ICS507-01/02
PECL Clock Synthesizer

Description

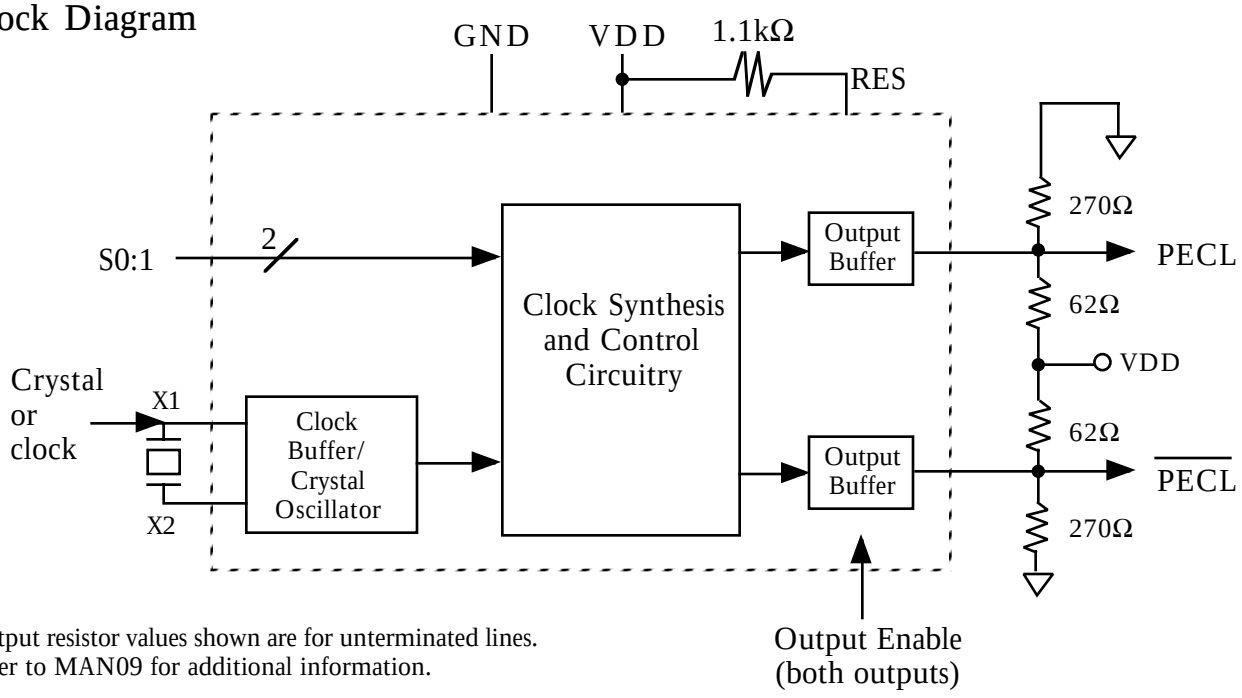
The ICS507-01 and ICS507-02 are inexpensive ways to generate a low jitter 155.52 MHz (or other high speed) differential PECL clock output from a low frequency crystal input. Using Phase-Locked-Loop (PLL) techniques, the devices use a standard fundamental mode crystal to produce output clocks up to 200 MHz.

Stored in each chip's ROM is the ability to generate a selection of different multiples of the input reference frequency, including an exact 155.52 MHz clock from common crystals. For lowest jitter and phase noise on a 155.52 MHz clock, a 19.44 MHz crystal and the x8 selection can be used.

Features

- Packaged as 16 pin narrow SOIC or die
- Input crystal frequency of 5 - 27 MHz
- Input clock frequency of 5 - 52 MHz
- Uses low-cost crystal
- Differential PECL output clock frequencies up to 200 MHz
- Duty cycle of 49/51
- 3.3 V or 5.0 V±10% operating supply
- Ideal for SONET applications and oscillator manufacturers
- Advanced, low power CMOS process
- Industrial temperature versions available

Block Diagram



Output resistor values shown are for unterminated lines.
Refer to MAN09 for additional information.

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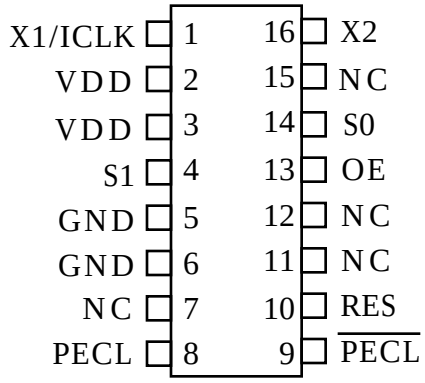
Pin Assignment

ICS507-01/02



16 pin narrow (150 mil) SOIC

Clock Multiplier Select Table

S1	S0	Multiplier
0	0	9.72X*
0	M	10X
0	1	12X
M	0	6.25X
M	M	8X
M	1	5X
1	0	2X
1	M	3X
1	1	4X

*Use this selection to get 155.52 MHz from a 16 MHz input.

For lowest phase noise generation of 155.52 MHz, use a 19.44 MHz crystal and the 8X selection.

0 = connect pin directly to ground
1 = connect pin directly to VDD
M = leave unconnected (floating)

Pin Descriptions

Number	Name	Type	Description
1	X1/ICLK	XI	Crystal or clock connection. Connect to a fundamental parallel mode crystal, or clock.
2	VDD	P	VDD. Connect to +3.3 V or +5 V, and to VDD on pin 3.
3	VDD	P	VDD. Connect to VDD on pin 2. Decouple with pin 5.
4	S1	TI	Multiplier select pin 1. Determines output frequency per table above.
5	GND	P	Connect to ground.
6	GND	P	Connect to ground.
7	NC	-	No connect. Nothing is connected internally to this pin.
8	PECL	O	PECL Output. Connect to resistor load as shown on page one.
9	$\overline{\text{PECL}}$	O	Complementary PECL Output. Connect to resistor load as shown on page one.
10	RES	I	Bias Resistor Input. Connect a resistor between this pin and VDD.
11	NC	-	No connect. Nothing is connected internally to this pin.
12	NC	-	No connect. Nothing is connected internally to this pin.
13	OE	I	Output Enable. Tri-states both outputs when low. Internal pull-up.
14	S0	TI	Multiplier select pin 0. Determines output frequency per table above.
15	NC	-	No Connect. Nothing is connected internally to this pin.
16	X2	XO	Cr stal connection. Connect to cr stal, or leave unconnected for clock input.

Key: I=Input, O=output, TI=tri-level input, P=power supply connection; XI, XO=crystal connections

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Electrical Specifications

Parameter		Conditions	Minimum	Typical	Maximum	Units
ABSOLUTE MAXIMUM RATINGS (stresses be ond these can permanentl 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		ICS507M-0x	0		70	°C
		ICS507M-0xI	-40		85	°C
Soldering Temperature		Max of 20 seconds			260	°C
Storage temperature			-65		150	°C
DC CHARACTERISTICS (VDD = 5.0 V unless otherwise noted)						
Operating Voltage, VDD			3.0		5.5	V
Input High Voltage, VIH		ICLK only	VDD/2 + 1	VDD/2		V
Input Low Voltage, VIL		ICLK only		VDD/2	VDD/2-1	V
Input High Voltage, VIH		S0, S1	VDD-0.5			V
Input Low Voltage, VIL		S0, S1			VDD+0.5	V
Output High Voltage, VOH		Note 2	VDD-1.2			V
Output Low Voltage, VOL		Note 2			VDD-2.0	V
IDD Operating Suppl Current, note 3		No Load, 155.52MHz		67		mA
Internal Cr stal Capacitance, X1 and X2		Pins 1, 8		26		pF
Input Capacitance		S0, S1		4		pF
AC CHARACTERISTICS (VDD = 5.0 V unless otherwise noted)						
Input Crystal Frequency			5		27	MHz
Input Clock Frequency			5		52	MHz
Output Frequency, ICS507-01	0 to 70°C	VDD = 5.0 V	10		200	MHz
	0 to 70°C	VDD = 3.3 V	10		156	MHz
Output Frequency, ICS507-01I	-40 to 85°C	VDD = 3.3 V or 5.0 V	10		125	MHz
Output Frequency, ICS507-02I	0 to 70°C	VDD = 5.0 V	125		200	MHz
	0 to 70°C	VDD = 3.3 V	125		200	MHz
	-40 to 85°C	VDD = 3.3 V or 5.0 V	125		160	MHz
Output Clock Duty Cycle			49		51	%
PLL Bandwidth			10			kHz
Absolute Clock Period Jitter		Deviation from mean		±75		ps
One Sigma Clock Period Jitter				20		ps

Notes: 1) All typical values are at 5.0 V and 25°C unless otherwise noted.
2) VOH and VOL can be set by the external resistor values on the PECL outputs.
3) IDD includes the current through the external resistors, which can be modified.
4) The phase relationship between input and output can change at power up. For a fixed phase relationship, see one of the ICS zero delay buffers.

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Applications

High Frequency Differential PECL Oscillators: The ICS507 plus a low frequency, fundamental mode crystal can build a high frequency differential output oscillator. For example, a 10 MHz crystal connected to the ICS507 with the 12X output selected (S1=0, S0=1) produces a 120 MHz PECL output clock.

High Frequency TCXO: Extending the previous application, an inexpensive, low frequency TCXO can be built and the output frequency can be multiplied using the ICS507. Since the output of the chip is phase-locked to the input, the ICS507 has no temperature dependence, and the temperature coefficient of the combined system is the same as that of the low frequency TCXO.

High Frequency VCXO: The bandwidth of the PLL is guaranteed to be greater than 10 kHz. This means that the PLL will track any modulation on the input with a frequency of less than 10 kHz. By using this property, a low frequency VCXO can be built, and the output can then be multiplied with the ICS507 to give a high frequency output, thereby producing a high frequency VCXO.

Decoupling and External Components

The ICS507 requires a 0.01µF decoupling capacitor to be connected between VDD and GND on pins 2 and 5. It must be connected close to the ICS507. Other VDD and GND connections should be connected to those pins, or to the VDD and GND planes on the board. A resistor must be connected between the RES (pin 10) and VDD. Another four resistors are needed for the PECL outputs as shown on the block diagram on page 1. Suggested values of these resistors are shown in the Block Diagram, but they can be varied to change the differential pair output swing, and the DC level; refer to MAN09.

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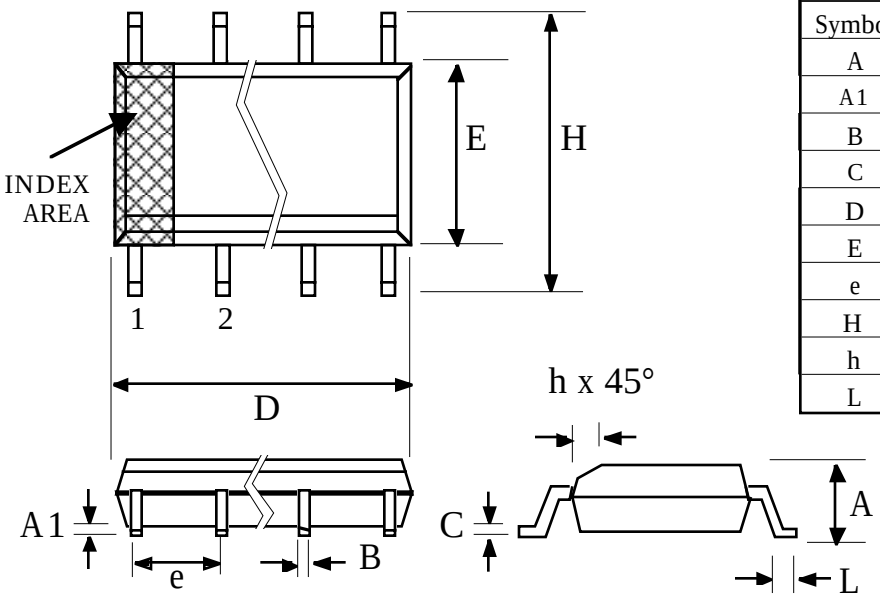
Package Outline and Package Dimensions

(For current dimensional specifications, see JEDEC Publication No. 95.)



16 pin SOIC narrow

	Inches		Millimeters	
Symbol	Min	Max	Min	Max
A	0.0532	0.0688	1.35	1.75
A1	0.0040	0.0098	0.10	0.24
B	0.0130	0.0200	0.33	0.51
C	0.0075	0.0098	0.19	0.24
D	0.3859	0.3937	9.80	10.00
E	0.1497	0.1574	3.80	4.00
e	.050 BSC		1.27 BSC	
H	0.2284	0.2440	5.80	6.20
h	0.0099	0.0195	0.25	0.50
L	0.0160	0.0500	0.41	1.27

Ordering Information

Part/Order Number	Marking	Package	Temperature	Minimum Quantities
ICS507M-01	ICS507M-01	16 pin narrow SOIC	0 to 70°C	-
ICS507M-01T	ICS507M-01	16 pin SOIC on tape and reel	0 to 70°C	2500 pieces
ICS507M-01I	ICS507M-01I	16 pin narrow SOIC	-40 to 85°C	-
ICS507M-01IT	ICS507M-01I	16 pin SOIC on tape and reel	-40 to 85°C	2500 pieces
ICS507-01-DSW	-	Probed wafers, cut, on sticky tape	0 to 70°C	1 wafer
ICS507-01-DPK	-	Tested die in waffle pack	0 to 70°C	1000 pieces
ICS507-01-DWF	-	Die on uncut, probed wafers	0 to 70°C	1 wafer
ICS507M-02I	ICS507M-02I	16 pin narrow SOIC	-40 to 85°C	-
ICS507M-02IT	ICS507M-02I	16 pin SOIC on tape and reel	-40 to 85°C	2500 pieces