Doc. Number :

☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

MODEL NO.: M270KCJ
SUFFIX: L5B

Customer:

APPROVED BY **SIGNATURE**

Name / Title _____ _____

Note
Product Version C1/C2

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

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REVISION HISTORY

Version	Date	Page	Description
0.0	June,16th,2016	All	Spec Ver. 0.0 was first issued.
1.0	Sept.9th, 2016	All	Spec Ver. 1.0 was first issued.
2.0	Dec.,20th,2016	All	Spec Ver. 2.0 was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

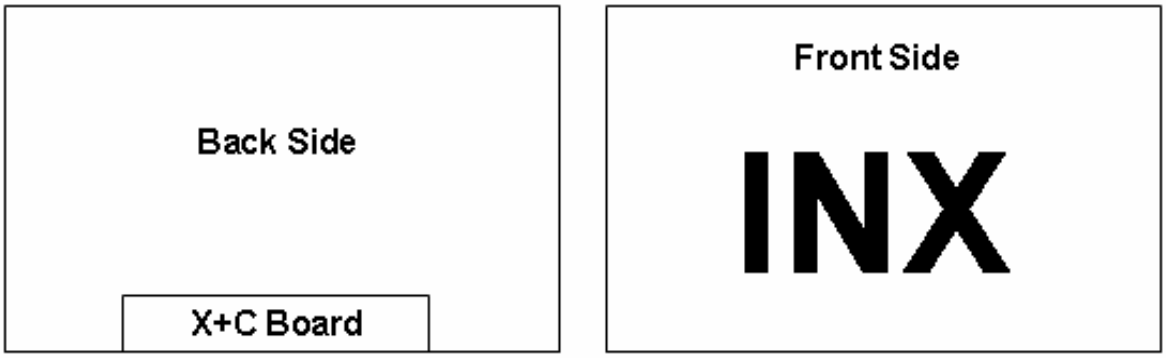
M270KCJ-L5B is a 27.0” TFT Liquid Crystal Display MNT module with WLED Backlight unit and 51 pins and 41 pins 4ch-LVDS interface.. This module supports 2560 x 1440 QHD mode and can display up to 16.7M colors. The converter module for Backlight is not built in.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	27.0” real diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	2560 x R.G.B. x 1440	pixel	-
Pixel Pitch	0.2331 (H) x 0.2331 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M (8bit)	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-
Luminance, White	350	Cd/m2	
Color Gamut	95% of DCI-P3(Typ)& 100% sRGB	-	-
Display Orientation	Signal input with “ INX”		(2)
RoHS,Halogen Free &TCO 6.0	RoHS, Halogen Free TCO 7.0 compliance		
Power Consumption	Total (31.1) W (Max.) @ cell (3.5) W (Max.), BL (27.6) W (Max.)		(1)

Note (1) The specified power consumption : Total= cell (reference 4.3.1)+BL (reference 4.3.3)

Note (2)



Note (3) Based on Coverage of DCI-P3/ sRGB color space on CIE -1976 system

2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	608.3	608.8	609.8	mm	(1)
	Vertical (V)	354.53	355.13	356.13	mm	
	Thickness (T)	12.3	12.8	13.8	mm	
Bezel Area	Horizontal	NA	NA	NA	mm	
	Vertical	NA	NA	NA	mm	
Active Area	Horizontal	-	596.736	-	mm	
	Vertical	-	335.664	-	mm	
Weight		2580	2870	3010	g	

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

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)

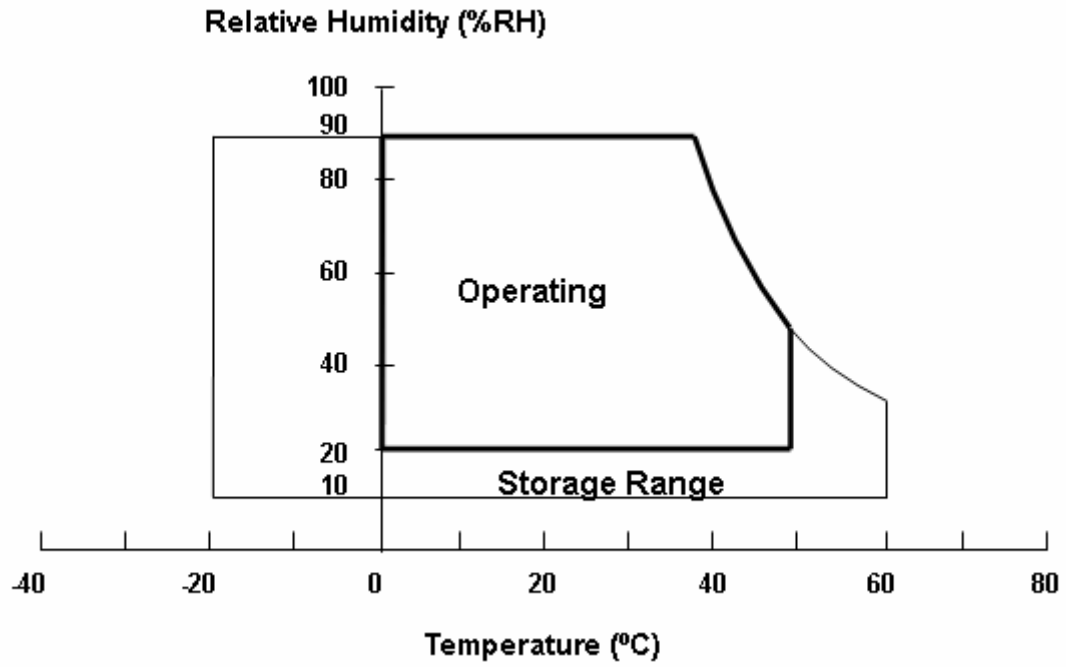
Note (1)

(a) 90 %RH Max.

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

(c) No condensation.

Note (2) Panel surface temperature should be 0℃ min. and 65℃ max under Vcc=10.0V, fr =60Hz, typical LED string current, 25℃ ambient temperature, and no humidity control . Any condition of ambient operating temperature ,the surface of active area should be keeping not higher than 65℃.



3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	6.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	3.6	V	

3.2.2 BACKLIGHT UNIT

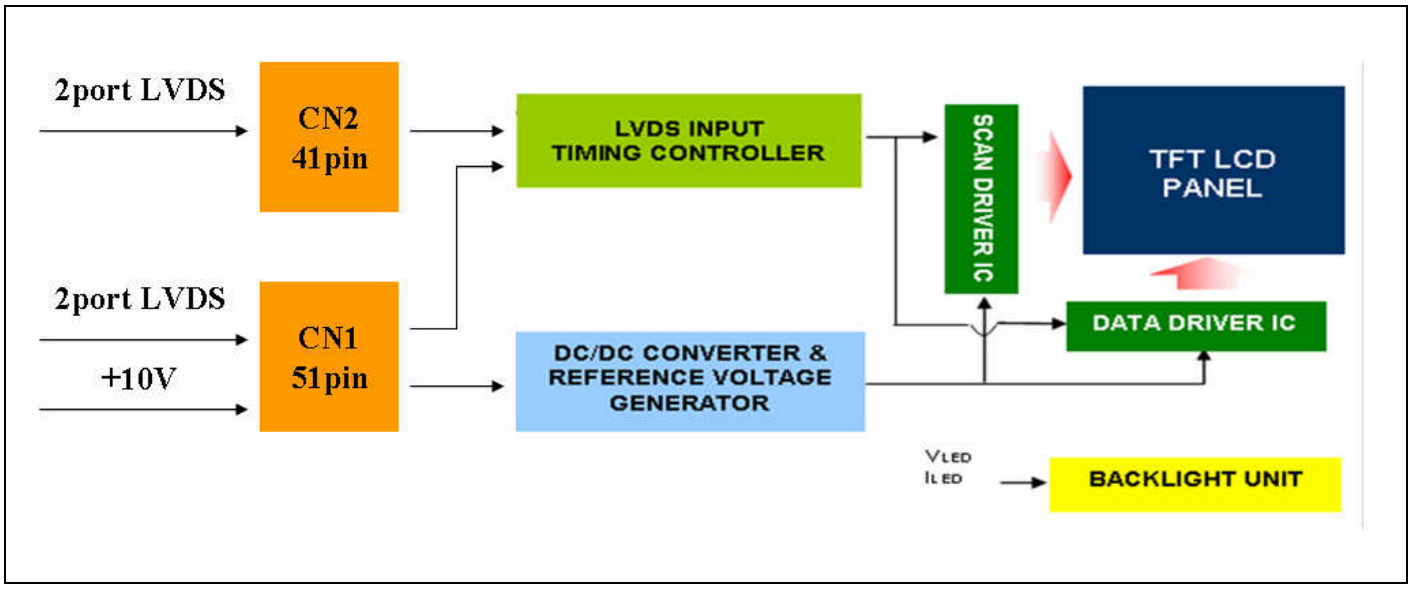
Item	Symbol	Value			Unit	Note
		Min.	Typ	Max.		
LED Forward Current Per Input Pin	I_F	0	(190)	(200)	mA	(1), (2) Duty=100%
LED Reverse Voltage Per Input Pin	V_R	---	---	---	V	
LED Pulse Forward Current Per Input Pin	I_P	---	---	500	mA	(1), (2) Pulse Width≦10msec. and Duty≦10%

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 input pin of LED light bar at Ta=25±2 ℃ (Refer to 4.3.3 and 4.3.4 for further information).

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT (CN1：51pins)

Pin	Name	Description
1	NC	For LCD internal use only, Do not connect
2	NC	For LCD internal use only, Do not connect
3	NC	For LCD internal use only, Do not connect
4	NC	For LCD internal use only, Do not connect
5	NC	For LCD internal use only, Do not connect
6	NC	For LCD internal use only, Do not connect
7	NC	For LCD internal use only, Do not connect
8	NC	For LCD internal use only, Do not connect
9	NC	For LCD internal use only, Do not connect
10	NC	For LCD internal use only, Do not connect
11	GND	Ground
12	ALV0N	1st LVDS Receiver Signal(0-)
13	ALV0P	1st LVDS Receiver Signal(0+)
14	ALV1N	1st LVDS Receiver Signal(1-)
15	ALV1P	1st LVDS Receiver Signal(1+)
16	ALV2N	1st LVDS Receiver Signal(2-)
17	ALV2P	1st LVDS Receiver Signal(2+)
18	GND	Ground
19	ALVCKN	1st LVDS Receiver Signal(CLK-)
20	ALVCKP	1st LVDS Receiver Signal(CLK+)
21	GND	Ground
22	ALV3N	1st LVDS Receiver Signal(3-)
23	ALV3P	1st LVDS Receiver Signal(3+)
24	NC	For LCD internal use only, Do not connect
25	NC	For LCD internal use only, Do not connect
26	NC	For LCD internal use only, Do not connect
27	NC	For LCD internal use only, Do not connect
28	BLV0N	2nd LVDS Receiver Signal(0-)
29	BLV0P	2nd LVDS Receiver Signal(0+)
30	BLV1N	2nd LVDS Receiver Signal(1-)
31	BLV1P	2nd LVDS Receiver Signal(1+)
32	BLV2N	2nd LVDS Receiver Signal(2-)
33	BLV2P	2nd LVDS Receiver Signal(2+)
34	GND	Ground
35	BLVCKN	2nd LVDS Receiver Signal(CLK-)
36	BLVCKP	2nd LVDS Receiver Signal(CLK+)
37	GND	Ground
38	BLV3N	2nd LVDS Receiver Signal(3-)
39	BLV3P	2nd LVDS Receiver Signal(3+)
40	NC	For LCD internal use only, Do not connect
41	NC	For LCD internal use only, Do not connect
42	NC	For LCD internal use only, Do not connect
43	NC	For LCD internal use only, Do not connect
44	GND	Ground
45	GND	Ground
46	GND	Ground
47	NC	For LCD internal use only, Do not connect
48	VIN(10V)	+10.0V power supply
49	VIN(10V)	+10.0V power supply

Pin	Name	Description
50	VIN(10V)	+10.0V power supply
51	VIN(10V)	+10.0V power supply

Connector Information

Item	Description
Manufacturer	P-TWO(禾昌) or FCN(全康)
Type part number	P-TWO: 187060-41221+ P-TWO: 187059-51221or FCN: WF23-400-413C+WF23-402-5133
User's Mating housing part number	FI-RE51HL(JAE) or compatible

PIN ASSIGNMENT (CN2：41pins)

Pin	Name	Description
1	NC	For LCD internal use only, Do not connect
2	NC	For LCD internal use only, Do not connect
3	NC	For LCD internal use only, Do not connect
4	NC	For LCD internal use only, Do not connect
5	NC	For LCD internal use only, Do not connect
6	NC	For LCD internal use only, Do not connect
7	NC	For LCD internal use only, Do not connect
8	NC	For LCD internal use only, Do not connect
9	GND	Ground
10	CLV0N	3rd LVDS Receiver Signal(0-)
11	CLV0P	3rd LVDS Receiver Signal(0+)
12	CLV1N	3rd LVDS Receiver Signal(1-)
13	CLV1P	3rd LVDS Receiver Signal(1+)
14	CLV2N	3rd LVDS Receiver Signal(2-)
15	CLV2P	3rd LVDS Receiver Signal(2+)
16	GND	Ground
17	CLVCKN	3rd LVDS Receiver Signal(CLK-)
18	CLVCKP	3rd LVDS Receiver Signal(CLK+)
19	GND	Ground
20	CLV3N	3rd LVDS Receiver Signal(3-)
21	CLV3P	3rd LVDS Receiver Signal(3+)
22	NC	For LCD internal use only, Do not connect
23	NC	For LCD internal use only, Do not connect
24	GND	Ground
25	GND	Ground
26	DLV0N	4th LVDS Receiver Signal(0-)
27	DLV0P	4th LVDS Receiver Signal(0+)
28	DLV1N	4th LVDS Receiver Signal(1-)
29	DLV1P	4th LVDS Receiver Signal(1+)
30	DLV2N	4th LVDS Receiver Signal(2-)
31	DLV2P	4th LVDS Receiver Signal(2+)
32	GND	Ground
33	DLVCKN	4th LVDS Receiver Signal(CLK-)
34	DLVCKP	4th LVDS Receiver Signal(CLK+)
35	GND	Ground
36	DLV3N	4th LVDS Receiver Signal(3-)
37	DLV3P	4th LVDS Receiver Signal(3+)
38	NC	For LCD internal use only, Do not connect
39	NC	For LCD internal use only, Do not connect
40	GND	Ground

Pin	Name	Description
41	GND	Ground

Connector Information

Item	Description
Manufacturer	P-TWO(禾昌) or FCN(全康)
Type part number	P-TWO: 187060-41221+ P-TWO: 187059-51221or FCN: WF23-400-413C+WF23-402-5133
User's Mating housing part number	FI-RE41HL(JAE) or compatible

*Notice：There would be compatible issues if not using the indicated connectors in the matching list.

Note (1) LVDS 4-port Data Mapping.

Port	Channel of LVDS	Data Stream
1st Port	First Pixel	1,5,9,……2553,2557
2nd Port	Second Pixel	2,6,10,……2554,2558
3rd Port	Third Pixel	3,7,11,……2555,2559
4th Port	Fourth Pixel	4,8,12,……2556,2560

Note (2) Input signal of 4port LVDS clock should be the same timing.

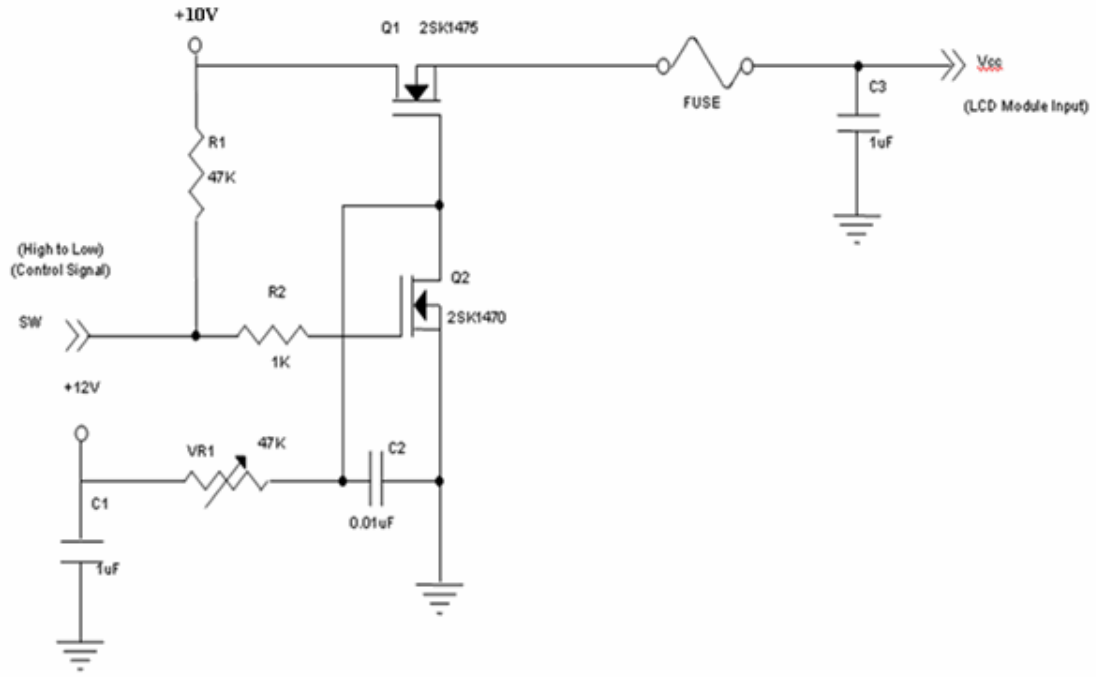
4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

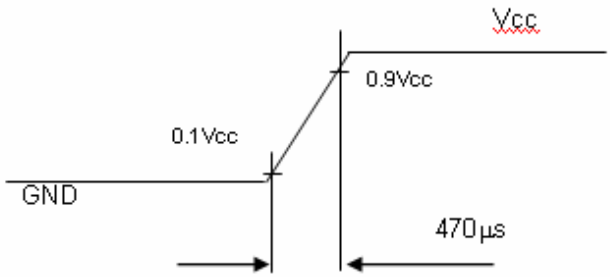
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	9	10	11	V	-
Ripple Voltage		V_{RP}			300	mV	-
Rush Current		I_{RUSH}			3	A	(2)
Power Supply Current	White			0.41	0.48	A	(3)a
	Black			0.40	0.47	A	(3)b
	Vertical Stripe			0.46	0.57	A	(3)c
Power Consumption		PLCD		4.6	5.7	Watt	(4)
LVDS differential input voltage		Vid	100			mV	
LVDS common input voltage		Vic	1.0	1.2	1.4	V	
Logic High Input Voltage		VIH			+100	V	
Logic Low Input Voltage		VIL	-100			V	

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

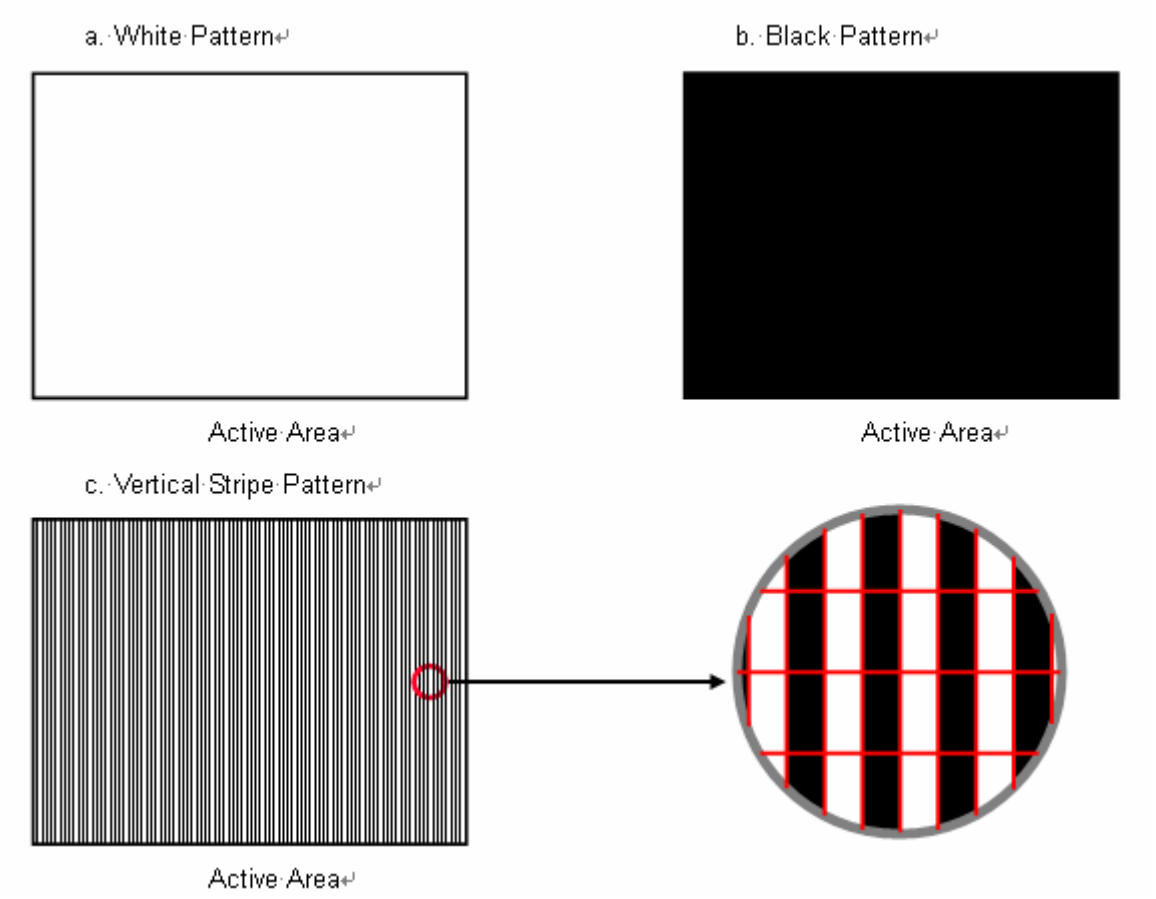
Note (2) Measurement Conditions:



Vcc rising time is 470µs

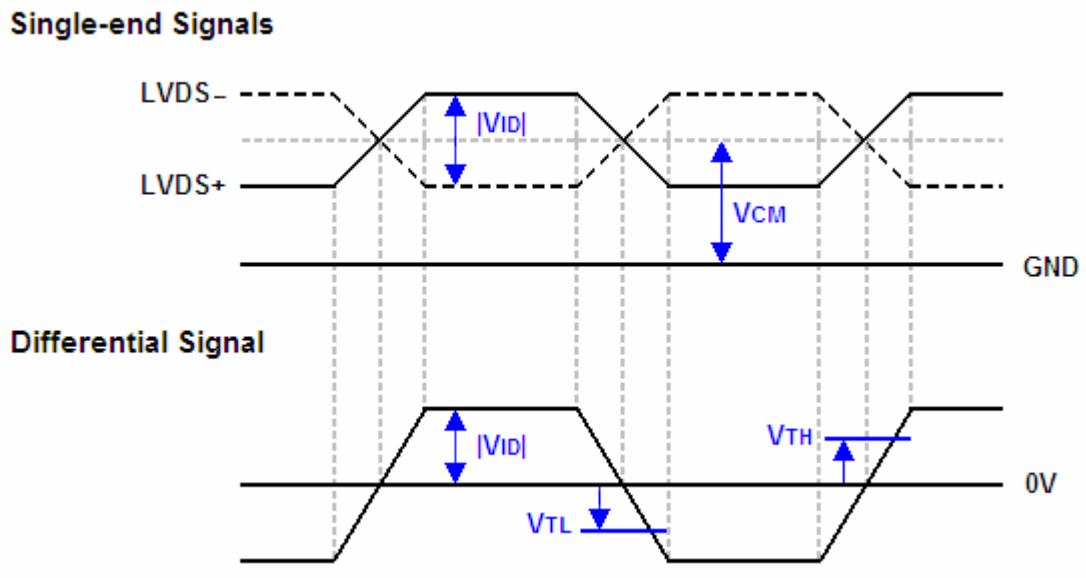


Note (3) The specified power supply current is under the conditions at Vcc = 10.0 V, Ta = 25 ± 2 ºC, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.

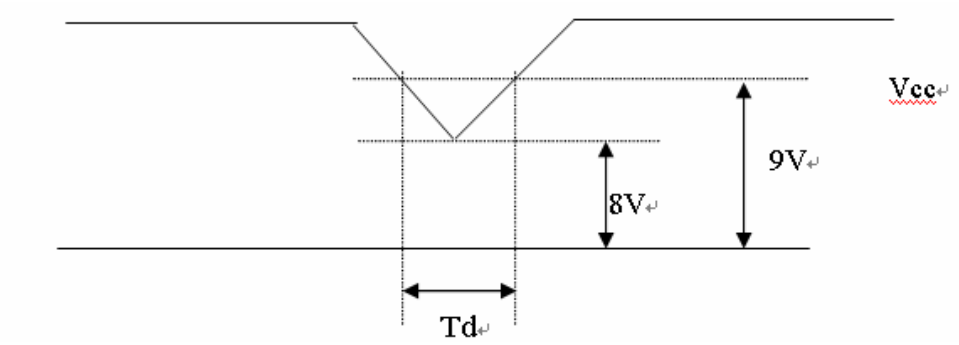


Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) VID waveform condition



4.3.2 VCC POWER DIP CONDITION



Dip condition:8V≦Vcc≦9V, Td≦20ms

4.3.3 BACKLIGHT UNIT

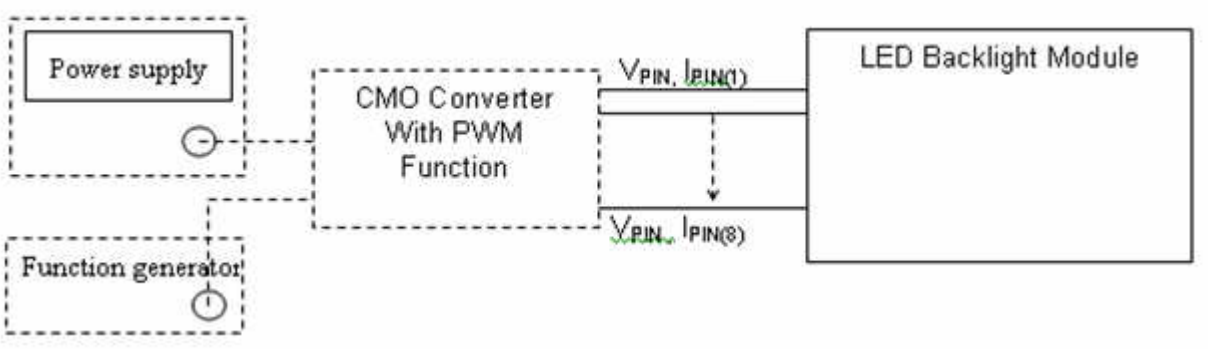
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	VPIN	(29)	(32.1)	(36.3)	V	(1), Duty=100%, IPIN=190mA
LED Light Bar Current Per Input Pin	IPIN	0	(190)	(200)	mA	(1), (2) Duty=100%
LED Life Time	LLED	30000			Hrs	(3)
Power Consumption	PBL	---	(24.4)	(27.6)	W	(1) Duty=100%, IPIN=190mA

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note (2) PBL = IPIN × VPIN × (4) input pins ,

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25 ±2 ℃ and I= (95)mA (per chip) until the brightness becomes ≦ 50% of its original value.

Note (4) The module must be operated with constant driving current.

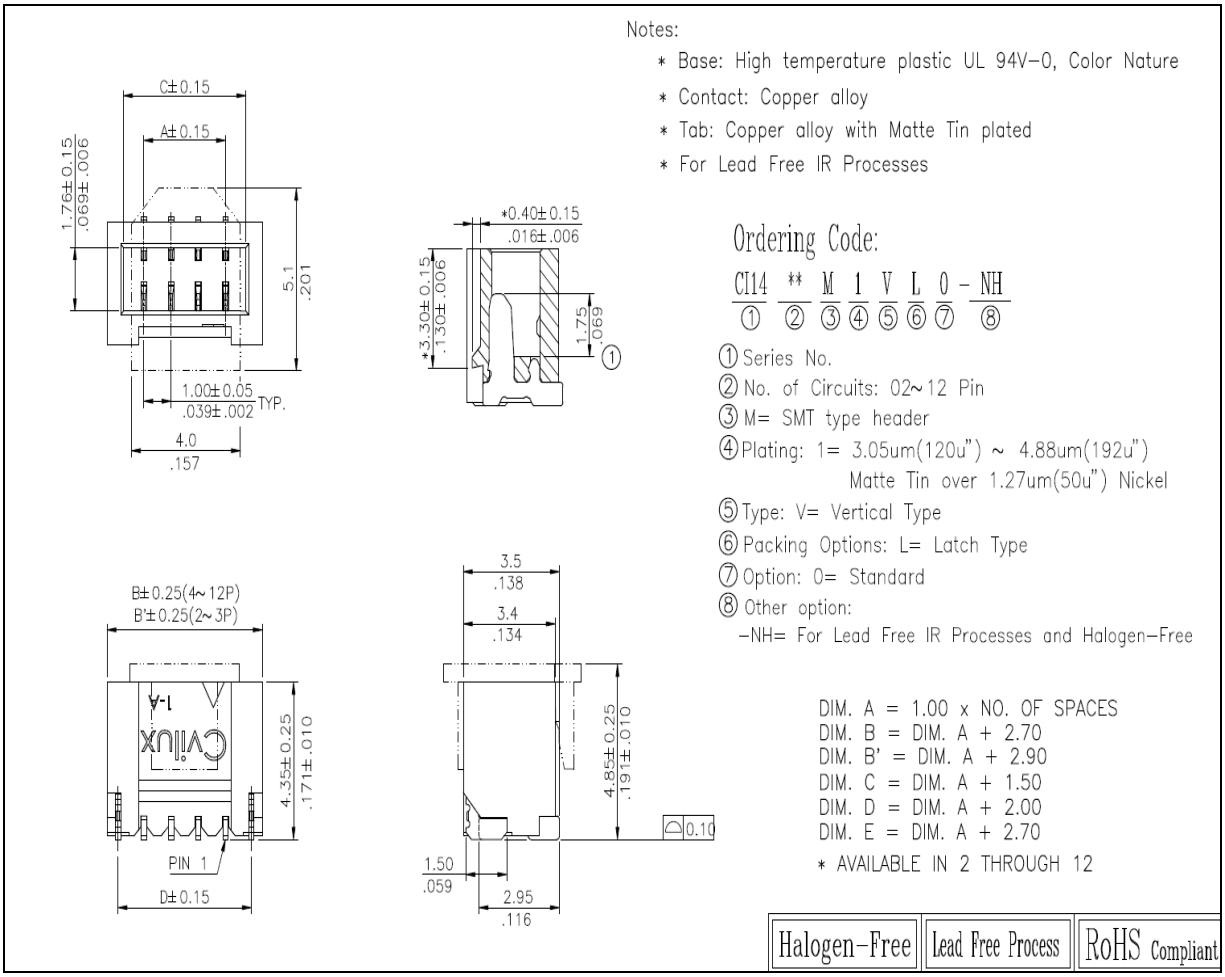


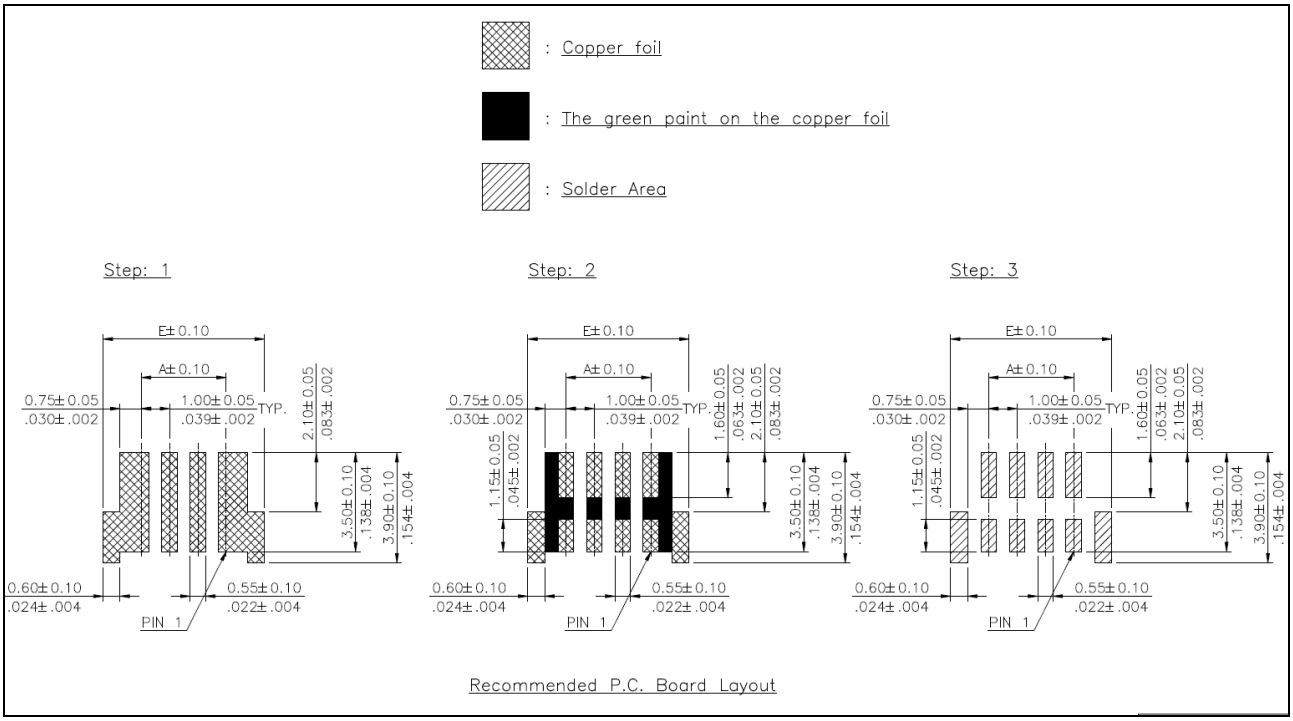
4.3.4 LIGHTBAR CONNECTOR PIN ASSIGNMENT

Connector:

Note(1) Connector(wire type): CviLux(CI1406M1VL0-NH)or equivalent.

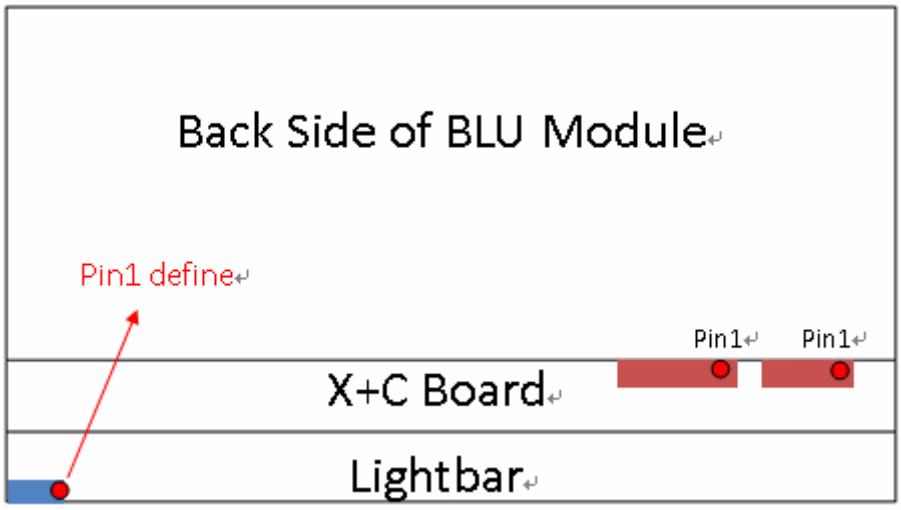
Note(2) User's mating connector part No.: FCN(WF1300106-B) or CviLux(CI1406SL000-NH) and hook width must be less than 4.5mm.





CN1

Pin number	Description
1	Cathode of LED string
2	Cathode of LED string
3	VLED
4	VLED
5	Cathode of LED string
6	Cathode of LED string



4.4 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 LVDS DATA MAPPING TABLE

LVDS Channel ALV0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	1G0	1R5	1R4	1R3	1R2	1R1	1R0
LVDS Channel ALV1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	1B1	1B0	1G5	1G4	1G3	1G2	1G1
LVDS Channel ALV2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	1B5	1B4	1B3	1B2
LVDS Channel ALV3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	1B7	1B6	1G7	1G6	1R7	1R6
LVDS Channel BLV0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	2G0	2R5	2R4	2R3	2R2	2R1	2R0
LVDS Channel BLV1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	2B1	2B0	2G5	2G4	2G3	2G2	2G1
LVDS Channel BLV2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	2B5	2B4	2B3	2B2
LVDS Channel BLV3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	2B7	2B6	2G7	2G6	2R7	2R6
LVDS Channel CLV0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	3G0	3R5	3R4	3R3	3R2	3R1	3R0
LVDS Channel CLV1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	3B1	3B0	3G5	3G4	3G3	3G2	3G1
LVDS Channel CLV2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	3B5	3B4	3B3	3B2
LVDS Channel CLV3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	3B7	3B6	3G7	3G6	3R7	3R6
LVDS Channel DLV0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	4G0	4R5	4R4	4R3	4R2	4R1	4R0
LVDS Channel DLV1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	4B1	4B0	4G5	4G4	4G3	4G2	4G1
LVDS Channel DLV2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	4B5	4B4	4B3	4B2
LVDS Channel DLV3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	4B7	4B6	4G7	4G6	4R7	4R6

4.4.2 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	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:		:		:		:		:	:	:			:		:	:	:	:	
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	:0	0	0	0	0	0	0	0	0	0	0	0	:0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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

4.5 DISPLAY TIMING SPECIFICATIONS

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

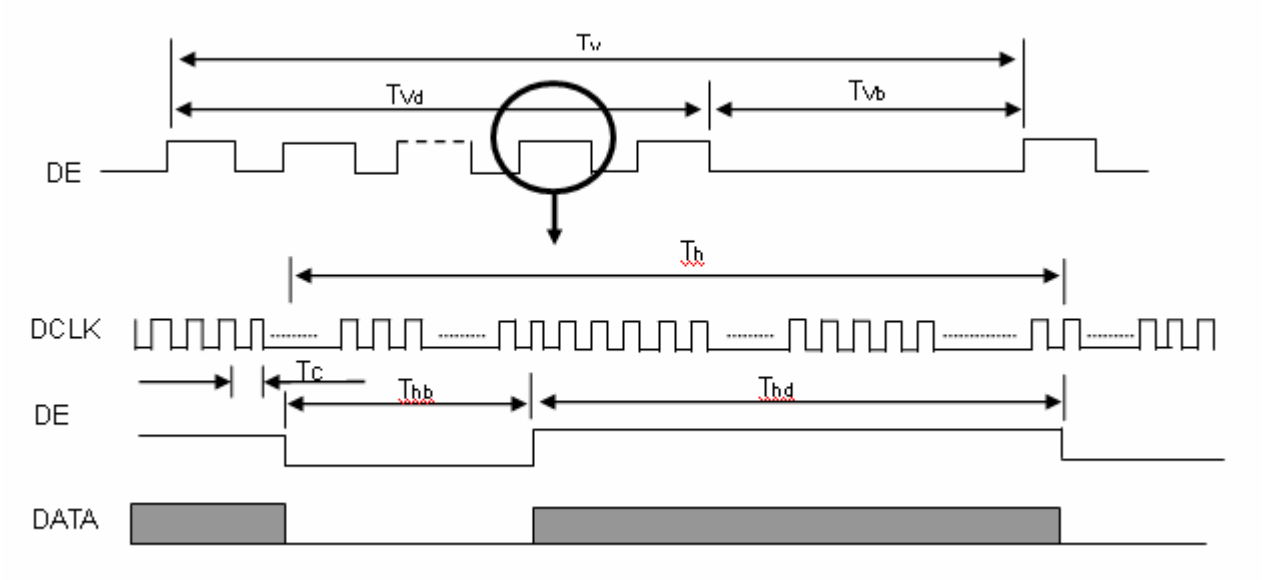
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	47.35	62.02	78.07	MHz	-
	Period	Tc	-	16.12	-	ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*Tc	-	0.02*Tc	ns	(1)
	Input Clock to data skew	TLVCCS	-0.02*Tc	-	0.02*Tc		(2)
	Spread spectrum modulation range	Fclkin_mod	0.97*Fc	-	1.03*Fc	MHz	(3)
	Spread spectrum modulation frequency	F_{SSM}	-	-	100	KHz	
Vertical Display Term	Frame Rate	Fr	46	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	1479	1481	1887	Th	-
	Active Display	Tvd	1440	1440	1440	Th	-
	Blank	Tvb	39	41	47	Th	-
Horizontal Display Term	Total	Th	696	698	700	Tc	Th=Thd+Thb
	Active Display	Thd	640	640	640	Tc	-
	Blank	Thb	56	58	60	Tc	-

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

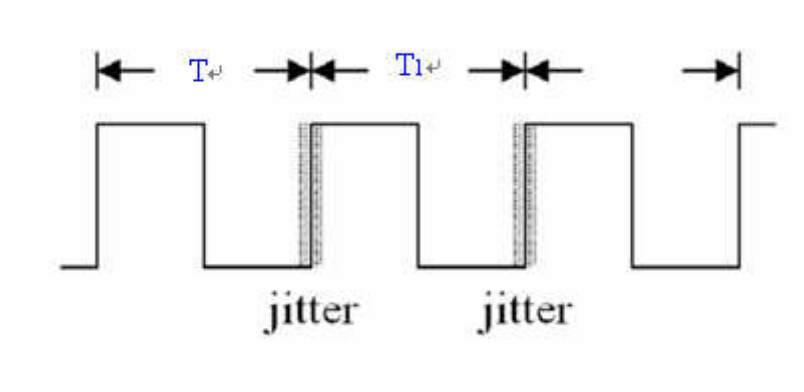
Fc = Fr X Tv X Th

Please make sure the range of pixel clock has follow the below equation and Fc, Fr, Tv , Th not allowed to get beyond the min or max spec.

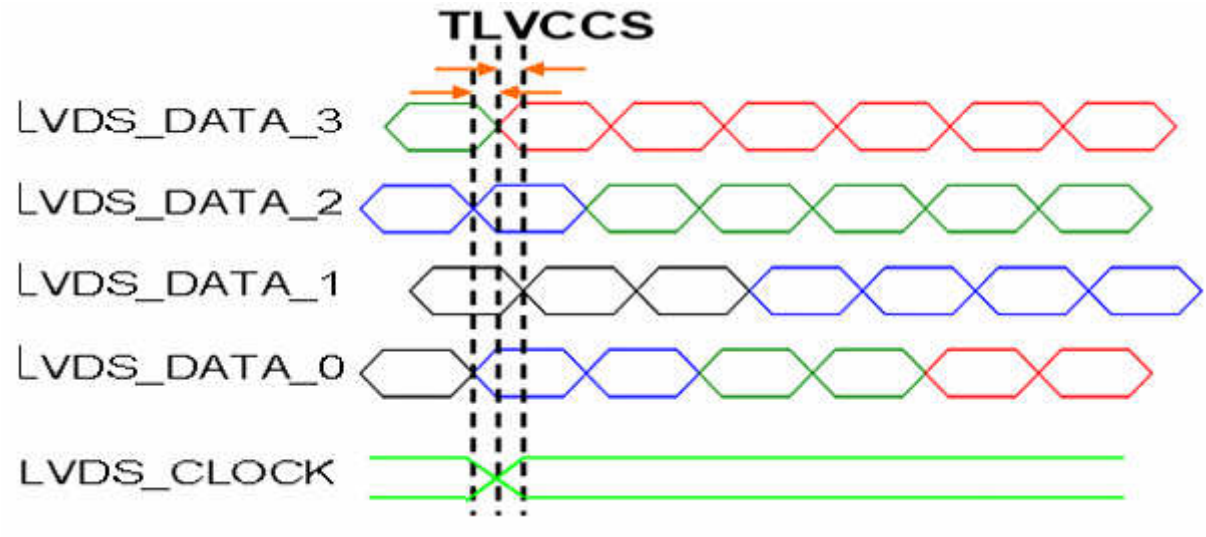
INPUT SIGNAL TIMING DIAGRAM



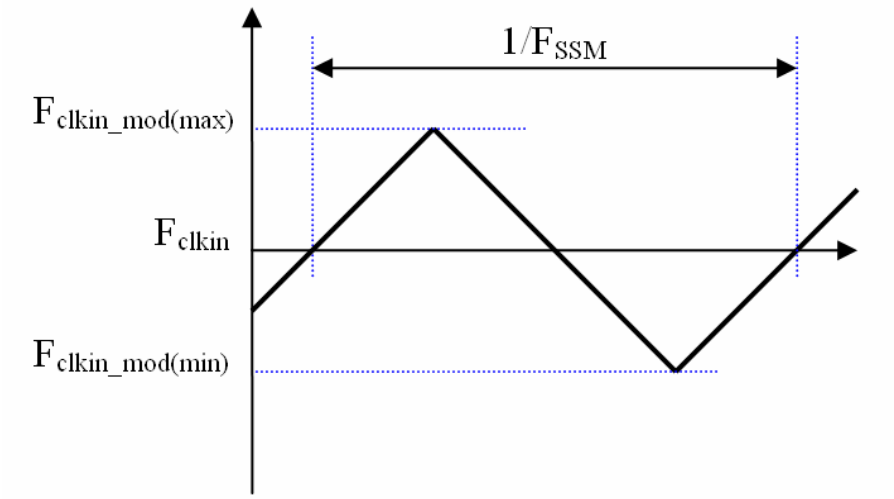
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI



Note (2) Input Clock to data skew is defined as below figures.



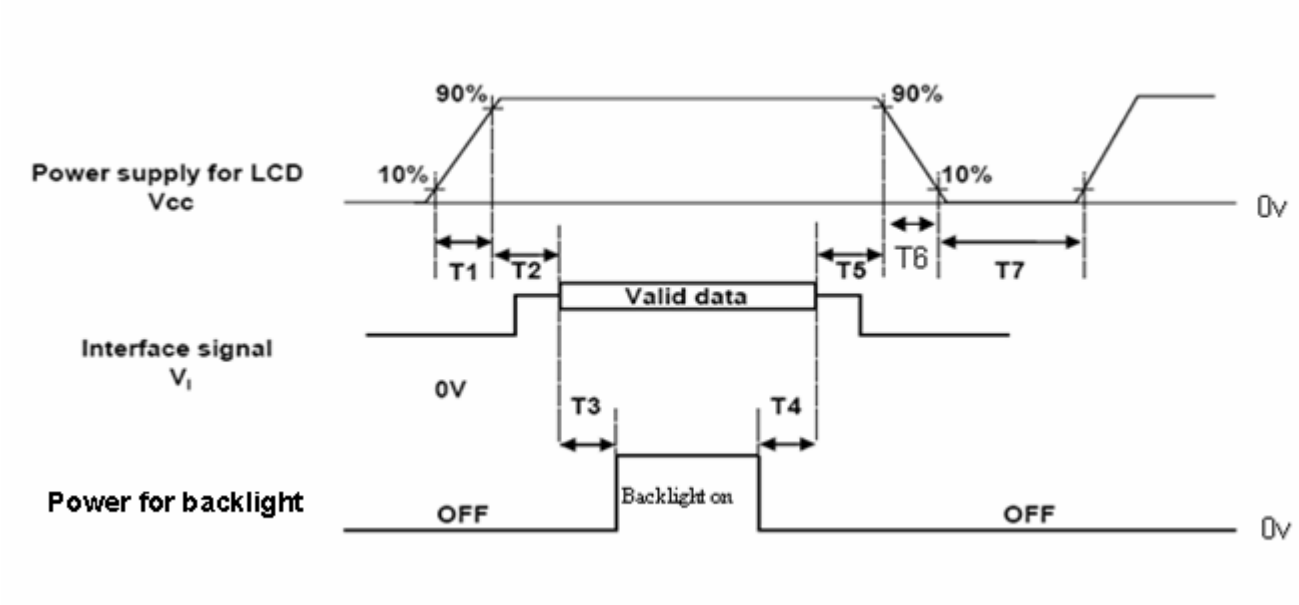
Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (4) The DCLK range at last line of V-blank should be set in 0 to Hdisplay/2

4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram**.**



Timing Specifications:

Parameters	Values			Units
	Min	Typ.	Max	
T1	0.5	-	10	ms
T2	0	30	50	ms
T3	450	-	-	ms
T4	100	250	-	ms
T5	0	20	50	ms
T6	0.1	-	100	ms
T7	1000	-	-	ms

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) INX won’ t take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".

5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

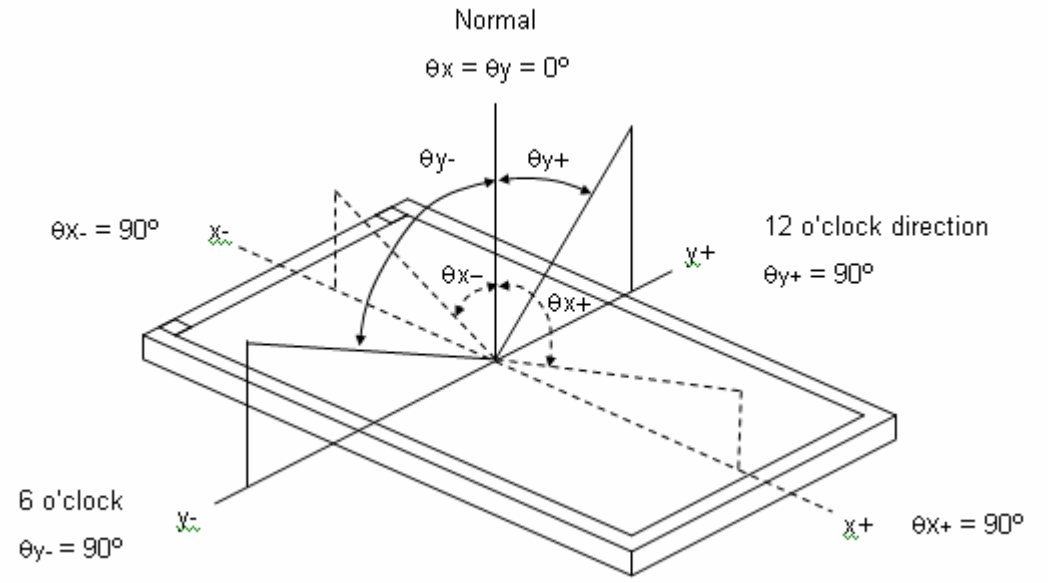
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	10	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	I_{PIN}	190 ± 1.2	mA_{DC}
PWM Duty Ratio	D	100	%
LED Light Bar Test Converter	INX 27-D041745		

5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rx	θ_x=0°, θ_Y =0° CS-2000 R=G=B=255 Gray scale	Typ – 0.03	(0.678)	Typ + 0.03	-	(1), (5)
		Ry			(0.310)			
	Green	Gx			(0.267)			
		Gy			(0.663)			
	Blue	Bx			(0.146)			
		By			(0.056)			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White (Center of Screen)		L_C		250	350	-	cd/m^2	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	(8)	(13)	ms	(3)
		T_F		-	(7)	(12)		
White Variation		W	θ_x=0°, θ_Y =0°	75	-	-	%	(5), (6)
Viewing Angle	Horizontal	θx- + θx+	CR ≧ 10	(170)	(178)	-	Deg.	(1), (5)
	Vertical	θy- + θy+		(170)	(178)	-		

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



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

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

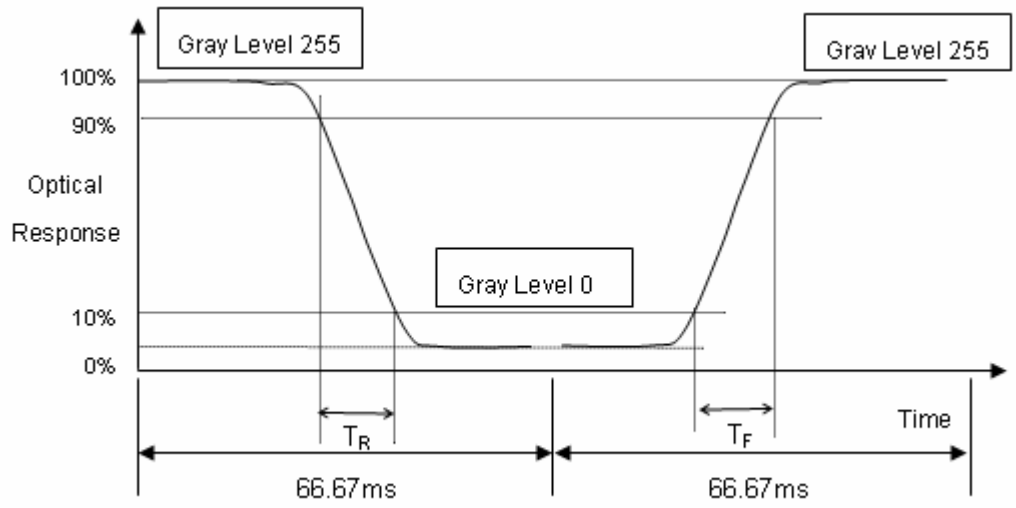
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (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):

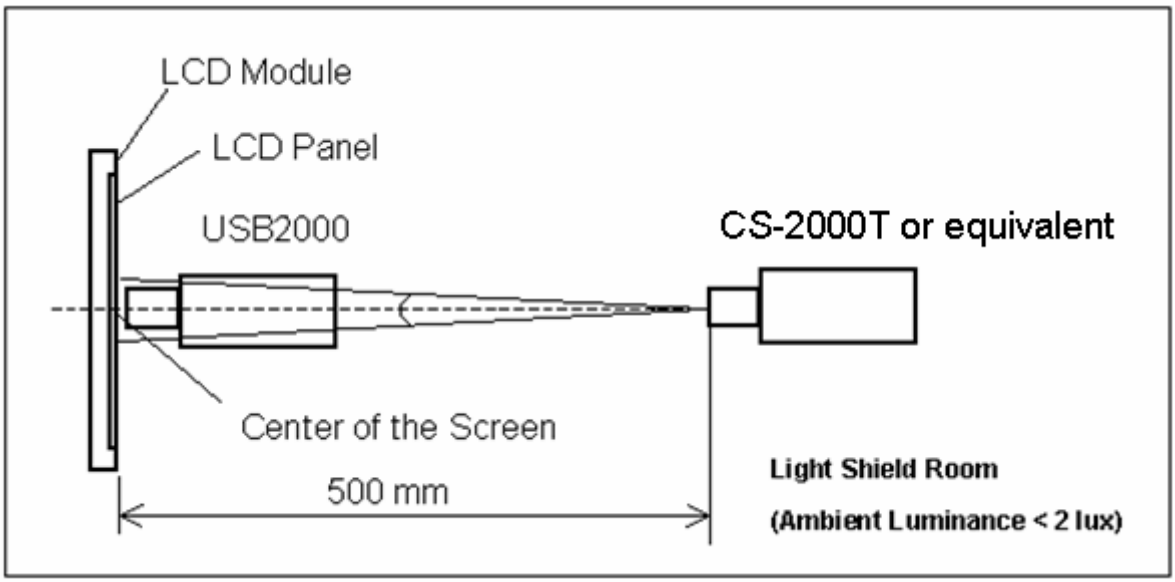
Measure the luminance of gray level 255 at center point

L_C = L (5)

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

Note (5) Measurement Setup:

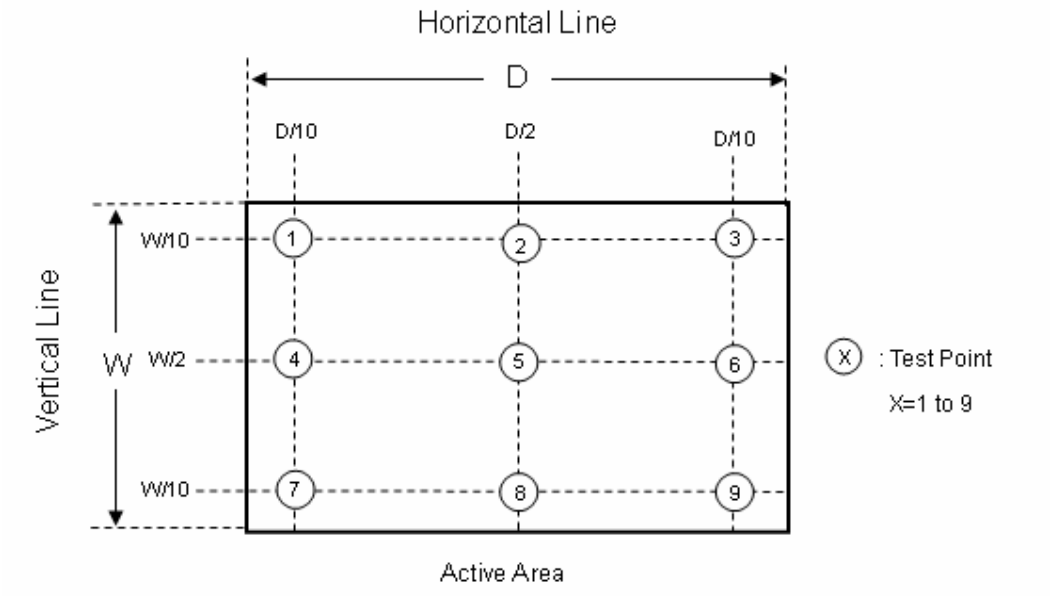
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



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

Measure the luminance of gray level 255 at 9 points

δW = (Minimum [L (1) ~ L (9)] / Maximum [L (1) ~ L (9)]) *100%



6. RELIABILITY TEST ITEM

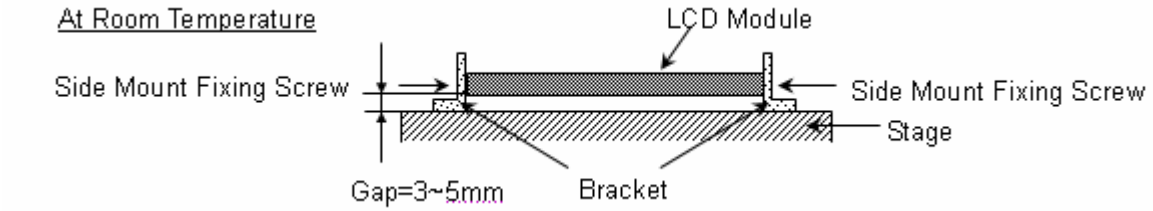
Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃ , 80%RH, 240hours	
High Temperature Operation (HTO)	Ta= 50℃ , 240hours	
Low Temperature Operation (LTO)	Ta= 0℃ , 240hours	
High Temperature Storage (HTS)	Ta= 60℃ , 240hours	
Low Temperature Storage (LTS)	Ta= -20℃ , 240hours	
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: sine Frequency: 10 - 300 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 11 ms Direction : ± X, ± Y, ± Z.(one time for each Axis)	
Thermal Shock Test (TST)	-20℃/30min , 60℃ / 30min , 100 cycles	
On/Off Test	25℃ ,On/10sec , Off /10sec , 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω)	
	Air Discharge: ± 15KV, 150pF(330Ω)	
Altitude Test	Operation:10,000 ft / 24hours Non-Operation:30,000 ft / 24hours	

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hour

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.

The fixing condition is shown as below:



7. MECHANICAL STRENGTH CHARACTERISTICS

7.1 MECHANICAL STRENGTH SPECIFICATIONS

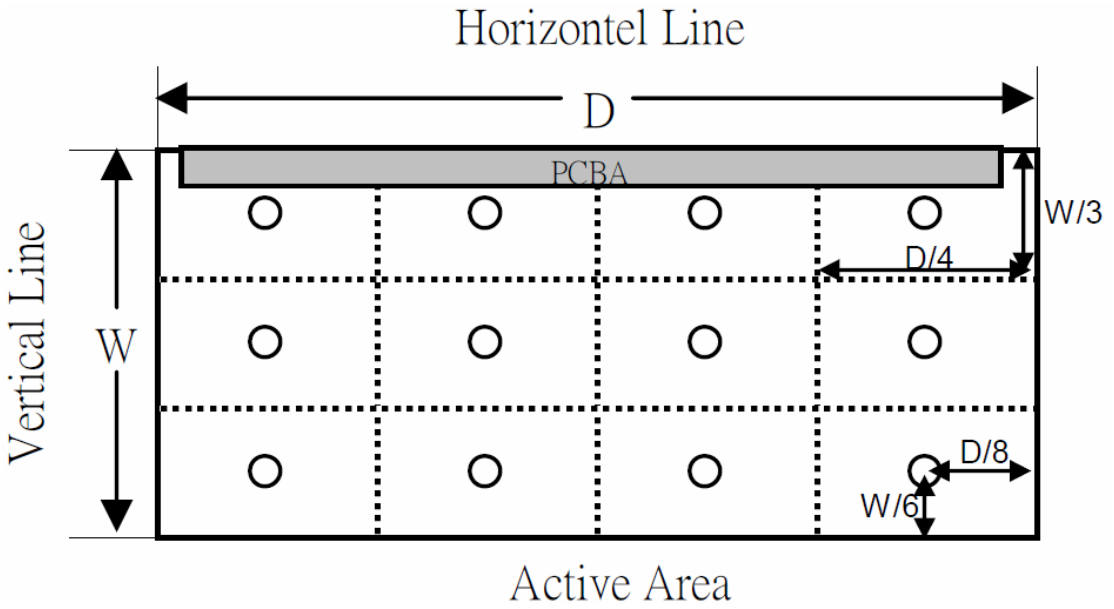
Item	Condition	Min	Unit	Note
Mechanical Strength	128th Gray Pattern	0.6	Kgf	

7.2 TEST CONDITIONS

Items	Description
Test Condition	1. Ambient Illumination : 10~15 lux 2. Test Pattern : 128 Gray 3. Distance of the judgment : 30cm from the surface of module 4. Viewing angle of the judgment : Front
Gage Information	1. Push pull guage a. Model name : HF-50, maker : ALGOL b. Shape of gage tip - Diameter : 2mm - Thickness : 2mm
Definition of Minimum force	To measure minimum force when operator detects any white spot and light leakage that have occurred while operator presses on back side of module with push pull gage.

7.3 DEFINITION OF TEST POINTS

Measure the minimum force of test points at 128th Gray pattern. The test points at back side of module area is showing as below (If the test points on the PCBA or TP board, these points are not included).



8. PACKING

8.1 PACKING SPECIFICATIONS

(1) 10 LCD modules / 1 Box

(2) Box dimensions: 553(L) X 283(W) X 453(H) mm

(3) Weight: approximately: 35.1kg

8.2 PACKING METHOD

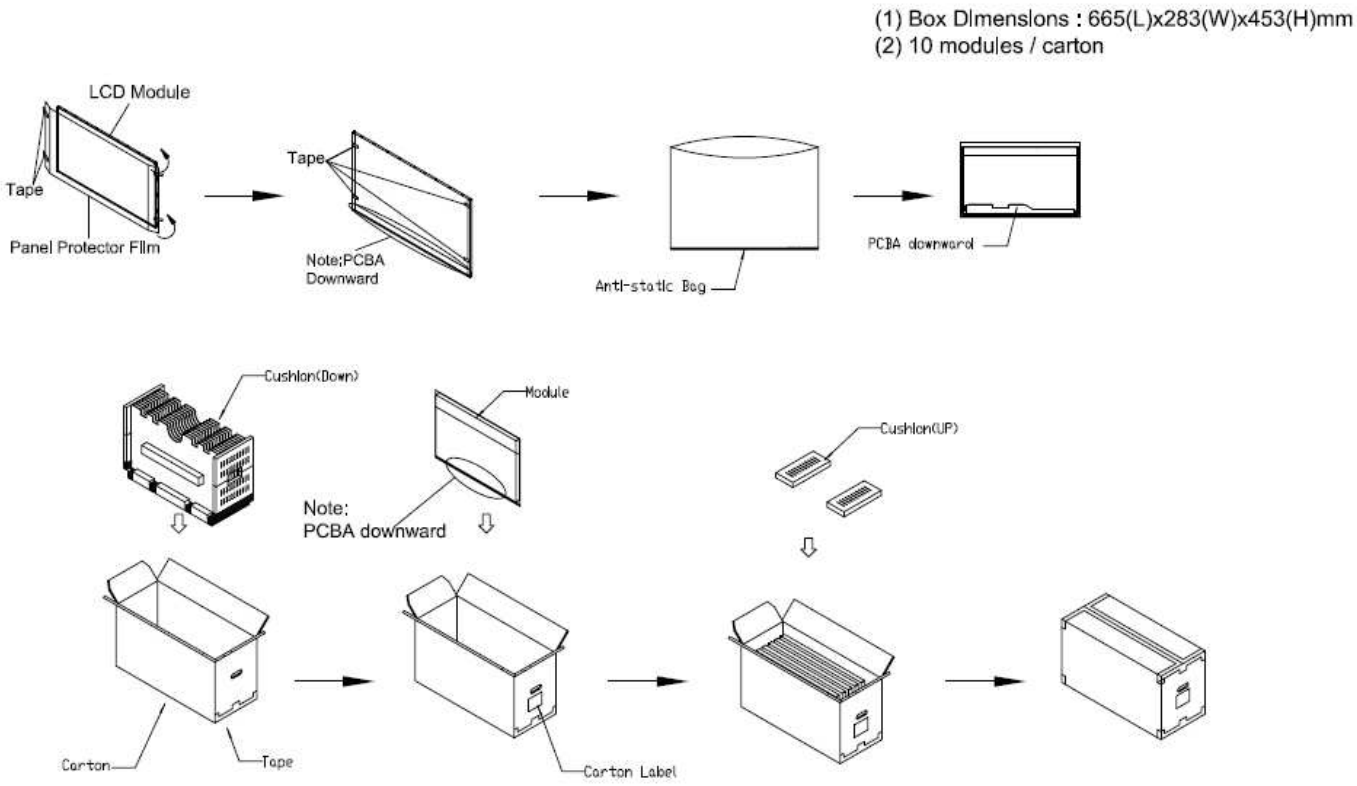
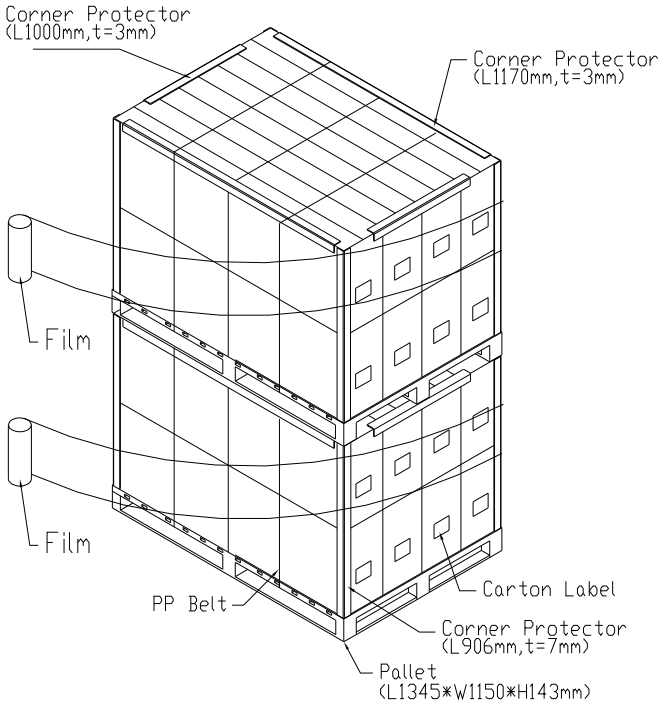


Figure. 8-1 Packing method

8.3 PALLET

Sea / Land Transportation (40ft HQ Container)

Sea / Land Transportation (40ft Container)



Air Transportation

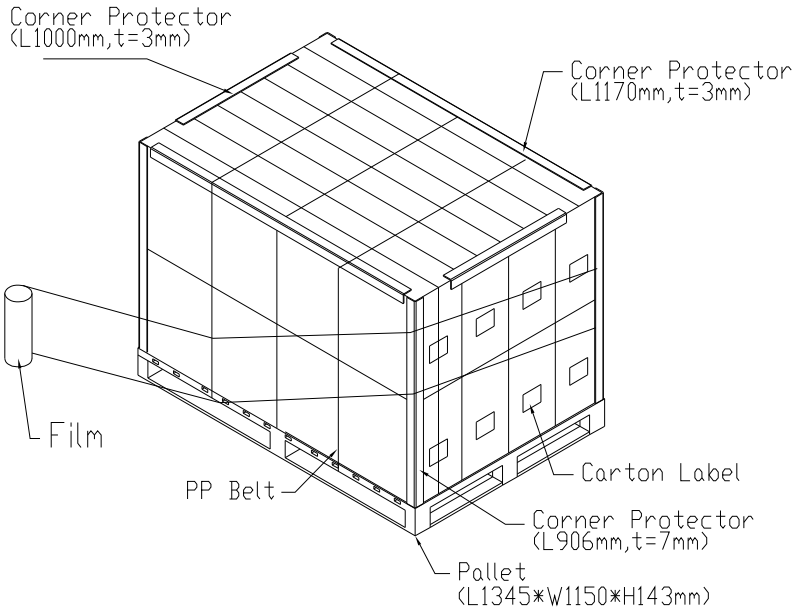


Figure. 8-2 Packing method

8.4 UN-PACKAGING METHOD

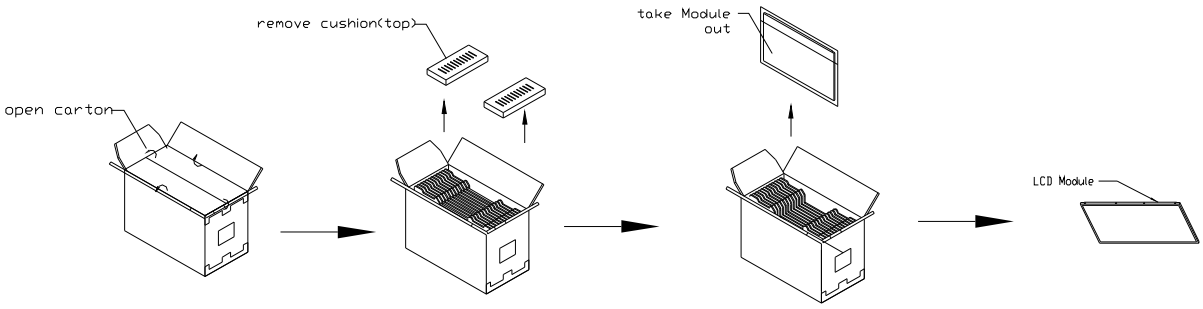
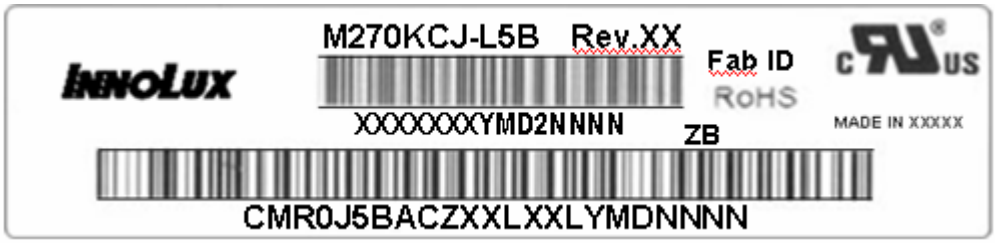


Figure. 8-3 Un-Packing method

9. INX MODULE LABEL

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



(a) Model Name: M270KCJ-L5B

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

(c) INX barcode definition:

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

Code	Meaning	Description
XX	INX internal use	-
XX	Revision	Cover all the change
X	INX internal use	-
XX	INX internal use	-
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3…2010=0, 2011=1, 2012=2… 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	Product line #	Line 1=1, Line 2=2, Line 3=3, …
NNNN	Serial number	Manufacturing sequence of product

(d) Customer's barcode definition:

Serial ID: CM- R0J5B-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	INX=CM
R0J5B	Model number	M270KCJ-L5B= R0J5B
X	Revision code	Non ZBD: 1,2,~,8,9 / ZBD: A~Z
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatek=C, OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M, ILITEK=Q, Fiti=Y, None IC =Z
X	Gate driver IC code	
XX	Cell location	Tainan Taiwan=TN, Ningbo China=CN, Hsinchu Taiwan=SC
L	Cell line #	1,2,~,9,A,B,~,Y,Z
XX	Module location	Tainan, Taiwan=TN ; Ningbo China=NP ; Shenzhen China=SH ; Nanhai China=NH
L	Module line #	1,2,~,9,A,B,~,Y,Z
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=3…2010=0, 2011=1, 2012=2… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	By LCD supplier

(e) FAB ID(UL Factory ID):

Region	Factory ID
TWINX	GEMN
NBCMI	LEOO
NBCMI	VIRO
NBCME	CANO
NHCMI	CAPG

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 10ºC may reduce the display quality. For example, the response time will become slowly.

10.2 STORAGE PRECAUTIONS

(1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0℃ to 35℃ and relative humidity of less than 90%

(2) Do not store the TFT – LCD module in direct sunlight

(3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

10.3 OPERATION PRECAUTIONS

(1) The LCD product should be operated under normal condition.

Normal condition is defined as below :

Temperature : 20±15℃

Humidity: 65±20%

Display pattern : continually changing pattern(Not stationary)

(2) If the product will be used in extreme conditions such as high temperature,high humidity,high altitude ,display pattern or operation time etc…It is strongly recommended to contact INX for application engineering advice . Otherwise , Its reliability and function may not be guaranteed.

10.4 SAFETY PRECAUTIONS

(1) 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.

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

10.5 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

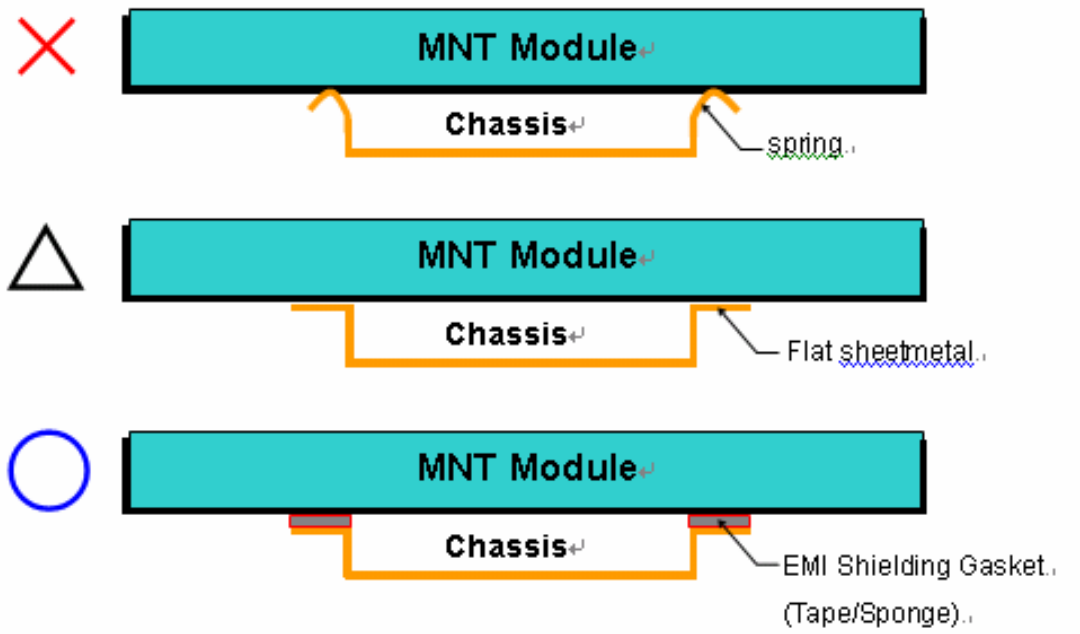
(1) UL60950-1 or updated standard.

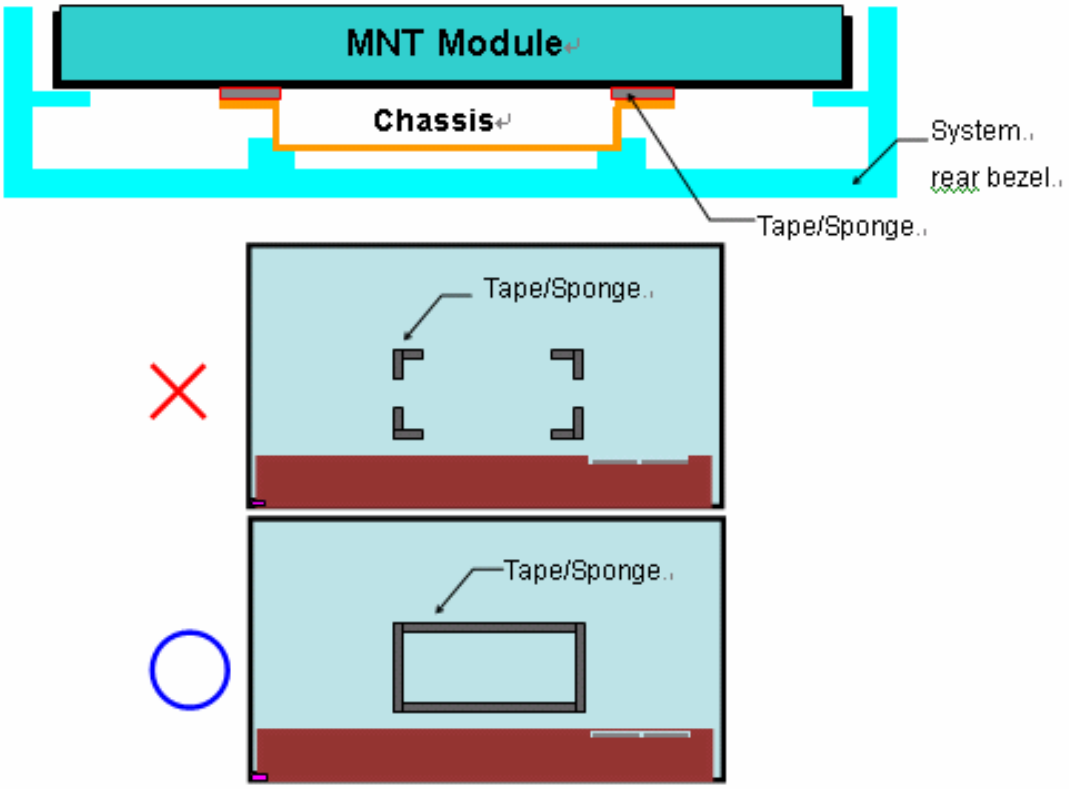
(2) IEC60950-1 or updated standard.

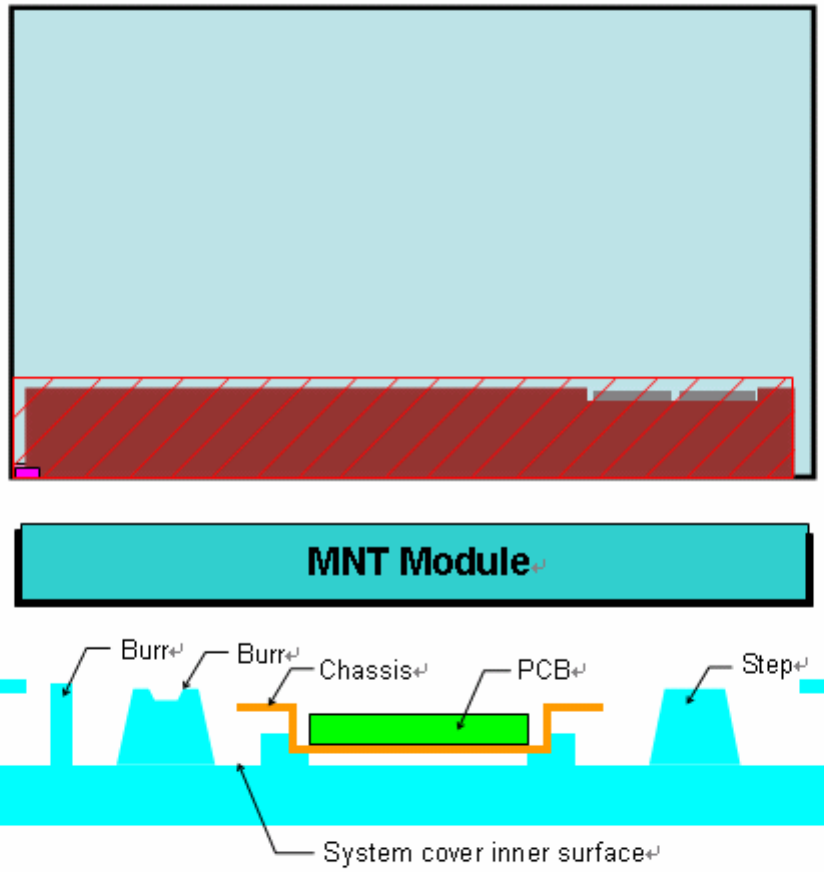
10.6 OTHER

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

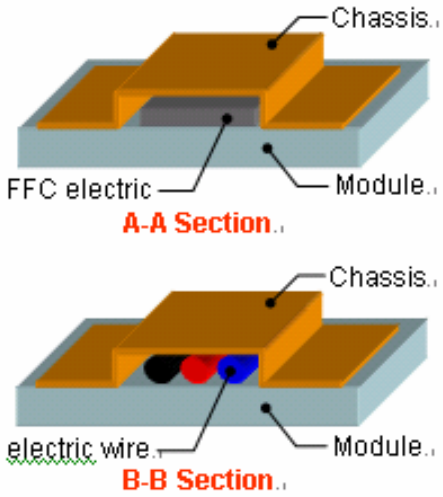
Appendix 1. SYSTEM COVER DESIGN NOTICE

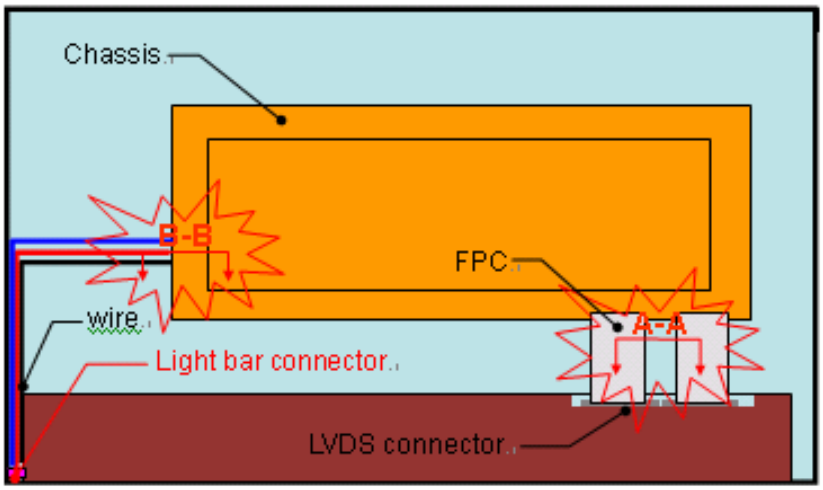
1.	Set Chassis and MNT Module touching Mode
	
Definition	a) To prevent from abnormal display & white spot after Mechanical test, it is not recommended to used spring type chassis. b) We suggest the contact mode between Chassis and Module rear cover is Tape/Sponge, sencond is Flat sheetmetal type chassis.

2.	Tape/sponge design on system inner surface.
	
Definition.	a) To prevent from abnormal display & white spot after Mechanical test, We suggest using Tape/Sponge as medium between chassis and Module rear cover could reduce the occurrence of white spot. b) When using the Tape/Sponge, suggest it be lay over between set chassis and module rear cover. it is not recommended to add tape/sponge in separate location. Since each tape/sponge may act as pressure concentration location.

3	System inner surface examination
禁佈區	
Definition	a). Burr at logo edge, step, protrusion or PCB board will easily cause white spot. b). Keeping flat surface underneath module is recommended. c). The area (▨) on Module PCBA and Light bar connector should keep at least 1mm gap to any structure with System cover inner surface.

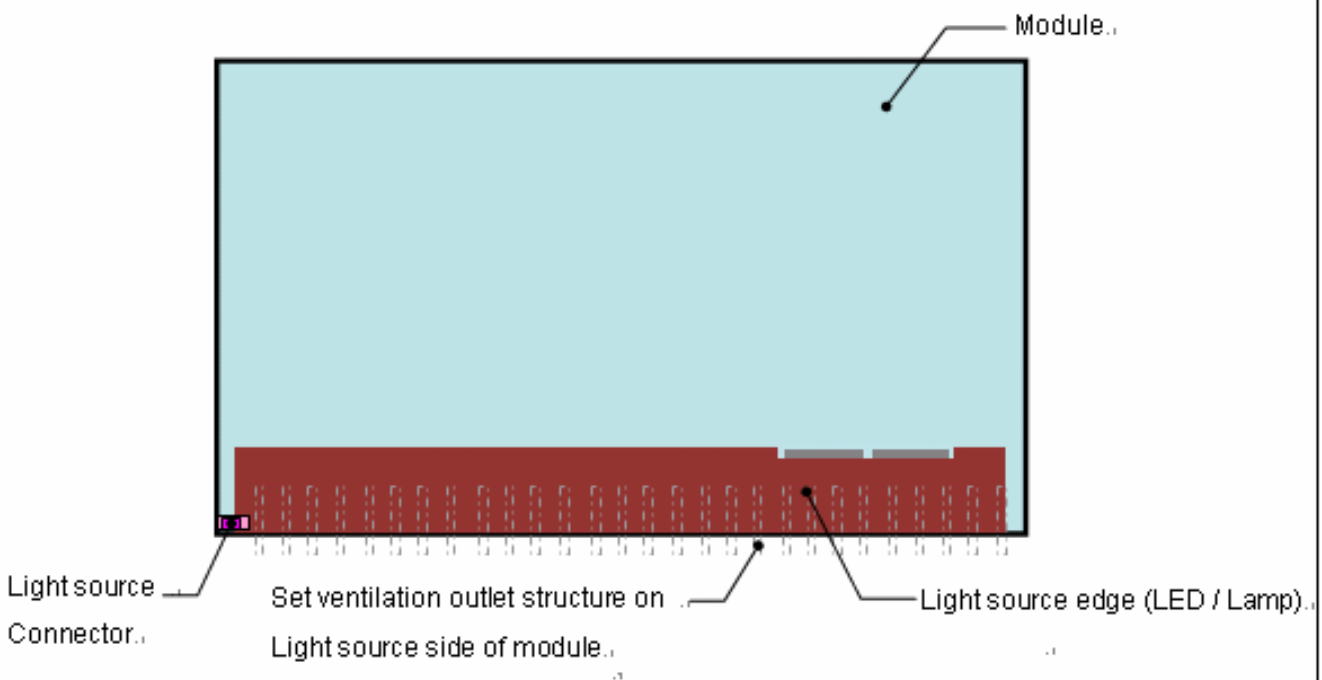
4	The overlapping part on System's Chassis and electric wire needs gap structure.





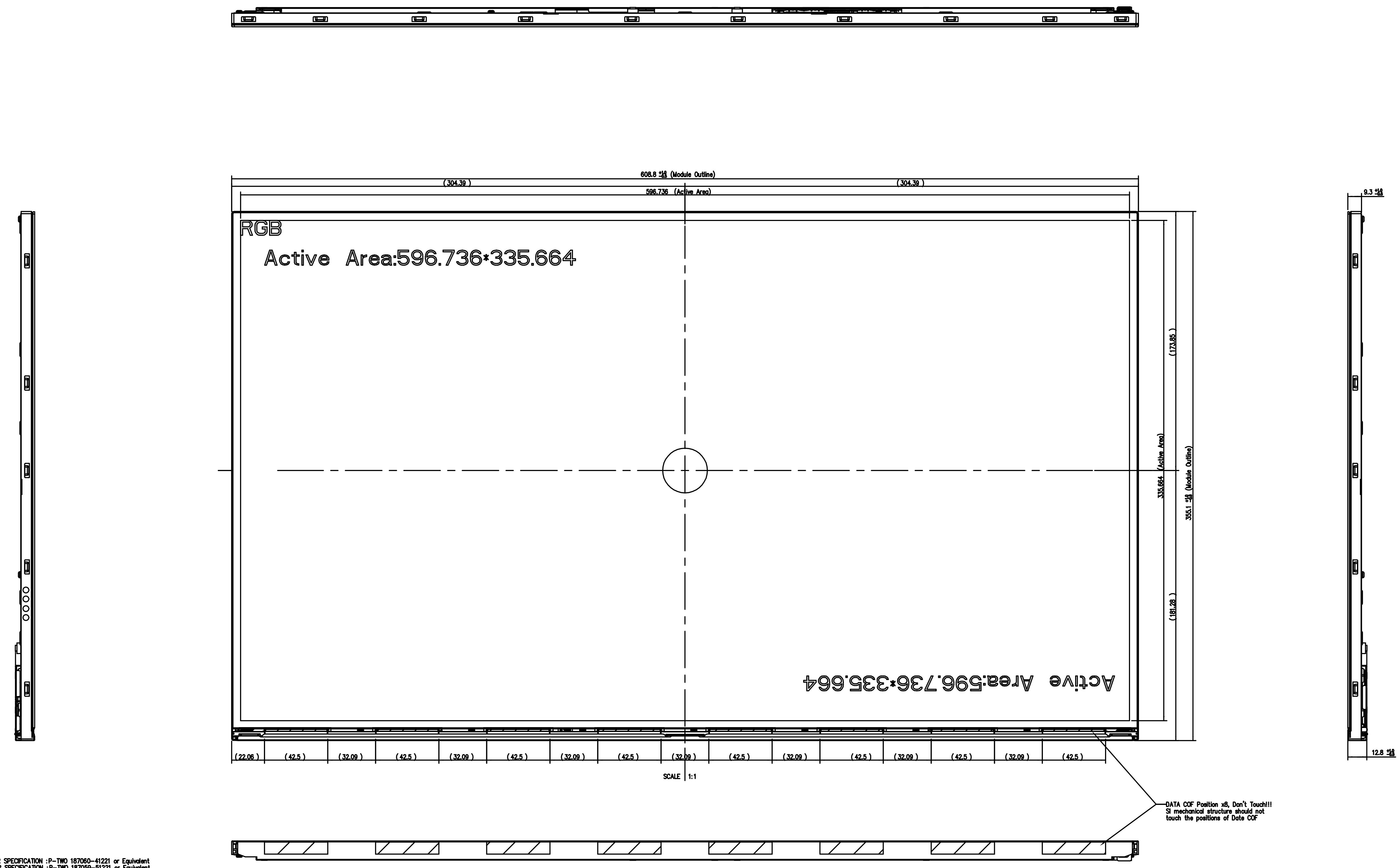
Definition	The overlapping part on System's Chassis and electric wire (FPC、FFC and wire) needs gap structure to avoid display of white spot by pressing overlapping part cause interference.

5	System cover's ventilation outlet structure



Definition	To prevent from abnormal display of light leakage, We suggest to set ventilation outlet structure on side of Module Light bar in system cover inner surface.

Appendix 2. OUTLINE DRAWING



NOTE:
1.LVDS INPUT 41PIN CONNECTOR SPECIFICATION :P-TWO 187060-41221 or Equivalent
2.LVDS INPUT 51PIN CONNECTOR SPECIFICATION :P-TWO 187059-51221 or Equivalent
3.LED CONNECTOR SPECIFICATION:CviLux CI1406M1VL0-NH or Equivalent
4.THE DIMENSION EXCLUDES DEFORMATION
5.TOLERANCE WITHOUT NOTICED TO BE ±0.5MM
6.TORQUE OF M3 USER HOLE SHOULD BE WITHIN 5 kgf-cm AND JUST RESCREW 10 TIMES

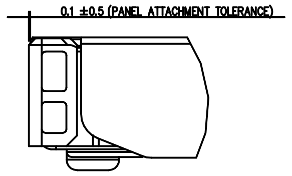
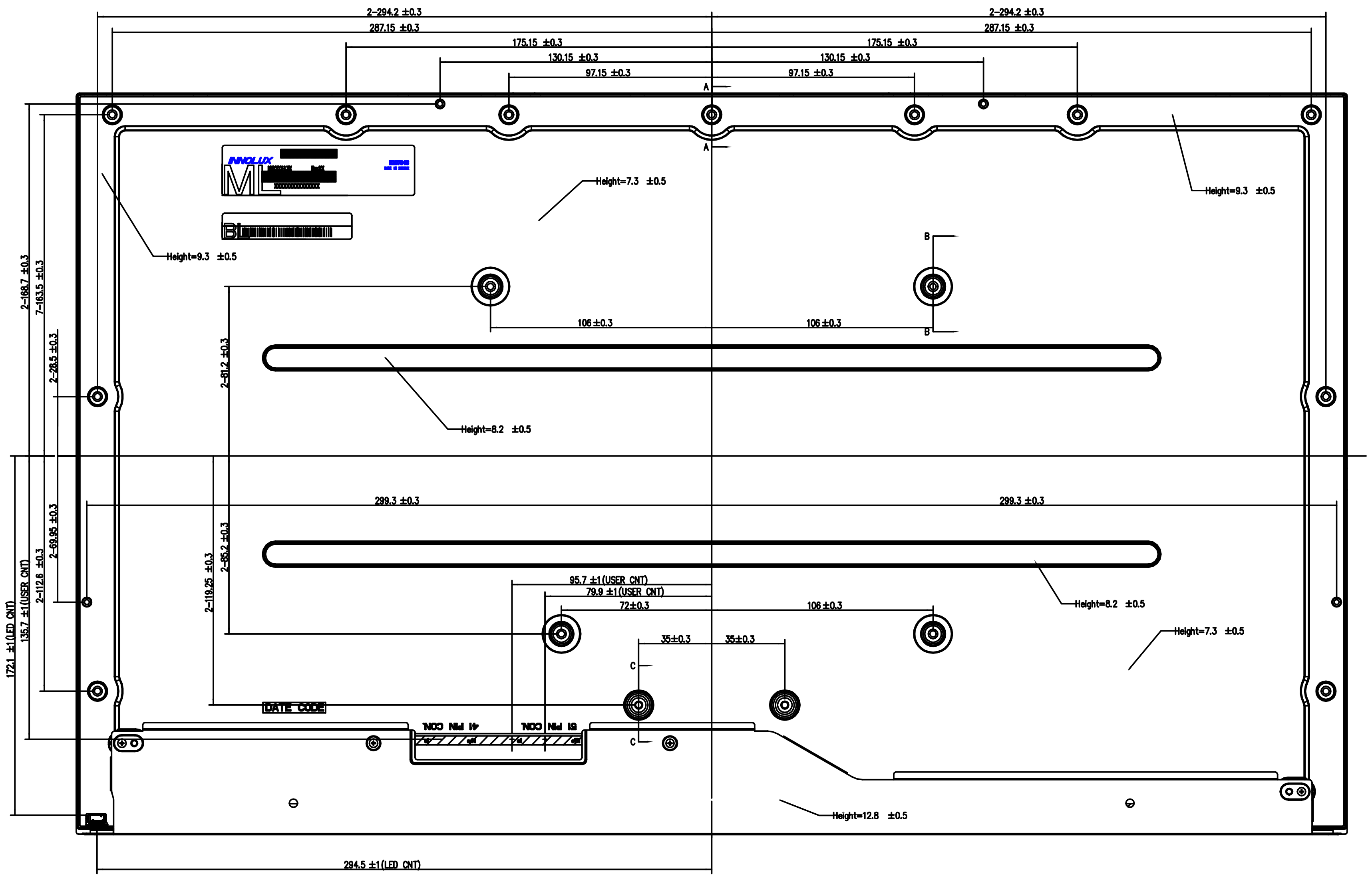
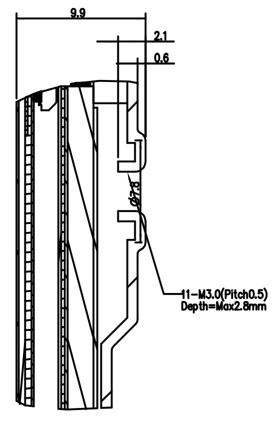


FIG.1

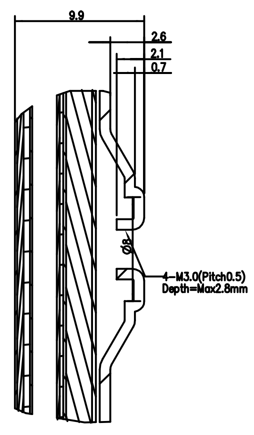
APPROVED	KuanLi Lin	DN0616690	A
CHECKED	Erwin Wu	ASSY Module N270KCJ-L5B	1/2
DESIGNED	Aiden Wan	InnoLux	A0



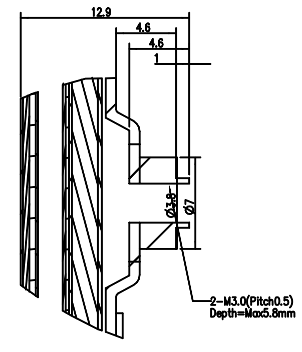
SCALE 1:1



SECTION A-A
SCALE 5:1



SECTION B-B
SCALE 5:1



SECTION C-C
SCALE 5:1

NOTE:
1.LVDS INPUT 41PIN CONNECTOR SPECIFICATION :P-TWO 187060-41221 or Equivalent
2.LVDS INPUT 51PIN CONNECTOR SPECIFICATION :P-TWO 187059-51221 or Equivalent
3.LED CONNECTOR SPECIFICATION:CviLux CI1406M1VL0-NH or Equivalent
4.THE DIMENSION EXCLUDES DEFORMATION
5.TOLERANCE WITHOUT NOTICED TO BE ±0.5MM
6.TORQUE OF M3 USER HOLE SHOULD BE WITHIN 5 kgf-cm AND JUST RESCREW 10 TIMES

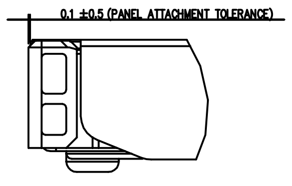


FIG.1

APPROVED	KuanLi Lin	DN0616690
CHECKED	Erwin Wu	ASSY_Module_N270KCJ-L5B 2/2
DESIGNED	Aiden Wan	InnoLux A0