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 RDS_{ON} 15 Ω at 3.0 V
- Matching Between the Switches ±1.5 Ω 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°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.

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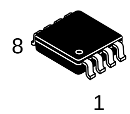
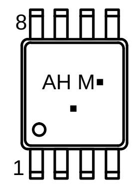
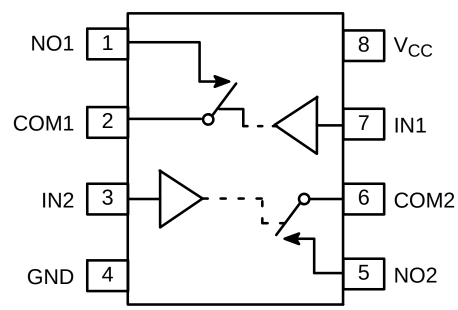
MARKING DIAGRAM



US8
US SUFFIX
CASE 493



AH = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)



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.

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

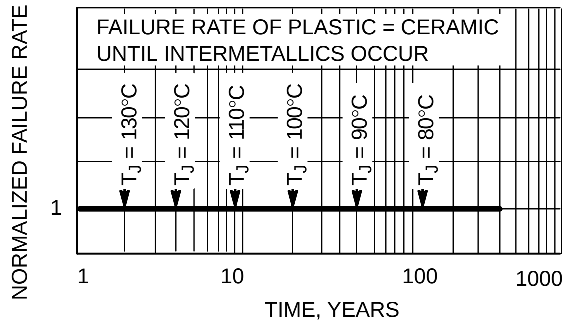


Figure 1. Failure Rate vs. Time Junction Temperature

DC CHARACTERISTICS − Digital Section (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_{CC}	Guaranteed Max Limit 25°C	Guaranteed Max Limit −40 to 85°C	Guaranteed Max Limit −55 to <125°C	Unit
V_{IH}	Minimum High−Level Input Voltage, Enable Inputs		2.3 ± 10% 2.7 ± 10% 3.0 ± 10% 5.0 ± 10%	V_{CC} x 0.55 V_{CC} x 0.55 V_{CC} x 0.55 V_{CC} x 0.55	V_{CC} x 0.55 V_{CC} x 0.55 V_{CC} x 0.55 V_{CC} x 0.55	V_{CC} x 0.55 V_{CC} x 0.55 V_{CC} x 0.55 V_{CC} x 0.55	V
V_{IL}	Maximum Low−Level Input Voltage, Enable Inputs		2.3 ± 10% 2.7 ± 10% 3.0 ± 10% 5.0 ± 10%	V_{CC} x 0.30 V_{CC} x 0.30 V_{CC} x 0.30 V_{CC} x 0.30	V_{CC} x 0.30 V_{CC} x 0.30 V_{CC} x 0.30 V_{CC} x 0.30	V_{CC} x 0.30 V_{CC} x 0.30 V_{CC} x 0.30 V_{CC} x 0.30	V
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.

DC ELECTRICAL CHARACTERISTICS − Analog Section

Symbol	Parameter	Condition	V_{CC}	Guaranteed Max Limit 25°C	−40 to 85°C	−55 to <125°C	Unit
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 2.7 3.0 4.5	50 20 15 7	54 24 19 11	54 24 19 11	Ω
$R_{FLAT(ON)}$	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 2.7 3.0 4.5	60 24 13.5 3.0	60 24 13.5 3.0	60 24 13.5 3.0	Ω
ΔR_{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 2.7 3.0 4.5	1.3 1.4 1.5 2.0	1.3 1.4 1.5 2.0	1.3 1.4 1.5 2.0	Ω
$I_{NO(OFF)}$	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)	25°C Min	25°C Typ	25°C Max	−40 to 85°C Min	−40 to 85°C Typ	−40 to 85°C Max	−55 to <125°C Min	−55 to <125°C Typ	−55 to <125°C Max	Unit
t_{ON}	Turn−On Time	R_L = 300 Ω, C_L = 35 pF (Figures 7, 14 and 15)	2.3 2.7 3.0 4.5		8 4 3 2	9 5 4 3			10 7 6 5			10 7 6 5	ns
t_{OFF}	Turn−Off Time	R_L = 300 Ω, C_L = 35 pF (Figures 7, 14 and 15)	2.3 2.7 3.0 4.5		8 6 5 4	10 8 7 6			11 9 8 7			11 9 8 7	ns

		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	

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 = Rgen = 600 Ω, C_L = 50 pF (Figure 13)	3.0 5.5	0.19 0.06	%

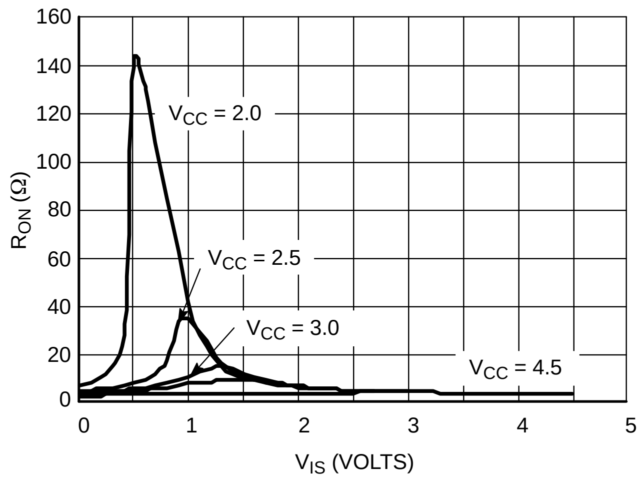


Figure 2. R_{ON} vs. V_{COM} and V_{CC} (@25°C)

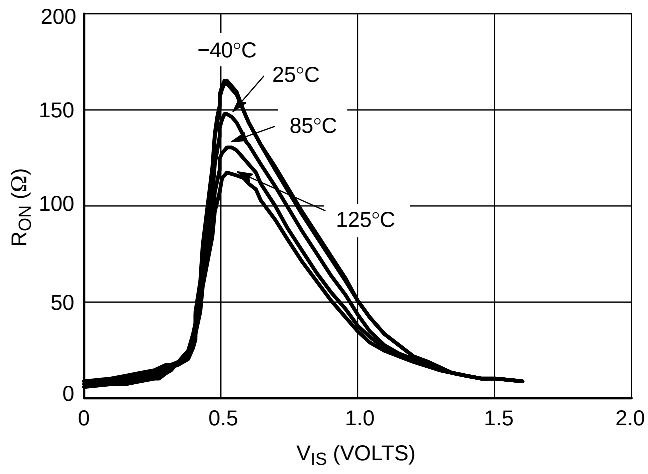


Figure 3. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 2.0 V

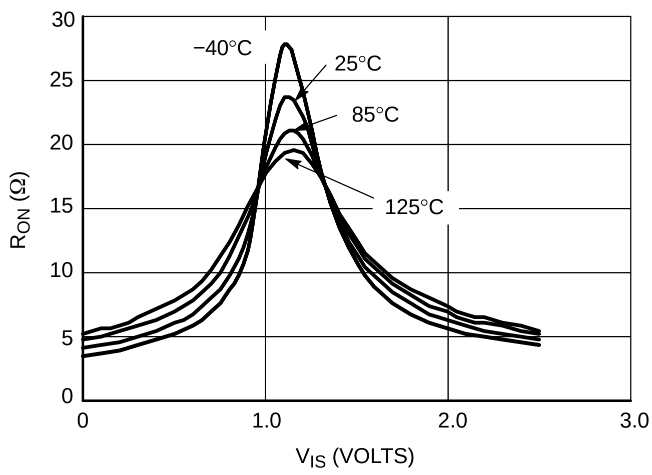


Figure 4. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 2.5 V

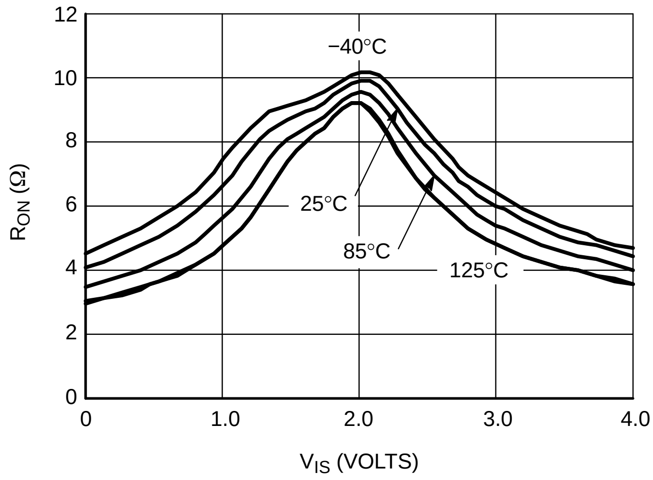


Figure 5. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 3.0 V

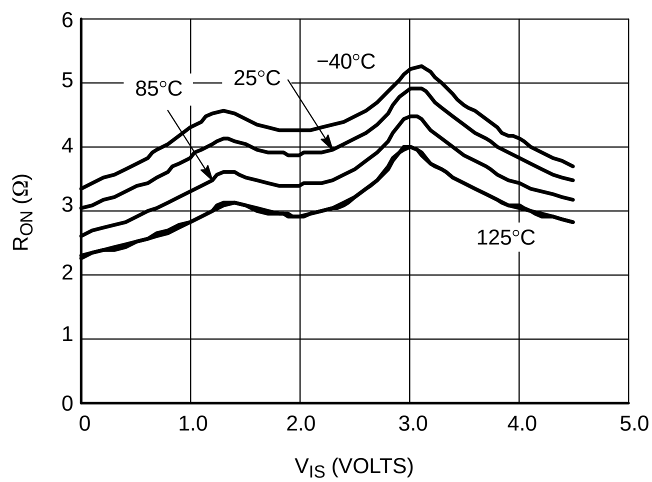


Figure 6. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 4.5 V

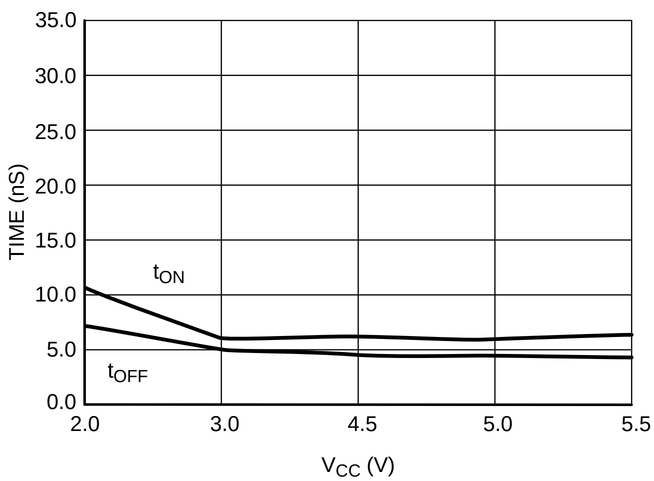


Figure 7. Switching Time vs. Supply Voltage, T = 25°C

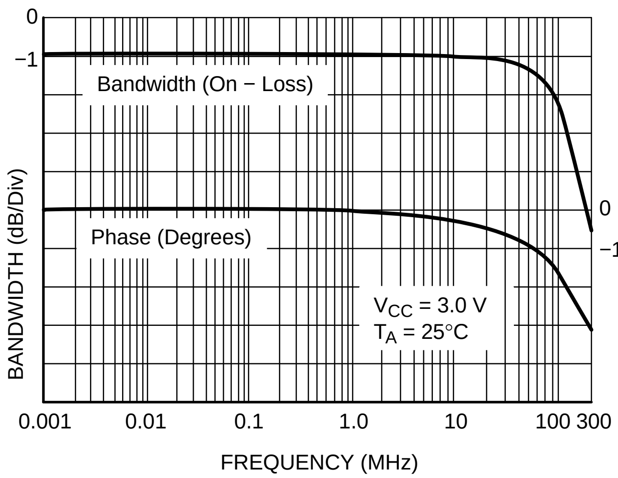


Figure 8. ON Channel Bandwidth and Phase Shift Over Frequency

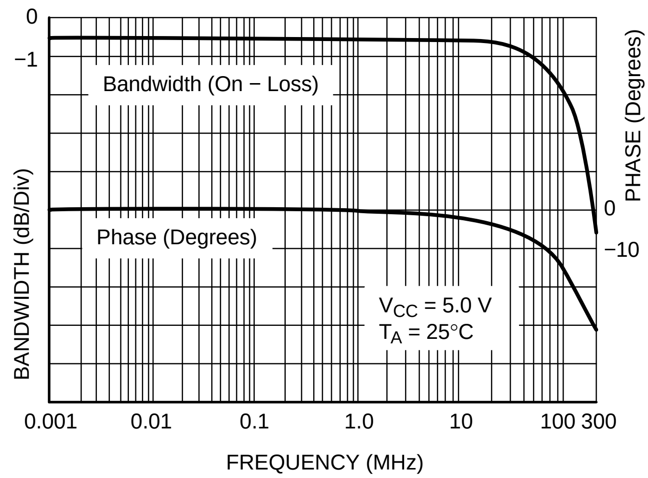


Figure 9. ON Channel Bandwidth and Phase Shift Over Frequency

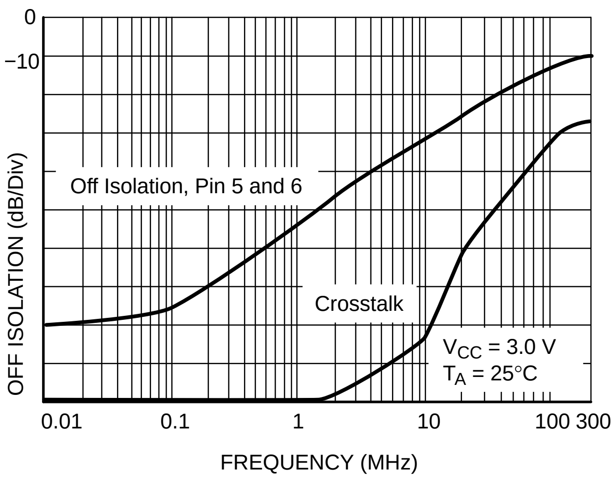


Figure 10. Off Isolation and Crosstalk

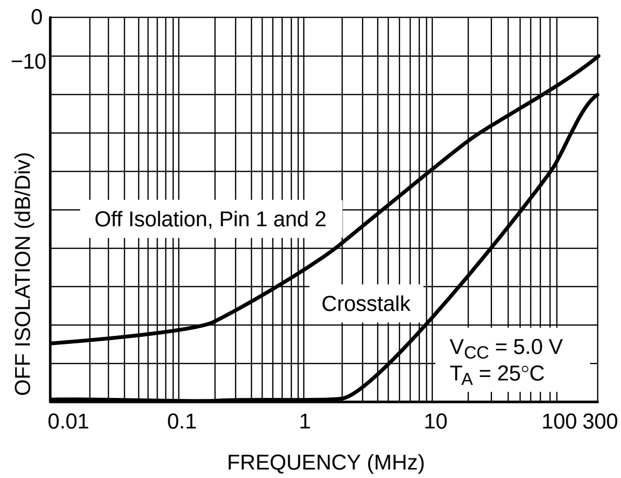


Figure 11. Off Isolation and Crosstalk

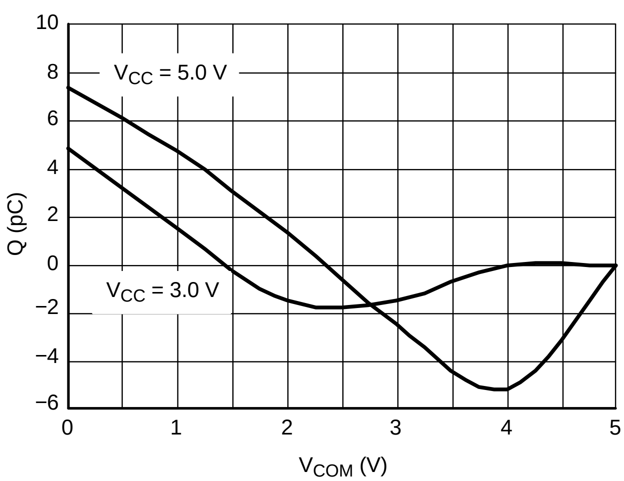


Figure 12. Charge Injection vs. V_{COM}

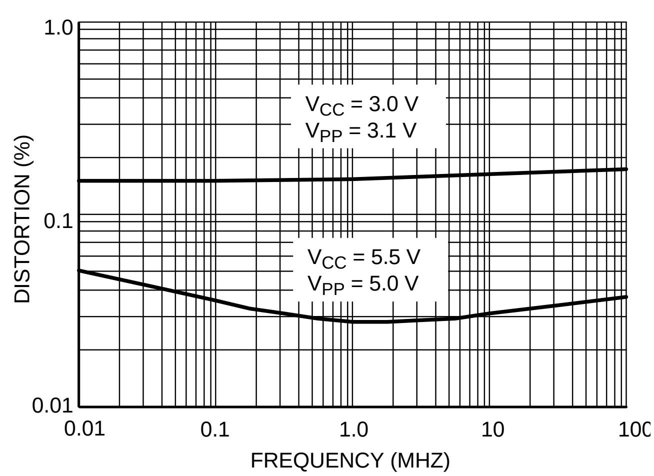


Figure 13. THD vs. Frequency

TIMING INFORMATION

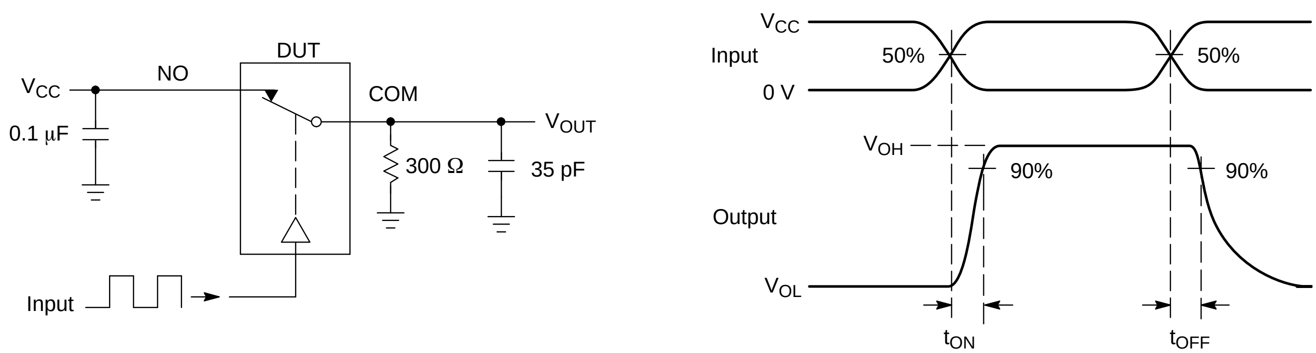


Figure 14. t_{ON}/t_{OFF}

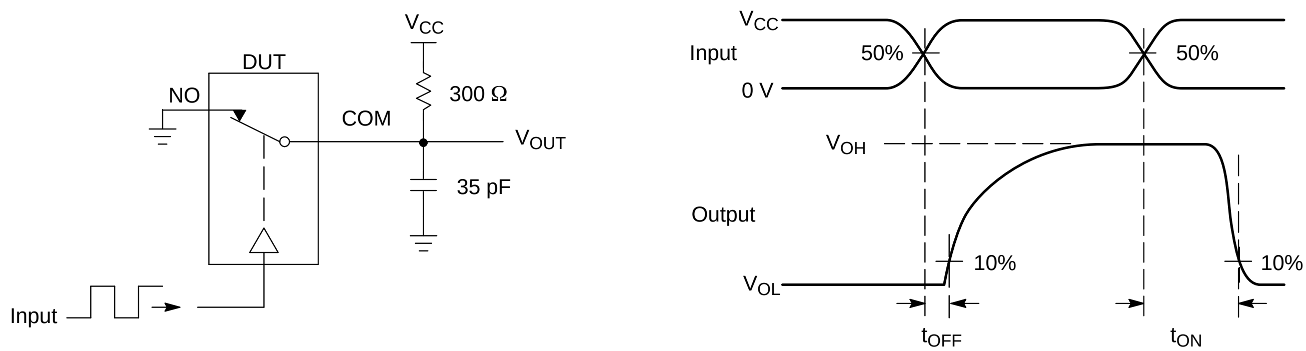


Figure 15. t_{ON}/t_{OFF}

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

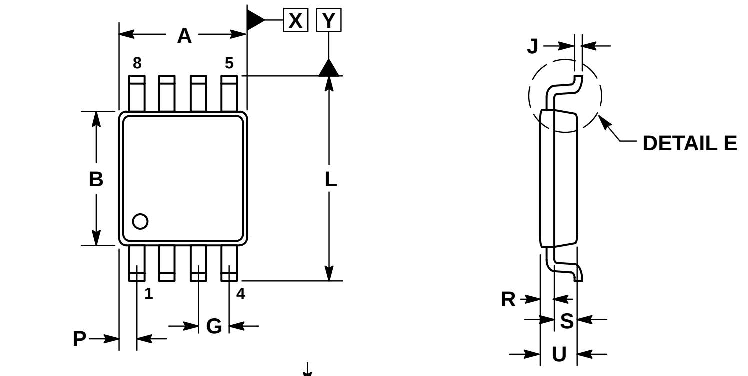
DEVICE ORDERING INFORMATION

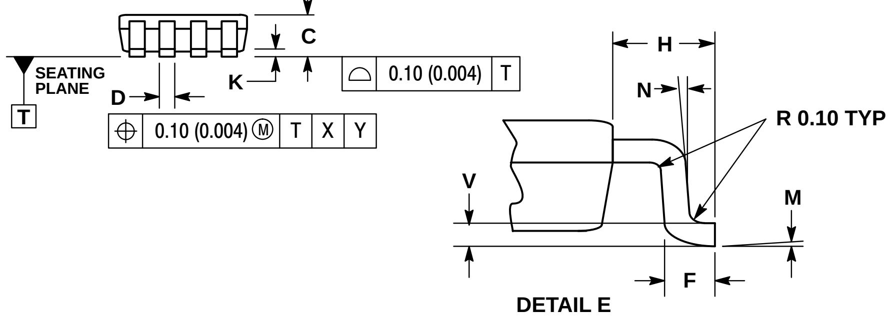
Device Order Number	Package	Shipping†
NLAS2066USG	US8 (Pb−Free)	3,000 / Tape & Reel
NLAS2066UST3G	US8 (Pb−Free)	10,000 / Tape & Reel

†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.

PACKAGE DIMENSIONS

US8
US SUFFIX
CASE 493−02
ISSUE D

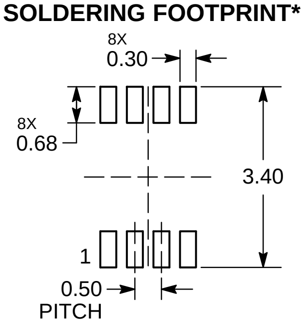




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR. MOLD FLASH. PROTRUSION AND GATE BURR SHALL NOT EXCEED 0.14MM (0.0055”) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH AND PROTRUSION SHALL NOT EXCEED 0.14MM (0.0055”) PER SIDE.
5. LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076−0.0203MM (0.003−0.008”).
6. ALL TOLERANCE UNLESS OTHERWISE SPECIFIED ±0.0508MM (0.0002”).

	MILLIMETERS		INCHES	
DIM	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	3.20	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
SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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