

# SM05T1 Series

## Transient Voltage Suppressor Diode Array

### SOT-23 Dual Common Anode Diodes for ESD Protection

These dual monolithic silicon TVS diodes are designed for applications requiring transient overvoltage protection capability. They are intended for use in voltage and ESD sensitive equipment such as computers, printers, business machines, communication systems, medical equipment and other applications. Their dual junction common anode design protects two separate lines using only one package. These devices are ideal for situations where board space is at a premium.

#### Specification Features:

- SOT-23 Package Allows Either Two Separate Unidirectional Configurations or a Single Bidirectional Configuration
- Working Peak Reverse Voltage Range – 5.0 V to 24 V
- Peak Power – 300 Watt (8 X 20  $\mu$ s)
- Low Leakage
- Flammability Rating UL 94 V-0
- These are Pb-Free Devices

#### Mechanical Characteristics:

**CASE:** Void-Free, Transfer-Molded, Thermosetting Plastic Case

**FINISH:** Corrosion Resistant Finish, Easily Solderable

#### MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:

260°C for 10 Seconds

Package Designed for Optimal Automated Board Assembly

Small Package Size for High Density Applications

Available in 8 mm Tape and Reel

Use the Device Number to Order the 7 Inch/3,000 Unit Reel

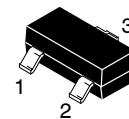
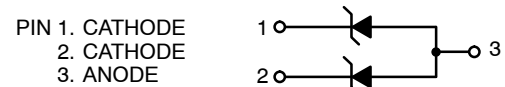
Replace the “T1” with “T3” in the Device Number to Order the

13 Inch/10,000 Unit Reel



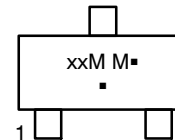
ON Semiconductor®

<http://onsemi.com>



SOT-23  
CASE 318  
STYLE 12

#### MARKING DIAGRAM



xxM = Device Code  
xx = 05, 12, 15, 24, 36  
M = Date Code\*  
■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

Device	Package	Shipping†
SM05T1G	SOT-23 (Pb-Free)	3000/Tape & Reel
SM12T1G	SOT-23 (Pb-Free)	3000/Tape & Reel
SM15T1G	SOT-23 (Pb-Free)	3000/Tape & Reel
SM24T1G	SOT-23 (Pb-Free)	3000/Tape & Reel
SM36T1G	SOT-23 (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation @ 20 $\mu$ s (Note 1) @ $T_L \leq 25^\circ\text{C}$	$P_{pk}$	300	W
IEC 61000-4-2 (ESD) Air Contact		$\pm 15$ $\pm 8.0$	kV
IEC 61000-4-4 (EFT)		40	A
IEC 61000-4-5 (Lightening)		12	A
Total Power Dissipation on FR-5 Board (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	1.8 556	$\text{mW}/^\circ\text{C}$ $^\circ\text{C}/\text{W}$
Total Power Dissipation on Alumina Substrate (Note 3) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	2.4 417	$\text{mW}/^\circ\text{C}$ $^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to +150	$^\circ\text{C}$
Lead Solder Temperature - Maximum (10 Second Duration)	$T_L$	260	$^\circ\text{C}$

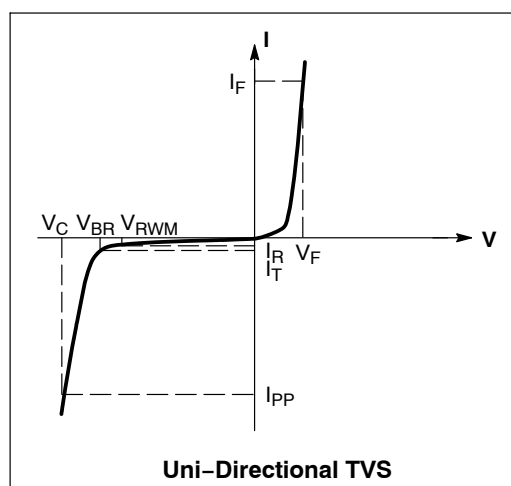
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Non-repetitive current pulse per Figure 3
  2. FR-5 = 1.0 x 0.75 x 0.62 in.
  3. Alumina = 0.4 x 0.3 x 0.024 in., 99.5% alumina
- NOTE: Other voltages may be available upon request

## ELECTRICAL CHARACTERISTICS

**UNIDIRECTIONAL** (Circuit tied to Pins 1 and 3 or 2 and 3)

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
$\theta V_{BR}$	Maximum Temperature Coefficient of $V_{BR}$
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$
$Z_{ZT}$	Maximum Zener Impedance @ $I_{ZT}$
$I_{ZK}$	Reverse Current
$Z_{ZK}$	Maximum Zener Impedance @ $I_{ZK}$



## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Device	Device Marking	$V_{RWM}$ (Volts)	$I_R$ @ $V_{RWM}$ ( $\mu\text{A}$ )	$V_{BR}$ , Breakdown Voltage (Volts)		$I_T$ mA	$V_C$ @ $I_{PP} = 1$ Amp (Volts)	Max $I_{PP}$ (Note 4) (Amps)	Typical Capacitance
				Min	Max				(pF)
				Pin 1 to 3 @ 0 Volts					
SM05T1G	05M	5	10	6.2	7.3	1.0	9.8	17	225
SM12T1G	12M	12	1.0	13.3	15.75	1.0	19	12	95
SM15T1G	15M	15	1.0	16.7	19.6	1.0	24	10	100
SM24T1G	24M	24	1.0	26.7	31.35	1.0	43	5.0	60
SM36T1G	36M	36	1.0	40.0	46.95	1.0	60	4.0	45

4.  $8 \times 20 \mu\text{s}$  pulse waveform per Figure 3

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## TYPICAL CHARACTERISTICS

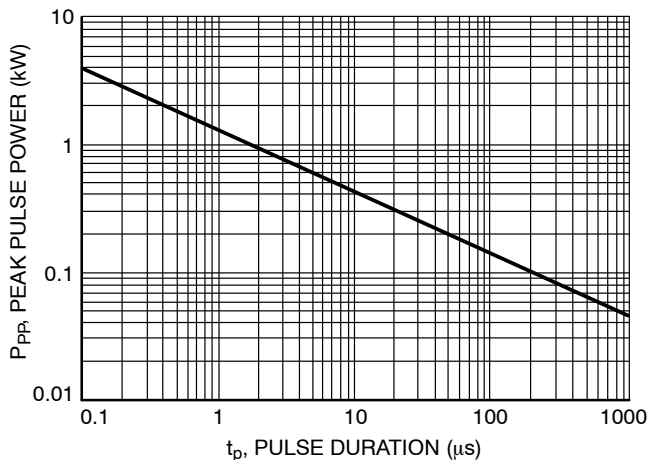


Figure 1. Non-Repetitive Peak Pulse Power versus Pulse Time

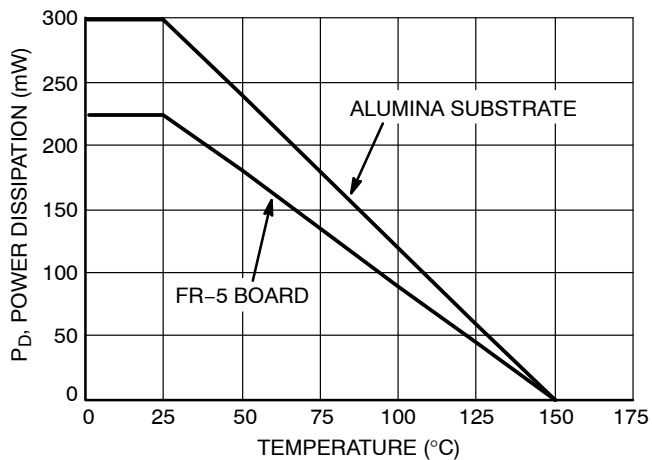


Figure 2. Steady State Power Derating Curve

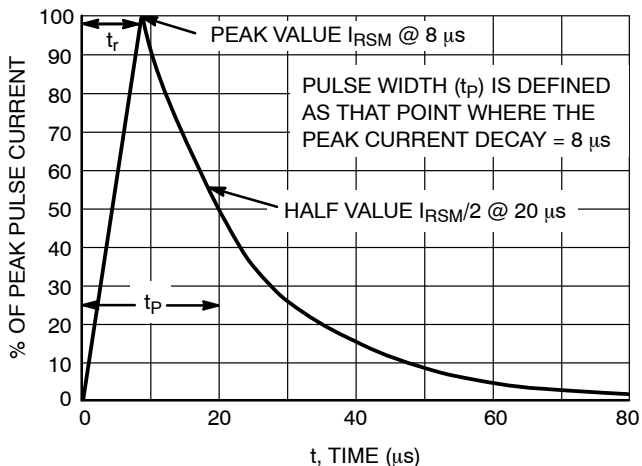


Figure 3.  $8 \times 20 \mu\text{s}$  Pulse Waveform

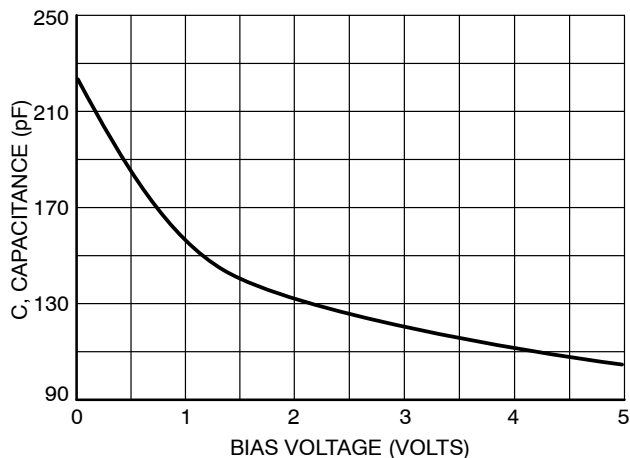


Figure 4. Typical Diode Capacitance (SM05)

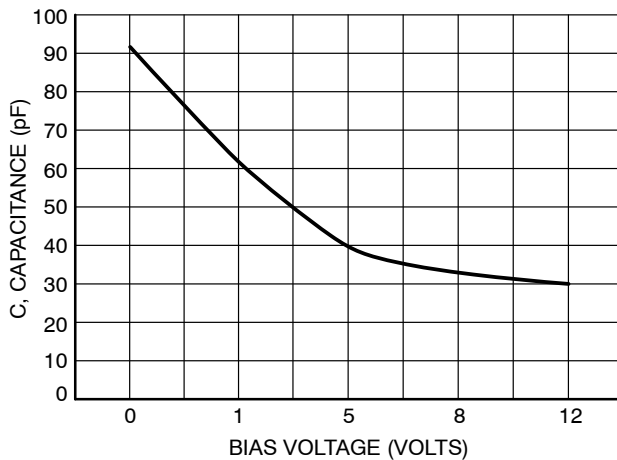


Figure 5. Typical Diode Capacitance (SM12)

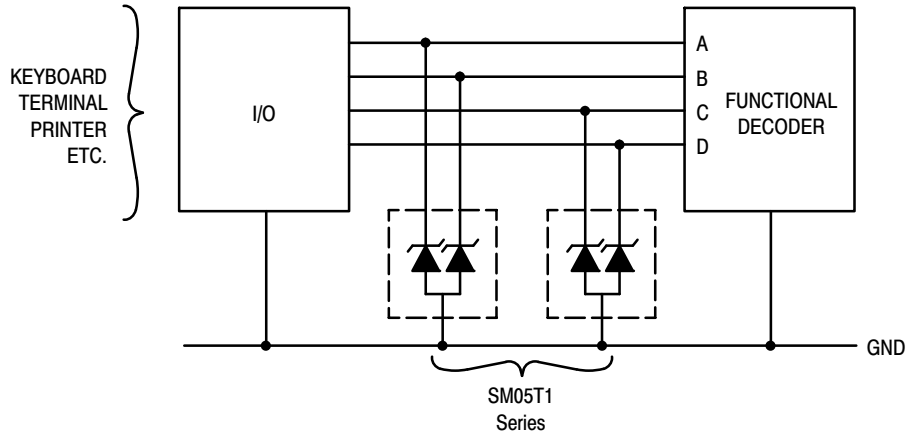
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## TYPICAL COMMON ANODE APPLICATIONS

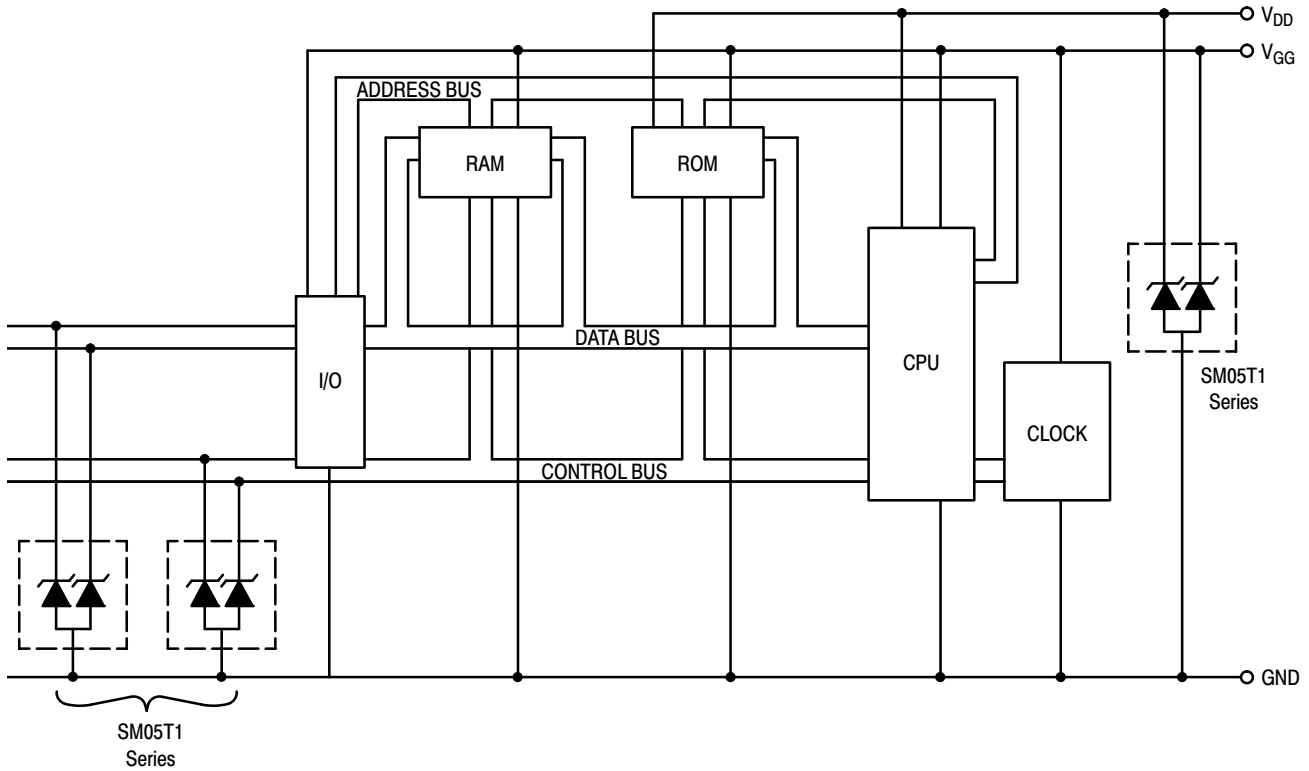
A quad junction common anode design in a SOT-23 package protects four separate lines using only one package. This adds flexibility and creativity to PCB design especially

when board space is at a premium. Two simplified examples of TVS applications are illustrated below.

### Computer Interface Protection



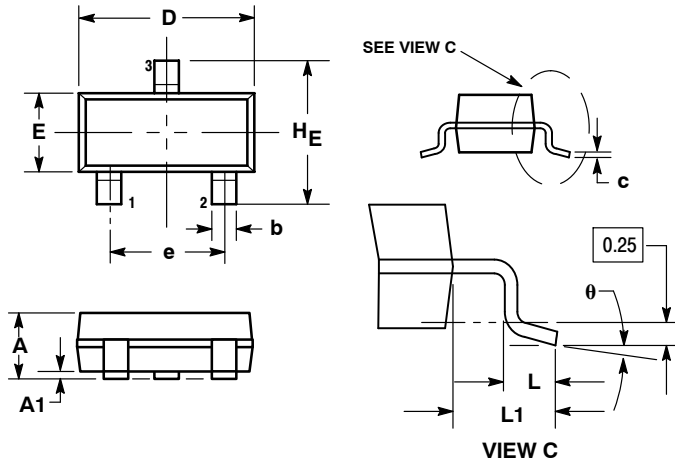
### Microprocessor Protection



# SM05T1 Series

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AN

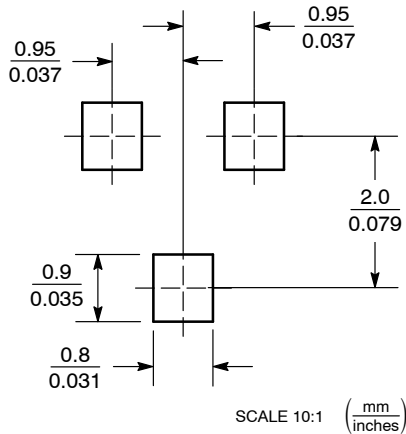


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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