



US Micro Products

ENGINEERED DISPLAY SOLUTIONS

PRODUCT SPECIFICATION

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INNOLUX

INNOLUX CORPORATION

PART NUMBER

USMP-G121S1-L01

12.1" MVA SVGA TFT-LCD module,
800x600 resolution with a 2-CCFL
Backlight Unit and a 20-pin 1ch-LVDS
interface. Displays 262,144 colors, the
inverter module for the Backlight Unit is
not built in.

ISSUE DATE	APPROVED BY	CHECKED BY	PREPARED BY
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REVISION HISTORY

Version	Date	Section	Description
3.0	Sep.12.'06	All	G121S1-L01 approved Specification was first issued .
3.1	Nov.07.'06	3.1	Modified Table 3.1

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

The G121S1-L01 model is a 12.1" TFT-LCD module with a 2-CCFL Backlight Unit and a 20-pin 1ch-LVDS interface. This module supports 800 x 600 SVGA mode and displays 262,144 colors. The inverter module for the Backlight Unit is not built in.

1.2 FEATURES

- Wide viewing angle
- High contrast ratio
- Fast response time
- High color saturation
- SVGA (800 x 600 pixels) resolution
- Wide operating temperature
- DE (Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface
- RoHS Compliance
- Reversible- Scan Function

1.3 APPLICATION

- TFT LCD Monitor
- TFT LCD TV
- Factory Application
- Amusement
- Vehicle

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Diagonal Size	12.1	inch	(1)
Active Area	246.00(H) x 184.50(V)	mm	
Bezel Opening Area	249.00(H) x 187.50(V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	800 x R.G.B. x 600	pixel	-
Pixel Pitch	0.3075(H) x 0.3075(V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	Hard coating (3H), Anti-glare (Haze 25%)	-	-

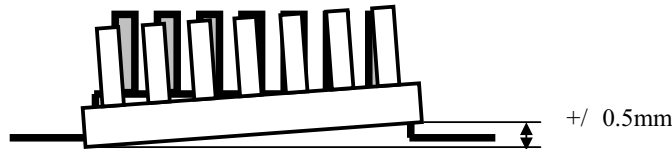
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1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note	
Module Size	Horizontal (H)	260.0	260.5	261.0	mm	(1)
	Vertical (V)	203.5	204.0	204.5	mm	
	Depth (D)	11.7	12.2	12.7	mm	
Weight	-	-	660	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



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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

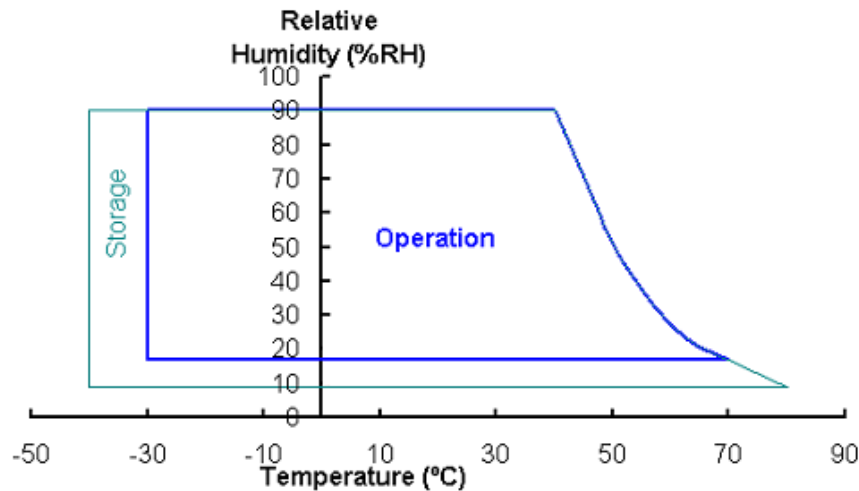
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Operating Ambient Temperature	T _{OP}	-30	+70	°C	(0), (1), (2)
Storage Temperature	T _{ST}	-40	+80	°C	(0), (1)

Test Item	Test Condition	Note
High Temperature Storage Test	80°C, 240 hours	(1) (2)
Low Temperature Storage Test	-40°C, 240 hours	
Thermal Shock Storage Test	-40°C, 0.5hour←→80°C, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	70°C, 240 hours	
Low Temperature Operation Test	-30°C, 240 hours	
High Temperature & High Humidity Operation Test	60°C, RH 90%, 240hours	
Heat Cycle Operation Test	-30°C, 1hour←→70°C, 1hour; 50cycles, 4hour/cycle	
ESD Test (Operation)	150pF, 330Ω, 1sec/cycle Condition 1 : panel contact, ±8KV Condition 2 : panel non-contact ±15KV	(2)
Shock (Non-Operating)	200G, 2ms, half sine wave, 1 time for ± X, ± Y, ± Z.	(2)(3)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z	(2)(3)

Note (0) All test conditions are as above table.

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

- (a) 90 %RH Max. (Ta ≤ 40 °C).
- (b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).
- (c) No condensation.



Note (2) No display malfunctions.

Note (3) At testing Vibration and Shock, 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.

Note (4) Temperature of panel display surface area should be 80 °C Max.

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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	6.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	2.7	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V _L	-	2.5K	V _{RMS}	(1), (2), I _L = 8mA
Lamp Current	I _L	2.0	8.5	mA _{RMS}	(1), (2)
Lamp Frequency	F _L	45	80	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).

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3. ELECTRICAL CHARACTERISTICS

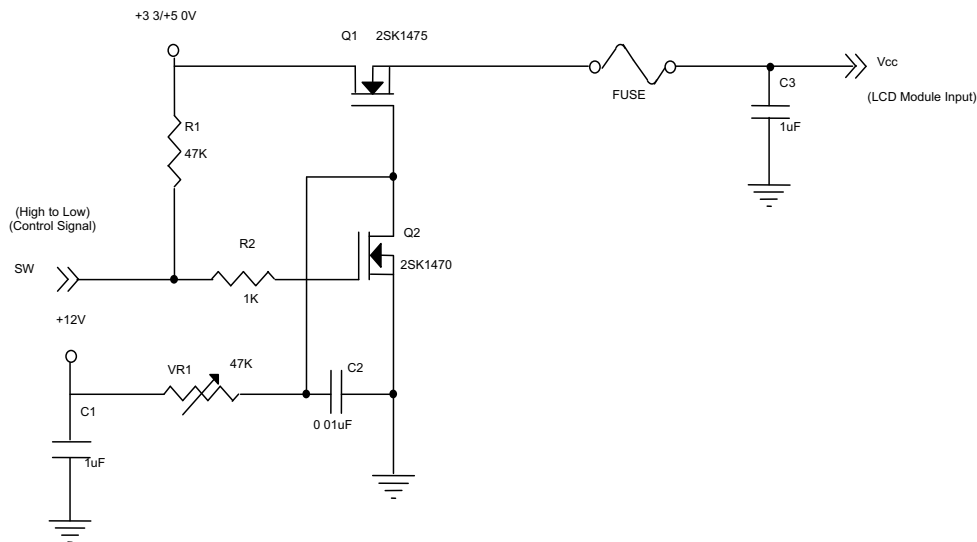
3.1 TFT LCD MODULE

Ta = 25 ± 2 °C

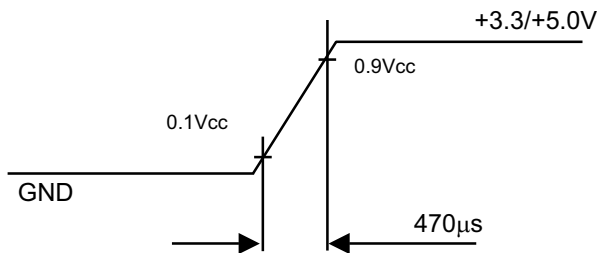
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V _{CC}	3.0	3.3 / 5.0	5.5	V	(1)
Ripple Voltage		V _{RP}	-	-	100	mV	-
Rush Current		I _{RUSH}	-	-	1.5	A	(2)
Power Supply Current	White	V _{CC} =3.3V	-	655	835	mA	(3)a
		V _{CC} =5.0V	-	400	490		(3)b
	Black	V _{CC} =3.3V	-	550	700	mA	(3)c
		V _{CC} =5.0V	-	350	440		(3)d
LVDS differential input voltage		V _{id}	-100	-	+100	mV	-
LVDS common input voltage		V _{ic}	-	1.2	-	V	-

Note (1) The module is recommended to operate within 3.3V or 5.0V for normal function.

Note (2) Measurement Conditions:



Vcc rising time is 470µs

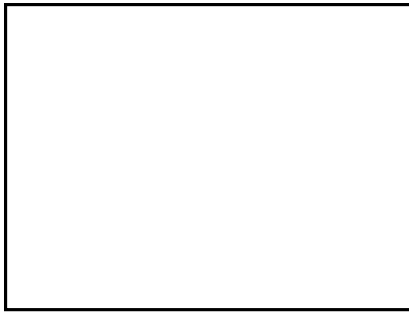


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Note (3) The specified power supply current is under the conditions at $V_{cc} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

- (3)a : $V_{cc} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, White Pattern
- (3)b : $V_{cc} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, White Pattern
- (3)c : $V_{cc} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, Black Pattern
- (3)d : $V_{cc} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, Black Pattern

a. White Pattern



Active Area

b. Black Pattern



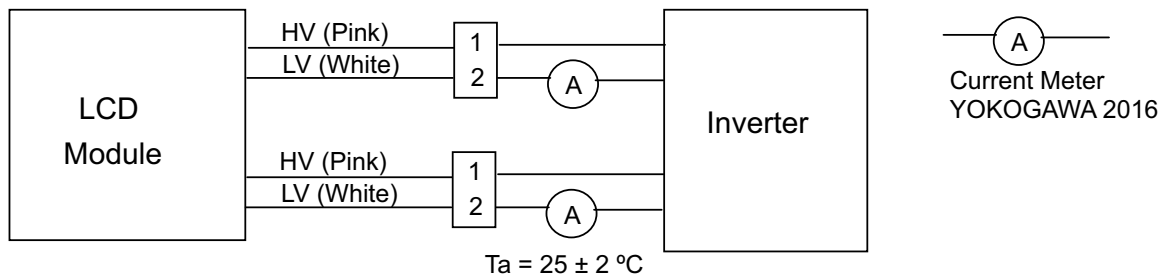
Active Area

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3.2 BACKLIGHT UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	450	500	550	V_{RMS}	$I_L = 8mA$
Lamp Current	I_L	2.0	8.0	8.5	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S	-	-	1010	V_{RMS}	25 °C, (2)
		-	-	1200	V_{RMS}	0 °C, (2)
Operating Frequency	F_L	45	-	80	KHz	(3)
Lamp Life Time	L_{BL}	50000	-	-	Hrs	(5), $I_L = 8mA$
Power Consumption	P_L	--	4.0	-	W	(4), $I_L = 8mA$

Note (1) Lamp current is measured by utilizing high-frequency current meters as shown below:



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

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) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition $T_a = 25 \pm 2 \text{ } ^\circ\text{C}$ and $I_L = 2.0 \sim 8.0 \text{ mA}_{RMS}$ until one of the following events occurs:

- (a) When the brightness becomes or lower 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.)

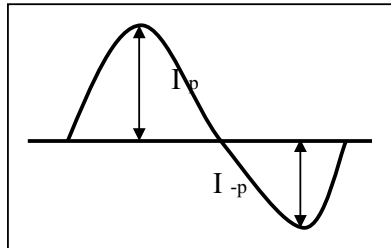
Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the 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.

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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.

- The asymmetry rate of the inverter waveform should be 10% below;
- The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$;
- The ideal sine wave form shall be symmetric in positive and negative polarities.



* Asymmetry rate:

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

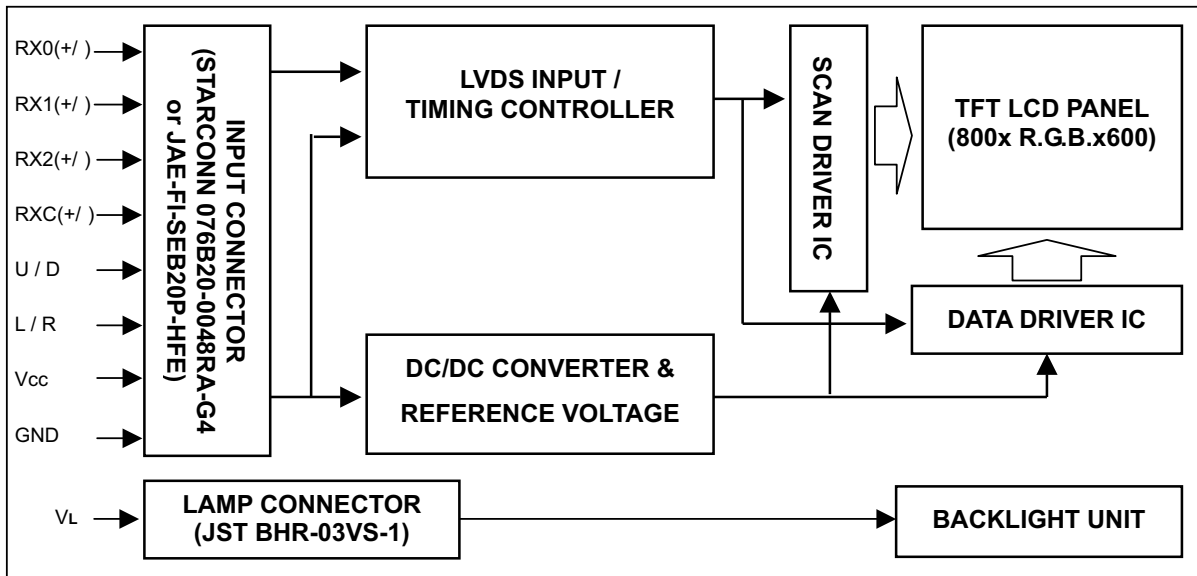
* Distortion rate

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

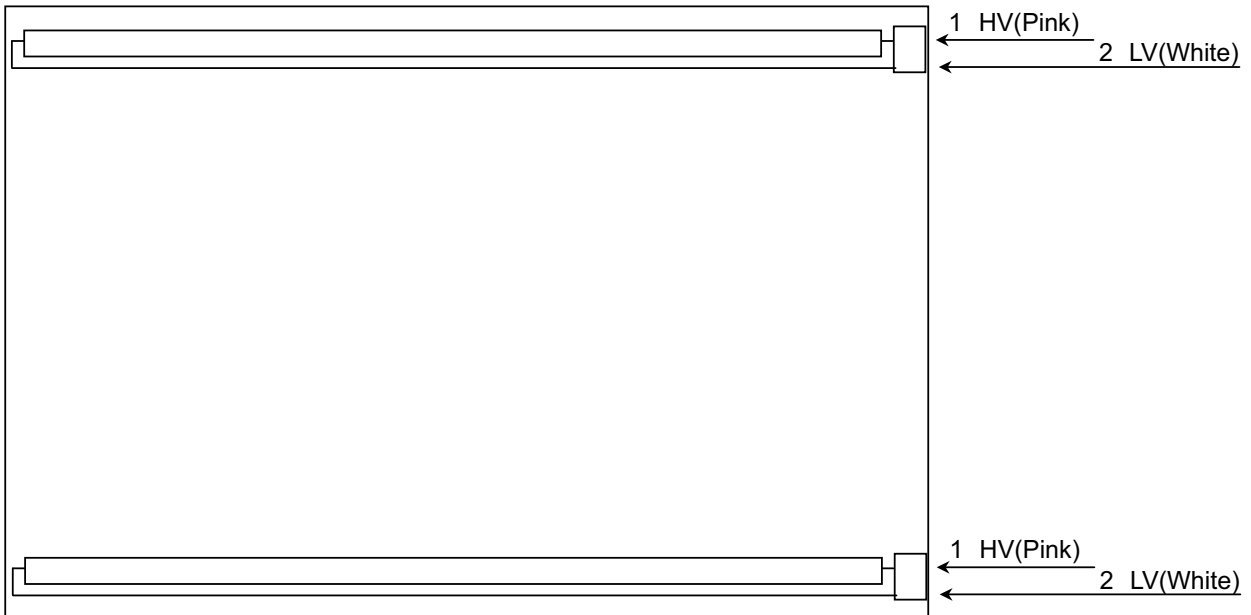
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4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT



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5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description	Remark
1	VCC_IN	Power Supply (5.0 V / 3.3 V)	
2	VCC_IN	Power Supply (5.0 V / 3.3 V)	
3	GND	Ground	
4	GND	Ground	
5	RX0-	Differential Data Input, CH0 (Negative)	R0 ~ R5, G0
6	RX0+	Differential Data Input, CH0 (Positive)	
7	GND	Ground	
8	RX1-	Differential Data Input, CH1 (Negative)	G1 ~ G5, B0, B1
9	RX1+	Differential Data Input , CH1 (Positive)	
10	GND	Ground	
11	RX2-	Differential Data Input , CH2 (Negative)	B2 ~ B5, DE
12	RX2+	Differential Data Input , CH2 (Positive)	
13	GND	Ground	
14	CLK-	Differential Clock Input (Negative)	LVDS Level Clock
15	CLK+	Differential Clock Input (Positive)	
16	GND	Ground	
17	L/R	Horizontal Display Mode Select Signal	Note (5)
18	U/D	Vertical Display Mode Select Signal	Note (5)
19	GND	Ground	
20	GND	Ground	

Note (1) Connector Part No.: STARCONN 076B20-0048RA-G4 or JAE FI-SEB20P-HFE or equivalent.

Note (2) Mating Connector Part No.: JAE-FI-SE20M, FI-S20S or equivalent.

Note (3) The first pixel is odd.

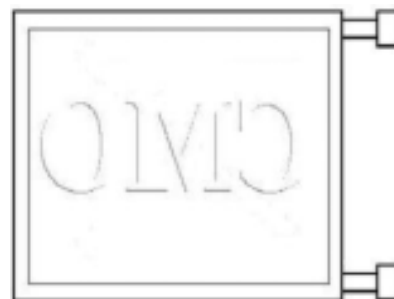
Note (4) Input signal of even and odd clock should be the same timing.

Note (5)

L/R=High, U/D=Low



L/R=Low, U/D=Low



R/L=High, U/D=High



R/L=Low, U/D=High



5.2 BACKLIGHT UNIT

Pin	Symbol	Description	Remark
1	HV	High Voltage	Pink
2	NA	NA	
3	LV	Low Voltage	White

Note (1) Connector Part No.: JST BHR-03VS-1 or equivalent

Note (2) User's connector Part No.: JST SM03(4.0)B-BHS-1-TB or equivalent

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	1	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	1	0	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

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6. INTERFACE TIMING

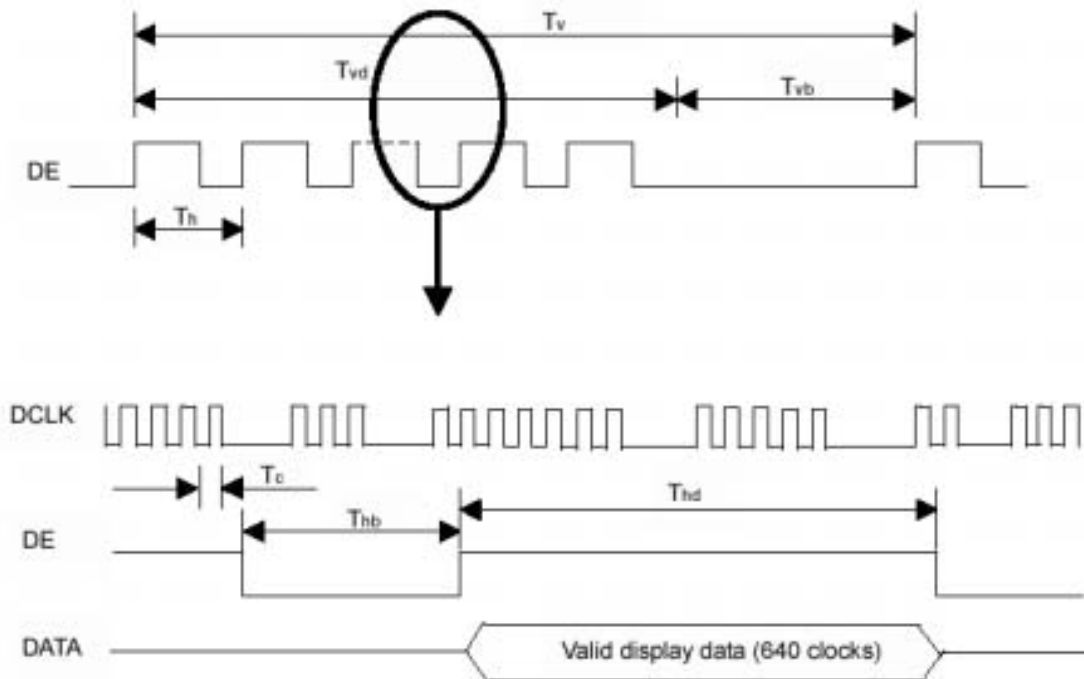
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	33.4	39.7	48.3	MHz	-
	Period	Tc	20.7	25.1	29.9	ns	
Vertical Active Display Term	Frame Rate	Fr	56	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	606	628	650	Th	-
	Display	Tvd	600	600	600	Th	-
	Blank	Tvb	Tv-Tvd	28	Tv-Tvd	Th	-
Horizontal Active Display Term	Total	Th	920	1056	1240	Tc	Th=Thd+Thb
	Display	Thd	800	800	800	Tc	-
	Blank	Thb	Th-Thd	256	Th-Thd	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.

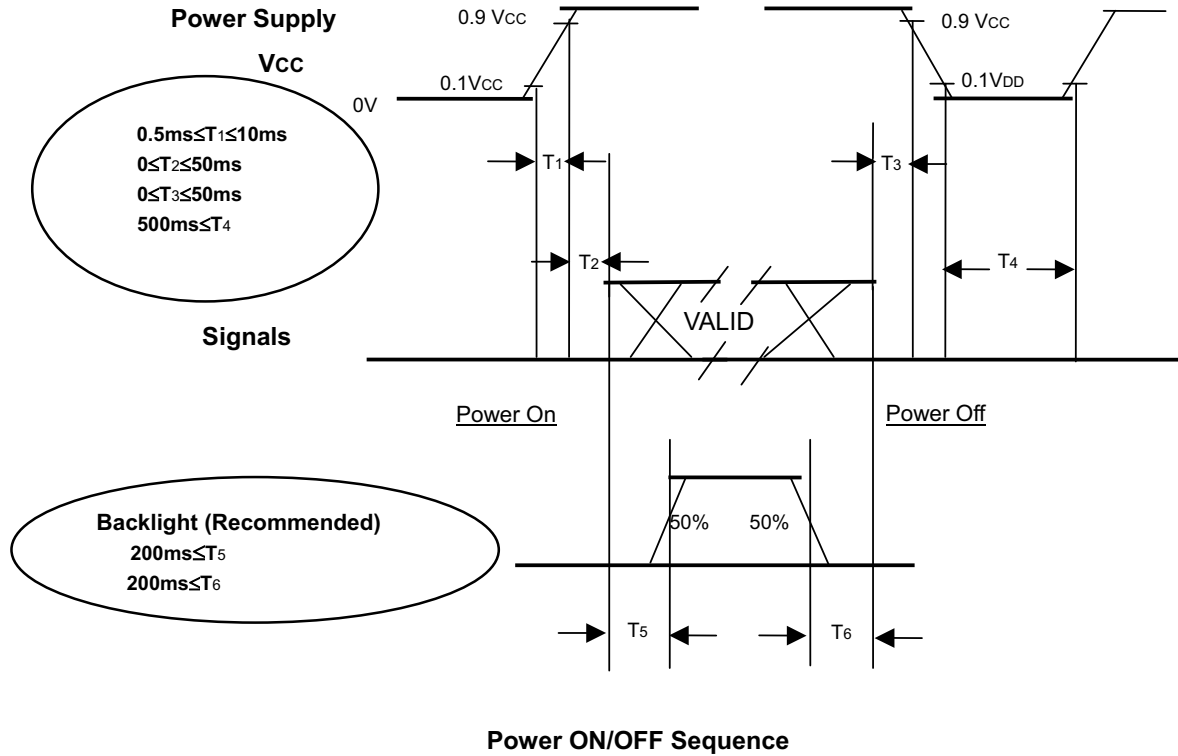
INPUT SIGNAL TIMING DIAGRAM



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6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.



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 inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

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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}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I _L	8.0	mA
Inverter Driving Frequency	F _L	61	KHz
Inverter	Sumida H05-5052		

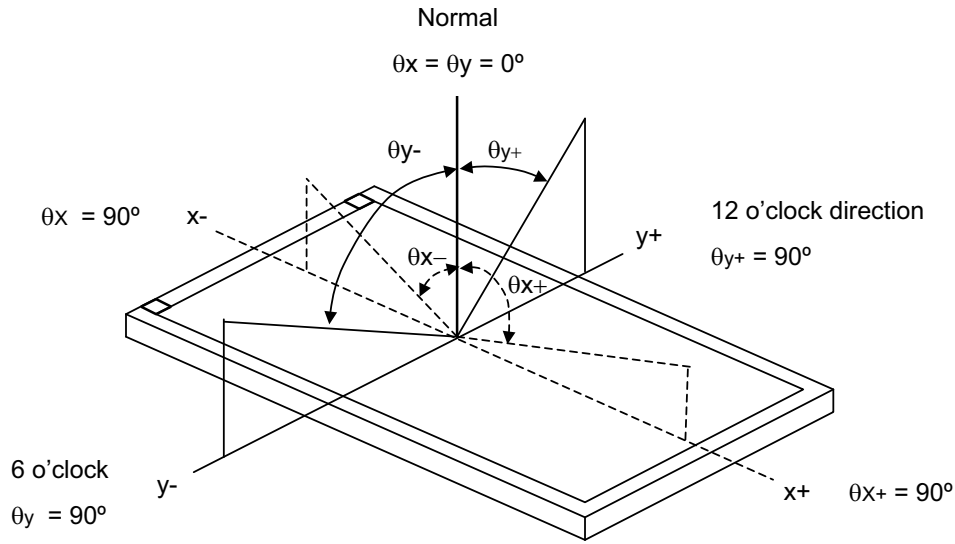
7.2 OPTICAL SPECIFICATIONS

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	R _x	$\theta_x=0^\circ, \theta_y=0^\circ$ CS-1000	Typ - 0.03	0.620	Typ + 0.03	-	(1), (5)
		R _y			0.345		-	
	Green	G _x			0.318		-	
		G _y			0.556		-	
	Blue	B _x			0.147		-	
		B _y			0.120		-	
	White	W _x			0.326		-	
		W _y			0.340		-	
Center Luminance of White		L _C		380	450	-	cd/m ²	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		T _R	$\theta_x=0^\circ, \theta_y=0^\circ$	-	13	18	ms	(3)
		T _F		-	12	17	ms	
White Variation		δW	$\theta_x=0^\circ, \theta_y=0^\circ$	-	1.25	1.4	-	(5), (6)
Viewing Angle	Horizontal	θ _{x+}	CR≥10	80	89	-	Deg.	(1), (5)
		θ _{x-}		80	89	-		
	Vertical	θ _{y+}		80	89	-		
		θ _{y-}		80	89	-		

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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.

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

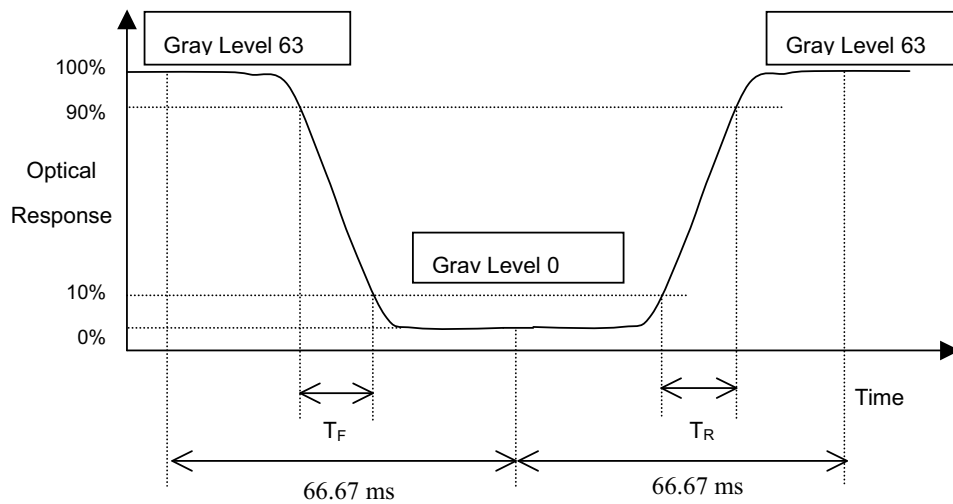
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

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):

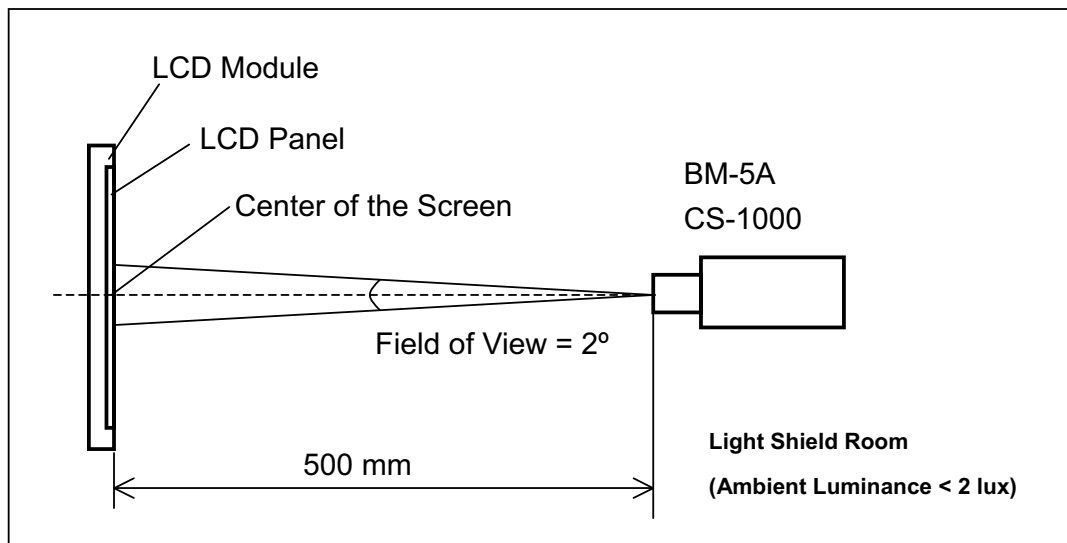
Measure the luminance of gray level 63 at center point

$$L_c = L(5)$$

$L(x)$ 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.

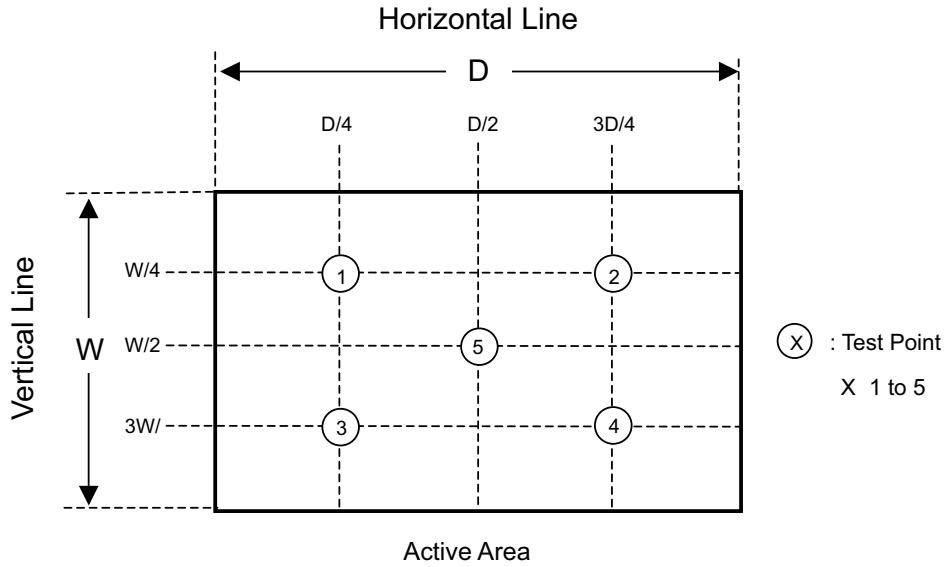


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Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

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



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8. PACKAGING

8.1 PACKING SPECIFICATIONS

- (1) 15pcs LCD modules / 1 Box
- (2) Box dimensions: 461 (L) X 362 (W) X 314 (H) mm
- (3) Weight: approximately 11.15Kg (15pcs 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

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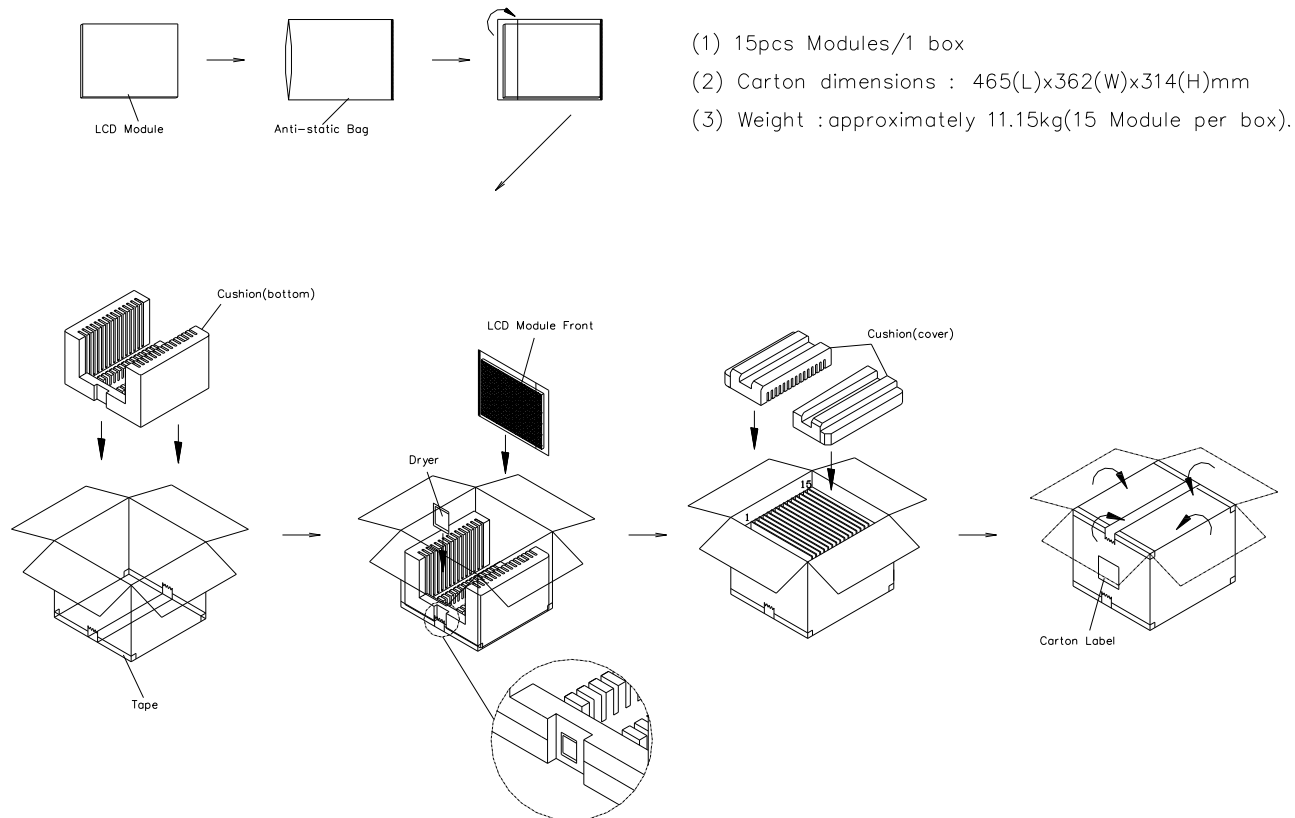
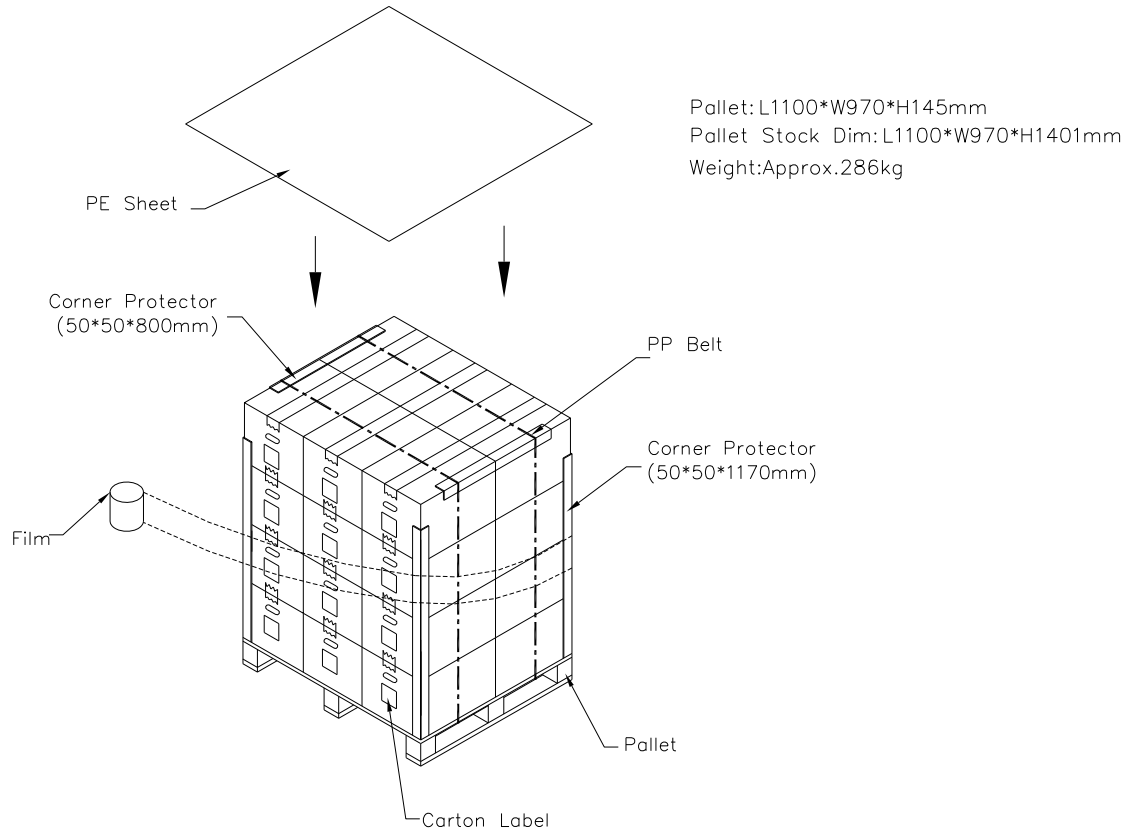


Figure. 8-1 Packing method



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Figure. 8-2 Packing method

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: G121S1-L01
- (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	-
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, U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3, ...etc.
NNNN	Serial number	Manufacturing sequence of product

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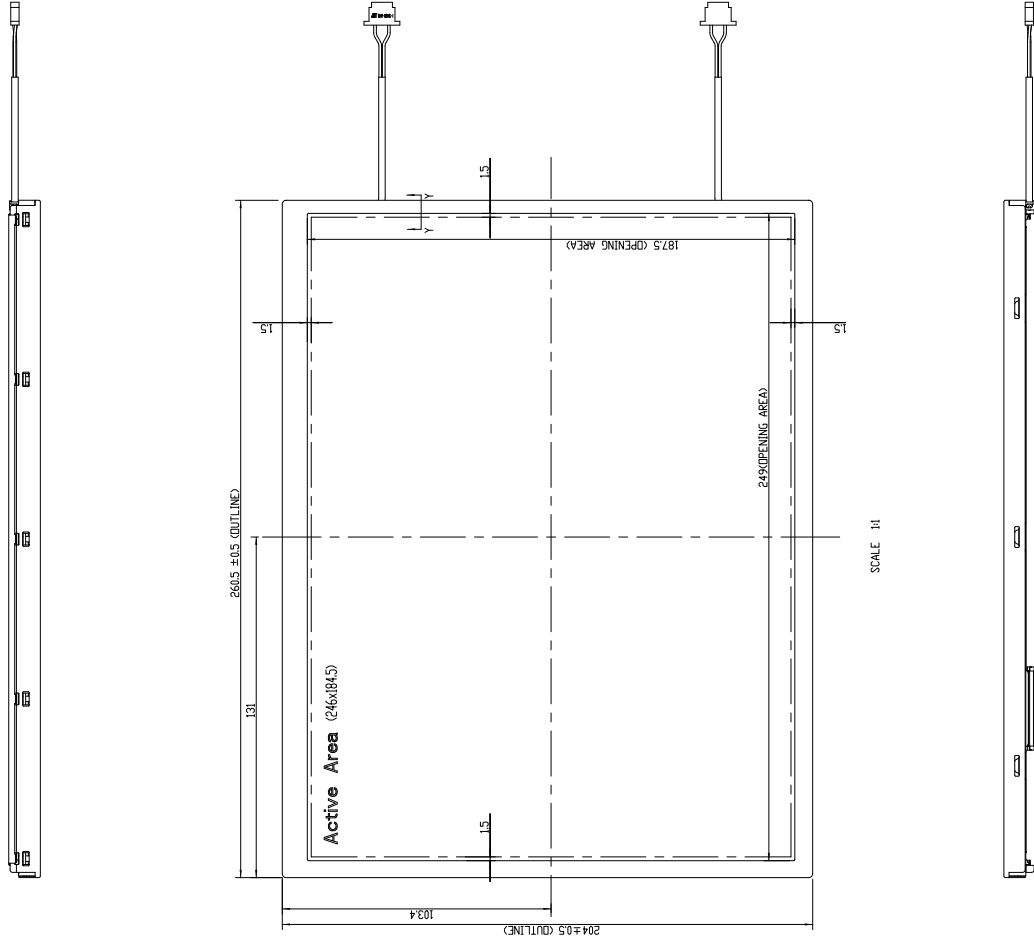
10. PRECAUTIONS

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 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.

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 Y-Y
SCALE 2:1

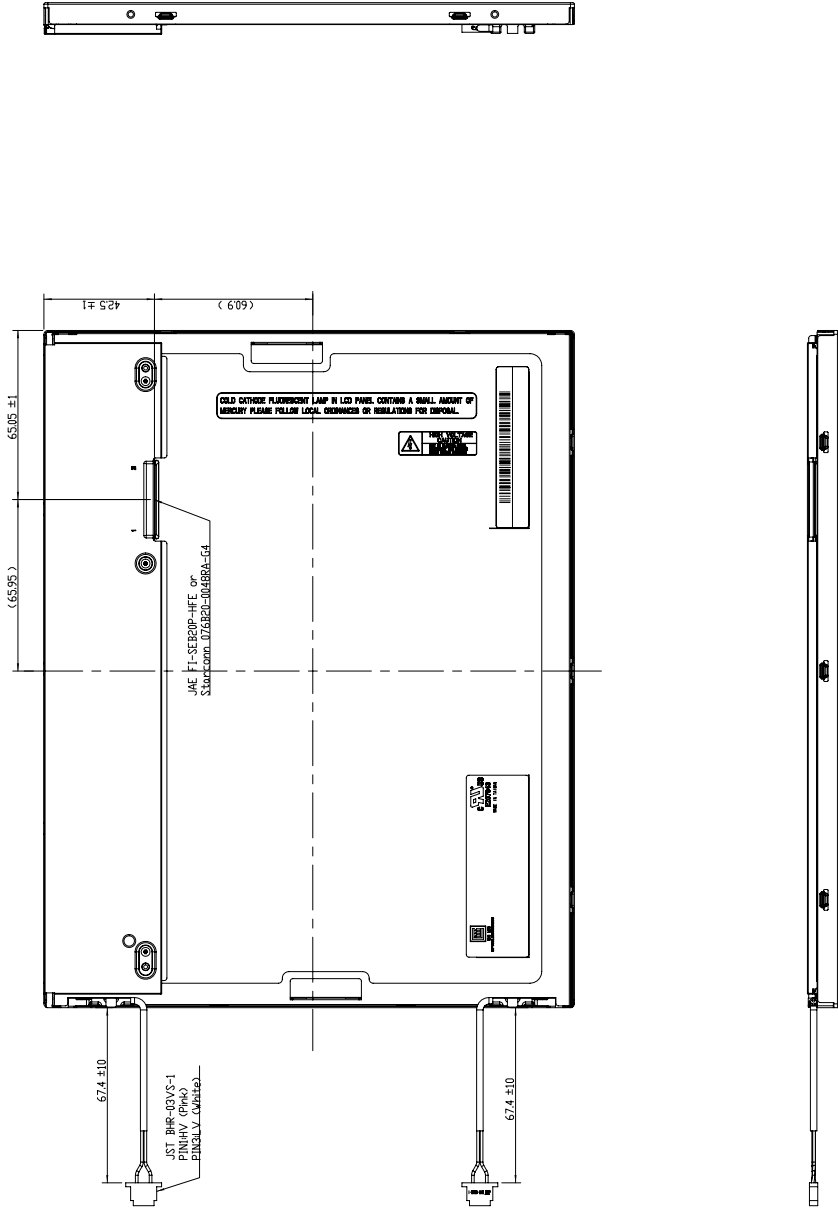
TITLE	LAST NAME	USER ID	28	REV	DATE
Approved	JDMV_CHANG	Drawing No.	16241818A		
Checked	TJEE_CHANG	Part No.	623101901		
General Tolerance	Unless Specified	Drawer	ALAN LEE	Date	14-Aug-2008
0-6	±0.1	1200-600	±0.3	Sheet	1 / 2
6-30	±0.15	600-1200	±0.6	Scale	H
30-300	±0.2	ANGLE	±1.0°	ALL RIGHTS RESERVED. COPYRIGHT INNOVIX CORPORATION	

- NOTES:
 1. OUTLINE TOLERANCE: ±0.5mm.
 2. * MARKS THE DESIGN CRITICAL DIMENSION.
 3. * MARKS THE PROCESS CRITICAL DIMENSION.
 4. MAX SCREW LENGTH: 2.0mm.
 5. MAX SCREW TORQUE: 2.0 kg-cm.

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Mark	Description	Date	Changed_By/Approved_By	ECN No.	Remark



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NOTES:
1. DIM LINE TOLERANCE: ±0.25mm
2. DIM LINE TOLERANCE: ±0.1mm
3. DIM MARKS THE PROCESS CRITICAL DIMENSION
4. MAX. SCREW LENGTH: 7mm
5. MAX. SCREW TORQUE: 0.2kg-cm

TITLE	MODEL	GERH-L01	DWG. NO.	020400A
APPROVED	DESIGNED	DATE	DRAWN	DATE
TIEZ CHANG	ALAN LEE	14-AUG-2006	TIEZ CHANG	14-AUG-2006
CHECKED	DRAWN	MATERIAL	DATE	SCALE
TIEZ CHANG	ALAN LEE	TBD	14-AUG-2006	Scale 1:1
GENERAL TOLERANCE UNLESS SPECIFIED	0-6	±0.1	600-600	±0.3
	6-30	±0.15	1600-	±0.6
	300-3000	±0.2	ANGLE	±1.0°

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Mark	Description	Date	Changed By	Approved By	ECN No.	Remark

DISPLAYS

Engineered to fit your application, US Micro Products offers a wide range of standard and custom LCD solutions. We dedicate ourselves to providing the best in displays for the medical, industrial, gaming, automotive, aerospace, military and consumer markets.

OLEDs



TFTs



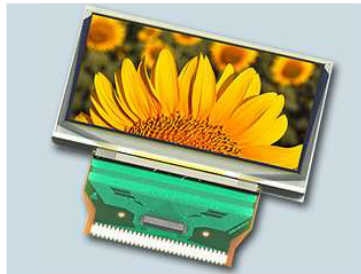
Open Frame Monitors



Passive LCDs



Multitouch



Touch Screen



As our customer, you receive expert knowledge, support and service. Our technical sales staff and experienced design engineers provide answers to your questions and engineered solutions to meet your displays needs.

PERIPHERAL DEVICES

Our full line of peripheral devices includes keyboards, trackballs, and printers. These rugged industrial products are designed to meet your demanding requirements and are available as both standard and custom solutions.

Keyboards



Trackballs



Aerospace Trackballs



Printers

