

### NINE OUTPUT 3.3V CLOCK BUFFER

#### FEATURES:

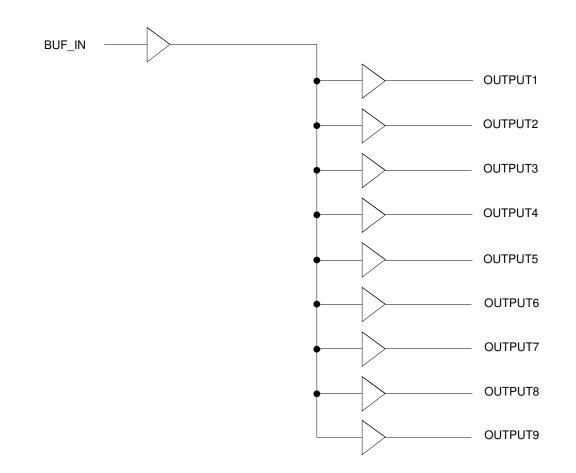
- One input to nine output buffer/driver
- Supports two DIMMs or four SO-DIMMs with one additional output for feedback to an external or chipset PLL
- Low power consumption for mobile applications: less than 32mA at 66.6MHz with unloaded outputs
- · 8.7ns input-output delay
- · Buffers all frequencies from DC to 133.33MHz
- Output-output skew < 250ps
- · Multiple VDD and Vss 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

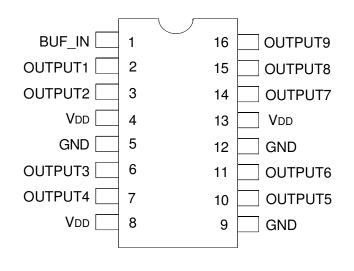
The IDT2309NZ is designed for low EMI and power optimization. It has multiple VDD and VSS pins for noise optimization and consumes less than 32mA at 66.6MHz, making it ideal for the low power requirements of mobile systems.

#### FUNCTIONAL BLOCK DIAGRAM



#### **COMMERCIAL AND INDUSTRIAL TEMPERATURE RANGES**

#### **PIN CONFIGURATION**



SOIC/ TSSOP TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Rating	Max.	Unit
Vdd	Supply Voltage Range	-0.5 to +4.6	V
VI <sup>(2)</sup>	Input Voltage Range (REF)	-0.5 to +5.5	V
VI	Input Voltage Range	-0.5 to	V
	(except REF)	VDD+0.5	
Iк (VI < 0)	Input Clamp Current	-50	mA
Io (Vo = 0 to VDD)	Continuous Output Current	±50	mA
VDD or GND	Continuous Current	±100	mA
TA = 55°C	Maximum Power Dissipation	0.7	W
(in still air) <sup>(3)</sup>			
Tstg	Storage Temperature Range	-65 to +150	°C
Operating	CommercialTemperature	0 to +70	°C
Temperature	Range		
Operating	Industrial Temperature	-40 to +85	°C
Temperature	Range		

NOTES:

**DIN DESCRIPTION** 

- 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.
- The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

Pin Name	Pin Number	Functional Description			
Vdd	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	Outputs			
	11, 14, 15, 16				

#### **OPERATING CONDITIONS - COMMERCIAL**

Symbol	Parameter	Min.	Max.	Unit
Vdd	VDD Supply Voltage		3.6	V
TA Operating Temperature (Ambient Temperature)		0	70	°C
CL	Load Capacitance, Fout < 100MHz	—	30	pF
	Load Capacitance 100MHz < Fout < 133.33MHz	—	15	
CIN	InputCapacitance	—	7	pF
BUF_IN, SDRAM[1:9]	Operating Frequency	DC	133.33	MHz

#### **OPERATING CONDITIONS - INDUSTRIAL**

Symbol	Parameter	Min.	Max.	Unit
Vdd	Supply Voltage	3	3.6	V
TA Operating Temperature (Ambient Temperature)		-40	+85	°C
CL	Load Capacitance, Fout < 100MHz	—	30	pF
	Load Capacitance 100MHz < Fout < 133.33MHz	—	15	
CIN	InputCapacitance	—	7	pF
BUF_IN, SDRAM[1:9]	Operating Frequency	DC	133.33	MHz

#### **DC ELECTRICAL CHARACTERISTICS - COMMERCIAL**

Symbol	Parameter	Conditions	Min.	Max.	Unit
VIL	Input LOW Voltage <sup>(1)</sup>		—	0.8	V
Vih	Input HIGH Voltage <sup>(1)</sup>		2	_	V
lıL	Input LOW Current	VIN = 0V	—	50	μA
Ін	Input HIGH Current	Vin = Vdd	—	100	μA
Vol	Output LOW Voltage <sup>(2)</sup>	IOL = 8mA	—	0.4	V
Vон	Output HIGH Voltage <sup>(2)</sup>	Iон = -8mA	2.4	_	V
IDD	Supply Current	Unloaded Outputs at 66.66MHz	—	32	mA

NOTES:

1. BUF\_IN input has a threshold voltage of VDD/2.

2. Parameter is guaranteed by design but not production tested.

#### **DC ELECTRICAL CHARACTERISTICS-INDUSTRIAL**

Symbol	Parameter	Conditions	Min.	Max.	Unit
Vil	Input LOW Voltage <sup>(1)</sup>		—	0.8	V
Vih	Input HIGH Voltage <sup>(1)</sup>		2	_	V
lıL	Input LOW Current	VIN = 0V	—	50	μA
Ін	Input HIGH Current	Vin = Vdd	—	100	μA
Vol	Output LOW Voltage <sup>(2)</sup>	IOL = 8mA	—	0.4	V
Vон	Output HIGH Voltage <sup>(2)</sup>	Iон = -8mA	2.4	—	V
Idd	Supply Current	Unloaded Outputs at 66.66MHz	_	35	mA

NOTES:

1. BUF\_IN input has a threshold voltage of VDD/2.

2. Parameter is guaranteed by design but not production tested.

## SWITCHING CHARACTERISTICS - COMMERCIAL<sup>(1)</sup>

Symbol	Parameter <sup>(2)</sup>	Conditions	Min.	Тур.	Max.	Unit
t3	RiseTime	Measured between 0.8V and 2V	_	_	1.5	ns
t4	FallTime	Measured between 0.8V and 2V	—	—	1.5	ns
ts	Output to Output Skew	All outputs equally loaded	—	_	250	ps
t6	Propagation Delay, BUF_IN Rising Edge	Measured at VDD/2	1	5	8.7	ns
	to OUTPUT Rising Edge					

NOTES:

1. All parameters specified with loaded outputs.

2. Parameter is guaranteed by design but not production tested.

# SWITCHING CHARACTERISTICS - INDUSTRIAL<sup>(1)</sup>

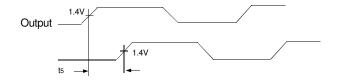
Symbol	Parameter <sup>(2)</sup>	Conditions	Min.	Тур.	Max.	Unit
t3	RiseTime	Measured between 0.8V and 2V	_	_	1.5	ns
t4	FallTime	Measured between 0.8V and 2V	—	—	1.5	ns
ts	Output to Output Skew	All outputs equally loaded	_	_	250	ps
t6	Propagation Delay, BUF_IN Rising Edge to OUTPUT Rising Edge	Measured at VDD/2	1	5	8.7	ns

NOTES:

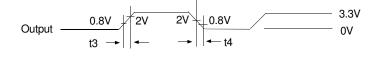
1. All parameters specified with loaded outputs.

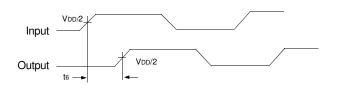
2. Parameter is guaranteed by design but not production tested.

### **SWITCHING WAVEFORMS**



**Output to Output Skew** 

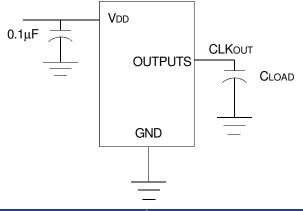




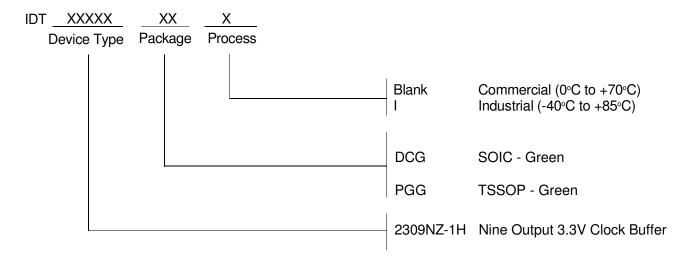




#### **TEST CIRCUIT**



#### **ORDERING INFORMATION**



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