

# WS05M501T through WS36M501T

## Transient Voltage Suppressor

### Features

- 350 watts peak pulse power ( $t_p = 8/20\mu s$ )
- ESD Protection > 40 kilovolts
- Protects one bidirectional line or two unidirectional lines
- Working Voltages: 5V, 12V, 15V, 24V and 36V
- Low clamping voltages

### IEC COMPATIBILITY (EN61000-4)

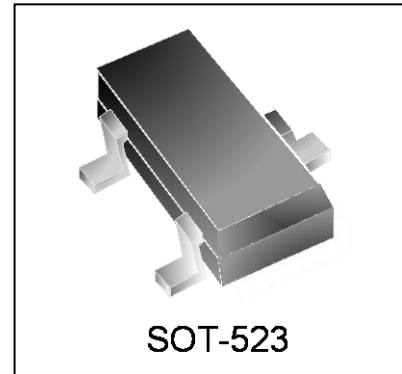
- IEC 61000-4-2 (ESD)  $\pm 15kV$  (air),  $\pm 8kV$  (contact)
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- IEC 61000-4-5 (Lightning) 20A (8/20 $\mu s$ )

### Mechanical Characteristics

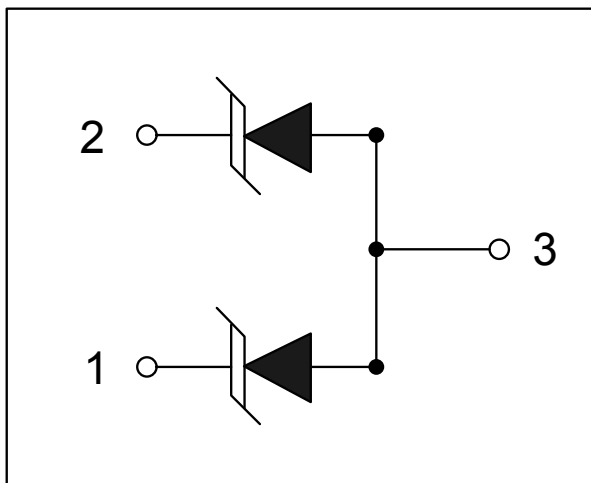
- JEDEC SOT-523 package
- Molding compound flammability rating:
- UL 94V-0
- Marking: Marking Code
- Packaging: Tape and Reel per EIA 481
- RoHS/WEEE Compliant

### Applications

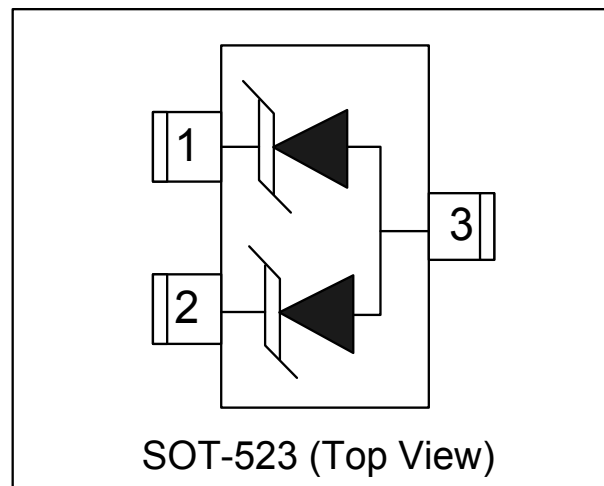
- Cellular Handsets and Accessories
- Control & Monitoring Systems
- Portable Electronics
- Set-Top Box
- Servers, Notebook, and Desktop PC
- Wireless Bus Protection



### Circuit Diagram



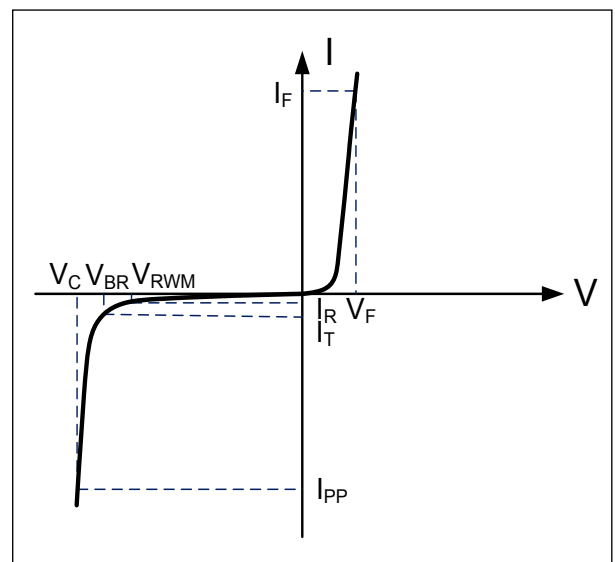
### Schematic & PIN Configuration



<b>Absolute Maximum Rating</b>			
Rating	Symbol	Value	Units
Peak Pulse Power ( $t_p=8/20\mu s$ )	$P_{PP}$	350	Watts
Lead Soldering Temperature	$T_L$	260(10sec)	°C
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**

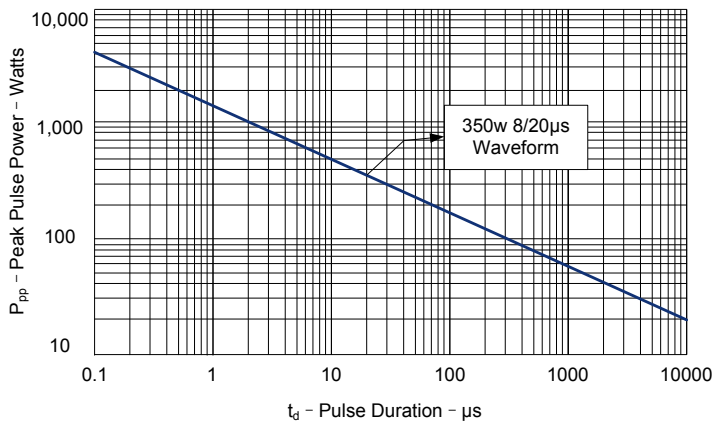
<b>WS05M501T</b>						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				5	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$	6			V
Reverse Leakage Current	$I_R$	$V_{RWM}=5V, T=25C$			1	$\mu A$
Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu s$			20	A
Clamping Voltage	$V_C$	$I_{PP}=1A, t_p=8/20\mu s$			9.8	V
Maximum Clamping Voltage	$V_C$	$I_{PP}=20A, t_p=8/20\mu s$		17	20	V
Junction Capacitance	$C_j$	Pin 1 to 3 and Pin 2 to 3 $V_R = 0V, f = 1MHz$		150		pF

<b>WS12M501T</b>						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				12	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$	13.3			V
Reverse Leakage Current	$I_R$	$V_{RWM}=12V, T=25^{\circ}C$			1	$\mu A$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			12	A
Clamping Voltage	$V_C$	$I_{PP}=1A, t_p=8/20\mu s$			19	V
Maximum Clamping Voltage	$V_C$	$I_{PP}=12A, t_p=8/20\mu s$			25	V
Junction Capacitance	$C_j$	Pin 1 to 2 $V_R=0V, f=1MHz$		30		pF
Junction Capacitance	$C_j$	Pin 1 to 3 and Pin 2 to 3 $V_R=0V, f=1MHz$		50		pF
<b>WS15M501T</b>						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				15	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$	16.7			V
Reverse Leakage Current	$I_R$	$V_{RWM}=15V, T=25^{\circ}C$			1	$\mu A$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			10	A
Clamping Voltage	$V_C$	$I_{PP}=1A, t_p=8/20\mu s$			24	V
Maximum Clamping Voltage	$V_C$	$I_{PP}=10A, t_p=8/20\mu s$			30	V
Junction Capacitance	$C_j$	Pin 1 to 2 $V_R=0V, f=1MHz$		25		pF
Junction Capacitance	$C_j$	Pin 1 to 3 and Pin 2 to 3 $V_R=0V, f=1MHz$		40		pF
<b>WS24M501T</b>						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				24	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$	26.7			V
Reverse Leakage Current	$I_R$	$V_{RWM}=24V, T=25^{\circ}C$			1	$\mu A$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			5	A
Clamping Voltage	$V_C$	$I_{PP}=1A, t_p=8/20\mu s$			43	V
Maximum Clamping Voltage	$V_C$	$I_{PP}=5A, t_p=8/20\mu s$			60	V
Junction Capacitance	$C_j$	Pin 1 to 2 $V_R=0V, f=1MHz$		20		pF
Junction Capacitance	$C_j$	Pin 1 to 3 and Pin 2 to 3 $V_R=0V, f=1MHz$		30		pF

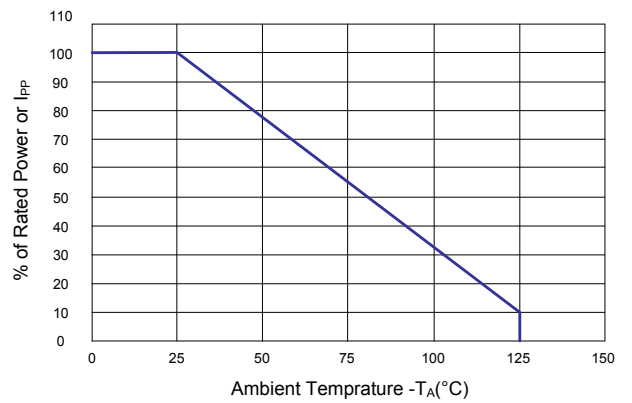
WS36M501T						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	$V_{RWM}$				36	V
Reverse Breakdown Voltage	$V_{BR}$	$I_T=1mA$	40			V
Reverse Leakage Current	$I_R$	$V_{RWM}=36V, T=25^\circ C$			1	$\mu A$
Peak Pulse Current	$I_{PP}$	$t_p=8/20\mu s$			4	A
Clamping Voltage	$V_C$	$I_{PP}=1A, t_p=8/20\mu s$			60	V
Maximum Clamping Voltage	$V_C$	$I_{PP}=4A, t_p=8/20\mu s$			75	V
Junction Capacitance	$C_j$	Pin 1 to 2 $V_R=0V, f=1MHz$		20		pF
Junction Capacitance	$C_j$	Pin 1 to 3 and Pin 2 to 3 $V_R=0V, f=1MHz$		26		pF

### Typical Characteristics

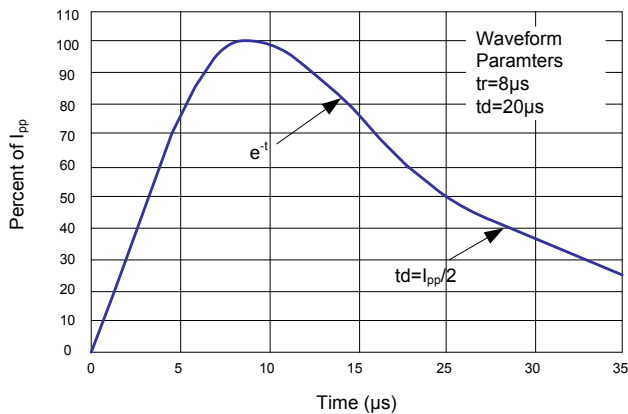
Peak Pulse Power vs. Pulse Time



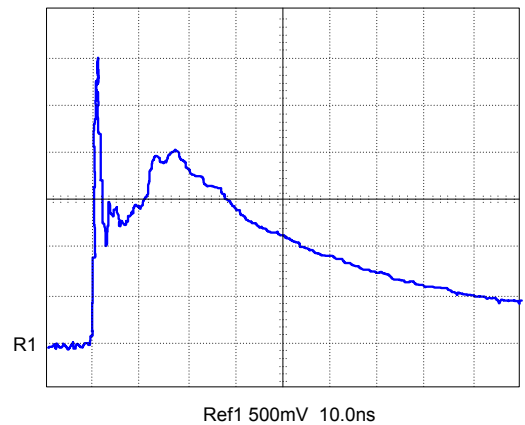
Power Derating Curve



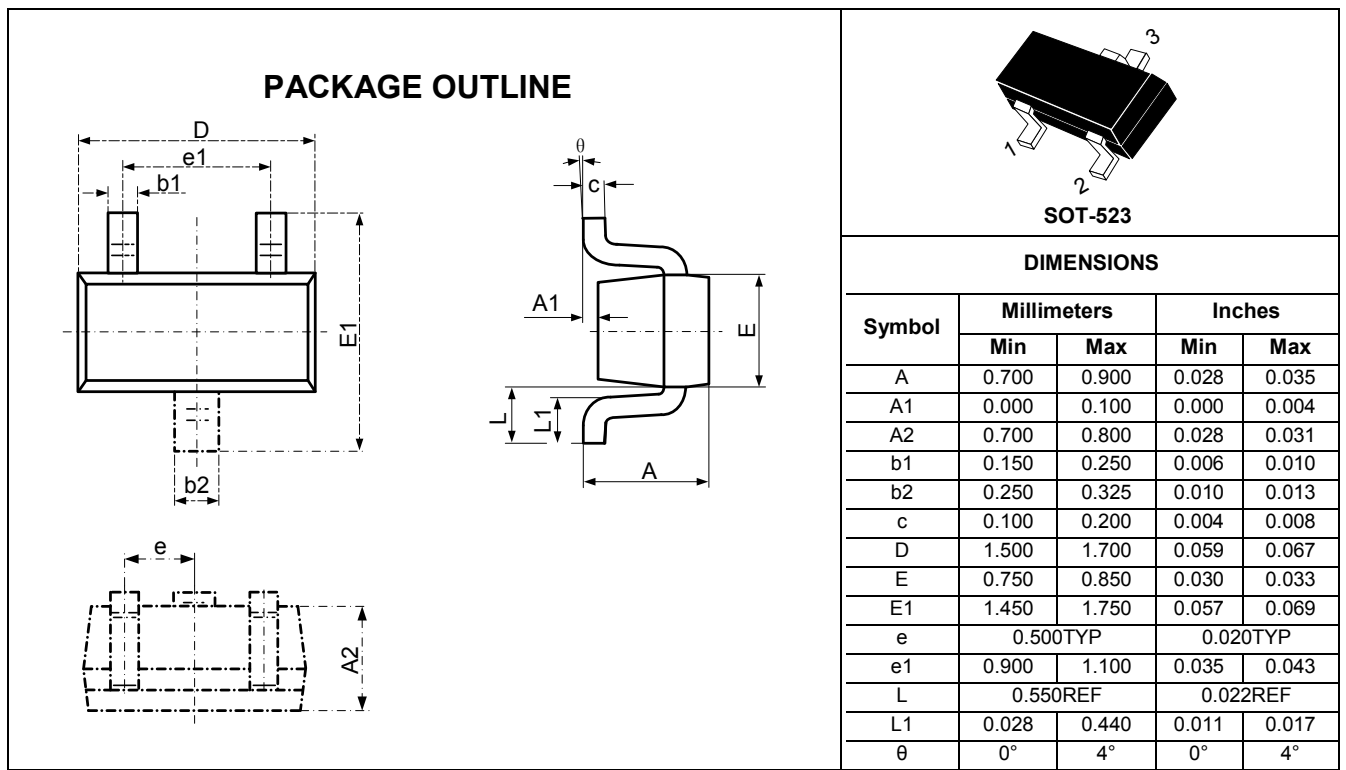
Pulse Waveform



ESD Pulse Waveform (Per IEC 61000-4-2)



### Outline Drawing – SOT-523



### Marking Codes

Part Number	WS05M501T	WS12M501T	WS15M501T	WS24M501T	WS36M501T
Marking Code	M1	M2	M3	M4	M5