

NB3F8L3010C

3.3V / 2.5V / 1.8V / 1.5V 1:10 LVCMOS Fanout Buffer

Description

The NB3F8L3010C is a 3:1:10 Clock / Data fanout buffer operating on a 3.3 V / 2.5 V Core V_{DD} and a flexible 3.3 V / 2.5 V / 1.8 V / 1.5 V V_{DDO} supply which must be equal or less than V_{DD} .

A Mux selects between a Crystal input, or either of two differential/SE Clock / Data inputs. Differential Inputs accept LVPECL, LVDS, HCSL, or SSTL and Single-Ended levels. The MUX control lines, SEL0 and SEL1, select CLK0/ $\overline{\text{CLK0}}$, CLK1/ $\overline{\text{CLK1}}$, or Crystal input pins per Table 3. The Crystal input is disabled when a Clock input is selected. Output enable pin, OE, synchronously forces a High Impedance state (HZ) when Low per Table 4.

Outputs consist of 10 single-ended LVCMOS outputs.

Features

- Ten CMOS / LVTTTL Outputs up to 200 MHz
- Differential Inputs Accept LVPECL, LVDS, HCSL, or SSTL
- Crystal Oscillator Interface
- Crystal Input Frequency Range: 10 MHz to 40 MHz
- Output Skew: 10 ps Typical
- Additive RMS Phase Jitter @ 125 MHz, (12 kHz – 20 MHz): 0.03 ps (Typical)
- Synchronous Output Enable
- Output Defined Level When Input is Floating
- Power Supply Modes:
 - ◆ Single 3.3 V
 - ◆ Single 2.5 V
 - ◆ Mixed 3.3 V \pm 5% Core/2.5 V \pm 5% Output Operating Supply
 - ◆ Mixed 3.3 V \pm 5% Core/1.8 V \pm 0.2 V Output Operating Supply
 - ◆ Mixed 3.3 V \pm 5% Core/1.5 V \pm 0.15 V Output Operating Supply
 - ◆ Mixed 2.5 V \pm 5% Core/ 1.8 V \pm 0.2 V Output Operating Supply
 - ◆ Mixed 2.5 V \pm 5% Core /1.5 V \pm 0.15 V Output Operating Supply
- Industrial temp. range -40°C to 85°C
- These are Pb-Free Devices

Applications

- Clock Distribution
- Networking and Communications
- High End Computing
- Wireless and Wired Infrastructure

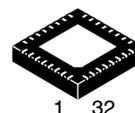
End Products

- Servers
- Ethernet Switch/Routers
- ATE
- Test and Measurement



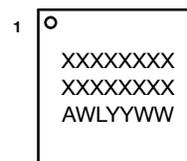
ON Semiconductor®

<http://onsemi.com>



QFN32
G SUFFIX
CASE 488AM

MARKING DIAGRAM



A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 12 of this data sheet.

NB3F8L3010C

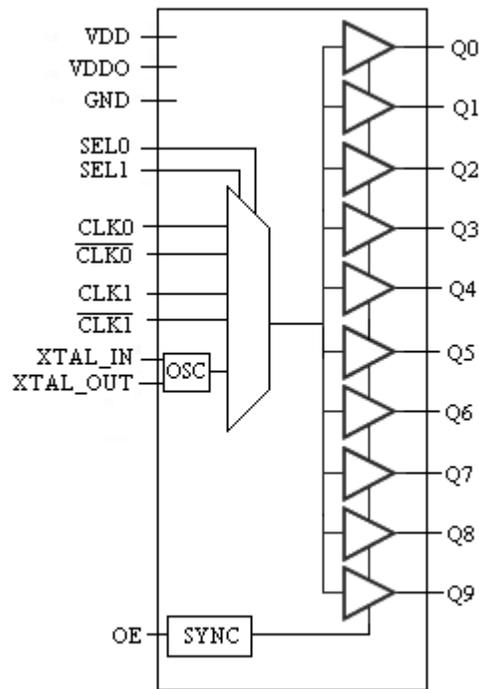


Figure 1. Simplified Logic Diagram

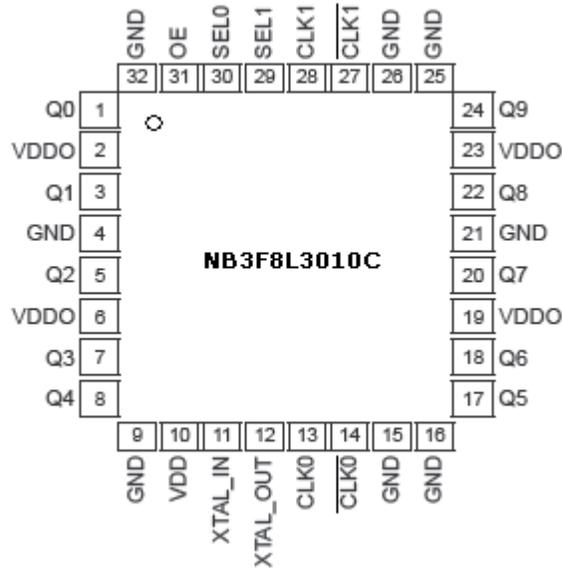


Figure 2. Pinout Configuration (Top View)

NB3F8L3010C

Table 1. PIN DESCRIPTION

Number	Name	Type	Input Default	Description
1, 3, 5, 7, 8, 17, 18, 20, 22, 24	Q[0:9]	LVC MOS Output		Output LVC MOS
2, 6, 19, 23	VDDO	Power		VDDO Positive Supply pin for outputs. VDDO pins must all be externally connected to a power supply to guarantee proper operation. Bypass with 0.01 μ F cap to GND
4, 9, 15, 16, 21, 25, 26, 32	GND	GND		Ground Supply. All GND pins must be externally connected to power supply to guarantee proper operation.
10	VDD	Power		V _{DD} Positive Supply pin for Core. VDD pin must be externally connected to a power supply to guarantee proper operation. Bypass with 0.01 μ F cap to GND.
11	XTAL_IN	XTAL OSC / CLK Input		Crystal Oscillator Interface or External Clock Source at LVC MOS Levels
12	XTAL_OUT	XTAL OSC Output		Crystal Oscillator Interface
13	CLK0	Diff / SE Input	Pulldown	Non-inverting clock/data input 0.
14	CLK $\bar{0}$	Diff / SE Input	Pullup / Pulldown	Inverting differential clock input 0.
27	CLK $\bar{1}$	Diff / SE Input	Pullup / Pulldown	Inverting differential clock input 1
28	CLK1	Diff / SE Input	Pulldown	Non-inverting clock/data input 1
29	SEL1	LVC MOS / LV TTL Input	Pulldown	Input clock select. See Table 3 for function. Input Pulldown
30	SEL0	LVC MOS / LV TTL Input	Pulldown	Input clock select. See Table 3 for function. Input Pulldown
31	OE	LVC MOS / LV TTL Input	Pulldown	Output Enable Control. See Table 4 for function.

Table 2. PIN CHARACTERISTICS

Symbol	Parameter	Min	Typ	Max	Unit
C _{IN}	Input Capacitance		4		pF
R	Input Pulldown Resistor; Input Pulldown Resistor		50		k Ω
C _{PD}	Power Dissipation Capacitance (per output) VDDO = 3.3 V VDDO = 2.5 V VDDO = 1.8 V VDDO = 1.5 V				pF
R _{OUT}	Output Impedance VDDO = 3.3 V VDDO = 2.5 V VDDO = 1.8 V VDDO = 1.5 V		20		Ω

NB3F8L3010C

FUNCTION TABLES

Table 3. CLOCK ENABLE (SELx) FUNCTION TABLE

SEL[1:0] Input	Selected Input Clock
00	CLK0/CLK0
01	CLK1/CLK1
10	Crystal Osc Input
11	Crystal Osc Input

Table 5. DIFF IN/OUT TABLE (Diff or S.E.)

Input Condition	Output
CLK0/1; $\overline{\text{CLK0}}/\overline{1}$ = OPEN	Logic LOW
CLK0/1; $\overline{\text{CLK0}}/\overline{1}$ = GND	Undefined
CLK0/1 = HIGH; $\overline{\text{CLK0}}/\overline{1}$ = LOW	Logic HIGH
CLK0/1 = LOW; $\overline{\text{CLK0}}/\overline{1}$ = HIGH	Logic LOW

Table 4. CLOCK OUTPUT ENABLE (OE) FUNCTION TABLE

OE Input	Q[9:0] Output
0	High Impedance
1	Outputs Enabled

Table 6. CRYSTAL CHARACTERISTICS

Parameter	Min	Typ	Max	Unit
Mode of Oscillation	Fundamental			
Frequency	10		40	MHz
Equivalent Series Resistance (ESR)			50	Ω
Shunt Capacitance			7	pF
Drive Power			100	μW

Table 7. ATTRIBUTES

Characteristic	Value
ESD Protection Human Body Model Machine Model	>2 kV 200 V
Moisture Sensitivity (Note 1) QFN32	Level 3
Flammability Rating Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in
Transistor Count	474 Devices
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

1. For additional information, see Application Note AND8003/D.

Table 8. MAXIMUM RATINGS (Note 2)

Symbol	Parameter	Condition	Rating	Unit
V _{DD}	Positive Power Supply	GND = 0 V	4.6	V
V _I	Input Voltage XTAL_IN Diff, SELx, OE Inputs		$0 \leq V_I \leq V_{DD}$ $-0.5 \leq V_I \leq V_{DD} + 0.5$	V
V _O	Output Voltage		$-0.5 \leq V_O \leq V_{DD} + 0.5$	V
T _A	Operating Temperature Range, Industrial		-40 to +85	°C
T _{stg}	Storage Temperature Range		-65 to +150	°C
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	31 27	°C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	(Note 2)	12	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power).

NB3F8L3010C

Table 9. POWER SUPPLY DC CHARACTERISTICS $V_{DD} = 3.3\text{ V} \pm 5\%$ (3.135 V to 3.465 V) or $V_{DD} = 2.5\text{ V} \pm 5\%$ (2.375 V to 2.625 V) and $V_{DDO} = 3.3\text{ V} \pm 5\%$ (3.135 V to 3.465 V) or $2.5\text{ V} \pm 5\%$ (2.375 V to 2.625 V) or $1.8\text{ V} \pm 0.2\text{ V}$ (1.6 V to 2.0 V) or $1.5\text{ V} \pm 0.15\text{ V}$ (1.35 V to 1.65 V); $T_A = -40^\circ\text{C}$ to 85°C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
IDD	VDD Power Supply Current	OE = 0, no load $3.3\text{ V} \pm 5\%$; $V_{DDO} = 3.3\text{ V} \pm 5\%$ or $2.5\text{ V} \pm 5\%$ or $1.8\text{ V} \pm 0.2\text{ V}$ or $1.5\text{ V} \pm 0.15\text{ V}$ $2.5\text{ V} \pm 5\%$; $V_{DDO} = 2.5\text{ V} \pm 5\%$ or $1.8\text{ V} \pm 0.2\text{ V}$ or $1.5\text{ V} \pm 0.15\text{ V}$		30	50	mA
IDDO	VDDO Power Supply Current	OE = 0, no load $3.3\text{ V} \pm 5\%$; $V_{DDO} = 3.3\text{ V} \pm 5\%$ or $2.5\text{ V} \pm 5\%$ or $1.8\text{ V} \pm 0.2\text{ V}$ or $1.5\text{ V} \pm 0.15\text{ V}$ $2.5\text{ V} \pm 5\%$; $V_{DDO} = 2.5\text{ V} \pm 5\%$ or $1.8\text{ V} \pm 0.2\text{ V}$ or $1.5\text{ V} \pm 0.15\text{ V}$			5	mA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

Table 10. DC CHARACTERISTICS $T_A = -40^\circ\text{C}$ to 85°C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IH}	LVC MOS / LV TTL Input High Voltage (OE, SELx)	$V_{DD} = 3.3\text{ V} \pm 5\%$ $V_{DD} = 2.5\text{ V} \pm 5\%$	2 1.7		$V_{DD} + 0.3$ $V_{DD} + 0.3$	V
V_{IL}	LVC MOS / LV TTL Input Low Voltage (OE, SELx)	$V_{DD} = 3.3\text{ V} \pm 5\%$ $V_{DD} = 2.5\text{ V} \pm 5\%$	-0.3 -0.3		0.8 0.7	V
I_{IH}	Input High Current OE, SELx, CLKx/CLKx	$V_{DD} = V_{IN} = 3.465\text{ V}$ $V_{DD} = V_{IN} = 3.465\text{ V}$ or 2.625 V			150 150	μA
I_{IL}	Input Low Current OE, SELx CLKx CLKx	$V_{DD} = 3.465\text{ V}$; $V_{IN} = 0.0\text{ V}$ $V_{DD} = 3.465\text{ V}$ or 2.625 V ; $V_{IN} = 0.0\text{ V}$ $V_{DD} = 3.465\text{ V}$ or 2.625 V ; $V_{IN} = 0.0\text{ V}$	-5 -5 -150			μA
V_{OH}	Output High Voltage (Note 3)	$V_{DDO} = 3.3\text{ V} \pm 5\%$	2.6			V
		$V_{DDO} = 2.5\text{ V} \pm 5\%$	1.8			
		$V_{DDO} = 1.8\text{ V} \pm 0.2\text{ V}$	1.2			
		$V_{DDO} = 1.5\text{ V} \pm 0.15\text{ V}$	0.9			
V_{OL}	Output Low Voltage (Note 3)	$V_{DDO} = 3.3\text{ V} \pm 5\%$ or $2.5\text{ V} \pm 5\%$			0.5	V
		$V_{DDO} = 1.8\text{ V} \pm 0.2\text{ V}$			0.4	
		$V_{DDO} = 1.5\text{ V} \pm 0.15\text{ V}$			0.37	
V_{PP}	Peak-to-Peak Input Voltage $V_{IL} > -0.3\text{ V}$ CLKx/CLKx	$V_{DD} = 3.3\text{ V} \pm 5\%$ or $V_{DD} = 2.5\text{ V} \pm 5\%$	0.15		1.3	V
V_{IHCMR}	Input High Level Common Mode Range $V_{CM} = V_{IH}$; $V_{IL} > -0.3\text{ V}$ CLKx/CLKx	$V_{DD} = 3.3\text{ V} \pm 5\%$ or $V_{DD} = 2.5\text{ V} \pm 5\%$	0.5		$V_{DD} - 0.85$	V

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

3. Outputs terminated with $50\ \Omega$ to $V_{DDO}/2$. See Parameter Measurement Information..

NB3F8L3010C

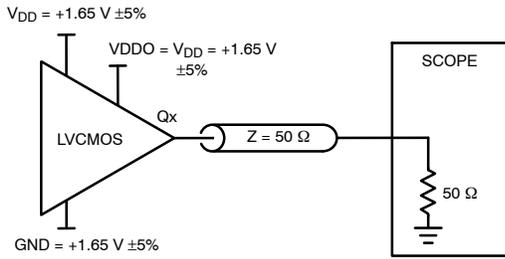
Table 11. AC CHARACTERISTICS $V_{DD} = 3.3\text{ V} \pm 5\%$ (3.135 V to 3.465 V) or $V_{DD} = 2.5\text{ V} \pm 5\%$ (2.375 V to 2.625 V) and $V_{DDO} = 3.3\text{ V} \pm 5\%$ (3.135 V to 3.465 V) or $2.5\text{ V} \pm 5\%$ (2.375 V to 2.625 V) or $1.8\text{ V} \pm 0.2\text{ V}$ (1.6 V to 2.0 V) or $1.5\text{ V} \pm 0.15\text{ V}$ (1.35 V to 1.65 V); $T_A = -40^\circ\text{C}$ to 85°C

Symbol	Parameter		Test Conditions	Min	Typ	Max	Unit
f_{MAX}	Output Frequency	Using External Crystal		10		40	MHz
		Using External Clock Source (Note 4)		DC		200	MHz
$t_{\text{sk(o)}}$	Output Skew (Notes 5 and 6)				10	55	ps
$t_{\text{JITTER}\Phi}$	Additive RMS Phase Jitter (Integrated 12 kHz – 20 MHz) (Note 7)	Input clock from CLK0/CLK0 or CLK1/CLK1	$V_{\text{DDO}} = 3.3\text{ V} \pm 5\%$		0.03		ps
			$V_{\text{DDO}} = 2.5\text{ V} \pm 5\%$		0.03		
			$V_{\text{DDO}} = 1.8\text{ V} \pm 0.2\text{ V}$		0.03		
			$V_{\text{DDO}} = 1.5\text{ V} \pm 0.15\text{ V}$		0.03		
		External clock over drives crystal interface	$V_{\text{DDO}} = 3.3\text{ V} \pm 5\%$		0.03		
			$V_{\text{DDO}} = 2.5\text{ V} \pm 5\%$		0.03		
			$V_{\text{DDO}} = 1.8\text{ V} \pm 0.2\text{ V}$		0.03		
			$V_{\text{DDO}} = 1.5\text{ V} \pm 0.15\text{ V}$		0.03		
		Input clock from crystal	$V_{\text{DDO}} = 3.3\text{ V} \pm 5\%$		0.03		
			$V_{\text{DDO}} = 2.5\text{ V} \pm 5\%$		0.03		
			$V_{\text{DDO}} = 1.8\text{ V} \pm 0.2\text{ V}$		0.03		
			$V_{\text{DDO}} = 1.5\text{ V} \pm 0.15\text{ V}$		0.03		
$t_{\text{R}} / t_{\text{F}}$	Output Rise/Fall Time (20% and 80%)		$V_{\text{DDO}} = 3.3\text{ V} \pm 5\%$	150	350	500	ps
			$V_{\text{DDO}} = 2.5\text{ V} \pm 5\%$	150	350	500	
			$V_{\text{DDO}} = 1.8\text{ V} \pm 0.2\text{ V}$	150	350	600	
			$V_{\text{DDO}} = 1.5\text{ V} \pm 0.15\text{ V}$	150	350	600	
odc	Output Duty Cycle		$V_{\text{DDO}} = 3.3\text{ V} \pm 5\%$	45		55	%
			$V_{\text{DDO}} = 2.5\text{ V} \pm 5\%$	40		60	
			$V_{\text{DDO}} = 1.8\text{ V} \pm 0.2\text{ V}$	40		60	
			$V_{\text{DDO}} = 1.5\text{ V} \pm 0.15\text{ V}$	40		60	
t_{EN}	Output Enable Time (Note 8)	OE				4	cycles
t_{DIS}	Output Disable Time (Note 8)	OE				4	cycles
MUX_ISOLATION	MUX_ISOLATION		155.52 MHz	55			dB

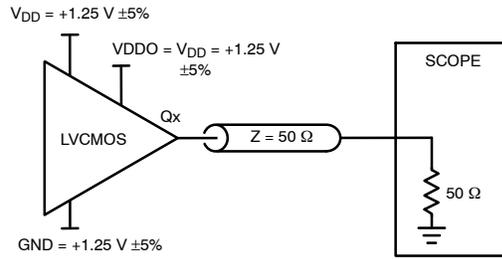
NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

4. XTAL_IN can be overdriven relative to a signal a crystal would provide.
5. Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at $V_{\text{DDO}}/2$.
6. This parameter is defined in accordance with JEDEC Standard 65.
7. See phase noise plot.
8. These parameters are guaranteed by characterization. Not tested in production. See Parameter Measurement Information

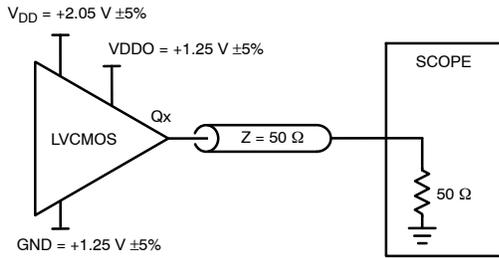
PARAMETER MEASUREMENT INFORMATION



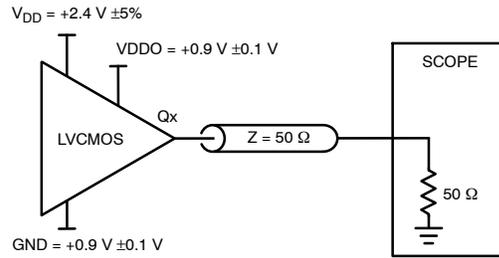
3.3 V Core / 3.3 V Output Load AC Test Circuit
(Terminating to VDDO/2)



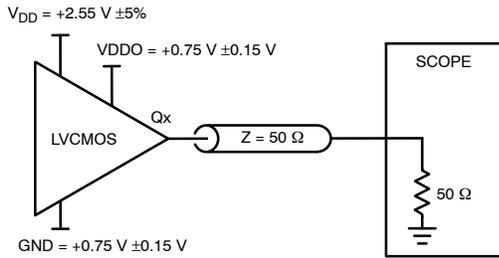
2.5 V Core / 2.5 V Output Load AC Test Circuit
(Terminating to VDDO/2)



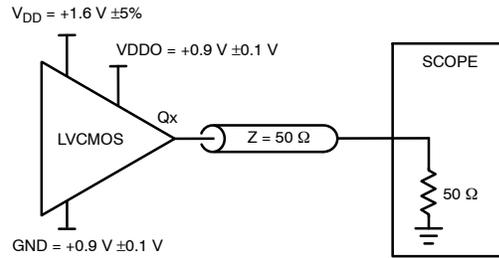
3.3 V Core / 2.5 V Output Load AC Test Circuit
(Terminating to VDDO/2)



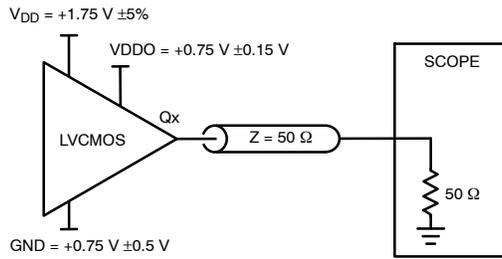
3.3 V Core / 1.8 V Output Load AC Test Circuit
(Terminating to VDDO/2)



3.3 V Core / 1.5 V Output Load AC Test Circuit
(Terminating to VDDO/2)



2.5 V Core / 1.8 V Output Load AC Test Circuit
(Terminating to VDDO/2)



2.5 V Core / 1.5 V Output Load AC Test Circuit
(Terminating to VDDO/2)

Figure 3. Operational Supply and Termination Test Conditions

PARAMETER MEASUREMENT INFORMATION

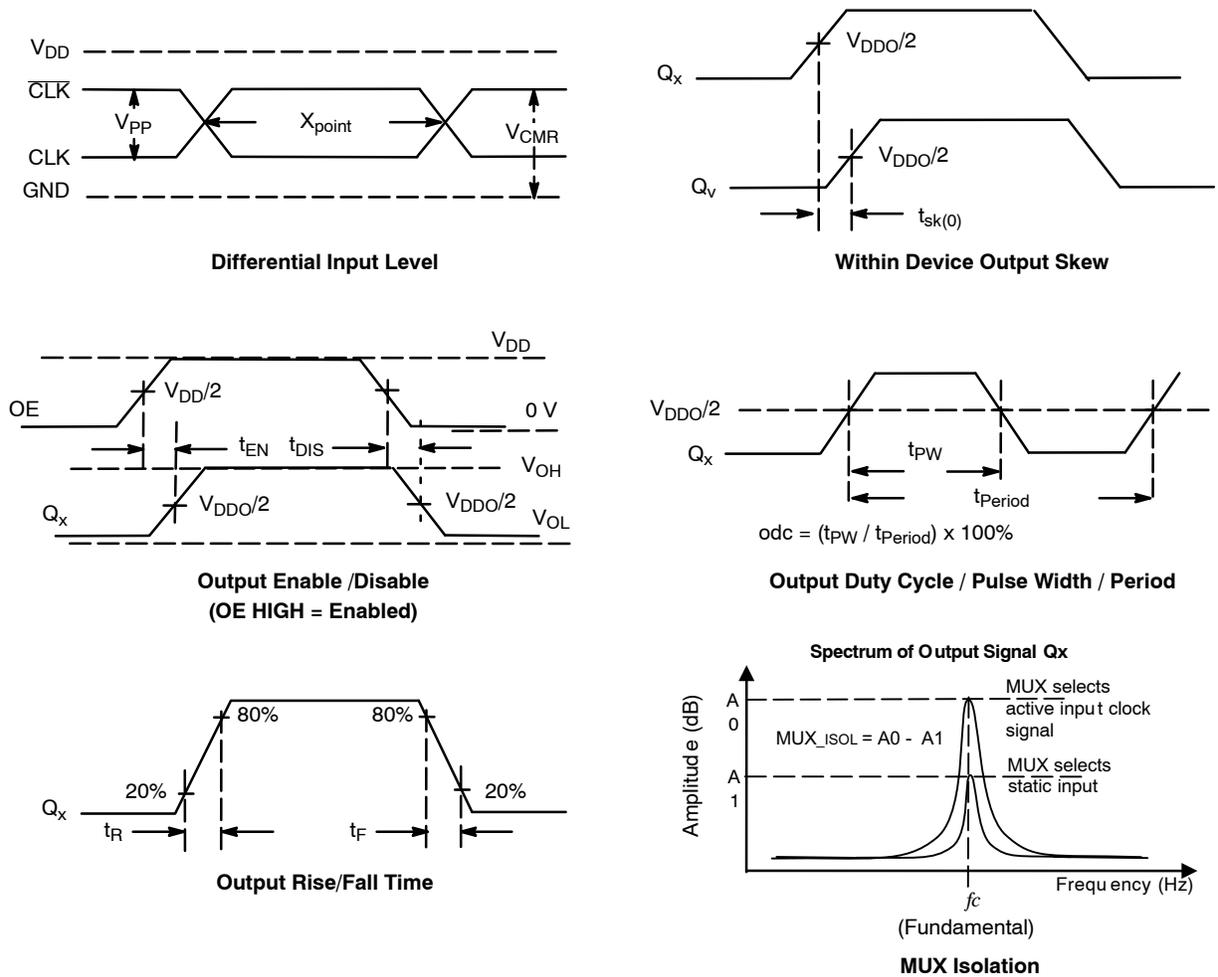


Figure 4. Operational Waveforms and MUX Input Isolation Plot

APPLICATION INFORMATION

Recommendations for Unused LVCMOS Output Pins

Inputs:

CLK/ $\overline{\text{CLK}}$ Inputs

For applications not requiring the use of the differential input, both CLK and $\overline{\text{CLK}}$ can be left floating. Though not required, but for additional protection, a 1k Ω resistor can be tied from CLK to ground.

Crystal Inputs

For applications not requiring the use of the crystal oscillator input, both XTAL_IN and XTAL_OUT can be left

floating. Though not required, but for additional protection, a 1 k Ω resistor can be tied from XTAL_IN to ground.

LVCMOS Control Pins

All control pins have internal pulldowns; additional resistance is not required but can be added for additional protection. A 1 k Ω resistor can be used.

Outputs:

LVCMOS Outputs

All unused LVCMOS outputs can be left floating with no trace attached.

Differential Input with Single-Ended Interconnect

Refer to Figure 5 to interconnect a single-ended to a Differential Pair of inputs. The reference bias voltage $V_{REF} = V_{DD}/2$ is generated by the resistor divider of R3 and R4. Bypass capacitor (C1) can filter noise on the DC bias. This bias circuit should be located as close to the input pin as possible. Adjust R1 and R2 to common mode voltage of the signal input swing to preserve duty cycle.

This configuration requires that the sum of the output impedance of the driver (R_o) and the series resistance (R_s) equals the transmission line impedance. In addition, matched termination by R1 and R2 will attenuate the signal

amplitude in half. Termination may be done by using R_s or by using R1 and R2. First, $R_s = 0$ and then R3 and R4 in parallel should equal the transmission line impedance. For most 50 Ω applications, R1 and R2 can be 100 Ω . The differential input can handle full rail LVCMOS signaling, but it is recommended that the amplitude be reduced. The datasheet specifies a differential amplitude which needs to be doubled for a single ended equivalent stimulus. V_{ILmin} cannot be less than -0.3 V and V_{IHmax} cannot be more than $V_{DD} + 0.3$ V. The datasheet specifications are characterized and guaranteed by using a differential signal.

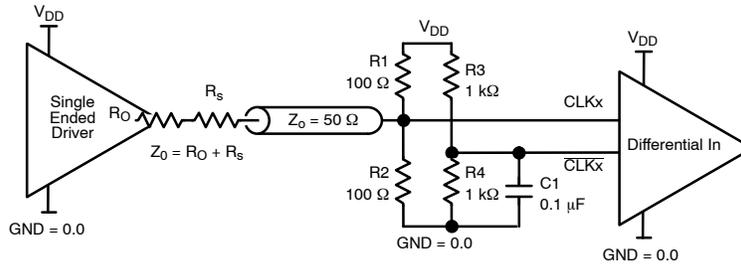


Figure 5. Differential Input with Single-ended Interconnect

Crystal Input Interface

The device has been characterized with 18 pF parallel resonant crystals. The capacitor values, C1 and C2, shown in Figure 6 below as 15 pF were determined using an 18 pF parallel resonant crystal and were chosen to minimize the ppm error. The optimum C1 and C2 values can be slightly adjusted for different board layouts.

CLOCK Overdriving the XTAL Interface

The XTAL_IN input can accept a single-ended LVCMOS signal through an AC coupling capacitor. A general LVCMOS interface diagram is shown in Figure 7 and a general LVPECL interface in Figure 8. The XTAL_OUT pin must be left floating. The maximum amplitude of the input signal should not exceed 2 V and the input edge rate can be as slow as 10 ns. This configuration requires that the output impedance of the driver (R_o) plus the series resistance (R_s) equals the transmission line impedance. In addition, matched termination at the crystal input will attenuate the signal in half. This can be done in one of two ways. First, R1 and R2 in parallel should equal the transmission line impedance. For most 50 Ω applications, R1 and R2 can be 100 Ω . This can also be accomplished by removing R1 and making R2 50 Ω . By overdriving the crystal oscillator, the device will be functional, but note, the device performance is guaranteed by using a quartz crystal.

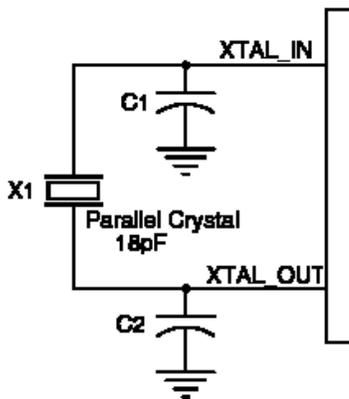


Figure 6. Crystal Input Interface

NB3F8L3010C

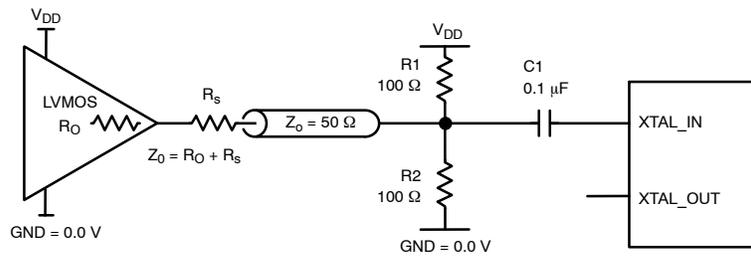


Figure 7. General Diagram for LVMOS Driver to XTAL Input Interface Use R_s or R_1 / R_2

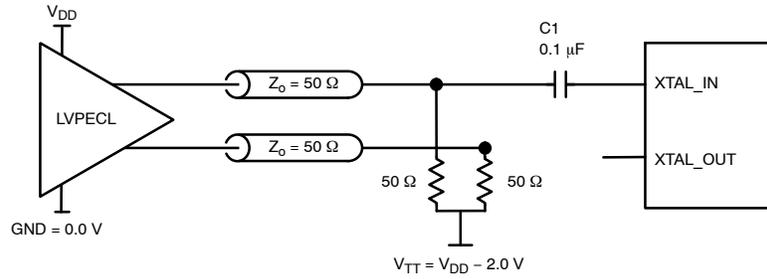


Figure 8. General Diagram for LVPECL Driver to XTAL Input Interface

Differential Clock Input Interface

The CLK / $\overline{\text{CLK}}$ accept LVDS, LVPECL, SSTL, HCSL differential signals. Signals must meet the V_{PP} and V_{CMR} input requirements. Figures 9 to 13 show interface examples for the CLK / $\overline{\text{CLK}}$ input with built-in 50 Ω terminations driven by the most common driver types. The

input interfaces suggested here are examples only. If the driver is from another vendor, use their termination recommendation. Please consult with the vendor of the driver component to confirm the driver termination requirements.

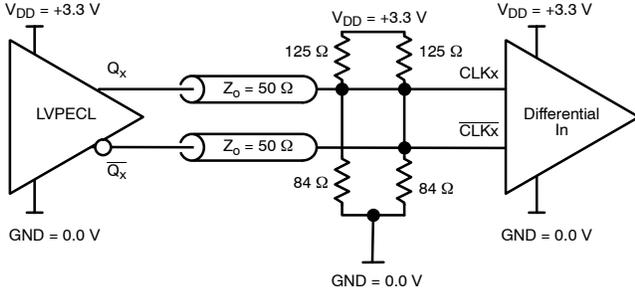


Figure 9. CLK / $\overline{\text{CLK}}$ Input Driven by 3.3 V LVPECL Driver (Thevenin Parallel Termination)

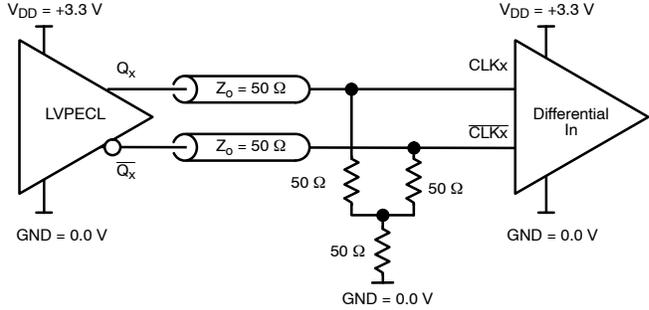


Figure 10. CLK / $\overline{\text{CLK}}$ Input Driven by 3.3 V LVPECL Driver ("Y" Parallel Termination)

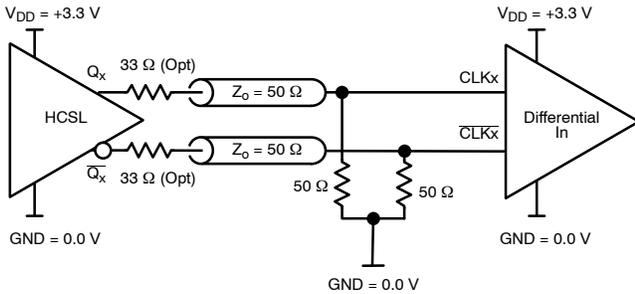


Figure 11. CLK / $\overline{\text{CLK}}$ Input Driven by a 3.3 V HCSL Driver

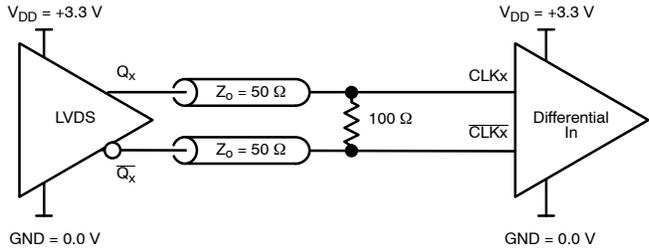


Figure 12. CLK / $\overline{\text{CLK}}$ Input Driven by 3.3 V LVDS Driver

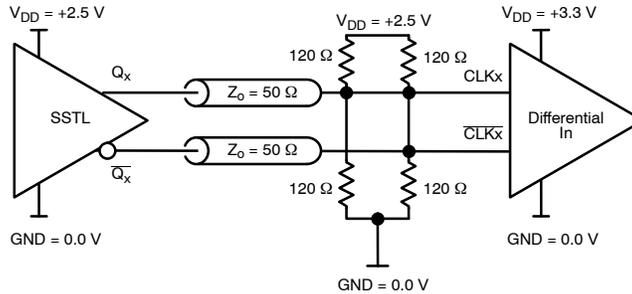


Figure 13. CLK / $\overline{\text{CLK}}$ Input Driven by 2.5 V SSTL Driver

NB3F8L3010C

VFQFN EPAD Thermal Release Path

In order to maximize both the removal of heat from the package and the electrical performance, a land pattern must be incorporated on the Printed Circuit Board (PCB) within the footprint of the package corresponding to the exposed metal pad or exposed heat slug on the package, as shown in Figure 14. The solderable area on the PCB, as defined by the solder mask, should be at least the same size/shape as the exposed pad/slug area on the package to maximize the thermal/electrical performance. Sufficient clearance should be designed on the PCB between the outer edges of the land pattern and the inner edges of pad pattern for the leads to avoid any shorts. While the land pattern on the PCB provides a means of heat transfer and electrical grounding from the package to the board through a solder joint, thermal vias are necessary to effectively conduct from the surface of the PCB to the ground plane(s). The land pattern must be connected to ground through these vias. The vias act as

“heat pipes”. The number of vias (i.e. “heat pipes”) is application specific and dependent upon the package power dissipation as well as electrical conductivity requirements. Thus, thermal and electrical analysis and/or testing are recommended to determine the minimum number needed. Maximum thermal and electrical performance is achieved when an array of vias is incorporated in the land pattern. It is recommended to use as many vias connected to ground as possible. It is also recommended that the via diameter should be 12 to 13 mils (0.30 to 0.33 mm) with 1 oz copper via barrel plating. This is desirable to avoid any solder wicking inside the via during the soldering process which may result in voids in solder between the exposed pad/slug and the thermal land. Precautions should be taken to eliminate any solder voids between the exposed heat slug and the land pattern. Note: These recommendations are to be used as a guideline only.

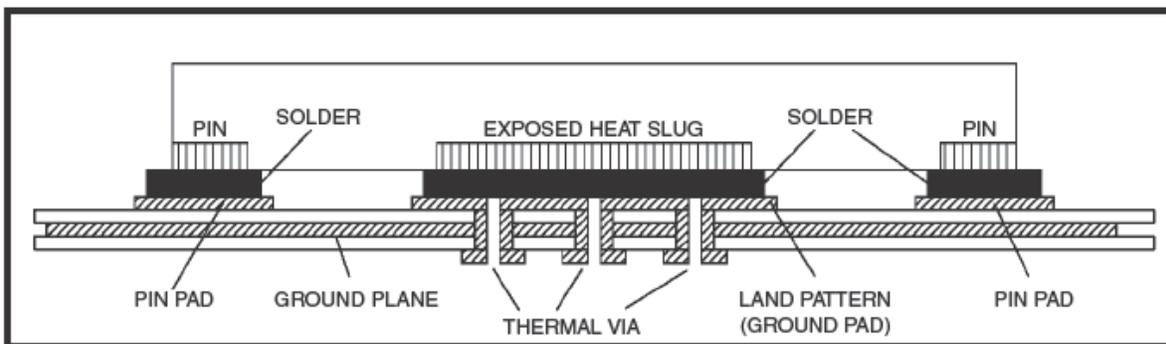


Figure 14. Suggested Assembly for Exposed Pad Thermal Release Path – Cut-away View (not to scale)

ORDERING INFORMATION

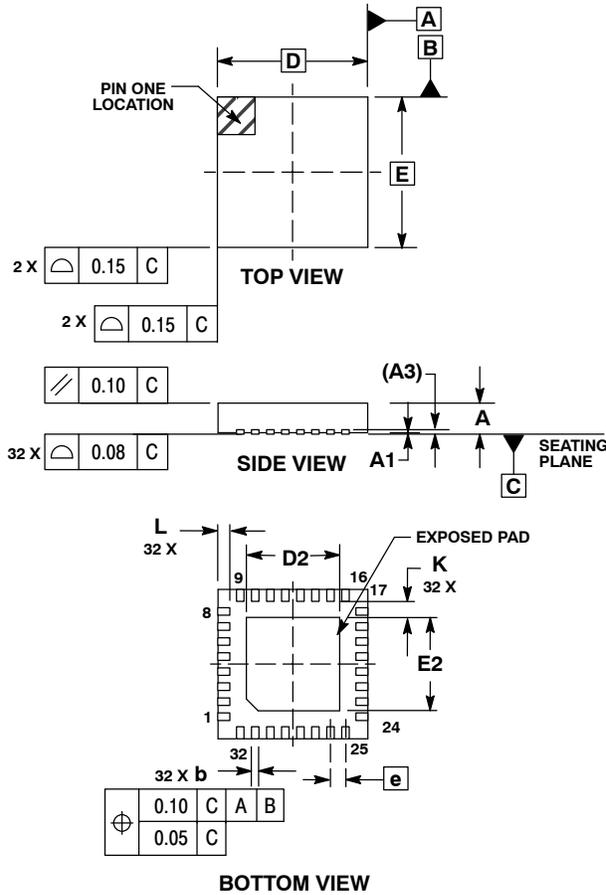
Device	Package	Shipping [†]
NB3F8L3010CG	QFN32 (Pb-Free)	74 Units / Rail
NB3F8L3010CTR2G	QFN32 (Pb-Free)	1000 / Tape & Reel

[†]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.

NB3F8L3010C

PACKAGE DIMENSIONS

QFN32 5*5*1 0.5 P
CASE 488AM-01
ISSUE O

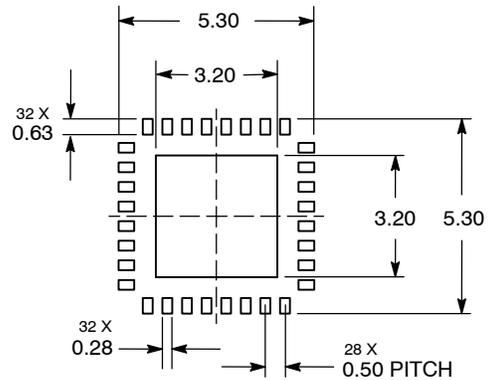


NOTES:

1. DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM TERMINAL
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.800	0.900	1.000
A1	0.000	0.025	0.050
A3	0.200 REF		
b	0.180	0.250	0.300
D	5.00 BSC		
D2	2.950	3.100	3.250
E	5.00 BSC		
E2	2.950	3.100	3.250
e	0.500 BSC		
K	0.200	---	---
L	0.300	0.400	0.500

SOLDERING FOOTPRINT*



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

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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