



INNOVATIVE DISPLAY TECHNOLOGIES

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## Specification

**Part Number** : SCA07030-BFA-LNC

**Customer** :

<b>APPROVED BY:</b> ( FOR CUSTOMER USE ONLY )	<b>PCB VERSION:</b>	<b>DATE:</b>
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SOLD BY	APPROVED BY	CHECKED BY	ISSUE DATE

MODLE NO :

**RECORDS OF REVISION**

**DOC. FIRST ISSUE**

VERSION	DATE	REVISED PAGE NO.	<b>SUMMARY</b>
0	2009.09.15		First issue

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# **1. Module Classification Information**

SCA 070 30 – B F A – L N C

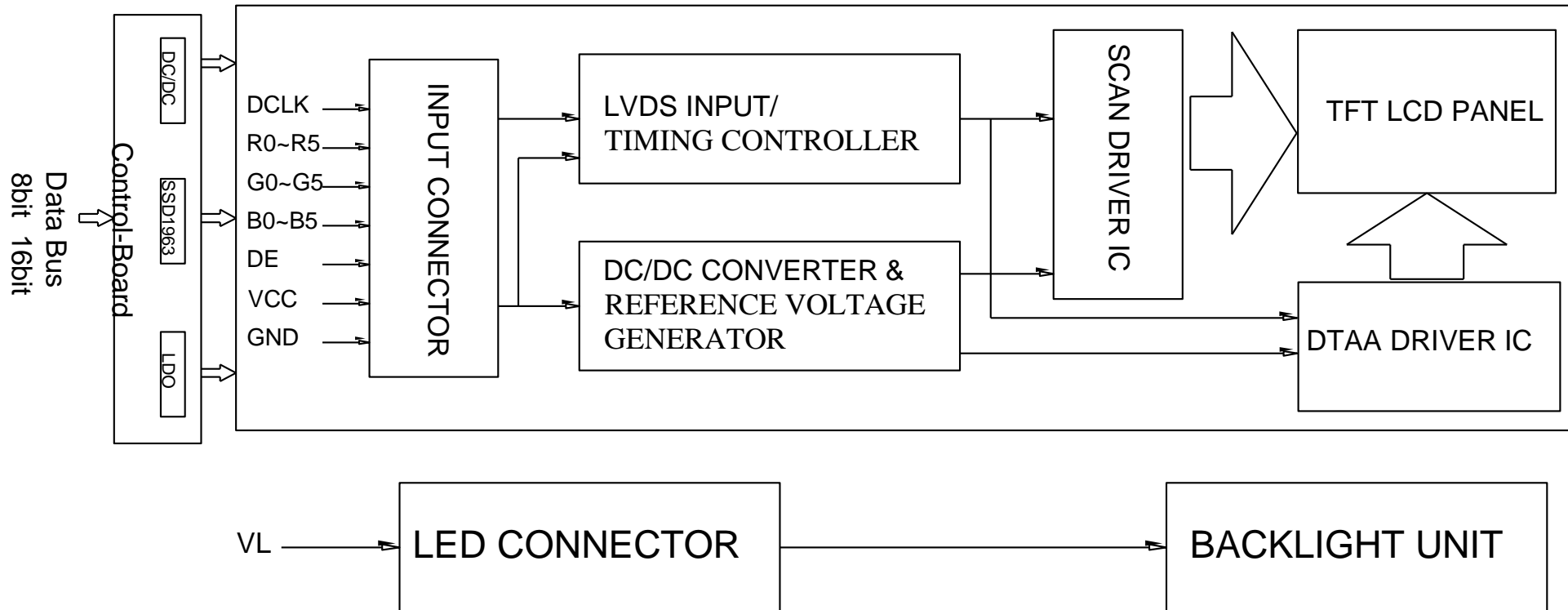
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

- ① Brand : Shelly Associates Inc.
- ② Display Type : SCA → TFT Type
- ③ Display Size : 7” TFT
- ④ Model serials no.
- ⑤ Backlight Type : L→ LED, White
- ⑥ LCD Polarize Type/ Temperature range/ View direction F→ Transmissive, B→ W. T, 6:00
- ⑦ B: TFT+FR+CONTROL BOARD
- ⑧ Solution:  
G:800480
- ⑨ D: Digital
- Version “0”
- ⑩
- ⑪ Special Code #:Fit in with ROHS directive regulations  
N = without TP  
A = Anti-glare

## 2.General Specification

Parameter	Specifications	Unit
Screen size	7”(Diagonal)	inch
Display Resolution	800 RGB x 480	pixel
Active area	152.4x91.44	mm
Dot Pitch	63.5 x 190.5	um
Pixel size	190.5 x 190.5	um
Surface treatment	Anti-glare	
Color Saturation (NTSC)	45	%
Pixel Configuration	RGB Vertical Stripe	
Outline dimension	165(W) x 104.44(H) x 5.2 (D)	mm
Weight	TBD	g
View Angle direction (Gray inversion)	6 o'clock	--
Interface Type	TTL	--
LCD Type	TN	--
Color Depth	262,144	colors

### 3. Block Diagram



## 4. Electrical Characteristics

### 4-1. ELECTRICAL CHARACTERISTICS OF LCM

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power supply for logic	VDD	VDD-DGND	3.0	3.3	3.6	V
Output voltage	VOH	Output high voltage	0.8VDD			
	VOL	Output low voltage			0.2VDD	
Input Voltage	VIH	Input high voltage	0.8VDD	-	VDD +0.5	V
	VIL	Input low voltage			0.2VDD	
Recommended TFT Driving Current for 25°C	I <sub>VDD</sub>	VDD=3.3V	-	200	260	mA
Brightness	L	I <sub>AK</sub> =160mA Pattern :All on (White Color)	300.0	350.0	-	cd/m <sup>2</sup>

## 5. Absolute Maximum Ratings

### 5-1. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	WIDE TEMP			
	OPERSTING		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature(°C)	-20	70	-30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4	

Note 2 Ta ≤ 70°C:75%RH MAX.

Note 3 Please refer to item of reliability test.

Note 4 Background color will change slightly depending on ambient temperature.

That phenomenon is reversible.

## **6.Interface Pin Function**

### **LCM PIN Definition**

Pin No.	Symbol	Pin No.	Symbol
1	GND	16	NC
2	VDD	17	NC
3	VO	18	RST
4	A0	19	NC
5	R/W	20	NC
6	E	21	NC
7	DB0	22	NC
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	CS		

### **LED BACKLIGHT (CN2): JST BHSR-02VS-1**

Pin No.	Symbol
1	A
2	K

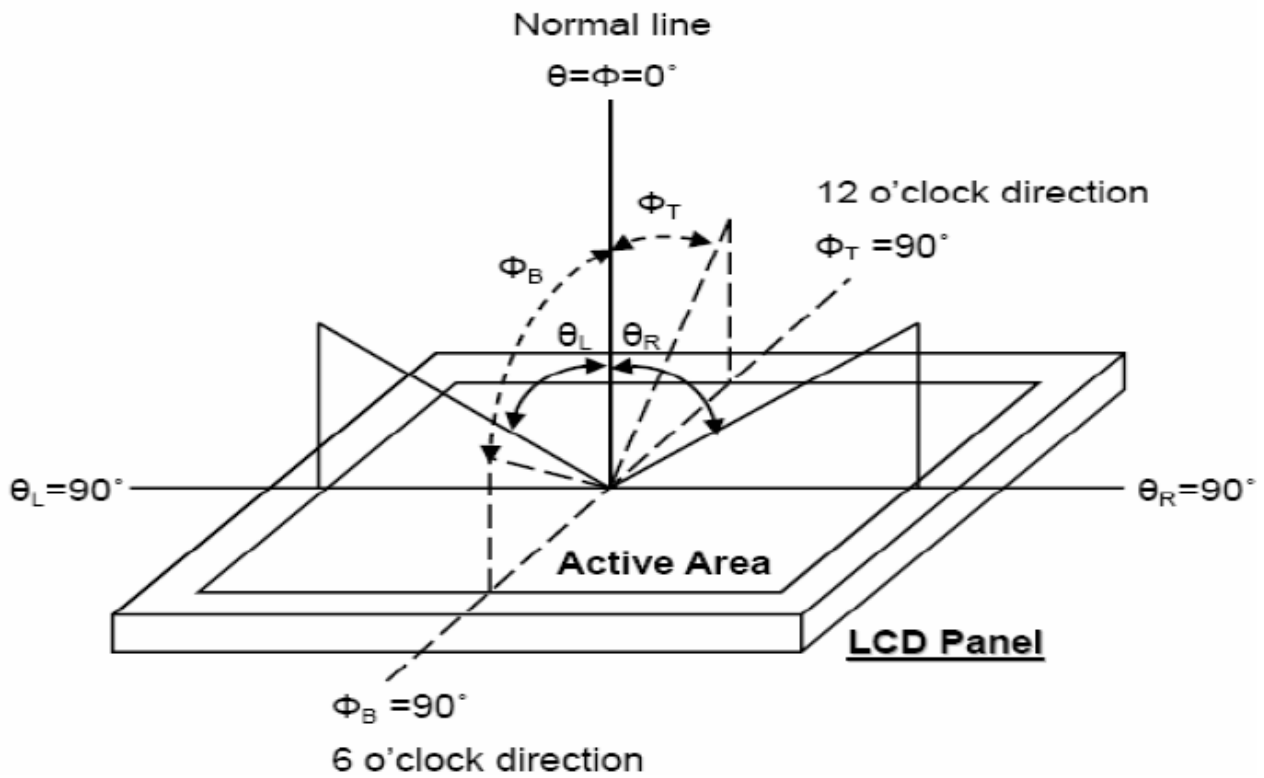
### **CORRESPONDABLE BACKLIGHT CONNECTOR : SM 02B-BHSS-1**



# 7. Electro-optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Brightness	-	Viewing normal angle $\theta = \phi = 0^\circ$	300	350	-	cd/m <sup>2</sup>	Center of display
Response time	Tr		-	5	10	.ms	Note 3,5
	Tf		-	11	16	.ms	
Contrast ratio	CR		250	400	-	-	Note 4,5
Color Chromaticity	White		Wx	0.249	0.299	0.349	-
		Wy	0.278	0.328	0.378		
Viewing angle	Hor.	$\theta_R$	60	70	-	Deg.	Note 1
		$\theta_L$	60	70	-		
	Ver.	$\phi_T$	50	60	-		
		$\phi_B$	60	70	-		

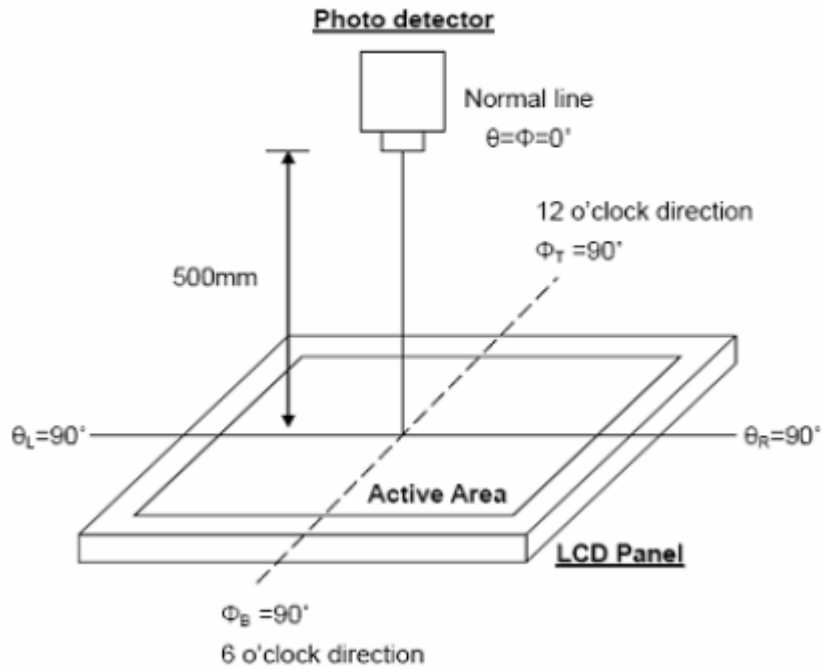
Note 1: Definition of viewing angle range



Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.



Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White state and “Black” state. Rise time,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10% . And fall time,  $T_f$ , is the time between photo detector output

Intensity changed from 10% to 90% .

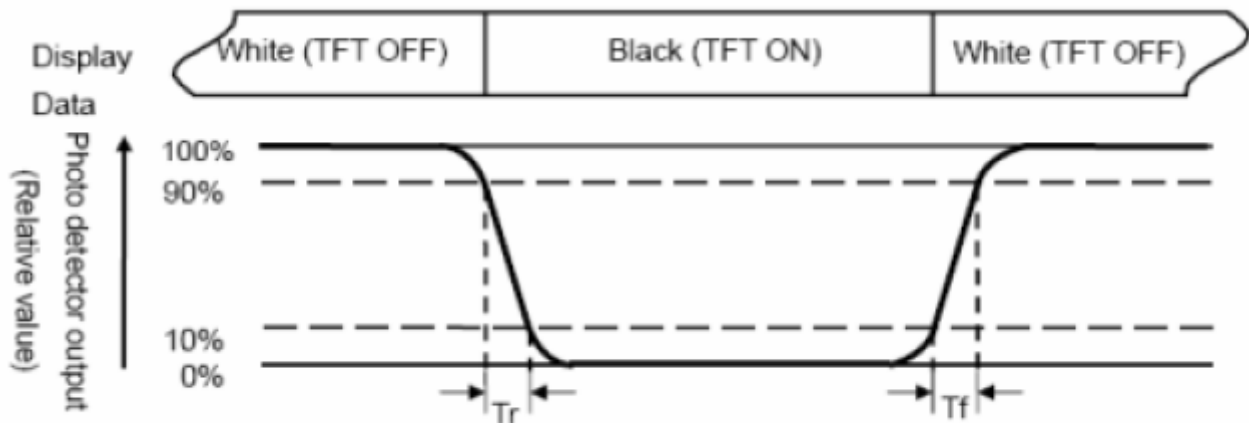


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White  $V_i = V_{i50} \pm 1.5V$

Black  $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

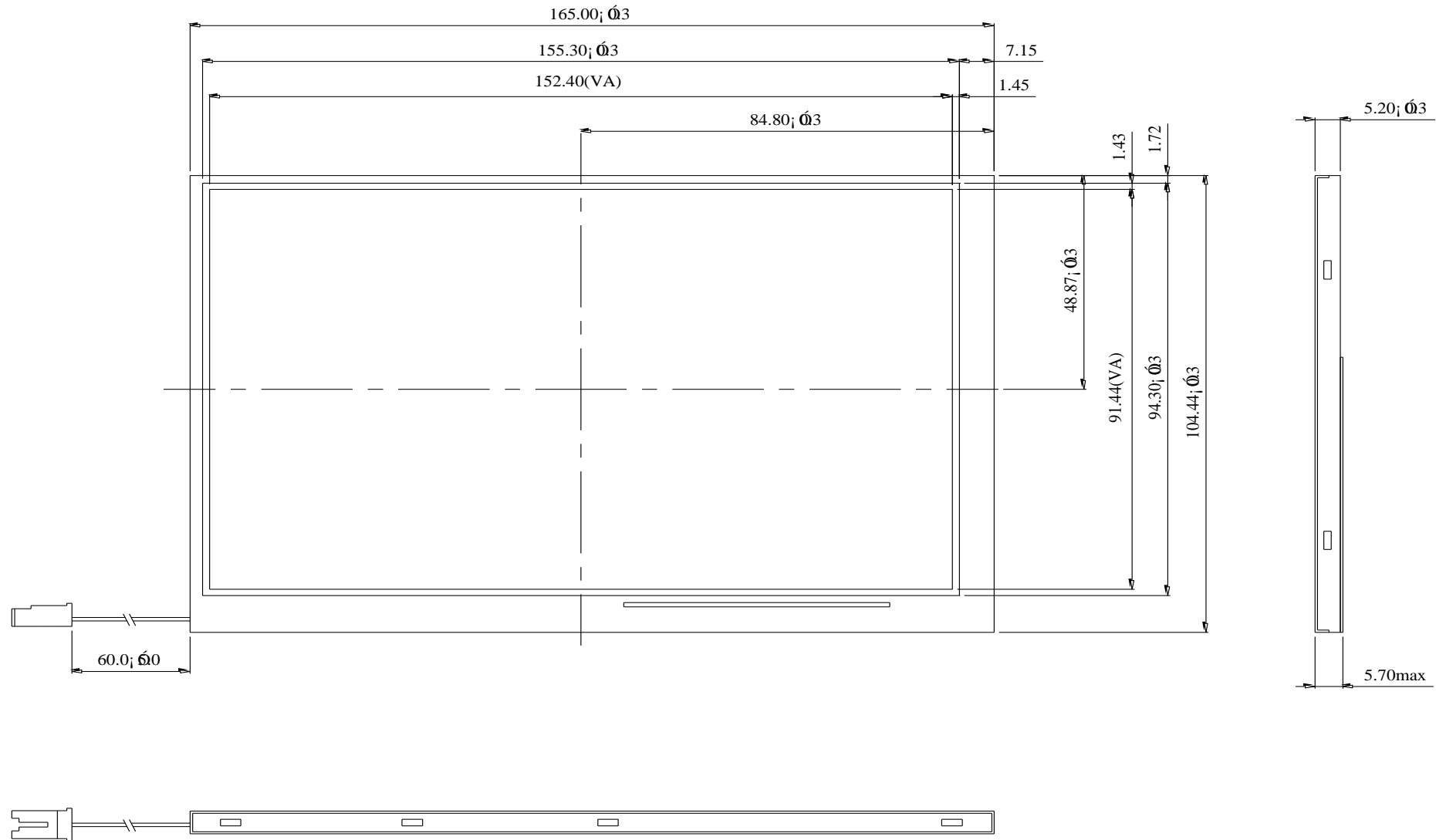
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

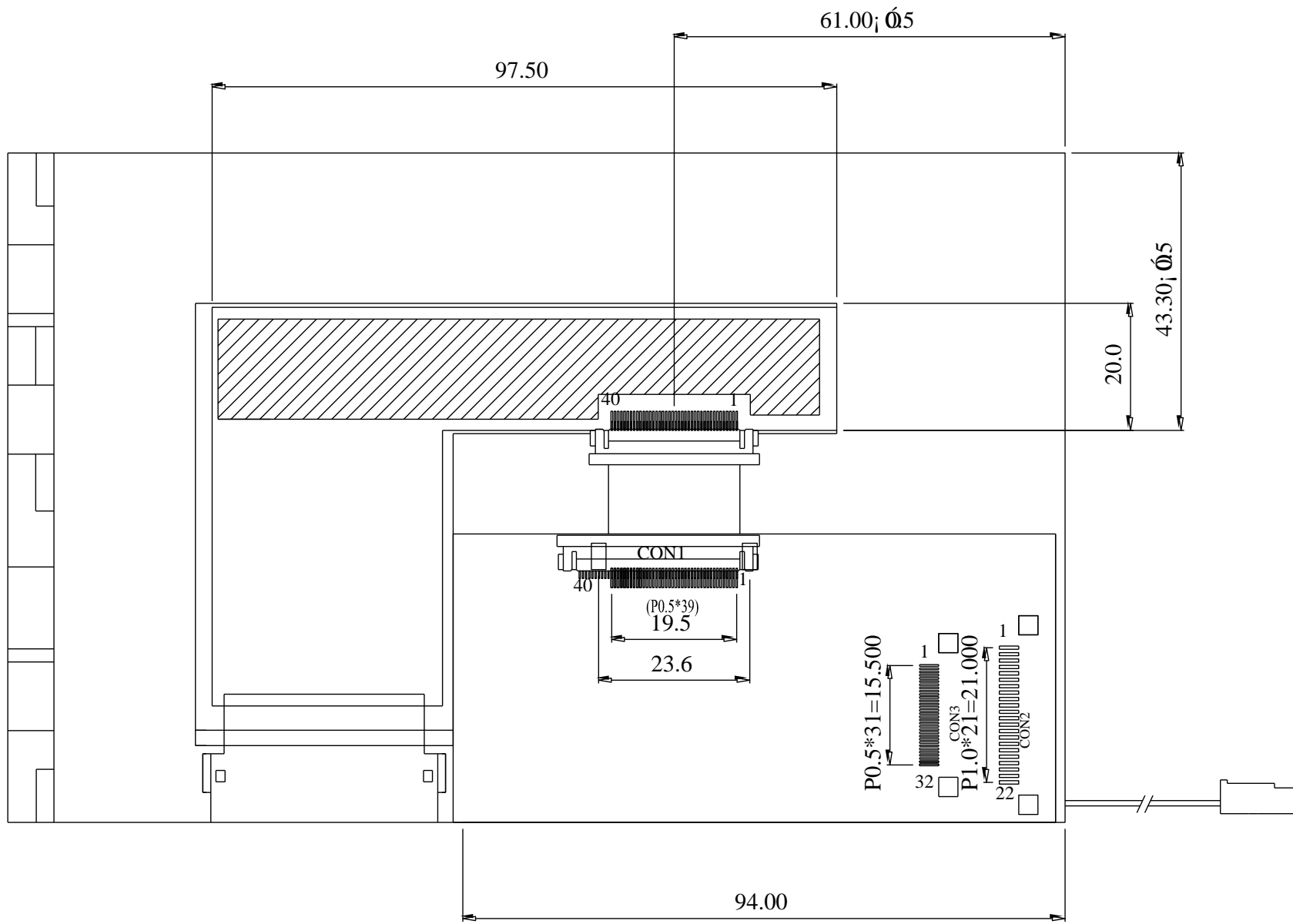
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 8. Contour Drawing





PIN NO.	SYMBOL
1	GND
2	VDD
3	VO
4	A0
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	CS
16	NC
17	NC
18	RST
19	NC
20	NC
21	NC
22	NC



## 9. AC Characteristics

### Conditions:

Voltage referenced to  $V_{SS}$

$V_{DD}, V_{DDPLL} = 1.2V$

$V_{DDIO}, V_{DDLCD} = 3.3V$

$T_A = 25^\circ C$

$C_L = 50pF$  (Bus/CPU Interface)

$C_L = 0pF$  (LCD Panel Interface)

### 9.1 Clock Timing

#### Clock Input Requirements for CLK (PLL-bypass)

Symbol	Parameter	Min	Max	Units
FCLK	Input Clock Frequency (CLK)		120	MHz
TCLK	Input Clock period (CLK)	1/fCLK		ns

#### Clock Input Requirements for CLK (Using PLL)

Symbol	Parameter	Min	Max	Units
FCLK	Input Clock Frequency (CLK)	2.5	50	MHz
TCLK	Input Clock period (CLK)	1/fCLK		ns

#### Clock Input Requirements for crystal oscillator XTAL (Using PLL)

Symbol	Parameter	Min	Max	Units
FXTAL	Input Clock Frequency	2.5	10	MHz
TXTAL	Input Clock period	1/fXTAL		ns

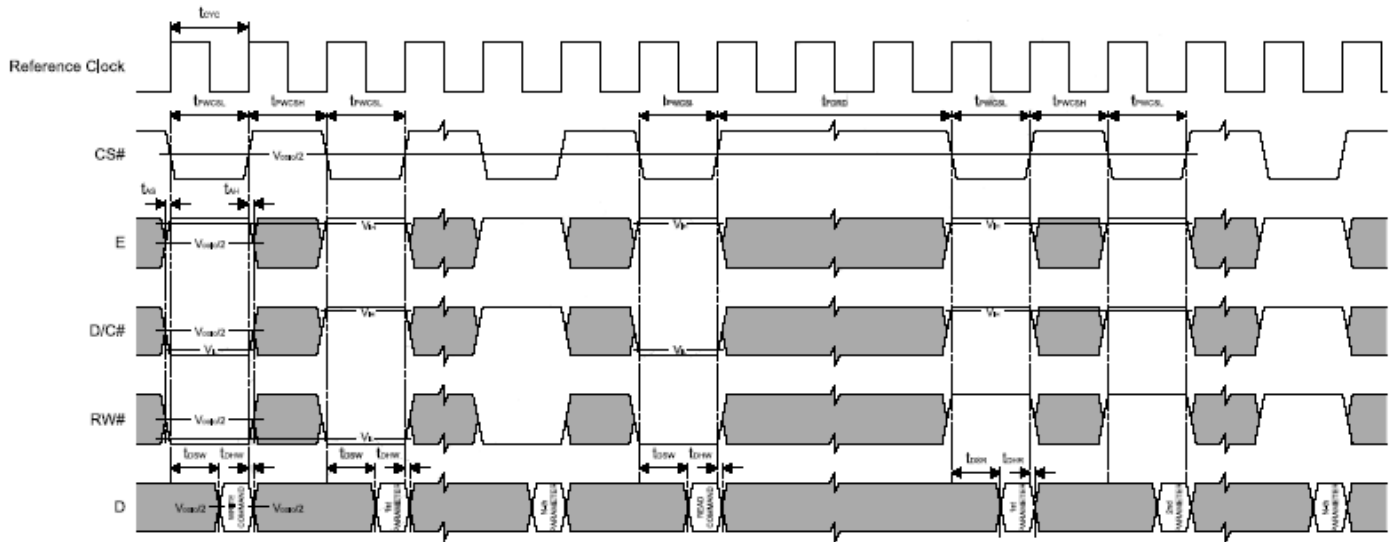
### 9.2 MCU Interface Timing

#### 9.2.1 6800 Mode

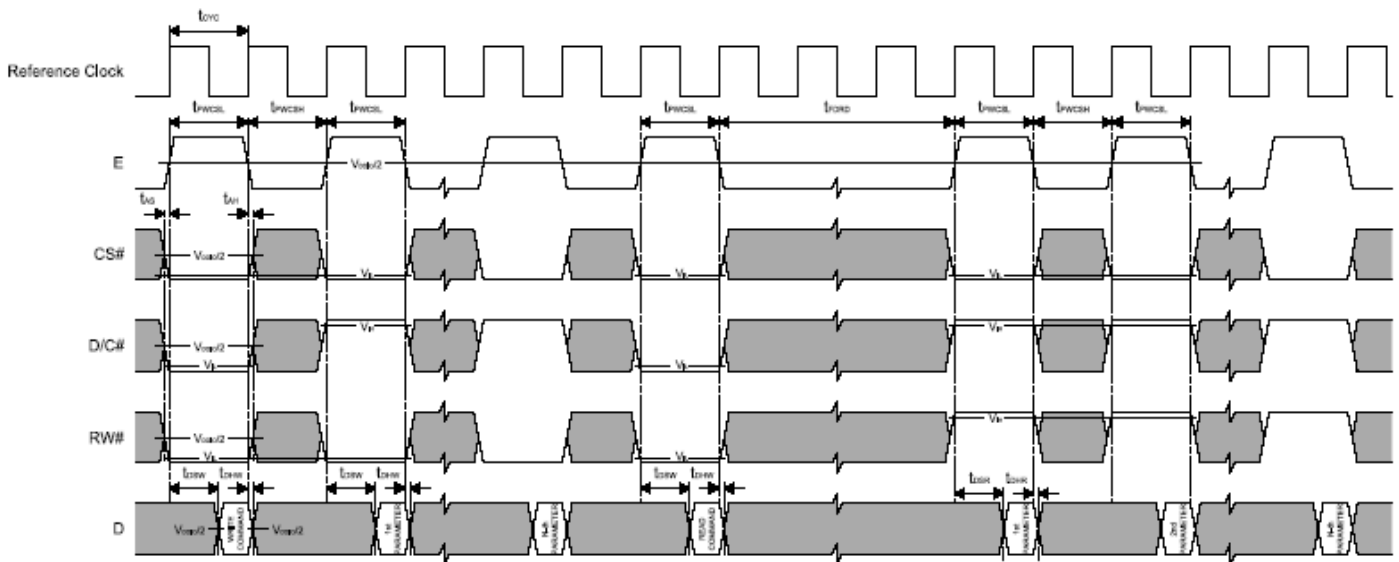
Table 7-4: 6800 Mode Timing

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>cy</sub>	Reference Clock Cycle Time	9	-	-	ns
t <sub>PWCSL</sub>	Pulse width CS# or E low	1	-	-	t <sub>CYC</sub>
t <sub>PWCSH</sub>	Pulse width CS# or E high	1	-	-	t <sub>CYC</sub>
t <sub>FDRD</sub>	First Data Read Delay	5	-	-	t <sub>CYC</sub>
t <sub>AS</sub>	Address Setup Time	1	-	-	ns
t <sub>AH</sub>	Address Hold Time	1	-	-	ns
t <sub>DSW</sub>	Data Setup Time	4	-	-	ns
t <sub>DHW</sub>	Data Hold Time	1	-	-	ns
t <sub>DSR</sub>	Data Access Time	-	-	5	ns
t <sub>DHR</sub>	Output Hold time	1	-	-	ns

**Figure 9-1: 6800 Mode Timing Diagram (Use CS# as Clock)**



**Figure 9-2: 6800 Mode Timing Diagram (Use E as Clock)**



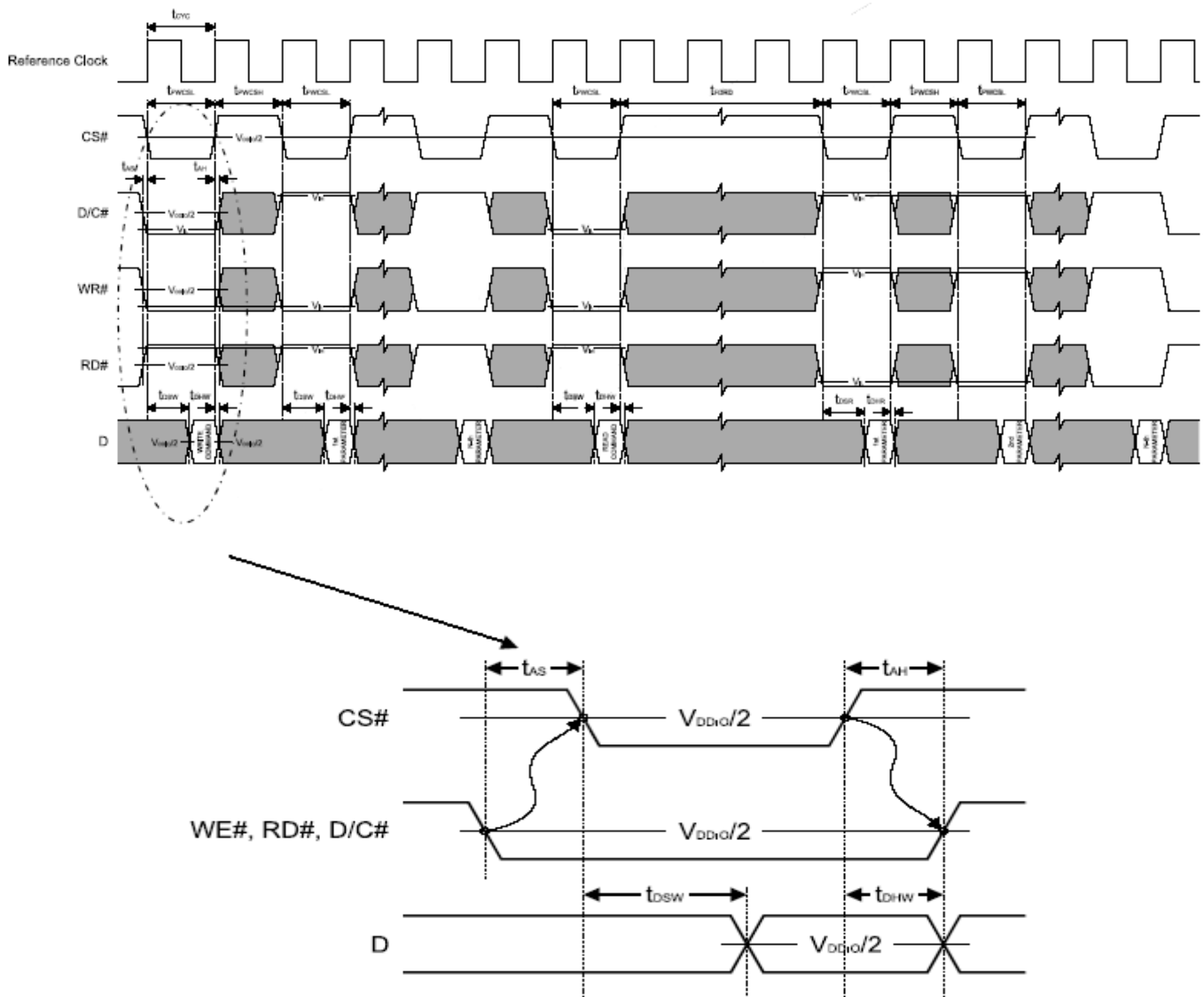


## 9.2.2 8080 Mode Write Cycle

**Table 7-5: 8080 Mode Timing**

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>cy</sub>	Reference Clock Cycle Time	9	-	-	ns
t <sub>PWCSL</sub>	Pulse width CS# low	1	-	-	t <sub>CYC</sub>
t <sub>PWCSH</sub>	Pulse width CS# high	1	-	-	t <sub>CYC</sub>
t <sub>FDRD</sub>	First Read Data Delay	5	-	-	t <sub>CYC</sub>
t <sub>AS</sub>	Address Setup Time	1	-	-	ns
t <sub>AH</sub>	Address Hold Time	1	-	-	ns
t <sub>DSW</sub>	Data Setup Time	4	-	-	ns
t <sub>DHW</sub>	Data Hold Time	1	-	-	ns
t <sub>DSR</sub>	Data Access Time	-	-	5	ns
t <sub>DHR</sub>	Output Hold time	1	-	-	ns

**Figure 7-3: 8080 Mode Timing Diagram**



# 10. Data transfer order Setting

## Pixel Data Format

Both 6800 and 8080 support 8-bit, 9-bit, 16-bit, 18-bit and 24-bit data bus. Depending on the width of the data bus, the display data are packed into the data bus in different ways.

Pixel Data Format :

Interface	Cycle	D[23]	D[22]	D[21]	D[20]	D[19]	D[18]	D[17]	D[16]	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]	
24 bits	1 <sup>st</sup>	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
18 bits	1 <sup>st</sup>							R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	
16 bits (565 format)	1 <sup>st</sup>									R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	
16 bits	1 <sup>st</sup>									R5	R4	R3	R2	R1	R0	X	X	G5	G4	G3	G2	G1	G0	X	X	
	2 <sup>nd</sup>									B5	B4	B3	B2	B1	B0	X	X	R5	R4	R3	R2	R1	R0	X	X	
	3 <sup>rd</sup>									G5	G4	G3	G2	G1	G0	X	X	B5	B4	B3	B2	B1	B0	X	X	
9 bits	1 <sup>st</sup>																	R5	R4	R3	R2	R1	R0	G5	G4	G3
	2 <sup>nd</sup>																	G2	G1	G0	B5	B4	B3	B2	B1	B0
8 bits	1 <sup>st</sup>																	R5	R4	R3	R2	R1	R0	X	X	
	2 <sup>nd</sup>																	G5	G4	G3	G2	G1	G0	X	X	
	3 <sup>rd</sup>																	B5	B4	B3	B2	B1	B0	X	X	

X: Don't Care

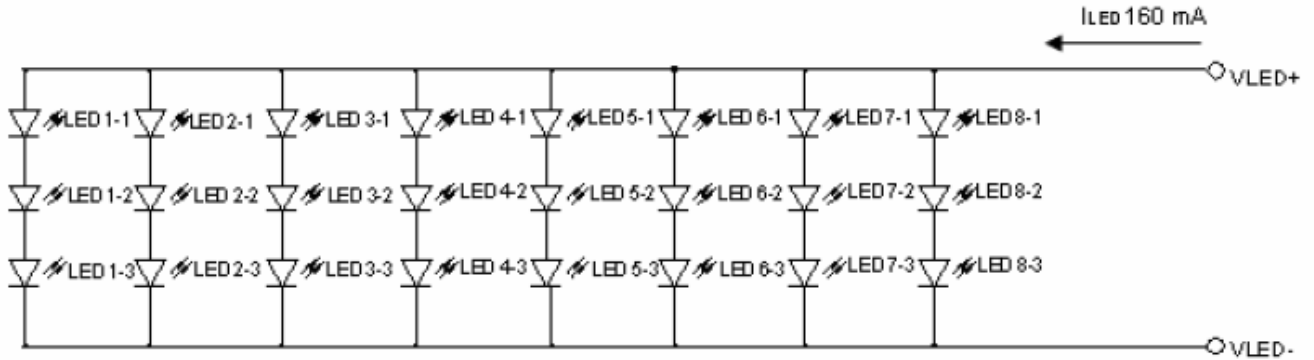
## **11 Register Depiction**

**Please consult the spec of SSD1963**

# 13. LED driving conditions

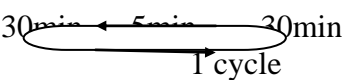
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I <sub>LED</sub>	-	160	-	mA	Note 1
LED voltage	V <sub>LED</sub>	-	9.9	-	V	
LED Life Time	-	10,000	20,000	-	Hr	Note 2

Note 1 : There are 8 Groups LED shown as below , V<sub>LED</sub>=9.9V , I<sub>LED</sub>=160mA.



Note 2 : Brightness to be decreased to 50% of the initial value.

# 14. Reliability

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C, 90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60°C, 90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20°C    25°C    70°C  	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V, RS=1.5kΩ CS=100pF 1 time	—

## Content of Reliability Test (wide temperature, -20°C~70°C)

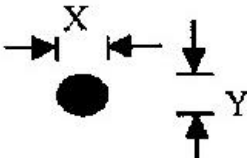
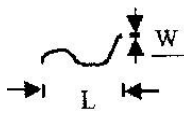
**Note1: No dew condensation to be observed.**

**Note2: The function test shall be conducted after 4 hours storage at the normal**

Temperature and humidity after remove from the test chamber.

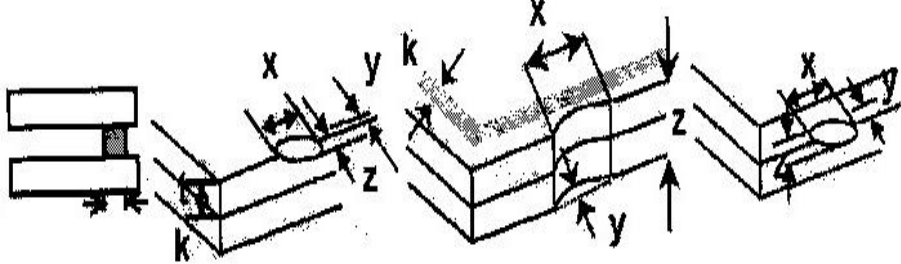
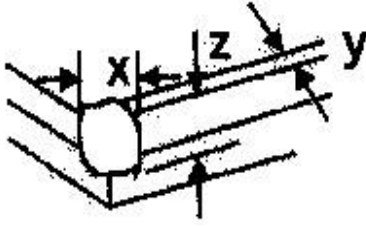
Note3: Vibration test will be conducted to the product itself without putting it in a container.

## 15. Inspection specification

NO	Item	Criterion	AQL												
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65												
02	Black or white spots on LCD (display only)	2.1 White and black spots on display $\leq 0.25\text{mm}$ , no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5												
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi = (x + y) / 2$  <table border="1" data-bbox="869 1019 1348 1523"> <thead> <tr> <th>SIZE</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.20</math></td> <td>2</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.25</math></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>	SIZE	Acceptable QTY	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	1	$0.25 < \Phi$	0	2.5		
		SIZE	Acceptable QTY												
$\Phi \leq 0.10$	Accept no dense														
$0.10 < \Phi \leq 0.20$	2														
$0.20 < \Phi \leq 0.25$	1														
$0.25 < \Phi$	0														
3.2 Line type : (As following drawing)  <table border="1" data-bbox="710 1556 1348 1825"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.02</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.03</math></td> <td rowspan="2">2</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> </tr> <tr> <td>---</td> <td><math>0.05 &lt; W</math></td> <td>As round type</td> </tr> </tbody> </table>	Length	Width	Acceptable QTY	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	---	$0.05 < W$	As round type	2.5
Length	Width	Acceptable QTY													
---	$W \leq 0.02$	Accept no dense													
$L \leq 3.0$	$0.02 < W \leq 0.03$	2													
$L \leq 2.5$	$0.03 < W \leq 0.05$														
---	$0.05 < W$	As round type													

04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.	Size $\Phi$	Acceptable Q TY	2.5
			$\Phi \leq 0.20$	Accept no dense	
			$0.20 < \Phi \leq 0.50$	3	
			$0.50 < \Phi \leq 1.00$	2	
			$1.00 < \Phi$	0	
			Total Q TY	3	

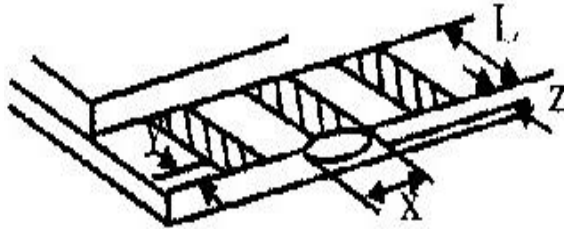
NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	

06	Chipped glass	<p>Symbols Define:  x: Chip length            y: Chip width            z: Chip thickness  k: Seal width            t: Glass thickness    a: LCD side length  L: Electrode pad length:</p> <p>6.1 General glass chip :  6.1.1 Chip on panel surface and crack between panels:</p> 	2.5									
		<table border="1"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></td> </tr> </table>		z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$
		z: Chip thickness		y: Chip width	x: Chip length							
		$Z \leq 1/2t$		Not over viewing area	$x \leq 1/8a$							
		$1/2t < z \leq 2t$		Not exceed 1/3k	$x \leq 1/8a$							
		<p>⊙ If there are 2 or more chips, x is total length of each chip.</p>										
		<p>6.1.2 Corner crack:</p> 										
		<table border="1"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> </table>		z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$			
		z: Chip thickness		y: Chip width	x: Chip length							
		$Z \leq 1/2t$		Not over viewing area	$x \leq 1/8a$							

		<table border="1"> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed <math>1/3k</math></td> <td><math>x \leq 1/8a</math></td> </tr> </table>	$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$	
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$				
		<p>⊙ If there are 2 or more chips, x is the total length of each chip.</p>				

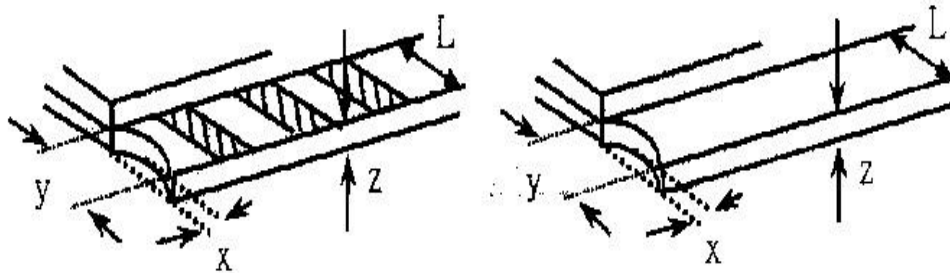
NO	Item	Criterion	AQL
06	Glass crack	<p>Symbols :</p> <p>x: Chip length      y: Chip width      z: Chip thickness  k: Seal width      t: Glass thickness      a: LCD side length  L: Electrode pad length  6.2 Protrusion over terminal :  6.2.1 Chip on electrode pad :</p>	2.5





y: Chip width	x: Chip length	z: Chip thickness
$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$

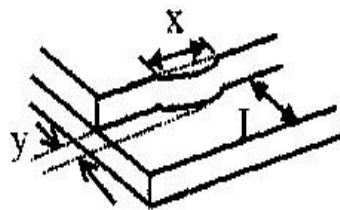
6.2.2 Non-conductive portion:



y: Chip width	x: Chip length	z: Chip thickness
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$

- ⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
- ⊙ If the product will be heat sealed by the customer, the alignment mark not be damaged.

6.2.3 Substrate protuberance and internal crack.



y: width	x: length
$y \leq 1/3L$	$x \leq a$

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down.	2.5 2.5 0.65 2.5 2.5 0.65 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 LCD pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	0.65



**INNOVATIVE DISPLAY TECHNOLOGIES**

**17171 MURPHY AVENUE**

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**P: 949-417-8070/F: 949-417-8075**

**SCA07030-BFA-LNC**

**Sales signature :** \_\_\_\_\_

**Customer Signature :** \_\_\_\_\_

**Date :** \_\_\_\_ / \_\_\_\_ / \_\_\_\_