PRELIMINARY

Integrated Circuit Systems, Inc.

ICS8304

LOW SKEW, 1-TO-4 LVCMOS / LVTTL FANOUT BUFFER

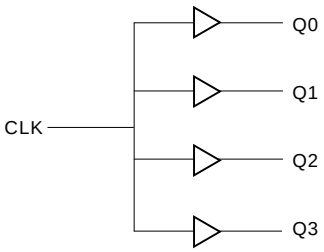
GENERAL DESCRIPTION

The ICS8304 is a low skew, 1-to-4 Fanout Buffer and a member of the HiPerClockS™ family of High Performance Clock Solutions from ICS. The ICS8304 is characterized at full 3.3V for input VDD, and mixed 3.3V and 2.5V for output operating supply modes (VDDO). Guaranteed output and part-to-part skew characteristics make the ICS8304 ideal for those clock distribution applications demanding well defined performance and repeatability.

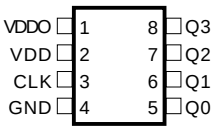
FEATURES

- 4 LVCMOS / LVTTL outputs
- LVCMOS clock input
- Output frequency up to 166MHz
- 3.3V input, outputs may be either 3.3V or 2.5V supply modes
- Small 8 lead SOIC package saves board space
- 3.8mm x 4.8mm x 1.47mm package body
- 1.27mm package lead pitch
- 0°C to 70°C ambient operating temperature

BLOCK DIAGRAM



PIN ASSIGNMENT



ICS8304

8-Lead SOIC
M Package
Top View

The Preliminary Information presented herein represents a product in prototyping or pre-production. The noted characteristics are based on initial product characterization. Integrated Circuit Systems, Incorporated (ICS) reserves the right to change any circuitry or specifications without notice.

TABLE 1. PIN DESCRIPTIONS

Number	Name	Type		Description
1	VDDO	Power		Power supply pin. Connect to 3.3V or 2.5V.
2	VDD	Power		Power supply pin. Connect to 3.3V.
3	CLK	Input	Pulldown	Clock input. LVCMOS / LVTTL interface levels.
4	GND	Power		Power supply ground. Connect to ground.
5	Q3	Output		Single clock output. LVCMOS / LVTTL interface levels.
6	Q2	Output		Single clock output. LVCMOS / LVTTL interface levels.
7	Q1	Output		Single clock output. LVCMOS / LVTTL interface levels.
8	Q0	Output		Single clock output. LVCMOS interface levels.

TABLE 2. PIN CHARACTERISTICS

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
CIN	Input Capacitance	CLK					pF
CPD	Power Dissipation Capacitance						pF
RPULLUP	Input Pullup Resistor				51		KΩ
RPULLDOWN	Input Pulldown Resistor				51		KΩ
ROUT	Output Impedance						Ω

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	4.6V
Inputs	-0.5V to VDD + 0.5V
Outputs	-0.5V to VDD + 0.5V
Ambient Operating Temperature	0°C to 70°C
Storage Temperature	-65°C to 150°C

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These ratings are stress specifications only and functional operation of product at these condition 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, VDD = VDDO = 3.3V±5%, TA=0°C TO 70°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
VDD	Power Supply Voltage		3.135	3.3	3.465	V
VDDO	Output Power Supply Voltage		3.135	3.3	3.465	V
IDD	Power Supply Current				50	mA

TABLE 3B. LVCMOS / LVTTL DC CHARACTERISTICS, VDD = VDDO = 3.3V±5%, TA=0°C TO 70°C

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
VIH	Input High Voltage	CLK		2		3.765	V
VIL	Input Low Voltage	CLK		-0.3		0.8	V
IIH	Input High Current	CLK				150	µA
IIL	Input Low Current	CLK		-5			µA
VOH	Output High Voltage		VDD = VDDO = 3.135V	2.6			V
VOL	Output Low Voltage		VDD = VDDO = 3.135V			0.5	V

TABLE 3C. POWER SUPPLY DC CHARACTERISTICS, VDD = 3.3V±5%, VDDO = 2.5V±5%, TA=0°C TO 70°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
VDD	Power Supply Voltage		3.135	3.3	3.465	V
VDDO	Output Power Supply Voltage		2.375	2.5	2.625	V
IDD	Power Supply Current				50	mA

TABLE 3D. LVCMOS / LVTTL DC CHARACTERISTICS, VDD = 3.3V±5%, VDDO = 2.5V±5%, TA=0°C TO 70°C

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
VIH	Input High Voltage	CLK		2		3.765	V
VIL	Input Low Voltage	CLK		-0.3		0.8	V
IIH	Input High Current	CLK				150	µA
IIL	Input Low Current	CLK		-5			µA
VOH	Output High Voltage		VDD = 3.135, VDDO = 2.375	1.9			V
VOL	Output Low Voltage		VDD = 3.135, VDDO = 2.375			0.5	V

TABLE 4. AC CHARACTERISTICS, VDD = 3.3V±5%, TA=0°C TO 70°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
fMAX	Maximum Input Frequency				166	MHz
tpLH	Propagation Delay, Low-to-High		2.1		3.9	ns
tpHL	Propagation Delay, High-to-Low					ns
tsk(o)	Output Skew; NOTE 3			19	40	ps
tsk(pp)	Part-to-Part; NOTE 4				300	ps
tR	Output Rise Time	20% to 80%				ps
tF	Output Fall Time	20% to 80%				ps
tPW	Output Pulse Width	f = 166MHz	2.4		3.8	ns
		0Hz ≤ f ≤ 166MHz	tcycle/2 - 700	tcycle/2	tcycle/2 + 700	ps
tEN	Output Enable Time; NOTE 5					ns
tDIS	Output Disable Time; NOTE 5					ns
tS	Clock Enable Setup Time					ns
tH	Clock Enable Hold Time					ns

NOTE 1: All parameters measured at 166MHz unless noted otherwise.
NOTE 2: Defined as skew within a bank of outputs at the same supply voltage and with equal load conditions.
NOTE 3: Defined as skew across banks of outputs at the same supply voltage and with equal load conditions.
NOTE 4: Defined as skew between outputs on different devices operating at the same supply voltages and with equal load conditions. Measured from 50% of like inputs to the differential output crossing point.
NOTE 5: Measured by triggering on input signal and measuring the largest displacement between output cycles.

PACKAGE OUTLINE - SUFFIX M

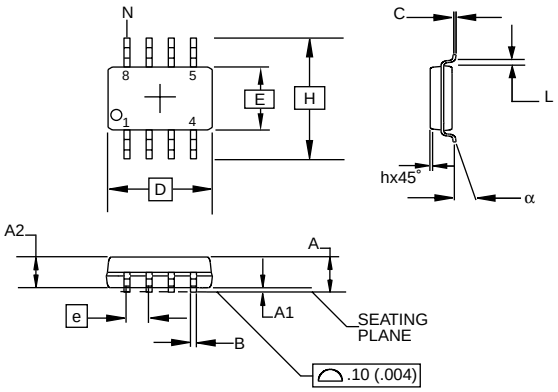


TABLE 5. PACKAGE DIMENSIONS - SUFFIX M

SYMBOL	Millimeters		Inches	
	MINIMUN	MAXIMUM	MINIMUN	MAXIMUM
N	8			
A	1.35	1.75	0.532	0.0688
A1	0.10	0.25	0.0040	0.0098
B	0.33	0.51	0.013	0.020
C	0.19	0.25	0.0075	0.0098
D	4.80	5.00	0.1890	0.1968
E	3.80	4.00	0.1497	0.1574
e	1.27 BASIC		0.050 BASIC	
H	5.80	6.20	0.2284	0.2440
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
α	0°	8°	0°	8°

Reference Document: JEDEC Publication 95, MS-012

TABLE 6. ORDERING INFORMATION

Part/Order Number	Marking	Package	Count	Temperature
ICS8304AM	ICS8304AM	8 lead SOIC	96 per tube	0°C to 70°C
ICS8304AMT	ICS8304AM	8 lead SOIC on Tape and Reel	2500	0°C to 70°C