Specification
G101ICE-L01

10.1" TFT WXGA

Version: 1.0
Date: 30.10.2014

■ Tentative Specification
□ Preliminary Specification
□ Approval Specification

MODEL NO.: G101ICE
SUFFIX: L01

Customer:

APPROVED BY **SIGNATURE**

Name / Title
Note

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

Approved By	Checked By	Prepared By

- CONTENTS -

REVISION HISTORY

Version	Date	Section	Description
Ver. 1.0	30 Oct. 2014	All	Tentative Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

G101ICE-L01 is a 10.1” TFT Liquid Crystal Display module with LED Backlight units and 40 pins LVDS interface. This module supports 1280 x 800 WXGA mode and can display 16.2M/ 262k colors. The LED driving device for Backlight is built in PCBA.

1.2 FEATURES

- WXGA (1280 x 800 pixels) resolution
- DE (Data Enable) only mode
- LVDS Interface with 1pixel/clock
- Wide operating temperature.
- RoHS compliance

1.3 APPLICATION

-TFT LCD Monitor
- Factory Application
- Amusement

1.4 GENERAL SPECIFICATI0NS

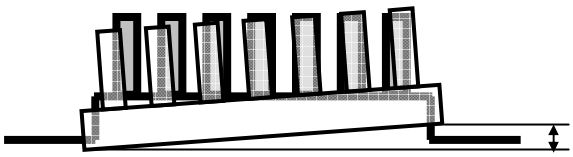
Item	Specification	Unit	Note
Active Area	216.96 (H) x 135.60 (V) (10.1” diagonal)	mm	(1)
Bezel Opening Area	218.96 (H) x 137.6 (V)	mm	
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1280 x R.G.B x 800	pixel	-
Pixel Pitch	0.1695 (H) x 0.1695 (V)	mm	-
Pixel Arrangement	RGB vertical Stripe	-	-
Display Colors	16,194,277 / 262,144	color	-
Display Mode	Normally Black	-	-
Surface Treatment	Hard Coating (3H), Anti-Glare	-	-
Module Power Consumption	TBD	W	Typical

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	230.2	230.7	231.2	mm	(1)
	Vertical(V)	152.05	152.55	153.05	mm	
	Depth(D)	6.0	6.5	7.0	mm	(1)(2)
Bezel Area	Horizontal	217.66	218.96	218.26	mm	
	Vertical	137.3	137.6	137.9	mm	
Active Area	Horizontal	-	216.96	-	mm	
	Vertical	-	135.6	-	mm	
Weight		-	366	380	g	

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

Note (2) The depth is without connector.



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

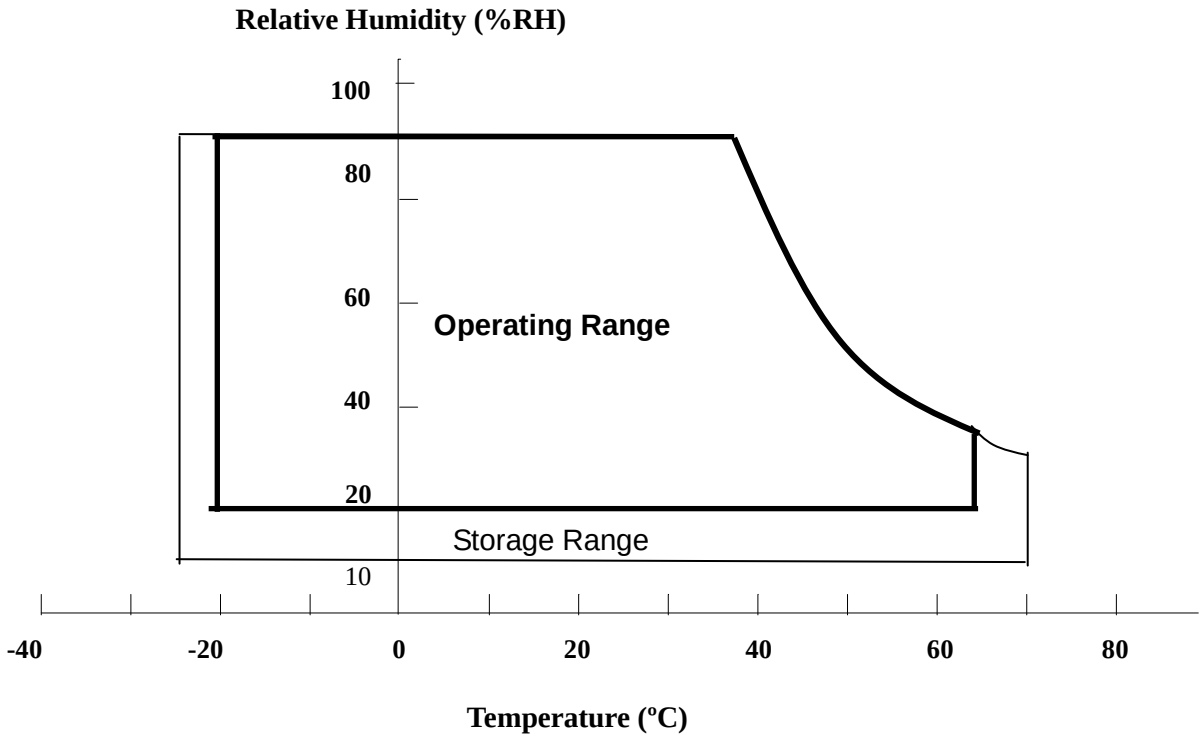
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Operating Ambient Temperature	T_{OP}	-20	+65	℃	
Storage Temperature	T_{ST}	-25	+70	℃	

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

(2) 90 %RH Max. (Ta < 40℃).

(3) Wet-bulb temperature should be 39℃ Max.

(4) No condensation.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCC	-0.3	4	V	(1)

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	V	(1) , (2)
Enable Voltage	EN	---	5.5	V	
Backlight Adjust	ADJ	---	5.5	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.

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

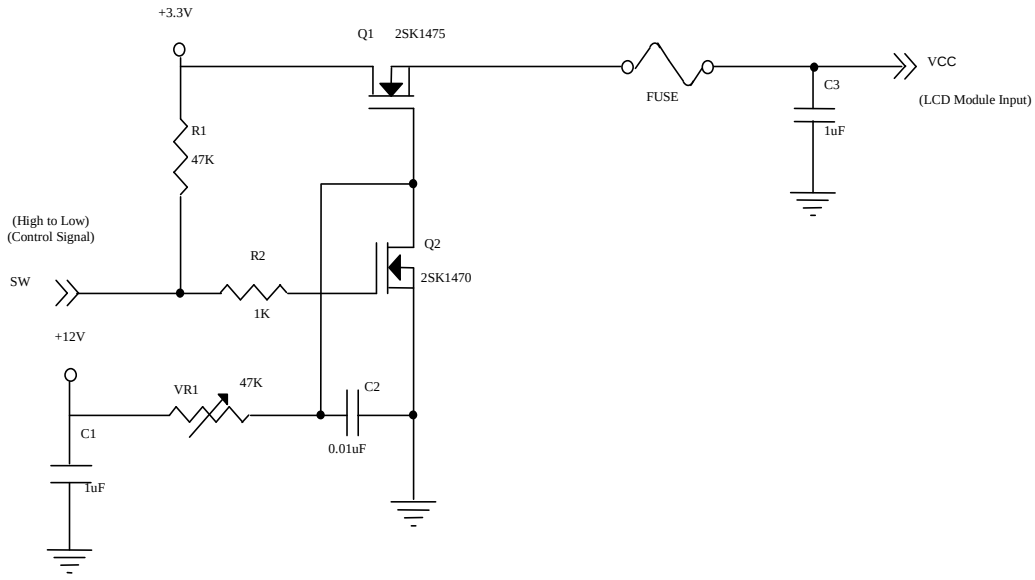
3. ELECTRICAL CHARACTERISTICS

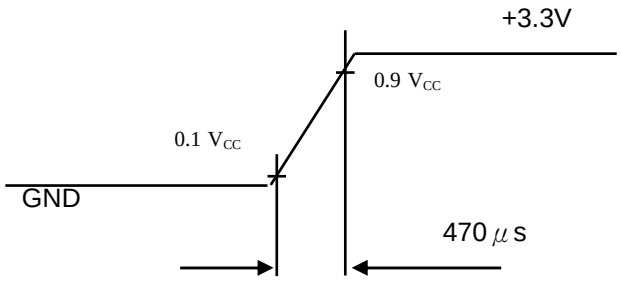
3.1 TFT LCD MODULE

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	-	100	mVp-p	
Rush Current		I_{RUSH}	-	-	TBD	A	(2)
Power Supply Current	White	Icc	-	TBD		mA	(3)a
	Black		-	TBD		mA	(3)b
LVDS differential input voltage		Vid	200	-	600	mV	
LVDS common input voltage		Vic	1.0	1.2	1.4	V	
Differential Input Voltage for LVDS Receiver Threshold	"H" Level	V_{IH}			100	mV	-
	"L" Level	V_{IL}	-100			mV	-
Terminating Resistor		R_T	-	100		Ohm	-

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

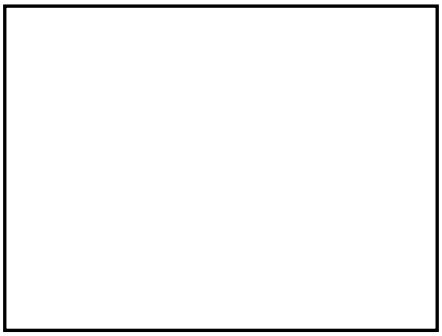
Note (2) Measurement Conditions:





Note (3) The specified power supply current is under the conditions at V_{DD} =3.3V, Ta = 25 ± 2 ℃, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

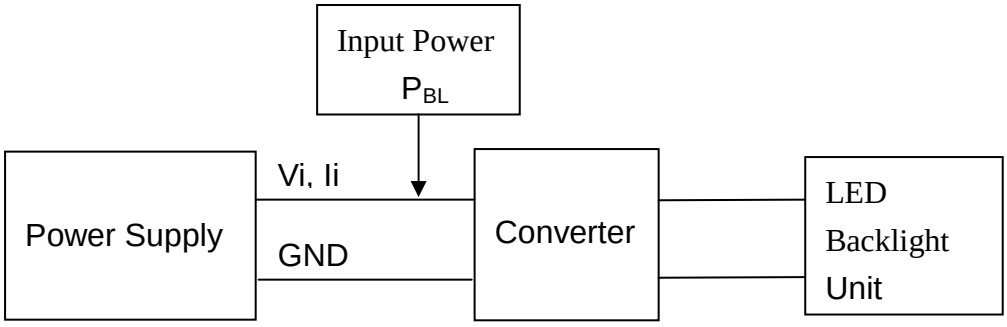
Active Area

3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ℃

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	
Converter Power Supply Current		I_i	-	0.42	0.46	A	@ Vi = 12V (Duty 100%)
Backlight Power Consumption		P_{BL}	-	4.6	4.9	W	@ Vi = 12V (Duty 100%)
EN Control Level	Backlight on	-	2.0	3.3	5.0	V	
	Backlight off		0	---	0.8	V	
PWM Control Level	PWM High Level	-	2.0	3.3	5.0	V	
	PWM Low Level		0	-	0.15	V	
PWM Control Duty Ratio		-	1	-	100	%	@200Hz
PWM Control Frequency		f_{PWM}	190	200	20k	Hz	(2)
LED Life Time		L_L	50,000	-	-	Hrs	(3)

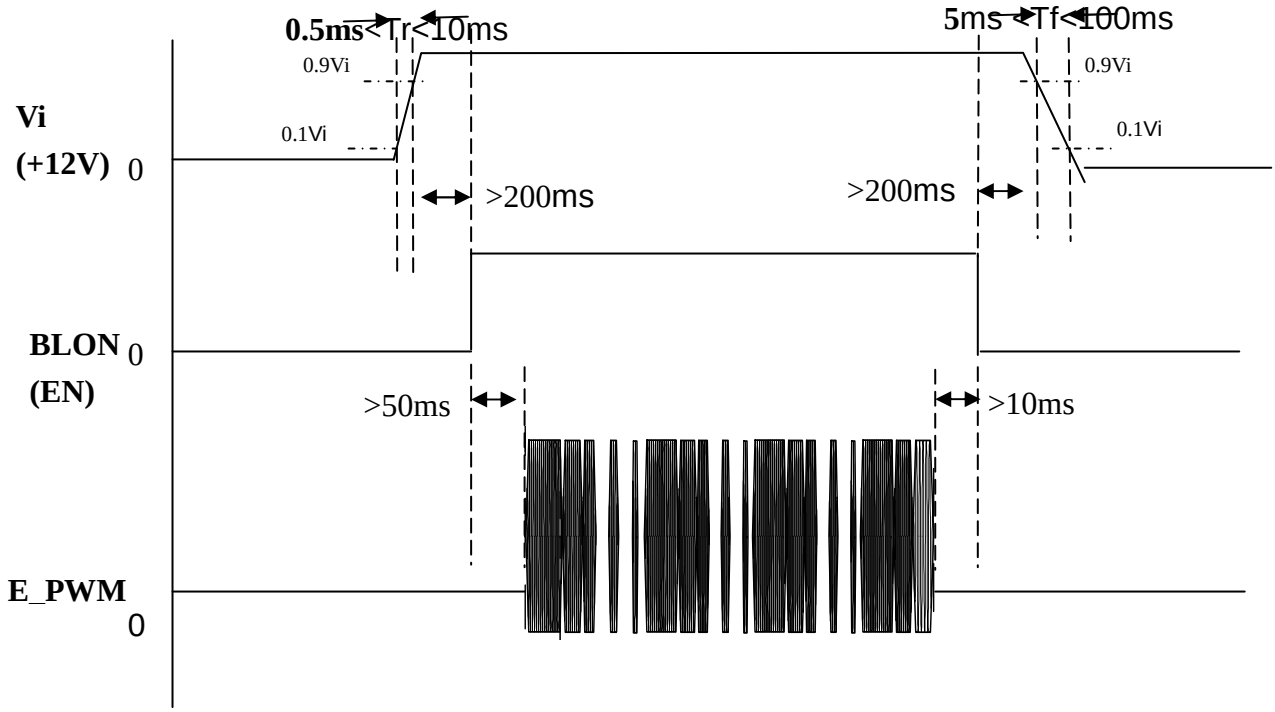
Note (1) LED current is measured by utilizing a high frequency current meter as shown below:



Note (2) At 200 Hz PWM control frequency，duty ratio range is restricted from 1% to 100%

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and Duty 100% until the brightness becomes ≦ 50% of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.

Power sequence and control signal timing are shown in the following figure



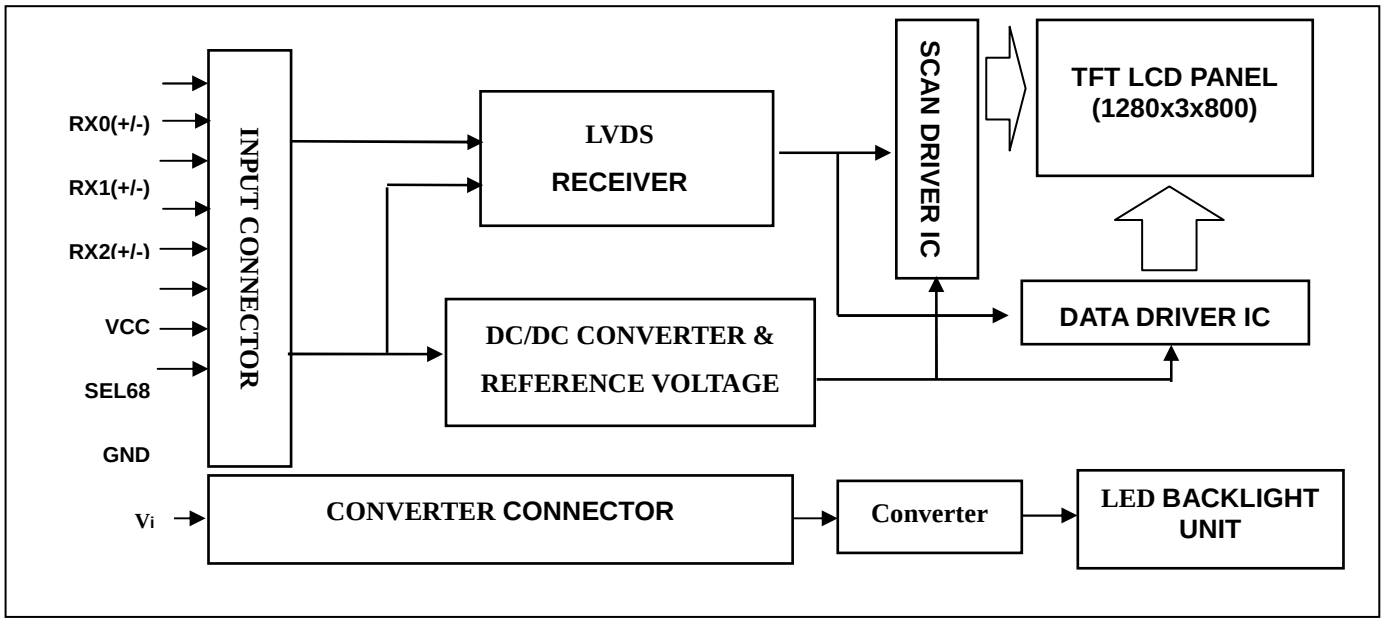
Note： While system is turned ON or OFF, the power sequences must follow as below descriptions

Turn ON sequence: Vi(+12V) → BLON → E_PWM signal

Turn OFF sequence: E_PWM signal → BLON → Vi(+12V)

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

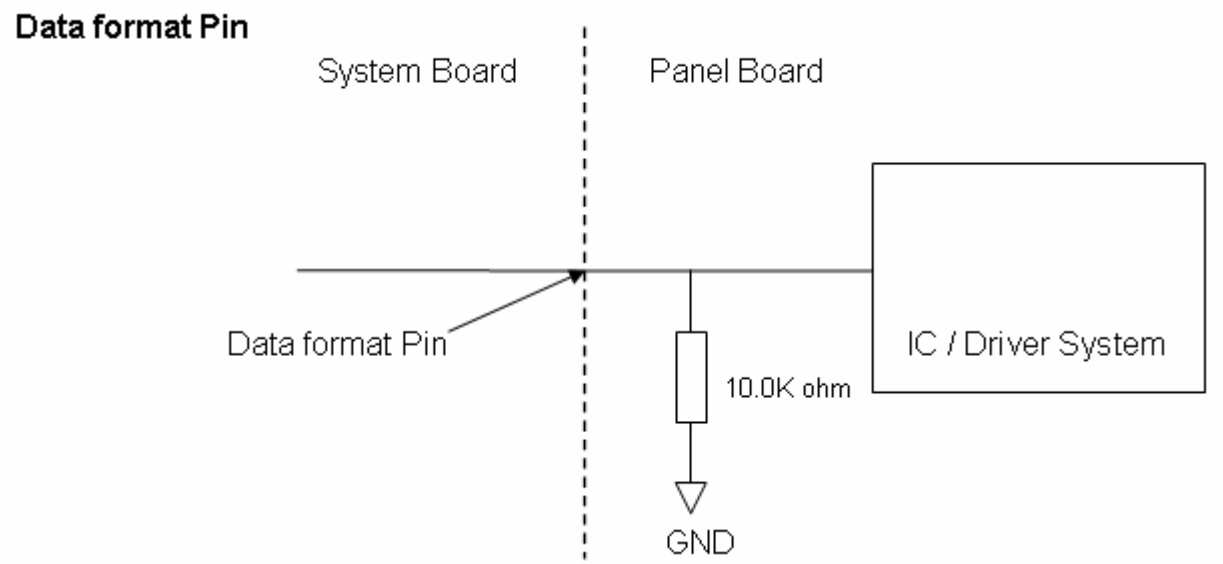
Pin No.	Symbol	Function	Polarity	Note
1	**VCCS**	Power Supply +3.3V(typical)		
2	**VCCS**	Power Supply +3.3V(typical)		
3	**VCCS**	Power Supply +3.3V(typical)		
4	**Data format**	L or NC :VESA format H : JEDIA format		Note (3),Note(4)
5	**NC**	No Conncetion (Reserve for INX test)		
6	**NC**	No Conncetion (Reserve for INX test)		
7	**NC**	No Conncetion (Reserve for INX test)		
8	**Rxin0-**	LVDS Differential Data Input	Negative	
9	**Rxin0+**	LVDS Differential Data Input	Positive	
10	**VSS**	Ground		
11	**Rxin1-**	LVDS Differential Data Input	Negative	
12	**Rxin1+**	LVDS Differential Data Input	Positive	
13	**VSS**	Ground		
14	**Rxin2-**	LVDS Differential Data Input	Negative	
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	**Rxin3-**	LVDS Differential Data Input	Negative	
21	**Rxin3+**	LVDS Differential Data Input	Positive	
22	**VSS**	Ground		
23	**NC**	No Conncetion (Reserve)		
24	**NC**	No Conncetion (Reserve)		
25	**VSS**	Ground		
26	**VSS**	Ground		
27	**LED_PWM**	PWM Control Signal od LED Converter		
28	**LED_EN**	Enable Control Signal od LED Converter		
29	**LED_GND**	LED Ground		
30	**LED_GND**	LED Ground		
31	**LED_GND**	LED Ground		
32	**LED_GND**	LED Ground		
33	**LED_GND**	LED Ground		
34	**NC**	No Conncetion (Reserve)		
35	**NC**	No Conncetion (Reserve)		
36	**LED_VCCS**	LED Power Supply		
37	**LED_VCCS**	LED Power Supply		
38	**LED_VCCS**	LED Power Supply		
39	**LED_VCCS**	LED Power Supply		
40	**LED_VCCS**	LED Power Supply		

Note (1) Connector Part No.: I-PEX 20455-040E-12 or Tyco_5-2069716-3.

Note (2) “Low” stands for 0V. “High” stands for 3.3V. “NC” stands for “No Connection”.

Note (3) Interface optional pin has internal scheme as following diagram, Customer should keep the interface voltage level requirement which including panel board loading as below.

Data format Pin



5.2 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(252)	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(252)	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(252)	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(252)	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(252)	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(252)	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(252)	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(252)	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(252)	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. INTERFACE TIMING

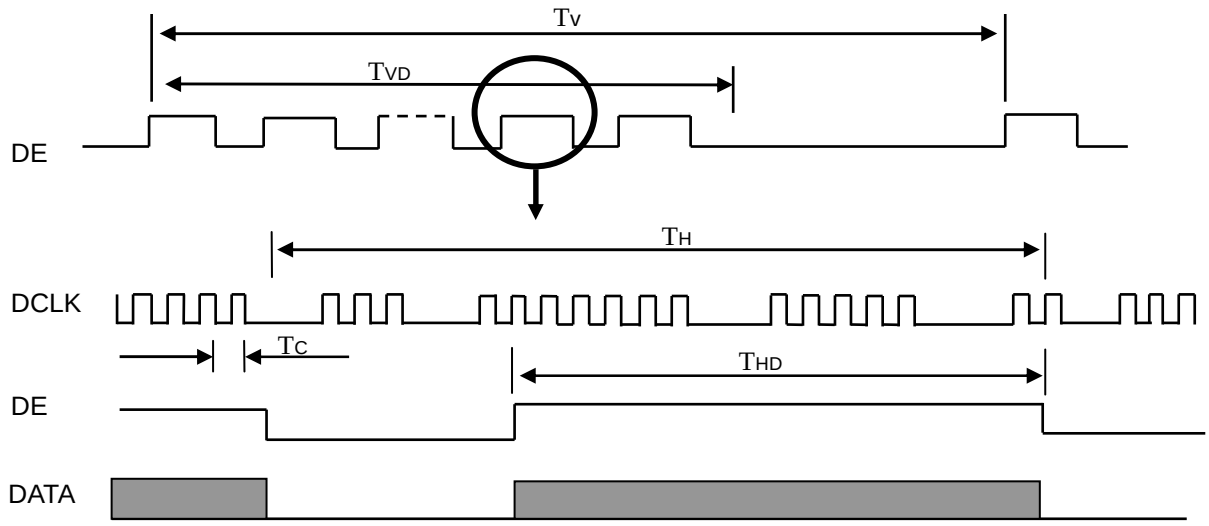
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

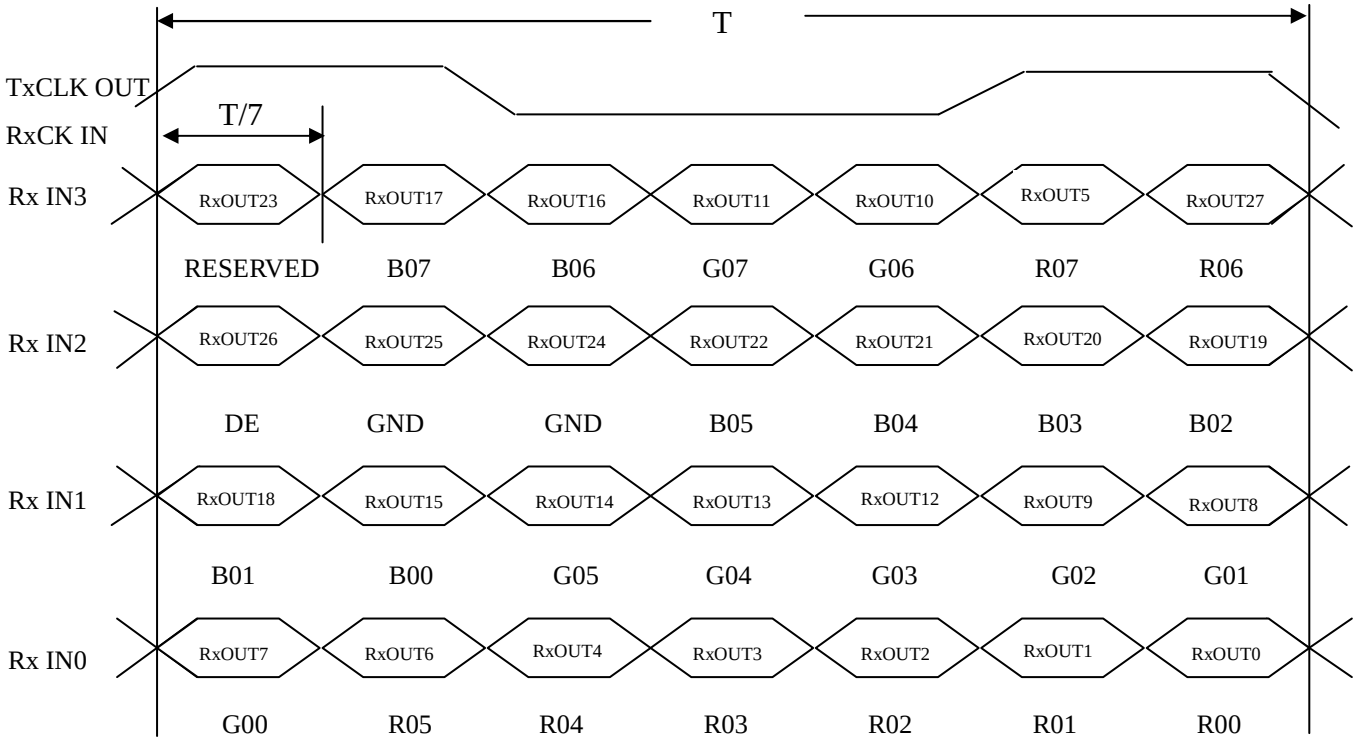
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Pixel Clock	$1/T_C$	60.40	71.1	74.7	MHz	-
DE	Vertical Total Time	T_V	810	823	829	T_H	-
	Vertical Address Time	T_{VD}	800	800	800	T_H	-
	Horizontal Total Time	T_H	1362	1440	1480	T_C	-
	Horizontal Address Time	T_{HD}	1280	1280	1280	T_C	-

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

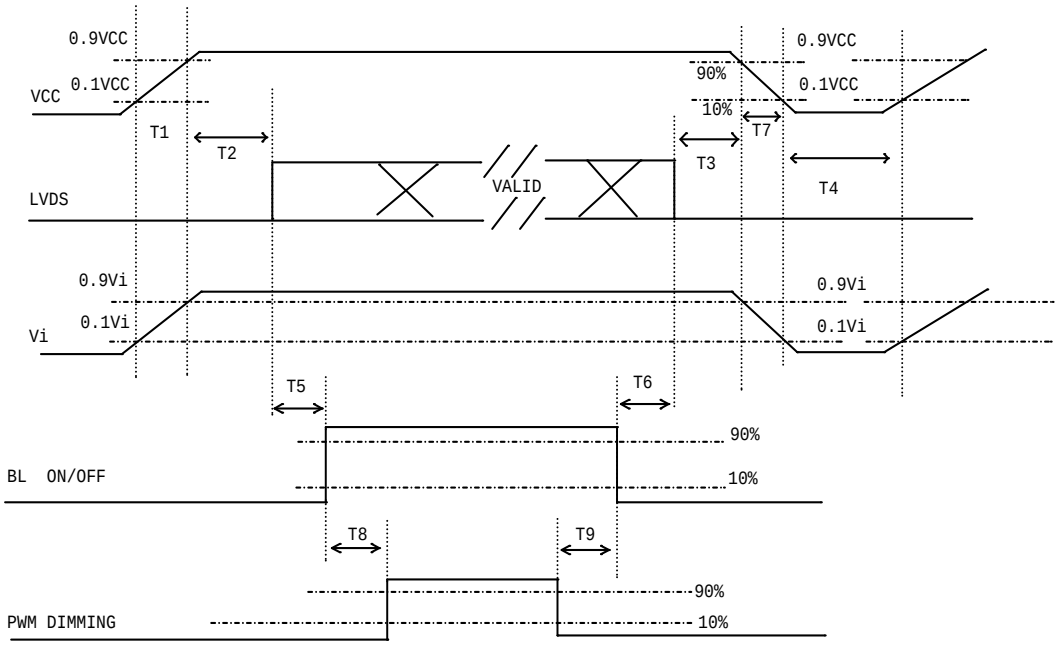


TIMING DIAGRAM of LVDS



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	200	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

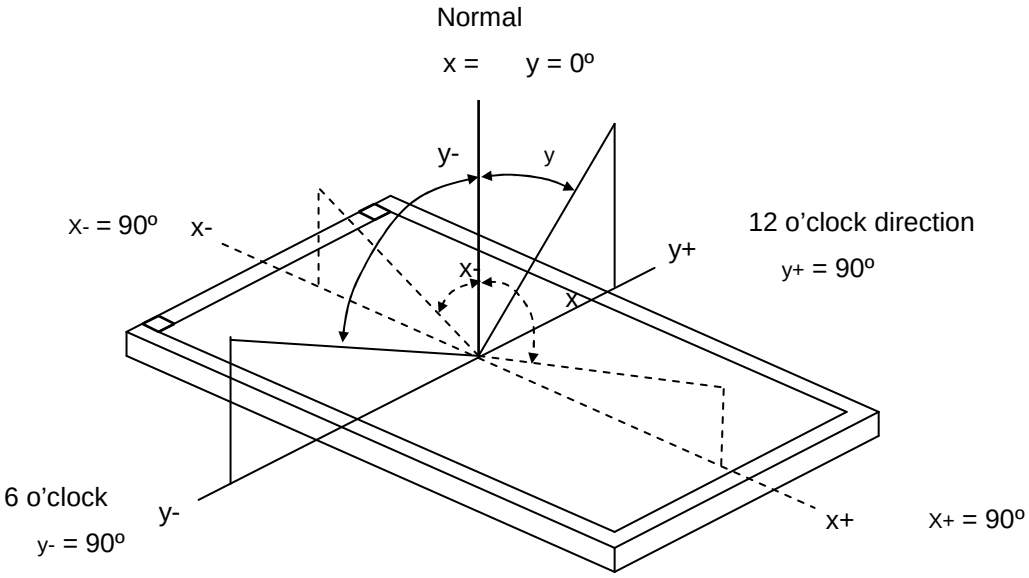
Item	Symbol	Value	Unit
Ambient Temperature	Ta	*25±2*	℃
Ambient Humidity	Ha	*50±10*	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Converter Voltage	V_i	12	V
Converter Duty		100%	

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	Rx	θ_x=0°, θ_Y =0° CS-1000T	Typ - 0.05	0.592	Typ+ 0.05	-	(1), (5)
		Ry			0.340			
	Green	Gx			0.310			
		Gy			0.579			
	Blue	Bx			0.150			
		By			0.128			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White		L_C		TBC	500		cd/m^2	(4), (5)
Contrast Ratio		CR		TBC	800		-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	14	17	ms	(3)
		T_F		-	11	14		
White Variation		δW	θ_x=0°, θ_Y =0° USB2000	70	-	-	%	(5), (6)
Viewing Angle	Horizontal	θ_x+	CR ≧ 10 USB2000	80	85	-	Deg.	(1), (5)
		θ_x-		80	85	-		
	Vertical	θ_Y+		80	85	-		
		θ_Y-		80	85	-		

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) = L252 / L0

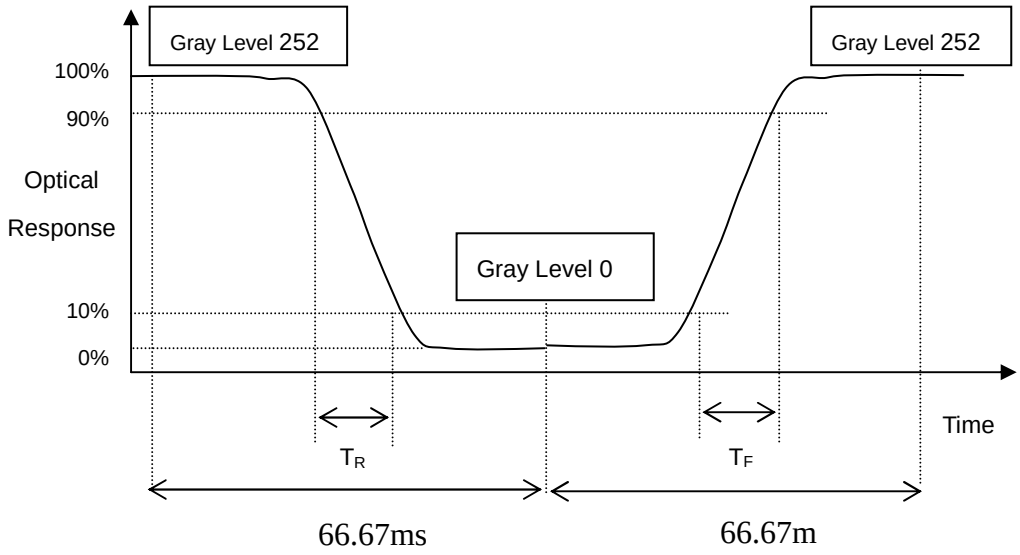
L252: Luminance of gray level 252

L0: 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):



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

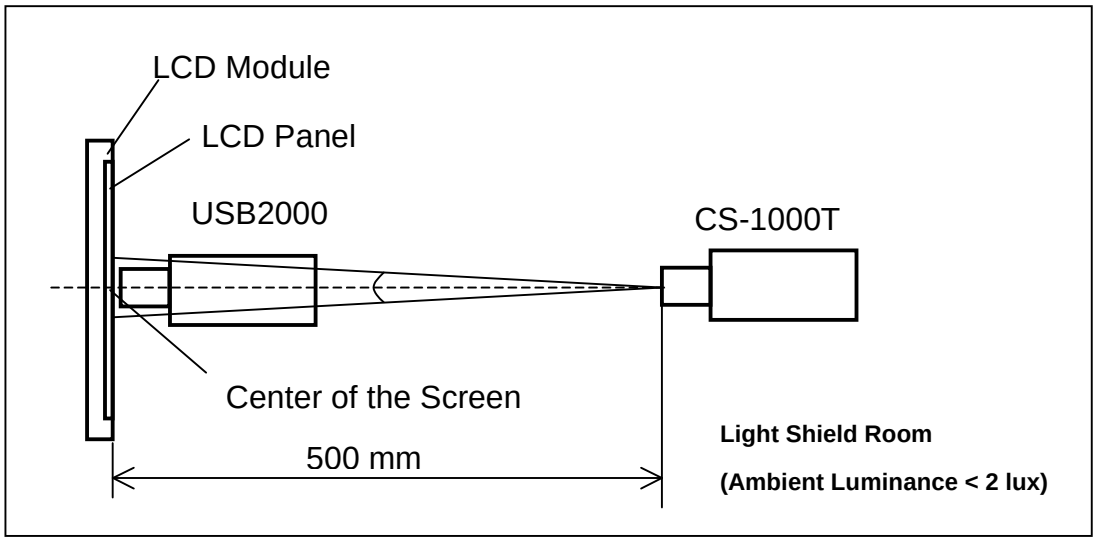
Measure the luminance of gray level 252 at center point

L_C = L (5)

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

Note (5) Measurement Setup:

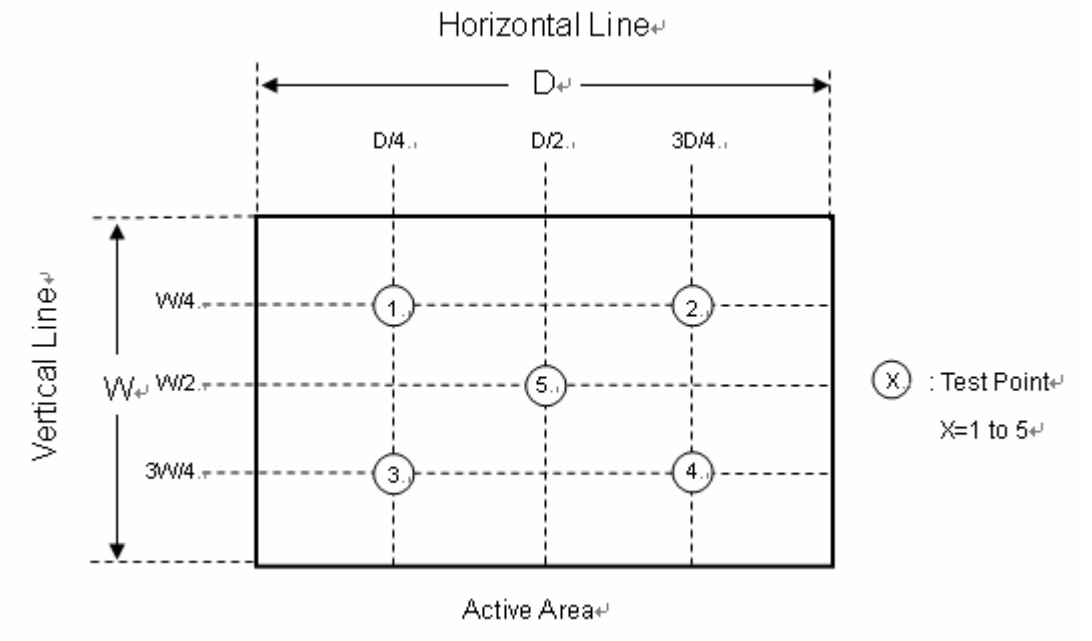
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



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

Measure the luminance of gray level 252 at 5 points

W_{5p} = {Minimum [L (1) ~ L (5)] / Maximum [L (1) ~ L (5)]}*100%



8. RELIABILITY TEST CRITERIA

Test Item	Test Condition	Note
High Temperature Storage Test	70℃, 240 hours	(1), (2) (4)
Low Temperature Storage Test	-25℃, 240 hours	
Thermal Shock Storage Test	-25℃, 0.5 hour←→70℃, 0.5 hour; 100cycles, 1 hour/cycle)	
High Temperature Operation Test	65℃, 240 hours	
Low Temperature Operation Test	-20℃, 240 hours	
High Temperature & High Humidity Operation Test	60℃, RH 90%, 240 hours	
ESD Test (Operation)	150pF, 330Ω, 1 sec/cycle Condition 1 : panel contact, ±8 KV Condition 2 : panel non-contact ±15 KV	(1)
Shock (Non-Operating)	50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z direction	(1), (3)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz sine wave, 10 min/cycle, 3 cycles each X, Y, Z direction	(1), (3)

Note (1) No display malfunction.

Note (2) Judgment should be tested after storage at room temperature for more than two hour. All the cosmetic specification is judged before reliability test.

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 75℃ Max.

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 28pcs LCD modules / 1 Box

(2) Box dimensions: 435(L) X 350 (W) X 275 (H) mm

(3) Weight: approximately 12.02Kg (28 modules per box)

9.2 PACKING METHOD

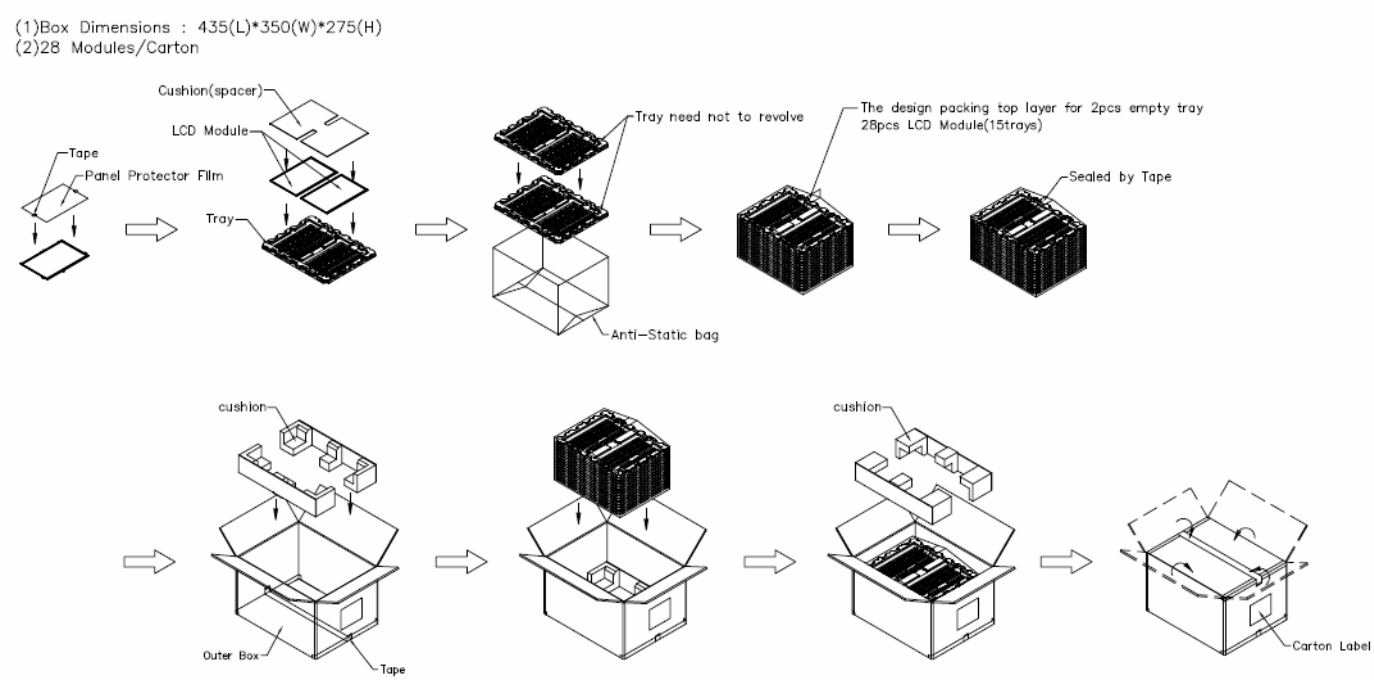


Figure. 9-1 Packing method

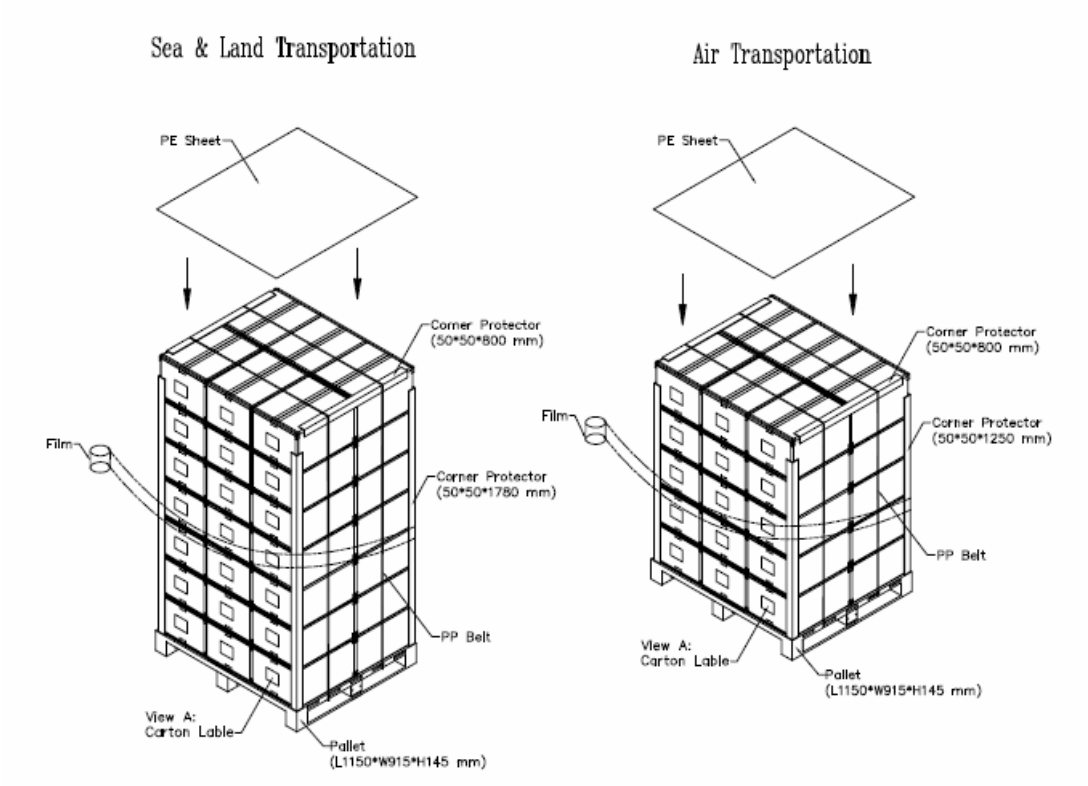


Figure. 9-2 Packing method

9.3 UN-PACKING METHOD

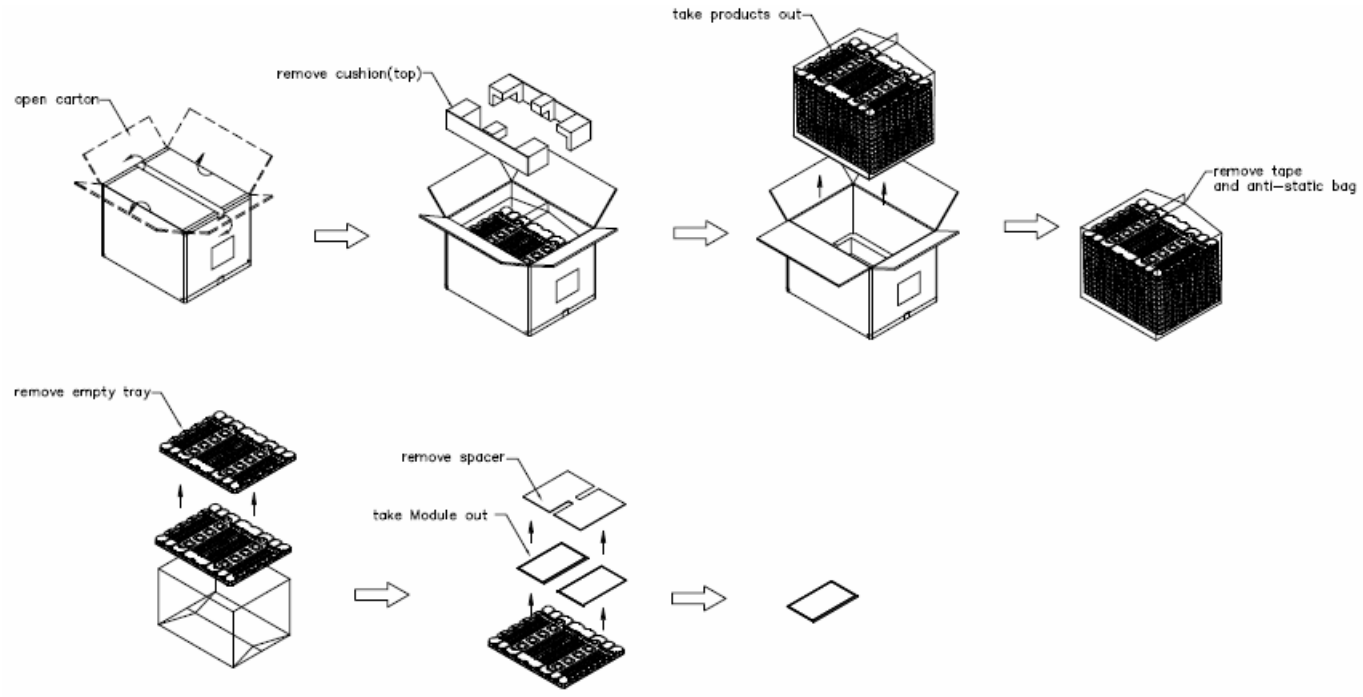
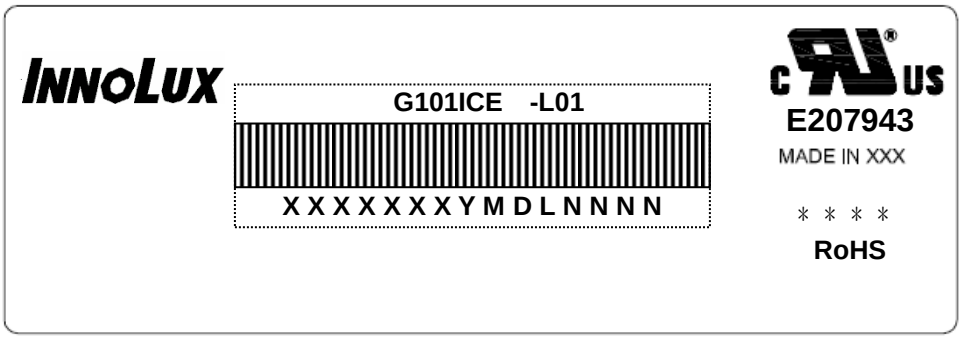


Figure. 9-3 UN-Packing method

10. DEFINITION OF LABELS

10.1 INX MODULE LABEL

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

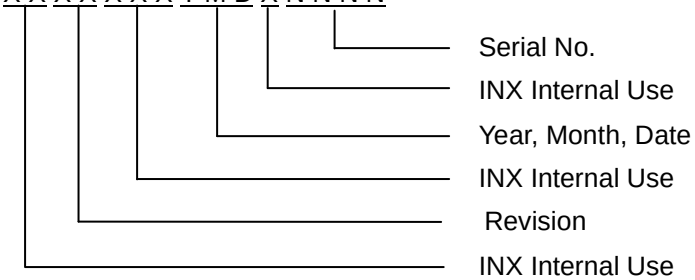


(a) Model Name: G101ICE -L01

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

(c) ＊ ＊ ＊ ＊ : Factory ID

(d) Serial ID: X X X X X X X Y M D X N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2011~2019

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

11. 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℃ may reduce the display quality. For example, the response time will become slowly.

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

11.2 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.

12. MECHANICAL CHARACTERISTICS