

**MODEL NO : TM070RDH13**  
**MODEL VERSION: 40**  
**SPEC VERSION : 2.9**  
**ISSUED DATE: 2018-08-21**

- Preliminary Specification  
 Final Product Specification

Customer : \_\_\_\_\_

Approved by	Notes

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This technical specification is subjected to change without notice

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## 1 General Specifications

	Feature	Spec
<b>Display Spec.</b>	Size	7 inch
	Resolution	800(RGB) x 480
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.1926 (H) x 0.1790(V)
	Display Mode	TM with Normally White
	Surface Treatment	Anti Glare
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
<b>Mechanical Characteristics</b>	LCM (W x H x D) (mm)	164.9x 100.0 x 5.7
	Active Area(mm)	154.08 (W) x 85.92 (H)
	With /Without TSP	Without TSP
	Matching Connection Type	FH12A-50S-0.5H
	LED Numbers	18 LEDs
	Weight (g)	160 g
<b>Electrical Characteristics</b>	Interface	RGB 24 bits with TCON
	Color Depth	16.7M
	Driver IC	HX8264-D0+HX8664-B0

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance:  $\pm 5\%$

## 2 Input/Output Terminals

### 2.1 CN1 of FPC

Matched connector type: FH12A-50S-0.5H

Pin No.	Symbol	I/O	Function	Remark
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	NC	N	No connection	
7	DVDD	P	Power for digital circuit	
8	MODE	I	DE/SYNC mode select. Normally pull high	MODE=1,DE mode, VS and HS must pull high; MODE=0, HSD/VSD mode, DE must be grounded
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	When input 18 bits RGB data, B1 must be grounded
19	B0	I	Blue data(LSB)	When input 18 bits RGB data, B0 must be grounded
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	When input 18 bits RGB data, G1 must be grounded
27	G0	I	Green data(LSB)	When input 18 bits RGB data, G0 must be grounded
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	When input 18 bits RGB data, R1 must be grounded
35	R0	I	RED data(LSB)	When input 18 bits RGB data, R0 must be grounded

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36	GND	P	Power ground	
37	DCLK	I	Sample clock	Data shall be latched at the falling edge of DCLK
38	GND	I	Power ground	
39	L/R	I	Left/right selection	Selection of scanning mode
40	U/D	I	Up/down selection	Selection of scanning mode
41	VGH	P	Gate on voltage	
42	VGL	P	Gate off voltage	
43	AVDD	P	Power for analog circuit	
44	RESET	I	Global reset pin	Active low to enter reset state, suggest to connect with an RC reset circuit for stability. Normally pull high
45	NC	N	No connection	
46	NC	N	No connection	
47	DITHB	I	Dithering function enable control, normally pull high;	When DITHB=1,disable internal dithering function; When DITHB=0, enable internal dithering function;
48	GND	P	Power ground	
49	NC	N	No connection	
50	NC	N	No connection	

Note1: Please add the FPC connector type and matched one if necessary .

Note2: I——Input, O——Output, P——Power/Ground, N--- No Connection

## 2.2 U/D R/L Function Description

3 Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	DVDD	Up to Down, Left to Right
DVDD	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
DVDD	DVDD	Down to Up, Left to Right

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### 3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.5	5.0	V	Note1
Input voltage	V <sub>IN</sub>	-0.5	5.0	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta ≤ 50°C
		--	≤55	%	50°C < Ta ≤ 60°C
		--	≤36	%	60°C < Ta ≤ 70°C
		--	≤24	%	70°C < Ta ≤ 80°C
Absolute Humidity	AH	--	≤70	g/m <sup>3</sup>	Ta > 70°C

**Table 3 Absolute Maximum Ratings**

Note1: Input voltage include R0~R7, G0~G7, B0~B7, DCIK, Hsync, Vsync, DE

Note2: Ta means the ambient temperature.

It is necessary to limit the relative humidity to the specified temperature range.  
Condensation on the module is not allowed.

## 4 Electrical Characteristics

### 4.1 Driving TFT LCD Panel

AGND=GND=0V, Ta = 25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage	VCC	3.00	3.30	3.60	V	
Analog supply Voltage	AVDD	10.3	10.4	10.5	V	
Gate on voltage	VGH	14.4	16	17.6	V	
Gate off voltage	VGL	-7.70	-7.00	-6.30	V	
Input Signal Voltage	Low Level	V <sub>IL</sub>	0	-	0.3xVCC	R0~R7,G0~G7,0~B7,DE, DCLK,HSYNC,VSYNC,MODE, RESET,LR,UD, DITHB
	High Level	V <sub>IH</sub>	0.7xVCC	-	VCC	
Current of digital supply voltage	I <sub>VCC</sub>	-	-	10	mA	VCC=3.3V,colorbar pattern
Current of analog supply voltage	I <sub>AVDD</sub>	-	-	30	mA	
Current of Gate on voltage	I <sub>VGH</sub>	-	-	0.3	mA	VGH=16.0V
Current of Gate off voltage	I <sub>VGL</sub>	-	-	0.3	mA	VGL=-7.0V

Note: The value is for design stage only.

**4.2 Recommended Driving Condition for Backlight**

Ta=25°C

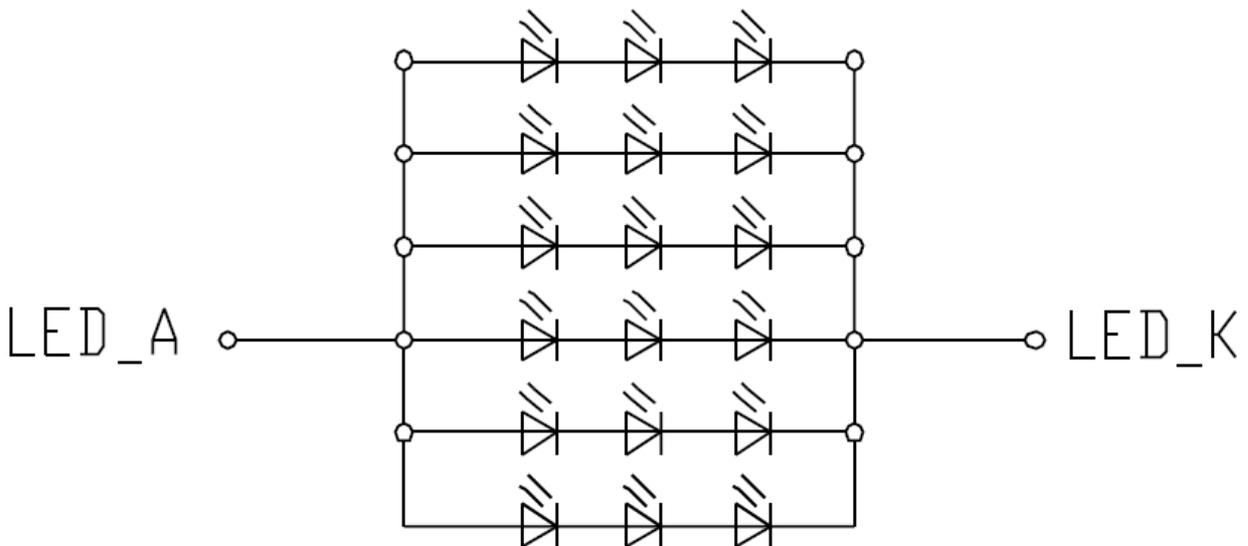
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	$I_F$	-	120	180	mA	18 LEDs (3 LED Serial, 6 LED Parallel)
Forward Voltage	$V_F$	9	9.6	10.8	V	
Operating Life Time	-	20,000	-	-	Hrs	

Note1: The LED driving condition is defined for each module (3 LED Serial, 6 LED Parallel).

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

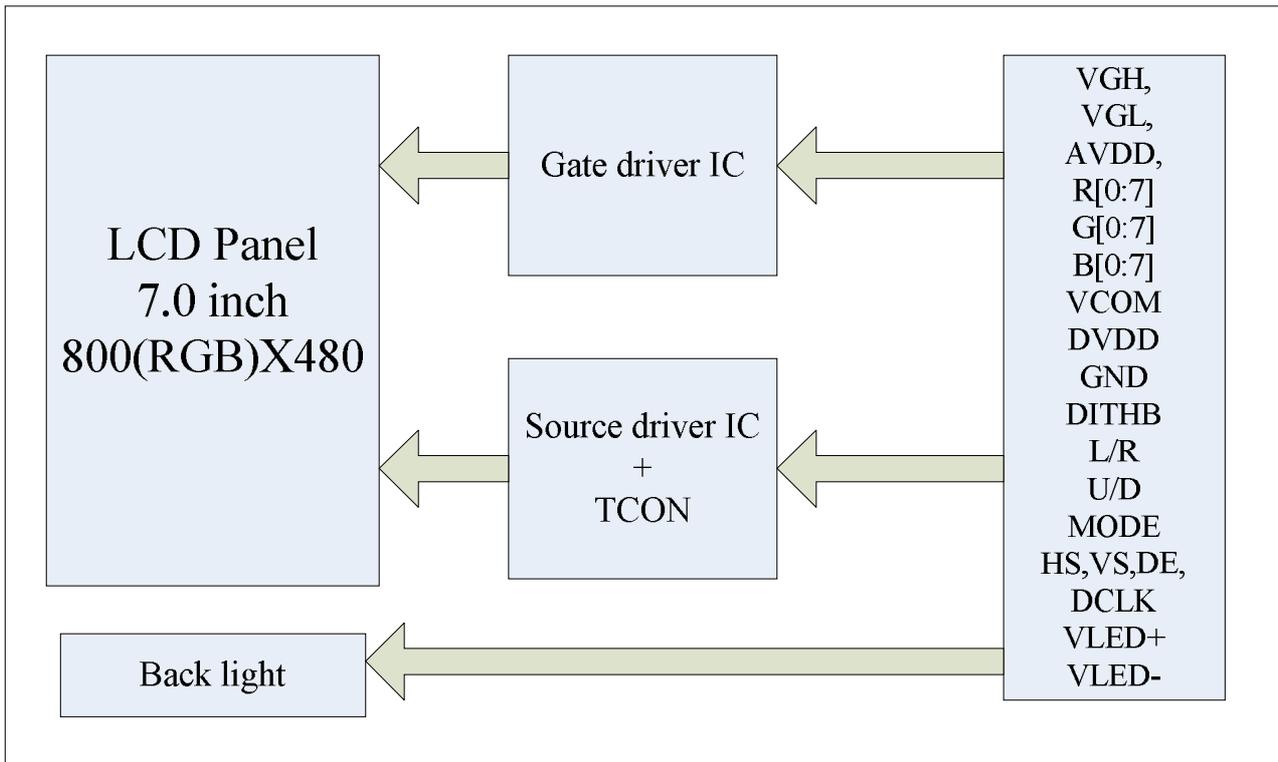
Note3:  $I_F$  is defined for six channel LED. Optical performance should be evaluated at Ta=25°C, When LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.



LED circuit

4.3 Block Diagram



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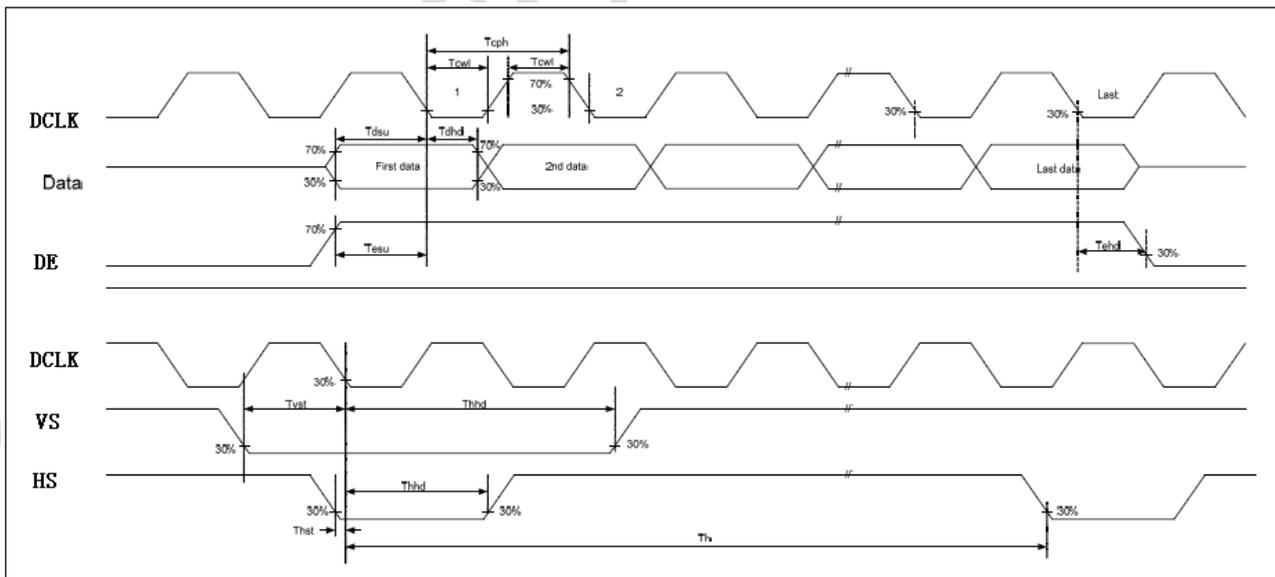
## 5 Timing Chart

### 5.1 TFT-LCD Input Timing

DVDD=3.3V, AVDD=10.4V, AGND=GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
DCLK Frequency	Fclk	-	30.0	40.0	MHz	
DCLK Cycle Time	Tcph	25.0	33.3	-	ns	
DCLK Pulse Width	Tcw	40%	50%	60%	Tcph	
VSD Setup Time	Tvst	8	-	-	ns	
VSD Hold Time	Tvhd	8	-	-	ns	
HSD Setup Time	Thst	8	-	-	ns	
HSD Hold Time	Thhd	8	-	-	ns	
Data Setup Time	Tdsu	8	-	-	ns	Data to DCLK
Data Hold Time	Tdhd	8	-	-	ns	Data to DCLK
DE Setup Time	Tesu	8	-	-	ns	
DE Hold Time	Tehd	8	-	-	ns	

#### Input Clock and Data timing Diagram:



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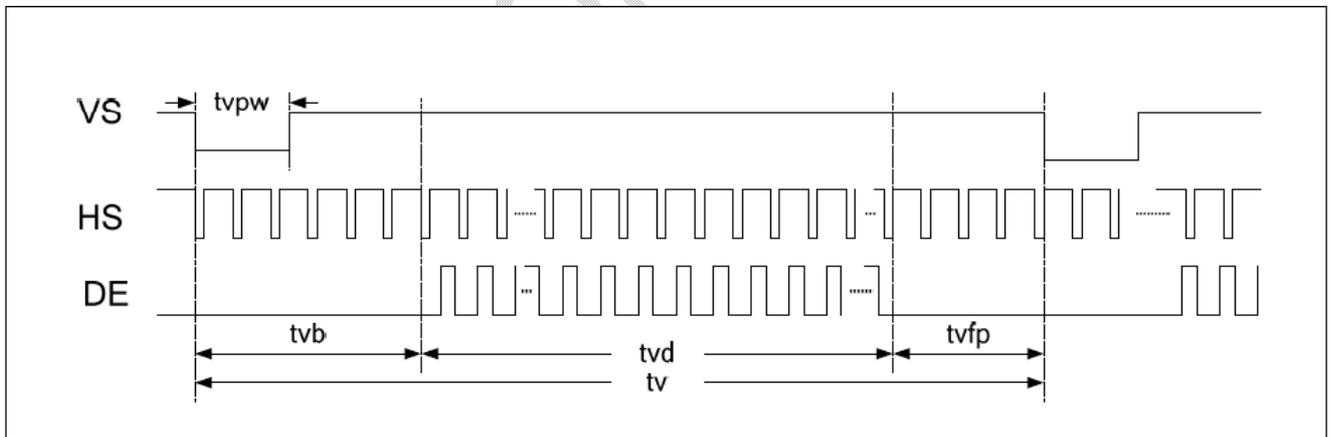
## 5.2 Recommended Timing Setting Of TCON

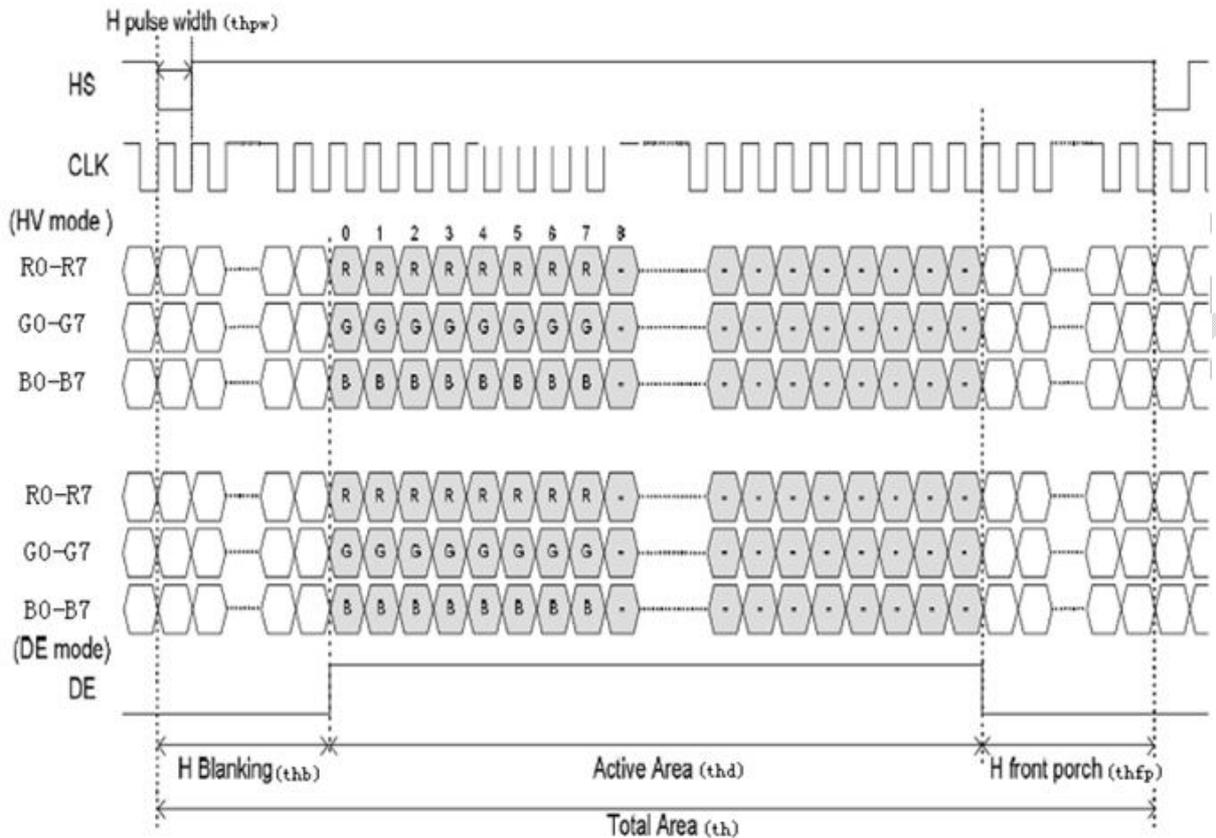
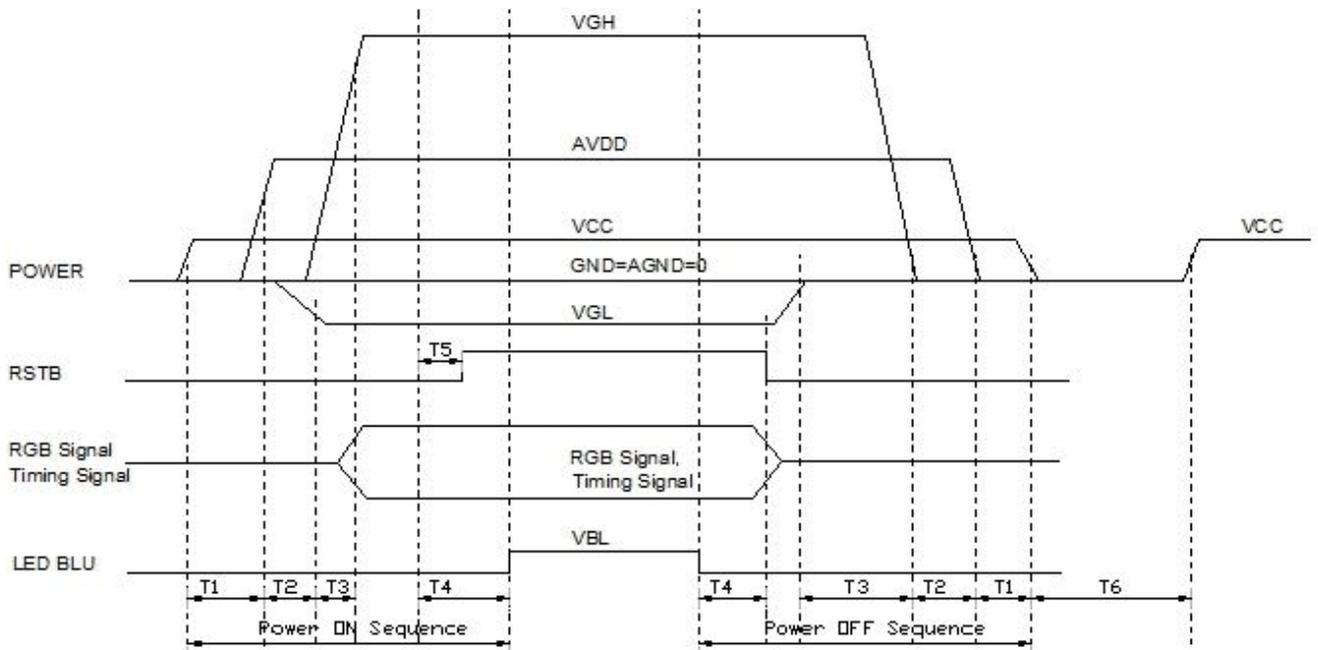
### TCON (Embedded In Source IC) Input Timing (DCLK, HSD, VSD, DE)

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	Fclk	24.36	30	40	MHZ	
	tclk	25.0	33.3	41	ns	
HSD	th	862	1056	1200	tclk	
	thd	800	800	800	tclk	
	thpw	1	-	40	tclk	
	thb	46	46	46	tclk	
	thfp	16	210	354	tclk	
VSD	tv	510	525	650	th	
	tvd	480	480	480	th	
	tvpw	1	3	20	th	
	tvb	23	23	23	th	
	tvfp	7	22	147	th	

Note: DE timing refer to HSD, VSD input timing.

#### Vertical input timing Diagram:



**TCON Horizontal Input Timing Diagram**

**5.3 Power ON/OFF Sequence**


Note 1:  $T1 \geq 20ms$ ,  $T2 \geq 20ms$ ,  $T3 \geq 5ms$ ,  $T4 \geq 100ms$ ,  $T5 \geq 5ms$ ,  $T6 \geq 1000ms$ .

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## 6 Optical Characteristics

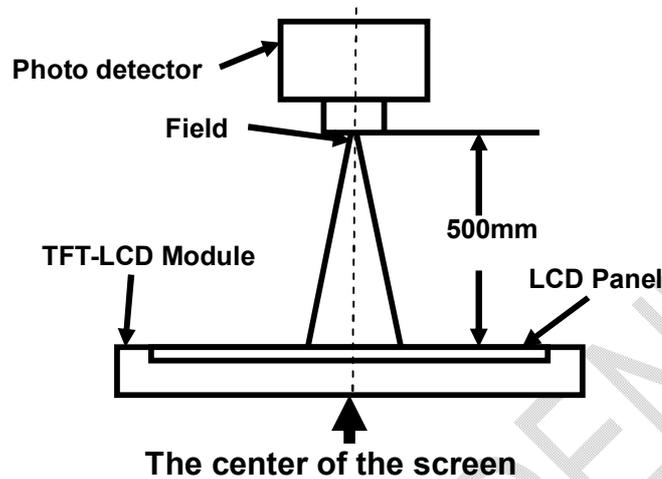
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
<b>View Angles</b>	$\theta T$	$CR \geq 10$	50	60		Degree	Note2,3
	$\theta B$		60	80			
	$\theta L$		60	80			
	$\theta R$		60	80			
<b>Contrast Ratio</b>	CR	$\theta=0^\circ$	600	800			Note 3
<b>Response Time</b>	$T_{ON}$	25°C	-	20	30	ms	Note 4
	$T_{OFF}$						
<b>Chromaticity</b>	<b>White</b>	x	Backlight is on	0.262	0.312	0.362	Note 1,5
		y		0.270	0.320	0.370	
	<b>Red</b>	x		0.535	0.585	0.635	Note 1,5
		y		0.301	0.351	0.401	
	<b>Green</b>	x		0.300	0.350	0.400	Note 1,5
		y		0.532	0.582	0.632	
	<b>Blue</b>	x		0.101	0.151	0.201	Note 1,5
		y		0.035	0.085	0.135	
<b>Uniformity</b>	U		75	80	-	%	Note 6
<b>NTSC</b>			-	50	-	%	Note 5
<b>Luminance</b>	L		250	300	-	cd/m <sup>2</sup>	Note 7

Test Conditions:

- 1  $I_F=120\text{ mA}$ , and the ambient temperature is 25°C.
- 2 The test systems refer to Note 1 and Note 2.

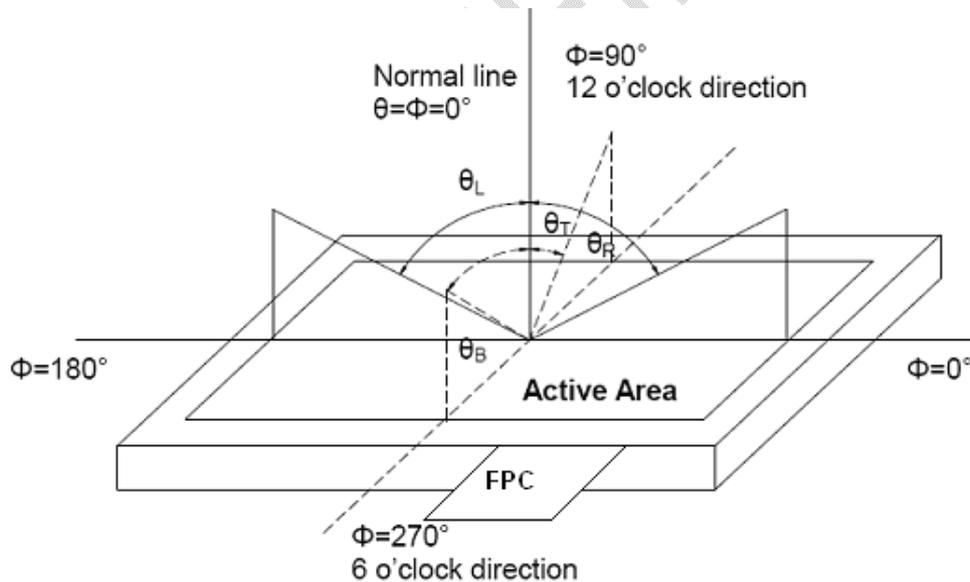
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

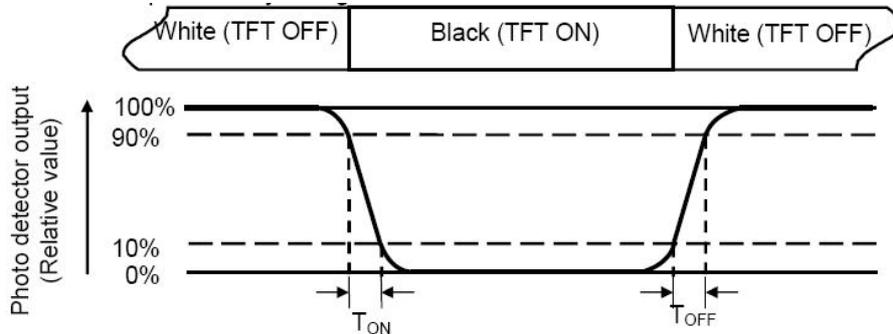
“White state “: The state is that the LCD should drive by  $V_{white}$ .

“Black state”: The state is that the LCD should drive by  $V_{black}$ .

$V_{white}$ : To be determined     $V_{black}$ : To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

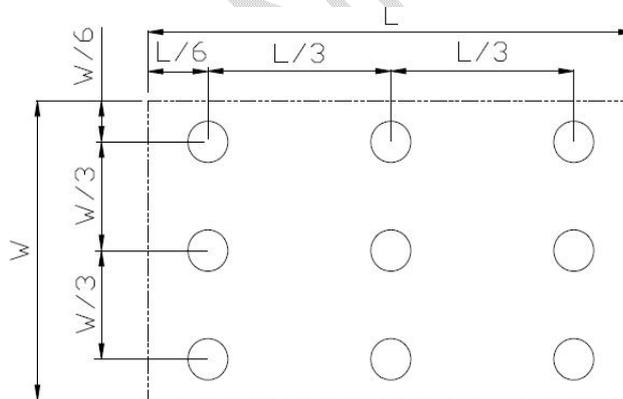
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

L-----Active area length W----- Active area width



$L_{\max}$ : The measured Maximum luminance of all measurement position.

$L_{\min}$ : The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

## 7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:60cm, 1corner,3 edges,6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

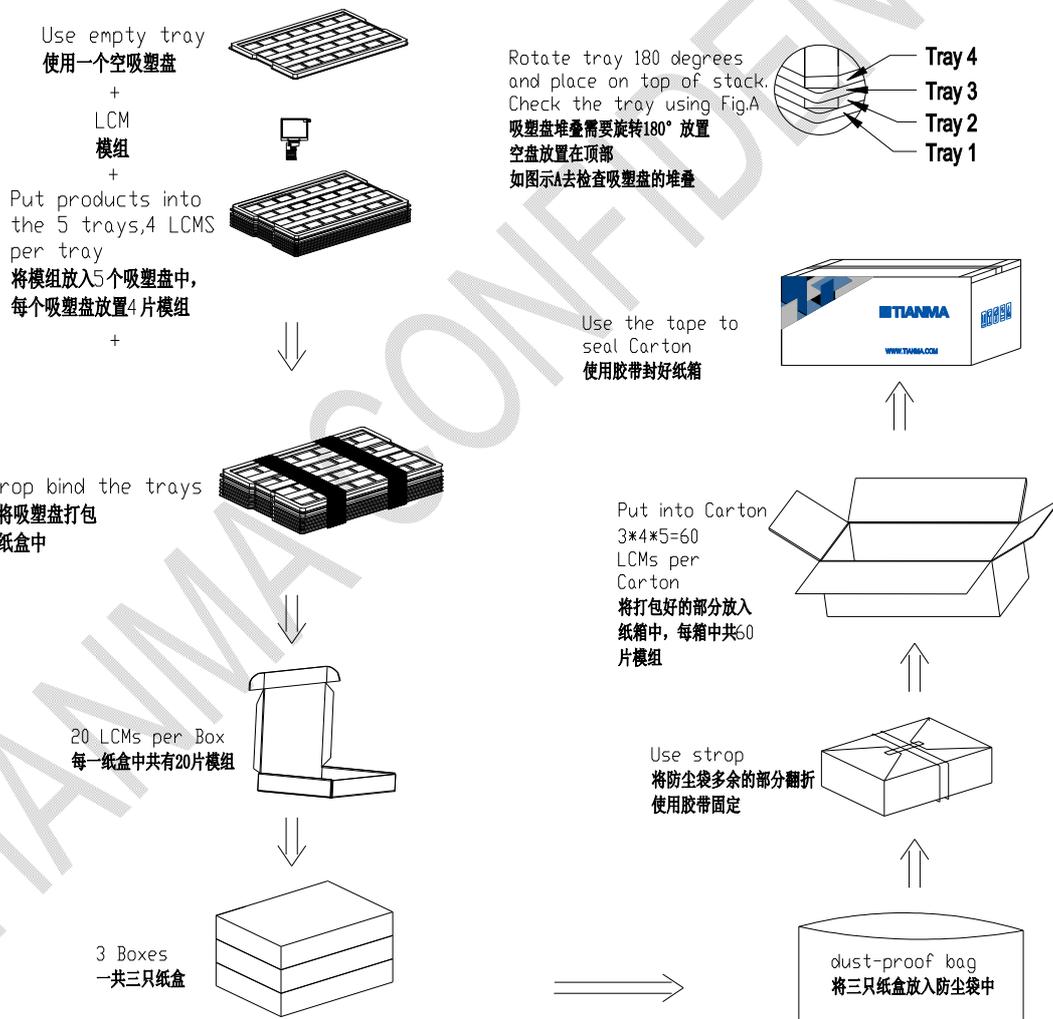
Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.



## 9 Packing Drawing

No	Item	Model(material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM Module	TM070RDH13	164.9×100.0×5.7	0.16	60	
2	Tray	PET	485×330×17	0.22	18	Anti-static
3	Dust-proof Bag	PE	700×545×0.05	0.021	1	
4	Carton	Corrugated Paper	544×365×250	1.01	1	
5	BOX	Corrugated Paper	520×345×74	0.227	3	
6	Label		100×52	0.001	1	
7	Total Weight	15.3kg ± 5%				



## **10 Precautions for Use of LCD Modules**

### **a) Handling Precautions**

- i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- ii. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- v. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
  - Isopropyl alcohol
  - Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
  - Ketone
  - Aromatic solvents
- vi. Do not attempt to disassemble the LCD Module.
  - vii. If the logic circuit power is off, do not apply the input signals.
  - viii. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

### **b) Storage precautions**

- i. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- ii. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

- iii. The LCD modules should be stored in the room without acid, alkali and harmful gas.

### **c) Transportation Precautions**

- i. The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.