

**Timing Generator IC for ICX026/027**

**Description**

CXD1156Q/R is a timing generator IC for CCD imagers ICX026AK/AL and ICX027AK/AL.

**Features**

- NTSC/CCIR
- Field accumulation mode
- Color/Black and White mode
- 1/60 to 1/10,000 sec. variable speed, built-in electronic shutter.
- Built-in horizontal driver.
- Initialize operation at every field.

**Functions**

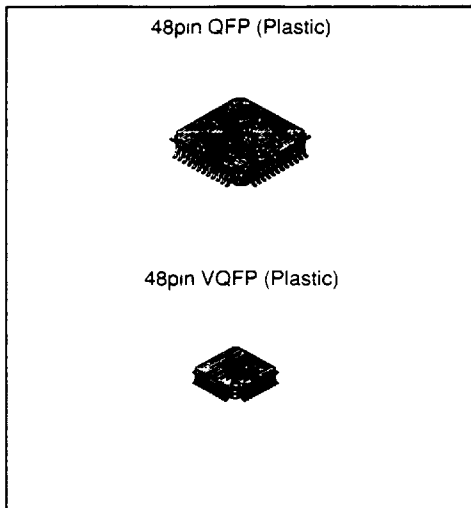
Timing generation for CCD imagers.

**Structure**

Silicon gate CMOS

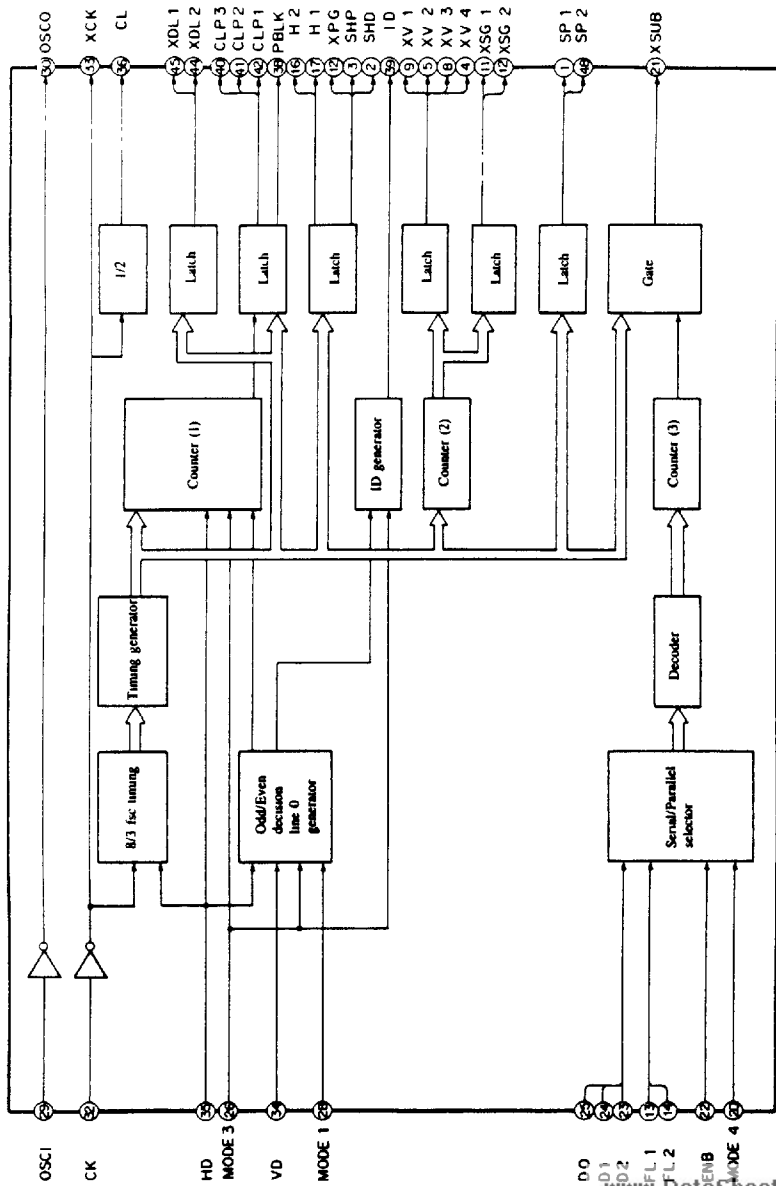
**Application**

CCD camera system



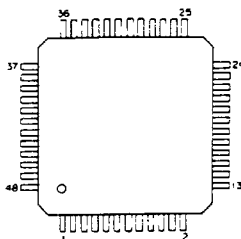
**Absolute Maximum Ratings (Ta = 25°C, Vss = 0V)**

• Supply voltage	VDD	Vss - 0.5 to +7.0	V
• Input voltage	VI	Vss - 0.5 to VDD + 0.5	V
• Output voltage	VO	Vss - 0.5 to VDD + 0.5	V
• Operating temperature	Topr	-20 to +75	°C
• Storage temperature	Tstg	-55 to +150	



Block Diagram

Pin Configuration (Top View)



Pin Description

No.	Symbol	I/O	Description
1	SP1	O	Color separation pulse ('L' in B/W mode)
2	SHD	O	Data sample hold pulse
3	SHP	O	Precharge level sample hold pulse
4	XV4	O	Vertical scanning clock
5	XV2	O	Vertical scanning clock
6	Vss	-	GND
7	TEST1	I	GND
8	XV3	O	Vertical scanning clock
9	XV1	O	Vertical scanning clock
10	XSG2	O	Sensor charge read out pulse
11	XSG1	O	Sensor charge read out pulse
12	XPG	O	Precharge gate pulse
13	FL1	I	Mode select L: Flicker less H: Normal, (pull up)
14	FL2	I	Mode select L: 60Hz H: 50Hz, (pull up)
15	Vss2	-	GND for driver
16	H2	O	Horizontal scanning clock
17	H1	O	Horizontal scanning clock
18	Vdd2	-	+ 5V supply pin for driver
19	Vdd	-	+ 5V
20	MODE4	I	Mode select L: Serial input H: Parallel input, (pull up)
21	XSUB	O	Discharge pulse
22	ENB	I	Enable signal L: Normal H: Electronic shutter (pull up)
23	D2	I	Shutter speed setting (schmitt input), (pull up)
24	D1	I	Shutter speed setting (schmitt input), (pull up)
25	DO	I	Shutter speed setting (schmitt input), (pull up)
26	MODE3	I	Mode select L: NTSC H: PAL., (pull down)
27	TEST2	I	GND
28	MODE1	I	Mode select L: Color H: B/W, (pull down)
29	OSCI	I	Oscillation input oscillation frequency. NTSC: 28.6364 MHz CCIR: 28.3750 MHz
30	OSCO	O	Oscillation output
31	Vss	-	GND
32	CK	I	Duty control inverter input
33	XCK	O	Duty control inverter output

No	Symbol	I/O	Description
34	VD	I	Vertical drive pulse
35	HD	I	Horizontal drive pulse
36	CL	O	4 fsc clock output (Sync generator clock input)
37	TEST0	I	GND
38	PBLK	O	Blanking cleaning pulse
39	ID	O	Line discrimination pulse
40	CLP3	O	Clamp pulse
41	CLP2	O	Clamp pulse
42	CLP1	O	Clamp pulse
43	V <sub>DD</sub>	-	+5V
44	XDL2	O	Delay line pulse ('L' in B/W mode)
45	XDL1	O	Delay line pulse ('L' in B/W mode)
46	TEST3	I	GND
47	TEST4	I	GND
48	SP2	O	Color separation pulse ('L' in B/W mode)

## Recommended Operating Conditions

### Electrical characteristics (DC characteristics)

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V <sub>DD</sub>	4.75	5.0	5.25	V
I/O voltage	V <sub>I</sub> , V <sub>O</sub>	V <sub>SS</sub>		V <sub>DD</sub>	V
Input voltage (Logical value) CMOS input cell	V <sub>IH</sub>	0.7V <sub>DD</sub>			V
	V <sub>IL</sub>			0.3V <sub>DD</sub>	
Schmitt trigger input voltage (D0, D1, D2)	V <sub>T+</sub>	0.8V <sub>DD</sub>			V
	V <sub>T-</sub>			0.2V <sub>DD</sub>	
	V <sub>T+</sub> - V <sub>T-</sub>	0.7	0.9		
Input rising, falling time	t <sub>r</sub> , t <sub>f</sub>	0		500	ns
Operating temperature	T <sub>a</sub>	-20		+75	°C
Output voltage 1	I <sub>OH</sub> = -2mA	V <sub>OH1</sub>	*3		V
	I <sub>OL</sub> = 4mA	V <sub>OL1</sub>		0.4	V
*1 Output voltage 2	I <sub>OH</sub> = -4mA	V <sub>OH2</sub>	*3		V
	I <sub>OL</sub> = 8mA	V <sub>OL2</sub>		0.4	V
*2 Output voltage 3	I <sub>OH</sub> = -8mA	V <sub>OH3</sub>	*3		V
	I <sub>OL</sub> = 8mA	V <sub>OL3</sub>		0.4	V

\*1. Pin 12 (XPG).

\*2. Pins 16 and 17 (H1,H2)

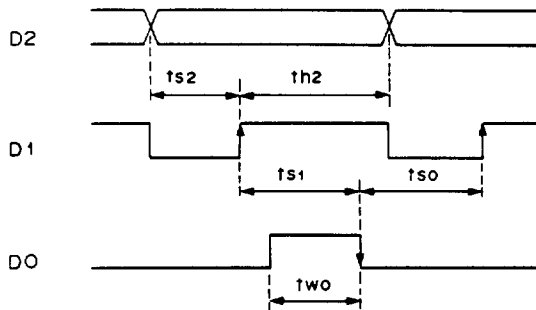
\*3. V<sub>DD</sub>-0.5

**Oscillation I/O Electrical Characteristics (OSCI, OSCO, CK, XCK)**

Item	Symbol	Min.	Typ.	Max.	Unit
Logical threshold value	$V_{th}$		$V_{DD}/2$		V
Input voltage	$V_{IH}$	$0.7V_{DD}$			V
	$V_{IL}$			$0.3V_{DD}$	V
Feedback resistor	$V_{IN} = V_{SS}$ or $V_{DD}$ $R_{FB}$	500k	2M	5M	$\Omega$
Output voltage	$I_{OH} = -1mA$ $V_{OH}$	$V_{DD}/2$			V
	$I_{OL} = 1mA$ $V_{OL}$			$V_{DD}/2$	V

**AC Characteristics**

**Serial input mode**



Symbol	Item	MIN.	MAX.
$t_{s2}$	D2 set up time vs. D1 rising edge	20nS	—
$t_{h2}$	D2 hold time vs. D1 rising edge	20nS	—
$t_{s1}$	D1 rising edge set up time vs. D0 falling edge	20nS	—
$t_{w0}$	D0 pulse width	20nS	50 $\mu$ S
$t_{s0}$	D0 falling edge set up time vs. D1 rising edge	20nS	—

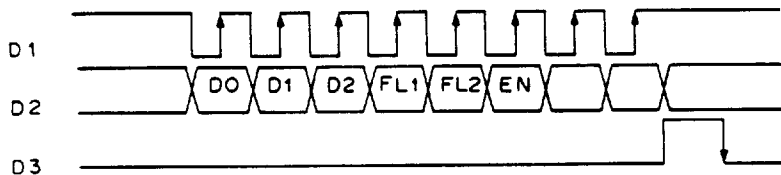
## Mode Setting

## 1. Parallel input (mode 4 = 'H')

Table-1

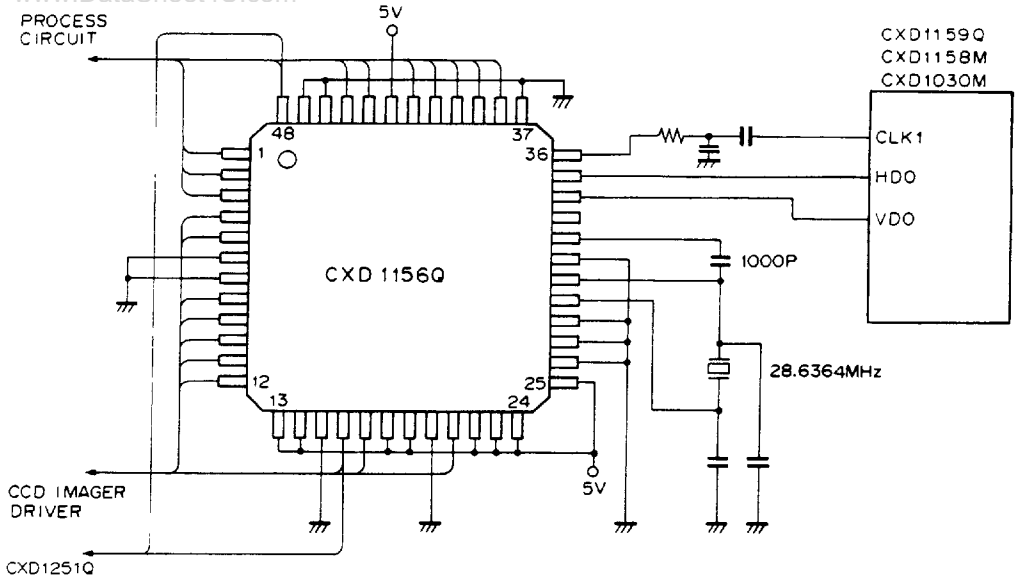
ENB	MODE 3	MODE 4	FL1	FL2	D2	D1	D0	Shutter speed
H	L	H	H		L	L	L	1/60
H	L	H	H		L	L	H	1/125
H	L	H	H		L	H	L	1/250
H	L	H	H		L	H	H	1/500
H	L	H	H		H	L	L	1/1000
H	L	H	H		H	L	H	1/2000
H	L	H	H		H	H	L	1/4000
H	L	H	H		H	H	H	1/10000
H	H	H	H		L	L	L	1/60
H	H	H	H		L	L	H	1/125
H	H	H	H		L	H	L	1/250
H	H	H	H		L	H	H	1/500
H	H	H	H		H	L	L	1/1000
H	H	H	H		H	L	H	1/2000
H	H	H	H		H	H	L	1/4000
H	H	H	H		H	H	H	1/10000
H	L		L	H				1/100
H	L		L	L				1/120
H	H		L	H				1/100
H	H		L	L				1/120
L								NORMAL

## 2. Serial input mode (mode 4 = 'L')

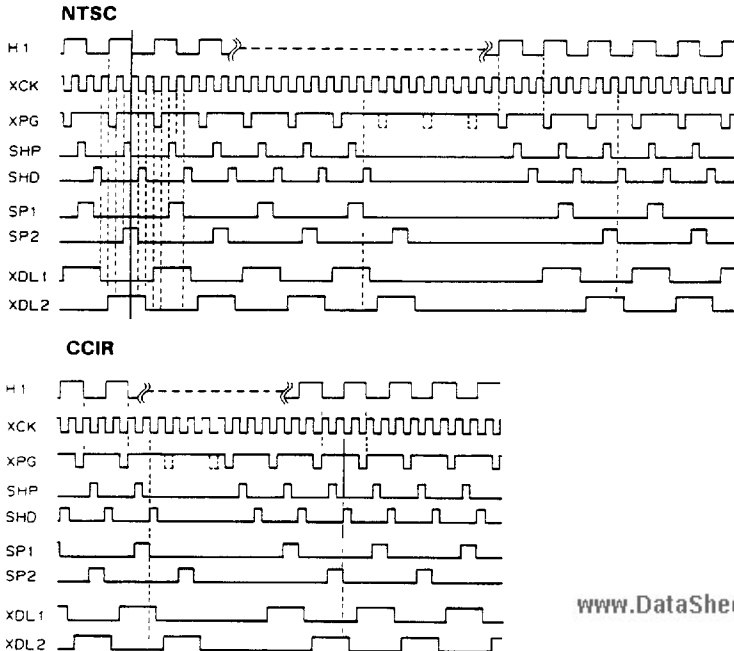


D2 data is latched by the register with the rising edge of D1, and taken inside with the falling edge of D0.

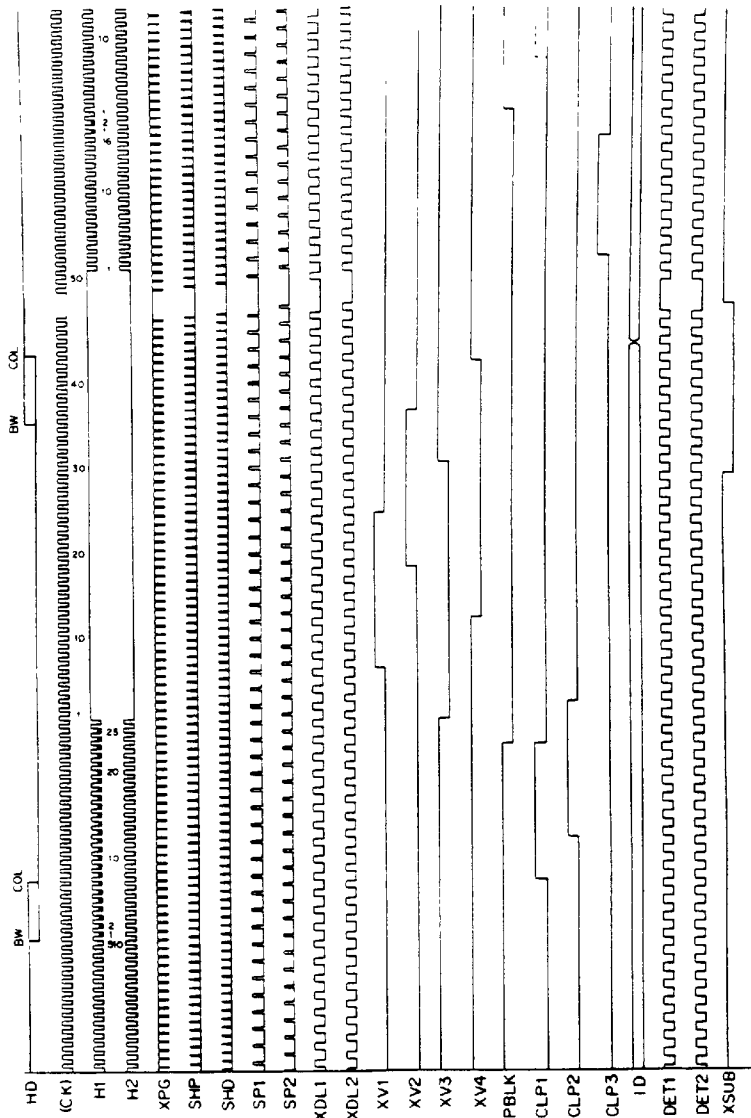
Application Circuit (NTSC mode, color mode)



Timing Chart 1. [High speed timing]

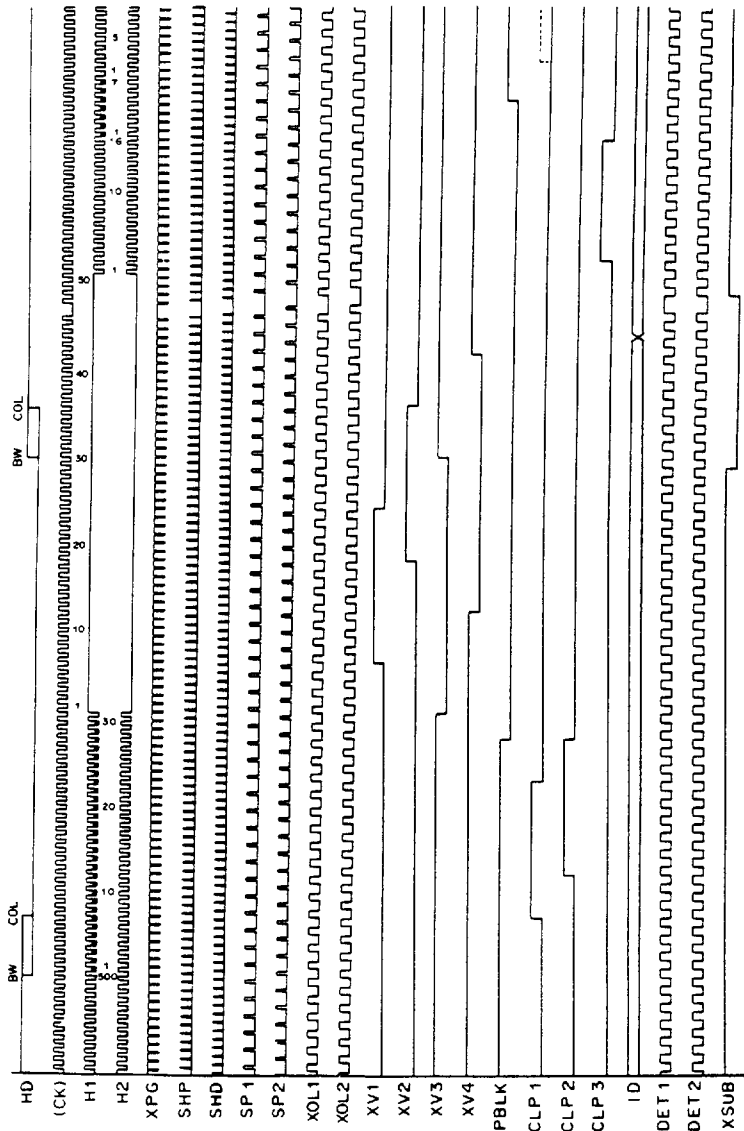


Timing Chart 2. [NTSC mode]

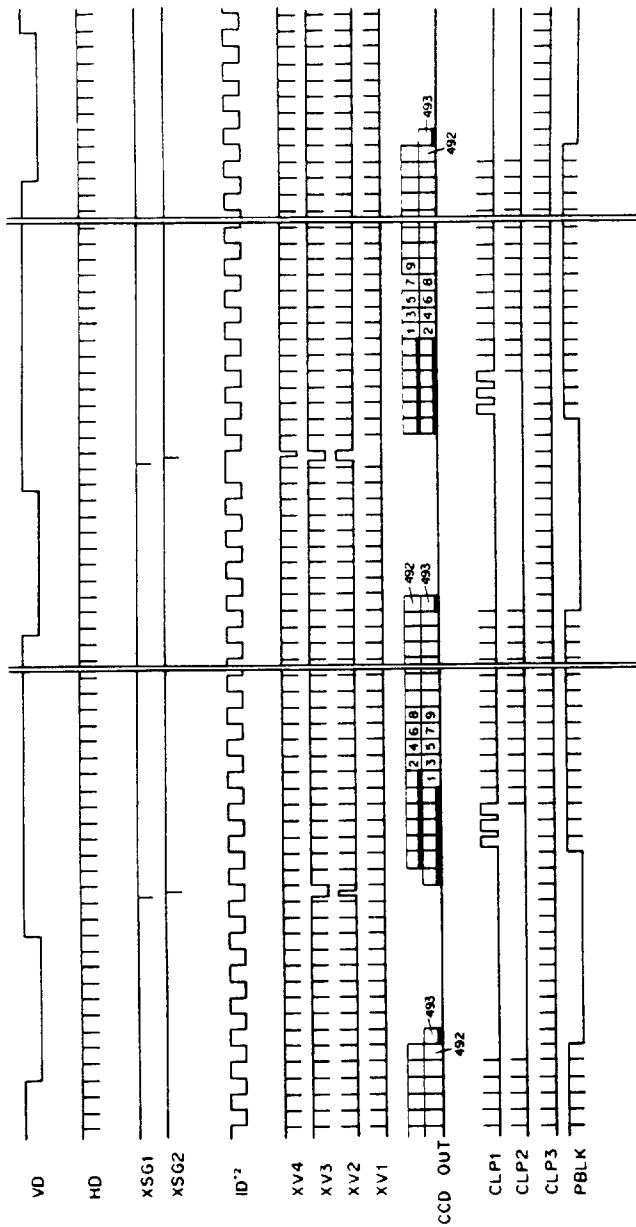




Timing Chart 3. [CCIR mode]

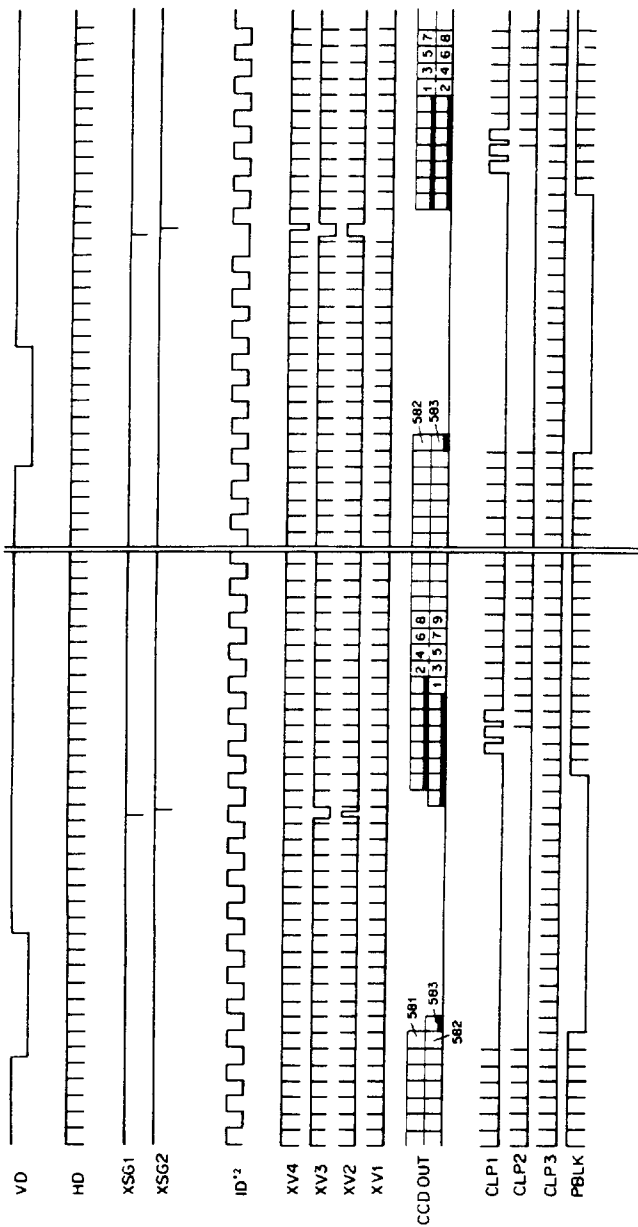


Timing Chart 4. [NTSC (Low speed timing) B/W mode]<sup>\*1</sup>



(Note) \*1. 1 H advance of the output signal to VD/HD in color mode.  
 \*2. 0 level in monochrome mode.

Timing Chart 5. [CCIR (Low speed timing)]\*1



Note \*1. 1 H advance of the output signal to VD/HD in color mode.  
 \*2. 0 level in monochrome mode.

Timing Chart 6. [XV1 to XV4 modulation]

