Product Specifications

Customer	
Description	12.1" TFT LCD Module
Model Name	EKL121AUS001L
Date	2009/08/10
Revision	01

Customer Approval	
Date	

Engineering			
Check	Date	Prepared	Date

Version	Revise Date	Page	Content	Modified by
V1.0	2009.11.17	-	First Issued.	

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1. GENERAL DESCRIPTION

1.1 DESCRIPTION

The specifications is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs and a backlight unit. The following table described the features EKL121AUS001L

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	12.1”	inch
2	Number of Pixels	1024 × RGB × 768	pixels
3	Active Area	245.76(H) × 184.32(V)	mm
4	Piexl Pitch	0.240(W) × 0.240(H)	mm
5	Outline Dimension	263(W) × 201.3(H) ×7.2(T)	mm
6	Number of Colors	262K Color	-
7	Display Mode	TN / Normally White / Transmissive	-
8	Display Format	RGB Stripe type	-
9	Surface Treatment	Anti-Glare	-
10	View direction	6 o’clock	
11	Interface	LVDS	-
12	Backlight	White LED	-
13	Operation Temperature	-20~60	℃
14	Storage Temperature	-30~70	℃
15	Weight	-	g

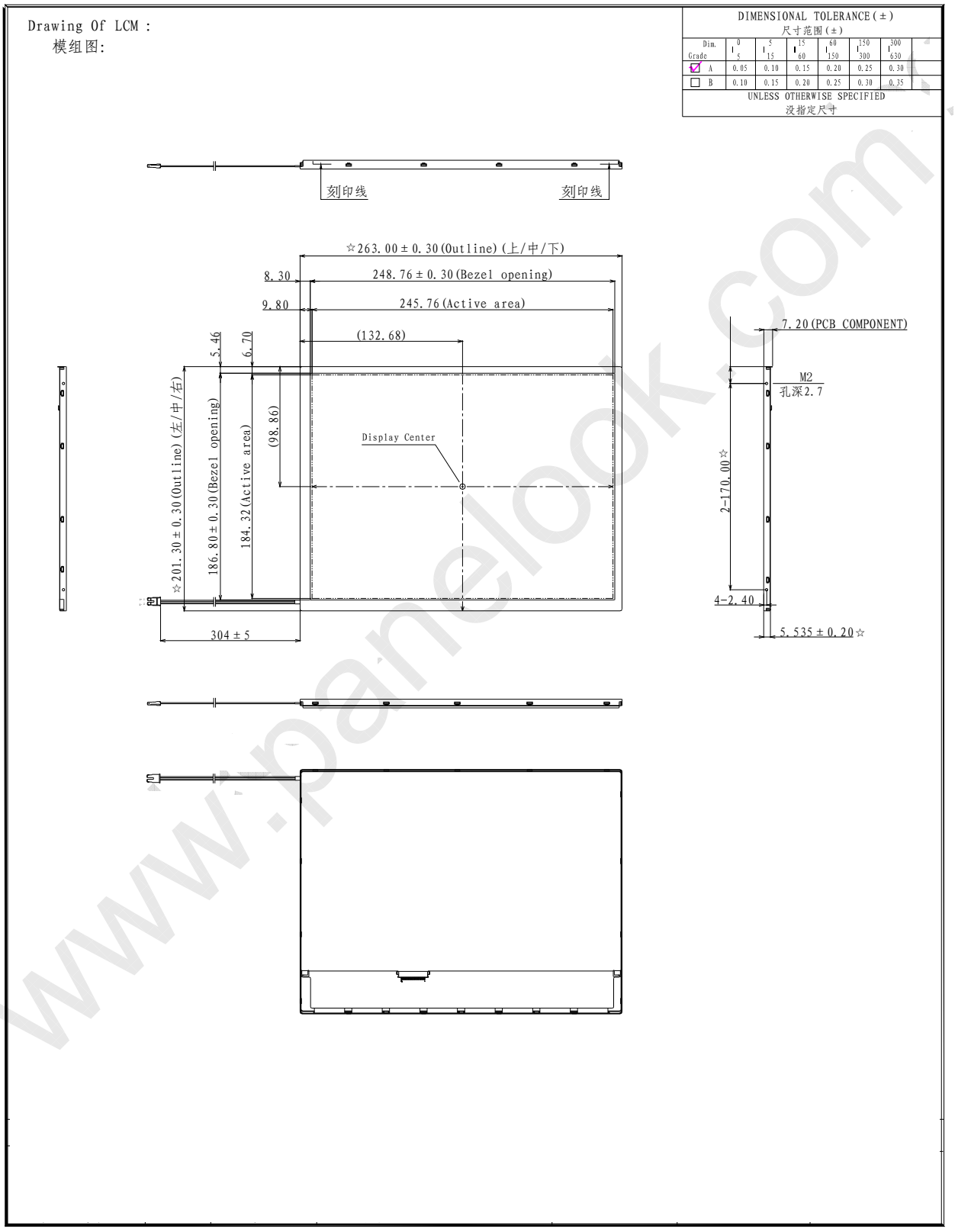
2. MECHANICAL SPECIFICATION

Drawing Of LCM :
模组图:

DIMENSIONAL TOLERANCE (±)
尺寸范围 (±)

Dim. / Grade	0 ~ 5	5 ~ 15	15 ~ 60	60 ~ 150	150 ~ 300	300 ~ 630
☑ A	0.05	0.10	0.15	0.20	0.25	0.30
☐ B	0.10	0.15	0.20	0.25	0.30	0.35

UNLESS OTHERWISE SPECIFIED
没指定尺寸



3. PIN DESCRIPTION

No.	Symbol	Function	Polarity	Remark
1	VSS	Ground		
2	VCC	Power Supply +3.3 V (typical)		
3	VCC	Power Supply +3.3 V (typical)		
4	VEDID	DDC 3.3V Power		DDC 3.3V Power
5	NC	Non-Connection		
6	CLKEDID	DDC Clock		DDC Clock
7	DATAEDID	DDC Data		DDC Data
8	Rxin0-	LVDS Differential Data Input	Negative	R0~R5,G0
9	Rxin0+	LVDS Differential Data Input	Positive	
10	VSS	Ground		
11	Rxin1-	LVDS Differential Data Input	Negative	G1~G5,B0,B1
12	Rxin1+	LVDS Differential Data Input	Positive	
13	VSS	Ground		
14	Rxin2-	LVDS Differential Data Input	Negative	B2~B5,DE,Hsync,Vsync
15	Rxin2+	LVDS Differential Data Input	Positive	
16	VSS	Ground		
17	CLK-	LVDS Clock Data Input	Negative	LVDS Level Clock
18	CLK+	LVDS Clock Data Input	Positive	
19	VSS	Ground		
20	VSS	Ground		

Note (1) The first pixel is even.

Note (2) Connector Part No.: HIROSE DF19L-20P-1H or equivalent

Note (3) User's connector Part No: HIROSE DF19G-20S-1C or equivalent

4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	VDD	-0.3	+4.0	V	(1)
Logic Input Voltage	VIN	-0.3	VCC+0.3	V	
Logic Output Signal	Vout	-0.3	VCC+0.3	V	

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

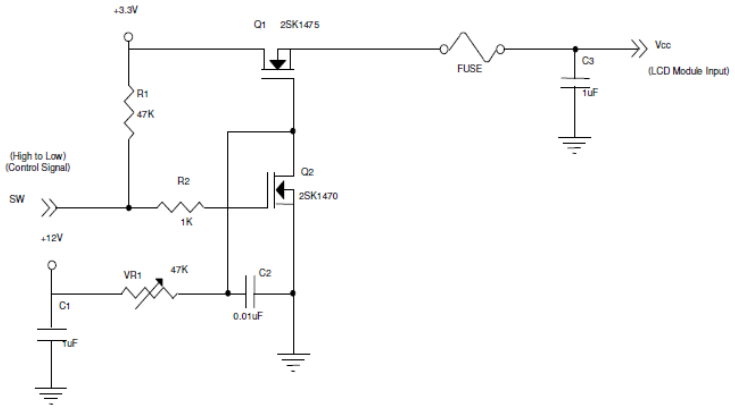
4.2 DC ELECTRICAL CHARACTERISTICS

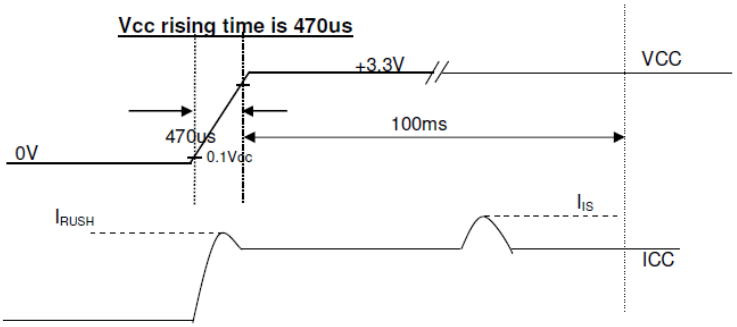
4.2.1 OPERATING CONDITIONS

Typical Operating Conditions (Ta=25℃)

Item		Symbol	Values			Unit	Remark
			Min	Typ	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	
Ripple Voltage		VRP	-	50		mV	
Rush Current		IRUSH	-	-	1.5	A	Note 2
Initial Stage Current		IIS	-	-	1.0	A	Note 2
Power Supply Current	White	Icc	-	240	-	mA	Note 3a
	Black		-	290	340	mA	Note 3b
LVDS Differential Input High Threshold		VTH(LVDS)	-	-	+100	mV	Note 5
LVDS Differential Input Low Threshold		VTL(LVDS)	-100	-	-	mV	Note 5
LVDS Common Mode Voltage		VCM	1.125	-	1.375	V	Note 5
LVDS Differential Input Voltage		|VID|	100	-	600	mV	Note 5
Terminating Resistor		RT	-	100	-	Ohm	

Note (1) The module should be always operated within above ranges.
Note (2) Measurement Conditions:





Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 °C, fv = 60Hz, whereas a power dissipation check pattern below is displayed.

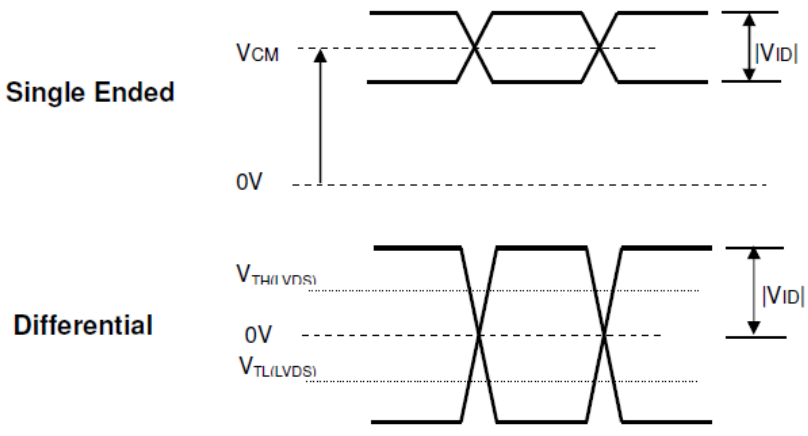
a. White Pattern

Active Area

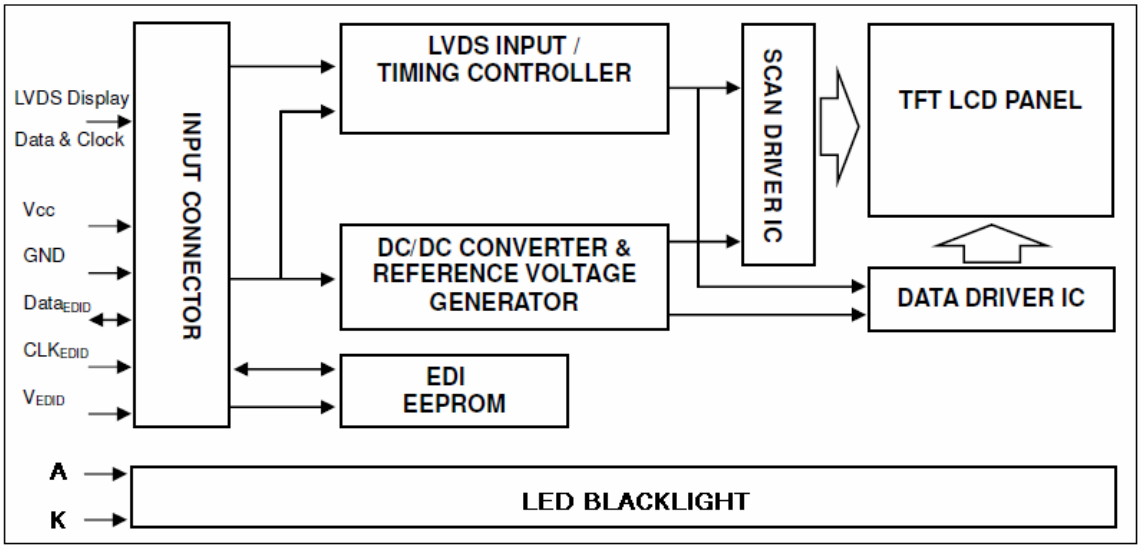
b. Black Pattern

Active Area

Note (4) The parameters of LVDS signals are defined as the following figures.



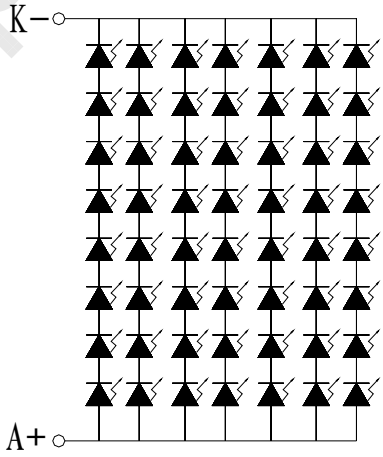
4.2.2 BLOCK DIAGRAM



4.2.3 BACKLIGHT UNIT (GND=0V)

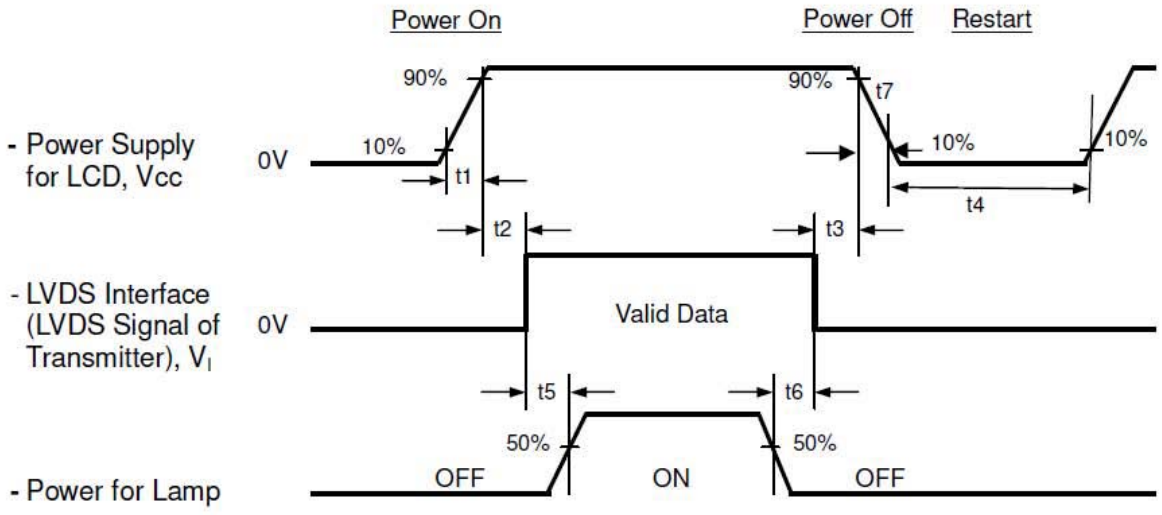
Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
LED Voltage	VF	24	26.4	28.0	V	IF=140mA 8*7=56
Center luminous Intensity	BLU	3700	4400	-	Cd/m2	IF=140mA 8*7=56
	LCM	250	300	-		
Chromaticity coordinates	X	0.26	0.28	0.31	-	IF=20mA/SMD
	Y	0.27	0.29	0.32	-	
Reverse Current	I	-	-	50	uA	VR=5V
Luminous Tolerance	Iv-m	75	85	-	%	(mix/max)*100

4.2.4 LED INTERNAL CIRCUIT



SMD-LED: 8*7=56PCS
20mA*7=140mA

4.3 POWER ON/OFF SEQUENCE



Timing Specifications:

t1 ≦ 10 msec

0 < t2 ≦ 50 msec

0 < t3

t4 ≧ 150 msec

t5 ≧ 200 msec

t6 ≧ 0 msec

t7 ≧ 10 msec (given by system)

Note (1): Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

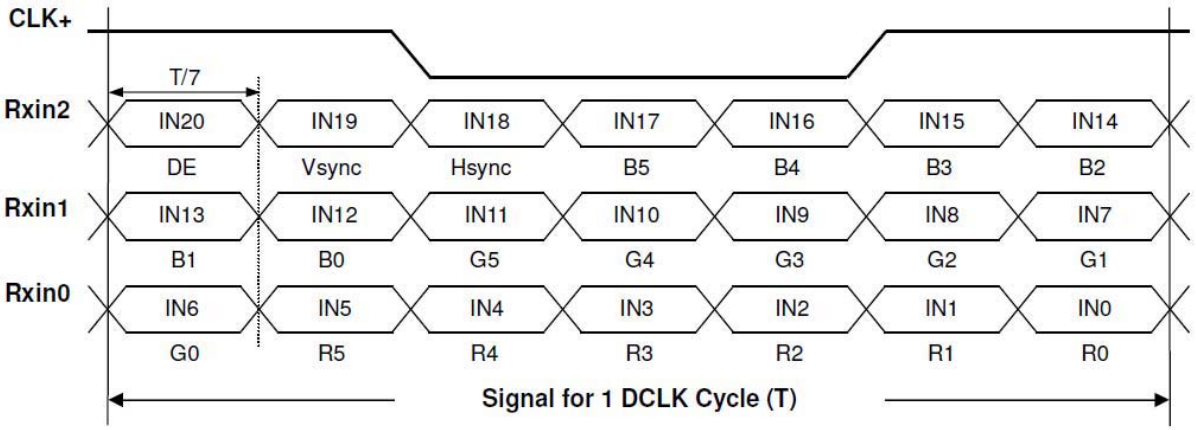
Note (2): Please avoid floating state of interface signal at invalid period. When the interface signal is invalid,be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow 5ms_t7_300 ms.

4.4 TIMING CHARACTERISTICS

4.4.1 TIMING DIAGRAM OF LVDS INPUT SIGNAL



4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of eash primary color(red, green and blue) is based on the 6-bit gray scale data input for the color, The higher the binary input the brighter the color. The table below provides the assignment of color versus data input

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
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
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(61)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	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
	Blue(1)	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	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

4.4.2 INTERFACE TIMING

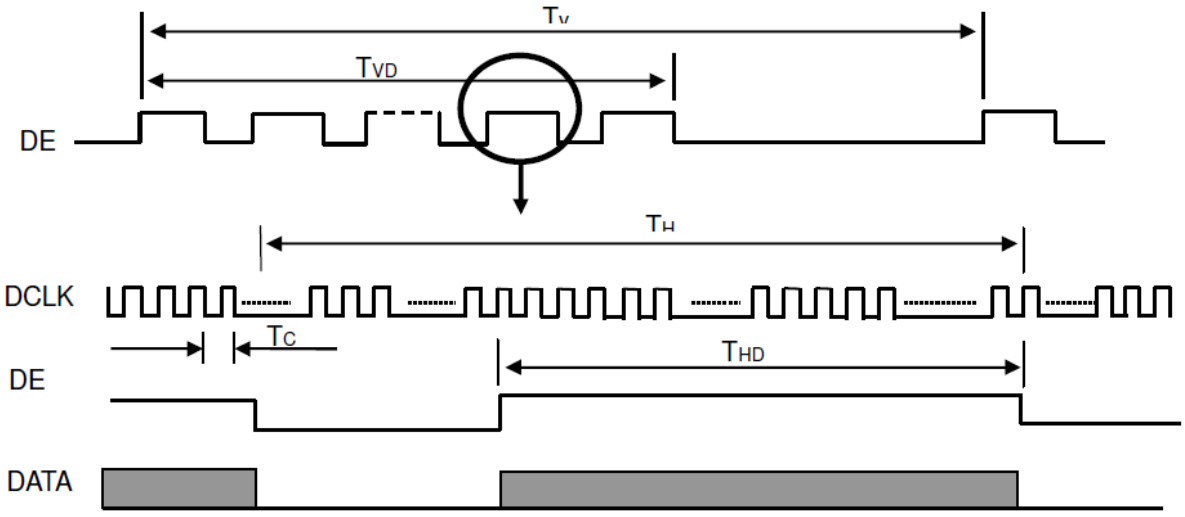
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	43.3	65	68	MHz	-
DE	Vertical Total Time	TV	771	806	850	TH	-
	Vertical Addressing Time	TVD	768	768	768	TH	-
	Horizontal Total Time	TH	1200	1344	1500	Tc	-
	Horizontal Addressing Time	THD	1024	1024	1024	Tc	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.

Note (2) 1 channels LVDS input.

INPUT SIGNAL TIMING DIAGRAM



5. OPTICAL CHARACTERISTICS

5.1 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 Note (6).

Item		Symbol	Conditions	Specifications Min.	Typ.	Max.	Unit	Note
Transmittance		T%	Viewing normal angle θ= 0° Φ= 0° B/L On		7.3		%	(1)
Contrast Ratio		CR		400	-	-	--	(3)(5)(6)
Brightness		B		250	300	-	cd/m^2	
Response time		T_r		-	5	-	ms	(4)
		T_f		-	11	-	ms	
Chromaticity	Red	Rx		0.512	0.562	0.567	--	(3)(6)(7)
		Ry		0.311	0.361	0.366	--	
	Green	Gx		0.299	0.349	0.399	--	
		Gy		0.502	0.552	0.602	--	
	Blue	Bx		0.099	0.149	0.199	--	
		By		0.046	0.096	0.146	--	
	White	Wx		0.26	0.31	0.36	--	
		Wy		0.28	0.33	0.38	--	
Viewing Angle	Hor.	θ_L	CR≧10 B/L On	50	70	-	deg.	(2)
		θ_R		50	70	-		
	Ver.	Φ_T		40	50	-		
		Φ_B		50	60	-		
NTSC		--	--	-	40	-	%	

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

1. Measure Module’s and BLU’s spectrums. White is without signal input and R, G, B are with signal input. BLU is supplied by Starry.
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 is supplied by Starry and driving voltages are based on suitable gamma voltages. White is without signal input and R, G, B are with signal input. SPEC is judged by Starry’s golden sample.

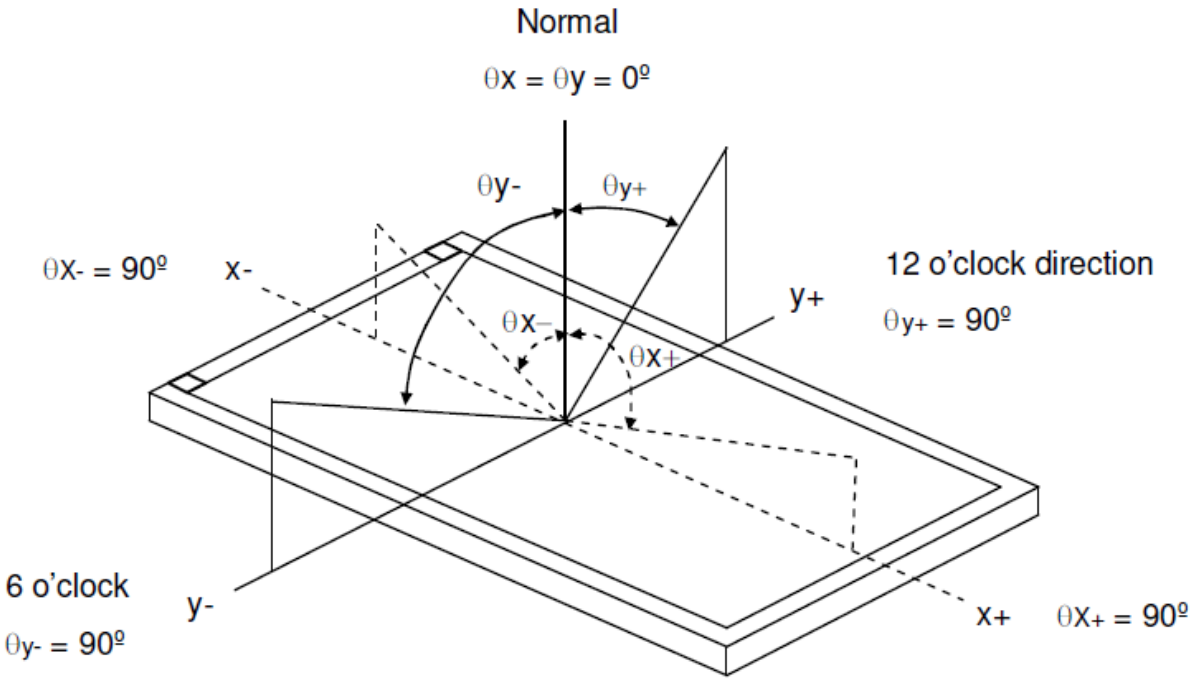
5.2 LED driving conditions

Item	SYMBOL	MIN	TYP	MAX	UNIT	REMARK
Power Consumption	PLED	—	3696	4312	mW	
LED Current	VF	—	140	154	mA	
Backlight Vlotage	VL		26.4	28.0	V	
LED Life Time		10000			Hr	Note 1

Note:

(1) Brightness to be decrease to 50% of the initial value

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



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

CR_{AVE}= [CR(1)+ CR(2)+ CR(3)+ CR(4)+ CR(5)] / 5

CR_{max}=Max value of CR at whole Viewing Angle

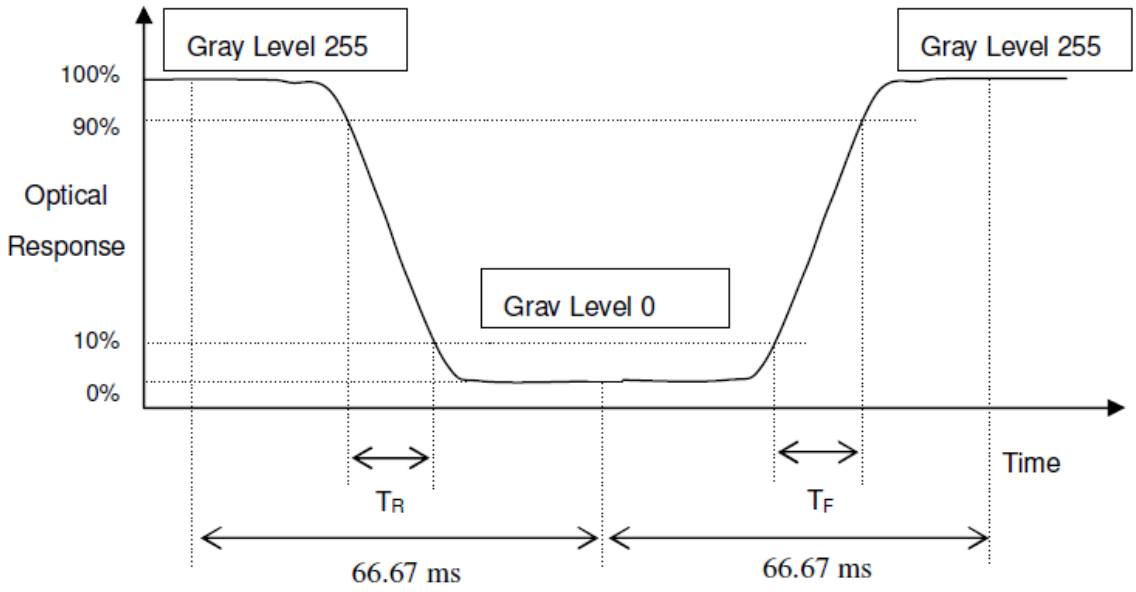
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

$$CR = \frac{\text{Luminance with all pixel white (Gmax)}}{\text{Luminance with all pixel black (Gmin)}}$$

Gmax: Luminance of gray max at the center point of panel.

Gmin: Luminance of gray min at the center point of panel.

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



Note (5) Definition of Luminance of White (L_C):

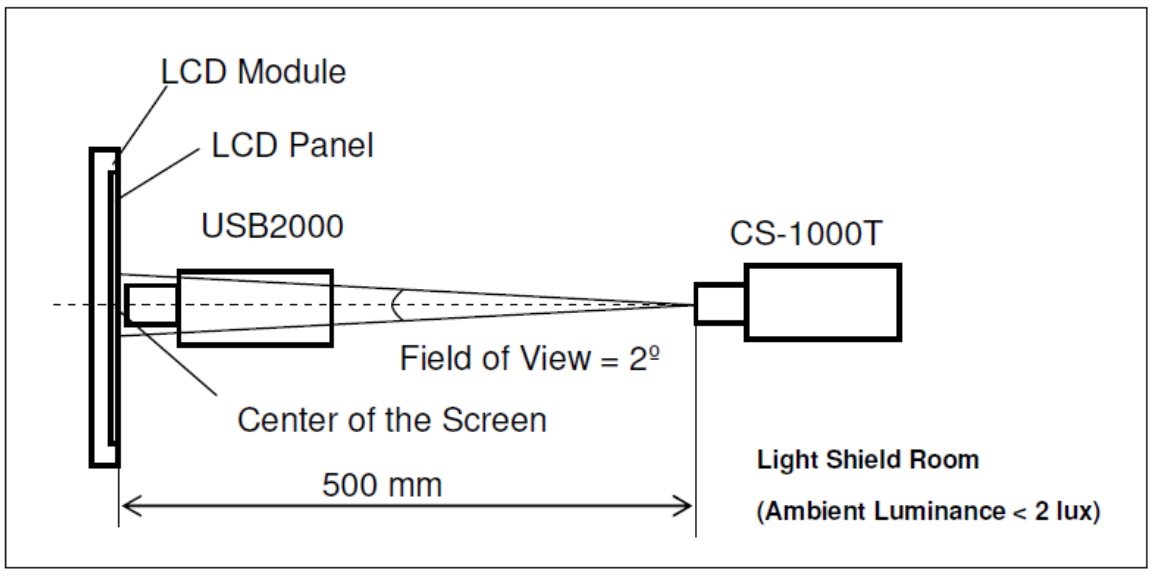
Measure the luminance of gray level 255 at center point

L_C = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (7).

Note (6) Measurement Setup:

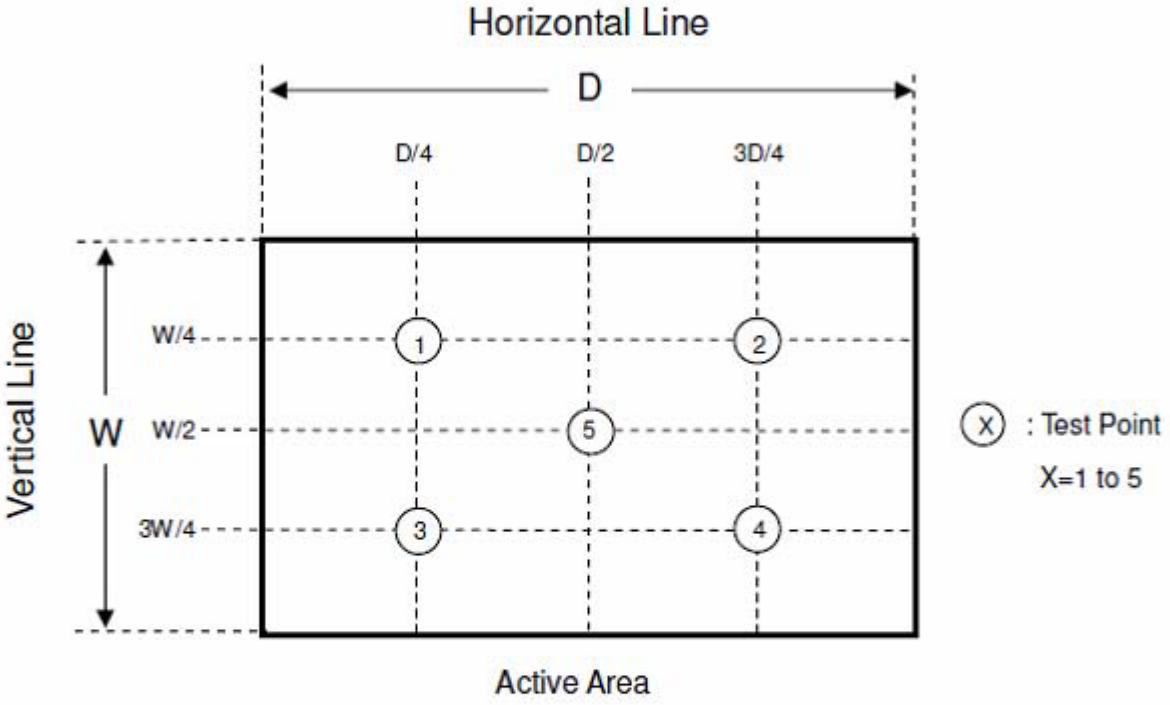
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (7) Definition of Transmittance Variation (δT%):

Measure the transmittance at 5 points

$$\delta T\% = \frac{\text{Maximum [T\%(1), T\%(2), ... T\%(5)]}}{\text{Minimum [T\%(1), T\%(2), ... T\%(5)]}}$$



Note (8) Definition of Transmittance (T%):

Module is without signal input.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

6. RELIABILITY

Test Item	Test Condition
High Temperature Storage	70℃ for 240 hours
Low Temperature Storage	-30℃ for 240 hours
High Temperature Operation	60℃ for 240 hours
Low Temperature Operation	-20℃ for 240 hours
High Temperature Operation Humidity Operation	60℃, 90%RH for 240 hours
Thermal Shock	-20℃(30min) ~ +60 (30min) for 100 cycles
Vibration Test (No Operation)	Frequency: 10~55Hz Amplitude:1.0mm Sweep Time: 11min Test Period: 6 Cycles for each direction of X, Y, Z
Package Drop Test (Non-Operating)	Hight:60cm 1 corner , 3 edges, 6 sufraces

7. HANDLING PRECAUTION

7.1 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.

7.2 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.