ST49C214

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PREPROGRAMMED DUAL VIDEO/MEMORY FREQUENCY GENERATOR

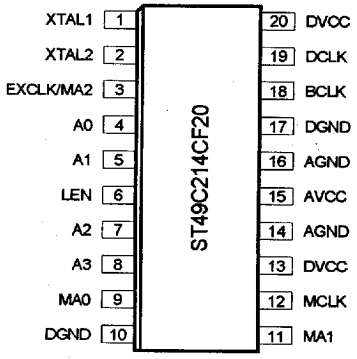
GENERAL DESCRIPTION

The ST49C214 is a monolithic analog CMOS device designed to generate dual frequency outputs from sixteen possible combinations for video Dot clock frequencies and four memory clock frequencies for high performance video display systems. The ST49C214 is a mask option programmable device to provide different output frequencies for custom applications. It is designed with 1.2μ process to achieve 100 MHz speed for high end frequencies.

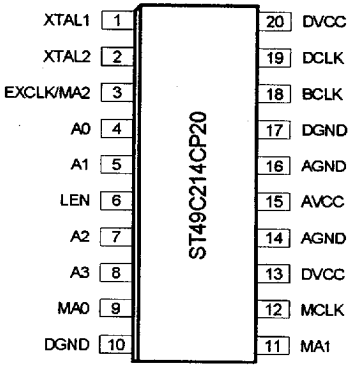
The ST49C214 is designed to replace existing video clocks generated from individual oscillators, to reduce board space and number of oscillators. To provide high speed and low jitter clock, The ST49C214 utilizes high speed analog CMOS phase locked loop using 14.318 MHz system clock as reference clock (reference clock can be changed to generate optional frequencies from standard programmed device) or external crystal connected between XTAL1 and XTAL2.

The ST49C214 can provide optional clock frequencies, utilizing single layer metal mask option. The programmed clock outputs are selectable via four address lines and address latch enable pin for video Dot clock selection and two address lines for memory clock selection.

SOIC Package



Plastic-DIP Package



FEATURES

- Can replace multiple oscillators/crystals
- Pin -to-pin compatible to ICS2494, AV9194
- Programmable analog phase locked loop
- High speed (up to 100 MHz output)
- Low power single 5V CMOS technology
- 20 pin dip or SOIC package

ORDERING INFORMATION

Part number	Package	Operating temperature
ST49C214CP20-xx	Plastic-DIP	0° C to +70° C
ST49C214CF20-xx	SOIC	0° C to +70° C
ST49C214CJ20-xx	PLCC	0° C to +70° C

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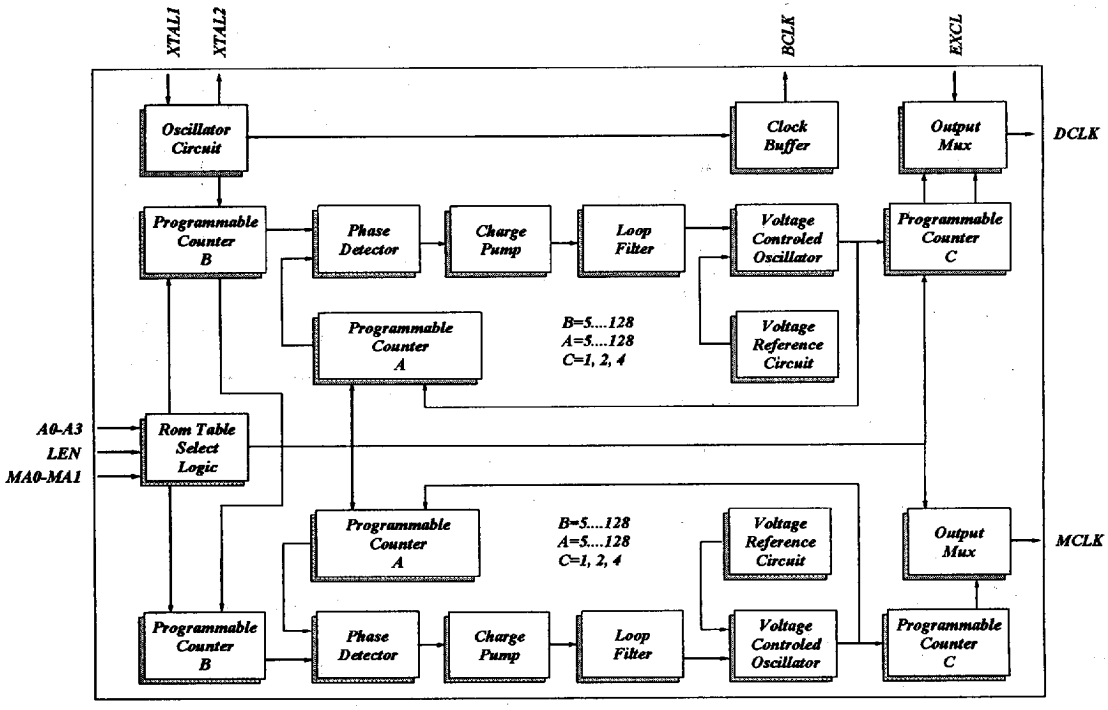
BLOCK DIAGRAM



SYMBOL DESCRIPTION

Symbol	Pin	Signal Type	Pin Description
XTAL1	1	I	Crystal or external clock input. A crystal can be connected to this pin and XTAL2 pin to generate internal phase locked loop reference clock. For external 14.318 MHz clock, XTAL2 is left open or used as buffered clock output.
XTAL2	2	O	Crystal output.
EXCLK/MA2	3*	I	External clock input or Memory clock select address 3
A0	4*	I	Dot clock Frequency select address 1.
A1	5*	I	Dot clock Frequency select address 2.
LEN	6*	I	Address latch enable input (active high). To latch selected programmed clock output.
A2	7*	I	Dot clock Frequency select address 3.
A3	8*	I	Dot clock Frequency select address 4.
MA0	9*	I	Memory clock Frequency select address 1.
GND	10	O	Digital and Analog ground.
MA1	11*	I	Memory clock Frequency select address 2.
MCLK	12	O	Programmed memory clock output frequency.
DVCC	13	I	Digital supply voltage. Single +5 volts.
GND	14	O	Digital and Analog ground.
AVCC	15	I	Analog supply voltage. Single +5 volts.
GND	16	O	Digital and Analog ground.
GND	17	O	Digital and Analog ground.
BCLK	18*	O	Buffered crystal clock output frequency.
DCLK	19	O	Programmed video clock output frequency.
DVCC	20	I	Digital supply voltage. Single +5 volts.

* Have internal pull-up resistor on inputs.

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FREQUENCY SELECT CALCULATION

The ST49C214 contains an analog phase locked loop circuit with a digital closed loop divider and a final series divider to achieve desired dividing ratios for clock output.
The accuracy of the frequencies produced by the ST49C214 depends on the input frequency and final output frequency. The formula for calculating the exact output frequency is as follows:

XCLK = (Reference clock) X A/(B X C)

where A=5, 6, 7,.....256
B=5, 6, 7,.....128, AND
C=1, 2, 3, 4, 6, 12

For proper output frequency, the ST49C214 can accept reference frequency from 5 - 40 MHz and divider ratio up to 15.

MASK OPTIONS

The following mask option are provided for custom applications.

*Any frequency can be in any decoding position.

ABSOLUTE MAXIMUM RATINGS

Supply range	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} = 8.0 mA
V_{OH}	Output high level	2.4			V	I_{OH} = 8.0 mA
I_{IL}	Input low current			-350	µA	Except crystal input
I_{IH}	Input high current			1	µA	VIN=Vcc
I_{CC}	Operating current		35	50	mA	No load. DCLK=80MHz, MCLK=40MHz
R_{IN}	Internal pull-up resistance	15	20	25	kΩ	

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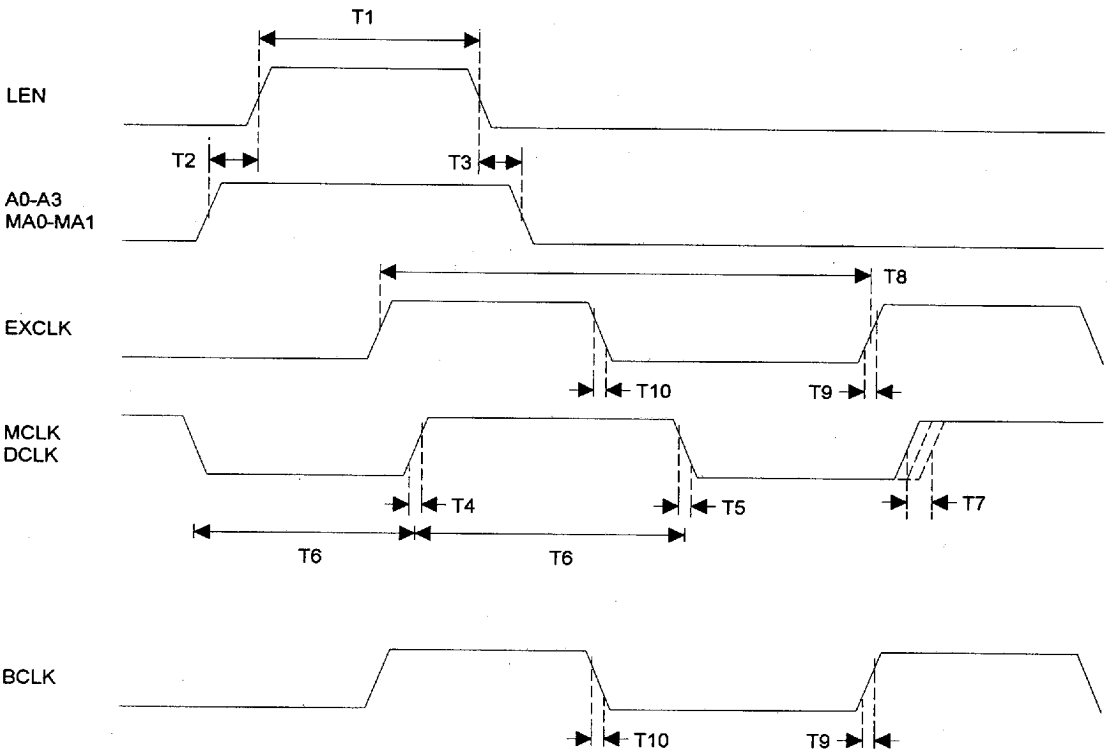
AC ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Limits Min	Typ	Max	Units	Conditions
T_1	Enable pulse width	20			ns	
T_2	Setup time data to enable	20			ns	
T_3	Hold time to data enable	10			ns	
T_4	Rise time		2	3	ns	0.8V - 2.0V, 15pF
T_5	Fall time		2	3	ns	2.0V - 0.8V, 15pF
T_6	Duty cycle	40	48/52	60	%	1.4V switch point
T_6	Duty cycle	45	48/52	55	%	Vcc/2 switch point
T_7	Jitter 1 sigma		±0.5	±2	%	
T_7	Jitter absolute		±2	±5	%	
T_8	Input frequency	14.318		32	MHz	
T_9	Input clock rise time			20	ns	
T_{10}	Input clock fall time			20	ns	

TIMING DIAGRAM



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Video clock address (Hex)	ST49C214-1 Frequency (MHz)	ST49C214-2 Frequency (MHz)	ST49C214-3 Frequency (MHz)	ST49C214-4 Frequency (MHz)	ST49C214-5 Frequency (MHz)
0	XTAL	30.000	25.175	20.000	50.350
1	65.028	77.250	28.325	24.000	56.644
2	EXCLK	EXCLK	85.000	32.000	65.000
3	36.000	80.000	44.900	40.000	72.000
4	25.175	31.500	40.000	50.000	80.000
5	28.322	36.000	48.000	66.667	89.800
6	24.000	75.000	50.000	80.000	63.000
7	40.000	50.000	81.150	100.000	75.000
8	44.900	40.000	25.175	54.000	25.175
9	50.350	50.000	28.325	70.000	28.322
A	16.257	32.000	37.500	90.000	31.500
B	32.514	44.900	44.900	110.000	36.000
C	56.644	25.175	40.000	25.000	40.000
D	20.000	28.322	32.500	33.333	44.900
E	41.539	65.000	50.000	40.000	50.000
F	80.000	36.000	65.000	50.000	65.000
Memory clock address (Hex)	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**
0	32.900	36.000	36.000	16.000	40.000
1	35.600	44.347	40.000	24.000	41.612
2	43.900	37.500	45.000	50.000	44.744
3	49.100	44.773	50.000	66.667	50.000

Compatible with	ICS-236 AV-36	ICS-242 AV-42	ICS-231	ICS-244 AV-44	ICS-237
Video Controller	GD6410	WD90C30	ET4000		ET4000

Video clock address (Hex)	ST49C214-6	ST49C214-8	ST49C214-9	ST49C214-10	ST49C214-16
	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
0	25.175	25.175	25.175	30.250	XTAL
1	28.322	28.322	28.322	65.000	16.257
2	40.000	40.000	40.000	85.000	EXCLK
3	65.000	32.500	EXCLK	36.000	32.514
4	44.900	50.000	50.000	25.175	25.175
5	50.000	65.000	77.000	28.322	28.322
6	130.000	38.000	36.000	34.000	24.000
7	75.000	44.900	44.889	40.000	40.000
8	25.175	31.500	130.00	44.900	XTAL
9	28.322	36.000	120.00	50.350	16.257
A	EXCLK	80.000	80.000	31.500	EXCLK
B	EXCLK	63.000	31.500	32.500	36.000
C	60.000	50.000	110.00	63.000	25.175
D	80.000	100.000	65.000	72.000	28.322
E	EXCLK	76.000	75.000	75.000	24.000
F	EXCLK	110.000	72.000	80.000	40.000
Memory clock address (Hex)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
0	50.000	70.000	55.000	36.000	31.000
1	60.000	63.830	75.000	44.000	36.000
2	65.000	60.000	70.000	49.000	43.000
3	75.000	81.000	80.000	40.000	49.000

Compatible with	ICS-253	ICS-263	ICS-256 AV-56	ICS-266	ICS-247
Video Controller	NCR77C22E	HT216	S3/86C911	GDS5410	GDS5320

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Video clock address (Hex)	ST49C214-17 Frequency (MHz)	ST49C214-18 Frequency (MHz)	ST49C214-19 Frequency (MHz)	ST49C214-20 Frequency (MHz)	ST49C214-25* Frequency (MHz)
0	25.175	25.175	25.175	50.350	25.175
1	28.322	28.322	28.322	56.644	28.322
2	28.636	40.000	40.000	33.250	40.000
3	36.000	EXCLK	EXCLK	52.000	72.000
4	40.000	50.000	50.000	80.000	50.000
5	42.954	77.000	77.000	63.000	77.000
6	44.900	36.000	36.000	EXCLK	36.000
7	57.272	44.889	44.889	75.000	44.900
8	60.000	130.00	130.00	25.175	130.00
9	63.960	120.00	120.00	28.322	120.00
A	75.000	80.000	80.000	31.500	80.000
B	80.000	31.500	31.500	36.000	31.500
C	85.000	110.00	110.00	40.000	110.00
D	99.000	65.000	65.000	44.900	65.000
E	102.00	75.000	75.000	50.000	75.000
F	108.00	94.500	94.500	65.000	94.500
Memory clock address (Hex)	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**
0	64.000	45.000	55.000	40.000	55.000
1	40.830	38.000	75.000	33.333	65.000
2	48.000	52.000	70.000	44.000	70.000
3	60.000	50.000	80.000	50.000	80.000
4					45.000
5					40.000
6					60.000
7					50.000

Compatible with	ICS-240	ICS-275 AV-07	ICS-305	ICS-260	CH9294-G
Video Controller	TI/34010/20	S3/801/805	S3/924	WEITEK W5186	S3/801/805

Video clock address (Hex)	ST49C214-26 Frequency (MHz)				ST49C214-27 Frequency (MHz)
0	25.175				75.000
1	28.322				80.000
2	36.000				85.000
3	65.000				90.000
4	44.900				95.000
5	50.000				100.00
6	80.000				105.00
7	75.000				110.00
8	56.644				115.00
9	63.000				120.00
A	72.000				125.00
B	130.00				130.00
C	90.000				135.00
D	100.00				140.00
E	110.00				145.00
F	120.00				150.00
Memory clock address (Hex)	Frequency (MHz)				Frequency (MHz)
0	50.000				40.000
1	60.000				45.000
2	65.000				50.000
3	75.000				55.000
4					60.000
5					65.000
6					70.000
7					75.000

Compatible with **ICS-277**
AV-46
Video Controller NCR77C22E+

*= The External clock input pin has been changed to MA2 to privide four additional preprogrammed memory clock selections. When Pin-3 of the ST49C214-25 is connected to ground it is downward compatible to standard ST49C214-XX. This pin contains internal pull-up resistor.