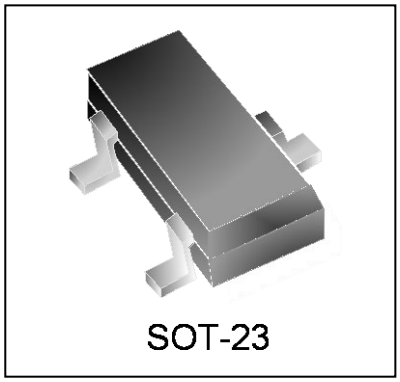
Document: W0301032, Rev: C

WS05M1T through WS36M1T

Transient Voltage Suppressor

Features

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


SOT-23

IEC COMPATIBILITY (EN61000-4)

- **IEC 61000-4-2 (ESD) ±15kV (air), ±8kV (contact)**
- **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- **IEC 61000-4-5 (Lightning) 24A (8/20μs)**

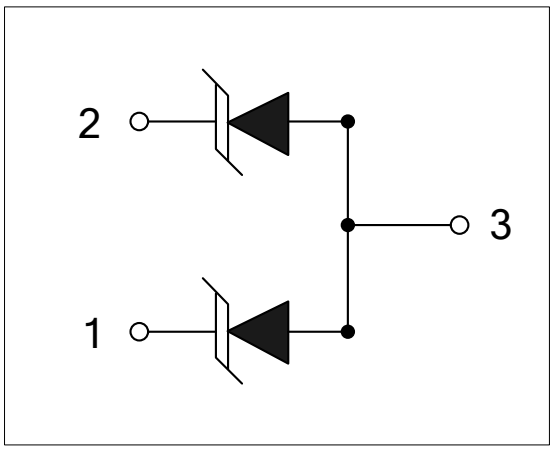
Mechanical Characteristics

- JEDEC SOT-23 package
- Molding compound flammability rating: UL 94V-0
- Marking: Marking Code
- Packaging: Tape and Reel per EIA 481
- RoHS/WEEE Compliant

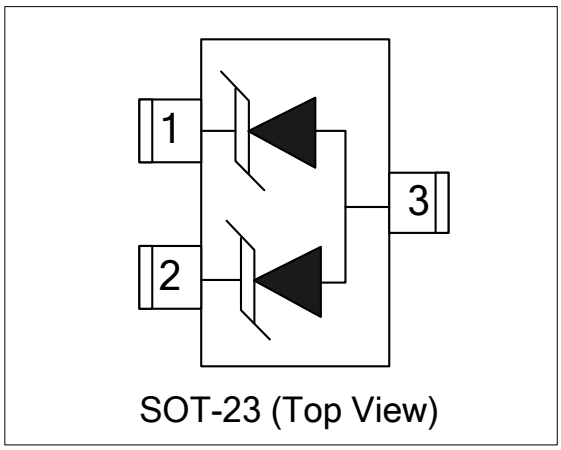
Applications

- RS-232, RS-422 & RS-485
- 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

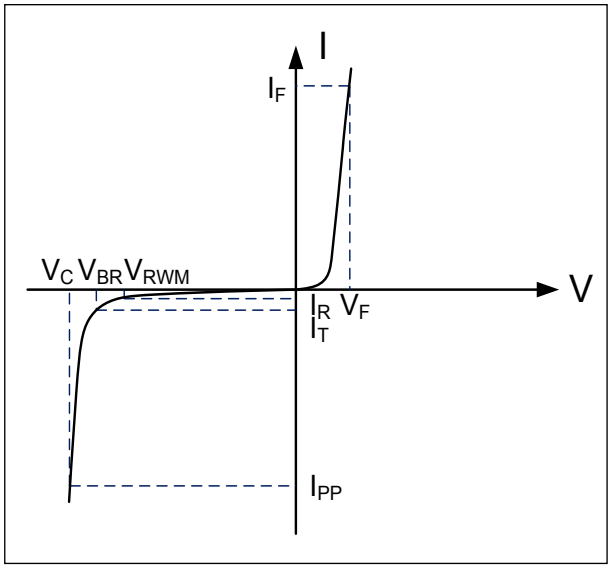


SOT-23 (Top View)

Absolute Maximum Rating			
Rating	**Symbol**	**Value**	**Units**
Peak Pulse Power（t_p=8/20μs）	P_{PP}	500	Watts
Lead Soldering Temperature	T_L	260(10sec)	℃
Operating Temperature	T_J	-55 to + 125	℃
Storage Temperature	T_{STG}	-55 to +150	℃

Electrical Parameters (T=25℃)

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

WS05M1T						
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=25℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			36.0	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			9.8	V
Maximum Clamping Voltage	V_C	I_{PP}=36.0A, tp=8/20μs			13.7	V
Junction Capacitance	C_j	Pin 1 to 2 VR = 0V, f = 1MHz		125		pF
Junction Capacitance	C_j	Pin 1 to 3 and Pin 2 to 3 VR = 0V, f = 1MHz		210		pF

WS12M1T

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℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			20.0	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			19.0	V
Maximum Clamping Voltage	V_C	I_{PP}=20.0A, tp=8/20μs			25.0	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		75		pF
Junction Capacitance	C_j	Pin 1 to 3 and Pin 2 to 3 V_R = 0V, f = 1MHz		120		pF

WS15M1T

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℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			17.0	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			24.0	V
Maximum Clamping Voltage	V_C	I_{PP}=17.0A, tp=8/20μs			30.0	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		55		pF
Junction Capacitance	C_j	Pin 1 to 3 and Pin 2 to 3 V_R = 0V, f = 1MHz		90		pF

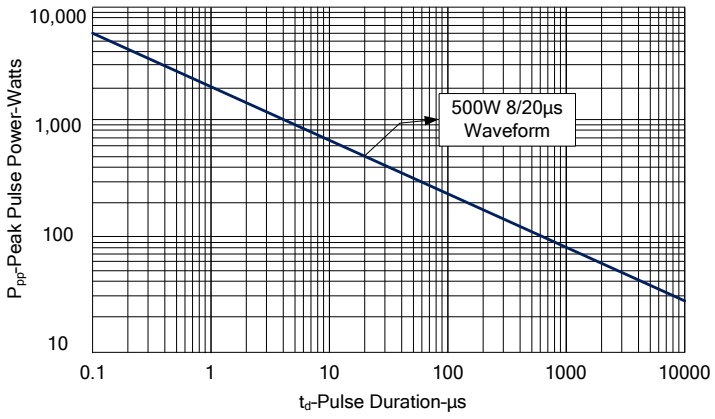
WS24M1T

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℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			11.0	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			43.0	V
Maximum Clamping Voltage	V_C	I_{PP}=11.0A, tp=8/20μs			49.0	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		40		pF
Junction Capacitance	C_j	Pin 1 to 3 and Pin 2 to 3 V_R = 0V, f = 1MHz		60		pF

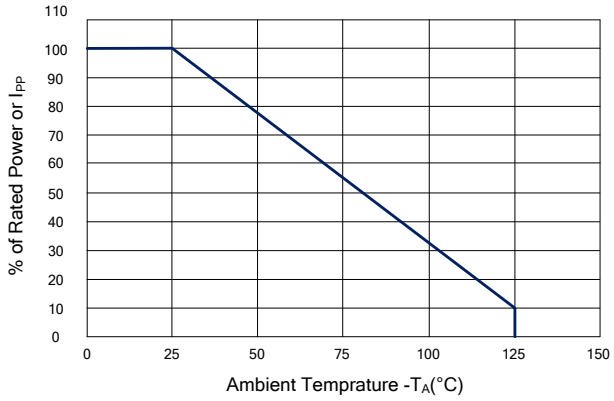
WS36M1T						
Parameter	**Symbol**	**Conditions**	**Minimum**	**Typical**	**Maximum**	**Units**
Reverse Stand-Off Voltage	V_{RWM}				36	V
Reverse Breakdown Voltage	V_{BR}	I_T=1mA	40			V
Reverse Leakage Current	I_R	V_{RWM}=36V,T=25℃			1	μA
Peak Pulse Current	I_{PP}	t_p =8/20μs			9.0	A
Clamping Voltage	V_C	I_{PP}=1A, tp=8/20μs			51.0	V
Maximum Clamping Voltage	V_C	I_{PP}=9.0A, tp=8/20μs			77.0	V
Junction Capacitance	C_j	Pin 1 to 2 V_R = 0V, f = 1MHz		36		pF
Junction Capacitance	C_j	Pin 1 to 3 and Pin 2 to 3 V_R = 0V, f = 1MHz		55		pF

Typical Characteristics

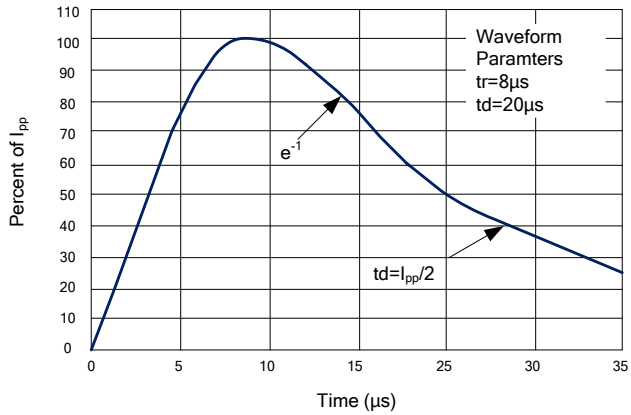
Peak Pulse Power vs. Pulse Time



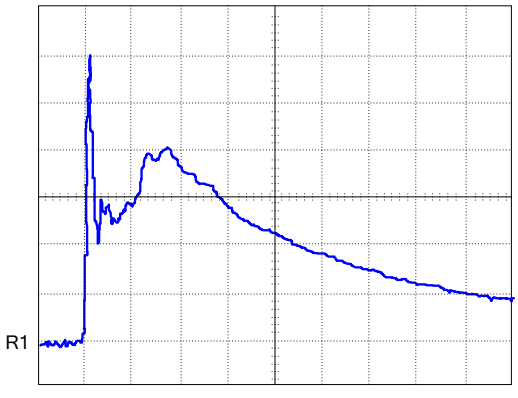
Power Derating Curve



Pulse Waveform

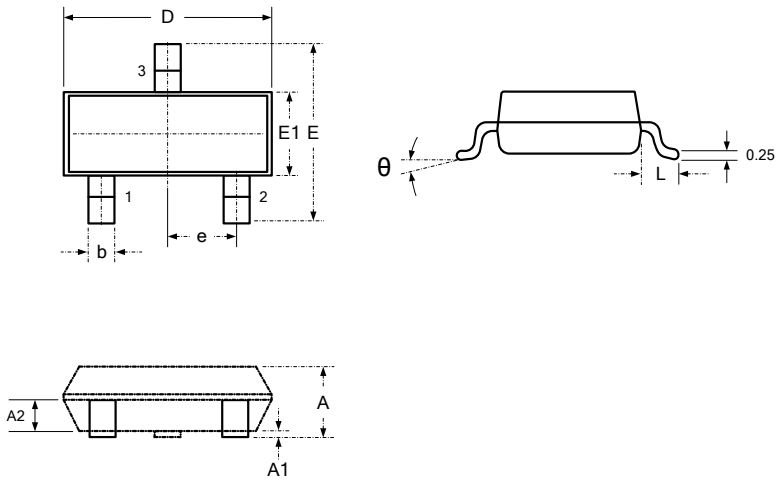


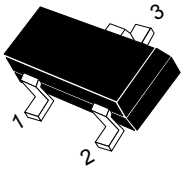
ESD Pulse Waveform (Per IEC 61000-4-2)



Outline Drawing – SOT-23

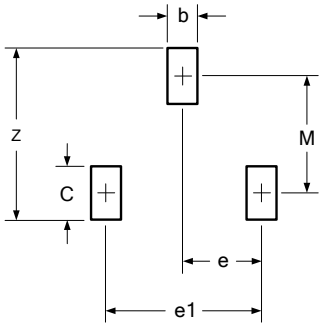
PACKAGE OUTLINE





SOT-23

DIMENSIONS				
SYMBOL	MILLIMETER		INCHES	
	MIN	MAX	MIN	MAX
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
D	2.800	3.000	0.110	0.118
b	0.300	0.500	0.012	0.020
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 BSC		0.037 BSC	
L	0.300	0.500	0.012	0.020
θ	0	8°	0	8°



DIMENSIONS		
DIM	INCHES	MILLIMETERS
M	0.088	2.20
C	0.0058	0.15
Z	0.093	2.35
e	0.037 BSC	0.95 BSC
e1	0.074 BSC	1.9 BSC
b	0.0389	0.35

Notes

1. Dimensioning and tolerances per ANSI Y14.5M, 1985.
2. Controlling Dimension: Inches
3. Pin 3 is the cathode (Unidirectional Only).
4. Dimensions are exclusive of mold flash and metal burrs.

Marking Codes

Part Number	WS05M1T	WS12M1T	WS15M1T	WS24M1T	WS36M1T
Marking Code	5M1	AM1	BM1	CM1	DM1