

NLAS2066

Ultra-Small Dual Single Pole, Single Throw Analog Switch with Over Voltage Tolerance

The NLAS2066 is a Dual SPST (Single Pole, Single Throw) Analog Switch high performance version of the popular NLAS323. Packaged in the ultra-small US8 package. It is designed as a general analog/digital switch and can also be used to isolate USB ports.

Features

- Same Pinout as the Popular NLAS323
- Excellent Performance – Maximum $R_{DS(ON)}$ 15 Ω at 3.0 V
- Matching Between the Switches $\pm 1.5 \Omega$ at 3.0 V
- 1.65 V to 5.5 V Operating Range
- Lower Threshold Voltages for LVTTL/CMOS Levels
- Ultra-Low Charge Injection ≤ 4.8 pC at 3.0 V
- Low Standby Power – $I_{CC} = 1.0$ nA (max) @ $T_A = 25^\circ\text{C}$
- CMOS Level Compatibility
- OVT* (Pins 1, 3, 5, and 7) These Pins may be Subjected to 0 to +7.0 V, Regardless of Operating Voltage
- Allows a Short from USB Line without Damage to the Device
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- USB Isolation
- Cell Phones
- PDAs
- MP3s Digital Still Cameras

Important Information

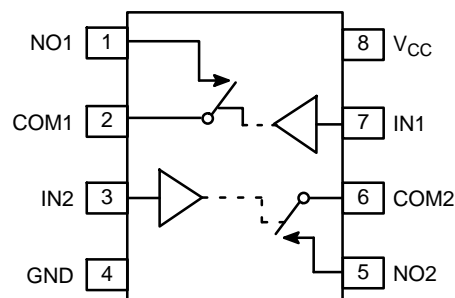
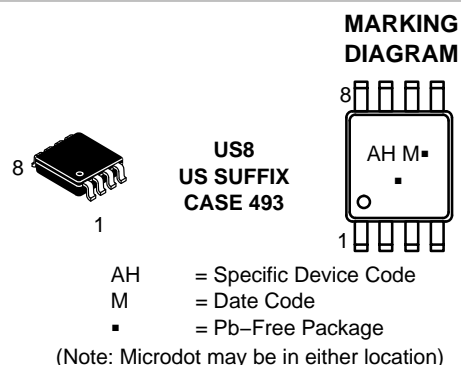
- ESD Protection: Human Body Model; > 1500 V
Machine Model; > 200 V
- Latch-Up Maximum Rating: 200 mA

*Over Voltage Tolerance (OVT) enables pins to function outside (higher) of their operating voltages, with no damage to the devices or to signal integrity.



ON Semiconductor®

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PIN ASSIGNMENT

| Pin | Function | OVT |
|-----|-----------------|-----|
| 1 | NO1 | Yes |
| 2 | COM1 | – |
| 3 | IN2 | Yes |
| 4 | GND | – |
| 5 | NO2 | Yes |
| 6 | COM2 | – |
| 7 | IN1 | Yes |
| 8 | V _{CC} | – |

FUNCTION TABLE

| On/Off Enable Input | State of Analog Switch |
|---------------------|------------------------|
| L | Off |
| H | On |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

NLAS2066

MAXIMUM RATINGS

| Symbol | Rating | Value | Unit |
|------------------|---|--|------|
| V _{CC} | DC Supply Voltage | - 0.5 to + 7.0 | V |
| V _I | DC Input Voltage Pins 1, 3, 5, 7 Pins 2, 6 | - 0.5 to + 7.0 - 0.5 to V _{CC} | V |
| V _O | DC Output Voltage | - 0.5 to + 7.0 | V |
| I _{IK} | DC Input Diode Current V _I < GND | - 50 | mA |
| I _{OK} | DC Output Diode Current V _O < GND | - 50 | mA |
| I _O | DC Output Sink Current | ± 50 | mA |
| I _{CC} | DC Supply Current per Supply Pin | ± 100 | mA |
| I _{GND} | DC Ground Current per Ground Pin | ± 100 | mA |
| T _{STG} | Storage Temperature Range | - 65 to + 150 | °C |
| T _L | Lead Temperature, 1 mm from Case for 10 Seconds | 260 | °C |
| T _J | Junction Temperature under Bias | + 150 | °C |
| θ _{JA} | Thermal Resistance (Note 1) | 250 | °C/W |
| P _D | Power Dissipation in Still Air at 85°C | 250 | mW |
| MSL | Moisture Sensitivity | Level 1 | - |
| F _R | Flammability Rating Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in | - |
| V _{ESD} | ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) | > 1500 > 200 N/A | V |

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.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow
2. Tested to EIA/JESD22-A114-A
3. Tested to EIA/JESD22-A115-A
4. Tested to JESD22-C101-A

RECOMMENDED OPERATING CONDITIONS

| Symbol | Characteristics | Min | Max | Unit |
|---------------------------------|---|------------|------------------------|------|
| V _{CC} | Positive DC Supply Voltage | 1.65 | 5.5 | V |
| V _{IN} | Digital Input Voltage (INx) | GND | 5.5 | V |
| V _{IO} | Static or Dynamic Voltage Across an Off Switch | GND | V _{CC} | V |
| V _{IS} | Analog Input Voltage NO COM | GND GND | 5.5 V _{CC} | V |
| T _A | Operating Temperature Range, All Package Types | -55 | +125 | °C |
| t _r , t _f | Input Rise or Fall Time (Enable Input) V _{CC} = 3.3 V ± 0.3 V V _{CC} = 5.0 V ± 0.5 V | 0 0 | 100 20 | ns/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DEVICE JUNCTION TEMPERATURE VS. TIME TO 0.1% BOND FAILURES

| Junction Temperature °C | Time, Hours | Time, Years |
|-------------------------|-------------|-------------|
| 80 | 1,032,200 | 117.8 |
| 90 | 419,300 | 47.9 |
| 100 | 178,700 | 20.4 |
| 110 | 79,600 | 9.4 |
| 120 | 37,000 | 4.2 |
| 130 | 17,800 | 2.0 |
| 140 | 8,900 | 1.0 |

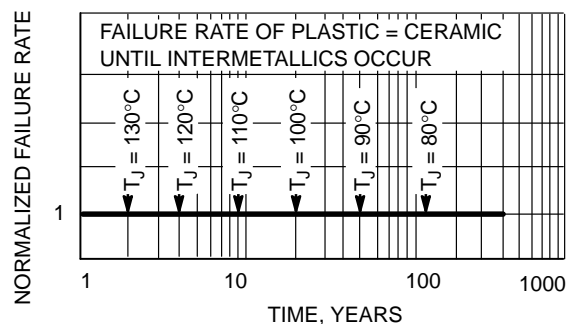


Figure 1. Failure Rate vs. Time Junction Temperature

DC CHARACTERISTICS – Digital Section (Voltages Referenced to GND)

| Symbol | Parameter | Condition | V _{CC} | Guaranteed Max Limit | | | Unit |
|-----------------|---|---|-----------------|------------------------|------------------------|------------------------|------|
| | | | | 25°C | -40 to 85°C | -55 to <125°C | |
| V _{IH} | Minimum High-Level Input Voltage, Enable Inputs | | 2.3 ± 10% | V _{CC} × 0.55 | V _{CC} × 0.55 | V _{CC} × 0.55 | V |
| | | | 2.7 ± 10% | V _{CC} × 0.55 | V _{CC} × 0.55 | V _{CC} × 0.55 | |
| | | | 3.0 ± 10% | V _{CC} × 0.55 | V _{CC} × 0.55 | V _{CC} × 0.55 | |
| | | | 5.0 ± 10% | V _{CC} × 0.55 | V _{CC} × 0.55 | V _{CC} × 0.55 | |
| V _{IL} | Maximum Low-Level Input Voltage, Enable Inputs | | 2.3 ± 10% | V _{CC} × 0.30 | V _{CC} × 0.30 | V _{CC} × 0.30 | V |
| | | | 2.7 ± 10% | V _{CC} × 0.30 | V _{CC} × 0.30 | V _{CC} × 0.30 | |
| | | | 3.0 ± 10% | V _{CC} × 0.30 | V _{CC} × 0.30 | V _{CC} × 0.30 | |
| | | | 5.0 ± 10% | V _{CC} × 0.30 | V _{CC} × 0.30 | V _{CC} × 0.30 | |
| I _{IN} | Maximum Input Leakage Current, Enable Inputs | V _{IN} = 5.5 V or GND | 0 V to 5.5 V | ±0.1 | ±1.0 | ±1.0 | µA |
| I _{CC} | Maximum Quiescent Supply Current (per package) | Enable and V _{IS} = V _{CC} or GND | 5.5 | 1.0 | 1.0 | 2.0 | µA |

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.

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DC ELECTRICAL CHARACTERISTICS – Analog Section

| Symbol | Parameter | Condition | V _{CC} | Guaranteed Max Limit | | | Unit |
|-----------------------|--------------------------------------|--|-----------------|----------------------|-------------|---------------|------|
| | | | | 25°C | -40 to 85°C | -55 to <125°C | |
| R _{ON} | Maximum On Resistance | V _{IN} = V _{IH} I _S = 8 mA V _{IS} = V _{CC} to GND I _S = 8 mA I _S = 24 mA I _S = 32 mA (Figures 2 and 3) | 2.3 | 50 | 54 | 54 | Ω |
| | | | 2.7 | 20 | 24 | 24 | |
| | | | 3.0 | 15 | 19 | 19 | |
| | | | 4.5 | 7 | 11 | 11 | |
| R _{FLAT(ON)} | On Resistance Flatness | V _{IN} = V _{IH} I _S = 8 mA V _{IS} = 0 to V _{CC} I _S = 8 mA I _S = 24 mA I _S = 32 mA (Figure 5) | 2.3 | 60 | 60 | 60 | Ω |
| | | | 2.7 | 24 | 24 | 24 | |
| | | | 3.0 | 13.5 | 13.5 | 13.5 | |
| | | | 4.5 | 3.0 | 3.0 | 3.0 | |
| Δ R _{ON} | On Resistance Match Between Channels | V _{IS} = 1.4 V V _{IS} = 1.6 V V _{IS} = 1.8 V V _{IS} = 2.7 V (Figures 4, 5 and 6) | 2.3 | 1.3 | 1.3 | 1.3 | Ω |
| | | | 2.7 | 1.4 | 1.4 | 1.4 | |
| | | | 3.0 | 1.5 | 1.5 | 1.5 | |
| | | | 4.5 | 2.0 | 2.0 | 2.0 | |
| I _{NO(OFF)} | Off Leakage Current | V _{IN} = V _{IL} V _{NO} = 1.0 V, V _{COM} = 4.5 V or V _{COM} = 1.0 V and V _{NO} 4.5 V | 5.5 | 1.0 | 10 | 100 | nA |
| I _{COM(OFF)} | Off Leakage Current | V _{IN} = V _{IL} V _{NO} = 4.5 V or 1.0 V V _{COM} = 1.0 V or 4.5 V | 5.5 | 1.0 | 10 | 100 | nA |

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0 ns)

| Symbol | Parameter | Condition | V _{CC} (V) | Guaranteed Max Limit | | | | | | | | | Unit |
|------------------|---------------|--|------------------------|----------------------|-----|-----|-------------|-----|-----|---------------|-----|-----|------|
| | | | | 25°C | | | -40 to 85°C | | | -55 to <125°C | | | |
| | | | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| t _{ON} | Turn-On Time | R _L = 300 Ω, C _L = 35 pF (Figures 7, 14 and 15) | 2.3 | | 8 | 9 | | | 10 | | | 10 | ns |
| | | | 2.7 | | 4 | 5 | | | 7 | | | 7 | |
| | | | 3.0 | | 3 | 4 | | | 6 | | | 6 | |
| | | | 4.5 | | 2 | 3 | | | 5 | | | 5 | |
| t _{OFF} | Turn-Off Time | R _L = 300 Ω, C _L = 35 pF (Figures 7, 14 and 15) | 2.3 | | 8 | 10 | | | 11 | | | 11 | ns |
| | | | 2.7 | | 6 | 8 | | | 9 | | | 9 | |
| | | | 3.0 | | 5 | 7 | | | 8 | | | 8 | |
| | | | 4.5 | | 4 | 6 | | | 7 | | | 7 | |

| | | Typical @ 25°C, V _{CC} = 5.0 V | | | Unit |
|------------------------------------|---|---|--|--|------|
| C _{IN} | Maximum Input Capacitance, Select Input | 3.0 | | | pF |
| C _{NO} or C _{NC} | Analog I/O (Switch Off) | 10 | | | |
| C _{COM(OFF)} | Common I/O (Switch Off) | 10 | | | |
| C _{COM(ON)} | Feedthrough (Switch Off) | 10 | | | |

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ADDITIONAL APPLICATIONS CHARACTERISTICS (Voltage Reference to GND Unless Noted)

| Symbol | Parameter | Condition | V _{CC} (V) | Typical 25°C | Unit |
|------------------|--|---|--------------------------|------------------------------|------|
| BW | Maximum On-Channel -3.0 dB Bandwidth or Minimum Frequency Response | V _{IS} = 0 dBm (Figure 8 and 9) | 2.3 2.7 3.0 4.5 | 102 175 180 186 | MHz |
| V _{ONL} | Maximum Feed-Through On Loss | V _{IS} = 0 dBm @ 10 kHz (Figure 8 and 9) | 2.3 2.7 3.0 4.5 | -2.2 -0.9 -0.8 -0.4 | dB |
| V _{ISO} | Off-Channel Isolation | f = 100 kHz V _{IS} = 1.0 V RMS (Figure 10 and 11) | 2.3 2.7 3.0 4.5 | -73 -74 -74 -75 | dB |
| Q | Charge Injection Enable Input to Common I/O | V _{IS} = V _{CC} to GND, F _{IS} = 20 kHz (Figure 12) | 3.0 5.5 | 4.8 7.4 | pC |
| THD | Total Harmonic Distortion TDH + Noise | F _{IS} = 10 Hz to 100 kHz, R _L = R _{gen} = 600 Ω, C _L = 50 pF (Figure 13) | 3.0 5.5 | 0.19 0.06 | % |

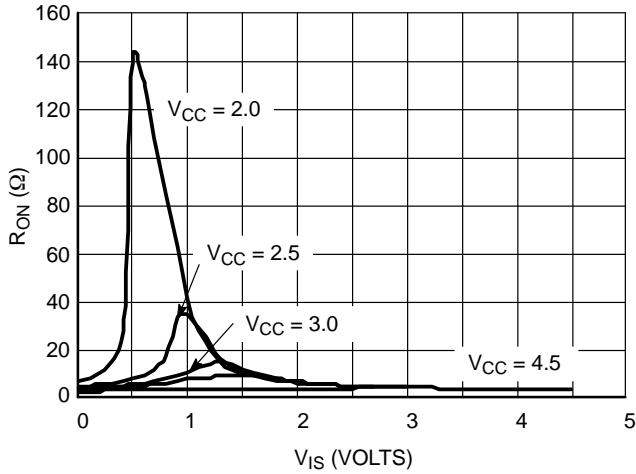


Figure 2. R_{ON} vs. V_{COM} and V_{CC} (@25°C)

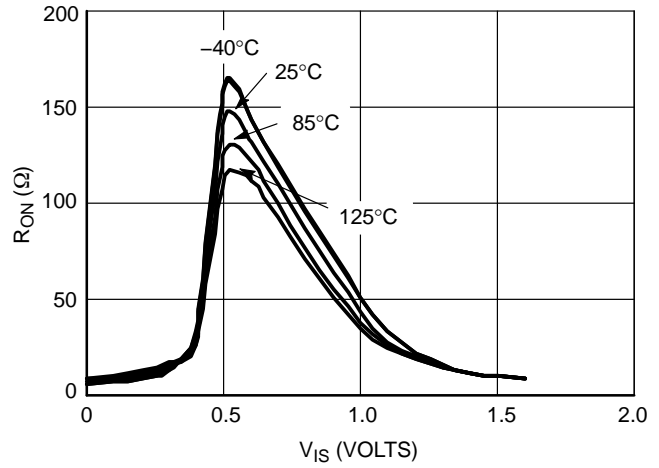


Figure 3. R_{ON} vs. V_{COM} and Temperature, $V_{CC} = 2.0$ V

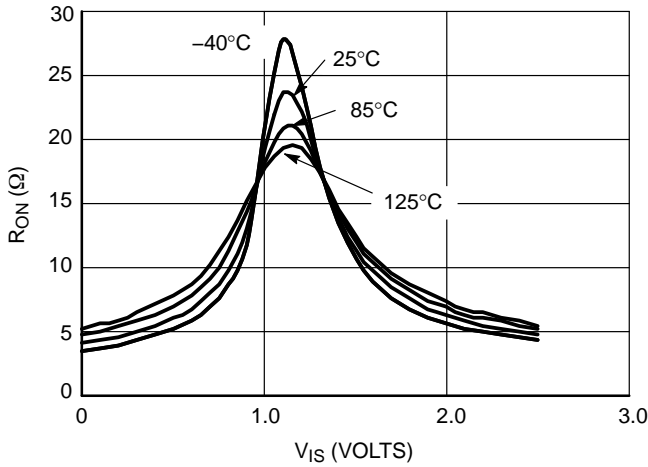


Figure 4. R_{ON} vs. V_{COM} and Temperature, $V_{CC} = 2.5$ V

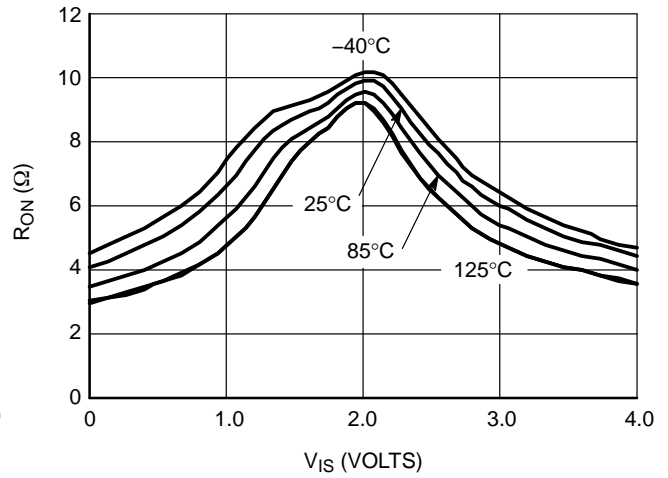


Figure 5. R_{ON} vs. V_{COM} and Temperature, $V_{CC} = 3.0$ V

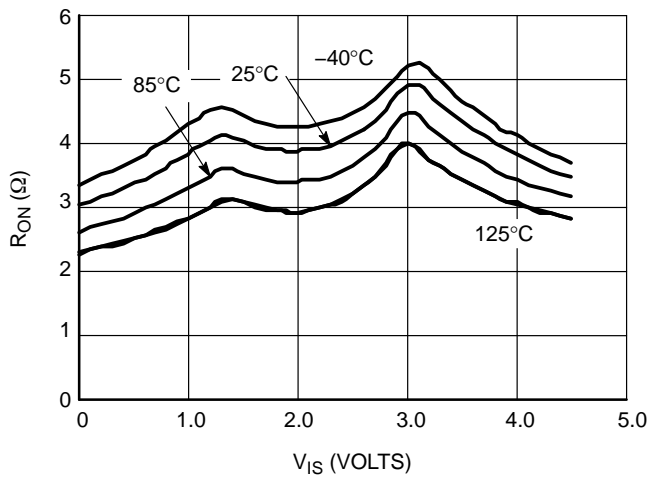


Figure 6. R_{ON} vs. V_{COM} and Temperature, $V_{CC} = 4.5$ V

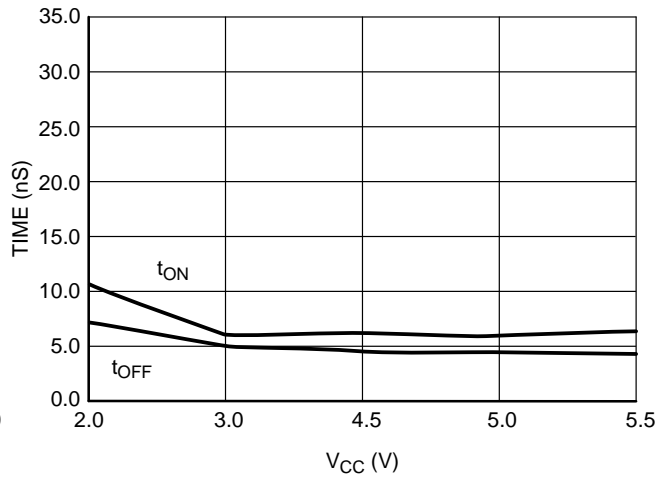


Figure 7. Switching Time vs. Supply Voltage, $T = 25^\circ\text{C}$

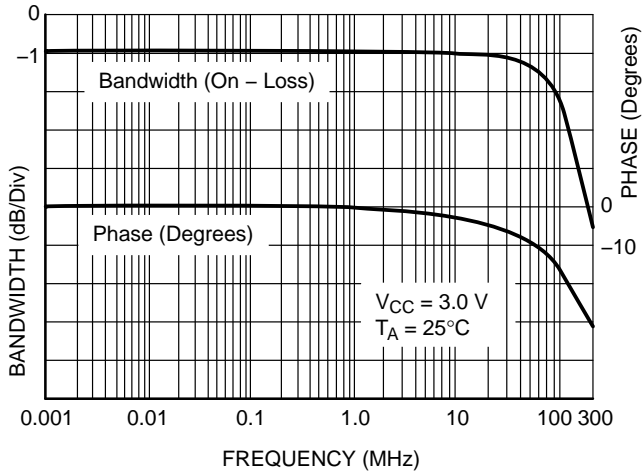


Figure 8. ON Channel Bandwidth and Phase Shift Over Frequency

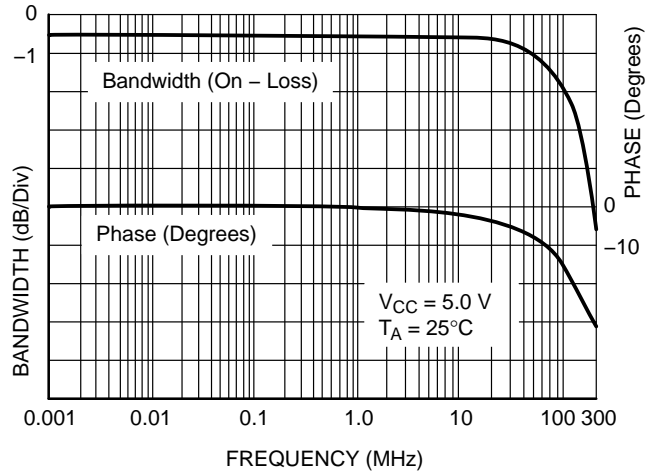


Figure 9. ON Channel Bandwidth and Phase Shift Over Frequency

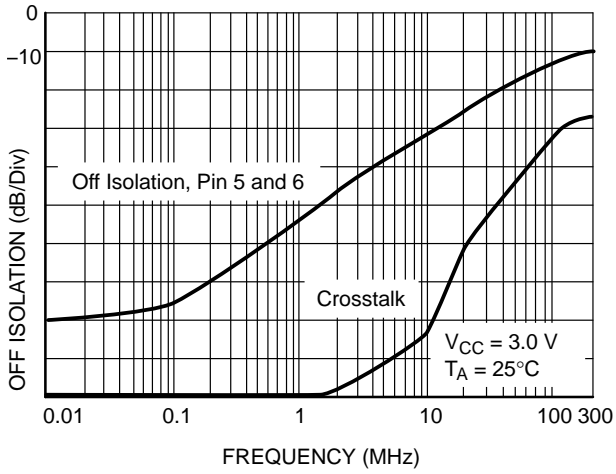


Figure 10. Off Isolation and Crosstalk

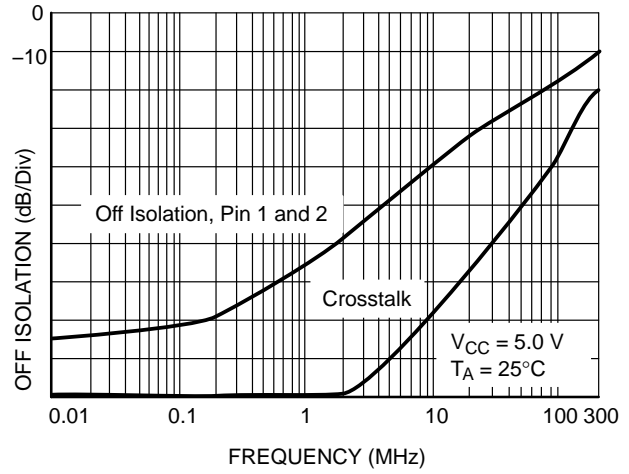


Figure 11. Off Isolation and Crosstalk

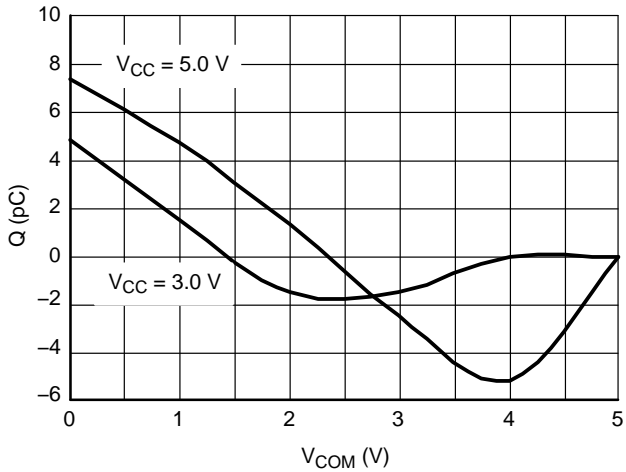


Figure 12. Charge Injection vs. V_{COM}

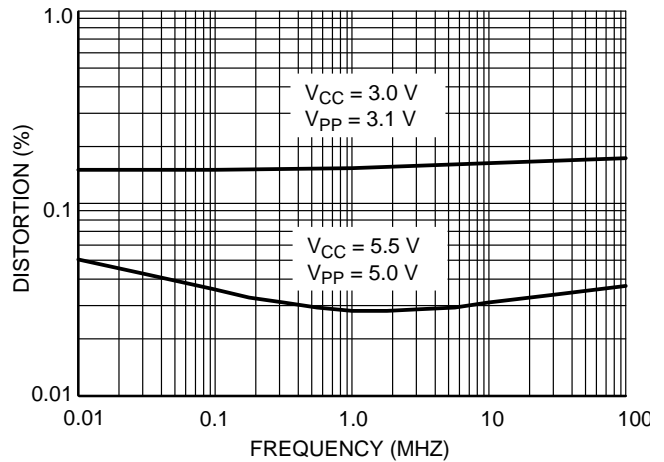


Figure 13. THD vs. Frequency

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TIMING INFORMATION

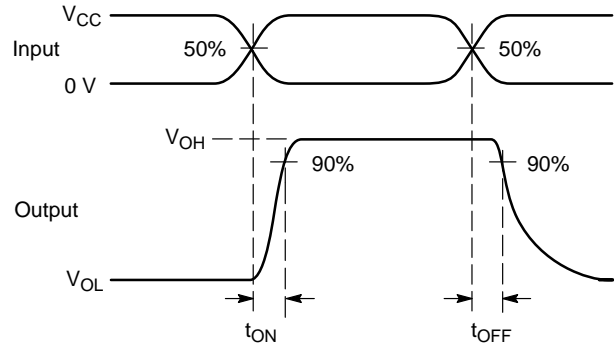
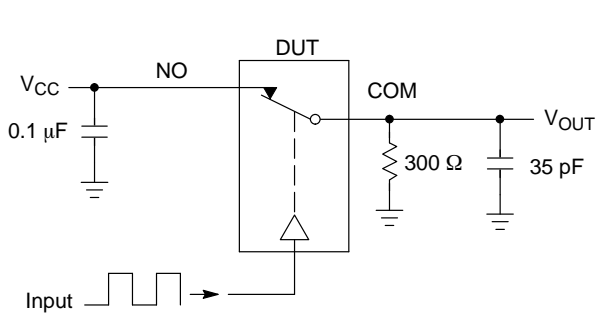


Figure 14. t_{ON}/t_{OFF}

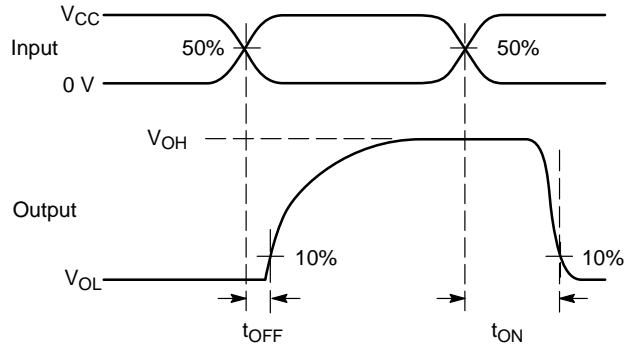
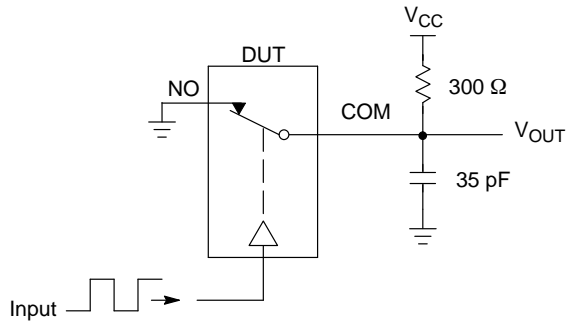


Figure 15. t_{ON}/t_{OFF}

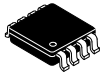
| V_{CC} | VMI |
|----------|-------|
| 2.0 V | 1.0 V |
| 3.0 V | 1.5 V |
| 4.5 V | 1.5 V |

DEVICE ORDERING INFORMATION

| Device Order Number | Package | Shipping† |
|---------------------|------------------|----------------------|
| NLAS2066USG | US8 (Pb-Free) | 3,000 / Tape & Reel |
| NLAS2066UST3G | US8 (Pb-Free) | 10,000 / Tape & Reel |

†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.

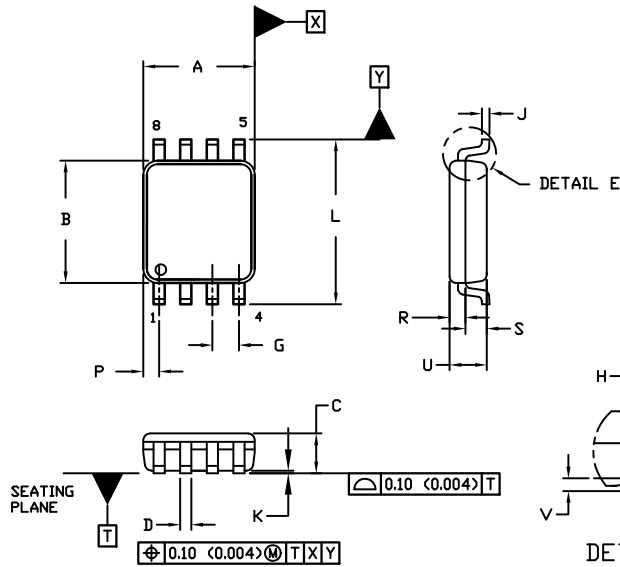
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

US8
CASE 493
ISSUE F

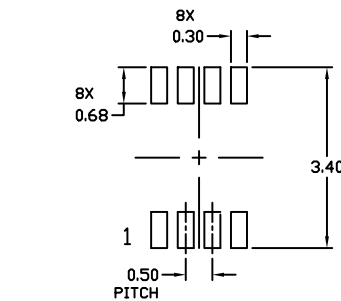
DATE 01 SEP 2021



NOTES:

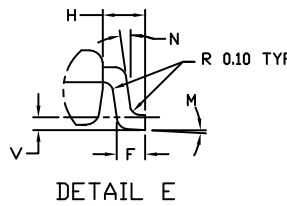
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSION, OR GATE BURR. MOLD FLASH, PROTRUSION, OR GATE BURR SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. 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 | |

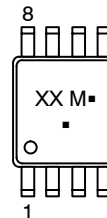


**RECOMMENDED *
MOUNTING FOOTPRINT**

* For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/T.



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.

| | | |
|-------------------------|--------------------|--|
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| DESCRIPTION: | US8 | PAGE 1 OF 1 |

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