

ESD5302F

2-Lines, Uni-directional, Ultra-low Capacitance Transient Voltage Suppressors

Descriptions

The ESD5302F is an ultra-low capacitance TVS (Transient Voltage Suppressor) array 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 ESD5302F incorporates two pairs of ultra- low capacitance steering diodes plus a TVS diode.

The ESD5302F may be used to provide ESD protection up to $\pm 20\text{kV}$ (contact and air discharge) according to IEC61000-4-2, and withstand peak pulse current up to 4A (8/20 μs) according to IEC61000-4-5.

The ESD5302F is available in SOT-23 package. Standard products are Pb-free and Halogen-free.

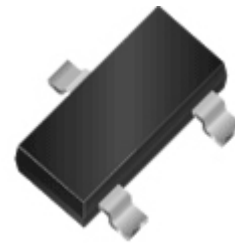
Features

- Stand-off voltage: 5V Max
- Transient protection for each line according to IEC61000-4-2 (ESD): $\pm 20\text{kV}$ (contact and air discharge)
IEC61000-4-4 (EFT): 40A (5/50ns)
IEC61000-4-5 (surge): 4A (8/20 μs)
- Ultra-low capacitance: $C_J = 0.4\text{pF}$ typ.
- Ultra-low leakage current: $I_R < 1\text{nA}$ typ.
- Low clamping voltage: $V_{CL} = 20\text{V}$ @ $I_{PP} = 16\text{A}$ (TLP)
- Solid-state silicon technology

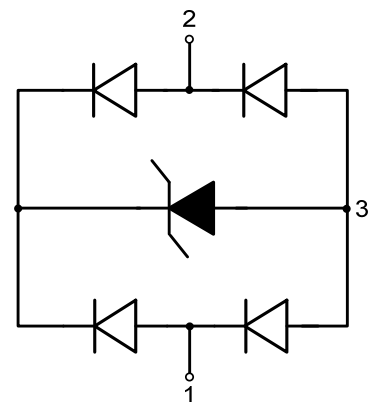
Applications

- 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

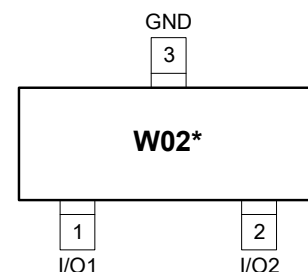
<http://www.sh-willsemi.com>



SOT-23 (Top View)



Circuit diagram



W = Will

02 = Device code

* = Month code (A~Z)

Marking (Top View)

Order information

| Device | Package | Shipping |
|---------------|---------|----------------|
| ESD5302F-3/TR | SOT-23 | 3000/Tape&Reel |

Absolute maximum ratings

| Parameter | Symbol | Rating | Unit |
|-------------------------------------------------|-----------|----------|-------------|
| Peak pulse power ($t_p = 8/20\mu s$) | P_{pk} | 60 | W |
| Peak pulse current ($t_p = 8/20\mu s$) | I_{PP} | 4 | A |
| ESD according to IEC61000-4-2 air discharge | V_{ESD} | ± 20 | kV |
| ESD according to IEC61000-4-2 contact discharge | | ± 20 | |
| Operation junction temperature | T_J | 125 | $^{\circ}C$ |
| Lead temperature | T_L | 260 | $^{\circ}C$ |
| Storage temperature | T_{STG} | -55~150 | $^{\circ}C$ |

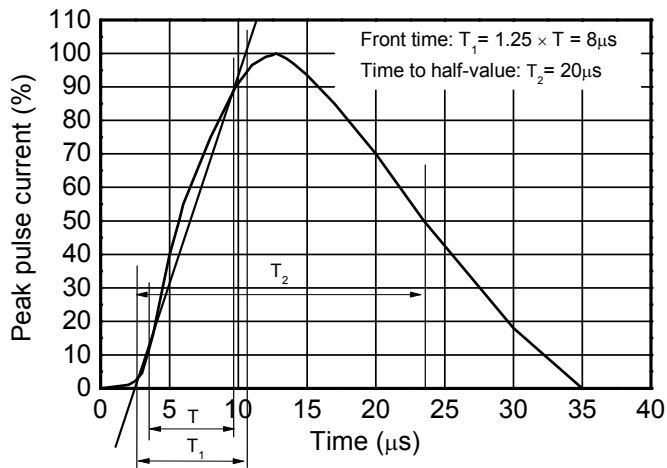
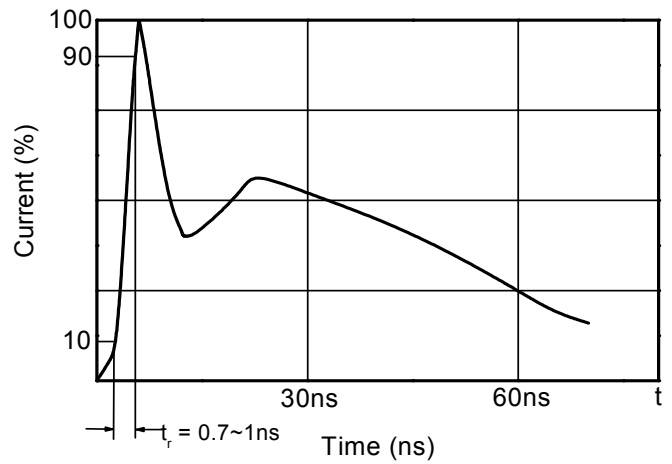
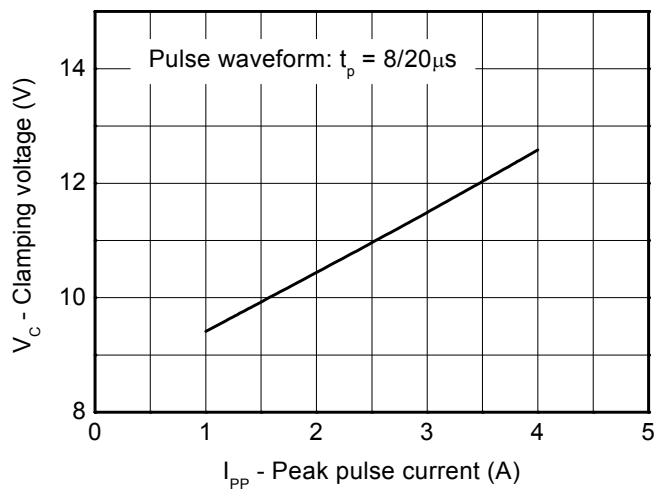
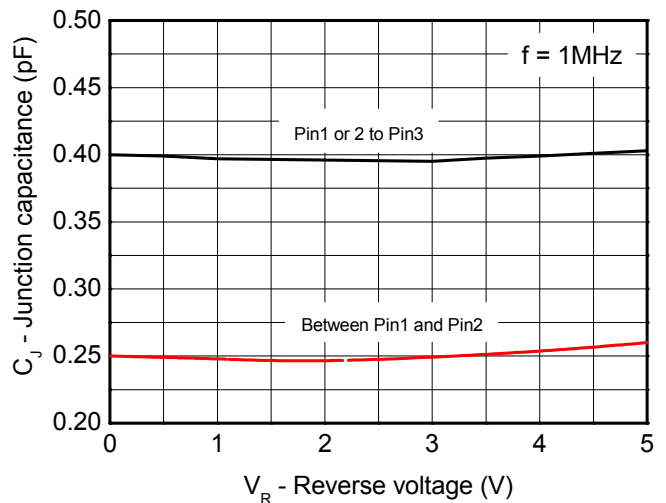
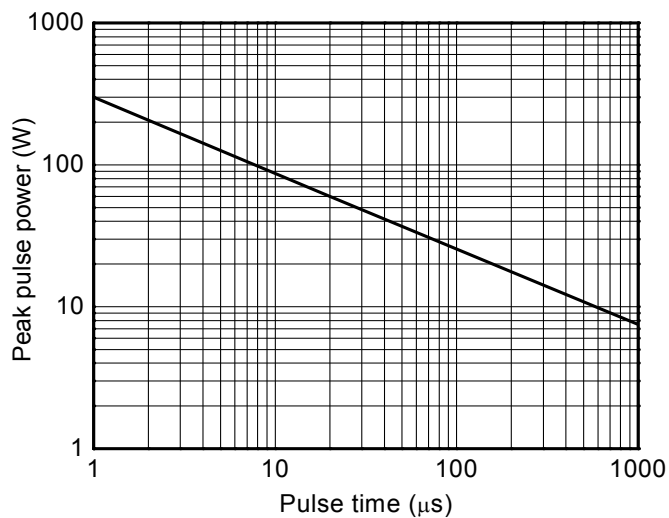
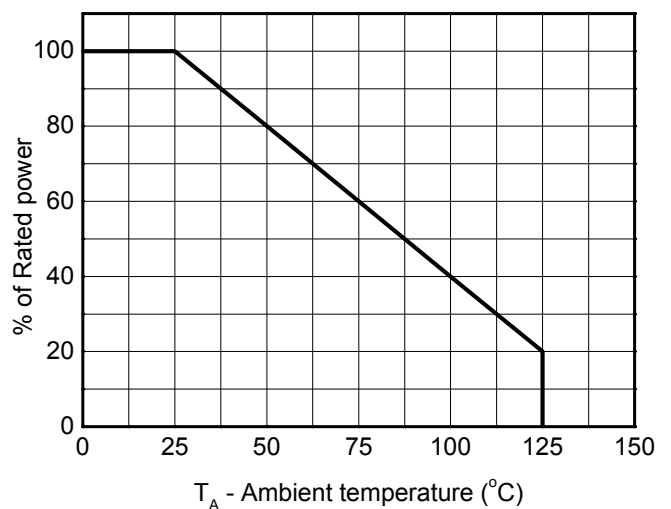
Electrical characteristics ($T_A=25^{\circ}C$, unless otherwise noted)

| 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} | $I_T = 1mA$ | 7.0 | 8.0 | 9.0 | V |
| Forward voltage | V_F | $I_T = 10mA$ | 0.6 | 0.9 | 1.2 | V |
| Clamping voltage ¹⁾ | V_{CL} | $I_{PP} = 16A, t_p = 100ns$ | | 20 | | V |
| Dynamic resistance ¹⁾ | R_{DYN} | | | 0.65 | | Ω |
| Clamping voltage ²⁾ | V_{CL} | $I_{PP} = 1A, t_p = 8/20\mu s$ | | | 11 | V |
| | | $I_{PP} = 4A, t_p = 8/20\mu s$ | | | 15 | V |
| Junction capacitance | C_J | $V_R = 0V, f = 1MHz$ Any I/O pin to GND | | 0.40 | 0.65 | pF |
| | | $V_R = 0V, f = 1MHz$ Between any I/O pin | | 0.25 | 0.40 | pF |

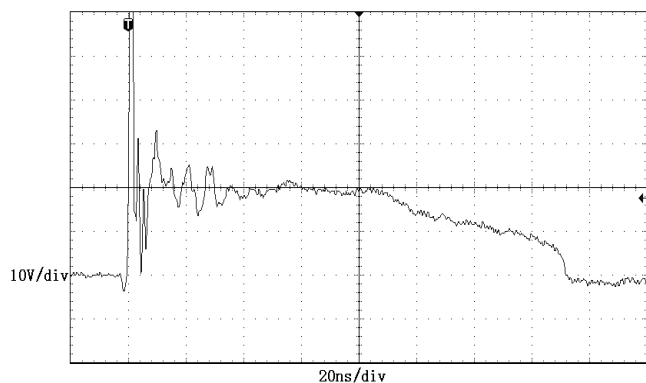
Notes:

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.

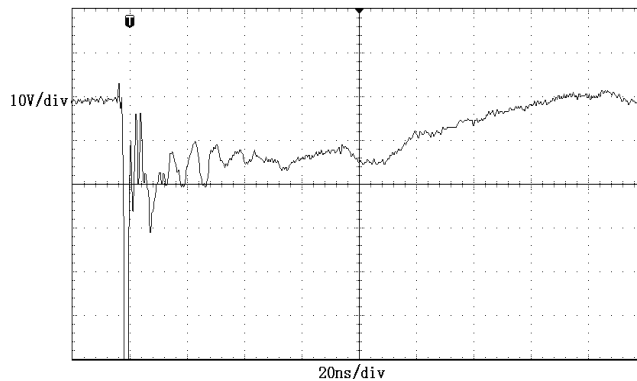
2) According to IEC61000-4-5.

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

8/20μs 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

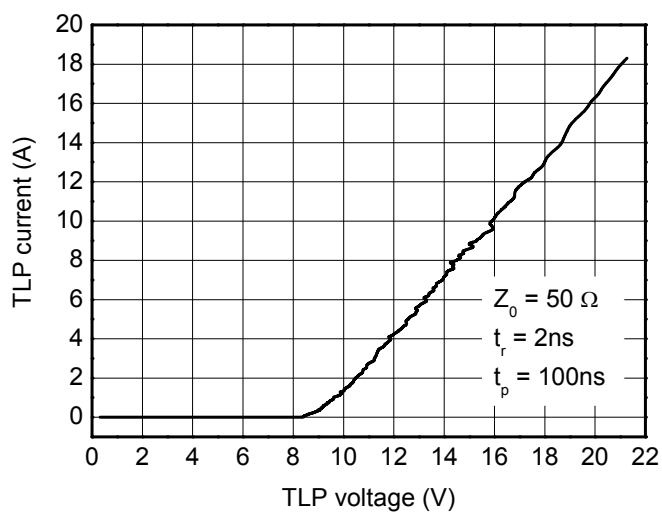
Typical characteristics ($T_A=25^{\circ}\text{C}$, unless otherwise noted)



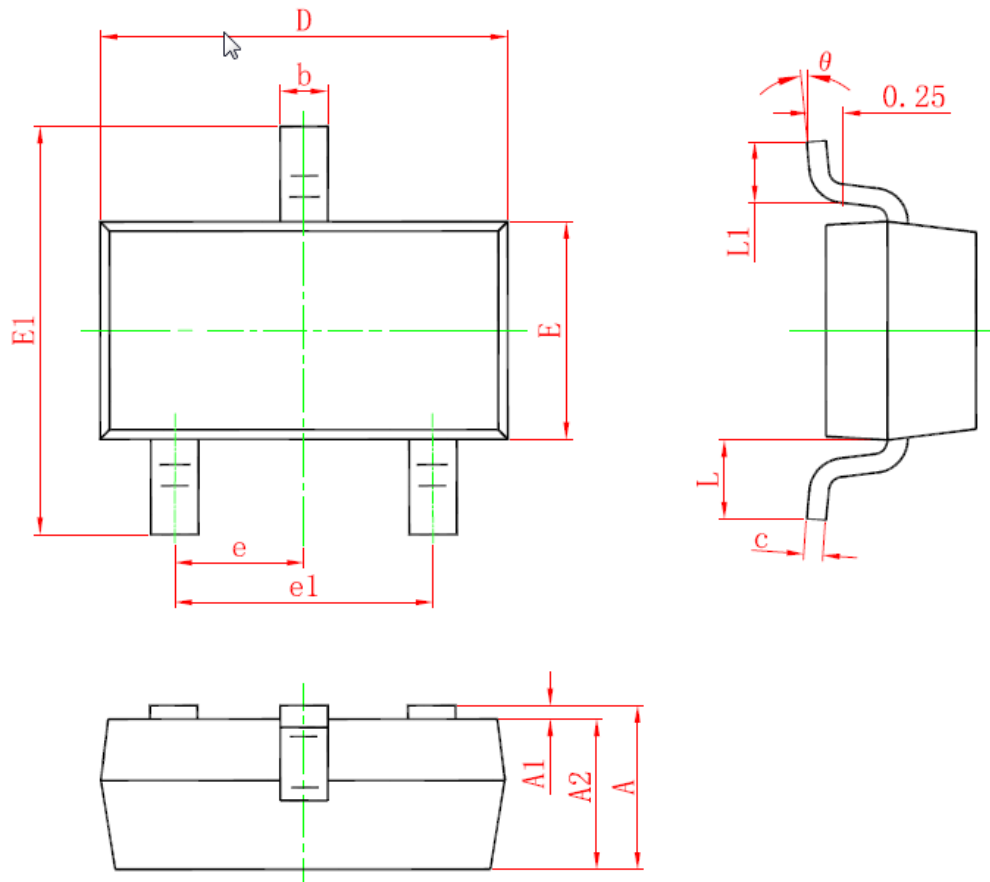
ESD clamping
(+8kV contact discharge per IEC61000-4-2)



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



TLP Measurement

Package outline dimensions
SOT-23


| Symbol | Dimensions in millimeter | | Dimensions in inches | |
|----------|--------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.150 | 0.035 | 0.045 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.050 | 0.035 | 0.041 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.800 | 3.000 | 0.110 | 0.118 |
| E | 1.200 | 1.400 | 0.047 | 0.055 |
| E1 | 2.250 | 2.550 | 0.089 | 0.100 |
| e | 0.950TYP | | 0.037TYP | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.500REF | | 0.022REF | |
| L1 | 0.300 | 0.500 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |