STARTECH

ST49C154

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PREPROGRAMMED CPU MOTHERBOARD FREQUENCY GENERATOR

GENERAL DESCRIPTION

The ST49C154 is a monolithic analog CMOS device designed to generate six simultaneous clock outputs for mother board and disk drive applications. It is designed in a 1.2μ process to achieve 100 MHz operation with low clock jitter.

The ST49C154 may be used to replace existing BUS, I/O, and disk drive clocks generated from individual oscillators so that board space and number of oscillators are reduced. The high speed analog CMOS phase locked loops use the 14.318 MHz system clock or external crystal connected between XTAL1 and XTAL2 as the reference clock (reference clock can be changed to generate non-standard frequencies from the standard programmed device).

The ST49C154 is metal mask programmable to provide any custom set of CPUCLK frequencies. The programmed clock outputs are selectable via four address lines for 1XCLK / 2XCLK outputs. The CPU clock makes glitch-free transitions from one frequency to the next and follows Intel's processors input clock specification.

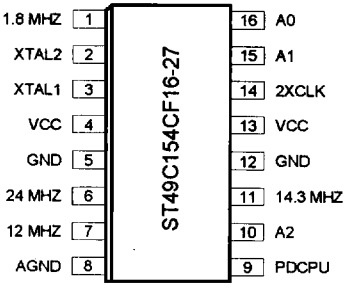
FEATURES

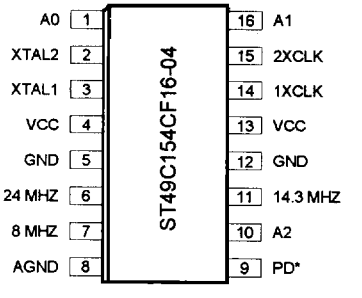
- Pin -to-pin compatible to AV9154
- Compatible with 286, 386, and 486 CPUs
- Supports Turbo modes
- Generates communications clock, keyboard clock, floppy disk clock, system reference clock, bus clock and CPU clock
- Skew controlled 2X and 1X clocks
- Programmable analog phase locked loop
- High speed (up to 130 MHz output)
- Low power single 3V / 5V CMOS technology
- 16 pin dip or SOIC package

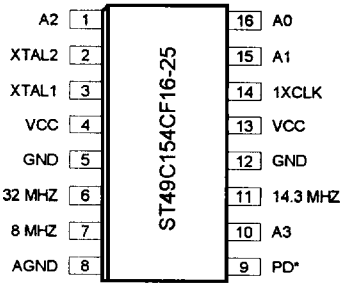
ORDERING INFORMATION

Part number	Package	Operating temperature
ST49C154CP16-xx	Plastic-DIP	0° C to +70° C
ST49C154CF16-xx	SOIC	0° C to +70° C

SOIC Package







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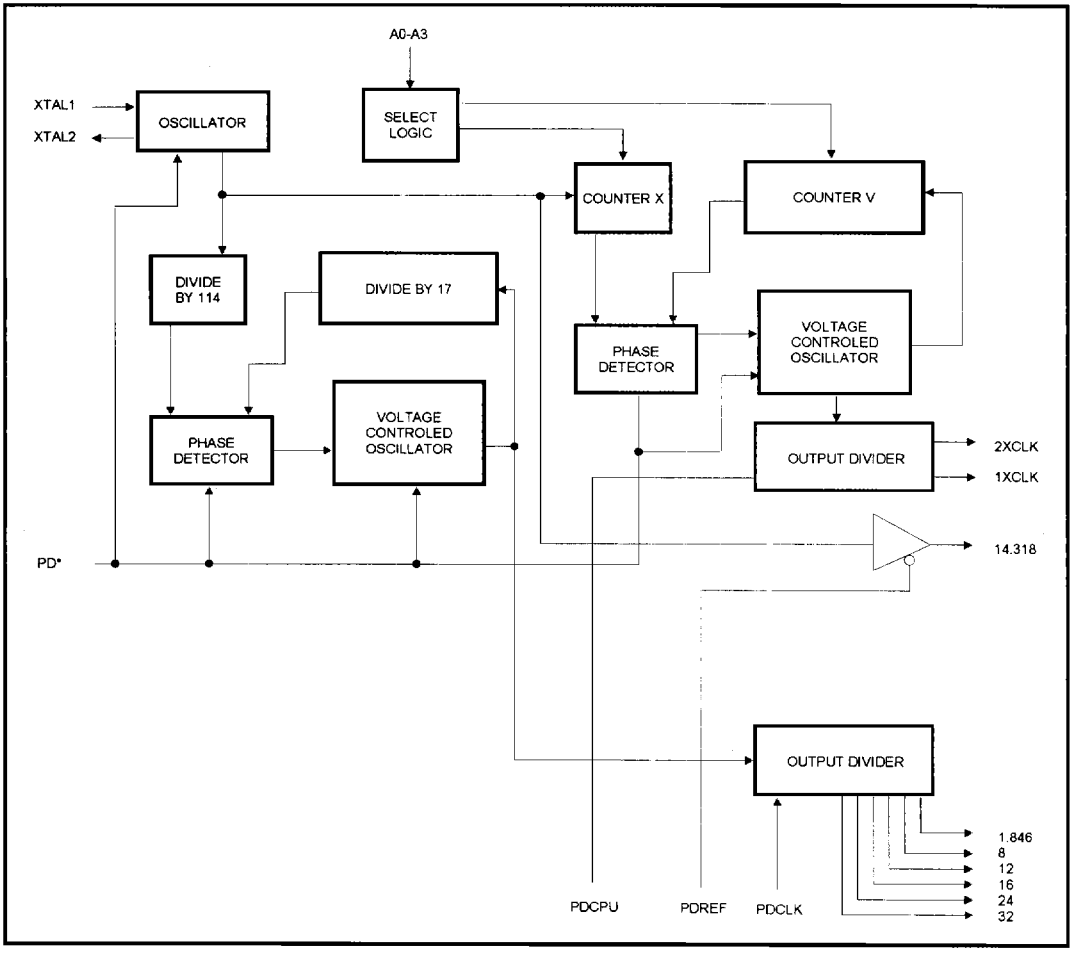
BLOCK DIAGRAM



SYMBOL DESCRIPTION

Symbol	Pin	Signal Type	Pin Description
XTAL2	2	O	Crystal output.
XTAL1	3	I	Crystal or External clock input.
VCC	4,13	I	Digital supply voltage. Single +3 / +5 volts.
GND	5,12	O	Digital signal ground.
AGND	8	O	Analog ground.
A0	*	I	CPU clock frequency select address 0. ST49C154-4, -6, -16, -26, -60 > pin 1. ST49C154-5, -10, -25, -27 > pin 16.
A1	*	I	CPU clock frequency select address 1. ST49C154-4, -6, -16, -26, -60 > pin 16. ST49C154-5, -10, -25, -27 > pin 15.
A2	*	I	CPU clock frequency select address 2. ST49C154-4, -26, -27 > pin 10. ST49C154-5, -25 > pin 1. ST49C154-6, -16, -60 > pin 15.
A3	*	I	CPU clock frequency select address 3. ST49C154-5, -25 > pin 10.
PD*	*	I	Power down (active low). Shuts off entire chip when low. ST49C154-4, -5, -25, -26 > pin 9.
PDCPU	*	I	Power down (active high). Shuts off 2XCLK output when high. ST49C154-6, -16, -60 > pin 10.
PDREF	*	I	Power down (active high). Shuts off the 14.318 MHz reference clock output. ST49C154-6, -16, -60 > pin 9.
PDCLK*	*	I	Power down (active low). Shuts off the 1.846 MHz, 8 MHz, 16 MHz, and 24 MHz clock outputs. ST49C154-10 > pin 9.

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SYMBOL DESCRIPTION

Symbol	Pin	Signal Type	Pin Description
1XCLK	*	O	Selectable CPU clock output. ST49C154-4, -5, -6, -10, -16, -25, -60 > pin 14.
2XCLK	*	O	Selectable 2X-CPU clock output. ST49C154-4, -6, -60 > pin 15. ST49C154-27 > pin 14.
1.846 MHz	*	O	1.846 MHz clock output. ST49C154-10 > pin 7. ST49C154-27 > pin 1.
8 MHz	*	O	8 MHz clock output. ST49C154-4, -5, -25 > pin 7. ST49C154-10 > pin 1.
12 MHz	*	O	12 MHz clock output. ST49C154-16, -26, -27 > pin 7.
14.318 MHz	*	O	14.318 MHz reference clock output. ST49C154-4, -5, -6, -16, -25, -27, -60 > pin 11. ST49C154-10 > pin 10.
16 MHz	*	O	16 MHz clock output. ST49C154-5, -10 > pin 6.
24 MHz	*	O	24 MHz clock output. ST49C154-4, -6, -16, -26, -27, -60 > pin 6. ST49C154-10 > pin 11.
32 MHz	*	O	32 MHz clock output. ST49C154-25 > pin 6.
128 kHz	*	O	128 kHz clock output. ST49C154-6, -60 > pin 7.

SYMBOL DESCRIPTION (ST49C154-22 with 25 MHz reference frequency)

Symbol	Pin	Signal Type	Pin Description
XTAL2	2	O	Crystal output.
XTAL1	1	I	Crystal or External clock input.
VCC	3,10,13	I	Digital supply voltage. Single +3 / +5 volts.
GND	4,12	O	Digital signal ground.
AGND	7	O	Analog ground.
20 MHz	15	O	20 MHz clock output.
24 MHz	5	O	24 MHz clock output.
25 MHz	11	O	25 MHz clock output.
32 MHz	6	O	32 MHz clock output.
40 MHz	14	O	40 MHz clock output.

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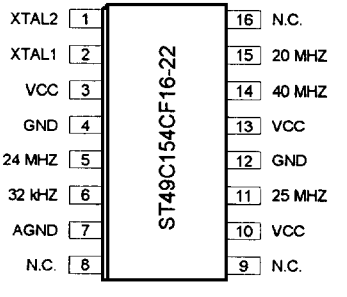
ST49C154 ACTUAL OUTPUT FREQUENCIES (using 14.318 MHz input. All frequencies in MHz).

A3 A2 A1 A0	CLK -5	CLK -6	CLK -10	CLK -16	CLK -25	CLK -27	CLK -60
0 0 0 0	2.15	16.11	PDCPU	16.11	2.15	75.17	8.182
0 0 0 1	8.18	20.05	40.09	20.05	8.18	31.94	16.11
0 0 1 0	16.11	25.06	50.11	25.06	16.11	60.136*	20.05
0 0 1 1	20.05	33.24	66.48*	33.41	20.05	40.09	25.06
0 1 0 0	25.06	40.09		40.09	25.06	50.11	33.24
0 1 0 1	33.24	50.11		50.11	33.24	66.48*	40.09
0 1 1 0	40.09	66.48		66.48*	40.09	80.18*	50.11
0 1 1 1	50.11	80.18*		80.18*	50.11	51.90	66.48*
1 0 0 0	4.30				4.30		
1 0 0 1	16.11				16.11		
1 0 1 0	32.22				32.22		
1 0 1 1	40.09				40.09		
1 1 0 0	50.11				50.11		
1 1 0 1	66.48*				66.48*		
1 1 1 0	80.18*				80.18*		
1 1 1 1	100.23*				100.23*		
I/O Clocks	8.00 14.318 16.00	0.128 14.318 24.00	1.846 8.00 14.318 16.00 24.00	12.00 14.318 24.00	8.00 14.318 32.01	1.846 12.00 14.318 24.00	0.128 14.318 24.00

ST49C154-04, -26 ACTUAL OUTPUT FREQUENCIES (using 14.318 MHz input. All frequencies in MHz).

A2 A1 A0	2XCLK	1XCLK
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
I/O Clocks	8.00, 24.00 14.318	12.00**



*These selections will only operate at 5V.
** ST49C154-26 only

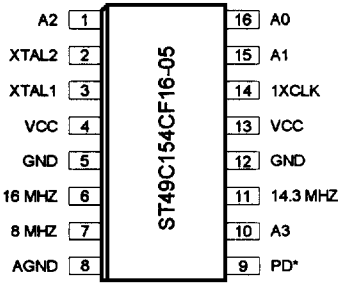
ABSOLUTE MAXIMUM RATINGS

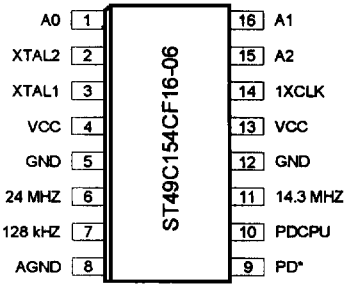
Supply voltage	7 Volts
Voltage at any pin	GND-0.3 V to VCC+0.3 V
Operating temperature	0° C to +70° C
Storage temperature	-40° C to +150° C
Package dissipation	500 mW

DC ELECTRICAL CHARACTERISTICS

T_A=0° - 70° C, Vcc=5.0 V ± 10% unless otherwise specified.

Symbol	Parameter	Limits Min	Typ	Max	Units	Conditions
V_{IL}	Input low level			0.8	V	
V_{IH}	Input high level	2.0			V	
V_{OL}	Output low level			0.4	V	I_{OL} = 4.0 mA
V_{OH}	Output high level	2.4			V	I_{OH} = -8.0 mA
I_{IL}	Input low current			-5	µA	V_{IN}=0V
I_{IH}	Input high current			5	µA	V_{IN}=Vcc
I_{CC}	Operating current		25	40	mA	No load.
I_{SB}	Stand by current		15		µA	Power down.
I_{SC}	Short circuit current	25	40		mA	Each output clock
C_I	Input capacitance		10		pF	Except Xtal1,2
C_L	Load capacitance		20		pF	





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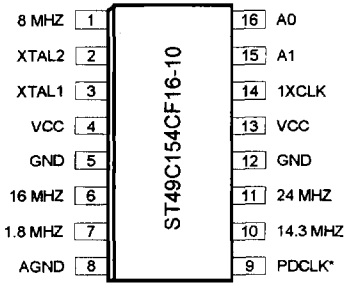
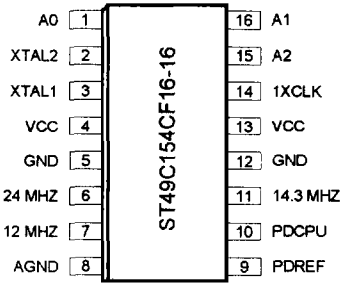
AC ELECTRICAL CHARACTERISTICS

T_A=0° - 70° C, Vcc=5.0 V ± 10% unless otherwise specified.

Symbol	Parameter	Limits Min	Typ	Max	Units	Conditions
T_4	Rise time 0.8 to 2.0V		1	2	ns	15pF load
T_5	Fall time 0.8 to 2.0V		1	2	ns	15pF load
T_6	Duty cycle	40	48/52	60	%	15pF load
T_R	Reference clock duty cycle	40	48/52	55	%	
T_T	Frequency transition time			20	ms	From 2-20MHz
T_P	Power up time		15		ms	From off to 50MHz
T_F	Output frequency	2		50	MHz	
T_I	Input frequency	2	14.318	32	MHz	
T_{IF}	Input clock rise/fall time			20	ns	
T_7	Jitter		±175	±300	ps	16-100MHz
T_{JIS}	Jitter, 1 sigma		±0.8	±2.5	%	All frequencies
T_{JA}	Jitter, absolute		2	5	%	All frequencies
T_8	Input frequency	2	14.318	32	MHz	
T_9	Input clock rise time			20	ns	
T_{10}	Input clock fall time			20	ns	
T_E	Enable pulse width	20			ns	
T_S	Clock skew berween 1XCLK and 2XCLK		0.5	1.0	ns	





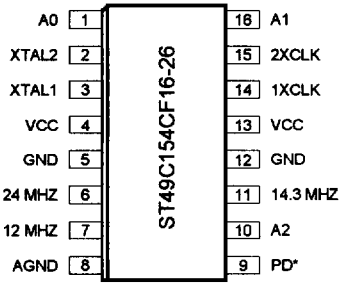
ABSOLUTE MAXIMUM RATINGS

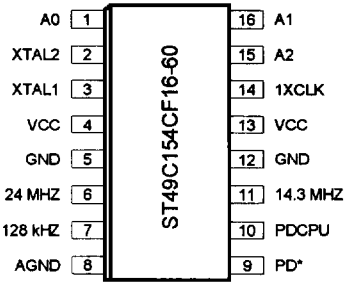
Supply voltage	7 Volts
Voltage at any pin	GND-0.3 V to VCC+0.3 V
Operating temperature	0° C to +70° C
Storage temperature	-40° C to +150° C
Package dissipation	500 mW

DC ELECTRICAL CHARACTERISTICS

T_A=0° - 70° C, Vcc=3.0 V ± 10% unless otherwise specified.

Symbol	Parameter	Limits Min	Typ	Max	Units	Conditions
V_{IL}	Input low level			0.15VCC	V	
V_{IH}	Input high level	0.7VCC			V	
V_{OL}	Output low level			0.1	V	I_{OL} = 8.0 mA
V_{OH}	Output high level	VCC-0.1V			V	I_{OH} = -4.0 mA
I_{IL}	Input low current	-5		-5	µA	V_{IN}=0
I_{IH}	Input high current	-5		5	µA	V_{IN}=Vcc
I_{CC}	Operating current		15		mA	No load.
I_{SB}	Stand by current		15		µA	Power down.
I_{SC}	Short circuit current		15		mA	No load.
C_I	Input capacitance			10	pF	Except Xtal1,2
C_L	Load capacitance		30		pF	





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AC ELECTRICAL CHARACTERISTICS

T_A=0° - 70° C, Vcc=3.0 V ± 10% unless otherwise specified.

Symbol	Parameter	Limits			Units	Conditions
		Min	Typ	Max		
T_4	Rise time			4	ns	15pF load.
T_5	Fall time			4	ns	15pF load.
T_6	Duty cycle	40	48/52	60	%	15pF load.
T_T	Frequency transition time			20	ms	From 2-20MHz
T_P	Power up time		15		ms	From off to 50MHz
T_F	Output frequency	2		50	MHz	
T_8	Input frequency	2	14.318	32	MHz	
T_{IF}	Input clock rise/fall time			20	ns	
T_7	Jitter		±175	±300	ps	
T_{JIS}	Jitter, 1 sigma		±8.5	±2	%	All frequencies
T_{JA}	Jitter, absolute		±3	±5	%	All frequencies
T_9	Input clock rise time			20	ns	
T_{10}	Input clock fall time			20	ns	
T_E	Enable pulse width	20			ns	

TIMING DIAGRAM