

# SPHV-C Series

200W Discrete Bidirectional TVS Diode

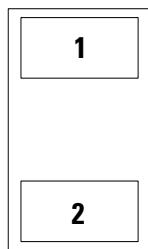


## Web Resources



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### 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 tP=8/20 $\mu\text{s}$ ) with very low clamping voltages.

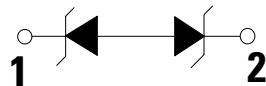
## Features & Benefits

- 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 (tP=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



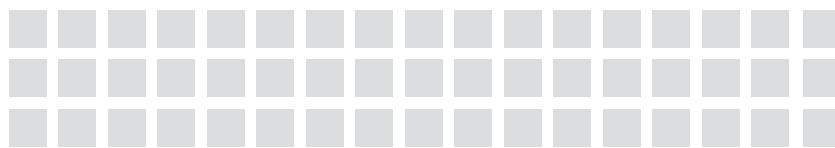
Life Support Note:

**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:**

1. Parameter is guaranteed by design and/or device characterization.
2. 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:**

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

# SPHV-C Series

## 200W Discrete Bidirectional TVS Diode

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu A$			24.0	V
Breakdown Voltage	$V_{BR}$	$I_R = 1mA$	26.7			V
Reverse Leakage Current	$I_{LEAK}$	$V_R = 24V$			1.0	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, Fwd$			36.0	V
		$I_{PP}=3A, t_p=8/20\mu s, Fwd$			50.0	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , I/O to GND		0.65		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			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:**

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

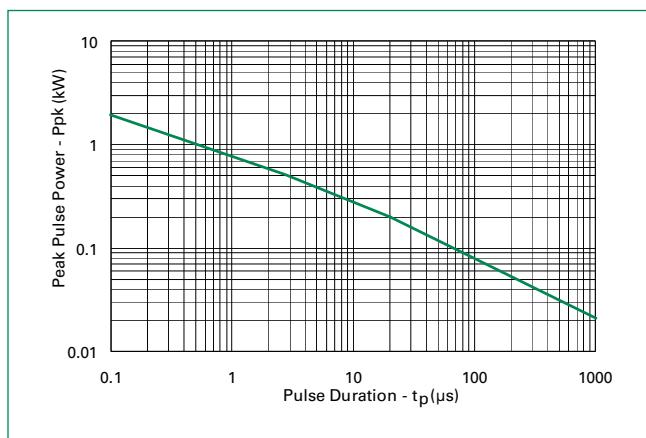
SPHV36-C Electrical Characteristics ( $T_{OP}=25^\circ C$ )

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$	$I_R \leq 1\mu A$			36.0	V
Breakdown Voltage	$V_{BR}$	$I_R = 1mA$	40.0			V
Reverse Leakage Current	$I_{LEAK}$	$V_R = 36V$			1.0	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A, t_p=8/20\mu s, Fwd$			52.0	V
		$I_{PP}=2A, t_p=8/20\mu s, Fwd$			65.0	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , I/O to GND		1.33		$\Omega$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			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

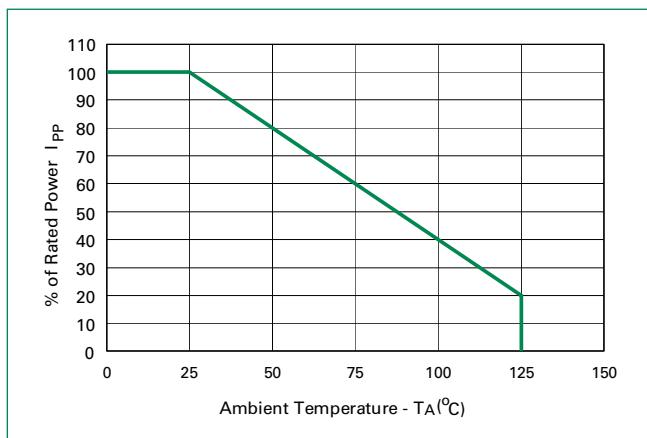
**Note:**

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

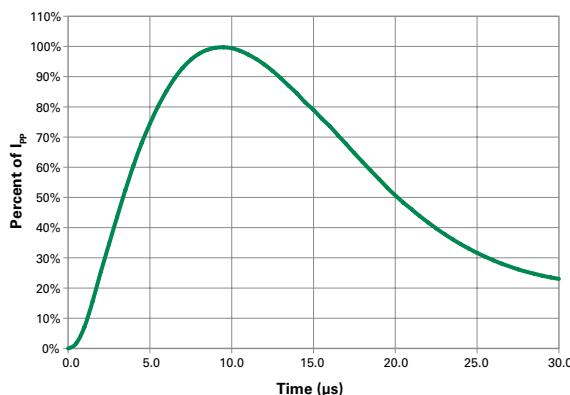


## Power Derating Curve

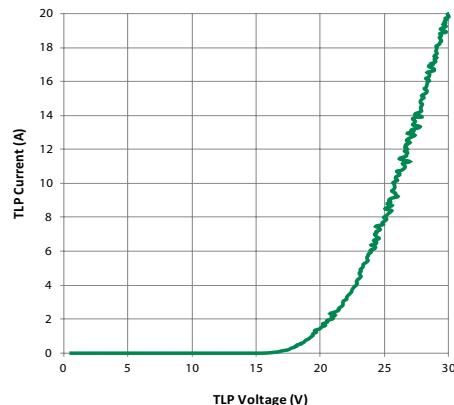


# SPHV-C Series

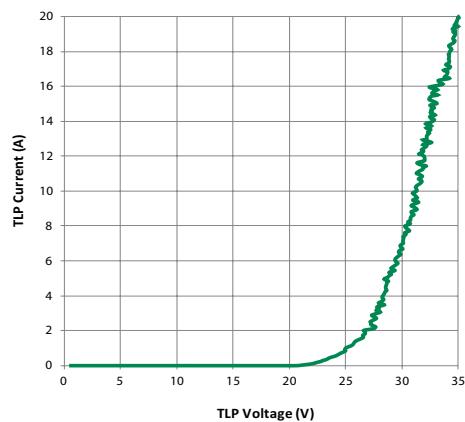
## 200W Discrete Bidirectional TVS Diode

8/20 $\mu$ s Pulse Waveform

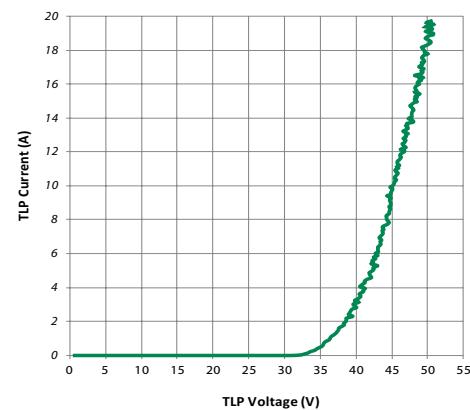
SPHV12-C Transmission Line Pulsing(TLP) Plot



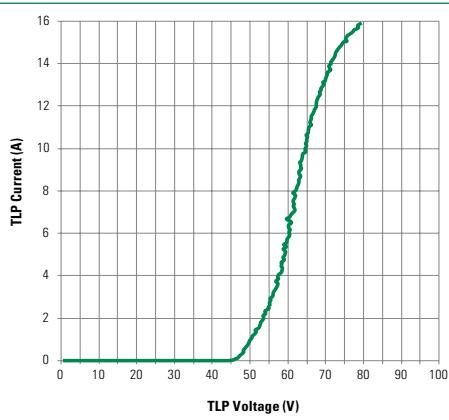
SPHV15-C Transmission Line Pulsing(TLP) Plot



SPHV24-C Transmission Line Pulsing(TLP) Plot



SPHV36-C Transmission Line Pulsing(TLP) Plot

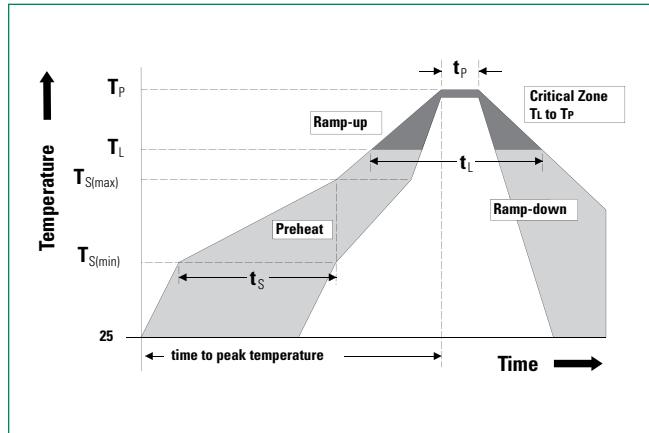


# SPHV-C Series

## 200W Discrete Bidirectional TVS Diode

### Soldering Parameters

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 – 120 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 <sup>+0/-5</sup> °C	
Time within 5°C of actual peak Temperature ( $t_p$ )	30 seconds	
Ramp-down Rate	6°C/second max	
Time 25°C to peak Temperature ( $T_p$ )	8 minutes Max.	
Do not exceed	260°C	



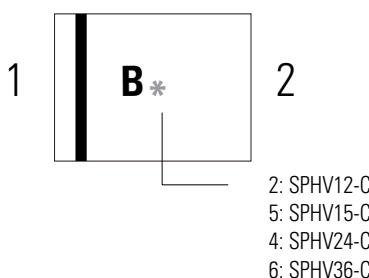
### Product Characteristics

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

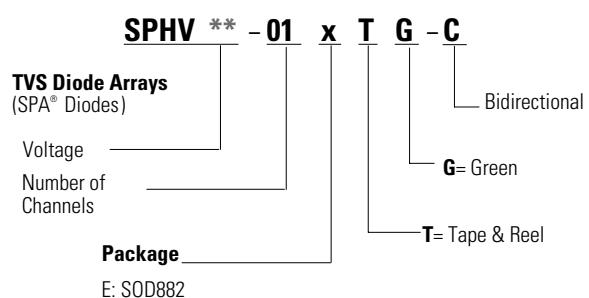
### Ordering Information

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

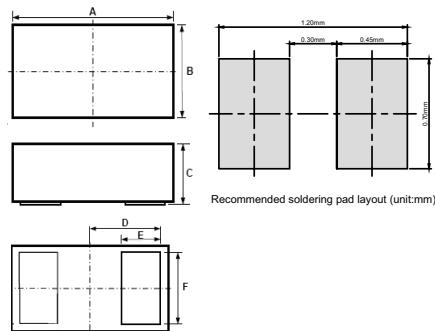


### Part Numbering System



# SPHV-C Series

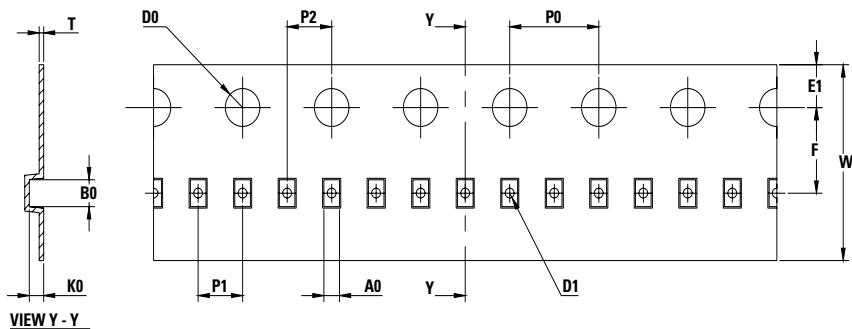
200W Discrete Bidirectional TVS Diode



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

Symbol	Package			SOD882		
	JEDEC			MO-236		
	Millimeters			Inches		
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



Symbol	Dimension (mm)		
	Min.	Nom.	Max.
A0	0.655	0.70	0.745
B0	1.055	1.10	1.145
D0	1.50	1.55	1.60
D1	0.35	0.40	0.45
E1	1.65	1.75	1.85
F	3.45	3.50	3.55
K0	0.605	0.65	0.695
P0	3.90	4.00	4.10
P1	1.90	2.00	2.10
P2	1.95	2.00	2.05
T	0.15	0.20	0.25
W	7.90	8.00	8.30

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