

ESD5451R

1-Line, Bi-directional, Transient Voltage Suppressors

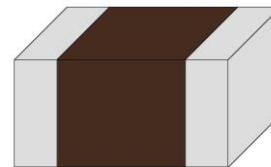
<http://www.sh-willsemi.com>

Descriptions

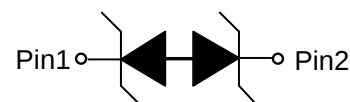
The ESD5451R is a bi-directional TVS (Transient Voltage Suppressor). It is specifically designed to protect sensitive electronic components which are connected to low speed data lines and control lines from over-stress caused by ESD (Electrostatic Discharge), EFT (Electrical Fast Transients) and Lightning.

The ESD5451R may be used to provide ESD protection up to $\pm 30\text{kV}$ (contact and air discharge) according to IEC61000-4-2, and withstand peak pulse current up to 8A (8/20 μs) according to IEC61000-4-5.

The ESD5451R is available in DFP1006-2L package. Standard products are Pb-free and Halogen-free.



DFP1006-2L



Circuit diagram

Features

- Reverse stand-off voltage: $\pm 5\text{V}$ Max
- Transient protection for each line according to
IEC61000-4-2 (ESD): $\pm 30\text{kV}$ (contact and air discharge)
IEC61000-4-4 (EFT): 40A (5/50ns)
IEC61000-4-5 (surge): 8A (8/20 μs)
- Capacitance: $C_J = 17.5\text{pF}$ typ.
- Low leakage current: $I_R < 1\text{nA}$ typ.
- Low clamping voltage: $V_{CL} = 11\text{V}$ typ. @ $I_{PP} = 16\text{A}$ (TLP)
- Solid-state silicon technology



Top View

Applications

- Cellular handsets
- Tablets
- Laptops
- Other portable devices
- Network communication devices

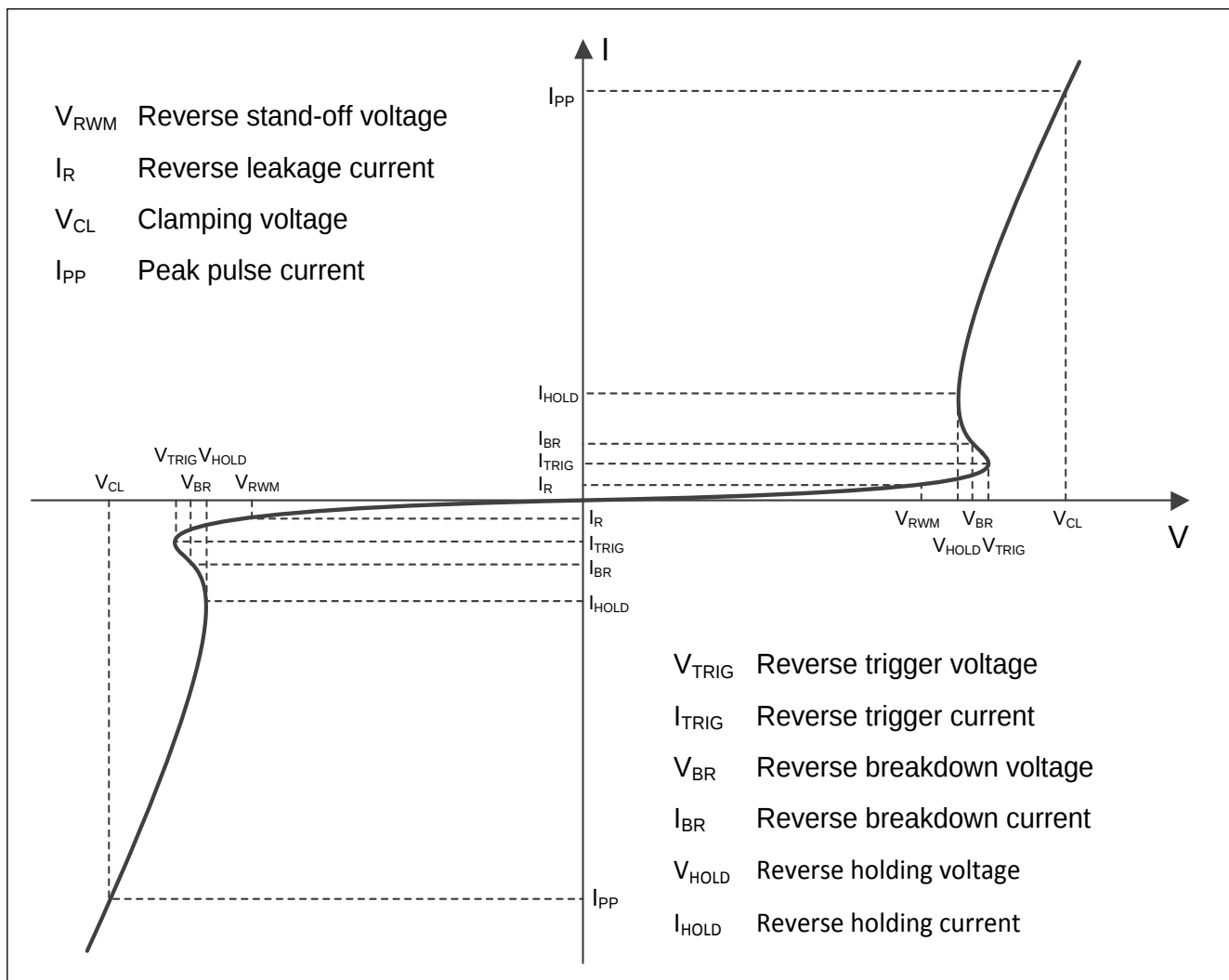
Order information

Device	Package	Shipping
ESD5451R-2/TR	DFP1006-2L	10000/Tape&Reel

Absolute maximum ratings

Parameter	Symbol	Rating	Unit
Peak pulse power ($t_p = 8/20\mu s$)	P_{pk}	80	W
Peak pulse current ($t_p = 8/20\mu s$)	I_{pp}	8	A
ESD according to IEC61000-4-2 air discharge	V_{ESD}	± 30	kV
ESD according to IEC61000-4-2 contact discharge		± 30	
Junction temperature	T_J	125	$^{\circ}C$
Operation temperature	T_{OP}	-40~85	$^{\circ}C$
Lead soldering temperature - SMT	$T_L - SMT$	260	$^{\circ}C$
Lead soldering temperature - manual	$T_L - manual$	<300	$^{\circ}C$
Storage temperature	T_{STG}	-55~150	$^{\circ}C$

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



Definitions of electrical characteristics

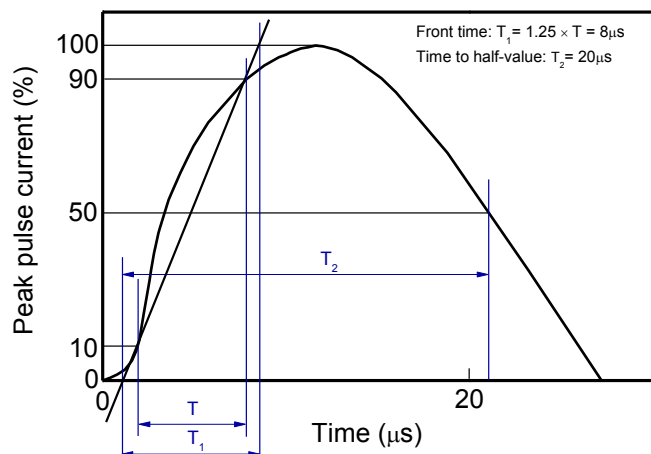
Electrical characteristics ($T_A=25^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	V_{RWM}				± 5	V
Reverse leakage current	I_{R}	$V_{\text{RWM}} = 5\text{V}$		<1	100	nA
Reverse breakdown voltage	V_{BR}	$I_{\text{BR}} = 1\text{mA}$	5.1			V
Reverse holding voltage	V_{HOLD}	$I_{\text{HOLD}} = 50\text{mA}$	5.1			V
Clamping voltage ¹⁾	V_{CL}	$I_{\text{PP}} = 16\text{A}$, $t_{\text{p}} = 100\text{ns}$		11		V
Clamping voltage ²⁾	V_{CL}	$V_{\text{ESD}} = 8\text{kV}$		12		V
Clamping voltage ³⁾	V_{CL}	$I_{\text{PP}} = 1\text{A}$, $t_{\text{p}} = 8/20\mu\text{s}$			6.5	V
		$I_{\text{PP}} = 5\text{A}$, $t_{\text{p}} = 8/20\mu\text{s}$			8.5	V
		$I_{\text{PP}} = 8\text{A}$, $t_{\text{p}} = 8/20\mu\text{s}$			10	V
Dynamic resistance ¹⁾	R_{DYN}			0.24		Ω
Junction capacitance	C_{J}	$V_{\text{R}} = 0\text{V}$, $f = 1\text{MHz}$		17.5	22	pF
		$V_{\text{R}} = 5\text{V}$, $f = 1\text{MHz}$		11.5	16	pF

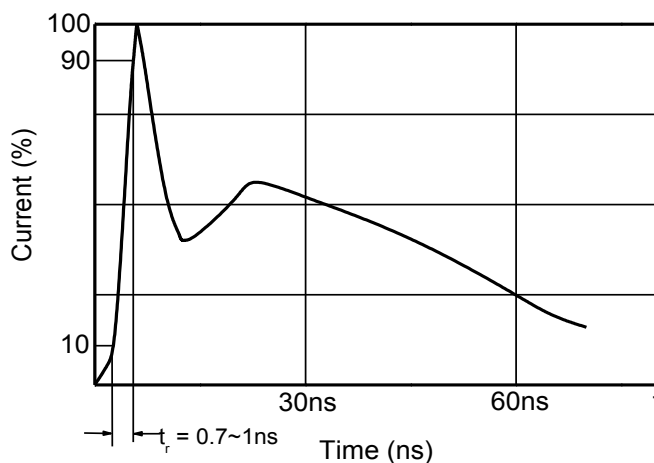
Notes:

- 1) TLP parameter: $Z_0 = 50\Omega$, $t_{\text{p}} = 100\text{ns}$, $t_{\text{r}} = 2\text{ns}$, 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.

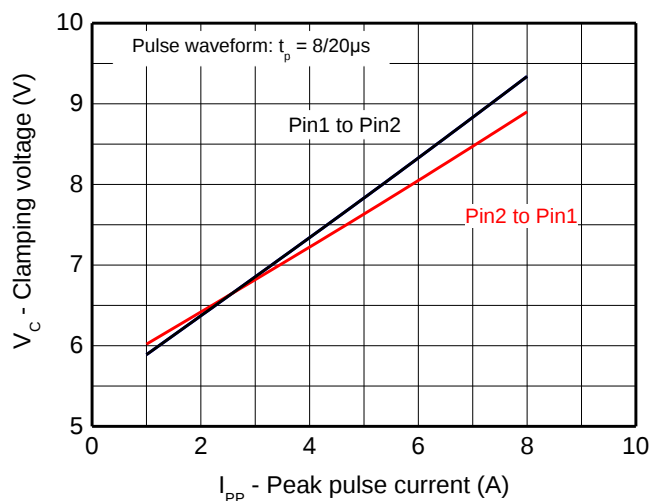
Typical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)



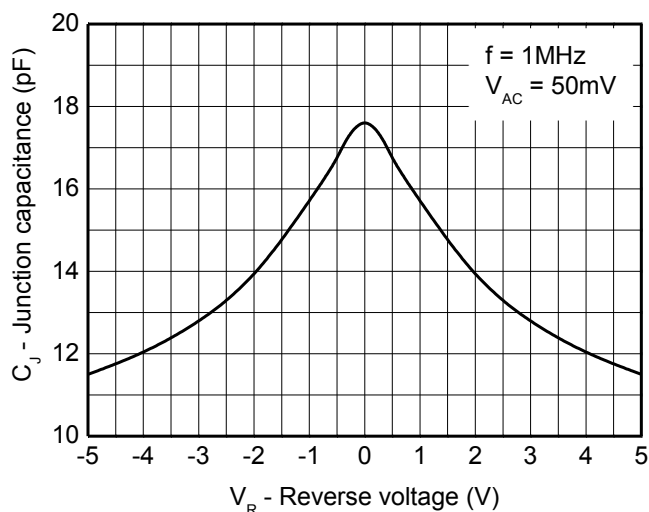
8/20 μs waveform per IEC61000-4-5



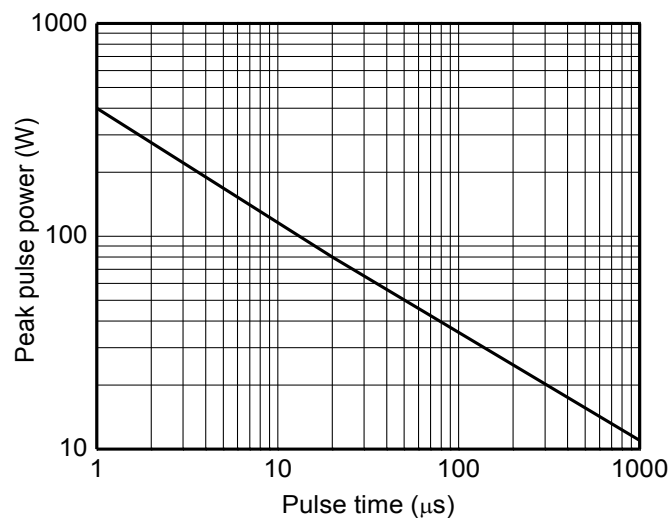
Contact discharge current waveform per IEC61000-4-2



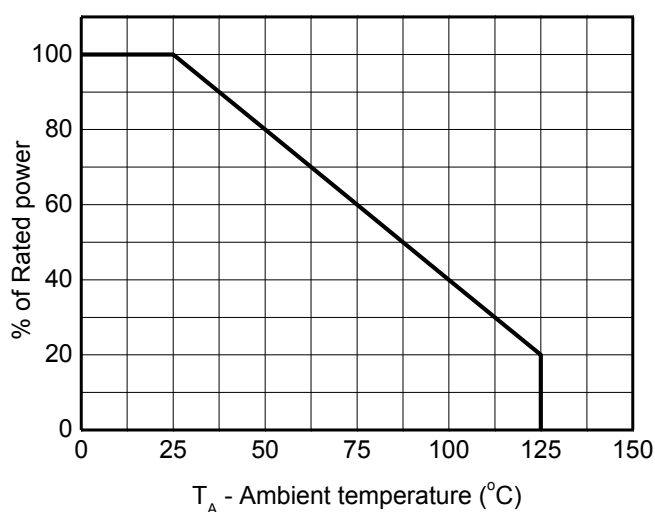
Clamping voltage vs. Peak pulse current



Capacitance vs. Reverse voltage

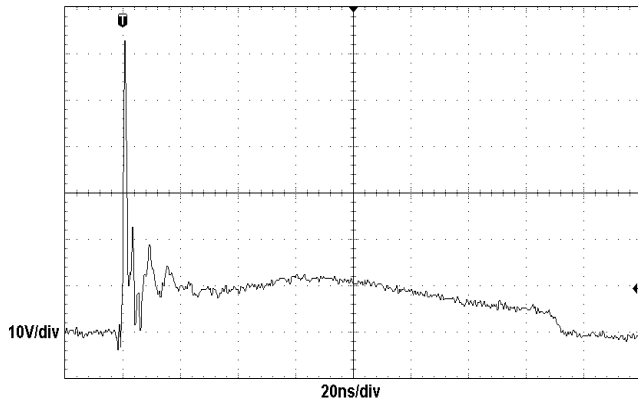


Non-repetitive peak pulse power vs. Pulse time

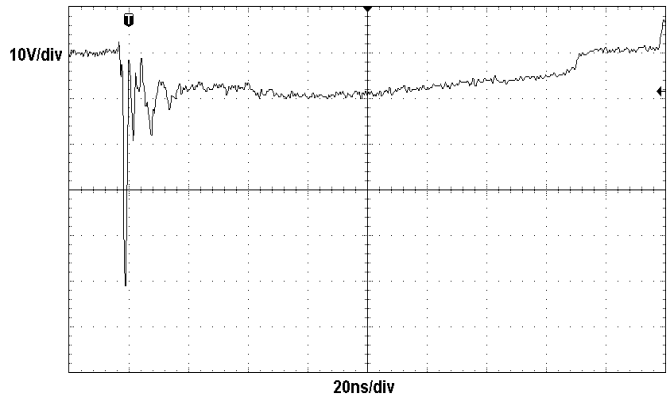


Power derating vs. Ambient temperature

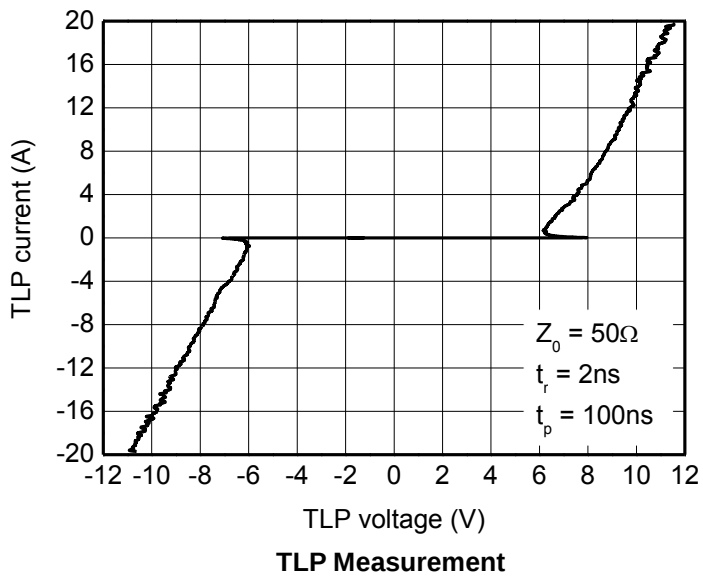
Typical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)

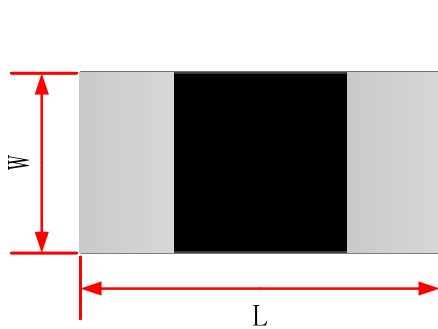
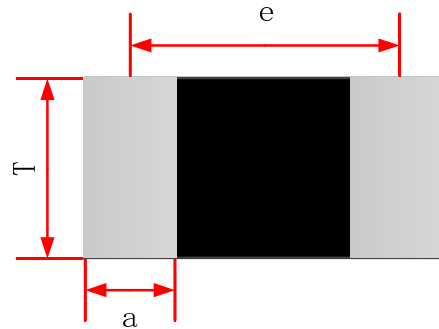


ESD clamping
(+8kV contact discharge per IEC61000-4-2)



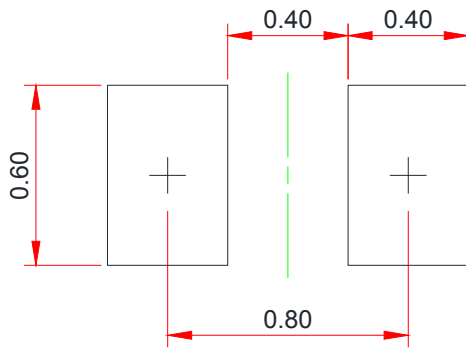
ESD clamping
(-8kV contact discharge per IEC61000-4-2)



Package outline dimensions
DFP1006-2L

Top View (Bottom View)

Side View

Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
W	0.40	0.50	0.53
L	0.90	1.00	1.10
T	0.40	0.50	0.53
a	0.15	0.25	0.35
e	0.75 Typ.		

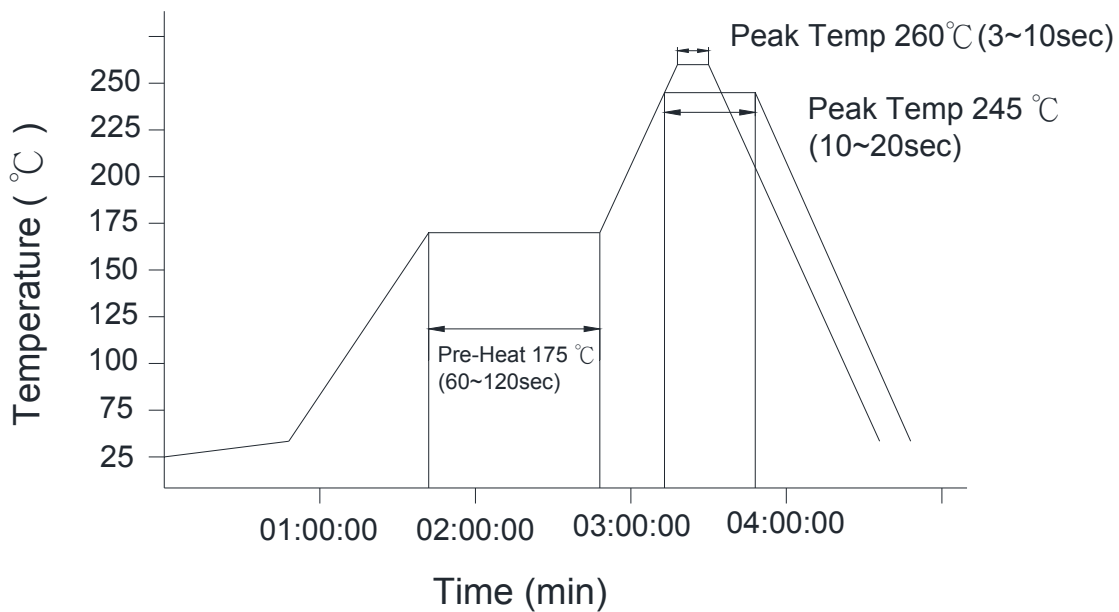
Recommend land pattern (Unit: mm)



Notes:

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

he IR reflow and temperature of Soldering for Pb Free



IR reflow Pb Free Process suggestion profile

- (1) The solder recommend is Sn96.5/Ag 3.5 of 120 to 150 μ m
- (2) Ramp-up rate (217°C to Peak) + 3°C/second max
- (3) Temp. maintain at 175 $\pm$ 25°C 180 seconds max
- (4) Temp. maintain above 217 °C 60-150 seconds
- (5) Peak temperature range 245°C +20°C / -10 °C time within 5 °C of actually peak temperature (tp)
10~20 seconds
- (6) Ramp down rate +6 °C/second max
- (7) Steel plate thickness 0.08mm