

MODEL NO. : TM060RDH03ISSUED DATE: 2010-11-24VERSION : Ver 2.1

- ☐ Preliminary Specification
☒ Final Product Specification

Customer : _____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by

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1. General Specifications

Feature		Spec
Display Spec.	Size	6.0 inch
	Resolution	800(RGB) x 480
	Interface	RGB 24 bits with TCON
	Color Depth	16M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.1665x0.1538
	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
Mechanical Characteristics	LCM (W x H x D) (mm)	145.50x87.80x3.40
	Active Area(mm)	133.20x73.80
	With /Without TSP	Without TSP
	Weight (g)	110
	LED Numbers	21 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: Q/S0002

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



2. Input/Output Terminals

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Comment
1	VLED-	P	LED light cathode	
2	VLED+	P	LED light anode	
3	GND	P	Ground	
4	VDD	P	Power supply 3.3V	
5	R0	I	Red data	
6	R1	I	Red data	
7	R2	I	Red data	
8	R3	I	Red data	
9	R4	I	Red data	
10	R5	I	Red data	
11	R6	I	Red data	
12	R7	I	Red data	
13	G0	I	Green data	
14	G1	I	Green data	
15	G2	I	Green data	
16	G3	I	Green data	
17	G4	I	Green data	
18	G5	I	Green data	
19	G6	I	Green data	
20	G7	I	Green data	
21	B0	I	Blue data	
22	B1	I	Blue data	
23	B2	I	Blue data	
24	B3	I	Blue data	
25	B4	I	Blue data	
26	B5	I	Blue data	
27	B6	I	Blue data	
28	B7	I	Blue data	
29	GND	I	Ground	
30	PCLK	I	Clock signal	
31	DISP	I	Display on/off	
32	HSYNC	I	Horizontal Synchronize signal	
33	VSNC	I	Vertical Synchronize signal	
34	DE	I	Enable signal	
35	NC	-	No use	
36	GND	P	Ground	
37	X1	O	Touch Panel Right side	
38	Y1	O	Touch Panel Bottom side	
39	X2	O	Touch Panel Left side	
40	Y2	O	Touch Panel Top side	

Note: I/O definition:

I----Input O----Output P----Power/Ground



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta = 25°C

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDD	-0.5	5.0	V	
Back Light Forward Current	I _{LED}		25	mA	For each LED
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	



4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

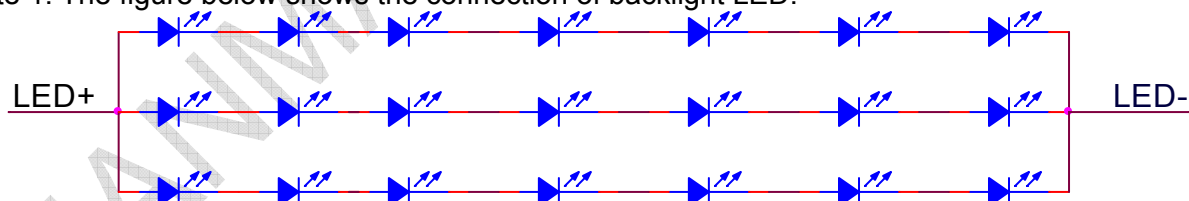
Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		VDD	2.7	3.3	3.6	V	
Input Signal Voltage	Low Level	V _{IL}	0	-	0.3xVDD	V	R0~R7,G0~G7,B0~B7, HSYNC,VSYNC,PCLK,DE,DISP
	High Level	V _{IH}	0.7xVDD	-	VDD	V	
Output Signal Voltage	Low Level	V _{OL}	-	-	0.3xVDD	V	X1,X2,Y1,Y2
	High Level	V _{OH}	0.7xVDD	-	VDD	V	
Power Consumption		Black Mode (60Hz)	-	900	-	mW	
		Standby Mode	-	517	-	uW	
		Back Light		1344		mW	

4.2 Driving Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	60	75	mA	21 LEDs (7 LED Serial, 3 LED Parallel)
Forward Voltage	V_F	--	22.4	--	V	
Backlight Power Consumption	W_{BL}	--	1344	--	mW	
Operating Life Time	--	10,000	(20,000)		Hrs	

Note 1: The figure below shows the connection of backlight LED.

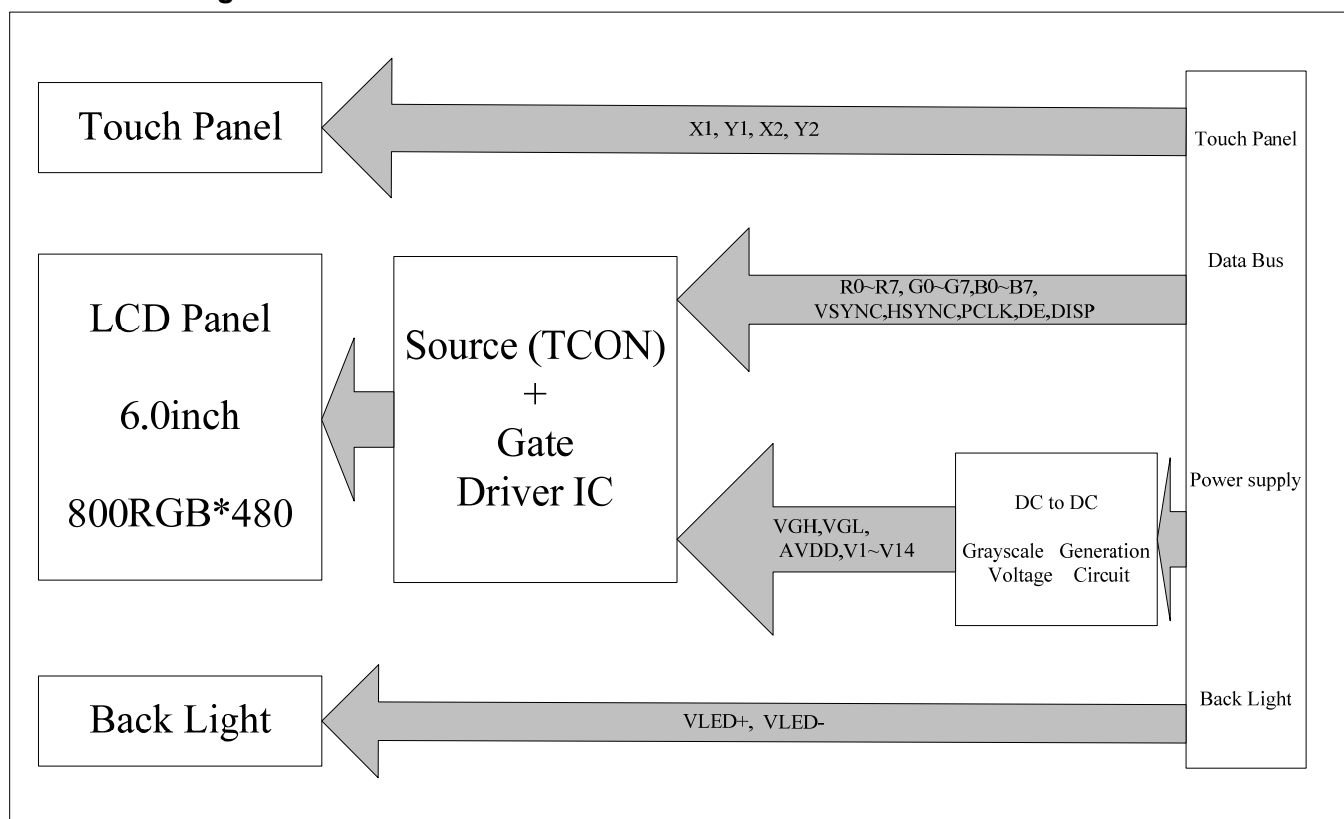


Note 2: Each LED : $I_F = 20 \text{ mA}$, $V_F = 22.4 \text{ V}$

Note 3: I_F is defined for one channel LED. Optical performance should be evaluated at Ta=25°C only. 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.



4.3 Block Diagram





5. Interface Timing

5.1 Data input timing

Parameter	Symbol	Value			Unit
Horizontal display area	thd	800			PCLK
PCLK frequency @ Frame rate =60HZ	fclk	Min.	Typ.	Max.	MHZ
		-	30	40	
1 Horizontal Line	th	928			PCLK
HSYNC pulse width	thpw	1	48	-	
HSYNC blanking	thb	-	88	-	
HSYNC front porch	thfp	-	40	-	

Table 5.1 Horizontal input timing

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Vertical display area	tvd	480			H
VSYNC period time	tv	525			
VSYNC pulse width	tpw	-	3	-	H
VSYNC Blanking(tvb)	tvb	-	32	-	H
VSYNC Front porch (tvfp)	tvfp	-	13	-	H

Table 5.2 Vertical input timing

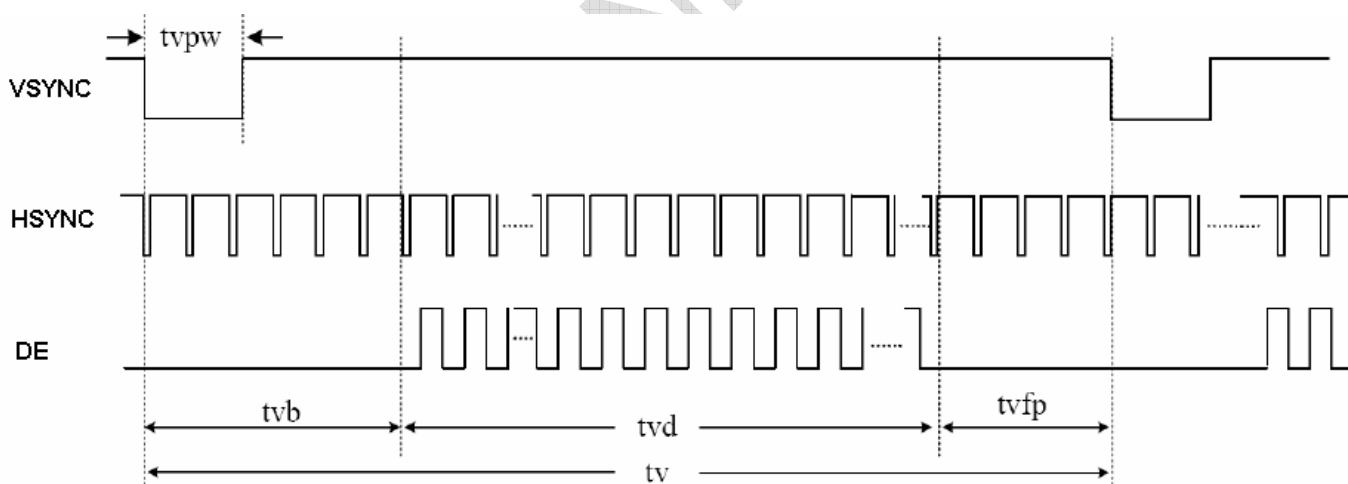


Figure 5.1 Vertical input timing

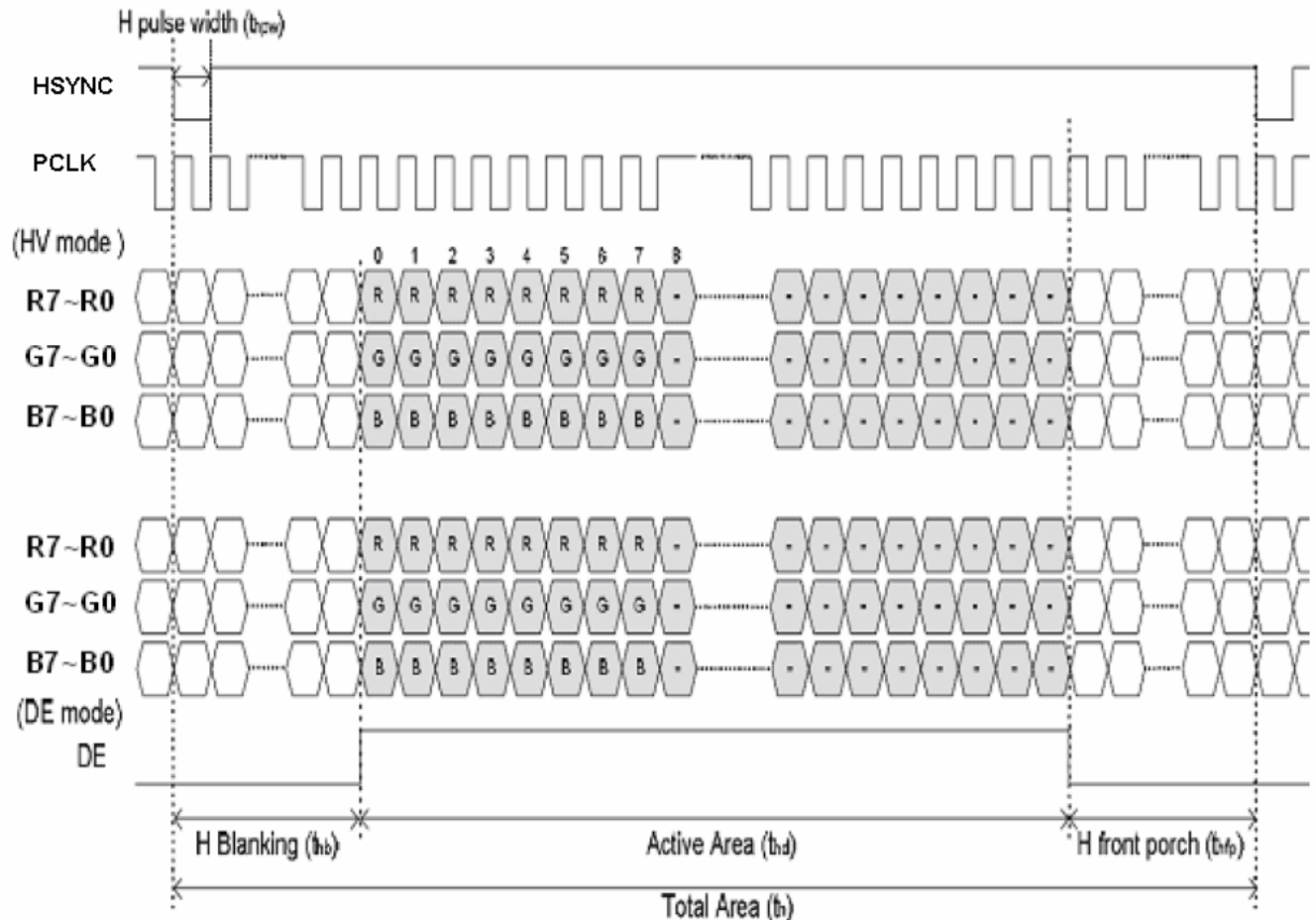
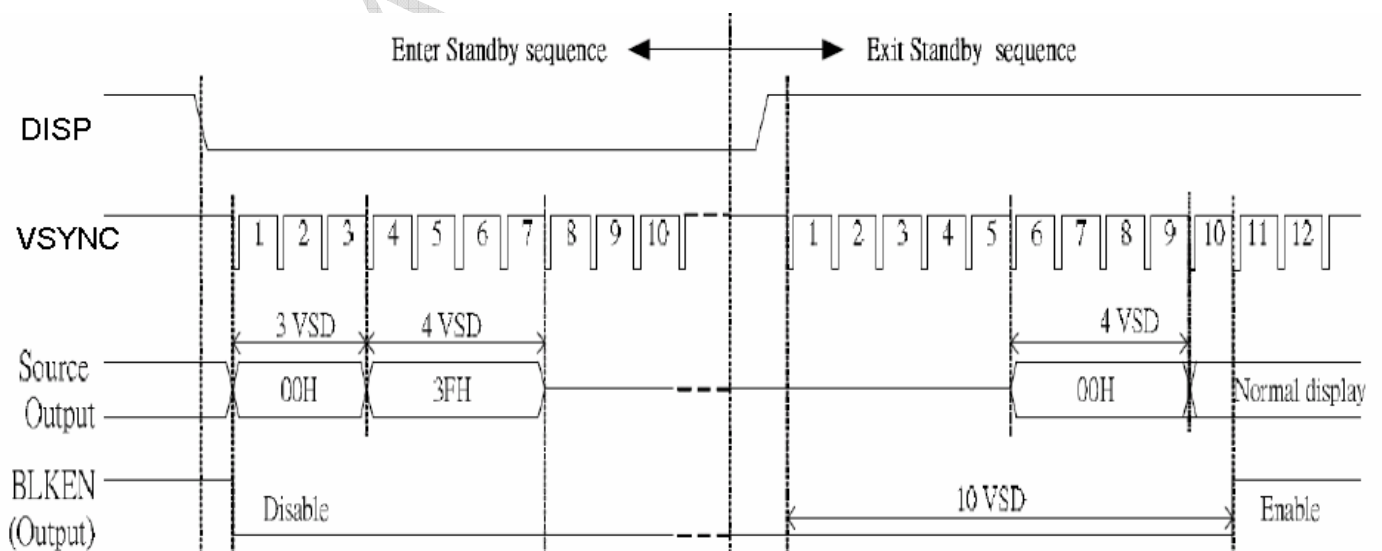


Figure 5.2 Horizontal input timing

5.2 Enter and Exit Standby Mode Sequence





5.3 Power on/off sequence

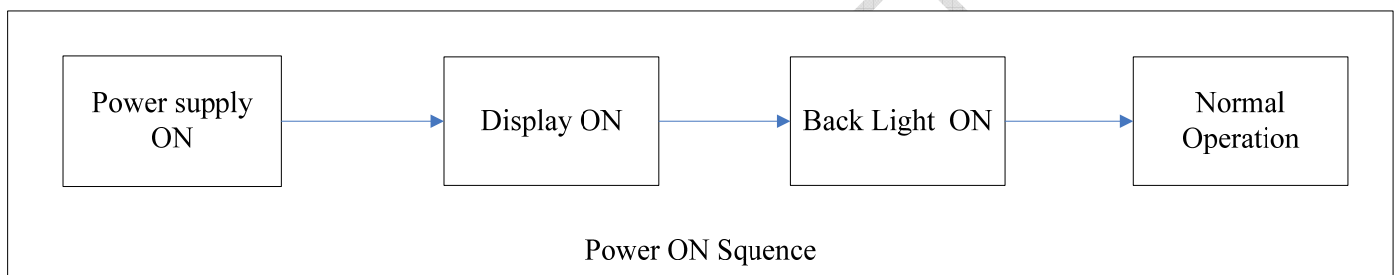
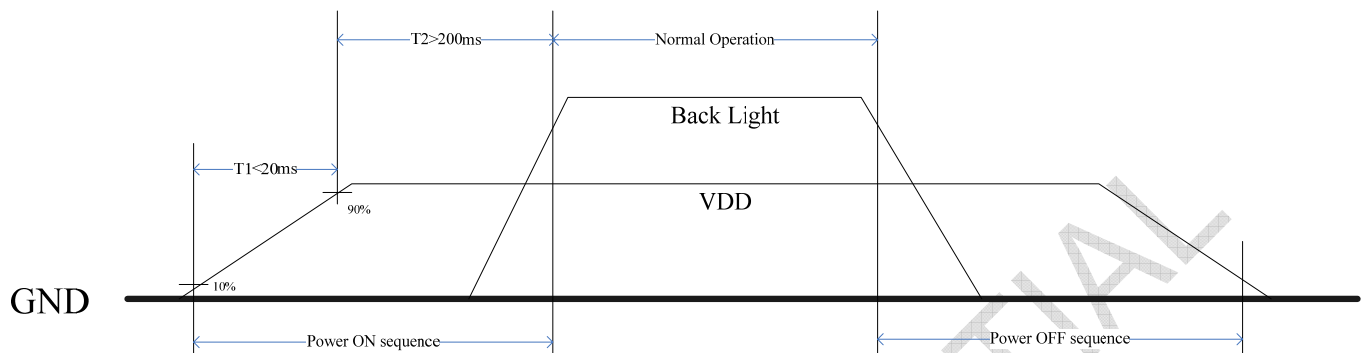


Figure 6.1 Power ON sequence

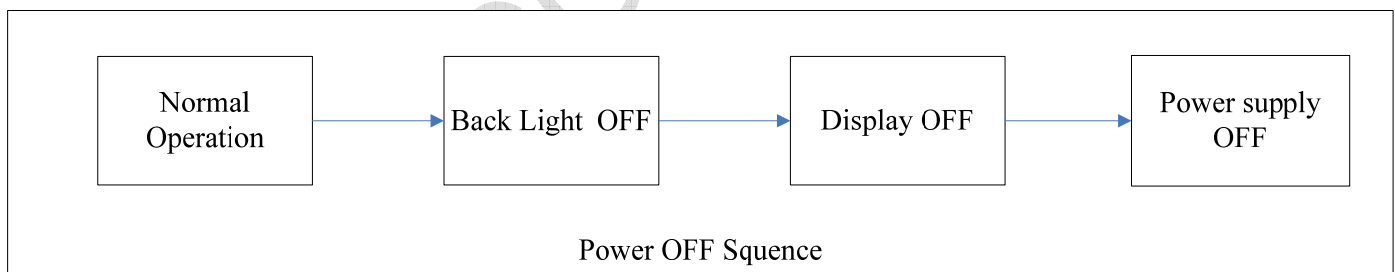


Figure 6.2 Power OFF sequence



6. Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥10	50	60	--	Degree	Note 2
		θB		60	70	--		
		θL		60	70	--		
		θR		60	70	--		
Contrast Ratio		CR	θ=0°	400	500	--		Note1 Note3
Response Time		T _{ON}	25℃	--	20	30	ms	Note1
		T _{OFF}						Note4
Chromaticity	White	x	Backlight is on	0.235	0.285	0.335		Note5 Note1
		y		0.240	0.290	0.340		
	Red	x		0.510	0.560	0.610		
		y		0.265	0.315	0.365		
	Green	x		0.290	0.340	0.395		
		y		0.515	0.565	0.615		
	Blue	x		0.100	0.150	0.200		
		y		0.045	0.095	0.145		
Uniformity		U		75	80	--	%	Note1 Note6
NTSC				--	50	--	%	Note 5
Luminance		L		250	350	--	cd/m ²	Note1 Note7

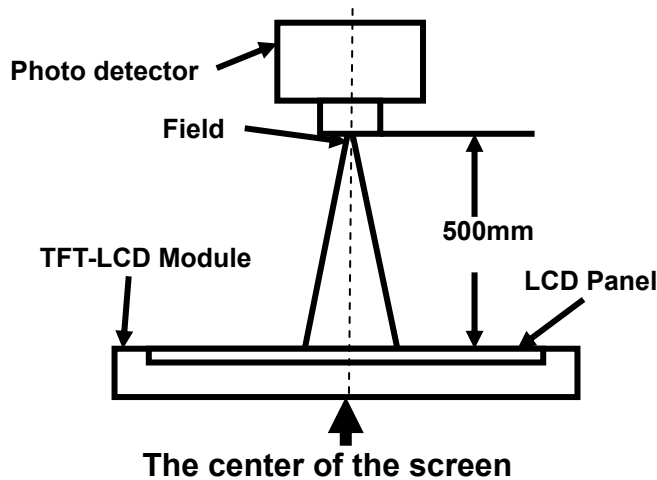
Test Conditions:

1. $I_F = 20\text{mA}$, $V_F = 22.4\text{V}$, the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

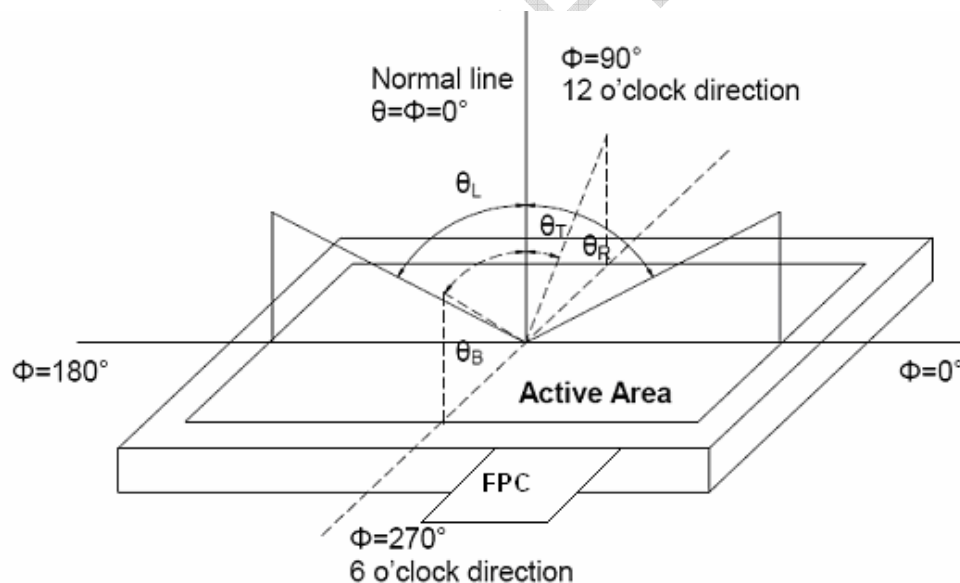
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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} .

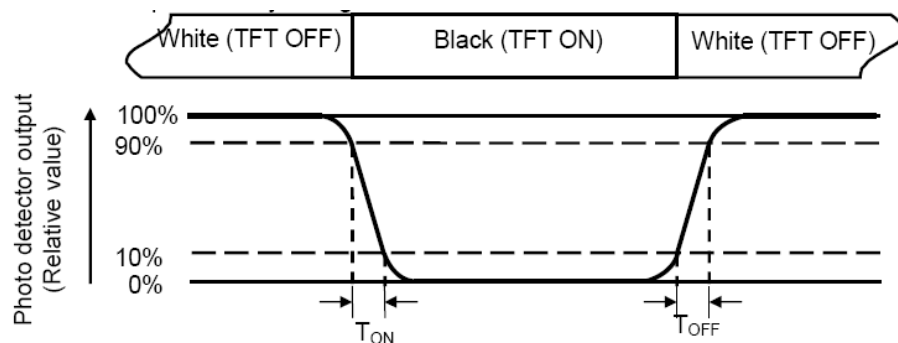
"Black state": The state is that the LCD should drive by V_{black} .

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)

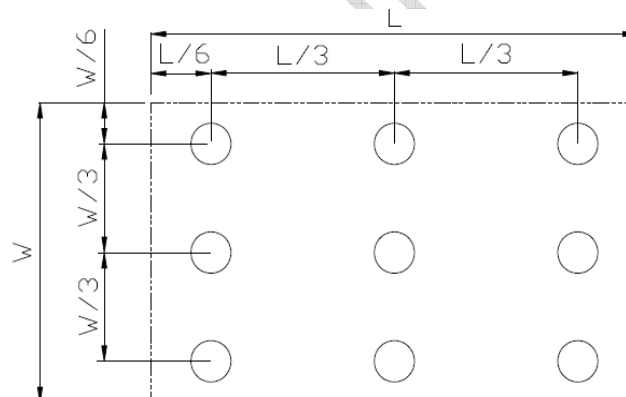
Color coordinates measured at center point of LCD.

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	IEC60068-2-2 GB2423.2
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-2 GB2423.2
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1 GB2423.1
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max, 240 hours	IEC60068-2-3 GB/T2423.3-
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time: 5min, 100 Cycle	IEC60068-2-14 GB2423.22
7	ESD	C=150pF, R=330Ω, 5point/panel Air: ±8Kv, 5times; Contact: ±4Kv, 5times (Environment: 15℃~35℃, 30%~60% .86Kpa~106Kpa)	IEC61000-4-2 GB/T2423.5
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 GB/T2423.10
9	Mechanical Shock (Non Op)	Half Sine Wave 100G 6ms, ±X, ±Y, ±Z 3times for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height: 60cm, 1corner, 3edges, 6surfaces	IEC60068-2-32 GB/T2423.8

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

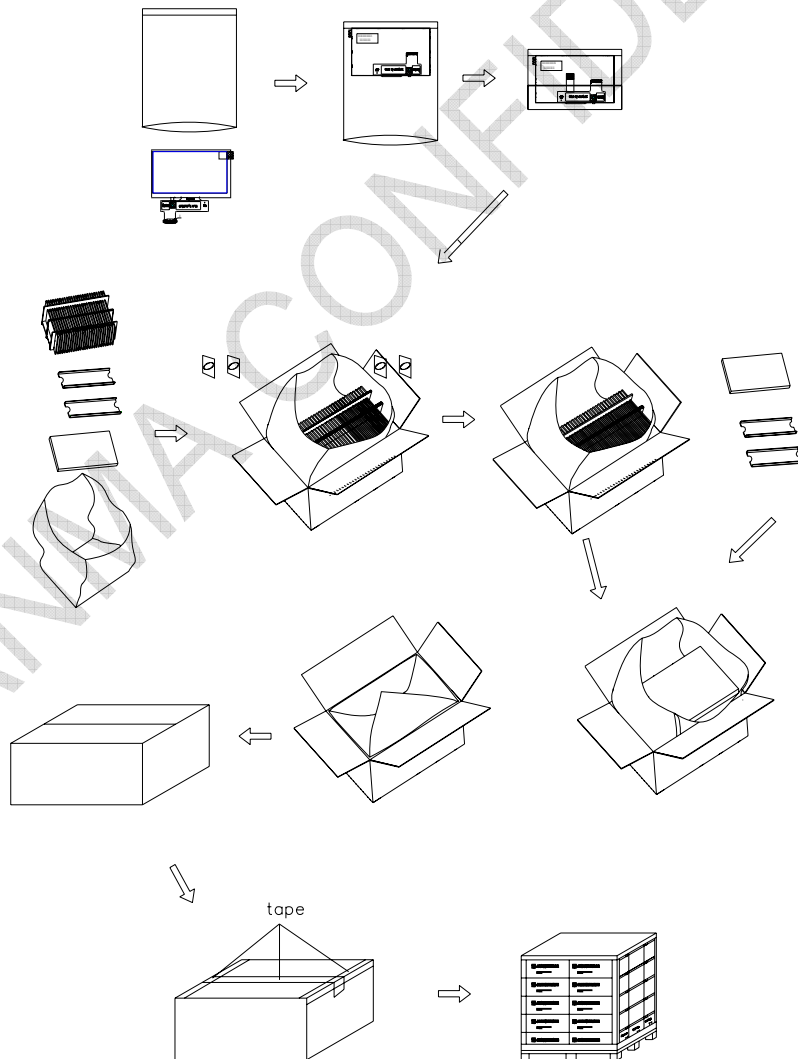
Note2: Ta is the ambient temperature of samples.





9. Packing Drawing

No	Item	Model(Material)	Dimensions (mm)	Unit Weight (Kg)	Quantity	Remark
1	LCM TM060RDH03		145.50x87.80x4.50	0.11	50	
2	Partition-1	Corrugated Paper	513x333x215	1.388	1	Anti-static
3	Anti-static Bag	PE	173x150x0.05	0.001	50	Anti-static
4	Dust-Proof Bag	PE	700x530	0.06	1	
5	Partition_2	Corrugated Paper	505x332x4.0	0.098	2	
6	Corrugated Paper	Corrugated Paper	513x100x30	0.048	4	
7	Carton	Corrugated Paper	530x350x250	1.12	1	
8	Total Weight (Kg)	8.56±5%				





10. Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 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.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 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

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 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.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 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℃ ~ 40℃ Relatively humidity: ≤80%

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

10.3 Transportation Precautions

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