

Transient Voltage Suppressors Array for ESD Protection

SM712

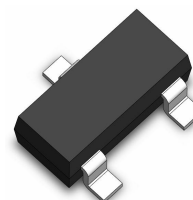
Features

- ◆ 400 watts peak pulse power ($t_p=8/20\mu s$)
- ◆ Protects two -7V to +12V lines
- ◆ Low capacitance
- ◆ Low clamping voltage
- ◆ Solid-state silicon avalanche technology

IEC Compatibility (EN61000-4)

- ◆ IEC 61000-4-2 (ESD) $\pm 30kV$ (air), $\pm 30kV$ (contact)
- ◆ IEC 61000-4-4 (EFT) 40A (5/50ns)

SOT-23



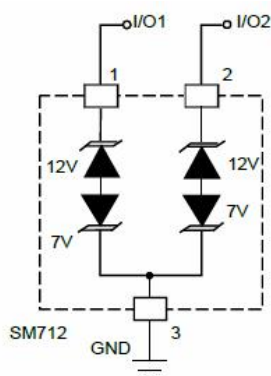
Applications

- ◆ Protection of RS-485 transceivers with extended common-mode range
- ◆ Security systems
- ◆ Automatic Teller Machines
- ◆ HFC systems
- ◆ Networks

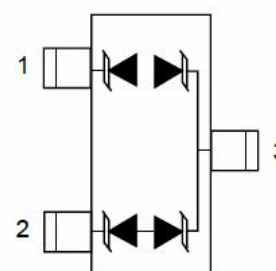
Mechanical Characteristics

- ◆ JEDEC SOT-23 package
- ◆ Molding compound flammability rating : UL 94V-0
- ◆ Packaging : Tape and Reel per EIA 481
- ◆ Quantity Per Reel : 3,000pcs
- ◆ Marking Code: 712

Circuit Diagram



Schematic & PIN Configuration



SOT-23 (Top View)

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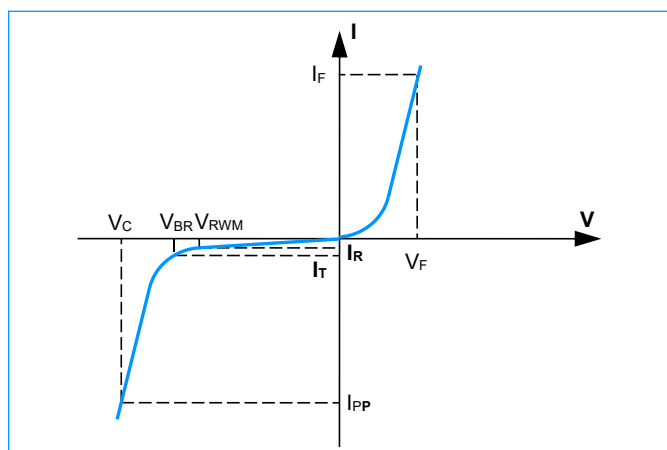
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Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p=8/20\mu s$)	P_{PP}	400	W
Lead Soldering Temperature	T_L	260 (10 sec.)	$^{\circ}C$
Peak Pulse Current ($t_p=8/20\mu s$)	I_{PP}	17/12	A
Operating Temperature	T_J	-55 to +125	$^{\circ}C$
Storage Temperature	T_{STG}	-55 to +150	$^{\circ}C$

Electrical Parameters ($T=25^{\circ}C$)

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

Parameter	Symbol	Conditions	Pins 1 to 3 and 2 to 3 (12V TVS)			Pins 3 to 1 and 3 to 2 (7V TVS)			Units
			Min	Typ	Max	Min	Typ	Max	
Reverse Stand-Off Voltage	V_{RWM}	Pin 3 to 1 or Pin 2 to 1	--	--	12	--	--	7	V
Reverse Breakdown Voltage	V_{BR}	$I_T = 1mA$	13.3	--	--	7.5	--	--	V
Reverse Leakage Current	I_R	$V_R = V_{RWM}$	--	--	1	--	--	1	μA
Clamping Voltage	V_C	$I_{PP} = 12A, t_p = 8/20\mu s$	--	30	35	--	--	--	V
		$I_{PP} = 17A, t_p = 8/20\mu s$	--	--	--	--	18	22	V
Junction Capacitance	C_j	$V_R = 0V, f = 1MHz$	--	--	75	--	--	75	pF
		$V_R = V_{RWM}, f = 1MHz$	--	45	--	--	45	--	pF

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Characteristic Curves

Fig1. Non-Repetitive Peak Pulse Power vs. Pulse Time

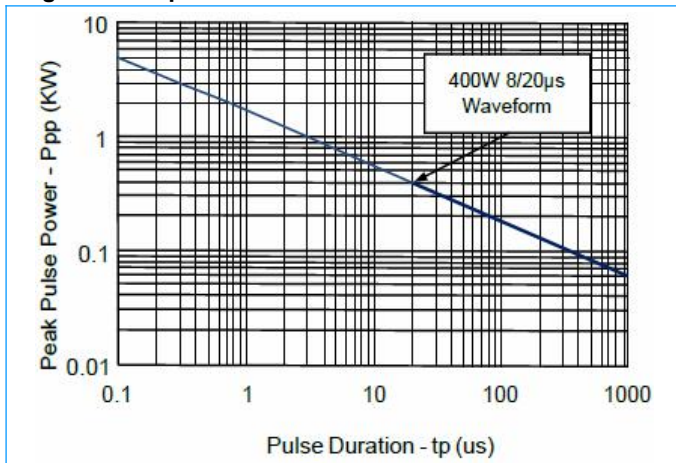


Fig2. Power Derating curve

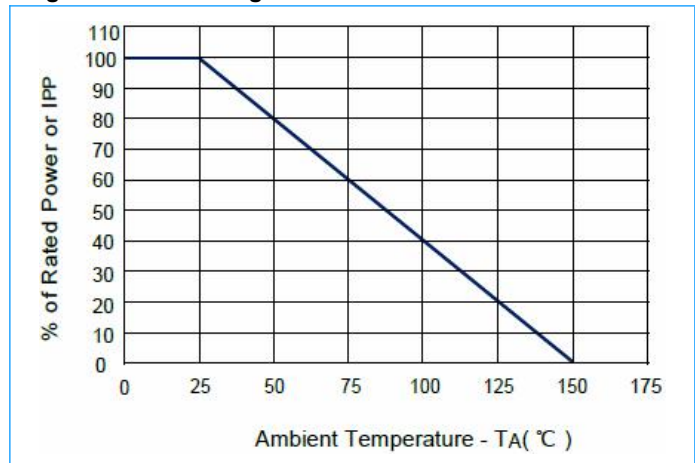


Fig3. Pulse Waveform

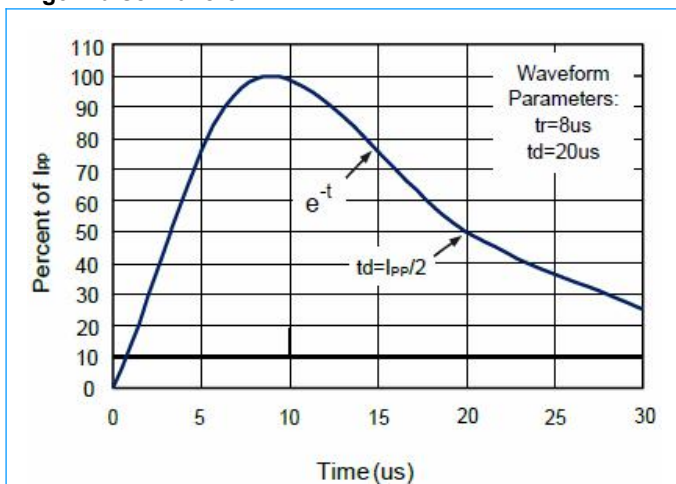


Fig4. Clamping Voltage vs. Peak Pulse Current

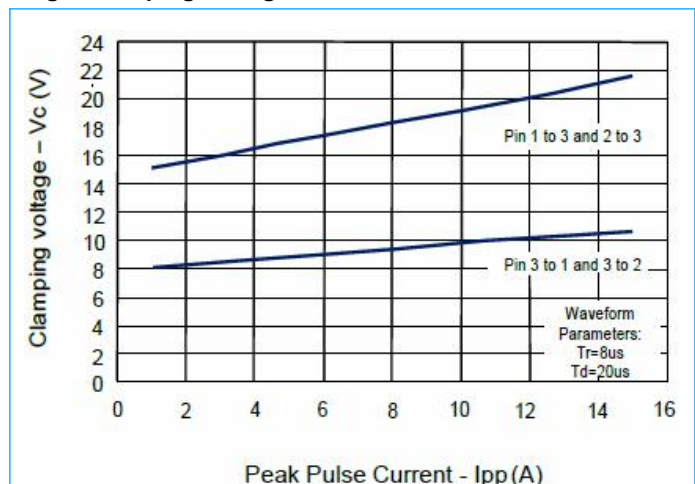
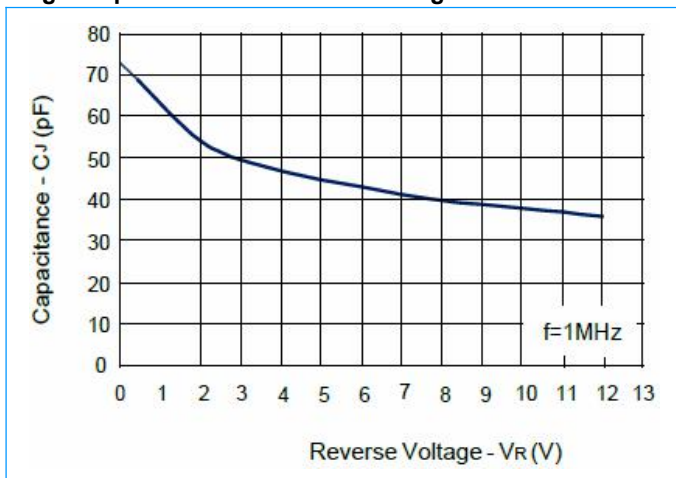


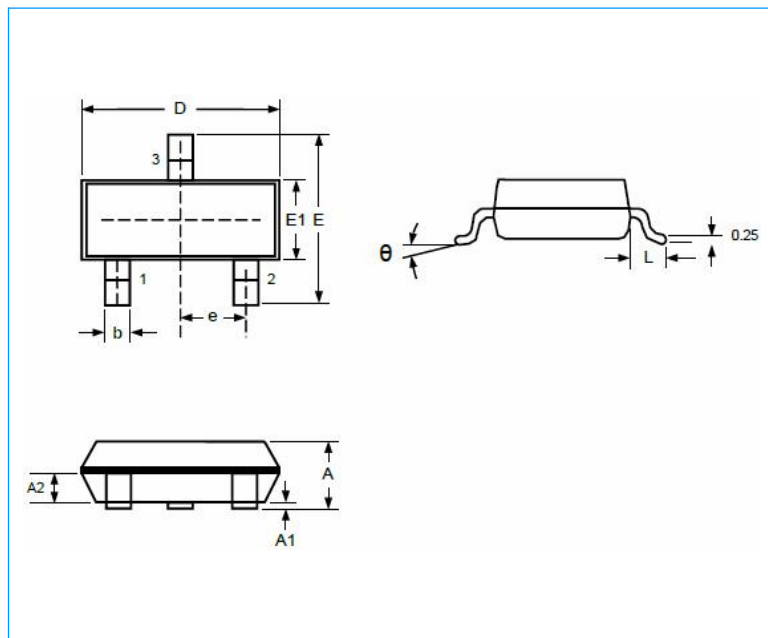
Fig5. Capacitance vs. Reverse Voltage



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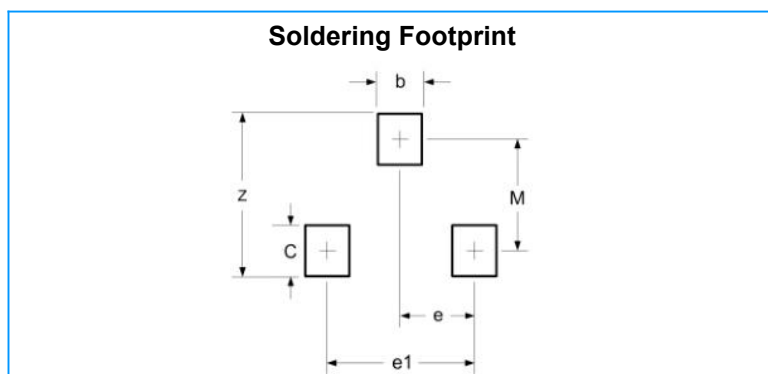
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SOT-23 Package Outline & Dimensions



Symbol	Millimeters		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°

Soldering Footprint



Dim	Millimeters	Inches
M	2.20	0.088
C	0.15	0.0058
Z	2.35	0.093
e	0.95 BSC	0.037 BCS
e1	1.90 BSC	0.074 BSC
b	0.35	0.0389

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.

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Application Information

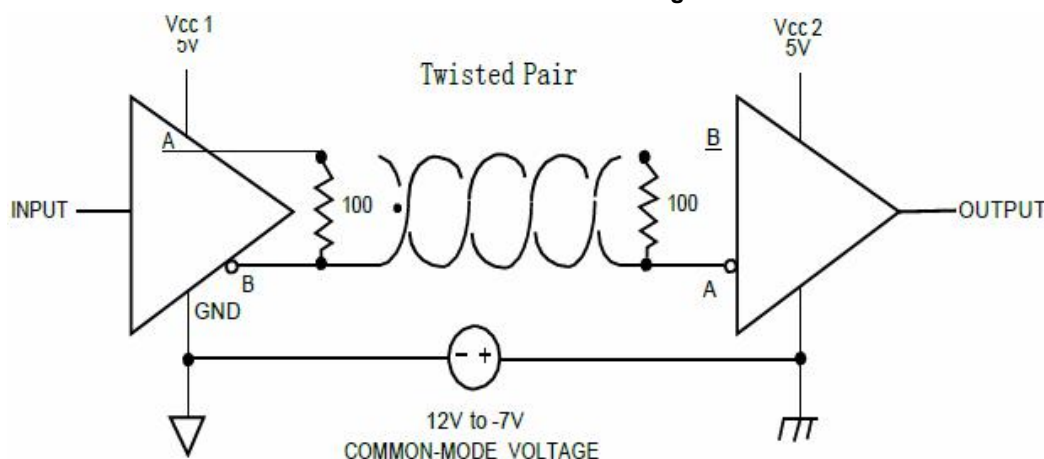
Device Connection for Protection of Two RS-485 Data Lines:

EIA RS-485 specifies a $\pm 7V$ ground difference between devices on the bus. This permits the bus voltage to range from +12V ($5V + 7V$) to -7V ($0 - 7V$).

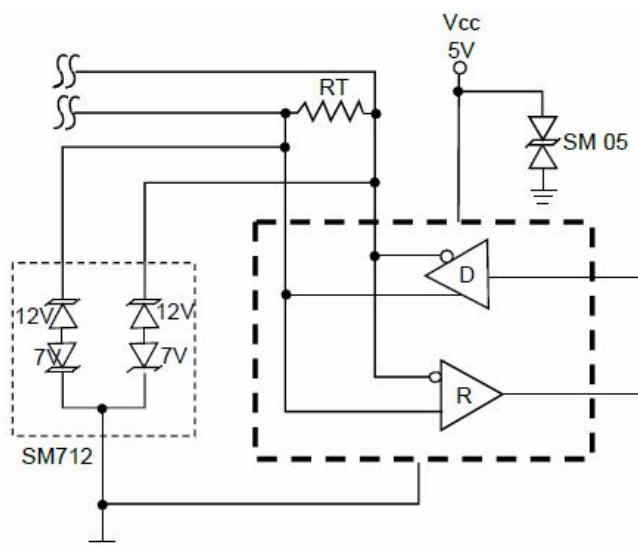
The SM712 is designed to protect two RS-485 data lines in extended common mode applications. The SM712 may be used to protect devices from transient voltages resulting from ESD, EFT, and lightning. The device is designed with asymmetrical operating voltages for optimum protection. The TVS diodes at pins 1 and 2 have a working voltage of 12 volts. These pins are connected to the differential data line pairs. The TVS diodes at pin 3 have a working voltage of 7 volts. Pin 3 is connected to ground. The internal TVS diodes of the SM712 will protect the transceiver input from positive transient voltage spikes greater than 12V and Negative spikes greater than 7V.

A series current limiting resistor may be added in applications requiring enhanced surge immunity.

RS-485 Common Mode Voltages



RS-485 Protection Circuit



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