



Doc. Number :

- Tentative Specification
- Preliminary Specification
- Approval Specification

MODEL NO.: FT154-EDC02 V.0 (G154I1-LE1)

Customer:

APPROVED BY

SIGNATURE

Name / Title _____

Note

Please return 1 copy for your confirmation with
your signature and comments.

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**REVISION HISTORY**

Version	Date	Section	Description
Ver 2.0	18 th , Mar., 2011	All	G154I1-LE1 Approval specification was first issued.

**I. GENERAL DESCRIPTION****1.1 OVERVIEW**

The model is a 15.4" TFT-LCD module with a white LED Backlight Unit and a 30-pin 1ch-LVDS interface. This module supports 1280 x 800 WXGA mode and displays 262k/16.2M colors.

1.2 FEATURES

- WXGA (1280 x 800 pixels) resolution
- Wide operating temperature
- DE (Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface
- RoHS Compliance
- LED Light Bar Replaceable
- Reverse Scan

1.3 APPLICATION

- TFT LCD Monitor
- Industrial Application
- Amusement

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Diagonal Size	15.4	inch	(1)
Active Area	331.2(H) x 207.0(V)	mm	
Bezel Opening Area	334.5 x 210.3	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 800	pixel	-
Pixel Pitch	0.259(H) x 0.259(V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262k/16.2M	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	AG, 3H	-	-

**1.5 MECHANICAL SPECIFICATIONS**

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	351.5	352	352.5	mm	(1)
	Vertical (V)	229.5	230	230.5	mm	
	Depth (D)	8.5	9	9.5	mm	
Weight			880		g	-
I/F connector mounting position		The mounting inclination of the connector makes the screen center within $\pm 0.5\text{mm}$ as the horizontal.			-	(2)

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

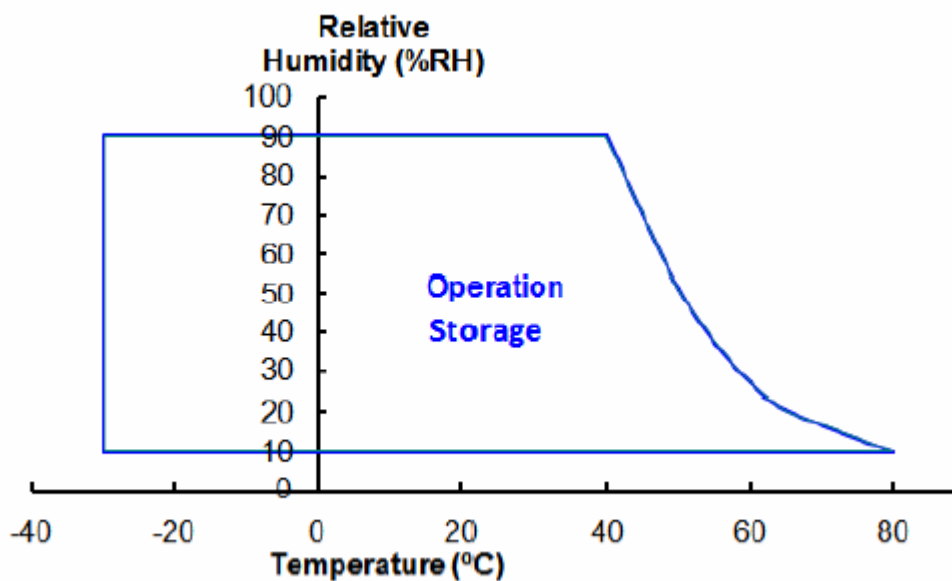
(2) Connector mounting position

**2. ABSOLUTE MAXIMUM RATINGS****2.1 ABSOLUTE RATINGS OF ENVIRONMENT**

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Operating Ambient Temperature	T_{OP}	-30	+80	$^{\circ}\text{C}$	T_{gs}
Storage Temperature	T_{ST}	-30	+80	$^{\circ}\text{C}$	

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

- (a) 90 %RH Max. ($T_a \leq 40^{\circ}\text{C}$).
- (b) Wet-bulb temperature should be 39°C Max. ($T_a > 40^{\circ}\text{C}$).
- (c) No condensation.
- (d) T_{gs} = Glass temp.(Panel surface temp.)





2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	4.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	V _{CC} +0.3	V	(1)

2.2.2 BACKLIGHT UNIT

Item	Value			Unit	Note
	Min	Typ.	Max.		
LED Light Bar Input voltage	-	18.3	18.5	V _{DC}	(1), (2)
LED Light Bar Input Current	-	660	700	mA _{DC}	

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 LED (Refer to Section 3.2 for further information).



3. ELECTRICAL CHARACTERISTICS

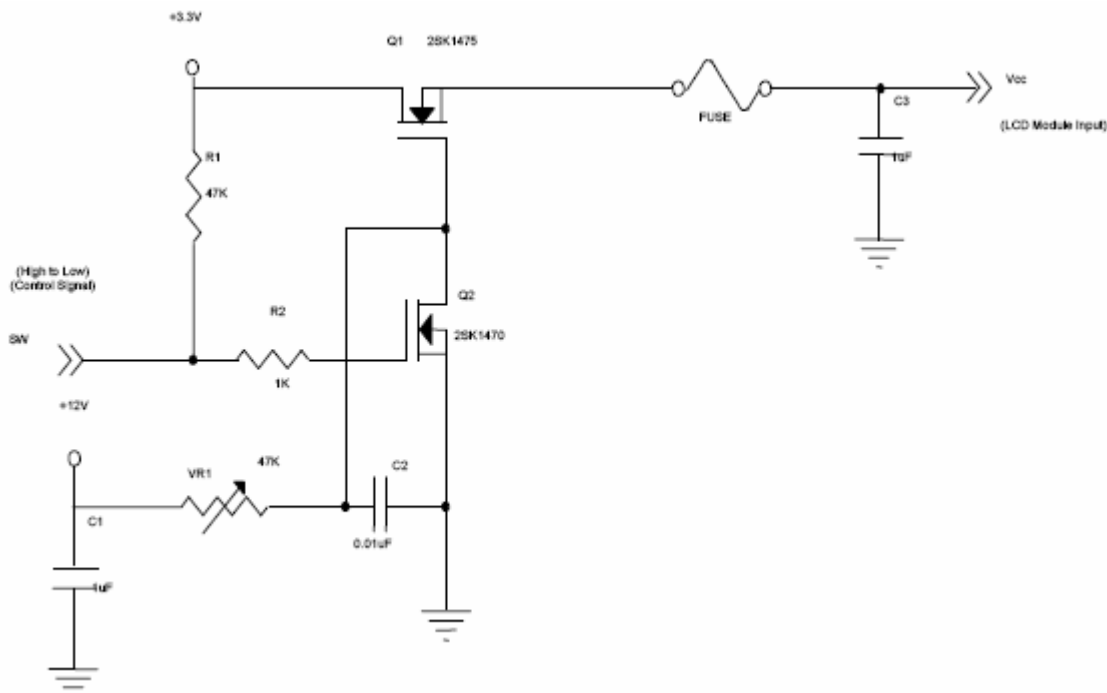
3.1 TFT LCD MODULE

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note	
		Min.	Typ.	Max.			
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	at V _{CC} =3.3V	
Ripple Voltage	V _{RP}	-	50		mV	-	
Rush Current	I _{RUSH}	-	-	1.5	A	(2)	
Initial Stage Current	I _{IS}	-	-	1.0	A	(2)	
Power Supply Current	White	I _{CC}	-	400	500	mA	(3)a, at V _{CC} =3.3V
	Black		-	550	650	mA	(3)b, at V _{CC} =3.3V
LVDS Differential Input High Threshold	V _{TH} (LVDS)	-	-	+100	mV	V _{CM} =1.2V	
LVDS Differential Input Low Threshold	V _{TL} (LVDS)	-100	-	-	mV	V _{CM} =1.2V	
LVDS Common Mode Voltage	V _{CM}	1.125	-	1.375	V		
LVDS Differential Input Voltage	V _{ID}	100	-	600	mV		
Terminating Resistor	R _T	-	100	-	Ohm		

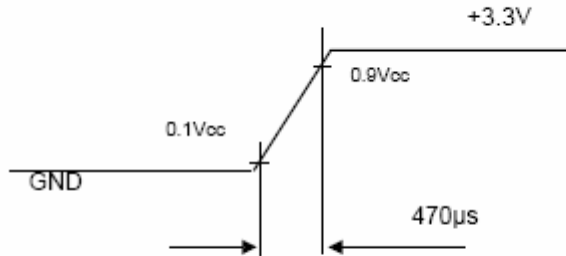
Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:





VCC rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 °C, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



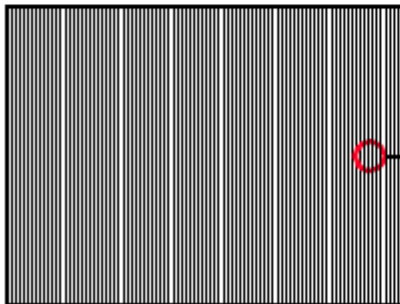
Active Area

b. Black Pattern



Active Area

c. Vertical Stripe Pattern



Active Area



**3.2 BACKLIGHT UNIT**

Ta = 25 ± 2 °C

Parameter guideline for LED driver is under stable conditions at 25 °C (Room Temperature):

Symbol	Parameter	Min	Typ	Max	Units	Remark
Vcc	Input Voltage	10.8	12	15	Volt	
Ivcc	Input Current	-	1.1	-	A	100% Dimming
PLED	Power Consumption	-	13.2	-	Watt	100% Dimming
FPWM	PWM Dimming Frequency	200	-	10k	Hz	
	Dimming Voltage	3	3.3	5		
	Dimming Duty Cycle	5	-	100	%	
VLED ON/OFF	On Control Voltage	1.25	5.0	-	Volt	
	Off Control Voltage		0.0	0.4	Volt	
I _F	LED Forward Current	-	660		mA	Ta = 25 ⁰ C
Operating Life		50000	-	-	Hrs	Ta = 25 ⁰ C

Note 1: Ta means ambient temperature of TFT-LCD module.

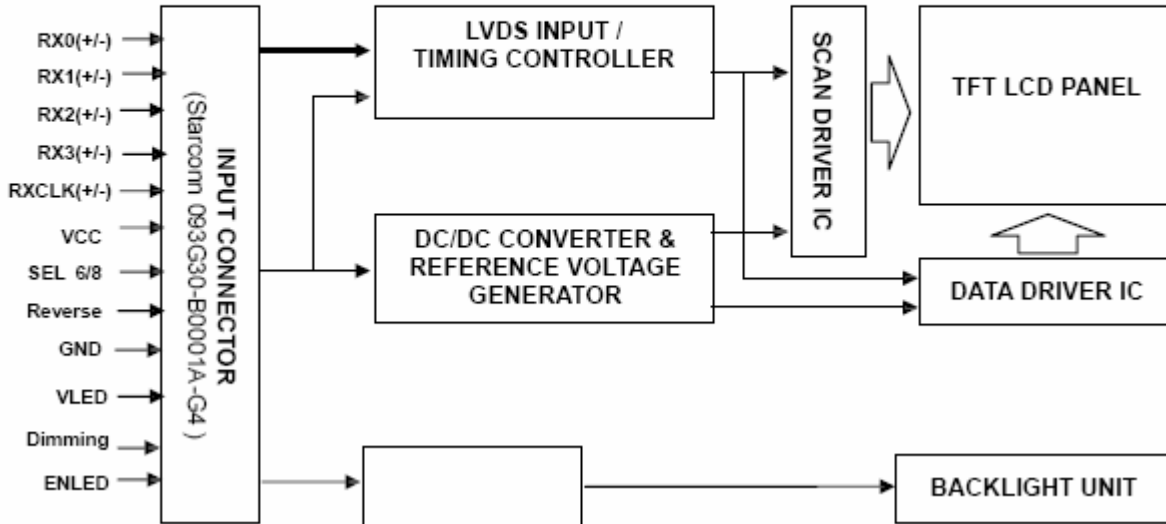
Note 2: If ED154C02 V0 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: Operating life means brightness goes down to 50% initial brightness. Min. operating life time is estimated data.



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



**5. INPUT TERMINAL PIN ASSIGNMENT****5.1 TFT LCD MODULE**

Pin	Name	Description	Remarks
1~6	NC		
7	GND	Ground	
8	GND	Ground	
9	VCC	Power Supply +3.3V	System power
10	VCC	Power Supply +3.3V	
11	GND	Ground	
12	GND	Ground	
13	RX0-	Differential Data input CH0(Negative)	
14	RX0+	Differential Data input CH0(Positive)	
15	GND	Ground	
16	RX1-	Differential Data input CH1(Negative)	
17	RX1+	Differential Data input CH1(Positive)	
18	GND	Ground	
19	RX2-	Differential Data input CH2(Negative)	
20	RX2+	Differential Data input CH2(Positive)	
21	GND	Ground	
22	RXCLK-	Differential Clock input (Negative)	
23	RXCLK+	Differential Clock input (Positive)	
24	GND	Ground	
25	RX3-	Differential Data input CH3(Negative)	
26	RX3+	Differential Data input CH3(Positive)	
27	GND	Ground	
28	SEL 6/8	LVDS 6/8bit select function control Low or NC: 6bit input mode High: 8bit input mode	2
29	Reverse	Scanning direction control Low or NC: normal display(default) High: display with 180 ° rotation	
30	GND	Ground	

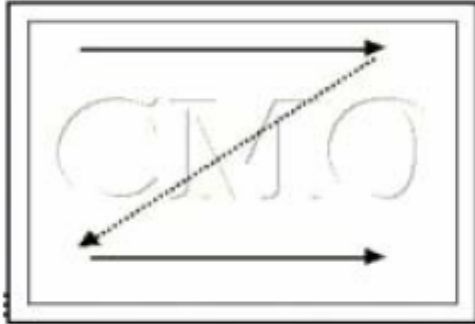
Note (1) Connector Part No.: STARCONN 093G30-B1001A-G4 or equivalent.

Note (2) "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connected".

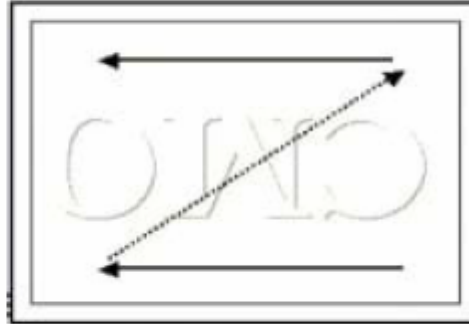


5.2 SCANNING DIRECTION

The following figures are seen from a front view and the arrow shows the direction of scan.



Reverse = GND/NC : normal display (default)



Reverse = High : display with 180 degree rotation



5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-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					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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
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
	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	
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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	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	
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
	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	

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



6. INTERFACE TIMING

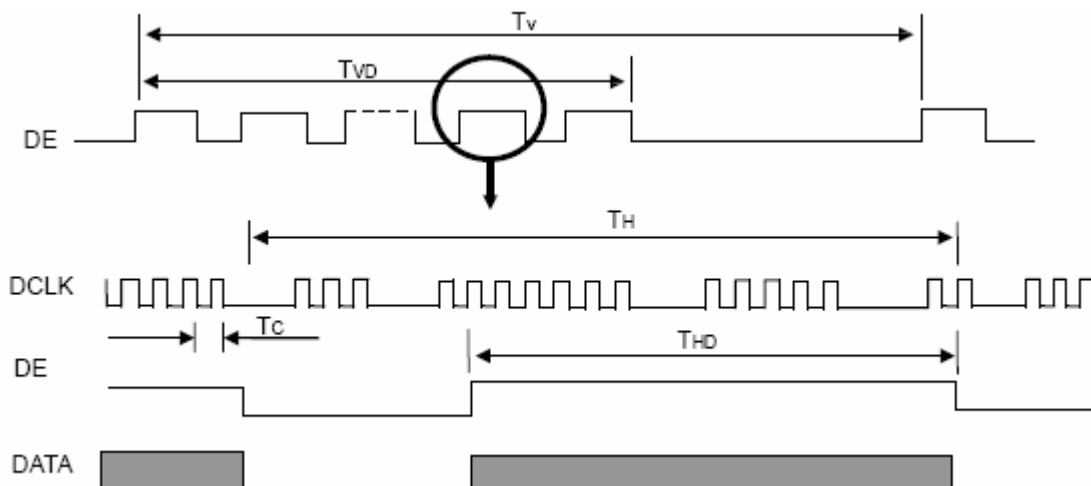
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	67.45	71	74.55	MHz	-
DE	Vertical Total Time	Tv	810	823	1000	TH	-
	Vertical Addressing Time	TVD	800	800	800	TH	-
	Horizontal Total Time	TH	1360	1440	1600	Tc	-
	Horizontal Addressing Time	THD	1280	1280	1280	Tc	-

Note : (1) 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.

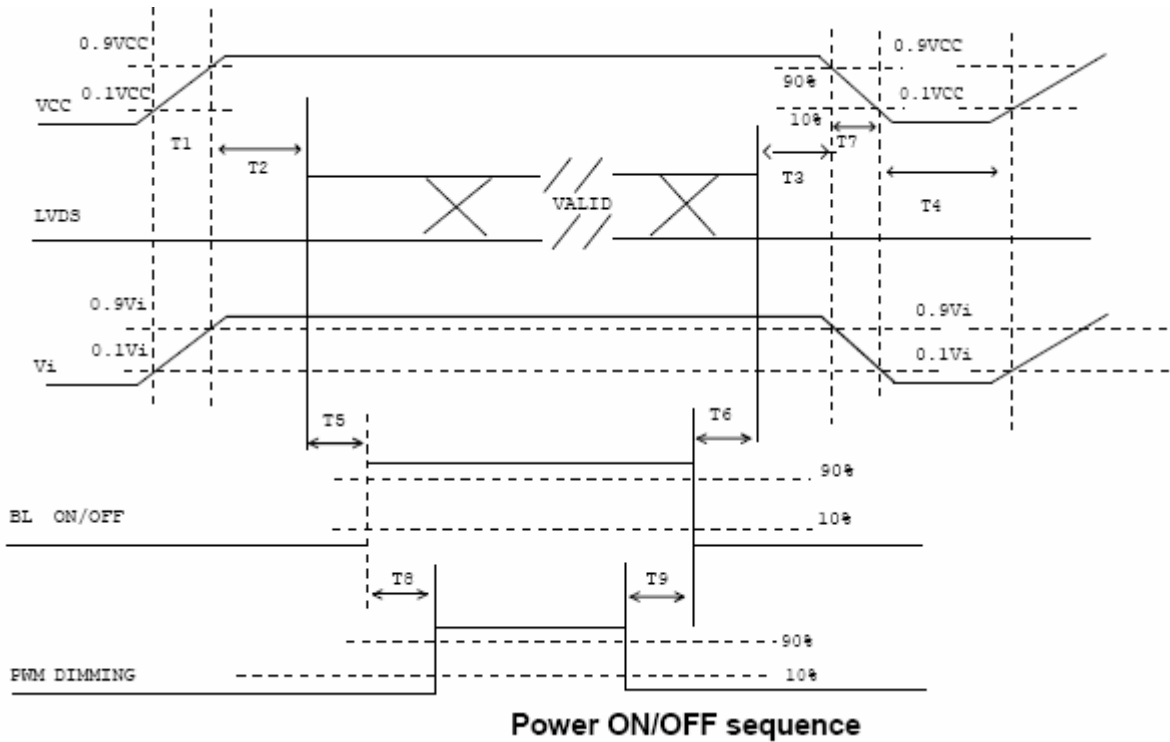
INPUT SIGNAL TIMING DIAGRAM





6.2 POWER ON/OFF SEQUENCE

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



Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

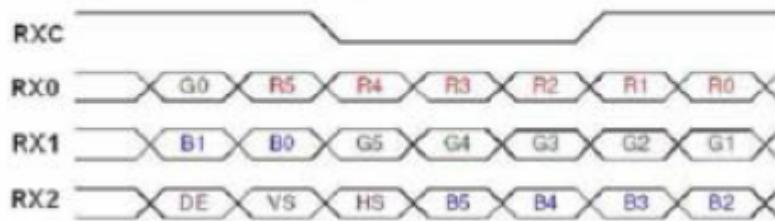
Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	200	-	-	ms
T6	20	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms



6.3 The Input Data Format

SEL 6/8="Low" or "NC" for 6 Bits LVDS



SEL 6/8="High" for 8 Bits LVDS



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

Note (2) Please follow PSWG

Signal Name	Description	Remark
R7	Red Data 7 (MSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
R6	Red Data 6	
R5	Red Data 5	
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Data 7 (MSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
G6	GreenData 6	
G5	GreenData 5	
G4	GreenData 4	
G3	GreenData 3	
G2	GreenData 2	
G1	GreenData 1	
G0	GreenData 0 (LSB)	
B7	Blue Data 7 (MSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
B6	Blue Data 6	
B5	Blue Data 5	
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
RXCLKIN+ RXCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

**7. OPTICAL CHARACTERISTICS****7.1 TEST CONDITIONS**

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Converter PWM duty		100%	

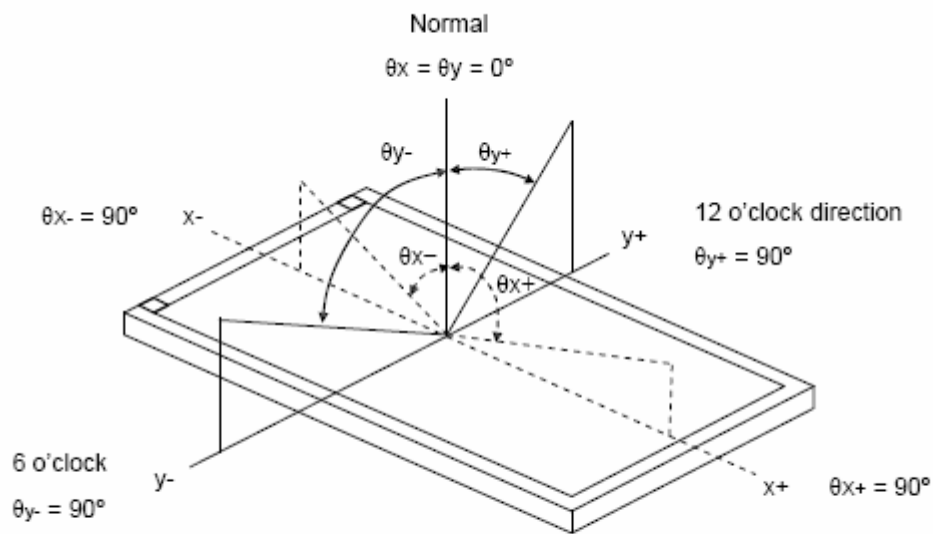
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note				
Color Chromaticity	Red	$\theta_x=0^\circ, \theta_y=0^\circ$ CS-1000	Typ - 0.05	0.601	Typ + 0.05	-	(1), (5)				
				0.340		-					
	Green			0.332		-					
				0.583		-					
	Blue			0.149		-					
				0.087		-					
	White			0.313		-					
				0.329		-					
	Center Luminance of White			L _C		900		1000	-	-	(4), (5)
	Contrast Ratio			CR		500		700	-	-	(2), (5)
Response Time	T _R	$\theta_x=0^\circ, \theta_y=0^\circ$	-	5	10	ms	(3)				
	T _F		-	11	16	ms					
White Variation	δW	$\theta_x=0^\circ, \theta_y=0^\circ$	-	1.25	1.4	-	(5), (6)				
Viewing Angle	Horizontal	CR _≥ 10	70	80	-	Deg.	(1), (5)				
				70	80			-			
	Vertical			60	70			-			
				60	70			-			



Note (1) Definition of Viewing Angle (θ_x , θ_y):



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

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

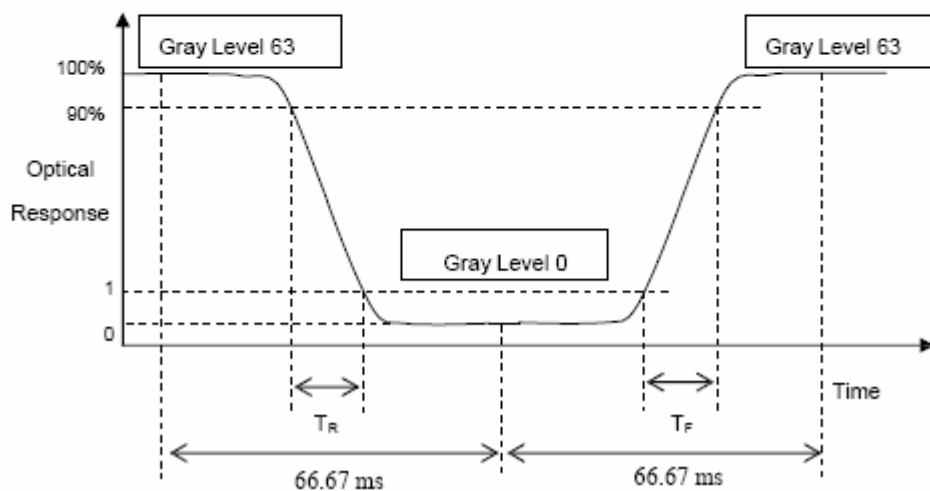
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$CR = CR(5)$$

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) and measurement method:



**Note (4) Definition of Luminance of White (L_c):**

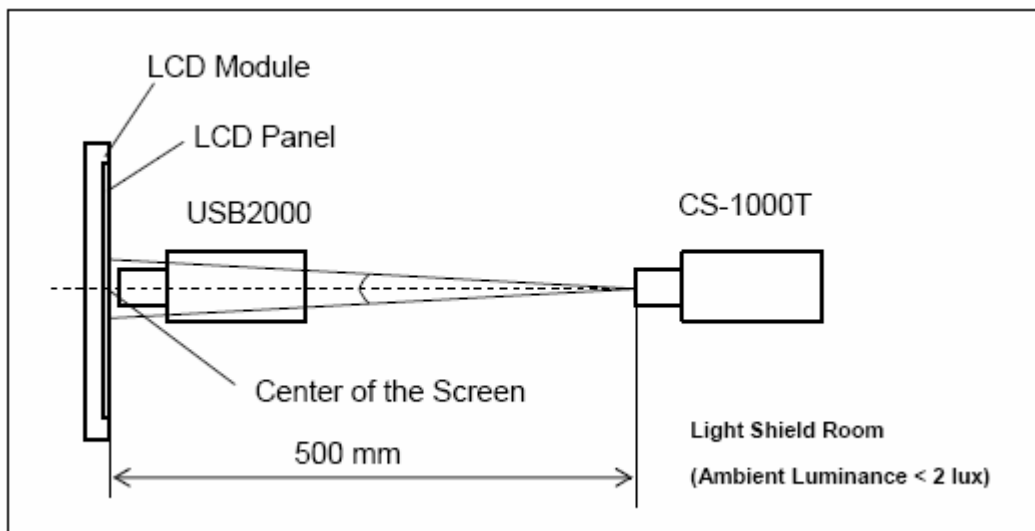
Measure the luminance of gray level 63 at center point

$$L_c = L(5)$$

$L(x)$ 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.

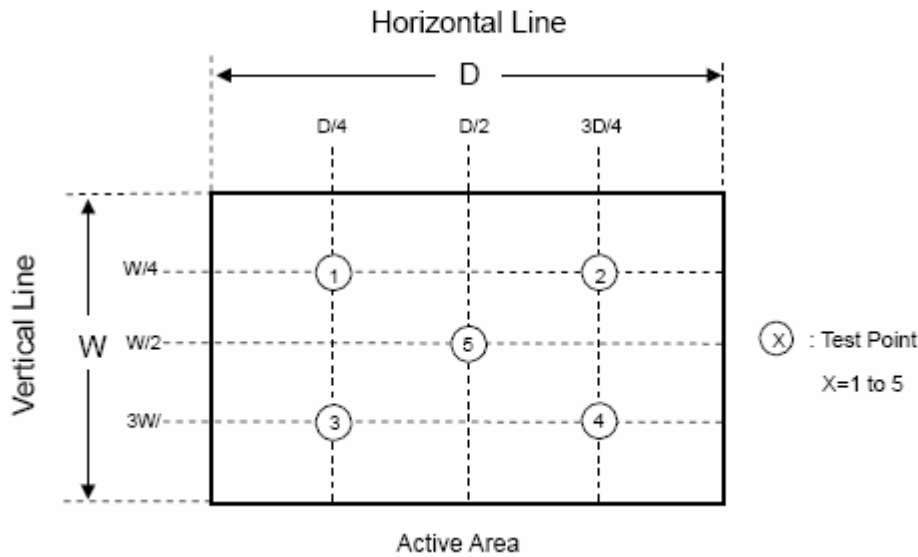




Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$





8. PACKAGING

8.1 PACKING SPECIFICATIONS

- (1) 13pcs LCD modules / 1 Box
- (2) Box dimensions: 465(L) X 362 (W) X 314 (H) mm
- (3) Weight: approximately 11 Kg (13 modules per box)

8.2 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: 2 – 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, 61 cm	Non Operation

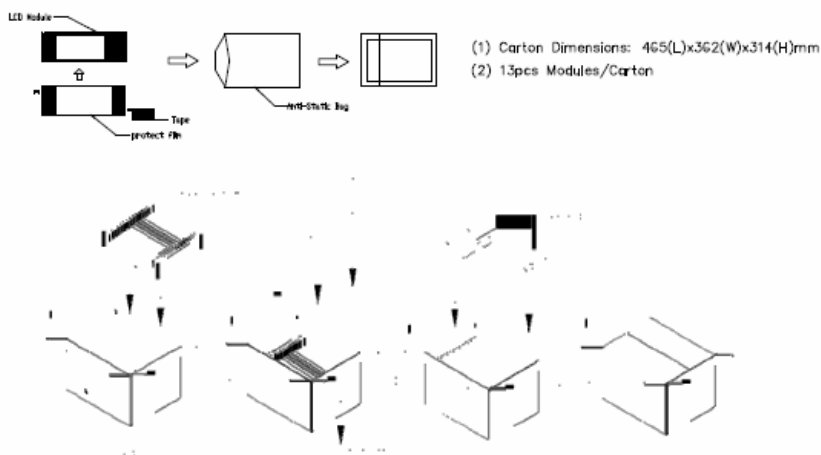
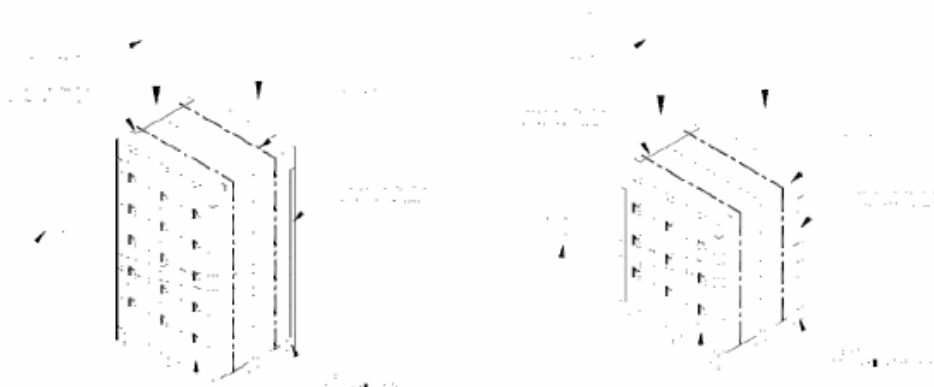


Figure. 8-1 Packing method

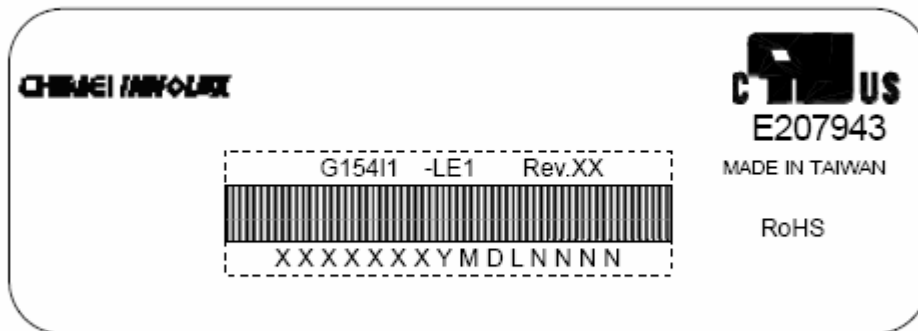
Sea / Land Transportation (40ft Container)

Air Transportation



**9. DEFINITION OF LABELS****9.1 CMO MODULE LABEL**

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



- (a) Model Name: G15411-LE1
- (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



10. PRECAUTIONS

11.1 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 10°C 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.
- (11) Do not keep same pattern in a long period of time. It may cause image sticking on LCD.

10.2 SAFETY PRECAUTIONS

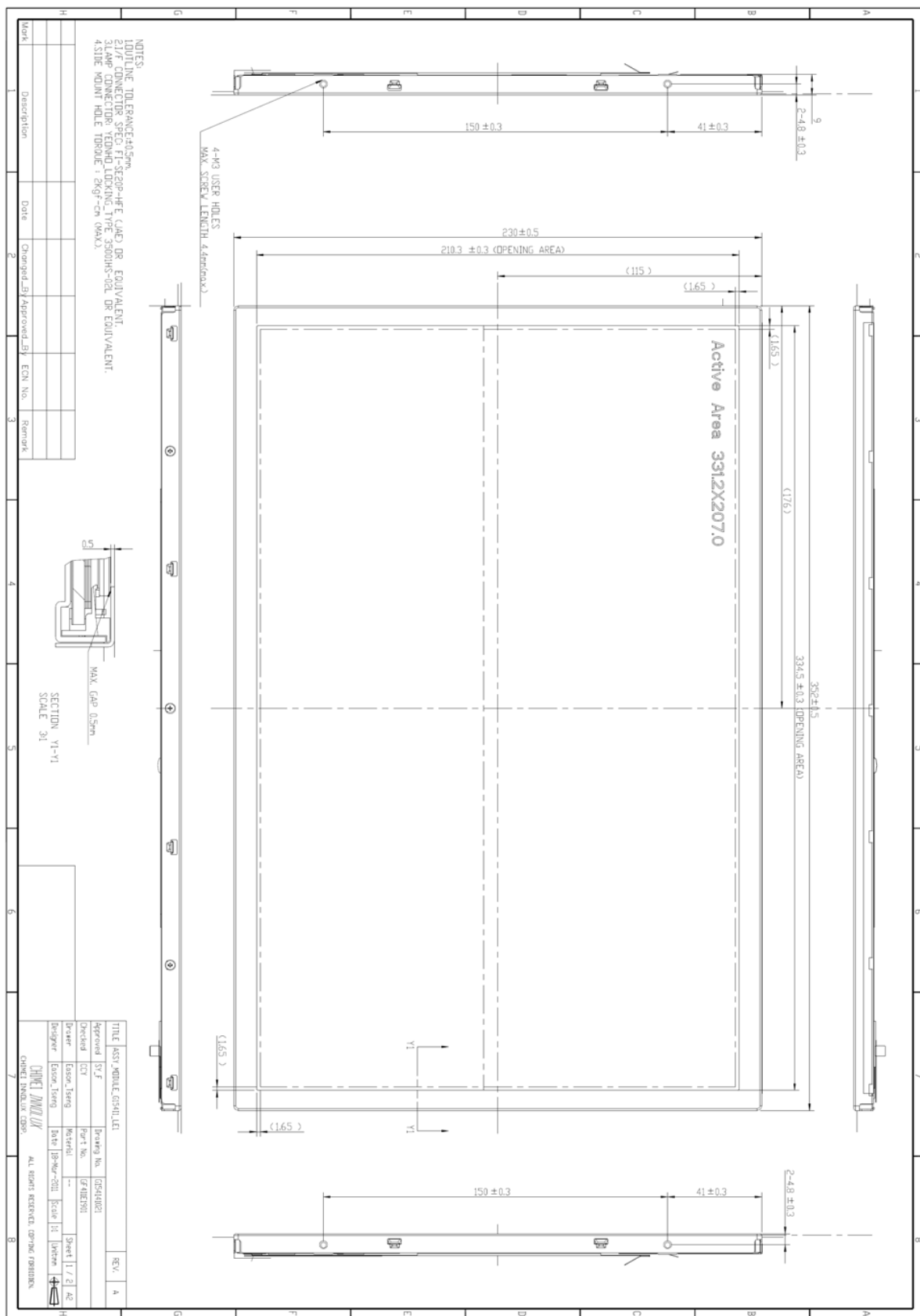
- (1) Do not disassemble the module or insert anything into the Backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (3) After the module's end of life, it is not harmful in case of normal operation and storage.

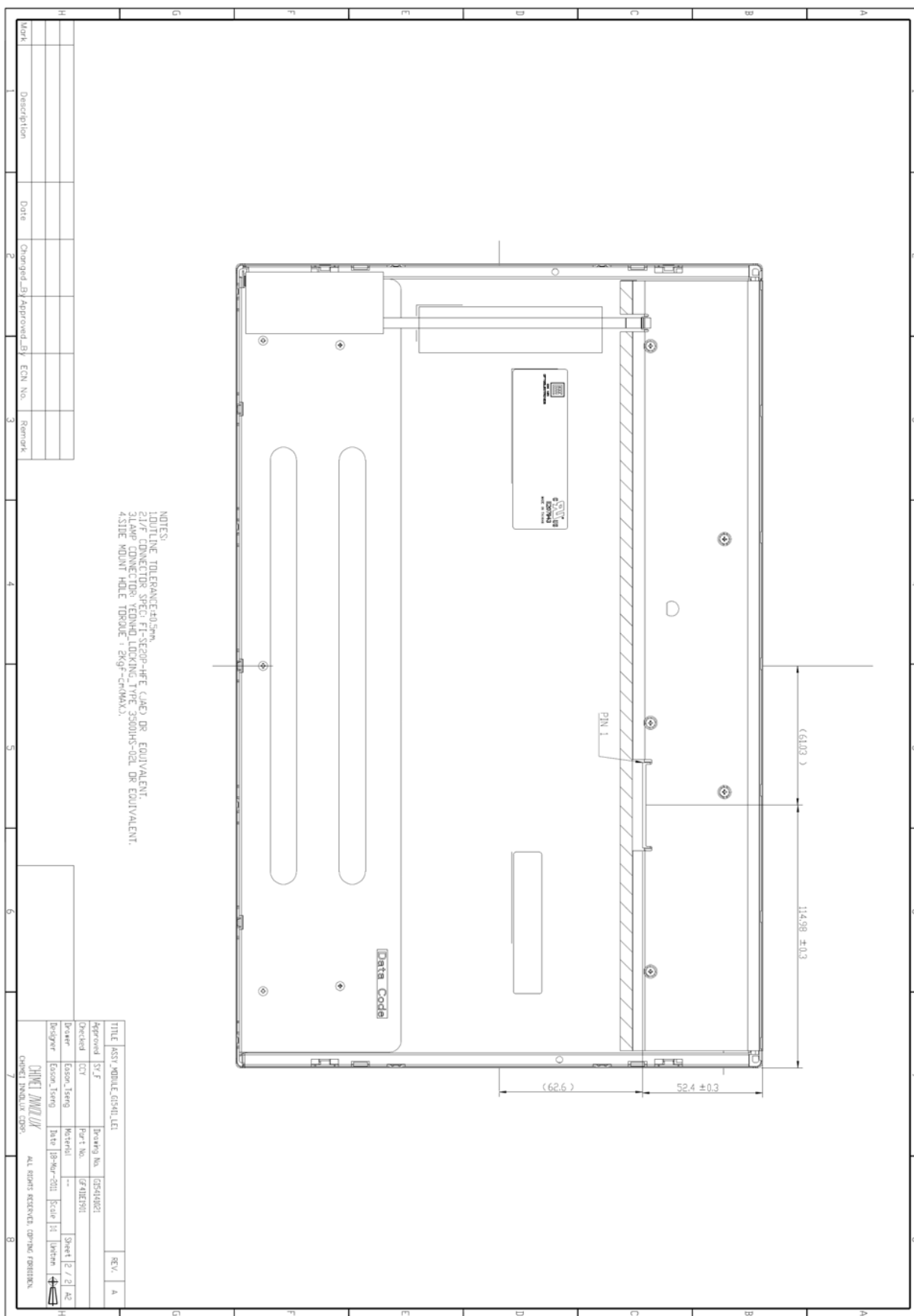


FORENEX

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NOTES:
 1. OUTLINE TOLERANCE ± 0.5mm.
 2. I/F CONNECTOR SPEC: FT-5220P-4PFC (A&E) OR EQUIVALENT.
 3. SIMP CONNECTOR YIELDING LOCKING TYPE: 3500HS-02L OR EQUIVALENT.
 4. SIDE MOUNT HOLE TYPICAL: 28x4.5-0.05MM MAX.

Mark	Description	Date	Checked By	Approved By	ECN No.	Remark

TITLE: M857 MOBILE CASE L&E		REV: A
Approved: SVF	Drawing No. 02540021	
Checked: CCY	Part No. 07418390	
Designer: Eason Tseng	Material: --	Sheet 2 / 2 of 2
	Date: 18-Nov-2011	Scale: 1:1
CHINESE INNOVATION GROUP		
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11. LED Backlight Unit: Driver Connector

Model Name : S7B-PH-SM4-TB(JST)

(J1)

Connector Type: 2.0mm 7pin Wafer (SMD)

Pin No.	Description
1	+12V
2	+12V
3	+12V
4	Ground
5	PWM or Vadj control
6	Ground
7	ON/OFF Control



(pin1)

Output connector : J2 , J3

Model Name : S2B-PH-SM4-TB(JST)

(J2)

Connector Type: 2.0mm 2pin Wafer (SMD)

Pin No.	Description
1	VLED+
2	VLED-

(J3)

Connector Type: 2.0mm 2pin Wafer (SMD)

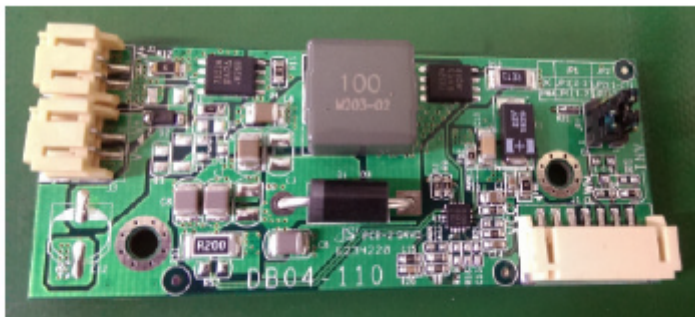
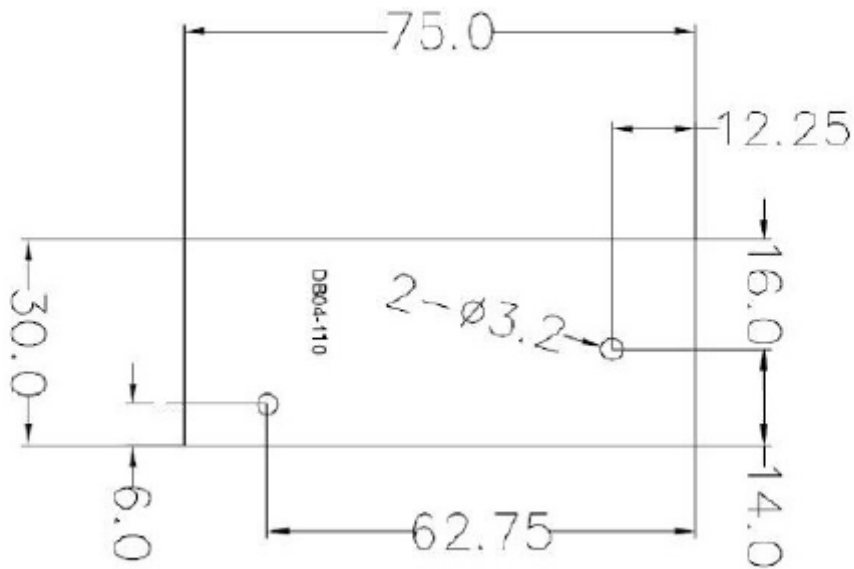
Pin No.	Description
1	VLED+
2	VLED-

Note: J2 = J3 , only one connector for single light bar use



LED Driving Board Outline Dimension (Rear View)

Dimension : 75(L)*30(W)*8.65(H)mm



Note: Brightness Control:

	JP1	JP2
DC (Vadj)	2-3 close	1-2 close
PWM	1-2 close	2-3 close