**Integrated
Circuit
Systems, Inc.**

32 kHz Motherboard Frequency Generator

General Description

The **ICS9134-06** and **ICS9134-07** are designed to generate clocks for all 286, 386, 486, Pentium and RISC-based mother-boards, including laptops and notebook computers. The only external components required are a 32.768 kHz crystal and decoupling capacitors. The device generates the 14.318 MHz system clock, eliminating the need for a 14.318 MHz crystal. High performance applications may require high speed clock termination components. The chip includes three independent clock generators plus the 32.768 kHz reference clock to produce all necessary frequencies, including real time clock/DRAM refresh, master clock, CPU clock, keyboard clock, floppy disk controller clock, serial communications clock and bus clocks. Different frequencies from clocks #2 can be selected using the frequency select pins, but clock #1 will be at 14.318 MHz for all standard versions.

VDD32 Supply

The **ICS9134-06** and **ICS9134-07** have a separate power supply for the 32.768 kHz oscillator circuitry. This allows the 32 kHz clock to run from a battery or other source while the main power to the chip is disconnected. The VDD32 supply is guaranteed to operate down to +2.0V, with the clock consuming less than 10μA at +3.3V with the main VDD at 0V.

The frequencies and power-down options in the **ICS9134-06** and **ICS9134-07** are mask programmable. Customer specific masks can be made and prototypes delivered within 6-8 weeks from receipt of order. Integrated Circuit Systems also offers standard versions, such as that described in this data sheet.
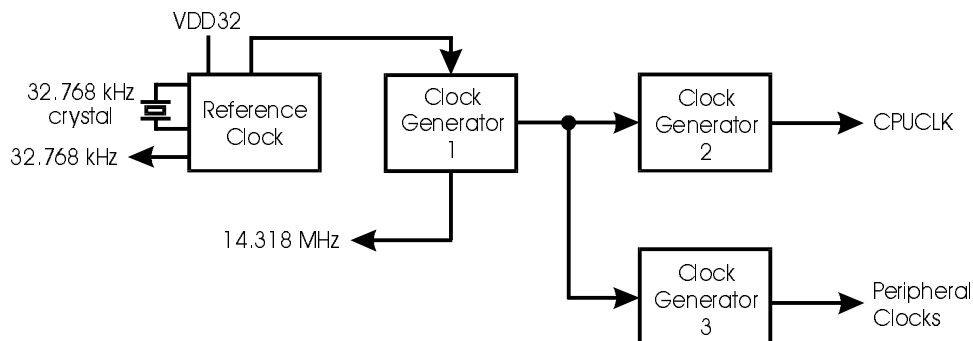
Features

- I_{DD} <10 μA when 32 kHz is running on VDD32
- Single 32.768 kHz crystal generates all PC motherboard clocks
- 3 independent clock generators
- Generates CPU clocks from 4.0 to 80 MHz
- Up to 5 output clocks
- Separate VDD for 32 kHz clock
- Power-down options available
- Operates from 3.3V or 5.0V supply
- Operates up to 66 MHz at 3.3V
- Supports OPTi 80C463/5 and Fir™ chipsets
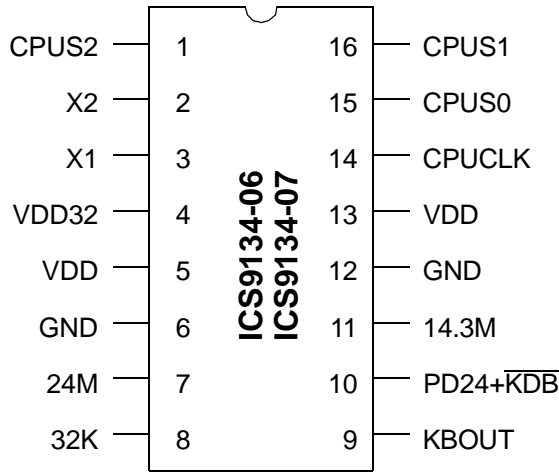- 16-pin, 300-mil, SOIC package

Applications

Notebook/Palmtop Computers: The **ICS9134-06** and **ICS9134-07** work with +3.3V and +5V and a single 32.768 kHz crystal, making it the ideal solution for generating clocks in portables with minimum board space. The user can save power by using this single part instead of oscillators or other frequency generators. The **ICS9134-06** and **ICS9134-07** further reduce the current consumption by having the ability to completely shut down the individual clocks when not in use, while still maintaining the separately powered 32.768 kHz clock.

Block Diagram

Fir is a trademark of Picopower Corporation.

ICS9134-06
ICS9134-07

Pin Configuration

```
            ┌───────∪───────┐
 CPUS2 ─────┤ 1          16 ├───── CPUS1
    X2 ─────┤ 2          15 ├───── CPUS0
    X1 ─────┤ 3          14 ├───── CPUCLK
 VDD32 ─────┤ 4   ICS9134-06  13 ├───── VDD
   VDD ─────┤ 5   ICS9134-07  12 ├───── GND
   GND ─────┤ 6          11 ├───── 14.3M
   24M ─────┤ 7          10 ├───── PD24+KDB
   32K ─────┤ 8           9 ├───── KBOUT
            └───────────────┘
```

16-Pin SOIC

Decoding Table for CPU Clock

CPUS2	CPUS1	CPUS0	CPUCLK (MHz)
0	0	0	Off+14M off
0	0	1	80.00
0	1	0	25.00
0	1	1	66.66
1	0	0	20.00
1	0	1	50.00
1	1	0	33.33
1	1	1	4.00

ICS9134 Option

KEYBOARD CLOCK	-06	-07
KBOUT	16 MHz	12 MHz

Pin Descriptions

PIN NUMBER	PIN NAME	TYPE	DESCRIPTION
1	CPUS2	I	Select 2 for 2XCPU and CPU frequencies. See Table above.
2	X2	O	Crystal connection. Connect to 32.768 kHz crystal. Includes internal XTAL load capacitance.
3	X1	I	Crystal connection. Connect to 32.768 kHz crystal. This pin includes internal XTAL load capacitance and feedback bias for a 32.768 kHz crystal.
4	VDD32	P	Separate power supply connection for 32.768 kHz clock. Will operate down to 2.0V, independent of the rest of the circuit VDD.
5	VDD	P	Connect to +3.3V or +5V.
6	GND	P	Connect to ground.
7	24M	O	24 MHz floppy (or super I/O) clock output.
8	32K	O	32.768 kHz square wave clock output.
9	KBOUT	O	Keyboard clock output, fixed 16 MHz (-06) or 12 MHz (-07).
10	PD24+$\overline{KBD}$	I	Power-down 24M+keyboard. Shuts off both clock outputs, pins 7 & 9 when low.
11	14.3M	O	14.318 MHz system clock output.
12	GND	P	Connect to ground.
13	VDD	P	Connect to +3.3V or +5V.
14	CPUCLK	O	CPUCLK output. See Table above.
15	CPUS0	I	Select 0 for 2XCPU and CPU frequencies. See Table above.
16	CPUS1	I	Select 1 for 2XCPU and CPU frequencies. See Table above.

Absolute Maximum Ratings

VDD referenced to GND 7V
Operating temperature under bias. . . . . 0°C to 70°C
Storage temperature . . . . -40°C to +150°C
Voltage on I/O pins referenced to GND. . . . . GND -0.5V to VDD +0.5V
Power dissipation . . . . 0.5 Watts

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and 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 may affect product reliability.

Electrical Characteristics

V_{DD} = +3.0 to 3.7V, T_A=0°C to 70°C unless otherwise stated

DC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Low Voltage	V_{IL}		-	-	$0.2V_{DD}$	V
Input High Voltage	V_{IH}		$0.7V_{DD}$	-	-	V
Input Low Current	I_{IL}	V_{IN}=0V	-15	-7	-	μA
Input High Current	I_{IH}	V_{IN}=V_{DD}	-2	-	2	μA
Output Low Voltage[1]	V_{OL}	I_{OL}=6mA	-	-	0.1	V
Output High Voltage[1]	V_{OH}	I_{OH}=-4mA	$0.85V_{DD}$	$0.9V_{DD}$	-	V
Output Low Current[1]	I_{OL}	V_{OL}=0.2V_{DD}	15	24	-	mA
Output High Current[1]	I_{OH}	V_{OH}=0.7V_{DD}	-	-13	-8	mA
Supply Current	I_{DD}	No load @ 33 MHz	-	9	17	mA
Supply Current	I_{DD}	No load @ 66.6 MHz	-	12	24	mA
V_{DD}32 Supply Current	I_{DD}32	No load, V_{DD}32=3.7V	-	4.6	12	μA
V_{DD}32 Supply Voltage	V_{DD}32	V_{DD}=0 to 3.7V, 32 kHz output operating	2.0	-	-	V
Pull-up Resistor Value[1]	R_{pu}		370	530	650	k ohm
AC Characteristics						
Rise Time[1]	t_r	15pF load, 0.8 to 2.0V	-	1.5	2	ns
Fall Time[1]	t_f	15pF load, 2.0 to 0.8V	-	1.5	2	ns
Rise Time[1]	t_r	15pF load, 20% to 80%	2	2.5	3.5	ns
Fall Time[1]	t_f	15pF load, 80% to 20%	2	2.5	3.5	ns
Duty Cycle[1]	d_t	15pF load	40	50	55	%
Jitter, One Sigma[1]	t_{jis}	As compared with clock period.	-	1	2	%
Jitter, Absolute[1]	t_{jab}		-	2	5.5	%
Input Frequency[1]	f_i		25	32.768	40	kHz
Power-up Time[1]	t_{pu}	Off to 33.3 MHz	-	4	8	ms
Transition Time[1]	t_{ft}	4 to 66.6 MHz	-	-	4.8	ms

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

ICS9134-06
ICS9134-07

Electrical Characteristics

V_{DD} = +5V±10%, T_A=0°C to 70°C unless otherwise stated

DC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Low Voltage	V_{IL}		-	-	0.8	V
Input High Voltage	V_{IH}		2	-	-	V
Input Low Current	I_{IL}	V_{IN}=0V	-22	-10	-	μA
Input High Current	I_{IH}	V_{IN}=V_{DD}	-2	-	2	μA
Output Low Voltage[1]	V_{OL}	I_{OL}=10mA	-	0.15	0.4	V
Output High Voltage[1]	V_{OH}	I_{OH}=-30mA	2.4	3.7	-	V
Output Low Current[1]	I_{OL}	V_{OL}=0.8V	25	45	-	mA
Output High Current[1]	I_{OH}	V_{OH}=2.0V	-	-58	-35	mA
Supply Current	I_{DD}	No load @ 33 MHz		15	28	mA
Supply Current	I_{DD}	No load @ 80 MHz	-	22	35	mA
V_{DD}32 Supply Current	I_{DD}32	No load, V_{DD}32=5.5V	-	7.5	20	μA
V_{DD}32 Supply Voltage	V_{DD}32	V_{DD}=0 to 5.5V, 32 kHz output operating	2.0	-	-	V
Pull-up Resistor Value[1]	R_{pu}		380	550	680	k ohm
AC Characteristics						
Rise Time[1]	t_r	15pF load, 0.8 to 2.0V	-	1	1.5	ns
Fall Time[1]	t_f	15pF load, 2.0 to 0.8V	-	1	1.5	ns
Rise Time[1]	t_r	15pF load, 20% to 80%	-	2	3	ns
Fall Time[1]	t_f	15pF load, 80% to 20%	-	2	3	ns
Duty Cycle[1]	d_t	15pF load	48	52	58	%
Jitter, One Sigma[1]	t_{jis}	As compared with clock period.	-	1	2	%
Jitter, Absolute[1]	t_{jab}		-	2	5	%
Input Frequency[1]	f_i		25	32.768	40	kHz
Power-up Time[1]	t_{pu}	Off to 80 MHz	-	7	14	ms
Transition Time[1]	t_{ft}	4 to 80 MHz	-	-	5	ms

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

Recommended External Circuit

32.768 kHz
crystal

VDD
0.1µF

VDD
2.2µF   0.1µF
(Note 3)

ICS9134-06
ICS9134-07

1   16
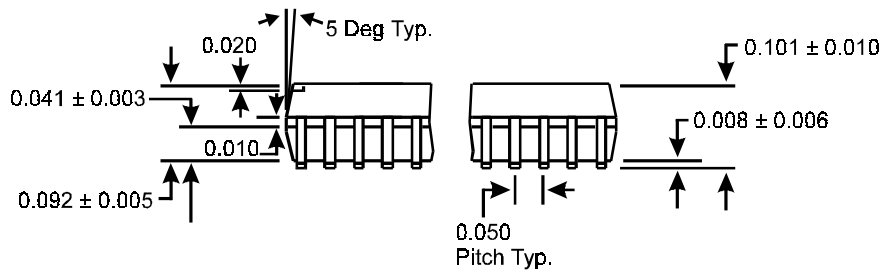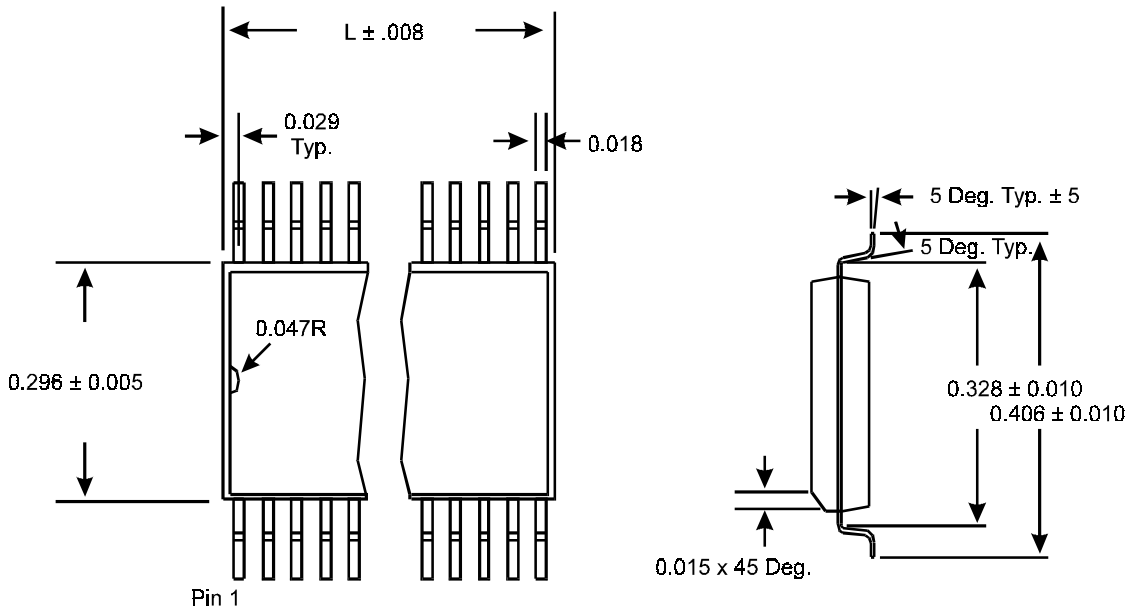2   15
3   14
4   13
5   12
6   11
7   10
8   9

0.1µF
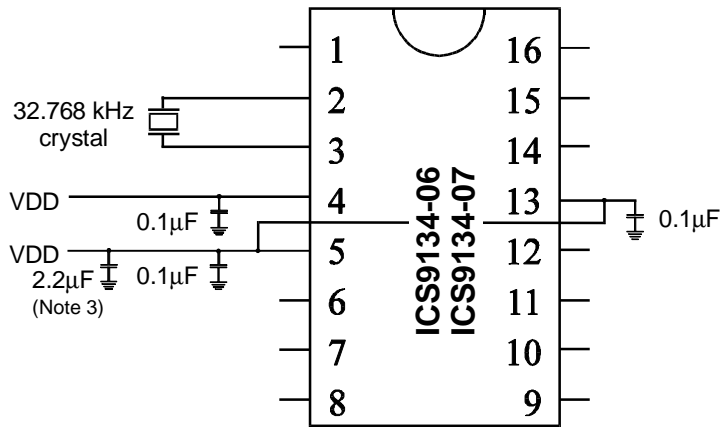
Notes:

1) The external components shown should be placed as close to the device as possible.

2) Pins 5 and 13 should be connected together externally. One decoupling capacitor may suffice for both pins.

3) May be part of system decoupling.

Typical 32 kHz Supply Current

$C_L = 25pF$

$C_L = 15pF$

$C_L = 0pF$

µA

Vdd
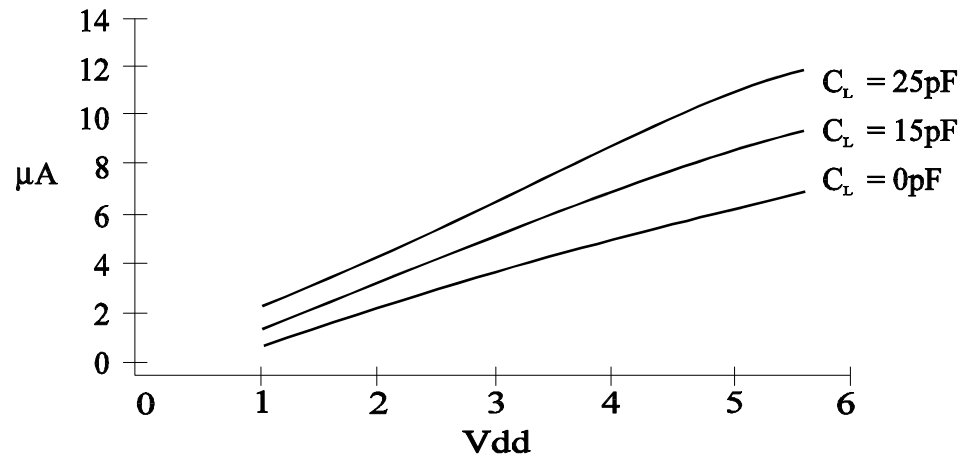
SOIC Package (wide body)

LEAD COUNT	16L
DIMENSION L	0.404

Ordering Information

ICS9134-06M or ICS9134-07M

Example:

ICS XXXX-PPP M

Package Type
M=SOIC

Pattern Number (2 or 3 digit number for parts with ROM code patterns)

Device Type (consists of 3 or 4 digit numbers)

Prefix
ICS, AV=Standard Device