



Low Cost 16-Pin Frequency Generator

General Description

The AV9154-24 is a low cost frequency generator designed specifically for desktop and notebook PC applications. Its CPU clocks provide all necessary CPU frequencies for 286, 386 and 486 systems, including support for the latest speeds of processors. The device uses a 14.318 MHz crystal to generate the CPU and all peripheral clocks for integrated desktop motherboards.

The 14.318 MHz clock output is provided for the input to an ICS graphics frequency generator such as the ICS2494.

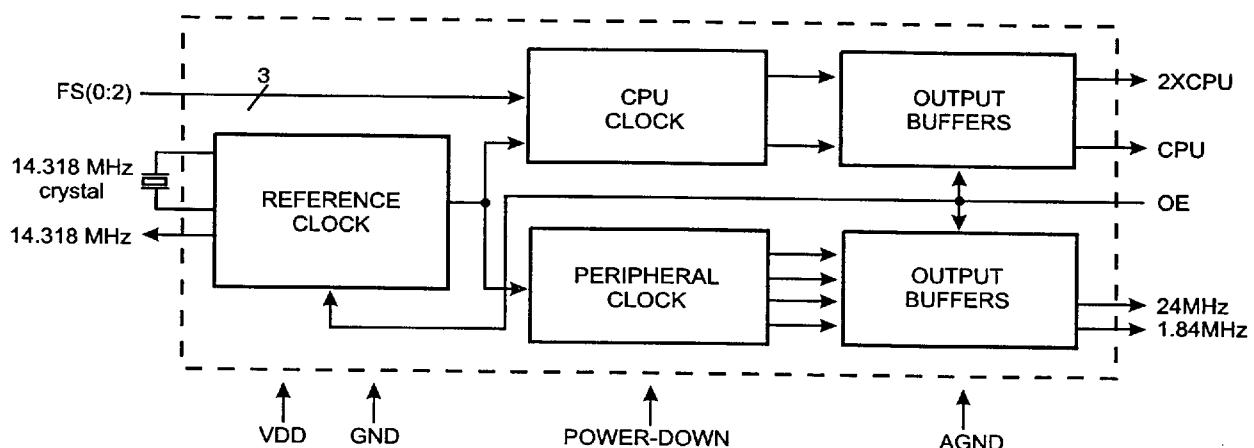
The CPU clock offers the unique feature of smooth, glitch-free transitions from one frequency to the next, making this an ideal device to use whenever slowing the CPU speed. The AV9154-24 makes a gradual transition between frequencies, so that it obeys the Intel cycle-to-cycle timing specification for 486 systems. The simultaneous 2X and 1X CPU clocks offer controlled skew to within 1.0ns (max) of each other.

Features

- Compatible with 286, 386, and 486 CPUs
- Supports turbo modes
- Generates communications clock, floppy disk clock, system reference clock, and CPU clock
- Up to 100 MHz at 5V+10%, -20% VDD
- 16-pin PDIP or 150-mil SOIC
- All loop filter components internal
- Skew-controlled 2X and 1X CPU clocks
- 3 volt and 5 volt operation
- Power-down option

ICS has been shipping motherboard frequency generators since April 1990, and is the leader in the area of multiple output clocks on a single chip. The AV9154-24 is a third generation device, and uses ICS's patented analog CMOS phaselocked loop technology for low phase jitter. ICS offers a broad family of frequency generators for motherboards, graphics and other applications, including cost-effective versions with only one or two output clocks. Consult ICS for all of your clock generation needs.

Block Diagram



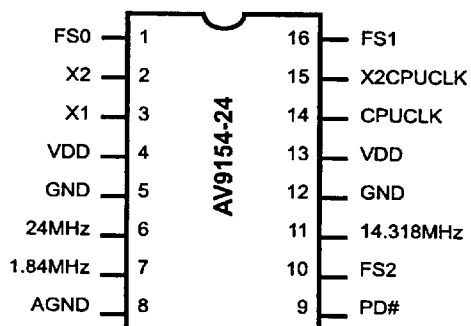
AV9154-24RevB053097P

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AV9154-24

Pin Configuration



16-Pin PDIP or 150-mil SOIC

Pin Descriptions for AV9154-24

PIN NUMBER	PIN NAME	TYPE	DESCRIPTION
7	1.843 MHz	Output	1.84 MHz clock output.
2	X2	Output	CRYSTAL connection.
3	X1	Input	CRYSTAL connection.
4	VDD	-	DIGITAL POWER SUPPLY (+5V).
5	GND	-	Digital GROUND.
6	24 MHz	Output	24 MHz floppy disk/combination I/O clock output.
8	AGND	-	ANALOG GROUND (original version).
9	PD#	Input	POWER-DOWN. Shuts off entire chip when low. (Has internal pull-up.)
11	14.318 MHz	Output	14.318 MHz reference clock output.
12	GND	-	Digital GROUND.
13	VDD	-	DIGITAL POWER SUPPLY (+5V).
15	2XCPU	Output	2X CPU clock output.
14	CPU	Output	1X CPU clock output.
16	FS1	Input	CPU CLOCK frequency SELECT #1. (Has internal pull-up.)
1	FS0	Input	CPU CLOCK frequency SELECT #0. (Has internal pull-up.)
10	FS2	Input	CPU CLOCK frequency SELECT #2. (Has internal pull-up.)



AV9154-24

Actual Output Frequencies

(In MHz)

FS2	FS1	FS0	2XCPUCLK	CPUCLK
0	0	0	100.23	50.11*
0	0	1	80.18*	40.09*
0	1	0	66.48*	33.24*
0	1	1	50.11	25.06
1	0	0	40.09	20.05
1	0	1	32.22	16.11
1	1	0	24.23	12.12
1	1	1	15.75	7.88

1.84 MHz Output 14.318 MHz Output 24 MHz Output	1.846 MHz (XTAL OSC Freq.) 24.00 MHz
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* These selections will only operate at 5V

Frequency Transitions

A key feature of the AV9154-24 is its ability to provide smooth, glitch-free frequency transitions on the CPU and 2XCPU clocks when the frequency select pins are changed. These frequency transitions do not violate the Intel 486 specification of less than 0.1% frequency change per clock period.

Using an Input Clock as Reference

The AV9154-24 is designed to accept a 14.318 MHz crystal as the input reference. With some external changes, it is possible to use a crystal oscillator or clock input. Please see application note AAN04 for details on driving the AV9154-24 with a clock.



AV9154-24

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 at 5V

VDD = 5V±10%, TA=0°C to 70°C

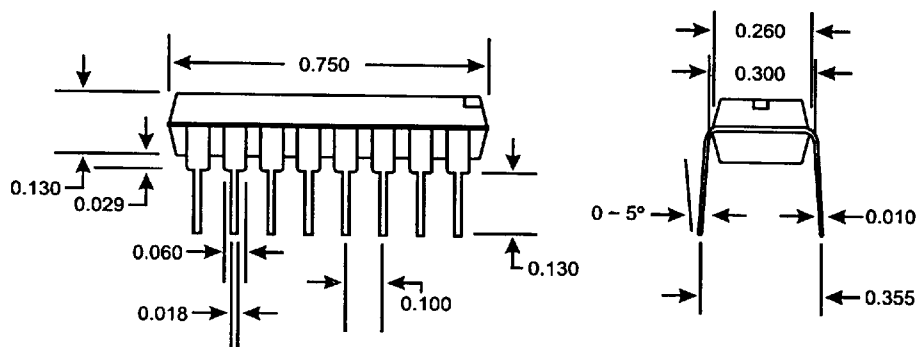
DC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Low Voltage	V _{IL}	V _{DD} =5V			0.8	V
Input High Voltage	V _{IH}	V _{DD} =5V	2.0			V
Input Low Current	I _{IL}	V _{IN} =0V			-5	μA
Input High Current	I _{IH}	V _{IN} =V _{DD}			5	μA
Output Low Voltage	V _{OL}	I _{OL} =4mA			0.4	V
Output High Voltage	V _{OH}	I _{OH} =-1mA, V _{DD} =5.0V	V _{DD} -4V			V
Output High Voltage	V _{OH}	I _{OH} =-4mA, V _{DD} =5.0V	V _{DD} -8V			V
Output High Voltage	V _{OH}	I _{OH} =-8mA	2.4			V
Supply Current	I _{DD}	No load ¹		25	40	mA
Output Frequency Change over Supply and Temperature	F _D	With respect to typical frequency		0.002	0.01	%
Short circuit current	I _{SC}	Each output clock	25	40		mA
Input Capacitance	C _I	Except X1, X2			10	pF
Load Capacitance	C _L	Pins X1, X2		20		pF
Supply Current, power-down	I _{DDSTBY}			30		μA
AC Characteristics						
Input Clock Rise time	t _{CR}				20	ns
Input Clock Fall time	t _{CF}				20	ns
Output Rise time, 0.8 to 2.0V	t _r	15pF load	-	1	2	ns
Rise time, 20% to 80% V _{DD}	t _r	15pF load	-	2	4	ns
Output Fall time, 2.0 to 0.8V	t _f	15pF load	-	1	2	ns
Fall time, 80% to 20% V _{DD}	t _f	15pF load	-	2	4	ns
Duty cycle	d	15pF load	40/60	48/52	60/40	%
Duty cycle, reference clocks	d	15pF load	40/60	43/57	60/40	%
Jitter, one sigma	f _{J1σ}	As compared with clock period		0.8	2.5	%
Jitter, absolute	t _{JAB}			2	5	%
Jitter, absolute	t _{JAB}	16-100 MHz clocks			700	ps
Input Frequency	f _I			14.318		MHz
Clock skew between CPU and 2XCPU outputs	T _{sk}			0.5	1.0	ns
Frequency Transition time	t _{tr}	From 8 to 100 Mhz		15	20	ms

Notes: 1. All clocks on AV9154-24 running at highest possible frequencies. Power supply current can change substantially with different mask configurations. Consult ICS.

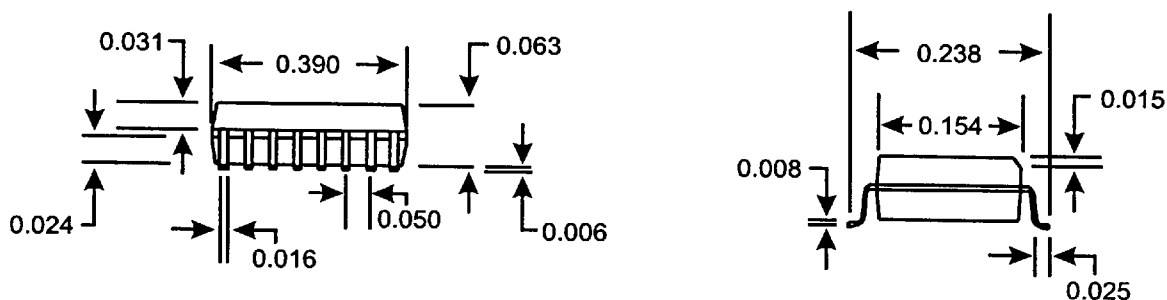
**Electrical Characteristics at 3.3V** $V_{DD} = +2.7$ to $+3.7V$, $T_A = 0^{\circ}C$ to $70^{\circ}C$

DC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Low Voltage	V_{IL}				$0.15V_{DD}$	V
Input High Voltage	V_{IH}		$0.7V_{DD}$	-	-	V
Input Low Current	I_{IL}	$V_{IN}=0V$	-5	-	-5	μA
Input High Current	I_{IH}	$V_{IN}=V_{DD}$	-5	-	5	μA
Output Low Voltage	V_{OL}	$I_{OL}=8mA$	-	-	0.1	V
Output High Voltage	V_{OH}	$I_{OH}=-4mA$	$V_{DD}-1V$	-	-	V
Supply Current	I_{DD}	Note 1	-	25		mA
Output Frequency Change over Supply and Temperature	F_d	With respect to typical frequency	-	0.002	0.01	%
Input Capacitance	C_i	Except X1, X2			10	pF
Load Capacitance	C_L	Pins X1, X2		20		pF
Supply Current, Standby	I_{DDSTBY}	When powered-down		15		μA
Short Circuit Current	I_{SC}			30		mA
AC Characteristics						
Enable pulse width	t_w		20	-	-	ns
Set-up time data to enable	t_{su}		20	-	-	ns
Input Clock Rise time	$ICLK_r$		-	-	20	ns
Input Clock Fall time	$ICLK_f$		-	-	20	ns
Hold time data to enable	t_{hd}		10	-	-	ns
Rise time	t_r	15pF load	-	-	4	ns
Fall time	t_f	15pF load	-	-	4	ns
Duty cycle	d_t	15pF load	40	48/52	60	%
Jitter, 1 sigma	$T_{j1\sigma}$	All frequencies		± 0.5	± 2	%
Jitter, absolute	T_{jabs}	All frequencies		± 3	± 5	%
Frequency Transition time	t_h	From 2 to 25 Mhz			20	ms
Power-up time	t_{pu}	From off to 50 Mhz		15		ms
Output Frequency	f_o		2		50	MHz
Input Frequency	f_i		2	14.318	32	MHz

Note 1: AV9154-24 with no load, with 14.318 MHz crystal input, and CLK1 running at 40 MHz. Power supply current varies with frequency.



16-Pin PDIP Package



16-Pin SOIC Package

Ordering Information

AV9154-24CN16 or AV9154-24CS16

Example:

ICS XXXX-PPP M X#W

