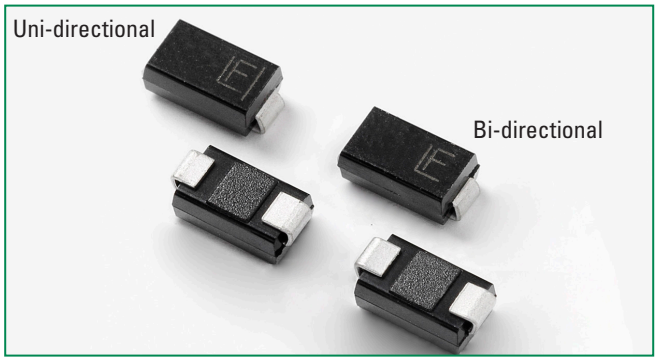
SMAJ-HR Series
Surface Mount - 400W



Agency Approvals

Agency	Agency File/Certificate Number
	E230531

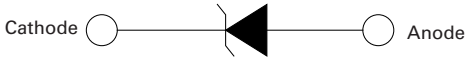
Maximum Ratings & Thermal Characteristics
(T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation (I_{PP} x V_C) by 10/1000µs Waveform (Fig.2) (Note 1), (Note 2)	P_{PPM}	400	W
Power Dissipation on Infinite Heat Sink at T_L=50°C	P_D	3.3	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	60	A
Maximum Instantaneous Forward Voltage at 25A 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	$R_{\theta JL}$	30	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	120	°C/W

Notes:
1. Non-repetitive current pulse , per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only

Functional Diagram


Bi-directional



Uni-directional

Description

The SMAJ-HR High Reliability series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- Excellent clamping capability
- Typical $I_R \leq 1\mu A$ for $V_R > 10V$
- For surface mounted applications to optimize 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, 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- 400W Peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Fast response time: typically less than 1.0ps from 0 Volts to V_{BR} min
- Glass passivated junction
- Low inductance
- High temperature to reflow soldering guaranteed: 260°C/40sec
- V_{BR} @ T_J= V_{BR}@25°C x (1+ α T x (T_J - 25))(α T:Temperature Coefficient, typical value is 0.1%) Coefficient, typical value
- UL Recognized epoxy 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)

Applications

TVS Components 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.

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Electrical Characteristics

Part Number (Uni)	Part Number (Bi)	Marking		Reverse Stand off Voltage V_R (Volts)	Breakdown Voltage V_{BR} (Volts) @ I_T		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{PP} (V)	Maximum Peak Pulse Current I_{PP} (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Agency Approval
		UNI	BI		MIN	MAX					
SMAJ6.0A-HR	SMAJ6.0CA-HR	AG	WG	6.0	6.67	7.37	10	10.3	38.8	800	X
SMAJ9.0A-HR	SMAJ9.0CA-HR	AV	WV	9.0	10.00	11.10	1	15.4	26.0	10	X
SMAJ10A-HR	SMAJ10CA-HR	AX	WX	10.0	11.10	12.30	1	17.0	23.5	5	X
SMAJ11A-HR	SMAJ11CA-HR	AZ	WZ	11.0	12.20	13.50	1	18.2	22.0	1	X
SMAJ12A-HR	SMAJ12CA-HR	BE	XE	12.0	13.30	14.70	1	19.9	20.1	1	X
SMAJ13A-HR	SMAJ13CA-HR	BG	XG	13.0	14.40	15.90	1	21.5	18.6	1	X
SMAJ14A-HR	SMAJ14CA-HR	BK	XK	14.0	15.60	17.20	1	23.2	17.2	1	X
SMAJ15A-HR	SMAJ15CA-HR	BM	XM	15.0	16.70	18.50	1	24.4	16.4	1	X
SMAJ16A-HR	SMAJ16CA-HR	BP	XP	16.0	17.80	19.70	1	26.0	15.4	1	X
SMAJ17A-HR	SMAJ17CA-HR	BR	XR	17.0	18.90	20.90	1	27.6	14.5	1	X
SMAJ18A-HR	SMAJ18CA-HR	BT	XT	18.0	20.00	22.10	1	29.2	13.7	1	X
SMAJ20A-HR	SMAJ20CA-HR	BV	XV	20.0	22.20	24.50	1	32.4	12.3	1	X
SMAJ26A-HR	SMAJ26CA-HR	CE	YE	26.0	28.90	31.90	1	42.1	9.5	1	X
SMAJ33A-HR	SMAJ33CA-HR	CM	YM	33.0	36.70	40.60	1	53.3	7.5	1	X
SMAJ36A-HR	SMAJ36CA-HR	CP	YP	36.0	40.00	44.20	1	58.1	6.9	1	X
SMAJ45A-HR	SMAJ45CA-HR	CV	YV	45.0	50.00	55.30	1	72.7	5.5	1	X

Note:

1. For bidirectional type having V_R of 10 volts and less, the I_R limit is double.
2. Each lot of parts will pass group B test requirement.

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Screen Process

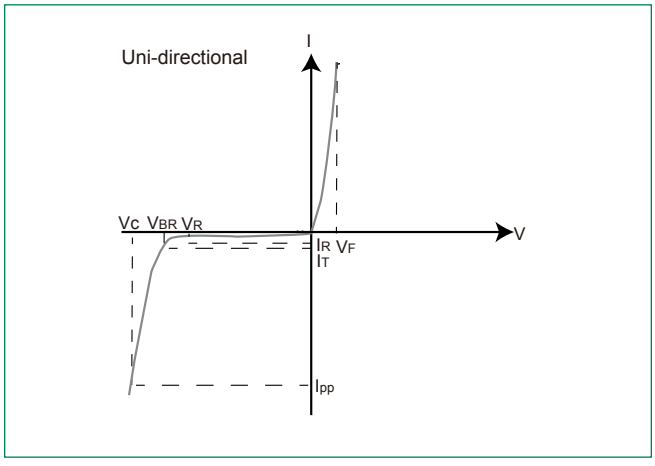
100% Vision Inspection	MIL-STD-750 method 2074
100%High Temperature Storage Life (168hrs,175°C)	MIL-STD-750 method 1031
100% X-RAY inspection	MIL-STD-750 method 2076
100% Temperature Cycle Test (-55 to150°C, 20 cycles, dwell time 15 min)	MIL-STD-750 method 1051
100% Reflow (2X)	JEDEC J-STD-020
100% Surge Test (2x)	MIL-STD-750 method 4066
100% HTRB 150°C Bias=V_R (80% breakdown voltage, 96hrs, and each direction 96hrs for Bi-directional products)	MIL–STD–750 method 1038
Final Electrical Test(100% 3 sigma limit, 100% dynamic test and PAT limit)	MIL-STD-750 method 4016.4021.4011

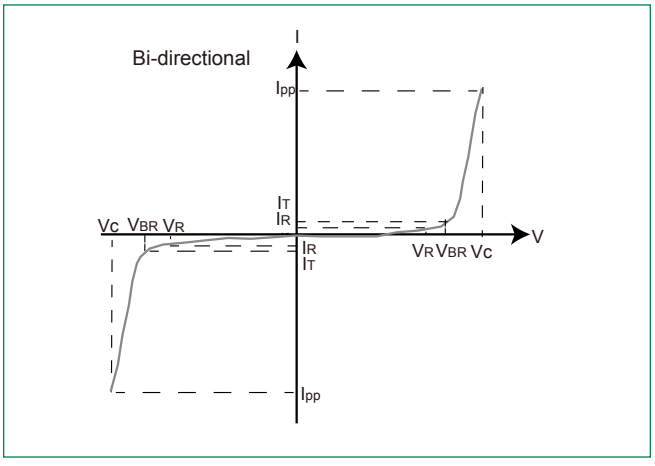
Note: Up-screen program can be specified by customer's request by contacting Littelfuse customer service

Group B Test Requirement

Screen	Method	Condition	Requirement
Surge Test	10/1000 µs Peak Pulse Waveform	Maximum clamping Voltage (V_C) @ Peak Pulse Current (I_{PP})	Sample Size 45 perform 10x Accept 0 failures
Burn - In (HTRB)	MIL -STD-750, Method 1038.5	Applied voltage 100% V_R @ 150°C	Sample size 45 340 hours (680 hours for bi-direction products, each direction 340 hours) Accept 0 failures
Electrical Test	–	I_R@V_R, V_{BR} @ I_T	Sample size 45 Accept 0 failures

I-V Curve Characteristics





P_{PPM} Peak Pulse Power Dissipation -- (I_{PP} x V_C) 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

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

Figure 1 - TVS Transients Clamping Waveform

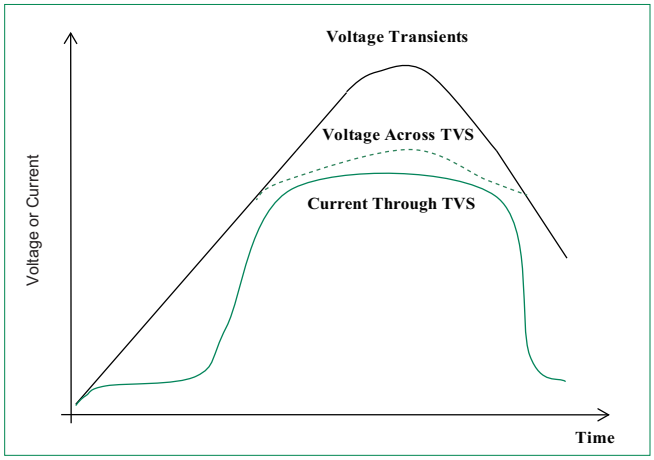

Figure 2 - PPeak Pulse Power Rating Curve

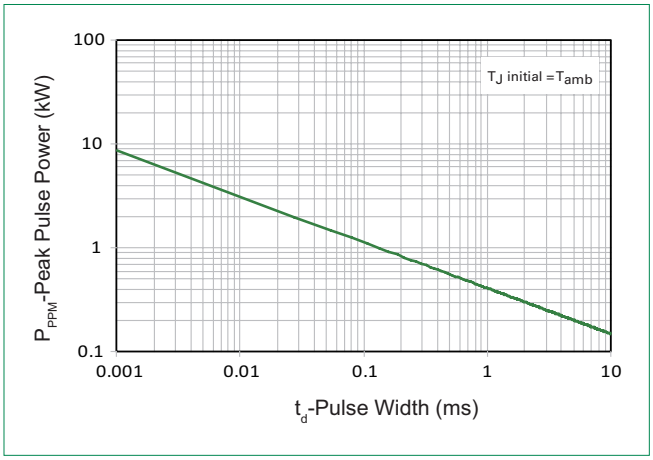

Figure 3 - Peak Pulse Power Derating Curve

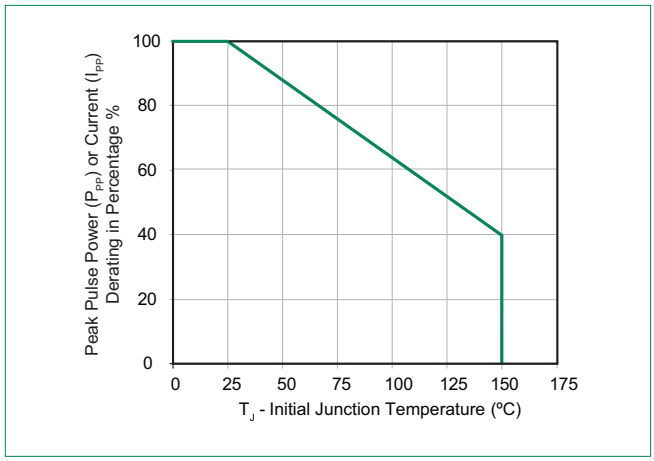

Figure 4 - Pulse Waveform

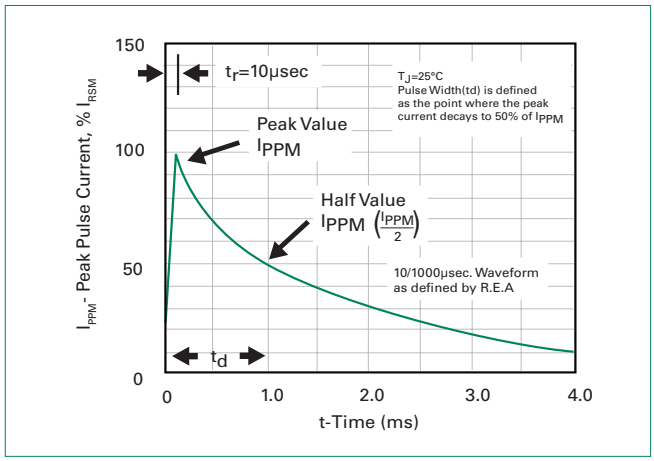

Figure 5 - Typical Junction Capacitance

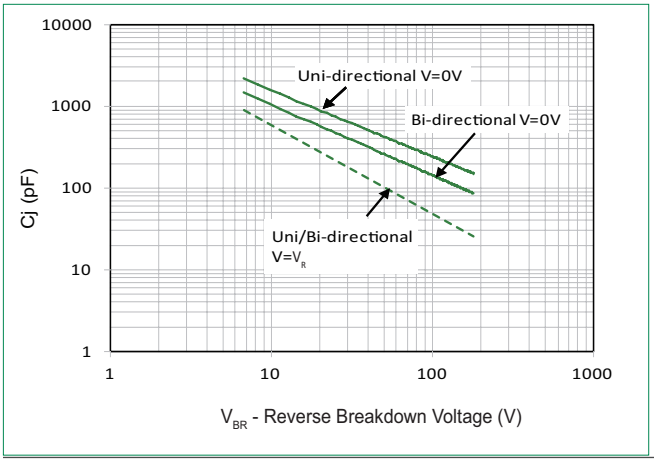

Figure 6 - Typical Transient Thermal Impedance

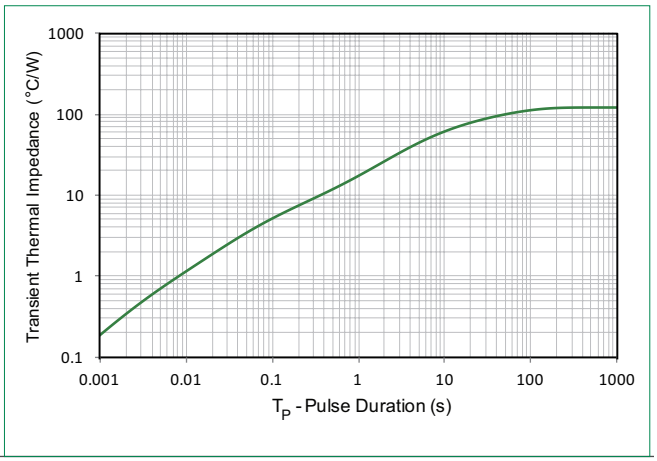

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Figure 7 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

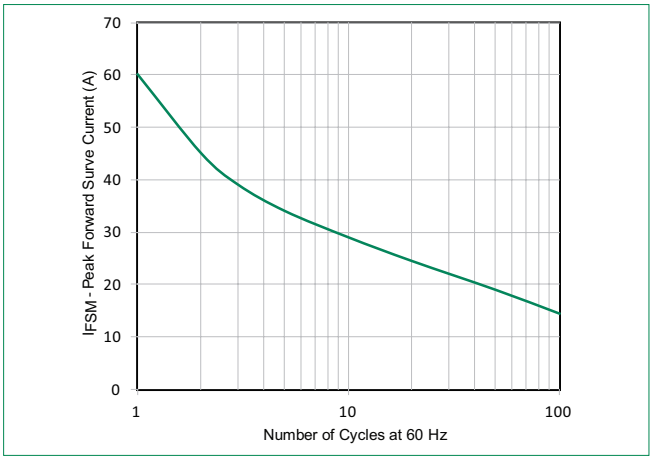
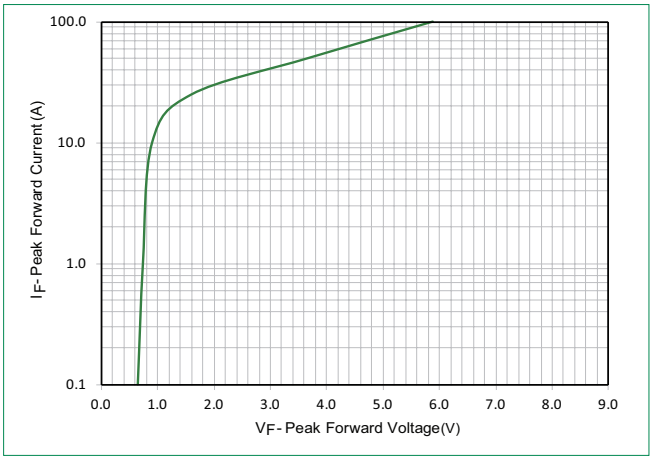
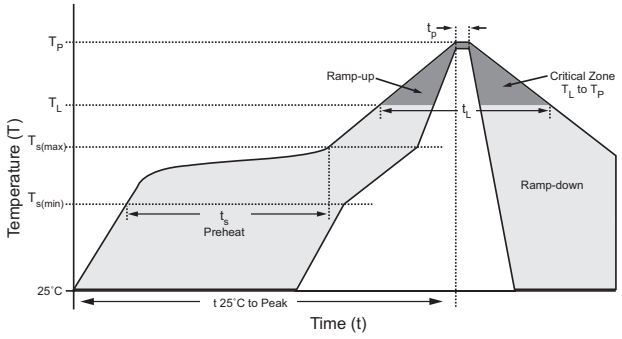


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



Soldering Parameters

Reflow Condition		Lead–free assembly
Pre Heat	**- Temperature Min ($T_{s(min)}$)**	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 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_s)	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



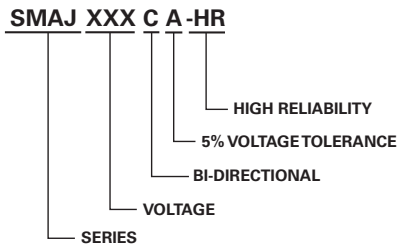
Physical Specifications

Weight	0.002 ounce, 0.061 gram
Case	JEDEC DO-214AC Molded Plastic over glass passivated junction
Polarity	Color band denotes cathode except Bidirectional
Terminal	Matte Tin-plated leads. Solderable per JESD22-B102

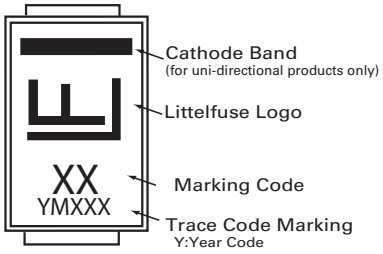
Environmental Specifications

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

Part Numbering System



Part Marking System



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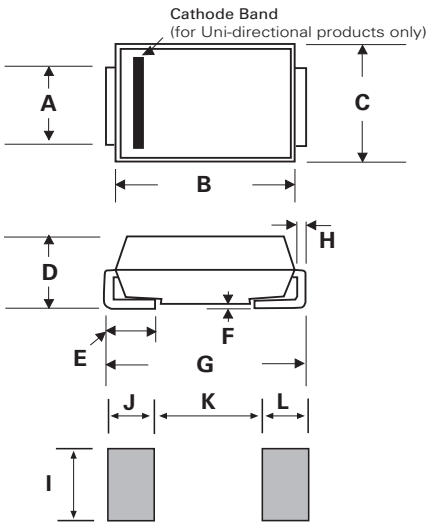
DO-214AC (SMA)



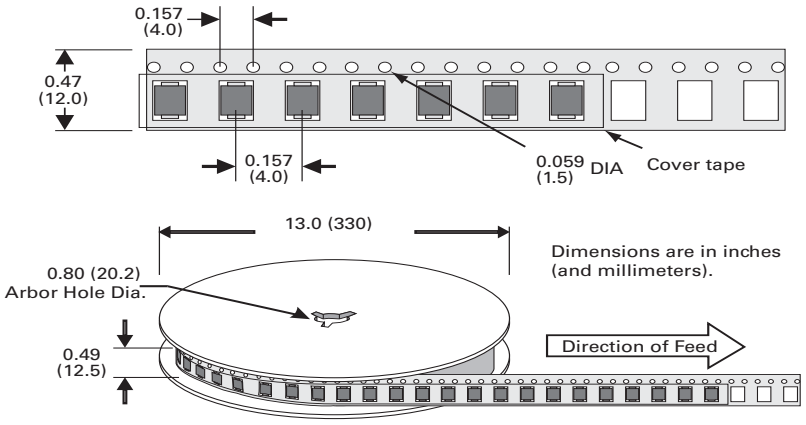
Dimensions

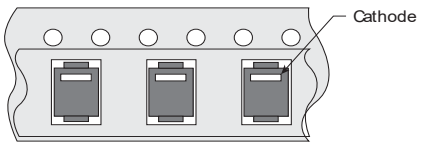
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.049	0.065	1.250	1.650
B	0.157	0.181	3.990	4.600
C	0.095	0.110	2.400	2.790
D	0.075	0.090	1.900	2.290
E	0.030	0.060	0.780	1.520
F	-	0.008	-	0.203
G	0.189	0.208	4.800	5.280
H	0.006	0.012	0.152	0.305
I	0.070	-	1.800	-
J	0.082	-	2.100	-
K	-	0.090	-	2.300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

Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
SMAJ-xxxXX-HR	DO-214AC	5000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

Tape and Reel Specification





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