FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

Color STN LCD MODULE

MODEL : KWH0145DN07-079C

【 】 Preliminary Specification

【 ◆ 】 Finally Specification

Prepared By :

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Http:// www.wandisplay.com

- 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 : Mar-27-2009

Design Specification for Approval

Customer				
Product Model	KWH0145DN07-079C		**REV.NO.**	**V0.0**
Designed by	**XUEQIUYI**	**Checked by**	**LIUJIAN**	
Approved by	**WANGYOUREN**	**Date**	**2009.03.27**	

Final Approval by Customer

Date:

Approved	**Checked**	**Department**

Contents

Revision History

Version	Contents	Date	Note
V0.0	Original	Mar, 2009	

1. Scope

This specification applies to the color STN LCD module that is designed and manufactured by FORMIKE ELECTRONIC.,LTD.

It is capable of using 8bits data bus and operating with 8080-series MPU. Also 65k 、262K、16M colors mode can be selected by setting instruction.

2. Normative Reference

GB/T4619-1996《 Liquid Crystal Display Test Method》
GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》
IEC61747-1 SIXTH PART
GB2828`2829-87《National Standard of PRC》

3. Definitions

3.1 Definition of Response Time Tr, Td

① Tr: The time required which the brightness of segment becomes 90% from 10% when waveform is switched to selected one from non-selected one.
(f_f=80Hz, Φ=10° θ=270° at 25℃)

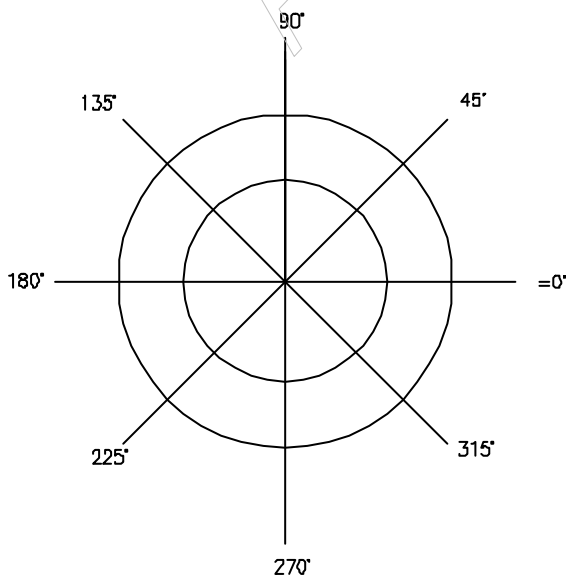
②Td: The time required which the brightness of segment becomes 10% from 90% When waveform is switched to non-selected one from selected one.
(f_f=80Hz, Φ=10° θ=270° at 25℃)

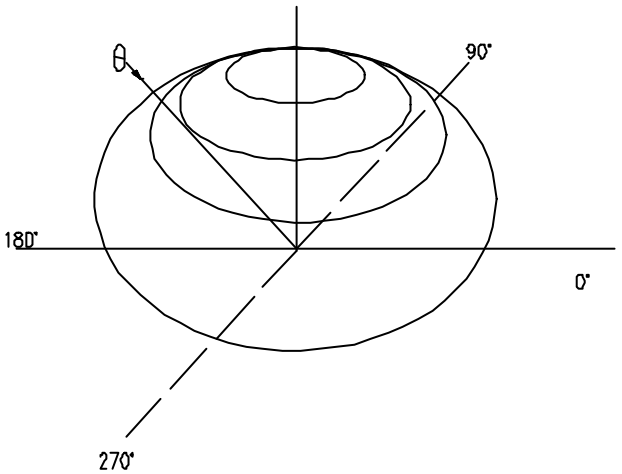
3.2 Definition of Contrast Ratio Cr

Cr=A/B

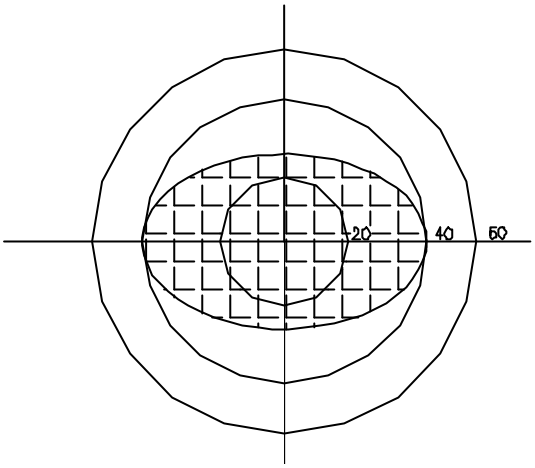
① A: Segments brightness in case of selected waveform
② B: Segments brightness in case of non-selected waveform

3.3 Definition of Angle and Viewing Range





Angular Graph: Constrast Ratio



	θ =0	Φ=0	Cr
Right	50 °		≥2
Left	50 °		
Front	40 °		
Back	40 °		

4. Technology Specifications

4.1 Feature

Item	Standard Value
Display Type	128(W)×RGB×128(H)
LCD Type	CSTN Negative Transmissive
Drive Mothod	1/128 Duty 1/12 Bias
Screen Size	1.45 (Diagonal)
Viewing Direction	6 o'clock
Color configuration	R.G.B vertical stripe
Backlight type	White LED B/L
Interface	8-bit data bus
Drive IC	ST7687S

4.2 Mechanical Specifications

Item	Specifications	Unit
Dimensional Outline	32.36(W) ×37.5(H)×2.7(T)	mm
Number Of Dots	128 (W) ×128(H)	Dots
Viewing Area	28.1(W) ×28.2(H)	mm
Active Area	25.49 (W) ×26.49 (H)	mm
Pixel Pitch	0.0664(W) ×0.207(H)	mm
Dots Size	0.0564(W) ×0.197(H)	mm

4.3 Absolute Max. Rating

Item	Symbol	Min	Max	Unit	Note
Supply voltage	Vdd1	-0.3	2.8	V	
Input Voltage	Vin	-0.3	Vdd+0.3	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Humidity	HD-	20	90	%RH	

4.4 Optical Characteristics

Item	Symbol	Condition	Temp	Min	Typ	Max	Units
LCD driving voltage	Vlcd	θ =ϕ =0	25℃	---	TBD	---	V
Response Time	Rise Time（Tr）	θ =ϕ =0	0℃	---	---	---	msec
	Decay Time（Td）			---	---	---	
	Rise Time（Tr）		25℃	---	250	---	
	Decay Time（Td）			---	200	---	
	Rise Time（Tr）		50℃	---	---	---	
	Decay Time（Td）			---	---	---	
Contrast Ratio	Cr	θ =ϕ =0	25℃	15	20	---	---

Item		Symbol	Temp	Condition	Min	Typ	Max	Unit	Note
Color Of CIE Coordinate	White	x	25℃	Φ=0 ° θ=0 °	0.22	0.27	0.32	-	-
		y			0.23	0.28	0.33		
	Red	x			0.44	0.49	0.54		
		y			0.24	0.29	0.34		
	Green	x			0.24	0.29	0.34		
		y			0.37	0.50	0.57		
	Blue	x			0.12	0.17	0.22		
		y			0.10	0.15	0.20		

4.5 Electrical Characteristics

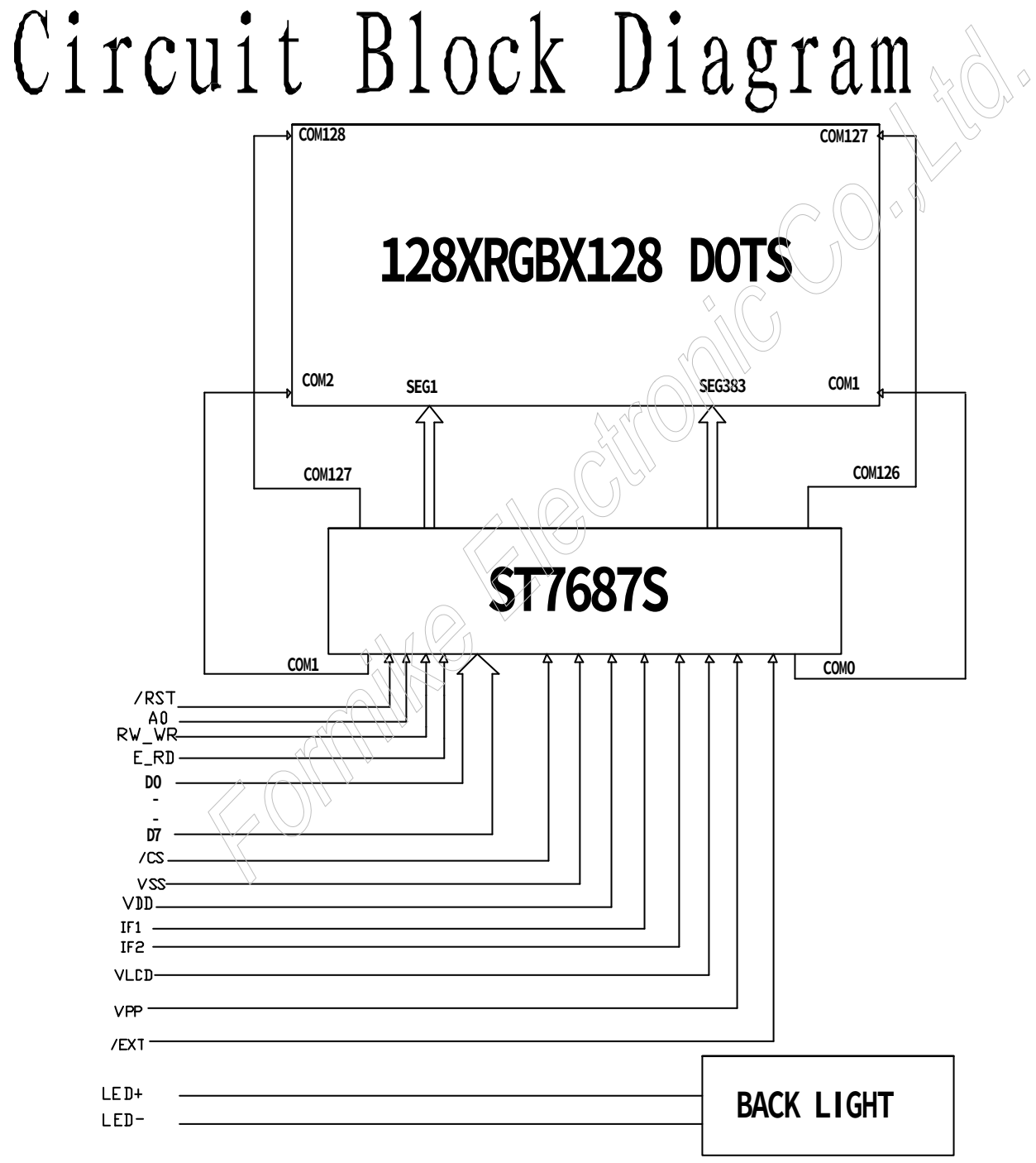
4.5.1 Electrical Characteristics (VSS=0V,Vdd=2.7-3.0V,Ta=-20 to 70°C)

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage (Logic)		Vdd	-	2.7	2.8	-	V	
Input Voltage	" H" level	VIH	VDD	0.7VDD	-	VDD	V	
	" L" level	VIL	VSS	VSS	-	0.3VDD		
Output Voltage	" H" level	VOH	0.8VDD	0.8VDD	-	VDD	V	
	" L" level	VOL	VSS	VSS	-	0.2VDD		
Current Consumption (Main LCD)		Idd1	Normal Mode	-	-	3.5	mA	

4.5.2 Interface Pin Connections

NO.	Symbol	Definition
1	NC	No connection
2	LED+	Anode of LED Backlight
3	LED-	Cathode of LED Backlight
4	VG	Bias LCD driver supply voltages
5	XV0	Negative LCD driver supply voltages
6	V0	Positive LCD driver supply voltages
7	VM	The I/O pin of LCD bias supply voltage
8	VDD	Power supply for logic circuit
9	VSS	Ground
10	VDD	Power supply for logic circuit
11	/EXT	EEPROM burn-in control Pin
12	/CS	Chip select input pins
13	IF2	Parallel / Serial data input select input
14	IF1	
15	/RST	Reset pin
16	E_RD	Read execution control pin
17	VDD	Power supply for logic circuit
18	D7	8-bit bi-directional data bus
19	D6	
20	D5	
21	D4	
22	D3	
23	D2	
24	D1	
25	D0	
26	RW_WR	Write execution control pin
27	A0	Register select input pin
28	VPP	Power supply for EEPROM
29	NC	No connection

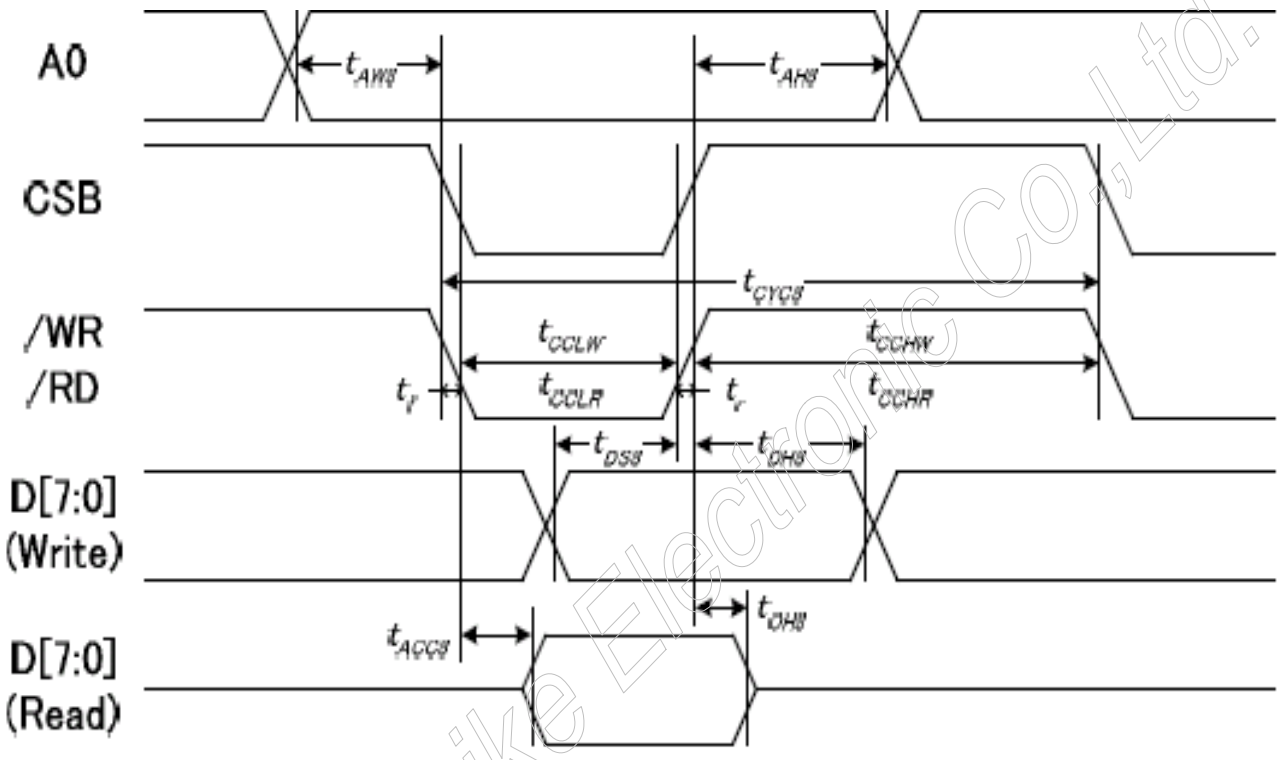
5.Circuit Block Diagram



6. Scheduling

ST7687S Scheduling

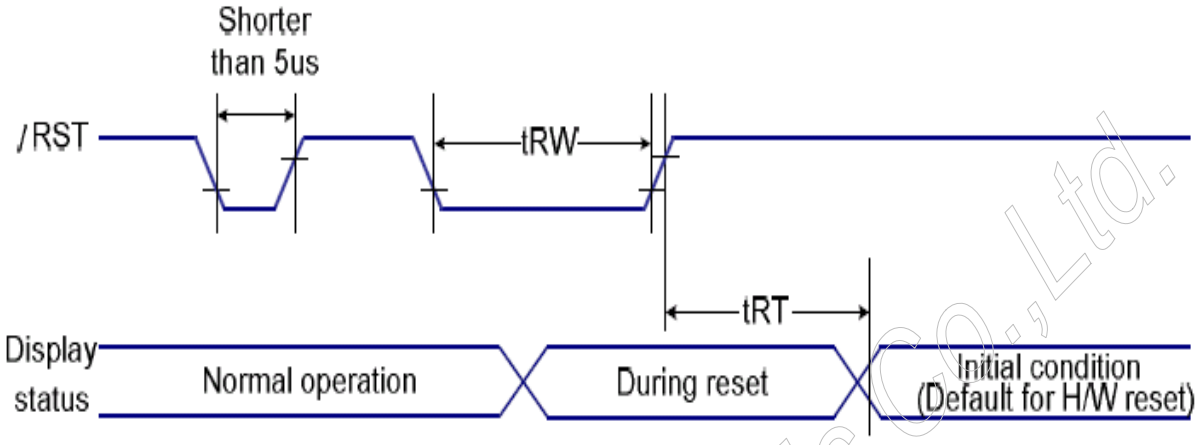
- **Read/write Characteristics (8080-series Parallel mode)**



(V_{DD}=2.8V, Ta= –30°C to 85°C, die)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH8		TBD	—	ns
Address setup time		tAW8		TBD	—	
System cycle time (WRITE)	WR	tCYC8		TBD	—	
/WR L pulse width (WRITE)		tCCLW		TBD	—	ns
/WR H pulse width (WRITE)		tCCHW		TBD	—	
System cycle time (READ)	RD (ID)	tCYC8	When read ID data	TBD	—	
/RD L pulse width (READ)		tCCLR		TBD	—	
/RD H pulse width (READ)		tCCHR		TBD	—	
System cycle time (READ)	RD (FM)	tCYC8	When read from frame memory	TBD	—	
/RD L pulse width (READ)		tCCLR		TBD	—	
/RD H pulse width (READ)		tCCHR		TBD	—	
WRITE data setup time	D0 to D7	tDS8		TBD	—	
WRITE data hold time		tDH8		TBD	—	
READ access time (ID)		tACC8 (ID)		—	TBD	
READ access time (FM)		tACC8 (FM)	CL = 100 pF	—	TBD	
READ Output disable time		tOH8	CL = 100 pF	—	TBD	

Reset Input Timing



Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Reset " L " pulse width	/RST	tRW		---	---	us
Reset time		tRT		---	---	ms

7. Reliability Test Conditions And Methods

NO	Check Item		Test condition	Criteria	Defects
1	Electricity aging (COG modules)		With normal testing procedures run 24H.	No adverse electrical properties, qualified	MA.
2	High temperature and high humidity storage		60℃,80%RH,48H	No abnormal appearance, qualified.	MA.
3	Packaging intensity	Fall	A packaging products, at a height of 75 cm, 6 along the two-rowed two cents for each face, corner, corner of the once free-fall campaign	No products or components without damage, qualified.	MA.
		Static pressure	Stacking limit.		
4	High Temperature operating		70℃±2℃ 48H	No adverse electrical properties, qualified	MA.
	Low Temperature operating		-20℃±2℃ 48H		
5	High temperature and high humidity operation		50℃ 90% RH,48H	No adverse electrical properties, qualified	MA.
6	Temperature Cycle		60℃,80%RH,48H Endurance test applying the low and high Temperature cycle -20℃ ↔ 25℃ ↔ 70℃ ↔ 25℃ 30min 5min 30min 5min 1 cycle 10 cycles	No abnormal appearance, qualified.	MA.
7	Slump		A packing case product, in 80 centimeters place, along 6 surface two edge two cents for each face, edge and corner of the once free-falling campaign	Meets the LCD each performance index requirement	
8	Poach		Ordinary product 6Hrs, distinctive product 8Hrs		

8. Inspection standard

8.1 Summary

8.1.1 Scope of application:

The standards apply to COG category module products factory inspection (this also applies to the production process when measured by the corresponding inspection of the criteria for judgment).

8.1.2 Criterion:

GB/T2828.1-2003 Scottish economy Sampling inspection procedures and sampling table.

8.1.3 Instruments:

The corresponding models module tester, a millimeter, and venire calipers.

8.1.4 Test application:

If this inspection standards and user standards, product specifications, samples confirmation, the confirmation, the design data, the standards

8.2 Inspection requirements

8.2.1 Examination preparation product specifications, drawings, module factory inspection standards, inspection recite the content and if necessary confirmation.

8.2.2 Inspection at the beginning of sets of hands onto fingers, wrist or associated anti-static gloves, confirmation test using the instrumentation and measurement devices is going to use normal state.

8.2.3 Inspections, in strict accordance with the operating conditions, operational guidance on operation and conscientiously make records.。

8.2.4 Inspections, equipment or products anomalies, should terminate inspection, leading to the related report.

8.2.5 During the inspections, found a high percentage of poor or reliability of the bad, it is timely to report to the relevant leadership.

8.2.6 After the inspection, used equipment, apparatus, instruments and measurement equipment, wiped it clean, back into custody place to facilitate the use of the next-time anomaly.

8.2.7 Module components or raw materials, such as LCD, backlight, FPC, IC, silica, ACF qualities and technical parameters has been found in the exceptional standard test into the rear qualified for the production of modules, the modules manufactured products not tested again for the detailed components itself for the quality test we should focus on the modules of the overall appearance, function and reliability test.

8.2.8 Under the inspection records to complete inspection reports, quality certification issued on time, and relevant departments served.

8.3 Test content

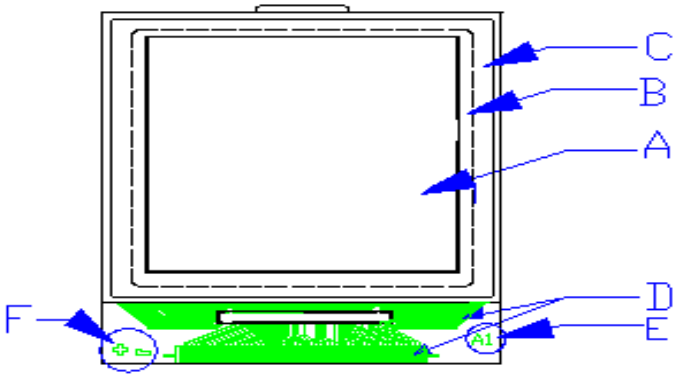
8.3.1 Front the product leaves the factory, as required sampling to determine the number of random sampling to.

8.3.2 To confirm acceptance of the grant installment, names, specifications, models, is the number line, without objection, as required, after being checked.

8.3.3 Visual inspection; Reliability Testing; Check the packaging.

Note: For standard users special requirements, then reference <<Product specifications>> or <<Confirmation sample>> the request.

8.3. 4 Shows the breakdown



A：active area (A.A)；B：visible area (V.A)；C： non-visible area；D：electrode; E：special marker; F：Right S;

8.4 Sampling

8.4.1 Stack the composition: the same model, the same design, the same material, the same manufacturing process in the same cycle of a product or several production constitute approved.

8.4.2 Inspection levels: normal production circumstances, inspection level II (except for dimensions).

8.4.3 Sample program:

Normal inspection, a sample。

8.4.4 Unqualified installment returned to the workshop after reviewed again after passing the submission of a sample test, and the relevant records marked "BACK TO CHECK" indication.

8.5 Detailed examinations

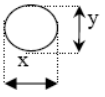
8.5.1 Heavy bug: can be caused failure or significantly reduce the expected performance of product defects.

8.5.2 Light bug: not significantly reduce the expected performance deficiencies; Deviated from the standard but only slightly affected the effective use of products or operating deficiencies.

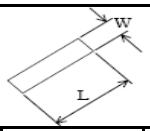
8.6 Checks and award level

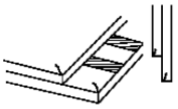
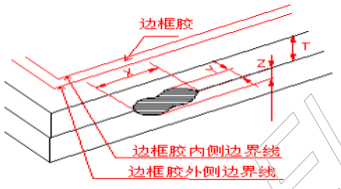
8.6.1 Visual inspection

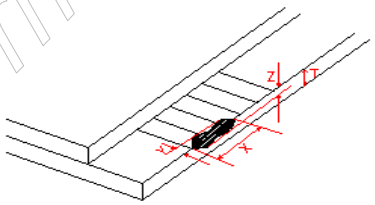
NO	ITEM	Content	Standard	Method	AQL
1	Model confirmed	With Model	An unusual mixed model, not allowed	Compared with the sample (visual or sounding)	0.65

<table>
<tr>
<td rowspan="10">2</td>
<td rowspan="10">Polaroid</td>
<td>bleb</td>
<td>
<table>
<tr><th colspan="4">V.A</th></tr>
<tr><th colspan="2">P1 standard</th><th colspan="2">P1 standard</th></tr>
<tr><th>size</th><th>Allow a few</th><th>size</th><th>Allow a few</th></tr>
<tr><td>Φ≤ 0.30</td><td>ignore</td><td>Φ≤ 0.20</td><td>ignore</td></tr>
<tr><td>0.30＜ Φ≤ 0.50</td><td>2</td><td>0.20＜ Φ≤ 0.30</td><td>1</td></tr>
<tr><td>0.50＜ Φ≤ 0.70</td><td>1</td><td>Φ＞ 0.30</td><td>0</td></tr>
<tr><td>Φ＞ 0.70</td><td>0</td><td></td><td></td></tr>
</table>
Note 1 : F for the bleb diameter; Note 2 : CSTN products even in the films visual bleb, but if black film excluding the region, is qualified goods.
</td>
<td>Open backlight or visual observation, Benchmark testing</td>
<td rowspan="10">1.5</td>
</tr>
<tr><td>Protective film</td><td>1 . Protective film or falling over sideways area of LCD 1/3 be allowed
2. Polaroid protective film off, not allowed</td><td>Visual</td></tr>
<tr><td>Partial affixed</td><td>Polaroid edges can not exceed the LCD glass as a fringe.</td><td>Visual</td></tr>
<tr><td>Scratch</td><td>Check exterior light 6.1 3 --- LCD boxes linear defects</td><td rowspan="2">Open backlight or visual observation, Benchmark testing</td></tr>
<tr><td>Injured</td><td>Check exterior light 6.1 3 --- LCD boxes Point defects.</td></tr>
<tr><td>Wrinkles</td><td>The naked eye can clearly distinguish allowed</td><td>Visual</td></tr>
<tr><td>Cock</td><td>Polaroid edge cock (unglued), not allowed.</td><td>Visual</td></tr>
<tr><td>Water bellows</td><td>Limits of reference samples.</td><td>Visual</td></tr>
<tr><td>Surface dirt</td><td>Surface dirt alcohol cloth to clean the surface dirt is prinkled gently, as if to remove qualified, wiping not to be ineligible.</td><td>Visual</td></tr>
<tr>
<td rowspan="2">3</td>
<td rowspan="2">LCD</td>
<td>Rainbow (box uneven thickness)</td>
<td>Rainbow emphasis on "restrictions" for failure.</td>
<td>Polarizing inspection</td>
<td rowspan="2">0.65</td>
</tr>
<tr>
<td>Point defects boxes</td>
<td> 

Φ=（X +Y）/2，unit(mm)
<table>
<tr><th>size （mm）</th><th>Allow a few</th></tr>
<tr><td>Φ≤0.15</td><td>ignore</td></tr>
<tr><td>0.15＜Φ≤ 0.20</td><td>3</td></tr>
<tr><td>0.20＜Φ≤ 0.25</td><td>2</td></tr>
<tr><td>Φ＞0.25</td><td>0</td></tr>
</table>
</td>
<td></td>
</tr>
</table>

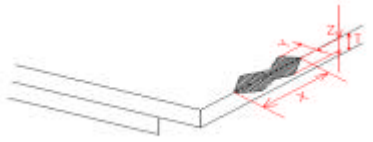
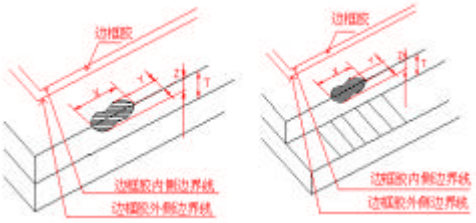
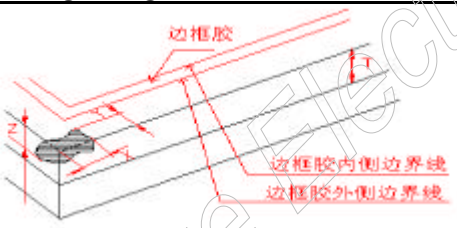
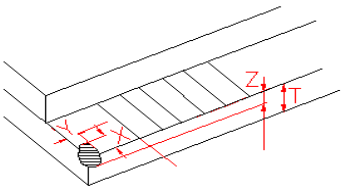
<table>
<tr>
<td></td>
<td></td>
<td>Boxes linear defects</td>
<td>


<table>
<tr><th>Length L</th><th>Width W</th><th>Allow a few</th></tr>
<tr><td>except</td><td>≤0.020</td><td>ignore</td></tr>
<tr><td>≤5.0</td><td rowspan="2">0.020＜W≤0.030</td><td>2</td></tr>
<tr><td>≤3.0</td><td>1</td></tr>
<tr><td>≤1.0</td><td>0.030＜W≤0.05</td><td>1</td></tr>
<tr><td>except</td><td>W＞0.05</td><td>According to determine round</td></tr>
</table>
</td>
<td>Polarizing inspection, Benchmark testing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions</td>
<td>LCD design drawings and not allowed.</td>
<td>Vernier calipers</td>
<td rowspan="3">0.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>glass cracks</td>
<td>

It extends to the glass inside the rift trend fail
</td>
<td>Light -visual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>From top to bottom of the glass breakage</td>
<td>


Y Not more than plastic frame lateral boundary line
X≤7.0mm，check out
Note : T : monolithic glass thickness; X / Y / Z : Damage length / width / thickness
</td>
<td>Caliper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Broken glass Edge</td>
<td>


A．Z≤T, and Y≤0.3mm, X except，allowing
B．Z≤T, and 0.3mm＜Y≤0.5mm, X≤7.0mm，allowing

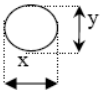
A．Z≤T, and Y≤0.3mm, X except，allowing
B．Z≤T, and 0.3mm＜Y≤0.5mm, X≤3.0mm，allowing
Note : T : monolithic glass thickness; X / Y / Z : Damage length / width / thickness.
</td>
<td>Caliper</td>
</tr>
</table>

3	LCD	ITO back edge of damaged port	 Z＜T,Y≤0.5mm,X≤7mm, allowing Note : T : monolithic glass thickness; X / Y / Z : Damage length / width / thickness; W : extraction electrode (PAD) height.	Caliper	0.65
		Other marginal damage	 Z <T and Y does not exceed the medial plastic frame; ≤ x 7.0mm, allowing Note : T : monolithic glass thickness; X / Y / Z : Damage length / width / thickness	Caliper	
		Angle Damage 1	 Z＜T, Y not excess plastic frame inside the boundary line, X does not exceed plastic frame inside the boundary line, allowing Z≥T, Y not excess plastic frame inside the boundary line, X does not exceed plastic frame inside the boundary line, allowing Note : T : monolithic glass thickness; X / Y / Z : Damage length / width / thickness	Caliper	
		Angle Damage 2	 The X, Y no violations ITO electrode (not including filling line) and there are special requirements for identification under the premise :Z≤T，X≤4.0mm, Y≤4.0mm Note : T : monolithic glass thickness; X / Y / Z : Damage length / width / thickness	Caliper	
4	FPC	FPC bad press	FPC visually evident with the undocking LCD，Unqualified	Visual	0.65

		PFC deviation	FPC deviation，Unqualified	Visual	
		FPC damaged	FPC Wrinkle, torn and damaged, FPC damage to the components Unqualified	Visual	
		FPC surface dirt	Obviously the milk attachment，Unqualified	Visual	
5	Backlighting	Crack	In light district are obvious cracks, or from the brink of a regional extension to the light of the trend of the cracks . Unqualified.	Visual	
		Breaking	The edge or corner breaking display has been exposed. Unqualified	Visual	
6	IC	IC breaking	IC any degree of damage , Unqualified.	Visual	
7	Silica	Silicone Uniformity	Silicone uneven, as well as some regional non-gel, but in some regions and the impact of too many plastic assembly , Unqualified.	Visual	
8	Other	Bad labeling	Marking and labeling requirements of the position and inconsistent, Unqualified.	Visual	
		Shading belt	There were bubbles and the crimp, tilt beyond Zebra paper edge, and polarizer overlapping folds, such as scratches phenomenon to be ineligible,	Visual	1.5
		Separation of components	Backlit LCD screen with the undocking, not allowed.	Visual	0.65

8.6.2 Electrical inspection

NO	Check content	Inspection standards	Inspection Methods	AQL
1	Backlight Power	Current voltage reference value "products specifications" or "sample confirmation" indicators, exceeded failure.	Determining current or constant voltage testing. The use of instruments : multimeters, constant current (pressure) source.	0.65
2	Bad Backlight	a. Overall does not shine、Not missing. b. Luminescence uneven areas (color or brightness) different from the samples or SPEC, not allowed.	Load test Equipment Electricity observation	
3	None Display	not allowed		
4	Perspective wrong	As some blurry or fuzzy part from the opposite direction to see more clearly, and failed.		
5	Low contrast	Show contrast lower, below, " Limited samples" impermissible.		

6	Contrast uneven	The show in different locations, inconsistent contrast, the difference in the " Limited samples " not allowed.		
7	Color difference	"Standard", compared to the naked eye can clearly distinguish，not allowed.		
8	short，turnoff	not allowed.		
9	Dark Line / dark zoned	not allowed.		
10	Deformation display graphics	Deformation ≤ 15% qualified, namely : (A-B) / A, is its admission. Of which : A normal show the width of T, B after deformation of the pen width.		
11	Fixed Point Defects	Refer to 6.1 Visual inspection 3 -- LCD boxes linear defects..		
12	Fixed Point Defects	Refer to 6.1 Visual inspection 3 -- LCD boxes linear defects.		
13	Scintillation black / white dots (block)	 Point / sizes of f = (X + Y) / 2 is flashing black and white in detection module production process or product tests, the display screen with instant conversion of seamless performance defects. A : rather dark / bright, ϕ ≤ 0.40, allowing three; B : more lightly, ϕ ≤ 0.80, allowing three; if necessary, see samples; special circumstances customer prototypes and testing procedures for confirmation	Observation testing procedures	0.65

8.6.3 Packaging Inspection

NO	Check content	Inspection standards	Inspection Methods	AQL
1	Packing method	According <<product specifications>>	Visual	0.65
2	Packet Size	According <<product specifications>>		
3	Packing material	According <<product specifications>>		
4	Printing content	A change color coated shallow, clear, defects such as missing characters not allowed.		
5	Packaging volume	According <<product specifications>>		
6	Complete content	Not neat, inaccurate, inconsistent with the actual , not allowed		
7	Packaging pollution	Packet or packaging materials, which have severe pollution not allowed.		

9 Handling Precautions

9.1 Mounting method

The LCD panel of FORMIKE LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board. Extreme care should be needed when handling the LCD modules.

9.28.2 Caution of LCD handling and cleaning

When polarizes have the protection of the film. Use soft cloth with solvent [Recommended below] and wipe lightly

- **Isopropyl alcohol**
- **Ethyl alcohol**

When the polarizers have not the protection of the film, Use the texture soft cloth to gently wipe the surface products

Do not wipe the display surface with dry or hard materials that will damage the polarizes surface

Do not use the following solvent:

- **Water**
- **Aromatics**

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

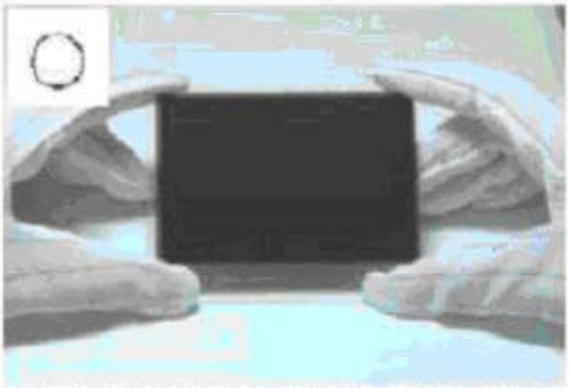
Do not use the following solvent on the pad or prevent it from being contaminated:

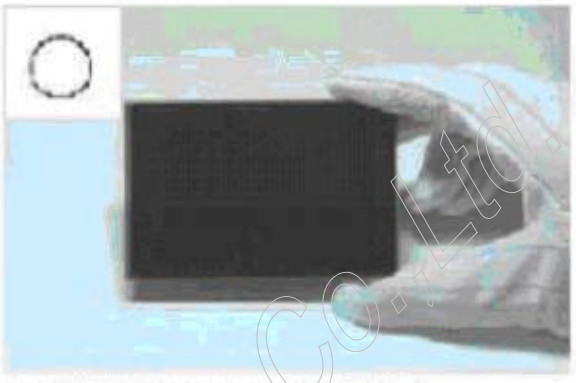
- **Soldering flux**
- **Chlorine (Cl), Salfur (S)**

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss handling or using some materials such as Chlorine (Cl), Sal fur (S) from customer, Responsibility is on customer.

Correct handling:

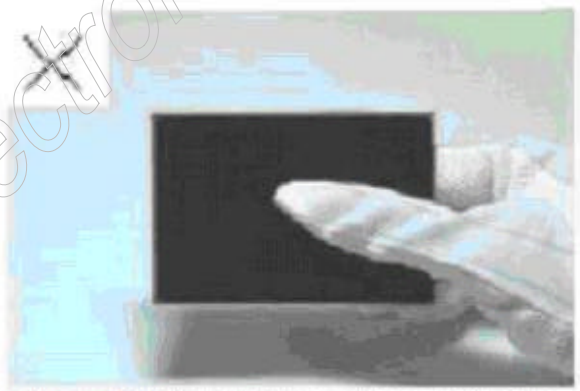




As above photo, please handle with anti-static gloves around LCD edges.

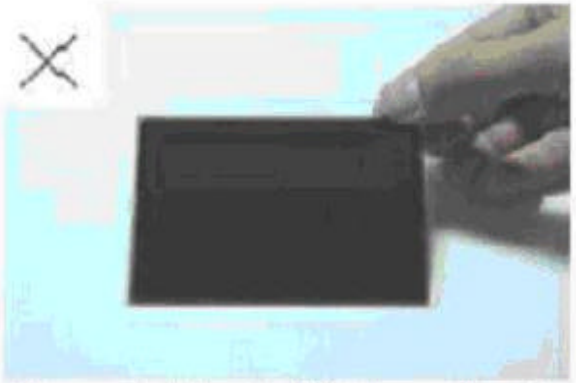
Incorrect handling:

Please don't stack the LCDS.



Please don't hold the surface of LCD.

Please don't operate with sharp stick such as pens.

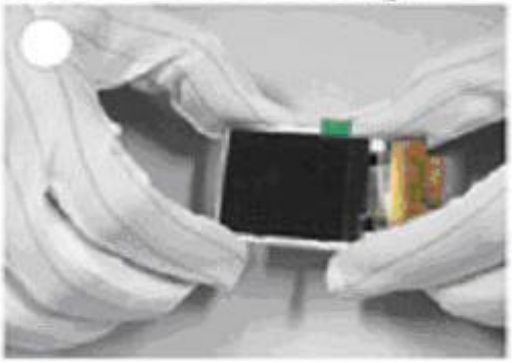


Please don't touch ITO glass without anti-static gloves.

Handing precaution for LCM

LCM is easy to be damaged.
Please note below and be careful for handling!

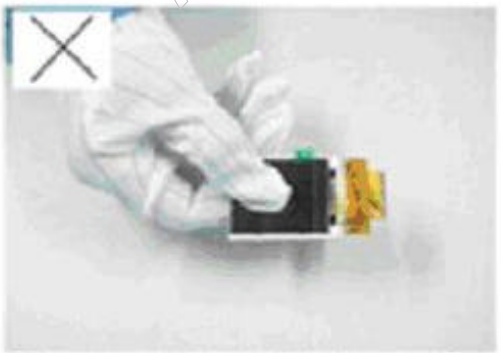
Correct handling:



As above picture,please handle with anti-static gloves around LCM edges.

Incorrect handling:

Please dont't stack LCM.



Please don't hold the surface of panel.

Please don't stretch interface of output, such as FPC cable.

9.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to VDD or VSS. according to the IC specification, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

9.4 Caution for operation

- **It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.**
- **An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.**
- **Response time will be extremely delayed at lower temperature and on the other hand LCD's dark color performance at higher temperature. However those phenomena do not mean malfunction 's LCD low-grade performance, which will come back in the specified operation temperature.**
- **If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.**
- **Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.**

Usage under the maximum operating temperature, 50%Rh or less is required.

9.6 Storage

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

- **Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.**
- **Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.**
- **Avoid scratching the surface products.**

[Recommended for preservation in the original packaging products]

9.7 Safety

- **If a product by the impact or by other factors impact crusher, emergency circumstances recommend the use of acetone or alcohol swabs to clean-out LCD**
- **When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water**

10. Precaution for use

10.1 A limit sample should provide by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

10.2 On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- **When a question is arisen in this specification**
- **When a new problem is arisen which is not specified in this specifications**
- **When an inspection specifications change or operating condition change in customer is reported to FORMIKE , and some problem is arisen in this specification due to the change**
- **When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.**

11. Dimensional Outline