Rocktech Displays Limited

LCD Module Specification

Module P/N: RK056IV52-T

Version: 1.0

Description : 5.6 inch TFT 640*480 Pixels
Pixels with LED backlight

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Revision History

Date	Rev.	Page	Description
07/01/2010	1.0	All	First issue

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1. General Features

Item	Spec	Remark
Display Mode	Normally White transmissive	
Gray Scale Inversion Direction	6 O'CLOCK	
Input Signals	RGB 24 bit	
Outside Dimensions	126.5 (W) x100(H) x7.1(D) Max	
Active Area	112.896mm(W)×84.672mm(H)	
Number of Pixels	640(RGB)×480	
Dot Pitch	0.0588mm(H) ×0.1764mm(W)	
Pixel Arrangement	RGB Vertical stripes	

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	Vcc	-0.3	-	6.5	V	
	AVDD	-0.3	-	6.5	V	
	VGH	-0.3		18		
	VGL	-15		0.3		
	VGH-VGL	-		33		
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		Vcc	3.0	3.3	3.6	V	
		AVDD	4.8	5.0	5.2	V	
		VGH	14.3	15.0	15.7	V	
		VGL	-10.5	-10.0	-9.5	V	
		VCOM	3.8	4.0	4.2	V	
Vcom		VCAC		5.50		V	
		VCDC	0.72	0.92	1.12		
Logic Input Voltage	Low Voltage	VIL	0.	-	0.3Vcc	V	
	High Voltage	VIH	0.7Vcc	-	Vcc	V	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	8.4	9.3	10.5	V	
Backlight driving current	I_F	90	100	110	mA	
Backlight Power Consumption	W_{BL}	-	930	-	mW	
Lift Time	-	-	20,000	-		Note 3

3.3 Current Consumption

Item	Sym.	Min	Typ.	Max	Unit	Note
Current for Driver	I_{GH}	-	0.12	0.24	mA	V_{GH}=15V
	I_{GL}	-	0.13	0.26	mA	V_{GL}=-10V
	Icc	-	10	15	mA	V_{cc}=3.3V
	I_{DD}	-	16	24		AV_{DD}=5V

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	150	180	-	cd/m^2	FIG.1
3)Response time	Tr+Tf	-	35	-	ms	FIG.2
4)Viewing Angle	θ_T	40	50	-	Degree	FIG.3
	θ_B	60	70	-		
	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 :

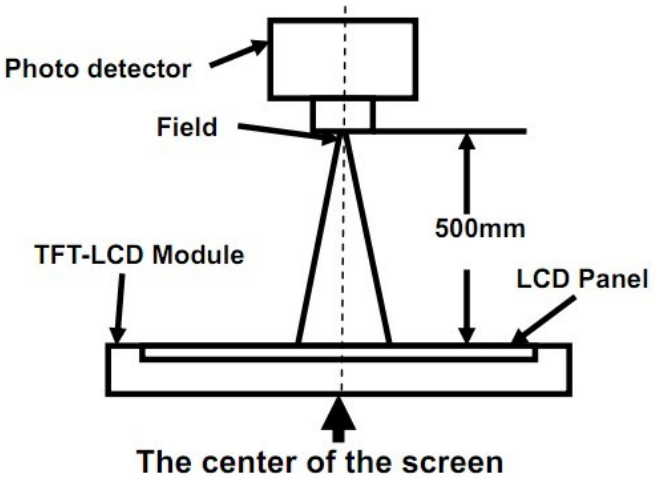
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

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.

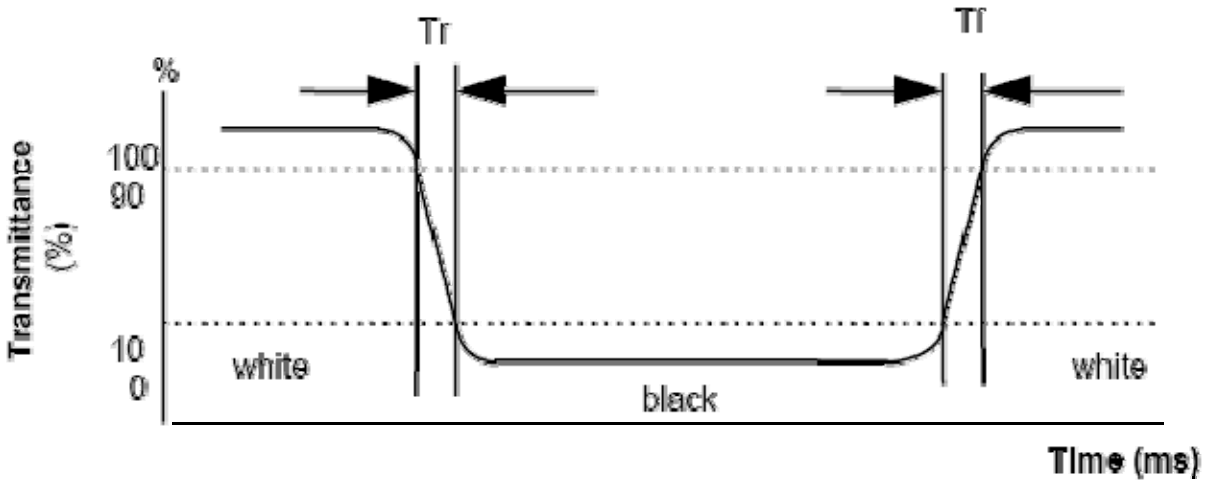
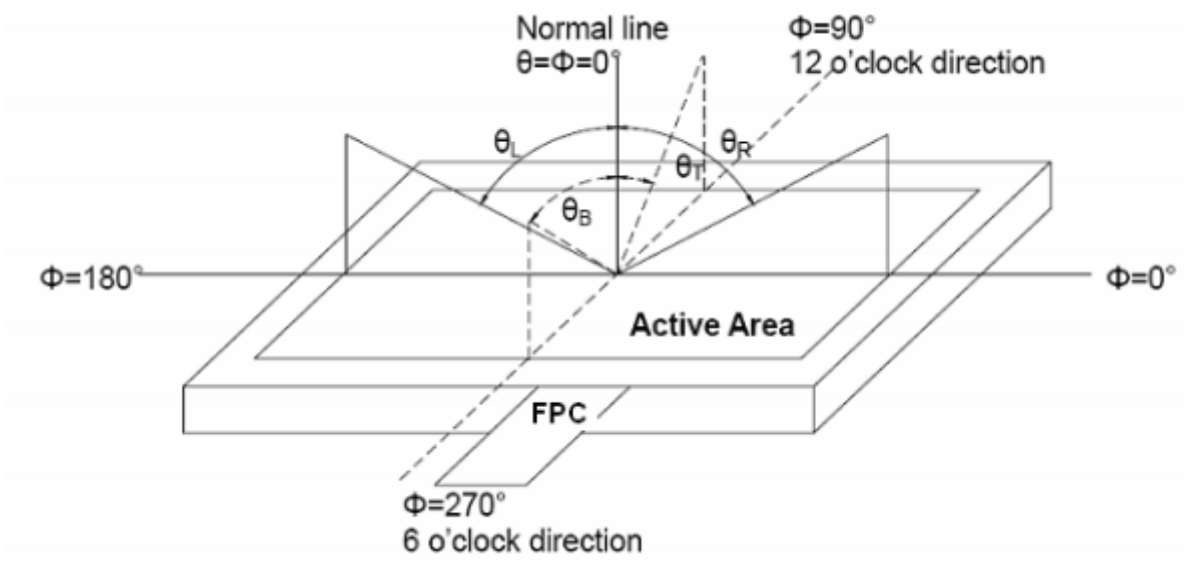
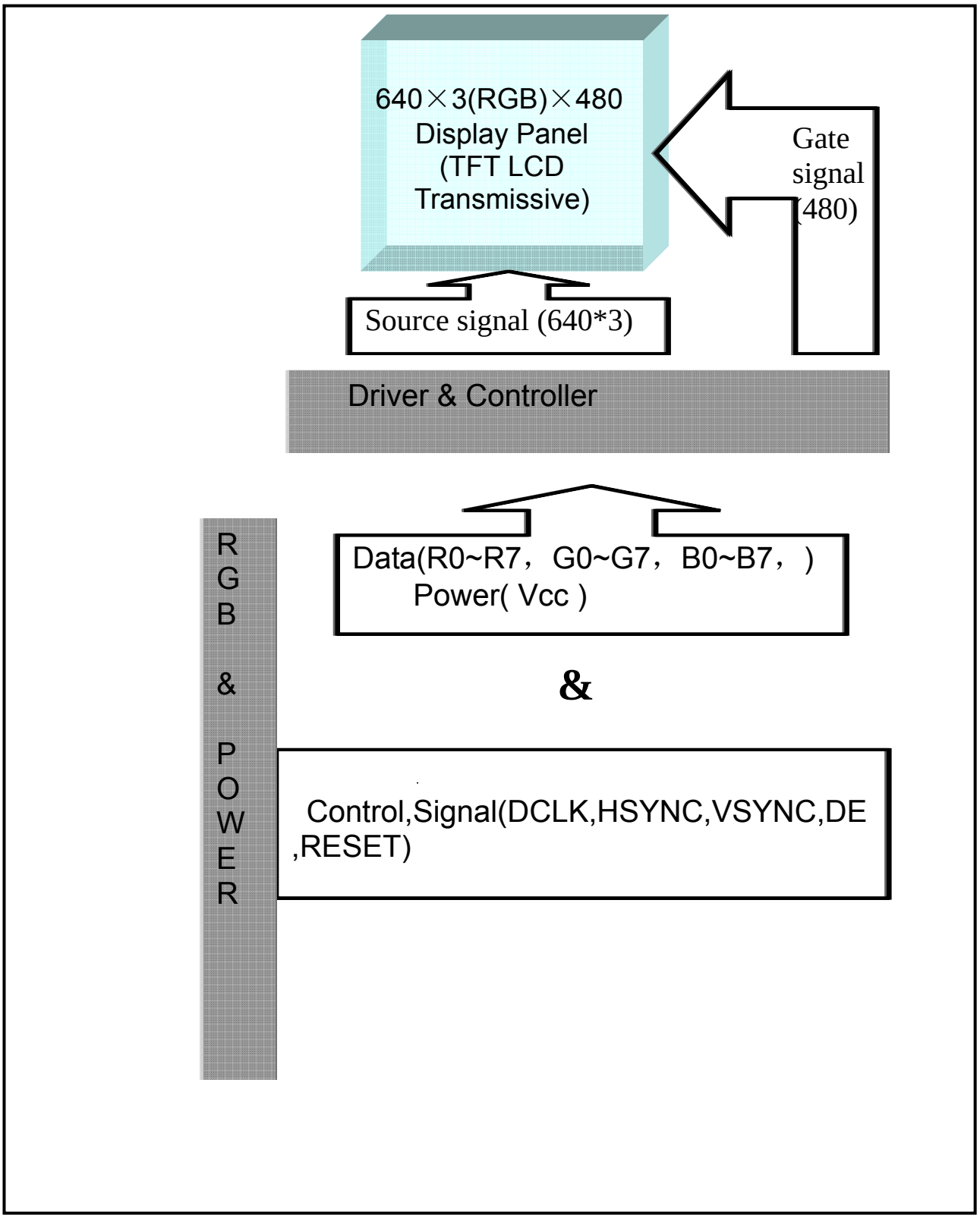


FIG. 3 The definition of Viewing Angle

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



6.Pin Description

Item	Terminal	I/O	Functions	
1	V_{LED+}	P	Power for LED backlight (Anode)	
2	V_{LED+}	P	Power for LED backlight (Anode)	
3	V_{LED-}	P	Power for LED backlight (Cathode)	
4	V_{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V_{COM}	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	
19	B0	I	Blue data(LSB)	
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	
27	G0	I	Gree data(LSB)	
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	
35	R0	I	Red data(LSB)	
36	GND	P	Power Ground	
37	DCLK	P	Sample clock	
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 2,3
40	U/D	I	Up/down selection	Note 2,3
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.	
45	POL	O	Polarity select for the line inversion control signal	
46	V_{COM}	I	Common Voltage	
47	NC	I	No connection	
48	NC	P	No connection	
49	NC	-	No connection	
50	NC	-	No connection	

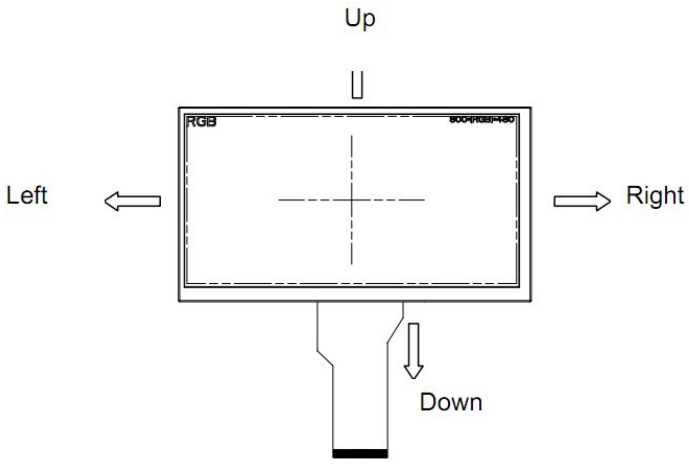
I: input, O: output, P: Power

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 floating.

Note 2: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	Vcc	Up to down, left to right
Vcc	GND	Down to up, right to left
GND	GND	Up to down, right to left
Vcc	Vcc	Down to up, left to right

Note 3: Definition of scanning direction.
Refer to the figure as below:



7.Timing Characteristics

7.1 Timing Conditions

Input/Output Timing

Input/Output Timing

Item	Symbol	Values			Unit.	Remark
		Min.	Typ.	Max.		
PXLCLK clock time	Tclk	33.3	39.7	-	ns	
PXLCLK pulse duty	Tcwh	40	50	60	%	Tclk
DATA set-up time	Tdsu	12	-	-	ns	DATA to PXLCLK
DATA hold time	Tdhd	12	-	-	ns	DATA to PXLCLK
DE setup time	Tesu	12	-	-	ns	DE to PXLCLK
VSYNC setup time	Tvst	12	-	-	ns	
VSYNC hold time	Tvhd	12	-	-	ns	
HSYNC setup time	Thst	12	-	-	ns	
HSYNC hold time	Thhd	12	-	-	ns	
HSYNC period time	Th	22.91	31.76	-	us	
HSYNC width	Thwh	1	-	-	Tclk	
VSYNC width	Tvwh	1	-	-	Th	
HSYNC to CLKIN	Thc	-	-	1	Tclk	

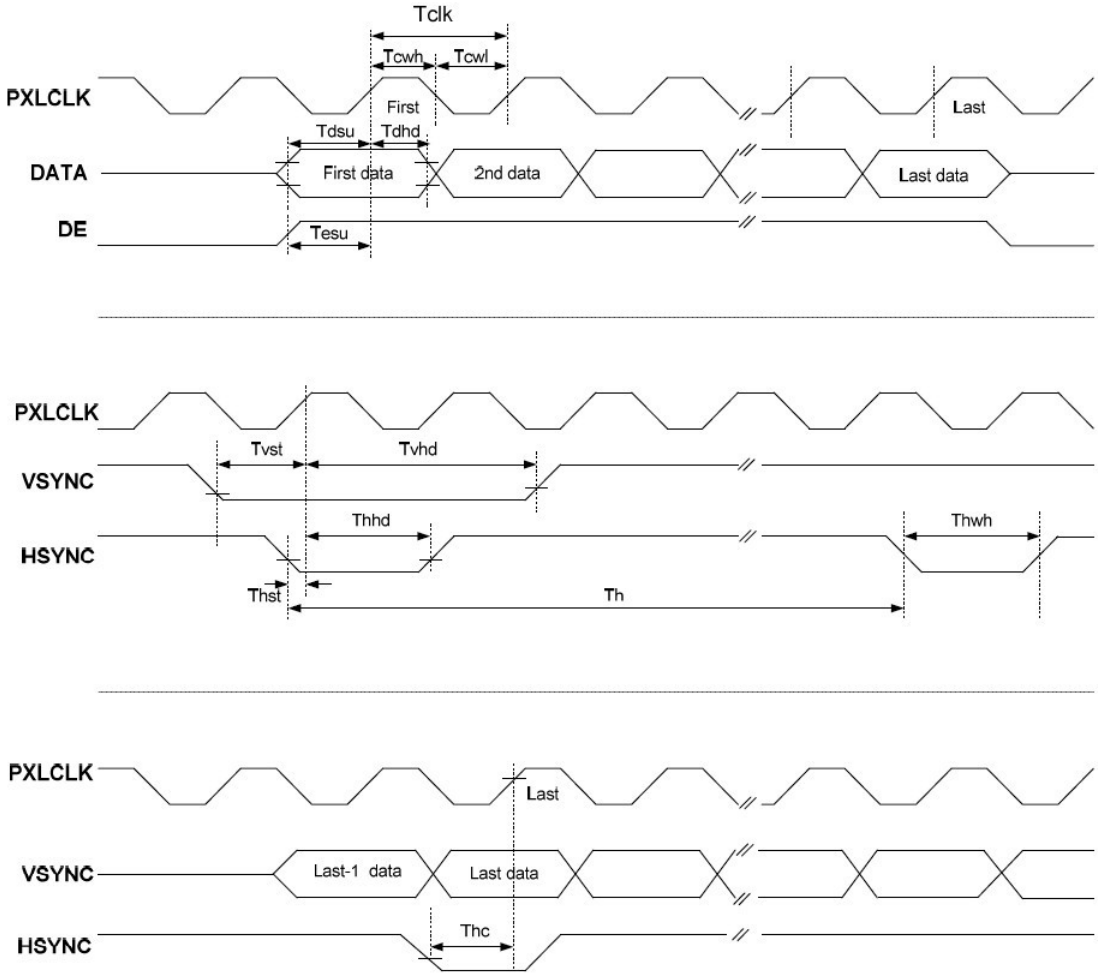
DE Mode input Timing Limitation

DE Mode	Values			Unit	Remark
	Min.	Typ.	Max.		
THC	48	160	765	tclk	
THD	640	640	640	tclk	
TH	688	800	1405	tclk	1TH=1line
TVC	6	45	255	line	
TVD	480	480	480	line	
TV	486	525	735	line	1TV=1field

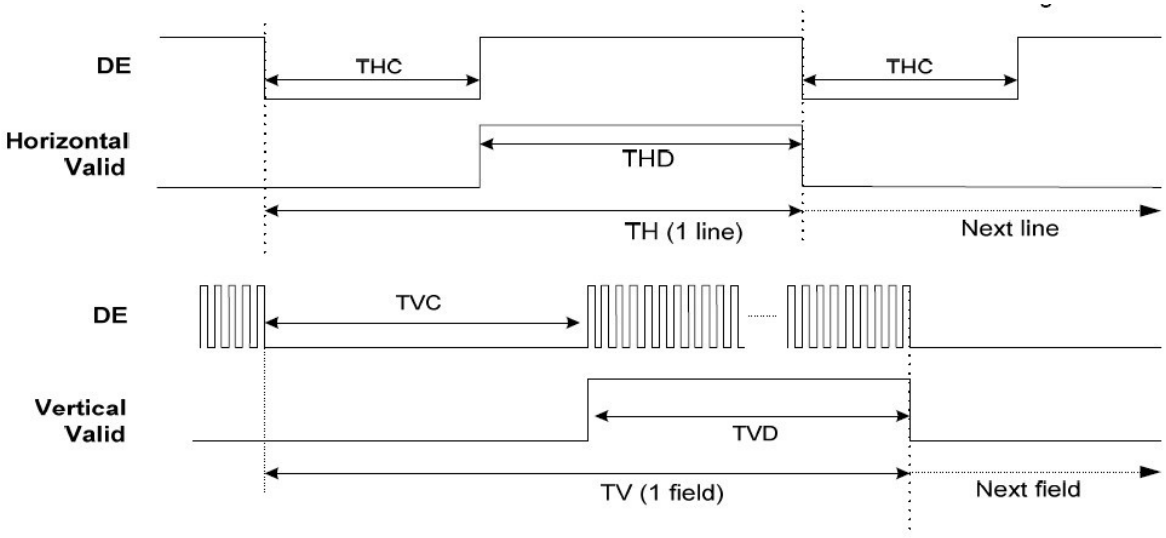
HV Mode input Timing Limitation

HV Mode	Values			Unit	Remark
	Min.	Typ.	Max.		
Thwh	-	10	-	tclk	
Thbp	-	134	-	tclk	
Thfp	-	16	-	tclk	
THD	-	640	-	tclk	
TH	-	800	-	tclk	1TH=1 line
Tvwh	-	2	-	line	
Tvbp	-	11	-	line	
Tvfp	-	32	-	line	
TVD	-	480	-	line	
TV	-	525	-	line	1TV=1 field

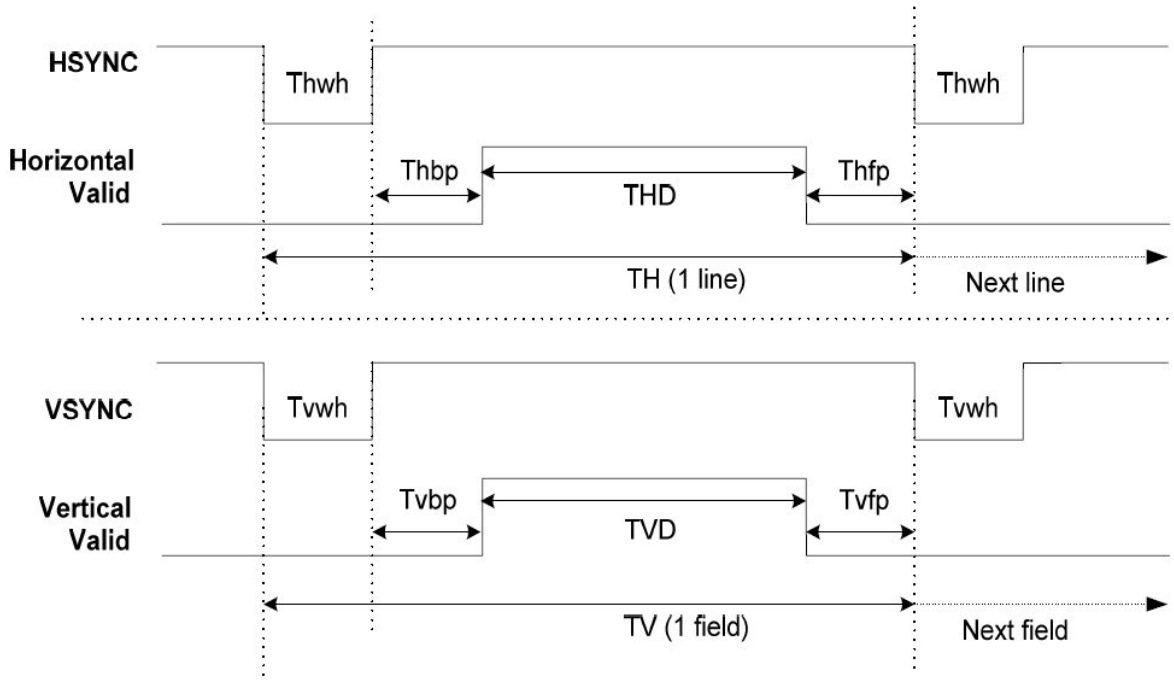
7.2 Timing Diagram



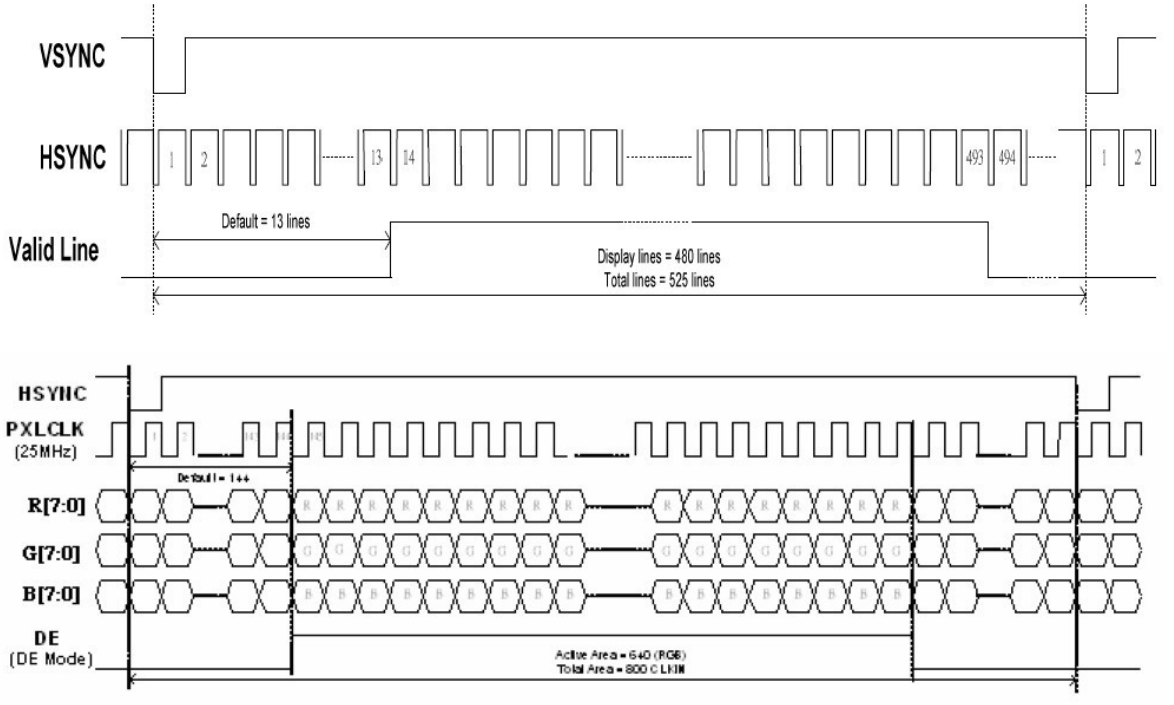
Clock and Data input Timing Diagram



DE Mode Input Timing



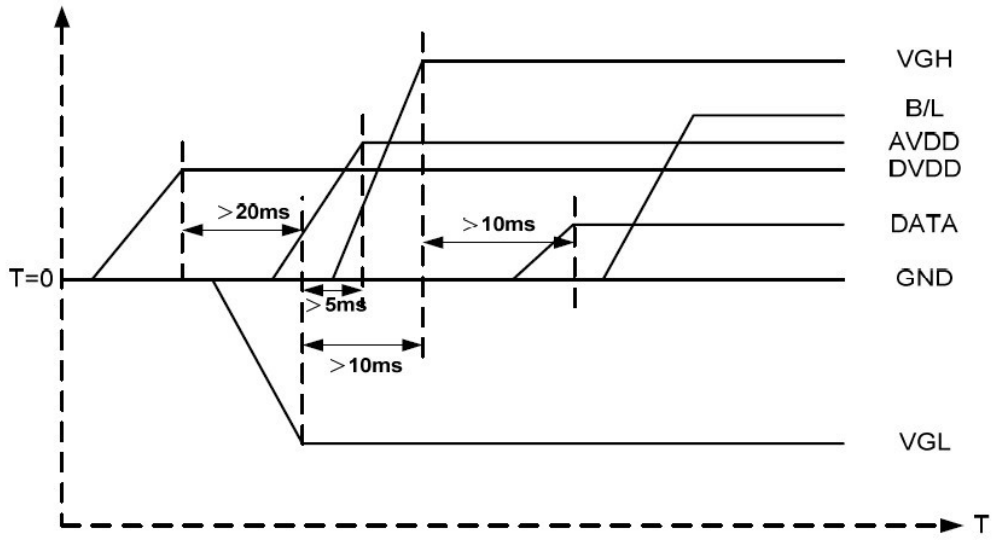
HV Mode Input Timing



24 Bit for 640(RGB)*480

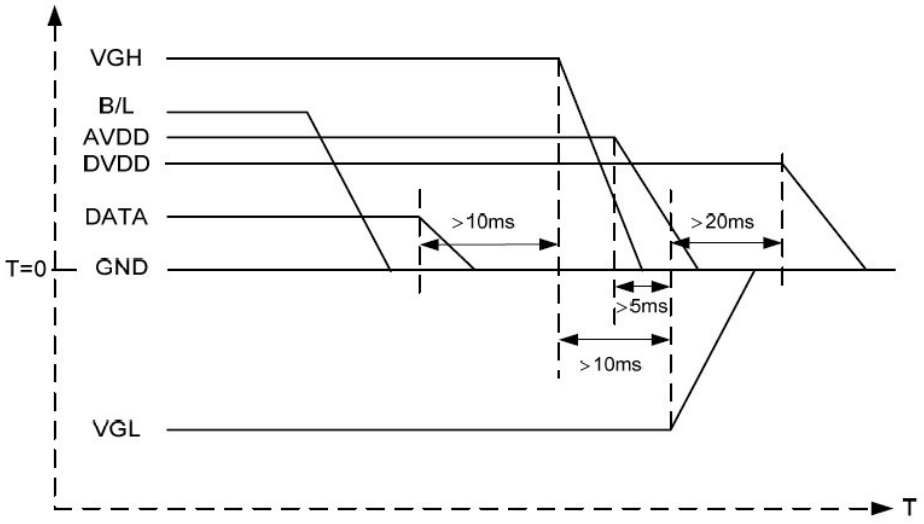
7.3 Power on/off Sequence

a. Power on:



DV_{DD}→VGL→VGH→Data→B/L

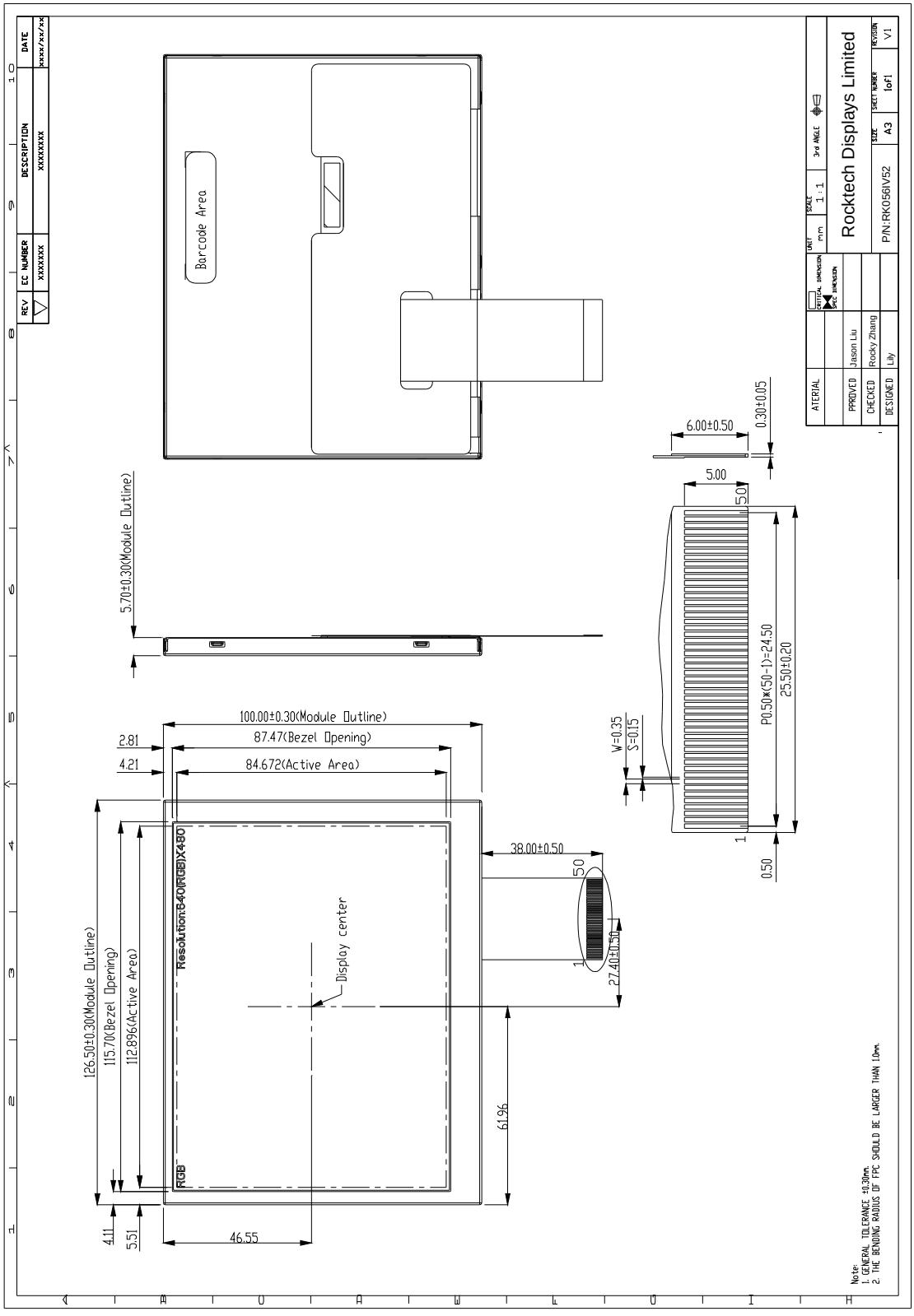
b. Power off:

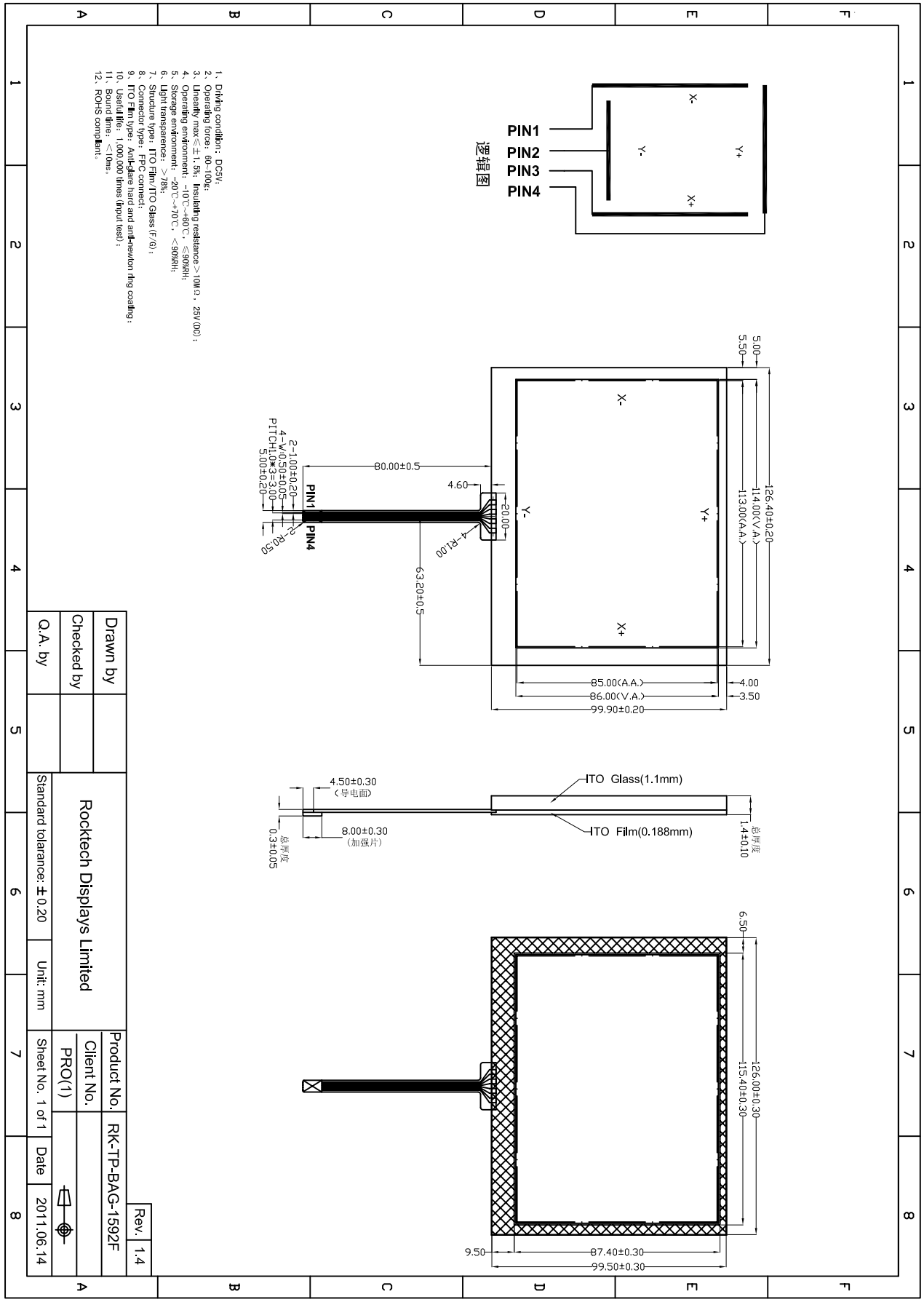


B/L→Data→VGH→VGL→DV_{DD}

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

7.Mechanical Drawing




1、Driving condition：DC5V;
2、Operating force：60~100g;
3、Linearity max≤±1.5%; Insulating resistance＞10MΩ，25V(DC)；
4、Operating environment：-10℃~+60℃，≤90%RH;
5、Storage environment：-20℃~+70℃，＜90%RH;
6、Light transparence：＞78%;
7、Structure type：ITO Film /ITO Glass (F/G)；
8、Connector type：FPC connect;
9、ITO Film type：Anti-glare hard and anti-newton ring coating；
10、Useful life：1,000,000 times input test)；
11、Bound time：＜10ms。
12、ROHS compliant。
逻辑图
PIN1
PIN2
PIN3
PIN4
X-
Y-
Y+
X+
5.00
5.50
80.00±0.5
4.60
20.00
4-R1.00
63.20±0.5
126.40±0.20
114.00(V.A.)
113.00(A.A.)
85.00(A.A.)
86.00(V.A.)
99.90±0.20
4.00
3.50
2-1.00±0.20
4-W0.50±0.05
PITCH1.0*3=3.00
5.00±0.20
2-R0.50
PIN1
PIN4
4.50±0.30
(导电面)
8.00±0.30
(加强片)
总厚度
0.3±0.05
ITO Glass(1.1mm)
ITO Film(0.188mm)
总厚度
1.4±0.10
6.50
126.00±0.30
115.40±0.30
9.50
87.40±0.30
99.50±0.30
Drawn by
Checked by
Q.A. by
Rocktech Displays Limited
Standard tolarance: ±0.20
Unit: mm
Sheet No. 1 of 1
Date
2011.06.14
Product No.
RK-TP-BAG-1592F
Client No.
PRO(1)
Rev.
1.4

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		60℃, 90%RH, 240Hr	Note
4	Peeling Off (Storage)		≧500gf/cm	Note
5	FPC Bending Test		≧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 ±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 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.