

## ■Description

HWES03016E is an ultra-low capacitance ESD and Surge Protector designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces.

HWES03016E is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 ( $\pm 15\text{kV}$  air,  $\pm 8\text{kV}$  contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5/50 ns), IEC 61000-4-5 (Surge) (20 A, 8/20 $\mu\text{s}$ ), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

HWES03016E is in an SOD-323 package. The combined features of ultra - low capacitance and high ESD robustness make HWES03016E ideal for applications where arrays are not practical. The low clamping voltage of the HWES03016E guarantees a minimum stress on the protected IC.

## ■Features

- Transient protection for high-speed data lines IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (Air)  
 $\pm 30\text{kV}$  (Contact)
- Low leakage current: 10nA @ VRWM (Typical)
- Low operating and clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge

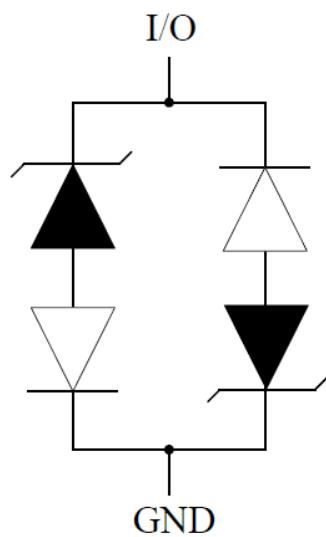
## ■Applications

- Desktops, Servers and Notebooks
- Cellular Phones
- Portable Instruments
- Analog Inputs

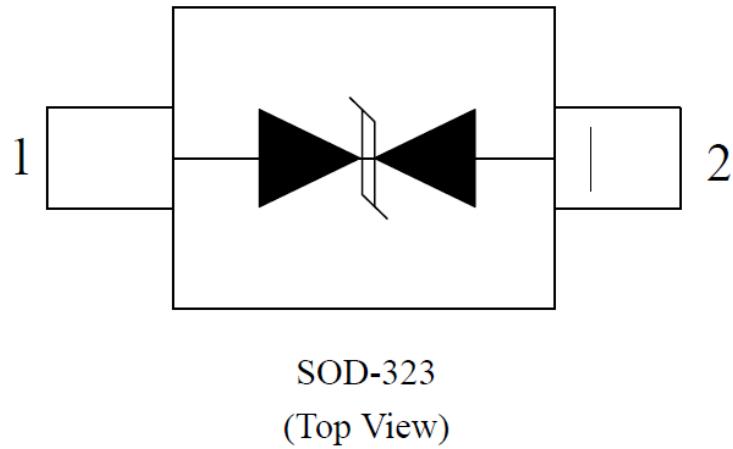
## ■Mechanical Characteristics

- SOD-323 package
- Flammability Rating: UL 94V-0
- Marking: Part number
- Packaging: Tape and Reel

## ■Circuit Diagram

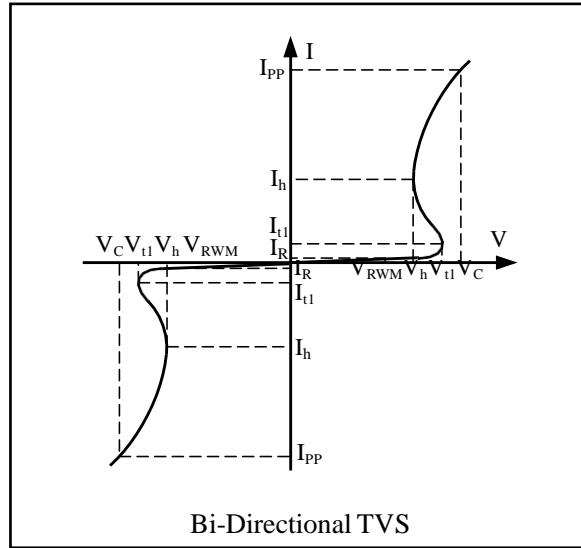


## ■Pin Configuration



## ■ Electrical characteristics (Ta = 25 °C)

Symbol	Parameter
V <sub>RWM</sub>	Nominal Reverse Working Voltage
I <sub>R</sub>	Reverse Leakage Current @ V <sub>RWM</sub>
V <sub>tl</sub>	Trigger Voltage
I <sub>tl</sub>	Trigger Current @ V <sub>tl</sub>
V <sub>h</sub>	Holding Voltage
I <sub>h</sub>	Holding Current @ V <sub>h</sub>
V <sub>C</sub>	Clamping Voltage @ I <sub>PP</sub>
V <sub>CR</sub>	Reverse Clamping Voltage @ I <sub>PP</sub>
I <sub>PP</sub>	Maximum Peak Pulse Current
C <sub>ESD</sub>	Parasitic Capacitance

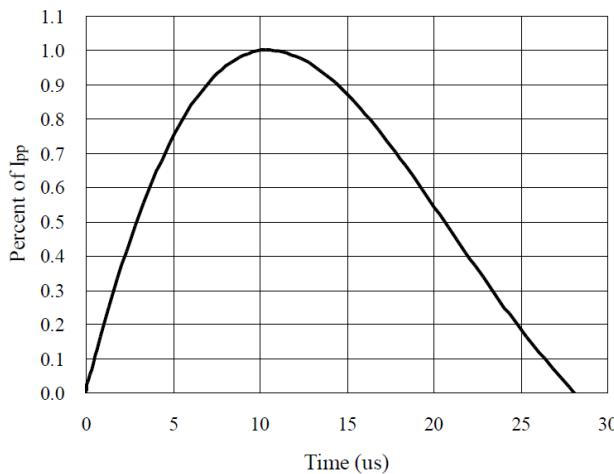


Symbol	Test Condition	Minimum	Typical	Maximum	Units
V <sub>RWM</sub>				3.3	V
I <sub>R</sub>	V <sub>RWM</sub> = 3.3V, T = 25°C		0.01	0.5	µA
V <sub>tl</sub>	I <sub>tl</sub> = 1µA	6.0		7.5	V
V <sub>h</sub>	I <sub>h</sub> = 10mA	4.0		5.0	V
V <sub>C</sub>	I <sub>PP</sub> = 1A, t <sub>p</sub> = 8/20µs			8.0	V
V <sub>C</sub>	I <sub>PP</sub> = 10A, t <sub>p</sub> = 8/20µs			12.0	V
V <sub>C</sub>	I <sub>PP</sub> = 20 A, t <sub>p</sub> = 8/20µs			16.0	V
C <sub>ESD</sub>	V <sub>R</sub> = 0V, f = 1MHz		0.6	0.8	pF
C <sub>ESD</sub>	V <sub>R</sub> = 3.3V, f = 1MHz		0.6	0.8	pF

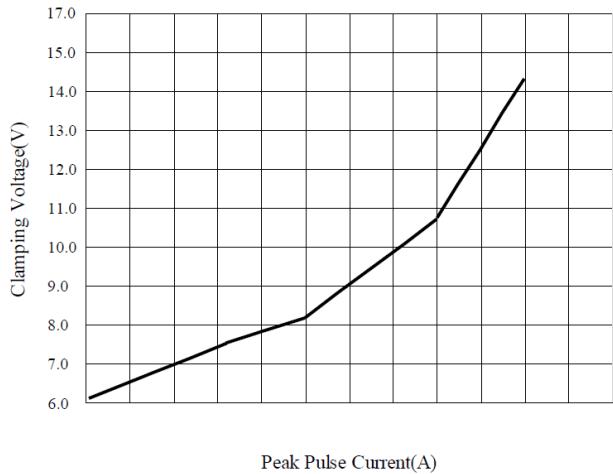
## ■ Absolute Maximum Rating

Symbol	Parameter	Value	Units
P <sub>PK</sub>	Peak Pulse Power (8/20µs)	320	Watts
V <sub>ESD</sub>	ESD per IEC 61000-4-2 (Air)	±30	kV
	ESD per IEC 61000-4-2 (Contact)	±30	
T <sub>OPT</sub>	Operating Temperature	-55 to +150	°C
T <sub>STG</sub>	Storage Temperature	-55 to +150	°C

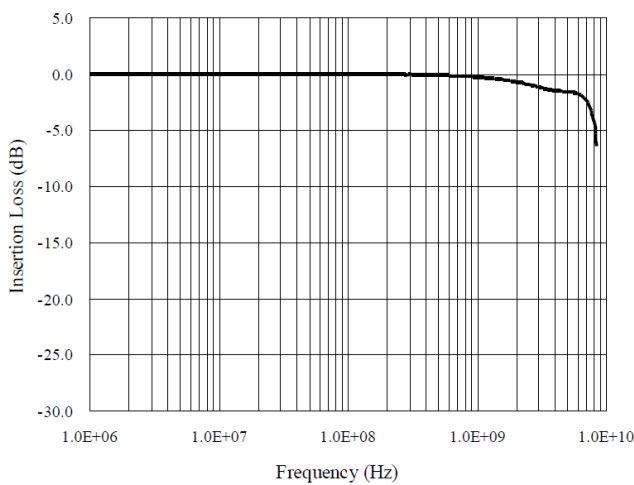
## 8/20 $\mu$ s Pulse Waveform



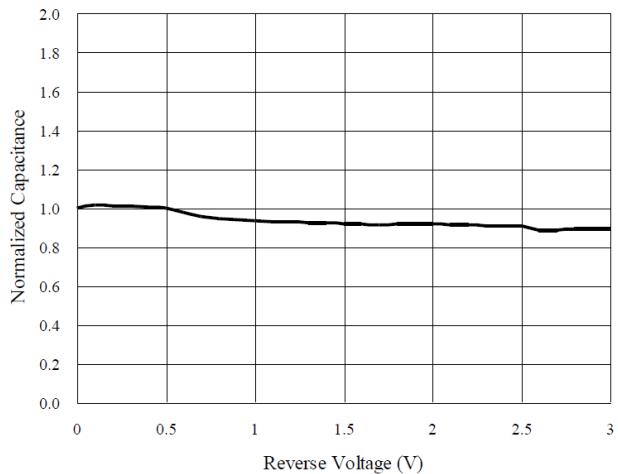
## Clamping Voltage V<sub>c</sub> vs. Current I<sub>PP</sub>



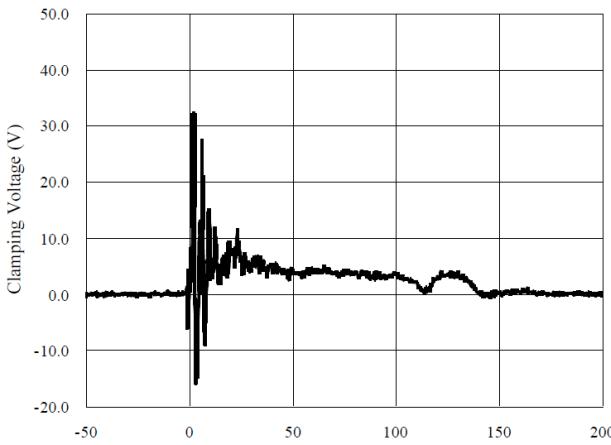
## Insertion Loss S21



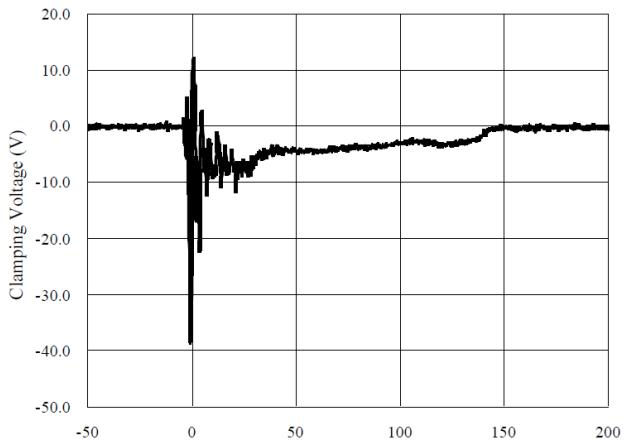
## Normalized Capacitance vs. Voltage



## ESD Clamping of I/O to GND (+8kV Contact per IEC 61000-4-2)

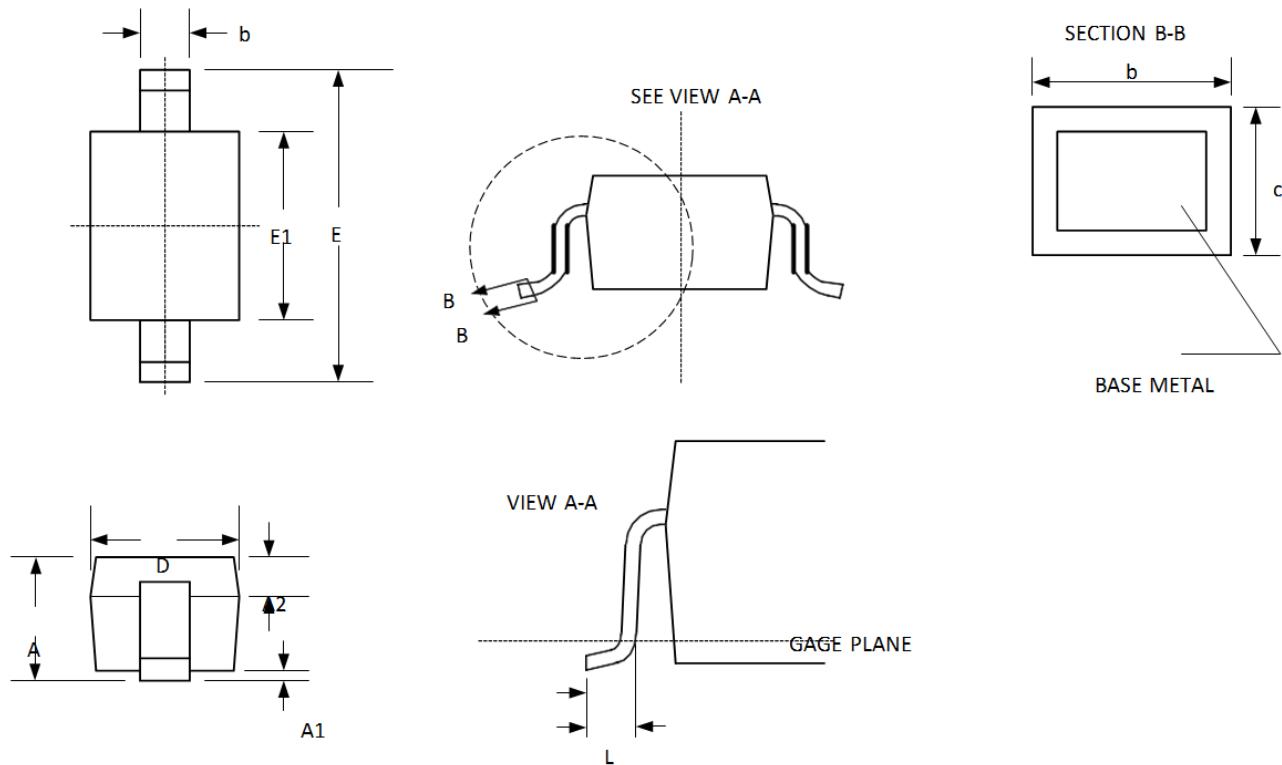


## ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)



## Package Outline

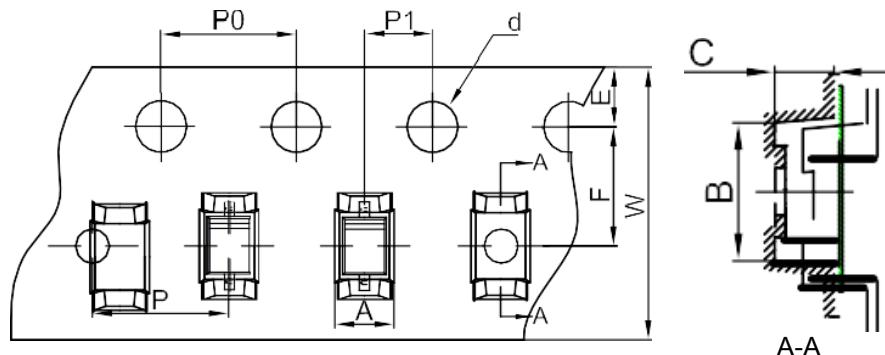
- SOD-323 Package



Package Dimensions (Controlling dimensions are in millimeters)

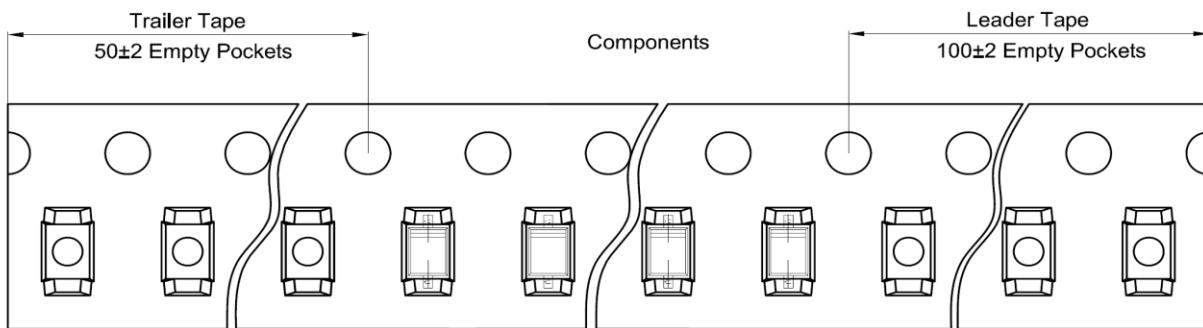
Symbol	Dimensions (mm)			Dimensions (Inches)		
	Minimum	Typical	Maximum	Minimum	Typical	Maximum
A	0.910	—	1.170	0.036	—	0.046
A1	0.000	—	0.100	0.000	—	0.004
A2	0.300	—	0.400	0.012	—	0.016
b	0.330	—	0.430	0.013	—	0.017
c	0.130	—	0.200	0.005	—	0.008
D	1.180	1.280	1.370	0.044	0.050	0.054
E	2.460	2.590	2.720	0.097	0.102	0.107
E1	1.500	1.640	1.780	0.060	0.065	0.070
L	0.250	0.350	0.450	0.010	0.014	0.018

## Tape and Reel Specification

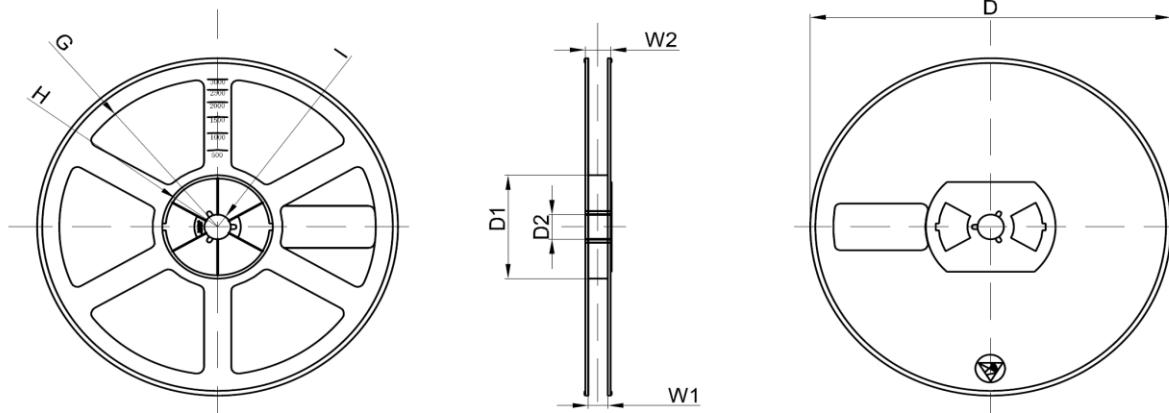


Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOD-323	1.46	2.90	1.25	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00
(Tolerance)	+/-0.05	+/-0.05	+/-0.05	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+0.3/-0.1

### SOD-323 Tape Leader and Trailer



### SOD-323 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7" Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30
Tolerance	+/-2	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1
REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)		
3000 pcs	7 inch	45,000 pcs	203×203×195	180,000 pcs	438×438×220			