

## Electrostatic Discharged Protection Devices (ESD) Data Sheet

### Description

Brightking's SDT23CXXL02 series are designed to protect sensitive electronics from damage or latch-up due to ESD and other voltage induced transient events. They are designed for use in applications where board space is at a premium. The devices will protect up to two lines. They are bidirectional devices and may be used on lines where the signal polarities are above ground. TVS diodes are solid state device designed specifically for transient suppression.

They feature large cross-sectional area junctions for conduction high transient currents. They offer desirable characteristics for board level protection including fast response time, low and clamping voltage, and no device degradation. The devices may be used to meet the immunity requirements of IEC61000-4-2, level 4. The size SOT-23 package makes them ideal for use in portable electronics such as RS-422 I/Os, RS-232 I/Os, notebook computers, and servers.

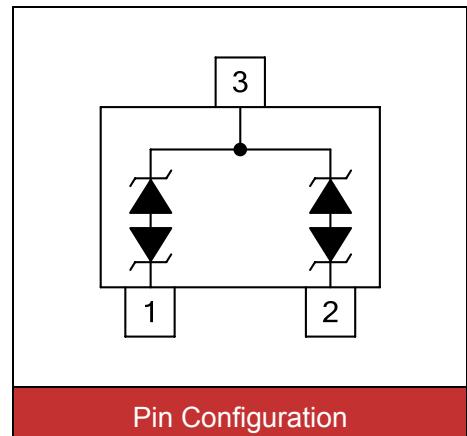


Contact : ±8kV  
Air : ±15kV



### Features

- IEC61000-4-2 ESD 15KV Air, 8KV contact compliance
- SOT-23 surface mount package
- Protects bidirectional two I/O lines
- Peak power dissipation of 350W under 8/20 $\mu$ s waveform
- Working voltage: 5V, 12V & 15V
- Low leakage current
- Low operating and clamping voltages
- Solid-state silicon avalanche technology
- Lead Free/RoHS compliant
- Solder reflow temperature: Pure Tin-Sn, 260~270°C
- Flammability rating UL 94V-0
- Meets MSL level 1, per J-STD-020



### Applications

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>● RS-232 and RS-422 data lines</li> <li>● Microprocessor based equipment</li> <li>● LAN/WAN equipment</li> <li>● Desktops PC and servers</li> </ul> | <ul style="list-style-type: none"> <li>● Notebook, Laptop and Palmtop computers</li> <li>● Set Top Box</li> <li>● Peripherals</li> <li>● Serial and Parallel ports</li> </ul> |
|--|---|

**Maximum Ratings**

Rating	Symbol	Value	Unit
Peak pulse power ( $tp=8/20\mu s$ waveform)	$P_{PP}$	350	W
ESD voltage (Contact discharge)	$V_{ESD}$	$\pm 8$	kV
ESD voltage (Air discharge)		$\pm 15$	
Storage & operating temperature range	$T_{STG}, T_J$	-55~+150	°C

**Electrical Characteristics ( $T_J=25^\circ C$ )**

SDT23C05L02 (Marking: C05)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	$V_{RWM}$				5	V
Reverse breakdown voltage	$V_{BR}$	$I_{BR}=1mA$	6			V
Reverse leakage current	$I_R$	$V_R=5V$ Each I/O pin			5	$\mu A$
Clamping voltage ( $tp=8/20\mu s$ )	$V_C$	$I_{PP}=1A$			9.8	V
Clamping voltage ( $tp=8/20\mu s$ )	$V_C$	$I_{PP}=10A$			18	V
Off state junction capacitance	$C_J$	0Vdc, $f=1MHz$ Between I/O pins and GND		150		pF

**Electrical Characteristics ( $T_J=25^\circ\text{C}$ )**

SDT23C12L02 (Marking: C12)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	$V_{RWM}$				12	V
Reverse breakdown voltage	$V_{BR}$	$I_{BR}=1\text{mA}$	13.3			V
Reverse leakage current	$I_R$	$V_R=12\text{V}$ Each I/O pin			1	$\mu\text{A}$
Clamping voltage ( $tp=8/20\mu\text{s}$ )	$V_C$	$I_{PP}=1\text{A}$			19	V
Clamping voltage ( $tp=8/20\mu\text{s}$ )	$V_C$	$I_{PP}=5\text{A}$			32	V
Off state junction capacitance	$C_J$	0Vdc, $f=1\text{MHz}$ Between I/O pins and GND		65		pF

SDT23C15L02 (Marking: C15)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	$V_{RWM}$				15	V
Reverse breakdown voltage	$V_{BR}$	$I_{BR}=1\text{mA}$	16.7			V
Reverse leakage current	$I_R$	$V_R=15\text{V}$ each I/O pin			1	$\mu\text{A}$
Clamping voltage ( $tp=8/20\mu\text{s}$ )	$V_C$	$I_{PP}=1\text{A}$			24	V
Clamping voltage ( $tp=8/20\mu\text{s}$ )	$V_C$	$I_{PP}=5\text{A}$			38	V
Off state junction capacitance	$C_J$	0Vdc, $f=1\text{MHz}$ Between I/O pins and GND		60		pF

## Typical Characteristics Curves

Figure 1. Power Derating Curve

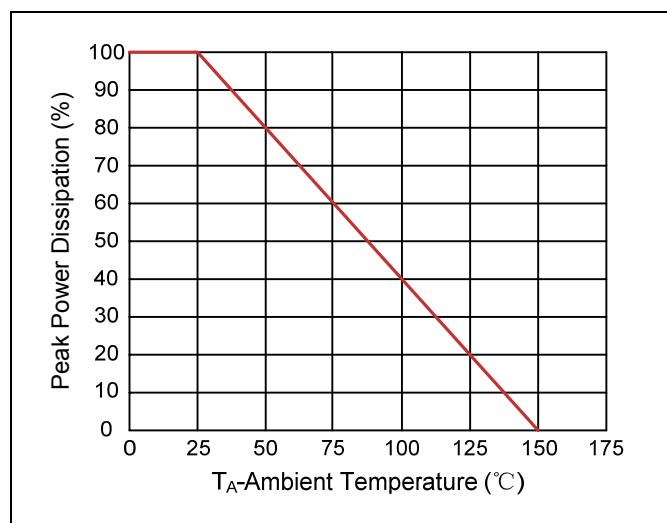


Figure 2. Pulse Waveforms

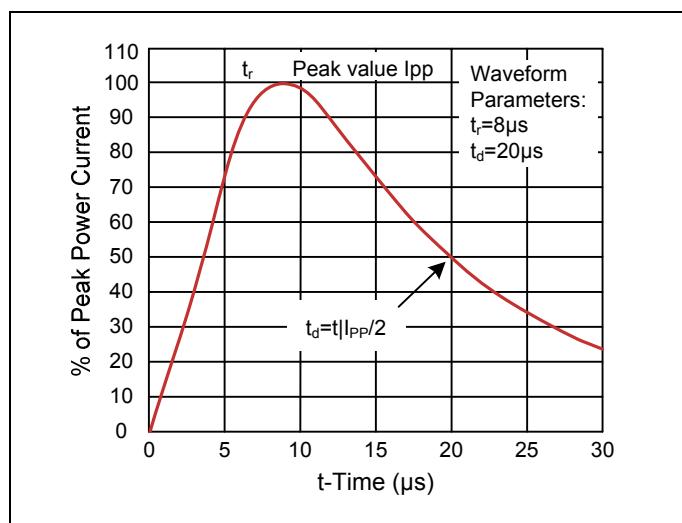


Figure 3. Non-Repetitive Peak Pulse vs. Pulse Time

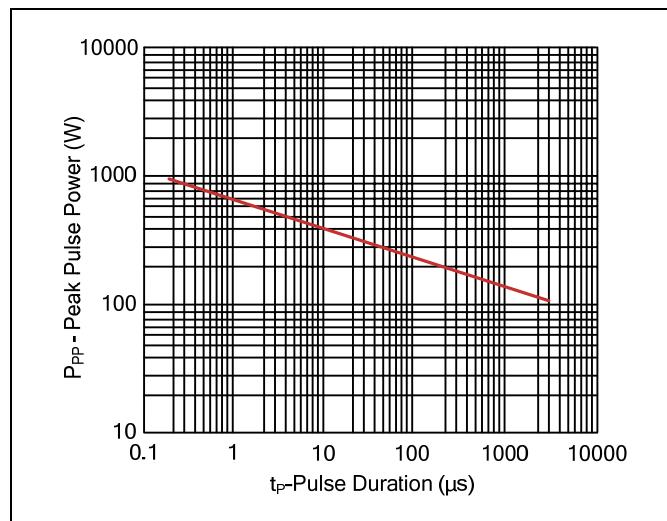


Figure 4. Normalized Capacitance vs. Reverse Voltage

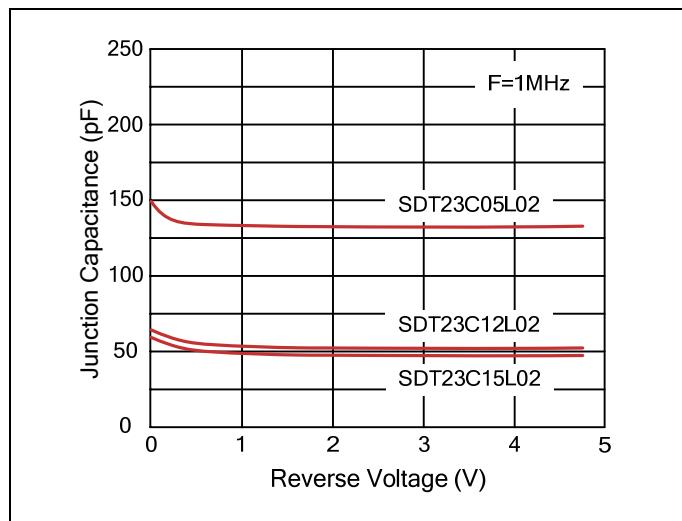


Figure 5. ESD Clamping(8kV Contact IEC61000-4-2)

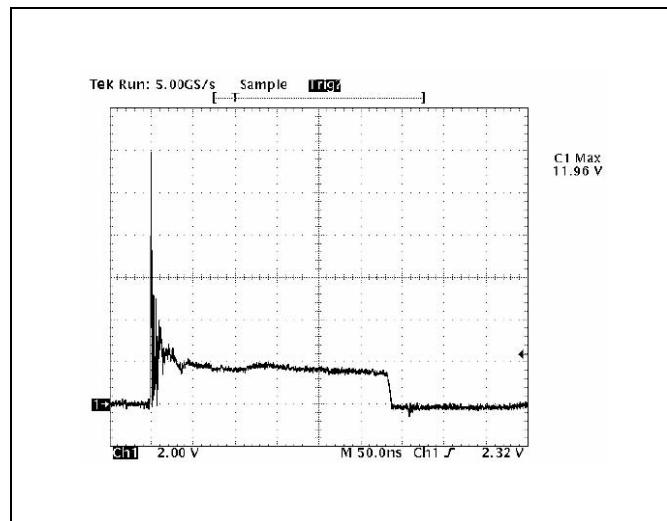
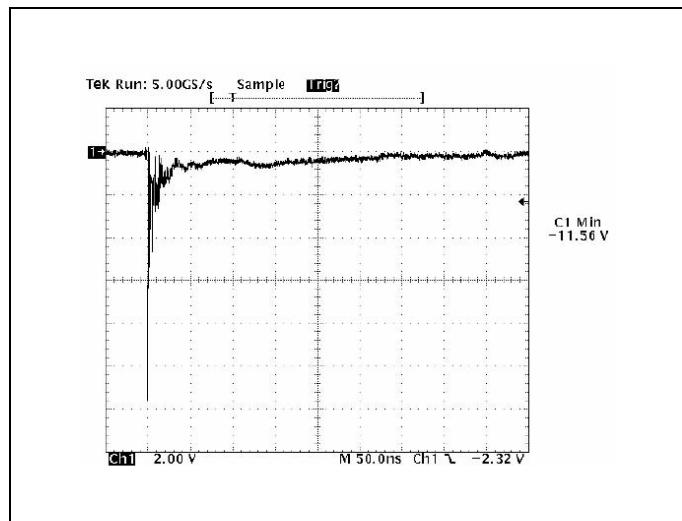
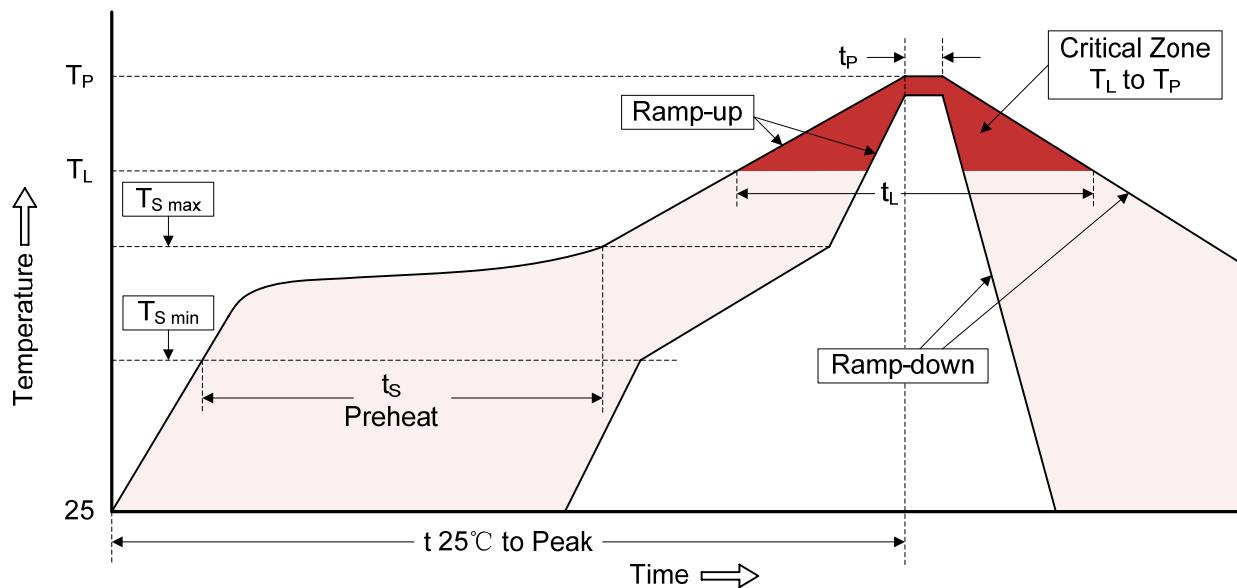


Figure 6. ESD Clamping(-8kV Contact IEC61000-4-2)



## Recommended Soldering Conditions

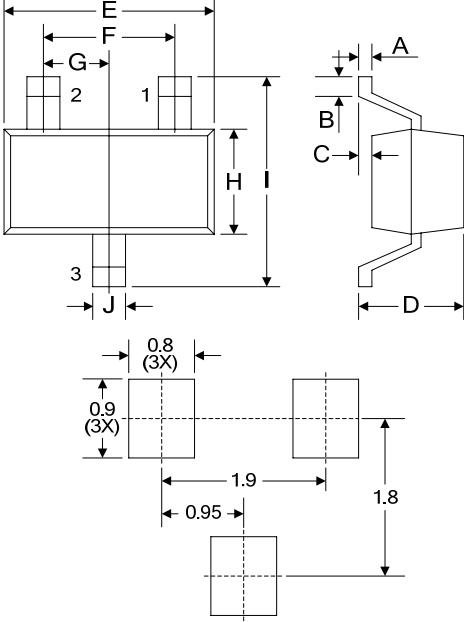
### Reflow Soldering



### Recommended Conditions

Profile Feature	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	3°C/second max.
Preheat	
- Temperature Min ( $T_{S\ min}$ )	150°C
- Temperature Max ( $T_{S\ max}$ )	200°C
- Time (min to max) ( $t_s$ )	60-180 seconds
$T_{S\ max}$ to $T_L$	
- Ramp-up Rate	3°C/second max.
Time maintained above:	
- Temperature ( $T_L$ )	217°C
- Time ( $t_L$ )	60-150 seconds
Peak Temperature ( $T_P$ )	260°C
Time within 5°C of actual Peak Temperature ( $t_P$ )	20-40 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

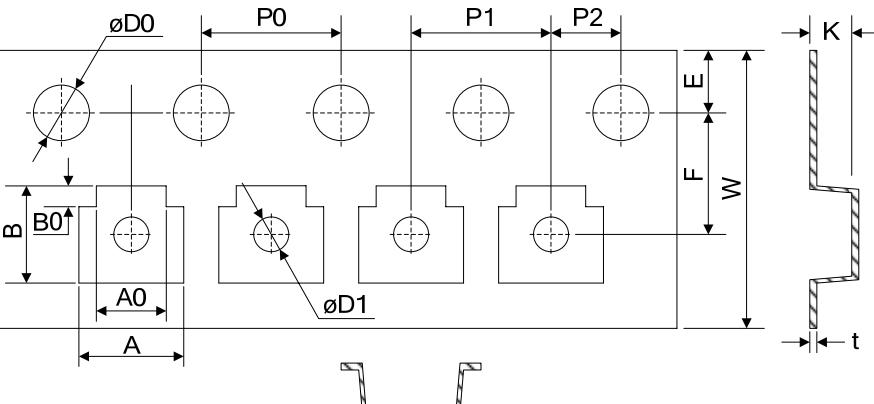
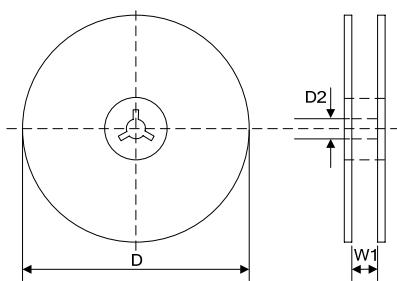
**Dimensions (SOT-23)**



The technical drawing shows the physical dimensions of the SOT-23 package. Key dimensions include:  
 - Total width (E) = 2.80 mm, total height (H) = 1.8 mm.  
 - Lead spacing (F) = 1.9 mm, lead thickness (G) = 0.9 mm.  
 - Lead height (A) = 0.08 mm, lead width (B) = 0.15 mm.  
 - Lead thickness (C) = 0.13 mm, lead width (D) = 0.89 mm.  
 - Lead height (J) = 0.35 mm, lead thickness (I) = 0.50 mm.  
 - Recommended Soldering Pad Layout: The layout consists of three pads per lead. Each pad has a width of 0.8 mm and a height of 0.9 mm. The distance between the centers of the pads is 1.9 mm, and the distance from the center of each pad to its respective lead is 0.95 mm.

Symbol	Dimension			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.08	0.18	0.003	0.007
B	0.15	-	0.006	-
C	-	0.13	-	0.005
D	0.89	1.09	0.035	0.043
E	2.80	3.05	0.110	0.120
F	1.90		0.075	
G	0.95		0.037	
H	1.19	1.40	0.047	0.055
I	2.10	2.49	0.083	0.098
J	0.35	0.50	0.014	0.020

**Packaging**

Tape	 <p>The technical drawing shows the dimensions for the tape used in the reel. Key dimensions include:      - Total width (W) = 8.00±0.30 mm.      - Pitch (P0, P1, P2) = 4.00±0.10 mm.      - Hole diameter (øD0, øD1) = 1.55±0.10 mm and 1.00±0.05 mm respectively.      - Other dimensions include A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z.</p>	<table border="1"> <thead> <tr> <th>Symbol</th> <th>Dimension (mm)</th> </tr> </thead> <tbody> <tr> <td>W</td> <td>8.00±0.30</td> </tr> <tr> <td>P0</td> <td>4.00±0.10</td> </tr> <tr> <td>P1</td> <td>4.00±0.10</td> </tr> <tr> <td>P2</td> <td>2.00±0.10</td> </tr> <tr> <td>D0</td> <td>Φ1.55±0.10</td> </tr> <tr> <td>D1</td> <td>Φ1.00±0.05</td> </tr> <tr> <td>E</td> <td>1.75±0.10</td> </tr> <tr> <td>F</td> <td>3.50±0.10</td> </tr> <tr> <td>A</td> <td>3.10±0.10</td> </tr> <tr> <td>A0</td> <td>2.10±0.10</td> </tr> <tr> <td>B</td> <td>2.75±0.10</td> </tr> <tr> <td>B0</td> <td>0.65±0.10</td> </tr> <tr> <td>K</td> <td>1.10±0.10</td> </tr> <tr> <td>t</td> <td>0.20±0.05</td> </tr> </tbody> </table>	Symbol	Dimension (mm)	W	8.00±0.30	P0	4.00±0.10	P1	4.00±0.10	P2	2.00±0.10	D0	Φ1.55±0.10	D1	Φ1.00±0.05	E	1.75±0.10	F	3.50±0.10	A	3.10±0.10	A0	2.10±0.10	B	2.75±0.10	B0	0.65±0.10	K	1.10±0.10	t	0.20±0.05
Symbol	Dimension (mm)																															
W	8.00±0.30																															
P0	4.00±0.10																															
P1	4.00±0.10																															
P2	2.00±0.10																															
D0	Φ1.55±0.10																															
D1	Φ1.00±0.05																															
E	1.75±0.10																															
F	3.50±0.10																															
A	3.10±0.10																															
A0	2.10±0.10																															
B	2.75±0.10																															
B0	0.65±0.10																															
K	1.10±0.10																															
t	0.20±0.05																															
Reel	 <p>The technical drawing shows the dimensions for the reel. Key dimensions include:      - Reel diameter (D) = 178.0±2.0 mm.      - Spacing between reels (D2) = 13.0 mm.      - Reel height (W1) = 9.5 mm.      - Quantity: 3000PCS</p>	<table border="1"> <thead> <tr> <th>D</th> <th>Φ178.0±2.0</th> </tr> </thead> <tbody> <tr> <td>D2</td> <td>Φ13.0</td> </tr> <tr> <td>W1</td> <td>9.5</td> </tr> <tr> <td>Quantity</td> <td>3000PCS</td> </tr> </tbody> </table>	D	Φ178.0±2.0	D2	Φ13.0	W1	9.5	Quantity	3000PCS																						
D	Φ178.0±2.0																															
D2	Φ13.0																															
W1	9.5																															
Quantity	3000PCS																															