

# Rocktech Displays Limited



Module P/N: RK070ER9427-CTG

Version: 1.0

Description : 7 inch TFT 800\*480 Pixels with LED  
backlight and capacitive touch panel

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**Revision History**

<b>Date</b>	<b>Rev.</b>	<b>Page</b>	<b>Description</b>
<b>2016-09-20</b>	<b>1.0</b>	<b>All</b>	<b>First issue</b>

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**1. General Features**

<b>Item</b>	<b>Spec</b>	<b>Remark</b>
Display Mode	Normally White transmissive	
Viewing Direction	12 O'CLOCK	
Input Signals	RGB 24 bit	
Outside Dimensions	164.9 (W) x100(H) x7.6(D)	With CTP
Active Area	154.08mm(W)× 85.92mm(H)	
Number of Pixels	800(RGB)× 480	
Dot Pitch	0.0642mm(H) × 0.1790mm(W)	
Pixel Arrangement	RGB Vertical stripes	
CTP IC	GT911	

## 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	DVDD	-0.3	-	5	V	
	AVDD	6.5	-	13.5	V	
	VGH	-0.3		40		
	VGL	-20		0.3		
	VGH-VGL	-		40		
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		DVDD	3.0	3.3	3.6	V	
		AVDD	10.2	10.4	10.6	V	
		VGH	15.3	16.0	16.7	V	
		VGL	-7.7	-7.0	-6.3	V	
		VCOM	3.6	3.8	4.0	V	
Logic Input Voltage	Low Voltage	V <sub>IL</sub>	0.	-	0.3VDD	V	
	High Voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V	
Power Consumption	Black Mode	P <sub>b</sub>	T.B.D	T.B.D	T.B.D	mW	
	Standby Mode	P <sub>w</sub>	T.B.D	T.B.D	T.B.D	mW	

### 3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V <sub>F</sub>	9.0	9.6	10.2	V	
Backlight driving current	I <sub>F</sub>	135	180	225	mA	
Backlight Power Consumption	W <sub>BL</sub>	-	1728	-	mW	
Life Time	-	-	30,000	-		Note 3

### 3.3 Current Consumption

Item	Sym.	Min	Typ.	Max	Unit	Note
Current for Driver	I <sub>GH</sub>	-	0.2	1.0	mA	V <sub>GH</sub> =16V
	I <sub>GL</sub>	-	0.2	1.0	mA	V <sub>GL</sub> =7V
	I <sub>DVDD</sub>	-	4.0	10	mA	DV <sub>DD</sub> =3.3V
	I <sub>AVDD</sub>	-	20	50		AV <sub>DD</sub> =10.4V

Note 1: (Unless specified, the ambient temperature Ta=25°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.

#### 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	-	320	-	cd/m <sup>2</sup>	After CTP
3) Response time	Tr+Tf	-	35	-	ms	FIG.2
4) Viewing Angle	$\theta_T$	60	70	-	Degree	FIG.3
	$\theta_B$	50	50	-		
	$\theta_L$	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	-	-	-		

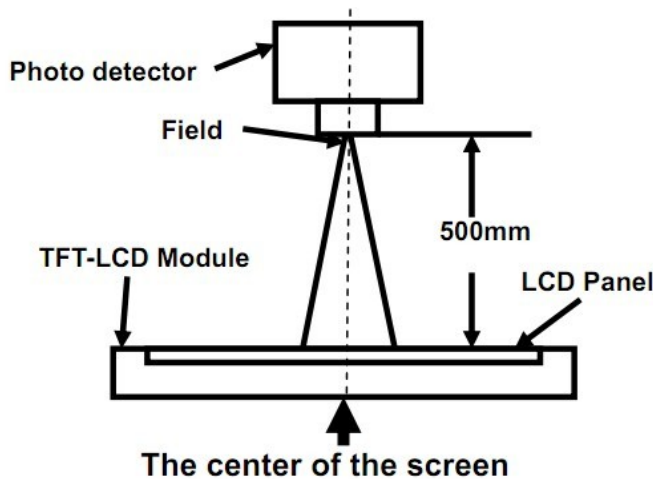
## ◆ Measurement System

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°

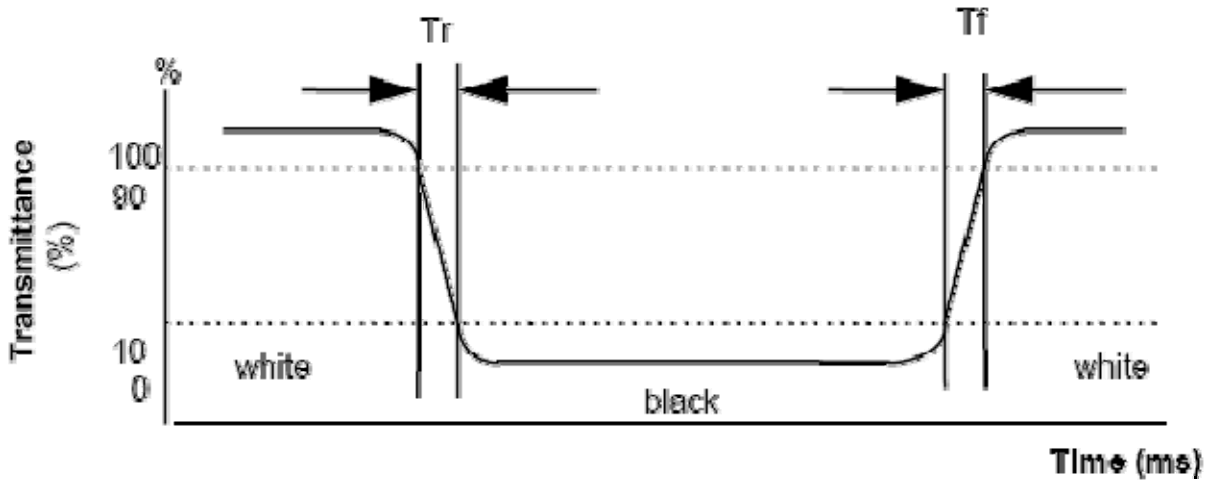


**FIG. 2 The definition of Response Time**

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

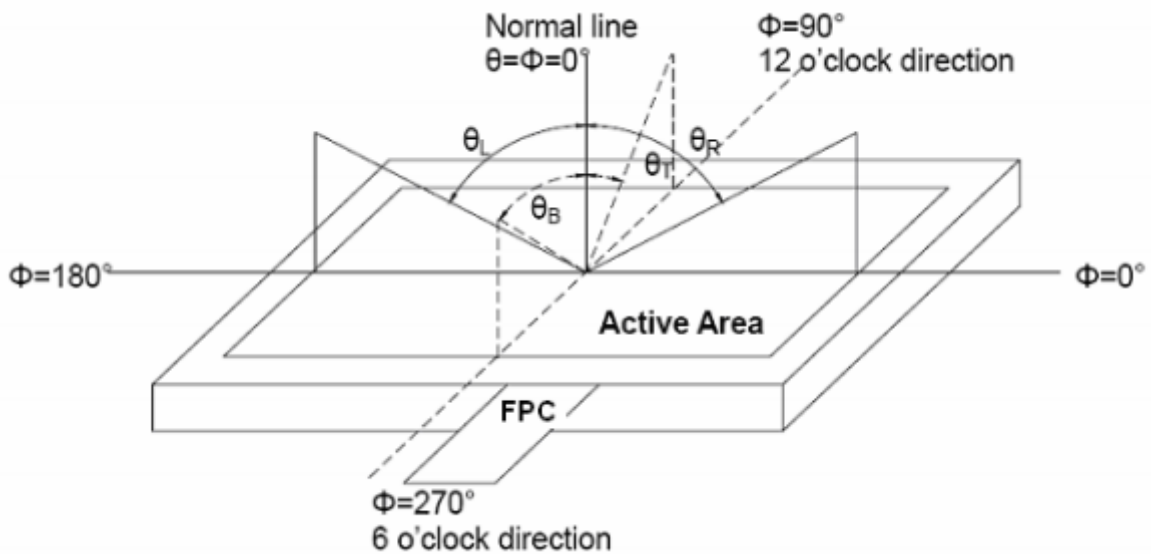
Response Time = Rising Time( $T_r$ ) + Falling Time( $T_f$ )

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

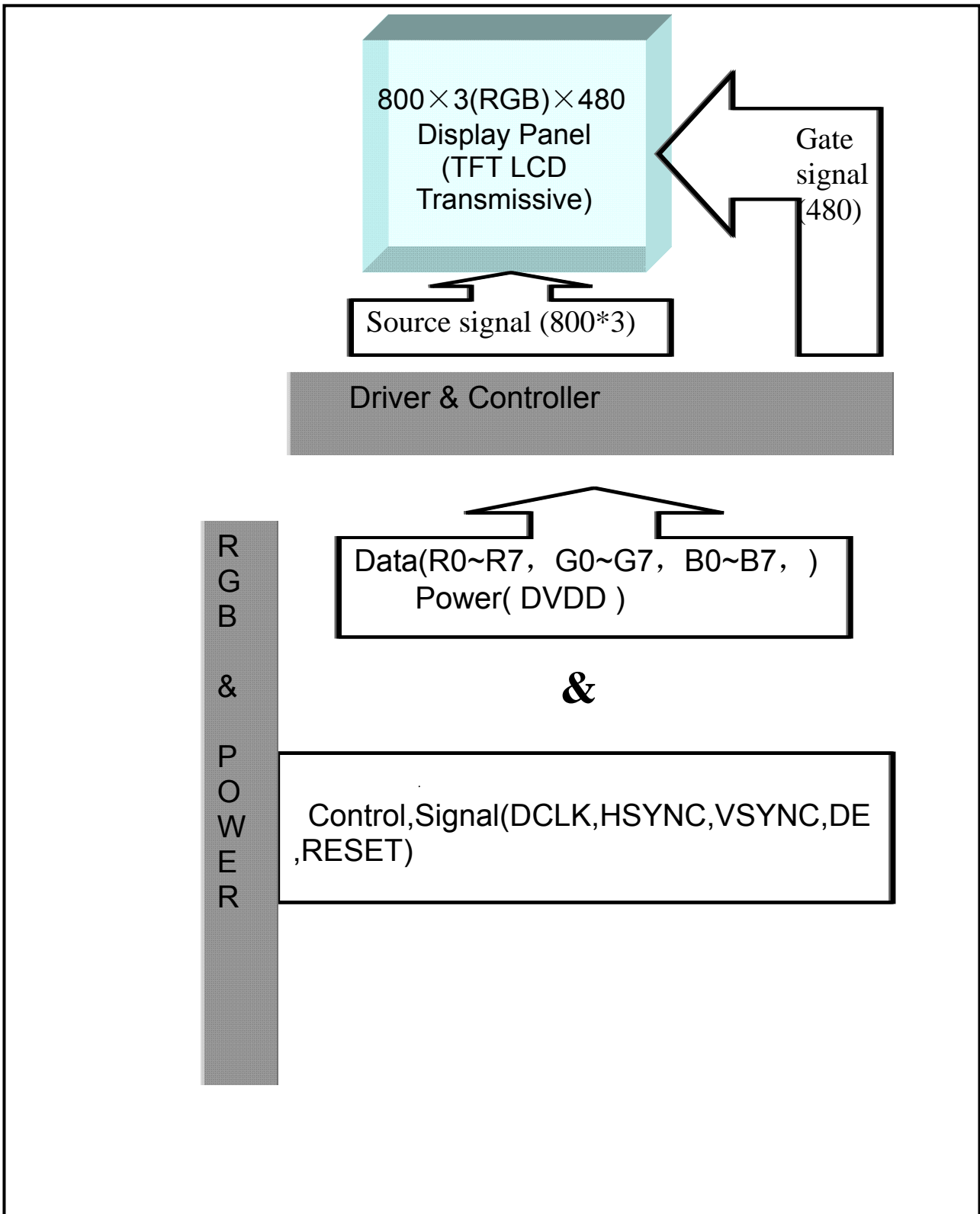


**FIG. 3 The definition of Viewing Angle**

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

Item	Terminal	I/O	Functions	
1	VLED+	P	Power for LED backlight (Anode)	
2	VLED+	P	Power for LED backlight (Anode)	
3	VLED-	P	Power for LED backlight (Cathode)	
4	VLED-	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	VCOM	I	Common voltage	
7	DV <sub>DD</sub>	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Gree data(MSB)	
21	G6	I	Gree data	
22	G5	I	Gree data	
23	G4	I	Gree data	
24	G3	I	Gree data	
25	G2	I	Gree data	
26	G1	I	Gree data	Note 2
27	G0	I	Gree data(LSB)	Note 2
28	R7	I	Red data(MSB)	

29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	P	Sample clock	Note 2
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V <sub>GH</sub>	P	Gate ON Voltage	
42	V <sub>GL</sub>	P	Gate OFF Voltage	
43	AV <sub>DD</sub>	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V <sub>COM</sub>	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

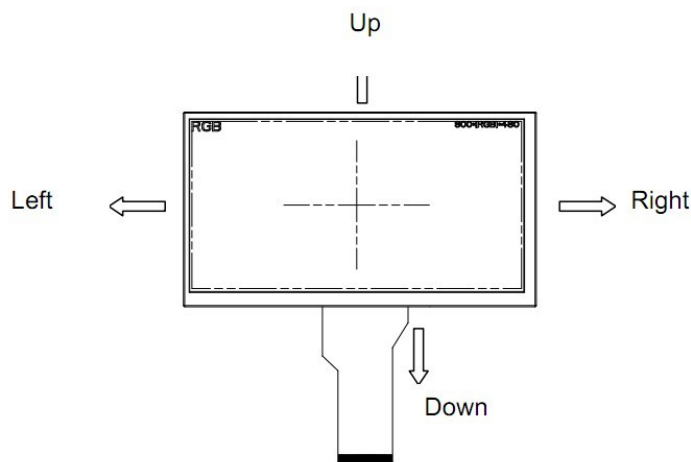
Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

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

Note 5: Definition of scanning direction.

Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.

When DITHB="1", Disable internal dithering function,

When DITHB="0", Enable internal dithering function,

**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.

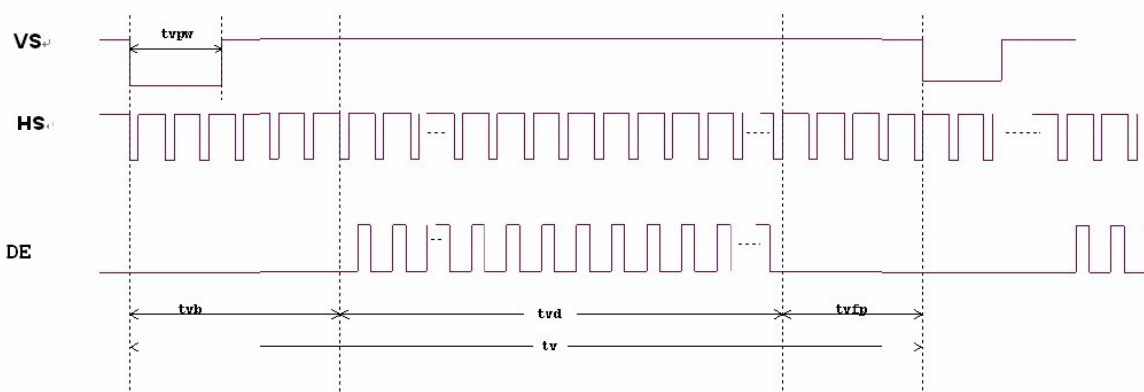
## 7. Timing Characteristics

### 7.1 AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hole time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hole time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	-	-	ms	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

### 7.2 Data Input Format





## 7.3 Timing

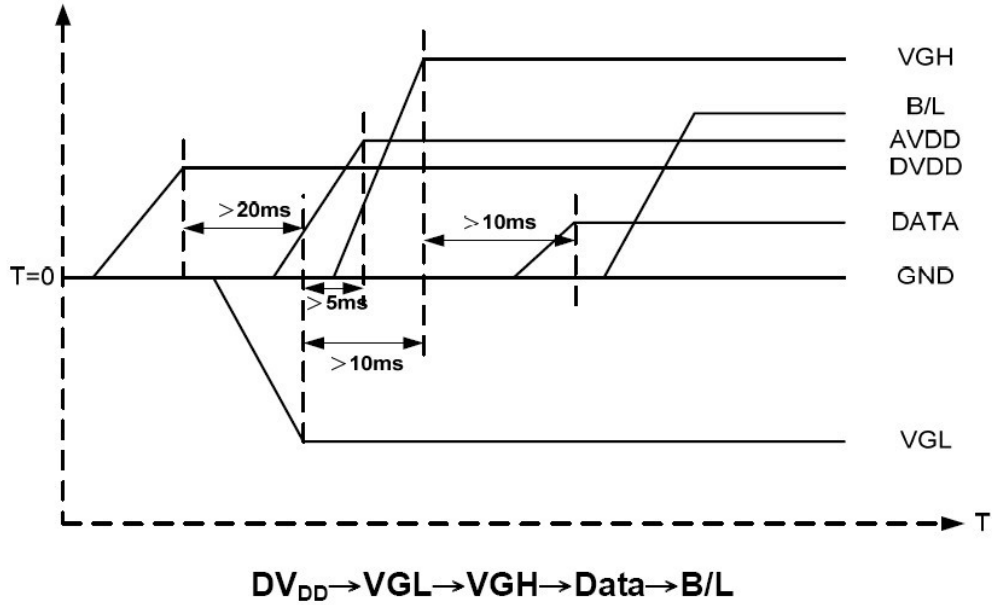
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

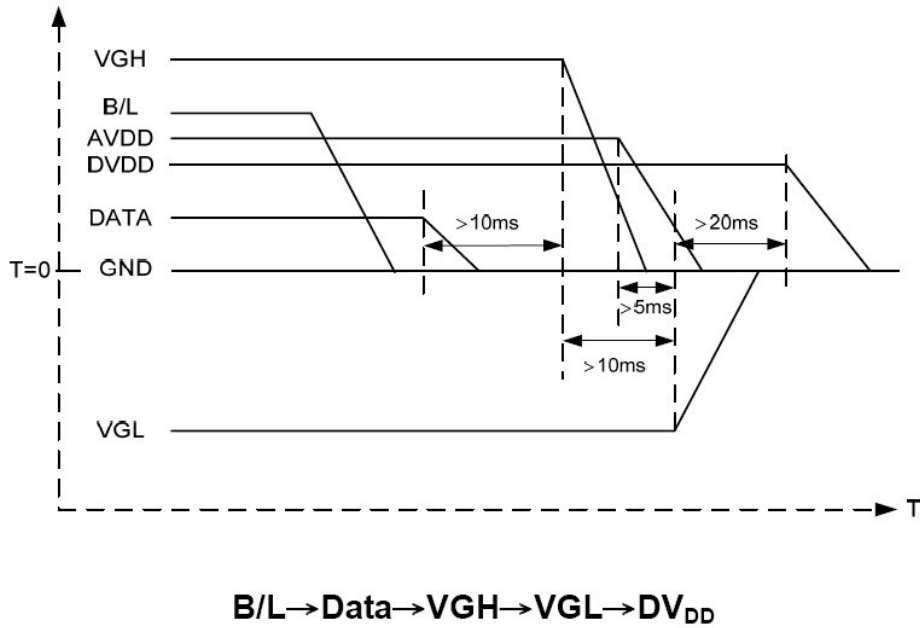


## 7.4 Power on/off Sequence

a. Power on:



b. Power off:



Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS,VS,DE.

## 8.Outline Dimension

Display Type	Transmissive Normally White
Display Resolution	800(RGB)X480
Viewing Angle	12:00
LCD Controller/Driver	G1911(CTP)
LCD Driving Voltage	3.3V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	27PCS LEDs V=9.6V I=180mA
Remark	CTP Interface: 12C CTP VDD: 3.3V , CTP VDDIO: 3.3V, G+G All materials in the drawing comply with the ROHS

TITLE:	LCM Outline
PROJECT NO:	RK070ER9427-CTG
DESCRIPTION:	7.0 inch TFT(9427)-CTP
GENERAL TOLERANCE:	±0.2

TFT ASSIGNMENT:	
PIN SYMBOL	
1 VLED+	
2 VLED+	
3 VLED+	
4 VLED+	
5 GND	
6 VCCM	
7 D/D0D	
8 D/D1E	
9 D/D2E	
10 VS	
11 HS	
12 B7	
13 B6	
14 B5	
15 B4	
16 B3	
17 B2	
18 B1	
19 B0	
20 G7	
21 G6	
22 G5	
23 G4	
24 G3	
25 G2	
26 G1	
27 G0	
28 R6	
29 R5	
30 R4	
31 R4	
32 R3	
33 R2	
34 R1	
35 R0	
36 GND	
37 D/CLK	
38 D/CLK	
39 L9E	
40 L9D	
41 VS1	
42 VGL	
43 AVDD	
44 RESET	
45 NC	
46 VCCM	
47 D/CLK	
48 D/CLK	
49 NC	
50 NC	

CTP ASSIGNMENT:

PIN SYMBOL	
1 SIG+	
2 SIG+	
3 RST	
4 VDD	
5 VDD	
6 GND	

THIRD ANGLE PROJECTION

NAME	SIGN	DATE
DRAWN	Marvin Zhou	2016.09.20
CHECKED	Marvin Zhou	2016.09.20
REV: 1.0	UNIT: MM	SCALE: 1/1
		SHEET: 1 OF 1

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## 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)	$\geq 500\text{gf/cm}$	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.

## 10. 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.