NLAS325

Dual SPST Analog Switch, Low Voltage, Single Supply

The NLAS325 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 Ultra−Small 8 package.

The use of advanced 0.6 μ 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
- 2.0−6.0 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 (HBM)
- R_{ON} Flatness ±6.0 Ω at 5.0 V
- Independent Enables; One Positive, One Negative
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

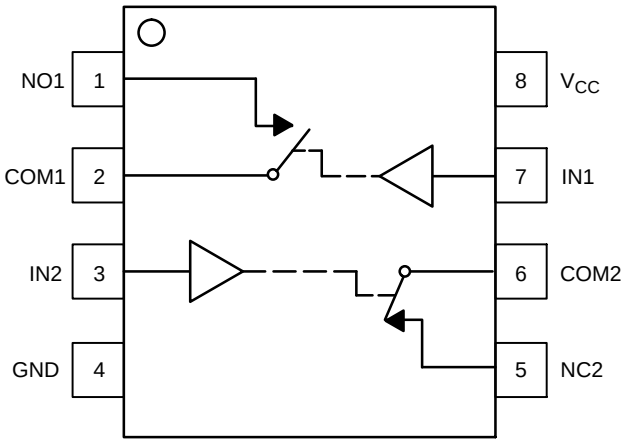
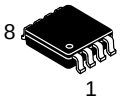


Figure 1. Pinout

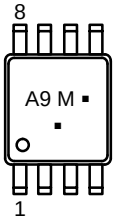
ON Semiconductor®

www.onsemi.com

MARKING DIAGRAM



US8
US SUFFIX
CASE 493



A9 = 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	NC2
6	COM2
7	IN1
8	V_{CC}

FUNCTION TABLE

On/Off Enable Input	Analog Switch 1	Analog Switch 2
L	Off	On
H	On	Off

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 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, 1.0 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 > 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	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage		2.0	5.5	V
V_{IN}	Digital Select Input Voltage		GND	5.5	V
V_{IS}	Analog Input Voltage (NC, NO, COM)		GND	V_{CC}	V
T_A	Operating Temperature Range		−55	+125	°C
t_r, t_f	Input Rise or Fall Time, SELECT	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 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

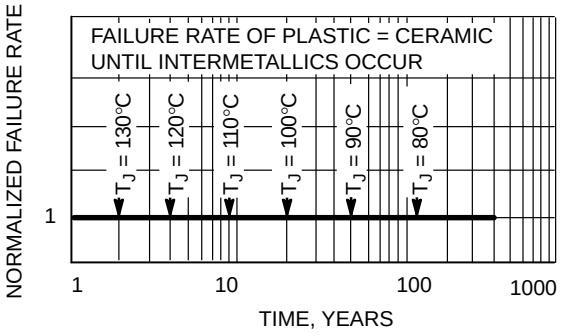


Figure 2. Failure Rate vs. Time Junction Temperature

DC CHARACTERISTICS − Digital Section (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_{CC}	Guaranteed Limit			Unit
				−55°C to 25°C	<85°C	<125°C	
V_{IH}	Minimum High−Level Input Voltage, Select Inputs		2.0 2.5 3.0 4.5 5.5	1.5 1.9 2.1 3.15 3.85	1.5 1.9 2.1 3.15 3.85	1.5 1.9 2.1 3.15 3.85	V
V_{IL}	Maximum Low−Level Input Voltage, Select Inputs		2.0 2.5 3.0 4.5 5.5	0.5 0.6 0.9 1.35 1.65	0.5 0.6 0.9 1.35 1.65	0.5 0.6 0.9 1.35 1.65	V
I_{IN}	Maximum Input Leakage Current, Select Inputs	V_{IN} = 5.5 V or GND	0 V to 5.5 V	±0.2	±2.0	±2.0	μA
I_{CC}	Maximum Quiescent Supply Current	Select and V_{IS} = V_{CC} or GND	5.5	4.0	4.0	8.0	μA

DC ELECTRICAL CHARACTERISTICS − Analog Section

Symbol	Parameter	Condition	V_{CC}	Guaranteed Limit			Unit
				−55°C to 25°C	<85°C	<125°C	
R_{ON}	Maximum “ON” Resistance (Figures 16 − 22)	V_{IN} = V_{IL} or V_{IH} V_{IS} = GND to V_{CC} $I_{IN}I \leq$ 10 mA	2.5 3.0 4.5 5.5	85 45 30 25	95 50 35 30	105 55 40 35	Ω
$R_{FLAT(ON)}$	ON Resistance Flatness (Figures 16 − 22)	V_{IN} = V_{IL} or V_{IH} $I_{IN}I \leq$ 10 mA V_{IS} = 1.0 V, 2.0 V, 3.5 V	4.5	4.0	4.0	5.0	Ω
$I_{NC(OFF)}$ $I_{NO(OFF)}$	NO or NC Off Leakage Current (Figure 8)	V_{IN} = V_{IL} or V_{IH} V_{NO} or V_{NC} = 1.0 V_{COM} 4.5 V	5.5	1.0	10	100	nA
$I_{COM(ON)}$	COM ON Leakage Current (Figure 8)	V_{IN} = V_{IL} or V_{IH} V_{NO} 1.0 V or 4.5 V with V_{NC} floating or V_{NO} 1.0 V or 4.5 V with V_{NO} floating 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)	V_{IS} (V)	Guaranteed Maximum Limit							Unit
					−55°C to 25°C			<85°C		<125°C		
					Min	Typ*	Max	Min	Max	Min	Max	
t_{ON}	Turn−On Time (Figures 11 and 12)	R_L = 300 Ω, C_L = 35 pF (Figures 4 and 5)	2.5	2.0	5.0	23	35	5.0	38	5.0	41	ns
			3.0	2.0	5.0	16	24	5.0	27	5.0	30	
			4.5	3.0	2.0	11	16	2.0	19	2.0	22	
			5.5	3.0	2.0	9.0	14	2.0	17	2.0	20	
t_{OFF}	Turn−Off Time (Figures 11 and 12)	R_L = 300 Ω, C_L = 35 pF (Figures 4 and 5)	2.5	2.0	1.0	7.0	12	1.0	15	1.0	18	ns
			3.0	2.0	1.0	5.0	10	1.0	13	1.0	16	
			4.5	3.0	1.0	4.0	6.0	1.0	9.0	1.0	12	
			5.5	3.0	1.0	3.0	5.0	1.0	8.0	1.0	11	
t_{BBM}	Minimum Break−Before−Make Time	V_{IS} = 3.0 V (Figure 3) R_L = 300 Ω, C_L = 35 pF	2.5	2.0	1.0	12		1.0		1.0		ns
			3.0	2.0	1.0	11		1.0		1.0		
			4.5	3.0	1.0	6.0		1.0		1.0		
			5.5	3.0	1.0	5.0		1.0		1.0		

*Typical Characteristics are at 25°C.

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

ADDITIONAL APPLICATION CHARACTERISTICS (Voltages Referenced 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 (Figure 10)	V_{IN} = 0 dBm V_{IN} centered between V_{CC} and GND (Figure 6)	3.0	145	MHz
			4.5	170	
			5.5	175	
V_{ONL}	Maximum Feedthrough On Loss	V_{IN} = 0 dBm @ 100 kHz to 50 MHz V_{IN} centered between V_{CC} and GND (Figure 6)	3.0	−2.0	dB
			4.5	−2.0	
			5.5	−2.0	
V_{ISO}	Off−Channel Isolation (Figure 9)	f = 100 kHz; V_{IS} = 1.0 V RMS V_{IN} centered between V_{CC} and GND (Figure 6)	3.0	−93	dB
			4.5	−93	
			5.5	−93	
Q	Charge Injection Select Input to Common I/O (Figure 14)	V_{IN} = V_{CC} to GND, F_{IS} = 20 kHz $t_r = t_f$ = 3.0 ns R_{IS} = 0 Ω, C_L = 1000 pF $Q = C_L * \Delta V_{OUT}$ (Figure 7)	3.0	1.5	pC
			5.5	3.0	
THD	Total Harmonic Distortion THD + Noise (Figure 13)	F_{IS} = 20 Hz to 100 kHz, R_L = Rgen = 600 Ω, C_L = 50 pF V_{IS} = 5.0 V_{PP} sine wave	5.5	0.1	%
VCT	Channel−to−Channel Crosstalk	f = 100 kHz; V_{IS} = 1.0 V RMS V_{IN} centered between V_{CC} and GND (Figure 6)	5.5	−90	dB
			3.0	−90	

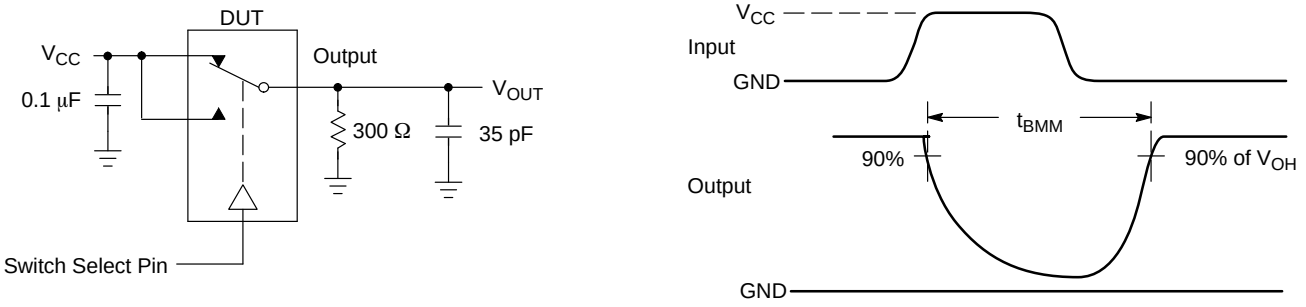


Figure 3. t_{BBM} (Time Break−Before−Make)

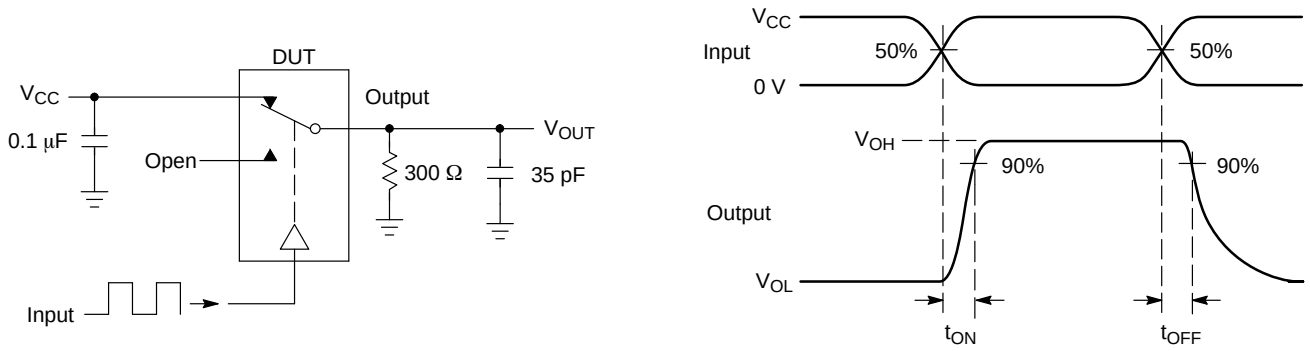


Figure 4. t_{ON}/t_{OFF}

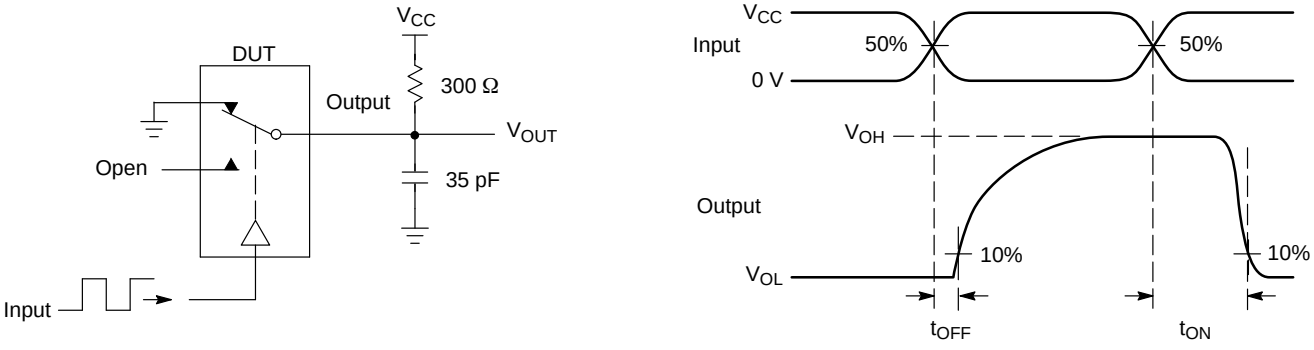
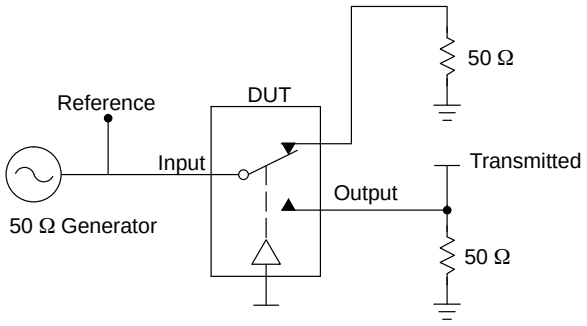


Figure 5. t_{ON}/t_{OFF}



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

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

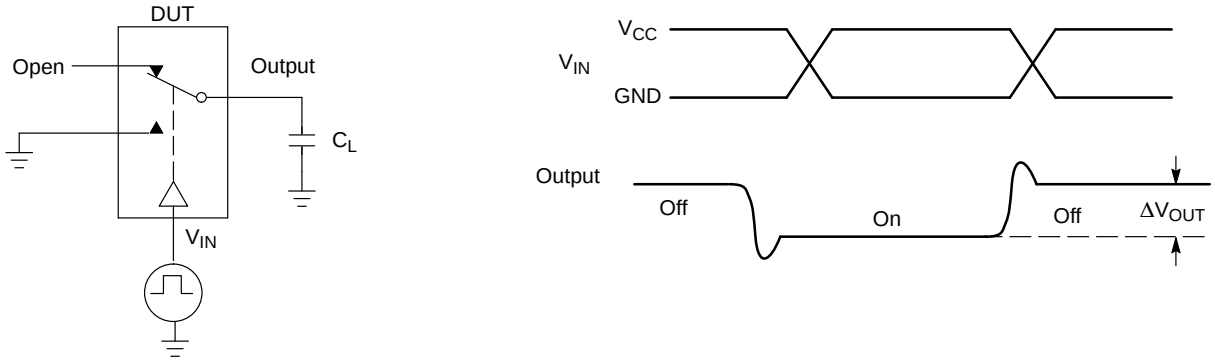


Figure 7. Charge Injection: (Q)

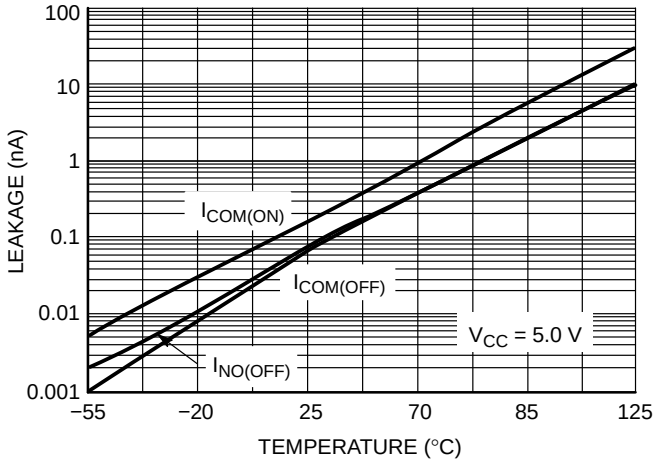


Figure 8. Switch Leakage vs. Temperature

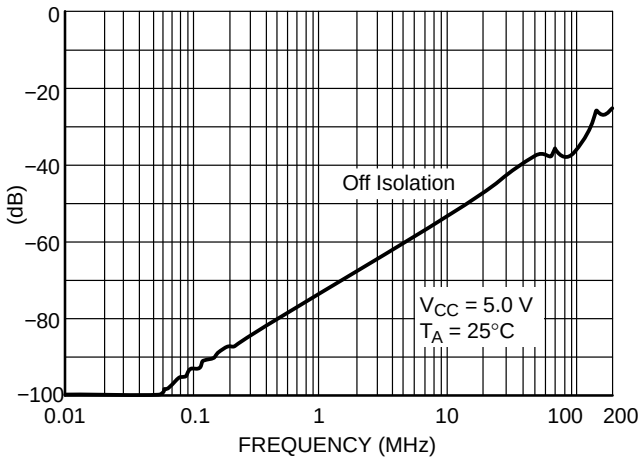


Figure 9. Off−Channel Isolation

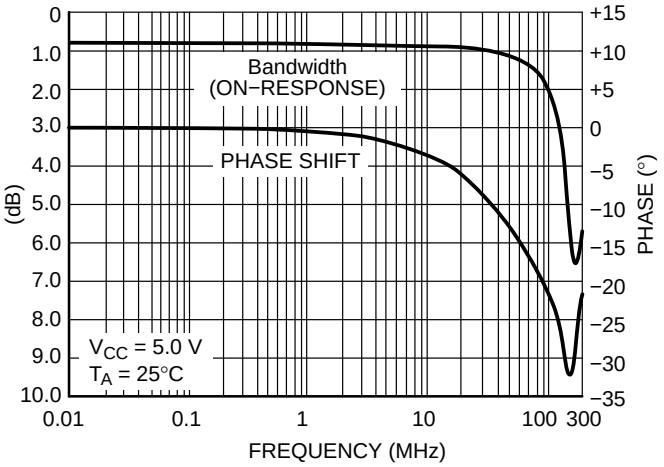


Figure 10. Typical Bandwidth and Phase Shift

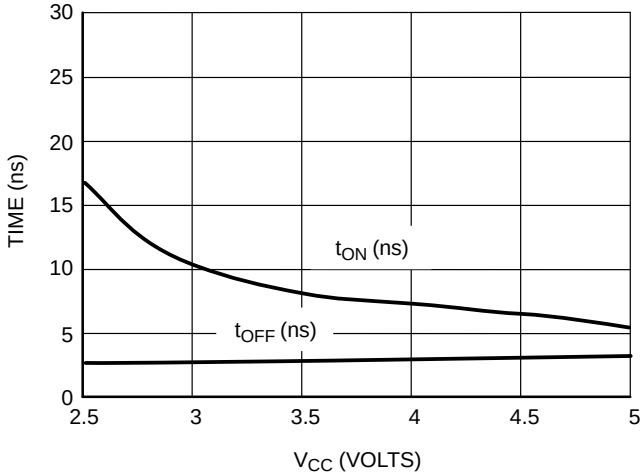


Figure 11. t_{ON} and t_{OFF} vs. V_{CC} at 25°C

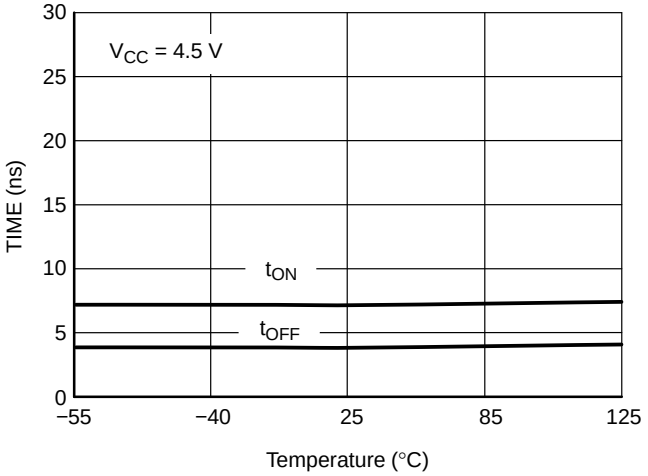


Figure 12. t_{ON} and t_{OFF} vs. Temp

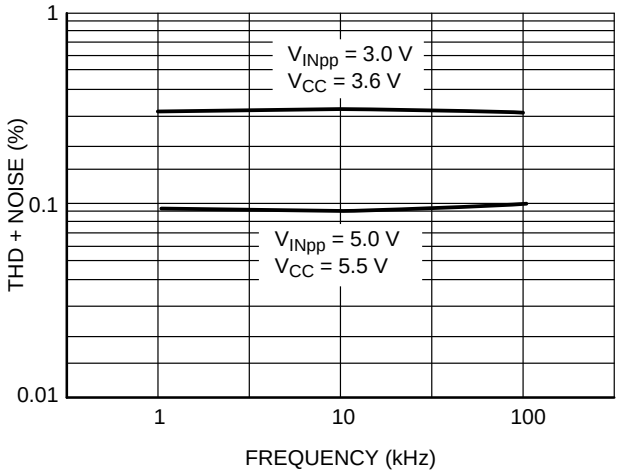


Figure 13. Total Harmonic Distortion Plus Noise vs. Frequency

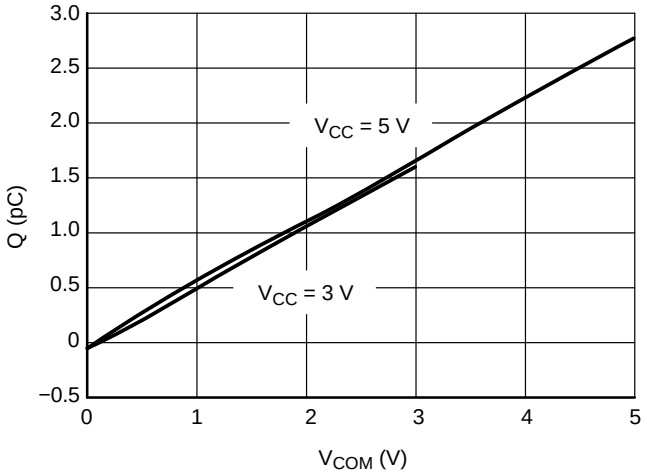


Figure 14. Charge Injection vs. COM Voltage

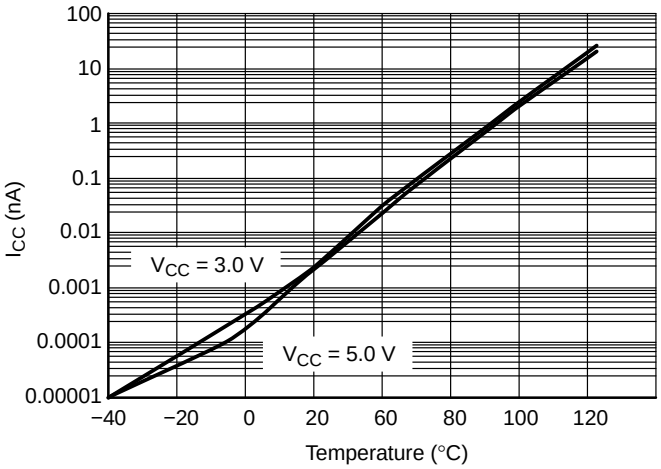


Figure 15. I_{CC} vs. Temp, V_{CC} = 3.0 V and 5.0 V

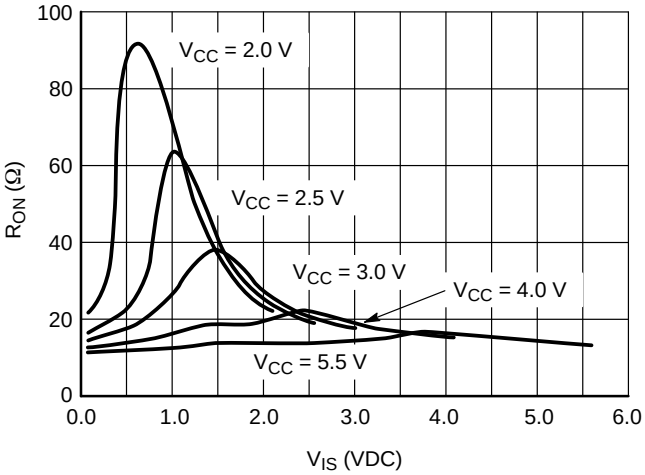


Figure 16. R_{ON} vs. V_{CC}, Temp = 25°C

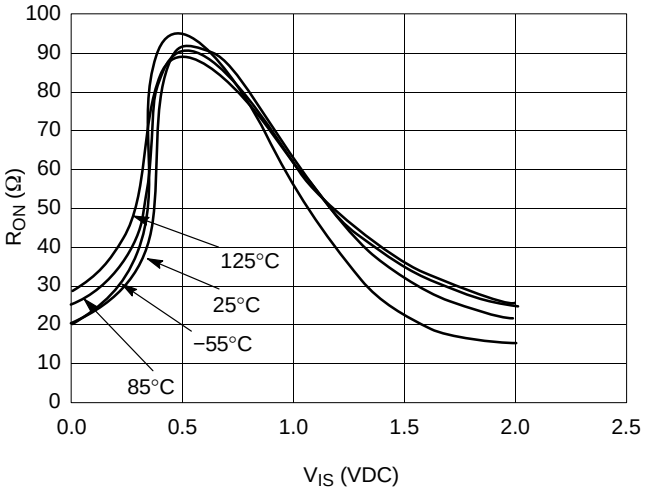


Figure 17. R_{ON} vs Temp, V_{CC} = 2.0 V

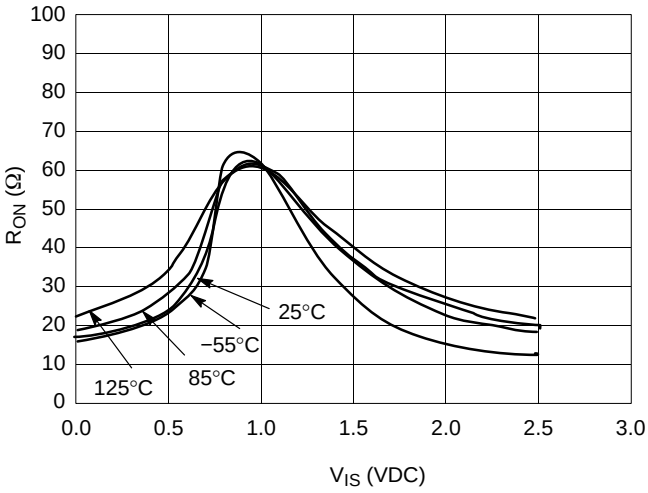


Figure 18. R_{ON} vs. Temp, V_{CC} = 2.5 V

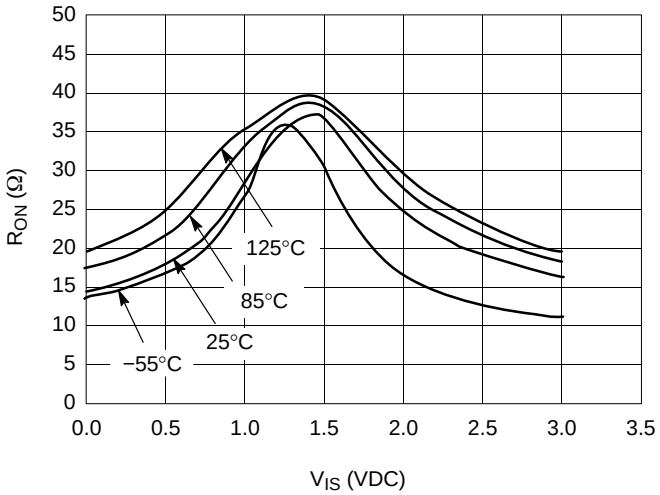


Figure 19. R_{ON} vs. Temp, V_{CC} = 3.0 V

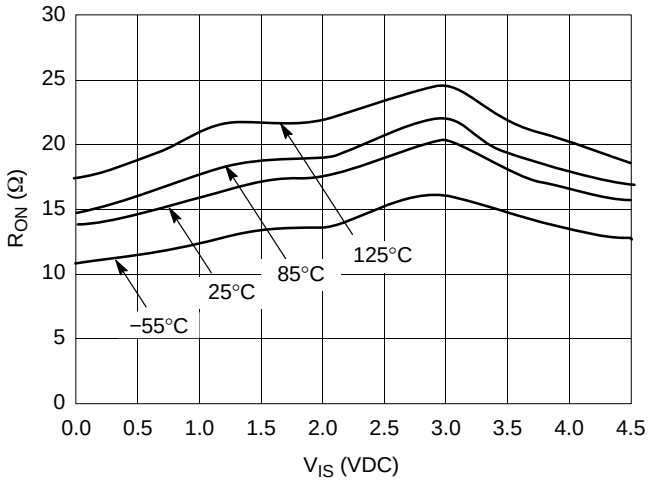


Figure 20. R_{ON} vs. Temp, V_{CC} = 4.5 V

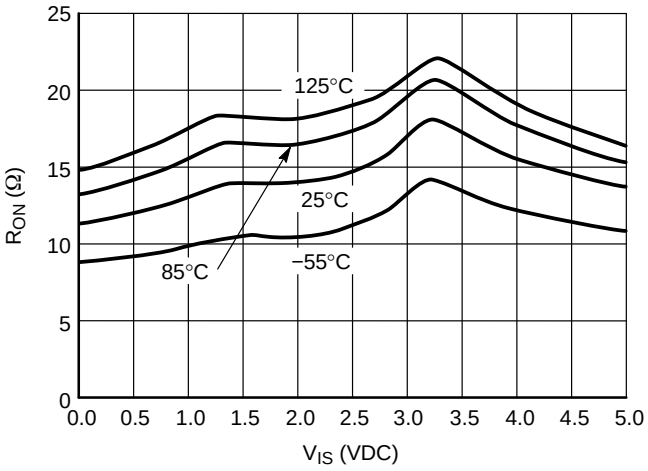


Figure 21. R_{ON} vs. Temp, V_{CC} = 5.0 V

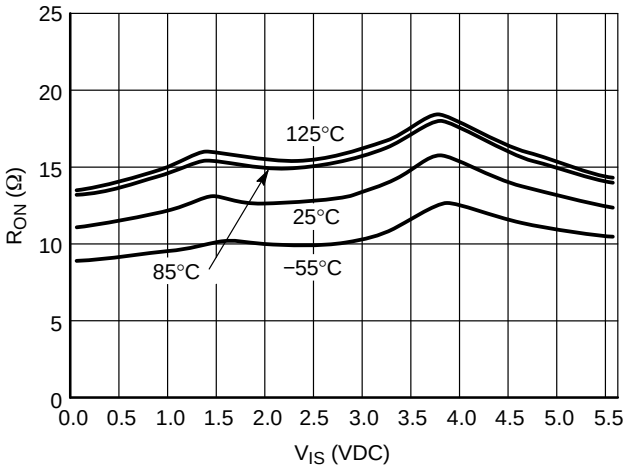


Figure 22. R_{ON} vs. Temp, V_{CC} = 5.5 V

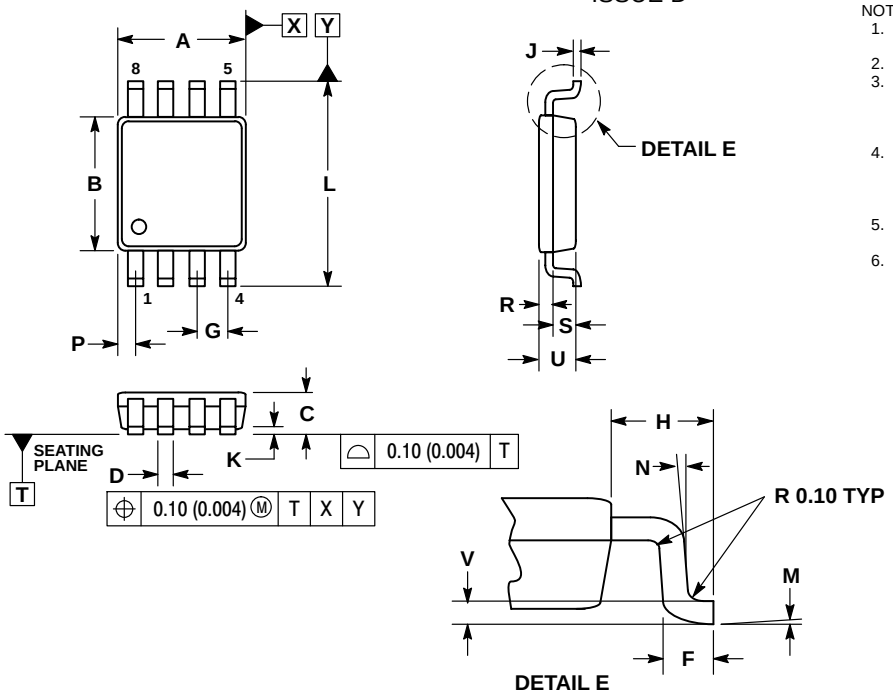
ORDERING INFORMATION

Device Order Number	Package Type	Tape and Reel Shippingize†
NLAS325USG	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 Specification Brochure, BRD8011/D.

PACKAGE DIMENSIONS

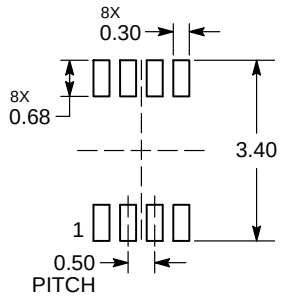
US8
US SUFFIX
CASE 493−02
ISSUE D



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:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative