

## Low Cost 20-Pin Frequency Generator

### Description

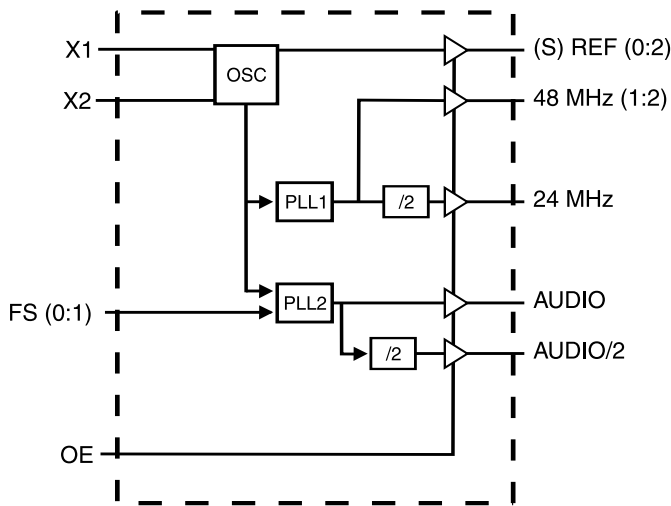
The ICS9169C-36 generates the I/O clocks needed as a satellite clock generator to a CPU and PCI clock source (such as the ICS9148-01 or ICS9150-01). This device can generate the audio Codec or DSP clocks if required (or Stop those outputs Low).

The device is nominally driven at the X1 pin by a 14.31818 MHz clock source. The device can also be driven by a crystal using external load capacitors as a stand-alone generator. The SREF0 output is a reference clock output which is stronger to allow multiple ISA slots.

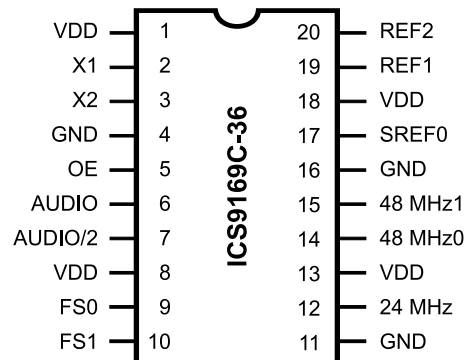
### Features

- Generator for peripheral clock chips as companion device to CPU/SDRAM/PCI generator.
- Accepts clock input at X1 pin or crystal across X1, X2 pins as 14.31818 MHz nominal inputs.
- Three REF clock buffer outputs (SREF is Strong)
- Two 48MHz and one 24 MHz outputs
- Selectable audio clock generator with audio (Audio) and half speed (Audio/2) outputs
- 20 pin (209 mil) SSOP package

### Block Diagram



### Pin Configuration



### 20-Pin SSOP

### Functionality

3.3V±10%, 0-70°C

Clock source driving X1 pin or crystal (X1, X2) = 14.31818 MHz

(all frequencies in MHz)

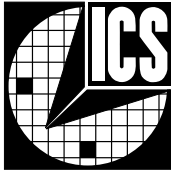
FS1	FS0	AUDIO	AUDIO/2	SREF, REF	48 MHz	24 MHz
0	0	XTAL/2	XTAL/4	14.318	XTAL/2	XTAL/4
0	1	24.5795	12.2898	14.318	48.008	24.004
1	0	33.8680	16.9340	14.318	48.008	24.004
1	1	LOW	LOW	14.318	48.008	24.004

OE	All Outputs
0	Tristate
1	Active



## Pin Descriptions

PIN NUMBER	PIN NAME	TYPE	DESCRIPTION
1, 8, 13, 18	VDD	PWR	3.3V I/O power supply
2	X1	IN	14.318MHz input (requires external components for feedback resistor and load capacitors to be used with a crystal)
3	X2	OUT	Crystal output (no connect for non-crystal applications)
4, 11, 16	GND	Ground	Ground
5	OE	IN	Output enable (Tri-states all outputs when held low). Has pullup
6	AUDIO	OUT	3.3V Audio clock, runs per select table
7	AUDIO/2	OUT	3.3V Audio clock, runs per select table
9, 10	FS0, FS1	IN	Frequency mode select pins. Has pullup.
12	24 MHz	OUT	3.3V clock, runs @ 24 MHz
14, 15	48 MHz (0:1)	OUT	3.3V Clock, runs @ 48 MHz
19, 20	REF1, REF2 (1:2)	OUT	3.3V clock, runs @ 1x X1
17	SREF0	OUT	Strong reference clock OUT 3.3V clock, runs @ 1x X1



## Absolute Maximum Ratings

Supply Voltage .....	7.0V
Voltage on I/O pins referenced to GND .....	GND -0.5V to V <sub>DD</sub> +0.5V
Operating Temperature under bias .....	0°C to +70°C
Power dissipation .....	0.5 Watts
Storage Temperature .....	-40°C to +150°C

Stresses above those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These ratings are stress specifications only and functional operation of the device at these or any other conditions above those listed in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

## Electrical Characteristics at 3.3V

V<sub>DD</sub> = 3.0 – 3.7 V, T<sub>A</sub> = 0 – 70° C unless otherwise stated

DC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Low Voltage	V <sub>IL</sub>	V <sub>DD</sub> =3.3V	-	-	0.2V <sub>DD</sub>	V
Input High Voltage	V <sub>IH</sub>	V <sub>DD</sub> =3.3V	0.7V <sub>DD</sub>	-	-	V
Input Low Current	I <sub>IL</sub>	V <sub>IN</sub> =0V (pull-up pin)	-250	-50		μA
Input High Current	I <sub>IH</sub>	V <sub>IN</sub> =V <sub>DD</sub>	-5	0	5	μA
Output Low Voltage	V <sub>OL1</sub>	SREF0 I <sub>OL</sub> = 16mA		0.25	0.40	V
Output High Voltage	V <sub>OH1</sub>	SREF0 I <sub>OH</sub> = -16mA	2.4	2.8		V
Output Low Current	I <sub>OL1</sub>	SREF0 V <sub>OL</sub> = 1.0V	32	50		mA
Output High Current	I <sub>OH1</sub>	SREF0 V <sub>OH</sub> = 2.0V		-44	-28	mA
Output Low Voltage	V <sub>OL2</sub>	AUDIO, AUDIO/2, 24MHz, 48MHz (0:1) Clocks I <sub>OL</sub> = 10mA		0.25	0.4	V
Output High Voltage	V <sub>OH2</sub>	AUDIO, AUDIO/2, 24MHz, 48MHz (0:1) Clocks I <sub>OH</sub> = -10mA	2.4	2.8		V
Output Low Current	I <sub>OL2</sub>	AUDIO, AUDIO/2, 24MHz, 48MHz (0:1) Clocks V <sub>OL</sub> = 0.8V	19	30		mA
Output High Current	I <sub>OH2</sub>	AUDIO, AUDIO/2, 24MHz, 48MHz (0:1) Clocks V <sub>OH</sub> = 2.0V		-26	-16	mA
Output Low Voltage	V <sub>OL3</sub>	REF (1:2) I <sub>OL</sub> = 8mA		0.3	0.4	V
Output High Voltage	V <sub>OH3</sub>	REF (1:2) I <sub>OH</sub> = -8mA	2.4	2.8		V
Output Low Current	I <sub>OL3</sub>	REF (1:2) V <sub>OL</sub> = 0.8V	16	25		mA
Output High Current	I <sub>OH3</sub>	REF (1:2) V <sub>OH</sub> = 2.0V		-22	-14	mA
Supply Current	I <sub>DD</sub>	Unloaded, 33.86 MHz	-	28	45	mA
Output Frequency Change over Supply and Temperature <sup>1</sup>	F <sub>D</sub>	With respect to typical frequency	-	20	100	ppm
Short circuit current <sup>1</sup>	I <sub>SC</sub>	Each output clock	20	30	-	mA
Input Capacitance <sup>1</sup>	C <sub>I</sub>	Except X1, X2	-	-	10	pF
Load Capacitance <sup>1</sup>	C <sub>L</sub>	Pins X1, X2	-	5	-	pF
Pull-up Resistor	R <sub>pu</sub>	at V <sub>IN</sub> =V <sub>DD</sub> -1V	15	30	60	k ohm

**Note 1:** Parameter is guaranteed by design and characterization. Not 100% tested in production.



# ICS9169C-36

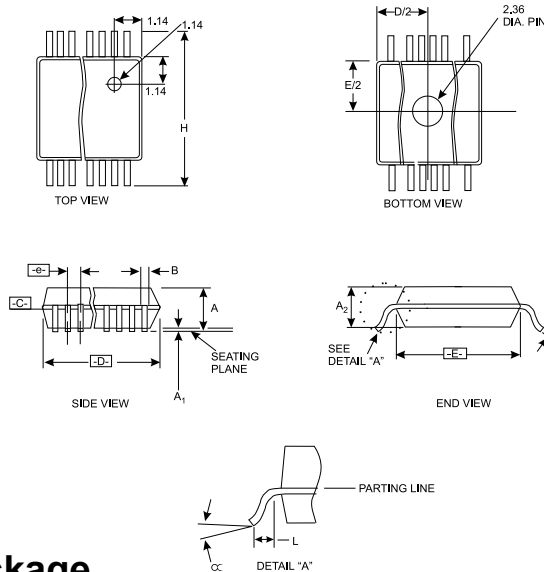
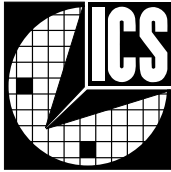
## Electrical Characteristics at 3.3V

$V_{DD} = +3.0 V \pm 10\%$ ,  $T_A = 0 - 70^\circ C$  unless otherwise stated

AC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Clock Rise Time <sup>1</sup>	t <sub>ICr</sub>		-	-	20	ns
Input Clock Fall Time <sup>1</sup>	t <sub>ICf</sub>		-	-	20	ns
Rise time <sup>1</sup> SREF0 output	t <sub>r1</sub>	45pF load, 0.8 to 2.0V	0.3	1.3	2.0	ns
Slew SREF0 Rising <sup>1</sup>	S <sub>lew1</sub>	45pF 0.4 to 2.4V	0.8	0.95	4.0	V/ns
Fall time <sup>1</sup> SREF0 output	t <sub>f1</sub>	45pF load, 0.8 to 2.0V	0.3	1.0	2.0	ns
Slew SREF0 Falling <sup>1</sup>	S <sub>lew2</sub>	45pF 2.4 to 0.4V	0.8	0.95	4.0	V/ns
Rise time <sup>1</sup> other outputs	t <sub>r2</sub>	20pF load, 0.8 to 2.0V	0.6	1.2	2.0	ns
Fall time <sup>1</sup> other outputs	t <sub>f2</sub>	20pF load, 0.8 to 2.0V	0.6	0.9	2.0	ns
Duty cycle <sup>1</sup>	d <sub>t</sub>	25pF load at 1.5V (All outputs)	45	50	55	%
Jitter, one sigma <sup>1,2</sup>	t <sub>jls1</sub>	10,000 cycles (All outputs)	-	100	250	ps
Jitter, absolute <sup>1,2</sup>	t <sub>jab1</sub>	10,000 cycles 24, Audio, Audio/2	750	-	750	ps
Jitter, absolute <sup>1,2</sup>	t <sub>jab2</sub>	10,000 cycles 48MHz	-500	-	500	ps
Jitter, absolute <sup>1,2</sup>	t <sub>jab3</sub>	10,000 cycles REF CLKS	-3.5%	-	3.5	%
Input Frequency <sup>1</sup>	f <sub>in</sub>		11	14.318	16	MHz
Normal output frequency	F <sub>NOM</sub>	with X1 driven at 14.31818MHz 48MHz 24MHz 33.86MHz 24.5795MHz		48.008MHz 24.004MHz 33.8650MHz 24.5795MHz		MHz
Ratio of Nominal frequency to target frequency <sup>1</sup>	f/f	with X1 driven at 14.31818MHz 24.0MHz 48.0MHz 33.8688MHz 24.576MHz	166 166 -200 -200	166.6 166.6 -23.6 +144	167 167 +200 +200	ppm
Clock skew between AUDIO/2 and AUDIO outputs <sup>1</sup>	T <sub>sk</sub>		250	-	+250	ps
Power-up Time <sup>1</sup>	t <sub>PO</sub>	to 33.8 MHz on Audio	-	5	10	ms

**Note 1:** Parameter is guaranteed by design and characterization. Not 100% tested in production.

**Note 2:** Absolute Jitter is defined as largest difference of the shortest period to the mean or the longest period to the mean in a sampling of 10,000 clock cycles. One Sigma Jitter is the calculated standard deviation.



**209 mil 20Pin SSOP Package**

SYMBOL	COMMON DIMENSIONS			VARIATIONS	D		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	0.068	0.073	0.078	14	0.239	0.244	0.249
A <sub>1</sub>	0.002	0.005	0.008	16	0.239	0.244	0.249
A <sub>2</sub>	0.066	0.068	0.070	20	0.278	0.284	0.289
b	0.010	0.012	0.015	24	0.318	0.323	0.328
c	0.004	0.006	0.008	28	0.397	0.402	0.407
D	See Variations			30	0.397	0.402	0.407
E	0.205	0.209	0.212	Dimensions in inches			
e	0.0256 BSC						
H	0.301	0.307	0.311				
L	0.025	0.030	0.037				
N	See Variations						
∞	0°	4°	8°				

**Ordering Information**

**ICS9169CF-36**

Example:

**ICS XXXX F-PPP**

