

**Features**

- 400 Watts peak pulse power capability at 10x1000µS Waveforms
- Typical  $I_R$  less than 1µA above 10VV<sub>R</sub>
- Low profile package with low inductance
- Excellent low clamping voltage
- Fast response time: typical less than 1ps from 0V to V<sub>BR</sub>Min.
- High temperature to reflow soldering: 260°C/40s at terminals
- Surface mounted devices to optimize board space
- Working voltage: 5V-440V
- RoHS Compliant



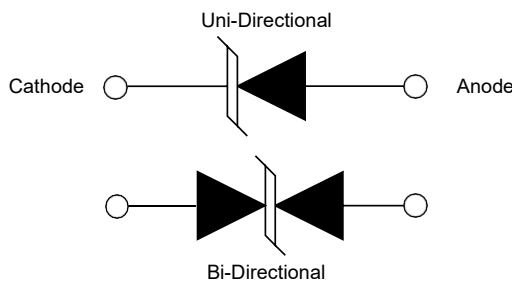
**Applications**

- Consumer electronic products
- Industries and Automotive
- Desktops, Servers and Notebooks
- Peripherals and Interfaces
- Switching Systems
- Power Management

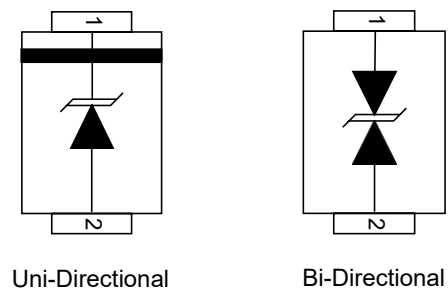
**Mechanical Characteristics**

- DO-214AC (SMA) package
- Flammability rating: UL 94V-0
- MSL-1 Level
- Marking: Part number, date code
- Packaging: Tape and reel

**Circuit Diagram**



**Pin Configuration**



**Ordering Information**

Part Number	Working Voltage (V)	Unit Weight (g/pcs) Typ.	Quantity Per Reel (pcs)	Reel Size (Inch)	Quantity Per Carton (pcs)
CSEXXXXSMA	5-440	0.067	5,000	13	80,000

### Absolute Maximum Rating ( $T_A=25^\circ\text{C}$ , RH=45%-75%, unless otherwise noted)

Symbol	Parameter	Value	Units
$P_{PP}$	Peak pulse power dissipation on 10/1000 $\mu\text{s}$ waveform	400	Watts
$P_{M(AV)}$	Steady state power dissipation at $T_L=75^\circ\text{C}$	3.3	Watts
$V_F$	Maximum instantaneous forward voltage at 25A for unidirectional	5.0	V
$I_{FSM}$	Peak forward surge current, 8.3ms single half sine wave (Note 1)	60	A
$R_{\theta JL}$	Typical thermal resistance junction to lead	30	$^\circ\text{C/W}$
$R_{\theta JA}$	Typical thermal resistance junction to ambient	120	$^\circ\text{C/W}$
$T_J/T_{STG}$	Operating junction and storage temperature range	-55 to +150	$^\circ\text{C}$

#### Notes:

- 1 Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum

### Electrical Characteristics ( $T_A=25^\circ\text{C}$ )

Part Number		$V_{RWM}$	$I_R@V_{RWM}$	$V_{BR}@I_T$		$I_T$	$V_C@I_{PP}$	$I_{PP}^{(1)}$
Uni-Polar	Bi-Polar	V	$\mu\text{A}$	Min(V)	Max(V)	mA	Max(V)	A
CSE5.0UCSMA	CSE5.0BCSMA	5.0	120	6.40	7.00	10	9.2	43.5
CSE6.0UCSMA	CSE6.0BCSMA	6.0	120	6.67	7.37	10	10.3	38.8
CSE6.5UCSMA	CSE6.5BCSMA	6.5	80	7.22	7.98	10	11.2	35.7
CSE7.0UCSMA	CSE7.0BCSMA	7.0	50	7.78	8.60	10	12.0	33.3
CSE7.5UCSMA	CSE7.5BCSMA	7.5	50	8.33	9.21	1	12.9	31.0
CSE8.0UCSMA	CSE8.0BCSMA	8.0	20	8.89	9.83	1	13.6	29.4
CSE8.5UCSMA	CSE8.5BCSMA	8.5	10	9.44	10.40	1	14.4	27.8
CSE9.0UCSMA	CSE9.0BCSMA	9.0	5	10.00	11.10	1	15.4	26.0
CSE10UCSMA	CSE10BCSMA	10	2	11.10	12.30	1	17.0	23.5
CSE11UCSMA	CSE11BCSMA	11	1	12.20	13.50	1	18.2	22.0
CSE12UCSMA	CSE12BCSMA	12	1	13.30	14.70	1	19.9	20.1
CSE13UCSMA	CSE13BCSMA	13	1	14.40	15.90	1	21.5	18.6
CSE14UCSMA	CSE14BCSMA	14	1	15.60	17.20	1	23.2	17.3
CSE15UCSMA	CSE15BCSMA	15	1	16.70	18.50	1	24.4	16.4
CSE16UCSMA	CSE16BCSMA	16	1	17.80	19.70	1	26.0	15.4
CSE17UCSMA	CSE17BCSMA	17	1	18.90	20.90	1	27.6	14.5

Part Number		$V_{RWM}$	$I_{R@V_{RWM}}$	$V_{BR@I_T}$		$I_T$	$V_C@I_{PP}$	$I_{PP}^{(1)}$
Uni-Polar	Bi-Polar	V	$\mu A$	Min(V)	Max(V)	mA	Max(V)	A
CSE18UCSMA	CSE18BCSMA	18	1	20.00	22.10	1	29.2	13.7
CSE20UCSMA	CSE20BCSMA	20	1	22.20	24.50	1	32.4	12.4
CSE22UCSMA	CSE22BCSMA	22	1	24.40	26.90	1	35.5	11.3
CSE24UCSMA	CSE24BCSMA	24	1	26.70	29.50	1	38.9	10.3
CSE26UCSMA	CSE26BCSMA	26	1	28.90	31.90	1	42.1	9.5
CSE28UCSMA	CSE28BCSMA	28	1	31.10	34.40	1	45.4	8.8
CSE30UCSMA	CSE30BCSMA	30	1	33.30	36.80	1	48.4	8.3
CSE33UCSMA	CSE33BCSMA	33	1	36.70	40.60	1	53.3	7.5
CSE36UCSMA	CSE36BCSMA	36	1	40.00	44.20	1	58.1	6.9
CSE40UCSMA	CSE40BCSMA	40	1	44.40	49.10	1	64.5	6.2
CSE43UCSMA	CSE43BCSMA	43	1	47.80	52.80	1	69.4	5.8
CSE45UCSMA	CSE45BCSMA	45	1	50.00	55.30	1	72.7	5.5
CSE48UCSMA	CSE48BCSMA	48	1	53.30	58.90	1	77.4	5.2
CSE51UCSMA	CSE51BCSMA	51	1	56.70	62.70	1	82.4	4.9
CSE54UCSMA	CSE54BCSMA	54	1	60.00	66.30	1	87.1	4.6
CSE58UCSMA	CSE58BCSMA	58	1	64.40	71.20	1	93.6	4.3
CSE60UCSMA	CSE60BCSMA	60	1	66.70	73.70	1	96.8	4.1
CSE64UCSMA	CSE64BCSMA	64	1	71.10	78.60	1	103.0	3.9
CSE70UCSMA	CSE70BCSMA	70	1	77.80	86.00	1	113.0	3.6
CSE75UCSMA	CSE75BCSMA	75	1	83.30	92.10	1	121.0	3.3
CSE78UCSMA	CSE78BCSMA	78	1	86.70	95.80	1	126.0	3.2
CSE85UCSMA	CSE85BCSMA	85	1	94.40	104.0	1	137.0	2.9
CSE90UCSMA	CSE90BCSMA	90	1	100.0	111.0	1	146.0	2.8
CSE100UCSMA	CSE100BCSMA	100	1	111.0	123.0	1	162.0	2.5
CSE110UCSMA	CSE110BCSMA	110	1	122.0	135.0	1	177.0	2.3
CSE120UCSMA	CSE120BCSMA	120	1	133.0	147.0	1	193.0	2.1
CSE130UCSMA	CSE130BCSMA	130	1	144.0	159.0	1	209.0	1.9
CSE150UCSMA	CSE150BCSMA	150	1	167.0	185.0	1	243.0	1.7
CSE160UCSMA	CSE160BCSMA	160	1	178.0	197.0	1	259.0	1.6
CSE170UCSMA	CSE170BCSMA	170	1	189.0	209.0	1	275.0	1.5

Part Number		$V_{RWM}$	$I_R@V_{RWM}$	$V_{BR}@I_T$		$I_T$	$V_C@I_{PP}$	$I_{PP}^{(1)}$
Uni-Polar	Bi-Polar	V	$\mu A$	Min(V)	Max(V)	mA	Max(V)	A
CSE180UCSMA	CSE180BCSMA	180	1	201.0	222.0	1	292.0	1.4
CSE200UCSMA	CSE200BCSMA	200	1	224.0	247.0	1	324.0	1.3
CSE220UCSMA	CSE220BCSMA	220	1	246.0	272.0	1	356.0	1.1
CSE250UCSMA	CSE250BCSMA	250	1	279.0	309.0	1	405.0	1.0
CSE300UCSMA	CSE300BCSMA	300	1	335.0	371.0	1	486.0	0.8
CSE350UCSMA	CSE350BCSMA	350	1	391.0	432.0	1	567.0	0.7
CSE400UCSMA	CSE400BCSMA	400	1	447.0	494.0	1	648.0	0.6
CSE440UCSMA	CSE440BCSMA	440	1	492.0	543.0	1	713.0	0.6

(1) Surge waveform: 10/1000 $\mu s$

$V_{RWM}$ : Stand-off voltage – Maximum voltage that can be applied

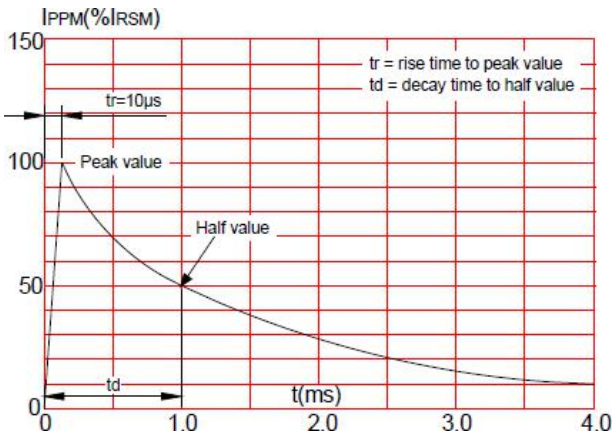
$V_{BR}$ : Breakdown voltage

$V_C$ : Clamping voltage – Peak voltage measured across the suppressor at a specified  $I_{PP}$

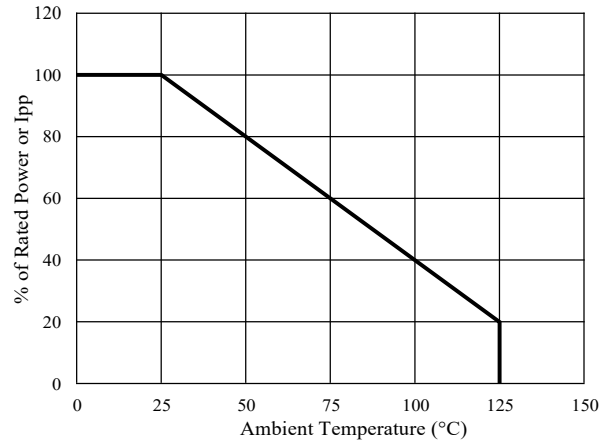
$I_R$ : Reverse leakage current

**Typical Characteristics**

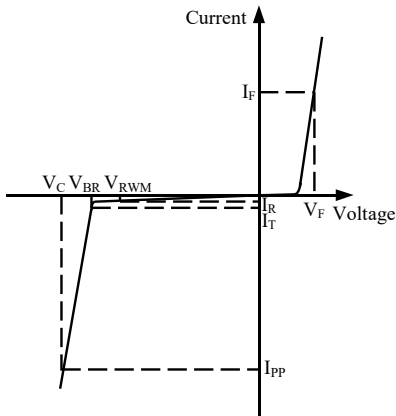
**10/1000 $\mu$ s Pulse Waveform**



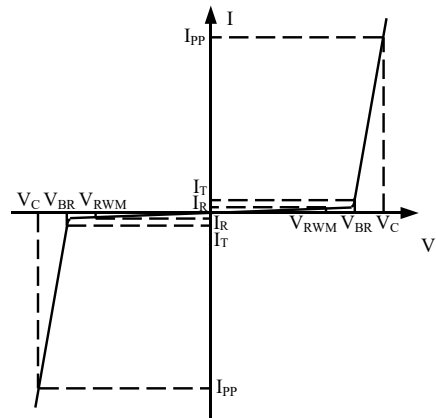
**Power Derating Curve**



**V-I Curve Characteristics (Uni-directional)**

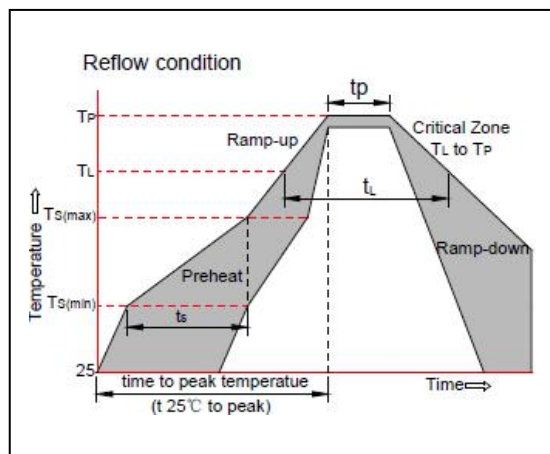


**V-I Curve Characteristics (Bi-directional)**



**Soldering Parameters**

Reflow Condition		Pb-Free Assembly (See figure at right)
Pre Heat	-Temperature Min ( $T_{S(min)}$ )	+150°C
	-Temperature Max ( $T_{S(max)}$ )	+200°C
	-Time (Min to Max) ( $t_s$ )	60-180 secs.
Average ramp up rate (Liquidus Temp $T_L$ to peak)		3°C/sec. Max
$T_{S(max)}$ to $T_L$ - Ramp up Rate		3°C/sec. Max
Reflow	-Temperature ( $T_L$ )(Liquidus)	+217°C
	-Time ( $t_L$ )	60-150 secs.
Peak Temp ( $T_P$ )		+260(+0/-5) °C
Time within 5°C of actual Peak Temp ( $t_p$ )		20-40 secs.
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp ( $T_P$ )		8 min. Max
Do not exceed		+260°C



**Package Outline**

- ❑ DO-214AC (SMA) package
- ❑ 2 leads, small package
- ❑ MSL-1

The drawing shows a top view and a side view of the SMA package. The top view labels dimensions A (lead height), B (package height), and C (package width). The side view labels dimensions D (package thickness), E (lead thickness), F (lead width), G (lead spacing), and H (total package length).

Package Dimensions

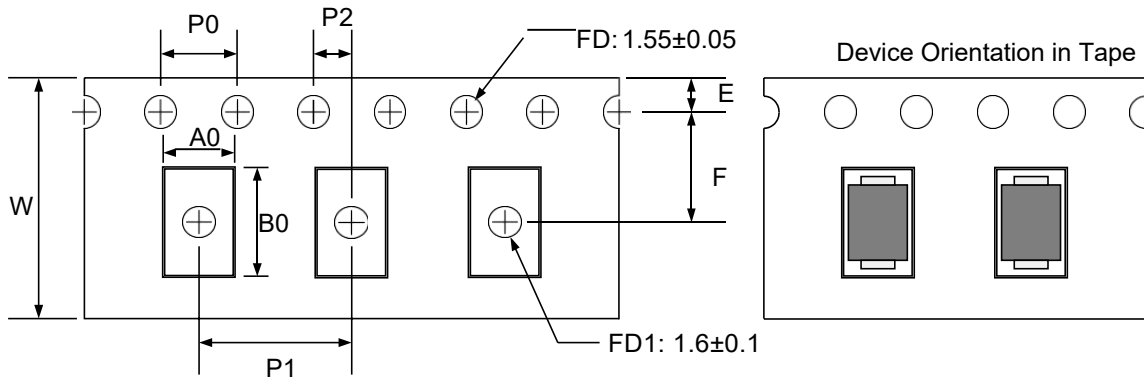
Ref.	Millimeters	Inches
A	1.25-1.65	0.049-0.065
B	2.60-3.00	0.102-0.118
C	4.15-4.65	0.163-0.183
D	2.00-2.44	0.079-0.096
E	0.15-0.31	0.006-0.012
F	0.95-1.52	0.037-0.060
G	0.051-0.203	0.002-0.008
H	4.90-5.30	0.193-0.209

**Recommended Soldering Pad**

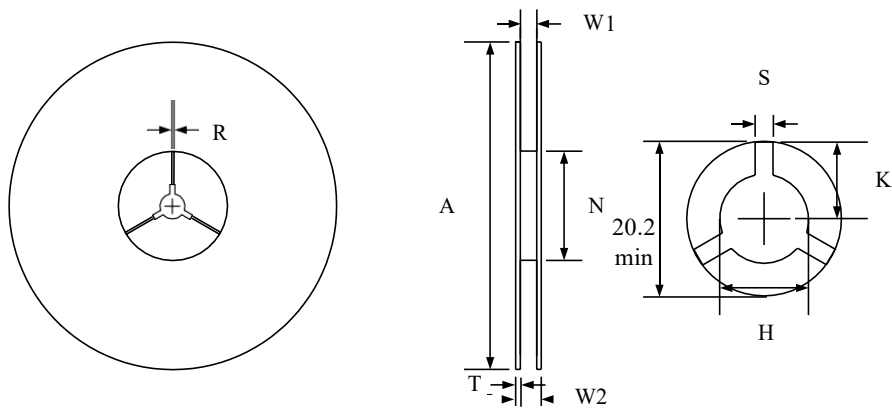
The diagram shows two rectangular soldering pads. Dimension J is the height of the first pad. Dimension L is the width of the first pad. Dimension K is the distance between the two pads.

Ref.	Millimeters	Inches
J	1.80 min.	0.071 min.
K	2.30 max.	0.091 max.
L	2.00 min.	0.079 min.

**Tape and Reel Specification**



Symbol	W	A0	B0	E	F	P1	P0	P2
Dimensions (mm)	12.00±0.2	2.79±0.3	5.33±0.3	1.75±0.2	5.50±0.2	8.00±0.2	4.0±0.2	2.0±0.2



Symbol	A	N	W2	W1	H	T	S	K	R
Dimensions (mm)	330.0±2.0	100.0±2.0	15.7±2.0	12±2.0	13±1.0	2.0±0.2	1.5 min	10.1 min	2.5 min



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