

CUSTOMER APPROVE

SPECIFICATION

FOR

DOUBLE LIN TFT-LCD MODULE

LED55A-OD28

Edition : Preliminary spec 1.0

Date of issue : 2017-03-16

Product No. : LC550EQY-SJA3

APPROVED	CHECKED	PREPARED

Revision History

Date	Rev.	Page	Old Description	New Description	Remark
2016-11-07	1.0	All	The specification was first issued		

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1.Scope

This specifications is applicable to CEJZ 's 55-OD28" diagonal module : "LED55A "designed for TFT LCD TV.

1.1 Features

- Super Wide viewing angle
- Super High contrast ratio
- Super Fast response time
- High color saturation
- DE(Data Enable) only mode
- LVDS Interface
- RoHS compliance

1.2 Application

TFT LCD TV
Multi-Media Display

1.3 General Specifications

Active Screen Size	54.64 inches(1387.8mm) diagonal
Outline Dimension	1225.2 (H) x 696.7 (V) x 1.3 (D) mm(Typ.)
Pixel Pitch	0.315 mm x 0.315 mm
Pixel Format	3840 horiz. by 2160 vert. Pixels,
Color Depth	10bit(D), 1.07Billion colors
Drive IC Data Interface	Source D-IC : 8-bit EPI, gamma reference voltage, and control signals Gate D-IC : Gate In Panel
Transmittance (With POL)	5.34 %(Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Min.), U/D 178 (Min.))
Weight	2.6Kg(TBD) (Typ.)
Display Mode	Transmissive mode, Normally black
Surface Treatment (Top)	Hard coating(2H), Anti-glare low reflection treatment of the front polarizer (Haze 3%(Typ.))

1.4 Mechanical Specification

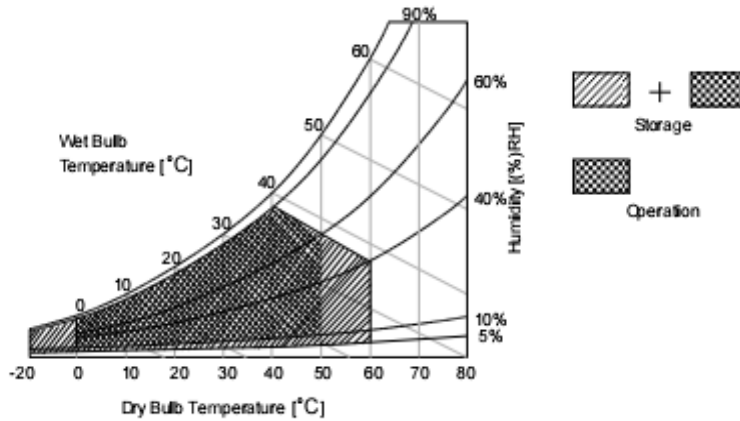
Item		Min	Typ	Max	Unit	Note
Weight		—	TBD	—	Kg	-
Module Size	Horizontal(H)	(TYP)-0.5	1243.00	(TYP)+0.5	mm	1
	Vertical (V)		711.00		mm	
	Depth(D)		32.0		mm	

Note 1: Please refer to the "outline dimension" for more information of back and front outline dimensions.

2. Absolute Maximum Ratings

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Power Input Voltage	LCD Circuit	V _{LCDB}	-0.3	+14.0	V _{DC}	1
T-Con Option Selection Voltage		V _{LOGIC}	-0.3	+4.0	V _{DC}	
Operating Temperature		T _{OP}	0	+50	°C	2,3
Storage Temperature (without packing)		T _{ST}	-20	+60	°C	
Panel Front Temperature		T _{SUR}	-	+68	°C	4
Operating Ambient Humidity		H _{OP}	10	90	%RH	2,3
Storage Humidity		H _{ST}	5	90	%RH	

- Note 1. Ambient temperature condition (T_a = 25 ± 2 °C)
- Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be Max 39°C, and no condensation of water.
 - Gravity mura can be guaranteed below 40°C condition.
 - The maximum operating temperatures is based on the test condition that the surface temperature of display area is less than or equal to 68°C 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 68°C. The range of operating temperature may be degraded in case of improper thermal management in final product design.



2.2 Electrical Absolute Ratings

2.2.1 TFT LCD MODULE

Item	Symbol	Min	Max	Unit	Note 1
Power Supply Module	VCC	10.8	13.2	V	Note 1

Note 1: Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under normal operating conditions.

2.2.2 Backlight Unit

Item	Symbol	Value		Unit	Note
		Min	Max		
Single LightBar Voltage	VL	—	132	V	Note 1,2
Single LightBar Current	IL	—	660	mA	

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.

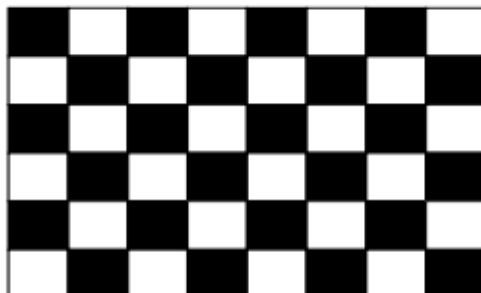
Note 2: Specified values are for input of LED lightbar at $T_a=25 \pm 2 \text{ }^\circ\text{C}$
 (Refer to 3.2 for further Information).

3. Electrical Specifications

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Circuit :						
Power Input Voltage	V _{LCB}	10.8	12.0	13.2	V _{bc}	
Power Input Current	I _{LCB}	-	1380	1795	mA	1
		-	1850	2405	mA	2
T-CON Option	Input High Voltage	V _{IH}	2.7	-	3.6	V _{DC}
Selection Voltage	Input Low Voltage	V _L	0	-	0.7	V _{DC}
Power Consumption	P _{LCB}	-	16.6	21.5	Watt	1
Rush current	I _{RUSH}	-	-	10	A	3

- Note
1. The specified current and power consumption are under the V_{LCB}=12.0V, Ta=25 ± 2°C, f_v=60Hz condition, and mosaic pattern(8 x 6) is displayed and f_v is the frame frequency.
 2. The current is specified at the maximum current pattern.
 3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).
 4. Ripple voltage level is recommended under ±5% of typical voltage

White : 1023 Gray
 Black : 0 Gray



Mosaic Pattern(8 x 6)

3.2 Backlight system

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	Remark
LightBar Voltage	V_L	117	—	130	V	Note 1
LightBar Current	I_L	—	600	660	mA	
Power Consumption	P_{BL}	—	74.88	—	W	
LED Life Time	L_{BL}	30000	—	—		

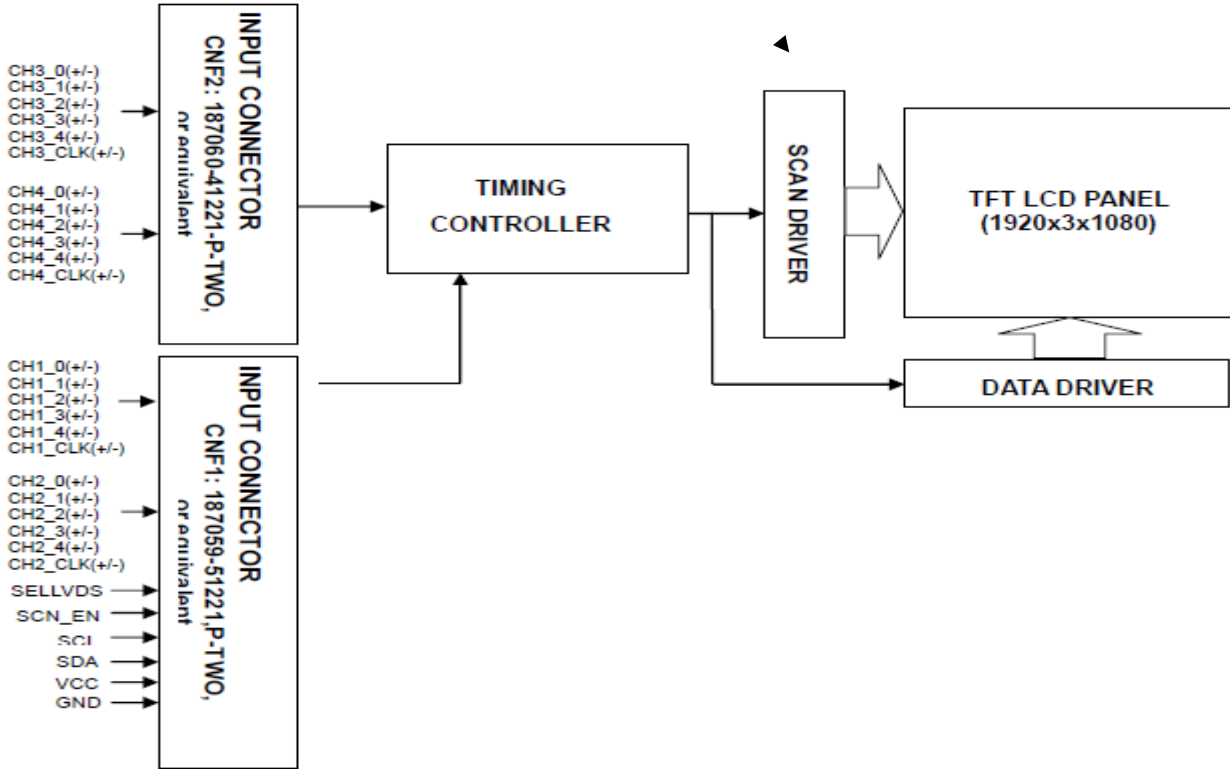
Note 1 The LED LightBar connector part No: PHR-6(JST) or equivalent, as shown next page.

Note 2: $P_{BL} = I_L \times V_L$, The LED LightBar circuit is 39 Series, 2 Parallel.

Note 3: The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ and $I = (600)\text{mA}$ (per chip) until the brightness becomes $\cong 50\%$ of its original value.

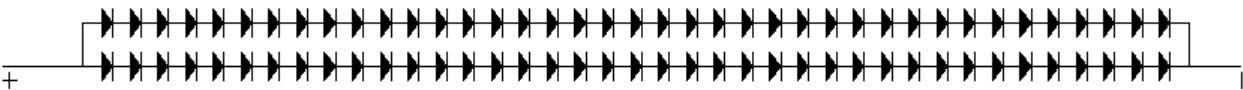
4. Block Diagram

4.1 TFT LCD Module



4.2 Backlight Unit

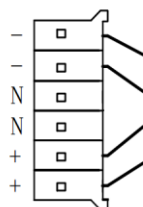
The LED LightBar Series and Parallel circuit, interface type as shown below:



39 Series, 2 Parallel

4.3 Backlight wire

Backlight Input connector model: PHR-6(JST) PITCH2.0mm *1 (一路PH2.0 6pin插头)



5. INTERFACE CONNECTIONS:

5.1 T-CON BOARD PIN MAP

No	Symbol	Description	No	Symbol	Description
1	VLCD	Power Supply +12.0V	27	GND	Ground
2	VLCD	Power Supply +12.0V	28	Rx0n	V-by-One HS Data Lane 0
3	VLCD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VLCD	Power Supply +12.0V	30	GND	Ground
5	VLCD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VLCD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VLCD	Power Supply +12.0V	33	GND	Ground
8	VLCD	Power Supply +12.0V	34	Rx2n	V-by-One HS Data Lane 2
9	NC	NO CONNECTION	35	Rx2p	V-by-One HS Data Lane 2
10	GND	Ground	36	GND	Ground
11	GND	Ground	37	Rx3n	V-by-One HS Data Lane 3
12	GND	Ground	38	Rx3p	V-by-One HS Data Lane 3
13	GND	Ground	39	GND	Ground
14	SPI_EN	SPI_WP Enable	40	Rx4n	V-by-One HS Data Lane 4
15	NC	NO CONNECTION	41	Rx4p	V-by-One HS Data Lane 4
16	SPI_DI	SPI Data In for Flash	42	GND	Ground
17	SPI_DO	SPI Data Out for Flash	43	Rx5n	V-by-One HS Data Lane 5
18	SDA	SDA for I2C	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	SCL for I2C	45	GND	Ground
20	nWP	WP(Write Protection)	46	Rx6n	V-by-One HS Data Lane 6
21	SPI_CLK	SPI_CLK for Flash	47	Rx6p	V-by-One HS Data Lane 6
22	SPI_CS	SPI_CS for Flash	48	GND	Ground
23	Ag&g Mode	H' or NC : AGP or Flicker PTN L' : NSB (No signal Black)	49	Rx7n	V-by-One HS Data Lane 7
24	GND	Ground	50	Rx7p	V-by-One HS Data Lane 7
25	HTPDN	Hot plug detect	51	GND	Ground
26	LOCKN	Lock detect	-	-	-

- Note**
- All GND (ground) pins should be connected together to the LCD module's metal frame.
 - All Input levels of V-by-One signals are based on the V-by-One-HS Standard Version 1.4
 - Specific pin No. #23 is used for "No signal detection" of system signal interface.
It should be GND for NSB (No Signal Black) while the system interface signal is not.
If this pin is "H", LCD Module displays AGP (Auto Generation Pattern).
 - Specific Pin No. #20 & #23 is used for "Vcom Adjustment", (Please see the Appendix V-2 for more information)

5.2 LVDS Interface

JEIDA Format : SELLVDS = L

VESA Format : SELLVDS = H or Open

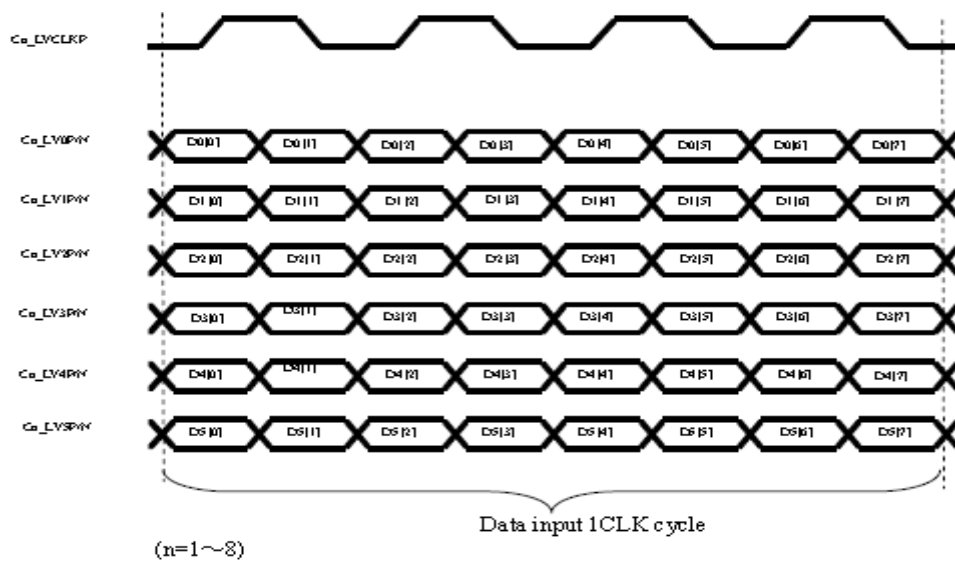


Fig 2 mini-LVDS Mapping

6. INTERFACE TIMING

6.1 Input Signal Timing Specifications

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frequency		F_{CLK} ($= 1/T_{CLK}$)	60.6	74.25	77	MHz	(1)
Frame Rate		F	57	60	63	Hz	
Vertical Term	Total	T_V	2230	2250	2450	T_H	$T_V = T_{VD} + T_{VB}$
	Display	T_{VD}	2160			T_H	
	Blank	T_{VB}	70	90	290	T_H	
Horizontal Term	Total	T_H	530	550	720	T_{CLK}	$T_H = T_{HD} + T_{HB}$
	Display	T_{HD}	480			T_{CLK}	
	Blank	T_{HB}	50	70	240	T_{CLK}	

6.2 Timing spec for Frame Rate = 50Hz

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frequency		F_{CLK} ($= 1/T_{CLK}$)	60	61.88	77.2	MHz	(1)
Frame Rate		F	47	50	53	Hz	
Vertical Term	Total	T_V	2172	2250	2450	T_H	$T_V = T_{VD} + T_{VB}$
	Display	T_{VD}	2160			T_H	
	Blank	T_{VB}	12	90	290	T_H	
Horizontal Term	Total	T_H	530	550	720	T_{CLK}	$T_H = T_{HD} + T_{HB}$
	Display	T_{HD}	480			T_{CLK}	
	Blank	T_{HB}	50	70	240	T_{CLK}	

6.3 Timing spec for Frame Rate = 120Hz

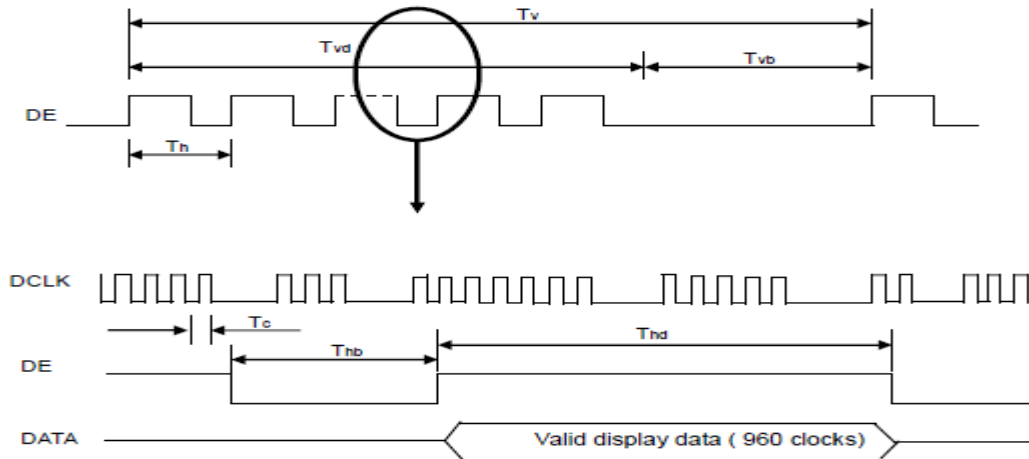
Frame rate	2D mode		Fr	114	120	126	Hz	
	3D mode		Fr	(228)	240	(252)	Hz	(6)
Vertical Active Display Term (4 Lan, 960X2160 Active Area)	2D Mode	Total	T_V	2200	2250	2790	T_H	$T_V = T_{VD} + T_{VB}$
		Display	T_{VD}	2160	2160	2160	T_H	—
		Blank	T_{VB}	40	90	630	T_H	—
	3D Mode	Total	T_V	(1116)	1125	(1200)	T_H	(6),(7)
		Display	T_{VD}	1080	1080	1080	T_H	
		Blank	T_{VB}	(36)	45	(120)	T_H	
Horizontal Active Display Term (4 Lan, 960X2160 Active Area)	2D Mode	Total	T_H	270	285	300	T_C	$T_H = T_{HD} + T_{HB}$
		Display	T_{HD}	240	240	240	T_C	—
		Blank	T_{HB}	30	45	60	T_C	—
	3D Mode	Total	T_H	(270)	285	(300)	T_C	$T_H = T_{HD} + T_{HB}$
		Display	T_{HD}	240	240	240	T_C	—
		Blank	T_{HB}	(30)	45	(60)	T_C	—

(Note (1) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

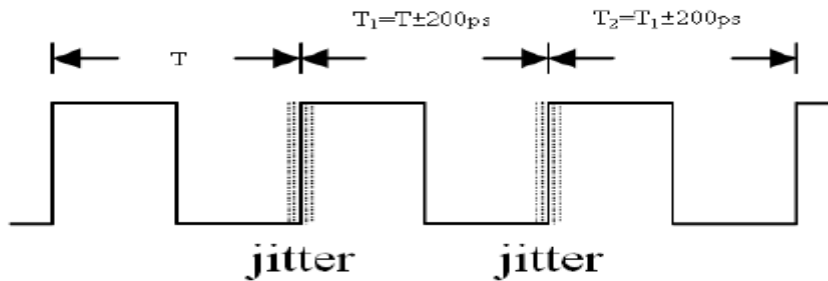
Note (2) Please make sure the range of pixel clock has follow the below equation:

$$F_{clkin(max)} \cong Fr6 \times Tv \times Th \qquad Fr5 \times Tv \times Th \cong F_{clkin(min)}$$

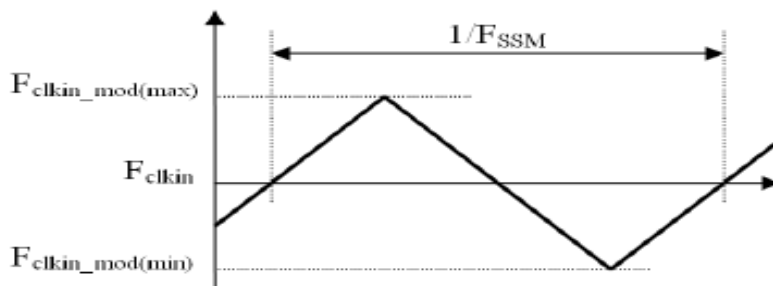
INPUT SIGNAL TIMING DIAGRAM



Note (3) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T_2|$

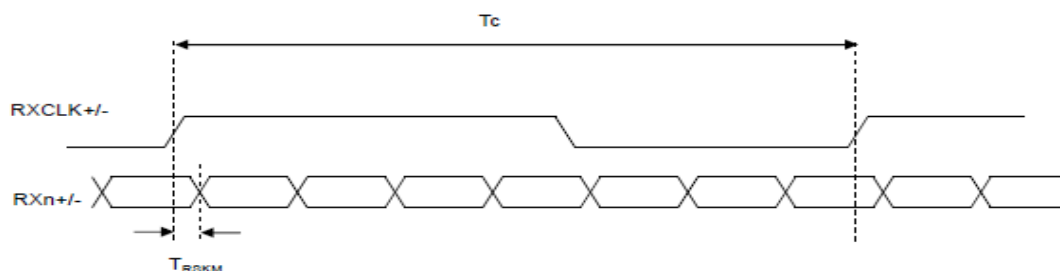


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



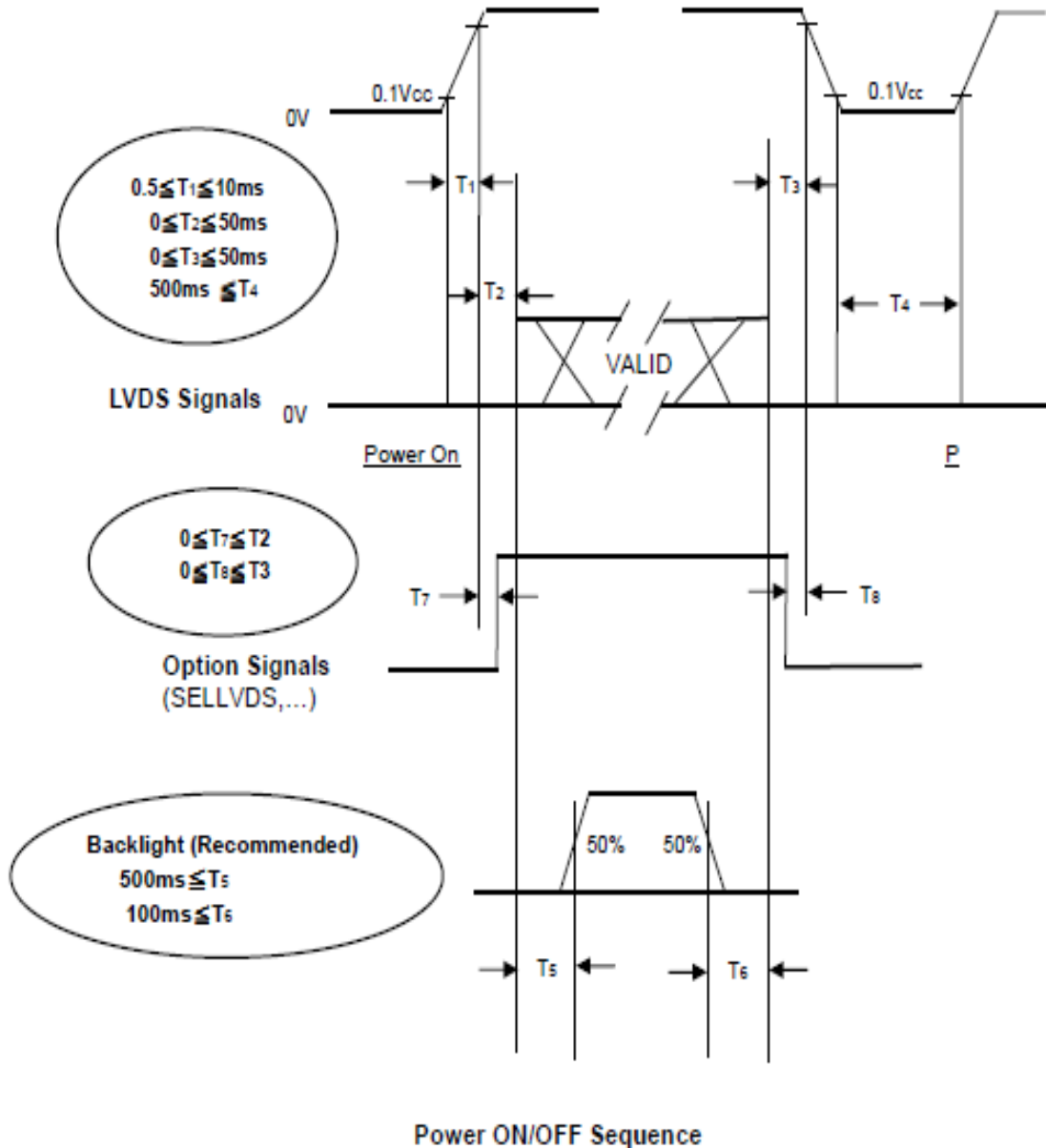
Note (5) LVDS receiver skew margin is defined and shown as below.

LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 Power On/Off Sequence

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



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 $T_2 < 0$, 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.

7 Optical Characteristics

7.1 Test Condition

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ±2	°C
Ambient Humidity	Ha	50 ±10	%RH
Supply Voltage	Vcc	12	V
Input Signal	According to typical value in "3. Electrical characteristics		
LED LightBar Current	I _L	3	mA

7.2 Optical Characteristics

The relative measurement methods of optical characteristics are shown in the 7.2. The following items should be measured under the test condition in 7.1 and the stable environment shown in the in 7.1.

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	T θx=0,θy=0, viewing normal angle	800	1100	—	—	—	
Response Time	Gray to gray average		—	8	12	ms	Note 3	
Transmittance			—	5.34	—	%	—	
Brightness uniformity	BU		—	1.33	1.42	—	Note 2	
Center Luminance of White	Lc		300	350	—	cd/m2	—	
The color chromaticity	Red		Rx	-0.03	0.659	+0.03	—	Note 0
			Ry		0.324		—	
	Green		Gx		0.267		—	
			Gy		0.585		—	
	Blue		Bx		0.133		—	
		By	0.107		—			
	White	Wx	0.285		—			
		Wy	0.295		—			
Viewing Angle	Horizontal	θx+	CR ≥ 10	89	—	Deg	Note 1、 2	
		θx-		89				
	Vertical	θy+		89				
		θy-		89				

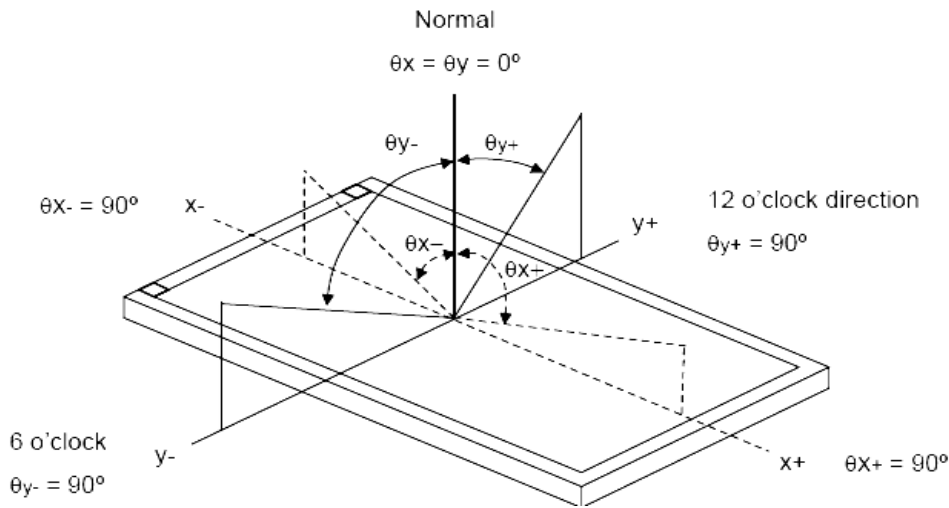
Note 0: Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following:

1. Measure Module's and BLU's spectrum at center point. White and R,G,B are with signal input. BLU (for JE695D3HC84) 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 (x, y):

Viewing angles are measured by Autronic Conoscope Cono-80



Note 3: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

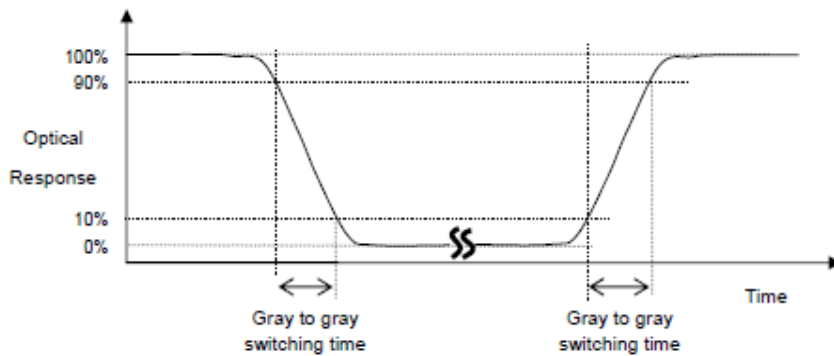
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (X), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (5).

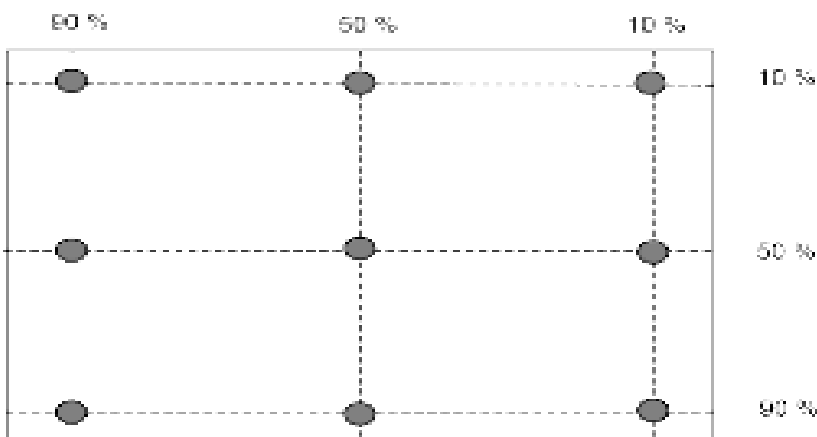
Note 4: Definition of Gray-to-Gray Switching Time:



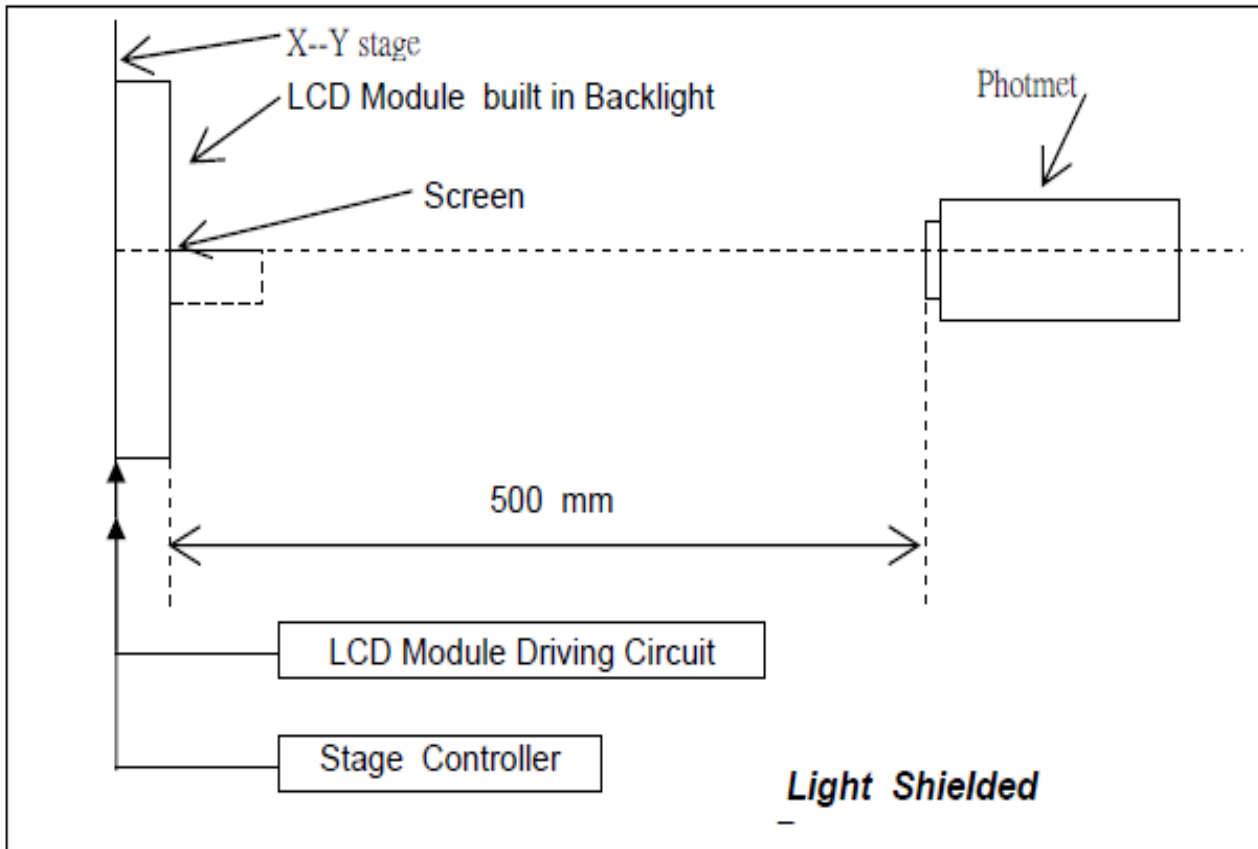
The driving signal means the signal of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023.

Gray to gray average time means the average switching time of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023 to each other.

Note 5: Definition of White Variation :



Note6: The measure method



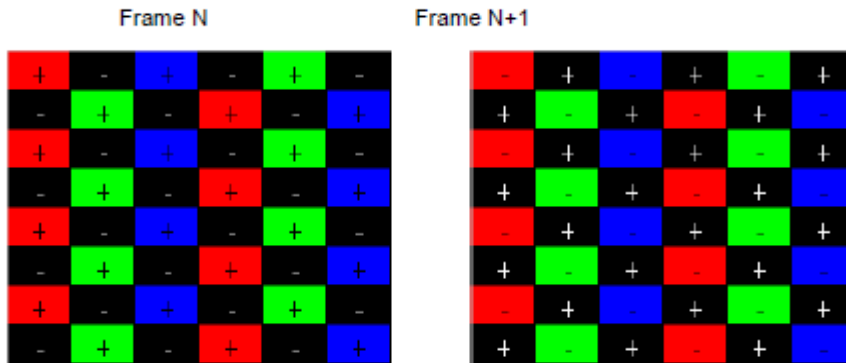
Note(1): The measurement point is the center of the active area except for the measurement of Luminance Uniformity

Note (2): Photometer :BM-7 TOPCON (Aperture 2deg.)

7.3 Flicker Adjustment

(1) Adjustment pattern :

Sub pixel on/off Pattern was shown as below. If customer need below pattern, please directly contact with Account FAE. (bright sub-pixel: G128 ; dark sub-pixel: G0)



(2) Adjustment method: (Digital V-com / Gamma)


Programmable memory IC is used for Digital V-com (Gamma) adjustment in this model. CMI provide Auto V-com (Auto Gamma) tools to adjust Digital V-com (Gamma). The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com (Auto Gamma) adjustment OI.

Below items is suggested to be ready before Digital V-com (Gamma) adjustment in customer LCM line.

8. Labels

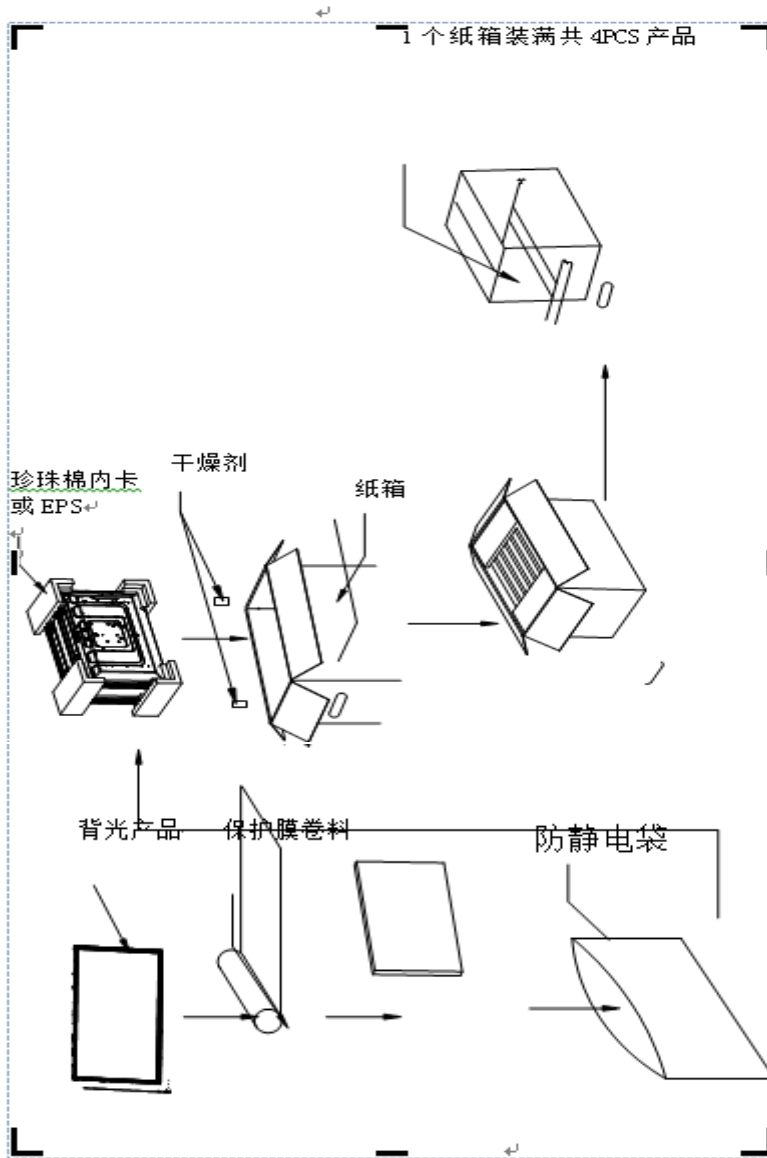
8.1 Panel Label:

8.2 Caution Label:

	CAUTION HIGH VOLTAGE RISK OF ELECTRIC SHOCK. DISCONNECT THE ELECTRIC POWER BEFORE SERVICING
COLD CATHODE FLUORESCENT LAMP IN LCD PANEL CONTAINS A SMALL AMOUNT OF MERCURY. PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR DISPOSAL	

9. Packaging

9.1 Carton(internal package)



9.2 Packaging Mark



10. PRECAUTION**10.1 ASSEMBLY AND HANDLING PRECAUTIONS**

- 1 Do not apply rough force such as bending or twisting to the module during assembly.
- 2 To assemble or install module into user's system can be 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 stored conditions.
- 10 When ambient temperature is lower than 10 °C may reduce the display quality.

10.2 SAFETY PRECAUTIONS

- 1 The LED LightBar voltage of Backlight is can't exceed out Volts Spec, otherwise it may cause electrical shock.. Do not disassemble the module or insert anything into the Backlight unit.
- 2 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.
- 3 After the modlule's end of life, it is not harmful in case of normal operation and storage.

11.Outline dimension

