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NLAS323

Dual SPST Analog Switch, Low Voltage, Single Supply

The NLAS323 is a dual SPST (Single Pole, Single Throw) switch, similar to 1/2 a standard 4066. The device permits the independent selection of 2 analog/digital signals. Available in the US8 package.

The use of advanced 0.6 micron CMOS process, improves the R_{ON} resistance considerably compared to older higher voltage technologies.

Features

- On Resistance is 20 Ω Typical at 5.0 V
- Matching is < 1.0 Ω Between Sections
- 2.0 to 6.0 V Operating Range
- Ultra Low < 5.0 pC Charge Injection
- Ultra Low Leakage < 1.0 nA at 5.0 V, 25 C
- Wide Bandwidth > 200 MHz, −3.0 dB
- 2000 V ESD (Human Body Model)
- Ron Flatness ±6.0 Ω at 5.0 V
- US8 Package
- Independent, Positive Enable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

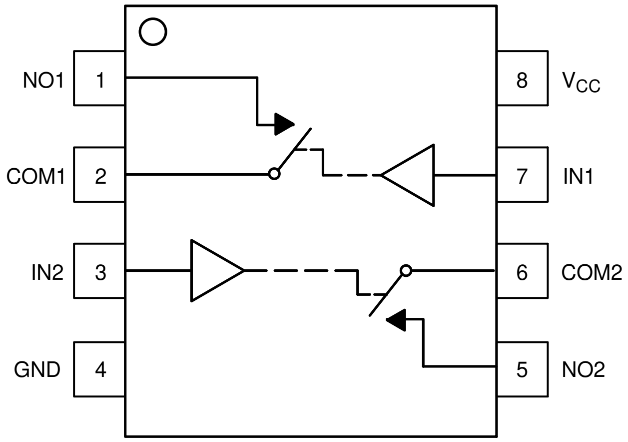

Figure 1. Pinout

ON Semiconductor®

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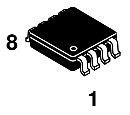
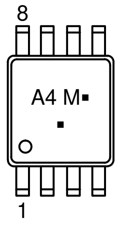
MARKING DIAGRAM



US8
US SUFFIX
CASE 493



A4 = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

PIN ASSIGNMENT

1	NO1
2	COM1
3	IN2
4	GND
5	NO2
6	COM2
7	IN1
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	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	−0.5 to +7.0	V
V_I	DC Input Voltage	−0.5 to +7.0	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)	 > 2000 > 150 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	2.0	5.5	V
V_{IN}	Digital Input Voltage (Enable)	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	V_{CC}	V
T_A	Operating Temperature Range, All Package Types	–55	+125	°C
t_r, t_f	Input Rise or Fall Time, $V_{cc} = 3.3\ V \pm 0.3\ V$ (Enable Input) $V_{cc} = 5.0\ V \pm 0.5\ V$	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 VERSUS 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

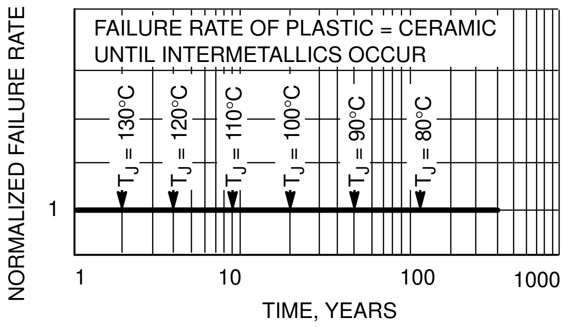


Figure 2. Failure Rate vs. Time Junction Temperature

DC CHARACTERISTICS – Digital Section (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_{CC}	Guaranteed Max Limit			Unit
				–55 to 25°C	<85°C	<125°C	
V_{IH}	Minimum High–Level Input Voltage, Enable Inputs		2.0 3.0 4.5 5.5	1.5 2.1 3.15 3.85	1.5 2.1 3.15 3.85	1.5 2.1 3.15 3.85	V
V_{IL}	Maximum Low–Level Input Voltage, Enable Inputs		2.0 3.0 4.5 5.5	0.5 0.9 1.35 1.65	0.5 0.9 1.35 1.65	0.5 0.9 1.35 1.65	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 VIS = V_{CC} or GND	5.5	1.0	1.0	2.0	μA

DC ELECTRICAL CHARACTERISTICS – Analog Section

Symbol	Parameter	Condition	V_{CC}	Guaranteed Max Limit			Unit
				–55 to 25°C	<85°C	<125°C	
R_{ON}	Maximum On Resistance (Figures 8 – 12)	$V_{IN} = V_{IH}$ $V_{IS} = V_{CC}$ to GND $I_{Is}I = \leq$10.0mA	3.0 4.5 5.5	45 30 25	50 35 30	55 40 35	Ω
$R_{FLAT(ON)}$	On Resistance Flatness	$V_{IN} = V_{IH}$ $I_{Is}I = \leq$10.0 mA V_{IS} = 1 V, 2 V, 3.5 V	4.5	4.0	4.0	5.0	Ω
$I_{NO(OFF)}$	Off Leakage Current, Pin 2 (Figure 3)	$V_{IN} = V_{IL}$ 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, Pin 1 (Figure 3)	$V_{IN} = V_{IL}$ 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	Test Conditions	V_{CC} (V)	Guaranteed Max Limit									Unit
				–55 to 25°C			<85°C			<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 4, 5, and 13)	2.0 3.0 4.5 5.5		7.0 5.0 4.5 4.5	14 10 9.0 9.0			16 12 11 11			16 12 11 11	ns
t_{OFF}	Turn–Off Time	R_L = 300 Ω, C_L = 35 pF (Figures 4, 5, and 13)	2.0 3.0 4.5 5.5		11.0 7.0 5.0 5.0	22 14 10 10			24 16 12 12			24 16 12 12	ns

		Typical @ 25, VCC = 5.0 V	
C_{IN} C_{NO} or C_{NC} $C_{COM(OFF)}$ $C_{COM(ON)}$	Maximum Input Capacitance, Select Input Analog I/O (switch off) Common I/O (switch off) Feedthrough (switch on)	8.0 10 10 20	pF

ADDITIONAL APPLICATION CHARACTERISTICS (Voltages Referenced to GND Unless Noted)

Symbol	Parameter	Condition	V_{CC} V	Limit 25°C	Unit
BW	Maximum On–Channel –3dB Bandwidth or Minimum Frequency Response	V_{IS} = 0 dBm V_{IS} centered between V_{CC} and GND (Figures 6 and 14)	3.0 4.5 5.5	190 200 220	MHz
V_{ONL}	Maximum Feedthrough On Loss	V_{IS} = 0 dBm @ 10 kHz V_{IS} centered between V_{CC} and GND (Figure 6)	3.0 4.5 5.5	–2 –2 –2	dB
V_{ISO}	Off–Channel Isolation	f = 100 kHz; V_{IS} = 1.0 V RMS V_{IS} centered between V_{CC} and GND (Figures 6 and 15)	3.0 4.5 5.5	–93	dB
Q	Charge Injection Enable Input to Common I/O	V_{IS} = V_{CC} to GND, F_{IS} = 20 kHz $t_r = t_f$ = 3.0 ns R_{IS} = 0 Ω, C_L = 1000 pF $Q = C_L * \Delta V_{OUT}$ (Figures 6 and 16)	3.0 5.5	1.5 3.0	pC
THD	Total Harmonic Distortion THD + Noise	F_{IS} = 20 Hz to 1 MHz, R_L = Rgen = 600 Ω, C_L = 50 pF V_{IS} = 3.0 V_{PP} sine wave V_{IS} = 5.0 V_{PP} sine wave (Figure 17)	3.3 5.5	0.3 0.15	%

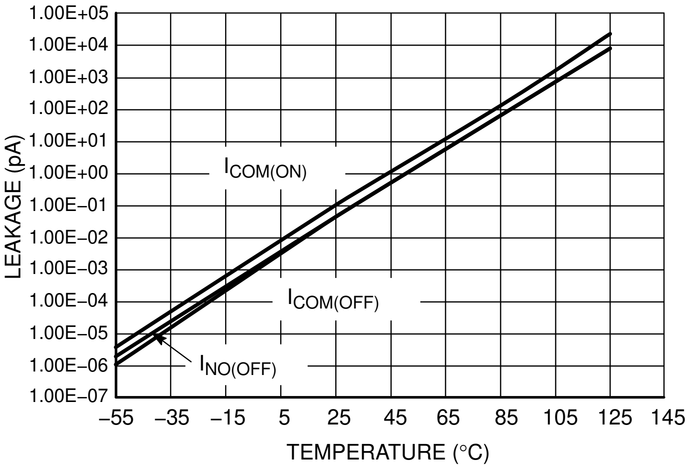


Figure 3. Switch Leakage vs. Temperature

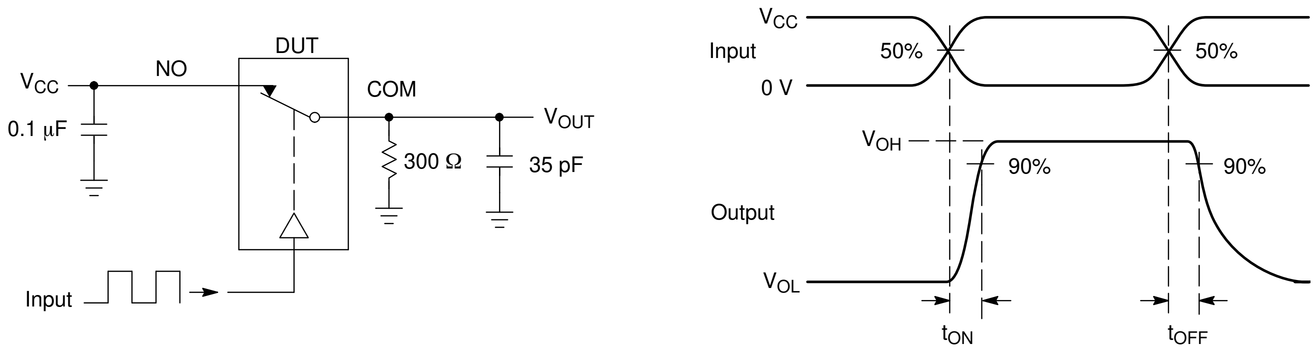


Figure 4. t_{ON}/t_{OFF}

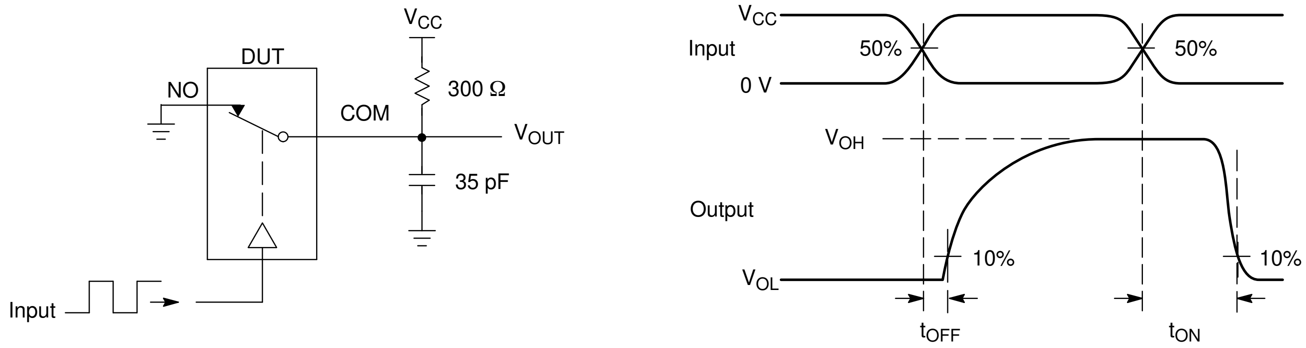
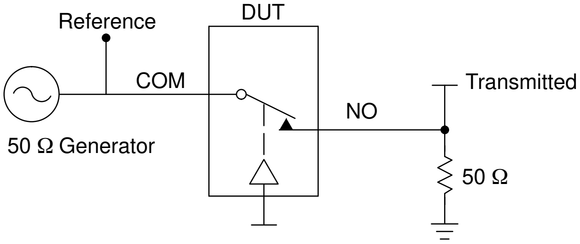


Figure 5. t_{ON}/t_{OFF}



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

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

Bandwidth (BW) = the frequency 3.0 dB below V_{ONL}

Figure 6. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

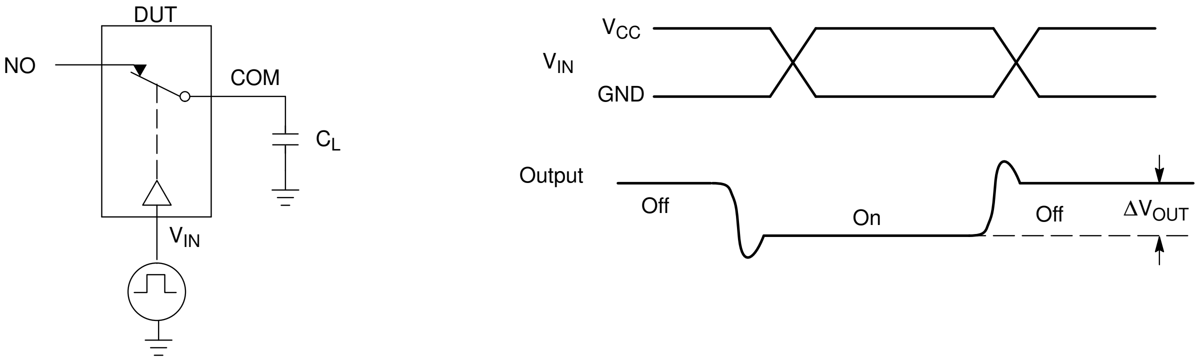


Figure 7. Charge Injection: (Q)

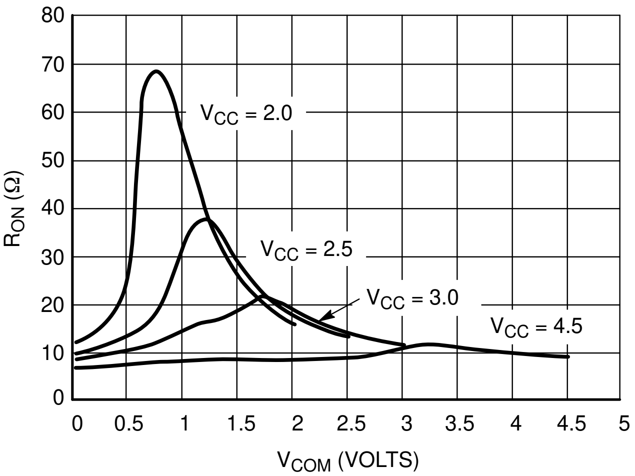


Figure 8. R_{ON} vs. V_{COM} and V_{CC} (@25°C)

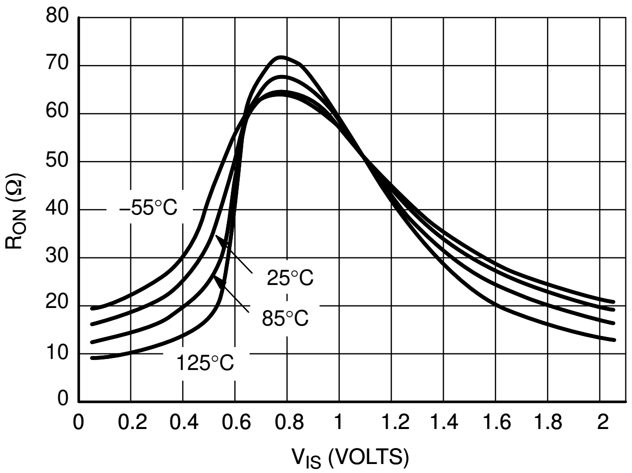


Figure 9. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 2.0 V

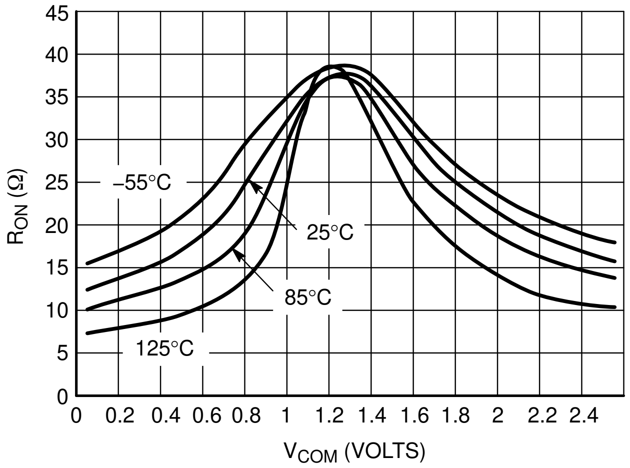


Figure 10. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 2.5 V

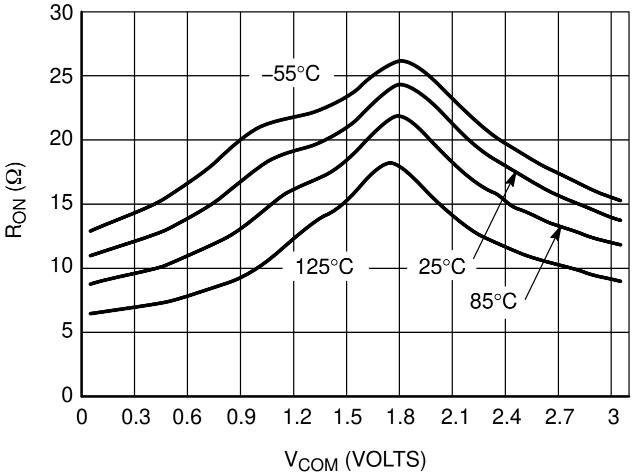


Figure 11. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 3.0 V

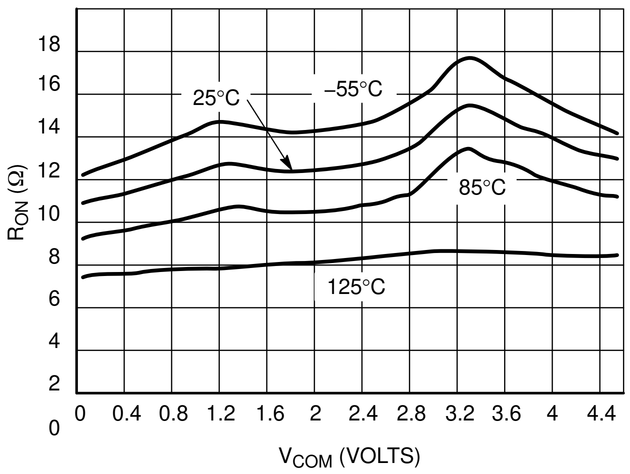


Figure 12. R_{ON} vs. V_{COM} and Temperature, V_{CC} = 4.5 V

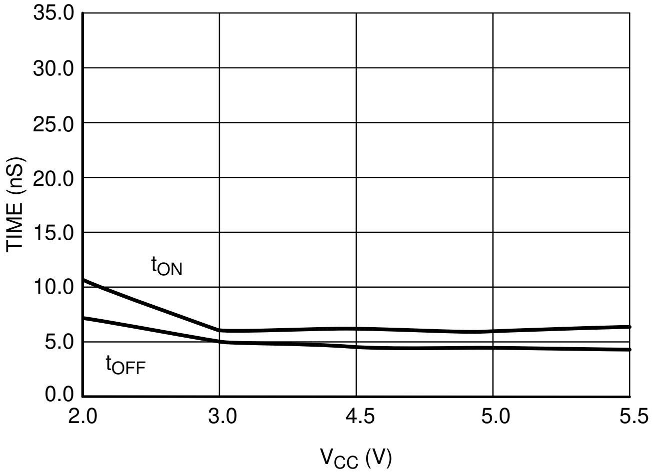


Figure 13. Switching Time vs. Supply Voltage, T = 25°C

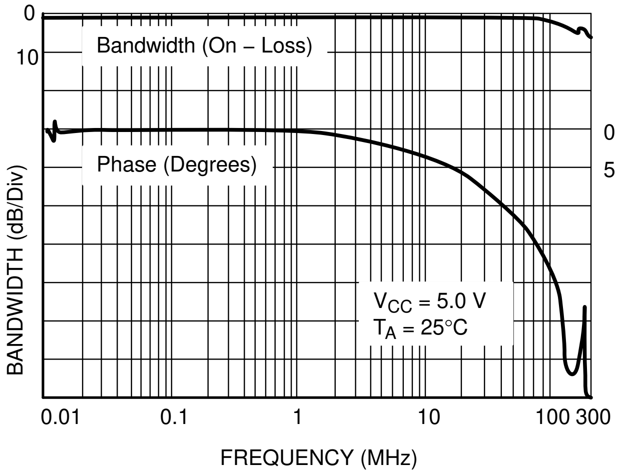


Figure 14. ON Channel Bandwidth and Phase Shift Over Frequency

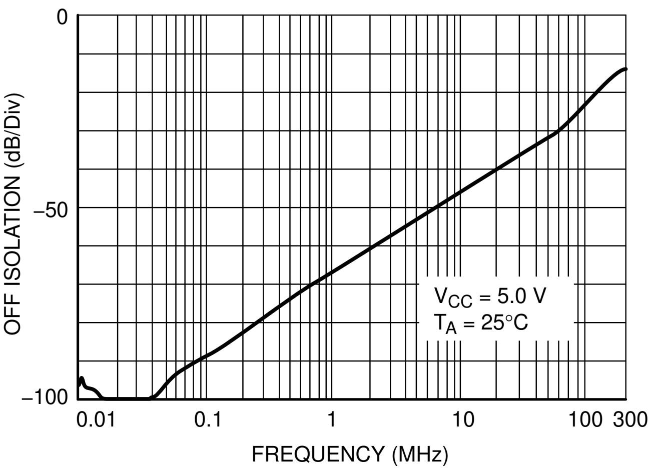


Figure 15. Off Channel Isolation

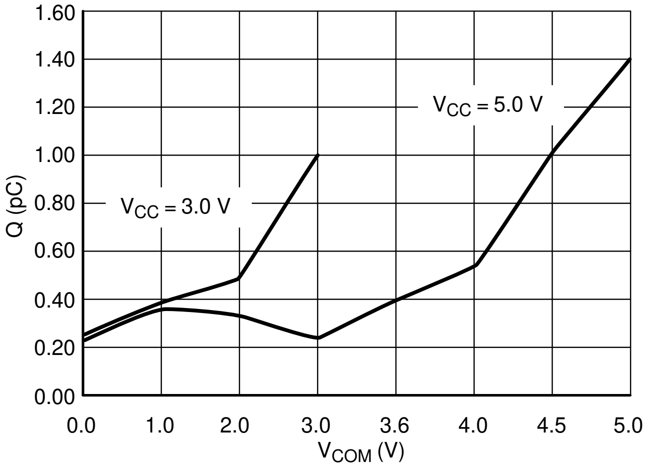


Figure 16. Charge Injection vs. V_{COM}

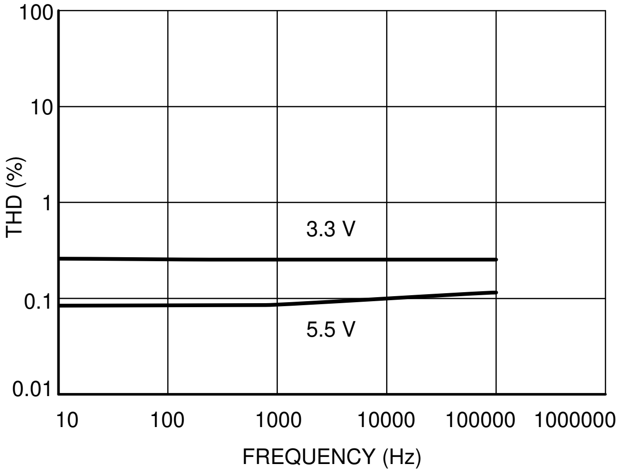


Figure 17. THD vs. Frequency

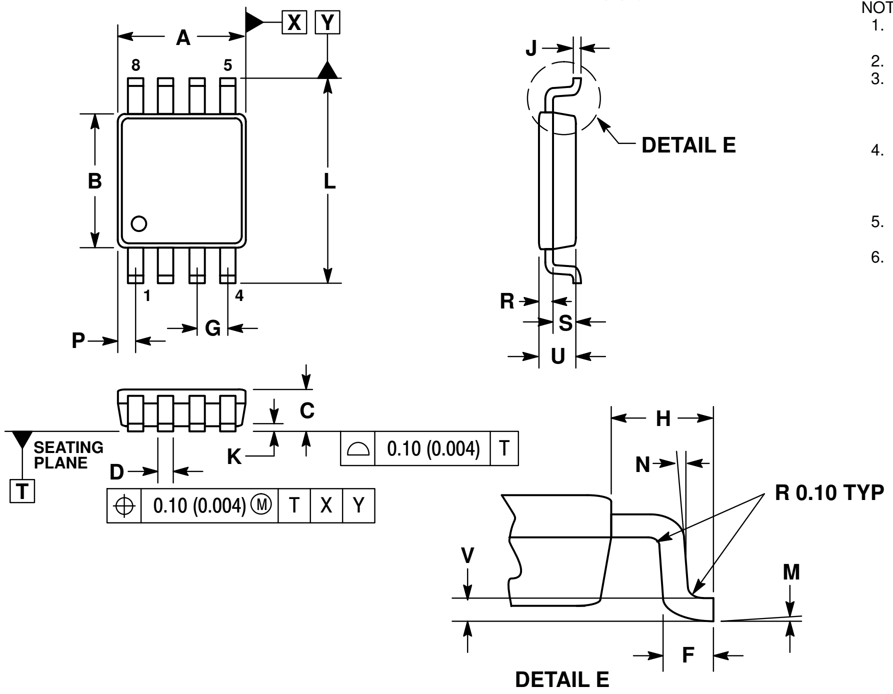
DEVICE ORDERING INFORMATION

Device Order Number	Package	Shipping†
NLAS323USG	US8 (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 Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

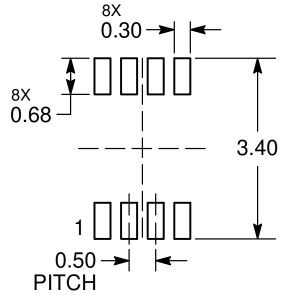
US8
US SUFFIX
CASE 493−02
ISSUE D



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.

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