23.6” FHD Specifications (Preliminary)

Doc. No1.

Customer	**TBD**
Customers Type	**TBD**
Module Type	**23.6“ FHD_60Hz (TXN612)**
Date	**2010-07-21**
Revision number	**Ver. 04**
Code	**TBD**

Customer Approved

CHILIN TECHNOLOGY				
QRA	**Manufacture**	**Approved**	**Checked**	**Design**
黃立元	黃進益	余鴻文	洪明鴻	紀秉賢

23.6” FHD Specifications (Preliminary)

Doc. No2.

Revision History

Version	Date	Page	Section	Description
01	07/01	All	All	Preliminary Specifications
02	07/13	13、14	1.4.2	Modify “1.4.2 LED BACKLIGHT MODULE”
			1.4.3	Modify “1.4.3 ABSOLUTE MAXIMUM RATING (ELECTRICAL)”
03	07/13	15	2.0	Modify “2.0 OPTICAL SPECIFICATIONS”
04	07/21	15	2.0	Modify “2.0 OPTICAL SPECIFICATIONS”

23.6” FHD Specifications (Preliminary)

CONTENTS OF LED MODULE FOR 23.6" LCM

23.6” FHD Specifications (Preliminary)

1.0 APPLIED TYPE

This model adopts: CMI V236H1-P01 （OPEN CELL）

Therefore, please refer to specifications of 23.6” TFT-LCD module for a drive method and an electrical characteristic of cell.

1.1 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	521.28(H) x 293.22 (V)	mm	
Bezel Opening Area	525.22 (H) x 297.22 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1,920x R.G.B. x1,080	pixel	
Pixel Pitch (Sub Pixel)	0.2715(per one triad) x 0.2715	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16.7M	color	
Display Operation Mode	Normally White	-	
Surface Treatment	AG/3H	-	

1.2 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	**Horizontal(H)**	544.3	544.8	545.3	mm	
	Vertical(V)	320	320.5	321	mm	
	Depth(U)	11.75	12.15	12.55	mm	To PCB Mylar
	Depth(D)	7.87	8.27	8.67	mm	
Weight			2.5		Kg	

1.3 ABSOLUTE MAXIMUM RATING

Table 1

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)

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

(a) 90 %RH Max. (Ta ≦ 40 ºC)

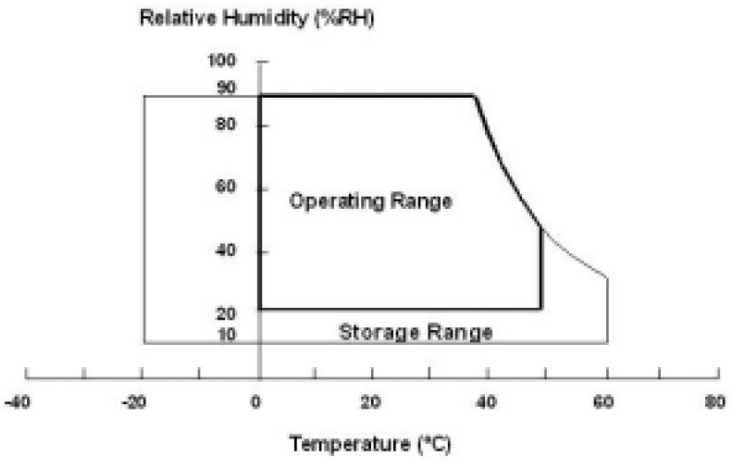
(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC)

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 60 ºC Max.

23.6” FHD Specifications (Preliminary)

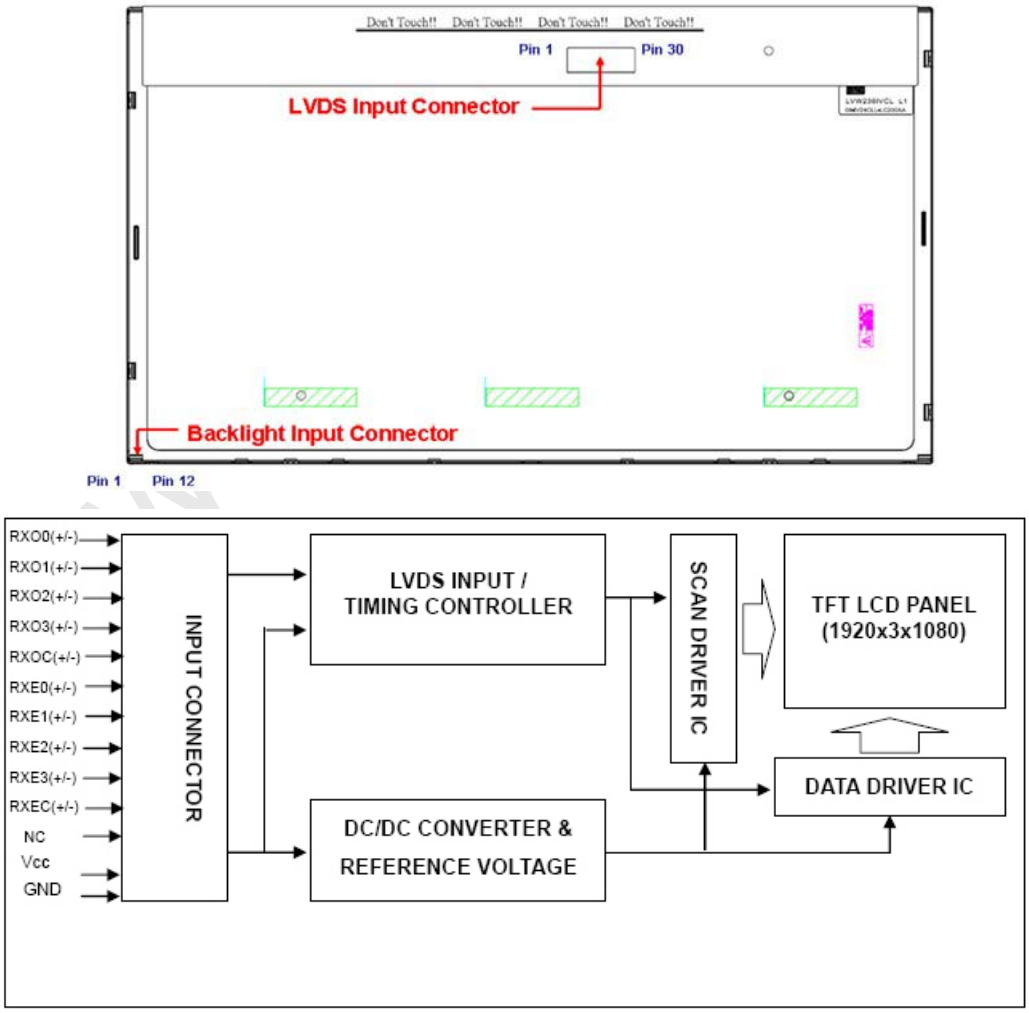
Figure 1



LED Backlight Rating : VL=29.5~34.5V, IL=352mA

1.4 LCM MODULE INTERFACE DEFINITION

Figure 2



1.4.1 CELL INFORMATION

1.4.1.1 REFERENCE TO CMI V236H1-P01 SPECIFICATION

1.4.1.2 LVDS INPUT CONNECTOR PIN ASSIGNMENT

Table 2

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	Not connection, this pin should be open.
26	NC	Not connection, this pin should be open.
27	NC	Not connection, this pin should be open.
28	Vcc	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

Note (1) Connector Part No.: STM MSAKT2407P30HA or Starconn 093G30-B0001A or Equivalent
Note (2) The first pixel is odd.
Note (3) Input signal of even and odd clock should be the same timing.

1.4.1.3 CONNECTOR EMECHANICAL SPECIFICATIONS

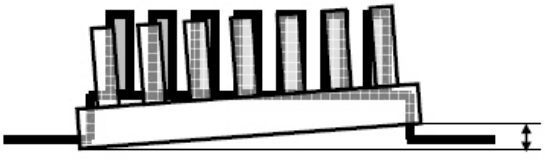
Table 3

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	720	-	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.				(2)

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

(2) Connector mounting position

(3) Please refer to sec.3.1 for more information of power consumption.



1.4.1.4 LVDS DATA MAPPING

Table 4

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

1.4.1.5 SIGNAL ELECTRICAL CHARACTERISTICS FOR LVDS RECEIVER

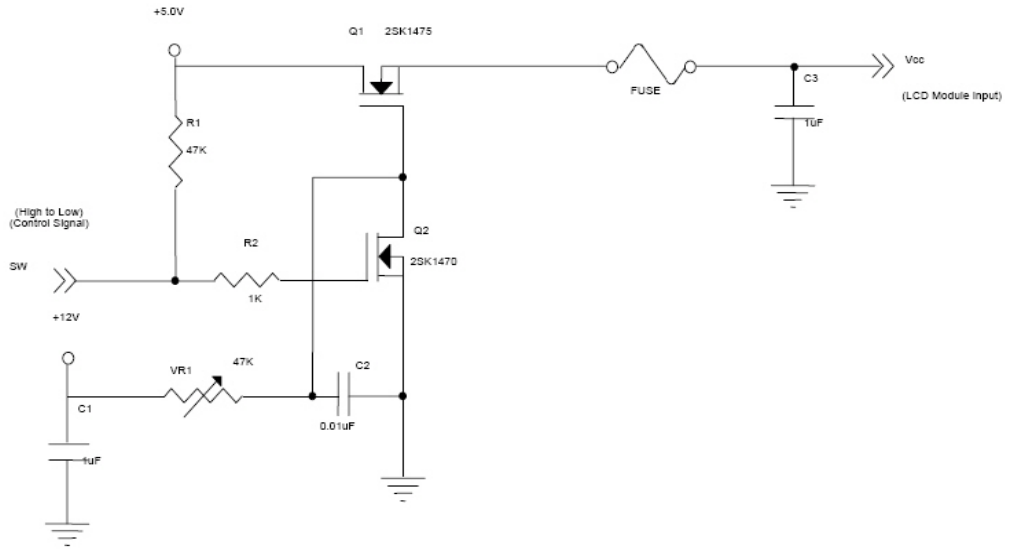
Table 6 LVDS Receiver Electrical Characteristics

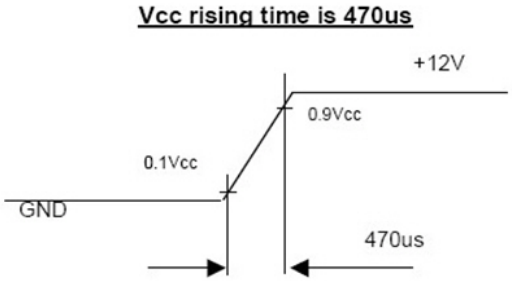
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	--	300	mV	-
Rush Current		I_{RUSH}	-	-	3.5	A	(2)
Power Supply Current	White	Icc	-	0.55	0.67	A	(3)a
	Black		-	1.5	1.9	A	(3)b
	Vertical Stripe		-	1.18	1.43	A	(3)c
Power Consumption		P_{LCD}		7.5	9.5	Watt	(4)
LVDS differential input voltage		Vid	100	-	600	mV	
LVDS common input voltage		Vic	-	1.2	-	V	
Logic High Input Voltage		VIH	2.64	-	3.6	V	
Logic Low Input Voltage		VIL	0	-	0.66	V	

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

Note (2) Power On Rush Current Measurement Conditions: (must follow power sequence)

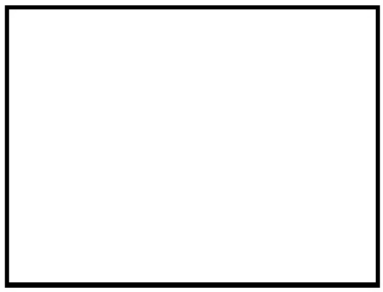
Figure 3





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

a. White Pattern

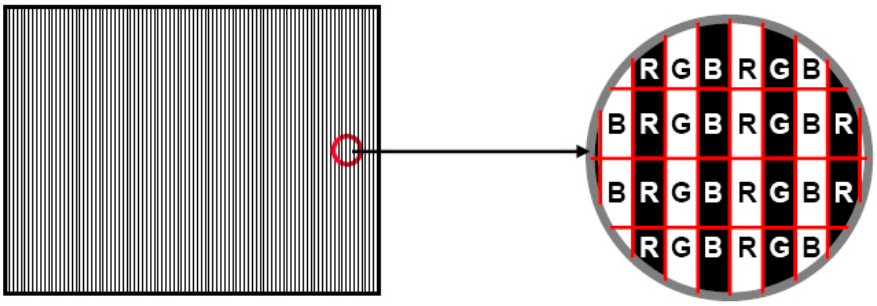


Active Area

b. Black Pattern

Active Area

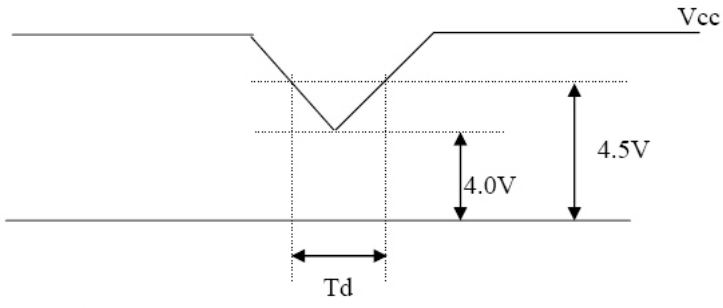
c. Vertical Stripe Pattern



Active Area

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

Figure 4 Vcc Power Dip Condition



Dip condition: $4.0V \leq Vcc \leq 4.5V, Td \leq 20ms$

1.4.1.6 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

1.4.1.7 INPUT SIGNAL TIMING SPECIFICATIONS

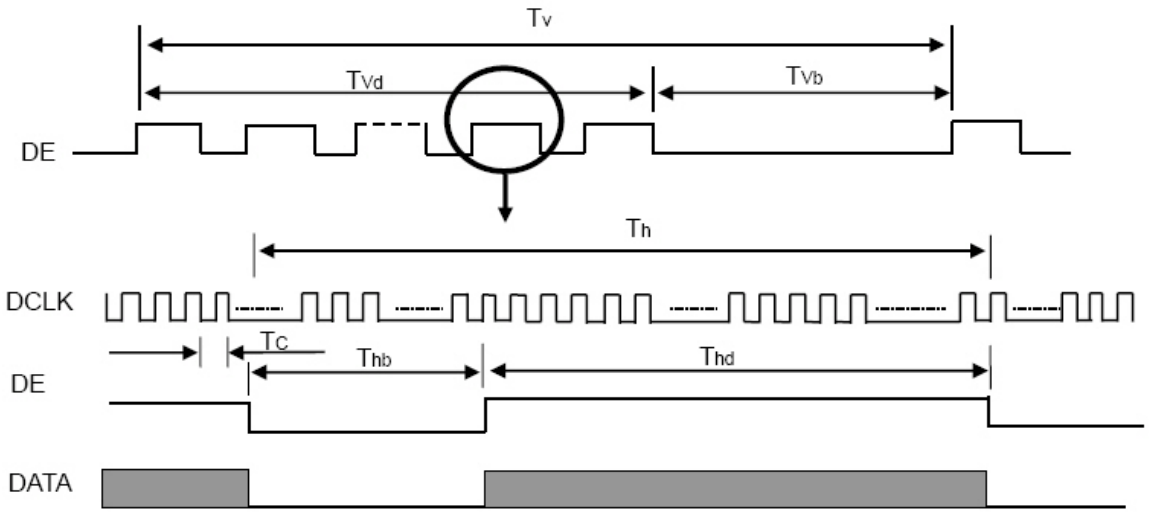
Table 7

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	98	MHz	-
	Period	Tc	-	13.47	-	ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*Tc	-	0.02*Tc	ns	(1)
	Spread spectrum modulation range	F_{clkin_mod}	0.98*Fc	-	1.02*Fc	MHz	(2)
	Spread spectrum modulation frequency	F_{SSM}	-	-	200	KHz	
	High Time	Tch	-	4/7	-	Tc	-
	Low Time	Tcl	-	3/7	-	Tc	-
LVDS Data	Setup Time	Tlvs	600	-	-	ps	(3)
	Hold Time	Tlvh	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr	50	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	1115	1125	1136	Th	-
	Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	35	45	56	Th	-
Horizontal Active Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Display	Thd	960	960	960	Tc	-
	Blank	Thb	90	140	190	Tc	-

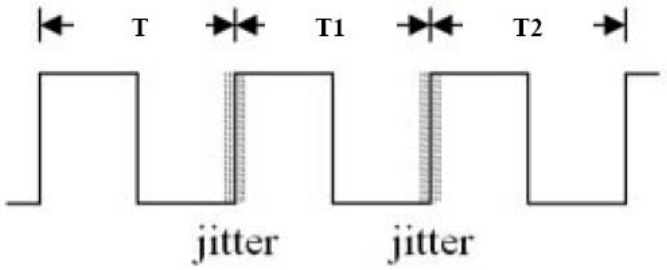
Note: (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

Figure 5



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

Figure 6



Note (2) The SSCG (Spread spectrum clock generator) is defined as below figures.

Figure 7

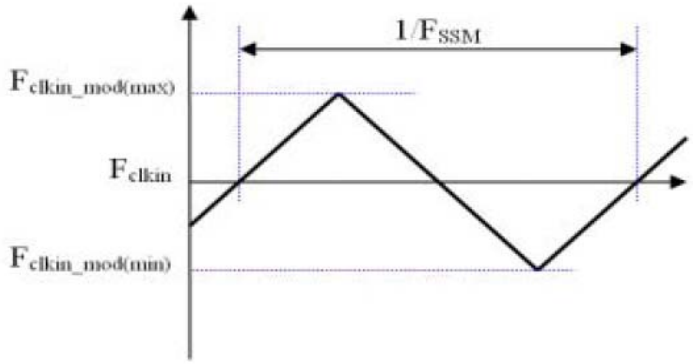
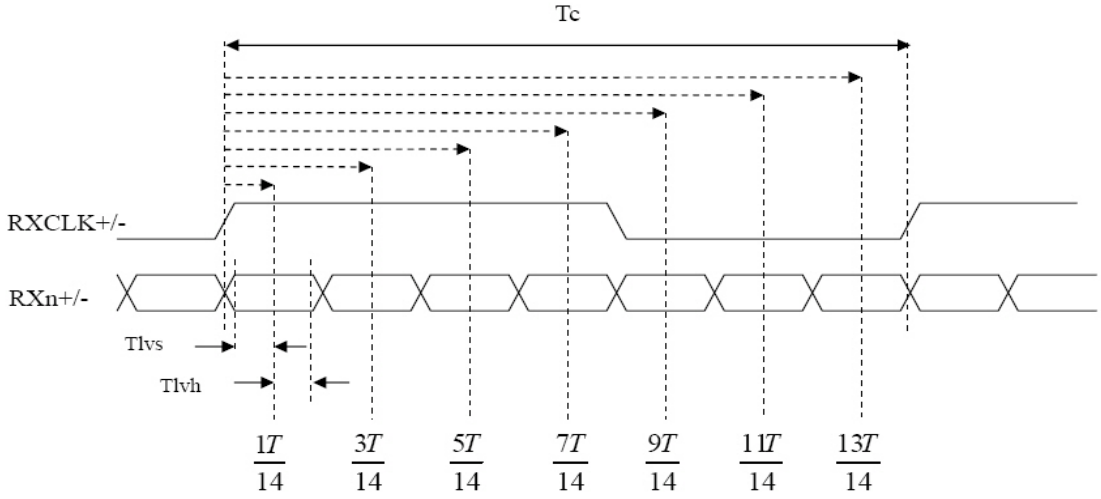


Figure 8

Note (3) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

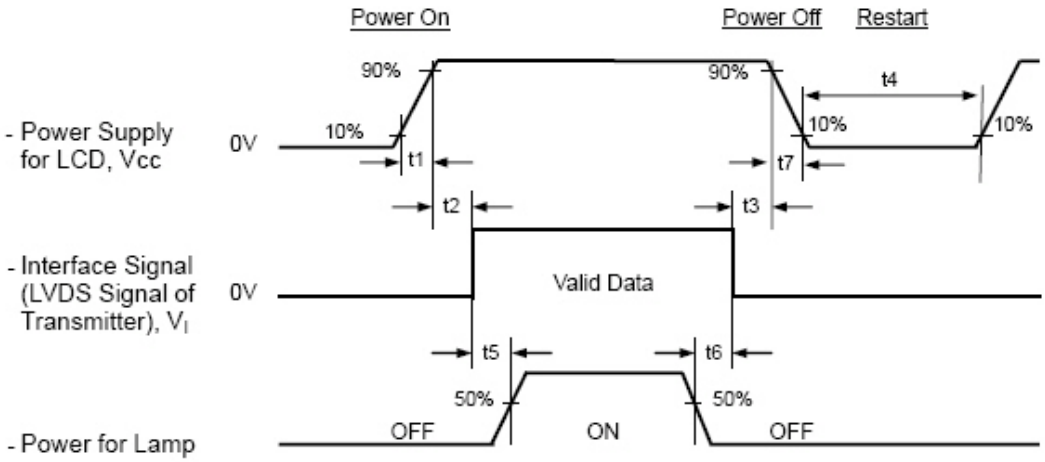
LVDS RECEIVER INTERFACE TIMING DIAGRAM



1.4.1.8 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.

Figure 9



Timing Specifications:

0.5< t1 ≦ 10 msec

0 < t2 ≦ 50 msec

0 < t3 ≦ 50 msec

t4 ≧ 500 msec

t5 ≧ 450 msec

t6 ≧ 90 msec

5 ≦ t7 ≦ 100 msec

Note:

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

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

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

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

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

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

(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 "t7 spec".

1.4.2 LED BACKLIGHT MODULE

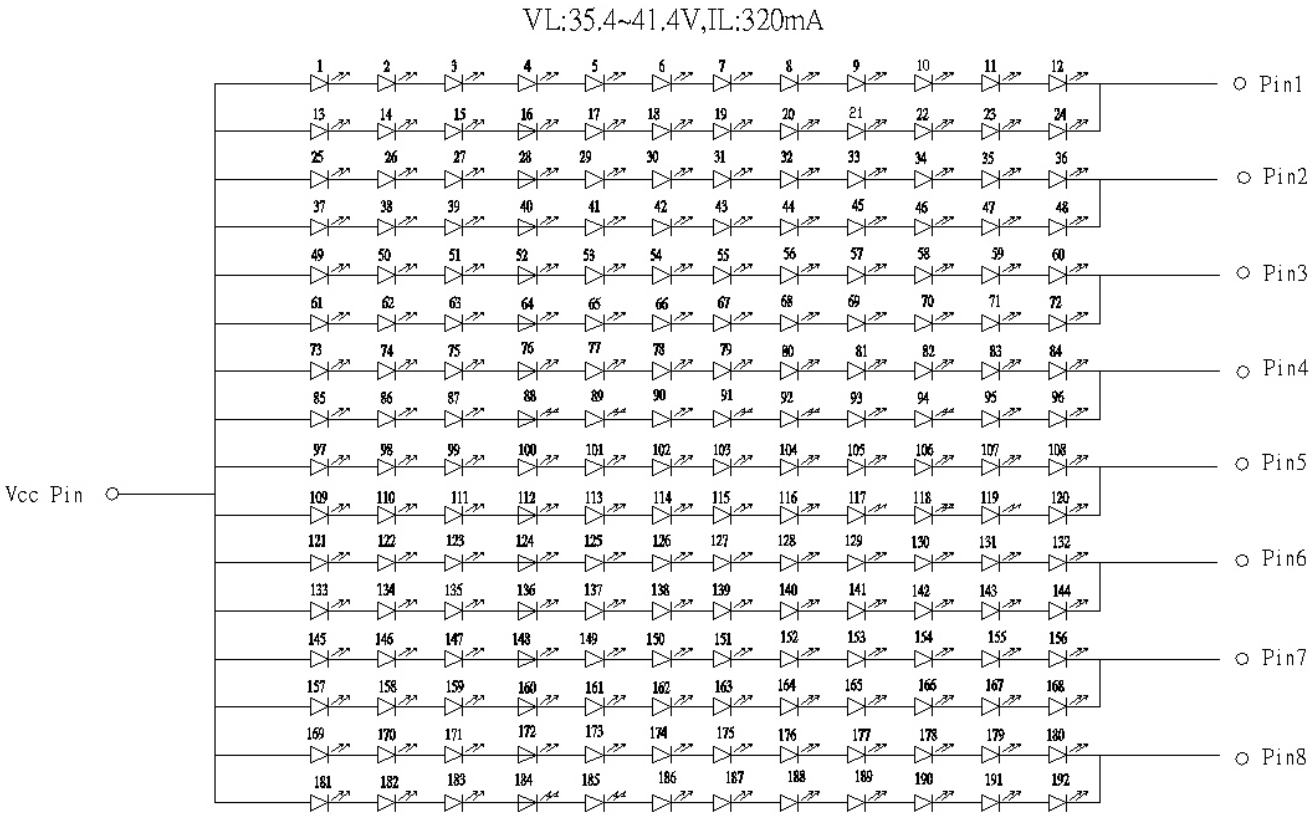
1.4.2.1 LED BACKLIGHT LIGHT ON CONNECTOR PIN DEFINITION AND SCHEMATIC

Connector : ENTERY 7083K-F12N-00L

Table 8

Pin No.	Symbol	Feature
1	VLED-	Negative of LED String
2	VLED-	
3	VLED-	
4	VLED-	
5	NC	No Connection
6	VLED+	Positive of LED String
7	VLED+	
8	NC	No Connection
9	VLED-	Negative of LED String
10	VLED-	
11	VLED-	
12	VLED-	

Figure 10



23.6” FHD Specifications (Preliminary)

1.4.2.2 LED BACKLIGHT LED RATING SPECIFICATION

Table 8

Items	Min.	Typ.	Max.	Unit	Remark
Input Voltage	35.4	38.4	41.4	V	定電流 320 mA
Input Current (Per Pin)	39	40	41	mA	

1.4.3 ABSOLUTE MAXIMUM RATING (ELECTRICAL)

Table 9

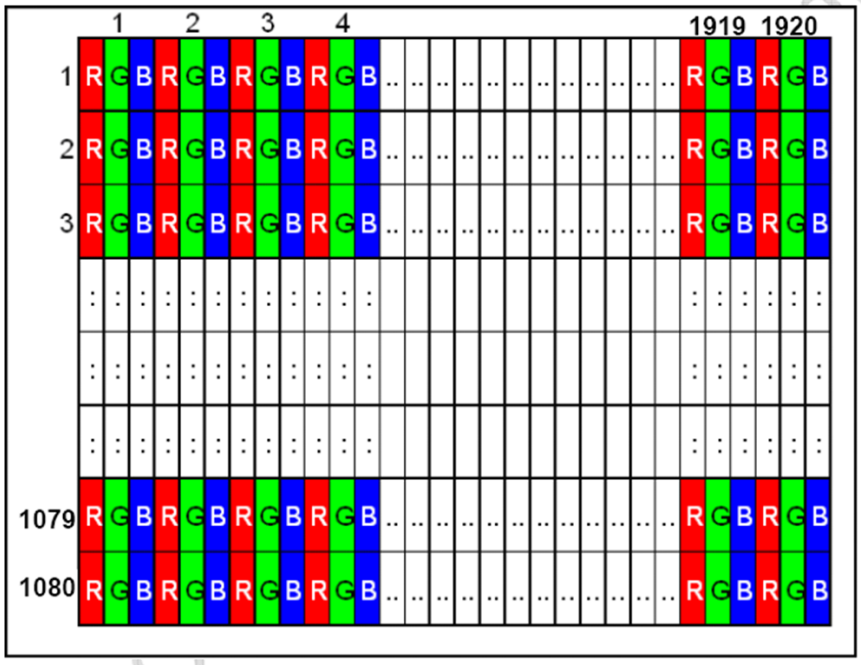
Items	Min.	Typ.	Max.	Unit	Remark
LED Forward Voltage	2.95	3.2	3.45	V	
LED Forward Current		20	30	mA	
LED Reverse Voltage		5		V	
LED Power Dissipation		100		mW	
ESD(HBM)		>1500		V	Note(1)
ESD(MM)		>150		V	Note(1)

Note (1) : Static electricity or surge voltage can damage the LEDs. All equipment, machinery and the treatment persons must be properly grounded. It is recommended to use a wristband or anti-electrostatic glove when handling the LED. And don’t touch interface pin directly.

1.4.4 PIXEL FORMAT IMAGE

Figure 11 shows the relationship of the input signals and LCD pixel format image.

Figure 11



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Doc. No15.

2.0 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		**CR**		—	**800**	—	—	(1),(2),(7)
Response Time		**Rising Time(Tr)**		—	**1.5**	**3**	**ms**	(1), (6) ,(7)
		Falling Time(Tf)		—	**3.5**	**5**		
Brightness		**B1**		**250**	**280**	—	**cd/m2**	(1),(3) Center point⑤ at LCM
Uniformity		**△B**	θ x=0°, θ Y=0° Viewing Normal Angle	**70**	**75**	—	**%**	(1),(4)
Color Chromaticity	White	**Wx**		**Typ –0.03**	**0.313**	**Typ +0.03**	—	(1),(3) , Center point⑤ at LCM
		Wy			**0.329**			
	Red	**Rx**			**0.631**			
		Ry			**0.347**			
	Green	**Gx**			**0.332**			
		Gy			**0.642**			
	Blue	**Bx**			**0.146**			
		By			**0.047**			
Viewing Angle	Horizontal	**θx+**	≥1/3 Center Brightness	—	**45**	—	**Deg.**	(1),(5)
		θx-		—	**45**	—		
	Vertical	**θY+**		—	**35**	—		
		θY-		—	**35**	—		

Note (1) Measurement Setup: The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.

Any outstanding stain (or mura) and/or any outstanding difference of Chromaticity between any parts of the active area will cause Backlight Assembly and LCM to be rejected.

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), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (4)

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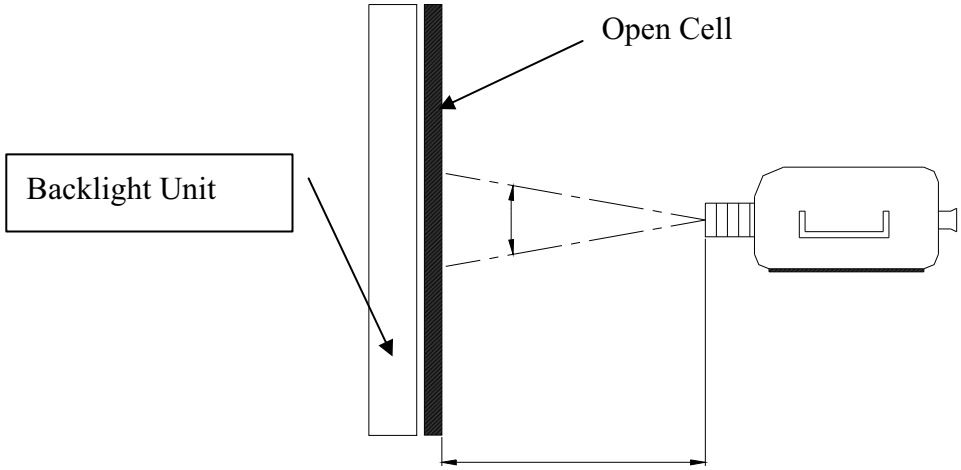
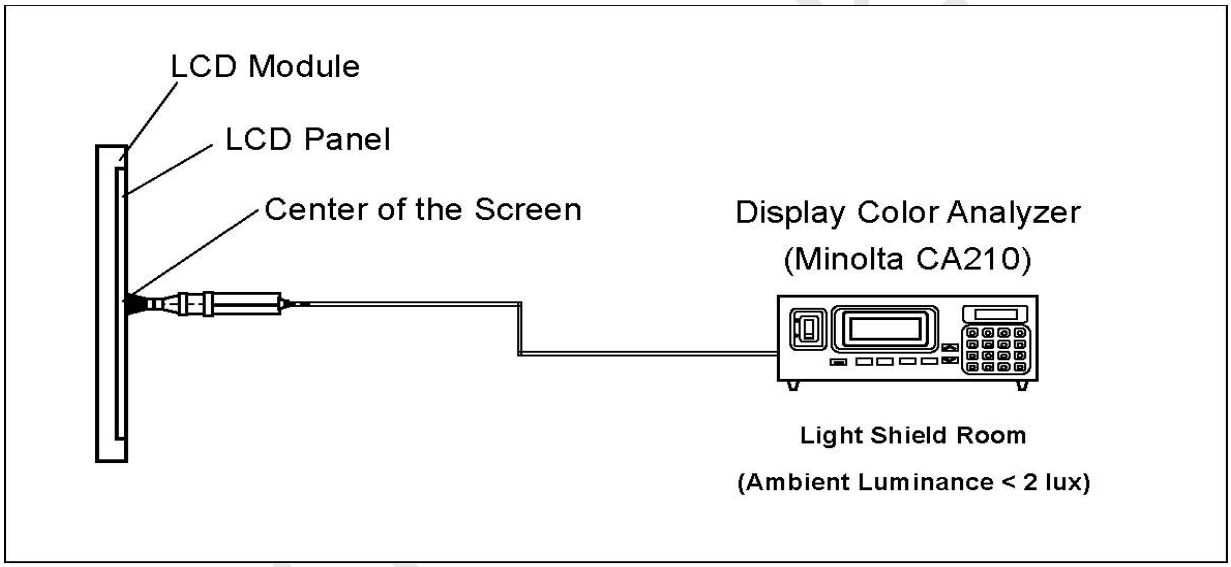
Note（3） Measurement Method





E / Item	CA210
Angle Θ	±2.5°
Distance L	3cm

Note (4) Definition of White Uniformity (△B):

Measure the brightness of white at 9 points

△B = Minimum [B (1) ~ B (9)] / Maximum [B(1) ~ B (9)]

where B (X) is corresponding to the brightness of the point X at the figure below.

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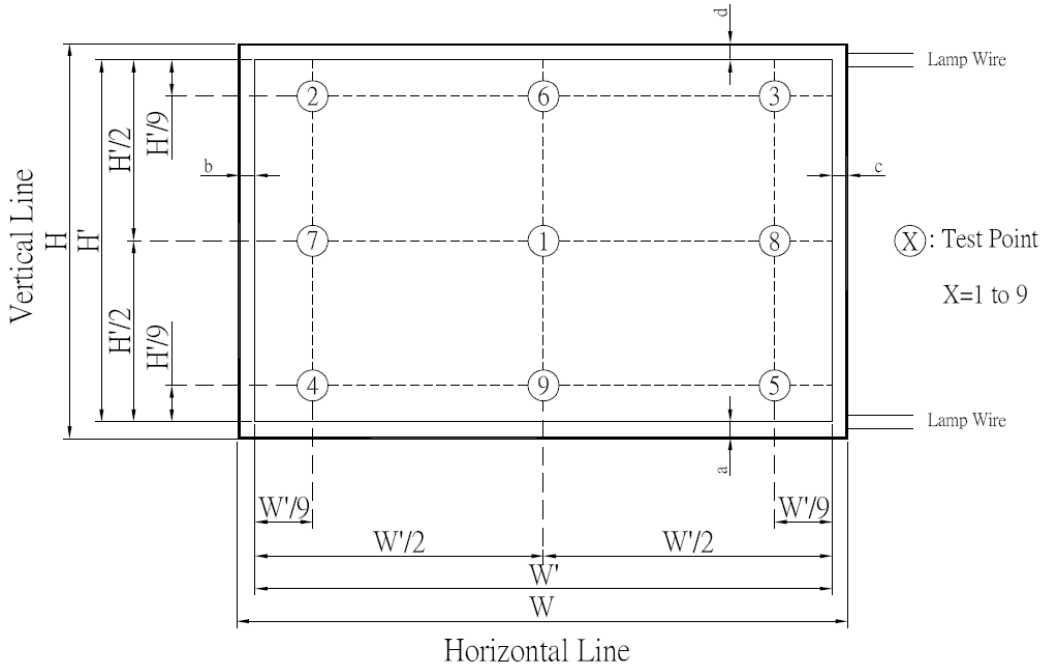
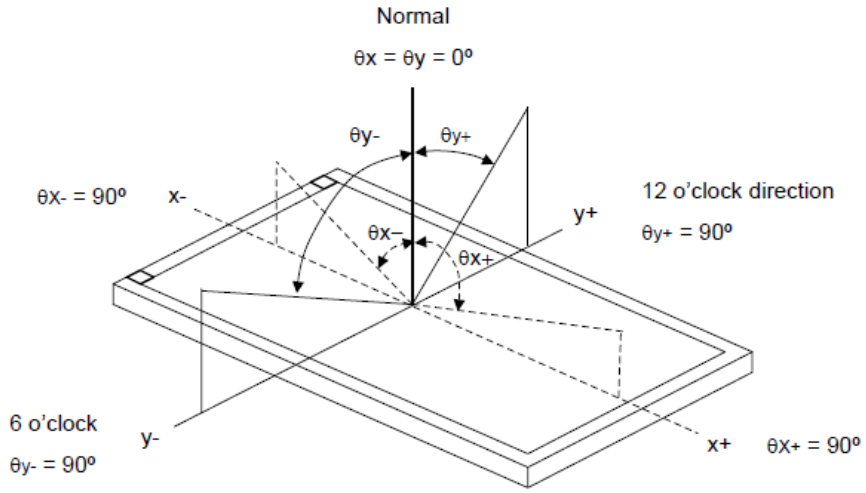


Note（5）Definition of Viewing Angle（θx, θy）：



This measurement method is referred to methods of Part 5.12 SJ/T 11348-2006(measurement for digital television flat panel displays).

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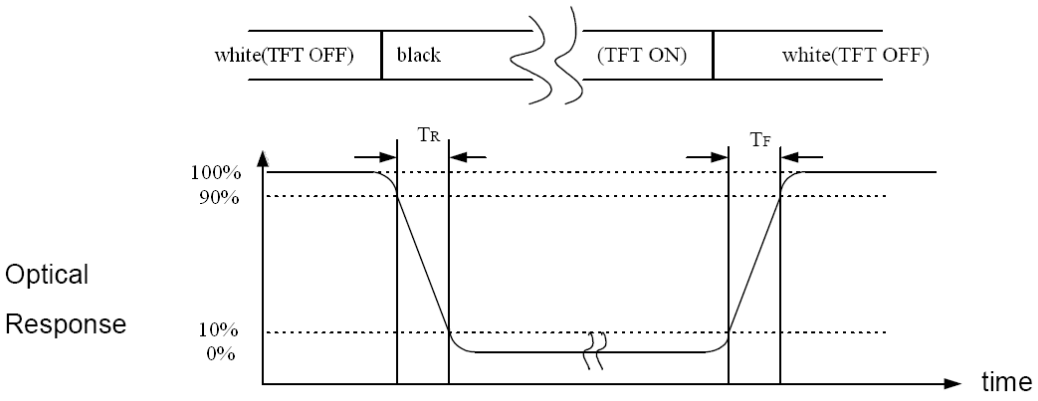
Note (6) Definition of Response Time(T_R , T_F)



Note (7)

Contrast ratio and response time is corresponding to the original cell specification of V236H1-P01 defined by CMI.

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3.0 RELIABILITY TEST ITEM

	Test Items	Q’ty	Condition
1	**High Temperature Operation**	3	50℃，300hrs
2	**High Temperature And High Humidity Operation**	3	50℃/ 80%RH，300hrs
3	**ESD Contact Mode**	3	+/-8,10KV, 1sec/cycle, class C , 2hrs
4	**ESD Air Mode**	3	+/-15KV, 1sec/cycle, class C , 2hrs
5	**Mechanical Shock (non-operation)**	3	50G, 11ms, half sine wave, 1 times for each direction of ±X,±Y, 35G, 11ms, half sine wave, 1 times for each direction of ±Z
6	**Panel Vibration**	3	10-200Hz, 1G, 30mm is Max., 30min/cycle, 1cycles for each X,Y,Z.

4.0 PACKING

4.1 PACKING SPECIFICATIONS

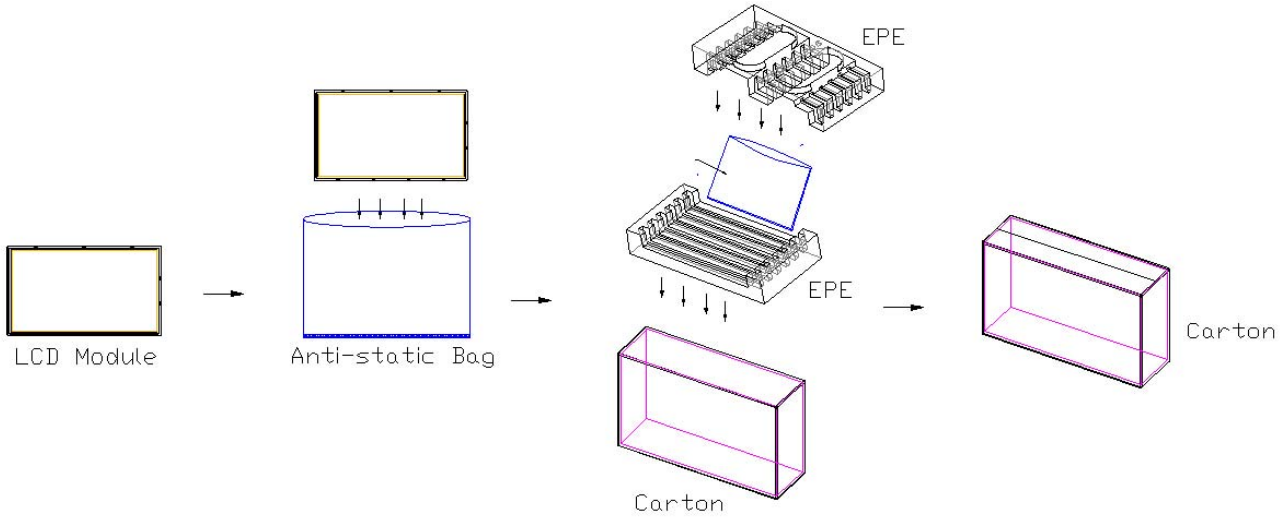
Carton SPECIFICATIONS

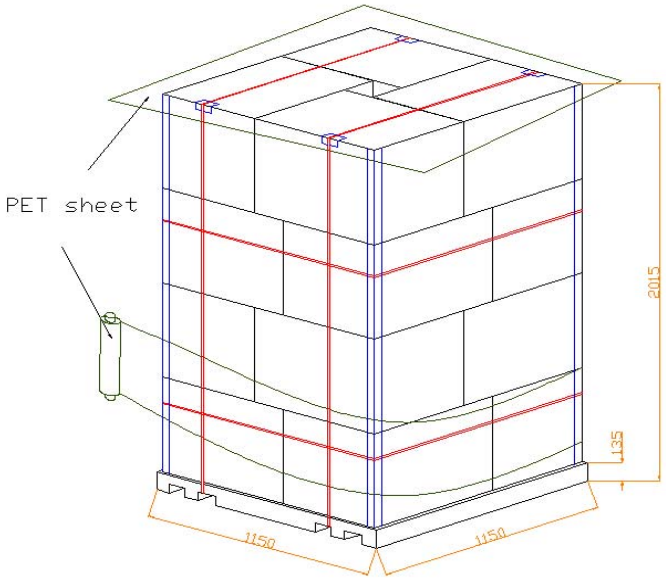
（1） 6 LCD modules / 1Box

（2） Box dimensions : 726（L）× 380 （W）× 467（H） mm

（3） Weight : approximately : 20 kg (6 modules per box，packaging materials including pallet)

4.2 PACKING METHOD



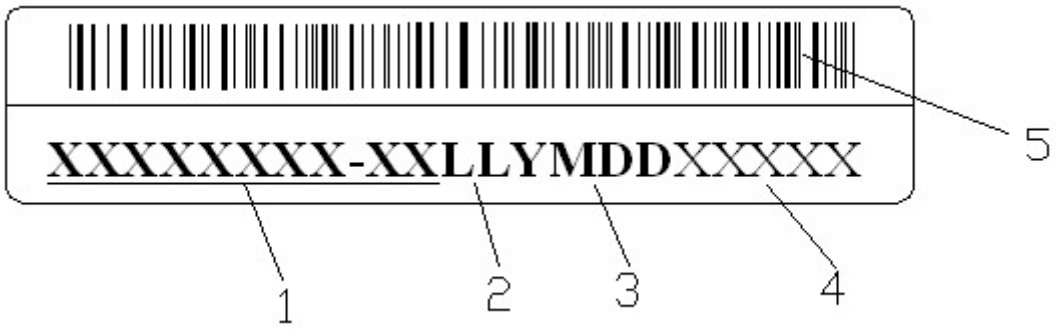


Sea/Land transportation
Pallet:1150*1150*135mm
Pallet stock dim:1150*1150*2015mm

4.3 PACKAGING LABEL

LCM Label

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



1 : LCM Part No : 10190115-A0

2 : Make Spaces: C4

3 : Year 2010 : A, 2011 : B, 2012 : C,…… not include I,O,U,V

Month : 1 2 3 4 5 6 7 8 9 X Y Z

Date : 01 02 03 04 ……30 31

4 : Serial No:00001~99999 (Reset every day)

5 : Barcode Format (CODE 93)

5.0 PRECAUTIONS

(1) You must mount a module using holes arranged in four corners or four sides.

(2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.

(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(4) You should adopt radiation structure to satisfy the temperature specification.

(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter cause circuit broken by electro-chemical reaction.

(6) Do not touch, push or rub the exposed polarizer with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)

(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizer. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(9) Do not open the case because inside circuits do not have sufficient strength.

5.2 OPERATING PRECAUTONS

(1) The device listed in the product specification sheets was designed and manufactured for TV application

(2) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V=±200mV(Over and under shoot voltage)

(3) Response time depends on the temperature. (In lower temperature, it becomes longer..)

(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

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

(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interface.

5.3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don’t touch interface pin directly.

5.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

5.5 STORAGE

When Storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 20℃and 30℃ at Humidity between 25% and 75%

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

5.6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape. When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.

(3) You can remove the glue easily. When the glue remains on the bezel or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

6.0 LOT NO. GENERATION

According to the customer supply specification

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7.0 MECHANICAL CHARACTERISTICS