CUSTOMER APPROVE

SPECIFICATION

FOR

TFT-LCD MODULE

LED700Q-OD28

Edition : Preliminary spec 1.0

Date of issue : 2017-03-20

Product No. : JE695R3HA47

APPROVED	CHECKED	PREPARED

Revision History

Date	Rev.	Page	Old Description	New Description	Remark
2016-11-3	1.0	All	The specification was first issued		

CONTENTS

1.Scope

This specifications is applicable to CEJZ 's 70-OD28" diagonal module :"LED70Q"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

Parameter	Specifications	Unit
Display size	176.56 (Diagonal)	cm
	69.5 (Diagonal)	inch
Active area	1538.88 (H) x 865.62 (V)	mm
Pixel Format	3840 (H) x 2160 (V) (1pixel = R + G + B dot)	pixel
Pixel pitch	0.40075 (H) x 0.40075 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally black	
Open Cell Outline Dimensions [Note1]	1562.76(H) x 927.52(V) x 4.0(D)	mm
Mass	4.7±0.5	kg
Surface treatment [Note2]	- Front polarizer :Super Low-Haze Anti Glare Hard coating: 2H and more, Haze: less than 5% - Rear polarizer : Hard coating less (plane)	

[Note1] Outline dimensions are shown in Page 22.
[Note2] With the protection film removed.

1.4 Mechanical Specification

Item		Min	Typ	Max	Unit	Note
Weight		—	TBD	—	Kg	-
Module Size	Horizontal(H)	(TYP)-0.5	1659.00	(TYP)+0.5	mm	1
	Vertical (V)		958.00		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

2.1 Abosolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	+60	℃	(1) With CMI Module
Operating Ambient Temperature	TOP	0	50	℃	(1), (2) With CMI Module

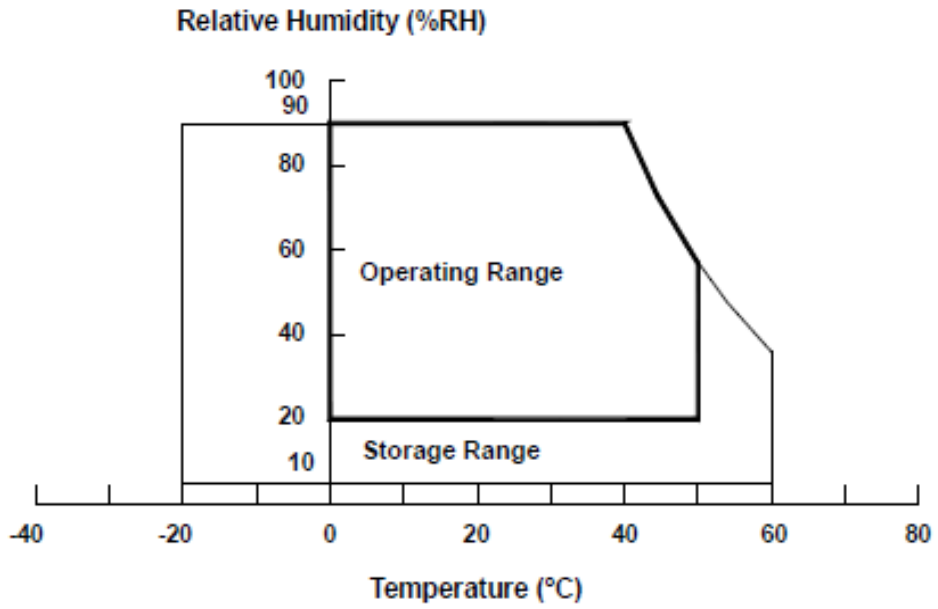
Note (1)Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ℃).

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

(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 ℃ 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 ℃. The range of operating temperature may degrade 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	—	122.4	V	Note 1,2
Single LightBar Current	IL	—	2400	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.

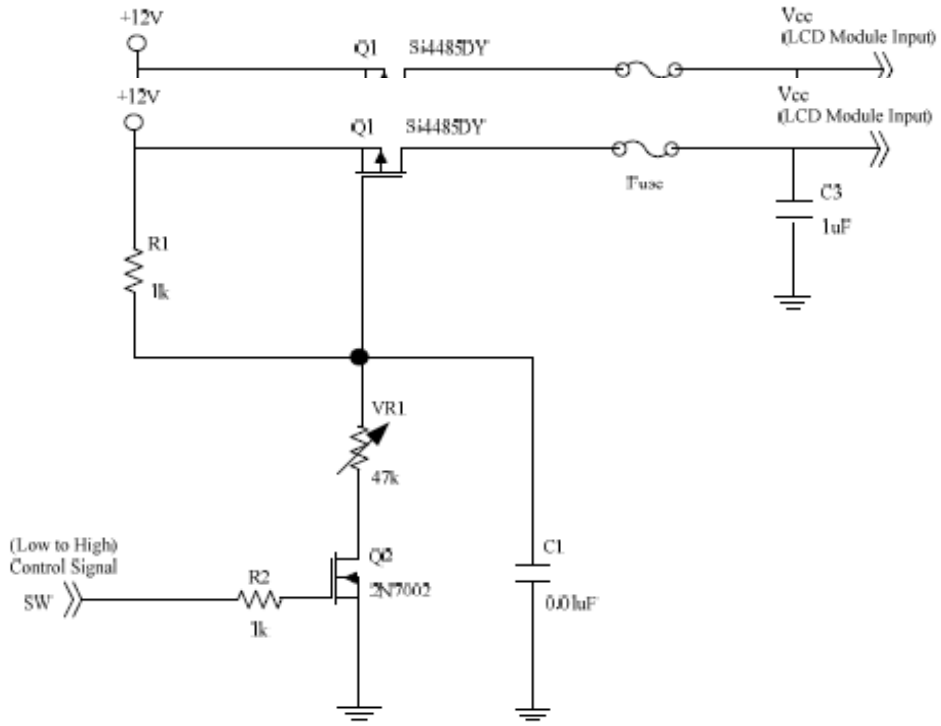
Note 2: Specified values are for input of LED lightbar at Ta=25±2 ℃ (Refer to 3.2 for further Information).

3. Electrical Specifications

3.1 TFT LCD Module

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Circuit :							
Power Input Voltage		V_{LCD}	10.8	12.0	13.2	VDC	
Power Input Current		I_{LCD}	-	320	416	mA	1
			-	450	585	mA	2
T-CON Option Selection Voltage	Input High Voltage	V_{IH}	1.62	-	1.98	VDC	
	Input Low Voltage	V_{IL}	0	-	0.54	VDC	
Power Consumption		P_{LCD}	-	3.8	5.0	Watt	1
Rush current		I_{RUSH}	-	-	5.0	A	3

Note 1. The specified current and power consumption are under the V_{LCD}=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



3.2 Backlight system

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	Remark
LightBar Voltage	V_L	104.4	115.2	122.4	V	Note 1
LightBar Current	I_L	—	1800	2400	mA	
Power Consumption	P_{BL}	—	207.36	—	W	
LED Life Time	L_{BL}	30000	—	—		

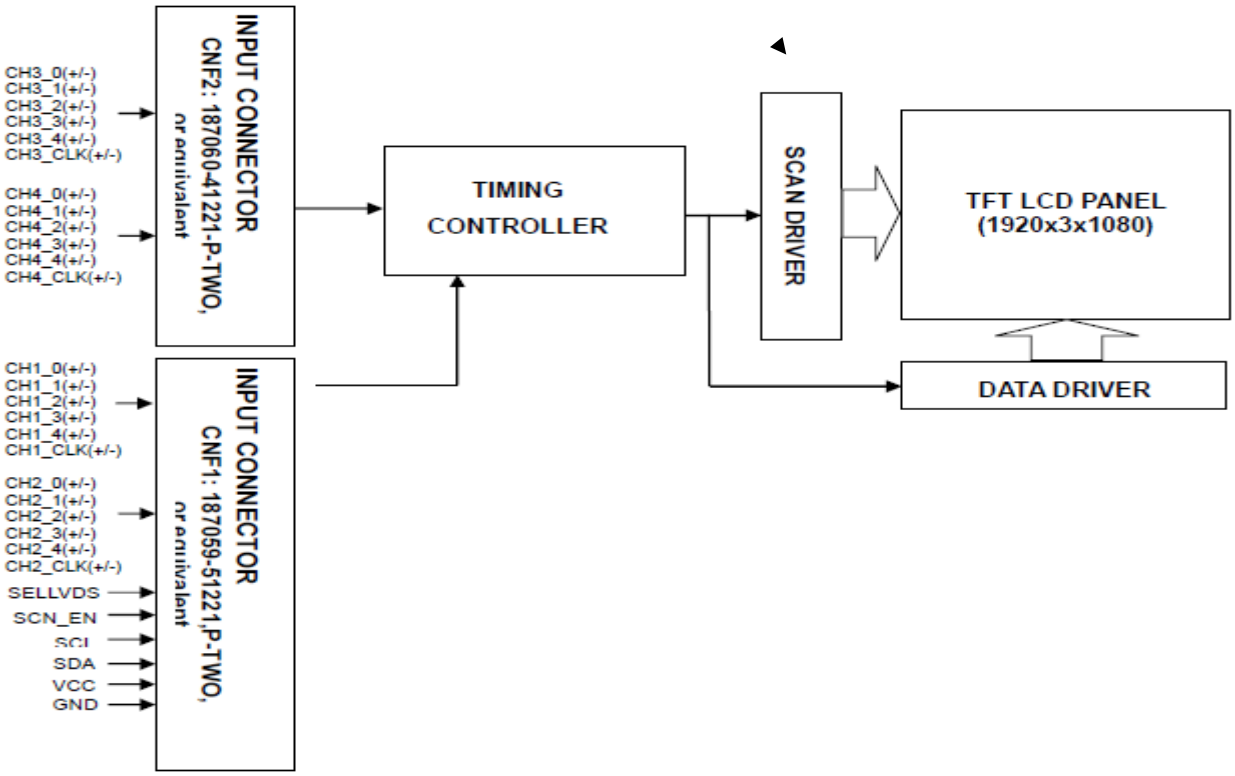
Note 1 The LED LightBar connector part No: PHR-6(JST) or equivalent, as shown next page.

Note 2: $P_{BL} = I_L \times V_L$, The LED LightBar circuit is 36 Series,4 Parallel.

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= (2400)mA (per chip) until the brightness becomes ≦ 50% of its original value.

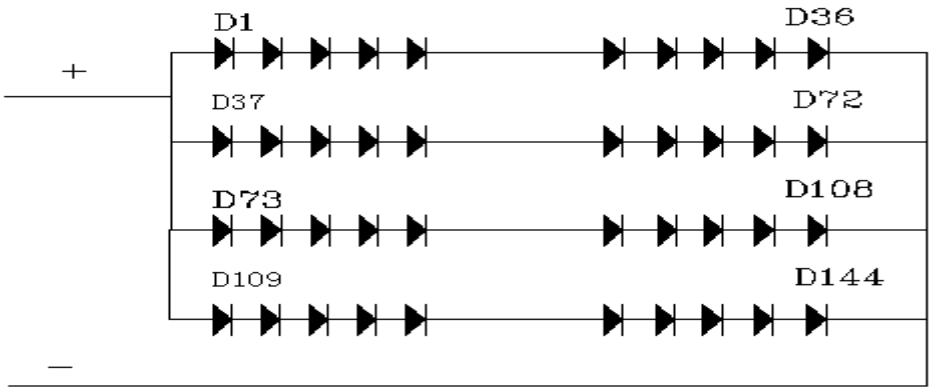
4. Block Diagram

4.1 TFT LCD Module



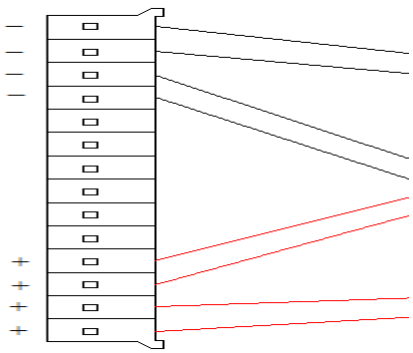
4.2 Backlight Unit

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



36 Series, 4 Parallel

4.3 Backlight wire



5.Input Termianl Pin Assignment

5.1 TFT LCD OPEN CELL

Source Driver Signal (CN1)
connector: 25P64B150-H9C (ZXEC)

No.	Symbol	I/O	Function
1	GND	-	GND
2	CDC CK 4P	I	CalDricon CLK(+)
3	CDC CK 4N	I	CalDricon CLK(-)
4	GND	-	GND
5	CDC DT 12P	I	CalDricon DATA(+)
6	CDC DT 12N	I	CalDricon DATA(-)
7	GND	-	GND
8	CDC DT 11P	I	CalDricon DATA(+)
9	CDC DT 11N	I	CalDricon DATA(-)
10	GND	-	GND
11	CDC DT 10P	I	CalDricon DATA(+)
12	CDC DT 10N	I	CalDricon DATA(-)
13	GND	-	GND
14	CDC CK 3P	I	CalDricon CLK(+)
15	CDC CK 3N	I	CalDricon CLK(-)
16	GND	-	GND
17	CDC DT 9P	I	CalDricon DATA(+)
18	CDC DT 9N	I	CalDricon DATA(-)
19	GND	-	GND
20	CDC DT 8P	I	CalDricon DATA(+)
21	CDC DT 8N	I	CalDricon DATA(-)
22	GND	-	GND
23	CDC DT 7P	I	CalDricon DATA(+)
24	CDC DT 7N	I	CalDricon DATA(-)
25	GND	-	GND
26	CDC DT 6P	I	CalDricon DATA(+)
27	CDC DT 6N	I	CalDricon DATA(-)
28	GND	-	GND
29	CDC DT 5P	I	CalDricon DATA(+)
30	CDC DT 5N	I	CalDricon DATA(-)
31	GND	-	GND
32	CDC DT 4P	I	CalDricon DATA(+)
33	CDC DT 4N	I	CalDricon DATA(-)
34	GND	-	GND
35	CDC CK 2P	I	CalDricon CLK(+)
36	CDC CK 2N	I	CalDricon CLK(-)
37	GND	-	GND
38	CDC DT 3P	I	CalDricon DATA(+)
39	CDC DT 3N	I	CalDricon DATA(-)
40	GND	-	GND
41	CDC DT 2P	I	CalDricon DATA(+)
42	CDC DT 2N	I	CalDricon DATA(-)
43	GND	-	GND
44	CDC DT 1P	I	CalDricon DATA(+)
45	CDC DT 1N	I	CalDricon DATA(-)
46	GND	-	GND
47	CDC CK 1P	I	CalDricon CLK(+)

Source Driver Signal (CN2)
connector: 25P64B150-H9C (ZXEC)

No.	Symbol	I/O	Function
1	GND	-	GND
2	OPEN	I	OPEN
3	VGL	I	Gate Dr Low Voltage
4	OPEN	I	OPEN
5	VGH	I	Gate Dr High Voltage
6	OPEN	I	OPEN
7	GND	-	GND
8	VCC	I	Dr DVDD
9	VCC	I	Dr DVDD
10	GND	-	GND
11	GSP1	I/O	Gate control signal
12	GSP2	I/O	Gate control signal
13	GCK	I	Gate control signal
14	GOE	I	Gate control signal
15	GLBR	I	Gate control signal
16	GND	-	GND
17	CDC VCC	I	Source Dr Power voltage
18	CDC VCC	I	Source Dr Power voltage
19	CDC VCC	I	Source Dr Power voltage
20	GND	-	GND
21	CS12	I	CS power supply
22	CS11	I	CS power supply
23	CS10	I	CS power supply
24	CS9	I	CS power supply
25	CS8	I	CS power supply
26	CS7	I	CS power supply
27	GND	-	GND
28	VL255	I	Gamma reference voltage
29	VL247	I	Gamma reference voltage
30	VL191	I	Gamma reference voltage
31	VL127	I	Gamma reference voltage
32	VL63	I	Gamma reference voltage
33	VL31	I	Gamma reference voltage
34	VL0	I	Gamma reference voltage
35	HALFVDD	I	Dr AVDD
36	HALFVDD	I	Dr AVDD
37	VH0	I	Gamma reference voltage
38	VH31	I	Gamma reference voltage
39	VH63	I	Gamma reference voltage
40	VH127	I	Gamma reference voltage
41	VH191	I	Gamma reference voltage
42	VH247	I	Gamma reference voltage
43	VH255	I	Gamma reference voltage
44	VLS	I	Dr AVDD
45	VLS	I	Dr AVDD
46	VLS	I	Dr AVDD
47	VLS	I	Dr AVDD

Source Driver Signal (CN3)
connector: 25P64B150-H9C (ZXEC)

No.	Symbol	I/O	Function
1	GND	-	GND
2	OPEN	I	OPEN
3	VGL	I	Gate Dr Low Voltage
4	OPEN	I	OPEN
5	VGH	I	Gate Dr High Voltage
6	OPEN	I	OPEN
7	GND	-	GND
8	VCC	I	Dr DVDD
9	VCC	I	Dr DVDD
10	GND	-	GND
11	GSP1	I/O	Gate control signal
12	GSP2	I/O	Gate control signal
13	GCK	I	Gate control signal
14	GOE	I	Gate control signal
15	GLBR	I	Gate control signal
16	GND	-	GND
17	CDC VCC	I	Source Dr Power voltage
18	CDC VCC	I	Source Dr Power voltage
19	CDC VCC	I	Source Dr Power voltage
20	GND	-	GND
21	CS12	I	CS power supply
22	CS11	I	CS power supply
23	CS10	I	CS power supply
24	CS9	I	CS power supply
25	CS8	I	CS power supply
26	CS7	I	CS power supply
27	GND	-	GND
28	VL255	I	Gamma reference voltage
29	VL247	I	Gamma reference voltage
30	VL191	I	Gamma reference voltage
31	VL127	I	Gamma reference voltage
32	VL63	I	Gamma reference voltage
33	VL31	I	Gamma reference voltage
34	VL0	I	Gamma reference voltage
35	HALFVDD	I	Dr AVDD
36	HALFVDD	I	Dr AVDD
37	VH0	I	Gamma reference voltage
38	VH31	I	Gamma reference voltage
39	VH63	I	Gamma reference voltage
40	VH127	I	Gamma reference voltage
41	VH191	I	Gamma reference voltage
42	VH247	I	Gamma reference voltage
43	VH255	I	Gamma reference voltage
44	VLS	I	Dr AVDD
45	VLS	I	Dr AVDD
46	VLS	I	Dr AVDD
47	VLS	I	Dr AVDD

Source Driver Signal (CN4)
connector: 25P64B150-H9C (ZXEC)

No.	Symbol	I/O	Function
1	GND	-	GND
2	GND	-	GND
3	GND	-	GND
4	GND	-	GND
5	OPEN	I	OPEN
6	OPEN	I	OPEN
7	OPEN	I	OPEN
8	OPEN	I	OPEN
9	OPEN	I	OPEN
10	GND	-	GND
11	OPEN	I	OPEN
12	OPEN	I	OPEN
13	OPEN	I	OPEN
14	OPEN	I	OPEN
15	OPEN	I	OPEN
16	GND	-	GND
17	CDC CK 8P	I	CalDricon CLK(+)
18	CDC CK 8N	I	CalDricon CLK(-)
19	GND	-	GND
20	CDC DT 24P	I	CalDricon DATA(+)
21	CDC DT 24N	I	CalDricon DATA(-)
22	GND	-	GND
23	CDC DT 23P	I	CalDricon DATA(+)
24	CDC DT 23N	I	CalDricon DATA(-)
25	GND	-	GND
26	CDC DT 22P	I	CalDricon DATA(+)
27	CDC DT 22N	I	CalDricon DATA(-)
28	GND	-	GND
29	CDC CK 7P	I	CalDricon CLK(+)
30	CDC CK 7N	I	CalDricon CLK(-)
31	GND	-	GND
32	CDC DT 21P	I	CalDricon DATA(+)
33	CDC DT 21N	I	CalDricon DATA(-)
34	GND	-	GND
35	CDC DT 20P	I	CalDricon DATA(+)
36	CDC DT 20N	I	CalDricon DATA(-)
37	GND	-	GND
38	CDC DT 19P	I	CalDricon DATA(+)
39	CDC DT 19N	I	CalDricon DATA(-)
40	GND	-	GND
41	CDC DT 18P	I	CalDricon DATA(+)
42	CDC DT 18N	I	CalDricon DATA(-)
43	GND	-	GND
44	CDC DT 17P	I	CalDricon DATA(+)
45	CDC DT 17N	I	CalDricon DATA(-)
46	GND	-	GND
47	CDC DT 16P	I	CalDricon DATA(+)

48	CDC CK 1N	I	CalDricon CLK(-)
49	GND	-	GND
50	OPEN	I	OPEN
51	OPEN	I	OPEN
52	OPEN	I	OPEN
53	OPEN	I	OPEN
54	OPEN	I	OPEN
55	GND	-	GND
56	OPEN	I	OPEN
57	OPEN	I	OPEN
58	OPEN	I	OPEN
59	OPEN	I	OPEN
60	OPEN	I	OPEN
61	GND	-	GND
62	GND	-	GND
63	GND	-	GND
64	GND	-	GND

48	OPEN	I	OPEN
49	GND	-	GND
50	CS6	I	CS power supply
51	CS5	I	CS power supply
52	CS4	I	CS power supply
53	CS3	I	CS power supply
54	CS2	I	CS power supply
55	CS1	I	CS power supply
56	GND	-	GND
57	VCOM	I	Common Voltage
58	VCOM	I	Common Voltage
59	GND	-	GND
60	GND	-	GND
61	CALLINK OUT2	O	CalDricon control signal
62	GND	-	GND
63	CALLINK OUT1	O	CalDricon control signal
64	GND	-	GND

48	OPEN	I	OPEN
49	GND	-	GND
50	CS6	I	CS power supply
51	CS5	I	CS power supply
52	CS4	I	CS power supply
53	CS3	I	CS power supply
54	CS2	I	CS power supply
55	CS1	I	CS power supply
56	GND	-	GND
57	VCOM	I	Common Voltage
58	VCOM	I	Common Voltage
59	GND	-	GND
60	GND	-	GND
61	CALLINK OUT4	O	CalDricon control signal
62	GND	-	GND
63	CALLINK OUT3	O	CalDricon control signal
64	GND	-	GND

48	CDC DT 16N	I	CalDricon DATA(-)
49	GND	-	GND
50	CDC CK 6P	I	CalDricon CLK(+)
51	CDC CK 6N	I	CalDricon CLK(-)
52	GND	-	GND
53	CDC DT 15P	I	CalDricon DATA(+)
54	CDC DT 15N	I	CalDricon DATA(-)
55	GND	-	GND
56	CDC DT 14P	I	CalDricon DATA(+)
57	CDC DT 14N	I	CalDricon DATA(-)
58	GND	-	GND
59	CDC DT 13P	I	CalDricon DATA(+)
60	CDC DT 13N	I	CalDricon DATA(-)
61	GND	-	GND
62	CDC CK 5P	I	CalDricon CLK(+)
63	CDC CK 5N	I	CalDricon CLK(-)
64	GND	-	GND

5.2 LVDS Interface

JEIDA Format : SELLVDS = L

VESA Format : SELLVDS = H or Open

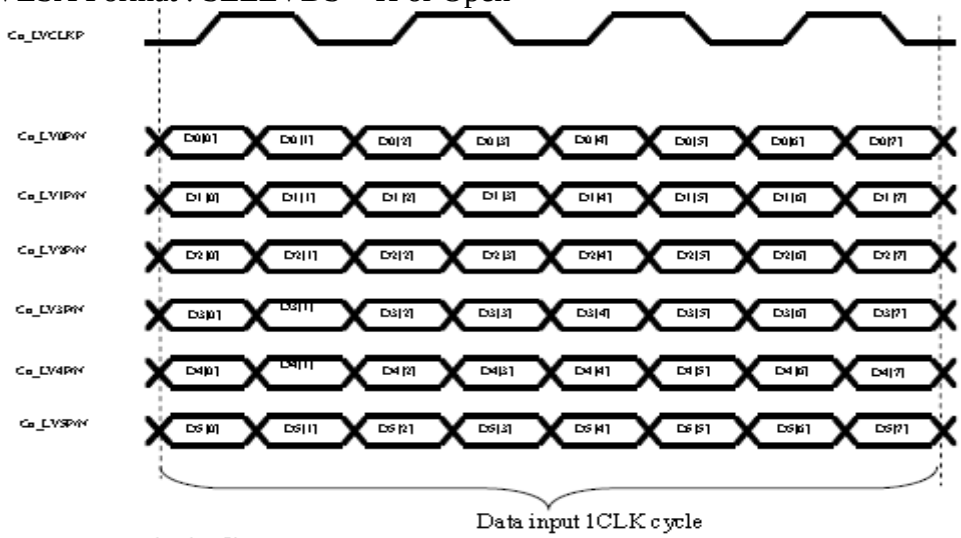


Fig 2 mini-LVDS Mapping

5.3 Colors Data Input Assignment

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

	Colors & Gray scale	Data signal																									
		Gray Scale	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	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
	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
	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
	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
	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
	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	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧ Darker	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter ⇩	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	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	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧ Darker	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter ⇩	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
		GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	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	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧ Darker	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	⇩	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇩	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter ⇩	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
		GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0: Low level voltage, 1 : High level voltage.

Each basic color can be displayed in 256 gray scales from 8 bits data signals. According to the combination of total 24 bits data signals, 16.7 million-color display can be achieved on the screen.

6. INTERFACE TIMNG

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	Data Clock	1/Tc	70	76.95	80	MHz	(1)
VbyOne Receiver	Data skew between each area (A/B/C/D)	Tblock	-0.06	–	0.06	H	(2)
	Intra-Pair skew		-0.3	–	0.3	UI	(3)
	Inter-pair skew		-5	–	5	UI	(4)
	Spread spectrum modulation range	F_{clkin_mod}	1/Tc-0.5%	–	1/Tc+0.5%	MHz	(5)
	Spread spectrum modulation frequency	F_{SSM}	–	–	30	KHz	

6.2 Timing spec for Frame Rate = 100Hz

Frame rate	2D mode		Frs	94	100	106	Hz	
	3D mode		Frs	188	200	212	Hz	(6)
Vertical Active Display Term (4 Lan,960X2160 Active Area)	2D Mode	Total	Tv	2200	2250	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160	2160	2160	Th	–
		Blank	Tvb	40	90	630	Th	–
	3D Mode	Total	Tv	(1116)	1125	(1396)	T	(6),(7)
		Display	Tvd	1080	1080	1080	Th	
		Blank	Tvb	(36)	45	(316)	Th	
Horizontal Active Display Term (4 Lan,960X2160 Active Area)	2D Mode	Total	Th	270	285	300	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	–
		Blank	Thb	30	45	60	Tc	–
	3D Mode	Total	Th	(270)	285	(300)	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	–
		Blank	Thb	**(30)**	45	**(60)**	Tc	–

6.3 Timing spec for Frame Rate = 120Hz

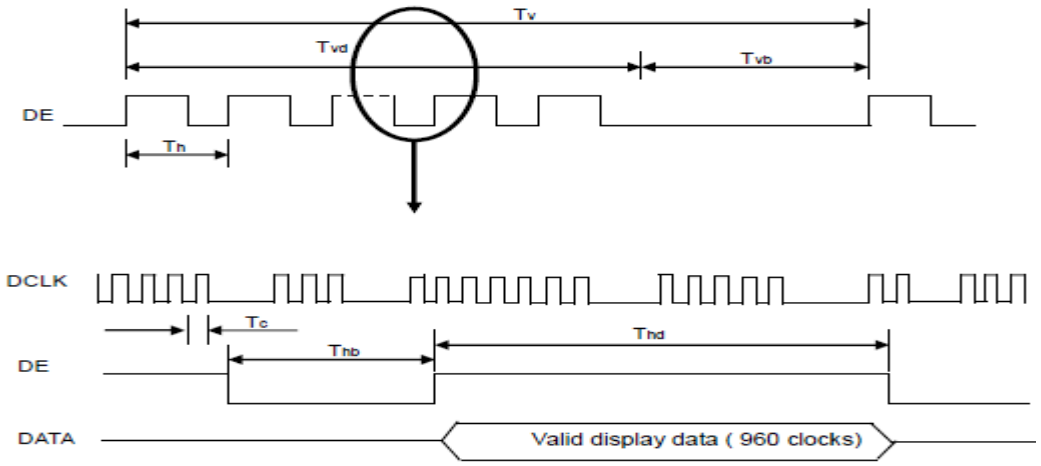
Frame rate	2D mode		Frs	114	120	126	Hz	
	3D mode		Frs	(228)	240	(252)	Hz	(6)
Vertical Active Display Term (4 Lan,960X2160 Active Area)	2D Mode	Total	Tv	2200	2250	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160	2160	2160	Th	–
		Blank	Tvb	40	90	630	Th	–
	3D Mode	Total	Tv	(1116)	1125	(1200)	Th	(6),(7)
		Display	Tvd	1080	1080	1080	Th	
		Blank	Tvb	(36)	45	(120)	Th	
Horizontal Active Display Term (4 Lan,960X2160 Active Area)	2D Mode	Total	Th	270	285	300	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	–
		Blank	Thb	30	45	60	Tc	–
	3D Mode	Total	Th	(270)	285	(300)	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	–
		Blank	Thb	(30)	45	(60)	Tc	–

(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.

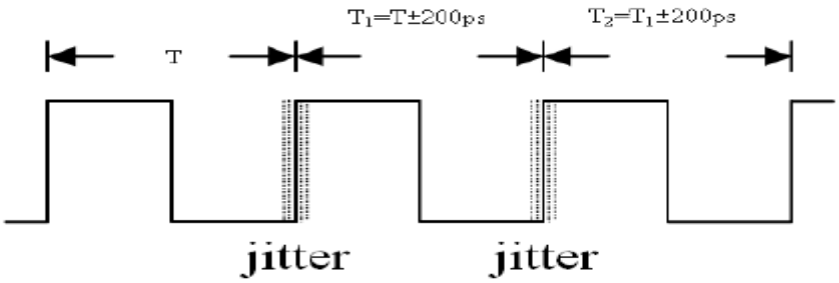
Note (2) Please make sure the range of pixel clock has follow the below equation:

Fclkin(max) ≧ Fr6 ╳ Tv ╳ Th Fr5 ╳ Tv ╳ Th ≧ Fclkin(min)

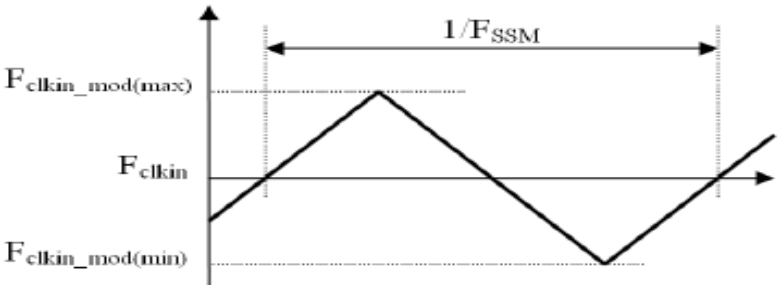
INPUT SIGNAL TIMING DIAGRAM



Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T1 – TI

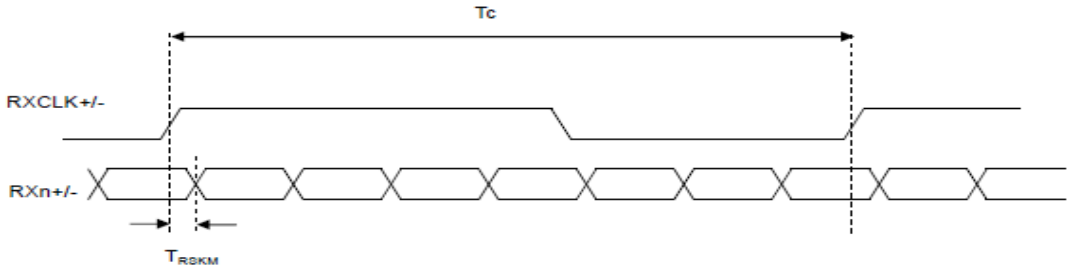


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



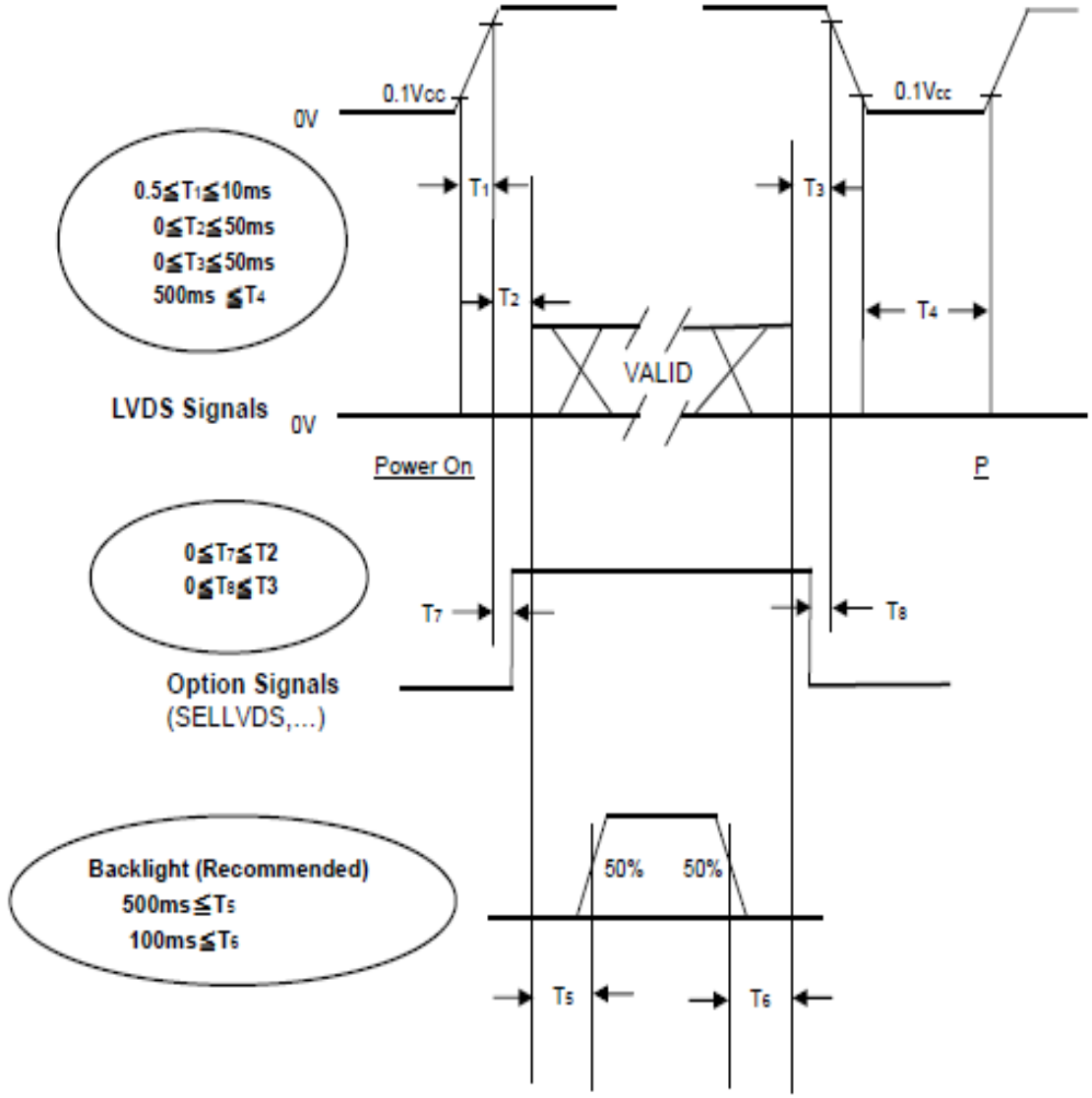
Note (5) LVDS receiver skew margin is defined and shown as below.

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.



Power ON/OFF Sequence

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.

7 Optical Characteristics

7.1 Test Condition

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ±2	℃
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	3000	4000	—	—	—
Response Time		Gray to gray average		—	6	—	ms	Note 3
Transmittance					4.3		%	
Brightness uniformity		BU		—	1.33	1.42	—	Note 2
Center Luminance of White		Lc		300	350	—	cd/m2	—
The color chromaticity	Red	Rx	θx=0,θy=0, viewing normal angle	-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		88	—	Deg	Note 1、2
		θx-			88	—		
	Vertical	θy+			88	—		
		θy-			88	—		

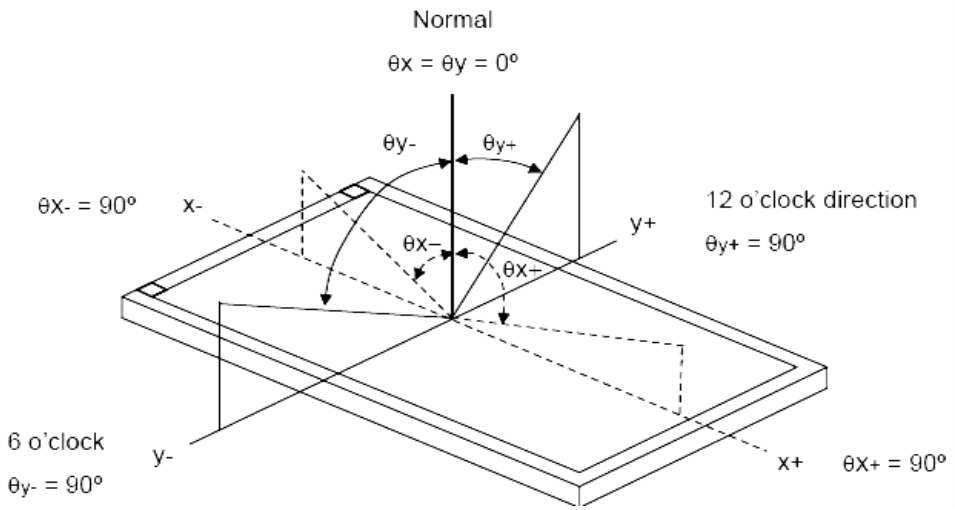
Note 0: Light source is the standard light source ”C” which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following:

1. Measure Module’s and BLU’s spectrum at center point. 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.

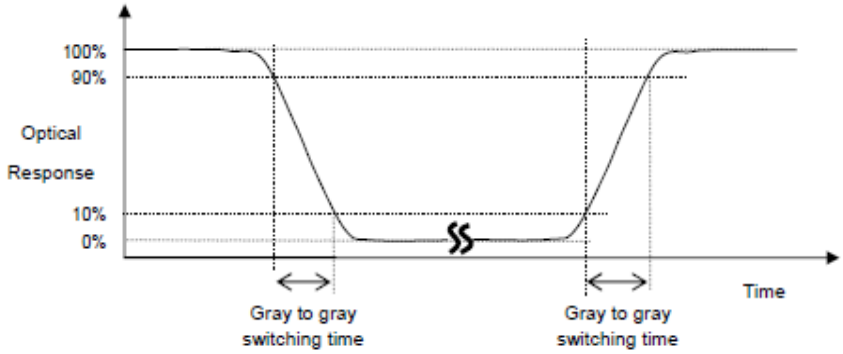
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

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

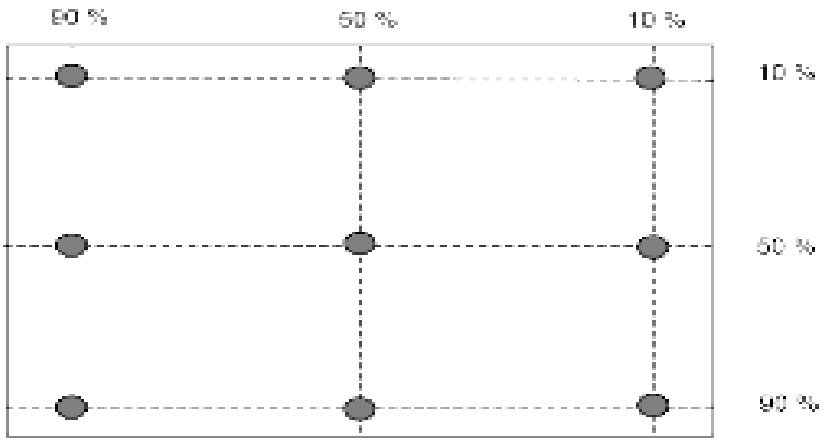
Note 4: Definition of Gray-to-Gray Switching Time:



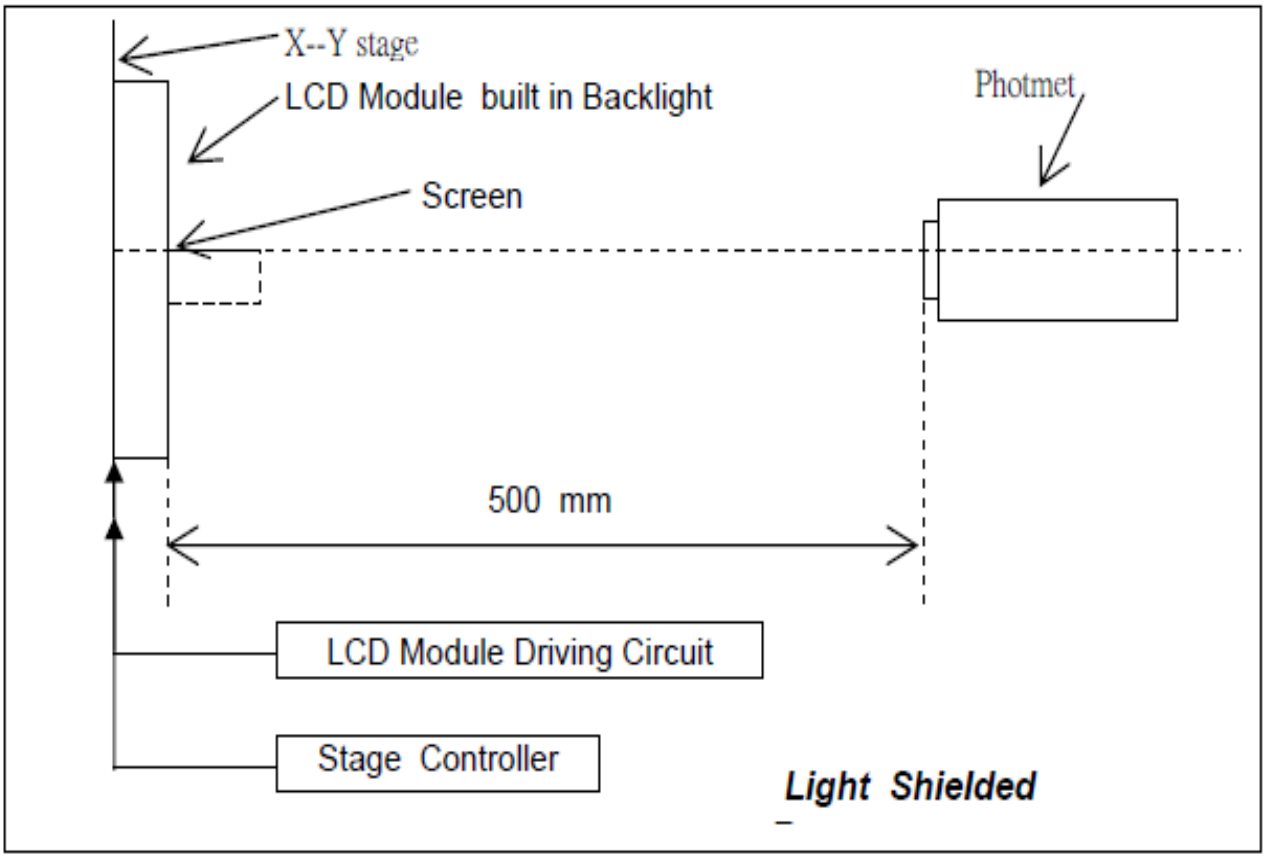
The driving signal means the signal of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023.

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



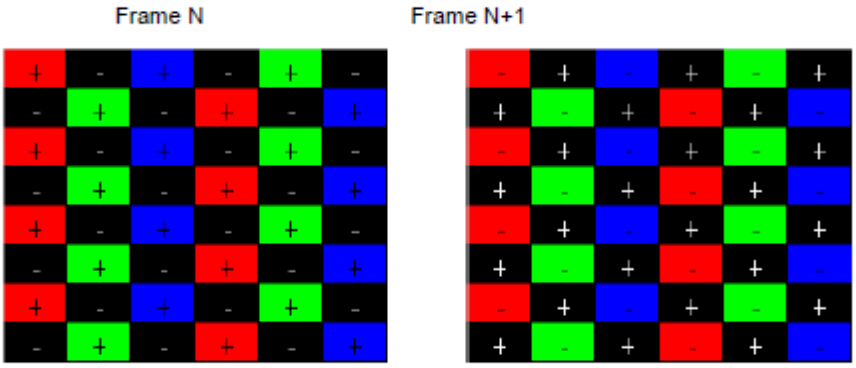
Note(1): The measurement point is the center of the active area except for the measurement of Luminance Uniformity

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)

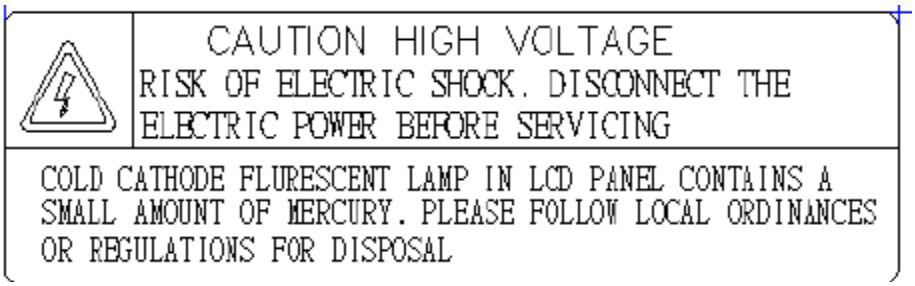
Programmable memory IC is used for Digital V-com (Gamma) adjustment in this model. CMI provide Auto V-com (Auto Gamma) tools to adjust Digital V-com (Gamma). The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com (Auto Gamma) adjustment OI.

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

8. Labels

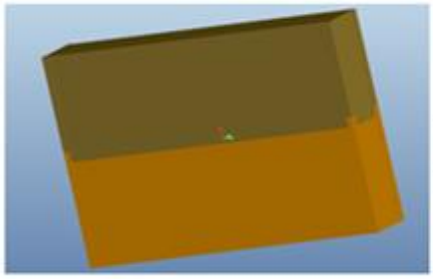
8.1 Panel Label:

8.2 Caution Label:

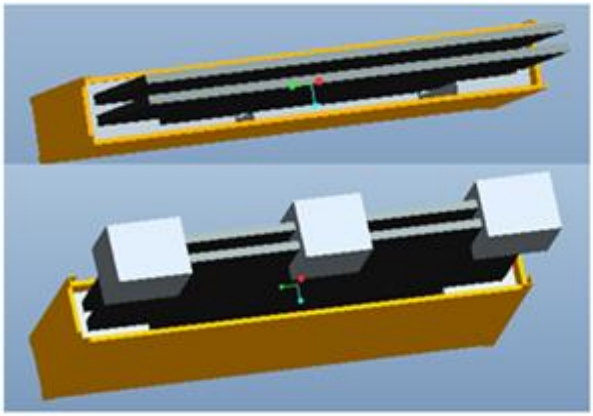


9. Packaging

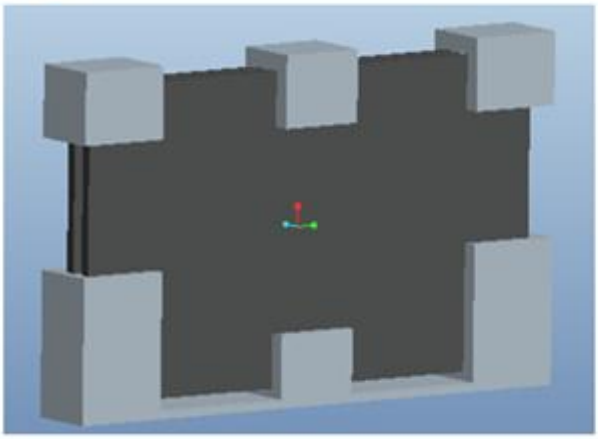
9.1 Carton(internal package)



使用蜂窝纸箱上下盖



产品四周用 20kgEPE 保护



底部增高 500mmEPE 加强防护

9.2 Pakaging 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 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 storaged conditions.
10 When ambient temperature is lower than 10 ℃ 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