晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-800600NTMCW-00H
APPROVED BY	
DATE	

☑ **Approved For Specifications**
☐ Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2010/8/19	-	New Release	Kevin

1. FEATURES

AM-800600N model is a 12.1" TFT-LCD module with a 2-CCFL Backlight Unit and a 20-pin 1ch-LVDS interface. This module supports 800 x 600 SVGA mode and displays 262,144 colors. The inverter module for the Backlight Unit is not bulilt in.

- Wide Viewing angle
- High contrast ratio
- Fast response time
- High color saturation
- SVGA (800 x 600 pixels) resolution
- Wide operating temperature
- DE (Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface
- RoHS Compliance
- Reversible – Scan Function

APPLICATIONS

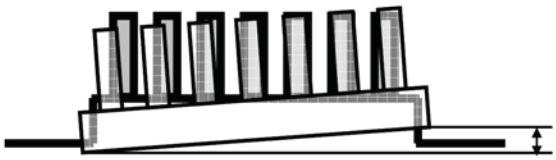
- TFT LCD Monitor
- TFT LCD TV
- Factory Application
- Amusement
- Vehicle

2. PHYSICAL SPECIFICATIONS

Item	Specifications	Unit	Note
Active area	246.00 (H) ×184.50 (V)	mm	(1)
Driver Element	a-si TFT active matrix	-	-
Pixel Number	800 x R.G.B x 600	pixel	-
Pixel Pitch	0.3075(H) x 0.3075(V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	Hard coating (3H), Anti-Glare (Haze 25%)	-	-
Weight	660(Max.)	g	-

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

(2) Connector mounting position



3. ABSOLUTE MAX. RATINGS

3.1 Absolute Max Rating

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Operating Ambient Temperature	TOP	-30	+70	℃	(0)(1)(2)
Storage Temperature	TST	-40	+80	℃	(0)(1)
Power Supply Voltage	VCC	-0.3	6.0	V	(1)
Logic Input Voltage	VIN	-0.3	2.7	V	(1)
Lamp Voltage	VL	-	2.5K	Vrms	(1)(2),IL=8mA
Lamp Current	IL	2.0	8.5	mARMS	(1)(2)
Lamp Frequency	FL	45	80	KHz	(1)(2)

∗ All the notes are in subject 3.2 (Absolute Ratings of Environment)

3.2 Absolute Ratings of Environment

Test Item	Test Condition	Note
High Temperature Storage Test	80°C, 240 hours	(1) (2)
Low Temperature Storage Test	-40°C, 240 hours	
Thermal Shock Storage Test	-40°C, 0.5hour←→80℃, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	70°C, 240 hours	
Low Temperature Operation Test	-30°C, 240 hours	
High Temperature & High Humidity Operation Test	60°C, RH 90%, 240hours	
Heat Cycle Operation Test	-30°C, 1hour←→70°C, 1hour; 50cycles, 4hour/cycle	
ESD Test (Operation)	150pF, 330Ω, 1sec/cycle Condition 1 : panel contact, ±8KV Condition 2 : panel non-contact ±15KV	(2)
Shock (Non-Operating)	200G, 2ms, half sine wave, 1 time for ± X, ± Y, ± Z.	(2)(3)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z	(2)(3)

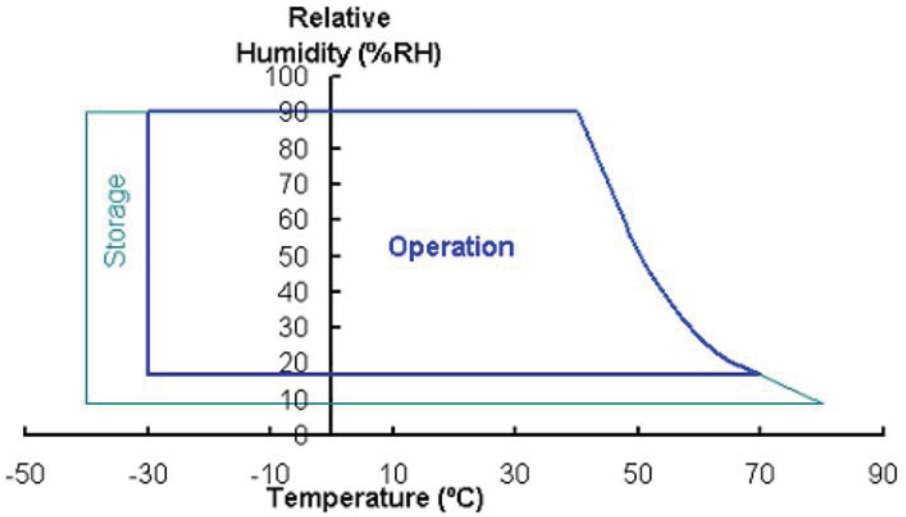
Note (0) All test conditions are as above table.

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

(a) 90 %RH Max. (Ta ≦ 40 °C).

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

(c) No condensation.



Note (2) No display malfunctions.

Note (3) 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.

Note (4) Temperature of panel display surface area should be 80 °C Max.

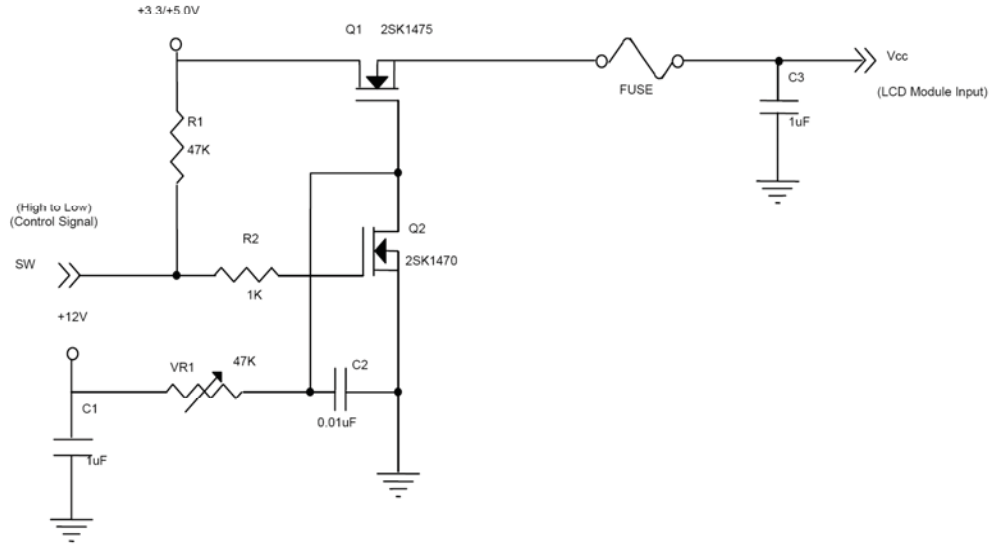
4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD Module

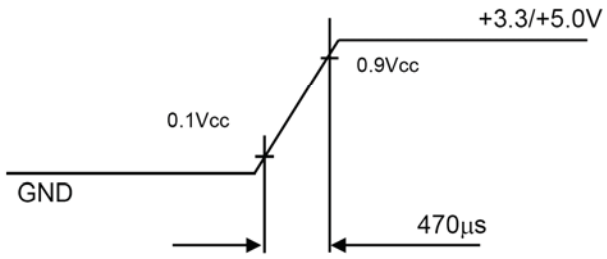
Parameter			Symbol	Value			Unit	Note
				Min.	Typ.	Max.		
Power Supply Voltage			Vcc	3.0	3.3 / 5.0	5.5	V	(1)
Ripple Voltage			V_{RP}	-	-	100	mV	-
Rush Current			I_{RUSH}	-	-	1.5	A	(2)
Power Supply Current	White	Vcc=3.3V	-	-	655	835	mA	(3)a
		Vcc=5.0V		-	400	490		(3)b
	Black	Vcc=3.3V		-	550	700	mA	(3)c
		Vcc=5.0V		-	350	440		(3)d
LVDS differential input voltage			Vid	-100	-	+100	mV	-
LVDS common input voltage			Vic	-	1.2	-	V	-

Note (1) The module is recommended to operate within 3.3V or 5.0V for normal function.

Note (2) Measurement Conditions:



Vcc rising time is 470μs



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

(3)a : Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, White Pattern

(3)b : Vcc = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, White Pattern

(3)c : Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, Black Pattern

(3)d : Vcc = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, Black Pattern

a. White Pattern

Active Area

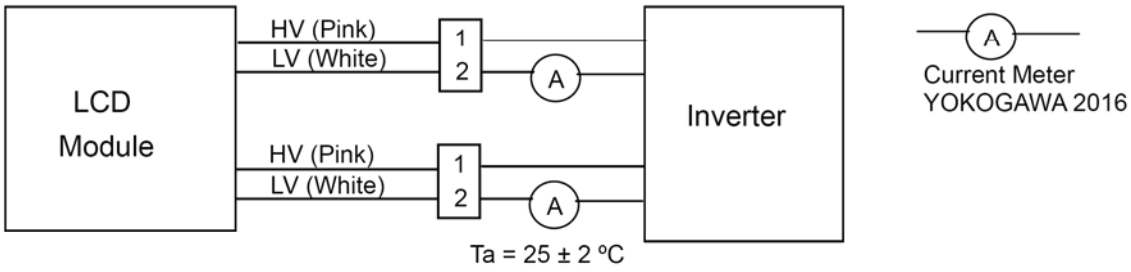
b. Black Pattern

Active Area

4.2 Backlight Unit

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	450	500	550	V_{RMS}	I_L =8mA
Lamp Current	I_L	2.0	8.0	8.5	mA_{RMS}	(1)
Lamp Turn On Voltage	V_S	-	-	1010	V_{RMS}	25 °C, (2)
		-	-	1200	V_{RMS}	0 °C, (2)
Operating Frequency	F_L	45	-	80	KHz	(3)
Lamp Life Time	L_{BL}	50000	-	-	Hrs	(5), I_L =8mA
Power Consumption	P_L	--	4.0	-	W	(4), I_L =8mA

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



Ta = 25 ± 2 °C

Note (2) The voltage that must be larger than Vs should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronization frequency from the display, which might cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronization frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition Ta = 25 ±2 °C and I_L = 2.0 ~ 8.0 mArms until one of the following events occurs:

(a) When the brightness becomes or lower than 50% of its original value.

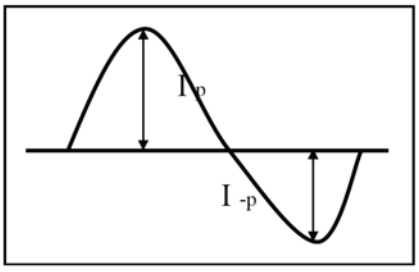
(b) When the effective ignition length becomes ≦ 80% of its original value. (The effective ignition length is a scope that luminance is over 70% of that at the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform. (Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp. It shall help increase the lamp lifetime and reduce its leakage current.

a. The asymmetry rate of the inverter waveform should be 10% below;
b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$;
c. The ideal sine wave form shall be symmetric in positive and negative polarities.



* Asymmetry rate:

$$| I_p - I_{-p} | / I_{rms} * 100\%$$

* Distortion rate

$$I_p \text{ (or } I_{-p}) / I_{rms}$$

5. OPTICAL SPECIFICATION

5.1 Test Conditions

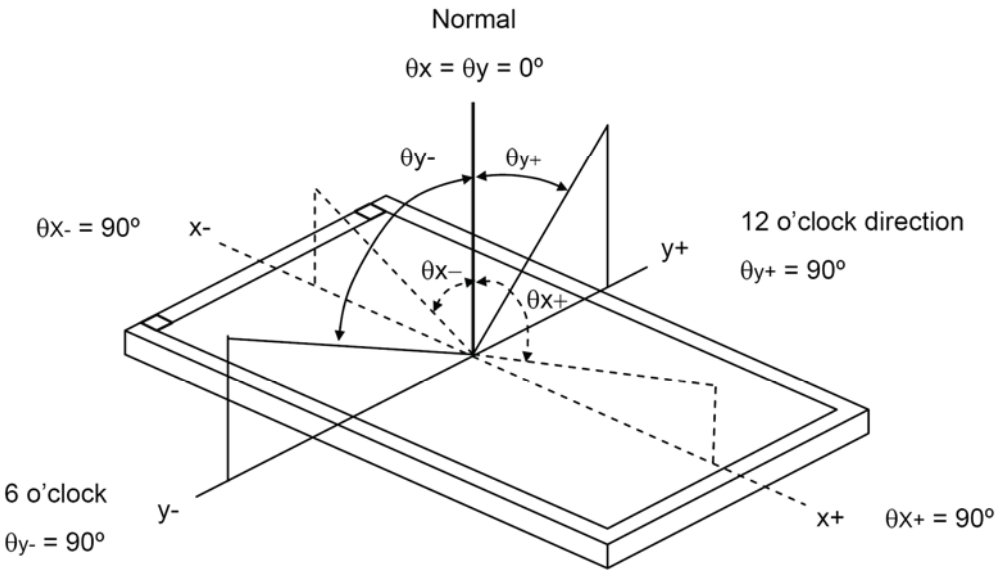
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	8.0	mA
Inverter Driving Frequency	F_L	61	KHz
Inverter	Sumida H05-5052		

5.2 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 (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° CS-1000	Typ - 0.03	0.620	Typ + 0.03	-	(1), (5)
		Ry			0.345		-	
	Green	Gx			0.318		-	
		Gy			0.556		-	
	Blue	Bx			0.147		-	
		By			0.120		-	
	White	Wx			0.326		-	
		Wy			0.340		-	
Center Luminance of White		L_C		380	450	-	cd/m^2	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	13	18	ms	(3)
		T_F		-	12	17	ms	
White Variation		δW	θ_x=0°, θ_Y =0°	-	1.25	1.4	-	(5), (6)
Viewing Angle	Horizontal	θ_x+	CR≥10	80	89	-	Deg.	(1), (5)
		θ_x-		80	89	-		
	Vertical	θ_Y+		80	89	-		
		θ_Y-		80	89	-		

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



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

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

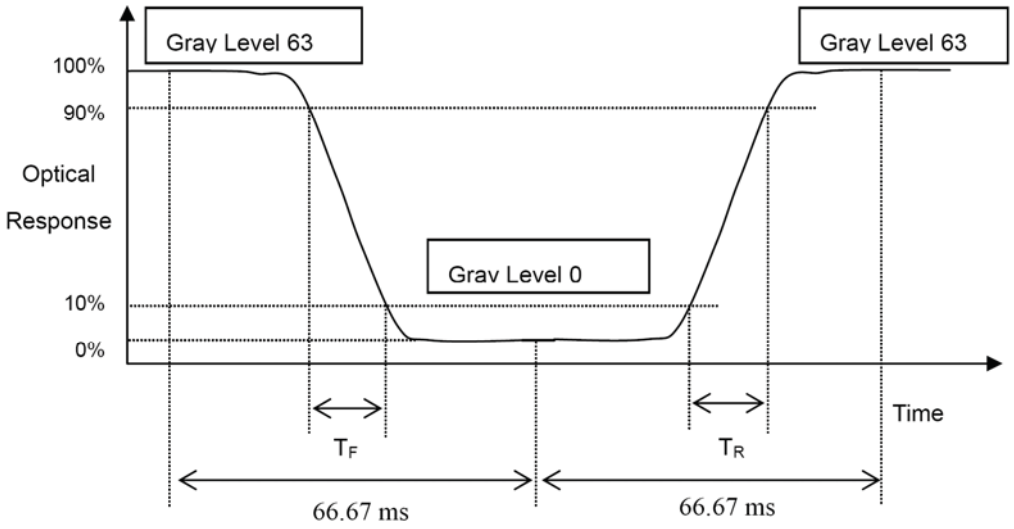
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

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

Note (3) Definition of Response Time (T_R, T_F) and measurement method:



Note (4) Definition of Luminance of White (L_C):

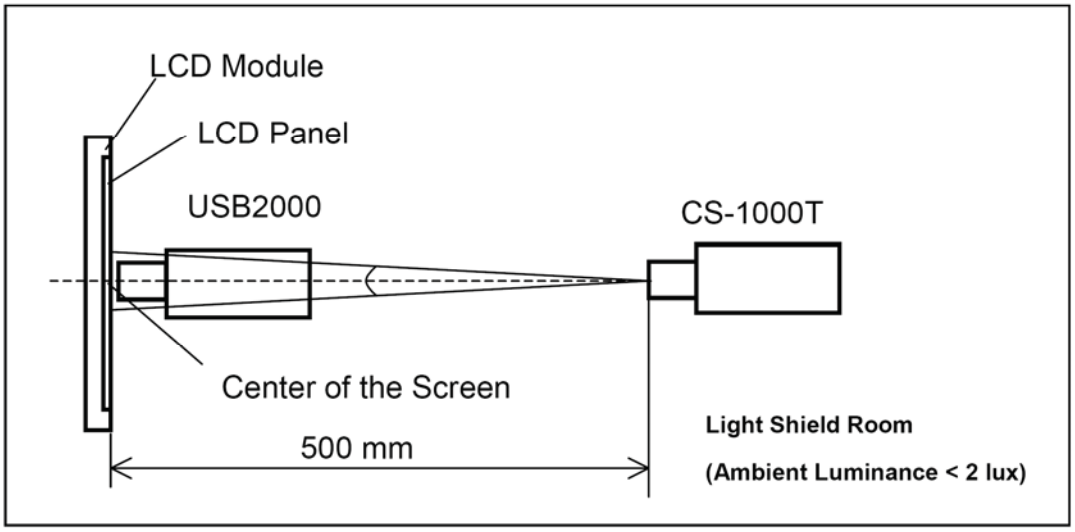
Measure the luminance of gray level 63 at center point

$L_C = L (5)$

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

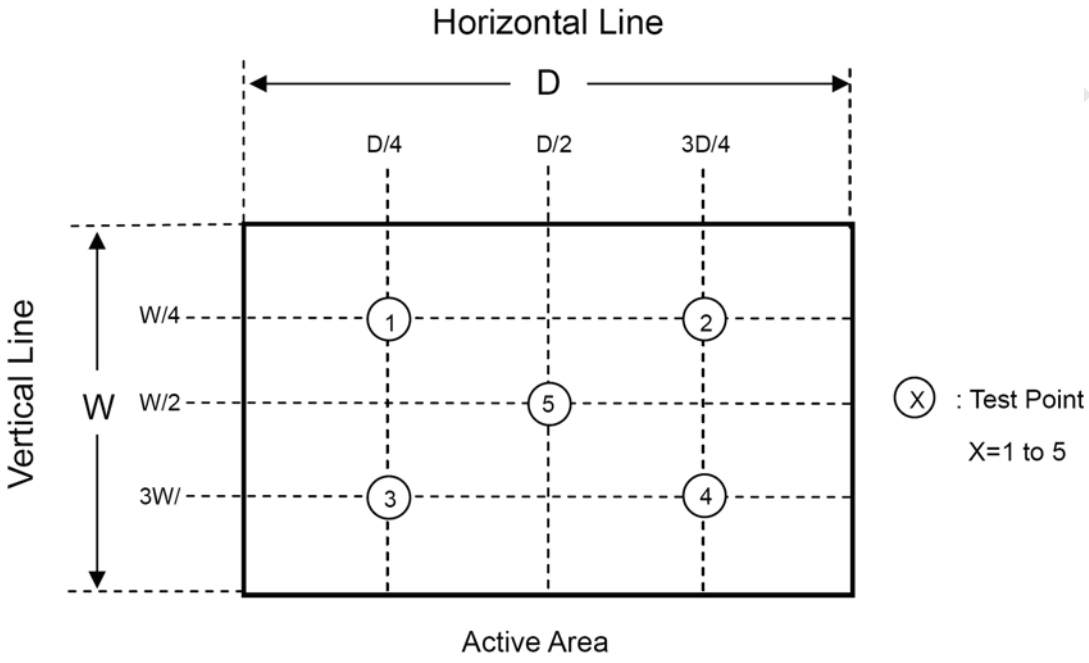
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$



6. INTERFACE

6.1 TFT LCD Module

Pin	Name	Description	Remark
1	VCC_IN	Power Supply (5.0 V / 3.3 V)	
2	VCC_IN	Power Supply (5.0 V / 3.3 V)	
3	GND	Ground	
4	GND	Ground	
5	RX0-	Differential Data Input, CH0 (Negative)	R0 ~ R5, G0
6	RX0+	Differential Data Input, CH0 (Positive)	
7	GND	Ground	
8	RX1-	Differential Data Input, CH1 (Negative)	G1 ~ G5, B0, B1
9	RX1+	Differential Data Input , CH1 (Positive)	
10	GND	Ground	
11	RX2-	Differential Data Input , CH2 (Negative)	B2 ~ B5, DE
12	RX2+	Differential Data Input , CH2 (Positive)	
13	GND	Ground	
14	CLK-	Differential Clock Input (Negative)	LVDS Level Clock
15	CLK+	Differential Clock Input (Positive)	
16	GND	Ground	
17	L/R	Horizontal Display Mode Select Signal	Note (5)
18	U/D	Vertical Display Mode Select Signal	Note (5)
19	GND	Ground	
20	GND	Ground	

Note (1) Connector Part No.: STARCONN 076B20-0048RA-G4 or JAE FI-SEB20P-HFE or equivalent.

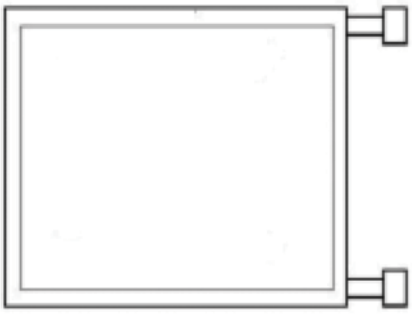
Note (2) Mating Connector Part No.: JAE-FI-SE20M, FI-S20S or equivalent.

Note (3) The first pixel is odd.

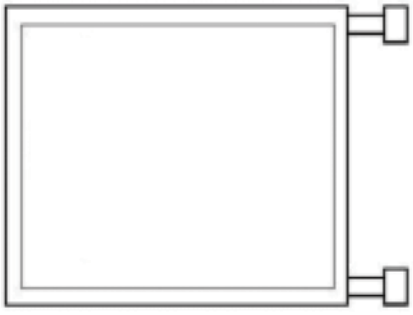
Note (4) Input signal of even and odd clock should be the same timing.

Note (5)

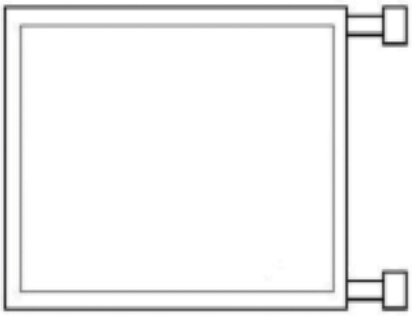
L/R=High, U/D=Low



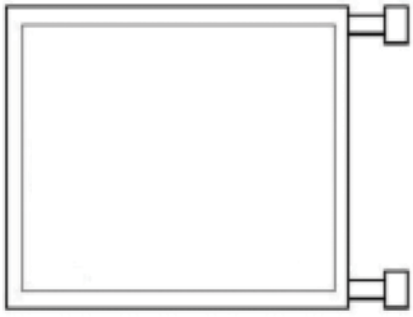
L/R=Low, U/D=Low



R/L=High, U/D=High



R/L=Low, U/D=High



6.2 Backlight Unit

Pin	Symbol	Description	Remark
1	HV	High Voltage	Pink
2	NA	NA	
3	LV	Low Voltage	White

Note (1) Connector Part No.: JST BHR-03VS-1 or equivalent

Note (2) User's connector Part No.: JST SM03(4.0)B-BHS-1-TB or equivalent

6.3 Color Data Input Assignment

The brightness of each 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
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	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
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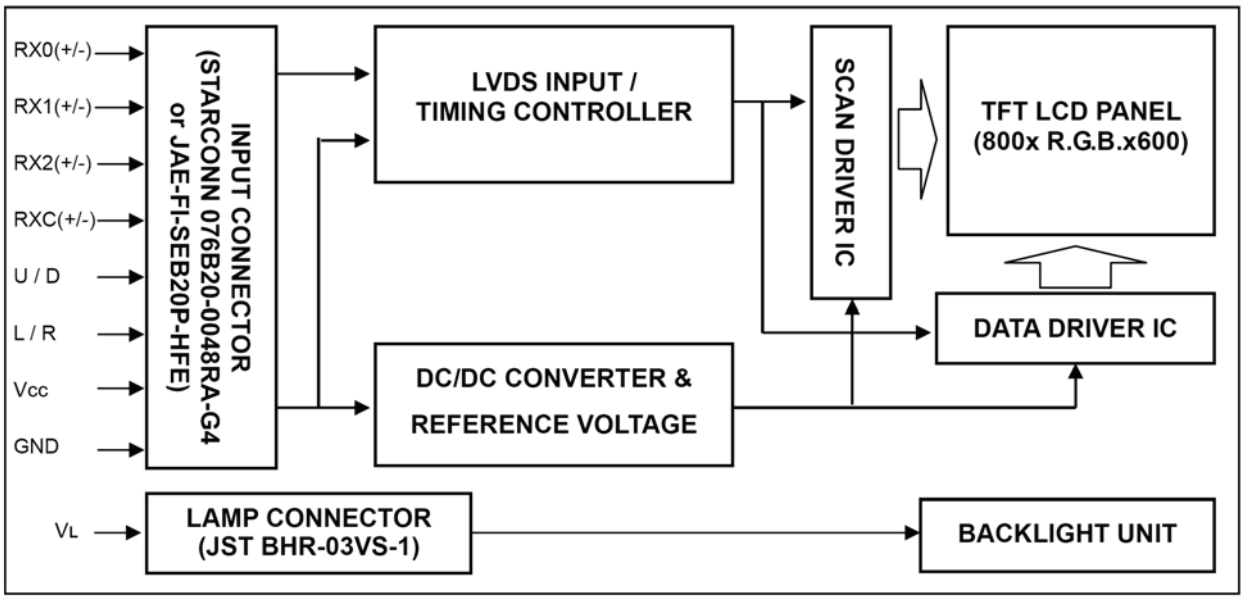
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

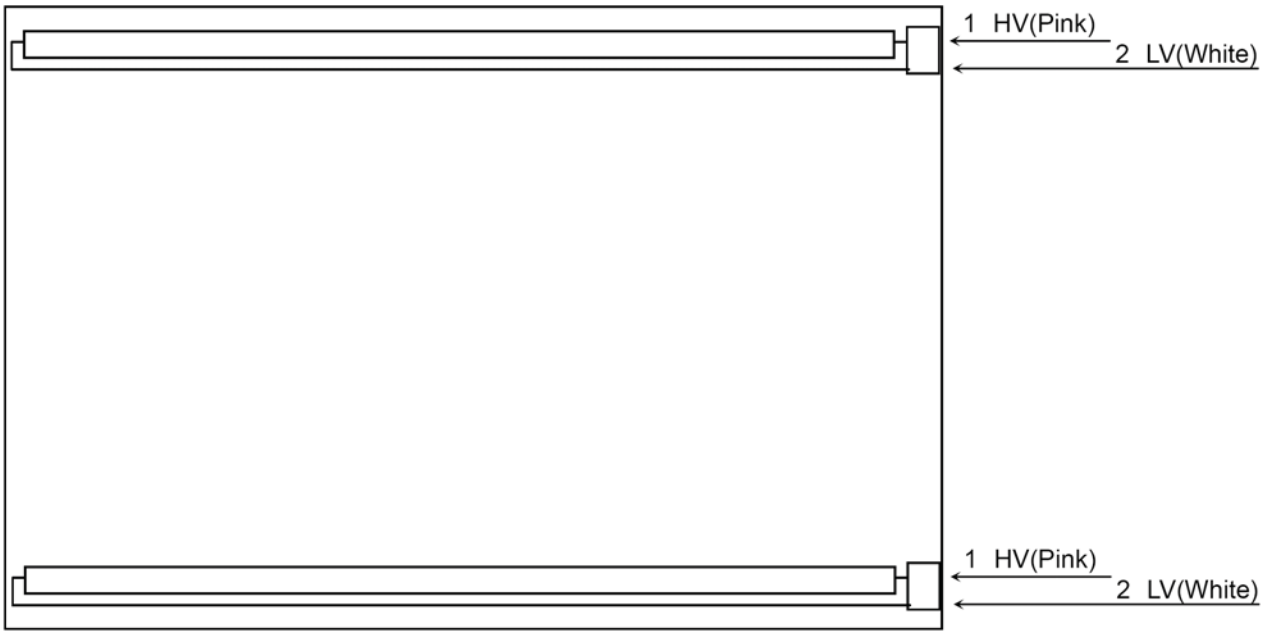
Note (1) 0: Low Level Voltage, 1: High Level Voltage

7. BLOCK DIAGRAM

7.1 TFTLCD Module



7.2 Backlight Unit



8.INTERFACE TIMING

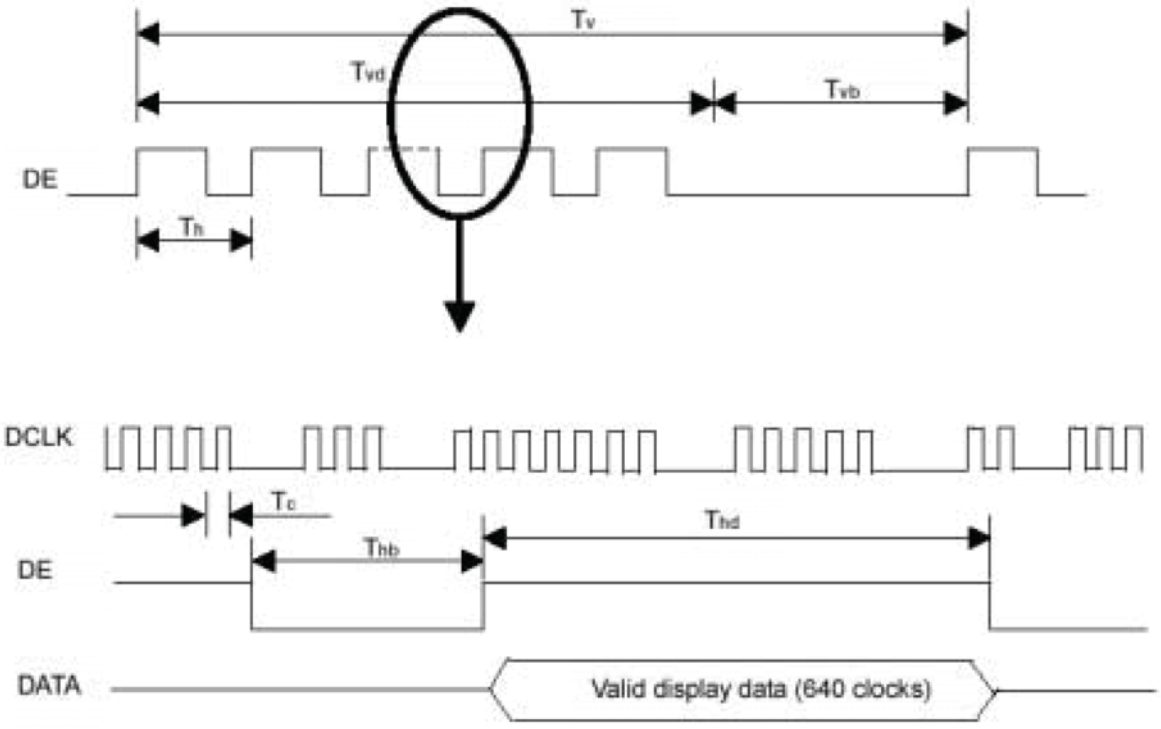
8.1 Input signal timing specifications

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	33.4	39.7	48.3	MHz	-
	Period	Tc	20.7	25.1	29.9	ns	
Vertical Active Display Term	Frame Rate	Fr	56	60	75	Hz	Tv=Tvd+Tvb
	Total	Tv	606	628	650	Th	-
	Display	Tvd	600	600	600	Th	-
	Blank	Tvb	Tv-Tvd	28	Tv-Tvd	Th	-
Horizontal Active Display Term	Total	Th	920	1056	1240	Tc	Th=Thd+Thb
	Display	Thd	800	800	800	Tc	-
	Blank	Thb	Th-Thd	256	Th-Thd	Tc	-

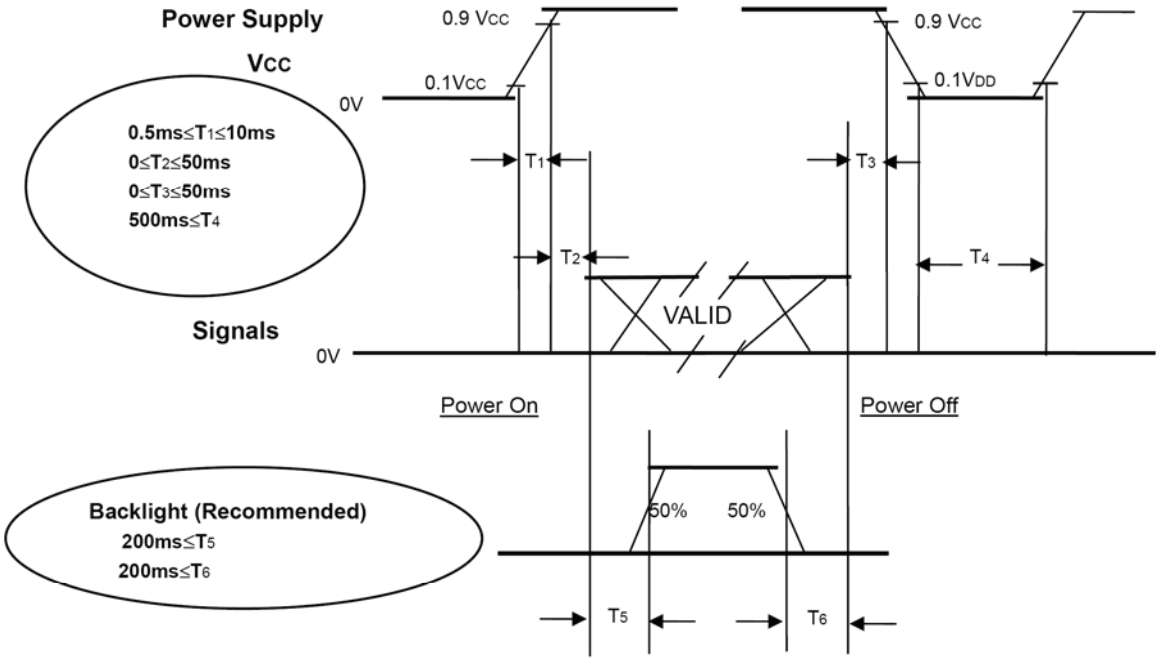
Note : (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



8.2 Power ON/OFF Sequence

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.



Power ON/OFF Sequence

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) 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.

9. HANDLING & CAUTIONS

9.1 Cautions when taking out the module

Pick the pouch only, when taking out module from a shipping package.

9.2 Cautions for handling the module

9.2.1 As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.

9.2.2 As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.

9.2.3 As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.

9.2.4 Do not pull the interface connector in or out while the LCD module is operating.

9.2.5 Put the module display side down on a flat horizontal plane.

9.2.6 Handle connectors and cables with care.

9.3 Cautions for the operation

9.3.1 When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.

9.3.2 Obey the supply voltage sequence. If wrong sequence were applied, the module would be damaged.

9.4 Cautions for the atmosphere

9.4.1 Dewdrop atmosphere should be avoided.

9.4.2 Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

9.5 Cautions for the module characteristics

9.5.1 Do not apply fixed pattern data signal to the LCD module at product aging.

9.5.2 Applying fixed pattern for a long time may cause image sticking.

9.6 Other cautions

9.6.1 Do not disassemble and/or re-assemble LCD module.

9.6.2 Do not re-adjust variable resistor or switch etc.

9.6.3 When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.

9.6.4 AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

10. OUTLINE DIMENSION