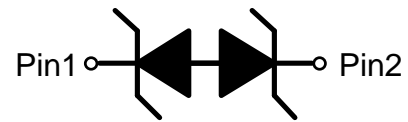


**ESD56191N**
**1-Line, Bi-directional, Transient Voltage Suppressor**
<http://www.sh-willsemi.com>
**Descriptions**

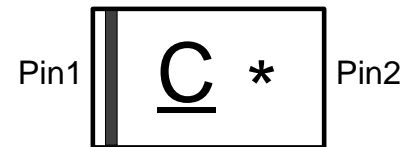
The ESD56191N is a TVS (Transient Voltage Suppressor) designed to protect sensitive electronic components which are connected to data and power lines from over-stress caused by ESD (Electrostatic Discharge), EFT (Electrical Fast Transients) and lightning.

The ESD56191N may be used to provide ESD protection up to  $\pm 30\text{kV}$  (contact discharge) according to IEC61000-4-2, and withstand peak pulse current up to 28A (8/20 $\mu\text{s}$ ) according to IEC61000-4-5.

The ESD56191N is available in DFN1006-2L package. Standard products are Pb-free and Halogen-free.


**DFN1006-2L**

**Circuit diagram**
**Features**

- Reverse stand-off voltage:  $\pm 4.8\text{V}$  Max.
- Transient protection for each line according to IEC61000-4-2 (ESD):  $\pm 30\text{kV}$  (contact discharge)  
IEC61000-4-5 (surge): 28A (8/20 $\mu\text{s}$ )
- Capacitance:  $C_J = 60\text{pF}$  typ.
- Low clamping voltage
- Low leakage current
- Solid-state silicon technology



C = Device code

\* = Month code (A-Z)

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

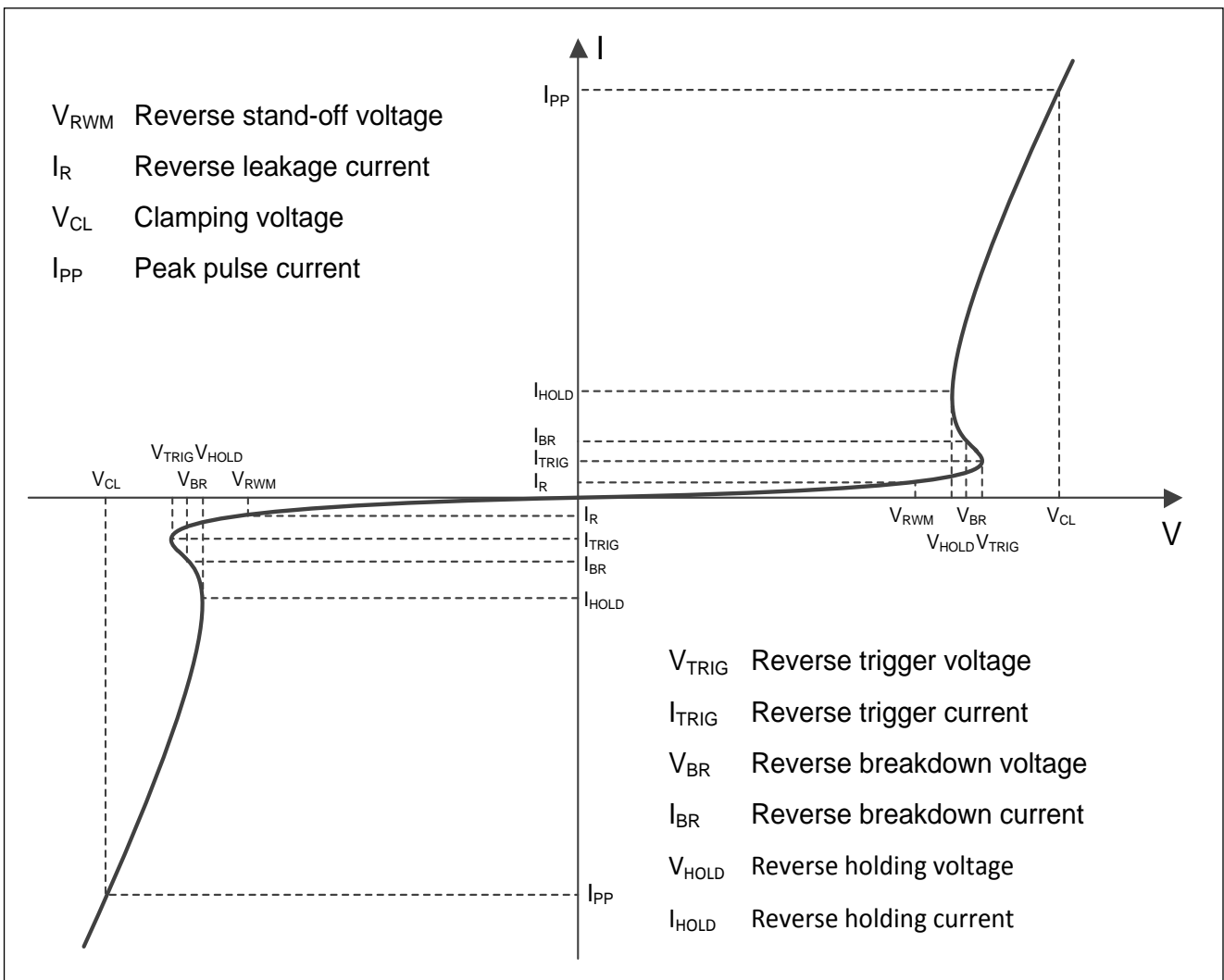
- Computers and peripherals
- Cellular handsets
- Portable Electronics
- Notebooks
- Camera

**Order information**

Device	Package	Shipping
ESD56191N-2/TR	DFN1006-2L	10000/Tape&Reel

**Absolute maximum ratings**

Parameter	Symbol	Rating	Unit
Peak pulse power ( $t_p = 8/20\mu s$ )	$P_{pk}$	420	W
Peak pulse current ( $t_p = 8/20\mu s$ )	$I_{PP}$	28	A
ESD according to IEC61000-4-2 air discharge	$V_{ESD}$	$\pm 30$	kV
ESD according to IEC61000-4-2 contact discharge		$\pm 30$	
Junction temperature	$T_J$	125	$^{\circ}C$
Operating temperature	$T_{OP}$	-40~85	$^{\circ}C$
Lead temperature	$T_L$	260	$^{\circ}C$
Storage temperature	$T_{STG}$	-55~150	$^{\circ}C$

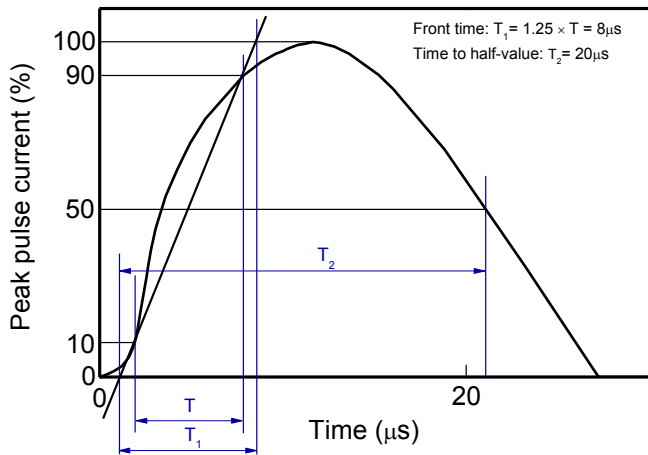
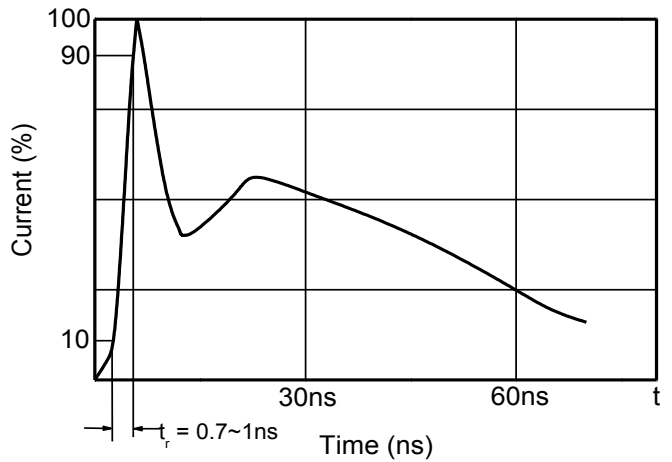
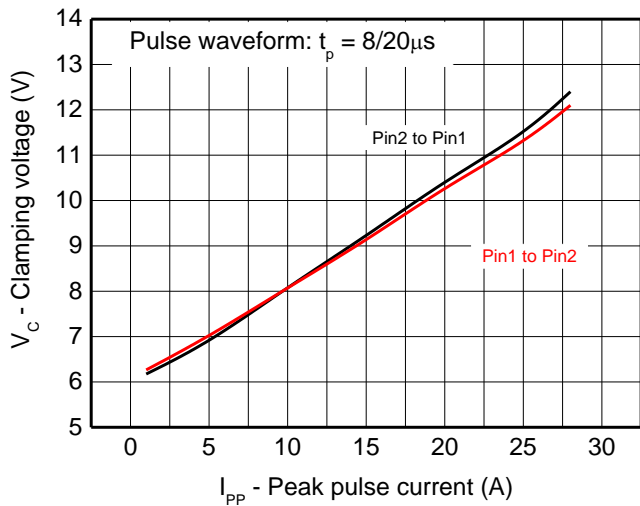
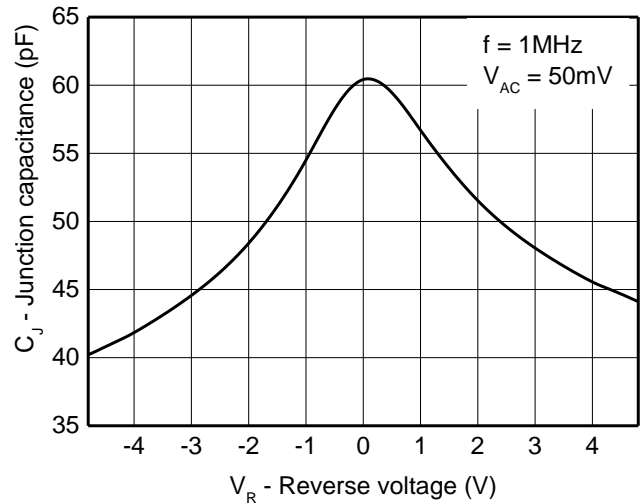
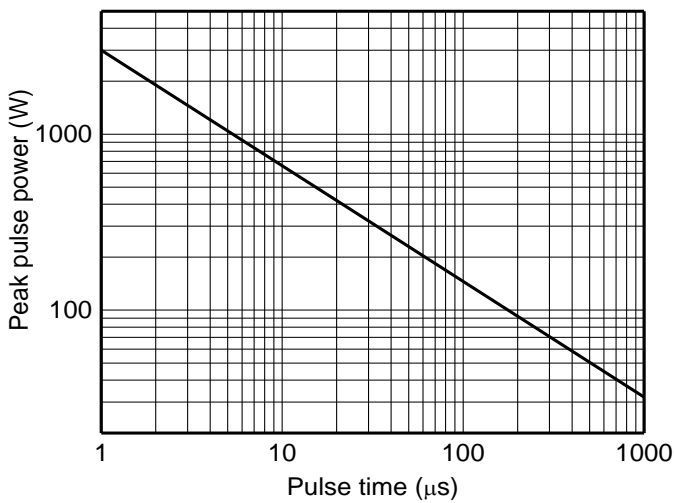
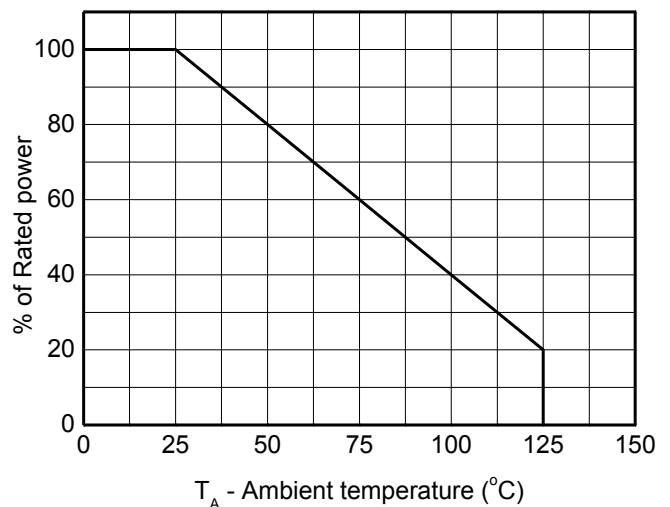
**Electrical characteristics ( $T_A=25^{\circ}C$ , unless otherwise noted)**

**Definitions of electrical characteristics**

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

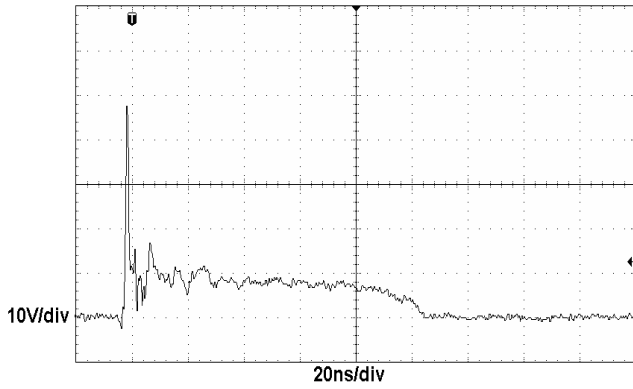
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	$V_{RWM}$				$\pm 4.8$	V
Reverse leakage current	$I_R$	$V_{RWM} = 4.8\text{V}$		<1	100	nA
Reverse breakdown voltage	$V_{BR}$	$I_{BR} = 1\text{mA}$	5.1			V
Reverse holding voltage	$V_{HOLD}$	$I_{HOLD} = 50\text{mA}$	5.1			V
Clamping voltage <sup>1)</sup>	$V_{CL}$	$I_{PP} = 16\text{A}$ , $t_p = 100\text{ns}$		7		V
Clamping voltage <sup>2)</sup>	$V_{CL}$	$V_{ESD} = 8\text{kV}$		8		V
Clamping voltage <sup>3)</sup>	$V_{CL}$	$I_{PP} = 1\text{A}$ , $t_p = 8/20\mu\text{s}$			9	V
		$I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$			10	V
		$I_{PP} = 28\text{A}$ , $t_p = 8/20\mu\text{s}$			15	V
Dynamic resistance <sup>1)</sup>	$R_{DYN}$	$t_p = 100\text{ns}$		0.04		$\Omega$
Junction capacitance	$C_J$	$V_R = 0\text{V}$ , $f = 1\text{MHz}$		60	75	pF
		$V_R = 4.8\text{V}$ , $f = 1\text{MHz}$		40	50	pF

**Notes:**

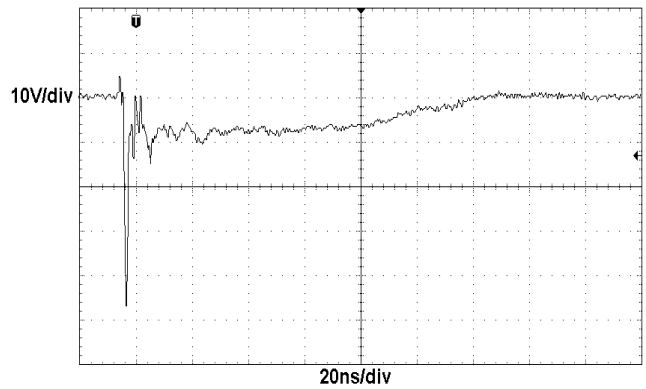
- 1) TLP parameter:  $Z_0 = 50\Omega$ ,  $t_p = 100\text{ns}$ ,  $t_r = 2\text{ns}$ , averaging window from 60ns to 80ns.  $R_{DYN}$  is calculated from 4A to 16A.
- 2) Contact discharge mode, according to IEC61000-4-2.
- 3) Non-repetitive current pulse, according to IEC61000-4-5.

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

**8/20 $\mu\text{s}$  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**

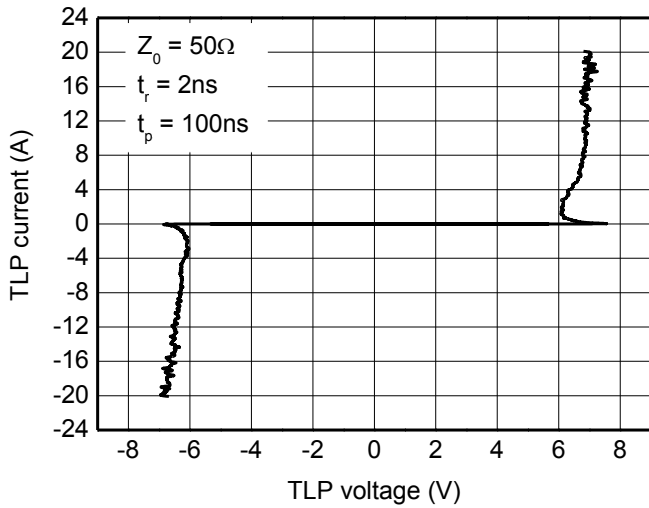
Typical characteristics ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



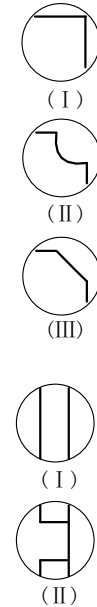
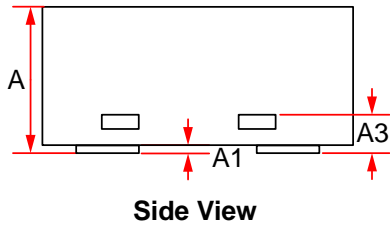
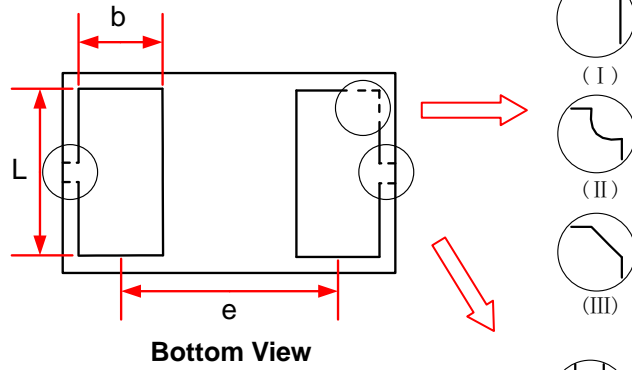
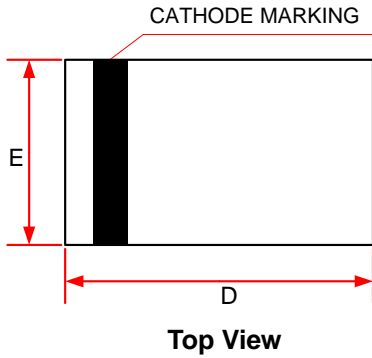
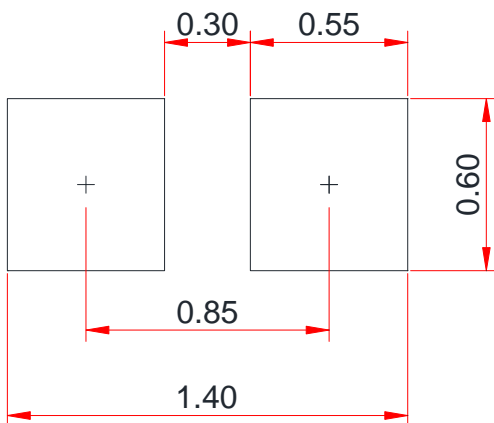
**ESD clamping**  
 (+8kV contact discharge per IEC61000-4-2)



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



**TLP Measurement**

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

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


Symbol	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	0.30	-	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.		

**Notes:**

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