



ICS8302-01

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

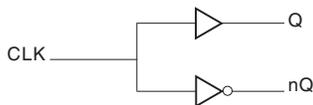
GENERAL DESCRIPTION

The ICS8302-01 is a low skew, 1-to-2 LVCMOS/LVTTTL Fanout Buffer w/Complementary Output. The ICS8302-01 has a single ended clock input. The single ended clock input accepts LVCMOS or LVTTTL input levels. The ICS8302-01 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 ICS8302-01 ideal for clock distribution applications demanding well defined performance and repeatability.

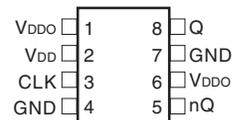
FEATURES

- 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 supply modes
- 0°C to 70°C ambient operating temperature
- Industrial temperature information available upon request

BLOCK DIAGRAM



PIN ASSIGNMENT



ICS8302-01 8-Lead SOIC

3.8mm x 4.8mm, x 1.47mm package body

M Package

Top View



ICS8302-01

LOW SKEW, 1-TO-2 LVCMOS / LVTTTL

FANOUT BUFFER W/ COMPLEMENTARY OUTPUT

TABLE 1. PIN DESCRIPTIONS

Number	Name	Type		Description
1, 6	V_{DDO}	Power		Output supply pins.
2	V_{DD}	Power		Core 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: *Pullup* and *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_{PULLUP}	Input Pullup Resistor			51		K Ω
$R_{PULLDOWN}$	Input Pulldown Resistor			51		K Ω
R_{OUT}	Output Impedance			7		Ω



ICS8302-01

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FANOUT BUFFER W/ COMPLEMENTARY OUTPUT

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 lfm)
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, $V_{DD} = V_{DDO} = 3.3V \pm 5\%$, $T_A = 0^\circ C$ TO $70^\circ C$

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

TABLE 3B. LVCMOS / LVTTTL DC CHARACTERISTICS, $V_{DD} = V_{DDO} = 3.3V \pm 5\%$, $T_A = 0^\circ C$ TO $70^\circ C$

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		1.3	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	50Ω to $V_{DDO}/2$	2.6			V
		$I_{OH} = -100\mu A$	2.9			V
V_{OL}	Output Low Voltage	50Ω to $V_{DDO}/2$			0.5	V
		$I_{OL} = 100\mu A$			0.2	V

TABLE 4A. AC CHARACTERISTICS, $V_{DD} = V_{DDO} = 3.3V \pm 5\%$, $T_A = 0^\circ C$ TO $70^\circ C$

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	2.18	2.7	ns
$t_{sk(o)}$	Output Skew; NOTE 2, 4			50	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.



ICS8302-01

LOW SKEW, 1-TO-2 LVCMOS / LVTTTL

FANOUT BUFFER W/ COMPLEMENTARY OUTPUT

TABLE 3C. POWER SUPPLY DC CHARACTERISTICS, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 2.5V \pm 5\%$, $T_A = 0^\circ C$ TO $70^\circ C$

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

TABLE 3D. LVCMOS / LVTTTL DC CHARACTERISTICS, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 2.5V \pm 5\%$, $T_A = 0^\circ C$ TO $70^\circ C$

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		1.3	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	50Ω to $V_{DDO}/2$	1.8			V
		$I_{OH} = -100\mu A$	2.2			V
V_{OL}	Output Low Voltage	50Ω to $V_{DDO}/2$			0.5	V
		$I_{OL} = 100\mu A$			0.2	V

TABLE 4B. AC CHARACTERISTICS, $V_{DD} = 3.3V \pm 5\%$, $V_{DDO} = 2.5V \pm 5\%$, $T_A = 0^\circ C$ TO $70^\circ C$

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
$t_{sk(o)}$	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%	250		650	ps
		$f \leq 133MHz$	45		55	%
odc	Output Duty Cycle	$133MHz < f \leq 250MHz$	40		60	%

NOTE 1: Measured from $V_{DD}/2$ of the input to $V_{DDO}/2$ of the output.

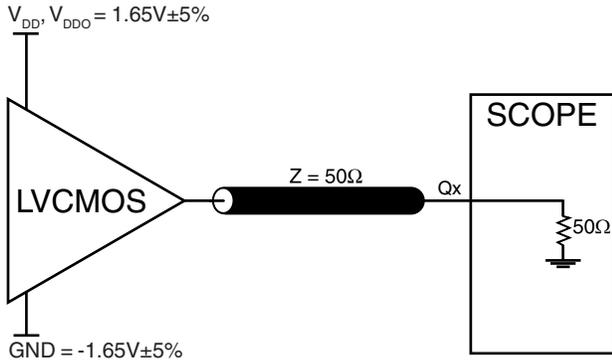
NOTE 2: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at $V_{DDO}/2$.

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 $V_{DDO}/2$.

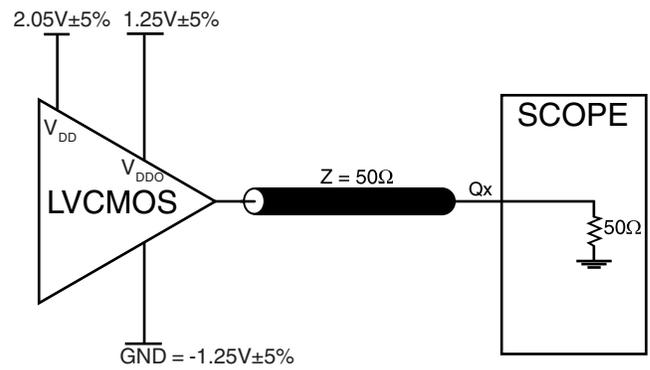
NOTE 4: This parameter is defined in accordance with JEDEC Standard 65.



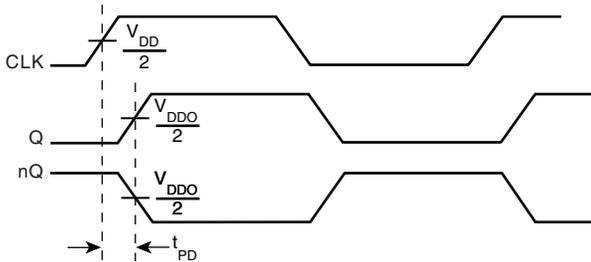
PARAMETER MEASUREMENT INFORMATION



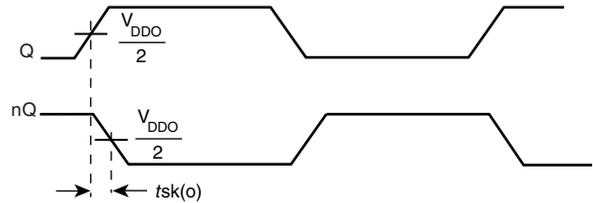
3.3V OUTPUT LOAD AC TEST CIRCUIT



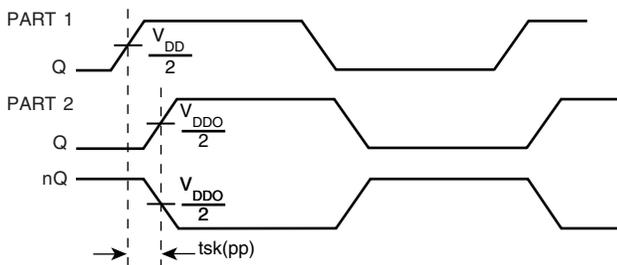
3.3V/2.5V OUTPUT LOAD AC TEST CIRCUIT



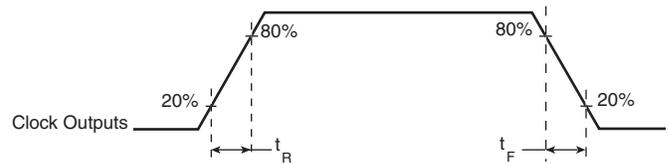
PROPAGATION DELAY



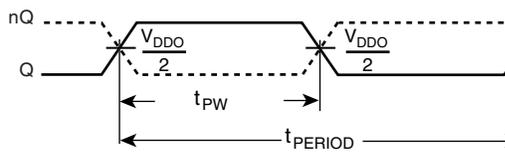
OUTPUT SKEW



PART-TO-PART SKEW



OUTPUT RISE/FALL TIME



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

odc & t_{PERIOD}



RELIABILITY INFORMATION

TABLE 5. θ_{JA} VS. AIR FLOW TABLE

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 ICS8302-01 is: 322

PACKAGE OUTLINE - SUFFIX M

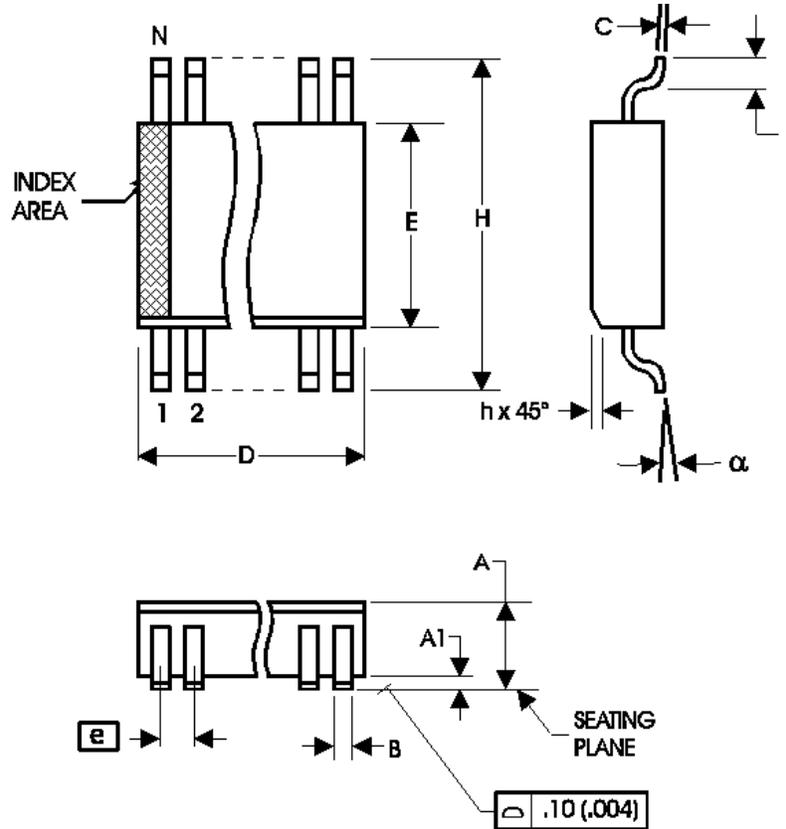


TABLE 6. PACKAGE DIMENSIONS

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



ICS8302-01
LOW SKEW, 1-TO-2 LVCMOS / LVTTTL
FANOUT BUFFER W/ COMPLEMENTARY OUTPUT

TABLE 7. ORDERING INFORMATION

Part/Order Number	Marking	Package	Shipping Packaging	Temperature
8302AM-01	8302A01	8 lead SOIC	tube	0°C to 70°C
8302AM-01T	8302A01	8 lead SOIC on Tape and Reel	2500	0°C to 70°C

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FANOUT BUFFER W/ COMPLEMENTARY OUTPUT

REVISION HISTORY SHEET				
Rev	Table	Page	Description of Change	Date
A	T7	8 10	Updated datasheet's header/footer with IDT from ICS. Removed ICS prefix from Part/Order Number column. Added Contact Page.	7/29/10



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