

# NLAS5213

## 1 $\Omega$ $R_{ON}$ DPST and Dual SPST Switches

The NLAS5213A and NLAS5213B are DPST and Dual SPST devices, respectively. They each consist of 2 single throw switches and are both designed for audio applications within portable devices. The NLAS5213A is controlled with a single enable pin while the NLAS5213B has two independent enables.

Both the NLAS5213A and NLAS5213B operate over a wide  $V_{CC}$  range, 1.65 V to 4.5 V, and maintain a very low  $R_{ON}$ : 1.3  $\Omega$  Max @  $V_{CC} = 4.2$  V. Each is available in a choice of two packages: US8 and UDFN8.

### Features

- PST and Dual SPST Pinouts
- $R_{ON}$ : 1.3  $\Omega$  Max @  $V_{CC} = 4.2$  V
- $V_{CC}$  Range: 1.65 V to 4.5 V
- 8 kV Human Body Model ESD on I/O to GND
- UDFN8 or US8 Packages Available
- These are Pb-Free Devices

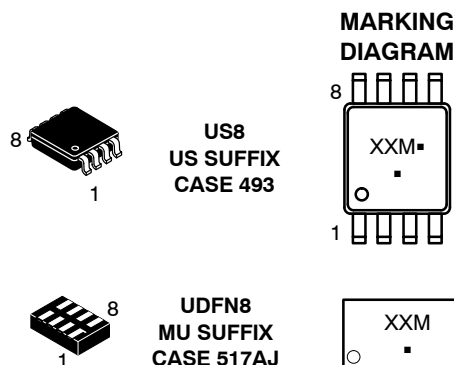
### Typical Applications

- Mobile Phones
- Portable Devices



**ON Semiconductor®**

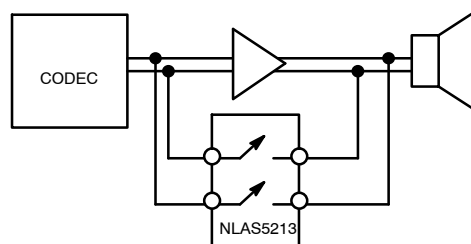
<http://onsemi.com>



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

(Note: Microdot may be in either location)

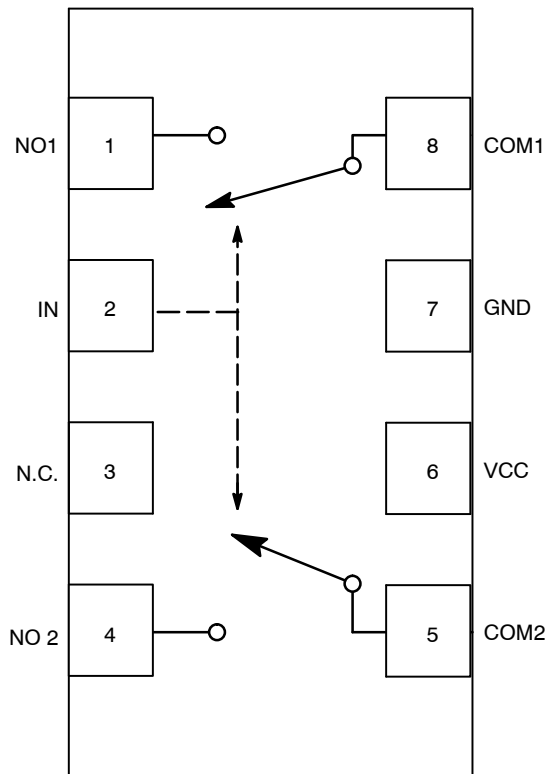
### APPLICATION DIAGRAM



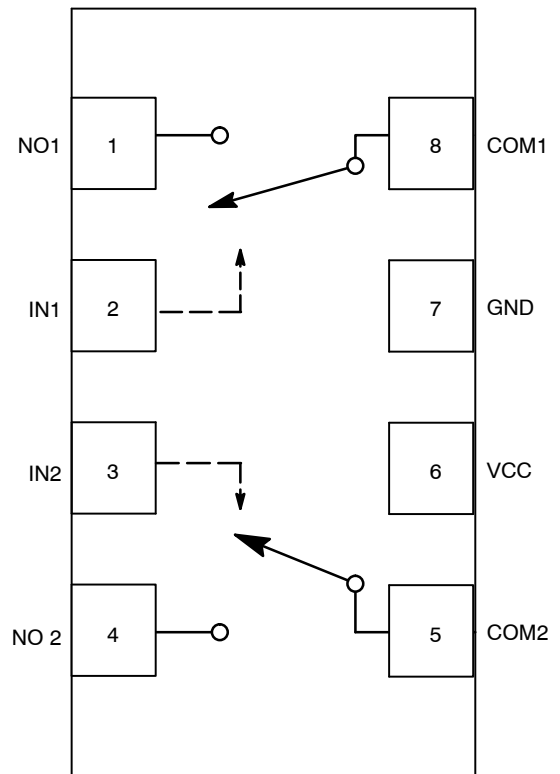
### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 9 of this data sheet.

# NLAS5213

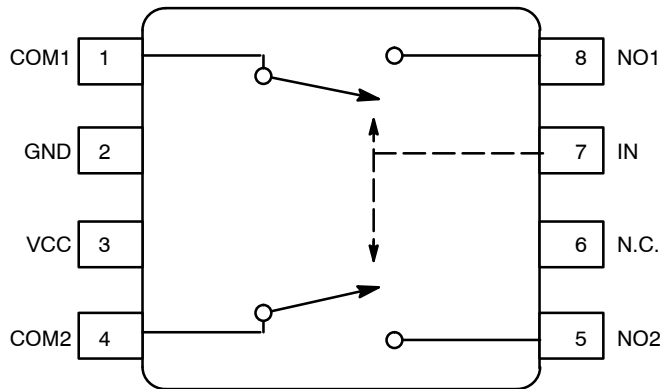


NLA5213A

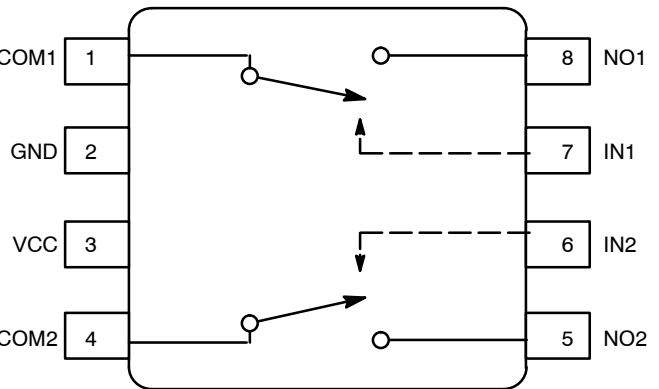


NLA5213B

Figure 1. Functional Block Diagram Pinouts (UDFN8)



NLA5213A



NLA5213B

Figure 2. Functional Block Diagram Pinouts (US8)

# NLAS5213

## NLAS5213A

| Pin # |     | Name            | Direction | Description                           |
|-------|-----|-----------------|-----------|---------------------------------------|
| UDFN8 | US8 |                 |           |                                       |
| 1     | 8   | NO1             | I/O       | Normally Open Signal Line of Switch 1 |
| 2     | 7   | IN              | Input     | Control Input                         |
| 3     | 6   | N.C.            | N/A       | No Connect                            |
| 4     | 5   | NO2             | I/O       | Normally Open Signal Line of Switch 2 |
| 5     | 4   | COM2            | I/O       | Common Signal Line of Switch 2        |
| 6     | 3   | V <sub>CC</sub> | Input     | Analog Supply Voltage                 |
| 7     | 2   | GND             | Input     | Ground                                |
| 8     | 1   | COM1            | I/O       | Common Signal Line of Switch 1        |

## NLAS5213B

| Pin # |     | Name            | Direction | Description                           |
|-------|-----|-----------------|-----------|---------------------------------------|
| UDFN8 | US8 |                 |           |                                       |
| 1     | 8   | NO1             | I/O       | Normally Open Signal Line of Switch 1 |
| 2     | 7   | IN1             | Input     | Control Input of Switch 1             |
| 3     | 6   | IN2             | Input     | Control Input of Switch 2             |
| 4     | 5   | NO2             | I/O       | Normally Open Signal Line of Switch 2 |
| 5     | 4   | COM2            | I/O       | Common Signal Line of Switch 2        |
| 6     | 3   | V <sub>CC</sub> | Input     | Analog Supply Voltage                 |
| 7     | 2   | GND             | Input     | Ground                                |
| 8     | 1   | COM1            | I/O       | Common Signal Line of Switch 1        |

### NLAS5213A FUNCTION TABLE

| IN | NO1, NO2 |
|----|----------|
| 0  | OFF      |
| 1  | ON       |

### NLAS5213B FUNCTION TABLE

| IN | NO1, NO2 |
|----|----------|
| 0  | OFF      |
| 1  | ON       |

## OPERATING CONDITIONS

### MAXIMUM RATINGS

| Symbol              | Pins            | Parameter                       | Value                         | Condition      | Unit |
|---------------------|-----------------|---------------------------------|-------------------------------|----------------|------|
| V <sub>CC</sub>     | V <sub>CC</sub> | Positive DC Supply Voltage      | –0.5 to 5.5                   |                | V    |
| V <sub>IS</sub>     | NOx, NCx, COMx  | Analog Signal Voltage           | –0.5 to V <sub>CC</sub> + 0.5 |                | V    |
| V <sub>IN</sub>     | IN1, IN2        | Control Input Voltage           | –0.5 to 5.5                   |                | V    |
| I <sub>CC</sub>     | V <sub>CC</sub> | Positive DC Supply Current      | 50                            |                | mA   |
| I <sub>IS_CON</sub> | NOx, NCx, COMx  | Analog Signal Continues Current | ±300                          | Closed Switch  | mA   |
| I <sub>IS_PK</sub>  | NOx, NCx, COMx  | Analog Signal Peak Current      | ±500                          | 10% Duty Cycle | mA   |
| I <sub>IN</sub>     | IN              | Control Input Current           | ±20                           |                | mA   |
| T <sub>STG</sub>    |                 | Storage Temperature Range       | –65 to 150                    |                | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### RECOMMENDED OPERATING CONDITIONS\*

| Symbol          | Pins            | Parameter                   | Value                | Condition | Unit |
|-----------------|-----------------|-----------------------------|----------------------|-----------|------|
| V <sub>CC</sub> | V <sub>CC</sub> | Positive DC Supply Voltage  | 1.65 to 4.5          |           | V    |
| V <sub>IS</sub> | NOx, NCx, COMx  | Analog Signal Voltage       | 0 to V <sub>CC</sub> |           | V    |
| V <sub>IN</sub> | IN1, IN2        | Control Input Voltage       | 0 to V <sub>CC</sub> |           | V    |
| T <sub>A</sub>  |                 | Operating Temperature Range | –40 to 85            |           | °C   |

Minimum and maximum values are guaranteed through test or design across the **Recommended Operating Conditions**, where applicable. Typical values are listed for guidance only and are based on the particular conditions listed for each section, where applicable. These conditions are valid for all values found in the characteristics tables unless otherwise specified in the test conditions.

### ESD PROTECTION

| Symbol | Parameter                                  | Value      | Unit |
|--------|--------------------------------------------|------------|------|
| ESD    | Human Body Model<br>I/O to GND<br>All Pins | 8.0<br>4.0 | kV   |

### DC ELECTRICAL CHARACTERISTICS

#### CONTROL INPUT (Typical: T = 25°C, V<sub>CC</sub> = 3.3 V)

| Symbol          | Pins | Parameter                     | Test Conditions                       | V <sub>CC</sub> (V) | –40°C to +85°C    |     |                   | Unit |
|-----------------|------|-------------------------------|---------------------------------------|---------------------|-------------------|-----|-------------------|------|
|                 |      |                               |                                       |                     | Min               | Typ | Max               |      |
| V <sub>IH</sub> | OE   | Control Input HIGH Voltage    |                                       | 2.7<br>3.3<br>4.2   | 1.4<br>1.7<br>2.3 | –   | –                 | V    |
| V <sub>IL</sub> | OE   | Control Input LOW Voltage     |                                       | 2.7<br>3.3<br>4.2   | –                 | –   | 0.5<br>0.5<br>0.8 | V    |
| I <sub>IN</sub> | OE   | Control Input Leakage Current | 0 ≤ V <sub>IS</sub> ≤ V <sub>CC</sub> | 1.65 – 4.5          | –                 | –   | ±1.0              | μA   |

# NLAS5213

## SUPPLY CURRENT AND LEAKAGE (Typical: T = 25°C, V<sub>CC</sub> = 3.3 V)

| Symbol           | Pins            | Parameter                                       | Test Conditions                                                | V <sub>CC</sub> (V) | -40°C to +85°C |     |      | Unit |
|------------------|-----------------|-------------------------------------------------|----------------------------------------------------------------|---------------------|----------------|-----|------|------|
|                  |                 |                                                 |                                                                |                     | Min            | Typ | Max  |      |
| I <sub>CC</sub>  | V <sub>CC</sub> | Quiescent Supply Current                        | V <sub>IS</sub> = V <sub>CC</sub> or GND; I <sub>D</sub> = 0 A | 1.65 – 4.5          | –              | –   | 1.0  | μA   |
| I <sub>CCT</sub> | V <sub>CC</sub> | Increase in I <sub>CC</sub> per Control Voltage | V <sub>IN</sub> = 2.6 V                                        | 3.6                 | –              | –   | 10.0 | μA   |
| I <sub>OZ</sub>  |                 | OFF State Leakage                               | 0 ≤ V <sub>IS</sub> ≤ V <sub>CC</sub>                          | 1.65 – 4.5          | –              | –   | ±1.0 | μA   |
| I <sub>OFF</sub> | D+, D–          | Power OFF Leakage Current                       | 0 ≤ V <sub>IS</sub> ≤ V <sub>CC</sub>                          | 0                   | –              | –   | ±1.0 | μA   |

## ON RESISTANCE (Typical: T = 25°C, V<sub>CC</sub> = 3.3 V)

| Symbol            | Pins | Parameter              | Test Conditions                                                     | V <sub>CC</sub> (V) | -40°C to +85°C |                      |                   | Unit |
|-------------------|------|------------------------|---------------------------------------------------------------------|---------------------|----------------|----------------------|-------------------|------|
|                   |      |                        |                                                                     |                     | Min            | Typ                  | Max               |      |
| R <sub>ON</sub>   |      | On-Resistance          | I <sub>ON</sub> = –100 mA<br>V <sub>IS</sub> = 0 to V <sub>CC</sub> | 2.7<br>3.3<br>4.2   | –              |                      | 2.0<br>1.4<br>1.3 | Ω    |
| R <sub>FLAT</sub> |      | On-Resistance Flatness | I <sub>ON</sub> = –100 mA<br>V <sub>IS</sub> = 0 to V <sub>CC</sub> | 2.7<br>3.3<br>4.2   | –              | 0.32<br>0.35<br>0.37 | –                 | Ω    |
| ΔR <sub>ON</sub>  |      | On-Resistance Matching | I <sub>ON</sub> = –100 mA<br>V <sub>IS</sub> = 0 to V <sub>CC</sub> | 2.7<br>3.3<br>4.2   | –              | 0.16<br>0.16<br>0.15 | –                 | Ω    |

## AC ELECTRICAL CHARACTERISTICS

### TIMING/FREQUENCY (Typical: T = 25°C, V<sub>CC</sub> = 3.3 V, R<sub>L</sub> = 50 Ω, C<sub>L</sub> = 5 pF, f = 1 MHz)

| Symbol           | Pins           | Parameter       | Test Conditions       | V <sub>CC</sub> (V) | -40°C to +85°C |     |     | Unit |
|------------------|----------------|-----------------|-----------------------|---------------------|----------------|-----|-----|------|
|                  |                |                 |                       |                     | Min            | Typ | Max |      |
| t <sub>ON</sub>  | Closed to Open | Turn-ON Time    |                       | 1.65 – 4.5          | –              | 20  | –   | ns   |
| t <sub>OFF</sub> | Open to Closed | Turn-OFF Time   |                       | 1.65 – 4.5          | –              | 15  | –   | ns   |
| BW               |                | –3 dB Bandwidth | C <sub>L</sub> = 5 pF | 1.65 – 4.5          | –              | 496 | –   | MHz  |

### ISOLATION (Typical: T = 25°C, V<sub>CC</sub> = 3.3 V, R<sub>L</sub> = 50 Ω, C<sub>L</sub> = 5 pF, f = 1 MHz)

| Symbol            | Pins       | Parameter                      | Test Conditions | V <sub>CC</sub> (V) | -40°C to +85°C |     |     | Unit |
|-------------------|------------|--------------------------------|-----------------|---------------------|----------------|-----|-----|------|
|                   |            |                                |                 |                     | Min            | Typ | Max |      |
| O <sub>IRR</sub>  | Open       | OFF-Isolation                  |                 | 1.65 – 4.5          | –              | –57 | –   | dB   |
| X <sub>TALK</sub> | HSD+, HSD– | Non-Adjacent Channel Crosstalk |                 | 1.65 – 4.5          | –              | –97 | –   | dB   |

### CAPACITANCE (Typical: T = 25°C, V<sub>CC</sub> = 3.3 V, R<sub>L</sub> = 50 Ω, C<sub>L</sub> = 5 pF, f = 1 MHz)

| Symbol           | Pins        | Parameter                     | Test Conditions                                  | -40°C to +85°C |     |     | Unit |
|------------------|-------------|-------------------------------|--------------------------------------------------|----------------|-----|-----|------|
|                  |             |                               |                                                  | Min            | Typ | Max |      |
| C <sub>IN</sub>  | OE          | Control Pin Input Capacitance | V <sub>CC</sub> = 0 V                            | –              | 8.5 | –   | pF   |
| C <sub>ON</sub>  | HSD+, to D+ | ON Capacitance                | V <sub>IN</sub> = 0 V                            | –              | 32  | –   | pF   |
| C <sub>OFF</sub> | HSD+, HSD–  | OFF Capacitance               | V <sub>IS</sub> = 3.3 V; V <sub>IN</sub> = 3.3 V | –              | 19  | –   | pF   |

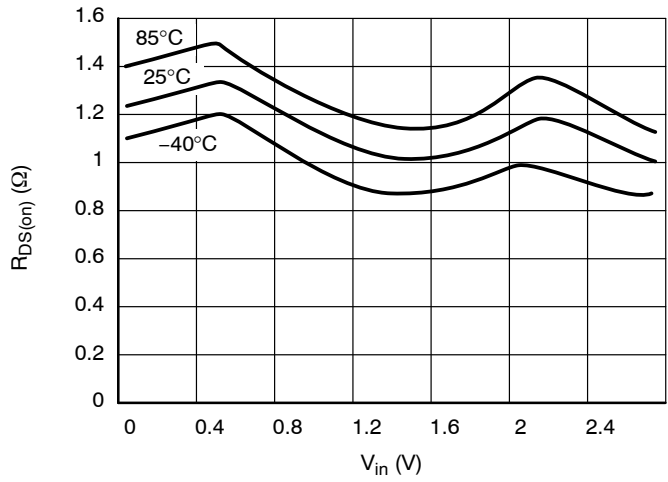


Figure 3.  $R_{ON}$  @  $V_{CC} = 2.7$  V

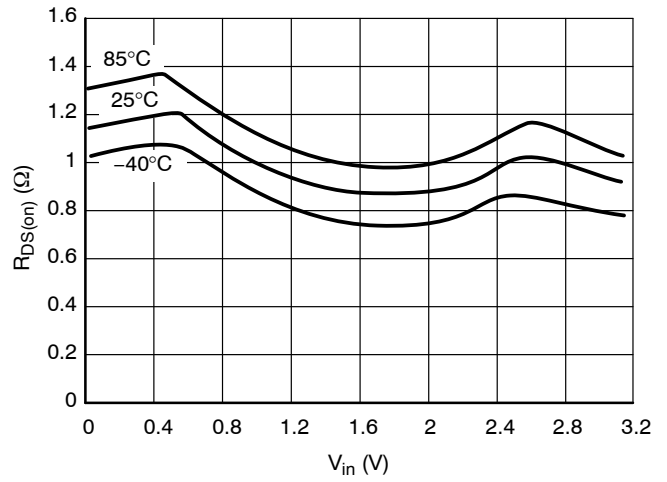


Figure 4.  $R_{ON}$  @  $V_{CC} = 3.3$  V

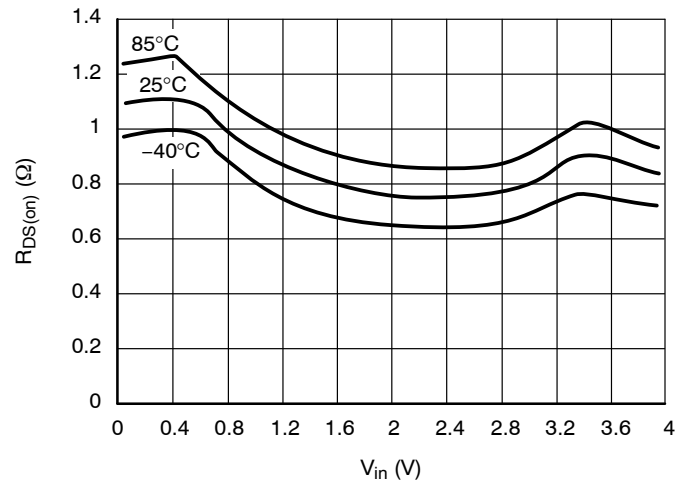


Figure 5.  $R_{ON}$  @  $V_{CC} = 4.2$  V

# NLAS5213

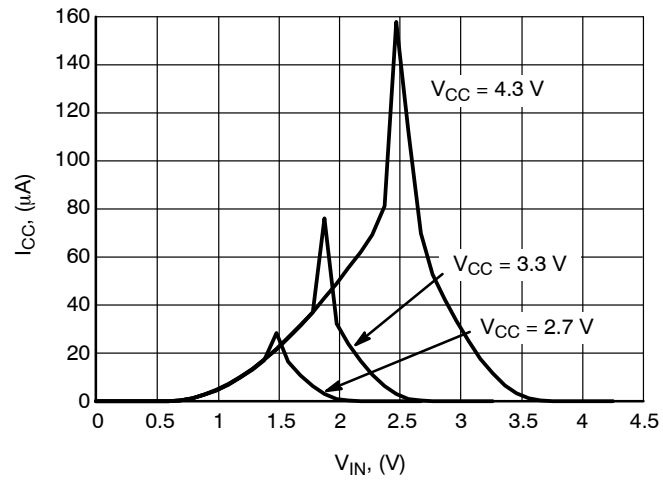


Figure 6.  $I_{CC}$  vs.  $V_{IN}$

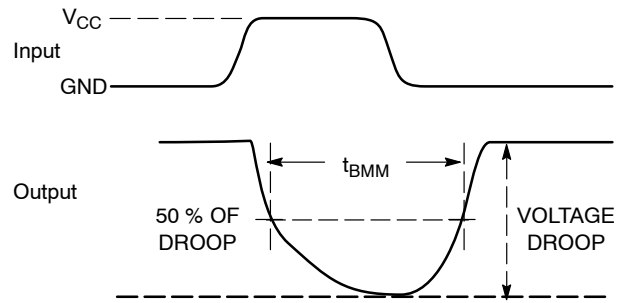
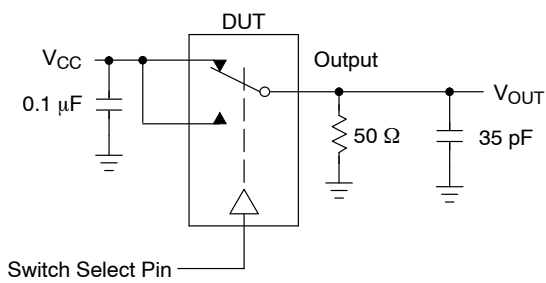


Figure 7.  $t_{BMM}$  (Time Break-Before-Make)

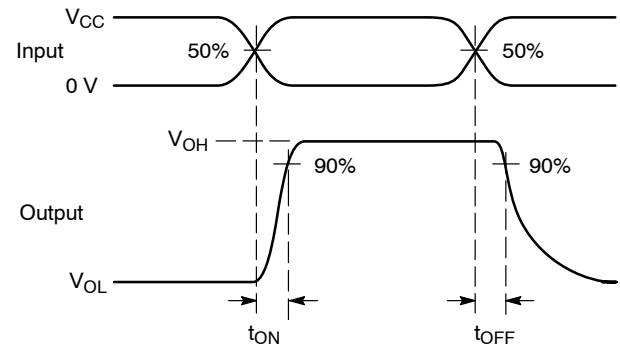
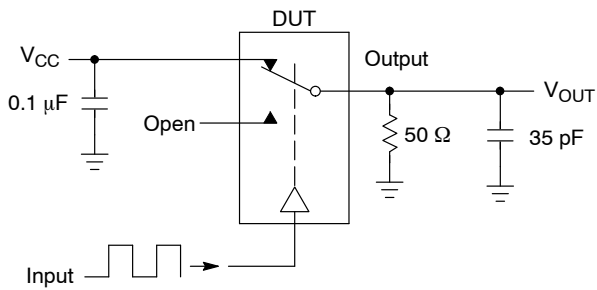


Figure 8.  $t_{ON}/t_{OFF}$

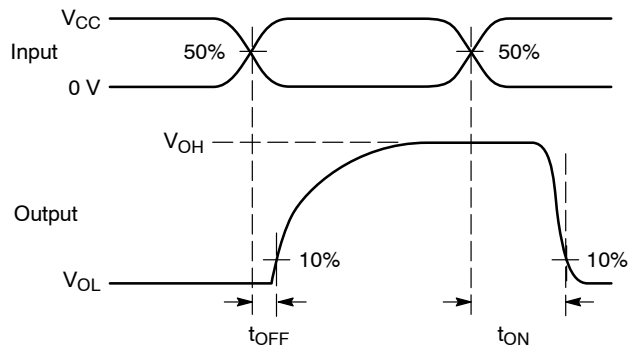
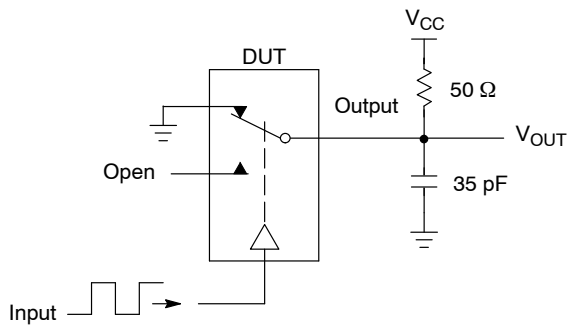
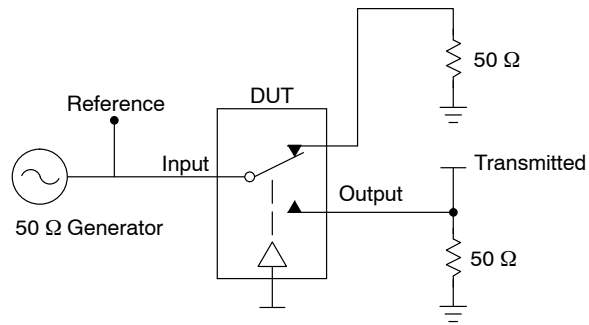


Figure 9.  $t_{ON}/t_{OFF}$



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch.  $V_{ISO}$ , Bandwidth and  $V_{ONL}$  are independent of the input signal direction.

$$V_{ISO} = \text{Off Channel Isolation} = 20 \text{ Log} \left( \frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz}$$

$$V_{ONL} = \text{On Channel Loss} = 20 \text{ Log} \left( \frac{V_{OUT}}{V_{IN}} \right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz to } 50 \text{ MHz}$$

Bandwidth (BW) = the frequency 3 dB below  $V_{ONL}$

$V_{CT}$  = Use  $V_{ISO}$  setup and test to all other switch analog input/outputs terminated with 50 Ω

**Figure 10. Off Channel Isolation/On Channel Loss (BW)/Crosstalk  
(On Channel to Off Channel)/ $V_{ONL}$**

## NLAS5213

### DEVICE ORDERING INFORMATION

| Device         | Marking | Package Type       | Shipping <sup>†</sup> |
|----------------|---------|--------------------|-----------------------|
| NLAS5213AUSG   | VD      | US8<br>(Pb-Free)   | 3,000 / Tape & Reel   |
| NLAS5213AMUTAG | VD      | UDFN8<br>(Pb-Free) | 3,000 / Tape & Reel   |
| NLAS5213BUSG   | VE      | US8<br>(Pb-Free)   | 3,000 / Tape & Reel   |
| NLAS5213BMUTAG | VE      | UDFN8<br>(Pb-Free) | 3,000 / Tape & Reel   |

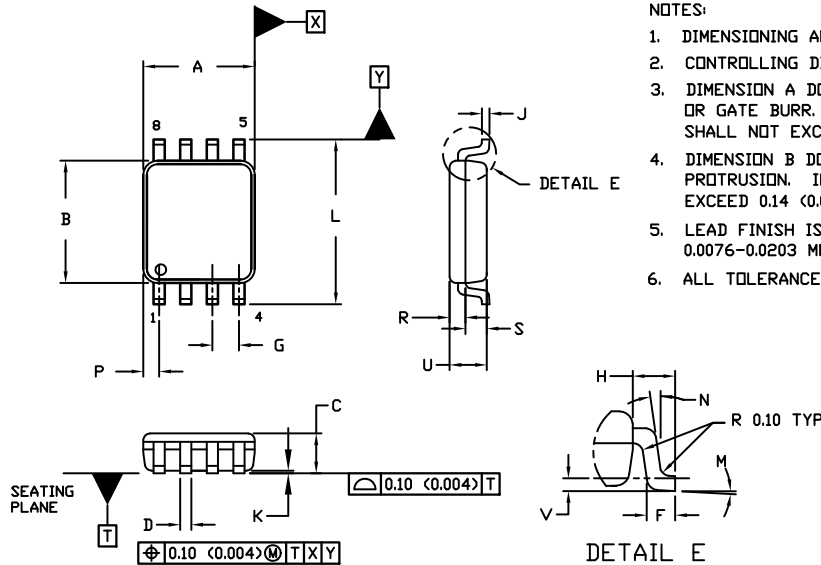
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



SCALE 4:1

**US8**  
**CASE 493**  
**ISSUE F**

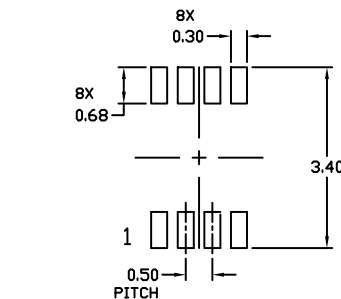
DATE 01 SEP 2021



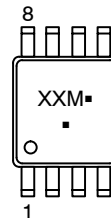
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSION, OR GATE BURR. MOLD FLASH, PROTRUSION, OR GATE BURR SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH AND PROTRUSION SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
5. LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076-0.0203 MM (0.003-0.008").
6. ALL TOLERANCE UNLESS OTHERWISE SPECIFIED ±0.0508 MM (0.002").

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN.        | MAX. | MIN.      | MAX.  |
| A   | 1.90        | 2.10 | 0.075     | 0.083 |
| B   | 2.20        | 2.40 | 0.087     | 0.094 |
| C   | 0.60        | 0.90 | 0.024     | 0.035 |
| D   | 0.17        | 0.25 | 0.007     | 0.010 |
| F   | 0.20        | 0.35 | 0.008     | 0.014 |
| G   | 0.50 BSC    |      | 0.020 BSC |       |
| H   | 0.40 REF    |      | 0.016 REF |       |
| J   | 0.10        | 0.18 | 0.004     | 0.007 |
| K   | 0.00        | 0.10 | 0.000     | 0.004 |
| L   | 3.00        | 3.25 | 0.118     | 0.128 |
| M   | 0°          | 6°   | 0°        | 6°    |
| N   | 0°          | 10°  | 0°        | 10°   |
| P   | 0.23        | 0.34 | 0.010     | 0.013 |
| R   | 0.23        | 0.33 | 0.009     | 0.013 |
| S   | 0.37        | 0.47 | 0.015     | 0.019 |
| U   | 0.60        | 0.80 | 0.024     | 0.031 |
| V   | 0.12 BSC    |      | 0.005 BSC |       |


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

\* For additional information on our Pb-Free strategy and soldering details, please download the DSI Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDER99/D.

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


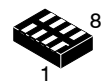
XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*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. Some products may not follow the Generic Marking.

|                         |                    |                                                                                                                                                                                  |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON04475D</b> | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>US8</b>         | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

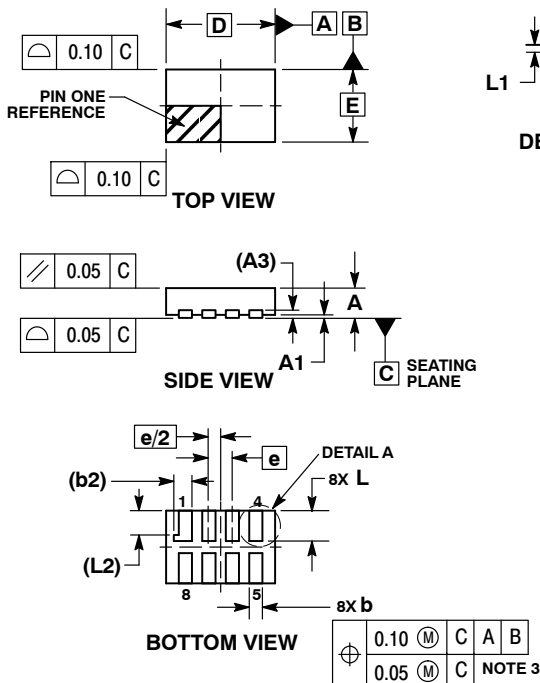
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SCALE 4:1

UDFN8 1.8x1.2, 0.4P  
CASE 517AJ  
ISSUE O

DATE 08 NOV 2006

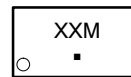


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL TIP.
4. MOLD FLASH ALLOWED ON TERMINALS ALONG EDGE OF PACKAGE. FLASH MAY NOT EXCEED 0.03 ONTO BOTTOM SURFACE OF TERMINALS.
5. DETAIL A SHOWS OPTIONAL CONSTRUCTION FOR TERMINALS.

| MILLIMETERS |           |      |
|-------------|-----------|------|
| DIM         | MIN       | MAX  |
| A           | 0.45      | 0.55 |
| A1          | 0.00      | 0.05 |
| A3          | 0.127 REF |      |
| b           | 0.15      | 0.25 |
| b2          | 0.30 REF  |      |
| D           | 1.80 BSC  |      |
| E           | 1.20 BSC  |      |
| e           | 0.40 BSC  |      |
| L           | 0.45      | 0.55 |
| L1          | 0.00      | 0.03 |
| L2          | 0.40 REF  |      |

GENERIC  
MARKING DIAGRAM\*



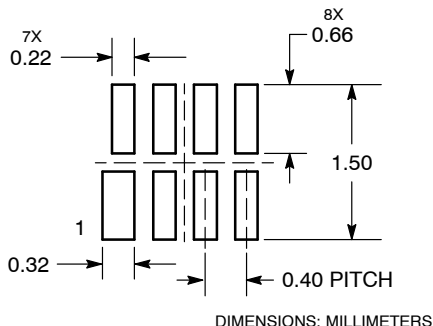
XX = Specific Device Code

M = Date Code

■ = Pb-Free Package

\*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.

MOUNTING FOOTPRINT  
SOLDERMASK DEFINED



|                         |                            |                                                                                                                                                                                  |
|-------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>UDFN8 1.8X1.2, 0.4P</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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