

APATL0000261

Date:Jan.24, 2008

For Messrs.Hitachi,Ltd., Consumer Business Group

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

AX094B002ACONTENTS

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Date: _____

IPS Alpha Technology,Ltd.

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IPS4PS 2601-AX094B002A-4

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DESCRIPTION

The following specifications are applied to the following TFT module.

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

Product Name : AX094B002A

General Specifications

Effective Display Area	: (H)819.60×(V)460.80	(mm)
Number of Pixels	: (H)1,366×(V)768	(pixels)
Pixel Pitch	: (H)0.600×(V)0.600	(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 $\phi=0^\circ, 90^\circ, 180^\circ, 270^\circ$, CR \geq 10)	
Input Signal	: 1-channel LVDS (LVDS:Low Voltage Differential Signaling)	
Back Light	: 20 pcs. of EEFL(EEFL:External Electrode Fluorescent Lamp)	
External Dimensions	: (H)877.0 x (V)516.8 x (t)55.5 max	(mm)
Weight	: Typ 9,500	(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)	-	14.7(1.5G)	m/s ²	3)
Shock	-	29.4(3G)	-	294(30G)	m/s ²	4)
Corrosive Gas	Not Acceptable		Not Acceptable		-	
Illumination at LCD Surface	-	50,000	-	50,000	lx	

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	Vin	0	28.0	V	
ON/OFF Control Input Voltage	ON/OFF	-0.3	5.5	V	
Brightness Control Voltage	BRT	-0.3	5.5	V	
Error Signal Control	ERR	-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.

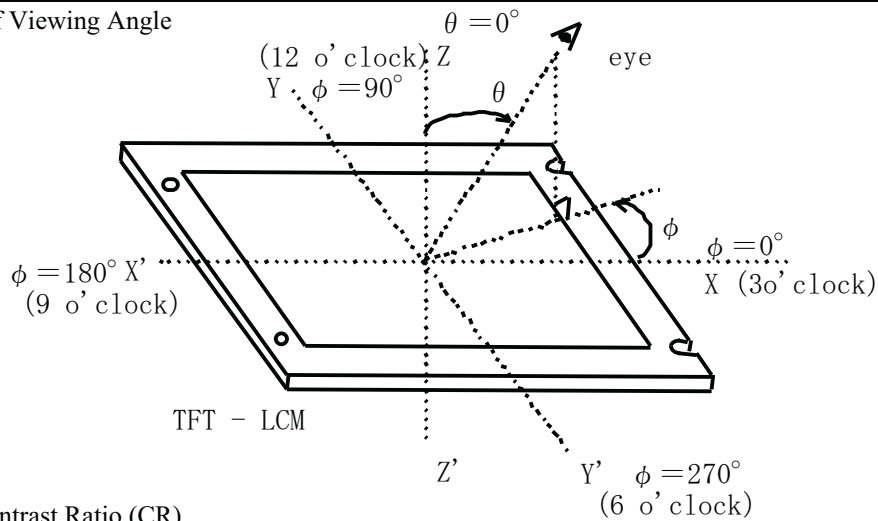
The optical characteristics should be measured in a dark room or equivalent state.

Measuring equipment : CS-1000A or equivalent

Ambient Temperature =25°C, VDD=12.0V, f V=60Hz, VBL=24V, BRT=3.3V

ITEM	SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE	
Contrast Ratio	C R		600	1000	-	-	2)	
Response Time	Rise	ton	-	8	20	ms	3)	
	Fall	toff	-	6	20	ms	3)	
Brightness of white	Bwh		420	(500)	-	cd/m ²		
Brightness control range	B _{RNG}		-	25	-	% of Bwh	BRT=0V	
Brightness uniformity	Buni		-	-	30	%	4)	
Color Chromaticity (CIE)	Red	χ	$\theta = 0^\circ$ 1)	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		0.254	0.284	0.314		
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		
Contrast Ratio at 89°	CR89	$\phi = 0^\circ, 90^\circ$ 180°, 270° 1)	10	-	-	-	Estimated value	

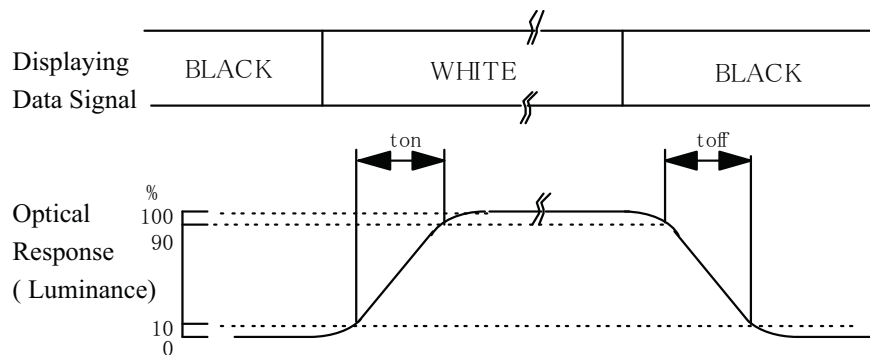
Note 1) Definition of Viewing Angle



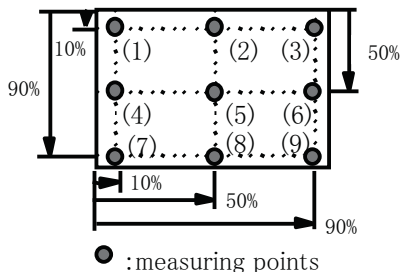
2) Definition of Contrast Ratio (CR)

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

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 $\theta = 50^\circ$ & $\phi = 0^\circ, 90^\circ, 180^\circ, 270^\circ$.

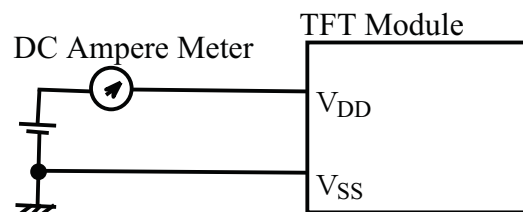
3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD Module

Ta=25°C、Vss=0V

ITEM	SYSTEM	Min.	Typ	Max	单位	備考
Power supply Voltage	V _{DD}	11.4	12.0	12.6	V	
Power supply Current	I _{DD}	-	0.55	0.70	A	1), 2)
Ripple voltage of power Supply	V _{DDR}	-	-	0.15	V	

Note 1) fV=60.0Hz, fCLK=82MHz, VDD=12.0V, and display pattern is white.



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	-	-	6.0	A	3) BRT=3.3V, 4) Ta=25°C	
		-	5.0	5.5			
ON/OFF Control Input Voltage	ON	3.0	3.3	5.5	V	TV set side impedance : 4.7k Ω	
	OFF	-0.3	0.0	0.8	V		
Brighness Control Input Voltage	Min. Brightness	-0.3	0	0.36	V	TV set side impedance : 1.0k Ω	
	Max. Brightness	3.135	3.3	3.465	V		
PWM Duty	Min. Brightness	on-Duty	-	20	-	BRT=0V	
Output Frequency	f	54.5	57.0	59.5	kHz		
Error Signal Control	Normal	ERR	Open Collector			V	Keep open while enable is on and low as long as system is abnormal.
	Abnormal		-	0.0	0.8	V	
Average Lamp Life Time	-	50,000	-	-	hours	5)	

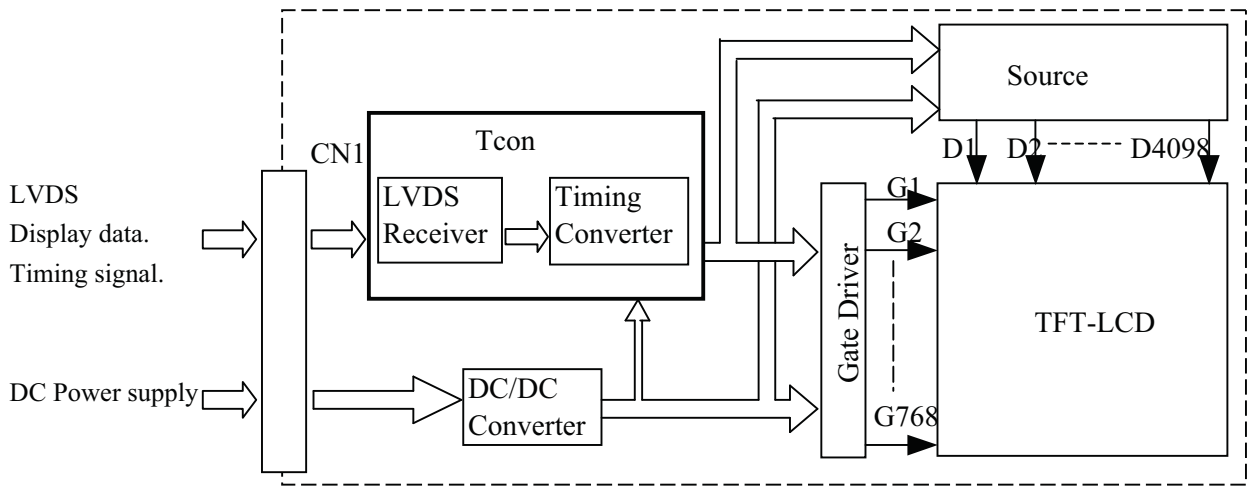
Note 3) Warm up period (1 hour after back light is turned on.)

4) Stable period (Average of 1min after warm up period)

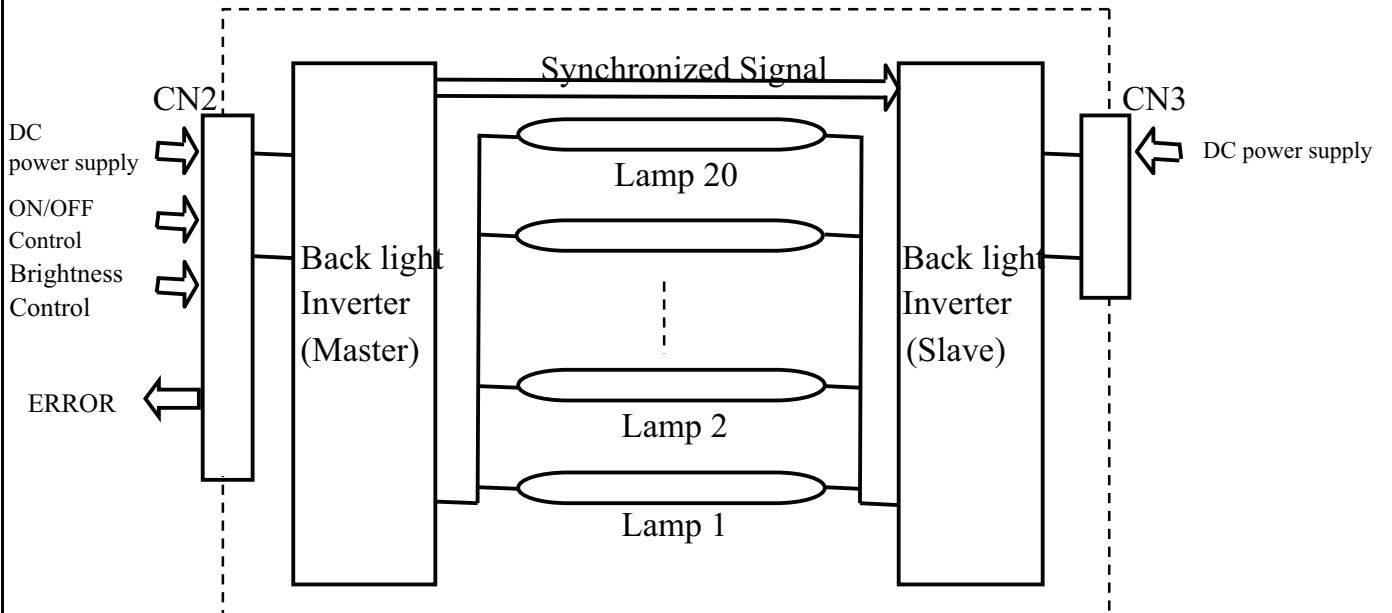
5) Life time of a lamp is defined as the time at which brightness of the lamp is 50% compared to that of initial value at that typical lamp current on condition of continuous operating at 25 ± 2°C.

4. BLOCK DIAGRAM

(1) TFT Module



(2) Back light unit



5. INTERFACE PIN ASSIGNMENT**5.1 TFT-LCD MODULE**

CN1:FX15S-41S-0.5SH

(Matching connector : FX15S-41P-C)

PIN No.	Symbol	Description	Note
1	VDD	Power Supply (typ.+12V)	1)
2	VDD		
3	VDD		
4	VDD		
5	VDD		
6	VDD		
7	VSS	GND(0V)	2)
8	VSS		
9	VSS		
10	VSS		
11	VSS		
12	VSS		
13	Rx0-	Pixel Data	3)
14	Rx0+		
15	VSS	GND(0V)	2)
16	Rx1-	Pixel Data	3)
17	Rx1+		
18	VSS	GND(0V)	2)
19	Rx2-	Pixel Data	3)
20	Rx2+		
21	VSS	GND(0V)	2)
22	CLK-	Pixel Clock	3)
23	CLK+		
24	VSS	GND(0V)	2)
25	Rx3-	Pixel Data	3)
26	Rx3+		
27	VSS	GND(0V)	2)

PIN No.	SYMBOL	Description	Note
28	IC	Internally Connected , Keep Open	
29	IC		
30	IC		
31	IC		
32	IC		
33	IC		
34	IC		
35	IC		
36	IC		
37	IC		
38	IC		
39	IC		
40	IC		
41	IC		

- 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) shall be wired by twisted-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	VIN	Power Supply (typ.+24.0V)	1)
2	VIN		
3	VIN		
4	VIN		
5	VIN		
6	VSS	GND(0V)	2)
7	VSS		
8	VSS		
9	VSS		
10	VSS		
11	ERR	Error Signal Control	
12	ON/OFF	High:Lamp ON, Low:Lamp OFF	
13	BRT	Brightness Control	
14	IC	Internally Conected, Keep Open	

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

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

CN3:JST S12B-PH-SM3-TF(LF)

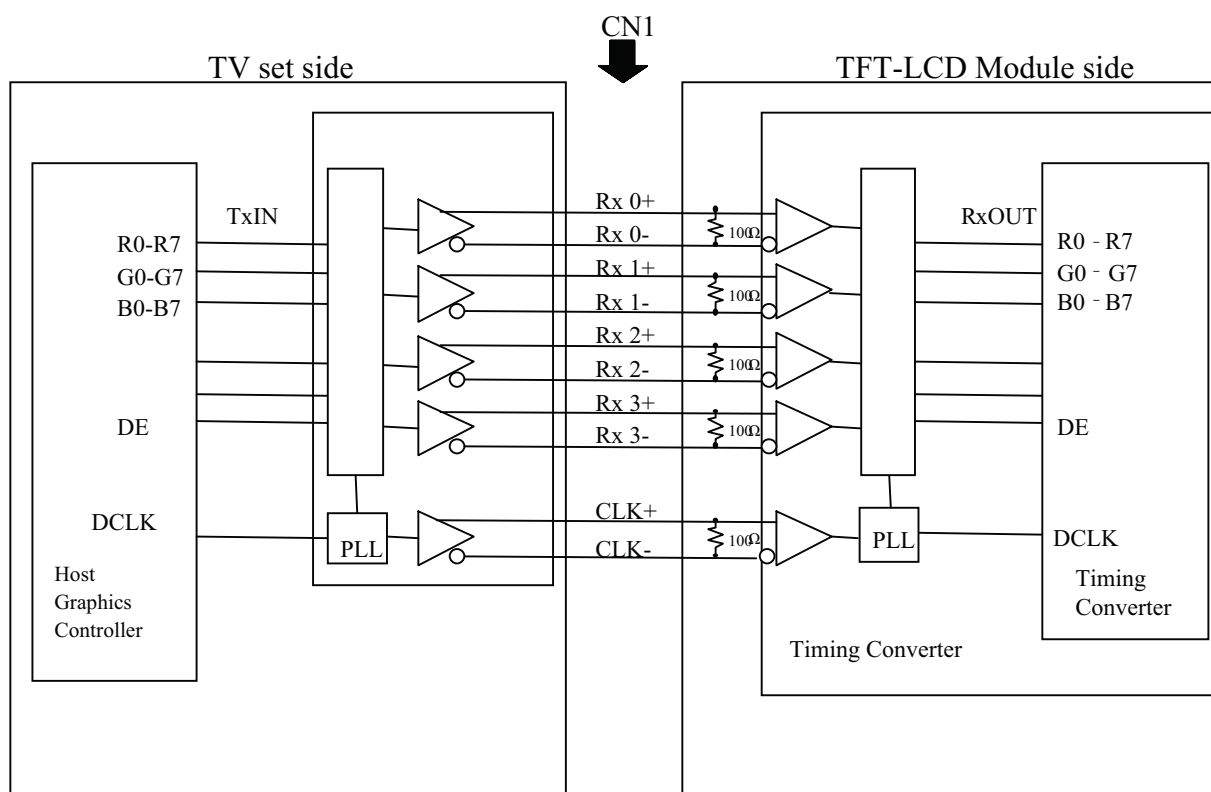
(Matching connecor : JST PHR-12)

Pin No.	SYMBOL	Description	Note
1	VIN	Power Supply (typ.+24.0V)	1)
2	VIN		
3	VIN		
4	VIN		
5	VIN		
6	VSS	GND(0V)	2)
7	VSS		
8	VSS		
9	VSS		
10	VSS		
11	NC	NC	
12	NC	NC	

Notes 1) All VIN 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



R0~R7 : Pixel R Data (7; MSB, 0; LSB)
 G0~G7 : Pixel G Data (7; MSB, 0; LSB)
 B0~B7 : Pixel B Data (7; MSB, 0; LSB)
 DE : Data Enable

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

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

5.4 LVDS INTERFACE

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL		
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT		
24bit	R2	51	Tx IN0	TA OUT0+	Rx 0+	27	Rx OUT0	R2		
	R3	52	Tx IN1			29	Rx OUT1	R3		
	R4	54	Tx IN2			30	Rx OUT2	R4		
	R5	55	Tx IN3			32	Rx OUT3	R5		
	R6	56	Tx IN4			33	Rx OUT4	R6		
	R7	3	Tx IN6			TA OUT0-	Rx 0-	35	Rx OUT6	R7
	G2	4	Tx IN7			37	Rx OUT7	G2		
	G3	6	Tx IN8	TA OUT1+	Rx 1+	38	Rx OUT8	G3		
	G4	7	Tx IN9			39	Rx OUT9	G4		
	G5	11	Tx IN12			43	Rx OUT12	G5		
	G6	12	Tx IN13			45	Rx OUT13	G6		
	G7	14	Tx IN14			46	Rx OUT14	G7		
	B2	15	Tx IN15			TA OUT1-	Rx 1-	47	Rx OUT15	B2
	B3	19	Tx IN18			51	Rx OUT18	B3		
	B4	20	Tx IN19	TA OUT2+	Rx 2+	53	Rx OUT19	B4		
	B5	22	Tx IN20			54	Rx OUT20	B5		
	B6	23	Tx IN21			55	Rx OUT21	B6		
	B7	24	Tx IN22			1	Rx OUT22	B7		
	HSYNC	27	Tx IN24			3	Rx OUT24	not connect		
	VSYNC	28	Tx IN25			TA OUT2-	Rx 2-	5	Rx OUT25	not connect
	DE	30	Tx IN26			6	Rx OUT26	DE		
	R0	50	Tx IN27	TA OUT3+	Rx 3+	7	Rx OUT27	R0		
	R1	2	Tx IN5			34	Rx OUT5	R1		
G0	8	Tx IN10	41			Rx OUT10	G0			
G1	10	Tx IN11	42			Rx OUT11	G1			
B0	16	Tx IN16	49			Rx OUT16	B0			
B1	18	Tx IN17	TA OUT3-			Rx 3-	50	Rx OUT17	B1	
RSVD 1)	25	Tx IN23	2			Rx OUT23	not connect			
	DCLK	31	TxCLK IN	TxCLK OUT+	RxCLK IN+	26	RxCLK OUT	DCLK		
				TxCLK OUT-	RxCLK IN-					

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

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

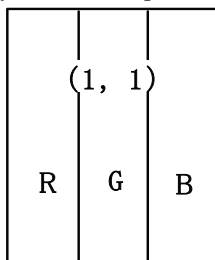
BA0~BA7, BB0~BB7 :Pixel B Data (7;MSB, 0;LSB)

DE :Data Enable

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

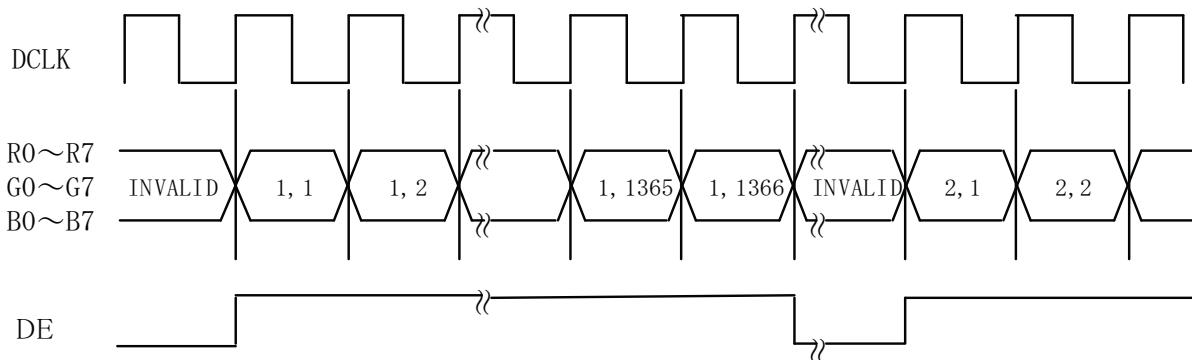
5.5 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE

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



pixel : R0~R7 :R data
 G0~G7 :G data
 B0~B7 :B data

1, 1	1, 2	1, 3	-----	1, 1366
2, 1	2, 2	2, 3	-----	2, 1366
3, 1	3, 2	3, 3	-----	3, 1366
⋮	⋮	⋮		⋮
768, 1	768, 2	768, 3	-----	768, 1366



5.6 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

Color	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						
		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						
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	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						
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	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	0	1						
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0						
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	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						

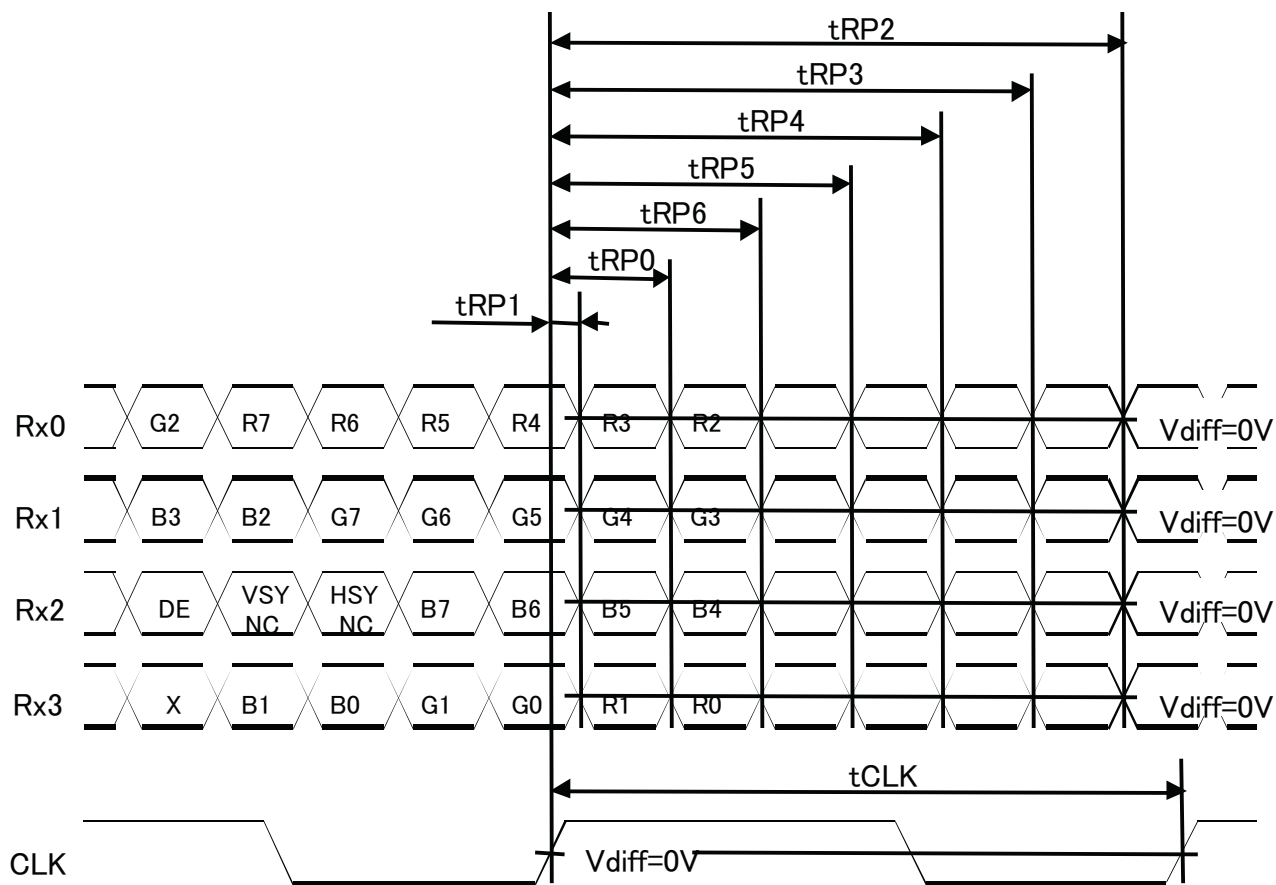
Notes 1) Definition of gray scale:

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

2) Data: 1:High, 0:Low

6. INTERFACE TIMING

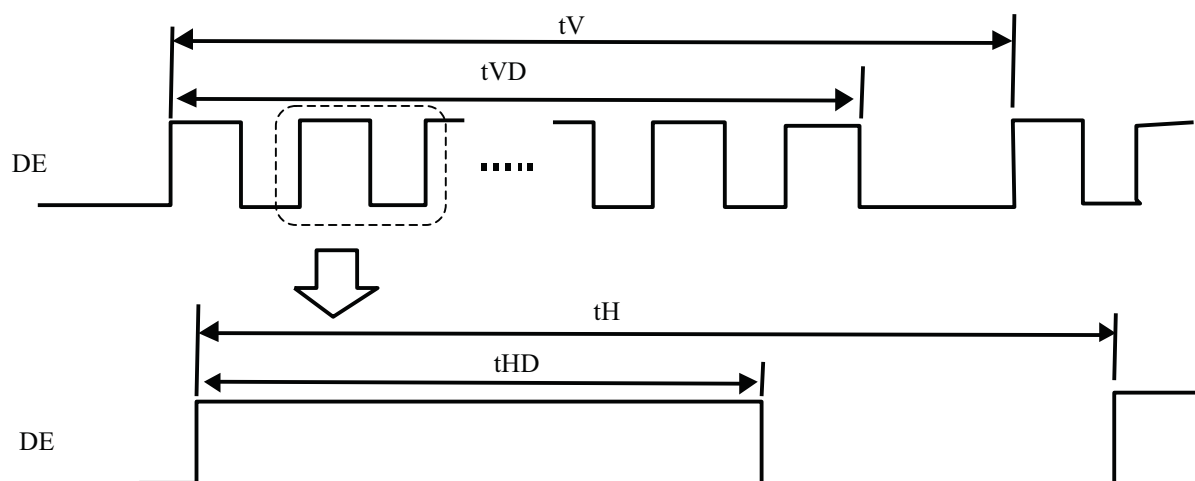
6.1 LVDS receiver timing



Rx0 = (Rx0+) - (Rx0-)
 Rx1 = (Rx1+) - (Rx1-)
 Rx2 = (Rx2+) - (Rx2-)
 Rx3 = (Rx3+) - (Rx3-)
 CLK = (CLK+) - (CLK-)

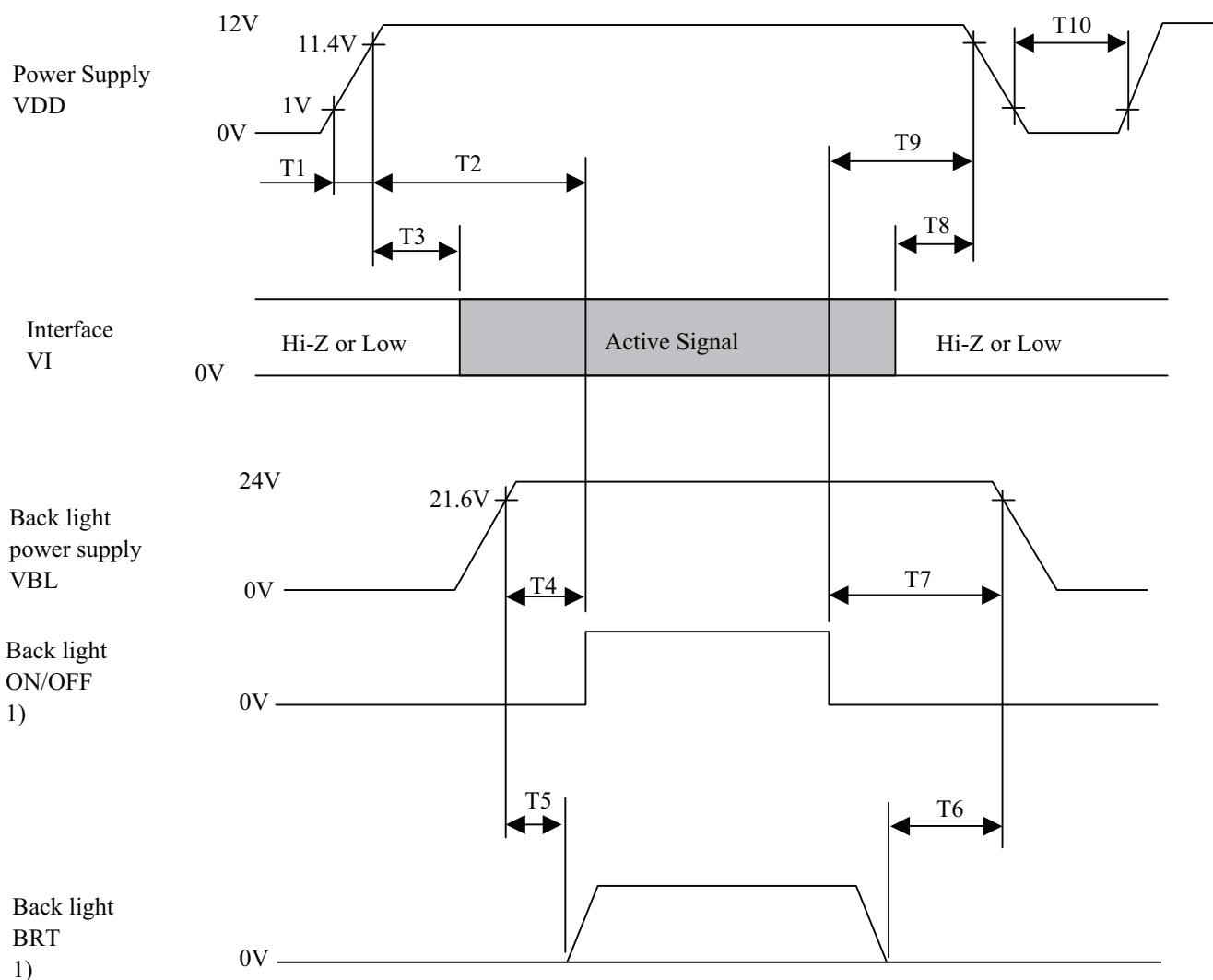
Item	Symbol	Min	Typ	Max	Unit	
RCLK	Frequency	$\frac{1}{t_{CLK}}$	65	82	85	MHz
Rx0 Rx1 Rx2 Rx3	0 data position	t_{RP0}	$1/7t_{CLK} - 0.40$	$1/7t_{CLK}$	$1/7t_{CLK} + 0.40$	ns
	1st data position	t_{RP1}	- 0.40	0	+ 0.40	
	2nd data position	t_{RP2}	$2/7t_{CLK} - 0.40$	$2/7t_{CLK}$	$2/7t_{CLK} + 0.40$	
	3rd data position	t_{RP3}	$3/7t_{CLK} - 0.40$	$3/7t_{CLK}$	$3/7t_{CLK} + 0.40$	
	4th data position	t_{RP4}	$4/7t_{CLK} - 0.40$	$4/7t_{CLK}$	$4/7t_{CLK} + 0.40$	
	5th data position	t_{RP5}	$5/7t_{CLK} - 0.40$	$5/7t_{CLK}$	$5/7t_{CLK} + 0.40$	
	6th data position	t_{RP6}	$6/7t_{CLK} - 0.40$	$6/7t_{CLK}$	$6/7t_{CLK} + 0.40$	

6.2 SYNCHRONIZATION SIGNAL TIMING



Item	Symbol	Min	Typ	Max	Unit	Note
DE	Vertical Frequency	fV	48	60	62	Hz
	Vertical Period	tV	784	800	1000	tH
	Vertical Valid	tVD	768			tH
	Horizontal Frequency	fH	41	48	49	kHz
	Horizontal Period	tH	1410	1708	1992	tCLK
	Horizontal Valid	tHD	1366			tCLK

6.3 TIMING BETWEEN INTERFACE SIGNALS POWER SUPPLY

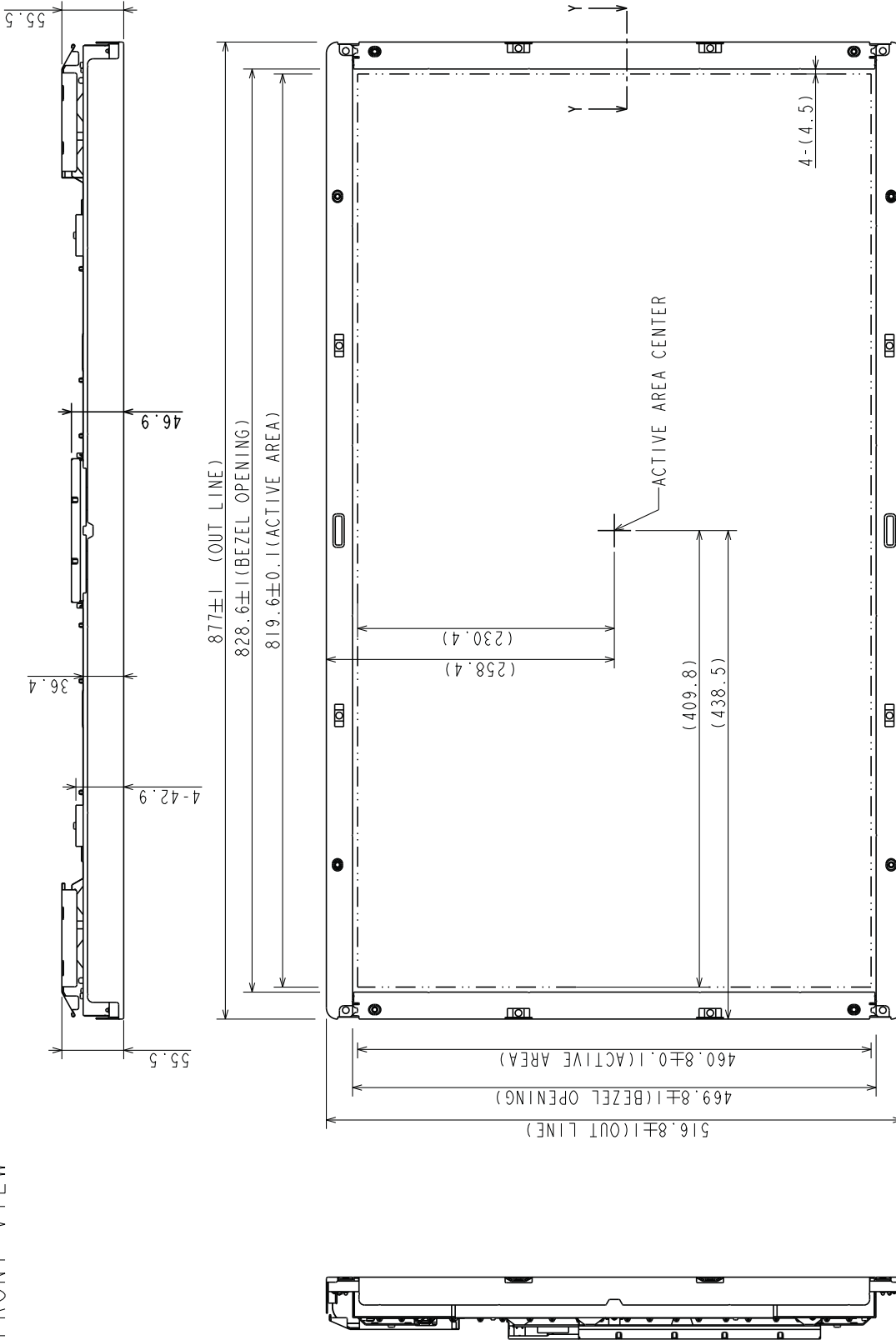


$0.5 \leq T1 \leq 10$	$-100 \leq T6$
$350 \leq T2$	$-100 \leq T7$
$10 \leq T3$	$0 \leq T8$
$0 \leq T4$	$0 \leq T9$
$0 \leq T5$	$1000 \leq T10$

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.

7. DIMENSIONAL OUT LINE
(1) FRONT VIEW



Note 1) The dimension in parenthesis is a reference value.
2) Unspecified tolerance to be ±1.0

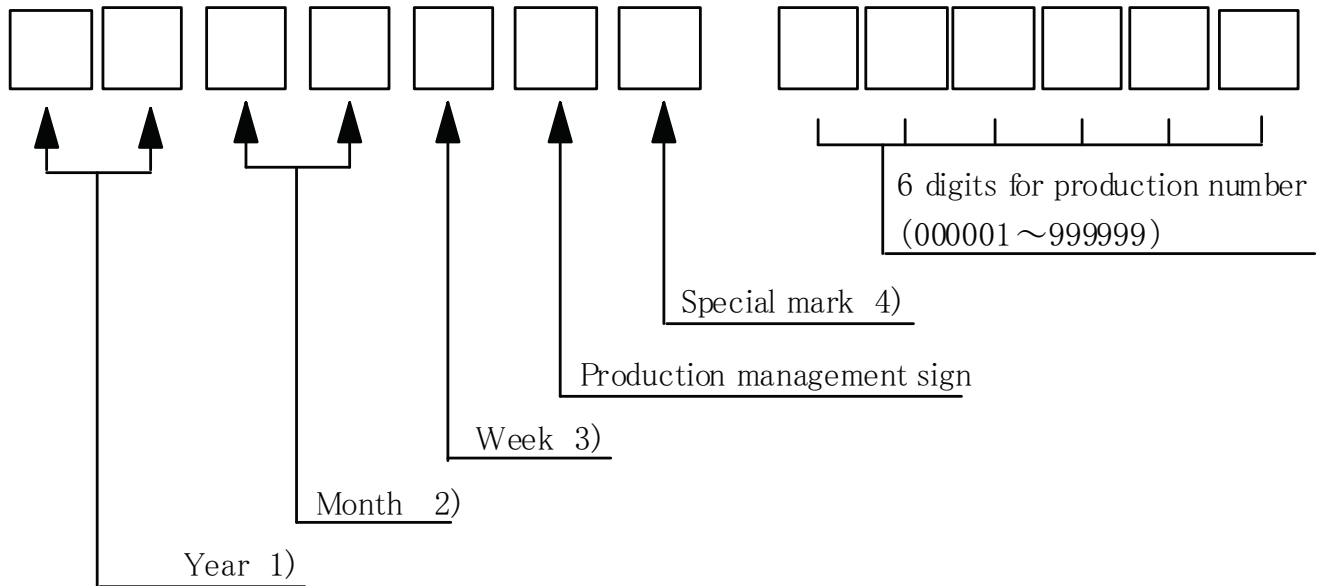
SECTION Y-Y

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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

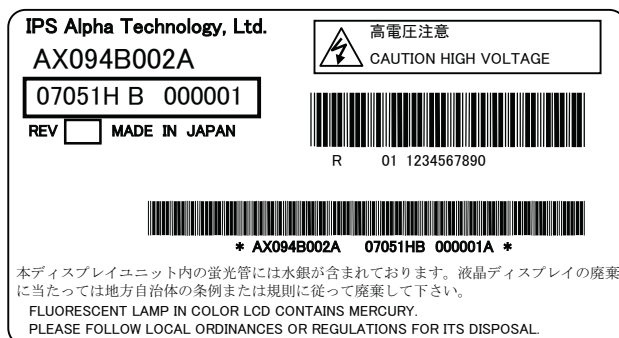
4) It is the mark that was opened up by production person to take correspondence with production number.

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.





8.4 Record of the revision described on the label

Revision	Specification
B / BA	-
C / CA	Initial
E / EA	Lamp is changed based on Rev.C/CA.

Note) *A=Easing cosmetic specification of sparkle mode classified

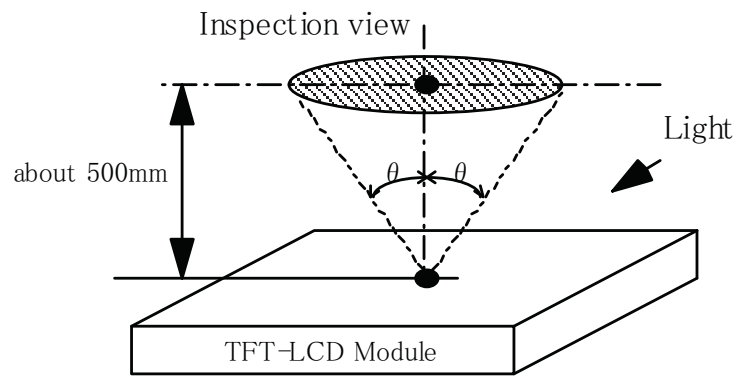
Item	B/BA	C/CA	E/EA						
Initial	-	○							
Prevention of hum noise Diffuser Board		○	○						
Lamp color chromaticity			○						
Lighting characteristic			○						

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)

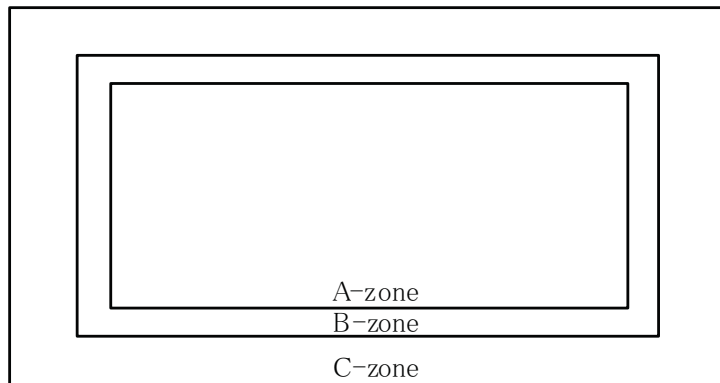


(2) Environmental

- 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				
				Standard	Easing			
Operating inspection	1	Dot defect	Sparkle mode	1-dot	0	2	pcs	1),2),4)
				2-dots	0	0	Units	1),2),5)
				3-dots	0	0		
				Density	0	2	pcs/φ20mm	1),2),6)
				Total	0	2	pcs	1),2)
			Black mode	1-dot	5	7	pcs	1),3),4)
				2-dots	1	1	Units	1),3),5)
				3-dots	0	0		
				Density	3	4	pcs/φ20mm	1),3),6)
				Total	5	7	pcs	1),3)
			Total	5	7	pcs	1)	
	2	Line defect		Serious one is not allowed		-	-	
	3	Uneven brightness		Serious one is not allowed		-	-	
	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	8			
				L > 4.0	0			
			W ≤ 0.08	L ≤ 2.0	8			
				L > 2.0	0			
	W > 0.08	-	(See dot shape)					
	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	10				
			L > 20	0				
		W > 0.08	-	0				
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			
Operating inspection	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% at white. (visible to eye)
 - 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 $20\text{mm}\phi$.
 - 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 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.

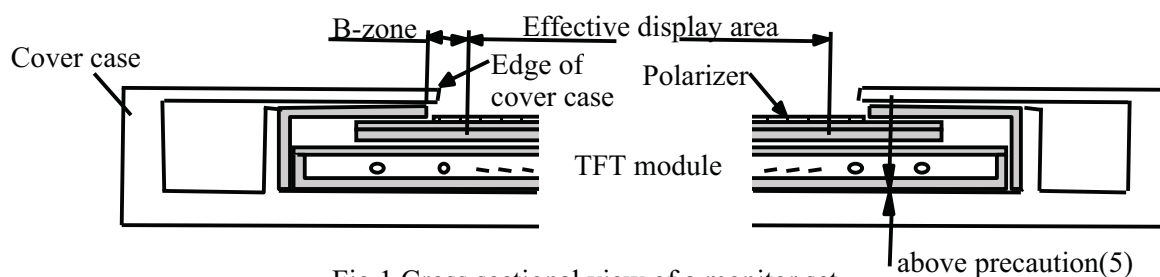


Fig.1 Cross sectional view of a monitor set

- (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 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 or Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a 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:
 $-200\text{mV} \leq \text{over- and under- shoot of VDD} \leq +200\text{mV}$
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 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 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 or Isopropyl alcohol. 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 or Isopropyl alcohol.

10.7 Safety

- (1) Since a 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 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.

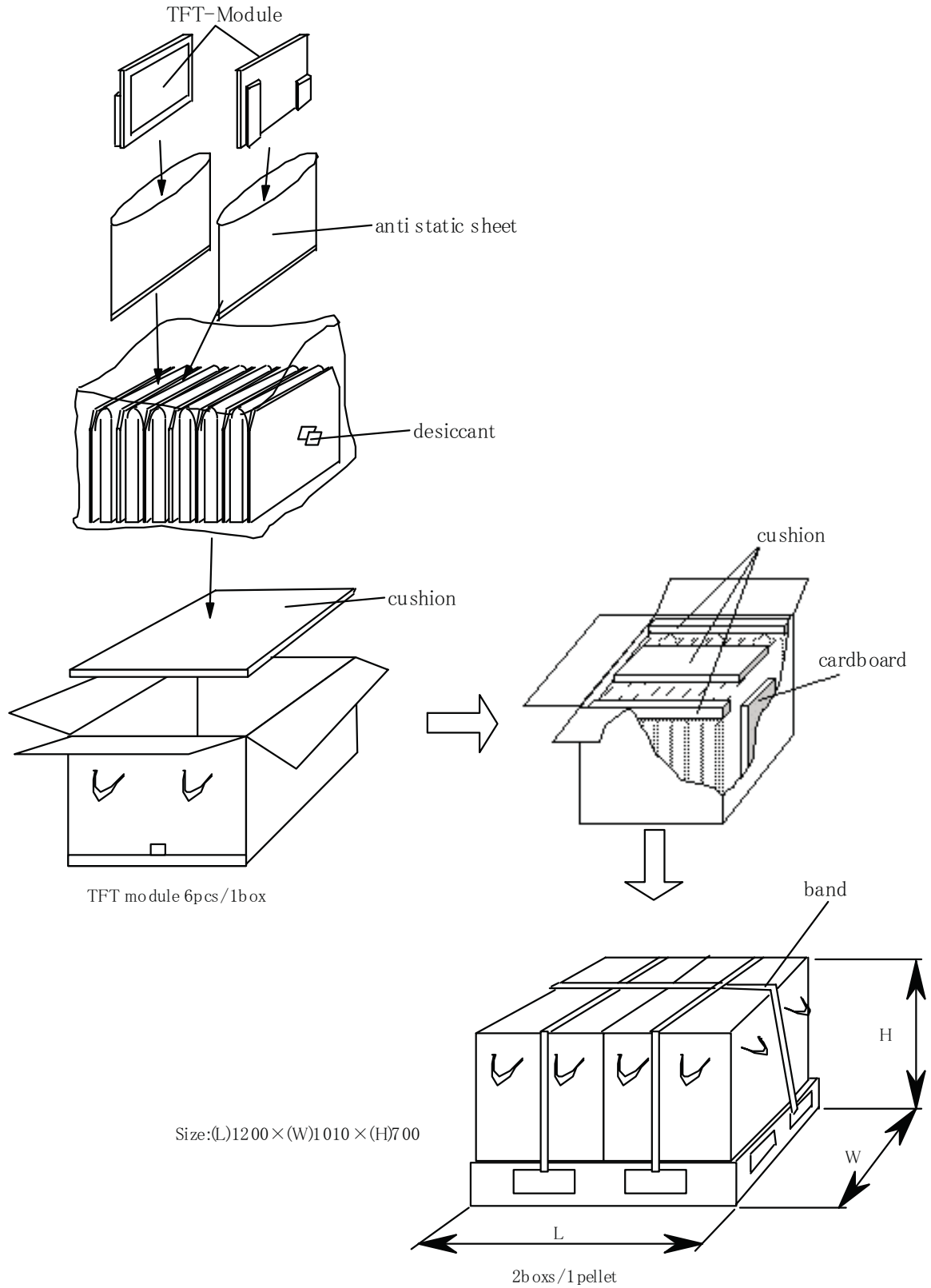
10.10 Others

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

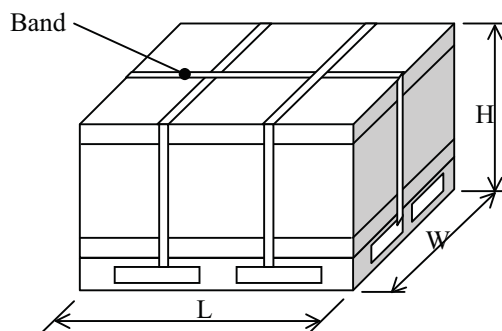
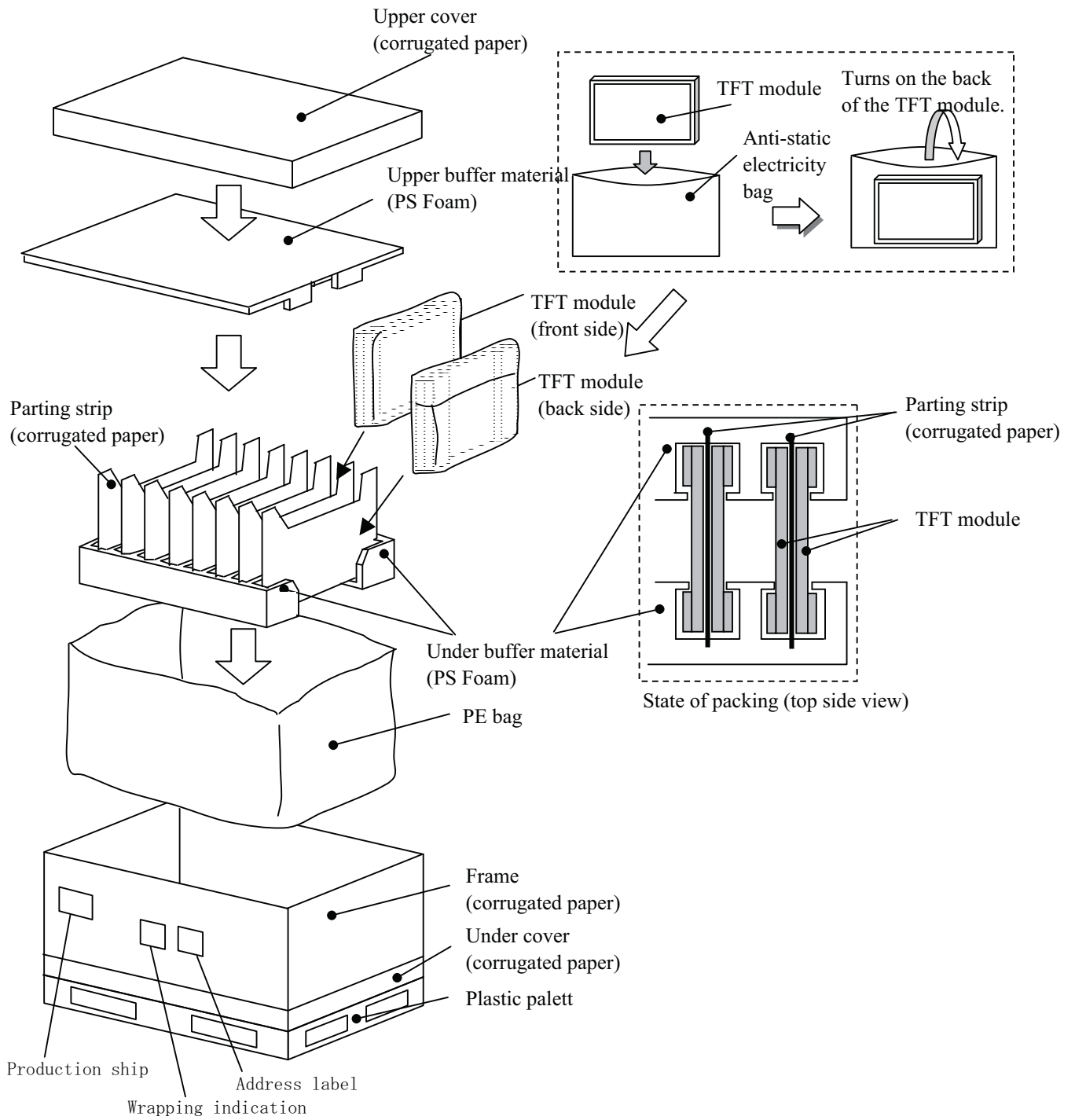
IPS Alpha Technology, Ltd.	Date	Jan. 24, 2008	Sheet No.	IPS4PS 2613 -AX094B002A-4	Page	13-3/3
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11.Packing

Type1 : TFT module 12pcs/pallet

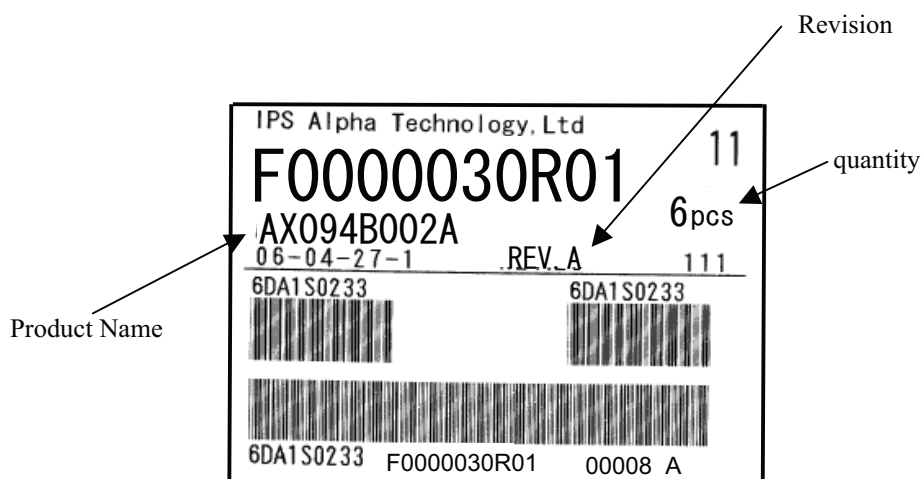
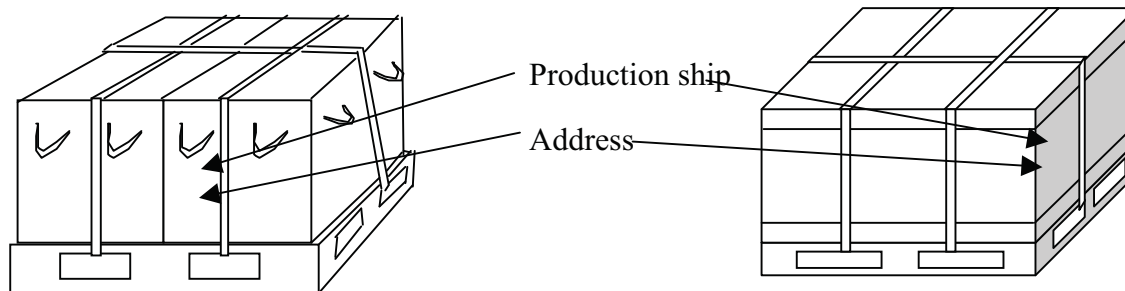


Type2 : TFT module 16pcs/pallet

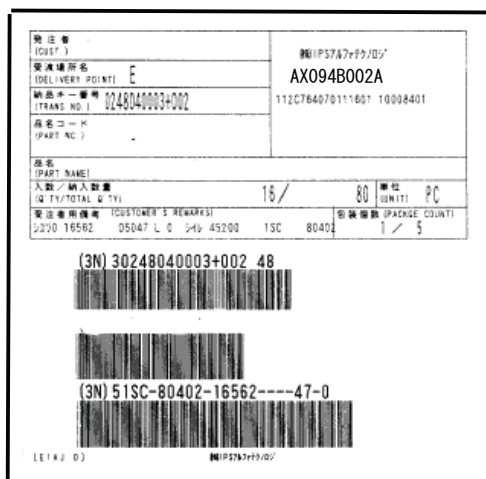


(L)1220mm×(W)1000mm×(H)720mm

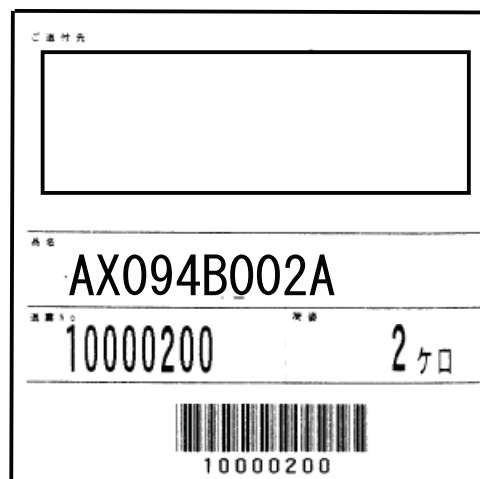
(TFT module 16pcs/pallet)



production slip (ex.) label size (102 × 70)



Wrapping indication(ex.)



Address label(ex.)

label size (100 × 100)

12. APPRICATION NOTE

(1) Distance between inverter cover and chassis metal

Distance between inverter cover surface and chassis metal of TV set shall be longer than 9mm.

