

## 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

48pin QFP (Plastic)

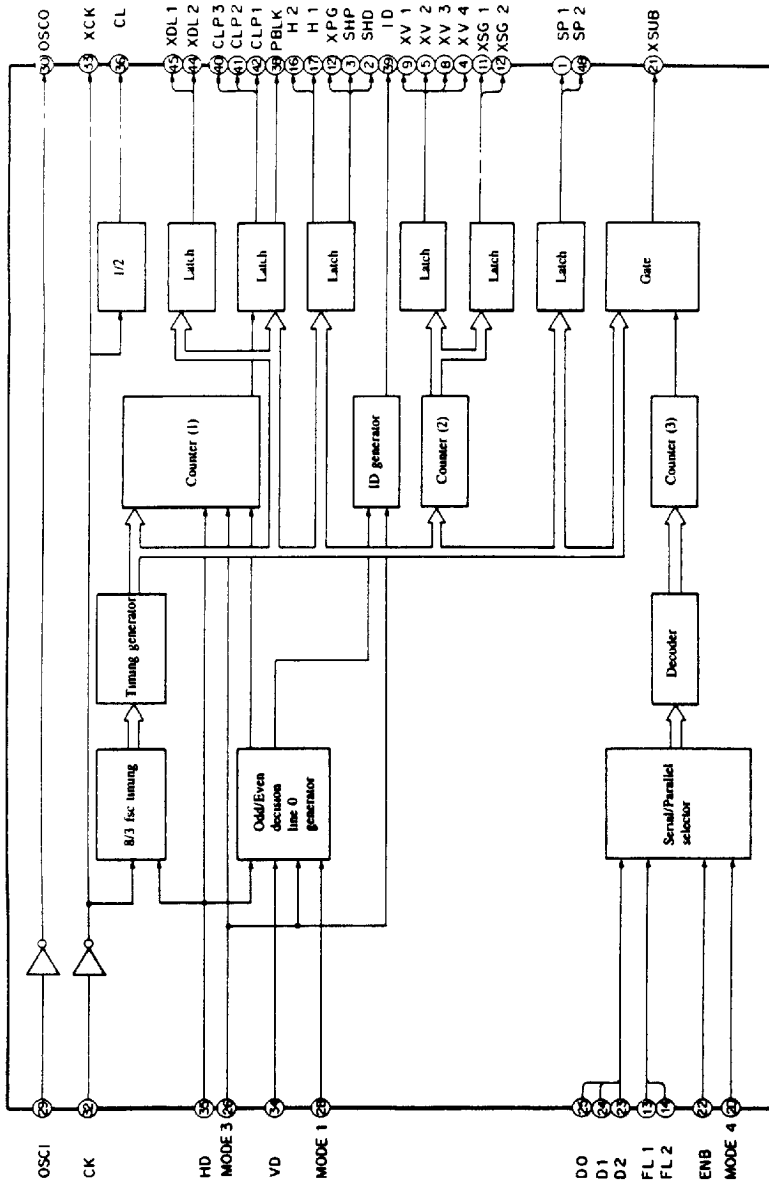


48pin VQFP (Plastic)

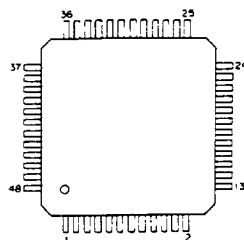
**Absolute Maximum Ratings (Ta = 25°C, Vss = 0V)**

|                         |      |                        |    |
|-------------------------|------|------------------------|----|
| • 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            | °C |

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  | D0     | 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 | VDD    | -   | +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                                |            | VDD       | 4.75   | 5.0  | 5.25   | V    |
| I/O voltage                                   |            | Vi, Vo    | VSS    |      | VDD    | V    |
| Input voltage (Logical value) CMOS input cell |            | VIH       | 0.7VDD |      |        | V    |
|                                               |            | VIL       |        |      | 0.3VDD |      |
| Schmitt trigger input voltage (D0, D1, D2)    |            | VT+       | 0.8VDD |      |        | V    |
|                                               |            | VT-       |        |      | 0.2VDD |      |
|                                               |            | VT+ - VT- | 0.7    | 0.9  |        |      |
| Input rising, falling time                    |            | tr, tf    | 0      |      | 500    | ns   |
| Operating temperature                         |            | Ta        | -20    |      | +75    | °C   |
| Output voltage 1                              | IOH = -2mA | VOH1      | *3     |      |        | V    |
|                                               | IOL = 4mA  | VOL1      |        |      | 0.4    | V    |
| *1<br>Output voltage 2                        | IOH = -4mA | VOH2      | *3     |      |        | V    |
|                                               | IOL = 8mA  | VOL2      |        |      | 0.4    | V    |
| *2<br>Output voltage 3                        | IOH = -8mA | VOH3      | *3     |      |        | V    |
|                                               | IOL = 8mA  | VOL3      |        |      | 0.4    | V    |

\*1. Pin 12 (XPG).

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

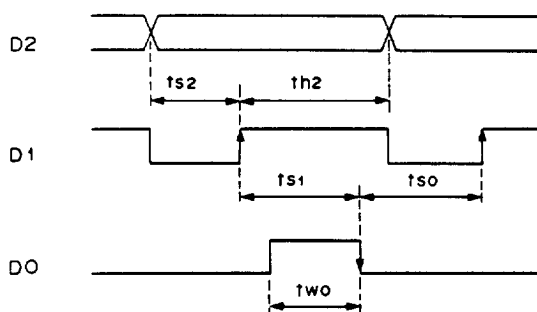
\*3. VDD-0.5

## 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          | $I_{OH} = -1\text{mA}$        | $V_{OH}$ | $V_{DD}/2$  |            |             | V        |
|                         | $I_{OL} = 1\text{mA}$         | $V_{OL}$ |             |            | $V_{DD}/2$  | V        |

## AC Characteristics

## Serial input mode



| Symbol | Item                                           | MIN. | MAX.       |
|--------|------------------------------------------------|------|------------|
| $ts2$  | D2 set up time vs. D1 rising edge              | 20nS | —          |
| $th2$  | D2 hold time vs. D1 rising edge                | 20nS | —          |
| $ts1$  | D1 rising edge set up time vs. D0 falling edge | 20nS | —          |
| $tw0$  | D0 pulse width                                 | 20nS | 50 $\mu$ S |
| $ts0$  | D0 falling edge set up time vs. D1 rising edge | 20nS | —          |

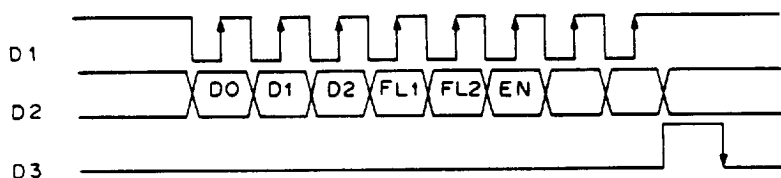
## Mode Setting

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

Table-1

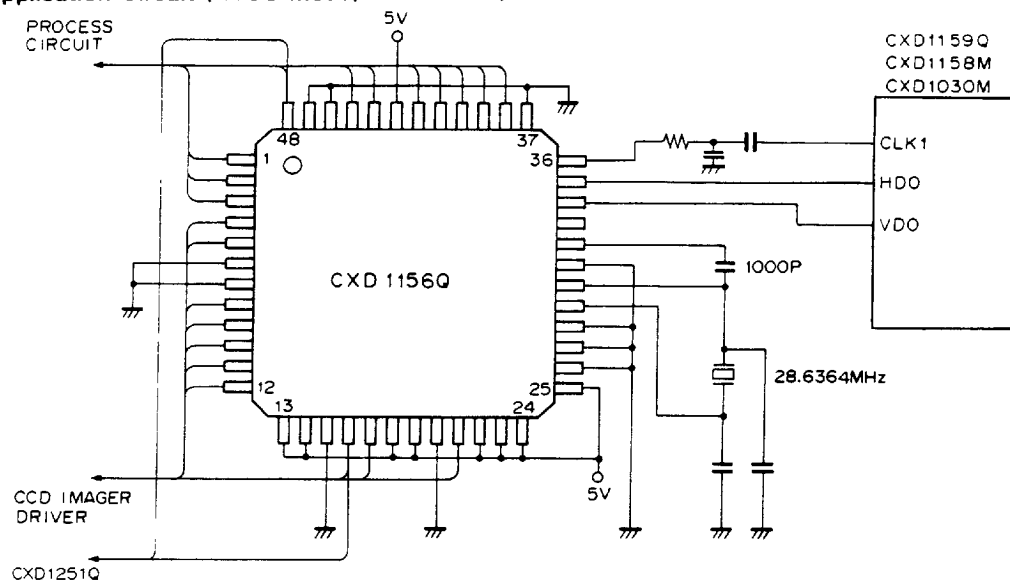
| ENB | MODE<br>3 | MODE<br>4 | FL1 | FL2 | D2 | D1 | D0 | Shutter<br>speed |
|-----|-----------|-----------|-----|-----|----|----|----|------------------|
| H   | L         | H         | H   |     | L  | L  | L  | 1/60             |
| H   | L         | H         | H   |     | L  | L  | H  | 1/125            |
| 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')

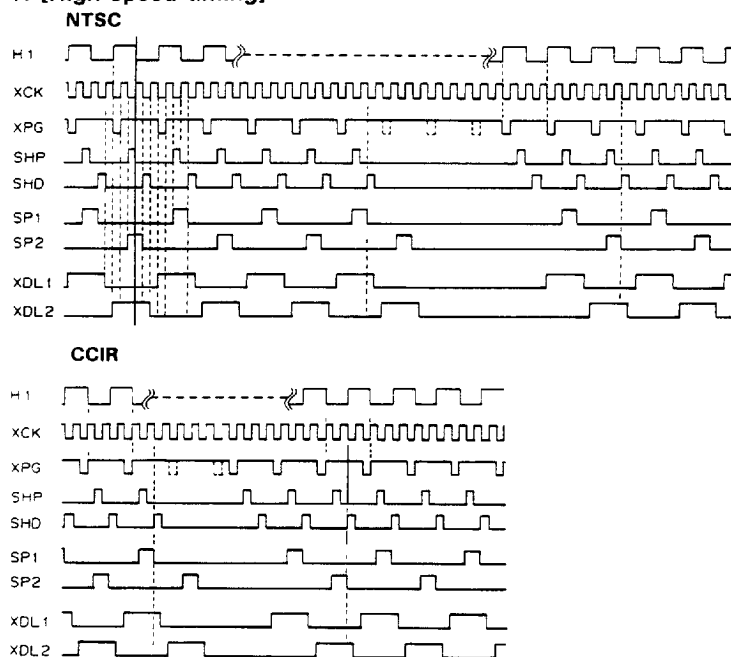


D2 data is latched by the register with the rising edge of D1, and taken inside with the falling edge of D0.

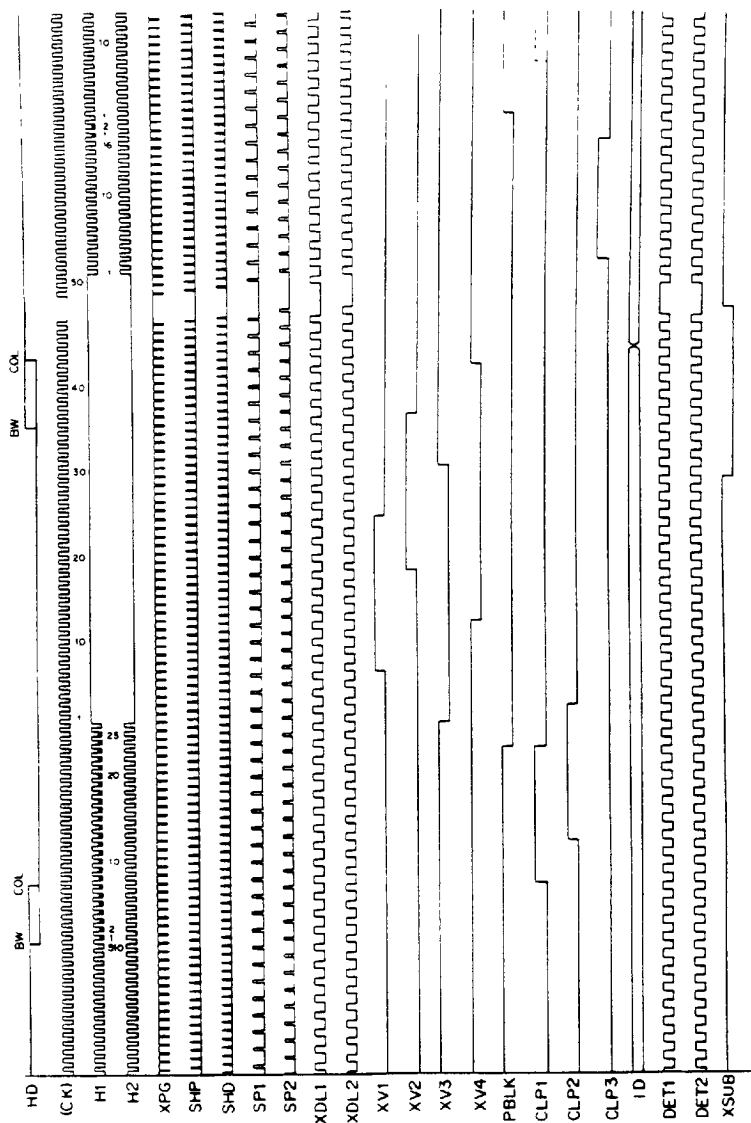
# Application Circuit (NTSC mode, color mode)



Timing Chart 1. [High speed timing]

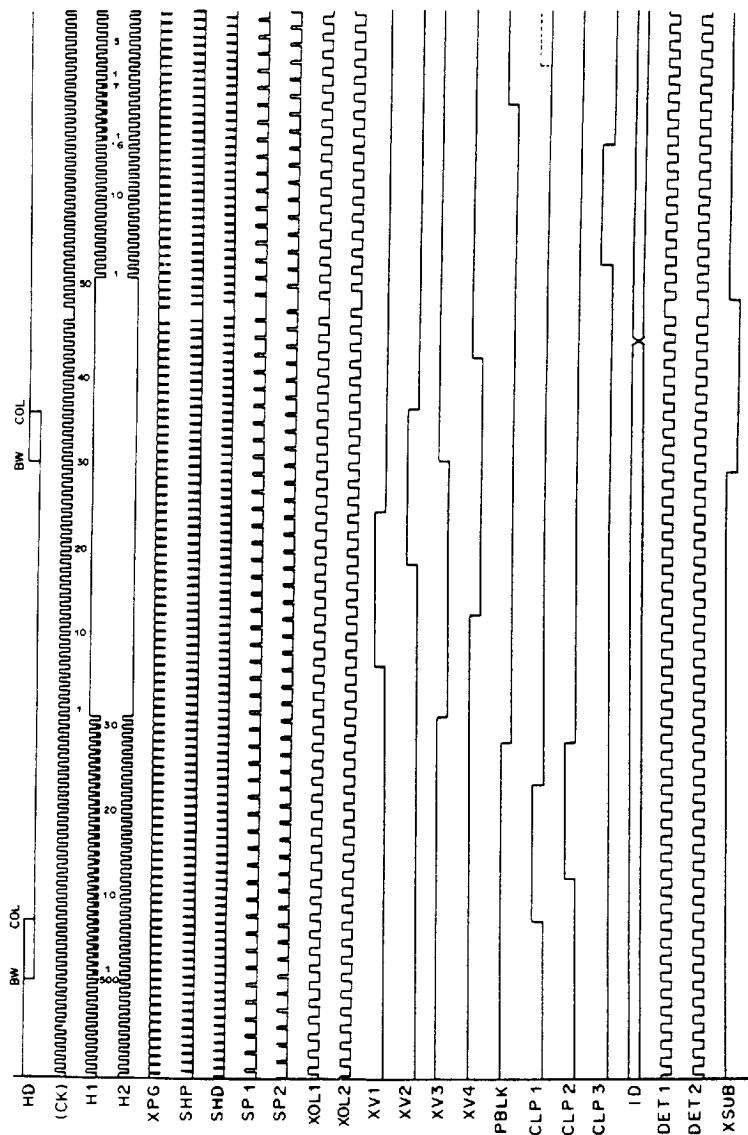


Timing Chart 2. [NTSC mode]

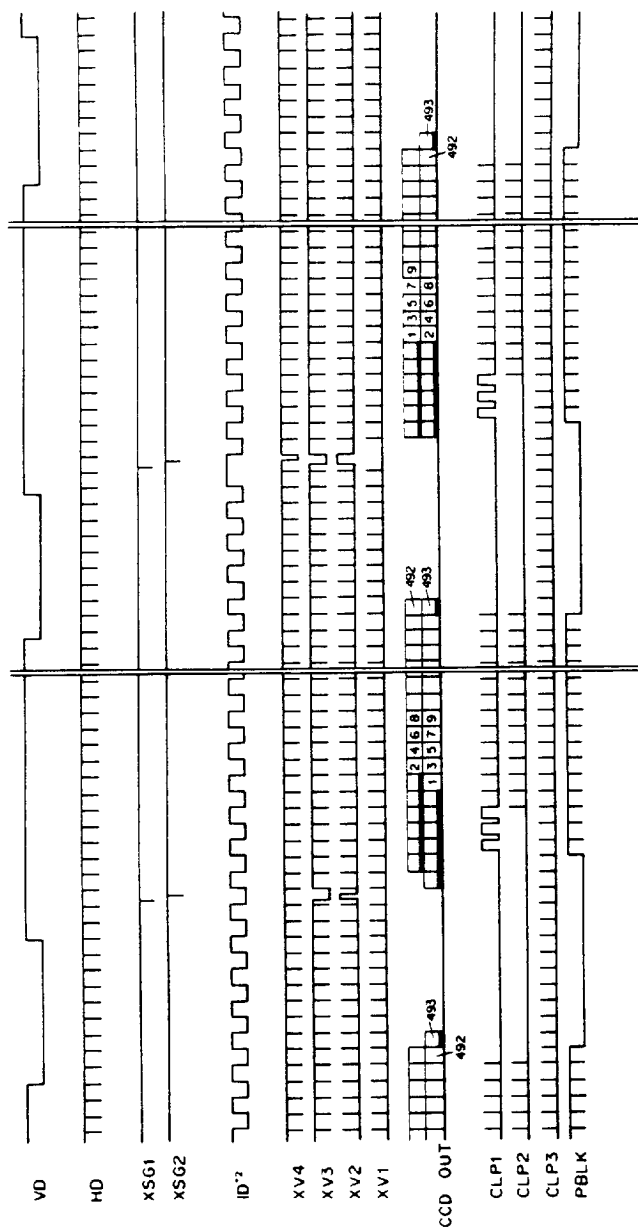




Timing Chart 3. [CCIR mode]

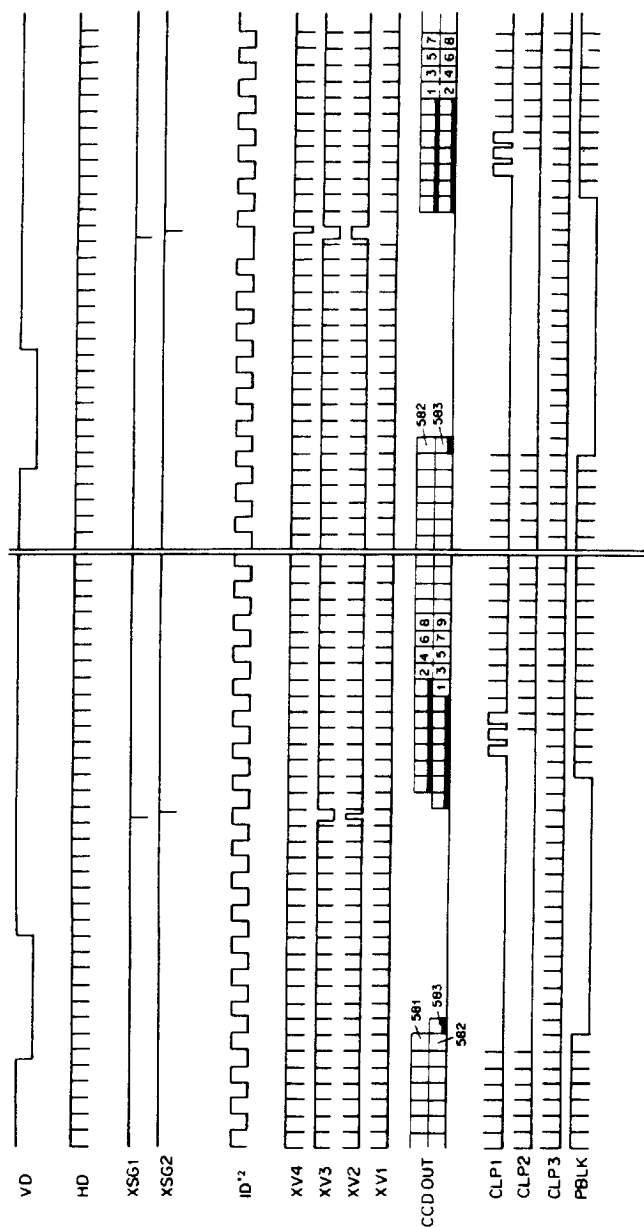


Timing Chart 4. [NTSC (Low speed timing) B/W mode]\*1



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)]<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 6. [XV1 to XV4 modulation]

