

# ESD and Surge Protection Diode

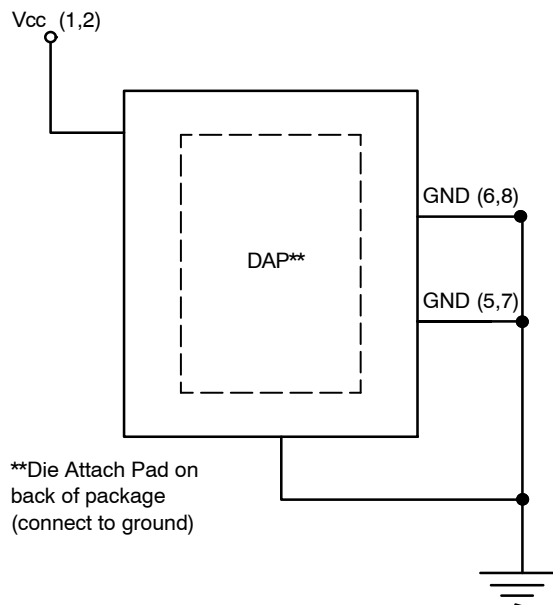
Low Clamping Voltage

## NSPU5201, NSPU5221 Series

### Features

- Unidirectional High Voltage ESD and Surge Protection
- Provides ESD Protection to IEC61000-4-2 Level 4:  $\pm 30$  kV Contact Discharge
- Small Package: 1.8 mm x 2.0 mm
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### APPLICATION DIAGRAM



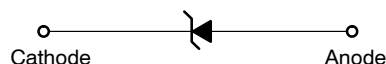
ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)



UDFN6  
CASE 517CS

### BLOCK DIAGRAM



### MARKING DIAGRAM



XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

### ORDERING INFORMATION

| Device        | Package         | Shipping†          |
|---------------|-----------------|--------------------|
| NSPU5201MUTBG | UDFN6 (Pb-Free) | 3000 / Tape & Reel |
| NSPU5221MUTBG | UDFN6 (Pb-Free) | 3000 / Tape & Reel |

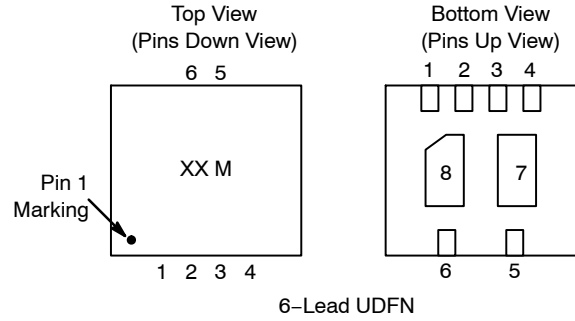
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NSPU5201, NSPU5221 Series

**Table 1. PIN DESCRIPTIONS**

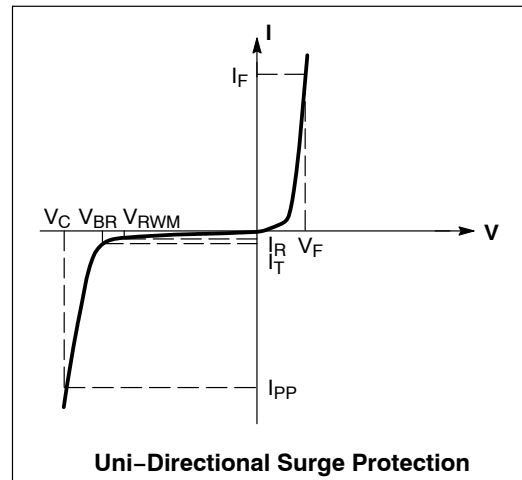
| 6-Lead, UDFN8 Package |          |             |
|-----------------------|----------|-------------|
| Pin                   | Name     | Description |
| 1                     | $V_{CC}$ | Cathode     |
| 2                     | $V_{CC}$ | Cathode     |
| 3                     | N/C      | No Connect  |
| 4                     | N/C      | No Connect  |
| 5                     | GND      | Anode       |
| 6                     | GND      | Anode       |
| 7                     | GND      | Anode       |
| 8                     | GND      | Anode       |

## PACKAGE / PINOUT DIAGRAMS



## ELECTRICAL CHARACTERISTICS

| 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 @ $I_F$                     |



# NSPU5201, NSPU5221 Series

## SPECIFICATIONS

**Table 2. MAXIMUM RATINGS**

| Parameter                   | Rating      | Units |
|-----------------------------|-------------|-------|
| Operating Temperature Range | –55 to +125 | °C    |
| Storage Temperature Range   | –65 to +150 | °C    |

Stresses at or above those listed in Maximum Ratings table may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Also, due to variations in test equipment, stresses shown above are averages.

## ELECTRICAL CHARACTERISTICS

| Device Name | Device Marking | $V_{RWM}$ (V) | $I_R$ @ $V_{RWM}$ ( $\mu$ A) | Breakdown Voltage |      |      |              | $I_{PP}$ (A)<br>(8 x 20 $\mu$ s) | $V_C$ @ $I_{PP}$<br>(8 x 20 $\mu$ s) |              |
|-------------|----------------|---------------|------------------------------|-------------------|------|------|--------------|----------------------------------|--------------------------------------|--------------|
|             |                |               |                              | $V_{BR}$ V        |      |      | @ $I_T$ (mA) |                                  | $V_C$ (V)                            | $I_{PP}$ (A) |
|             |                | Max           | Max                          | Min               | Nom  | Max  |              | Min                              | Max                                  |              |
| NSPU5201    | AZ             | 20            | 1                            | 21.7              | 22.7 | 23.7 | 1            | 140                              | 31.5                                 | 110          |
| NSPU5221    | A2             | 20            | 1                            | 24                | 25   | 26   | 1            | 120                              | 33                                   | 100          |
|             |                | 22            | 2                            |                   |      |      |              |                                  | 35                                   | 120          |

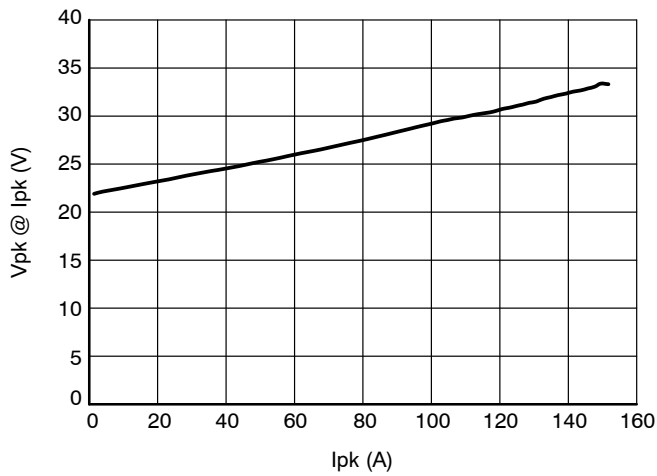
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## ELECTRICAL CHARACTERISTICS (NSPU5221)

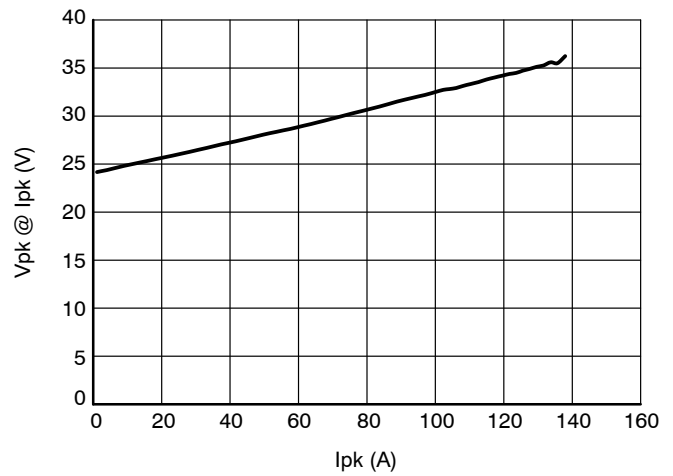
|                           | Description                                                                                             | Min | Typ  | Max  | Unit |
|---------------------------|---------------------------------------------------------------------------------------------------------|-----|------|------|------|
| $V_{CLAMP}$ Clamp Voltage | 24 A IEC61000–4–5 Surge (8/20 $\mu$ s) from IO to GND, $V_{IN}$ = 0 V before surge, 25°C                |     | 26.8 | 28.5 | V    |
|                           | 40 A IEC61000–4–5 Surge (8/20 $\mu$ s) from IO to GND, $V_{IN}$ = 0 V before surge, 25°C                |     | 28.3 | 30   | V    |
|                           | 35 A IEC61000–4–5 Surge (8/20 $\mu$ s) from IO to GND, $V_{IN}$ = $V_{RWM}$ before surge, $T_A$ = 125°C |     | 29.4 | 31   | V    |

# NSPU5201, NSPU5221 Series

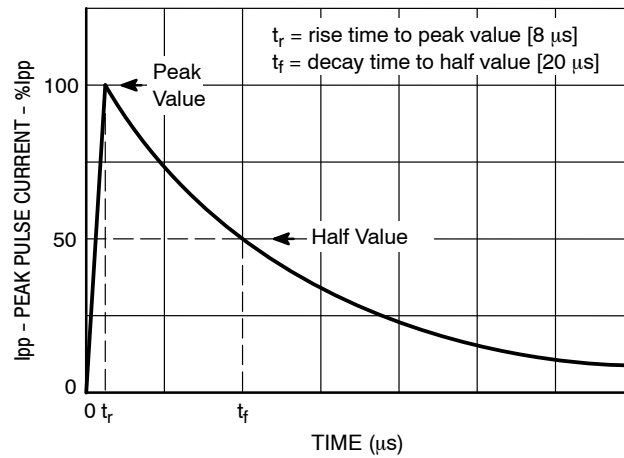
## TYPICAL CHARACTERISTICS



**Figure 1. NSPU5021 Positive Clamping Voltage vs. Peak Pulse Current ( $t_p = 8/20 \mu s$ )**



**Figure 2. NSPU5221 Positive Clamping Voltage vs. Peak Pulse Current ( $t_p = 8/20 \mu s$ )**



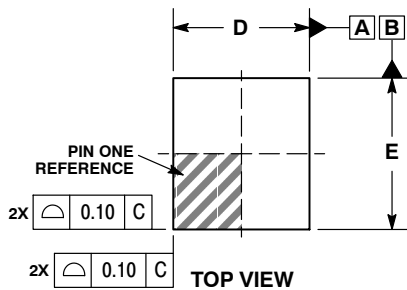
**Figure 3. IEC61000-4-5 8/20  $\mu s$  Pulse Waveform**



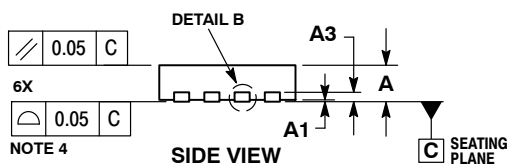
SCALE 4:1

**UDFN6, 1.8x2, 0.4P**  
CASE 517CS  
ISSUE O

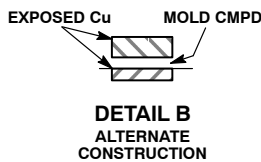
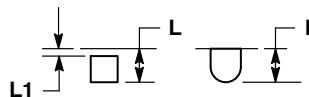
DATE 30 APR 2013



TOP VIEW



SIDE VIEW


DETAIL B  
ALTERNATE  
CONSTRUCTION

DETAIL A  
ALTERNATE  
CONSTRUCTIONS

## NOTES:

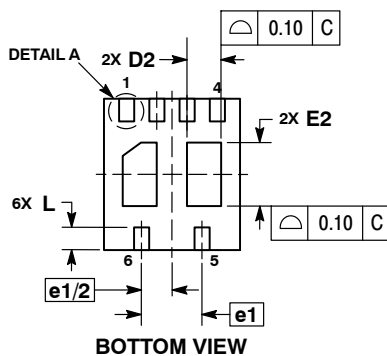
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| MILLIMETERS |           |      |
|-------------|-----------|------|
| DIM         | MIN       | MAX  |
| A           | 0.45      | 0.55 |
| A1          | 0.00      | 0.05 |
| A3          | 0.125 REF |      |
| b           | 0.15      | 0.25 |
| D           | 1.80 BSC  |      |
| D2          | 0.35      | 0.55 |
| E           | 2.00 BSC  |      |
| E2          | 0.74      | 0.94 |
| e           | 0.40 BSC  |      |
| e1          | 0.80 BSC  |      |
| e2          | 0.95 BSC  |      |
| L           | 0.20      | 0.40 |
| L1          | ---       | 0.15 |

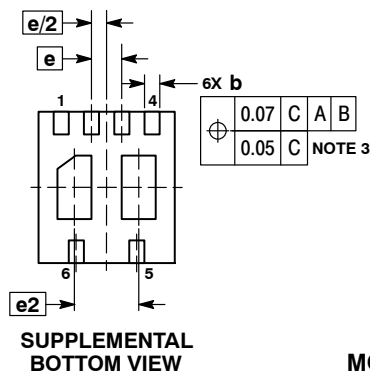
**GENERIC**  
**MARKING DIAGRAM\***

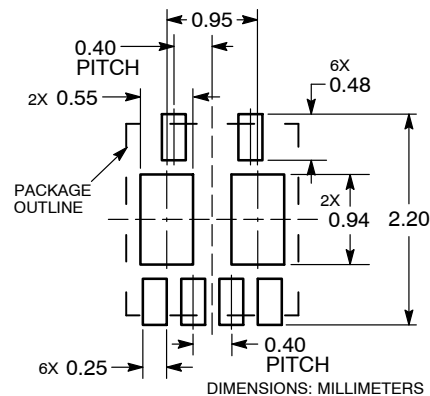
XX = Specific Device Code  
M = Date Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.



BOTTOM VIEW


SUPPLEMENTAL  
BOTTOM VIEW

**RECOMMENDED**  
**MOUNTING FOOTPRINT\***


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

|                         |                          |                                                                                                                                                                                  |
|-------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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