



FORMIKE ELECTRONIC CO.,LTD

PRODUCT SPECIFICATION

TFT LCD MODULE

MODEL : KWH101ST01-F01 Ver A

【 ◆ 】 Preliminary Specification

【 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED BY
Kam	/	Stephen	Roy

Prepared By :

FORMIKE ELECTRONIC CO.,LTD

Address :Room A818 New Energy Building, NanHai Road, NanShan District, ShenZhen, China. 518054

TEL:(86) 755 88306921,88306931 FAX:(86) 755 88304615

Http:// www.wandisplay.com

- This specification is subject to change without notice.Please contact FORMIKE or it's representative before designing your product based on this specification.



CONTENTS

1. GENERAL DESCRIPTION	3
1.1 OVERVIEW.....	3
1.2 FEATURES.....	3
1.3 APPLICATION.....	3
1.4 GENERAL SPECIFICATIONS.....	3
1.5 MECHANICAL SPECIFICATIONS.....	3
2. ABSOLUTE MAXIMUM RATINGS.....	4
2.1 ABSOLUTE RATINGS OF ENVIRONMENT.....	4
2.2 ELECTRICAL ABSOLUTE RATINGS	5
2.2.1 TFT LCD MODULE5	5
2.2.2 BACKLIGHT UNIT5	5
3. ELECTRICAL CHARACTERISTICS	6
3.1 TFT LCD MODULE.....	7
3.2 BACKLIGHT UNIT	8
4. BLOCK DIAGRAM	9
4.1 TFT LCD MODULE	9
5. INPUT TERMINAL PIN ASSIGNMENT	10
5.1 TFT LCD MODULE	11
5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL.....	11
5.3 COLOR DATA INPUT ASSIGNMENT	12
6. CONVERTER SPECIFICATION.....	15
6.1 ABSOLUTE MAXIMUM RATINGS	15
6.2 RECOMMENDED OPERATING RATINGS	15
6.3 LED BACKLIGHT CONTROLL ON/OFF SEQUENCE	15
7. INTERFACE TIMING.....	16
7.1 INPUT SIGNAL TIMING SPECIFICATIONS.....	16
7.2 POWER ON/OFF SEQUENCE.....	16
8. OPTICAL CHARACTERISTICS	17
8.1 TEST CONDITIONS	17
8.2 OPTICAL SPECIFICATIONS.....	18
9. PRECAUTIONS.....	19
9.1 SYSTEM MATCHING PRECAUTIONS.....	19
9.2 HANDLING PRECAUTIONS.....	19
9.3 STORAGE PRECAUTIONS.....	19
9.4 OPERATION PRECAUTIONS.....	19
9.5 OTHER PRECAUTIONS	19
10. PACKING	20



1. GENERAL DESCRIPTION

1.1 OVERVIEW

KWH101ST01 is a 10.1" TFT Liquid Crystal Display module with LED Backlight unit and 40 pins LVDS interface. This module supports 1024 x 600 Wide-SVGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The converter module for Backlight is built in.

1.2 FEATURES

- WSVGA (1024 x 600 pixels) resolution
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock
- Build in LED Converter

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	222.72 (H) x 125.28 (V) (10.06" diagonal)	mm	(1)
Bezel Opening Area	226.34 (H) x 128.1 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1024 x R.G.B. x 600	pixel	-
Pixel Pitch	0.2175 (H) x 0.2088 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Hard coating (3H), Glare	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	234.5	235.0	235.5	mm	(1)
	Vertical(V)	142.5	143.0	143.5	mm	
	Thickness(T)	-	4.9	5.2	mm	
Weight		-	180	190	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	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(1), (2)
Shock (Non-Operating)	S _{NOP}	-	220/2	G/ms	(3), (5)
Vibration (Non-Operating)	V _{NOP}	-	1.5	G	(4), (5)

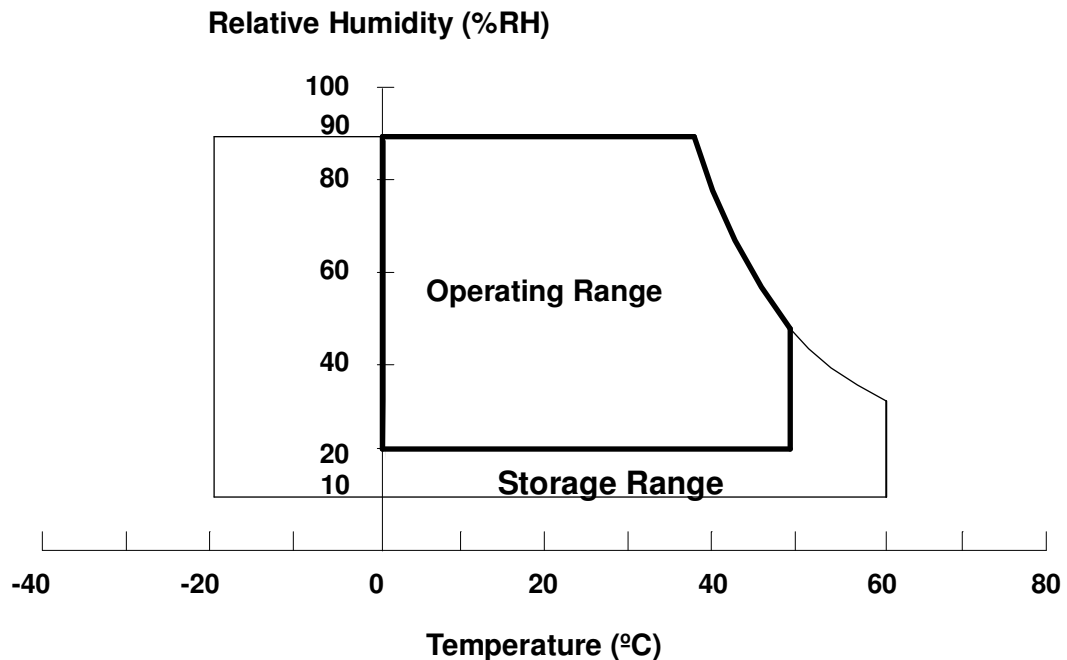
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≤ 40 °C).

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

(c) No condensation.

Note (2) The temperature of panel surface area should be 0 °C min. and 60 °C max.

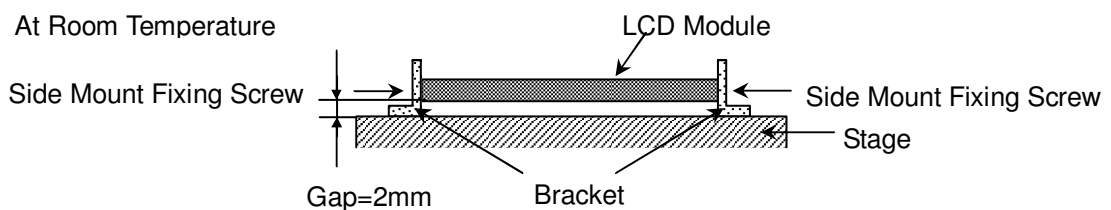


Note (3) 1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4) 10~500 Hz, 30 min/cycle, 1cycle for X,Y,Z-axis.

Note (5) 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.

The fixing condition is shown as below:





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	

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.

2.2.2 BACKLIGHT UNIT

Item	Value		Unit	Note
	Min	Max.		
LED Light Bar Power Supply Voltage	-45	30.6	V_{DC}	(1), (2)
LED Light Bar Power Supply Current	--	40	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

 $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$

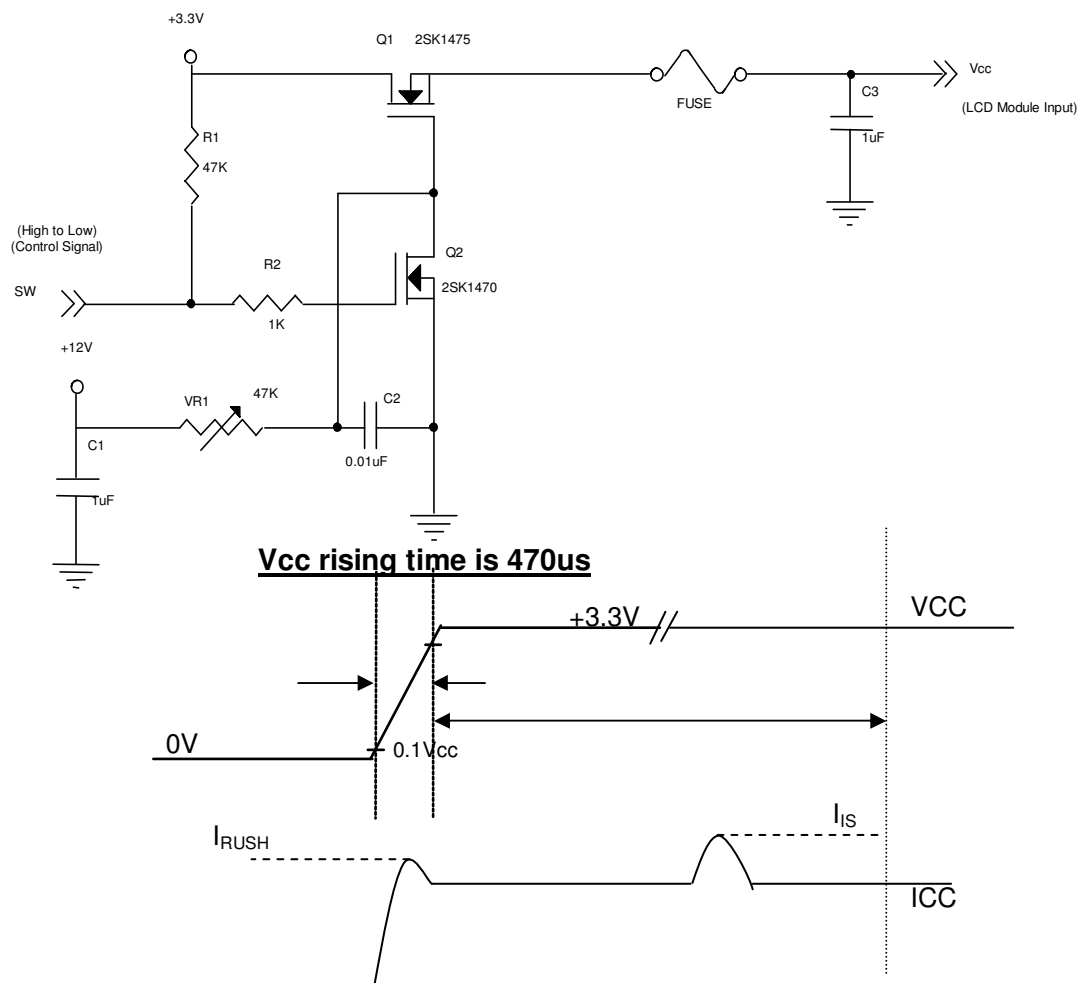
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V_{CC}	3.0	3.3	3.6	V	-
Ripple Voltage	V_{RP}	-	50		mV	-
Rush Current	I_{RUSH}	-	-	1.5	A	(2)
Initial Stage Current	I_{IS}	-	-	1.0	A	(2)
Power Supply Current	White	-	(160)	TBD	mA	(3)a
	Black		(240)	TBD	mA	(3)b
LVDS Differential Input High Threshold	$V_{TH(LVDS)}$	-	-	+100	mV	(5), $V_{CM}=1.2V$
LVDS Differential Input Low Threshold	$V_{TL(LVDS)}$	-100	-	-	mV	(5) $V_{CM}=1.2V$
LVDS Common Mode Voltage	V_{CM}	1.125	-	1.375	V	(5)
LVDS Differential Input Voltage	$ V_{ID} $	100	-	600	mV	(5)
Terminating Resistor	R_T	-	100	-	Ohm	-
Power per EBL WG	P_{EBL}	-	TBD	-	W	(4)

Note (1) The ambient temperature is $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$.

Note (2) I_{RUSH} : the maximum current when VCC is rising

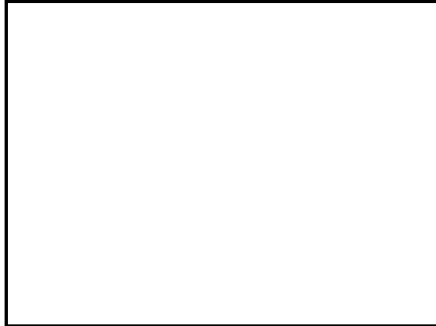
I_{IS} : the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.



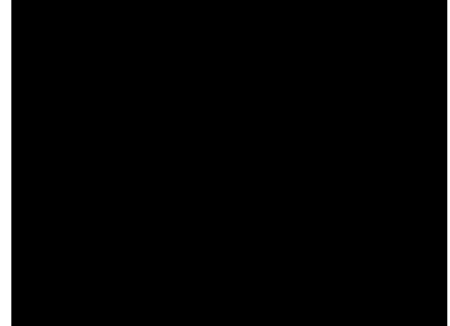
Note (3) The specified power supply current is under the conditions at $V_{CC} = 3.3 \text{ V}$, $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, DC Current and $f_v = 60 \text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

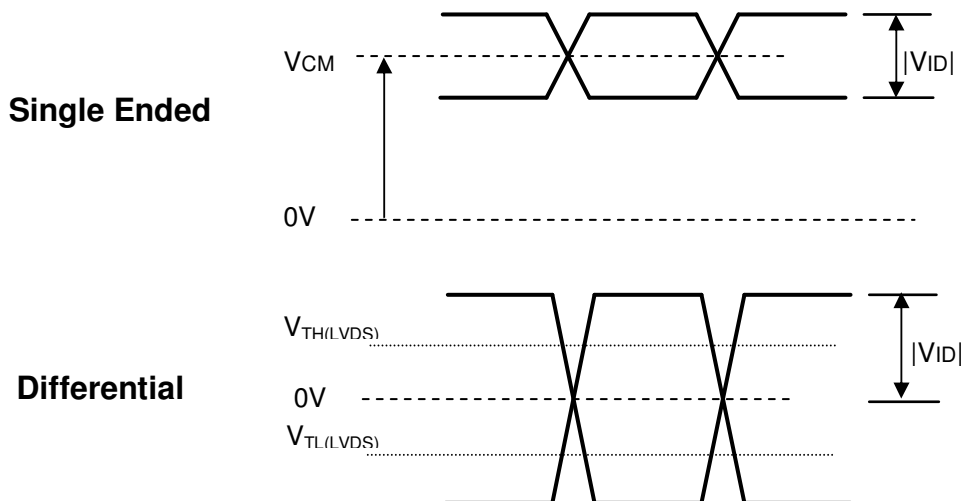


Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

- (a) $V_{CC} = 3.3 \text{ V}$, $T_a = 25 \pm 2 \text{ }^\circ\text{C}$, $f_v = 60 \text{ Hz}$,
- (b) The pattern used is a black and white 32×36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.
- (c) Luminance: 60 nits.

Note (5) The parameters of LVDS signals are defined as the following figures.



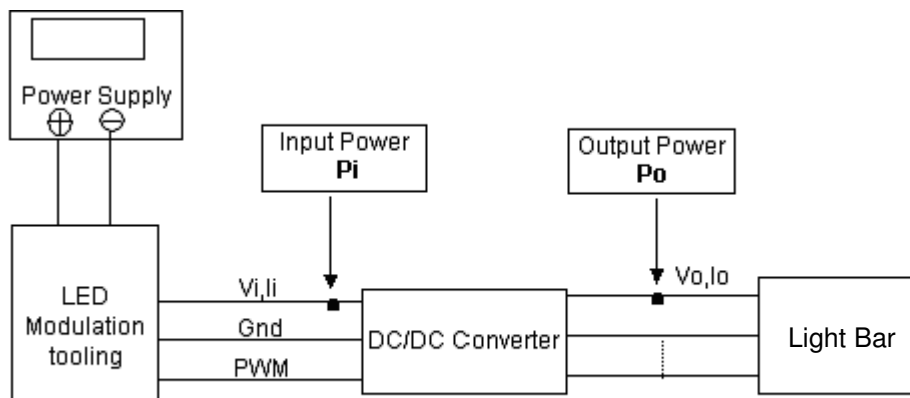


3.2 BACKLIGHT UNIT

 $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	V_o	26.1	28.8	30.6	V	(1) (Duty 100%)
LED Light Bar Power Supply Current	I_o	36	40	60	mA	
Power Consumption	P_o	1.04	1.15	1.22	W	(2) (@ $I_o=40 \text{ mA}$)
LED Life Time	L_{BL}	15000	-	-	Hrs	(3)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below :



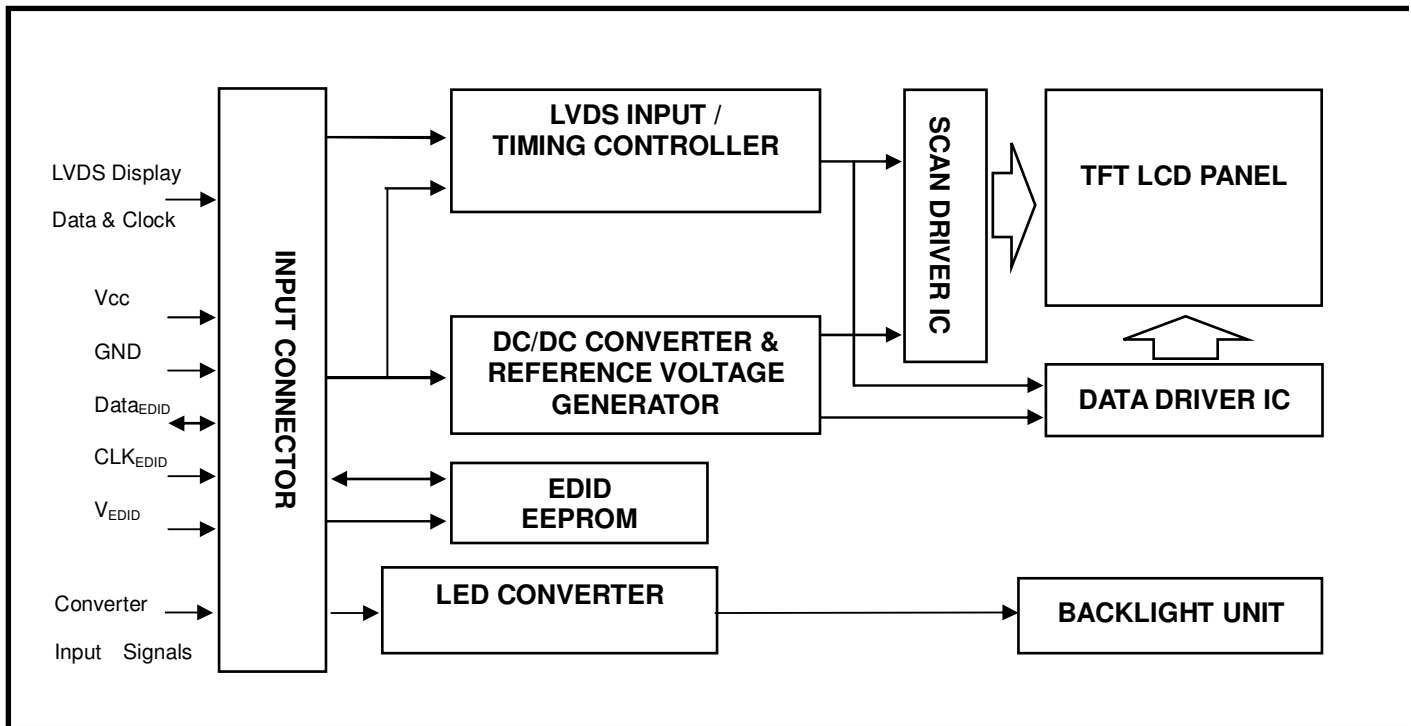
Note (2) $P_o = I_o \times V_o$

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$ and $I = 20 \text{ mA}$ (Per EA) until the brightness becomes $\leq 50\%$ of its original value.



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE





5. INPUT TERMINAL PIN ASSIGNMENT

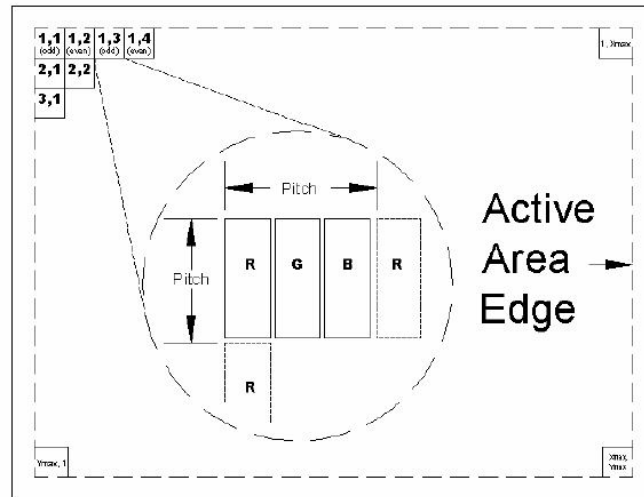
5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	NC	No Connection (Reserve)		
2	VDD	Power Supply (3.3V typ.)		
3	VDD	Power Supply (3.3V typ.)		
4	VEDID	DDC 3.3V power		
5	NC	No Connection		
6	CLKEDID	DDC clock		
7	DATAEDID	DDC data		
8	Rxin0-	LVDS differential data input	Negative	R0-R5, G0
9	Rxin0+	LVDS differential data input	Positive	
10	VSS	Ground		
11	Rxin1-	LVDS differential data input	Negative	G1~G5, B0, B1
12	Rxin1+	LVDS differential data input	Positive	
13	VSS	Ground		
14	Rxin2-	LVDS Differential Data Input	Negative	B2-B5,HS,VS, DE
15	Rxin2+	LVDS Differential Data Input	Positive	
16	VSS	Ground		
17	RxCLK-	LVDS differential clock input	Negative	
18	RxCLK+	LVDS differential clock input	Positive	
19	VSS	Ground		
20	NC	No Connection (Reserve)		
21	NC	No Connection (Reserve)		
22	VSS	Ground		
23	NC	No Connection (Reserve)		
24	NC	No Connection (Reserve)		
25	VSS	Ground		
26	NC	No Connection (Reserve)		
27	NC	No Connection (Reserve)		
28	VSS	Ground		
29	NC	No Connection (Reserve)		
30	NC	No Connection (Reserve)		
31	LED_GND	LED Ground		
32	LED_GND	LED Ground		
33	LED_GND	LED Ground		
34	Reserve	Non connection		
35	LED_PWM	PWM Control Signal of LED Converter		
36	LED_EN	Enable Control Signal of LED Converter		
37	NC	Non connection		
38	LED_VCCS	LED Power		
39	LED_VCCS	LED Power		
40	LED_VCCS	LED Power		

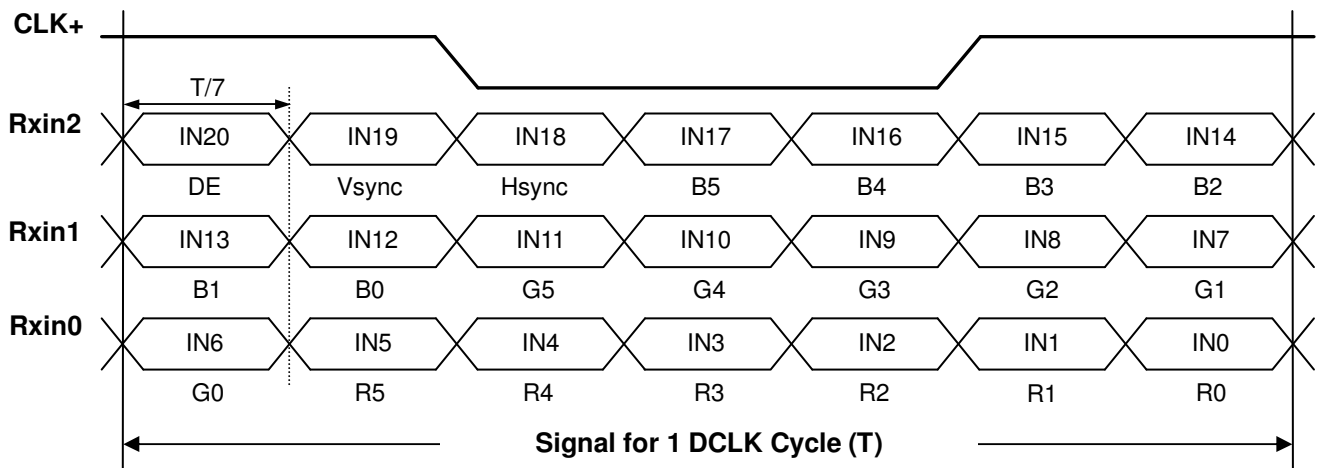
Note (1) Connector Part No.: GS13401-1110P-7F or equivalent

Note (2) User's connector Part No: IPEX-20453-040T-01 or equivalent

Note (3) The first pixel is odd as shown in the following figure.



5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL





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.CONVERTER SPECIFICATION

6.1 ABSOLUTE MAXIMUM RATINGS

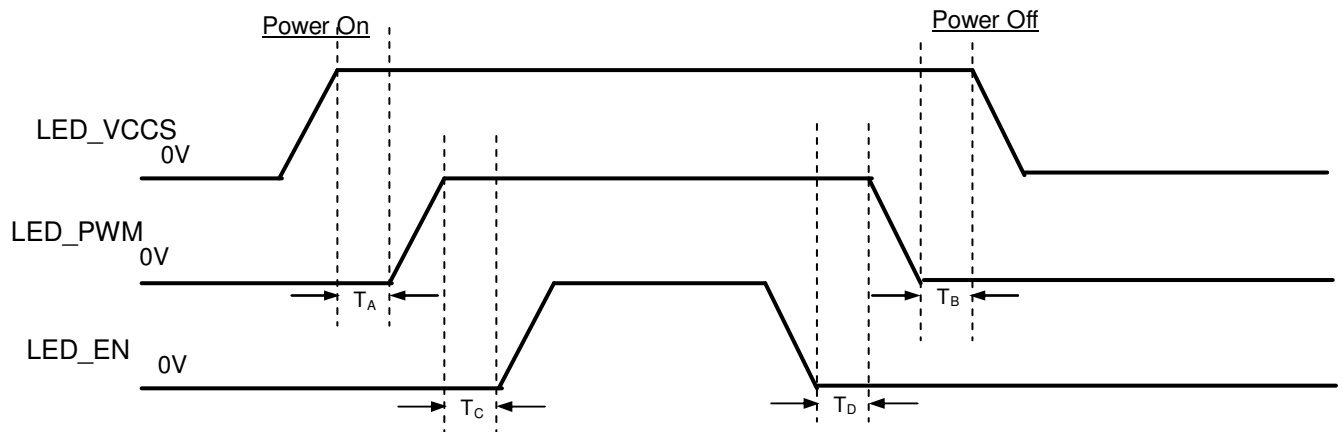
Symbol	Ratings
LED_VCCS	28.0V
LED_PWM, LED_EN	-0.3V~5.5V

6.2 RECOMMENDED OPERATING RATINGS

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_Vccs	5	12	20	V	
EN Control Level	Backlight on		(2)	---	(5)	V	
	Backlight off		0	---	(0.8)	V	
PWM Control Level	PWM High Level		(2)	---	(5)	V	
	PWM Low Level		0	---	(0.15)	V	
PWM Control Duty Ratio			(20)		100	%	
PWM Control Permissive Ripple Voltage		V _{PWM_pp}			100	mV	
PWM Control Frequency		f _{PWM}	190	210	230	Hz	
LED Power Current	LED_VCCS=Min	I _{BL}	(220)	(271)	(321)	mA	(1)
	LED_VCCS=Typ		(92)	(113)	(134)	mA	(1)
	LED_VCCS=Max		(52)	(65)	(77)	mA	(1)

Note (1) The specified LED power supply current is under the conditions at “LED_VCCS = Min, Typ, Max”, $T_a = 25 \pm 2^\circ\text{C}$, $f_{\text{PWM}} = 200\text{ Hz}$, Duty=100%.

6.3 LED BACKLIGHT CONTROL ON/OFF SEQUENCE



Timing Specifications:

$$T_A \geq (0\text{ms})$$

$$T_B \geq (0\text{ms})$$

$$T_C \geq (10\text{ms})$$

$$T_D \geq (0\text{ms})$$

Note (1) Please follow the LED backlight power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller



7. INTERFACE TIMING

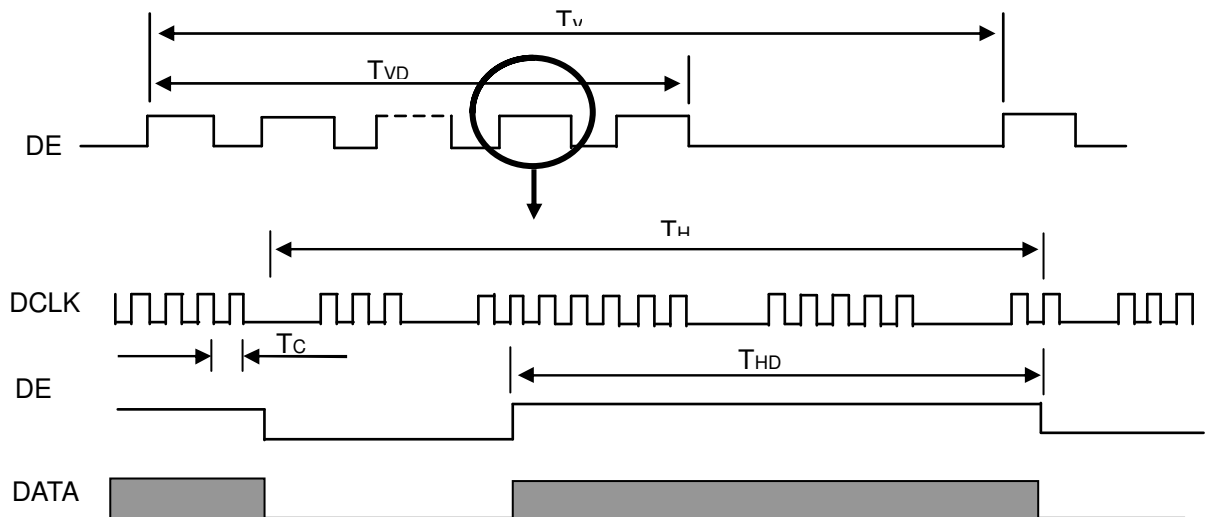
7.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

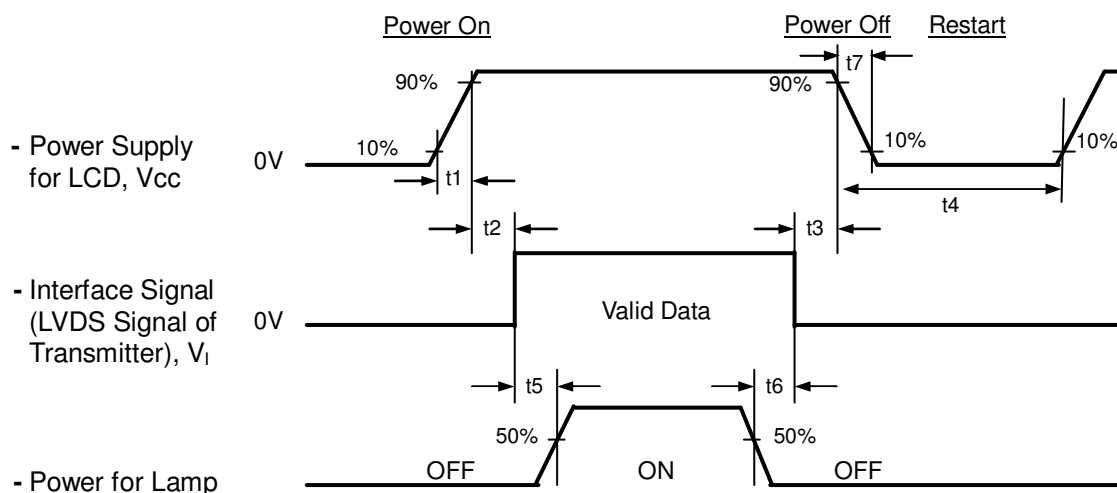
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	$1/T_c$	TBD	(43.97)	TBD	MHz	(2)
DE	Vertical Total Time	TV	TBD	(619)	TBD	TH	-
	Vertical Active Display Period	TVD	TBD	600	TBD	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	(19)	TV-TVD	TH	
	Horizontal Total Time	TH	TBD	(1184)	TBD	Tc	(2)
	Horizontal Active Display Period	THD	TBD	1024	TBD	Tc	(2)
	Horizontal Active Blanking Period	THB	TH-THD	(160)	TH-THD	Tc	(2)

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.

INPUT SIGNAL TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE





Timing Specifications:

$0.5 < t_1 \leq 10 \text{ msec}$

$0 < t_2 \leq 50 \text{ msec}$

$0 < t_3 \leq 50 \text{ msec}$

$t_4 \geq 500 \text{ msec}$

$t_5 \geq 200 \text{ msec}$

$t_6 \geq 200 \text{ msec}$

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. 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.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow $(50\mu\text{s}) \leq t_7 \leq 10 \text{ ms}$.



8. OPTICAL CHARACTERISTICS

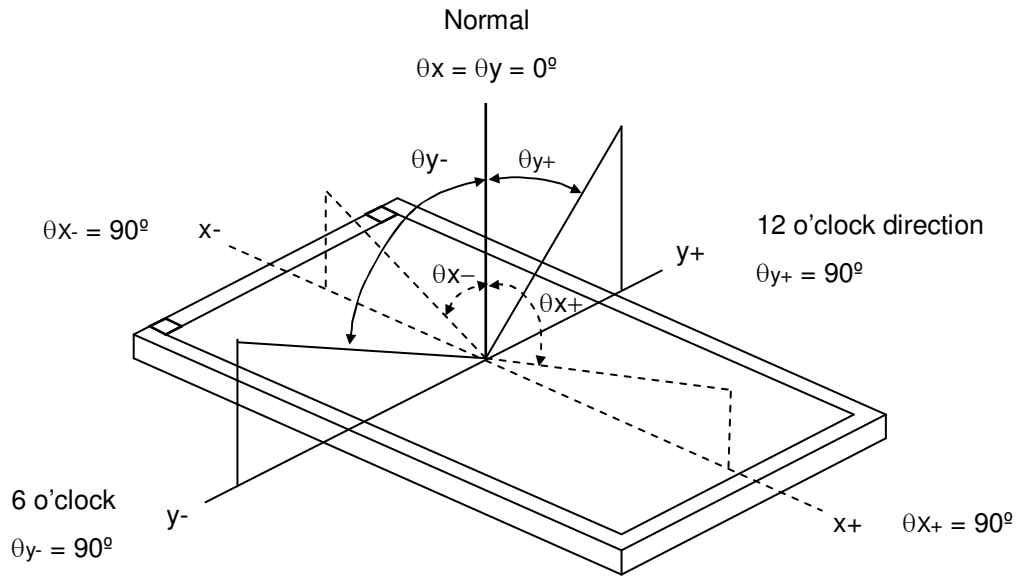
8.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I _L	40	mA

8.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_Y=0^\circ$ Viewing Normal Angle	500	650	-	-	(2), (5)
Response Time		T _R		-	3	8	ms	(3)
		T _F		-	7	12	ms	
Average Luminance of White		L _{AVE}		160	200	-	cd/m ²	(4), (5)
Color Chromaticity	Red	R _x		TYP. -0.03	0.569	TYP. +0.03	-	(1)
		R _y			0.355		-	
	Green	G _x			0.344		-	
		G _y			0.568		-	
	Blue	B _x			0.155		-	
		B _y			0.126		-	
	White	W _x			0.313		-	
		W _y			0.329		-	
Viewing Angle	Horizontal	θ_{x+}	CR≥10	40	45	-	Deg.	(1),(5)
		θ_{x-}		40	45	-		
	Vertical	θ_{y+}		15	20	-		
		θ_{y-}		40	45	-		
White Variation of 5 Points		δW _{5p}	$\theta_x=0^\circ, \theta_Y=0^\circ$	80	-	-	%	(5),(6)

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.

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

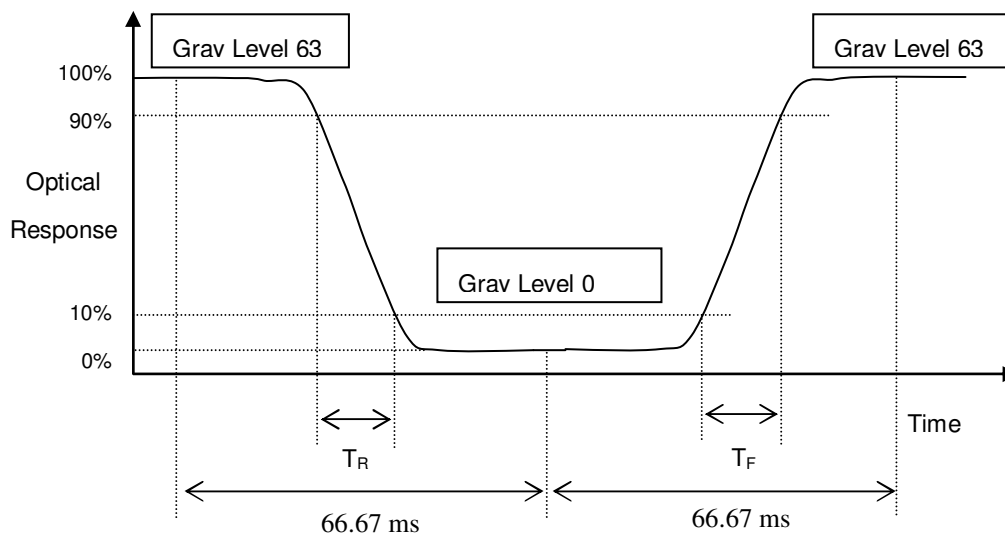
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$CR = CR(1)$$

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 Average Luminance of White (L_{AVE}):

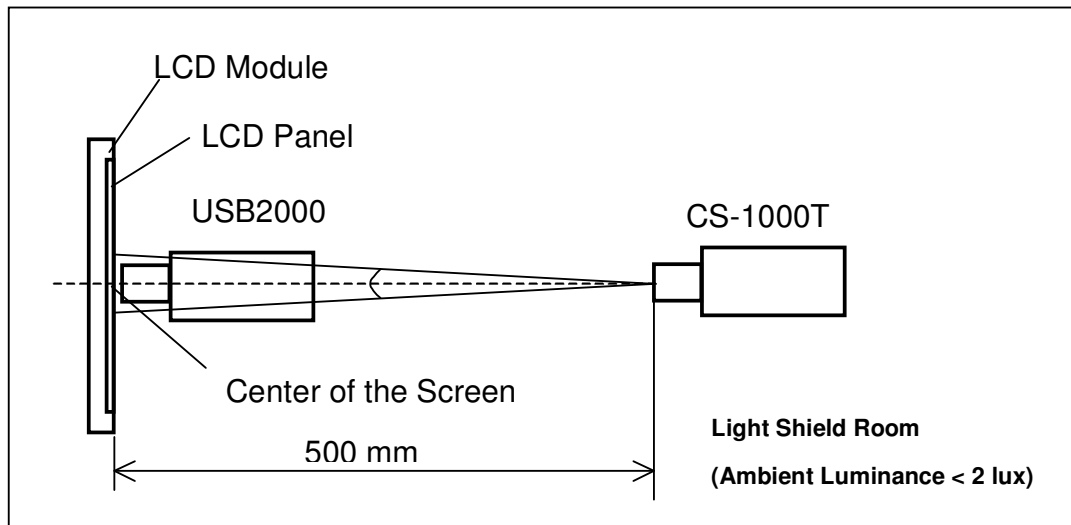
Measure the luminance of gray level 63 at 5 points

$$L_{AVE} = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$$

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

Note (5) Measurement Setup:

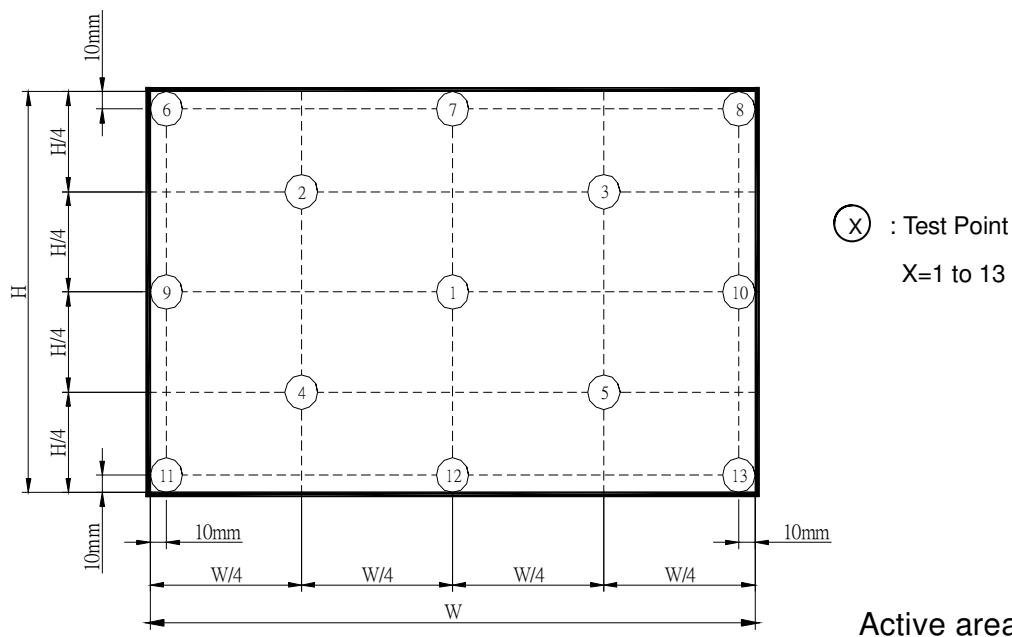
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



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

Measure the luminance of gray level 63 at 5 points

$$\delta W_{5p} = \text{Minimum} [L(1) + L(2) + L(3) + L(4) + L(5)] / \text{Maximum} [L(1) + L(2) + L(3) + L(4) + L(5)]$$





9. PRECAUTIONS

9.1 SYSTEM MATCHING PRECAUTIONS

- (1) Refer to the drawing.
- (2) To avoid wireless noise interference, please keep the antenna away from LCD control board.

9.2 HANDLING PRECAUTIONS

- (1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- (2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the module.
- (10) Do not pull or fold the lamp wire.
- (11) Pins of I/F connector should not be touched directly with bare hands.

9.3 STORAGE PRECAUTIONS

- (1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- (3) It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

9.4 OPERATION PRECAUTIONS

- (1) Do not pull the I/F connector in or out while the module is operating.
- (2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the FORMIKE LSI chips from damage during latch-up.
- (3) 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.

9.5 OTHER PRECAUTIONS

- (1) When fixed patterns are displayed for a long time, remnant image is likely to occur.



10. PACKING

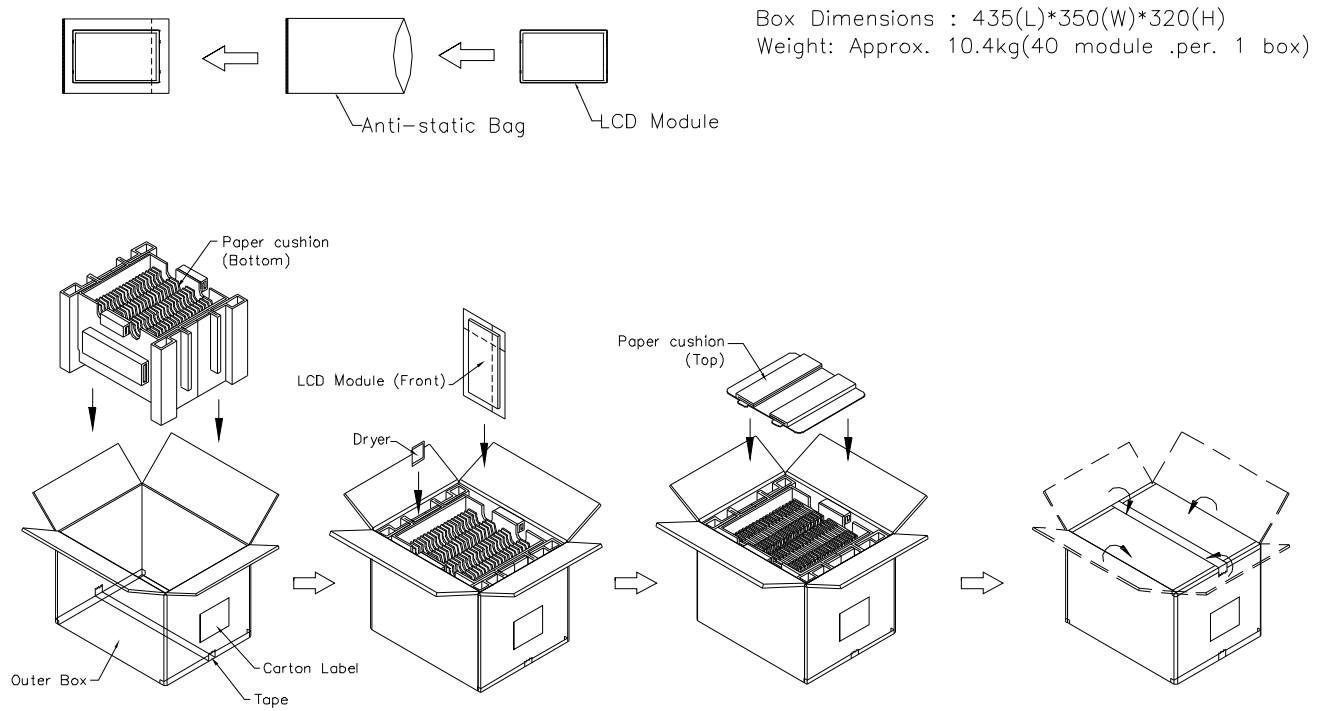


Figure. 10-1 Packing method