



# NB2870A

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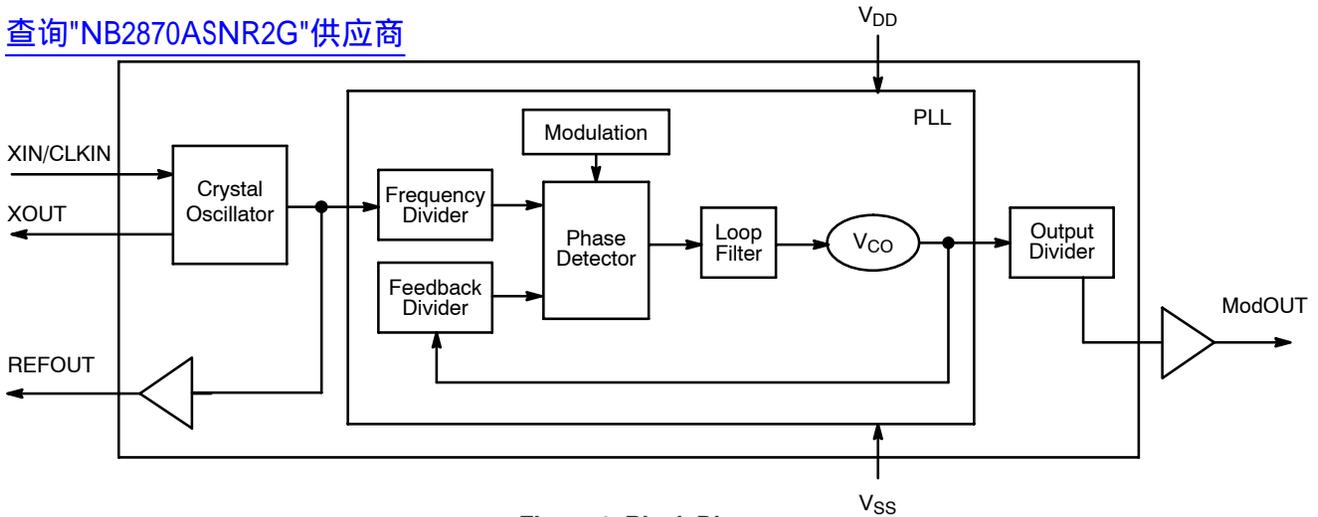


Figure 1. Block Diagram

Table 1. KEY SPECIFICATIONS

Description	Specification
Supply Voltages	$V_{DD} = 3.3\text{ V} / 2.5\text{ V}$
Frequency Range	$13\text{ MHz} < \text{CLKIN} < 30\text{ MHz}$
Cycle-to-Cycle Jitter	200 ps (maximum)
Output Duty Cycle	45/55% (worst case)
Modulation Equation	$F_{IN}/640$
Frequency Deviation	$\pm 0.75\%$ (TYP) @ 22 MHz

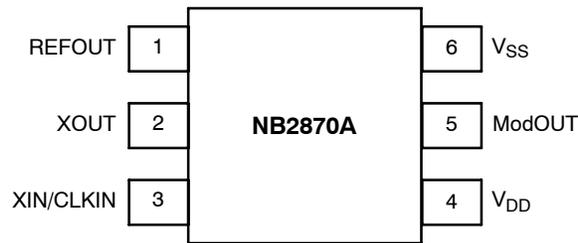


Figure 2. Pin Configuration

Table 2. PIN DESCRIPTION

Pin #	Pin Name	Type	Description
1	REFOUT	O	Buffered output of the input frequency.
2	XOUT	O	Crystal connection. If using an external reference, this pin must be left unconnected.
3	XIN/CLKIN	I	Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock
4	$V_{DD}$	P	Power supply for the entire chip.
5	ModOUT	O	Spread spectrum clock output.
6	$V_{SS}$	P	Ground connection.

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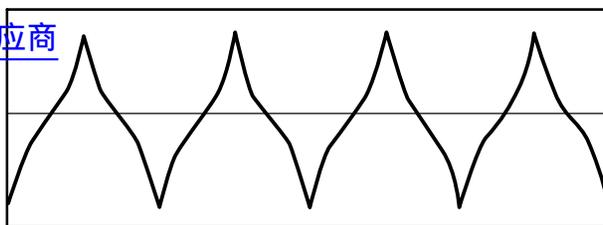


Figure 3. Modulation Profile

Table 3. MAXIMUM RATINGS

Symbol	Description	Rating	Unit
$V_{DD}, V_{IN}$	Voltage on any pin with respect to Ground	0.5 to + 7.0	V
$T_{STG}$	Storage Temperature	-65 to +125	°C
$T_A$	Operating Temperature	0 to 70	°C
$T_s$	Max. Soldering Temperature (10 sec)	260	°C
$T_J$	Junction Temperature	150	°C
$T_{DV}$	Static Discharge Voltage (As per MIL-STD-883, Method 3015)	2	kV

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.

# NB2870A

**Table 4. DC ELECTRICAL CHARACTERISTICS FOR 2.5 V SUPPLY** (Test Conditions: All parameters are measured at room temperature 25°C)  
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Symbol	Description	Min	Typ	Max	Unit
V <sub>IL</sub>	Input LOW Voltage	GND – 0.3		0.8	V
V <sub>IH</sub>	Input HIGH Voltage	2.0		V <sub>DD</sub> + 0.3	V
I <sub>IL</sub>	Input LOW Current			–35	μA
I <sub>IH</sub>	Input HIGH Current			35	μA
I <sub>XOL</sub>	XOUT Output LOW Current (@ 0.5 V, V <sub>DD</sub> = 2.5 V)		3.0		mA
I <sub>XOH</sub>	XOUT Output HIGH Current (@ 1.8 V, V <sub>DD</sub> = 2.5 V)		3.0		mA
V <sub>OL</sub>	Output LOW Voltage (V <sub>DD</sub> = 2.5 V, I <sub>OL</sub> = 8.0 mA)			0.6	V
V <sub>OH</sub>	Output HIGH Voltage (V <sub>DD</sub> = 2.5 V, I <sub>OH</sub> = 8.0 mA)	1.8			V
I <sub>DD</sub>	Static Supply Current (Note 1)		1.0		mA
I <sub>CC</sub>	Dynamic Supply Current (2.5 V, 22 MHz, and No Load)		3.0		mA
V <sub>DD</sub>	Operating Voltage	2.375	2.5	2.625	V
t <sub>ON</sub>	Powerup Time (first locked cycle after powerup) (Note 2)			5.0	mS
Z <sub>OUT</sub>	Clock Output Impedance		50		Ω

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.

1. XIN/CLKIN pin is pulled low.
2. V<sub>DD</sub> and XIN/CLKIN input are stable.

**Table 5. AC ELECTRICAL CHARACTERISTICS FOR 2.5 V SUPPLY**

Symbol	Description	Min	Typ	Max	Unit
CLKIN	Input Frequency	13		30	MHz
ModOUT	Output Frequency	13		30	MHz
f <sub>d</sub>	Frequency Deviation Input Frequency = 13 MHz Input Frequency = 30 MHz			±1.20 ±0.47	%
t <sub>LH</sub> (Note 3)	Output Rise Time (measured at 0.7 V to 1.7 V)	0.7	1.4	1.6	ns
t <sub>HL</sub> (Note 3)	Output Fall Time (measured at 1.7 V to 0.7 V)	0.4	0.8	1.0	ns
t <sub>JC</sub>	Jitter (Cycle-to-Cycle)			200	ps
t <sub>D</sub>	Output Duty Cycle	45	50	55	%

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.

3. t<sub>LH</sub> and t<sub>HL</sub> are measured at capacitive load of 15 pF.

# NB2870A

**Table 6. DC ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY** (Test Conditions: All parameters are measured at room temperature 25°C)  
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Symbol	Description	Min	Typ	Max	Unit
V <sub>IL</sub>	Input LOW Voltage	GND – 0.3		0.8	V
V <sub>IH</sub>	Input HIGH Voltage	2.0		V <sub>DD</sub> + 0.3	V
I <sub>IL</sub>	Input LOW Current			–35	μA
I <sub>IH</sub>	Input HIGH Current			35	μA
I <sub>XOL</sub>	XOUT Output LOW Current (@ 0.4 V, V <sub>DD</sub> = 3.3 V)		3		mA
I <sub>XOH</sub>	XOUT Output HIGH Current (@ 2.5 V, V <sub>DD</sub> = 3.3 V)		3		mA
V <sub>OL</sub>	Output LOW Voltage (V <sub>DD</sub> = 3.3 V, I <sub>OL</sub> = 8.0 mA)			0.4	V
V <sub>OH</sub>	Output HIGH Voltage (V <sub>DD</sub> = 3.3 V, I <sub>OH</sub> = 8.0 mA)	2.5			V
I <sub>DD</sub>	Static Supply Current (Note 4)		1.2		mA
I <sub>CC</sub>	Dynamic Supply Current (3.3 V, 22 MHz, and No Load)		4.0		mA
V <sub>DD</sub>	Operating Voltage	2.7	3.3	3.6	V
t <sub>ON</sub>	Powerup Time (first locked cycle after powerup) (Note 5)			5.0	mS
Z <sub>OUT</sub>	Clock Output Impedance		45		Ω

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. XIN/CLKIN pin is pulled low.
5. V<sub>DD</sub> and XIN/CLKIN input are stable.

**Table 7. AC ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY**

Symbol	Description	Min	Typ	Max	Unit
CLKIN	Input Frequency	13		30	MHz
ModOUT	Output Frequency	13		30	MHz
f <sub>d</sub>	Frequency Deviation Input Frequency = 13 MHz Input Frequency = 30 MHz			±1.20 ±0.47	%
t <sub>LH</sub> (Note 6)	Output Rise Time (measured at 0.8 V to 2.0 V)	0.4	1.2	1.5	ns
t <sub>HL</sub> (Note 6)	Output Fall Time (measured at 2.0 V to 0.8 V)	0.3	0.8	1.1	ns
t <sub>JC</sub>	Jitter (Cycle-to-Cycle)			200	ps
t <sub>D</sub>	Output Duty Cycle	45	50	55	%

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.

6. t<sub>LH</sub> and t<sub>HL</sub> are measured at capacitive load of 15 pF.

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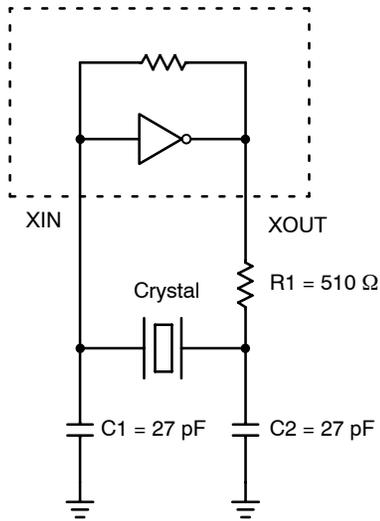


Figure 4. Typical Crystal Oscillator Circuit

Table 8. TYPICAL CRYSTAL SPECIFICATIONS

Fundamental AT Cut Parallel Resonant Crystal	
Nominal Frequency	14.31818 MHz
Frequency Tolerance	±50 ppm or better at 25°C
Operating Temperature Range	-25°C to +85°C
Storage Temperature	-40°C to +85°C
Load Capacitance	18 pF
Shunt Capacitance	7 pF Maximum
ESR	25 Ω

# NB2870A

## ORDERING INFORMATION

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Device	Marking	Temperature Range	Package	Shipping†	Availability
NB2870ASNR2	E09	0°C – 70°C	TSOP-6 (TSOT-23-6)	2500 Tape & Reel	<i>Now</i>
NB2870ASNR2G	E09	0°C – 70°C	TSOP-6 (TSOT-23-6) (Pb-Free)	2500 Tape & Reel	<i>Contact Sales Representative</i>

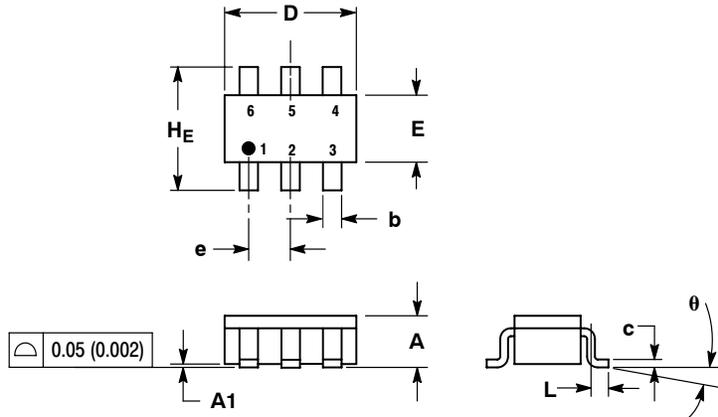
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# NB2870A

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## PACKAGE DIMENSIONS

TSOP-6  
CASE 318G-02  
ISSUE S

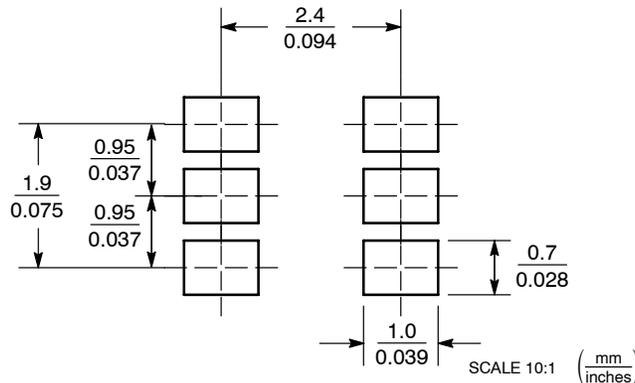


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.38	0.50	0.010	0.014	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.75	3.00	0.099	0.108	0.118
θ	0°	-	10°	0°	-	10°

### 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.

This product utilizes US Patent #6,646,463 Impedance Emulator Patent issued to Alliance Semiconductor, Dated 11-11-2003.

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