



Low Skew Clock Inverter and Divider


Description

The ICS548-03 is a low cost, low skew, high performance general-purpose clock designed to produce a set of one output clock, one inverted output clock, and one clock divided-by-2. Using our patented analog Phase-Locked Loop (PLL) techniques, the device operates from a frequency range from 10 MHz to 120 MHz in the PLL mode, and up to 160 MHz in the non-PLL mode.

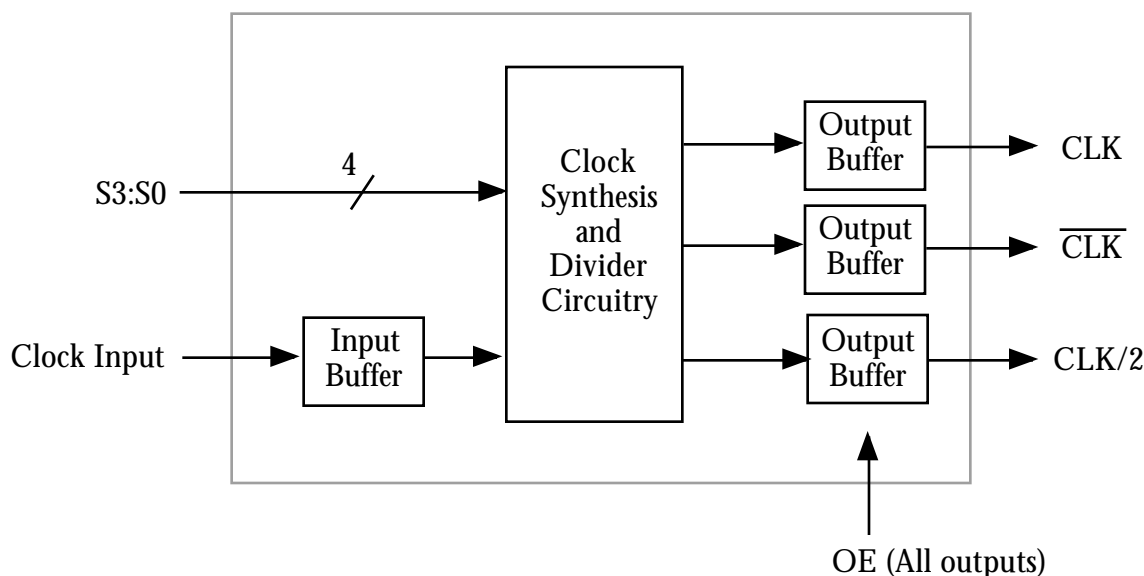
In applications that need maintain low phase noise in the clock tree, the non-PLL (when $S3=S2=1$) mode should be used.

This chip is not a zero delay buffer. Many applications may be able to use the ICS527 for zero delay dividers.

Features

- Packaged in 16 pin narrow (150 mil) SOIC 
- Input clock up to 160 MHz in the non-PLL mode
- Provides clock outputs of CLK, $\overline{\text{CLK}}$, and CLK/2
- Low skew (500 ps) on CLK, $\overline{\text{CLK}}$, and CLK/2
- All outputs can be tri-stated
- Entire chip can be powered down by changing one or two select pins
- 3.3V or 5.0V operating voltage

Block Diagram





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Pin Assignment

ICLK	□	1	16	□	DC
VDD	□	2	15	□	DC
VDD	□	3	14	□	DC
S3	□	4	13	□	$\overline{\text{CLK}}$
GND	□	5	12	□	CLK
GND	□	6	11	□	CLK/2
S2	□	7	10	□	OE
S0	□	8	9	□	S1

CLK, $\overline{\text{CLK}}$, and CLK/2 Select Table (in MHz)

S3	S2	S1	S0	CLK, $\overline{\text{CLK}}$	CLK/2	PLL	Input Range
0	0	0	0	Low	Low	Off	Power down
0	0	0	1	Input/4	Input/8	On	20 -120
0	0	1	0	Input	Input/2	On	20 -120
0	0	1	1	Input/2	Input/4	On	20 -120
0	1	0	0	Low	Low	Off	Power down
0	1	0	1	Input x 2	Input	On	20 - 60
0	1	1	0	Input/5	Input/10	On	20 -120
0	1	1	1	Input/3	Input/6	On	20 - 120
1	0	0	0	Low	Low	Off	Power down
1	0	0	1	Input/4	Input/8	On	10 - 60
1	0	1	0	Input	Input/2	On	10 - 60
1	0	1	1	Input/2	Input/4	On	10 - 60
1	1	0	0	Low	Low	Off	Power down
1	1	0	1	Input/6	Input/12	Off	0 - 160
1	1	1	0	Input/8	Input/16	Off	0 - 160
1	1	1	1	Input/2	Input/4	Off	0 - 160

Pin Descriptions

Number	Name	Type	Description
1	ICLK	CI	Input Clock. Connect to a CMOS level input clock.
2	VDD	P	Connect to +3.3V or +5.0V.
3	VDD	P	Connect to +3.3V or +5.0V.
4	S3	I	Clock Select Pin 3. See above table.
5	GND	P	Connect to ground.
6	GND	P	Connect to ground.
7	S2	I	Clock Select Pin 2. See above table.
8	S0	I	Clock Select Pin 0. See above table.
9	S1	I	Clock Select Pin 1. See above table.
10	OE	I	Output Enable. Tri-states all clock outputs when low.
11	CLK/2	O	Clock Output divided by 2. See above table.
12	CLK	O	Clock Output. See above table.
13	$\overline{\text{CLK}}$	O	Inverted Clock Output. See above table.
14	DC	-	Don't Connect. Do not connect anything to this pin.
15	DC	-	Don't Connect. Do not connect anything to this pin.
16	DC	-	Don't Connect. Do not connect anything to this pin.

Key: I = Input; O = Output; P = Power Supply connection; CI = Clock Input



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Electrical Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Units
ABSOLUTE MAXIMUM RATINGS (stresses beyond these can permanently damage the device)					
Supply Voltage, VDD	Referenced to GND			7	V
Inputs	Referenced to GND	-0.5		VDD+0.5	V
Clock Output	Referenced to GND	-0.5		VDD+0.5	V
Ambient Operating Temperature		0		70	°C
Soldering Temperature	Max of 10 seconds			260	°C
Storage temperature		-65		150	°C
DC CHARACTERISTICS (VDD = 3.3V unless otherwise noted)					
Operating Voltage, VDD		3		5.5	V
Input High Voltage, VIH, ICLK only	ICLK (Pin 1)	(VDD/2)+1	VDD/2		V
Input Low Voltage, VIL, ICLK only	ICLK (Pin 1)		VDD/2	(VDD/2)-1	V
Input High Voltage, VIH	All other inputs	2			V
Input Low Voltage, VIL	All other inputs			0.8	V
Output High Voltage, VOH, CMOS level	IOH=-8mA	VDD-0.4			V
Output High Voltage, VOH	IOH=-12mA	2.4			V
Output Low Voltage, VOL	IOL=12mA			0.4	V
IDD Operating Supply Current, 100 MHz clock	S3=S2=S0=0, S1=1		TBD		mA
Short Circuit Current	Each output		±50		mA
Input Capacitance, S3, S2, S1, S0, and OE	All inputs		5		pF
AC CHARACTERISTICS (VDD = 3.3V unless otherwise noted)					
Input Frequency, clock input, PLL on		10		120	MHz
Input Frequency, clock input, PLL off		0		160	MHz
Output Frequency (see table on page 2)	Mode dependent	0		120	MHz
Output Clock Rise Time	0.8 to 2.0V		1		ns
Output Clock Fall Time	2.0 to 0.8V		1		ns
Output Clock Duty Cycle	at VDD/2	45	49 to 51	55	%
Output Enable Time, OE high to output on				50	ns
Output Disable Time, OE low to tri-state				50	ns
Absolute Clock Period Jitter, PLL modes	Deviation from mean		TBD		ps
One Sigma Clock Period Jitter, PLL modes			TBD		ps
Output clock skew for CLK, $\overline{\text{CLK}}$, or CLK/2	at VDD/2			500	ps

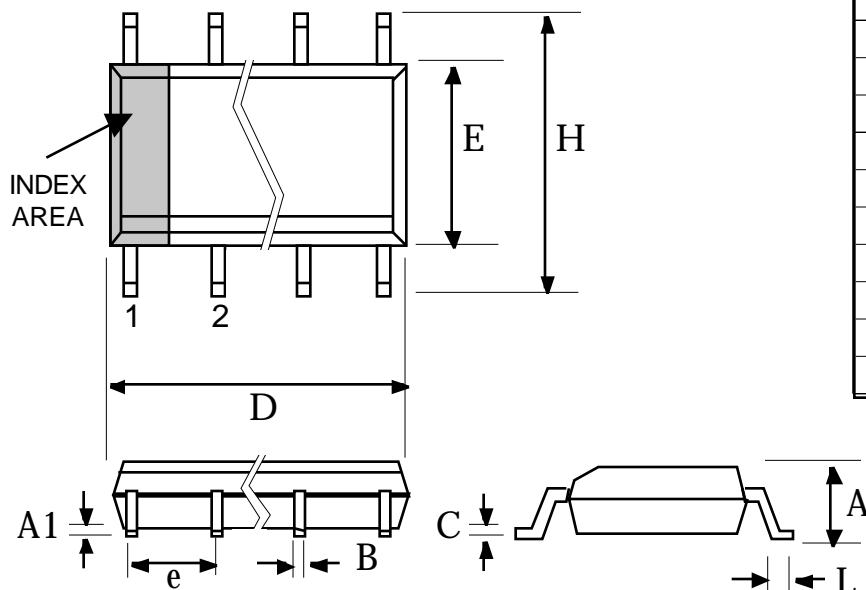
Note 1: The phase relationship between input and output clocks can change at power up. Use the ICS570 or ICS527 Zero Delay Buffers for a guaranteed phase relationship.

External Components/Application Information

The device requires a 0.01 μF decoupling capacitor between pins 3 and 5, as close to the pins as possible. Connect pin 2 directly to pin 3, and pin 6 directly to pin 5. Series termination resistors of 33 Ω can be used on all used clock outputs, also close to the device. Leave any unused clock outputs floating. There are no pull-up resistors on the input pins, so they should be connected directly to VDD or ground.

**Package Outline and Package Dimensions**

(For current dimensional specifications, see JEDEC publication no. 95.)

16 pin SOIC narrow

Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	0.059	0.069	1.50	1.75
A1	0.004	0.0098	0.10	0.25
B	0.013	0.020	0.33	0.51
C	0.007	0.0098	0.19	0.25
D	0.386	0.394	9.80	10.00
E	0.150	0.157	3.80	4.00
e	.050 BSC		1.27 BSC	
H	0.228	0.244	5.80	6.20
L	0.016	0.05	0.41	1.27

Ordering Information

Part/Order Number	Marking	Package	Temperature
ICS548M-03	ICS548M-03	16 pin SOIC	0 to 70 °C
ICS548M-03T	ICS548M-03	16 pin SOIC on tape and reel	0 to 70 °C

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