LZ95G69

Single-chip Driver LSI for CCD

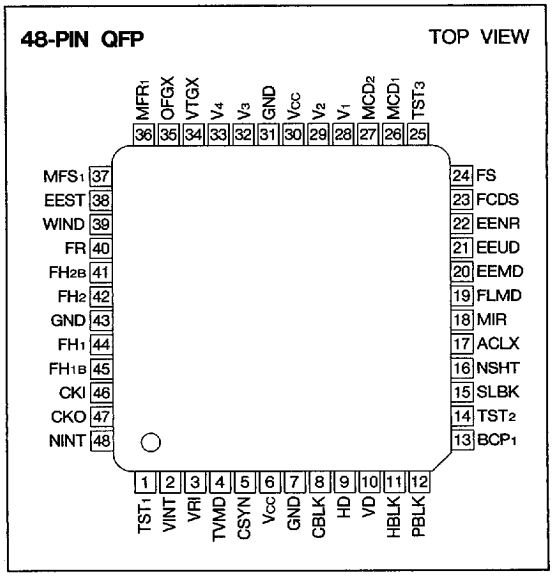
DESCRIPTION

The LZ95G69 is a CMOS single chip driver LSI which provides timing pulses used to drive a CCD area sensor, and generates synchronous pulses for TV signals and processing pulses for video signals.

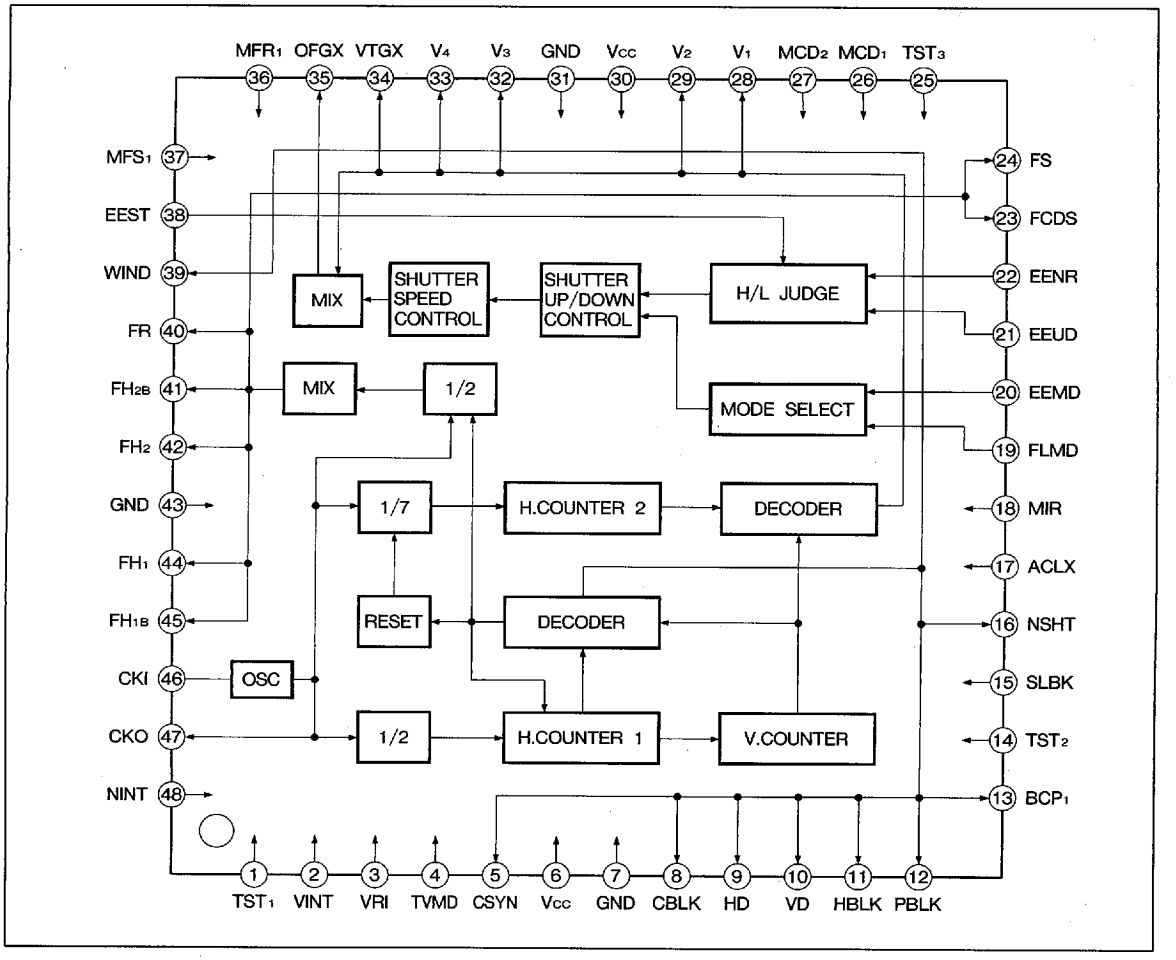
FEATURES

- Switchable between 190 000 pixels B/W CCD and 220 000 pixels B/W CCD
- Switchable between EIA and CCIR systems
- Built-in EE (Electronic Exposure) control (1/60 to 1/100 000 s for EIA; 1/50 to 1/100 000 s for CCIR)
- Flicker-less function
- Switchable between normal and mirror image
- Non-interlace mode is possible
- External synchronization is possible
- Single +5 V power supply
- Package : 48-pin QFP(QFP048-P-1010)

PIN CONNECTIONS



BLOCK DIAGRAM



ABSOULUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply voltage	V_{CC}	−0.3 to 7.0	V
Input voltage	V_I	−0.3 to V_{CC}+0.3	V
Output voltage	V_O	−0.3 to V_{CC}+0.3	V
Operating temperature	Topr	−20 to +70	°C
Storage temperature	Tstg	−55 to +150	°C

DC CHARACTERISTICS

(V_{CC} = +5 V±10%, Ta = −20 to +70°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	NOTE
Input Low voltage	V_{IL}				1.5	V	1
Input High voltage	V_{IH}		3.5			V	
Input Low threshold voltage	V_{T+}				3.7	V	2
Input High threshold voltage	V_{T-}		1.0			V	
Hysteresis voltage	$V_{T+}-V_{T-}$		0.4			V	
Input Low current	$\lvert I_{IL1} \rvert$	V_I=0 V			1.0	μA	3
	$\lvert I_{IL2} \rvert$	V_I=0 V	8.0		60	μA	4
Input High current	$\lvert I_{IH1} \rvert$	V_I=V_{CC}			1.0	μA	5
	$\lvert I_{IH2} \rvert$	V_I=V_{CC}	8.0		60	μA	6
Output High voltage	V_{OH1}	I_{OH}=−2 mA	4.0			V	7
Output Low voltage	V_{OL1}	I_{OL}=4 mA			0.4	V	
Output High voltage	V_{OH2}	I_{OH}=−6 mA	4.0			V	8
Output Low voltage	V_{OL2}	I_{OL}=12 mA			0.4	V	
Output High voltage	V_{OH3}	I_{OH}=−9 mA	4.0			V	9
Output Low voltage	V_{OL3}	I_{OL}=18 mA			0.4	V	

NOTES :

1. Applied to inputs (IC, ICD, ICU,IBF0).
2. Applied to input (ICSU).
3. Applied to inputs (IC, ICD, IBF0).
4. Applied to inputs (ICU, ICSU).
5. Applied to inputs (IC, ICU, ICSU, IBF0).
6. Applied to input (ICD).
7. Applied to outputs (OR1, OSC).
   (Output (OSC) measures on conditions that input (IBF0) level is 0 V or V_{CC}).
8. Applied to output (O6R12).
9. Applied to output (O6R13).

PIN FUNCTION

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	FUNCTION
1	TST_1	ICD	–	Test terminal 1	A test Pin. Set open or to L level in the Normal mode.
2	VINT	ICSU	–	Initialize input	An input pin for initializing circuit. It can be used field-reset input, and the circuit is initialized with the 1/2 dividing pulse of VINT. The frequency of VINT is 60 Hz in EIA or 50 Hz in CCIR. It may be occured jitter because of catching VINT pulse with the 1/2 dividing pulse of CKI (pin 46). The point of resetting is following, the trailing edge of VINT is advanced; At EIA mode, 0 to 148 ns from the start of ODD field. At CCIR mode, 0 to 148 ns from the start of 1st field. Set open or to H level when Internal Synchronization mode or no initializing.
3	VRI	ICSU	–	Vertical reset input	An input pin for resetting internal vertical counter. The input pulse is necessary 1/2 horizontal max. delay from vertical synchronous start point, because VRI is counted 2 times horizontal frequency. The point of resetting is following; At EIA mode, 3.5 H from the start of VD. At CCIR mode, 3 H from the start of VD. Set open or to H level when internal synchronization or using VINT (pin 2).
4	TVMD	ICU	–	TV mode select	An input pin to select TV standards. L level : EIA mode H level or open : CCIR mode
5	CSYN	O	⊓	Composite synchronizing pulse	Composite synchronous signal output pin.
6	Vcc	–	–	Power supply	Supply +5 V power.
7	GND	–	–	Ground	A grounding pin.
8	CBLK	O	⊓	Composite blanking pulse	Composite blanking pulse. At EIA mode : H; 10.52 ns, V; 20 H period. At CCIR mode : H; 11.26 ns, V; 25 H period.
9	HD	O	⊓	Horizontal drive pulse	The pulse occurs at the start of lines.
10	VD	O	⊓	Vertical drive pulse	The pulse occurs at the start of every field.
11	HBLK	O	⊓	Horizontal blanking pulse	A pulse that correspondes to the cease period of the horizontal transfer pulse.
12	PBLK	O	⊓	Pre-blanking pulse	Equivalent to CBLK (pin 8) pulse except for shorter pulse width with cut-off falling edge.
13	BCP_1	O	⊓	Optical black clamp pulse	A pulse to clamp the optical black signal. This pulse stays low during the absence of effective pixels within the vertical blanking.

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	FUNCTION
14	TST_2	ICD	–	Test terminal 2	A test pin. Set open or to L level in the Normal mode.
15	SLBK	ICD	–	Horizontal transfer pulse control	An input pin to control the horizontal transfer pulses [FH_1 (pin 44), FH_{1B} (Pin 45), FH_2 (Pin 42), FH_{2B} (pin 41)] . L level or open : Horizontal transfer pulses is intermittently. H level : Only minimum shutter speed, horizontal transfer pulses is continually.
16	NSHT	O	⎍	Minimum shutter speed index	The pulse is used for detecting minimum shutter speed. When shutter speed is minimum, the pulse is High level.
17	ACLX	ICU	–	All clear input	An input pin for resetting all internal cireuit at power on.
18	MIR	ICU	–	Mirror mode select	An input pin to select Mirror mode or Normal mode. L level : Normal Drive mode H level or open : Mirror Drive mode
19	FLMD	ICD	–	Flicker-less select	An input pin to select Flicker-less Shutter mode with EEMD (pin 20).
20	EEMD	ICD	–	Electronic Exposure select	An input pin to select Electronic Exposure mode with FLMD (pin 19). FLMD / EEMD / Shutter speed (s): EIA / CCIR L / L / 1/60 / 1/50 H / L / 1/100 / 1/120 L / H / 1/54 220 max. / 1/54 220 max. H / H / 1/98 540 max. / 1/98 540 max.
21	EEUD	IC	–	Electronic Exposure control 1	An input pin to control Electronic Exposure with EENR (pin 22).
22	EENR	IC	–	Electronic Exposure control 2	An input pin to control Electronic Exposure with EEUD (pin 21). EEUD / EENR / Shutter speed control H / L / up H / H / stop L / H / down
23	FCDS	O	⎍	CDS pulse 1	A pulse to clamp the feed-through level from CCD.
24	FS	O	⎍	CDS pulse 2	A pulse to sample-hold the signal from CCD.
25	TST_3	ICD	–	Test terminal 3	A test pin. Set open or to L level in the Normal mode.
26	MCD_1	ICU	–	FCDS phase control input	Pins to control the phase between the FH_1 (pin 44) and FCDS (pin 23).
27	MCD_2	ICU	–		

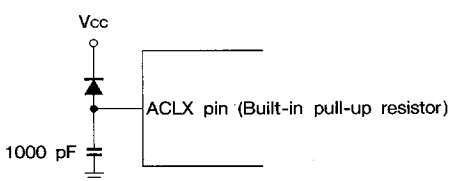
PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	FUNCTION
28	V_1	O	⊓	Vertical transfer pulse 1	A vertical transfer pulse for CCD. Connect to ϕ_{V1} pin of CCD.
29	V_2	O	⊓	Vertical transfer pulse 2	A vertical transfer pulse for CCD. Connect to ϕ_{V2} pin of CCD.
30	V_{CC}	–	–	Power supply	Supply +5 V power.
31	GND	–	–	Ground	A grounding pin.
32	V_3	O	⊓	Vertical transfer pulse 3	A vertical transfer pulse for CCD. Connect to ϕ_{V3} pin of CCD.
33	V_4	O	⊓	Vertical transfer pulse 4	A vertical transfer pulse for CCD. Connect to ϕ_{V4} pin of CCD.
34	VTGX	O	⊓	Read out pulse	A pulse that transfers the charge of the photodiode to the vertical shift register. Connect to VTG pin of CCD through the invert and level shift circuit.
35	OFGX	O	⊓	OFG pulse outpput	A pulse that sweeps the charge of the photodiode for electrical shutter. Connect to OFG of CCD through the invert, level shift and DC offset circuit. It is held at H level in Normal mode.
36	MFR_1	ICU	–	FR phase control input	Pins to control the phase between FH_1 (pin 44) and FR (pin 40).
37	MFS_1	ICU	–	FS phase control input	Pins to control the phase between FH_1 (pin 44) and FS (pin 24).
38	EEST	ICU	–	Electronic Exposure control 3	An input pin to control Electronic Exposure, with using EEUD (pin 21) and EENR (pin 22). L level : Electronic Exposure is stopped. H level or open : Electronic Exposure is operated.
39	WIND	O	⊓	Window pulse	A pulse for window pulse. When connected to EEST (pin 38), the operation of Electronic Exposure can be stopped at the upper side of monitor.
40	FR	O	⊓	Reset pulse	A reset pulse for CCD. Connect to ϕ_R of CCD through the DC offset circuit.
41	FH_{2B}	O	⊓	Horizontal transfer pulse 2B	A horizontal transfer pulse for CCD. Connect to ϕ_{H2B} of CCD.
42	FH_2	O	⊓	Horizontal transfer pulse 2	A horizontal transfer pulse for CCD. Connect to ϕ_{H2} of CCD.
43	GND	–	–	Ground	A grounding pin.
44	FH_1	O	⊓	Horizontal transfer pulse 1	A horizontal transfer pulse for CCD. Connect to ϕ_{H1} of CCD.
45	FH_{1B}	O	⊓	Horizontal transfer pulse 1B	A horizontal transfer pulse for CCD. Connect to ϕ_{H1B} of CCD.

PIN NO.	SYMBOL	I/O	POLARITY	PIN NAME	FUNCTION
46	CKI	IBF0	⎍	Clock input	An input pin for reference clock oscillation. The frequencies are as follows : At EIA mode : 13.500 MHz (858 fH) At CCIR mode : 13.500 MHz (864 fH) (fH = Horizontal frequency)
47	CKO	OSC	⎍	Clock output	An output pin for reference clock oscillation. The output is the inverse CKI (pin 46).
48	NINT	ICU	–	Non-interlace select	An input pin to select Non-interlace mode. L level : Interlace mode H level or open : Non-interlace mode At Non-interlace mode, the field is ODD field and 262 H period at EIA mode, and 1st field and 312 H period at CCIR mode.

IC : Input pin (CMOS level).
ICU : Input pin (CMOS level with pull-up resistor).
ICD : Input pin (CMOS level with pull-down resistor).
ICSU : Schmitt-trigger input pin (CMOS level with pull-up resistor).
OR1 : Output pin.
O6R12 : Output pin.
O6R13 : Output pin.
IBF0 : Input pin for oscillation.
OSCO : Output pin for oscillation.

NOTE :

1. How to use ACLX pin (pin 17)



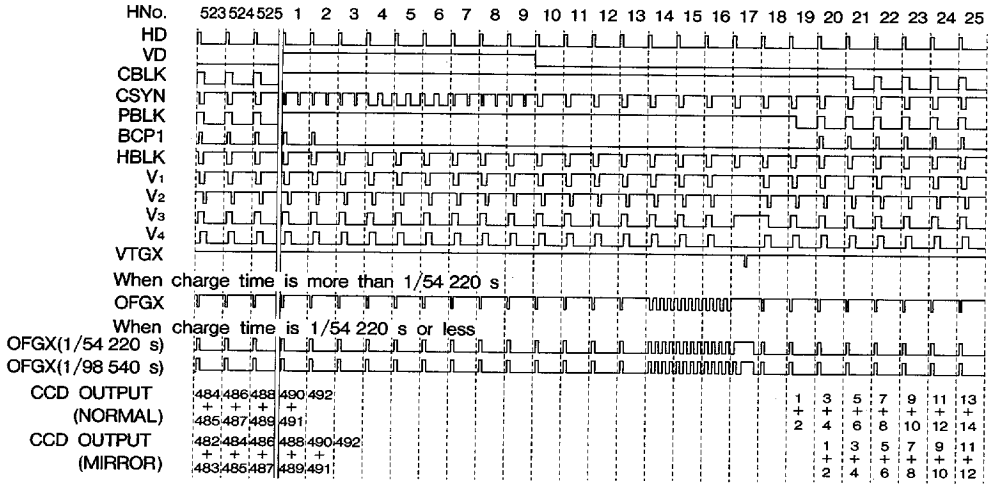
2. Shutter speed changes at Electronic Exposure Control mode

EIA		CCIR	
EXPOSURE TIME (μs)	SHUTTER SPEED (s)	EXPOSURE TIME (μs)	SHUTTER SPEED (s)
10.15	1/98 540	10.15	1/98 540
18.44	1/54 220	18.44	1/54 220
32.96	1/30 340	33.41	1/29 930
49.04	1/20 390	49.48	1/20 210
65.11	1/15 360	65.10	1/15 360
82.0	1/12 200	82.4	1/12 130
96.5	1/10 360	97.4	1/10 270
112.6	1/8 880	113.5	1/8 810
128.7	1/7 770	129.6	1/7 720
145.6	1/6 870	146.4	1/6 830
160.1	1/6 250	161.4	1/6 200
176.1	1/5 680	177.5	1/5 630
192.2	1/5 200	193.6	1/5 170
209.1	1/4 780	210.4	1/4 750
271.6	1/3 680	273.4	1/3 660
(every 63.6 μs)		(every 64.0 μs)	
1 288.5	1/776	1 425.4	1/702
(every 254.2 μs)		(every 256.0 μs)	
4 339.2	1/230	4 625.4	1/216
(every 572.0 μs)		(every 576.0 μs)	
16 351.2	1/61.1	19 473.4	1/51.4

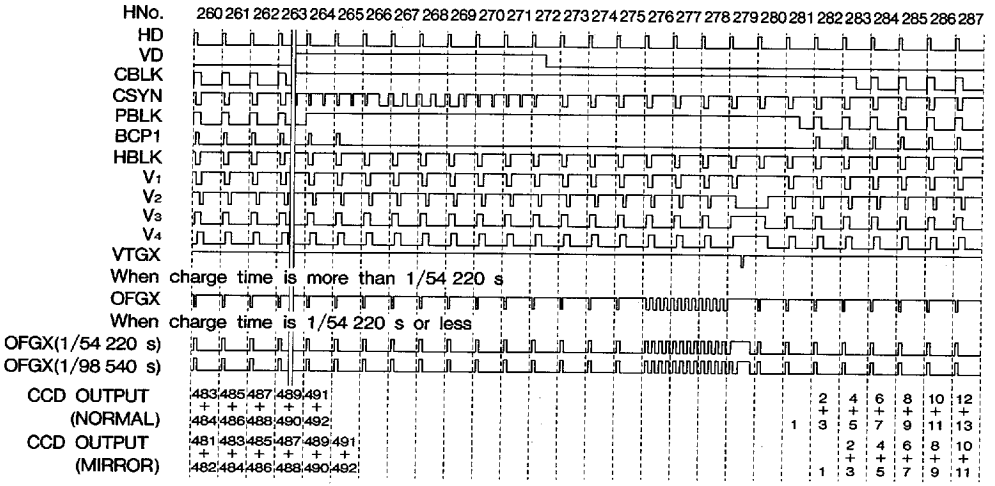
TIMING DIAGRAM

VERTICAL PULSE TIMING < NTSC >

(ODD FIELD)

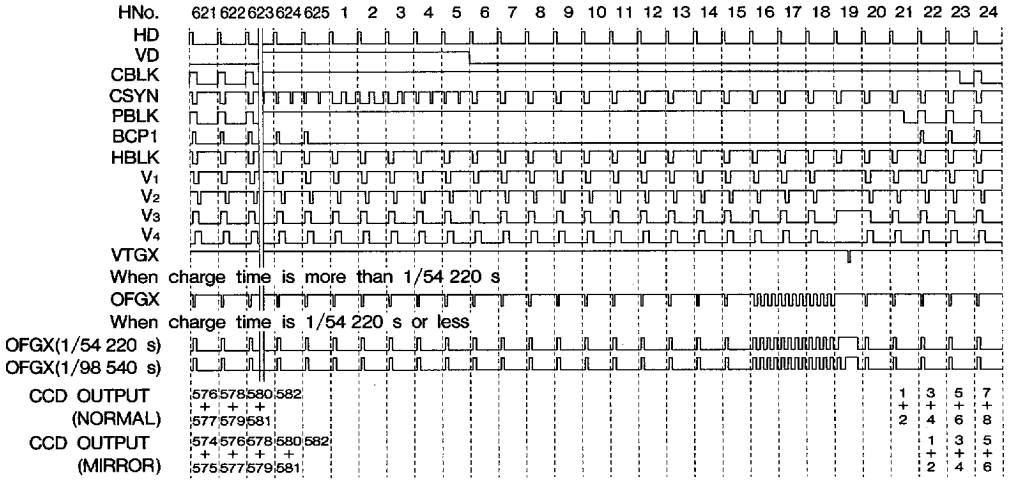


(EVEN FIELD)

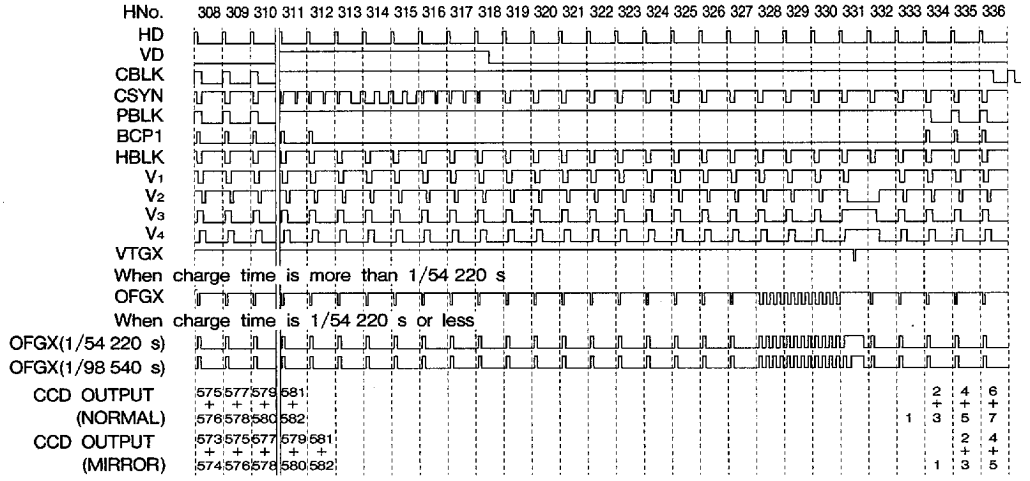


VERTICAL PULSE TIMING < PAL >

(1st, 3rd FIELD)

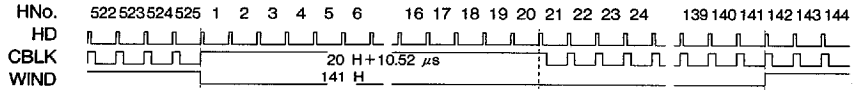


(2nd, 4th FIELD)

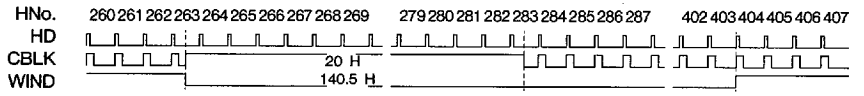


"WIND" PULSE TIMING < NTSC >

(ODD FIELD)

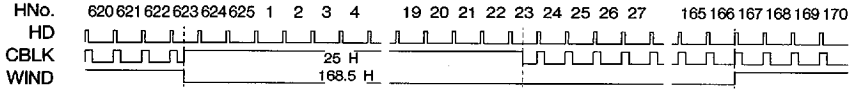


(EVEN FIELD)

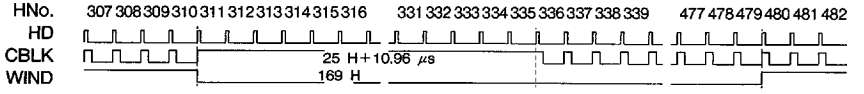


"WIND" PULSE TIMING < PAL >

(1st, 3rd FIELD)

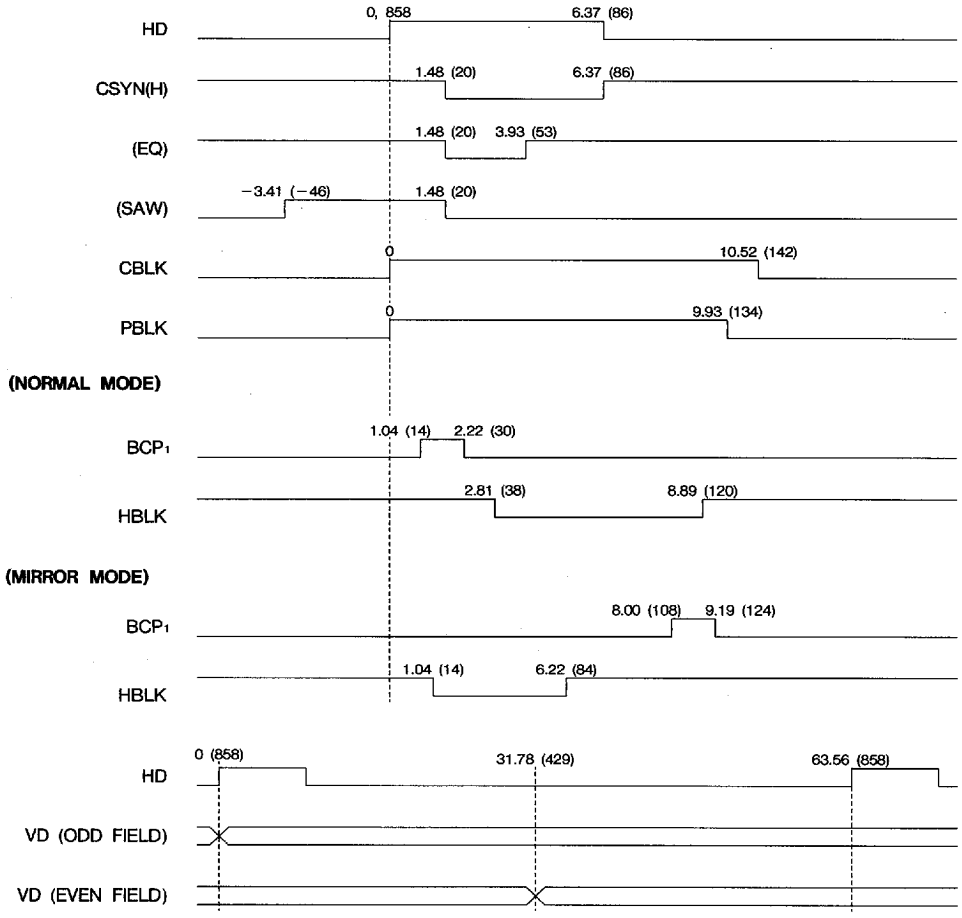


(2st, 4rd FIELD)



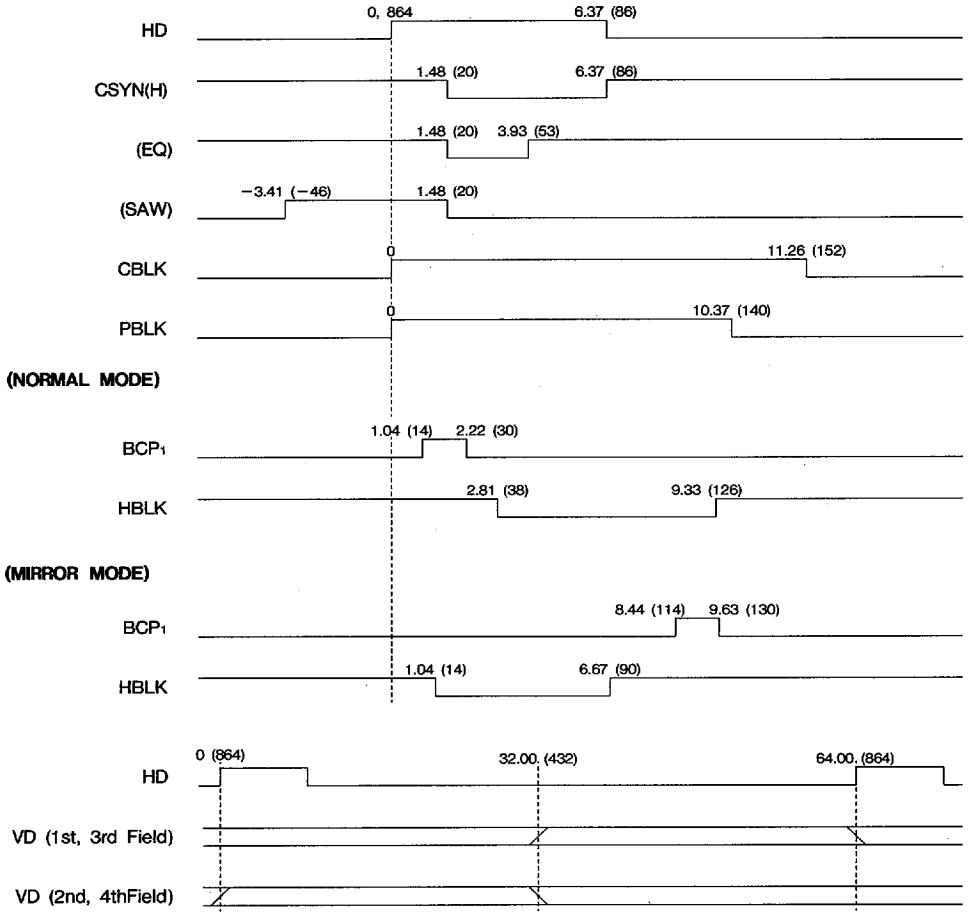
HORIZONTAL PULSE TIMING < NTSC > Unit : μs

The inside of ( ) is a number of CKI clock.

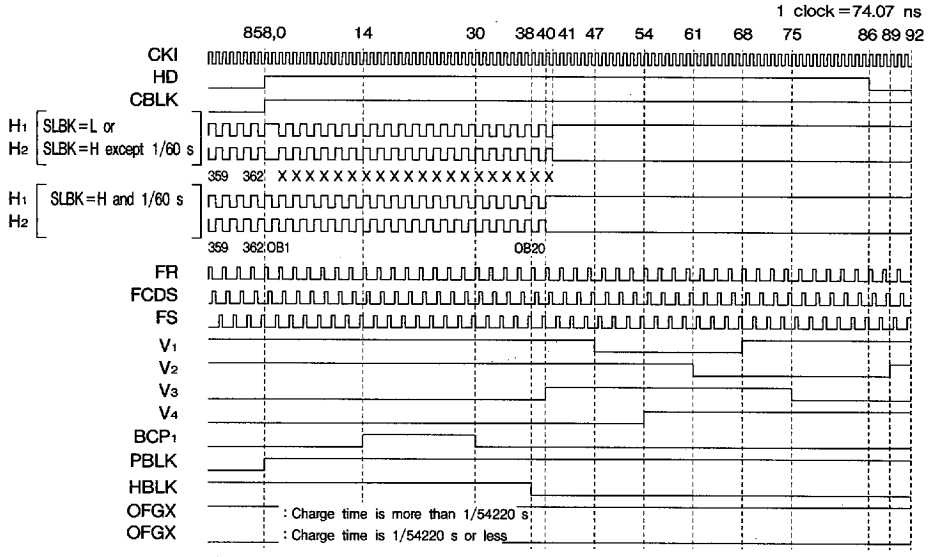


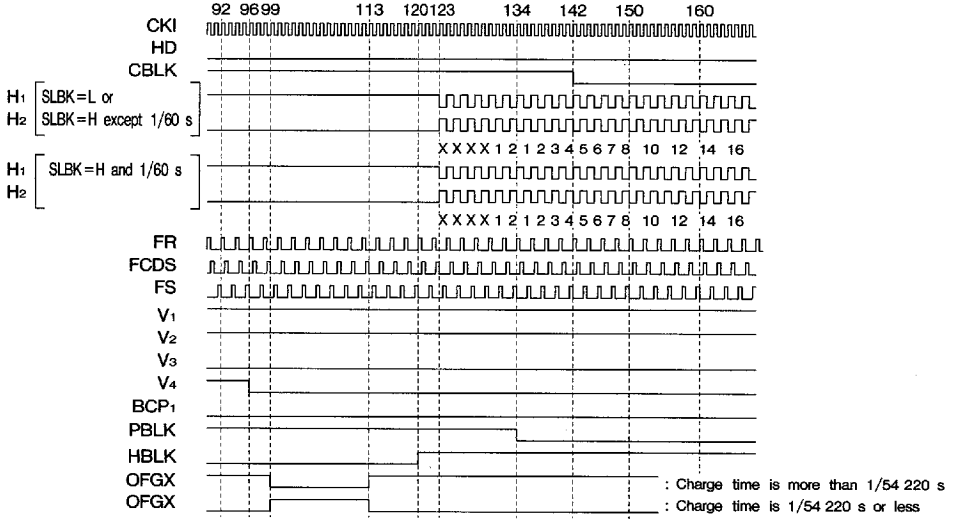
HORIZONTAL PULSE TIMING < PAL > Unit : μs

The inside of ( ) is a number of CKI clock.



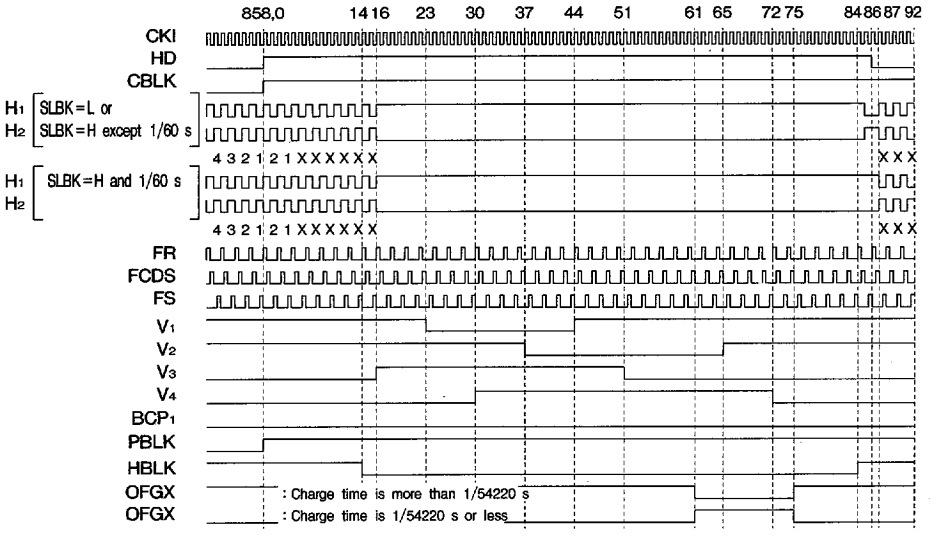
HORIZONTAL TIMING < NTSC, NORMAL MODE >

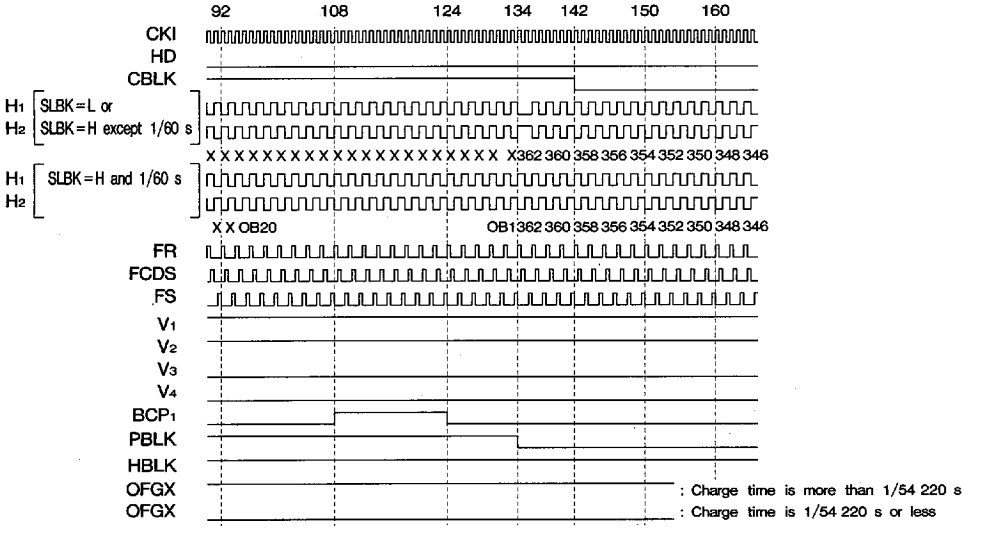




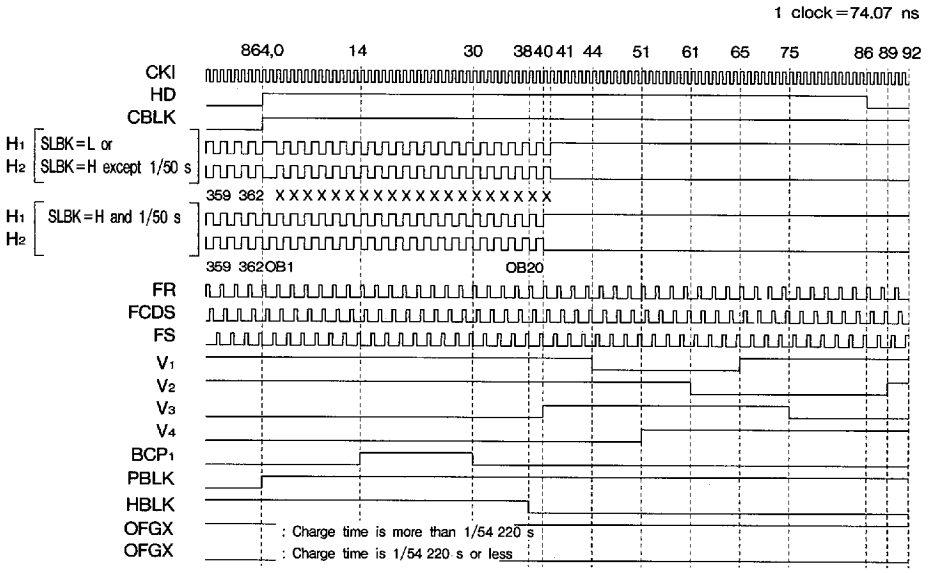
HORIZONTAL TIMING < NTSC, MIRROR MODE >

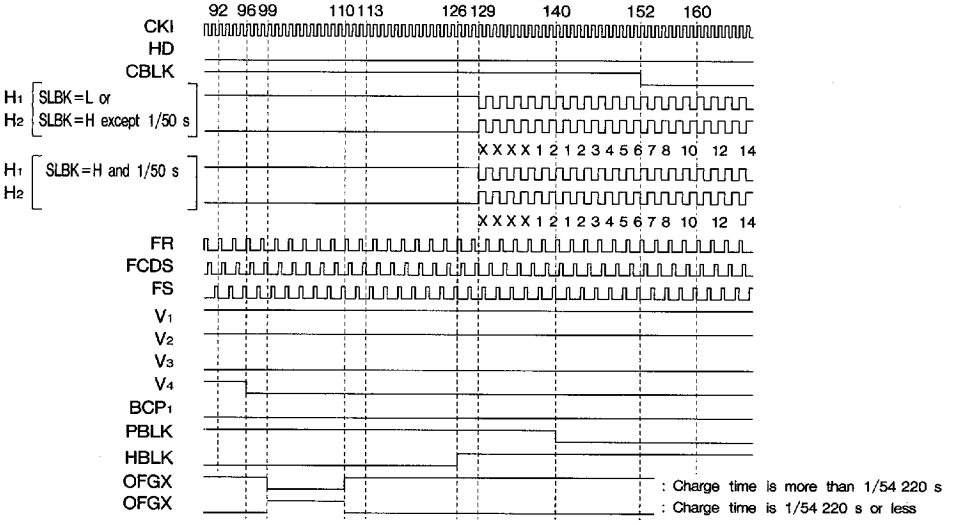
1 clock = 74.07 ns



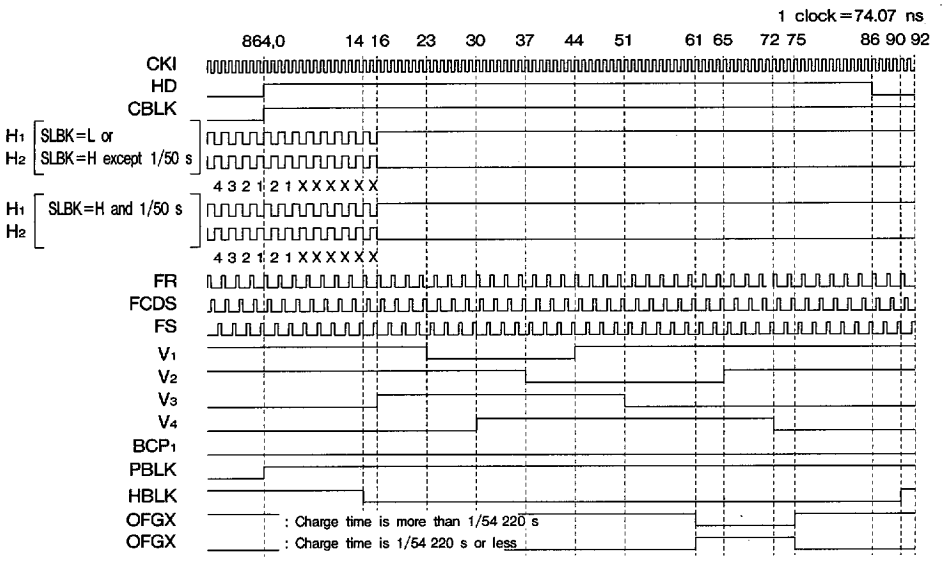


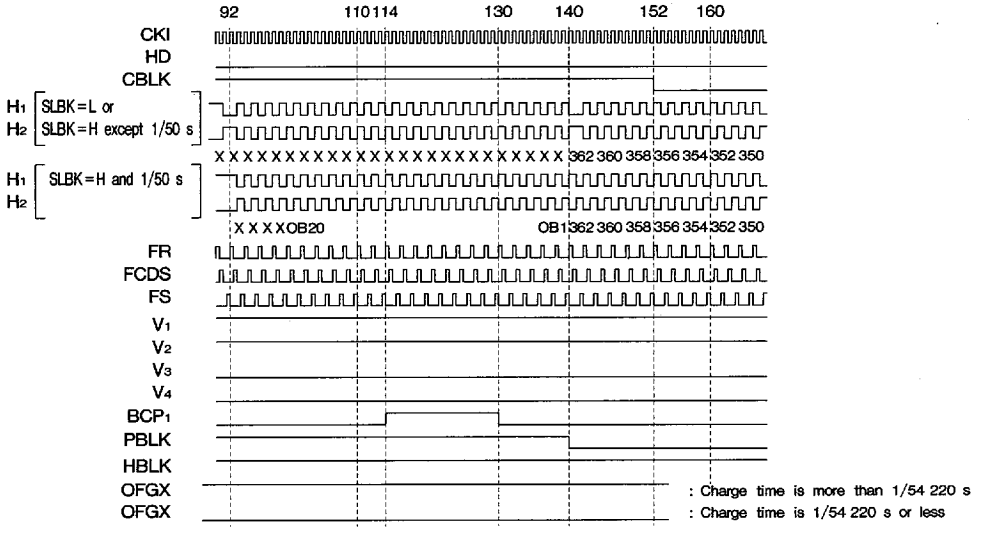
HORIZONTAL TIMING < PAL, NORMAL MODE >





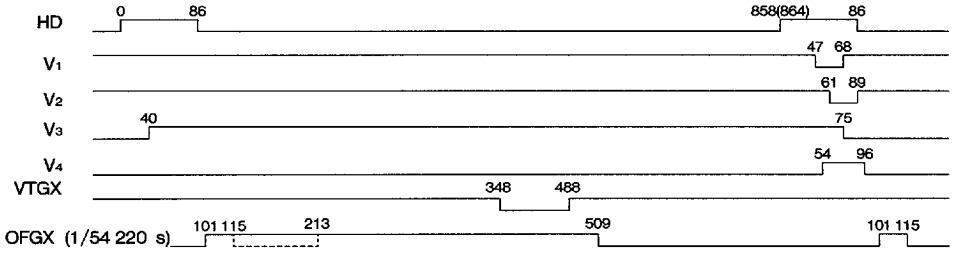
HORIZONTAL TIMING < PAL, MIRROR MODE >



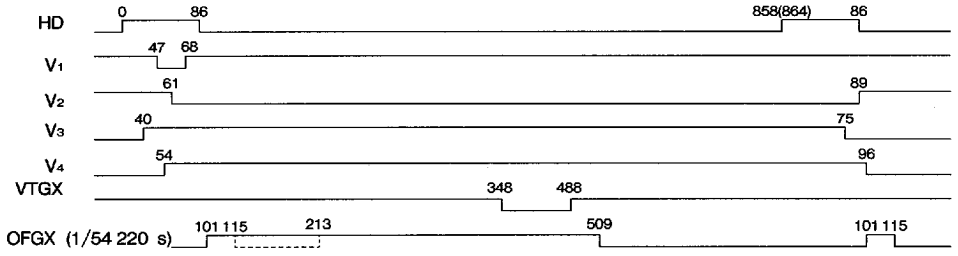


READ OUT PULSE TIMING < NORMAL MODE >

(ODD (1st, 3rd) FIELD)

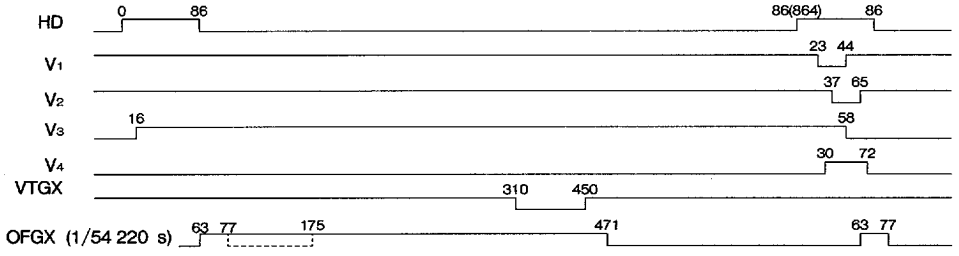


(EVEN (2nd, 4th) FIELD)

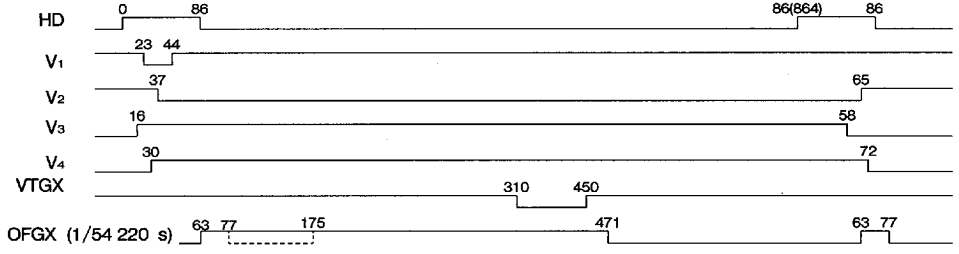


READ OUT PULSE TIMING < MIRROR MODE >

(ODD (1st, 3rd) FIELD)



(EVEN (2nd, 4th) FIELD)



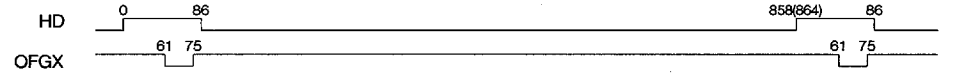
OFD PULSE TIMING

The number : clock pulse, ( ) : PAL

• Charge time is more than 1/4780 s (1/4750 s)
[While shutter speed changes every 9 H, 4 H, 1 H.]

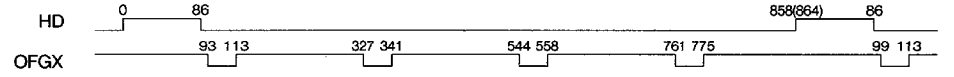
(NORMAL MODE)

(MIRROR MODE)



• Charge time is more than 1/4780 s (1/4750 s) to 1/54 220 s
[While shutter speed changes every 1/4 H.]

(NORMAL MODE)



(MIRROR MODE)