



FORMIKE ELECTRONIC CO.,LTD

PRODUCT SPECIFICATION

TFT LCD MODULE

MODEL : KWH070KQ38-F03

【 】 Preliminary Specification

【 ◆ 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

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1. General Specifications

1.1 Description

KWH070KQ38-F03 is a-si type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver IC and a back-light unit . Graphics and texts can be displayed on 800 (W) x 3 x 480 (H) dots RGB data signal. The following table described the features of FORMIKE KWH070KQ38-F03

1.2 Application

Automobile products, medical treatment, instrument Device and other electronic Products
Etc.

1.3 Features

Feature	Description
Size	7.0 inchs (Diagonal)
Display element	a-si TFT
Resolution	800 x 3 (RGB) x480
Surface Treatment	Anti- Glare type
Display Format	Normally white, Transmissive
Inteface	Digital
Active Area(W x H mm)	154.08 X 85.92
LCM Size	164.9 X 100.0 X 7.0 mm
Dot pitch	0.0642 X 0.1790mm
With/Without TSP	With TSP
Contrast Ratio	500(Type)
Luminance	370 Cd/m ²
View angle	12 o'clock
Operating Temperature	-20~70°C
Storage Temperature	-30~80 °C

2. Pin Assignment

TFT LCD Panel Driving Section

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	V _{LED+}	P	Power for LED backlight (Anode)	
2	V _{LED+}	P	Power for LED backlight (Anode)	
3	V _{LED-}	P	Power for LED backlight (Cathode)	
4	V _{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V _{COM}	I	Common voltage	
7	DV _{DD}	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
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	Note 2
19	B0	I	Blue data(LSB)	Note 2
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	Note 2
27	G0	I	Green data(LSB)	Note 2
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	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V _{GH}	P	Gate ON Voltage	
42	V _{GL}	P	Gate OFF Voltage	
43	AV _{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V _{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

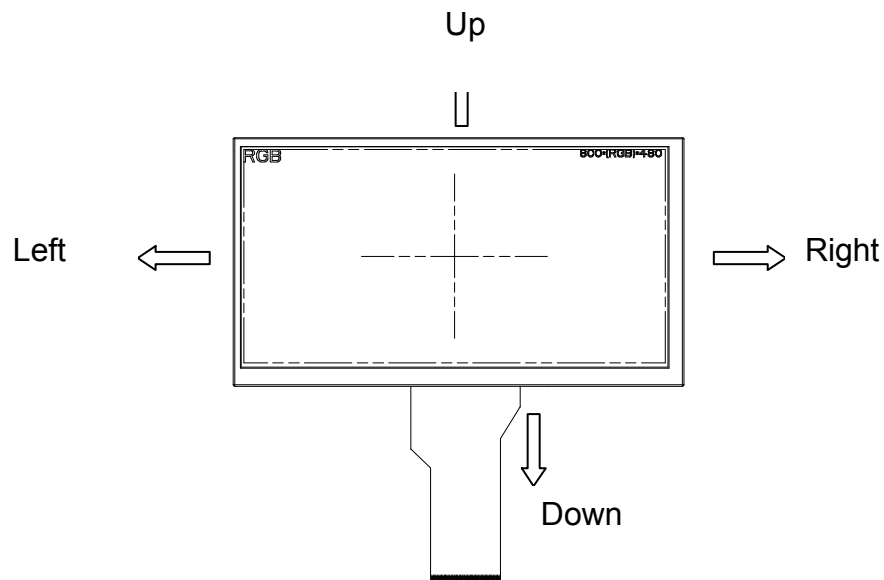
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV _{DD}	Up to down, left to right
DV _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV _{DD}	DV _{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function,
When DITHB="0", Enable internal dithering function,

3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	DV_{DD}	-0.3	5.0	V	
	AV_{DD}	6.5	13.5	V	
	V_{GH}	-0.3	40.0	V	
	V_{GL}	-20.0	0.3	V	
	$V_{GH}-V_{GL}$	-	40.0	V	
Operation Temperature	T_{OP}	-20	70	°C	
Storage Temperature	T_{ST}	-30	80	°C	
LED Reverse Voltage	V_R	-	4.0	V	Each LED Note 2
LED Forward Current	I_F	-	25	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2: V_R Conditions: Zener Diode 20mA

3.1.1. Typical Operation Conditions

(Note 1)

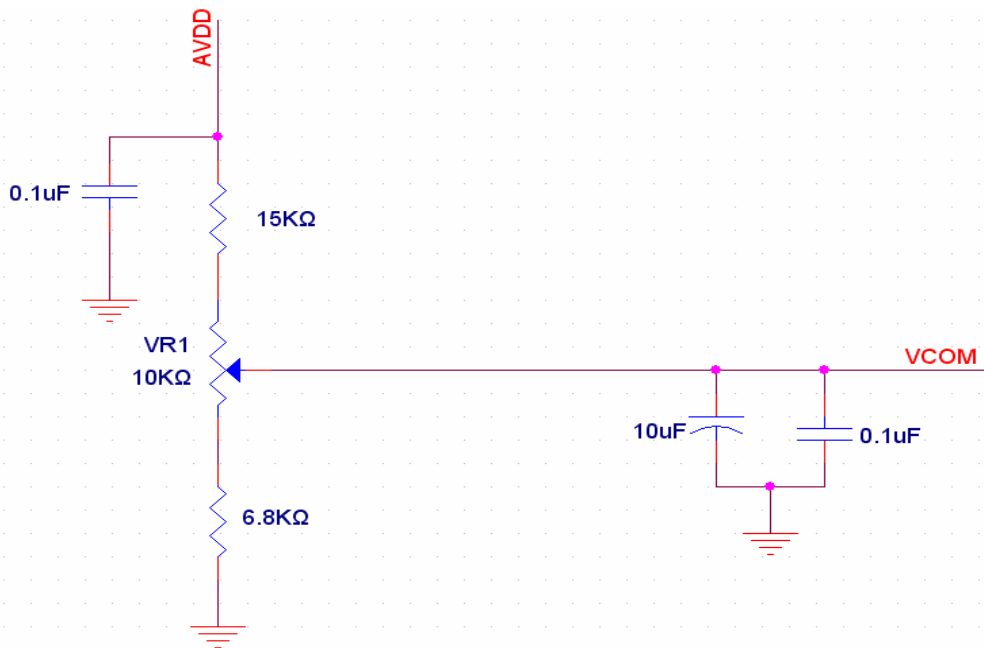
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV_{DD}	3.0	3.3	3.6	V	Note 2
	AV_{DD}	10.2	10.4	10.6	V	
	V_{GH}	15.3	16.0	16.7	V	
	V_{GL}	-7.7	-7.0	-6.3	V	
Input signal voltage	V_{COM}	2.6	(3.6)	4.6	V	Note 4
Input logic high voltage	V_{IH}	$0.7 DV_{DD}$	-	DV_{DD}	V	Note 3
Input logic low voltage	V_{IL}	0	-	$0.3 DV_{DD}$	V	

Note 1: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH} .

Note 2: DV_{DD} setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typical V_{COM} is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.



3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	0.2	1.0	mA	$V_{GH} = 16.0V$
	I_{GL}	-	0.2	1.0	mA	$V_{GL} = -7.0V$
	IDV_{DD}	-	4.0	10	mA	$DV_{DD} = 3.3V$
	$I_{AV_{DD}}$	-	20	50	mA	$AV_{DD} = 10.4V$

3.1.3. Backlight Driving Conditions

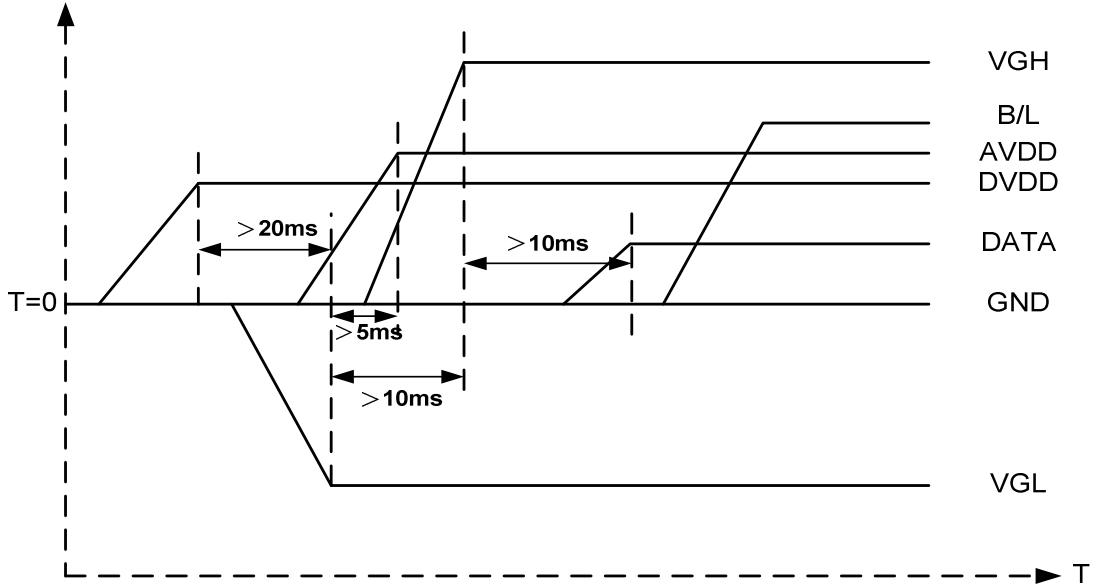
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition	Note
Supply Voltage	V_f	9.0	9.6	10.8	V	$I_f = 180 \text{ mA}$	-
Supply Current	I_f	-	180	-	mA	-	-
Reverse Voltage	V_r	-	-	4	V	-	
Power dissipation	P_d	-	1728	-	mW	-	
Luminous Intensity for Backlight		9000	10000		Cd/m^2	$I_f = 180 \text{ mA}$	
Luminous Intensity for LCM		320	370	-	Cd/m^2	$I_f = 180 \text{ mA}$	
Uniformity for LCM	-	75	80	-	%	$I_f = 180 \text{ mA}$	
Life Time	-	20000	-	-	Hr	$I_f = 180 \text{ mA}$	-
Backlight Color	White						

Note 1: The LED Supply Voltage is defined by the number of LED at $T_a = 25^\circ\text{C}$ and $I_L = 180\text{mA}$.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a = 25^\circ\text{C}$ and $I_L = 180\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 180mA.

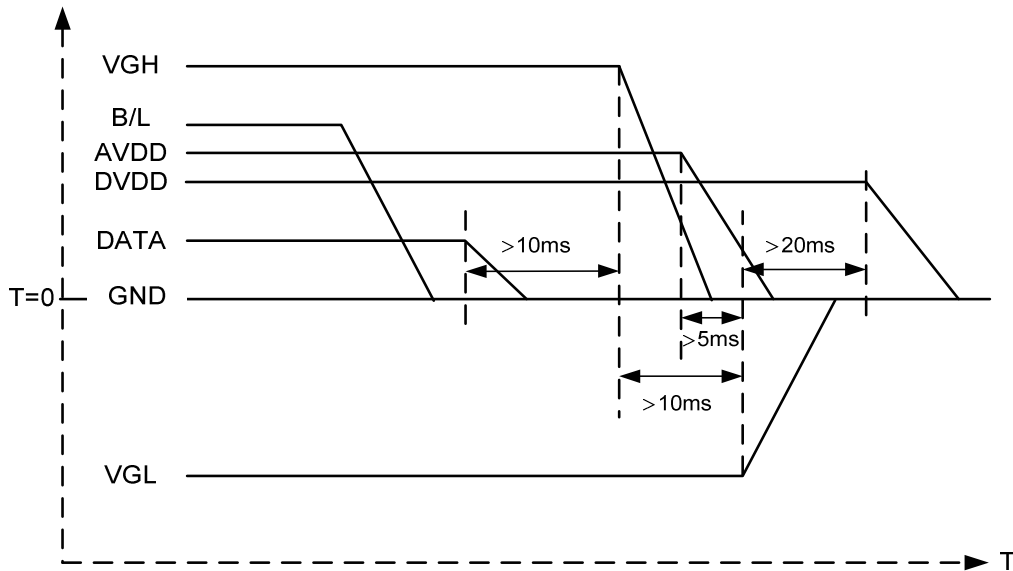
3.2. Power Sequence

a. Power on:



DV_{DD}→VGL→VGH→Data→B/L

b. Power off:



B/L→Data→VGH→VGL→DV_{DD}

Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS,VS,DE.

3.3. Timing Characteristics

3.3.1. AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T_{hst}	8	-	-	ns	
HS hold time	T_{hhd}	8	-	-	ns	
VS setup time	T_{vst}	8	-	-	ns	
VS hold time	T_{vhd}	8	-	-	ns	
Data setup time	T_{dsu}	8	-	-	ns	
Data hole time	T_{dhd}	8	-	-	ns	
DE setup time	T_{esu}	8	-	-	ns	
DE hole time	T_{ehd}	8	-	-	ns	
DV _{DD} Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DV _{DD}
RESET pulse width	T_{Rst}	1	-	-	ms	
DCLK cycle time	T_{coh}	20	-	-	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

3.3.2. Data Input Format

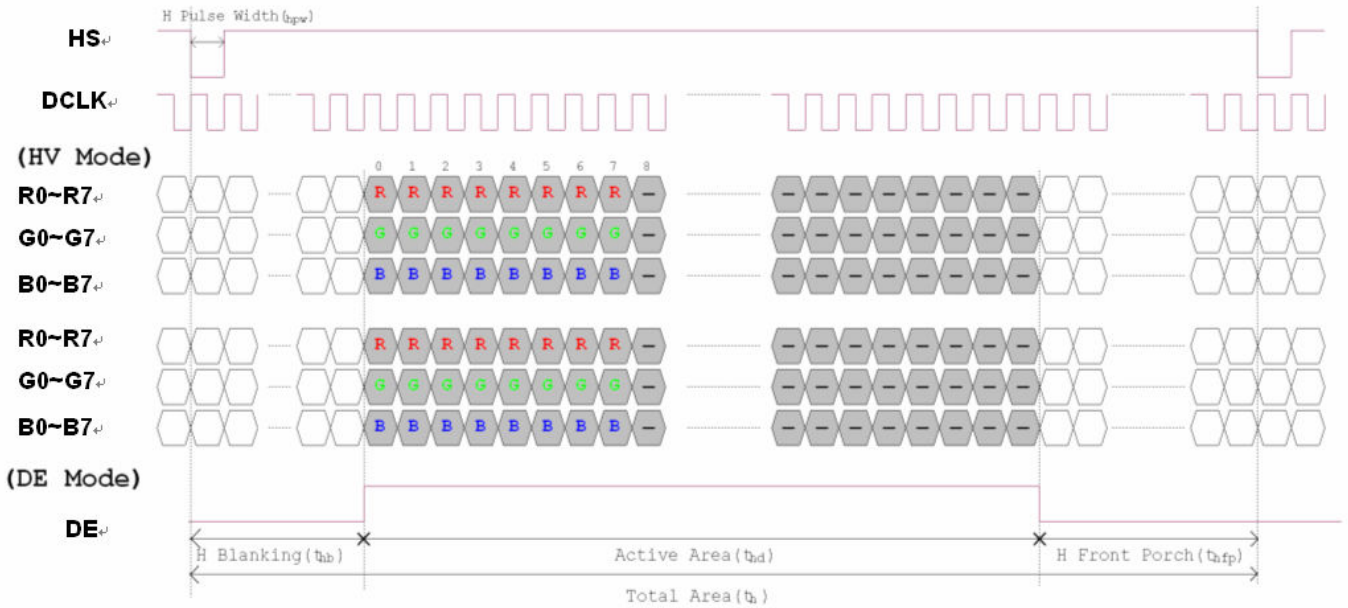


Figure 3. 1 Horizontal input timing diagram.

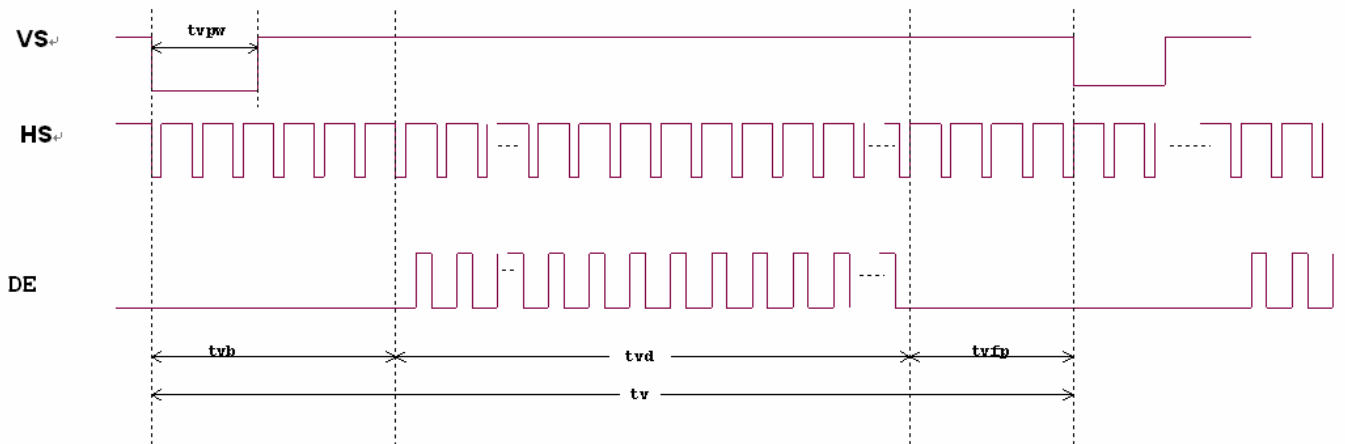


Figure 3. 2 Vertical input timing diagram.

3.3.3. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	

Test Conditions:

1. $DV_{DD}=3.3V$, $I_L=180mA$ (Backlight current), the ambient temperature is $25^\circ C$.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

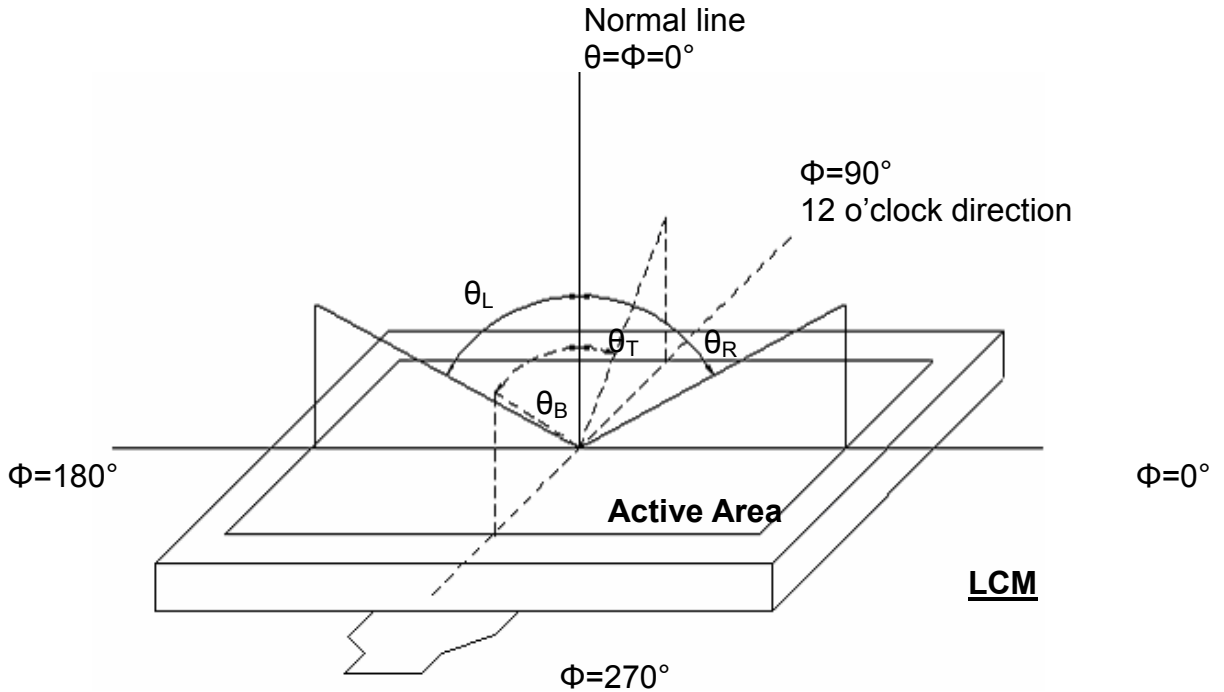


Fig. 4-1 Definition of viewing angle 6 o'clock direction

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

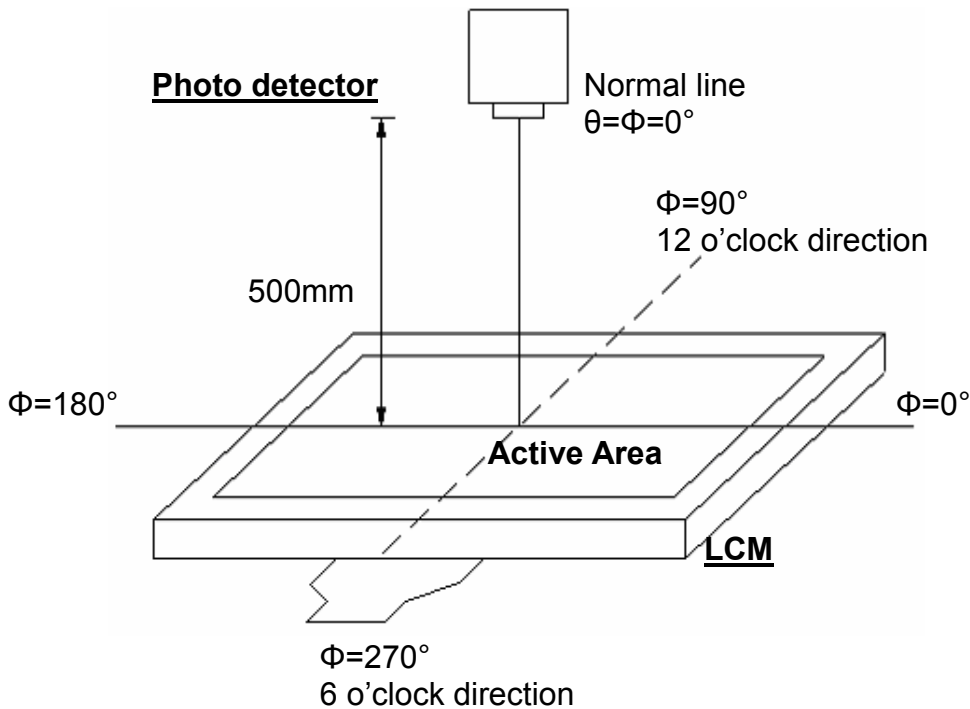


Fig. 4-2 Optical measurement system setup

Note 3: 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%.

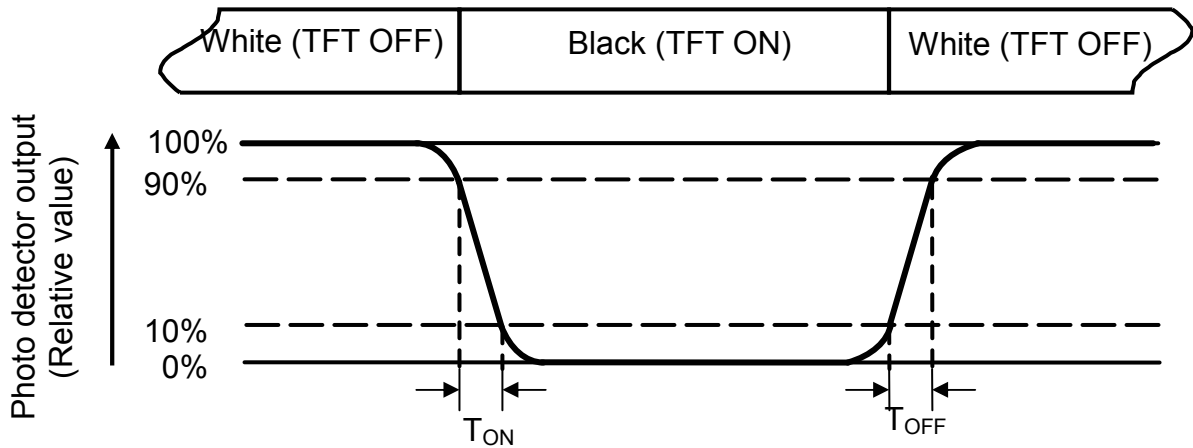


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=80\text{mA}$.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

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

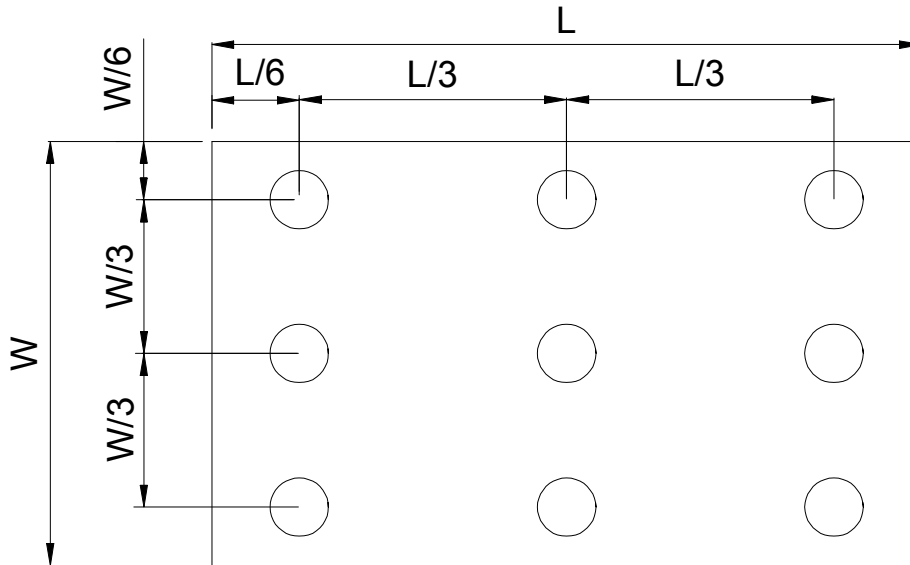


Fig. 4-4 Definition of measuring points

B_{max}: The measured maximum luminance of all measurement position.

B_{min}: The measured minimum luminance of all measurement position.

5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80℃ 240hrs	Note 1 · Note 4
Low Temperature Storage	Ta = -30℃ 240hrs	Note 1 · Note 4
High Temperature Operation	Ts = 70℃ 240hrs	Note 2 · Note 4
Low Temperature Operation	Ta = -20℃ 240hrs	Note 1 · Note 4
Operate at High Temperature and Humidity	+60℃, 90%RH 240hrs	Note 4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
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)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: 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.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

6. General Precautions

6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

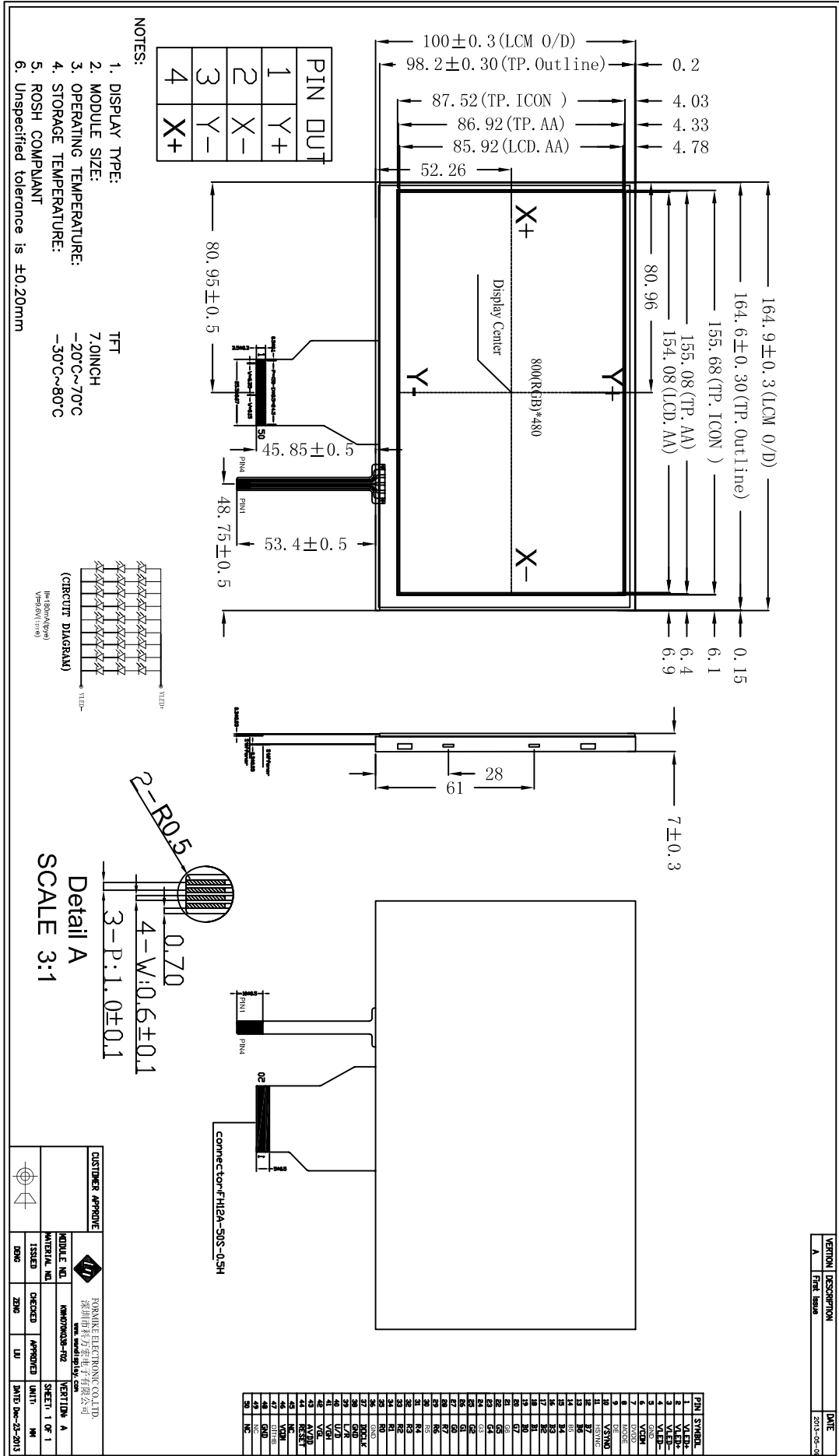
6.4. Storage

1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

7. Mechanical Drawing



8. Package Drawing

8.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	KWH070KQ38-F02	164.9 × 100.0 × 7.0	TBD	50pcs	
2	Partition	BC Corrugated paper	512 × 349 × 226	1.466	1set	
3	Corrugated Paper	B Corrugated paper	510 × 350	0.071	4pcs	
4	Corrugated Bar	B Corrugated paper	512 × 11 × 3	0.046	4pcs	
5	Dust-Proof Bag	PE	700 × 530	0.048	1pcs	
6	A/S Bag	PE	180 × 133 × 0.2	0.002	50pcs	
7	Carton	Corrugated paper	530 × 355 × 255	1.100	1 pcs	
8	Total weight	TBD				

8.1 Packaging Quantity

Total LCM quantity in Carton: no. of Partition 2 Rows × quantity per Row 25 = 50
--

8.3 Packing Drawing

TBD



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Http:// www.wandisplay.com

Spec.No.: IQM-0892007A

Date: 2009.02.15

Ver 1.0

TFT-LCD MODULE INCOMING INSPECTION STANDARD

Apply to 5inch or over 5inch

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED BY
LiDengk	Zhan Li	Chris Cai	May zeng

Prepared By :

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1. Incoming Inspection

Both parties agree that the inspection specifications of TFT-LCD Modules (hereinafter known as "Modules") stipulated hereunder is the only and final standard applicable in the process of inspection. Formike shall be under no liability or obligation (including incidental loss, products liability or other consequential loss) whatsoever for any defect in quality or performance or shortage in quantity of the Modules that have passed such inspection.

2. Liability

2.1 Inspection Deadline

The Customer should inspect the Modules either at the Delivery Point or within twenty (20) calendar days after arrival at the Delivery Destination.

2.2 Notification of Rejection

The Customer may reject one or more defective or non-conforming Modules if the Modules fail to meet the AQL (Acceptable Quality Level) and pass the inspection. In that case, the customer should notify FORMIKE of the rejection by either documents or mail within in three (3) business days from the date of reception of the Modules. Otherwise, the Modules shall be deemed to have met the AQL and passed the inspection.

3. Inspection Specifications

Both parties agree that the inspection shall contain and follow the inspection specifications stipulated in the attachment, including:

3.1 Scope

3.2 Sampling Plan

3.3 Panel Inspection Condition

3.4 Display Quality

3.5 Mechanics Specifications

3.6 Notification for Storage Handling

4. Limited Warranty

Formike represents and warrants that all Modules shall (i) conform to the specifications set hereunder, and (ii) be free from any defects in material and workmanship for twelve (12) months after the Customer's acceptance or deemed acceptance. Formike will replace, rework or refund the Customer for the defective or non-conforming Modules at Formike's option, provided that the Customer (i) promptly informs Formike of the defects or non-conformities within the warranty period, (ii) complies with the specifications and conditions hereunder, and (iii) complies with Formike's procedure for Modules replacement, reworking and/or return. The warranty period for the Modules replaced or reworked shall be the remaining term for such Modules.



5. THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, TERMS OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. FORMIKE'S WARRANTIES HEREIN APPLY ONLY TO THE CUSTOMER AND ARE NOT TO BE EXTENDED TO ANY THIRD PARTY.

6. Governing Law

This Agreement shall be governed and construed in accordance with the laws of the The Government of the Hong Kong Special Administrative Region. Both parties agree to submit any dispute, which cannot be amicably resolved, to Hong Kong District Court for the first instance.



Inspection Specifications

1. Scope

Specifications contain

- 1.1 Display Quality Evaluation
- 1.2 Mechanics Specification

2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E.

- 2.1 Lot size: Quantity per shipment as one lot (different model as different lot).
- 2.2 Sampling type: Normal inspection, single sampling.
- 2.3 Sampling level: Level II.
- 2.4 AQL: Acceptable Quality Level
 - Major defect: AQL=0.65
 - Minor defect: AQL=1.0

3. Panel Inspection Condition

3.1 Environment:

Room Temperature: $25\pm 5^{\circ}\text{C}$.
Humidity: $65\pm 5\%$ RH.
Illumination: 300 ~ 700 Lux.

3.2 Inspection Distance:

35 ± 5 cm

3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

3.4 Inspection time

Perceptibility Test Time:20 seconds max.

4. Display Quality

4.1 Function Related:

The function defects of line defect, abnormal display, and no display are considered Major defects.



5. Mechanics specifications

As for the outside dimensions and weight of the Modules, please refer to product specifications for more details.

6. Notification for Storage Handling

6.1 Storage:

- 6.1.1 Environment condition must be within the product specifications, otherwise the Module might be damaged.
- 6.1.2 Pile of stacking shall follow the instruction of **FORMIKE**.

6.2 Handling:

- 6.2.1 Twisting or Bending of the Module is prohibited.
- 6.2.2 All chemicals are unfit for use unless otherwise instructed by **FORMIKE**.
- 6.2.3 Plugging in & unplugging:
 - The power must be turned off before plugging in or unplugging the Module.
- 6.2.4 ESD protection:
 - The Module must not be touched without proper grounding.
- 6.2.5 High Voltage:
 - The rear side of Module must not be touched without protection.
- 6.2.6 Power sequence:
 - Shall follow the instruction of **FORMIKE**.



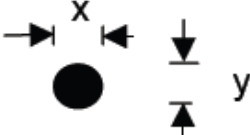
7. Inspection Criteria

Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

7.1 Major defect

Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
5.1.2	missing	Missing function component
5.1.3	Crack	Glass Crack

7.2 Minor defect

Item No	Items to be inspected	Inspection standard	
7.2.1	Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt	For dark/white spot is defined $\varphi = (x+y) / 2$ 	
		Size φ (mm)	Acceptable Quantity
		$\varphi \leq 0.25$	Ignore
		$0.25 < \varphi \leq 0.50$	3
		$0.50 < \varphi$	Not allowed



7.2.2	Line Defect Including Black line White line Scratch	Define:			
		Width(mm) Length(mm)		Acceptable Quantity	
		W≤0.03		Ignore	
		0.03 < W≤0.05 L≤5.0		4	
0.05 < W L>5.0		Not allowed			
7.2.3	Polarizer Dent/Bubble	Sizeφ(mm)		Acceptable Quantity	
		φ≤0.25		Ignore	
		0.25 < φ≤0.5		3	
		0.5 < φ		0	
7.2.4	Electrical Dot Defect	Bright and Black dot define:			
		Inspection pattern: Full white、 Full black、 Red、 green and blue screens			
		Item	Acceptable Quantity		
			I area	O area	Total
		Black dot defect	2	3	4
Bright dot defect	0	2	2		
Total Dot	2	4	5		



7.2.5	Glass defect	1. Corner Fragment:	
		Size(mm)	Acceptable Quantity
		$X \leq 3\text{mm}$ $Y \leq 3\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: thickness
		2. Side Fragment:	
		Size(mm)	Acceptable Quantity
		$X \leq 5.0\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: thickness

Note: 1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

2. The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.

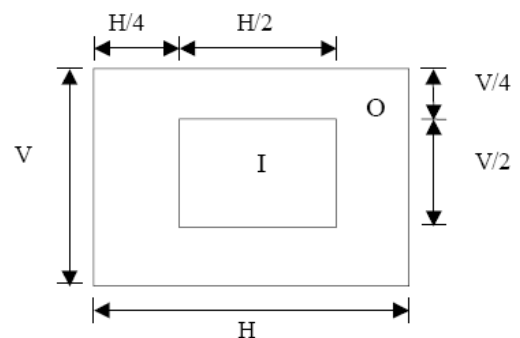
3. The distance between black dot defects or black and bright dot defects should be more than 5mm apart.

4. The definitions of the inner display area

And outer display area

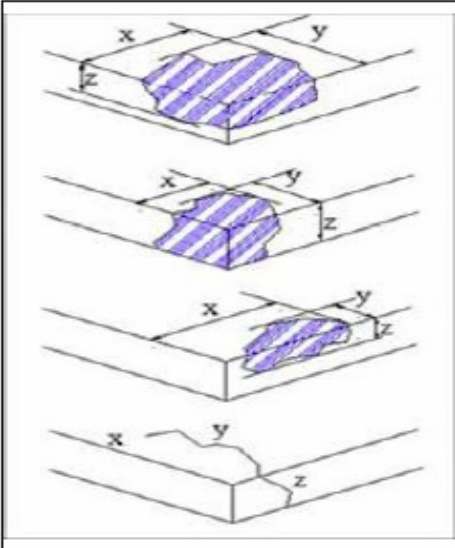
I: Inner display area

O: Outer display area





8. Inspection Standard of touch screen

Item	Specifications (mm)		Description
Scratch	$W \leq 0.03$	$L \leq 20$	Ignore
	$0.03 < W \leq 0.05$	$L \leq 10$	3 accepted defect
	$W > 0.05$ or $W \leq 0.03$ or $0.03 < W < 0.05$	$L > 20$ $L > 10$	Reject
Lint (Fibrous materials, Hair adhesive, and other colorful lint)	$W \leq 0.03$	$L \leq 5$	Ignore
	$0.03 < W \leq 0.05$	$L \leq 5$	Two or less accepted defect
	$W > 0.05$ or $L > 5$		Reject
Hollow Spot or Protuberance Spot	$D \leq 0.4$		Accept
	$D > 0.4$		Reject
Opaque Spot	$D < 0.2$		Ignore
	$0.2 \leq D \leq 0.3$		Accept 3 spots
	$D > 0.3$		Reject
Translucent Defect	$D \leq 0.3$		Ignore
	$0.3 < D \leq 0.60$		Accept
	$D > 0.6$		Reject
Water Stain	In View area		Reject
	In Active Area as following	$L \leq 20$	Ignore
	$W \leq 3$ or $D \leq 3$ $3 < W \leq 10$ or $3 < D \leq 10$ $W > 10$ or $D > 10$ or $L > 20$		Accept Reject
Newton Ring	Inspect criteria by limiting sample a. The distance between produce and eye is about 30cm b. The angle between eye and lighting source is 60 degree c. The lightness of environment is 500 Lux		
Crack	 <p>Corner : $X \neq 3.0\text{mm}$ and $Y \neq 3.0\text{mm}$ and $Z < \text{Glass Thickness}$</p> <p>Corner : $X \neq 1.0\text{mm}$ and $Y \neq 1.0\text{mm}$ and $Z = \text{Glass Thickness}$</p> <p>Edges : $X \neq 6.0\text{mm}$ and $Y \neq 2.0\text{mm}$ and $Z < \text{Glass Thickness}$</p> <p>Cracks : Reject</p>		