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RECORD OF REVISION

Date	Sheet No.	Page	Summary
Jan. 07, 2013	3284PS 2603-TX48D02VM0BAA-1C	3-1/1	Changed DESCRIPTION The following specifications are applied to the following IPS-Pro module. ↓ This specification is applied to the following IPS-Pro module.
	3284PS 2603-TX48D02VM0BAA-2C		
	3284PS 2604-TX48D02VM0BAA-1C	4-1/2	1.1 ELECRTICAL ABSOLUTE MAXIMUM RATING Added an illustration to Notes 2)
	3284PS 2604-TX48D02VM0BAA-2C		
	3284PS 2604-TX48D02VM0BAA-1C	4-2/2	Added Page 4-2/2,and Item 1.2 is moved from Page 4-1/2 to Page 4-2/2.
	3284PS 2604-TX48D02VM0BAA-2C		
	3284PS 2605-TX48D02VM0BAA-1C	5-1/2	2. INITIAL OPTICAL CHARACTERISTICS Changed Brightness of white Min. 280 → 250, Typ. 350 → 300 Changed Variation of Color Position Max. volue : 0.040 → 0.050
	3284PS 2605-TX48D02VM0BAA-2C		
	3284PS 2606-TX48D02VM0BAA-1C	6-2/2	3.2 BACK LIGHT Added 6) to the note column of the Input Current. Changed Note 6) A protection fuse is built into this module. →A protection fuse is built in this module.
	3284PS 2606-TX48D02VM0BAA-2C		
	3284PS 2608-TX48D02VM0BAA-1C	8-3/6	BLOCK DIAGRAM OF INTERFACE Revised the contents.
	3284PS 2608-TX48D02VM0BAA-2C		
	3284PS 2608-TX48D02VM0BAA-1C	10-1/2	7.DIMENSIONAL OUTLINE Changed Note 2) Tolerance not specified is ±1㎜. →Tolerance unspecified is ±1㎜.
	3284PS 2608-TX48D02VM0BAA-2C		
	3284PS 2608-TX48D02VM0BAA-1C	10-2/2	7.DIMENSIONAL OUTLINE Changed Note 2) Tolerance not specified is ±1㎜. →Tolerance unspecified is ±1㎜.
	3284PS 2608-TX48D02VM0BAA-2C		
	3284PS 2611-TX48D02VM0BAA-1C	11-1/1	8.2 REVISION(REV.) CONTROL Added Rev.D
	3284PS 2611-TX48D02VM0BAA-2C		

DESCRIPTION

This specification is applied to the following IPS-Pro module.

Note :The LED driver for backlight unit is built in this module.

Product Name : TX48D02VM0BAA

Effective Display Area	: H409.50 × V255.9375 [mm]
Number of Pixels	: H1,680 × V1,050 [pixels]
Pixel Pitch	: H0.24375 × V0.24375 [mm]
Color Pixel Arrangement	: R+G+B Vertical Stripe
Display Mode	: Transmissive Mode Normally Black Mode IPS-Pro
Top Polarizer Type	: Anti-glare (Hardness: 2H)
Number of Colors	: 16,777,216 colors
Viewing Angle Range	: Super Wide Version
Input Signal	: 2-channel LVDS (LVDS: Low Voltage Differential Signaling)
Back Light	: Edge Light Type with White LED
External Dimensions	: H444 × V300 × t24.0 [mm]
Weight	: Typ. 1,900g

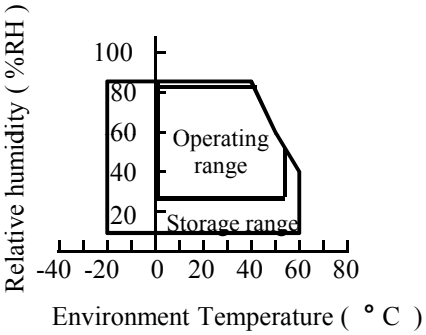
1. ABSOLUTE MAXIMUM RATINGS

1.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

Item	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Temperature	0	55	-20	60	°C	1)
Humidity	2)		2)		%RH	1)
Vibration	—	4.9 (0.5G)	—	9.8 (1.0G)	m/s^2	3)
Shock	—	29.4 (3G)	—	294 (30G)		4)
Corrosive Gas	Not Acceptable		Not Acceptable		—	—
Illumination at LCD Surface	—	50,000	—	50,000	lx	—

Notes 1) Temperature and Humidity should be applied to the center glass surface of a IPS-Pro module, not to the system installed with a module.
The temperature at the center of rear surface should be less than 60°C on the condition of operating.
Function of module is guaranteed in above operating temperature range, but optical characteristics is specified for only 25°C operating condition.

2) Ta ≤ 40°C ..... Relative humidity should be less than 85%RH max. Dew is prohibited.
Ta > 40°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. (Except the resonance point)

4) Pulse width of the shock is 10 ms.

1.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

(1) TFT Module

Vss=0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	0	13.5	V	—
Input Voltage for logic	V_I	-0.3	3.6	V	1)
Electrostatic Durability	V_{ESD0}	±100		V	2), 3)
	V_{ESD1}	±8		kV	2), 4)

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

2) Discharge Coefficient: 200pF-250Ω, 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

VSS=0V

Item	Symbol	Min.	Max.	Unit	Note
Input Voltage	V_{IN}	-	16.0	V	
ON/OFF Control Input Voltage	ON/OFF	0	5.5	V	
Analog Dimming Signal Voltage	V_{BC}	0	5.5	V	1)
PWM Dimming Signal Voltage	PWM	0	5.5	V	1)

Notes 1) These signals can't input at the same time.

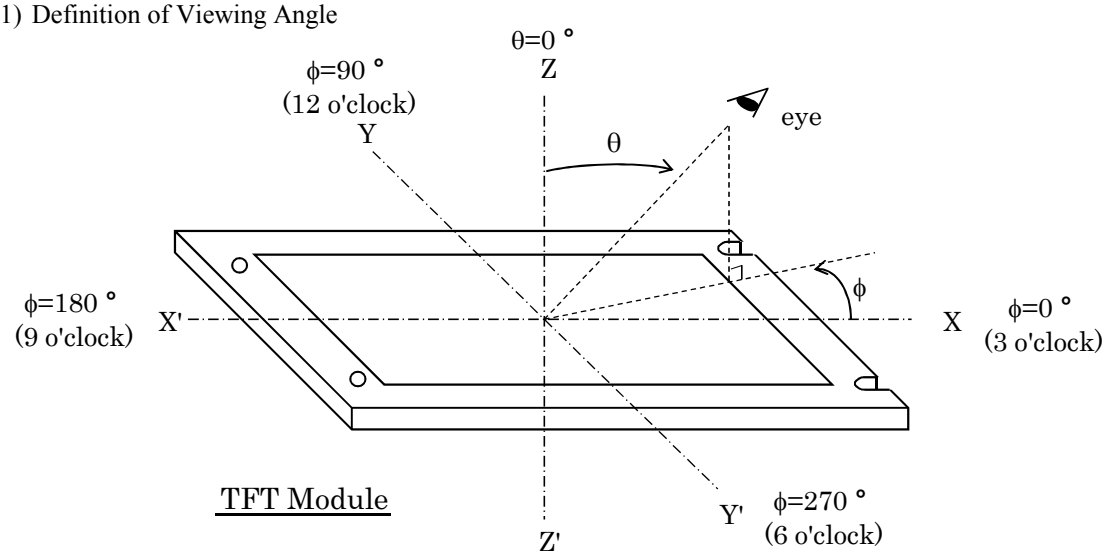
2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured when the LCD is set alone (apart from driving circuits and monitor cabinets) and 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:KONICA MINOLTA: CS-2000, or equevalent
Ambient Temperature = 25±3°C, V_{DD}=12.0V, f_V=60Hz,V_{IN}=12.0V
and V_{BC}=3.3V or PWM=100%(PWMf=150Hz)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		600	1000	—	—	2)
Response Time	Rise	ton		—	11	19	ms	3)
	Fall	toff		—	10	18		
Brightness of white		Bwh		250	300	—	cd/m^2	—
Brightness uniformity		Buni		70	—	—	%	4)
Color Chromaticity (CIE)	Red	x	θ = 0° 1)	0.618	0.648	0.678	—	(Gray scale = 255)
		y		0.299	0.329	0.359		
	Green	x		0.284	0.314	0.344		
		y		0.584	0.614	0.644		
	Blue	x		0.119	0.149	0.179		
		y		0.028	0.058	0.088		
	White	x		0.283	0.313	0.343		
		y		0.299	0.329	0.359		
Variation of Color Position (CIE)	Red	Δx	θ = +50° ϕ = 0º, 90º 180°, 270° 1)	—	—	0.050	—	5) (Gray scale = 255)
		Δy		—	—	0.050		
	Green	Δx		—	—	0.050		
		Δy		—	—	0.050		
	Blue	Δx		—	—	0.050		
		Δy		—	—	0.050		
	White	Δx		—	—	0.050		
		Δy		—	—	0.050		
Contrast Ratio at 85°		CR85°	θ = +85° ϕ = 0º, 90º 180°, 270° 1)	10	—	—	—	—

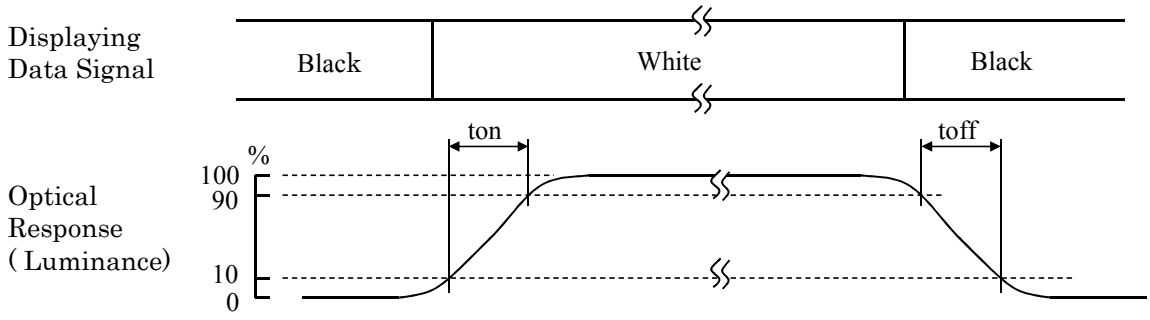
Notes 1) Definition of Viewing Angle



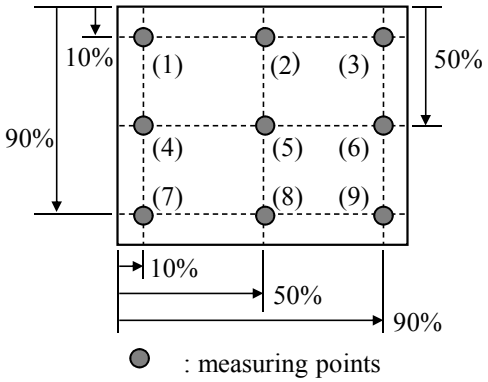
2) Definition of Contrast Ratio (CR)

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

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.

$$Buni = \left(\frac{Bmin}{Bmax} \right) \times 100$$

where, Bmax = Maximum brightness
Bmin = Minimum brightness

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

3. ELECTRICAL CHARACTERISTICS

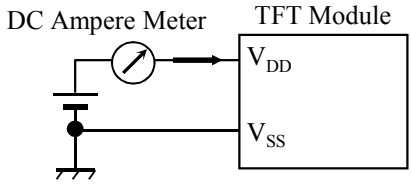
3.1 TFT-LCD MODULE

Ta=25°C, Vss=0V

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	11.4	12.0	12.6	V	—
Power Supply Current	I_{DD}	—	500	800	mA	1), 2), 3)
Vsync Frequency	f_V	50	60	60	Hz	4)
Hsync Frequency	f_H	52.7	63.2	66.0	kHz	—
DCLK Frequency	f_{CLK}	51.7	62	69.3	MHz	—

* The LCD panel works ordinarily when fv is set between 60Hz.
However, picture quality and optical characteristics can be guaranteed only at fv=60Hz.
If the LCD is used other than fv=60Hz, customers are requested to check picture quality of the LCD under customers' specific conditions.

Note 1) DC current at fv=60.0Hz, fCLK=62MHz and V_{DD}=12.0V



2) Current capacity of power supply for V_{DD} should be larger than 5A, so that the fuse can be opened at the trouble of power supply.
3) The picture on maximum current is white picture.
4) When at low frequency drive, flicker may appear on screen. Therefore, please verify the flicker level before system design.

3.2 BACK LIGHT

Ta=25°C

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage		V_{IN}	10.8	12.0	13.2	V	—
Input Current		I_{IN}	—	1.41	1.91	A	6),7), 8)
ON/OFF Control Signal	ON	ON/OFF	2.5	3.3	5.0	V	B/L=ON
	OFF		0	—	0.8	V	B/L=OFF
	Current	I_{BL}	0.02	—	0.2	mA	B/L=5.0V
Analog Dimming Signal	Dimming Max. Level Range	V_{BC}	3.0	—	5.0	V	1), 2), 4)
	Dimming Min. Level Range		0	—	0.5	V	
PWM Dimming Signal	High Level Range	PWM	2.1	—	5.0	V	3), 5)
	Low Level Range		0	—	0.9	V	
		I_{PWM}	0.1	—	1.0	mA	PWM=5.0V
Duty Ratio		$D.R._{DPWM}$	5	—	100	%	
PWM Frequency		PWMf	140	150	160	Hz	

Notes 1) As for V_{BC}, it is recommendable to use more than 1.0V.
If V_{BC} is set less than 1.0V in which brightness becomes less than 20% to the maximum, display image may look unstable since relative change of brightness tends to become large by the slight drift of V_{BC}.

Notes 2) Brightness rises almost linearly by increaseing the V_{BC} in less than 3.0V.
However, brightness is saturated when V_{BC} exceeds 3.0V.

Notes 3) Brightness is almost proportional to the on-Duty ratio of PWM signal input.

Notes 4) Analog Dimming Control(Reference value)

V_{BC}(Typ.)	Brightness
0.0V	OFF
0.5V	OFF
0.9V	10%
1.1V	20%
1.4V	30%
1.6V	40%
1.9V	50%
2.1V	60%
2.3V	70%
2.5V	80%
2.7V	90%
3.0V	100%
5.0V	100%

Notes 5) PWM Dimming Control(Reference value)

PWM(Typ.)	Brightness
5%	5%
10%	10%
20%	20%
30%	30%
40%	40%
50%	50%
60%	60%
70%	70%
80%	80%
90%	90%
100%	100%

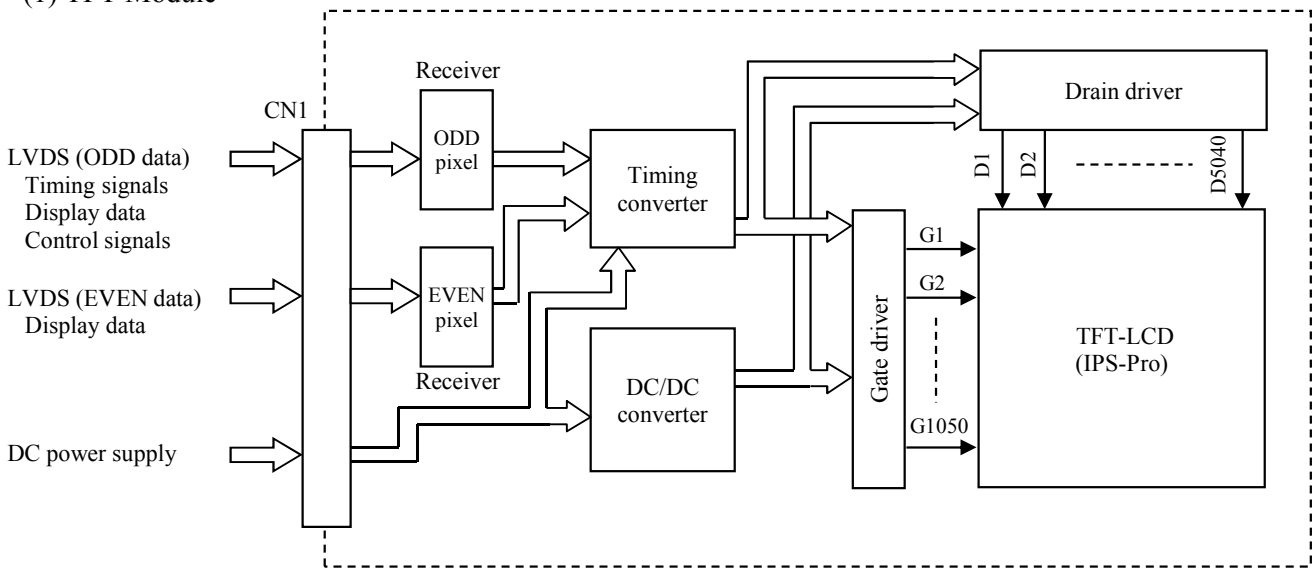
Notes 6) A protection fuse is built in this module. Current capacity of the power supply for V_{IN} should be greater than 6A, so that the fuse can 'blow' if there is a problem with the power supply.

Notes 7) I_{IN} Typ. value is for V_{IN}=12.0V, V_{BC}=3.3V or PWMf=150Hz and brightness control is 100%.

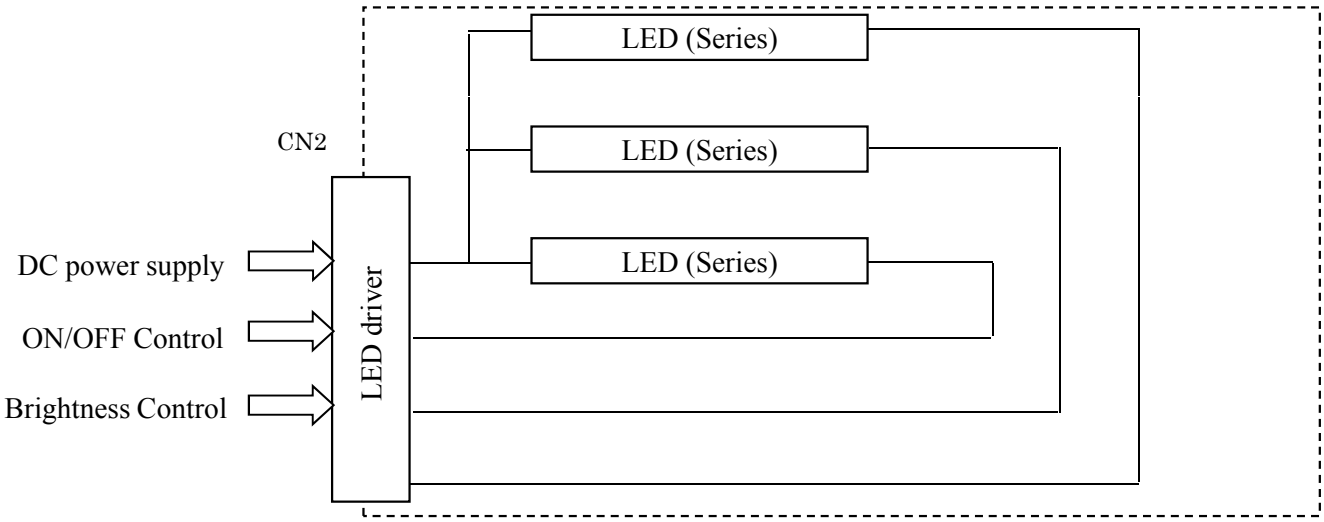
Notes 8) I_{IN} Max. value is for V_{IN}=10.8V, maximum current

4. BLOCK DIAGRAM

(1) TFT Module



(2) Back light unit



5. INTERFACE PIN ASSIGNMENT

5.1 TFT-LCD MODULE

CN1 <<HIROSE: MDF76GW-30S-1H or Equivalent>>
(Matching connector: JAE FI-X30H or FI-X30M or Equivalent)

Pin No.	Symbol	Function	Note
1	RAIN0–	ODD pixel data	2)
2	RAIN0+		
3	RAIN1–	ODD pixel data	2)
4	RAIN1+		
5	RAIN2–	ODD pixel data	2)
6	RAIN2+		
7	Vss	GND (0V)	1)
8	RACLKIN–	ODD pixel clock	2)
9	RACLKIN+		
10	RAIN3–	ODD pixel data	2)
11	RAIN3+		
12	RBIN0–	EVEN pixel data	2)
13	RBIN0+		
14	Vss	GND (0V)	1)
15	RBIN1–	EVEN pixel data	2)
16	RBIN1+		
17	Vss	GND (0V)	1)
18	RBIN2–	EVEN pixel data	2)
19	RBIN2+		
20	RBCLKIN–	EVEN pixel clock	2)
21	RBCLKIN+		
22	RBIN3–	EVEN pixel data	2)
23	RBIN3+		
24	Vss	GND (0V)	1)
25	NC	No connection	3)
26	DE	No connection	3)
27	NC	No connection	3)
28	V_{DD}	Power supply (12V)	4)
29	V_{DD}		
30	V_{DD}		

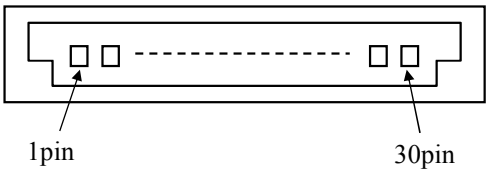
Notes 1) All Vss pins should be grounded.

2) RnINm+ and RnINm– (n=A,B m=0,1,2,3) should be wired by twist-pairs or side-by-side FPC patterns, respectively.

3) Please keep open.

4) All V_{DD} pins should be connected to +12.0 V (typ.).

5) Pin assignment is as follows.



(Figure from top-view)

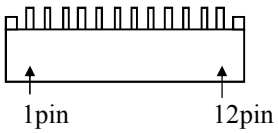
5.2 BACK-LIGHT UNIT

CN2 : TARNG YU Enterprise TU2001WNR-12S or Equivalent
(Matching connector : JST PHR-12 or TARNG YU Enterprise TU2001HNO-12)

Pin No.	Symbol	Description	Note
1	V_{IN}	Power Supply (typ. 12.0V)	1)
2	V_{IN}		
3	V_{IN}		
4	V_{IN}		
5	ON/OFF	High : Backlight ON, Low : Backlight OFF	4)
6	V_{SS}	GND (0V)	2)
7	V_{SS}		
8	V_{BC}	Brightness Control Signal	5),6)
9	PWM	PWM Dimming Signal	3),6)
10	NC	NC(OPEN)	
11	V_{SS}	GND (0V)	2)
12	V_{SS}		

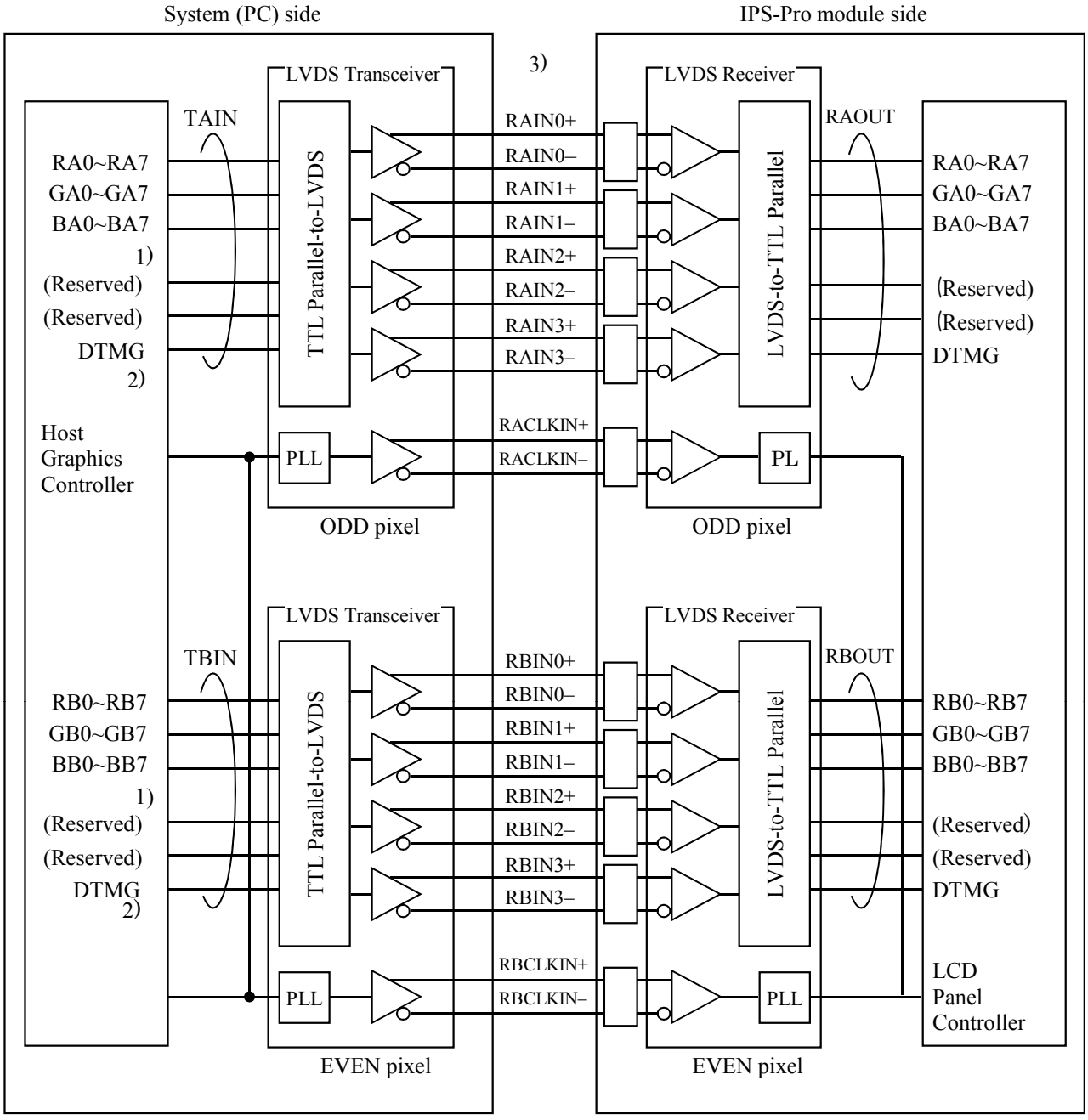
Notes

1) V_{IN} pins should be connected to +12.0V (Typ.).
2) V_{SS} pins should be grounded. The metal bezel is internally connected to GND.
3) High level:2.1~5.0V, Low level:0~0.9V
4) High level:2.5~5.0V, Low level:0~0.8V
5) Input Voltage : 1.0 ~ 3.6V DC (Brightness becomes maximum at 3.3 +/- 0.3V.)
6)These signals can't input at the same time. Please keep open when the input is not used.
7) Pin assignment is as follows.



(Figure from top-view)

BLOCK DIAGRAM OF INTERFACE



RA0~7, RB0~7 : R data
GA0~7, GB0~7 : G data
BA0~7, BB0~7 : B data
DTMG : Display timing data

Receiver: Equivalent of THC63LVDF84B by THine

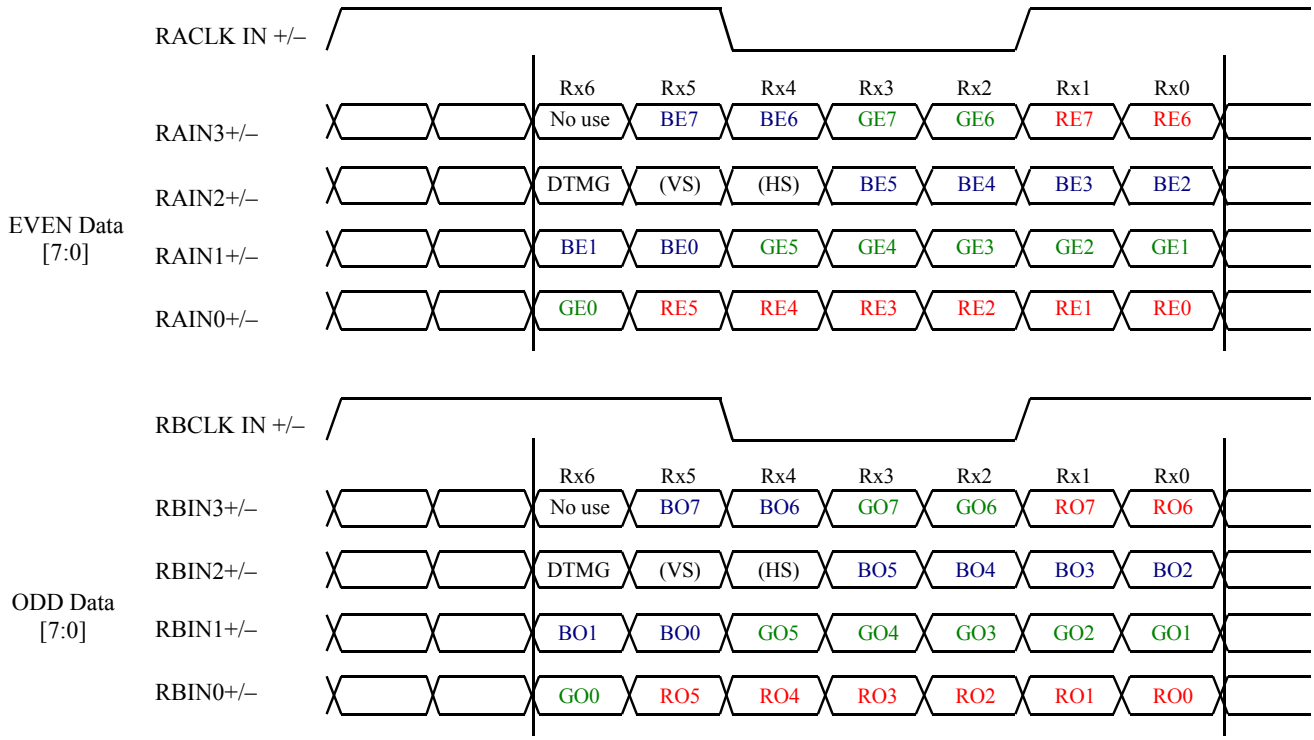
Notes 1) RSVD (reserved) pins on a transmitter should be connected with Vss.

2) The system must have a LVDS transmitter to drive a module.
Moreover, each channel must have a DTMG signal.

3) The impedance of LVDS cable should be 50 ohms per a signal line or about 100 ohms per a twist-pair line when it is used differentially.

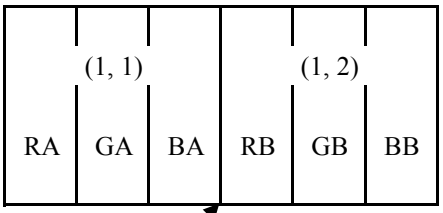
LVDS INTERFACE

8bit Digital



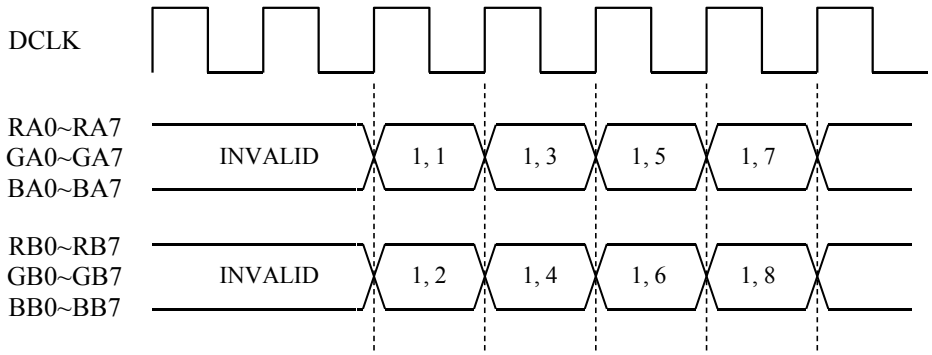
8 bit x 3 LVDS Interface Format

CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE



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, 1680
2, 1	2, 2	2, 3	.....	2, 1680
3, 1	3, 2	3, 3	.....	3, 1680
⋮	⋮	⋮		⋮
1050, 1	1050, 2	1050, 3	.....	1050, 1680



RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

Color \ Input data		R data								G data								B data							
		RA7	RA6	RA5	RA4	RA3	RA2	RA1	RA0	GA7	GA6	GA5	GA4	GA3	GA2	GA1	GA0	BA7	BA6	BA5	BA4	BA3	BA2	BA1	BA0
		RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0	GB7	GB6	GB5	GB4	GB3	GB2	GB1	GB0	BB7	BB6	BB5	BB4	BB3	BB2	BB1	BB0
		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	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
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	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

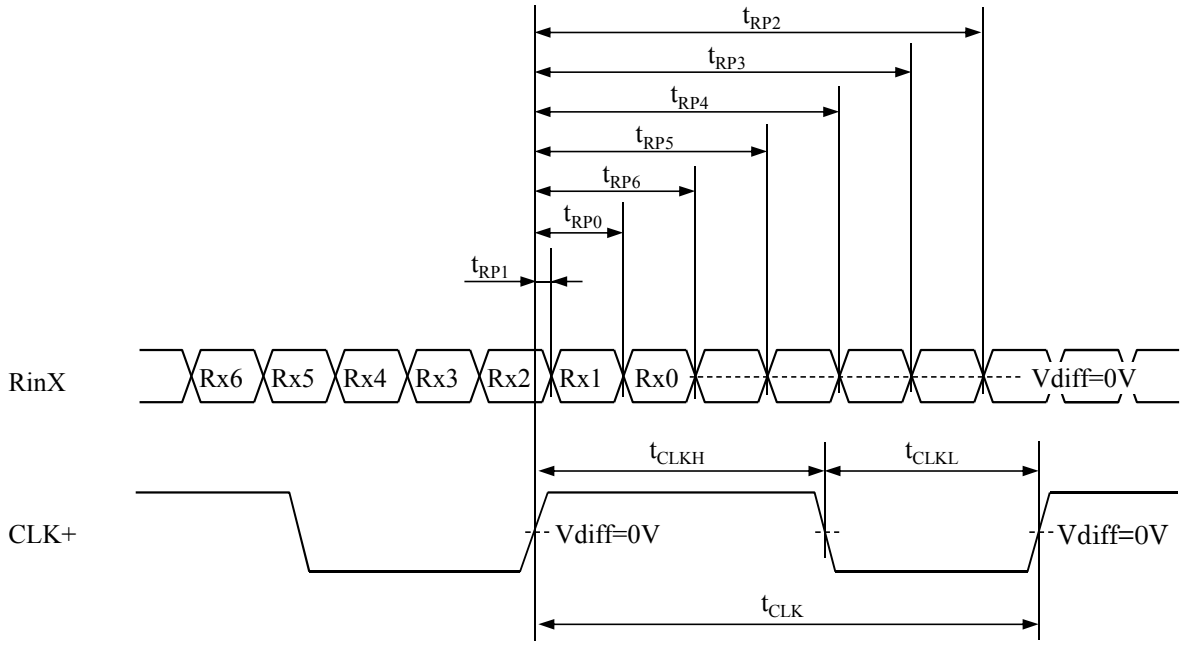
Notes 1) Definition of gray scale: Color (n)

n indicates gray scale level. Higher n means brighter level.

2) Data signals: 1: High, 0: Low

6. INTERFACE TIMING

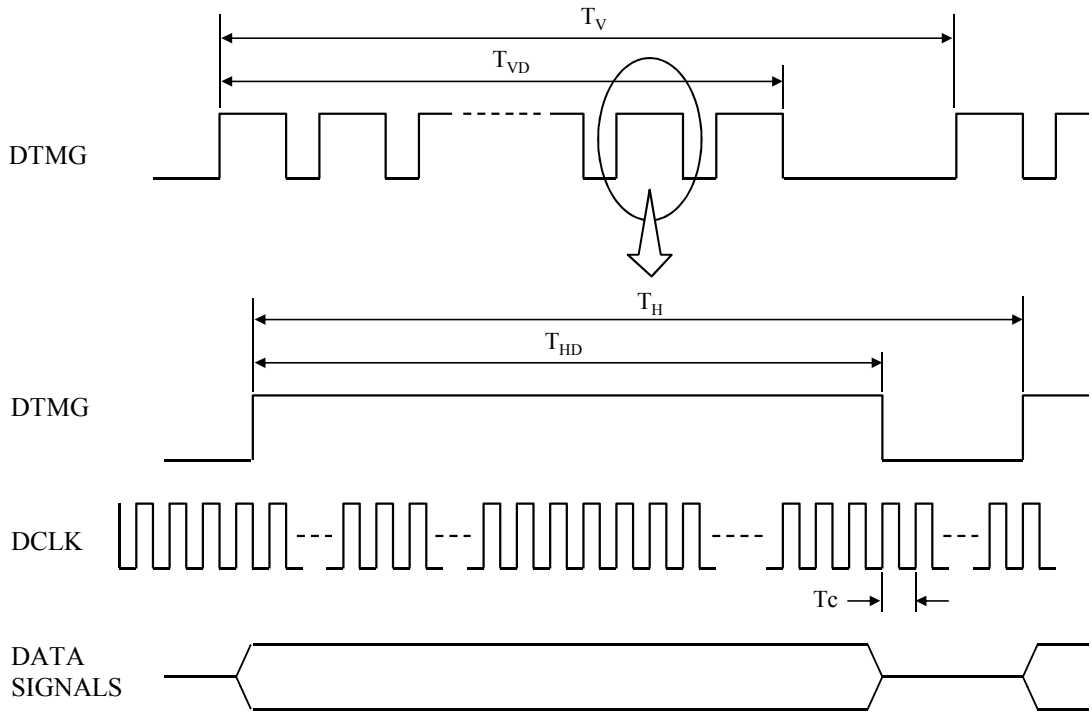
6.1 RECEIVER INPUT DATA POSITION



RinX=(RinX+) – (RinX–) (X=0,1,2)

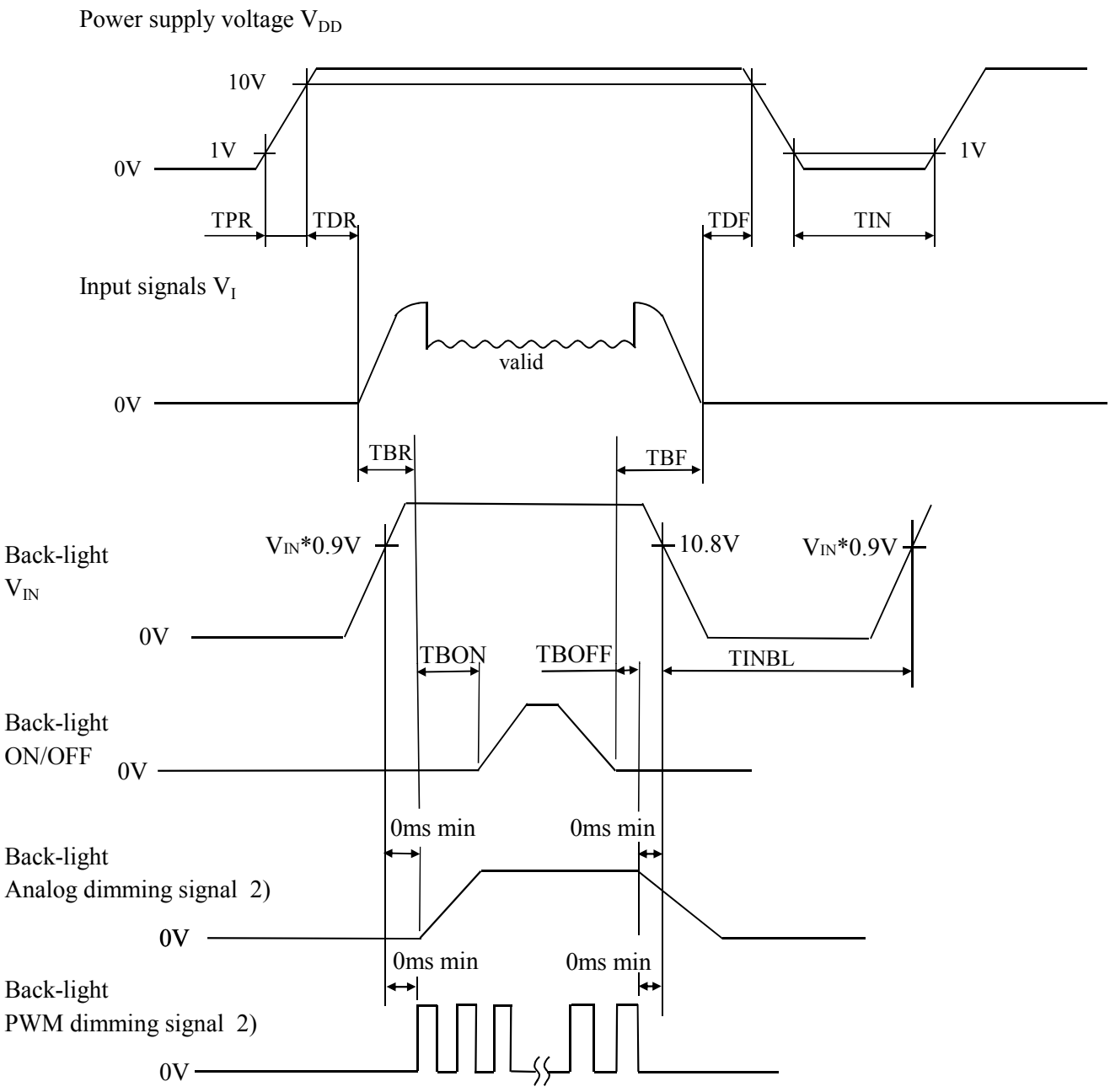
Item		Symbol	Min.	Typ.	Max.	Unit	Note
CLK+	Input CLK frequency	$1/t_{CLK}$	51.7	62.0	69.3	MHz	
	Differential CLK High Time	t_{CLKH}	—	$4/7t_{CLK}$	—	ns	
	Differential CLK Low Time	t_{CLKL}	—	$3/7t_{CLK}$	—		
RinX (X=0,1,2)	0 data position	t_{RP0}	$1/7t_{CLK}$–0.41	$1/7t_{CLK}$	$1/7t_{CLK}$+0.41	ns	
	1st data position	t_{RP1}	–0.41	0	+0.41		
	2nd data position	t_{RP2}	$6/7t_{CLK}$–0.41	$6/7t_{CLK}$	$6/7t_{CLK}$+0.41		
	3rd data position	t_{RP3}	$5/7t_{CLK}$–0.41	$5/7t_{CLK}$	$5/7t_{CLK}$+0.41		
	4th data position	t_{RP4}	$4/7t_{CLK}$–0.41	$4/7t_{CLK}$	$4/7t_{CLK}$+0.41		
	5th data position	t_{RP5}	$3/7t_{CLK}$–0.41	$3/7t_{CLK}$	$3/7t_{CLK}$+0.41		
	6th data position	t_{RP6}	$2/7t_{CLK}$–0.41	$2/7t_{CLK}$	$2/7t_{CLK}$+0.41		

6.2 TIMING CONVERTER SIGNAL TIMING



Item		Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Cycle time	T_C	14.4	16.1	19.3	ns	
DTMG	Horizontal period	T_H	980	980	1050	T_C	
	Horizontal width-Active	T_{HD}	840	840	840	T_C	
	Vertical period	T_V	1054	1054	1100	T_H	
	Vertical width-Active	T_{VD}	1050	1050	1050	T_H	
	Frame frequency	f_V	50	60	60	Hz	

6.3 TIMING BETWEEN INTERFACE SIGNALS AND POWER SUPPLY



Note

1) Timing of power supply voltage and input signals should be used under the following specifications.

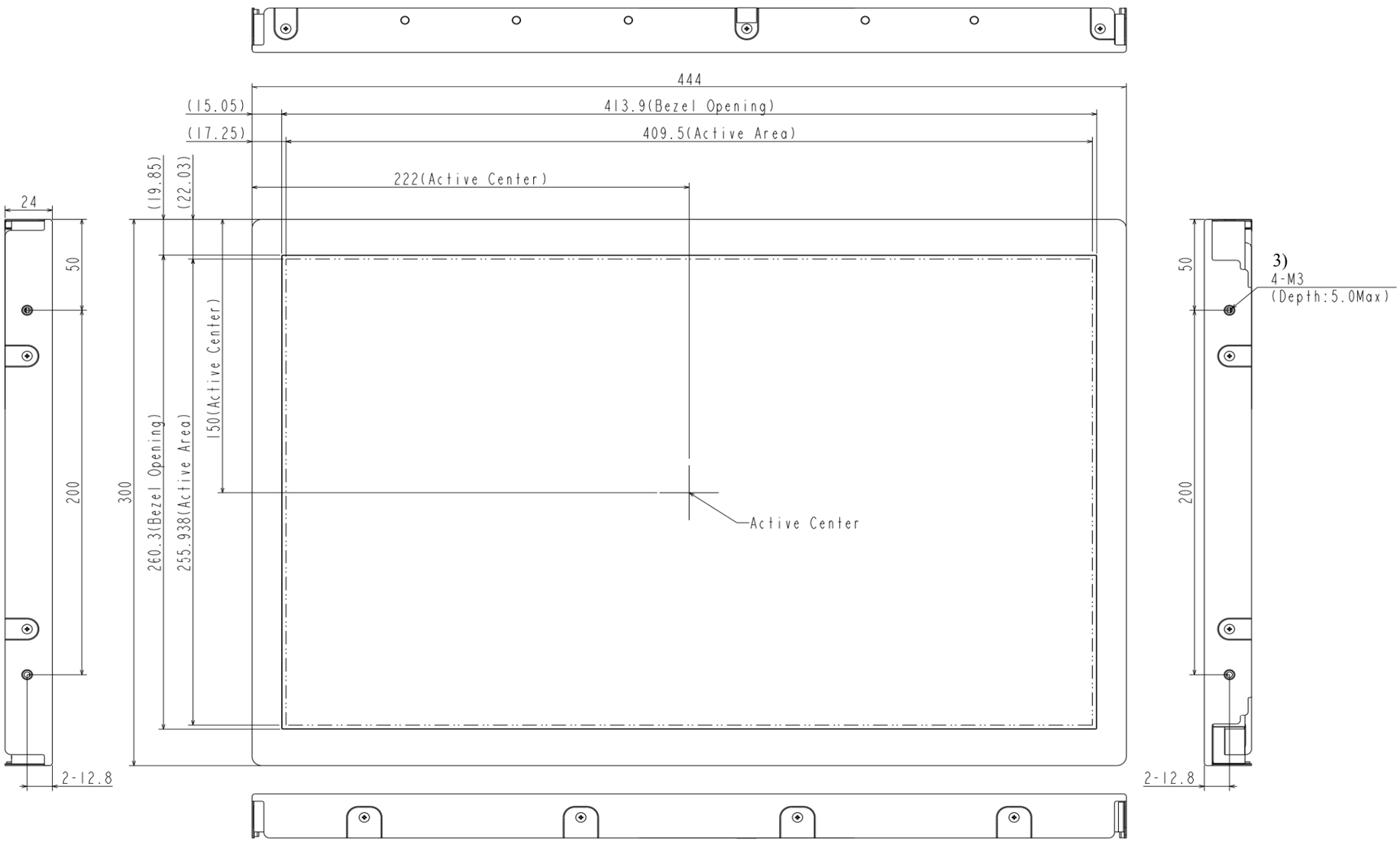
0ms ≤ TPR ≤ 10ms
10ms ≤ TDR ≤ 50ms
0ms ≤ TDF ≤ 50ms
TIN ≥ 1000 ms
TBR ≥ 500ms
TBF ≥ 100ms

TBON > 1ms
TBOFF > 1ms
TINBL > 1000ms

2) These signals can't input at the same time.

7. DIMENSIONAL OUTLINE

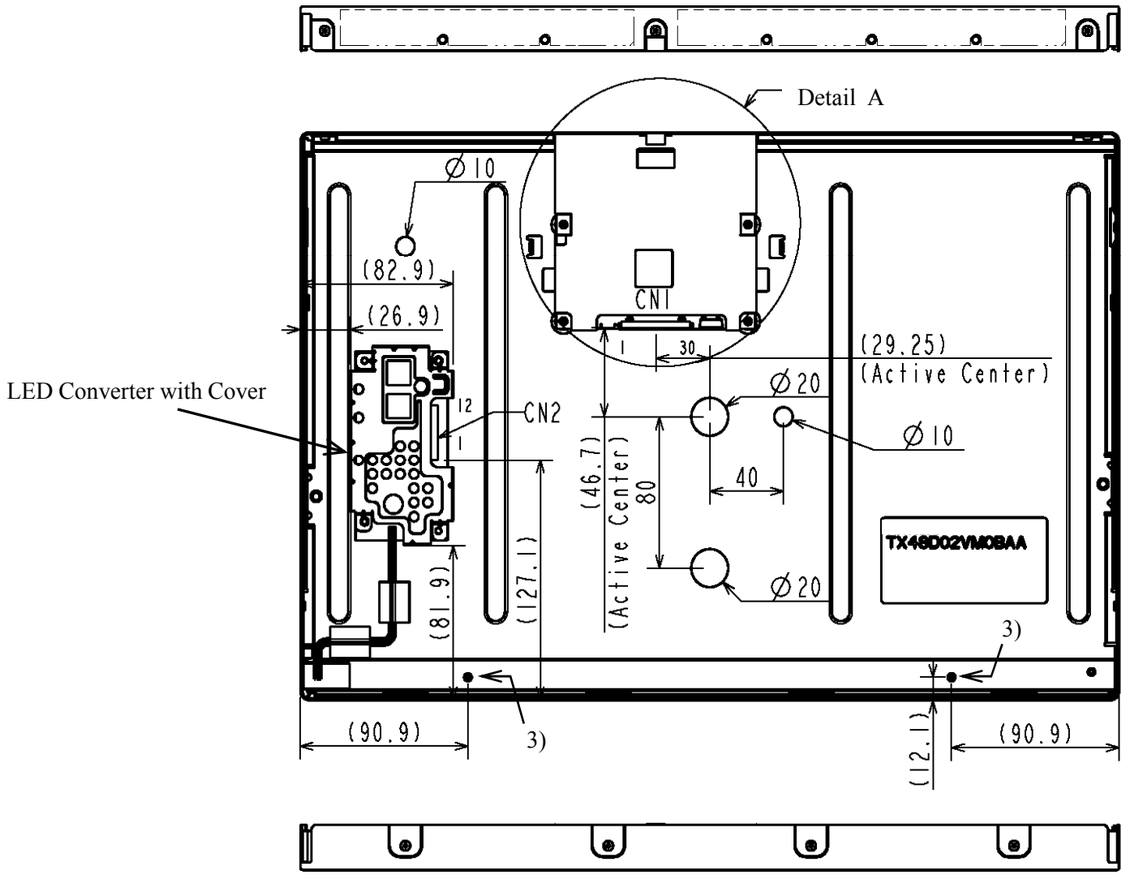
(1) Front View

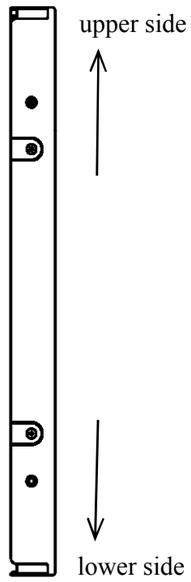


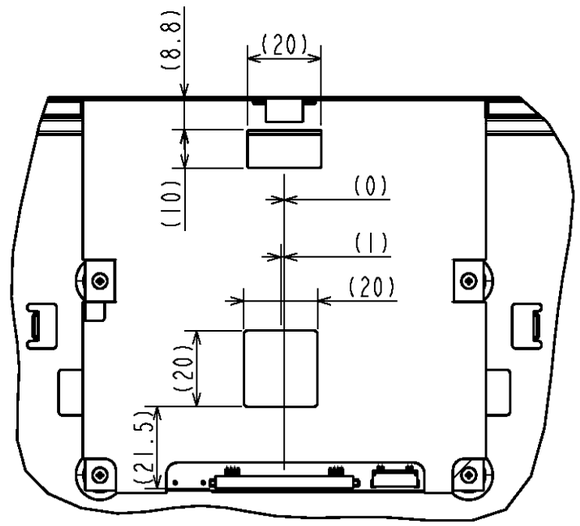
Note 1) Dimension in parentheses are reference value.
2) Tolerance unspecified is +/- 1.0mm.
3) Holes for panel mount：M3：4holes(right and left side)
Maximum torque for panel mount：0.294N・m (3kgf・cm)

Unit: mm
Scale:NTS

(2) Rear View







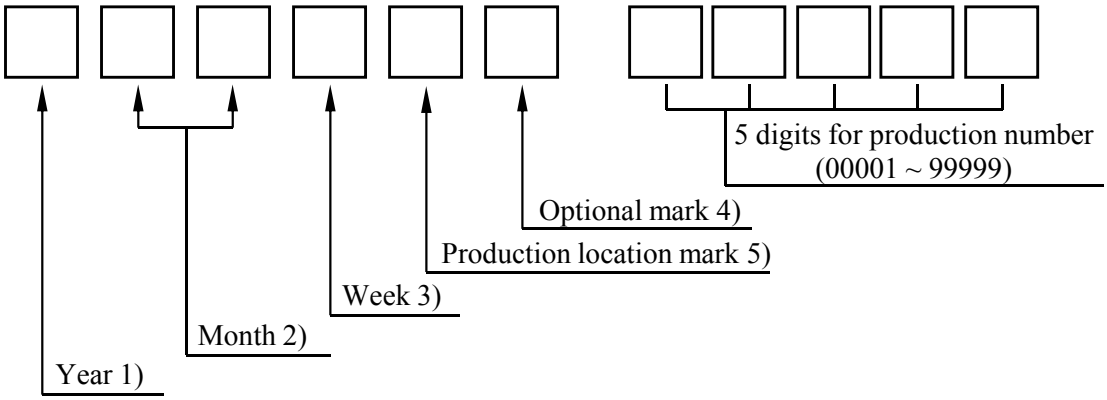
Detail A

Note 1) Dimension in parentheses are reference value.
2) Tolerance unspecified is +/- 1.0mm.
3) Screws for LED bar fixation.(M2)
Maximum screwing torque for light bar screw: 0.294N·m (3kgf·cm)

Unit: mm
Scale:NTS

8. DESIGNATION OF LOT MARK

8.1 LOT MARK



Notes 1)

Year	Mark
2012	2
2013	3
2014	4
2015	5
2016	6

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) for Japan Display internal use only.

5)

Production management sign	
H	Made in Japan
T	Made in Taiwan

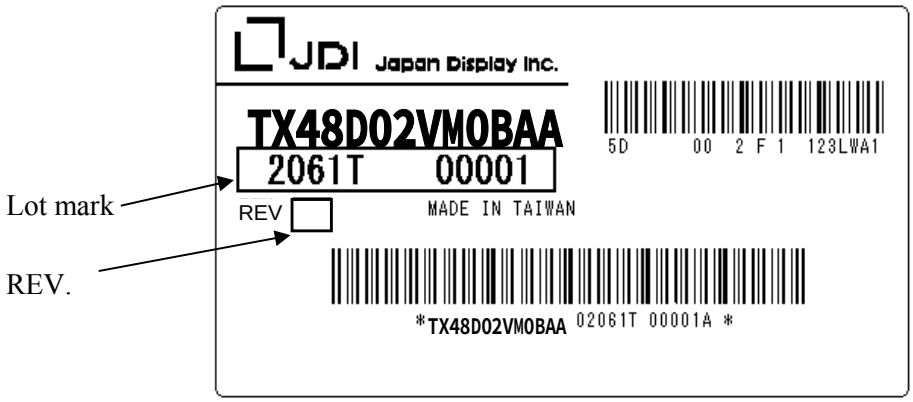
8.2 REVISION (REV.) CONTROL

Revision version is denoted by letter A through Z, except I and O, for Japan Display manufacturing convenience.

Rev.	Note
D	—

8.3 LOCATION OF LOT MARK

The Lot mark is printed on a label which is attached to the rear bezel, as shown in 7. External Dimensional. The style of character can be changed without prior notice.

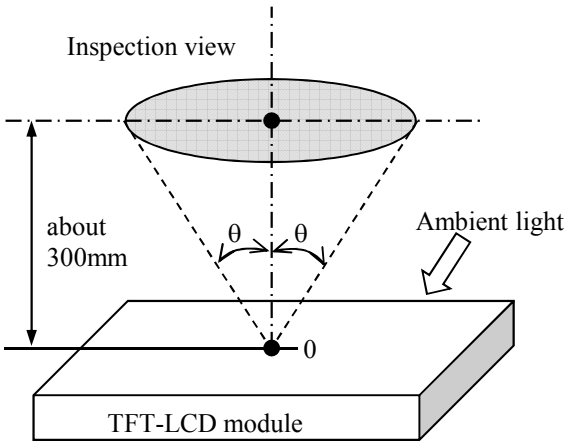


9. COSMETIC SPECIFICATIONS

9.1 CONDITIONS FOR COSMETIC INSPECTION

(1) Viewing zone

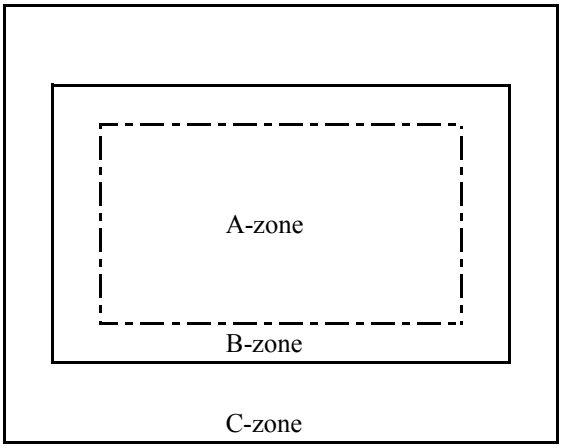
a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.
   θ < 45° : when non-operating inspection
   θ < 5° : when operating inspection
b) Inspection should be executed only from front side, and only A-zone.
   Cosmetic of B-zone and C-zone are ignored.
   (refer to 9.2 DEFINITION OF ZONE)



(2) Environmental

a) Temperature : 25°C
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 : Metal bezel area.
(Include I/F connector)

9.3 COSMETIC SPECIFICATIONS

When displaying condition is 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	2),4)
				2-dots	0	Units	2),5)
				3-dots	0		
				4-dots	0		
				Density	0	pcs/ϕ20mm	2)
				Total	0	pcs	2)
			Black mode	1-dot	7	pcs	1),3),4)
				2-dots	3	Units	1),3),5)
				3-dots	0		
				4-dots	0		
				Density	2	pcs/ϕ20mm	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 ≤ 0.1	L < 1.0	4	pcs	7)
				L ≥ 1.0	0		
	5	Stain Inclusion (Dot shape, D: ave. dia. (mm))	D ≤ 0.22		Ignore	pcs	7)
			D ≤ 0.4		5		
			0.4 < D ≤ 0.5		4		
			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 ≤ 0.04	L ≤ 40	10		
				L > 40	0		
			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 A-zone	Unit	Note
non-operating inspection	8	Bubbles, peeling in polarizer (D: ave. dia. (mm))	D ≤ 0.3	Ignore	pcs	8)
			D ≤ 0.5	10		
			D ≤ 1.0	5		
			D > 1.0	0		
	9	Wrinkles on polarizer		Serious one is not allowed.	—	—

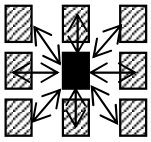
Notes 1) Dot defect : defect area > 1/2 dot

2) Sparkle mode : brightness of dot is more than DDL:96(W≧96,R≧96,G≧96,B≧96) at Black (0 level).

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 20mm ϕ.

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

8) Polarizer area inside of B-zone is not applied.

10. PRECAUTIONS

Please pay attention to the followings when a IPS-Pro 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.

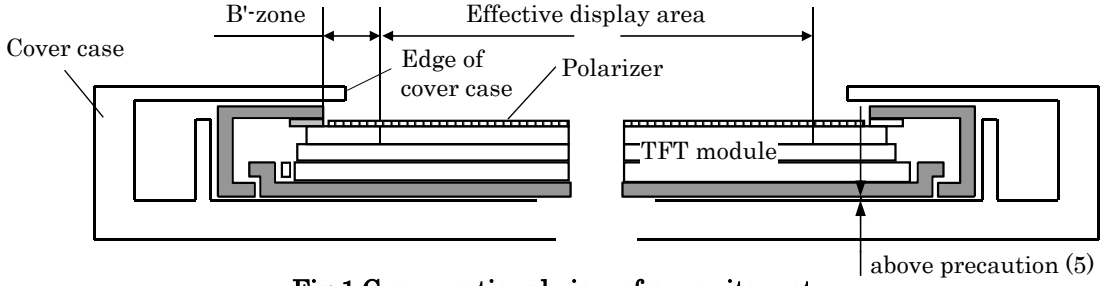


Fig.1 Cross sectional view of a monitor set

(6) The edge of a cover case should be located inside more than 1mm from the edge of a module front frame.

(7) Materials included acetic acid and chlorine should not be used for a cover case as well as other parts and boards near a module. Acetic acid attacks a polarizer. Chlorine attacks electric circuits due to electro-chemical reaction.

(8) 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.

(9) 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. Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a IPS-Pro cell. Other cleaning chemicals such as acetone, toluene and Normal-hexane should not be used to clean adhesives because they cause chemical damage to a polarizer.

(10) Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer may be deformed and its color may be faded.

(11) The module should not be opened or modified. It may cause not to operate properly.
If the module is once opened or modified, warranty of the module becomes invalid and Japan Display doesn't guarantee its quality and reliability.

(12) 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.

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 miss-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 IPS-Pro module.

(4) Sudden temperature change may cause dew on and/or in the 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.

10.3 ELECTROSTATIC DISCHARGE CONTROL

(1) Since a module consists of a IPS-Pro 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.

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, PACKAGE AND TRANSPORTATION

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

(1) The surface of polarizers should not come in contact with any other object. It is recommended that modules should be stored in the Japan Display's shipping box.

(2) The module should not be transported when display side was downward.
It causes the breakdown of the module.

10.6 PRECAUTION TO HANDLING PROTECTION SHEET

(1) The protection sheet 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.

10.7 SAFETY

(1) Since a IPS-Pro cell is 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) Flexible circuits board 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 Japan Display Inc. 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.

(3) This specification is valid only for a bare panel. The specification values are not valid for a panel after fabrication work, which gives any effect on panel characteristics such as disassemble, glass bonding, or else.

10.10 OTHERS

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