深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.： TST020CY-T01

Version： V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer’ s Acceptance：	
Approved by	Comment

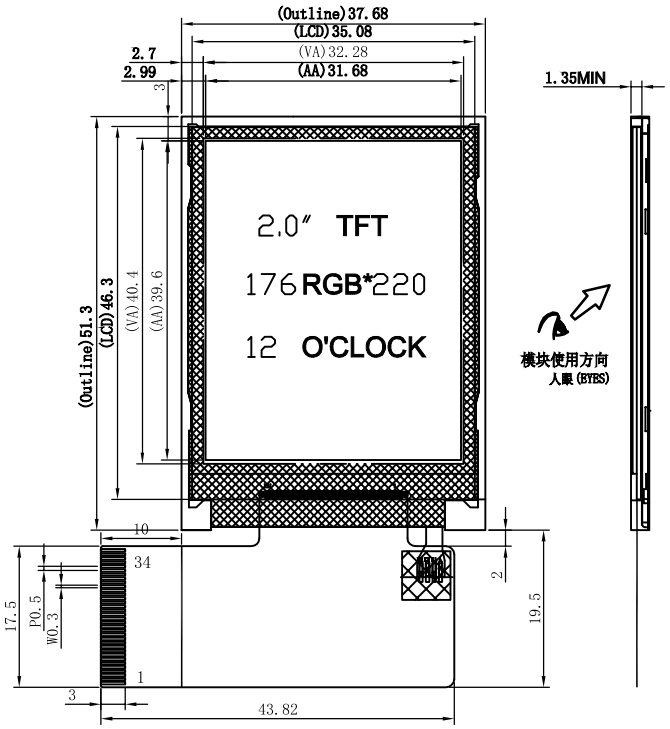
Team Source Display：		
Presented by	Reviewed by	Organized by

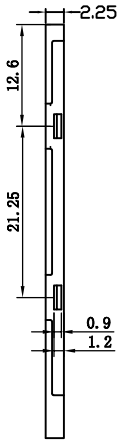
Version No.	Date	Content	Remark
V1.0	2012-04-19	Initial Release	

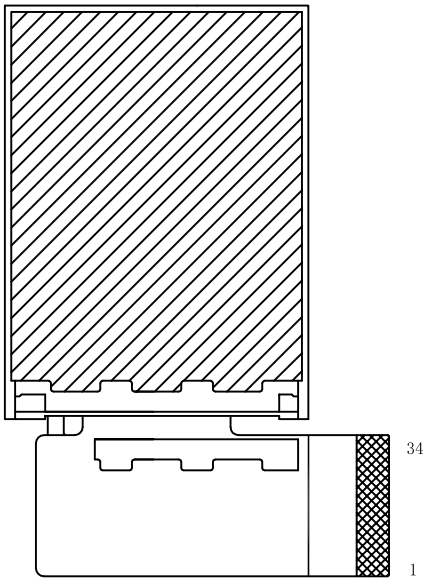
2. General Information

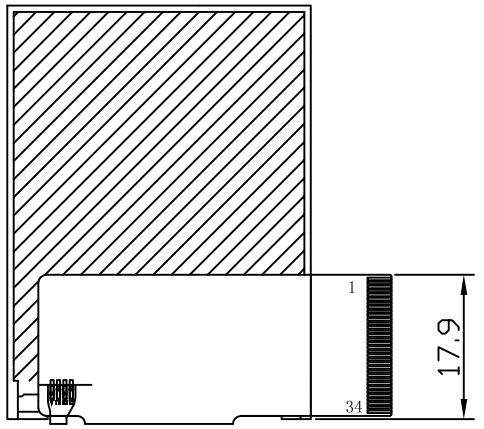
ITEM	STANDARD VALUES	UNITS
LCD type	2.0”TFT	--
Dot arrangement	176（RGB）×220	dots
Driver IC	ILI9225	--
Module size	51.3(L) ×35.1(W) ×2.5(T)	mm
Active area	39.6 (L) ×31.68(W)	mm
Dot pitch	0.18 (L) × 0.18 (W)	mm
Back Light	3 White LED	--
Weight	TBD	G

由 Autodesk 教育版产品制作









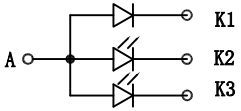
PIN	DISCRIPTION
1	BL-K1
2	BL-K2
3	BL-K3
4	BL-A
5	GND
6	VDD
7	CS
8	RS
9	WR
10	RD
11	IM0
12	DB0
13	DB1
14	DB2
15	DB3
16	DB4
17	DB5
18	DB6
19	DB7
20	DB8
21	IM3
22	DB9
23	DB10
24	DB11
25	DB12
26	DB13
27	DB14
28	DB15
29	DB16
30	DB17
31	RESET
32	VCI
33	VDD
34	GND

一.产品特征（Features）：

1. LCD类型:2.0″ TFT.
2. 分辨率(Resolution)： 176*220
3. 显示色彩(Colr)：65K
4. 驱动IC(Driver IC)： ILI9225G
5. 人眼观察视角(Viewing Angle)： 12 O'CLOCK.
6. 接口类型(Interface Types):MCU8/9 /16/18-bit 可选.
7. 背光类型(Backlight Tyoes)： 3颗LED灯并联。
   电压：3.2V 电流：60mA.
8. 操作温度(Operating temperature)： -20 C° ~70 C° .
9. 储存温度(Storage Temperature)： -30 C° ~80 C° .
10. 储存湿度(Storage Humidity):10RH ~ 40RH .
11. **产品所有物料符合ROHS标准(All materials comply with ROHS standard).**
12. 建议手机镜片的双面胶不要粘到触摸屏银浆以内,以免影响TP性能及使用寿命.
13. VAmds:模块可视区域,建议外壳可视区域比VAmds单边小0.3mm以上
14. 未注尺寸公差:±0.2mm

二.防静电PCB'A设计建议及要求（The antistatic PCB'A design suggestions and requests）：

1.在RESET信号脚上接TVS管，连接TVS管GND要铺完整
2.信号走线，如RD,WR,CS,FMARK,RS走在一起，同时两侧包GND线
3.注意整个FPC接地的完整性(Note the integrity of the entire FPC grounded).



背光电路图:

IM3/IM0=00 i80-system 16-bit interface DB[17:10], DB[8:1]
IM3/IM0=01 i80-system 8-bit interface DB[17:10]
IM3/IM0=10 i80-system 18-bit interface DB[17:0]
IM3/IM0=11 i80-system 9-bit interface DB[17:9]

注:标注 请重点确认 尺寸中带有"*"为重点管控尺寸

深圳市一众显示科技有限公司

版本(Version)	变更记录(Change History)	日期(Date)
V1		
V2		
V3		

视 角 (View):		比例(Proportion):	1 : 1	设 计 (DESIGN)	审 核 (AUDITING)	批 准 (APPROVED)
单 位 (Unit):	M M	页 面 (Page):	1 / 1			
产品型号 (Product Type):	TST020CY-T01 V4					
版 本 (Version):	V0			2015.6.11	2015.6.11	2015.6.11

由 Autodesk 教育版产品制作

4. Interface Description

NO	SYMBOL	FUNCTION
1	BL_K1	BACK LIGHT K
2	BL_K2	BACK LIGHT K
3	BL_K3	BACK LIGHT K
4	BL_A	BACK LIGHT A,3.2V(TYP)
5	GND	GROUND
6	VDD	A supply voltage to the digital circuit. Connect to an external power supply of 1.65 ~ 3.6V
7	/CS	A chip select signal. Low: the chip is selected and accessible
8	/RS	Display data / Command selection pin. RS='1': Display data. RS='0': Command data.
9	WR	Write enable in parallel interface.
10	RD	Read enable.
11	IM0	NOTE 1*
12	DB0	DATA BUS
13	DB1	DATA BUS
14	DB2	DATA BUS
15	DB3	DATA BUS
16	DB4	DATA BUS
17	DB5	DATA BUS
18	DB6	DATA BUS
19	DB7	DATA BUS
20	DB8	DATA BUS
21	IM3	NOTE 1*
22	DB9	DATA BUS
23	DB10	DATA BUS
24	DB11	DATA BUS
25	DB12	DATA BUS
26	DB13	DATA BUS
27	DB14	DATA BUS
28	DB15	DATA BUS
29	DB16	DATA BUS
30	DB17	DATA BUS
31	RESET	A reset pin. Initializes the ILI9225G with a low input. Be sure to execute a Power-on reset after supplying power.
32	VCI	A supply voltage to the analog circuit. Connect to an external Power supply of 2.5 ~ 3.6V. 2.8V(TYP)
33	VDD	A supply voltage to the digital circuit. Connect to an external power supply of 1.65 ~ 3.6V
34	GND	GROUND

NOTE 1*

IM3/IM0=00 i80-system 16-bit interface DB[17:10], DB[8:1]
IM3/IM0=01 i80-system 8-bit interface DB[17:10]
IM3/IM0=10 i80-system 18-bit interface DB[17:0]
IM3/IM0=11 i80-system 9-bit interface DB[17:9]

5. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{DD}	-	-0.3	4.6	V
LCD Driver Supply Voltage	VGH-VSS	-	-0.3	18.5	V
Input voltage	VCI		-0.3	4.6	V
Operating Temperature	T_{OP}	-	-20	+70	°C
Storage Temperature.	T_{ST}	-	-30	+80	°C
Storage Humidity	H_D	Ta < 40 °C	-	90	%RH

6. Optical /Electrical Characteristics V_{DD} = 2.4~3.3V, V_{SS} = 0V, Ta = 25°C

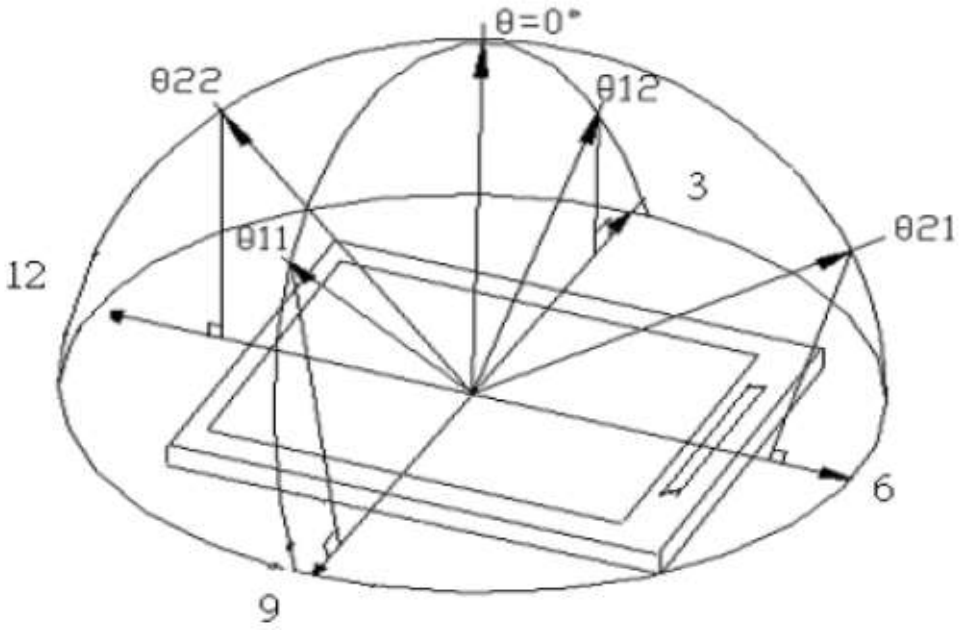
6.1 Electrical Characteristics

Item	Symbol	Condition	Min.	Type	Max.	Unit
Logic Supply Voltage	VDD	-	1.65	**2.8**	3.3	V
Analog Circuit Voltage	VCI		2.5	**2.8**	3.3	
“H” Input Voltage	V_{IH}	-	0.8 V_{DD}	-	V_{DD}	V
“L” Input Voltage	V_{IL}	-	V_{SS}	-	0.2 V_{DD}	V
“H” Output Voltage	V_{OH}	-	0.8V_{DD}	-	V_{DD}	V
“L” Output Voltage	V_{OL}	-	V_{SS}	-	0.2 V_{DD}	V
Supply Current	I_{DD}	V_{DD} = 2.8V	-	**TBD**		mA

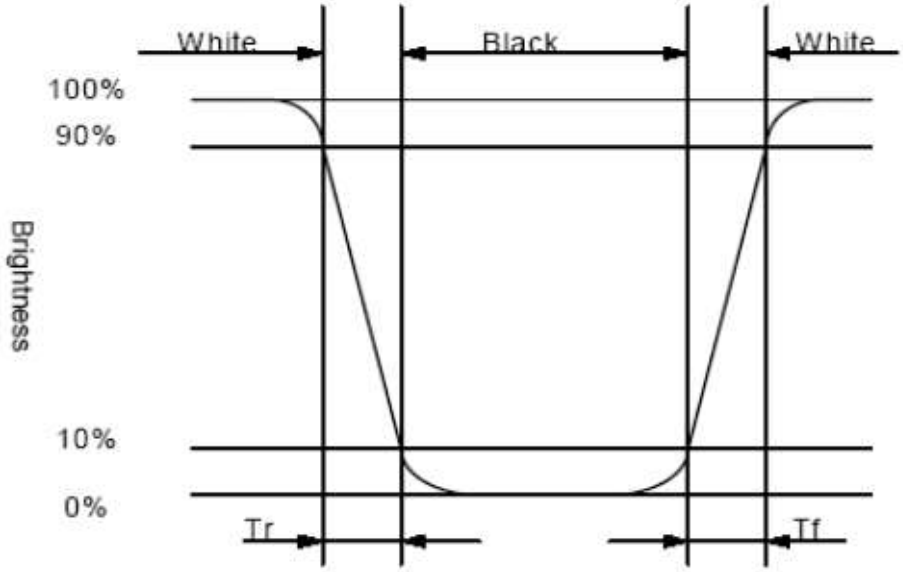
6.2 Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
Back light Supply Voltage	BL_A	IF= 45mA		3.2V	3.5V	
View Angle	θ11, θ12	C≥10,∅=0°	-	45	--	Note6-1
	θ21		-	45	--	Note6-1
	θ22		-	20	--	Note6-1
Contrast Ratio	C	θ=0°, ∅=0°	400	500	-	--
Response Time(rise)	tr	θ=0°, ∅=0°	-	2ms		Note6-3
Response Time(fall)	tf	θ=0°, ∅=0°	-	6ms		Note6-3
Luminance(with LCD)	B	θ =0° ∮ =0°	–	TBD	-	cd/m^2

Note 6-1 : The definitions of viewing angles



Note 6-3 : The definition of response time :



7. Timing Characteristics.

Please refer to ILI9225 DATASHEET.

8. Display Command

Please refer to ILI9225 DATASHEET.

10. Reliability Test Conditions And Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High Temperature Storage	80℃±2℃×200Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1,Air bublle in the LCD. 2,Sealleak. 3,Non-display. 4,Missing segments. 5,Glass crack. 6,Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric Characteristics requirements shall be satisfied.
②	Low Temperature Storage	-30℃±2℃×200Hours	
③	High Temperature Operating	70℃±2℃×120Hours	
④	Low Temperature Operating	-20℃±2℃/120Hours	
⑤	Temperature Cycle(Storage)	-30℃±2℃ ⟺ 25℃ 80℃±2℃ (30min) (5min) (30min) 1cycle Total 10cycle	
⑥	Damp Proof Test	50℃±5℃×90%RH×120Hours	
⑦	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (Packing Condition)	

⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
⑨	ESD Test	Voltage: ± 8KV,R:330Ω ,C:150PF,Air Mode,10times	

REMARK:

1,The Test samples should be applied to only one test item.

2,Sample side for each test item is 5~10pcs.

3,For Damp Proof Test,Pure water(Resistance＞10MΩ)should be used.

4,In case of malfunction defect caused by ESD damage,if it would be recovered to normal state after resetting,it would be judge as a good part.

5,EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.

6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Inspection Standard

This standard apply to C-STN/TFT module

1. Spot check plan：

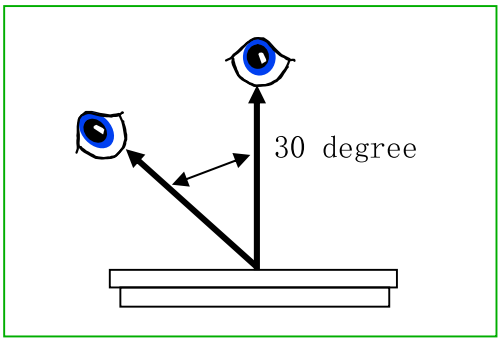
According to spot check level Ⅱ,MIL-STD-105D Level Ⅱ,the rank of accept or reject is below:

3A level、2A level：major non-conformance：AQL 0.25 minor non-conformance：AQL 0.4

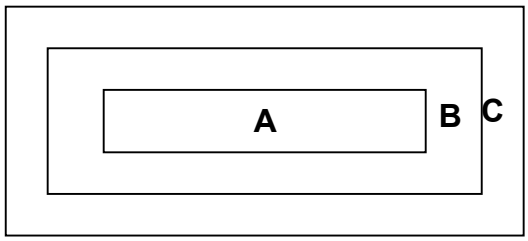
A level：major non-conformance： AQL 0.65minor non-conformance： AQL 1.

2. Inspection condition：

Under daylight lamp 20～40W，product distance inspector'eye 30cm,incline degree 30°。



3. LCD area define：



Area A：display area

Area B：VA area

Area C：out of VA area,not in sight after assemby

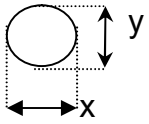
Remark：non-conformance at area C,but is OK that isn't influence raliability of product & assembly by customer.

4. Inspection standard

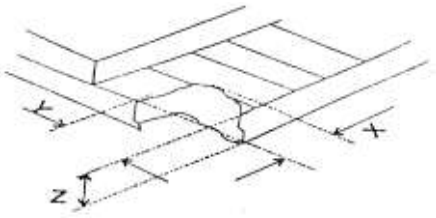
4.1 major non-conformance

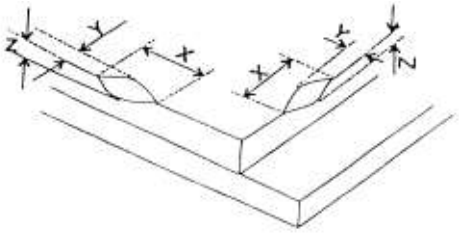
NO.	item	Inspection standard	rate
4.1.1	Function non-conformance	1)no display,display abnormaly 2)Miss line,short 3)B/L no function or function abnormaly 4)TP no function	major
4.1.2	miss	No matter miss what component	
4.1.3	Out of size	Module dimension out of spec	

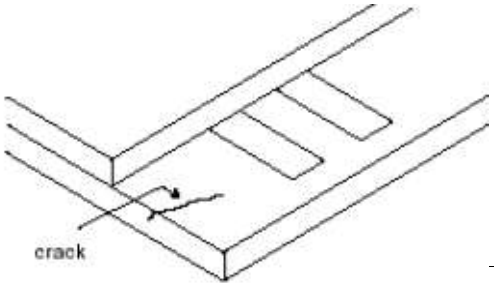
4.2 appearance non-conformance：

<table>
<tr><th>NO.</th><th>item</th><th>Inspection standard</th><th>rate</th></tr>
<tr><td rowspan="2">4.2.1</td><td>Clearly dot</td><td>dot non-conformance define:
$\Phi = \frac{(x+y)}{2}$ 

Most approve 3 dots,dot to dot ≥10mm
<table>
<tr><th rowspan="2">area / size（mm）</th><th colspan="3">Most approve q’ty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.15</td><td colspan="2">ignore</td><td rowspan="5">ignore</td></tr>
<tr><td>0.15＜Φ≤0.20</td><td colspan="2">3</td></tr>
<tr><td>0.20＜Φ≤0.25</td><td colspan="2">2</td></tr>
<tr><td>0.25＜Φ≤0.35</td><td colspan="2">1</td></tr>
<tr><td>0.35＜Φ</td><td colspan="2">0</td></tr>
</table></td><td>minor</td></tr>
<tr><td>Fuzzy dot</td><td>
<table>
<tr><th colspan="2">size(mm)</th><th colspan="3">Most approve q’ty</th></tr>
<tr><th rowspan="2">L（length）</th><th rowspan="2">W(width)</th><th colspan="3">area</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>ignore</td><td>W≤0.03</td><td colspan="2">ignore</td><td rowspan="4">ignore</td></tr>
<tr><td>L≤5.0</td><td>0.03＜W≤0.05</td><td colspan="2">2</td></tr>
<tr><td>L≤3.0</td><td>0.05＜W≤0.07</td><td colspan="2">1</td></tr>
<tr><td></td><td>0.07＜W</td><td colspan="2">Treat with dot non-conformance</td></tr>
<tr><td colspan="5">Most approve 3 lines,line to line ≥10mm</td></tr>
</table></td><td>minor</td></tr>
</table>

<table>
<tr><td>4.2.2</td><td>polarizer position</td><td>1polarizer attach meet drawing,disallow out of LCD.
2polarizer must cover display area （special require unless）.</td><td>minor</td></tr>
<tr><td>4.2.3</td><td>LCD non-conf ormance</td><td>(i) crash at side（remark: S=ITO length）
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>⩽3.0</td><td>⩽S</td><td>ignore</td></tr></table>Crash disallow extend to ITO or seal.</td><td>minor</td></tr>
<tr><td rowspan="3">4.2.4</td><td rowspan="3">Contrast voltage warp</td><td>(ii)commonly surface scathe
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>⩽2.0</td><td><frame edge</td><td>ignore</td></tr></table></td><td>minor</td></tr>
<tr><td>(iii) crack
Disallow extend crack
 
</td><td>major</td></tr>
<tr><td>VOP/Vlcd voltage of confirmed sample±0.15V</td><td>minor</td></tr>
<tr><td>4.2.5</td><td>color</td><td>Color & luminance of module scope reference spec</td><td>minor</td></tr>
<tr><td>4.2.6</td><td>Cross talk</td><td>Reference confirmed limit sample</td><td>minor</td></tr>
</table>

12. Handling Precautions

12.1 Mounting method

TSLCD's 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.

12.2 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.

12.3 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.

12.4 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

12.5 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.

12.6 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

12.7 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

13. Precaution For Use

13.1

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.

13.2

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 NS Co.,ltd , 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.

14. Packaging Required

PARAMETER	Specification	Unit
Outside box	390(L) x 350(W) x 480(H)	mm
Inside pearl wool box	330(L)x185(W)x110(H)	mm
Product quantity of Inside box	64	pcs
Total product quantity	64*8=512	pcs
Total weight	11 ±0.5	Kg