

## Features

- For Sensitive ESD Protection
- Excellent Clamping Capability
- Low Leakage
- For Space Saving Application
- Fast Response, Response Time Less than 1ns
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free. "Green" Device (Note 1)
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

- Operating Junction Temperature Range: -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 625°C/W Junction to Ambient

| MCC Part Number | Device Marking |
|-----------------|----------------|
| ESD3V3D5        | ZE             |
| ESD5V0D5        | ZF             |
| ESD7V0D5        | ZH             |
| ESD12VD5        | ZM             |

|                    |                    |                 |
|--------------------|--------------------|-----------------|
| IEC61000-4-2(ESD)  | Air Contact        | ±30KV<br>±30KV  |
| JESD22-A114-B(ESD) | Machine Human Body | ±0.4KV<br>±16KV |

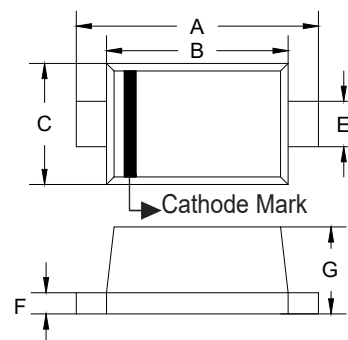
Note: 1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Internal Structure

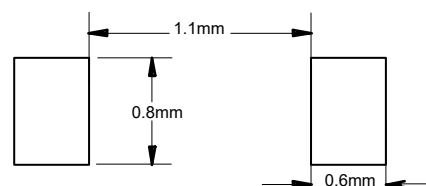


## ESD Protection Device

## SOD-523

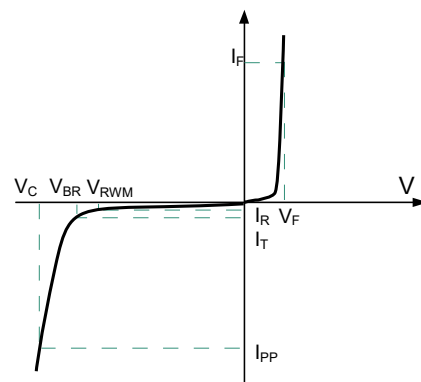


| DIMENSIONS |        |       |      |      |      |
|------------|--------|-------|------|------|------|
| DIM        | INCHES |       | MM   |      | NOTE |
|            | MIN    | MAX   | MIN  | MAX  |      |
| A          | 0.059  | 0.067 | 1.50 | 1.70 |      |
| B          | 0.043  | 0.051 | 1.10 | 1.30 |      |
| C          | 0.030  | 0.033 | 0.75 | 0.85 |      |
| E          | 0.010  | 0.014 | 0.25 | 0.35 |      |
| F          | 0.003  | 0.008 | 0.08 | 0.20 |      |
| G          | 0.020  | 0.026 | 0.50 | 0.65 |      |



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

| Symbol    | Parameter                           |
|-----------|-------------------------------------|
| $V_{RWM}$ | Peak Reverse Working Voltage        |
| $I_R$     | Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$  | Breakdown Voltage @ $I_T$           |
| $I_T$     | Test Current                        |
| $I_{PP}$  | Maximum Reverse Peak Pulse Current  |
| $V_C$     | Clamping Voltage @ $I_{PP}$         |
| $P_{PP}$  | Peak Pulse Power                    |
| $C_J$     | Junction Capacitance                |
| $I_F$     | Forward Current                     |
| $V_F$     | Forward Voltage @ $I_F$             |



**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

**ESD3V3D5**

| Parameter                 | Symbol    | Conditions                                      | Min. | Typ. | Max. | Units         |
|---------------------------|-----------|-------------------------------------------------|------|------|------|---------------|
| Reverse Working Voltage   | $V_{RWM}$ |                                                 |      |      | 3.3  | V             |
| Reverse Breakdown Voltage | $V_{BR}$  | $I_T = 1\text{mA}$                              | 5    |      |      | V             |
| Reverse Leakage Current   | $I_R$     | $V_{RWM} = 3.3\text{V}$                         |      |      | 0.08 | $\mu\text{A}$ |
| Forward Voltage           | $V_F$     | $I_F = 10\text{mA}$                             |      |      | 0.9  | V             |
| Peak Pulse Current        | $I_{PP}$  | $t_p = 8/20\mu\text{s}$                         |      |      | 16   | A             |
| Clamping Voltage          | $V_C$     | $I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$  |      |      | 9.4  | V             |
| Clamping Voltage          | $V_C$     | $I_{PP} = 16\text{A}$ , $t_p = 8/20\mu\text{s}$ |      |      | 13   | V             |
| Peak Pulse Power          | $P_{PK}$  | $t_p = 8/20\mu\text{s}$                         |      |      | 220  | W             |
| Junction Capacitance      | $C_J$     | $V_R = 0\text{V}$ , $f = 1\text{MHz}$           |      | 105  |      | pF            |

**ESD5V0D5**

| Parameter                 | Symbol    | Conditions                                       | Min. | Typ. | Max. | Units         |
|---------------------------|-----------|--------------------------------------------------|------|------|------|---------------|
| Reverse Working Voltage   | $V_{RWM}$ |                                                  |      |      | 5    | V             |
| Reverse Breakdown Voltage | $V_{BR}$  | $I_T = 1\text{mA}$                               | 6.2  |      |      | V             |
| Reverse Leakage Current   | $I_R$     | $V_{RWM} = 5\text{V}$                            |      |      | 0.05 | $\mu\text{A}$ |
| Forward Voltage           | $V_F$     | $I_F = 10\text{mA}$                              |      |      | 0.9  | V             |
| Peak Pulse Current        | $I_{PP}$  | $t_p = 8/20\mu\text{s}$                          |      |      | 9.4  | A             |
| Clamping Voltage          | $V_C$     | $I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$   |      |      | 11.6 | V             |
| Clamping Voltage          | $V_C$     | $I_{PP} = 9.4\text{A}$ , $t_p = 8/20\mu\text{s}$ |      |      | 18.6 | V             |
| Peak Pulse Power          | $P_{PK}$  | $t_p = 8/20\mu\text{s}$                          |      |      | 174  | W             |
| Junction Capacitance      | $C_J$     | $V_R = 0\text{V}$ , $f = 1\text{MHz}$            |      | 80   |      | pF            |

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

ESD7V0D5

| Parameter                 | Symbol    | Conditions                       | Min. | Typ. | Max. | Units   |
|---------------------------|-----------|----------------------------------|------|------|------|---------|
| Reverse Working Voltage   | $V_{RWM}$ |                                  |      |      | 7    | V       |
| Reverse Breakdown Voltage | $V_{BR}$  | $I_T = 1mA$                      | 7.5  |      |      | V       |
| Reverse Leakage Current   | $I_R$     | $V_{RWM} = 7V$                   |      |      | 0.03 | $\mu A$ |
| Forward Voltage           | $V_F$     | $I_F = 10mA$                     |      |      | 0.9  | V       |
| Peak Pulse Current        | $I_{PP}$  | $t_p = 8/20\mu s$                |      |      | 8.8  | A       |
| Clamping Voltage          | $V_C$     | $I_{PP} = 5A, t_p = 8/20\mu s$   |      |      | 13.5 | V       |
| Clamping Voltage          | $V_C$     | $I_{PP} = 8.8A, t_p = 8/20\mu s$ |      |      | 22.7 | V       |
| Peak Pulse Power          | $P_{PK}$  | $t_p = 8/20\mu s$                |      |      | 200  | W       |
| Junction Capacitance      | $C_J$     | $V_R = 0V, f = 1MHz$             |      | 65   |      | pF      |

ESD12VD5

| Parameter                 | Symbol    | Conditions                       | Min. | Typ. | Max. | Units   |
|---------------------------|-----------|----------------------------------|------|------|------|---------|
| Reverse Working Voltage   | $V_{RWM}$ |                                  |      |      | 12   | V       |
| Reverse Breakdown Voltage | $V_{BR}$  | $I_T = 1mA$                      | 14.1 |      |      | V       |
| Reverse Leakage Current   | $I_R$     | $V_{RWM} = 12V$                  |      |      | 0.02 | $\mu A$ |
| Forward Voltage           | $V_F$     | $I_F = 10mA$                     |      |      | 0.9  | V       |
| Peak Pulse Current        | $I_{PP}$  | $t_p = 8/20\mu s$                |      |      | 9.6  | A       |
| Clamping Voltage          | $V_C$     | $I_{PP} = 5A, t_p = 8/20\mu s$   |      |      | 23   | V       |
| Clamping Voltage          | $V_C$     | $I_{PP} = 9.6A, t_p = 8/20\mu s$ |      |      | 25   | V       |
| Peak Pulse Power          | $P_{PK}$  | $t_p = 8/20\mu s$                |      |      | 240  | W       |
| Junction Capacitance      | $C_J$     | $V_R = 0V, f = 1MHz$             |      | 55   |      | pF      |

## Curve Characteristics

Fig. 1 - 8 X 20 $\mu$ s Pulse Waveform

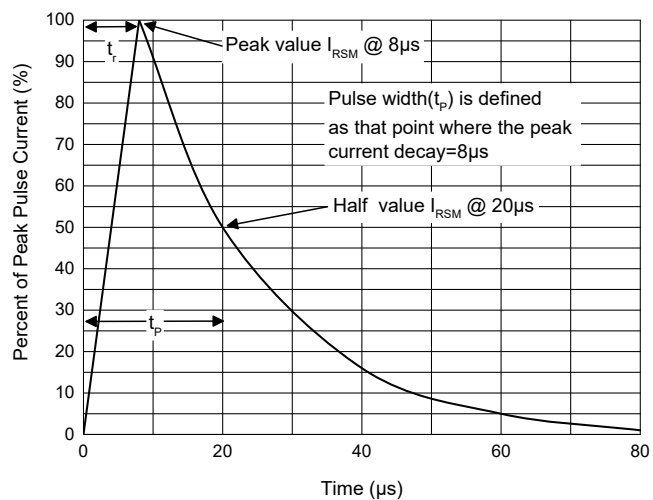
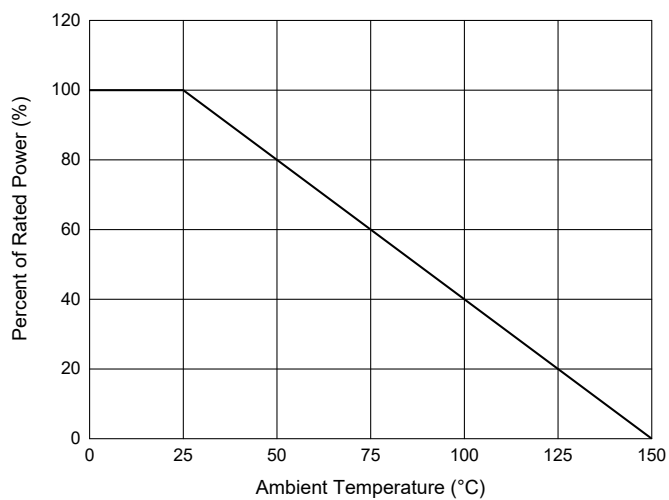


Fig. 2 - Pulse Derating Curve



## Ordering Information

| Device         | Packing               |
|----------------|-----------------------|
| Part Number-TP | Tape&Reel: 8Kpcs/Reel |

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