SPECIFICATION
FOR
LCM Module

MODULE:	KD055FHFID003_C004A
CUSTOMER:	

REV	DESCRIPTION	DATE
V1.0	FIRST ISSUE	2018.06.08

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

Date	Rev. No.	Page	Summary
2018.06.08	V1.0	ALL	FIRST ISSUE

Contents

*Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystaldisplay) that uses amorphous silicon TFT as a switching device. This model iscomposed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit.The resolution of a 5.5'TFT-LCD contains 1080x1920pixels, and can display up to65K/262K/16.7Mcolors.

*Features

-Low Input Voltage: AVDD: 5.5V(Typ),AVEE: -5.5V(Typ), IOVCC:1.8V(Typ)

-Interface: MIPI VIDEO MODE 4 LANE

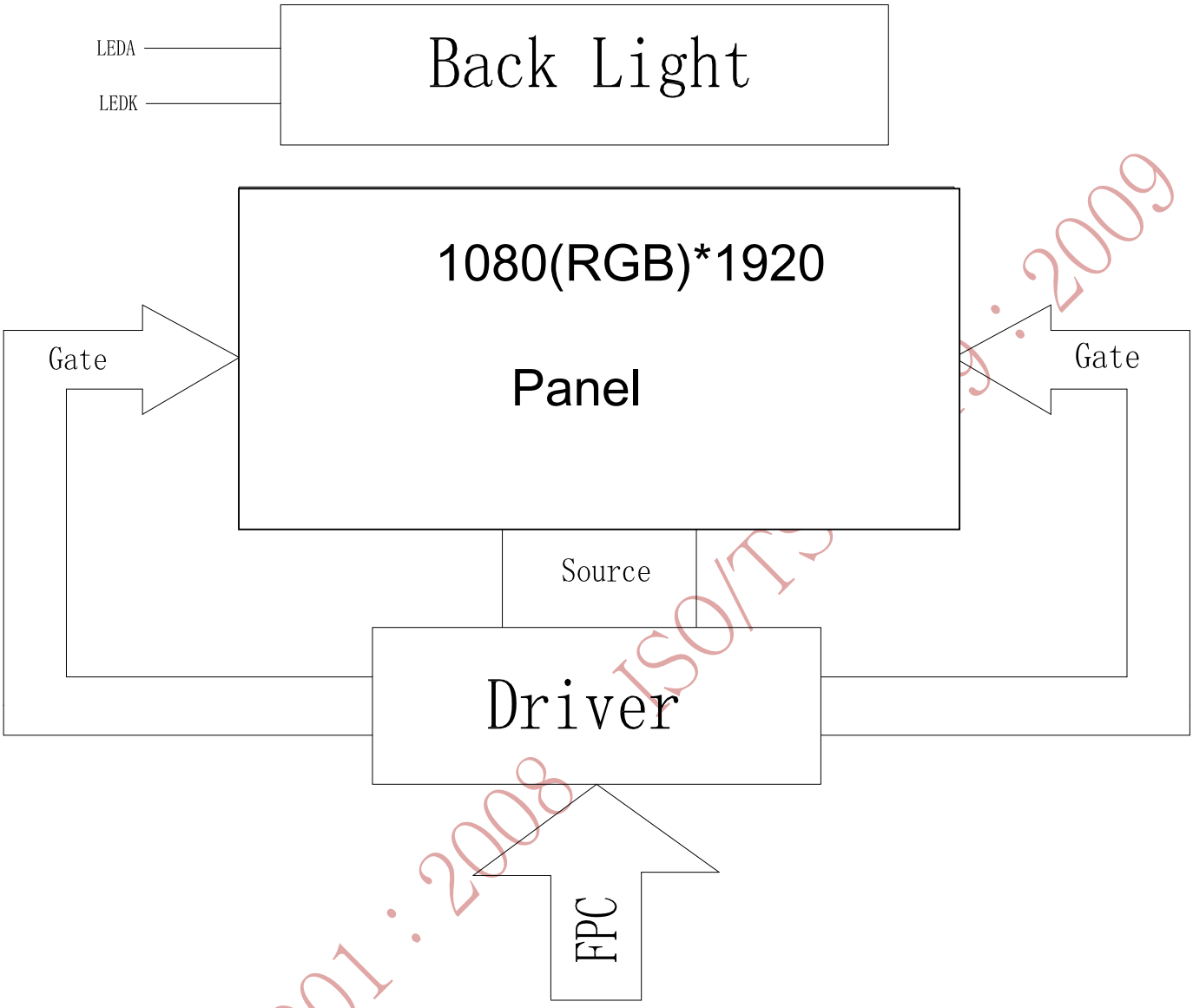
-CTP Interface:I2C

General InformationItems	Specification	Unit	Note
	Main Panel		
Display area(AA)	68.04(H)*120.96(V)	mm	-
CTP View area	68.84(H)*121.76(V)	mm	
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	1080 (RGB)*1920	pixel	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.063(H) x 0.063 (V)	mm	-
Viewing angle	Free viewing angle	o'clock	-
TFT Controller IC	NT35532	-	-
CTP Driver IC	GT911		
Display mode	Transmissive/Normally Black	-	-
Touch mode	5-points and Gestures		
Module Bonding type	Tape bonding		
Operating temperature	-20～+60	℃	-
Storage temperature	-30～+70	℃	-

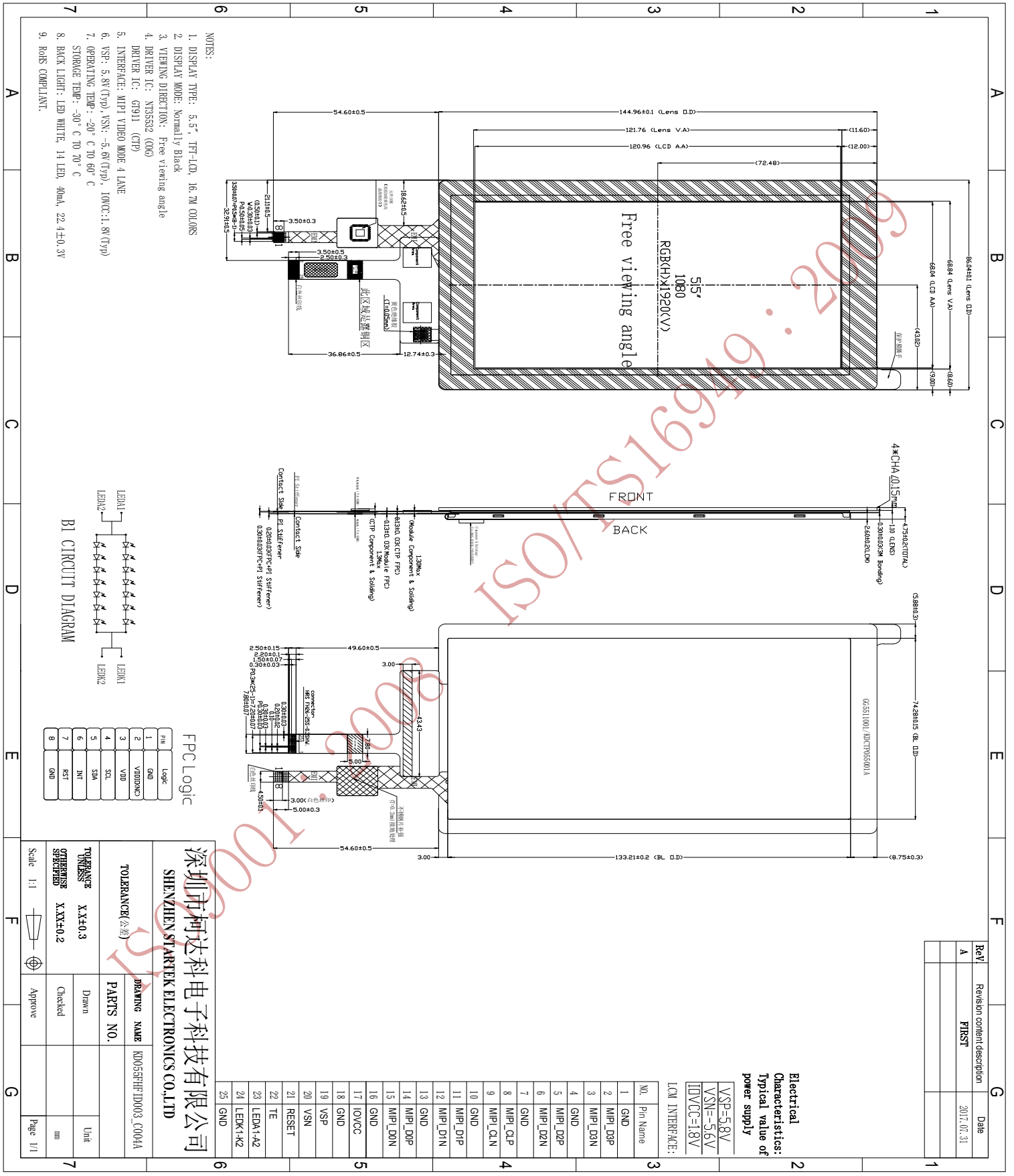
*Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		86.04		mm	-
	Vertical(V)		144.96		mm	-
	Depth(D)		4.75		mm	-
Weight			97		g	-

1. Block Diagram



2. Outline dimension



NO.	Pin Name
1	GND
2	MIPI_D3P
3	MIPI_D3N
4	GND
5	MIPI_D2P
6	MIPI_D2N
7	GND
8	MIPI_CLP
9	MIPI_CLN
10	GND
11	MIPI_D1P
12	MIPI_D1N
13	GND
14	MIPI_D0P
15	MIPI_D0N
16	GND
17	IOVCC
18	GND
19	VSP
20	VSN
21	RESET
22	TE
23	LEDA1-A2
24	LEDK1-K2
25	GND

PIN	Logic
1	GND
2	VDDIO(NC)
3	VDD
4	SCL
5	SDA
6	INT
7	RST
8	GND

3. Input terminal Pin Assignment

_ LCM interface definition

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	
2	MIPI_3P	MIPI DSI differential data pair (Data lane 3)	IO
3	MIPI_3N		IO
4	GND	Ground.	
5	MIPI_2P	MIPI DSI differential data pair (Data lane 2)	IO
6	MIPI_2N		IO
7	GND	Ground.	
8	MIPI_CKP	MIPI DSI differential data pair	IO
9	MIPI_CKN		IO
10	GND	Ground.	
11	MIPI_1P	MIPI DSI differential data pair (Data lane 1)	IO
12	MIPI_1N		IO
13	GND	Ground.	
14	MIPI_0P	MIPI DSI differential data pair (Data lane 0)	IO
15	MIPI_0N		IO
16	GND	Ground.	
17	IOVCC	Power supply for I/O pad(IOVCC=1.8V)	P
18	GND	Ground.	
19	VSP	Supply voltage (5.8V TYP).	P
20	VSN	Supply voltage (-5.6V TYP).	P
21	RESET	nitializes the chip with a low input .Be sure to execute a power-on reset after supplying power	IO
22	TE	Tearing effect output pin. Leave the pin open when not in use	O
23	LEDA1~A2	LED WHITE, 14 LED, 40mA, 22.4±0.3V	
24	LEDK1~K2	BL negative level output	

25	GND	Ground.	

_ CTP interface definition

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	P
2	NC	--	--
3	VDD	Supply voltage.	P
4	SCL	I2C clock input.	I
5	SDA	I2C data input and output	I/O
6	INT	External interrupt to the host.	I
7	RST	External Reset, Low is active.	I
8	GND	Ground.	P

4. LCD Optical Characteristics

Optical specification

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21 θ22	CR≧10	-	85	-	Deg.	[Note1,5]
	Vertical	θ11 θ12		-	85	-	Deg.	
Brightness		Br			-		nits	[Note 2]
Contrast ratio		CR		700	1000	-	-	[Note3,5]
Response time		τ_{DRV}		-	-	35	ms	[Note4,5,6]
Transmittance		Tr%		(4.0)	(5.0)			[With APCF] [Under C light simulation]
Chromaticity of white		x	θ=0 deg.	0.280	0.310	0.340	-	[Note 5] [Under C light simulation]
		y		0.320	0.350	0.380	-	
Chromaticity of red		x		0.625	0.655	0.685	-	
		y		0.293	0.323	0.353	-	
Chromaticity of green		x		0.240	0.270	0.300	-	
		y		0.550	0.580	0.610	-	
Chromaticity of blue		x		0.108	0.138	0.168	-	
		y		0.075	0.105	0.135	-	
Uniformity		%	-	-	80	-	-	[Note 7]

5. TFT Electrical Characteristics

Absolute Maximum Ratings

Ta=25°C

Parameter	Symbol	Condition	Ratings		Unit	Remark
			Min.	Max.		
Driver IC(Positive Analog) Power Supply Voltage	VSP-AGND	Ta=+25°C	-0.3	+6.5	V	[Note 5-1]
Driver IC(Negative Analog) Power Supply Voltage	AGND-VSN	Ta=+25°C	-6.5	+0.3	V	[Note 5-1]
Driver IC(Digital) Power Supply Voltage	VDDI-GND	Ta=+25°C	-0.3	+4.6	V	[Note 5-1]

【Note5-1】Voltage applied to GND pins. GND pin conditions are based on all the same voltage (0V). Always connect all GND externally and use at the same voltage.

Power Supply Voltage Range

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Driver IC(Analog) Power Supply Voltage	VSP	5.65	5.8	5.95	V	[Note 5-2]
Driver IC(Analog) Power Supply Voltage	VSN	-5.75	-5.6	-5.45	V	[Note 5-2]
Driver IC(Analog) Power Supply Voltage	VDDI	1.7	1.8	1.9	V	[Note 5-2]

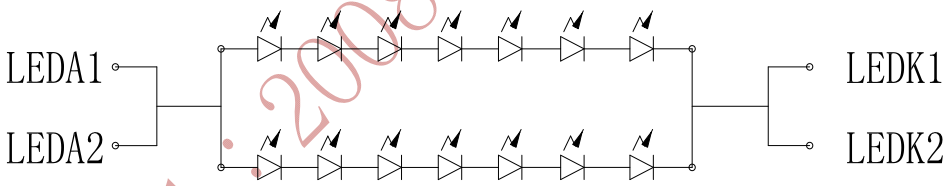
5.1 LED Backlight Characteristics

The back-light system is edge-lighting type with 14chipsWhite LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	30	40	--	mA	--
Forward Voltage	V_F	--	22.4	--	V	--
LCM Luminance	L_V	380	430	--	cd/m2	Note3
LED life time	Hr	50000			Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

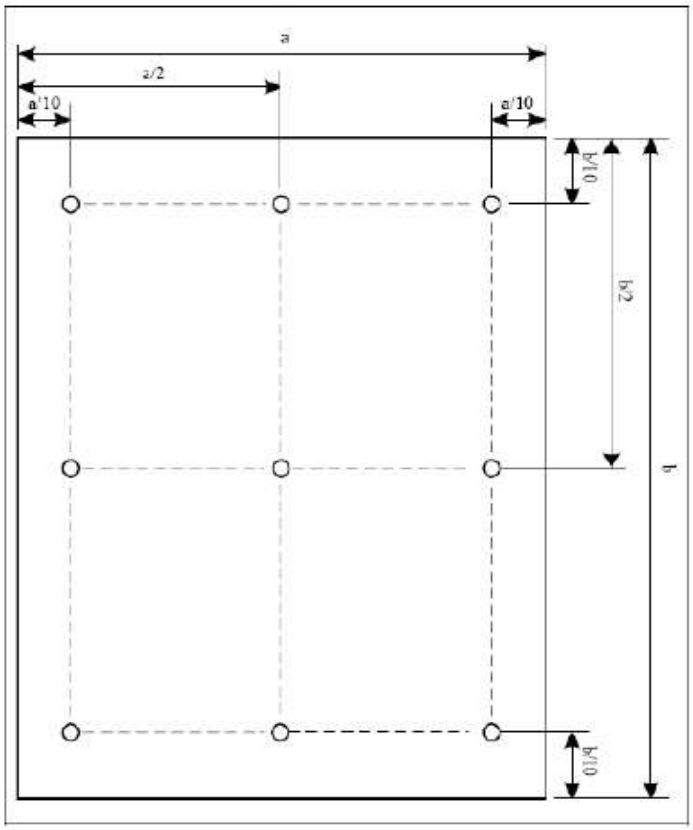
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.



B1 CIRCUIT DIAGRAM

NOTE 3：Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

6. Timing for DSI video mode

Timing Characteristics of MIPI Signals

Parameter		Symbol	Min.	Typ.	Max.	Unit
Item	Description					
Vertical Timing	Vertical Refresh Rate	VRR	58.40	60.00	62.00	Hz
	Verticle cycle	VPT		1942	—	Line
	Vertical active area	VACT	—	1920	—	Line
	Verticle low pulse width	VSP	—	2	—	Line
	Vertical front porch	VFP	—	14	—	Line
	Vertical back porch	VBP	—	6	—	Line
	Vertical data start point	VSP+VBP	—	8	—	Line
	Vertical blanking period	VSP+VBP+VFP	—	22	—	Line
Horizontal Timing	Pixel clock frequency	PCLK	—	137.38	—	MHz
	MIPI Speed	—	840	860	900	Mbps/Lane
	1 Horizontal Timing		8.30	8.56	8.82	us
	Horizontal cycle	HPT	—	1176	—	PCLK
	Horizontal active area	HACT	—	1080	—	PCLK
	HS low Pulse width	HSP	—	8	—	PCLK
	Horizontal front porch	HFP	—	72	—	PCLK
	Horizontal back porch	HBP	—	16	—	PCLK
	HS data start point	HSP+HBP	—	24	—	PCLK
	HS blanking period	HSP+HBP+HFP	—	96	—	PCLK

Ta = -20 °C ~ +60°C, VSP=5.8V, VSN=-5.6V ,VDDI=1.8V, GND = 0 V

7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

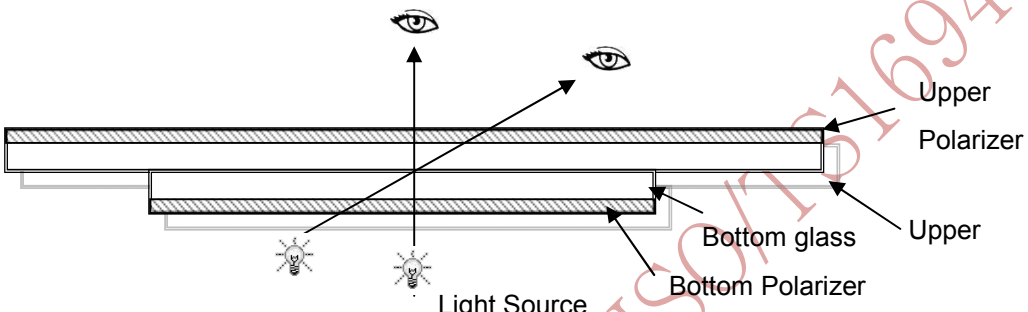
Temperature : 25±5℃

Humidity : 65%±10%RH

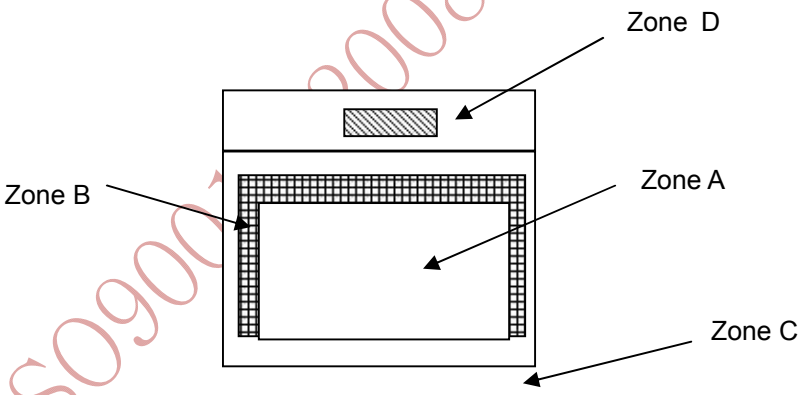
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



7.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product functionor appearance after assembly by customer

7.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class Ⅱ

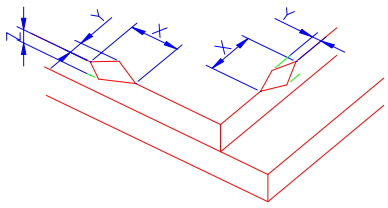
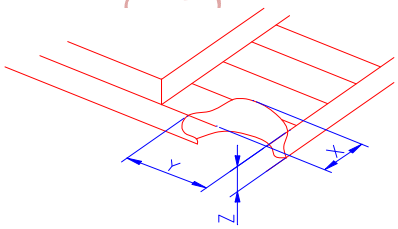
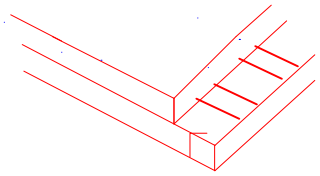
AQL:

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

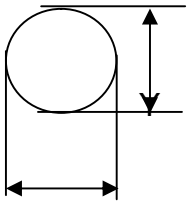
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	SpotLine defect	Light dot，Dim spot,Polarizer Bubble ; Polarizer accidented spot.	
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

7.1.4 Criteria (Visual)

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken
NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

2.0

Spot defect



X

Φ=(X+Y)/2

① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.10	Ignore		Ignore
0.10<Φ≤0.25	4(distance≧10mm)		
0.25<Φ≤0.35	3		
Φ>0.4	0		

②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10<Φ≤0.25	4(distance≧10mm)		
0.25<Φ≤0.35	3		
Φ>0.4	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.3<Φ≤0.5	3(distance≧10mm)		
Φ>0.5	1		

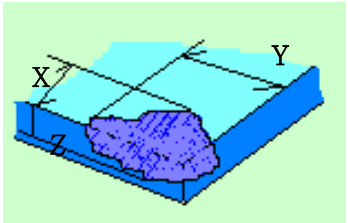
④Pixel bad points（light dot，Dim dot, color dot）

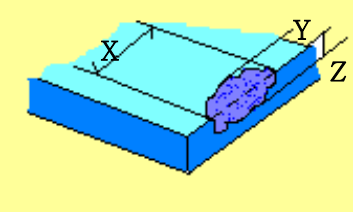
Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore		Ignore
0.2<Φ≤0.3	2(distance≧10mm)		
Φ>0.4	1		

⑤ Polarizer Bubble

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.3<Φ≤0.4	4(distance≧10mm)		
0.4<Φ≤0.5	3		
Φ>0.5	1		

<table>
<tr><td>3.0</td><td>Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)</td><td>
<table>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Length(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤5.0</td><td colspan="2">N≤3</td></tr>
<tr><td>0.07<W≤0.08</td><td>L≤4.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td></tr>
<tr><td>4.0</td><td>Electronic Components SMT</td><td>Notallowmissing parts，solderless connection，cold solder joint，mismatch，The positive and negative polarity opposite</td></tr>
<tr><td>5.0</td><td>Display color&Brightness</td><td>1. Color：Measuringthecolor coordinates, Themeasurementstandardaccordingtothedatasheetorsamples.
2. Brightness：MeasuringthebrightnessofWhitescreen,Themeasurement standardaccordingtothedatasheetorSamples.</td></tr>
<tr><td>6.0</td><td>RTP Related</td><td>TP film bubble/ accidented spot</td><td>
<table>
<tr><td rowspan="2">Size Φ(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.25</td><td colspan="2">4（distance≧10mm）</td></tr>
<tr><td>0.25<Φ≤0.35</td><td colspan="2">3</td></tr>
<tr><td>Φ>0.4</td><td colspan="2">1</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>TP film scratch</td><td>
<table>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Length(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤5.0</td><td colspan="2">N≤3</td></tr>
<tr><td>0.07<W≤0.08</td><td>L≤4.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>Assembly</td><td>beyond the edge of backlight ≤0.2mm</td></tr>
</table>

		deflection		
		Bulge (undulation included)	The ITO film plumped below 0.40mm, it's ok.  	
		Newton Ring	Newton Ring area>1/3 TP area NG Newton Ring area≤1/3 TP area OK	   似牛顿环
		TP corner broken X：length Y：width Z：height	X: X≤3mm; Y: Y≤3mm; Z: Z<COVER thickness *Circuitry broken is not allowed.	

		TP edge broken X：length Y：width Z：height	<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>X≤4mm</td><td>Y≤2mm</td><td>Z<COVER thickness</td></tr></table>* Circuitry broken is not allowed.	

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

8. Reliability Test Result

Reliability test item

No.	Test item	Condition
1	High temperature storage test	Ta= 60°C 120h
2	Low temperature storage test	Ta=−30°C 120h
3	High temperature and high humidity operation test	Ta= 40°C ; 95%RH 120h (No condensation)
4	High temperature operation test	Ta= 60°C 120h
5	Low temperature operation test	Ta= −20°C 120h
6	ESD	At the following conditions, it is a thing without incorrect operation and destruction. Both under Contact and Non-contact conditions, apply electric discharge ±200V to the input terminal. condition:200pF 0Ω under non-operation.

[Result evaluation criteria]
Under the display quality test condition with normal operation state, there shall be no change, which may affect practical display function.

9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
(4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes ormouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
(8) Protect the module from static; it may cause damage to the CMOS ICs.
(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the “Power ON” condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence &6.2 Power Off Sequence

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from beingoperated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

10. Packing

----TBD----------