

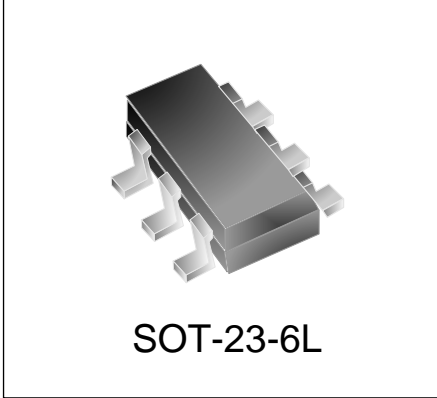


# WS05-4RUL

## Transient Voltage Suppressor

### Features

- Solid-state silicon-avalanche technology
- 500 Watts Peak Pulse Power per Line ( $t_p=8/20\mu s$ )
- Low operating and clamping voltage
- Up to four I/O Lines of Protection
- Ultra low capacitance
- Low Leakage
- Low operating voltage:5V



### IEC COMPATIBILITY (EN61000-4)

- IEC 61000-4-2 (ESD)  $\pm 30kV$  (air),  $\pm 30kV$  (contact)
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- IEC 61000-4-5 (Lightning) 25A (8/20 $\mu s$ )

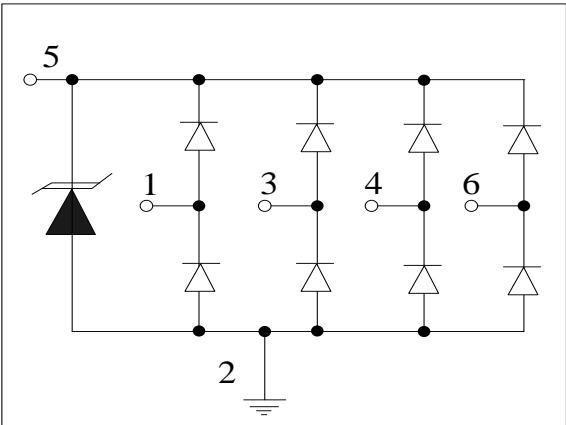
### Mechanical Characteristics

- SOT-23-6L package
- Marking: Marking Code
- Packaging: Tape and Reel
- RoHS Compliant

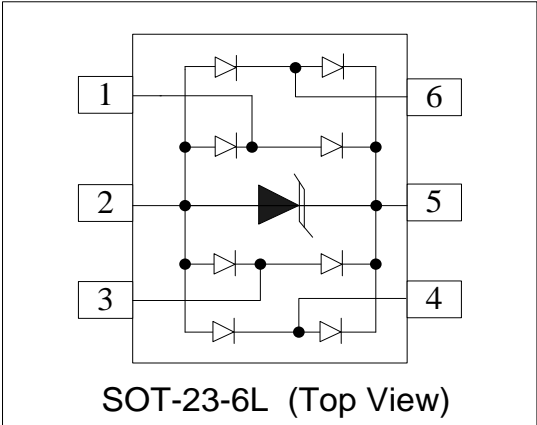
### Applications

- Video/Graphics Card
- Handheld & Portable Electronics
- PC/Notebook USB2.0/IEEE1394 ports
- 10/100/1000 Ethernet
- DVI interfaces
- Wireless data (WAN/LAN) systems

### Circuit Diagram



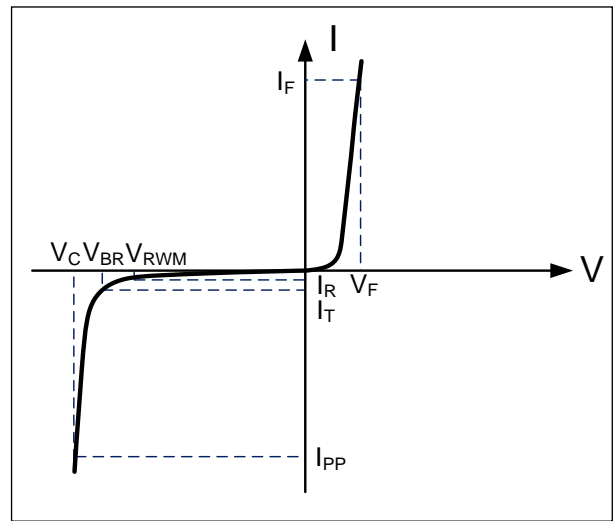
### Schematic & PIN Configuration



Absolute Maximum Rating			
Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p = 8/20\mu s$ )	$P_{PP}$	500	Watts
Peak Pulse Current ( $t_p = 8/20\mu s$ )	$I_{pp}$	25	A
Operating Temperature	$T_J$	-55 to + 125	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

Electrical Parameters (T=25°C)

Symbol	Parameter
$I_{PP}$	Maximum Reverse Peak Pulse Current
$V_C$	Clamping Voltage @ $I_{PP}$
$V_{RWM}$	Working Peak Reverse Voltage
$I_R$	Maximum Reverse Leakage Current @ $V_{RWM}$
$V_{BR}$	Breakdown Voltage @ $I_T$
$I_T$	Test Current
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$



Electrical Characteristics

WS05-4RUL						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$	I/O pin to GND			5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T = 1mA$ I/O pin to GND	6			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 5V, T = 25^\circ C$ I/O pin to GND			500	nA
Clamping Voltage	$V_C$	$I_{PP} = 25A, t_p = 8/20\mu s$ I/O or VCC to GND		17	20	V
Dynamic Resistance <sup>1,2</sup>	$R_{DYN}$	TLP=0.2/100ns		0.25		$\Omega$
ESD Clamping Voltage <sup>1</sup>	$V_C$	$I_{PP} = 4A,$ $t_p = 0.2/100ns$ (TLP)		9		V
ESD Clamping Voltage <sup>1</sup>	$V_C$	$I_{PP} = 16A,$ $t_p = 0.2/100ns$ (TLP)		12		V
Junction Capacitance	$C_j$	$V_R = 0V, f = 1MHz$ I/O pin to GND		3	4	pF
		$V_R = 0V, f = 1MHz$ Between I/O pins		1.5	2	pF

Notes : 1. TLP Setting :  $t_p = 100ns, t_r = 0.2ns, I_{TLP}$  and  $V_{TLP}$  sample window:  $t_1 = 70ns$  to  $t_2 = 90ns$ .

2. Dynamic resistance calculated from  $I_{PP} = 4A$  to  $I_{PP} = 16A$  using "Best Fit".

Typical Characteristics

Figure 1: Peak Pulse Power vs. Pulse Time

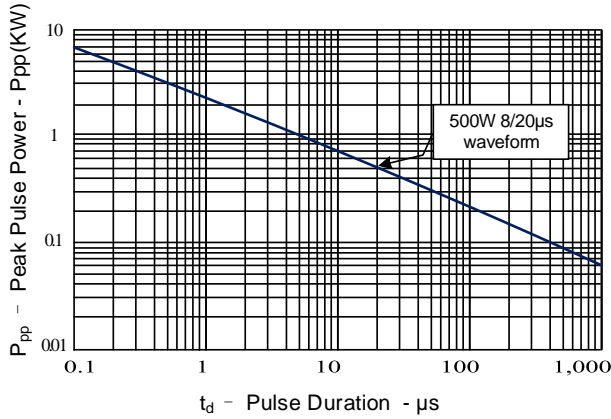


Figure 2: Power Derating Curve

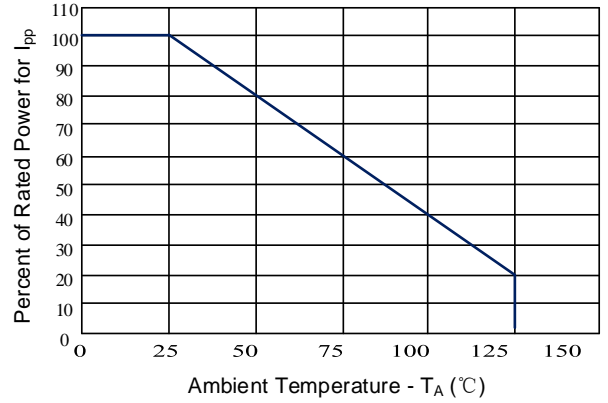


Figure 3: Clamping Voltage vs. Peak Pulse Current (IO or VCC to GND)

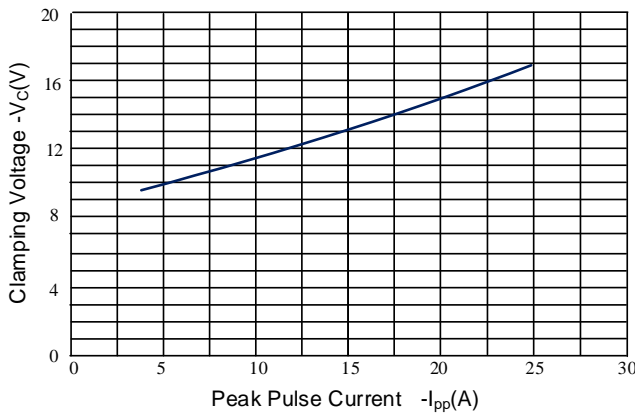


Figure 4: Normalized Junction Capacitance vs. Reverse Voltage

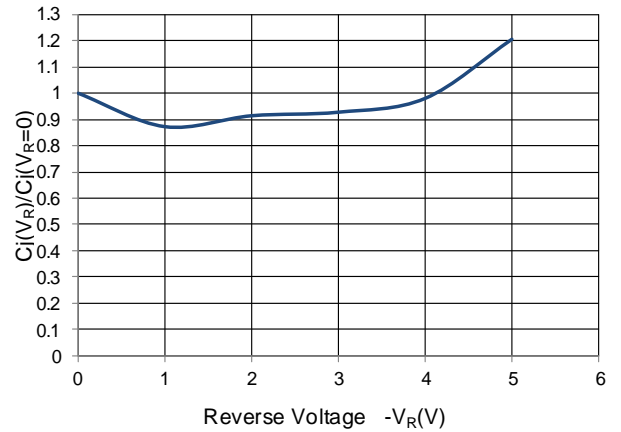


Figure 5: 8/20µs Pulse Waveform

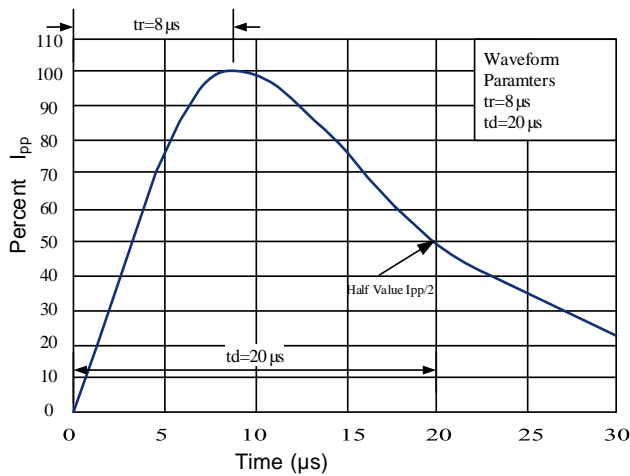
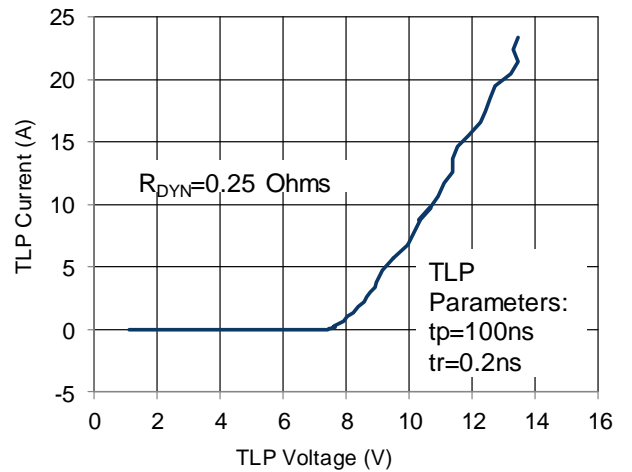
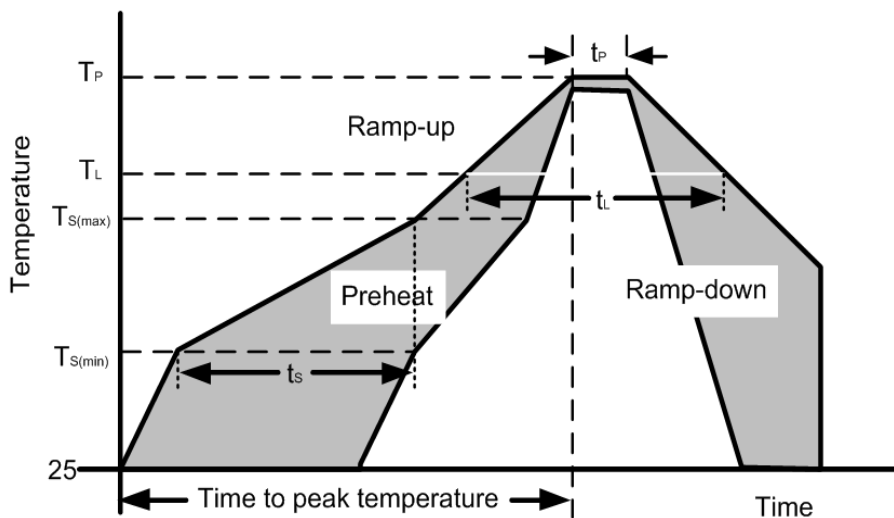


Figure 6: TLP I-V Curve



Soldering Parameters

Reflow Condition		Pb – Free assembly
Pre Heat	Temperature Min ( $T_{s(min)}$ )	150°C
	Temperature Max ( $T_{s(max)}$ )	200°C
	Time (min to max) ( $t_s$ )	60 – 190 secs
Average ramp up rate (Liquidus Temp) ( $T_L$ ) to peak		5°C/second max
$T_{s(max)}$ to $T_L$ —Ramp-up Rate		5°C/second max
Reflow	Temperature ( $T_L$ ) (Liquidus)	217°C
	Temperature ( $t_L$ )	60 – 150 seconds
Peak Temperature ( $T_P$ )		260+0/-5 °C
Time within actual peak Temperature ( $t_p$ )		20 – 40 seconds
Ramp-down Rate		5°C/second max
Time 25°C to peak Temperature ( $T_P$ )		8 minutes Max.
Do not exceed		280°C



Outline Drawing – SOT-23-6L

**PACKAGE OUTLINE**

SIDE VIEW SEE DETAIL A

DETAIL A

SOT-23-6L

DIMENSIONS				
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.057	0.90	1.45
A1	0.000	0.006	0.00	0.15
A2	0.035	0.051	0.90	1.30
b	0.014	0.020	0.35	0.50
c	0.003	0.008	0.08	0.20
D	0.110	0.119	2.80	3.02
E1	0.060	0.069	1.50	1.75
E	0.102	0.118	2.60	3.00
e	0.037 BSC		0.95 BSC	
e1	0.075 BSC		1.90 BSC	
L	0.014	0.024	0.35	0.60
L1	0.022	0.030	0.55	0.75
θ 1	0°	8°	0°	8°
N	6		6	

DIMENSIONS		
DIM	INCHES	MILLIMETERS
C	0.098	2.50
G	0.055	1.40
P	0.037	0.95
X	0.024	0.60
Y	0.043	1.10
Z	0.141	3.60

**Notes:**

Controlling Dimension: Millimeter.

**Marking Codes**

Part Number	WS05-4RUL
Marking Code	05U

**Package Information**

Qty: 3k/Reel

**CONTACT INFORMATION**

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For additional information, please contact your local Sales Representative.

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Specifications are subject to change without notice.  
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.  
Users should verify actual device performance in their specific applications.