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APOLLO DISPLAY
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DISPLAY
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Datasheet

Innolux

V236BJ1-P01

CH-01-063

奇美電子
CHIMEI *INNOLUX*

□ Tentative Specification
□ Preliminary Specification
■ Approval Specification

MODEL NO.: V236BJ1
SUFFIX: P01

Customer:

APPROVED BY   **SIGNATURE**

Name / Title
Note

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

Approved By	Checked By	Prepared By
Chao-Chun Chung	YP Lee	Chris Chen

CONTENTS

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver. 2.1	Sep.12, 2012	All	All	The Approval Specification for 0.5mm Cell was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V236BJ1-P01 is a 23.6" TFT Liquid Crystal Display product with driver ICs and 1ch-LVDS interface. This product supports 1366*768 HDTV format and can display 16.7M colors (8-bit / color).

1.2 FEATURES

CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	23.6
Pixels [lines]	1366 x 768
Active Area [mm]	521.4705 (H) x 293.184 (V)
Sub-Pixel Pitch [mm]	0.12725 (H) x 0.38175 (V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	TYP. 500 g
Physical Size [mm]	535.06(W) × 307.34(H) × 1.53(D) Typ.
Display Mode	Transmissive mode / Normallly black
Contrast Ratio	3000:1 Typ. (Typical value measure at CMI's module)
Glass thickness (Array / CF) [mm]	0.5 / 0.5
Viewing Angle (CR>20)	+88/-88(H), +88/-88(V) Typ. (CR$\geq$20) (Typical value measure at CMI's module)
Color Chromaticity	* Please refer to "color chromaticity" on p.22
Cell Transparency [%]	5.5%
Polarizer Surface Treatment	Anti-Glare coating (Haze 1%), Hard coating (3H)

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	485	500	515	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.

Note (2) Connector mounting position

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

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 $\leqq$ 40 ºC).

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

    (c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of
display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber.
Thermal management should be considered in final product design to prevent the surface temperature
of display area from being over 65 ºC. The range of operating temperature may degrade in case of
improper thermal management in final product design.

Relative Humidity (%RH)
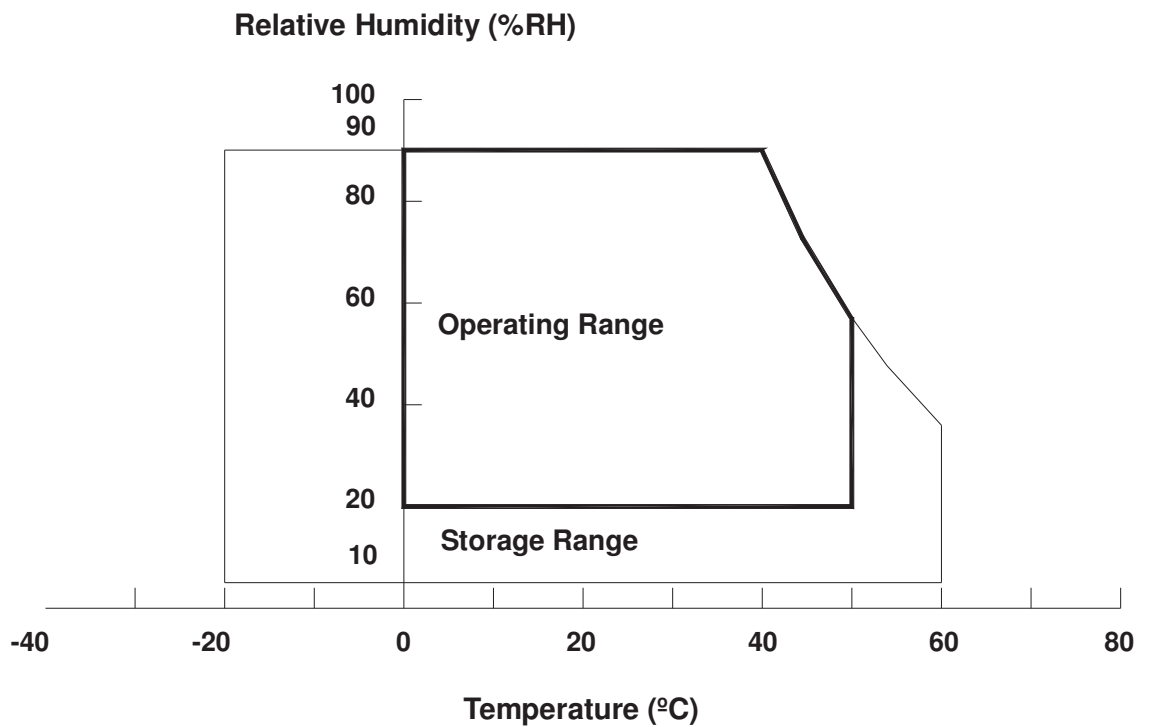
Temperature (ºC)

2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

(a) 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 ℃ at normal humidity without condensation.

(b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

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

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	—	—	3.172	A	(2)
Power consumption	White Pattern	PT	—	5.256	6.24	W	(3)
	Black Pattern	PT	—	3.269	3.822		
	Heavy Loading pattern Ex: Horizontal Stripe (by cell and platform)	PT	—	5.0976	6.053		
Power Supply Current	White Pattern	PT	—	0.44	0.52	A	
	Black Pattern	PT	—	0.272	0.3185		
	Heavy Loading pattern Ex: Horizontal Stripe (by cell and platform)	PT	—	0.425	0.5044		
LVDS interface	Differential Input High Threshold Voltage	V_{LVTH}	+100	—	+300	mV	(4)
	Differential Input Low Threshold Voltage	V_{LVTL}	-300	—	-100	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential input voltage (single-end)	$|V_{ID}|$	200	—	600	mV	
	Terminating Resistor	R_T	—	100	—	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 module should be always operated within the above ranges.

The ripple voltage should be controlled under 10% of Vcc (Typ.).

urement condition :

Vcc rising time is 470us

Vcc

0.9Vcc

0.1Vcc

GND

470us
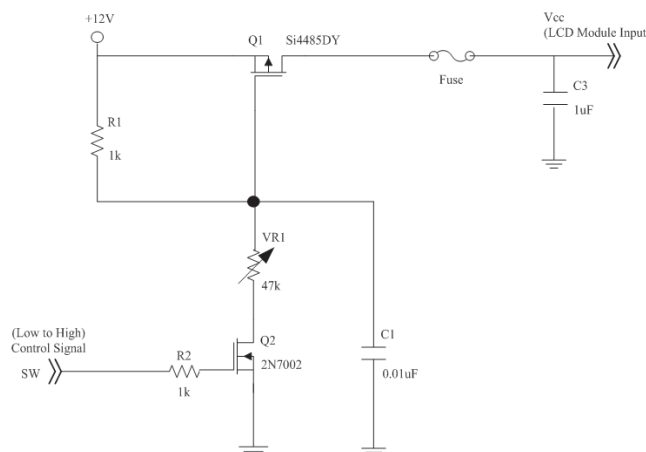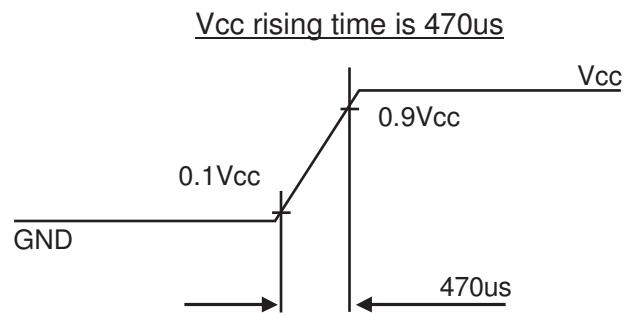
Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, f$_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

b. Black Pattern
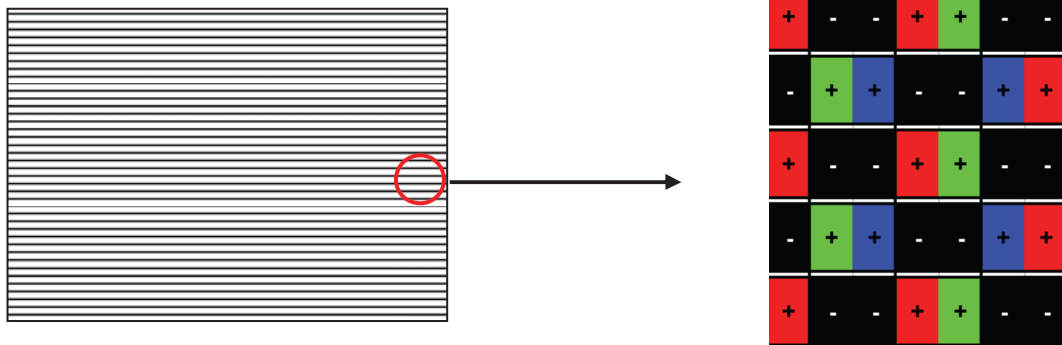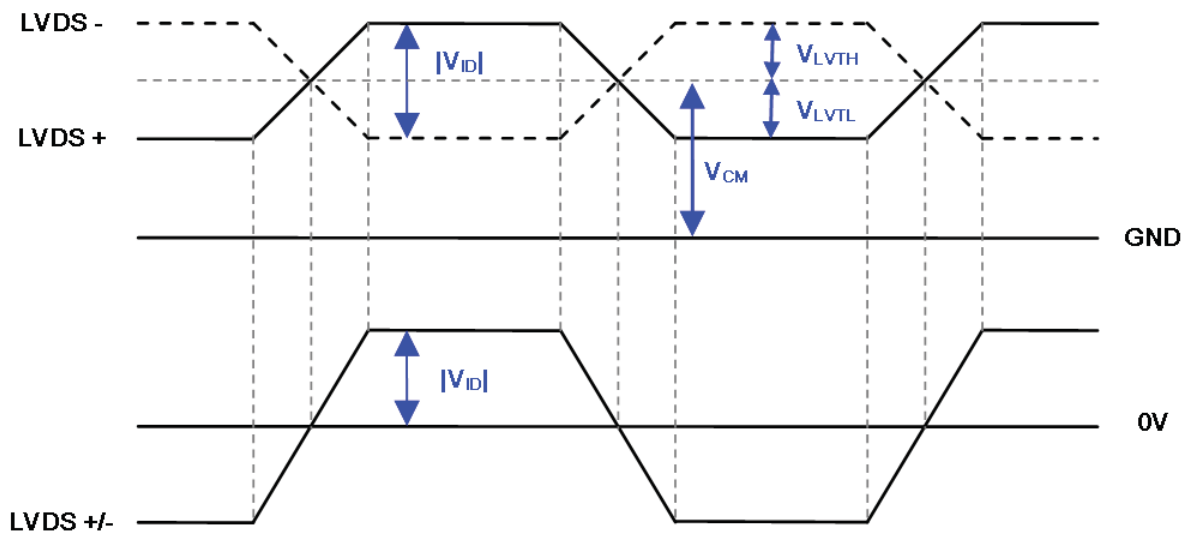
Active Area

Active Area

c. Heavy Loading pattern Ex: Horizontal Stripe
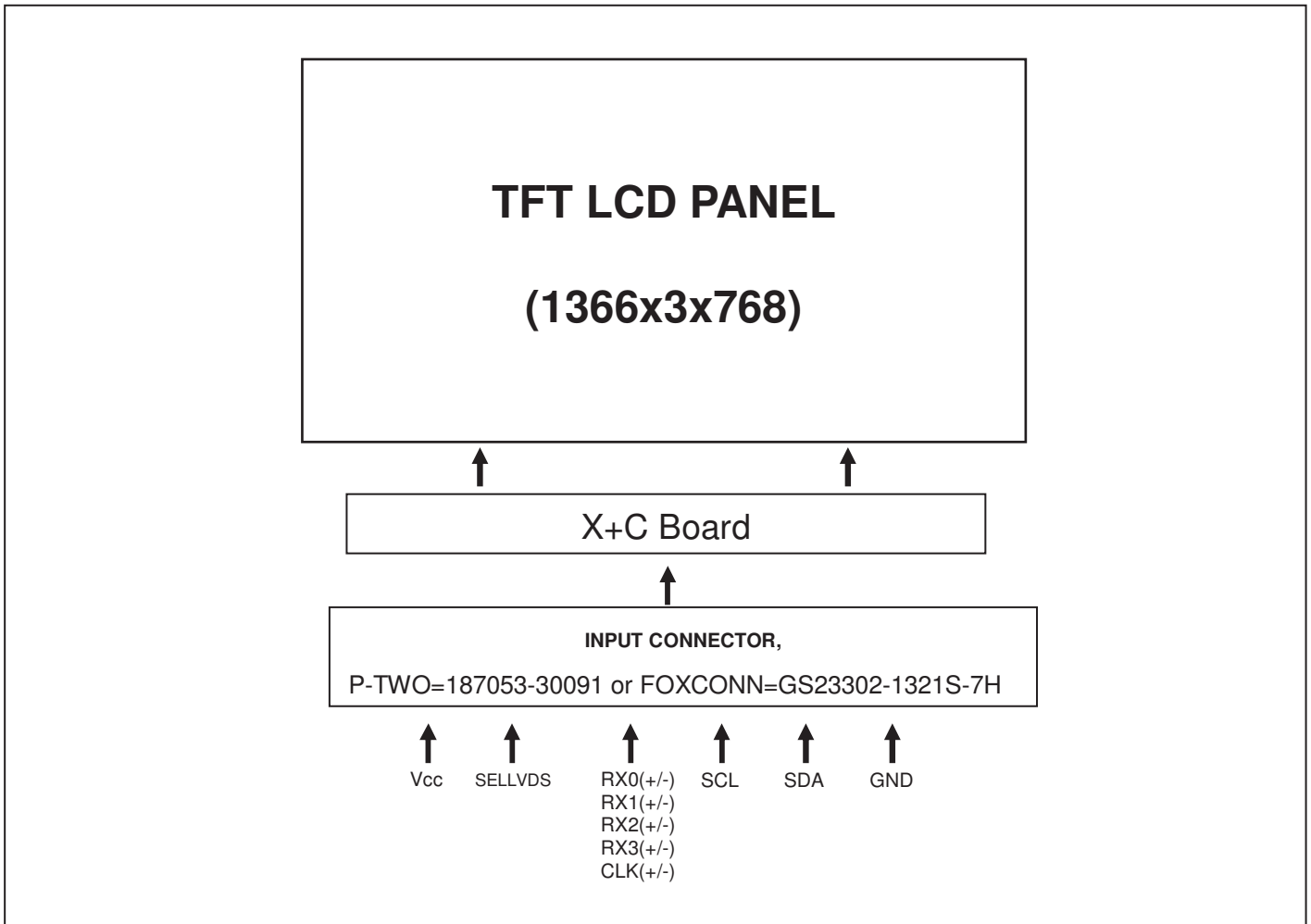
Note (4) The LVDS input characteristics is shown as below :

4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD MODULE

TFT LCD PANEL

(1366x3x768)

X+C Board

INPUT CONNECTOR,

P-TWO=187053-30091 or FOXCONN=GS23302-1321S-7H

Vcc SELLVDS RX0(+/-) SCL SDA GND
RX1(+/-)
RX2(+/-)
RX3(+/-)
CLK(+/-)

5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE INPUT

CNF1 Connector Pin Assignment P-TWO=187053-30091 or FOXCONN=GS23302-1321S-7H

Pin	Name	Description	Remark
1	VCC	+12.0V power supply	
2	VCC	+12.0V power supply	
3	VCC	+12.0V power supply	
4	VCC	+12.0V power supply	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	NC	No connection	(2)
9	SELLVDS	Select LVDS Format	(3)(4)
10	NC	NC	(2)
11	GND	Ground	
12	RX0-	Negative LVDS differential data input. Channel 0	
13	RX0+	Positive LVDS differential data input. Channel 0	
14	GND	Ground	
15	RX1-	Negative LVDS differential data input. Channel 1	
16	RX1+	Positive LVDS differential data input. Channel 1	
17	GND	Ground	
18	RX2-	Negative LVDS differential data input. Channel 2	
19	RX2+	Positive LVDS differential data input. Channel 2	
20	GND	Ground	
21	RXLCK-	Negative LVDS differential clock input.	
22	RXCLK+	Positive LVDS differential clock input.	
23	GND	Ground	
24	RX3-	Negative LVDS differential data input. Channel 3	
25	RX3+	Positive LVDS differential data input. Channel 3	
26	GND	Ground	
27	NC	No connection	(2)
28	SCL	I2C clock (For Vcom tunning)	
29	SDA	I2C data (For Vcom tunning)	
30	GND	Ground	

Note (1) Connector type: (P-TWO=187053-30091 or FOXCONN=GS23302-1321S-7H)

LVDS connector pin order defined as follows
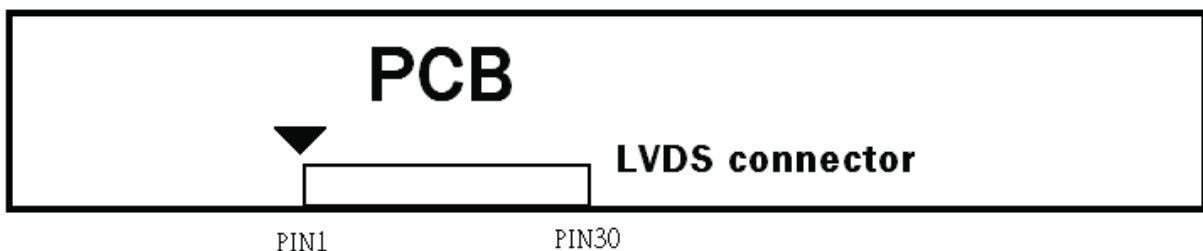
Note (2) Reserved for internal use. Please leave it open.

Note (3) LVDS data format Selection (0V~0.7V→VESA , 2.7V~3.3V/Open→JEDIA)

SELLVDS	Mode
0V~0.7V	VESA
2.7V~3.3V/Open	JEIDA

L : Connect to GND, H : Connect to +3.3V

Note (4) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.
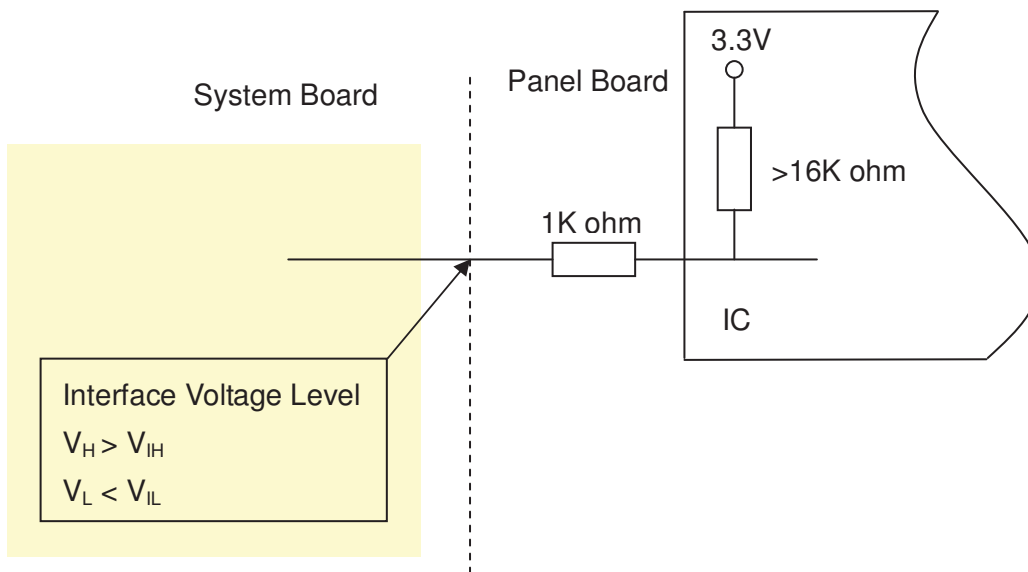
Note (5) LVDS connector mating dimension range request is 0.93mm~1.0mm as below.
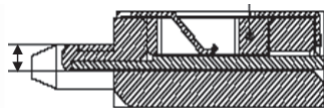
Note (6) The screw hole which is distant from the connector is merged with Ground.

5.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the 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

5.3 FLICKER (Vcom) ADJUSTMENT

(1) Adjustment Pattern :

The adjustment pattern is shown as below. If customer needs below pattern, please directly contact with CMI account FAE.
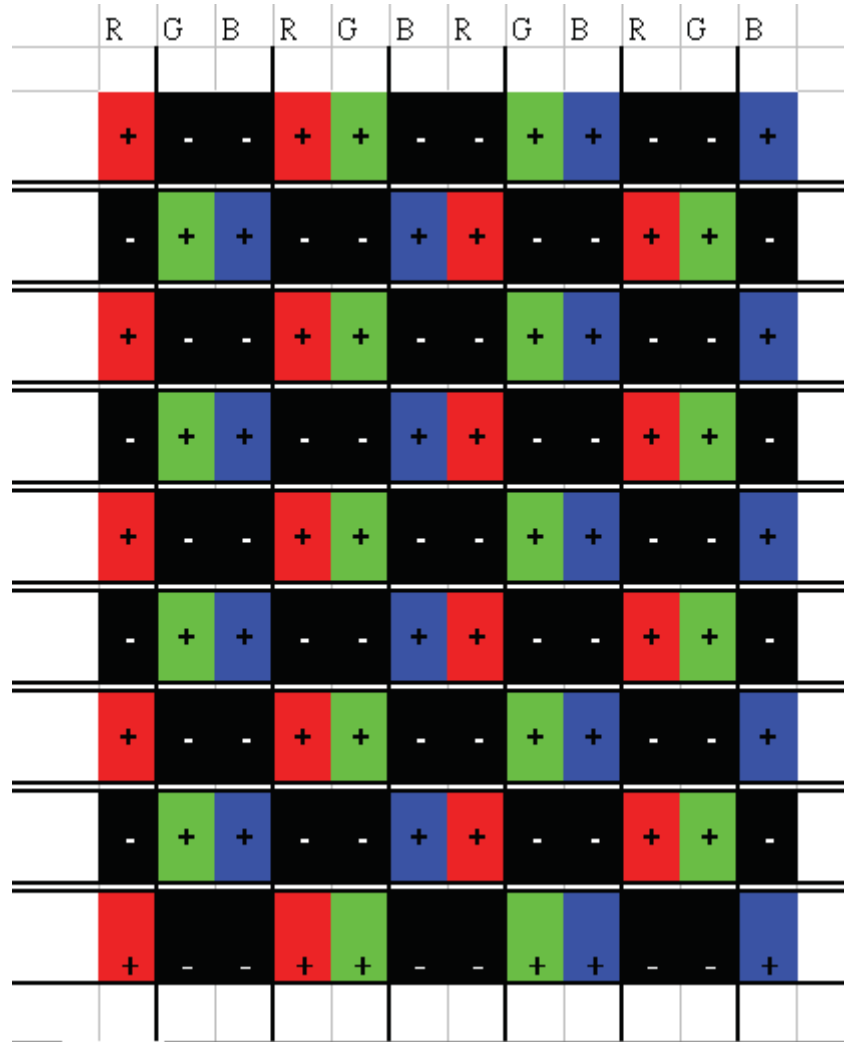
(2) Adjustment method: (Digital V-com)

Programmable memory IC is used for Digital V-com adjustment in this model. CMI provide Auto Vcom tools to adjust Digital V-com.The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com adjustment OI. Below items is suggested to be ready before Digital V-com adjustment in customer LCM line.

a. USB Sensor Board.

b. Programmable software.

c. Document: Auto V-com adjustment suggestion OI.

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 ºC)

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	F_{clkin} (=1/TC)	67.67	76	82	MHz	
	Input cycle to cycle jitter	T_{rcl}	—	—	200	ps	(2)
	Spread spectrum modulation range	F_{clkin_mod}	F_{clkin}-2%	—	F_{clkin}+2%	MHz	(3)
	Spread spectrum modulation frequency	F_{SSM}	—	—	200	KHz	
LVDS Receiver Data	Setup Time	Tlvsu	600	—	—	ps	
	Hold Time	Tlvhd	600	—	—	ps	
Vertical Active Display Term	Frame Rate	F_{r5}	47	50	53	Hz	
		F_{r6}	57	60	63	Hz	
	Total	Tv	778	806	986	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	
	Blank	Tvb	10	38	218	Th	
Horizontal Active Display Term	Total	Th	1446	1560	1936	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	
	Blank	Thb	80	194	570	Tc	

Note (1) Please make sure the range of pixel clock has follow the below equation :
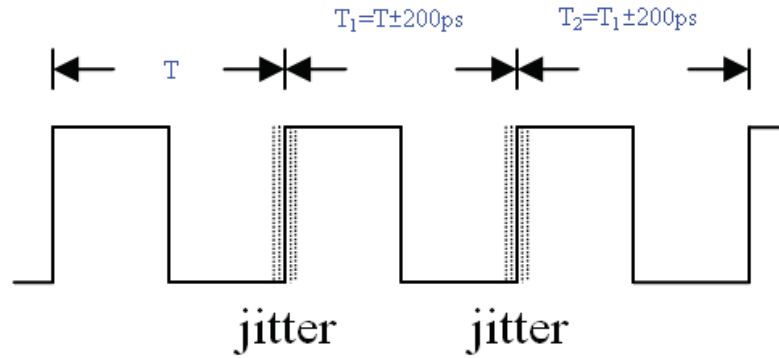
Fclkin(max) $\geqq$ Fr6 $\times$ Tv $\times$ Th

Fr5 $\times$ Tv $\times$ Th $\geqq$ Fclkin (min)

Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below :
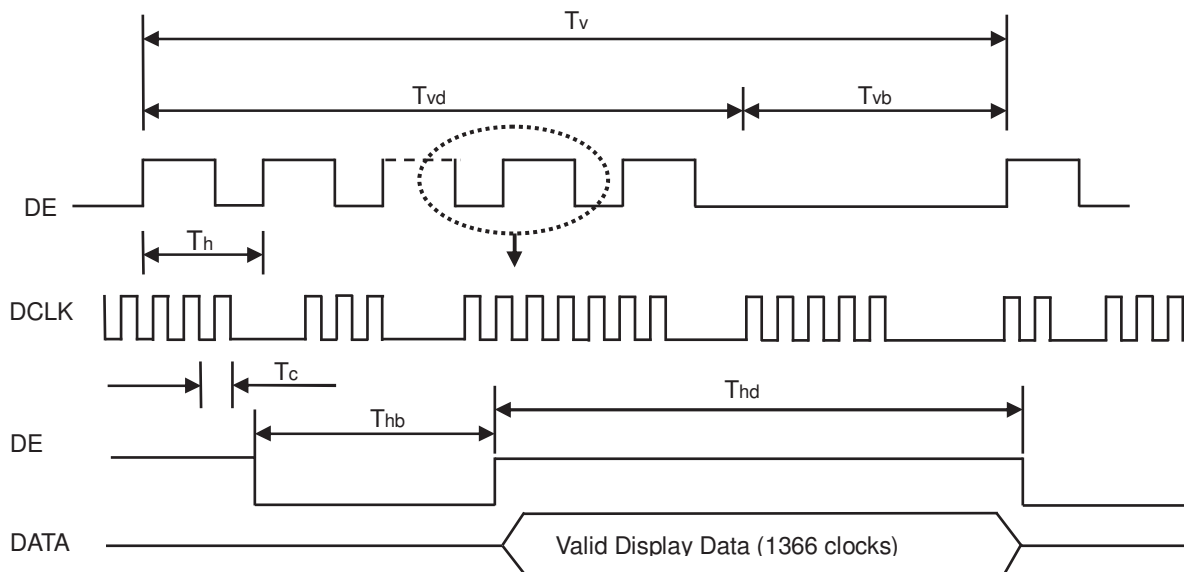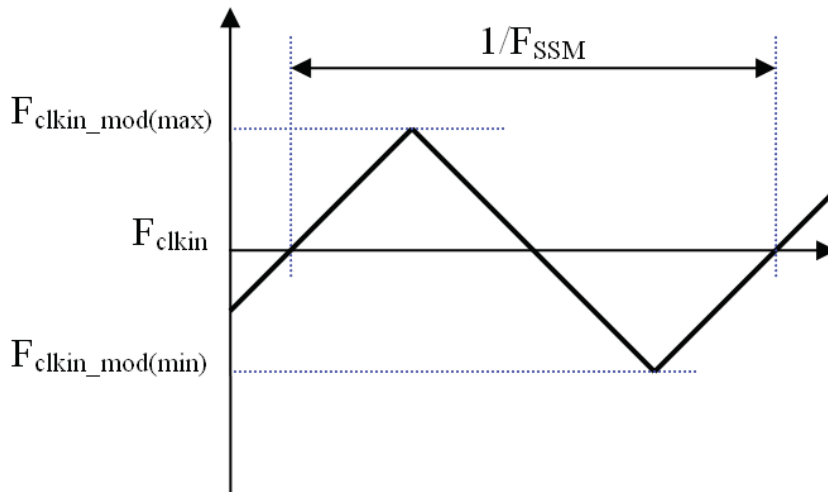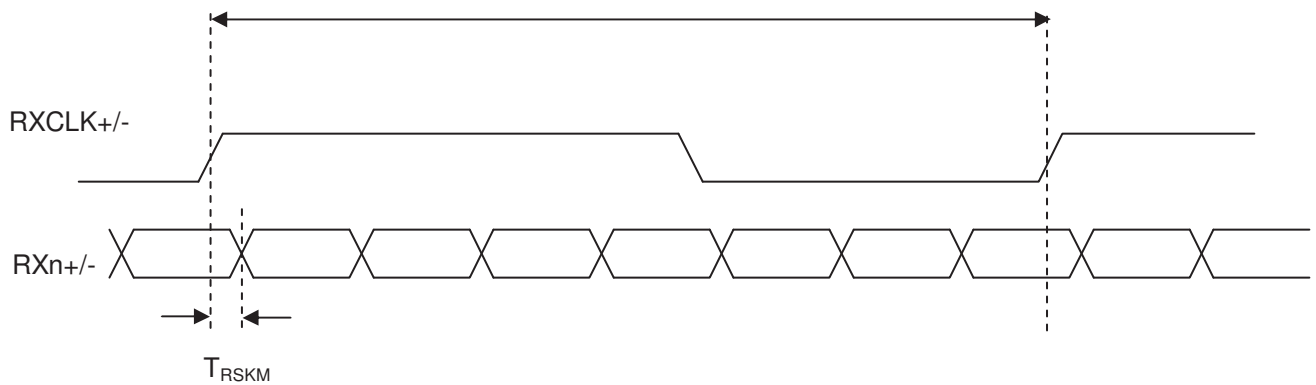
Note (3) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = | T_1 - T |$

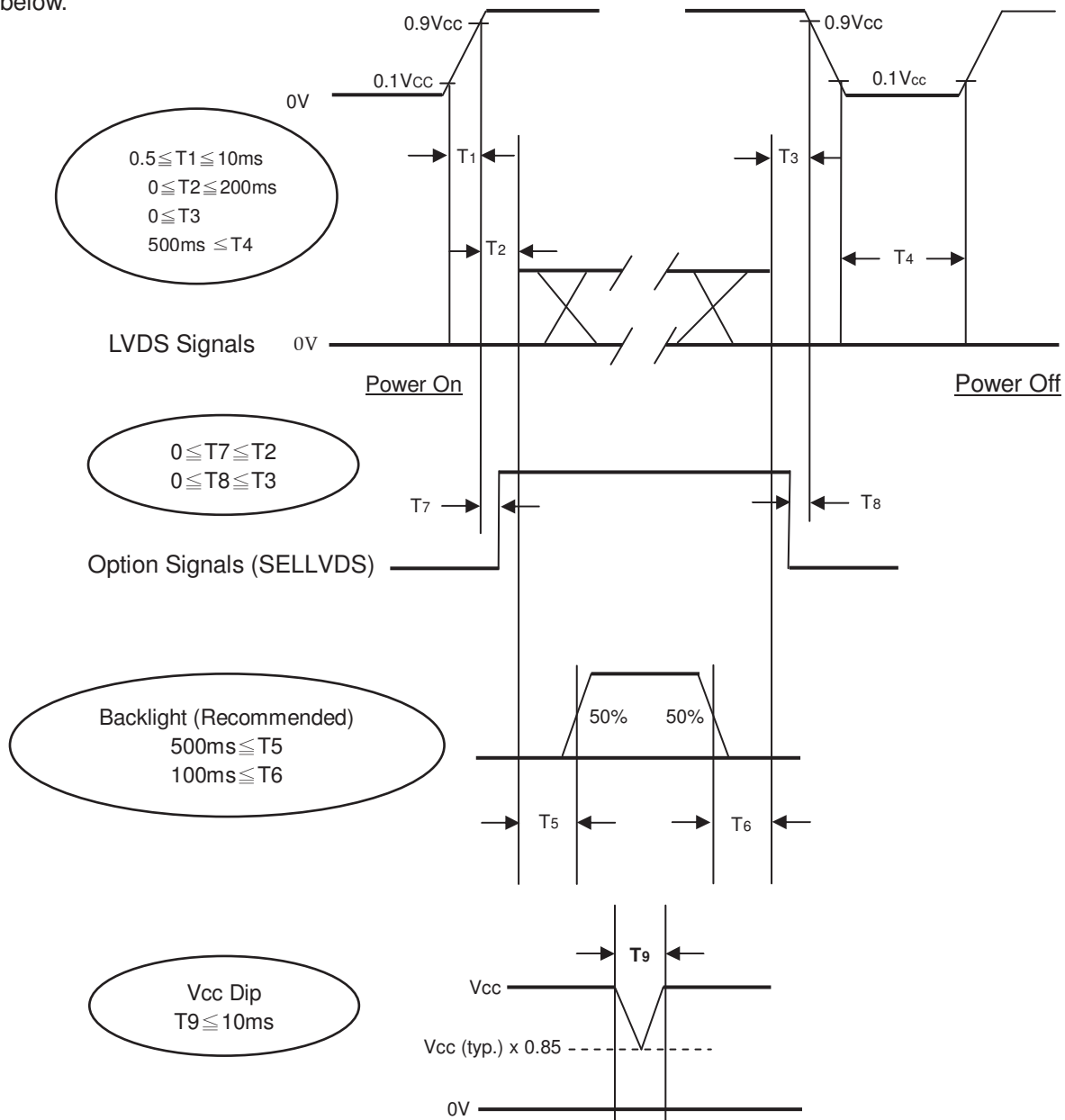Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.

Note (5) The LVDS timing diagram and the receiver skew margin is defined and shown in following figure.

6.2 POWER ON/OFF SEQUENCE

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

$0.5 \leq T1 \leq 10ms$
$0 \leq T2 \leq 200ms$
$0 \leq T3$
$500ms \leq T4$

LVDS Signals

Power On   Power Off

$0 \leq T7 \leq T2$
$0 \leq T8 \leq T3$

Option Signals (SELLVDS)

Backlight (Recommended)
$500ms \leq T5$
$100ms \leq T6$

50%   50%

Vcc Dip
$T9 \leq 10ms$

Vcc
Vcc (typ.) x 0.85
0V

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

Note (2) Apply the lamp 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.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VCC	12V	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	IL	12.5±0.5	mA
Oscillating Frequency (Inverter)	FW	58±3	KHz
Vertical Frame Rate	Fr	60	Hz

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.
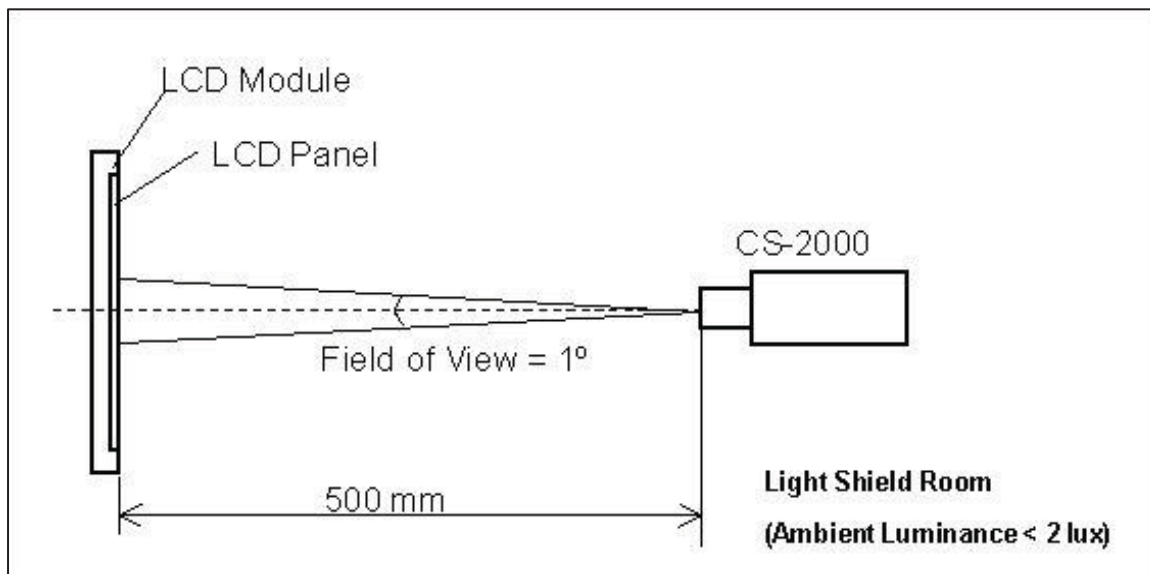
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in 7.1.

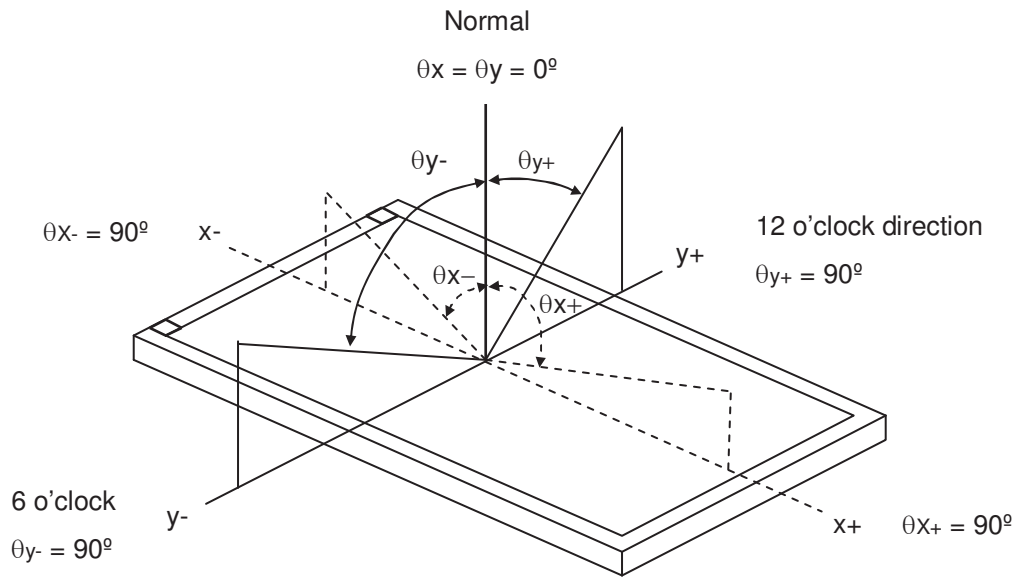| Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rcx	$\theta_x=0°$, $\theta_Y=0°$ Viewing Angle at Normal Direction Standard light source "C"	-0.03	0.654	+0.03	-	(1)
		Rcy			0.329		-	
	Green	Gcx			0.274		-	
		Gcy			0.602		-	
	Blue	Bcx			0.133		-	
		Bcy			0.115		-	
	White	Wcx			0.310		-	
		Wcy			0.356		-	
Center Transmittance		T%	$\theta_x=0°$, $\theta_Y=0°$ with CMI Module @60Hz	-	5.5	-	%	(1),(6)
Transmittance Variation		δT		-	-	1.42	-	(1),(5)
Contrast Ratio		CR		2000	3000	-	-	(1),(3)
Response Time		Gray to gray	$\theta_x=0°$, $\theta_Y=0°$ with CMI Module.	-	8.5	20	ms	(1),(4)
Viewing Angle	Horizontal	θ_x+	CR$\geq$20 (VA Model) with CMI Module	80	88	-	Deg.	(1),(2)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrum at center point. W, R, G, B are with signal input. BLU (V236BJ1-L01) is supplied by CMI.

2. Calculate cell's spectrum.

3. Calculate cell's chromaticity by using the spectrum of standard light source "C".

Note (1) Light source is the BLU which supplied by CMI and driving voltage are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Autronic Conoscope Cono-80

Normal

$\theta x = \theta y = 0^\circ$

$\theta y-$ $\theta y+$

$\theta X- = 90^\circ$ x-

12 o'clock direction

y+

$\theta y+ = 90^\circ$

$\theta x-$

$\theta x+$

6 o'clock

y-

x+ $\theta X+ = 90^\circ$

$\theta y- = 90^\circ$

Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

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 (5).
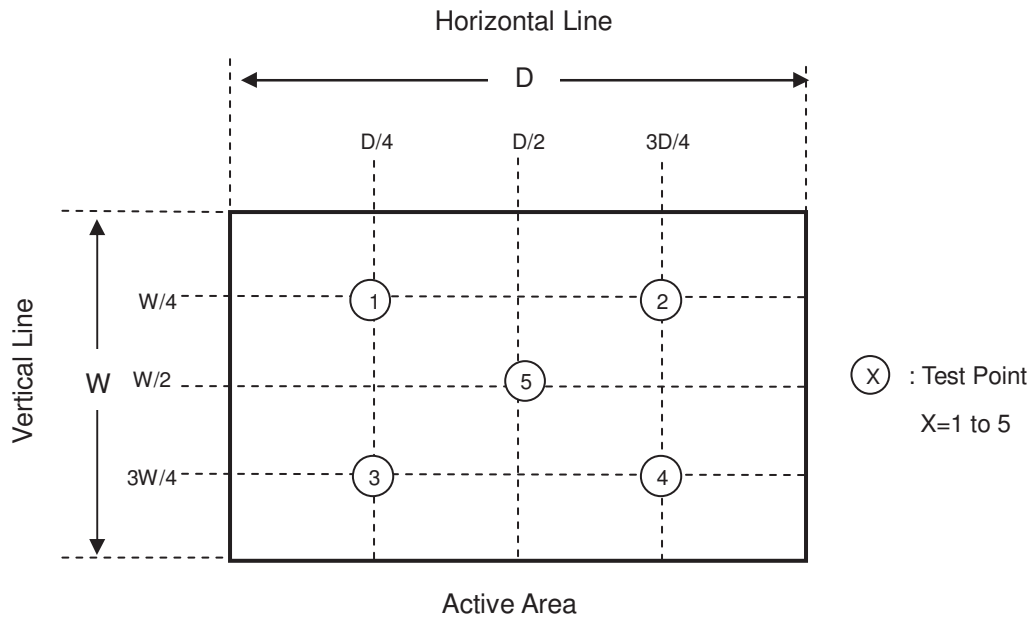
Note (4) Definition of Response Time (T_R, T_F):

Gray Level 255   Gray Level 255

100%
90%

Optical

Response

Gray Level 0

10%
0%

T_R T_F Time
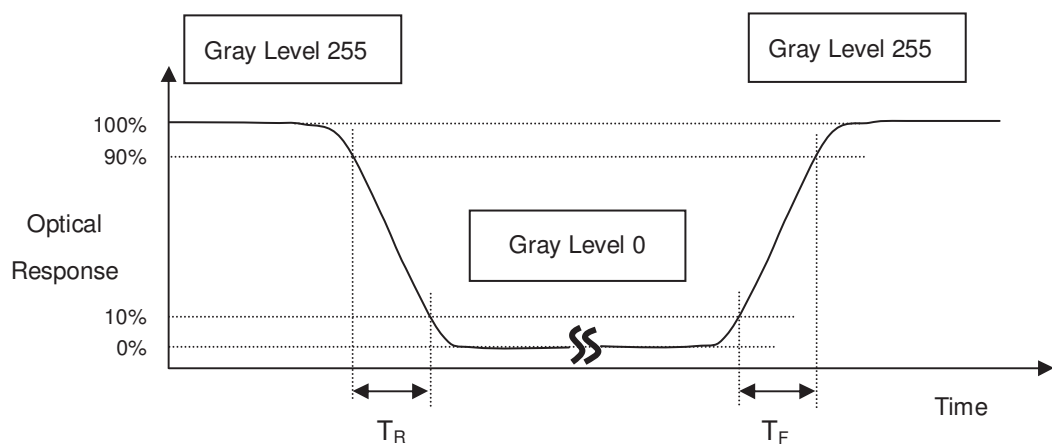
Note (5) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Horizontal Line

Active Area

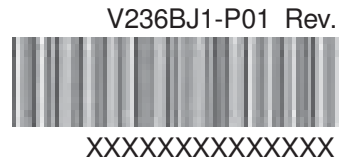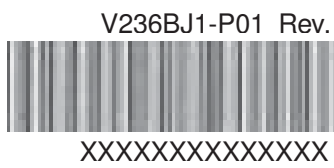Note (6) Definition of Transmittance (T%) :

Measure the luminance of gray level 255 at center point of LCD module.

$$\text{Transmittance (T\%)} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backligh unit}} \times 100\%$$

8. DEFINITION OF LABELS

8.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMI internal control.

V236BJ1-P01 Rev.

XXXXXXXXXXXXXX

V236BJ1-P01 Rev.

XXXXXXXXXXXXXX

8.2 CARTON LABEL

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

P.O. NO._____   **Made in Taiwan**

Parts ID._____   Quantities   15

Model Name   V236BJ1-P01   Rev._____

Carton ID._____ **RoHS**

XXXXXXXXXXXXXX

P.O. NO._____   **Made in China**

Parts ID._____   Quantities   15

Model Name   V236BJ1-P01   Rev._____

Carton ID._____ **RoHS**

XXXXXXXXXXXXXX

(a) Model Name: V236BJ1– P01

(b) Carton ID: CMI internal control

(c) Quantities: 15

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 15 PCS LCD TV Panels / 1 Box

(2) Box dimensions : 630 (L) X 480 (W) X93 (H)mm

(3) Weight : approximately 10.3Kg

(4) 540 PCS LCD TV Panels / 1 Group

9.2 PACKING METHOD

Packing method (Hard Box) is shown in following figures.
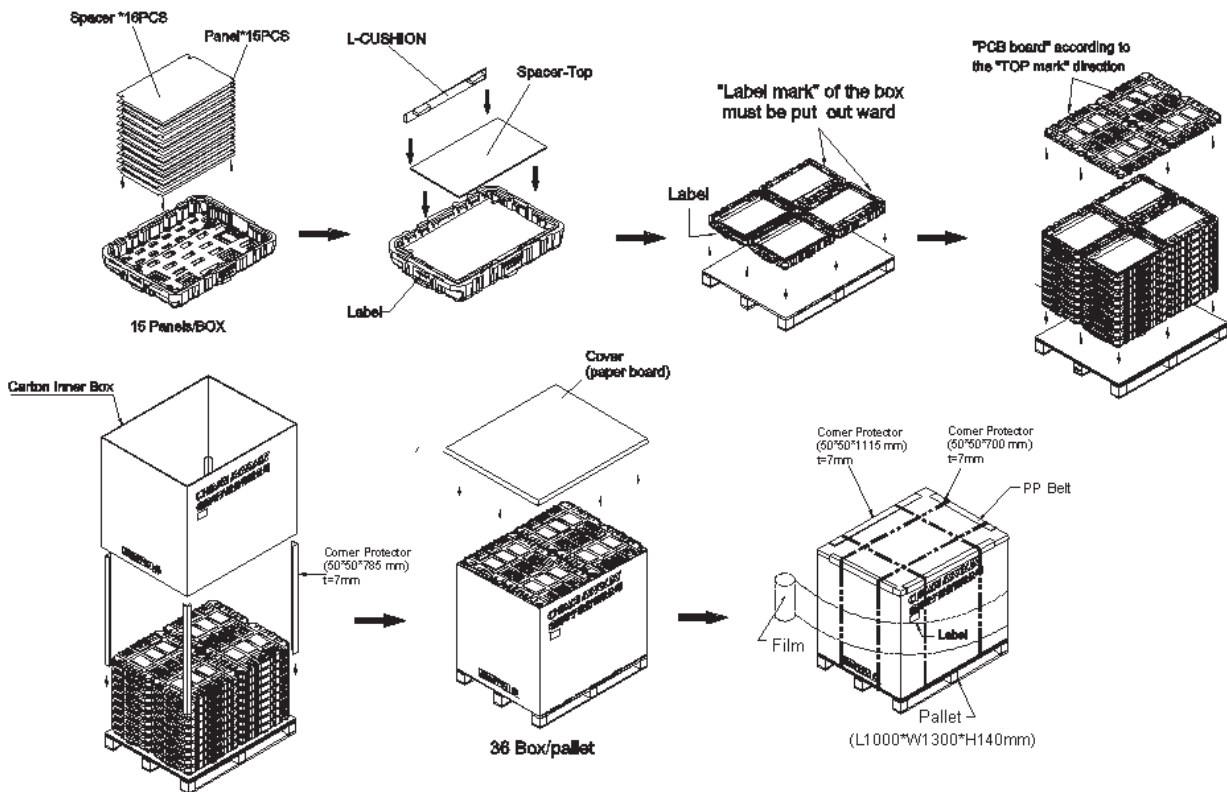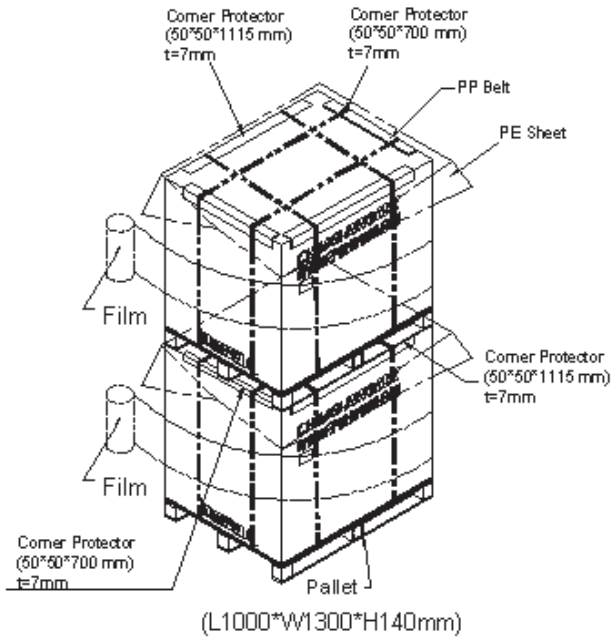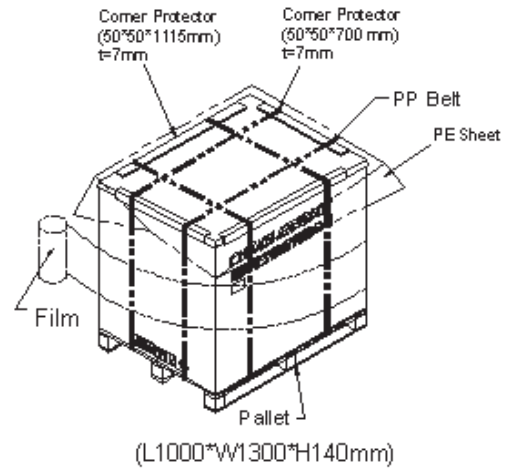
Figure.9-1 packing method

Sea / Land Transportation

Corner Protector
(50*50*1115 mm)
t=7mm

Corner Protector
(50*50*700 mm)
t=7mm

PP Belt

PE Sheet

Film

Corner Protector
(50*50*1115 mm)
t=7mm

Film

Corner Protector
(50*50*700 mm)
t=7mm

Pallet

(L1000*W1300*H140mm)

36 Box / Pallet +36 Box / Pallet

Air Transportation

Corner Protector
(50*50*1115mm)
t=7mm

Corner Protector
(50*50*700 mm)
t=7mm

PP Belt

PE Sheet

Film

Pallet

(L1000*W1300*H140mm)

36 Box / Pallet

Figure.9-2 packing method

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble backlight 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 will be damaged.

(4) Always follow the correct power sequence when the product 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) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

10.2 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 product's end of life, it is not harmful in case of normal operation and storage.

11. MECHANICAL CHARACTERISTIC
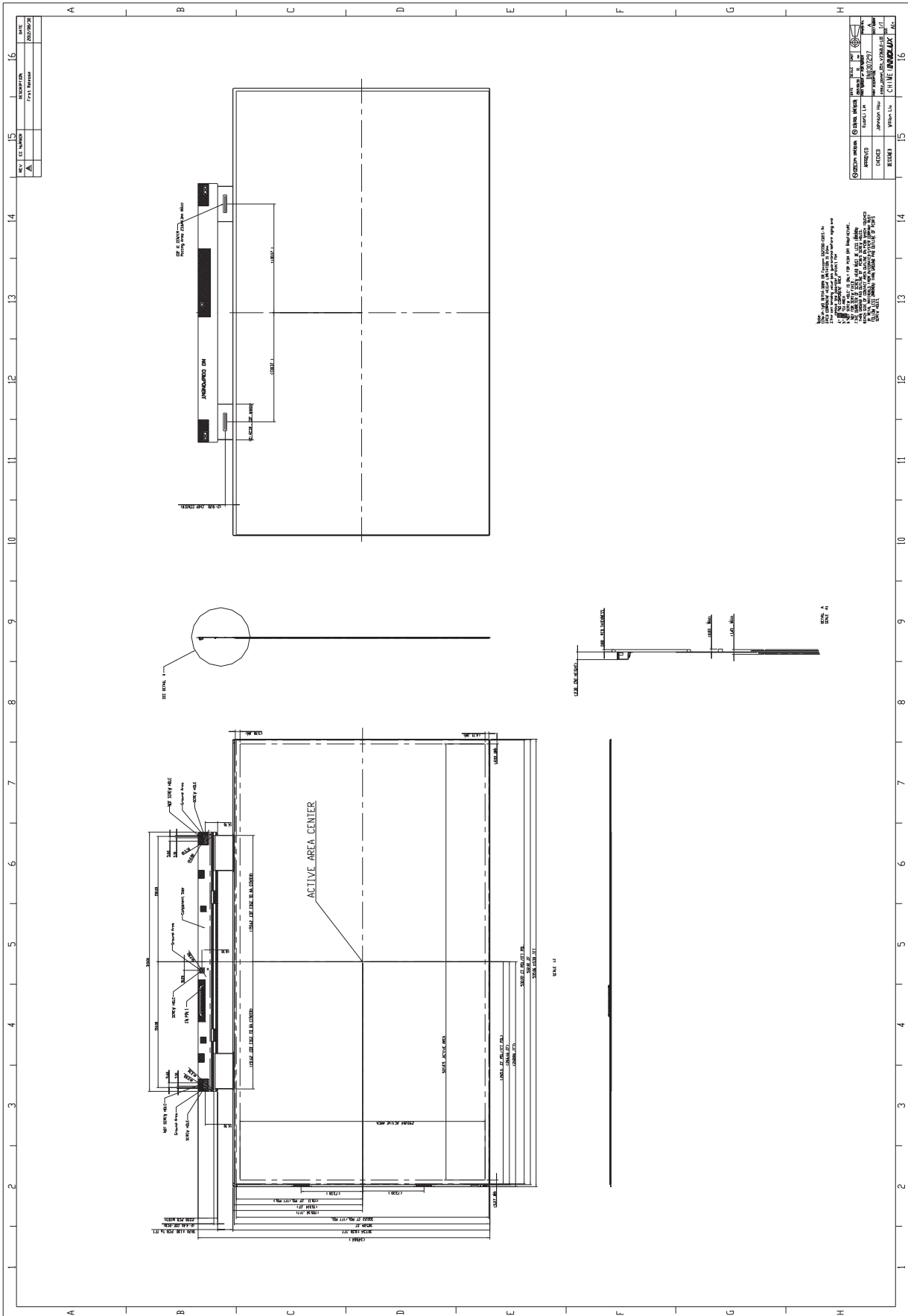
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