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Buffer with Open Drain Output

NL17SG07MU3TBG

The NL17SG07 is a buffer with open drain output in tiny footprint packages. The device is designed to operate for $V_{CC} = 0.9\text{ V}$ to 3.6 V .

Features

- Designed for 0.9 V to 3.6 V V_{CC} Operation
- 3.7 ns (Typ) at $V_{CC} = 3.0\text{ V}$, $C_L = 15\text{ pF}$
- Inputs/Outputs Over-Voltage Tolerant up to 3.6 V
- I_{OFF} Supports Partial Power Down Protection
- Available in UDFN Package
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen-Free/BFR-Free and RoHS-Compliant

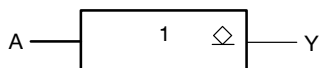


Figure 1. Logic Symbol

PIN ASSIGNMENTS

Pin	UDFN
1	NC
2	A
3	GND
4	Y
5	NC
6	V_{CC}

FUNCTION TABLE

Input	Output
A	Y
L	L
H	Z



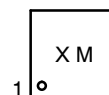
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UDFN6
1.0 x 1.0
CASE 517BX

MARKING DIAGRAM

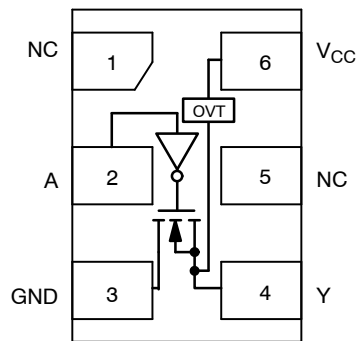


- X = Specific Device Code
- M = Date Code*
- = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

PINOUT DIAGRAM



(Top View)

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 7 of this data sheet.

NL17SG07MU3TBG

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit	
V_{CC}	DC Supply Voltage	-0.5 to +4.3	V	
V_{IN}	DC Input Voltage	-0.5 to +4.3	V	
V_{OUT}	DC Output Voltage	Active-Mode (High or Low State) Tri-State Mode (Note 1) Power-Down Mode ($V_{CC} = 0$ V)	-0.5 to $V_{CC} + 0.5$ -0.5 to +4.3 -0.5 to +4.3	V
I_{IK}	DC Input Diode Current	$V_{IN} < GND$	-20	mA
I_{OK}	DC Output Diode Current	$V_{OUT} < GND$	-20	mA
I_{OUT}	DC Output Source/Sink Current		± 20	mA
I_{CC} or I_{GND}	DC Supply Current Per Supply Pin or Ground Pin		± 20	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 2)		154	°C/W
P_D	Power Dissipation in Still Air		812	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 (Note 3)	Human Body Model Charged Device Model	2000 1000	V
$I_{LATCHUP}$	Latchup Performance (Note 4)		± 100	mA

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. Applicable to devices with outputs that may be tri-stated.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm – by – 1inch, 2 ounce copper trace no air flow per JESD51-7.
3. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.
4. Tested to EIA/JESD78 Class II.

Table 1. RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit	
V_{CC}	Positive DC Supply Voltage	0.9	3.6	V	
V_{IN}	Digital Input Voltage	0	3.6	V	
V_{OUT}	Output Voltage	Active Mode (High or Low State) Tri-State Mode (Note 1) Power Down Mode ($V_{CC} = 0$ V)	0 0 0	V_{CC} 3.6 3.6	V
T_A	Operating Free-Air Temperature	-55	+125	°C	
t_r, t_f	Input Transition Rise or Fall Rate	$V_{CC} = 3.3$ V \pm 0.3 V	0	10	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.

NL17SG07MU3TBG

Table 2. DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	T _A = 25°C			T _A = -55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
V _{IH}	High-Level Input Voltage		0.9	-	V _{CC}	-	-	-	V
			1.1 to 1.3	0.7 × V _{CC}	-	-	0.7 × V _{CC}	-	
			1.4 to 1.6	0.65 × V _{CC}	-	-	0.65 × V _{CC}	-	
			1.65 to 1.95	0.65 × V _{CC}	-	-	0.65 × V _{CC}	-	
			2.3 to 2.7	1.7	-	-	1.7	-	
			3.0 to 3.6	2.0	-	-	2.0	-	
V _{IL}	Low-Level Input Voltage		0.9	-	GND	-	-	-	V
			1.1 to 1.3	-	-	0.3 × V _{CC}	-	0.3 × V _{CC}	
			1.4 to 1.6	-	-	0.35 × V _{CC}	-	0.35 × V _{CC}	
			1.65 to 1.95	-	-	0.35 × V _{CC}	-	0.35 × V _{CC}	
			2.3 to 2.7	-	-	0.7	-	0.7	
			3.0 to 3.6	-	-	0.8	-	0.8	
V _{OL}	Low-Level Output Voltage	V _{IN} = V _{IH} or V _{IL}							V
		I _{OL} = 20 μA	0.9	-	0.1	-	-	-	
		I _{OL} = 0.3 mA	1.1 to 1.3	-	-	0.25 × V _{CC}	-	0.25 × V _{CC}	
		I _{OL} = 1.7 mA	1.4 to 1.6	-	-	0.25 × V _{CC}	-	0.25 × V _{CC}	
		I _{OL} = 3.0 mA	1.65 to 1.95	-	-	0.45	-	0.45	
		I _{OL} = 4.0 mA	2.3 to 2.7	-	-	0.4	-	0.4	
		I _{OL} = 8.0 mA	2.7 to 3.6	-	-	0.4	-	0.4	
I _{IN}	Input Leakage Current	V _{IN} = 0 V to 3.6 V	0.9 to 3.6	-	-	±0.1	-	±1.0	μA
I _{OFF}	Power Off Leakage Current	V _{IN} = 0 V to 3.6 V; V _{OUT} = 0 V to 3.6 V	0	-	-	1.0	-	10.0	μA
I _{CC}	Quiescent Supply Current	V _{IN} = V _{CC} or GND	0.9 to 3.6	-	-	0.5	-	10.0	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.

NL17SG07MU3TBG

Table 3. AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	V _{CC} (V)	T _A = 25°C			T _A = -55°C to +125°C		Unit	
				Min	Typ	Max	Min	Max		
t _{pZL}	Propagation Delay A to Y (Figures 3 and 4)	C _L = 10 pF; R _L = 100 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ							ns	
			0.9	-	31.6	-	-	-		
			1.1 to 1.3	-	8.2	12.7	-	13.0		
			1.4 to 1.6	-	4.3	5.7	-	7.3		
			1.65 to 1.95	-	3.4	4.5	-	5.9		
			2.3 to 2.7	-	2.2	3.3	-	4.5		
			3.0 to 3.6	-	1.7	2.9	-	3.7		
		C _L = 15 pF; R _L = 100 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ								
			0.9	-	32.5	-	-	-		
			1.1 to 1.3	-	8.5	13.0	-	13.5		
			1.4 to 1.6	-	4.5	6.0	-	7.9		
			1.65 to 1.95	-	3.6	4.5	-	6.2		
			2.3 to 2.7	-	2.3	3.4	-	4.6		
			3.0 to 3.6	-	1.8	3.0	-	3.7		
		C _L = 30 pF; R _L = 100 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ								
			0.9	-	35.2	-	-	-		
			1.1 to 1.3	-	9.3	14.0	-	14.2		
			1.4 to 1.6	-	5.1	6.2	-	8.5		
			1.65 to 1.95	-	4.0	4.9	-	6.4		
			2.3 to 2.7	-	2.6	3.6	-	4.7		
			3.0 to 3.6	-	2.1	3.1	-	3.9		
t _{PLZ}	Propagation Delay, A to Y (Figures 3 and 4)	C _L = 10 pF; R _L = 100 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ						ns		
			0.9	-	14.9	-	-		-	
			1.1 to 1.3	-	7.2	10.9	-		11.5	
			1.4 to 1.6	-	5.1	7.2	-		8.3	
			1.65 to 1.95	-	4.8	7.0	-		7.8	
			2.3 to 2.7	-	4.2	6.5	-		7.3	
			3.0 to 3.6	-	3.8	6.2	-		6.8	
		C _L = 15 pF; R _L = 100 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ								
			0.9	-	16.2	-	-		-	
			1.1 to 1.3	-	8.5	13.4	-		14.0	
			1.4 to 1.6	-	6.4	10.0	-		10.8	
			1.65 to 1.95	-	6.1	9.5	-		10.5	
			2.3 to 2.7	-	5.5	7.8	-		10.0	
			3.0 to 3.6	-	5.2	7.2	-		9.3	
		C _L = 30 pF; R _L = 100 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ R _L = 5 kΩ								
			0.9	-	20.1	-	-		-	
			1.1 to 1.3	-	12.4	18.4	-		20.0	
			1.4 to 1.6	-	10.2	15.0	-		16.0	
			1.65 to 1.95	-	9.9	14.5	-		15.8	
			2.3 to 2.7	-	9.4	13.5	-		15.4	
			3.0 to 3.6	-	9.0	13.2	-		14.3	

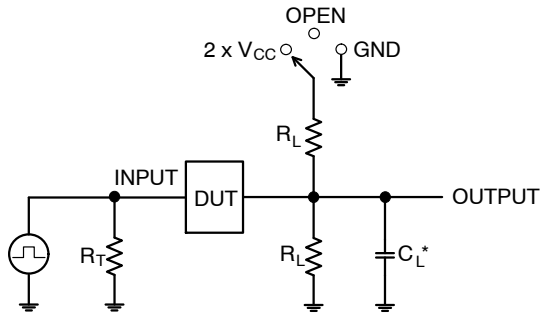
NL17SG07MU3TBG

Table 4. CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Typical (T _A = 25°C)	Unit
C _{IN}	Input Capacitance	V _{CC} = 0 V	3.0	pF
C _{OUT}	Output Capacitance	V _{CC} = 0 V	3.0	pF
C _{PD}	Power Dissipation Capacitance (Note 5)	f = 10 MHz, V _{CC} = 0.9 V to 3.6 V, V _{IN} = 0 V or V _{CC}	4.0	pF

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation $I_{CC(OPR)} = C_{PD} \times V_{CC} \times f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption: $P_D = C_{PD} \times V_{CC}^2 \times f_{in} + I_{CC} \times V_{CC}$.

NL17SG07MU3TBG



C_L includes probe and jig capacitance
 R_T is Z_{OUT} of pulse generator (typically 50 Ω)
 $f = 1$ MHz

Figure 2. Test Circuit

Test	Switch Position
t_{PLH} / t_{PHL}	Open
t_{PLZ} / t_{PZL}	$2 \times V_{CC}$
t_{PHZ} / t_{PZH}	GND

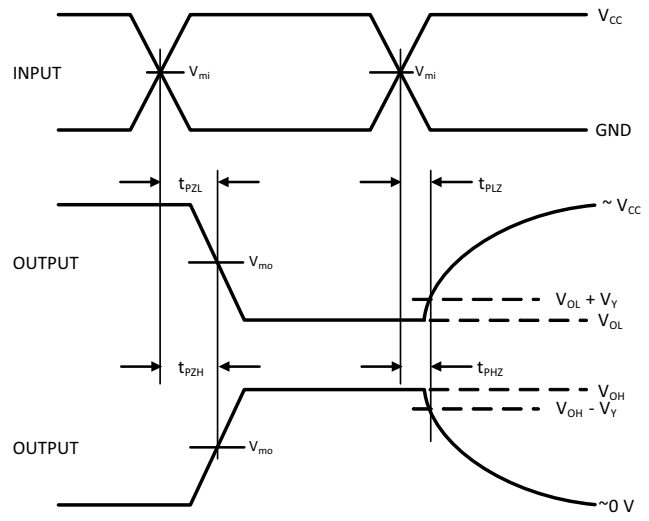
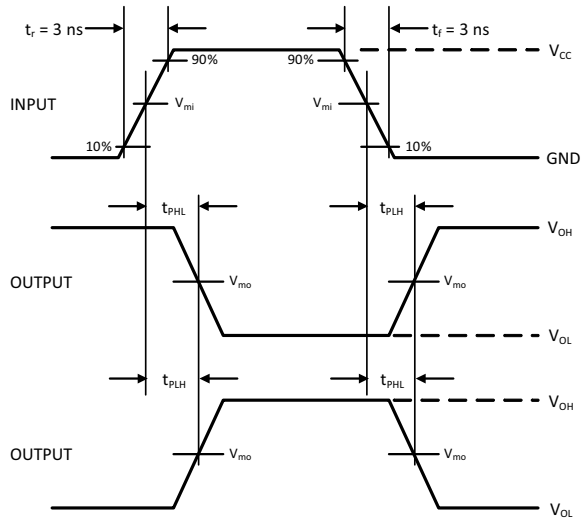


Figure 3. Switching Waveforms

V_{CC}, V	V_{mi}, V	V_{mo}, V	V_y, V
0.9	$V_{CC}/2$	$V_{CC}/2$	0.1
1.1 to 1.3	$V_{CC}/2$	$V_{CC}/2$	0.1
1.4 to 1.6	$V_{CC}/2$	$V_{CC}/2$	0.1
1.65 to 1.95	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	$V_{CC}/2$	$V_{CC}/2$	0.15
3.0 to 3.6	1.5	1.5	0.3

NL17SG07MU3TBG

ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping†
NL17SG07MU3TBG	UDFN6, 1.0 x 1.0, 0.35P	J	Q2	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.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC – Q100 Qualified and PPAP Capable.

Pin 1 Orientation in Tape and Reel

Direction of Feed

