FORMIKE® GROUP
LCD·SOLUTION·TOUCHSCREEN

PRODUCT SPECIFICATION

MONO LCD MODULE

MODEL : WC2002B0 V.1 Series Version: 1.0

【 ◆ 】 Preliminary Specification
【 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

●It signifies that you fully understand and accept all the contents of this specification if you sign and send back the first page of this specifications.

Designed by	R&D Checked by	Quality Department by	Approved by
SIMON			

Prepared By :

FORMIKE ELECTRONIC CO.,LTD

Address : Flat 401-403, 4th Floor, Block B, iPARK Building, DengLiang Rd.,No.26, NanShan District, ShenZhen, 518054,China

TEL:(86) 755 88306921,88306931 FAX:(86) 755 88304615

Http:// www.wandisplay.com

● This specification is subject to change without notice. Please contact FORMIKE or it's representative before designing your product based on this specification.

Revision record

VER NO.	VER DATE	CONTENTS	Note
1.0	**2019-01-17**	**NEW ISSUE**	SIMON

Table Of Contents

1. General Description

1.1. FEATURES

The features of LCD are as follows

* Display format : 20character*2 line

* IC :AIP31066 Or Eqv （Defualt English / Japan Font）

* Interface Input Data : 4-bit or 8-bit 6800 MPU interface enabled

* Driving Method : 1/16 Duty, 1/5 Bias

* Viewing Direction : 6 O'clock

1.2.MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
Module Size	116.0L×37.0W×12.8（max）H	mm
View Area	82.6×18.4	mm
Number of Character	20×2 L i n e s	—
Character Size	3.2×5.5	mm
Character Pitch	3.7×5.9	mm

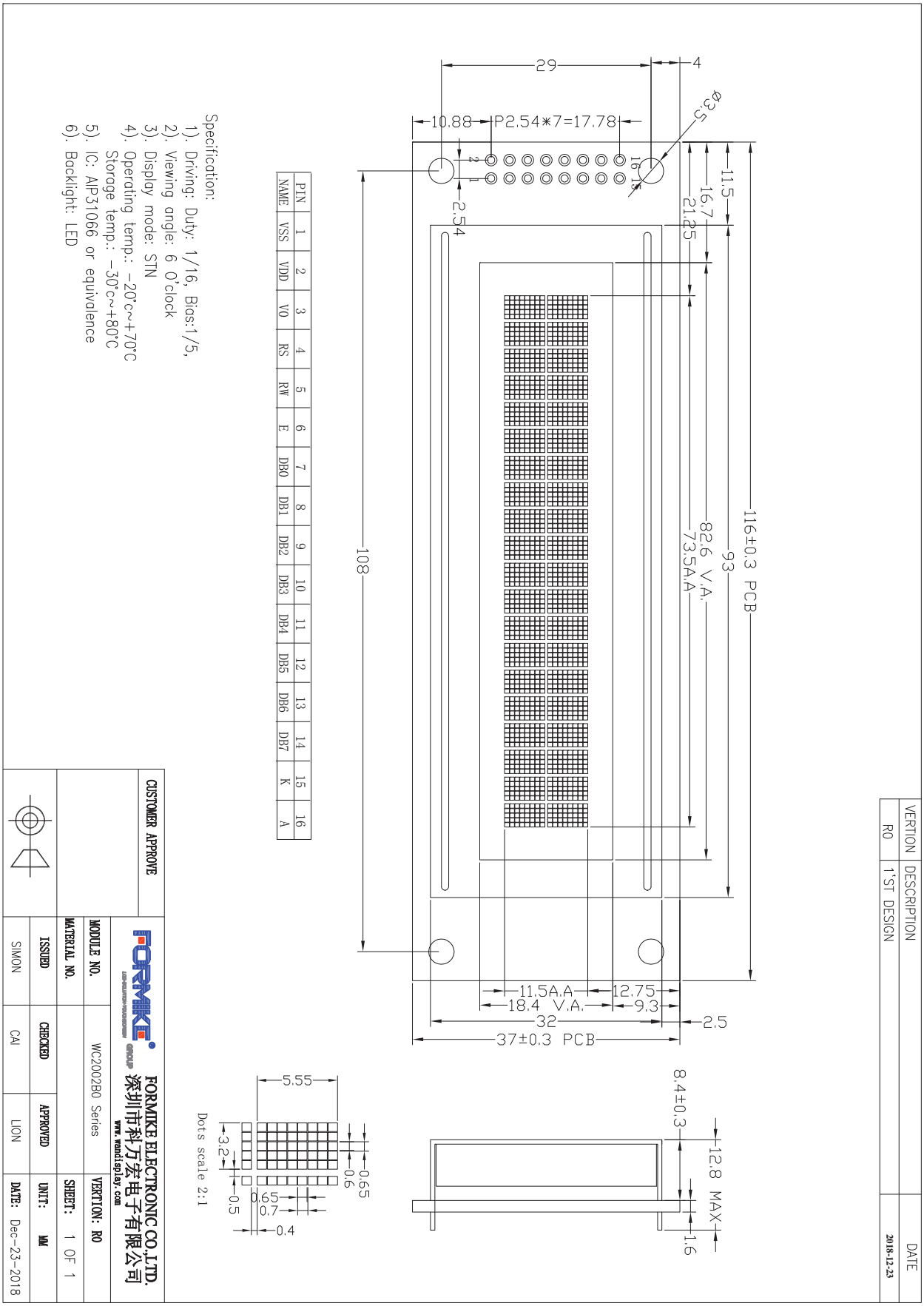
1.3.SERIES TABLE FOR LCD TYPE

*The number of series table is for different type LCD Mode

No.	Part Number	LCD Type	Backlight Color	Graphic & Font Color	Background Color	Voltage
1	WC2002B0SBY6B-A1	STN Y-G Positive	Yellow Green Color	Black Color	Yellow Green Color	5V
2	WC2002B0SBY6B-A2	STN Y-G Positive	Yellow Green Color	Black Color	Yellow Green Color	3V3
3	WC2002B0SGW6B-A1	STN Negative Blue	White Color	White Color	Blue Color	5V
4	WC2002B0SGW6B-A2	STN Negative Blue	White Color	White Color	Blue Color	3V3
5	WC2002B0SKW6B-A1	STN GREY Positive	White Color	Black Color	Grey Color	5V
6	WC2002B0SKW6B-A2	STN GREY Positive	White Colorr	Black Color	Grey Color	3V3

* Build-in negative voltage for 3V3 LCM module.

2. External Dimensions



PIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
NAME	VSS	VDD	V0	RS	RW	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	K	A

Specification:
1). Driving: Duty: 1/16, Bias:1/5,
2). Viewing angle: 6 0'clock
3). Display mode: STN
4). Operating temp.: -20°c~+70°C
Storage temp.: -30°c~+80°C
5). IC: AIP31066 or equivalence
6). Backlight: LED

VERTION	DESCRIPTION	DATE
R0	1'ST DESIGN	2018-12-23

CUSTOMER APPROVE

FORMIKE ELECTRONIC CO.,LTD.
深圳市科万宏电子有限公司
www.wandisplay.com

MODULE NO.	WC2002B0 Series	VERTION: R0	
MATERIAL NO.		SHEET: 1 OF 1	
ISSUED	CHECKED	APPROVED	UNIT: MM
SIMON	CAI	LION	DATE: Dec-23-2018

3. Interface Description

Pin NO.	Symbol	I / O	Functions
1	VSS	P	Ground.
2	VDD	P	Power Supply.
3	V0	P	LCD supply voltage
4	RS	I	Select registers. 0: Instruction register (for write) Busy flag: address counter (for read) 1: Data register (for write and read)
5	R/W	I	Select read or write. 0: Write 1: Read
6	E	I	Starts data read/write.
7-10	DB0-DB3	I/O	Four low order bi-directional tristate data bus pins. Used for data transfer and receive between the MPU and the AIP31066. These pins are not used during 4-bit operation.
11-14	DB4-DB7	I/O	Four high order bi-directional tristate data bus pins. Used for data transfer and receive between the MPU and the AIP31066. DB7 can be used as a busy flag.
15	LEDK	P	Backlight cathode
16	LEDA	P	Backlight supply.

I: input, O:output, P:Power.

4. Absolute Maximum Ratings (Vss=0V)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V_{DD}	-0.3		+6.0	V
Supply Voltage For LCD Drive	VLCD	VDD-10.0		VDD+0.3	V
Input Voltage	V_{IN}	-0.4		V_{DD}+0.5	V
Operating Temp.	T_{OP}	-20	-	+60	℃
Storage Temp.	T_{ST}	-30	-	+70	℃

5. Electrical Characteristics(Vss=0V)

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic		V_{DD} - V_{SS}	5V LCM	4.8	5.0	5.2	V
			3V3 LCM	3.0	3.3	3.5	V
Supply Voltage For LCD		V_0	VDD-V0	4.2	4.4	4.6	V
Input Voltage	"H" Level	V_{IH}		0.85V_{DD}	-	-	V
	"L" Level	V_{IL}		-	-	0.15V_{DD}	V
Output Voltage	"H" Level	V_{OH}	I_{OH}= -0.5mA	0.8V_{DD}	-	-	V
	"L" Level	V_{OL}	I_{OL}=0.5mA	-	-	0.2V_{DD}	V
Current Consumption		I_{DD}	VLCD=4.5V	-	1.0	2	mA
Frame Frequency		f_{FLM}	-	-	70	-	Hz

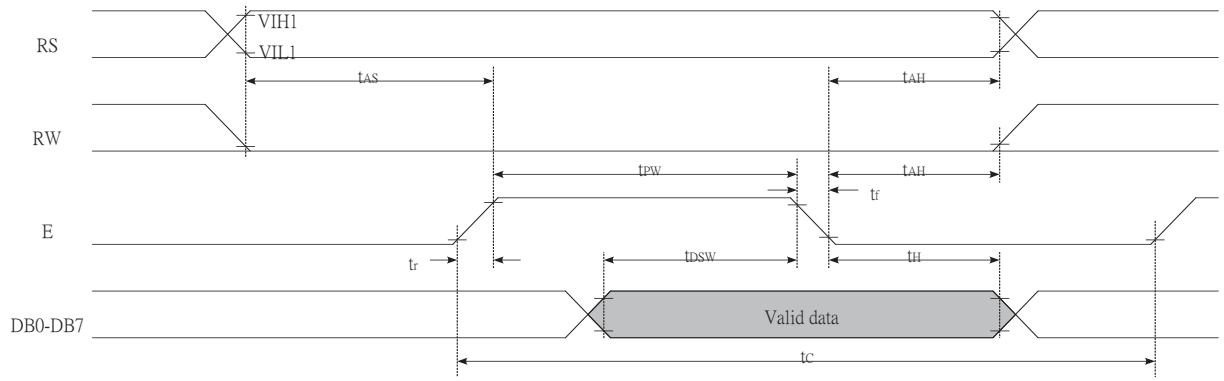
NOTE: 1) Duty Ratio=1/16 Bias Ratio=1/5

2) Measuring in Dots ON-state

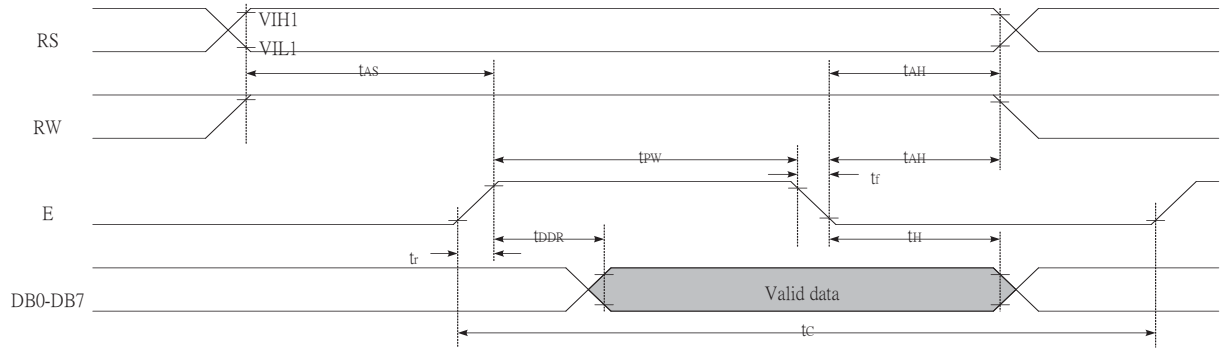
6. Timing Characteristics.

6.1. Timing Characteristics.

- **Writing data from MPU to AIP31066**



- **Reading data from AIP31066 to MPU**



Write Mode (Writing data from MPU to AIP31066

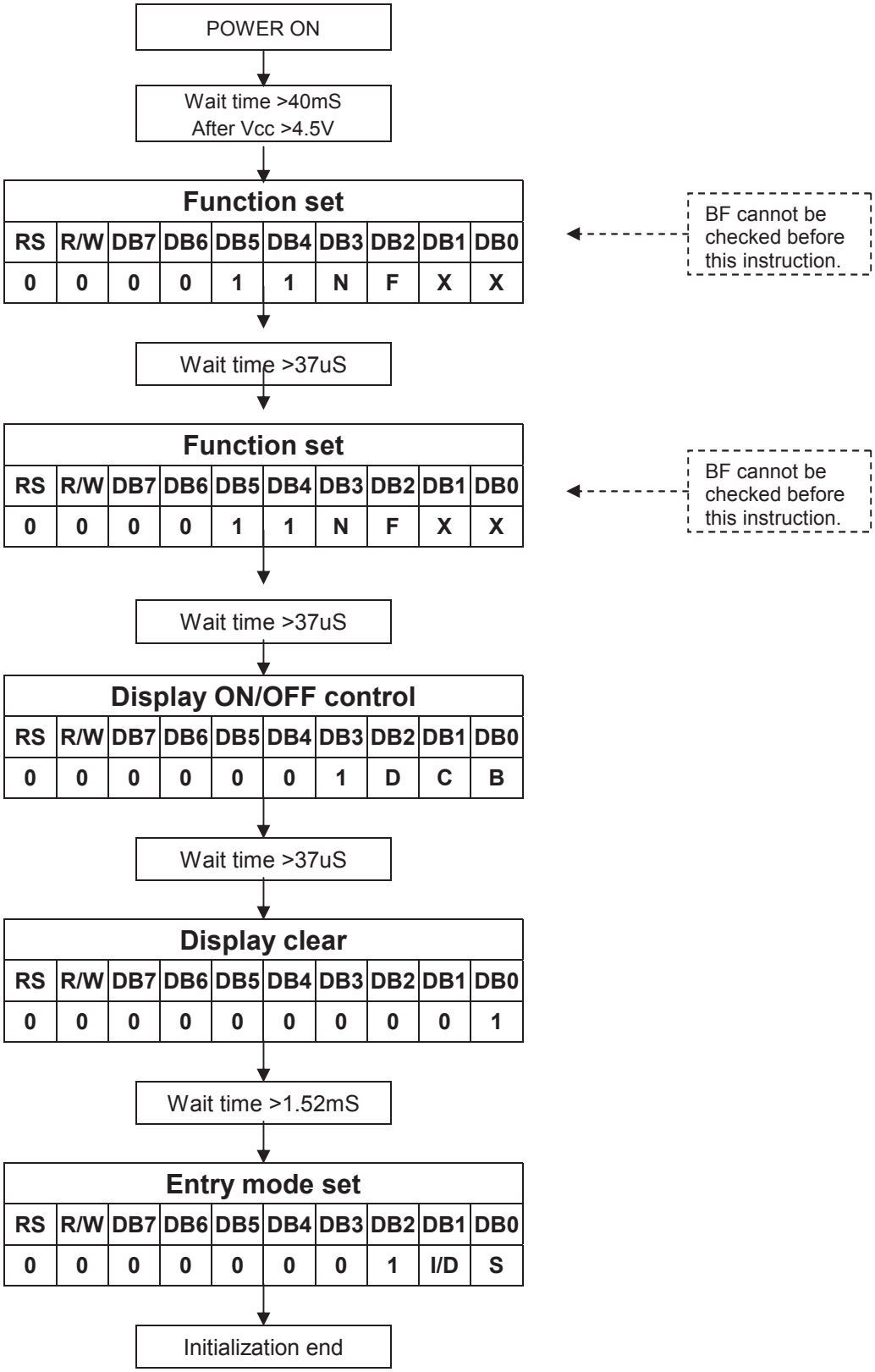
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R,T_F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DSW}	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns
Read Mode (Reading Data from AIP31066 to MPU)						
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R,T_F	Enable Rise/Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
T_{DDR}	Data Setup Time	Pins: DB0 - DB7	-	-	100	ns
T_H	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

6.2. COMMAND LIST AND INITIAL CODE

Instruction Table:

Instruction	Instruction Code										Description	Description Time (270KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 us
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

6.3. COMMAND LIST AND INITIAL CODE (CONTINUE)



7. Backlight Characteristics.

7.1 For 5V LCM module backlight default 5V

Item	Conditions	Symbol	MIN	TYP	MAX	Unit
Luminance Intensity	If=45mA (VLED=LEDA-LEDK)	LV (Y-G)	100	150	-	cd/m2
		LV (White)	400	500	-	cd/m2
Forward Voltage		VLED	4.8	5.0	5.2	V
Uniformity		U		>=70%		
Reverse Current	Vr=5V	Ir	-	-	25	μA

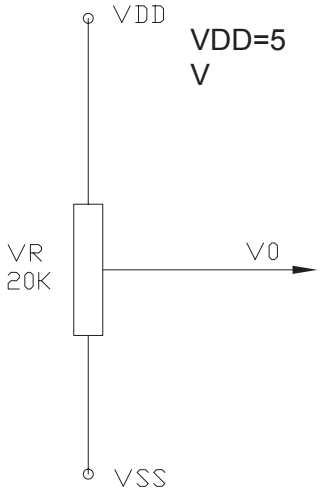
7.2 For 3V3 LCM module backlight default 3V3

Item	Conditions	Symbol	MIN	TYP	MAX	Unit
Luminance Intensity	If=45mA (VLED=LEDA-LEDK)	LV (Y-G)	100	150	-	cd/m2
		LV (White)	400	500	-	cd/m2
Forward Voltage		VLED	3.1	3.3	3.4	V
Uniformity		U		>=70%		
Reverse Current	Vr=5V	Ir	-	-	25	μA

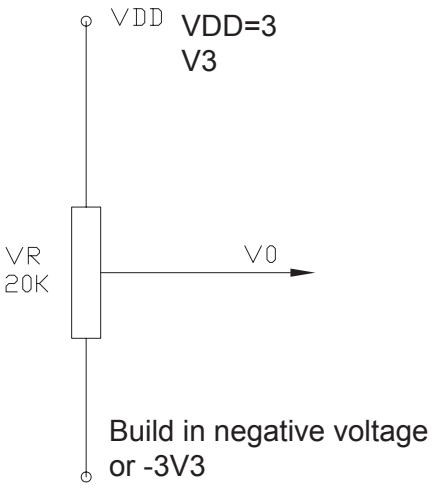
* The brightness is measured without LCD panel

8. POWER SUPPLY AND BLOCK DIAGRAM

A Variable-Resistor must be connected to the LCD module for providing a reference to V0.The recommended value of the Variable-Resistor is 10K to 20K.



a) VDD = 5V, contrast adjustable



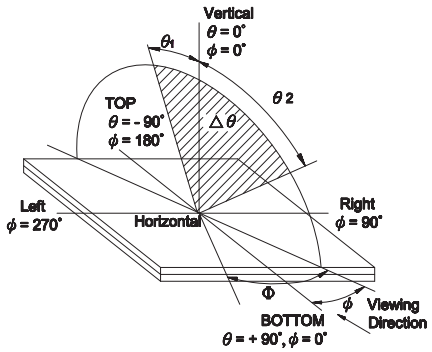
B) VDD =3.3V, contrast adjustable

* VO is for LCD contrast adjusting

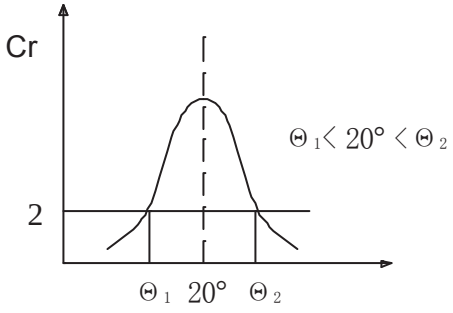
9. Optical Characteristics

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Conditions	Note
Viewing Angle	Θ2 –Θ1	25℃	30	60	-	Deg.	Cr=2.0	1,2
	Φ		60	95	-			
Contrast Ratio	Cr	25℃	2	6	-	-	Θ= 20° Φ= 0°	3
Response Time(rise)	Tr	25℃	-	90	250	ms	Θ= 20° Φ= 0°	4
Response Time(fall)	Tf	25℃	-	108	250	ms	Θ= 20° Φ= 0°	4

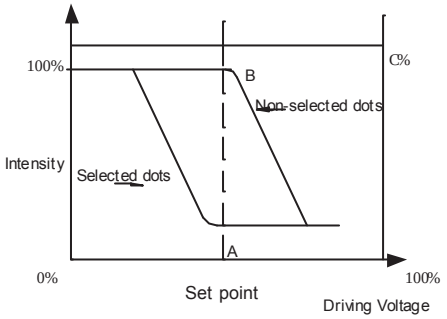
Note1 . Definition of angle Θ&Φ



Note2. Definition of viewing angle Θ1&Θ1

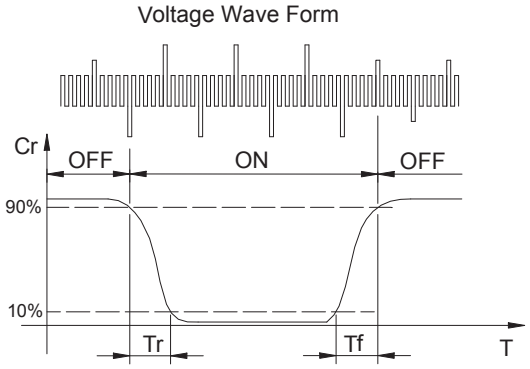


Note3 . Definition of contrast Cr



Cr = B/A

Note4. Definition of optical response



10. RELIABILITY

NO.	Item	Condition	Criterion
1	High Temperature Operating	70℃, 120Hrs	No defect in cosmetic and operational function allowable. Total current Consumption should be below double of initial value.
2	Low Temperature Operating	-20℃ , 120Hrs	
3	High Humidity	40℃ , 90%RH, 120Hrs	
4	High Temperature Storage	80℃ , 120Hrs	
5	Low Temperature Storage	-30℃, 120Hrs	
6	Vibration	Random wave 10 ~ 100Hz Acceleration: 2g 2 Hrs per direction(X,Y,Z)	
7	Thermal Shock	-0℃ to 25℃ to 50℃ (60Min) (5Min) (60Min) 10Cycles	
8	ESD Testing	Contract Discharge Voltage:+1 ~ 2kV and –1 ~ –2kV	There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV.
		Air Discharge Voltage: +1 ~ 8kV and –1 ~ -8kV	

Note: 1) Above conditions are suitable for FORMIKE standard products.
2) For restrict products, the test conditions listed as above must be revised.

11. PRECAUTION RELATING & PRODUCT HANDLING

Display is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification.

11.1 SAFETY

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

11.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

11.2 HANDLING

11.2.1 Avoid any strong mechanical shock which can break the glass.

11.2.2 Avoid static electricity which can damage the CMOS LSI - When working with the module, be sure to ground your body and any electrical equipment you may be using. The followings should be noted:

11.2.2.1 CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.

11.2.2.2 Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.

11.2.2.3 Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.

11.2.2.4 The modules should be kept in anti-static bags or other containers resistant to static for storage.

11.2.2.5 Only properly grounded soldering irons should be used.

11.2.2.6 If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

11.2.2.7 The normal static prevention measures should be observed for work clothes and working benches.

11.2.3.8 Since dry air is inductive to static, a relative humidity of 50-60% is recommended

11.2.3 Do not remove the panel or frame from the module.

11.2.4 The polarizing plate of the display is very fragile. Please handle it very carefully, do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass, tweezers, etc.)

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

11.2.6 Do not touch the display area with bare hands, this will stain the display area.

11.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

11.2.8 To control temperature and time of soldering is 300± 10℃and 3-4 sec.

To avoid liquid (include organic solvent) stained on LCD Module.

11.3 STORAGE

11.3.1 Store the panel or module in a dark place where the temperature is 25℃±5℃and the humidity is below 60% RH.

11.3.2 Avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.3.3 Do not place the module near organic solvents or corrosive gases.

Do not crush, shake, or jolt the module.

11.4 LIMITED WARRANTY

11.4.1 FORMIKE modules are not consumer products, but may be incorporated by FORMIKE's customers into consumer products or components thereof, FORMIKE does not warrant that its modules and components are fit for any such particular purpose.

11.4.2 The liability of FORMIKE is limited to repair or replacement on the terms set forth below. FORMIKE will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between FORMIKE and the customer, FORMIKE will only replace or repair any of its Modules which is found defective electrically or visually when inspected in accordance with FORMIKE INSPECTION CRITERIA

11.4.3 No warranty can be granted if any of the precautions state in handling liquid crystal display has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.

11.4.4 In returning the modules, they must be properly packaged; there should be detailed description of the failures or defect.

12. OTHERS

12.1 If there is any not specified quality standard in this specification as well as RMA , please refer to < INSPECTION CRITERIA>. Contact FORMIKE to get the complete <INSPECTION CRITERIA> by the contact window or feedback@wandisplay.com.

12.2 Special agreement of <INSPECTION CRITERIA> is recognized only in writhing between FORMIKE and the customer also indicated it before ordering.

Doc No.: IQM-201507001SA
Date: Oct 10, 2015
Version: 2.0

INSPECTION CRITERIA

MONO LCD MODULE

Customer Approved	
Signature:	**Date: (MM/DD/YY)**

- This inspection criteria is subject to change without notice, please contact with FORMIKE before design or place order.
- Once signature is seen as agree and accept to all inspection criteria. Further mass production will subject to it.

FORMIKE ELECTRONIC CO., LTD

Approved	Checked	Issued
CL	JW	GW

FORMIKE ELECTRONIC CO., LTD
Flat 401-403, Block B, iPARK Building, No.26 Dengliang Road, Nanshan District, Shenzhen 518054, China.

TEL: (86) 755 88306921,88306931 FAX: (86) 755 88304615
Http:// www.wandisplay.com

1. 检测标准 Incoming Inspection

合约双方同意此检测标准为MONO-LCD（以下被称为“模组”）检测中的唯一也是最终标准。除“模组”本身不良，科万宏公司不再对其他任何品质或性能上的不良或数量短缺负有任何责任或义务（如意外附带损失，产品责任，其它间接损失等）。

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

2. 责任 Liability

2.1 检测期限 Inspection Deadline

客户应在发货地点或模组到达目的地日起20个自然日内在交货目的地检测模组。

The customer should inspect the Modules either at the delivery point or within twenty (20) calendar days after modules arrival at the Delivery Destination.

2.2 拒收通知 Notification of Rejection

当模组不能达到AQL（合格质量水平）且无法通过验收，客户可以拒绝一个或一个以上的不良或不合格的模组。在这种情况下，客户应当在收到产品后的3个工作日内通过文件或邮件给到科万宏拒绝通知，否则，该批产品被视为已符合AQL并验收合格。

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. 检测规格 Inspection Specifications

双方共同认定检测应该包含并遵循如下列明的检测规格，包括：

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

3.1 范围 Scope

3.2 抽样检验方法 Sampling Plan

3.3 面板检测条件 Panel Inspection Condition

3.4 显示质量 Display Quality

3.5 机构规格 Mechanics Specifications

3.6 存储处理说明 Notification for Storage Handling

4. 质量保证 Limited Warranty

4.1. 自出货日起提供十二（12）个月的质量保证期，质量保证不包括客户责任不良品。

The period is within 12 months since the date of shipping out under normal using and storage conditions. The warranty will be avoided in case of defect induced by customer.

4.2. 科万宏有权选择对确认为科万宏责任的不良品进行更换，重工，或扣款，前提条件为

（1）客户在保质期限内立即就不良或非符合标准的产品通知了科万宏公司。

（2）符合以下指明的规格或条件。

（3）符合科万宏公司关于模组补货，重工，或退货的程序。

Formike replace, rework or refund to customer for the defective or non-conforming Modules at Formike option only when Formike confirm that it is Formike responsibility, also 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 procedure for modules replacement, reworking and/or return.

4.3. 补货或返工的模组保质期应当是剩余的期限。

The warranty period for the modules replaced or reworked shall be the remaining term for such Modules.

4.4. 当客户发现不良品时，科万宏有权要求其退回科万宏指定的地址作进一步分析，并且由客户支付退回产品的费用。

When customers found defective or non-conforming, Formike has the right to require customers to send them back on customer's expenses to Formike specified address for further analysis.

4.5. 有限保修

(1) 科万宏的模组不是消费性产品，但有可能补用于客户的消费性产品或部件，因此科万宏不会保证模组或部件适用于任何特定用途。

(2) 科万宏对于维修或换货是有限责任，条款列于以下

附带损失或间接损失，事故，损害，损毁对任何对个人，使用者包括第三方的个人或使用者，科万宏不会负责任何责任，除非另有科万宏与客户的书面协议。科万宏只会对按照科万宏检验标准检验而发现电性不良或外观不良模组进行更换或维修。

(3) 如果不按照科万宏指定的对液晶显示屏的预防操作，将不会给予任何的保证

(4）所退回的模组必须妥善包装，并且详细列出不良明细

Limited Warranty

(1) FORMIKE modules are not consumer products, but may be incorporated by FORMIKE's customers into consumer products or components thereof, FORMIKE does not warrant that its modules and components are fit for any such particular purpose.

(2)The liability of FORMIKE is limited to repair or replacement on the terms set forth below. FORMIKE will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between FORMIKE and the customer, FORMIKE will only replace or repair any of its Modules which is found defective electrically or visually when inspected in accordance with FORMIKE INSPECTION CRITERIA

(3) No warranty can be granted if any of the precautions state in handling liquid crystal display has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.

(4) In returning the Moudules, they must be properly packaged; there should be detailed description of the failures or defect.

5. 如上设定的保证和解决办法为唯一的并替代了其他所有的保证，条文或条件，表述或暗指，不管是事实上还是法定的。此外，包括担保或适销性和特殊目的的适用性都会被明确否认。科万宏公司就此作出的所有保证，仅仅适用于客户，不延伸到任何第三方。

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 warranties herein apply only to the customer and are not to be extended to any third party.

Tems 规格：

1. 范围 Scope

1.1 显示屏质量评估 Display Quality Evaluation

1.2 结构规格 Mechanics Specification

2. 抽样计划 Sampling Plan

除非特别说明，抽样计划都应该遵循MIL-STD-105E

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

2.1 批量大小:每次发货的数量为一批 （不同产品则为不同批次）

Lot size: Quantity per shipment as one lot (different model as different lot).

2.2 抽样类型: 一般检验，单次抽样 Sampling type: Normal inspection, single sampling.

2.3 抽样级别: 二级（II级）Sampling level: Level II.

2.4 AQL: 可接受品质标准Acceptable Quality Level

不良类别 Item	说明 Indication	AQL
重大缺陷 Major Defect（MA）	功能不全 Function	0.65
	尺寸不符 Size	
轻微缺陷 Minor Defect（MI）	不影响产品功能但对外观有影响 Effects on LCD appearance but not on function	1.5

3. 不良级别分类 Classification of defects：

3.1 重大缺陷 Major defect

任何缺陷可能导致故障,或减少产品的可用性的。例子: 功能不全、尺寸不符等。

Any defect may result in functional failure, or reduce the usability of product for its purpose. For Example：Function incomplete, wrong size and etc.

3.2 轻微缺陷 Minor defect

不影响产品功能但对外观有影响，如：点不良

Effects on LCD appearance but not on function, dot defect and etc..

判断重大缺陷和轻微缺陷将依据不良级别分类

The criteria on major or minor judgment will be according with the classification of defects.

4. 显示屏检测条件 Panel Inspection Condition

4.1 环境Environment:

室温Room Temperature: 25±5°C.

湿度Humidity: 50±20% RH.

照明Illumination: Fluorescent lamps 20W x 2 fluorescent lamps.

距离 Distance between LCM and fluorescent lamps: 100 cm or more.

4.2 检测距离Inspection Distance between LCM and inspector eyes : ≥30 cm

4.3 检测角度Inspection Angle:

The Inspection angel range 15°C from vertical against LCM

4.4 检测时间Inspection time

可察觉的测试时间:最多10秒 Perceptibility Test Time: 10 seconds max.

5. 结构规格 Mechanics specifications

关于模组的外观尺寸，细节请参考产品规格书。

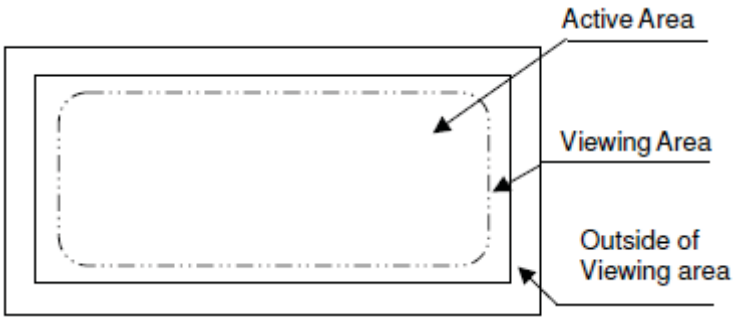
As for the outside dimensions of the Modules, please refer to product specifications for more details.

6. 检验区域定义 Definition Of Inspection Area

Active Area: AA

Viewing Area: A

Outside of viewing area: B



7. 存储处理的说明 Notification for Storage Handling

7.1 存储 Storage:

7.1.1 存储环境需遵循产品规格，否则模组可能被毁坏。

Environment condition must be within the product specifications, otherwise the Module might be damaged.

7.1.2 叠放的层数应在科万宏公司指导下进行。

Pile of stacking shall follow the instruction of Formike.

7.2 操作方法 Handling :

7.2.1 不可扭曲或弯折模组。

Twisting or Bending of the Module is prohibited.

7.2.2 除非有科万宏的指导，所有化学品都不宜用在模块上

All chemicals are unfit for use unless otherwise instructed by Formike.

7.2.3 插塞或拔取: 插塞或拔取模组前先要保证电源关掉。

Plugging in & unplugging:

The power must be turned off before plugging in or unplugging the Module

7.2.4 ESD protection: 没有合适的接地线情况下，禁止接触模组。

The Module must not be touched without proper grounding.

7.2.5 高压: 没有保护的情况下，模组背部禁止接触。

High Voltage: The rear side of Module must not be touched without protection

7.2.6 上电时序: 请遵循科万宏公司说明。

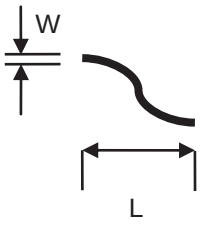
Power on sequence: Shall follow the instruction of FORMIKE

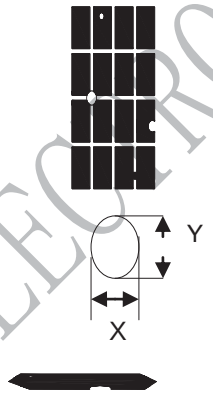
8. 检验标准 Inspection criterion

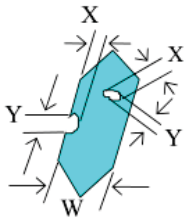
Classification of defects	Item		Reference check note	AQL
Major defects	Display on	1.No display	NO.1	0.65
		2.Missing line, darker or bright line		
		3.Short or open circuit		
		4.Wong viewing angle		
		5.Large current		
		6. Flickering		
		7.Wrong backlight		
		8. Contrast defect (dim, ghost)	No. 2	
	Display off	9. Polarizer stick against	NO.1	
		10.Leakage liquid crystal		
		11.Wrong or missing component		
Minor defects	Display on	1.Backgroound color deviation	NO.2	1.5
		2.Black spot and dust	NO.3	
		3.Line defect	NO.4	
		4.Scratch	NO.4	
		5. Rainbow	NO.5	
		6.Pin hole	NO.6	
	Polarizer	7. Bubble and foreign material	NO.3	
		8. Scratch	NO.4	
	PCB	9. Scratch	NO.4	
	Soldering	10. Poor connection	NO.7	
	Wire	11.Poor connection	NO.8	
	LCD glass	12. Dirty、blot、scratch	NO 10	
		13. Crack		
		14. Raised LCD、burr		
	Metal pin	15. PIN deformation/over length	NO. 11	
	Metal frame	16. Rust	NO. 12	

Note on Defect classification (Reference check note)

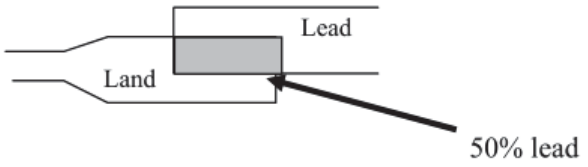
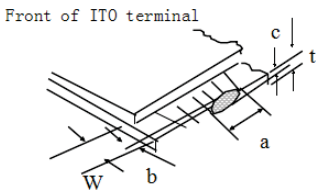
<table>
<tr><th>No</th><th>Item</th><th>Description</th><th>Criterion</th></tr>
<tr><td rowspan="10">1</td><td>No display</td><td>No display under normal test mode</td><td rowspan="10">Not allow</td></tr>
<tr><td>Missing line, darker or bright</td><td>Display content incomplete</td></tr>
<tr><td>Short or open circuit</td><td>Appear Seg-Seg、Com-Com or Seg-Com short circuit</td></tr>
<tr><td>Large current</td><td>The current is larger than the design under normal test mode</td></tr>
<tr><td>Flickering</td><td>Flickering under normal test mode</td></tr>
<tr><td>Wrong Backlight</td><td>(1) No working,
(2) Not allow flickering</td></tr>
<tr><td>Wrong viewing angle</td><td>View angle is inconformity with specification</td></tr>
<tr><td>Polarizer stick against</td><td>inconformity with specification</td></tr>
<tr><td>Leakage liquid crystal</td><td>Leakage or no liquid crystal</td></tr>
<tr><td>Wrong or missing component</td><td>Inconformity with specification</td></tr>
<tr><td rowspan="2">2</td><td>Background color deviation</td><td colspan="2" rowspan="2">Refer to approved sample</td></tr>
<tr><td>Contrast defect (dim, ghost)</td></tr>
<tr><td>3</td><td>Point defect (Black spot, dust, incl. Polarizer)</td><td>y
x
φ=(X+Y)/2
Unit: mm</td><td>
<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>φ≤0.10</td><td>Disregard</td></tr>
<tr><td>0.1 <φ≤0.2</td><td>3</td></tr>
<tr><td>0.2 <φ≤0.25</td><td>2</td></tr>
<tr><td>0.25<φ≤0.30</td><td>1</td></tr>
<tr><td>φ> 0.3</td><td>0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>N0</th><th>Item</th><th>Description</th><th>Criterion</th></tr>
<tr><td>4</td><td>Line defect</td><td> 

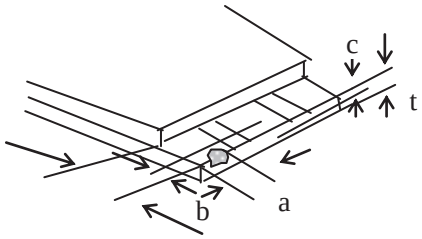
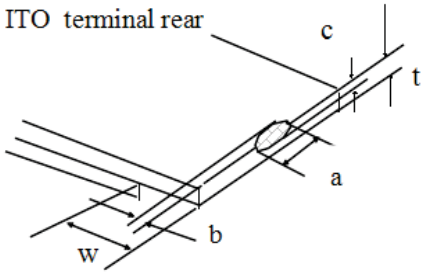
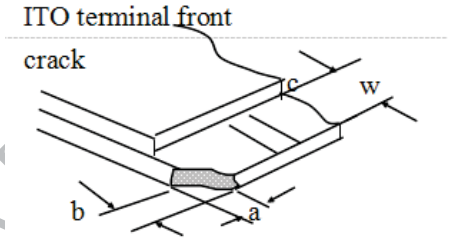
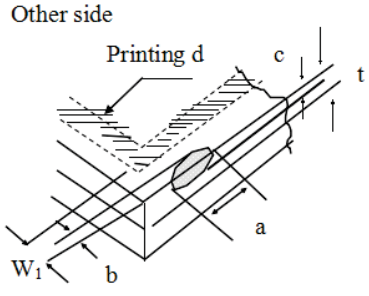
Unit: mm</td><td>
<table>
<tr><th colspan="2">LINE</th><th>Acceptable Qty</th></tr>
<tr><th>L</th><th>W</th><th></th></tr>
<tr><td>--</td><td>0.015≥ W</td><td>Disregard</td></tr>
<tr><td>3.0≥ L</td><td>0.03≥W</td><td>2</td></tr>
<tr><td>2.0≥ L</td><td>0.05≥W</td><td>2</td></tr>
<tr><td>1.0≥ L</td><td>0.1>W</td><td>1</td></tr>
<tr><td>---</td><td>0.05<W</td><td>Applied as point defect</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Rainbow</td><td colspan="2">Not more than two color changes across the viewing area</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Pin hole</td><td>Pin hole of Dot matrix
< 0.10mm is acceptable
 

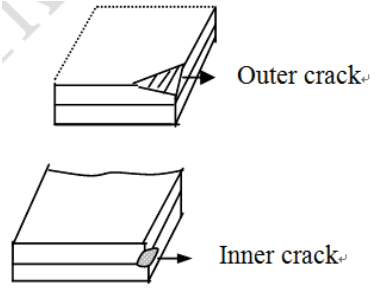
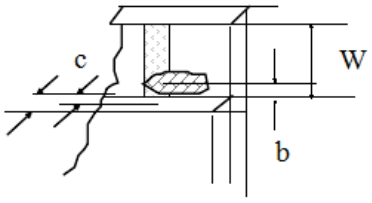
φ = (X+Y)/2</td><td>Same as Point Defect</td></tr>
<tr><td>Pin hole of Segment
< 0.10mm is acceptable
 

φ = (X+Y)/2
Unit: mm</td><td>
<table>
<tr><th>Point size</th><th>Acceptable Qty</th></tr>
<tr><td>φ≤ 1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W<φ≤1/2W</td><td>1</td></tr>
<tr><td>φ>1/2W</td><td>0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Description</th><th>Criterion</th></tr>
<tr><td>7</td><td>Soldering</td><td colspan="3">(1)Not allow heavy dirty and solder ball on PCB (The size of dirty refer to point and dust defect)
(2) Over 50% of lead should be soldered on land.
 
</td></tr>
<tr><td>8</td><td>Wire</td><td colspan="3">(1) Copper wire should not be rusted
(2) Not allow crack on copper wire connection
(3) Not allow reversing the position of the flat cable
(4)</td></tr>
<tr><td>9</td><td>PCB</td><td colspan="3">(1) Not allow screw rust or damage
(2) Not allow missing or wrong putting of component</td></tr>
<tr><td>10</td><td>LCD glass</td><td></td><td> 

(1) Front of ITO terminal
a = length of crack
b = width of crack
c = thickness of crack
t = thickness of lcd
W = LCD with of the terminal</td><td><table><tr><td>c</td><td>a</td><td>b</td></tr><tr><td>c≤t</td><td>Ignore</td><td>≤t</td></tr></table></td></tr>
</table>

10	Collapse or crack Note : a=length of crack b= width of crack c=thickness of collapse t=Glass thickness L=LCD terminal lenthg W=LCD terminal wide X=Distance from glass edge to first PDA d=Seal wide W1= Distance from glass edge to printing frame edge	 W (2) ITO terminal front (Not crack to ITO）   	<table><tr><th>c</th><th>a</th><th>b</th></tr><tr><td>≤t/2</td><td>≤5</td><td>≤W</td></tr><tr><td>t/2<c≤t</td><td>≤4</td><td>≤W</td></tr></table> <table><tr><td>c</td><td>a</td><td>b</td></tr><tr><td>C≤t/2</td><td>≤5</td><td>≤1/2W</td></tr></table> <table><tr><td>c</td><td>a+b</td></tr><tr><td>c≤t</td><td>≤5</td></tr></table> <table><tr><td>b</td><td>a</td><td>c</td></tr><tr><td>b≤W1 +d/2(Sealring)</td><td>≤10</td><td>c≤t/2</td></tr><tr><td></td><td>≤5</td><td>t/2 < c < t</td></tr><tr><td></td><td>≤3</td><td>c≥t</td></tr><tr><td>b > W1+d</td><td colspan="2">Not allow</td></tr><tr><td>b≤W1</td><td>≤5</td><td>c < t</td></tr><tr><td></td><td>≤3</td><td>c≥t</td></tr></table>

<table>
<tr><td rowspan="2">10</td><td></td><td> 
</td><td>
<table>
<tr><td rowspan="4">Outer crack</td><td rowspan="3">Crack not in screen frame (and not crack on Sealring)</td><td>a+b</td><td>c</td></tr>
<tr><td>≤10</td><td>c≤t/2</td></tr>
<tr><td>≤5</td><td>t/2＜c＜t</td></tr>
<tr><td>≤4</td><td>c≥t</td></tr>
<tr><td colspan="2">Crack on edge of screen frame</td><td>Not allowed</td></tr>
<tr><td rowspan="3">Inner crack</td><td colspan="2">Crack on screen frame</td><td>Not allowed</td></tr>
<tr><td rowspan="2">Crack not on screen frame</td><td>≤5</td><td>c＜t</td></tr>
<tr><td>≤4</td><td>c≥t</td></tr>
</table>
</td></tr>
<tr><td>c.Convex
glass/Flash</td><td> 
</td><td>
<table>
<tr><td rowspan="3">ITO terminal side</td><td rowspan="2">c</td><td>W</td><td>b</td></tr>
<tr><td rowspan="2">≤t/2</td><td>≥2.0</td><td>≤0.5</td></tr>
<tr><td>＜2.0</td><td>W/4</td></tr>
<tr><td>＞t/2</td><td colspan="2">Exceed tolerance</td></tr>
<tr><td colspan="2">Other sides</td><td colspan="2">b≤0.2</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Metal PIN</td><td> 

PIN deformation/over length
In the left drawing：
a≤W/3
ψ±≤5°
PIN length：Refer to drawing</td></tr>
<tr><td>12</td><td>Metal frame</td><td>Rust is not allow</td></tr>
</table>

9. Others.

1. Defect which is on the Black Matrix (outside of viewing area) are not considered as a defect.
2. If any specific defect is not included in the above defect table, this defect should be judged by Formike.

10. Revised Record

Version	Revise record	Issued	date
1.0	First issue	May Zeng	Feb. 20th, 2010.
2.0	Adjusted the format and LCD part	Joe W	Oct. 10th, 2015