

# SLD5S Series

## Surface Mount



### Agency Approvals

Agency	Agency File Number
	E230531

### Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation 1. 10ms/150ms test waveform	$P_{PPM}$	1200	W
2. 10 $\mu\text{s}$ /1000 $\mu\text{s}$ test waveform		3600	W
Power dissipation on infinite heatsink at $T_C = 25^\circ\text{C}$	$P_D$	5.0	W
Maximum Instantaneous Forward Voltage at 100A for Unidirectional only	$V_F$	1.8	V
Peak forward surge current 8.3ms single half sine-wave	$I_{FSM}$	500	A
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Typical Thermal Resistance Junction to case	$R_{\theta JC}$	1.3	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	14	$^\circ\text{C/W}$

### Functional Diagram



### Description

The SLD5S unidirectional TVS Diode series is housed in a SMTO-263 package with lead modifications. It is designed to protect sensitive electronics against ESD, EFT, 10/1000 surge events and inductive load switching voltage transient events for severe Automotive Load Dump applications.

### Features & Benefits

- AEC-Q101 qualified with automotive grade (PPAP capable)
- SMTO-263 package, and foot print is compatible to industrial popular DO-218AB package
- Meet ISO7637-2 5a/5b protection, ISO16750 and JASO D-001 load dump test (refer to APP note for details)
- $VBR @ T_J = VBR @ 25^\circ\text{C} \times (1 + \alpha_T \times (T_J - 25))$  ( $\alpha_T$ : Temperature Coefficient, typical value is 0.1%)
- Glass passivated chip junction in modified TO-263 package
- 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
- Fast response time: typically less than 1.0ps from 0 Volts to VBR min
- Excellent clamping capability
- Low incremental surge resistance
- UL Recognized compound meeting flammability rating V-0
- Meets MSL level 1, per J-STD-020, High temperature reflow soldering guaranteed: 260 $^\circ\text{C}$ /10sec at terminals
- For surface mounted applications to optimize board space
- Low profile package
- 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

Designed to protect sensitive electronics from:

- Inductive Load Switching
- Alternator Load Dump

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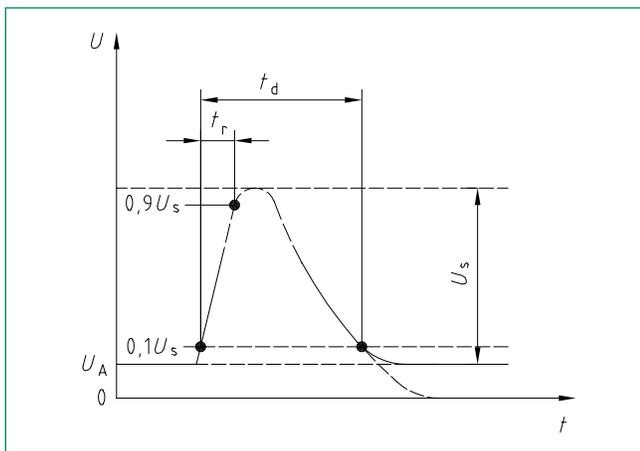
### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Part Number (Uni)	Breakdown Voltage $V_{BR}$ @ $I_T$ (V)		Test Current $I_T$ (mA)	Reverse Stand off Voltage $V_R$ (Volts)	Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ )	$T_J=150^\circ\text{C}$ Max. Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ )	Maximum Peak Pulse Surge Current $I_{PP}$ (A)	Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V)	Agency Approval 
	MIN	MAX							
SLD5S14A	15.6	17.2	5.0	14	10	50	155	23.2	X
SLD5S15A	16.7	18.5	5.0	15	10	50	148	24.4	X
SLD5S16A	17.8	19.7	5.0	16	2.0	50	138	26.0	X
SLD5S17A	18.9	20.9	5.0	17	2.0	50	130	27.6	X
SLD5S18A	20.0	22.1	5.0	18	2.0	50	123	29.2	X
SLD5S20A	22.2	24.5	5.0	20	2.0	50	111	32.4	X
SLD5S22A	24.4	26.9	5.0	22	2.0	50	101	35.5	X
SLD5S24A	26.7	29.5	5.0	24	2.0	50	93	38.9	X
SLD5S26A	28.9	31.9	5.0	26	2.0	50	86	42.1	X
SLD5S27A	29.9	33.1	5.0	27	2.0	50	83	43.6	X
SLD5S28A	31.1	34.4	5.0	28	2.0	50	79	45.4	X
SLD5S30A	33.3	36.8	5.0	30	2.0	50	74	48.4	X
SLD5S33A	36.7	40.6	5.0	33	2.0	50	68	53.3	X
SLD5S36A	40.0	44.2	5.0	36	2.0	50	62	58.1	X
SLD5S40A	44.4	49.1	5.0	40	2.0	50	56	64.5	X

#### Notes:

- $V_{BR}$  measured after  $I_T$  applied for 300 $\mu\text{s}$ ,  $I_T$ = square wave pulse or equivalent.
- Surge current waveform per 10 $\mu\text{s}$ /1000 $\mu\text{s}$  exponential wave and derated per Fig. 2
- All terms and symbols are consistent with ANSI/IEEE C62.35.

### Load Dump Test Wave Form



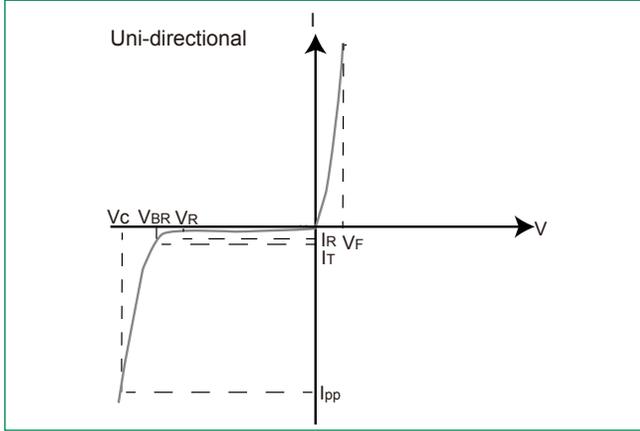
Note: LF use  $t_d=400\text{ms}$  for 12V system test;  $t_d=350\text{ms}$  for 24V system

Parameter	12V system	24V system
$U_s$	65v to 87V	123V to 174V
$R_i$	0.5 $\Omega$ to 4 $\Omega$	1 $\Omega$ to 8 $\Omega$
$t_d$	40 ms to 400 ms	100 ms to 350 ms
$t_r$	$(10^{0.5})\text{ms}$	

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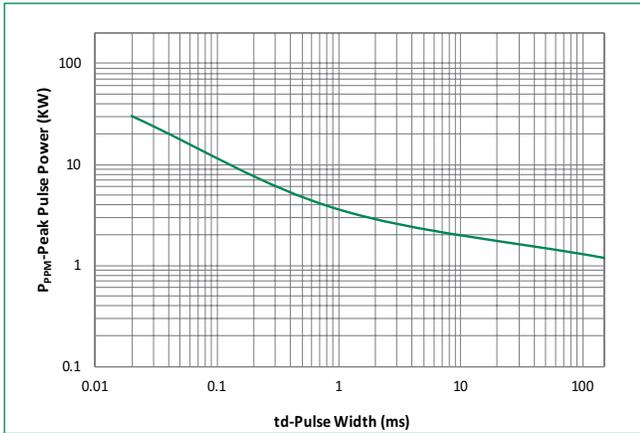
### I-V Curve Characteristics



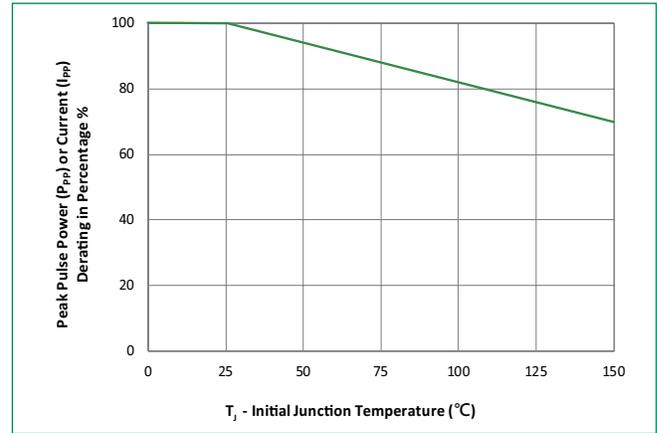
- P<sub>PPM</sub> Peak Pulse Power Dissipation** – Max power dissipation
- V<sub>r</sub> Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- V<sub>BR</sub> Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current (I<sub>r</sub>)
- V<sub>c</sub> Clamping Voltage** – Peak voltage measured across the TVS at a specified I<sub>PPM</sub> (peak impulse current)
- I<sub>r</sub> Reverse Leakage Current** – Current measured at V<sub>r</sub>
- V<sub>f</sub> Forward Voltage Drop for Uni-directional**

### Ratings and Characteristic Curves (T<sub>A</sub>=25°C unless otherwise noted)

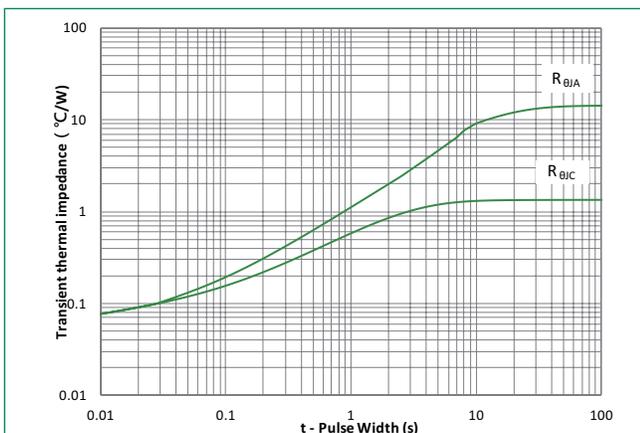
**Figure 1 - Peak Pulse Power Rating Curve**



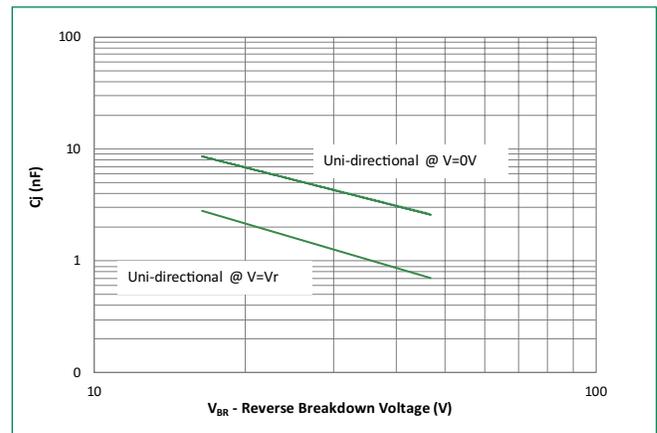
**Figure 2 - Peak Pulse Power Derating Curve**



**Figure 3 - Typical Transient Thermal Impedance**



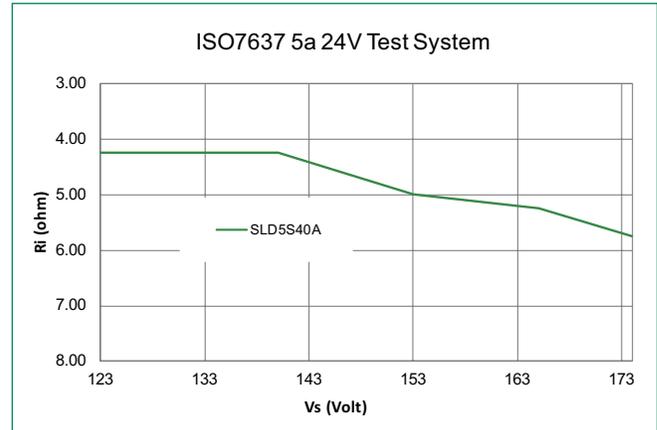
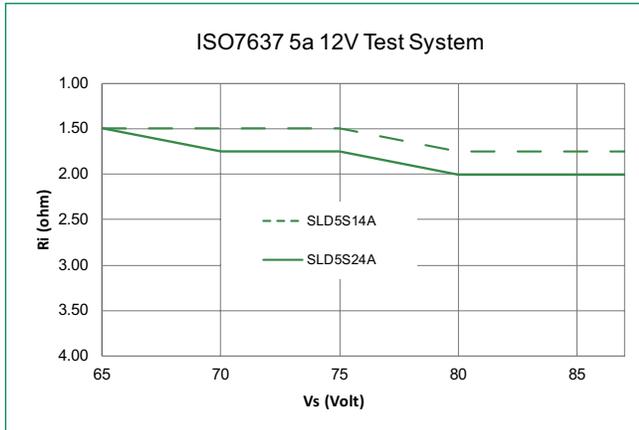
**Figure 4 - Typical Junction Capacitance**



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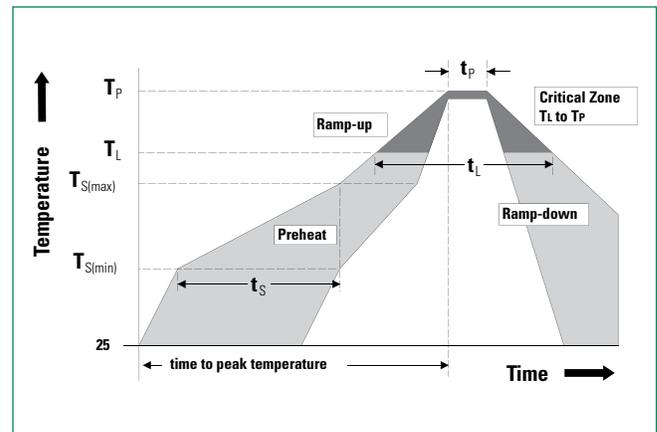
**Figure 5 - Typical SOA Chart**



Note: SOA (Safe Operation Area) refer to the area which below the curve line and refer to APP note for details.

### Soldering Parameters

<b>Reflow Condition</b>		Lead-free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak)</b>		3°C/second max
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time (min to max) ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/-5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		30 seconds max
<b>Ramp-down Rate</b>		6°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes max.
<b>Do not exceed</b>		260°C



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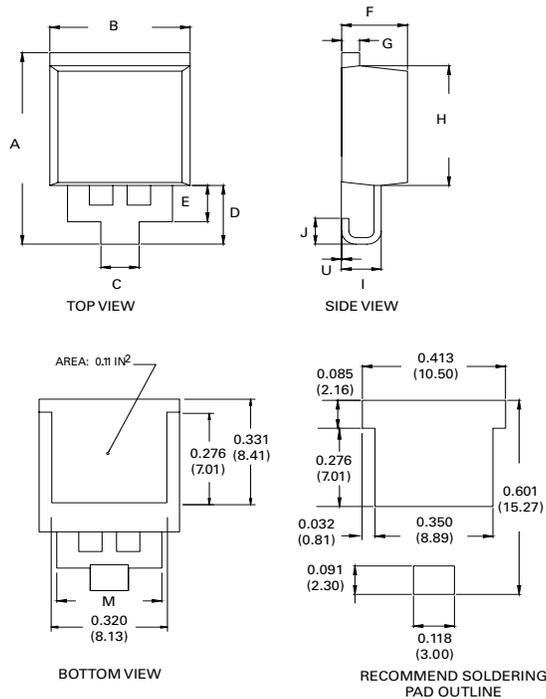
### Physical Specifications

<b>Terminal Finish</b>	100% Matte Tin-plated
<b>Body Material</b>	UL Recognized compound meeting flammability classification 94V-0
<b>Lead Material</b>	Copper Alloy

### Environmental Specifications

<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Temperature Cycling</b>	JESD22-A104
<b>MSL</b>	JEDEC-J-STD-020, LEVEL 1
<b>H3TRB</b>	JESD22-A101
<b>RSH</b>	JESD22-A111

### Dimensions

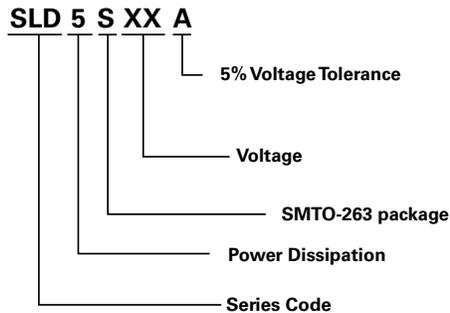


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.568	0.600	14.44	15.24
B	0.380	0.420	9.65	10.67
C	0.098	0.114	2.50	2.90
D	0.169	0.189	4.30	4.80
E	0.102	0.118	2.60	3.00
F	0.178	0.188	4.52	4.78
G	0.045	0.060	1.14	1.52
H	0.360	0.370	9.14	9.40
I	0.106	0.122	2.69	3.09
J	0.069	0.089	1.75	2.25
M	0.284	0.300	7.22	7.62
U	0	0.010	0	0.25

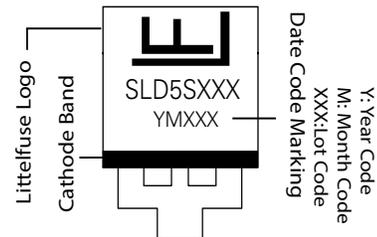
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### Part Numbering System



### Part Marking System

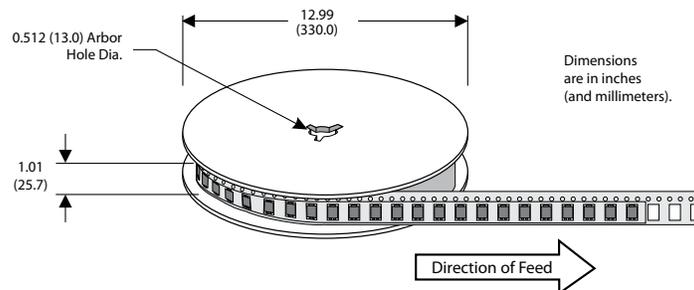
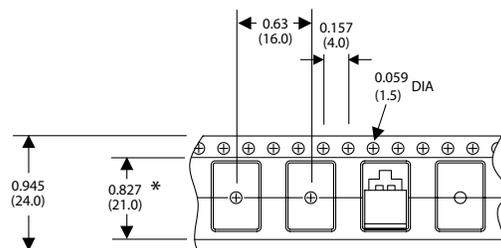


### Packaging

Part Number	Component Package	Quantity	Packaging Option
SLD5SxxA	SMTO-263	500	Embossed Carrier

### SMTO-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



Dimensions are in inches (and millimeters).

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