



Integrated
Circuit
Systems, Inc.

ICS8302I-01

LOW SKEW, 1-TO-2 LVCMOS / LVTTTL FANOUT BUFFER W/ COMPLEMENTARY OUTPUT

GENERAL DESCRIPTION

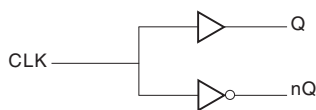


The ICS8302I-01 is a low skew, 1-to-2 LVCMOS/LVTTTL Fanout Buffer w/Complementary Output and a member of the HiPerClockS™ family of High Performance Clock Solutions from ICS. The ICS8302I-01 has a single ended clock input. The single ended clock input accepts LVCMOS or LVTTTL input levels. The ICS8302I-01 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 ICS8302I-01 ideal for clock distribution applications demanding well defined performance and repeatability.

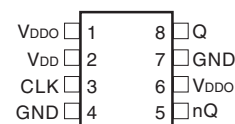
FEATURES

- Complementary LVCMOS / LVTTTL output
- LVCMOS / LVTTTL clock input accepts LVCMOS or LVTTTL 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 both standard and lead-free compliant packages

BLOCK DIAGRAM



PIN ASSIGNMENT



ICS8302I-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 / LVTTTL clock input.
4,7	GND	Power		Power supply ground.
5	nQ	Output		Complementary clock output. LVCMOS / LVTTTL interface levels.
8	Q	Output		Clock output. LVCMOS / LVTTTL 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 $V_{DD} + 0.5V$
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 specifications only. Functional operation of product at these conditions or any conditions beyond those listed in the *DC Characteristics* or *AC Characteristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

TABLE 3A. POWER SUPPLY DC CHARACTERISTICS, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 3.3V \pm 5\%$ OR $2.5V \pm 5\%$, $T_A = -40^\circ C$ TO $85^\circ C$

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 / LVTTTL DC CHARACTERISTICS, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 3.3V \pm 5\%$ OR $2.5V \pm 5\%$, $T_A = -40^\circ C$ TO $85^\circ C$

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	$V_{DDO} = 3.465, 50\Omega$ to $V_{DDO}/2$	2.6			V
		$V_{DDO} = 3.465, I_{OH} = -100\mu A$	2.9			V
		$V_{DDO} = 2.625, 50\Omega$ to $V_{DDO}/2$	1.8			V
		$V_{DDO} = 2.625, I_{OH} = -100\mu A$	2.2			V
V_{OL}	Output Low Voltage	$V_{DDO} = 3.465, 50\Omega$ to $V_{DDO}/2$			0.5	V
		$V_{DDO} = 3.465, I_{OL} = 100\mu A$			0.2	V
		$V_{DDO} = 2.625, 50\Omega$ to $V_{DDO}/2$			0.5	V
		$V_{DDO} = 2.625, I_{OL} = 100\mu A$			0.2	V



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

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
f_{MAX}	Output Frequency				250	MHz
$t_{p_{LH}}$	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, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 2.5V \pm 5\%$, $T_A = -40^\circ C$ TO $85^\circ C$

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
f_{MAX}	Output Frequency				250	MHz
$t_{p_{LH}}$	Propagation Delay, Low-to-High; NOTE 1		1.9		2.9	ns
$t_{sk(o)}$	Output Skew; NOTE 2, 4				250	ps
$t_{sk(pp)}$	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.

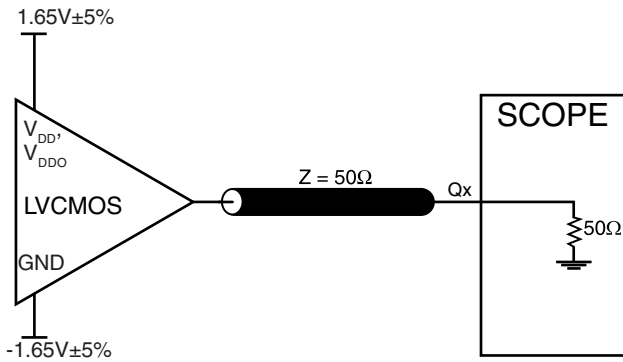
NOTE 2: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at $V_{DDO}/2$.

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 $V_{DDO}/2$.

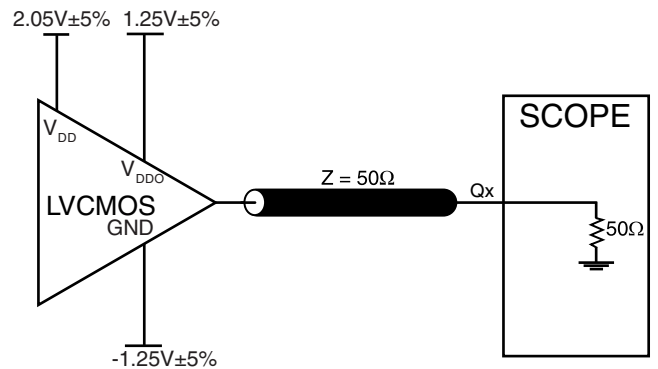
NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.



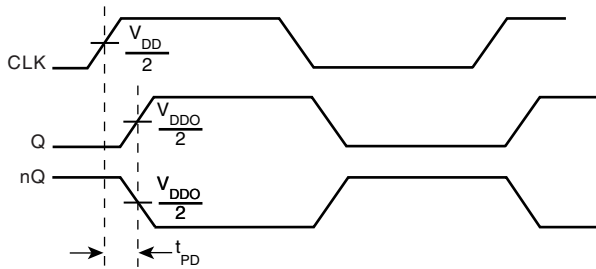
PARAMETER MEASUREMENT INFORMATION



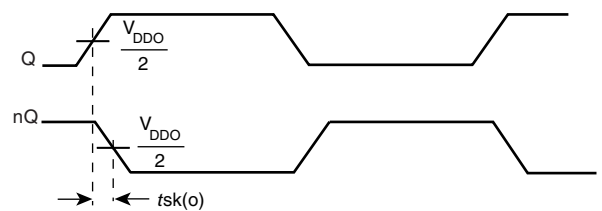
3.3V CORE/3.3V OUTPUT LOAD AC TEST CIRCUIT



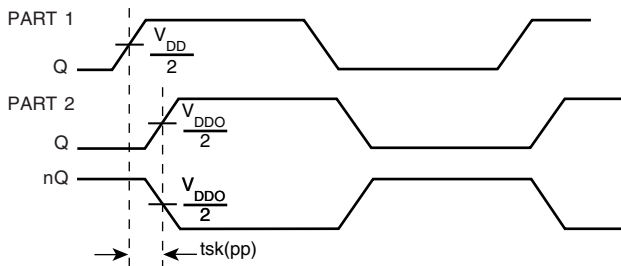
3.3V/2.5V OUTPUT LOAD AC TEST CIRCUIT



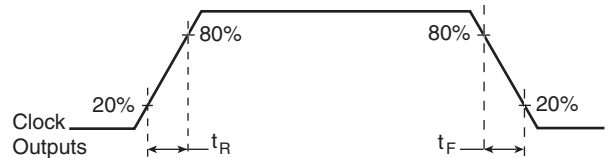
PROPAGATION DELAY



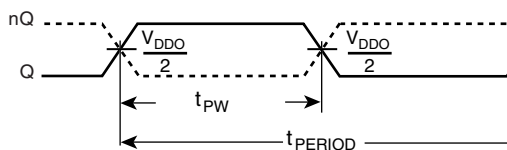
OUTPUT SKEW



PART-TO-PART SKEW



OUTPUT RISE/FALL TIME



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

OUTPUT DUTY CYCLE/PULSE WIDTH/PERIOD



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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 ICS8302I-01 is: 322



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PACKAGE OUTLINE - SUFFIX M FOR 8 LEAD SOIC

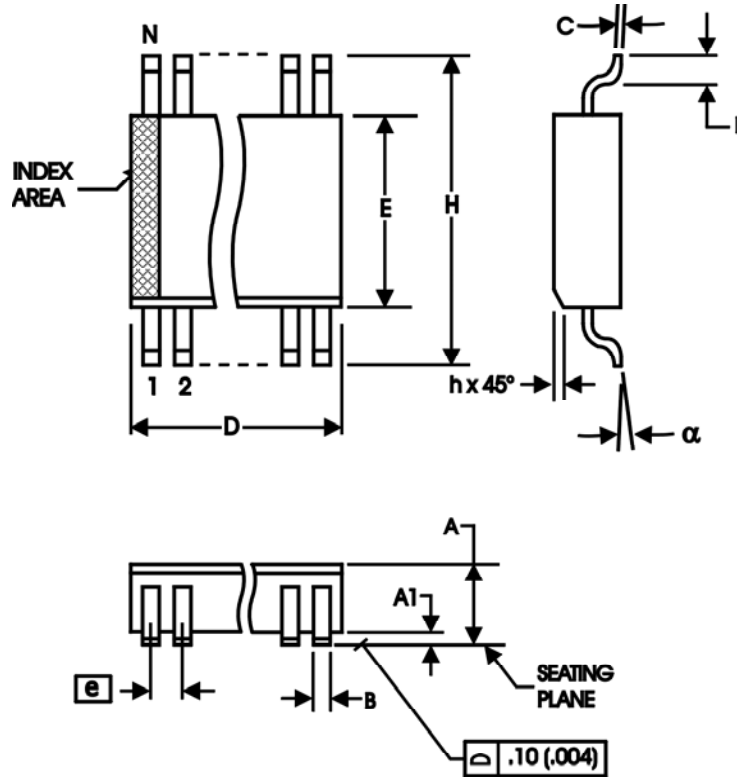


TABLE 6. PACKAGE DIMENSIONS

SYMBOL	Millimeters	
	MINIMUM	MAXIMUM
N	8	
A	1.35	1.75
A1	0.10	0.25
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BASIC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
α	0°	8°

Reference Document: JEDEC Publication 95, MS-012



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TABLE 7. ORDERING INFORMATION

Part/Order Number	Marking	Package	Shipping Packaging	Temperature
ICS8302AMI-01	302AI01	8 lead SOIC	tube	-40°C to 85°C
ICS8302AMI-01T	302AI01	8 lead SOIC	2500 tape & reel	-40°C to 85°C
ICS8302AMI-01LF	302AI01L	8 lead "Lead-Free" SOIC	tube	-40°C to 85°C
ICS8302AMI-01LFT	302AI01L	8 lead "Lead-Free" SOIC	2500 tape & reel	-40°C to 85°C

NOTE: Parts that are ordered with an "LF" suffix to the part number are the Pb-Free configuration and are RoHS compliant.

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