TFT LCD Approval Specification

MODEL NO.: G260J1- L05

Customer: _____

Approved by: _____

Note:

記錄	工作	審核	角色	投票
2010-07-28 08:35:36	APPL 產品管理處	張喻翔	Director	Accept

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REVISION HISTORY

Version	Date	Section	Description
Ver. 2.0	Jul 19, 10'	-	G260J1 -L05 Approval specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

G260J1-L05 is a 25.54 inches TFT Liquid Crystal Display module with 16 CCFL Backlight unit and 30 pins 2 channels LVDS interface. This module supports 1920 x 1200 WUXGA mode and can display up to 16.7 millions colors and over 92% NTSC color gamut. The inverter module for Backlight is built in.

1.2 FEATURES

- Super MVA extra-wide viewing angle.
- High contrast ratio.
- Fast response time.
- High color saturation.
- Low color shift
- WUXGA (1920 x 1200 pixels) resolution.
- DE (Data Enable) only mode.
- LVDS (Low Voltage Differential Signaling) interface.
- RoHS compliance.
- TCO'03 compliance.

1.3 APPLICATION

- TFT LCD Monitor

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	550.08 (H) x 343.8 (V) (25.54" diagonal)	mm	(1)
Bezel Opening Area	554.1 (H) x 347.8 (V)	mm	
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1200	pixel	-
Pixel Pitch	0.2865 (H) x 0.2865 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	581.5	582.0	582.5	mm	(1)
	Vertical(V)	375.1	375.6	376.1	mm	
	Depth(D)	41.0	41.5	42.0	mm	
Weight		-	-	3450	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	40	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

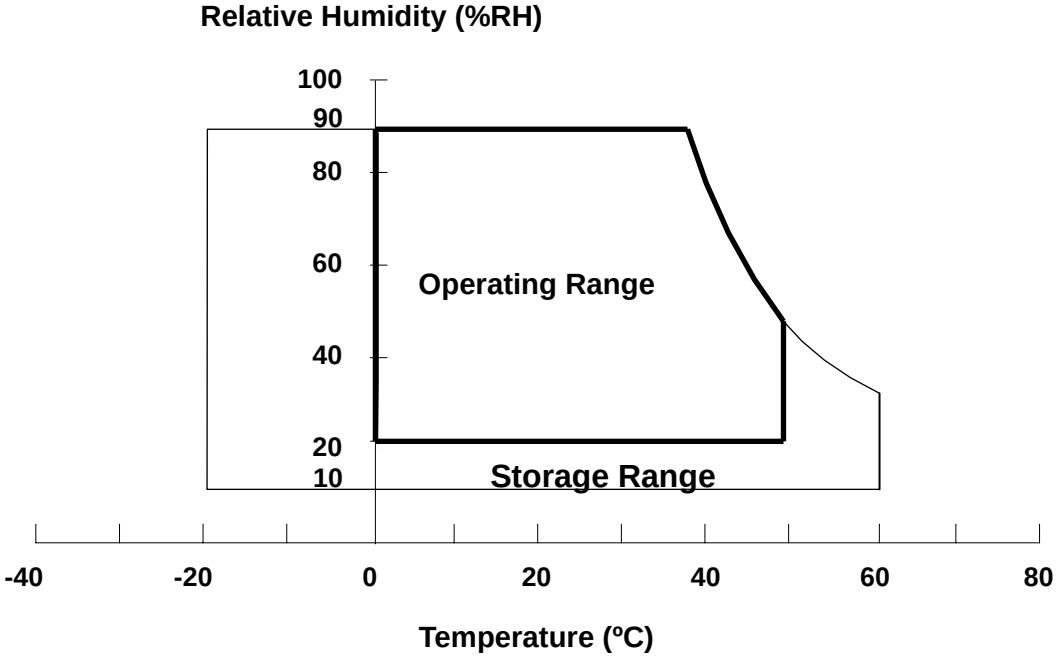
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 60 ºC Max.



Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z.

Note (5) At testing Vibration and Shock, the top and bottom side of the module must be held by the bracket. The fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:

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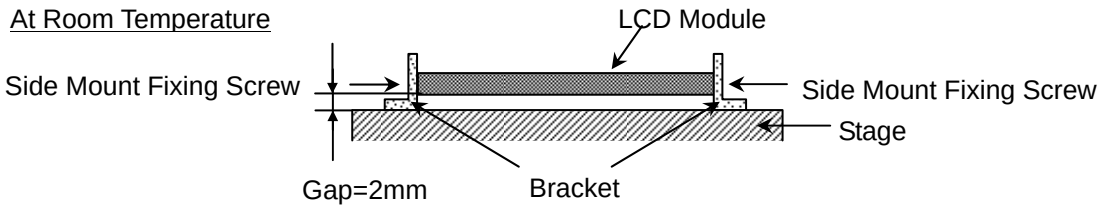
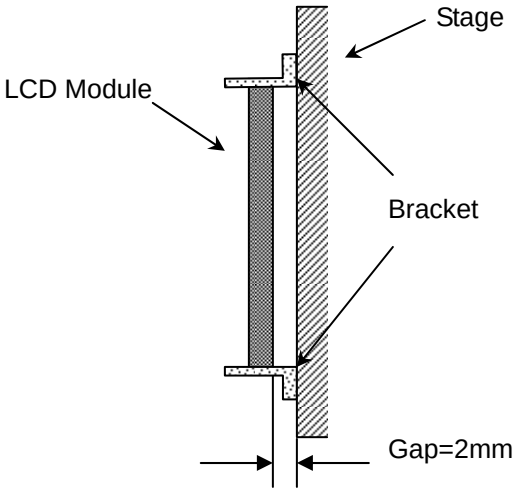


X Direction



Y Direction

2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+6.0	V	(1)

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	932	1140	V_{RMS}	(1), (2)
Lamp Current	I_L	4.5	5.5	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	48	70	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

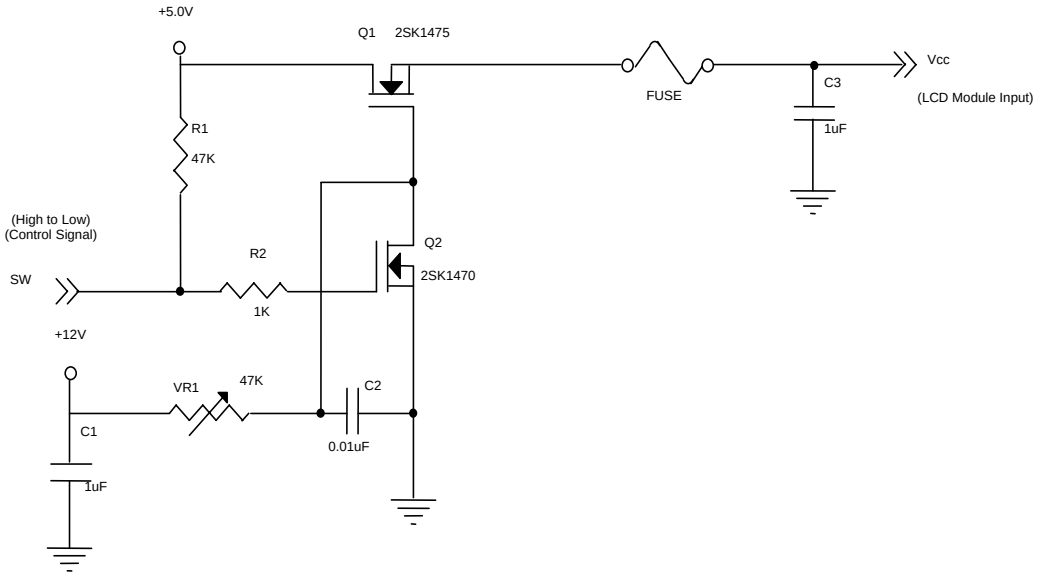
3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

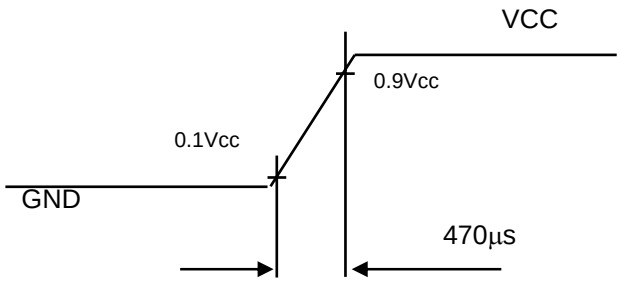
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	-	100	mV	-
Rush Current		I_{RUSH}	-	-	3.8	A	(2)
Power Supply Current	White	-	-	-	3.2	A	(3)a
	Black	-	-	-	1.56	A	(3)b
	Vertical Stripe	-	-	-	2.86	A	(3)c
LVDS differential input voltage		Vid	100	-	600	mV	
LVDS common input voltage		Vic	-	1.2	-	V	
Logic “L” input voltage		Vil	Vss	-	0.8	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470μs



Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

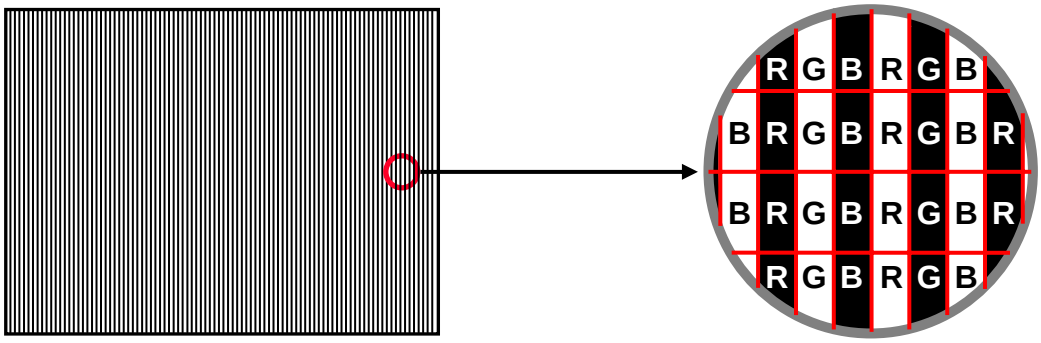
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



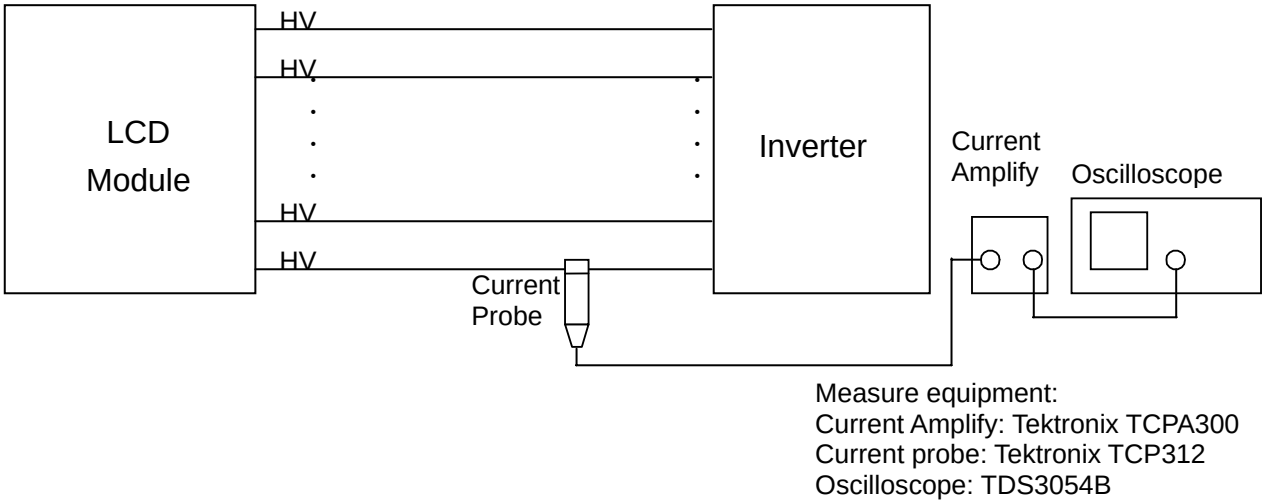
Active Area

3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	932	1036	1140	V_{RMS}	I_L = 5.0 mA
Lamp Current	I_L	4.5	5.0	5.5	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S	-	-	1920 (0°C)	V_{RMS}	(2)
		-	-	1620 (25°C)	V_{RMS}	(2)
Operating Frequency	F_L	48	55	70	KHz	(3)
Lamp Life Time	L_{BL}	40,000	-	-	Hrs	(5), I_L = 5.0mA
Power Consumption	P_L	-	83	-	W	(4), I_L = 5.0 mA

Note (1) Lamp current is measured by current amplify & oscilloscope as shown below:



Measure equipment:
Current Amplify: Tektronix TCPA300
Current probe: Tektronix TCP312
Oscilloscope: TDS3054B

Note (2) The voltage that must be larger than Vs should be applied to the lamp for more than 1 second after startup. Otherwise, the lamp may not be turned on normally.

Note (3) The lamp frequency may produce interference with horizontal synchronization frequency from the display, which might cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronization frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L \times 16$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition Ta = 25 ±2 °C and I_L = 5.0 mArms until one of the following events occurs:

(a) When the brightness becomes or lowers than 50% of its original value.

(b) When the effective ignition length becomes or lowers than 80% of its original value. (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight,

such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

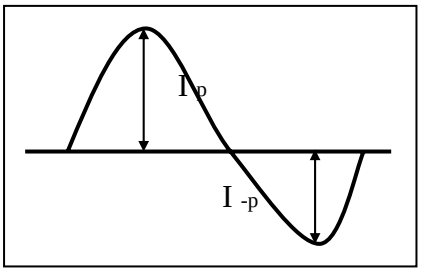
The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp. It shall help increase the lamp lifetime and reduce its leakage current.

a. The asymmetry rate of the inverter waveform should be 10% below;

b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$;

c. The ideal sine wave form shall be symmetric in positive and negative polarities



* Asymmetry rate:

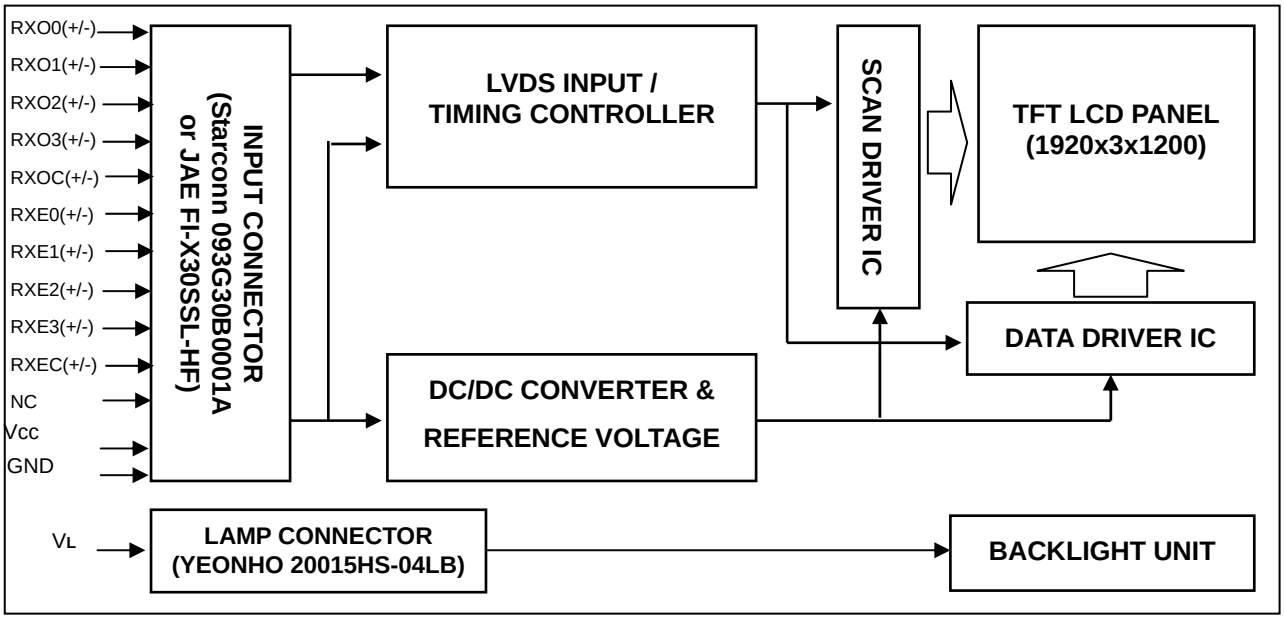
$$| I_p - I_{-p} | / I_{rms} * 100\%$$

* Distortion rate

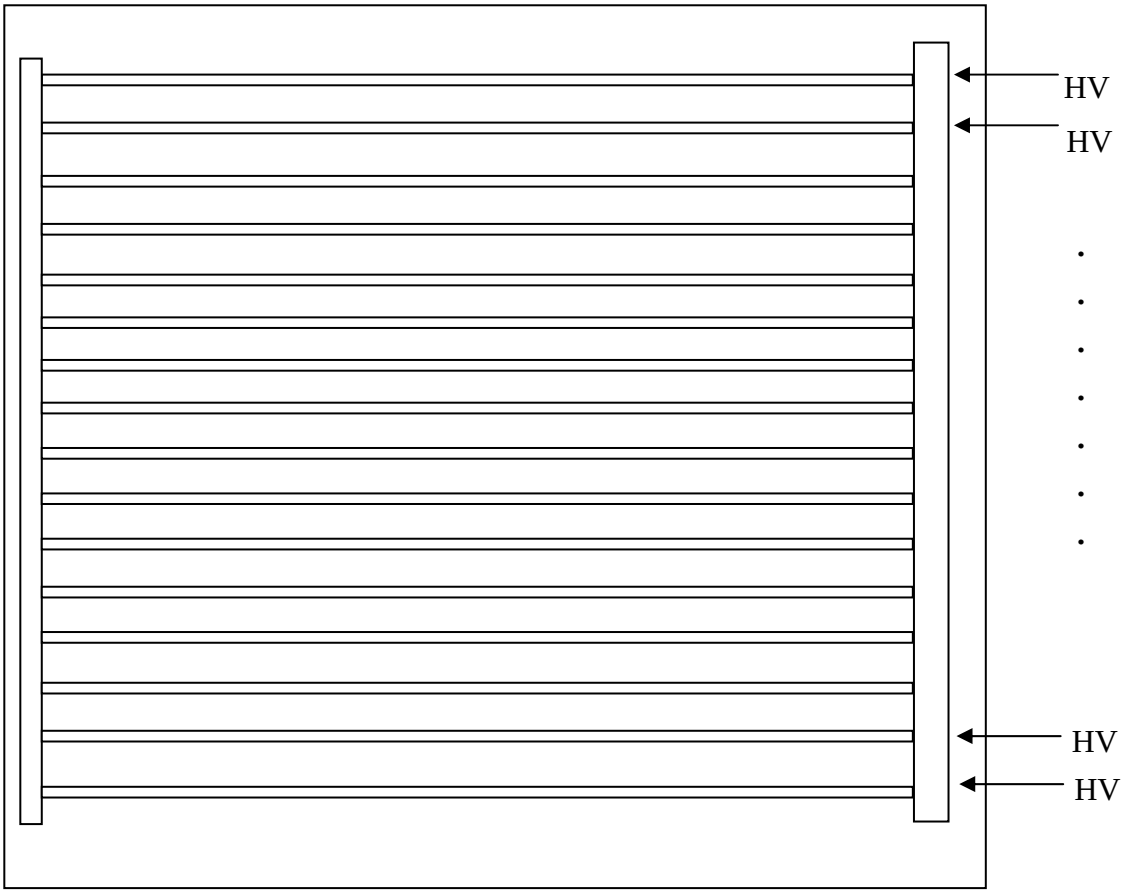
$$I_p \text{ (or } I_{-p}) / I_{rms}$$

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	No connection, this pin should be opened.
26	NC	No connection, this pin should be opened.
27	VCC	+5.0V power supply
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

Note (1) Connector Part No.: STARCONN 093G30-B0001A or JAE FI-X30SSL-HF.

Note (2) The first pixel is odd.

Note (3) Input signal of even and odd clock should be the same timing.

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

5.2 BACKLIGHT UNIT:

Pin	Symbol	Description	Remark
1-1	HV	High Voltage	Blue
1-2	HV	High Voltage	White
2-3	HV	High Voltage	Pink
2-4	HV	High Voltage	White
3-5	HV	High Voltage	Blue
3-6	HV	High Voltage	White
4-7	HV	High Voltage	Pink
4-8	HV	High Voltage	White
5-9	HV	High Voltage	Blue
5-10	HV	High Voltage	White
6-11	HV	High Voltage	Pink
6-12	HV	High Voltage	White
7-13	HV	High Voltage	Blue
7-14	HV	High Voltage	White
8-15	HV	High Voltage	Pink
8-16	HV	High Voltage	White

Note (1) Connector Part No.: YEONHO 20015HS-04LB or equivalent.

5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	G5	G4	G3	G2	G1	G0	R7	R6	B5	B4	B3	B2	B1	B0
Basic Colors	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	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	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	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
Gray Scale Of Red	Red(0) / Dark	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(253)	1	1	1	1	1	1	0	1	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
Gray Scale Of Green	Green(0) / Dark	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(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	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
Gray Scale Of Blue	Blue(0) / Dark	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(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	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

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INVERTERS SPECIFICATIONS

6.1 INVERTER CHARACTERISTICS (Ta = 25 ± 2 °C)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	84	87	W	I_L=5.5mA
Power Supply Voltage	V_{BL}	22.8	24	25.2	V_{DC}	
Power Supply Current	I_{BL}	-	3.65	-	A	Non Dimming
Input Ripple Noise	-	-	-	500	mV_{P-P}	V_{BL}=22.8V
Backlight Turn On Voltage	V_{BS}	2100	-	-	V_{RMS}	Ta = 0 °C
		1800	-	-	V_{RMS}	Ta = 25 °C
Oscillating Frequency	F_W	53	55	57	kHz	
Dimming Frequency	F_B	150	160	170	Hz	
Minimum Duty Ratio	$D_{MIN.}$	-	20	-	%	

6.2 INVERTER INTERFACE CHARACTERISTICS (Ta = 25 ± 2 °C)

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
Error Signal		ERR	-	-	-	-	-	(Note 1)
On/Off Control Voltage	ON	V_{BLON}	-	2.0	-	5.0	V	
	OFF		-	0	-	0.8	V	
Internal PWM Control Voltage	MAX.	V_{IPWM}	V_{SEL} = L	3.0	3.15	3.3	V	Maximum duty ratio
	MIN.			-	0	-	V	Minimum duty ratio

Note 1: Abnormal = High voltage (5V)

Normal = low voltage (GND)

6.3 INVERTER PIN ASSIGNMENT

CN1(Header): 20022WR-14L(YEONHO) or equivalent

Pin No.	Signal Name	Feature
1	V_{BL}	+24V
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10	DIM-OUT	Dimming Out
11	ERR	Normal(GND) Abnormal(Open Connector)
12	BLON	BL ON/OFF
13	I_PWM	Internal PWM Control
14	DIM-IN	Dimming In

CN2-CN9(Header): 20015WR-07B(YEONHO) or equivalent

Pin No.	Name	Description
1	CCFL HOT	CCFL High Voltage
2	CCFL HOT	CCFL High Voltage

7. INTERFACE TIMING

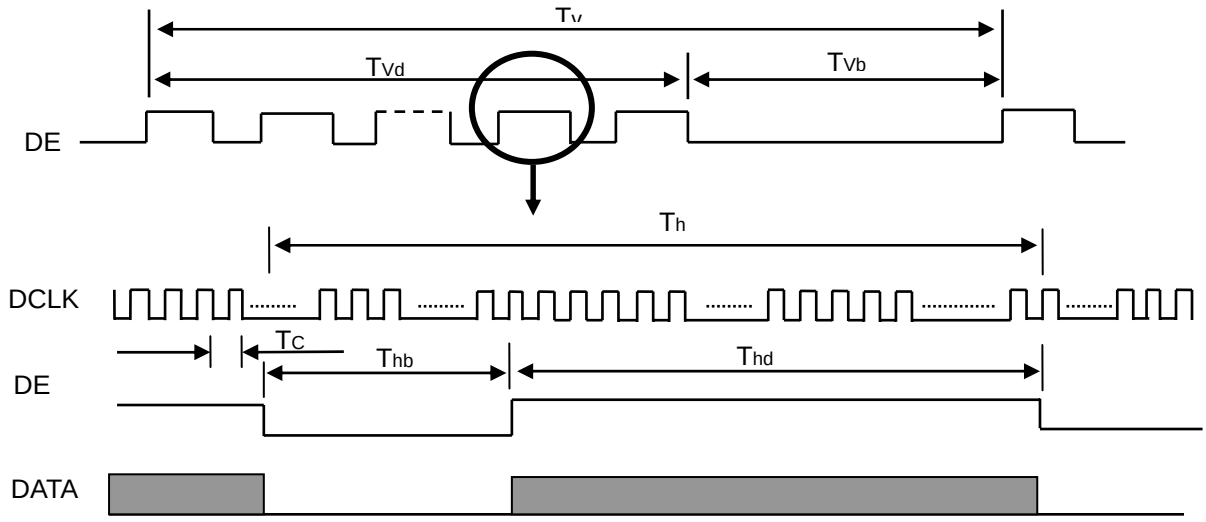
7.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	50.0	77	83.0	MHz	-
	Period	Tc	-	13.0	-	ns	
	High Time	Tch	-	4/7	-	Tc	-
	Low Time	Tcl	-	3/7	-	Tc	-
LVDS Data	Setup Time	Tlvs	600	-	-	ps	-
	Hold Time	Tlvh	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr	40	60	63	Hz	Tv=Tvd+Tvb
	Total	Tv	1209	1235	1245	Th	-
	Display	Tvd	1200	1200	1200	Th	-
	Blank	Tvb	9	35	Tv-Tvd	Th	-
Horizontal Active Display Term	Total	Th	1030	1040	1075	Tc	Th=Thd+Thb
	Display	Thd	960	960	960	Tc	-
	Blank	Thb	70	80	Th-Thd	Tc	-

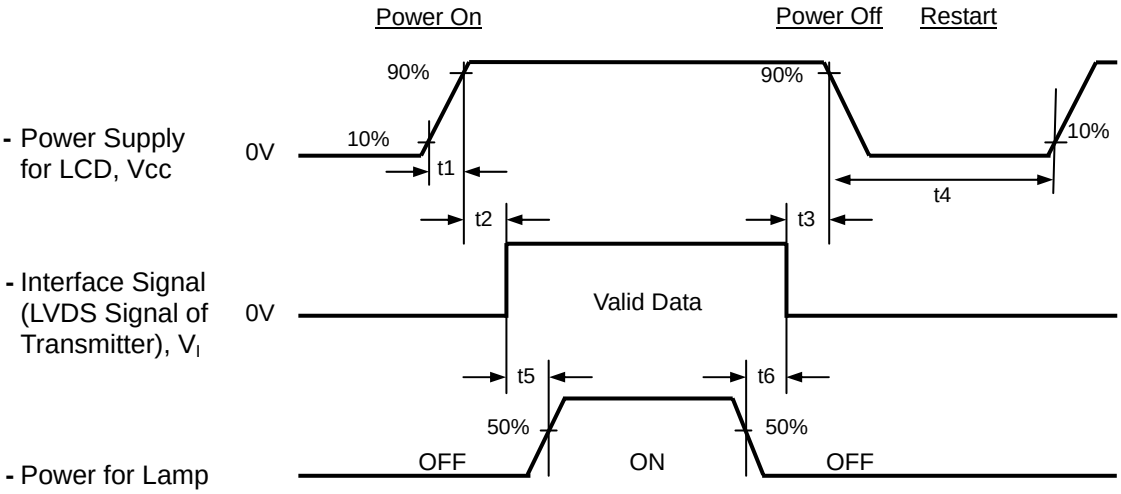
Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Timing Specifications:

0.5< t1 ≦ 10 msec

0 < t2 ≦ 50 msec

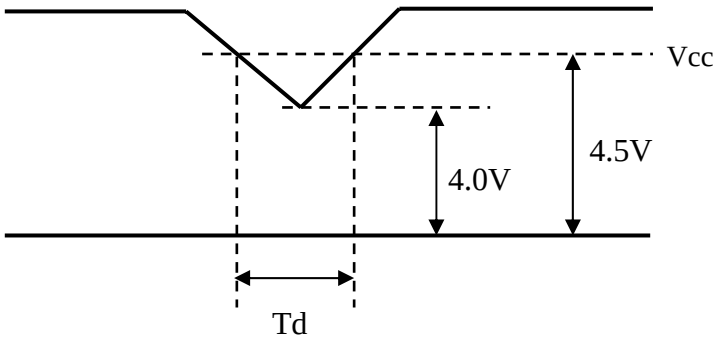
0 < t3 ≦ 50 msec

t4 ≧ 500 msec

t5 ≧ 500 msec

t6 ≧ 90 msec

7.3 VDD Power DIP Condition



Dip condition: $4.0V \le Vcc \le 4.5V, Td \le 20ms$

8. OPTICAL CHARACTERISTICS

8.1 TEST CONDITIONS

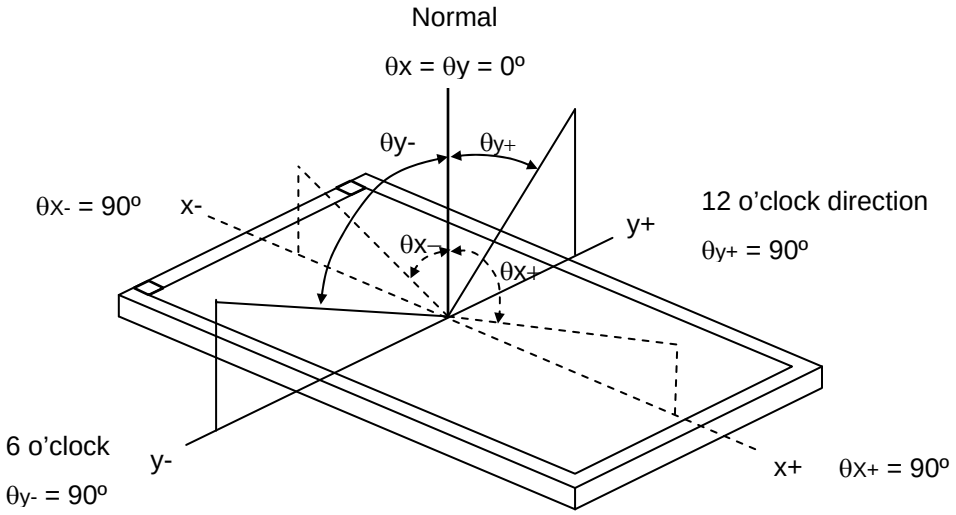
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5V	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	5.0	mA
Inverter Operating Frequency	F_L	58±2	KHz
Inverter	CMO 4H.V2281.011/D 27D-D016512		

8.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 8.2. The following items should be measured under the test conditions described in 8.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rx	θ_x=0°, θ_Y =0° CS-1000T	Typ - 0.03	0.666	Typ + 0.03	-	(1), (5)
		Ry			0.318			
	Green	Gx			0.185			
		Gy			0.689			
	Blue	Bx			0.150			
		By			0.081			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White (Center of Screen)		L_C		250	350	-	cd/m^2	(4), (5)
Contrast Ratio		CR		1200	1500	-	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	15	-	ms	(3), (7)
		T_F		-	5	-		
		$T_{GtG\_AVE\_}$		-	8	-		
White Variation		δW	θ_x=0°, θ_Y =0° USB2000	-	1.4	1.5	-	(5), (6)
Viewing Angle	Horizontal	θ_x+	CR ≧ 10 USB2000	80	88	-	Deg.	(1), (5)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

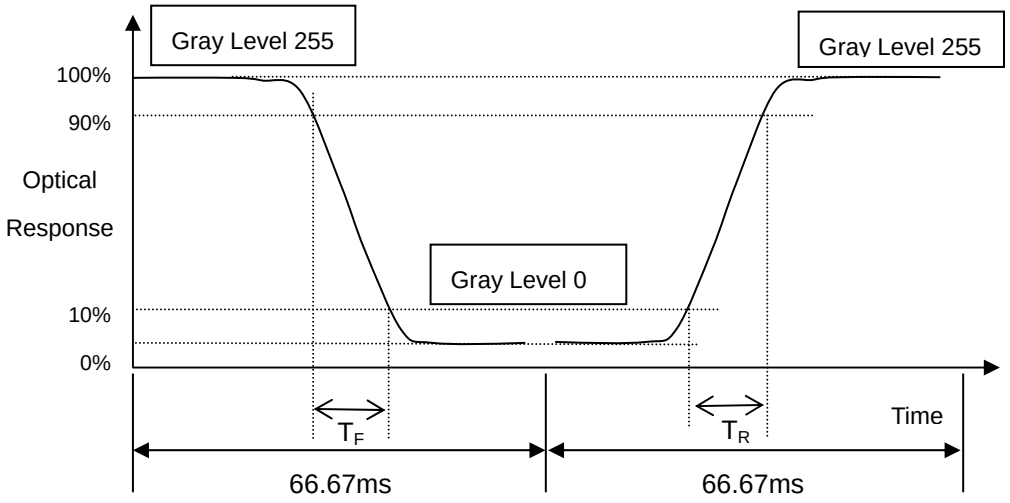
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L_C):

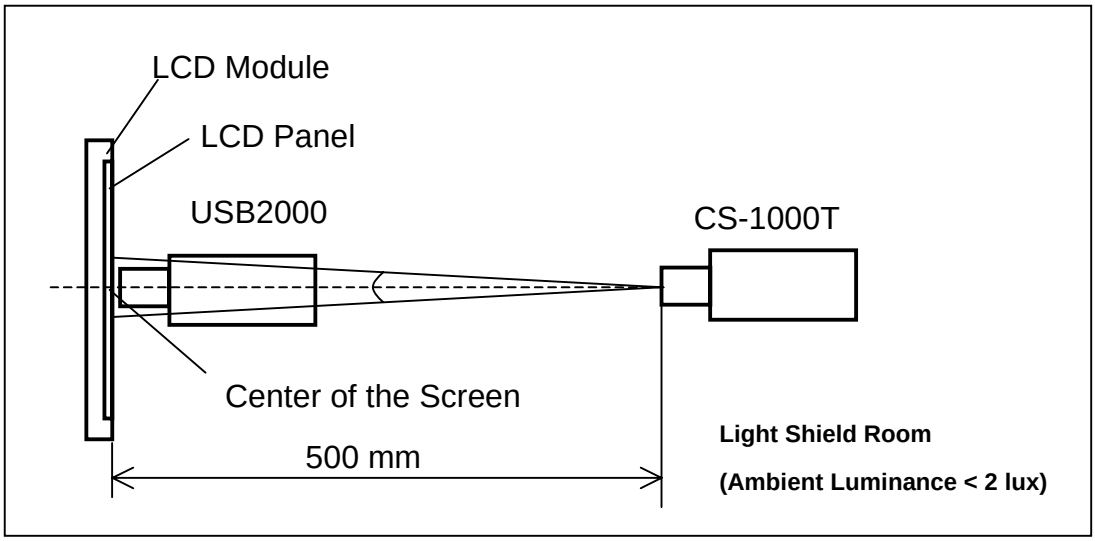
Measure the luminance of gray level 255 at center point

L_C = L (1)

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

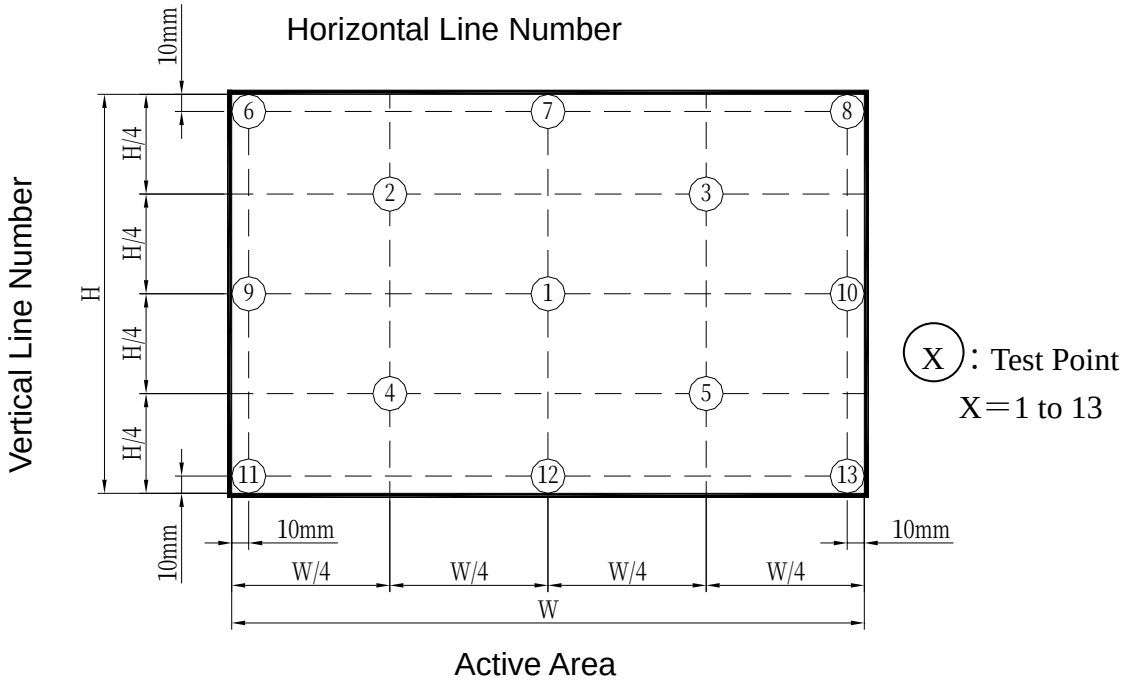
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 13 points

$$\delta W = \frac{\text{Maximum [L(1), L(2), L(3), L(4), L(5), L(6), L(7), L(8), L(9), L(10), L(11), L(12), L(13)]}}{\text{Minimum [L(1), L(2), L(3), L(4), L(5), L(6), L(7), L(8), L(9), L(10), L(11), L(12), L(13)]}}$$



Note (7) Definition of Response Time (T_{GTG_AVE}):

T_{GTG_AVE} is defined as the total average response time for “Gray To Gray “.

The Gray to Gray response time is defined as the following chart.

Gray to Gray		Target Gray								
		G0	G32	G64	G96	G128	G160	G192	G224	G255
Initial Gray	G0									
	G32									
	G64									
	G96									
	G128									
	G160									
	G192									
	G224									
	G255									

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 5 LCD modules / 1 Box

(2) Box dimensions: 680(L) X 400(W) X 360(H) mm

(3) Weight: approximately 17.5Kg (5 modules per box)

9.2 PACKING METHOD

(1) Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation
Dropping Test	1 Angle, 3 Edge, 6 Face, 60cm	Non Operation

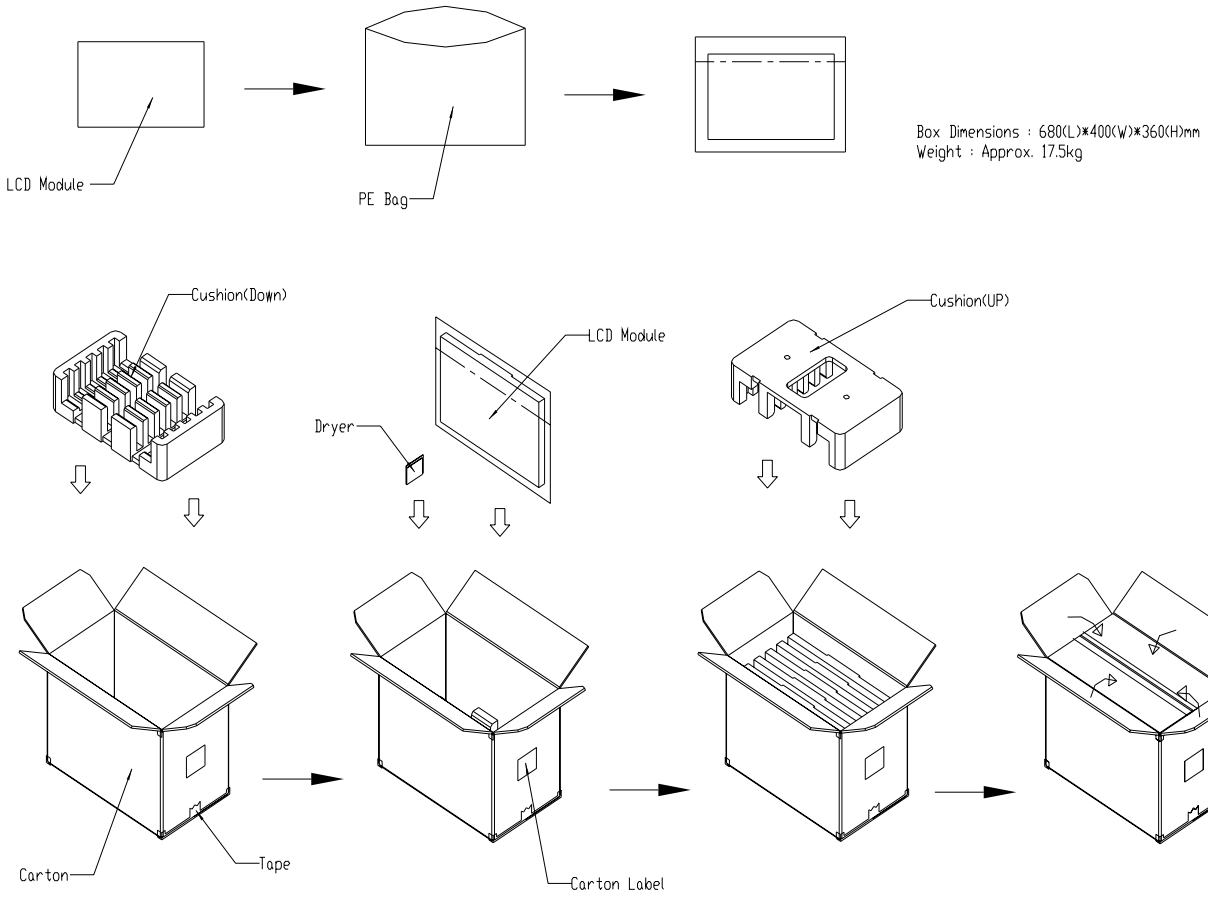


Figure. 8-1 Packing method

For ocean shipping

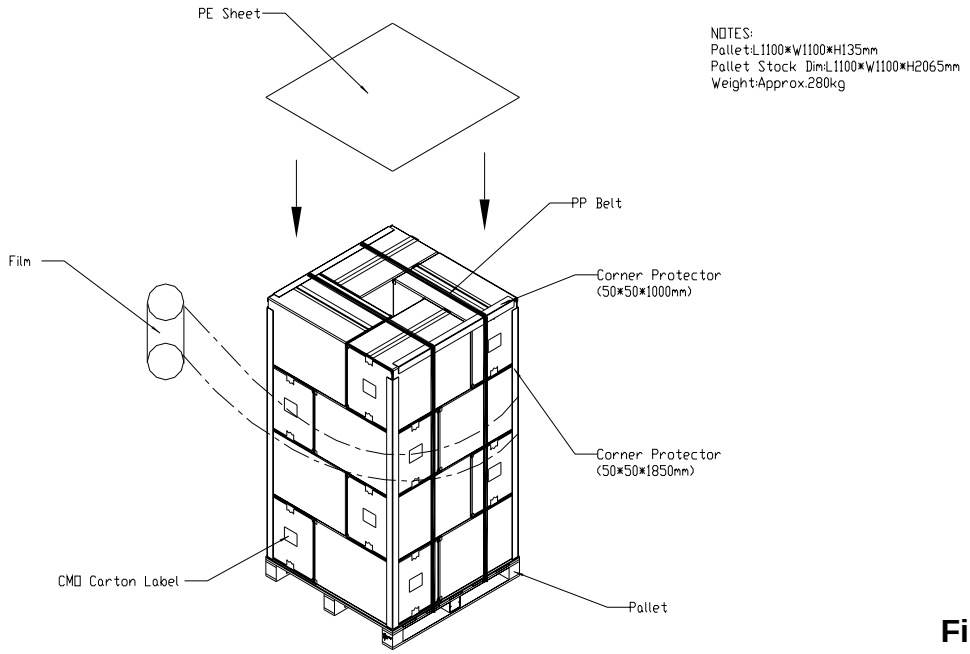


Figure. 8-2 Packing method

For air transport

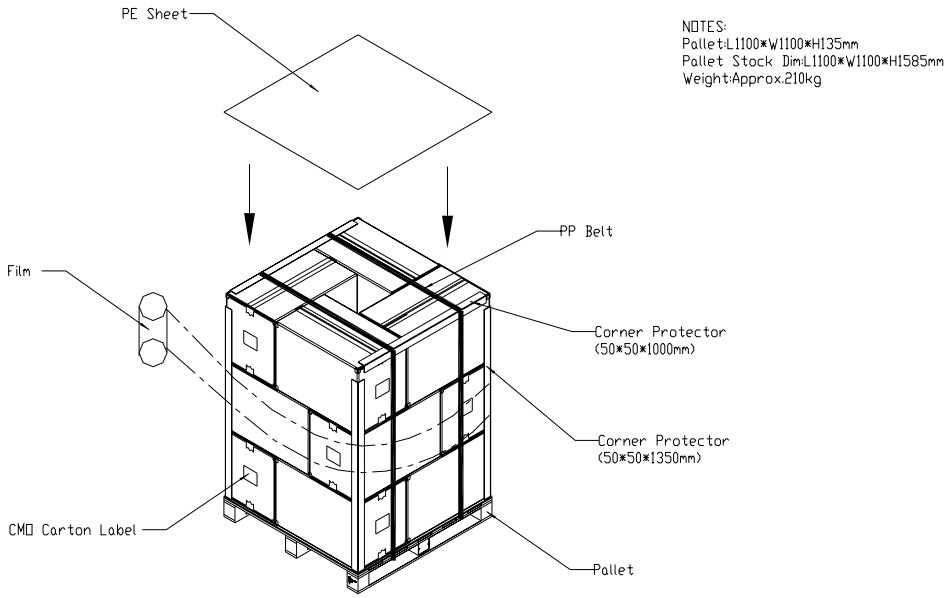
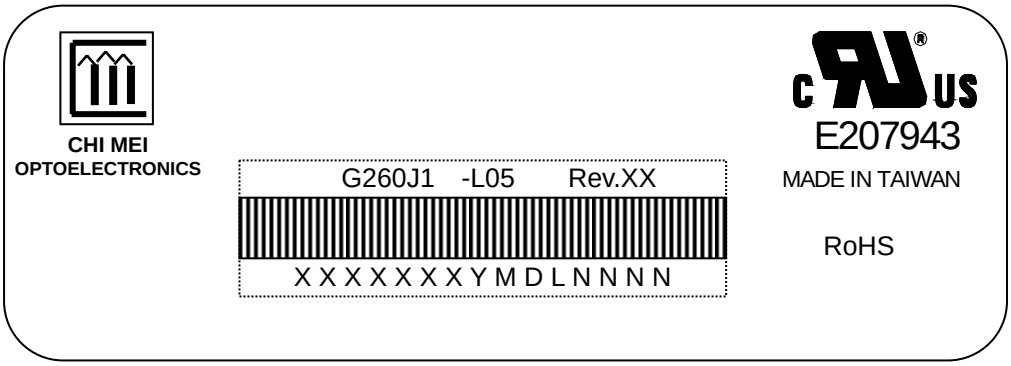


Figure. 8-3 Packing method

10. DEFINITION OF LABELS

10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: G260J1-L05

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) CMO barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMO internal use	-
XX	Revision	Cover all the change
X	CMO internal use	-
XX	CMO internal use	-
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	CMO internal use	-
NNNN	Serial number	Manufacturing sequence of product

11. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

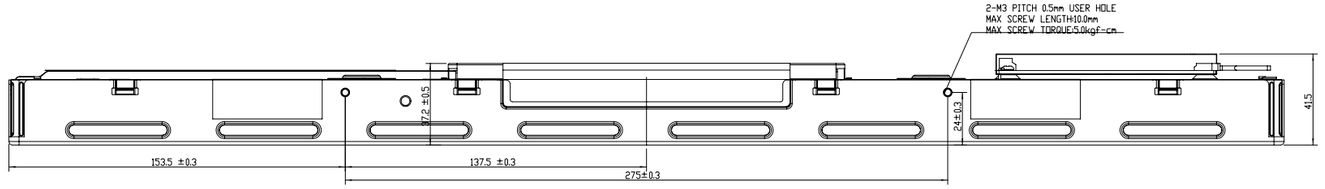
(10) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

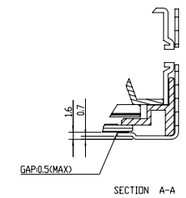
10.2 SAFETY PRECAUTIONS

(1) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

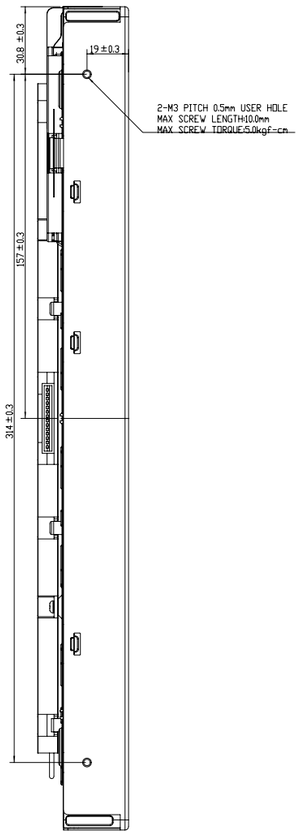
(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

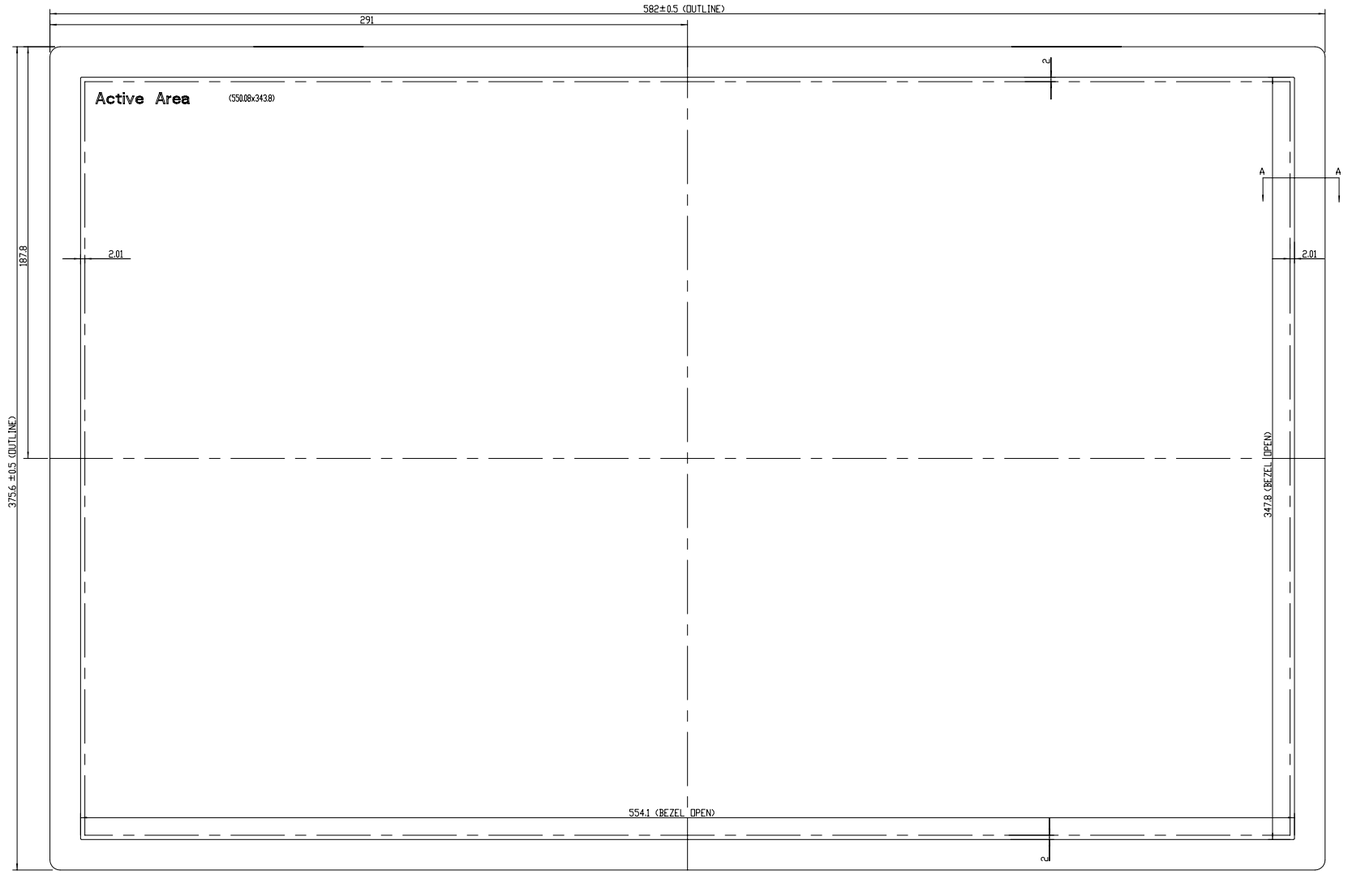
(3) After the module's end of life, it is not harmful in case of normal operation and storage.



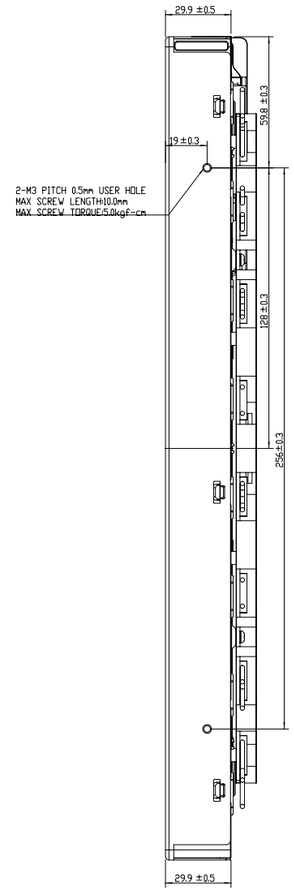


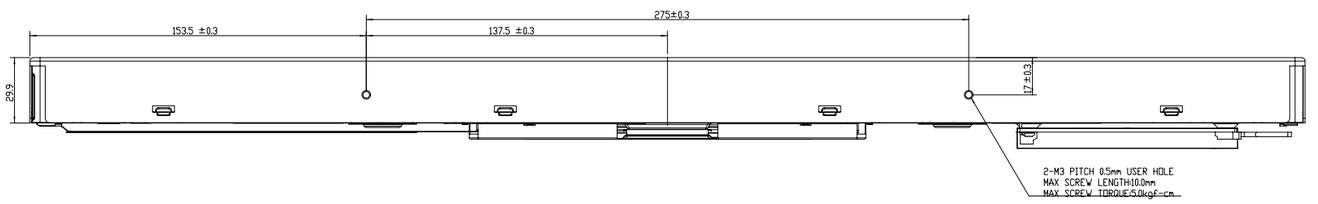
SECTION A-A





SCALE 1:1





Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark

NOTES:
1.OUTLINE TOLERANCE:±0.5mm
2."*"MARKS THE DESIGN CRITICAL DIMENSION
3."Ⓟ"MARKS THE PROCESS CRITICAL DIMENSION
4.MAX SCREW TORQUE:5.0kgf-cm
5.SCREW LENGTH FOLLOW THE NOTES IN THE DRAWING

TITLE	ASSY_MODULE_M260J2				2B REV:A0 3B REV:L72	
Approved	YULE_LIN	Drawing No.	M260J4101A			
Checked	TIGER_CHANG	Part No.	TBD			
Drawer	ALAN_LEE	Material	TBD	Sheet	1 / 2	A0
Designer	ALAN_LEE	Date	06-Jul-2007	Scale	1:1	Unitmm

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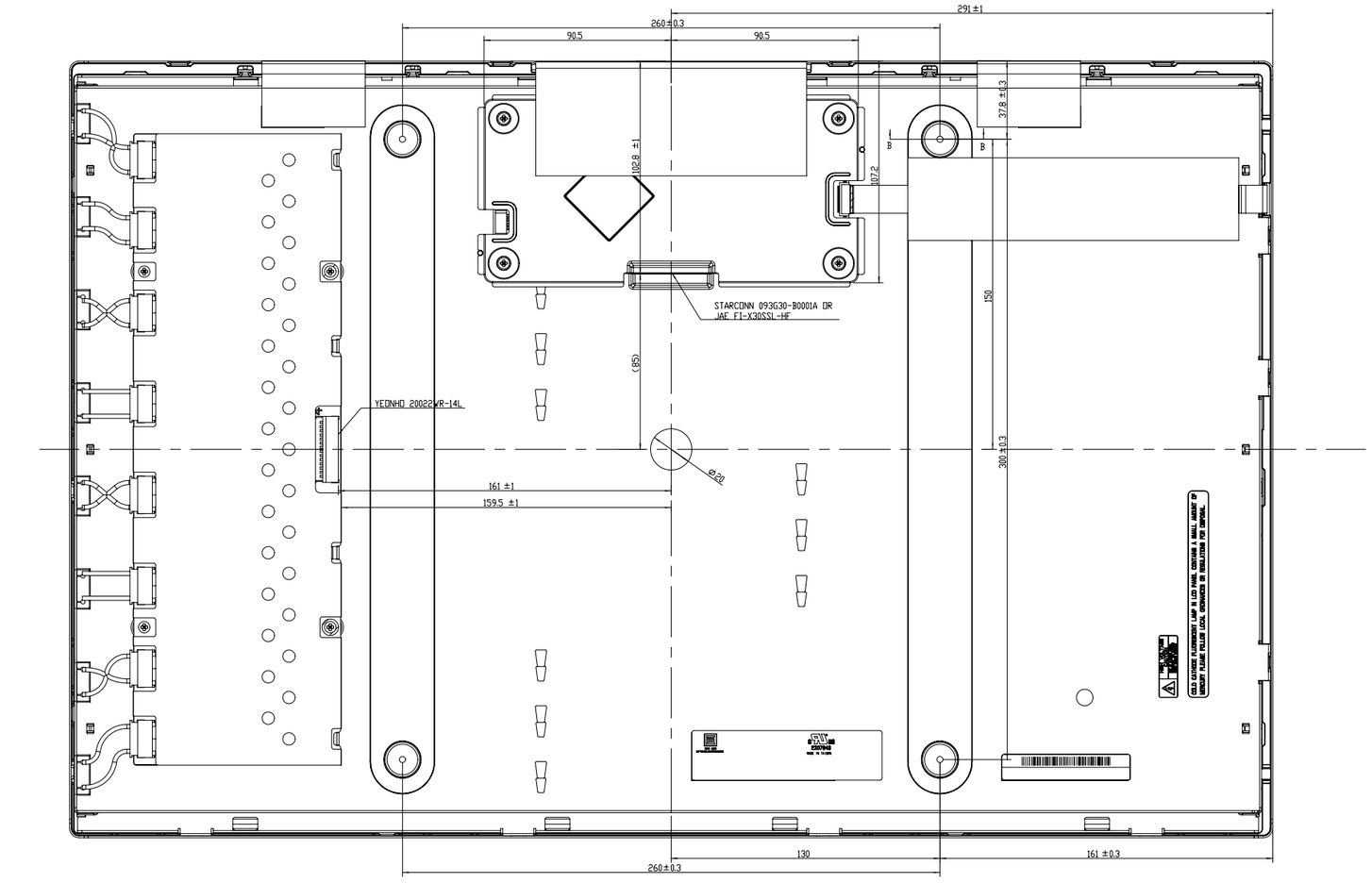

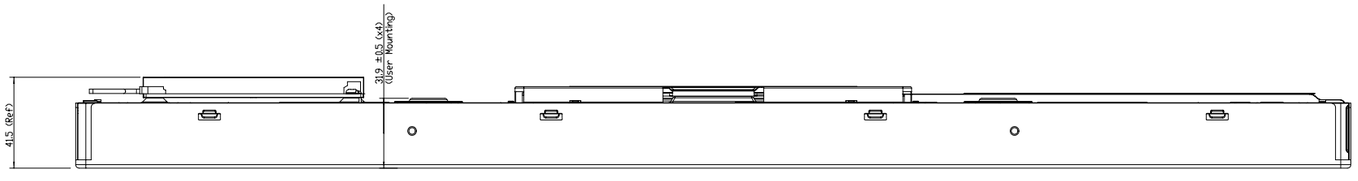

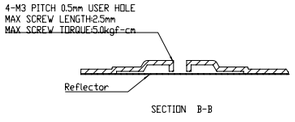

SECTION B-B

NOTES:
1.OUTLINE TOLERANCE:±0.5mm
2.'*'MARKS THE DESIGN CRITICAL DIMENSION
3.' @'/'MARKS THE PROCESS CRITICAL DIMENSION
4.MAX. SCREW TORQUE:5.0kgf-cm
5.SCREW LENGTH FOLLOW THE NOTES IN THE DRAWING

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark

TITLE	ASSY_MODULE_M260J1					2D REV	A0
						3D REV	L72
Approved	YULE_LIN	Drawing No.	M260J4101A				
Checked	TIGER_CHANG	Part No.	TBD				
Drawer	ALAN_LEE	Material	TBD		Sheet	2 / 2	A0
Designer	ALAN_LEE	Date	06-Jul-2007	Scale	1/1	Unitmm	

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