

Low Cost 20-Pin Frequency Generator

Features

- Pin-to-Pin compatible with Avasec AV9155-01, -02, -03.
- Generate all the CPU Clocks for 286, 386, 486, and Pentium CPU.
- Generate five clocks for most peripheral controllers.
- Replace seven crystal oscillators, for cost savings and board space savings.
- On-chip loop filters — no external loop filter circuit.
- Low power CMOS technology.
- Single +5V power supply operation.
- Improved output drive characteristics.
- Packaged in 20-pin plastic DIP or surface mount SOIC.

General Description

The PI6C9155 clock generators provide a low cost solution for desktop and notebook PC applications. It offers eight simultaneous clocks, including all the necessary frequencies for 286, 386, and 486 motherboards, for tremendous cost savings and board space savings.

The two main clock outputs CPU and 2XCPU can be set by the user to one of several popular processor clock frequencies. The 9155-01 and -02 versions support eight different selections via SCLK20–SCLK22, while the 9155-03 supports sixteen selections via SCLK20–SCLK23. The CPU clock is a 1X clock output while the 2XCPU clock is a 2X, skew-controlled version of the CPU clock. These outputs are compatible with 286, 386 and most 486 processors.

It also offers 5 simultaneous clocks for popular peripherals, plus two reference clock outputs which are identical to the input reference clock frequency.

The device includes on-chip loop filter circuits, for simplifying the board design.

Enhanced versions with customized frequencies and features are also available. Contact factory for the enhanced versions.

The CPU clock and 2XCPU clock offers an additional feature of reducing the operating clock speeds for saving power of the entire computer while the computer is idling. This feature cannot be accomplished by metal-can oscillators. A smooth, jitter-free frequency transition is provided for the CPU and 2XCPU clocks during the transition of slow down and speed up. The frequency transition rates are meeting the specifications of all 386DX, 386SX, 486DX2, and 486SX processors.

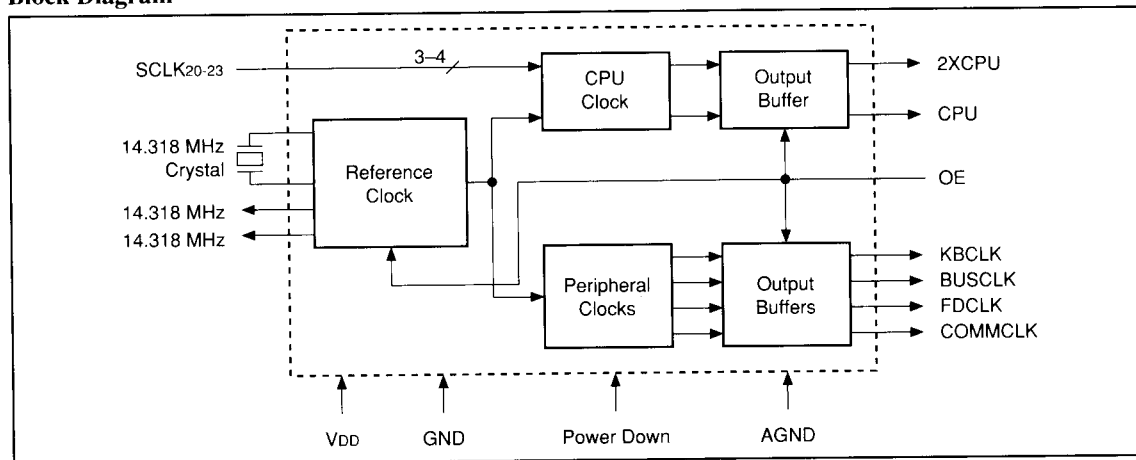
Peripherals — The device is also an ideal substitute for multiple metal-can oscillators on disk drive controllers, laser printer controllers, and other peripheral controllers. Contact factory for the custom frequencies required.

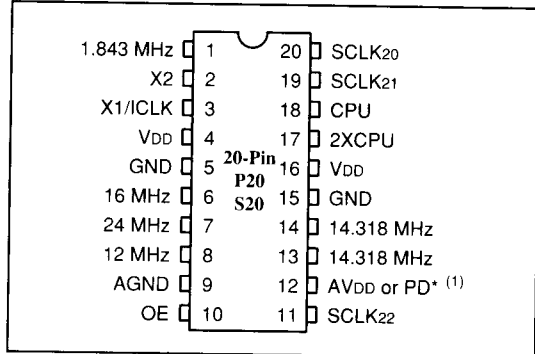
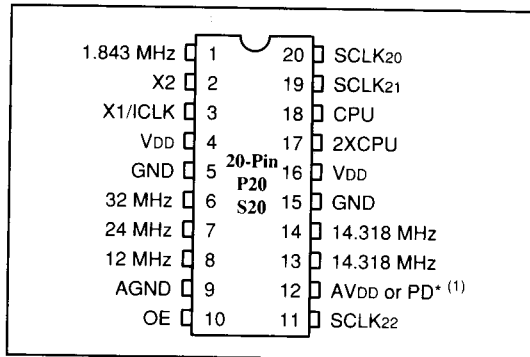
The PI6C9155-01, PI6C9155-02 and PI6C9155-03 are available in 20-pin 300 mil wide plastic DIP or surface mount SOIC packages.

Clock Table (MHz)

Clock	PI6C9155-01	PI6C9155-02
KBCLK	12	12
BUSCLK	16	32
FDCLK	24	24
COMMCLK	1.84	1.84
14.318 (2)	14.318	14.318
CPUCLK	4, 8, 16, 20, 25, 33.3, 40, or 50	
2XCPUCLK	8, 16, 32, 40, 50, 66.6, 80, or 100	

Block Diagram



Product Pin Configuration, PI6C9155-01

Product Pin Configuration, PI6C9155-02

PI6C9155-01, PI6C9155-02 Product Pin Description

Pin Name	Pin Number	Pin Type	Description
1.843 MHz	1	Output	1.84 MHz Clock Output
X2	2	Output	Crystal connection. Leave as NC for clock input
X1/ICLK	3	Input	Crystal connection/Input Clock
VDD	4	—	Digital power supply (+5V)
GND	5	—	Digital Ground
16MHz/32MHz	6	Output	16 MHz (PI6C9155-01) or 32 MHz (PI6C9155-02) Clock Input
24 MHz	7	Output	24 MHz Floppy disk/Combination I/O Clock Output
12 MHz	8	Output	12 MHz Keyboard Clock Output
AGND	9	—	Analog Ground (Original version)
OE	10	Input	Output Enable. Tri-states all outputs when low
SCLK22	11	Input	CPU Clock frequency Select #2
AVDD	12	—	Analog power supply (+5V)
PD*	12	Input	Hard Power Down. Shuts off entire chip when low (U version)
14.318 MHz	13	Output	14.318 MHz Reference Clock Output
14.318 MHz	14	Output	14.318 MHz Reference Clock Output
GND	15	—	Digital Ground
VDD	16	—	Digital power supply (+5V)
2XCPU	17	Output	2X CPU Clock Output
CPU	18	Output	1X CPU Clock Output
SCLK21	19	Input	CPU Clock frequency Select #1
SCLK20	20	Input	CPU Clock frequency Select #0

Note:

- The "U" version offers an entire chip power down with an internal pull-up resistor to keep it drop-in compatible with the original version. Refer to the next page for further explanation.



PI6C9155-01 Decoding and Clock Tables (14.318 MHz Input. All frequencies in MHz)

Clock #2 CPU and 2XCPU

SCLK22 (Pin 11)	SCLK21 (Pin 19)	SCLK20 (Pin 20)	2XCPU (Pin 17)	CPU (Pin 18)
0	0	0	8	4
0	0	1	16	8
0	1	0	32	16
0	1	1	40	20
1	0	0	50	25
1	0	1	66.66	33.33
1	1	0	80	40
1	1	1	100	50

Peripheral Clocks

COMMCLK (Pin 1)	BUSCLK (Pin 6)	FDCLK (Pin 7)	KBCLK (Pin 8)
1.843	16	24	12

Reference Clocks

REFCLK1 (Pin 13)	REFCLK2 (Pin 14)
14.318	14.318

PI6C9155-02 Decoding and Clock Tables (14.318 MHz Input. All frequencies in MHz)

Clock #2 CPU and 2XCPU

SCLK22 (Pin 11)	SCLK21 (Pin 19)	SCLK20 (Pin 20)	2XCPU (Pin 17)	CPU (Pin 18)
0	0	0	8	4
0	0	1	16	8
0	1	0	32	16
0	1	1	40	20
1	0	0	50	25
1	0	1	66.66	33.33
1	1	0	80	40
1	1	1	100	50

Peripheral Clocks

COMMCLK (Pin 1)	BUSCLK (Pin 6)	FDCLK (Pin 7)	KBCLK (Pin 8)
1.843	32	24	12

Reference Clocks

REFCLK1 (Pin 13)	REFCLK2 (Pin 14)
14.318	14.318

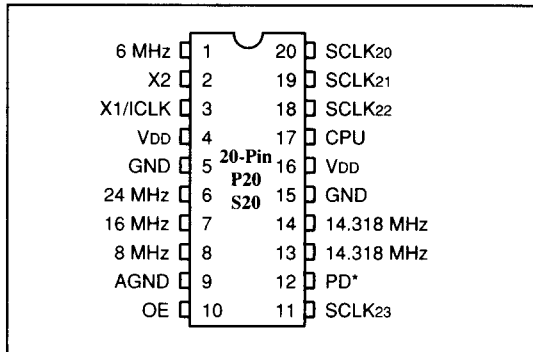
"U"

Pericom offers enhanced versions of the PI6C9155-01 and PI6C9155-02 which are fully compatible with the original versions. They provide improved performance and the ability to turn off the entire chip via a power down pin.

Frequency Transitions

The PI6C9155 offers smooth, glitch-free frequency transitions on the CPU and 2XCPU clocks when the frequency select pins are changed. These frequency transitions follow Intel 486 specifications to within 0.1% frequency change per clock period.

Product Pin Configuration, PI6C9155-03



PI6C9155-03 Product Pin Description

Pin Name	Pin Number	Pin Type	Description
6 MHz	1	Output	6 MHz Clock Output
X2	2	Output	Crystal connection. Leave as NC for clock input
X1/CLK	3	Input	Crystal connection/Input Clock
VDD	4	—	Digital power supply (+5V)
GND	5	—	Digital Ground
24 MHz	6	Output	24 MHz Floppy disk/Combination I/O Clock Output
16 MHz	7	Output	16 MHz Bus Clock Output
8 MHz	8	Output	8 MHz Keyboard Clock Output
AGND	9	—	Analog Ground
OE	10	Input	Output Enable. Tri-states all outputs when low
SCLK23	11	Input	CPU Clock frequency Select #3
PD*	12	Input	Power Down. Shuts off entire chip when low
14.318 MHz	13	Output	14.318 MHz Reference Clock Output
14.318 MHz	14	Output	14.318 MHz Reference Clock Output
GND	15	—	Digital Ground
VDD	16	—	Digital power supply (+5V)
CPU	17	Output	CPU Clock Output
SCLK22	18	Input	CPU Clock frequency Select #2
SCLK21	19	Input	CPU Clock frequency Select #1
SCLK20	20	Input	CPU Clock frequency Select #0

Note:

- The "U" version offers an entire chip power down with an internal pull-up resistor to keep it drop-in compatible with the original version. Refer to the next page for further explanation.

PI6C9155-03 Decoding and Clock Tables (14.318 MHz Input. All frequencies in MHz)

Clock #2 CPU

SCLK23 (Pin 11)	SCLK22 (Pin 18)	SCLK21 (Pin 19)	SCLK20 (Pin 20)	CPU (Pin 17)
0	0	0	0	16
0	0	0	1	40
0	0	1	0	50
0	0	1	1	80
0	1	0	0	66.66
0	1	0	1	100
0	1	1	0	8
0	1	1	1	4
1	0	0	0	8
1	0	0	1	20
1	0	1	0	25
1	0	1	1	40
1	1	0	0	33.3
1	1	0	1	50
1	1	1	0	4
1	1	1	1	2

To guarantee smooth, glitch-free frequency transitions, the state of SCLK23 (pin 11) must remain unchanged (smooth transitions are guaranteed in either the top or bottom half of the frequency decode table).

386

486

Peripheral Clocks

COMMCLK (Pin 1)	BUSCLK (Pin 7)	FDCLK (Pin 6)	KBCLK (Pin 8)
6	16	24	8

Reference Clocks

REFCLK1 (Pin 13)	REFCLK2 (Pin 14)
14.318	14.318

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	-65°C to +150°C
Ambient Temperature with Power Applied	0°C to +70°C
Supply Voltage to Ground Potential (Inputs & Vcc Only)	-0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5V to Vcc
DC Input Voltage	-0.5V to +7.0V
DC Output Current	120 mA
Power Dissipation	0.5W

Note:

Stresses greater than those listed under 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 this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC Electrical Characteristics at 5V (Operating Range, $V_{DD} = +5\text{ V} \pm 10\%$, Temperature 0°C to $+70^{\circ}\text{C}$)

Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -1\text{ mA}, V_{DD} = 5\text{ V}$	$V_{DD}-0.4$			V
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -4\text{ mA}, V_{DD} = 5\text{ V}$	$V_{DD}-0.8$			V
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -12\text{ mA}$	2.4			V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 12\text{ mA}$			0.4	V
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level $V_{DD} = 5\text{ V}$	2.0			V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level $V_{DD} = 5\text{ V}$			0.8	V
I_{DD}	Supply Current	No Load ⁽¹⁾		40		mA
F_d	Output Freq. Change ⁽²⁾	With Respect to Typical Frequency		0.002	0.01	%
I_{SC}	Short Circuit Current	Each Output Clock	25	40		mA
R_{PU}	Pull-up Resistor Value	Pin 10 (and 12, U version only)		680		k Ω
C_i	Input Capacitance	Except X1, X2			10	pF
C_L	Load Capacitance	Pins X1, X2		20		pF

Notes:

1. PI6C9155-01 clocks running at the highest possible frequencies.
2. Over Supply and Temperature.

AC Electrical Characteristics at 5V (Operating Range, $V_{DD} = +5\text{ V} \pm 10\%$, Temperature 0°C to $+70^{\circ}\text{C}$)

Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
t_{ICr}	Input Clock Rise Time				20	ns
t_{ICf}	Input Clock Fall Time				20	ns
t_r	Output Rise Time, 0.8 to 2.0 V	25 pF Load for CPU and 2XCPU			2	ns
		25 pF Load for Peripherals			3	ns
t_f	Output Fall Time, 2.0 to 0.8 V	25 pF Load for CPU and 2XCPU			2	ns
		25 pF Load for Peripherals			3	ns
d_i	Duty Cycle, CPU and 2XCPU	25 pF Load	45/55	48/52	55/45	%
d_i	Duty Cycle, Other Clocks	25 pF Load	40/60	48/57	60/40	%
T_{jis}	Jitter, 1 Sigma	As Compared with Clock Period		0.8	2.5	%
T_{jab}	Jitter, Absolute			2	5	%
T_{jab}	Jitter, Absolute	16-100 MHz Clocks			700	ps
f_i	Input Frequency			14.318		MHz
T_{sk}	Clock Skew between CPU & 2XCPU outputs	(1.0 ns max. for "U" version)		1	1.5	ns
t_{ft}	Frequency Transition Time	8 to 100 MHz		15	20	ms



ACTUAL OUTPUT FREQUENCIES
(14.318 MHz Input. All frequencies in MHz)

PI6C9155-01 and PI6C9155-02

CPU Clock

SCLK22 (Pin 11)	SCLK21 (Pin 19)	SCLK20 (Pin 20)	2XCPU (Pin 17)	CPU (Pin 18)
0	0	0	7.50	3.75
0	0	1	15.51	7.76
0	1	0	32.22	16.11
0	1	1	40.09	20.05
1	0	0	50.11	25.06
1	0	1	66.82	33.41
1	1	0	80.18	40.09
1	1	1	100.23	50.11

Peripheral Clocks (Non U Version)

COMMCLK (Pin 1)	BUSCLK (Pin 6)	FDCLK (Pin 7)	KBCLK (Pin 8)
1.844	32.01 or 16.00	23.71	11.86

Peripheral Clocks (U Version)

COMMCLK (Pin 1)	BUSCLK (Pin 6)	FDCLK (Pin 7)	KBCLK (Pin 8)
1.846	32.01 or 16.00	24.00	12.00

PI6C9155-03

Clock #2 CPU

SCLK23 (Pin 11)	SCLK22 (Pin 18)	SCLK21 (Pin 19)	SCLK20 (Pin 20)	CPU (Pin 17)
0	0	0	0	15.51
0	0	0	1	40.09
0	0	1	0	50.11
0	0	1	1	80.18
0	1	0	0	66.82
0	1	0	1	100.23
0	1	1	0	7.58
0	1	1	1	4.30
1	0	0	0	7.76
1	0	0	1	20.05
1	0	1	0	25.06
1	0	1	1	40.09
1	1	0	0	33.41
1	1	0	1	50.11
1	1	1	0	3.79
1	1	1	1	2.15

Peripheral Clocks

COMMCLK (Pin 1)	BUSCLK (Pin 7)	FDCLK (Pin 6)	KBCLK (Pin 8)
6.00	16.00	24.00	8.00