MODEL NO. : _	TM070RBH01
ISSUED DATE: _	2008-11-25
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Preliminary Specification Final Product Specification

Customer :

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2008-11-10	Preliminary Specification Release	Yuna Wang
1.1	2008-11-25	Update Model Name from TS070RAATB01-00 to TM070RBH01	Yuna Wang



1 General Specifications

	Feature	Spec
	Size	6.95 inch
	Resolution	800(RGB) x 480
	Interface	TTL RGB 6 bits
	Color Depth	262K
	Technology Type	a-Si
Display Spoc	Pixel Pitch (mm)	0.1965x0.1715
Display Spec.	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti Glare
	Surface Treatment(TSP)	Anti Glare
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
	LCM (W x H x D) (mm)	167.40x93.70x4.69
	Active Area(mm)	157.20x82.32
Mechanical Characteristics	With /Without TSP	With TSP
	Weight (g)	146.5
	LED Numbers	27 LEDs

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: RoHS
- Note 3: LCM weight tolerance: +/- 5%

2 Input/Output Terminals

TFT-LCD Panel Driving

J1 of FPC2

Matching Connector of 089H35

Pin	Symbol	I/O	Description	Remark
1	LED+	Р	LED Anode	Note4
2	NC	Ν	No connection	
3	LED1-	Р	LED Cathode	Note4
4	LED2-	Р	LED Cathode	Note4
5	LED3-	Р	LED Cathode	Note4
6	DIO1	I/O	Horizontal start pulse signal	Note2
7	VSS1	Р	Ground	Note1
8	VDD1	Р	Power supply	Note1
9	CLK	Ι	Horizontal shift clock	
10	VSS1	Р	Ground	Note1
11	R/L	Ι	Right/left selection	Note2
12	R0	Ι	Red data(LSB)	
13	R1	Ι	Red data	
14	R2	Ι	Red data	
15	R3	Ι	Red data	
16	R4	I	Red data	
17	R5	I	Red data	
18	VSS1	Р	Ground	Note1
19	G0	Ι	Green data(LSB)	
20	G1	Ι	Green data	
21	G2	Ι	Green data	
22	G3	Ι	Green data	
23	G4	Ι	Green data	
24	G5	Ι	Green data	
25	VSS1	Р	Ground No	
26	B0	I	Blue data(LSB)	
27	B1	I	Blue data	
28	B2	I	Blue data	

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29	В3	I	Blue data			
30	B4	I	Blue data			
31	B5	I	Blue data			
32	LD	I	Load output signal	Note2		
33	REV	I	Data invert control			
34	POL	I	Polarity selection			
35	DIO2	I/O	Horizontal start pulse signal	Note2		

J2 of FPC1

Pin	Symbol	I/O	Description	Remark
1	VSS2	Р	Ground	Note1
2	V1	I	Gamma voltage 1	Note1
3	V2	Ι	Gamma voltage 2	
4	V3	I	Gamma voltage 3	
5	V4	I	Gamma voltage 4	
6	V5	I	Gamma voltage 5	
7	V6	I	Gamma voltage 6	
8	V7	I	Gamma voltage 7	
9	VSS2	Р	Ground	Note1
10	V8	Ι	Gamma voltage 8	
11	V9	I	Gamma voltage 9	
12	V10	I	Gamma voltage 10	
13	V11	Ι	Gamma voltage 11	
14	V12	I	Gamma voltage 12	
15	V13	I	Gamma voltage 13	
16	V14	I	Gamma voltage 14	
17	VSS2	Р	Ground	Note1
18	VDD2	Р	Voltage for analog circuit	Note1
19	VCOM	Р	Common voltage	
20	XON	I	No connection	
21	OE	I	Output enable	Note1
22	U/D	Ι	Up/down selection N	
23	CKV	I	Vertical shift clock	Note1

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24	STVU	I/O	Vertical shift pulse signal	Note1,2
25	STVD	I	Vertical shift pulse signal	Note2
26	VGG	Р	Gate on voltage	
27	GND	Р	Ground	
28	VCC	Р	Voltage for logic circuit	
29	GND	Р	Ground	
30	VEE	Р	Gate off voltage	
31	NC	N	No connection	
32	XL	I	Touch panel left	Note3
33	YD	I	Touch panel down	Note3
34	XR	I	Touch panel right	Note3
35	YU	I	Touch panel up	Note3

Note1: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No connection Note2:

Scan Control Input		IN/	OUT State	Scanning Direction		
U/D	R/L	STVD	STVU	DIO2	DIO1	Scanning Direction
GND	VCC	0	I	0	I	Up to down, left to right
VCC	GND	Ι	0	Ι	0	Down to up, right to left
GND	GND	0	I	I	0	Up to down, right to left
VCC	VCC	I	0	0	I	Down to up, left to right



3 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
	VDD1	-0.50	5.00	V	
Power Voltage	VDD2	-0.50	13.50	V	
	VGG	-0.30	40.00	V	
	VEE	-20.00	0.30	V	
	VGG-VEE	-0.30	40.00	V	
Backlight Forward Current	I _{LED}	-	25.0	mA	For each LED
Operating Temperature	T _{OPR}	-20	60	°C	
Storage Temperature	T _{STG}	-30	70	°C	



4 Electrical Characteristics

4.1 Recommended Operating Condition

	VSS1=VSS2=GND=0V, Ta = 25°C									
lten	n	Symbol	Min	Тур	Max	Unit	Remark			
Digital Supply	y Voltage	VDD1	3.00	3.30	3.60	V				
Digital Supply	y Voltage	VCC	3.00	3.30	3.60	V				
Analog Supp	ly Voltage	VDD2	9.45	9.84	10.23	V				
Gate On Volt	age	VGG	17.10	19.00	20.90	V				
Gate Off Volt	age	VEE	-7.70	-7.00	-6.30	V				
Common Ele Driving Signa	Common Electrode Driving Signal		-	4.21	-	V				
Input Level	Of Gamma	V1~V7	0.4xAVDD	-	VDD2-0.1	V				
Voltage		V8~V14	0.10	-	0.6xVDD2	V				
Input Signal	Low Level	V _{IL}	0	-	0.2xVDD1	V				
Voltage	High Level	V _{IH}	0.8xVDD1	-	VDD1	V				
Output Signal	Low Level	V _{OL}	0	-	0.2xVDD1	V				
Voltage	High Level	V _{OH}	0.8xVDD1	-	VDD1	V				

Note: The value is for design stage only.

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4.2 Recommended Driving Condition for Backlight

		-				Ta=25 ℃
Item	Symbol	Min	Тур	Мах	Unit	Remark
Forward Current	I _{LED}	-	20.00	-	mA	
Forward Current Voltage	V_{LED}	-	28.80	-	V	Note 1,2
Backlight Power Consumption	W _{BL}	-	1.73	-	W	

Note 1: The LED driving condition is defined for each LED module (3 LED Serial).

Input current = 20 mA x 3 = 60 mA

- Note2: The minimum life of LED is 20,000 hours, which is defined that the brightness becomes 50% of the original value under standard condition.
- Note3: The LED driving condition is defined for each LED module.





4.3 Power Consumption

	VSS1=VSS2=GND=0V , Ta = 25°C										
ltem	Symbol	Condition	Min	Тур	Мах	Unit	Remark				
Digital Supply Current	IDD1	VDD1=3.3V	-	3.50	5.16	mA					
Digital Supply Current	ICC	VCC=3.3V	-	3.50	5.16	mA					
Analog Supply Current	IDD2	VDD2=9.84V	-	28.00	40.00	mA					
Gate On Current	IGG	VGG=19.0V	-	0.22	0.40	mA					
Gate Off Current	IEE	VEE=-7.0V	-	0.22	0.40	mA					
	Panel		-	0.30	-	W					
Power Consumption	Backlight		-	1.73	-	W					
	Total		-	2.03	-	W					

Note: The power consumption condition is defined as colorbar pattern.

4.4 Block Diagram



5 Timing Chart

5.1 Source Driver Input Timing

(VDD1=3.3V, VDD2=9.84V, VSS1=VSS2=GND=0V, Ta=25°C)										
Parameter	Symbol	Min	Тур	Мах	Unit	Conditions				
CLK Frequency	Fclk	-	33.3	40.0	MHz	EDGSL="0"				
CLK Pulse Width	Tcw	40%	-	60%	Tcph	Tcph is CLK cycle				
Data Set-up Time	Tsu	4	-	-	ns	DIO1/2 to CLK				
Data Hold Time	Thd	2	-	-	ns	DIO1/2 to CLK				
Propagation Delay Of DIO1/2	Tphl	5	10	15	ns	CL=25pF				
Time That The Last Data To LD	Tld	1	-	-	Tcph					
Pulse Width Of LD	Twld	2	-	-	Tcph					
Time That LD To DIO1/2	Tlds	5	-	-	Tcph					
POL Set-up Time	Tpsu	6	-	-	ns	POL to LD				
POL Hold Time	Tphd	6	-	-	ns	POL to LD				
Output Stable Time	Tst	-	-	9	us	10% or 90% Target voltage. CL=60pF, R=2Kohm				

5.1.1 EDGSL='0', Source Driver Input Timing



<< EDGSL= "0", Default >>

5.1.2



Source Driver Input Timing



5.2 Gate Driver Ir

	()	/GG=19V	, VEE=-7	v, vdd1=	3.3V, VSC	ST=GND=0V, Ta=25C)
Parameter	Symbol	Min	Тур	Мах	Unit	Conditions
STVD/STVU Delay Time	Tdt	-	-	500	ns	CL=20pF
Driver Output Delay Time	Tdo	-	-	900	ns	CL=200pF
Output Falling Time	Tthl	-	400	800	ns	CL=200pF 90% to 10%
Output Rising Time	Ttlh	-	500	1000	ns	CL=200pF 10% to 90%
XON To Driver Output Delay Time	Txon	-	-	20	ns	CL=200pF
OE To Driver Output Delay Time	Тое	-	-	900	ns	CL=200pF
Clock Frequency	Fclk	-	-	200	KHz	In cascade connection
Clock Rising Time	Trck	-	-	100	ns	CL=20pF
Clock Falling Time	Tfck	-	-	100	ns	CL=20pF
Clock Pulse Width(High & Low)	PWCLK	500	-	-	ns	
STVD/STVU Set-up Time	Tsu	200	I	-	ns	
STVD/STVU Hold Time	Thd	300	-	-	ns	
Output Enable Pulse Width	Twcl	1	-	-	us	

Gate Driver Input Timing

5.2.1 Gate Driver Input Timing





5.3 Recommended Timing Setting Of TCON At HV Mode

5.3.1 DCLK/ HSYNC/VSYNC Timing

Parameter	Symbol	Min	Тур	Max	Unit	Remark
	Fclk	26.4	33.3	40.0	MHZ	
DOLK	Tclk	37.9	30.0	25.0	ns	
	t _h	862	1056	1200	Tclk	
	t _{hd}	800	800	800	Tclk	
HSYNC	t _{hpw}	1	-	40	Tclk	
	t _{hb}	46	46	46	Tclk	
	t _{hfp}	16	210	354	Tclk	
	t _v	510	525	650	th	
	t _{vd}	480	480	480	th	
VSYNC	t _{vpw}	1	-	20	th	
	t _{vb}	23	23	23	th	
	t _{vfp}	7	22	147	th	

Note: Base on TCON NT39703-5



5.3.3 Horizontal Input Timing



5.4 Power On/Off Sequence



NOTE: T1≥10ms; T2≥20ms; T3≥100ms;



6 **Optical Characteristics**

	Ta=25℃									
ltem		Symbol	Condition	Min	Тур	Мах	Unit	Remark		
		θТ		45	50	-				
View Angles		θΒ	CD>10	60	65	-	Dograa	Noto2 2		
view Aligies		θL	CK≡ IU	60	65	-	Degree	NOIEZ,3		
		θR		60	65	-				
Contrast Ratio)	CR	θ=0°	300	400	-		Note 3		
Response Time		T _{ON}	25℃		25	40	me	Note 4		
		T _{OFF}	20 C	-	20	-10	1115			
	White	x		0.271	0.321	0.371		Note 1,5		
	vviiite	у		0.298	0.348	0.398				
	Ded	x		0.528	0.578	0.628		Note 1,5		
Chromaticity	Neu	У	Backlight is	0.302	0.352	0.402				
omoniationy	Green	x	on	0.293	0.343	0.393		Note 1.5		
	Oreen	у		0.532	0.582	0.632		INULE 1,5		
	Blue	x		0.096	0.146	0.196		Note 1 5		
	Dide	У		0.056	0.106	0.156				
Uniformity		U		70	80	-	%	Note 6		
NTSC				-	50	-	%	Note 5		
Luminance (1	(SP)	L		220	280	-	cd/m ²	Note 7		

Test Conditions:

- 1. The ambient temperature is 25° C. And one LED current is 20mA,
- 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

Contrast ratio (CR) = Luminance measured when LCD is on the "White" state "White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

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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.

Luminance Uniformity (U) = Lmin/ Lmax

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



Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

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7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Storage	Ta = +70℃, 240 hours	IEC60068-2-2
2	Low Temperature Storage	Ta = -30 $^\circ\!\!\mathrm{C}$, 240 hours	IEC60068-2-1
3	High Temperature Operation	Ts = +60℃, 240 hours	IEC60068-2-2
4	Low Temperature Operation	Ta = -20 $^\circ\!\!\mathrm{C}$, 240 hours	IEC60068-2-1
5	Operation at High Temperature and Humidity	Ta = +40℃, 90% RH max,240hours	IEC60068-2-3
6	Thermal Shock (non-operation)	-20℃ 30 min~+60℃ 30 min, Change time:5min, 100 Cycle	IEC60068-2-14
7	Vibration Test	Sine Wave 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 JISC7021, A-10 condition A
8	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27 JISC7021, A-10 condition C
9	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32
10	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times	ISO10605

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

Note2: Ta is the ambient temperature of samples.



8 Touch Screen Panel

8.1 Electrical Characteristics

Item	Min	Тур	Max	Unit	Remark
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Torminal Posistanco	100	-	1300	ohm	x
Terminal Resistance	100	-	900	ohm	Y
Insulation Resistance	10	-	-	ohm	DC 25V
Voltage	-	5	7	V	DC
Chattering	-	-	10	Ms	100k pull-up
Transparency	78	-	-	%	JIS-K7105,ASTM D1003,@550nm

Note1: Do not operate it with a thing except a placental pen (tip R0.8mm or more) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

Note2: The figure below shows the connection of touch panel.



8.2 Mechanical& Reliability Characteristics

ltem	Min	Тур	Max	Unit	Remark
Activation Force	-	I	80	g	Note1
Durability(Surface Scratching)	Write 1,000,000	-	-	characters	Note2
Durability(Surface Pitting)	1,000,000	-	-	touches	Note3
Surface Hardness	3	-	-	Н	JIS-K5400, ASTM D3363

Note1: Stylus pen input: R0.8mm placental pen or finger.

Note2: Measurement for surface area:

Scratch 100,000 times straight line on the film with a stylus change every 20,000 times

Force: 250gf

Speed: 60 mm/sec

Stylus: R0.8 placental tip

Note3: Pit 1,000,000 times on the film with a R8.0 silicon rubber.

Force: 250gf

Speed: 2 times/sec

9 Mechanical Design Guide



9.1 Explain

1. Active area

The area which guarantees a touch panel operation normally when pressed.

2. Operation non-guaranteed area

The area which does not guarantee a touch panel operation and its function. When this area is pressed, touch panel shows degradation of its performance and durability such as a pen sliding durability becomes about one-tenth compared. With the active area (Area-(a) as guaranteed area) and its operation force requires about double. About 0.5mm~1mm out side form a boundary of the active corresponds to this area.

3. Pressing prohibition area

The area which forbids pressing, because an excessive load is applied a transparent electrode and a serious damage is given to touch panel function by pressing.

4. Non-Active area

The area which does not activate even if passed.

9.2 The handling of sensitive area:

1. The sensitive area is between the edge of the double-side tape and the edge of the active area. Because the double-side tape has a certain height, the more transformative the ITO layer is pressed, the easier it would be to be broken. So it is suggested that pointed tools should be put away from the sensitive area to avoid them touching the sensitive area during operation.

2. When assembling the touch panel, it would be better to add a protective gasket on the

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surface of the product before assembling on to the housing. The gasket should be placed on the double-side tape and should not go beyond it.

3. If the housing is designed bigger than the active area, the edge of the sensitive area would be left outside of it. In addition, the protective gasket adds the thickness of this area, so do not use pens or other pointed tools to score along with the screen edge which may cause the damage of the ITO layer. If the panel is drawn with large force, the glass would even be broken.

4. If the housing is designed smaller than the active area, it can cover the sensitive area completely, in which case the scoring along with screen edge does no harm to the ITO layer.Nevertheless, due to the housing extending into the active area, the thickness of the gasket is very important. If it is too thick, the gap between the housing and the ITO film surface would be too wide which may affect the appearance of the product. If it is too thin, the housing would be pressed on the film surface which may cause short-circuit. The gap between the housing and the film should better be kept between 0.2mm and 0.3mm.





10 Mechanical Drawing





11 Packing Drawing

No	Item	Model(Material)	Dimensions (mm)	Unit Weigt (Kg)	Quantit y	Remar k				
1	LCM		167.40x93.70x4.69	0.146	48					
2	Tray	PET(Transmit)	315x247x13	0.087	30	Anti-sta tic				
3	EPP	EPE	315x247x5	0.009	12					
4	Dust-Proof Bag	PE	700x545	0.05	1					
5	Box	Corrugated Paper	260x345x70	0.227	6					
6	Dust-Proof Bag	PE	327x270	0.021	6					
7	Carton	Corrugated Paper	544x365x250	1.01	1					
8	Total Weight		11.264							



12 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
- vi. Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- vii. Do not attempt to disassemble the LCD Module.
- viii. If the logic circuit power is off, do not apply the input signals.
- ix. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - b) Be sure to ground the body when handling the LCD Modules.
 - c) Tools required for assembly, such as soldering irons, must be properly ground.
 - d) To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - e) 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.
 - f) 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:
 - g) Temperature : 0 $^\circ$ C \sim 40 $^\circ$ C Relatively humidity: ≤80%
- i. The LCD modules should be stored in the room without acid, alkali and harmful gas.
- ii. Transportation Precautions
 - h) The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

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