



SPECIFICATIONS

CUSTOMER NAME : _____

CUSTOMER REFERENCE NO. : _____

MODULE NUMBER : TSG12864-1186-FFDLWS-R

SAMPLE VERSION : NO.1

SPECIFICATIONS EDITION : V0

DRAWING NO. (Ver.) : A1

PACKAGING NO. (Ver.) : TBD

Customer Approved

Date:

Approved	Checked	Designer
	Aron	Sean

- Preliminary specification for design input
- Full specification for sample approval



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1. SPECIFICATIONS

1.1 Features

Item	Description
Display Type	128*64 Dots
LCD Type	FSTN /Positive/ Transflective
Driver Condition	1/65 duty, 1/9bais
Viewing Direction	6 O'clock
Backlight Color	White Color
Module weight	About 35.6g
Interface	6800/8080/4SPI
LCD driver IC	ST7565R
ROHS	YES

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	77.40(L) *52.40(w) *6.50 (H) (Exclude the pin)	mm
Viewing Area	70.00(L) * 40.00(w)	mm
Active Area	66.52(L) * 33.24(w)	mm
Dots Size	0.48(L) *0.48(w)	mm
Dots Pitch	0.52(L) *0.52(W)	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
LCD Power Supply Voltage	VLCD, V ₀	—	-0.3	13.5	V
LCD Power supply voltage	V ₁ , V ₂ , V ₃ , V ₄	—	-0.3	V ₀	V
Any input/output	V _{IN} / V _{OUT}	—	-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	T _a < 40 °C	-	90	%RH



1.4 DC Electrical Characteristics

$V_{DD}=3.0\text{ V} \pm 5\%$, $V_{SS}=0\text{ V}$, $T_a=25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}	-	2.85	3.0	3.15	V
Input High-level Voltage	V_{IHC}	-	$0.7V_{DD}$	-	V_{DD}	V
Input Low-level Voltage	V_{ILC}	-	V_{SS}	-	$0.3V_{DD}$	V
Output High-level Voltage	V_{OHC}	-	$0.8V_{DD}$	-	V_{DD}	V
Output Low-level Voltage	V_{OLC}	-	V_{SS}	-	$0.2V_{DD}$	V
LCD Supply Power	V_{LCD}	-	8.8	9.0	9.2	V
Supply Current	I_{DD}	$V_{DD}=3.0\text{V}, V_{op}=9.0\text{V},$ Pattern= Vertical display	-	0.56	0.84	mA

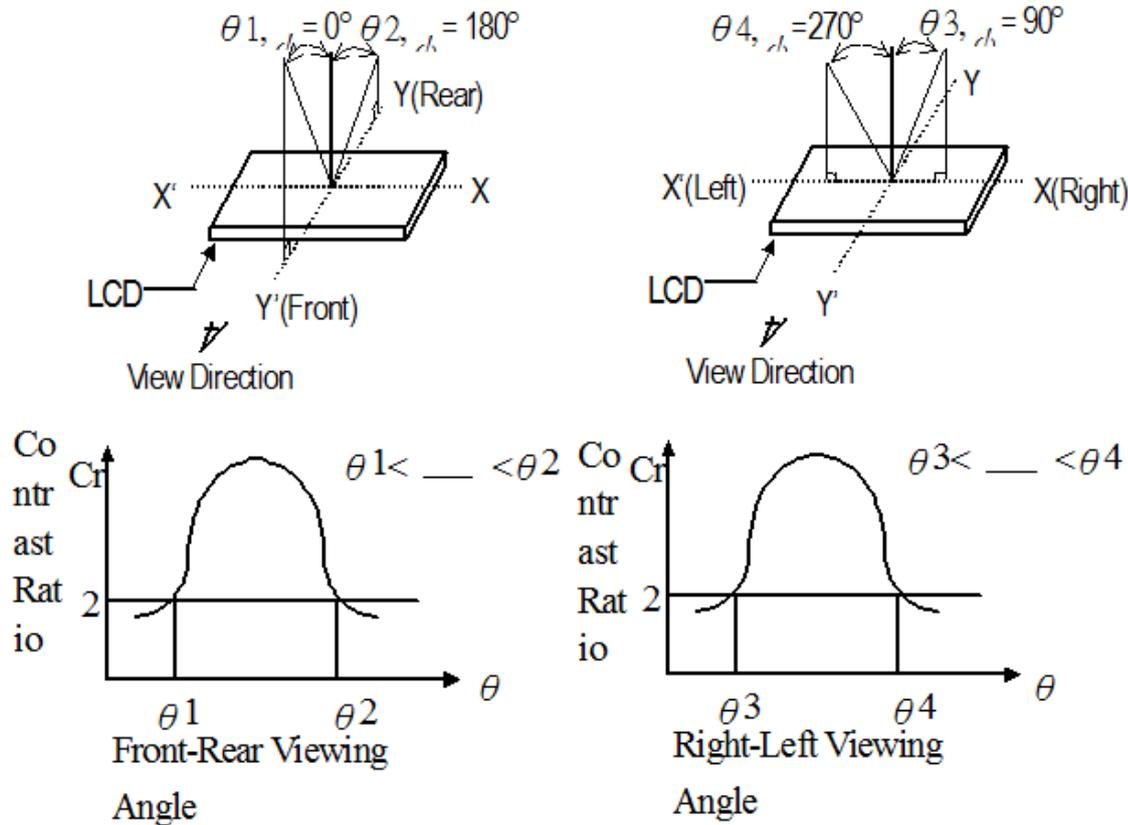
1.5 Optical Characteristics

LCD Panel : 1/65Duty , 1/9Bias , $V_{OP}=9.0\text{ V}$, $T_a=25^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Reference
Response Time	T_{on}	$C \geq 2.0$	-	150	250	ms	Note3
	T_{off}		-	170	300		
Viewing angle range	=0(6H) Y'		20	35	-	Deg.	Note1
	=90(3H) X		20	35	-		
	=180(12H) Y	10	25	-			
	=270(9H) X'	20	35	-			
Contrast Ratio	C	$\theta = 0^\circ$	4	6	-	-	Note2
Average Brightness (with LCD)	IV	$V_F=3.2\text{V}$	50	100	-	Cd/m ²	Note4
Uniformity(with LCD)	ΔB		70	75	-	%	

Note 1

Definition of viewing angle

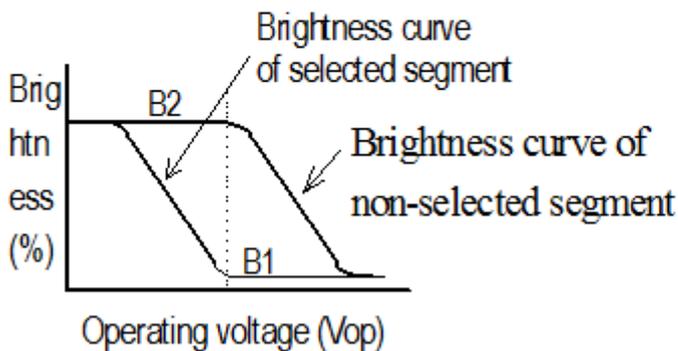


Note 2

Definition of contrast

RATIO

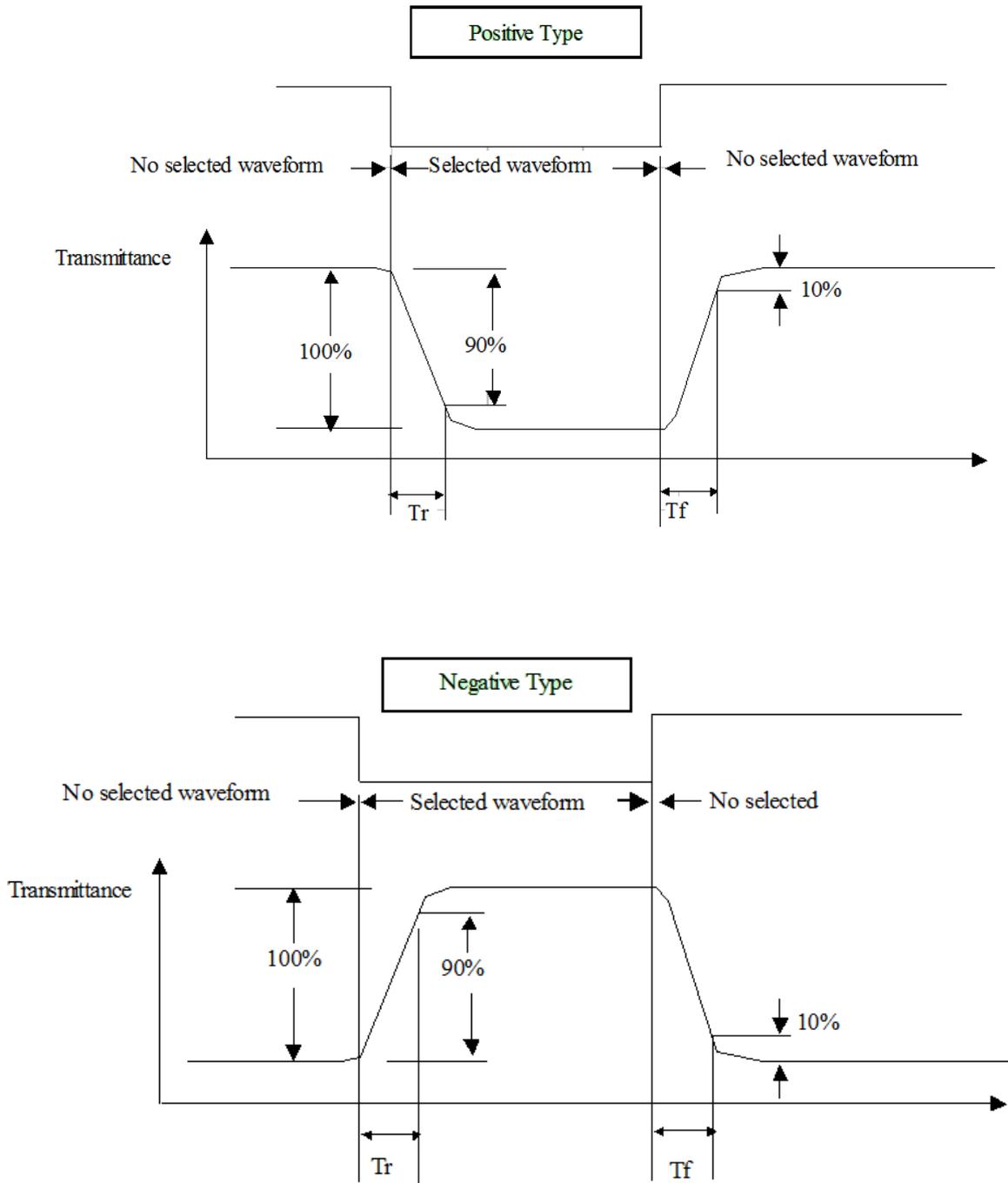
$$C.R = \frac{\text{Brightness of nonselected segment (B2)}}{\text{Brightness of selected segment}}$$





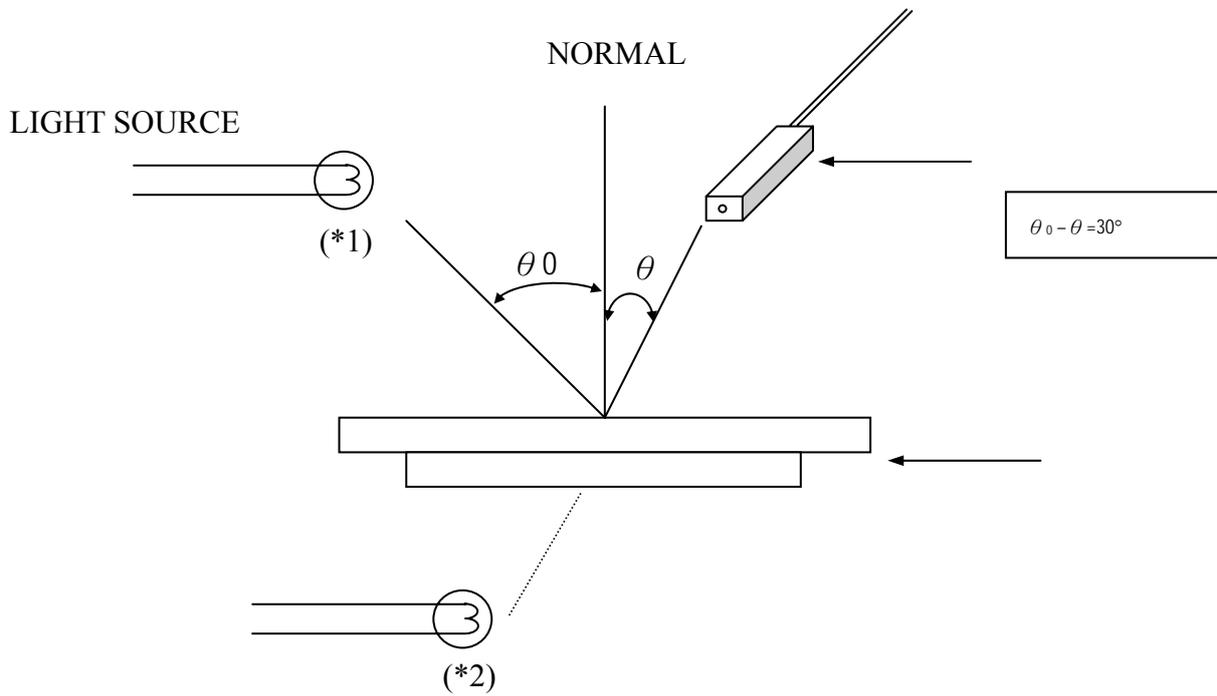
Note 3

Definition of response time



Note 4

Measuring Instruments For Electro-optical Characteristics



*1.Light source position for measuring the reflective type of LCD panel

*2.Light source position for measuring the transfective / transmissive types of LCD panel



1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	80	mA
Reverse Voltage	VR	Ta =25℃	-	5.0	V
Reverse Current	IR	VR= 5V	-	40	uA
Power Dissipation	PD	Ta =25℃	-	240	mW

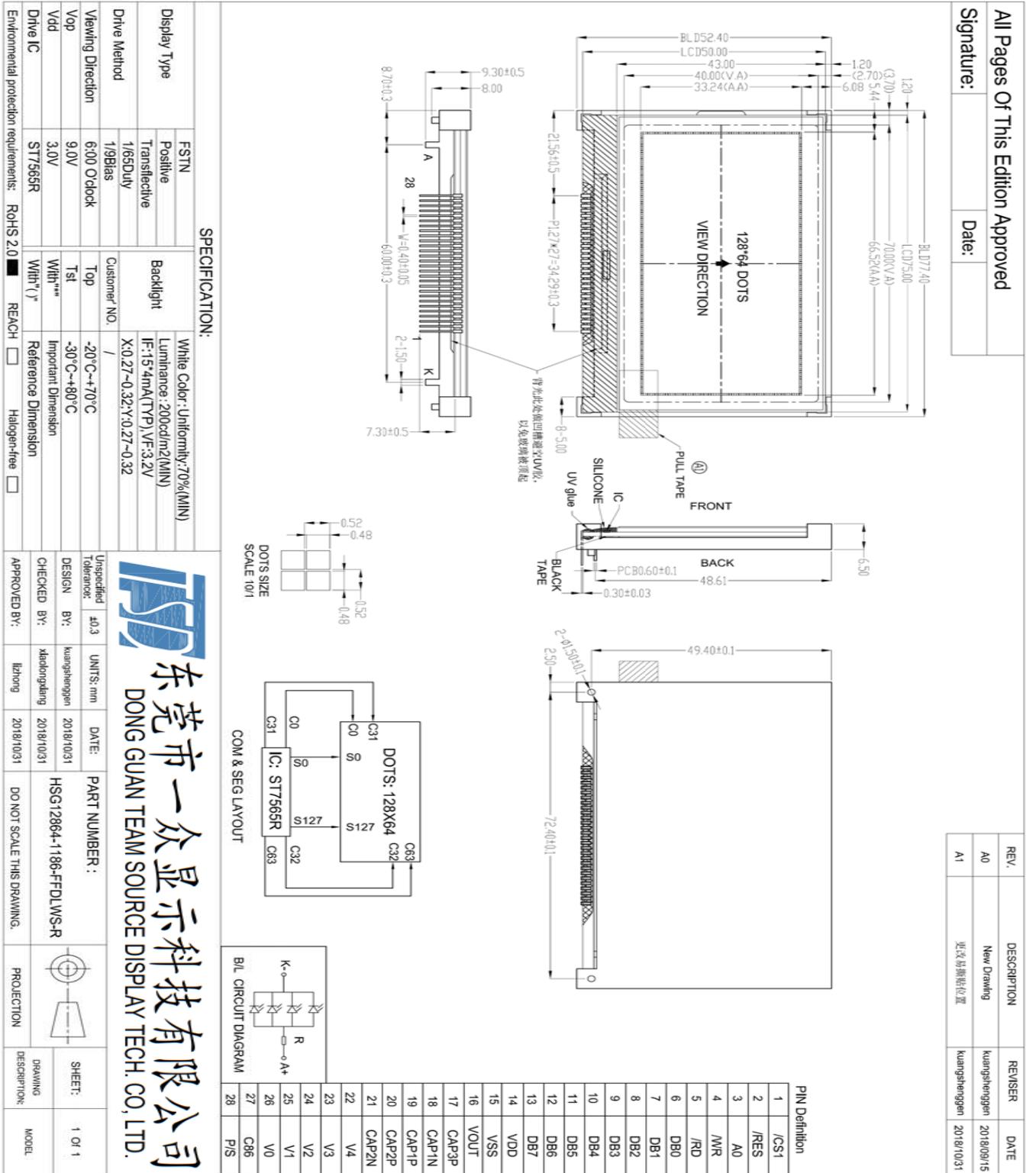
Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Current	IF	VF=3.2V	40	60	80	mA
Average Brightness (without LCD)	IV	VF=3.2V	200	-	-	cd/m ²
Color Coordinates (Without LCD)	Hue	VF=3.2V	X=0.27 Y=0.27	X=0.29 Y=0.29	X=0.32 Y=0.32	nm
Color	White					

2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram



SPECIFICATION:

Display Type	FTN	Backlight	Write Color: Uniformly; 70%(MIN)
Drive Method	Positive Transflective	Customer NO.	Luminance: 200cd/m2(MIN)
Viewing Direction	1/9Bias	Top	IF:15.4mA(TYP) VF:3.2V
Vop	6.00 C/dock	Tst	X:0.27-0.32; Y:0.27-0.32
Vdd	9.0V	Important Dimension	
Drive IC	ST7565R	Reference Dimension	
Environmental protection requirements:	ROHS 2.0	REACH	Halogen-free

东莞市一众显示科技有限公司

DONG GUAN TEAM SOURCE DISPLAY TECH. CO, LTD.

UNSPECIFIED TOLERANCE: ±0.3

UNITS: mm

DESIGN BY: kungshenggen

CHECKED BY: khdongsheng

DATE: 2018/10/31

PART NUMBER: HSG12864-1186-FFDLWS-R

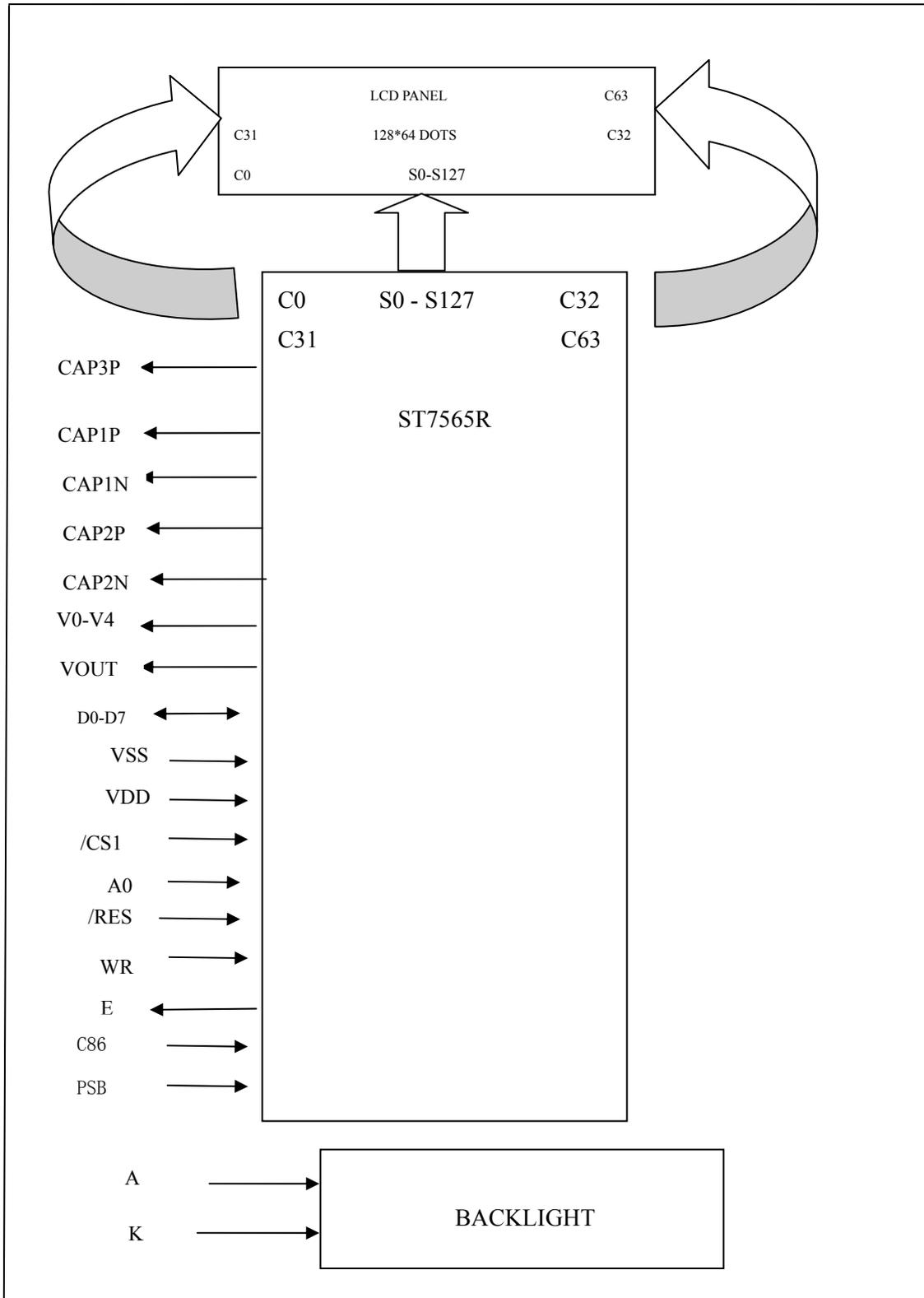
PROJECTION:

SHEET: 1 OF 1

DRAWING DESCRIPTION: MODEL



2.1.2 Block Diagram





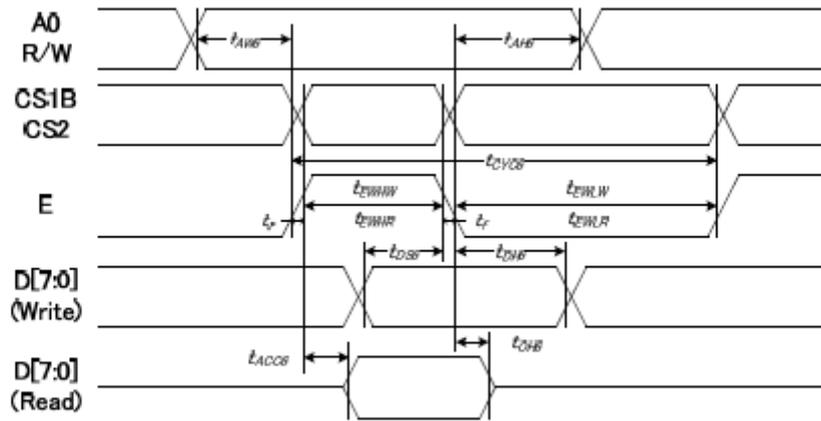
2.2 Interface Pin Description

Pin No.	Symbol	Signal Description
1	/CS	Chip selection control pin. Low active
2	/RST	Hardware reset pin. Low active
3	A0	Command/Data selection control pin.H for display data and L for command data
4	RW(R/W)	Read/Write signal for 6800 series MPU.
5	RD(E)	Enable clock input for 6800 series MPU
6	D0	8-bit Bi-direction databus D[7:0].
7	D1	
8	D2	
9	D3	
10	D4	
11	D5	
12	D6	
13	D7	
14	VDD	Main Power supply for the LCM
15	VSS	Power Ground
16	VOUT	DC/DC voltage converter. Connect a capacitor to VDD or VSS
17	CAP3P	DC/DC voltage converter. Connect a capacitor to CAP3+-
18	CAP1N	DC/DC voltage converter. Connect a capacitor to CAP1-
19	CAP1P	DC/DC voltage converter. Connect a capacitor to CAP1+
20	CAP2P	DC/DC voltage converter. Connect a capacitor to CAP2+
21	CAP2N	DC/DC voltage converter. Connect a capacitor to CAP2-
22	V4	V0 power supply for LCD. Connect a capacitor to VSS
23	V3	V1 power supply for LCD. Connect a capacitor to VSS
24	V2	V2 power supply for LCD. Connect a capacitor to VSS
25	V1	V3 power supply for LCD. Connect a capacitor to VSS
26	V0	V4 power supply for LCD. Connect a capacitor to VSS
27	C86	This is the MPU interface selection pin. C86 = "H": 6800 Series MPU interface. C86 = "L": 8080 Series MPU interface.
28	PSB	PSB selects the interface type: Serial or Parallel.



2.3 Timing Characteristics

System Bus Timing for 6800 Series MPU



(VDD = 3.3V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		0	—	ns
Address hold time		tAH6		0	—	
System cycle time	E	tCYC6		240	—	
Enable L pulse width (WRITE)		tEHLW		80	—	
Enable H pulse width (WRITE)		tEHWLW		80	—	
Enable L pulse width (READ)		tEHLR		80	—	
Enable H pulse width (READ)	tEHWLH		140	—		
Write data setup time	D[7:0]	tDS6		40	—	
Write data hold time		tDH6		10	—	
Read data access time		tACC6	CL = 100 pF	—	70	
Read data output disable time		tOH6	CL = 100 pF	5	50	



(VDD = 2.7V, Ta = 25°C)

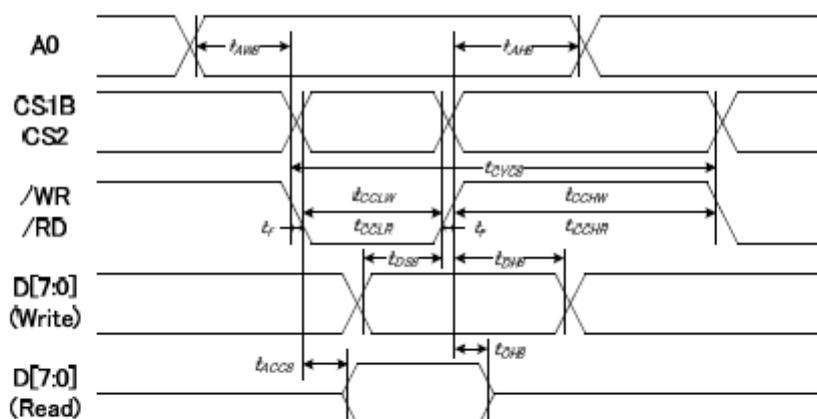
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		0	—	ns
Address hold time		tAH6		0	—	
System cycle time	E	tCYC6		400	—	
Enable L pulse width (WRITE)		tEWLW		220	—	
Enable H pulse width (WRITE)		tEWHW		180	—	
Enable L pulse width (READ)		tEWLR		220	—	
Enable H pulse width (READ)		tEWHR		180	—	
Write data setup time		D[7:0]	tDS6		40	
Write data hold time	tDH6			0	—	
Read data access time	tACC6		CL = 100 pF	—	140	
Read data output disable time	tOH6		CL = 100 pF	10	100	

*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, (tr + tf) ≤ (tCYC6 - tEWLW - tEWHW) for (tr + tf) ≤ (tCYC6 - tEWLR - tEWHR) are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 tEWLW and tEWLR are specified as the overlap between CS1B being "L" (CS2="H") and E.

System Bus Timing for 8080 Series MPU



(VDD = 3.3V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		0	—	ns
Address hold time		tAH8		0	—	
System cycle time	/WR	tCYC8		240	—	
/WR L pulse width (WRITE)		tCCLW		80	—	
/WR H pulse width (WRITE)		tCCHW		80	—	
/RD L pulse width (READ)		RD	tCCLR		140	
/RD H pulse width (READ)	tCCHR			80	—	
WRITE Data setup time	D[7:0]	tDS8		40	—	
WRITE Data hold time		tDH8		20	—	
READ access time		tACC8	CL = 100 pF	—	70	
READ Output disable time		tOH8	CL = 100 pF	5	50	



(VDD = 2.7V, Ta = 25°C)

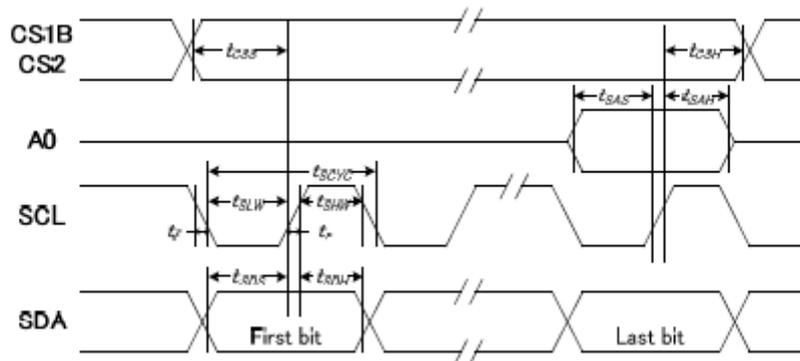
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		0	—	ns
Address hold time		tAH8		0	—	
System cycle time	/WR	tCYC8		400	—	
/WR L pulse width (WRITE)		tCCLW		220	—	
/WR H pulse width (WRITE)		tCCHW		180	—	
/RD L pulse width (READ)	RD	tCCLR		220	—	
/RD H pulse width (READ)		tCCHR		180	—	
WRITE Data setup time	D[7:0]	tDS8		40	—	
WRITE Data hold time		tDH8		0	—	
READ access time		tACC8	CL = 100 pF	—	140	
READ Output disable time		tOH8	CL = 100 pF	10	100	

*1 The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC8} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC8} - t_{CCLR} - t_{CCHR})$ are specified.

*2 All timing is specified using 20% and 80% of VDD as the reference.

*3 tCCLW and tCCLR are specified as the overlap between CS1B being "L" (CS2="H") and WR and RD being at the "L" level.

System Bus Timing for 4-Line Serial Interface

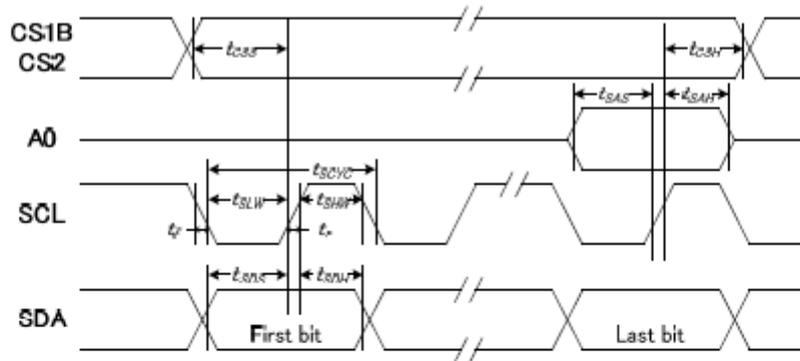


(VDD = 3.3V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK "H" pulse width		tSHW		25	—	
SCLK "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CS-SCLK time	CS1B	tCSS		20	—	
CS-SCLK time	CS2	tCSH		40	—	



System Bus Timing for 4-Line Serial Interface



(VDD = 3.3V, Ta = 25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK "H" pulse width		tSHW		25	—	
SCLK "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CS-SCLK time	CS1B	tCSS		20	—	
CS-SCLK time	CS2	tCSH		40	—	



3. Inspection Specification

AQL inspection standard

Sampling method: GB/T2828.1-2012, Level II, single sampling

Defect classification :

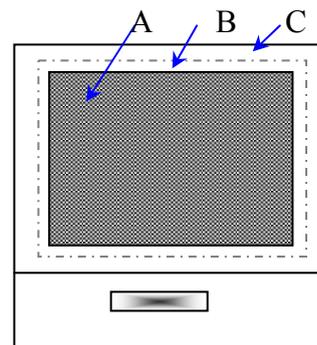
Classify	Item	Note	AQL
Major	Short or open circuit	1	0.65
	LC Leakage		
	Display flickering		
	No display		
	Wrong viewing direction		
	Wrong Back-light color		
Minor	Contrast defect(dim,ghost)	2	1.0
	Background color deviation	2	
	black & white spot, dust	3	
	Black,white line defect	4	
	Rainbow	5	
	Chip	6	
	Pin hole	7	
	Cross talk	Refer to sample	

Definition:

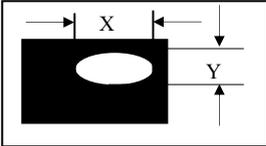
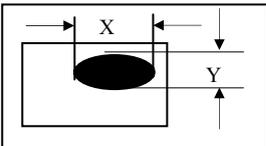
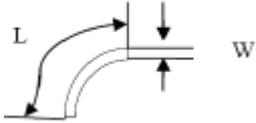
Zone A: Active Area

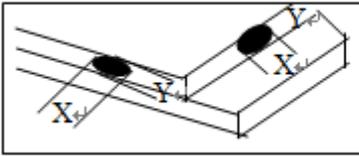
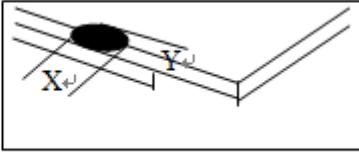
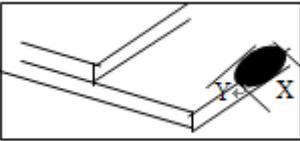
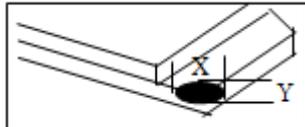
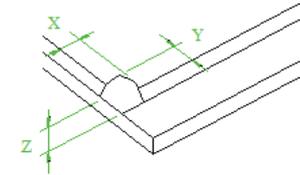
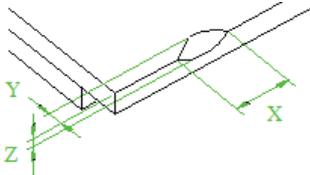
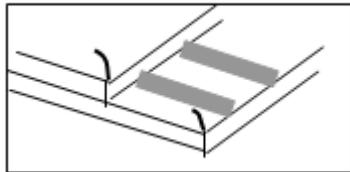
Zone B: Visible Area

Zone C: outside of Visible Area

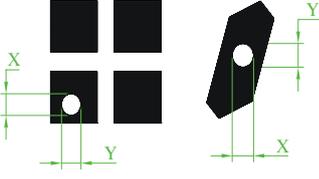




No.	Item	Criterion																										
1	Short or open circuit	Not allowed																										
	LC leakage																											
	Flickering																											
	No display																											
	Wrong viewing direction																											
	Wrong Back-light color																											
2	Contrast defect	Refer to approval sample																										
	Background color deviation																											
3	black & white spot, dust(including polarizer). $\phi = (X + Y) / 2$	  <table border="1" data-bbox="954 891 1417 1182"> <thead> <tr> <th rowspan="2">Point size</th> <th colspan="3">Acceptable QTY</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="2">Any</td> <td rowspan="3">Any</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.15$</td> <td>2</td> <td>3</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.2$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>Unit:mm</p>	Point size	Acceptable QTY			A	B	C	$\Phi \leq 0.1$	Any		Any	$0.1 < \Phi \leq 0.15$	2	3	$0.15 < \Phi \leq 0.2$	0	1									
Point size	Acceptable QTY																											
	A	B	C																									
$\Phi \leq 0.1$	Any		Any																									
$0.1 < \Phi \leq 0.15$	2	3																										
$0.15 < \Phi \leq 0.2$	0	1																										
4	Black,white line defect	 <table border="1" data-bbox="826 1294 1417 1585"> <thead> <tr> <th colspan="2">Size</th> <th colspan="3">Acceptable QTY</th> </tr> <tr> <th>L</th> <th>W</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Any</td> <td>$W \leq 0.01$</td> <td>Any</td> <td>Any</td> <td rowspan="3">Any</td> </tr> <tr> <td rowspan="2">$L \leq 2$</td> <td>$0.01 < W \leq 0.02$</td> <td>2</td> <td>4</td> </tr> <tr> <td>$0.02 < W \leq 0.03$</td> <td>1</td> <td>2</td> </tr> <tr> <td></td> <td>$0.03 < W$</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>Unit:mm Remark: While $W > 0.03$, refer to point defect</p>	Size		Acceptable QTY			L	W	A	B	C	Any	$W \leq 0.01$	Any	Any	Any	$L \leq 2$	$0.01 < W \leq 0.02$	2	4	$0.02 < W \leq 0.03$	1	2		$0.03 < W$	0	0
Size		Acceptable QTY																										
L	W	A	B	C																								
Any	$W \leq 0.01$	Any	Any	Any																								
$L \leq 2$	$0.01 < W \leq 0.02$	2	4																									
	$0.02 < W \leq 0.03$	1	2																									
	$0.03 < W$	0	0																									
5	Rainbow	Not more than two colors change across the viewing area																										

<p>6</p> <p>Chip</p> <p>Remark:</p> <p>T: glass thickness</p> <p>X: Notch in X direction</p> <p>Y : Notch in Y direction</p> <p>Z : Notch in Z direction</p>	<p>A type and B type :General</p> <div style="display: flex; justify-content: space-around;">   </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Any</td> <td>≤ 2.0</td> <td>$\leq 1/2t$</td> </tr> <tr> <td>2</td> <td>$\leq 1/8 X$ direction glass length</td> <td>Can not reach the Visible area</td> <td>$\leq t$</td> </tr> </tbody> </table>		X	Y	Z	1	Any	≤ 2.0	$\leq 1/2t$	2	$\leq 1/8 X$ direction glass length	Can not reach the Visible area	$\leq t$
		X	Y	Z									
	1	Any	≤ 2.0	$\leq 1/2t$									
	2	$\leq 1/8 X$ direction glass length	Can not reach the Visible area	$\leq t$									
	<p>C Type :ITO terminal</p> <div style="display: flex; justify-content: space-between;">  <table border="1" style="width: 60%; border-collapse: collapse;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Any</td> <td>≤ 0.3</td> <td>$\leq 1/2t$</td> </tr> <tr> <td>$\leq 1/8X$ direction (or $X \leq 2$)</td> <td>$\leq 1/5t$</td> <td>$\leq t$</td> </tr> </tbody> </table> </div>	X	Y	Z	Any	≤ 0.3	$\leq 1/2t$	$\leq 1/8X$ direction (or $X \leq 2$)	$\leq 1/5t$	$\leq t$			
	X	Y	Z										
	Any	≤ 0.3	$\leq 1/2t$										
$\leq 1/8X$ direction (or $X \leq 2$)	$\leq 1/5t$	$\leq t$											
<p>D Type :Corner 1 (on ledge)</p> <div style="display: flex; justify-content: space-between;">  <table border="1" style="width: 60%; border-collapse: collapse;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤ 2</td> <td>≤ 1.5 (Can not reach ITO terminal)</td> <td>$\leq t$</td> </tr> </tbody> </table> </div>	X	Y	Z	≤ 2	≤ 1.5 (Can not reach ITO terminal)	$\leq t$							
X	Y	Z											
≤ 2	≤ 1.5 (Can not reach ITO terminal)	$\leq t$											
<p>E Type:Corner 2 (beside seal)</p> <div style="display: flex; justify-content: space-between;">  <table border="1" style="width: 60%; border-collapse: collapse;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>≤ 3.0</td> <td>Can not reach seal</td> <td>Any</td> </tr> </tbody> </table> </div>	X	Y	Acceptable QTY	≤ 3.0	Can not reach seal	Any							
X	Y	Acceptable QTY											
≤ 3.0	Can not reach seal	Any											
<p>F Type :Back of the ITO terminal</p> <div style="display: flex; justify-content: space-between;">  <table border="1" style="width: 60%; border-collapse: collapse;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>≤ 3.0</td> <td>≤ 1.0</td> <td>$Z \leq 1/2t$</td> <td>Any</td> </tr> </tbody> </table> </div>	X	Y	Z	Acceptable QTY	≤ 3.0	≤ 1.0	$Z \leq 1/2t$	Any					
X	Y	Z	Acceptable QTY										
≤ 3.0	≤ 1.0	$Z \leq 1/2t$	Any										
<p>G Tyep:Crack</p> <div style="display: flex; justify-content: space-between;">  <p>Can not accept any crack at anywhere</p> </div>													



No.	Item	Criterion								
7	Pin hole	 <p> $D=(X+Y)/2$ X:pin hole length Y:pin hole width d:pattern(segments,dot) width </p> <table border="1" data-bbox="954 432 1423 678"> <thead> <tr> <th>D</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>$D \leq 1/5d$ and $D \leq 0.15$</td> <td>Any</td> </tr> <tr> <td>$D \leq 1/5d$ and $0.15 < D < 0.2$</td> <td>1</td> </tr> <tr> <td>$D > 1/5d$ or $D \geq 0.2$</td> <td>0</td> </tr> </tbody> </table>	D	Acceptable QTY	$D \leq 1/5d$ and $D \leq 0.15$	Any	$D \leq 1/5d$ and $0.15 < D < 0.2$	1	$D > 1/5d$ or $D \geq 0.2$	0
D	Acceptable QTY									
$D \leq 1/5d$ and $D \leq 0.15$	Any									
$D \leq 1/5d$ and $0.15 < D < 0.2$	1									
$D > 1/5d$ or $D \geq 0.2$	0									
8	Total number of acceptable defect	A area(active area) Maximum 2 minor non-conformities per one unit. Defect distance: should be over 10 mm between each point B area(Visible area) It is acceptable when it is no trouble for quality and assembly in customer's end product								

4. RELIABILITY TEST

4.1 Reliability Test Condition

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage Test	Keep in $80 \pm 2^\circ\text{C}$ 96 hrs Surrounding temperature, then storage at normal condition 4hrs
2	Low Temperature Storage Test	Keep in $-30 \pm 2^\circ\text{C}$ 96 hrs Surrounding temperature, then storage at normal condition 4hrs
3	High Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the elemen Keep in $70^\circ\text{C} \pm 2^\circ\text{C}$ 96 hrs
4	Low Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element. Keep in $-20 \pm 2^\circ\text{C}$ 96 hrs
5	High Humidity Storage	Keep in $+40^\circ\text{C}/90\%\text{RH}$ duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs(excluding the polarizer)



liquid crystal is poisonous.)

- (4) If liquid crystal is exposed to skin, wash the area thoroughly with alcohol or soap.
- (5) When disposing of the product, please observe industrial waste disposal laws in each country and district.
- (6) In case of injury, give immediate treatment and consult with a doctor.
- (7) This product is constructed precisely. Don't disassemble or modify.

※ Neglecting this mark can cause injury to humans and damage to materials

6.0 PACKING SPECIFICATION

TBD