

Rocktech Displays Limited



Module P/N: RK070CU03H-CTG

Version: 1.0

Description : 7.0 inch TFT 1024*600 pixels with LED
backlight , All viewing angle, 800 nits
brightness, Capacitive touch panel

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Revision History

Date	Rev.	Page	Description
2019-04-12	1.0	All	First Issue

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1. General Features

Item	Spec	Remark
Display Mode	Normally Black transmissive	
Viewing Direction	FREE	IPS
Input Signals	RGB 24bit	
Outside Dimensions(mm)	164.9 (W) x100(H) x7.6(D)	With CTP
Active Area(mm)	154.21(W)×85.92(H)	
Number of Pixels	1024(RGB)×600	
Dot Pitch(mm)	0.1506 (H) x 0.1432 (V)	
Pixel Arrangement	RGB Vertical stripes	
Drive IC	---	
CTP Drive 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 for Circuit Driving	VDD	-0.3	-	3.96	V	
	AVDD	-0.5		14.85	V	
	VGH	-0.3		40	V	
	VGL	-20		0.3	V	
Storage Humidity	H _{ST}	10	-		%RH	At 25±5°C
Storage Temperature	T _{ST}	-30	-	80	°C	
Operating Ambient Humidity	H _{OP}	10	-		%RH	
Operating Ambient temperature	T _{OP}	-20	-	70	°C	

3. Electrical Specification

3.1 Driving TFT LCD Panel

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	DV _{DD}	3.0	3.3	3.6	V	
	V _{GH}	17	18	19	V	
	V _{GL}	-6.6	-6	-5.4	V	
	AV _{DD}	9.4	9.6	9.8	V	
	V _{com}	3.6	3.8	4.0		
Video signal amplitude (V _R ,V _G ,V _B)	V _{IA}	-	-	AV _{DD} -0.4	V	
	V _{IAC}	-	-	-	V	AC component,
	V _{IDC}	-	AV _{DD} /2	-	V	DC component
VCOM	V _{CAC}		-	-	VP-P	AC component
	V _{CDC}	-	-	-	V	DC component, (1)
Input signal voltage	V _{IH}	0.7DV _{DD}	-	DV _{DD}	V	(2)
	V _{IL}	0	-	0.3DV _{DD}	V	(2)
Current of power supply	I _{DD}	-	30	45	mA	DV _{DD} =3.3V
	I _{ADD}	-	35	45	mA	AV _{DD} =9.6V
	I _{GH}	-	0.5	1	uA	V _{GH} =18V
	I _{GL}	-	0.5	1	mA	V _{GL} =-6V

Note (1): The brightness of LCD panel could be changed by adjusting the AC component of VCOM.

Note (2): STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D

3.2 Driving LED Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V _F	9.0	9.6	10.2	V	
Backlight driving current	I _F	-	270	-	mA	
Backlight Power Consumption	W _{BL}	-	2592	-	mW	
Life Time	-	-	30,000	-		Note 1

Note 1: 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.

3.3 Power Consumption

ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX	UNIT	NOTE
Gate on power current	IVGH	VGH = 18V	--	0.5	1	mA	Note1
Gate off power current	IVGL	VGL = -6V	--	0.5	1	mA	Note1
Digital power current	IDVDD	DVDD = 3.3V	--	30	45	mA	Note1
Analog power current	IAVDD	AVDD = 9.6V	--	35	45	mA	Note1
Total Power Consumption	PC		--	447	604	mW	Note1

Note1: Typ. specification : Gray-level test Pattern

Max. specification : Black test Pattern



256 gray pattern



Black Pattern

3.4 Driving CTP

Item	Value
Working Voltage	DC 3.3V
Interface	I2C
Support Touch	5 Points

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	-	800	-		FIG.1
2) Module Luminance	L	700	800	-	cd/m ²	After CTP
3) Response time	Tr+Tf	-	35	-	ms	FIG.2
4) Viewing Angle	θ_T	-	85	-	Degree	FIG.3
	θ_B	-	85	-		
	θ_L	-	85	-		
	θ_R	-	85	-		
5) Chromaticity	Wx	0.27	0.31	0.35		
	Wy	0.29	0.33	0.37		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

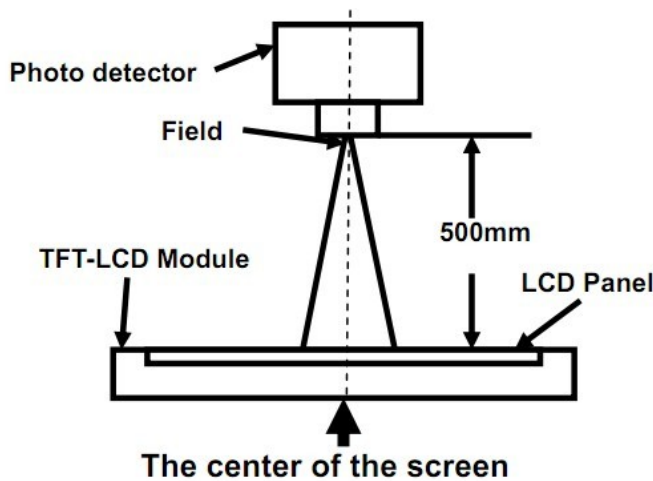
◆ Measurement System

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	BM-7A	2°
Response Time		

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”.

$$\text{Response Time} = \text{Rising Time}(T_r) + \text{Falling Time}(T_f)$$

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

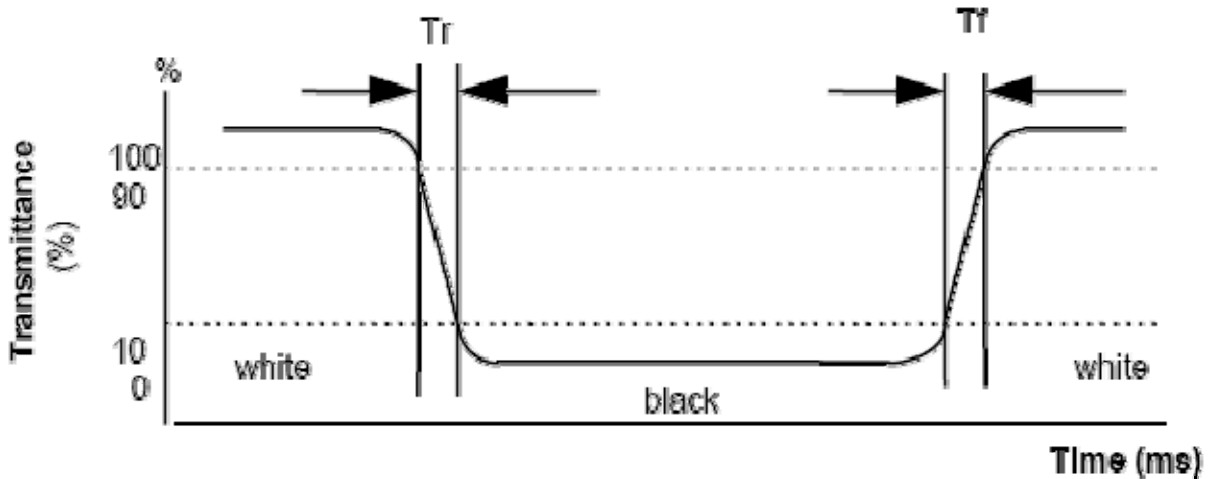
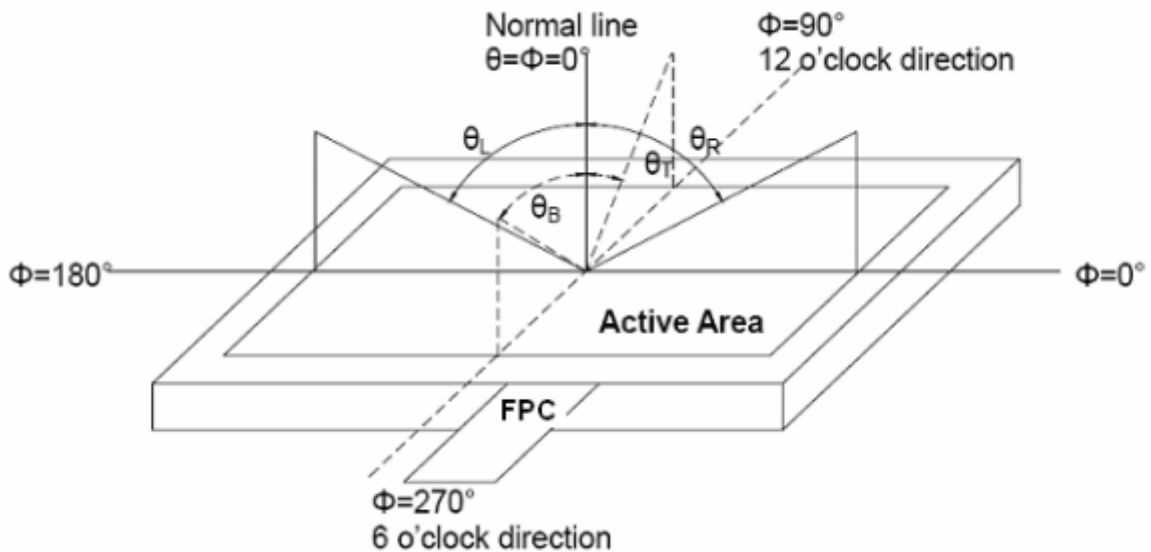
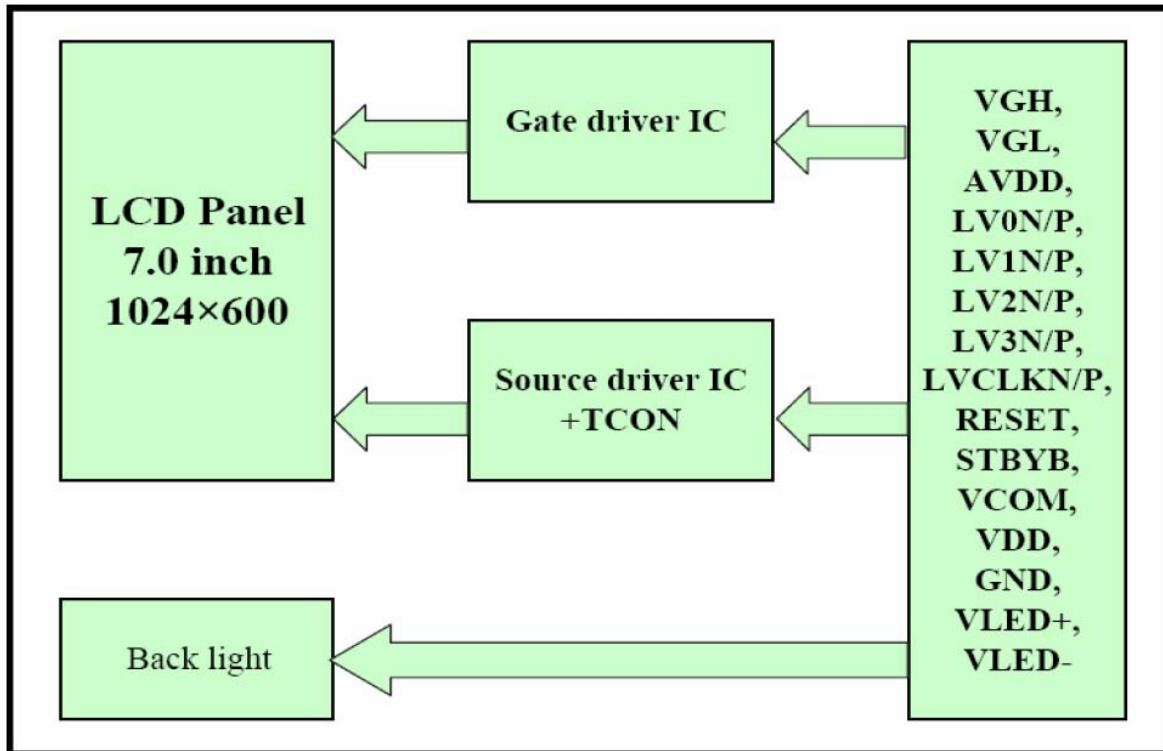


FIG. 3 The definition of Viewing Angle

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. Block Diagram



6.Pin Description

6.1 TFT LCD Panel

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 _{DD}	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 _{GH}	P	Gate ON Voltage	
42	V _{GL}	P	Gate OFF Voltage	
43	AV _{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V _{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	

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.

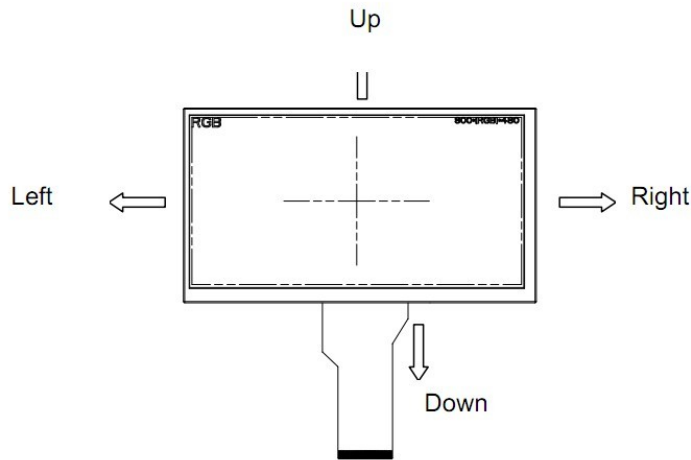
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

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 _{DD}	Up to down, left to right
DV _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV _{DD}	DV _{DD}	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,

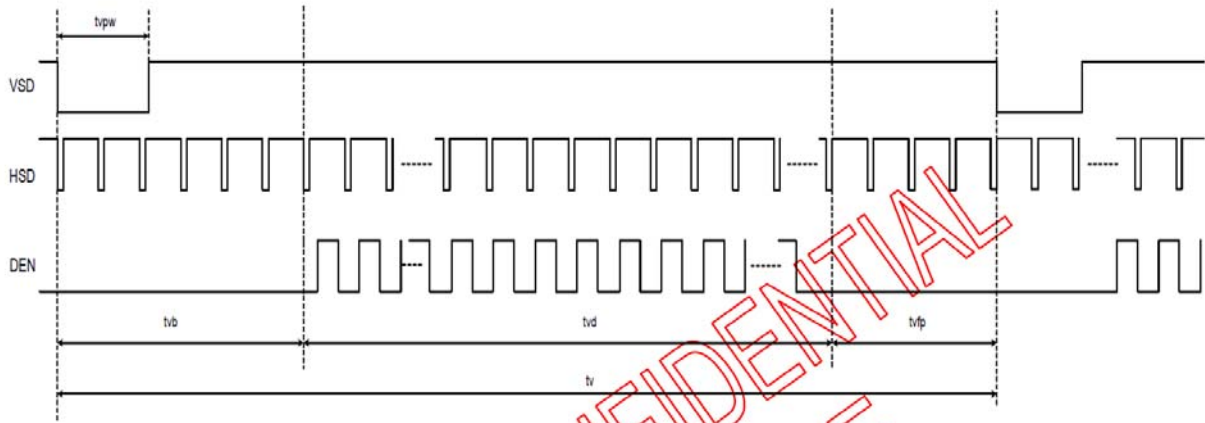
6.2 CTP LCD Pin Description

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

CTP IC driver source code will be offered separately

7. Timing Characteristics

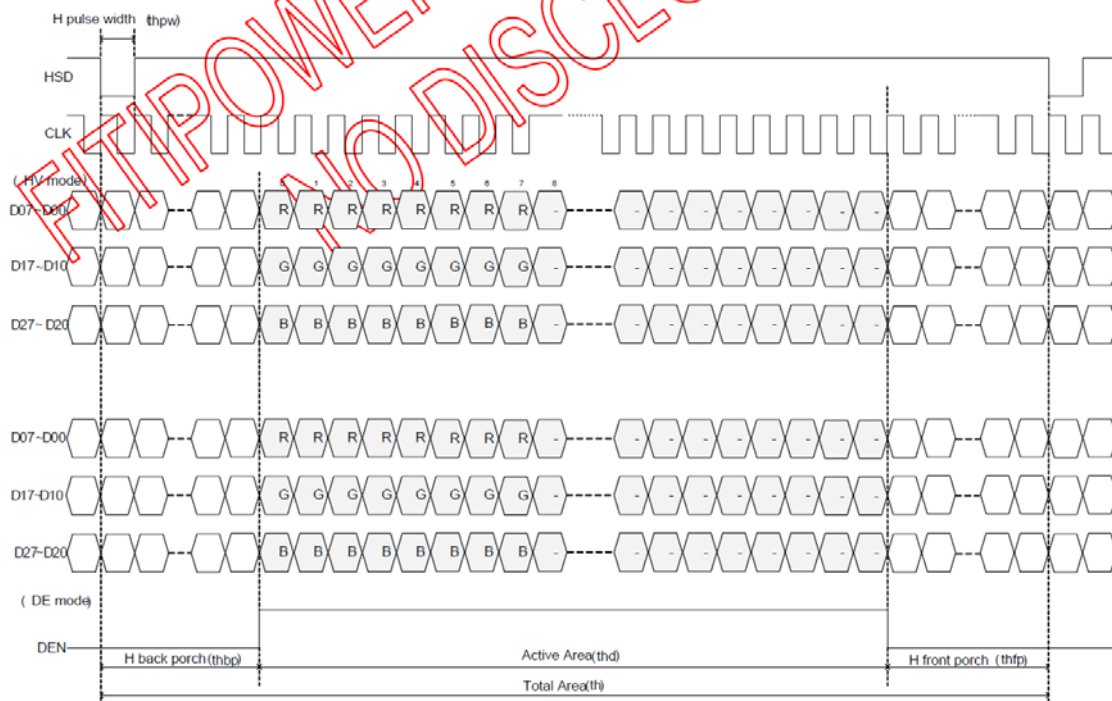
7.1 Vertical input timing



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Vertical input timing

7.2 Horizontal input timing



CONFIDENTIAL
DISCLOSURE

Horizontal input timing

7.3 Parallel RGB Timing characteristic

DE mode

DE mode					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

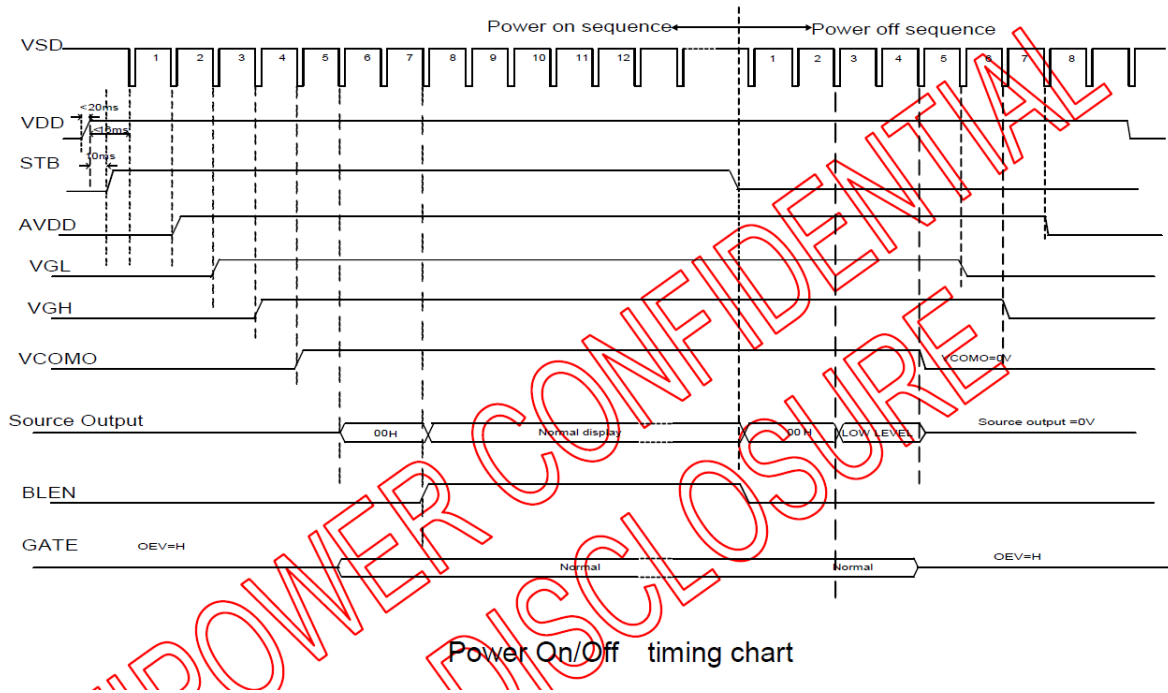
HV mode(1)

HV mode					
Horizontal input timing					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Horizontal display area	thd	1024			DCLK
DCLK frequency@Frame rate=60hz	fclk	44.9	51.2	63	Mhz
1 Horizontal Line	th	1200	1344	1400	DCLK
HSYNC pulse width	thpw	Min.	1		
		Typ.	-		
		Max.	140		
HSYNC back porch	thbp	160	160	160	
HSYNC front porch	thfp	16	160	216	

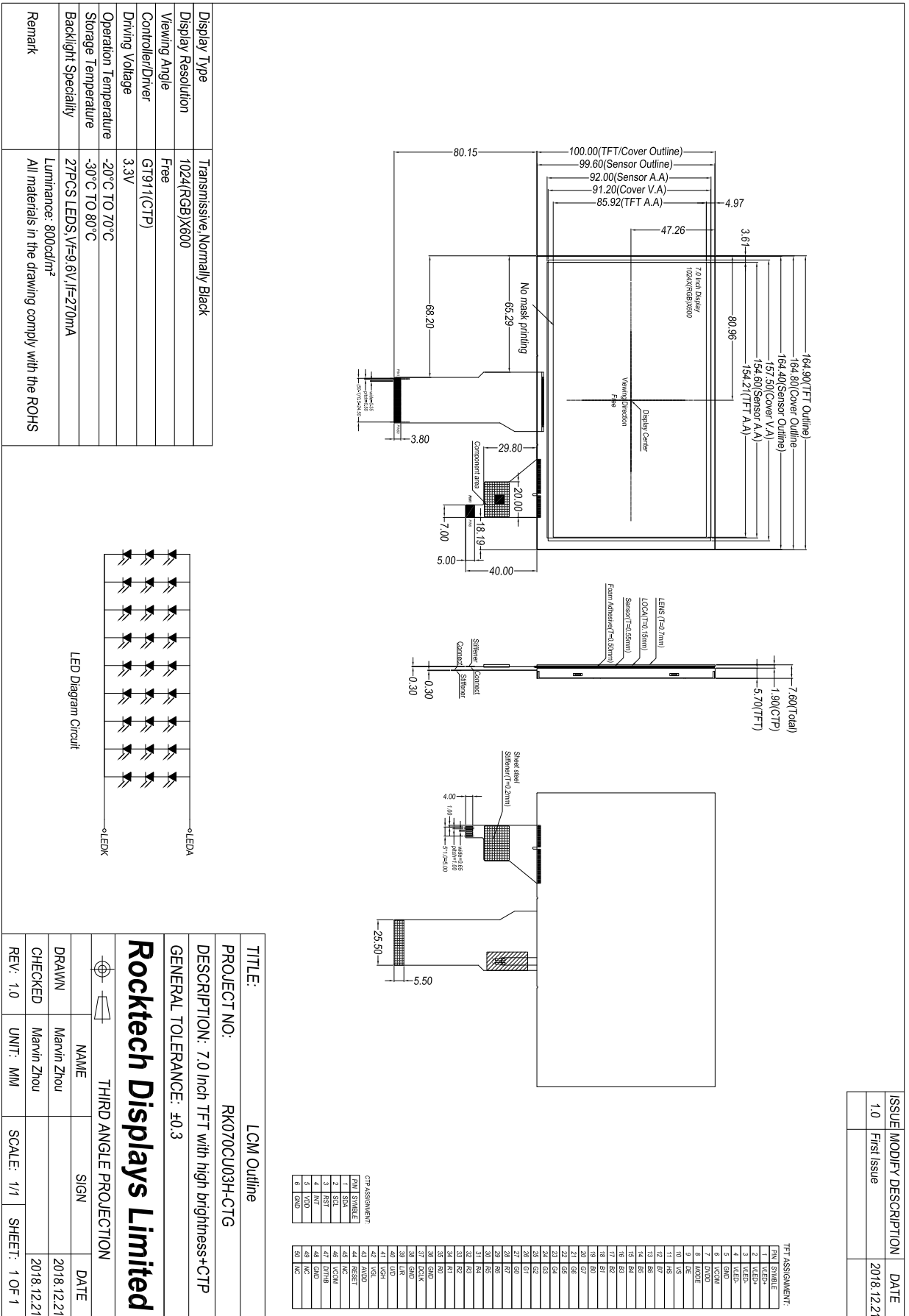
HV mode(2)

Vertical input timing					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tpw	1	-	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

7.4 Power On/Off Sequence



8. Outline Dimension



ISSUE	MODIFY DESCRIPTION	DATE
1.0	First Issue	2018.12.21

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	Thermal Cycling Test(No operation)	-20C for 30min, 70c 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

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.