TOSHIBA

Technical Information

18cm FULL-COLOR
TFT-LCD MONITOR MODULE
TFD70W10-MM1

1. FEATURE

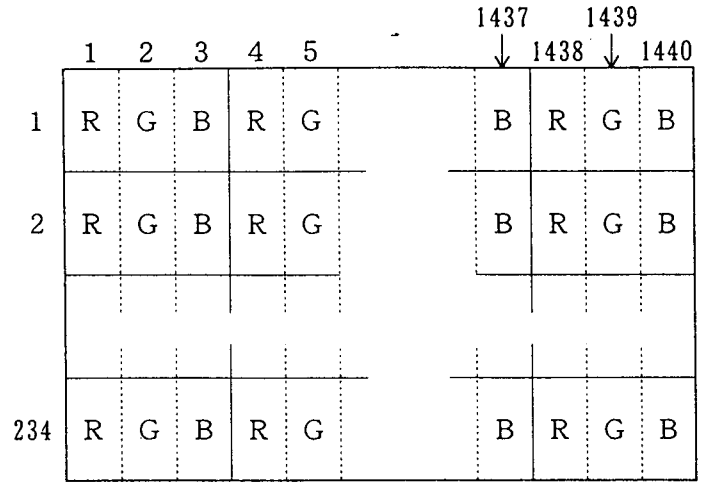
(1) 18cm (7.0 inch) diagonal and wide display. (The ratio 9(H):16(W))
(2) High resolution display. (234(H)×480(W) pixel)
(3) High luminance. (350 cd/m²)
(4) Wide viewing angle spec..
(5) Wide range temperature. (operating:−20 to +60℃, storage:−40 to +85℃)
(6) Anti-glare surface.
(7) Composite video signal (NTSC) and analog RGB signal (NTSC/PAL) interface.
(8) +9.0V single power supply.

2. MECHANICAL SPECIFICATIONS

Items		Specifications	Note
Screen Size		18cm (7-inch) diagonal screen	
Display Mode		TN full color, Transmissive type	Normally white
Input Signal	Composite	Composite Video Signal (NTSC)	1.0Vp-p, Zin=75Ω
	Analog RGB	Analog RGB Signal (NTSC/PAL)	0.7Vp-p, Zin=75Ω
		Composite Sync. Signal Negative Polarity	1.0Vp-p, Zin=75Ω
Output Signals		Horizontal / Vertical Sync. Output Negative Polarity	5Vp-p (C-MOS level)
Dimensional Outline		167.05(W)×102.0(H)×16.0 Max.(D)	[unit:mm]
Active Area		154.1(W)× 87.0(H)	[unit:mm]
Pixel Arrangement		RGB stripe	1)
Number of Pixels		480(W)×234(H) (RGB trio)	
Number of Sub Pixels		1440(W)×234(H)	
Pixel Pitch		0.321(W)× 0.372(H)	[unit:mm]
Backlight	Type	Cold-cathode fluorescent lamp for side lighting. (コ-type)	
	Dimmer	3～100% (Dimmer Frequency:100Hz)	
Viewing Direction		12 o'clock (in direction of Max. contrast ratio)	
Surface Treatment		Anti-glare coating on LCD panel surface	

3 Sep. 1998

Note 1 : Pixel Arrangement



3. ABSOLUTE MAXIMUM RATINGS

Items		Symbol	Conditions	Absolute Maximum Ratings[2]		Unit	Remarks
				Min.	Max.		
Supply Voltage	for Video Circuit	VCC	Ta=25±5℃ VSS=0V	VSS -0.2	13.0	V	
	for B/L Inverter	VBL		VSS -0.2	11.0	V	
Input Signal Voltage	Composite Video	VIDEO	Ta=25±5℃ VSS=0V VCC=9.0V VBL=9.0V Zin=75Ω	—	1.5	Vp-p	
	Analog RGB	R, G, B		—	1.5	Vp-p	
	Composite sync.	SYNC		—	1.5	Vp-p	
	Color, Tint Bright Dimmer	COLOR, TINT BRT, DIM	Ta=25±5℃ VSS=0V VCC=9.0V VBL=9.0V	VSS -0.3	VDD +0.3	V	
	Signal Switch	SSW, VSW MODE 1～3 L/R, U/D		VSS -0.3	VDD +0.3	V	
Operating Temperature		Top	—	-20	60	℃	3) 4)
Storage Temperature		Tstg	—	-40	85	℃	3)

Note 2 : Do not exceed the maximum rating values under the worst probable conditions taking into account the supply voltage variation, input voltage variation, variation in part constants, and ambient temperature and so on. Otherwise the module may be damaged.

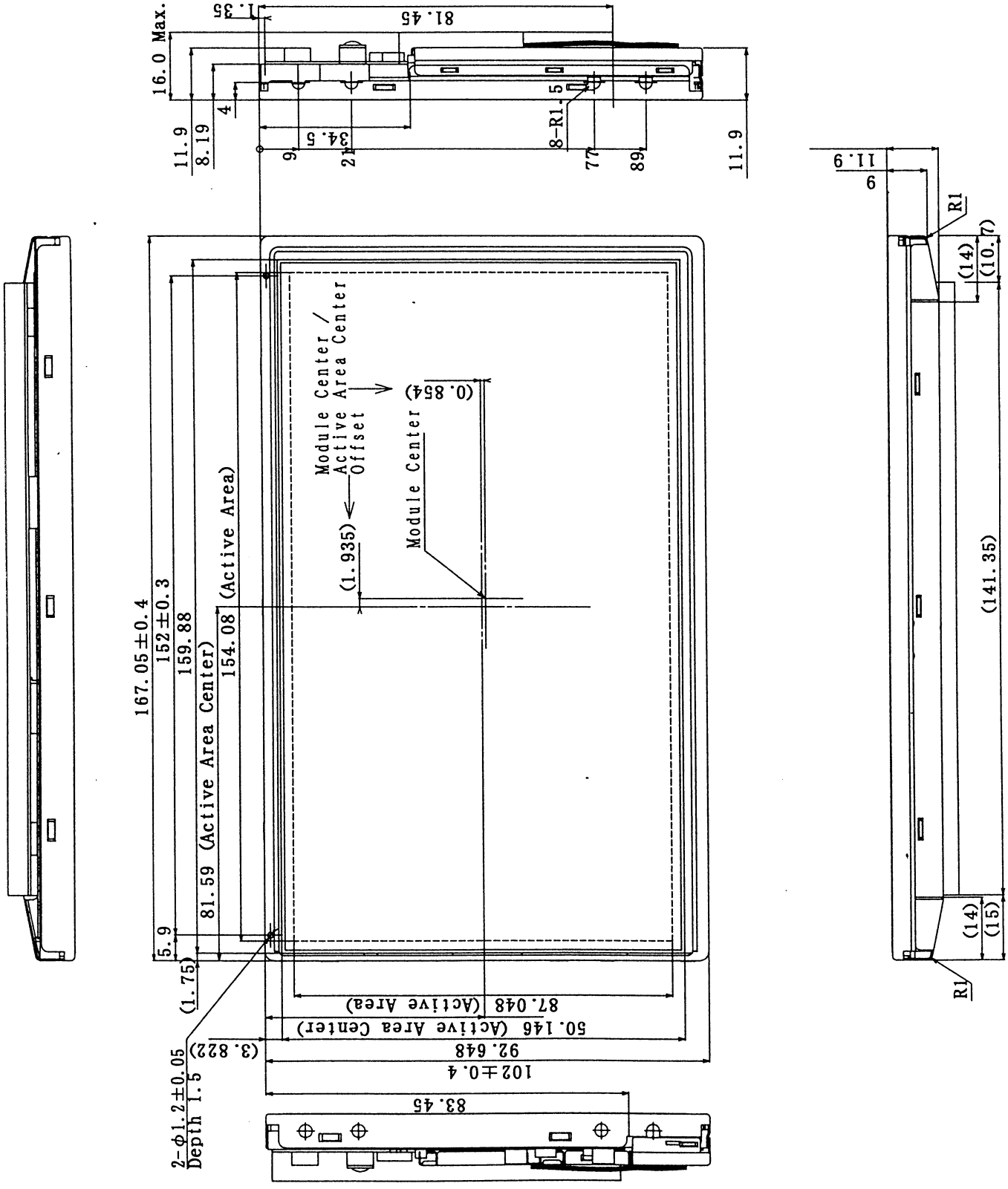
Note 3 : Environmental temperature.
(Environmental temperature define the area bigger than LCD by 5mm per each dimension.)

Note 4 : The temperature of the module rises under the influence of the backlight. Please design that any parts of this monitor module dose not to exceed 85℃.

4. OUTLINE DIMENSIONS

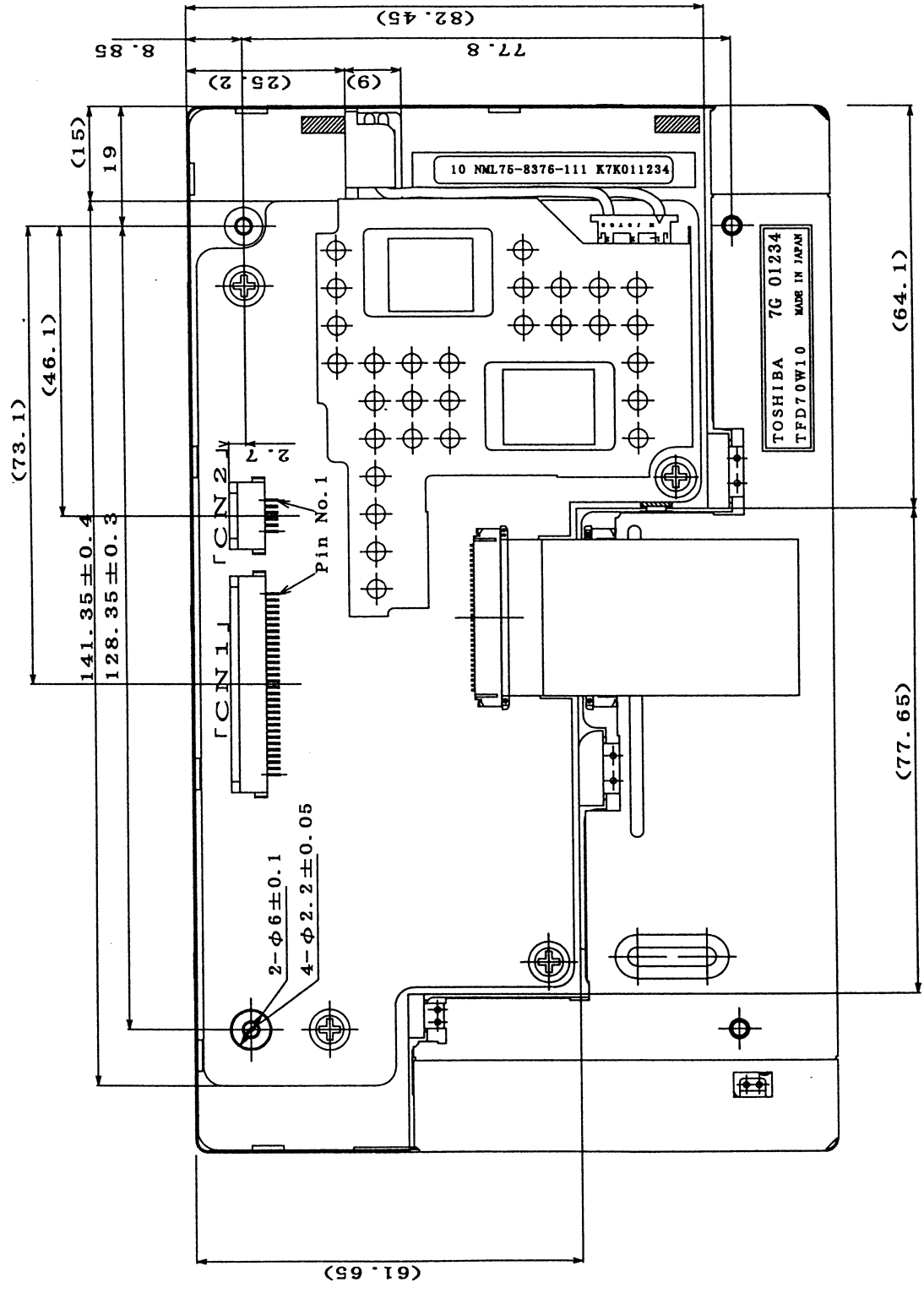
(a) Front View

Unit : mm
Standard tolerance : 0.5mm



(b) Rear View

Unit : mm
Standard tolerance : 0.5mm



* : These values are measured on the condition that the TFT-LCD module are fixed at each corner using appropriate screws.

** : [Recommend Screws]

Tapping Screw : φ2.5mm L=3.0 mm×4 (JIS 1115 TYPE2)

Torque pressure : 27.44 N·cm

5. RECOMMENDED OPERATING CONDITIONS

(Ta=25±5℃, VSS=0V)

Items		Symbol	Conditions	Specifications [6]			Unit	Remark
				Min.	Typ.	Max.		
Supply Voltage	for Video Circuit	VCC	—	8.5	9.0	9.5	V	[6]
	for B/L Inverter	VBL		8.5	9.0	9.5	V	[6]
Input Signal Voltage	Composite Video	VIDEO	75Ω	—	1.0	—	Vp-p	
	Analog RGB	R,G,B		—	0.7	—	Vp-p	
	Composite Sync.	SYNC		—	1.0	—	Vp-p	
	Bright	BRT	VCC=9.0V	—	2.6	—	V	[7]
	Tint	TINT		1.0	2.7	—	V	[7]
	Color	COLOR		—	2.5	—	V	[7]
	B/L Dimmer Adjust	DIM		1.35	—	3.90	V	
	Signal Switch	SSW,VSW L/R,U/D MODE1～3	H Level	3.5	—	5.3	V	
			L Level	0.3	—	1.5	V	
Frame Frequency		fVDN	NTSC	57.14	59.939	62.86	Hz	
		fHDN		15.00	15.734	16.50	kHz	
		fVDP	PAL	48.64	50.00	51.20	Hz	
		fHDP		15.20	15.625	16.00	kHz	

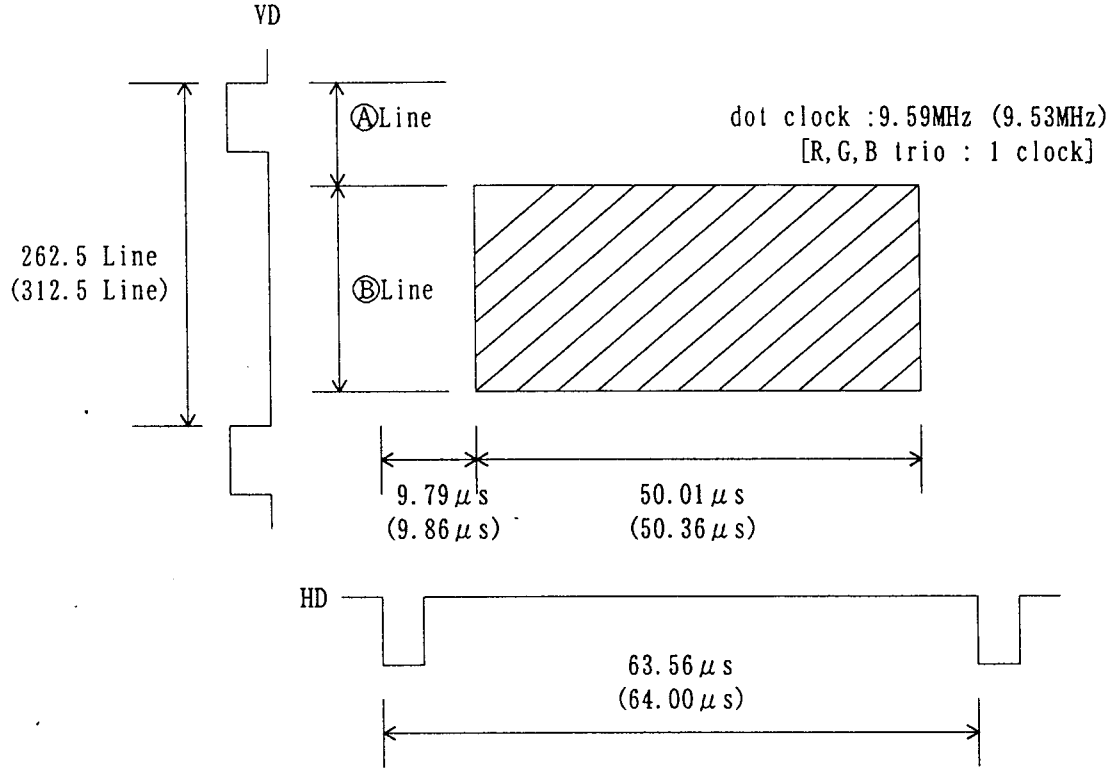
Note 5 : The recommended operating conditions show the ranges in which the device can operate normally.
Operation beyond the limit of the recommended operating conditions is not assured, even though operating conditions are within the limit of the absolute maximum ratings.

Note 6 : Use power supplies with capacity lower than 3A.

Note 7 : Optimization of input voltage on viewing angle is necessary.

6. TIMING DIAGRAM

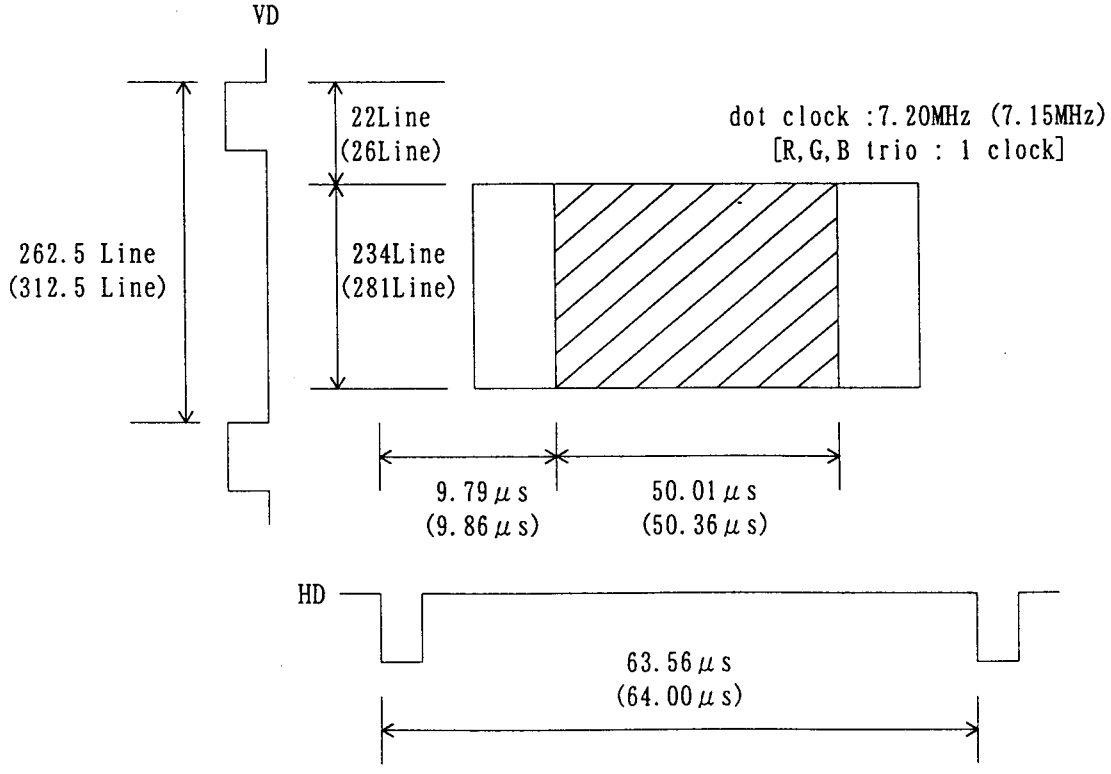
[Case 1 : Full mode / Wide mode / Zoom 1～3 mode]



※ : Value of Ⓐ and Ⓑ are different among display modes refer to 2.7 Electrical Characterictics.

※ : Values in brackets correspond to PAL mode.

[Case 2 : 4:3 mode (Normal Center / Normal Left / Normal Right)]

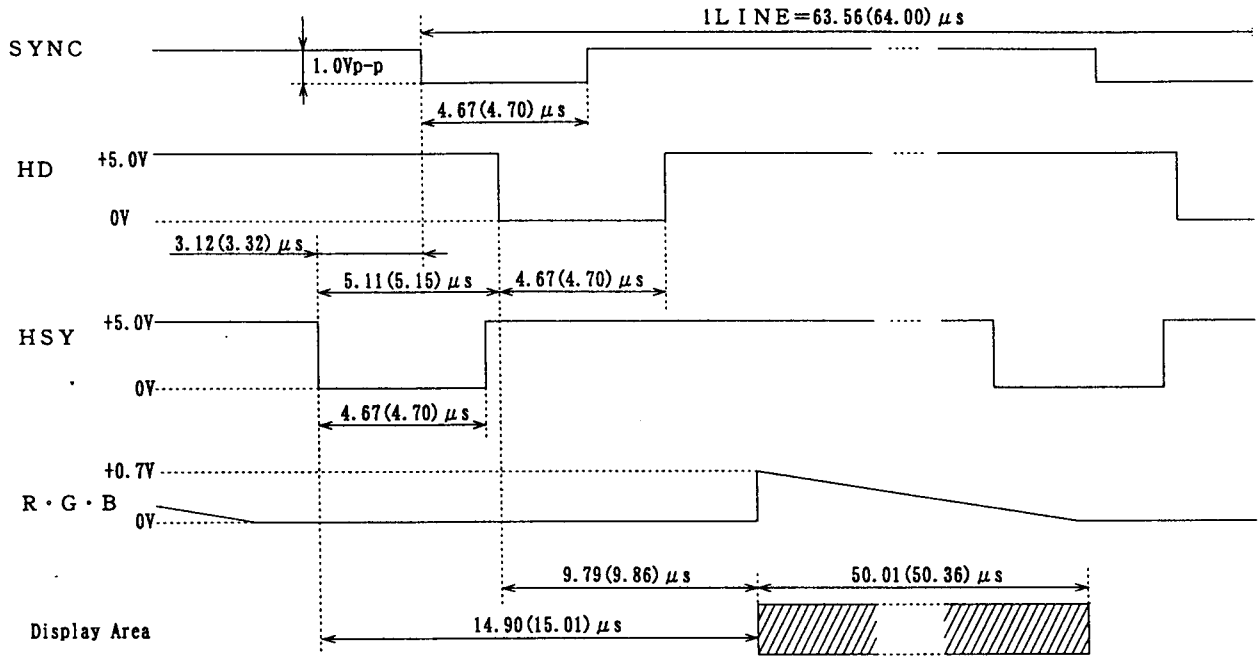


※ : Normal Left and Normal Right mode is same timing.

※ : Values in brackets correspond to PAL mode.)

7. TIMING CHART

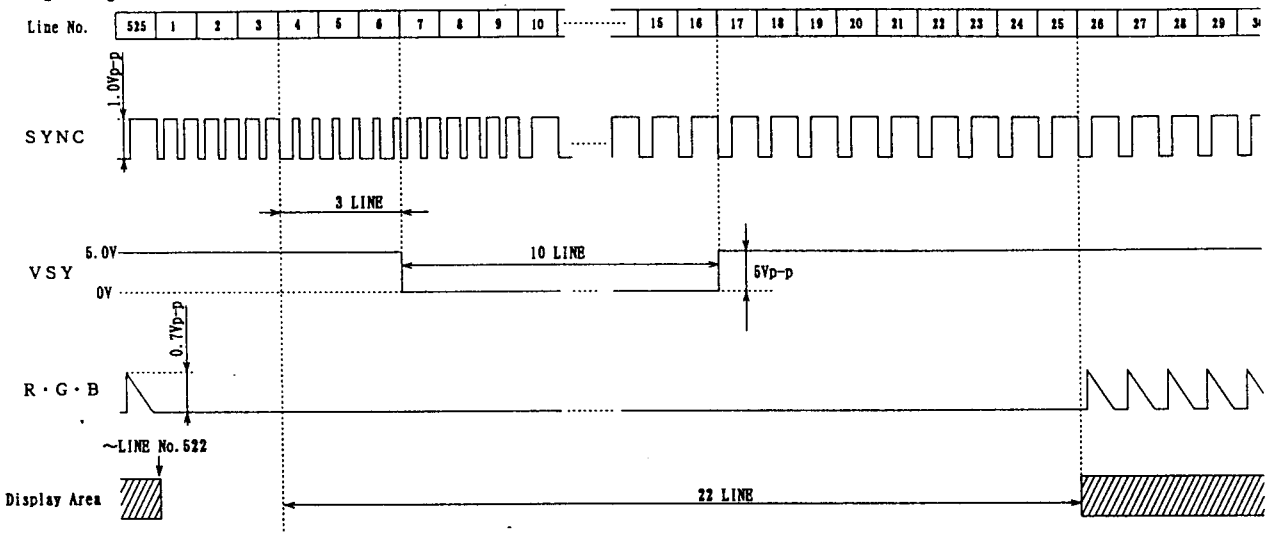
Horizontal (NTSC/PAL)

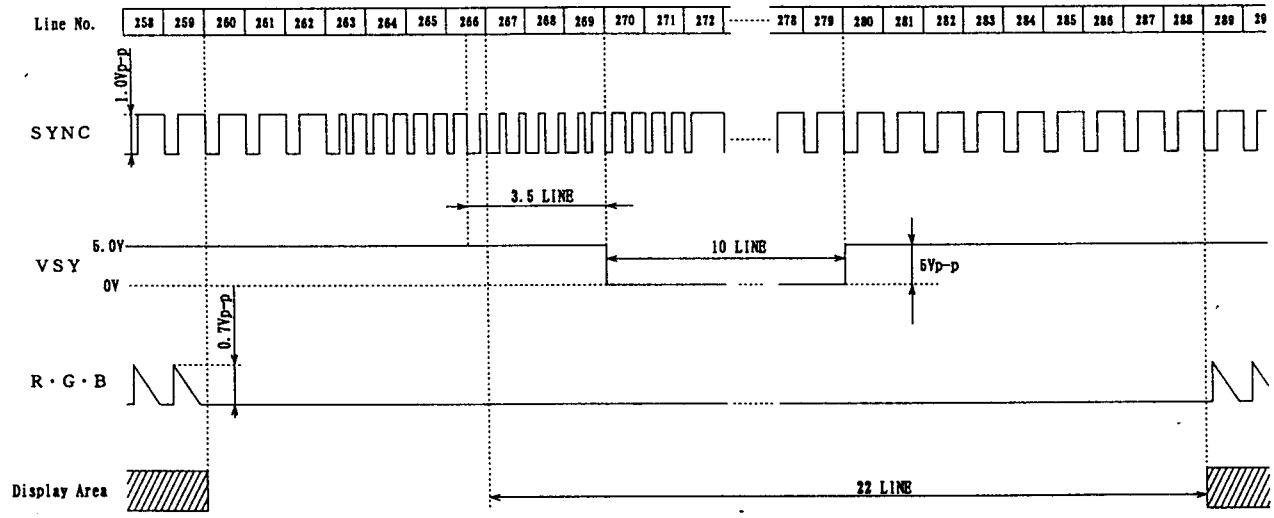


※ : Values in brackets correspond to PAL mode.
※ fH=15.734(15.625)kHz

Vertical (Case : Full mode or 4:3 mode)

[NTSC]

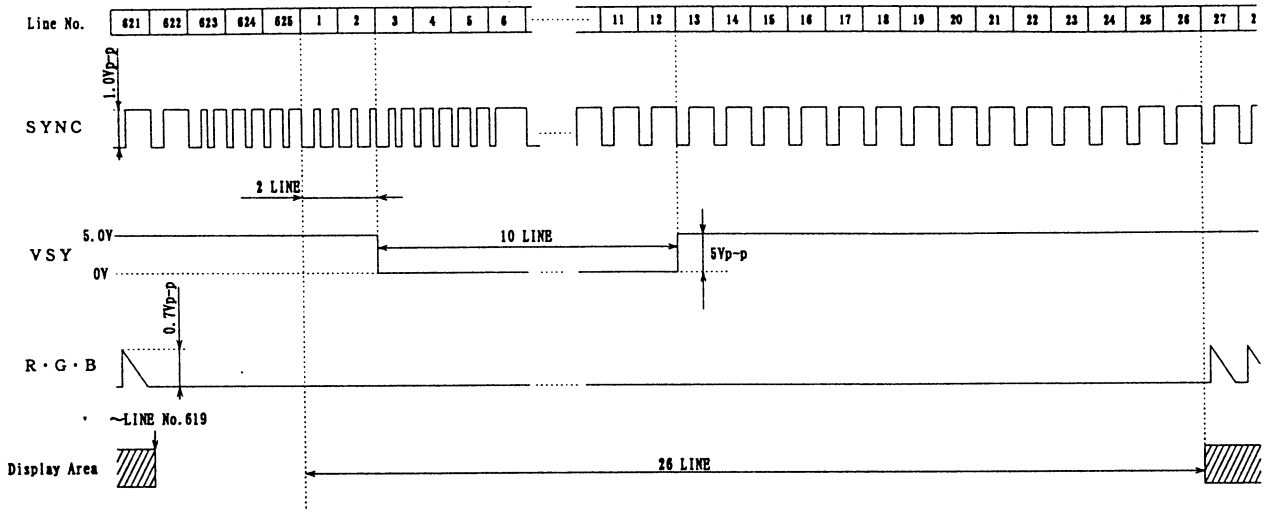


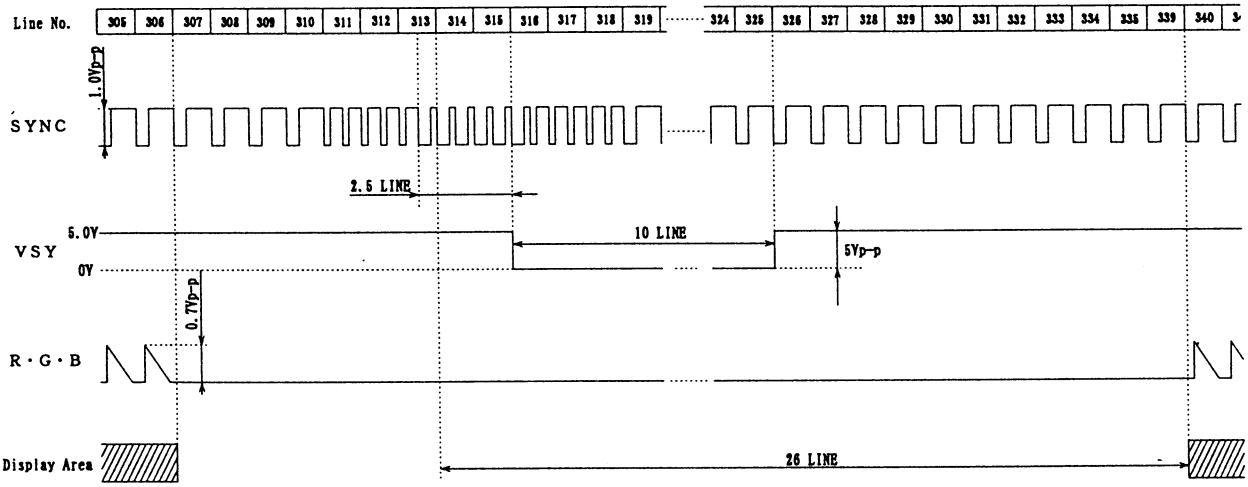


※ : Display start position (of vertical) is different among display modes refer to "7. Electrical Characterictics" (Page 10).

Vertical (Case : Full mode or 4:3 mode)

[PAL]





※ : Display start position (of vertical) is different among display modes refer to "8. ELECTRICAL CHARACTERICTICS" (Page 10).

8. ELECTRICAL CHARACTERISTICS

8.1 Electrical Characteristics

Common Test Conditions : Ta=25±5℃, VBL=9.0V, VCC=9.0V, VSS=0V, BRT=2.6V, COLOR=2.5V, TINT=2.7V, DIM=3.90V
Measured after 30 minutes operation.

Items	Symbol	Conditions	Specifications			Unit	Remark
			Min.	Typ.	Max.		
Current Consumption	ICC+IBL	VCC=9.0V	—	945	1015	mA	8)
Output Voltage	HSY, VSY	H Level	3.5	—	5.3	V	
		L Level	0.3	—	1.5	V	
Video Signal Frequency Range	—	Sine wave (composite video). -3dB down	—	2.6	—	MHz	
Tint Adjust Range	—	TINT 1V～5V (NTSC)	—	120	—	deg.	
		TINT=2.7V～1V	—	75	—		
		TINT=2.7V～5V	—	45	—		
Color Adjust Range	—	COLOR 5V/0V (NTSC)	—	3.9	—	dB	

Note 8 : Although protection circuit is inclueded in this product, please add the appropriate protection circuit for this product.

8.2 Electrical Characteristics (Display Position : Horizontal and Vertical)

[Horizontal]

Items	Symbol	Conditions	NTSC	PAL	Unit	Remark
Horizontal Start Position	HPOS	—	9.79	9.86	μs	9)
Horizontal Display Area	HDIS	—	50.01	50.36	μs	

Note 9 : Sampling start based on the internal horizontal sync front edge.

[Vertical]

Items	Symbol	Conditions		Display Mode					Unit	Remark
				Full Normal	Wide	Zoom1	Zoom2	Zoom3		
Vertical Start Position	VPOS	NTSC	ODD	23	23	52	38	53	Line	10)
			EVEN	286	286	315	301	315		
		PAL	ODD	27	50	62	50	62	Line	10)
			EVEN	339	363	375	363	375		
Vertical Display Position	VDIS	NTSC		234	234	176	204	204	Line	
		PAL		281	234	210	234	234	Line	

Note 10 : Sampling start line number base on the vertical sync. pulse (SYNC).
Refer to "7. TIMING CHART" (Page 8～9).

9. OPTICAL CHARACTERISTICS

Common Test Conditions : Ta=25±5℃, VBL=9.0V, VCC=9.0V, VSS=0V, BRT=2.6V, COLOR=2.5V, TINT=2.7V, DIM=3.90V
Measured after 30 minutes operation.

Items	Symbol	Conditions	Specifications			Unit	Remarks
			Min.	Typ.	Max.		
Contrast Ratio	CR	R,G,B = 0.7V/0V	40	100	—	—	11)
Luminance	LUM	R,G,B = 0.7V	300	350	—	cd/m^2	12)
Specular Reflectance Ratio	RS	Non-operating	—	1	3	%	
After Image	STG	—	No conspicuous pattern observed after 3 seconds.			—	
Backlight Life	—	DIM = 3.90V	—	10,000	—	h	13) 14)

Note 11 : These values vary with brightness input.
Note 12 : Maximum BRT.
Note 13 : MTTF(Mean Time to Failure), time to become 50% brightness.
Note 14 : Reference Value.

10. INTERFACE PIN ASSIGNMENT

【CN1】 Input Signal (Connector : 52207-3090 /Japan Molex)

No.	Symbol	Functions	I/O	Remarks
1	VIDEO	Composite Video Input (1.0Vp-p Zin=75Ω)	Input	
2	NC	No Connection	—	
3	VSS	Ground (0V)	—	
4	SYNC	Composite Sync. Input (Negative 1.0Vp-p Zin=75Ω)	Input	
5	R	Video Input R (0.7Vp-p Zin=75Ω)	Input	
6	G	Video Input G (0.7Vp-p Zin=75Ω)	Input	
7	B	Video Input B (0.7Vp-p Zin=75Ω)	Input	
8	VSS	Ground (0V)	—	
9	HSY	Horizontal Sync. Output (Negative C-MOS 5.0V)	Output	
10	VSY	Vertical Sync. Output (Negative C-MOS 5.0V)	Output	
11	BLK(NC)	Blanking Control Output	Output	
12	NC	No Connection	—	
13	NC	No Connection	—	
14	NC	No Connection	—	
15	VSS	Ground (0V)	—	
16	SSW	Sync. Signal Selection Switch (0V:Composite Video , 5V:RGB)	Input	
17	N/P	NTSC/PAL Selection Switch (0V:NTSC , 5V:PAL)	Input	
18	VSS	Ground (0V)	—	
19	VDD	5V Output for Control Terminals	Output	
20	L/R	Scanning Direction Switch[0V:Normal,5V:Reverse(Left and Right)	Input	
21	U/D	Scanning Direction Switch[0V:Normal,5V:Reverse(Up and Down)]	Input	
22	BRT	Brightness Control (0V to 5V)	Input	
23	DIM	Dimmer Control (1.35V to 3.9V)	Input	
24	COLOR	Color Control (0V to 5V)	Input	
25	TINT	Tint Control (1V to 5V)	Input	
26	VSW	Video Signal Selection Switch (0V:Composite Video , 5V:RGB)	Input	
27	MODE 1	Display Mode Selection Switch (Refer to table 1 : Next page)	Input	16)
28	MODE 2			
29	MODE 3			
30	NC	No Connection	—	

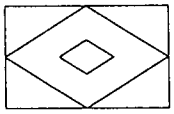
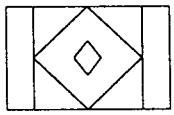
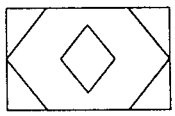
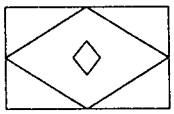
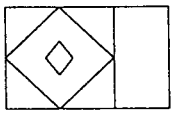
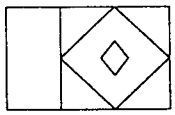
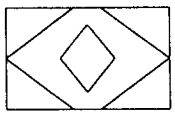
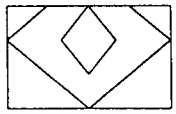
【CN2】 Input Power Supply (Connector : 52207-0690 /Japan Molex)

No.	Symbol	Functions	I/O	Remarks
1	VBL-VCC	Power Supply (+9.0V) for Backlight Inverter	Input	
2				
3	VBL-GND	Ground (0V) for Backlight	—	15)
4				
5	VID-GND	Ground (0V) for Video Circuit	—	15)
6	VID-VCC	Power Supply (+9.0V) for Video Circuit	Input	

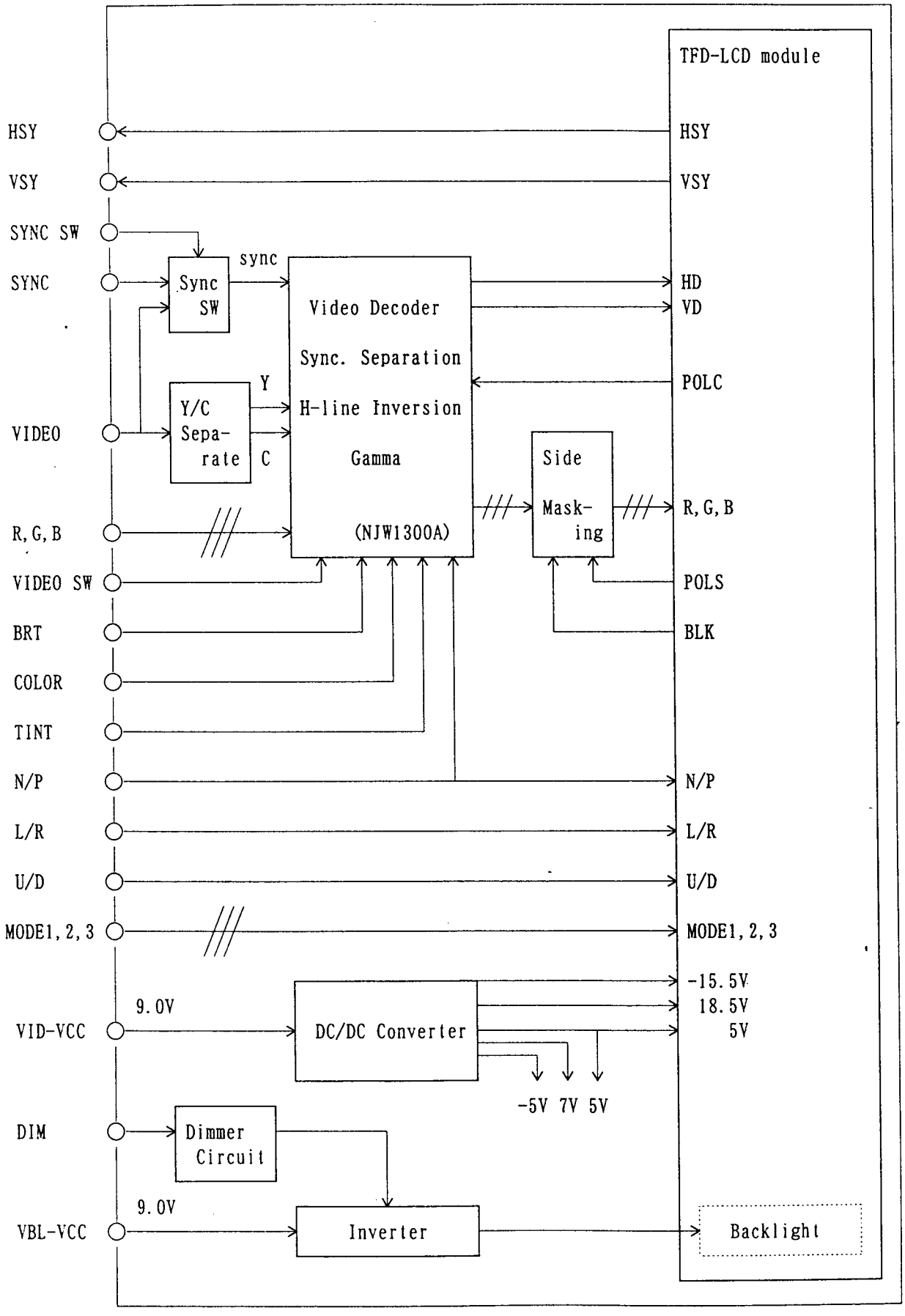
Note 15 : The ground of power supply between inverter unit and video unit are separated.

Note 16 : Display mode can be selected with the input level of terminal No.27 to 29 of CN1.

Table 1 : Display Mode

Display Mode	Display (Input signal of 4:3 aspect ratio)	No. 27	No. 28	No. 29	Note
		MODE 1	MODE 2	MODE 3	
Full		Lo	Lo	Lo	Input video signals are displayed in full screen.
Normal Center		Hi	Lo	Lo	Input video signals are displayed in the center screen. (4:3 aspect ratio)
Zoom 1		Hi	Hi	Lo	Input video signal of central 176 lines are displayed in full screen. (Vertically extension)
Wide		Lo	Hi	Lo	Input video signals are displayed in full screen. (Horizontal modification)
Normal Left		Hi	Lo	Hi	Input video signals are displayed in the left screen. (4:3 aspect ratio)
Normal Right		Lo	Hi	Hi	Input video signals are displayed in the right screen. (4:3 aspect ratio)
Zoom 2		Lo	Lo	Hi	Input video signal of centeral 204 lines are displayed in full screen. (Vertically extension and horizontal modification)
Zoom 3		Hi	Hi	Hi	Same as Zoom 2 mode vertically offset centered

11. BLOCK DIAGRAM



12. Caution & Handling Precautions

12.1 For Safety

(1) Special Purposes

Please inform and consult Toshiba when LCD monitor is used for the equipment that relates to the safety of human body or human life.

(2) Electric Shock

Disconnect power supply before handling LCD monitor. Do not touch the parts inside LCD module in order to prevent electric shock.

(3) Disassembling or Modification

Do not disassemble or modify the monitor. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display.
Toshiba dose not warrant the monitor, if customer disassembled or modified it.

(4) Breakage of LCD Panel

Do not ingest liquid crystal material, do not inhale this material, and do not contact the material with skin, if LCD panel is broken and liquid crystal material spills out.

If liquid crystal material comes into mouth or eyes, rinse mouth or eyes outwith water immediately.

If this material contact with skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

(5) Glass of LCD Panel

Be careful with chips of glass that may cause injuring fingers or skin, when the glass is broken.

(6) Absolute Maximum Ratings

Do not exceed the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts constants, environmental temperature, etc., otherwise LCD module may be damaged.

(7) Capacity of Power Supply

Be sure that power supply output from the system should be limited to smaller values than listed below.

It is because this LCD monitor explained in this data sheet has a current limiter, or a circuit with such function at power input lines, but there may be some possibility of overheat and/or burning of LCD monitor and its peripheral devices before current limitter of the monitor when open-short test of the module is performed by using higher power supply than following recommended value.

Power supply	Recommended maximum output current of power supply
VBL, VCC TOTAL	3 A

(8) Power Protection Circuit

Suitable protection circuit should be applied for each system design.

(9) Disposal

When dispose LCD monitor, obey to the applicable environmental regulations.

12.2 For Designing The System

(1) Mounting Holes

LCD monitor should be assembled to the system by using all mounting holes specified in the "3. Outline Dimension" with the specified screws.

(2) Sequence of Power Supplies and Input Signals

Power supply lines should be designed as follows.

Power supplies should always be turned on before the input signals are applied to LCD monitor, and the input signals should be disconnected before power supplies are turned off.

(3) Protective Cover

In case of severe environmental condition like outdoor usage, a proper transparent protective cover over LCD monitor is recommended to apply in order to prevent scratches, and invation of dust, water, etc., from the system's window on to LCD monitor.

Ultra-violet ray cut filter is recommended to apply onto LCD module for outdoor operation. Strong ultra-violet ray may cause damage the panel.

12.3 For Installation in Assembly

(1) ESD (Electro-Static Dischage) Prevention

The C-MOS LSIs used in LCD monitor are very sensitive to ESD.

The following caution should be taken when installing LCD monitor to an enclosure of the system in order to prevent damage of C-MOS LSIs used in LCD monitor.

Person handling LCD monitor should be grounded with wrist band.

Grounded electro-conductive mats are recommended to be covered on the floor of working area and surface of working benches.

(2) Dust Prevention

Reduce dust level in working area.

Especially the level of metal particle should be decreased, otherwise electrical circuit in LCD monitor may be damaged due to short circuit by metal particles.

Use finger stalls or soft and dust-free gloves in order to keep clean appearance of LCD module when handled for incoming inspection and assembly.

(3) Protection Film

LCD monitor may be shipped with "protection film" on LCD panel in order to prevent from scratches and dust. It is recommended to remove the film at later process of assembling when it is attached.

When remove this film from LCD panel, peel off the film slowly (more than three seconds) from the edge of the panel to minimize ESD.

(4) Wiping off Dust on the Panel

When LCD panel becomes dirty, wipe off the panel surface softly with absorbentcotton or another soft cloth.

If necessary, breathe upon the panel surface and then wipe off immediately and softly again.

If the dirt can not be wiped off, absorbent cotton wetted a little with normalhexane or petroleum benzine can be used for wiping the panel.

Be careful not to spill this solvent into the inside of LCD monitor.

Driver ICs and PCB area used inside LCD monitor may be damaged by the solvent.

The polarizer laminated to LCD panel and adhesives may be damaged by some solvents, so do not use any organic cleaner other than petroleum benzine or normal-hexane for wiping off LCD panel.

(5) Water Spot on LCD Panel

Wipe off a spot or spots of water or mist on LCD panel softly with absorventcotton or another cloth as soon as possible if happened, othewise discoloration or stain may be caused.

(6) Bending/Twisting of LCD monitor During Assembly

LCD monitor is sensitive to bending or twisting which may cause LCD monitor damages.

Do not bend or twist LCD monitor even momentary when LCD monitor is installed an enclosure of the system.

(7) Strong Mechanical Shock

Refrain from strong mechanical shock like dropping from the working bench or knocking against hard object.

These may cause glass of the panel crack, or other mis-operation.

(8) Excessive Force

Refrain from excessive force like pushing the surface of LCD panel. This may cause damage of the panel or electrical parts on PCB.

(9) Scratch on the Panel

Do not put heavy object such as tools, books, etc., and do not pile up LCD monitor.

Be careful not to touch surface of the polarizer laminated to the panel with any hard and sharp object.

The polarizer is so soft that it can be easily scratched, even the protect film covers it.

(10) FFC Cable

Be careful not to pull the FFC cable of the interface in order to avoid mechanical damage in cable and soldering area.

(11) Operation

Be sure that the following caution should be taken under assembly and inspection of the system.

Power supplies should always be turned off in assembling process.

Do not connect or disconnect the power cables and connectors with power applied to LCD monitor.

The signal should be applied after power supplies are turned on.

The signal should be removed before power supplies are turned off.

12.4 Transporation and Storage

(1) Temperature

Do not store LCD monitor in high temperature, especially in high humidity for a long time (approximately more than one month).

It is recommended to store LCD monitor where the temperature is in the range of 0 to 35 degrees Celsius and the relative humidity is lower than 70%.

(2) Ultra Violet Ray

Store LCD monitor without exposure to direct sunlight of fluorescent lamps in order to prevent the monitor from strong ultra violet ray.

(3) Condensation of Water

Avoid condensation of water on LCD monitor, otherwise it may cause mis-operation or defects. Keep away LCD monitor from such ambient.