FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

TFT LCD MODULE
MODEL : KWH050GM03-F01

【　】 Preliminary Specification
【 ♦ 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED BY
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- This specification is subject to change withouth notice.Please contact FORMIKE or it's
  representative before designing your product based on this specification.

Issued Date: Feb-06-2008

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1. GENERAL DESCRIPTION

The KWH050GM03-F01 model is a Color TFT LCD supplied by FORMIKE. This main Module has a 5.0 inch diagonally measured active display area with 480 X RGB X 272 resolutions. Each pixel is divided into Red, Green and Blue sub-pixels and dots that are arranged in vertical stripes. LCD color is determined with Dithering 16.7M Color signal for each pixel. The KWH050GM03-F01 has been designed to apply the interface method that enables low power, high speed, and high contrast. The KWH050GM03-F01 is intended to support applications where thin thickness, wide viewing angle, low power are critical factors and graphic displays are important.

2. FEATURES

Display Mode	TFT module, Trans-missive Type, Positive mode
Display Format	RGB vertical stripe
Color	16.7M color
Input Data	RGB data bus, 24 bit parallel data
Viewing Direction	6 O'clock
Backlight	White LED
Driver IC	HX8227-A HX8655-A

3. MECHANICAL SPECIFICATION

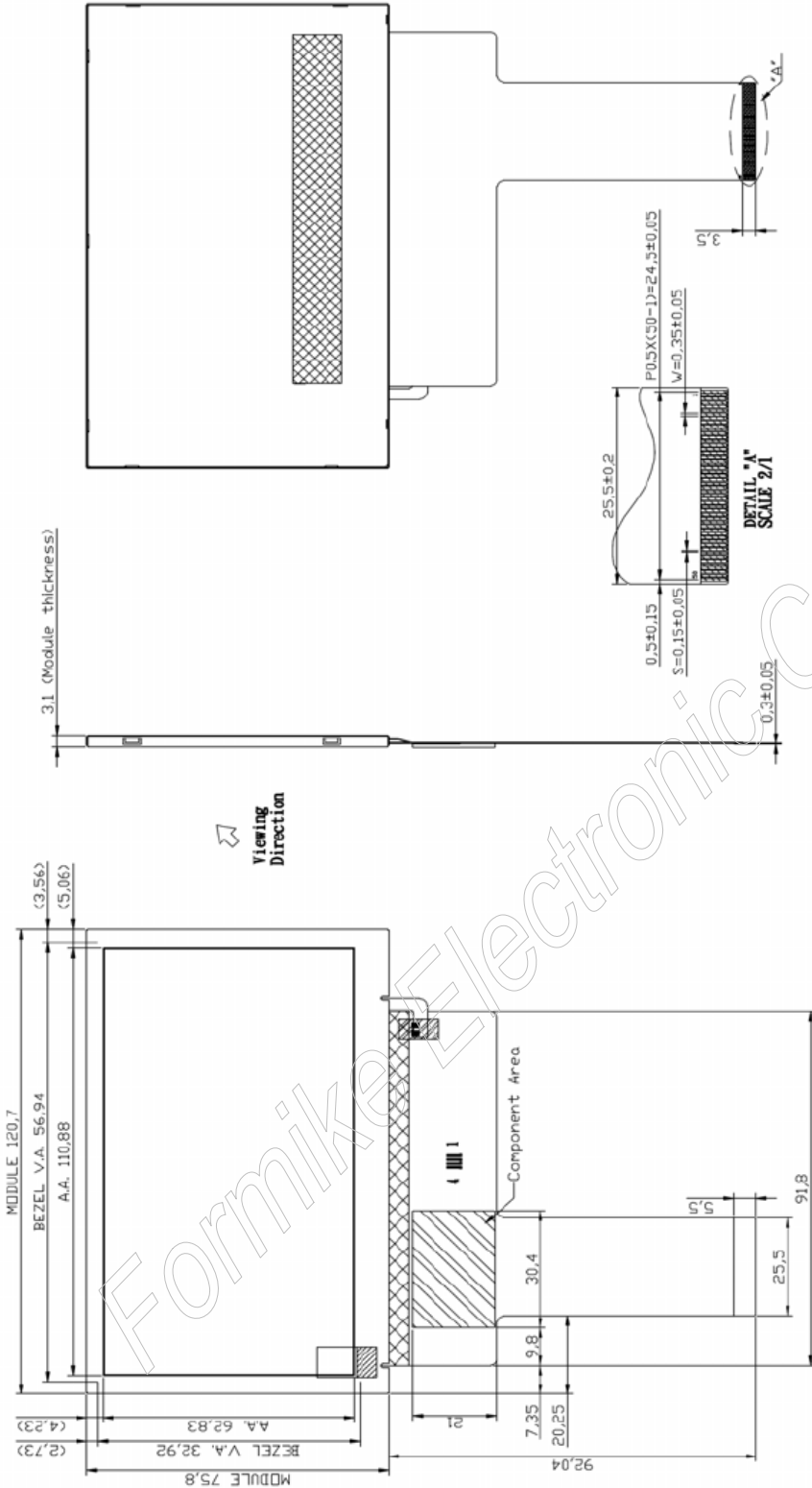| Item	Specifications	Unit
Dimensional outline	120.7 (W) × 75.8 (H) × 3.1 (D)	mm
Resolution	480 × RGB × 272	Pixel
Active area	110.88 (W) × 62.83 (H)	mm
Pixel pitch	0.231 (W) × 0.231 (H)	mm

*Not Include FPC

*1 pixel = 3 dots = Red dot +Green dot +Blue dot

4. MECHANICAL DIMENSION

*** FOR REFERENCE ONLY ***

Customer's Approval

| Customer | |
| Date | |

Formike Electronic Co.,Ltd.

PROJECT NO:

MODULE: KWH050GM03-F01

DWG NO.

DCN | A4 | VERSION

P 1 OF 1 | A

REVISED RECORD

A			
B			
C			
D			
E			

TOLERANCE	±0.3
ORG DATE	04.10.08
DRAWN BY	mark
CHECKED BY	
CONCURRED BY	
APPROVED BY	

SCALE	
UNIT	mm
MATERIAL	
FINISH	

DOUBLE SIDE TAPE

MYLAR TAPE

DETAIL "A" SCALE 2/1

P0.5X(50-1)=24.5±0.05
W=0.35±0.05
S=0.15±0.05
25.5±0.2
0.5±0.15
0.3±0.05
3.5

3.1 (Module thickness)

Viewing Direction

Component Area

MODULE 120.7
BEZEL V.A. 56.94
A.A. 110.88
91.8
30.4
25.5
9.8
5.5
7.35
20.25
92.04
21
(3.56)
(5.06)

(4.23)
A.A. 62.83
(2.73)
BEZEL V.A. 32.92
MODULE 75.8

FPC PIN FUNCTION:

NO.	SYMBOL	NO.	SYMBOL
1	VSS	26	B5
2	VSS	27	B6
3	Vcc	28	B7
4	Vcc	29	Vss
5	R0	30	DCLK
6	R1	31	DISP
7	R2	32	Hsync
8	R3	33	Vsync
9	R4	34	DE
10	R5	35	U/D
11	R6	36	(L/R)
12	R7	37	Vss
13	C0	38	Vss
14	G1	39	X1
15	G2	40	Y1
16	G3	41	X2
17	G4	42	Y2
18	G5	43	Vss
19	G6	44	Vss
20	G7	45	Vss
21	B0	46	LED-
22	B1	47	LED+
23	B2	48	Vss
24	B3	49	Vss
25	B4	50	Vss

5. MAXIMUM RATINGS (for IC)

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Item	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Supply for Logic	VCC	-0.3	6.0	V	
Input voltage	Vi	-0.3	VCC+0.3	V	
Storage Temperature	T_{ST}	-30	80	°C	
Operating Temperature (Ambient Temperature)	T_{OP}	-20	70	°C	
Singal LED forward current	I_F	-	30	mA	
Singal LED pulse forward current	I_{FP}	-	100	mA	
Singal LED reverse current	V_R	-	5	V	
Humidity	-	-	90	%RH	Note1

Note1: $T_A \leq 40°C$ Without dewing

2. All of voltage listed above are with respective to GND=VSS=0V.

3. Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

6. ELECTRICAL CHARACTERISTICS

Typical operating conditions (GND=AVss=0V)

ITEM	SYMBOL	Min	Typ	Max	Units
Power Supply	VCC	3.0	3.3	3.6	V
LCD input current	ICC	---	60	---	mA
Driver Input signal voltage	VIN	0		VCC	V
	V_{TH}	0.7*VCC	-	VCC	V
	V_{TL}	0	-	0.3*VCC	V

Note1: $T_A \leq 40°C$ Without dewing

6.1.Backlight Characteristic

ITEM	SYMBOL	CONDITION	Min	Typ	Max	Units
LED module voltage	V_{LED}	I_{LED}=20mA	27.0	33.0	37.0	V
LED module current	I_{LED}	V_{LED}=33.0V	---	20	---	mA
Power consumption	W_{LED}	I_{LED}=20mA		660.0		mW
Surface brightness uniform（without LCD）	L_D	I_{LED}=20mA V_{LED}=33.0V	---	80	---	%

★ 1 Backlight LED Circuit：
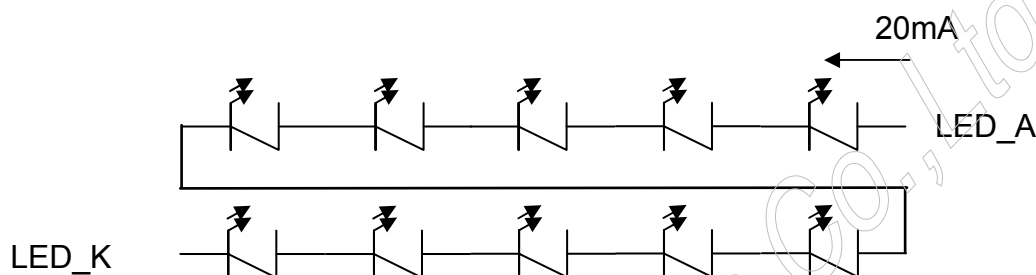
★2 Uniform measure condition：

    (a) To Measure 9 point. Measure location is show below：

    (b) Uniform = (Min. brightness / Max. brightness)×100%

    (c) Best Contrast, Main and sub panel all dots turn ON (White screen)
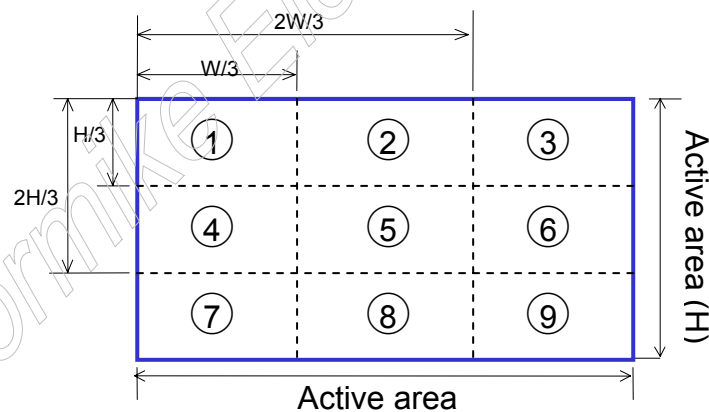
6.2.Pin Description

NO	Pin Name	Description
1	VSS	Ground
2	VSS	Ground
3	Vcc	Power Supply
4	Vcc	Power Supply
5~12	R0 ~ R7	Red Data Bit 0 ~ 7
13~20	G0 ~ G7	Green Data Bit 0 ~ 7
21~28	B0 ~ B7	Blue Data Bit 0 ~ 7
29	Vss	Ground
30	DCLK	Dot Data Clock
31	DISP	Display on / Display off Note：DISP set High , input data are valid . DISP set Low , input data are invalid .
32	Hsync	Horizontal Sync Input
33	Vsync	Vertical Sync Input
34	DE	Data Enable Control DE is High , data can be access . DE is Low , data can not be access .
35	U/D	Shift up or down Control U/D set High→UP to Down. U/D set Low→Down to UP.
36	(L/R)	(Shift Left or Right Control) L/R set High→Left to Right. L/R set Low→Right to Left.
37	Vss	Ground
38	Vss	Ground
39	NC	NC
40	NC	NC
41	NC	NC
42	NC	NC
43	Vss	Ground

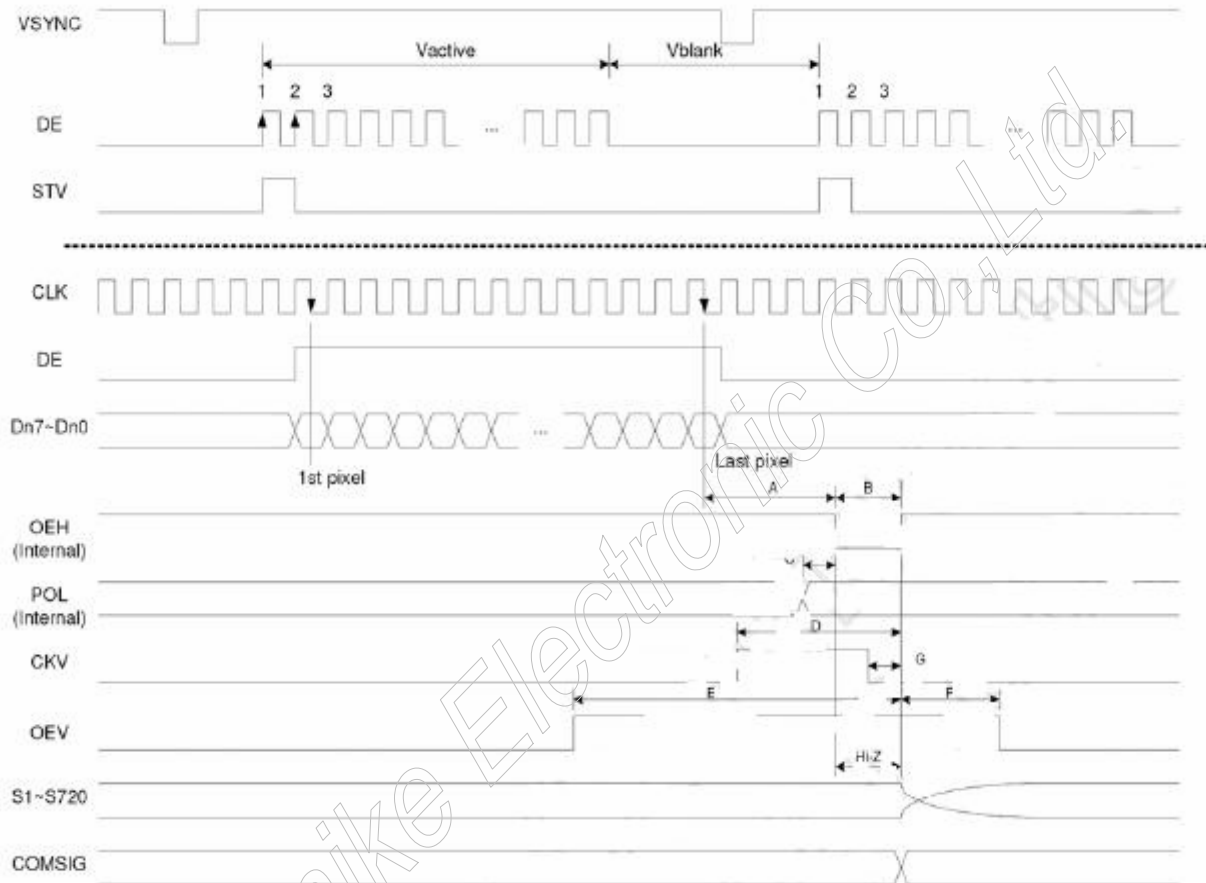| 44	Vss	Ground
45	Vss	Ground
46	VLED -	LED Ground (K)
47	VLED +	LED Power (A)
48	Vss	Ground
49	Vss	Ground
50	Vss	Ground

6.3.System Interface

6.3.1.Gate Driver Timing Control

HX8227-A01 outputs gate driver timing signals from CKV, STV, and OEV pins.

| Timing	480RGBx272	480RGBx240	240RGBx320	240RGBx240
A	8	8	4	4
B	4	4	2	2
C	0	0	0	0
D	10	10	5	5
E	34	34	17	17
F	6	6	3	3
G	2	2	1	1

**Note:** The above parameters are for 24-bit parallel RGB interface. For 8-bit serial RGB interface, the

6.3.2.Power ON/OFF Control

When DISP pin is pulled "H", blank data is outputted for 10-frames first, from the falling edge of the following VSYNC signal. Similarly, when DISP is pulled "L", 10-frames of blank data will be outputted from the falling edge of the following VSYNC, too. The blank data would be gray level 0 for normally black LC (NBW="H"), and be gray level 255 for normally white LC (NBW="L").
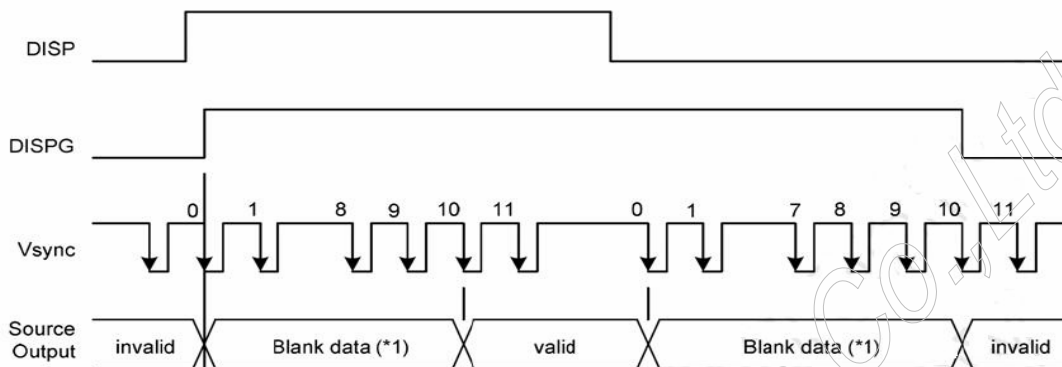
6.3.3.Reset
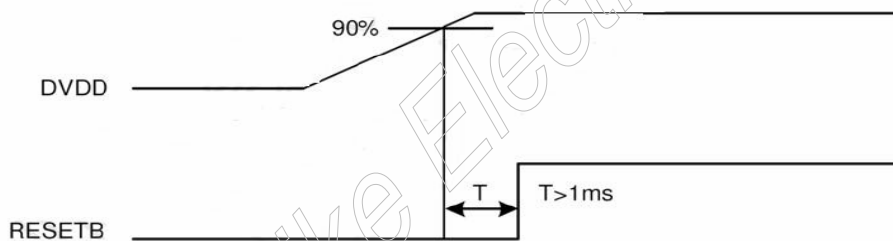
6.3.4.Timing Specification

(480RGBx272, TA =25°C, DVDD=2.25V to 3.6V, DVSS= 0V)

| PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	f_{CLK}	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th [2]	-	525	-	CLK
Horizontal display period	thd	-	480	-	CLK
Horizontal front porch	thf	2	-	-	CLK
Horizontal pulse width	thp	2	41	-	CLK
Horizontal back porch	thb	2	2	-	CLK
Vertical Signal					
Vertical cycle	tv	-	286	-	H
Vertical display period	tvd	-	272	-	H
Vertical front porch	tvf	1	2	-	H
Vertical pulse width	tvp	1	10	-	H
Vertical back porch	tvb	1	2	-	H

Note:

1. The table is parallel interface. Clock frequency and horizontal signal parameters are tripled in serial

interface. The maximum clock frequency of serial interface is 33MHz

2. thd=480CLK, thf=2CLK, thp=41CLK, thb=2CLK, thf + thp + thb > 44CLK. (CLK=1/ fCLK ,H=th)

6.3.5.Timing Chart
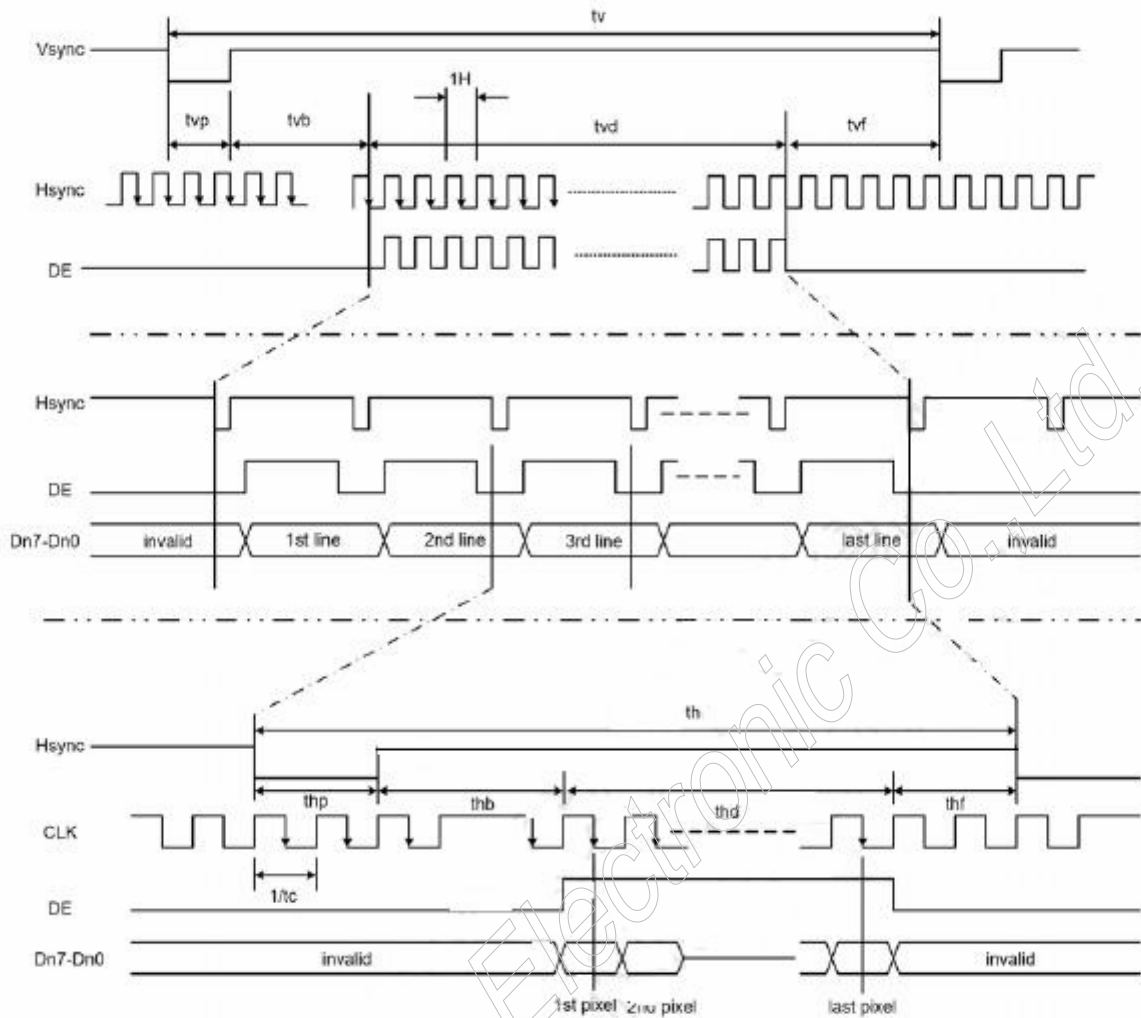
6.3.3 Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7 MSB	R6	R5	R4	R3	R2	R1	R0 LSB	G7 MSB	G6	G5	G4	G3	G2	G1	G0 LSB	B7 MSB	B6	B5	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[Note]
    (1) Definition of gray scale
      Color (n)：n means level of gray scale
        Larger n means brighter level
    (2)Data:1-High,0-Low

7. ELECTRO-OPTICAL CHARACTERISTICS

Parameter		Symbol	Min.	Typ.	Max.	Units	Note
Luminance of white		Lwh	(250)	(320)	---	cd/m^2	
Contrast Ratio		CR	280	350	---	-	*5)
Response Time (Tr+Tf)			---	25	30	ms	*4)
Viewing Angle (CR≧10)	X axis right (ψ=0°)	Θx	---	65	---	Degree	*6)
	X axis left (ψ=180°)	θx	---	65	---		
	Y axis up (ψ=90°)	θy	---	60	---		
	Y axis down (ψ=270°)	θy	---	50	---		
CIE color Coordinates	White	Wx	---	0.313	---	BM7; 2° angle	
		Wy	---	0.329	---		
	Red	Rx	---	0.591	---		
		Ry	---	0.332	---		
	Green	Gx	---	0.345	---		
		Gy	---	0.577	---		
	Blue	Bx	---	0.153	---		
		By	---	0.109	---		

● For LCM

Note 1. Ambient temperature = 25℃±2℃.

Note 2. To be measured in the dark room.

Note 3. To be measured at the center area of panel with a viewing cone of 2° by Topcon luminance meter BM-7,after 10 minutes operation（module）.

Note 4. Definition of response time：

The output signals of photo detector are measured when the input signals are changed from "black" to "white"（falling time）and from "white" to "black"（rising time）,respectively.

The response time is defined as the time interval between the 10％ and 90％ of amplitudes.

Refer to figure as below：
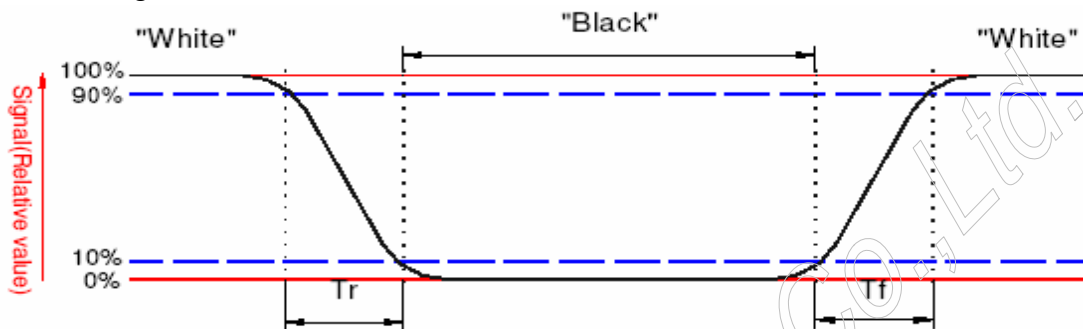
Note 5. Definition of contrast ratio：

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 6. Definition of viewing angle（LCD-5200）：

Refer to the figure as below
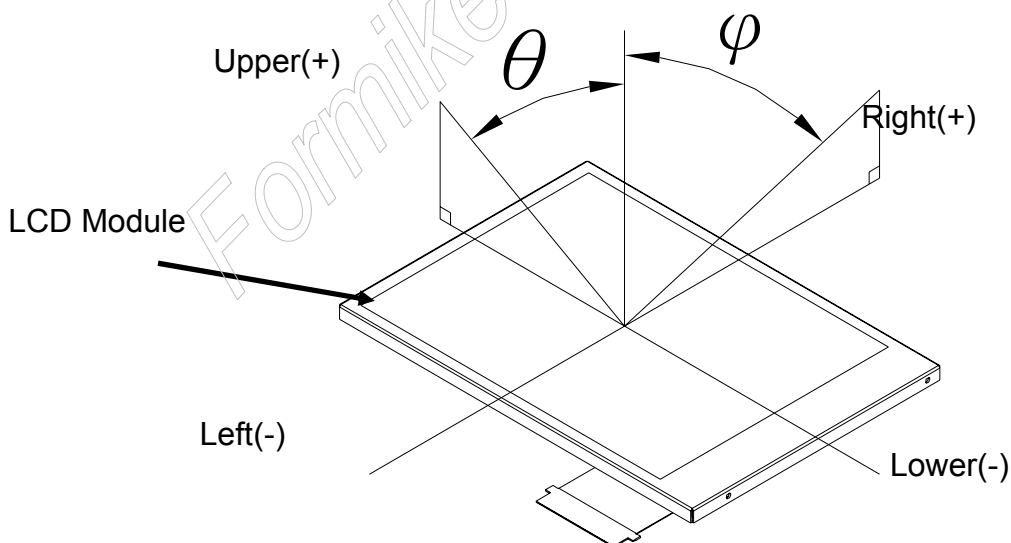
8. RELIABILITY

8.1. MTTF

The LCD module shall be designed to meet a minimum MTTF value of 50,000 hours with normal condition. (25°C in the room without sunlight; not include life time of backlight)

8.2. Tests

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Operating	70℃ 240 hrs	◦ No defect of Operational function in room temperature are allowable. ◦ Leakage current should be below double of initial value.
2	Low Temperature Operating	-20℃ 240 hrs	
3	High Temperature Non-Operating	80℃ 240 hrs	
4	Low Temperature Non-Operating	-30℃ 240 hrs	
5	High Temperature/ Humidity Non-Operating	50℃,90%RH 240 hrs	
6	Temperature Shock Non-Operating	-30℃ ◄──────► 80℃ (30min) (5min) (30min) 10 CYCLES	
7	Electro-static Discharge	HBM: ±2kv	

Note 1: Test after 24 hours in room temperature.
Note 2: The sampling above is individually for each reliability testing condition.
Note 3: The color fading of polarizing filter should not care.
Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value:
     1.0 MΩ-cm)
Note 5: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state
     after resetting, it would be judged as a good part.

9. INSPECTION CRITERIA

9.1.Inspection Conditions

Environmental conditions

The environmental conditions for inspection shall be as follows

Room temperature: 23±5°C

Humidity: 50±20%RH

The external visual inspection

With a single 1000±200lux fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes.

9.2.Light Method

Environment lamp under 1000±200 lux, Viewing direction for inspection over 30 ㎝
The distance from eye to defect around 300mm, the distance from ND Filter to defect around 25~30mm
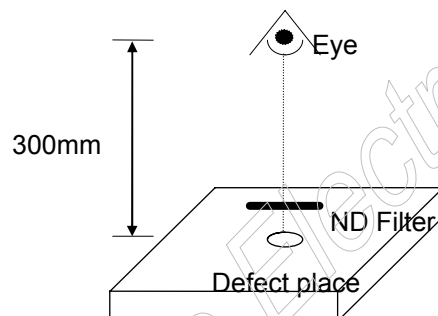
9.3.Classification Of Defects

Major defect

A major defect refers to a defect that may substantially degrade usability for product applications.

Minor defect

A minor defect refers to a defect which is not considered to be able substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

Notes: If the LCD/LCM 's cosmetic and display performance do not specify in "inspection criterion", it should be based on these delivered samples.

9.4.Sampling & Acceptable Quality Level

Level II, MIL-STD-105E

	Major	Minor
Cosmetic	1.0 %	1.5 %
Electrical-display	0.4%	0.65 %

9.5.Definition Of Inspection Area

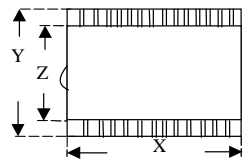V.A: Viewing Area

A.A: Active Area

Active Area

Viewing Area
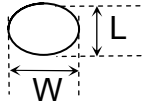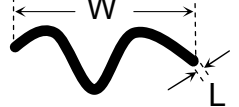
Outside of
Viewing area
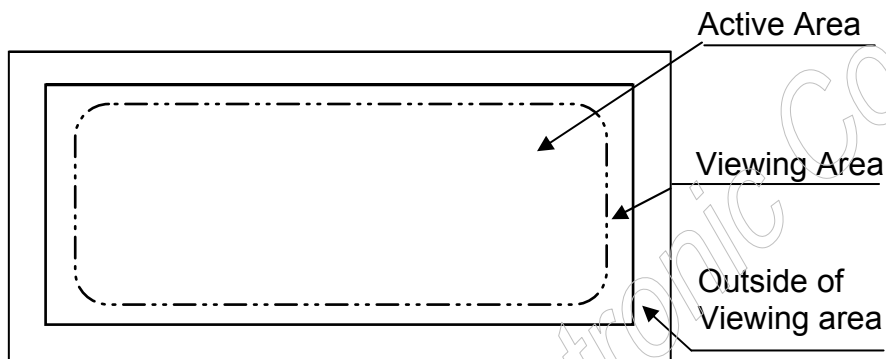
9.6. Inspection Items and Criteria
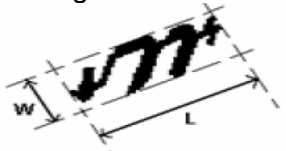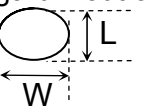
Visual inspection criterion in cosmetic
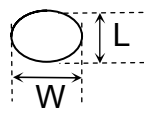
9.6.1 Cosmetic criterion

(1) Glass defect

No	Defect	Criteria	Remark
1	Dimension (Minor)	By engineering diagram	
2	Cracks (Major)	Extensive crack 【Reject】	

(2) LCM appearance defect with in A.A (Without Touch Panel)

No	Defect	Criteria		Remark
1	Round type (Minor)	Spec.	Permissible Q'ty	1. ϕ =(L+W)/2, L: Length, W: Width 2. Disregard if out of A.A.
		ϕ <0.15mm	Disregard	
		0.15mm$\leqq \phi \leqq$0.50mm	3	
		0.50mm< ϕ	0	
2	Scratch (Minor)	Spec.	Permissible Q'ty	1.L: Length, W: Width 2. Disregard if out of A.A.
		W$\leqq$0.01mm and L$\leqq$10mm	Disregard	
		0.01mm<W$\leqq$0.05mm and L$\leqq$10mm	4	
		W>0.05mm or L>10mm	0	
3	Fiber (Minor)	Spec.	Permissible Q'ty	1.L: Length, W: Width 2. Disregard if out of A.A.
		W$\leqq$1.0mm and L$\leqq$1.5mm	4	
		W>1.0mm or L>1.5mm	0	
4	Polarizer Bubble (Minor)	Spec.	Permissible Q'ty	1. ϕ =(L+W)/2 , L: Length, W: Width 2. Disregard if out of A.A.
		ϕ <0.25mm	Disregard	
		0.25mm$\leqq \phi \leqq$0.50mm	2	
		0.50mm< ϕ	0	

5	Polarizer Dent (Minor)	Spec.	Permissible Q'ty	1. ϕ =(L+W)/2 , L: Length, W: Width
		ϕ <0.25mm	Disregard	2. Disregard if out of A.A.
		0.25mm$\leqq \phi \leqq$0.50mm	4	
		0.50mm< ϕ	0	

(3) FPC

No	Defect	Criteria	Remark
1	Copper peeling (Minor)	Copper peeling 【Reject】	

(4) Black tape

No	Defect	Criteria	Remark
1	Shift (Minor)	IC exposed 【Reject】	
2	No black tape (Minor)	No black tape 【Reject】	

(5) Silicon

No	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed 【Reject】	

(6) Bezel

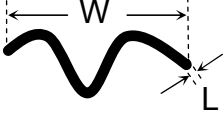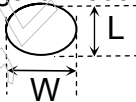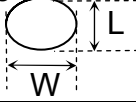| No	Defect	Criteria	Remark
1	Oxidized spot (Minor)	Oxidized spot, rust 【Reject】	
2	Outline deformation (Minor)	By engineering diagram	
3	Greasiness (Minor)	Greasiness 【Reject】	
4	Spots, round Type (Minor)	H$\leqq$By engineering diagram 【Disregard】	H=Total height (thickness)
5	Plating (Minor)	Bubble, peeling 【Reject】	

(7) Power cord

No	Defect	Criteria	Remark
1	Power cord (Minor)	Power core loose	

9.6.2 LCM electrical criterion

(1).LCM electrical criterion (Without Touch Panel)

No	Defect	Criteria				Remark
1	No display (Major)	Not allowed				
2	Missing line (Major)	Not allowed				
3	Darker or lighter line (Major)	Not allowed				
4	Weak line (Minor)	By limit sample				
5	Bright / Dark point (Minor)		A Area	B Area	Total	1.1sub-pixel: 1R or 1G or 1B 2.Point defect area≧1/2 sub pixel.
		Bright point	0	2	2	
		Dark dot point	2	3	3	
		Bright +Dark point	2	3	4	
		Two adjacent dot	0	1	1	

No	Defect	Criteria		Remark
6	Round type (Minor)	Spec.	Permissible Q'ty	1. ϕ =(L+W)/2, L: Length, W: Width 2. Disregard if out of A.A.
		ϕ <0.15mm	Disregard	
		0.15mm≦ ϕ ≦0.50mm	3	
		0.50mm< ϕ	0	
7	Scratch	Spec.	Permissible Q'ty	1. L: Length, W: Width

		W≦0.01mm and L≦10mm	Disregard	2. Disregard if out of A.A.
	(Minor)	0.01mm<W≦0.05mm and L≦10mm	4	
		W>0.05mm or L>10mm	0	
8	Fiber	Spec.	Permissible Q'ty	(2) L: Length, W: Width 2. Disregard if out of A.A.
	(Minor)	W≦1.0mm and L≦1.5mm	4	
		W>1.0mm or L>1.5mm	0	
9	Polarizer Bubble	Spec.	Permissible Q'ty	(2) $\phi=(L+W)/2$, L: Length, W: Width
	(Minor)	ϕ<0.25mm	Disregard	2. Disregard if out of A.A.
		0.25mm≦ϕ≦0.50mm	2	
		0.50mm<ϕ	0	
10	Polarizer Dent	Spec.	Permissible Q'ty	(2) $\phi=(L+W)/2$, L: Length, W: Width
	(Minor)	ϕ<0.25mm	Disregard	2. Disregard if out of A.A.
		0.25mm≦ϕ≦0.50mm	4	
		0.50mm<ϕ	0	
11	Mura (Minor)	By 2% ND filter invisible		

Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

10.RoHS COMPLIANT WARRANTY

RoHs Hazardous substances including:
- Cd< 100 ppm
- Pb< 1000 ppm
- Hg< 1000 ppm
- Cr +6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm

11.PRECAUTIONS FOR USE

11.1.Safety

(1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.

(2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.

(3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

11.2.Storage Conditions

(1) Store the panel or module in a dark place where the temperature is 23±5°C and the humidity is below 50±20%RH.

(2) Store in anti-static electricity container.

(3) Store in clean environment, free from dust, active gas, and solvent.

(4) Do not place the module near organics solvents or corrosive gases.

(5) Do not crush, shake, or jolt the module.

(6) Do not exposed to direct sun light of fluorescent lamps.

11.3.Installing LCD Module

Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.

(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

11.4.Precautions For Operation

(1) Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.

(2) Driving the LCD in the voltage above the limit will shorten its lifetime.

(3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

(4) When turning the power on, input each signal after the positive/negative voltage becomes stable.

(5) Do not apply water or any liquid on product which composed of T/P.

11.5.Handling Precautions

(1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.

(2) The polarizing plate of the display is very fragile. so, please handle it very carefully.

(3) Do not give external shock.

(4) Do not apply excessive force on the surface; it may cause display abnormal .

(5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

(6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

(7) Do not operate it above the absolute maximum rating.

(8) Do not remove the panel or frame from the module.

(9) Do not apply water or any liquid on product, which composed of T/P.

11.6.Warranty

(1) The period is within 12 months since the date of shipping out under normal using and storage conditions.

(2) The warranty will be avoided in case of defect induced by customer.