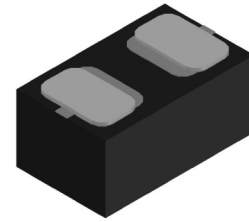
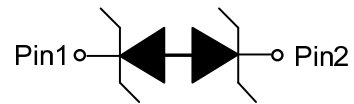


**ESD5251X**
**1-Line, Bi-directional, Transient Voltage Suppressor**
<http://www.sh-willsemi.com>
**Descriptions**

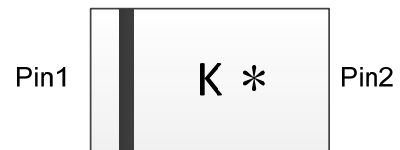
The ESD5251X is a bi-directional TVS (Transient Voltage Suppressor). It is specifically designed to protect sensitive electronic components which are connected to low speed data lines and control lines from over-stress caused by ESD (Electrostatic Discharge), EFT (Electrical Fast Transients) and Lightning.

The ESD5251X 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 3A (8/20 $\mu\text{s}$ ) according to IEC61000-4-5.

The ESD5251X is available in WBFBP-02C-C package. Standard products are Pb-free and Halogen-free.


**WBFBP-02C-C (Bottom View)**

**Circuit diagram**
**Features**

- Reverse stand-off voltage:  $\pm 5\text{V}$  Max
- Transient protection for each line according to  
IEC61000-4-2 (ESD):  $\pm 20\text{kV}$  (contact and air discharge)  
IEC61000-4-4 (EFT): 20A (5/50ns)  
IEC61000-4-5 (surge): 3A (8/20 $\mu\text{s}$ )
- Capacitance:  $C_J = 5.0\text{pF}$  typ.
- Low leakage current:  $I_R < 1\text{nA}$  typ.
- Low clamping voltage:  $V_{CL} = 13\text{V}$  typ. @  $I_{PP} = 16\text{A}$  (TLP)
- Solid-state silicon technology



\* = Month code (A~Z)  
K = Device Code

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

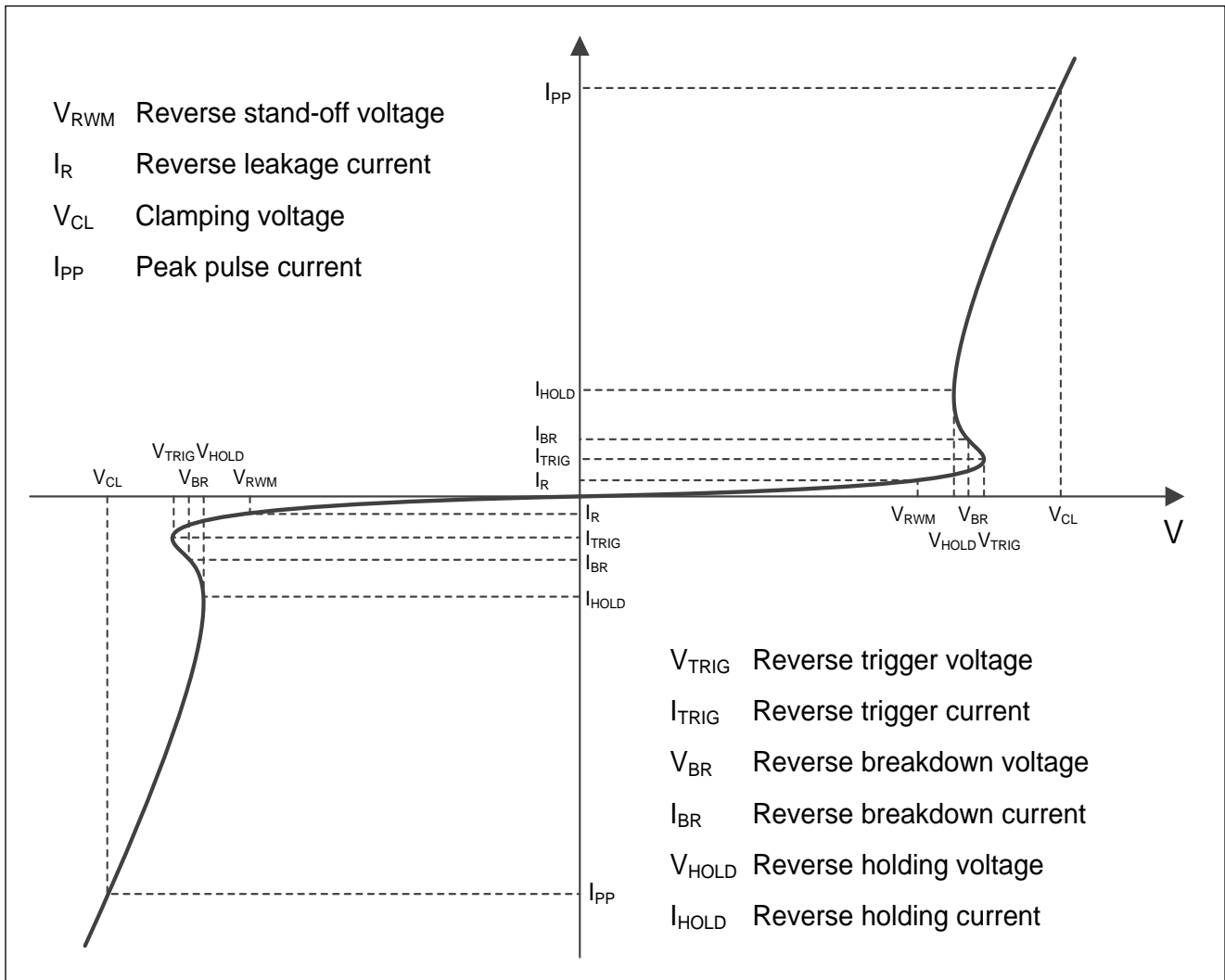
- Cellular handsets
- Tablets
- Laptops
- Other portable devices
- Network communication devices

**Order information**

Device	Package	Shipping
ESD5251X-2/TR	WBFBP-02C-C	10000/Tape&Reel

**Absolute maximum ratings**

Parameter	Symbol	Rating	Unit
Peak pulse power ( $t_p = 8/20\mu s$ )	$P_{pk}$	33	W
Peak pulse current ( $t_p = 8/20\mu s$ )	$I_{PP}$	3	A
ESD according to IEC61000-4-2 air discharge	$V_{ESD}$	$\pm 20$	kV
ESD according to IEC61000-4-2 contact discharge		$\pm 20$	
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	$^{\circ}C$

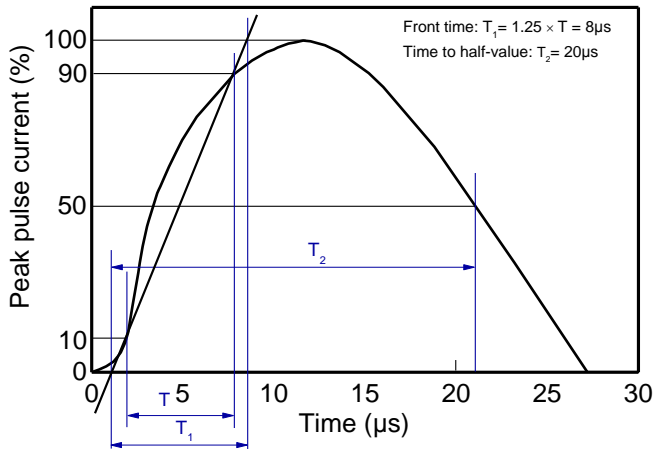
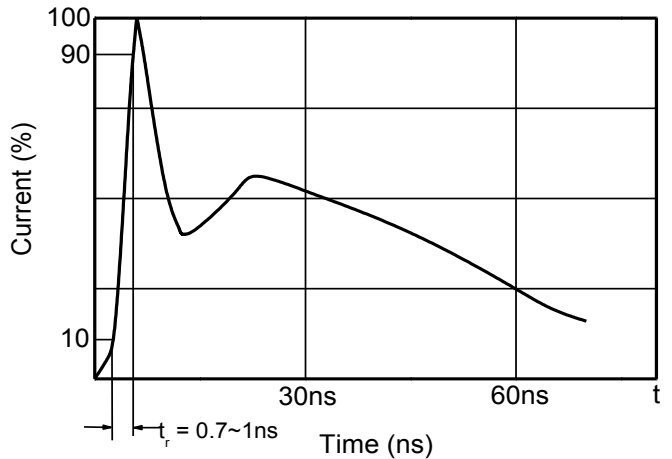
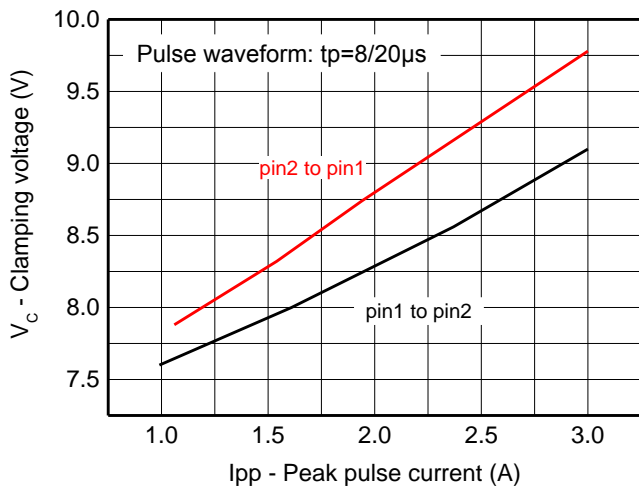
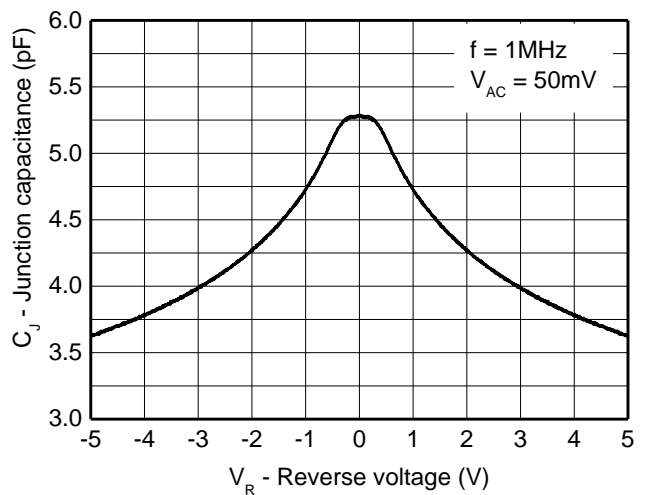
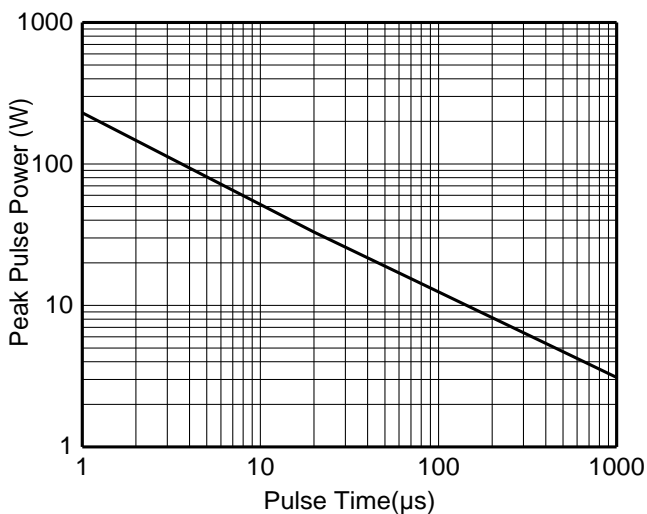
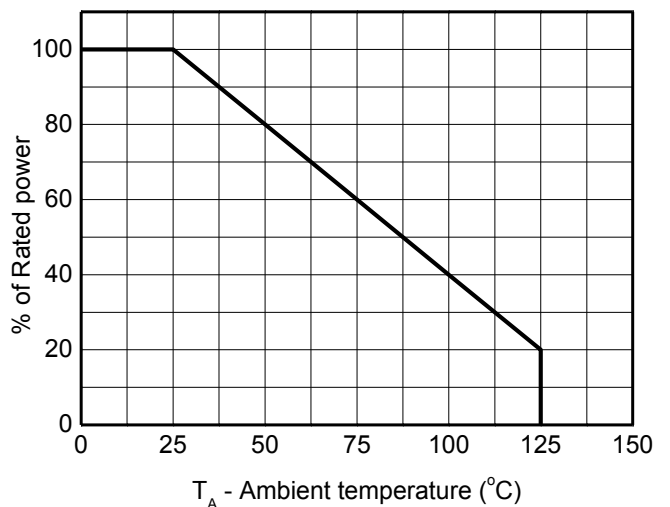
**Electrical characteristics ( $T_A=25^{\circ}C$ , unless otherwise noted)**

**Definitions of electrical characteristics**

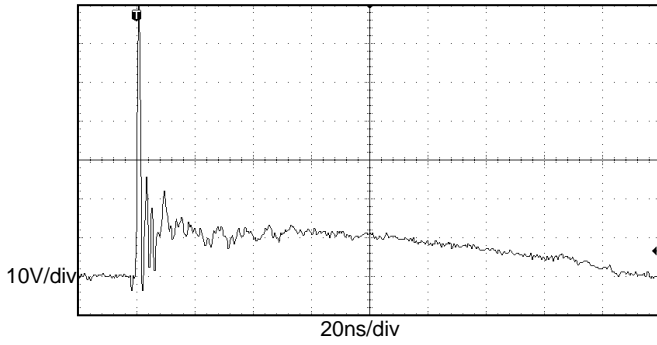
**Electrical characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	$V_{RWM}$				$\pm 5$	V
Reverse leakage current	$I_R$	$V_{RWM} = 5\text{V}$		<1	100	nA
Reverse breakdown voltage	$V_{BR}$	$I_{BR} = 1\text{mA}$	5.8		8.3	V
Clamping voltage <sup>1)</sup>	$V_{CL}$	$I_{PP} = 16\text{A}$ , $t_p = 100\text{ns}$		13		V
Clamping voltage <sup>2)</sup>	$V_{CL}$	$V_{ESD} = 8\text{kV}$		13		V
Clamping voltage <sup>3)</sup>	$V_{CL}$	$I_{PP} = 1\text{A}$ , $t_p = 8/20\mu\text{s}$			8.5	V
		$I_{PP} = 3\text{A}$ , $t_p = 8/20\mu\text{s}$			11	V
Dynamic resistance <sup>1)</sup>	$R_{DYN}$			0.4		$\Omega$
Junction capacitance	$C_J$	$V_R = 0\text{V}$ , $f = 1\text{MHz}$		5.0	7	pF
		$V_R = 5\text{V}$ , $f = 1\text{MHz}$		3.6	5	pF

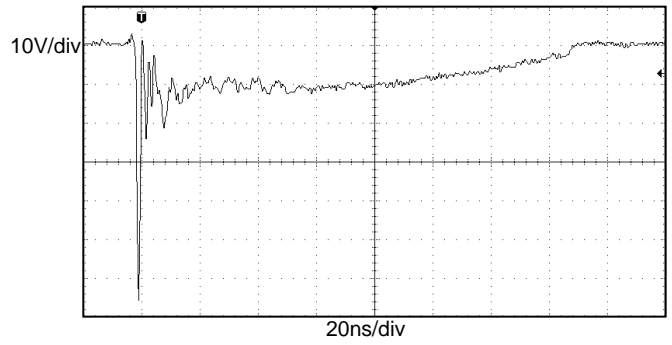
Notes:

- 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.

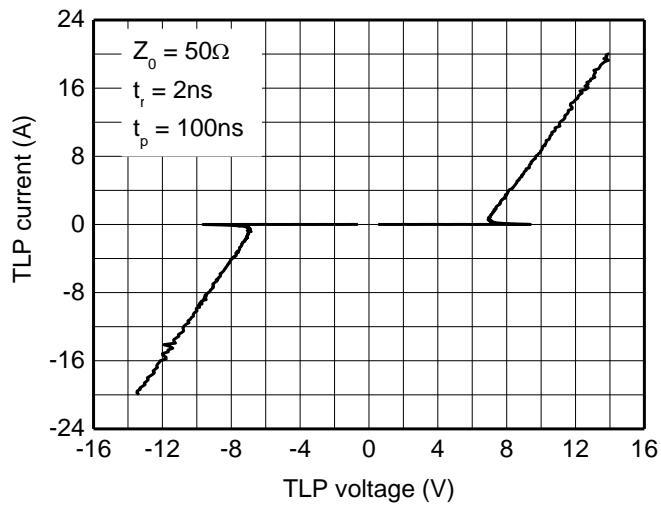
**Typical characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)**

**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)**


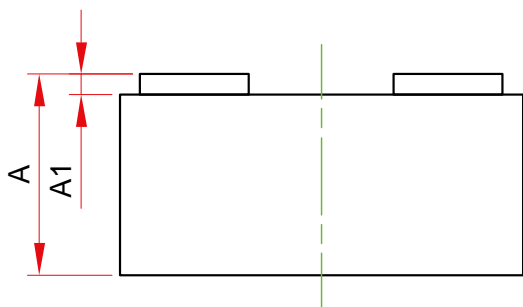
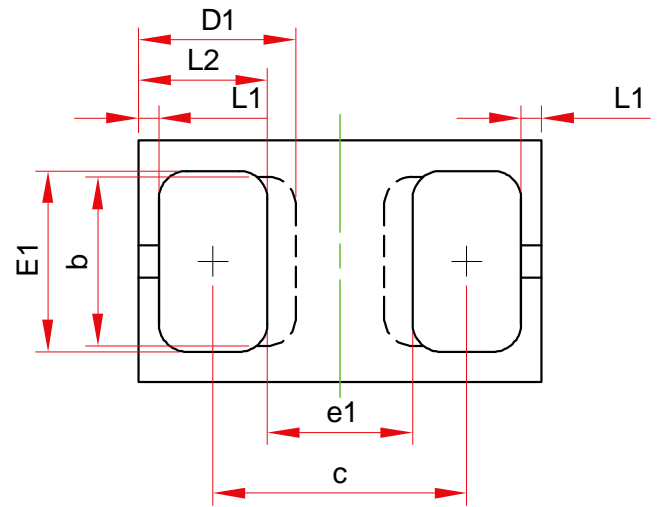
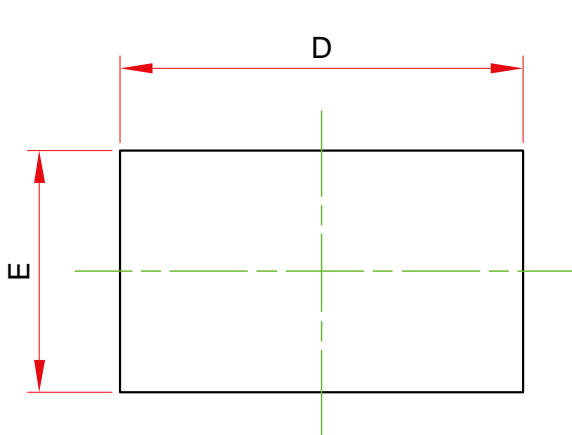
**ESD clamping**  
 (+8kV contact discharge per IEC61000-4-2)



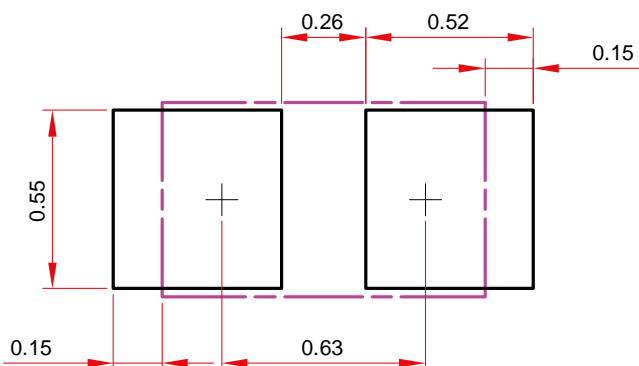
**ESD clamping**  
 (-8kV contact discharge per IEC61000-4-2)



**TLP Measurement**

**Package outline dimensions**
**WBFBP-02C-C**


Symbol	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	0.450	--	0.550
A1	0.010	--	0.090
D	0.950	--	1.050
E	0.550	--	0.650
D1	0.390 Ref.		
E1	0.400	--	0.500
b	0.420 Ref.		
c	0.580	--	0.680
e1	0.360 Ref.		
L1	0.050 Ref.		
L2	0.270	--	0.370

**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.