

# NSPM0101

## ESD Protection Diode

### Features

- Protection for the following IEC Standards:  
IEC61000-4-2 Level 4:  $\pm 30$  kV Contact Discharge  
IEC61000-4-5 (Lightning) 60 A (8/20  $\mu$ s)
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS

| Rating  | Symbol            | Value                | Unit |
|---|-------------------|----------------------|------|
| IEC 61000-4-2 (ESD)<br>Contact Air                                    |                   | $\pm 30$<br>$\pm 30$ | kV   |
| Operating Junction and Storage Temperature Range                      | $T_J$ , $T_{stg}$ | -65 to +150          | °C   |
| Maximum Peak Pulse Current<br>8/20 $\mu$ s @ $T_A = 25^\circ\text{C}$ | $I_{PP}$          | 60                   | A    |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



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### MARKING DIAGRAM



UDFN2  
CASE 517CZ



E = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

| Device        | Package            | Shipping <sup>†</sup> |
|---------------|--------------------|-----------------------|
| NSPM0101MUT5G | UDFN2<br>(Pb-Free) | 8000 / Tape & Reel    |

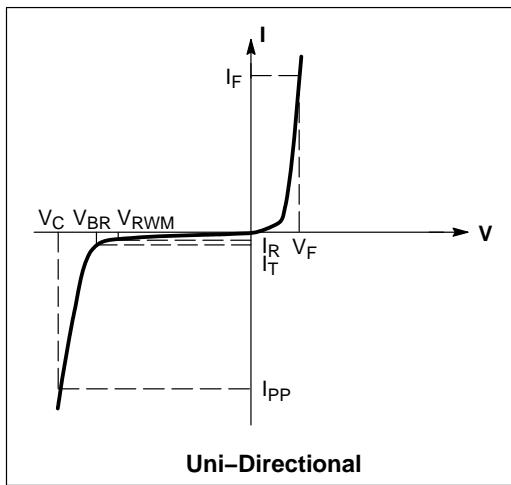
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted)

| Symbol           | Parameter  |
|------------------|--|
| I <sub>PP</sub>  | Maximum Reverse Peak Pulse Current                 |
| V <sub>C</sub>   | Clamping Voltage @ I <sub>PP</sub>                 |
| V <sub>RWM</sub> | Working Peak Reverse Voltage                       |
| I <sub>R</sub>   | Maximum Reverse Leakage Current @ V <sub>RWM</sub> |
| V <sub>BR</sub>  | Breakdown Voltage @ I <sub>T</sub>                 |
| I <sub>T</sub>   | Test Current                                       |

\*See Application Note AND8308/D for detailed explanations of datasheet parameters.

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise specified)

| Parameter                 | Symbol           | Conditions                       | Min | Typ  | Max | Unit |
|---------------------------|------------------|----------------------------------|-----|------|-----|------|
| Reverse Working Voltage   | V <sub>RWM</sub> |                                  |     |      | 10  | V    |
| Breakdown Voltage         | V <sub>BR</sub>  | I <sub>T</sub> = 1 mA            | 12  |      |     | V    |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>RWM</sub> = 10 V          |     |      | 0.5 | µA   |
| Clamping Voltage (Note 1) | V <sub>C</sub>   | I <sub>PP</sub> = 10 A           |     |      | 15  | V    |
| Clamping Voltage (Note 1) | V <sub>C</sub>   | I <sub>PP</sub> = 60 A           |     |      | 20  | V    |
| Dynamic Resistance        | R <sub>DYN</sub> | 100 ns TLP Pulse, I/O Pin to GND |     | 0.05 |     | Ω    |
| Junction Capacitance      | C <sub>J</sub>   | V <sub>R</sub> = 0 V, f = 1 MHz  |     |      | 400 | pF   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Non-repetitive current pulse at T<sub>A</sub> = 25°C, per IEC61000-4-5 waveform.

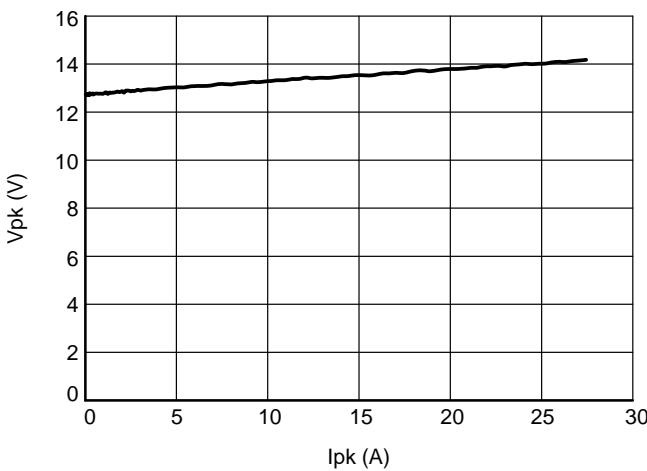


Figure 1. Positive TLP I-V Curve

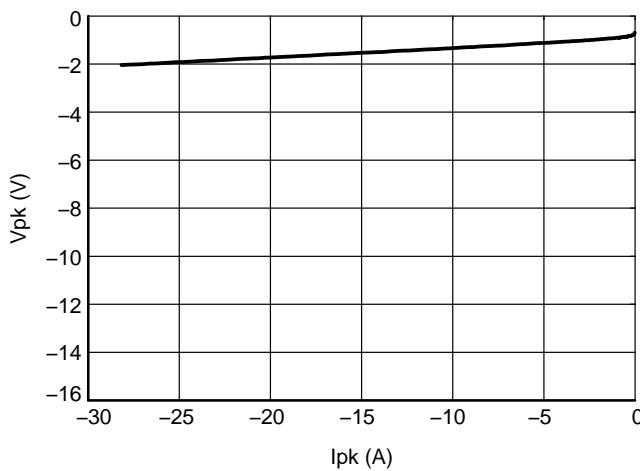


Figure 2. Negative TLP I-V Curve

## IEC 61000-4-2 Spec.

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

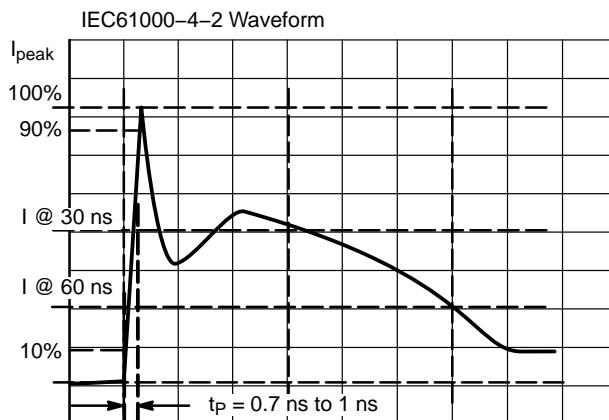


Figure 3. IEC61000-4-2 Spec

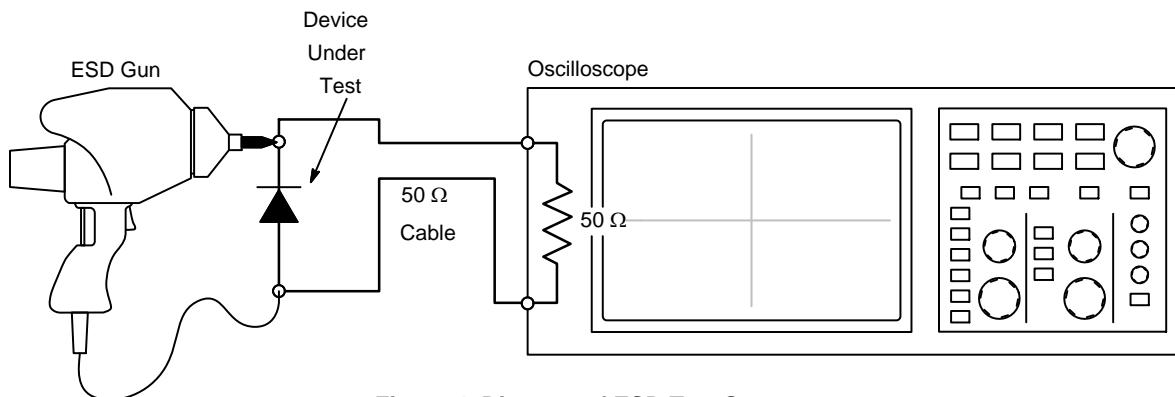


Figure 4. Diagram of ESD Test Setup

## ESD Voltage Clamping

For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000-4-2 waveform. Since the IEC61000-4-2 was written as a pass/fail spec for larger systems such as cell phones or laptop computers it is not clearly defined in the spec how to specify a clamping voltage

at the device level. ON Semiconductor has developed a way to examine the entire voltage waveform across the ESD protection diode over the time domain of an ESD pulse in the form of an oscilloscope screenshot, which can be found on the datasheets for all ESD protection diodes. For more information on how ON Semiconductor creates these screenshots and how to interpret them please refer to AND8307/D.

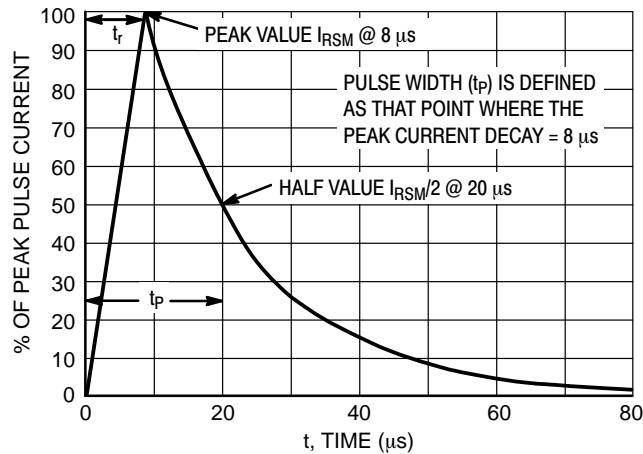


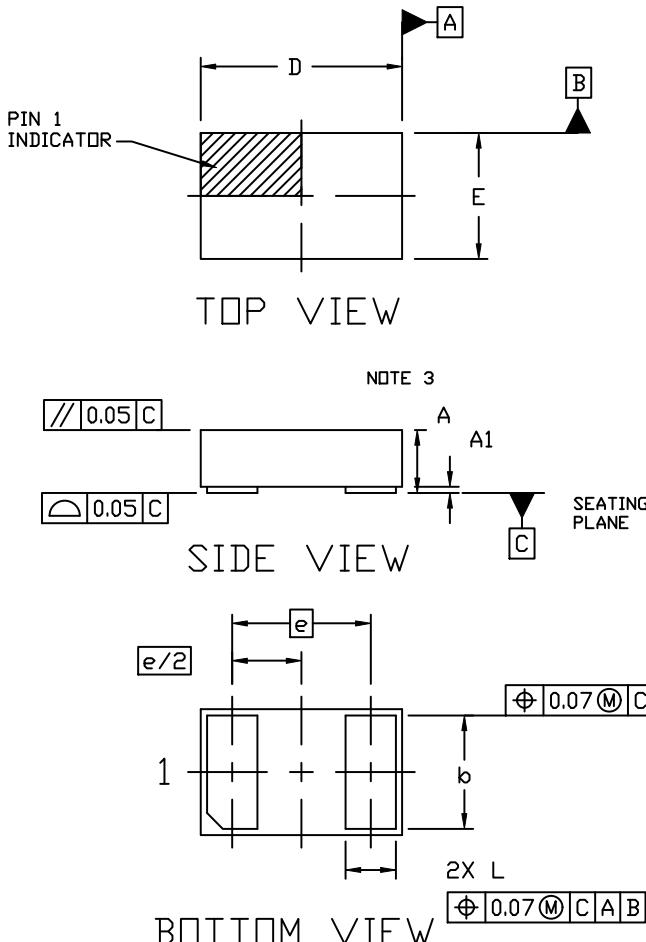
Figure 5. 8 x 20  $\mu\text{s}$  Pulse Waveform



SCALE 4:1

**UDFN2 1.6x1.0, 1.1P**  
CASE 517CZ  
ISSUE D

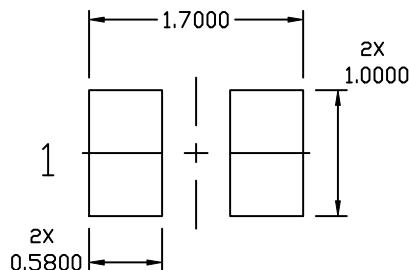
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NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS

|     | MILLIMETERS |      |      |
|-----|-------------|------|------|
| DIM | MIN.        | NOM. | MAX. |
| A   | 0.45        | 0.50 | 0.55 |
| A1  | ---         | ---  | 0.05 |
| b   | 0.83        | 0.88 | 0.93 |
| D   | 1.52        | 1.60 | 1.68 |
| E   | 0.92        | 1.00 | 1.08 |
| e   | 1.10 BSC    |      |      |
| L   | 0.35        | 0.40 | 0.45 |



**RECOMMENDED  
MOUNTING FOOTPRINT**

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

**GENERIC  
MARKING DIAGRAM\***



XX = Specific Device Code  
M = Date Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G", may or not be present. Some products may not follow the Generic Marking.

|                  |                     |   |
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