5.0SMDJxxS Series
Single Chip Design

HF | RoHS | UL | Pb | e3

Description

The 5.0SMDJxxS series, single chip design is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- 5000W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Recognized to UL 497B as an Isolated Loop Circuit Protector
- DO214AB SMT package for minimized board space
- Low profile package
- 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
- ESD protection of data lines in accordance with IEC 61000-4-2, ESD 30kV (Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- Very fast response time

- Excellent clamping capability
- Low incremental surge resistance
- Typical IR less than 2µA when VBR min>12V
- High temperature to reflow soldering guaranteed: 260°C/10sec
- VBR @ TJ= VBR@25°C x (1+αT x (TJ - 25))(αT: Temperature Coefficient)
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, LF maximun peak of 260°C
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Additional Information

Resources   **Accessories**   **Samples**

Agency Approvals

Agency	Agency File Number
UL	E230531

Applications

TVS components are ideal for the protection of I/O Interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

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

Parameter	Symbol	Value	Unit
Maximum Peak Pulse Power Dissipation at T_L=25°C by 10/1000µs Waveform (Fig.2)(Note 1)(Note 2)	P_{PPM}	5000	W
Power Dissipation on Infinite Heat Sink at T_L=50°C (Note 4)	P_D	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	300	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only	V_F	3.5	V
Operating Temperature Range	T_J	-65 to 150	°C
Storage Temperature Range	T_{STG}	-65 to 175	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	°C/W

Notes:
1. Non-repetitive current pulse , per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. Voltage of 6.0V~60V products's peak pulse power dissipation is 5000W, and 64V and 70V is 4500W. Bi-directional products 33V~58V are also 4500W.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional components only,duty cycle=4 per minute maximum.
4. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.

Functional Diagram

Bi-directional

Cathode ——— **Anode**

Uni-directional

Littelfuse

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

Part Number (Uni)	Part Number (Bi)	Marking UNI	Marking BI	Reverse Stand off Voltage V_R (Volts)	Breakdown Voltage V_{BR} (Volts) @ I_T Min	Breakdown Voltage V_{BR} (Volts) @ I_T Max	Test Current I_T (mA)	Maximum Clamping Voltage VC @I_{PP} (10/1000µs) (V)	Maximum Peak Pulse Current I_{PP} (10/1000µs) (A)	Maximum Clamping Voltage V_C @ I_{PP} (8/20µs) (V)	Maximum Peak Pulse Current I_{PP} (8/20µs) (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Maximum Temperature coefficient of V_{BR} (%/C)	Agency Approval
5.0SMDJ6.0AS	5.0SMDJ6.0CAS	5PAB	5BAB	6.0	6.67	7.37	10	10.3	485.4	13.3	2669.7	800.0	0.046	X
5.0SMDJ6.5AS	5.0SMDJ6.5CAS	5PAE	5BAE	6.5	7.22	7.98	10	11.2	446.4	14.5	2455.2	500.0	0.052	X
5.0SMDJ7.0AS	5.0SMDJ7.0CAS	5PAF	5BAF	7.0	7.78	8.60	10	12.0	416.7	15.5	2291.9	200.0	0.058	X
5.0SMDJ7.5AS	5.0SMDJ7.5CAS	5PAG	5BAG	7.5	8.33	9.21	1	12.9	387.6	16.7	2131.8	100.0	0.061	X
5.0SMDJ8.0AS	5.0SMDJ8.0CAS	5PAK	5BAK	8.0	8.89	9.83	1	13.6	367.6	17.6	2021.8	50.0	0.064	X
5.0SMDJ8.5AS	5.0SMDJ8.5CAS	5PAM	5BAM	8.5	9.44	10.4	1	14.4	347.2	18.6	1909.6	20.0	0.066	X
5.0SMDJ9.0AS	5.0SMDJ9.0CAS	5PAP	5BAP	9.0	10.0	11.1	1	15.4	324.7	19.9	1785.9	10.0	0.069	X
5.0SMDJ10AS	5.0SMDJ10CAS	5PAR	5BAR	10.0	11.1	12.3	1	17.0	294.1	22.0	1617.6	5.0	0.071	X
5.0SMDJ11AS	5.0SMDJ11CAS	5PAT	5BAT	11.0	12.2	13.5	1	18.2	274.7	23.5	1510.9	2.0	0.074	X
5.0SMDJ12AS	5.0SMDJ12CAS	5PAV	5BAV	12.0	13.3	14.7	1	19.9	251.3	25.7	1382.2	2.0	0.075	X
5.0SMDJ13AS	5.0SMDJ13CAS	5PAX	5BAX	13.0	14.4	15.9	1	21.5	232.6	27.8	1279.3	2.0	0.076	X
5.0SMDJ14AS	5.0SMDJ14CAS	5PAZ	5BAZ	14.0	15.6	17.2	1	23.2	215.5	30.0	1185.3	2.0	0.080	X
5.0SMDJ15AS	5.0SMDJ15CAS	5PBE	5BBE	15.0	16.7	18.5	1	24.4	204.9	31.5	1127.0	2.0	0.083	X
5.0SMDJ16AS	5.0SMDJ16CAS	5PBG	5BBG	16.0	17.8	19.7	1	26.0	192.3	33.6	1057.7	2.0	0.084	X
5.0SMDJ17AS	5.0SMDJ17CAS	5PBK	5BBK	17.0	18.9	20.9	1	27.6	181.2	35.7	996.6	2.0	0.085	X
5.0SMDJ18AS	5.0SMDJ18CAS	5PBM	5BBM	18.0	20.0	22.1	1	29.2	171.2	37.7	941.6	2.0	0.088	X
5.0SMDJ20AS	5.0SMDJ20CAS	5PBP	5BBP	20.0	22.2	24.5	1	32.4	154.3	41.9	848.7	2.0	0.091	X
5.0SMDJ22AS	5.0SMDJ22CAS	5PBR	5BBR	22.0	24.4	26.9	1	35.5	140.8	45.9	774.4	2.0	0.092	X
5.0SMDJ24AS	5.0SMDJ24CAS	5PBT	5BBT	24.0	26.7	29.5	1	38.9	128.5	50.3	706.8	2.0	0.092	X
5.0SMDJ26AS	5.0SMDJ26CAS	5PBV	5BBV	26.0	28.9	31.9	1	42.1	118.8	54.4	653.4	2.0	0.093	X
5.0SMDJ28AS	5.0SMDJ28CAS	5PBX	5BBX	28.0	31.1	34.4	1	45.4	110.1	58.7	605.6	2.0	0.094	X
5.0SMDJ30AS	5.0SMDJ30CAS	5PBZ	5BBZ	30.0	33.3	36.8	1	48.4	103.3	62.5	568.2	2.0	0.096	X
5.0SMDJ33AS	-	5PCB	-	33.0	36.7	40.6	1	53.3	93.9	68.9	516.5	2.0	0.097	X
-	5.0SMDJ33CAS	-	5BCB	33.0	36.7	40.6	1	53.3	84.4	68.9	516.5	2.0	0.097	X
5.0SMDJ36AS	-	5PCE	-	36.0	40.0	44.2	1	58.1	86.1	75.1	430.5	2.0	0.098	X
-	5.0SMDJ36CAS	-	5BCE	36.0	40.0	44.2	1	58.1	77.5	75.1	430.5	2.0	0.098	X
5.0SMDJ40AS	-	5PCF	-	40.0	44.4	49.1	1	64.5	77.6	83.3	388.0	2.0	0.099	X
-	5.0SMDJ40CAS	-	5BCF	40.0	44.4	49.1	1	64.5	69.8	83.3	388.0	2.0	0.099	X
5.0SMDJ43AS	-	5PCG	-	43.0	47.8	52.8	1	69.4	72.1	89.7	360.5	2.0	0.100	X
-	5.0SMDJ43CAS	-	5BCG	43.0	47.8	52.8	1	69.4	64.8	89.7	360.5	2.0	0.100	X
5.0SMDJ45AS	-	5PCK	-	45.0	50.0	55.3	1	72.7	68.8	93.9	344.0	2.0	0.101	X
-	5.0SMDJ45CAS	-	5BCK	45.0	50.0	55.3	1	72.7	61.9	93.9	344.0	2.0	0.101	X
5.0SMDJ48AS	-	5PCM	-	48.0	53.3	58.9	1	77.4	64.7	100.0	323.5	2.0	0.101	X
-	5.0SMDJ48CAS	-	5BCM	48.0	53.3	58.9	1	77.4	58.1	100.0	323.5	2.0	0.101	X
5.0SMDJ51AS	-	5PCP	-	51.0	56.7	62.7	1	82.4	60.7	106.5	303.5	2.0	0.101	X
-	5.0SMDJ51CAS	-	5BCP	51.0	56.7	62.7	1	82.4	54.6	106.5	303.5	2.0	0.101	X
5.0SMDJ54AS	-	5PCR	-	54.0	60.0	66.3	1	87.1	57.5	112.5	287.5	2.0	0.102	X
-	5.0SMDJ54CAS	-	5BCR	54.0	60.0	66.3	1	87.1	51.7	112.5	287.5	2.0	0.102	X
5.0SMDJ58AS	-	5PCT	-	58.0	64.4	71.2	1	93.6	53.5	120.9	267.5	2.0	0.103	X
-	5.0SMDJ58CAS	-	5BCT	58.0	64.4	71.2	1	93.6	48.1	120.9	267.5	2.0	0.103	X
5.0SMDJ60AS	-	5PCV	-	60.0	66.7	73.7	1	96.8	51.7	125.1	258.5	2.0	0.103	X

For bidirectional type having V_R of 10 volts and less, the I_R limit is double.

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Single Chip Design

I-V Curve Characteristics

Uni-directional

Bi-Directional
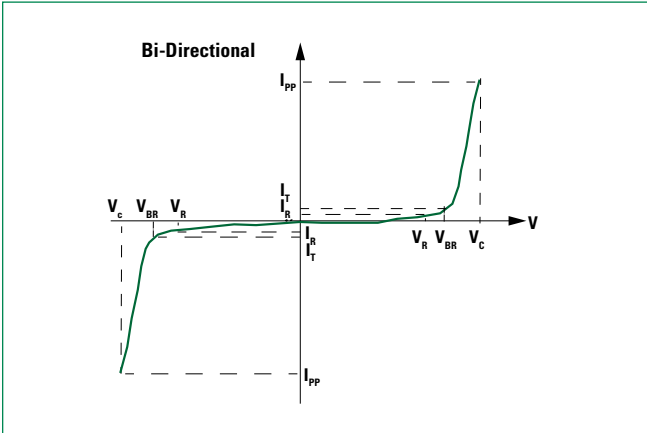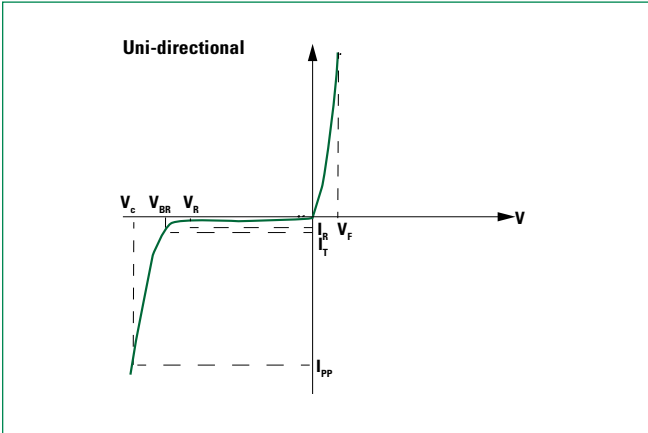
P_{PPM} **Peak Pulse Power Dissipation** – Max power dissipation
V_R **Stand-off Voltage** -- Maximum voltage that can be applied to the TVS without operation
V_{BR} **Breakdown Voltage** -- Maximum voltage that flows though the TVS at a specified test current (I_T)
V_C **Clamping Voltage** -- Peak voltage measured across the TVS at a specified Ippm (peak impulse current)
I_R **Reverse Leakage Current** -- Current measured at V_R
V_F **Forward Voltage Drop for Uni-directional**

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

Figure 1:
TVS Transients Clamping Waveform
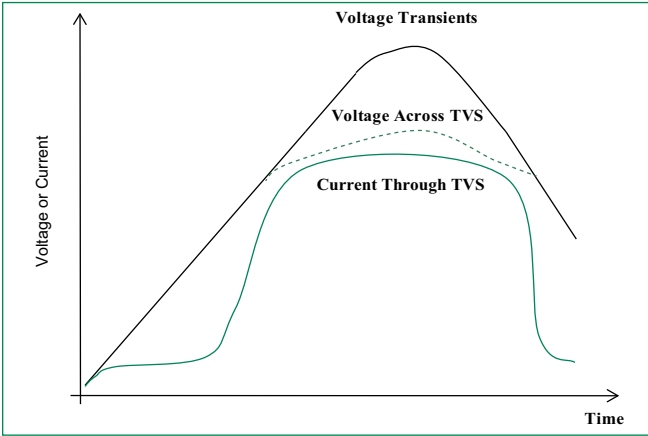
Figure 2:
Peak Pulse Power Rating
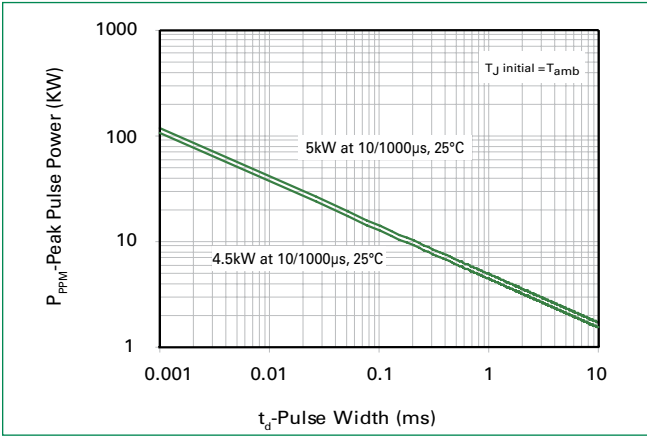
5.0SMDJxxS Series
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Figure 3:
Peak Pulse Power Derating Curve
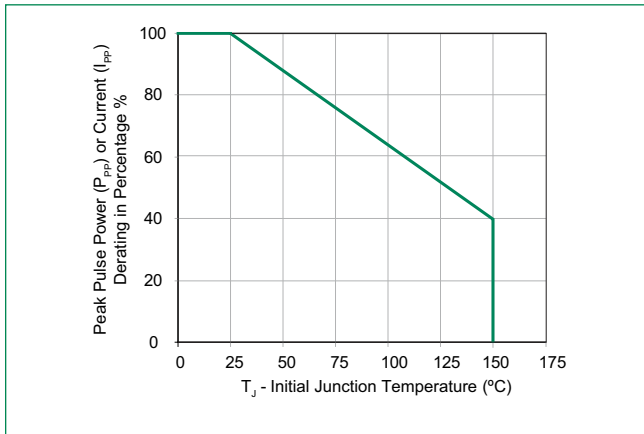
Figure 4:
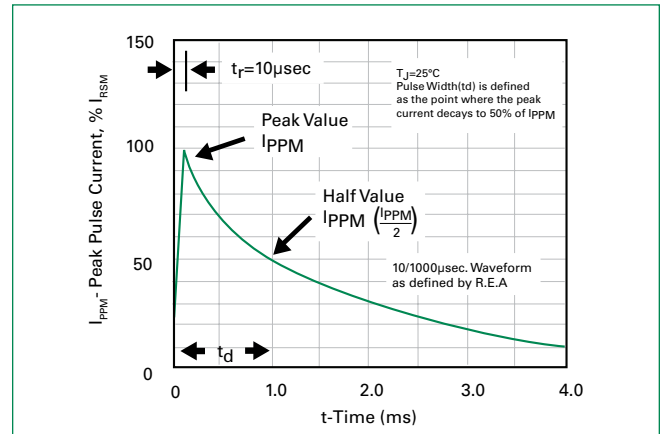Pulse Waveform

Figure 5:
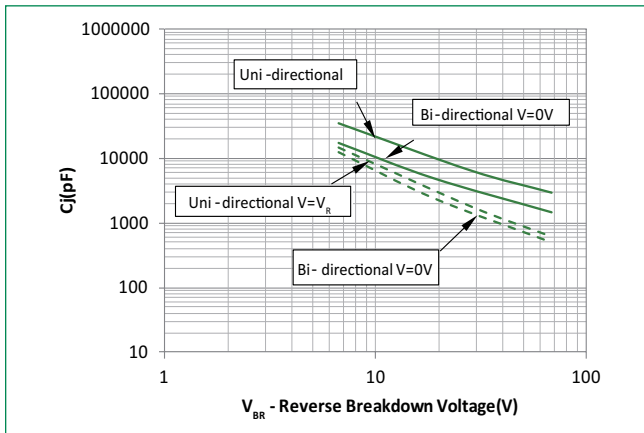Typical Junction Capacitance

Figure 6:
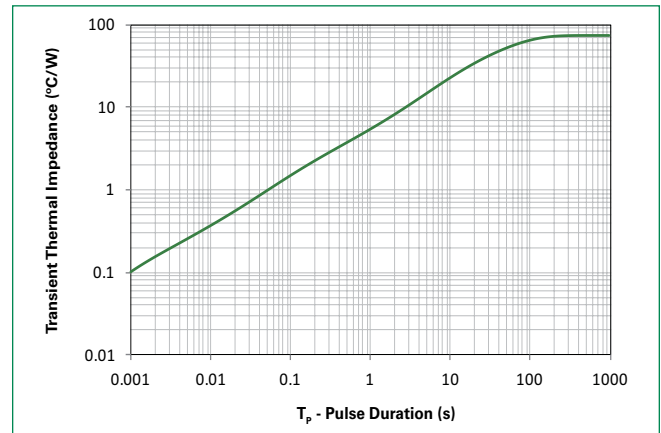Typical Transient Thermal Impedance

Figure 7:
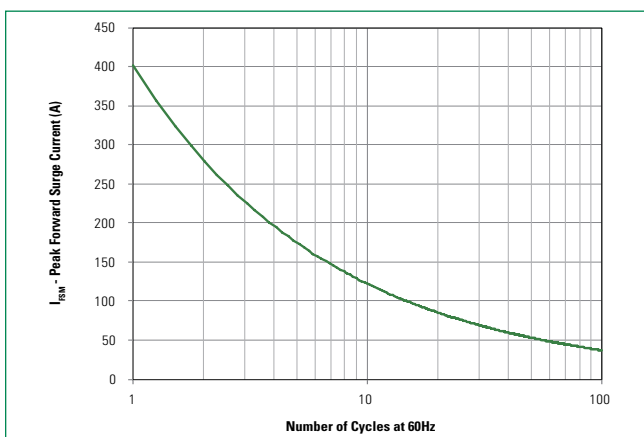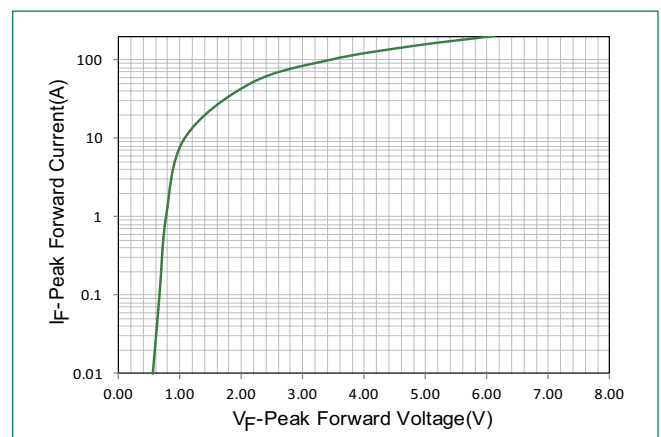Maximum Non-Repetitive Peak Forward Surge Current
Uni-Directional Only

Figure 8:
Peak Forward Voltage Drop vs Peak Forward Current
(Typical Values)

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Soldering Parameters

| Reflow Condition		Lead–free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_L)	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$^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		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
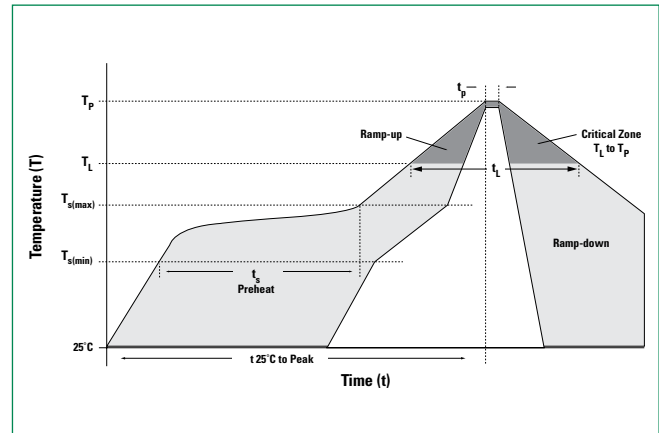
Physical Specifications

Weight	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded compound body over glass passivated junction
Polarity	Color band denotes positive end (cathode) except for bidirectional versions.
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22-A111

Dimensions

DO-214AB (SMC J-Bend)

Cathode Band
(for Uni-directional products only)
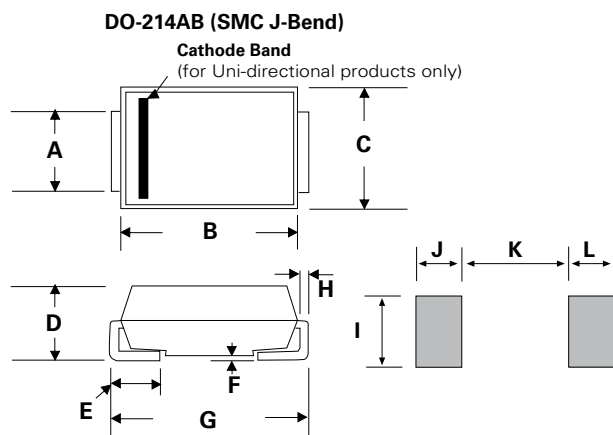
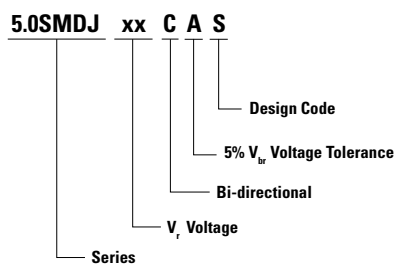| Dimensions	Inches		Millimeters	
	Min	**Max**	**Min**	**Max**
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200
L	0.094	-	2.400	-

5.0SMDJxxS Series
Single Chip Design

Packaging Options

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
5.0SMDJxxXXS	DO-214AB	3000	Tape & Reel - 16mm tape/13″ reel	EIA STD RS-481

Part Numbering System

5.0SMDJ   xx   C   A   S

Design Code

5% V_{br} Voltage Tolerance

Bi-directional

V_r Voltage

Series

Part Marking System

Cathode Band
(for Uni-directional products only)

Littelfuse Logo

XXX
YMXXX

Marking Code

Trace Code Marking
Y: Year Code
M: Month Code
XXX: Lot Code
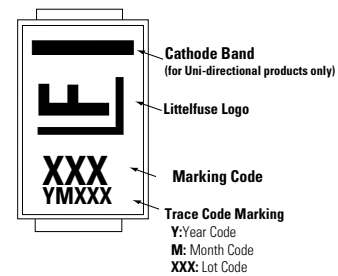
Tape and Reel Specification

0.157 (4.0)

0.63 (16.0)

0.315 (8.0)

0.059 (1.5) DIA

Cover tape

Cathode

13″ 13.0 (330)

0.80 (20.2) Arbor Hole Dia.

0.65 (16.4)

Dimensions are in inches (and millimeters).

Direction of Feed