APATL0000191

IPS Alpha Technology, Ltd.

Date : Sep. 10, 2007

For Messrs. TOSHIBA CORPORATION
Digital Media Network Company

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

AX080E002B

TOSHIBA Part No. : V33A00013300

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Accepted by : _____

Proposed by : _____

Date: _____

RECORD OF REVISION

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Jun. 18, 2007	IPS4PS-2611-AX080E002B-1	11-2/2	Changing Inverter and FFC (Add Rev.B)
	IPS4PS-2611-AX080E002B-2	11-2/2	
Aug. 28, 2007	IPS4PS-2611-AX080E002B-2	11-2/2	Added buffer material (Add Rev.C)
	IPS4PS-2611-AX080E002B-3	11-2/2	
Sep. 10, 2007	IPS4PS-2611-AX080E002B-3	11-2/2	Changing Source Driver (Add Rev.D)
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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 : AX080E002B

General Specifications

Effective Display Area	: (H)697.685×(V)392.256	(mm)
Number of Pixels	: (H)1,366×(V)768	(pixels)
Pixel Pitch	: (H)0.51075×(V)0.51075	(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 ϕ=0° ,90° , 180° ,270° , CR≧10)	
Input Signal	: 1-channel LVDS (LVDS:Low Voltage Differential Signaling)	
Back Light	: 16 pcs. of EEFL	
External Dimensions	: (H)760.0 x (V)450.0 x (t)49.0 max	(mm)
Weight	: Typ 7,000	(g)

1. ABSOLUTE MAXIMUM RATINGS

1.1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Temperature	0	65 1)	-20	60	℃	5)
Humidity	2)		2)		%RH	
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	1x	

Note 1) Temperature of display screen's surface.

2) Ta≦40 ℃ · · · · · Relative humidity should be less than 90%RH max. Dew is prohibited.
Ta＞40 ℃ · · · · · Relative humidity should be lower than the moisture of the 90%RH at 40℃.

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

4) Pulse width of the shock is 10 ms. All mounting holes shall be fixed. (Rear mountng holes)

5) The brightness of a lamp tends to drop at low temperature. Besides, the life-time becomes shorter at low temperature.
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 Vss = 0 V

ITEM	SYMBOL	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	13.2	V	
Input Voltage for logic	V_1	-0.3	3.6	V	1)
Electrostatic Durability	V_{ESD0}	±100		V	2), 3)
	V_{ESD1}	±8		kV	2), 4)

Note 1)It is applied to pixel data signal and clock signal.
2)Discharge Coefficient：200pF-250Ω, Environmental：25℃-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 Vss = 0 V

ITEM	SYMBOL	Min.	Max.	Unit	Note
Input Voltage	Vin	-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.

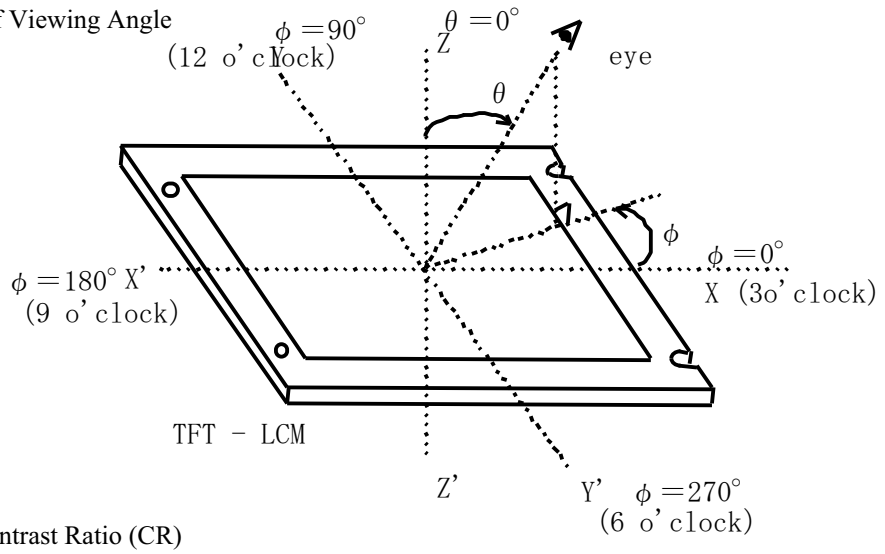
Measuring equipment：CS-1000A or equivalent (Except MPRT)

MPRT-1000 (MPRT)

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		700	950	-	-	2)
Response Time	Rise	ton		-	8	20	ms	3)
	Fall	toff		-	6	20	ms	3)
Brightness of white		Bwh		400	500	-	cd/m^2	
Brightness uniformity		Buni		-	-	30	%	4)
Color Chromaticity (CIE)	Red	χ	θ =0° 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		0.60	0.63	0.66		
	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	Δ χ	θ =+50° φ =0°, 90° 180°, 270° 1)	-	-	0.04	-	5) 【Gray scale =255】
		Δ y		-	-	0.04		
	Green	Δ χ		-	-	0.04		
		Δ y		-	-	0.04		
	Blue	Δ χ		-	-	0.04		
		Δ y		-	-	0.04		
	White	Δ χ		-	-	0.04		
		Δ y		-	-	0.04		
Contrast Ratio at 89°		CR89	φ =0°, 90°, 180°, 270° 1)	10	-	-	-	Estimated value
Gray scale		L255	θ =0° 1)	-	100%	-	-	
		L239		-	87%	-		
		L223		-	74%	-		
		L207		-	63%	-		
		L191		-	53%	-		
		L175		-	44%	-		
		L159		-	35%	-		
		L143		-	28%	-		
		L127		-	22%	-		
		L111		-	16%	-		
		L95		-	11%	-		
		L79		-	7.6%	-		
		L63		-	4.6%	-		
		L47		-	2.4%	-		
		L31		-	0.97%	-		
		L15		-	0.34%	-		
		L0		-	0.12%	-		
MPRT		MPRT		-	17	-	ms	

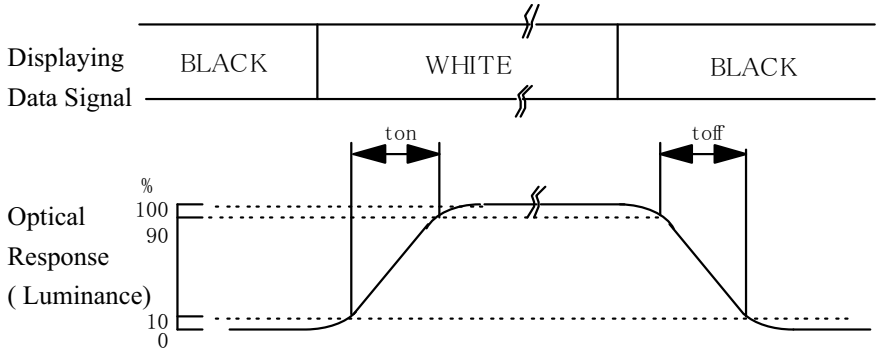
Note 1) Definition of Viewing Angle



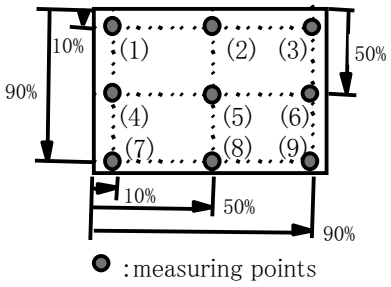
2) Definition of Contrast Ratio (CR)

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

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.

$$Buni = \frac{\left| \text{Bmax or Bmin - Bave} \right|}{\text{Bave}} \times 100$$

where, Bmax = Maximum brightness

Bmin = Minimum brightness

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

5) Variation of color position on CIE is defined as difference between colors at θ =0° and at θ =50°and ϕ =0°, 90°, 180°, 270°.

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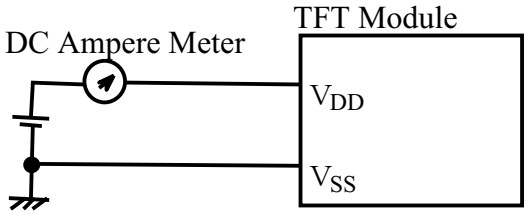
3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD Module

Ta=25℃、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}	-	0.5	0.6	A	1), 2)
Ripple voltage of power Supply	V_{DDR}	-	-	350	mV	

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

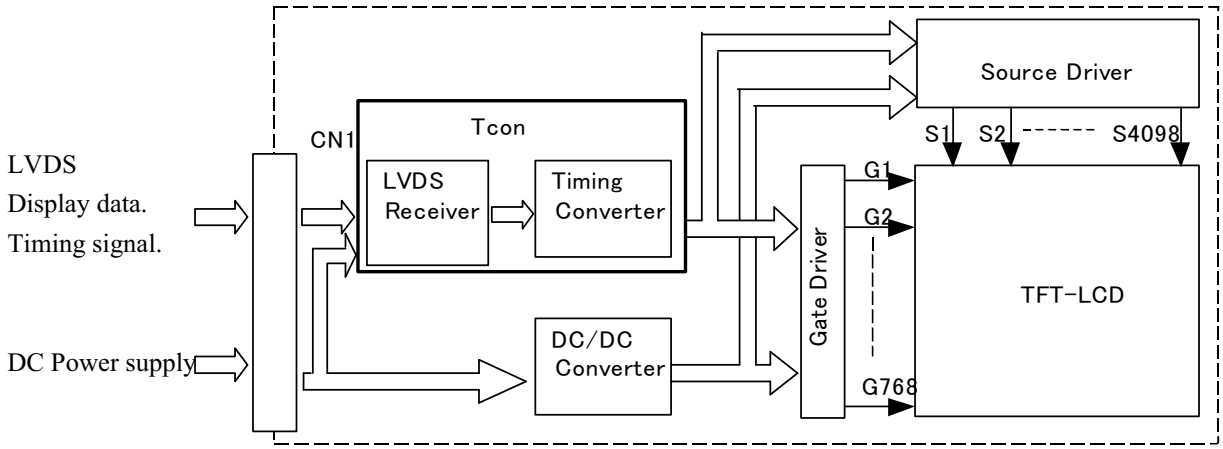
ITEM		Symbol	Min.	Typ.	Max.	Unit	Notes	
Input Voltage		VBL	21.6	24.0	26.4	V		
Input Current		IBL	-	-	4.8	A	3)	BRT=3.3V, Ta=25℃
			-	4.1	4.5		4)	
ON/OFF Control Imput Voltage	ON	ON/OFF	2.2	-	5.5	V		
	OFF		0	-	0.8	V		
Brigthness Control Input Voltage	Min. Brightness	BRT	-	0	-	V		
	Max. Brightness		3.0	-	3.3	V		
PWM Duty	Min. Brightness	on-Duty	-	20	-	%	BRT=0V	
	Max. Brightness		-	-	100		BRT=3.3V	
Average Lamp Life Time		-	60,000	-	-	hours	5)	

Note 3) Warm up period (1 hour after back light is turnd on.)
4) Stable period (After warm up period)

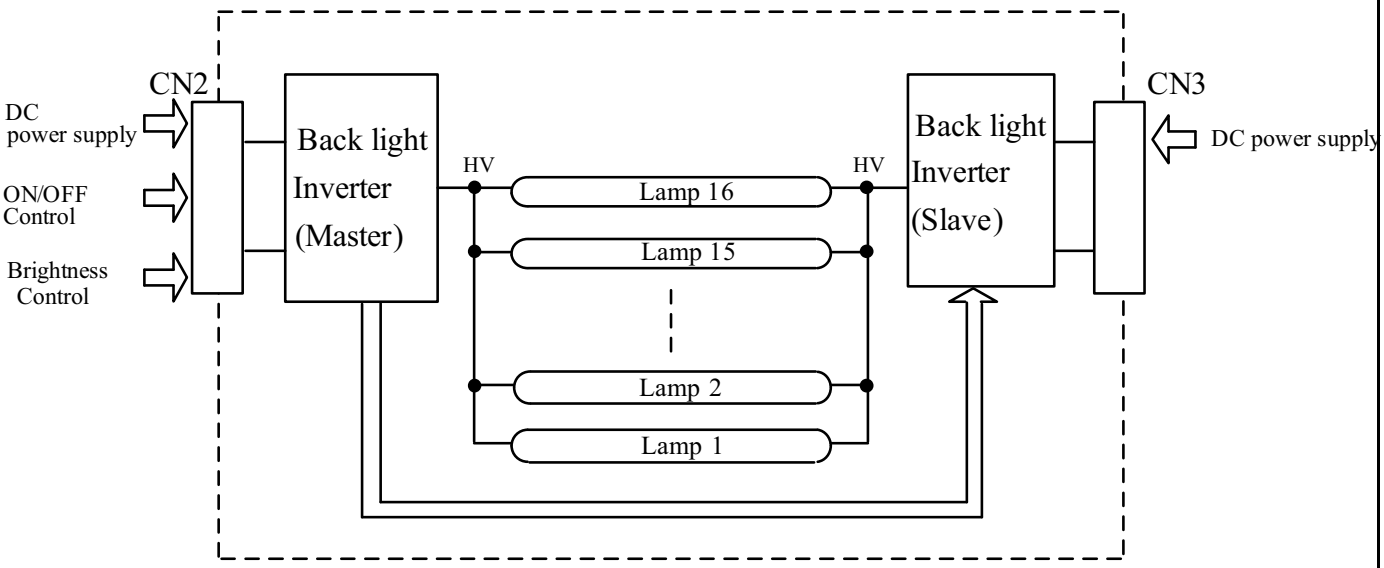
5) Life time of a lamp is defined as the time at which brightness of the lamp is 50% compared to that of initial value at that typical lamp current on condition of continuous operating at 25 ± 2℃.

4. BLOCK DIAGRAM

(1) TFT Module



(2) Back light unit



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5. INTERFACE PIN ASSIGNMENT

5. 1 TFT-LCD MODULE

CN1:HIROSE FX15S-41S-0.5SH

(Matching connector : HIROSE 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)

CN3 : JST S12B-PH-SM3-TF(LF) (Matching connecor : JST PHR-12)

Pin No.	SYMBOL		Description	Note
	Master(CN2)	Slave(CN3)		
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	NC	Normal:External Pull-up, Abnormal:0V	3)
12	ON/OFF	NC	High:Lamp ON, Low:Lamp OFF	
13	BRT	—	Brightness controll of Back Light	4)
14	NC	—		

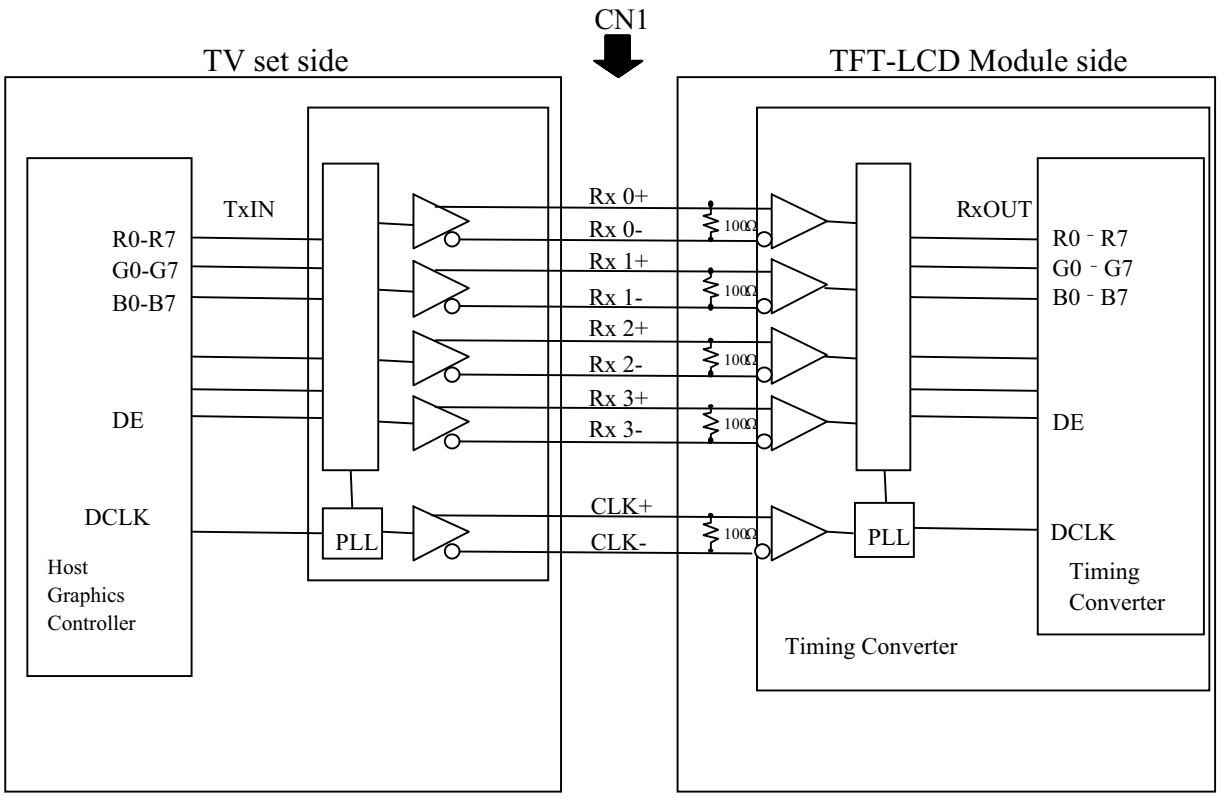
Notes 1) All VBL pins shall be connected to +24.0V(Typ.).

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

3) Pin 11 and 12 of Slave (CN3) are ignored.

4) Pin 14 of Master (CN2) are ignored.

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

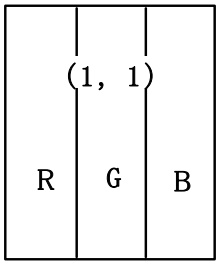
	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		TFT CONTROL INPUT
		PIN	INPUT	TV Set	TFT-LCD	
24bit	R2	51	Tx IN0	TA OUT0+	Rx 0+	R2
	R3	52	Tx IN1			R3
	R4	54	Tx IN2			R4
	R5	55	Tx IN3			R5
	R6	56	Tx IN4			R6
	R7	3	Tx IN6	TA OUT0-	Rx 0-	R7
	G2	4	Tx IN7			G2
	G3	6	Tx IN8	TA OUT1+	Rx 1+	G3
	G4	7	Tx IN9			G4
	G5	11	Tx IN12			G5
	G6	12	Tx IN13			G6
	G7	14	Tx IN14			G7
	B2	15	Tx IN15	TA OUT1-	Rx 1-	B2
	B3	19	Tx IN18			B3
	B4	20	Tx IN19	TA OUT2+	Rx 2+	B4
	B5	22	Tx IN20			B5
	B6	23	Tx IN21			B6
	B7	24	Tx IN22			B7
	-	27	Tx IN24			not connected
	-	28	Tx IN25	TA OUT2-	Rx 2-	not connected
	DE	30	Tx IN26			DE
	R0	50	Tx IN27	TA OUT3+	Rx 3+	R0
	R1	2	Tx IN5			R1
	G0	8	Tx IN10			G0
	G1	10	Tx IN11			G1
	B0	16	Tx IN16			B0
	B1	18	Tx IN17	TA OUT3-	Rx 3-	B1
	RSVD 1)	25	Tx IN23			not connected
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLK IN+ RxCLK IN-	DCLK

R0～R7 :Pixel B Data (7;MSB, 0;LSB)
G0～G7 :Pixel B Data (7;MSB, 0;LSB)
B0～B7 :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".

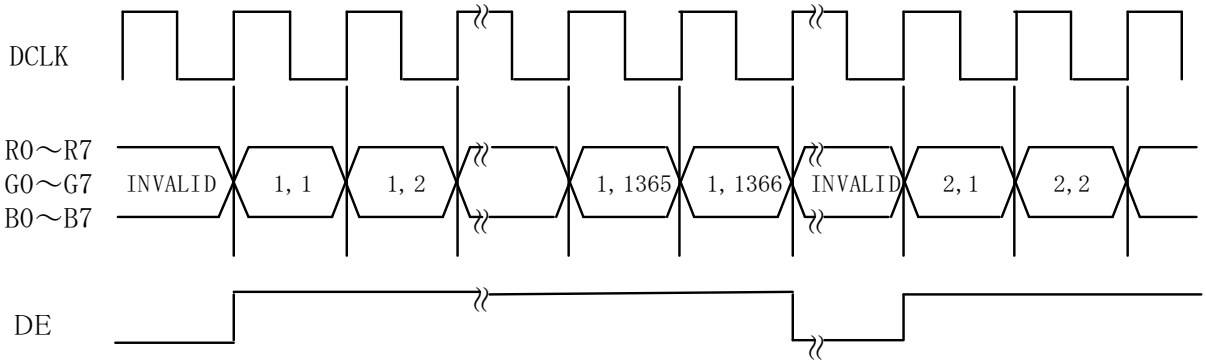
5.5 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE

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		Red Data								Green Data								Blue Data							
	Input	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	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

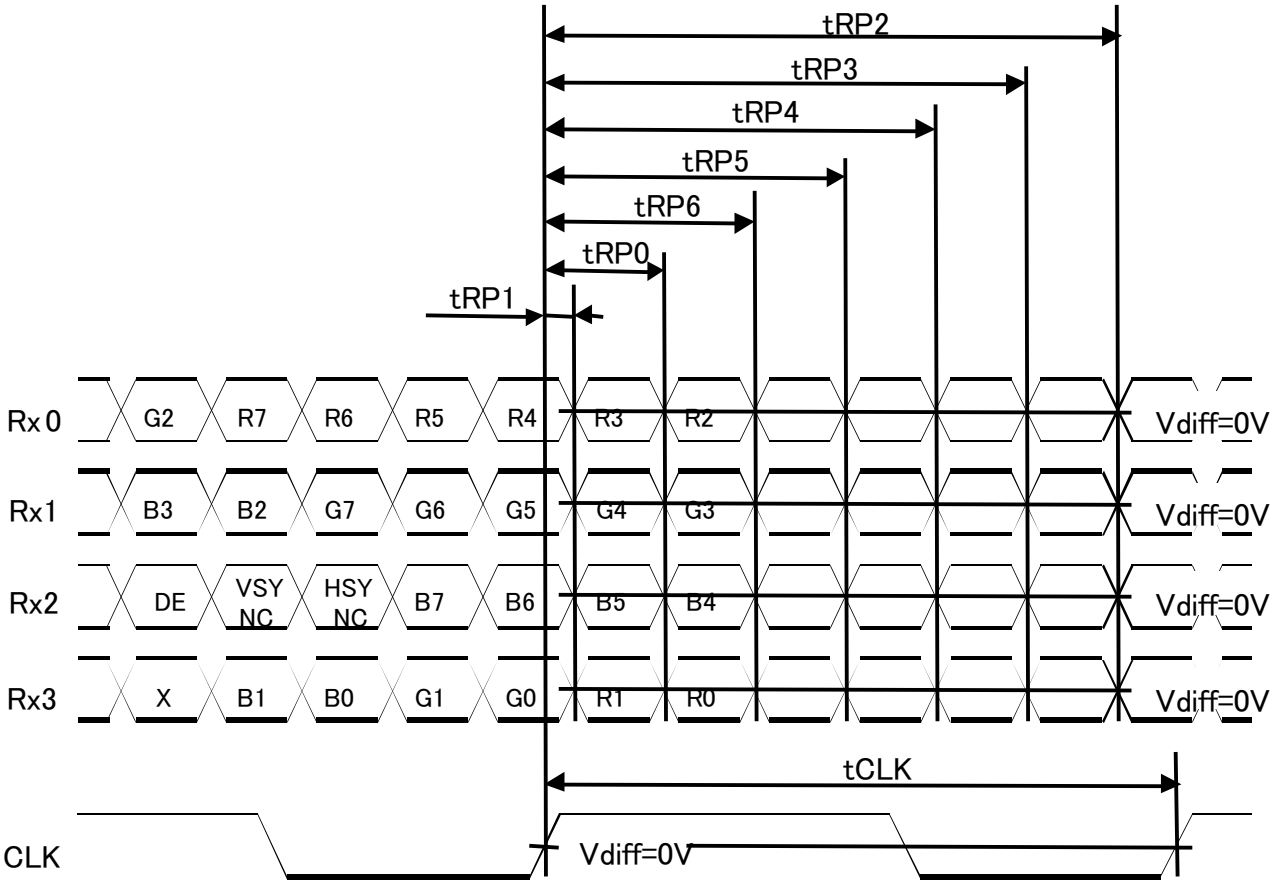
Notes 1) Definition of gray scale:

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

2) Data: 1:High, 0:Low

6. INTERFACE TIMING

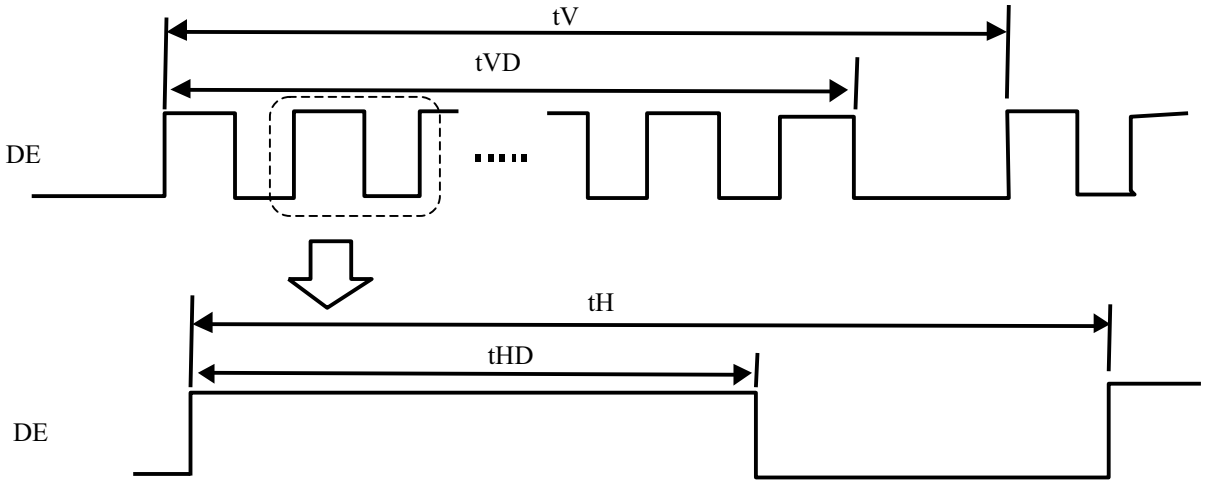
6.1 LVDS receiver timing



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

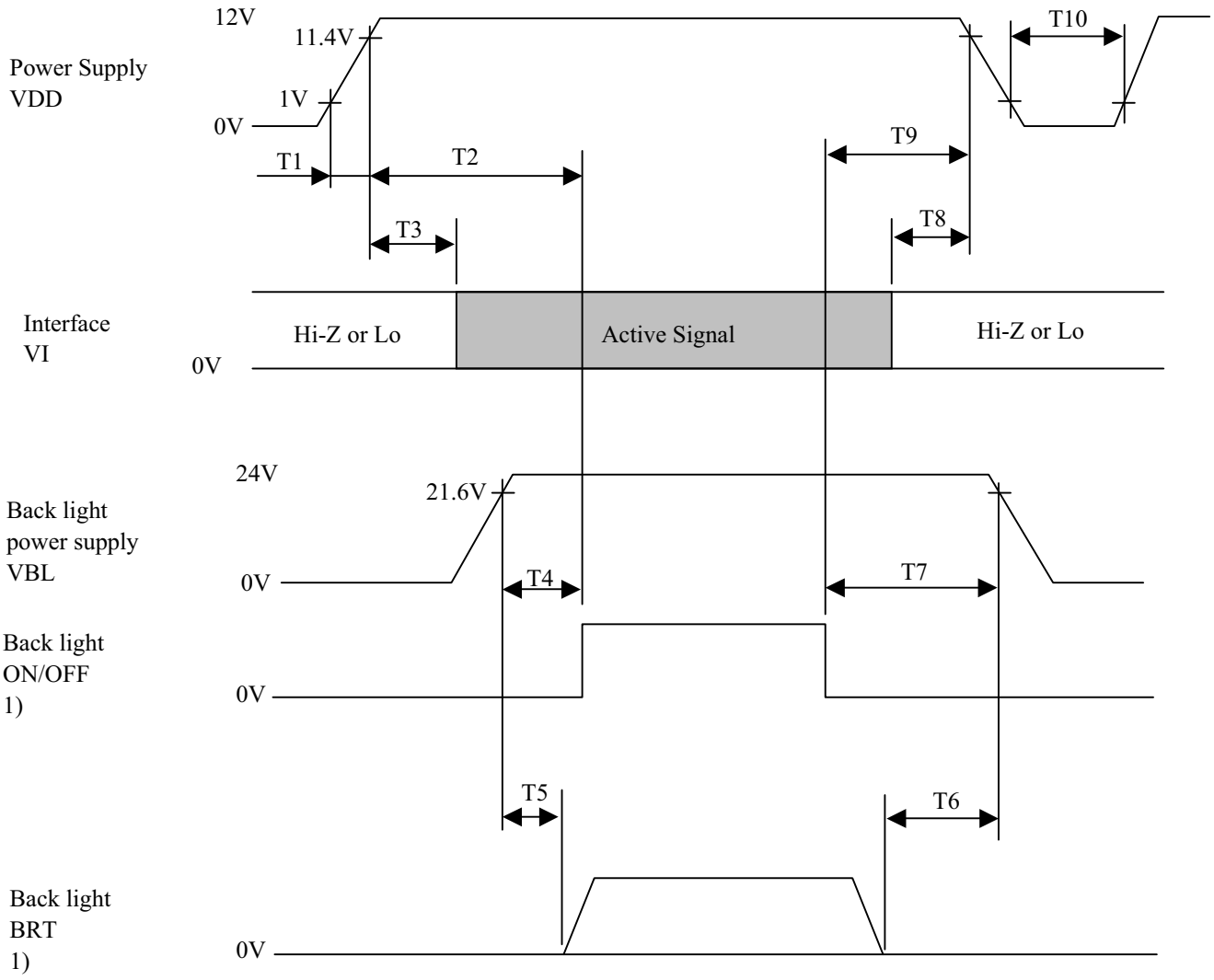
Item		Symbol	Min	Typ	Max	Unit
RCLK	Frequency	$\frac{1}{tCLK}$	65	82	85	MHz
Rx0 Rx1 Rx2 Rx3	0 data position	tRP0	1/7tCLK - 0.40	1/7tCLK	1/7tCLK + 0.40	ns
	1st data position	tRP1	- 0.40	0	+ 0.40	
	2nd data position	tRP2	6/7tCLK - 0.40	6/7tCLK	6/7tCLK + 0.40	
	3rd data position	tRP3	5/7tCLK - 0.40	5/7tCLK	5/7tCLK + 0.40	
	4th data position	tRP4	4/7tCLK - 0.40	4/7tCLK	4/7tCLK + 0.40	
	5th data position	tRP5	3/7tCLK - 0.40	3/7tCLK	3/7tCLK + 0.40	
	6th data position	tRP6	2/7tCLK - 0.40	2/7tCLK	2/7tCLK + 0.40	

6.2 SYNCRONIZATION SIGNAL TIMING



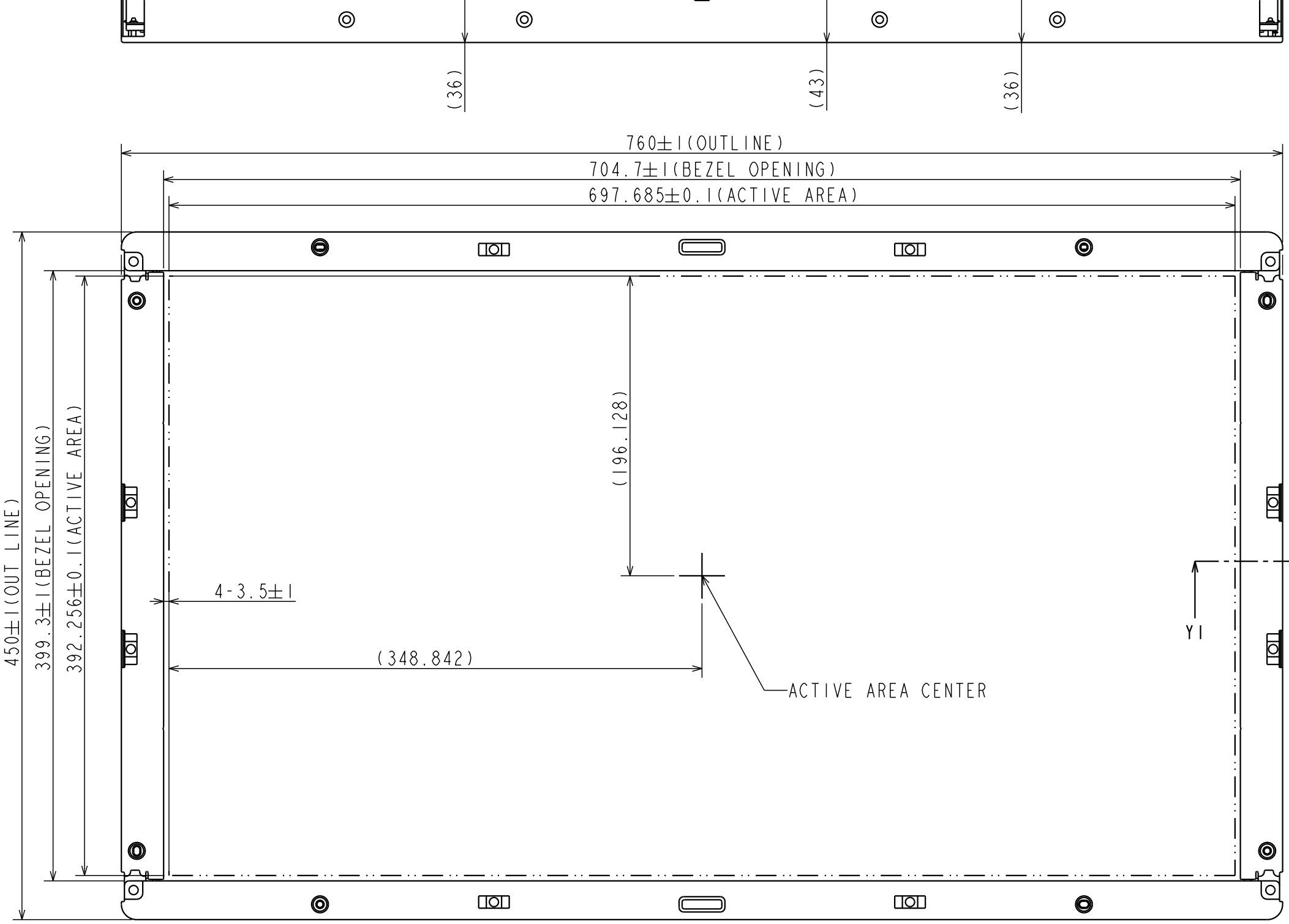
Item		Symbol	Min	Typ	Max	Unit	Note
DE	Vertical Frequency	fV	48	60	62	Hz	
	Vertical Period	tV	784	800	1000	tH	
	Vertical Valid	tVD		768		tH	
	Horizontal Frequency	fH	41	48	60	kHz	
	Horizontal Period	tH	1410	1708	1992	tCLK	
	Horizontal Valid	tHD		1366		tCLK	

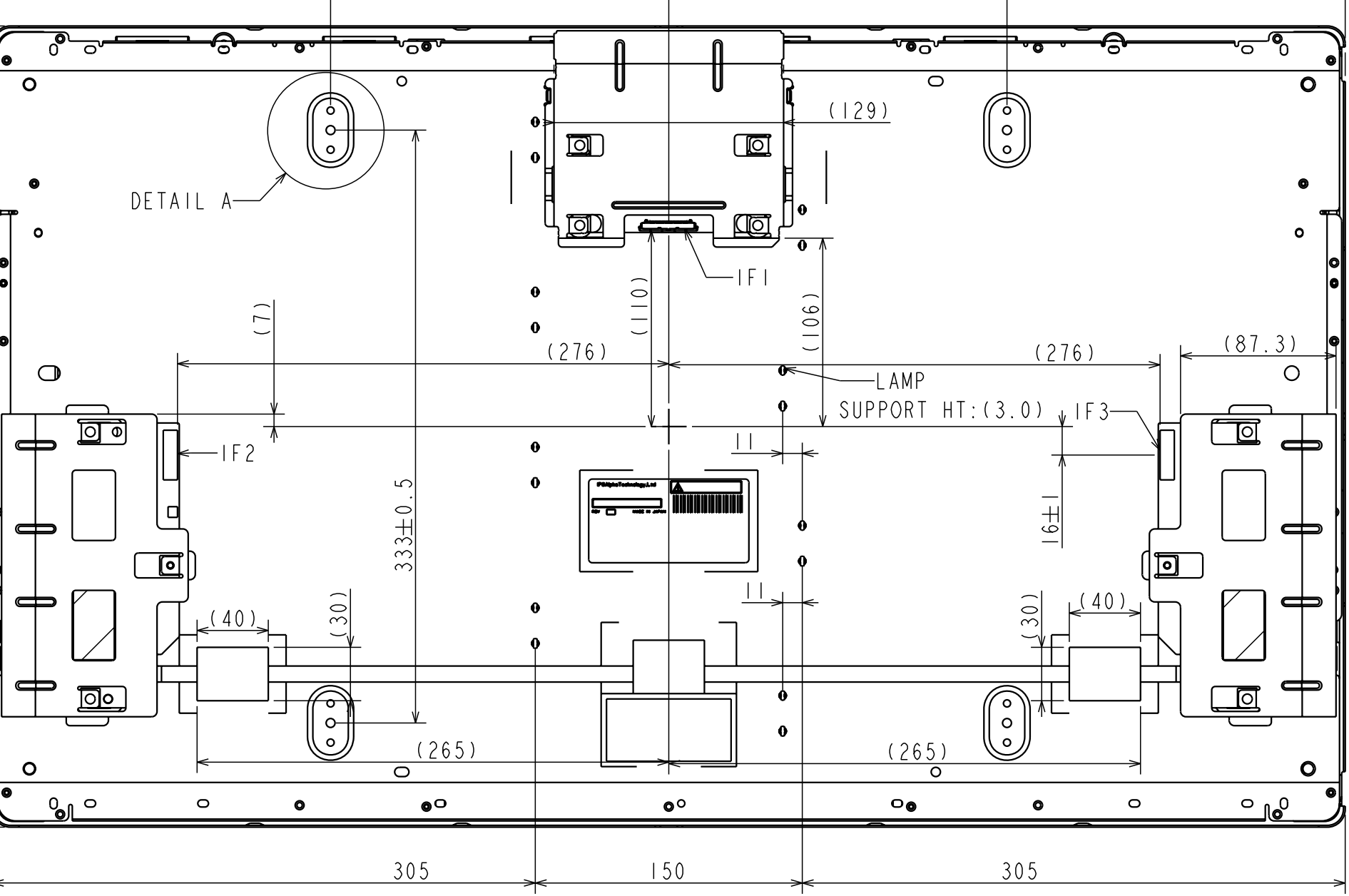
6.3 TIMING BETWEEN INTERFACE SIGNALS POWER SUPPLY

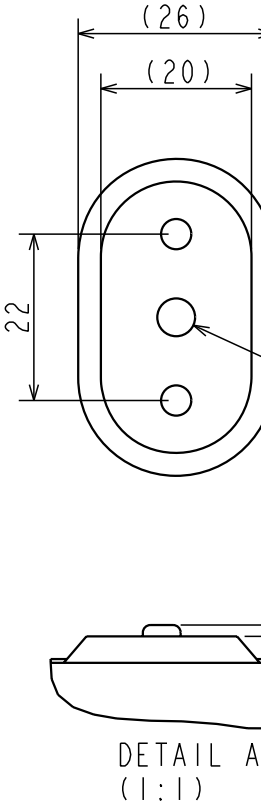


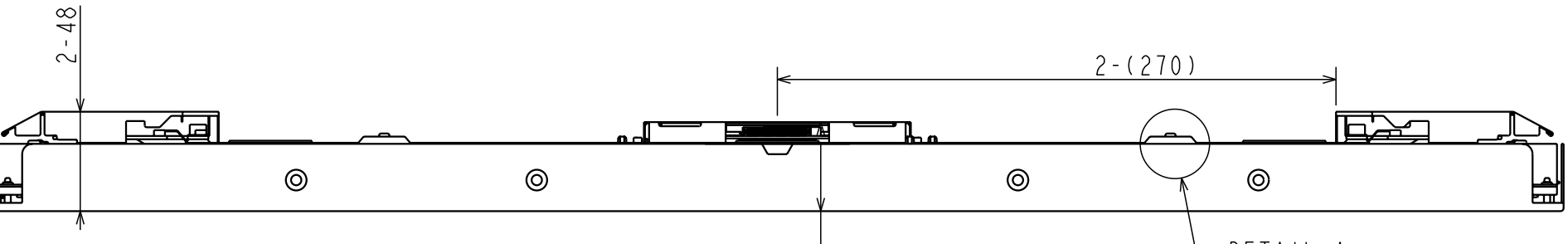
0.5	≦ T1 ≦	10	-100	≦ T6	
350	≦ T2		-100	≦ T7	
10	≦ T3		0	≦ T8	
0	≦ T4		0	≦ T9	
0	≦ T5		1000	≦ T10	Unit : ms

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.


(36)
(43)
(36)
760±1(OUTLINE)
704.7±1(BEZEL OPENING)
697.685±0.1(ACTIVE AREA)
450±1(OUT LINE)
399.3±1(BEZEL OPENING)
392.256±0.1(ACTIVE AREA)
(196.128)
4-3.5±1
(348.842)
ACTIVE AREA CENTER
Y1


DETAIL A
(129)
IF1
(110)
(106)
(7)
(276)
(276)
(87.3)
LAMP
SUPPORT HT:(3.0)
IF3
IF2
11
16±1
333±0.5
11
(40)
(30)
(30)
(40)
(265)
(265)
305
150
305

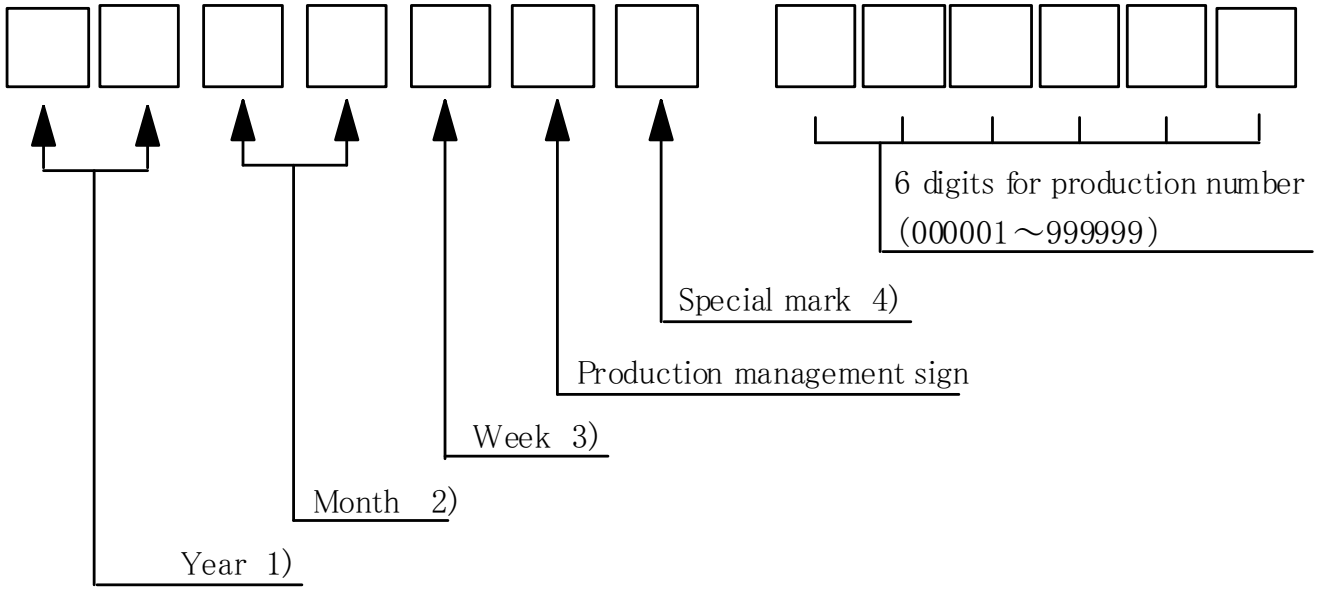

(26)
(20)
22
DETAIL A
(1:1)


2-48
2-(270)

[LOWER SIDE]

8. DESIGNATION OF LOT MARK

8.1 LOT MARK



Notes

1)

Year	Mark
2006	06
2007	07
2008	08

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

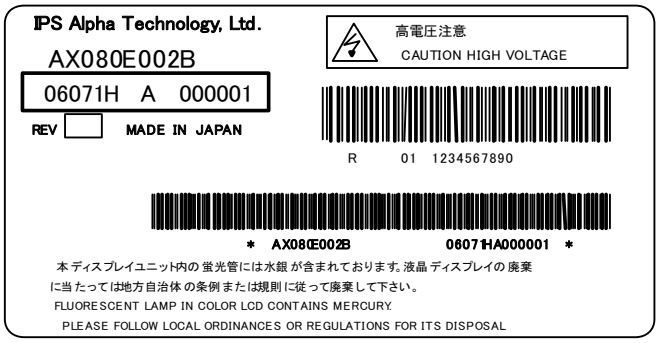
4) "A":Liquid crystal A, "B":Liquid crystal B

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 descrrived on the label

Rev. / No.	A	B	C	D
1	○	–	–	–
2	—	○	○	○
3	—	—	○	○
4	—	—	—	○

No.	Specification
1	Initial
2	Changing Inverter and FFC (Setting up of GND stability) Inverter Rev: E → F FFC: 8pin → 10pin
3	Added buffer material (Prevention of hum noise)
4	Changing Source Driver 【Before】Matsushita Electric Industrial Co., Ltd. 【After】SAMSUNG ELECTRONICS CO.,LTD.

9. COSMETIC SPECIFICATIONS

9.1 Condition for cosmetic inspection

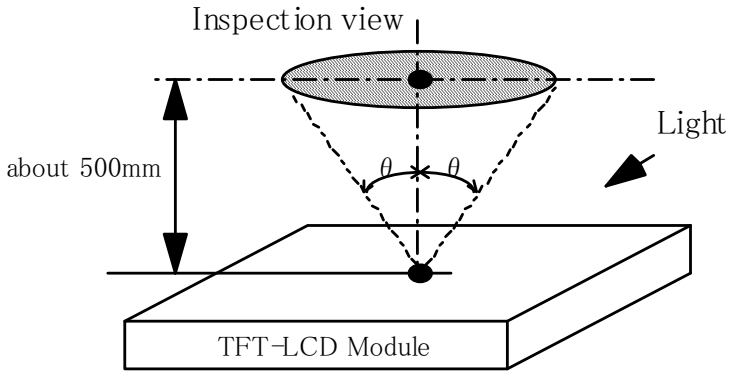
(1) Viewing zone

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

$\theta \leqq 45^{\circ}$: when non-operating inspection

$\theta \leqq 5^{\circ}$: 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

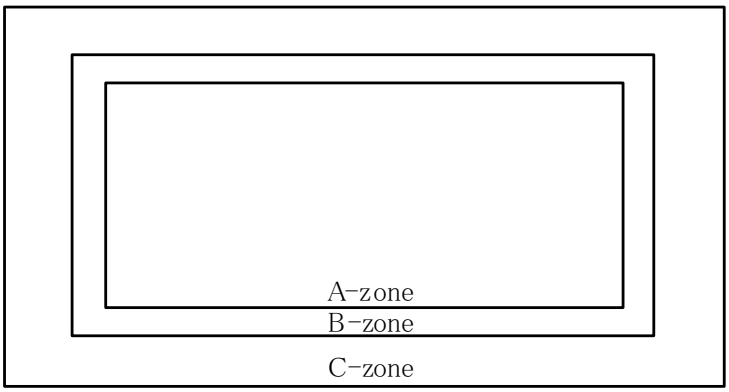
a) Temperature : 25 degrees

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 A-zone	Unit	Note
Operating inspection	1	Dot defect	Sparkle mode	1-dot	0	pcs	1), 3)
				2-dots	0	Units	
				3-dots	0		
				Density	0	pcs/ ϕ 20mm	4)
				Total	0	pcs	
			Partial Sparkle mode	1-dot	4	pcs	1), 3)
				2-dots	0	Units	
				3-dots	0		
				Density	1	pcs/ ϕ 20mm	4)
				Total	4	pcs	
			Black mode	1-dot	5	pcs	2), 3), 4)
				2-dots	1	Units	
				3-dots	0		
				Density	3	pcs/ ϕ 20mm	4), 5)
				Total	5	pcs	
	2	Line defect			Serious one is not allowed	-	-
	3	Uneven brightness					
	4	Stain inclusion (Line shape, W : width (mm), L : length (mm))	W≦0.01	L : Ignore	Ignore	pcs	6)
			0.01＜W＜0.08	L＜3.0	3		
				3.0≦L	0		
			0.08≦W	-	(See dot shape)		
			Total		3		
	5	Stain inclusion (Dot shape, D : ave. dia (mm))	D≦0.22		Ignore	pcs	6)
			0.22＜D≦0.5		3		
			0.5＜D		0		
	6	Scratch on polarizer (Line shape, W : width (mm), L : length (mm))	W≦0.01	L : Ignore	Ignore	pcs	7)
			0.01＜W≦0.08	L＜10	4		
				10≦L	0		
			0.08＜W	-	0		
	7	Scratch on polarizer Dot shape and Bubbles, Peeling in polarizer (D : ave. dia (mm))	D＜0.1		Ignore	pcs	7)
			0.1≦D≦0.5		4		
			0.5＜D		0		
			Total		4		
	8	Wrinkles on polarizer			Serious one is not allowed.	-	-

Note

1) Definition of dot defect (Sparcle mode)

Bdot : Brightness of the dot at displaying black raster

	Ignore	Partial Sparcle mode	Sparcle mode
Red dot	Bdot≦7.8%	7.8%＜Bdot≦24.3%	24.3%＜Bdot
Green dot	Bdot≦4.1%	4.1%＜Bdot≦24.3%	24.3%＜Bdot
Blue dot	Bdot≦18.0%	18.0%＜Bdot≦24.3%	24.3%＜Bdot

2) Definition of dot defect (Black mode)

Brightness of the dot is less than 70% of L255 brightness.

3) 1 dot : defect dot is isolated, not attached to other defect dot.
N dots : N defect dots are consecutive. (N means the number of defects dots)

4) Density : number of defect dots inside ϕ 20mm

5) Distance between defects shall be longer than 5mm.

6) Those stains which can be wiped out easily are acceptable.

7) Not applied to B-zone.

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.

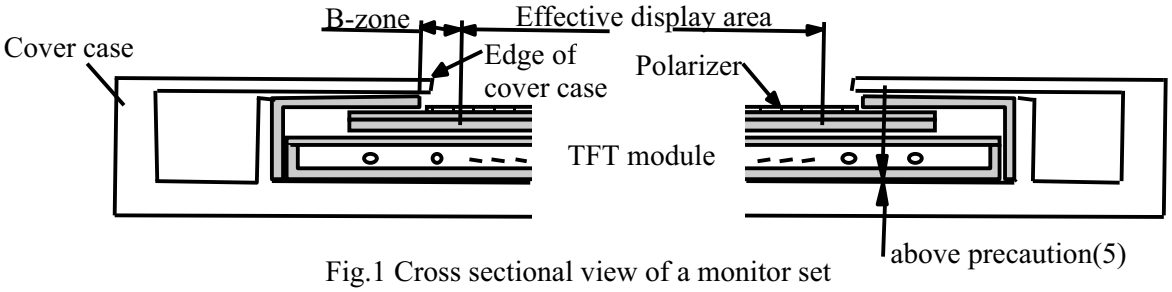


Fig.1 Cross sectional view of a monitor set

(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 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:
-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 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 pealed 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 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

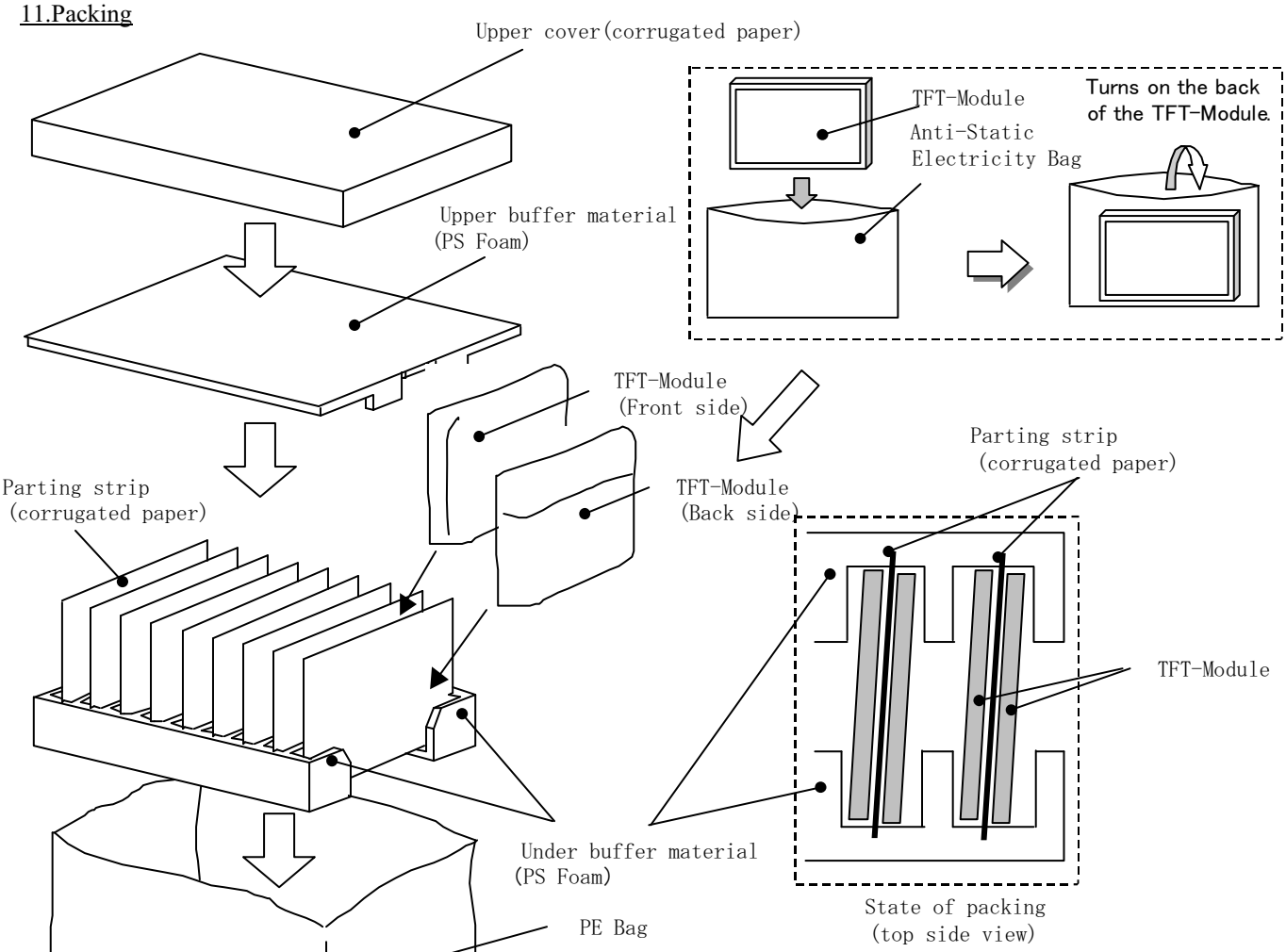
(1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.

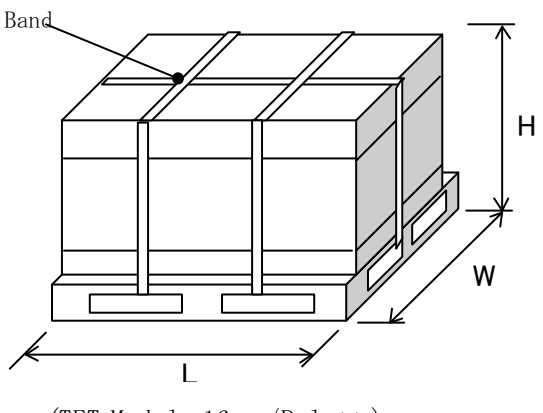
(2) In no event shall Hitachi, Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contact, 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.

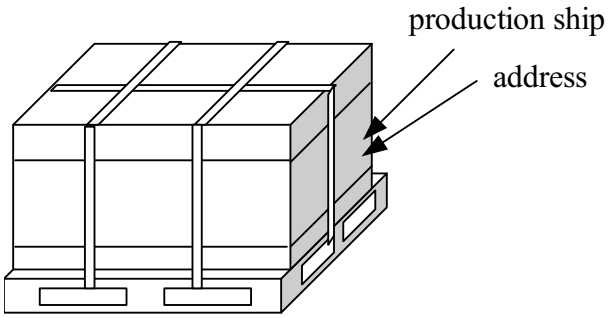
11.Packing

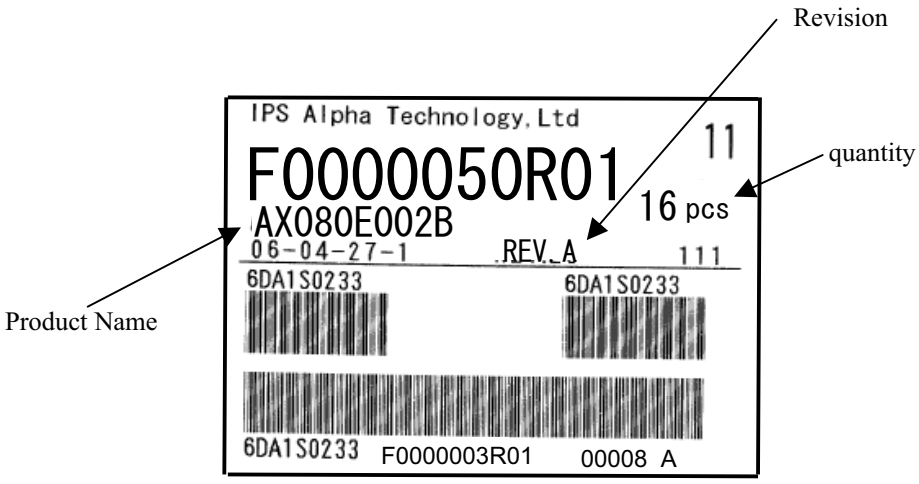




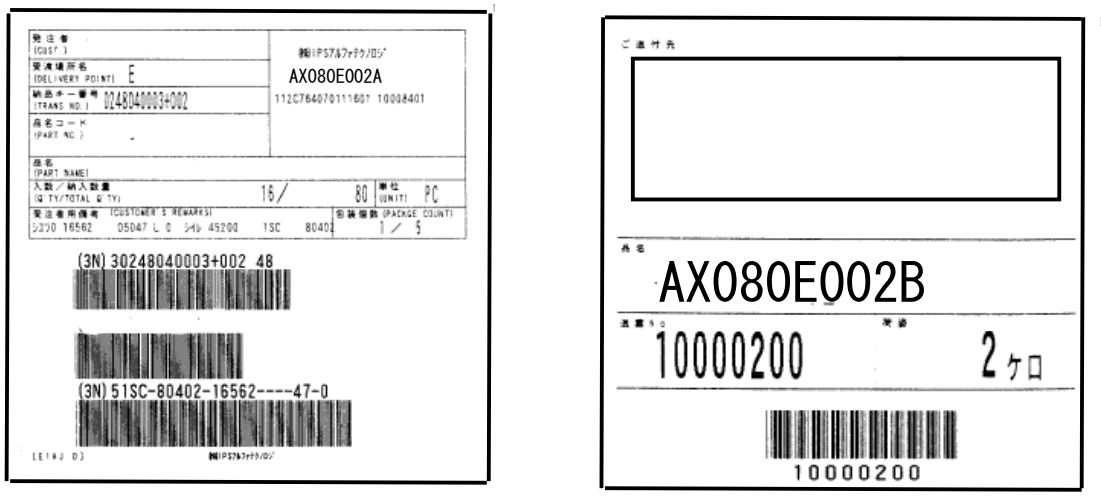
(TFT-Module 16pcs/Palette)

Size : 1210(L)×1000(W)×680(H) mm
Weight : 142kg
Maximum stack up : 3 layers





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



Address label
label size (100 × 100)

IPS Alpha Technology, Ltd.	Date	Sep. 10, 2007	Sheet No.	IPS4PS 2614 -AX080E002B-4	Page	14-2/2