

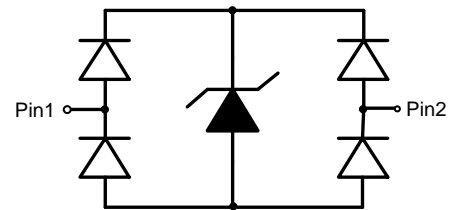
**ESD5311N**
**1-Line, Bi-directional, Ultra-low Capacitance  
Transient Voltage Suppressors**
<http://www.willsemi.com>
**Descriptions**

The ESD5311N is an ultra-low capacitance TVS (Transient Voltage Suppressor) designed to protect high speed data interfaces. It has been specifically designed to protect sensitive electronic components which are connected to data and transmission lines from over-stress caused by ESD (Electrostatic Discharge).

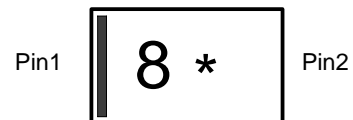
The ESD5311N incorporates one pair of ultra- low capacitance steering diodes plus a TVS diode.

The ESD5311N may be used to provide ESD protection up to  $\pm 20\text{kV}$  (contact discharge) according to IEC61000-4-2, and withstand peak pulse current up to 4A (8/20 $\mu\text{s}$ ) according to IEC61000-4-5.

The ESD5311N is available in DFN1006-2L package. Standard products are Pb-free and Halogen-free.


**DFN1006-2L (Bottom View)**

**Pin configuration**
**Features**

- Stand-off voltage: 5V Max
- Transient protection for each line according to IEC61000-4-2 (ESD):  $\pm 20\text{kV}$  (contact discharge)  
IEC61000-4-5 (surge): 4 A (8/20 $\mu\text{s}$ )
- Ultra-low capacitance:  $C_J = 0.25\text{pF}$  typ.
- Ultra-low leakage current:  $I_R < 1\text{nA}$  typ.
- Low clamping voltage:  $V_{CL} = 21\text{V}$  typ. @  $I_{PP} = 16\text{A}$  (TLP)
- Solid-state silicon technology



8 = Device code

\* = Month code ( A~Z)

**Marking (Top View)**
**Applications**

- USB 2.0 and USB 3.0
- HDMI 1.3 and HDMI 1.4
- SATA and eSATA
- DVI
- IEEE 1394
- PCI Express
- Portable Electronics
- Notebooks

**Order information**

| Device        | Package    | Shipping        |
|---------------|------------|-----------------|
| ESD5311N-2/TR | DFN1006-2L | 10000/Tape&Reel |

**Absolute maximum ratings**

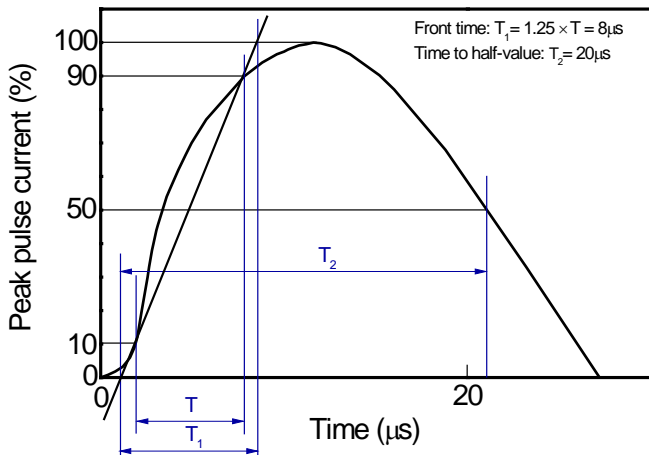
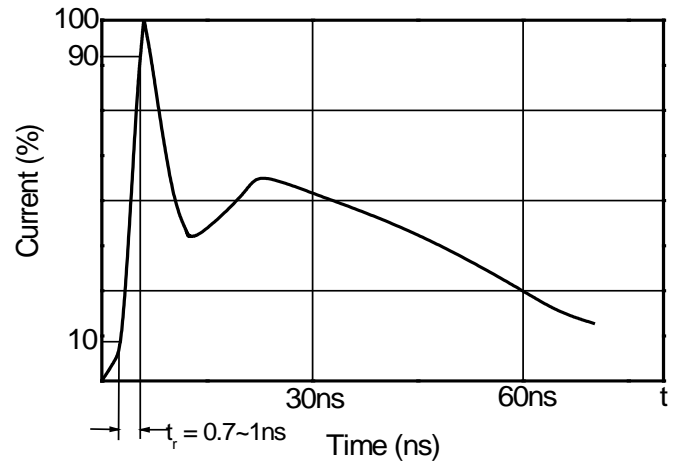
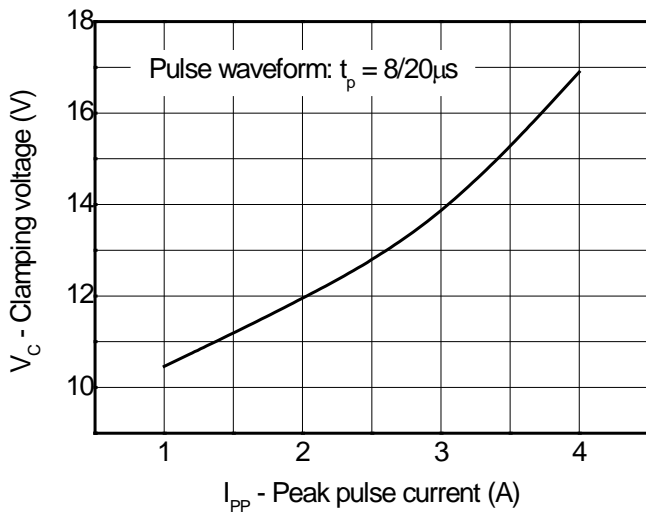
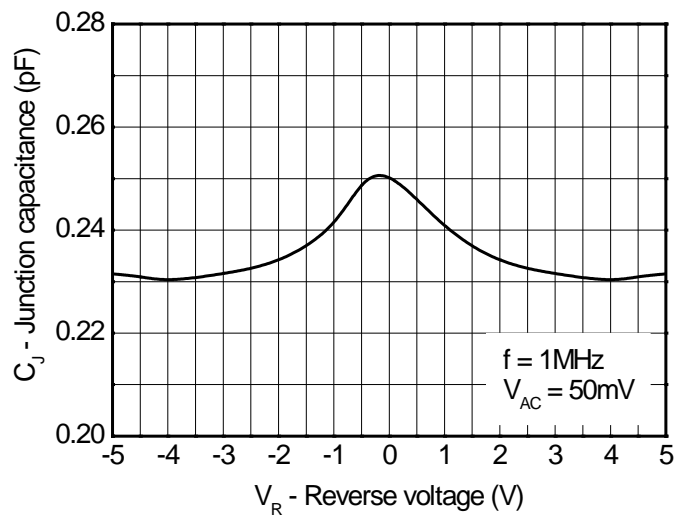
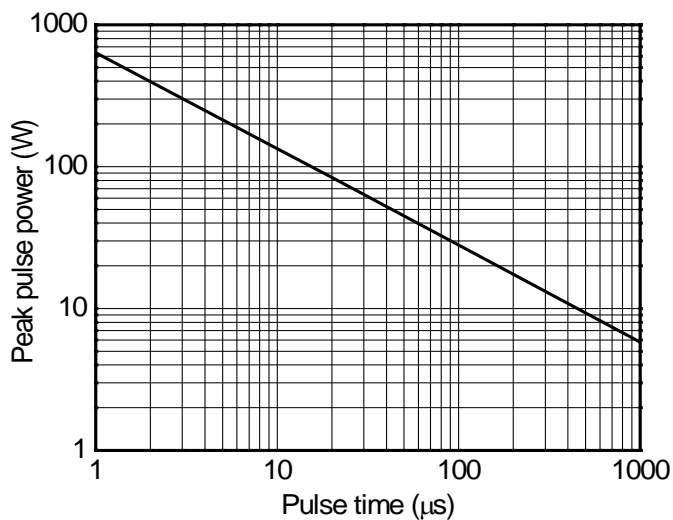
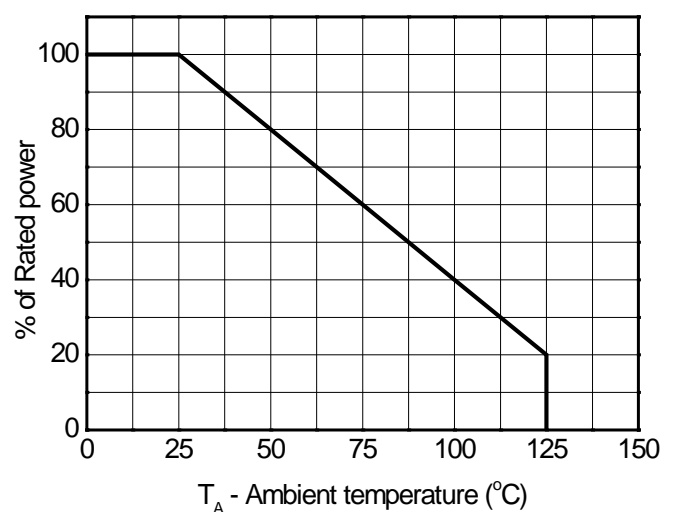
| Parameter                                       | Symbol    | Rating   | Unit        |
|---|-----------|----------|-------------|
| Peak pulse power ( $t_p = 8/20\mu s$ )          | $P_{pk}$  | 84       | W           |
| Peak pulse current ( $t_p = 8/20\mu s$ )        | $I_{PP}$  | 4        | A           |
| ESD according to IEC61000-4-2 air discharge     | $V_{ESD}$ | $\pm 20$ | kV          |
| ESD according to IEC61000-4-2 contact discharge |           | $\pm 20$ |             |
| Operation junction temperature                  | $T_J$     | 125      | $^{\circ}C$ |
| Lead temperature                                | $T_L$     | 260      | $^{\circ}C$ |
| Storage temperature                             | $T_{STG}$ | -55~150  | $^{\circ}C$ |

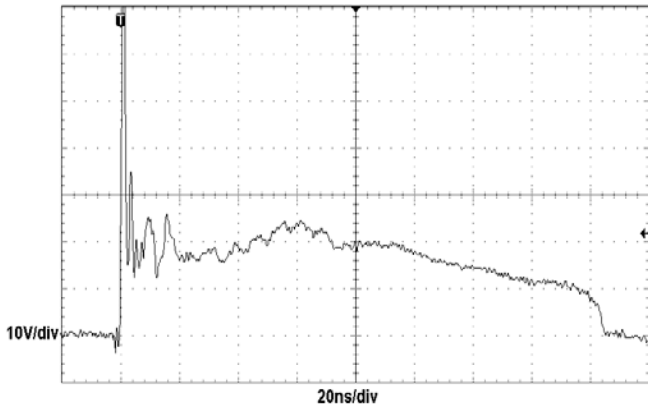
**Electrical characteristics ( $T_A=25^{\circ}C$ , unless otherwise noted)**

| Parameter                        | Symbol    | Condition                                  | Min. | Typ. | Max. | Unit     |
|----------------------------------|-----------|--|------|------|------|----------|
| Reverse maximum working voltage  | $V_{RWM}$ |  |      |      | 5.0  | V        |
| Reverse leakage current          | $I_R$     | $V_{RWM} = 5V$                             |      | <1   | 100  | nA       |
| Reverse breakdown voltage        | $V_{BR}$  | $I_T = 1mA$                                | 7.5  | 9.0  | 10.0 | V        |
| Clamping voltage <sup>1)</sup>   | $V_{CL}$  | $I_{PP} = 16A, t_p = 100ns$                |      | 21.0 |      | V        |
| Dynamic resistance <sup>1)</sup> | $R_{DYN}$ |  |      | 0.7  |      | $\Omega$ |
| Clamping voltage <sup>2)</sup>   | $V_{CL}$  | $V_{ESD} = 8kV$                            |      | 21   |      | V        |
| Clamping voltage <sup>3)</sup>   | $V_{CL}$  | $I_{PP} = 1A, t_p = 8/20\mu s$             |      |      | 14   | V        |
|                                  |           | $I_{PP} = 4A, t_p = 8/20\mu s$             |      |      | 21   | V        |
| Junction capacitance             | $C_J$     | $V_R = 0V, f = 1MHz$<br>Any I/O pin to GND |      | 0.25 | 0.4  | pF       |

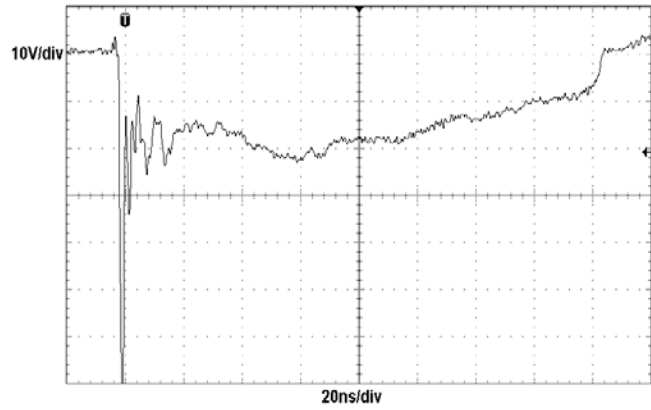
Notes:

- 1) TLP parameter:  $Z_0 = 50\Omega$ ,  $t_p = 100ns$ ,  $t_r = 2ns$ , averaging window from 60ns to 80ns.  $R_{DYN}$  is calculated from 4A to 16A.
- 2) Contact discharge mode, according to IEC61000-4-2.
- 3) Non-repetitive current pulse, according to IEC61000-4-5.

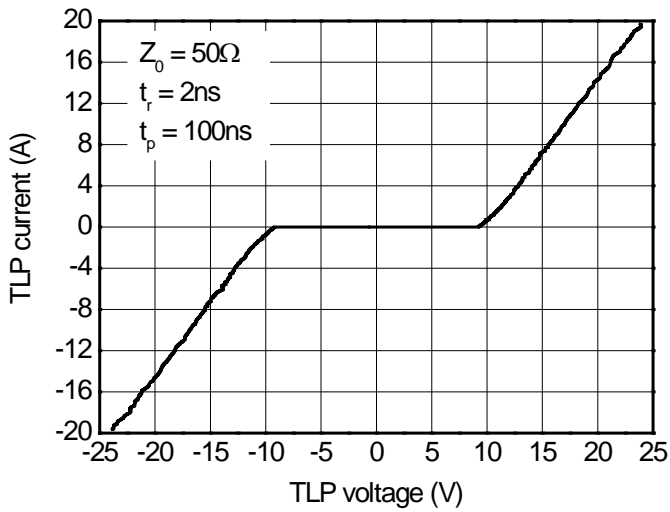
**Typical characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)**

**8/20 $\mu\text{s}$  waveform per IEC61000-4-5**

**Contact discharge current waveform per IEC61000-4-2**

**Clamping voltage vs. Peak pulse current**

**Capacitance vs. Reverses voltage**

**Non-repetitive peak pulse power vs. Pulse time**

**Power derating vs. Ambient temperature**



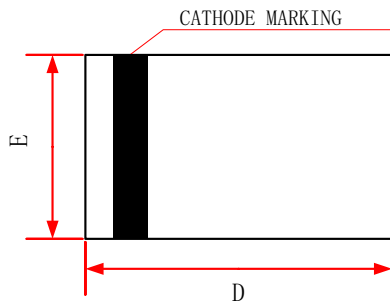
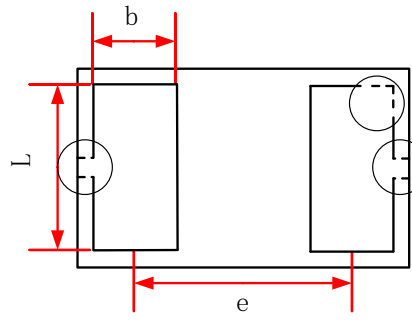
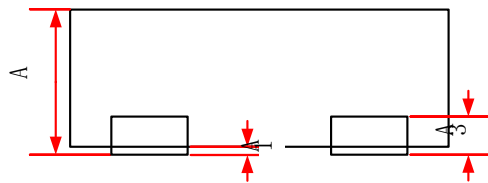
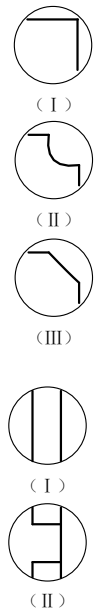
**ESD clamping**  
 (+8kV contact discharge per IEC61000-4-2)



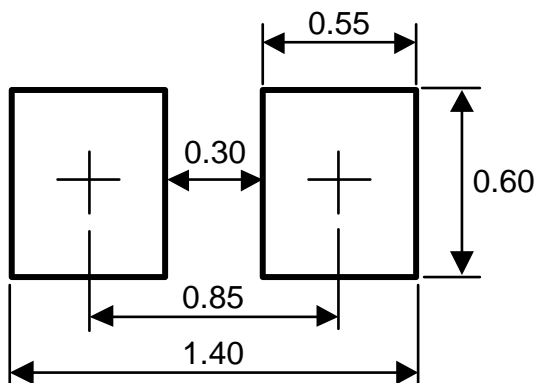
**ESD clamping**  
 (-8kV contact discharge per IEC61000-4-2)



**TLP Measurement**

**Package outline dimensions**
**DFN1006-2L**

**Top View**

**Bottom View**

**Side View**


|    | Min.       | Typ. | Max. |
|----|------------|------|------|
|    | A          | 0.30 | -    |
| A1 | 0.00       | -    | 0.05 |
| A3 | 0.125 Ref. |      |      |
| D  | 0.95       | 1.00 | 1.05 |
| E  | 0.55       | 0.60 | 0.65 |
| b  | 0.20       | 0.25 | 0.30 |
| L  | 0.45       | 0.50 | 0.55 |
| e  | 0.65 Typ.  |      |      |

**Recommend land pattern (Unit: mm)**

**Notes:**

This recommended land pattern is for reference purposes only. Please consult your manufacturing group to ensure your PCB design guidelines are met.