Rocktech Displays Limited

LCD Module Specification

Module P/N: RK050BHD206A0

Version: 1.0

Description : 5.0 inch TFT 720*1280 Pixels with LED backlight, All viewing angle, 350 nits brightness

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Revision History

Date	Rev.	Page	Description
2018-12-20	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	64.70(W) x118.70(H) x1.60(D)	
Active Area	62.10mm(W)×110.40mm(H)	
Number of Pixels	720（RGB)×1280	
Dot Pitch	0.08625mm(W）×0.08625mm(H)	
Pixel Arrangement	RGB Vertical stripes	
Drive IC	RM68200	

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 Supply for Analog Circuit	VDD	-0.3	-	4.8	V	
Power Supply for I/O Circuit	IOVDD	-0.3	-	3.3	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		VDD	2.5	2.8	3.6	V	
						V	
		IOVDD	1.65	1.8	3.3	V	
						V	
Logic Input Voltage	Low Voltage	V_{IL}	0	-	0.3IOVDD	V	
	High Voltage	V_{IH}	0.7IOVDD	-	IOVDD	V	
Logic Output Voltage	Low Voltage	V_{OL}	0	-	0.2IOVDD	V	
	High Voltage	V_{OH}	0.8IOVDD	-	IOVDD	V	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	-	19.2	-	V	
Backlight driving current	I_F	30	40	50	mA	
Backlight Power Consumption	W_{BL}	-	768	-	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	-	800	-		FIG.1
2)Module Luminance	L	300	350	-	cd/m^2	FIG.1
3)Response time	Tr	-	35	45	ms	FIG.2
	Tf					
4)Viewing Angle	θ_T	70	80	-	Degree	FIG.3
	θ_B	70	80	-		
	θ_L	70	80	-		
	θ_R	70	80	-		
5)Chromaticity	Wx	0.271	0.311	0.351		
	Wy	0.299	0.339	0.379		
	Rx	-	-	-		
	Ry	-	-	-		
	Gx	-	-	-		
	Gy	-	-	-		
	Bx	-	-	-		
	By	-	-	-		

◆ Measurement System

Notes:

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

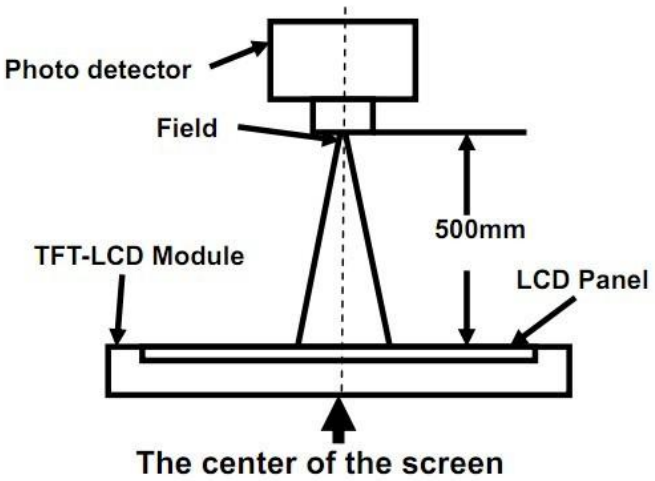
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

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.

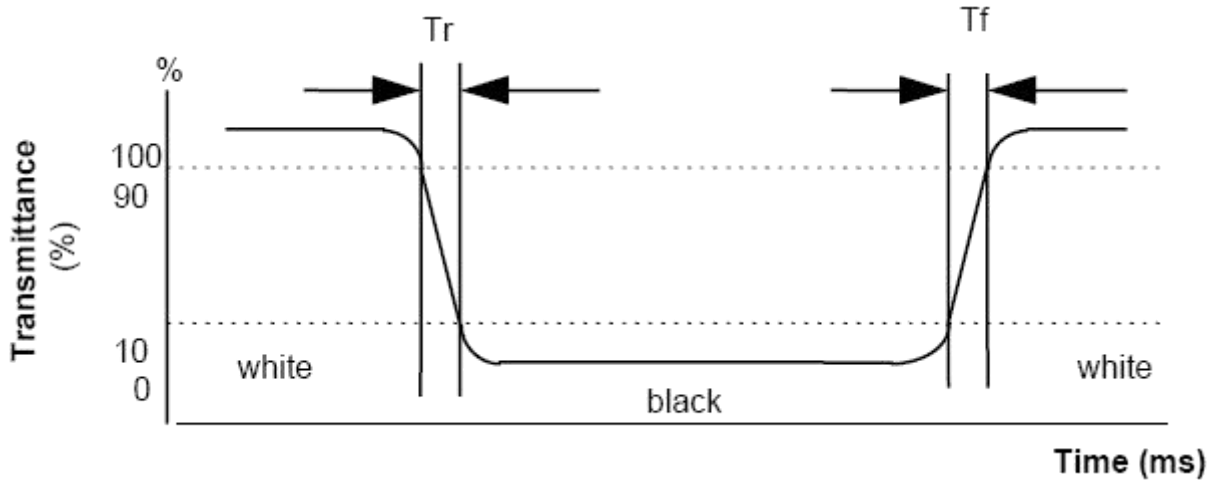
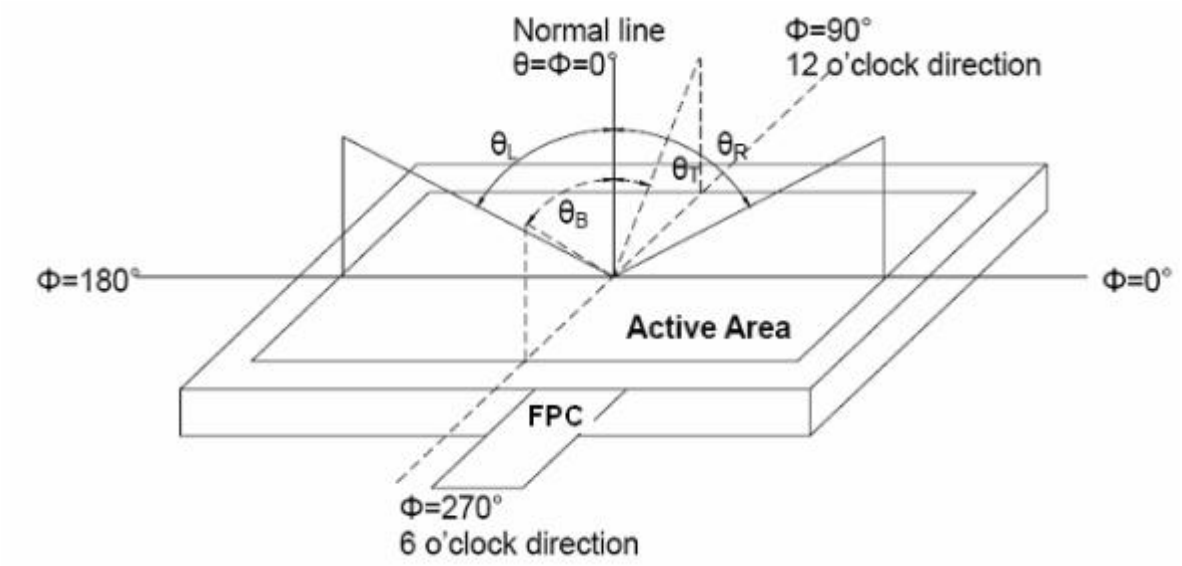
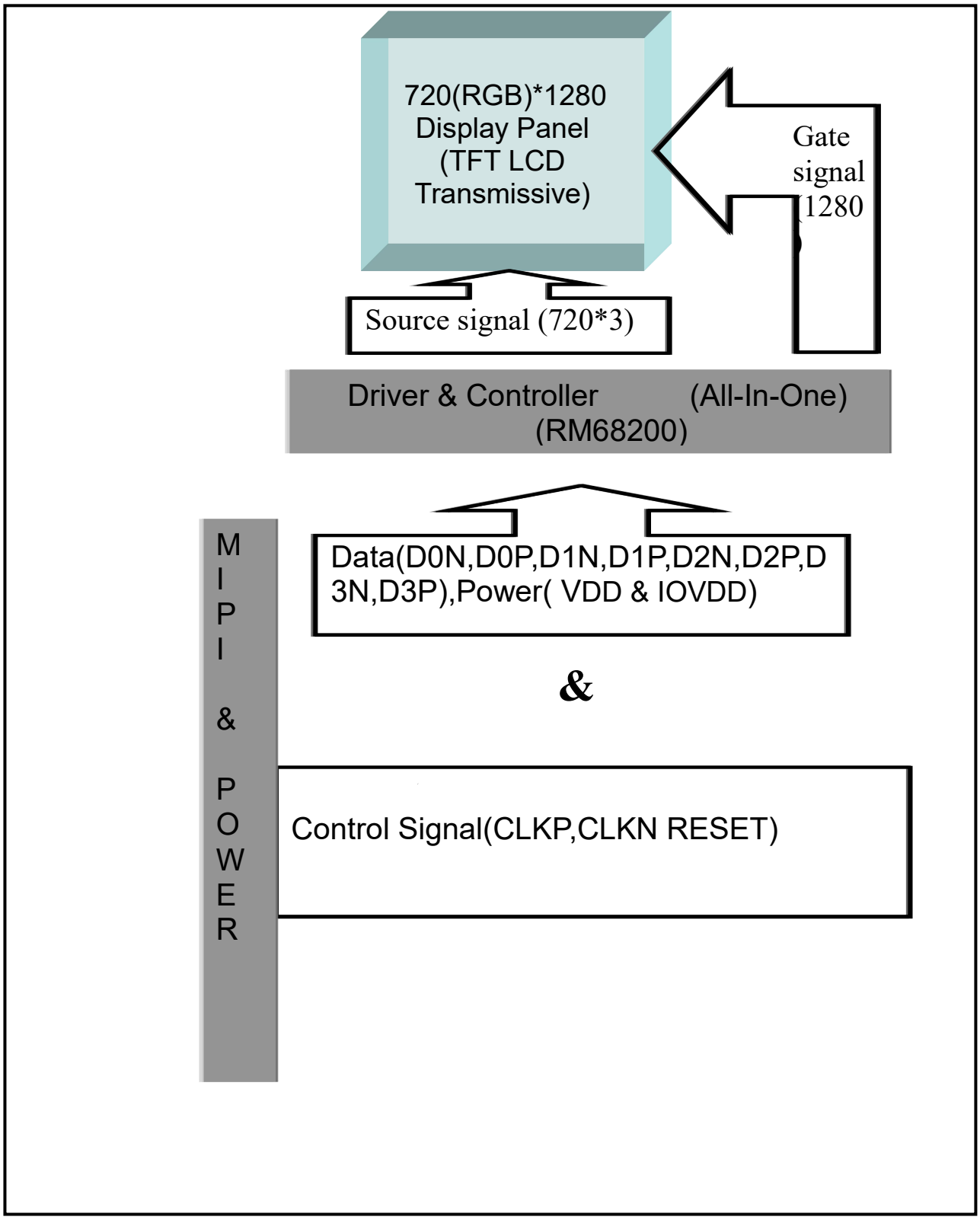


FIG. 3 The definition of Viewing Angle

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

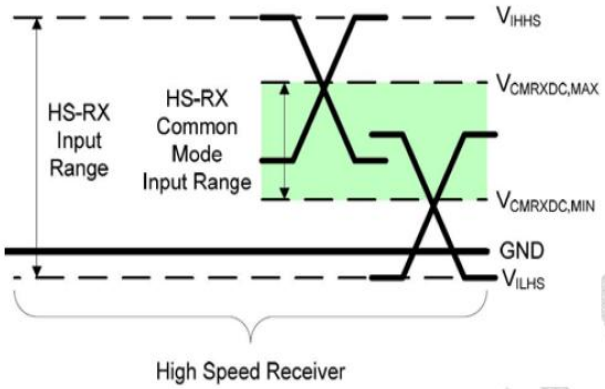
Item	Terminal	Functions
1	GND	GND
2	LCD_VDD_2V8	Power supply VDD 2.8V
3	LCD_IOVDD_1V8	Power supply VDD 1.8V
4	GND	GND
5	LCD_ID	NC
6	LCM_RST	LRSTB
7	LCD_TE	Tearing effect output pin to synchronies MCU to frame writing, activated by S/W command.
8	GND	GND
9	LCD_D1P	MIPI DSI data-1 signal line (+)
10	LCD_D1N	MIPI DSI data-1 signal line (-)
11	GND	GND
12	LCD_CLK_N	MIPI DSI Clock strobe signal line (-).
13	LCD_CLK_P	MIPI DSI Clock strobe signal line (+).
14	GND	GND
15	LCD_D0P	MIPI DSI data-0 signal line (+)
16	LCD_D0N	MIPI DSI data-0 signal line (-)
17	GND	GND
18	LCD_D2P	MIPI DSI data-2 signal line (+)
19	LCD_D2N	MIPI DSI data-2 signal line (-)
20	GND	GND
21	LCD_D3P	MIPI DSI data-3 signal line (+)
22	LCD_D3N	MIPI DSI data-3 signal line (-)
23	LED-	Backlight Cathode input pin.
24	LED+	Backlight Anode input pin.

7. Timing Characteristics(Details refer to RM68200 spec)

7.1. High Speed Mode Characteristics

High-Speed Receiver Specification

DC Specifications

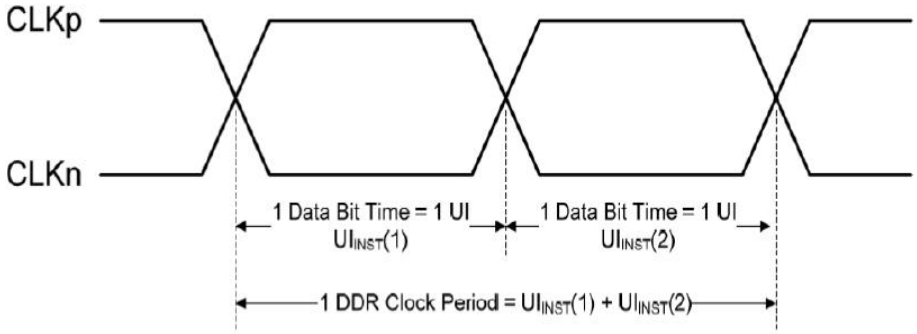


Parameter	Description	Min	Nom	Max	Units	Note
VCMRX(DC)	Common-mode voltage HS receive mode	70		330	mV	1,2
VIDTH	Differential input high threshold			70	mV	
VIDTL	Differential input low threshold	-70			mV	
VIHHS	Single-ended input high voltage			460	mV	1
VILHS	Single-ended input low voltage	-40			mV	1
ZID	Differential input impedance	80	100	125	Ω	

Notes:
1. Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
2. This table value includes a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz

Forward high speed transmissions

DDR Clock Definition



Clock Parameter	Symbol	Min	Typ	Max	Units	Notes
UI instantaneous	UI_{INST}			12.5	ns	1,2

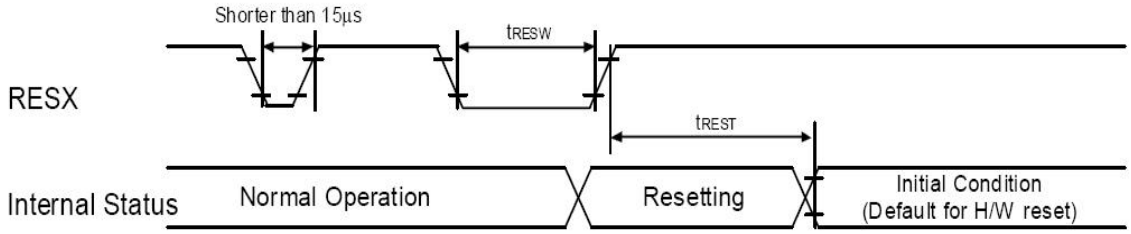
Notes:
1. This value corresponds to a minimum 80 Mbps data rate.
2. The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a data burst.

Data-Clock Timing Specifications

Parameter	Symbol	Min	Typ	Max	Units	Notes
Data to Clock Skew [measured at transmitter]	$T_{SKEW[TX]}$	-0.15		0.15	UI_{INST}	1
Data to Clock Setup Time [receiver]	$T_{SETUP[RX]}$	0.15			UI_{INST}	2
Clock to Data Hold Time [receiver]	$T_{HOLD[RX]}$	0.15			UI_{INST}	2

Notes:
1. Total silicon and package delay budget of 0.3*UI_{INST}
2. Total setup and hold window for receiver of 0.3*UIINST

7.2 Reset Operation



Reset input timing:

IOVCC=1.65 to 3.6V, VCI=2.5 to 3.6V, AGND=DGND=0V, Ta=-40 to 85℃

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	15	-	-	-	μs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-		-	120	When reset applied during Sleep out mode	ms

Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

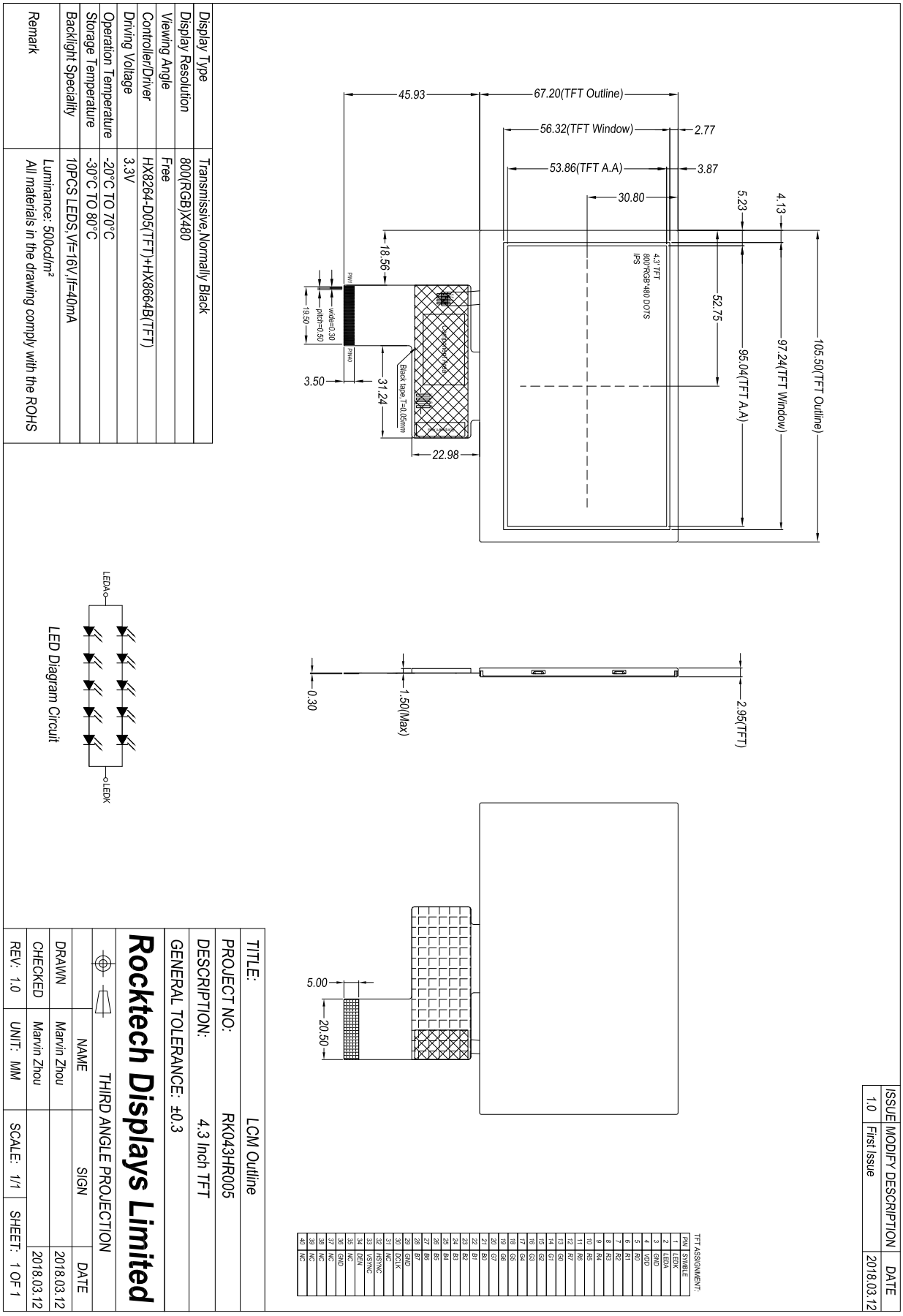
RESX Pulse	Action
Shorter than 5μs	Reset Rejected
Longer than 15μs	Reset
Between 5μs and 15μs	Reset starts (It depends on voltage and temperature condition.)

Note 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.

Note 3. During Reset Complete Time, data 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 5ms after a rising edge of RESX.

Note 4. Spike Rejection also applies during a valid reset pulse as shown below:

8.Outline Dimension



ISSUE	MODIFY DESCRIPTION	DATE
1.0	First Issue	2018.03.12

Display Type	Transmissive,Normally Black
Display Resolution	800(RGB)X480
Viewing Angle	Free
Controller/Driver	HX8264-D05(TFT)+HX8664B(TFT)
Driving Voltage	3.3V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Backlight Speciality	10PCS LEDS,Vf=16V,If=40mA
Remark	Luminance: 500cd/m² All materials in the drawing comply with the ROHS

TITLE:	LCM Outline		
PROJECT NO:	RK043HR005		
DESCRIPTION:	4.3 Inch TFT		
GENERAL TOLERANCE: ±0.3			
Rocktech Displays Limited			
THIRD ANGLE PROJECTION			
	NAME	SIGN	DATE
DRAWN	Marvin Zhou		2018.03.12
CHECKED	Marvin Zhou		2018.03.12
REV: 1.0	UNIT: MM	SCALE: 1/1	SHEET: 1 OF 1

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.