1.Description

The SMxx-02HTG series TVS Diode Array is designed to protect sensitive equipment from damage due to electrostatic discharge (ESD), electrical fast transients (EFT), and lightning induced surges.The SM series can absorb repetitive ESD strikes above the maximum level specified in the IEC 61000-4-2 international standard without performance degradation and safely dissipate up to 24A of 8/20μs induced surge current (IEC-61000-4-5, 2nd Edition) with very low clamping voltages.

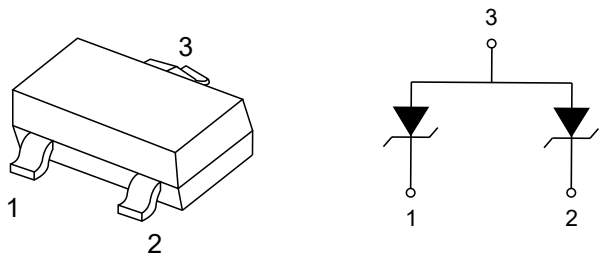
2.Applications

- Industrial Equipment
- Test and Medical
- Equipment
- Point-of-Sale Terminals
- Motor Controls
- Legacy Ports
- (RS-232, RS-485)
- Security and Alarm
- System
- Automotive Electronics

3.Features

- RoHS compliant and lead-free
- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 50A (5/50ns)
- Lightning, IEC 61000-4-5, 2nd Edition, 24A (t_p=8/20μs, SM05)
- Working voltages: 5V, 12V, 15V, 24V and 36V
- Low clamping voltage
- Low leakage current
- AEC-Q101 qualified (SOT23-3 package)
- Moisture Sensitivity Level (MSL-1)

4.Pinning information



SOT-23

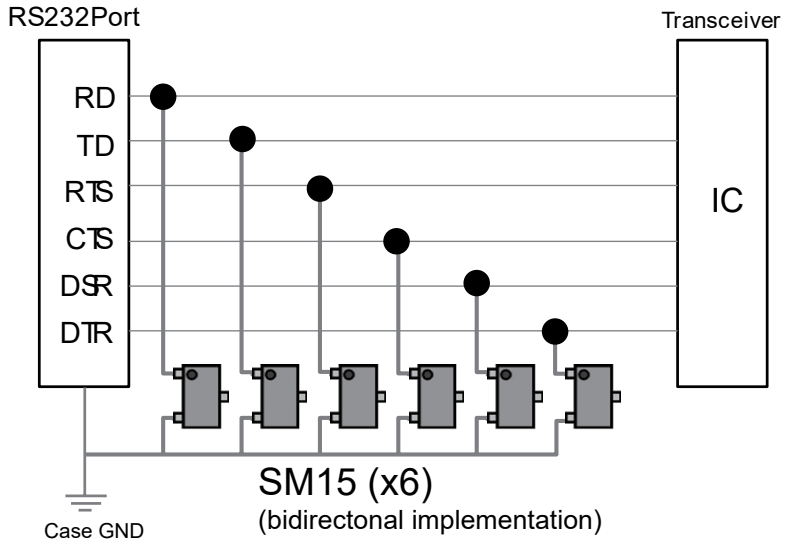
5.Absolute Maximum Ratings T_J= 25°C

Parameter	Symbol	Value	Units
Peak Pulse Power (t_p=8/20μs)	P_{PK}	400	W
Junction Temperature	T_{OP}	-40 to 125	°C
Storage Temperature	T_{STOR}	-55 to 150	°C

Notes:

CAUTION: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

6.RS-232 Application Example



7.1Electrical Characteristics (SM05)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse Stand off Voltage	V_{RWM}	I_R≤1μA			5	V
Reverse Voltage Drop	V_R	I_R=1mA	6			V
Leakage Current	I_{LEAK}	V_R=5V			1	μA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			9.8	V
		I_{PP}=10A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			13	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.19		Ω
Peak Pulse Current (8/20μs)[1]	I_{PP}	t_p=8/20μs			24	A
ESD Withstand Voltage [1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±30			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance [1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			400	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz			350	pF

7.2Electrical Characteristics (SM12)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse Stand off Voltage	V_{RWM}	I_R≤1μA			12	V
Reverse Voltage Drop	V_R	I_R=1mA	13.3			V
Leakage Current	I_{LEAK}	V_R=12V			1	μA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			18.5	V
		I_{PP}=10A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			22.5	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.25		Ω
Peak Pulse Current (8/20μs)[1]	I_{PP}	t_p=8/20μs			17	A
ESD Withstand Voltage [1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±30			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance [1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			150	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz			120	pF

7.3Electrical Characteristics (SM15)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse Stand off Voltage	V_{RWM}	I_R≤1μA			15	V
Reverse Voltage Drop	V_R	I_R=1mA	16.7			V
Leakage Current	I_{LEAK}	V_R=15V			1	μA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			24	V
		I_{PP}=10A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			30	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.3		Ω
Peak Pulse Current (8/20μs)[1]	I_{PP}	t_p=8/20μs			12	A
ESD Withstand Voltage [1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±30			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance [1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			100	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz			75	pF

7.4Electrical Characteristics (SM24)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse Stand off Voltage	V_{RWM}	I_R≤1μA			24	V
Reverse Voltage Drop	V_R	I_R=1mA	26.7			V
Leakage Current	I_{LEAK}	V_R=24V			1	μA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			36	V
		I_{PP}=5A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			42	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.5		Ω
Peak Pulse Current (8/20μs)[1]	I_{PP}	t_p=8/20μs			7	A
ESD Withstand Voltage [1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±30			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance [1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			65	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz			50	pF

7.5Electrical Characteristics (SM36)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reverse Stand off Voltage	V_{RWM}	I_R≤1μA			36	V
Reverse Voltage Drop	V_R	I_R=1mA	40			V
Leakage Current	I_{LEAK}	V_R=36V			1	μA
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			52	V
		I_{PP}=4A, t_p=8/20μs, Pin 1 or Pin 2 to Pin 3			62	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns, I/O to GND		0.65		Ω
Peak Pulse Current (8/20μs)[1]	I_{PP}	t_p=8/20μs			5	A
ESD Withstand Voltage [1]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±30			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance [1]	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz			50	pF
	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz			40	pF

8.1Typical characteristic

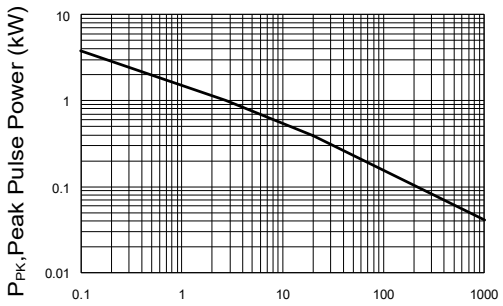


Figure 1: Non-Repetitive Peak Pulse Power vs. Pulse Time

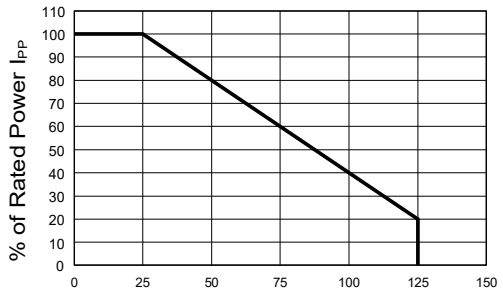


Figure 2: Power Derating Curve

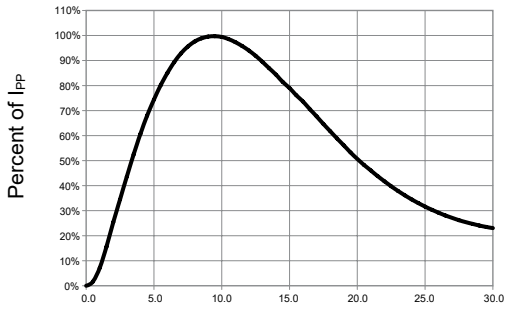


Figure 3: Pulse Waveform

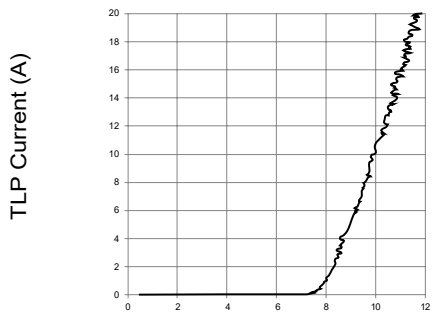


Figure 4: SM05 Transmission Line Pulsing(TLP) Plot

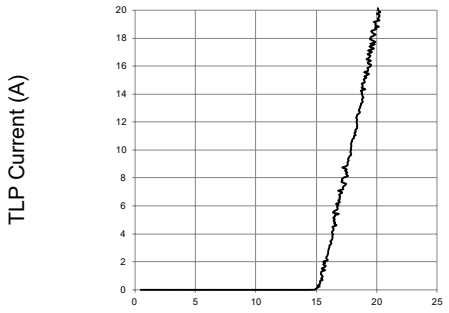


Figure 5: SM12 Transmission Line Pulsing(TLP) Plot

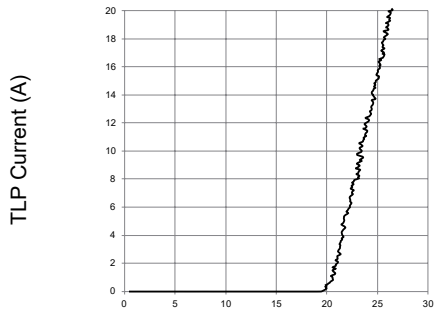


Figure 6: SM15 Transmission Line Pulsing(TLP) Plot

8.2Typical characteristic

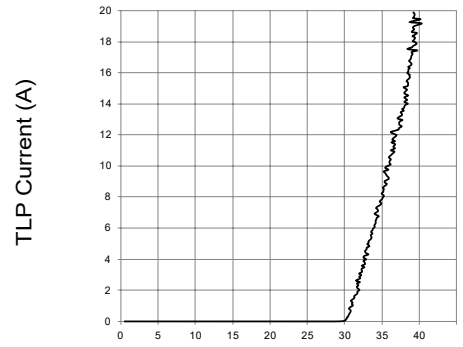


Figure 7: SM24 Transmission Line Pulsing(TLP) Plot

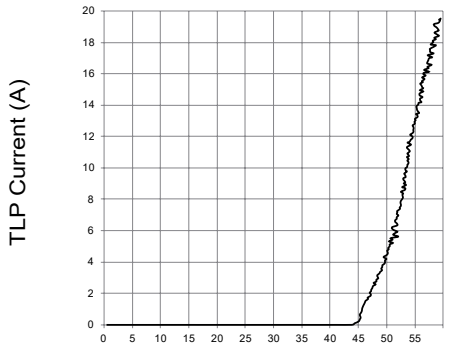
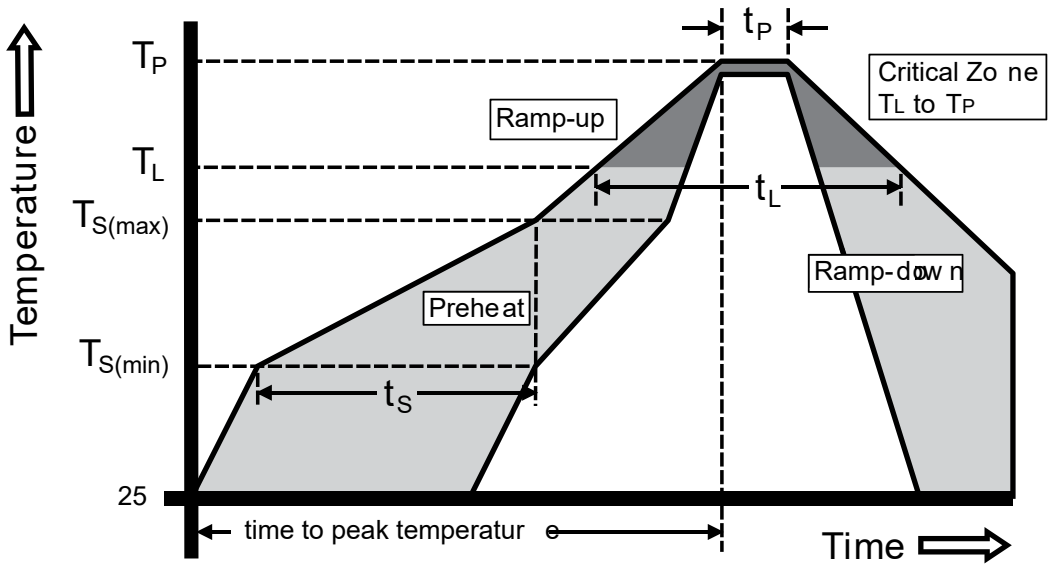


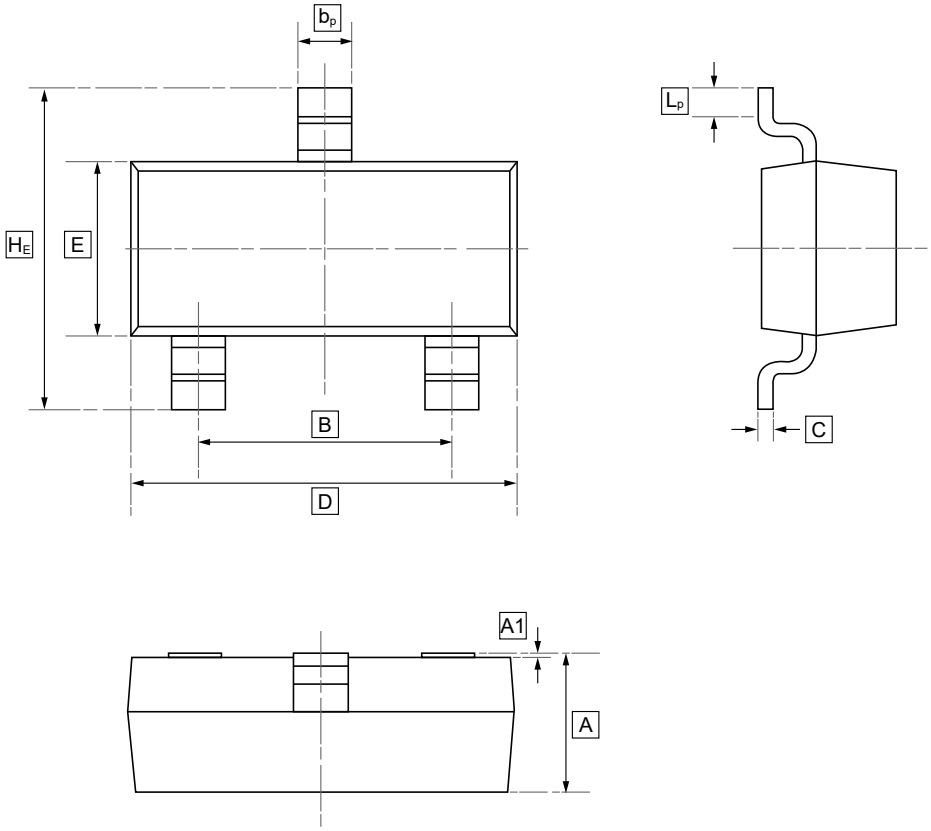
Figure 8: SM36 Transmission Line Pulsing(TLP) Plot

9.Recommended Soldering Conditions

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)	60-180 secs.
Average ramp up rate (Liquidus) Temp (T_L) to peak		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature (T_L) (Liquidus)	217°C
	-Temperature (T_L)	60-150 secs.
Peak Temp (T_p)		$260^{+0/-5}$ °C
Time within 5°C of actual Peak Temp (T_p)		20-40 seconds
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temperature (T_p)		8 min. Max
Do not exceed		260°C



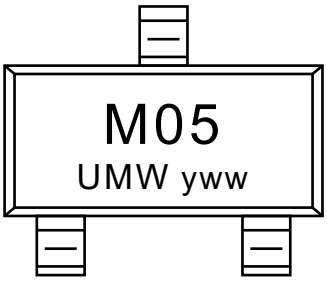
10.SOT-23 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	B	b_p	C	D	E	H_E	A1	L_p
Min	0.95	1.78	0.35	0.08	2.70	1.20	2.20	0.013	0.20
Max	1.40	2.04	0.50	0.19	3.10	1.65	3.00	0.100	0.50

11.Ordering information



yww: Batch Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW SM05-02HTG	M05	SOT-23	3000	Tape and reel
UMW SM12-02HTG	M12	SOT-23	3000	Tape and reel
UMW SM15-02HTG	M15	SOT-23	3000	Tape and reel
UMW SM24-02HTG	M24	SOT-23	3000	Tape and reel
UMW SM36-02HTG	M36	SOT-23	3000	Tape and reel

11.Disclaimer

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