0	14.4	15.9	1	21.5	69.8	1
SMCJ14A	SMCJ14CA	GEK	BEK	14.0	15.6	17.2	1	23.2	64.7	1
SMCJ15A	SMCJ15CA	GEM	BEM	15.0	16.7	18.5	1	24.4	61.5	1
SMCJ16A	SMCJ16CA	GEP	BEP	16.0	17.8	19.7	1	26.0	57.7	1
SMCJ17A	SMCJ17CA	GER	BER	17.0	18.9	20.9	1	27.6	54.4	1
SMCJ18A	SMCJ18CA	GET	BET	18.0	20.0	22.1	1	29.2	51.4	1
SMCJ20A	SMCJ20CA	GEV	BEV	20.0	22.2	24.5	1	32.4	46.3	1
SMCJ22A	SMCJ22CA	GEX	BEX	22.0	24.4	26.9	1	35.5	42.3	1
SMCJ24A	SMCJ24CA	GEZ	BEZ	24.0	26.7	29.5	1	38.9	38.6	1
SMCJ26A	SMCJ26CA	GFE	BFE	26.0	28.9	31.9	1	42.1	35.7	1
SMCJ28A	SMCJ28CA	GFG	BFG	28.0	31.1	34.4	1	45.4	33.1	1
SMCJ30A	SMCJ30CA	GFK	BFK	30.0	33.3	36.8	1	48.4	31.0	1
SMCJ33A	SMCJ33CA	GFM	BFM	33.0	36.7	40.6	1	53.3	28.2	1
SMCJ36A	SMCJ36CA	GFP	BFP	36.0	40.0	44.2	1	58.1	25.9	1
SMCJ40A	SMCJ40CA	GFR	BFR	40.0	44.4	49.1	1	64.5	23.3	1
SMCJ43A	SMCJ43CA	GFT	BFT	43.0	47.8	52.8	1	69.4	21.7	1
SMCJ45A	SMCJ45CA	GFV	BFV	45.0	50.0	55.3	1	72.7	20.6	1
SMCJ48A	SMCJ48CA	GFX	BFX	48.0	53.3	58.9	1	77.4	19.4	1
SMCJ51A	SMCJ51CA	GFZ	BFZ	51.0	56.7	62.7	1	82.4	18.2	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



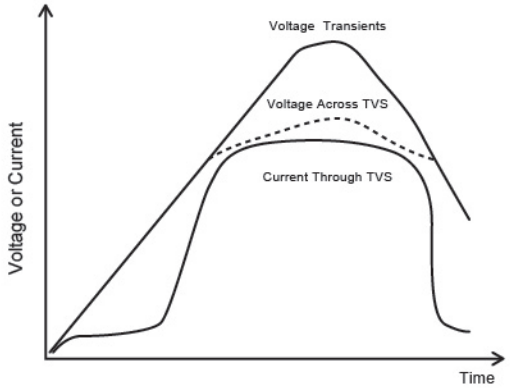
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMCJ54A	SMCJ54CA	GGE	BGE	54.0	60.0	66.3	1	87.1	17.3	1
SMCJ58A	SMCJ58CA	GGG	BGG	58.0	64.4	71.2	1	93.6	16.1	1
SMCJ60A	SMCJ60CA	GGK	BGK	60.0	66.7	73.7	1	96.8	15.5	1
SMCJ64A	SMCJ64CA	GGM	BGM	64.0	71.1	78.6	1	103.0	14.6	1
SMCJ70A	SMCJ70CA	GGP	BGP	70.0	77.8	86.0	1	113.0	13.3	1
SMCJ75A	SMCJ75CA	GGR	BGR	75.0	83.3	92.1	1	121.0	12.4	1
SMCJ78A	SMCJ78CA	GGT	BGT	78.0	86.7	95.8	1	126.0	11.9	1
SMCJ85A	SMCJ85CA	GGV	BGV	85.0	94.4	104.0	1	137.0	11.0	1
SMCJ90A	SMCJ90CA	GGX	BGX	90.0	100.0	111.0	1	146.0	10.3	1
SMCJ100A	SMCJ100CA	GGZ	BGZ	100.0	111.0	123.0	1	162.0	9.3	1
SMCJ110A	SMCJ110CA	GHE	BHE	110.0	122.0	135.0	1	177.0	8.5	1
SMCJ120A	SMCJ120CA	GHG	BHG	120.0	133.0	147.0	1	193.0	7.8	1
SMCJ130A	SMCJ130CA	GHK	BHK	130.0	144.0	159.0	1	209.0	7.2	1
SMCJ150A	SMCJ150CA	GHM	BHM	150.0	167.0	185.0	1	243.0	6.2	1
SMCJ160A	SMCJ160CA	GHP	BHP	160.0	178.0	197.0	1	259.0	5.8	1
SMCJ170A	SMCJ170CA	GHR	BHR	170.0	189.0	209.0	1	275.0	5.5	1
SMCJ180A	SMCJ180CA	GHT	BHT	180.0	201.0	222.0	1	292.0	5.1	1
SMCJ200A	SMCJ200CA	GHV	BHV	200.0	224.0	247.0	1	324.0	4.6	1
SMCJ220A	SMCJ220CA	GHX	BHX	220.0	246.0	272.0	1	356.0	4.2	1
SMCJ250A	SMCJ250CA	GHZ	BHZ	250.0	279.0	309.0	1	405.0	3.7	1
SMCJ300A	SMCJ300CA	GJE	BJE	300.0	335.0	371.0	1	486.0	3.1	1
SMCJ350A	SMCJ350CA	GJG	BJG	350.0	391.0	432.0	1	567.0	2.6	1
SMCJ400A	SMCJ400CA	GJK	BJK	400.0	447.0	494.0	1	648.0	2.3	1
SMCJ440A	SMCJ440CA	GJM	BJM	440.0	492.0	543.0	1	713.0	2.1	1
SMCJ480A	SMCJ480CA	GJP	BJP	480.0	536.0	593.0	1	750.0	2.0	1
SMCJ520A	SMCJ520CA	GJR	BJR	520.0	578.0	640.0	1	762.0	2.0	1
SMCJ550A	SMCJ550CA	GJT	BJT	550.0	615.0	680.0	1	860.0	1.7	1

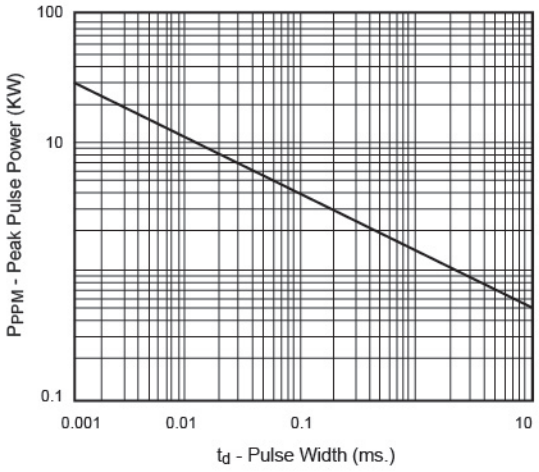
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

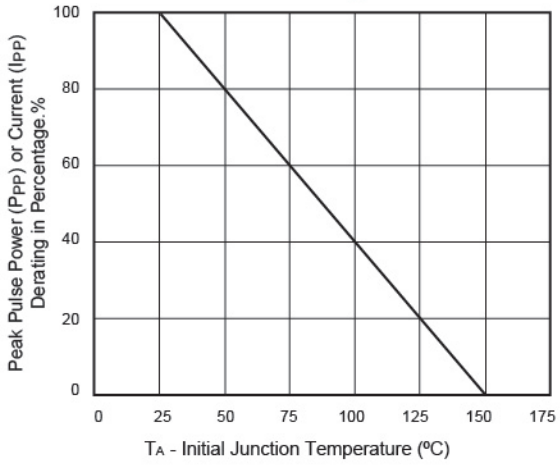
TVS Transients Clamping Waveform



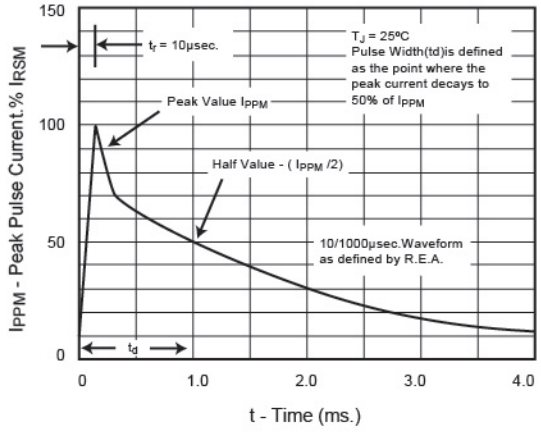
Peak Pulse Power Rating Curve



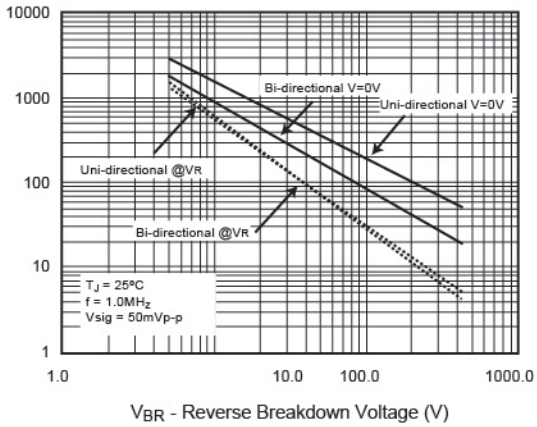
Pulse Derating Curve



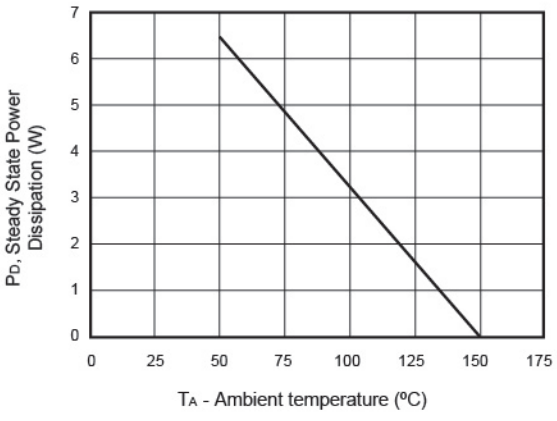
Pulse Waveform



Typical Junction Capacitance

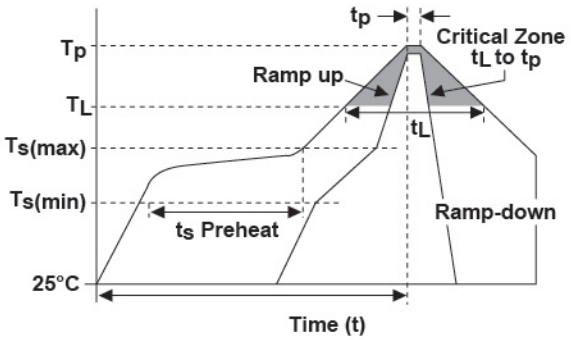


Steady State Power Dissipation Derating Curve

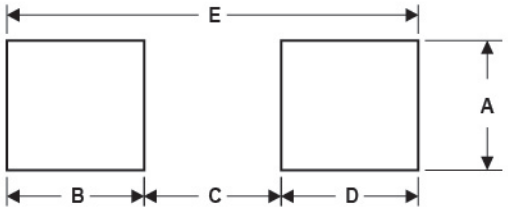


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



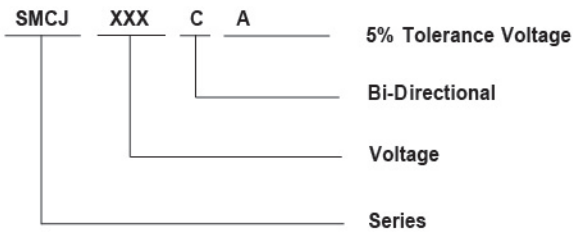
Recommended Pad Lay Out Dimensions



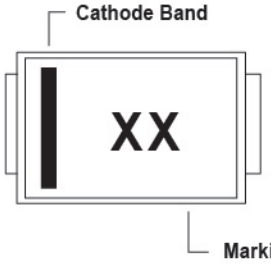
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.30	-	0.129	-
B	2.40	-	0.094	-
C	-	4.20	-	0.165
D	2.40	-	0.094	-
E	8.20 REF		0.323 REF	

Part Numbering and Marking System

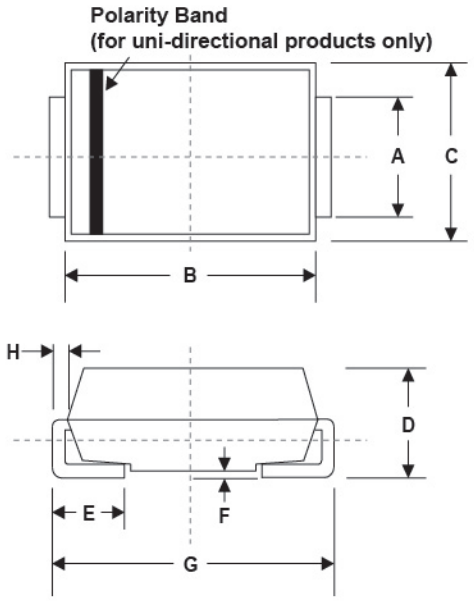
Part Numbering System



Marking System



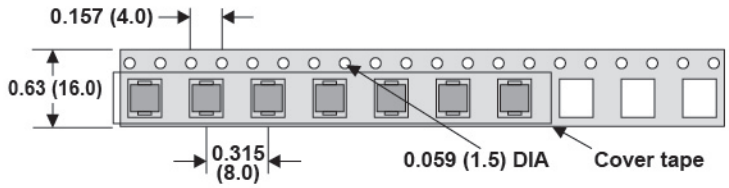
DO-214AB(SMC) Package Information

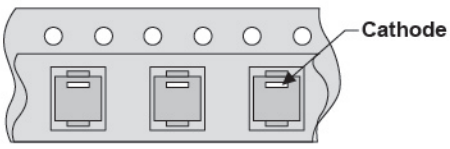


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.80	3.20	0.110	0.126
B	6.60	7.20	0.260	0.283
C	5.70	6.10	0.224	0.240
D	2.15	2.75	0.085	0.108
E	1.00	1.60	0.039	0.063
F	0.02	0.20	0.000	0.008
G	7.60	8.00	0.299	0.315
H	0.15	0.30	0.006	0.012

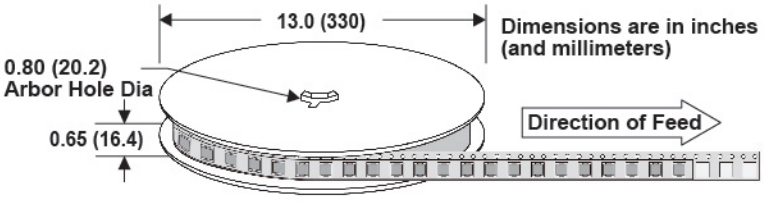
Packaging Specification

Part Number	Quantity	Reel Size
SMCJxx (CA)	3000	13" inch





Polarity Band is only applicable to the undirectional package



1.5SMC Series

1500W

Operating Voltage : 6.8 to 600V
Peak Pulse Power: 1500W

DO-214AB (SMC)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 1500 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

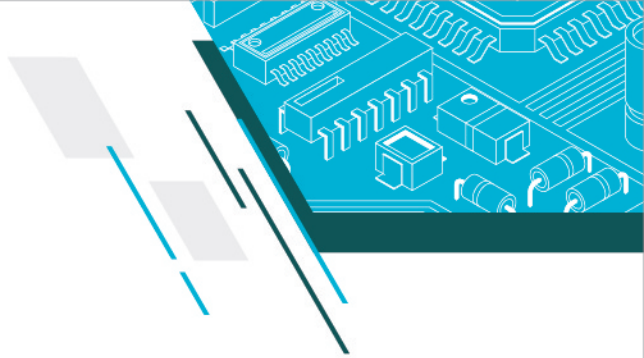
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	1500	W
Steady State Power Dissipation at T_L=50°C,Lead lengths.375"(9.5mm)(Note2)	P_D	6.5	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	75	°C/W

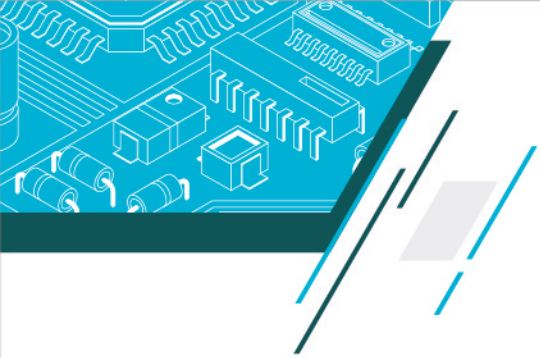
Notes : 1. Non-repetitive current pulse, T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
1.5SMC6.8A	1.5SMC6.8CA	6V8A	6V8C	5.8	6.5	7.1	10	10.5	145.0	1000
1.5SMC7.5A	1.5SMC7.5CA	7V5A	7V5C	6.4	7.1	7.9	10	11.3	135.0	500
1.5SMC8.2A	1.5SMC8.2CA	8V2A	8V2C	7.0	7.8	8.6	10	12.1	126.0	200
1.5SMC9.1A	1.5SMC9.1CA	9V1A	9V1C	7.8	8.7	9.6	1	13.4	113.0	50
1.5SMC10A	1.5SMC10CA	10A	10C	8.6	9.5	10.5	1	14.5	105.0	10
1.5SMC11A	1.5SMC11CA	11A	11C	9.4	10.5	11.6	1	15.6	97.4	5
1.5SMC12A	1.5SMC12CA	12A	12C	10.2	11.4	12.6	1	16.7	91.0	5
1.5SMC13A	1.5SMC13CA	13A	13C	11.1	12.4	13.7	1	18.2	83.5	1
1.5SMC15A	1.5SMC15CA	15A	15C	12.8	14.3	15.8	1	21.2	71.7	1
1.5SMC16A	1.5SMC16CA	16A	16C	13.6	15.2	16.8	1	22.5	67.6	1
1.5SMC18A	1.5SMC18CA	18A	18C	15.3	17.1	18.9	1	25.5	60.3	1
1.5SMC20A	1.5SMC20CA	20A	20C	17.1	19.0	21.0	1	27.7	54.9	1
1.5SMC22A	1.5SMC22CA	22A	22C	18.8	20.9	23.1	1	30.6	49.7	1
1.5SMC24A	1.5SMC24CA	24A	24C	20.5	22.8	25.2	1	33.2	45.8	1
1.5SMC27A	1.5SMC27CA	27A	27C	23.1	25.7	28.4	1	37.5	40.5	1
1.5SMC30A	1.5SMC30CA	30A	30C	25.6	28.5	31.5	1	41.4	36.7	1
1.5SMC33A	1.5SMC33CA	33A	33C	28.2	31.4	34.7	1	45.7	33.3	1
1.5SMC36A	1.5SMC36CA	36A	36C	30.8	34.2	37.8	1	49.9	30.5	1
1.5SMC39A	1.5SMC39CA	39A	39C	33.3	37.1	41.0	1	53.9	28.2	1
1.5SMC43A	1.5SMC43CA	43A	43C	36.8	40.9	45.2	1	59.3	25.6	1
1.5SMC47A	1.5SMC47CA	47A	47C	40.2	44.7	49.4	1	64.8	23.5	1
1.5SMC51A	1.5SMC51CA	51A	51C	43.6	48.5	53.6	1	70.1	21.7	1
1.5SMC56A	1.5SMC56CA	56A	56C	47.8	53.2	58.8	1	77.0	19.7	1
1.5SMC62A	1.5SMC62CA	62A	62C	53.0	58.9	65.1	1	85.0	17.9	1
1.5SMC68A	1.5SMC68CA	68A	68C	58.1	64.6	71.4	1	92.0	16.5	1
1.5SMC75A	1.5SMC75CA	75A	75C	64.1	71.3	78.8	1	103.0	14.8	1
1.5SMC82A	1.5SMC82CA	82A	82C	70.1	77.9	86.1	1	113.0	13.5	1
1.5SMC91A	1.5SMC91CA	91A	91C	77.8	86.5	95.5	1	125.0	12.2	1
1.5SMC100A	1.5SMC100CA	100A	100C	85.5	95.0	105.0	1	137.0	11.1	1
1.5SMC110A	1.5SMC110CA	110A	110C	94.0	105.0	116.0	1	152.0	10.0	1

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



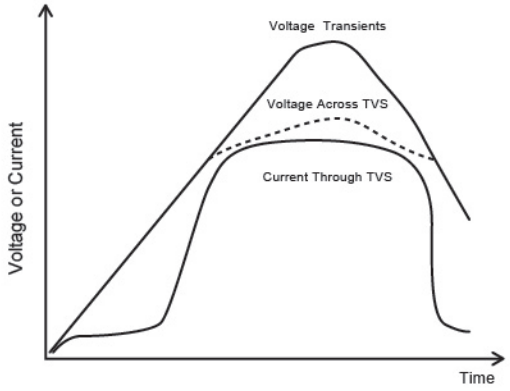
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
1.5SMC120A	1.5SMC120CA	120A	120C	102.0	114.0	126.0	1	165.0	9.2	1
1.5SMC130A	1.5SMC130CA	130A	130C	111.0	124.0	137.0	1	179.0	8.5	1
1.5SMC150A	1.5SMC150CA	150A	150C	128.0	143.0	158.0	1	207.0	7.3	1
1.5SMC160A	1.5SMC160CA	160A	160C	136.0	152.0	168.0	1	219.0	6.9	1
1.5SMC170A	1.5SMC170CA	170A	170C	145.0	162.0	179.0	1	234.0	6.5	1
1.5SMC180A	1.5SMC180CA	180A	180C	154.0	171.0	189.0	1	246.0	6.2	1
1.5SMC200A	1.5SMC200CA	200A	200C	171.0	190.0	210.0	1	274.0	5.5	1
1.5SMC220A	1.5SMC220CA	220A	220C	185.0	209.0	231.0	1	328.0	4.6	1
1.5SMC250A	1.5SMC250CA	250A	250C	214.0	237.0	263.0	1	344.0	4.4	1
1.5SMC300A	1.5SMC300CA	300A	300C	256.0	285.0	315.0	1	414.0	3.7	1
1.5SMC350A	1.5SMC350CA	350A	350C	300.0	332.0	368.0	1	482.0	3.2	1
1.5SMC400A	1.5SMC400CA	400A	400C	342.0	380.0	420.0	1	548.0	2.8	1
1.5SMC440A	1.5SMC440CA	440A	440C	376.0	418.0	462.0	1	602.0	2.5	1
1.5SMC480A	1.5SMC480CA	480A	480C	408.0	456.0	504.0	1	658.0	2.3	1
1.5SMC510A	1.5SMC510CA	510A	510C	434.0	485.0	535.0	1	698.0	2.1	1
1.5SMC530A	1.5SMC530CA	530A	530C	451.0	503.0	557.0	1	725.0	2.1	1
1.5SMC540A	1.5SMC540CA	540A	540C	459.0	513.0	567.0	1	740.0	2.0	1
1.5SMC550A	1.5SMC550CA	550A	550C	467.0	522.0	578.0	1	760.0	2.0	1
1.5SMC600A	1.5SMC600CA	600A	600C	510.0	570.0	630.0	1	828.0	1.8	1

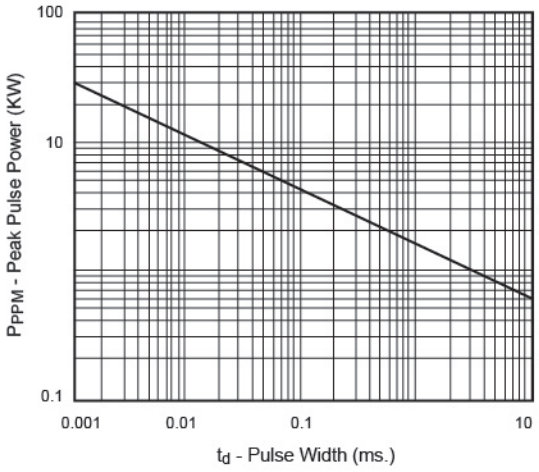
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

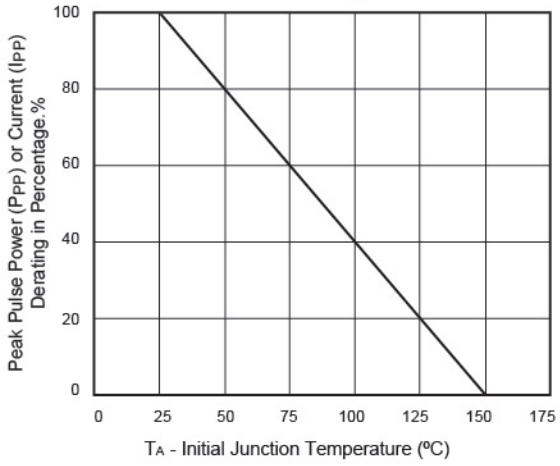
TVS Transients Clamping Waveform



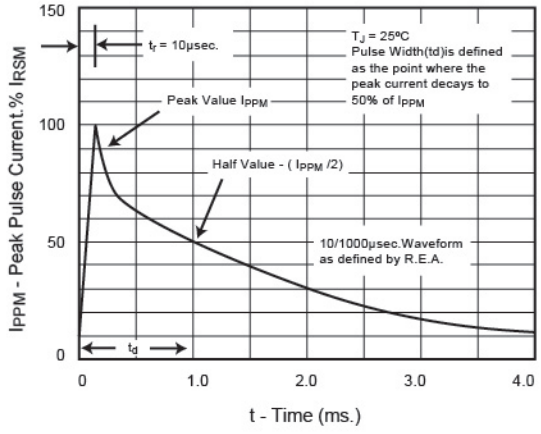
Peak Pulse Power Rating Curve



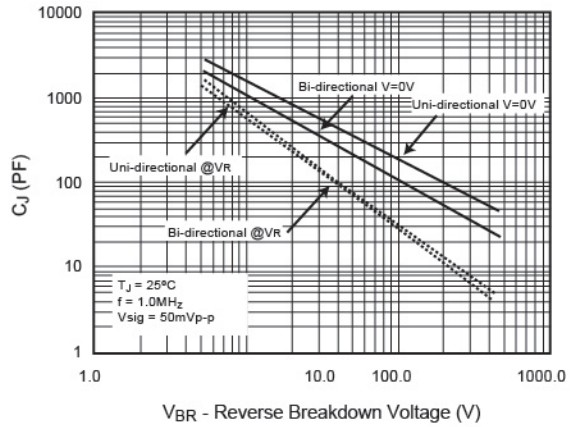
Pulse Derating Curve



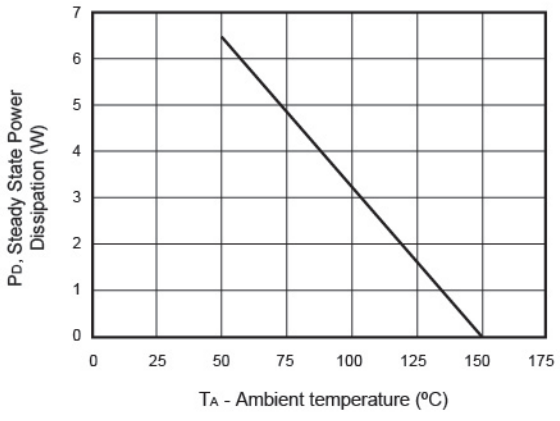
Pulse Waveform



Typical Junction Capacitance

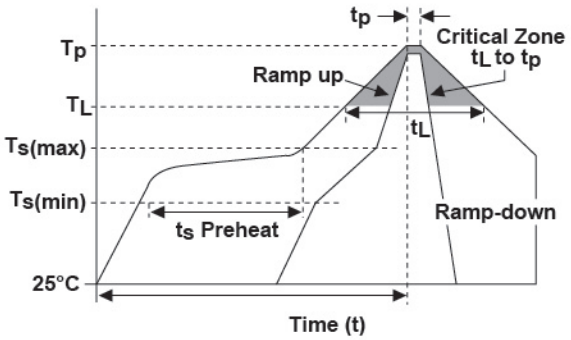


Steady State Power Dissipation Derating Curve

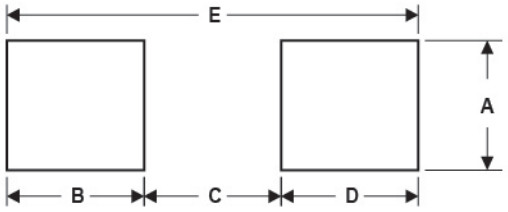


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



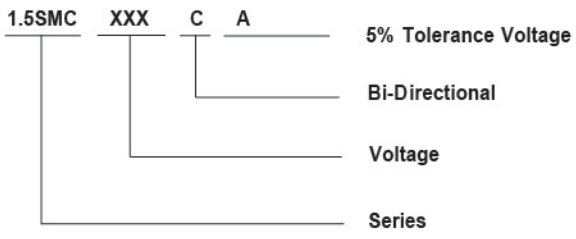
Recommended Pad Lay Out Dimensions



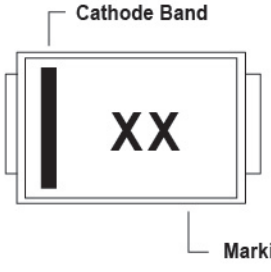
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.30	-	0.129	-
B	2.40	-	0.094	-
C	-	4.20	-	0.165
D	2.40	-	0.094	-
E	8.20 REF		0.323 REF	

Part Numbering and Marking System

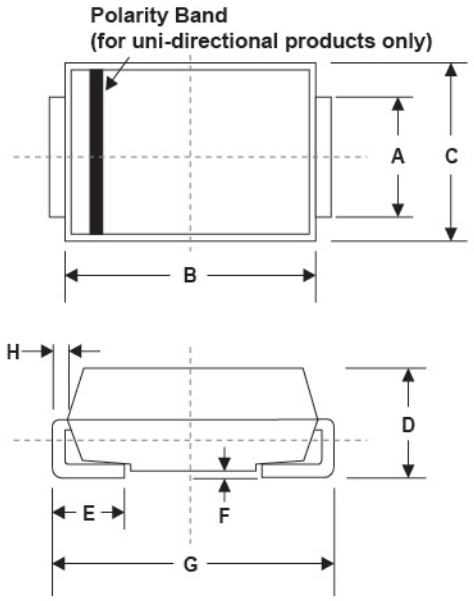
Part Numbering System



Marking System



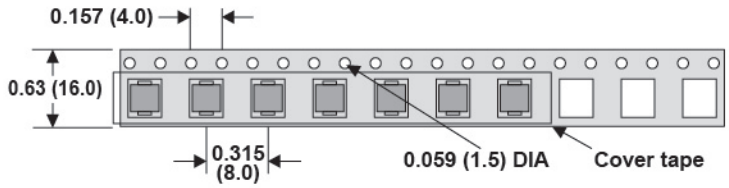
DO-214AB(SMC) Package Information

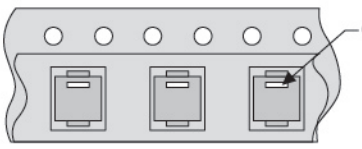


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.80	3.20	0.110	0.126
B	6.60	7.20	0.260	0.283
C	5.70	6.10	0.224	0.240
D	2.15	2.75	0.085	0.108
E	1.00	1.60	0.039	0.063
F	0.02	0.20	0.000	0.008
G	7.60	8.00	0.299	0.315
H	0.15	0.30	0.006	0.012

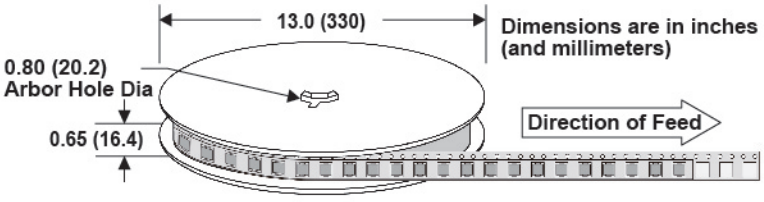
Packaging Specification

Part Number	Quantity	Reel Size
1.5SMCxx (CA)	3000	13" inch





Polarity Band is only applicable to the undirectional package



SMDJ Series
3000W

Operating Voltage : 5.0 to 440V
Peak Pulse Power: 3000W
DO-214AB (SMC)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 3000 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

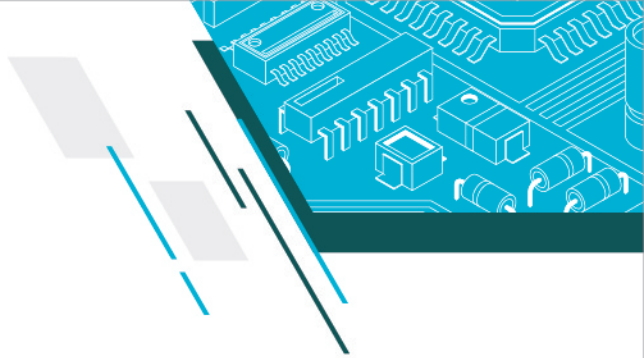
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	3000	W
Steady State Power Dissipation at T_L=50°C,Lead lengths.375"(9.5mm)(Note2)	P_D	6.5	W
Operating Junction Temperature	T_J	-55 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	75	°C/W

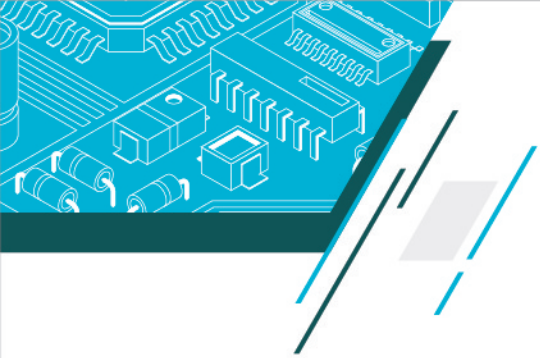
Notes : 1. Non-repetitive current pulse,T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMDJ5.0A	SMDJ5.0CA	RDE	DDE	5.0	6.4	7.0	10	9.2	326.1	800
SMDJ6.0A	SMDJ6.0CA	RDG	DDG	6.0	6.7	7.4	10	10.3	291.3	800
SMDJ6.5A	SMDJ6.5CA	RDK	DDK	6.5	7.2	8.0	10	11.2	267.9	500
SMDJ7.0A	SMDJ7.0CA	PDM	DDM	7.0	7.8	8.6	10	12.0	250.0	200
SMDJ7.5A	SMDJ7.5CA	PDP	DDP	7.5	8.3	9.2	1	12.9	232.6	100
SMDJ8.0A	SMDJ8.0CA	PDR	DDR	8.0	8.9	9.8	1	13.6	220.6	50
SMDJ8.5A	SMDJ8.5CA	PDT	DDT	8.5	9.4	10.4	1	14.4	208.3	20
SMDJ9.0A	SMDJ9.0CA	PDV	DDV	9.0	10.0	11.1	1	15.4	194.8	10
SMDJ10A	SMDJ10CA	PDX	DDX	10.0	11.1	12.3	1	17.0	176.5	5
SMDJ11A	SMDJ11CA	PDZ	DDZ	11.0	12.2	13.5	1	18.2	164.8	2
SMDJ12A	SMDJ12CA	PEE	DEE	12.0	13.3	14.7	1	19.9	150.8	2
SMDJ13A	SMDJ13CA	PEG	DEG	13.0	14.4	15.9	1	21.5	139.5	2
SMDJ14A	SMDJ14CA	PEK	DEK	14.0	15.6	17.2	1	23.2	129.3	2
SMDJ15A	SMDJ15CA	PEM	DEM	15.0	16.7	18.5	1	24.4	123.0	2
SMDJ16A	SMDJ16CA	PEP	DEP	16.0	17.8	19.7	1	26.0	115.4	2
SMDJ17A	SMDJ17CA	PER	DER	17.0	18.9	20.9	1	27.6	108.7	2
SMDJ18A	SMDJ18CA	PET	DET	18.0	20.0	22.1	1	29.2	102.7	2
SMDJ20A	SMDJ20CA	PEV	DEV	20.0	22.2	24.5	1	32.4	92.6	2
SMDJ22A	SMDJ22CA	PEX	DEX	22.0	24.4	26.9	1	35.5	84.5	2
SMDJ24A	SMDJ24CA	PEZ	DEZ	24.0	26.7	29.5	1	38.9	77.1	2
SMDJ26A	SMDJ26CA	PFE	DFE	26.0	28.9	31.9	1	42.1	71.3	2
SMDJ28A	SMDJ28CA	PFG	DFG	28.0	31.1	34.4	1	45.4	66.1	2
SMDJ30A	SMDJ30CA	PFK	DFK	30.0	33.3	36.8	1	48.4	62.0	2
SMDJ33A	SMDJ33CA	PFM	DFM	33.0	36.7	40.6	1	53.3	56.3	2
SMDJ36A	SMDJ36CA	PFP	DFP	36.0	40.0	44.2	1	58.1	51.6	2
SMDJ40A	SMDJ40CA	PFR	DFR	40.0	44.4	49.1	1	64.5	46.5	2
SMDJ43A	SMDJ43CA	PFT	DFT	43.0	47.8	52.8	1	69.4	43.2	2
SMDJ45A	SMDJ45CA	PFV	DFV	45.0	50.0	55.3	1	72.7	41.3	2
SMDJ48A	SMDJ48CA	PFX	DFX	48.0	53.3	58.9	1	77.4	38.8	2
SMDJ51A	SMDJ51CA	PFZ	DFZ	51.0	56.7	62.7	1	82.4	36.4	2

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



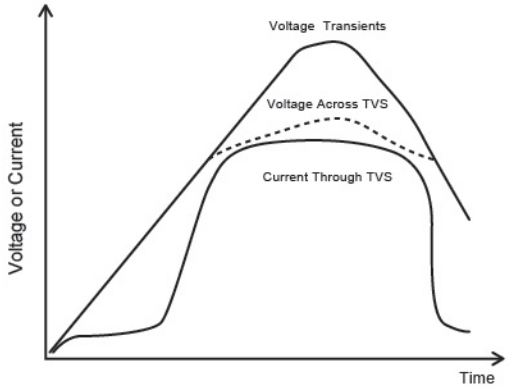
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
SMDJ54A	SMDJ54CA	RGE	DGE	54.0	60.0	66.3	1	87.1	34.4	2
SMDJ58A	SMDJ58CA	PGG	DGG	58.0	64.4	71.2	1	93.6	32.1	2
SMDJ60A	SMDJ60CA	PGK	DGK	60.0	66.7	73.7	1	96.8	31.0	2
SMDJ64A	SMDJ64CA	PGM	DGM	64.0	71.1	78.6	1	103.0	29.1	2
SMDJ70A	SMDJ70CA	PGP	DGP	70.0	77.8	86.0	1	113.0	26.5	2
SMDJ75A	SMDJ75CA	PGR	DGR	75.0	83.3	92.1	1	121.0	24.8	2
SMDJ78A	SMDJ78CA	PGT	DGT	78.0	86.7	95.8	1	126.0	23.8	2
SMDJ85A	SMDJ85CA	PGV	DGV	85.0	94.4	104.0	1	137.0	21.9	2
SMDJ90A	SMDJ90CA	PGX	DGX	90.0	100.0	111.0	1	146.0	20.5	2
SMDJ100A	SMDJ100CA	PGZ	DGZ	100.0	111.0	123.0	1	162.0	18.5	2
SMDJ110A	SMDJ110CA	PHE	DHE	110.0	122.0	135.0	1	177.0	16.9	2
SMDJ120A	SMDJ120CA	PHG	DHG	120.0	133.0	147.0	1	193.0	15.5	2
SMDJ130A	SMDJ130CA	PHK	DHK	130.0	144.0	159.0	1	209.0	14.4	2
SMDJ150A	SMDJ150CA	PHM	DHM	150.0	167.0	185.0	1	243.0	12.3	2
SMDJ160A	SMDJ160CA	PHP	DHP	160.0	178.0	197.0	1	259.0	11.6	2
SMDJ170A	SMDJ170CA	PHR	DHR	170.0	189.0	209.0	1	275.0	10.9	2
SMDJ180A	SMDJ180CA	PHT	DHT	180.0	201.0	222.0	1	292.0	10.3	2
SMDJ190A	SMDJ190CA	PHU	DHU	190.0	209.0	243.0	1	308.0	9.7	2
SMDJ200A	SMDJ200CA	PHV	DHV	200.0	224.0	247.0	1	324.0	9.3	2
SMDJ210A	SMDJ210CA	PHW	DHW	210.0	231.0	269.0	1	340.0	8.8	2
SMDJ220A	SMDJ220CA	PKE	DKE	220.0	246.0	272.0	1	356.0	8.4	2
SMDJ250A	SMDJ250CA	PKG	DKG	250.0	279.0	309.0	1	405.0	7.4	2
SMDJ300A	SMDJ300CA	PKK	DKK	300.0	335.0	371.0	1	486.0	6.2	2
SMDJ350A	SMDJ350CA	PKM	DKM	350.0	391.0	432.0	1	567.0	5.3	2
SMDJ400A	SMDJ400CA	PKP	DKP	400.0	447.0	494.0	1	648.0	4.6	2
SMDJ440A	SMDJ440CA	PKR	DKR	440.0	492.0	543.0	1	713.0	4.2	2

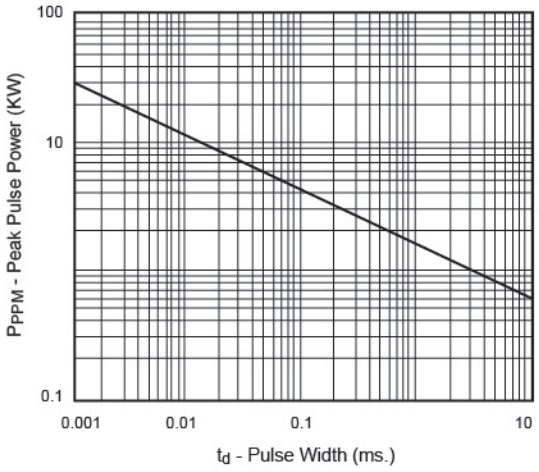
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

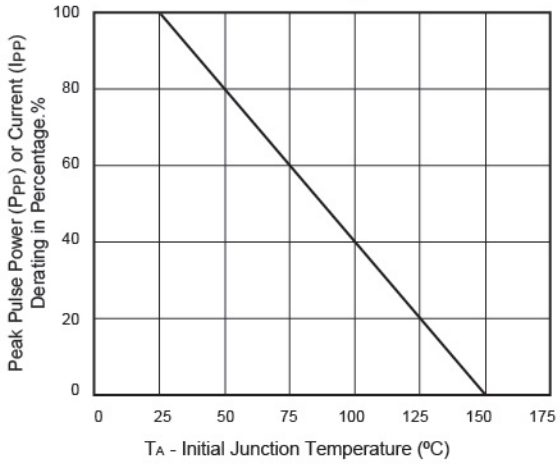
TVS Transients Clamping Waveform



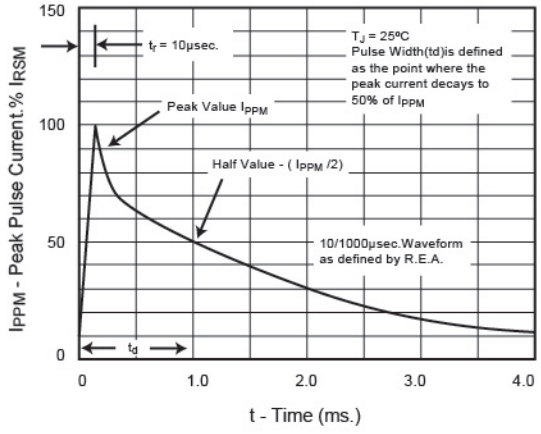
Peak Pulse Power Rating Curve



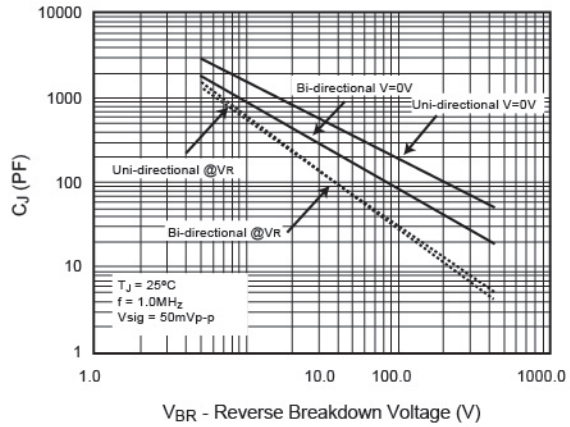
Pulse Derating Curve



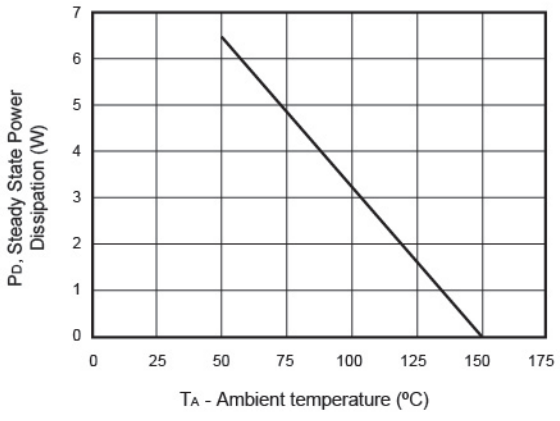
Pulse Waveform



Typical Junction Capacitance

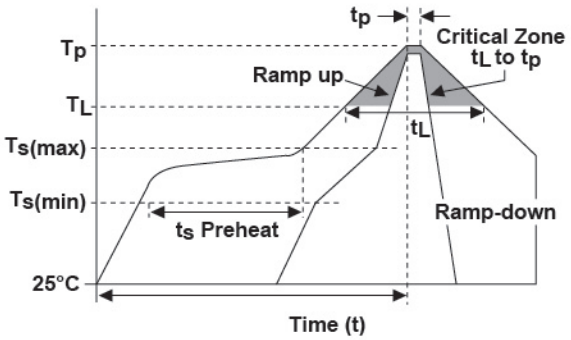


Steady State Power Dissipation Derating Curve

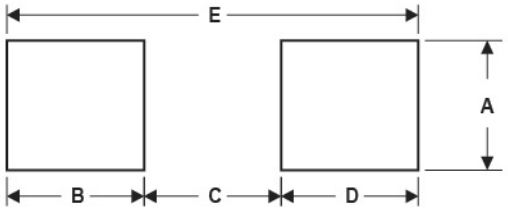


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



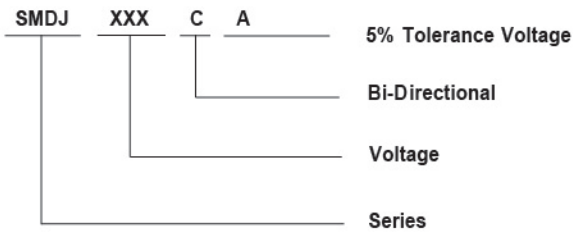
Recommended Pad Lay Out Dimensions



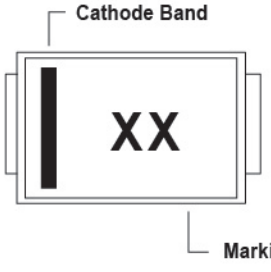
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.30	-	0.129	-
B	2.40	-	0.094	-
C	-	4.20	-	0.165
D	2.40	-	0.094	-
E	8.20 REF		0.323 REF	

Part Numbering and Marking System

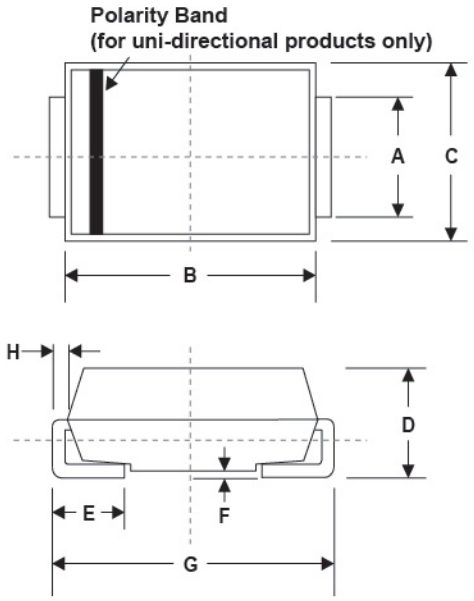
Part Numbering System



Marking System



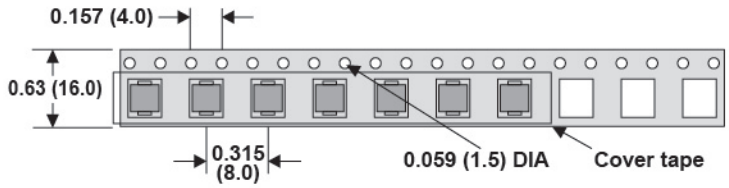
DO-214AB(SMC) Package Information

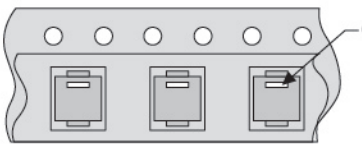


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.80	3.20	0.110	0.126
B	6.60	7.20	0.260	0.283
C	5.70	6.10	0.224	0.240
D	2.15	2.75	0.085	0.108
E	1.00	1.60	0.039	0.063
F	0.02	0.20	0.000	0.008
G	7.60	8.00	0.299	0.315
H	0.15	0.30	0.006	0.012

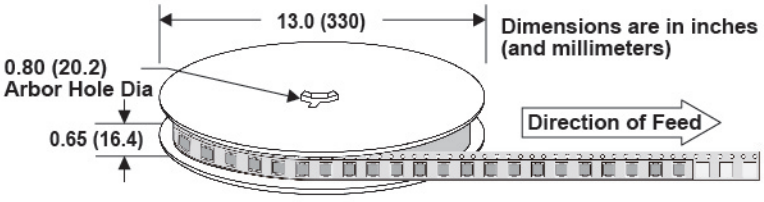
Packaging Specification

Part Number	Quantity	Reel Size
SMDJxx (CA)	3000	13" inch





Polarity Band is only applicable to the undirectional package



5.0SMDJ Series

5000W

Operating Voltage : 11 to 400V
Peak Pulse Power: 5000W

DO-214AB (SMC)

RoHS | HF Halogen Free

Features

- Low profile package
- Ideal for automated placement
- 5000 Watt peak pulse power capability with a 10/1000μs waveform
- For surface mounted applications to optimize board space
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- RoHS and HF Compliant

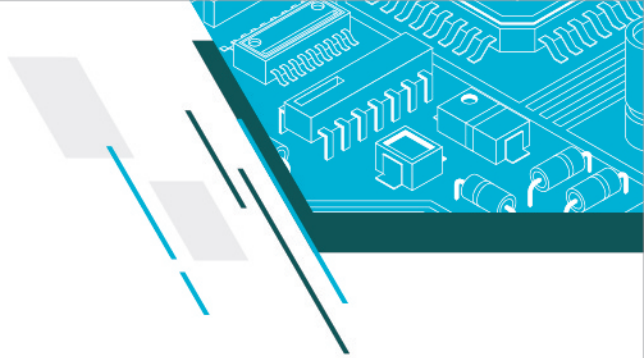
Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

Maximum Ratings and Thermal Considerations (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation on 10/1000us waveform (Note1,Note2)	P_{PPM}	5000	W
Steady State Power Dissipation at T_L=50°C,Lead lengths.375”(9.5mm) (Note2)	P_D	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note3)	I_{FSM}	300	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only	V_F	5.0	V
Operating Junction Temperature	T_J	-65 to +150	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C
Junction to Ambient on printed circuit	$R_{\theta JA}$	75	°C/W

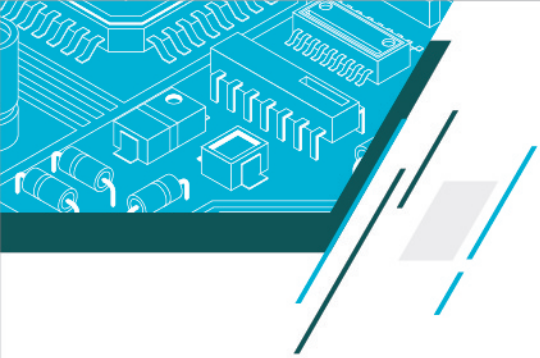
Notes : 1. Non-repetitive current pulse,T_A =25°C.
2. Mounted on 5.0mm*5.0mm (0.03mm thick) Copper Pads to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4per minute maximum.



Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
5.0SMDJ11A	5.0SMDJ11CA	5PEN	5BEN	11.0	12.2	13.5	10	18.2	275.0	800
5.0SMDJ12A	5.0SMDJ12CA	5PEP	5BEP	12.0	13.2	14.7	10	19.9	252.0	800
5.0SMDJ13A	5.0SMDJ13CA	5PEQ	5BEQ	13.0	14.4	15.9	10	21.5	233.0	500
5.0SMDJ14A	5.0SMDJ14CA	5PER	5BER	14.0	15.6	17.2	10	23.2	216.0	200
5.0SMDJ15A	5.0SMDJ15CA	5PES	5BES	15.0	16.7	18.5	1	24.4	205.0	100
5.0SMDJ16A	5.0SMDJ16CA	5PET	5BET	16.0	17.8	19.7	1	26.0	193.0	50
5.0SMDJ17A	5.0SMDJ17CA	5PEU	5BEU	17.0	18.9	20.9	1	27.6	181.0	20
5.0SMDJ18A	5.0SMDJ18CA	5PEV	5BEV	18.0	20.0	22.1	1	29.2	172.0	10
5.0SMDJ20A	5.0SMDJ20CA	5PEW	5BEW	20.0	22.2	24.5	1	32.4	155.0	5
5.0SMDJ22A	5.0SMDJ22CA	5PEX	5BEX	22.0	24.4	26.9	1	35.5	141.0	5
5.0SMDJ24A	5.0SMDJ24CA	5PEZ	5BEZ	24.0	26.7	29.5	1	38.9	129.0	5
5.0SMDJ26A	5.0SMDJ26CA	5PFE	5BFE	26.0	28.9	31.9	1	42.1	119.0	5
5.0SMDJ28A	5.0SMDJ28CA	5PFG	5BFG	28.0	31.1	34.4	1	45.4	110.0	5
5.0SMDJ30A	5.0SMDJ30CA	5PFK	5BFK	30.0	33.3	36.8	1	48.4	103.0	5
5.0SMDJ33A	5.0SMDJ33CA	5PFM	5BFM	33.0	36.7	40.6	1	53.3	93.9	5
5.0SMDJ36A	5.0SMDJ36CA	5PFP	5BFP	36.0	40.0	44.2	1	58.1	86.1	5
5.0SMDJ40A	5.0SMDJ40CA	5PFR	5BFR	40.0	44.4	49.1	1	64.5	77.6	5
5.0SMDJ43A	5.0SMDJ43CA	5PFT	5BFT	43.0	47.8	52.8	1	69.4	72.1	5
5.0SMDJ45A	5.0SMDJ45CA	5PFV	5BFV	45.0	50.0	55.3	1	72.7	68.8	5
5.0SMDJ48A	5.0SMDJ48CA	5PFX	5BFX	48.0	53.3	58.9	1	77.4	64.7	5
5.0SMDJ51A	5.0SMDJ51CA	5PFZ	5BFZ	51.0	56.7	62.7	1	82.4	60.7	5
5.0SMDJ54A	5.0SMDJ54CA	5PGE	5BGE	54.0	60.0	66.3	1	87.1	57.5	5
5.0SMDJ58A	5.0SMDJ58CA	5PGG	5BGG	58.0	64.4	71.2	1	93.6	53.5	5
5.0SMDJ60A	5.0SMDJ60CA	5PGK	5BGK	60.0	66.7	73.7	1	96.8	51.7	5
5.0SMDJ64A	5.0SMDJ64CA	5PGM	5BGM	64.0	71.1	78.6	1	103.0	48.6	5
5.0SMDJ70A	5.0SMDJ70CA	5PGP	5BGP	70.0	77.8	86.0	1	113.0	44.3	5
5.0SMDJ75A	5.0SMDJ75CA	5PGR	5BGR	75.0	83.3	92.1	1	121.0	41.4	5
5.0SMDJ78A	5.0SMDJ78CA	5PGT	5BGT	78.0	86.7	95.8	1	126.0	39.7	5
5.0SMDJ85A	5.0SMDJ85CA	5PGV	5BGV	85.0	94.4	104.0	1	137.0	36.5	5
5.0SMDJ90A	5.0SMDJ90CA	5PGX	5BGX	90.0	100.0	111.0	1	146.0	34.3	5

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



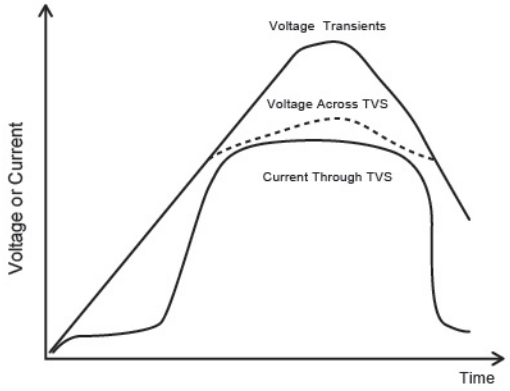
Electrical Characteristics (T_A=25°C)

Part Number		Device Marking Code		Reverse Stand-Off Voltage V_{RWM}(V)	Breakdown Voltage V_{BR}(V) @I_T		Test Current I_T (mA)	Maximum Clamping Voltage @I_{PP} V_C(V)	Peak Pulse Current I_{PP}(A)	Reverse Leakage @V_{RWM} I_R(μA)
Uni-Polar	Bi-Polar	Uni	Bi		Min.	Max.				
5.0SMDJ100A	5.0SMDJ100CA	5PGZ	5BGZ	100.0	111.0	123.0	1	162.0	30.9	5
5.0SMDJ110A	5.0SMDJ110CA	5PHE	5BHE	110.0	122.0	135.0	1	177.0	28.3	5
5.0SMDJ120A	5.0SMDJ120CA	5PHG	5BHG	120.0	133.0	147.0	1	193.0	26.0	5
5.0SMDJ130A	5.0SMDJ130CA	5PHK	5BHK	130.0	144.0	159.0	1	209.0	24.0	5
5.0SMDJ150A	5.0SMDJ150CA	5PHM	5BHM	150.0	155.0	171.0	1	226.8	22.3	5
5.0SMDJ160A	5.0SMDJ160CA	5PHP	5BHP	160.0	167.0	185.0	1	243.0	20.8	5
5.0SMDJ170A	5.0SMDJ170CA	5PHR	5BHR	170.0	178.0	197.0	1	259.0	19.5	5
5.0SMDJ180A	5.0SMDJ180CA	5PHT	5BHT	180.0	189.0	209.0	1	275.0	18.4	5
5.0SMDJ190A	5.0SMDJ190CA	5PHV	5DHV	190.0	200.0	220.0	1	291.6	17.3	5
5.0SMDJ200A	5.0SMDJ200CA	5PHX	5DHX	200.0	211.0	232.0	1	307.8	16.4	5
5.0SMDJ210A	5.0SMDJ210CA	5PHZ	5DHZ	210.0	224.0	247.0	1	324.0	15.6	5
5.0SMDJ220A	5.0SMDJ220CA	5PIE	5DIE	220.0	246.0	272.0	1	356.0	14.2	5
5.0SMDJ250A	5.0SMDJ250CA	5PIG	5DIG	250.0	279.0	309.0	1	405.0	12.5	5
5.0SMDJ300A	5.0SMDJ300CA	5PIK	5DIK	300.0	335.0	371.0	1	486.0	10.4	5
5.0SMDJ350A	5.0SMDJ350CA	5PIM	5DIM	350.0	391.0	432.0	1	567.0	8.9	5
5.0SMDJ400A	5.0SMDJ400CA	5PIP	5DIP	400.0	447.0	494.0	1	648.0	7.8	5

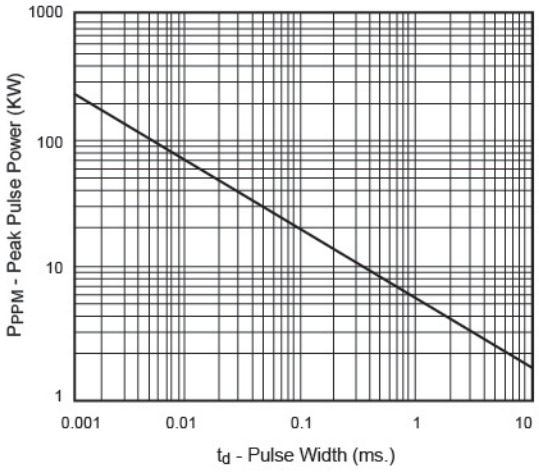
* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves

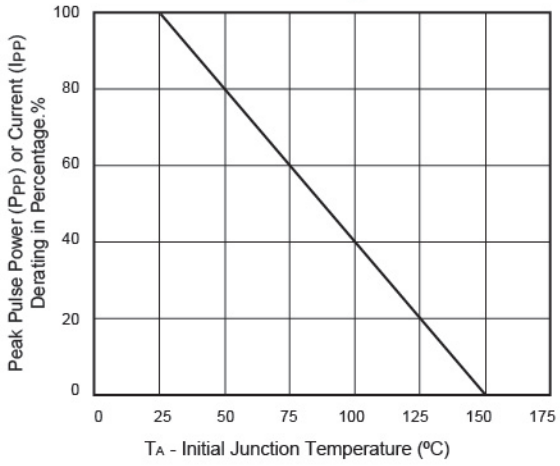
TVS Transients Clamping Waveform



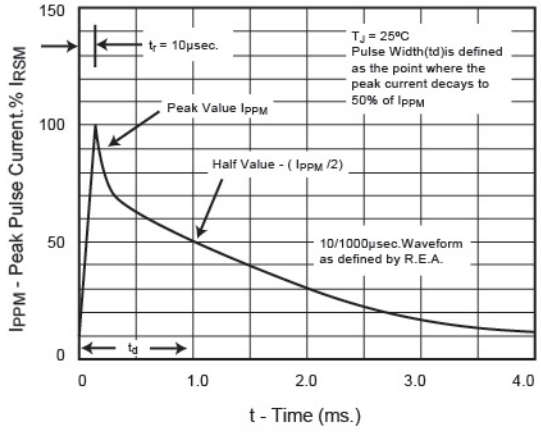
Peak Pulse Power Rating Curve



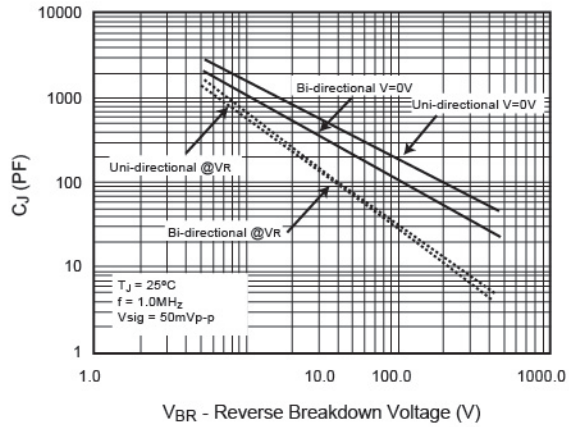
Pulse Derating Curve



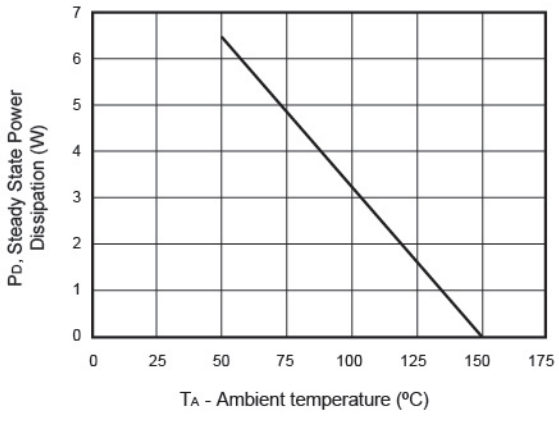
Pulse Waveform



Typical Junction Capacitance

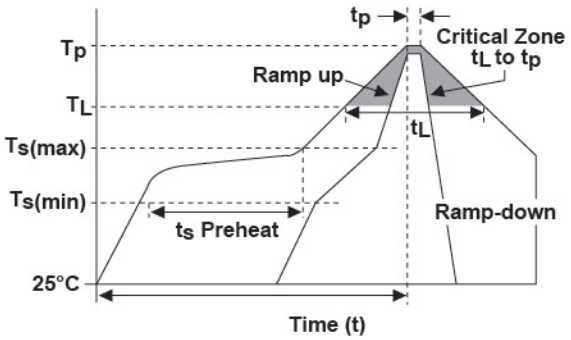


Steady State Power Dissipation Derating Curve

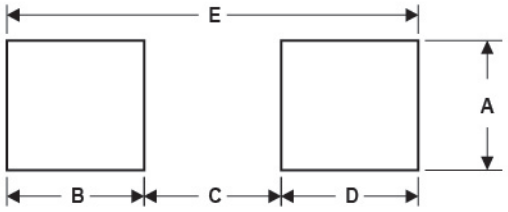


Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		260°C



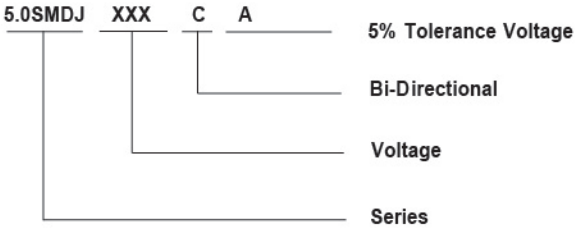
Recommended Pad Lay Out Dimensions



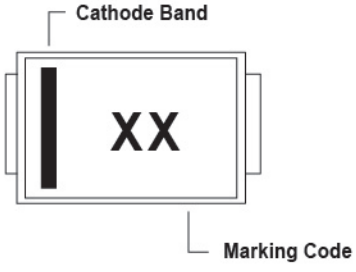
Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.30	-	0.129	-
B	2.40	-	0.094	-
C	-	4.20	-	0.165
D	2.40	-	0.094	-
E	8.20 REF		0.323 REF	

Part Numbering and Marking System

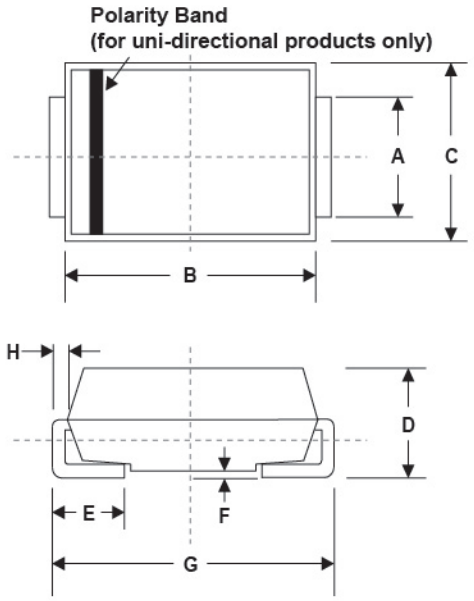
Part Numbering System



Marking System



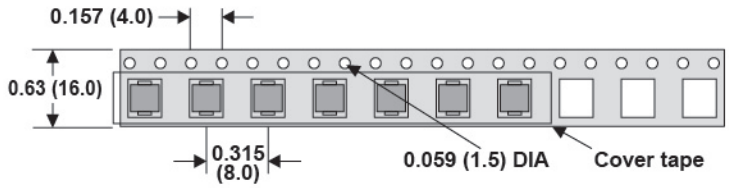
DO-214AB(SMC) Package Information

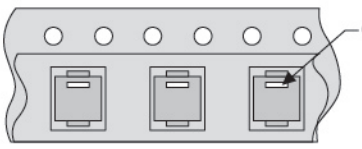


Ref.	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.80	3.20	0.110	0.126
B	6.60	7.20	0.260	0.283
C	5.70	6.10	0.224	0.240
D	2.15	2.75	0.085	0.108
E	1.00	1.60	0.039	0.063
F	0.02	0.20	0.000	0.008
G	7.60	8.00	0.299	0.315
H	0.15	0.30	0.006	0.012

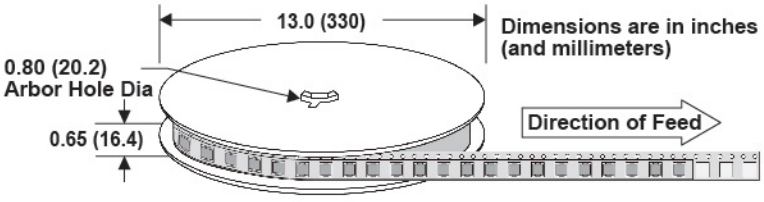
Packaging Specification

Part Number	Quantity	Reel Size
5.0SMDJxx (CA)	3000	13" inch

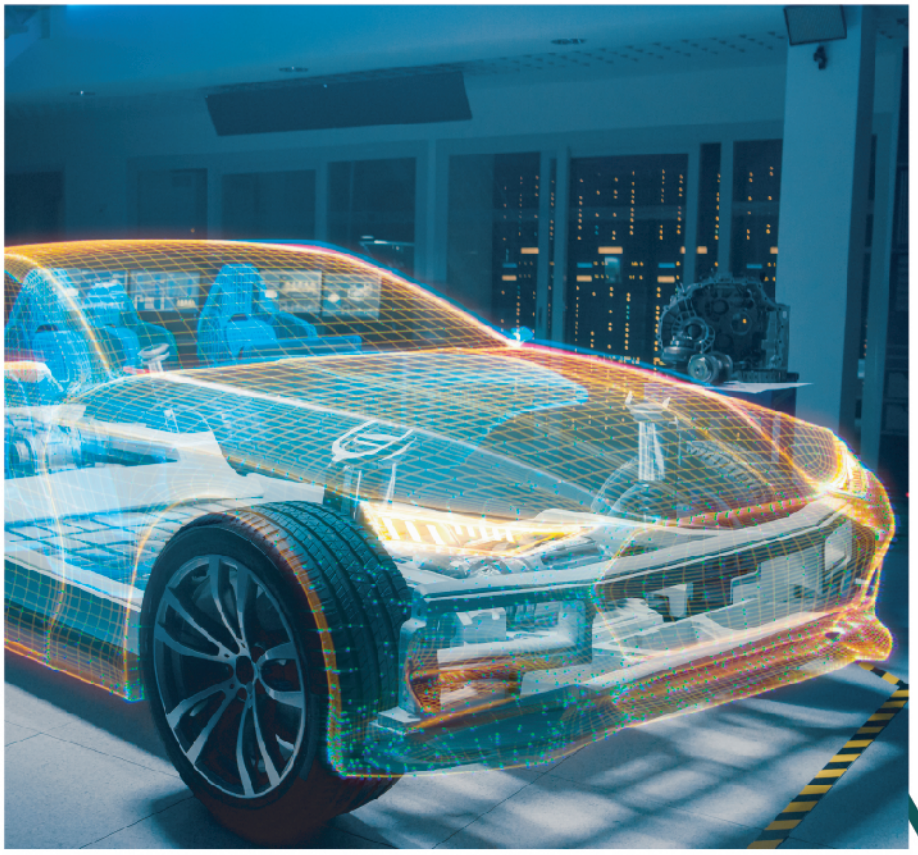




Polarity Band is only applicable to the undirectional package



Automotive
TVS Series



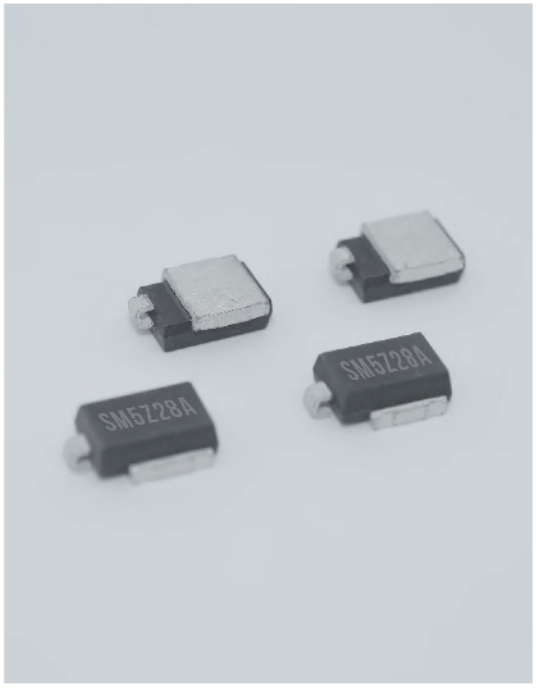
AEC Q-101 qualified TVS diodes, provide high quality automotive transient voltage solutions, protect auto-semiconductors from damage caused by load-dump or power rail transient.

SM5Z Series

3600W

Operating Voltage : 10 to 43V
Peak Pulse Power: 3600W

DO-218AB



RoHS | HF Halogen Free

Features

- Chip produced by chemical method
- Junction passivated by high temperature resistant insulating adhesive
- T_J = 175 °C capability suitable for high reliability and automotive requirement
- Available in uni-directional polarity only
- Low leakage current
- Low forward voltage drop
- High surge capability
- Meets ISO7637-2 surge specification (varied by test condition)
- LF maximum peak of 245 °C
- AEC-Q101 qualified

Applications

- Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting, especially for automotive load dump protection application.

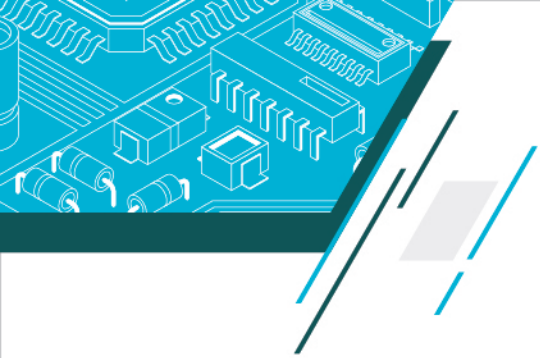
Mechanical Data

- Case: DO-218AB
- Molding compound meets UL 94 V-0 flammability rating Base P/NHE3_X - RoHS-compliant and AEC-Q101 qualified ("X"denotes revision code e.g. A, B, ...)
- Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

Maximum Ratings (T_C=25°C)

Parameter		Symbol	Value	Units
Peak pulse power dissipation	with 10/1000 µs waveform	P_{PPM}	3600	W
	with 10/10000 µs waveform		2800	W
Power dissipation on infinite heatsink at T_C = 25 °C (fig. 1)		P_D	5.0	W
Peak pulse current with 10/1000 µs waveform		I_{PPM}(1)	See Next Table	A
Peak forward surge current 8.3 ms single half sine-wave		I_{FSM}	500	A
Operating junction and storage temperature range		T_J , T_{STG}	-55 to + 175	°C

Notes : 1. Non-repetitive current pulse, derated above T_A= 25 °C.



Electrical Characteristics (Tc=25°C)

Part Number		Breakdown Voltage V_{BR}(V)			Test Current I_T (mA)	Stand-Off Voltage V_{WM} (V)	Maximum Reverse Leakage at V_{WM} I_D(μA)	Maximum Reverse Leakage at V_{WM} TJ=175 °C I_D(μA)	Max. Peak Pulse Current at 10/1000 μs Waveform (A)	Maximum Clamping Voltage at IPP VC(V)	Typical Temp. Coefficient of V_{BR} (1) αT (%/°C)
Uni-Polar	Bi-Polar	Min.	Nom.	Max.							
SM5Z10A	SM5Z10CA	11.1	11.7	12.3	5	10	10	150	212	17.0	0.069
SM5Z11A	SM5Z11CA	12.2	12.9	13.5	5	11	10	150	198	18.2	0.072
SM5Z12A	SM5Z12CA	13.3	14.0	14.7	5	12	10	150	181	19.9	0.074
SM5Z13A	SM5Z13CA	14.4	15.2	15.9	5	13	10	150	167	21.5	0.076
SM5Z14A	SM5Z14CA	15.6	16.4	17.2	5	14	10	150	155	23.2	0.078
SM5Z15A	SM5Z15CA	16.7	17.6	18.5	5	15	10	150	148	24.4	0.080
SM5Z16A	SM5Z16CA	17.8	18.8	19.7	5	16	10	150	138	26.0	0.081
SM5Z17A	SM5Z17CA	18.9	19.9	20.9	5	17	10	150	130	27.6	0.082
SM5Z18A	SM5Z18CA	20.0	21.1	22.1	5	18	10	150	123	29.2	0.083
SM5Z20A	SM5Z20CA	22.2	23.4	24.5	5	20	10	150	111	32.4	0.085
SM5Z22A	SM5Z22CA	24.4	25.7	26.9	5	22	10	150	101	35.5	0.086
SM5Z24A	SM5Z24CA	26.7	28.1	29.5	5	24	10	150	93	38.9	0.087
SM5Z26A	SM5Z26CA	28.9	30.4	31.9	5	26	10	150	86	42.1	0.088
SM5Z28A	SM5Z28CA	31.1	32.8	34.4	5	28	10	150	79	45.4	0.089
SM5Z30A	SM5Z30CA	33.3	35.1	36.8	5	30	10	150	74	48.4	0.090
SM5Z33A	SM5Z33CA	36.7	38.7	40.6	5	33	10	150	68	53.3	0.091
SM5Z36A	SM5Z36CA	40.0	42.1	44.2	5	36	10	150	62	58.1	0.091
SM5Z40A	SM5Z40CA	44.4	46.8	49.1	5	40	10	150	56	64.5	0.092
SM5Z43A	SM5Z43CA	47.8	50.3	52.8	5	43	10	150	52	69.4	0.093

Notes : For all types maximum V_F = 1.8 V at IF = 100 A measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.
(1) To calculate V_{BR} vs. junction temperature, use the following formula: V_{BR} at T_J = V_{BR} at 25 °C x (1 + αT x (T_J - 25))

Thermal Characteristics (T_C = 25 °C unless otherwise noted)			
Parameter	Symbol	Value	Units
Typical thermal resistance, junction to case	RθJC	1.0	°C / W

Ratings and Characteristic Curves (TA=25°C)

Fig.1 Power Derating Curve

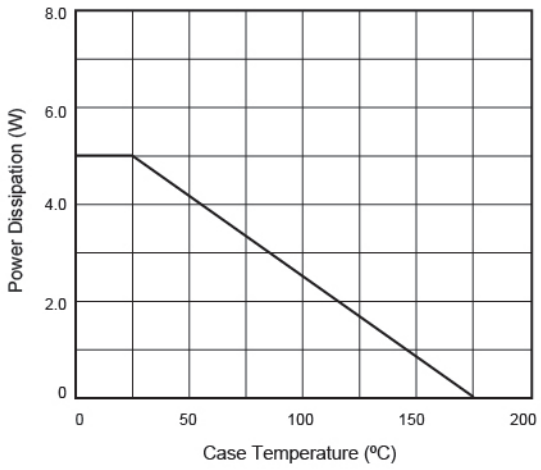


Fig.2 Load Dump Power Characteristics (10 ms Exponential Waveform)

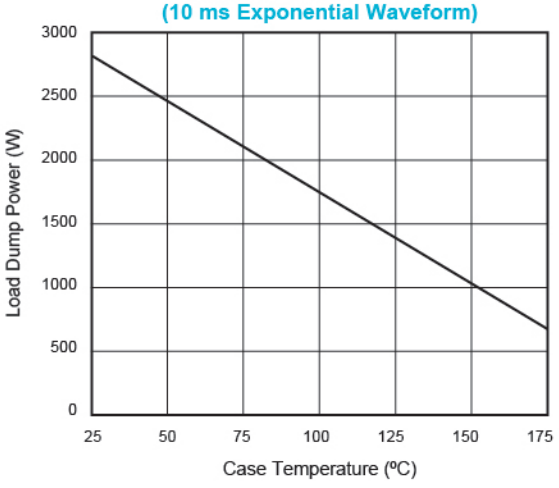


Fig.3 Pulse Waveform

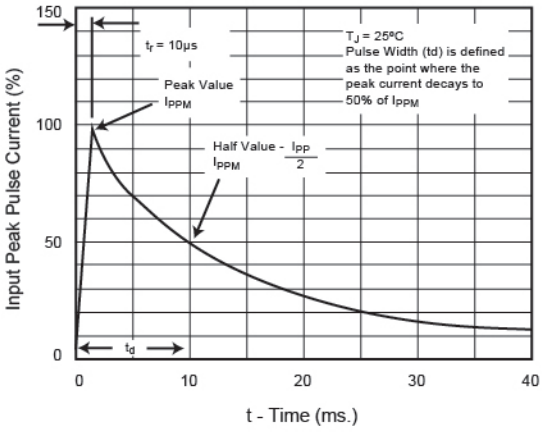


Fig.4 Reverse Power Capability

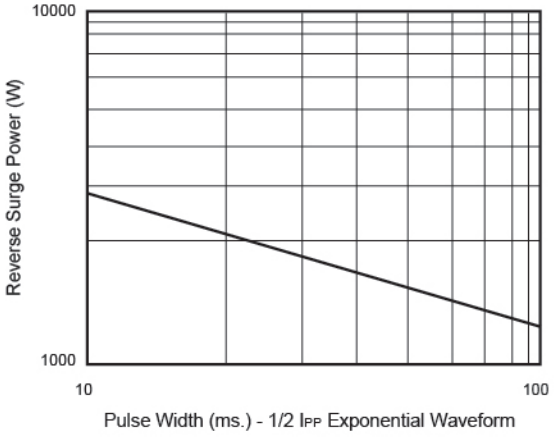
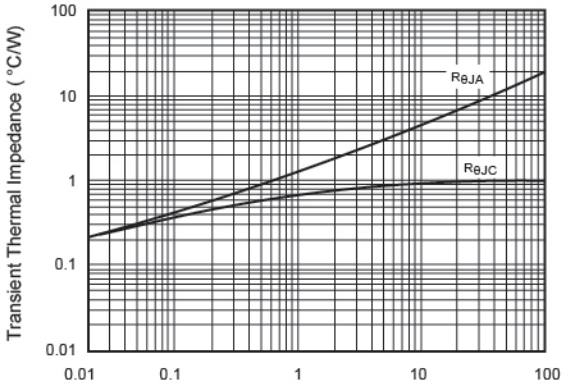
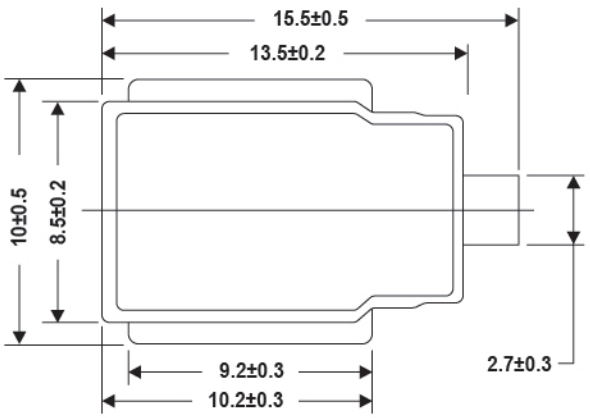


Fig.5 Typical Transient Thermal Impedance

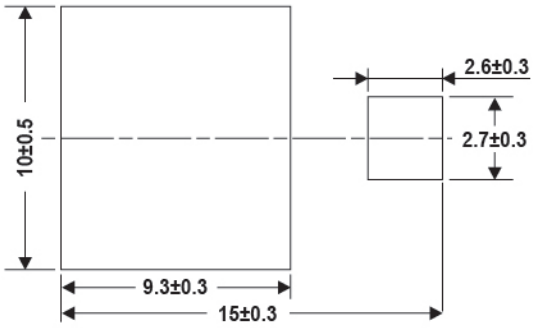


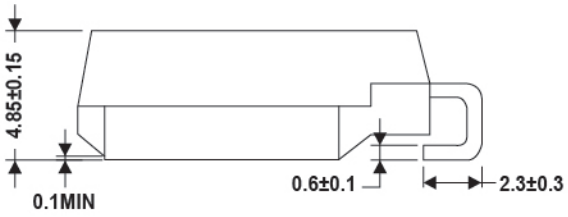
Package Outline Dimensions (millimeters)

DO-218AB



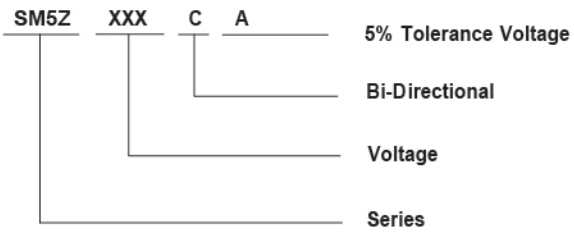
Mounting Pad Layout



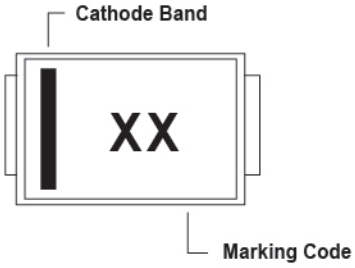


Part Numbering and Marking System

Part Numbering System



Marking System

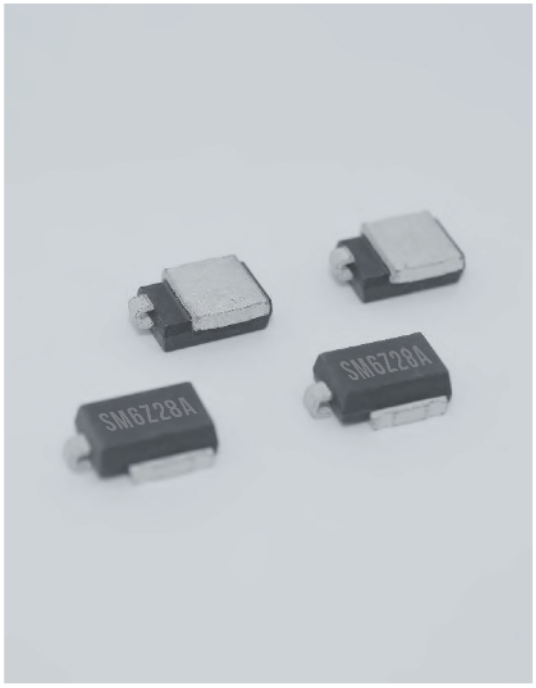


SM6Z Series

4600W

Operating Voltage : 10 to 43V
Peak Pulse Power: 4600W

DO-218AB



RoHS | HF Halogen Free

Features

- Chip produced by chemical method
- Junction passivated by high temperature resistant insulating adhesive
- T_J = 175 °C capability suitable for high reliability and automotive requirement
- Available in uni-directional polarity only
- Low leakage current
- Low forward voltage drop
- High surge capability
- Meets ISO7637-2 surge specification (varied by test condition)
- LF maximum peak of 245 °C
- AEC-Q101 qualified

Applications

- Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting, especially for automotive load dump protection application.

Mechanical Data

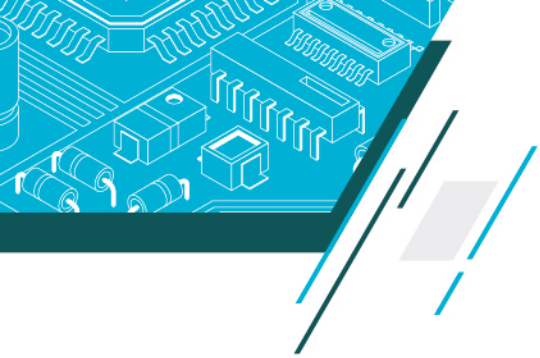
- Case: DO-218AB
- Molding compound meets UL 94 V-0 flammability rating Base P/NHE3_X - RoHS-compliant and AEC-Q101 qualified ("X"denotes revision code e.g. A, B, ...)
- Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

Maximum Ratings (T_C=25°C)

Parameter		Symbol	Value	Units
Peak pulse power dissipation	with 10/1000 µs waveform	P_{PPM}	4600	W
	with 10/10000 µs waveform		3600	W
Power dissipation on infinite heatsink at T_C = 25 °C (fig. 1)		P_D	6.0	W
Peak pulse current with 10/1000 µs waveform		I_{PPM}(1)	See Next Table	A
Peak forward surge current 8.3 ms single half sine-wave		I_{FSM}	600	A
Operating junction and storage temperature range		T_J , T_{STG}	-55 to + 175	°C

Notes : 1. Non-repetitive current pulse, derated above T_A= 25 °C.

FUZETEC | TVS SM6Z



Electrical Characteristics (Tc=25°C)

Part Number		Breakdown Voltage V_{BR}(V)			Test Current I_T (mA)	Stand-Off Voltage V_{WM} (V)	Maximum Reverse Leakage at V_{WM} I_D(μA)	Maximum Reverse Leakage at V_{WM} TJ=175 °C I_D(μA)	Max. Peak Pulse Current at 10/1000 μs Waveform (A)	Maximum Clamping Voltage at IPP V_C(V)	Typical Temp. Coefficient of V_{BR} (1) αT (%/°C)
Uni-Polar	Bi-Polar	Min.	Nom.	Max.							
SM6Z10A	SM6Z10CA	11.1	11.7	12.3	5	10	10	150	271	17.0	0.069
SM6Z11A	SM6Z11CA	12.2	12.9	13.5	5	11	10	150	253	18.2	0.072
SM6Z12A	SM6Z12CA	13.3	14.0	14.7	5	12	10	150	231	19.9	0.074
SM6Z13A	SM6Z13CA	14.4	15.2	15.9	5	13	10	150	214	21.5	0.076
SM6Z14A	SM6Z14CA	15.6	16.4	17.2	5	14	10	150	198	23.2	0.078
SM6Z15A	SM6Z15CA	16.7	17.6	18.5	5	15	10	150	189	24.4	0.080
SM6Z16A	SM6Z16CA	17.8	18.8	19.7	5	16	10	150	177	26.0	0.081
SM6Z17A	SM6Z17CA	18.9	19.9	20.9	5	17	10	150	167	27.6	0.082
SM6Z18A	SM6Z18CA	20.0	21.1	22.1	5	18	10	150	158	29.2	0.083
SM6Z20A	SM6Z20CA	22.2	23.4	24.5	5	20	10	150	142	32.4	0.085
SM6Z22A	SM6Z22CA	24.4	25.7	26.9	5	22	10	150	130	35.5	0.086
SM6Z24A	SM6Z24CA	26.7	28.1	29.5	5	24	10	150	118	38.9	0.087
SM6Z26A	SM6Z26CA	28.9	30.4	31.9	5	26	10	150	109	42.1	0.088
SM6Z28A	SM6Z28CA	31.1	32.8	34.4	5	28	10	150	101	45.4	0.089
SM6Z30A	SM6Z30CA	33.3	35.1	36.8	5	30	10	150	95	48.4	0.090
SM6Z33A	SM6Z33CA	36.7	38.7	40.6	5	33	10	150	86	53.3	0.091
SM6Z36A	SM6Z36CA	40.0	42.1	44.2	5	36	10	150	79	58.1	0.091
SM6Z40A	SM6Z40CA	44.4	46.8	49.1	5	40	10	150	71	64.5	0.092
SM6Z43A	SM6Z43CA	47.8	50.3	52.8	5	43	10	150	66	69.4	0.093

Notes : For all types maximum V_F = 1.8 V at IF = 100 A measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.

(1) To calculate V_{BR} vs. junction temperature, use the following formula: V_{BR} at T_J = V_{BR} at 25 °C x (1 + αT x (T_J - 25))

Thermal Characteristics (T_C = 25 °C unless otherwise noted)			
Parameter	Symbol	Value	Units
Typical thermal resistance, junction to case	RθJC	0.95	°C / W

Ratings and Characteristic Curves (TA=25°C)

Fig.1 Power Derating Curve

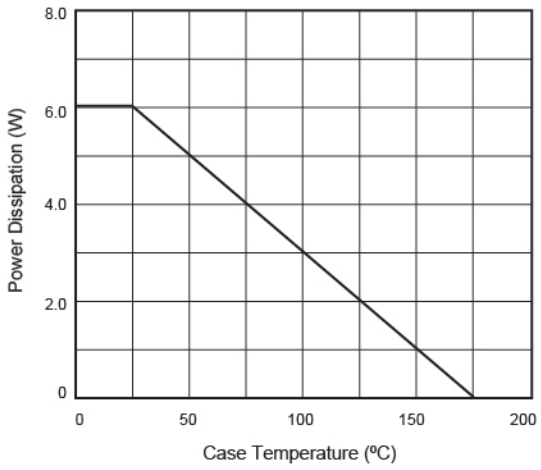


Fig.2 Load Dump Power Characteristics (10 ms Exponential Waveform)

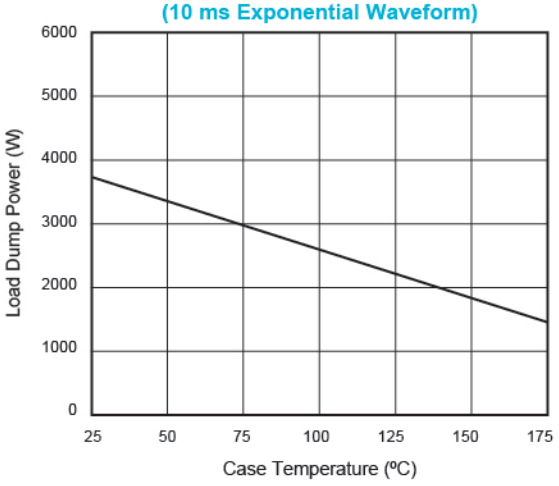


Fig.3 Pulse Waveform

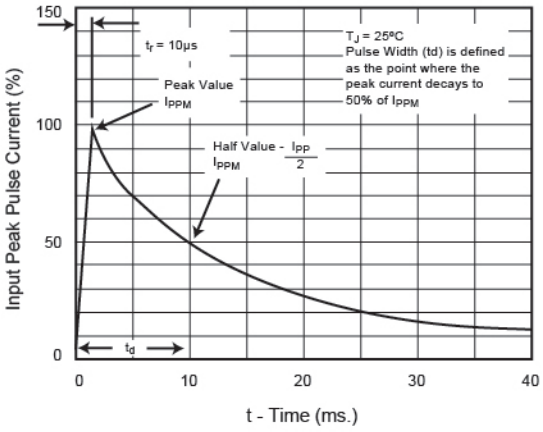


Fig.4 Reverse Power Capability

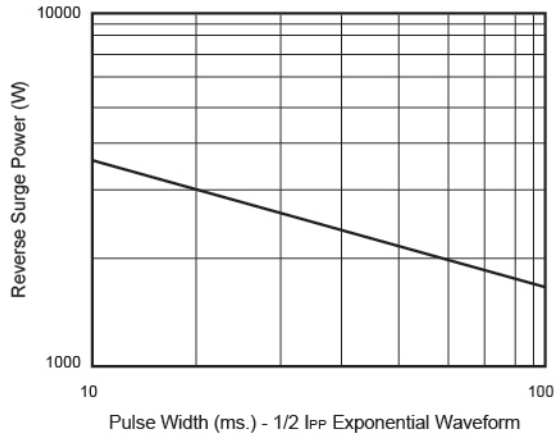
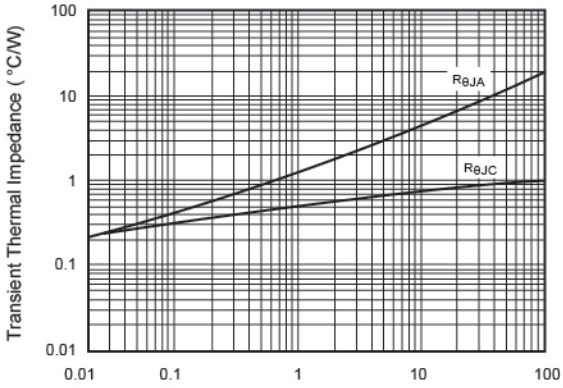
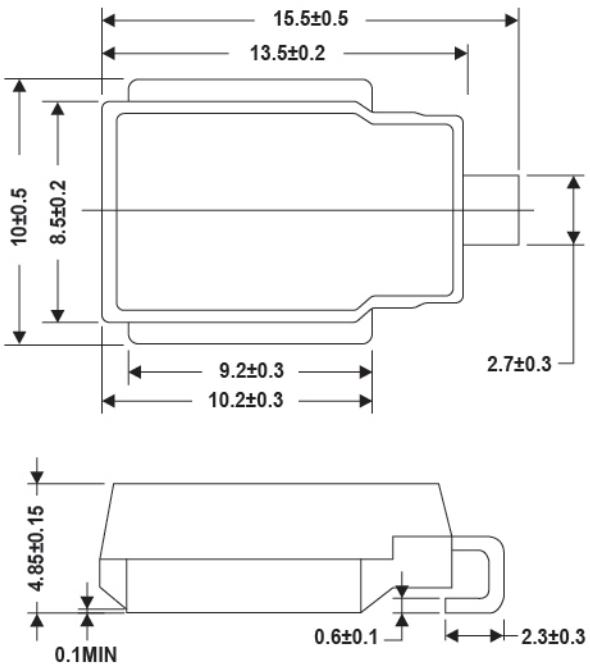


Fig.5 Typical Transient Thermal Impedance

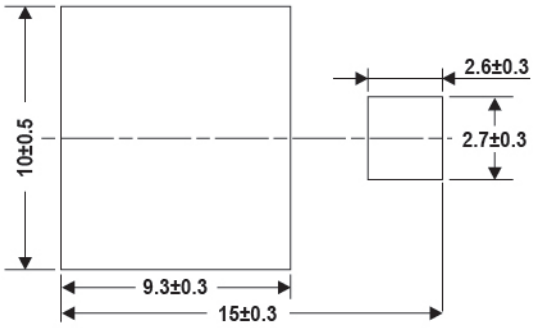


Package Outline Dimensions (millimeters)

DO-218AB

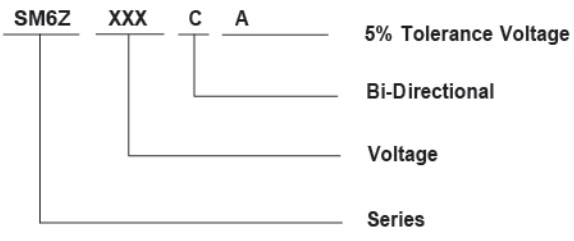


Mounting Pad Layout

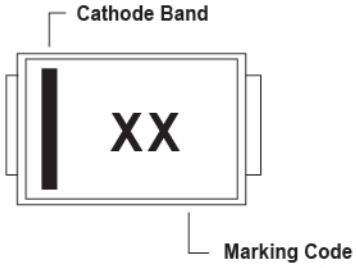


Part Numbering and Marking System

Part Numbering System



Marking System

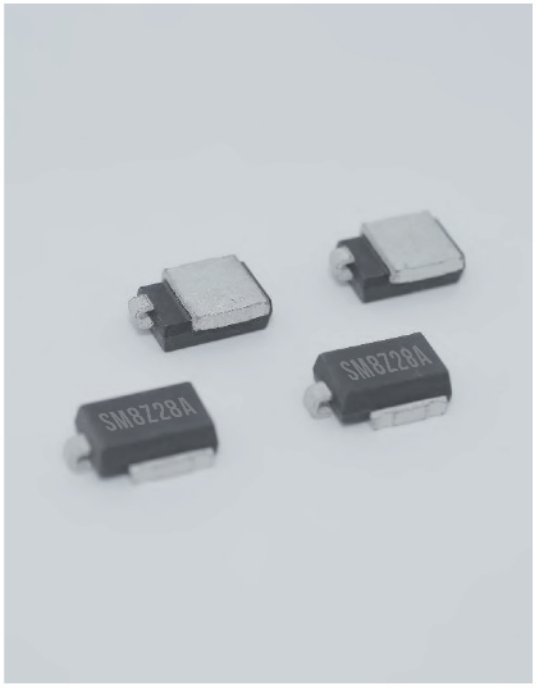


SM8Z Series

6600W

Operating Voltage : 10 to 43V
Peak Pulse Power: 6600W

DO-218AB



RoHS | HF Halogen Free

Features

- Chip produced by chemical method
- Junction passivated by high temperature resistant insulating adhesive
- T_J = 175 °C capability suitable for high reliability and automotive requirement
- Available in uni-directional polarity only
- Low leakage current
- Low forward voltage drop
- High surge capability
- Meets ISO7637-2 surge specification (varied by test condition)
- LF maximum peak of 245 °C
- AEC-Q101 qualified

Applications

- Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting, especially for automotive load dump protection application.

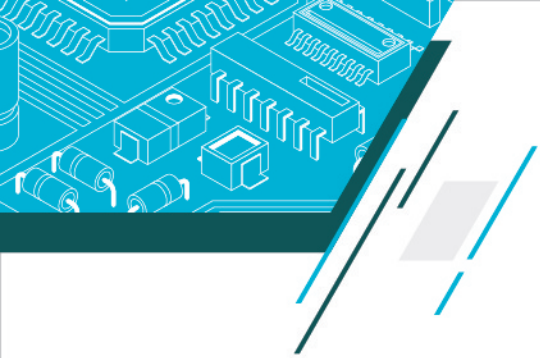
Mechanical Data

- Case: DO-218AB
- Molding compound meets UL 94 V-0 flammability rating Base P/NHE3_X - RoHS-compliant and AEC-Q101 qualified ("X" denotes revision code e.g. A, B, ...)
- Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

Maximum Ratings (T_C=25°C)

Parameter		Symbol	Value	Units
Peak pulse power dissipation	with 10/1000 µs waveform	P_{PPM}	6600	W
	with 10/10000 µs waveform		5200	W
Power dissipation on infinite heatsink at T_C = 25 °C (fig. 1)		P_D	8.0	W
Peak pulse current with 10/1000 µs waveform		I_{PPM}(1)	See Next Table	A
Peak forward surge current 8.3 ms single half sine-wave		I_{FSM}	700	A
Operating junction and storage temperature range		T_J , T_{STG}	-55 to + 175	°C

Notes : 1. Non-repetitive current pulse, derated above T_A= 25 °C.



Electrical Characteristics (TC=25°C)

Part Number		Breakdown Voltage V_{BR}(V)			Test Current I_T (mA)	Stand-Off Voltage V_{WM} (V)	Maximum Reverse Leakage at V_{WM} I_D(μA)	Maximum Reverse Leakage at V_{WM} TJ=175 °C I_D(μA)	Max. Peak Pulse Current at 10/1000 μs Waveform (A)	Maximum Clamping Voltage at IPP VC(V)	Typical Temp. Coefficient of V_{BR} (1) αT (%/°C)
Uni-Polar	Bi-Polar	Min.	Nom.	Max.							
SM8Z10A	SM8Z10CA	11.1	11.7	12.3	5	10	10	150	388.0	17.0	0.069
SM8Z11A	SM8Z11CA	12.2	12.9	13.5	5	11	10	150	363.0	18.2	0.072
SM8Z12A	SM8Z12CA	13.3	14.0	14.7	5	12	10	150	332.0	19.9	0.074
SM8Z13A	SM8Z13CA	14.4	15.2	15.9	5	13	10	150	307.0	21.5	0.076
SM8Z14A	SM8Z14CA	15.6	16.4	17.2	5	14	10	150	284.0	23.2	0.078
SM8Z15A	SM8Z15CA	16.7	17.6	18.5	5	15	10	150	270.0	24.4	0.080
SM8Z16A	SM8Z16CA	17.8	18.8	19.7	5	16	10	150	254.0	26.0	0.081
SM8Z17A	SM8Z17CA	18.9	19.9	20.9	5	17	10	150	239.0	27.6	0.082
SM8Z18A	SM8Z18CA	20.0	21.1	22.1	5	18	10	150	226.0	29.2	0.083
SM8Z20A	SM8Z20CA	22.2	23.4	24.5	5	20	10	150	204.0	32.4	0.085
SM8Z22A	SM8Z22CA	24.4	25.7	26.9	5	22	10	150	186.0	35.5	0.086
SM8Z24A	SM8Z24CA	26.7	28.1	29.5	5	24	10	150	170.0	38.9	0.087
SM8Z26A	SM8Z26CA	28.9	30.4	31.9	5	26	10	150	157.0	42.1	0.088
SM8Z28A	SM8Z28CA	31.1	32.8	34.4	5	28	10	150	145.0	45.4	0.089
SM8Z30A	SM8Z30CA	33.3	35.1	36.8	5	30	10	150	136.0	48.4	0.090
SM8Z33A	SM8Z33CA	36.7	38.7	40.6	5	33	10	150	124.0	53.3	0.091
SM8Z36A	SM8Z36CA	40.0	42.1	44.2	5	36	10	150	114.0	58.1	0.091
SM8Z40A	SM8Z40CA	44.4	46.8	49.1	5	40	10	150	102.0	64.5	0.092
SM8Z43A	SM8Z43CA	47.8	50.3	52.8	5	43	10	150	95.1	69.4	0.093

Notes : For all types maximum V_F = 1.8 V at IF = 100 A measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.

(1) To calculate V_{BR} vs. junction temperature, use the following formula: V_{BR} at T_J = V_{BR} at 25 °C x (1 + αT x (T_J - 25))

Thermal Characteristics (T_C = 25 °C unless otherwise noted)			
Parameter	Symbol	Value	Units
Typical thermal resistance, junction to case	RθJC	0.90	°C / W

Ratings and Characteristic Curves (TA=25°C)

Fig.1 Power Derating Curve

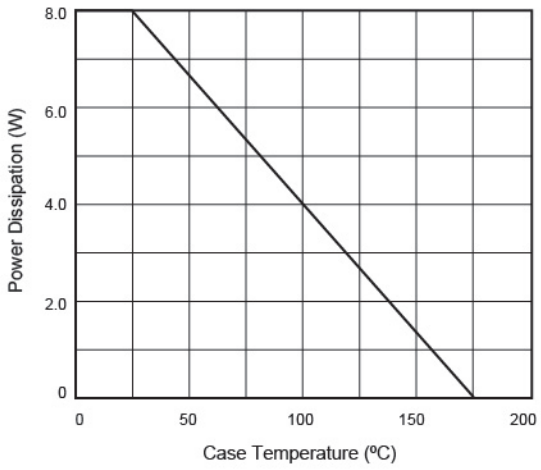


Fig.2 Load Dump Power Characteristics (10 ms Exponential Waveform)

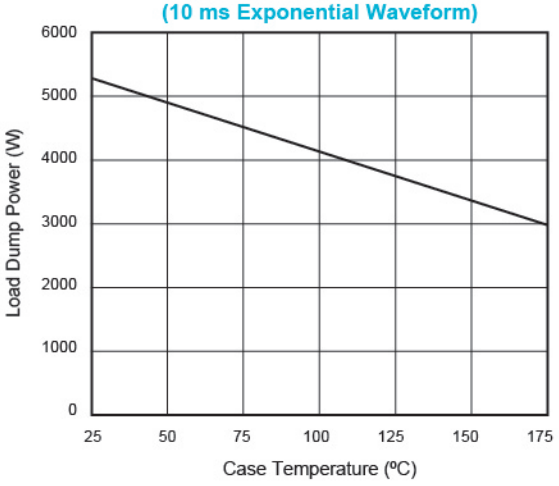


Fig.3 Pulse Waveform

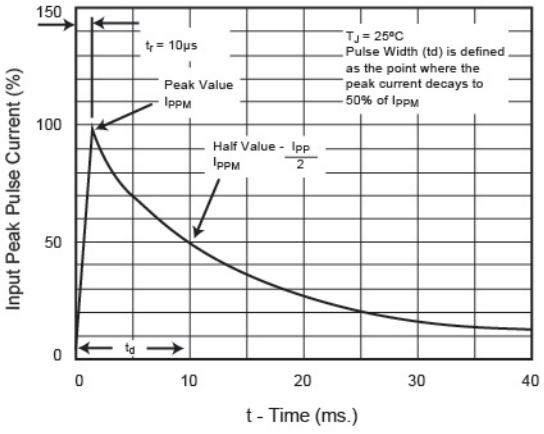


Fig.4 Reverse Power Capability

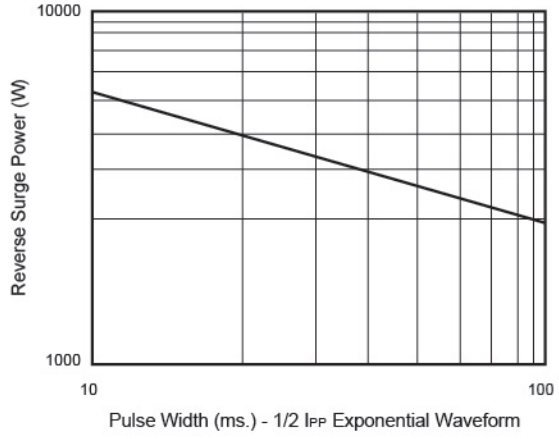


Fig.5 Typical Transient Thermal Impedance

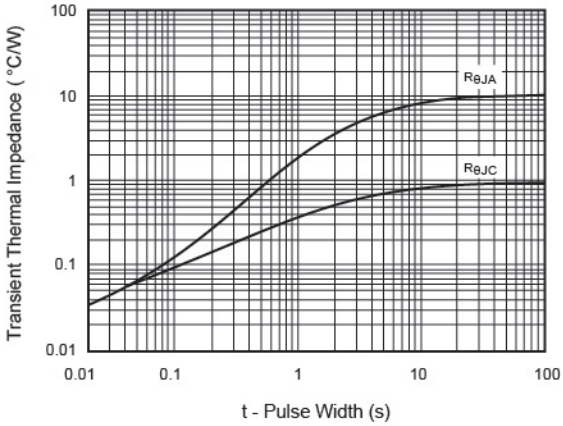
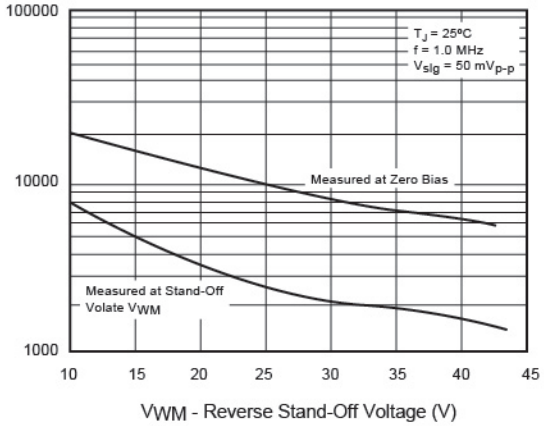
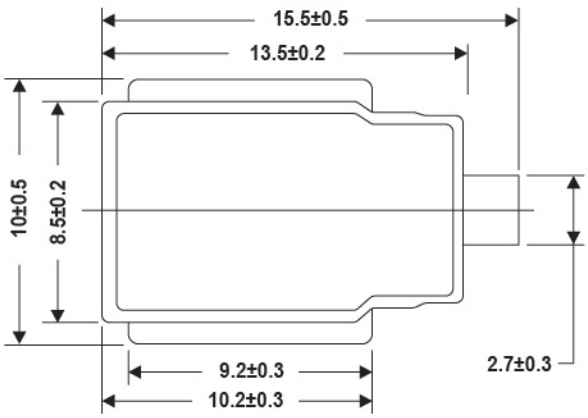


Fig.6 Typical Junction Capcitance

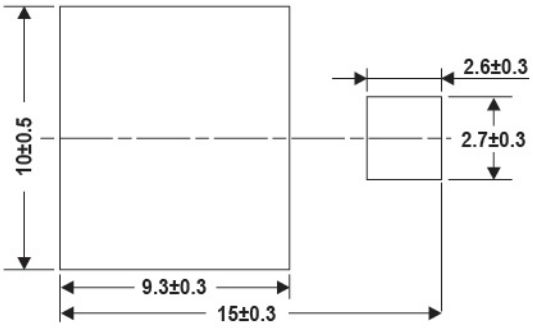


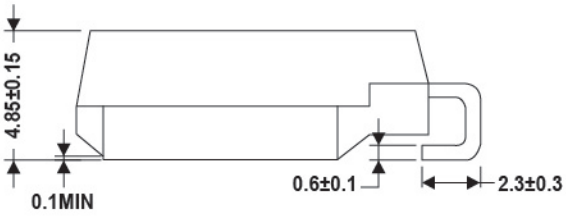
Package Outline Dimensions (millimeters)

DO-218AB



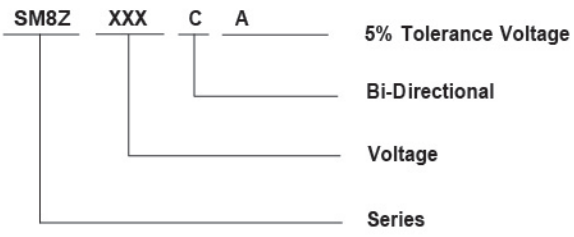
Mounting Pad Layout



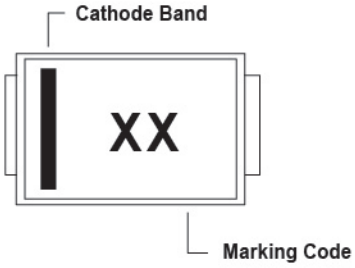


Part Numbering and Marking System

Part Numbering System



Marking System

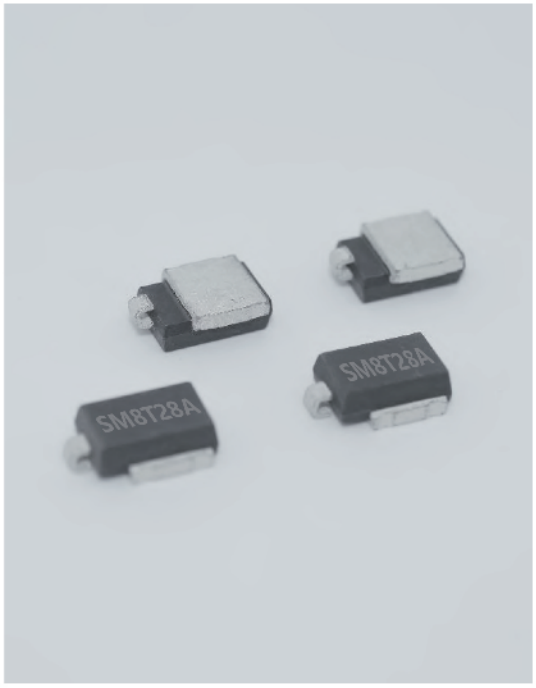


SM8T Series

8000W

Operating Voltage : 10 to 43V
Peak Pulse Power: 8000W

DO-218AB



RoHS | HF Halogen Free

Features

- Chip produced by chemical method
- Junction passivated by high temperature resistant insulating adhesive
- T_J = 175 °C capability suitable for high reliability and automotive requirement
- Available in uni-directional polarity only
- Low leakage current
- Low forward voltage drop
- High surge capability
- Meets ISO7637-2 surge specification (varied by test condition)
- LF maximum peak of 245 °C
- AEC-Q101 qualified

Applications

- Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting, especially for automotive load dump protection application.

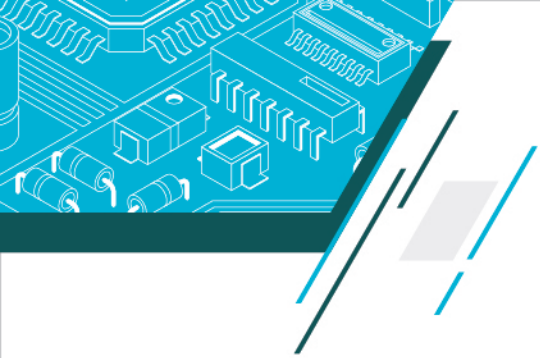
Mechanical Data

- Case: DO-218AB
- Molding compound meets UL 94 V-0 flammability rating Base P/NHE3_X - RoHS-compliant and AEC-Q101 qualified ("X" denotes revision code e.g. A, B, ...)
- Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

Maximum Ratings (T_C=25°C)

Parameter		Symbol	Value	Units
Peak pulse power dissipation	with 10/1000 µs waveform	P_{PPM}	8000	W
	with 10/10000 µs waveform		8000	W
Power dissipation on infinite heatsink at T_C = 25 °C (fig. 1)		P_D	8.5	W
Peak pulse current with 10/1000 µs waveform		I_{PPM}(1)	See Next Table	A
Peak forward surge current 8.3 ms single half sine-wave		I_{FSM}	750	A
Operating junction and storage temperature range		T_J , T_{STG}	-55 to + 175	°C

Notes : 1. Non-repetitive current pulse, derated above T_A= 25 °C.



Electrical Characteristics (TC=25°C)

Part Number		Breakdown Voltage V_{BR}(V)			Test Current I_T (mA)	Stand-Off Voltage V_{RWM} (V)	Maximum Reverse Leakage at V_{WM} I_D(μA)	Maximum Reverse Leakage at V_{WM} TJ=175 °C I_D(μA)	Max. Peak Pulse Current at 10/1000 μs Waveform (A)	Maximum Clamping Voltage @IPP V_C(V)	Typical Temp. Coefficient of V_{BR} αT (%/°C)
Uni-Polar	Bi-Polar	Min	Nom	Max							
SM8T10A	SM8T10CA	11.1	11.7	12.3	5	10	10	150	471	17.0	0.069
SM8T11A	SM8T11CA	12.2	12.9	13.5	5	11	10	150	440	18.2	0.072
SM8T12A	SM8T12CA	13.3	14.0	14.7	5	12	10	150	402	19.9	0.074
SM8T13A	SM8T13CA	14.4	15.2	15.9	5	13	10	150	372	21.5	0.076
SM8T14A	SM8T14CA	15.6	16.4	17.2	5	14	10	150	345	23.2	0.078
SM8T15A	SM8T15CA	16.7	17.6	18.5	5	15	10	150	328	24.4	0.080
SM8T16A	SM8T16CA	17.8	18.8	19.7	5	16	10	150	308	26.0	0.081
SM8T17A	SM8T17CA	18.9	19.9	20.9	5	17	10	150	290	27.6	0.082
SM8T18A	SM8T18CA	20.0	21.1	22.1	5	18	10	150	274	29.2	0.083
SM8T20A	SM8T20CA	22.2	23.4	24.5	5	20	10	150	247	32.4	0.085
SM8T22A	SM8T22CA	24.4	25.7	26.9	5	22	10	150	225	35.5	0.086
SM8T24A	SM8T24CA	26.7	28.1	29.5	5	24	10	150	205	38.9	0.087
SM8T26A	SM8T26CA	28.9	30.4	31.9	5	26	10	150	190	42.1	0.088
SM8T28A	SM8T28CA	31.1	32.8	34.4	5	28	10	150	176	45.4	0.089
SM8T30A	SM8T30CA	33.3	35.1	36.8	5	30	10	150	165	48.4	0.090
SM8T33A	SM8T33CA	36.7	38.7	40.6	5	33	10	150	150	53.3	0.091
SM8T36A	SM8T36CA	40.0	42.1	44.2	5	36	10	150	138	58.1	0.091
SM8T40A	SM8T40CA	44.4	46.8	49.1	5	40	10	150	124	64.5	0.092
SM8T43A	SM8T43CA	47.8	50.3	52.8	5	43	10	150	115	69.4	0.093

Notes : For all types maximum V_F = 1.8 V at IF = 100 A measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.
(1) To calculate V_{BR} vs. junction temperature, use the following formula: V_{BR} at T_J = V_{BR} at 25 °C x (1 + αT x (T_J - 25))

Thermal Characteristics (T_C = 25 °C unless otherwise noted)			
Parameter	Symbol	Value	Units
Typical thermal resistance, junction to case	$R_{\theta JC}$	0.90	°C / W

Ratings and Characteristic Curves (TA=25°C)

Fig.1 Power Derating Curve

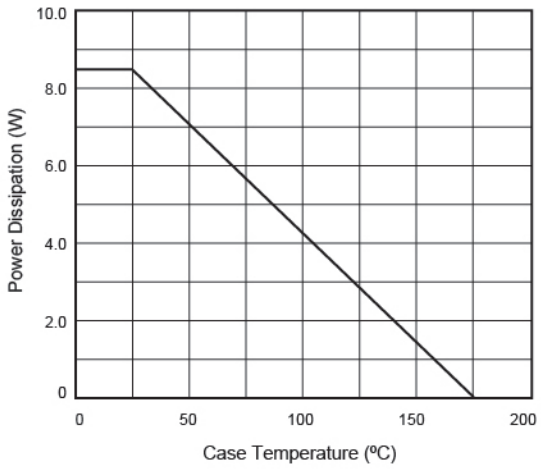


Fig.2 Load Dump Power Characteristics (10 ms Exponential Waveform)

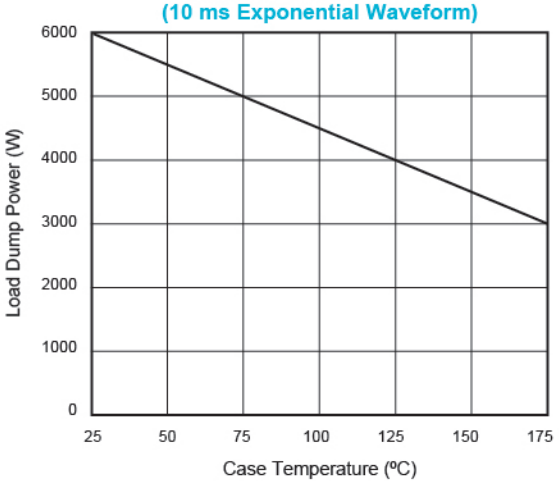


Fig.3 Pulse Waveform

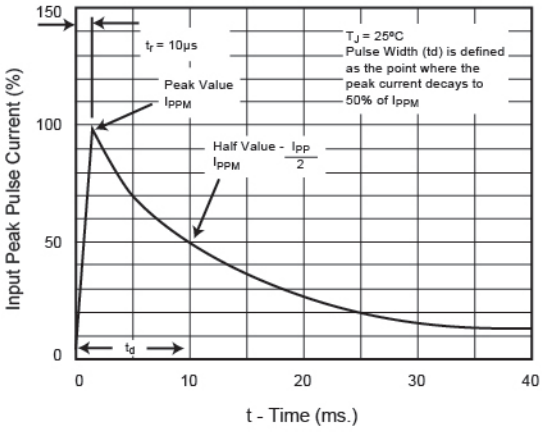


Fig.4 Reverse Power Capability

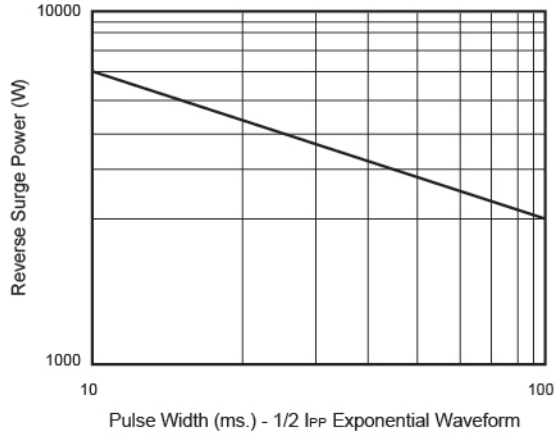
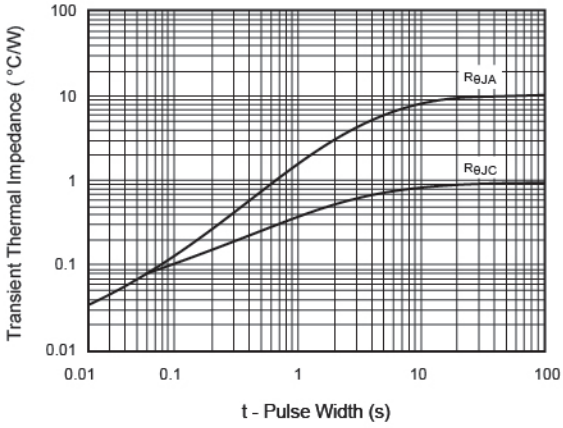
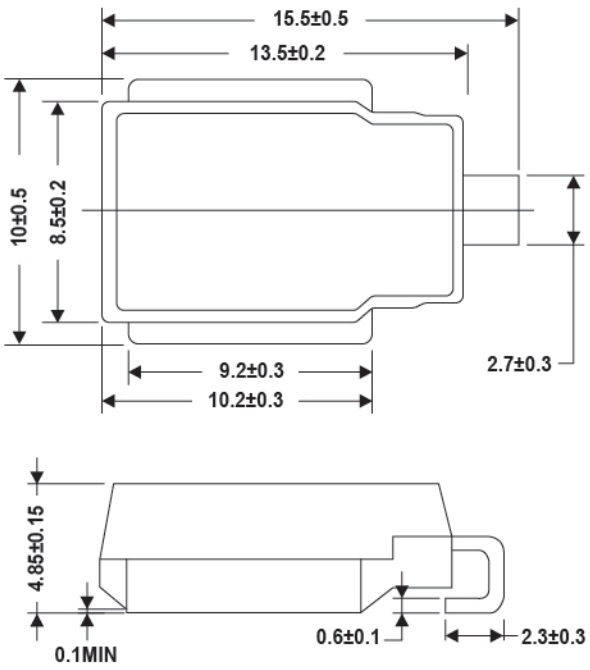


Fig.5 Typical Transient Thermal Impedance

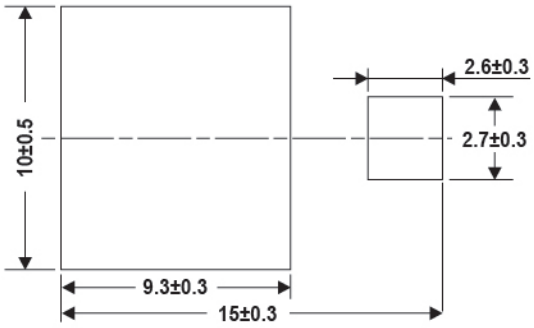


Package Outline Dimensions (millimeters)

DO-218AB

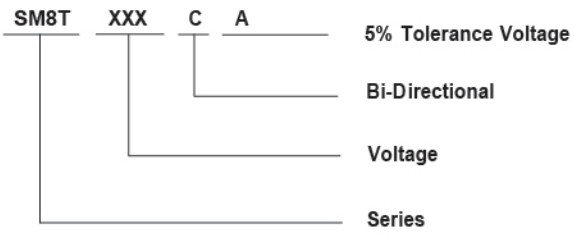


Mounting Pad Layout

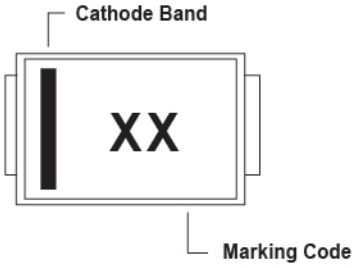


Part Numbering and Marking System

Part Numbering System



Marking System



Axial Leaded
TVS Series

Axial leaded and custom TVS diodes are the perfect solution for high voltage transients induced by lightning or electromagnetic pulses, ideal for industrial and telecom applications.

15KP Series

15000W

Operating Voltage : 17 to 280V
Peak Pulse Power: 15000W

R6/ P600

RoHS | HF Halogen Free

Features

- Glass passivated chip
- 15000 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle):0.01 %
- Low leakage current
- Uni and Bidirectional unit
- Excellent clamping capability
- Very fast response time
- RoHS compliant

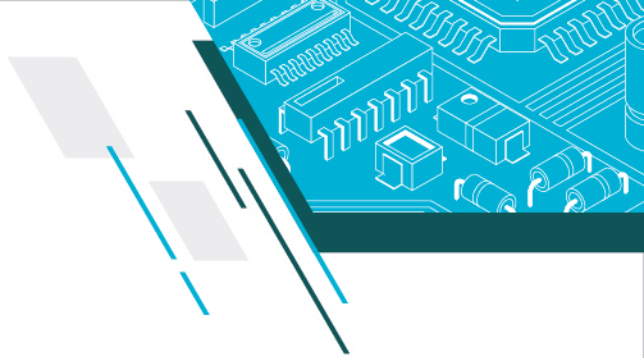
Mechanical Data

- Case: Molded plastic
- Epoxy: UL 94V-0 rate flame retardant
- Lead: Solderable per MIL-STD-202, method 208 guaranteed
- Polarity: Color band denotes cathode end except Bipolar
- Mounting position: Any

Maximum Ratings and Thermal Characteristics (T_C=25°C)

Parameter	Symbol	Value	Units
Peak Power Dissipation with a 10/1000μs waveform(1)	P_{PPM}	15000	W
Peak Pulse Current with a 10/1000μs waveform(1)	I_{PPM}	See Next Table	A
Power dissipation on infinite heatsink at T_C = 25 °C	P_D	8.0	W
Peak forward surge current, 8.3ms single half sine- wave unidirectional only(2)	I_{FSM}	400	A
Operating junction and Storage Temperature Range	T_J , T_{STG}	-55 to + 175	°C

Notes : 1. Non-repetitive current pulse per Fig.5 and derated above T_A = 25 °C per Fig.1
2. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.



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

Part Number		Breakdown Voltage V_{BR} @I_T			Maximum Reverse Leakage I_R@ V_{RWM} (μA)	Working Peak Reverse Voltage V_{RWM} (V)	Maximum Reverse Surge Current I_{PP} (A)	Maximum Clamping Voltage V_C @I_{PP} (V)
(Uni)	(Bi)	Min (V)	Max (V)	I_T (mA)				
15KP17A	15KP17CA	17	18.99	20.79	50	29.3	515.4	5000
15KP18A	15KP18CA	18	20.11	22.01	50	30.9	488.7	5000
15KP20A	15KP20CA	20	22.34	24.46	20	34.3	440.2	1500
15KP22A	15KP22CA	22	24.57	26.91	10	37.1	407.0	500
15KP24A	15KP24CA	24	26.81	29.35	5	40.7	371.0	150
15KP26A	15KP26CA	26	29.04	31.80	5	44.0	343.2	50
15KP28A	15KP28CA	28	31.28	34.24	5	47.5	317.9	25
15KP30A	15KP30CA	30	33.51	36.70	5	50.7	297.8	15
15KP33A	15KP33CA	33	36.90	40.40	5	54.7	276.1	2
15KP36A	15KP36CA	36	40.20	44.00	5	59.8	252.5	2
15KP40A	15KP40CA	40	44.70	48.90	5	65.8	229.5	2
15KP43A	15KP43CA	43	48.00	52.60	5	69.8	216.3	2
15KP45A	15KP45CA	45	50.30	55.00	5	72.8	207.4	2
15KP48A	15KP48CA	48	53.60	58.70	5	77.7	194.3	2
15KP51A	15KP51CA	51	57.00	62.40	5	82.9	182.1	2
15KP54A	15KP54CA	54	60.30	66.00	5	87.7	172.2	2
15KP58A	15KP58CA	58	64.80	70.90	5	93.8	161.0	2
15KP60A	15KP60CA	60	67.00	73.40	5	97.4	155.0	2
15KP64A	15KP64CA	64	71.50	78.30	5	104.2	144.9	2
15KP70A	15KP70CA	70	78.20	85.60	5	113.6	132.9	2
15KP75A	15KP75CA	75	83.80	91.70	5	122.0	123.8	2
15KP78A	15KP78CA	78	87.10	95.40	5	126.1	119.7	2
15KP85A	15KP85CA	85	94.90	104.00	5	137.6	109.7	2
15KP90A	15KP90CA	90	100.50	110.10	5	145.6	103.7	2
15KP100A	15KP100CA	100	111.70	122.30	5	161.3	93.6	2
15KP110A	15KP110CA	110	122.90	134.50	5	178.6	84.5	2
15KP120A	15KP120CA	120	134.00	146.80	5	192.3	78.5	2
15KP130A	15KP130CA	130	145.20	159.00	5	208.3	72.5	2
15KP150A	15KP150CA	150	167.60	183.50	5	241.9	62.4	2
15KP160A	15KP160CA	160	178.70	195.70	5	258.6	58.4	2
15KP170A	15KP170CA	170	189.90	207.90	5	272.7	55.4	2
15KP180A	15KP180CA	180	201.10	220.10	5	288.5	52.3	2

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

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

Part Number		Breakdown Voltage V_{BR} @I_T			Maximum Reverse Leakage I_R@ V_{RWM} (μA)	Working Peak Reverse Voltage V_{RWM} (V)	Maximum Reverse Surge Current I_{PP} (A)	Maximum Clamping Voltage V_C @I_{PP} (V)
(Uni)	(Bi)	Min (V)	Max (V)	I_T (mA)				
15KP200A	15KP200CA	200	223.40	244.60	5	319.1	47.3	2
15KP220A	15KP220CA	220	245.70	269.10	5	356.0	42.4	2
15KP240A	15KP240CA	240	268.10	293.50	5	384.6	39.3	2
15KP260A	15KP260CA	260	290.40	318.00	5	416.7	36.2	2
15KP280A	15KP280CA	280	312.80	342.40	5	454.5	33.2	2

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves(T_A=25°C unless otherwise noted)

Fig.1 Peak Pulse Power Rating

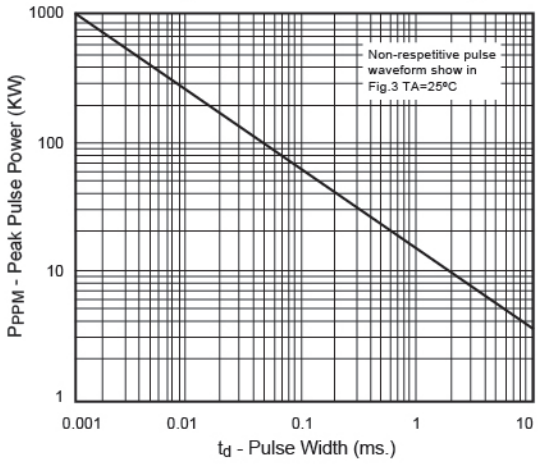


Fig.2 Pulse Derating Cure

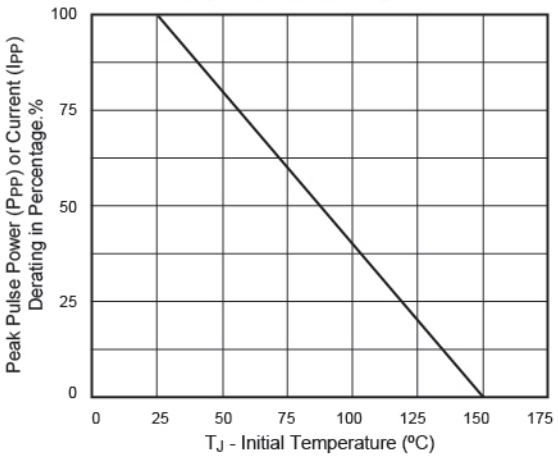


Fig.3 Pulse Waveform

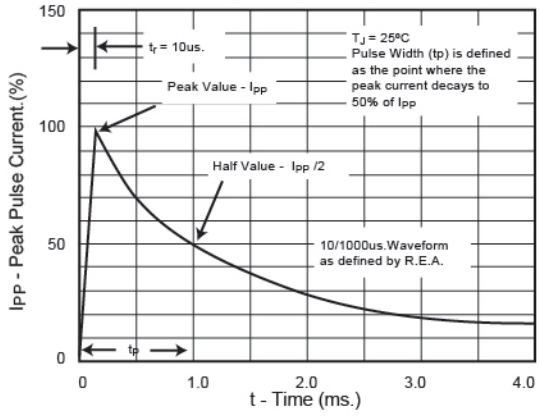
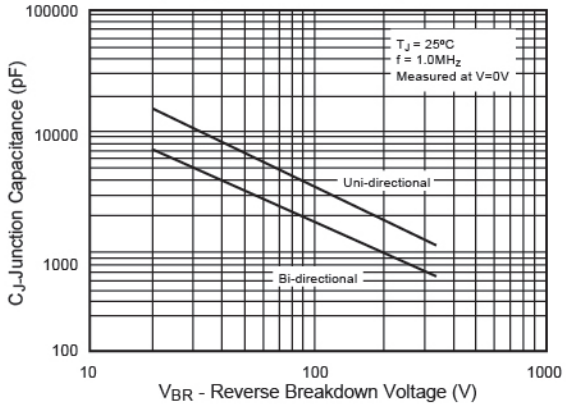
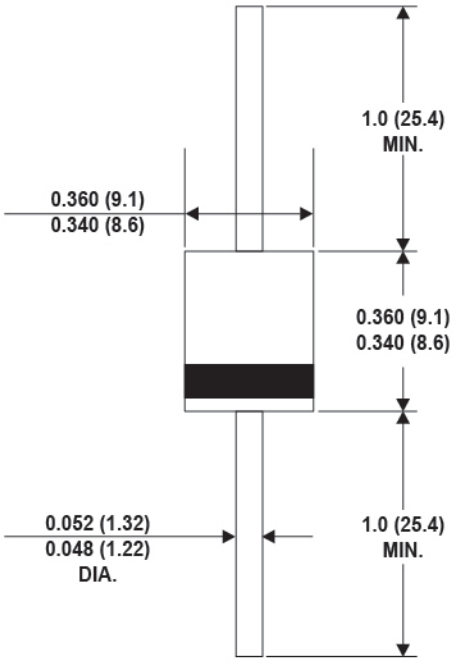


Fig.4 Typical Junction Capacitance



Dimensions

R6/P600



Unit : mm

30KPA Series

30000W

Operating Voltage : 28 to 288V

Peak Pulse Power: 30000W

R6/ P600

RoHS | HF Halogen Free

Features

- Glass passivated chip junction in P600 Package
- Low leakage
- Uni and Bidirectional unit
- Excellent clamping capability
- 30000W Peak power capability at 10 × 1000μs waveform Repetition rate (duty cycle) : 0.01%
- Fast response time: typically less than 1.0ps from 0 Volts to VBR min
- Typical I_R less than 2μA above 73V.
- High Temperature soldering: 260°C/40 seconds at terminals
- Typical maximum temperature coefficient ΔV_{BR} = 0.1% × V_{BR}@25°C× ΔT
- Plastic package has Underwriters Laboratory Flammability 94V-0
- Matte tin lead-free Plated
- Halogen free and RoHS compliant
- 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 15kV(Air), 8kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

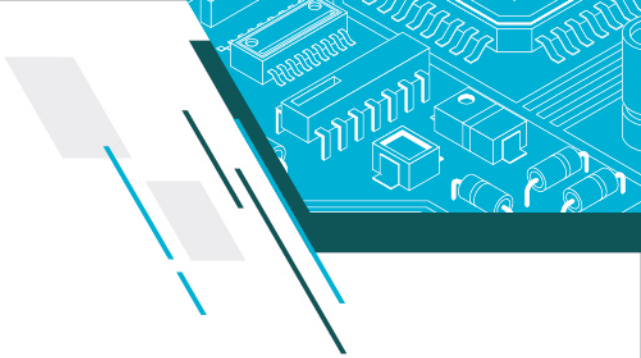
Applications

- TVS devices are ideal for the protection of I/O interfaces, V_{CC} bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

Maximum Ratings and Thermal Characteristics (T_A=25°C)

Parameter	Symbol	Value	Units
Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note1)(Note2)	P_{PPM}	30000	W
Peak Pulse Current with a 10/ 1000μs waveform.(Note1,Fig.3)	I_{PP}	See Next Table	A
Power Dissipation on Infinite Heat Sink at TL=75°C	P_D	8.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note3)	I_{FSM}	500	A
Operating junction and Storage Temperature Range.	T_J , T_{STG}	-55 to + 150	°C

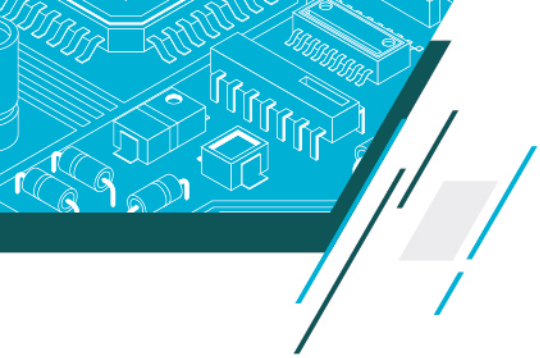
Notes : 1. Non- repetitive current pulse, per Fig.3 and derated above T_A=25 °C per Fig.2.
2. Mounted on 5.0 mm x 5.0 mm (0.03 mm thick) Copper Pads to each terminal.
3. 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
4. V_F<3.5V for V_{BR}<200 V and V_F<6.5V for V_{BR}>201V.



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

Part Number		Reverse Stand-off Voltage @V_{RWM}(V)	Breakdown Voltage Min.@IT V_{BR} Min(V)	Test Current I_T(ma)	Maximum Clamping Voltage @I_{PPM} V_C(V)	Maximum Peak Pulse Current I_{PP}(A)	Maximum Reverse Leakage I_R at V_{WM} I_R(μA)
(Uni)	(Bi)						
30KPA28A	30KPA28CA	28	31.28	50	50.0	606.0	5000
30KPA30A	30KPA30CA	30	33.51	50	55.2	548.9	5000
30KPA33A	30KPA33CA	33	36.90	50	58.5	517.9	5000
30KPA36A	30KPA36CA	36	40.20	50	61.8	490.3	5000
30KPA39A	30KPA39CA	39	43.60	20	67.2	450.9	2000
30KPA42A	30KPA42CA	42	46.90	10	72.0	420.8	1000
30KPA43A	30KPA43CA	43	48.00	10	73.0	415.1	1000
30KPA45A	30KPA45CA	45	50.30	5	77.4	391.5	250
30KPA48A	30KPA48CA	48	53.60	5	81.6	371.3	150
30KPA51A	30KPA51CA	51	57.00	5	86.4	350.7	50
30KPA54A	30KPA54CA	54	60.30	5	91.4	331.5	20
30KPA58A	30KPA58CA	58	64.80	5	92.4	327.9	20
30KPA60A	30KPA60CA	60	67.00	5	102.0	297.1	15
30KPA64A	30KPA64CA	64	71.50	5	104.0	291.3	10
30KPA66A	30KPA66CA	66	73.70	5	107.0	283.2	2
30KPA70A	30KPA70CA	70	78.20	5	109.0	278.0	2
30KPA71A	30KPA71CA	71	79.30	5	111.5	271.7	2
30KPA72A	30KPA72CA	72	80.40	5	114.0	265.8	2
30KPA75A	30KPA75CA	75	83.80	5	119.4	253.8	2
30KPA78A	30KPA78CA	78	87.10	5	129.0	234.9	2
30KPA84A	30KPA84CA	84	93.80	5	139.2	217.7	2
30KPA90A	30KPA90CA	90	100.50	5	146.4	207.0	2
30KPA96A	30KPA96CA	96	107.20	5	156.0	194.2	2
30KPA102A	30KPA102CA	102	113.90	5	165.6	183.0	2
30KPA108A	30KPA108CA	108	120.60	5	175.2	172.9	2
30KPA120A	30KPA120CA	120	134.00	5	194.4	155.9	2
30KPA132A	30KPA132CA	132	147.40	5	213.0	142.3	2
30KPA144A	30KPA144CA	144	160.80	5	223.2	135.8	2
30KPA150A	30KPA150CA	150	167.60	5	233.4	129.8	2
30KPA156A	30KPA156CA	156	174.30	5	245.0	123.7	2

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.



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

Part Number		Reverse Stand-off Voltage @V_{RWM}(V)	Breakdown Voltage Min.@IT V_{BR} Min(V)	Test Current I_T(ma)	Maximum Clamping Voltage @I_{PPM} V_C(V)	Maximum Peak Pulse Current I_{PP}(A)	Maximum Reverse Leakage I_R at V_{WM} I_R(μA)
(Uni)	(Bi)						
30KPA160A	30KPA160CA	160	178.70	5	252.6	120.0	2
30KPA168A	30KPA168CA	168	187.70	5	272.4	111.2	2
30KPA170A	30KPA170CA	170	189.90	5	275.0	110.2	2
30KPA180A	30KPA180CA	180	201.10	5	290.4	104.3	2
30KPA198A	30KPA198CA	198	221.20	5	319.8	94.7	2
30KPA216A	30KPA216CA	216	241.30	5	348.6	86.9	2
30KPA240A	30KPA240CA	240	268.10	5	387.0	78.3	2
30KPA258A	30KPA258CA	258	188.20	5	416.4	72.8	2
30KPA260A	30KPA260CA	260	290.40	5	416.0	72.8	2
30KPA270A	30KPA270CA	270	301.60	5	436.2	69.5	2
30KPA280A	30KPA280CA	280	312.80	5	464.0	65.3	2
30KPA288A	30KPA288CA	288	321.70	5	469.9	64.5	2

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Ratings and Characteristic Curves(TA=25°C unless otherwise noted)

Fig.1 - Peak Pulse Power Rating Curve

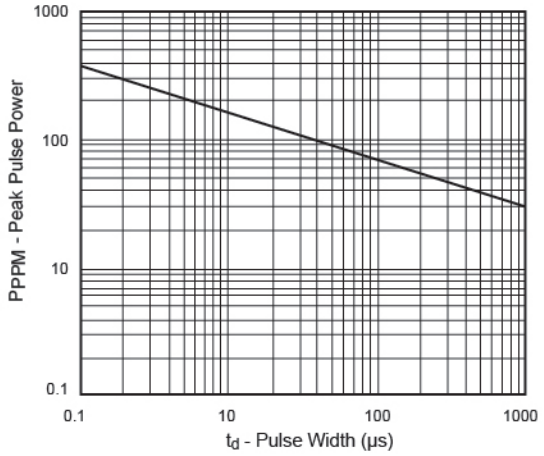


Fig.2 - Pulse Derating Curve

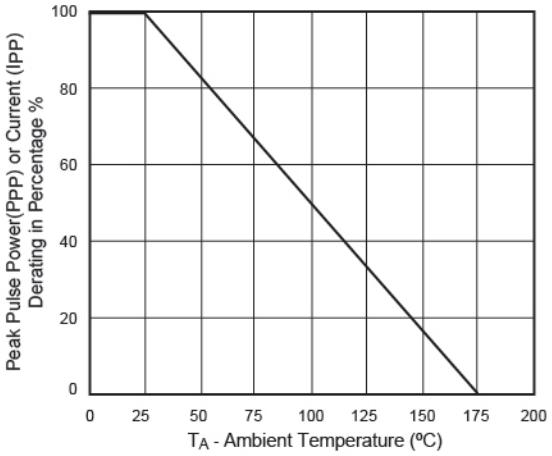


Fig.3 - Pulse Waveform

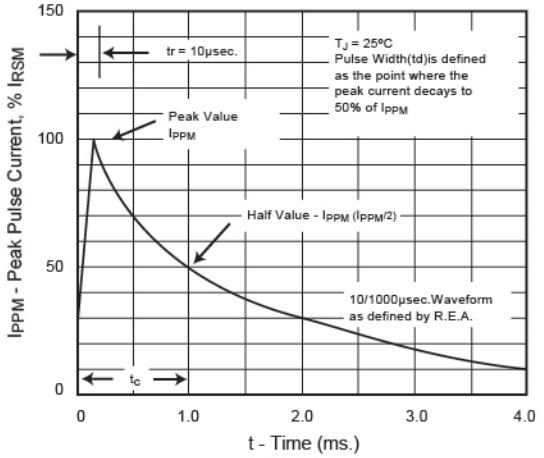


Fig.4 - Typical Junction Capacitance

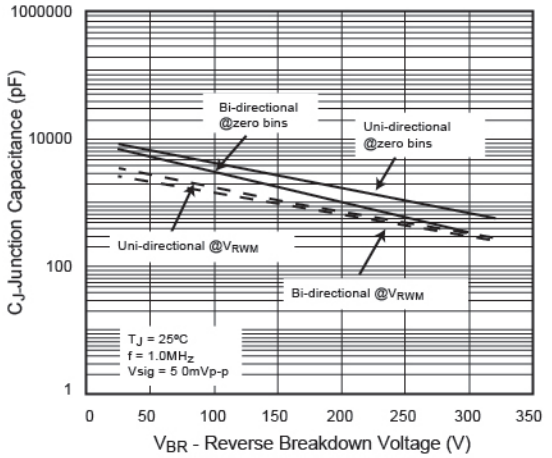


Fig.5 - Steady State Power Derating Curve

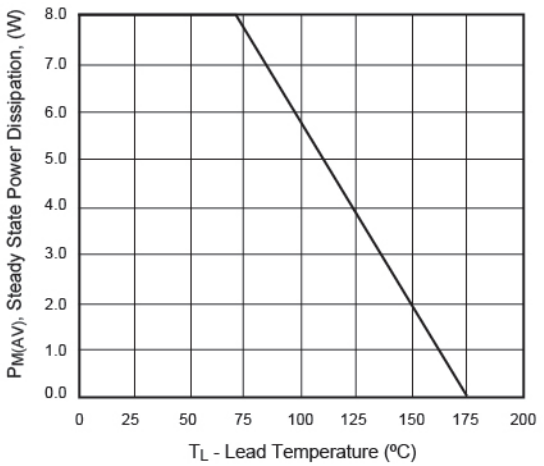
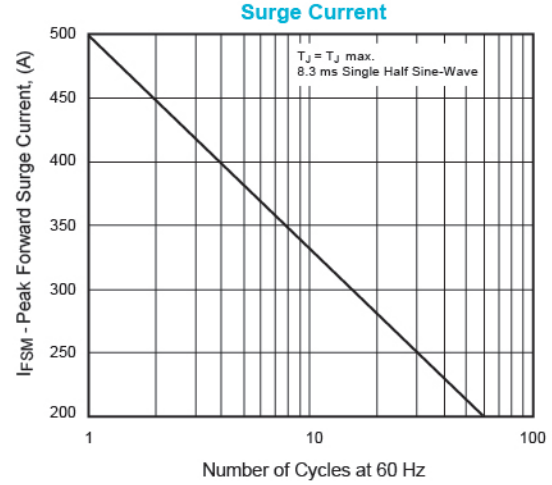
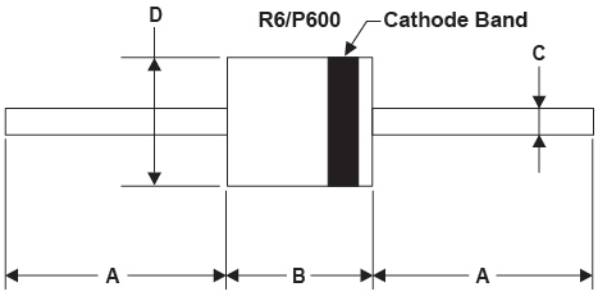


Fig.6 - Maximum Non-Repetitive Surge Current

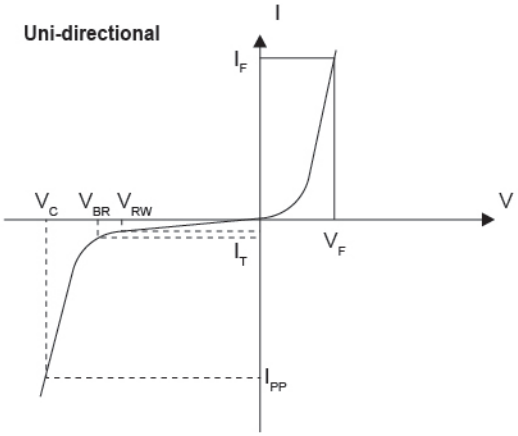


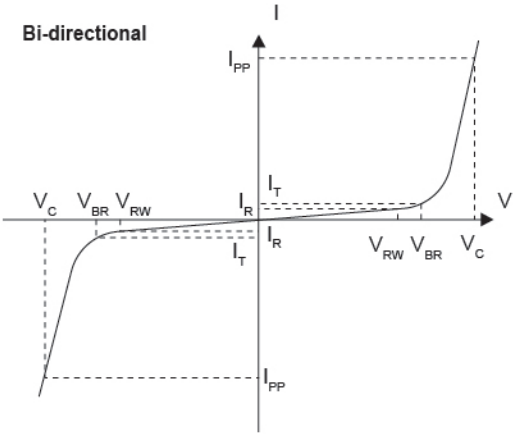
Dimensions



Dimensions	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	1.000	-	25.40	-
B	0.340	0.360	8.64	9.14
C	0.048	0.052	1.22	1.32
D	0.340	0.360	8.64	9.14

I-V Curve Characteristics





Physical Specifications

Weight	Case
0.07 ounce, 2.1gram	JEDEC R-6/P600 Molded Plastic over glass passivated junction

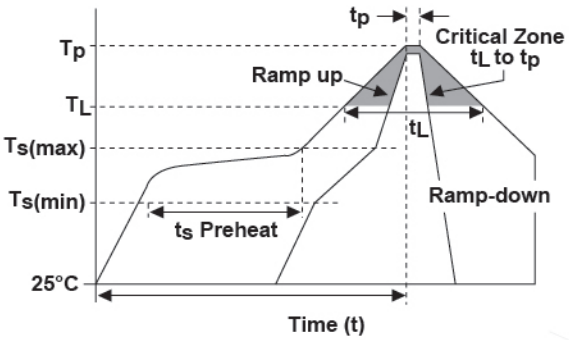
Polatity	Terminal
Color band denotes cathode except Bipolar	Matte Tin-plated leads, Solderable per JESD22-B102D

Environmental Specifications

Temperature Cycle	Pressure Cooker	High Temp. Storage	HTRB	Thermal Shock
JESD22-A104	JESD22-A102	JESD22-A103	JESD22-A108	JESD22-A106

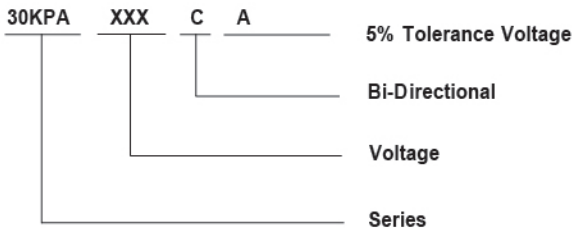
Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
	Temperature Max (Ts(max))	200°C
	Time (min to max) (ts)	60 – 180 secs
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°C
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		280°C

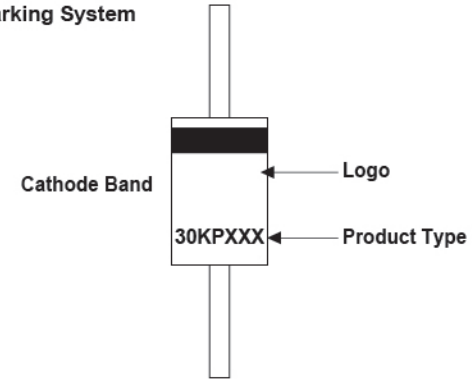


Part Numbering and Marking System

Part Numbering System

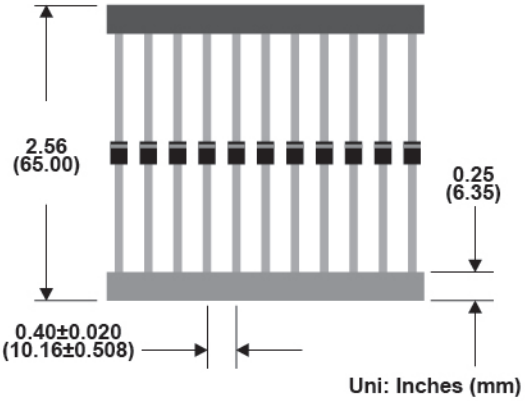


Marking System



Packaging Specification

Part Number	Component Package	Quantity	Packaging Option
30KPAXXXXX	R6/P600	250	Box



AK3 Series

Operating Voltage : 12.8 to 430V

Custom Part

RoHS | HF Halogen Free

Features

- Axial lead terminals
- High current transient suppressor
- Excellent Clamping Capability
- Glass Passivated Junction
- Bi-directional
- Low Slope Resistance
- Repetition Rate (duty cycle):0.01%
- Hazardous Substances Free
- RoHS Compliant
- High Temperature soldering: 260°C/10 seconds at terminals
- Epoxy Encapsulated
- Silver plated leads

Maximum Ratings and Thermal Characteristics (T_A=25°C)

Parameter	Symbol	Value	Units
Operating junction	T_J	-55 to + 150	°C
Storage Temperature Range	T_{STG}	-55 to + 150	°C
Current Rating[1]	I_{PP}	3	KA

Notes : 1. Rated I_{PP} measured with 8 × 20μs pulse.

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

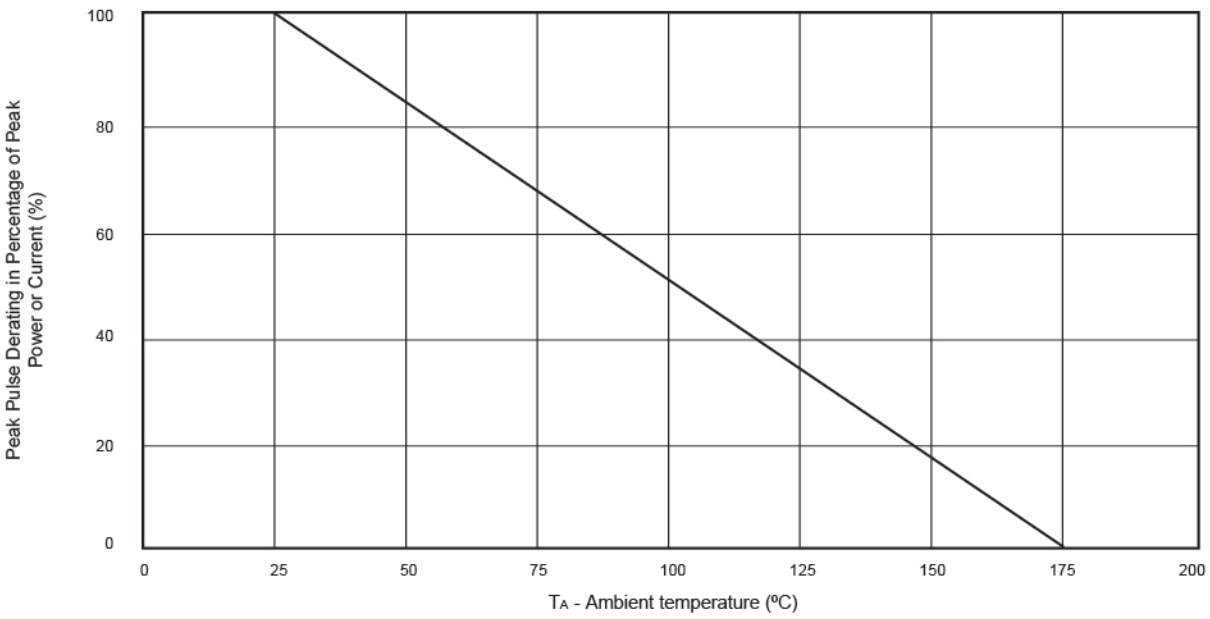
Part Number	Reverse Stand-Off Voltage		Breakdown Voltage	Test Current	Current Rating	Maximum Clamping Voltage	Reverse Leakage
	V_{AC} (V)	V_{DC}(V)	V_{BR}(V) Min.@IT	I_T (mA)	I_{PP} 8/20μs (KA)	V_C(V) @I_{PP}	IR(μA) @V_{DC}
AK3-012C	8.5	12.80	14	10.0	3.0	28	5
AK3-015C	11	15.00	17	10.0	3.0	30	5
AK3-020C	14	20.00	22	10.0	3.0	40	5
AK3-025C	17	25.00	28	10.0	3.0	50	5
AK3-030C	21	30.00	33	10.0	3.0	60	5
AK3-042C	30	42.00	47	10.0	3.0	77	5
AK3-058C	40	58.00	64	10.0	3.0	110	5
AK3-066C	45	66.00	70	10.0	3.0	125	5
AK3-076C	54	76.00	85	10.0	3.0	140	5
AK3-100C	72	100.00	110	10.0	3.0	165	5
AK3-133C	100	133.00	147	10.0	3.0	220	5
AK3-170C	130	170.00	180	10.0	3.0	260	5
AK3-190C	145	190.00	200	10.0	3.0	290	5
AK3-200C	150	200.00	222	10.0	3.0	330	5
AK3-240C	180	240.00	250	10.0	3.0	340	5
AK3-380C	275	380.00	401	10.0	3.0	520	5
AK3-430C	310	430.00	440	10.0	3.0	625	5

* For bidirectional type having Vrwm of 10 volts and less, the IR limit is double.

Physical Specifications

Weight	Case	Terminal
Contact manufacturer	Epoxy encapsulated	Silver plated leads, solderable per MIL-STD-750, Method 2026

Ratings and Characteristic Curves(TA=25°C unless otherwise noted)



Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	Temperature Max (Ts(min))	150°C
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	Time (min to max) (ts)	60 – 180 secs
Average ramp up rate (Liquidus Temp (T_L) to peak)		3°C/second max
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Reflow	Temperature (T_L) (Liquidus)	217°C
	Time (min to max) (t_L)	60 – 150 seconds
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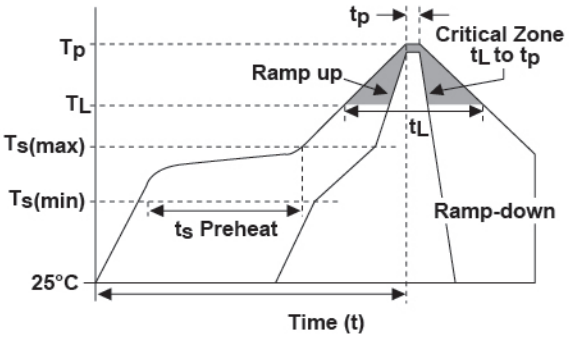
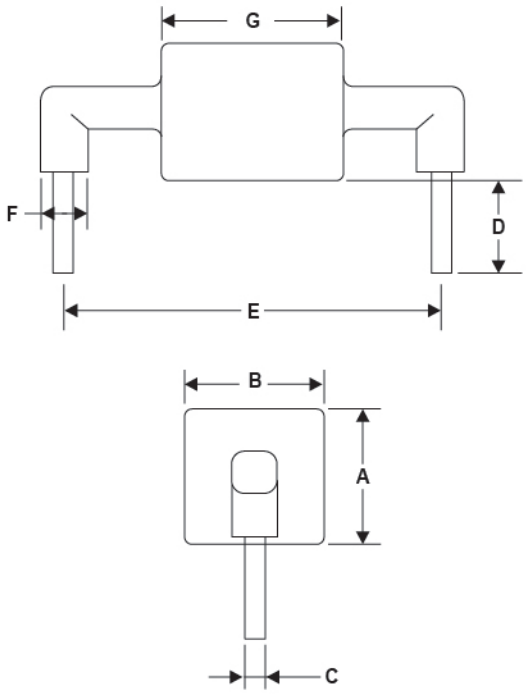
Time within 5°C of actual peak Temperature (tp)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes max
Do not exceed		280°C



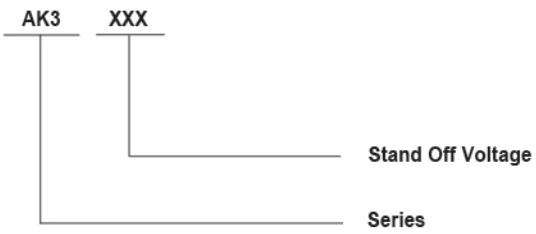
Dimensions



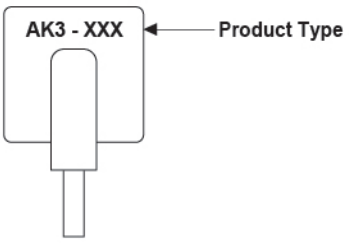
Dimensions		Inches	Millimeters
A		0.370 ± 0.039	9.00 ± 1.0
B		0.370 ± 0.039	9.00 ± 1.0
C		0.051 ± 0.004	1.30 ± 0.1
D		0.236 ± 0.039	6.00 ± 1.0
E		0.950 ± 0.028	24.15 ± 0.7
F		0.138 ± 0.028	3.00 ± 0.7
G	012~025	0.177 ± 0.047	4.50 ± 1.2
	030~042	0.209 ± 0.047	5.30 ± 1.2
	058~076	0.244 ± 0.047	6.20 ± 1.2
	100	0.307 ± 0.047	7.80 ± 1.2
	133	0.339 ± 0.047	8.60 ± 1.2
	170~200	0.370 ± 0.047	9.40 ± 1.2
	240	0.433 ± 0.047	11.00 ± 1.2
	380	0.567 ± 0.047	14.40 ± 1.2
	430	0.598 ± 0.047	15.20 ± 1.2

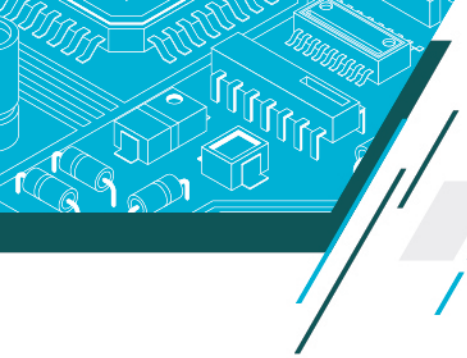
Part Numbering and Marking System

Part Numbering System



Marking System





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