Doc. Number :

☐ Tentative Specification
■ Preliminary Specification
☐ Approval Specification

MODEL NO.: M236HJK
SUFFIX: L5B

Customer: Common

APPROVED BY **SIGNATURE**

Name / Title _____ _____

Note
Product Version B1

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

Approved By	Checked By	Prepared By
梁永祥	林秋森	邱詩容

CONTENTS

REVISION HISTORY

Version	Date	Page	Description
1.0	Dec./2014	ALL	Preliminary spec was first issued.
1.1	Feb./2015	P5	Add 2.MECHANICAL SPECIFICATIONS Weight 0g→3080g
		P8	Modify 3.2.2 BACKLIGHT UNIT LED Forward Current Per Input Pin Valve Min.61.1→70.5mA Typ 65→75mA Max.68.9→79.5mA
		P10	Modify 4.2.3 TOUCH SENSOR PIN ASSIGNMENT INT I2C Interrupt→ I2C Mode: Interrupt ,USB Mode: delay max.200ms then output low
		P12	Modify 4.3 ELECTRICAL CHARACTERISTICS Power Supply Current white typ.0.84→0.83 max.1.092→1.079, Black. typ.0.54→0.51 max.9.702→0.663 Vertical Stripe typ.0.77→0.83 max.1.001→1.079 Power Consumption typ.3.85→4.15 max.5.46→5.395
		P15	Modify 4.3.3 BACKLIGHT UNIT LED Light Bar Current Per Input Pin Min.61.1→70.5mA Typ 65→75mA Max.68.9→79.5mA Power Consumption Typ.8.19→9.45, Max.9.1→10.5
		P28	Modify 6.2 OPTICAL SPECIFICATIONS Color Chromaticity Red Rx Typ. 0.633→0.645, Ry Typ.0.338→0.337 Green Gx Typ. 0.310→0.321, Gy Typ.0.628→0.618 Blue Bx Typ. 0.150→0.151, By Typ.0.058→0.057
		P33	Modify 9.1 PACKING SPECIFICATIONS Weight: approximately: 27kg→35kg

1. GENERAL DESCRIPTION

1.1 OVERVIEW

M236HJK-L5B is a 23.6” TFT Liquid Crystal Display MNT module with PCT* sensor embedded, white-LED back-light unit and 30 pins 2 channels LVDS interface. This module supports 1920x1080 native resolutions and can display up to 16.7 millions colors. The converter module for Backlight is not built in.

*Projected Capacitive Touch

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area Size	23.6” real diagonal		
Driver Element	a-si TFT active matrix	-	
Pixel Number	1920 x R.G.B. x 1080	pixel	
Pixel Pitch	0.2715(H) x 0.2715(V)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16.7M	color	
Transmissive Mode	Normally black	-	
Luminance, White	250	cd/m^2	
Color Gamut	72% of NTSC(Typ.)	-	
Touch Technology	Projected Capacitive Multi-Touch Panel	-	
Touch Method	Finger or Electrically Charged Object	-	
Numbers of Touch	10	Points	
Interface	USB/I2C	-	
Cover Glass Type	Soda-Lime	-	
RoHS, Halogen Free &TCO	Compliance	-	
Power Consumption	Total (14.225) (W) @ cell (4.15)W, BL(9.45) (W), Touch sensor (0.625W)		(1)

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

2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Qwertyu9Unit	Note
Module Size	Horizontal	543.68	544.68	545.68	mm	
	Vertical	317.9	318.9	319.9	mm	
	Thickness	15.91	16.41	16.91	mm	
Bezel Area	Horizontal	NA	NA	NA	mm	
	Vertical	NA	NA	NA	mm	
Touch Sensor Visible Area	Horizontal		522.28		mm	
	Vertical		294.22		mm	
Display Active Area	Horizontal	-	521.28	-		
	Vertical	-	293.22	-	mm	
Weight			(3080)	-	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)

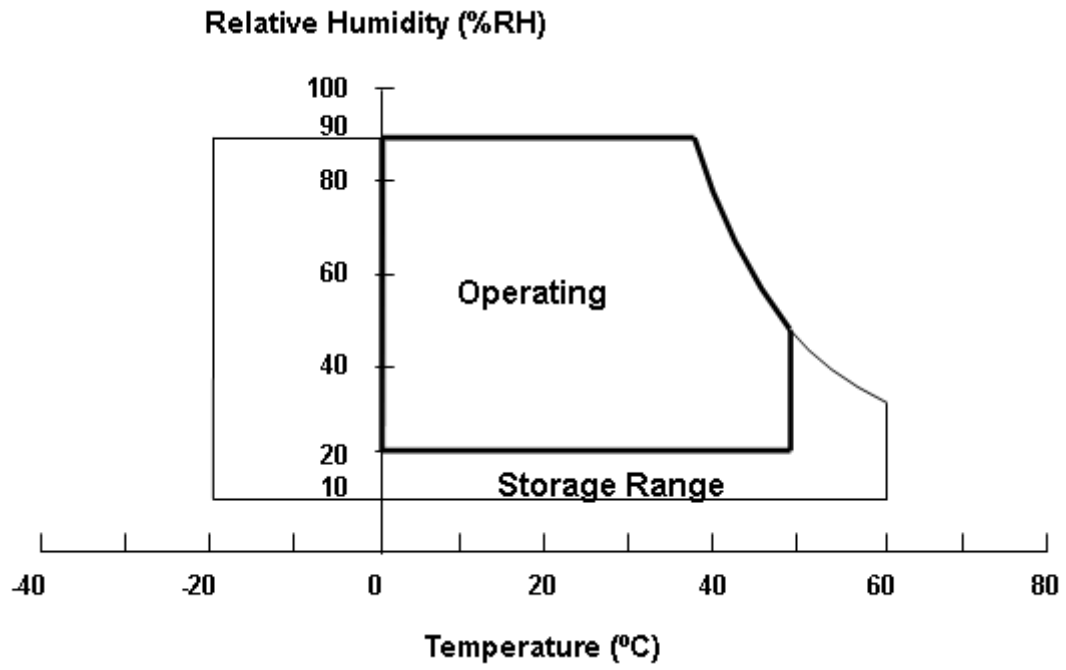
Note (1)

(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=5.0V, 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	(70.5)	(75)	(79.5)	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 4.3.3 and 4.3.4 for further information).

3.2.3 TOUCH MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
DC Supply Voltage	USB_VDD	-0.5	6.0	V	

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM

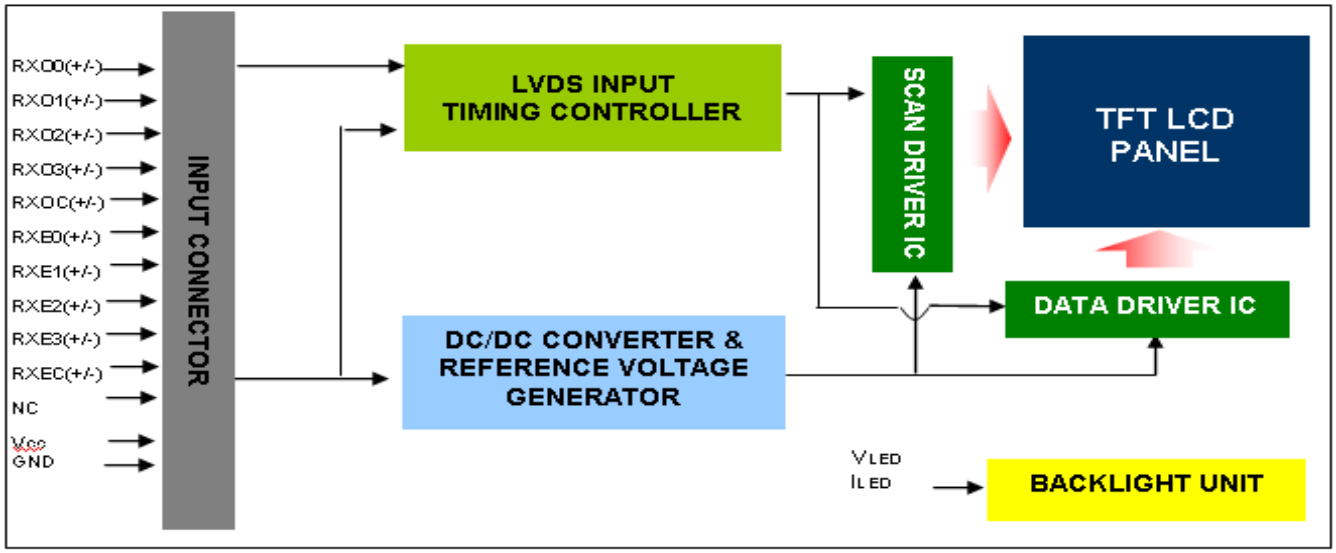


Fig. 4-1 Module Function Block Diagram

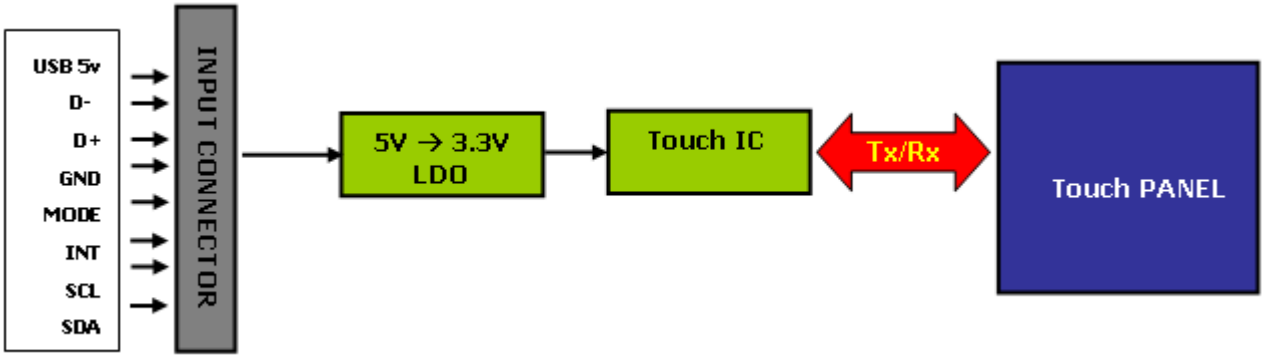


Fig. 4-2 Touch Panel Function Block Diagram

4.2. INTERFACE CONNECTIONS

4.2.1 MODULE LCD PIN ASSIGNMENT

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
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	Vcc	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

4.2.2 MODULE PANEL CONNECTOR INFORMATION

Item	Description
Manufacturer	P-TWO
Type part number	P-TWO:187098-30091
Mating housing part number	FI-X30H(JAE)

4.2.3 TOUCH SENSOR PIN ASSIGNMENT

Pin	Name	Description
1	5V	Power
2	D-	USB D-
3	D+	USB D+
4	GND	Ground
5	MODE	Hi：I2C Interface ≧2.5V, Low：USB Interface≦0.5V
6	INT	I2C Mode : Interrupt ,USB Mode : delay max.200ms then output low
7	SCL	I2C SCL
8	SDA	I2C SDA

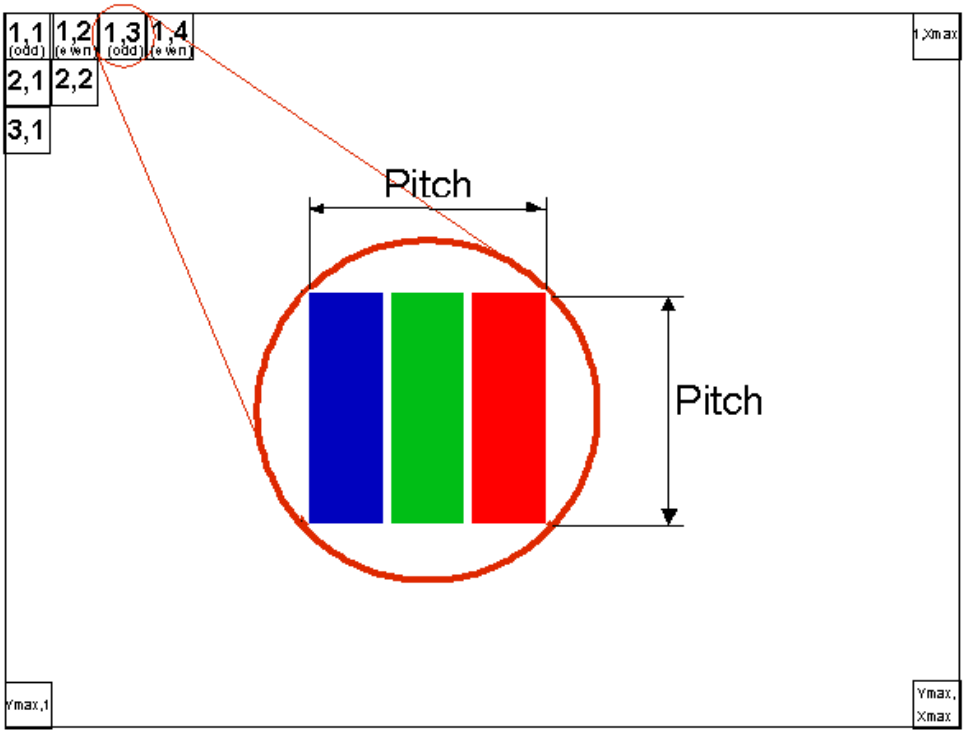
4.2.4 TOUCH SENSOR CONNECTOR INFORMATION

Item	Description
Manufacturer	FCN
Type part number	FCN WM13-406-083N
Mating housing part number	WF1300108

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

Note (1) The first pixel is odd.

Note (2) Input signal of even and odd clock should be the same timing.



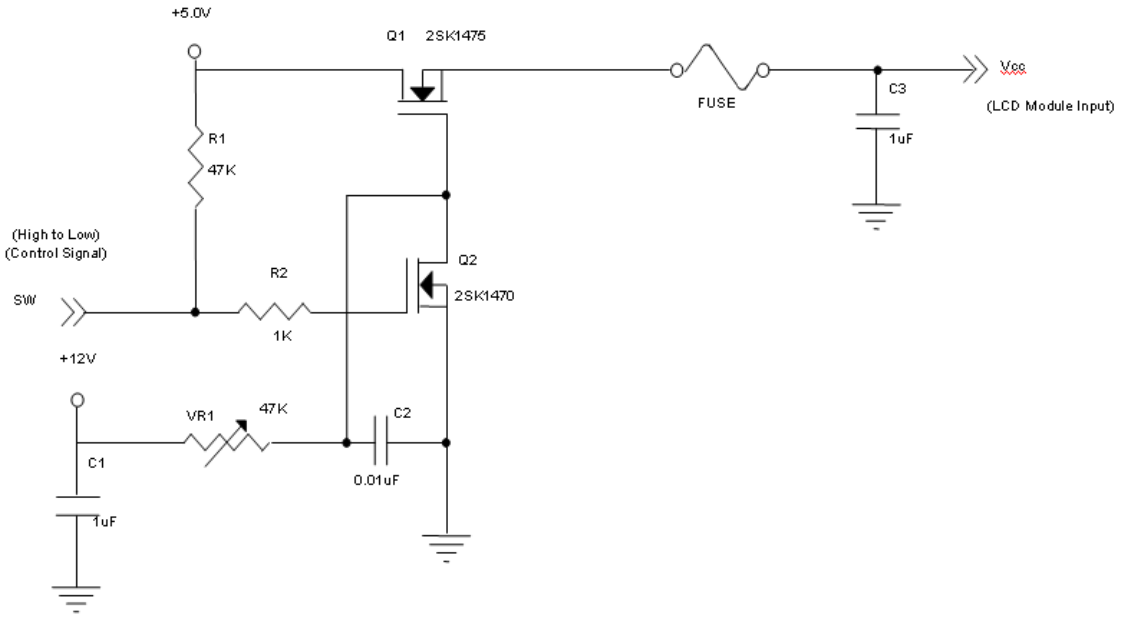
4.3 ELECTRICAL CHARACTERISTICS

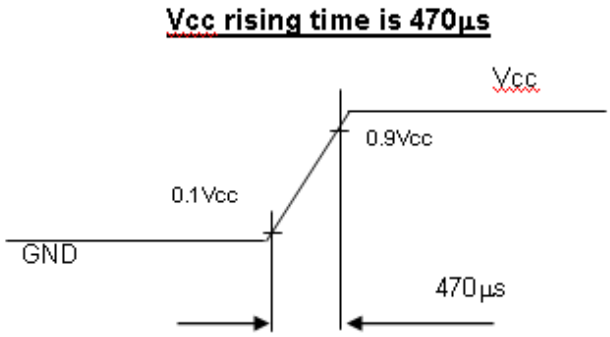
4.3.1 LCD ELETRONICS SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	-	300	mV	-
Rush Current		I_{RUSH}	-	-	3	A	(2)
Power Supply Current	White		-	(0.83)	(1.079)	A	(3)a
	Black		-	(0.51)	(0.663)	A	(3)b
	Vertical Stripe		-	(0.83)	(1.079)	A	(3)c
Power Consumption		PLCD	-	(4.15)	(5.395)	Watt	(4)
LVDS interface	Differential Input Voltage	V_{ID}	100	-	600	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential Input High Threshold Voltage	V_{TH}	-	-	+100	mV	
	Differential Input Low Threshold Voltage	V_{TL}	-100	-	-	mV	

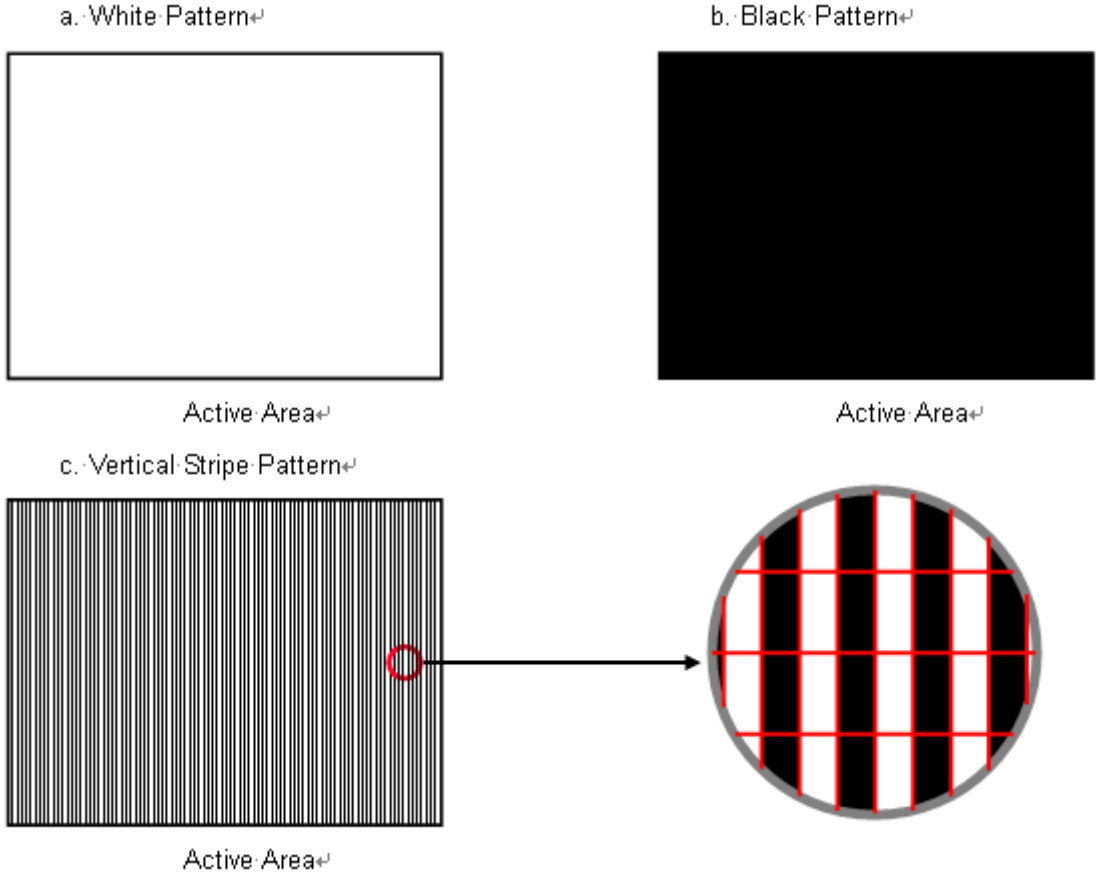
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) Measurement Conditions:



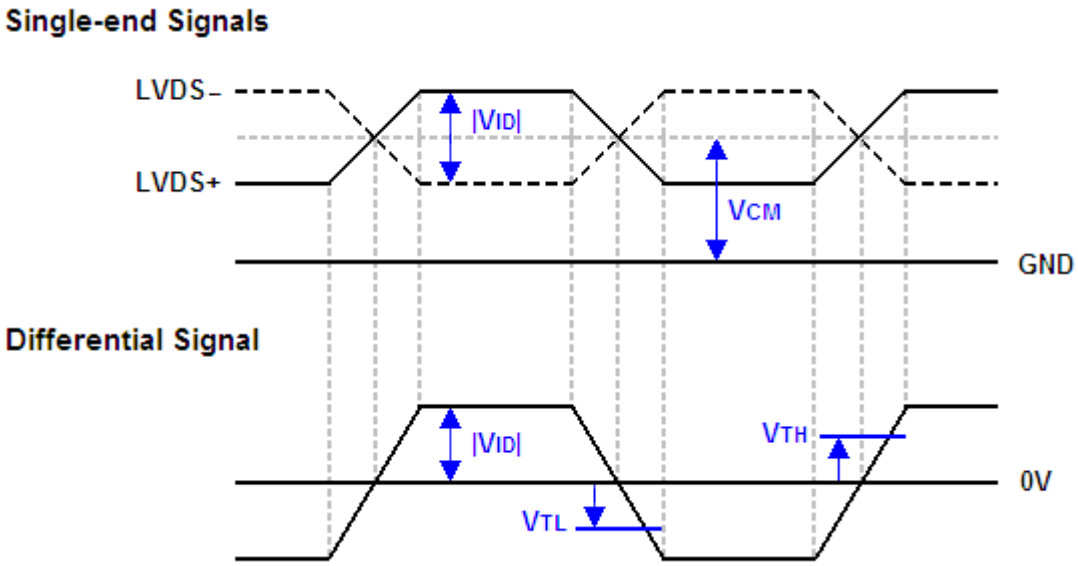


Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.

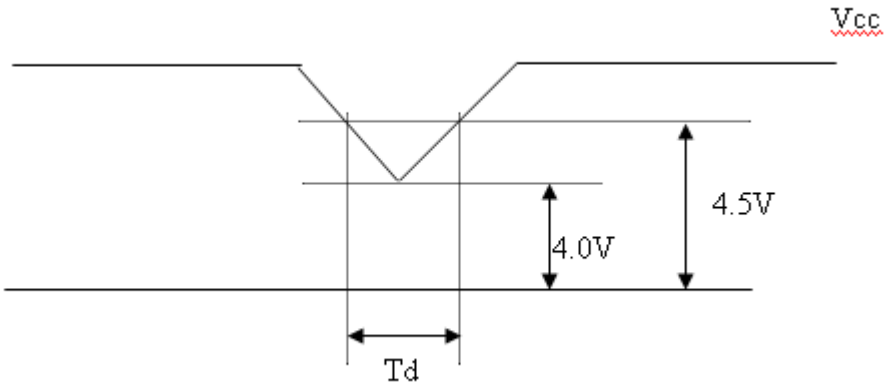


Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) The LVDS input characteristics are as follows:



4.3.2 VCC POWER DIP CONDITION



Dip condition:4.0≦Vcc≦4.5, Td≦20ms

4.3.3 BACKLIGHT UNIT

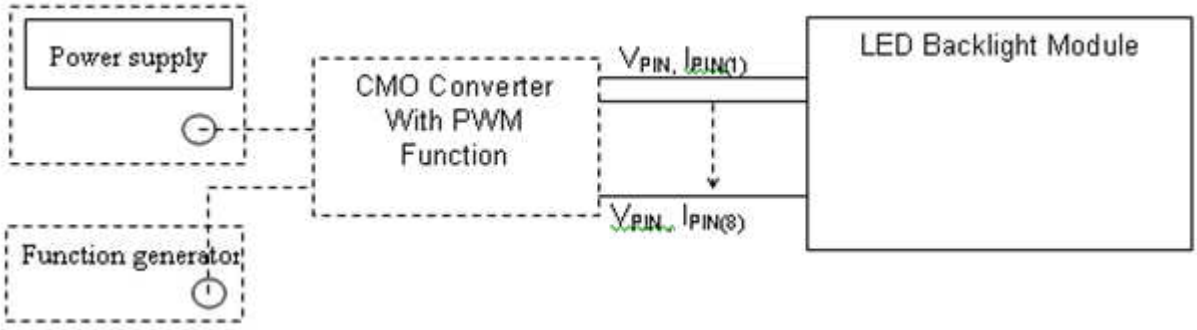
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	VPIN	(29)	(31.5)	(35)	V	(1), Duty=100%, IPIN=66.2mA
LED Light Bar Current Per Input Pin	IPIN	(70.5)	(75)	(79.5)	mA	(1), (2) Duty=100%
LED Life Time	LLED	(40000)			Hrs	(3)
Power Consumption	PBL	---	(9.45)	(10.5)	W	(1) Duty=100%, IPIN=66.2mA

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

Note (2) PBL (Typ) = IPIN(Typ) × VPIN(Typ) × (4) PBL(Max) = IPIN(Typ) x VPIN(Max)x(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= (120)mA (per chip) until the brightness becomes ≦ 50% of its original value.

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



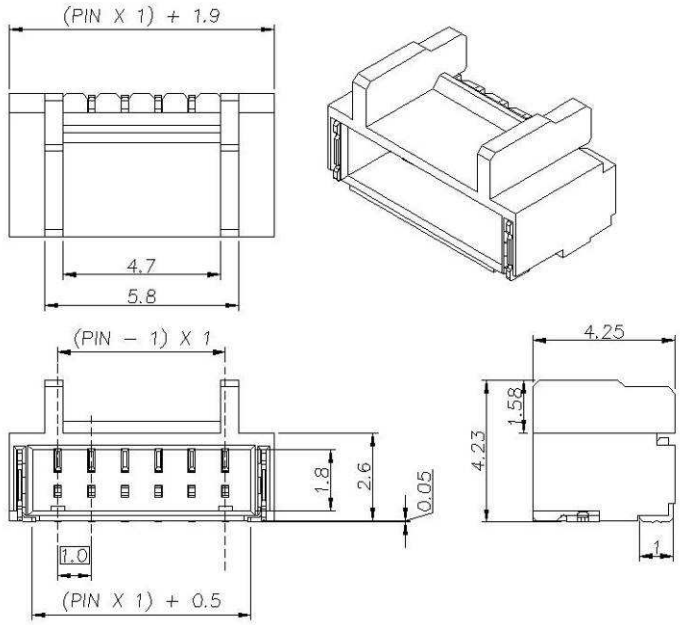
4.3.4 LIGHTBAR CONNECTOR PIN ASSIGNMENT

(1) Connector Information:

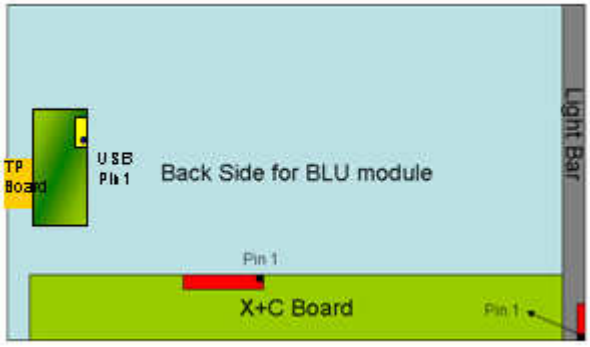
Item	Description
Manufacturer	FCN
Type part number	WM13-406-083N(FCN)
Mating housing part number	IWF13-00108(FCN)

*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 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	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
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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

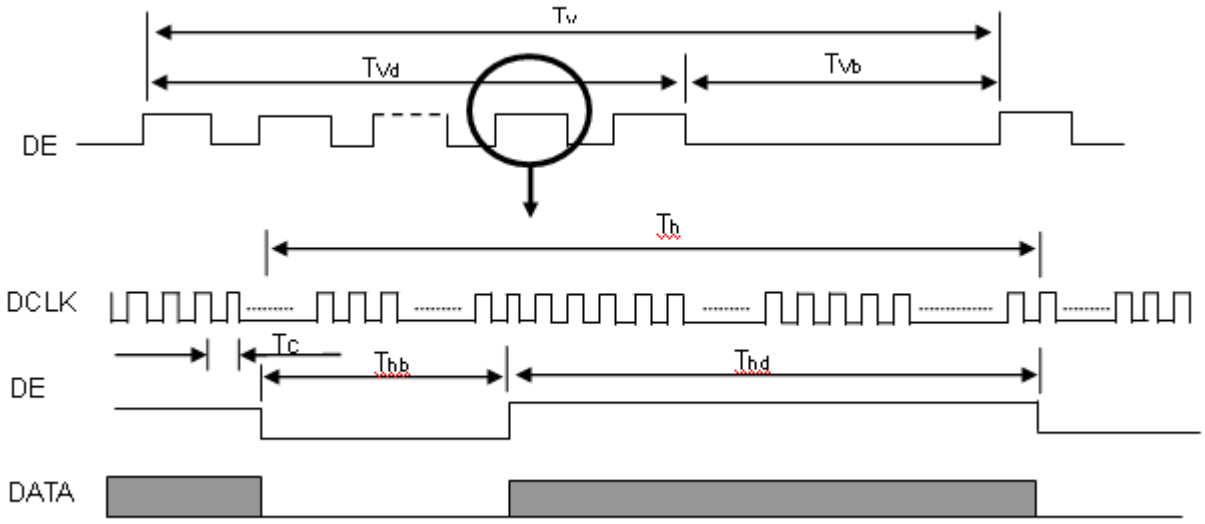
4.5 DISPLAY TIMING SPECIFICATIONS

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	58.54	74.25	97.98	MHz	(1)
	Period	Tc		13.47		ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*TC	-	0.02*TC	ns	(2)
	Input Clock to data skew	TLVCCS	-0.02*TC		0.02*TC		(3)
	Spread spectrum modulation range	Fclkin_mod	0.97*FC	-	1.03*FC	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}	-	-	100	KHz	
Vertical Display Term	Frame Rate	Fr	50	60	75	Hz	
	Total	Tv	1115	1125	1136	Th	Tv=Tvd+Tvb-
	Active Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	Tv-Tvd	Tv-Tvd	Tv-Tvd	Th	-
Horizontal Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	-
	Blank	Thb	Th-Thd	Th-Thd	Th-Thd	Tc	-

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

INPUT SIGNAL TIMING DIAGRAM

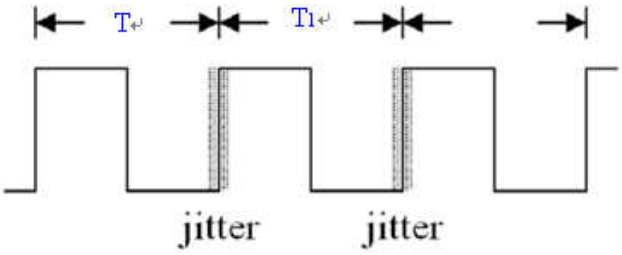


Note (1) Please make sure the range of pixel clock has follow the below equation:

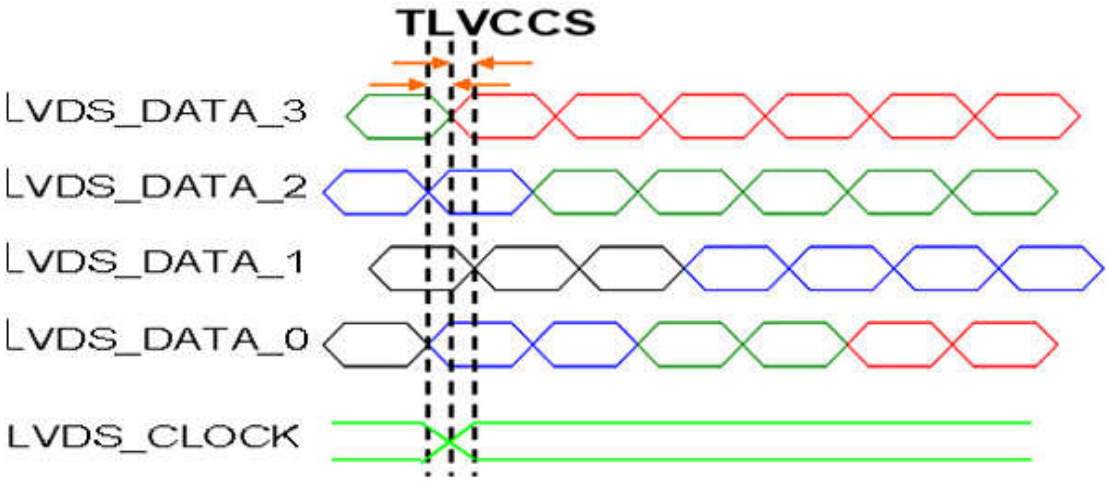
Fc(max) ≥ Fr X Tv X Th

Fr X Tv X Th ≥ Fc(min)

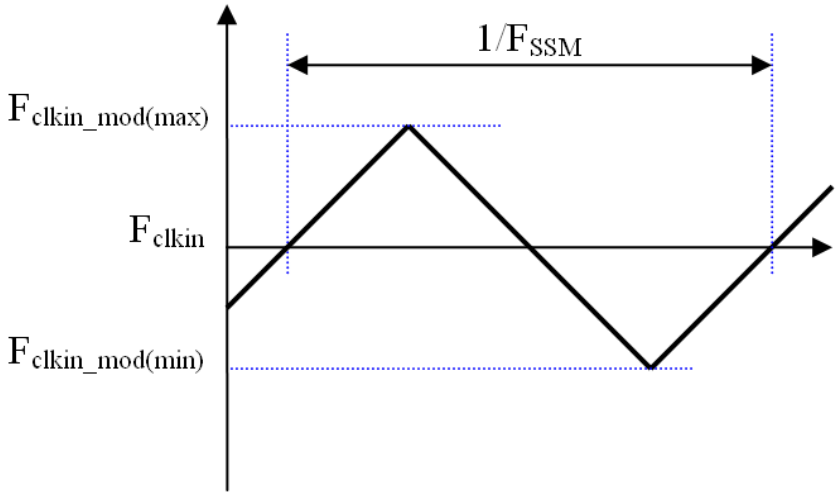
Note (2) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI



Note (3) Input Clock to data skew is defined as below figures.



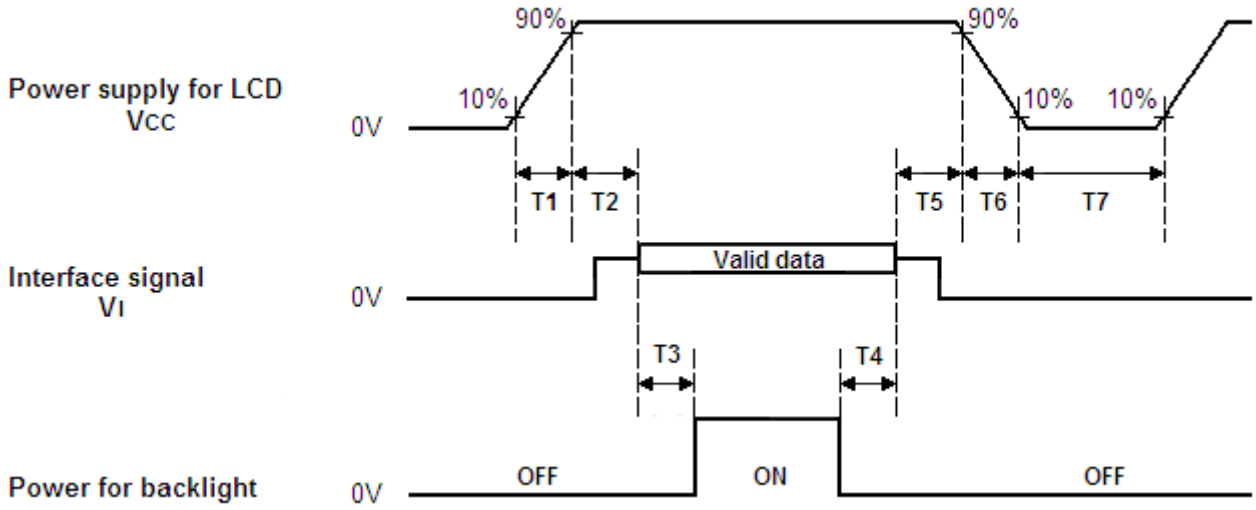
Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



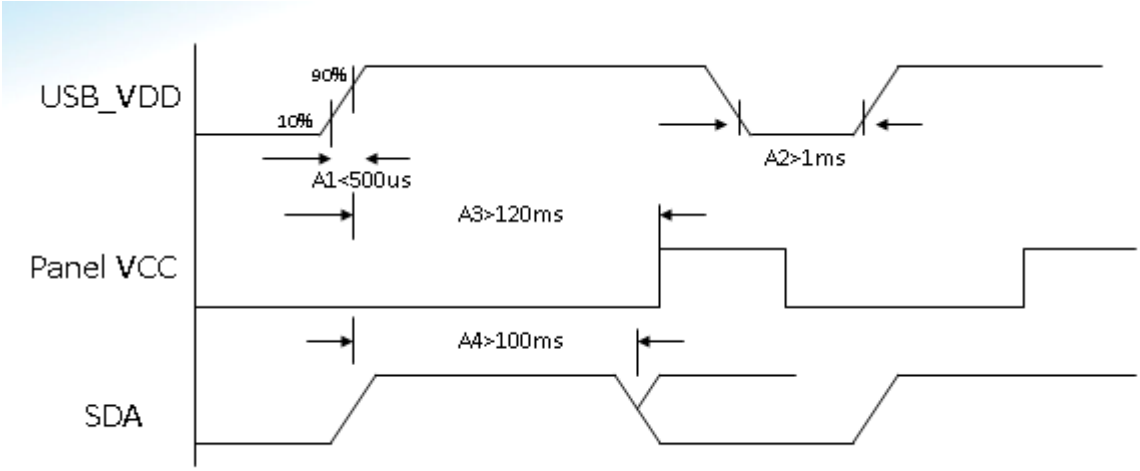
Note(5) The DCLK range at last line of V-blank should be set in 0 to Hdisplay/2

4.6 POWER ON/OFF SEQUENCE

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



※Touch Panel Power sequence →



Timing Specifications:

Parameters	Values			Units
	Min	Typ.	Max	
T1	0.5	--	10	ms
T2	0	30	50	ms
T3	200	250	--	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) T7 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.TOUCH SENSOR SPECIFICATION

5.1 TOUCH GENERAL SPECIFICATION

Items	General
Touch Module Size	23.6”
Touch Technology	Projected Capacitive Multi-Touch Panel
Number of Channels	105*60
Touch Method	Finger
Numbers of Touch	10 Points
Accuracy	+/- 1 mm
Linearity	Maximum of 1 mm over 10 mm of travel
Reporting rate	>100 Hz
Minimum stylus diameter	9 mm
Sensor Glass Material	Soda-lime Glass
TP unit cell pattern pitch size	X 4997 um / Y 4937 um
TP Type	One Glass Sensor
Touch Module Outline	539.8 mm X 317.2 mm
Touch Active Area	521.28 mm X 293.22 mm
Touch Window Visible Area	522.28 mm X 294.22 mm
Touch Panel Thickness	1.1 mm +/-0.1
Surface Hardness	6H
	Electrical
Supply Voltage	USB: 5V
Interface	USB/I2C
Touch Channels (X - Y)	105*60
Sensor Pitch (X - Y)	X 4997 um / Y 4937 um

5.2 TOUCH ELECTRICAL SPECIFICATION

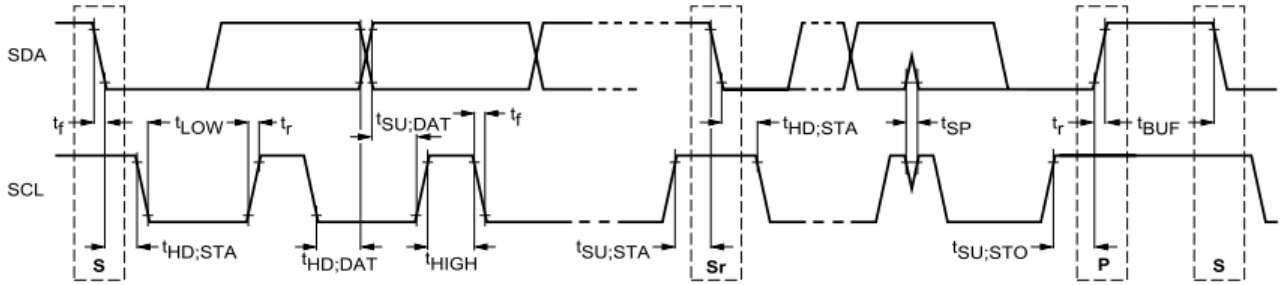
Item		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
USB Power Supply Voltage		USB	4.8	5	5.2	V	
Power Consumption	Active mode	IDD		125		mA	
	Sleep mode	IDD		0		mA	

5.3 TOUCH TEST CONDITIONS

All of the touch test conditions are following Win 8 specification.

5.4 TOUCH PANEL I2C INTERFACE PROTOCAL

5.4.1 I2C TIMING



Characteristics of the SDA and SCL bus lines

PARAMETER	SYMBOL	STANDARD MODE		FAST MODE		UNIT
		MIN	MAX	MIN	MAX	
SCL clock frequency	f_{SCL}	0	100	0	400	kHz
Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD;STA}$	4.0	-	0.6	-	µs
LOW period of the SCL clock	t_{LOW}	4.7	-	1.3	-	µs
HIGH period of the SCL clock	t_{HIGH}	4.0	-	0.6	-	µs
Set-up time for a repeated START condition	$t_{SU;STA}$	4.7	-	0.6	-	µs
Data hold time:	$t_{HD;DAT}$	200.0	-	200.0	-	ns
Data set-up time	$t_{SU;DAT}$	250	-	100	-	ns
Rise time of both SDA and SCL signals	t_f	-	1000	20	300	ns
Fall time of both SDA and SCL signals	t_f	-	300	20	300	ns
Set-up time for STOP condition	$t_{SU;STO}$	4.0	-	0.6	-	µs
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	1.3	-	µs
Capacitive load for each bus line	C_b	-	400	-	400	pF
Noise margin at the LOW level for each connected device (including hysteresis)	V_{nL}	$0.1V_{DD}$	-	$0.1V_{DD}$	-	V
Noise margin at the HIGH level for each connected device (including hysteresis)	V_{nH}	$0.2V_{DD}$	-	$0.2V_{DD}$	-	V

5.4.2 DEVICE ADDRESS

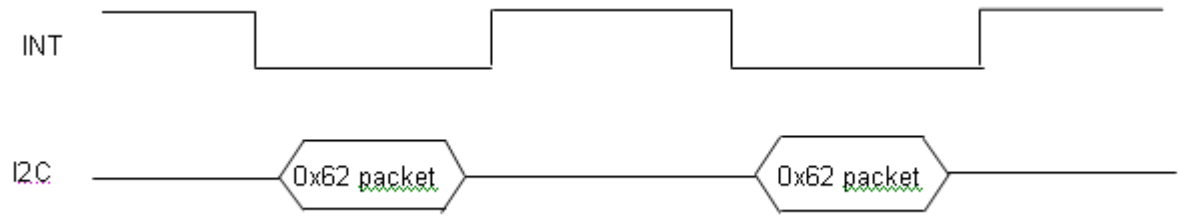
The device addresses are 7-binary bits long and are conventionally expressed as 4 bits followed by 3 bits followed by the letter ‘b’,0010 000 These addresses occupy the high seven bits of an eight-bit field on the bus.

MSB							LSB
0	0	1	0	0	0	0	0/1
Device Address							R/W
7-bit Device Address: 0x10							
8-bit Device Read Address: 0x21							
8-bit Device Write Address: 0x20							

5.4.3 I2C COMMUNICATION PROTOCOL

Touch device uses interrupt pin to signal the host when detecting touch events on the sensor. When a finger touches the sensor surface, the device pulls low $\overline{\text{INT}}$ to inform the host to read finger message packet, which starts with a 0x62 byte. The $\overline{\text{INT}}$ will keep low until host read the whole packet, 40 bytes in

INT Pin Control Diagram



5.4.4 TOUCH POINTS REPORTING FORMAT

Read Touch Reported Number (with header 0x62 packet)

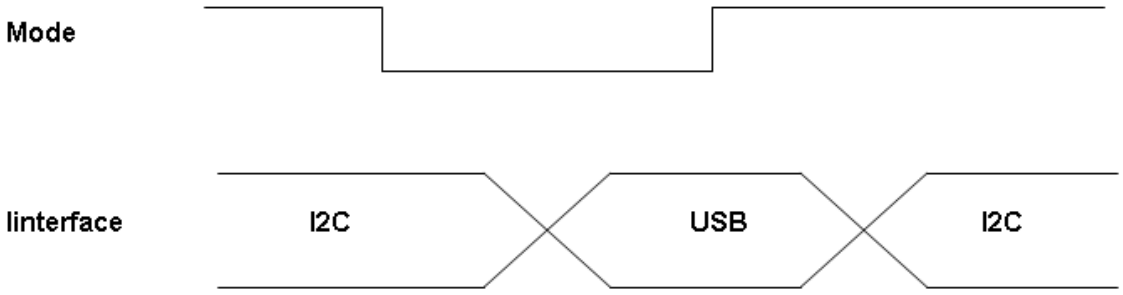
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	0	1	1	0	0	0	1	0
Byte 2	id7	id6	id5	id4	id3	id2	id1	id0
Byte 3	0	0	id9	id8	Finger 3	Finger 2	Finger 1	Finger 0
Byte 4	X1 Absolute Position High (X1 Bits 11~8)				Y1 Absolute Position High (Y1 Bits 11~8)			
Byte 5	X1 Absolute Position Low (X1 Bits 7~0)							
Byte 6	Y1 Absolute Position Low (Y1 Bits 7~0)							
Byte 7	X2 Absolute Position High (X2 Bits 11~8)				Y2 Absolute Position High (Y2 Bits 11~8)			
Byte 8	X2 Absolute Position Low (X2 Bits 7~0)							
Byte 9	Y2 Absolute Position Low (Y2 Bits 7~0)							
Byte 10	X3 Absolute Position High (X3 Bits 11~8)				Y3 Absolute Position High (Y3 Bits 11~8)			
Byte 11	X3 Absolute Position Low (X3 Bits 7~0)							
Byte 12	Y3 Absolute Position Low (Y3 Bits 7~0)							
Byte 13	X4 Absolute Position High (X4 Bits 11~8)				Y4 Absolute Position High (Y4 Bits 11~8)			
Byte 14	X4 Absolute Position Low (X4 Bits 7~0)							
Byte 15	Y4 Absolute Position Low (Y4 Bits 7~0)							
Byte 16	X5 Absolute Position High (X5 Bits 11~8)				Y5 Absolute Position High (Y5 Bits 11~8)			
Byte 17	X5 Absolute Position Low (X5 Bits 7~0)							
Byte 18	Y5 Absolute Position Low (Y5 Bits 7~0)							
Byte 19	X6 Absolute Position High (X6 Bits 11~8)				Y6 Absolute Position High (Y6 Bits 11~8)			
Byte 20	X6 Absolute Position Low (X6 Bits 7~0)							
Byte 21	Y6 Absolute Position Low (Y6 Bits 7~0)							
Byte 22	X7 Absolute Position High (X7 Bits 11~8)				Y7 Absolute Position High (Y7 Bits 11~8)			
Byte 23	X7 Absolute Position Low (X7 Bits 7~0)							
Byte 24	Y7 Absolute Position Low (Y7 Bits 7~0)							
Byte 25	X8 Absolute Position High (X8 Bits 11~8)				Y8 Absolute Position High (Y8 Bits 11~8)			
Byte 26	X8 Absolute Position Low (X8 Bits 7~0)							
Byte 27	Y8 Absolute Position Low (Y8 Bits 7~0)							
Byte 28	X9 Absolute Position High (X9 Bits 11~8)				Y9 Absolute Position High (Y9 Bits 11~8)			
Byte 29	X9 Absolute Position Low (X9 Bits 7~0)							
Byte 30	Y9 Absolute Position Low (Y9 Bits 7~0)							
Byte 31	X10 Absolute Position High (X10 Bits 11~8)				Y10 Absolute Position High (Y10 Bits 11~8)			
Byte 32	X10 Absolute Position Low (X10 Bits 7~0)							
Byte 33	Y10 Absolute Position Low (Y10 Bits 7~0)							
Byte 34	Btn1	Btn2	Btn3	Btn4	Btn5	Btn6	Btn7	1
Byte 35	Check sum							

idx: 1 = touch, 0 = un-touch

5.5 TOUCH PANEL USB INTERFACE PROTOCAL

The USB interface fulfills the specification of HID requirements and does not require any extra coding.

5.6 TOUCH PANEL USB & I2C INTERFACE CHANGE SEQUENCE.



6. OPTICAL CHARACTERISTICS

6.1 TEST CONDITIONS

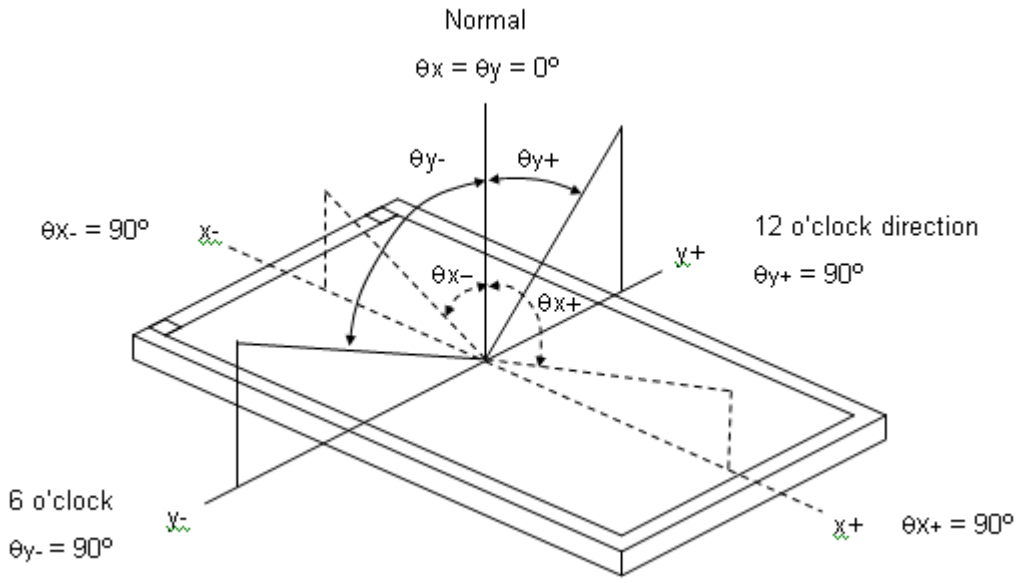
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	I_{PIN}	(65)	mA_{DC}
PWM Duty Ratio	D	100	%
LED Light Bar Test Converter	INX 27-D092896		

6.2 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	(0.645)	Typ + 0.03	-	(1), (5)
		Ry			(0.337)			
	Green	Gx			(0.321)			
		Gy			(0.618)			
	Blue	Bx			(0.151)			
		By			(0.057)			
	White	Wx			(0.313)			
		Wy			(0.329)			
Center Luminance of White (Center of Screen)		L_C		200	250	-		(4), (5)
Contrast Ratio		CR		(2000)	(3000)			(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	(20)	(25)	ms	(3)
		T_F		-	(5	(10)		
		T_{GtG_AVE}			(30)	(35)		
White Variation		W	θ_x=0°, θ_Y =0°	72	75	-	-	(5), (6)
Viewing Angle	Horizontal	θx- + θx+	CR ≧ 5	(160)	(178)	---	Deg.	(1), (5)
	Vertical	θy- + θy+		(160)	(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

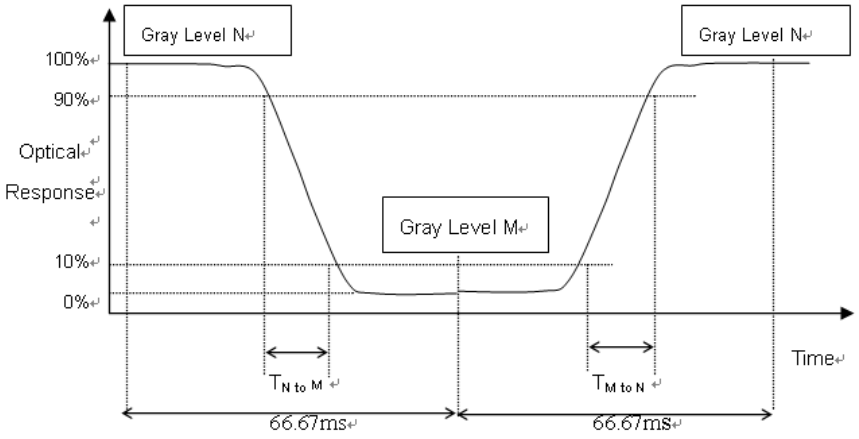
CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time：

-The TR is the rising-time means the transition time from “Full-Black (gray 0)” to “Full-White (gray 255)” and the TF is the falling-time means the transition time from “Full-White (gray 255)” to “Full-White (gray 0)” as the following figure.(Measured by TEKTRONIX TDS3054B).

-The T_{GtG} is the response time means the transition time from “Gray N” to “Gray M” (N,M=0~255).



- TGtG_AVE is the total average of the TGtG data (Measured by INX GTG instrument)
- The gray (N,M) stands for the (0,31,63,~255) as the following table.
- If system use ODC (Over Driving Circuit) function, TGtG_AVE may be 5ms~15ms.

* It depends on Overshoot rate

Gray to Gray		Rising time								
		0	31	63	95	127	159	191	223	255
Falling time	0									
	31									
	63									
	95									
	127									
	159									
	191									
	223									
	255									

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

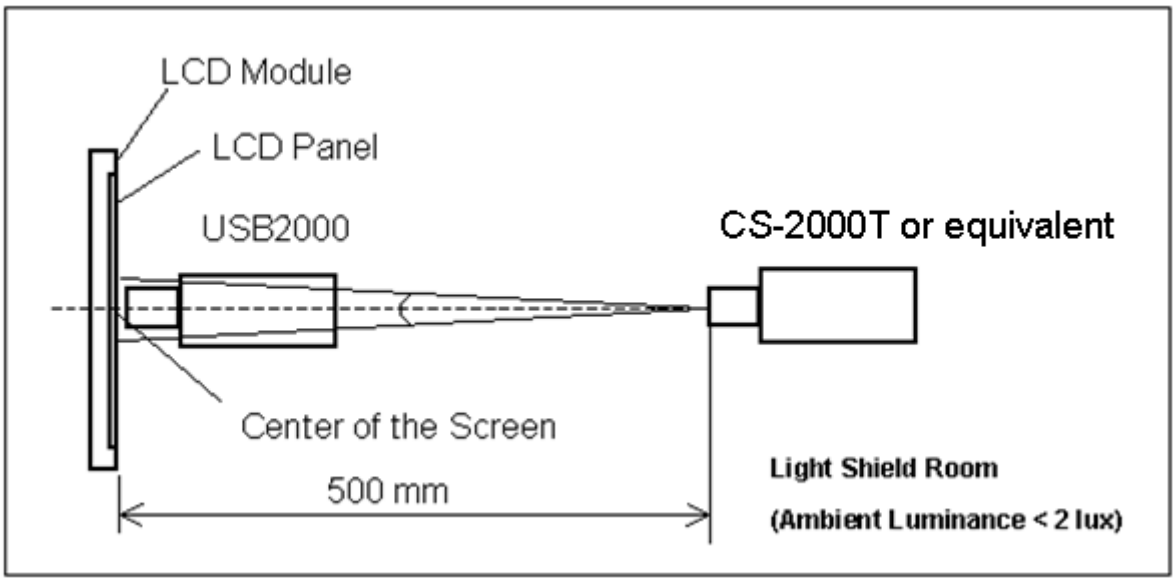
Measure the luminance of gray level 255 at center point

$L_C = L (5)$

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

Note (5) Measurement Setup:

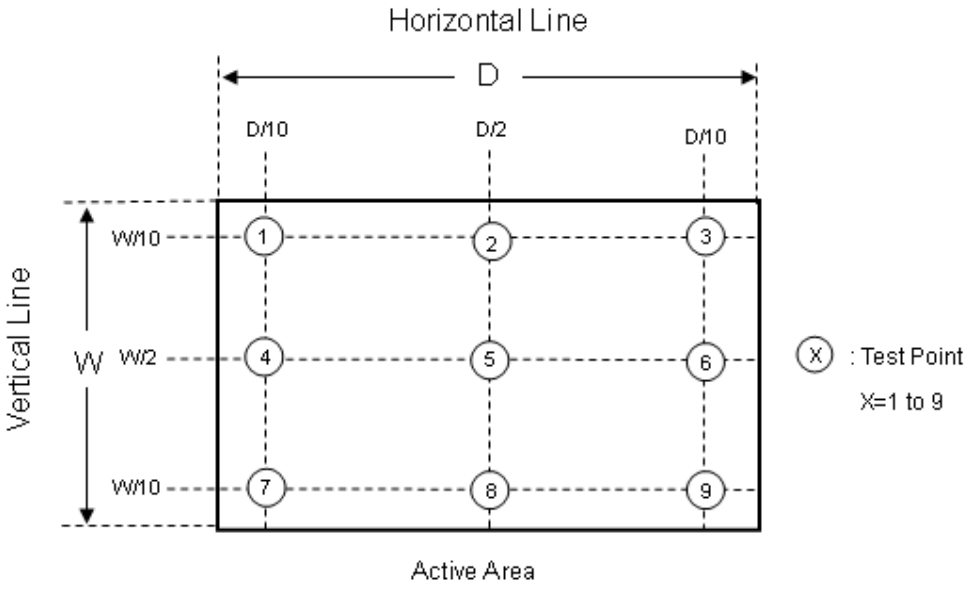
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



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%



7. RELIABILITY TEST ITEM

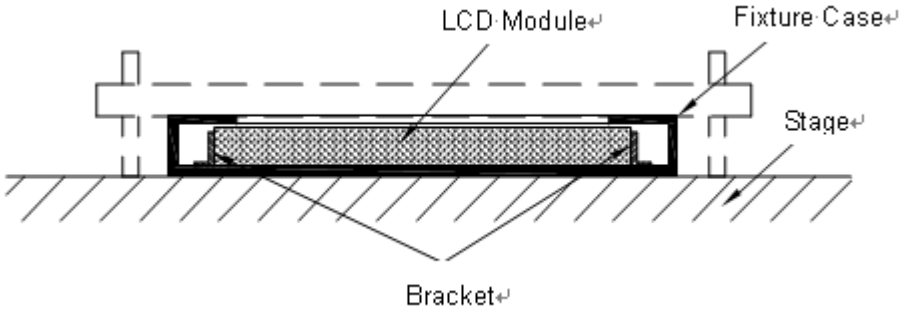
Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃ , 80%RH, 240hours	
High Temperature Operation (HTO)	Ta= 50℃ , 240hours	
Low Temperature Operation (LTO)	Ta= 0℃ , 240hours	
High Temperature Storage (HTS)	Ta= 60℃ , 240hours	
Low Temperature Storage (LTS)	Ta= -20℃ , 240hours	
Vibration 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:



8. MECHANICAL STRENGTH CHARACTERISTICS

8.1 MECHANICAL STRENGTH SPECIFICATIONS

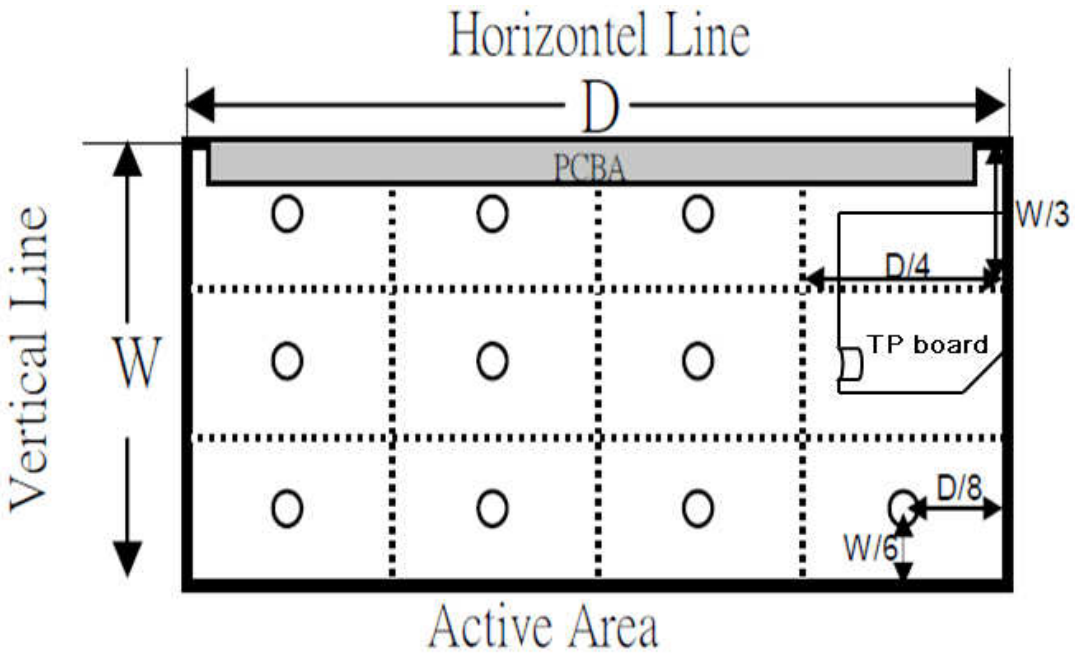
Item	Condition	Min	Unit	Note
Mechanical Strength	128th Gray Pattern	0.6	Kgf	

8.2 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.

8.3 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).



9.PACKING

9.1 PACKING SPECIFICATIONS

(1) 10 LCD modules / 1 Box

(2) Box dimensions: 620(L) X 348(W) X 430(H) mm

(3) Weight: approximately: 35kg (10 modules per box)

9.2 PACKING METHOD

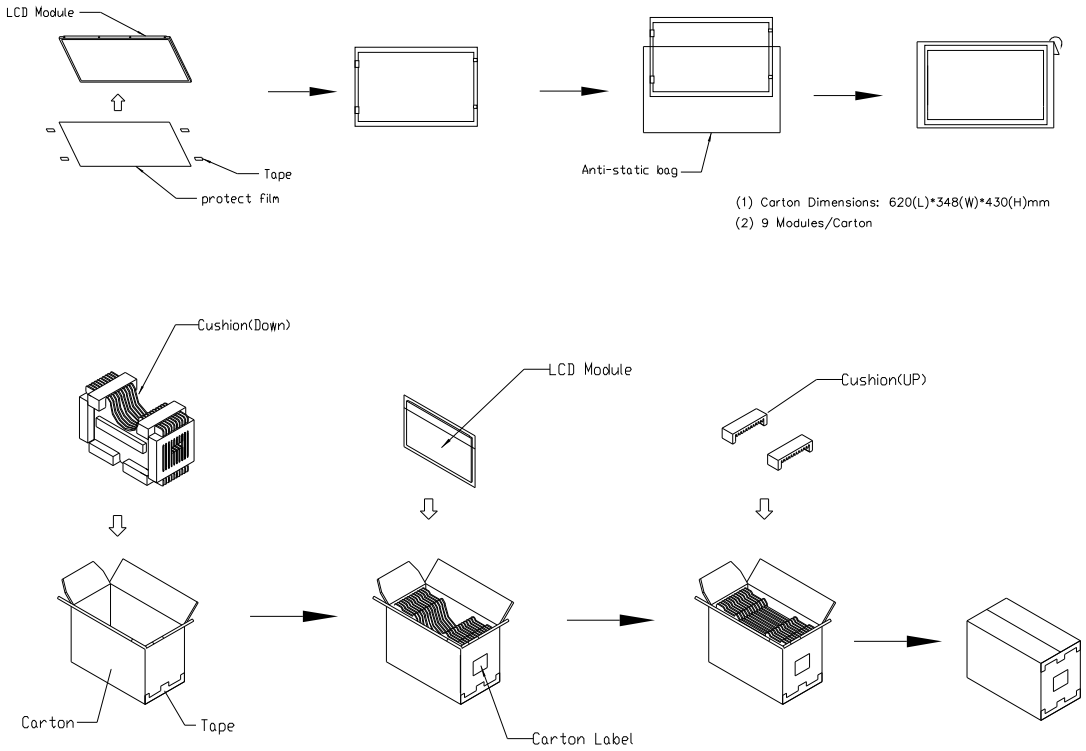
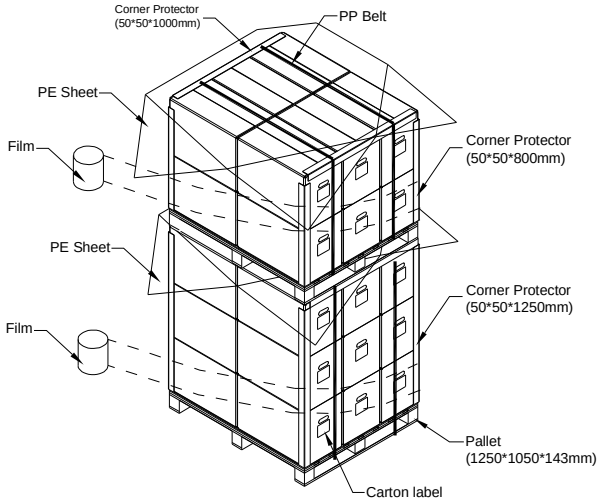


Figure. 9-1 Packing method

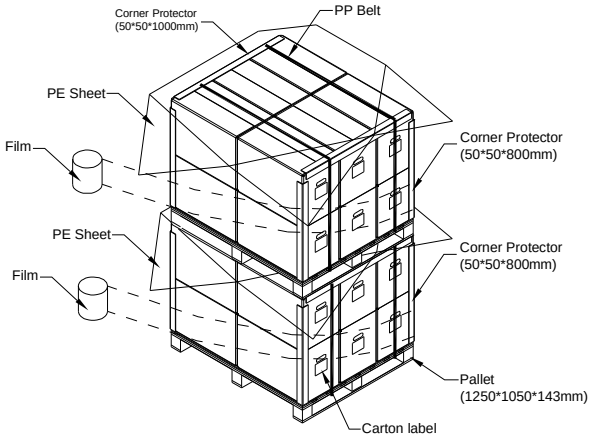
9.3 PALLET

For ocean shipping

Sea / Land Transportation (40ft HQ Container)



Sea / Land Transportation (40ft Container)



For air transport

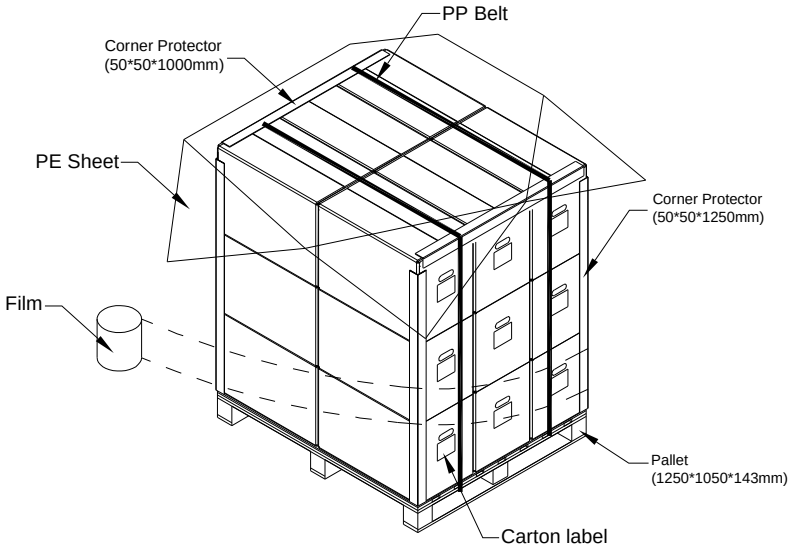


Figure. 9-2 Packing method

9.4 UN-PACKING METHOD

For un-packing

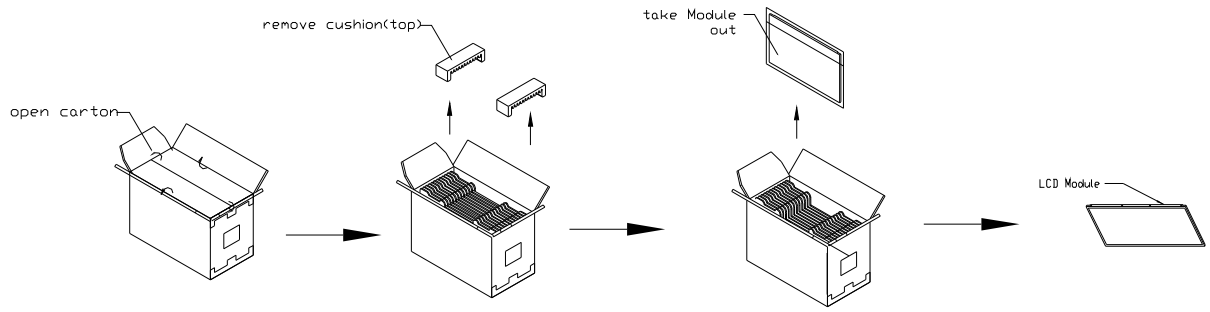


Figure. 9-3 UN-Packing method

10. INX MODULE LABEL

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

(a) Model Name: M236HJK-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- N6K5B-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	INX=CM
N6K30	Model number	M236HJK-L5B= N6K5B
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

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

(11) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

11.2 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

11.3 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.

11.4 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.

11.5 SAFETY STANDARDS

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

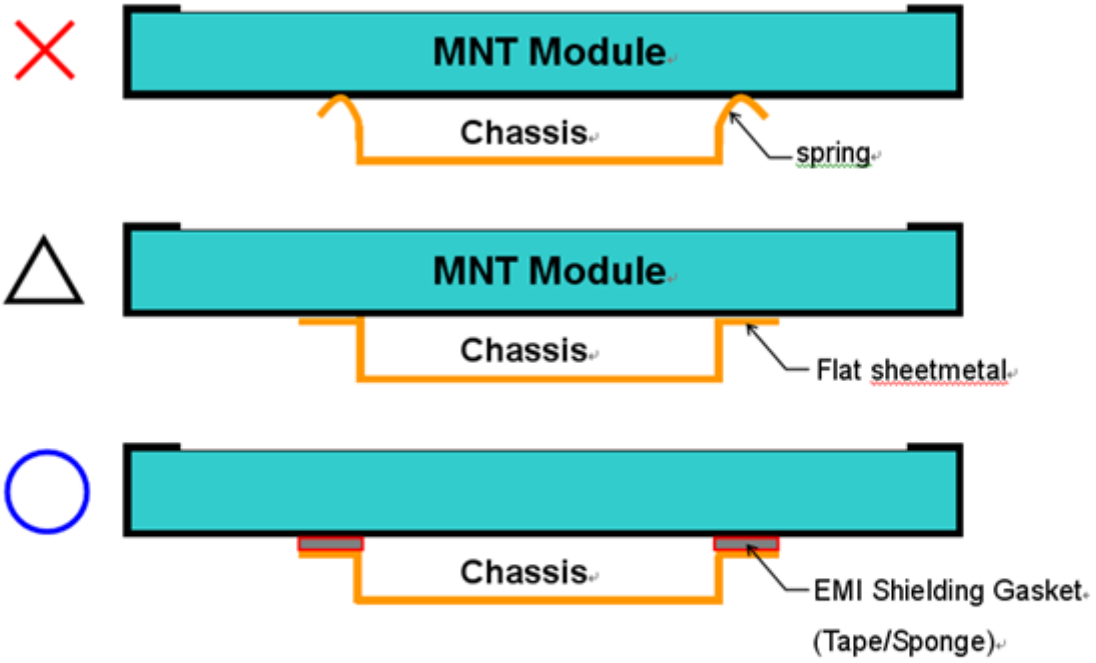
(1) UL60950-1 or updated standard.

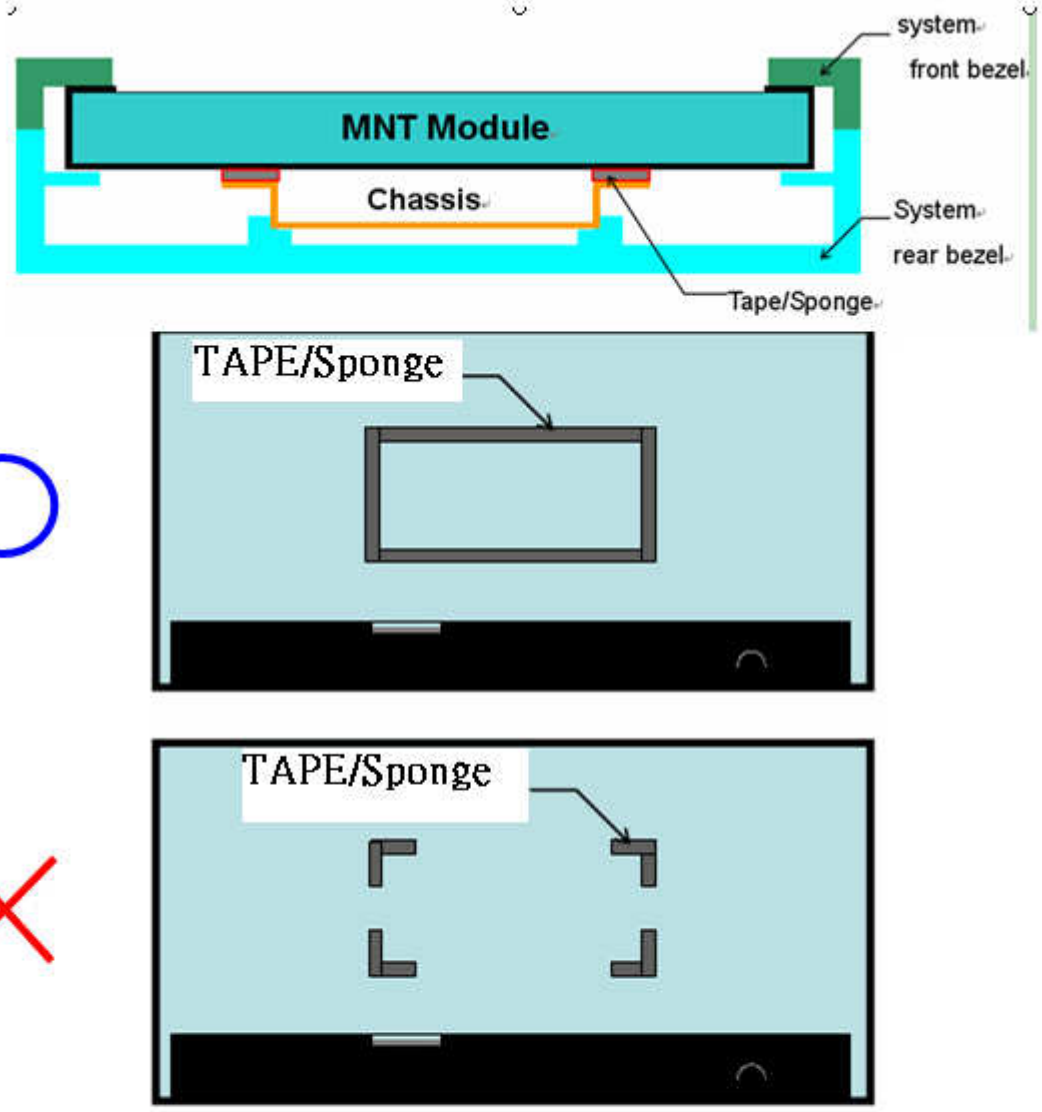
(2) IEC60950-1 or updated standard.

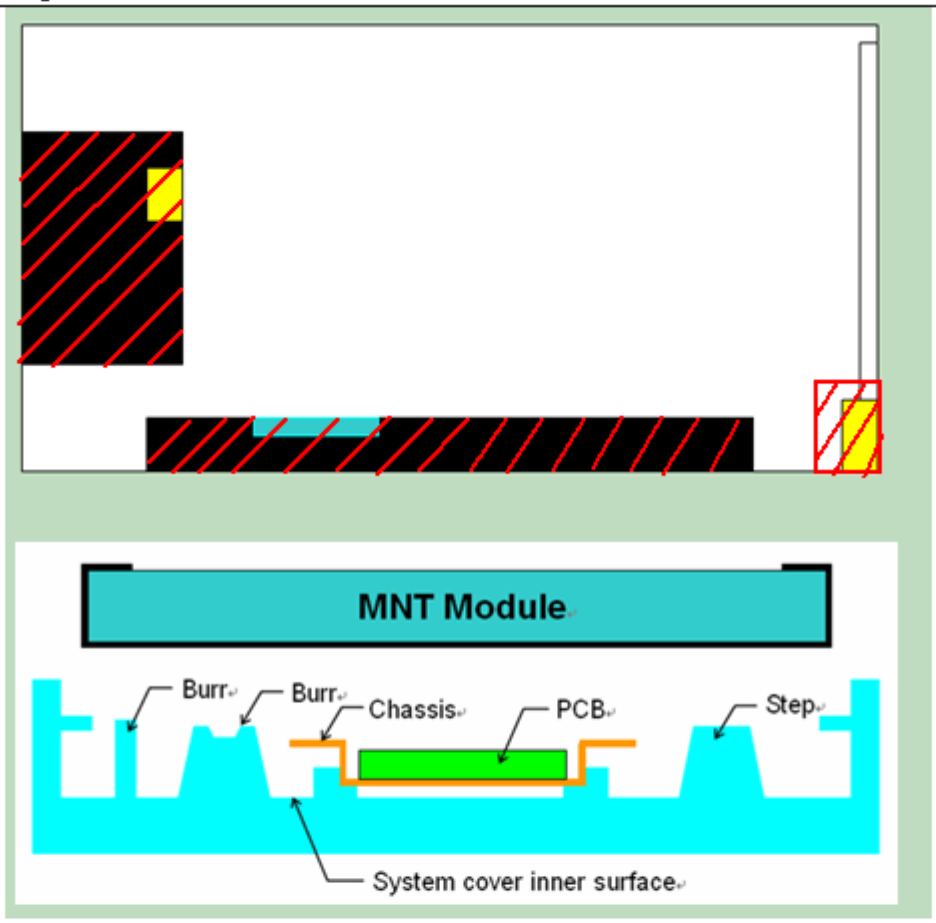
11.6 OTHER

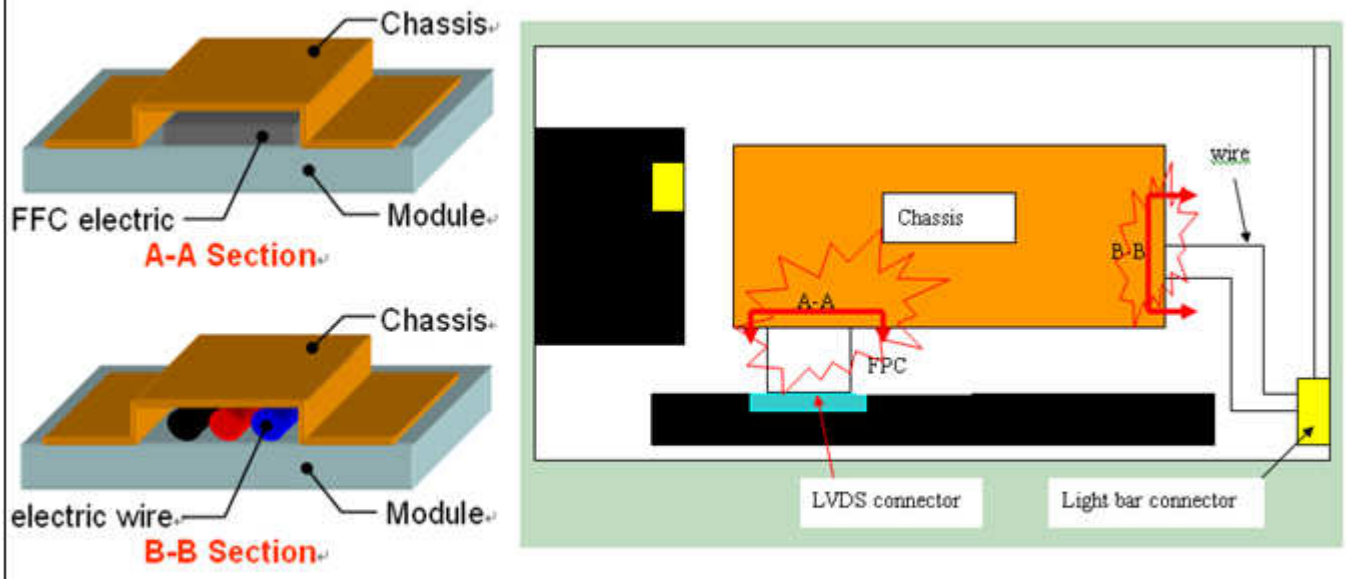
When fixed patterns are displayed for a long time, remnant image is likely to occur.

Appendix 1. SYSTEM COVER DESIGN NOTICE

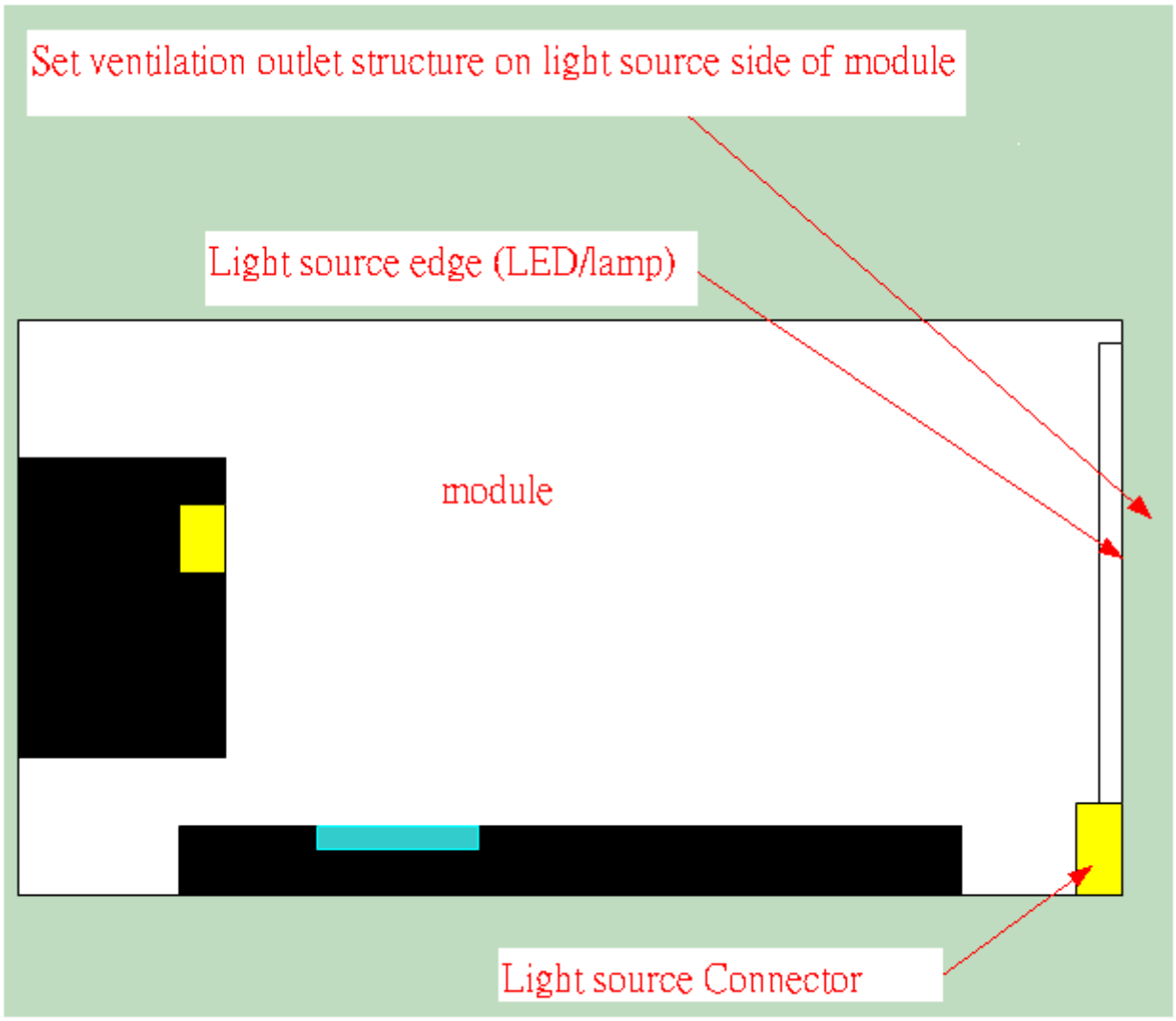
1.	Set Chassis and MNT Module touching Mode
	
Definition	a) To prevent from abnormal display & white spot after Mechanical test, it is not recommended to used spring type chassis. b) We suggest the contact mode between Chassis and Module rear cover is Tape/Sponge, sencond is Flat sheetmetal type chassis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

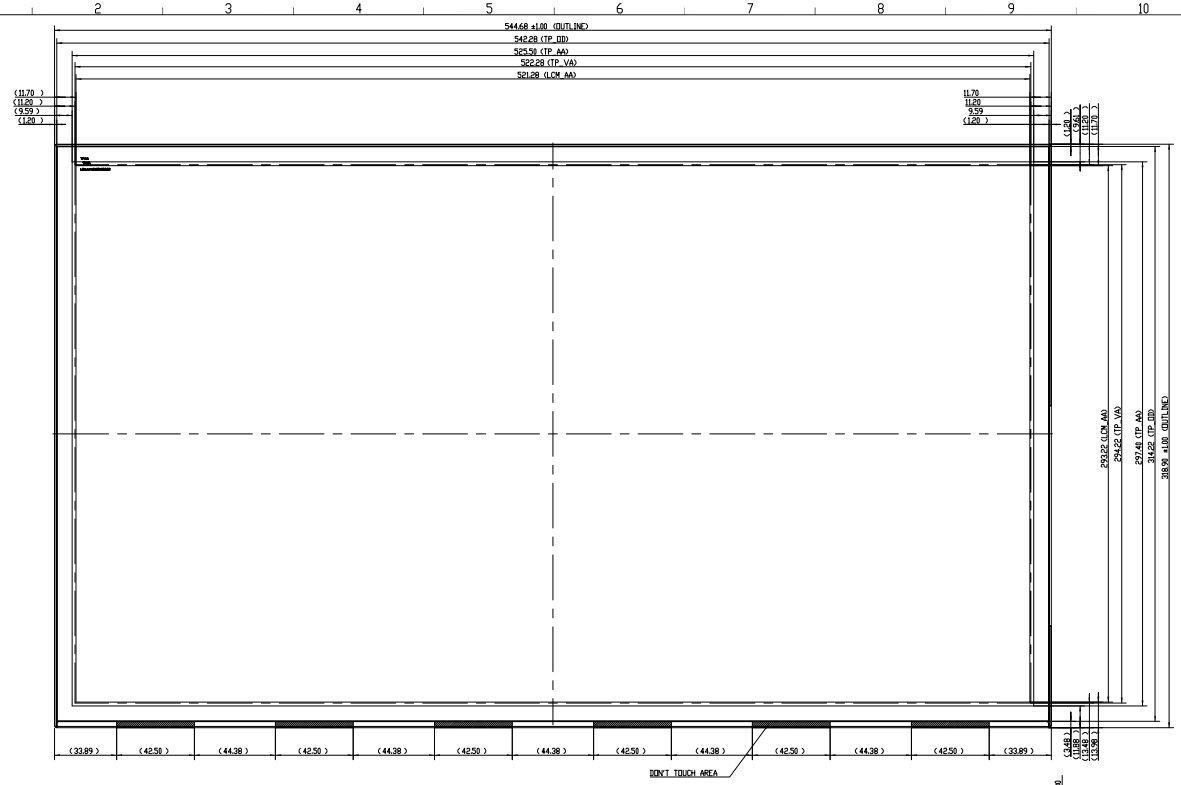
4	The overlapping part on System's Chassis and electric wire needs gap structure.
	
Definition	The overlapping part on System's Chassis and electric wire (FPC、FFC and wire) needs gap structure to avoid display of white spot by pressing overlapping part cause interference.

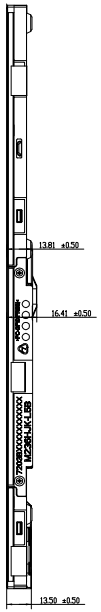
5	System cover's ventilation outlet structure

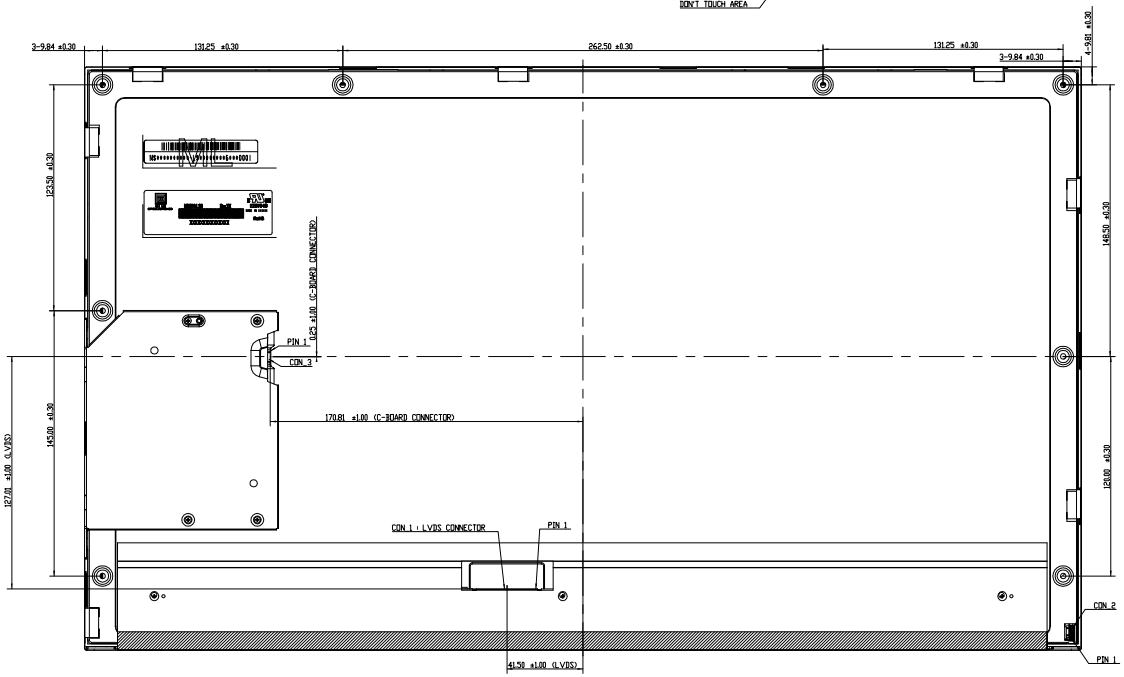


Definition	To prevent from abnormal display of light leakage, We suggest to set ventilation outlet structure on side of Module Light bar in system cover inner surface.

Appendix 2. OUTLINE DRAWING







NOTES:
1. * : COF position (S1 mechanical structure should not touch the positions of COF)
2. CONNECTOR TYPE:
   CON_1 : P-TWO 187098-30091
   CON_2 : FCN WM13-406-063N
   CON_3 : FCN WM13-406-083N
3. The dimension excludes deformation.
4. Tolerance without noticed to be +/-0.5mm.
5. The COF area is weak, please don't press the COF area.
6. User hole MAX. Screw Length 3.5mm

REV	EC NUMBER	DESCRIPTION	DATE
A		First Release	2024/05/31

DRAWN BY	CONTROL ENGINEER	DATE: 2024/05/31	SHEET NO. 1/1	
APPROVED	Kuoli Lin	PART NUMBER: XXXX		REVISION: A
CHECKED	Checker	PART DESCRIPTION: ASSY_MODULE_W236AUK_LCM		SHEET NUMBER: 1/1
DESIGNED	JESSICA LIU			SIZE: A3