Rocktech Displays Limited

ROCKTECH

LCD Module Specification

Module P/N: RK070ER9727-CTG

Version: 1.0

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

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Revision History

Date	Rev.	Page	Description
2020-03-19	1.0	All	First issue

CONTENTS

1. General Features

Item	Spec	Remark
Display Mode	Normally White transmissive	
Viewing Direction	12 O'CLOCK	
Input Signals	RGB 18 bit	
Outside Dimensions	164.9(W) x100.0(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	VDD	-0.3	-	5	V	
	VLED	-	-	5.5	V	
Storage Humidity	H_{ST}	10	-		%RH	At 25±5℃
Storage Temperature	T_{ST}	-30	-	80	℃	
Operating Ambient Humidity	H_{OP}	10	-		%RH	
Operating Ambient temperature	T_{OP}	-20	-	70	℃	

3. Electrical Specification

3.1 Driving TFT LCD Panel

Item		Sym.	Min	Typ.	Max	Unit	Note
Power Voltage		V_{DD}	3.0	3.3	3.6	V	
		VLED	3.0	5.0	5.5	V	
Logic Input Voltage	Low Voltage	V_{IL}	0.	-	0.3VDD	V	
	High Voltage	V_{IH}	0.7VDD	-	VDD	V	
Power Consumption	Black Mode	P_b	T.B.D	T.B.D	T.B.D	mW	
	Standby Mode	P_w	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_F	3.0	3.3	3.6	V	
Backlight driving current	I_F	-	860	-	mA	
Backlight Power Consumption	W_{BL}	-	2970	-	mW	
Backlight driving voltage	V_F	4.5	5.0	5.5	V	
Backlight driving current	I_F	-	560	-	mA	
Backlight Power Consumption	W_{BL}	-	2800	-	mW	
Life Time	-	-	30,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25℃)

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 ℃. 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	400	500	-		FIG.1
2)Module Luminance	L	300	400	-	cd/m^2	After CTP
3)Response time	Tr+Tf	-	35	-	ms	FIG.2
4)Viewing Angle	θ$_T$	60	70	-	Degree	FIG.3
	θ$_B$	50	50	-		
	θ$_L$	60	70	-		
	θ$_R$	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
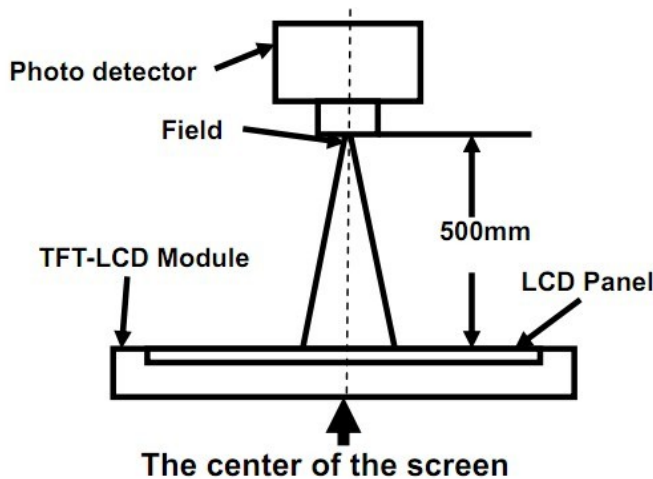
| Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% → Full White 10% Transmittance.
- Falling Time(Tf) : Full White 10% → Full White 90% Transmittance.
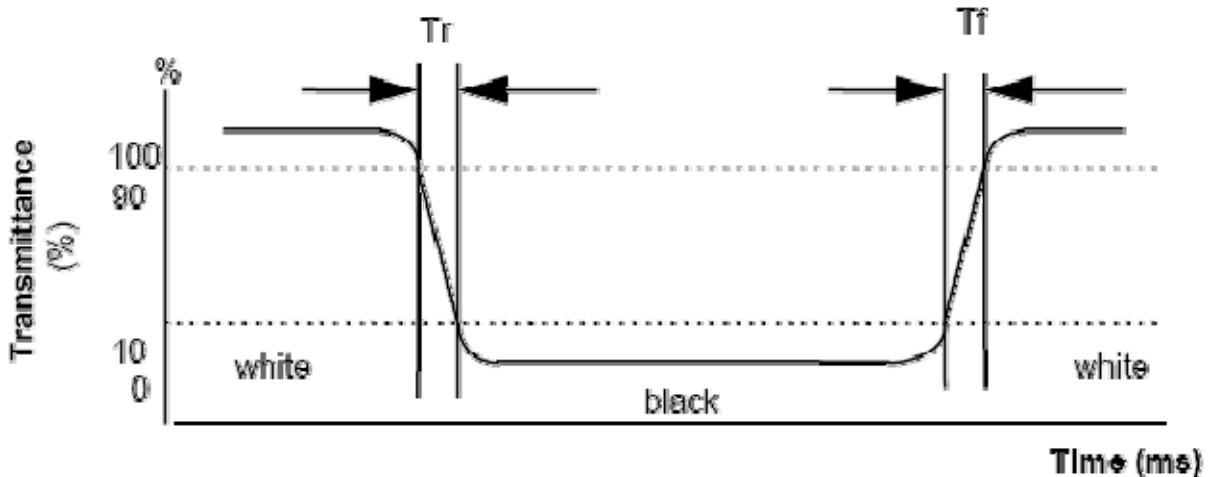
FIG. 3 The definition of Viewing Angle

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

Block diagram showing the display panel (800×3(RGB)×480 Display Panel (TFT LCD Transmissive)), Gate signal (480), Source signal (800*3), Driver & Controller, Data(R0~R5, G0~G5, B0~B5), Power(VDD,VLED), Control,Signal(DCLK,HSYNC,VSYNC,DE), and RGB & POWER.
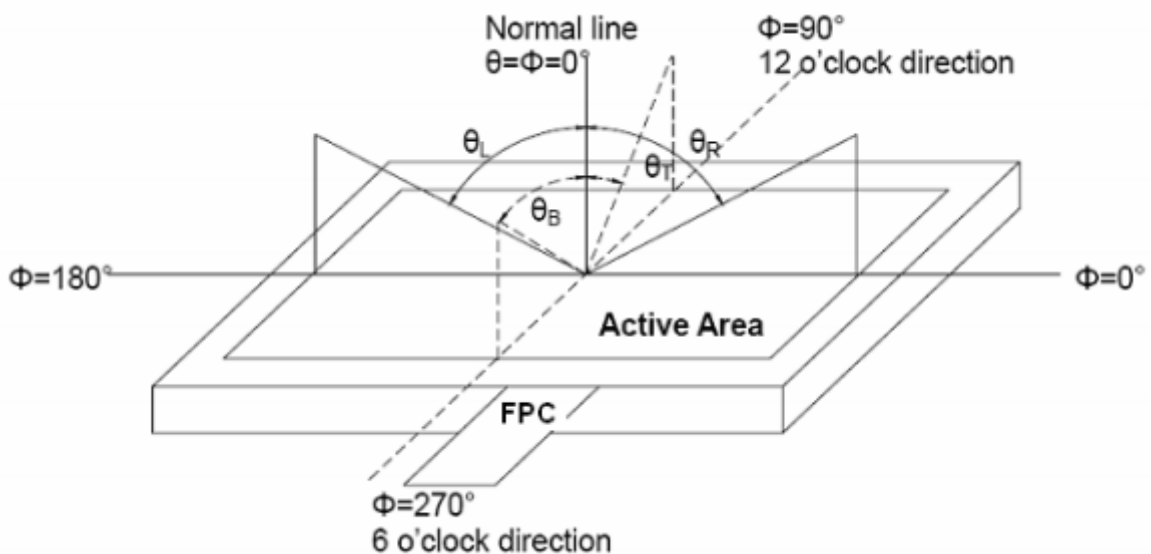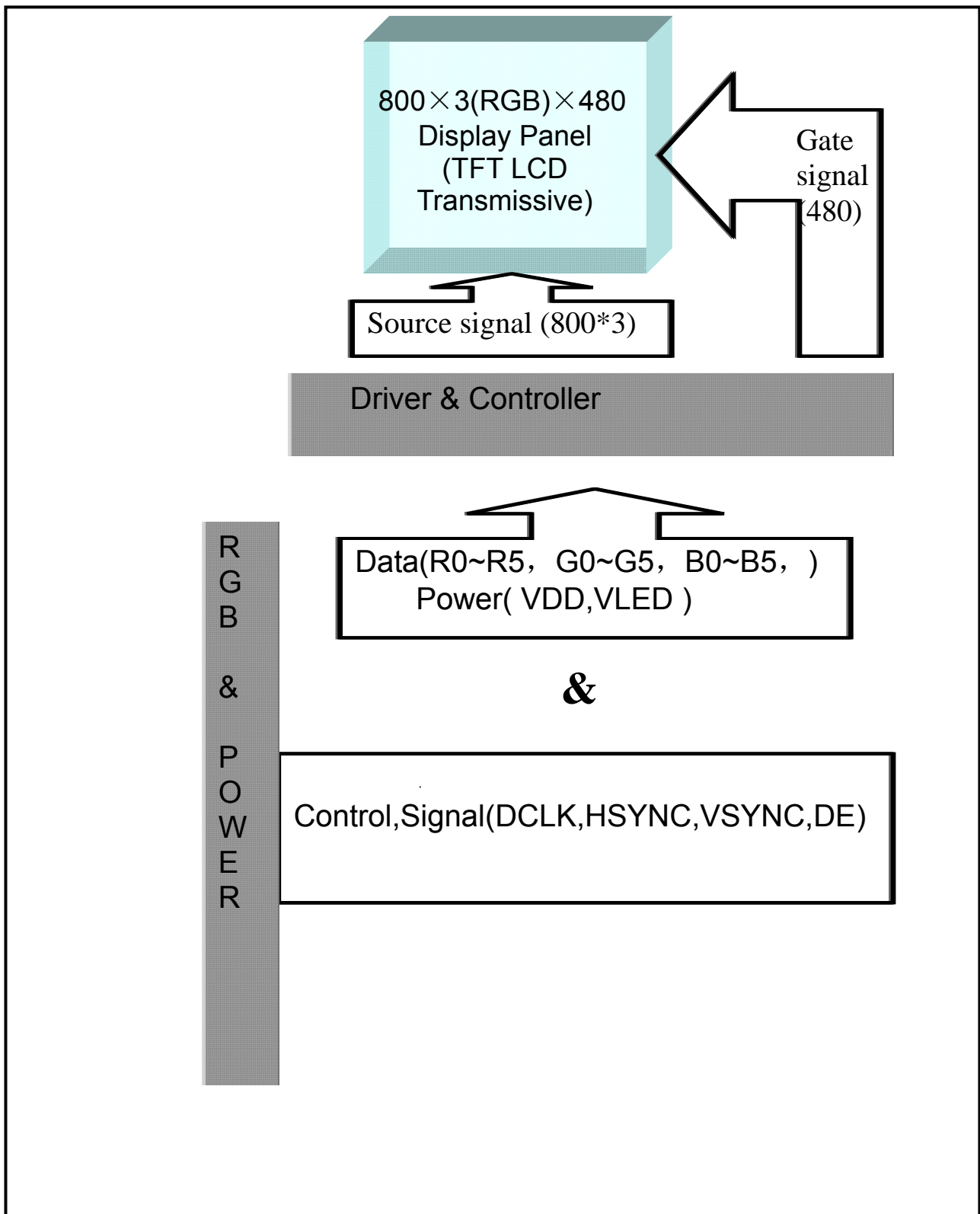
6.Pin Description

6.1 LCD Pin interface

| Item	Terminal	I/O	Functions	
1,2	VLED	P	Power supply for LED Driver,3.3V or 5.0V	
3	ADJ	I	Adjust the LED brightness with PWM pulse,0-3.3V	Note 1,2
4,5	GLED	P	Ground for LED circuit	
6,7	VDD	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 3
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	GND	P	Power Ground	
13-15	B5-B3	I	Blue data	
16	GND	P	Power Ground	
17-19	B2-B0	I	Blue data	
20	GND	P	Power Ground	
21-23	G5-G3	I	Green data	
24	GND	P	Power Ground	
25-27	G2-G0	I	Green data	
28	GND	P	Power Ground	
29-31	R5-R3	I	Red data	
32	GND	P	Power Ground	
33-35	R2-R0	I	Red data	
36	GND	P	Power Ground	
37	DLCK	P	Sample clock	
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

I: input, O: output, P: Power

Note1: Pin3. is used to adjust brightness.
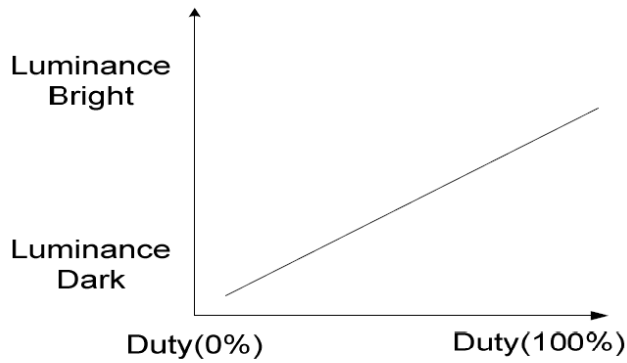
Note 2: ADJ signal=0 ~3.3V; Operating frequency:100~300Hz.

F=100~300Hz

3.3V

0V
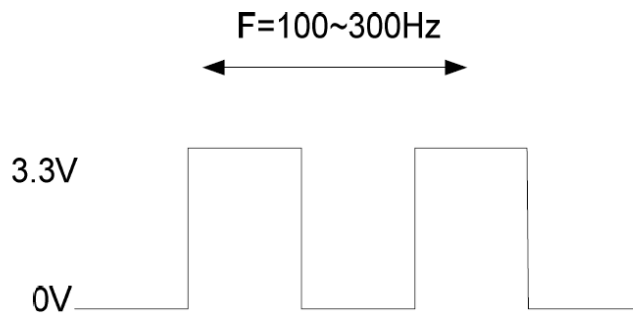
Note 3: DE Mode: Mode="H",HS floating and VS floating.
HV Mode: Mode="L" and DE floating.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	V$_{CC}$	Up to down, left to right
V$_{CC}$	GND	Down to up, right to left
GND	GND	Up to down, right to left
V$_{CC}$	V$_{CC}$	Down to up, left to right

Note 5: Scanning direction refer to the figure below.

Up

Left

Right

Resolution:800(RGB)X480

Down
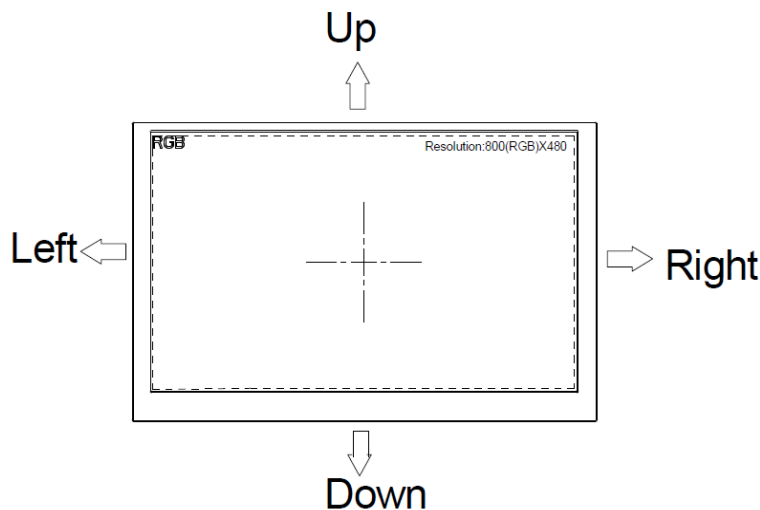
6.2 CTP Pin interface

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_{DD} Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DV_{DD}
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
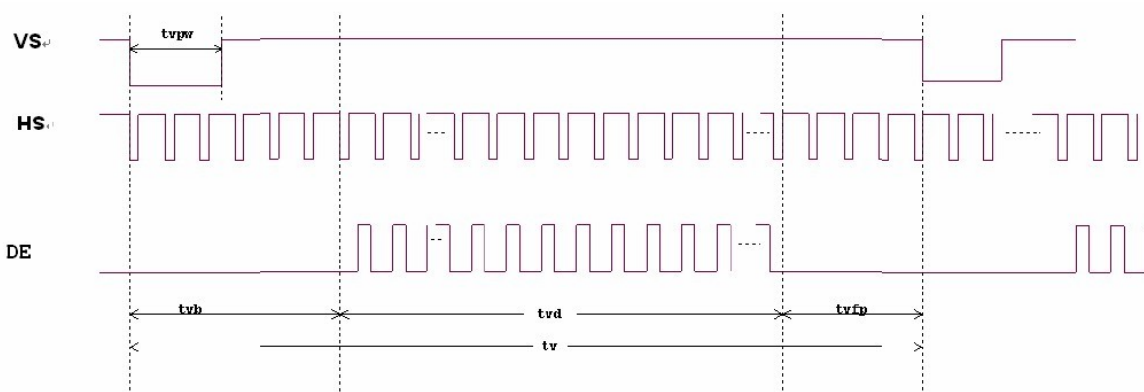
7.3 Timing

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:

$DV_{DD} \rightarrow VGL \rightarrow VGH \rightarrow Data \rightarrow B/L$

b. Power off:

$B/L \rightarrow Data \rightarrow VGH \rightarrow VGL \rightarrow DV_{DD}$
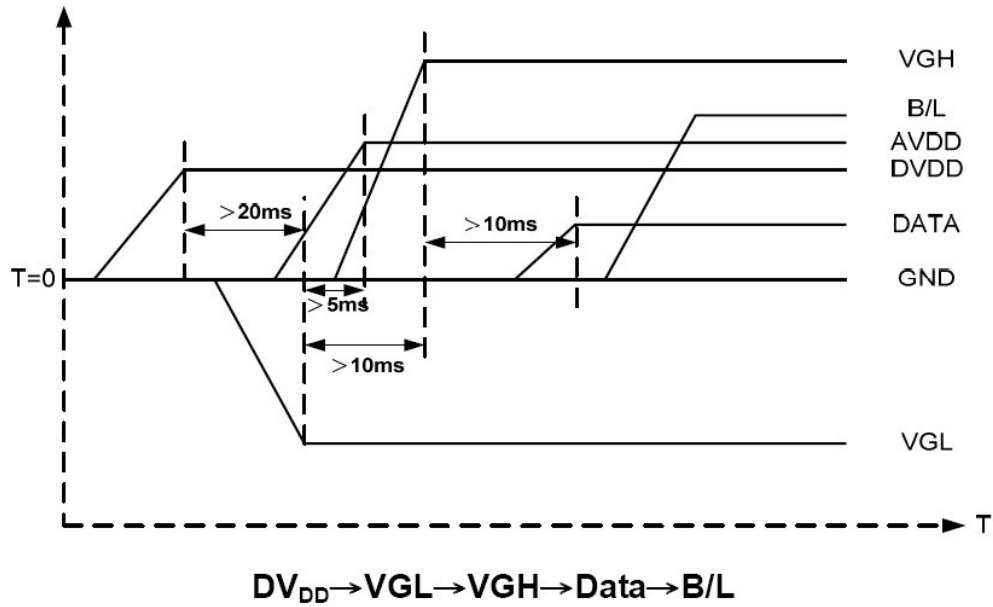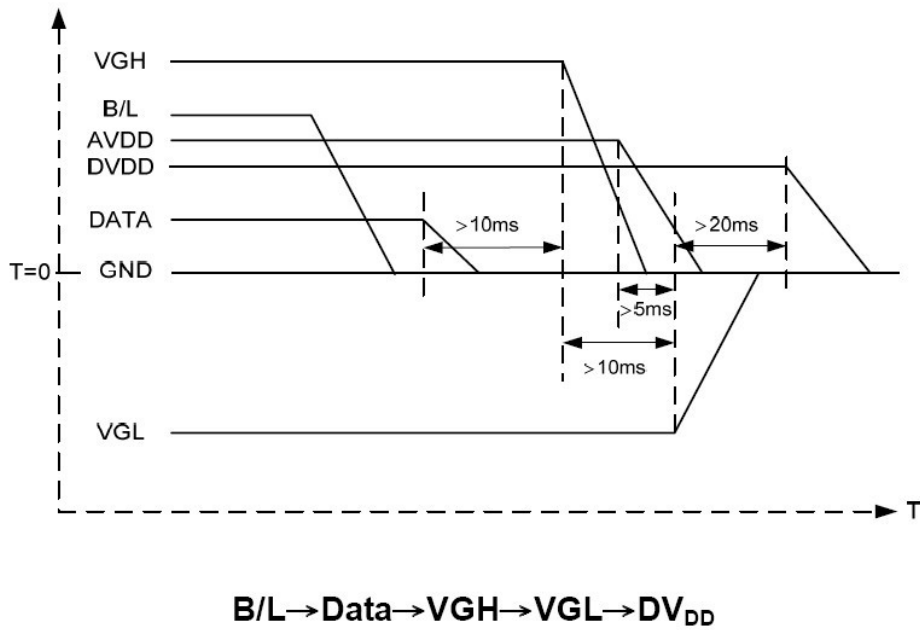
Note: Data include R0~R7, B0~B7, G0~G7, U/D, L/R, DCLK, HS,VS,DE.

8.Outline Dimension

Display Type	Transmissive,Normally White
Display Resolution	800(RGB)X480
Viewing Angle	12:00
Controller/Driver	GT911(CTP)
Driving Voltage	3.3V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	27PCS LEDS,Vf=9.6V,If=180mA
Remark	CTP Interface: I2C CTP VDD:3.3V, CTP VDDIO:3.3V, G+G Module brightness: 400cd/m² All materials in the drawing comply with the ROHS

LED Diagram Circuit

○LEDK ○LEDA

164.90(TFT Outline)
164.80(Cover Outline)
164.40(Sensor Outline)
157.50(Cover V.A)
154.60(Sensor V.A)
154.08(TFT A.A)
100.00(TFT/Cover Outline)
99.60(Sensor Outline)
92.00(Sensor A.A)
91.20(Cover V.A)
85.92(TFT A.A)
45.85
47.74
68.20
80.96
0.05
3.65
3.92
0.20
2.30
4.78

No mask printing
7.0 Inch Display 800(RGB)X480
Viewing Direction 12:00
Display Center

Component area
29.80
20.00
18.19
7.00
3.80
5.00
40.00

LENS(T=0.7mm)
LOCA(T=0.15mm)
Adhesive(T=0.50mm)
Sensor(T=0.55mm)
Stiffener
Connect
0.30
0.30
7.60(Total)
1.90(CTP)
5.70(TFT)

Sheet steel
Stiffener(T=0.2mm)
4.00
5.00
20.50

Rocktech Displays Limited

THIRD ANGLE PROJECTION

TITLE:	LCM Outline
PROJECT NO:	RK070ER9727-CTG
DESCRIPTION:	7.0 Inch TFT(9727)+CTP
GENERAL TOLERANCE:	±0.3
REV: 1.0	
CHECKED	Marvin Zhou
DRAWN	Marvin Zhou
	NAME
UNIT: MM	
SCALE: 1/1	SHEET: 1 OF 1

	SIGN	DATE
		2019.11.19
		2019.11.19

CTP ASSIGNMENT:

PIN	SYMBEL
1	SCL
2	SDA
3	RST
4	INT
5	VDD
6	GND

PIN	SYMBEL
33	GND
34	R1
35	R0
36	GND
37	DCLK
38	GND
39	L/R
40	U/D

TFT ASSIGNMENT:

PIN	SYMBEL
1	VLED
2	VLED
3	AD(4)0~3.3V
4	GLED
5	GLED
6	VDD(3.3V)
7	VDD(3.3V)
8	MODE
9	DE
10	VS
11	HS
12	GND
13	B5
14	B4
15	B3
16	B2
17	B1
18	B0
19	GND
20	GND
21	G5
22	G4
23	G3
24	G2
25	G1
26	G0
27	GND
28	GND
29	R5
30	R4
31	R3
32	R2

ISSUE	MODIFY DESCRIPTION	DATE
1.0	First Issue	2019.11.19

9. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	80℃, 120Hr	Note
		Operation	70℃, 120Hr	Note
2	Low Temperature	Storage	-30℃, 120Hr	Note
		Operation	-20℃, 120Hr	
3	High Temperature and High Humidity		40℃, 90%RH, 120Hr	Note
4	Thermal Cycling Test(No operation)		-20℃ for 30min, 70℃ for 30 min. 100 cycles. Then test at room temperature after 1 hour	Note
5	Vibration Test(No operation)		Frequency :10~55 HZ; Stroke :1.5 mm;Sweep:10HZ~55HZ~10HZ; 2hours for each direction of X, Y, Z(6 hours for total)	
6	Package Drop Test		Height:60 cm,1 corner, 3 edges, 6 surfaces	
7	Electro Static Discharge		±2KV,Human Body Mode, 100pF/1500Ω	

Note:
1) Sample quantity for each test item is 5~10pcs.
2) Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

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 is contacting 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 alcohol
  Do 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 solvents
  Wipe 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.