

# Rocktech Displays Limited



Module P/N: RK070IR83-T

Version: 1.0

Description : 7 inch TFT 800\*480 Pixels  
With Tcon board

TEL: 0086-755-26065260

Fax: 0086-755-26065261

E-mail: [Sales@rocktech.com.hk](mailto:Sales@rocktech.com.hk)

Web: [www.rocktech.com.hk](http://www.rocktech.com.hk)

**Revision History**

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**1. General Features**

<b>Item</b>	<b>Spec</b>	<b>Remark</b>
Display Mode	Normally White transmissive	
Viewing Direction	6 O'CLOCK	
Input Signals	TTL	
Outside Dimensions	165 (W) x104(H) x6.6(D) Max	WITH TP
Active Area	152.4mm(W)×91.44mm(H)	
Number of Pixels	800(RGB)×480	
Dot Pitch	0.0635mm(H) ×0.1905mm(W)	
Pixel Arrangement	RGB Vertical stripes	

## 2. Absolute Maximum Ratings

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

ITEM	Sym.	Min.	Typ.	Max.	Unit	Remark
Power Voltage	VDD	-0.3	-	6	V	
Input Signal Voltage	VI	-0.3		6.3		
Storage Humidity	H <sub>ST</sub>	10	-		%RH	At 25±5°C
Storage Temperature	T <sub>ST</sub>	-30	-	80	°C	
Operating Ambient Humidity	H <sub>OP</sub>	10	-		%RH	
Operating Ambient temperature	T <sub>OP</sub>	-20	-	70	°C	

## 3. Electrical Specification

### 3.1 Driving TFT LCD Panel

Item	Sym.	Min	Typ.	Max	Unit	Note
Power Voltage	VDD	3.0	3.3	3.6	V	
Logic Input Voltage	Low Voltage	V <sub>IL</sub>	0.	-	0.3VDD	V
	High Voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V
Consumption	I <sub>CC</sub>	-	250	300	mA	

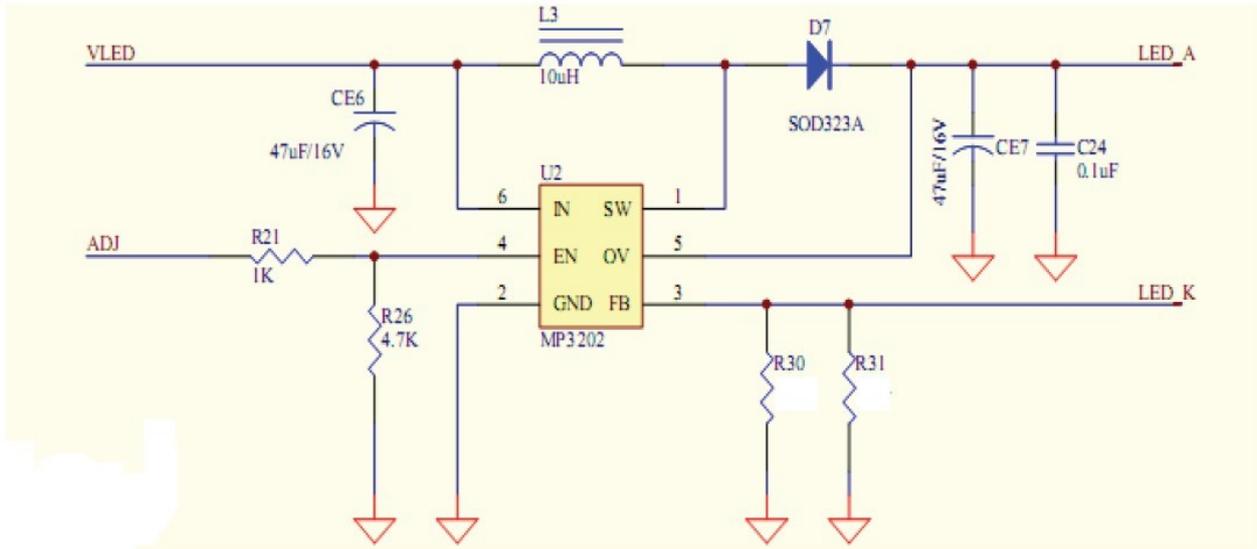
### 3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V <sub>F</sub>	4.8	5	5.2	V	
Backlight driving current	I <sub>F</sub>	-	500	550	mA	
Backlight Power Consumption	W <sub>BL</sub>	-	-	-	mW	
Lift Time	-	-	20,000	-		Note 3

Note 1: (Unless specified, the ambient temperature  $T_a=25^{\circ}\text{C}$ )

Note 2: The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



Included in LED backlight driver

## 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  $\Phi$  and  $\theta$  equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1) Contrast Ratio	C/R	400	500	-		FIG.1
2) Module Luminance	L	200	240	-	cd/m <sup>2</sup>	With TP
3) Response time	Tr+Tf	-	16	-	ms	FIG.2
4) Viewing Angle	$\theta_T$	40	50	-	Degree	FIG.3
	$\theta_B$	60	70	-		
	$\theta_L$	60	70	-		
	$\theta_R$	60	70	-		
5) Chromaticity	Wx	0.26	0.31	0.36		
	Wy	0.28	0.33	0.38		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

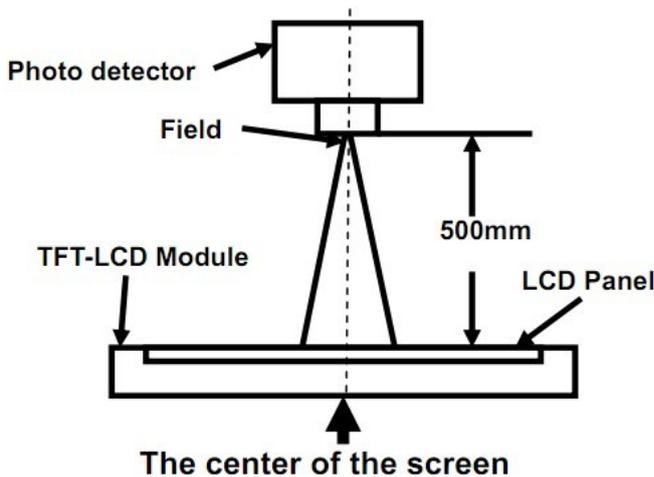
## ◆ Measurement System

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**



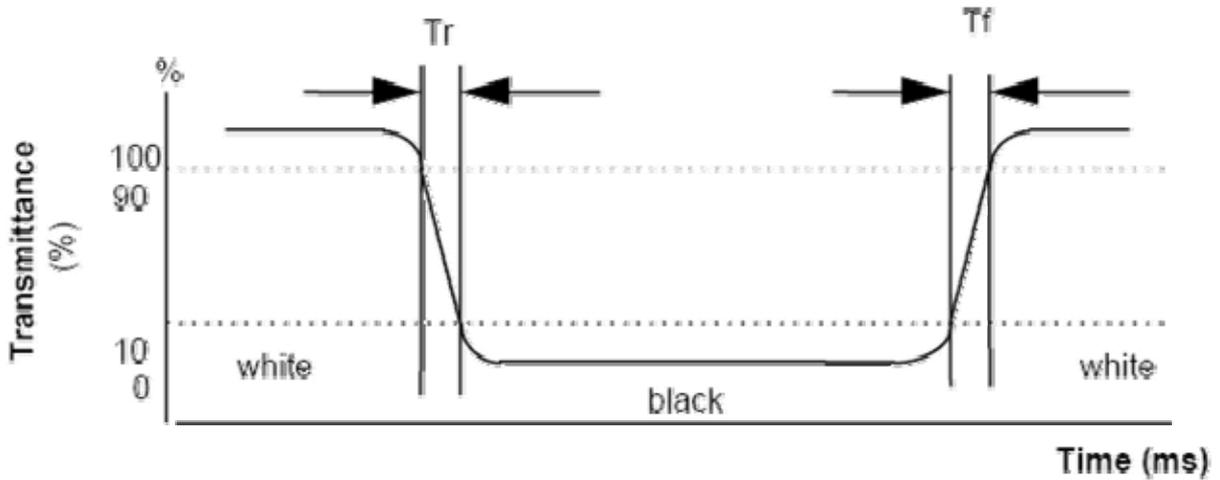
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

**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”.

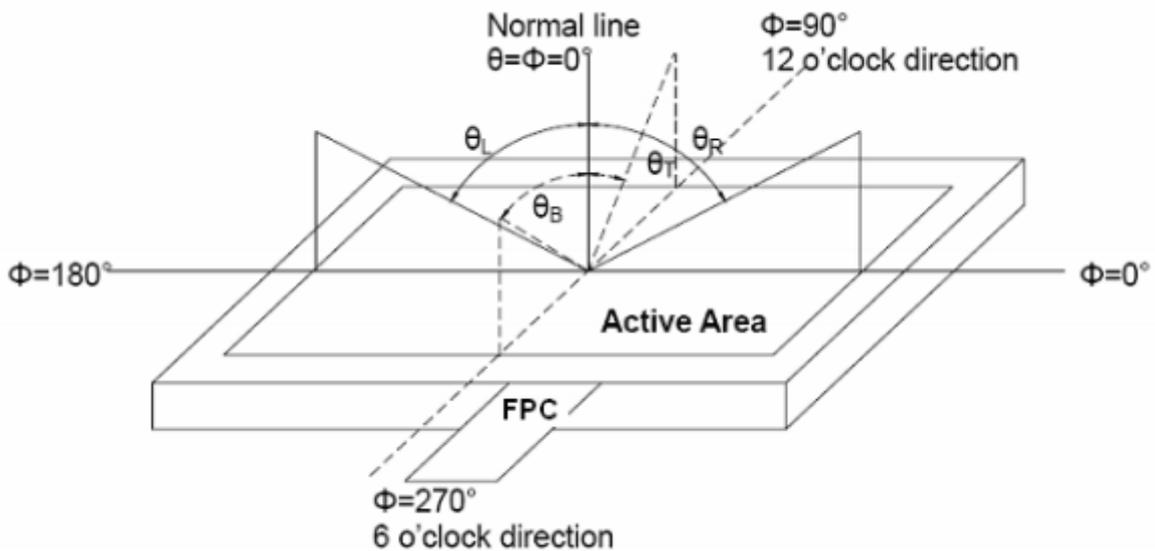
$$\text{Response Time} = \text{Rising Time}(Tr) + \text{Falling Time}(Tf)$$

- Rising Time( $Tr$ ) : Full White 90%  $\rightarrow$  Full White 10% Transmittance.
- Falling Time( $Tf$ ) : Full White 10%  $\rightarrow$  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.



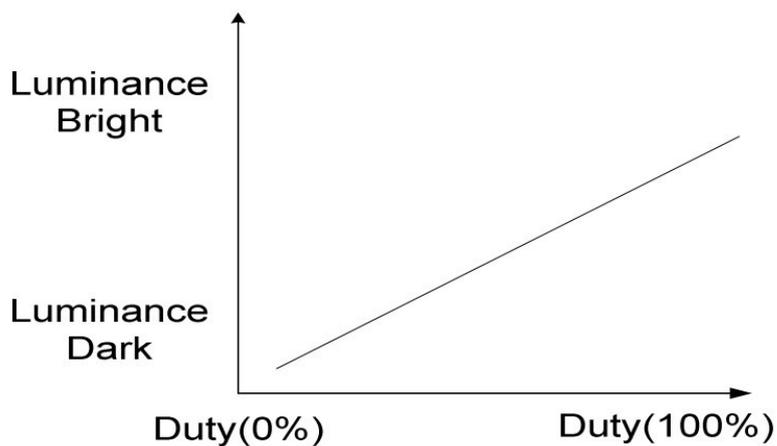
## 5.Pin Description

Item	Terminal	I/O	Functions	
1	VLED	P	Power voltage for LED backlight	
2	VLED	P	Power voltage for LED backlight	
3	ADJ	I	Adjust LED brightness with PWM Pulse	Note 1,2
4	GLED	P	Ground for LED circuit	
5	GLED	P	Ground for LED circuit	
6	VDD	P	Power supply for digital circuit	
7	VDD	P	Power supply for digital circuit	
8	Mode	I	DE or HV mode control	Note 3
9	DE	I	Data Input Enable	
10	VS	I	Vsync signal input	
11	HS	I	Hsync signal input	
12	GND	P	Power ground	
13	B5	I	Blue data	
14	B4	I	Blue data	
15	B3	I	Blue data	
16	GND	P	Power ground	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data(LSB)	
20	GND	P	Power ground	
21	G5	I	Gree data	
22	G4	I	Gree data	
23	G3	I	Gree data	
24	GND	P	Power ground	
25	G2	I	Gree data	
26	G1	I	Gree data	
27	G0	I	Gree data(LSB)	
28	GND	P	Power ground	
29	R5	I	Red data(MSB)	
30	R4	I	Red data	

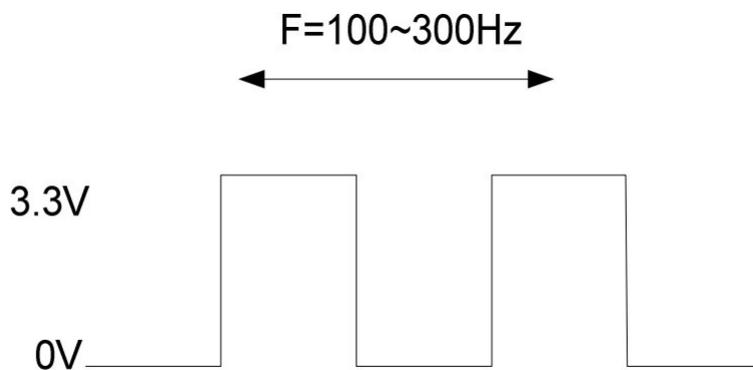
31	R3	I	Red data	
32	GND	P	Power ground	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample Clock	
38	GND	P	Power ground	
39	L/R	I	Select left or right scanning direction	Note 4,5
40	U/D	I	Select up or down scanning direction	Note 4,5

I: input, O: output, P: Power

Note1: Pin3. is used to adjust brightness.



Note 2: ADJ signal=0 ~3.3V; Operating frequency:100~300HZ

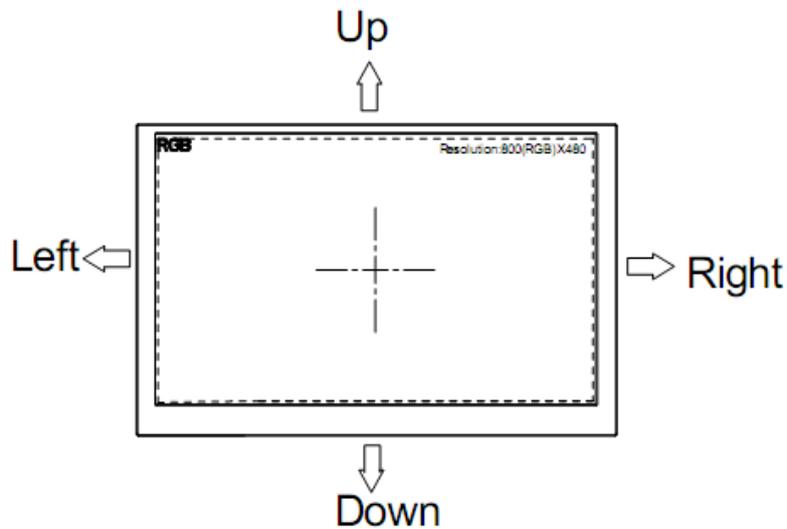


Note3: DE Mode: Mode="H", HS floating and VS floating.  
 HV Mode: Mode="L" and DE floating.

Note 4: Selection of Scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	V <sub>CC</sub>	Up to down, left to right
V <sub>CC</sub>	GND	Down to up, right to left
GND	GND	Up to down, right to left
V <sub>CC</sub>	V <sub>CC</sub>	Down to up, left to right

Note 5: Scanning direction refer to the figure below.



## 6. Timing Characteristics

### 6.1 AC Electrical Characteristics

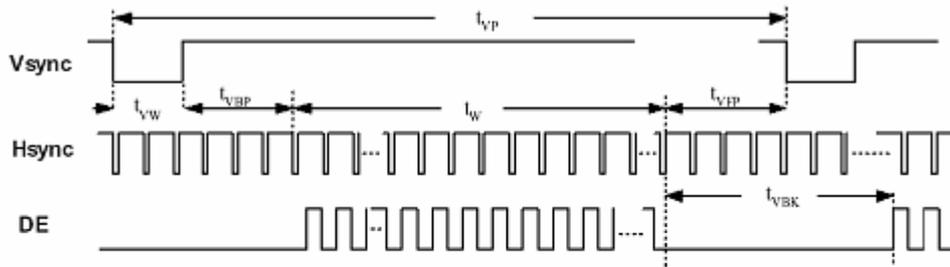
Input signal characteristics of SYNC mode.

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Period	t <sub>CLK</sub>	23.2	25.0	30.7	ns	
Clock Frequency	f <sub>CLK</sub>	32.4	40	43	MHz	
Clock Low Level Width	t <sub>wCL</sub>	8	-	-	ns	
Clock High Level Width	t <sub>wCH</sub>	8	-	-		
Clock Rise/Fall Time	t <sub>CLKr</sub> , t <sub>CLKf</sub>	-	-	3		
HSYNC Period	t <sub>HP</sub>	862	1056	1100	t <sub>CLK</sub>	
HSYNC Pulse Width	t <sub>HW</sub>	-	1	-	t <sub>CLK</sub>	
HSYNC Back Porch	t <sub>HBP</sub>	-	45	-	t <sub>CLK</sub>	
HSYNC Width + Back Porch	t <sub>w</sub> + t <sub>HBP</sub>	46			t <sub>CLK</sub>	
Horizontal valid data width	t <sub>HV</sub>	800			t <sub>CLK</sub>	
HSYNC Front Porch	t <sub>HFP</sub>	t <sub>HP</sub> - t <sub>HW</sub> - t <sub>HBP</sub> - t <sub>HV</sub>			t <sub>CLK</sub>	
Horizontal Blank	t <sub>HBK</sub>	t <sub>HP</sub> - t <sub>HV</sub>			t <sub>CLK</sub>	
VSYNC Period	t <sub>VP</sub>	628	635	650	t <sub>HP</sub>	
VSYNC Pulse Width	t <sub>VW</sub>	-	1	-	t <sub>HP</sub>	
VSYNC Back Porch	t <sub>VBP</sub>	22			t <sub>HP</sub>	
Vertical valid data width	t <sub>v</sub>	480			t <sub>HP</sub>	
Vertical Front Porch	t <sub>VFP</sub>	t <sub>VP</sub> - t <sub>VW</sub> - t <sub>VBP</sub> - t <sub>v</sub>			t <sub>HP</sub>	
Vertical Blank	t <sub>VBK</sub>	t <sub>VP</sub> - t <sub>v</sub>			t <sub>HP</sub>	
Data Setup Time	t <sub>DS</sub>	5	-	-	ns	
Data Hold Time	t <sub>DH</sub>	10	-	-	ns	

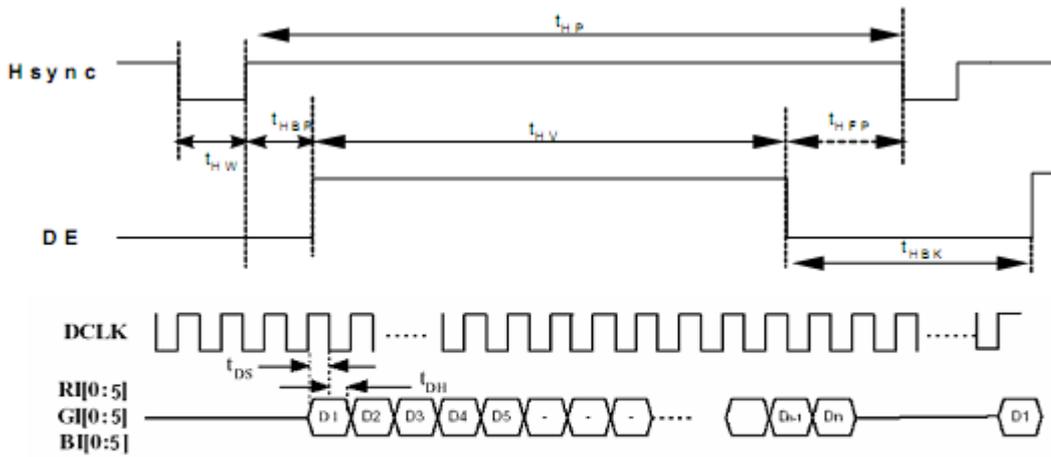
Input signal characteristics of DE mode.

Item		Symbol	Values			Unit	Remark
			Min.	Typ.	Max.		
DCLK	Period	t <sub>CLK</sub>	23.2	25.0	30.7	ns	
	Frequency	f <sub>CLK</sub>	32.4	40	43	MHz	
	Low Level Width	t <sub>WCL</sub>	6	-	-	ns	
	High Level Width	t <sub>WCH</sub>	6	-	-		
	Rise/Fall Time	t <sub>CLKr</sub> , t <sub>CLKf</sub>	-	-	3		
	Duty	-	0.45	0.50	0.55	-	t <sub>CLKU</sub> / t <sub>CLK</sub>
DE	Setup Time	t <sub>DES</sub>	5	-	-	ns	
	Hold Time	t <sub>DEH</sub>	10	-	-		
	Rise/Fall Time	t <sub>DEr</sub> , t <sub>DEf</sub>	-	-	16		
	Horizontal Period	t <sub>HP</sub>	862	1056	1100	t <sub>CLK</sub>	
	Horizontal Valid	t <sub>HV</sub>	800				
	Horizontal Blank	t <sub>HBK</sub>	t <sub>HP</sub> - t <sub>HV</sub>				
	Vertical Period	t <sub>VP</sub>	628	635	650	t <sub>HP</sub>	
	Vertical Valid	t <sub>V</sub>	480				
	Vertical Blank	t <sub>VBK</sub>	t <sub>VP</sub> - t <sub>V</sub>				
Setup Time	t <sub>DS</sub>	5	-	-	ns		
Hold Time	t <sub>DH</sub>	10	-	-			
Rise/Fall Time	t <sub>Dr</sub> , t <sub>Df</sub>	-	-	3			

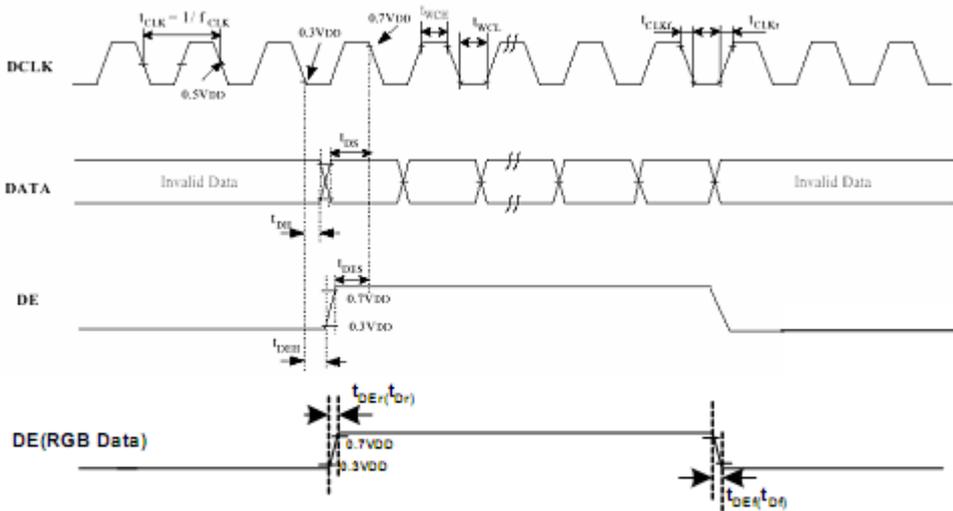
## 6.2 Timing Diagram



Input Vertical Timing

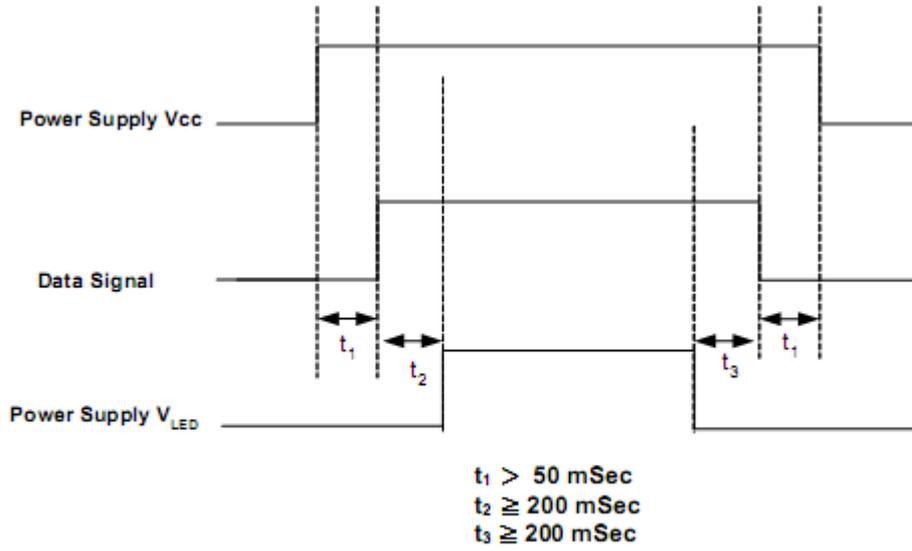


Input Horizontal Timing



DE and RGB Input Timing

## 6.3 Power on/off Sequence



Note: Data Signal includes DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.



## 8. 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		60°C, 90%RH, 240Hr	Note
4	Peeling Off (Storage)		$\geq 500\text{gf/cm}$	Note
5	FPC Bending Test		$\geq 6,000$ 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  $\pm 20\%$ .
- 9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

## 9. PRECAUTIONS FOR USING LCD MODULES

### Handing 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.