

HITACHI

Hitachi Displays, Ltd.

Date: April 22, 2008

For _____

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX26D55VM1CAA

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Please return **1** copy with your signature on this page for approval.

Accepted by : _____ Proposed by: _____

Date : _____

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RECORD OF REVISION

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

DESCRIPTION

< 26cm (10.4inch) VGA >

This specification is applied to the following TFT Liquid Crystal Display Module with Back-light unit.

Note: Inverter device for Back-light is not built in and so it needs to be prepared on your side.

General Specifications

Type name	: TX26D55VM1CAA
Display Area	: (H)211.2 × (V)158.4 [mm]
Display Pixels (Display Dots)	: (H)640 × (V)480 pixels (H(640× 3) × V480 [dots])
Resolution	: VGA
Power Supply Voltage	: 3.3 V
Pixel Pitch	: (H)0.330 × (V)0.330 [mm]
Color Pixel Arrangement	: R·G·B Vertical Stripe
Display Mode	: Transmissive & Normally White Mode
Color Number	: 262k Colors
Dimensions Outlines	: (H)243.0 typ. × (V)181.6 typ. × (t)12.5 max. [mm]
Weight	: 450 typ. [g]
Interface	: CMOS
Surface Polarizing Film	: Anti-Glare Polarizing Film (Hard Coat 3H: Pencil Hardness)
Back-light	: Two Cold Cathode Fluorescent Lamp (Side-Light type: Both Long Side) Back-light inverter is not contained in Module.
Warranty	: 18months from production date

• APPLICATION, WARRANTY PERIOD AND OTHERS

- (1) This LCD module was designed and manufactured to be used in an air-conditioned room away from direct sunlight.
- (2) This LCD module cannot be applied to an instrument which requires extremely high reliability and safety from its functions and precision. These instruments include medical equipment which affects life- and/or wealth-support apparatus.
- (3) Any problems caused by a use with deviation from the conditions mentioned in this specification are not included in the warranty.
- (4) Warranty period
The warranty period of this LCD module shall be 18 months from the manufacturing date. However, the backlight system is not included for problems other than initial failures. If the module is disassembled, we will not warrant any of these specifications including quality and safety sections. Because a reassembled or modified module may have foreign particles inside or its electronic circuit and/or electronic components may fail or malfunction.
- (5) Maintenance
This LCD module and the aforementioned data may be changed without notice. When you demand maintenance parts, please inquire about the changes in advance.
- (6) Repair
We will replace or repair all defective modules if the relevant defect is caused by Hitachi Displays. However, we will not take any responsibilities for defective modules after the expiration of warranty period. Also, if you access the modules for repairs, we will not warrant them either even if it is within the warranty period.
- (7) Failure in production and failure in the market
When a product which employs this LCD module is found to be a failure in the market, we will investigate the cause of the problem. If we find the LCD module is the cause of the failure, we will replace or refund the module.
- (8) Items in this specification may change for improvement without prior notice.
Please consult our sales division before engineering an instrument with this LCD module.
- (9) When a question arises concerning the specification, please contact our sales division.

1. ABSOLUTE MAXIMUM RATINGS

1.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

Item	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Ambient Temperature	-20	70	-30	70	°C	1)
Humidity	2)		2)		%RH	1)
Vibration	–	4.9 (0.5G)	–	19.6 (2G)	m/s ²	3)
Shock	–	29.4 (3G)	–	490 (50G)	m/s ²	4)
Corrosive Gas	Not Acceptable		Not Acceptable		–	
Illumination at LCD Surface	–	50,000	–	50,000	lx	

Notes 1) Environmental temperature and humidity of this unit, not of system installed with this unit.

Operating temperature means functional temperature without regard to optical performance.

Life characteristic is specified at 25±5 degree.

At low temperature the brightness of CFL drop and the life time of CFL become to be short.

(especially below 0 degree)

2) Ambient temp. Ta ≤ 40°C : 85%RH MAX. without condensation

Ta > 40°C : Absolute humidity must be lower than the saturated vapor of 85%RH at 40°C. Without condensation.

3) Vibration frequency : 20~50Hz.(Except resonance frequency)

4) 3ms, X·Y·Z·Z'.

1.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

1.2.1 TFT LIQUID CRYSTAL DISPLAY MODULE

V_{SS}=0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V _{DD}	0	4.0	V	
Input Voltage for logic	V _I	-0.2	V _{DD} +0.2	V	1)
Electrostatic Durability	V _{ESD0}	±100		V	2),3)
	V _{ESD1}	±8		kV	4),5)

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

2) Electric discharge constant 200pF-0Ω, 25°C-70%RH.

3) The Interface Connector pins are subjected.

4) Electric discharge constant 200pF-250Ω, 25°C-70%RH.

5) The Surface of Metal bezel and LCD are subjected.

1.2.2 BACK-LIGHT UNIT

GND=0V

Item	Symbol	Min.	Max.	Unit	Note
Lamp Current	I _L	0	7.0	mArms	1)
Lamp Voltage	V _L	0	1,800	V _{rms}	2)

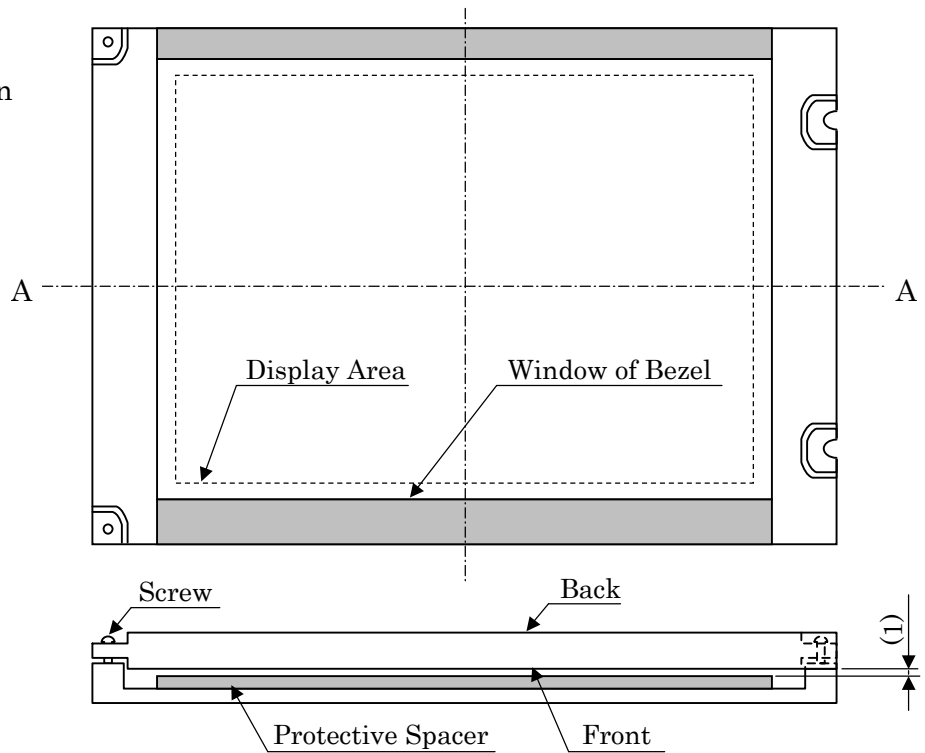
Notes 1) The specification shall be applied each CFL. The specification is defined at ground line.

2) The specification shall be applied connector pins for a CFL at start-UP.

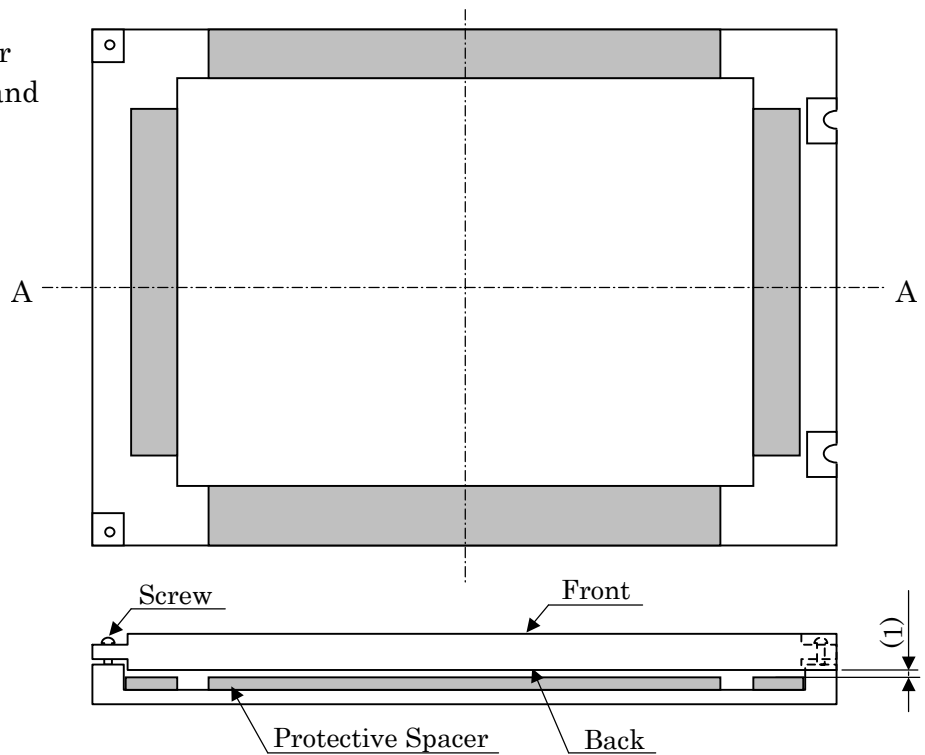
Adding protective spacer at shock & vibration test

Shaded area is to be supported with additional spacer.

- (1) This protective spacer is to be added at shock and vibration test on the front side



- (2) This protective spacer is to be added shock and vibration test on the back side



2. OPTICAL CHARACTERISTICS

We can guarantee only initial characteristics.

The following items are measured on the conditions that this unit operation (TFT panel and Back-light) and measuring systems are stable. (more than 30minutes' operation)

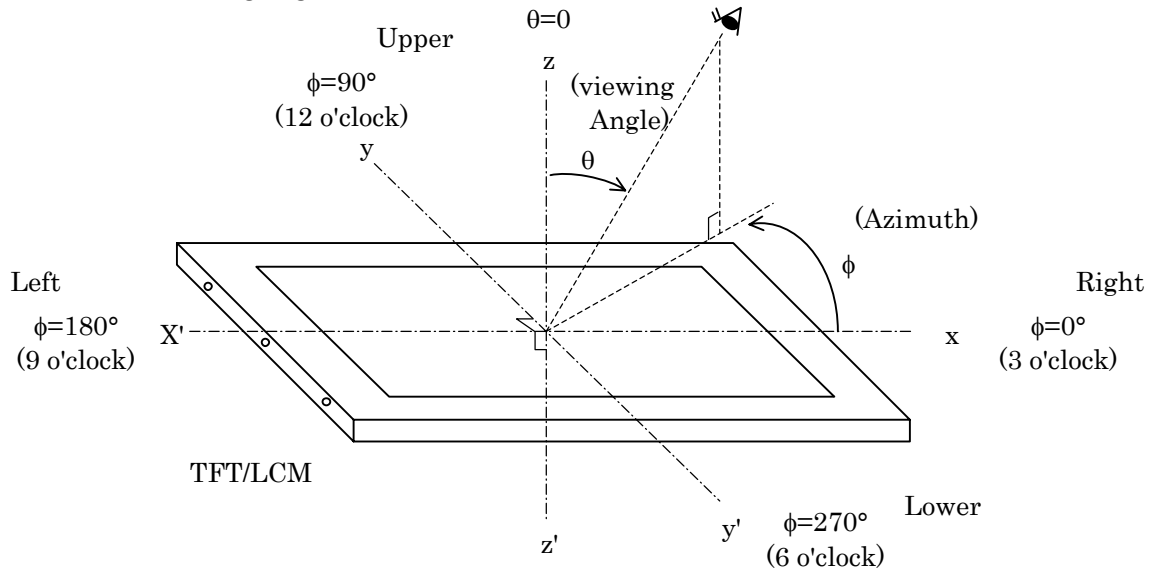
The ambient light excluding The Back-light unit is nothing.

- Measuring equipment : TOPCON BM-7, Prichard 1980A, or equivalent
- Measuring point : Active area center

Temperature of LCD=25±3°C, V_{DD} =3.3V, f_v =60Hz, I_L =6mA,
Back-Light operation Frequency=50kHz

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	$\theta=0^\circ$ Note 1)	200	500	—	—	2)	
Response Time	Rise		tr	—	30	—	ms	3)
	Fall		tf	—	20	—		
Brightness (white)	Bwh		—	350	—	cd/m ²		
Color of CIE	Red		x	0.59	0.63	0.67	—	
			y	0.30	0.34	0.38		
	Green		x	0.28	0.32	0.36		
			y	0.55	0.59	0.63		
	Blue		x	0.10	0.14	0.18		
			y	0.05	0.09	0.13		
	White	x	0.28	0.32	0.36			
		y	0.29	0.33	0.37			
Viewing Angle (CR≥10)	x-x'	θ_x	$\phi = 0^\circ$	50	60	—	deg.	
		$\theta_{x'}$	$\phi = 180^\circ$	50	60	—		
	y-y'	θ_y	$\phi = 90^\circ$	50	60	—		
		$\theta_{y'}$	$\phi = 270^\circ$	50	60	—		

Notes 1) Definition of Viewing Angle

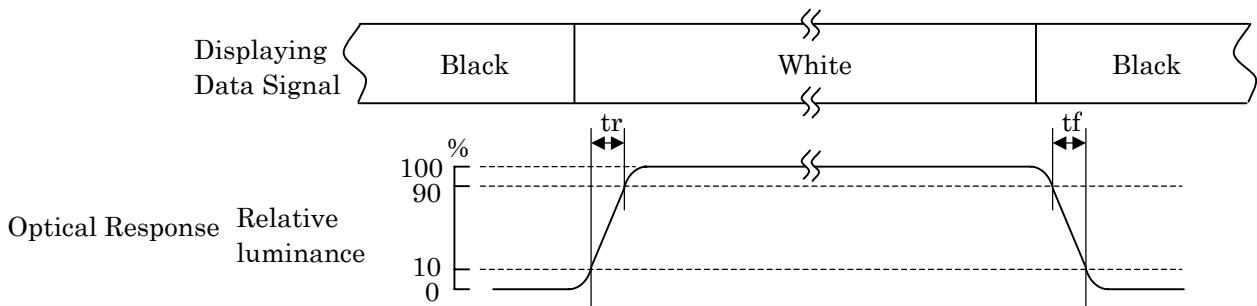


2) Definition of Contrast Ratio (CR)

$$CR = \frac{\text{Brightness when displaying White raster}}{\text{Brightness when displaying Black raster}}$$

These Brightness is measured on the center of screen.
 * Measurement in the darkroom.

3) Definition of Response Time



3. ELECTRICAL CHARACTERISTICS

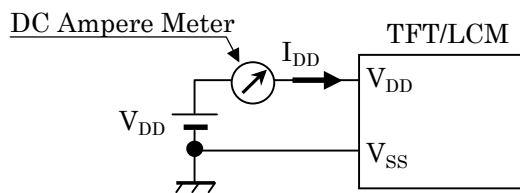
3.1 TFT LIQUID CRYSTAL DISPLAY MODULE

Ta=25°C, Vss=0V

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	V _{DD}	3.0	3.3	3.6	V	
Input Voltage for Logic Signal	Hi	V _{IH}	2.0	–	V _{DD}	1)
	Lo	V _{IL}	V _{SS}	–	0.8	
Power Supply Current	I _{DD}	–	190	300	mA	2),3)
Vertical Frequency	f _V	–	60	70	Hz	
Horizontal Frequency	f _H	–	31.6	38	kHz	
DCLK Frequency	f _{CLK}	–	25	29	MHz	

Notes 1) The specification is applicable to Display Data Signal pin, Timing Signal pin.

2) f_V=60Hz, f_{CLK}=25MHz, V_{DD}=3.3V, DC Current is measured with the method as below.



Typical value is measured when displaying Black Pattern.

Maximum is measured when displaying Vertical-stripe (Black-7 Gray scale)

3) 0.63A fuse is built in the unit. Current capacity for V_{DD} power supply should be larger than 2A, so that the fuse built in the unit (Maximum) could appropriately work in the abnormal.

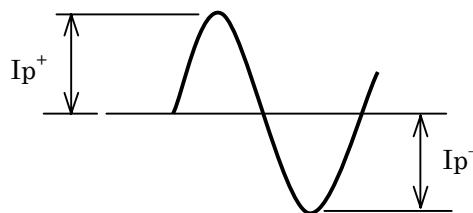
3.2 BACK-LIGHT UNIT

Ta=25°C, GND=0V

ITEM	SYMBOL	Min.	Typ.	Max.	Unit	Note
Lamp Current	I_L	4.0	6.0	6.5	mArms	1),2)
Lamp Voltage	V_L	–	490	–	Vrms	7)
Frequency	f_L	50	–	70	kHz	3)
Starting Lamp Voltage	V_s	950	–	–	Vrms	Ta=25°C 4),5)
		1200	–	–		Ta=-10°C 4),5)

Notes 1) I_L is Current of GND side.

- 2) Higher I_L cause the short life time of CFL.
- 3) Lamp frequency may produce interference with Hsync frequency, causing beat or flicker on the display.
- 4) Starting Lamp Voltage should be more than V_s (Min).
- 5) Inverter open output voltage please makes the design which 1 seconds or more can be continued at least. When it is below that, there are times when the lamp dose not light up.
- 6) Quality of the inverter produces big effect on illumination efficiency and life of back light. When it arranges the inverter, that back light and flicker etc. the illumination malfunction of back light does not occur, we request verification. In addition, as for verification as much as possible we recommend that it executes when it is close to the apparatus. In addition, as for the inverter, over voltage, use you ask those which have the safe protection circuit such as the over current inspection circuit and the discharge corrugated inspection circuit.
- 7) $I_L=6\text{mArms}$
- 8) Distribution difference of lamp surface temperature should be less than 5°C
- 9) When the lighting wave form of the inverter is asymmetry, the inclination of mercury is generated. Therefore, please adjust the unbalance ($|I_p^+ - I_p^-| / I_{rms} \times 100\%$) of the lighting current wave form to 10% or less, and adjust the wave high rate (I_p^+ (or I_p^-) / I_{rms}) to 1.2~1.63.

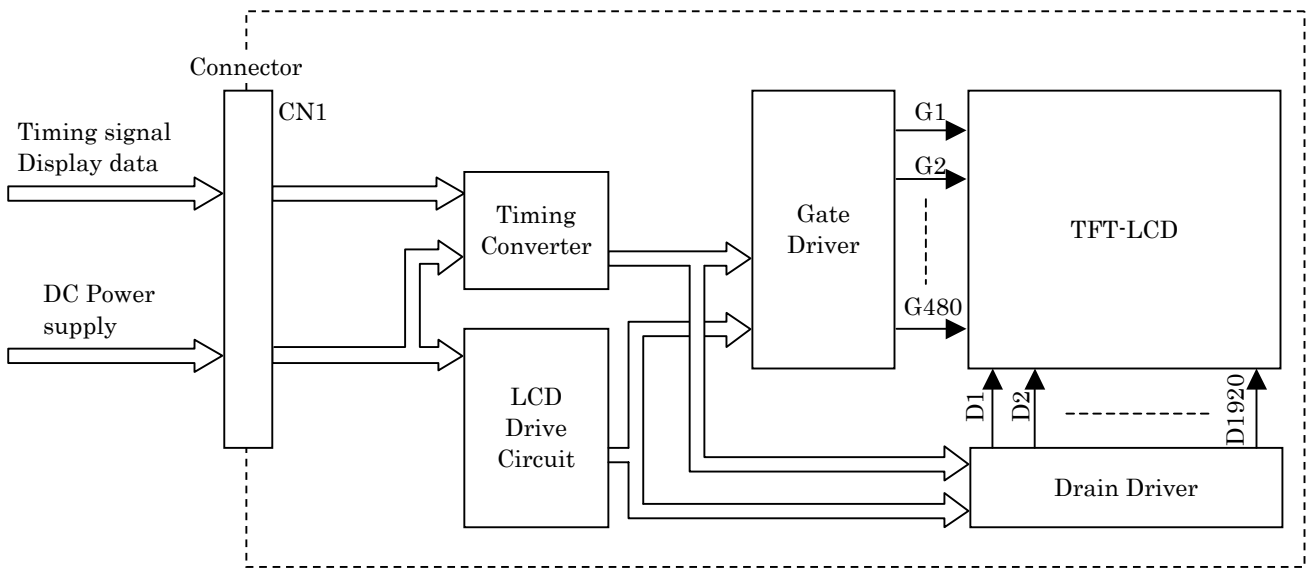


Inverter current wave form.

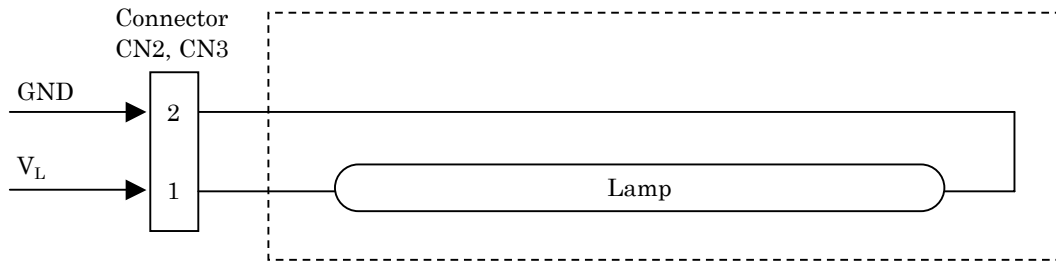
- 10) Recommendation inverter : HITACHI LIGHTING, Ltd.
Type name : INVC655 suitable item

4. BLOCK DIAGRAM

4.1 TFT LIQUID CRYSTAL DISPLAY MODULE



4.2 BACK-LIGHT UNIT



Color of wires CFL to CN2, CN3

1 (V_L) : Pink

2 (GND) : Blue

5. INTERFACE PIN CONNECTION

5.1 TFT LIQUID CRYSTAL DISPLAY MODULE

CN1 <<HIROSE: FH12-32S-0.5SH (55)>>

Pin No.	Symbol	Function	Note
1	V _{SS}		2)
2	DCLK	Clock Signal	
3	NC		4)
4	NC		4)
5	V _{SS}		2)
6	R0	Red Data Signal (LSB)	
7	R1	Red Data Signal	
8	R2	Red Data Signal	
9	R3	Red Data Signal	
10	R4	Red Data Signal	
11	R5	Red Data Signal (MSB)	
12	V _{SS}		2)
13	G0	Green Data Signal (LSB)	
14	G1	Green Data Signal	
15	G2	Green Data Signal	
16	G3	Green Data Signal	
17	G4	Green Data Signal	
18	G5	Green Data Signal (MSB)	
19	V _{SS}		2)
20	B0	Blue Data Signal (LSB)	
21	B1	Blue Data Signal	
22	B2	Blue Data Signal	
23	B3	Blue Data Signal	
24	B4	Blue Data Signal	
25	B5	Blue Data Signal (MSB)	
26	V _{SS}		2)
27	DTMG	Display Timing Signal	
28	V _{DD}	Power Supply 3.3V (typical)	1)
29	V _{DD}	Power Supply 3.3V (typical)	1)
30	TEST	TEST Pin	3)
31	NC		4)
32	V _{SS}		2)

Notes 1) All V_{DD} pins shall be connected to +3.3V (Typ.).

2) All V_{SS} pins shall be grounded. Metal bezel is internally connected to V_{SS}.

3) Keep open. Hitachi test use only.

4) Unconnected to the module

5) This connector is gilding. FFC or FPC to connect should use a gilding.

5.2 BACK-LIGHT UNIT

CN2, CN3 <<JST: BHR-02 (8.0) VS-1N>>

Pin No.	Symbol	Function	Note
1	V _L	Power Supply	
2	GND	GND (0V)	

RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

Input data Color		R Data						G Data						B Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Black	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	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Red (61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	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
	Green (1)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Green (61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	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
	Blue (1)	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	1	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Blue (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Notes 1) Definition of gray scale :

Color (n) --- number in parenthesis indicates gray scale level.

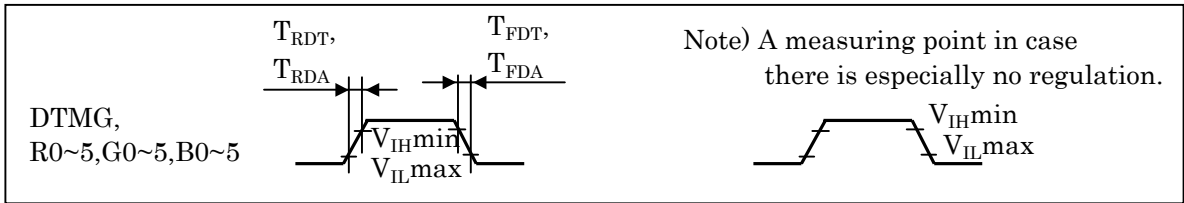
Larger number corresponds to brighter level.

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

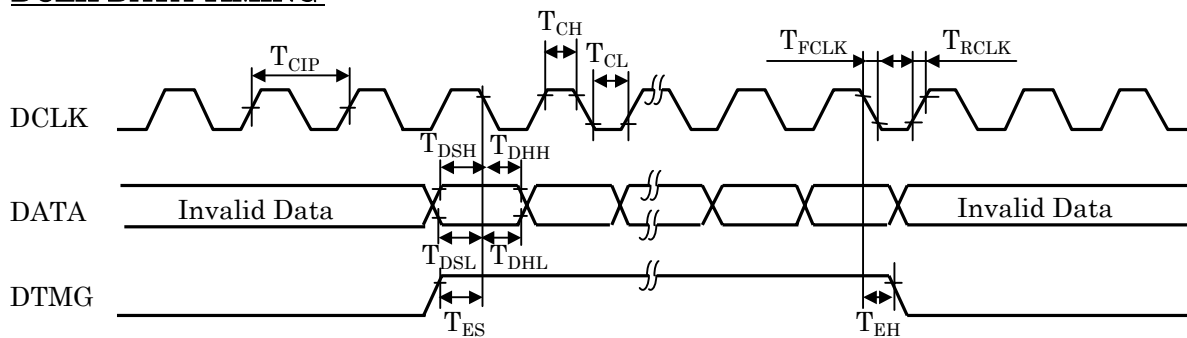
6. INTERFACE TIMING

6.1 TIMING CHART

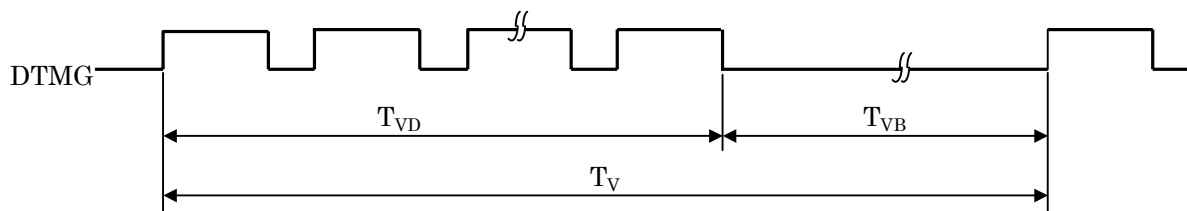
(Data : Latched at Fall edge of DCLK)



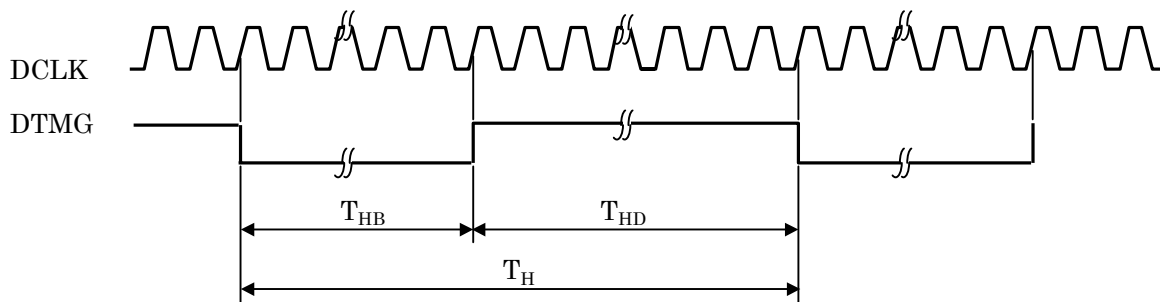
DCLK-DATA TIMING



VERTICAL TIMING



HORIZONTAL TIMING

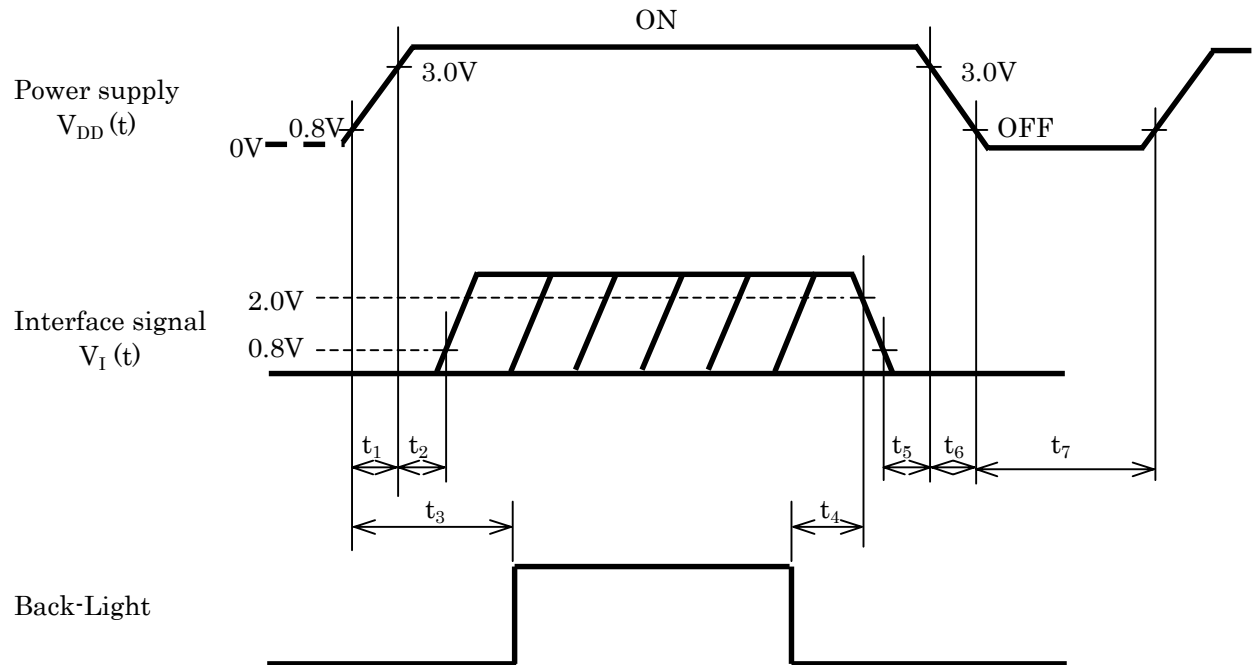


* This module is driven only by the DTMG signal and does not need to input Hsync and a Vsync signal.
As for the period (Blank period) when effective data is not inputted, a DTMG signal should surely serve as L level.

6.2 INTERFACE TIMING SPECIFICATIONS

Item		Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Period	T_{CIP}	34.5	40	43	ns	-
	Width-Low	T_{CL}	12	-	-		
	Width-Hi	T_{CH}	12	-	-		
	Duty	D	0.45	0.5	0.55	-	$D=T_{CL}/T_{CIP}$
	Rise Time	T_{RCLK}	-	-	5	ns	-
	Fall Time	T_{FCLK}	-	-	5		
DATA	Set up Time	T_{DSH}/T_{DSL}	5	-	-	ns	-
	Hold Time	T_{DHH}/T_{DHL}	10	-	-		
	Rise Time	T_{RDA}	-	-	5	ns	-
	Fall Time	T_{FDA}	-	-	5		
DTMG	Set up Time	T_{ES}	5	-	-	ns	-
	Hold Time	T_{EH}	10	-	-		
	Period	T_V	515	525	609	T_H	-
	Vertical Front Porch	T_{VD}	-	480	-		
	Vertical Back Porch	T_{VB}	-	45	-		
	Period	T_H	760	800	870	DCLK	-
	Horizontal Front Porch	T_{HD}	-	640	-		
	Horizontal Back Porch	T_{HB}	-	160	-		
	Rise Time	T_{RDT}	-	-	5		
	Fall Time	T_{FDT}	-	-	5	ns	-

6.3 TIMING BETWEEN INTERFACE SIGNAL AND POWER SUPPLY



POWER ON

$t_1 \leq 15\text{ms}$
 $0\text{ms} < t_2 \leq 45\text{ms}$
 $0.1\text{s} \leq t_3$

POWER OFF

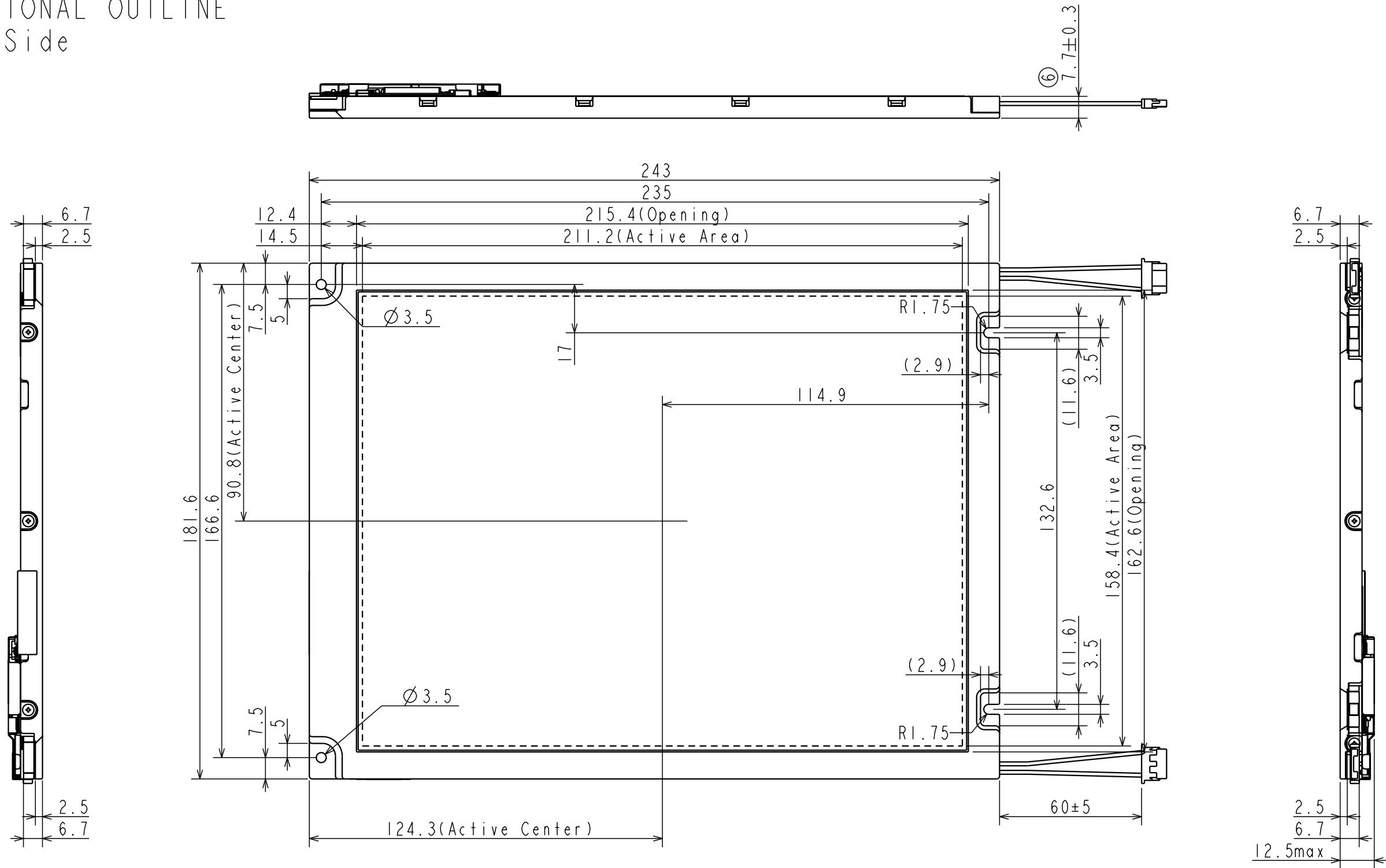
$5\text{ms} \leq t_4$
 $0\text{ms} \leq t_5 \leq 45\text{ms}$
 $0\text{ms} \leq t_6 \leq 20\text{ms}$
 $0.4\text{s} \leq t_7$

Notes 1) Set $0\text{V} \leq V_I(t) \leq V_{DD}(t)$

Here, $V_I(t)$, $V_{DD}(t)$ indicate the transitive state of V_I , V_{DD} when power supply is turned ON or OFF.

2) Do not keep interface signal high-impedance when power on.

7. DIMENSIONAL OUTLINE
Front-Side



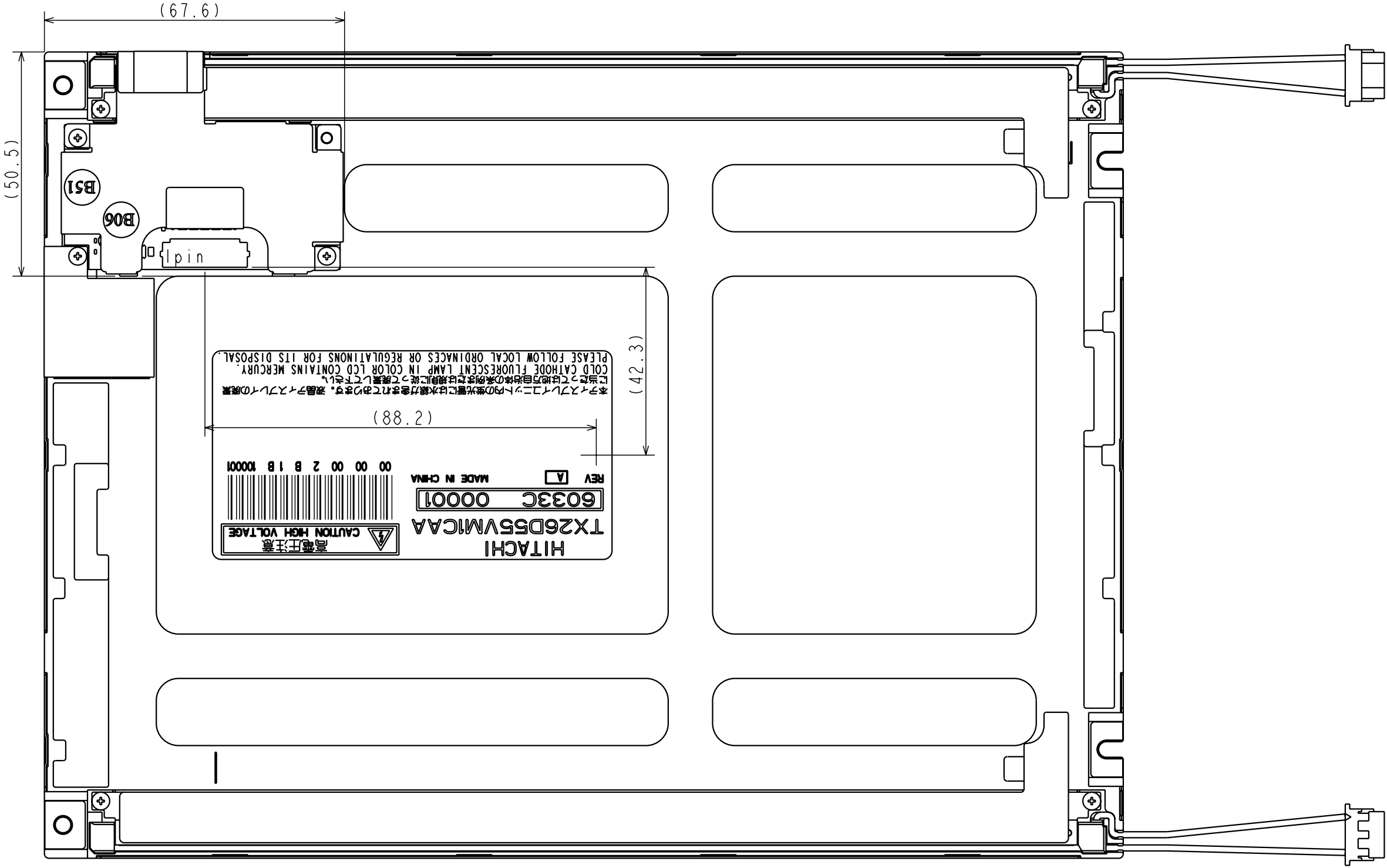
NOTE

- ① Interface connector
HRS:FH12-32S-0.5SH(55) 「Gilding」
- ② CFL cable connector
JST:BHR-02(8.0)VS-1N
- ③ The unspecified tolerance:±0.5mm
- ④ Holes for mounting LCD MODULE
top mounting:4holes
- ⑤ The screws mounted in the side of LCD MODULE:6points
- ⑥ Dimension measurement should be done with adding pressure of 9.8×10^4 Pa

UNIT:mm

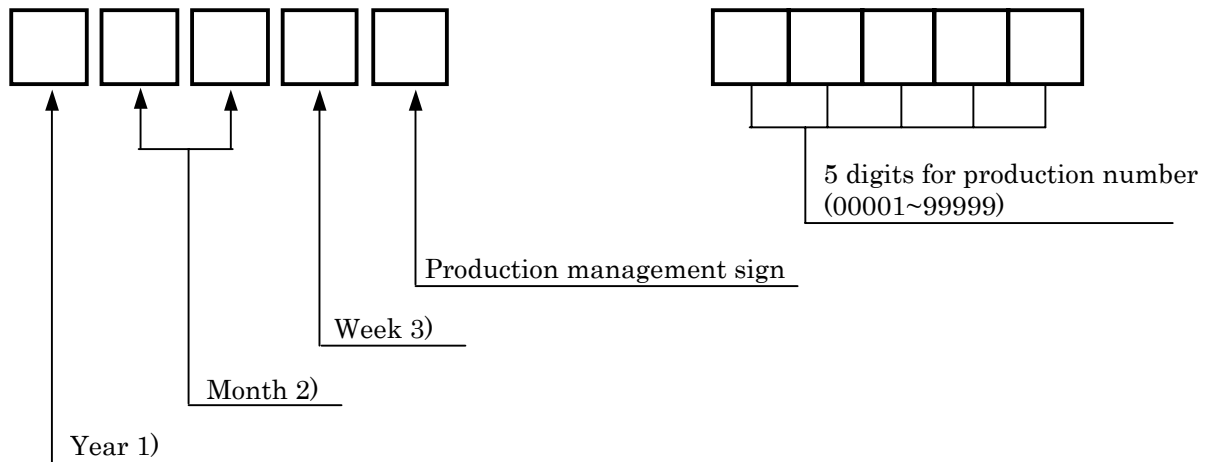
Hitachi Displays, Ltd.	Date	Apr. 22, 2008	Sh. No.	3284PS26 10-TX26D55VM1CAA-1	Page	10-1/2
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Back-Side



8. DESIGNATION OF LOT MARK

8.1 LOT MARK



Notes

1)

Year	Mark
2008	8
2009	9
2010	0
2011	1
2012	2

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)

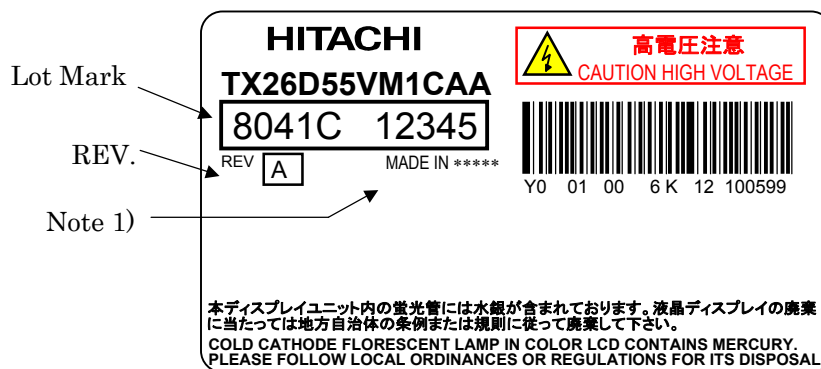
Week (Days)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

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 sticks on back of TFT module. The style of character will be changed without notice.



Note 1) Indication of place of origin
(****section)

CHINA
JAPAN
TAIWAN

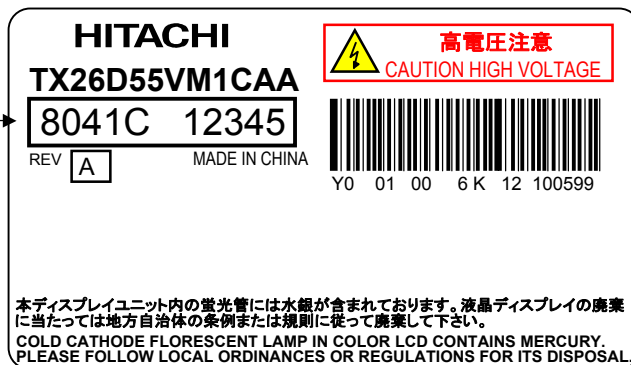
8.4 LOCATION OF LOT MARK

Label is attached on the back side of module.

The items mentioned change without notice.

8.4.1 MADE IN CHINA

Lot No. &
Production Control No.



8.4.2 MADE IN TAIWAN

Lot No. &
Production Control No.



8.4.3 MADE IN JAPAN

Lot No. &
Production Control No.

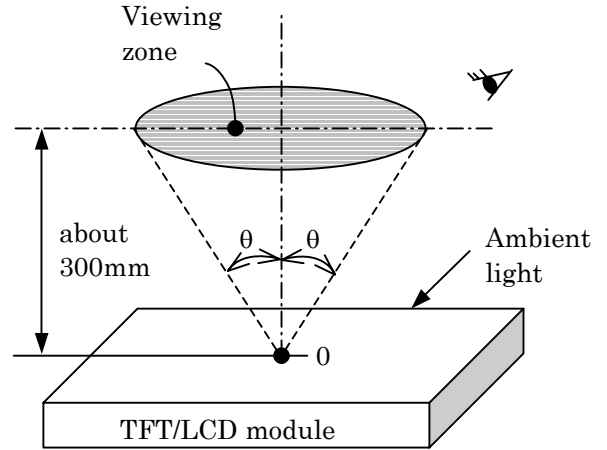


9. COSMETIC SPECIFICATIONS

9.1 CONDITIONS FOR COSMETIC INSPECTION

(1) Viewing zone

- i) The figure shows the correspondence between eyes (of inspector) and TFT/LCD module.
 - $\theta \leq 15^\circ$ when non-operating inspection
 - $\theta \leq 5^\circ$ when operating inspection
- ii) 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)



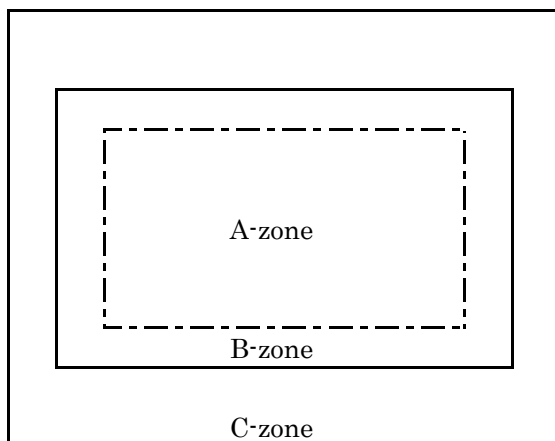
(2) Environmental

- i) Temperature : 25°C
When operating inspection, surface temperature of LCD panel is 25°C.
- ii) Ambient light : More than 2000 [lx] and non-directive.
- iii) Back-light : When non-operating inspection, Back-light should be off.

(3) Operating inspection

Operating inspection should be done with 8 color mode (without gray scale).

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 Interface 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			Maximum acceptable number		Note
				A-zone	Unit	
1	Dot Defect	Sparkle mode	1dot	5	pcs	1), 2), 4)
			2dots	2	units	1), 2), 5)
			3dots	0		
			4dots	0		
			Density	2	pcs φ 15mm	1), 2), 6)
		Total	5	pcs	1), 2)	
		Black mode	1dot	10	pcs	1), 3) 4)
			2dots	5	units	1), 3), 5)
			3dots	0		
			4dots	0		
	Density		3	pcs φ 5mm	1), 3), 7)	
	Total	10	pcs	1), 3)		
	Total	15	pcs	1)		
	2	Line Defect			Serious one is no good.	-
3	Uneven Brightness					
4	Stain Inclusion (Line shape W: width (mm) L: length (mm))	W ≤ 0.06	L: Ignore	Ignore	pcs	8)
		W > 0.06	L > 1.0	By Dot shape		
			L ≤ 1.0	Ignore		
5	Stain Inclusion (Dot shape D: average dia.(mm))	D ≤ 0.45		Ignore	pcs	8)
		D ≤ 0.7		5		
		D > 0.7		0		
6	Scratch on polarizer (Line shape W: width (mm) L: length (mm))	W ≤ 0.01	L: Ignore	Ignore	pcs	9)
		W ≤ 0.02	L ≤ 40	10		
			L > 40	0		
		W ≤ 0.04	L ≤ 20	10		
			L > 20	0		
7	Scratch on polarizer (Dot shape D: average dia.(mm))	D ≤ 0.45		Ignore	pcs	9)
		D ≤ 0.7		10		
		D > 0.7		0		

No.	Item	Maximum acceptable number		Note
		A-zone	Unit	
8	Bubbles of Polarizer [D: average dia.(mm)]	D ≤ 0.3	Ignore	pcs 9)
		D ≤ 0.5	10	
		D ≤ 1.0	5	
		D > 1.0	0	
9	Wrinkles on Polarizer	Serious one is no good.		-
10	Burr of Polarizer edge	L ≤ 1.0	Ignore	pcs
		L > 1.0	0	

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

2) Sparkle mode : Brightness of dot is more than 30% at Black raster. (Visible to eye)

3) Black mode : Brightness of dot is less than 70% at white raster. (Visible to eye)

4) 1 dot : defect dot is isolated, not attached to other defect dot.

5) N dot : N defect dots are consecutive. (N means the number of defect dots. (N ≥ 2))

6) Dense Dot Defect of Sparkle mode : the number of defects in the area of φ 15mm.

7) Dense Dot Defect of Black mode : the number of defects in the area of φ 5mm.

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

9) Polarizer area inside of A-zone is applied, and B/C-zone is not applied.

10. PRECAUTIONS

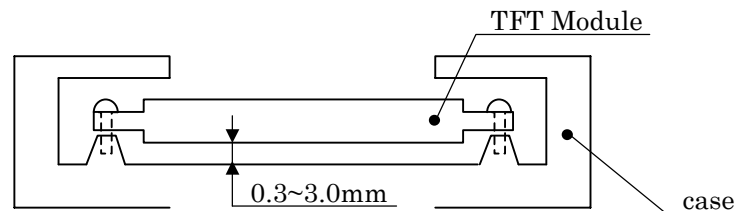
Please pay attention to the followings when you use this TFT/LCD module with Back-light unit.

10.1 MOUNTING PRECAUTION

- (1) You must mount Module using mounting holes arranged in 8 corners tightly.
- (2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to Module.

And the case which Module is mounted should have sufficient strength so that external force is not transmitted directly to Module.

- (3) To improve the strength of module against the mechanical shock the space between module and the case should be 0.3~3.0mm.



- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case should not be used. Because the former generate corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub by dusty clothes with chemical treatment.
Do not touch the surface of polarizer with bare hand or greasy close.
(Some cosmetics are detrimental to the polarizer.)
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton. IPA (Isopropyl Alcohol) is recommended for cleaning the adhesives used to attach front/rear polarizers. Don't use acetone, toluene, and alcohol because they cause chemical damage to polarizer
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits have not sufficient strength.
- (10) Use fingerstalls of soft gloves in order to keep clean display quality, when you handle the device for incoming inspection and assembly.
- (11) Do not pull or do not fold the CFL cable.

10.2 OPERATING PRECAUTION

- (1) Response time depends on the temperature. (In lower temperature, it becomes longer).
And also Transmittance and Color depend on the temperature.
- (2) Brightness depends on the temperature. (In lower temperature, it becomes lower).
And in lower temperature, response time (required time that brightness is stable after turn on) becomes longer.
- (3) Optical characteristics (eg. Luminance, uniformity, color coordinate etc.)
gradually change by operating condition, especially low temperature change faster,
because LCD module has Cold Cathode Fluorescent Lamp.
- (4) Be careful for condensation at sudden temperature change.
Condensation make damage to polarizer or electrical contact part.
And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed at long times, afterimage is likely to occur.
- (6) The Module have high frequency circuit. If you need to shield the electromagnetic
noise, please do in yours.
- (7) When Back-light unit is operating, it sounds.
If you need to shield the noise, please do in yours.
- (8) Please connect the Back-light connector to the inverter circuit directly.
The long cable between CFL and the inverter may cause the brightness drop of CFL
and may cause the rise of starting lamp Voltage (Vs).
In addition, it causes CFL life to shorten.
- (9) Do not connect or remove the module from main system with power applied.

10.3 ELECTROSTATIC DISCHARGE CONTROL

- (1) Since Module is composed with electronic circuit, it is not strong to electrostatic
discharge. Make certain that treatment persons are connected to ground through
list band etc.. And don't touch Interface pin directly.
- (2) When the polarizer protection film is peeled off, electrostatic discharge occurs.
Please peel it of slowly.

10.4 PRECAUTION FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

10.5 PRECAUTION TO STORAGE

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

- (1) For preventing the liquid crystal deterioration with the ultraviolet ray, please retain when by all means it is inserted in the Hitachi shipping box.
- (2) When it cannot retain in the Hitachi shipping box, Modules should be stored in a dark place.
It is prohibited to apply sunlight or fluorescent light during storage.
- (3) The surface of polarizers should not come in contact with any other object.
It is recommended that modules should be stored in the Hitachi shipping box.
- (4) Modules should be at 5 to 35 at normal humidity (60%RH or less).
- (5) Please follow to the environmental condition of statement in the page 4-1/3 of CAS excluding the long term storage.

10.6 HANDLING PRECAUTIONS FOR PROTECTIVE FILM

- (1) When the protective film is peeled off, static electricity is generated between the film and the polarizer.
This film should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- (2) The protective film is attached to the polarizer with a small amount of glue.
If some stress is applied to rub the protective film against the polarizer during the time you peel off the film, the glue is apt to remain more on the polarizer.
So please carefully peel off the protective film without rubbing it against the polarizer.
- (3) When the Module with protective film attached is stored for long time, sometimes there remains a very small amount of glue, still on the polarizer after the protective film is peeled off.
Please refrain from storing the Module at the high temperature and high humidity for glue is apt to remain in these condition.
- (4) The Glue may be taken for the Modules failure, but you can remove the Glue easily.
When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material soaked with IPA (Isopropyl Alcohol).

10.7 SAFETY

- (1) If Module is broken, be careful to handle not to injure. (TFT/LCD and Lamp are made of glass.)
Please wash hands sufficiently when you touch the liquid crystal coming out from broken LCDs.
- (2) As Back-light unit has high voltage circuit internal, do not open the case and do not insert foreign materials in the case.

10.8 ENVIRONMENTAL CONSERVATION

- (1) The LCD Modules include Cold Cathode Fluorescent Lamp (CFL).
CFL contains a small amount of mercury. Please follow local ordinances or regulations for disposal.
- (2) Printed circuits board used in a module contain small amount of lead below RoHS regulation value.
Please follow local ordinance or regulations for its disposal.