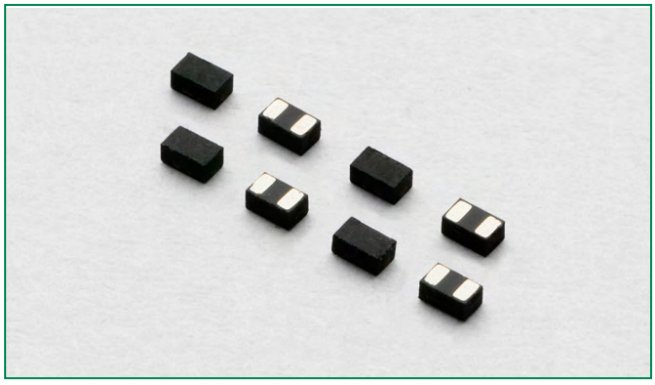
SPHV-C Series 200W Discrete Bidirectional TVS Diode

AUTOMOTIVE GRADE | RoHS | Pb GREEN

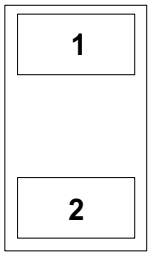


Description

The SPHV-C series is designed to replace multilayer varistors (MLVs) in portable applications, LED lighting modules, and low speed I/Os. It will protect sensitive equipment from damage due to electrostatic discharge (ESD) and other overvoltage transients.

The SPHV-C series can safely absorb repetitive ESD strikes above the maximum level of the IEC61000-4-2 international standard (Level 4, ±8kV contact discharge) without performance degradation and safely dissipate up to 8A (SPHV12-01ETG-C) of induced surge current (IEC61000-4-5, t_P=8/20µs) with very low clamping voltages.

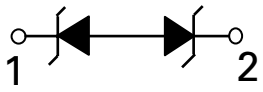
Pinout



Features

- ESD, IEC61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC61000-4-4, 40A (5/50ns)
- Lightning, IEC61000-4-5, 8A (t_P=8/20µs, SPHV12-01ETG-C)
- Low clamping voltage
- Low leakage current
- Small SOD882 packaging helps save board space
- AEC-Q101 qualified

Functional Block Diagram



Applications

- LED Lighting Modules
- Portable Instrumentation
- General Purpose I/O
- Mobile & Handhelds
- RS232 / RS485
- CAN and LIN Bus

Life Support Note:

Not Intended for Use in Life Support or Life Saving Applications

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

Revised: 06/17/14

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
P_{pk}	Peak Pulse Power (t_p=8/20µs)	200	W
T_{OP}	Operating Temperature	-40 to 125	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

Notes:

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Thermal Information

Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

SPHV12-01ETG-C Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			12.0	V
Reverse Breakdown Voltage	V_{BR}	I_R=1mA	13.3			V
Leakage Current	I_{LEAK}	V_R=12V			1.0	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			19.0	V
		I_{PP}=8A, t_p=8/20µs, Fwd			25.0	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.48		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			8.0	A
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact Discharge)	±30			kV
		IEC61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance[1]	C_{D-GND}	Reverse Bias=0V, f=1MHz			30	pF

Note:

[1] Parameter is guaranteed by design and/or device characterization.

[2] Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

SPHV15-01ETG-C Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			15.0	V
Reverse Breakdown Voltage	V_{BR}	I_R=1mA	16.7			V
Leakage Current	I_{LEAK}	V_R=15V			1.0	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			22.0	V
		I_{PP}=5A, t_p=8/20µs, Fwd			30.0	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.43		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			5.0	A
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact Discharge)	±30			kV
		IEC61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			24	pF

Note:

[1] Parameter is guaranteed by design and/or device characterization.

[2] Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

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SPHV24-01ETG-C Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			24.0	V
Reverse Breakdown Voltage	V_{BR}	I_R=1mA	26.7			V
Leakage Current	I_{LEAK}	V_R=24V			1.0	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			36.0	V
		I_{PP}=3A, t_p=8/20µs, Fwd			50.0	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.65		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			3.0	A
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact Discharge)	±24			kV
		IEC61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			17	pF

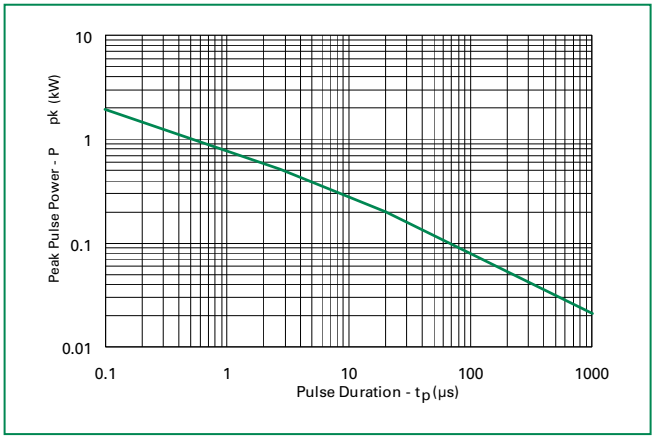
Note:
[1] Parameter is guaranteed by design and/or device characterization.
[2] Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

SPHV36-01ETG-C Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R≤1µA			36.0	V
Reverse Breakdown Voltage	V_{BR}	I_R=1mA	40.0			V
Leakage Current	I_{LEAK}	V_R=36V			1.0	µA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs, Fwd			52.0	V
		I_{PP}=2A, t_p=8/20µs, Fwd			65.0	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		1.33		Ω
Peak Pulse Current	I_{pp}	t_p=8/20µs			2.0	A
ESD Withstand Voltage[1]	V_{ESD}	IEC61000-4-2 (Contact Discharge)	±15			kV
		IEC61000-4-2 (Air Discharge)	±20			kV
Diode Capacitance[1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			13	pF

Note:
[1] Parameter is guaranteed by design and/or device characterization.
[2] Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

Non-Repetitive Peak Pulse Power vs. Pulse Time



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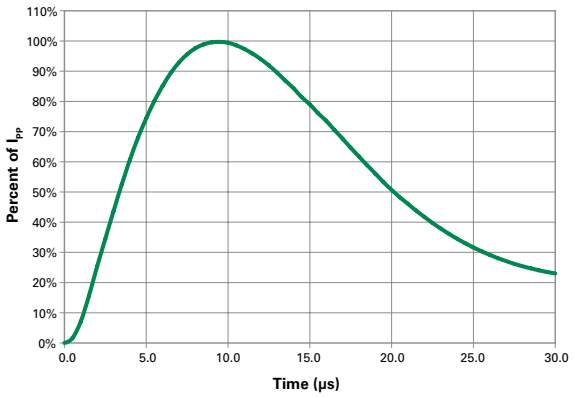
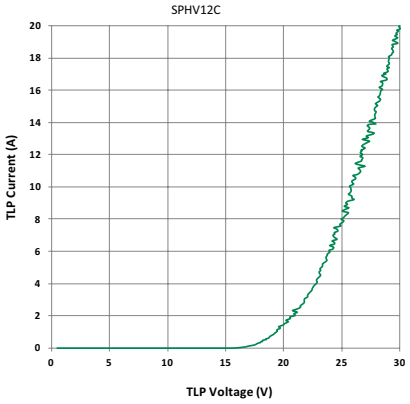
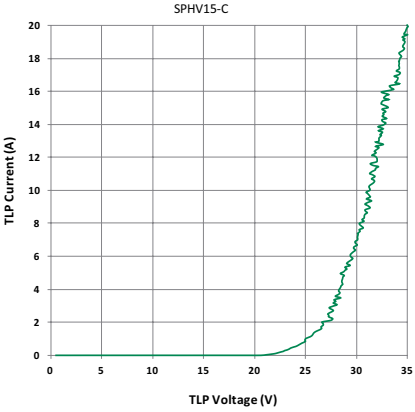
Pulse Waveform



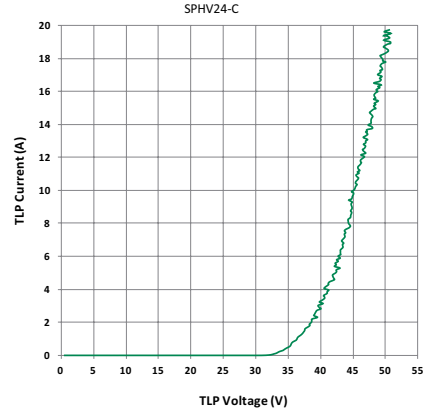
SPHV12-01ETG-C Transmission Line Pulsing(TLP) Plot



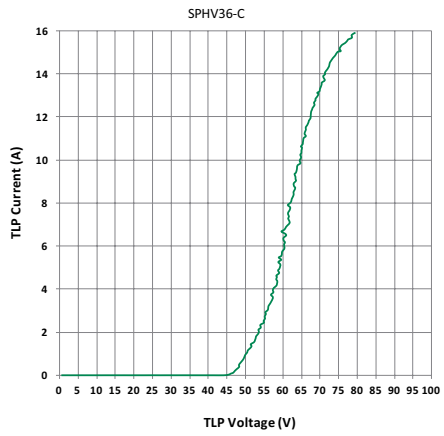
SPHV15-01ETG-C Transmission Line Pulsing(TLP) Plot



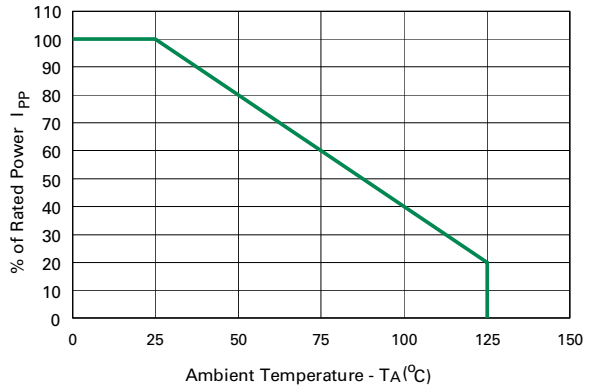
SPHV24-01ETG-C Transmission Line Pulsing(TLP) Plot



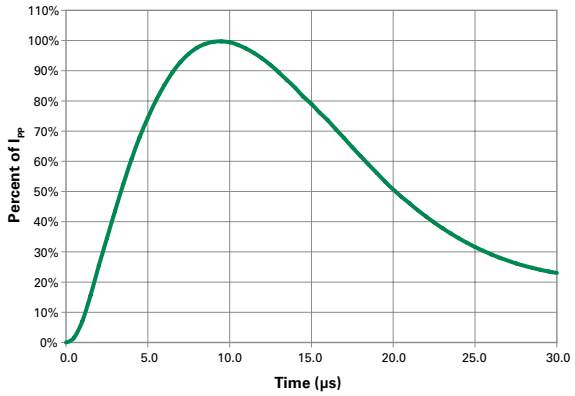
SPHV36-01ETG-C Transmission Line Pulsing(TLP) Plot



Power Derating Curve

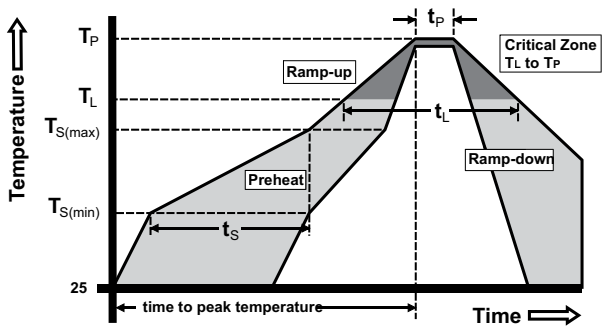


Pulse Waveform



Soldering Parameters

Reflow Condition		Pb – 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
	-Temperature (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



Product Characteristics

Lead Plating	Pre-Plated Frame
Lead Material	Copper Alloy
Lead Coplanarity	0.0004 inches (0.102mm)
Substitute Material	Silicon
Body Material	Molded Epoxy
Flammability	UL 94 V-0

Notes :
1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.

Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SPHV12-01ETG-C	SOD882	B2	10000
SPHV15-01ETG-C	SOD882	B5	10000
SPHV24-01ETG-C	SOD882	B4	10000
SPHV36-01ETG-C	SOD882	B6	10000

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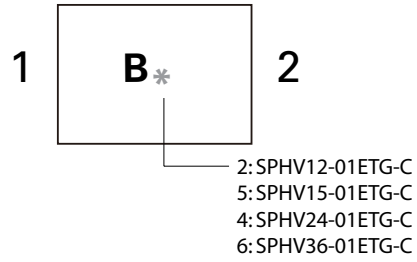
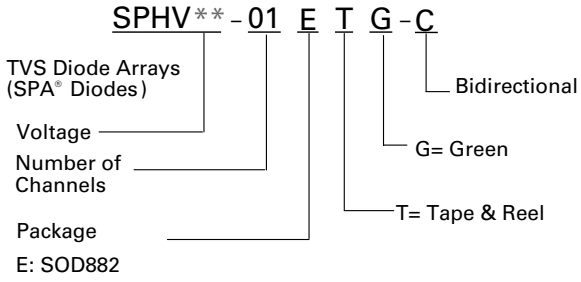
TVS Diode Arrays (SPA® Diodes)

General Purpose ESD Protection - SPHV-C Series

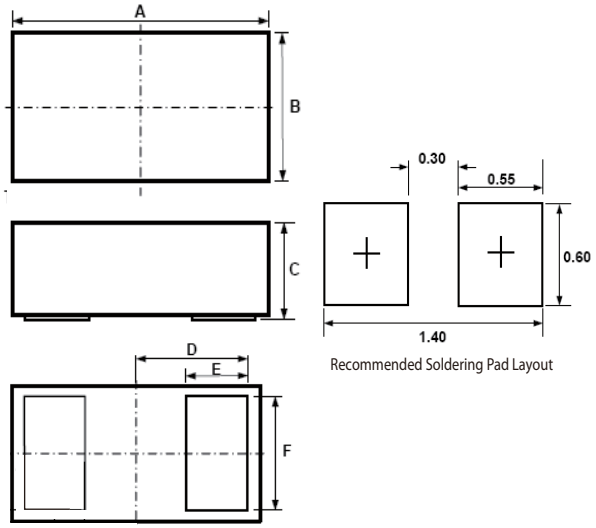
Part Marking System



Part Numbering System

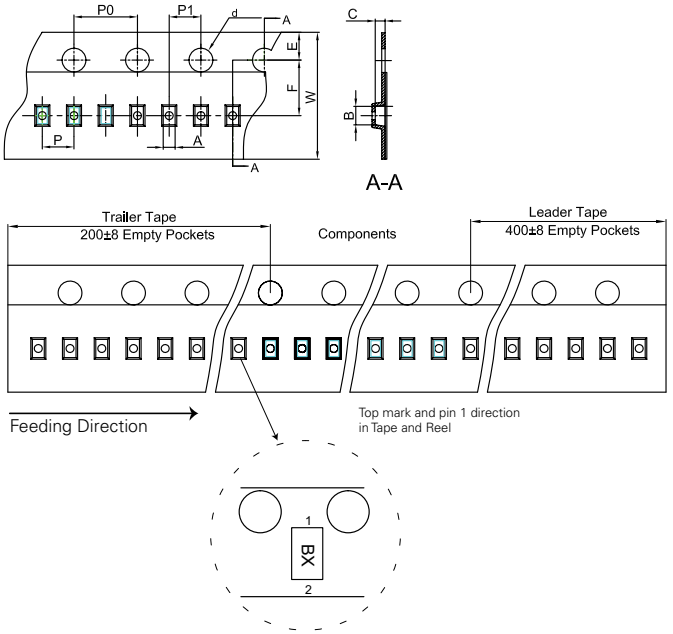


Package Dimensions — SOD882



Symbol	Package	SOD882				
	JEDEC	MO-236				
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.90	1.00	1.10	0.037	0.039	0.041
B	0.50	0.60	0.70	0.022	0.024	0.026
C	0.40	0.50	0.60	0.016	0.020	0.024
D		0.45			0.018	
E	0.20	0.25	0.35	0.008	0.010	0.012
F	0.45	0.50	0.55	0.018	0.020	0.022

Embossed Carrier Tape & Reel Specification — SOD882



Symbol	Millimeters
A	0.70+/-0.045
B	1.10+/-0.045
C	0.65+/-0.045
d	1.55+/-0.10
E	1.75+/-0.05
F	3.50+/-0.05
P	2.00+/-0.10
P0	4.00+/-0.10
P1	2.00+/-0.10
W	8.00 + 0.30 -0.10

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