NB3N511

PLL Clock Multiplier, 14 MHz - 200 MHz, 3.3 V / 5.0 V

ON Semiconductor®

www.onsemi.com

Description

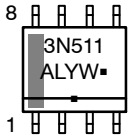
The NB3N511 is a clock multiplier that will generate one of nine selectable output multiples of an input frequency via two 3−level select inputs (S0, S1). It accepts a standard fundamental mode crystal or an external reference clock signal. Phase−Locked−Loop (PLL) design techniques are used to produce a low jitter, TTL level clock output up to 200 MHz with a 50% duty cycle. An Output Enable (OE) pin is provided, and when asserted low, the clock output goes into tri −state (high impedance). The NB3N511 is commonly used in electronic systems as a cost efficient replacement for crystal oscillators

Features

- Clock Output Frequencies up to 200 MHz
- Nine Selectable Multipliers of the Input Frequency
- Operating Range: V_{DD} = 3.3 V ±10% or 5.0 V ±5%
- Low Jitter Output of 25 ps One Sigma (rms)
- Zero ppm Clock Multiplication Error
- 45% – 55% Output Duty Cycle
- TTL/CMOS Output with 25 mA TTL Level Drive
- Crystal Reference Input Range of 5 – 32 MHz
- Input Clock Frequency Range of 1 – 50 MHz
- OE, Output Enable with Tri−State Output
- 8−Pin SOIC
- Industrial Temperature Range −40°C to +85°C
- These are Pb−Free Devices

MARKING DIAGRAM

SOIC−8
D SUFFIX
CASE 751



3N511	= Specific Device Code
A	= Assembly Location
L	= Wafer Lot
Y	= Year
W	= Work Week
▪	= Pb−Free Package

ORDERING INFORMATION

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

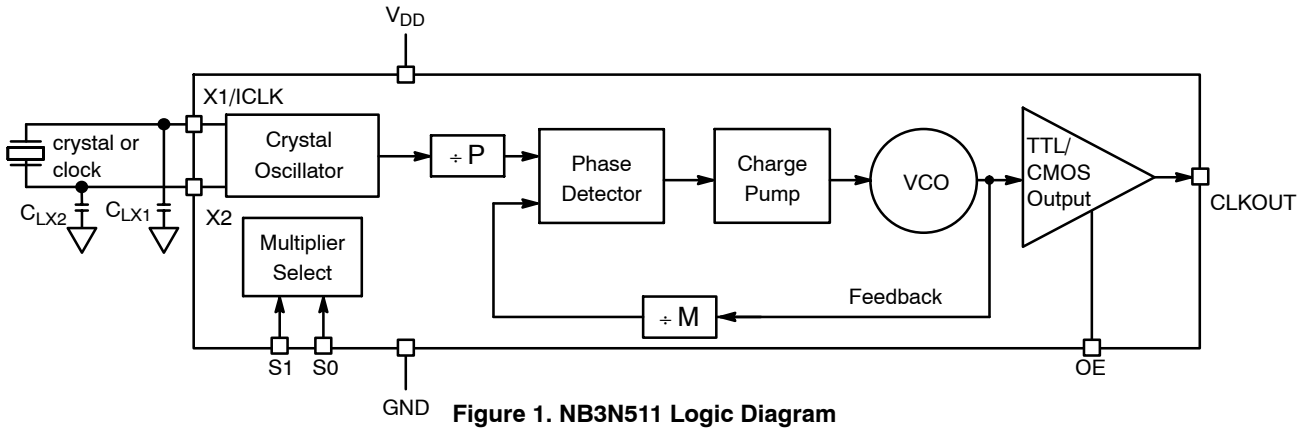


Figure 1. NB3N511 Logic Diagram

Table 1. CLOCK MULTIPLIER SELECT TABLE

S1*	S0*	CLKOUT Multiplier
L	L	4X Input
L	M	5.333X Input
L	H	5X Input
M	L	2.5X Input
M	M	2X Input
M	H	3.333X Input
H	L	6X Input
H	M	3X Input
H	H	8X Input

*Pins S1 and S0 default to M when open
L = GND
H = VDD
M = OPEN (unconnected; will default to VDD/2)

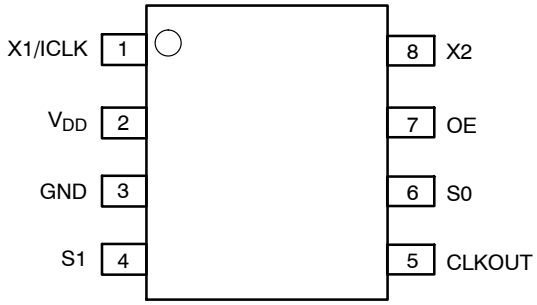


Figure 2. NB3N511 Package Pinout, 8−Pin (150 mil) SOIC (Top View)

Table 2. PIN DESCRIPTION

Pin #	Name	I/O	Description
1	X1/ICLK	Crystal or LVCMOS/LVTTL Input	Crystal or external reference clock input
2	VDD	Power supply	Positive supply voltage
3	GND	Power supply	0 V. Ground.
4	S1	Three level Input	Multiplier select pin − connect to V_{DD}, GND or float
5	CLKOUT	LVCMOS/LVTTL Output	Clock output
6	S0	Three level Input	Multiplier select pin − connect to V_{DD}, GND or float
7	OE	LVCMOS/LVTTL Input	Output Enable. CLKOUT is high impedance when OE is low. Internal pullup
8	X2	Crystal	Crystal input − Leave open when providing an external clock reference

Table 3. COMMON OUTPUT FREQUENCY EXAMPLES

Output Frequency (MHz)	Input Frequency (MHz)	S1, S0
20	10	M, M
24	12	M, M
30	10	H, M
32	16	M, M
33.33	16.66	M, M
37.5	15	M, L
40	10	L, L
48	12	L, L
50	20	M, L
60	10	H, L
64	16	L, L

Table 4. COMMON OUTPUT FREQUENCY EXAMPLES

Output Frequency (MHz)	Input Frequency (MHz)	S1, S0
66.66	20	M, H
72	12	H, L
75	25	H, M
80	10	H, H
83.33	25	M, H
90	15	H, L
100	20	L, H
120	15	H, H
125	25	L, H
133.3	25	L, M
150	25	H, L

Table 4. ATTRIBUTES

Characteristics		Value
ESD Protection	Human Body Model Machine Model Charged Device Model	> 1 kV > 150 V > 1 kV
RPU − OE Input Pull−up Resistor		270 kΩ
Moisture Sensitivity (Note 1)	SOIC−8	Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V 0 @ 0.125 in
Transistor Count		9555
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

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

Table 5. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{DD}	Positive Power Supply	GND = 0 V		7	V
V_{IO}	Input and Output Voltages			$-0.5\ V \le V_{IO} \le V_{DD} + 0.5$	V
T_A	Operating Temperature Range			−40 to +85	°C
T_{stg}	Storage Temperature Range			−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	SOIC−8 SOIC−8	190 130	°C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	(Note 2)	SOIC−8	41 to 44	°C/W
T_{sol}	Wave Solder Pb−Free			265	°C

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.

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

Table 6. DC CHARACTERISTICS V_{DD} = 3.3 V ±10% or 5.0 V ± 5% unless otherwise noted, GND = 0 V, T_A = −40°C to +85°C

Symbol	Characteristic	Min	Typ	Max	Unit
V_{DD}	Operating Voltage V_{DD} = 5 V V_{DD} = 3.3 V	4.75 3.0		5.25 3.6	V
I_{DD}	Power Supply Current – Inputs and outputs open, CLKOUT operating at 100 MHz (with 20 MHz crystal) V_{DD} = 5 V V_{DD} = 3.3 V		9 8		mA
V_{OH}	Output HIGH Voltage I_{OH} = −4 mA CMOS High	V_{DD} − 0.4			V
V_{OH}	Output HIGH Voltage I_{OH} = −25 mA TTL High	2.4			V
V_{OL}	Output LOW Voltage I_{OL} = 25 mA			0.4	V
V_{IH}	Input HIGH Voltage, ICLK only (pin 1) V_{DD} = 5 V V_{DD} = 3.3 V	(V_{DD} / 2) + 1 (V_{DD} / 2) + 0.7			V
V_{IL}	Input LOW Voltage, ICLK only (pin 1) V_{DD} = 5 V V_{DD} = 3.3 V			(V_{DD} / 2) − 1 (V_{DD} / 2) − 0.7	V
V_{IH}	Input HIGH Voltage, S0, S1	V_{DD} − 0.5			V
V_{IL}	Input LOW Voltage, S0, S1			0.5	V
V_{IH}	Input HIGH Voltage, OE (pin 7)	2.0			V
V_{IL}	Input LOW Voltage, OE (pin 7)			0.8	V
C_{in}	Input Capacitance, S0, S1 and OE		4		pF
I_{SC}	Output Short Circuit Current, CLKOUT		±70		mA
	Nominal Output Impedance		20		Ω

Table 7. AC CHARACTERISTICS V_{DD} = 3.3 V ±10% or 5.0 V ± 5% unless otherwise noted, GND = 0 V, T_A = −40°C to +85°C

Symbol	Characteristic	Min	Typ	Max	Unit
f_{Xtal}	Crystal Input Frequency (Note 3)	5		32	MHz
f_{CLKIN}	Clock Input Frequency	1		50	MHz
f_{OUT}	Output Frequency Range $f_{OUTMIN} \le f_{IN}$ x Multiplier $\le f_{OUTMAX}$ V_{DD} = 4.25 to 5.25 V (5.0 V ± 5%) V_{DD} = 3.0 to 3.6 V (3.3 V ± 10%)	 4 4		 200 200	MHz
DC	Output Clock Duty Cycle at 1.5 V	45	50	55	%
OE_H	Output enable time, OE high to output on		50		ns
OE_L	Output disable time, OE low to tri−state		50		ns
$t_{jitter\ (rms)}$	Period Jitter (rms, 1 σ)		25		ps
$t_{jitter\ (pk-to-pk)}$	Total Period Jitter, (peak−to−peak)		±70		ps
t_r/t_f	Output rise/fall time (0.8 V to 2.0 V) (measured with 15 pF load)		1	1.5	ns

3. The crystal should be fundamental mode, parallel resonant. Do not use third overtone. For exact tuning when using a crystal, capacitors should be connected from pins X1/CLK to GND and X2 to GND. The value of these capacitors is given by the following equation, where C_L is the specified crystal load capacitance: Crystal capacitance (pF) = (C_L − 12) X 2. So, for a crystal with 16 pF load capacitance, use two 8 pF capacitors.

APPLICATIONS INFORMATION

High Frequency CMOS/TTL Oscillators

The NB3N511, along with a low frequency fundamental mode crystal, can build a high frequency TTL output oscillator. For example, a 20 MHz crystal connected to the NB3N511 with the 5X output selected (S1 = L, S0 = H) produces an 100 MHz CMOS/TTL output clock.

Decoupling and External Components

The NB3N511 requires a 0.01 μF decoupling capacitor to be connected between V_{DD} and GND on pins 2 and 3. It must be connected close to the NB3N511 to minimize lead inductance. Control input pins can be connected to device pins V_{DD} or GND, or to the V_{DD} and GND planes on the board.

Series Termination Resistor

A 33 Ω terminating resistor can be used next to the CLK pin for trace lengths over one inch.

Crystal Information

The crystal used should be a fundamental mode (do not use third overtone), parallel resonant. Crystal load capacitors should be connected from pins X1 to ground and X2 to ground to optimize the frequency accuracy, See Figure 1.

The total on chip capacitance is approximately 12 pF. A parallel resonant, fundamental mode crystal should be used. The device crystal connections should include pads for small capacitors from X1 to ground and from X2 to ground. These capacitors are used to adjust the stray capacitance of the board to match the nominally required crystal load capacitance. Because load capacitance can only be increased in this trimming process, it is important to keep stray capacitance to a minimum by using very short PCB traces (and no vias) between the crystal and device. Crystal capacitors, if needed, must be connected from each of the pins X1 and X2 to ground. The value (in pF) of these crystal caps should equal (C_L − 12 pF) * 2. In this equation, C_L = crystal load capacitance in pF. Example: For a crystal with a 16 pF load capacitance, each crystal capacitor would be 8 pF [(16 − 12) x 2 = 8].

Table 8. RECOMMENDED CRYSTAL PARAMETERS

Parameter	Value
Crystal Cut	Fundamental AT Cut
Resonance	Parallel Resonance
Load Capacitance	18 pF
Operating Range	−40 to +85°C
Shunt Capacitance	5 pF Max
Equivalent Series Resistance (ESR)	50 Ω Max
Correlation Drive Level	1.0 mW Max

ORDERING INFORMATION

Device	Package	Shipping†
NB3N511DG	SOIC−8 (Pb−Free)	98 Units / Rail
NB3N511DR2G	SOIC−8 (Pb−Free)	2500 / 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.

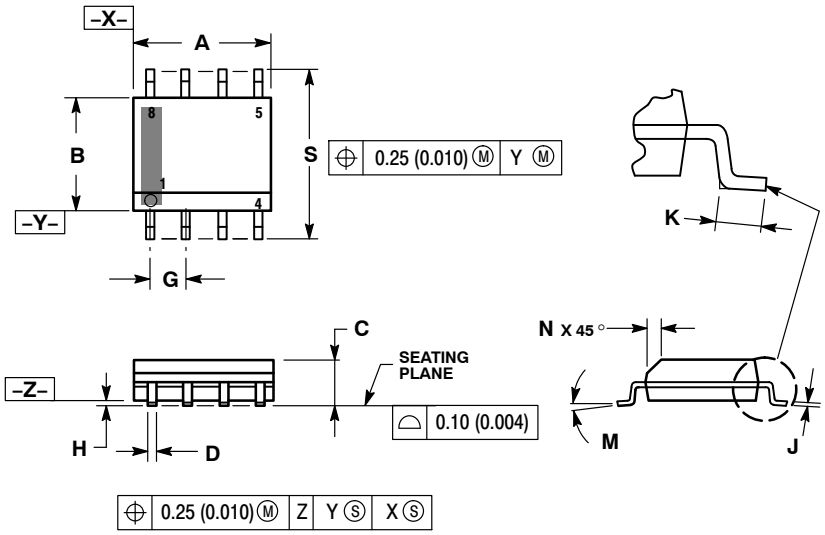
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

SCALE 1:1

SOIC−8 NB
CASE 751−07
ISSUE AK

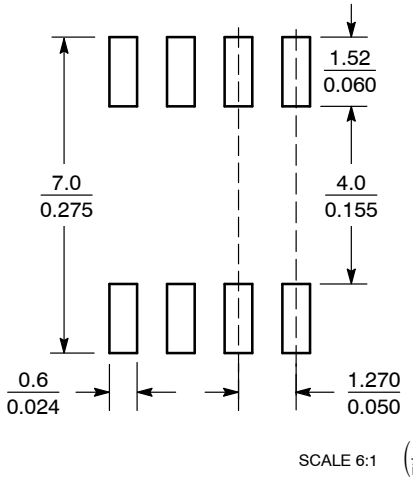
DATE 16 FEB 2011



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

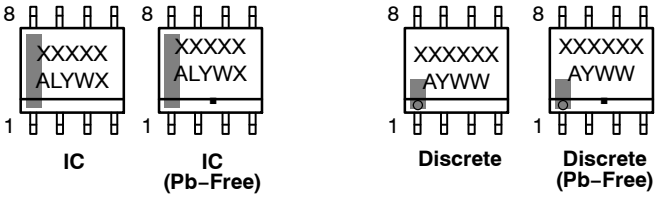
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

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.

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

DOCUMENT NUMBER:	**98ASB42564B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**SOIC−8 NB**		**PAGE 1 OF 2**

SOIC−8 NB
CASE 751−07
ISSUE AK

DATE 16 FEB 2011

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. COLLECTOR
4. EMITTER
5. EMITTER
6. BASE
7. BASE
8. EMITTER

STYLE 2:
PIN 1. COLLECTOR, DIE, #1
2. COLLECTOR, #1
3. COLLECTOR, #2
4. COLLECTOR, #2
5. BASE, #2
6. EMITTER, #2
7. BASE, #1
8. EMITTER, #1

STYLE 3:
PIN 1. DRAIN, DIE #1
2. DRAIN, #1
3. DRAIN, #2
4. DRAIN, #2
5. GATE, #2
6. SOURCE, #2
7. GATE, #1
8. SOURCE, #1

STYLE 4:
PIN 1. ANODE
2. ANODE
3. ANODE
4. ANODE
5. ANODE
6. ANODE
7. ANODE
8. COMMON CATHODE

STYLE 5:
PIN 1. DRAIN
2. DRAIN
3. DRAIN
4. DRAIN
5. GATE
6. GATE
7. SOURCE
8. SOURCE

STYLE 6:
PIN 1. SOURCE
2. DRAIN
3. DRAIN
4. SOURCE
5. SOURCE
6. GATE
7. GATE
8. SOURCE

STYLE 7:
PIN 1. INPUT
2. EXTERNAL BYPASS
3. THIRD STAGE SOURCE
4. GROUND
5. DRAIN
6. GATE 3
7. SECOND STAGE Vd
8. FIRST STAGE Vd

STYLE 8:
PIN 1. COLLECTOR, DIE #1
2. BASE, #1
3. BASE, #2
4. COLLECTOR, #2
5. COLLECTOR, #2
6. EMITTER, #2
7. EMITTER, #1
8. COLLECTOR, #1

STYLE 9:
PIN 1. EMITTER, COMMON
2. COLLECTOR, DIE #1
3. COLLECTOR, DIE #2
4. EMITTER, COMMON
5. EMITTER, COMMON
6. BASE, DIE #2
7. BASE, DIE #1
8. EMITTER, COMMON

STYLE 10:
PIN 1. GROUND
2. BIAS 1
3. OUTPUT
4. GROUND
5. GROUND
6. BIAS 2
7. INPUT
8. GROUND

STYLE 11:
PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. DRAIN 2
7. DRAIN 1
8. DRAIN 1

STYLE 12:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 13:
PIN 1. N.C.
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 14:
PIN 1. N−SOURCE
2. N−GATE
3. P−SOURCE
4. P−GATE
5. P−DRAIN
6. P−DRAIN
7. N−DRAIN
8. N−DRAIN

STYLE 15:
PIN 1. ANODE 1
2. ANODE 1
3. ANODE 1
4. ANODE 1
5. CATHODE, COMMON
6. CATHODE, COMMON
7. CATHODE, COMMON
8. CATHODE, COMMON

STYLE 16:
PIN 1. EMITTER, DIE #1
2. BASE, DIE #1
3. EMITTER, DIE #2
4. BASE, DIE #2
5. COLLECTOR, DIE #2
6. COLLECTOR, DIE #2
7. COLLECTOR, DIE #1
8. COLLECTOR, DIE #1

STYLE 17:
PIN 1. VCC
2. V2OUT
3. V1OUT
4. TXE
5. RXE
6. VEE
7. GND
8. ACC

STYLE 18:
PIN 1. ANODE
2. ANODE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. CATHODE
8. CATHODE

STYLE 19:
PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. MIRROR 2
7. DRAIN 1
8. MIRROR 1

STYLE 20:
PIN 1. SOURCE (N)
2. GATE (N)
3. SOURCE (P)
4. GATE (P)
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 21:
PIN 1. CATHODE 1
2. CATHODE 2
3. CATHODE 3
4. CATHODE 4
5. CATHODE 5
6. COMMON ANODE
7. COMMON ANODE
8. CATHODE 6

STYLE 22:
PIN 1. I/O LINE 1
2. COMMON CATHODE/VCC
3. COMMON CATHODE/VCC
4. I/O LINE 3
5. COMMON ANODE/GND
6. I/O LINE 4
7. I/O LINE 5
8. COMMON ANODE/GND

STYLE 23:
PIN 1. LINE 1 IN
2. COMMON ANODE/GND
3. COMMON ANODE/GND
4. LINE 2 IN
5. LINE 2 OUT
6. COMMON ANODE/GND
7. COMMON ANODE/GND
8. LINE 1 OUT

STYLE 24:
PIN 1. BASE
2. EMITTER
3. COLLECTOR/ANODE
4. COLLECTOR/ANODE
5. CATHODE
6. CATHODE
7. COLLECTOR/ANODE
8. COLLECTOR/ANODE

STYLE 25:
PIN 1. VIN
2. N/C
3. REXT
4. GND
5. IOUT
6. IOUT
7. IOUT
8. IOUT

STYLE 26:
PIN 1. GND
2. dv/dt
3. ENABLE
4. ILIMIT
5. SOURCE
6. SOURCE
7. SOURCE
8. VCC

STYLE 27:
PIN 1. ILIMIT
2. OVLO
3. UVLO
4. INPUT+
5. SOURCE
6. SOURCE
7. SOURCE
8. DRAIN

STYLE 28:
PIN 1. SW_TO_GND
2. DASIC_OFF
3. DASIC_SW_DET
4. GND
5. V_MON
6. VBULK
7. VBULK
8. VIN

STYLE 29:
PIN 1. BASE, DIE #1
2. EMITTER, #1
3. BASE, #2
4. EMITTER, #2
5. COLLECTOR, #2
6. COLLECTOR, #2
7. COLLECTOR, #1
8. COLLECTOR, #1

STYLE 30:
PIN 1. DRAIN 1
2. DRAIN 1
3. GATE 2
4. SOURCE 2
5. SOURCE 1/DRAIN 2
6. SOURCE 1/DRAIN 2
7. SOURCE 1/DRAIN 2
8. GATE 1

DOCUMENT NUMBER:	**98ASB42564B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**SOIC−8 NB**		**PAGE 2 OF 2**

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Phase Locked Loops - PLL ***category:***

Click to view products by ON Semiconductor ***manufacturer:***

Other Similar products are found below :

CPLL58-2400-2500 MB15E07SLPFV1-G-BND-6E1 PI6C2409-1HWEX BA4116FV-E2 HMC764LP6CETR CY22050KFI LMX2430TMX/NOPB NB3N5573DTG ADF4153ABCPZ PI6C2405A-1LE CD74HC4046AM CPLL66-2450-2450 NJM567D 74HC4046ADB.112 74HC4046APW.112 CY23S05SXI-1 STW81200T ADF4208BRUZ ADF4218LBRUZ ADF4355-3BCPZ ADF4355-2BCPZ ADF4355BCPZ ADF4169WCCPZ ADF4360-7BCPZ ADF4360-6BCPZ ADF4360-5BCPZRL7 ADF4360-5BCPZ ADF4360-4BCPZRL7 ADF4360-4BCPZ ADF4360-3BCPZ ADF4360-2BCPZRL7 ADF4252BCPZ ADF4159CCPZ ADF4169CCPZ ADF4252BCPZ-R7 ADF4360-0BCPZ ADF4360-1BCPZ ADF4360-1BCPZRL7 ADF4360-2BCPZ ADF4360-3BCPZRL7 ADF4360-7BCPZRL7 ADF4360-8BCPZ ADF4360-8BCPZRL7 ADF4360-9BCPZ ADF4360-9BCPZRL7 ADF4159CCPZ-RL7 ADF4159WCCPZ ADF4360-0BCPZRL7 AD9901KPZ AD9901KQ