3.3 V / 5.0 V Ultra-Low Skew 1:4 Clock Fanout Buffer

Description

The SB3N551 is a low skew 1-to-4 clock fanout buffer, designed for clock distribution in mind. The SB3N551 specifically guarantees low output-to-output skew. Optimal design, layout and processing minimize skew within a device and from device to device.

The output enable (OE) pin three-states the outputs when low.

Features

- Input/Output Clock Frequency up to 160 MHz
- Low Skew Outputs (50 ps typical)
- RMS Phase Jitter (12 kHz 20 MHz): 43 fs (Typical)
- Output goes to Three-State Mode via OE
- Operating Range: $V_{DD} = 3.0$ V to 5.5 V
- Ideal for Networking Clocks
- Packaged in 8-pin SOIC
- Industrial Temperature Range
- These are Pb–Free Devices

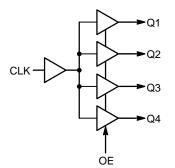
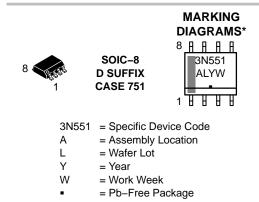


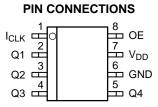
Figure 1. Block Diagram



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ORDERING INFORMATION

Device	Package	Shipping [†]
SB3N551DG	SOIC-8 (Pb-Free)	98 Units/Rail
SB3N551DR2G	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 Specification Brochure, BRD8011/D.

Table 1. OE, OUTPUT ENABLE FUNCTION

OE	Function
0	Disable
1	Enable

Table 2. PIN DESCRIPTION

Pin #	Name	Туре	Description
1	I _{CLK}	(LV)CMOS/(LV)TTL Input	Clock Input. Internal pull-up resistor.
2	Q1	(LV)CMOS/(LV)TTL Output	Clock Output 1
3	Q2	(LV)CMOS/(LV)TTL Output	Clock Output 2
4	Q3	(LV)CMOS/(LV)TTL Output	Clock Output 3
5	Q4	(LV)CMOS/(LV)TTL Output	Clock Output 4
6	GND	Power	Negative supply voltage; Connect to ground, 0 V
7	V _{DD}	Power	Positive supply voltage (3.0 V to 5.5 V)
8	OE	(LV)CMOS/(LV)TTL Input	Output Enable for the clock outputs. Outputs are enabled when HIGH or when left open; OE pin has internal pull-up resistor. Three-states outputs when LOW.
-	EP	Thermal Exposed Pad	(DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V _{DD}	Positive Power Supply	GND = 0 V	-	7.0	V
V _I /V _O	Input/Output Voltage	t ≤ 1.5 ns	-	$GND-1.5 \leq V_I/V_O \leq V_{DD}+1.5$	V
T _A	Operating Temperature Range, Industrial	-	-	\geq -40 to \leq +85	°C
T _{stg}	Storage Temperature Range	-	-	-65 to +150	°C
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	SOIC-8	190 130	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	(Note 1)	SOIC-8	41 to 44	°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. 1. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

Table 4. ATTRIBUTES

Charac	Value		
ESD Protection	Human Body Model Machine Model	> 4 kV > 200 V	
Moisture Sensitivity, Indefinite Ti	Level 1		
Flammability Rating	UL-94 code V-0 @ 0.125 in		
Transistor Count	531 Devices		
Meets or Exceeds JEDEC Stand			

2. For additional Moisture Sensitivity information, refer to Application Note AND8003/D.

Symbol	Characteristic	Min	Тур	Max	Unit
I _{DD}	Power Supply Current @ 135 MHz, No Load, V _{DD} = 3.3 V	-	20	40	mA
V _{OH}	Output HIGH Voltage – I_{OH} = –25 mA, V_{DD} = 3.3 V	2.4	-	-	V
V _{OL}	Output LOW Voltage – I _{OL} = 25 mA	-	-	0.4	V
V _{OH}	Output HIGH Voltage – I _{OH} = –12 mA (CMOS level)	V _{DD} – 0.4	-	-	V
$V_{IH,} I_{CLK}$	Input HIGH Voltage, I _{CLK}	(V _{DD} /2)+0.7	-	3.8	V
V _{IL,} I _{CLK}	Input LOW Voltage, I _{CLK}	-	-	(V _{DD} /2)-0.7	V
$V_{\text{IH},}\text{OE}$	I, OE Input HIGH Voltage, OE		-	VDD	V
V_{IL} OE	Input LOW Voltage, OE	0	-	0.8	V
ZO	Nominal Output Impedance	-	20	-	Ω
RPU	Input Pull–up Resistor, OE	-	220	-	kΩ
CIN	Input Capacitance, OE	-	5.0	-	pF
IOS	Short Circuit Current	_	± 50	_	mA

Table 5. DC CHARACTERISTICS (V_{DD} = 3.0 V to 3.6 V, GND = 0 V, T_A = -40° C to $+85^{\circ}$ C) (Note 3)

DC CHARACTERISTICS (V_{DD} = 4.5 V to 5.5 V, GND = 0 V, $T_A = -40^{\circ}C$ to +85°C) (Note 3)

Symbol	Characteristic	Min	Тур	Max	Unit
I _{DD}	Power Supply Current @ 135 MHz, No Load, V_{DD} = 5.0 V	-	50	95	mA
V _{OH}	Output HIGH Voltage – I _{OH} = -35 mA	2.4	-	-	V
V _{OL}	Output LOW Voltage – I _{OL} = 35 mA	-	-	0.4	V
V _{OH}	Output HIGH Voltage – I _{OH} = –12 mA (CMOS level)	V _{DD} - 0.4	-	-	V
V _{IH,} I _{CLK}	Input HIGH Voltage, I _{CLK}	(V _{DD} /2) + 1	-	5.5	V
V _{IL,} I _{CLK}	Input LOW Voltage, I _{CLK}	-	-	(V _{DD} /2) – 1	V
V _{IH,} OE	Input HIGH Voltage, OE	2.0	-	V _{DD}	V
V_{IL} OE	Input LOW Voltage, OE	0	-	0.8	V
ZO	Nominal Output Impedance	-	20	-	Ω
RPU	Input Pull-up Resistor, OE	-	220	-	kΩ
CIN	Input Capacitance, OE	-	5.0	-	pF
IOS	Short Circuit Current	-	±80	-	mA

Table 6. AC CHARACTERISTICS (V_{DD} = 3.0 V to 5.5 V, GND = 0 V, T_A = -40° C to $+85^{\circ}$ C) (Note 3)

Symbol	Characteristic	Conditions	Min	Тур	Max	Unit
f _{in}	Input Frequency		-	-	160	MHz
t _{jitter} (φ)	RMS Phase Jitter (Integrated 12 kHz – 20 MHz) (See Figures 2 and 3)	f _{carrier} = 25 MHz f _{carrier} = 50 MHz		43 16		fs
t _{jitter} (pd)	Period Jitter (RMS, 1o)		-	2.0	-	ps
t _r /t _f	Output rise and fall times; 0.8 V to 2.0 V		-	0.5	1.0	ns
t _{pd}	Propagation Delay, CLK to Qn, 0 – 180 MHz, (Note 4)		1.5	3.0	6.0	ns
t _{skew}	Output-to-Output Skew; (Note 5)		-	50	250	ps

3. Outputs loaded with external $R_L = 33-\Omega$ series resistor and $C_L = 15 \text{ pF}$ to GND. Duty cycle out = duty in. A 0.01 μ F decoupling capacitor should be connected between V_{DD} and GND. A 33 Ω series terminating resistor may be used on each clock output if the trace is longer than 1 inch.

Measured with rail-to-rail input clock.
Measured on rising edges at V_{DD} ÷ 2.

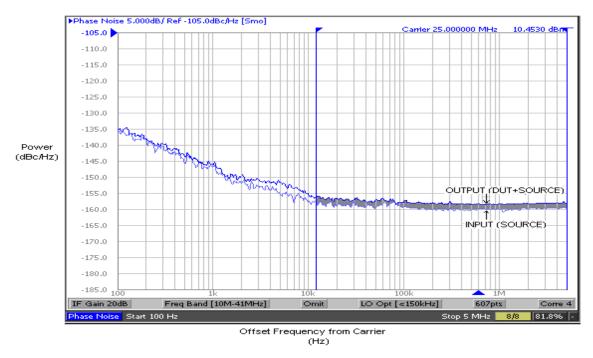


Figure 2. Phase Noise Plot at 25 MHz at an Operating Voltage of 3.3 V, Room Temperature

The above plot captured using Agilent E5052A shows Additive Phase Noise of the SB3N551 device measured with an input source generated by Agilent E8663B. The RMS phase jitter contributed by the device (integrated between 12 kHz to 20 MHz; as shown in the shaded region of the plot) is 43 fs (RMS Jitter of the input source is 203.31 fs and Output (DUT+Source) is 247.06 fs).

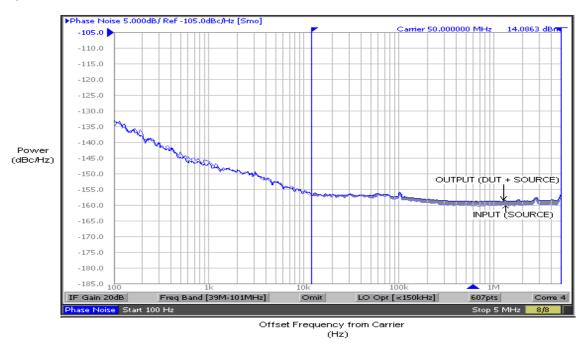
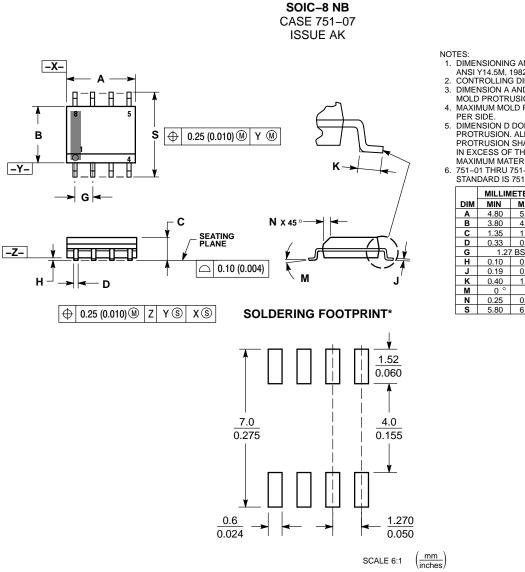


Figure 3. Phase Noise Plot at 50 MHz at an Operating Voltage of 5 V, Room Temperature

The above plot captured using Agilent E5052A shows Additive Phase Noise of the SB3N551 device measured with an input source generated by Agilent E8663B. The RMS phase jitter contributed by the device (integrated between 12 kHz to 20 MHz; as shown in the shaded region of the plot) is 16 fs (RMS Jitter of the input source is 104.08 fs and Output (DUT + Source) is 119.77 fs).

PACKAGE DIMENSIONS



*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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DIM	MIN	MAX	MIN	MAX			
Α	4.80	5.00	0.189	0.197			
в	3.80	4.00	0.150	0.157			
С	1.35	1.75	0.053	0.069			
D	0.33	0.51	0.013	0.020			
G	1.27	1.27 BSC		0 BSC			
Н	0.10	0.25	0.004	0.010			
J	0.19	0.25	0.007	0.010			
ĸ	0.40	1.27	0.016	0.050			
М	0 °	8 °	0 °	8 °			
N	0.25	0.50	0.010	0.020			
S	5.80	6.20	0.228	0.244			