NB3Nxxxxx - VCXO Series

3.3V PureEdge™ VCXO Clock Generator with Differential LVPECL Outputs

ON Semiconductor®

http://onsemi.com

Description

The NB3NXXXXX − series voltage−controlled crystal oscillator (VCXO) devices are designed to meet today's requirements for 3.3 V LVPECL clock generation applications. These devices use an external high Q fundamental mode pullable crystal and Phase Locked Loop (PLL) multiplier to provide a wide range of frequencies from 60 MHz to 700 MHz (factory configurable per user specifications) with a pullable range of ±100 ppm. The silicon−based PureEdge products provides users with exceptional frequency stability and reliability. They produce an ultra low jitter and phase noise LVPECL differential output. The NB3NXXXXX − series are members of ON Semiconductor's PureEdge clock family that provides accurate and precision clock generation solutions.

Available in the industry standard 4 mm x 4 mm QFN−20 package.

Features

- LVPECL Differential Output
- Operating Range: 3.3 V ±10%
- Ultra Low Jitter and Phase Noise − 0.5 ps (12 kHz − 20 MHz)
- 245 ps Typical Rise and Fall Times
- Factory Configurable Frequencies from 60 MHz to 700 MHz (see Standard Frequencies in the Ordering Information Table in page 5)
- Pullable Range Minimum of ±100 ppm
- Control Voltage with Positive Slope
- −40°C to +85°C Ambient Operating Temperature
- These Devices are Pb−Free and are RoHS Compliant

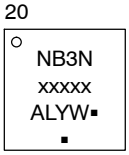
Applications

- Networking
- SONET
- 10 Gigabit Ethernet
- Networking Base Stations
- Broadcasting

MARKING DIAGRAM



QFN20
MN SUFFIX
CASE 485E



XXXXX = Frequency XXX.XX
A = Assembly Location
L, WL = Wafer Lot
Y = Year
W, WW = Work Week
G or ▪ = Pb−Free Package

(*Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

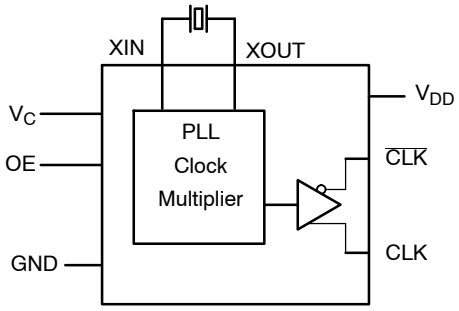


Figure 1. Simplified Block Diagram of NB3Nxxxxx

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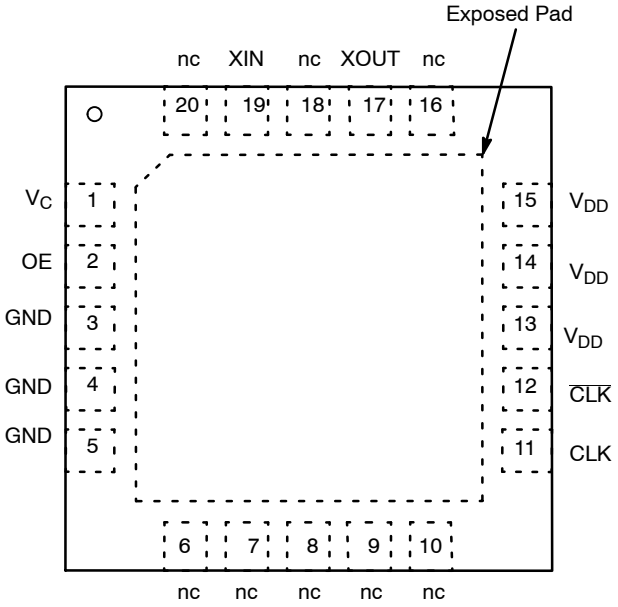


Figure 2. QFN−20 Pinout (Top View)

Table 1. OUTPUT ENABLE TRI−STATE FUNCTION

OE	Output Pins Function
Open	Active
High	Active
Low	High Z

Table 2. PIN DESCRIPTION

Pin	Name	I/O	Description
1	VC	Analog Input	Analog control voltage input pin that adjusts output oscillation frequency. f0 = V_C = 1.65 V. Control voltage has a positive slope with a linearity of ±10%; V_C = 1.65 V ± 1 V.
2	OE	LVTTL / LVCMOS Input	Output Enable Pin. When left floating pin defaults to logic HIGH and output is active. See OE pin description Table 1.
3	GND	Ground	Negative Supply Voltage
4	GND	Ground	Negative Supply Voltage
5	GND	Ground	Negative Supply Voltage
6	nc	No connect	
7	nc	No connect	
8	nc	No connect	
9	nc	No connect	
10	nc	No connect	
11	CLK	LVPECL Output	Non−inverted Differential Output. Typically Terminated with 50 Ω Resistor to V_{DD} − 2 V.
12	$\overline{CLK}$	LVPECL Output	Inverted Differential Output. Typically Terminated with 50 Ω Resistor to V_{DD} − 2 V.
13	VDD	Power Supply	3.3 V Positive Supply Voltage
14	VDD	Power Supply	3.3 V Positive Supply Voltage
15	VDD	Power Supply	3.3 V Positive Supply Voltage
16	nc	No connect	
17	XOUT	Crystal	Crystal Input. This pin forms an oscillator when connected to an external parallel−resonant crystal.
18	nc	No connect	
19	XIN	Crystal	Crystal Input. This pin forms an oscillator when connected to an external parallel−resonant crystal.

Table 2. PIN DESCRIPTION

Pin	Name	I/O	Description
20	nc	No connect	
–	EP		The Exposed Pad (EP) on the QFN−20 package bottom is thermally connected to the die for improved heat transfer out of package. The exposed pad must be attached to a heat−sinking conduit. The pad is electrically connected to the die, and must be electrically and thermally connected to GND on the PC board.

1. All VDD and GND pins must be externally connected to a power supply for proper operation.

Table 3. ATTRIBUTES

Characteristics	Value
Internal Default State Resistor (OE)	170 kΩ
ESD Protection Human Body Model Machine Model	2 kV 200 V
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 2)	Level 1
Flammability Rating Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in
Transistor Count	3510 Devices
Meets or Exceeds JEDEC Standard EIA/JESD78 IC Latchup Test	

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

Table 4. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 1	Rating	Unit
V_{DD}	Positive Power Supply	GND = 0 V		4.6	V
V_{IN}	Control Input (V_C and OE)		$V_{IN} \le V_{DD}$ + 200 mV $V_{IN} \ge$ GND − 200 mV		V
I_{OUT}	LVPECL Output Current	Continuous Surge		25 50	mA
T_A	Operating Temperature Range			−40 to +85	°C
T_{stg}	Storage Temperature Range			−55 to +120	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	QFN−20 QFN−20	47 33	°C/W
θ_{JC}	Thermal Resistance (Junction−to−Case) (Note 3)	Standard Board	QFN−20	18	°C/W
T_{sol}	Wave Solder Pb−Free			265	°C

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.

3. JEDEC standard multilayer board − 2S2P (2 signal, 2 power) with 8 filled thermal vias under exposed pad.

Table 5. RECOMMENDED CRYSTAL PARAMETERS

Crystal Type	Fundamental AT−Cut
Frequency	Various − Device dependent; see AC Table
Load Capacitance	16 pF
Shunt Capacitance, C0	3.2 pF typical
Motional Capacitance (C1)	12 fF typical
Capacitance Ratio (C0/C1)	260 typical
ESR (Equivalent Series Resistance)	25 Ω max; 5 Ω typical

Table 6. DC CHARACTERISTICS (V_{DD} = 3.3 V ± 10%, GND = 0 V, T_A = −40°C to +85°C) (Note 4)

Symbol	Characteristic	Min	Typ	Max	Unit
IDD	Power Supply Current		90	110	mA
VIH	Input HIGH Voltage, OE	2000		V_{DD}	mV
VIL	Input LOW Voltage, OE	GND – 200		800	mV
IIH	Input HIGH Current, OE	−100		+100	uA
IIL	Input LOW Current, OE	−100		+100	uA
VOH	Output HIGH Voltage	V_{DD} – 1195		V_{DD} – 945	mV
VOL	Output LOW Voltage	V_{DD} – 1945		V_{DD} – 1600	mV
VOUTPP	Output Voltage Amplitude		700		mV

4. Measurement taken with outputs terminated with 50 Ω to V_{DD} − 2.0 V. See Figure 3.

Table 7. AC CHARACTERISTICS (V_{DD} = 3.3 ±10%, GND = 0 V, T_A = −40°C to +85°C)

Symbol	Characteristic		Conditions	Min	Typ	Max	Unit
f_{CLKOUT}	Output Clock Frequency	Crystal fref = 28.276363 MHz	NB3N15552		155.52		MHz
		Crystal fref = 28.409090 MHz	NB3N15625		156.25		
		Crystal fref = 30.703125 MHz	NB3N49152		491.52		
		Crystal fref = 28.276363 MHz	NB3N62208		622.08		
$t_{jit(cp)}$	RMS Phase Jitter		12 kHz to 20 MHz		0.5	0.9	ps
t_{jitter}	Cycle to Cycle, RMS		1000 Cycles		2	8	ps
	Cycle to Cycle, Peak−to−Peak		1000 Cycles		10	30	
	Period, RMS		10,000 Cycles		1	4	
	Period, Peak−to−Peak		10,000 Cycles		6	20	
$t_{OE/OD}$	Output Enable/Disable Time					200	ns
F_P	Crystal Pull ability (Note 5)		$0 \le V_C \le 3.3$ V	±100			ppm
$V_{C(bw)}$	Control Voltage Bandwidth		−3 dB	20			kHz
t_{DUTY_CYCLE}	Output Clock Duty Cycle (Measured at Cross Point)			45	50	55	%
t_R	Output Rise Time (20% and 80%)				245	400	ps
t_F	Output Fall Time (80% and 20%)				245	400	ps
t_{start}	Start−up Time				1	5	ms

5. Gain transfer is positive with a rate of 130 ppm/V.

Table 8. PHASE NOISE PERFORMANCE

Parameter	Characteristic	Condition	155.52 MHZ	156.25 MHz	491.52 MHz	622.08 MHZ	Unit
θNOISE	Output Phase-Noise Performance	100 Hz offset	−82	−82	−72	−70	dBc/Hz
		1 kHz offset	−106	−106	−96	−94	dBc/Hz
		10 kHz offset	−126	−126	−116	−114	dBc/Hz
		100 kHz offset	−128	−128	−119	−116	dBc/Hz
		1 MHz offset	−135	−135	−125	−123	dBc/Hz
		10 MHz offset	−159	−159	−151	−149	dBc/Hz

ORDERING INFORMATION

Device	Frequency (MHz)	Package	Shipping†
NB3N15552MNG	155.52	QFN−20 (Pb−Free)	92 Units / Rail
NB3N15552MNTXG	155.52	QFN−20 (Pb−Free)	3000 / Tape & Reel
NB3N15625MNG	156.25	QFN−20 (Pb−Free)	92 Units / Rail
NB3N15625MNTXG	156.25	QFN−20 (Pb−Free)	3000 / Tape & Reel
NB3N49152MNG	491.52	QFN−20 (Pb−Free)	92 Units / Rail
NB3N49152MNTXG	491.52	QFN−20 (Pb−Free)	3000 / Tape & Reel
NB3N62208MNG	622.08	QFN−20 (Pb−Free)	92 Units / Rail
NB3N62208MNTXG	622.08	QFN−20 (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.

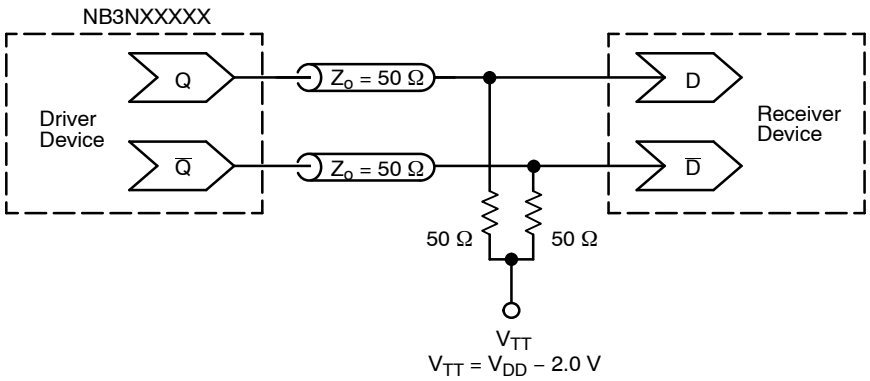
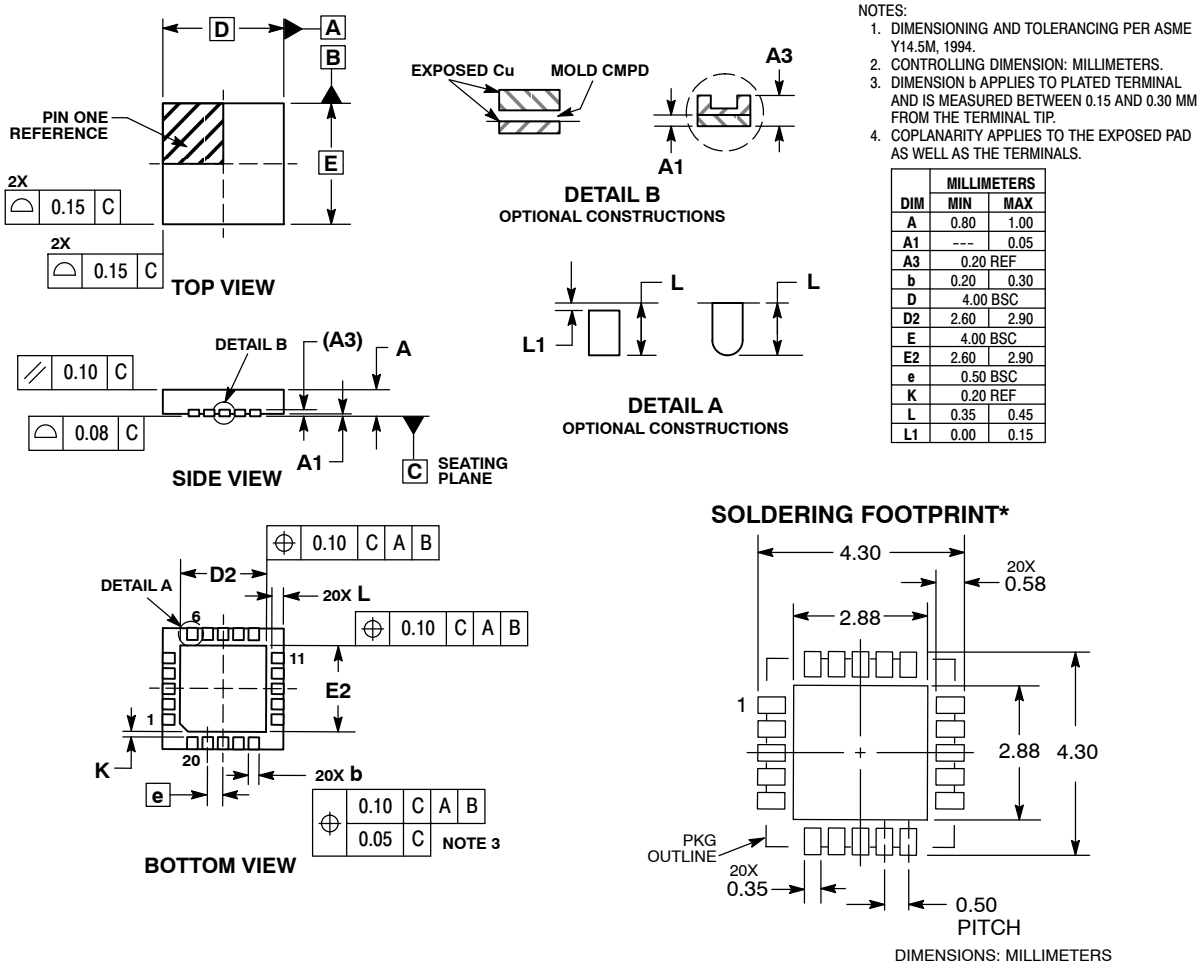


Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)

PACKAGE DIMENSIONS

QFN20, 4x4, 0.5P
CASE 485E–01
ISSUE B



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.80	1.00
A1	---	0.05
A3	0.20 REF	
b	0.20	0.30
D	4.00 BSC	
D2	2.60	2.90
E	4.00 BSC	
E2	2.60	2.90
e	0.50 BSC	
K	0.20 REF	
L	0.35	0.45
L1	0.00	0.15

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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