TOP ELECTRONIC PARTS

	PRODUCT GROUP	REV.	ISSUE DATA
	AMOLED - PRODUCT	P0	2016.7.13

TOP055FHDT00CTP01 Product Specification Rev. P0

Customer Name	:	
Product Name	:	5.5" FHD1080 LOLED
Model Name	:	TOP055FHDT00CTP01
Description	:	5.5" FHD (1920×1080) 16M Color

Proposed by			Customer's Approval
Designed	Checked	Approved	

Revision History

Rev.	ECN No.	Description of Change	Date	Prepared
P0	-	-.Initial issue	July. 13. 2016	Xuan Minghua

Content

1. General Description

1-1. Introduction

5.5" FHD1080 is a color active matrix AMOLED module using Low Temperature Poly-silicon Thin Film Transistors as active switching devices. This module has a 5.5inch diagonally measured active area with FHD resolutions (1920horizontal by1080vertical pixel arrays). Each pixel is divided into RED and GREEN dots, or BLUE and GREEN dots, and two pixels share RED or BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors.

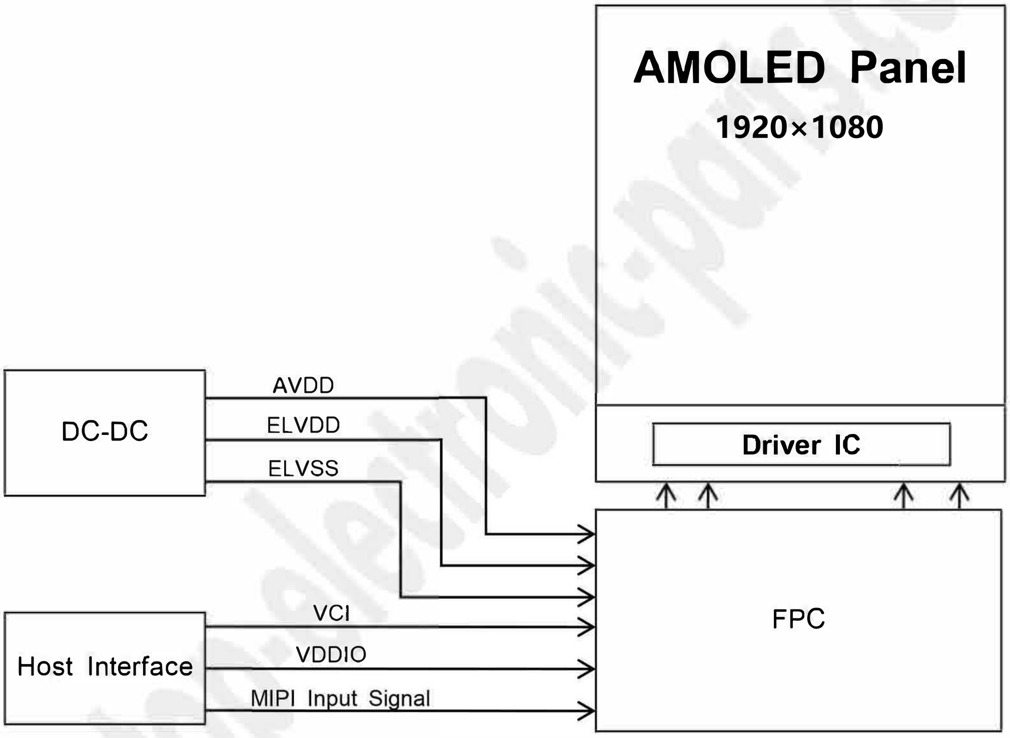


Figure 1

1-2. Features

1) Display Colors : 16.7M
2) Display Format : 5.5" FHD OLED Star :1920×1080
3) Interface : MIPI 4-lane
4) Driver IC : WD5EA5F01
5) Touch IC : GT1151
6) Polarizer : Hard Coating Polarizer

1-3. Application

7) Smart Mobile Phone

2. Mechanical Specification

Table 1

Item	Specifications	Unit	Remark
Glass outline	70.71(W) × 128.44(H) × 0.50(T)	mm	
Number of dots	720(W)RGB × 1920(H)	Dots	FHD (HRA)
Active area	68.31(W) × 121.44(H)	mm	
Diagonal Inch	5.486	inch	
Pixel pitch	63.25(W) × 63.25(H)	um	
Pixel Arrangement	OLED Star Delta		
Weight	TBD	g	
Total Thickness(Pol+Cell)	0.679	mm	

3. Absolute Maximum Ratings

Table 2

Item	Symbol	Min.	Max.	Unit	Note
I/O Voltage	VDDIO	-0.3	3.6	V	
Operation Voltage	VCI	-0.3	6.5	V	
EL Driving Voltage	ELVDD	4.4	5	V	
	ELVSS	-6.4	-1.4	V	
Supply voltage (TSP)	TSP_VDD	-0.3	7.2	V	
	IOVDD	-0.3	4.0	V	
Operating temperature	Topr	-20	70	℃	-
Storage temperature	Tstg	-40	85	℃	-

4. Electrical Characteristics

Test Condition: Temp=25±2℃

Table 3

<table>
<tr><th colspan="2">Item</th><th colspan="2">Symbol</th><th>Condition</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th><th>Remark</th></tr>
<tr><td colspan="2">ELVDD</td><td colspan="2">ELVDD</td><td>-</td><td>4.4</td><td>4.6</td><td>5.0</td><td>V</td><td>100mVStep</td></tr>
<tr><td colspan="2">ELVSS</td><td colspan="2">ELVSS</td><td>-</td><td>-6.4</td><td>-5.0</td><td>-1.4</td><td>V</td><td>100mV Step</td></tr>
<tr><td colspan="2">AVDD</td><td colspan="2">AVDD</td><td>-</td><td>5.0</td><td>7.6</td><td>7.7</td><td>V</td><td></td></tr>
<tr><td colspan="2">VCI</td><td colspan="2">VCI</td><td>-</td><td>2.8</td><td>3.0</td><td>3.6</td><td>V</td><td></td></tr>
<tr><td colspan="2">VDDIO</td><td colspan="2">VDDIO</td><td>-</td><td>1.65</td><td>1.8</td><td>3.3</td><td>V</td><td></td></tr>
<tr><td rowspan="6">Current Consumption (Display)</td><td rowspan="4">Display on mode</td><td rowspan="3">IC</td><td>VCI</td><td rowspan="4">Frame F=60Hz White pattern</td><td>-</td><td>1.0</td><td>-</td><td>mA</td><td></td></tr>
<tr><td>VDDIO</td><td>-</td><td>30</td><td>-</td><td>mA</td><td></td></tr>
<tr><td>AVDD</td><td>-</td><td>11</td><td>-</td><td>mA</td><td></td></tr>
<tr><td>Panel</td><td>EL</td><td>-</td><td>100</td><td>-</td><td>mA</td><td>Full White Half Brightness</td></tr>
<tr><td rowspan="2">Sleep in mode</td><td rowspan="2">IC</td><td>VCI</td><td rowspan="2">Sleep mode</td><td>-</td><td>1.0</td><td>-</td><td>mA</td><td></td></tr>
<tr><td>VDDIO</td><td>-</td><td>13.5</td><td>-</td><td>mA</td><td></td></tr>
<tr><td colspan="2">Frame Frequency</td><td colspan="2">F_{frm}</td><td>-</td><td>59</td><td>60</td><td>61</td><td>Hz</td><td></td></tr>
<tr><td colspan="2" rowspan="2">Vin</td><td colspan="2" rowspan="2">Vin(DC DC Input)</td><td rowspan="2">White Mode L255</td><td>-</td><td>640</td><td>680</td><td>mA</td><td>Vin=4V</td></tr>
<tr><td>-</td><td>700</td><td>740</td><td>mA</td><td>Vin=3.7</td></tr>
</table>

Notes :

1. The value is just the reference value. The customer may optimize the setting value.
2. The current of Vin is just the reference value,because it depends on the efficiency of Power IC.

5. Electro-optical Characteristics

Table 4

Item		Symbol	Temp	Condition	Min.	Typ.	Max.	Unit	Note
Brightness			25℃	Normal (W L255)	320	350	380	cd/m^2	Center brightness
Uniformity			25℃	Normal (W L255)	75	85	-	%	(1)
Contrast ratio		K	25℃	Φ=0°,θ=0°	10,000	17,000	-	-	(2)
Color of CIE coordinate	White	x	25℃	Φ=0°,θ=0° CIE1931	0.300	0.310	0.320	-	Color of CIE coordinate
		y			0.300	0.310	0.320	-	
	Red	x			0.635	0.665	0.695	-	
		y			0.314	0.334	0.354	-	
	Green	x			0.166	0.226	0.286	-	
		y			0.659	0.719	0.779	-	
	Blue	x			0.119	0.139	0.159	-	
		y			0.035	0.055	0.075	-	
Color Gamut			25℃	NTSC , CIE1931	85	101	-	%	(3)
Viewing Angle			25℃	Up/Down/Right/Left CR ratio ≥10	75	80	-	°	(4)
Cross Talk			25℃	Background: gray128	-	-	2.5	%	(5)
Gamma			25℃	-	1.9	2.2	2.5	-	
Life time			25℃	Light on for 240 hrs	Luminance decrease≤6%			%	(6)

Notes :

(1) Uniformity Measuring Point

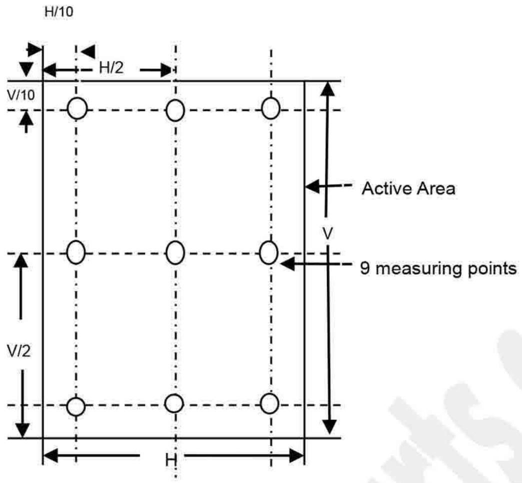


Figure 1. Uniformity Measuring Point

Uniformity=$L_{min}/L_{max} \times 100\%$

(2) Definition of contrast ratio(K)

$$CR = \frac{\text{Luminance When Display panel is at "White" state}}{\text{Luminance When Display panel is at "Black" state}}$$

(3) Definition of Color of CIE Coordinate and NTSC Ratio

$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

(4) Viewing Angle measuring system

Refer to the graph below marked by θ and Φ

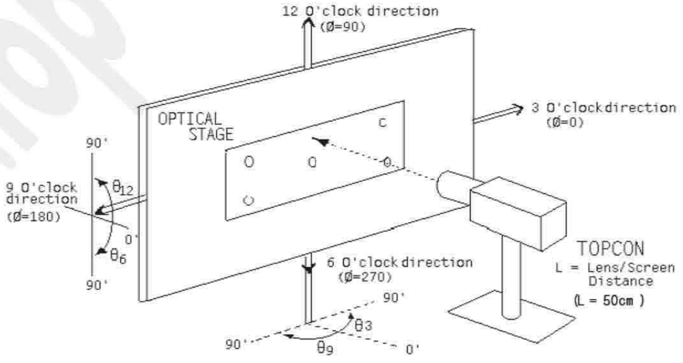


Figure 2. Viewing Angle measuring system

(5) Crosstalk measurement shall be done at the center of the different pattern and the result shall be calculated as follow formula.

a. measure luminance at the center.

b. calculate cross talk as below equation:

$$\text{Crosstalk(V)} = \max\left(\left|\frac{L_{V1}-L_{V2}}{L_{V2}}\right| \times 100, \left|\frac{L_{V3}-L_{V4}}{L_{V4}}\right| \times 100\right)$$

$$\text{Crosstalk(H)} = \max\left(\left|\frac{L_{H1}-L_{H2}}{L_{H2}}\right| \times 100, \left|\frac{L_{H3}-L_{H4}}{L_{H4}}\right| \times 100\right)$$

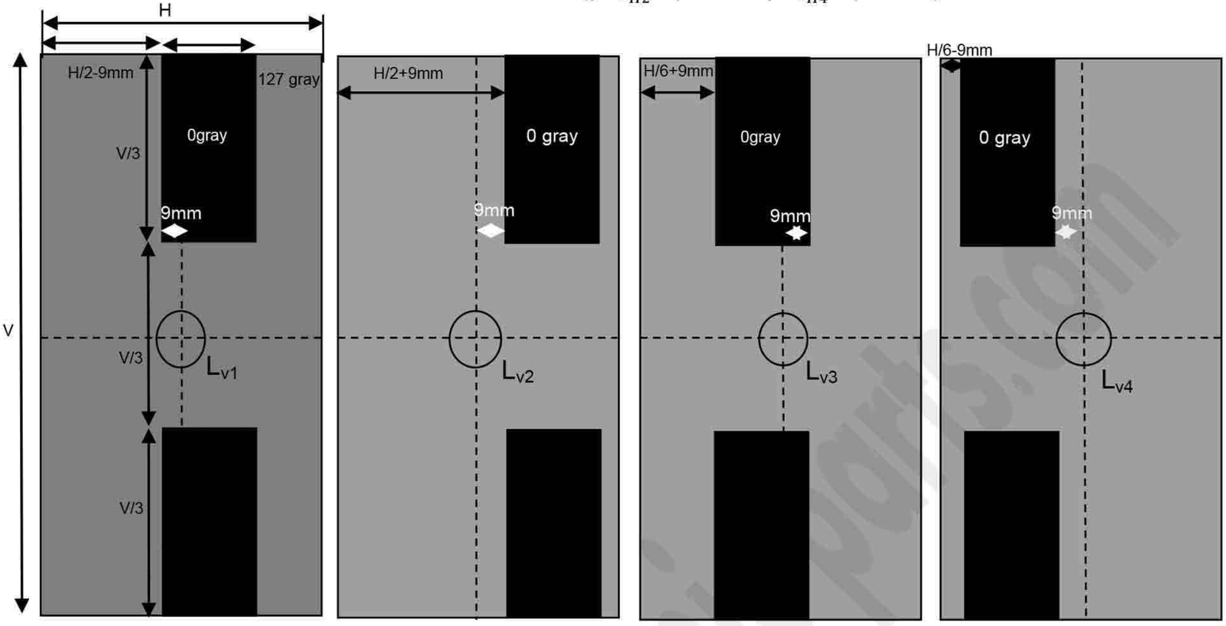


Figure 3.Vertical crosstalk measuring pattern

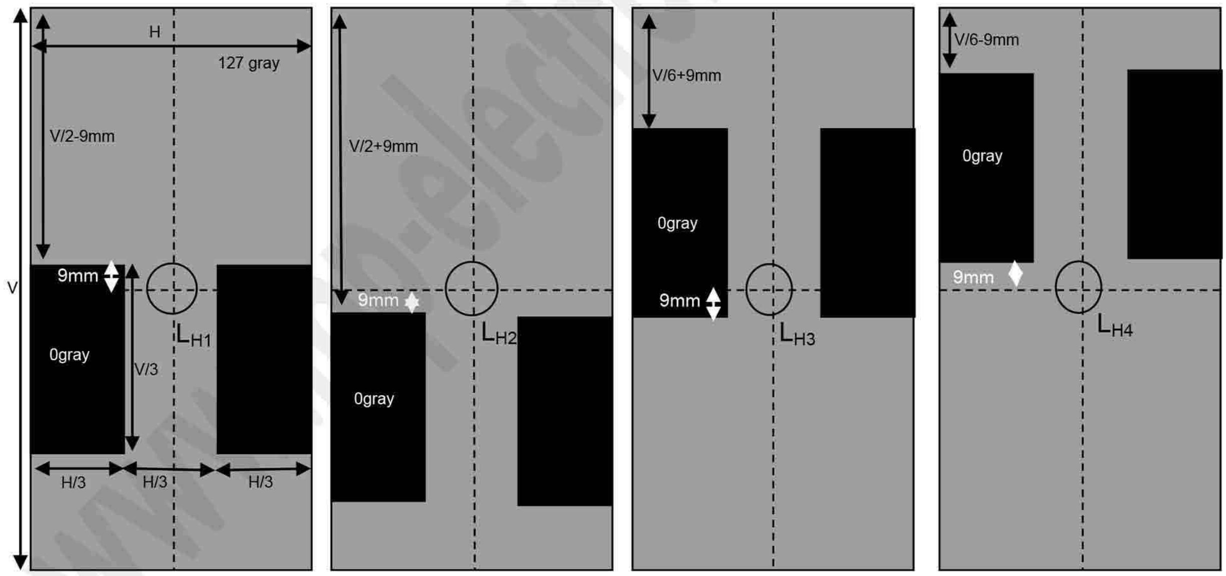


Figure 4. Horizontal crosstalk measuring pattern

(6) OLED life time

Test samples 8pcs;

At room temperature(25℃), light the module with typical value brightness, display a white pattern.

Keep working 240 hours, luminance decrease≤6%.

The test data must pass the specification.

6. FPC Pin Assignment

Main FPC assignment- AMOLED Panel Input/output Signal Interface.

Recommended connector: Kyocera 145806040002829+.

Table 5

No.	Name	No.	Name
1	TSP_ATTN	2	ID1
3	TSP_SDA	4	GND
5	TSP_SCL	6	D2P
7	TSP_RESET	8	D2N
9	TSP_1.8V	10	GND
11	TSP_3.3V	12	D1P
13	PCD	14	D1N
15	VPP	16	GND
17	EL_ON2	18	CKP
19	VDDP_EN	20	CKN
21	TE	22	GND
23	ERR_FG	24	D0P
25	RESET	26	D0N
27	VDD_1.8V	28	GND
29	VLIN1	30	D3P
31	VCI_3.3V	32	D3N
33	ID0	34	GND
35	ELVDD	36	ELVSS
37	ELVDD	38	ELVSS
39	ELVDD	40	ELVSS

<Pin layout of B-to-B contact pads>

7. AC Characteristics

7-1. MIPI DSI Characteristics

7-1-1. DC Characteristics for MIPI DSI

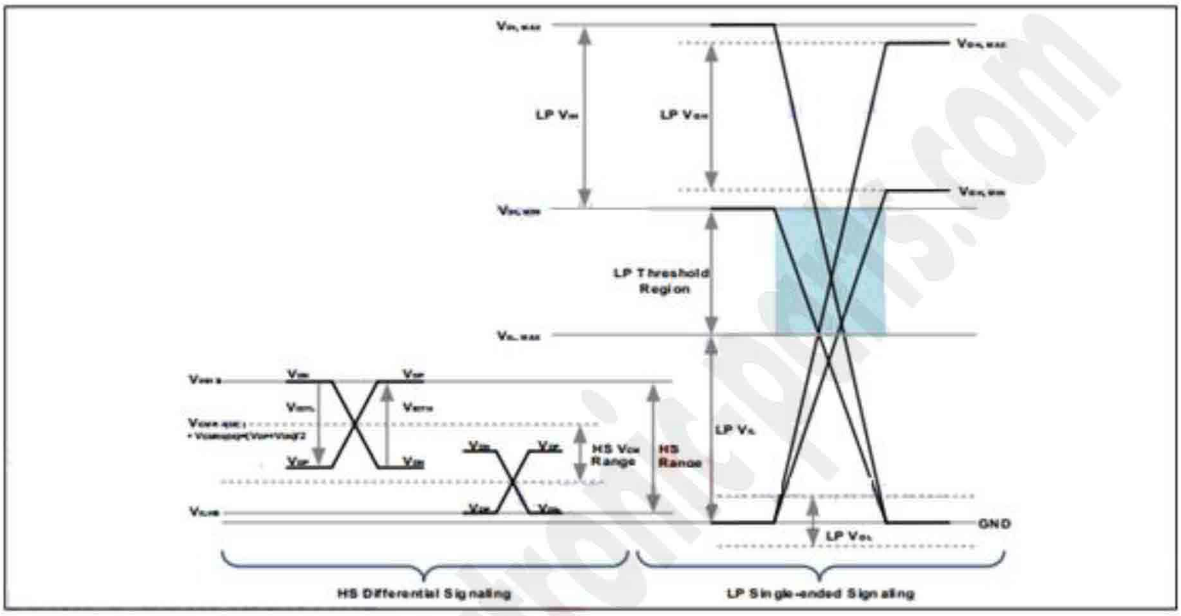


Figure 5 MIPI DSI Signaling Levels

Table 6

Signal	Symbol	Parameter	Min.	Typ.	Max.	Unit
HS_RX	V_{IDTH}	Differential input high threshold	-	-	70	mV
	V_{IDTL}	Differential input low threshold	-70	-	-	
	V_{IHHS}	Single-ended input high voltage	-	-	460	
	V_{ILHS}	Single-ended input low voltage	-40	-	-	
	$V_{TERM\text{-}EN}$	Single-ended threshold for HS termination enable	-	-	450	
	$V_{CMRX(DC)}$	Common-mode voltage HS receive mode	70	-	330	
	Z_{ID}	Differential input impedance	-	100	-	Ω
LP_RX	V_{IL}	Logic0 voltage not in ULP State	-	-	550	mV
	V_{IH}	Logic1 input voltage	880	-	-	
	V_{LEAK}	I/O leakage current	-10	-	10	uA
LP_TX	V_{OL}	The venin output low level	-50	-	50	mV
	V_{OH}	The venin output high level	1.1	1.2	1.3	V
	Z_{OLP}	Output impedance of LP transmitter	110	-	-	Ω

7-1-2. MIPI DSI High-Speed RX Clock and Data-Clock Timing

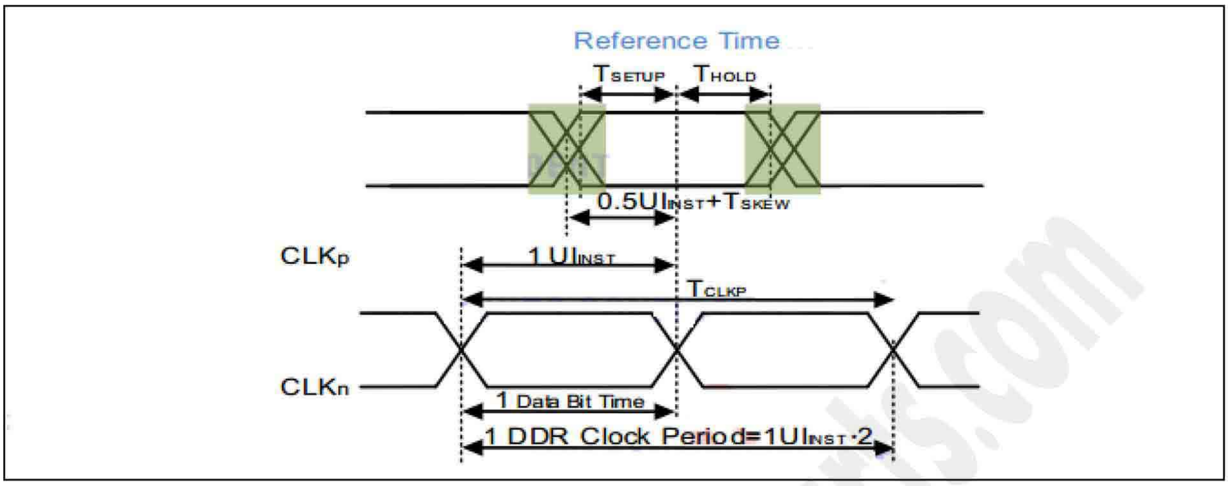


Figure 6 MIPI Data to Clock Timing Definitions

Table 7

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
F_{DSICLK}	DISCLK Frequency	VDDI=1.65~3.3V	T.B.D.		500	MHz
T_{CLKP}	DSICLK Cycle time		1		10	Ns
T_{DSIR}	DSI Data Transfer Rate		T.B.D.		1000	Mbps
$T_{SKEW[TX]}$	Data to Clock Skew		-0.15		0.15	UI_{INST}
T_{SETUP}	Data to Clock Setup time		0.15	-	-	UI_{INST}
			0.15	-	-	ns
T_{HOLD}	Data to Clock Hold time		0.15	-	-	UI_{INST}
			0.15	-	-	ns
UI_{INST}	UI instantaneous		1		12.5	ns

7-1-3. Global Operation Timings

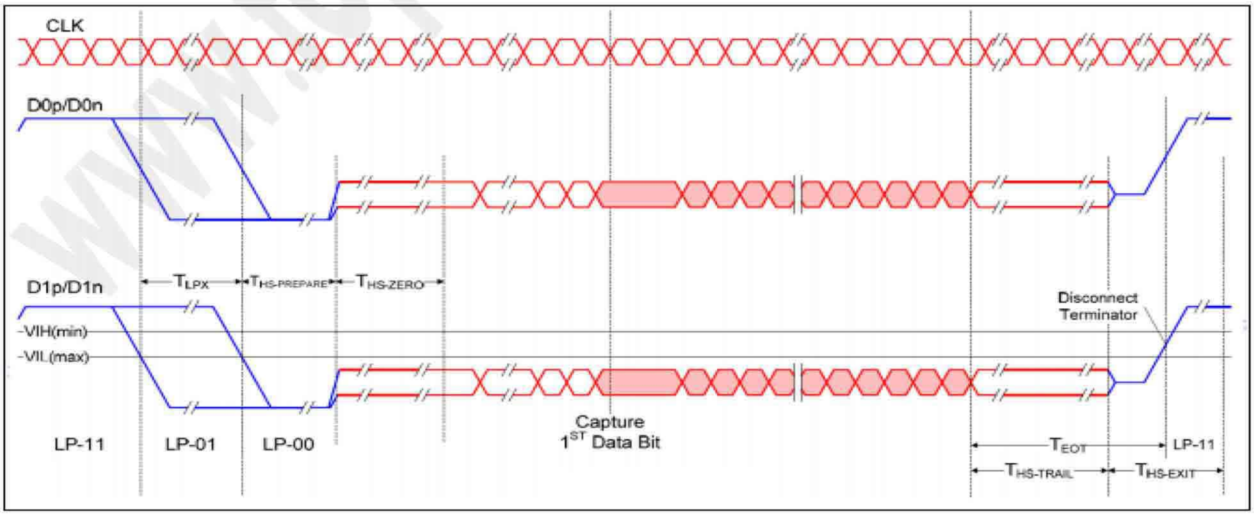


Figure 11 MIPI HS Data Transmission in Bursts

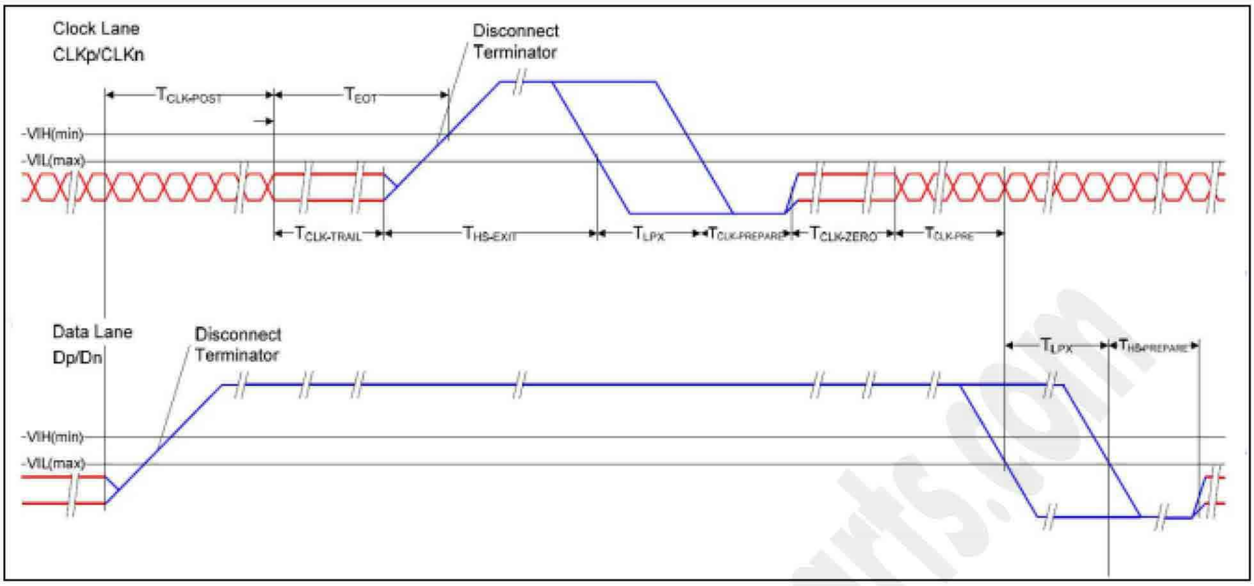


Figure 12 MIPI switching the Clock Lane between Clock Transmission and LP mode

Table 8

Parameter	Description	Spec.			Unit
		Min.	Typ.	Max.	
$T_{CLK-MISS}$	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.			60	ns
$T_{CLK-POST}$	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to beginning of $T_{CLK-TRAIL}$	60 ns +52*UI	-	-	ns
$T_{CLK-PRE}$	Time that the HS clock shall be driver by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8	-	-	UI
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-00 Line state starting the HS transmission.	38	-	95	ns
$T_{CLK-SETTLE}$	Time interval during which the HS receiver shall ignore any clock Lane HS transitions, starting from the beginning of $T_{CLK-PREPARE}$.	95	-	300	ns
$T_{CLK-TERM-EN}$	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses V_{ILMAX}.	Time for Dn to reach VTERM-EN	-	38	ns
$T_{CLK-TRAL}$	Time that the transmitter drives the HS-00 state after the last payload clock bit of a HS HS transmission burst.	60	-	-	ns
$T_{CLK-PREPARE}$ +	$T_{CLK-PREPARE}$ + Time to that the transmitter drives	300	-	-	ns

$T_{CLK-ZERO}$	the HS-00 state prior to starting the clock.				
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses V_{ILMAX}.	Time for Dn to reach VTERM-EN	-	35ns+4*UI	-
T_{EOT}	Transmitted time interval from the start of $T_{HS-TRAIL}$ or $T_{CLK-TRAL}$, to the start of the LP-11 state following a HS burst.	-	-	105 ns +n*12*UI	-
$T_{HS-EXIT}$	Time that the transmitter drives LP-11 following HS burst.	100	-	-	ns
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-00 Line state starting the HS transmission.	40ns+4*UI	-	85ns+6*UI	ns
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + Time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.	145 ns + 10*UI	-	-	ns
$T_{HS-SETTLE}$	Time interval during which the HS receiver shall ignore any Data Lane HS transitions , starting from the beginning of $T_{HSPREPARE}$	85 ns + 6*UI	-	145 ns +10*UI	ns
$T_{HS-SKIP}$	Time interval during which the HS-RX should ignore any transitions on the Data Lane, following a HS burst. The end point of the interval is defined as the beginning of the LP-11 state following the HS burst.	40	-	55 ns + 4*UI	ns
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	Max(n*8*UI, 60ns +n 4* UI)	-	-	ns
T_{INIT}	-	-	-	-	-
T_{LPX}	Transmitted length of any Low-Power state period	-	56.6	-	ns
Ratio T_{LPX}	Ratio of $T_{LPX(MARSTER)}$/$T_{LPS(SLAVE)}$ between Master and Slave side	2/3	-	3/2	
T_{TA-GET}	Time that the new transmitter drives the bridge state (LP-00) after accepting control during a Link Turnaround.	5*T_{LPX}			ns
T_{TA-GO}	Time that the new transmitter drives the bridge state (LP-00) before releasing control during a Link Turnaround.	4*T_{LPX}			ns
$T_{TA-SURE}$	Time that the new transmitter waits after the LP-10 state before transmitting the Bridge state (LP-00) during a Link turnaround.	T_{LPX}	-	2*T_{LPX}	ns
T_{WAKEUP}	Time that a transmitter drivers a Mark-1 state prior to a Stop state in order to initiate an exit from ULPS.	1			ms

7-1-4. AC Characteristics of MIPI DSI Characteristics

Table 9

Symbol	Parameter	Min.	Typ.	Max.	Unit
Thost-enable	Host output enable time	0	-	24*t-bit	ns
Thost-disable	Host output disable time, entire length of the Turnaround 1 field	0	-	24*t-bit	
Tclient-enable	Client output enable time, entire length of the Turnaround 1 field	0	-	24*t-bit	
Tclient-disable	Client output disable time, measured from the end of the last bit of the Turnaround 2 field.	0	-	24*t-bit	

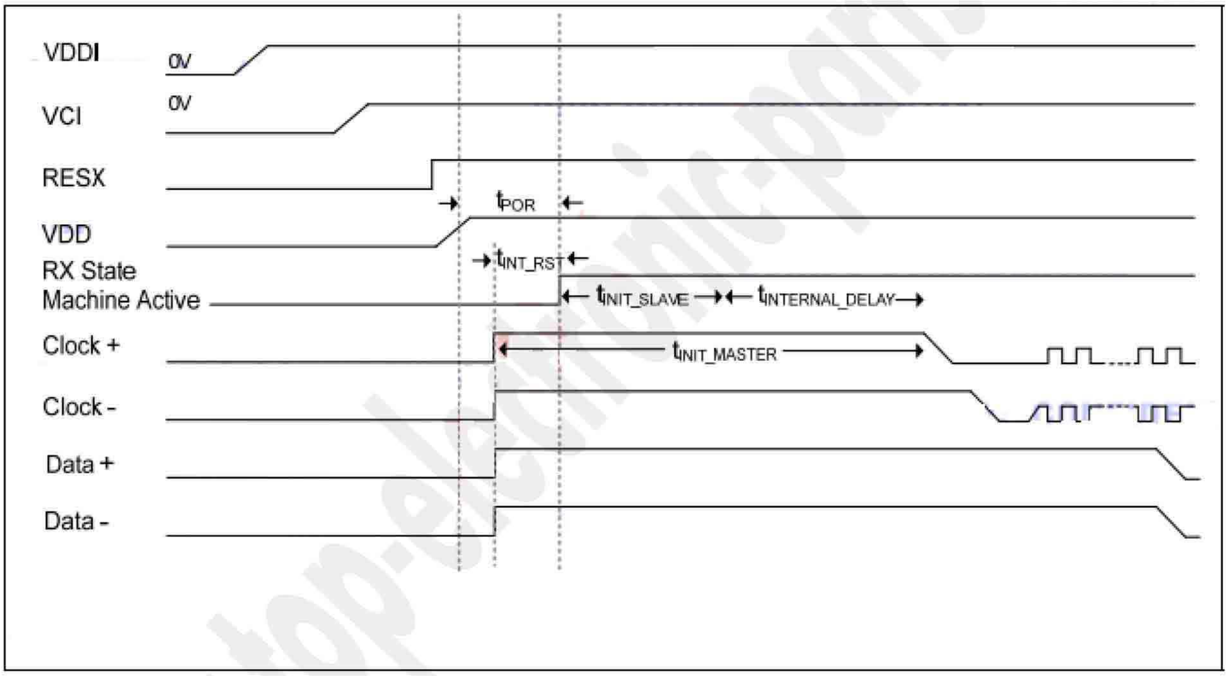
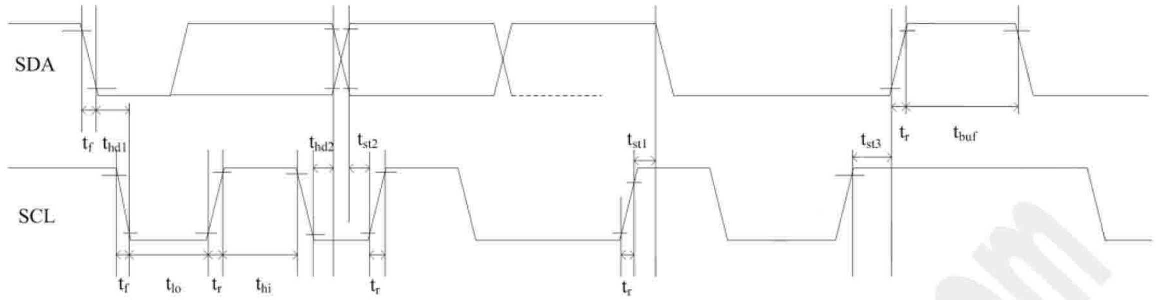


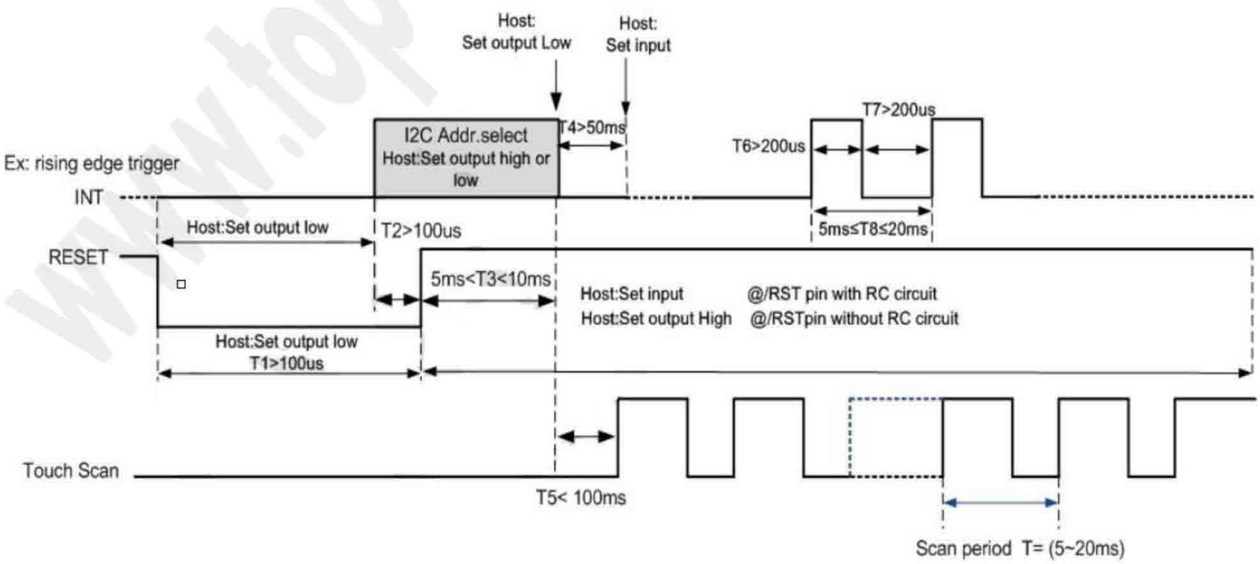
Figure 13 MIPI lanes status when reset operation

7-2. Touch Panel I2C Timing Characteristics



Parameter	Symbol	Min.	Typ.	Max.	Unit
SCL clock frequency.	f_{SCL}	-	100	400	kHz
LOW period of the SCL clock.	t_{lo}	1.3	-	-	μs
HIGH period of the SCL clock.	t_{hi}	0.6	-	-	μs
SCL set-up time for START condition.	t_{st1}	0.6	-	-	μs
SCL set-up time for STOP condition	t_{st3}	0.6	-	-	μs
SCL hold time for START condition	T_{hd1}	0.6	-	-	μs
SDA hold time	t_{hd2}	0	-	-	μs
SDA set-up time	t_{hd2}	0.1	-	-	μs

7-3. Touch panel external reset timing



7-4 Touch Specification

No.	ITEM		SPEC	REMARK
1	Touch IC		GT1151	GOODIX
2	Communication Protocol to Host		I2C	
3	Multi-Finger		10	
4	I2C Address		0x__	
5	Touch Origination Dot		Left up	
6	Performance	Accuracy	Edge area<1.5mm Center area<1.0mm	Note (1)
		Linearity	Edge area<1.5mm Center area<1.0mm	Note (2)
		Point Sensitivity	≦Φ6mm	Note (3)
		Move Sensitivity	≦Φ6mm	Note (4)
		Jitter	Edge area<0.3mm Center area<0.2mm	Note (5)
		Water Proof	Refer to Note (6)	Note (6)
7	Structure		On cell	
8	Sensor Pitch(A)		4.0mm <A<4.5mm	
9	Connector type /No.		FOF / 13pin	
10	Low Tempera ure		-10℃	Handset can response exactly (No ghost finger, No missing finger, etc)
11	Obvious ITO etching pattern		Invisible	

Note (1)：Accuracy is determined by a comparison of the actual copper position and the reported position when the copper touch on the surface of touch.

1.Test Condition : Handset is on the insulated table.

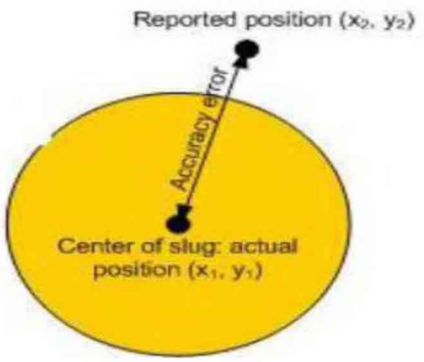
2. Measurement equipment: Arm of robot with 7mm diameter copper.

3.Test procedure: Test touch panel with 7*9 points , each point 10 time.

4.The Accuracy is calculated by using following formula:

Calculate every distance from reported position to actual position (Each point contains 10 reported position dates)

Accuracy Error = square root [(xi – x0)2 + (yi – y0)2] (i-1,2…10)



Note (2): Linearity is defined as the difference between reported finger positions versus the least square fitted line as the finger moves linearly across a specified trajectory of the Display panel area.

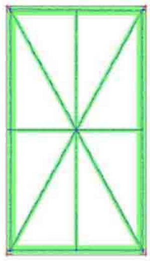
1.Test Condition : Handset is on the insulated table.

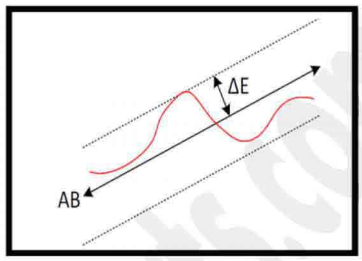
2.Measurement equipment: Arm of robot

3.Test procedure: Draw 8 line with 30mm/s by 7mm copper.

4. The Precision is calculated by using following formula:

Calculate the max △E for each line





Note (3): Point sensitivity is determined by the minimum size finger that touch panel can detect. When the minimum size finger touch on the surface of touch, the touch can report to host exactly.

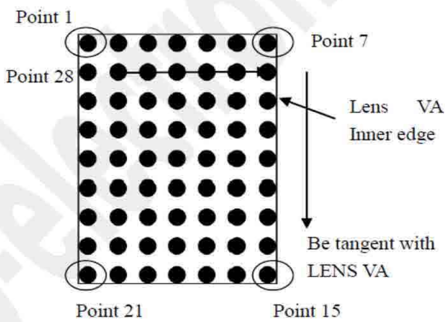
1.Test Condition : Handset is on the insulated table.

2. Measurement equipment: Arm of robot with 6mm diameter copper.

3. Test procedure: Test touch panel with 7*9 points , each point 10 times

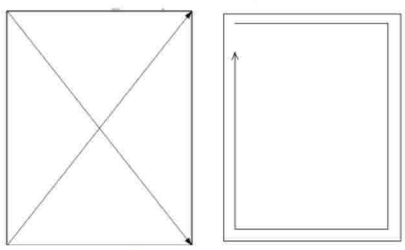
4. The point sensitivity is calculated by using following formula:

Report Rate = Reported points/280*100%



Test Matrix(7*9)

Note (4): Move sensitivity is determined by the minimum size finger that touch panel can detect. When the minimum size finger draw on the surface of touch, the touch can report to host exactly.



Move sensitivity test

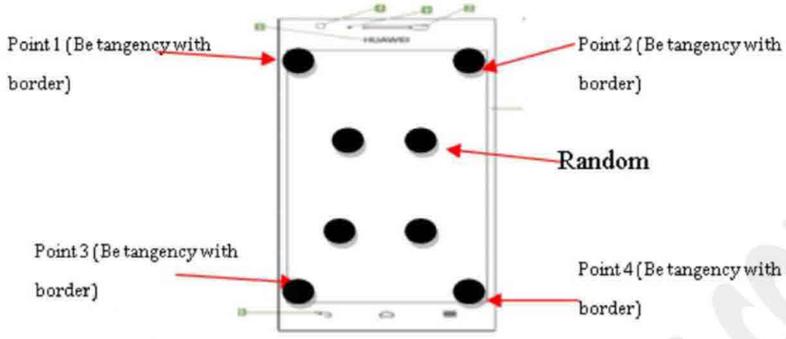
1. Test Condition : Handset is on the insulated table.

2. Measurement equipment: Arm of robot

3. Test procedure: Draw 8 line with 30mm/s by 6mm copper

Standard: No missing point.

Note (5)：Jitter is defined as the deltas of reported positions when a conductive copper is in stationary contact with the sensor cover lens. A total of hundred sequential samples are collected with each stationary contact of the Copper with the sensor cover lens.



1. Test Condition : Handset is on the insulated table.
2. Measurement equipment: Arm of robot with 6mm diameter copper.
3. Test procedure: Test 8 points in the touch for 1s
4. The Precision is calculated by using following formula:

Then we will get the result like below (Take point 1 as the example)

(1). calculate distance from each reported position to the rest of points

Distance Error = square root [(xi – Xj)2 + (yi – yj)2] (i=1,2….120,j=1,2…120)

(2). Select the maximum distance error from one to each one

jitter 1= max(error 1,error 2….error 120)

(3). Repeat 1to 2 for the other 7 point as the jitter value

(4). Select the maximum value as our test result

jitter= max (jitter1 ,jitter 2……jitter 8)

Note (6)：Anti-water:

The presence of moisture on the surface of touch can affect touch performance. Performance will vary based on the amount of moisture and its properties. In the test we will define the basic requirement in the document.

Method:

Drop: Size : ø10 mm diameter drop,4 drops

Spray size: 3ml once

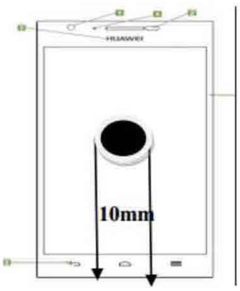
Procedure:

Test 1-drop test:

Step 1: Make 4 drops water on the surface of touch, each drop with 10mm diameter.

Step 2: Test the area (without water area) handwork, and test it again after wiped off water

Step 3: Observe whether the water area report ghost finger



Water Dorp

Water Spray Test

8. Recommended Operating Sequence

8-1. Display Power on/off Sequence

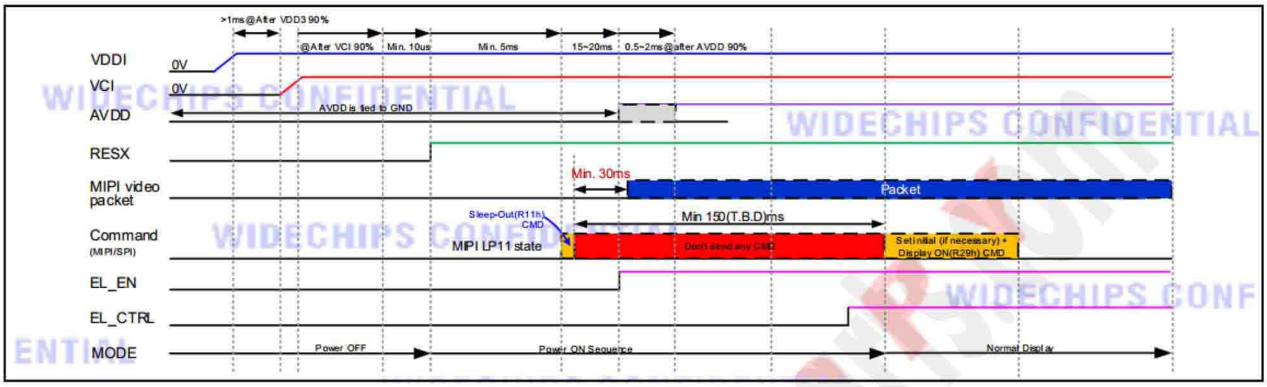


Figure 14 Power On to Display On Sequence

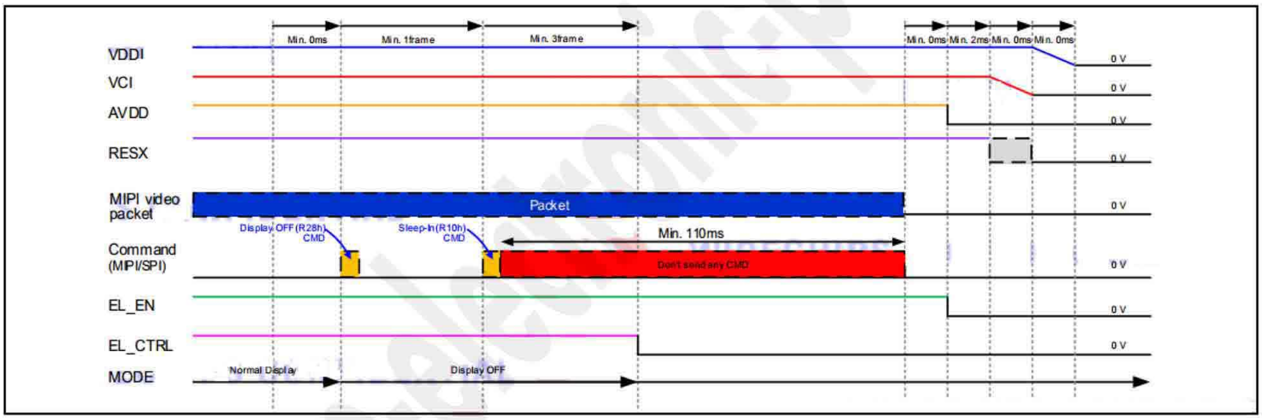
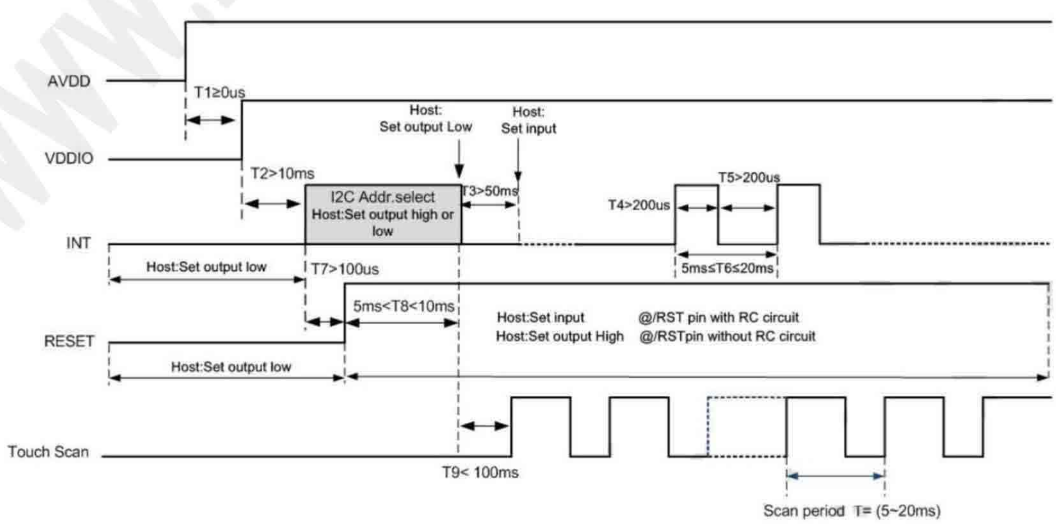


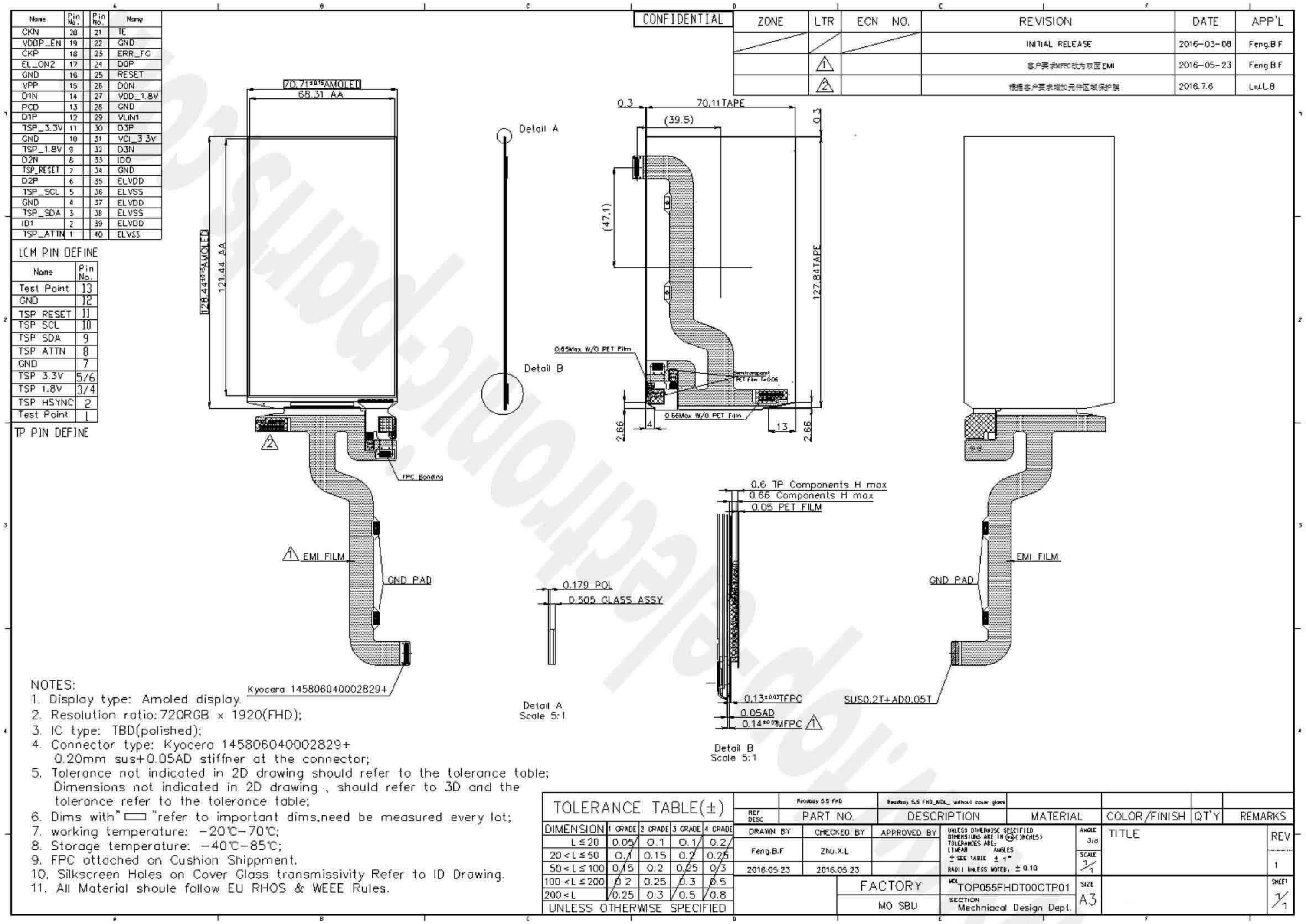
Figure 15 Display Off to Power Off Sequence

8-2. Touch Panel Power on Sequence



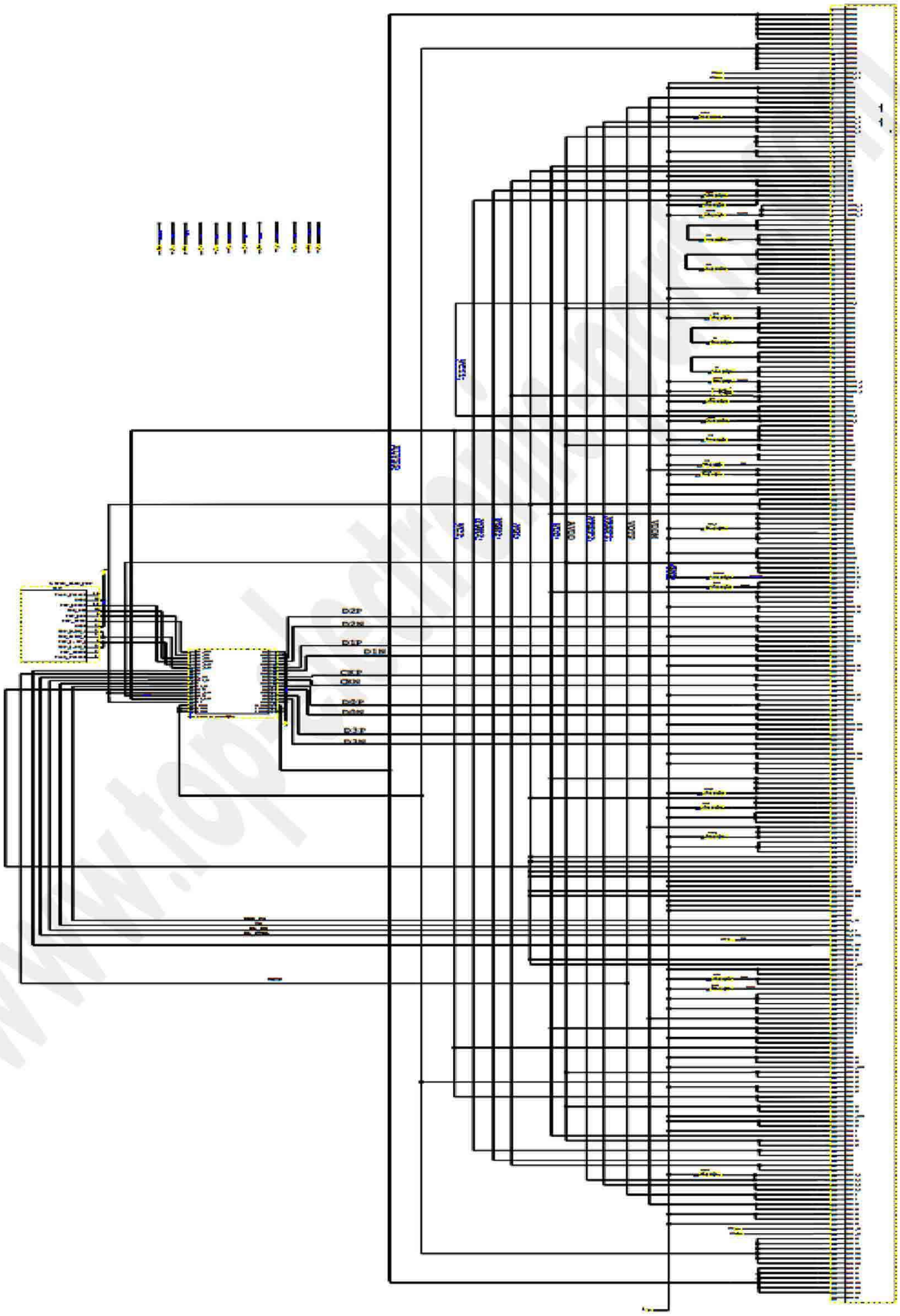
9. Outline Information

9-1. Total Outline



9-2. Main FPCB Drawing

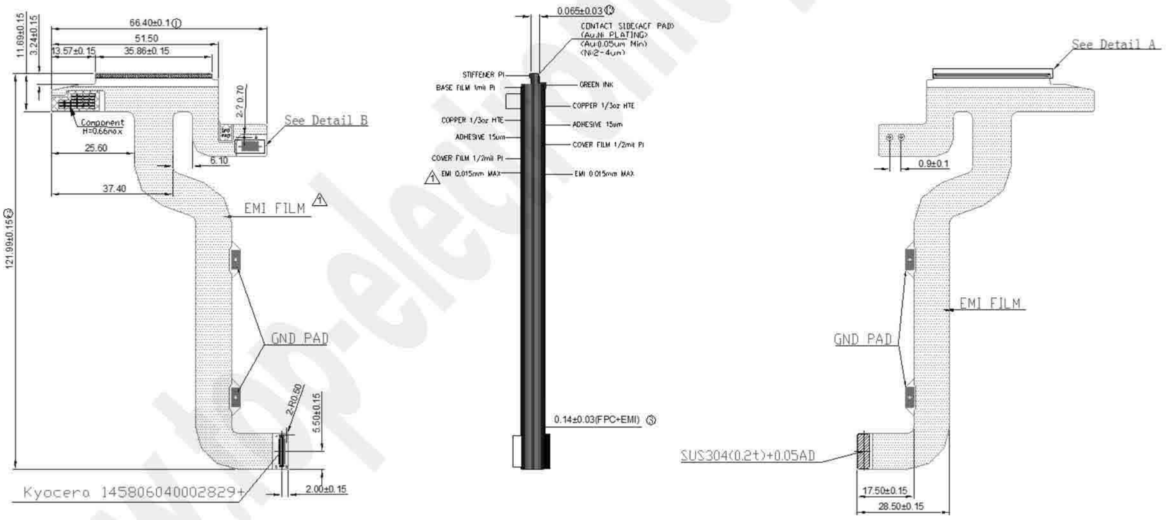
9-2-1.Main FPC Schematic Diagram

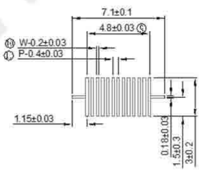


9-2-2.Main FPC Electronic Part List

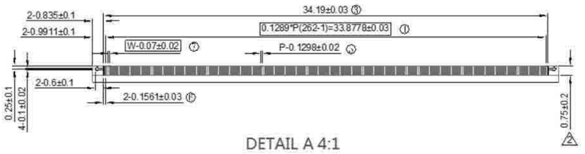
CATEGORY	REFRENCE	SPECIFICATION	VALUE	耐压值	封装	材质	Q'ty	MAKER
CAPACITOR	C23		1uf	6V	0402	X5R	1	Samsung Electro-Mechanics 三星
	C7，C13，C9，C11，C10，C14		2.2uf	6V	0402	X5R	6	
	C1，C2，C20		2.2uf	16V	0402	X5R	3	
	C21，C15，C6，C18，C24，C22		2.2uf	10V	0402	X5R	6	
	C3，C4		2.2uf	25V	0402	X5R	2	
	C8，C12		4 7uf	6V	0402	X5R	2	
	C16，C5		4.7uf	10V	0402	X5R	2	
	C19		0.1uf	16V	0402	X5R	1	
	C17		4.7uf	16V	0402	X5R	1	
DIODE	U18	RB520CS-30	-	-	0402	-	1	-
CONNECTOR	U21	145806040002829+ (40PIN)					1	Kyocera

9-2-3.Main FPC Placement





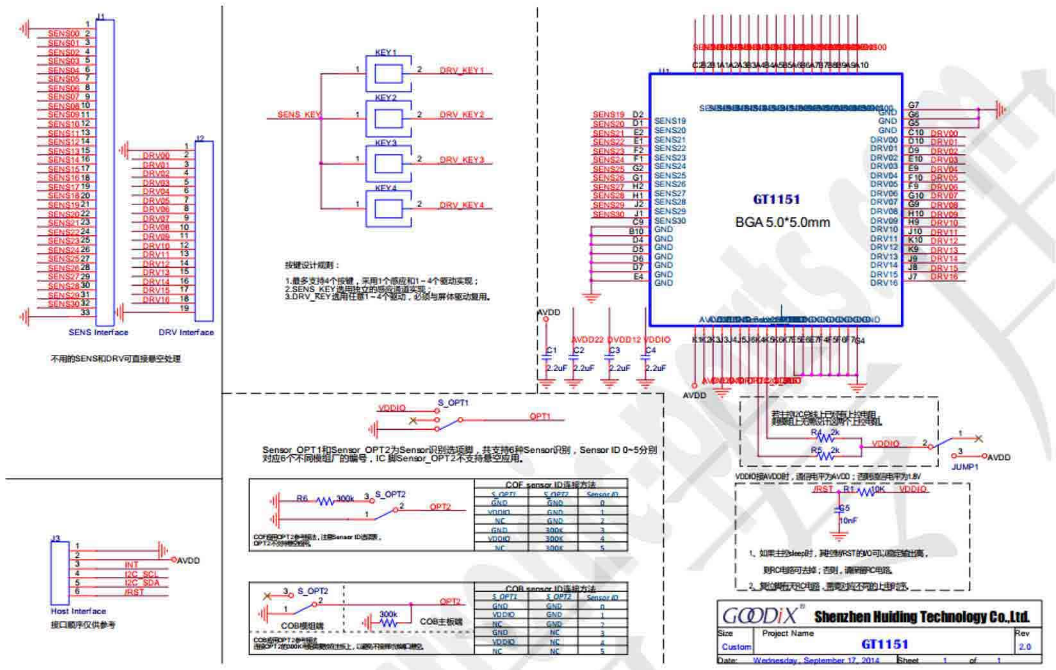
DETAIL B 4:1



DETAIL A 4:1

9-3. TSP FPCB Drawing

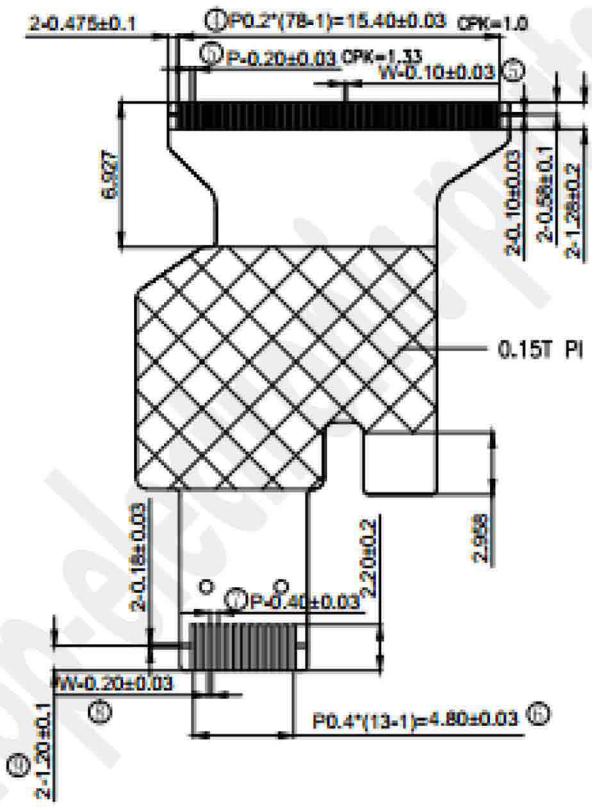
9-3-1.TSP FPC Schematic Diagram



9-3-2.TSP FPC Electronic Part List

CATEGORY	REFRENCE	SPECIFICATION	VALUE	耐压值	封装	材质	Q'ty	MAKER
CAPACITOR	C11,C12, C13,C14		2.2uF	6.3V	0402	X5R/X7R	4	Samsung Electro-Mechanics 三星
	C15		10nF	6.3V	0402	X5R/X7R	1	
Resistance	R3		10K		0402		1	
	R1,R2		2K		0402		2	
U1	GT1151						1	

9-3-3.TSP FPC Placement

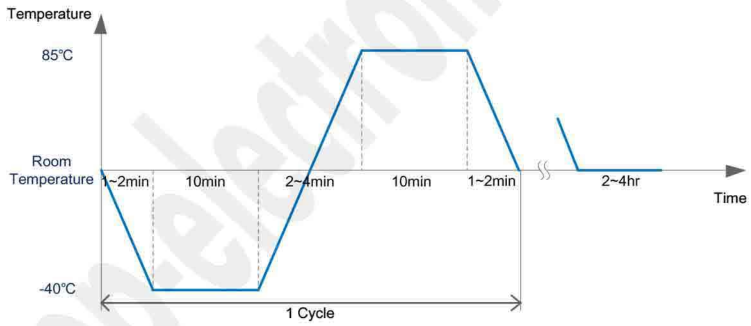


10. Reliability TEST

No.	Item		Condition	Q'y	Result	Remark
1	High Temperature Storage test		80℃,240hr	10 ea	OK	
2	Low Temperature Storage test		-30℃,240hr	10 ea	OK	
3	Thermal Humidity Storage test		60℃/90%RH,240hr	10 ea	OK	
4	High Temperature Operating test		70℃,240hr	10 ea	OK	
5	Low Temperature Operating test		-20℃,240hr	10 ea	OK	
6	Thermal Humidity Operating test		60℃/90%RH,240hr	10 ea	OK	
7	Thermal Cycle Storage test		-40℃~85℃, 100 Cycles	10 ea	OK	Note 1
8	Electrical Static Discharge	Contact	±4(Corner)/6kV(center), 150pF/330Ω	5 ea	OK	
		Air	±6(Corner)/8kV(center), 150pF/330Ω	5 ea	OK	
9	FPC Anti-Bending Test		Forward:90° ; Reverse:90°	3 ea	OK	Note 2
10	Box Vibration / Drop		Random Vibration	1 box	OK	Note 3

Note1:

Thermal Cycle Storage test



Note2:

Forward / Reverse residence time: 0.1s, speed 36 times per min, R = 0.5mm, bending times: 30 times, bending position: thin metal fingers/ crude metal fingers

Note3:

Condition A:5~50Hz, 20min, Amplitude:±1.5mm;

Condition B:10~100Hz, 60min, Amplitude:±1.5mm.

11. Handling Precautions

11-1. Mounting Method

The AMOLED panel module consists of two slim glasses with polarizer which can easily get damaged. Since the module is constructed as to be fixed by utilizing fitting holes in the printed circuit board. Extreme care should be used when handling the AMOLED modules.

11-2. Caution of AMOLED Handling and Cleaning

When cleaning the display surface, use soft cloth solvent as recommended below and wipe gently.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotriflorothane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent.

- Water
- Ketone
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns. Do not use the following solvent on the pad and prevent it from being contaminated.

- HCFC (Other area except ITO pad can use the HCFC for cleaning process)
- Soldering flux
- Chlorine(Cl), Sulfur(S)
- Spittle, Fingerprint

If the product is not wrapped with a desiccant added pad, ITO pattern can be damaged by corrosion. BOE suggests wrapping a product with a desiccant unless customers particularly indicate that they do not want it. In case ITO pattern corrodes due to the usage of chlorine, sulfur or customer's mishandling of the product, the responsibility lies with the customer.

11-3. Caution against Static Charge

For AMOLED module, use C-MOS LSI drivers, therefore we recommend that you ; Connect any unused input terminal to VCI or VSS, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity. It could occur static electricity when taping off the film which protects AMOLED. Against static charge, you should make sure that the product is safe or not by experiment in advance.

11-4. Packing

- The packing principle is that AMOLED module should keep its packing condition at the time of delivery.
- For safety & avoiding the module damage, Carton box must stack the below 4 boxes. When storing the AMOLED after unpacking, note the followings.

- AMOLED module is consisted of GLASS and assemblies. It should avoid pressure, strong impact, and being dropped from a height.
- To prevent modules from degradation, do not operate or store them in a place where they are directly exposed to sunlight or high temperature/humidity.

11-5. Caution for Operation

- If you do not follow normal POWER ON, OFF sequence or abnormal operating, then AMOLED module can be damaged electro-optically and does not recover. Do not change software without BOE confirmation.
- Response time may extremely delay at a temperature lower than operating range; AMOLED does not normally operate at a high temperature. But this may recover at a proper temperature.
- When you set optimal operating voltage to AMOLED module, you can see the optimal contrast of AMOLED. So, add voltage controllable function at SET Module.
- AMOLED module may not display normally when twisting power or pressing power is added. Therefore you should secure AMOLED module maximum thickness at set assembly not to have any pressure affect AMOLED module.
- Electro-chemical reaction may occur when there is humidity on pad; therefore, you should use AMOLED Module below maximum operating humidity.
- AMOLED Module Power Vdd should be designed to protect surge current at SET Module.
- You should not damage connector and cable for AMOLED module assembly by force folding or by applying extreme power.
- AMOLED may not display normally when it is interfered by surrounding elements, therefore you should consider setting design not to damage AMOLED module by surrounding elements.
- To satisfy EMI standards, you should plan your design after considering emitting energy.
- We cannot guarantee display characteristics outside viewing area, therefore your set window should be fixed into viewing area.
- Image-sticking may occur if AMOLED displays same image for a long time, so you need to make a change for AMOLED.
- When remove the window protective film, necessarily need to apply as a way to prevent Cushion and conductive tape Delamination.
  - As an upper Figure, the handler takes off the direction of the arrow to remove the protective film.

11-6. Storage

- Place in a dark place where neither exposure to direct sunlight nor any fluorescent light is permitted and keep at room temperature & room humidity.
- Store with no contact with polarizer surface.
  [It is recommended to store them as they have been contained in the inner container when we delivered them.]

11-7. Safety Precautions

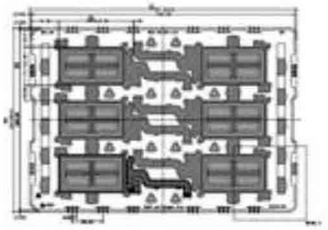
- Disassembly or modification may cause electric shock, damages to sensitive part inside of the AMOLED module, dust adhesion, or scratches on the display part.
- In the event that the contents of AMOLED module are on skin, wipe them with a paper towel or

gauge and wash the part well, and receive medical attention if necessary.

- Do not use the AMOLED module for the special purpose besides display units.
- Be careful of the glass chips that may cause injury to fingers of skin, when the display part is broken.
- For keeping safe quality from outer exposure or contamination, modules should be consumed within 2 months after unpacking.

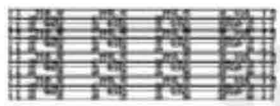
12. Packing Specification

12-1. Box Pack



-. 将 6pcs LCM（CF向下）平放入Tray

①

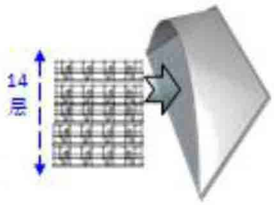


-. 将盛Moudle的Tray 叠码13层

顶部1pcs 空Tray

-. Tray 不旋转码放 无需胶带缠绕

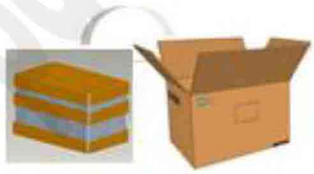
②



-.将14层 Tray 放入一个气泡袋中
形成一包

-. 容量：78pcs/袋

③



-.放入气泡袋后，两包产品放一箱，两包上中下各扣一个纸浆模塑隔垫（共三个），然后将其放入Box。

-. 容量：156pcs/箱

④

- .采用“H”形封箱方式，对Box进行封箱，并在Box的Mark处粘贴相应标签。

⑤

-. 按“田”字型每个Pallet上放5层Box，1层4箱,共计20ea Box

-. Pallet外进行缠膜包装

-. 容量：3120pcs/Pallet

⑥