深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

TFT-LCD Module Specification

Module NO.：TSM070CBOT-02WC

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	2018-5-15	Initial Release	

CONTENTS

1   General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally white,TN	-
LCD Size	7.0	inch
Resolution (W x H)	800x (RGB) × 480	pixel
CTP+LCM+PCB size	190.08(H) x 121.92(V) x 6.35(T)	mm
LCM size	164.9(H) x 100(V) x 3.5(T)	mm
Active Area	154.08 (H) x 85.92 V)	mm
Dot Pitch	0.0642(H) × 0.1790(V)	mm
Viewing Direction	12 o'clock	-
Gray Scale Inversion Direction	6 o'clock	-
Viewing Angle	Top:75,Bottom:70; Left/ Right:75	deg.
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	21 LEDs，60mA	-
Surface Luminance	300	cd/m2
Surface Treatment	Anti-Glare	-
LCD Driver IC	SSD1963	-
Interface Type	MCU8/16bit	-
Input Voltage	5	V
I/O port operating voltage	3.3	V
With/Without TP	With CTP(IC:FT5446)	-
Weight	TBD	g

Note 1: RoHS compliant
Note 2: LCM weight tolerance: ± 5%.

2 Product drawings

D		1
LCD Type	7.0"TFT Transmissive, Normally white,TN	
Resolution	800(RGB)*480	
View Direction	12 O'CLOCK	
Driver IC	SSD1963	
Color Depth	16.7M	
Interface Types	MCU6/16-Bit	
Operating voltage	3.3V	
With/without TP	With Ctp/FT5446	
Backlight LEDs	21 LEDs, 60mA,22.4V	
Surface luminance	300 cd/m2	
Operating temperature	-20℃~70℃	
Storage Temperature	-30℃~80℃	
Storage Humidity	10RH ~ 40RH	

If=60MA Vf=22.4V

"Need to pay attention to" the key size with *

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

东莞市一众显示科技有限公司
DONG GUAN TEAM SOURCE DISPLAY TECH. CO.,LTD.

视 角(View):	单 位(Unit):	产品型号(Product Type):	TSM070CBOT-02WC	
MM	比例(Proportion): 1:1	页 面(Page): 1/1	版 本(Version): V0	
设 计(DESIGN)	审 核(AUDITING)	批 准(APPROVED)		
Aron				
2018.5.15				

Touch Panel PIN CTP Driver IC: FT5446

PIN NO.	DIMENSION
1	NC
2	NC
3	RST
4	INT
5	GND
6	SDA
7	SCL
8	VDD
9	VDD

Pin NO.	Symbol
1	GND
2	VCC(5.0V)
3	BL_EN
4	RS
5	VR
6	RD
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	DB8
16	DB9
17	DB10
18	DB11
19	DB12
20	DB13
21	DB14
22	DB15
23	NC
24	NC
25	CS
26	RESET
27	NC
28	YD/TPIC_SDA
29	YD/TPIC_SCL
30	XL/TPIC_PENIRQ
31	YU/NC
32	DISP/NC

3 Interface description

3.1 LCM interface description

| PIN NO.	Symbol	description
1	GND	System Ground. (0V)
2	VDD	Power supply +5V
3	BL_EN	Backlight enable
4	RS	Data/Command select
5	WR	write strobe signal
6	RD	read strobe signal
7~22	DB0~DB15	MCU16-bit Data bus. Pins not used should be floating.
23	NC	
24	NC	
25	CS	Chip select
26	RESET	Reset signal input
27	NC	
28	NC/XR/ TP_I2C_SDA	The RTP X right pin
29	NC/YD/ TP_I2C_SCL	The RTP Y down pin
30	NC/XL/TP_INT	The RTP X left pin
31	NC/YU/CTP_RST	The RTP Y up pin
32	DISP	Standby mode control. (Normally pull high) DISP="L", enter standby mode for power saving. Timing controller and source driver will turn off, all outputs are Hi-Z. DISP="H", normal operation. If no use please open it.

3.2   CTP interface description

PIN NO.	Symbol	description
1	NC	
2	NC	
3	RST	External Reset, Low is active
4	GND	Ground. (0V)
5	INT	Interrupt request to the host
6	SDA	I2C data input and output
7	SCL	I2C clock input
8	GND	Ground. (0V)
9	GND	Ground. (0V)
10	VDD	Power supply +3.3V

4   Timing Characteristics

4.1 Parallel 8080-series Interface Timing
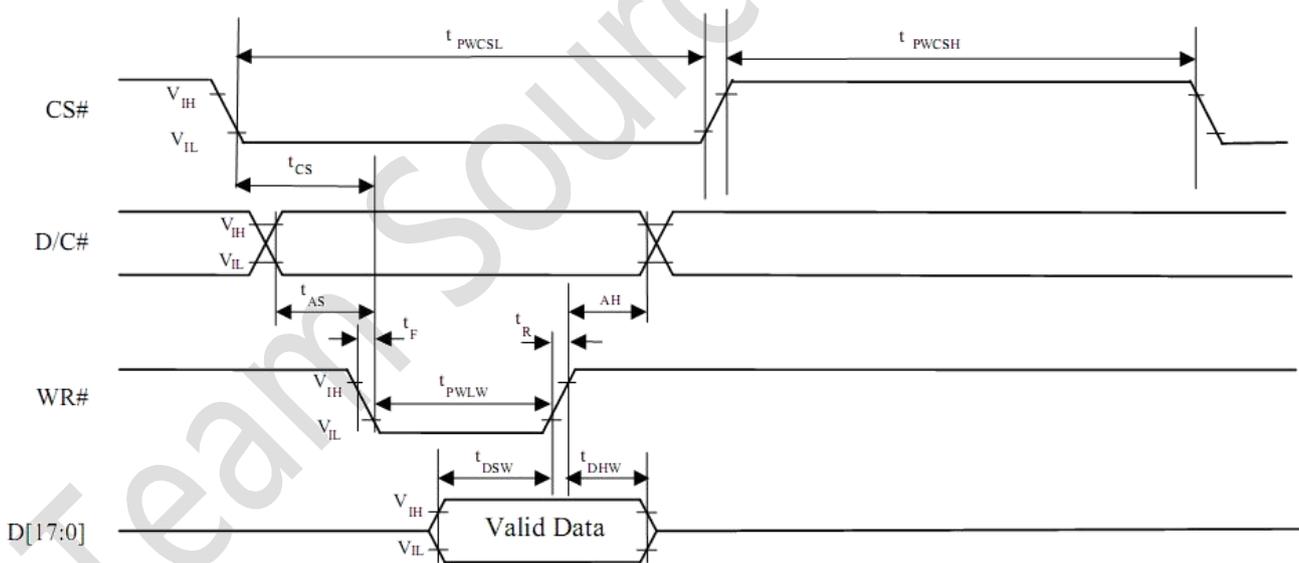
Parallel 8080-series Interface Timing Diagram (Write Cycle)
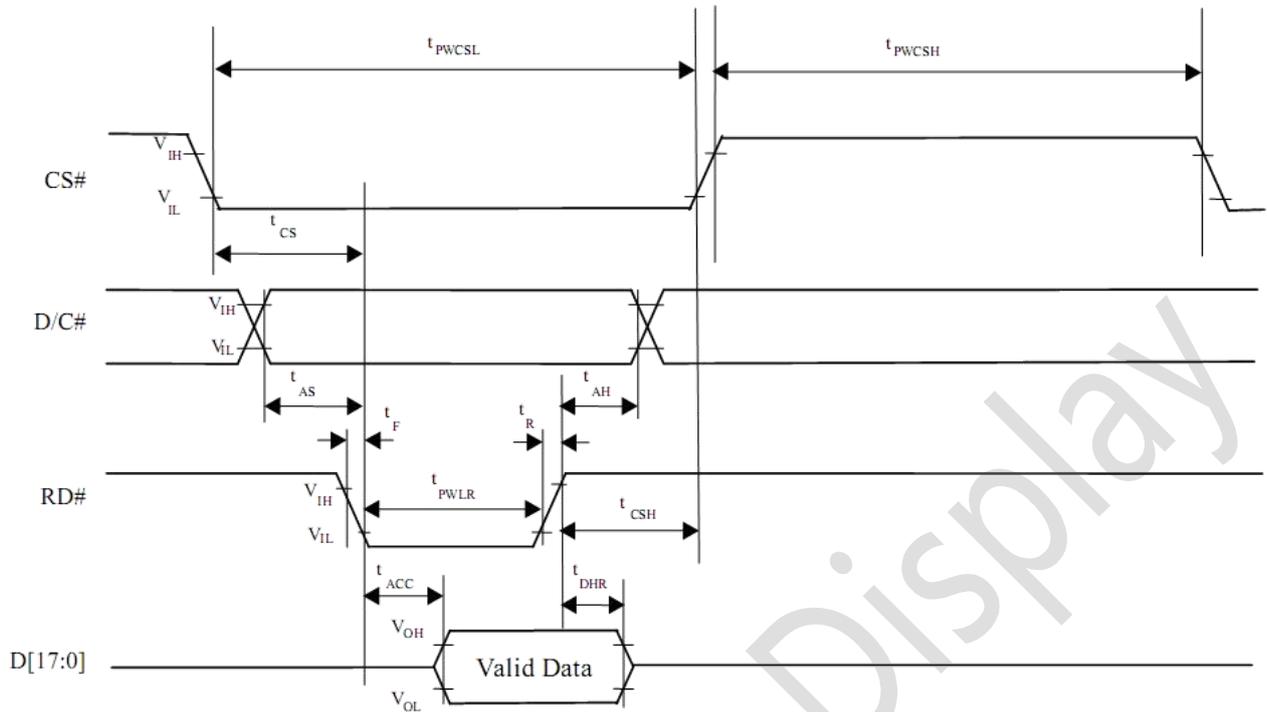
Parallel 8080-series Interface Timing Diagram (Read Cycle)

Symbol	Parameter		Min	Typ	Max	Unit
f_{MCLK}	System Clock Frequency*		1	-	110	MHz
t_{MCLK}	System Clock Period*		$1/\,f_{MCLK}$	-	-	ns
t_{PWCSL}	Control Pulse High Width	Write	13	$1.5*\,t_{MCLK}$	-	ns
		Read	30	$3.5*\,t_{MCLK}$		
t_{PWCSH}	Control Pulse Low Width	Write (next write cycle)	13	$1.5*\,t_{MCLK}$	-	ns
		Write (next read cycle)	80	$9*\,t_{MCLK}$		
		Read	80	$9*\,t_{MCLK}$		
t_{AS}	Address Setup Time		1	-	-	ns
t_{AH}	Address Hold Time		2	-	-	ns
t_{DSW}	Write Data Setup Time		4	-	-	ns
t_{DHW}	Write Data Hold Time		1	-	-	ns
t_{PWLW}	Write Low Time		12	-	-	ns
t_{DHR}	Read Data Hold Time		1	-	-	ns
t_{ACC}	Access Time		32	-	-	ns
t_{PWLR}	Read Low Time		36	-	-	ns
t_{R}	Rise Time		-	-	0.5	ns
t_{F}	Fall Time		-	-	0.5	ns
t_{CS}	Chip select setup time		2	-	-	ns
t_{CSH}	Chip select hold time to read signal		3	-	-	ns

* System Clock denotes external input clock (PLL-bypass) or internal generated clock (PLL-enabled)

4.2 LCD RGB Timing Characteristics

DE Mode Timing Diagram
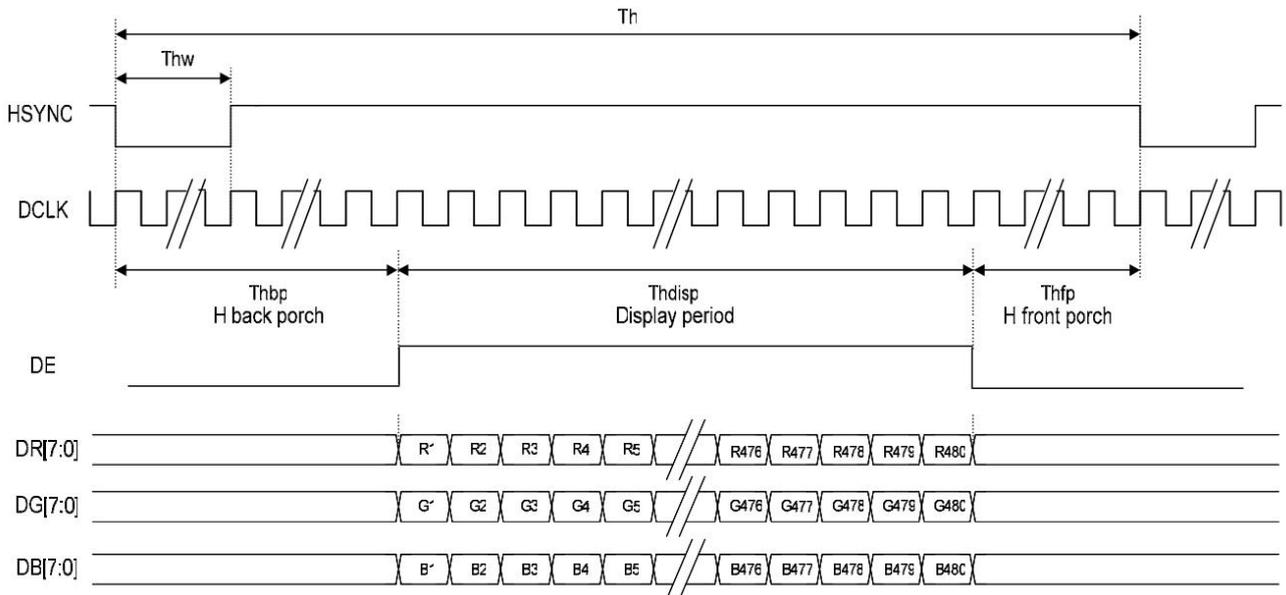
Horizontal Input Timing

Parameter	Symbol	min	Typ.	max	Unit
Horizontal display area	tHD	-	800	-	DCLK
CLKIN frequency	f_{clk}	-	30	50	MHz
1 Horizontal line period	t_H	862	1056	1200	DCLK
HSD pulse width	t_{HPW}	1	-	40	
HSD back porch	t_{HBP}	-	46	-	
HSD front porch	t_{HFP}	16	210	354	
DE mode blanking	Th-thd	85	256	400	
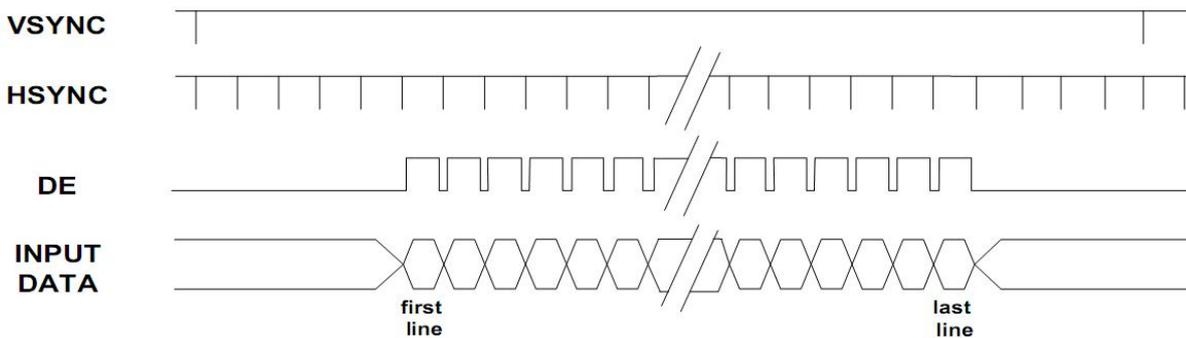
Vertical Input Timing

Parameter	Symbol	min	Typ.	max	Unit
Vertical display area	t_{VD}	-	480	-	HSD
VSD period time	t_V	513	525	650	
VSD pulse width	T_{VPW}	3	-	20	
VSD back porch	t_{VBP}	-	23	-	
VSD front porch	t_{VFP}	7	22	147	

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VDD~GND	-0.3	6.0	V
Logic signal voltage(I/O)	IOVDD~GND	-0.3	3.3	V
Operating Temperature	TOP	-20	70	° C
Storage Temperature	TST	-30	80	° C
Humidity	RH	-	90%(Max 60° C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VDD	4.5	5	6	V
Logic operating voltage	IOVDD	-0.3	3.3	-	V
Input Current	IDD	-	TBD	-	mA
Input Voltage ' H ' level	VIH	0.7IOVCC	-	IOVCC	V
Input Voltage ' L ' level	VIL	GND	-	0.3IOVCC	
Output Voltage ' H ' level	VOH	0.8IOVCC	-	IOVCC	
Output Voltage ' L ' level	VOL	GND	-	0.2IOVCC	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	21.7	22.4	V
Current for LED backlight	I_f	-	45	60	mA
Power consumption	Wbl	-	976.5	1344	mW
Uniformity	Avg	80	-	-	%
LED Life Time	-	30000	40000	-	Hrs

Note:

1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.

2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.

3. Typical operating life time is an estimated data.

4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	θ = 0°	-	25	-	ms	Note 5
Contrast ratio	CR	θ = 0°	400	500	-		Note 2,6
Viewing angle	Top	CR≧10	70	75	-		Note 2,6,7

	Bottom	CR≧10	65	70	-	Deg.	
	Left	CR≧10	70	75	-		
	Right	CR≧10	70	75	-		
Color Filter Chromacicity with C light	Wx	θ = 0°	0.294	0.304	0.314	Note 3	
	Wy		0.329	0.339	0.349		
	Rx		0.586	0.601	0.616		
	Ry		0.309	0.324	0.339		
	Gx		0.291	0.301	0.311		
	Gy		0.552	0.567	0.582		
	Bx		0.133	0.143	0.153		
	By		0.159	0.174	0.189		
NTSC			-	50%	-	Note 3	
Transmittance	Trans		-	6.03%	-	Note 4	

Note 1: Ambient temperature = 25°C.

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is ±10%.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.
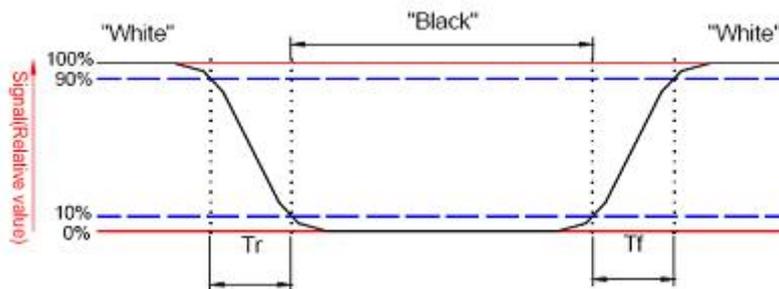
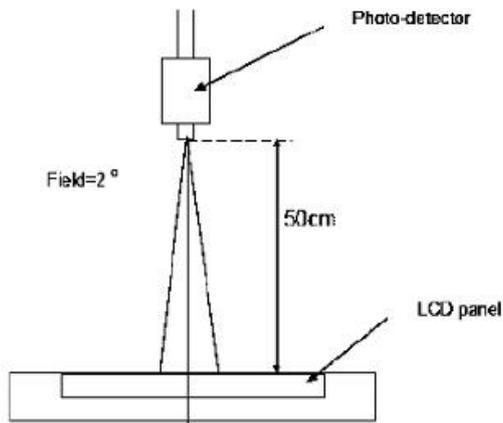Note 6: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$
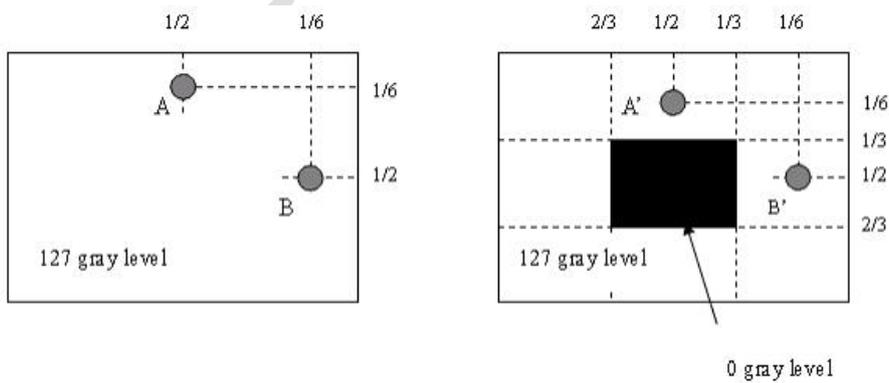
Note 7: Definition of viewing angle

Normal

$\theta x = \theta y = 0°$

12 o'clock direction

$\theta x- = 90°$ x-

$\theta y+ = 90°$

$\theta y-$ $\theta y+$

$\theta x-$ y+

$\theta x+$

x+ $\theta x+ = 90°$

6 o'clock

$\theta y- = 90°$

IC Bonding Pad

y-

FPC
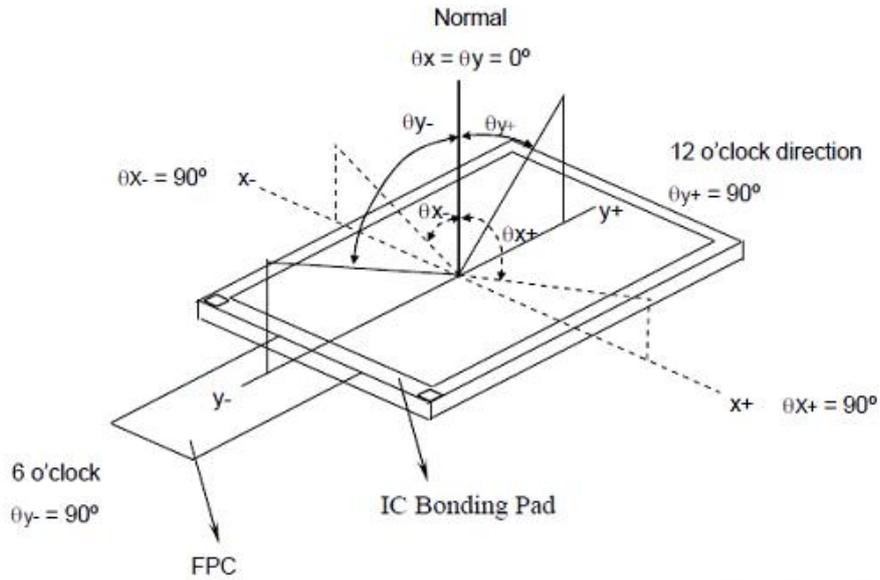
Note 8: Optical characteristic measurement setup.

Photo-detector

Field=2 °

50cm

LCD panel

Note 9:

1/2   1/6

2/3   1/2   1/3   1/6

A   1/6

A'   1/6

1/3

B   1/2

1/2

B'

2/3

127 gray level

127 gray level

0 gray level

l LA-LA' l / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

l LB-LB' l / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

9   Capacitive Touch Panel specifications

9.1   Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	7.0	
Outline Dimension (OD)	190.08(H) x 121.92(V)mm	Cover Lens Outline
Product Thickness	2.8mm(max)	With FPC and frame D.S.T
Glass Thickness	2.0mm	
Ink View Area	154.82x87.1mm	
Input Method	5 Fingers	
Activation Force	Touch	
Surface Hardness	≥6H	

9.2   Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.3V
Power Consumption (IDD)	Active Mode	12~4.5mA
	Sleep Mode	TBD
Interface		I^{2}C
Controller IC		FT5446
I^{2}C address		0x70
Resolution		800*480

9.3   Interface timing characteristics
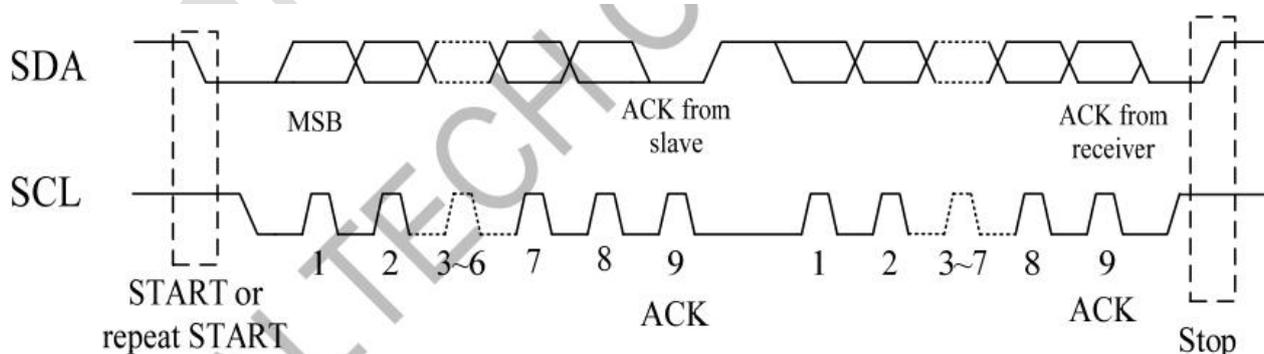
PARAMETER	MIN	MAX	UNIT
SCL Frequency	-	400K	Hz
Bus Free Time Between a STOP and START Condition	1.3	-	uS

Hold Time (repeated) START Condition	0.6	-	uS
Data Setup Time	100	-	nS
Setup Time for Repeated START Condition	0.6	-	uS
Setup Time for STOP Condition	0.6	-	uS

10 RELIABILITY TEST

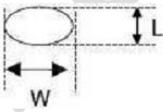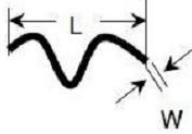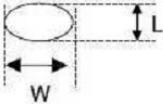| NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/96 hours	
2	Low Temperature Storage	-30±2°C/96 hours	
3	High Temperature Operating	70±2°C/96 hours	
4	Low Temperature Operating	-20±2°C/96 hours	Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack
5	Temperature Cycle	-30±2°C ~ 25~ 80± 2°C × 10 cycles (30 min.) (5min.) (30min.)	
6	Damp Proof Test	60°C ±5°C × 90%RH/96 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	
8	Shock Test	Half-sine, wave, 300m/s	
9	Packing Drop Test	Height: 80 cm 1 corner, concrete floor	
10	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	

11 Inspection standards

11.1 Visual inspection criterion in cosmetic

11.1.1 Glass defect

NO.	Defect	Criteria	Remark
1	Dimension(Minor)	By engineering diagram	
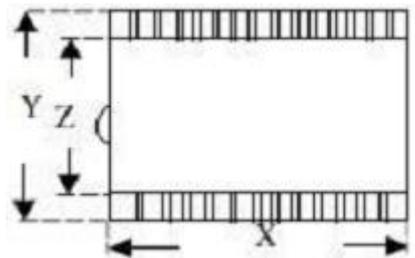
| 2 | Cracks(Major) | Extensive crack [Reject] | |
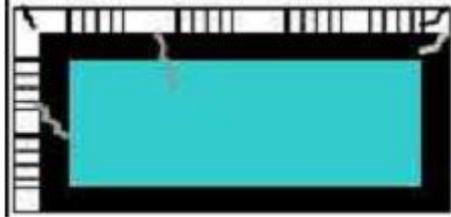
11.1.2 LCM appearance defect

NO.	Defect	Criteria		Remark
		Spec	Permissible Qty	
1	Round type(Minor)	Φ≤0.1mm	Disregard	1. Φ=(W+L)/2, L:Length,W=Width 2.Disregard if out of A.A
		0.1mm<Φ≤0.2mm	2	
		Φ>0.2mm	0	
2	Line type(Minor)	W ≤0.03mm	Disregard	1. L:Length,W=Width 2.Disregard if out of A.A
		L≤ 3.0mm and 0.03mm<W≤0.05mm	2	
		L≤ 3.0mm and 0.05mm<W≤0.1mm	1	
		W>0.10mm or L>3.0mm	0	
3	Polarizer dent(Minor)	Φ≤0.2mm	Disregard	1. Φ=(W+L)/2, L:Length,W=Width 2.Disregard if out of A.A
		0.2mm<Φ≤0.3mm	2	
		0.3mm<Φ≤0.5mm	1	
		Φ>0.5mm	0	

11.1.3 FPC

NO.	Defect	Criteria	Remark
1	Copper peeling(Minor)	Copper peeling [Reject]	
2	Damaged	Damaged[Reject]	

11.1.4 Black tape

NO.	Defect	Criteria	Remark
1	Shift(Minor)	IC exposed [Reject]	
2	No black tape(Minor)	No black tape [Reject]	

11.1.5 Silicon

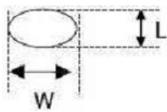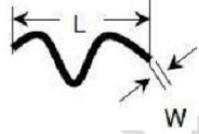| NO.	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed [Reject]	

11.1.6 Touch Panel

Defect	Criteria	Remark

TP shift	Click on the TP, the distance between the show position and click position>1.5mm [Reject]	

TP Circle, Dent Dot, Bubble MI	Size(mm)	Accessible QTY	
	D ≤0.20	Access	
	0.2<D≤0.3	2	
	0.3<D≤0.5	1	
	D>0.5	0	

TP Ripple MI	1.(Figure A): Ripple D>5mm [Reject] 2.(Figure B): Ripple area<1/7 TP area and not impact fonts display effect [Access] 	 A B
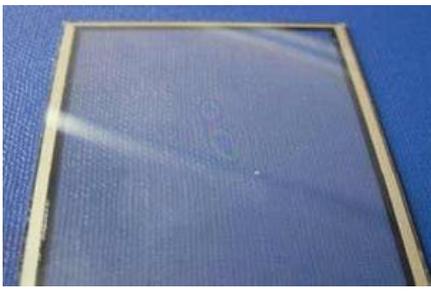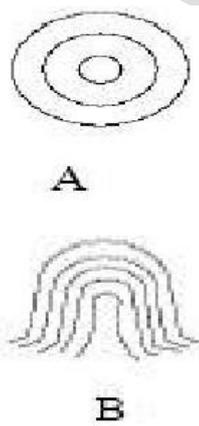
Remark: Tear up the protective film to inspect.

The distance of two dirt must>10mm;

The white dot found in manufacture is conformity to 0.1mm, if >0.1mm [Reject]

11.2 Visual inspection criterion in electrical display

NO.	Defect	Criteria		Remark
		Spec.	Permissible Qty	
1	No display (Major)	Not allowed		
2	Missing line (Major)	Not allowed		
3	Darker or lighter Line (Major)	Not allowed		
4	Weak line(Major)	By limited sample		
5	Bright / Dark point (Minor)	Bright point	1	1:1sub-pixel: 1R or 1G or 1B
		Dark point	2	2:Point defect area 1/2 sub pixel.
6	Round type (Minor)	Φ ≤0.1mm	Disregard	1. Φ =(W+L)/2,

		0.1＜φ≤0.2	3	L:Length,W=Width
		φ>0.2mm	0	2.Disregard if out of A.A
	Line type (Minor)	W ≤0.03mm	Disregard	1. L:Length,W=Width
		L≤ 3.0mm and 0.03mm<W≤0.05mm	2	2.Disregard if out of A.A
		L≤ 3.0mm and 0.05mm<W≤0.1mm	1	
		W>0.10mm or L>3.0mm	0	
	Mura (Minor)	By 5% ND filter invisible		

11.3 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)

2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

12 Suggestions for using LCD modules

12.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

3. Don't apply excessive force on the surface of the LCM.

4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The   following solvents is especially prohibited: water , ketone Aromatic solvents etc.

5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping   and   distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

7. Don't disassemble the LCM.

8. To prevent destruction of the elements by static electricity, be careful   to maintain an optimum work environment.

\- Be sure to ground the body when handling the LCD modules.

\- Tools required for assembling, such as soldering irons, must be properly grounded.

\- To   reduce   the amount of static electricity generated, do not conduct assembling and other work under dry conditions.

\- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its   shape   or   change the positions   of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.

12.2 Storage

1. Store in an ambient temperature of 5 to 45   C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.