

	PRODUCTION SPECIFICATION OF TFT LCD MODULE	Model No: M270C1B01 BAN
		OC PN: SG2701B01-A

**PRODUCTION SPECIFICATION
OF TFT LCD MODULE**

Model No. : M270C1B01 BAN

OC PN: SG2701B01-A

CUSTOMER	
CONFIRMED BY	
APPROVED BY	

DILIANG ELECTRONICS	
PREPARED BY	
CONFIRMED BY	



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Date	Rev.	Page	Old Description	New Description	Remark
2023.07.10	1.0	All	The specification was first issued		



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1. GENERAL DESCRIPTION

1.1 OVERVIEW

The specification is applied to 27" frame less module (M270C1B01 BAN) used CSOT SG2701B01-A opencell. This opencellSG2701B01-A is a diagonal 27"color active matrix LCD open cell with 2Channel LVDS interface. This open cell is a transmissive type display operating in the normally black mode. It supports 1920 x 1080 FHD resolution and can display up to 16.7M colors (8bit). Each pixel is divided into Red, Green and Blue sub-pixels which are arranged in vertical stripe. There is no backlight built-in.

This open cell dedicates for LCD Monitor products and provides excellent performance which includes high transmittance, ultra wide viewing angle and high color depth. CSOT open cell comply with RoHS for identification.

1.2 General Specifications

Item	Specification	Unit	Note
Screen Size	27	INCH	
Module Size	630.00(H) x 368.20(V)*13.00(D)	mm	
Active Area	597.888 (H) x 336.312 (V)	mm	
Weight	2650	kg	Max.
Driving Scheme	a-Si TFT Active Matrix	-	
Number of Pixels	1920 * 1080	pixel	
Pixel Pitch (Sub Pixel)	0.10384*0.3114	mm	
Pixel Arrangement	RGB Vertical Stripe	-	
Display Colors	16.7 M	color	6Bit+FRC
Display Mode	Transmissive Mode, Normally Black		
Module Brightness	250	Cd/m ²	
Contrast Ratio	4000:1(Typ.)		
View Angle (CR 10)	+89/-89 (H), +89/-89 (V) (Typ.)		
Surface Treatment	Anti-glare, Haze 2.5%, Hard Coating (3H)		
Interface	LVDS		
Display Orientation	DE (Data Enable)		(1)

1.3 Mechanical Specification

Item		Min	Typ	Max	Unit	Note
Weight		-200	2650	+200	g	-
Module Size	Horizontal(H)	(TYP)-0.5	630.00	(TYP)+0.5	mm	1
	Vertical (V)		368.20		mm	
	Depth(D)		13.00		mm	

2. Absolute Maximum Ratings



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2.1 Absolute Maximum Ratings

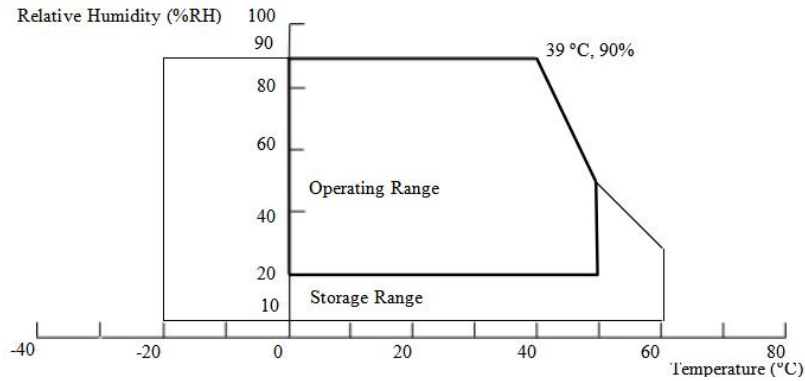
The followings are maximum values which, if exceeded, may cause damage to the unit.

Item	Symbol	Value		Unit
		Min.	Max.	
Power Supply Voltage	VCC	-0.3	13.8	V
Input Signal Voltage	V _{IN}	-0.3	3.6	V
Operating Temperature	T _{OP}	0	+50	°C
Storage Temperature	T _{ST}	-20	+60	°C

2.2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	Note 3
Glass surface temperature (operation)	TGS	0	+65	[°C]	Note 3, Note 4
Operation Humidity	HOP	5	90	[%RH]	Note 3
Storage Temperature	TST	-20	+60	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: (1) Temperature and relative humidity range are shown as below



- (a) 90%RH maximum (TA < 39 °C).
- (b) Wet-bulb temperature should be 39 °C maximum (TA > 39 °C).
- (c) No condensation

(2) The storage temperature is between - 20 °C to 60 °C, and the operating ambient temperature is between 0 °C to 50 °C.

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

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(3) The rating of environment is based on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

2.3 Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
LED operation Voltage	V_{led}	50.4	-	59.4	V_{led}	
LED operation Current	I_{led}	-	360	-	mA	- (1)
BackLight Power	P_{BL}	18.14	-	21.38	W	
Lift time	Lt	30000	40000	-	Hrs	

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.

2.4 Package Storage

When storing module as spares for a long time, please follow the precaution instructions:

- (1) Do not store the open cell in high temperature and high humidity for a long time. It is highly recommended to store the module with temperature from 20°C to 30°C in normal humidity (50 ± 10%RH) with shipping package.
- (2) The module should be keep within six-month shelf life.

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3. ELECTRICAL SPECIFICATIONS

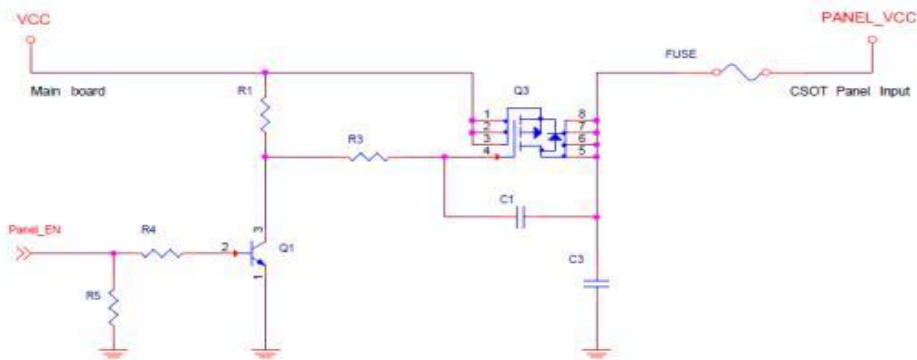
3.1 Open Cell Power Consumption (TA = 25 ± 2 °C)

Parameter	Symbol	Value			Unit	Note	
		Min.	Typ.	Max.			
Power Supply Voltage	V _{CC}	10.8	12.0	13.2	Vdc	-	
Permissible Input Ripple Voltage	V _{RIPPLE}	-	-	400	mVp-p	(1)	
Rush Current	I _{RUSH}	-	-	3	A	(2)	
Power Supply Current	White Pattern	I _{CC}	-	290	348	A	60Hz
	Horizontal Stripe		-	380	456	A	
	Black Pattern		-	230	276	A	
	Mosaic Pattern(8*8)		-	260	312	A	
	White Pattern		-	270	324	A	100Hz
	Horizontal Stripe		-	330	396	A	
	Black Pattern		-	220	264	A	
	Mosaic Pattern(8*8)		-	240	288	A	
Power Consumption	Horizontal Stripe	P _{CC}	-	4.55	5.46	Watt	60Hz
			-	4.03	4.836	Watt	100Hz

Note:

1)Ripple Voltage should be measured under the condition of VCC =12.0V,TA=25±2 °C,FR =Max.(Frame Rate)condition and at that time, we recommend the bandwidth configuration of oscilloscope is to be under 20MHz.Refer to page 9 for the white pattern.

2)Inrush Current measurement condition: VCC rising time = 470 μs.



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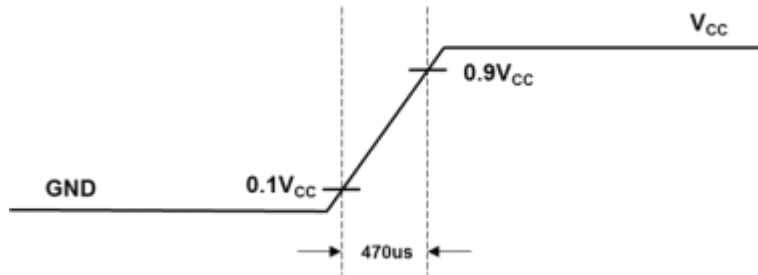
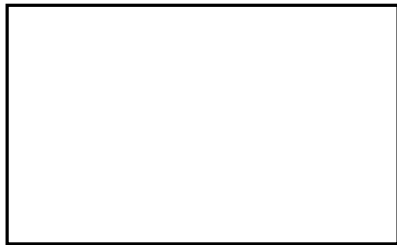
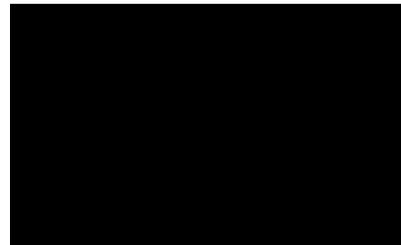


Fig. 3.1 VCC rising time condition

(3) Measurement condition: VCC = 12V(typ), Ta = 25 ± 2 °C, the test patterns are shown as below. a. White Pattern b. Black Pattern



C. Horizontal Stripe Pattern



Mosaic Pattern(8*8)

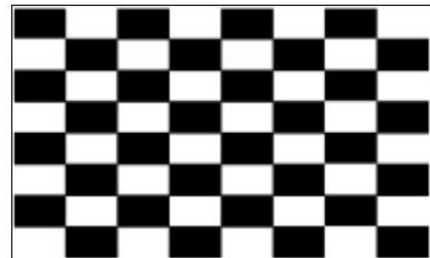
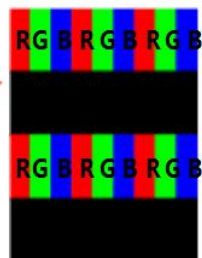
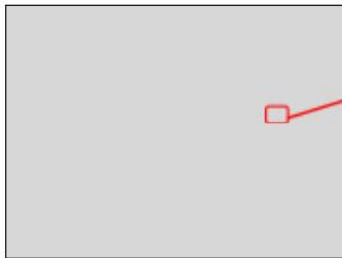


Fig. 3.2 Test patterns

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3.3 Temperature Specifications

Parameter	Symbol	Specification			Unit	Recommended test pattern	Note
		Min.	Typ.	Max.			
Surface Temperature	T _{CON}	-	-	100	°C	Horizontal Pattern	(1)
	T _{PMIC}			100		Horizontal Pattern	(1)
	T _{Driver}	-	-	115		Horizontal Pattern	(1)

Note:

(1) Any point on the IC surface must be less than Max. specification, If the surface temperature is out of the specification, thermal solutions should be applied to avoid be damaged. The IC surface temperature is measured at room temperature of 25°C.

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3.4. Input Terminal Pin Assignment

3.4.1 CN1: 187114-30091 (P2) or equivalent (see Note(1))

	Symbol	Function
1	RX1AN	Negative LVDS differential data output
2	RX1AP	Positive LVDS differential data output
3	RX1BN	Negative LVDS differential data output
4	RX1BP	Positive LVDS differential data output
5	RX1CN	Negative LVDS differential data output
6	RX1CP	Positive LVDS differential data output
7	GND	Ground
8	RX1CLKN	Negative Sampling Clock
9	RX1CLKP	Positive Sampling Clock
10	RX1DN	Negative LVDS differential data output
11	RX1DP	Positive LVDS differential data output
12	RX2AN	Negative LVDS differential data output
13	RX2AP	Positive LVDS differential data output
14	GND	Ground
15	RX2BN	Negative LVDS differential data output
16	RX2BP	Positive LVDS differential data output
17	GND	Ground
18	RX2CN	Negative LVDS differential data output
19	RX2CP	Positive LVDS differential data output
20	RX2CLKN	Negative Sampling Clock
21	RX2CLKP	Positive Sampling Clock
22	RX2DN	Negative LVDS differential data output
23	RX2DP	Positive LVDS differential data output
24	GND	Ground

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25	SDA_I	* Reserved for LCD manufacturer's use (SDA)
26	SCL_I	* Reserved for LCD manufacturer's use (SCL)
27	B_INT	* Reserved for LCD manufacturer's use (WPN)
28	PVDD	Input Power Supply : +12V
29	PVDD	
30	PVDD	

Note(1): The direction of pin assignment is shown as below:

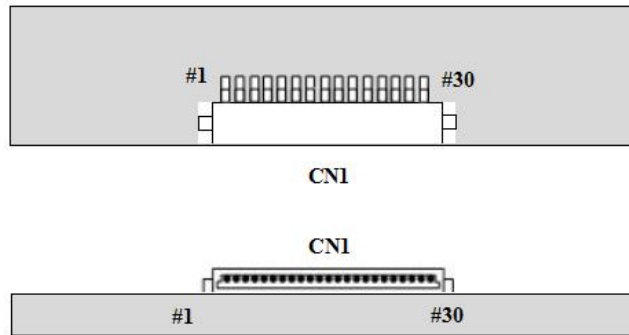


Fig. 4.1 Connector direction sketch map

3.4.2 Block Diagram of Interface

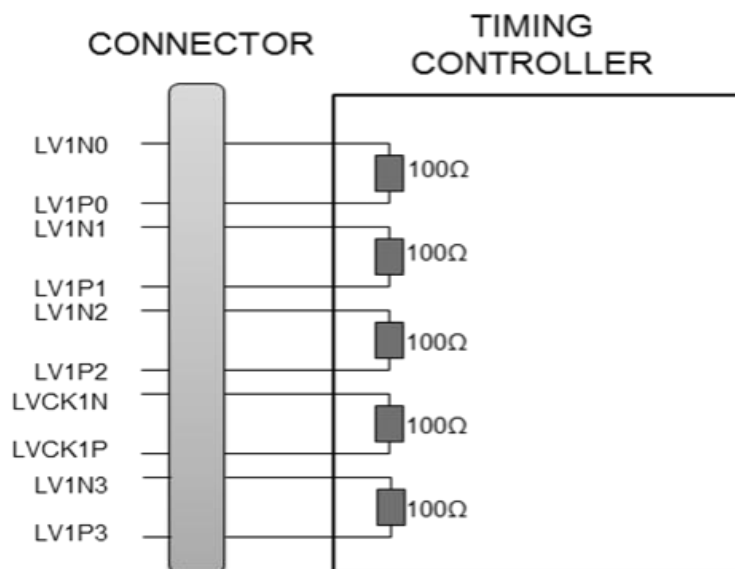


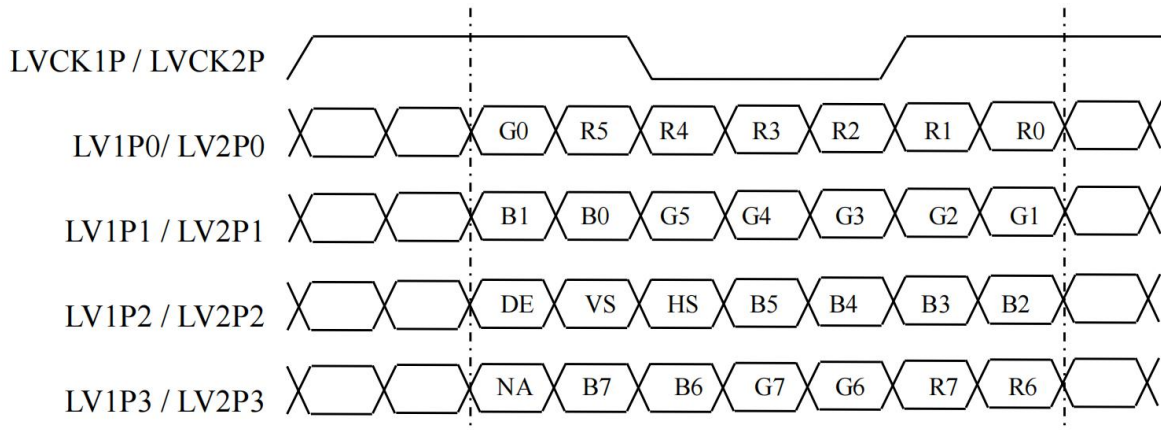
Fig. 4.2 Block diagram of interface

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Attention:

- (1) This open cell uses a 100 ohms (Ω) resistor between positive and negative lines of each receiver input.
- (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line respectively

3.4.3 LVDS Interface



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3.5 Backlight Electrical / Optical Characteristics

3.5.1 backlight connector

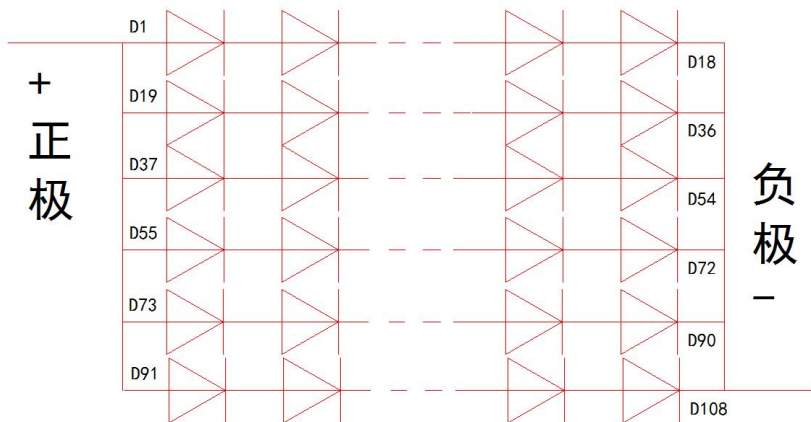
"CN2 : PH2.0-2P

Pin#	Signal Name
1	VDD-
2	VDD+

3.5.2 LED Bar

Parameter	Symbols	Min	Typ	Max	Unit
Forward Voltage (one circuit)	VF	2.8	-	3.6	MHz
Reverse Current (one circuit)	IR	-	-	10	μA
Forward Current	IF	-	90	120	Ma
Chromaticity Coordinates	X	0.2385	0.2585	0.2785	
	Y	0.2052	0.2252	0.2452	
Lumen	ℓ	34	36	38	LM
Viewing Angle	2θ1/2	-	120	-	Deg.
Number Of LED	Pcs	-	108	-	Pcs
Operation Voltage(LB)	VLB	50.4	-	59.4	V
Operation Current(LB)	ILB	-	360	-	mA
Power Consumption	PLB	18.1	-	21.3	W

Array Mode Of LED Bar



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3.6 Timing spec

Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Frequency	D _{CLK}	60	74.25	95.15	MHz	(1)	
Frame Rate	F _R	48	60	75	Hz		
Vertical Term	Total	T _V	1100	1125	1802	Line	T _V = T _{VD} + T _{VB} (2)
	Active Display	T _{VD}	1080			Line	
	Blank	T _{VB}	20	45	722	Line	
Horizontal Term	Total	T _H	1046	1100	1174	Pixel	T _H = T _{HD} + T _{HB}
	Active Display	T _{HD}	960			Pixel	
	Blank	T _{HB}	86	140	214	Pixel	
LVDS Receiver Clock	Input cycle to cycle jitter	Trcl	–	–	200	ps	(3)
	Spread spectrum modulation range	F _{clk} in _{mod}	F _{clk} in _{-2%}	–	F _{clk} in _{+2%}	MHz	(4)
	Spread spectrum modulation frequency	FSSM	10		200	KHz	
LVDS Receiver Data	Receiver Skew Margin	TRSM	-380	–	380	ps	(5)

Note:

(1) The TFT LCD open cell is operated in DE only mode, H sync and V sync input signal have no effect on normal operation.

(2) Dclk = TH × TV × FR, TH, TV and FR should operate within the range between Pixel clock frequency Min. and Pixel clock frequency Max..

Attention:

The module is operated in DE only mode, H sync and V sync input signal have no effect on normal operation.



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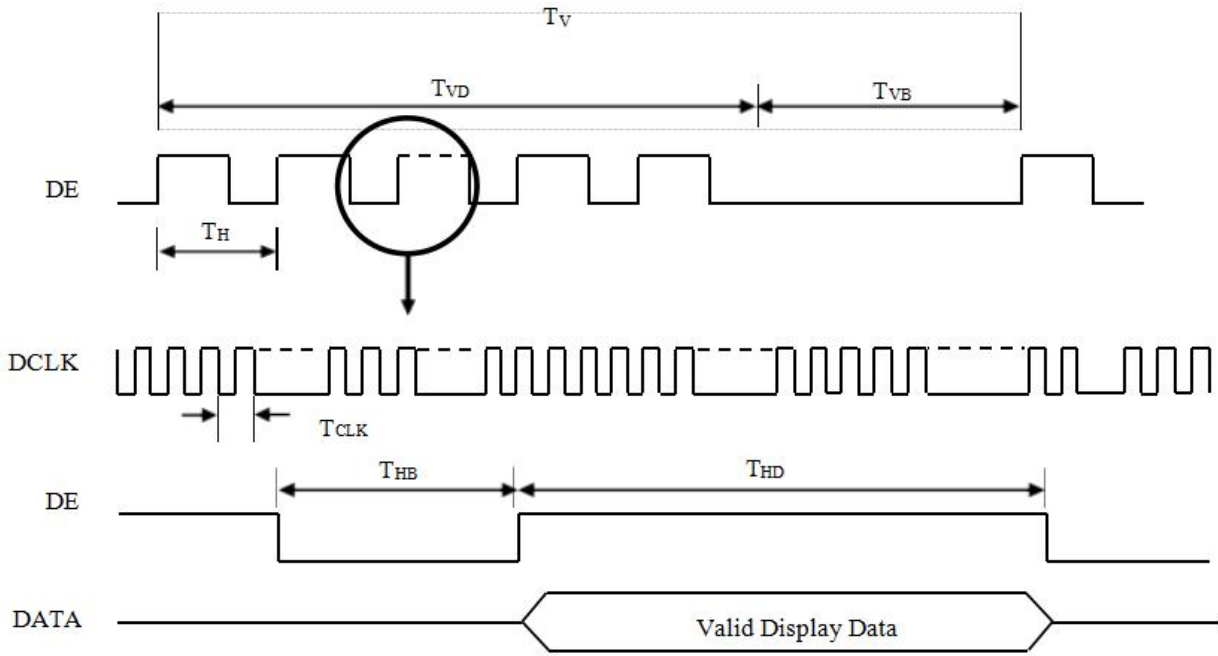


Fig. 3.6.1 Interface signal timing diagram

(3) The input clock cycle-to-cycle is defined as below figures.

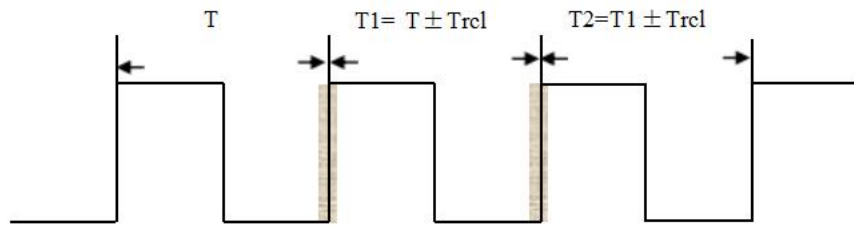


Fig. 3.6.2 Jitter

(4) The SSM (Spread Spectrum Modulation) is defined as the following figure. The LVDS SSM's suggestion is disabled by default; SOC board should test all validation if SOC board enables the LVDS SSM.

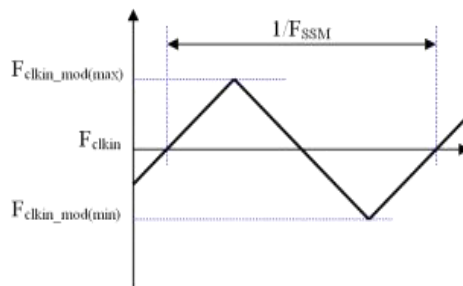


Fig. 3.6.3 SSM

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(5) The LVDS timing diagram and setup/hold time is defined in the following figure.

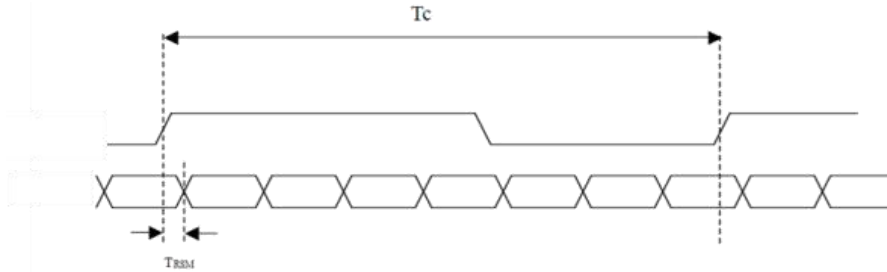


Fig.3.6.4 LVDS receiver interface timing diagram

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3.7 Power On/Off Sequence

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

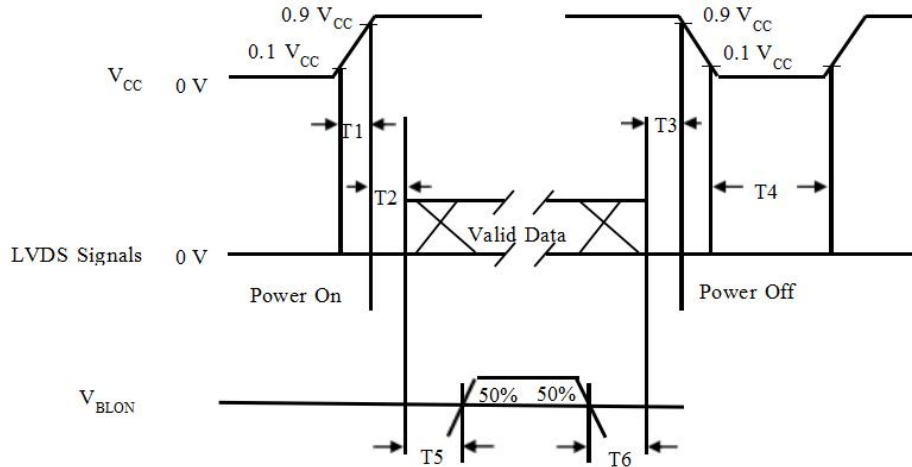


Fig. 3.7.1 Power on/off signal sequence

Parameter	Values			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	20	-	-	ms
T3	100	-	-	ms
T4	1000	-	-	ms
T5	500	-	-	ms
T6	100	-	-	ms

Attention:

- (1) The supplied voltage of the external system for the open cell input should follow the definition of VCC.
- (2) 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.
- (3) In case that VCC is in off level, keep the level of input signals on the low or high impedance. If T2 < 0, that may cause electrical overstress.
- (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.

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4 Optical Characteristics

4.1 Test Condition

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ± 2	°C
Ambient Humidity	Ha	50 ± 10	%RH
Supply Voltage	Vcc	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Input Voltage	V _{LED}	52	V
LED Input Current	I _{LED}	360	mA
Power Consumption	Pw	18.7	W

4.2 Optical Characteristics

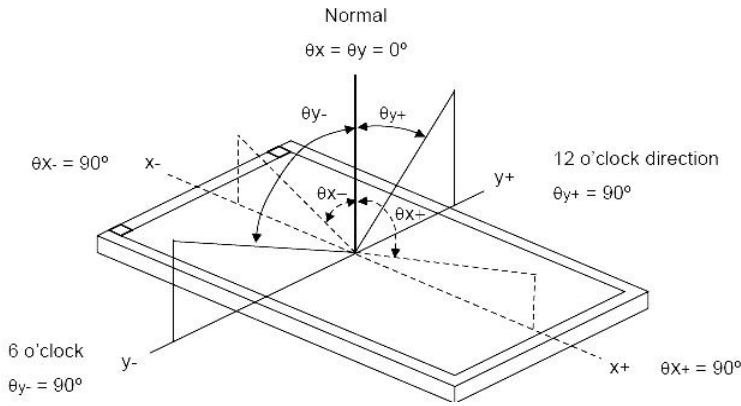
The relative measurement methods of optical characteristics are shown as below.

The following items should be measured under the test conditions described in 4.1

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR		3000	4000	—	—	—	
Response Time(OD ON)	TL	FR=75Hz	—	6.5	12	ms	Note 3	
Response Time(OD OFF)	TL	FR=75Hz	—	14	20	ms		
Brightness uniformity	BU	θx=0,θy=0 , viewing normal angle	70	75	—	—	Note 2	
Center Luminance of White	Lc		220	250	—	cd/m2	—	
The color chromatic	Red		Rx	Typ. -0.03	0.650	Typ. +0.03	—	—
			Ry		0.335		—	—
	Green		Gx		0.301		—	—
			Gy		0.612		—	—
	Blue		Bx		0.150		—	—
			By		0.059		—	—
	White		Wx		0.313		—	—
			Wy		0.329		—	—
Viewing Angle	Horizontal	θx+	—	89	—	Deg	Note 1	
		θx-	—	89	—			
	Vertical	θy+	—	89	—			
		θy-	—	89	—			

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Note 1: The definition of viewing angle



Note 2: Definition of luminance , CR measured positions and brightness uniformity

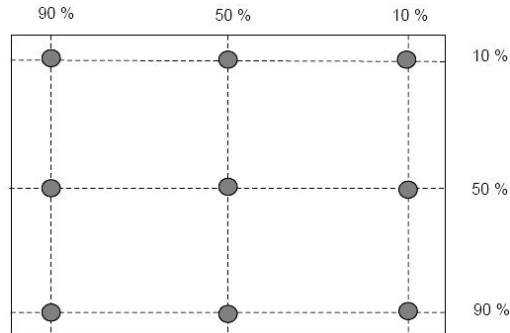
(a) Measure White luminance on the below 9 points and take the average value .

(b) CR : measures the same 9 points and take the average value .The Definition of Contrast Ratio is as follows :

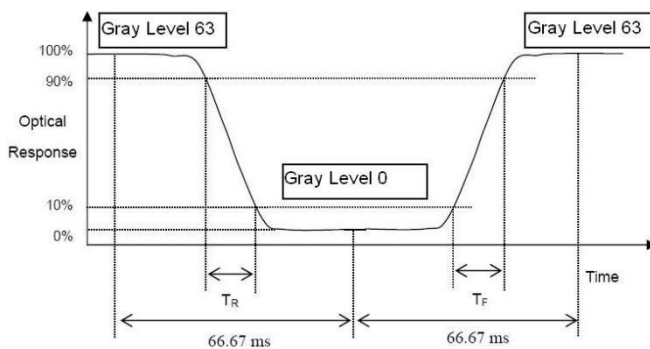
$$CR = \text{ON(white L63)Luminance} / \text{OFF (Black L0)Luminance}$$

(c) The definition of White Vibration

$$\frac{\text{The minimum brightness of 9 dot}}{\text{The maximum brightness of 9 dot}} \times 100\%$$

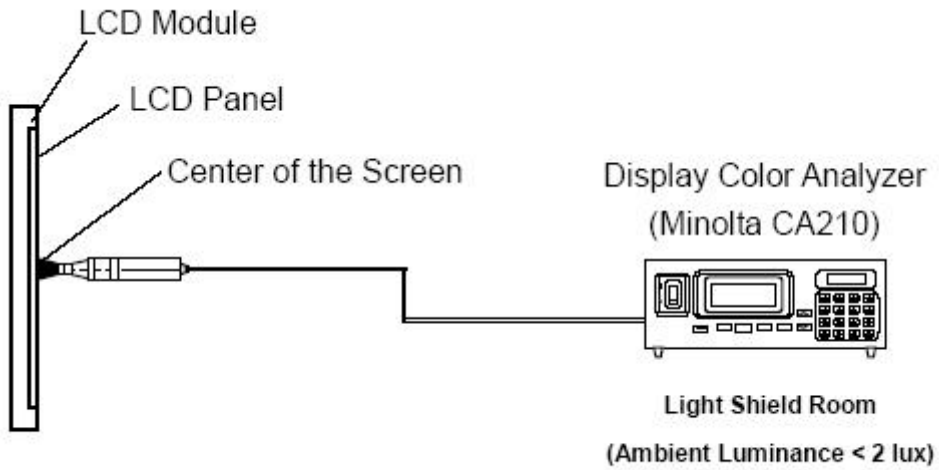


Note 3: Definition of Response Time (TR, TF):



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Note 4: The measure method



- (a) : The measurement point is the center of the active area except for the measurement of Luminance Uniformity
- (b) : Photometer :CA-210

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5.0 Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C , 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50°C , 50%RH, 300hours	
Low Temperature Operation (LTO)	Ta= 0°C , 300hours	
High Temperature Storage (HTS)	Ta= 60°C , 300hours	
Low Temperature Storage (LTS)	Ta= -20°C , 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction:±X,±Y,±Z(one time for each Axis)	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330) 1sec, 8 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330) 1sec 8 points, 25 times/ point.	

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: EN61000-4-2, ESD class B: Certain performance degradation allowed

No data lost

Self-recoverable

No hardware failures.

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6.0 Shipping Label

6.1 Panel Label



6.2 Carton Label



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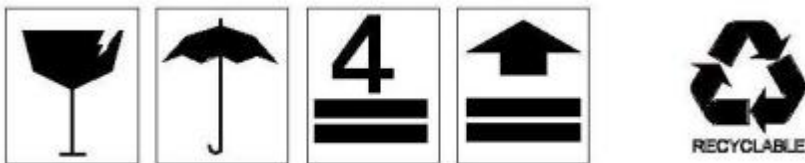
7. Packaging

7.1 Carton(internal package)

- (1)Packaging Form
- (2) Packaging Method

Note 1) Acceptable number of piling : 8 sets

7.2 Packing Mark



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8. PRECAUTION

8.1 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 LED panel and Backlight will be damaged.
- 4 Always follow the correct power sequence when LED 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.
Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very
- 7 soft and easily scratched.
- 8 It is dangerous that moisture come into or contacted the LED module, because moisture may damage LED module when it is operating.
- 9 High temperature or humidity may reduce the performance of module. Please store LED module within the specified storage conditions.
- 10 When ambient temperature is lower than 10 °C may reduce the display quality. For example, the response time will become slowly.

8.2 SAFETY PRECAUTIONS

- 1 It is dangerous that moisture come into or contacted the LED module, because the moisture may damage LED module when it is operating.
- 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 module's end of life, it is not harmful in case of normal operation and storage.

	PRODUCTION SPECIFICATION OF TFT LCD MODULE	Model No: M270C1B01 BAN
		OC PN: SG2701B01-A

9. Outline dimensions

