ICS650-05
HDTV Clock Synthesizer

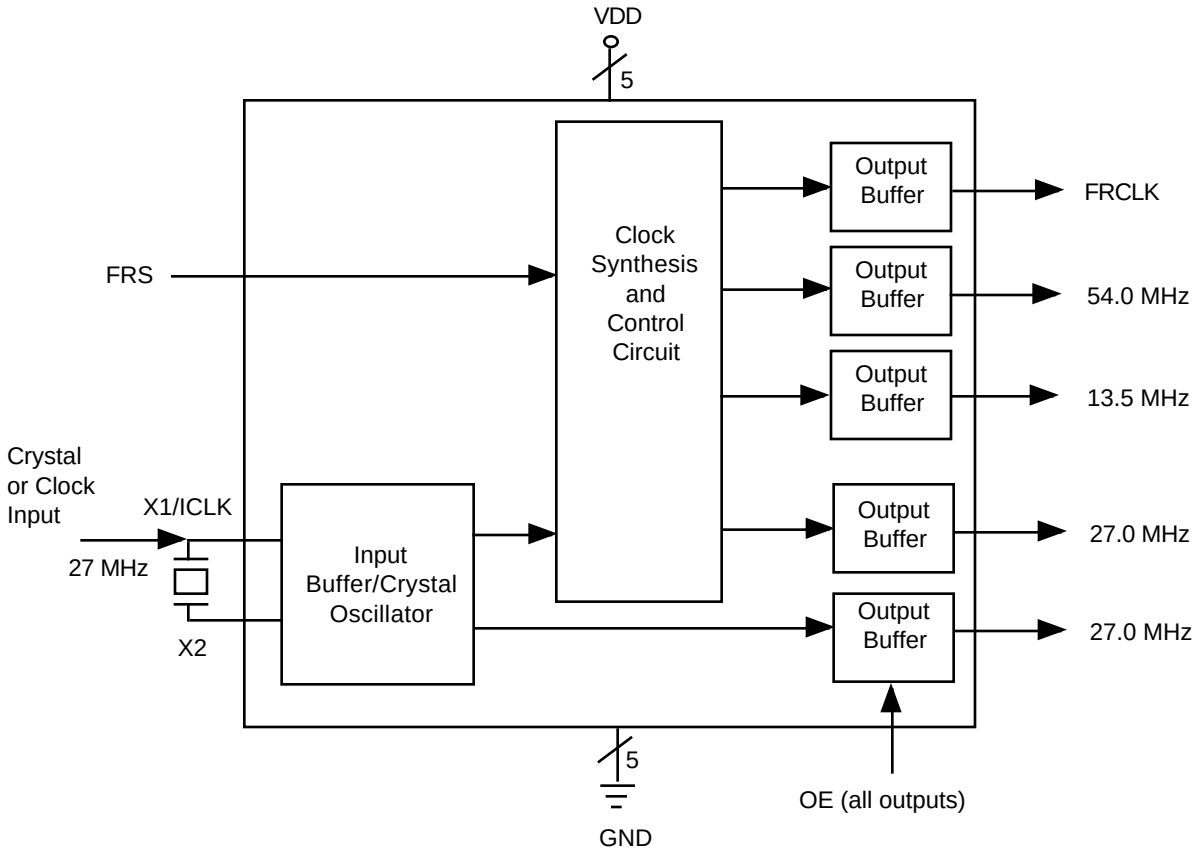
Description

The ICS650-05 is a low cost, low jitter, high performance clock synthesizer designed to produce 74.175824 MHz and 74.250000 MHz as necessary for HDTV applications. Using our patented analog Phase-Locked Loop (PLL) techniques, the device uses a 27.0 MHz clock or fundamental crystal input to produce buffered, fixed clocks and a selectable frame rate clock for HDTV systems.

Features

- Packaged in 20 pin tiny SSOP (QSOP)
- Input Frequency of 27.0 MHz
- Zero ppm synthesis error in output clocks
- Provides fixed 13.5 MHz, dual 27.0 MHz, and 54.0 MHz output clocks with a selectable Frame Rate Clock of 74.175824 MHz or 74.250000 MHz
- Ideal for HDTV applications
- 3.3 V or 5.0 V operating voltage.

Block Diagram



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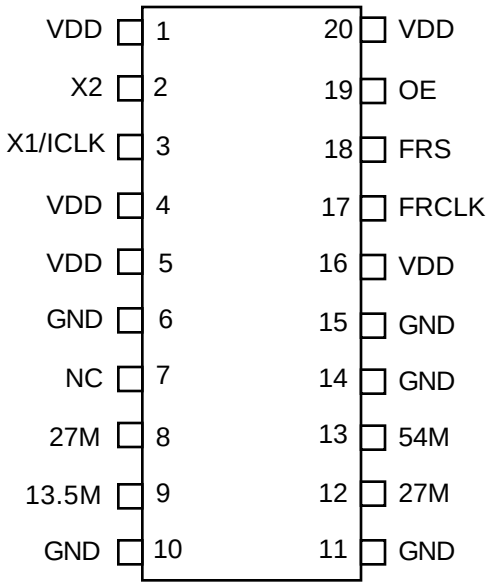
Pin Assignment



20 pin SSOP (QSOP)

FRCLK Output Select Table (in MHz)

FRS Pin 18	FRCLK Pin 17
0	74.175824
1	74.250000

Pin Descriptions

Pin #	Name	Type	Description
1	VDD	P	Connect to +3.3 V or +5.0 V. Must be same as other VDDs.
2	X2	XO	Crystal connection to a 27.0 MHz crystal or leave unconnected for clock input
3	X1/ICLK	XI	Crystal connection. Connect to a 27.0 MHz fundamental mode crystal or clock input.
4	VDD	P	Connect to +3.3 V or +5.0 V. Must be same as other VDDs.
5	VDD	P	Connect to +3.3 V or +5.0 V. Must be same as other VDDs.
6	GND	P	Connect to ground.
7	NC	-	No Connect. Do not connect anything to this pin.
8	27M	O	27 MHz buffered reference output.
9	13.5M	O	13.5 MHz clock output.
10	GND	P	Connect to ground.
11	GND	P	Connect to ground.
12	27M	O	27 MHz buffered clock output.
13	54M	O	54 MHz buffered clock output.
14	GND	P	Connect to ground.
15	GND	P	Connect to ground.
16	VDD	P	Connect to +3.3 V or +5.0 V. Must be same as other VDDs.
17	FRCLK	O	Frame Rate Clock as shown on table.
18	FRS	I	Frame Rate Frequency Select input pin. Determines FRCLK output as shown on table.
19	OE	I	Output Enable. Tri-states all clocks when low.
20	VDD	P	Connect to +3.3 V or +5.0 V. Must be same as other VDDs.

Key: I = Input with internal pull-up; O = output; P = power supply connection; XI, XO = crystal connections

Electrical Specifications

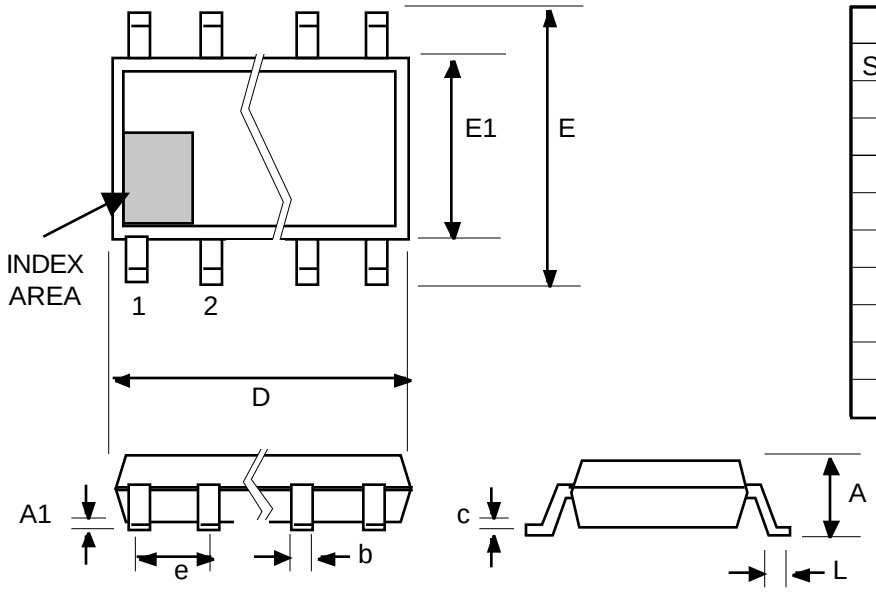
Parameter	Conditions	Minimum	Typical	Maximum	Units
ABSOLUTE MAXIMUM RATINGS (note 1)					
Supply voltage, VDD	Referenced to GND			7	V
Inputs and Clock Outputs	Referenced to GND	-0.5		VDD+0.5	V
Ambient Operating Temperature		0		70	℃
Soldering Temperature	Max of 10 seconds			260	℃
Storage temperature		-65		150	℃
DC CHARACTERISTICS (VDD = 3.3V or 5V unless noted)					
Operating Voltage, VDD		3.0		5.5	V
Input High Voltage, VIH	X1/ICLK	VDD/2+1			V
Input Low Voltage, VIL	XI/ICLK			VDD/2-1	V
Input High Voltage, VIH	FRS, OE	2			V
Input Low Voltage, VIL	FRS, OE			0.8	V
Output High Voltage, VOH	VDD=3.3V, IOH=-8mA	2.4			V
Output Low Voltage, VOL	VDD=3.3V, IOL=8mA			0.4	V
Output High Voltage, VOH, VDD = 3.3 or 5V	IOH=-8mA	VDD-0.4			V
Operating Supply Current, IDD, at 5V	No Load		26		mA
Operating Supply Current, IDD, at 3.3V	No Load		14		mA
Short Circuit Current, VDD = 3.3 V	Each output		±50		mA
Input Capacitance	Except X1		5		pF
AC CHARACTERISTICS (VDD = 3.3V or 5V unless noted)					
Input Crystal or Clock Frequency			27		MHz
Output Clocks Accuracy (synthesis error)	All clocks			1	ppm
Output Clock Rise Time	0.8 to 2.0V			1.5	ns
Output Clock Fall Time	2.0 to 0.8V			1.5	ns
Output Clock Duty Cycle	At VDD/2	40	50	60	%
One Sigma Jitter	VDD = 3.3V, 13.5M, FRCLK, 27M (pin 12)		50		ps
	VDD=3.3V, 27M (pin8), 54M		125		ps
	VDD=5.0V, except 27M (pin8)		50		ps
	VDD = 5.0V, 27M (pin 8)		65		ps
Absolute Clock Period Jitter	VDD=3.3V, except 27M (pin 8), 54M		±125		ps
	VDD=3.3V, 27M (pin 8), 54M		±350		ps
	VDD=5.0V		±175		ps

Notes: 1. Stresses beyond those listed under Absolute Maximum Ratings could cause permanent damage to the device. Prolonged exposure to levels above the operating limits but below the Absolute Maximums may affect device reliability.

External Components

A minimum number of external components are required for proper operation. A decoupling capacitor of 0.01 µF should be connected between VDD and GND on pins 4 and 6, and 16 and 14, and a 33 Ω terminating resistor may be used on each clock output if the trace is longer than 1 inch.

Package Outline and Package Dimensions



20 pin SSOP

	Inches		Millimeters	
Symbol	Min	Max	Min	Max
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
b	0.008	0.012	0.20	0.30
c	0.007	0.010	0.18	0.25
D	0.337	0.344	8.55	8.75
e	.025 BSC		0.635 BSC	
E	0.228	0.244	5.80	6.20
E1	0.150	0.157	3.80	4.00
L	0.016	0.050	0.40	1.27

Ordering Information

Part/Order Number	Marking	Package	Shipping	Temperature
ICS650R-05	ICS650R-05	20 pin SSOP	Tubes	0 to 70 °C
ICS650R-05T	ICS650R-05	20 pin SSOP	Tape and Reel	0 to 70 °C