DATA MODUL

SPECIFICATION

BOE

GT050WVM-NS0

5.0" - WVGA - RGB

Version: 0
Date: 19.10.2018

Note: This specification is subject to change without prior notice

CONTENT LIST

Record of Revisions				
Revision	Date	Page	Description	Released by
Pre.0	2018.10.19		Initial Released	Huangdongmei

1.0 GENERAL DESCRIPTION

1.1 Introduction

GT050WVM-NS0 is a color active matrix TFT-LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This model is composed of a TFT-LCD Panel, a driving circuit and a back light system. It is a transmissive type display operating in the normal white. This TFT-LCD has a 5.0 inch diagonally measured active area with WVGA resolutions (800 horizontal by 480 vertical pixel array). Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripe and this panel can display 16.7M colors.

1.2 Features

● 0.8t Glass

● Thin and light weight

● High luminance and contrast ratio, low reflection and wide viewing angle

● Module Design

● RoHS Compliant

1.3 Application

● Application

1.4 General Specifications (H: horizontal length, V: vertical length)

Parameter	Specification	Unit	Remark
Active Area	108(H) × 64.8(V)	mm	
Number of Pixels	800(H) RGB × 480(V)	pixels	
Pixel Pitch	135(H) × 135(V)	um	
Pixel Arrangement	RGB Vertical stripe		
Display Colors	16.7 M	colors	
Color Gamut	50%(typ.)		
Display Mode	Normally White, Transmissive mode		
Dimensional Outline	120.7±0.3(H) × 76.3±0.3(V) ×3.1± 0.2(D)	mm	W/o. components
Viewing Direction (Human Eye)	12 O'clock		FPC downward on phone assembly
Gray Scale Inversion Direction	6 O'clock		
Surface Treatment	Glare HC(3H)		Up polarizer
D-IC	HX8264D02(source) HX8664B(gate)		COG
Weight	TBD	gram	
Interface	RGB 24bit		

Note:
1. Gray Inversion 6:00 o'clock
2. TFT & CF Rubbing direction and Pol attach Direction
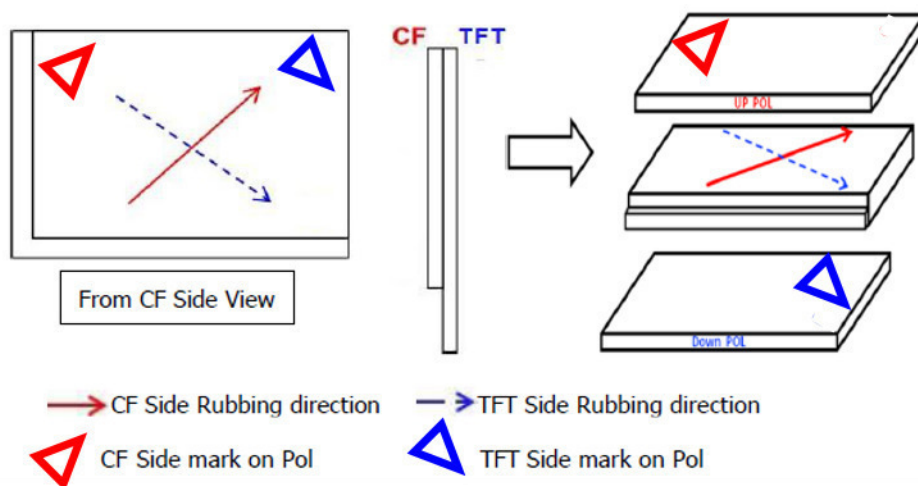
3. These data of Product Specification were based on HIMAX Drive IC HX8264D (Source), HX8664B (Gate), Other Drive IC Novatek NT39416Q (Source), NT52001 (Gate) & ILITEK ILI6123C (Source), ILI5960 (Gate) is compatible, but we only gained Product qualification in HIMAX Drive IC HX8264D (Source), HX8664B (Gate), if Customer want to use compatible IC, Please contact our technic personnel.

2.0 ELECTRICAL SPECIFICATION

2.1 Absolute Maximum Ratings

The absolute maximum ratings are list on table as follows. When used out of the absolute maximum ratings, the LSI may be permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LSI will malfunction and cause poor reliability.

Parameter	Symbol	Min.	Max.	Unit
Supply voltage for logic and analog	VCI	-0.5	5.0	V
Operating temperature range	TOPR	-20	+70	℃
Storage Temperature range	TSTG	-30	+80	℃

Note:

If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily ,the quality of the product may be degraded .Absolute maximum ratings ,therefore ,specify the values exceeding which the product may be physically damaged .Be sure to use the product .within the range of the absolute maximum ratings.

2.2 TFT LCD Module DC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Logic and Analog Supply Voltage	VCI	3.0	3.3	3.6	V	-
Power supply for analog circuits	VDDA	7	TBD	12	V	
Logic Low Voltage	VIL	0		0.3xVCI	V	
Logic High Voltage	VIH	0.7xVCI		VCI	V	
Power Consumption	Normal Mode		TBD		mW	
	Standby Mode		TBD		uW	

2.3 Backlight Driving Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED Forward Voltage	VF	8.4	9	9.6	V	3V/LED
LED Forward Current	IF		60		mA	20mA/LED
LED Power Consumption	PLED		540		mW	Note 1
LED Life-time		20000			hrs	Note 2

Notes:

1. Calculator Value for reference ILED×VLED×LED Quantity = PLED

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

2.4 Block Diagram
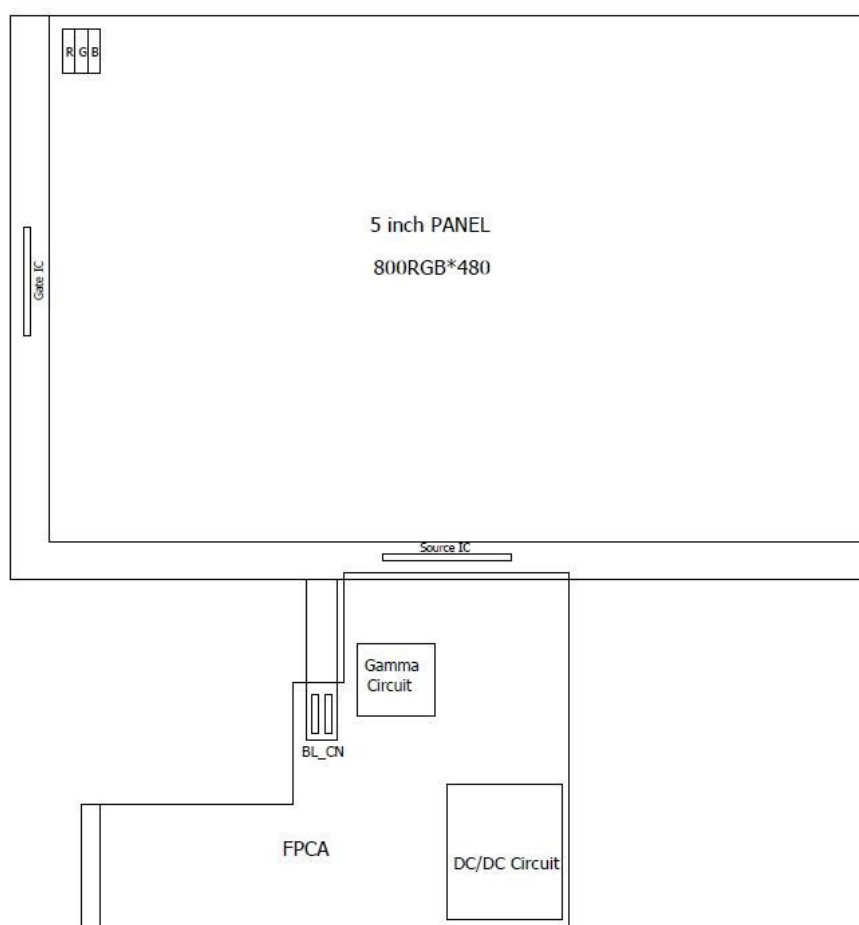
2.5 Power ON/OFF Sequence
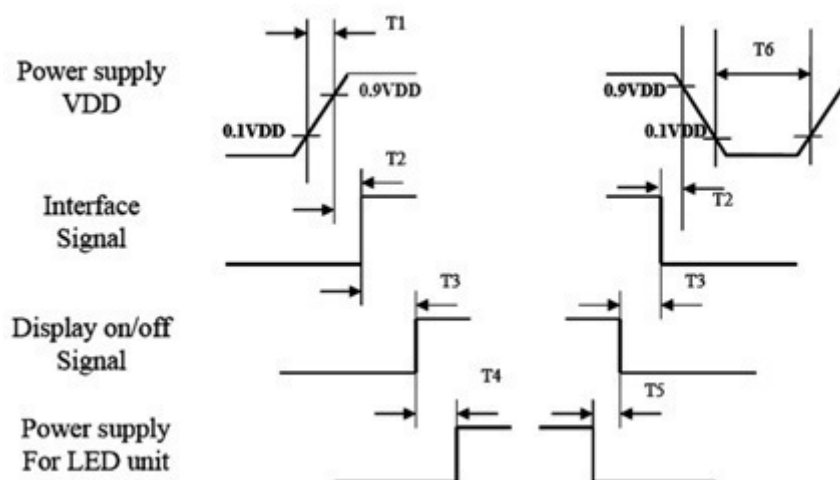
Symbol	Specification	Symbol	Specification
T1	0≤T1≤10ms	T4	T4≥200ms
T2	16≤T2≤100ms	T5	T5≥100ms
T3	0≤T3≤200ms	T6	T6≥16ms

Note:

1. LCM possible abnormal display at first frame due to short T6 time. And it can recover in next several frames.

2. LCM low-probability can't power on (black out) and need to reset.

3.0 SIGNAL TIMING SPECIFICATION

3.1 TCON (Embedded in Source IC) Input timing at HV mode

VDD=3.3V, GND=0V, Ta=25°C

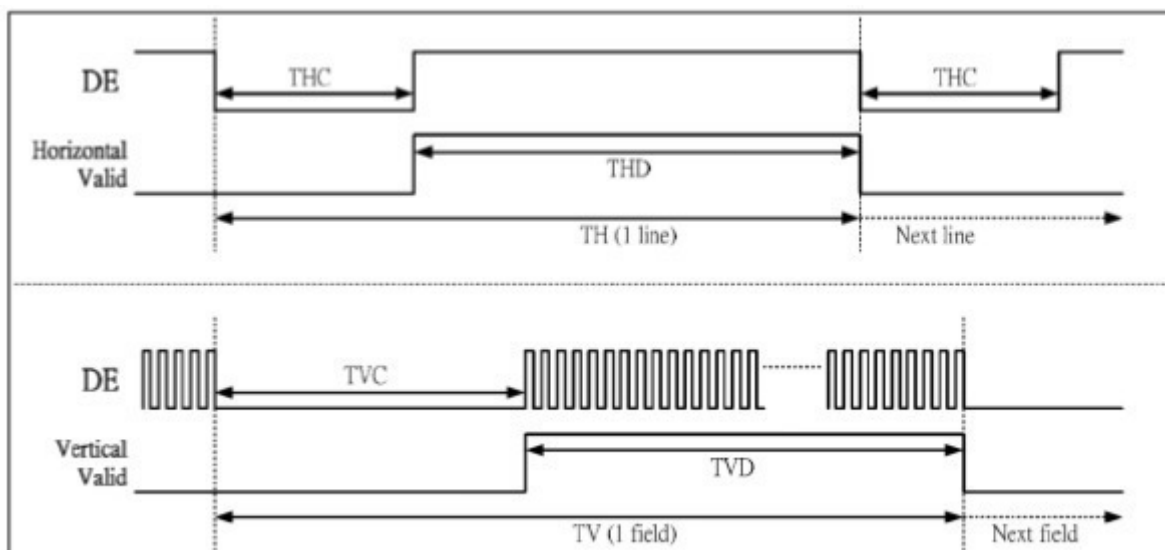| Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	Fclk	25	30	36	MHz	Tclk=1/Fclk
	Tclk	27.8	33.3	40	ns	
HSYNC	TH	889	928	1143	Tclk	
	THD		800		Tclk	
	Thwh	1	48	255	Tclk	
	Thbp		88		Tclk	
	Thfp	1	40	255	Tclk	
VSYNC	TV	513	525	767	TH	
	TVD		480		TH	
	Tvwh	3	3	255	TH	
	Tvbp		32		TH	
	Tvfp	1	13	255	TH	
	Frame rate	50	60	75	HZ	

Note: Above parameters are based on default setting without initial setting.
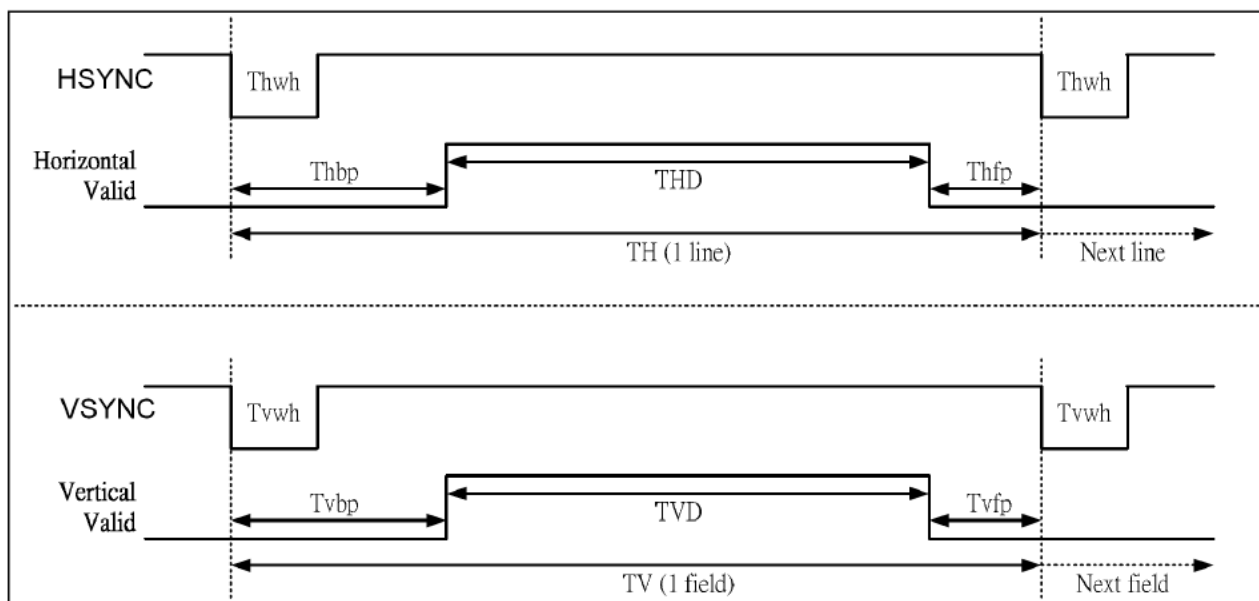
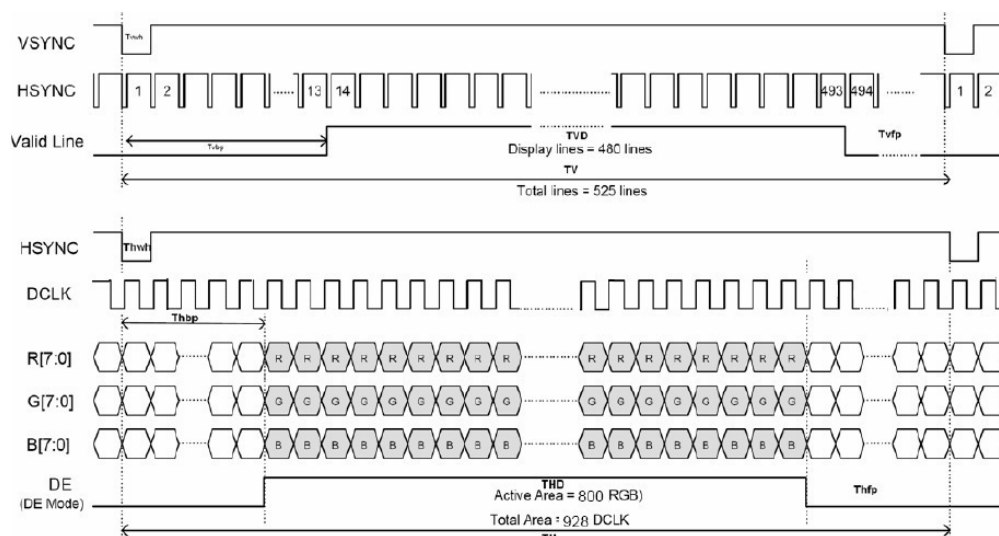### 3.2 TCON (Embedded in Source IC) Input timing at DE mode

VDD=3.3V, GND=0V, Ta=25℃

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency		Fclk	25	30	36	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	TH	885	928	1312	Tclk	
	Horizontal blanking	THC	85	128	512	Tclk	
	Valid Data Width	THD		800		Tclk	
Vertical section	Frame rate	-	50	60	75	Hz	
	Vertical total	TV	484	525	735	TH	
	Vertical blanking	TVC	4	45	255	TH	
	Valid Data Width	TVD		480		TH	

**Note:** This LCD is designed using DE mode as default

3.3 RGB Data input format

3.4 AC Electrical Characteristics

VDD=3.3V, GND=0V, Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency	Fclk	25	30	36	MHz	Tclk=1/Fclk
DCLK duty cycle	Tcwh	40%	50%	60%	Tclk	
HSYNC width	Thwh	1	-	-	Tclk	
VSYNC setup time	Tvst	8			ns	
VSYNC hold time	Tvhd	8	-	-	ns	
HSYNC setup time	Thst	8			ns	
HSYNC 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 to DCLK
DE hold time	Tehd	8	-	-	ns	DE to DCLK
Horizontal total	TH	885	928	1312	Tclk	
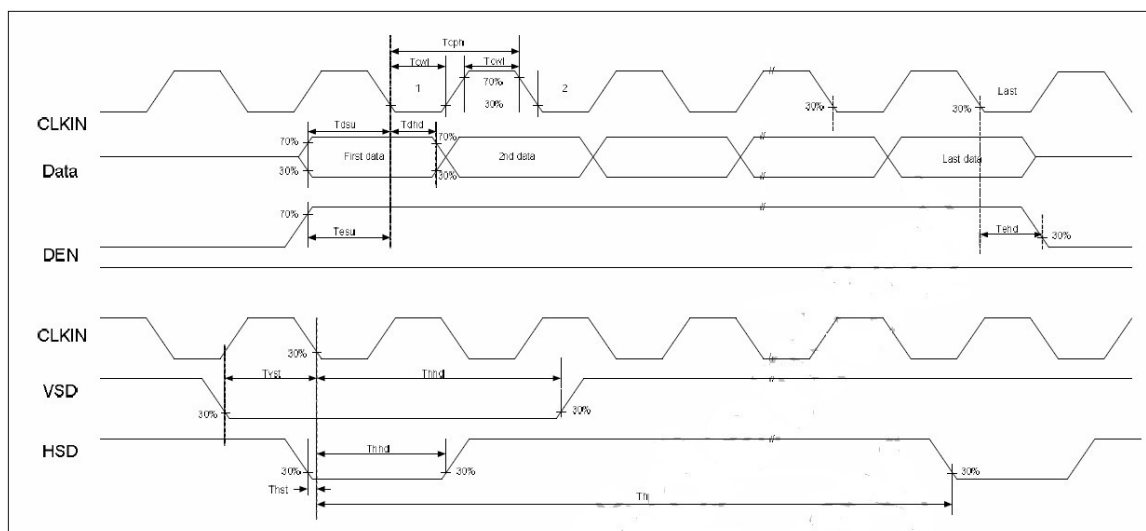
4.0 INTERFACE CONNECTION

FPC Connector is used for the module electronics interface.

Pin No.	Symbol	I/O	Function	Remark
1	V_{LED-}	P	Power for LED backlight (Cathode)	
2	V_{LED+}	P	Power for LED backlight (Anode)	
3	DV_{DD}	P	Power for Digital Circuit	
4	GND	P	Power Ground	
5	DISP	I	Standby mode, normally pulled high STBY "1",normal operation STBY "0",timing controller, source driver will turn off , all output are High-Z	
6	R0	I	Red data(LSB)	
7	R1	I	Red data	
8	R2	I	Red data	
9	R3	I	Red data	
10	GND	P	Power Ground	
11	R4	I	Red data	
12	R5	I	Red data	
13	R6	I	Green data	
14	R7	I	Green data(MSB)	
15	GND	P	Power Ground	
16	G0	I	Green data(LSB)	
17	G1	I	Green data	
18	G2	I	Green data	
19	G3	I	Green data	
20	GND	P	Power Ground	
21	G4	I	Green data	
22	G5	I	Green data	
23	G6	I	Green data	
24	G7	I	Green data(MSB)	
25	GND	P	Power Ground	
26	B0	I	Blue data(LSB)	
27	B1	I	Blue data	
28	B2	I	Blue data	
29	B3	I	Blue data	
30	GND	P	Power Ground	
31	B4	I	Blue data	
32	B5	I	Blue data	
33	B6	I	Blue data	
34	B7	I	Blue data(MSB)	
35	GND	P	Power Ground	
36	DCLK	I	Sample clock	
37	GND	P	Power Ground	
38	DE	I	Data Input Enable	
39	HS	I	Horizontal Sync Input	
40	VS	I	Vertical Sync Input	

Note: I/O Definition   I---Input, O---Output, P--- Power/Ground

5.0 OPTICAL SPECIFICATIONS

5.1 Overview

   The test of Optical specifications shall be measured in a dark room(ambient luminance≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Topcon SR-UL1R and Westar TRD-100A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°.The center of the measuring spot on the Display surface shall stay fixed.

   The backlight should be operating for 30 minutes prior to measurement.

5.2 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Horizontal	Θ3	CR>10	60	70		°	Note 1
		Θ9		60	70		°	
	Vertical	Θ12		40	50		°	
		Θ6		60	70		°	
Contrast Ratio		CR	Θ= 0°	500	600			Note 2
Luminance		cd/m2	Θ= 0°	280	350		nit	Note 3
Uniformity		%	Θ= 0°	75	80			Note 4
NTSC		%	Θ= 0°	45	50			
Reproduction Of color	Red	Rx	Θ= 0°	0.56	0.60	0.64		Note 5
		Ry		0.28	0.32	0.36		
	Green	Gx		0.31	0.35	0.39		
		Gy		0.50	0.54	0.58		
	Blue	Bx		0.12	0.16	0.20		
		By		0.05	0.09	0.13		
White		Wx	Θ= 0°	0.27	0.31	0.35		
		Wy		0.28	0.32	0.36		
Response Time		Tr+Tf	Θ= 0°		20	30	ms	Note 6

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIG.1,FPC downward on phone assembly).

2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Surface luminance is the center point across the LCD surface 50cm from the surface with all pixels displaying white.

4. Uniformity measurement shall be taken at the locations shown in FIG. 2&3, for a total of the measurements per display, measure surface luminance of these nine points across the LCD surface 50cm from the surface with all pixels displaying white.

$$\text{Uniformity} = \frac{\text{Min Luminance of 9 points}}{\text{Max Luminance of 9 points}} \times 100\%$$

5. The color chromaticity coordinates specified in Table able are simulation data. Will updated based on first sample's data. Measurements shall be made at the center of the Module.

6. The electro-optical response time measurements shall be made as FIG.4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tf and 90% to 10% is Tr.

Figure 1. Measurement Set Up
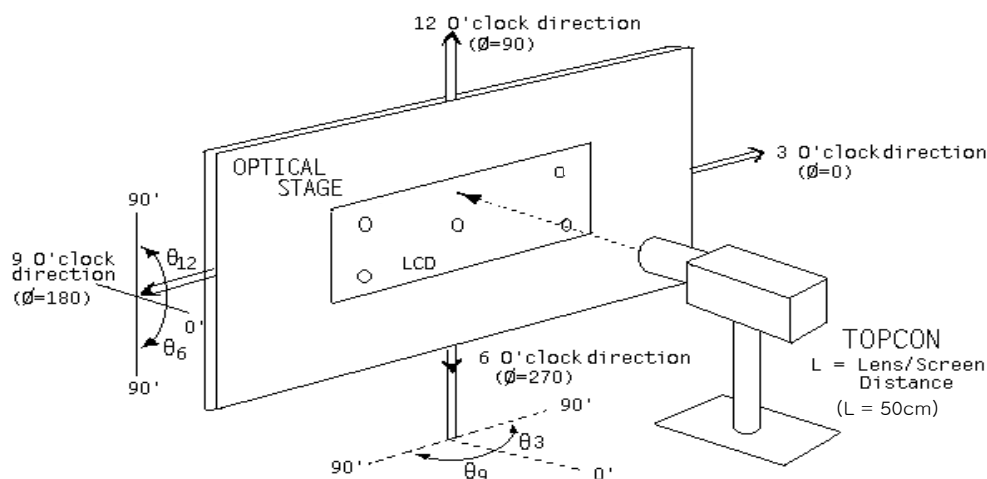
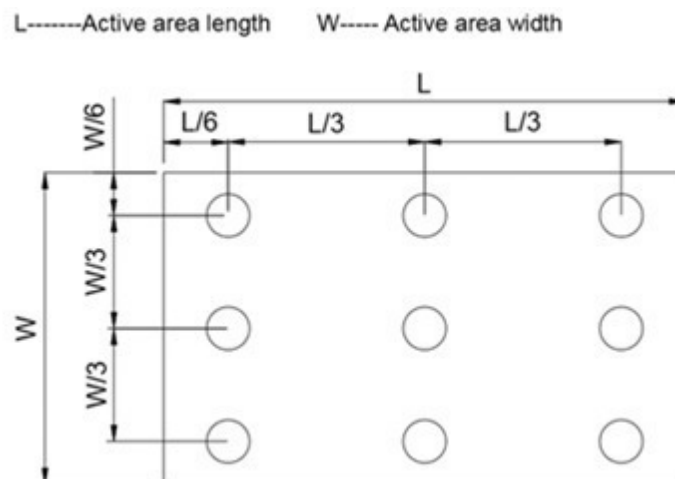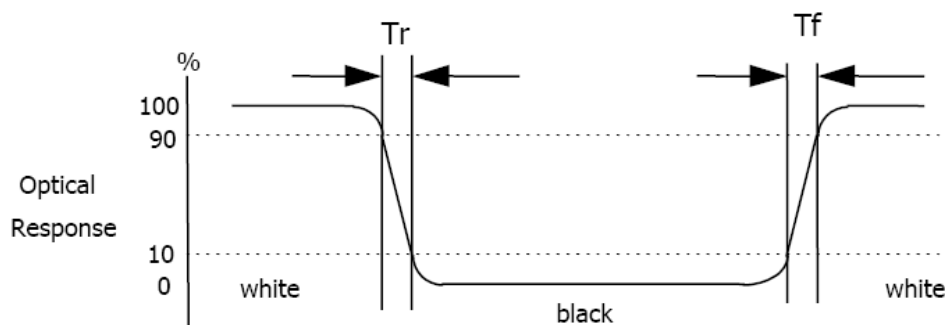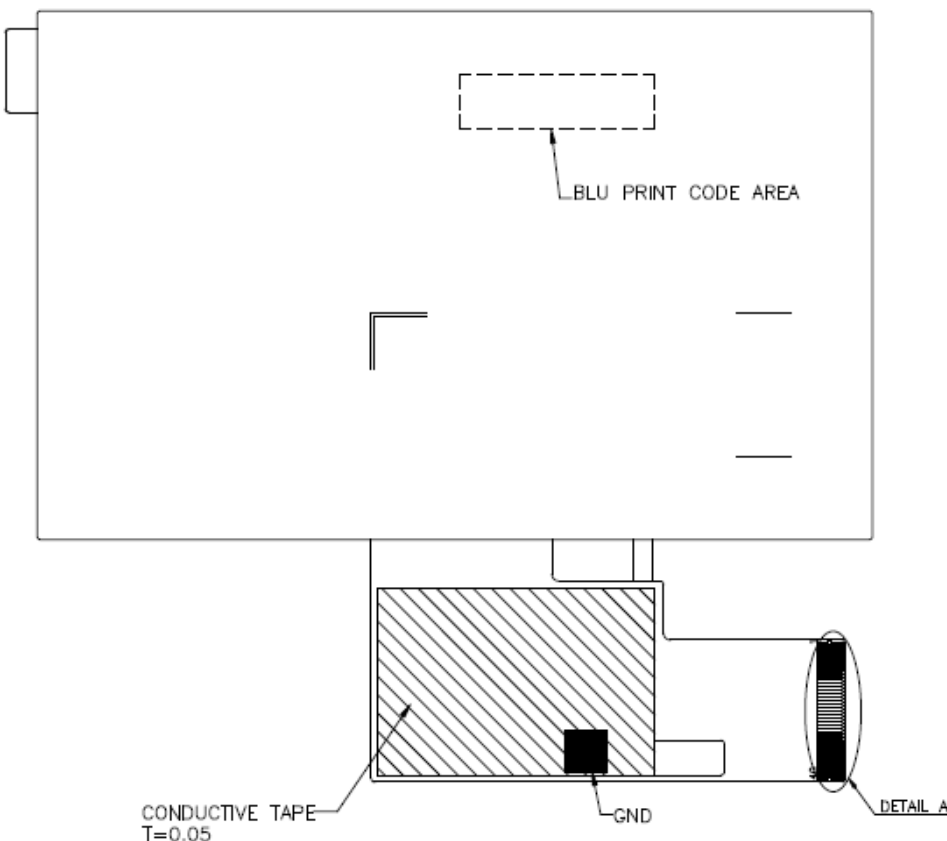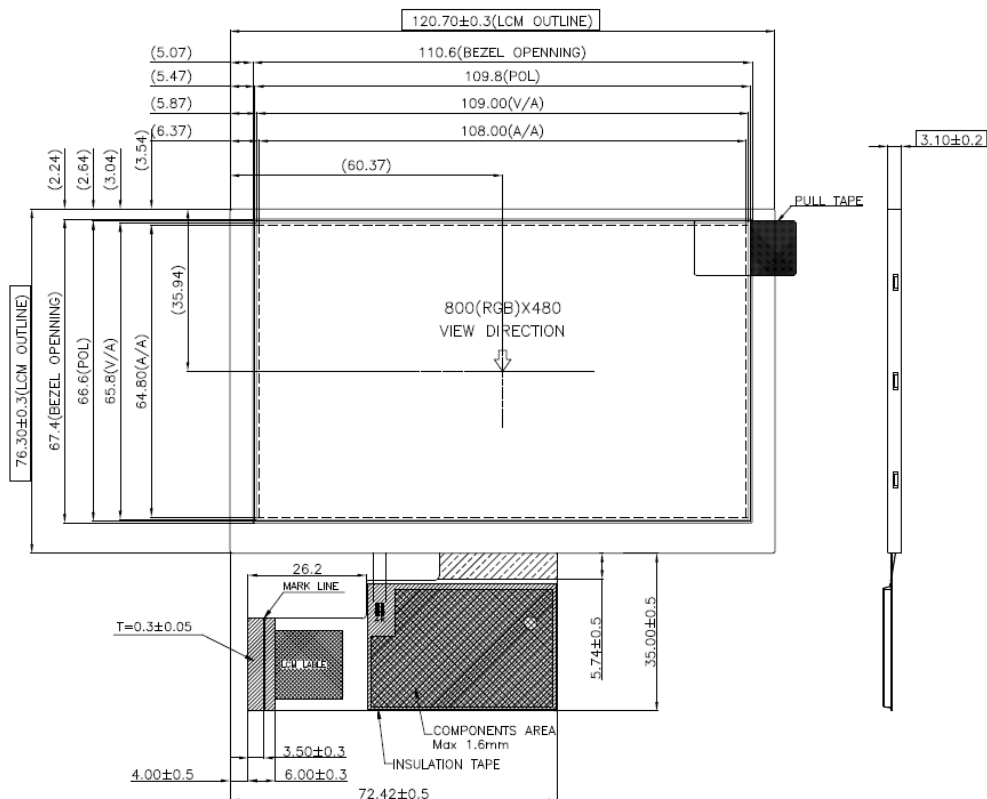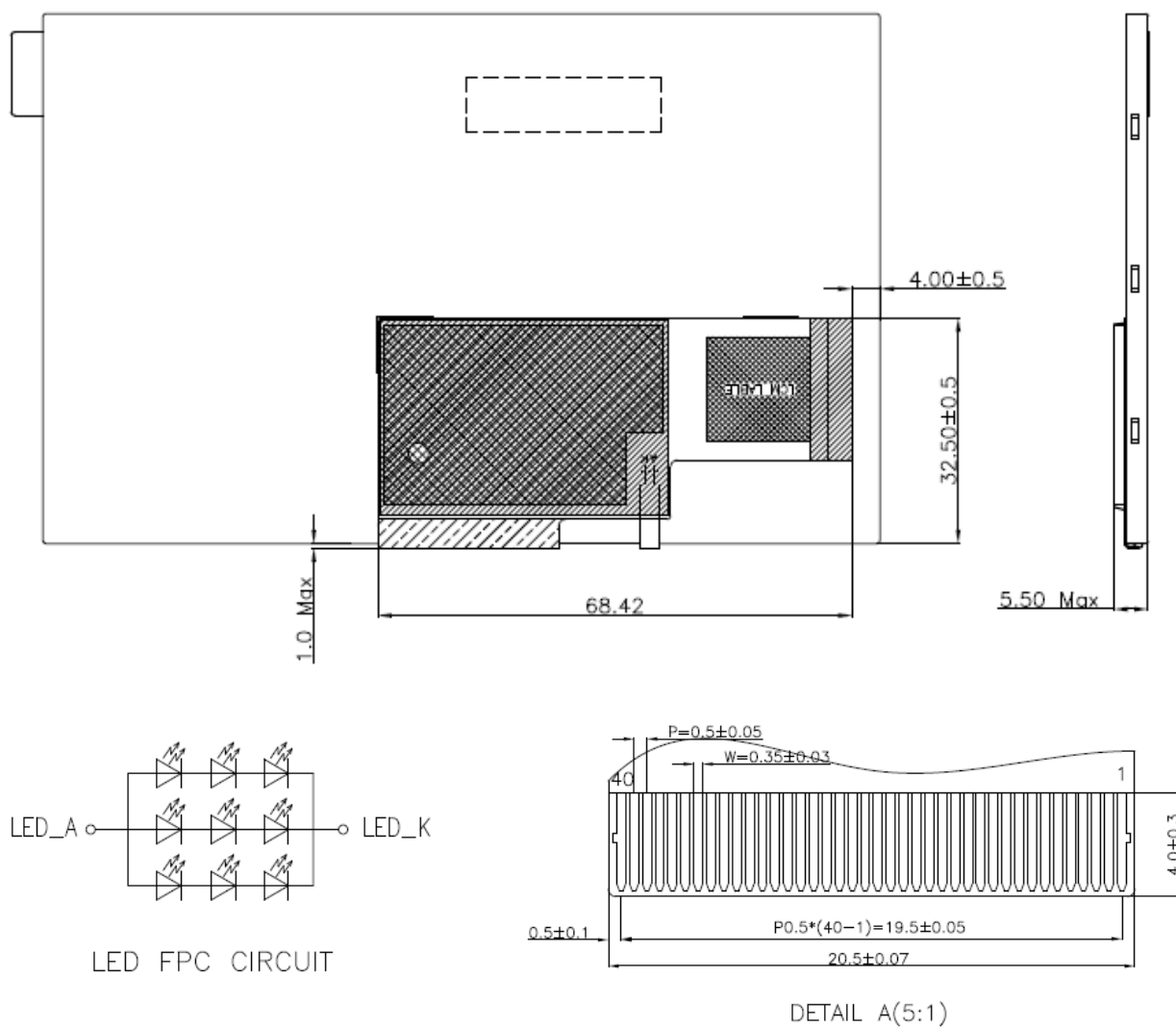**Figure 2. Uniformity Measurement Locations**

Figure 3. Response Time Testing

6.0 MECHANICAL CHARACTERISTICS
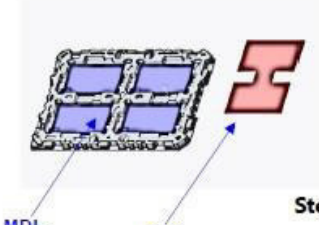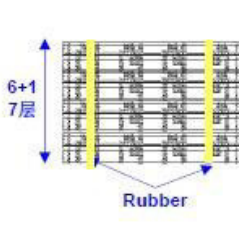
8.1 Dimension Requirements for MDL Part

4.00±0.5

32.50±0.5

1.0 Max

68.42

5.50 Max

LED_A ○ ———○ LED_K

LED FPC CIRCUIT

P=0.5±0.05

W=0.35±0.03

40

1

4.0±0.3

0.5±0.1

P0.5*(40−1)=19.5±0.05

20.5±0.07

DETAIL A(5:1)
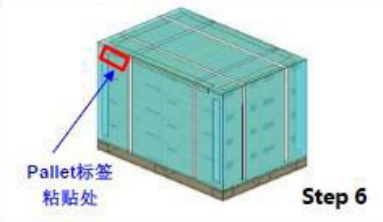
7.0 RELIABILITY TEST

NO.	Test Item	Test Condition	Duration
1	High temperature, high humidity operation test(THO)	40℃, 90%RH	240hrs
2	Low temperature operation test(LTO)	-20 ℃	240hrs
3	High temperature operation test(HTO)	70 ℃	240hrs
4	High temperature storage test(HTS)	80℃	240hrs
5	Low temperature storage test(LTS)	-30℃	240hrs
6	Thermal shock test (TST)	-30 ℃ →80 ℃ (0.5hr)	50 Cycle
7	ESD	±4KV(Contact), ±8KV(Air) 330Ω 150pF, 9points, 6times/point	Display function can recover automatically
8	Vibration	Frequency range:10~55Hz Stroke: 1.5mm, Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X/Y/Z(6 hours for total)	

8.0 PACKING METHOD

Put 4 MDL upon Tray , Put 1 Pad upon 2 MDL. 4 MDL/ Tray ; 2 Pad/Tray	Put 6 full Tray with MDL & Pad , Put 1 dummy Tray on the top , then rubber band. (Tray Rotate 180°) 24 MDL/7 Tray ; 12 Pad/7 Tray	Put 7 Tray with 1 Shielding Bag into 1 Inner Box. Vacuum pressure : -8KPa~-6KPa 24 MDL/ Inner Box ; 1 Bag/Inner Box
Step 1	Step 2	Step 3
Put 6 Inner Box into 1 Outer Box , sealing box with type "H". 6 Inner Box/Outer Box ; 144 MDL/Outer Box	Put 1 Dual Cover on pallet , 2x2x4. 16 Outer Box/Pallet	Put 8 Paper Corner , 3 layers stretch film wind 5 surface , belt pack with total 4 line , paste Label. 2,304 MDL/Pallet
Step 4	Step 5	Step 6

Note:
Tray size: 340(L) x 248(W) mm
Inner box size: 360(L) x 260(W) x 80(H) mm
Outer box size: 545(L) x 380(W) x 270(H) mm

9.0 PRODUCT ID RULE

G T 050 WVM −NS0

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① <Application area>

Code	Description
G	Industrial
E	Healthcare
H	TV

② <Mode>

Code	Description
T	TN-a Si
V	ADS-a Si
S	ADS-LTPS

③ <Size>

Code	Description
050	5.0"
022	2.2"
018	1.77"

④ <Resolution>

Code	Description
WV	800x480
QC	QCIF
FB	170x320

⑤ <Product type>

Code	Description
M	MDL
A	Array
E	Cell

⑥ <Production state>

Code	Description
N	Normal
E	In Cell Touch
T	Touch on cell

⑦ <Product THK>

Code	Description
S	0.8mm
6	0.6mm
5	0.5mm

⑧ <Product Rev>

Code	Description
0	First Mode
1	Second Mode
2	Third Mode

10.0 HANDDLING & CAUTIONS

10.1 Mounting Method

● The panel of the LCM consists of two thin glasses with polarizer which easily get damaged. So extreme care should be taken when handling the LCM.

● Excessive stress or pressure on the glass of the LCM should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCM unit when it is mounted.

● If the customer's set presses the main parts of the LCM, the LCM may show the abnormal display. But this phenomenon does not mean the malfunction of the LCM and should be pressed by the way of mutual agreement.

● To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.

● Mount a LCM with the specified mounting parts.

10.2 Caution of LCM Handling and Cleaning

● Since the LCM is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass maybe broken.

● The polarizer on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizer or it leads the polarizer to be deteriorated.

● If the use of a chemical is unavoidable, use soft cloth with solvent recommended below to clean the LCM's surface with wipe lightly.

-IPA (Isopropyl Alcohol), Ethyl Alcohol, Tri-chloro, tri-florothane.

● Do not wipe the LCM's surface with dry or hard materials that will damage the polarizer and others. Do not use the following solvent—Water, acetone, Aromatics.

● It is recommended that the LCM be handled with soft gloves during assembly, etc.

The polarizer on the LCM's surface are vulnerable to scratch and thus to be damaged by shape particles.

● Do not drop water or any chemicals onto the LCM's surface.

● A protective film is supplied on the LCM and should be left in place until the LCM is required for operation.

● The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent from the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

● Please handle FPC with care.

10.3 Caution Against Static Charge

● The LCM use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.

● Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.

● Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

● In handling the LCM, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.4 Caution For Operation

● It is indispensable to drive the LCM within the specified voltage limit since the higher voltage than the limit causes LCM's life shorter. An electro-chemical reaction due to DC causes undesirable deterioration of the LCM so that the use of DC drive should avoid.

● Do not connect or disconnect the LCM to or from the system when power is on.

● Never use the LCM under abnormal conditions of high temperature and high humidity.

● When expose to drastic fluctuation of temperature(hot to cold or cold to hot), the LCM may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCM's surface which may affect the operation of the polarizer on the LCM.

● Response time will be extremely delay at lower temperature than the operating temperature range and on the other hand LCM may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCM. The LCM will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

● Do not display the fixed pattern for a long time because it may develop image sticking due to the LCM structure. If the screen is displayed with fixed pattern, use a screen saver.

● Do not disassemble and/or re-assemble LCM module

10.5 Packaging

● Modules use LCM element, and must be treated as such.

 -Avoid intense shock and falls from a height.

 -To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

10.6 Storage

● A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.

● Original protective film should be used on LCM's surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizer.

● Do not store the LCM near organic solvents or corrosive gasses.

● Keep the LCM safe from vibration, shock and pressure.

● Black or white air-bubbles may be produced if the LCM is stored for long time in the lower temperature or mechanical shocks are applied onto the LCM.

● In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.

-Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.

-Store in a dark place where neither exposure to direct sunlight nor light is.

-Keep temperature in the specified storage temperature range.

-Store with no touch on polarizer surface by the anything else. If possible, store the LCM in the packaging situation when it was delivered.

10.7 Safety

● For the crash damaged or unnecessary LCM, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol an should be burned up later.

● In the case of LCM is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.

● If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.

● If the liquid crystal get in your eyes, flush your eyes with running water for at least fifteen minutes.

● If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.

11.0 Applicable Scope

●This product specification only applies to the products manufactured and sold by our company.

● Any specification, quality etc. about other parts mentioned in this product spec are no concern of our company.

DATA MODUL

ALL TECHNOLOGIES. ALL COMPETENCIES. ONE SPECIALIST.
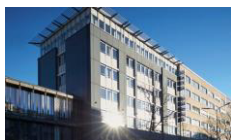
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