

Specification

For

LCD Module

HTT128128N04A144
Rev.A

CUSTOMER APPROVED:

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PREPARED BY	CHECKED BY	APPROVED BY

RECORDS OF REVISION

Date	Rev.	Description	Note	Page
2013-2-21	A	Preliminary		

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Note : For detailed information please refer to IC data sheet :ST7735S.

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	128*(R,G,B)*128 Dots
LCD Type	Color TFT , Transmissive
Screen Size(inch)	1.44 (Diagonal)
Viewing Direction	12 O'clock
Backlight	White Edge LED B/L
Weight	3.9g
Interface	I8080 8 bits Data Bus
Other(controller/driver IC)	ST7735S

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	30.9(W) * 36.51(L) * 2.3(H)	mm
Active Area	25.5(W) * 26.5 (L)	mm
Dots Pitch	0.1992 (W)*0.207(L)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V _{DD}	-	-0.3	3.6	V
Input Voltage	V _{IN}	-	V _{SS} -0.3	V _{DD} +0.3	V
Operating Temperature	T _{OP}	-	-20	70	°C
Storage Temperature	T _{ST}	-	-30	80	°C
Storage Humidity	H _D	Ta < 40 °C	20	90	%RH

1.4 DC Electrical Characteristics

 $V_{DD} = 3.3\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$, $T_a = 25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	-	3.0	3.3	3.6	V
“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}	-	0.8 V_{DD}	-	V_{DD}	V
“L” Output Voltage	V_{OL}	-	V_{SS}	-	0.2 V_{DD}	V
Supply Current	I_{DD}	$V_{DD} = 3.3\text{V}$	-	1.9	5	mA
LCM Driver Voltage	V_{COM}	$V_{COM}-V_{SS} (-20^\circ\text{C})$	-	-	-	V
		$V_{COM}-V_{SS} (25^\circ\text{C})$	-	-	-	
		$V_{COM}-V_{SS} (70^\circ\text{C})$	-	-	-	

1.5 Optical Characteristics

 $T_a = 25^\circ\text{C}$

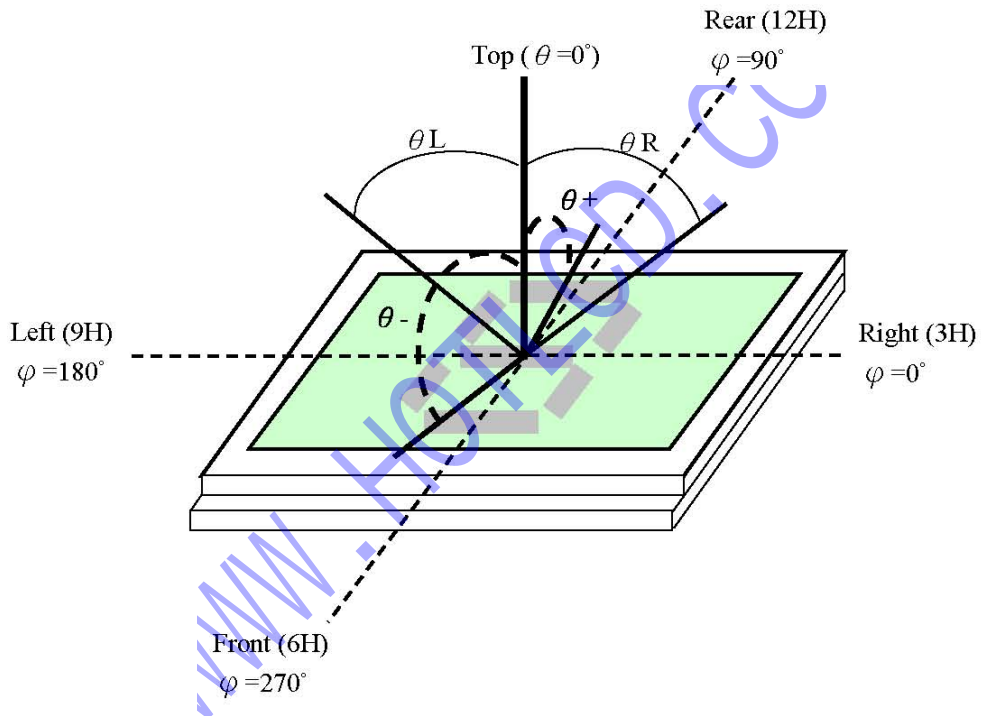
Item	Symbol	Conditions	Min.	Typ.	Max.	Reference	
View Angle	TOP	$C \geq 2.0, \varnothing = 0^\circ$	-	35°	-	Notes 1 & 2	
	BOTTOM		-	15°	-		
	LEFT		-	45°	-		
	RIGHT		-	45°	-		
CIE *1	WHITE	$T_a = 25^\circ$ $\varnothing_x, \varnothing_y = 0^\circ$	X	0.285	0.305	0.325	
			Y	0.314	0.334	0.354	
	RED		X	0.588	0.608	0.628	
			Y	0.296	0.316	0.336	
	GREEN		X	0.285	0.305	0.325	
			Y	0.536	0.556	0.576	
	BLUE		X	0.115	0.135	0.155	
			Y	0.117	0.137	0.157	
Contrast Ratio	C	$\varnothing_y = 5^\circ, \varnothing = 0^\circ$	250	350	-	Note 3	
Response Time(rise)	tr	$\varnothing = 5^\circ, \varnothing = 0^\circ$	-	10ms	20 ms	Note 2	
Response Time(fall)	tf	$\varnothing = 5^\circ, \varnothing = 0^\circ$	-	15ms	30 ms	Note 2	

*1: This value will be changed while mass product.

Note 1.

Optical characteristics-2

Viewing angle

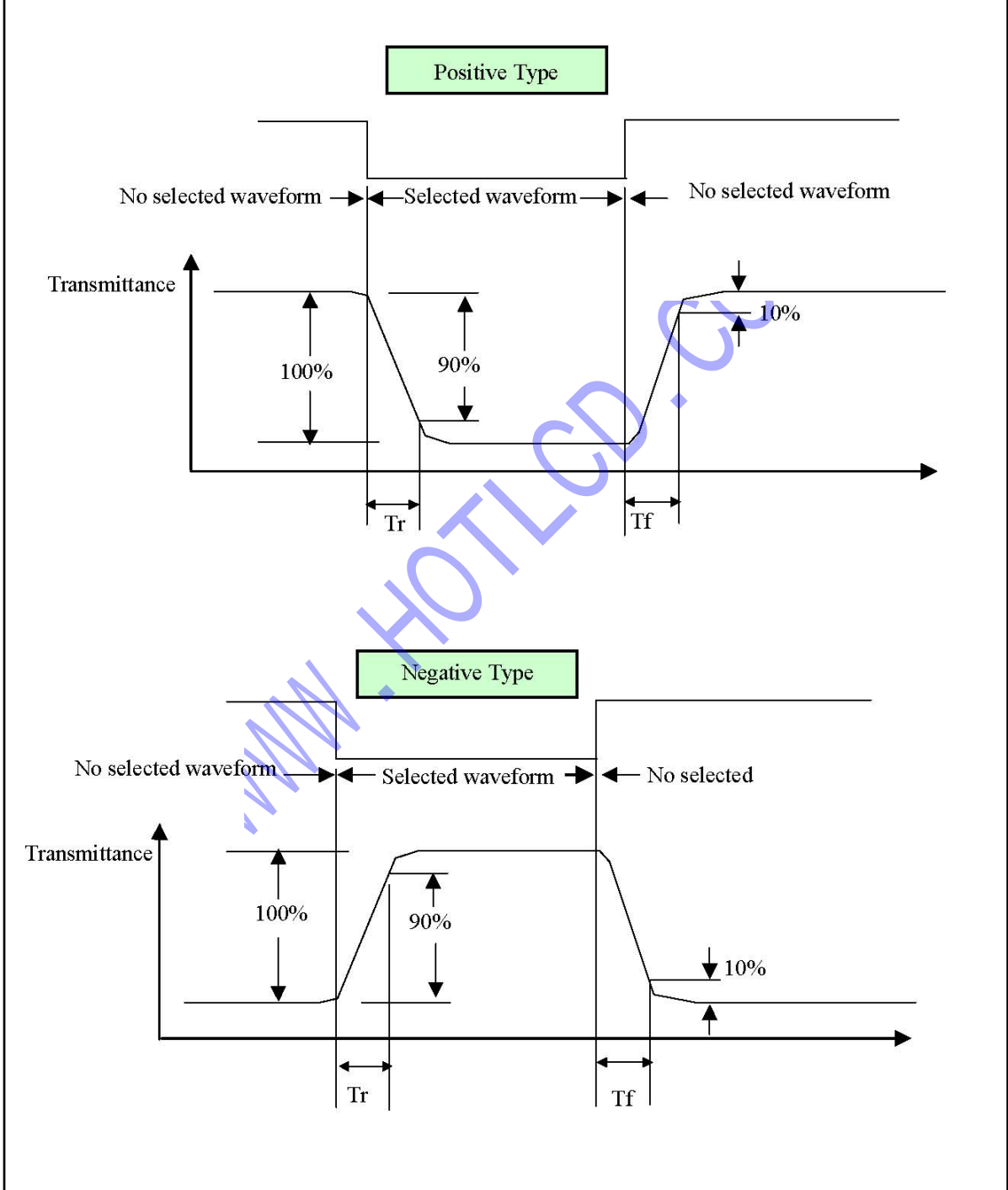


Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time



Electrical characteristics-2

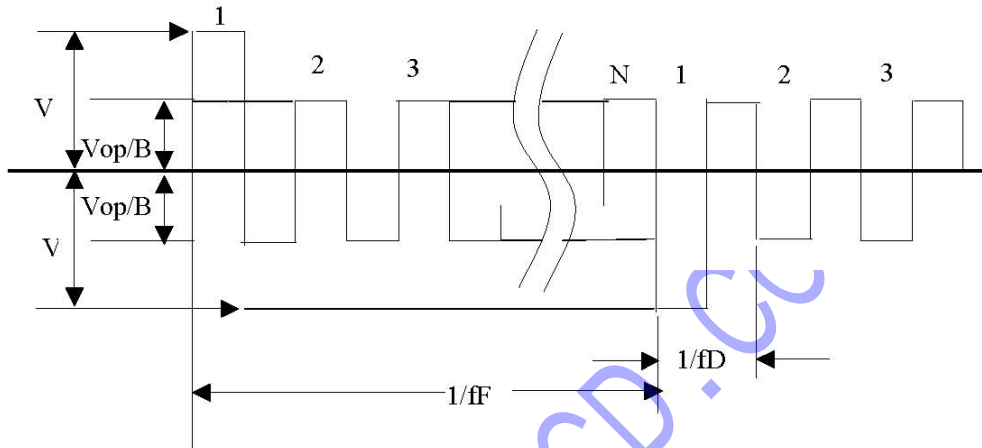
※2 Drive waveform

V_{op} : Drive voltage fF : Frame frequency

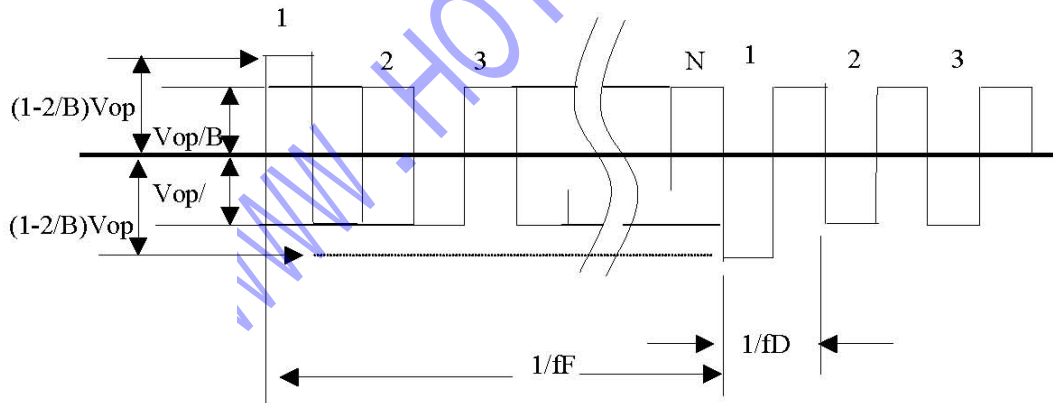
$1/B$: Bias fD : Drive frequency

N : Duty

(1) Selected waveform



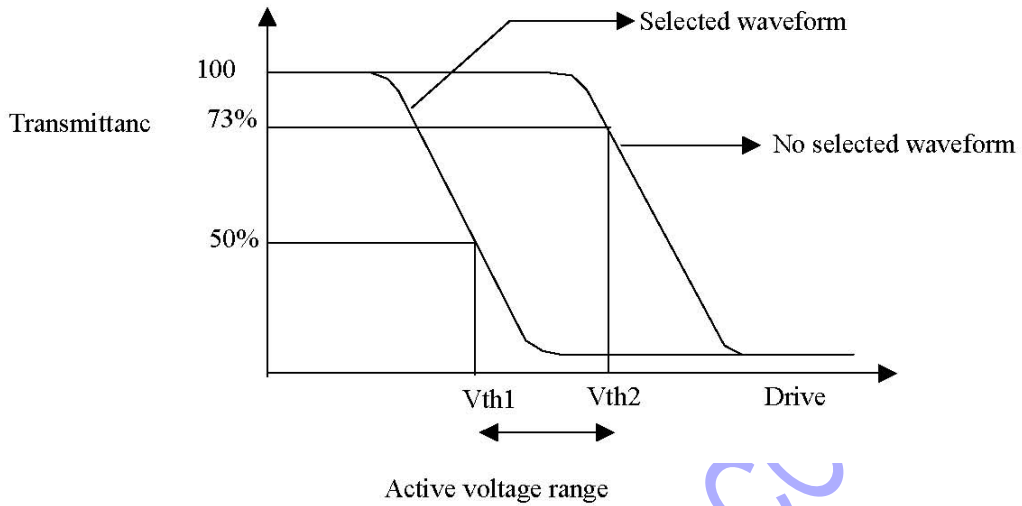
(2) Non- Selected wave form



Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak / 2 = 1 period

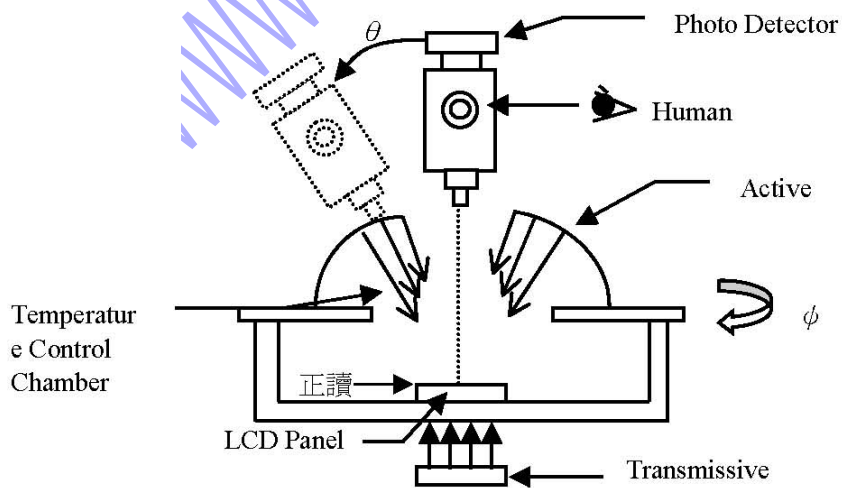
Note 3. : Definition of Vth



	Vth1	Vth2
View direction	10°	40°
Drive waveform	(Selected waveform)	(No selected waveform)
Transmittance	50%	73%

※1 Contrast ratio
 = (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System



Measuring System: Autronic DMS-803

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	I_F	One LED	-	20	mA
Reverse Voltage	V_R	One LED	-	5	V
Power Dissipation	P_d	One LED	-	100	mW
Operating Temperature	T_{OP}	-	-20	70	°C
Storage Temperature	T_{ST}	-	-30	80	°C

Electrical / Optical Characteristics

$T_a = 25^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$I_F = 15\text{ mA}$	2.9	3.2	3.4	V
Forward Current	I_F		-	15	-	mA
Average Brightness (with LCD)	I_v	$I_F = 18\text{ mA}$	140	160	-	cd/m ²
CIE Color Coordinate (Without LCD)	X	$I_F = 18\text{ mA}$	0.25	0.27	0.30	-
	Y		0.25	0.28	0.30	
Color	White					

2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram

2.2 Interface Pin Description

Pin No.	Symbol	Function
1	GND	POWER Ground
2	/RESET	System reset
3	RS	Register select
4	/WR	Write signal
5	/RD	Read signal
6	DB0	Data Bus
7	DB1	Data Bus
8	DB2	Data Bus
9	DB3	Data Bus
10	DB4	Data Bus
11	DB5	Data Bus
12	DB6	Data Bus
13	DB7	Data Bus
14	/CS	Chip select
15	VCCIO	Power supply
16	IC-ID	No connection
17	VDD	Power supply
18	VLED+	Backlight anode
19	VLED-	Backlight cathode
20	GND	Ground

2.3 Timing Characteristics

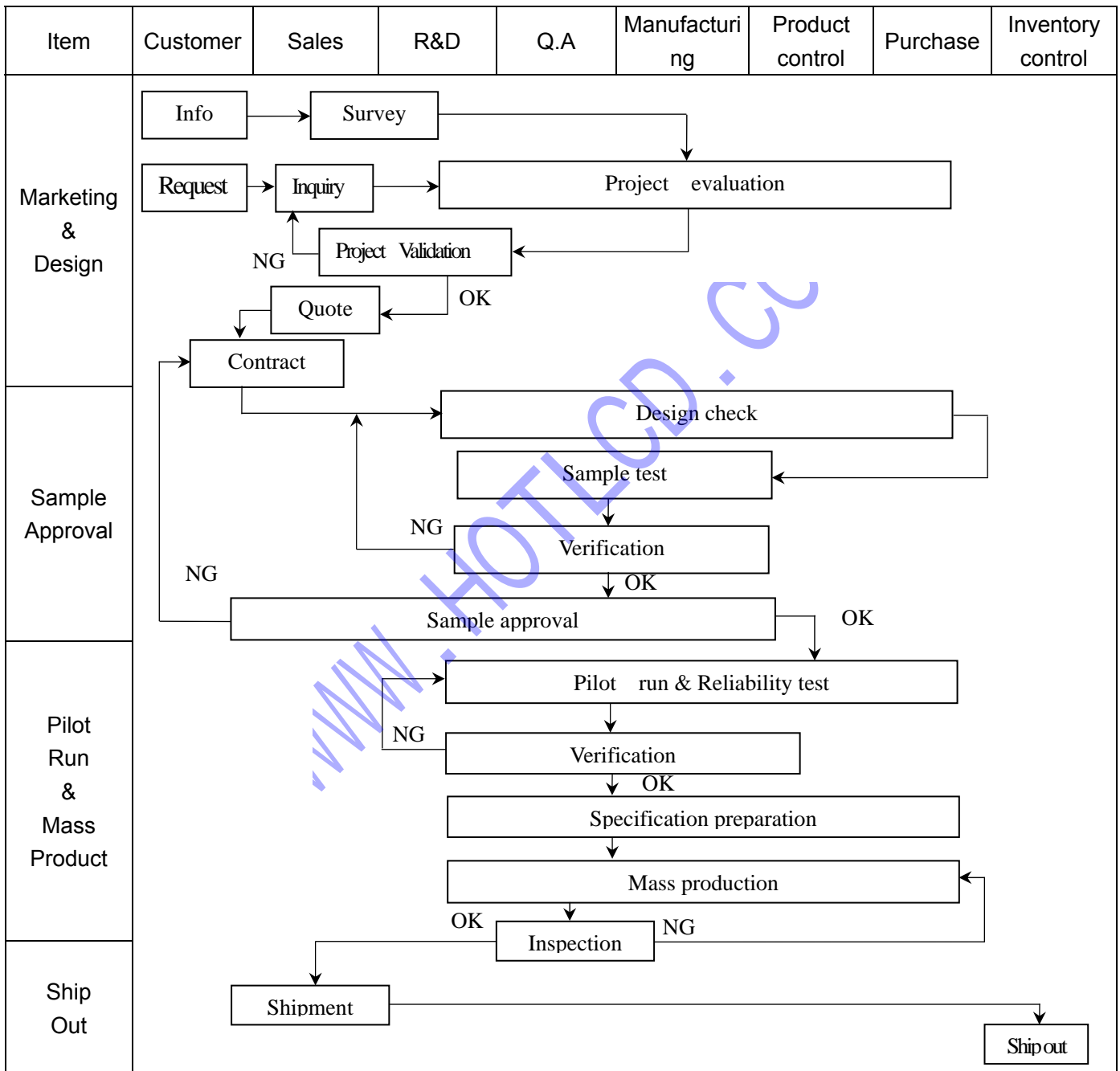
Please refer to ST7735S Data sheet.

2.4 Display Command

Please refer to ST7735S Data sheet.

3. QUALITY ASSURANCE SYSTEM

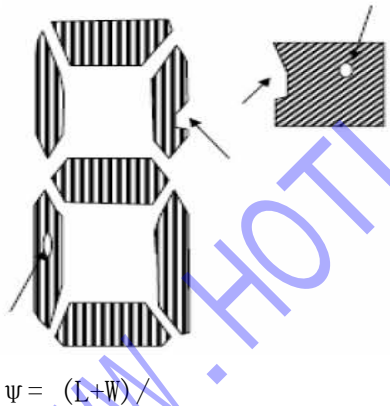
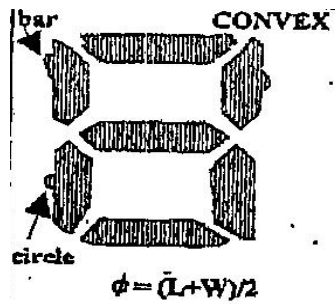
3.1 Quality Assurance Flow Chart

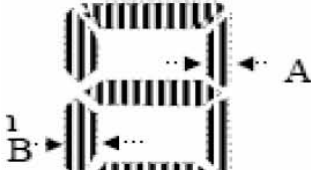
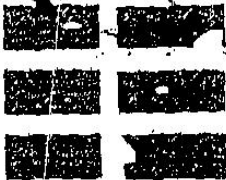
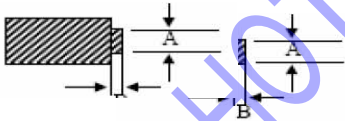
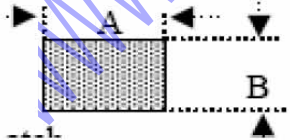


3.2 Inspection Specification

Electrical inspection failure

Defect	Define/description	Criteria
1. 开路/不显示 (主要) Open circuit/no displaying (maj)	线路断开造成缺划或不显 missing or no displaying due to Circuit open	拒收 reject
2. 短路 (主要) short circuit (maj)	线路短接 Circuit short	拒收 reject
3. 光暗 (主要) Dim (maj)	部分笔划比正常状态明显显示淡 part of figures display dim than normal obviously	拒收 reject
4. 显示淡 (主要) all display dim (maj)	比样板明显显示淡 all the figure display dimmer than sample	如有特殊要求参考样板范围 if required strictly, refer to the signed sample limit. 一般情况下, $ V_{th, \text{产品}} - V_{th, \text{样品}} \leq 0.05V$. Normally, $ V_{th, \text{product}} - V_{th, \text{sample}} \leq 0.05V$.
5. 鬼影 (主要) ghost (maj)	不该显示的部分显示 the figures in Voff state display	如有特殊要求参考样板范围 if required strictly, refer to the signed sample limit. 一般情况下, $ V_{th, \text{产品}} - V_{th, \text{样品}} \leq 0.05V$. Normally, $ V_{th, \text{product}} - V_{th, \text{sample}} \leq 0.05V$.
6. 大电流 (主要) Large current (maj)	功耗大于规范 the current larger than the engineer SPEC.	不允许 Reject
7. 反应慢 (主要) Response slow (maj)	响应速度超出规范 The response time is longer than the Spec.	不允许 Reject
8. 视角方向错 (主要) Wrong viewing angle (maj)	视角方向与工程规定不一致 Viewing angle different from spec. (Or sample)	不允许 Reject

9. 扭字 (主要) Twist segment (maj)	个别字体或笔划的视角方向与正常方向不一致。 Some segments displaying with the wrong viewing angle.	不允许 Reject																											
10. 化字 (主要) Segment pervasion (maj)	字体像浸水似的扩散 The displaying segment pervasion	不允许 Reject																											
11. 多余线路 (主要) Extra lines (maj)	不该显示的 ITO 走线在通电时显示出来了 Displaying the extra lines than the Spec	不允许 Reject																											
12. 针孔, 白点 (次要) Pinhole, white spots (min)	针孔, 图白, 图缺 PIN hole, lack  $\psi = (L+W)/2$	<table border="1"> <thead> <tr> <th>规格 Specification</th> <th>允许个数 acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\psi \leq 0.1 \text{ mm}$</td> <td>无视(不可密集) disregard(no gathering)</td> </tr> <tr> <td>$0.10\text{mm} < \psi \leq 0.2 \text{ mm}$</td> <td>3</td> </tr> <tr> <td colspan="2">(两点距离需 $\geq 5 \text{ mm}$) (The distance between two points $\geq 5\text{mm}$)</td> </tr> <tr> <td>$0.2\text{mm} < \psi \leq 0.25 \text{ mm}$</td> <td>1</td> </tr> <tr> <td>$\psi > 0.25\text{mm}$</td> <td>0</td> </tr> <tr> <td>$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character</td> <td>0</td> </tr> <tr> <td>$0.10 \text{ mm} < \psi \leq 0.15\text{mm}$</td> <td>2</td> </tr> <tr> <td colspan="2">(单片LCD之总个数需 ≤ 3个, 两点距离 $\geq 5\text{mm}$). total amount on single LCD sheet ≤ 3, The distance between two points $\geq 5\text{mm}$</td> </tr> </tbody> </table>	规格 Specification	允许个数 acceptable number	$\psi \leq 0.1 \text{ mm}$	无视(不可密集) disregard(no gathering)	$0.10\text{mm} < \psi \leq 0.2 \text{ mm}$	3	(两点距离需 $\geq 5 \text{ mm}$) (The distance between two points $\geq 5\text{mm}$)		$0.2\text{mm} < \psi \leq 0.25 \text{ mm}$	1	$\psi > 0.25\text{mm}$	0	$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character	0	$0.10 \text{ mm} < \psi \leq 0.15\text{mm}$	2	(单片LCD之总个数需 ≤ 3 个, 两点距离 $\geq 5\text{mm}$). total amount on single LCD sheet ≤ 3 , The distance between two points $\geq 5\text{mm}$		<table border="1"> <thead> <tr> <th>规格 Specification</th> <th>允许个数 acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\psi \leq 0.2\text{mm}$</td> <td>3</td> </tr> <tr> <td>$\psi > 0.25\text{mm}$</td> <td>0</td> </tr> <tr> <td>$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character</td> <td>0</td> </tr> </tbody> </table>	规格 Specification	允许个数 acceptable number	$\psi \leq 0.2\text{mm}$	3	$\psi > 0.25\text{mm}$	0	$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character	0
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13. 突點:(次要) Bar (min)	 $\phi = (L+W)/2$	<table border="1"> <thead> <tr> <th>规格 Specification</th> <th>允许个数 acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\psi \leq 0.2\text{mm}$</td> <td>3</td> </tr> <tr> <td>$\psi > 0.25\text{mm}$</td> <td>0</td> </tr> <tr> <td>$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character</td> <td>0</td> </tr> </tbody> </table>	规格 Specification	允许个数 acceptable number	$\psi \leq 0.2\text{mm}$	3	$\psi > 0.25\text{mm}$	0	$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character	0	<table border="1"> <thead> <tr> <th>规格 Specification</th> <th>允许个数 acceptable number</th> </tr> </thead> <tbody> <tr> <td>$\psi \leq 0.2\text{mm}$</td> <td>3</td> </tr> <tr> <td>$\psi > 0.25\text{mm}$</td> <td>0</td> </tr> <tr> <td>$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character</td> <td>0</td> </tr> </tbody> </table>	规格 Specification	允许个数 acceptable number	$\psi \leq 0.2\text{mm}$	3	$\psi > 0.25\text{mm}$	0	$\psi > 1/3$ 字节宽 $\psi > 1/3$ width of the character	0										
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	$\psi = (L+W)/2$	接收标准:1个字最多1個, 全部最多3 個 Acceptable case: per character, not more than 1 per cell, not more than 3.	
14. 組合歪 (次要) assembly not match (min)	 $\psi = (L+W)/2$	1. $B-A > 0.25\text{mm}$ 拒收 (reject) 2. $A/B \cong 3/4$ 拒收 (reject)	
15. 点阵针孔\缺口 (次要) Dot Matrix Pin Hole Lack (min)	Dot Matrix: Pin Hole Lack 	规格 Specification	允许个数 Acceptable number
		$\phi \leq 0.1\text{mm}$	Disregard
		$0.1\text{mm} < \phi \leq 0.2\text{mm}$ (Distance between two points $\geq 10\text{mm}$)	3
		$0.2\text{mm} < \phi \leq 0.25\text{mm}$	1
		$\phi > 0.25\text{mm}$	0
16. 图凸 (次要) Convex (min)		1. $A > 0.25\text{mm}$	拒收 Reject
		2. $B > 0.05\text{mm}$	
17. 点距阵组合歪(次要) assembly not match(min)	assembly not match(dot-matrix) 	1. A 变形: $ A-\text{规格值} / \text{规格值} \leq 15\%$ Distortion of A: $ A-\text{define} / \text{define} \leq 15\%$	允许 Accept
2. B 变形: $ B-\text{规格值} / \text{规格值} \leq 15\%$: Distortion of B : $ B-\text{define} / \text{define} \leq 15\%$			
18 显示黑点(黑斑) (次要) Black spot (min)	显示时出现点状或斑状更黑的部位 Black spots in displaying	正常显示时对比不明显, 接收。明显时按点状缺陷看 if not clear in normal state of working, regardless. If defect clear, according to item of black/white spot.	

Appearance inspection

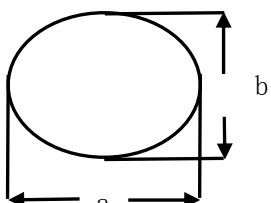
不良项目	内容或图示	判定标准
1. 漏液(主要) 1. Leakage (maj)	盒内液晶漏出 LC in the cell leaks out.	不允许 Reject
2. 玻璃裂痕(主要) 2. Cracks (maj)	玻璃破裂 ITO glass crack	不允许 Reject
3. 排列不良 3. Malalignment	LC 排列不一致, 有不通出, 颜色与正常不一致。 Difference due to misalignment	点状或线状的参照点状或线状不良标准 Refer to the standard of spots and lines.
4. 封口宽、高(次要) 4. End sealant over height, over width (min)		超出在产品资料规定尺寸范围, 不允许; According to engineering spec.
5. 封口胶(次要) 5. Permeating resin (min)		有封口挡板: 超出封口挡板不允许; Baffle: not overstep baffle 无封口挡板: 不允许超出 C 区; No baffle: The resin exceed the C zone, reject.
6. 边框肥大/偏(次要) 6. seal line larger/smaller (min)	边框胶的宽度比规定粗或细 The width of the seal larger or smaller than the define.	1. 参照规范。Refer to the Spec. 2. 一般情况: A: 实测值 the measurement value B: 规范值(样品值) Spec. (or Value of sample) $ A-B /B \leq 1/3$
7. 彩虹(次要) 7. Rainbow (min)	同一个 LCD 有两种或以上的颜色 Different color in one panel	在规定的视角范围内观察明显, 拒收; In the viewing angle, if the rainbow is obvious, reject. 对客户有特殊要求, 以双方确认的样板为准; If required strictly, sign and refer to the limited samples.

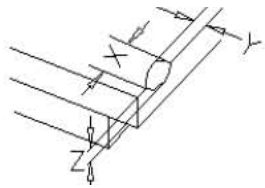
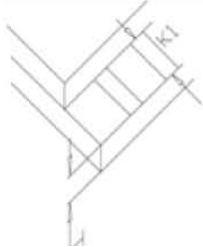
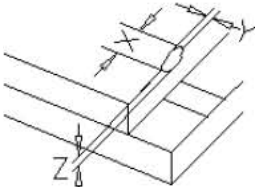
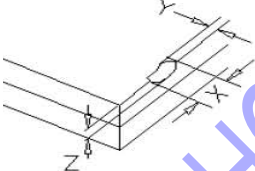
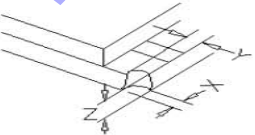
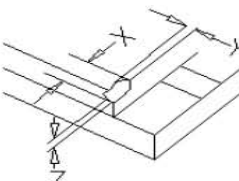
8. ITO 底影 (次要) 8. ITO lines appear	不通电时能清楚地看到 ITO 图形或走线 Design shows without voltage input	拒收 Reject (if required strictly, sign and refer to the limited samples.)
9. 磨角 (次要) 9. Cutting defect (min)		1. 尺寸不能超出产品设计值 2. 不能损伤胶边 3. 玻璃崩裂参考相关规定 1. Dimension refers to engineering spec. 2. Not allowed to damage the Epoxy. 3. Glass damage refers the related spec.
10. 磨边 (次要) 10. Grind off edge defect (min)		磨损高度 $H \leq 0.20$ mm ; 具体要求的见限度样板 The damaged height: $H \leq 0.20$ mm, according to the limited sample
11. 钻孔 (次要) 11. Drilling (min)		1. 孔径和位置参照设计规范。 Diameter and position according to engineering spec. 2. 崩裂玻璃: 不允许损伤胶边 Not allow damaging Epoxy, and referring to related Spec.
12. 玻璃边麻点 (次要) 12. Dirty spot of ITO glass		边框以外的麻点不计边框以内的麻点按 03 项黑/白 要求判定 A: outside seal expose, disregard B: inside seal epoxy, according to black spot
13. 油墨丝印 13. Back print (MIN)	丝印断线、针孔, 凸点, 起毛(次要) Broken line; pinhole; convex; fuzz (min)	A: 丝印断线, 针孔, 凸点按点状, 线状不良标准 B: 丝印毛边 1/4 丝印宽度 A: Broken line; pinhole; convex refer to item of black/white spot or linear B: fuzz of printing over 1/4 spec reject
	丝印缺划, 多印, 印反 (主要) Some printing missing; extra printing; printing on wrong face; invert printing (maj)	不允许 Reject
	尺寸和位置 (主要) Position and dimension	尺寸超过规定不允许 Refer to the engineer spec

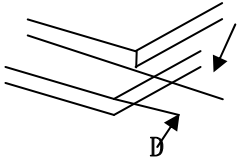
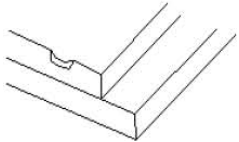
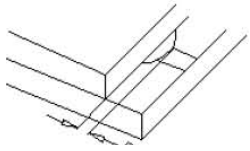
14. 偏光片 14. Polarizer attaching	偏光片品种贴错 (主要) Wrong polarizer type (maj)	不允许 Reject
	偏光片贴反 (主要) Attaching on the wrong face (maj)	不允许 Reject
	偏光片损伤(次要) polarizer damage (min)	不允许穿孔, 按点状或线状缺陷 Not allow perforation of polarizer. Refer to the standard of spots and lines
	偏光片贴歪 (次要) Polarizer slanting (min)	偏光片须覆盖所有的边框内缘且不能超出玻璃外边。 Polarizer should touch all the inner sealing side and not exceeding outside of the glass.
15. 装 PIN 脚 15. Pin defect	尺寸和位置 Dimensions	尺寸偏差不超过设计尺寸公差 According to engineering spec
	装 PIN 脚歪斜 Pin tilt	歪斜角度 > 5 ° 则拒收 Tilt angle > 5 ° reject
	少 (多) 脚断脚 (主要), 则不允许	not allow the more or less number of metal pin
	UV 胶污染偏光片或渗入偏光片与玻璃之间则不允许	UV glue permeates inside polarizer or polarizer surface is polluted by UV glue reject
	UV 胶超出上偏光片之高度 (次) 则拒收;	The height of UV glue over the front polarizer. Reject
	PIN 脚或两脚间无胶不允许;	There is no glue on the Pin or between two pins. Reject.
	装 PIN 脚夹头之间距 Pitch of pins D 标准间距 (spec) E 实际间距 (actual)	Standard D-E < 1/6D 1/6D ≤ D-E ≤ 1/3D D-E > 1/3D

16. 热压斑马纸	对位尺寸 (次要) Dimension (min)	超出规范 Out of the Spec	拒收 Reject
16. Heat seal connector Defect	斑马纸断裂 (主要) Connector broken (maj)	斑马纸断裂造成缺划或光暗 Connector broken cause missing or dim	拒收 Reject
	拉力 (主要) Peel strength (major)	$F \geq 2N/cm$	接受 Accepted
	碳粉脱落 (主要) Carbon layer fall off	造成开路, 光暗 Cause missing or dim	不允许 Reject
	保护膜贴歪, 贴皱, 气泡 (次要) Protecting film adhering defect, bubble, crumple etc	不影响客户使用或客户特殊要求, 1. Not affect the use of customer. 2. meet the requirement of customer	接受 Accept

standard for spot, line, cutting breaking defect

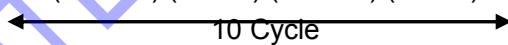
不良项目	内容或图示	判定标准				
		◆ 面积 $\geq 50cm^2$ $S \geq 50cm$		普通 normal		
		Φ (mm)	A 区	B 区	A 区	B 区
1. 黑白点 (次要) Black/white spots (min)	 $\Phi = (a+b)/2$ 在 10mm 范围内不允许有两个 Not allow 2 defects within 10 mm	$\Phi \leq 0.10$	不计 disregard	不计 disregard	不计 disregard	不计 disregard
		$0.10 < \Phi \leq 0.15$	3	不计 disregard	2	2
		$0.15 < \Phi \leq 0.20$	1	2	1	1
		$0.20 < \Phi \leq 0.25$	1	1	0	
		$\Phi > 0.3$	0	0	0	0

<p>2. 玻璃崩边 (次要) LCD side damage (min) X: Length Y: Width Z: Depth K: length of ITO pin T: Thickness of glass</p>		<p>崩在引出 ITO 的边上</p> <p>1. 崩在 ITO 上, if damage on ITO pad $X \leq 3.0\text{mm}$ $Y \leq K1/3$, and $\leq 1\text{mm}$ $Z \leq T$ ACC NO. ≤ 2</p> <p>2. 崩在非 ITO 处, If not on ITO pad, $X+Y \leq 6\text{mm}$, $Z \leq T$</p> <p>装管脚的型号: X 的尺寸不计, 缺陷数不计 Products with pins disregard</p>
		<p>崩在其他边上, damage on other side $X \leq 3.0\text{mm}$, $Y \leq$ 边框的外缘, Y: not reach the seal line $Z \leq T$ 允许两处 ACC NO. ≤ 2</p>
		<p>崩在玻璃表面 damage on the surface</p> <p>1. 在 C 区以外, out of the C area $X+Y \leq 10\text{mm}$, $Z \leq 1/2T$, not inside C area 但不得进入 C 区。</p> <p>2. 在 C 区内, inside c area According to spot defects 按点状缺陷来判定。</p>
<p>3. 玻璃崩角 Corner damage (min)</p>		<p>$X+Y \leq 6\text{mm}$, $Z \leq T$, but Not damage the crossover dots, Not allow the crossover dots appear outside; not damage the Epoxy sealing.</p>
		<p>If $Z \leq 1/2T$, $X+Y \leq 10\text{mm}$ But not inside C area 但不得进入 C 区。</p>

4. 玻璃突出 (次要) Poor cutting		在非 ITO 边, at side of not ITO pad 1. $D \leq 0.25\text{mm}$ 2. 不允许超出设计尺寸 2. according to engineering diagram			
		不允许超出设计尺寸 According to engineering diagram			
		在 ITO 边, At the ITO pad 1. $D \leq 0.5\text{mm}$ 且 $D \leq K1/3$ 2. 不允许超出设计尺寸 2. according to engineering diagram			
5. 线状缺陷 (次要) Linear defect		长 L (mm)	宽 W (mm)	A 区	B 区
			$W \leq 0.02$	不计 disregard	不计 disregard
		$L \leq 3.0$	$W \leq 0.03$	1	2
		$L \leq 2.0$	$0.03 < W \leq 0.05$	1	2
		$L > 3.0$	$W \leq 0.03$	0	1
		$L > 2.0$	$0.03 < W \leq 0.05$	0	1
6. 贴片气泡 (次要)	因贴片操作引出的气泡	尺寸 Size	允许个数 acceptable number		
		$\Phi \leq 0.3\text{ mm}$	不计 disregard		
		$0.3\text{ mm} \leq \Phi \leq 0.5\text{ mm}$	1		
		$0.5\text{ mm} < \Phi$	0		

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO	Item	Test Condition	
1	High Temperature Storage	Storage at $80 \pm 2^\circ\text{C}$ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage	Storage at $-30 \pm 2^\circ\text{C}$ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Temperature /Humidity Storage	1.Storage 96~100 hrs $60 \pm 2^\circ\text{C}$, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer). or 2.Storage 96~100 hrs $40 \pm 2^\circ\text{C}$, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.	
4	Temperature Cycling	$-20^\circ\text{C} \rightarrow 25^\circ\text{C} \rightarrow 70^\circ\text{C} \rightarrow 25^\circ\text{C}$ (30mins) (5mins) (30mins) (5mins) 	
5	Vibration	10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs)	
6	ESD Test	Air Discharge: Apply 4 KV with 5 times discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		Testing location: Around the face of LCD	Testing location: 1.Apply to bezel. 2.Apply to Vdd, Vss.
7	Drop Test	Packing Weight (Kg)	Drop Height (cm)
		0 ~ 45.4	122
		45.4 ~ 90.8	76
		90.8 ~ 454	61
		Over 454	46

5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

- 5.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.
- 5.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

5.2 HANDLING

- 5.2.1 Avoid any strong mechanical shock which can break the glass.
- 5.2.2 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.
- 5.2.3 Do not remove the panel or frame from the module.
- 5.2.4 The polarizing plate of the display is very fragile. So , 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.)
- 5.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.
- 5.2.6 Do not touch the display area with bare hands , this will stain the display area.
- 5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.
- 5.2.8 To control temperature and time of soldering is $280 \pm 10^{\circ}\text{C}$ and 3-5 sec.
- 5.2.9 To avoid liquid (include organic solvent) stained on LCM

5.3 STORAGE

- 5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
- 5.3.2 Do not place the module near organics solvents or corrosive gases.
- 5.3.3 Do not crush , shake , or jolt the module.

5.4 TERMS OF WARRANTY

- 5.4.1 Applicable warrant period
The period is within thirteen months since the date of shipping out under normal using and storage conditions.
- 5.4.2 Unaccepted responsibility
This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment,

aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.

