

4.5V, Single Li-ion Battery Port Surge Protector

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.

Features

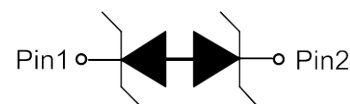
- Reverse stand-off voltage: $\pm 4.5\text{V Max}$
- Transient protection for each line according to IEC61000-4-2 (ESD): $\pm 30\text{kV}$ (contact and air discharge)
IEC61000-4-4 (EFT): 40A (5/50ns)
IEC61000-4-5 (surge): 35A (8/20 μs)
- Capacitance: $C_J = 65\text{pF typ.}$
- Low leakage current
- Low clamping voltage: $V_{CL} = 6.5\text{V typ. @ } I_{PP} = 16\text{A (TLP)}$
- Solid-state silicon technology

Applications

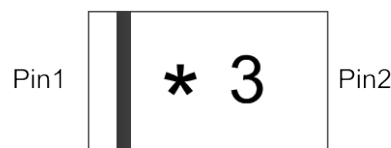
- Power lines
- Cellular handsets
- Tablets
- Microprocessors
- Portable Electronics



DFN1006-2L (Bottom View)



Circuit diagram



3 = Device code
* = Month code (A~Z)

Marking (Top View)

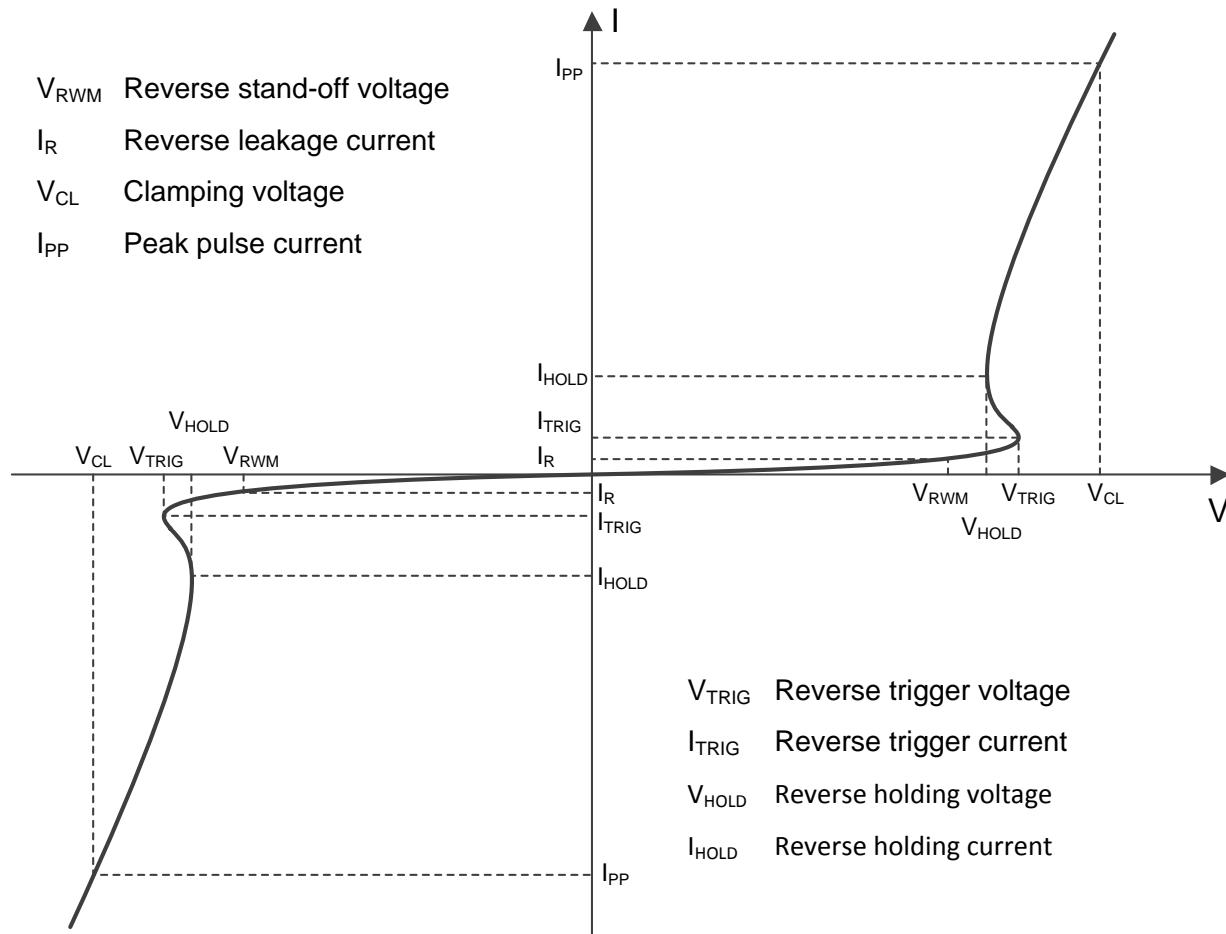
Order information

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

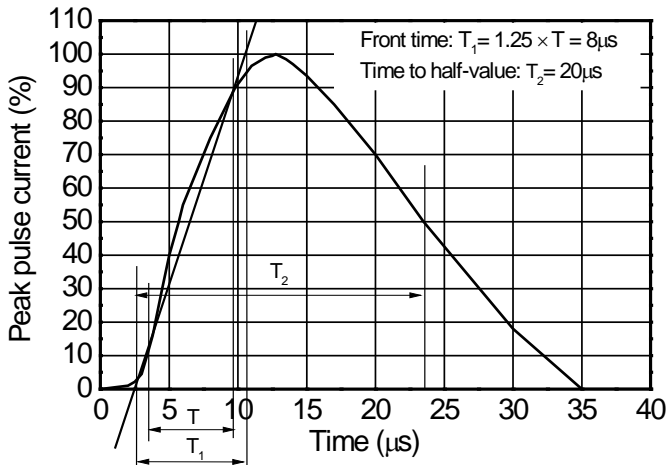
Electrical characteristics (T_A=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	V _{RWM}				±4.5	V
Reverse leakage current	I _R	V _{RWM} = 4.5V			1	μA
Reverse trigger voltage	V _{TRIG}	I _{TRIG} = 2μA	4.7			V
Reverse holding voltage	V _{HOLD}	I _{HOLD} = 50mA	4.6			V
Clamping voltage ¹⁾	V _{CL}	I _{PP} = 16A, t _p = 100ns		6.5		V
Clamping voltage ²⁾	V _{CL}	V _{ESD} = 8kV		6.5		V
Clamping voltage ³⁾	V _{CL}	I _{PP} = 1A, t _p = 8/20μs			6	V
		I _{PP} = 20A, t _p = 8/20μs			11	V
		I _{PP} = 35A, t _p = 8/20μs			15	V
Dynamic resistance ¹⁾	R _{DYN}			0.12		Ω
Junction capacitance	C _J	V _R = 0V, f = 1MHz		65	80	pF
		V _R = 4.5V, f = 1MHz		45	60	pF

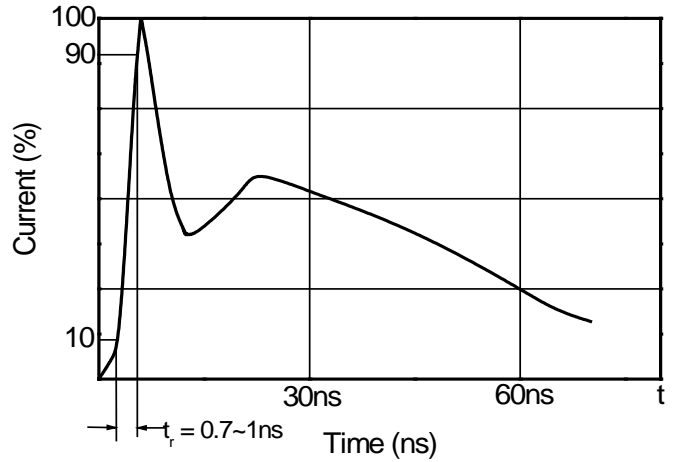
Notes:

- 1) TLP parameter: Z₀ = 50Ω, 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.

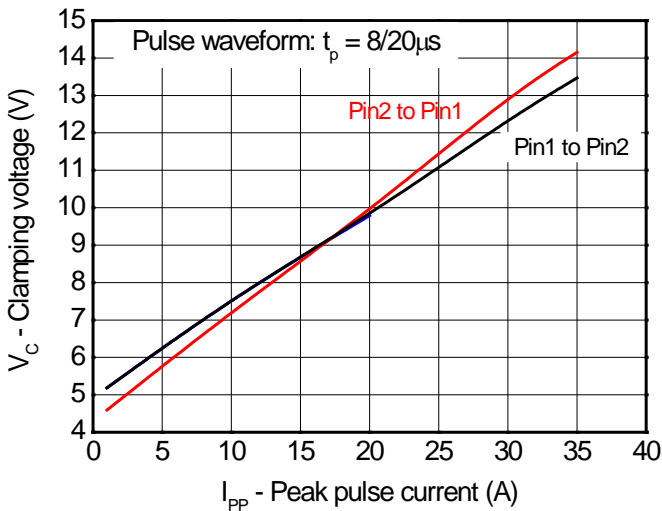
Typical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)



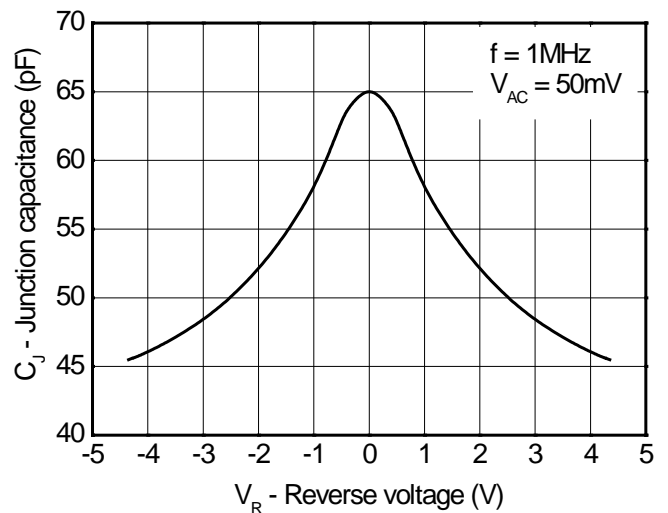
8/20 μs waveform per IEC61000-4-5



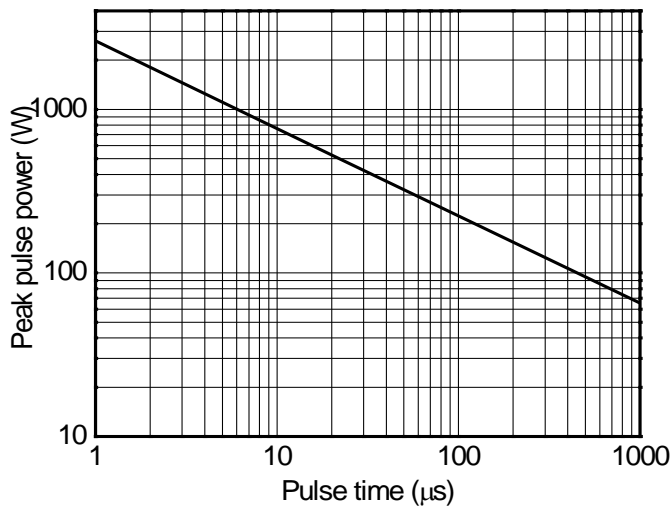
Contact discharge current waveform per IEC61000-4-2



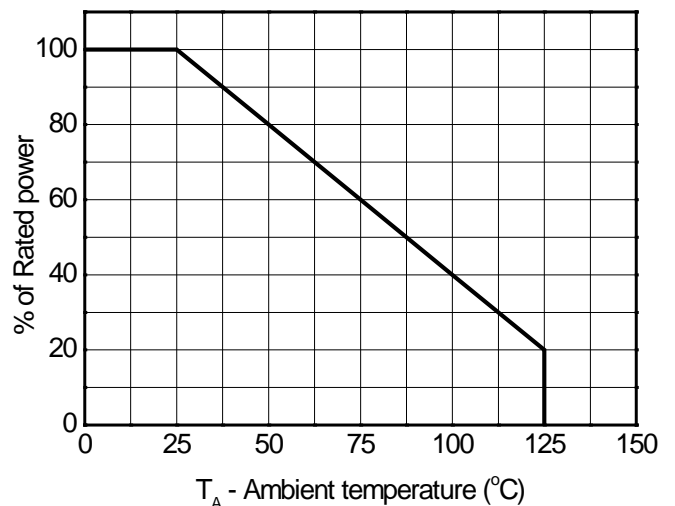
Clamping voltage vs. Peak pulse current



Capacitance vs. Reverse voltage

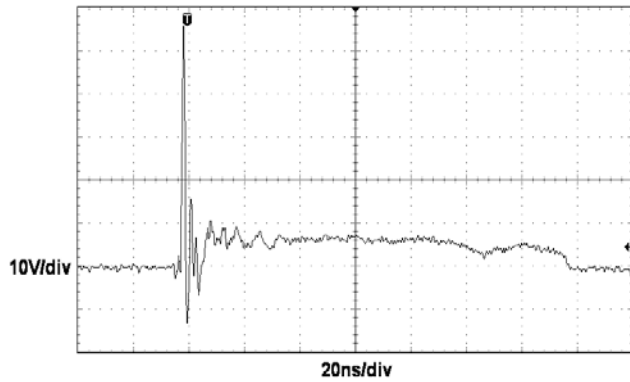


Non-repetitive peak pulse power vs. Pulse time

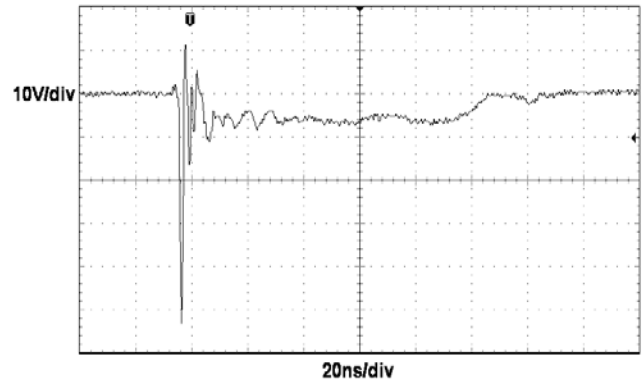


Power derating vs. Ambient temperature

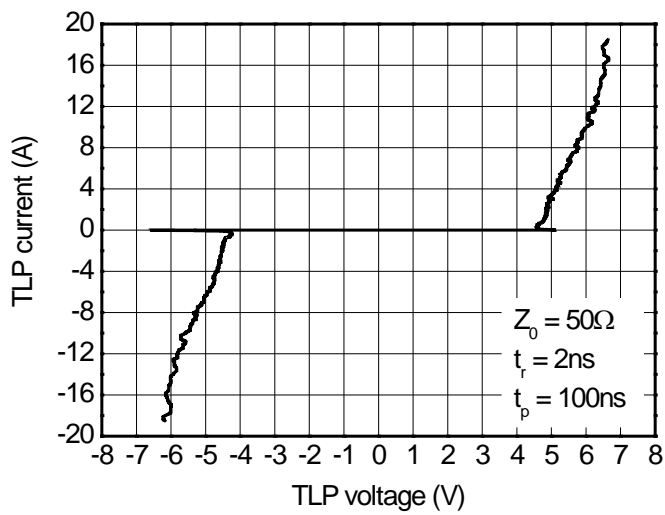
Typical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)



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



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

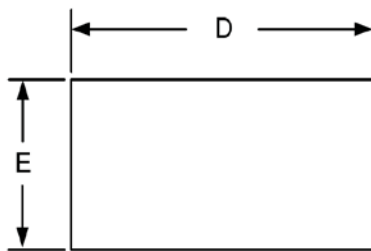


TLP Measurement

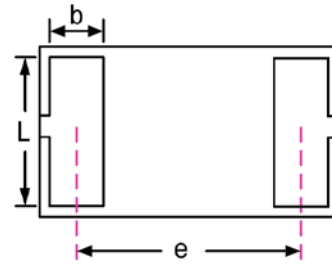
Package outline dimensions

ESD5651N

DFN1006-2L



Top View



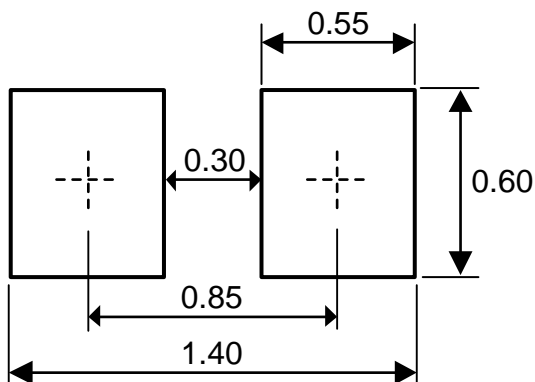
Bottom View



Side View

Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
A	0.40	-	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)



Note: This land pattern is for your reference only. Actual pad layouts may vary depending on application.