

TECHNICAL DATA**AX080F030B****CONTENTS**

No.	Item	Page
-	COVER	1-1/1
-	RECORD OF REVISION	2-1/1
-	DESCRIPTION	3-1/1
1	ABSOLUTE MAXIMUM RATINGS	4-1/1
2	INITIAL OPTICAL CHARACTERISTICS	5-1/2 ~ 2/2
3	ELECTRICAL CHARACTERISTICS	6-1/1
4	BLOCK DIAGRAM	7-1/1
5	INTERFACE PIN ASSIGNMENT	8-1/7 ~ 7/7
6	INTERFACE TIMING	9-1/3 ~ 3/3
7	DIMENSIONAL OUTLINE	10-1/2 ~ 2/2
8	DESIGNATION OF LOT MARK	11-1/1
9	COSMETIC SPECIFICATIONS	12-1/3 ~ 3/3
10	PRECAUTION	13-1/3 ~ 3/3

RECORD OF REVISION

Date	The upper section : Before revision The lower section : After revision		Summary
	Sheet No.	Page	

DESCRIPTION

The following specifications are applied to the following IPS-Pro module.

Note : Inverter for back light unit is built in this module.

Product Name : AX080F030B

General Specifications

Effective Display Area	: (H)698.4×(V)392.85	(mm)
Number of Pixels	: (H)1,920×(V)1,080	(pixels)
Pixel Pitch	: (H)0.3638×(V)0.3638	(mm)
Color Pixel Arrangement	: R+G+B Vertical Stripe	
Display Mode	: Transmissive Mode Normally Black Mode	
Top Polarizer Type	: Anti-Glare	
Number of Colors	: 16,777,216	(colors)
Viewing Angle Range	: Wide Version (Horizontal & Vertical : 178° at $\phi=0^\circ$, 90° , 180° , 270° , CR $\geq$ 10)	
Input Signal	: 2-channel LVDS (LVDS:Low Voltage Differential Signaling)	
Back Light	: 16 pcs. of EEFL	
External Dimensions	: (H)760.0 x (V)450.0 x (t)50.5 max	(mm)
Weight	: TBD	(g)

1. ABSOLUTE MAXIMUM RATINGS

1.1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	°C	1),5)
Humidity	2)		2)		%RH	1)
Vibration	-	4.9(0.5G)	-	9.8(1.0G)	m/s ²	3)
Shock	-	29.4(3G)	-	294(30G)	m/s ²	4)
Corrosive Gas	Not Acceptable		Not Acceptable		-	

Note 1) Temperature and Humidity should be applied to the glass surface of a Super-TFT module, not to the system installed with a module.

The temperature at the center of rear surface should be less than 70°C on the condition of operating.

The brightness of a EEFL tends to drop at low temperature. Besides, the life-time becomes shorter at low temperature.

2) $T_a \leq 40^\circ\text{C}$ Relative humidity should be less than 85%RH max. Dew is prohibited.

$T_a > 40^\circ\text{C}$ Relative humidity should be lower than the moisture of the 85%RH at 40°C.

3) Frequency of the vibration is between 15Hz and 100Hz. (Remove the resonance point)

4) Pulse width of the shock is 10 ms.

5) Long operation under low temperature may cause some portion of display area to be reddish for several minutes after turning on the product.

However, it does not affect the characteristics and reliability of the product.

1.2 Electrical Absolute Maximum Ratings

(1)TFT Module

$V_{SS} = 0\text{ V}$

ITEM	SYMBOL	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	0	13.2	V	
Input Voltage for logic	V1	-0.3	3.6	V	1)
Electrostatic Durability	VESD0	± 100		V	2),3)
	VESD1	± 8		kV	2),4)

Note 1)It is applied to pixel data signal and clock signal.

2)Discharge Coefficient : 200pF-250 Ω , Environmental : 25°C-70%RH

3)It is applied to I/F connector pins.

4)It is applied to the surface of a metallic bezel and a LCD panel.

(2) Back-light Inverter

$V_{SS} = 0\text{ V}$

ITEM	SYMBOL	Min.	Max.	Unit	Note
Input Voltage	VBL	-0.3	28.0	V	
ON/OFF Control Input Voltage	ON/OFF	-0.3	5.5	V	
Brightness Control Voltage	BRT	-0.3	5.5	V	

2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

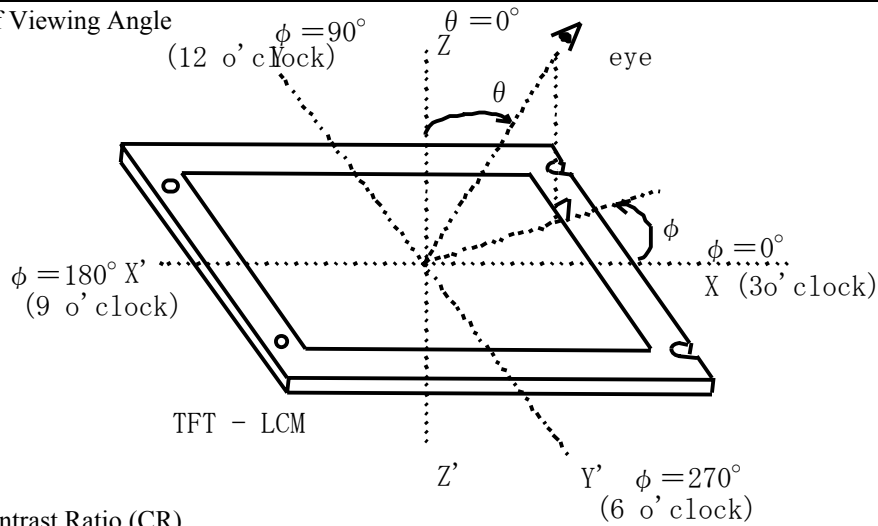
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25℃、VDD=12.0V、f V=60Hz、

VBL=24V、BRT=3.3V

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast Ratio		C R	$\theta = 0^{\circ}$ 1)	500	1000	-	-	2)
Response Time	Rise	ton		-	8	20	ms	3)
	Fall	toff		-	6	20	ms	3)
Brightness of white		Bwh		350	(450)	-	cd/m ²	
Brightness uniformity		Buni		-	-	30	%	4)
Color Chromaticity (CIE)	Red	χ		0.62	0.65	0.68	-	【Gray scale =255】
		y		0.30	0.33	0.36		
	Green	χ		0.27	0.30	0.33		
		y		0.59	0.62	0.65		
	Blue	χ		0.12	0.15	0.18		
		y		0.04	0.07	0.10		
	White	χ		0.243	0.273	0.303		
		y		0.245	0.275	0.305		
Variation of Color Position (CIE)	Red	$\Delta \chi$	$\theta = +50^{\circ}$ $\phi = 0^{\circ}、90^{\circ}$ 180°、270° 1)	-	-	0.04	-	5) 【Gray scale =255】
		Δy		-	-	0.04		
	Green	$\Delta \chi$		-	-	0.04		
		Δy		-	-	0.04		
	Blue	$\Delta \chi$		-	-	0.04		
		Δy		-	-	0.04		
	White	$\Delta \chi$		-	-	0.04		
		Δy		-	-	0.04		
				-	-	0.04		
Contrast Ratio at 85°		CR85		10	-	-	-	Estimated value

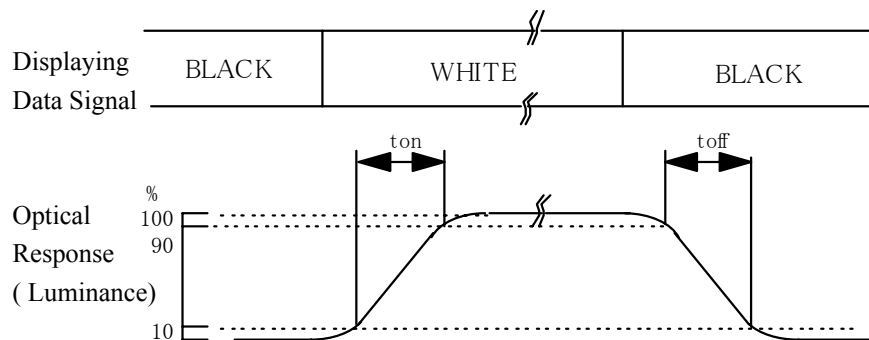
Note 1) Definition of Viewing Angle



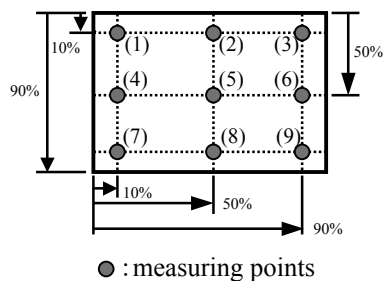
2) Definition of Contrast Ratio (CR)

$$CR = \frac{\text{(Luminance at displaying WHITE)}}{\text{(Luminance at displaying BLACK)}}$$

3) Definition of Response Time



4) Definition of Brightness Uniformity Display pattern is white (255 level). The brightness



uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.

$$B_{uni} = \frac{|B_{max} \text{ or } B_{min} - B_{ave}|}{B_{ave}} \times 100$$

where, B_{max} = Maximum brightness

B_{min} = Minimum brightness

$$B_{ave} = \text{Average brightness} = \frac{\sum_{k=1}^9 (B(k))}{9}$$

5) Variation of color position on CIE is defined as difference between colors at $\theta = 0^\circ$ and at $\theta = 50^\circ$ & $\phi = 0^\circ, 90^\circ, 180^\circ, 270^\circ$.

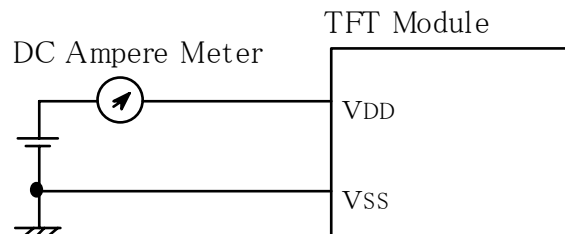
3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD Module

Ta=25°C、Vss=0V

ITEM	SYSTEM	Min.	Typ	Max	単位	備考
Power supply Voltage	V _{DD}	11.4	12.0	12.6	V	
Power supply Current	I _{DD}	-	0.75	1.1	A	1),2)
Ripple voltage of power Supply	V _{DDR}	-	-	150	mV	

Note 1) fV=60.0Hz, fCLK=66MHz, VDD=12.0V, and Display pattern is horizontal stripe.



2) Current fuse is built in a module. Current capacity of power supply for VDD should be larger than 4A, so that the fuse can be opened at the trouble of electrical circuit of module.

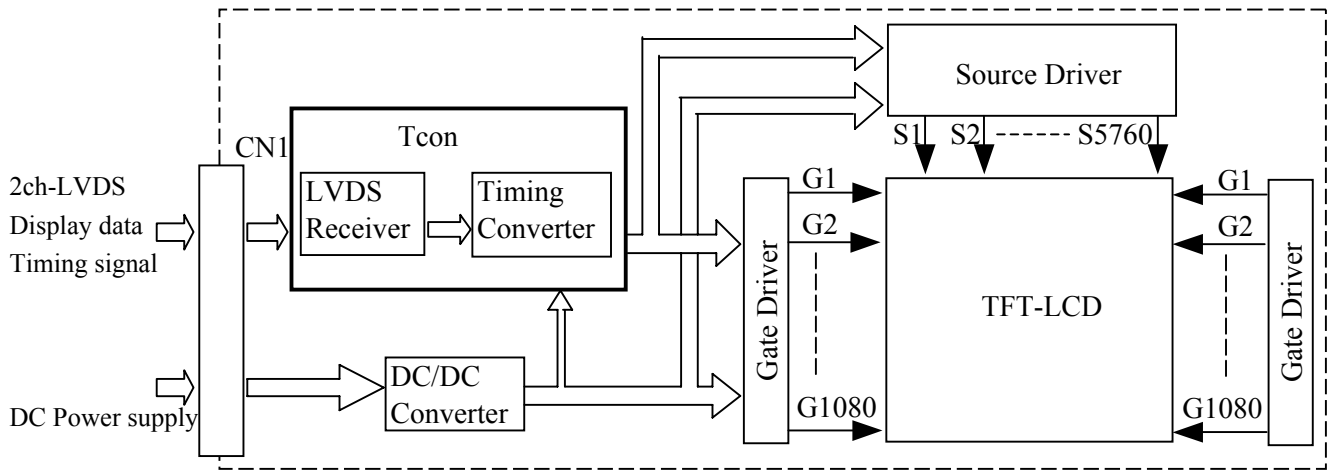
3.2 Back Light

ITEM		Symbol	Min.	Typ.	Max.	Unit	Notes
Input Voltage		VBL	21.6	24.0	26.4	V	
Input Current		IBL	-	(4.1)	TBD	A	VBL=24V, BRT=3.3V,3)
ON/OFF Control Voltage	ON	ON/OFF	2.0	5.0	5.5	V	
	OFF		0	-	0.8	V	
brighness Control Input Voltage	Min. Brightness	BRT	0	-	-	V	
	Max. Brightness		TBD	-	3.3	V	
PWM Duty	Min. Brightness	on-Duty	-	20	-	%	BRT=0V
	Max. Brightness		-	-	100		BRT=3.3V

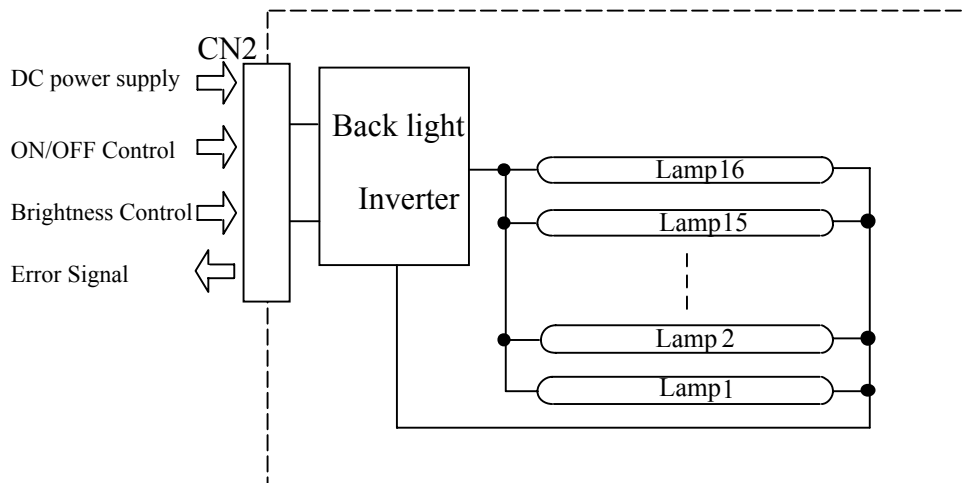
Note 3) This characteristics should be applied putting on the lamp about 60 minutes later with ambient temperature. (Ta=25°C±2°C)

4. BLOCK DIAGRAM

(1) TFT Module



(2) Back light unit



5. INTERFACE PIN ASSIGNMENT

5.1 TFT-LCD MODULE

CN1:JAE FI-R51S-HF

(Matching connector : JAE FI-R51-HL)

PIN No.	Symbol	Description	Note
1	VSS	GND(0V)	2)
2	IC	Internally Connected , Keep Open	
3	IC		
4	IC		
5	IC		
6	IC		
7	LVDSSEL	Select LVDS Data Format	
8	IC	Internally Connected, Keep Open	
9	IC		
10	IC		
11	VSS	GND(0V)	2)
12	RxA0-	ODD Pixel Data	3)
13	RxA0+		
14	RxA1-	ODD Pixel Data	3)
15	RxA1+		
16	RxA2-	ODD Pixel Data	3)
17	RxA2+		
18	VSS	GND(0V)	2)
19	CLKA-	ODD Pixel Clock	3)
20	CLKA+		
21	VSS	GND(0V)	2)
22	RxA3-	ODD Pixel Data	3)
23	RxA3+		
24	IC	Internally Connected, Keep Open	
25	IC		
26	VSS	GND(0V)	2)
27	VSS		

PIN No.	Symbol	Description	Note
28	RxB0-	EVEN Pixel Data	3)
29	RxB0+		
30	RxB1-	EVEN Pixel Data	3)
31	RxB1+		
32	RxB2-	EVEN Pixel Data	3)
33	RxB2+		
34	VSS	GND(0V)	2)
35	CLKB-	EVEN Pixel Clock	3)
36	CLKB+		
37	VSS	GND(0V)	2)
38	RxB3-	EVEN Pixel Data	3)
39	RxB3+		
40	IC	Internally Connected, Keep Open	
41	IC		
42	VSS	GND(0V)	2)
43	VSS		
44	VSS		
45	VSS		
46	VSS	No Connection	
47	NC		
48	VDD		
49	VDD		
50	VDD	Power Supply (typ.+12V)	1)
51	VDD		

- Notes
- 1) All VDD pins shall be connected to +12.0V(Typ.).
 - 2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.
 - 3) Rx n+ and Rx n- (n=0,1,2,3) should be wired by twist-pairs or side-by-side FPC patterns, respectively.

5.2 BACK-LIGHT UNIT

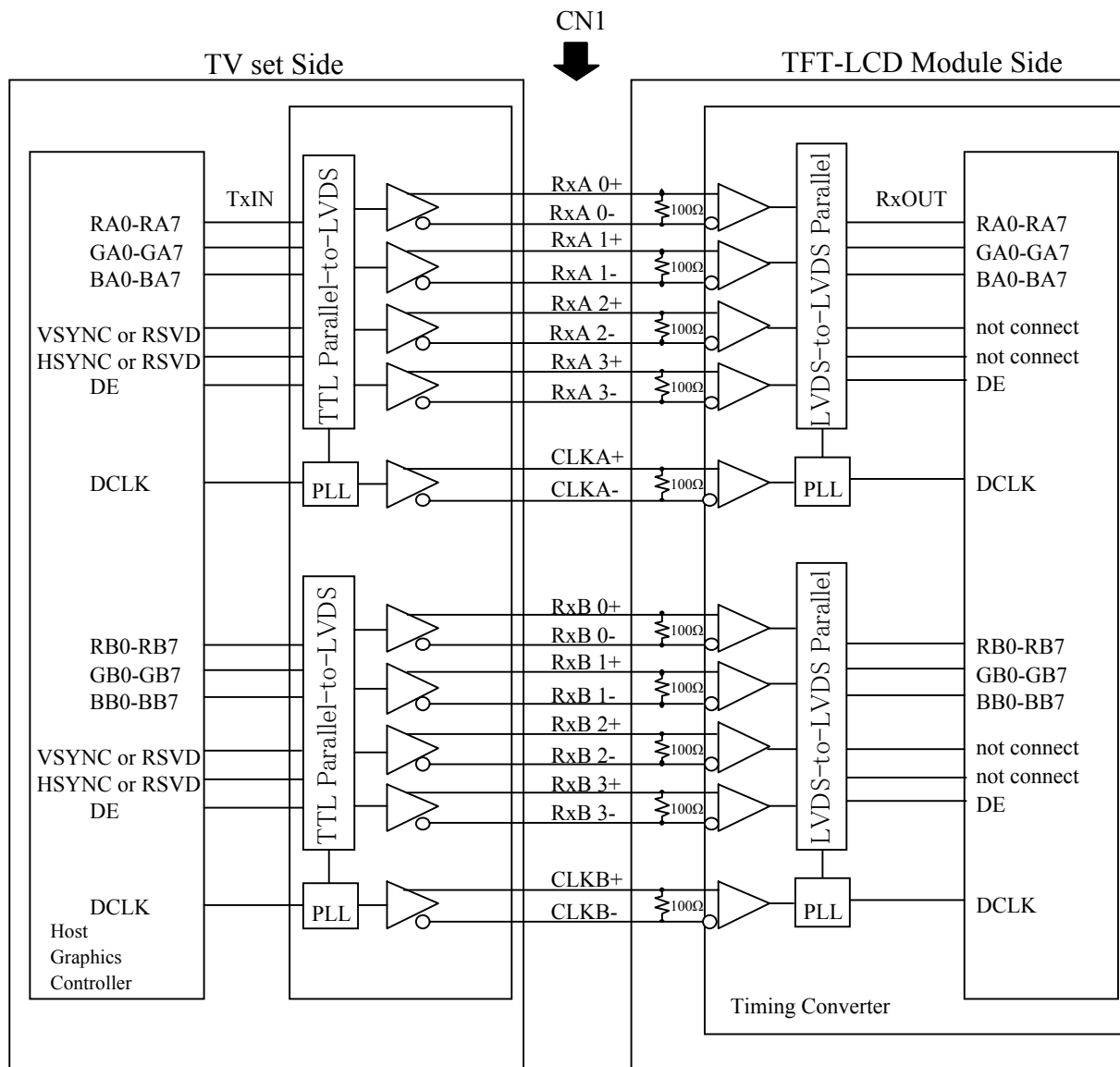
CN2 : JST S14B-PH-SM3-TF(LF) (Matching connecor : JST PHR-14)

Pin No.	Symbol	Description	Note
1	VBL	Power Supply (typ.+24.0V)	1)
2	VBL		
3	VBL		
4	VBL		
5	VBL		
6	VSS	GND(0V)	2)
7	VSS		
8	VSS		
9	VSS		
10	VSS		
11	ERR	Normal:External Pull-up, Abnormal:0V	
12	ON/OFF	High:Lamp ON, Low:Lamp OFF	
13	BRT	Brightness controll of Back Light	
14	IC	Internally Connected , Keep Open	

Notes 1) All VBL pins shall be connected to +24.0V(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.

5.3 BLOCK DIAGRAM OF INTERFACE



RA0~RA7, RB0~RB7	: Pixel R Data	(7; MSB, 0; LSB)
GA0~GA7, RB0~RB7	: Pixel G Data	(7; MSB, 0; LSB)
BA0~BA7, BB0~BB7	: Pixel B Data	(7; MSB, 0; LSB)
DE	: Data Enable	

Notes 1) The system must have the transmitter to drive the module.

2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5.4 LVDS INTERFACE

The 7st LVDSSEL signal of the connector pin specification is “L” or open.【LVDSSEL = L or open】

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT
24bit	RA0/RB0	51	Tx IN0	TA OUT0+	RxA/B 0+	27	Rx OUT0	RA0/RB0
	RA1/RB1	52	Tx IN1			29	Rx OUT1	RA1/RB1
	RA2/RB2	54	Tx IN2			30	Rx OUT2	RA2/RB2
	RA3/RB3	55	Tx IN3			32	Rx OUT3	RA3/RB3
	RA4/RB4	56	Tx IN4	TA OUT0-	RxA/B 0-	33	Rx OUT4	RA4/RB4
	RA5/RB5	3	Tx IN6			35	Rx OUT6	RA5/RB5
	GA0/GB0	4	Tx IN7			37	Rx OUT7	GA0/GB0
	GA1/GB1	6	Tx IN8			38	Rx OUT8	GA1/GB1
	GA2/GB2	7	Tx IN9	TA OUT1+	RxA/B 1+	39	Rx OUT9	GA2/GB2
	GA3/GB3	11	Tx IN12			43	Rx OUT12	RA3/RB3
	GA4/GB4	12	Tx IN13			45	Rx OUT13	RA4/RB4
	GA5/GB5	14	Tx IN14			46	Rx OUT14	RA5/RB5
	BA0/BB0	15	Tx IN15	TA OUT1-	RxA/B 1-	47	Rx OUT15	RA0/RB0
	BA1/BB1	19	Tx IN18			51	Rx OUT18	RA1/RB1
	BA2/BB2	20	Tx IN19			53	Rx OUT19	RA2/RB2
	BA3/BB3	22	Tx IN20			54	Rx OUT20	RA3/RB3
	BA4/BB4	23	Tx IN21	TA OUT2+	RxA/B 2+	55	Rx OUT21	RA4/RB4
	BA5/BB5	24	Tx IN22			1	Rx OUT22	RA5/RB5
	HSYNC/RSVD 1)	27	Tx IN24			3	Rx OUT24	HSYNC/RSVD 1)
	VSYNC/RSVD 1)	28	Tx IN25	TA OUT2-	RxA/B 2-	5	Rx OUT25	VSYNC/RSVD 1)
	DE	30	Tx IN26			6	Rx OUT26	DE
	RA6/RB6	50	Tx IN27			7	Rx OUT27	RA6/RB6
	RA7/RB7	2	Tx IN5	TA OUT3+	RxA/B 3+	34	Rx OUT5	RA7/RB7
	GA6/GB6	8	Tx IN10			41	Rx OUT10	GA6/GB6
	GA7/GB7	10	Tx IN11			42	Rx OUT11	GA7/GB7
	BA6/BB6	16	Tx IN16			49	Rx OUT16	BA6/BB6
	BA7/BB7	18	Tx IN17	TA OUT3-	RxA/B 3-	50	Rx OUT17	BA7/BB7
	RSVD 1)	25	Tx IN23			2	Rx OUT23	RSVD 1)
	DCLK	31	TxCLK IN	TxCLK OUT+	RxCLKA/B IN+	26	RxCLK OUT	DCLK
				TxCLK OUT-	RxCLKA/B IN-			

RA0~RA7, RB0~RB7 :Pixel R Data (7;MSB, 0;LSB)

GA0~GA7, GB0~GB7 :Pixel G Data (7;MSB, 0;LSB)

BA0~BA7, BB0~BB7 :Pixel B Data (7;MSB, 0;LSB)

DE :Data Enable

Notes 1)RSVD(reserved)pins on the transmitter shall be tied to"H"or"L".

The 7st LVDSSEL signal of the connector pin specification is “H”.【LVDSSEL = H】

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT
24bit	RA2/RB2	51	Tx IN0	TA OUT0+	RxA/B 0+	27	Rx OUT0	RA2/RB2
	RA3/RB3	52	Tx IN1			29	Rx OUT1	RA3/RB3
	RA4/RB4	54	Tx IN2			30	Rx OUT2	RA4/RB4
	RA5/RB5	55	Tx IN3			32	Rx OUT3	RA5/RB5
	RA6/RB6	56	Tx IN4	TA OUT0-	RxA/B 0-	33	Rx OUT4	RA6/RB6
	RA7/RB7	3	Tx IN6			35	Rx OUT6	RA7/RB7
	GA2/GB2	4	Tx IN7			37	Rx OUT7	GA2/GB2
	GA3/GB3	6	Tx IN8			38	Rx OUT8	GA3/GB3
	GA4/GB4	7	Tx IN9	TA OUT1+	RxA/B 1+	39	Rx OUT9	GA4/GB4
	GA5/GB5	11	Tx IN12			43	Rx OUT12	GA5/GB5
	GA6/GB6	12	Tx IN13			45	Rx OUT13	GA6/GB6
	GA7/GB7	14	Tx IN14			46	Rx OUT14	GA7/GB7
	BA2/BB2	15	Tx IN15	TA OUT1-	RxA/B 1-	47	Rx OUT15	BA2/BB2
	BA3/BB3	19	Tx IN18			51	Rx OUT18	BA3/BB3
	BA4/BB4	20	Tx IN19			53	Rx OUT19	BA4/BB4
	BA5/BB5	22	Tx IN20			54	Rx OUT20	BA5/BB5
	BA6/BB6	23	Tx IN21	TA OUT2+	RxA/B 2+	55	Rx OUT21	BA6/BB6
	BA7/BB7	24	Tx IN22			1	Rx OUT22	BA7/BB7
	HSYNC/RSVD 1)	27	Tx IN24			3	Rx OUT24	HSYNC/RSVD 1)
	VSYNC/RSVD 1)	28	Tx IN25	TA OUT2-	RxA/B 2-	5	Rx OUT25	VSYNC/RSVD 1)
	DE	30	Tx IN26			6	Rx OUT26	DE
	RA0/RB0	50	Tx IN27			7	Rx OUT27	RA0/RB0
	RA1/RB1	2	Tx IN5	TA OUT3+	RxA/B 3+	34	Rx OUT5	RA1/RB1
	GA0/GB0	8	Tx IN10			41	Rx OUT10	GA0/GB0
	GA1/GB1	10	Tx IN11			42	Rx OUT11	GA1/GB1
	BA0/BB0	16	Tx IN16			49	Rx OUT16	BA0/BB0
	BA1/BB1	18	Tx IN17	TA OUT3-	RxA/B 3-	50	Rx OUT17	BA1/BB1
	RSVD 1)	25	Tx IN23			2	Rx OUT23	RSVD 1)
	DCLK	31	TxCLK IN	TxCLK OUT+	RxCLKA/B IN+	26	RxCLK OUT	DCLK
				TxCLK OUT-	RxCLKA/B IN-			

RA0~RA7, RB0~RB7 :Pixel R Data (7;MSB, 0;LSB)

GA0~GA7, GB0~GB7 :Pixel G Data (7;MSB, 0;LSB)

BA0~BA7, BB0~BB7 :Pixel B Data (7;MSB, 0;LSB)

DE :Data Enable

Notes 1)RSVD(reserved)pins on the transmitter shall be tied to"H"or"L".

5.5 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE

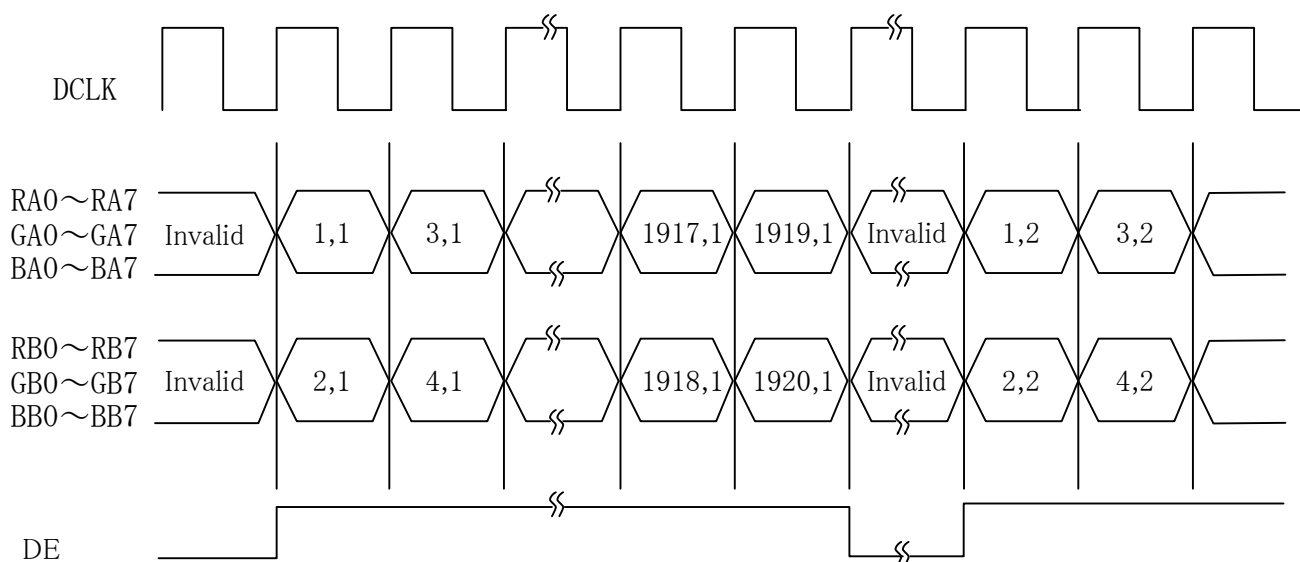
Display data of adjacent one pixel is latched during one cycle of DCLK.

	(1,1)			(1,2)	
RA	GA	BA	RB	GB	BB

odd pixel : RA0~RA7 :R data
GA0~GA7 :G data
BA0~BA7 :B data

Even pixel: RB0~RB7 :R data
GB0~GB7 :G data
BB0~BB7 :B data

1, 1	1, 2	1, 3	-----	1, 1920
2, 1	2, 2	2, 3	-----	2, 1920
3, 1	3, 2	3, 3	-----	3, 1920
⋮	⋮	⋮		⋮
1080, 1	1080, 2	1080, 3	-----	1080, 1920



5.6 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

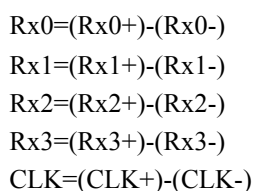
Input		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Color		MSB				LSB				MSB				LSB				MSB				LSB			
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Notes 1) Definition of gray scale:

Color(n) Number in parenthesis indicates gray scale level. Larger n corresponds to brighter level.

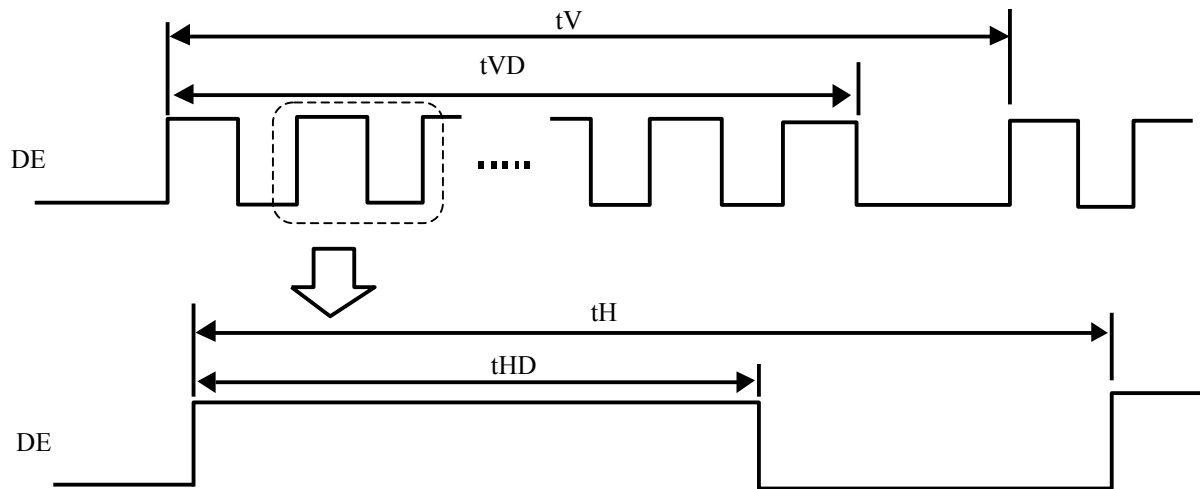
2) Data: 1:High, 0:Low

6.1 LVDS receiver timing



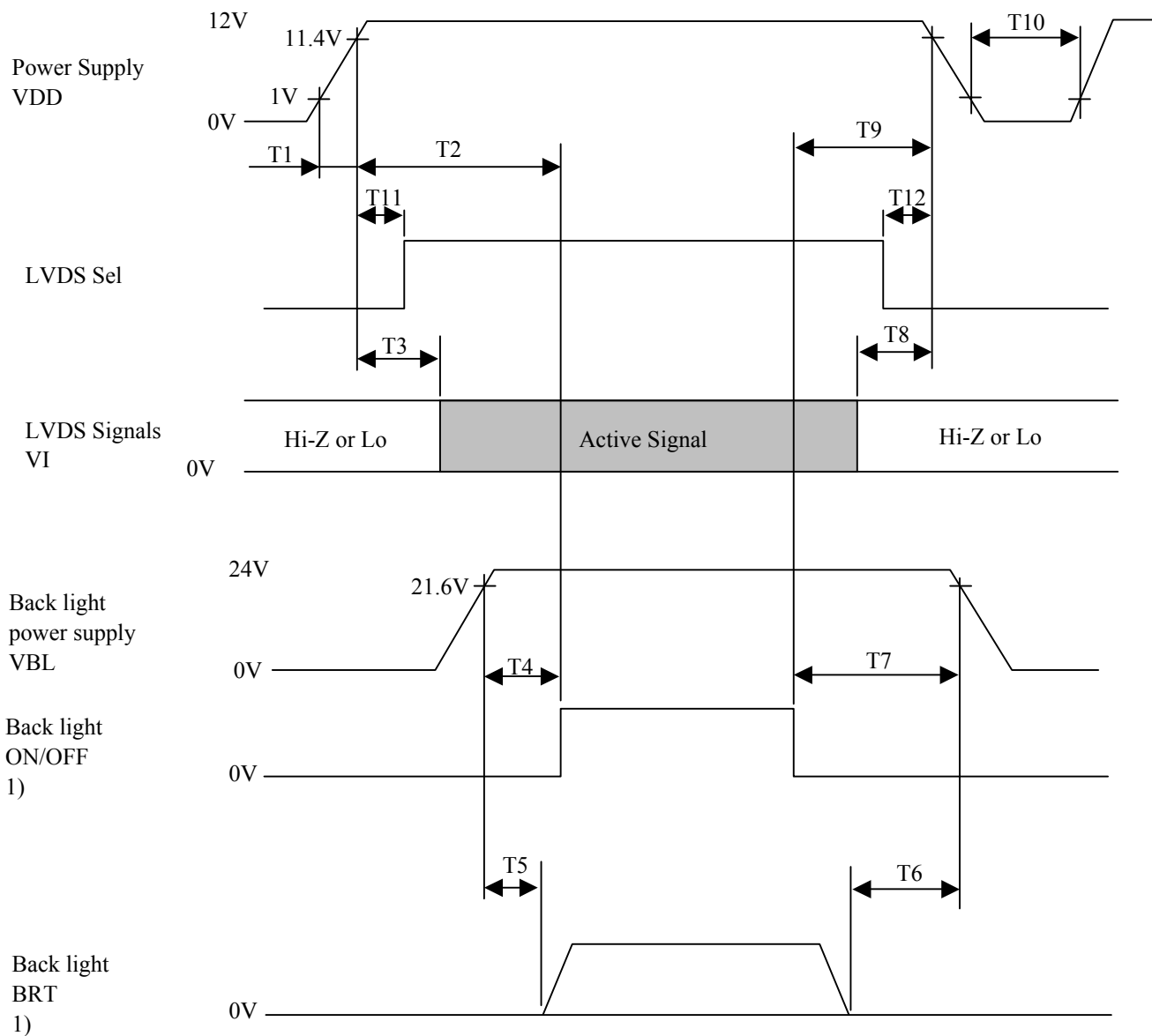
Item		Symbol	Min	Typ	Max	Unit	Note
CLK	Frequency	DCLK	65	66	67.5	MHz	=1/tclk
	CLK Skew	tSC	-4.0	0	+4.0	ns	
Rx*0 Rx*1 Rx*2 Rx*3	0 data position	tRP0	1/7tCLK - 0.4	1/7tCLK	1/7tCLK +0.4	ns	
	1st data position	tRP1	-0.4	0	+0.4		
	2nd data position	tRP2	6/7tCLK -0.4	6/7tCLK	6/7tCLK +0.4		
	3rd data position	tRP3	5/7tCLK -0.4	5/7tCLK	5/7tCLK + 0.4		
	4th data position	tRP4	4/7tCLK - 0.4	4/7tCLK	4/7tCLK +0.4		
	5th data position	tRP5	3/7tCLK - 0.4	3/7tCLK	3/7tCLK + 0.4		
	6th data position	tRP6	2/7tCLK - 0.4	2/7tCLK	2/7tCLK + 0.4		

6.2 SYNCHRONIZATION SIGNAL TIMING



ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	48	60	62	Hz	
	Vertical Period	tV	1090	1100	1350	tH	
	Vertical Valid	tVD	1080			tH	
	Horizontal Frequency	fH	63	66	68	kHz	
	Horizontal Period	tH	990	1000	1035	tCLK	
	Horizontal Valid	tHD	960			tCLK	

6.3 TIMING BETWEEN INTERFACE SIGNALS POWER SUPPLY



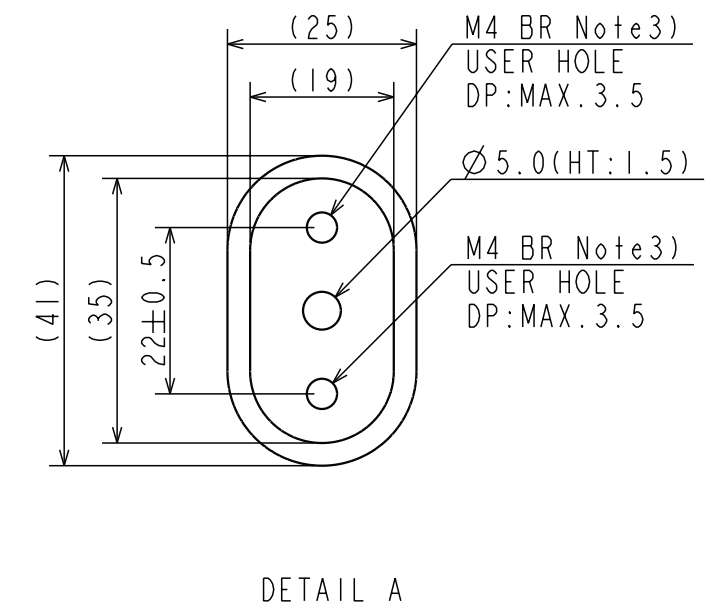
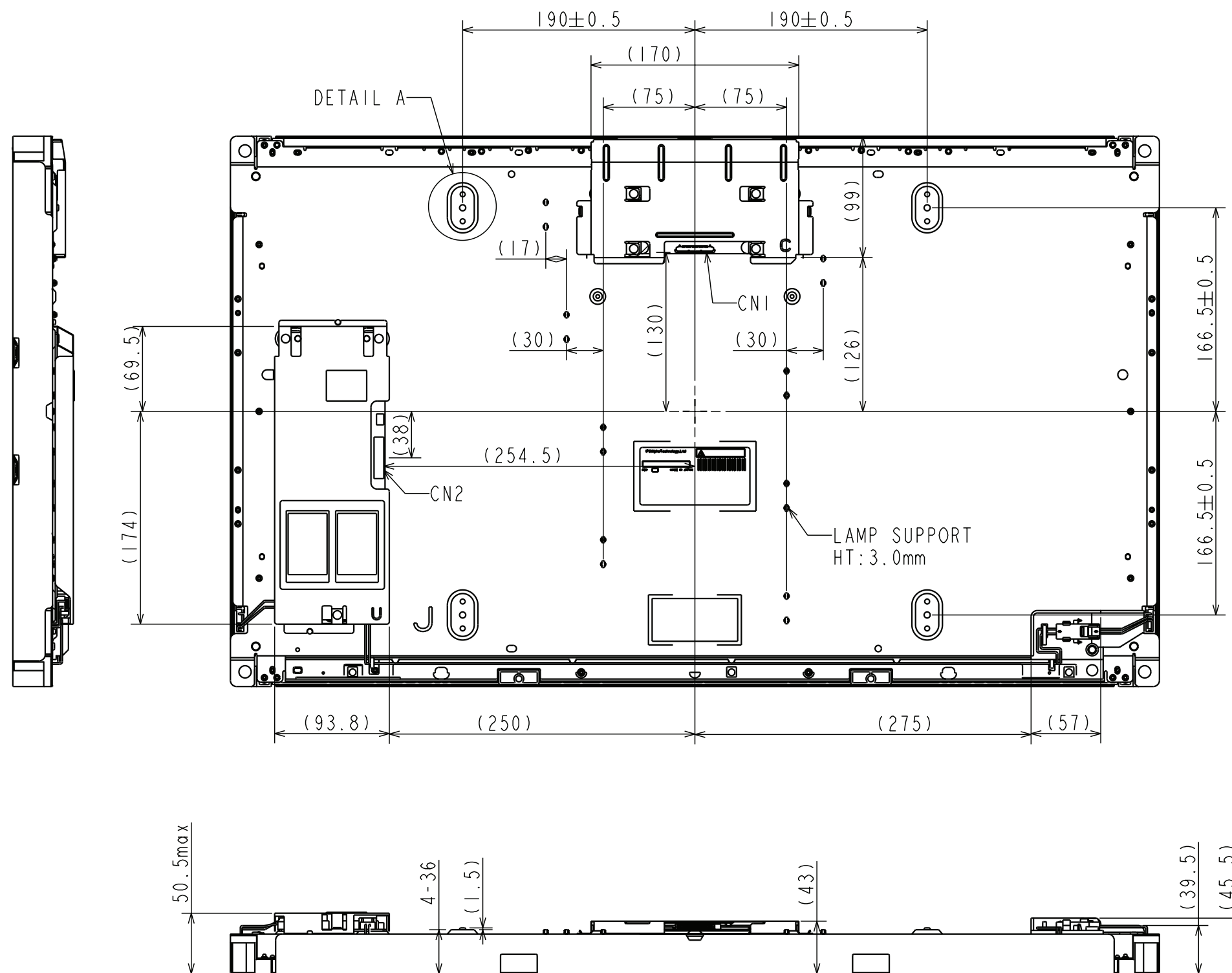
$0 \leq T1 \leq 10$	$0 \leq T6$	$10 \leq T11 \leq T2-150$
$350 \leq T2$	$0 \leq T7$	$0 \leq T12$
$10 \leq T3$	$0 \leq T8$	
$0 \leq T4$	$0 \leq T9$	
$0 \leq T5$	$350 \leq T10$	

Unit : ms

Note 1) In all periods, the backlight ON/OFF signal voltage and the BRT signal voltage should be lower than the backlight power supply voltage.

10-1/2

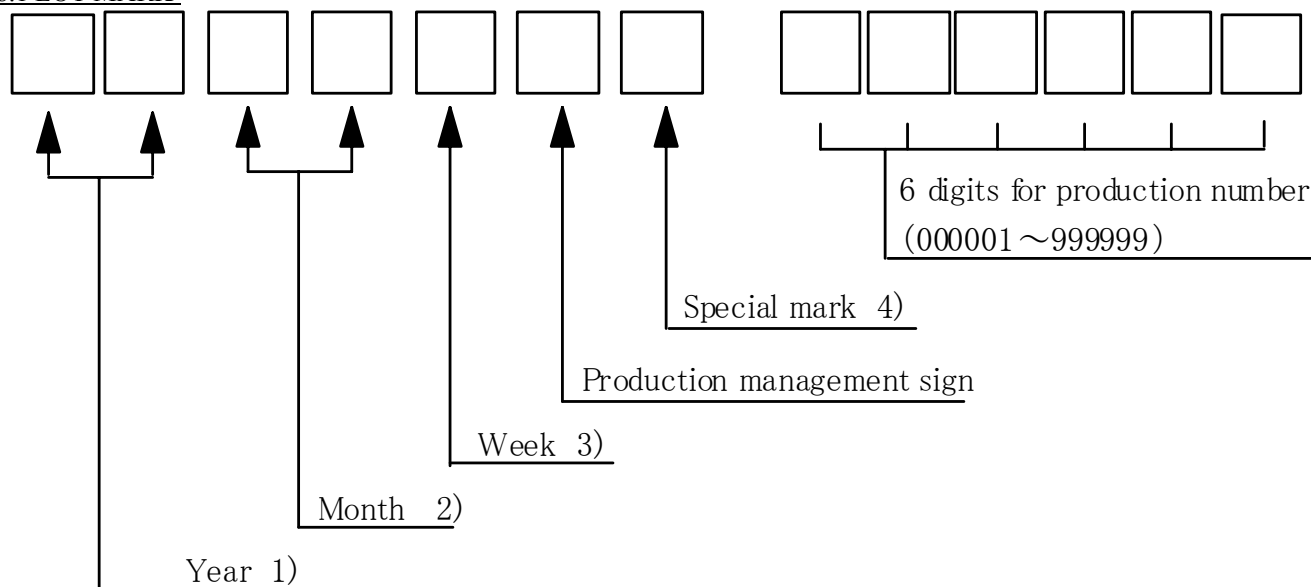
(2)BACK VIEW



- Note 1) The dimension in a parenthesis is a reference value.
 2) Unspecified tolerance to be ± 0.8
 3) Torque MAX. $1.47 \text{ N} \cdot \text{m}$ ($15 \text{ kgf} \cdot \text{cm}$)

8. DESIGNATION OF LOT MARK

8.1 LOT MARK



Notes

1)

Year	Mark
2007	07
2008	08
2009	09

2)

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

3)

Week(Day)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

- 4) It is the mark that was opened up by production person to take correspondence with production number.

8.2 Revision (REV.) control

REV. is the column for manufacturing convenience. A-Z except I and O may be written on this column.

8.3 Location of lot mark

Lot mark is printed on a label. The label is on the metallic bezel as shown in 7. External Dimensional. The style of character will be changed without notice.



9. COSMETIC SPECIFICATIONS

9.1 Condition for cosmetic inspection

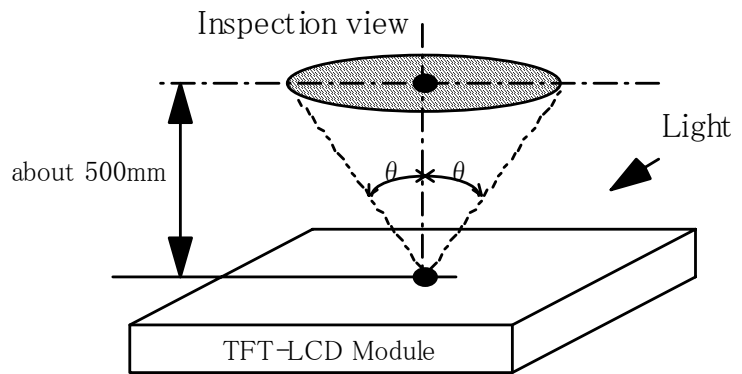
(1) Viewing zone

- a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

$\theta \leq 45^\circ$: when non-operating inspection

$\theta \leq 5^\circ$: when operating inspection

- b) Inspection should be executed only from front side and only A-zone.
Cosmetic of B-zone and C-zone are ignore.
(refer to 9.2 Definition of zone)

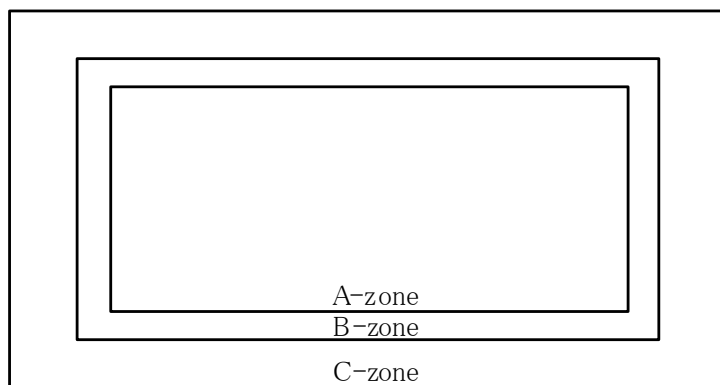


(2) Environmental

- a) Temperature : 25 degrees
b) Ambient light : about 700 lx and non-directive when operating inspection.
: about 1000 lx and non-directive when non-operating inspection.
c) Back-light : when non-operating inspection, back-light should be off .

9.2 Definition of zone

- A-zone : Display area (pixel area)
- B-zone : Area between A-zone and C-zone
- C-zone : Metallic bezel area



9.3 COSMETIC SPECIFICATIONS

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

	No	ITEM			Max. acceptable number	Unit	Note
					A-zone		
Operating inspection	1	Dot defect	Sparkle mode	1-dot	2	pcs	1),2),4)
				2-dots	0	Units	1),2),5)
				3-dots	0		
				Density	2	pcs/ ϕ 20mm	1),2),6)
				Total	2	pcs	1),2)
			Black mode	1-dot	7	pcs	1),3),4)
				2-dots	1	Units	1),3),5)
				3-dots	0		
				Density	4	pcs/ ϕ 20mm	1),3),6)
				Total	7	pcs	1),3)
			Total	7	pcs	1)	
	2	Line defect			Serious one is not allowed	-	-
	3	Uneven brightness					
	4	Stain inclusion ⎧ Line shape W : width (mm) L : length (mm) ⎫	W≤0.02	L : Ignore	Ignore	pcs	7)
				W≤0.04	L≤4.0		
			W≤0.08		L>4.0		
				W≤0.08	L≤2.0		
			W>0.08		L>2.0		
				W>0.08			
	5	Stain inclusion ⎧ Dot shape D : ave. dia (mm) ⎫	D≤0.22		Ignore	pcs	7)
			D≤0.5		8		
			D>0.5		0		
	6	Scratch on polarizer ⎧ Line shape W : width (mm) L : length (mm) ⎫	W≤0.02	L : Ignore	Ignore	pcs	8)
				W≤0.08	L≤20		
			W>0.08		L>20		
				W>0.08			
	7	Scratch on polarizer ⎧ Dot shape D : ave. dia (mm) ⎫	D≤0.2		Ignore	pcs	8)
			D≤0.6		10		
			D>0.6		0		

	No	ITEM		Max. acceptable number	Unit	Note
				A-zone		
	8	Bubbles, peeling in polarizer [D : ave. dia (mm)]	$D \leq 0.2$	Ignore	pcs	8)
			$D \leq 0.5$	10		
			$D > 0.5$	0		
	9	Wrinkles on polarizer		Serious one is not allowed.	-	-

- Note
- 1) Dot defect : defect area $> 1/2$ dot
 - 2) Sparkle mode : brightness of dot is more than 30% at black. (visible to eye)
 - 3) Black mode : brightness of dot is less than 70% of L255 brightness.
 - 4) 1 dot : defect dot is isolated, not attached to other defect dot.
 - 5) N dots : N defect dots are consecutive. (N means the number of defects dots)
 - 6) Density : number of defect dots inside 20mm ϕ .
 - 7) Those stains which can be wiped out easily are acceptable.
 - 8) Polarizer area inside of B-zone is not applied.
 - 9) No major (serious) defects when viewed in gray scale mode.

10. PRECAUTION

Please pay attention to the followings when a Super-TFT module with a back-light unit is used, handled and mounted.

10.1 Precaution to handling and mounting

- (1) Applying strong force to a part of the module may cause partial deformation of frame or mold, and cause damage to the display.
- (2) The module should gently and firmly be held by both hands. Never hold by just one hand in order to avoid any internal damage. Never drop or hit the module.
- (3) The module should be installed with mounting holes of a module.
- (4) Uneven force such as twisted stress should not be applied to a module when a module is mounted on the cover case. The cover case must have sufficient strength so that external force can not be transmitted directly to a module.
- (5) It is recommended to leave a space between a module and a holding board of a module so that partial force is not applied to a module.

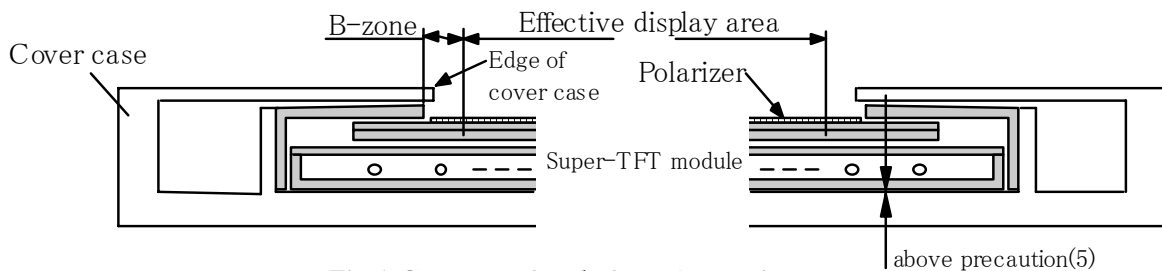


Fig.1 Cross sectional view of a monitor set

- (6) The edge of a cover case should be located inside more than 1mm from the edge of a module front frame.
- (7) A transparent protective plate should be added on the display area of a module in order to protect a polarizer and Super-TFT cell. The transparent protective plate should have sufficient strength so that the plate can not touch a module by external force.
- (8) Materials included acetic acid and choline should not be used for a cover case as well as other parts and boards near a module. Acetic acid attacks a polarizer. Choline attacks electric circuits due to electro-chemical reaction.
- (9) The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything harder than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand, greasy clothes or dusty clothes.
- (10) The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-hexane as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a Super-TFT cell. Other cleaning chemicals such as acetone, toluen and alcohol should not be used to clean adhesives because they cause chemical damage to a polarizer.
- (11) Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer may be deformed and its color may be faded.
- (12) The module should not be opened or modified. It may cause not to operate properly.

- (13) Metallic bezel of a module should not be handled with bare hand or dirty gloves. Otherwise, color of a metallic frame may become dirty during its storage. It is recommended to use clean soft gloves and clean finger stalls when a module is handled at incoming inspection process and production (assembly) process.
- (14) Lamp(EEFL) cables should not be pulled and held.

10.2 Precaution to operation

- (1) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.
- (2) The spike noise causes the mis-operation of a module. The level of spike noise should be as follows:
-200mV<=over- and under- shoot of VDD<= +200mV
VDD including over- and under- shoot should be satisfied with the absolute maximum ratings.
- (3) Optical response time, luminance and chromaticity depend on the temperature of a Super-TFT module. Response time and saturation time of EEFL luminance become longer at lower temperature operation.
- (4) Sudden temperature change may cause dew on and/or in the a module. Dew males damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.
- (5) Fixed patterns displayed on a module for a long time may cause after-image. It will be recovered soon.
- (6) A module has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.
- (7) Noise may be heard when a back-light is operated. If necessary, sufficient suppression should be done by system manufacturers.
- (8) The module should not be connected or removed while a main system works.
- (9) Inserting or pulling I/F connectors causes any trouble when power supply and signal dates are on-state.I/F connectors should be inserted and pulled after power supply and signal dates are turned off.

10.3 Electrostatic discharge control

- (1) Since a module consists of a Super-TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a module should be grounded through adequate methods such as a list band. I/F connector pins should not be touched directly with bare hands.
- (2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic charge can be minimized.

10.4 Precaution to strong light exposure

- (1) A module should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a module may be degraded.

10.5 Precaution to storage

When modules for replacement are stored for a long time, following precautions should be taken care of:

- (1) Modules should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. Modules should be stored at 0 to 35 –C at normal humidity (60%RH or less).
- (2) The surface of polarizers should not come in contact with any other object. It is recommended that modules should be stored in the Hitachi's shipping box.

10.6 Precaution to handling protection film

- (1) The protection film for polarizers should be peeled off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.
- (2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.
- (3) The module with protection film should be stored on the conditions explained in 10.5 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a module is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.
- (4) The adhesive can be removed easily with Normal-Hexane. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane.

10.7 Safety

- (1) Since a Super-TFT cell and lamps are made of glass, handling to the broken module should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken cell should be washed sufficiently.
- (2) The module should not be taken apart during operation so that back-light drives by high voltage.

10.8 Environmental protection

- (1) The Super-TFT module contains cold cathode fluorescent lamps. Please follow local ordinance or regulations for its disposal.
- (2) Flexible printed circuits and printed circuits board used in a module contain small amount of lead. Please follow local ordinance or regulations for its disposal.

10.9 Use restrictions and limitations

- (1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.
- (2) In no event shall Hitachi, Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contract, breach of warranty, negligence, strict liability, misrepresentation and other torts.

10.10 Others

- (1) Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.