Rocktech Displays Limited

LCD Module Specification

Module P/N: RK035BV237

Version: 1.0

Description : 3.5 inch TFT 640*480 Pixels with
LED backlight,All viewing angle
700 nits brightness

TEL: 0086-755-26065260

Fax: 0086-755-26065261

E-mail: Sales@rocktech.com.hk

Web: www.rocktech.com.hk

Revision History

Date	Rev.	Page	Description
2025-05-15	1.0	All	First issue

CONTENTS

1.General Features

Item	Spec	Remark
Display Mode	Normally Black transmissive	
Viewing Direction	Free	IPS
Input Signals	MIPI	
Outside Dimensions	74.50(W)×62.40(H)×2.40(D)	
Active Area	70.08mm(W)×52.56mm(H)	
Number of Pixels	640(RGB)×480	
Dot Pitch	0.1095mm(W) ×0.1095mm(H)	
Pixel Arrangement	RGB Vertical stripes	
Driver IC	ST7703I	

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	VCC	-0.3	-	6.6	V	
	IOVCC	-0.3	-	5.5	V	
	VSP	-0.3	-	6.6	V	
	VSN	-6.6	-	0.3	V	
Storage Temperature	T_{ST}	-30	-	80	℃	
Operating Ambient Humidity	H_{OP}	10	-		%RH	
Operating Ambient temperature	T_{OP}	-20	-	70	℃	

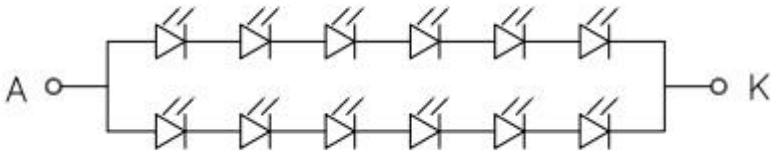
3.Electrical Specification

3.1 Driving TFT LCD Panel

Item		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		VCC	2.5	-	6.2	V	
		IOVCC	1.65	1.8	2.0	V	
		VSP	5.0	5.5	6.0	V	
		VSN	-6.0	-5.5	-5.0	V	
Logic Input Voltage	Low Voltage	V_{IL}	0	-	0.3IOVCC	V	
	High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	
Logic Output Voltage	Low Voltage	V_{OL}	0	-	0.2IOVCC	V	
	High Voltage	V_{OH}	0.8IOVCC	-	IOVCC	V	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	-	18	-	V	
Backlight driving current	I_F	30	40	50	mA	
Backlight Power Consumption	W_{BL}	-	720	-	mW	
Life Time	-	-	50,000	-		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	900	1200	-		FIG.1
2)Module Luminance	L	600	700	-	cd/m^2	FIG.1
3)Response time	Tr+Tf	-	25	35	ms	FIG.2
4)Viewing Angle	θ_T	-	80	-	Degree	FIG.3
	θ_B	-	80	-		
	θ_L	-	80	-		
	θ_R	-	80	-		
5)Chromaticity	Wx	0.285	0.325	0.365		
	Wy	0.285	0.325	0.365		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

◆ Measurement System

Notes:

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

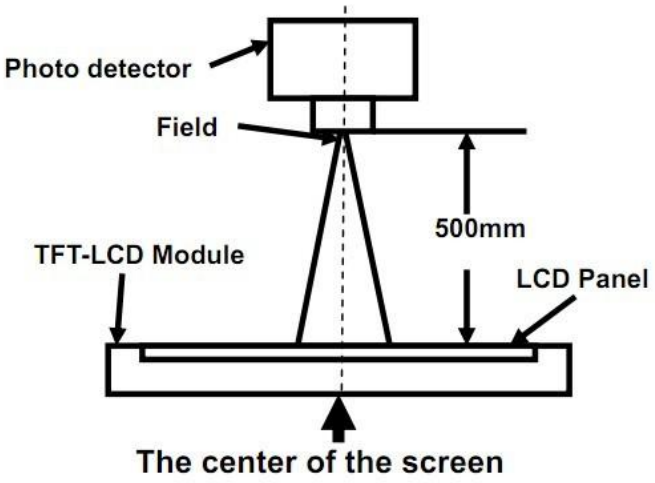
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

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.

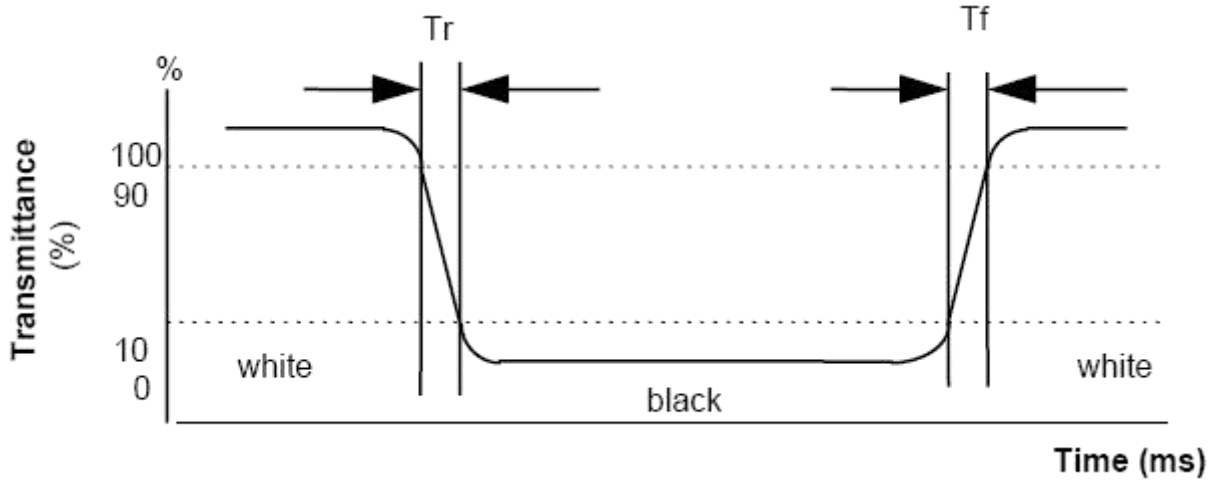
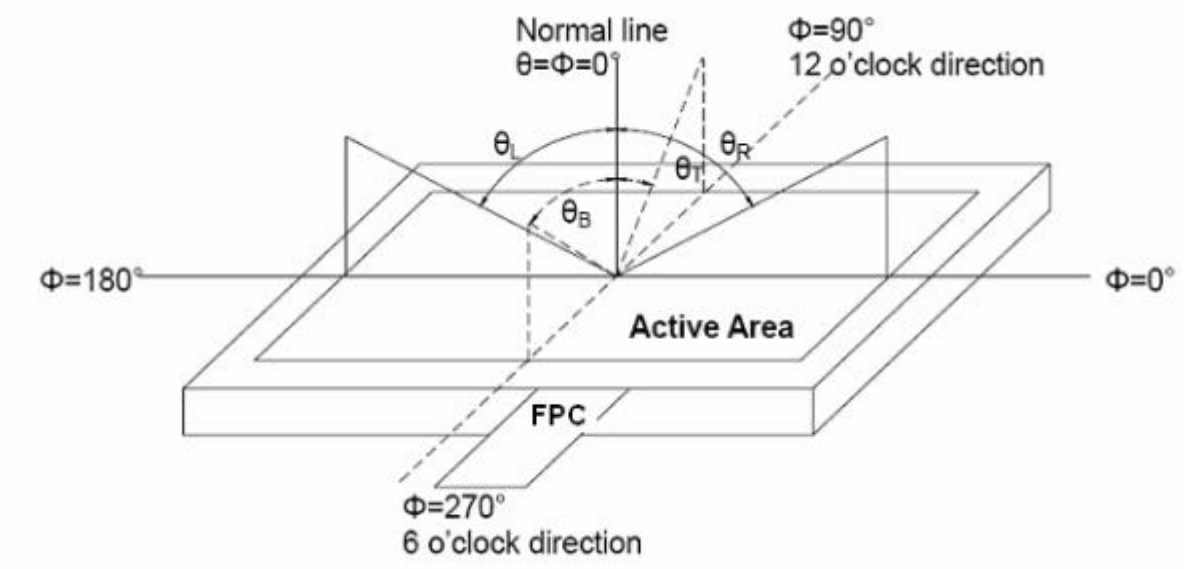
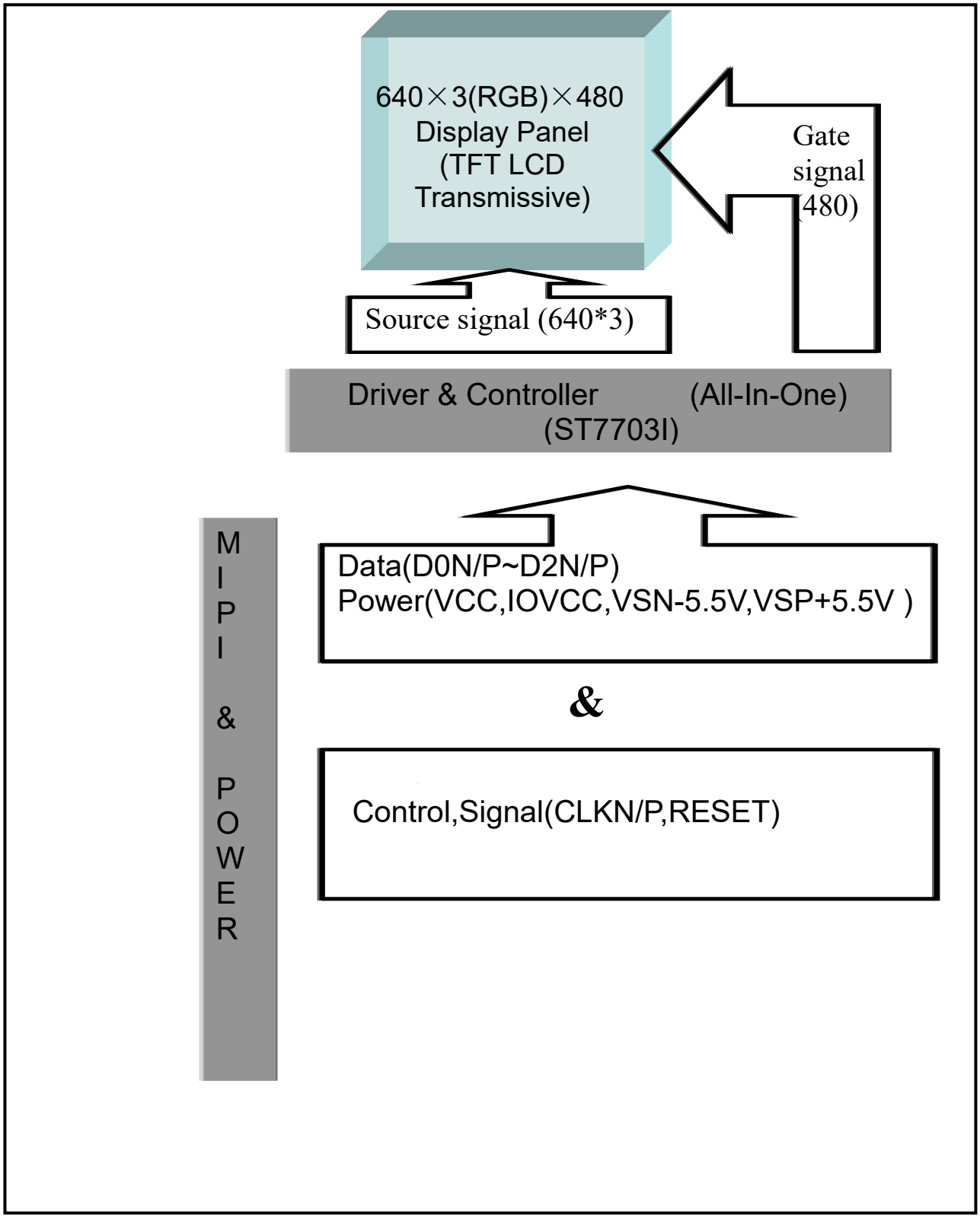


FIG. 3 The definition of Viewing Angle

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



6.Pin Description

Item	Symbol	Functions	Remarks
1	GND	Power ground	
2	LEDA1	The anode of the backlight	
3	LEDA2	The anode of the backlight	
4	LEDK1	The cathode of the backlight	
5	LEDK2	The cathode of the backlight	
6	GND	Power ground	
7	D0N	Negative polarity of low voltage differential data0 signal	
8	D0P	Positive polarity of low voltage differential data0 signal	
9	GND	Power ground	
10	D1N	Negative polarity of low voltage differential data1 signal	
11	D1P	Positive polarity of low voltage differential data1 signal	
12	GND	Power ground	
13	CLKN	Negative polarity of low voltage differential clock signal	
14	CLKP	positive polarity of low voltage differential clock signal	
15	GND	Power ground	
16	D2N	Negative polarity of low voltage differential data2 signal	
17	D2P	Positive polarity of low voltage differential data2 signal	
18	GND	Power ground	
19	IOVCC	Interface pin Power supply +1.8V	
20	VCC	NC	
21	GND	Power ground	
22	RESET	Global reset pin	
23	GND	Power ground	
24	VSN	Power supply -5.5V	
25	VSP	Power supply +5.5V	
26	GND	Power ground	
27	GND	Power ground	
28	GND	Power ground	

7. Timing Characteristics

7.1 High Speed Mode-Clock Channel Timing

High Speed Mode

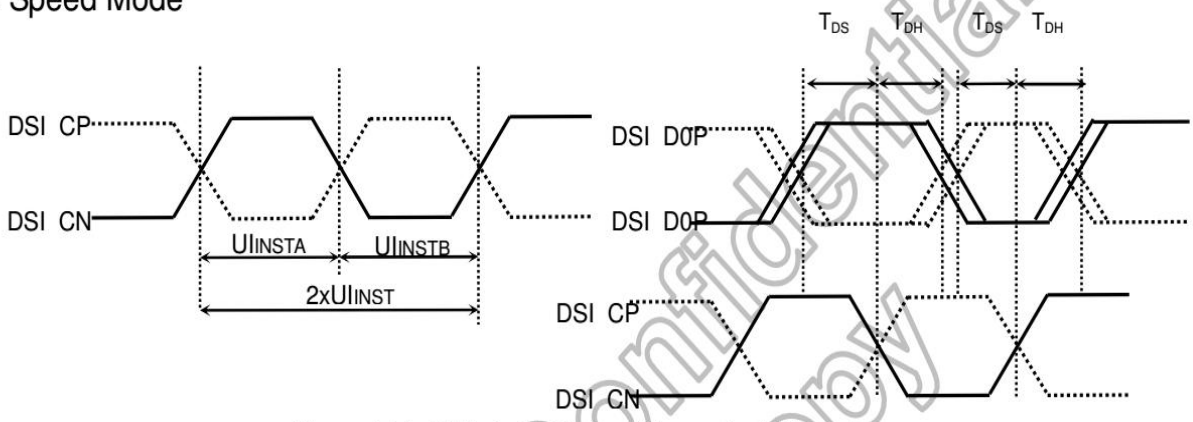


Figure 7.4: DSI clock timing Characteristics

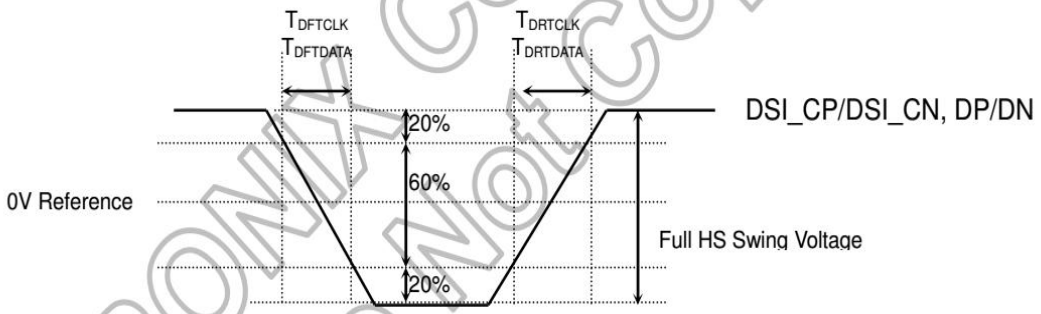


Figure 7.5: Rising and falling time on clock and data channel

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, T_A = -30 to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Double UI instantaneous	$2xUI_{INST}$	TBD	-	25	ns
	UI instantaneous	UI_{INSTA} UI_{INSTB}	TBD	-	12.5	ns
DP/DN	Data to clock setup time	T_{DS}	0.15xUI	-	-	ps
	Data to clock hold time	T_{DH}	0.15xUI	-	-	ps
DSI_CP/ DSI_CN	Differential rise time for clock	T_{DRTCLK}	150	-	0.3UI	ps
	Differential fall time for clock	T_{DFTCLK}	150	-	0.3UI	ps
DP/DN	Differential rise time for data	$T_{DRTDATA}$	150	-	0.3UI	ps
	Differential fall time for data	$T_{DFTDATA}$	150	-	0.3UI	ps

Table 7.3: DSI High Speed Mode Characteristics

7.2 Reset Operation

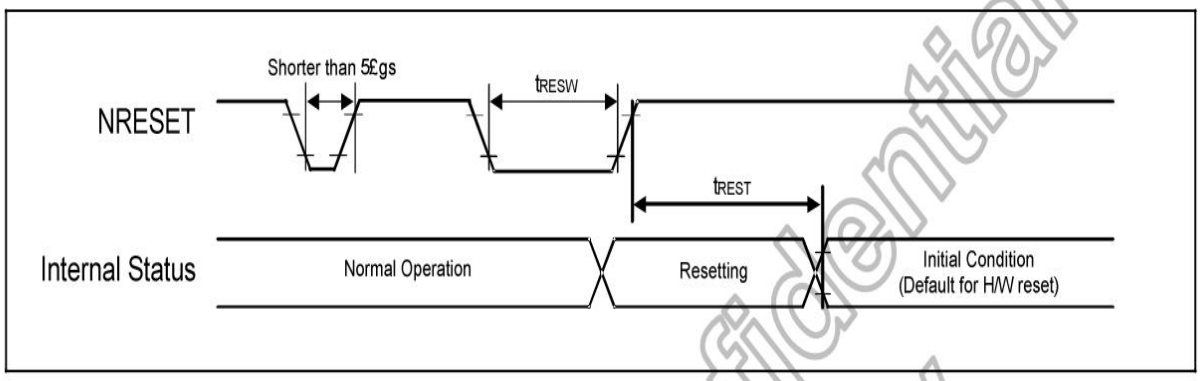


Figure 7.8: Reset input timing

Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width(1)	NRESET	10	-	-	-	µs
tREST	Reset complete time(2)	-	15	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

Table 7.8: Reset Input Timing

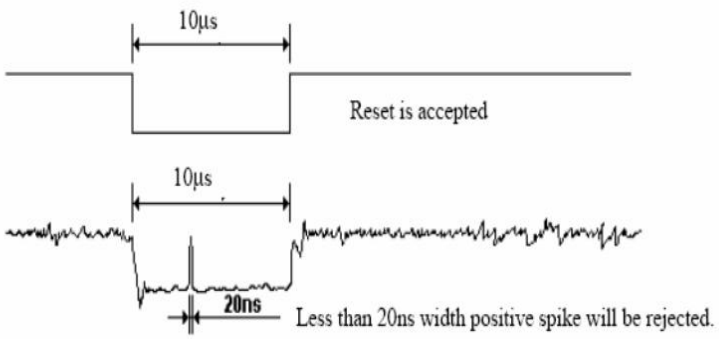
Note: (1) Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the following table.

NRESET Pulse	Action
Shorter than 5 µs	Reset Rejected
Longer than 10 µs	Reset
Between 5 µs and 10 µs	Reset Start

(2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which Maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.

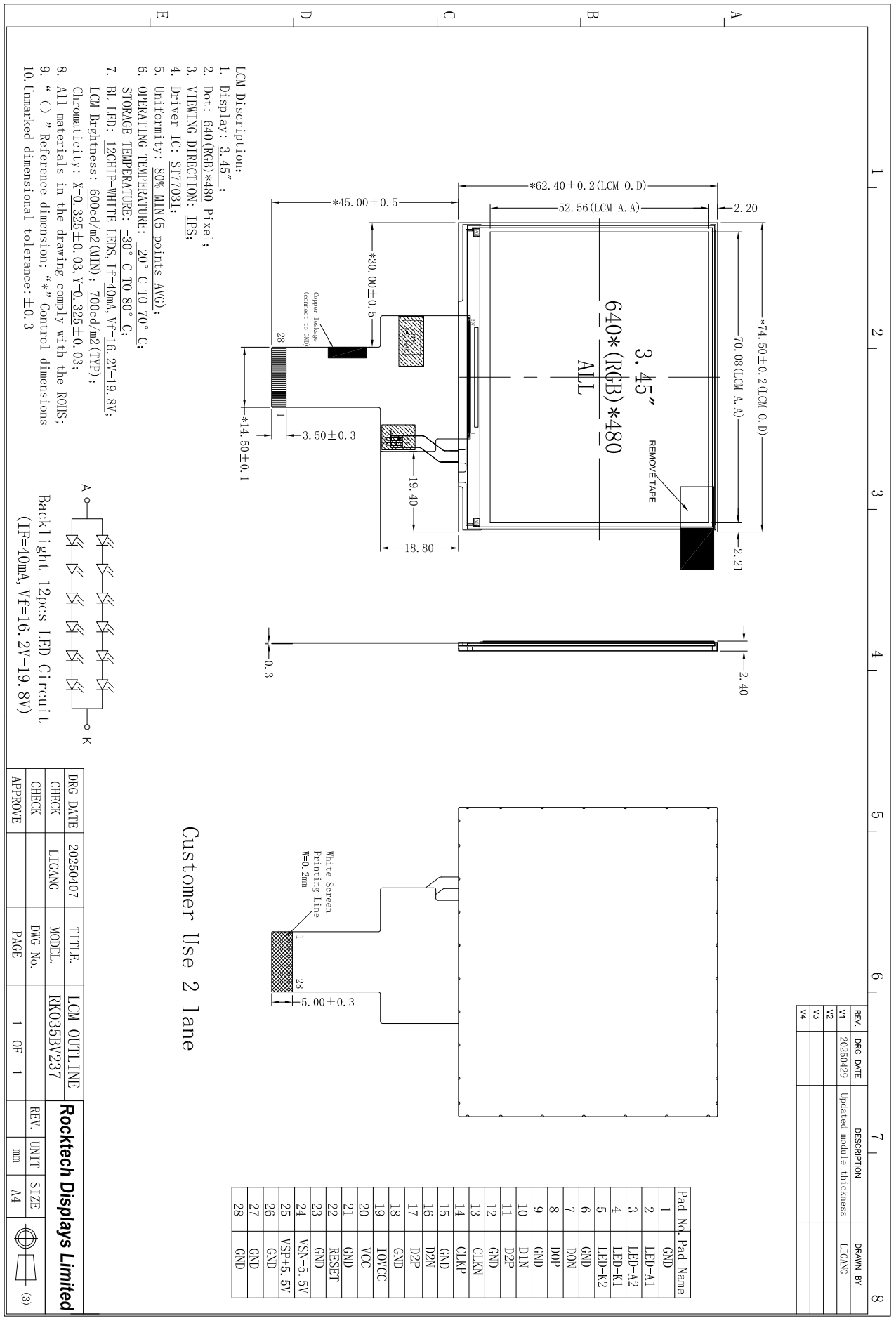
(3) During Reset Complete Time, ID and VCOM value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 15ms after a rising edge of NRESET.

(4) Spike Rejection also applies during a valid reset pulse as shown as below:



(5) It is necessary to wait 15msec after releasing NRESET before sending commands. Also Sleep Out command cannot be sent for 120msec.

8. Outline Dimension



LCM Discription:
1. Display: 3.45″;
2. Dot: 640(RGB)*480 Pixel;
3. VIEWING DIRECTION: IPS;
4. Driver IC: ST7703I;
5. Uniformity: 80% MIN(5 points AVG);
6. OPERATING TEMPERATURE: -20° C TO 70° C;
   STORAGE TEMPERATURE: -30° C TO 80° C;
7. BL LED: 12CHIP-WHITE LEDS, If=40mA, Vf=16.2V-19.8V;
   LCM Brightness: 600cd/m2(MIN); 700cd/m2(TYP);
   Chromaticity: X=0.325±0.03, Y=0.325±0.03;
8. All materials in the drawing comply with the ROHS;
9. “ ( ) ” Reference dimension; “*” Control dimensions
10. Unmarked dimensional tolerance: ±0.3

Backlight 12pcs LED Circuit
(IF=40mA, Vf=16.2V-19.8V)

Customer Use 2 lane

Pad No.	Pad Name
1	GND
2	LED-A1
3	LED-A2
4	LED-K1
5	LED-K2
6	GND
7	DON
8	DOP
9	GND
10	DIN
11	D2P
12	GND
13	CLKN
14	CLKP
15	GND
16	D2N
17	D2P
18	GND
19	IOVCC
20	VCC
21	GND
22	RESET
23	GND
24	VSN-5.5V
25	VSP+5.5V
26	GND
27	GND
28	GND

REV.	DRG DATE	DESCRIPTION	DRAWN BY
V1	20250429	Updated module thickness	LIGANG
V2			
V3			
V4			

DRG DATE	20250407	TITLE.	LCM OUTLINE
CHECK	LIGANG	MODEL.	RK035BV237
CHECK		DWG No.	
APPROVE		PAGE	1 OF 1

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REV.	UNIT	SIZE
	mm	A4

(3)

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.