![InnoLux 群創光電 logo]

Doc. Number :

Tentative Specification
Preliminary Specification
Approval Specification

MODEL NO.: M280DGJ
SUFFIX: L30

Customer: ALL

APPROVED BY   **SIGNATURE**

Name / Title

Note
Product Version C1/C2

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

Approved By	Checked By	Prepared By

CONTENTS

REVISION HISTORY

Version	Date	Page	Description
3.0	10.17, 2013	All	Approval Spec Ver.3.0 was first issued.
3.1	11.23.2013	5	1.2 Total power consumption Cell 11.664 →14.256w Total 34.344→36.936 w
3.2	04.30.2014	Appendixes	Drawing add Back cover add emboss

1. GENERAL DESCRIPTION

1.1 OVERVIEW

M280DGJ-L30 is a 28.0" TFT Liquid Crystal Display module with WLED Backlight unit and 51 pins 8 lane –

V by 1 interface. This module supports 3840 x 2160 UHD(Ultra High Definition) mode and can display up to

1.073G colors. The converter module for Backlight is not built in.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	648.9 (H) X 369.3 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	3840 x R.G.B. x 2160	pixel	-
Pixel Pitch	0.16 (H) x 0.16 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	1.073G	color	-
Transmissive Mode	Normally White	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-
Color Gamut	72% of NTSC(Typ.)	-	-
RoHS,Halogen Free &TCO 6.0	RoHS, Halogen Free TCO 6.0 compliance		
Luminance, White	300	Cd/m2	
Power Consumption	Total (36.936) W(Typ.) @ cell (14.256) W(Typ.), BL (22.68)W(Typ.)		(1)

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

2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	647.90	648.90	649.90	mm	(1)
	Vertical (V)	368.30	369.30	370.30	mm	
	Thickness (T)	18.85	19.85	20.85	mm	
Bezel Area	Horizontal	625.93	626.93	627.93	mm	
	Vertical	346.28	347.28	348.28	mm	
Active Area	Horizontal	-	620.93	-	mm	
	Vertical	-	341.28	-	mm	
Weight		-	2910	3055	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

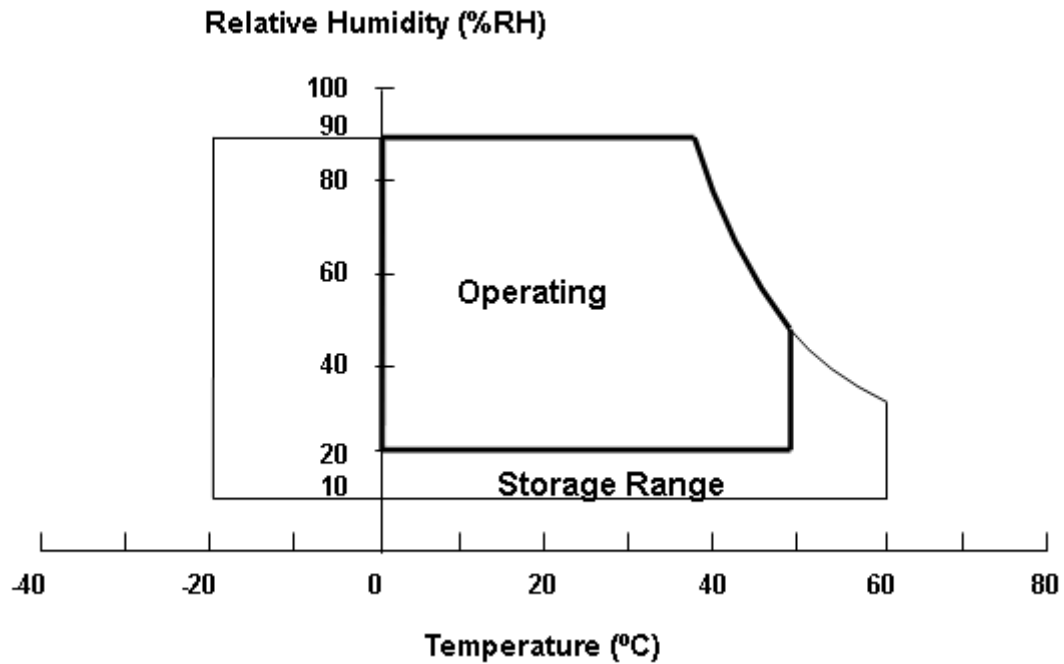| Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)

Note (1)

(a) 90 %RH Max. (Ta <40 oC).

(b) Wet-bulb temperature should be 39 oC Max. (Ta < 40 oC).

(c) No condensation.

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

3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	13.5.	V	(1)
Logic Input Voltage	VIN	-0.3	3.6	V	

3.2.2 BACKLIGHT UNIT

Item	Symbol	Value			Unit	Note
		Min.	Typ	Max.		
LED Forward Current Per Input Pin	IF	141	150	159	mA	(1), (2) Duty=100%

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 4.3.2 and 4.3.3 for

further information).

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM
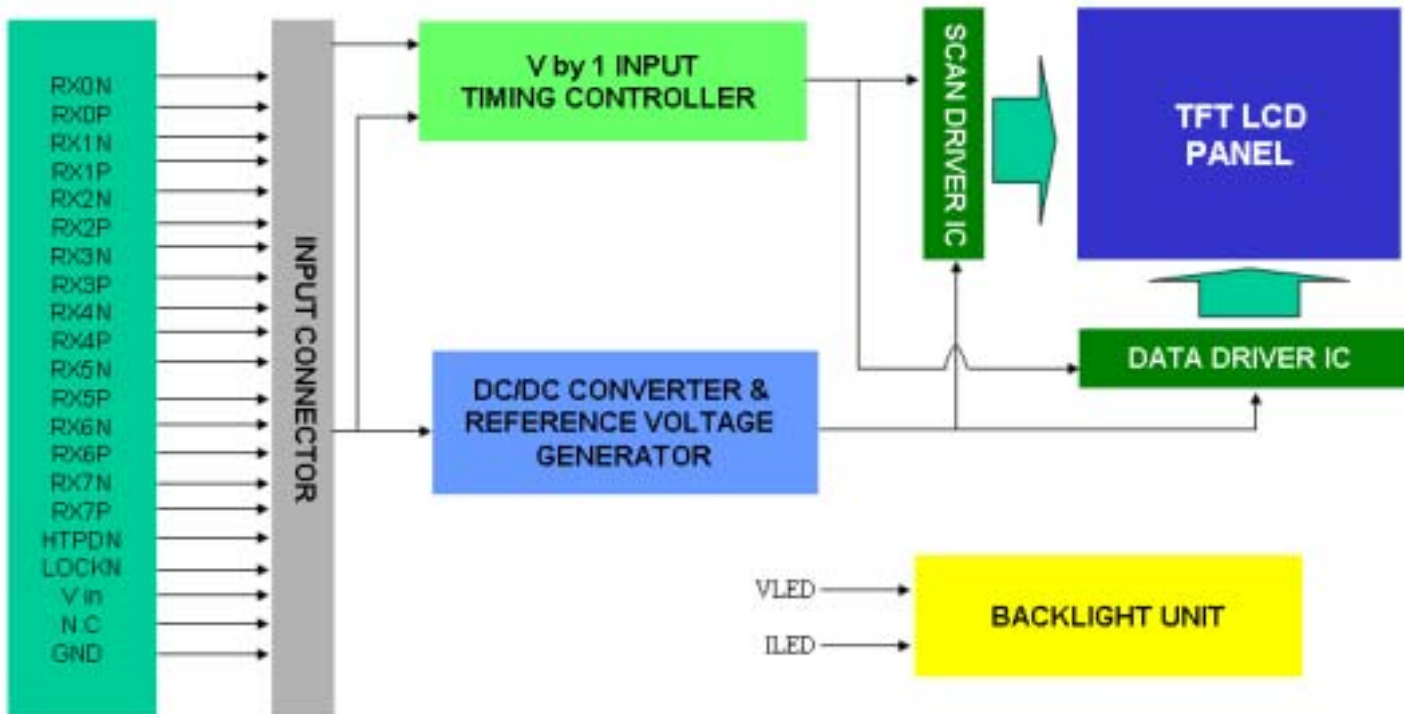
4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

Pin	Name	Description	Note
1	Vin	Power input (+12V)	
2	Vin	Power input (+12V)	
3	Vin	Power input (+12V)	
4	Vin	Power input (+12V)	
5	Vin	Power input (+12V)	
6	Vin	Power input (+12V)	
7	Vin	Power input (+12V)	
8	Vin	Power input (+12V)	
9	N.C.	No Connection	(2)
10	GND	Ground	
11	GND	Ground	
12	GND.	Ground	
13	GND.	Ground	
14	GND.	Ground	
15	N.C.	No Connection	(2)
16	N.C.	No Connection	(2)
17	N.C.	No Connection	(2)
18	N.C	For internal use, no connection	
19	N.C	For internal use, no connection	
20	N.C.	No Connection	(2)
21	N.C.	No Connection	(2)
22	N.C.	No Connection	(2)

Pin	Name	Description	Note
23	N.C.	No Connection	(2)
Pin	Name	Description	Note
24	N.C.	No Connection	(2)
25	HTPDN	Hot plug detect output, Open drain.	
26	LOCKN	Lock detect output, Open drain.	
27	GND	Ground	
28	RX0N	1st Pixel Negative VbyOne differential data input in area A. Lan 0	(1)
29	RX0P	1st Pixel Positive VbyOne differential data input in area A. Lan 0	
30	GND	Ground	
31	RX1N	2nd Pixel Negative VbyOne differential data input in area A. Lan 1	(1)
32	RX1P	2nd Pixel Positive VbyOne differential data input in area A. Lan 1	
33	GND	Ground	
34	RX2N	3rd Pixel Negative VbyOne differential data input in area A. Lan 2	(1)
35	RX2P	3rd Pixel Positive VbyOne differential data input in area A. Lan 2	
36	GND	Ground	
37	RX3N	4th Pixel Negative VbyOne differential data input in area A. Lan 3	(1)
38	RX3P	4th Pixel Positive VbyOne differential data input in area A. Lan 3	
39	GND	Ground	
40	RX4N	5th Pixel Negative VbyOne differential data input in area A. Lan 4	(1)
41	RX4P	5th Pixel Positive VbyOne differential data input in area A. Lan 4	
42	GND	Ground	
43	RX5N	6th Pixel Negative VbyOne differential data input in area A. Lan 5	(1)
44	RX5P	6th Pixel Positive VbyOne differential data input in area A. Lan 5	
45	GND	Ground	
46	RX6N	7th Pixel Negative VbyOne differential data input in area A. Lan 6	(1)
47	RX6P	7th Pixel Positive VbyOne differential data input in area A. Lan 6	
48	GND	Ground	
49	RX7N	8th Pixel Negative VbyOne differential data input in area A. Lan 7	(1)
50	RX7P	8th Pixel Positive VbyOne differential data input in area A. Lan 7	
51	GND	Ground	

Connector Information

| Item	Description
Manufacturer	FCN/ P-TWO
Type part number	FCN: WF23-402-5133 P-TWO: 187059-51221
User's Mating housing part number	JAE: FI-RE51HL

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

Note (1) V-by-One$^{®}$ HS Data Mapping

Lan	Data Stream
Lan 0	1, 9, 17, ..., 3825, 3833
Lan 1	2, 10, 18, ..., 3826, 3834
Lan 2	3, 11, 19, ..., 3827, 3835
Lan 3	4, 12, 20, ..., 3828, 3836
Lan 4	5, 13, 21, ..., 3829, 3837
Lan 5	6, 14, 22, ..., 3830, 3838
Lan 6	7, 15, 23, ..., 3831, 3839
Lan 7	8, 16, 24, ..., 3832, 3840

Note (2) Reserved for internal use. Please leave it open.

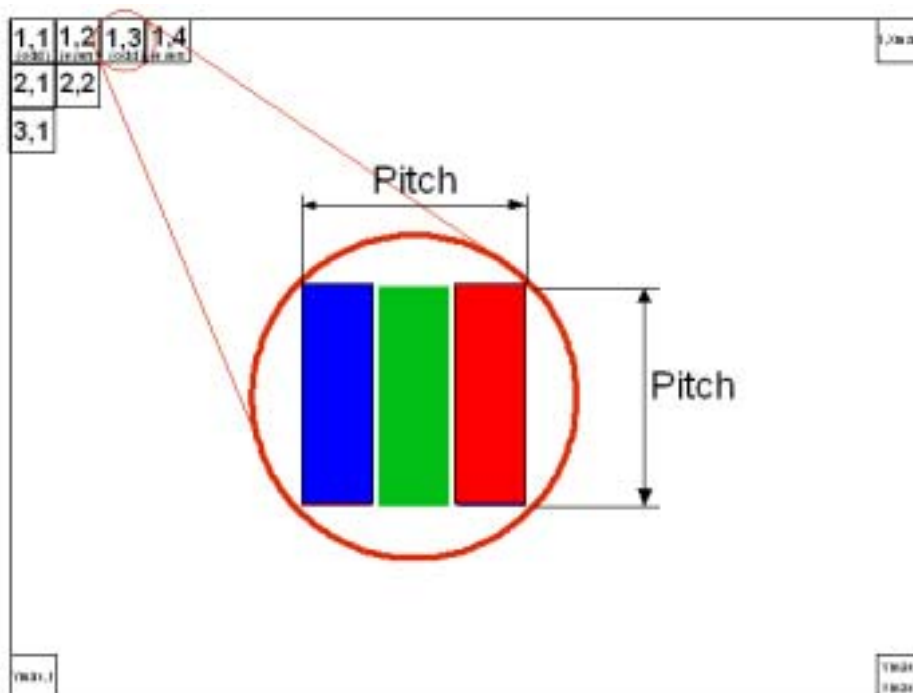Note (3) VbyOne HS connector pin order defined as following:
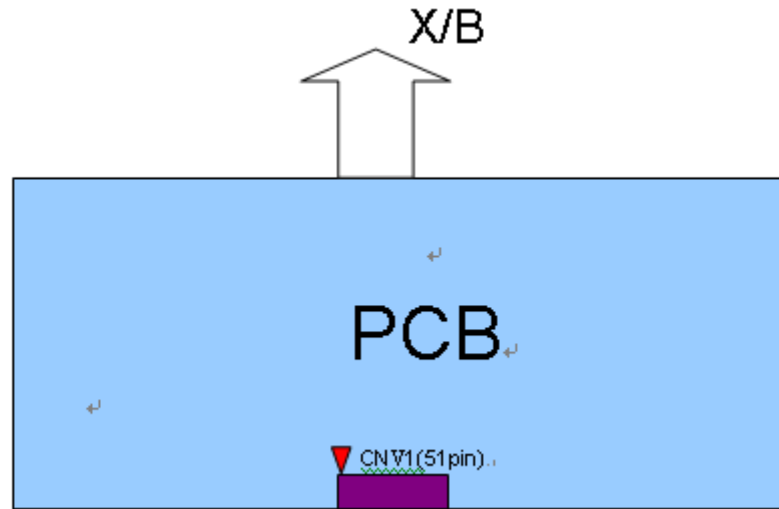
Note (4) V-by-One connector mating dimension range request is 0.93mm~1.0mm as below:
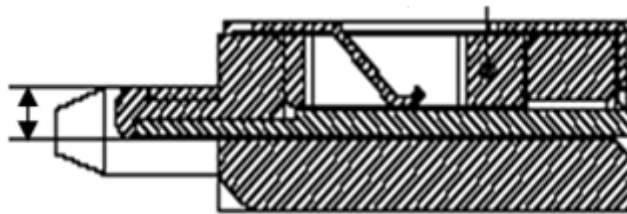
Note (5) The first pixel is odd.

Note (6) Input signal of even and odd 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	10.8	12	13.2	V	(2)
Ripple Voltage		V_{RP}	-	-	300	mV	-
Rush Current		I_{RUSH}	-	2	2.6	A	(3)
Power Supply Current	White	P_T	-	0.552	0.65	A	(4)a
	Black		-	0.54	0.637	A	(4)b
	Horizontal Stripe		-	1.188	1.417	A	(4)c
Power Consumption		PLCD	-	14.256	17	Watt	(5)
V-by-One interface	Differential Input High Threshold Voltage	VLV_{TH}	-	-	50	mV	(6)
	Differential Input Low Threshold Voltage	VLV_{TL}	-50	-	-	mV	
	Differential input voltage (single-end)	$|VID|$	200		600	mV	
	Differential Input Resistor	RRIN	80	100	120	ohm	
CMOS interface	Input High Threshold voltage	V_{IH}	2.7		3.3	V	
	Input Low threshold voltage	V_{IL}	0		0.7	V	

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

Note (2) The module should be always operated within the above ranges. The ripple voltage should be controlled under 10 % of Vcc (Typ.)

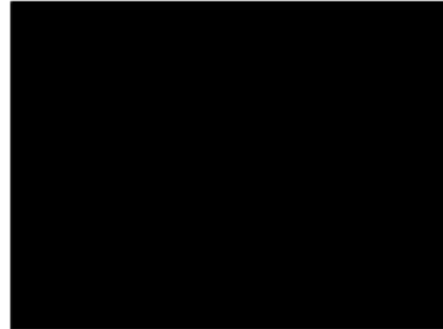Note (3) Measurement Conditions:

Vcc rising time is 470μs

Vcc

0.9Vcc

0.1Vcc

GND
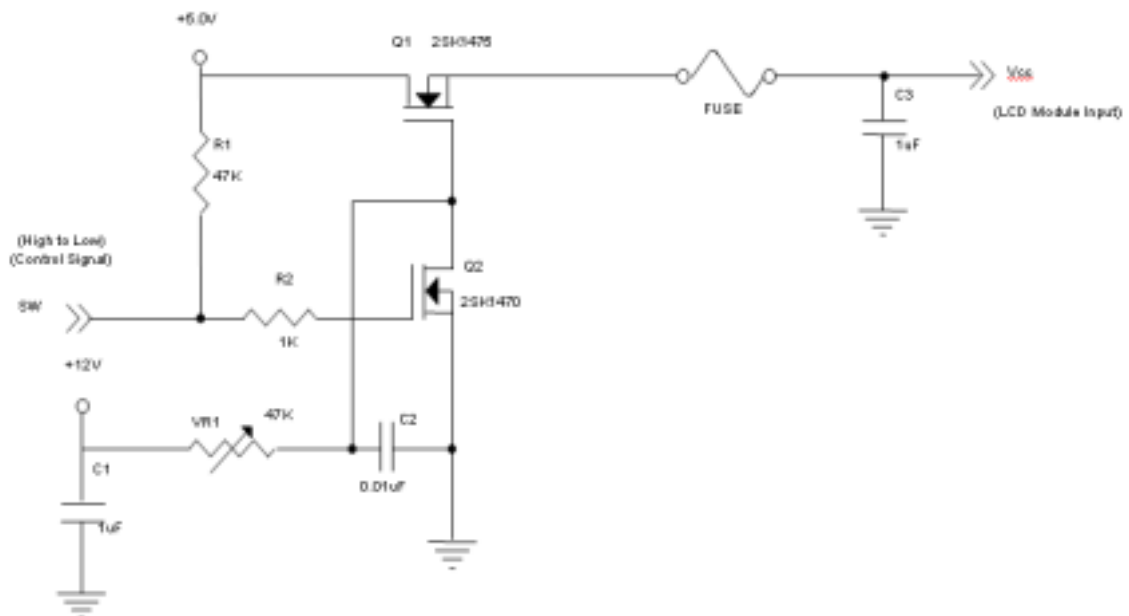
470μs
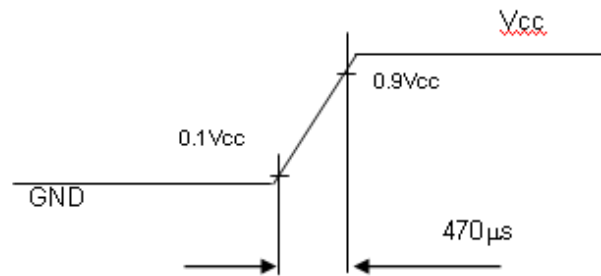
Note (4) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 °C, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.
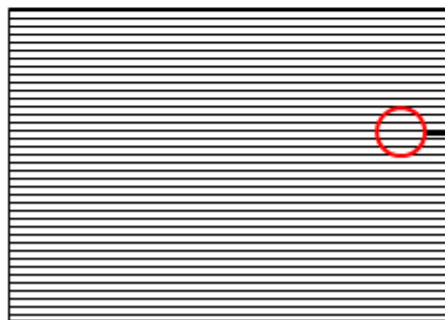
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Horizontal Pattern

Note (5) The power consumption is specified at the pattern with the maximum current.

4.3.2 BACKLIGHT UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	VPIN	-	37.8	40.2	V	(1), Duty=100%, IPIN=150mA
LED Light Bar Current Per Input Pin	IPIN	141	150	159	mA	(1), (2) Duty=100%
LED Life Time	LLED	30000			Hrs	(3)
Power Consumption	PBL	-	22.68	24.12	W	(1) Duty=100%, IPIN=150mA

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= (150)mA (per chip) until the brightness becomes   50% of its original value.
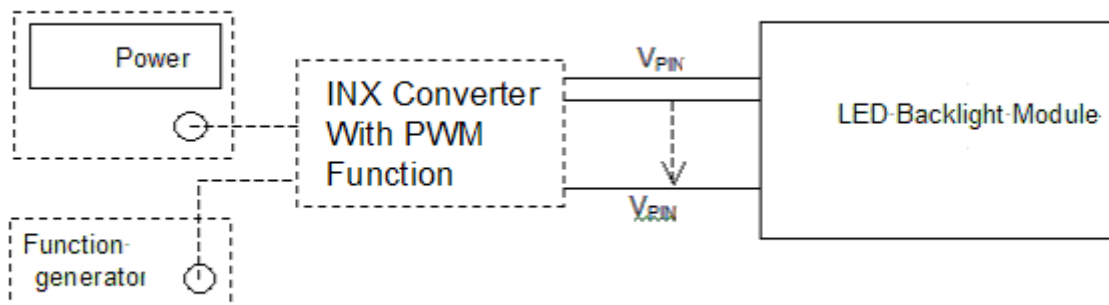
### 4.3.3 LIGHTBAR Connector Pin Assignment:

(1) Connector Information:

Item	Description
Manufacturer	FCN/ CviLux
Type part number	WM13-406-063N(FCN) / CI1406M1HRK-NH(CviLux)
Mating housing part number	WF1300106-B (FCN) / CI1406SL000-NH (CviLux).

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

(2) LB Connector drawing:
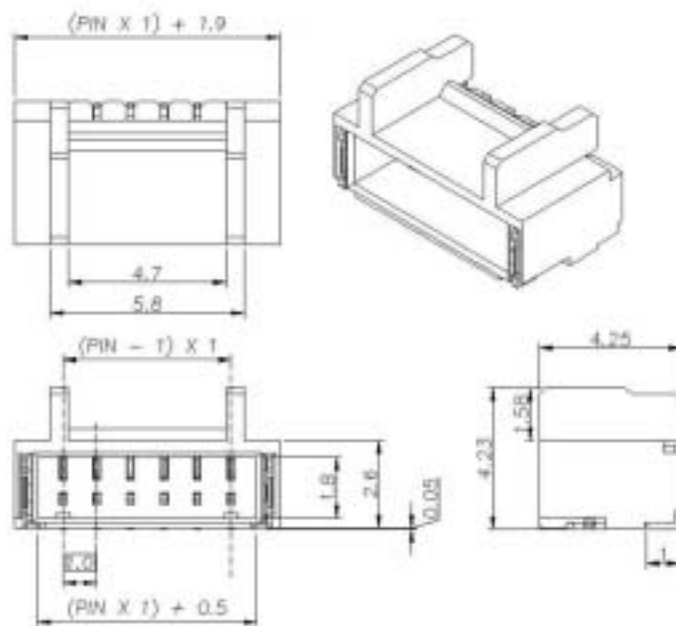
Pin number	Description
1	Cathode of LED string1
2	Cathode of LED string2
3	VLED
4	VLED
5	Cathode of LED string3
6	Cathode of LED string4
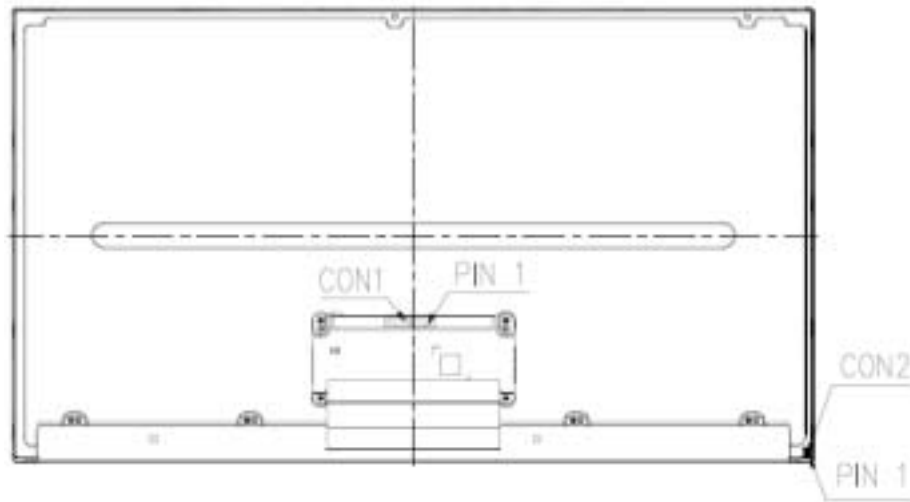
4.4 V by One INPUT SIGNAL SPECIFICATIONS

4.4.1 V by One DATA MAPPING TABLE

Lan	Data Stream
Lan 0	1, 9, 17, ..., 3825, 3833
Lan 1	2, 10, 18, ..., 3826, 3834
Lan 2	3, 11, 19, ..., 3827, 3835
Lan 3	4, 12, 20, ..., 3828, 3836
Lan 4	5, 13, 21, ..., 3829, 3837
Lan 5	6, 14, 22, ..., 3830, 3838
Lan 6	7, 15, 23, ..., 3831, 3839
Lan 7	8, 16, 24, ..., 3832, 3840

4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-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									
		R9	R8	G7	G6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	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	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	1	1	1	1	1	1	1	1	1	1	0	0	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	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	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	1	1	0	0	0	0	0	0	0	0	0	0	1	1	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	1	1	1	1	0	0	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	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	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(1021)	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(1021)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	Green(1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	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	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	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	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(1021)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1
	Blue(1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	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
V by One	Frequency	Fc	70	74.25	80	MHz	(1)
	Intra-Pair skew		-0.3	-	0.3	UI	(2)
	Inter-Pair skew		-5	-	5	UI	(3)
	Spread spectrum modulation range	Fclkin_mod	F_{clkin}-0.5%	-	F_{clkin}+0.5%	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}	-	-	30	KHz	
Vertical Display Term	Frame Rate	Fr	57.5	60	62.5	Hz	(5)(6)
	Total	Tv	2200	2250	2790	Th	Tv=Tvd+Tvb
	Active Display	Tvd	2160	2160	2160	Th	-
	Blank	Tvb	40	90	630	Th	-
Horizontal Display Term	Total	Th	530	550	570	Tc	Th=Thd+Thb
	Active Display	Thd	480	480	480	Tc	-
	Blank	Thb	50	70	90	Tc	-

Note (1) Please make sure the range of pixel clock has follow the below equation:

Fclkin(max)　Fr　Tv　Th

Fr　Tv　Th　Fclkin (min)

INPUT SIGNAL TIMING DIAGRAM
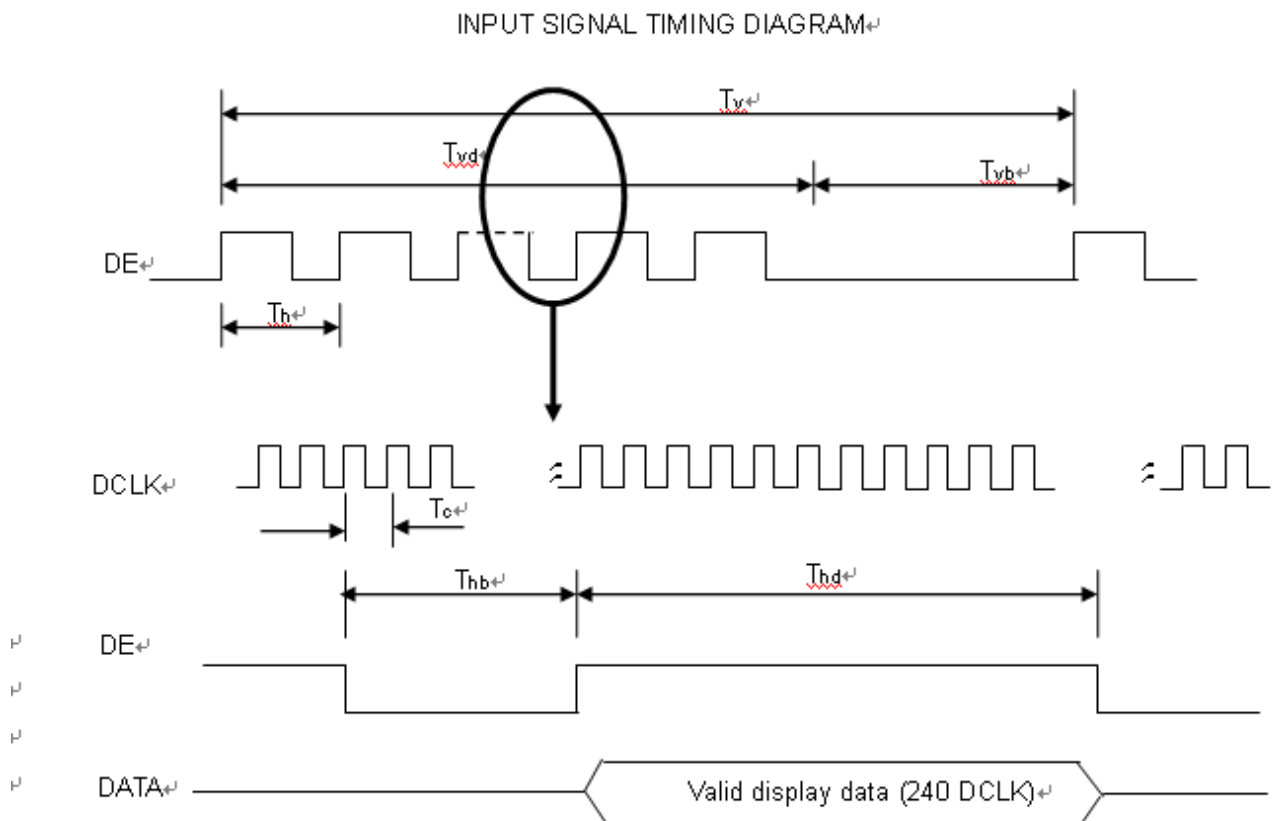
Note (2) V-by-One HS Intra-pair skew
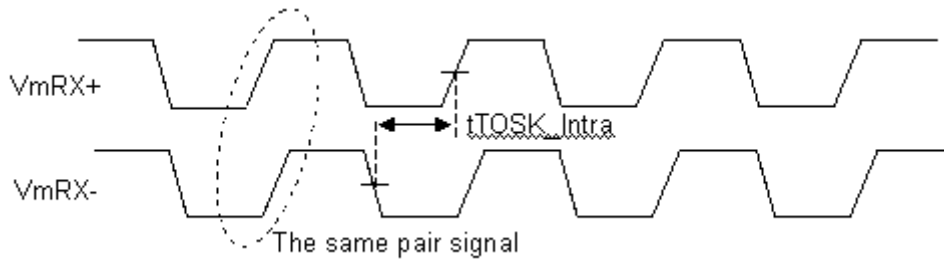
Note (3) V-by-One HS Inter-pair skew
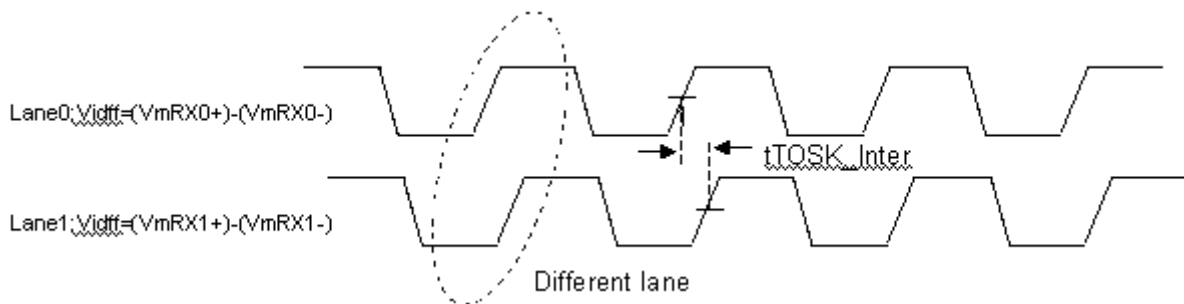
Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.
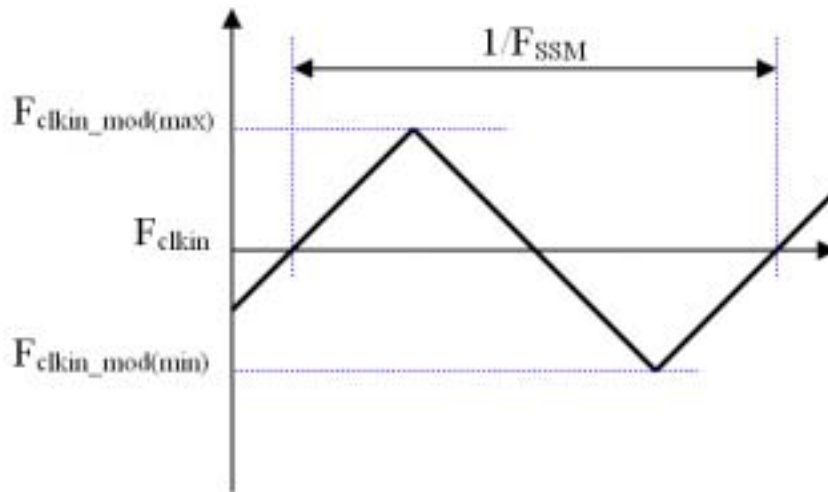
Note (5) The frame-to-frame jitter of the input frame rate is defined as the above figures. FRn = FRn-1 ± 0.5%.

Note (6) The setup of the frame rate jitter > 0.5% may result in the cosmetic LED backlight symptom and the electric function is affected.
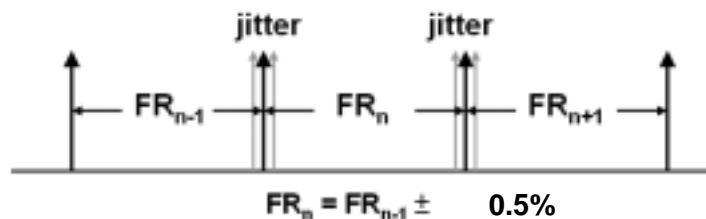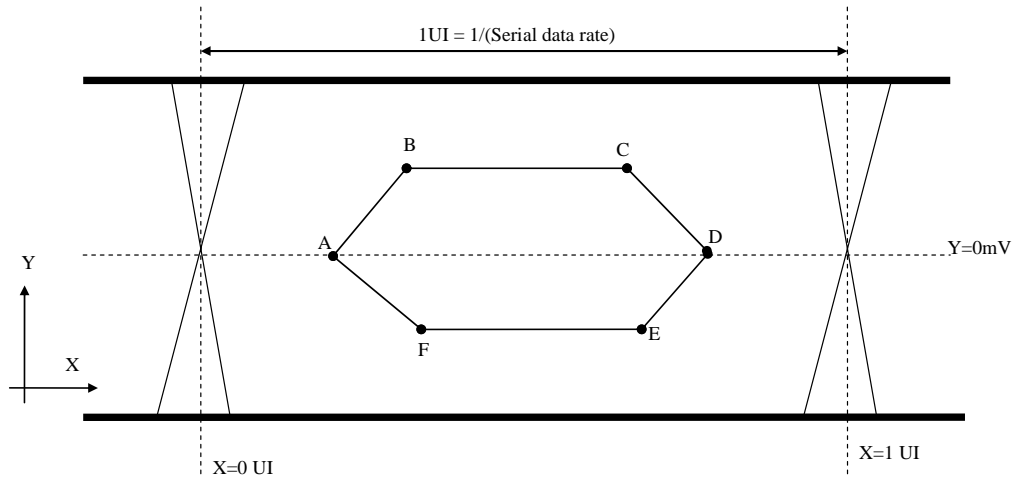
4.6 V by One Input Signal Timing Diagram

Table 1 Eye Mask Specification

	X [UI]	Y [mV]	Note
A	0.25	0	(1)
B	0.3	50	(1)
C	0.7	50	(1)
D	0.75	0	(1)
E	0.7	-50	(1)
F	0.3	-50	(1)

Note (1) Input levels of V-by-One HS signals are comes from "V-by-One HS Stander Ver.1.4"

4.7 Byte Length and Color mapping of V-by-One HS

Packer input & Unpacker output		30bpp RGB (10bit)
Byte 0	D[0]	R[2]
	D[1]	R[3]
	D[2]	R[4]
	D[3]	R[5]
	D[4]	R[6]
	D[5]	R[7]
	D[6]	R[8]
	D[7]	R[9]
Byte 1	D[8]	G[2]
	D[9]	G[3]
	D[10]	G[4]
	D[11]	G[5]
	D[12]	G[6]
	D[13]	G[7]
	D[14]	G[8]
	D[15]	G[9]
Byte 2	D[16]	B[2]
	D[17]	B[3]
	D[18]	B[4]
	D[19]	B[5]

	D[20]	B[6]
	D[21]	B[7]
	D[22]	B[8]
	D[23]	B[9]
Byte 3	D[24]	X
	D[25]	X
	D[26]	B[0]
	D[27]	B[1]
	D[28]	G[0]
	D[29]	G[1]
	D[30]	R[0]
	D[31]	R[1]

4.8 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ℃)

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

0.5 T1 10ms
0 T2 200ms
0 T3 50ms
500ms T4

V-by-One Signals

0.1Vcc
0V
T1
T2
T3
T4
VALID

Power On   Power Off

Backlight (Recommended)
500ms T5
100ms T6

50%   50%

T5   T6

Vcc Dip
T15 10ms

Power ON/OFF Sequence

T15

Vcc

Vcc(typ.) x 0.85
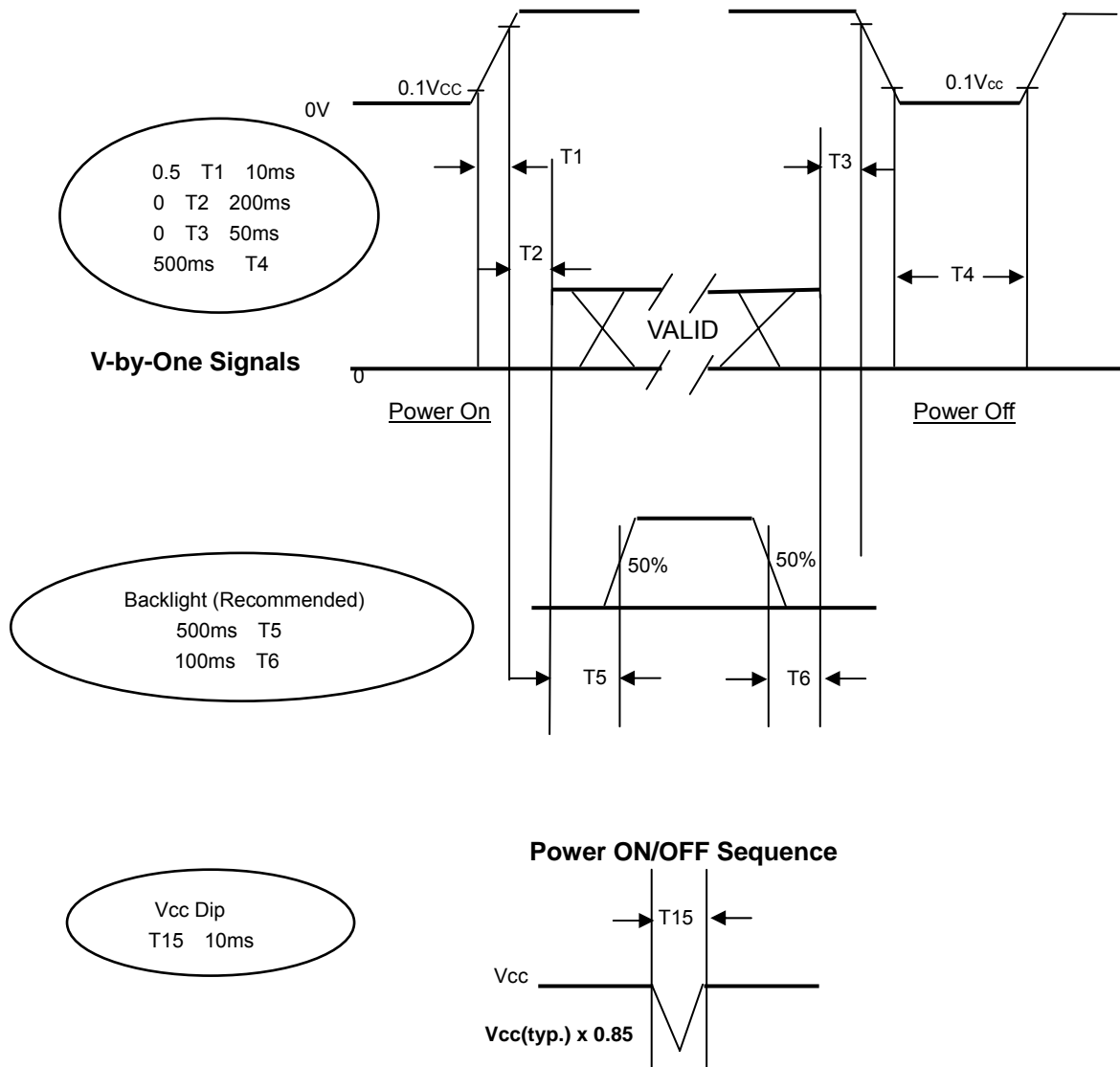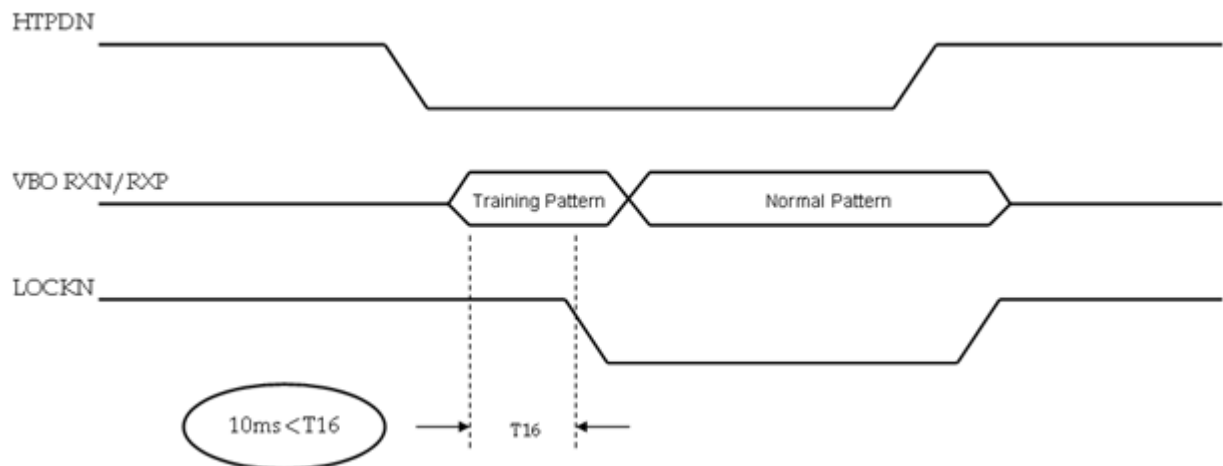
Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the LED voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen..

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If T2<0,that maybe cause electrical overstress failure.

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) Vcc must decay smoothly when power-off

5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	oC
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VCC	12±0.12	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	IPIN	150	mA
PWM Duty Ratio	D	100	%
LED Light Bar Test Converter	(INX 27 - D089583)		

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	$\theta_x=0°$, $\theta_Y=0°$ CS-2000 R=G=B=255 Gray scale	Typ – 0.03	0.633	Typ + 0.03	-	(1), (5)
		Ry			0.340			
	Green	Gx			0.311			
		Gy			0.633			
	Blue	Bx			0.158			
		By			0.061			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White (Center of Screen)		L_C		250	300	-	cd/m^2	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		T_R	$\theta_x=0°$, $\theta_Y=0°$	-	1.5	2.5	ms	(3)
		T_F		-	3.5	5.5		
White Variation		W	$\theta_x=0°$, $\theta_Y=0°$	--	-	1.42	--	(5), (6)
Viewing Angle	Horizontal	θx- + θx+	CR 10	150	170	-	Deg.	(1), (5)
	Vertical	θy- + θy+		140	160	-		

Note (1) Definition of Viewing Angle (θx, θy):
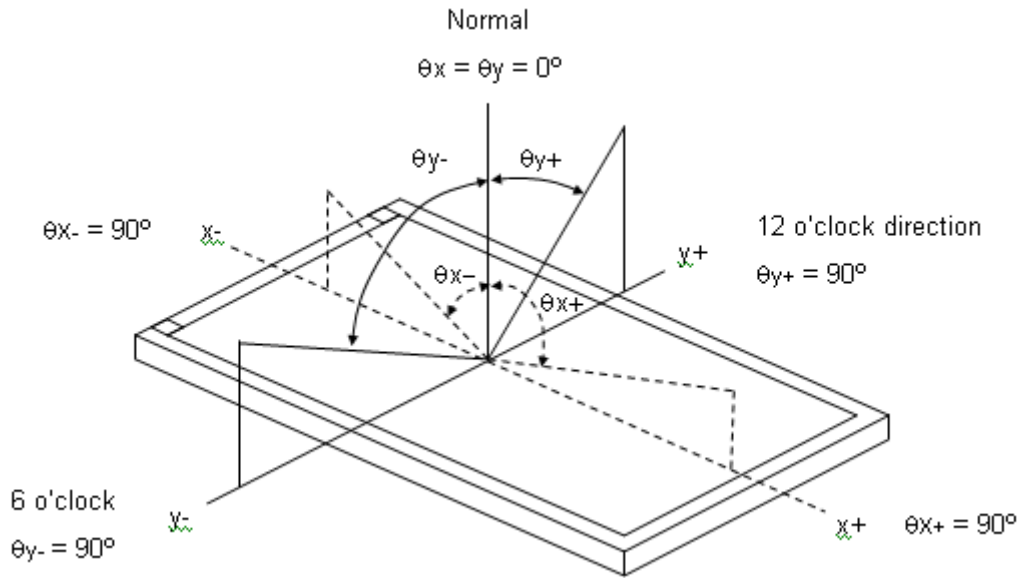
Note (2) Definition of Contrast Ratio (CR):

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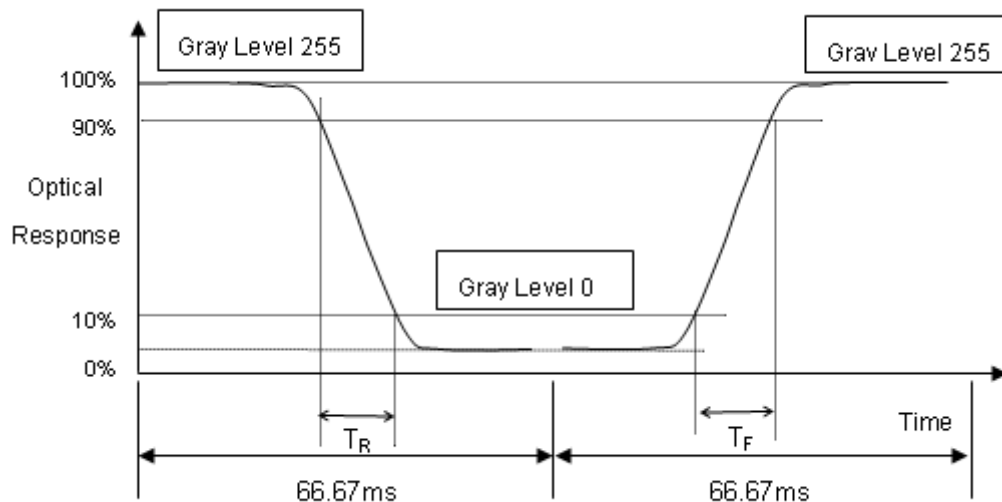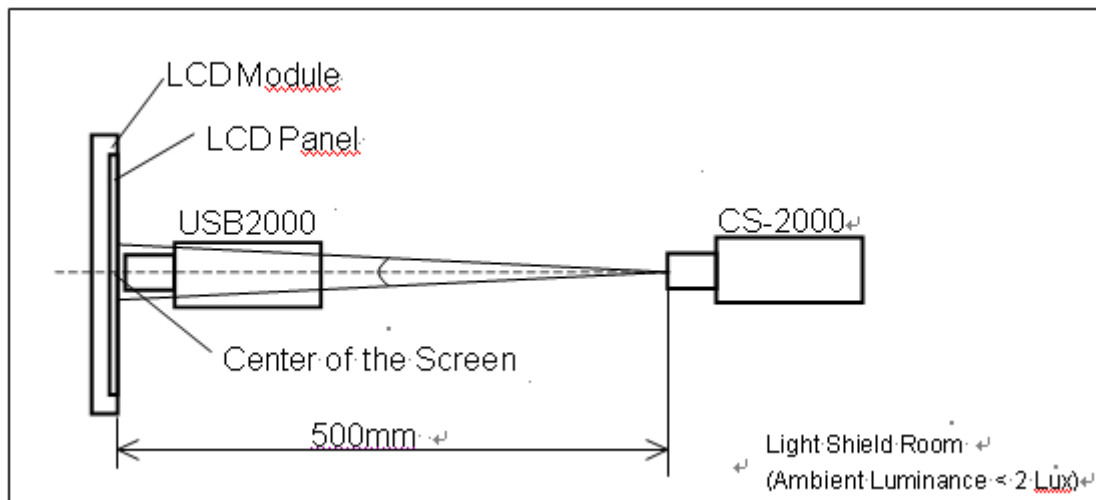
Note (4) Definition of Luminance of White (L_C):

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

$\delta W = $ Maximum [L (1) ~ L (9)] / Minimum [L (1) ~ L (9)]
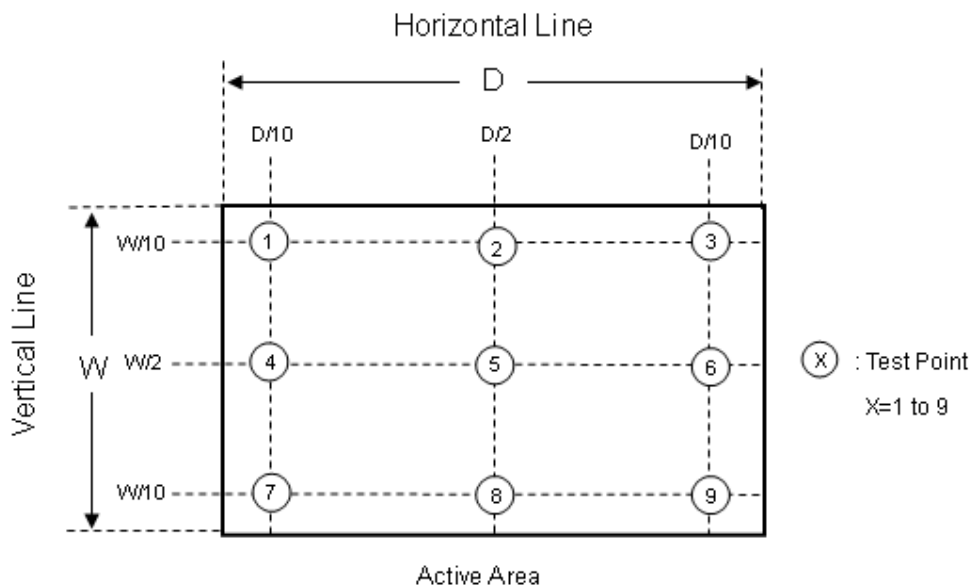
6. RELIABILITY TEST ITEM

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:
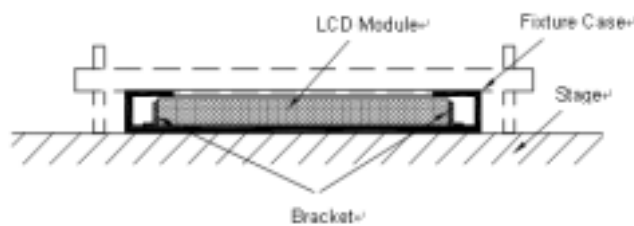
7. Mechanical Strength Characteristics

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 (except PCBA).
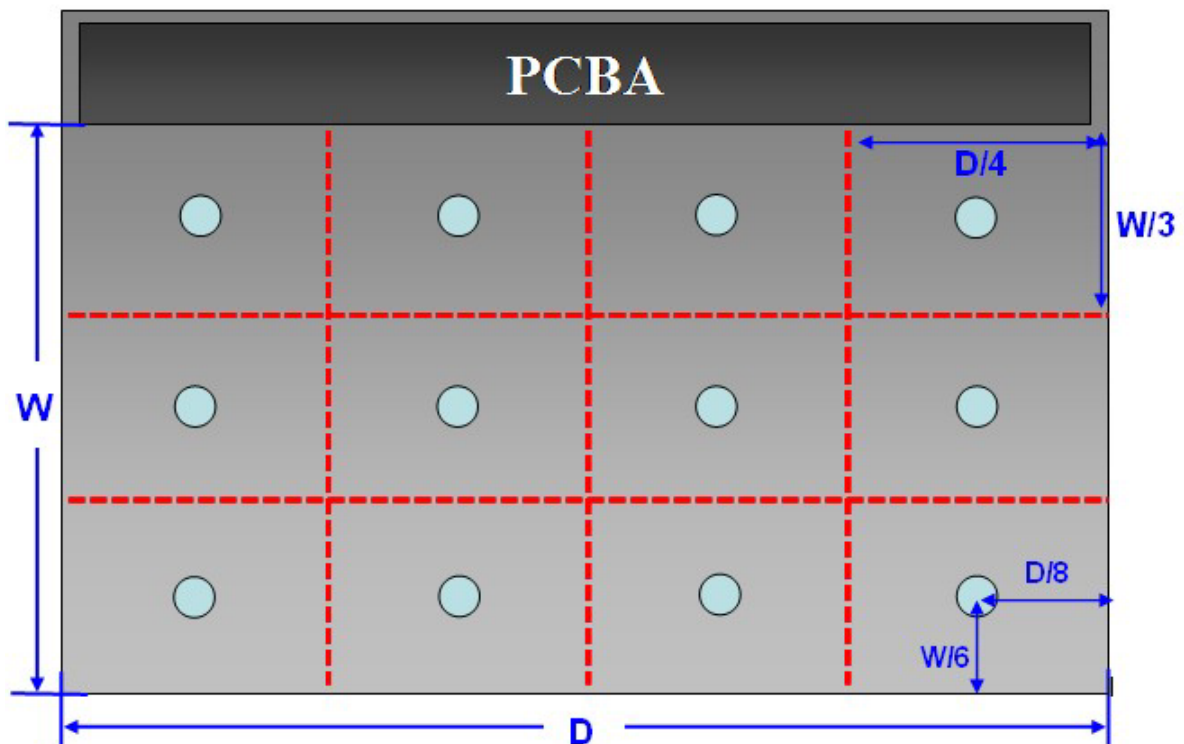
8. PACKING

8.1 PACKING SPECIFICATIONS

(1) 9 LCD modules / 1 Box

(2) Box dimensions: 713(L) X 429(W) X 453(H) mm

(3) Weight: approximately: (34) Kg (9 modules per box)

8.2 PACKING METHOD
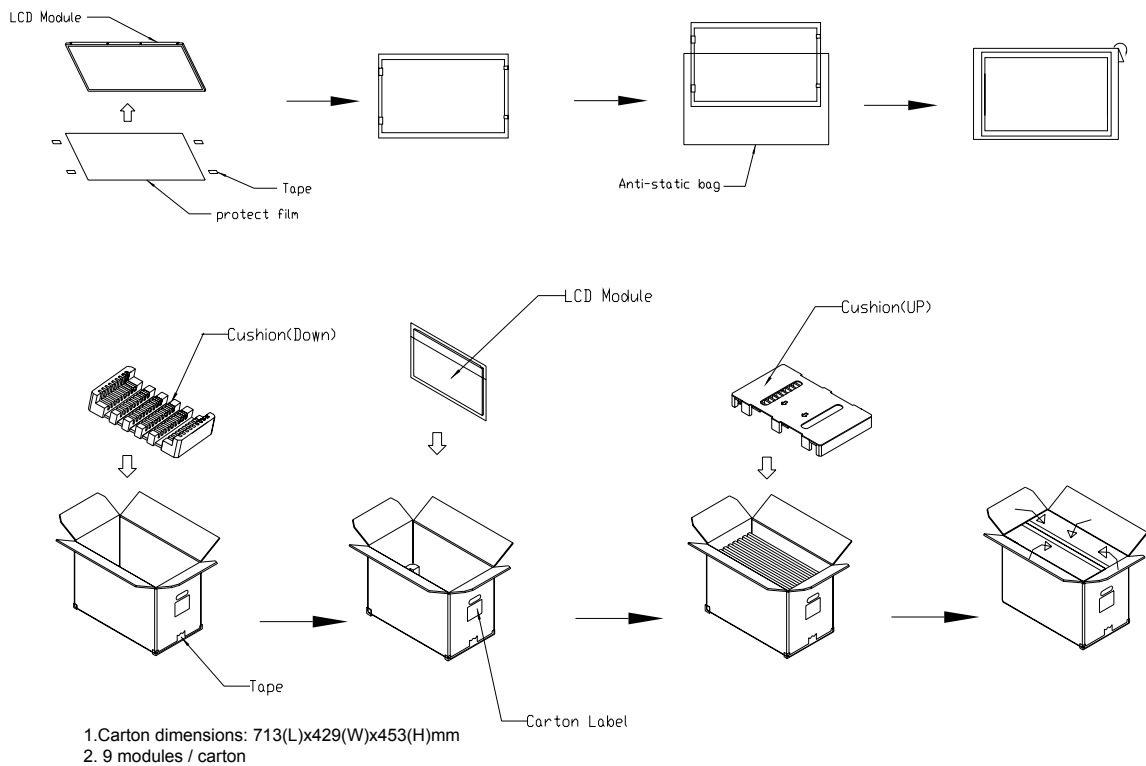
Figure. 8-1 Packing method

8.3 PALLET

For ocean shipping

Air Transportation
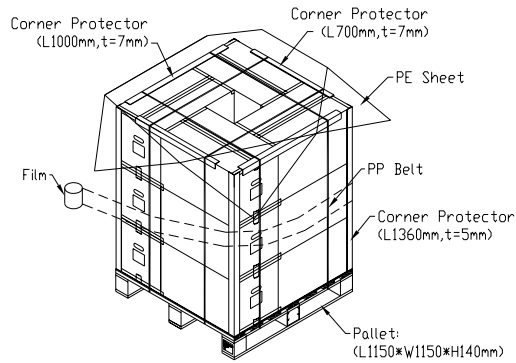
For air transport

Sea / Land Transportation
(40ft HQ Container)
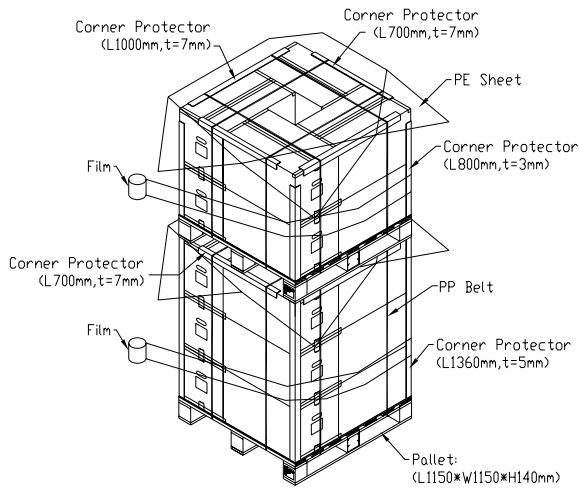
Sea / Land Transportation
(40ft Container)
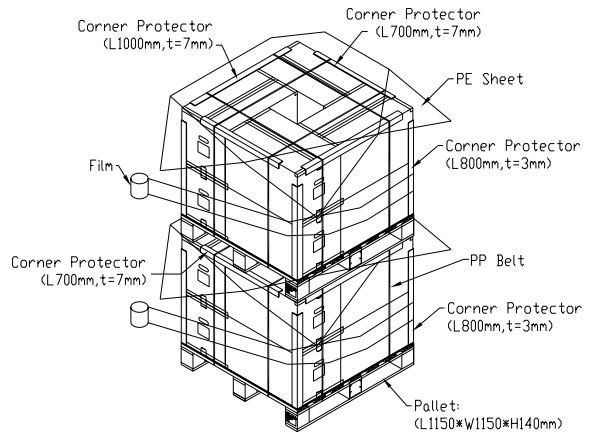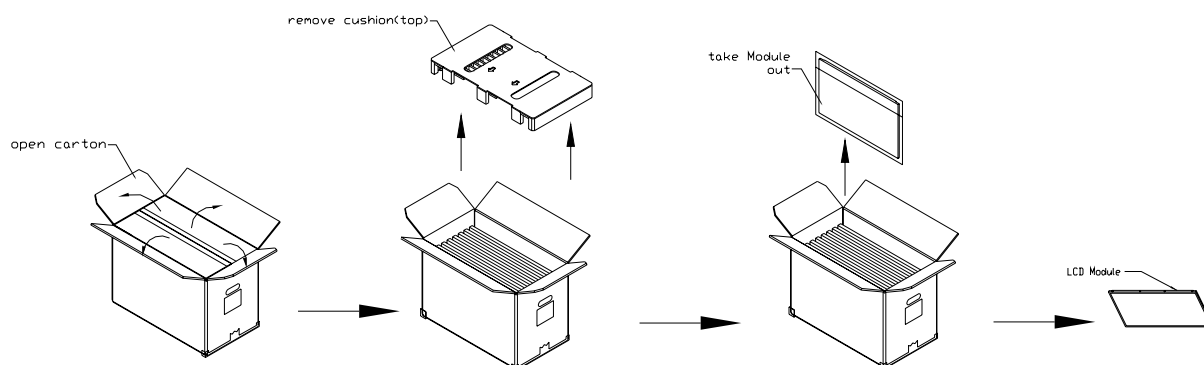
Figure. 8-2 Packing method

8.4 UN-PACKING 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: M280DGJ-L30

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

(c) InnoLux barcode definition:

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

Code	Meaning	Description
XX	InnoLux internal use	-
XX	Revision	Cover all the change
X	InnoLux internal use	-
XX	InnoLux 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-S0J03-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	INX=CM
S0J03	Model number	M280DGJ-L30= S0J03
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, Novatec=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 70%

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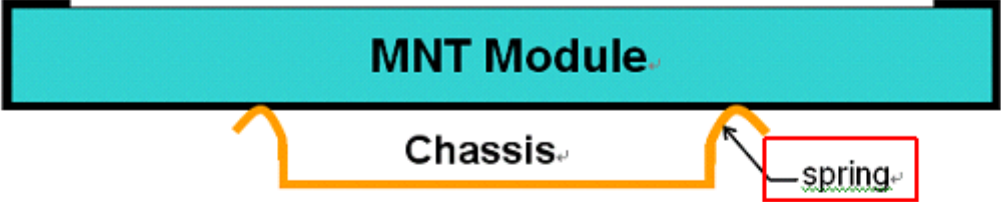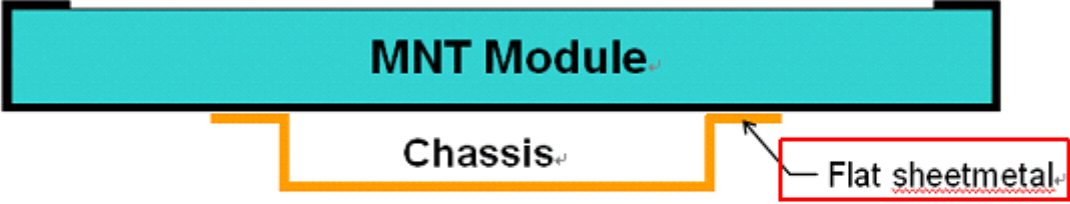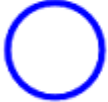
The LCD module should be certified with safety regulations as follows:

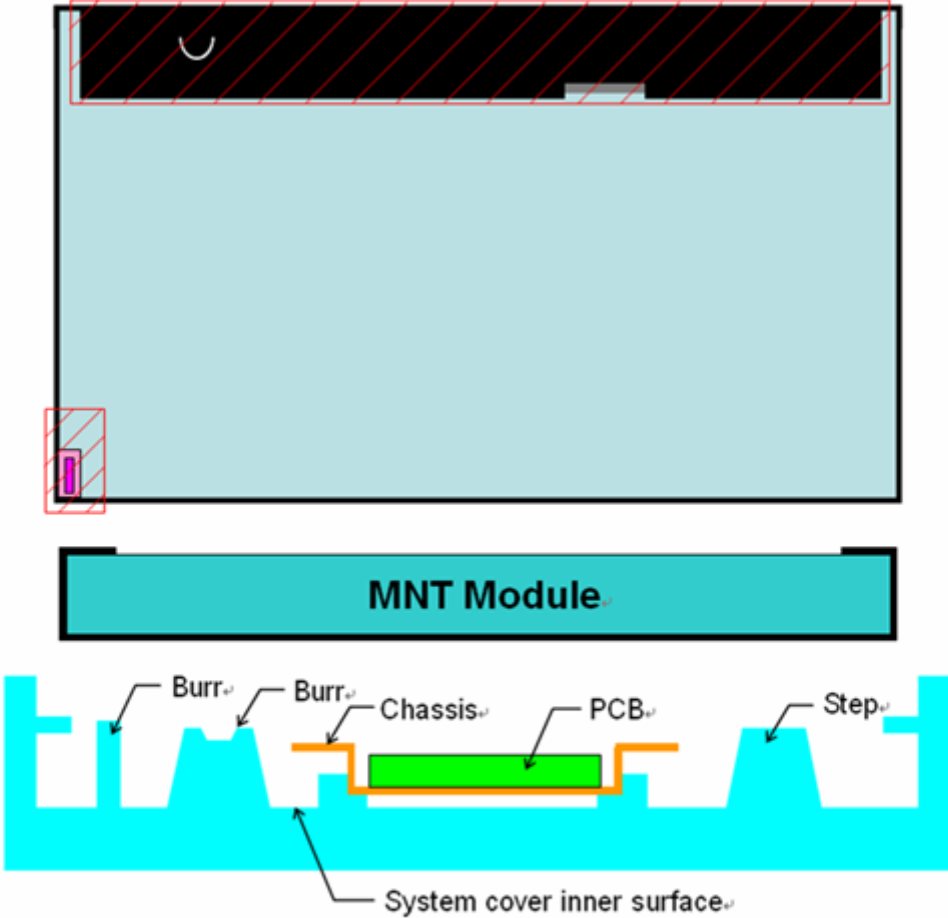| Requirement	Standard	remark
UL	UL60950-1:2006 or Ed.2:2007	
cUL/CSA	CAN/CSA C22.2 No.60950-1-03 or 60950-1-07	
CB	IEC60950-1:2005 / EN60950-1:2006+ A11:2009	

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, second is Flat sheetmetal type chassis (Don't interference from flat sheetmetal of chassis to rear cover of Module).

2	Tape/sponge design on system inner surface

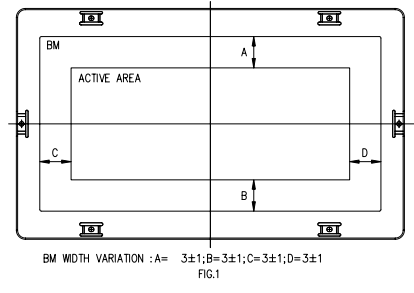| Definition	a) To prevent from abnormal display & white spot after Mechanical test, We suggest using Tape/Sponge as medium between chassis and Module rear cover could reduce the occurrence of white spot. b) When using the Tape/Sponge, suggest it be lay over between set chassis and module rear cover. 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

	a). Burr at logo edge, step, protrusion or PCB board will easily cause white spot.
Definition	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.

FFC electric — **Chassis**
A-A Section
Module

electric wire — **Chassis**
B-B Section
Module

LVDS connector — **FPC**
A-A
B-B
Chassis
wire
Light bar connector

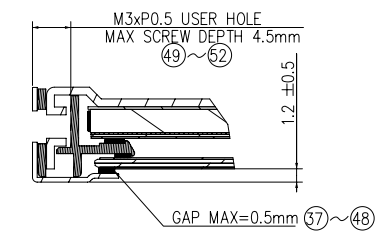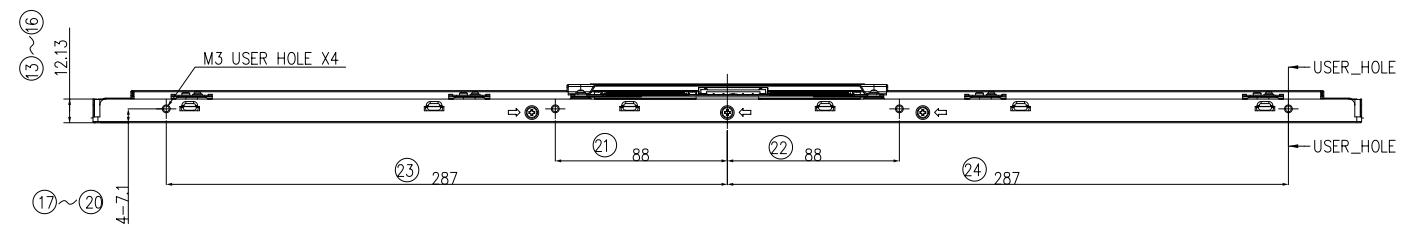| Definition	The overlapping part on System's Chassis and electric wire (FPC、FFC and wire) needs gap structure to avoid display of white spot by pressing overlapping part cause interference.

5	System cover's ventilation outlet structure

Set ventilation outlet structure on Light source side of module.

Light source Connector
Light source edge (LED / Lamp)
Module

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

REV	EC NUMBER	DESCRIPTION	DATE
⚠		First Release	2013/12/12

BM
ACTIVE AREA

A
C   D
B

BM WIDTH VARIATION : A= 3±1;B=3±1;C=3±1;D=3±1
FIG.1

③~④ 12.13

M3 USER HOLE X4

⑰~⑳ 4~7.1

㉑ 88   ㉒ 88
㉓ 287   ㉔ 287

㉝~㊱

USER_HOLE
USER_HOLE
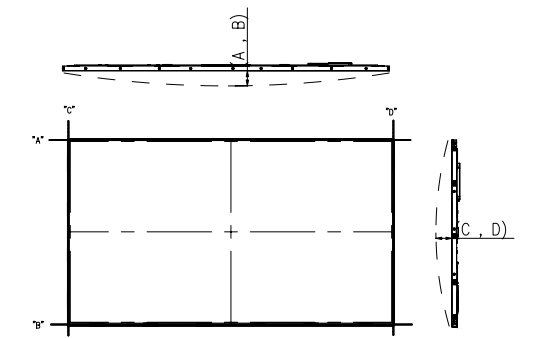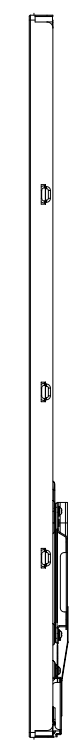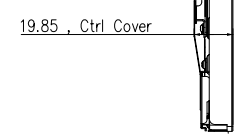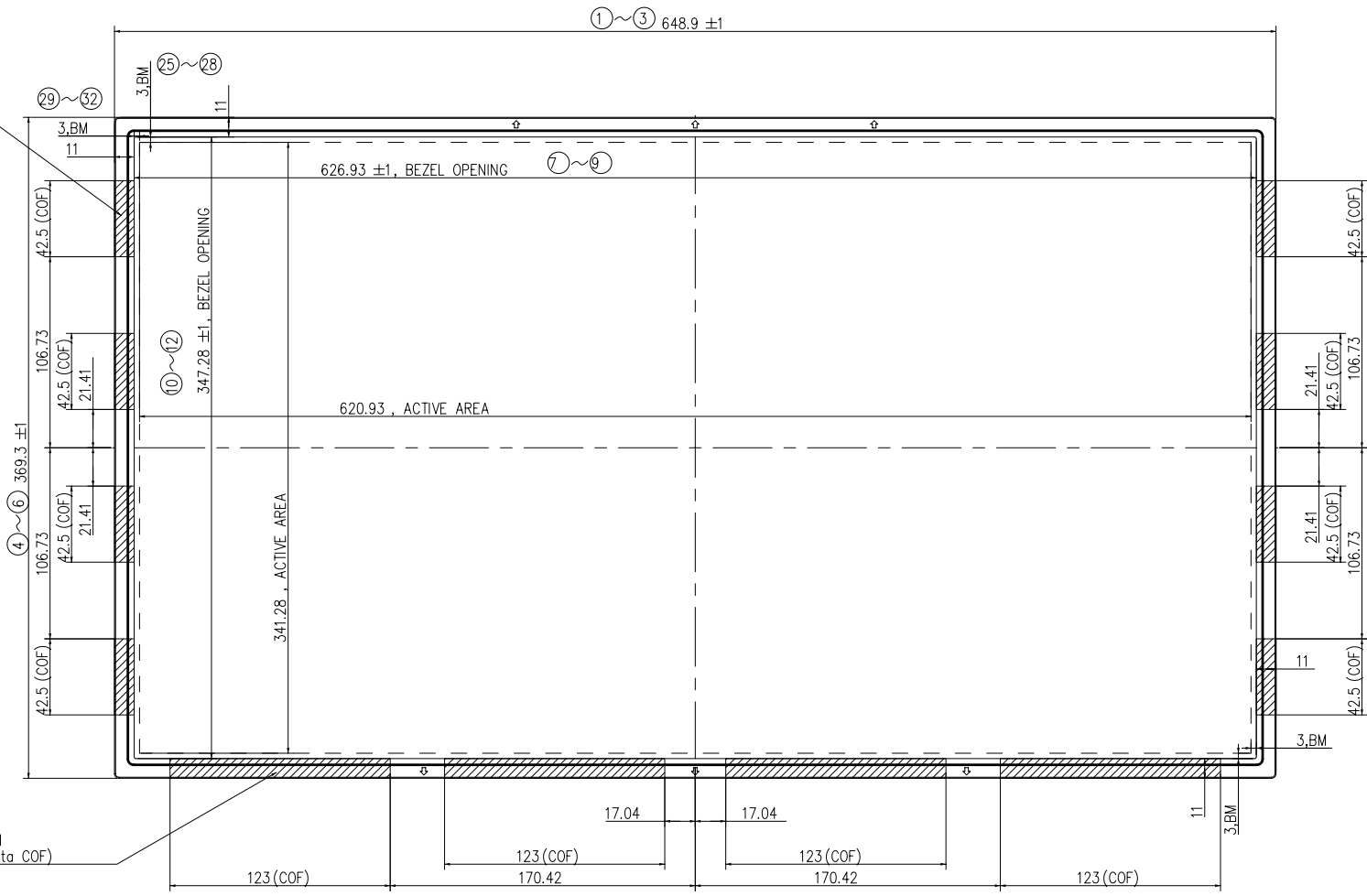
M3xP0.5 USER HOLE
MAX SCREW DEPTH 4.5mm
㊾~㊿ 1.2 ±0.5

GAP MAX=0.5mm ㊲~㊽

SECTION USER_HOLE-USER_HOLE
SCALE 4:1

Scan COF Position
(SI mechanical structure should
not touch the positions of Data COF)

①~③ 648.9 ±1

㉕~㉘ 3,BM
㉙~㉜ 3,BM
11
626.93 ±1, BEZEL OPENING ⑦~⑨

42.5 (COF)
42.5 (COF)
106.73
347.28 ±1, BEZEL OPENING
42.5 (COF)
21.41
620.93 , ACTIVE AREA
369.3 ±1
341.28 , ACTIVE AREA
④~⑥
106.73
42.5 (COF)
21.41
42.5 (COF)
⑩~⑫
11 (COF)
42.5 (COF)

19.85 , Ctrl Cover

Data COF Position
(SI mechanical structure should
not touch the positions of Data COF)

123(COF)   123(COF)   123(COF)   123(COF)
170.42   170.42
17.04 17.04

3,BM
11
3,BM

16.43 , PCB-X Cover

㊼~㊽ A , B)
C , D)
㊿~㊱

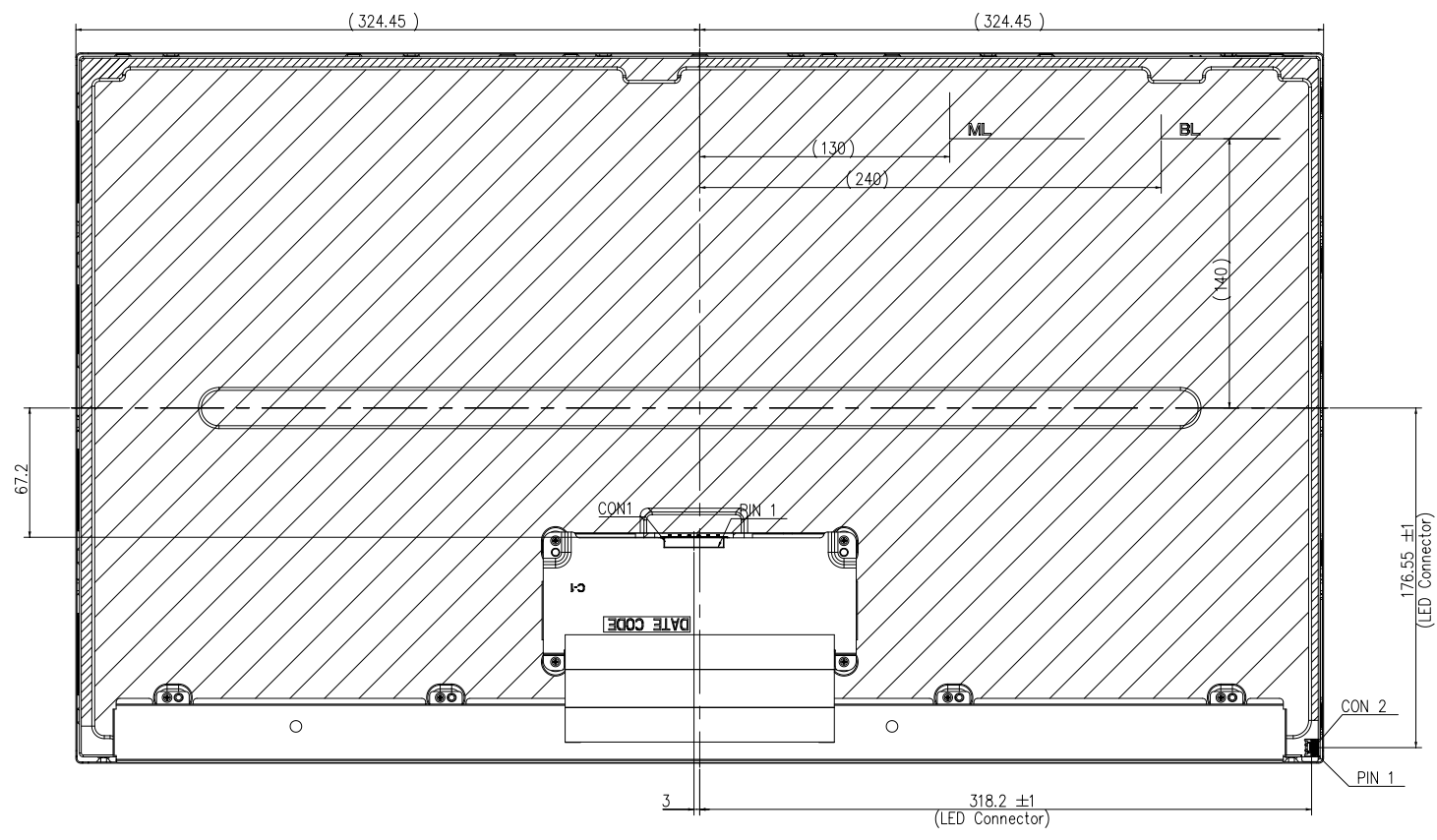MODULE BENDING TOL. :
|A|B| <=   1.23
|C|D| <=   0.72

NOTES:
1. UNLESS OTHERWISE SPECIFY TOLERENCE IS ±1.0mm.
2. " ▧ ": COF position (SI mechanical structure should not touch the positions of COF)
3. CONNECTOR TYPE:
   CON_1: FCN WF23-402-5133 or P-TWO 187059-51221, OR EQUIVALENT
   CON_2: FCN WM13-406-063N or Cvilux CI1406M1HRK-NH, OR EQUIVALENT
4. SCREW HOLES TYPE:
   M3:PITCH 0.5 / MACHINE, MAX. TORQUE=5 KGF-CM, MAX.DEPTH=4.5mm
5. System integration company must keep module up and down direction on the drawing to design set

CPK DIMENSION	CONTROL DIMENSION	DATE 2014/04/14	SCALE 1:1	UNIT mm	⊕
APPROVED	Hans Liu	PART NUMBER or P/N NUMBER			
CHECKED	James Huang	DN0333213		REV A
DESIGNED	Allen Tsai	PART DESCRIPTION module_M280GJ-L30		SHEET NUMBER 1/2
	INNOLUX			SIZE A1+

NOTES:
1. UNLESS OTHERWISE SPECIFY TOLERENCE IS ±1.0mm.
2. CONNECTOR TYPE:
   CON_1: FCN WF23-402-5133 or P-TWO 187059-51221, OR EQUIVALENT
   CON_2: FCN WM13-406-063N or Cvilux CI1406M1HRK-NH, OR EQUIVALENT
3. SCREW HOLES TYPE:
   M3:PITCH 0.5 / MACHINE, MAX. TORQUE=5 KGF-CM, MAX.DEPTH=4.5mm
4. " ▨ ": SUGGESTED MOUNTING AREA POSITION, NO MARK AREA CAN'T BE CLIPPED

5. The wire and FFC cables of the system integration company can't overlap the screw holes of the rearcover

(324.45)   (324.45)
(130)   ML   BL
(240)
(140)
67.2
176.55 ±1 (LED Connector)
CON1   PIN 1
DATE CODE   C1
CON 2
PIN 1
3   318.2 ±1 (LED Connector)