FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

Color- LCD MODULE

MODEL : KWH0133DN01-050A VER:A

【 】 Preliminary Specification

【◆】 Finally Specification

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Design Specification for Approval

Customer				
Product Model	KWH0133DN01-050A		**REV.NO.**	**A**
Designed by	**Zhoubo**	**Checked by**	**XuYuPing**	
Approved by	**Wang Youren**	**Date**	**2007.04.19**	

Final Approval by Customer

Date:

Approved	**Checked**	**Department**

Contents

Revision History

Version	Contents	Date	Note
A	Original	Apr, 2007	

1. Scope

This specification applies to the color STN LCD module which is designed and manufactured by Formike Electronic Co.,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℃)

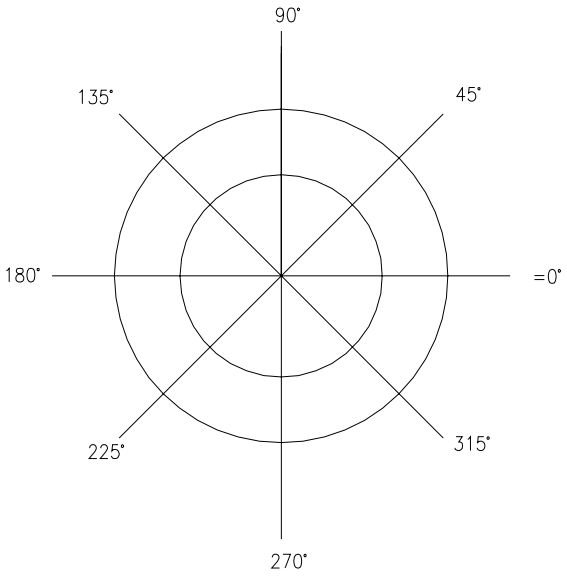
②Td: The time required which the brightness of segment becomes 10% from 90% when waveform is switched to non-selected one from selected one. (f_f=80Hz, Φ=10 ° θ=270 ° at 25℃)

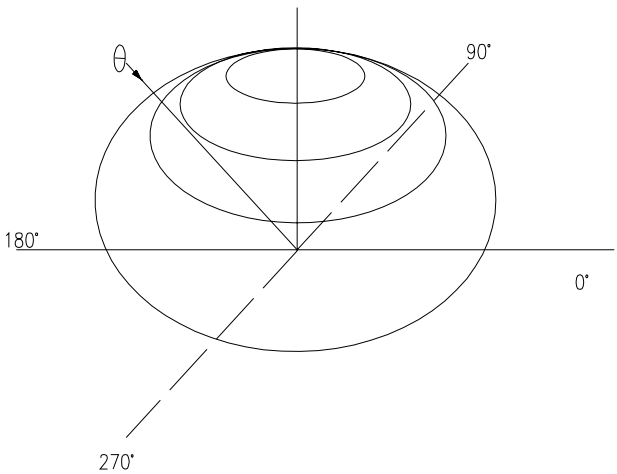
3.2 Definition of Contrast Ratio Cr

Cr=A/B

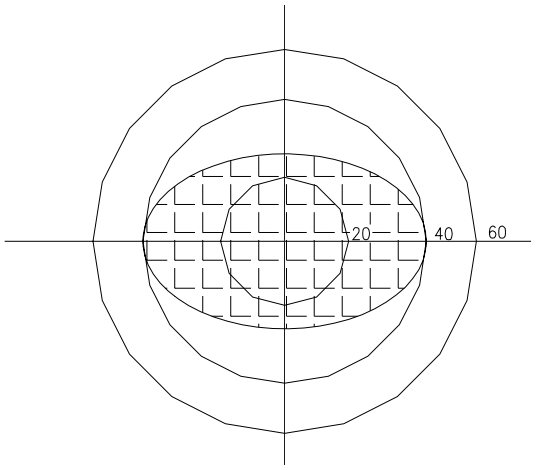
① A: Segments brightness in case of selected waveform
② B: Segments brightness in case of non-selected waveform

3.3 Definition of Angle and Viewing Range





Angular Graph: Constrast Ratio



	θ	Φ	Cr
Right	40 °	90 °	≥2
Left	40 °	270 °	
Front	35 °	0 °	
Back	35 °	180 °	

4. Technology Specifications

4.1 Feature

Item	Standard Value
Display Type	98(W)×RGB×67(H)
LCD Type	CSTN Negative Transmissive
Drive Mothod	1/67 Duty 1/9Bias
Screen Size	1.33 (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	ST7628 (Support 65K)

4.2 Mechanical Specifications

Item	Specifications	Unit
Dimensional Outline	34.7(W) ×46.6(H)×3.40 (D)	mm
Number Of Dots	98xRGBx67	Dots
Viewing Area	30.00(W) ×22.10(H)	mm
Active Area	27.92 (W) ×19.03 (H)	mm
Pixel Pitch	0.095 (W) x 0.285(H)	mm
Dots Size	0.083 (W) ×0.273(H)	mm

4.3 Absolute Max. Rating

Item	Symbol	Min	Max	Unit	Note
Supply voltage	Vdd	-0.3	3.0	V	
Input Voltage	Vin	-0.3	Vdd+0.5	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℃	---	13.33	---	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	0.42	0.47		
	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=2.8V,Ta=-30to70°C)

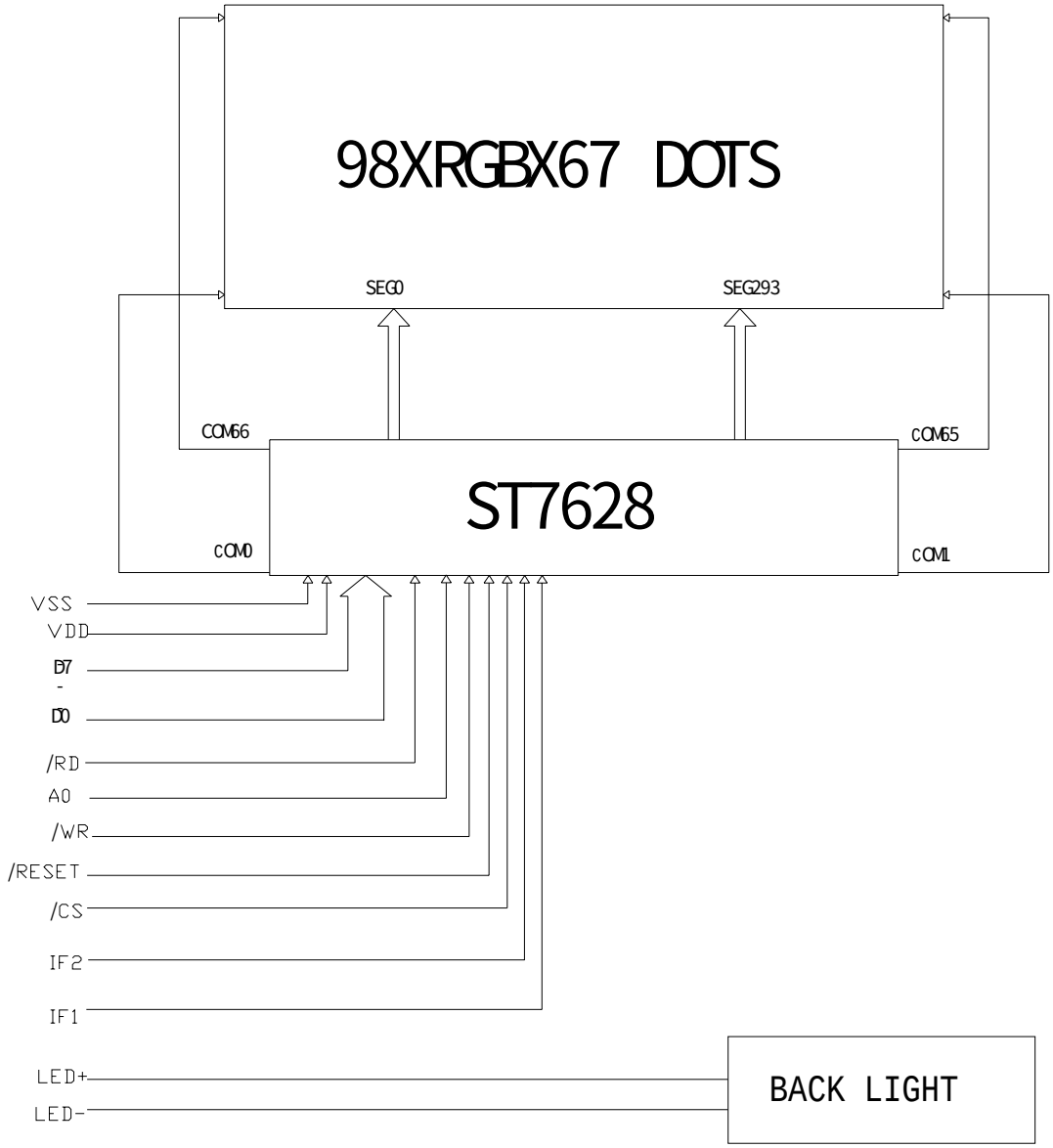
Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage (Logic)		Vdd	-	2.3	2.8	2.9	V	
Input Voltage	"H" level	VIH	VDD	0.7VDD	-	VDD	V	
	"L" level	VIL	VSS	VSS	-	0.3VDD		
Output Voltage	"H" level	VOH	0.8VDD	0.8VDD	-	VDD	V	
	"L" level	VOL	VSS	VSS	-	0.2VDD		
Current Consumption (Main LCD)		Idd1	Normal Mode	-	-	3.0	mA	
LED Supply Voltage		Vled	If=15mA	-	3.2	-	V	

4.5.2 Interface Pin Connections

<table>
<tr><th>NO.</th><th>Symbol</th><th>Definition</th></tr>
<tr><td>1</td><td>K</td><td>Cathode of LED Backlight</td></tr>
<tr><td>2</td><td>A</td><td>Anode of LED Backlight</td></tr>
<tr><td>3</td><td>NC</td><td>No connection</td></tr>
<tr><td>4</td><td>NC</td><td>No connection</td></tr>
<tr><td>5</td><td>NC</td><td>No connection</td></tr>
<tr><td>6</td><td>NC</td><td>No connection</td></tr>
<tr><td>7</td><td>IF1</td><td rowspan="2">Parallel/Serial data input select input
<table><tr><th>IF1</th><th>IF2</th><th>MPU interface type</th></tr><tr><td>L</td><td>H</td><td>80 series 8-bit parallel</td></tr><tr><td>L</td><td>L</td><td>68series 8-bit parallel</td></tr></table></td></tr>
<tr><td>8</td><td>IF2</td></tr>
<tr><td>9</td><td>CS</td><td>Chip select input pins
Data / Instruction I/O is enabled only when /CS is "L".
When chip select is non-active, D0 to D7 become high impedance.</td></tr>
<tr><td>10</td><td>RESET</td><td>Reset input pin. When RESETB is “L”, initialization is executed.</td></tr>
<tr><td>11</td><td>WR</td><td>Read / Write execution control pin
<table><tr><th>MPU type</th><th>RW_WR</th><th>Description</th></tr><tr><td>6800 series</td><td>RW</td><td>Read / Write control input pin
RW = “H”: read RW = “L” : write</td></tr><tr><td>8080 series</td><td>/WR</td><td>Write enable clock input pin
The data on D0 to D7 are latched at the rising
edge of the /WR signal.</td></tr></table></td></tr>
<tr><td>12</td><td>A0</td><td>Register select input pin
A0 = "H": D0 to D7 are display data
A0 = "L": D0 to D7 are control data</td></tr>
</table>

<table>
<tr><td>13</td><td>RD</td><td>Read / Write execution control pin
<table>
<tr><th>MPU type</th><th>RW_WR</th><th>Description</th></tr>
<tr><td>6800 series</td><td>E</td><td>Read / Write control input pin
RW = “H”: When E is “H”, D0 to D7 are in an
output status.
RW = “L”: The data on D0 to D7 are latched
at the falling edge of the E signal.</td></tr>
<tr><td>8080 series</td><td>/RD</td><td>Read enable clock input pin
When /RD is “L”, D0 to D7 are in an output
status.</td></tr>
</table></td></tr>
<tr><td>14</td><td>D0</td><td rowspan="8">Data input/output.</td></tr>
<tr><td>15</td><td>D1</td></tr>
<tr><td>16</td><td>D2</td></tr>
<tr><td>17</td><td>D3</td></tr>
<tr><td>18</td><td>D4</td></tr>
<tr><td>19</td><td>D5</td></tr>
<tr><td>20</td><td>D6</td></tr>
<tr><td>21</td><td>D7</td></tr>
<tr><td>22</td><td>VDD</td><td>Power supply.</td></tr>
<tr><td>23</td><td>VSS</td><td>Ground (0V).</td></tr>
<tr><td>24</td><td>NC</td><td>No connection</td></tr>
</table>

5.Circuit Block Diagram



6. Scheduling

ST7628 Scheduling

Parallel Interface Characteristics bus (8080-series MCU)

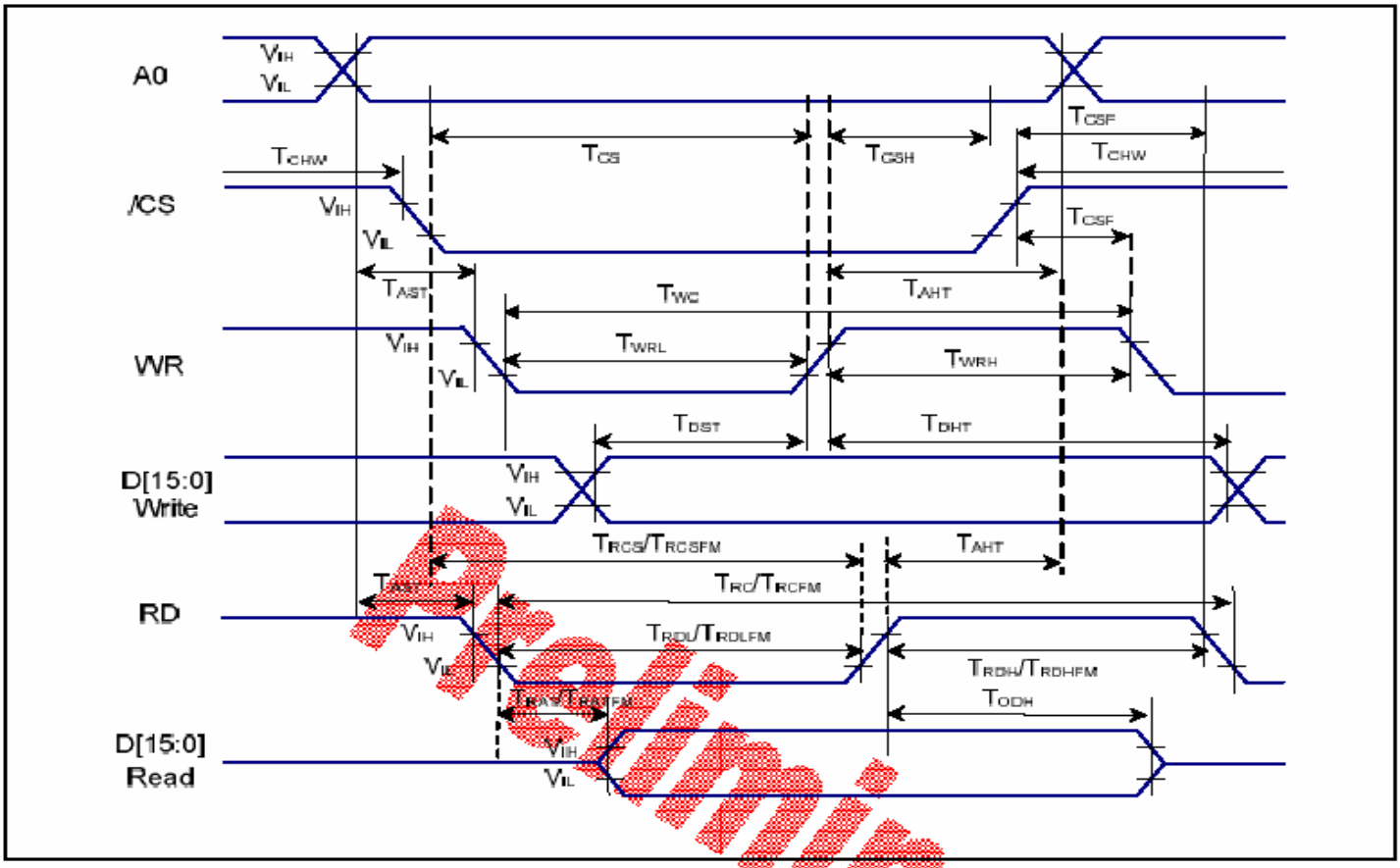
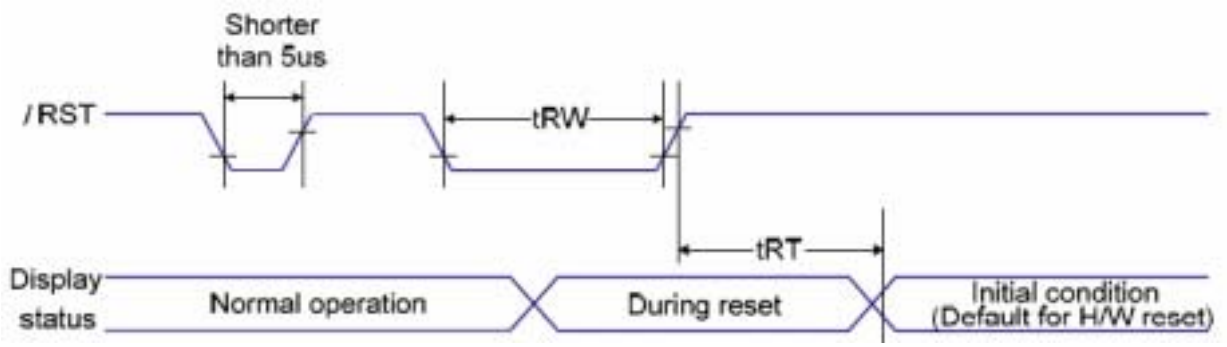


Figure 11.1 Parallel Interface Characteristics bus(8080-series MCU)

(VSS=0V, VDDI=1.65V to 2.9V, VDDA=2.3V to 3.3V,Ta = -30 to 70°C)

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
A0	T_{AST}	Address setup time	10	-	ns	
	T_{AHT}	Address hold time (Write/Read)	10	-	ns	
/CS	T_{CHW}	Chip select "H" pulse width	0	-	ns	
	T_{CS}	Chip select setup time (Write)	35	-	ns	
	T_{RCS}	Chip select setup time (Read ID)	45	-	ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355	-	ns	
	T_{CSF}	Chip select wait time (Write/Read)	10	-	ns	
WR	T_{WC}	Write cycle	100	-	ns	
	T_{WRH}	Control pulse "H" duration	45	-	ns	
	T_{WRL}	Control pulse "L" duration	45	-	ns	
RD (ID)	T_{RC}	Read cycle (ID)	160	-	ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90	-	ns	
	T_{RDL}	Control pulse "L" duration (ID)	45	-	ns	
RD (FM)	T_{RCFM}	Read cycle (FM)	450	-	ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90	-	ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355	-	ns	
D[15:0]	T_{DST}	Data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	T_{DHT}	Data hold time	10	-	ns	
	T_{RAT}	Read access time (ID)	-	40	ns	
	T_{RATFM}	Read access time (FM)	-	340	ns	
	T_{ODH}	Output disable time	20	80	ns	

Reset Input Timing



Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Reset " L " pulse width	/RST	t_{RW}		10	---	us
Reset time		t_{RT}		---	5	ms
				---	120	ms

7. Reliability Test Conditions And Methods

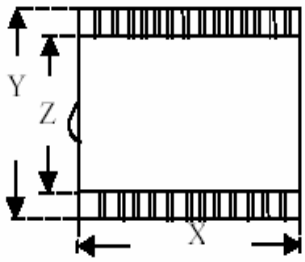
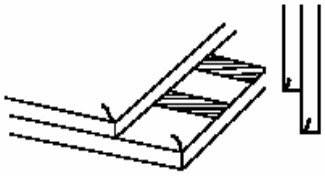
No.	Test item	Test Condition	Inspection after test
1	High Temperature Storage	80℃±2℃ 96h	No Defect of operational function in room temperature are allowable. IDD of LCM in pre-and post-test should follow specification
2	Low Temperature Storage	-30℃±2℃ 96h	
3	High Temperature operating	70℃±2℃ 96h	
4	Low Temperature operating	-20℃±2℃ 96h	
5	High Temperature、 High Humidity Operating	50℃ 90% RH, 96h	
6	Temperature Cycle	Endurance test applying the low and high temperature cycle -20℃ ⟷ 25℃ ⟷ 70℃ ⟷ 25℃ 30min 5min 30min 5min 1 cycle 10 cycles	

Notes:

1. **Judgments should be made after exposure in room temperature for two hours.**
2. **The distill water is used for the high tempetature/humidity test.**
3. **The sample above is individually for every reliability tests condition.**

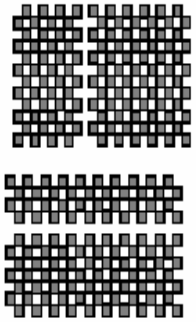
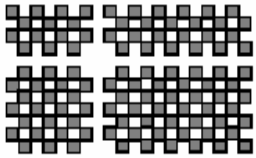
8. Inspection standard

8.1 Visual inspection criterion in cosmetic Glass defect

No	Item	Criteria		Remark/fig
1	Dimension Unconformity (major)	By Engineering Drawing		
2	Cracks (Major)	Linear cracks on panel 【Reject】 Nonlinear crack contrast with broken specification		
3	Glass broken (Minor)	More than one-eighths of length or width of glass 【Reject】		
4	The height, width and deviation of end seal (Minor)	By engineering Drawing		
5	The leakage of end-seal (Minor)	The leakage of end-seal exceeds the view area. 【Reject】		
6	Black dots, Dirty dots, impurities, Polarizer prick (Major)	Spec	Permissible Qty	1: ϕ =(L+W)/2 ,L= Length，W= Width 2:Disregard if out of AA 3:Distance between two dots >5mm
		$\phi \leqq$0.1mm	Disregard	
		$\phi \leqq$0.25mm	2	
7	Fiber, scratch, polarizer folded	Spec	Permissible Qty	1: L =Length，W= Width 2:Less than 2 per cm^2

No	Item	Criteria		Remark/fig
	(Major)	L≦3mm and W≦0.02mm	Disregard	3: Disregard if out of AA
		L≦3mm and W≦0.03mm	3	
		L≦3mm and W≦0.05mm	1	
		L >3mm or W >0.05mm	0	
8	Polarizer concave and convex, bubble	Spec	Permissible Qty	1: ϕ =(L+W)/2 ：L=Length，W=Width 2:Define by customer if out of AA 3:Distance between two spots >5mm 4 Less than 3 per cm^2
		ϕ ≦0.3mm	Disregard	
		0.3mm< ϕ ≦0.7mm	1	
	(Major)	0.7mm< ϕ	0	
9	Polarizer shift	1.The bulge over glass side more than 0.2mm 【Reject】 2.The recess exceeds 1.4mm 【Reject】 3.Front or rear polarizer overtop the top glass area 【Reject】 4. Inner frame of sealant invisible after polarizer attached 【Reject】		Remark: 1:Measure from the side of panel 2.Abide by this criteria if no relevant engineering drawing provided
	(Minor)			
10	Protecting film peels off on polarizer.	1.Turnup of protecting film >1/3of the length or width of its corresponding axis. 【Reject】		Except for special requirements
	(Minor)	2.Turnup of protecting film>15mm 【Reject】		
11	Glue covering	No fully covering of IC,ITO and conductive line area 【Reject】		
	(Minor)			
12	Depth of glue covering	Depth of glue covering overtop front Polarizer 【Reject】		
	(Minor)			

8.2 Electrical criteria

No	Item	Criteria		Remark
1	Missing line (Major)	Missing line 【Reject】		
2	Short cut (Major)	Short cut 【Reject】		
3	Pattern blur ,error code (Major)	Pattern blur ,error code 【Reject】		
4	No display in immobility (Major)	No display in immobility 【Reject】		
5	Flicker of Pattern (Major)	Flicker of Pattern 【Reject】		
6	IDD , Voltage Over (Major)	By engineering specification 【Reject】		
7	Dark light, Flicker (Major)	Dark light, Flicker 【Reject】		
8	Black/White, dirty dots, impurities (Major)	Spec	Permissible Qty	1: ϕ =(L+W)/2 ；L=Length，W=width 2:Disregard if out of A.A 3:Distance between two dots >5mm 3:Inspection by RGB pattern
		$\phi \leqq$0.1mm	Disregard	
		$\phi \leqq$0.25mm	2	

No	Item	Criteria	Remark
9	White pellet (Minor)	By limited sample	1: ϕ =(L+W)/2 ; L=Length , W=Width 2:Disregard if out of AA 3:Distance between two dots >5mm 4: Inspection by RGB pattern
10	Diagonal (Minor)	Not allowed in RGB pattern	
11	Light line Caused by Spacer gather (Minor)	By limited sample	1: Inspection by RGB pattern
12	Display Mura (Minor)	By limited sample	
13	Cross talk (Minor)	By limited sample	
14	Strip Mura (Minor)	By limited sample	

9 Handling Precautions

9.1 Mounting method

The LCD panel of DF 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.

9.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly

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

Do not wipe the display surface with dry or hard materials that will damage the polarizer 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 sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

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

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, 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 packing

- **Module employ LCD elements and must be treated as such.**
- **Avoid intense shock and falls from a height.**
- **To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity**

9.5 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 then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, 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.**
- **A 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.**
- **Storing with no touch on polarizer surface by the anything else.**

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

9.7 Safety

- **It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.**
- **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 be provided 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 Lanser , 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