



# **HM070WV101T**

## **7.0" Color TFT-LCD**

**FUNCTIONAL DRAFT SPECIFICATION**

(This document is meant for customers' approval)

**Release Date**  
31<sup>st</sup> Oct 2019

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## 1 General Specifications

	Feature	Spec
<b>Display Spec.</b>	Size	7.0 inch
	Resolution	800(RGB) x 480
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.1926 (H) x 0.179(V)
	Display Mode	TM,NW
	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 x 5.7
	Active Area(mm)	154.08 (W) x 85.92 (H)
	With /Without TSP	Without TSP
	Matching Connection Type	HIROSE FH12A-50S-0.5H
	LED Numbers	24 LEDS
	Weight (g)	157.5g
<b>Electrical Characteristics</b>	Interface	RGB 24 bits with TCON
	Color Depth	16.7M
	Driver IC	HX8264D*1+HX8664B*1

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: +/- 5%

## 2 Input/Output Terminals

### CN1 of FPC

Mating connector type: HIROSE FH12A-50S-0.5H

PIN	Symbol	I/O	Description	Remark
1	VLED+	P	Led anode	
2	VLED+	P	Led anode	
3	VLED-	P	Led cathode	
4	VLED-	P	Led cathode	
5	GND	P	Ground	
6	VCOM	P	For external VCOM DC input	
7	DVDD	P	Digital power supply	
8	MODE	I	DE/SYNC mode select. H:DE mode, L:SYNC mode	
9	DE	I	Data enable signal, active high to enable data,if not used,please pull low	
10	VSYNC	I	Vertical sync input, negative polarity,if not used,please pull High	
11	HSYNC	I	Horizontal sync input, negative polarity,if not used,please pull High	
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	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	
27	G0	I	Green 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	Ground	

37	DCLK	I	Clock for input data, latching data at falling edge	
38	GND	P	Ground	
39	LR	I	Source left or right sequence control	
40	UD	I	Gate up or down scan control	
41	VGH	P	Positive power of TFT	
42	VGL	P	Negative power of TFT	
43	AVDD	P	Analog power supply	
44	RESET	I	Global reset pin	
45	NC	-	No Connection	
46	VCOM	P	For external VCOM DC input	
47	DITHB	I	Dithering setting. H: 6bit resolution, L: 8bit resolution	
48	GND	P	Ground	
49	NC	-	No Connection	
50	NC	-	No Connection	

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

**Table 2.1 terminal pin assignments**

**U/D R/L Function Description**

Scan control input		Scanning direction
UD	LR	
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

### 3 Absolute Maximum Ratings

Ta = 25°C

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.50	5.00	V	
	AVDD	-0.50	15.00	V	
	VGH	-0.30	42.00	V	
	VGL	-20.00	0.30	V	
	VGH-VGL	-0.30	40.00	V	
Signal Input Voltage	V <sub>in</sub>	-0.50	5.00	V	Note1
Operating Temperature	T <sub>op</sub>	-20.0	70.0	°C	
Storage Temperature	T <sub>st</sub>	-30.0	80.0	°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 3.1 absolute maximum rating**

Note1: Input voltage include R0~R7, G0~G7, B0~B7, DCLK, HSYNC, VSYNC, DE, R/L, U/D, MODE, RESET, DITHB.

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

### Recommended Operating Condition

VCC=3.3V, 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	10.1	10.4	10.7	V		
Gate on voltage	VGH	14.4	16	17.6	V		
Gate off voltage	VGL	-7.70	-7.00	-6.30	V		
Common Electrode Driving Signal	VCOM	3.85	3.95	4.05	V		
Input Signal Voltage	Low Level	V <sub>IL</sub>	0	-	0.3xVCC	V	R0~R7,G0~G7,0~B7,DE, DCLK,HSYNC,VSYNC,MODE, RESET,LR,UD, DITHB
	High Level	V <sub>IH</sub>	0.7xVCC	-	VCC	V	
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	

**Table 4.1 LCD module electrical characteristics**

Note 1: It is necessary to keep the input voltage within the suggested range.

### Backlight Unit Driving Condition

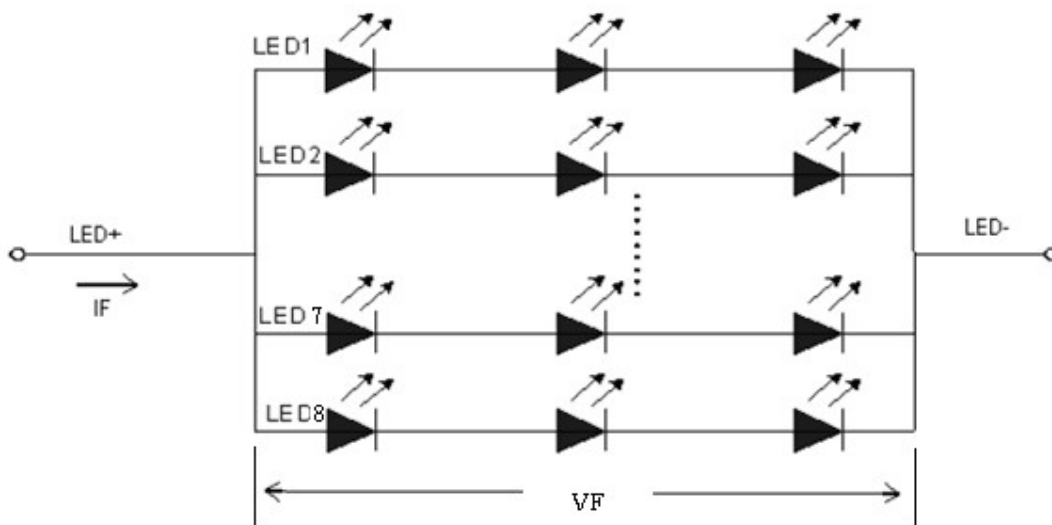
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	$I_F$	-	160.0	200	mA	24 LEDs (3 LED Serial, 8 LED Parallel)
Forward Current Voltage	$V_F$	9	9.6	10.8	V	
Backlight Power Consumption	$W_{BL}$	-	1536	2160	mW	
Operating Life Time	--	20000	--	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 8 LED Parallel).

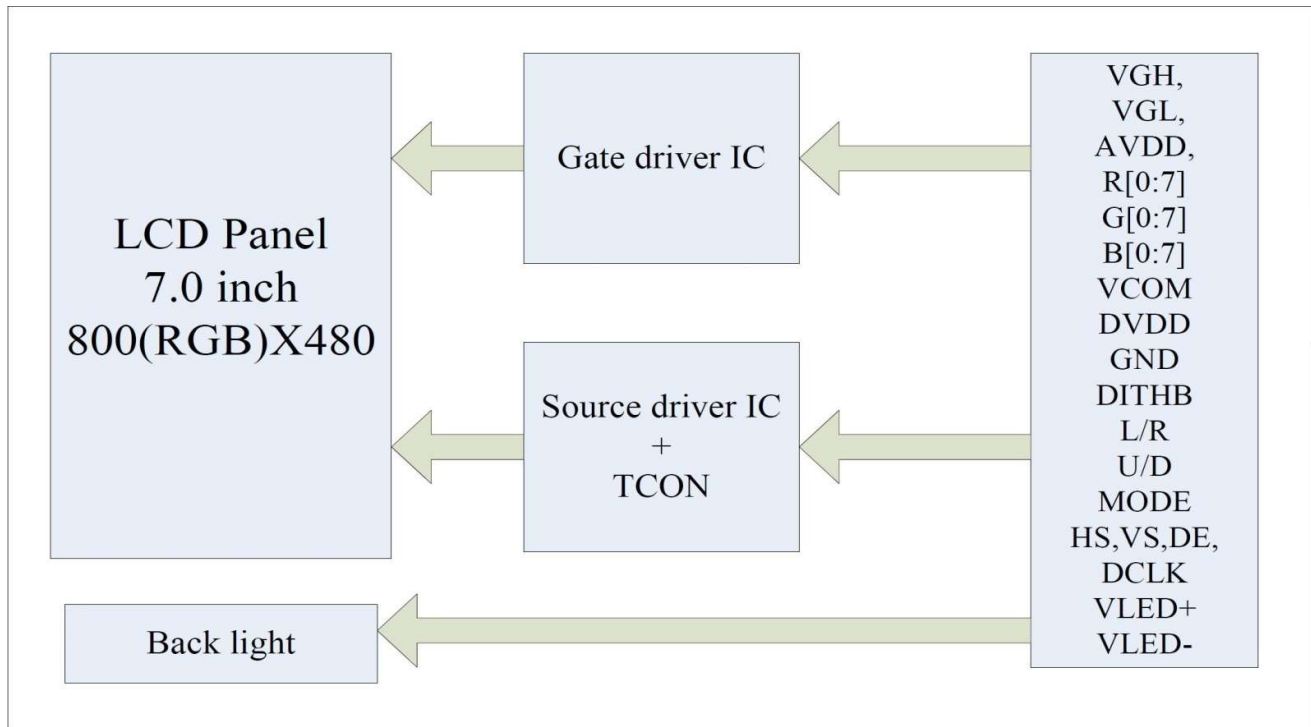
Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at  $T_a=25^\circ\text{C}$  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.

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



# BLOCK DIAGRAM





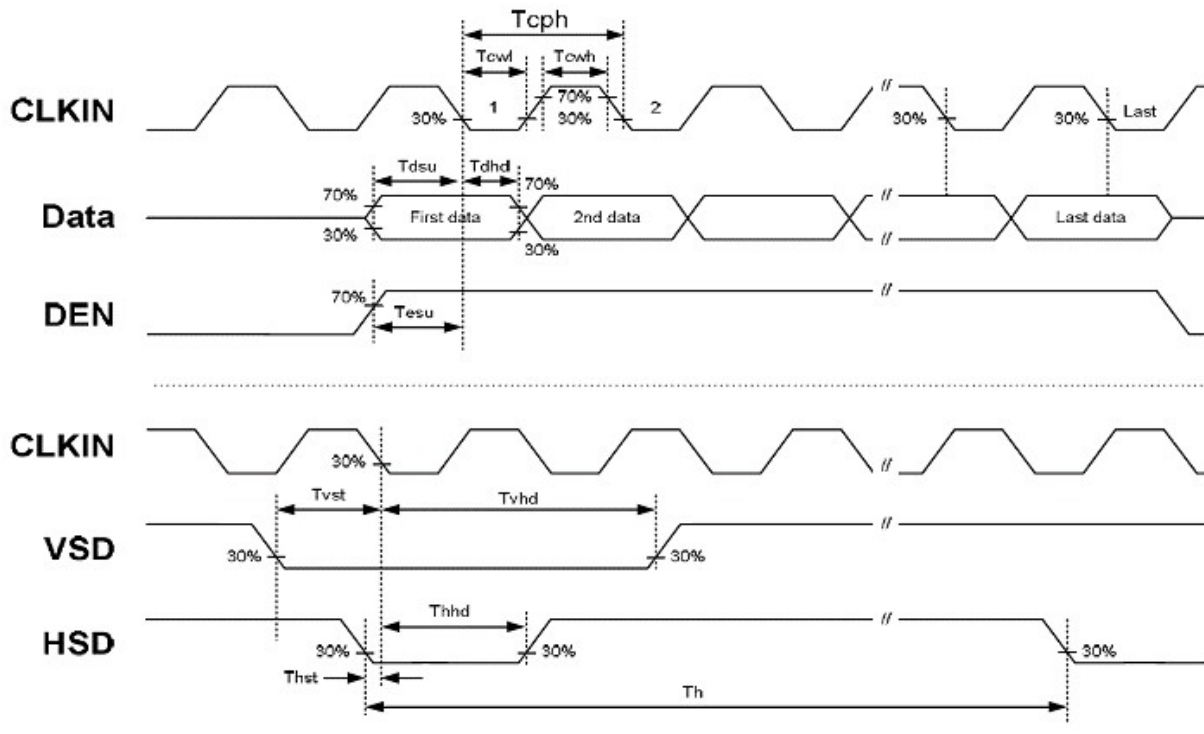
## 5 Timing Chart

### TFT-LCD Input Timing

VCC=3.3V, GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	$F_{clk}$	28	30.0	40.0	MHz	
DCLK cycle time	$T_{cph}$	25	33.3	36	ns	
DCLK pulse width	$T_{cw}$	40%	50%	60%	$T_{cph}$	
VS setup time	$T_{vst}$	8			ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
HS setup time	$T_{hst}$	8			ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8			ns	Data to DCLK
Data hold time	$T_{dhd}$	8	-	-	ns	Data to DCLK
DE setup time	$T_{esu}$	8	-	-	ns	
DE hold time	$T_{ehd}$	8	-	-	ns	

### Input Clock and Data timing Diagram:



## Recommended Timing Setting Of TCON

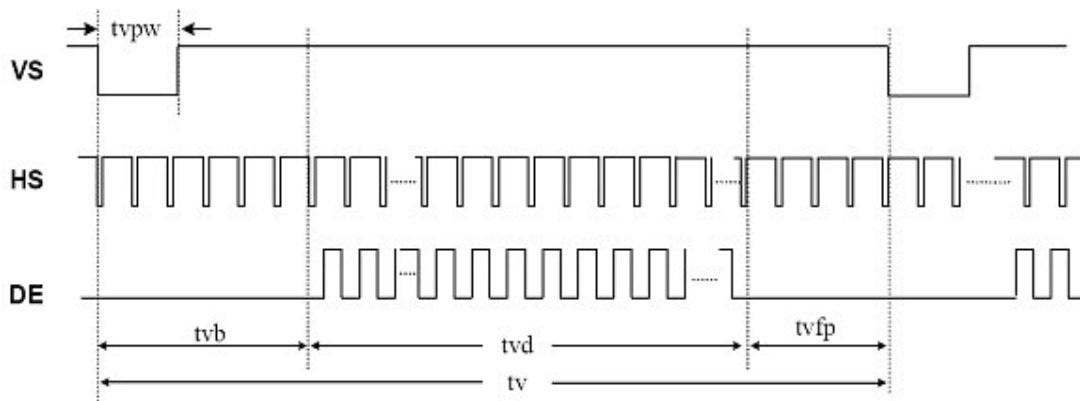
### TCON (Embedded In Source IC) Input Timing (DCLK, HS, VS, DE)

VCC=3.3V, GND=0V, Ta=25°C

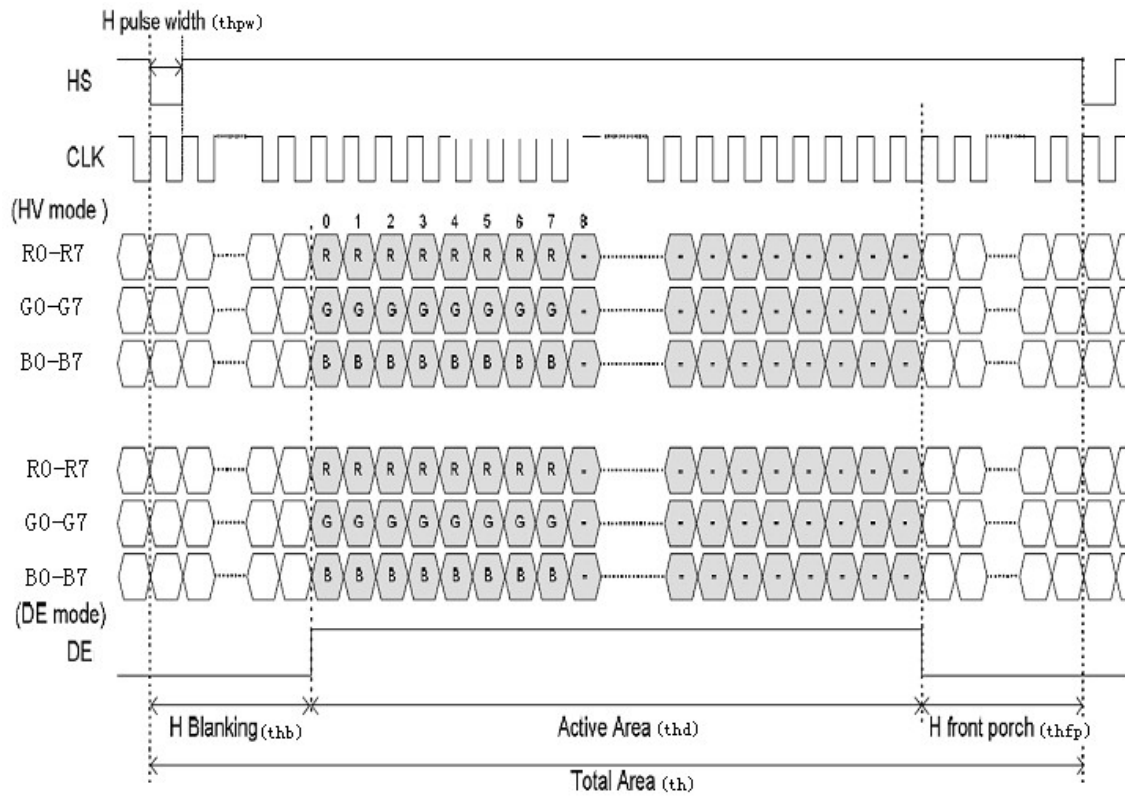
Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	F <sub>clk</sub>	28	30	40	MHZ	
	t <sub>clk</sub>	20	33.3	36	ns	
HSD	t <sub>h</sub>	862	1056	1200	t <sub>clk</sub>	
	t <sub>hd</sub>	800	800	800	t <sub>clk</sub>	
	t <sub>hpw</sub>	1	-	40	t <sub>clk</sub>	
	t <sub>hb</sub>	46	46	46	t <sub>clk</sub>	
	t <sub>hfp</sub>	16	210	354	t <sub>clk</sub>	
VSD	t <sub>v</sub>	510	525	650	th	
	t <sub>vd</sub>	480	480	480	th	
	t <sub>vpw</sub>	1	3	20	th	
	t <sub>vb</sub>	23	23	23	th	
	t <sub>vfp</sub>	7	22	147	th	

Note 1: DE timing refer to HS, VS input timing.

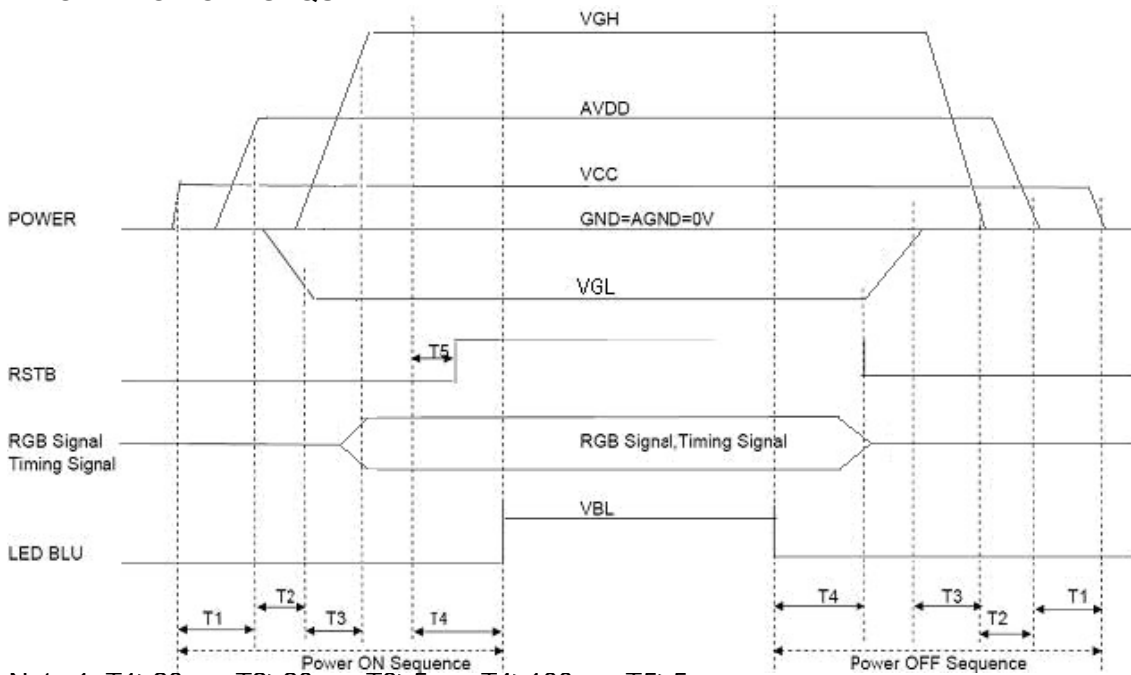
### TCON Vertical Input Timing Diagram HV



## TCON Horizontal Input Timing Diagram



## POWER ON/OFF SEQUENCE



Note 1:  $T_1 \geq 20\text{ms}$ ,  $T_2 \geq 20\text{ms}$ ,  $T_3 \geq 5\text{ms}$ ,  $T_4 \geq 100\text{ms}$ ,  $T_5 \geq 5\text{ms}$ .

## 6 Optical Characteristics

Ta=25°C

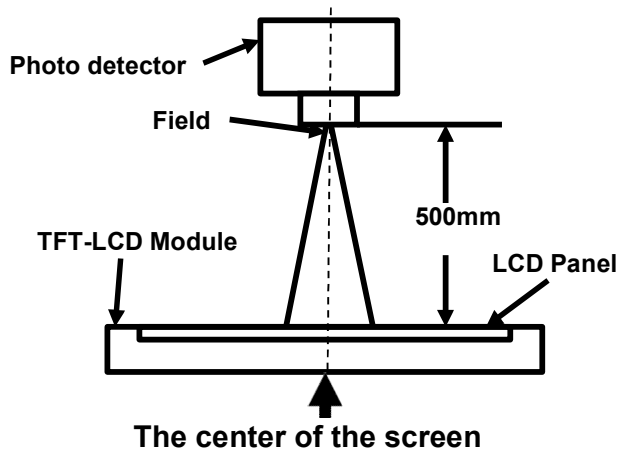
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	$\theta T$	$CR \geq 10$	50	60	-	Degree	Note 2
	$\theta B$		60	70	-		
	$\theta L$		60	80	-		
	$\theta R$		60	80	-		
Contrast Ratio	CR	$\theta=0^\circ$	600	800	-		Note1 Note3
Response Time	$T_{ON}$	25°C	-	25	-	ms	Note1 Note4
	$T_{OFF}$						
Chromaticity	White	x	Backlight is on	0.279	0.309	0.339	Note1 Note5
		y		0.288	0.318	0.348	
	Red	x		0.558	0.588	0.618	
		y		0.322	0.352	0.382	
	Green	x		0.318	0.348	0.378	
		y		0.551	0.581	0.611	
	Blue	x		0.120	0.150	0.180	
		y		0.056	0.086	0.116	
Uniformity	U		80	85	-	%	Note1 Note6
NTSC			45	50	-	%	Note 5
Luminance (Without )	L		350	400	-	cd/m <sup>2</sup>	Note1 Note7

Test Conditions:

1.  $I_F = 160 \text{ mA}$ ,  $V_F = 9.6 \text{ V}$  and the ambient temperature is  $25 \pm 2\%$ . humidity is  $65 \pm 7\%$
2. The test systems refer to Note 1 and Note 2.

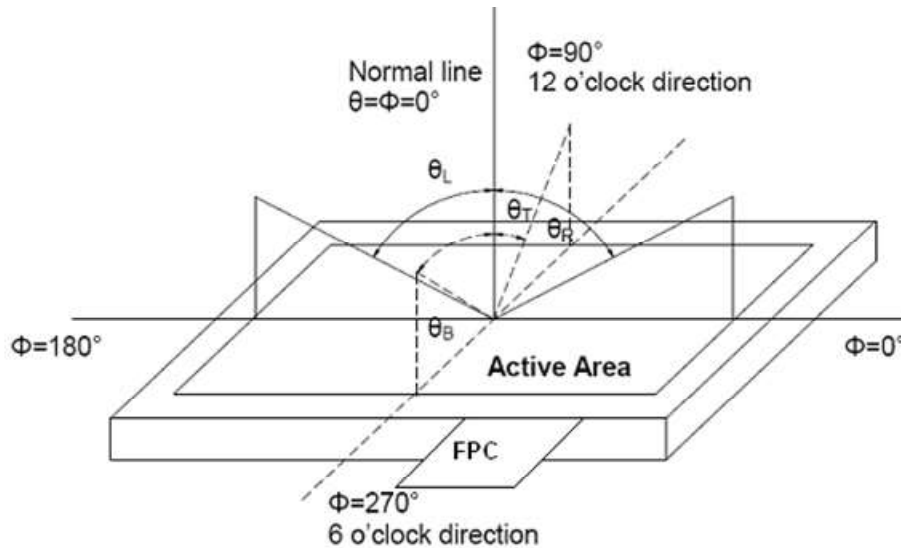
Note 1: Definition of optical measurement system.

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

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

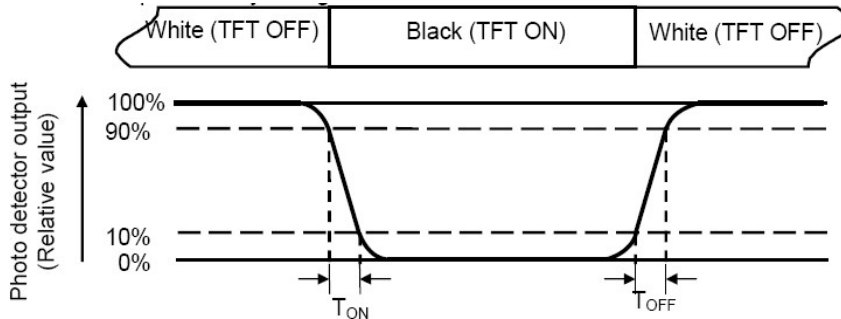
“White state “: The state is that the LCD should drive by  $V_{\text{white}}$ .

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

$V_{\text{white}}$ : To be determined     $V_{\text{black}}$ : 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)

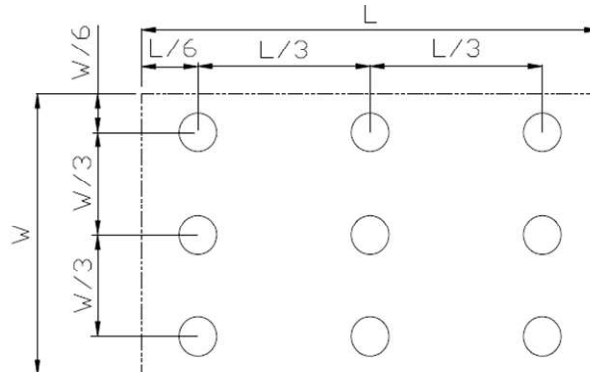
Color coordinates measured at center point of LCD.

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.

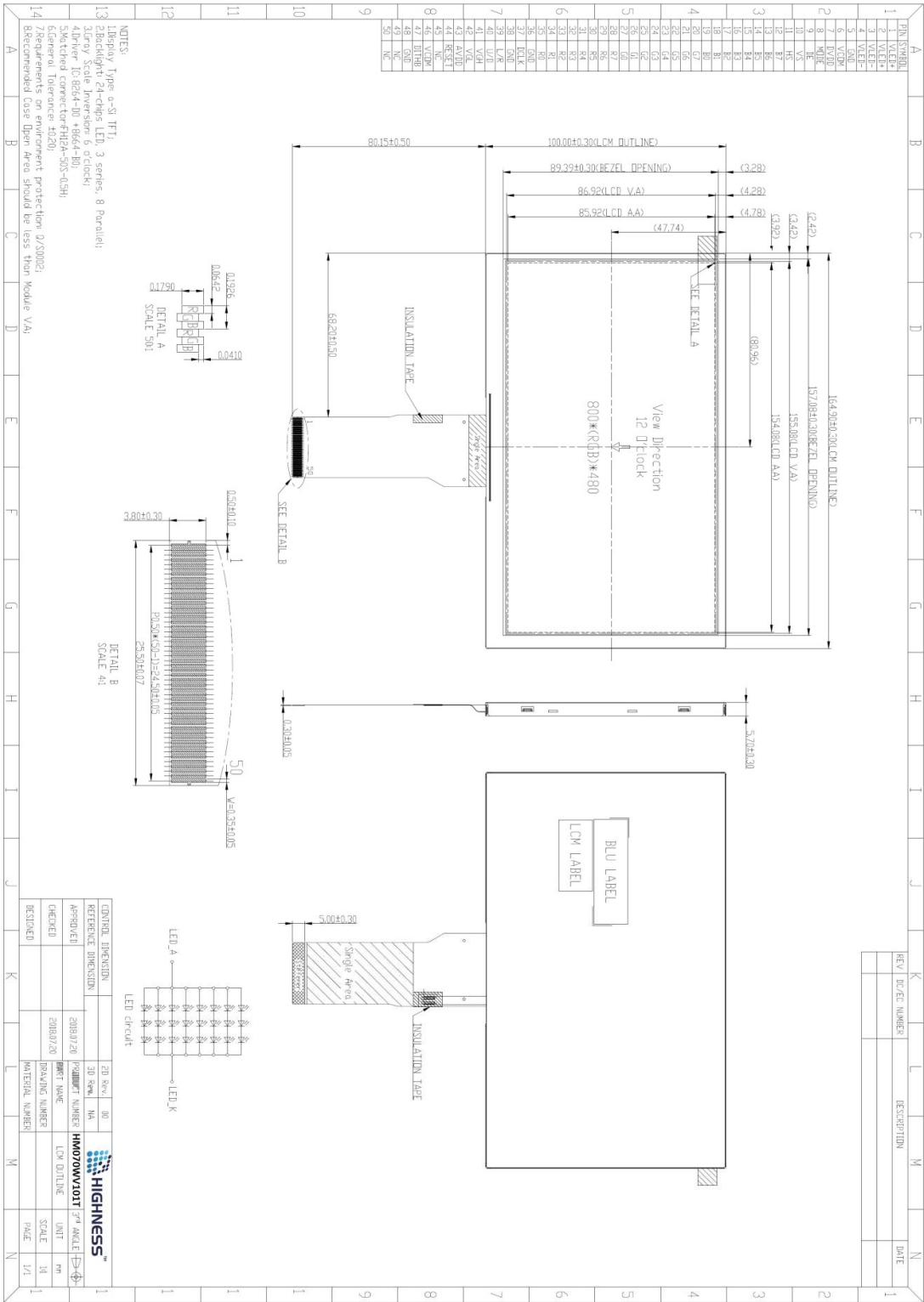
## 7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta = +70°C, 240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Operation	Ta = -20°C, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80°C, 240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -30°C, 240 hours	IEC60068-2-1 GB2423.1
5	Storage at High Temperature and Humidity	Ta = +60°C, 90% RH max,240hours	IEC60068-2-78 GB/T2423.3
6	Thermal Shock (non-operation)	-30°C~+80°C, 30min, Change Time: 5min, total 100cycle	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment: 15°C~35°C, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
8	Vibration (package condition)	5~20-200Hz,PSD:0.01-0.01-0.001 Total:0.781g2/Hz, X,Y,Z directions 30mins each direction	IEC60068-2-6 GB/T2423.10
9	Package Drop Test	1 box≤10Kg, Height:80cm; 1 box> 10Kg., 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.

# 8 Mechanical Drawing





## 9 PACKING, TRANSPORTATION AND DELIVERY

<b>Panel Size</b>	7.0 inch	<b>Customer</b>	
<b>Module No.</b>	HM070WV101T	<b>Main Display</b>	<b>Sub Display</b>
<b>Display Type</b>		TFT	NA
<b>Resolution</b>		800*480	NA
<b>Color</b>		Full Color	NA
<b>Module Demand Dimension</b>	164.9x 100 x 5.7		

### Packaging Material

#### Per Carton list

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	HM070WV101T	164.90×100.00×5.70	0.1575	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			-	1	
7	Total weight	15.15 Kg±0.5				

### Packaging Specification and Quantity

(1) LCM quantity per tray: 2row×2column =4

(2) Total LCM quantity in Carton: Number of PET trays15 × quantity per tray 4=60

Note: Please refer to the data from “estimated report about the dimension and stack of Carton “ about stacking carton

## 10 Precautions for Use of LCD Modules

### 10.1 Handling Precautions

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

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.

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

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

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

Do not attempt to disassemble the LCD Module.

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

To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

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

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

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

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

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

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%

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.