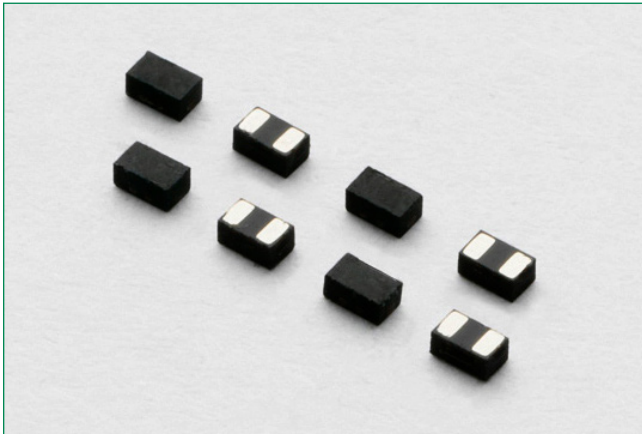


# SPHV-C Series

## 200W Discrete Bidirectional TVS Diode



### Additional Information



Resources

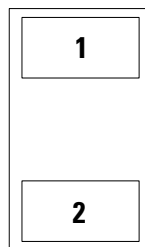


Accessories



Samples

### Pinout



### Description

The Bidirectional SPHV-C series is designed for use in portable applications, LED lighting modules, automotive applications, 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 IEC 61000-4-2 international standard (Level 4,  $\pm 8\text{kV}$  contact discharge) without performance degradation and safely dissipate up to 8A (SPHV12-C) of induced surge current (IEC 61000-4-5, 2nd Edition  $t_P=8/20\mu\text{s}$ ) with very low clamping voltages.

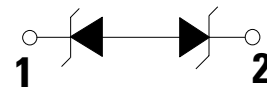
### Features & Benefits

- ESD, IEC 61000-4-2,  $\pm 30\text{kV}$  contact,  $\pm 30\text{kV}$  air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd Edition, 8A ( $t_P=8/20\mu\text{s}$ , SPHV12-C)
- Low clamping voltage
- Low leakage current
- Small SOD882 packaging helps save board space
- AEC-Q101 Qualified
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level(MSL -1)

### Applications

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

### Functional Block Diagram



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.

# SPHV-C Series

## 200W Discrete Bidirectional TVS Diode

### Absolute Maximum Ratings

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

**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.

### SPHV12-C Electrical Characteristics ( $T_{OP}=25^\circ C$ )

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

**Note:**

- Parameter is guaranteed by design and/or device characterization.
- Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

### SPHV15-C Electrical Characteristics ( $T_{OP}=25^\circ C$ )

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

**Note:**

- Parameter is guaranteed by design and/or device characterization.
- Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

# SPHV-C Series

## 200W Discrete Bidirectional TVS Diode

### SPHV24-C Electrical Characteristics ( $T_{OP}=25^{\circ}\text{C}$ )

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

**Note:**

- Parameter is guaranteed by design and/or device characterization.
- Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

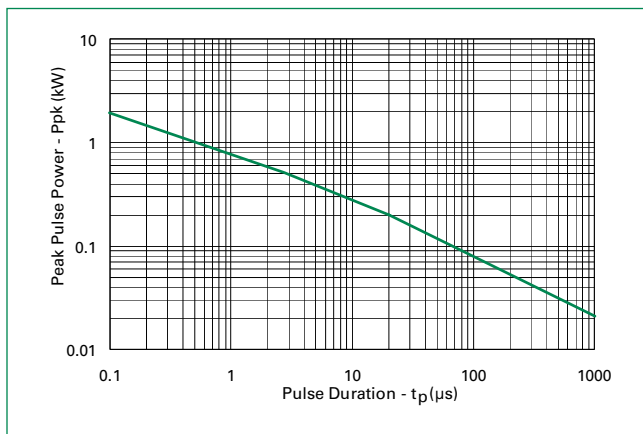
### SPHV36-C Electrical Characteristics ( $T_{OP}=25^{\circ}\text{C}$ )

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

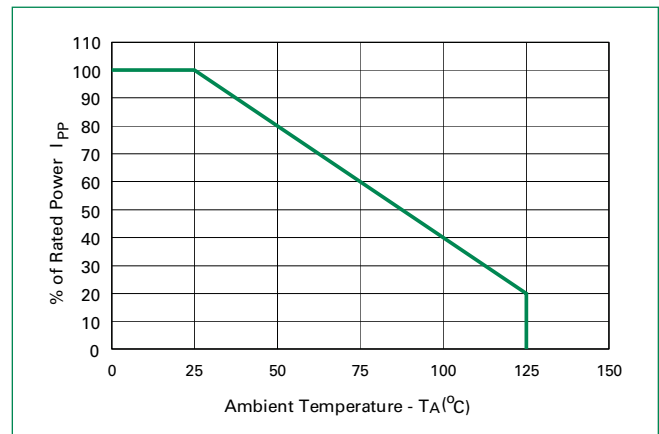
**Note:**

- Parameter is guaranteed by design and/or device characterization.
- Transmission Line Pulse (TLP) with 100ns width and 200ps rise time.

#### Non-Repetitive Peak Pulse Power vs. Pulse Time



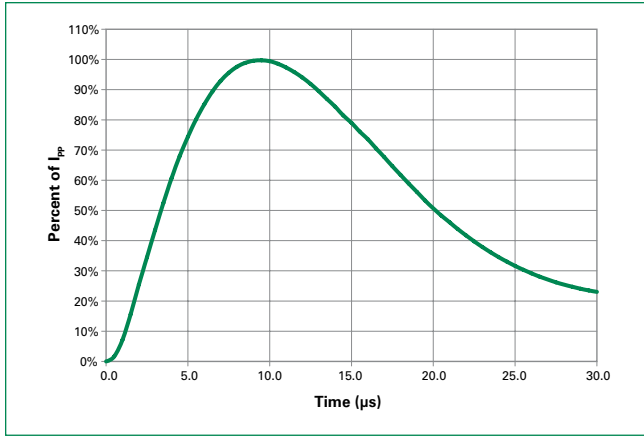
#### Power Derating Curve



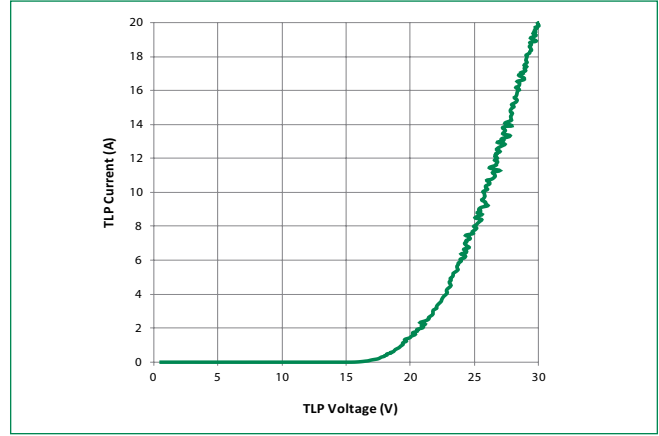
# SPHV-C Series

## 200W Discrete Bidirectional TVS Diode

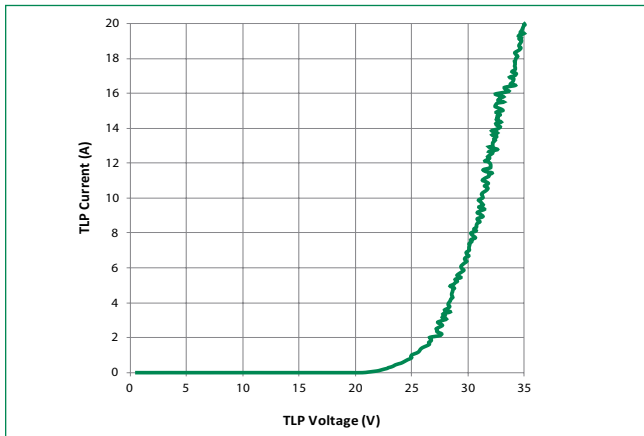
8/20μs Pulse Waveform



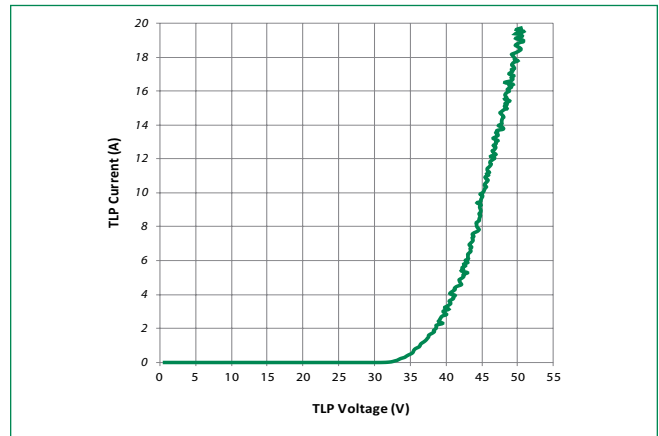
SPHV12-C Transmission Line Pulsing (TLP) Plot



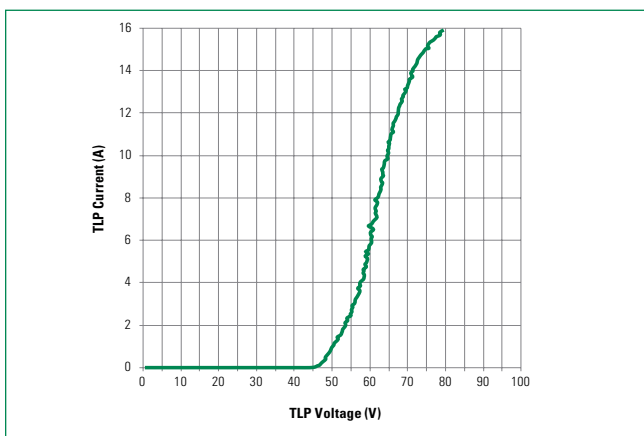
SPHV15-C Transmission Line Pulsing (TLP) Plot



SPHV24-C Transmission Line Pulsing (TLP) Plot

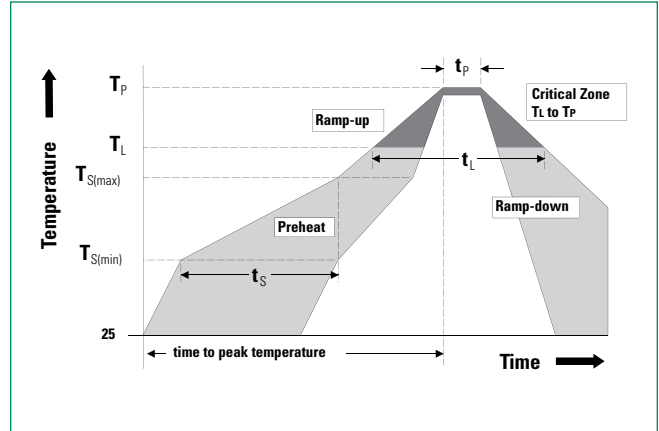


SPHV36-C Transmission Line Pulsing (TLP) Plot



**SPHV-C Series****200W Discrete Bidirectional TVS Diode****Soldering Parameters**

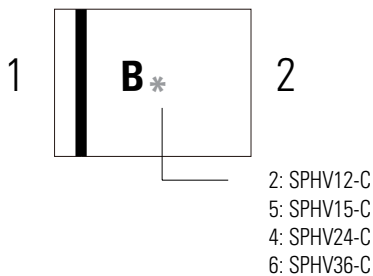
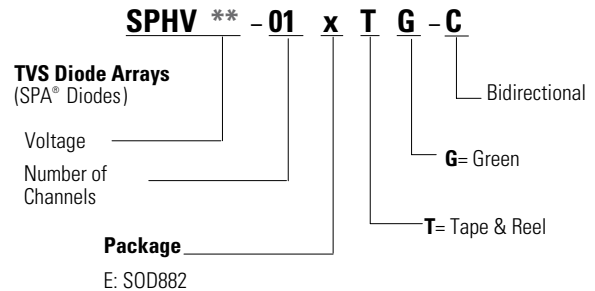
<b>Reflow Condition</b>		Pb – Free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_p$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b>		3°C/second max
<b><math>T_{S(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	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
<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

**Product Characteristics**

<b>Lead Plating</b>	Matte Tin, Pre-Plated Frame
<b>Lead Material</b>	Copper Alloy
<b>Substitute Material</b>	Silicon
<b>Body Material</b>	Molded Compound
<b>Flammability</b>	UL Recognized compound meeting flammability rating V-0

**Ordering Information**

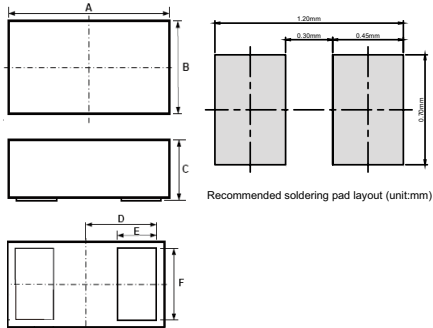
Part Number	Package	Marking	Min. Order Qty.
SPHV12-01ETG-C	SOD882	B2	10000
SPHV15-01ETG-C		B5	
SPHV24-01ETG-C		B4	
SPHV36-01ETG-C		B6	

**Part Marking System****Part Numbering System**

# SPHV-C Series

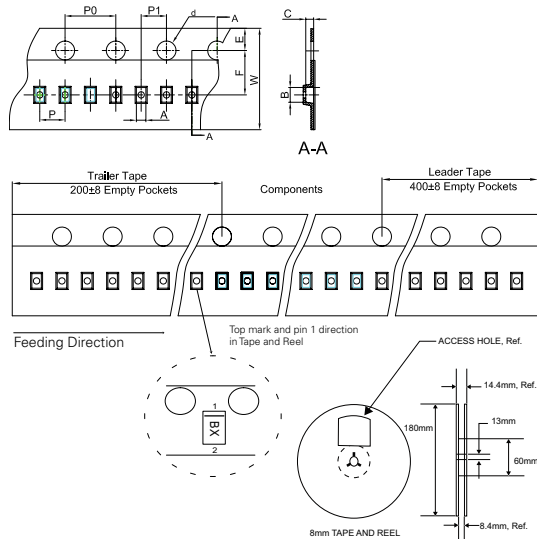
## 200W Discrete Bidirectional TVS Diode

### Package Dimensions — SOD882(SPHVxx-01ETG-C)



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

### Embossed Carrier Tape & Reel Specification



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

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