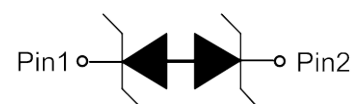


ESD5651N
4.5V, Single Li-ion Battery Port Surge Protector
<http://www.sh-willsemi.com>
Descriptions

The ESD5651N is a bi-directional TVS (Transient Voltage Suppressor). It is specifically designed to protect sensitive electronic components which are connected to power lines, from over-stress caused by ESD (Electrostatic Discharge), EFT (Electrical Fast Transients) and Lightning.

The ESD5651N 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 35A (8/20 μs) according to IEC61000-4-5.

The ESD5651N is available in DFN1006-2L package. Standard products are Pb-free and Halogen-free.


DFN1006-2L (Bottom View)

Circuit diagram
Features

- Reverse stand-off voltage: $\pm 4.5\text{V}$ 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): 35A (8/20 μs)
- Capacitance: $C_J = 65\text{pF}$ typ.
- Low leakage current
- Low clamping voltage: $V_{CL} = 6.5\text{V}$ typ. @ $I_{PP} = 16\text{A}$ (TLP)
- Solid-state silicon technology



3 = Device code

* = Month code (A~Z)

Marking (Top View)
Applications

- Power lines
- Cellular handsets
- Tablets
- Microprocessors
- Portable Electronics

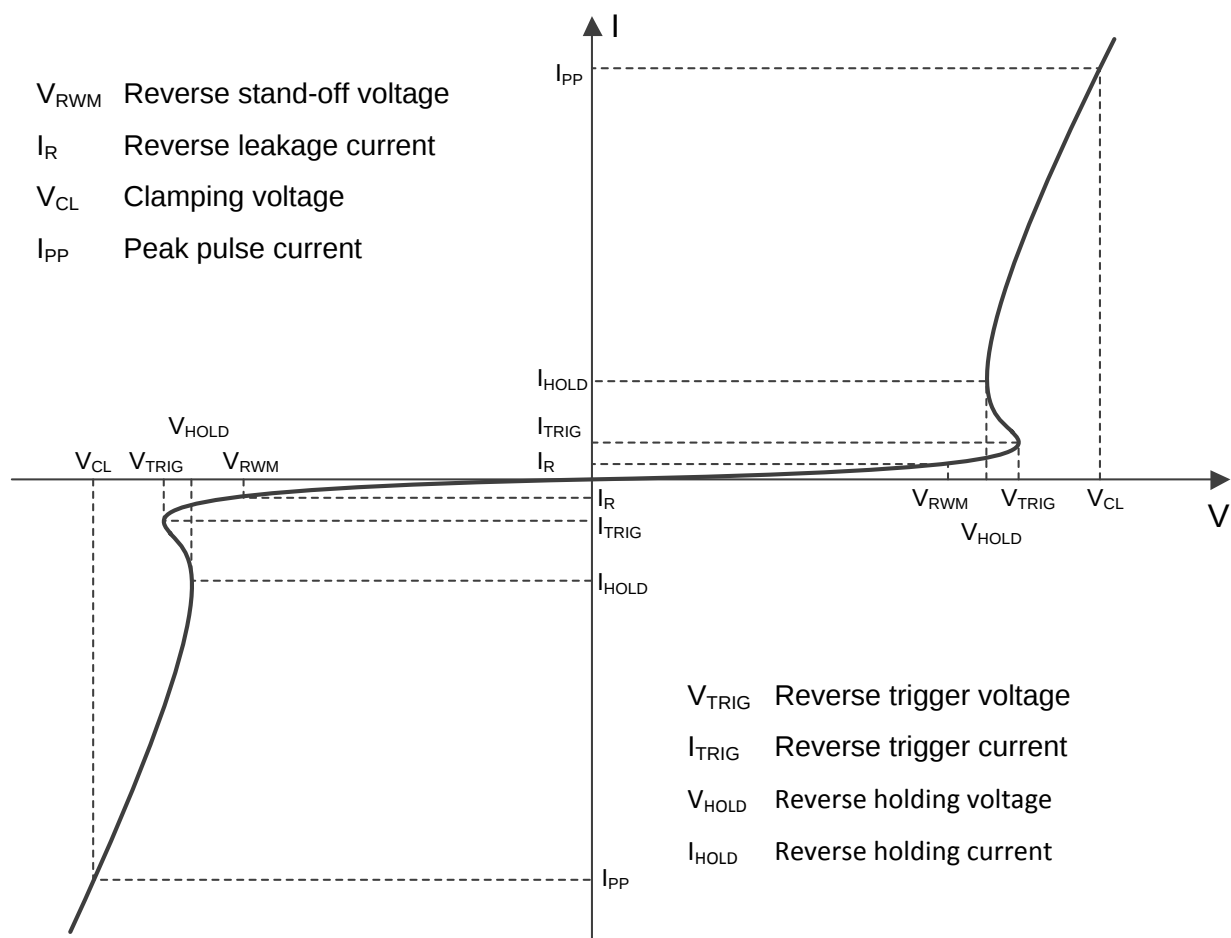
Order information

Device	Package	Shipping
ESD5651N-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}	525	W
Peak pulse current ($t_p = 8/20\mu s$)	I_{pp}	35	A
ESD according to IEC61000-4-2 air discharge	V_{ESD}	± 30	kV
ESD according to IEC61000-4-2 contact discharge		± 30	
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)



Definitions of electrical characteristics

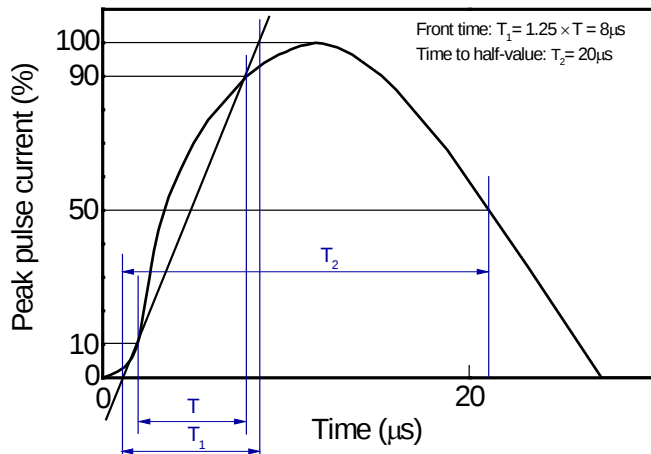
Electrical characteristics ($T_A=25^{\circ}\text{C}$, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	V_{RWM}				± 4.5	V
Reverse leakage current	I_{R}	$V_{\text{RWM}} = 4.5\text{V}$			1	μA
Reverse trigger voltage	V_{TRIG}	$I_{\text{TRIG}} = 2\mu\text{A}$	4.7			V
Reverse holding voltage	V_{HOLD}	$I_{\text{HOLD}} = 50\text{mA}$	4.6			V
Clamping voltage ¹⁾	V_{CL}	$I_{\text{PP}} = 16\text{A}$, $t_p = 100\text{ns}$		6.5		V
Clamping voltage ²⁾	V_{CL}	$V_{\text{ESD}} = 8\text{kV}$		6.5		V
Clamping voltage ³⁾	V_{CL}	$I_{\text{PP}} = 1\text{A}$, $t_p = 8/20\mu\text{s}$			6	V
		$I_{\text{PP}} = 20\text{A}$, $t_p = 8/20\mu\text{s}$			11	V
		$I_{\text{PP}} = 35\text{A}$, $t_p = 8/20\mu\text{s}$			15	V
Dynamic resistance ¹⁾	R_{DYN}			0.12		Ω
Junction capacitance	C_{J}	$V_{\text{R}} = 0\text{V}$, $f = 1\text{MHz}$		65	80	pF
		$V_{\text{R}} = 4.5\text{V}$, $f = 1\text{MHz}$		45	60	pF

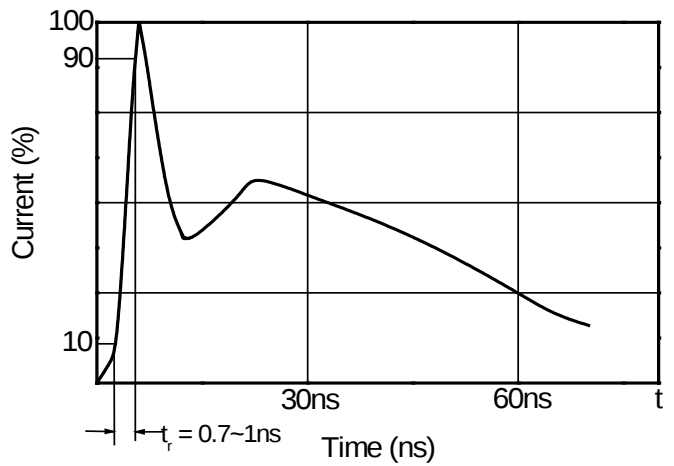
Notes:

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

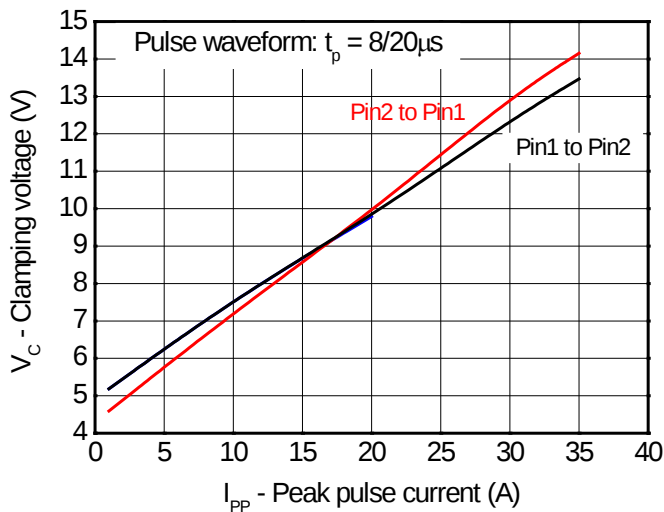
Typical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)



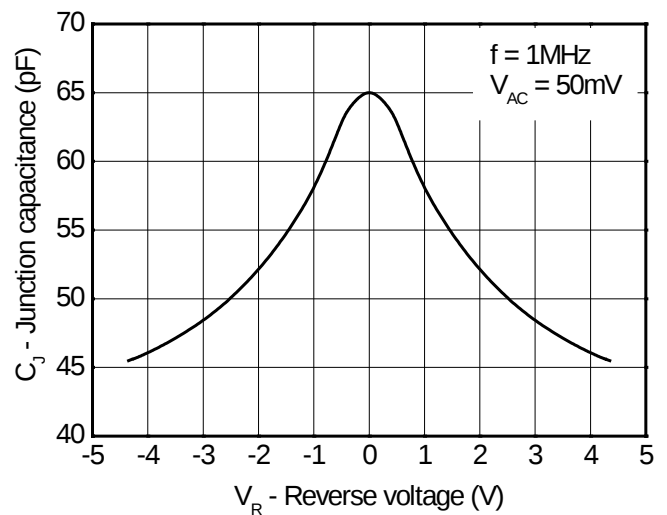
8/20 μs waveform per IEC61000-4-5



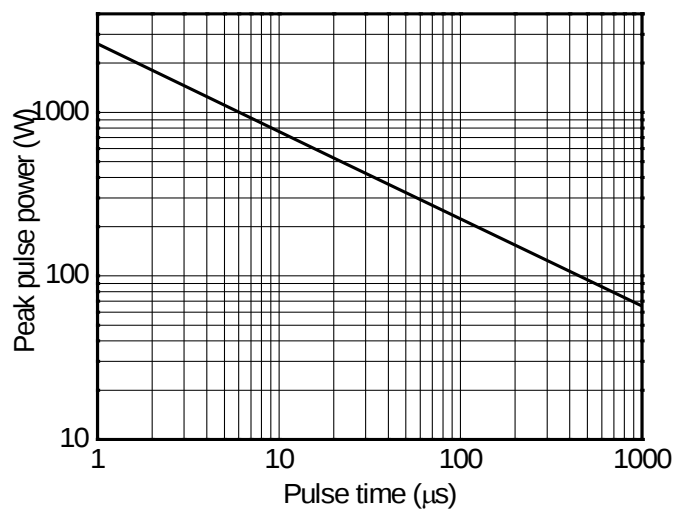
Contact discharge current waveform per IEC61000-4-2



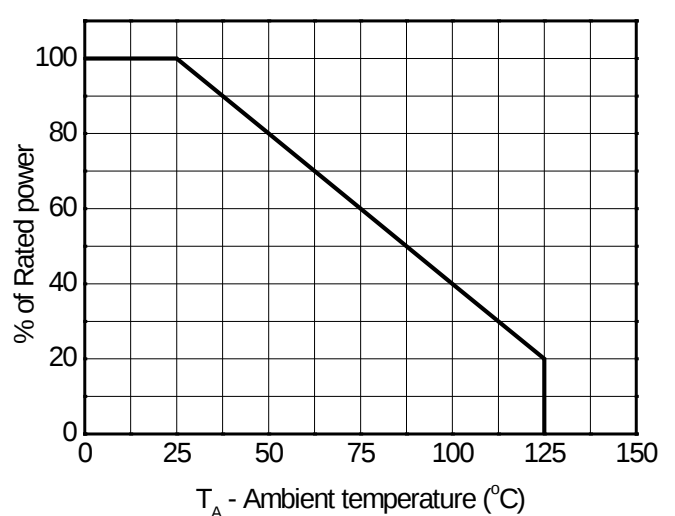
Clamping voltage vs. Peak pulse current



Capacitance vs. Reverse voltage

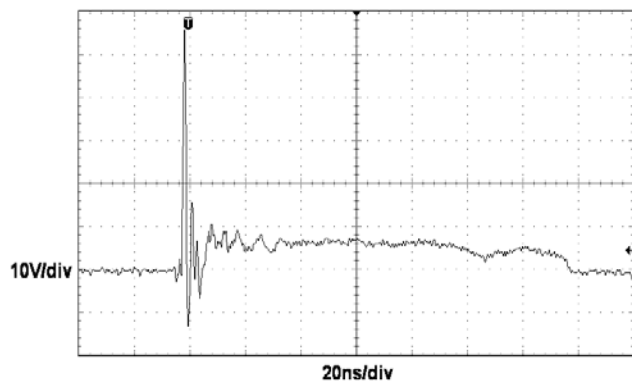


Non-repetitive peak pulse power vs. Pulse time

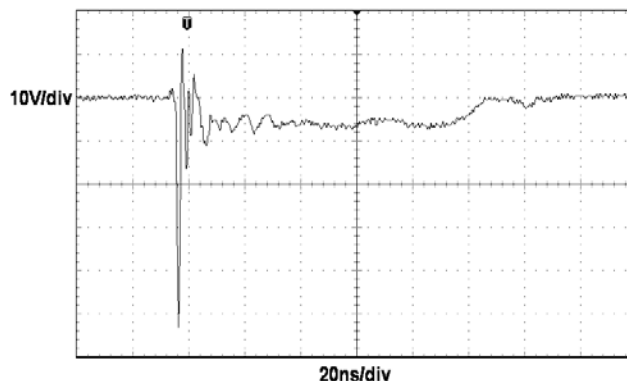


Power derating vs. Ambient temperature

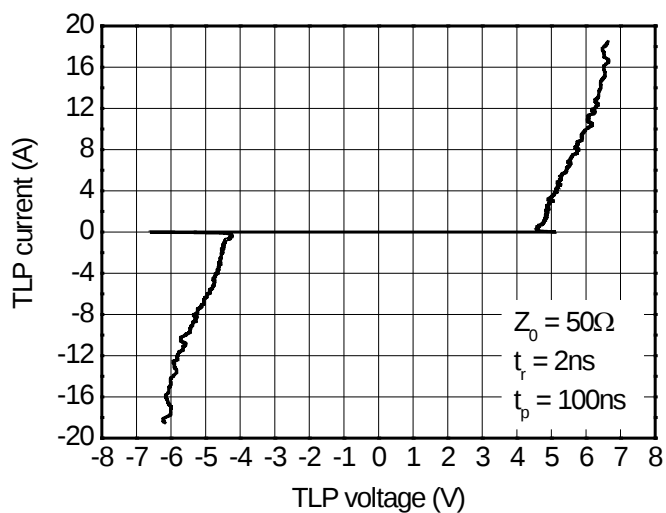
Typical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)



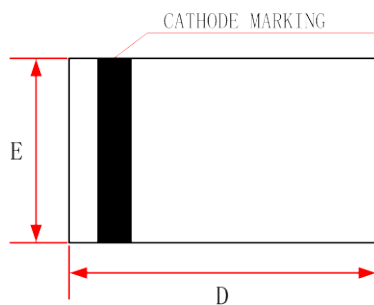
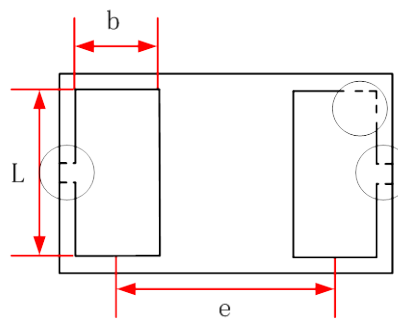
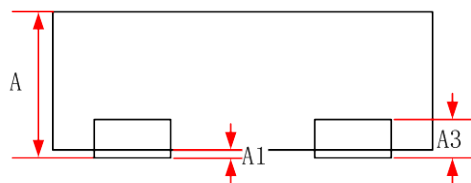
ESD clamping
(+8kV contact discharge per IEC61000-4-2)



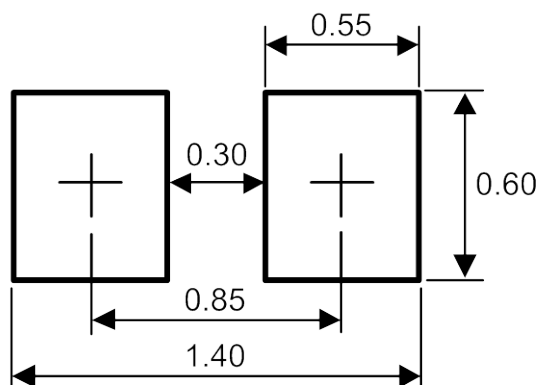
ESD clamping
(-8kV contact discharge per IEC61000-4-2)



TLP Measurement

Package outline dimensions
DFN1006-2L

Top View

Bottom View

Side View


	Min.	Typ.	Max.
A	0.35	0.4	0.50
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.