



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-1024600LHMQW-T09H</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

- ☐ Approved For Specifications  
☐ Approved For Specifications & Sample

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## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2019/3/29	-	New Release	Mantle

## 1. FEATURES

The TFT is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module is composed of a TFT LCD panel, a driving circuit , touch panel, and a back light system. This TFT LCD has a 10.1 (17:10) inch diagonally measured active display area with WSVGA(1024 x 600 pixel) resolution.

- (1) 10.1 (17:10 diagonal) inch configuration
- (2) One channel LVDS interface
- (3) 262K color by 6 bit R.G.B signal input
- (4) RoHS Compliance
- (5) Five-Wire Analog Resistive touch panel

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	Unit	Note
LCD size	10.1" (Diagonal)	inch	
Active area	222.72 (H) ×125.28 (V)	mm	
Number of pixels	1024(H) × 600(V)	pixels	
Pixel pitch	0.2715(H) × 0.2088(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262,144	colors	
Display mode	Normally white		
Dimensional outline	235.0 (Typ) ×145.8 (Typ) ×7.75(D)	mm	
Back-light	Single LED (Side-Light type)		
Surface treatment	Anti-glare		

### 3. ABSOLUTE MAX. RATINGS

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

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
LED Power Supply Voltage	V <sub>LED</sub>	-0.3	15.0	V	GND=0
Logic Supply Voltage	V <sub>DD</sub>	-0.3	5.0	V	
Operating Temperature	T <sub>OPA</sub>	-10	70	°C	
Storage Temperature	T <sub>STG</sub>	-30	80	°C	

## 4. ELECTRICAL CHARACTERISTICS

### 4.1 TFT LCD Module

Item	Symbol	Values			UNIT	Note
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	Note1
Current of power supply	IDD	-	0.3	-	A	VDD=3.3V Black pattern
Power voltage for LED driver	VLED	4.7	5	5.3	V	
LED driver current of power supply	ILED	-	600		mA	VLED=5V ADJ=100%

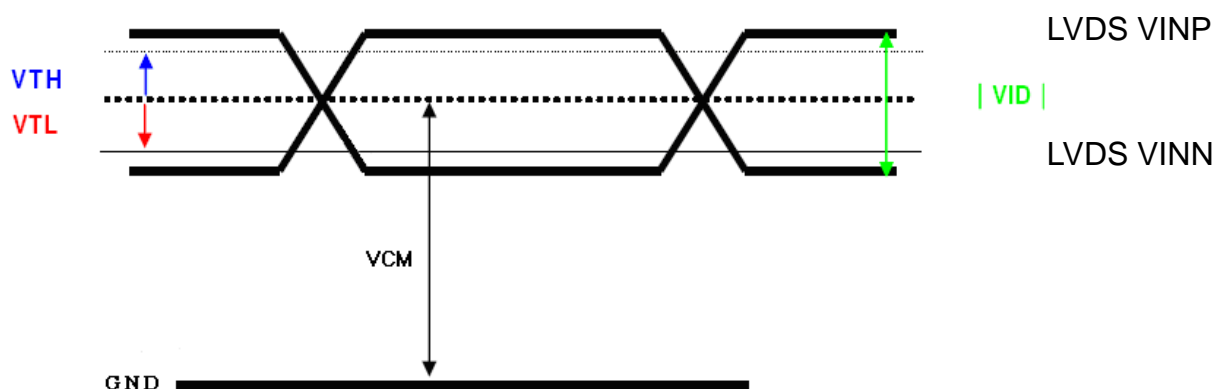
Note 1: VDD-dip condition :

when  $2.7V \leq VDD < 3.0V$  ,  $t_d \leq 10ms$ .

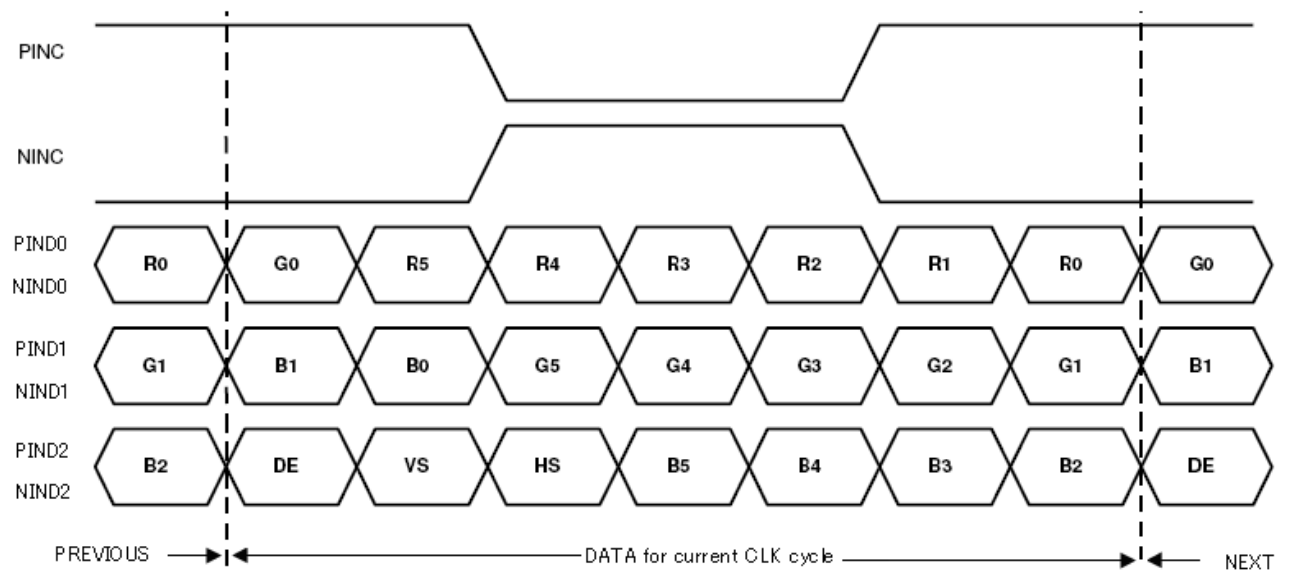
$VDD > 3.0V$  , VDD-dip condition should be same as VDD-turn-con condition.

### 4.2 Switching Characteristics of LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential Input High Threshold	VTH	--	--	100	mV	VCM=1.2V
Differential Input Low Threshold	VTL	-100	--	--	mV	
Input current	IIN	-10	--	+10	uA	
Differential input Voltage	VID	0.2	--	0.6	V	
Common Mode Voltage Offset	VCM	$\frac{ VID }{2}$	1.25	$2.4 - \frac{ VID }{2}$	V	



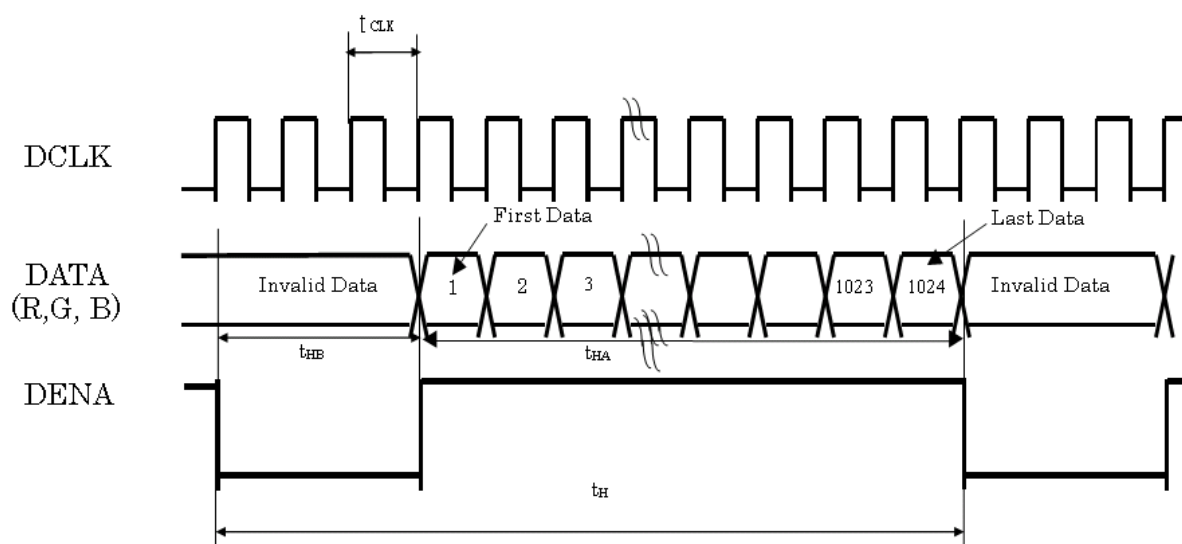
### 4.3 6-bit LVDS Input Data Mapping



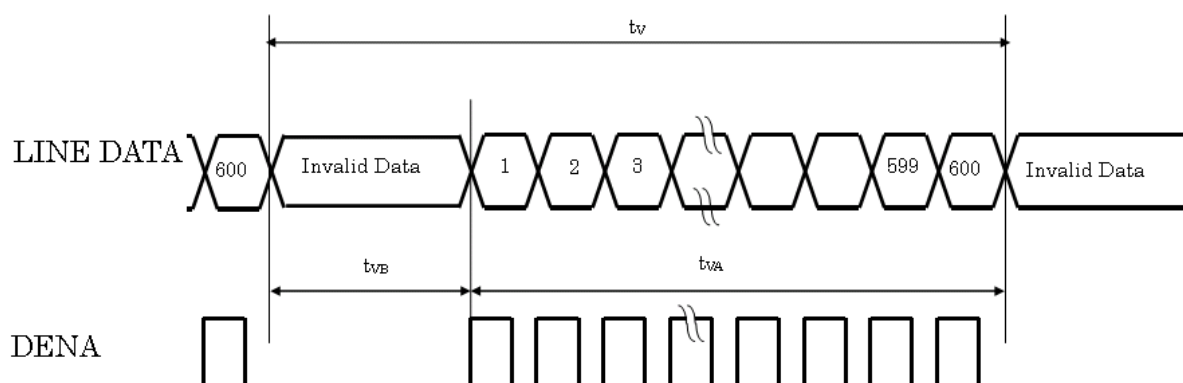
#### 4.4 Timing characteristics of input signals

Item				Symbol	Min.	Typ.	Max.	Unit
LVDS input signal sequence	Frame Rate			tclk	42.6	51.2	67.2	MHz
LCD input signal sequence (input LVDS Transmitter)	DENA	Horizontal	Horizontal total Timing	t <sub>H</sub>	1164	1344	1400	tCLK
			Horizontal effective Timing	t <sub>HA</sub>	1024			tCLK
			Horizontal Blank Time	t <sub>HB</sub>	190	320	376	tCLK
		Vertical	Vertical total Time	t <sub>V</sub>	610	635	800	t <sub>H</sub>
			Vertical effective Time	t <sub>VA</sub>	600			t <sub>H</sub>
			Vertical Blank Time	t <sub>VB</sub>	15	35	200	t <sub>H</sub>

##### Horizontal timing sequence



##### Vertical timing sequence



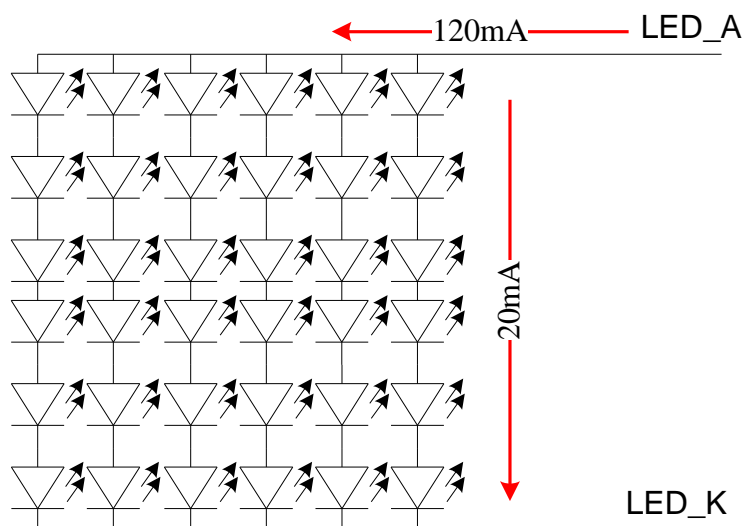
#### 4.5 Backlight Driving Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
LED Driver voltage	VLED	4.7	5	5.3	V	
Power Supply Current For LED Driver	ILED	-	600	-	mA	VLED=5V VADJ=3.3V (duty 100%)
ADJ Input Voltage	V <sub>ADJ</sub>	-	3.3	VLED	V	duty=100% Note(3)
LED voltage	VAK	--	19.2	--	V	I <sub>L</sub> =120mA Ta=25°C
LED current	I <sub>L</sub>	--	120	--	mA	Ta=25°C
		--	100	--	mA	Ta=60°C
LED Life Time	-	--	20K	--	Hour	Note (2)

Note (1) The constant current source is needed for white LED back-light driving.

When LCM is operated over 60 deg.C ambient temperature, the I<sub>L</sub> of the LED back-light should be adjusted to 100mA max

There are 6 Groups LED shown as below , V<sub>LED A-LEDK</sub>=10V ,Ta=25°C





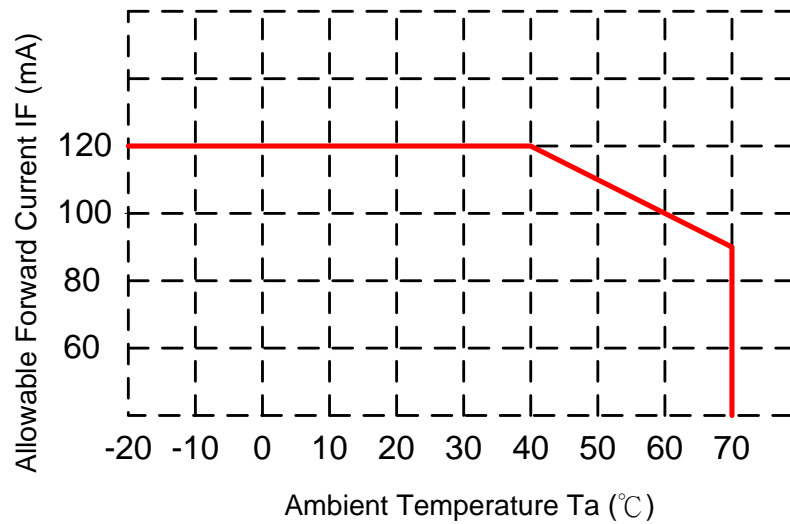
Note2 : Condition:  $T_a=25^{\circ}\text{C}$ , continuous lighting

Life time is estimated data.

Definitions of failure:

1. LCM brightness becomes half of the minimum value.
2. LED doesn't light normally.

When LCM is operated over  $40^{\circ}\text{C}$  ambient temperature, the LED should be follow :



## 5. OPTICAL SPECIFICATION

### 5.1 Optical specification

Item	Symbol	Condition	Values			Unit	Note
			Min.	Typ.	Max.		
Viewing angle	$\theta L$	$(CR \geq 10)$	60	70	--	degree	Note1 Note2
	$\theta R$		60	70	--		
	$\theta U$		60	70	--		
	$\theta D$		40	50	--		
Response time	$T_R$	Normal $\theta = \Phi = 0^\circ$	--	4	8	msec	Note3
	$T_F$		--	12	24	msec	
Contrast ratio	CR		400	500	--	--	Note2
Color chromaticity	WX		0.263	0.313	0.363	--	Note1 Note4
	WY		0.279	0.329	0.379	--	
	RX		0.555	0.605	0.655	--	
	RY		0.277	0.327	0.377	--	
	GX		0.236	0.286	0.336	--	
	GY		0.476	0.526	0.576	--	
	BX		0.100	0.150	0.200	--	
	BY		0.095	0.145	0.195	--	
Luminance	L		160	200	--	cd/m <sup>2</sup>	Note4
Luminance uniformity	YU		70	--	--	%	Note5

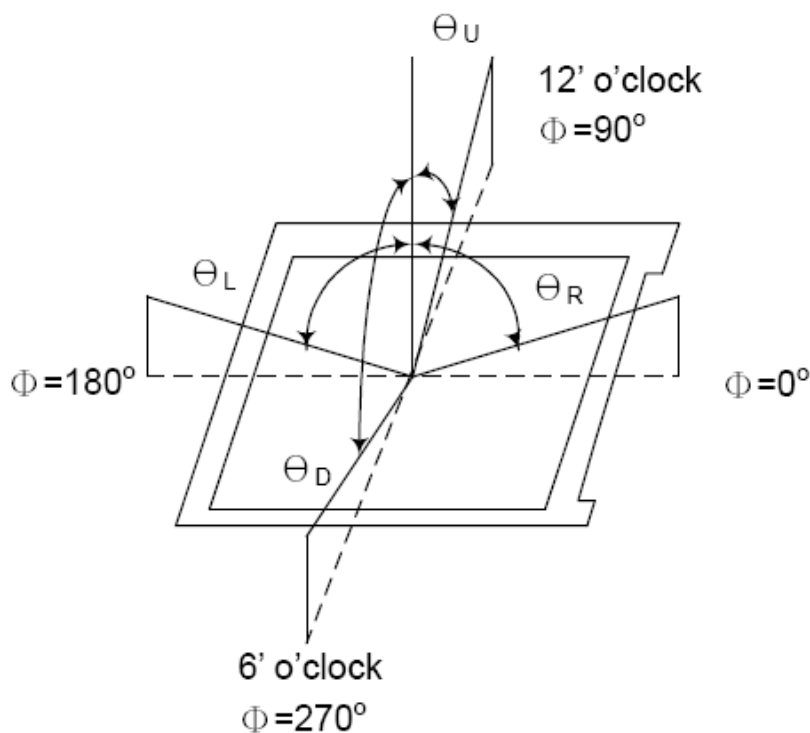
### 5.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature :  $25 \pm 2^\circ\text{C}$
- 15min. warm-up time

## 5.2 Measuring Equipment

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7 of view : 1° / Height : 120mm.)

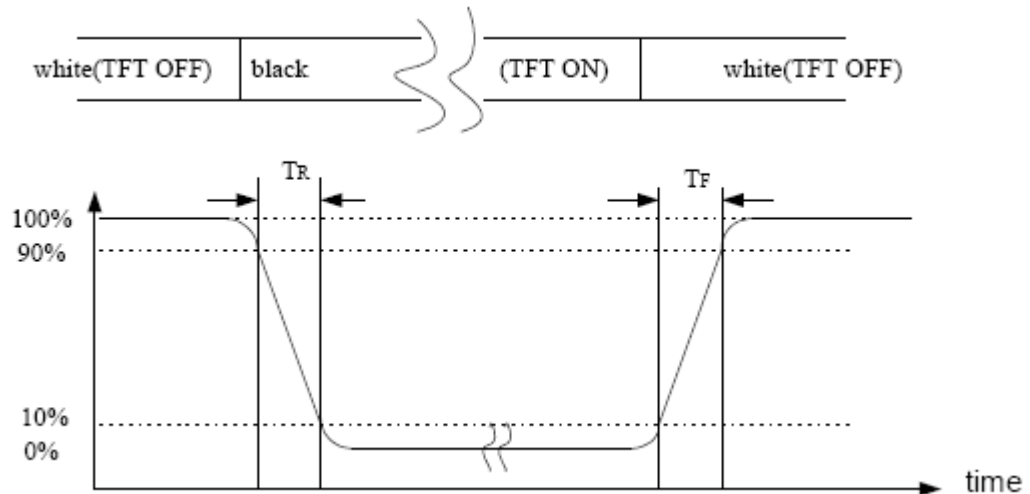
Note 1 : Definition of viewing angle range



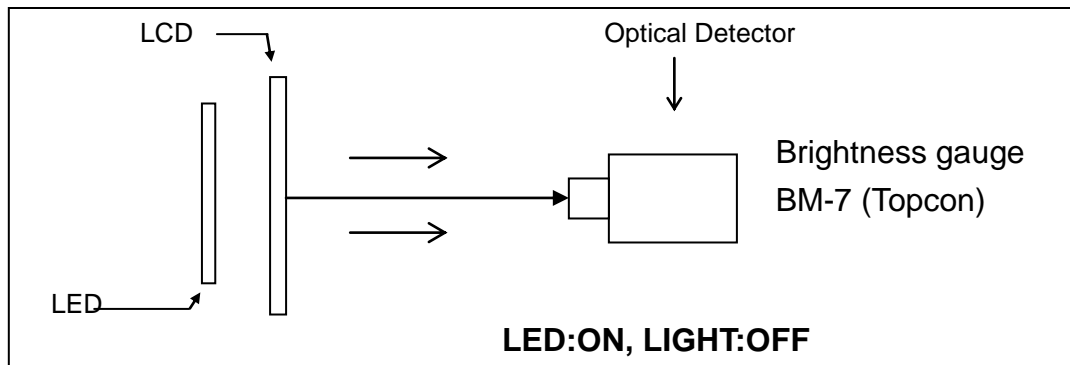
Note 2 : Definition of Contrast Ratio (CR) :  
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

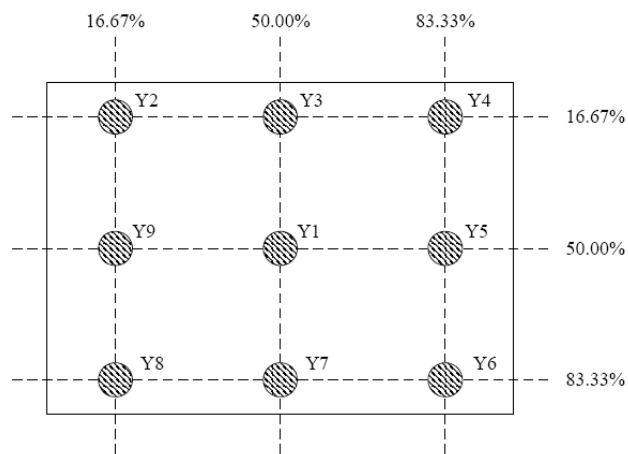
Note 3 : Definition of Response time : Sum of  $T_R$  and  $T_F$



Note 4 : Definition of optical measurement setup



Note 5 : Definition of brightness uniformity



(Min Luminance of 9 points)

$$\text{Luminance uniformity} = \frac{\text{Min Luminance of 9 points}}{\text{Max Luminance of 9 points}} \times 100\%$$

Note 6 : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction)

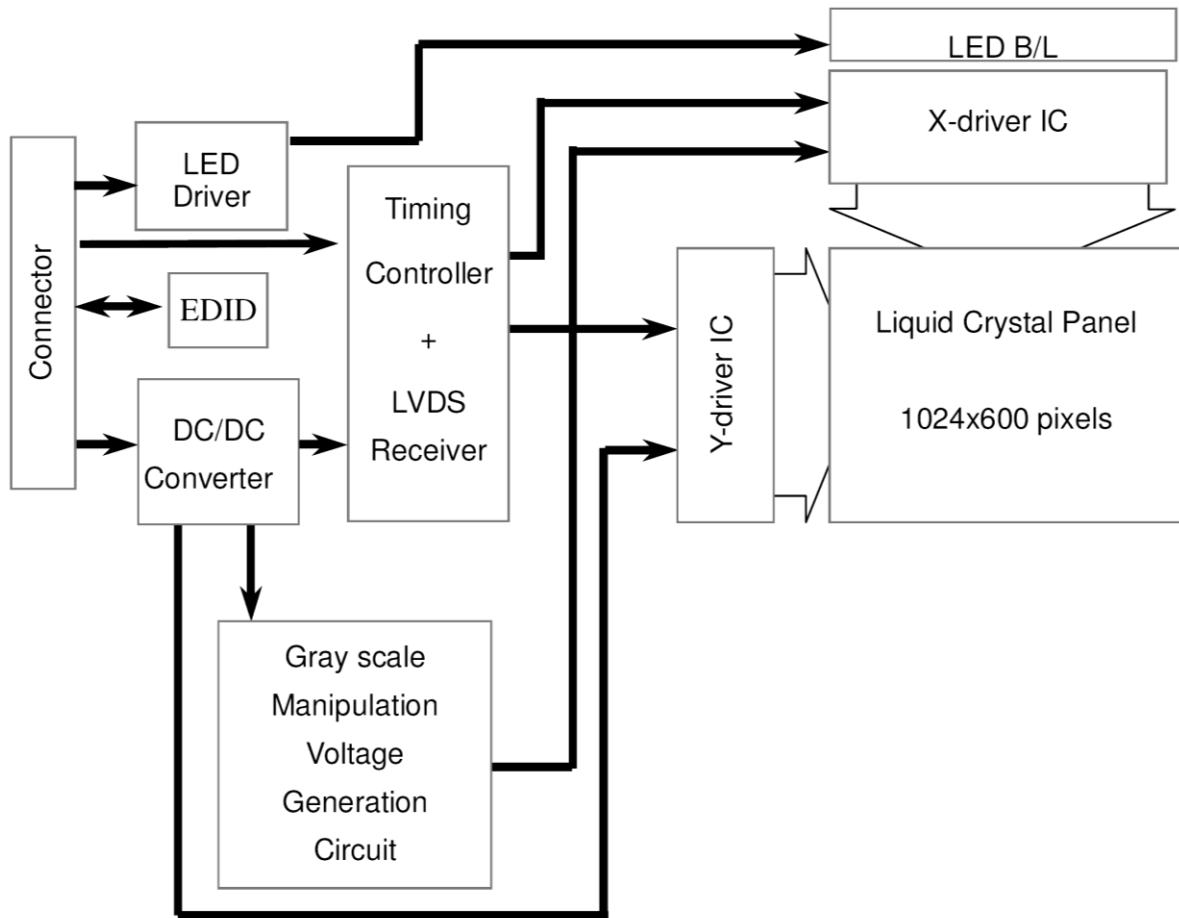
Note 7 : Condition:  $T_a=25^{\circ}\text{C}$ , Life time is estimated data.

Definitions of failure:

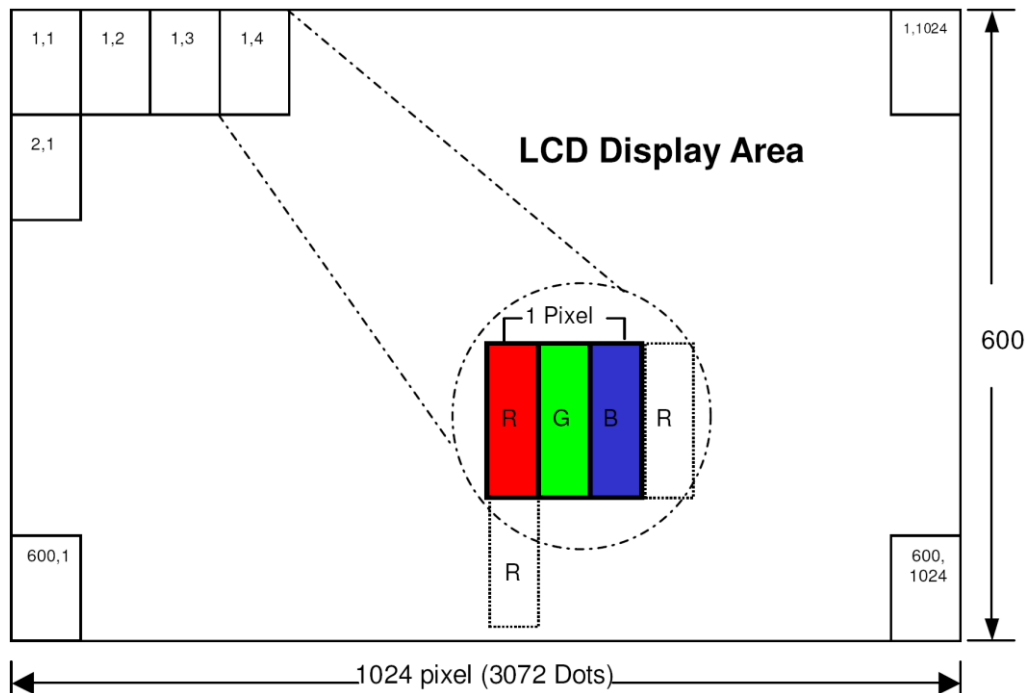
- i. LCM brightness becomes half of the minimum value.
- ii. LED doesn't light normally.

## 6. BLOCK DIAGRAM

### 6.1 TFTLCD Module



### 6.2 Pixel format



## 7. TOUCH PANEL SPECIFICATION

Item [項目]		Specifications [規格]
(1)	Loop Resistance [迴路阻抗]	X:20~500Ω, Y:20~500Ω (See Figure 6-1)
(2)	Linearity [線性]	$X \leq 1.5\%$ , $Y \leq 1.5\%$ (See Figure 10-2)
(3)	Chattering [作動時間]	$\leq 15\text{ms}$
(4)	Insulation [絕緣阻抗]	$\geq 20\text{M}\Omega/25\text{V}(\text{DC})$
(5)	Endurance [耐電壓]	No acting damage at DC50V/60sec.

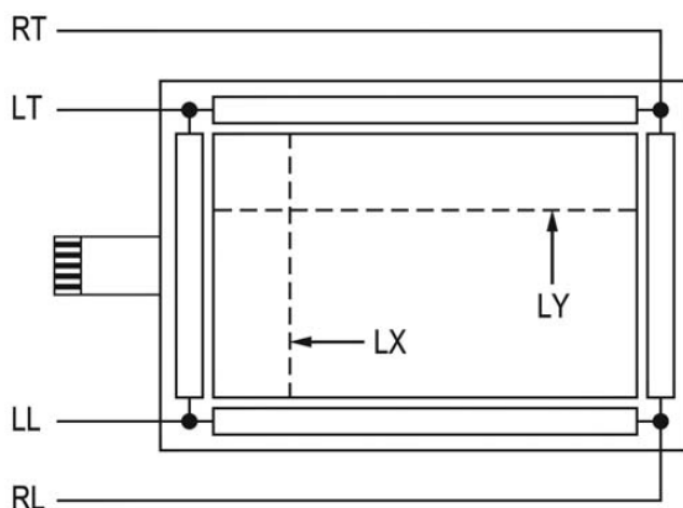


Figure 6-1

Loop Resistance X = short RT and RL , short LT and LL , measure the resistance between RT and LT  
 Loop Resistance Y = short RT and LT , short RL and LL ,measure the resistance between RT and RL

## 8.INTERFACE

### 7.1 Electrical Interface Connection

CN1(Input signal): CSTAR DS100-430-H23 (equivalent JAE FI-XB30SSRL-HF16)

Pin No.	Symbol	Description	Note
1	GND	Ground	
2	VDD	3.3V Power	
3	VDD	3.3V Power	
4	V_EDID	3.3V Power for EDID	
5	ADJ	Adjust for LED brightness	Note*
6	CLK_EDID	EDID Clock Input	
7	DATA_EDID	EDID Data Input	
8	RXIN0-	LVDS Signal - channel0-	
9	RXIN0+	LVDS Signal+ channel0+	
10	GND	Ground	
11	RXIN1-	Data Input channel1-	
12	RXIN1+	Data Input channel1+	
13	GND	Ground	
14	RXIN2-	Data Input channel2-	
15	RXIN2+	Data Input channel2+	
16	GND	Ground	
17	RXCLKIN-	Data Input CLK-	
18	RXCLKIN+	Data Input CLK+	
19	GND	Ground	
20	NC	No connection	
21	NC	No connection	
22	GND	Ground	
23	GND	Ground	
24	VLED	VLED Power +5V	



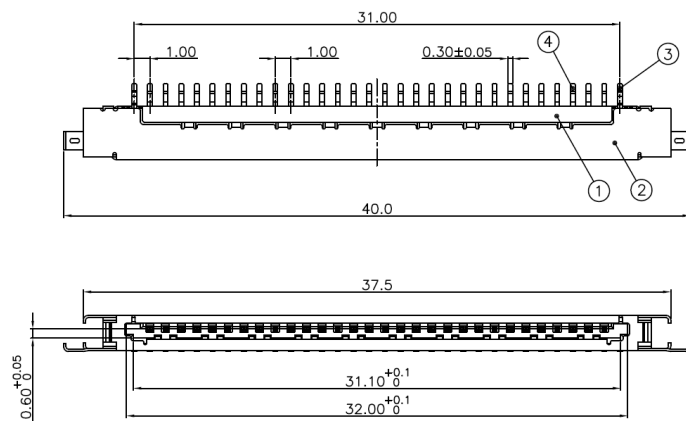
25	VLED	VLED Power +5V	
26	VLED	VLED Power +5V	
27	NC	No connection	
28	NC	No connection	
29	NC	No connection	
30	NC	No connection	

**Note\* : The brightness of LCD panel could be changed by adjusting ADJ**

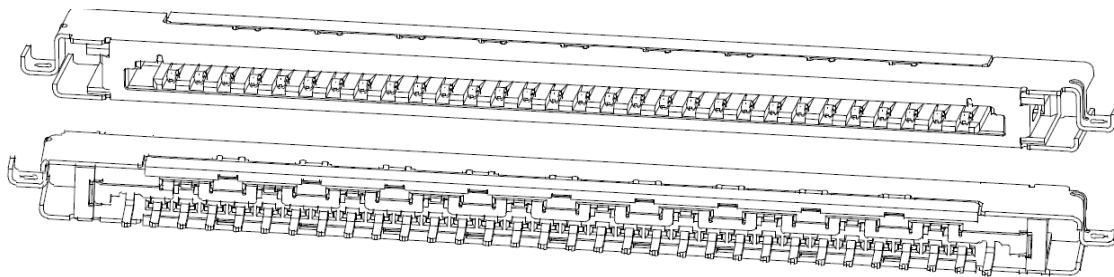
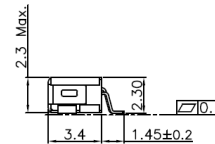
(1) ADJ is PWM signal input. It is for brightness control.

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
ADJ signal frequency	f <sub>PWM</sub>	5	--	100	KHz
ADJ signal logic level High	VIH	1.2V	--	VLED (5.0V)	V
ADJ signal logic level Low	VIL	0	--	0.4	V

### (3) LVDS Connector : CSTAR DS100-430-H23

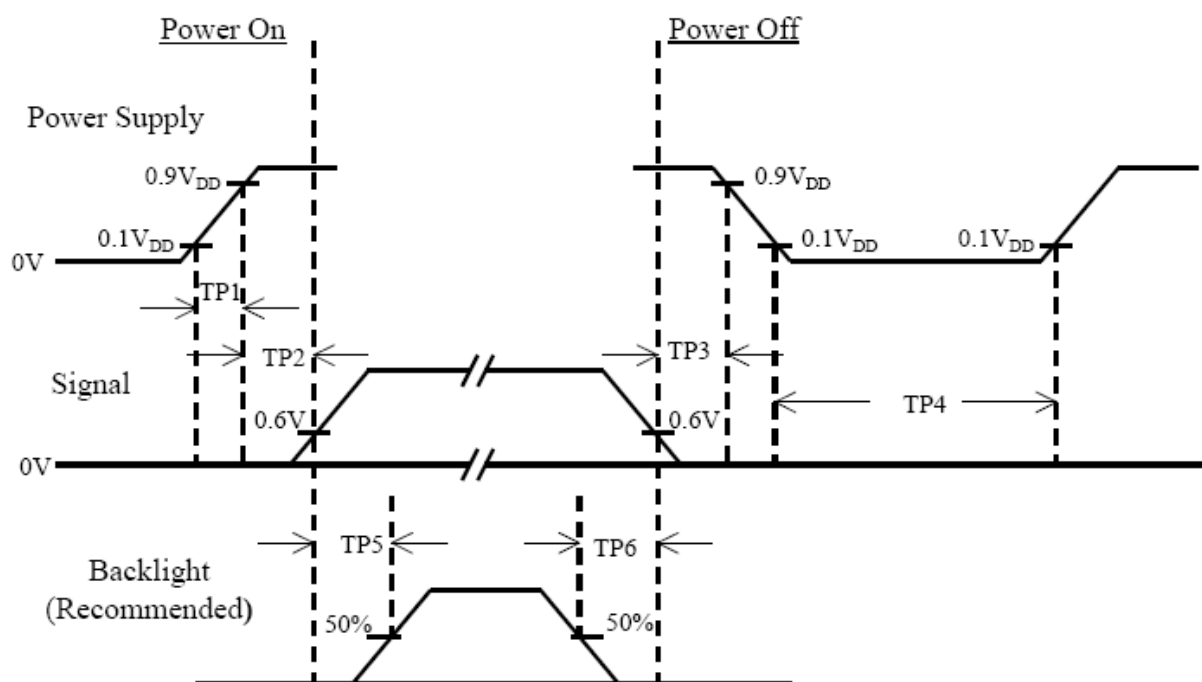


NOTES:  
 1.INSULATOR:THERMOPLASTIC;COLOR:BEIGE  
 2.CONTACT:COPPER ALLOY t=0.15mm  
 PLATING:CONTACT AREA 5u"9GOLD,  
 SOLDER AREA 80~120u" TIN (LEAD FREE),  
 OVERALL WITH 50u"NICKEL UNDER PLATED.  
 3.SHELL: STAINLESS t=0.15mm  
 PLATING:SOLDER AREA PLATED WITH GOLD FLASH  
 4.GROUND: COPPER ALLOY t=0.15mm  
 PLATING:TIN(LEAD FREE).  
 ELECTRICAL:  
 VOLTAGE RATING:200V AC(RMS)/DC  
 CURRENT RATING:1A AC(RMS)/DC  
 CONTACT RESISTANCE:40mΩ Max.  
 INSULATION RESISTANCE:100MΩ Min.  
 DIELECTRIC WITHSTANDING VOLTAGE:500V AC(RMS)  
 OPERTING TEMPERATURE:-40°C~+80°C



DS100-430-H23  
 BOTTOM MOUNT

## 9. Power On/Off Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	

Note :

- (1) The supply voltage of the external system for the module input should be the same as the definition of VDD.
- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.
- (4) TP4 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.

## 10. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-10±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-20°C (30min) ~ 70°C (30min) 100 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Note 3 : The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4 : All the reliability tests should be done without protective film on the module.

## **11. HANDLING & CAUTIONS**

### **11.1 Cautions when taking out the module**

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

### **11.2 Cautions for handling the module**

11.2.1 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.

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

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

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

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

11.2.6 Handle connectors and cables with care.

### **11.3 Cautions for the operation**

11.3.1 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.

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

### **11.4 Cautions for the atmosphere**

11.4.1 Dewdrop atmosphere should be avoided.

11.4.2 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.

### **11.5 Cautions for the module characteristics**

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

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

### **11.6 Other cautions**

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

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

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

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

11.6.5 Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

## 12. OUTLINE DIMENSION

