TFT LCD Preliminary Specification

MODEL NO.: HE315CH-B12

Unconfirmed

CONTENTS

REVISION HISTORY

Version	Date	Page	Section	Description
Ver 1.0	Jan18.2011	All	All	Approval Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

HE315CH-B12 is a 32" TFT Liquid Crystal Display module with 90 LEDs Backlight unit and 1ch-LVDS interface. This module supports 1366 x 768 WXGA format and can display true 16.7M colors (8-bits/colors).

1.2 FEATURES

- High Brightness (360) nits
- Ultra-high Contrast ratio 1000:1
- Fast response time (Gray to Gray Average 6.5ms)
- High Color saturation NTSC 60%
- Ultra Wide Viewing angle: 176(H)/176(V) (CR≥20) with Super MVA Technology
- DE (Data Enable) Only Mode
- LVDS (Low Voltage Differential Signaling) interface
- Color reproduction (Nature color)
- RoHS compliance

1.3 APPLICATION

- TFT LCD TVs
- Multi-Media Display

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	697.6845 (H) x 392.256 (V) (31.5" diagonal)	mm	(1)
Bezel Opening Area	(H) 716. 685× (V) 409. 856	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1366 x R.G.B. x 768	pixel	
Pixel Pitch (Sub Pixel)	(H)0.51075×(V)0.51075	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	16.7M	color	
Display Operation Mode	Transmissive mode / Normally black	-	
Surface Treatment	Anti-Glare coating (Haze 17%), Hard coating (2H)	-	

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	751	751.4	752	mm	(1)
	Vertical(V)	442.5	443	443.5	mm	(1)
Weight	Depth(D)		25.9		mm	To Rear
Weight			5500		g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

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)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

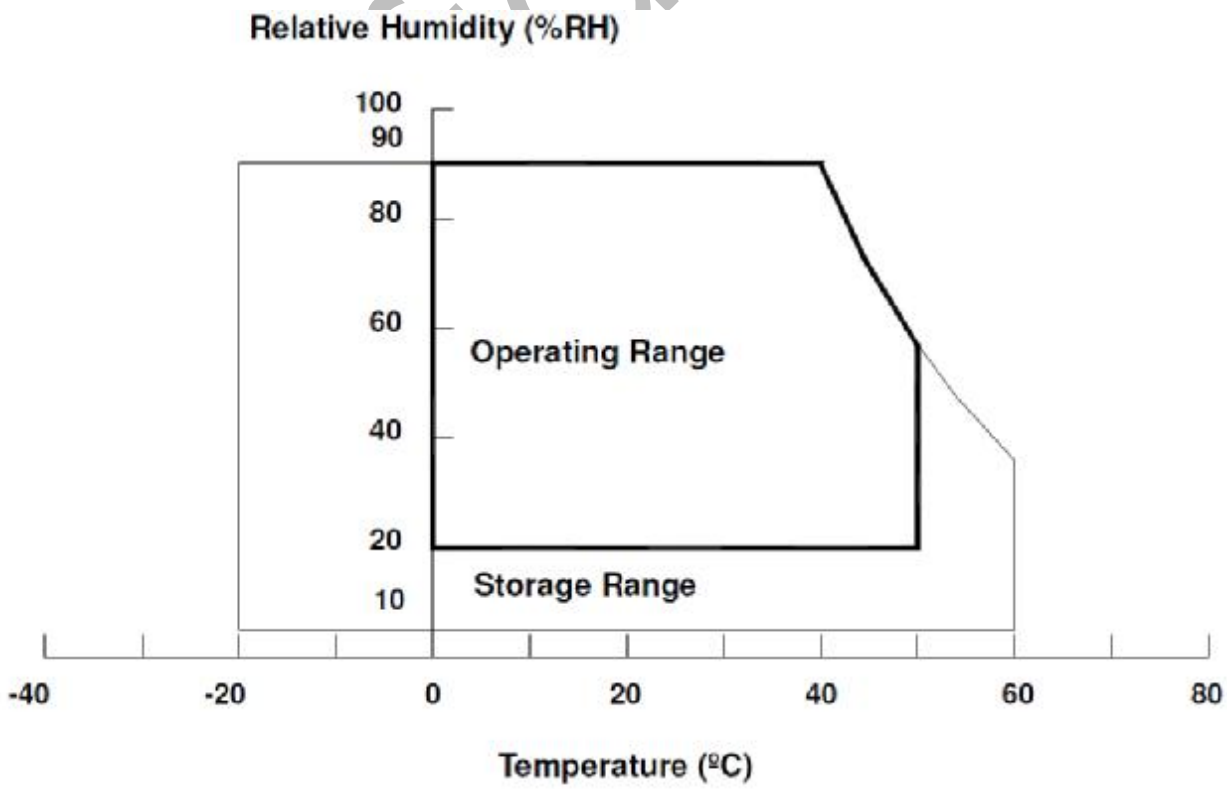
Note (1) Temperature and relative humidity range is shown in the figure below.
(a) 90 %RH Max. (Ta ≦ 40 ºC).
(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).
(c) No condensation.

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.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



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

2.3.1 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

Item	Symbol	Value		Unit	Note
		MIN.	Max.		
Power Supply Voltage	V_{CC}	-0.3	13.0	V	(1)
Input Signal Voltage	V_{IN}	-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.

2.3.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
LED Voltage	V_W	130	162	V_{RMS}	
LED Driver Input Voltage	V_{BL}	0	250	V	(1)
Power Supply Input Voltage	Vin	100	240	Vac	(2)

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.

Note (2) Power and Driver are two in one.

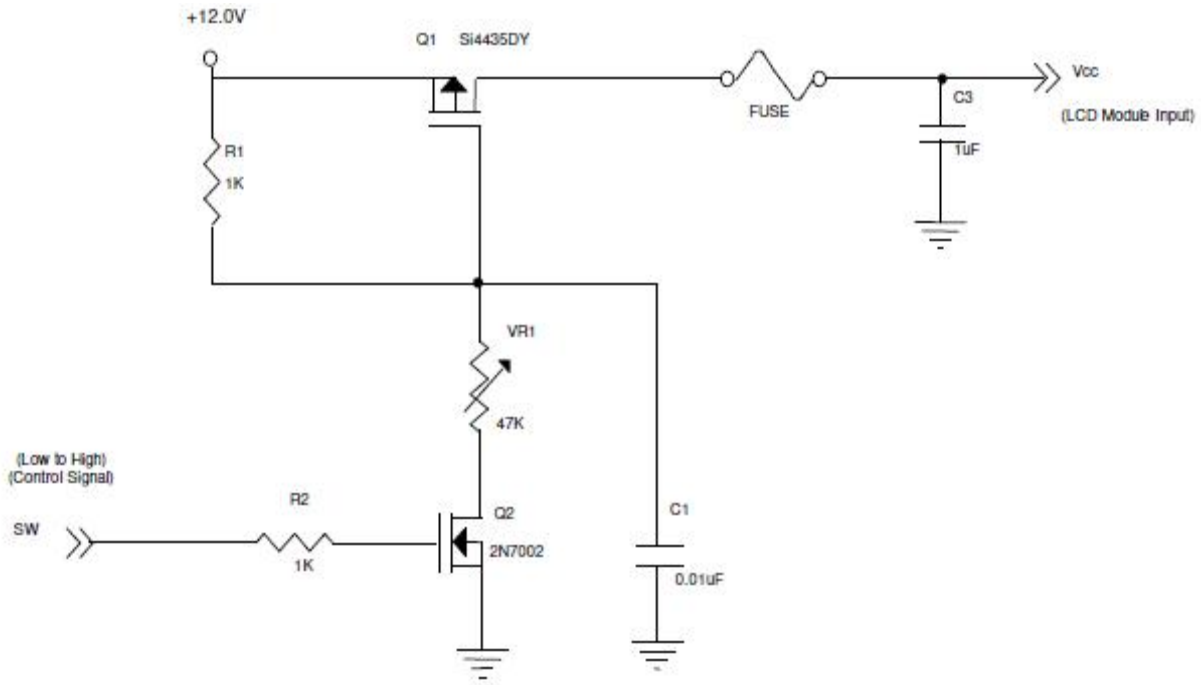
3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

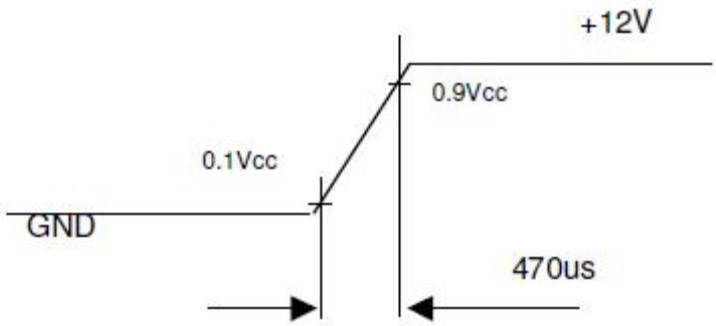
Parameter			Symbol	Value			Unit	Note
				Min.	Typ.	Max.		
Power Supply Voltage			V_{CC}	11.4	12.0	12.6	V	(1)
Power Supply Ripple Voltage			V_{RP}	-	-	100	mV	
Rush Current			I_{RUSH}	-	-	3.4	A	(2)
Power Supply Current		White	I_{CC}	-	0.45	0.52	A	(3)
		Black		-	0.33	-	A	
		Vertical Stripe		-	0.45	-	A	
LVDS Interface	Differential Input High Threshold Voltage		V_{LVTH}	-	-	+100	mV	
	Differential Input Low Threshold Voltage		V_{LVTL}	-100	-	-	mV	
	Common Input Voltage		V_{LVC}	1.125	1.25	1.375	V	
	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.

Note (2) Measure Conditions:



Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at V_{CC} = 12V, Ta = 25 ± 2℃, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

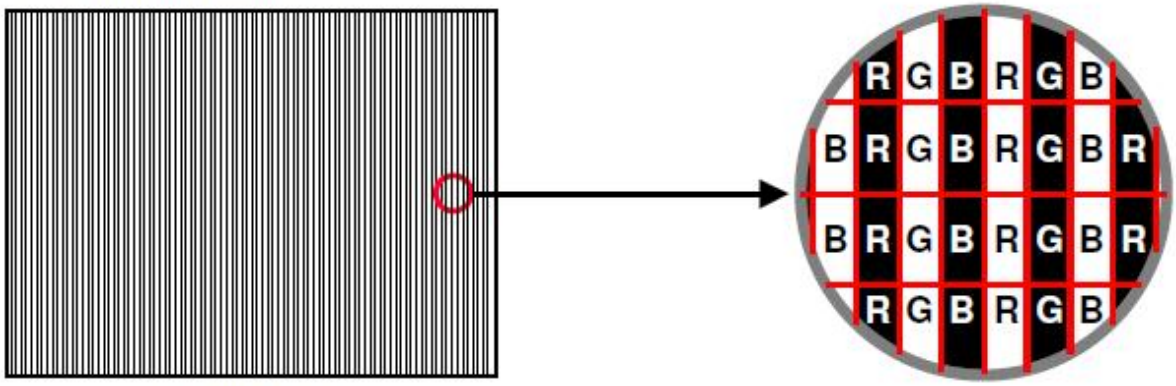
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



Active Area

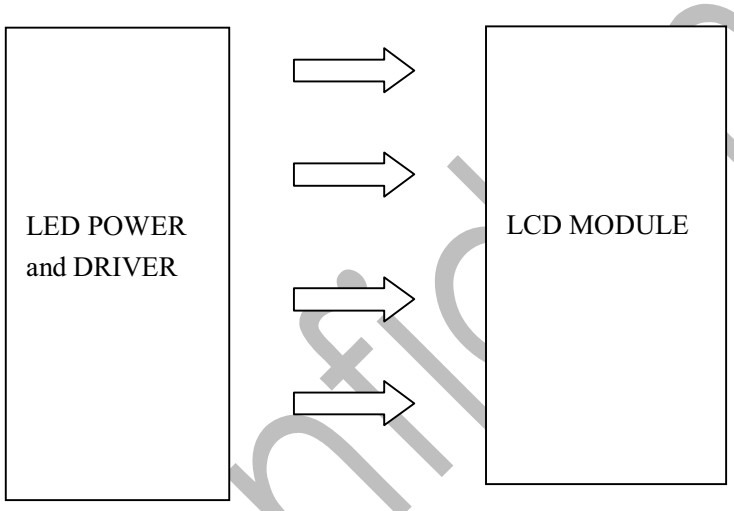
3.2 BACKLIGHT INVERTER UNIT

3.2.1 LED (LIGHT EMITTING DIODES) CHARACTERISTICS (Ta=25±2°)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max		
LED Voltage	V_W	-	3.2	3.5	V_{RMS}	I_L =120mA
LED Current	I_L	-	120	150	mA_{RMS}	(1)
LED Starting Voltage	V_s	-	-	3.2	V_{RMS}	(2), Ta = 25 °C
Operating Frequency	F_O	0	-	180	KHz	(3)
LED Life Time	L_{BL}	100,000		-	Hrs	(4)

3.2.2 HISENSE LED DRIVER CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max		
Power Consumption	P_{BL}	-	38	41	W	(5),(6),I_L=120mA
Input Voltage	V_{ac}	100		240	V_{ac}	
Input Current	Iac	-	-	2	A	Non Dimming
Input LED Driving Voltage	Vdc			210	Vrms	
Output The Other Voltage	12V	11.4	12	12.6	V	For the meanboard ,max 3A
Oscillating Frequency	F_W		180		KHz	
Dimming frequency	F_B	200		500	Hz	
Minimum Duty Ratio	D_{MIN}	0		100	%	



Note (1) LED current is measured by utilizing high frequency current meters as shown below:

Note (2) The LED starting voltage V_S should be applied to the lamp for more than 3.2v under starting up duration. Otherwise the LED could not be lighted on completed.

Note (3) The LED frequency decides its application in backlight .If the backlight need to realize controlling dynamically, high frequency LED need to be selected. Otherwise the backlight is easy to flick, so enough high frequency LED must be selcted.

Note (4) The life time of a LED is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at Ta = 25 ±2℃ and IL = 60mARMS.

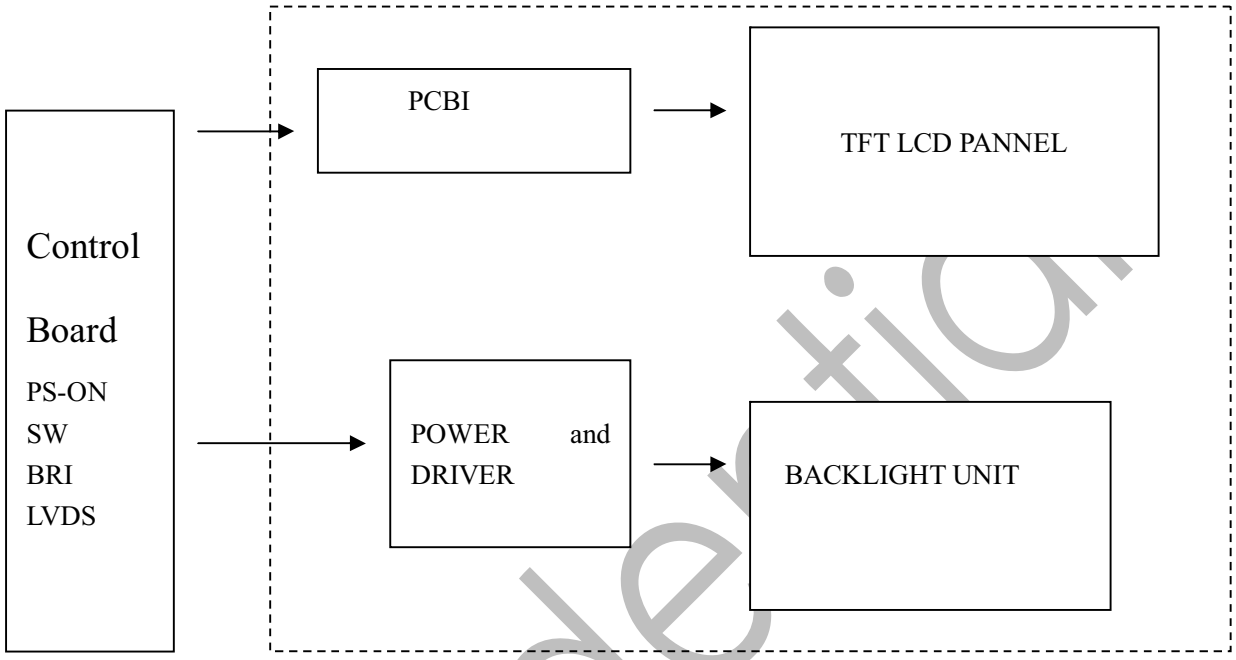
Note (5) The power supply capacity should be higher than the total LED driver power consumption PBL. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

Note (6) To enhance the performance of backlight, the power consumption will increase to 1.5 times of the typical power consumption PBL in the power on stage and 20 seconds later it will

return to typical value. Thus, the power source capacity for inverter should be considered to supply the initial power consumption at power on duration.

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5 PIN CONNECTIONS

5.1 TFT LCD MODULE

CNF1 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	VCC	Power supply: +12V	
2	VCC	Power supply: +12V	
3	VCC	Power supply: +12V	
4	VCC	Power supply: +12V	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	S_SCL	NC	(1)
10	S_SDA	NC	(1)
11	GND	Ground	
12	RX0-	Negative transmission data of channel 0	
13	RX0+	Positive transmission data of channel 0	
14	GND	Ground	
15	RX1-	Negative transmission data of channel 1	
16	RX1+	Positive transmission data of channel 1	
17	GND	Ground	
18	RX2-	Negative transmission data of channel 2	
19	RX2+	Positive transmission data of channel 2	
20	GND	Ground	
21	RXCLK-	Negative of clock	
22	RXCLK+	Positive of clock	
23	GND	Ground	
24	RX3-	Negative transmission data of channel 3	
25	RX3+	Positive transmission data of channel 3	
26	GND	Ground	
27	PWM_I	LED Input Duty Control	(2)
28	PWM_O	LED Output Duty Control	(2)
29	GND	Ground	
30	GND	Ground	

Note (1) Reserved for potential use. Left it open.

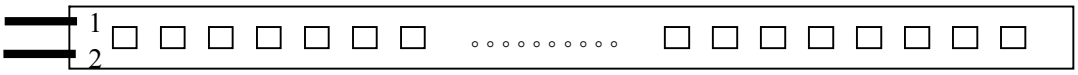
Note (2) For Lightbar duty control signal.

5.2 BACKLIGHT UNIT

The pin configuration for the connecting component and wire is shown in the table below.

5.2.1 Light Bar

Pin No.	Symbol	Description
1	P	Positive
2	N	Negative



5.2.2 HISENSE LED DRIVER BOARD

XP901

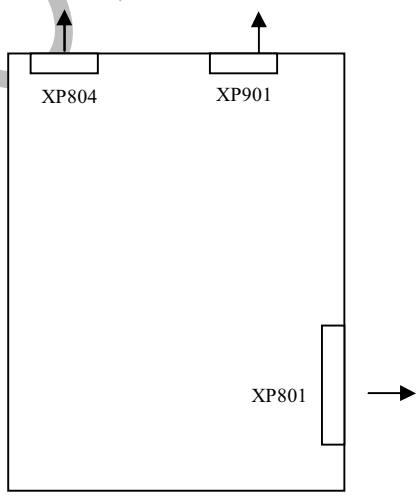
Pin No.	Symbol	Description
1	LED-	Positive
2	LED+	Negative
3	LED-	Positive
4	LED+	Negative

XP804

Pin No.	Symbol	Description
1	GND	GND
2	GND	GND
3	DIM	
4	SW	
5	12V	
6	12V	

XP801

Pin No.	Symbol	Description
1	L(N)	
2	N(L)	



5.3 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 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

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

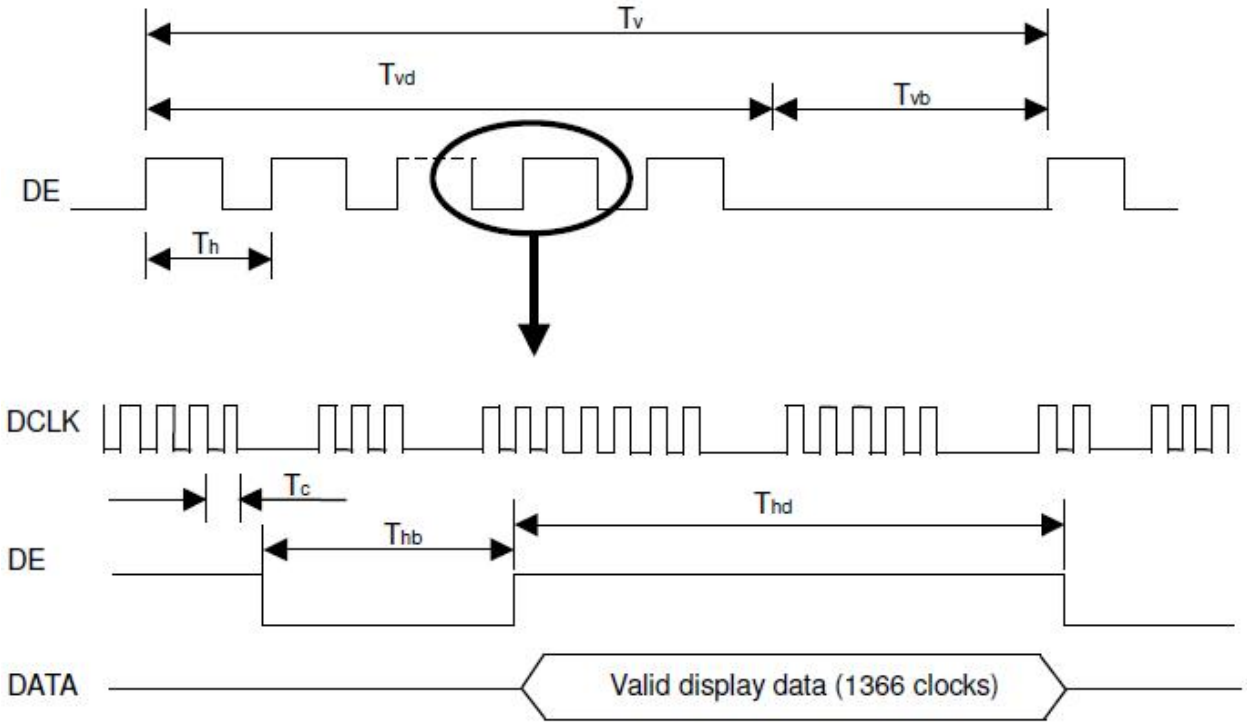
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	60	76	82	MHZ	-
	Input cycle to cycle jitter	Trcl	-	-	200	ps	-
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	-
	Hold Time	Tlvhd	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr5	47	50	53	Hz	(2)
		Fr6	57	60	63	Hz	
	Total	Tv	778	806	888	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	-
	Blank	Tvb	10	38	120	Th	-
Horizontal Active Display Term	Total	Th	1442	1560	1936	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	-
	Blank	Thb	76	194	570	Tc	-

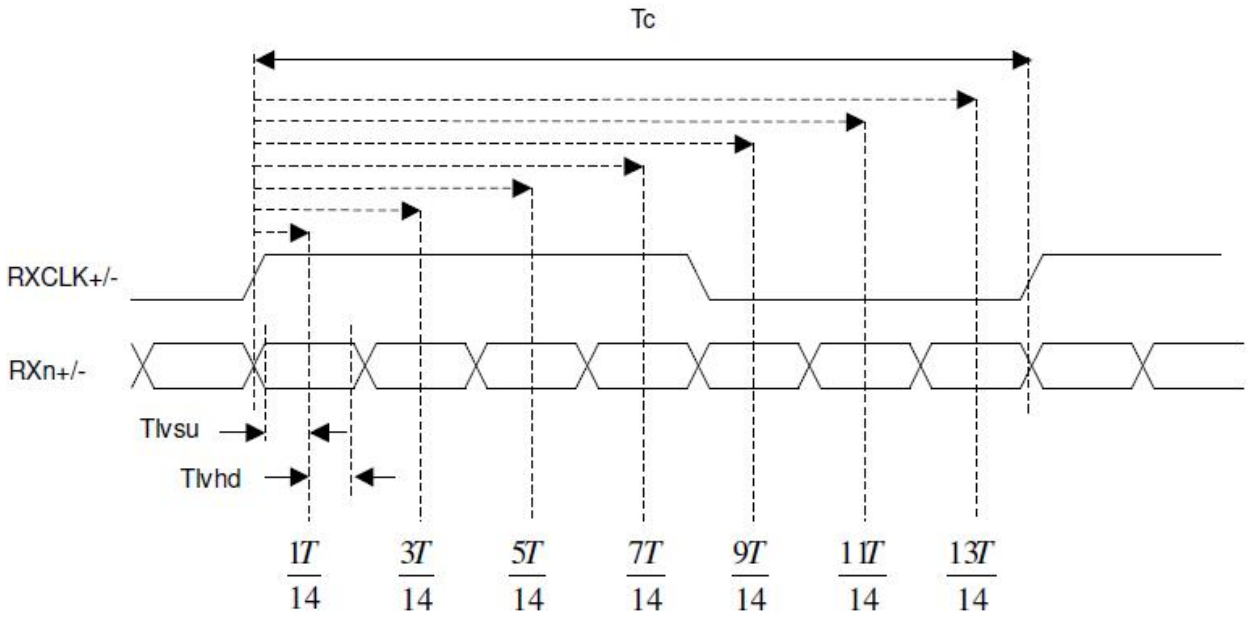
Note (1) Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

Note (2) Please refer to 5.1 for detail information.

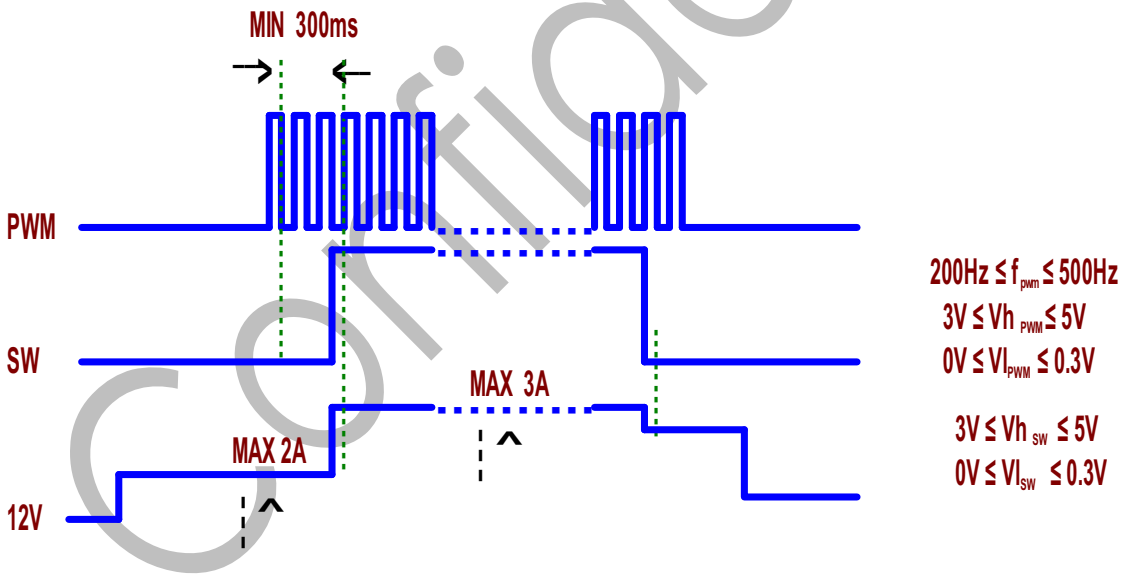
INPUT SIGNAL TIMING DIAGRAM



LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE



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	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		

Lamp Current	I_L	8.0 ± 0.5	mA
Oscillating Frequency (Inverter)	F_W	63±3	KHz
Frame rate	Fr	60	Hz

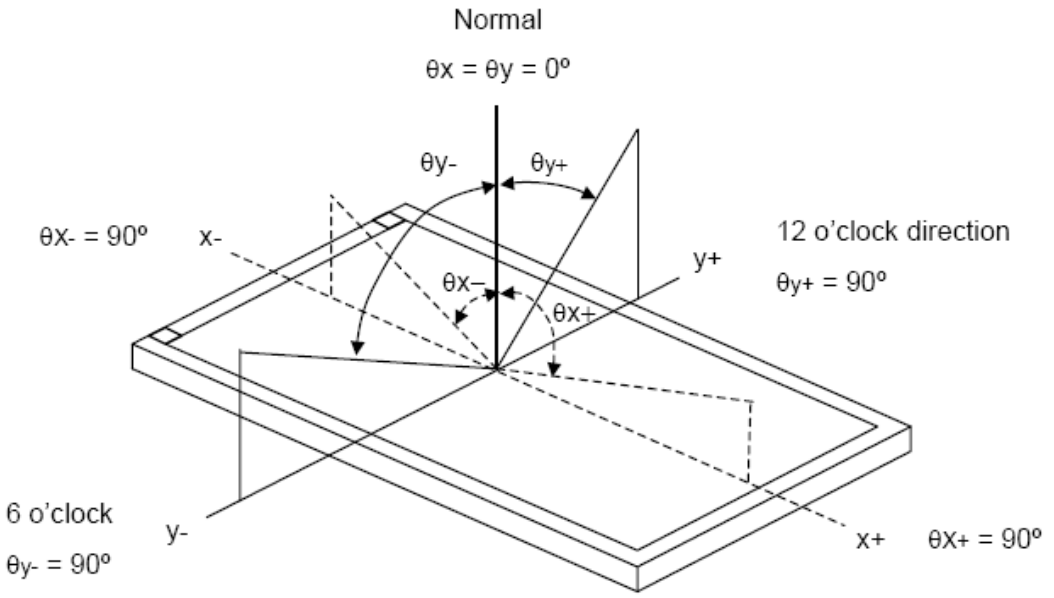
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y=0° Viewing Angle at Normal Direction	(2000)	(3000)		-	(2)
Response Time		Gray to gray average		-	6.5		ms	(3)
Center Luminance of White		L_C		300	360	-	Cd/m^2	(4)
White Variation		δ W		-	-	1.3	-	(7)
Cross Talk		CT		-	-	4	%	(5)
Color Chromaticity	Red	Rx		Typ. -0.03	0.597	Typ. +0.03	-	(6)
		Ry			0.338		-	
	Green	Gx			0.332		-	
		Gy			0.593		-	
	Blue	Bx			0.152		-	
		By			0.078		-	
	White	Wx			0.295		-	
		Wy			0.308			
	Color Gamut	CG		82	91		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥20	80	88		Deg.	(1)
		θ_x-		80	88			
	Vertical	θ_Y+		80	88			
		θ_Y-		80	88			

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

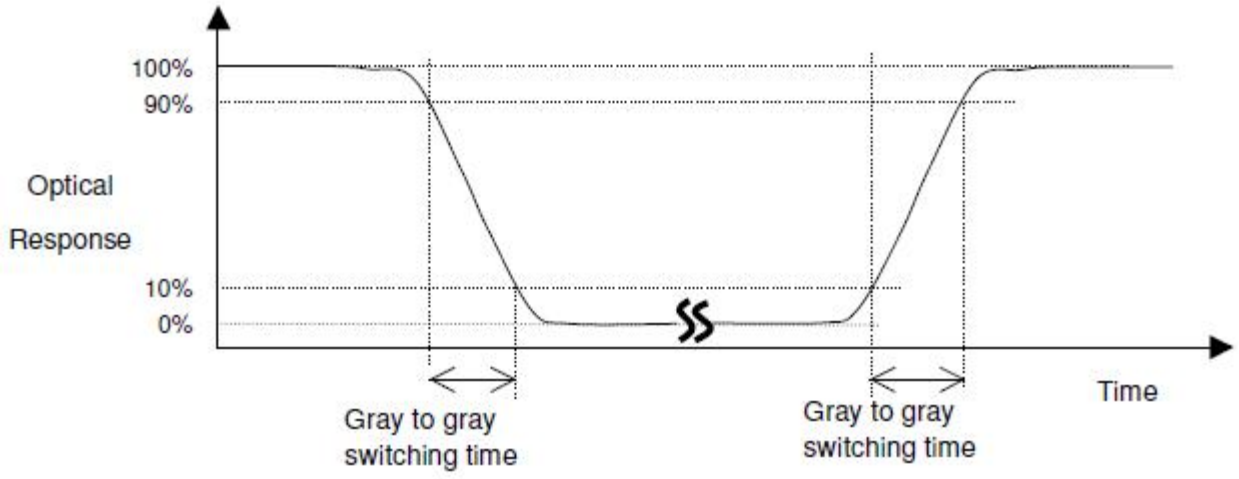
Contrast Ratio (CR) = L255 / L0

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 (7).

Note (3) Definition of Gray to Gray Switching Time:



The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.Gray to gray average time means the average switching time of luminance 0%,20%, 40%, 60%, 80%, 100% to each other.

Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

L_C = L (5)

L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

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

Note (5) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100$ (%)

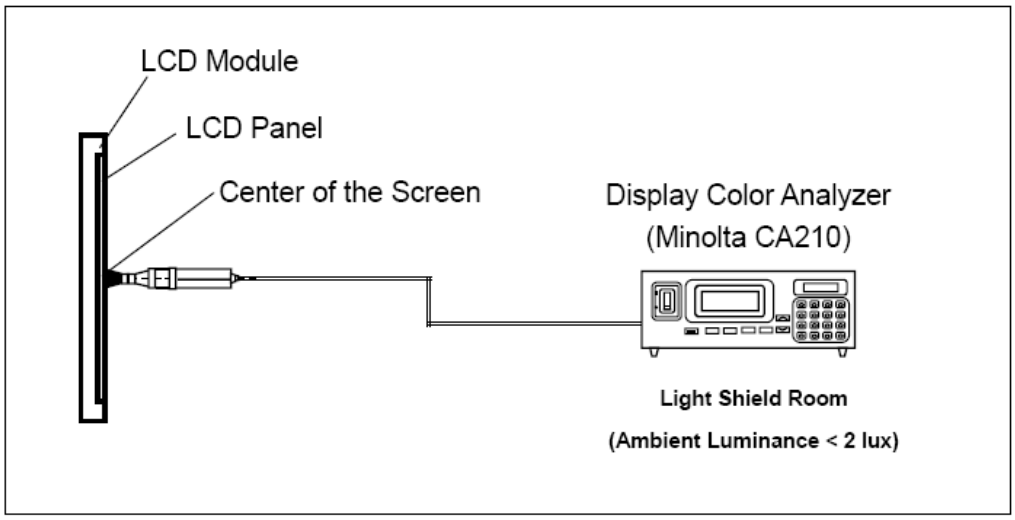
Where:

Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)

Note (6) Measurement Setup:

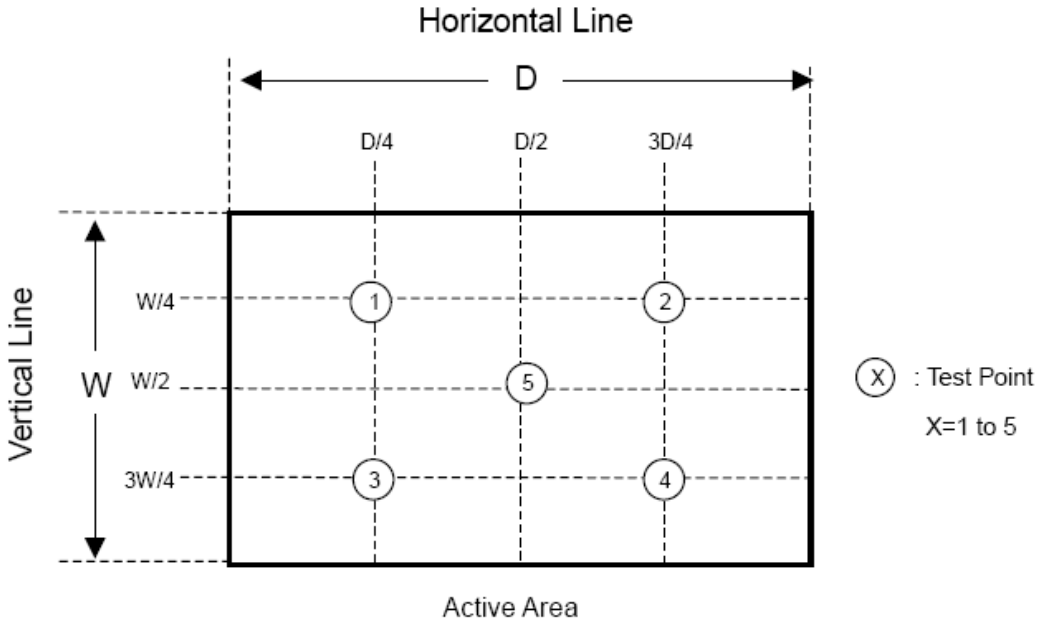
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (7) 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)]



8. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

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

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(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) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

8.2 SAFETY PRECAUTIONS

(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. 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 module's end of life, it is not harmful in case of normal operation and storage.

8.3 STORAGE PRECAUTIONS

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

(1) 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.

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

9. MECHANICAL CHARACTERISTIC