

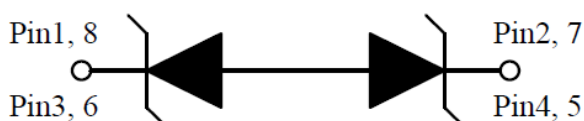
### ■ Description

HWES2502PN is a low-capacitance Transient Voltage Suppressor (TVS) array designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces.

With typical capacitance of 4.5pF only, HWES2502PN 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.

HWES2502PN is in a DFN-8L package. Each HWES2502PN device can protect two high-speed line pairs. The “flow-thru” design minimizes trace inductance and reduces voltage overshoot associated with ESD events. The combined features of low capacitance and high ESD robustness make HWES2502PN ideal for high-speed data port and high-frequency line (e.g., Gigabit Ethernet Ports) applications. The low clamping voltage of the HWES2502PN guarantees a minimum stress on the protected IC.

### ■ Circuit Diagram



### ■ Features

- Transient protection for high-speed data lines IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (Air)  $\pm 30\text{kV}$  (Contact)
- IEC 61000-4-4 (EFT) 40A (5/50 ns)
- IEC 61000-4-5 (Surge) 20A (8/20 $\mu\text{s}$ )
- Package optimized for high-speed lines
- Provides protection for two line pairs
- Low capacitance: 4.5pF @ 2.5V (Typical)
- Low leakage current: 0.01 $\mu\text{A}$  @  $V_{\text{RWM}}$  (Typical)
- Low operating and clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge

- ROHS Compliant

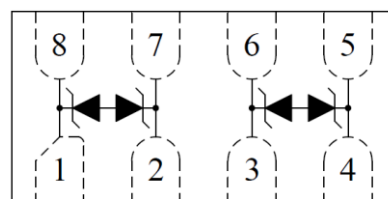
### ■ Applications

- 10/100/1000M Ethernet Ports
- WAN/LAN Equipment
- Desktops, Servers and Notebooks
- Cellular Phones
- Switching Systems
- Audio/Video Inputs

### ■ Mechanical Characteristics

- DFN-8L package
- Flammability Rating: UL 94V-0
- Marking: Part number
- Packaging: Tape and Reel

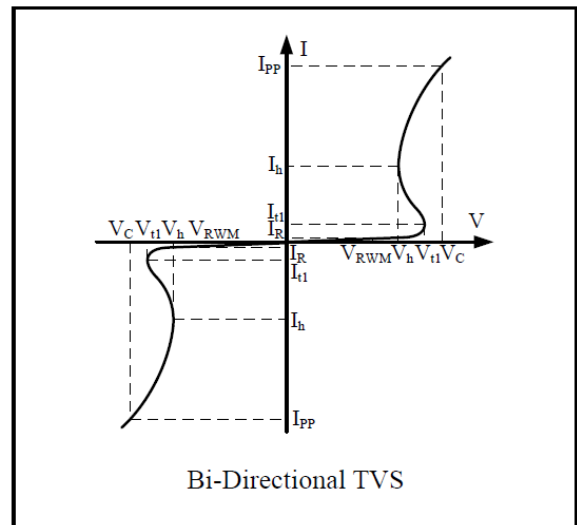
### ■ Pin Configuration



DFN-8L  
(Top View)

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

Symbol	Parameter
$V_{RWM}$	Nominal Reverse Working Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{t1}$	Trigger Voltage
$I_{t1}$	Trigger Current @ $V_{t1}$
$V_h$	Holding Voltage
$I_h$	Holding Current @ $V_h$
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Maximum Peak Pulse Current
$C_{ESD}$	Parasitic Capacitance
$C_{\Delta}$	Variation in $C_{ESD}$ with Reverse Bias

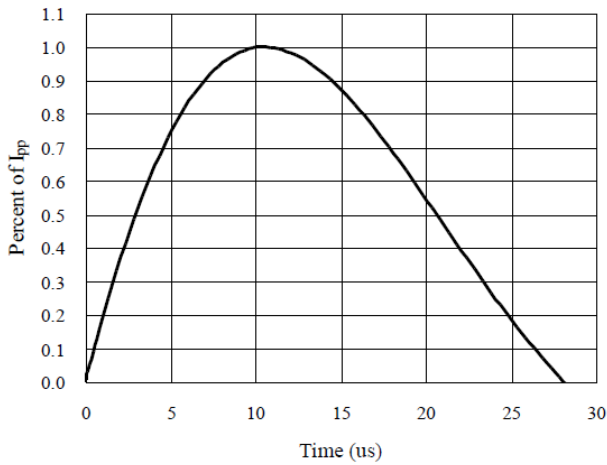


Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				2.5	V
$I_R$	$V_{RWM} = 2.5V, T = 25^{\circ}C$		0.01	0.05	uA
$V_{t1}$	$I_{t1} = 1\mu A$	3	3.7	4.5	V
$V_h$	$I_h = 1mA$	3		4	V
$V_C$	$I_{PP} = 2A, t_p = 8/20\mu s$ (Each Line)			5	V
$V_C$	$I_{PP} = 10A, t_p = 8/20\mu s$ (Each Line)			8	V
$C_{ESD}$	$V_R = 2.5V, f = 1MHz$ (Each Line)		4.5	6	pF
$C_{\Delta}$	Pin1, 8 to 2, 7 & Pin3, 6 to Pin4, 5 $V_R = 0V \sim 2.5V, f = 1MHz$		1.3		pF

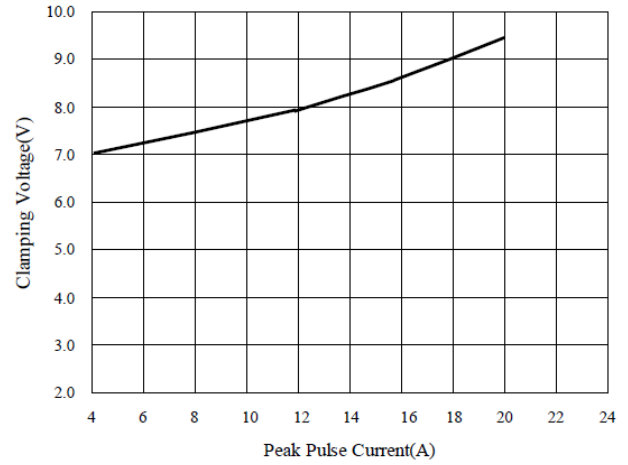
### Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Pulse Current (8/20 $\mu s$ )	20	A
$P_{PK}$	Peak Pulse Power (8/20 $\mu s$ )	300	Watts
$V_{ESD}$	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	$\pm 30$ $\pm 30$	kV
$T_{OPT}$	Operating Temperature	-45 to +85	$^{\circ}C$
$T_{STG}$	Storage Temperature	-55 to +150	$^{\circ}C$

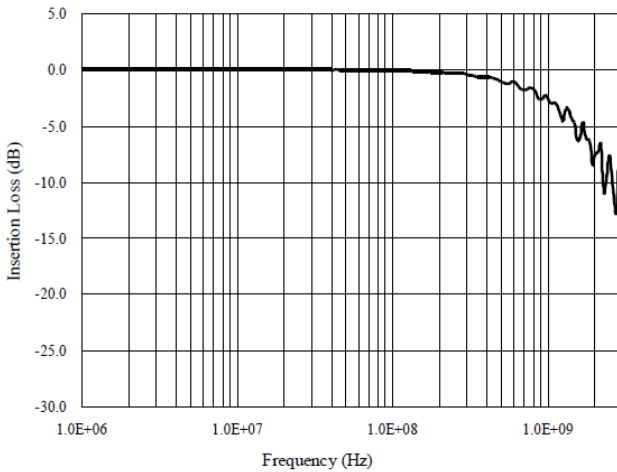
### 8/20 $\mu$ s Pulse Waveform



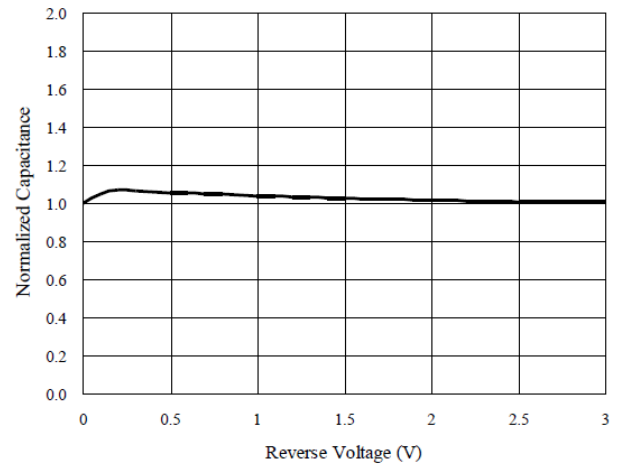
### Clamping Voltage V<sub>C</sub> vs. Current I<sub>pp</sub>



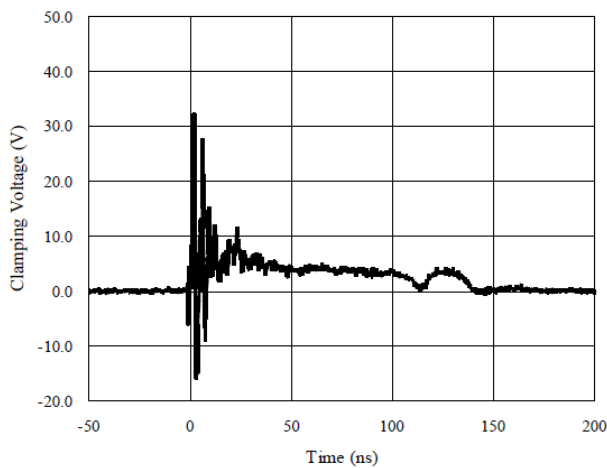
### Insertion Loss S21



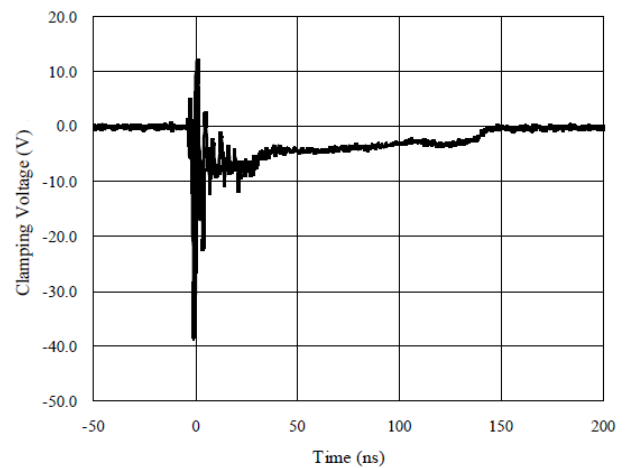
### Normalized Capacitance vs. Voltage



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

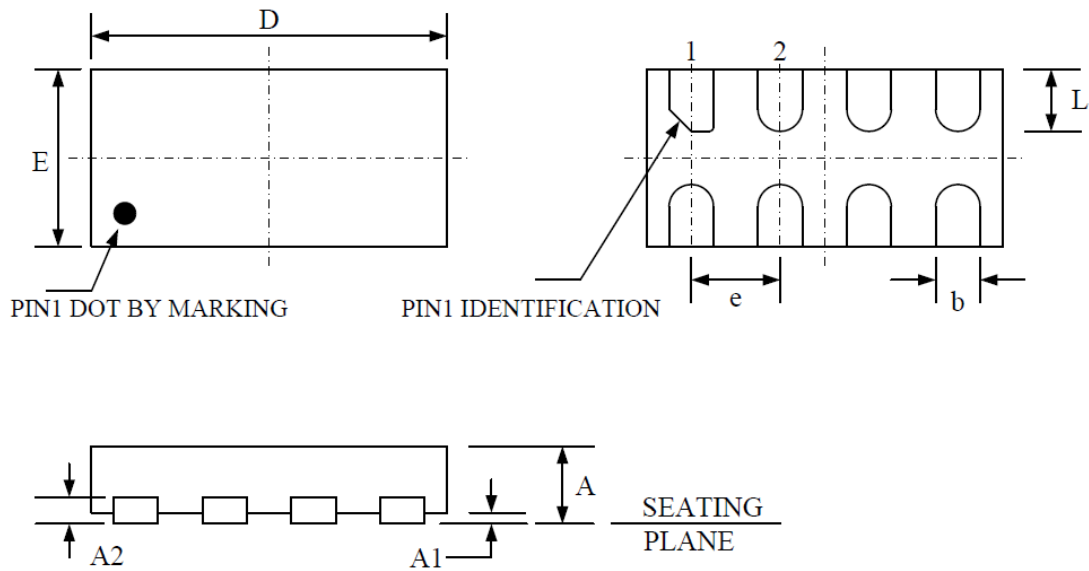


### ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)



### Package Outline

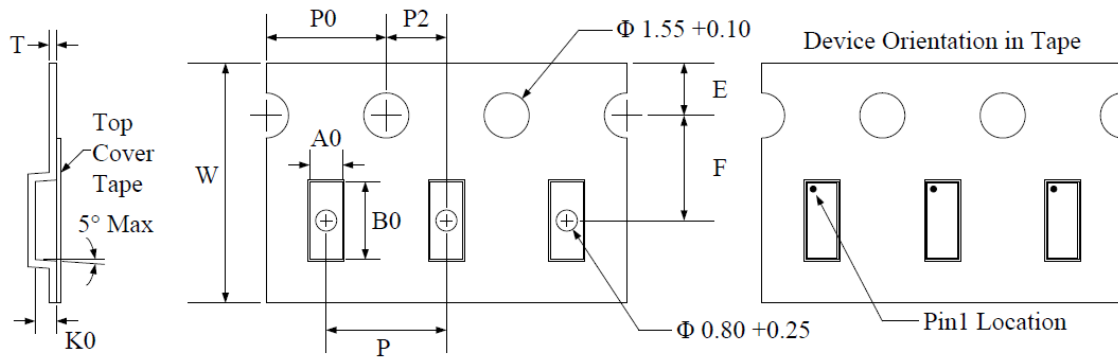
- DFN-8L Package
- Flow-Through
- MSL 1 & Thermally-Enhanced



Package Dimensions (Controlling dimensions are in millimeters)

Symbol	Dimensions (mm)			Dimensions (Inches)		
	Minimum	Typical	Maximum	Minimum	Typical	Maximum
A	0.370	0.400	0.430	0.015	0.016	0.017
A1	0.000	0.020	0.050	0.000	0.001	0.002
A2	0.130			0.005		
b	0.200	0.250	0.300	0.008	0.010	0.012
D	1.900	2.000	2.100	0.075	0.079	0.083
E	0.900	1.000	1.100	0.035	0.039	0.043
e	0.500 BSC			0.020 BSC		
L	0.300	0.350	0.400	0.012	0.014	0.016
R	0.050	0.100	0.150	0.002	0.004	0.006

### Tape and Reel Specification



Symbol	W	A0	B0	K0	E	F	P	P0	P2	T
Dimensions (mm)	8.00+0.3 -0.1	1.15±0.05	2.15±0.05	0.48±0.05	1.75±0.1	3.5±0.10	4.0±0.1	4.0±0.1	2.0±0.05	0.2±0.03

