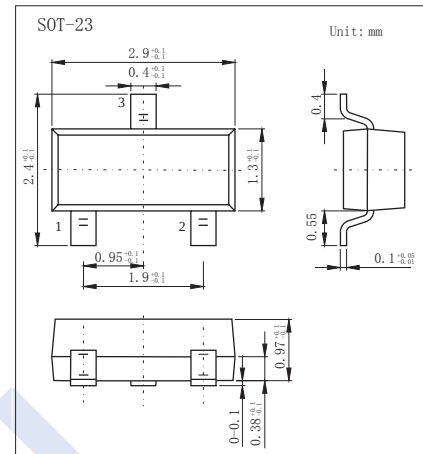
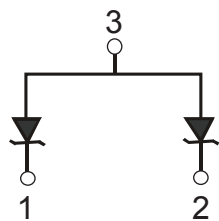


## TVS Diodes

### SM05 ~ SM36

#### ■ Features

- 300 Watts Peak Pulse Power ( $t_p = 8/20\mu s$ )
- Transient protection for data & power lines to  
IEC 61000-4-2 (ESD)  $\pm 15kV$  (air),  $\pm 8kV$  (contact)  
IEC 61000-4-4 (EFT) 40A (5/50ns)  
IEC 61000-4-5 (Lightning) 12A (8/20 $\mu s$ )
- Working Voltages: 5V, 12V, 15V, 24 and 36V
- Low clamping voltage



#### ■ Absolute Maximum Ratings $T_a = 25^\circ C$

| Parameter                                 | Symbol          | Rating     | Unit         |
|-------------------------------------------|-----------------|------------|--------------|
| Peak Pulse Power ( $t_p = 8/20\mu s$ )    | $P_{PK}$        | 300        | W            |
| Thermal Resistance Junction to Ambient *3 | $R_{\theta JA}$ | 556        | $^\circ C/W$ |
| Lead Soldering Temperature                | $T_L$           | 260        | $^\circ C$   |
| Junction Temperature                      | $T_J$           | 125        |              |
| Storage Temperature range                 | $T_{stg}$       | -55 to 150 |              |

#### ■ Electrical Characteristics $T_a = 25^\circ C$

SM05

| Parameter                 | Symbol    | Test Conditions                                 | Min | Typ | Max | Unit    |
|---------------------------|-----------|-------------------------------------------------|-----|-----|-----|---------|
| Reverse Breakdown Voltage | $V_{BR}$  | $I_T = 1mA$                                     | 6   |     |     | V       |
| Reverse Stand-Off Voltage | $V_{RWM}$ |                                                 |     |     | 5   |         |
| Clamping Voltage          | $V_C$     | $I_{PP} = 1A, t_p = 8/20\mu s$                  |     |     | 9.8 |         |
| Reverse Leakage Current   | $I_R$     | $V_R = 5V$                                      |     |     | 20  | $\mu A$ |
| Peak Pulse Current        | $I_{PP}$  | $t_p = 8/20\mu s$                               |     |     | 17  | A       |
| Junction Capacitance      | $C_J$     | Pin 1 to 2, $V_R = 0V, f = 1MHz$                |     |     | 350 | pF      |
|                           |           | Pin 1 to 2 and Pin 2 to 3, $V_R = 0V, f = 1MHz$ |     |     | 400 |         |

## TVS Diodes

### SM05 ~ SM36

#### ■ Electrical Characteristics Ta = 25°C

SM12

| Parameter                 | Symbol           | Test Conditions                                       | Min  | Typ | Max | Unit |
|---------------------------|------------------|-------------------------------------------------------|------|-----|-----|------|
| Reverse Breakdown Voltage | V <sub>BR</sub>  | I <sub>T</sub> =1mA                                   | 13.3 |     |     | V    |
| Reverse Stand-Off Voltage | V <sub>RWM</sub> |                                                       |      |     | 12  |      |
| Clamping Voltage          | V <sub>C</sub>   | I <sub>PP</sub> = 1 A, t <sub>P</sub> =8/20us         |      |     | 19  |      |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>R</sub> =12 V                                  |      |     | 1   | uA   |
| Peak Pulse Current        | I <sub>PP</sub>  | t <sub>P</sub> =8/20us                                |      |     | 12  | A    |
| Junction Capacitance      | C <sub>J</sub>   | Pin 1 to 2 ,V <sub>R</sub> = 0V,f=1MHz                |      |     | 120 | pF   |
|                           |                  | Pin 1 to 2 and Pin 2 to 3 ,V <sub>R</sub> = 0V,f=1MHz |      |     | 150 |      |

SM15

| Parameter                 | Symbol           | Test Conditions                                       | Min  | Typ | Max | Unit |
|---------------------------|------------------|-------------------------------------------------------|------|-----|-----|------|
| Reverse Breakdown Voltage | V <sub>BR</sub>  | I <sub>T</sub> =1mA                                   | 16.7 |     |     | V    |
| Reverse Stand-Off Voltage | V <sub>RWM</sub> |                                                       |      |     | 15  |      |
| Clamping Voltage          | V <sub>C</sub>   | I <sub>PP</sub> = 1 A, t <sub>P</sub> =8/20us         |      |     | 24  |      |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>R</sub> =15 V                                  |      |     | 1   | uA   |
| Peak Pulse Current        | I <sub>PP</sub>  | t <sub>P</sub> =8/20us                                |      |     | 10  | A    |
| Junction Capacitance      | C <sub>J</sub>   | Pin 1 to 2 ,V <sub>R</sub> = 0V,f=1MHz                |      |     | 75  | pF   |
|                           |                  | Pin 1 to 2 and Pin 2 to 3 ,V <sub>R</sub> = 0V,f=1MHz |      |     | 100 |      |

SM24

| Parameter                 | Symbol           | Test Conditions                                       | Min  | Typ | Max | Unit |
|---------------------------|------------------|-------------------------------------------------------|------|-----|-----|------|
| Reverse Breakdown Voltage | V <sub>BR</sub>  | I <sub>T</sub> =1mA                                   | 26.7 |     |     | V    |
| Reverse Stand-Off Voltage | V <sub>RWM</sub> |                                                       |      |     | 24  |      |
| Clamping Voltage          | V <sub>C</sub>   | I <sub>PP</sub> = 1 A, t <sub>P</sub> =8/20us         |      |     | 43  |      |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>R</sub> =24 V                                  |      |     | 1   | uA   |
| Peak Pulse Current        | I <sub>PP</sub>  | t <sub>P</sub> =8/20us                                |      |     | 5   | A    |
| Junction Capacitance      | C <sub>J</sub>   | Pin 1 to 2 ,V <sub>R</sub> = 0V,f=1MHz                |      |     | 50  | pF   |
|                           |                  | Pin 1 to 2 and Pin 2 to 3 ,V <sub>R</sub> = 0V,f=1MHz |      |     | 60  |      |

SM36

| Parameter                 | Symbol           | Test Conditions                                       | Min | Typ | Max | Unit |
|---------------------------|------------------|-------------------------------------------------------|-----|-----|-----|------|
| Reverse Breakdown Voltage | V <sub>BR</sub>  | I <sub>T</sub> =1mA                                   | 40  |     |     | V    |
| Reverse Stand-Off Voltage | V <sub>RWM</sub> |                                                       |     |     | 36  |      |
| Clamping Voltage          | V <sub>C</sub>   | I <sub>PP</sub> = 1 A, t <sub>P</sub> =8/20us         |     |     | 60  |      |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>R</sub> =36 V                                  |     |     | 1   | uA   |
| Peak Pulse Current        | I <sub>PP</sub>  | t <sub>P</sub> =8/20us                                |     |     | 4   | A    |
| Junction Capacitance      | C <sub>J</sub>   | Pin 1 to 2 ,V <sub>R</sub> = 0V,f=1MHz                |     |     | 40  | pF   |
|                           |                  | Pin 1 to 2 and Pin 2 to 3 ,V <sub>R</sub> = 0V,f=1MHz |     |     | 45  |      |

#### ■ Marking

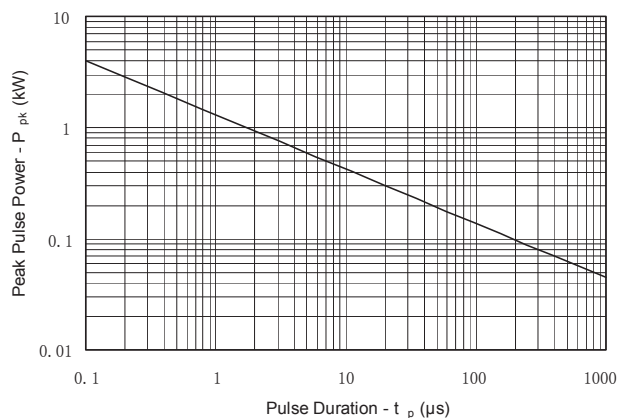
|         |      |      |      |      |      |
|---------|------|------|------|------|------|
| NO      | SM05 | SM12 | SM15 | SM24 | SM36 |
| Marking | M05  | M12  | M15  | M24  | M36  |

## TVS Diodes

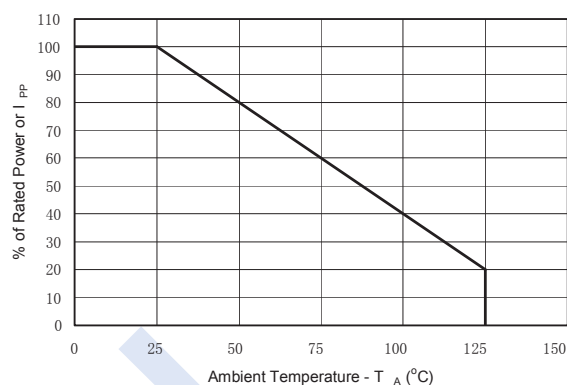
### SM05 ~ SM36

#### ■ Typical Characteristics

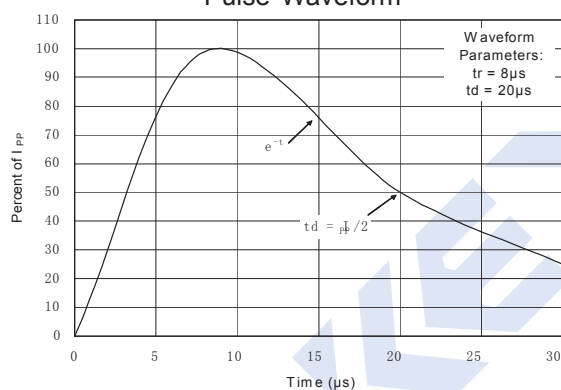
Non-Repetitive Peak Pulse Power vs. Pulse Time



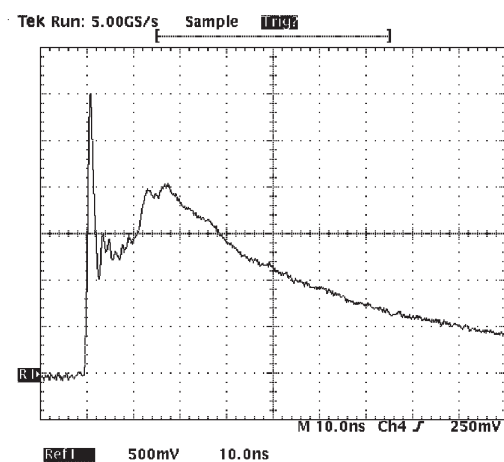
Power Derating Curve



Pulse Waveform



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



IEC 61000-4-2 Discharge Parameters

| Level | First Peak Current (A) | Peak Current at 30 ns (A) | Peak Current at 60 ns (A) | Test Voltage (Contact Discharge) (kV) | Test Voltage (Air Discharge) (kV) |
|-------|------------------------|---------------------------|---------------------------|---------------------------------------|-----------------------------------|
| 1     | 7.5                    | 4                         | 8                         | 2                                     | 2                                 |
| 2     | 15                     | 8                         | 4                         | 4                                     | 4                                 |
| 3     | 22.5                   | 12                        | 6                         | 6                                     | 8                                 |
| 4     | 30                     | 16                        | 8                         | 8                                     | 15                                |