



CPU Frequency Generator

General Description

The AV9107C offers a tiny footprint solution for generating two simultaneous clocks. One clock, the REFCLK, is a fixed output frequency which is the same as the input reference crystal (or clock). The other clock, CLK1, can vary between 2 and 120 MHz, with up to 16 selectable preprogrammed frequencies stored in internal ROM (frequency range depends on design option).

The device has advanced features which include on-chip loop filters, tristate outputs, and power-down capability. A minimum of external components - two decoupling capacitors and an optional ferrite bead - are all that are required for jitter-free operation. Standard versions for computer motherboard applications are the AV9107C-03, and AV9107C-05. Custom masked versions, with customized frequencies and features, are available in 6-8 weeks for a small NRE.

Applications

Graphics: The AV9107C is the easiest to use, lowest cost, and smallest footprint frequency generator for graphics applications. It can generate up to 16 different frequencies, including all frequencies necessary for VGA standards. It should be used in place of the AV9105/6 when the reference clock is also needed.

Computer: The AV9107C is the ideal solution for replacing high speed oscillators and for reducing clock speeds to save power in computers. The device provides smooth, glitch-free frequency transitions so that the CPU can continue to operate during slow down or speed up. The rate of frequency change makes the AV9107C compatible with all 386DX, 386SX, 486DX, 486DX2, and 486SX devices. Standard versions include the AV9107C-03, -05, -10, -11.

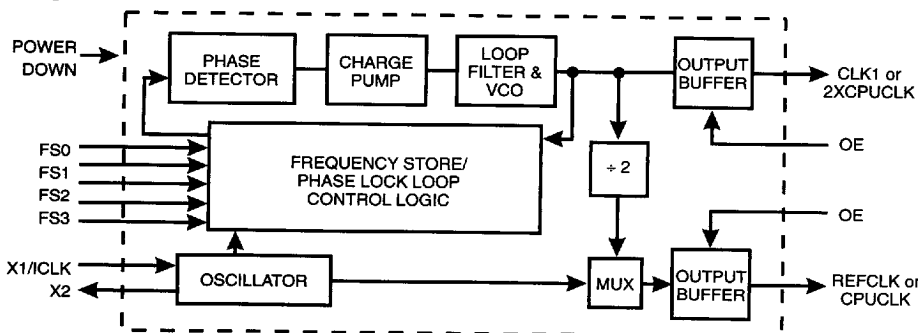
Features

- Patented on-chip Phase-Locked Loop with VCO for clock generation
- Provides reference clock and synthesized clock
- Generates frequencies from 2 to 120 MHz (depending on option)
- 8-pin DIP or SOP package or 14-pin DIP or SOP package
- 2 to 32 MHz input reference frequency (depending on option)
- On-chip loop filter
- Up to 16 frequencies stored internally
- Low power CMOS technology
- Single +3.3 or +5 volt power supply

Disk Drives: Smaller than a single crystal or an oscillator, the tiny SOIC package can be used for any general purpose frequency generation in disk drives. The most popular application is for Constant Density Recording, where its low jitter output clock provides the necessary frequencies for reading and recording. Another popular application is for slowing the disk drive CPU to save power.

High Speed Systems: The AV9107C can be used as a proximity oscillator - using a low frequency (down to 2 MHz) input to generate a high frequency clock (up to 120 MHz) near the device requiring the high frequency (depending on option). This avoids the need to route high speed traces over a long distance.

Block Diagram

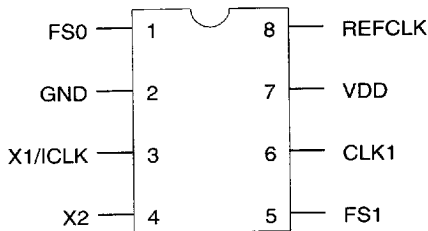


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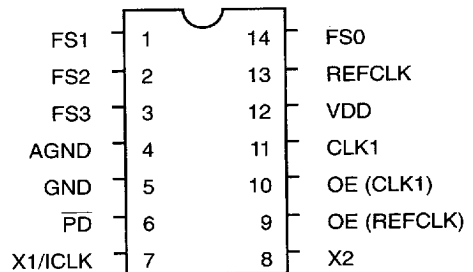


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Pin Configuration



AV9107C-05/-10
8-Pin DIP, SOIC
K-3, K-6



AV9107C-03/-11
14-Pin DIP, SOIC
K-3, K-6

Pin Descriptions for AV9107C-03, AV9107C-05 and AV9107C-10

PIN NUMBER		PIN NAME	TYPE	DESCRIPTION
-05/-10	-03			
1	14	FS0	Input	Frequency Select 0 for CLK1 (-03 has pull-up).
5	1	FS1	Input	Frequency Select 1 for CLK1 (-03 has pull-up).
	2	FS2	Input	Frequency Select 2 for CLK1 (-03 has pull-up).
	3	FS3	Input	Frequency Select 3 for CLK1 (-03 has pull-up).
	4	AGND	-	Analog GROUND.
2	5	GMD	-	Digital GROUND.
	6	PD	Input	POWER-DOWN. Shuts off chip when low. Internal pull-up.
3	7	X1/ICLK	Input	CRYSTAL OUTPUT or INPUT CLOCK frequency. Typically 14.318 MHz system clock.
4	8	X2	Output	CRYSTAL OUTPUT (No Connect when clock used).
	9	OE(REFCLK)	Input	OUTPUT ENABLE. Tristates REFCLK when low. Pull-up.
	10	OE(CLK1)	Input	OUTPUT ENABLE. Tristates CLK1 when low. Pull-up.
6	11	CLK1	Output	CLOCK1 Output (see decoding tables).
7	12	VDD	-	Digital power supply (+5V DC).
8	13	REFCLK	Output	REFERENCE CLOCK output. Produces a buffered version of the input clock or crystal frequency (typically 14.318 MHz).



Frequency Accuracy and Calculation

The accuracy of the frequencies produced by the AV9107C depends on the input frequency and the desired actual output frequency. The formula for calculating the exact frequency is as follows:

$$\text{Output Frequency} = \text{Input Frequency} \times \frac{A}{B}$$

where A=2, 3, 4 ... 128, and
B=2, 3, 4 ... 32.

For example, to calculate the actual output frequency for a video monitor expecting a 44.900 MHz clock and using a 14.318 MHz input clock, the closest A/B ratio is 69/22, which gives an output of 44.906 MHz (within 0.02% of the target frequency). Generally, the AV9107C can produce frequencies within 0.1% of the desired output.

Frequency Transitions

A key AV9107C feature is the ability to provide glitch-free frequency transitions across its output frequency range. The AV9107C-03 provides smooth transitions between any of the two groups of eight frequencies (when FS3=0 or FS3=1), so that the device will switch glitch-free between 4-100 MHz and 2-50 MHz.

Allowable Input and Output Frequencies for Possible Options

The input frequency should be between 2 and 32 MHz, depending on options, and the A/B ratio should not exceed 24. The output should fall in the range of 2-120 MHz, depending on options.

Output Enable

The Output Enable feature tristates the specified output clock pins. This places the selected output pins in a high impedance state to allow for system level diagnostic testing.

Power-Down

If equipped, the power-down shuts off the specified PLL or entire chip to save current. A few milliseconds are required to reach full functioning speed from a power-down state.

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Absolute Maximum Ratings

AVDD, VDD referenced to GND	7V
Operating temperature under bias	0°C to +70°C
Storage temperature	-65°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

Operating VDD = +4.5V to +5.5V; TA = 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}		2.0	-	-	V
Input Low Current	I _{IL}	V _{IN} =0V	-	6.0	16.0	μA
Input High Current	I _{IH}	V _{IN} =V _{DD}	-2.0	-	2.0	μA
Output Low Voltage, Note 1	V _{OL}	I _{OL} =10mA	-	0.15	0.40	V
Output High Voltage, Note 1	V _{OH}	I _{OH} =-30mA	2.4	3.25	-	V
Output Low Current, Note 1	I _{OL}	V _{OL} =0.8V	22.0	35.0	-	mA
Output High Current, Note 1	I _{OH}	V _{OH} =2.0V	-	-50.0	-35.0	mA
Supply Current	I _{CC}	Unload, 50 MHz	-	18.0	42.0	mA
Supply Current	I _{CC} (PD low)	Unload, Logic Inputs 000	-	38.0	100.0	μA
Supply Current	I _{CC} (PD low)	Unload, Logic Inputs 111	-	14.0	40.0	μA
Pull-up Resistor, Note 1	R _{pu}		-	380.0	700.0	k ohms
AC Characteristics						
Rise Time 0.8 to 2.0V, Note 1	T _r	15pf load	-	0.60	1.40	ns
Fall Time 2.0 to 0.8V, Note 1	T _f	15pf load	-	0.40	1.00	ns
Rise Time 20% to 80%, Note 1	T _r	15pf load	-	2.0	3.5	ns
Fall Time 80% to 20%, Note 1	T _f	15pf load	-	1.0	2.5	ns
Duty Cycle, Note 1	D _i	15pf load @ 1.4V	45.0	50.0	55.0	%
Jitter, One Sigma, Note 1	T _{jis}	From 20 to 100 MHz	-	50.0	150.0	ps
Jitter, One Sigma, Note 1	T _{jis}	From 14 to 16 MHz	-	100.0	200.0	ps
Jitter, One Sigma, Note 1	T _{jis}	From 14 to Below	-	0.2	1.0	%
Jitter, Absolute, Note 1	T _{jab}	From 20 to 100 MHz	-250.0	-	250.0	ps
Jitter, Absolute, Note 1	T _{jab}	From 14 to 16 MHz	-500.0	-	500.0	ps
Jitter, Absolute, Note 1	T _{jab}	From 14 to Below	-	1.0	3.0	%
Input Frequency, Note 1	F _i		11.0	14.3	19.0	MHz
Output Frequency	F _o		2.0	-	120.0	MHz
Power-up Time, Note 1	T _{pu}		-	7.58	18.0	ms
Transition Time, Note 1	T _{ft}	8 to 66.6 MHz	-	6.0	13.0	ms

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

**Electrical Characteristics at 3.3V**Operating $V_{DD} = +3.0V$ to $+3.7V$; $T_A = 0^{\circ}C$ to $70^{\circ}C$ unless otherwise stated

DC Characteristics						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Low Voltage	V_{IL}		-	-	$0.20V_{DD}$	V
Input High Voltage	V_{IH}		$0.7V_{DD}$	-	-	V
Input Low Current	I_{IL}	$V_{IN}=0V$	-	2.5	7.0	μA
Input High Current	I_{IH}	$V_{IN}=V_{DD}$	-2.0	-	2.0	μA
Output Low Voltage, Note 1	V_{OL}	$I_{OL}=6mA$	-	0.15	0.1	V
Output High Voltage, Note 1	V_{OH}	$I_{OH}=-5mA$	0.85	0.92	-	V
Output Low Current, Note 1	I_{OL}	$V_{OL}=0.2V_{DD}$	15.0	22.0	-	mA
Output High Current, Note 1	I_{OH}	$V_{OL}=0.7V_{DD}$	-	-17.0	-10.0	mA
Supply Current	I_{CC}	Unloaded, 50 MHz	-	22.0	40.0	mA
Supply Current	I_{CC} (PD low)	Unload, Logic Inputs 000	-	13.0	40.0	μA
Supply Current	I_{CC} (PD low)	Unload, Logic Inputs 111	-	4.0	12.0	μA
Pull-up Resistor	R_{pu}		-	550.0	900.0	k ohms
AC Characteristics						
Rise Time 20% to 80%, Note 1	T_r	15pf load	-	2.2	3.5	ns
Fall Time 80% to 20%, Note 1	T_f	15pf load	-	1.2	2.5	ns
Duty Cycle, Note 1	D_c	15pf load @ 50%	40.0	46.0	53.0	%
Jitter, One Sigma, Note 1	T_{jis}	From 25 to 85 MHz	-	50.0	150.0	ps
Jitter, One Sigma, Note 1	T_{jis}	From 14 to 20 MHz		100.0	200.0	ps
Jitter, One Sigma, Note 1	T_{jis}	From 14 to Below		0.4	1.0	%
Jitter, Absolute, Note 1	T_{jab}	From 25 to 85 MHz	-250.0		250.0	ps
Jitter, Absolute, Note 1	T_{jab}	From 14 to 20 MHz	-500.0		500.0	ps
Jitter, Absolute, Note 1	T_{jab}	From 14 to Below		1.0	3.0	%
Input Frequency, Note 1	F_i		13.3	14.3	15.3	MHz
Output Frequency, Note 1	F_o		2.0	-	66.6	MHz
Power-up Time, Note 1	T_{pu}		-	7.58	18.0	ms
Transition Time, Note 1	T_{ft}	8 to 66.6 MHz	-	6.0	13.0	ms

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



AV9107C

Actual Frequencies

Decoding Table for AV9107C-05, 14.318 input

FS1	FS0	CLK1
0	0	40.01 MHz
0	1	50.11 MHz
1	0	66.61 MHz
1	1	80.01 MHz

*5V only

Decoding Table for AV9107C-03, 14.318 input

FS3	FS2	FS1	FS0	CLK1
0	0	0	0	16.00 MHz
0	0	0	1	39.99 MHz
0	0	1	0	50.11 MHz
1	0	1	1	80.01 MHz
0	1	0	0	66.58 MHz
0	1	0	1	100.23 MHz
0	1	1	0	8.02 MHz
0	1	1	1	4.01 MHz
1	0	0	0	8.02 MHz
1	0	0	1	20.00 MHz
1	0	1	0	25.06 MHz
1	0	1	1	40.01 MHz
1	1	0	0	33.29 MHz
1	1	0	1	50.11 MHz
1	1	1	0	4.01 MHz
1	1	1	1	2.05 MHz

*5V only

Decoding Table for AV9107C-11 (in MHz)

FS3	FS2	FS1	FS0	CLK1
0	0	0	0	16.00 MHz
0	0	0	1	33.99 MHz
0	0	1	0	50.11 MHz
1	0	1	1	80.01 MHz
0	1	0	0	66.58 MHz
0	1	0	1	100.23 MHz
0	1	1	0	60.00 MHz
0	1	1	1	4.01 MHz
1	0	0	0	8.02 MHz
1	0	0	1	20.00 MHz
1	0	1	0	25.06 MHz
1	0	1	1	39.99 MHz
1	1	0	0	33.25 MHz
1	1	0	1	50.11 MHz
1	1	1	0	30.00 MHz
1	1	1	1	4.01 MHz

*5V only

Decoding Table for AV9107C-10, 14.318 Input

FS1	FS0	CLK1
0	0	25.057 MHz
0	1	33.289 MHz
1	0	40.006 MHz
1	1	50.113 MHz

*5V only

Ordering Information

AV9107C-05CN8, AV9107C-10CN8, AV9107C-03CN14, AV9107C-11CN14 or
AV9107C-05CS8, AV9107C-10CS8, AV9107C-03CS14, AV9107C-11CS14

Example:

XXX XXXX-PPP M X#W

