NINE OUTPUT 3.3V CLOCK BUFFER

IDT2309NZ

FEATURES:

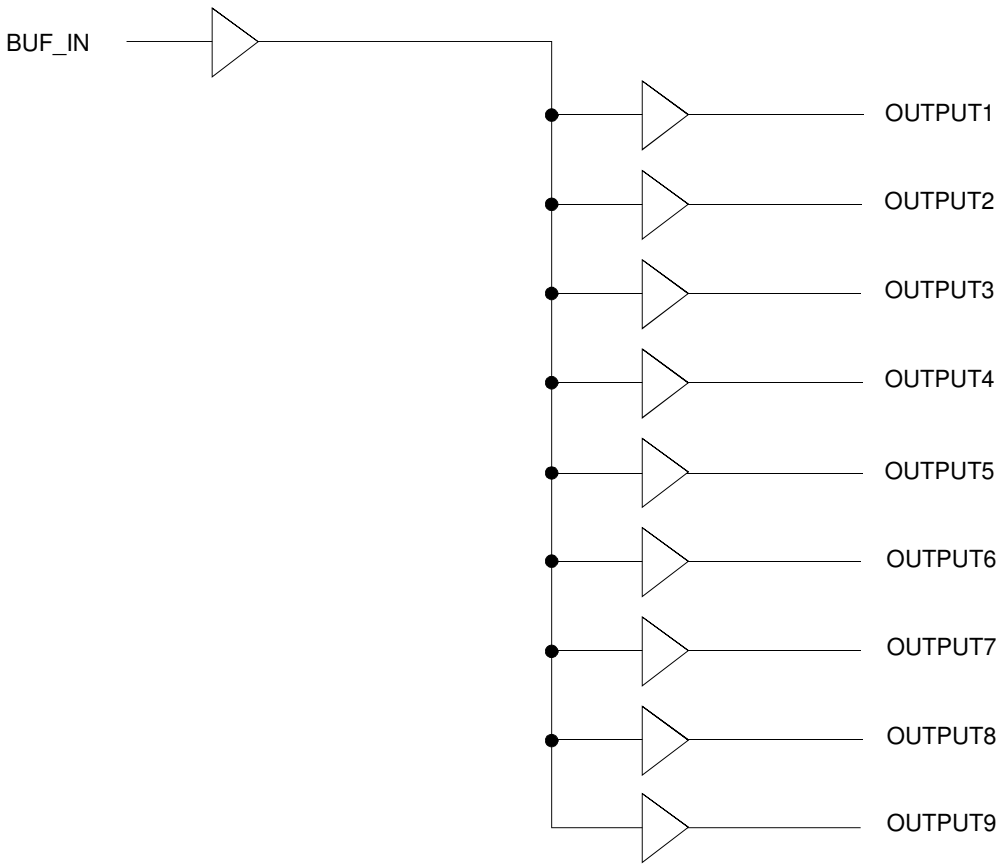
- One input to nine output buffer/driver
- Supports two DIMMs or four SO-DIMMs with one additional output for feedback to an external or chipset PLL
- Low power consumption for mobile applications: less than 32mA at 66.6MHz with unloaded outputs
- 8.7ns input-output delay
- Buffers all frequencies from DC to 133.33MHz
- Output-output skew < 250ps
- Multiple V_{DD} and V_{SS} pins for noise and EMI reduction
- 3.3V operation
- High drive capability
- Available in SOIC and TSSOP packages

DESCRIPTION:

The IDT2309NZ is a low-cost buffer designed to distribute high-speed clocks in mobile PC systems and desktop PC systems with SDRAM support. This part has nine outputs, eight of which can be used to drive two DIMMs or four SO-DIMMs, and the remaining can be used for external feedback to a PLL. The IDT2309NZ operates at 3.3V and outputs can run up to 133.33MHz

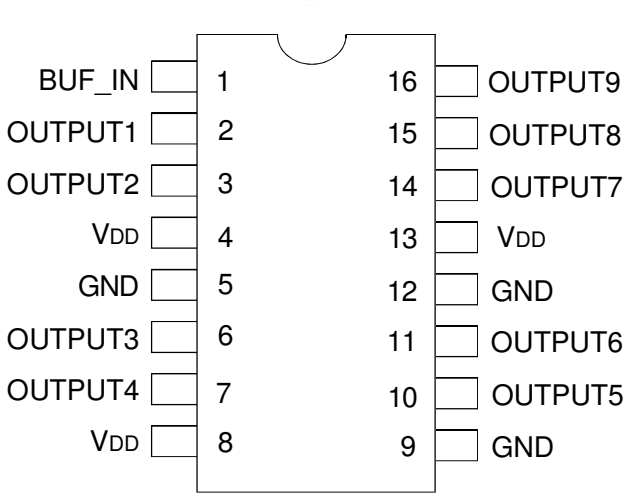
The IDT2309NZ is designed for low EMI and power optimization. It has multiple V_{DD} and V_{SS} pins for noise optimization and consumes less than 32mA at 66.6MHz, making it ideal for the low power requirements of mobile systems.

FUNCTIONAL BLOCK DIAGRAM



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PIN CONFIGURATION



SOIC/ TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating	Max.	Unit
V_{DD}	Supply Voltage Range	–0.5 to +4.6	V
V_I(2)	Input Voltage Range (REF)	–0.5 to +5.5	V
V_I	Input Voltage Range (except REF)	–0.5 to V_{DD}+0.5	V
I_{IK} (V_I < 0)	Input Clamp Current	–50	mA
I_O (V_O = 0 to V_{DD})	Continuous Output Current	±50	mA
V_{DD} or GND	Continuous Current	±100	mA
T_A = 55°C (in still air)(3)	Maximum Power Dissipation	0.7	W
T_{STG}	Storage Temperature Range	–65 to +150	°C
Operating Temperature	Commercial Temperature Range	0 to +70	°C
Operating Temperature	Industrial Temperature Range	-40 to +85	°C

NOTES:
1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
3. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

PIN DESCRIPTION

Pin Name	Pin Number	Functional Description
V_{DD}	4, 8, 13	3.3V Digital Voltage Supply
GND	5, 9, 12	Ground
BUF_IN	1	Input clock
OUTPUT[1:9]	2, 3, 6, 7, 10 11, 14, 15, 16	Outputs

OPERATING CONDITIONS - COMMERCIAL

Symbol	Parameter	Min.	Max.	Unit
V_{DD}	Supply Voltage	3	3.6	V
T_A	Operating Temperature (Ambient Temperature)	0	70	°C
C_L	Load Capacitance, F_{OUT} < 100MHz	—	30	pF
	Load Capacitance 100MHz < F_{OUT} < 133.33MHz	—	15	
C_{IN}	Input Capacitance	—	7	pF
BUF_IN, SDRAM[1:9]	Operating Frequency	DC	133.33	MHz

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OPERATING CONDITIONS - INDUSTRIAL

Symbol	Parameter	Min.	Max.	Unit
V_{DD}	Supply Voltage	3	3.6	V
T_A	Operating Temperature (Ambient Temperature)	-40	+85	°C
C_L	Load Capacitance, F_{OUT} < 100MHz	—	30	pF
	Load Capacitance 100MHz < F_{OUT} < 133.33MHz	—	15	
C_{IN}	Input Capacitance	—	7	pF
BUF_IN, SDRAM[1:9]	Operating Frequency	DC	133.33	MHz

DC ELECTRICAL CHARACTERISTICS - COMMERCIAL

Symbol	Parameter	Conditions	Min.	Max.	Unit
V_{IL}	Input LOW Voltage[1]		—	0.8	V
V_{IH}	Input HIGH Voltage[1]		2	—	V
I_{IL}	Input LOW Current	V_{IN} = 0V	—	50	µA
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}	—	100	µA
V_{OL}	Output LOW Voltage[2]	I_{OL} = 8mA	—	0.4	V
V_{OH}	Output HIGH Voltage[2]	I_{OH} = -8mA	2.4	—	V
I_{DD}	Supply Current	Unloaded Outputs at 66.66MHz	—	32	mA

NOTES:
1. BUF_IN input has a threshold voltage of V_{DD}/2.
2. Parameter is guaranteed by design but not production tested.

DC ELECTRICAL CHARACTERISTICS - INDUSTRIAL

Symbol	Parameter	Conditions	Min.	Max.	Unit
V_{IL}	Input LOW Voltage[1]		—	0.8	V
V_{IH}	Input HIGH Voltage[1]		2	—	V
I_{IL}	Input LOW Current	V_{IN} = 0V	—	50	µA
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}	—	100	µA
V_{OL}	Output LOW Voltage[2]	I_{OL} = 8mA	—	0.4	V
V_{OH}	Output HIGH Voltage[2]	I_{OH} = -8mA	2.4	—	V
I_{DD}	Supply Current	Unloaded Outputs at 66.66MHz	—	35	mA

NOTES:
1. BUF_IN input has a threshold voltage of V_{DD}/2.
2. Parameter is guaranteed by design but not production tested.

SWITCHING CHARACTERISTICS - COMMERCIAL[1]

Symbol	Parameter[2]	Conditions	Min.	Typ.	Max.	Unit
t_3	Rise Time	Measured between 0.8V and 2V	—	—	1.5	ns
t_4	Fall Time	Measured between 0.8V and 2V	—	—	1.5	ns
t_5	Output to Output Skew	All outputs equally loaded	—	—	250	ps
t_6	Propagation Delay, BUF_IN Rising Edge to OUTPUT Rising Edge	Measured at V_{DD}/2	1	5	8.7	ns

NOTES:
1. All parameters specified with loaded outputs.
2. Parameter is guaranteed by design but not production tested.

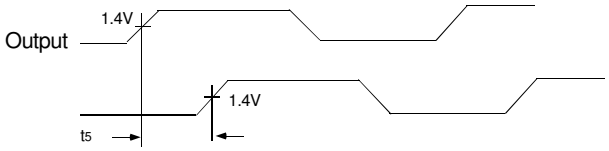
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SWITCHING CHARACTERISTICS - INDUSTRIAL (1)

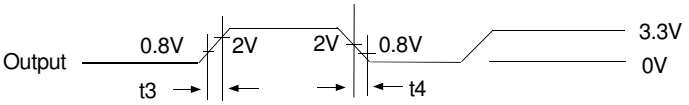
Symbol	Parameter(2)	Conditions	Min.	Typ.	Max.	Unit
t_3	Rise Time	Measured between 0.8V and 2V	—	—	1.5	ns
t_4	Fall Time	Measured between 0.8V and 2V	—	—	1.5	ns
t_5	Output to Output Skew	All outputs equally loaded	—	—	250	ps
t_6	Propagation Delay, BUF_IN Rising Edge to OUTPUT Rising Edge	Measured at $V_{DD}/2$	1	5	8.7	ns

NOTES:
1. All parameters specified with loaded outputs.
2. Parameter is guaranteed by design but not production tested.

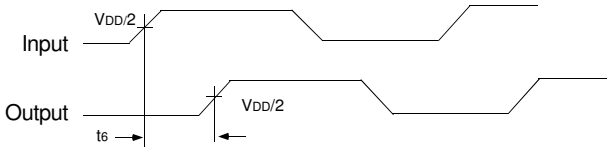
SWITCHING WAVEFORMS



Output to Output Skew

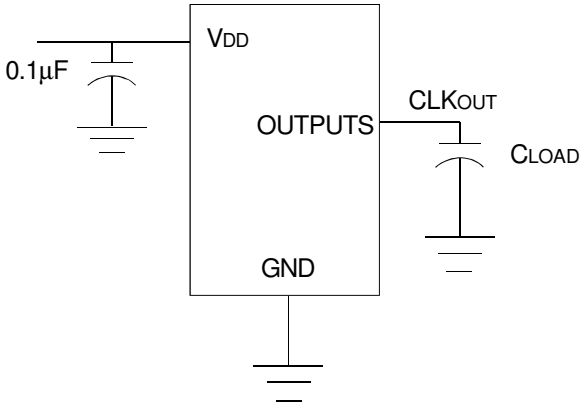


All Outputs Rise/Fall Time



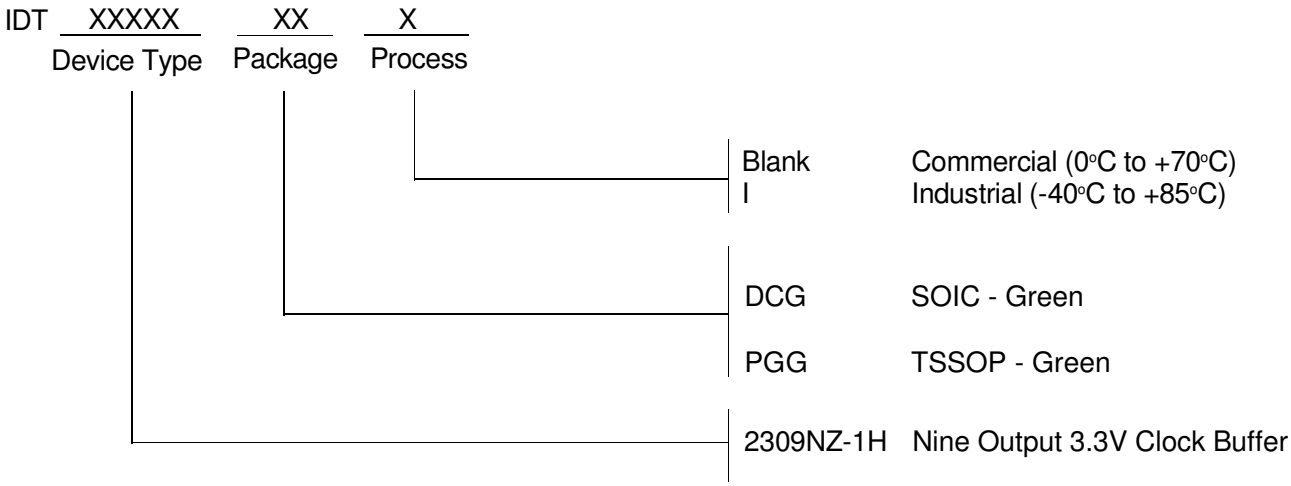
Input to Output Propagation Delay

TEST CIRCUIT



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ORDERING INFORMATION



Part / Order Number	Shipping Packaging	Package	Temperature
2309NZ-1HDCG	Tubes	16-pin SOIC	0° to +70° C
2309NZ-1HDCG8	Tape and Reel	16-pin SOIC	0° to +70° C
2309NZ-1HDCGI	Tubes	16-pin SOIC	-40° to +85°C
2309NZ-1HDCGI8	Tape and Reel	16-pin SOIC	-40° to +85°C
2309NZ-1HPGG	Tubes	16-pin TSSOP	0° to +70° C
2309NZ-1HPGG8	Tape and Reel	16-pin TSSOP	0° to +70° C
2309NZ-1HPGGI	Tubes	16-pin TSSOP	-40° to +85°C
2309NZ-1HPGGI8	Tape and Reel	16-pin TSSOP	-40° to +85°C

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