

Rocktech Displays Limited



LCD Module Specification

Module P/N: RK101II01D-CT

Version: 3.0

Description : 10.1 inch TFT 1280*800 Pixels with LED
Backlight and capacitive touch panel

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Revision History

Date	Rev.	Page	Description
2015-12-31	1.0	All	First issue
2017-04-08	2.0	7,8,18	Modify Backlight luminance
2018-06-20	3.0	18	Modify PCB Connector

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1. General Features

Item	Spec	Remark
Display Mode	Normally Black transmissive	
Viewing Direction	Free	IPS Panel
Input Signals	LVDS Signal	
Outside Dimensions	229.46(W) x149.1(H) x4.5(D)	With CTP
Active Area	216.96mm(W)×135.60mm(H)	
Number of Pixels	1280(RGB)×800	
Dot Pitch	0.0565mm(H) × 0.1695mm(W)	
Pixel Arrangement	RGB Vertical stripes	
CTP IC	GT928	

2. Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	VDD	-0.3	3.9	V	
	AVDD	-0.3	14	V	
	V _{GH}	-0.3	42.0	V	
	V _{GL}	-19	0.3	V	
	V _{GH} -V _{GL}	12	40.0	V	
Operation Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

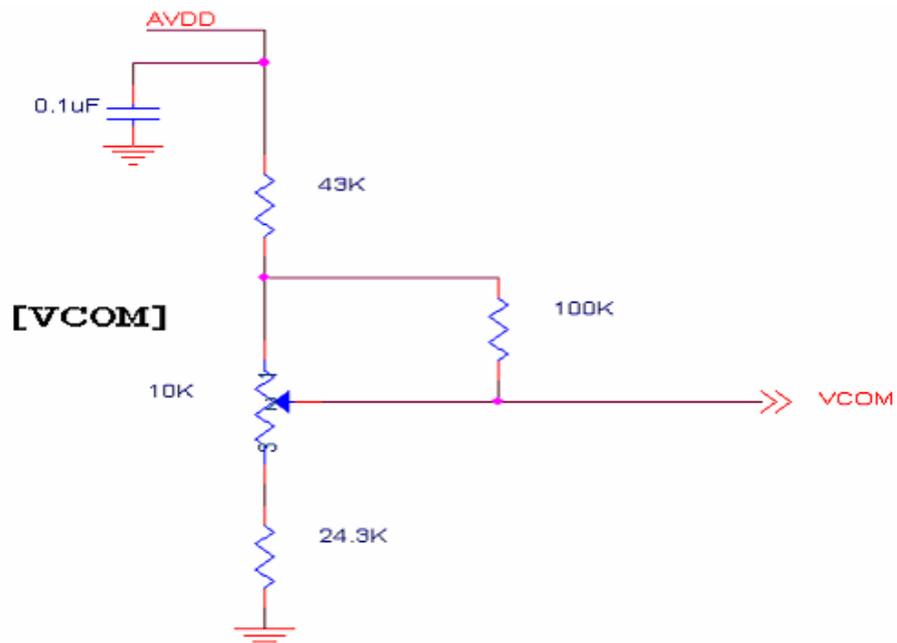
3. Electrical Specification

3.1 Driving TFT LCD Panel

(Note 1)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	2.3	2.5	2.7	V	Note 2
	AVDD	8.0	8.2	8.4	V	
	V _{GH}	21.7	22	22.3	V	
	V _{GL}	-7.3	-7	-6.7	V	
Input signal voltage	VCOM	3.0	3.3	3.6	V	Note 4
Input logic high voltage	V _{IH}	0.8 VDD	-	VDD	V	Note 3
Input logic low voltage	V _{IL}	0	-	0.2 DV _{DD}	V	

- Note 1: Be sure to apply VDD and V_{GL} to the LCD first, and then apply V_{GH}.
 Note 2: VDD setting should match the signals output voltage (refer to Note 3) of customer's system board.
 Note 4: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR.



3.2 Backlight Driving Conditions

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V _F	9.3	9.6	9.9	V	Note 1
Backlight driving current	I _F	240	260	280	mA	
Backlight Power Consumption	W _{BL}	-	2496	-	mW	
Life Time	-	-	30,000	-		Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and I_L =200mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and I_L =200mA. The LED lifetime could be decreased if operating I_L is larger than 200mA.

3.3 Current Consumption

Item	Sym.	Min	Typ.	Max	Unit	Note
Current for Driver	I _{GH}	-	705	750	uA	V _{GH} =22V
	I _{GL}	-	705	750	uA	V _{GL} =-7V
	I _{VDD}	-	95	120	mA	DVDD=2.5V
	I _{AVDD}	-	45	70	mA	AVDD=8.2V

4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1) Contrast Ratio	C/R	600	800	-		FIG.1
2) Module Luminance	L	-	280	-	cd/m ²	After CTP
3) Response time	Tr+Tf	-	25	-	ms	FIG.2
4) Viewing Angle	θ_T	75	85	-	Degree	FIG.3
	θ_B	75	85	-		
	θ_L	75	85	-		
	θ_R	75	85	-		
5) Chromaticity	Wx	0.26	0.31	0.36		
	Wy	0.28	0.33	0.38		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

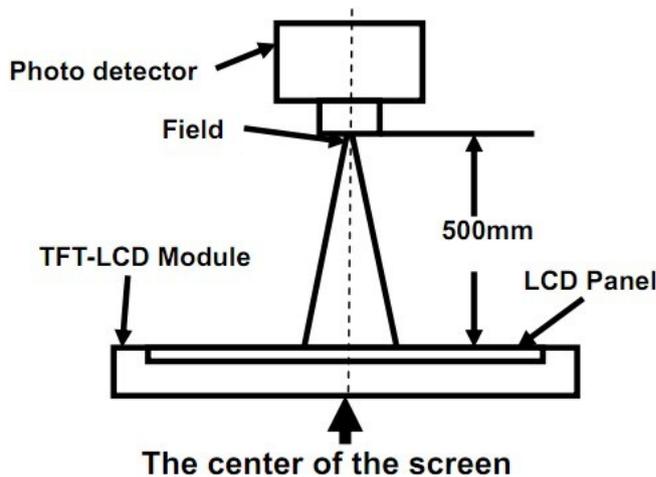
◆ Measurement System

Notes:

1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$
2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.
3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 2.
4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

FIG. 1 Optical Characteristic Measurement Equipment and Method



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

FIG. 2 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

Response Time = Rising Time(T_r) + Falling Time(T_f)

- Rising Time(T_r) : Full White 90% → Full White 10% Transmittance.
- Falling Time(T_f) : Full White 10% → Full White 90% Transmittance.

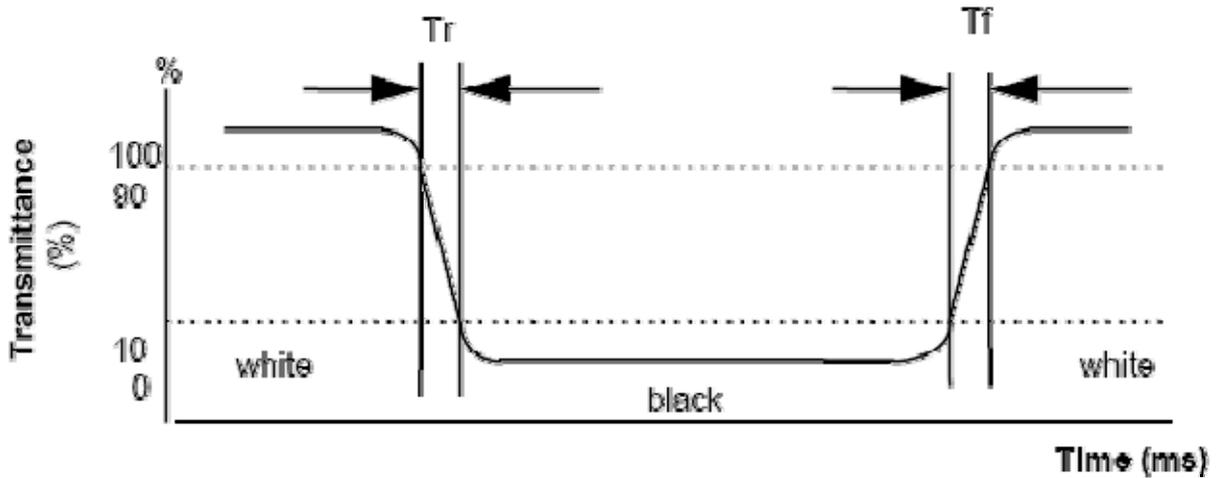
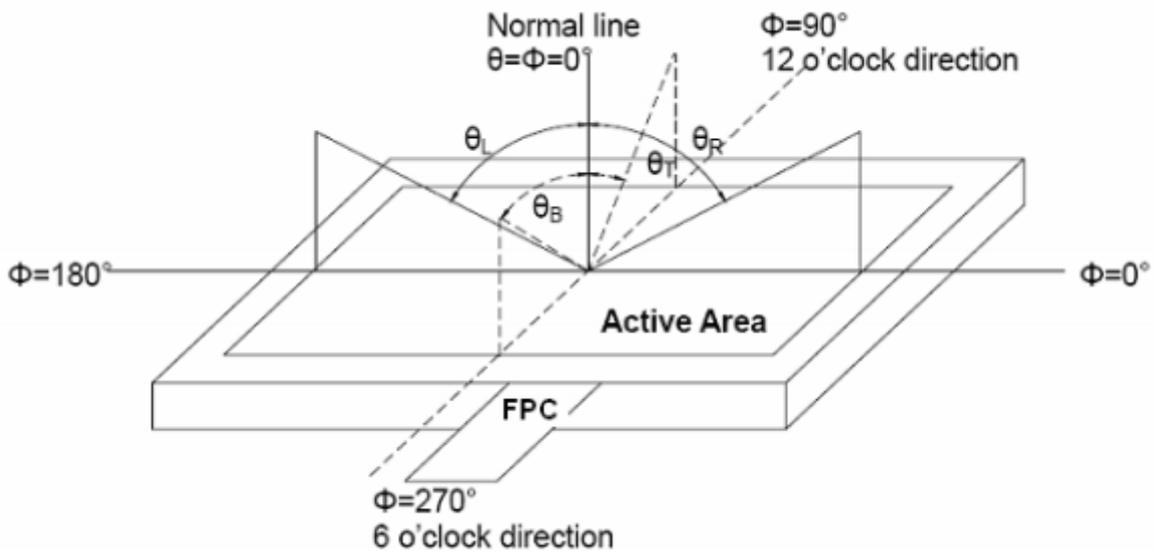
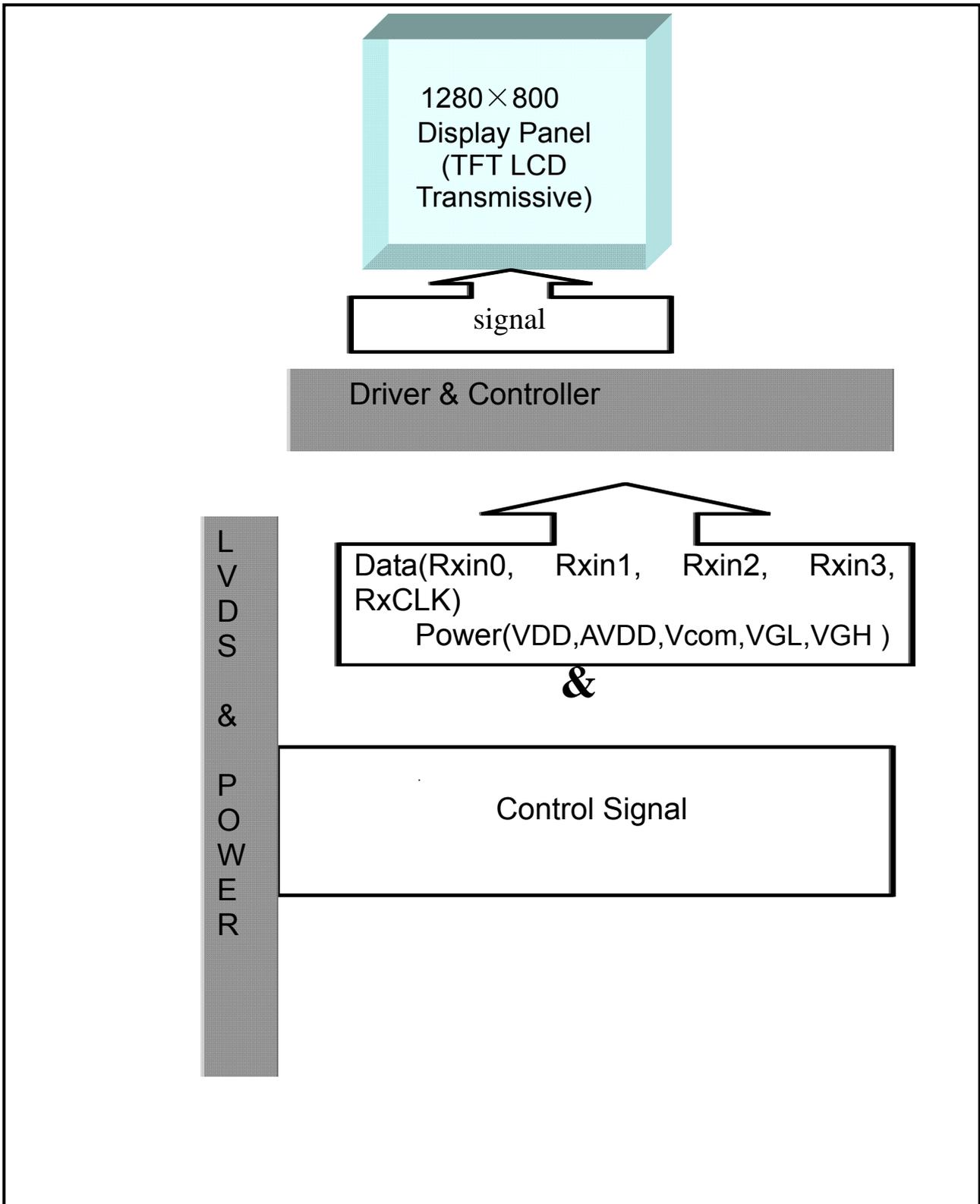


FIG. 3 The definition of Viewing Angle

Use Fig. 1(Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



5. Block Diagram



6.Pin Description

6.1 LCD Pin interface

A 40pin connector is used for the module electronics interface. The model used 196479-40041-3 manufactured by P2 connector.

Item	Terminal	I/O	Functions	
1	VCOM	P	Common Voltage	
2	VDD	P	Power Supply	
3	VDD	P	Power Supply	
4	NC	-	No connection	
5	NC	-	No connection	
6	NC	-	No connection	
7	GND	P	Ground	
8	Rxin0-	I	-LVDS Differential Data Input	R0-R5, G0
9	Rxin0+	I	+LVDS Differential Data Input	
10	GND	P	Ground	
11	Rxin1-	I	-LVDS Differential Data Input	G1~G5, B0,B1
12	Rxin1+	I	+LVDS Differential Data Input	
13	GND	P	Ground	
14	Rxin2-	I	-LVDS Differential Data Input	B2-B5,HS,VS, DE
15	Rxin2+	I	+LVDS Differential Data Input	
16	GND	P	Ground	
17	RxCLK-	I	-LVDS Differential Data Input	LVDS CLK
18	RxCLK+	I	+LVDS Differential Data Input	
19	GND	P	Ground	
20	Rxin3-	I	-LVDS Differential Data Input	R6, R7, G6, G7, B6, B7
21	Rxin3+	I	+LVDS Differential Data Input	
22	GND	P	Ground	
23	NC	-	No connection	
24	NC	-	No connection	
25	GND	P	Ground	
26	NC	-	No connection	
27	LED_P WM	O	CABC controller signal output for backlight	Note2
28	NC	-	No connection	

29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	NC	-	No connection	
34	NC	-	No connection	
35	VGL	P	Gate OFF Voltage	
36	NC	-	No connection	
37	CABC_EN	I	CABC Enable Input	Note1
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power

Note1: The setting of CABC function are as follows.

Pin	Enable	Disable
CABC_EN	High Voltage	Low Voltage or Open

Note2: LED_PWM is used to adjust backlight brightness.

6.2 CTP Pin interface

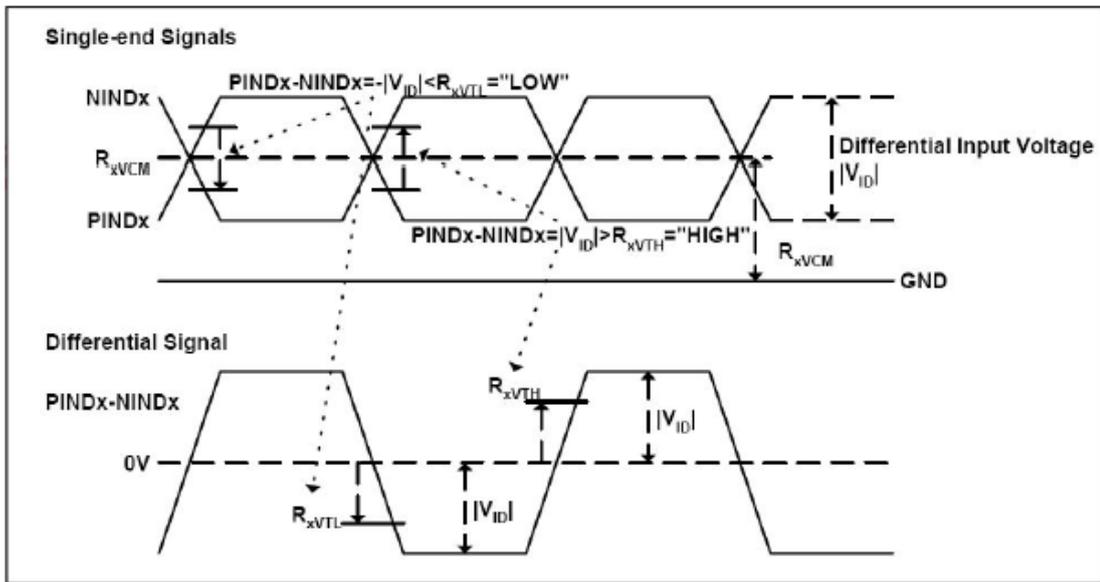
Pin	Symbol	Description
1	SDA	I2C data
2	SCL	I2C clock
3	Reset	Reset
4	INT	Interrupt
5	VDD	Working voltage 2.8V~3.3V
6	GND	GND

CTP IC driver source code will be offered separately.

7. Timing Characteristics

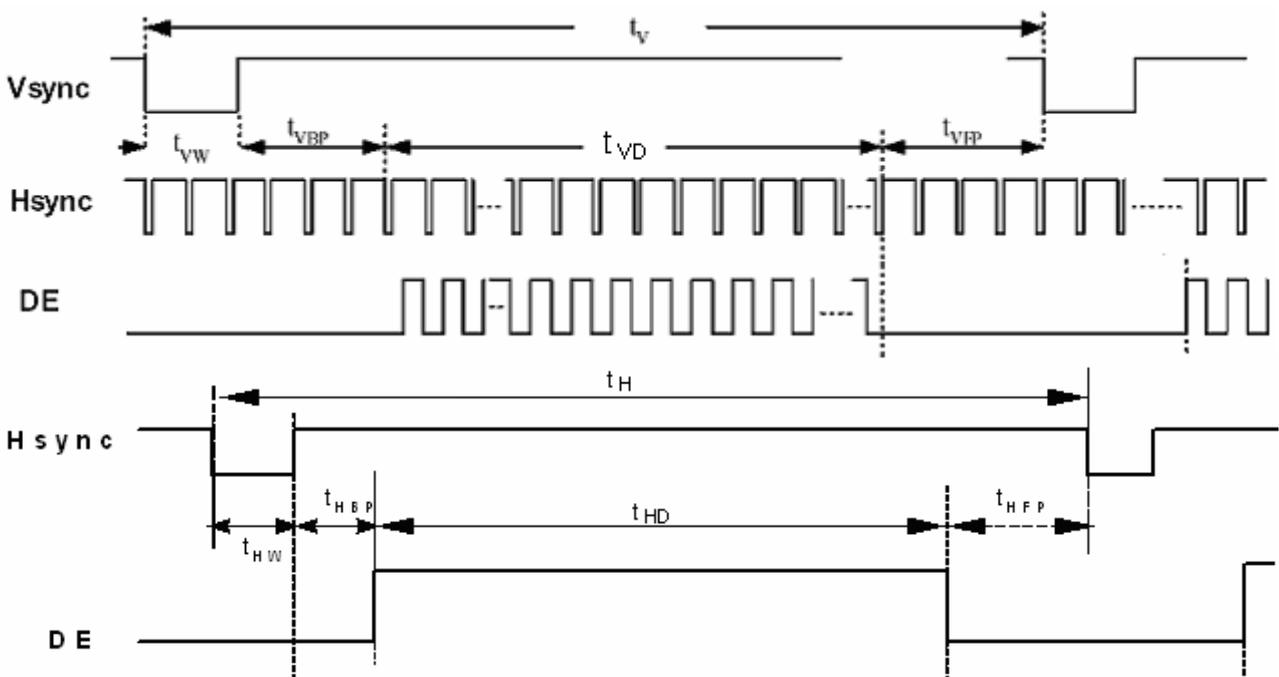
7.1 AC Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	$R_{xVCM}=1.2V$
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
LVDS Differential input common mode voltage	R_{xVCM}	0.7	-	1.6	V	
LVDS Differential voltage	$ V_{ID} $	100	-	600	mV	

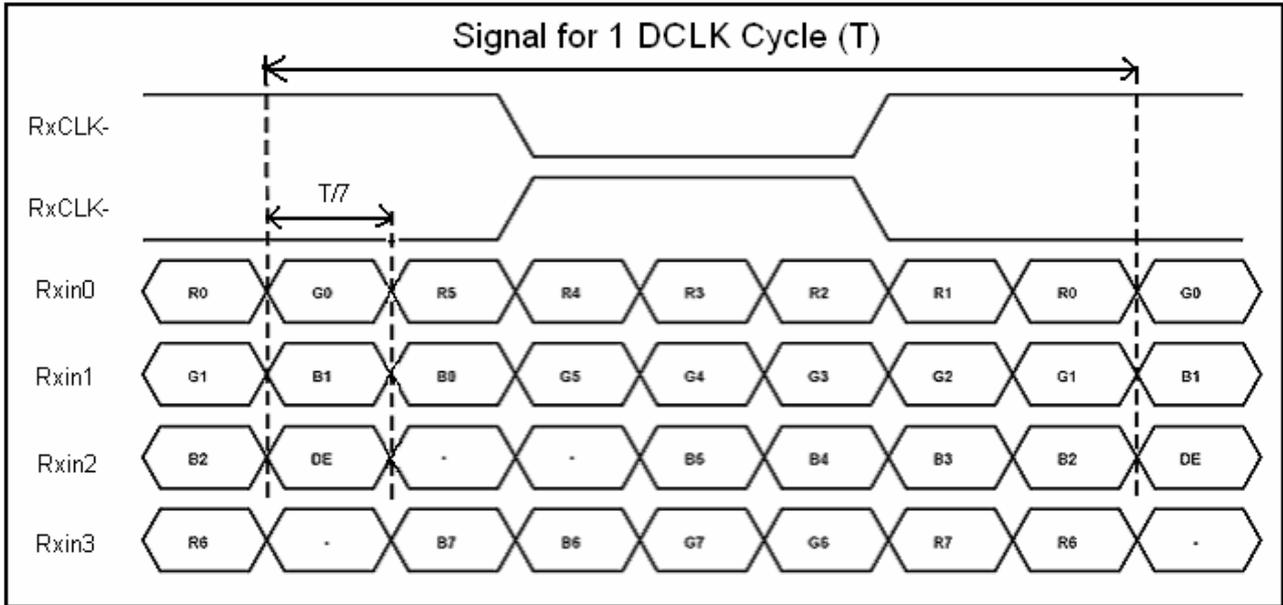


7.2 Timing Table

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	1/Tc	(68.9)	71.1	(73.4)	MHz	Frame rate =60Hz
Horizontal display area	t _{HD}	1280			Tc	
HS period time	t _H	(1410)	1440	(1470)	Tc	
HS Width +Back Porch +Front Porch	t _{HW} + t _{HBP} +t _{HFP}	(60)	160	(190)	Tc	
Vertical display area	t _{VD}	800			t _H	
VS period time	t _V	(815)	823	(833)	t _H	
VS Width +Back Porch +Front Porch	t _{VW} + t _{VBP} +t _{VFP}	(15)	23	(33)	t _H	

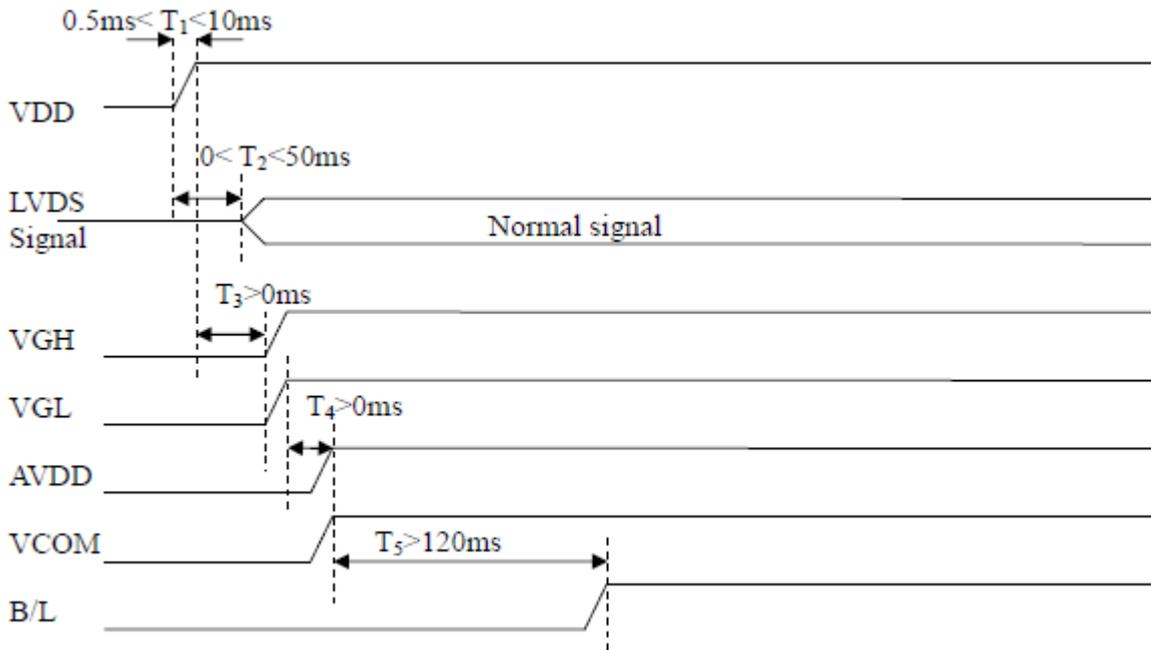


7.3 LVDS Data Input Format

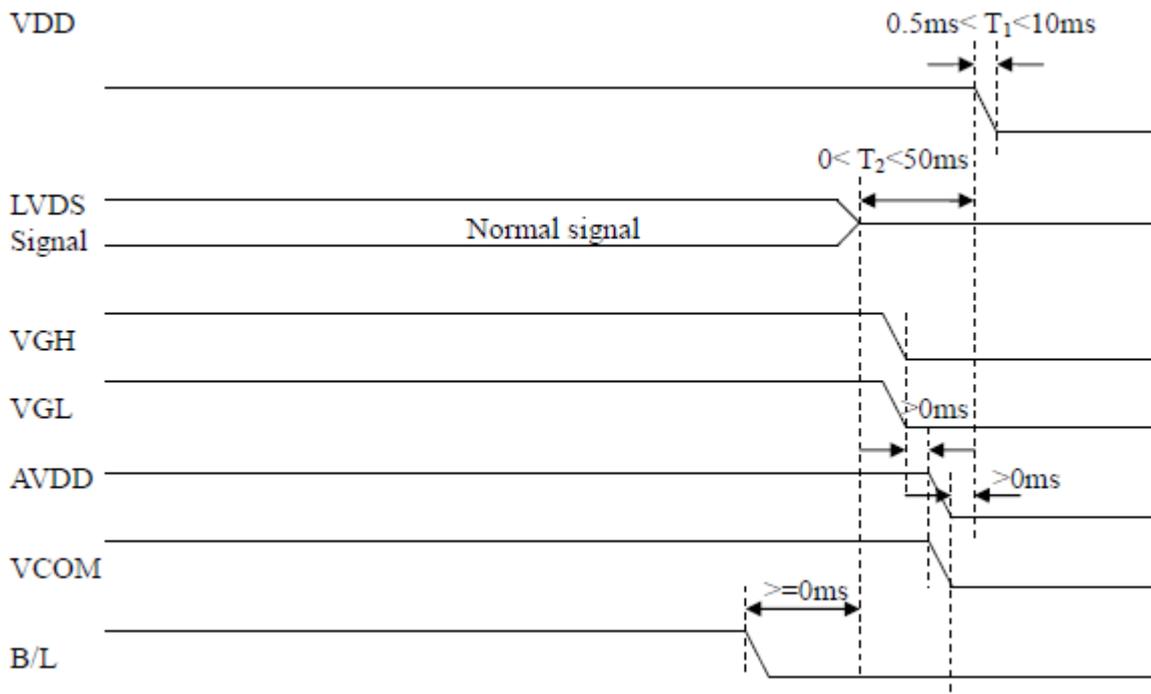


7.4 Power Sequence

A. Power On



B. Power Off



9. Reliability and Inspection Standard

No.	Test Item	Test Conditions	Remark	
1	High Temperature	Storage	80°C, 120Hr	Note
		Operation	70°C, 120Hr	Note
2	Low Temperature	Storage	-30°C, 120Hr	Note
		Operation	-20°C, 120Hr	
3	High Temperature and High Humidity	40°C, 90%RH, 120Hr	Note	
4	Peeling Off (Storage)	≥500gf/cm	Note	
5	FPC Bending Test	≥6,000 times, 2/sec	Note	
6	Vibration Test(Storage)	50HZ, 30min, Amplitude: 2 cm, X/Y/Z directions	Note	
7	Drop Test	60cm/ 3Corner/ 8Face, 1Cycle	Note	

Note:

- 1) The test samples should be applied to only one test item.
- 2) Sample size for each test item is 5~10pcs.
- 3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
- 4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
- 6) After the reliability test, the test samples should be inspected after 2 hours at least.
- 7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
- 8) After testing, the current Idd should be within initial value ±20%.
- 9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

10. PRECAUTIONS FOR USING LCD MODULES

Handling Precautions

- (1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in contact with room temperature air.
- (5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
 - Isopropyl alcohol
 - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solventsWipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
- (7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- (8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- (9) Do not attempt to disassemble or process the LCD module.
- (10) NC terminal should be open. Do not connect anything.
- (11) If the logic circuit power is off, do not apply the input signals.
- (12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
 - Do not alter, modify or change the shape of the tab on the metal frame.
 - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
 - Do not damage or modify the pattern writing on the printed circuit board.
 - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal

connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.