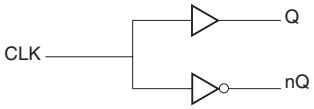
Description

The 8302I-01 is a low skew, 1-to-2 LVCMOS/LVTTL Fanout Buffer w/Complementary Output. The 8302I-01 has a single ended clock input. The single ended clock input accepts LVCMOS or LVTTL input levels. The 8302I-01 is characterized at full 3.3V for input V_{DD}, and mixed 3.3V and 2.5V for output operating supply modes (V_{DDO}). Guaranteed output and part-to-part skew characteristics make the 8302I-01 ideal for clock distribution applications demanding well defi ned performance and repeatability.

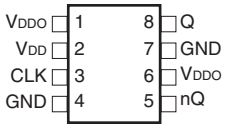
Features

- Complementary LVCMOS / LVTTL output
- LVCMOS / LVTTL clock input accepts LVCMOS or LVTTL input levels
- Maximum output frequency: 250MHz
- Output skew: 165ps (maximum)
- Part-to-part skew: 800ps (maximum)
- Small 8 lead SOIC package saves board space
- Full 3.3V or 3.3V core/2.5V output supply modes
- -40°C to 85°C ambient operating temperature
- Available in lead-free compliant package

Block Diagram



Pin Assignments



8302I-01
8-Lead SOIC
3.8mm x 4.8mm, x 1.47mm package body
M Package
Top View

Table 1. Pin Descriptions

Number	Name	Type		Description
1, 6	V_{DDO}	Power		Output supply pins.
2	V_{DD}	Power		Power supply pin.
3	CLK	Input	Pulldown	LVCMOS / LVTTL clock input.
4,7	GND	Power		Power supply ground.
5	nQ	Output		Complementary clock output. LVCMOS / LVTTL interface levels.
8	Q	Output		Clock output. LVCMOS / LVTTL interface levels.

NOTE: *Pulldown* refer to internal input resistors. See Table 2, Pin Characteristics, for typical values.

Table 2. Pin Characteristics

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
C_{IN}	Input Capacitance			4		pF
C_{PD}	Power Dissipation Capacitance (per output)	V_{DD}, V_{DDO} = 3.465V		22		pF
		V_{DD} = 3.465V, V_{DDO} = 2.625V		16		pF
$R_{PULLDOWN}$	Input Pulldown Resistor			51		kΩ
R_{OUT}	Output Impedance		5	7	12	Ω

Absolute Maximum Ratings

Supply Voltage, V_{DD}	4.6V
Inputs, V_I	-0.5V to V_{DD} + 0.5 V
Outputs, V_O	-0.5V to V_{DDO} + 0.5V
Package Thermal Impedance, θ_{JA}	112.7°C/W (0 lfpm)
Storage Temperature, T_{STG}	-65°C to 150°C

NOTE: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These ratings are stress specifi cations only. Functional operation of product at these conditions or any conditions beyond those listed in the *DC Characteristics* or *AC Charac-teristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Table 3A. Power Supply DC Characteristics, V_{DD} = 3.3V±5%, V_{DDO} = 3.3V±5% or 2.5V±5%, T_A = -40°C to 85°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
V_{DD}	Power Supply Voltage		3.135	3.3	3.465	V
V_{DDO}	Output Power Supply Voltage		3.135	3.3	3.465	V
			2.375	2.5	2.625	V
I_{DD}	Power Supply Current				13	mA
I_{DDO}	Output Supply Current				4	mA

Table 3B. LVCMOS / LVTTL DC Characteristics, V_{DD} = 3.3V±5%, V_{DDO} = 3.3V±5% or 2.5V±5%, T_A = -40°C to 85°C

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
V_{IH}	Input High Voltage			2		V_{DD} + 0.3	V
V_{IL}	Input Low Voltage			-0.3		0.8	V
I_{IH}	Input High Current	CLK	V_{DD} = V_{IN} = 3.465V			150	µA
I_{IL}	Input Low Current	CLK	V_{DD} = 3.465V, V_{IN} = 0V	-5			µA
V_{OH}	Output High Voltage		V_{DDO} = 3.465, 50Ω to V_{DDO}/2	2.6			V
			V_{DDO} = 3.465, I_{OH} = -100µA	2.9			V
			V_{DDO} = 2.625, 50Ω to V_{DDO}/2	1.8			V
			V_{DDO} = 2.625, I_{OH} = -100µA	2.2			V
V_{OL}	Output Low Voltage		V_{DDO} = 3.465, 50Ω to V_{DDO}/2			0.5	V
			V_{DDO} = 3.465, I_{OL} = 100µA			0.2	V
			V_{DDO} = 2.625, 50Ω to V_{DDO}/2			0.5	V
			V_{DDO} = 2.625, I_{OL} = 100µA			0.2	V

TABLE 4A. AC CHARACTERISTICS, $V_{DD} = V_{DDO} = 3.3V \pm 5\%$, T_A = -40°C TO 85°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
f_{MAX}	Output Frequency				250	MHz
tp_{LH}	Propagation Delay, Low-to-High; NOTE 1		1.8		2.7	ns
*t*sk(o)	Output Skew; NOTE 2, 4				165	ps
*t*sk(pp)	Part-to-Part Skew; NOTE 3, 4				800	ps
t_R / t_F	Output Rise/Fall Time	20% to 80%	300		800	ps
odc	Output Duty Cycle	$f \leq$ 133MHz	45		55	%
		133MHz < $f \leq$ 250MHz	40		60	%

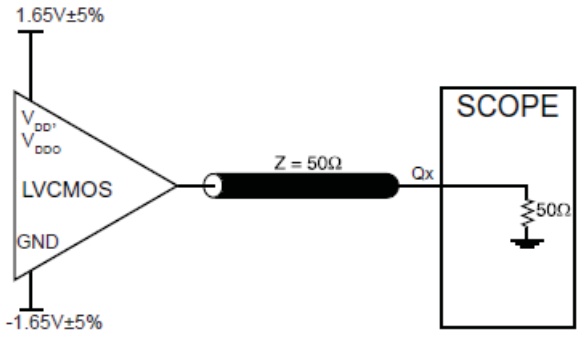
NOTE 1: Measured from $V_{DD}/2$ of the input to $V_{DDO}/2$ of the output.
NOTE 2: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at $V_{DDO}/2$.
NOTE 3: Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at $V_{DDO}/2$.
NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.

TABLE 4B. AC CHARACTERISTICS, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 2.5V \pm 5\%$, T_A = -40°C TO 85°C

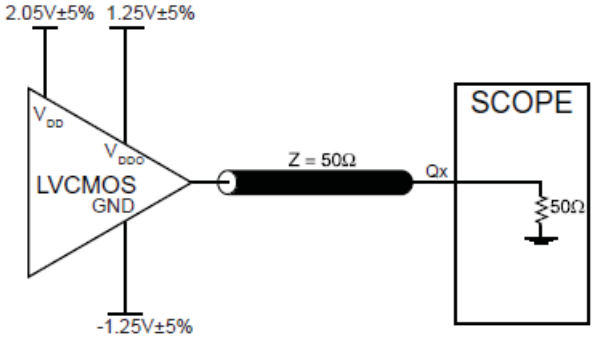
Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
f_{MAX}	Output Frequency				250	MHz
tp_{LH}	Propagation Delay, Low-to-High; NOTE 1		1.9		2.9	ns
tsk(o)	Output Skew; NOTE 2, 4				250	ps
tsk(pp)	Part-to-Part Skew; NOTE 3, 4				900	ps
t_R / t_F	Output Rise/Fall Time	20% to 80%	100		850	ps
odc	Output Duty Cycle	$f \leq$ 133MHz	45		55	%
		133MHz < $f \leq$ 250MHz	40		60	%

NOTE 1: Measured from $V_{DD}/2$ of the input to $V_{DDO}/2$ of the output.
NOTE 2: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at $V_{DDO}/2$.
NOTE 3: Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at $V_{DDO}/2$.
NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.

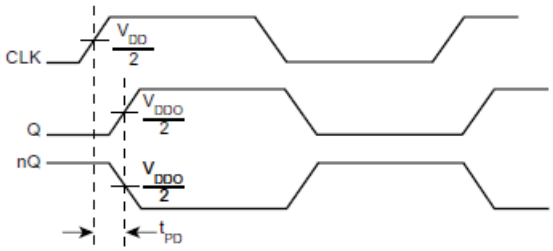
Parameter Measurement Information



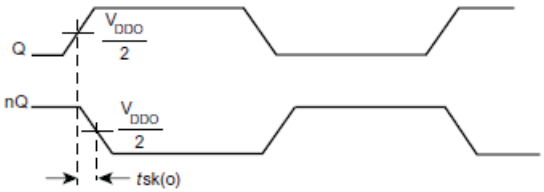
3.3V Core/3.3V Output Load AC Test Circuit



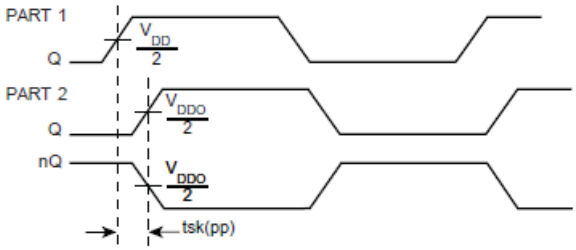
3.3V/2.5V Output Load AC Test Circuit



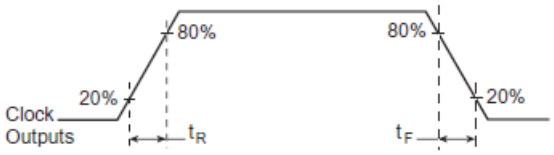
Propagation Delay



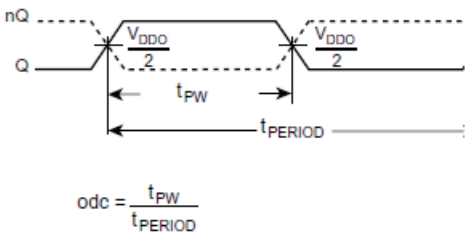
Output Skew



Part-to-Part Skew



Output Rise/Fall Time



$$odc = \frac{t_{PW}}{t_{PERIOD}}$$

Output Duty Cycle/Pulse Width/Period

RELIABILITY INFORMATION

TABLE 5. θ_{JA} VS. AIR FLOW TABLE FOR 8 LEAD SOIC

θ_{JA} by Velocity (Linear Feet per Minute)			
	0	**200**	**500**
Single-Layer PCB, JEDEC Standard Test Boards	153.3°C/W	128.5°C/W	115.5°C/W
Multi-Layer PCB, JEDEC Standard Test Boards	112.7°C/W	103.3°C/W	97.1°C/W

NOTE: Most modern PCB designs use multi-layered boards. The data in the second row pertains to most designs.

TRANSISTOR COUNT

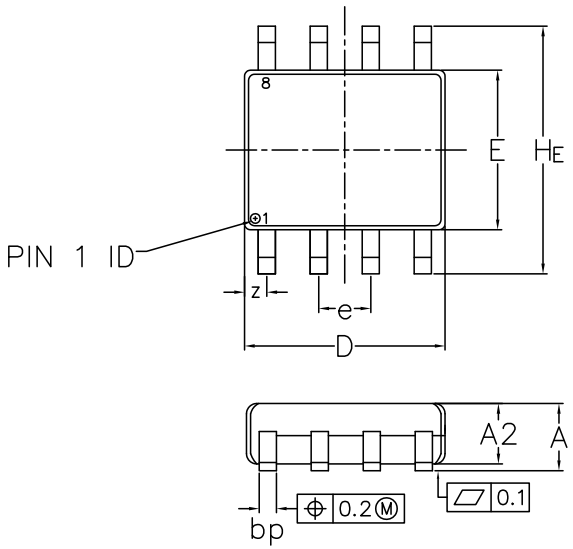
The transistor count for 8302I-01 is: 322

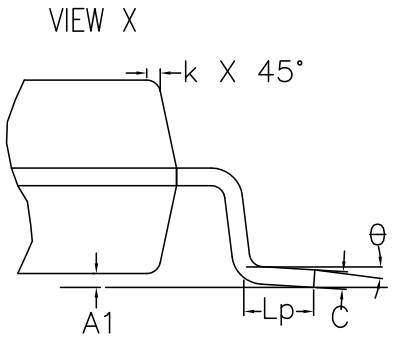
BASED ON IEC 191-2Q: TYPE 076E35 B

DIMENSIONS IN MILLIMETERS

1. DIMENSIONS

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	2/24/16	J.H





DIMENSIONS OF SUB-GROUP B1	
A max	1.95
bp min	0.35
bp max	0.49
e nom	1.27
H_E min	5.80
H_E max	6.30
Lpmin	0.40
Z max	0.635

DIMENSIONS OF SUB-GROUP C1	
A min	1.55
A1 min	0.10
A1 max	0.30
A2 min	1.40
A2 max	1.80
c min	0.15
c max	0.25
D min*	4.80
D max*	5.00
E min*	3.80
E max*	4.00
k min	0.33
θ max	0°
θ max	8°

2. WEIGHT ≤ 0.3 g
3. BODY MATERIAL LOW STRESS EPOXY
4. LEAD MATERIAL FeNi-ALLOY or Cu-ALLOY
5. LEAD FINISH SOLDER PLATING
6. LEAD FORM Z-BENDS

* WITHOUT MOLD FLASH

TOLERANCES UNLESS SPECIFIED DECIMAL ANGULAR XX± ± XXX± XXXX±	IDT™ www.IDT.com	6024 Silver Creek Valley Rd San Jose, CA 95138 PHONE: (408) 284-8200 FAX: (408) 284-3572	
APPROVALS / DATE	TITLE	DCG8 PACKAGE OUTLINE 150 mil SOP	
DRAWN RAC 2/24/16			
CHECKED	SIZE	DRAWING No.	REV
	C	PSC-4068-03	00
	DO NOT SCALE DRAWING		SHEET 1 OF 1

Ordering Information

Orderable Part Number	Marking	Package	Carrier Type	Temperature
8302AMI-01LF	302AI01L	3.8 x 4.8 x 1.47 mm 8-SOIC	Tube	-40° to +85°C
8302AMI-01LF	302AI01L	3.8 x 4.8 x 1.47 mm 8-SOIC	Tape and Reel	-40° to +85°C

Revision History

Revision Date	Description of Change
May 4, 2017	▪ Corrected and updated the Ordering Information Table. ▪ Updated package information. ▪ Updated datasheet header/footer.
March 9, 2016	▪ Features section - removed reference to leaded package ▪ Ordering Information table - removed quantity from tape and reel. Deleted LF note below table. ▪ Added Contact Page
July 29, 2010	▪ Updated datasheet header/footer with IDT logo from ICS logo. ▪ Ordering Information table - removed ICS prefix from Part/Order Number column. ▪ Added Contact Page.

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 who are 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 to develop 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 from 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.

(Disclaimer Rev.1.01)

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-us/.

Trademarks

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