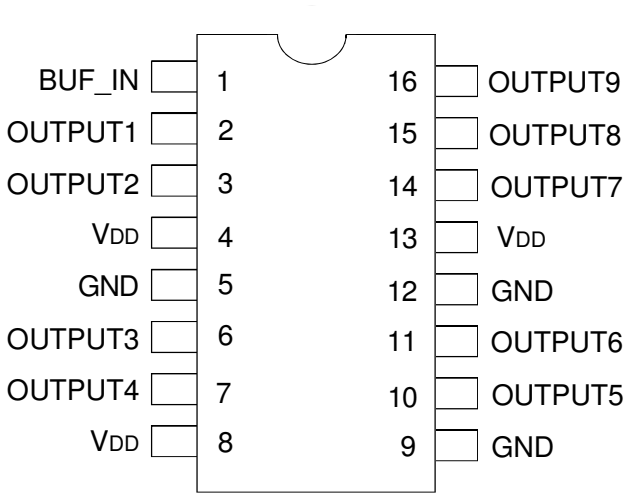
PIN CONFIGURATION



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

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

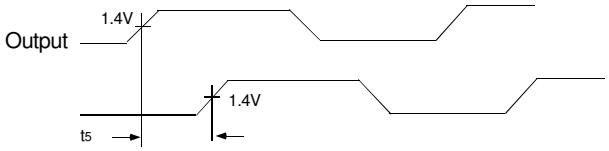
NOTES:
1. All parameters specified with loaded outputs.
2. Parameter is guaranteed by design but not production tested.

SWITCHING CHARACTERISTICS - INDUSTRIAL (1)

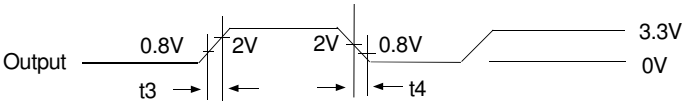
Symbol	Parameter(2)	Conditions	Min.	Typ.	Max.	Unit
t_3	Rise Time	Measured between 0.8V and 2V	—	—	1.5	ns
t_4	Fall Time	Measured between 0.8V and 2V	—	—	1.5	ns
t_5	Output to Output Skew	All outputs equally loaded	—	—	250	ps
t_6	Propagation Delay, BUF_IN Rising Edge to OUTPUT Rising Edge	Measured at $V_{DD}/2$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

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

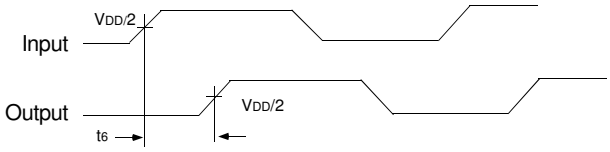
SWITCHING WAVEFORMS



Output to Output Skew

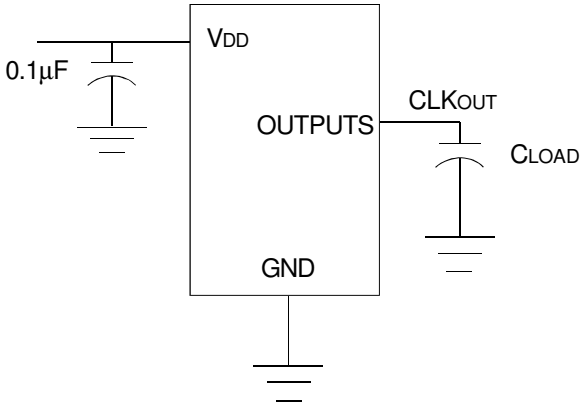


All Outputs Rise/Fall Time

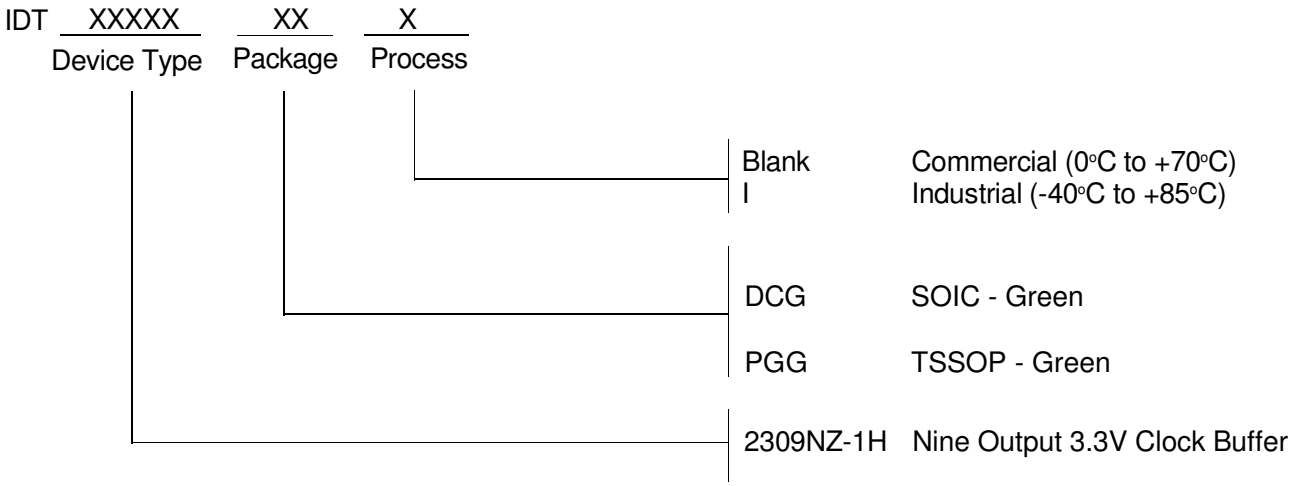


Input to Output Propagation Delay

TEST CIRCUIT



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

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Rev.1.0 Mar 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Renesas Electronics:

2309NZ-1HDCG 2309NZ-1HPGG 2309NZ-1HDCGI 2309NZ-1HPGGI 2309NZ-1HPGGI8 2309NZ-1HDCG8 2309NZ-1HPGG8 2309NZ-1HDCGI8