HDTV CLOCK SYNTHESIZER

ICS667-01

Description

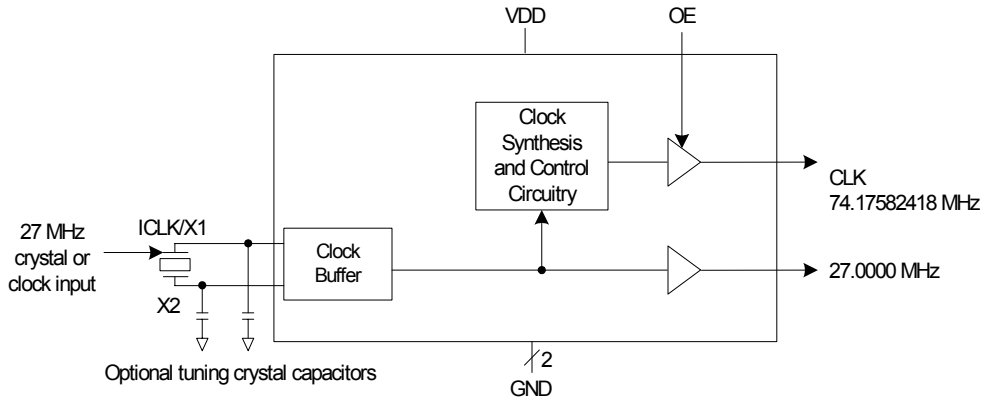
The ICS667-01 is a low-cost, low jitter, high-performance PLL clock synthesizer designed to produce the 74.176 MHz clock necessary for HDTV systems. Using IDT's patented analog Phase-Locked Loop (PLL) techniques, the device accepts a 27 MHz crystal or clock input. The zero ppm synthesis error exactly locks the display to the digital stream.

IDT manufactures the largest variety multimedia clock synthesizers for all applications. Consult IDT to eliminate crystals and oscillators from your board.

Features

- Packaged in 8-pin SOIC
- Pb (lead) free package, RoHS compliant
- Input frequency of 27 MHz
- Zero ppm synthesis error in output clock
- 3.3 V ±5% operating supply
- Ideal for HDTV applications and oscillator manufacturers
- Advanced, low power, sub-micron CMOS process

Block Diagram



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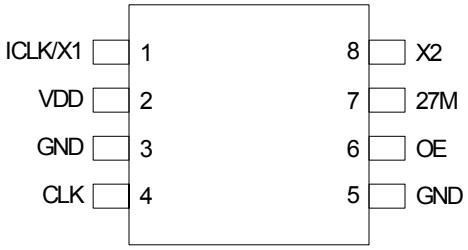
Pin Assignment



Pin Descriptions

Pin Number	Pin Name	Pin Type	Pin Description
1	ICLK/X1	XI	Crystal connection. Connect to a 27 MHz fundamental crystal or clock.
2	VDD	Power	Connect to +3.3 V.
3	GND	Power	Connect to ground.
4	CLK	Output	74.17582418 MHz.
5	GND	Power	Connect to ground.
6	OE	Input	Output enable. Tri-states CLK output when low. Internal pull-up to VDD.
7	27M	Output	27 MHz buffered clock or crystal oscillator output.
8	X2	XO	Crystal connection. Connect to a 27 MHz crystal, or leave unconnected for clock input.

External Components

Decoupling Capacitor

As with any high performance mixed-signal IC, the ICS667-01 must be isolated from system power supply noise to perform optimally.

A decoupling capacitor of 0.01µF must be connected between VDD and GND on pins 2 and 3. It must be connected close to the ICS667-01 to minimize lead inductance. Pin 5 can be connected to pin 3. No external power supply filtering is required for the ICS667-01.

Series Termination Resistor

A 33Ω terminating resistor can be used next to the clock outputs for trace lengths over one inch.

Crystal Load Capacitors

The total on-chip capacitance is approximately 18 pF. A parallel resonant, fundamental mode, AT cut 27 MHz crystal should be used. The device crystal connections should include pads for small capacitors from X1 to ground and from X2 to ground. These capacitors are used to adjust the stray capacitance of the board to match the nominally required crystal load capacitance. Because load capacitance can only be increased in this trimming process, it is important to keep stray capacitance to a minimum by using very short PCB traces (and no vias) between the crystal and device. Crystal capacitors, if needed, must be connected from each of the pins X1 and X2 to ground.

The value (in pF) of these crystal caps should equal (C_L -16 pF)*2. In this equation, C_L= crystal load capacitance in pF. Example: For a crystal with an 18 pF load capacitance, each crystal capacitor would be 4 pF [(18-16) x 2] = 4.

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Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the ICS667-01. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

Item	Rating
Supply Voltage, VDD	7 V
All Inputs and Outputs	-0.5 V to VDD+0.5 V
Ambient Operating Temperature	0 to +70° C
Storage Temperature	-65 to +150° C
Soldering Temperature	260° C

Recommended Operation Conditions

Parameter	Min.	Typ.	Max.	Units
Ambient Operating Temperature	0		+70	° C
Power Supply Voltage (measured in respect to GND)	+3.150	3.3	+3.465	V

DC Electrical Characteristics

VDD=3.3 V± 5% unless otherwise noted, Ambient temperature 0 to +70° C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		3.15	3.3	3.465	V
Input High Voltage	V_{IH}	ICLK, OE	2.0			V
Input Low Voltage	V_{IL}	ICLK, OE			0.8	V
Output High Voltage	V_{OH}	I_{OH} = -4 mA	VDD-0.4			V
Output Low Voltage	V_{OL}	I_{OL} = 4 mA			0.4	V
Operating Supply Current	IDD	No load		30		mA
Short Circuit Current		Each output		±50		mA
Input Capacitance	C_{IN}			7		pF

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AC Electrical Characteristics

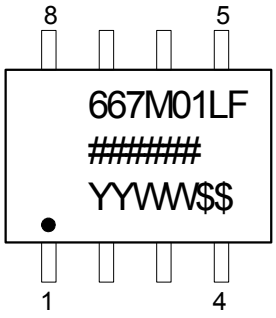
VDD =3.3V± 5%, C_L=15pF unless otherwise noted, Ambient Temperature 0 to +70° C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency	F_{IN}			27		MHz
Frequency Error, Output Clock					0	ppm
Output Clock Rise Time	t_{OR}	0.8 to 2.0 V			1.5	ns
Output Clock Fall Time	t_{OF}	2.0 to 8.0 V			1.5	ns
Output Clock Duty Cycle		at 1.4 V	40	50	60	%
Maximum Absolute Jitter, short term	t_{ja}	Deviation from mean		200		ps
Maximum Absolute Jitter, Long term term over 1µs	t_{jl}	Deviation from mean		500		ps
Output Enable Time		OE going from Low to High		20		ns
Internal Pull-up Resistor	R_{PUP}	OE pin		750		kΩ

Thermal Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Thermal Resistance Junction to Ambient	θ_{JA}	Still air		150		°C/W
	θ_{JA}	1 m/s air flow		140		°C/W
	θ_{JA}	3 m/s air flow		120		°C/W
Thermal Resistance Junction to Case	θ_{JC}			40		°C/W

Marking Diagram



Notes:

1. ###### is the lot number.
2. YYWW is the last two digits of the year and week that the part was assembled.
3. Bottom marking: (origin)
   Origin = country of origin if other than USA.
4. “LF” denotes Pb (lead) free package.

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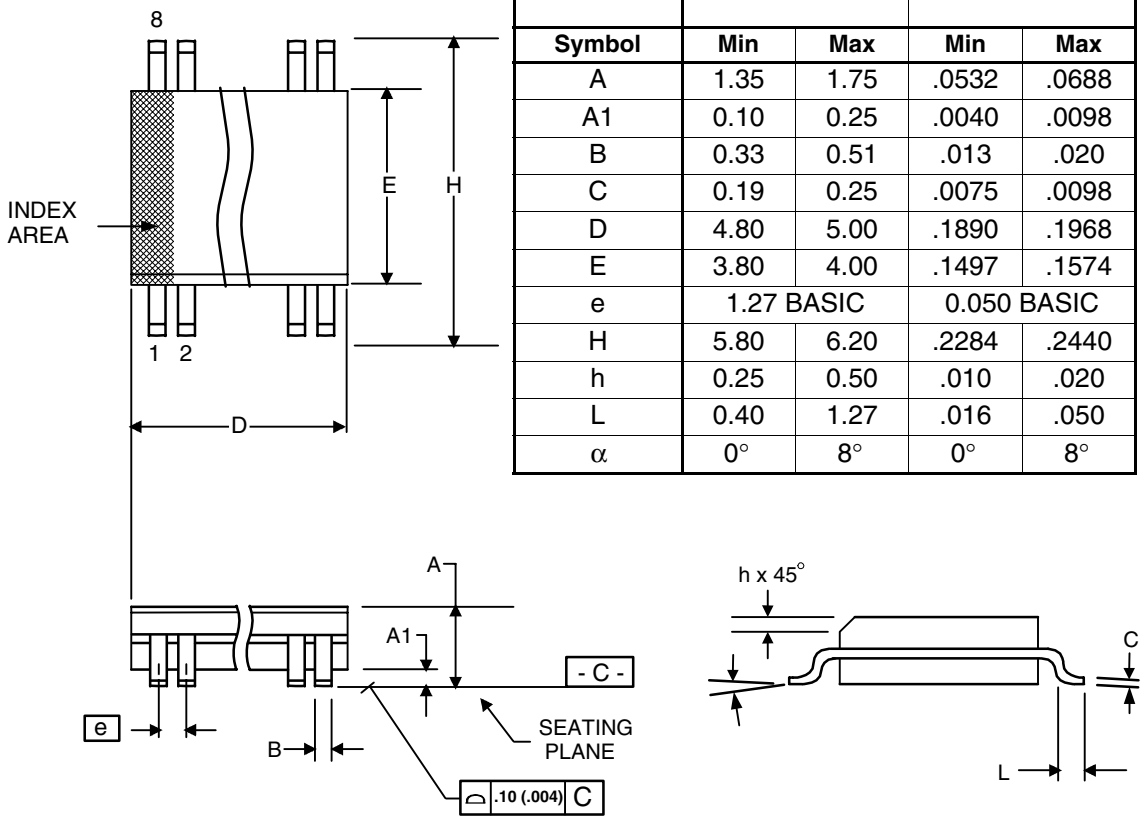
Package Outline and Package Dimensions (8-pin SOIC, 150 Mil. Narrow Body)

Package dimensions are kept current with JEDEC Publication No. 95



	Millimeters		Inches	
Symbol	**Min**	**Max**	**Min**	**Max**
A	1.35	1.75	.0532	.0688
A1	0.10	0.25	.0040	.0098
B	0.33	0.51	.013	.020
C	0.19	0.25	.0075	.0098
D	4.80	5.00	.1890	.1968
E	3.80	4.00	.1497	.1574
e	1.27 BASIC		0.050 BASIC	
H	5.80	6.20	.2284	.2440
h	0.25	0.50	.010	.020
L	0.40	1.27	.016	.050
α	0°	8°	0°	8°

Ordering Information

Part / Order Number	Marking	Shipping Packaging	Package	Temperature
667M-01LF	see page 5	Tubes	8-pin SOIC	0 to +70° C
667M-01LFT		Tape and Reel	8-pin SOIC	0 to +70° C

"LF" suffix to the part number are the Pb-Free configuration and are RoHS compliant.

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