SPECIFICATION

FOR

AMOLED MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HG MODEL : HG055FH022

☐**Preliminary Specification**

■**Final Specification**

Customer Confirmation column:

Approved by : _____ Dept. : _____ Data : _____

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by

Table of Contents

Table of Contents 2
Record of Revision 4
1 General Specifications 5
2 Input/output Terminals 6
2.1 Main TP-FPC Pin Assignment 6
2.2 MCU and Display Module Interface Conflagration 7
3 Absolute Maximum Ratings 8
3.1 Driving AMOLED Panel 8
4 Electrical Characteristics 8
4.1 Driving AMOLED Panel 8
5 AC Characteristics 9
5.1 MIPI Interface Characteristics 9
5.2 Display RESET Timing Characteristics 11
5.3 TE Timing Characteristics 12
6 Recommended Operating Sequence 12
6.1 Display Power on / off Sequence 12
6.2 Brightness control 14
7 Touch Specification 15
7.1 Touch Design 15
8 Touch Specification 16
8.1 General Specifications 16
8.2 Electrical Characteristics 16
8.2.1 Maximum Ratings 16
8.2.2 Power supply DC characteristics 16
8.3 TP FPC Pin Assignment 16
8.4 Touch Design 17
8.5 TOUCH FPCB Schematic 17
8.6 TSP FPC Electronic Part List 17
9 Optical Characteristics Optical Specification 19
10 Environmental / Reliability Test 24
11 Quality Level 25
11.1 AMOLED Module of Characteristic Inspection 25
11.2 Sampling Procedures for Each Item Acceptance Table ..... 错误!未定义书签。
11.3 Telecommunications Inspection Item ..... 错误!未定义书签。
11.4 Appearance Inspection Item ..... 错误!未定义书签。
11.5 Inspection picture library ..... 错误!未定义书签。
12 Mechanical Drawing 42
13 Precautions for Use of AMOLED Modules 43

13.1 Handling Precautions:.....43
13.2 Storage Precautions: 43
13.3 Transportation Precautions: 44

Record of Revision

Rev	Issue Date	Description	Editor
A0	2024.08.19	Draft	M

1 General Specifications

Feature		Spec	Remark
Display Spec	Screen Size (inch)	5.48	
	Display Mode	AMOLED	
	Resolution(dot)	1080(W)×1920(H)	
	Active Area(mm)	68.256(W)×121.344 (H)	
	Pixel Pitch (um)	94.8 (W)×63.2(H)	
	Technology Type	LTPS	
	Color Depth	16.7M	
	Interface	MIPI 4LANE	
Mechanical Characteristics	Polarizer Surface Treatment	HC Coating	
	With TP/Without TP	With TP(on Cell)	
	Module Outline Dimension(W x H x D) (mm)	70.356(W)*127.344(H)*0.825(D)	
Electronic	Driver IC(Type)	CH13721C	
	Touch IC(Type)	FT3519	
	Frame Rate	60HZ	

Note 1: Requirements on Environmental Protection: RoHS 2.0.

2 Input/output Terminals

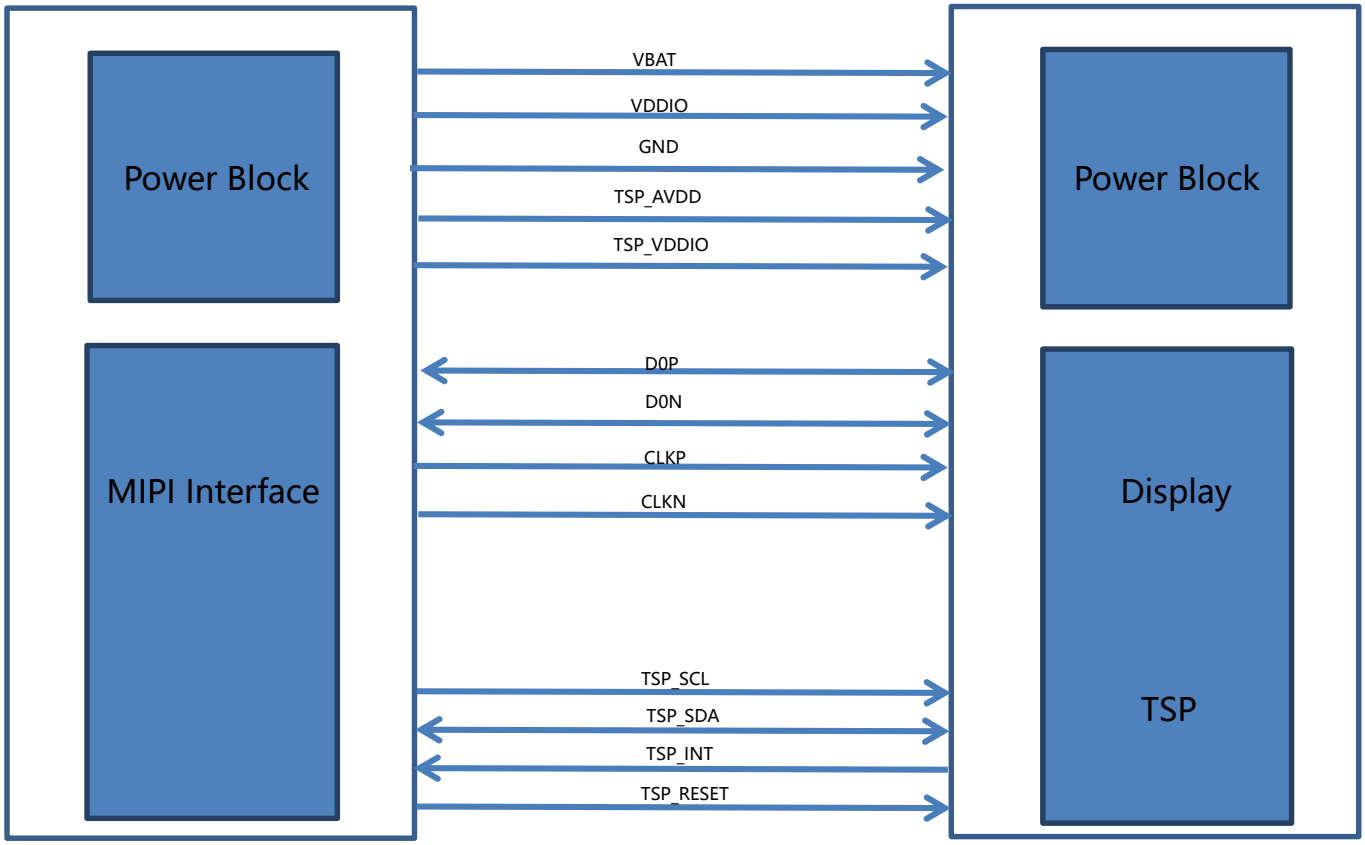
2.1 Main TP-FPC Pin Assignment

Number	Signal	Description
1	GND	Ground
2	D0P	MIPI Data Line
3	D0N	MIPI Data Line
4	GND	Ground
5	D1P	MIPI Data Line
6	D1N	MIPI Data Line
7	GND	Ground
8	CLKP	MIPI CLK Line
9	CLKN	MIPI CLK Line
10	GND	Ground
11	D2P	MIPI Data Line
12	D2N	MIPI Data Line
13	GND	Ground
14	D3P	MIPI Data Line
15	D3N	MIPI Data Line
16	GND	Ground
17	TSP_INT	Interrupt Signal for Touch Panel
18	TSP_RESET	Reset Pin for Touch Panel
19	TSP_SCL	Serial Clock Signal for Touch Panel I2C I/F
20	TSP_SDA	Serial Data Signal for Touch Panel I2C I/F
21	TSP_AVDD	Analog Power for Touch Panel
22	TSP_VDDIO	Digital Power for Touch Panel
23	AVDD	AMOLED charge pumping power for DDIC
24	AVDD_EN	AVDD enable
25	SWIRE	Control the PMIC
26	TE	Tear Effect
27	REST	Drive IC reset
28	VDDIO	AMOLED logic power for DDIC
29	GND	Ground（or NA）
30	ELVSS	AMOLED EL Negative power
31	ELVSS	
32	ELVSS	
33	GND	Ground （or NA）
34	ELVDD	AMOLED EL Positive power

35	ELVDD	
36	ELVDD	
37	MTP_PWR	Power supply for MTP Programming or Erase
38	VCI	AMOLED logic power for DDIC
39	DVDD/NC	No Connect

Note: I=Input; O=Output; P=Power; I/O=Input / Output

2.2 MCU and Display Module Interface Conflagration



3 Absolute Maximum Ratings

3.1 Driving AMOLED Panel

Maximum Ratings (Voltage Referenced to VSS) VSS=0V, Ta=25ºC

Item	Symbol	MIN	MAX	Unit
Analog Power supply	VCI	0	+6.3	V
Logic Power supply	VDDIO	0	+6.3	V
Analog Power supply	AVDD	0	+8.4	V
Positive Power Input	ELVDD	-	+5.0	V
Negative Power Input	ELVSS	-5.0	-	V

Not6.3e: Functional operation should satisfy the limits in the Electrical Characteristics tables or Pin Description section. If the module exceeds the absolute maximum ratings, permanent damage may occur. Besides, if the module is operated with the absolute maximum ratings for a long time, the reliability may also drop.

4 Electrical Characteristics

4.1 Driving AMOLED Panel

Ta=25℃

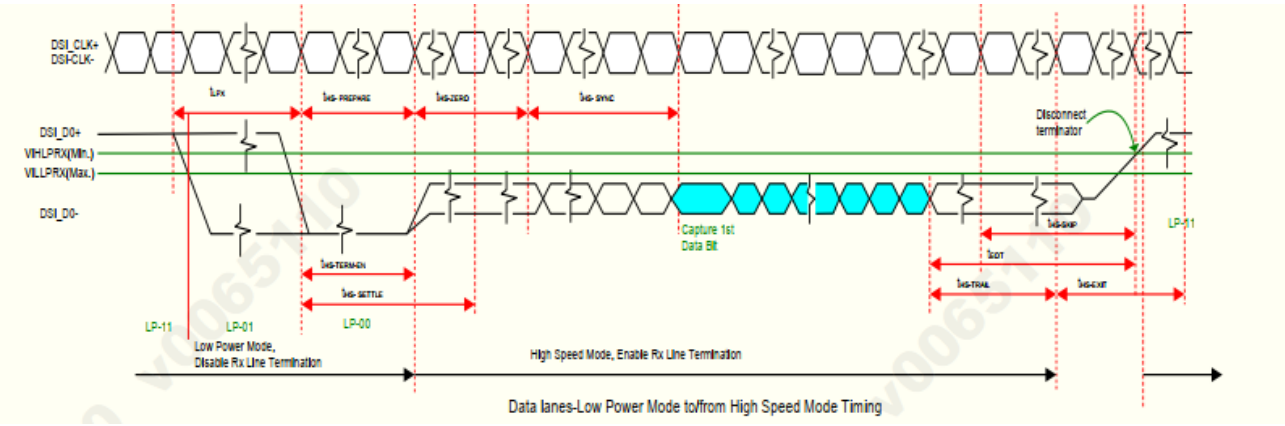
Item		Symbol	MIN	TYP	MAX	Unit
Logic Power Supply		VDDIO	1.65	1.80	3.3	V
Analog Power Supply		VCI	2.5	3.0	3.60	V
Analog Power Supply		AVDD	6.4	6.7	TBD	V
Default Positive Output Voltage		ELVDD		4.60		V
Positive Output Voltage Total Variation				-		%
Default Negative Output Voltage		ELVSS		-3.00		V
Negative Output Voltage Total Variation				-		%
Input Signal Voltage	High Level	VIH	0.70*VDDIO	-	VDDIO	V
	Low Level	VIL	0.00	-	0.30*VDDIO	V
Output Signal Voltage	High Level	VOH	0.80*VDDIO	-	VDDIO	V
	Low Level	VOL	0.00	-	0.20*VDDIO	V

Note: The current and power consumption were tested under White pattern，25℃

5 AC Characteristics

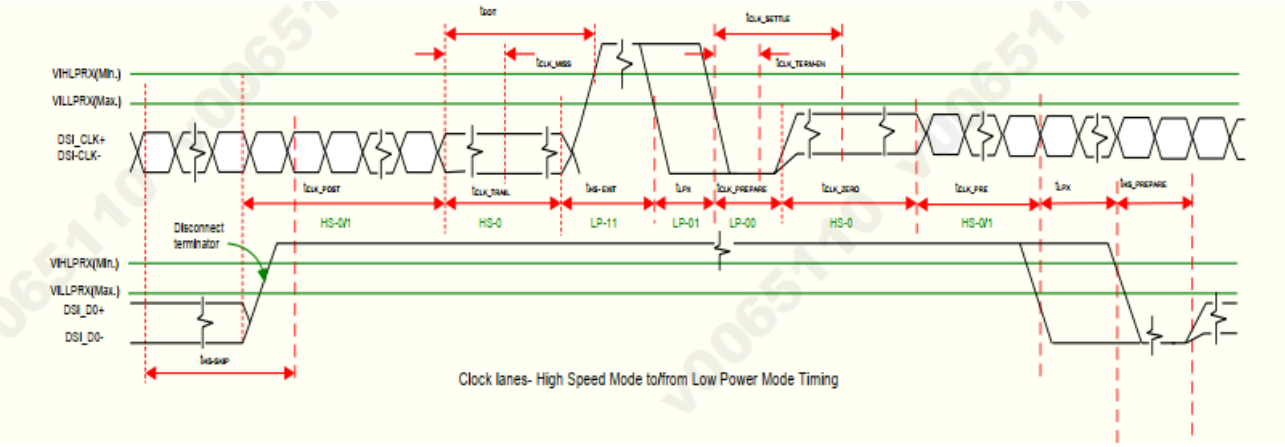
5.1 MIPI Interface Characteristics

HS Data Transmission Burst



Data lanes-Low Power Mode to/from High Speed Mode Timing

HS clock transmission



Clock lanes- High Speed Mode to/from Low Power Mode Timing

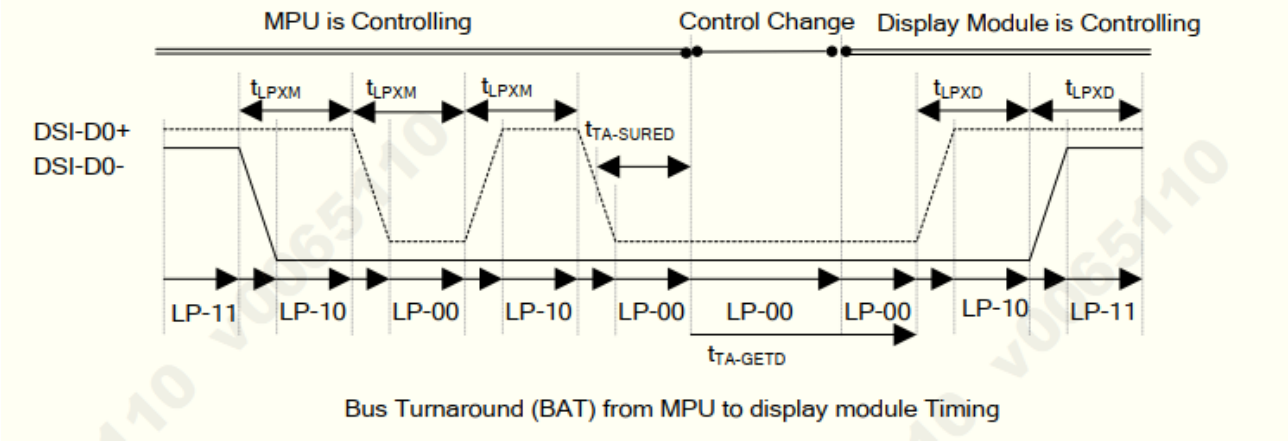
Timing Parameters:

Signal	Symbol	Parameter	Min.	Typ.	Max.	Unit	Description
Low Power Mode to High Speed Mode Timing							
DSI-Dn+/-	t_{LPX}	Length of any low power state period	50	-	-	ns	Input
DSI-Dn+/-	$t_{HS-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	40+4×UI	-	85+6×UI	ns	Input
DSI-Dn+/-	$t_{HS-TERM-EN}$	Time to enable data receiver line termination measured from when Dn crosses V_{ILMAX}	-	-	35+4×UI	ns	Input
High Speed Mode to Low Power Mode Timing							
DSI-Dn+/-	$t_{HS-SKIP}$	Time-out at display module to ignore transition period of EoT	40	-	55+4×UI	ns	Input
DSI-Dn+/-	$t_{HS-EXIT}$	Time to drive LP-11 after HS burst	100	-	-	ns	Input
DSI-Dn+/-	$t_{HS-TRAIL}$	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60+4×UI	-	-	ns	Input
High Speed Mode to/from Low Power Mode timing							
DSI-CLK+/-	$t_{CLK-POS}$	Time that the MPU shall continue sending HS clock after the last associated data lane has transition to LP mode	60+52×UI	-	-	ns	Input
DSI-CLK+/-	$t_{CLK-TRAIL}$	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	-	ns	Input
DSI-CLK+/-	$t_{HS-EXIT}$	Time to drive LP-11 after HS burst	100	-	-	ns	Input
DSI-CLK+/-	$t_{CLK-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	38	-	95	ns	Input
DSI-CLK+/-	$t_{CLK-TERM-EN}$	Time-out at clock lane display module to enable HS transmission	-	-	38	ns	Input
DSI-CLK+/-	$t_{CLK-PREPARE}$ +$t_{CLK-ZERO}$	Minimum lead HS-0 drive period before starting clock	300	-	-	ns	Input
DSI-CLK+/-	$t_{CLK-PRE}$	Time that the HS clock shall be driven prior to any associated data lane beginning the transition from LP to HS mode	8×UI	-	-	ns	Input

Note 1: VDDIO/VDDAM/VDDR =1.65~3.6V, VCI=2.5 to3.6V VSSIO=DVSS=VSSA=VSSAM=VSSR =VSSB=0V, Ta=-30 to +85 ºC.

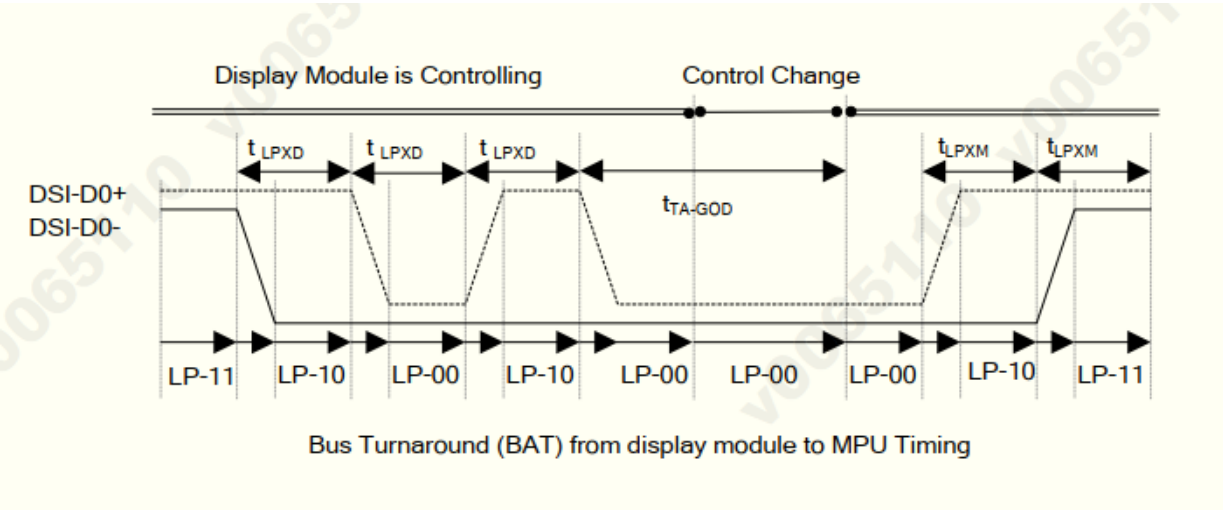
Note 2: Dn=D0, D1, D2 and D3.

Bus Turnaround from MPU to display module



Bus Turnaround (BAT) from MPU to display module Timing

Bus Turnaround from display module to MPU



Bus Turnaround (BAT) from display module to MPU Timing

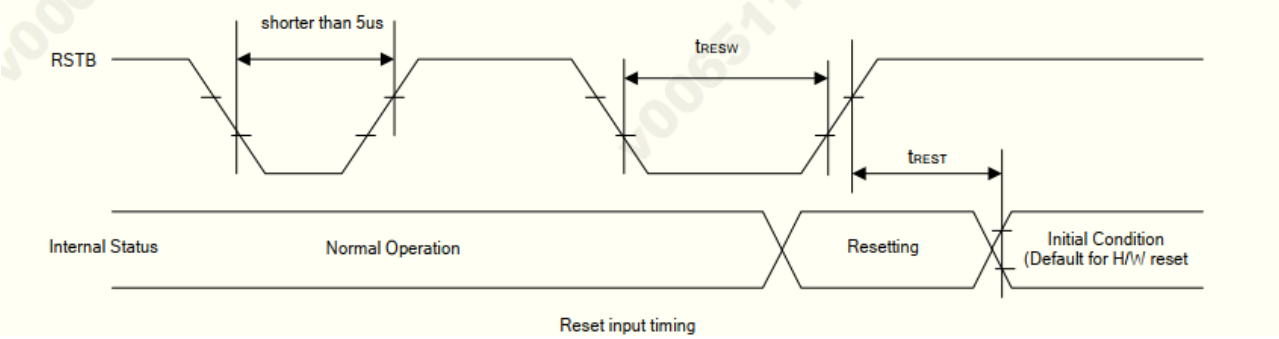
Timing Parameters：

Signal	Symbol	Parameter	Min.	Typ.	Max.	Unit	Description
DSI-D0+/-	t_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periodsMPU → Display Module	50	-	75	ns	Input
DSI-D0+/-	t_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11periodsDisplay Module → MPU	50	-	75	ns	Output
DSI-D0+/-	$t_{TA-SURED}$	Time-out before the MPU start driving	t_{LPXD}	-	$2\times t_{LPXD}$	ns	Output
DSI-D0+/-	$t_{TA-GETD}$	Time to drive LP-00 by display module	$5\times t_{LPXD}$	-	-	ns	Input
DSI-D0+/-	t_{TA-GOD}	Time to drive LP-00 after turnaround request - MPU	$4\times t_{LPXD}$	-	-	ns	Output

Note 1: VDDIO/VDDAM/VDDR =1.65~3.6V, VCI=2.5 to3.6V,VSSIO=DVSS=VSSA=VSSAM=VSSR =VSSB=0V, Ta=-30 to +85 ºC.

5.2 Display RESET Timing Characteristics

Reset input timing:



Reset input timing

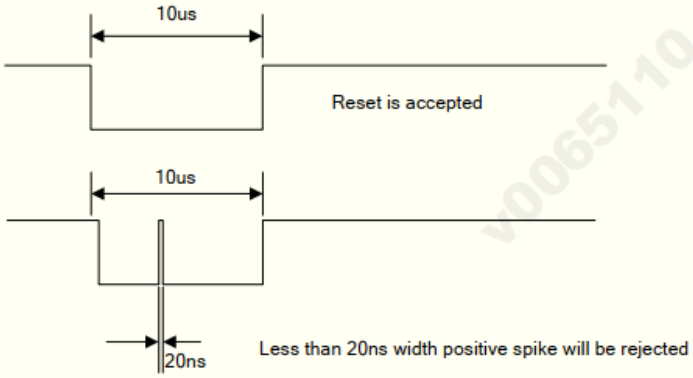
Timing Parameters

Signal	Symbol	Parameter	Min.	Typ.	Max.	Unit	Description
RSTB	tRESW	Reset "L" pulse width (Note 1)	10	-	-	μs	-
	tREST	Reset complete time (Note 2)	-	-	5	ms	When reset applied during Sleep In Mode
			-	-	120	ms	When reset applied during Sleep Out Mode

Note 1: Spike due to an electrostatic discharge on RSTB line does not cause irregular system Reset according to the table below.

RSTB Pulse	Action
Shorter than 5μs	Reset Rejected
Longer than 10μs	Reset
Between 5μs and 10μs	Reset Start

Note 2: During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In–mode) and then return to Default condition for H/W Reset.
Note 3: During Reset Complete Time, values in OTP memory will be latched to internal register during this period. This loading is done every time when there is H/W Reset complete time (t_{REST}) within 5ms after a rising edge of RSTB.
Note 4: Spike Rejection also applies during a valid Reset pulse as shown below:

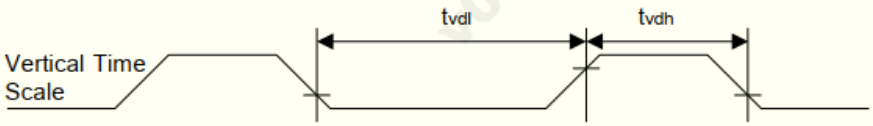


Note 5: It is necessary to wait 5msec after releasing RSTB before sending commands. Also Sleep Out command cannot be sent for 120msec.

5.3 TE Timing Characteristics

Mode1, The Tearing Effect Output line consists of V-Blanking information only.

Mode 1, the Tearing Effect Output signal consists of V-Blanking Information only:



Tvdh = The display panel is not updated from the Frame Memory
Tvdl = The display panel is updated from the Frame Memory(except Invisible Line –see below)
Mode 2, the Tearing Effect Output signal consists of V-Blanking and H-Blanking Information, there is one Vsync and 1920 H-sync pulses per field.

6 Recommended Operating Sequence

6.1 Display Power on / off Sequence

6.1.1 Power On Sequence

The Power on sequence has been appliedfollowing Fig1, otherwise correct functionality is not guaranteed.

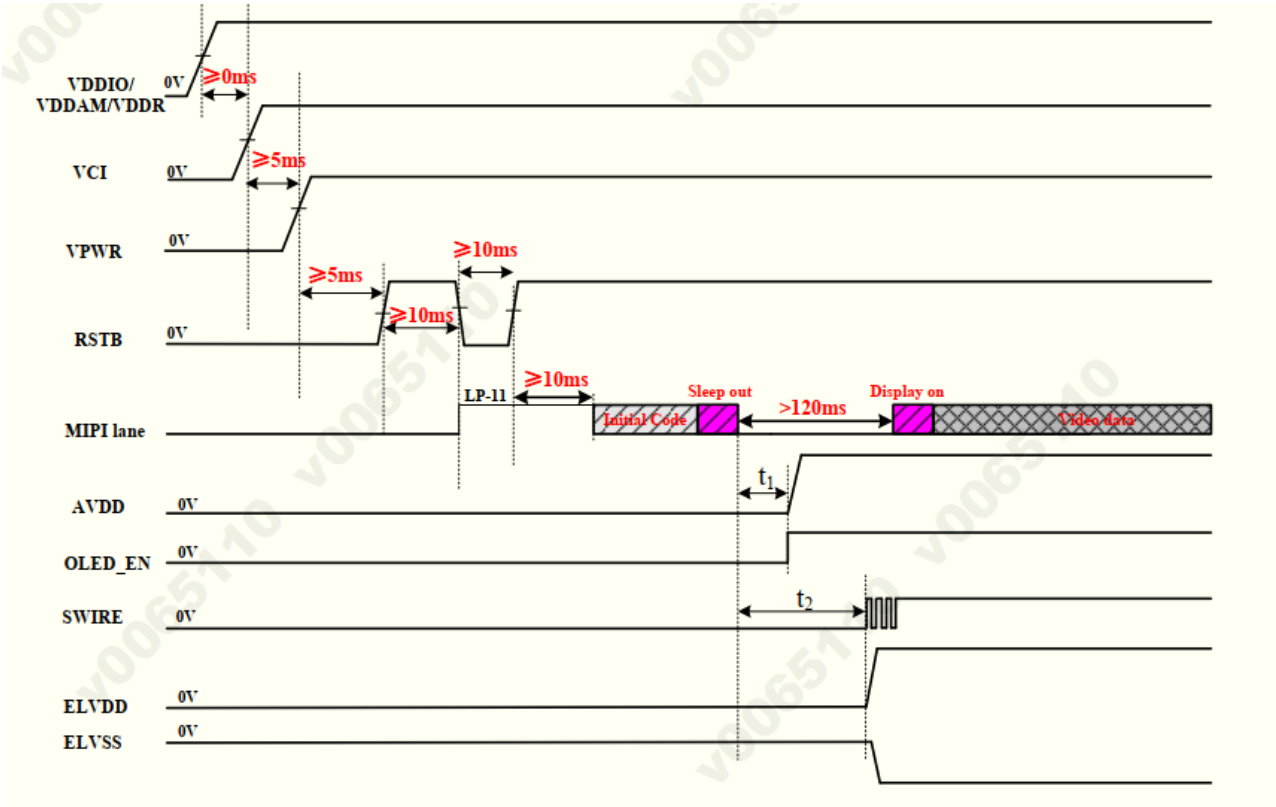


Fig 1 Power on sequence

Note1: t1 is AVDD set up time, is controlled by AVDD_ONT[7:0];
Note2: t2 is ELVDD/ELVSS set up time, is controlled by SWIRE_ONF[5:0];
Note3: VPWR is the power of Power IC for AVDD/ELVDD/ELVSS;

6.1.2 Power Off Sequence

The Power off sequence have been appliedfollowing Fig2, otherwise correct functionality is not guaranteed

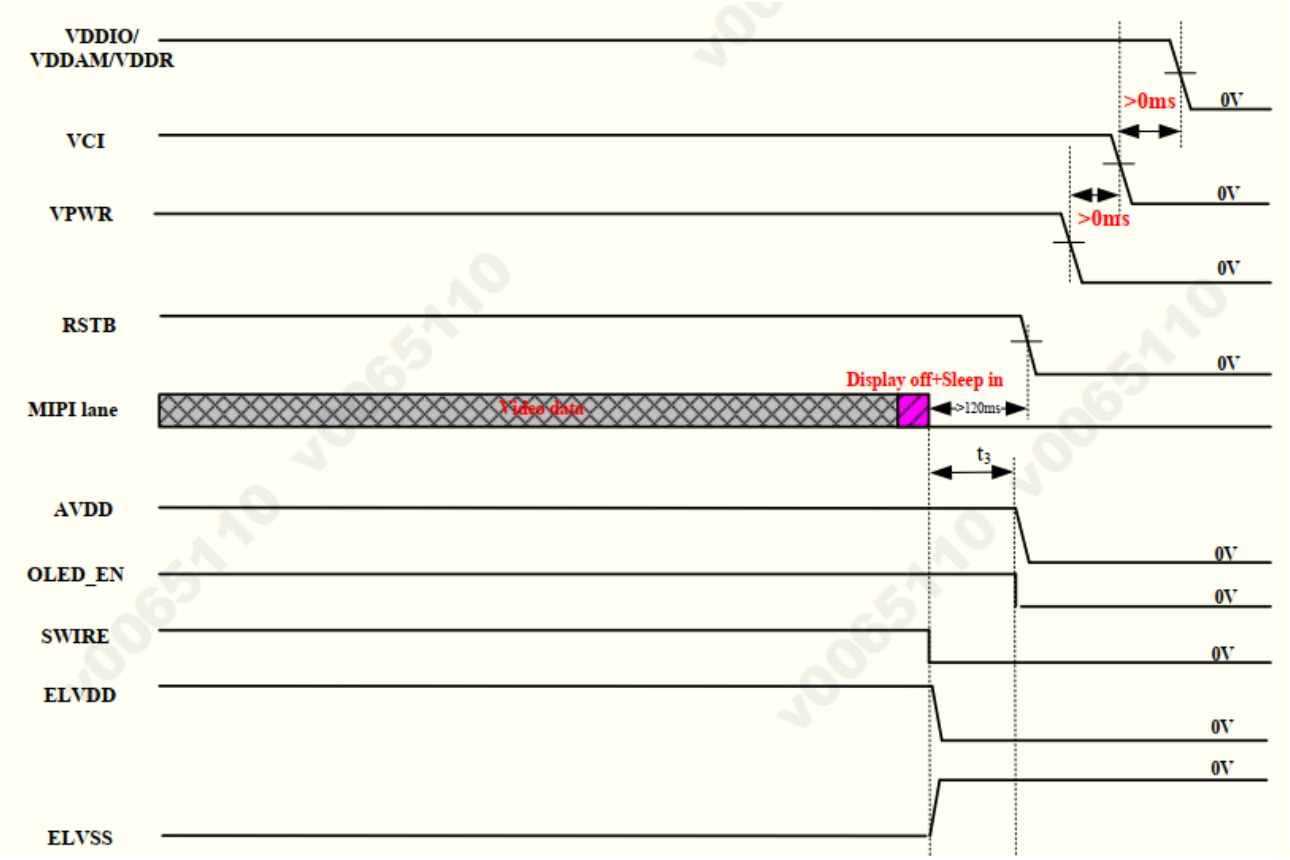


Fig 2 Power off sequence

Note1: t_3 is Power off Delay time, is controlled by AVDD_OFT[7:0];
Note2: VPWR is the power of Power IC for AVDD/ELVDD/ELVSS;

6.2 Brightness control

Inst/Para	R/W	Address		Date Type	Description
		MIPI	Other		
BRTCTRL	W	51h	5100h	Hex	Value form 0~255(FF)

7 Touch Specification

7.1 Touch Design

Item		Description	Notes
Touch Design	Sensor structure	Oncell	
	Sensor pitch	Tx:4.341mm · Rx:4.276mm	
	Sensor pattern	Diamond	
	CH Number	16(Tx) / 28(Rx)	
	Trace mode	2T1R	

8 Touch Specification

8.1 General Specifications

NO	ITEM	SPEC	REMARK
1	Accuracy @D7mm Finger(mm)	center≤1.0mm border≤1.5mm	
2	Linearity @ D7mm Finger(mm)	center≤1.0mm border≤1.5mm	
3	Jitter @D7mm Finger(mm)	All≤1.0mm	
4	Sensitivity @D7mm Finger(mm)	w/o line broken	
5	Report rate	Typ：120Hz Max：240Hz	
6	Touch Point	Max 10 Fingers	

8.2 Electrical Characteristics

8.2.1 Maximum Ratings

Item	Symbol	MIN	MAX	Unit
TP power supply Input	TSP_AVDD	2.7	3.6	V
TP power supply for logic circuits	TSP_VDDIO	1.7	3.6	V

8.2.2 Power supply DC characteristics

Item	Symbol	MIN	TYP	MAX	Unit
TP power supply Input	TSP_AVDD	2.8	2.8/3.0/3.3	3.6	V
TP power supply for logic circuits	TSP_VDDIO	1.7	1.8/TSP_AVDD	3.6	V

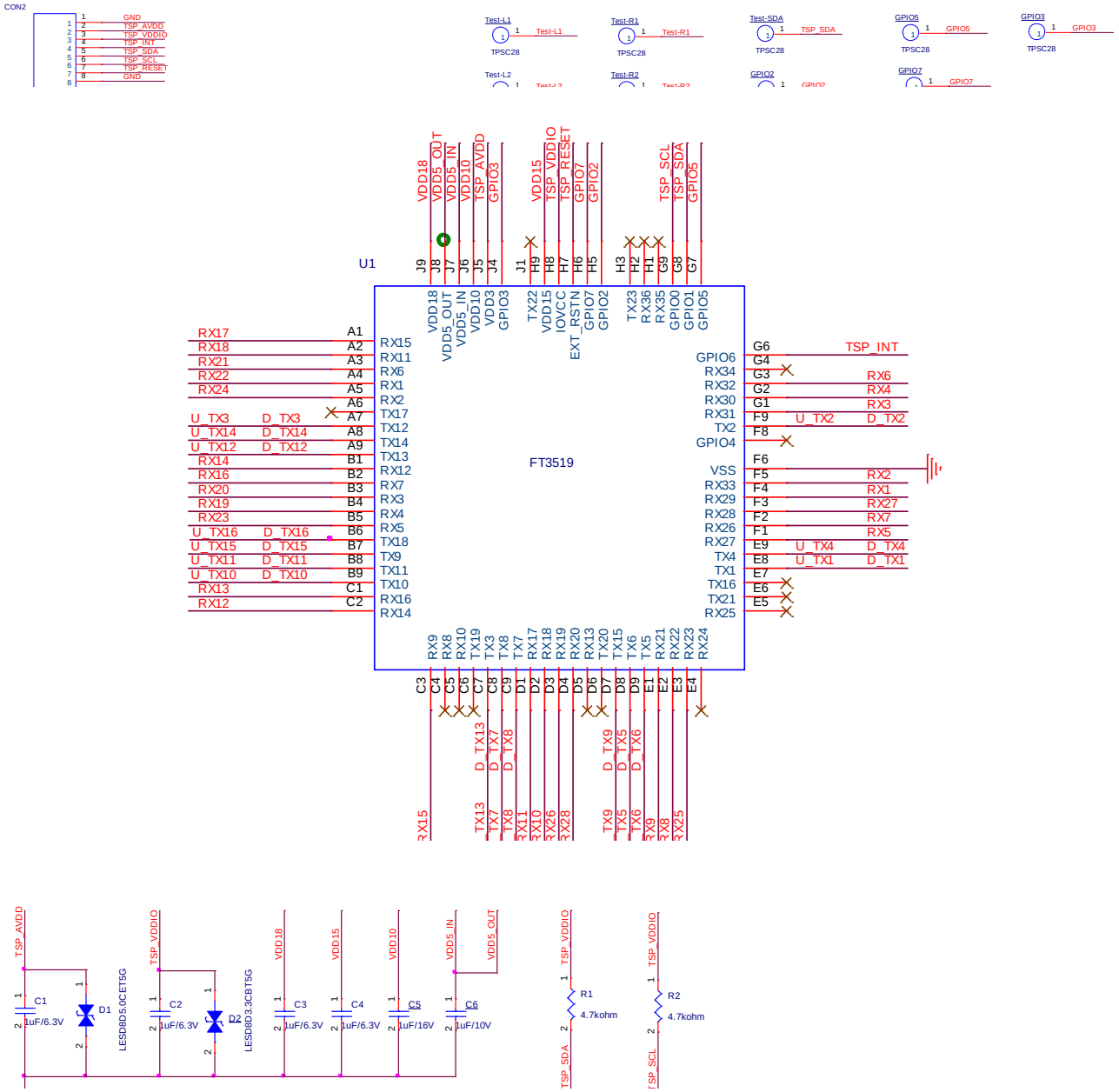
8.3 TP FPC Pin Assignment

No	Symbol	I/O	Description
1	GND	GND	Ground
2	TSP_AVDD	Power	Analog Power for Touch Panel
3	TSP_IOVCC	Power	Digital Power for Touch Panel
4	TSP_INT	O	Interrupt signal for Touch Panel
5	TSP_SDA	I/O	SDA pin for Touch Panel
6	TSP_SCL	I	SCL pin for Touch Panel
7	TSP_RESET	I	Reset Pin for Touch Panel
8	GND	GND	Ground

8.4 Touch Design

Item		Description	Notes
Touch Design	Sensor structure	Oncell	

8.5 TOUCH FPCB Schematic



8.6 TSP FPC Electronic Part List

Item	Reference	Specification
1	C1 C2 C3 C4	1uF/6.3V/0402

2	C5	1uF/16V/0402
3	C6	1uF/10V/0402
4	D1	Bi-directional /5V/0402
5	D2	Bi-directional /3.3V/0402
6	R1 R2	4.7KΩ/0402
7	U1	Touch IC ,FT3519

9 Optical Characteristics Optical Specification

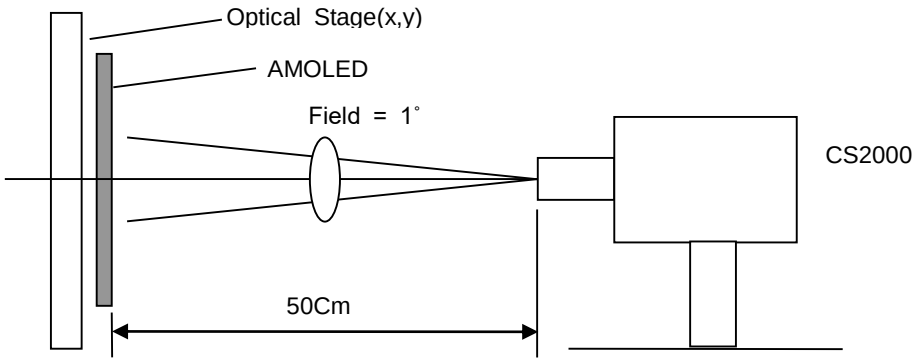
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angle		θT	CR≥10	80			Degree	Note 2 Test Equipment：CS2000A
		θB		80				
		θL		80				
		θR		80				
Contrast Ratio		CR	θ=0°	100000				Note1 Note3 Test Equipment：CS2000A
Chromaticity	White	x			(0.300)			Note 5 Test Equipment：CS2000A Note: Chromaticity can be modified according to customer demand
		y			(0.315)			
	Red	x		(0.652)	(0.682)	(0.712)		
		y		(0.285)	(0.315)	(0.345)		
	Green	x		(0.200)	(0.240)	(0.280)		
		y		(0.676)	(0.716)	(0.756)		
	Blue	x		(0.108)	(0.138)	(0.168)		
		y		(0.018)	(0.048)	(0.078)		
Uniformity		U		75			%	Note1 Note7 Test Equipment：CS2000A
NTSC				100			%	Note5
Luminance		L	Normal	450	500	550	Cd/m^2	Note1 Note8 Test Equipment：CS2000A
			HBM	630	700	770	Cd/m^2	
Cross-talk						2	%	Note9 Test Equipment：CS2000A
Gamma				2.0	2.2	2.4		Test Equipment：CA310
Flicker			Normal			-30	dB	Test Equipment：CA310

Test Conditions:

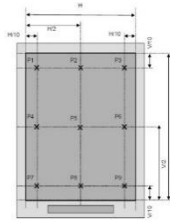
1. The ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical properties are measured at the center point of the AMOLED screen. All input terminals AMOLED panel must be ground when measuring the center area of the panel.

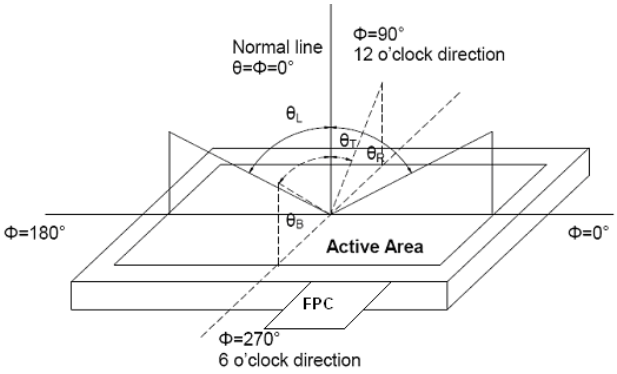


Optical Characteristic Measurement Equipment and Method



Measuring point for surface luminance

Note 2: Definition of viewing angle range and measurement system.



Definition of viewing angle

Note 3: Definition of contrast ratio

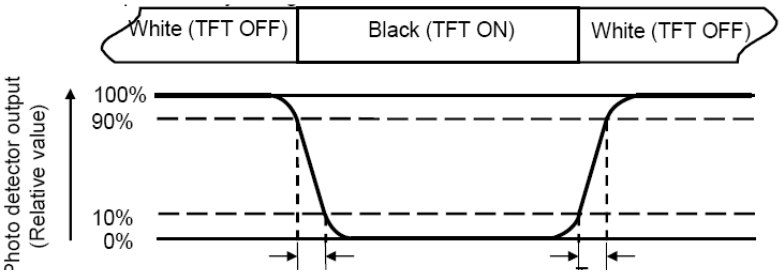
$$\text{Contrast ratio(CR)} = \frac{Luminance\ measured\ when\ AMOLED\ \text{is on the "white" state}}{Luminance\ measured\ when\ AMOLED\ is\ on\ the\ "Black"\ state}$$

"White state ": A state where the AMOLED should be driven by Vwhite.

“Black state”: A state where the AMOLED should be driven by Vblack.

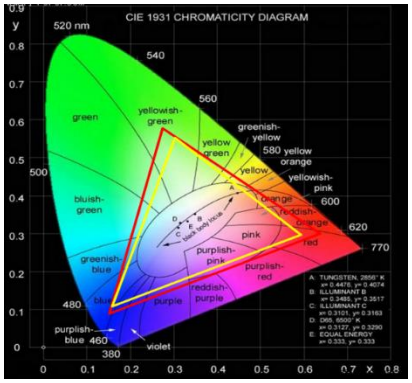
Note 4: Definition of response time

The response time is defined as the AMOLED optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changing from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changing from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of AMOLED.



Note 6: Flicker

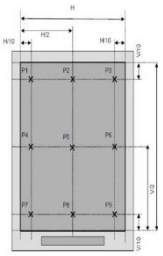
Adjust the sample to Gray127 screen and measure Flicker value by JEITA with CA310.

Note 7: Definition of luminance uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

L-------Active area length W----- Active area width



Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 8: Definition of luminance:

Measure the luminance of white state at center point.

Note 9: Cross Talk

A. Measure luminance at the position, P0.

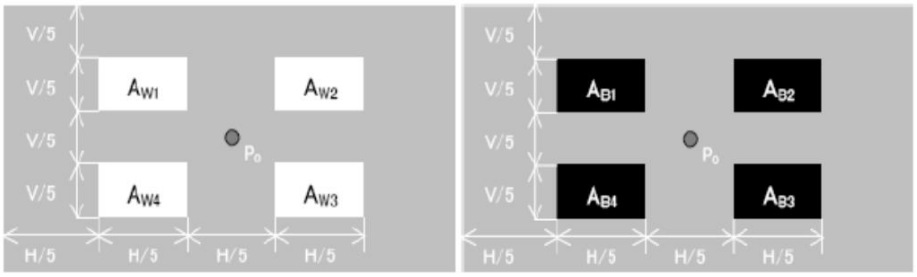
B. Calculate cross talk as below equation.

$$L_{W\_OFF} = \frac{L_{W1} + L_{W2} + L_{W3} + L_{W4}}{4}$$

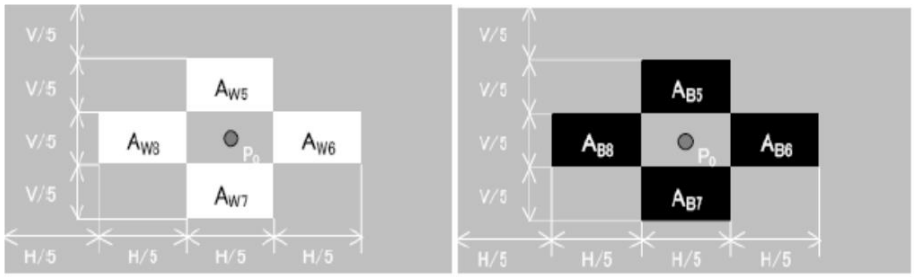
$$L_{B\_OFF} = \frac{L_{B1} + L_{B2} + L_{B3} + L_{B4}}{4}$$

$$crosstalk = \frac{|L_{Wi\_ON} - L_{W\_OFF}|}{L_{W\_OFF}} \times 100\% \qquad (i = 5 \text{ to } 8)$$

$$crosstalk = \frac{|L_{Bi\_ON} - L_{B\_OFF}|}{L_{B\_OFF}} \times 100\% \qquad (i = 5 \text{ to } 8)$$



(a) L_{W_OFF}, L_{B_OFF} measuring pattern



(b) L_{W_ON}, L_{B_ON} measuring pattern

10 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	+70℃, 120hrs	IEC60068-2-2,GB2423.2
2	Low Temperature Operation	-40℃, 120hrs	IEC60068-2-1 GB2423.1
3	High Temperature Storage	+80℃, 120hrs	IEC60068-2-2 GB2423.2
4	Low Temperature Storage	-50℃, 120hrs	IEC60068-2-1 GB2423.1
5	High Temperature & High Humidity Operation	60℃, 90% RH,120hrs	IEC60068-2-78 GB/T2423.3
6	Thermal Shock (Non-operation)	-40(℃)/30(min) ~+80 (℃)/30(min), Change time:10min, 30Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22

Note：Product reliability items in the form of GK are used as reference items. The test results shall refer to the results of the reliability test of HG standards.

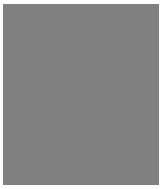
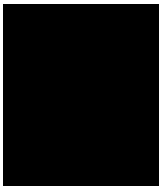
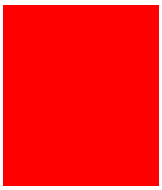
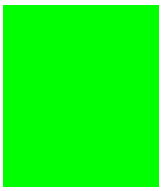
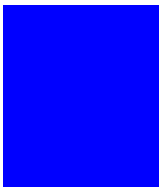
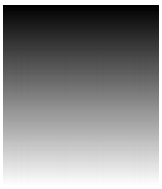
11 Quality Level

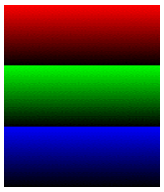
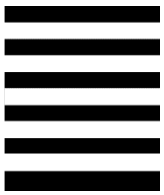
11.1 MP Quality Control Baseline

制程能力	管控项	具体要求					
		序号	测试项目	样品状态	测试条件	抽样频率	抽样数量
可靠性质量监控	ORT 测试 ORT Test	1	高温动作	Module	70℃,120H	前 6 个月：每个月测一次；6 个月之后：每季度测一次；	10pcs/每种料号
		2	低温动作	Module	-40℃,120H		
		3	高温存储	Module	+80℃, 120hrs		
		4	低温存储	Module	-50℃, 120hrs		
		5	温度冲击实验	Module	-40(℃)/30(min)~+80 (℃)/30(min), Change time:10min, 30Cycles		
		6	高温高湿动作试验	Module	60℃, 90% RH,120hrs		
功能外观质量监控	电测&外观缺陷检验 Appearance Test	如下第 3 和 4					

11.2 Final inspection test screen（终检测试画面）

序号	图片	图片名称	主要判定不良	锁秒
1		W_GRAD(64) 64 灰阶	功能不良、亮点/暗点类、线类、Mura 类/显示不均、异物点/线类、常规偏色类	3S

2		W_GRAD(128) 128 灰阶	功能不良、亮点/暗点类、线类、Mura 类/显示不均、异物点/线类、常规偏色类	1S
3		WHITE 白	功能不良、亮点/暗点类、线类、Mura 类/显示不均、异物点/线类、色彩一致性	3S
4		Black 黑	功能不良、线类、亮点类、Mura 类/显示不均	3S
5		HBM WHITE 高亮白	Normal mode 和 HBM Max 亮度切换判定白屏颜色变化等显示异常	1S
6		RED 红	功能不良、亮点/暗点类、线类、Mura 类/显示不均、异物点/线类、色彩一致性	1S
7		GREEN 绿	功能不良、亮点/暗点类、线类、Mura 类/显示不均、异物点/线类、色彩一致性	1S
8		BLUE 蓝	功能不良、亮点/暗点类、线类、Mura 类/显示不均、异物点/线类、色彩一致性	1S
9		HSCALE 水平渐层灰阶	Gamma 测试、功能不良、亮点/暗点类、线类、渐层过渡	1S

10		VSCALE 垂直渐层灰阶	Gamma 测试、功能不良、亮点/暗点类、线类、渐层过渡	1S
11		RGB3H 3 色渐变灰阶	RGB Gamma 测试、功能不良、亮点/暗点类、线类、色彩过渡	1S
12		Complex	功能不良、线类	1S
13		黑白条画面+低 51 值 注：低 51 值为将 51 寄存器赋值， 51,00,02，为模拟客户端亮度条拉为最低时状态	1、画面异常 2、闪屏，水波纹	1S

注：画面实际顺序及锁秒可根据客户要求及内部需求做调整。

11.3 Acceptance Quality Limit（限度样清单）

详情见签样清单。

11.4 Functional and Appearance Test（功能和外观缺陷检验）

11.4.1 定义：

11.4.1.1 致命缺陷（Critical Defect）：凡是直接或间接影响人身健康与安全，或使用产品的功能丧失之缺陷。

11.4.1.2 主要缺陷（Major Defect）：直接或间接影响产品功能，或使产品部分功能丧失，及其它顾客不能接收之缺陷（包括三个或以上轻微缺陷的集合）。

11.4.1.3 次要缺陷（Minor Defect）：不影响产品功能，顾客尚能接收之外观缺陷。

11.4.2 执行水准

11.4.2.1 抽样标准：采取《GB/T2828.1 2012》正常检查一次抽样方案。

11.4.2.2 检查项目及频率

类别	检验内容	标准	抽样标准	备注
一般项目	电讯/外观	电讯检验标准 外观检验标准	致命缺陷（CR 0.25）； 主要缺陷(MA AQL 0.65); 次要缺陷（MI AQL 1.0）；	详情见检验标准
特殊项目	尺寸测量	图纸	5pcs/工单或按照客户要求	符合图纸要求（抽检重点关键尺寸）；符合样品承认书要求。

11.4.2.3 不良数判定标准 CR=CR，MA=CR +MA，MI=CR +MA+ MI。

11.4.2.4 当一个产品含有两个或以上缺点时，以较严重之缺点为判定 。

11.4.3 内容

11.4.3.1 检验资格：检验员必须经过培训，并取得培训上岗证后方可检验产品。

11.4.3.2 检验条件：OLED 不点亮，冷白荧光灯，光照度 1000±200lux ；OLED 点亮光源不高于 200lux，四周为黑色背景。

11.4.3.3 检验距离：被检测物体所有表面的标准观察距离为 30cm±5cm。

11.4.3.4 检验角度 ：产品与水平面的夹角为 45°，眼睛垂直于检视面，检视时产品需上下左右转动 45°，观察视线需在锥体的半截面内，观察角度与产品顶点的垂直轴成 45 度夹角。锥体的中轴线必须标准的垂直于产品表面并通过荧光灯。

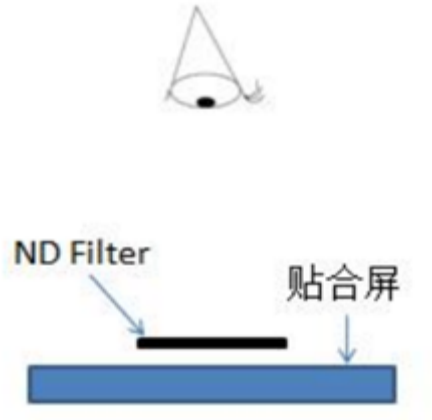
11.4.3.5 检验时间：不点亮检验时间至少为 10~12 秒；OLED 点亮检验每个画面时间为 1~3 秒，在规定时间内缺陷仍不可见，则此检视件视为合格。

11.4.3.6 检验温度：室温 15-35℃，环境湿度：20-75%RH。

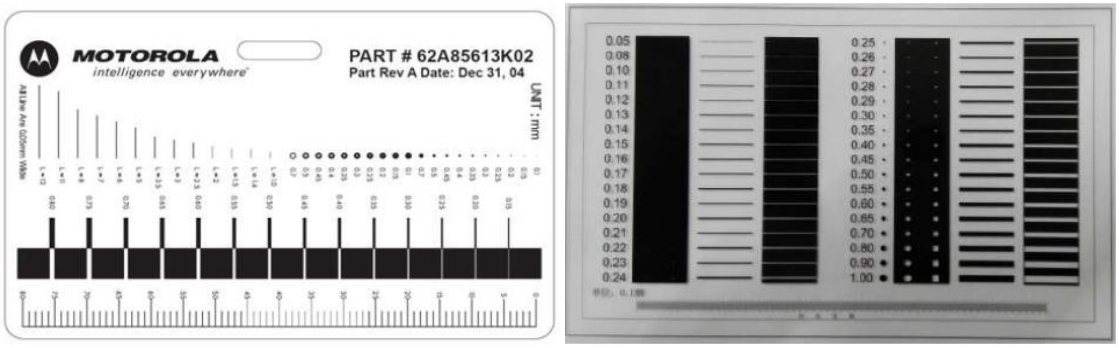
11.4.3.7 检验工具：

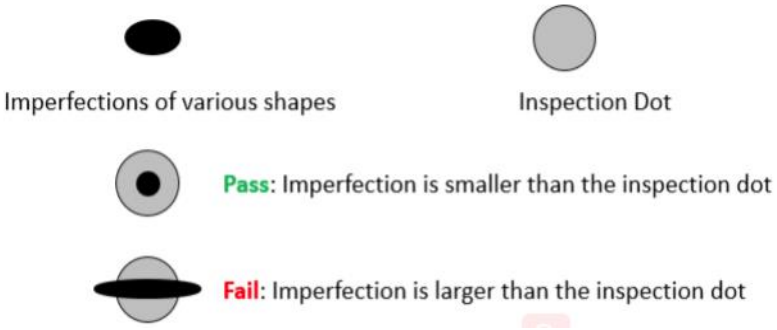
11.4.3.7.1 ND Filter：ND Filter 放于距缺陷上面约 2~3cm 处 2-3s，用于判断缺陷是否可见。如下图：

（ND Filter 用于检验 mura 等色、光不均现象）



11.4.3.7.2 点规（推荐下图点规），判定方法：如图所示，用点规菲林片可以覆盖的为 Pass，不能覆盖的为 Fail。例如，A 级面允许最大 0.2mm 的同色点缺陷，用菲林片上 0.2mm 可以覆盖的为 Pass，不能覆盖的为 Fail。





11.4.3.7.3 镜检：使用 20-50 倍可调显微镜，10-30 倍测试目镜。

11.4.3.7.4 数显卡尺：分辨率 0.01mm。

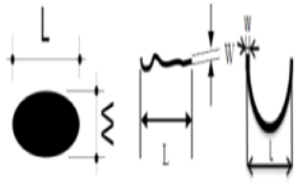
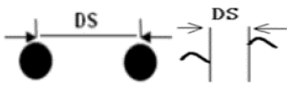
11.4.3.7.5 投影仪：二次元显微镜，3D 投影仪。

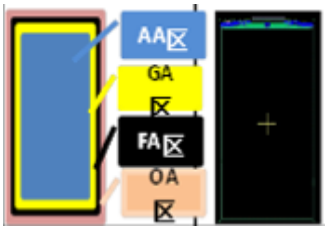
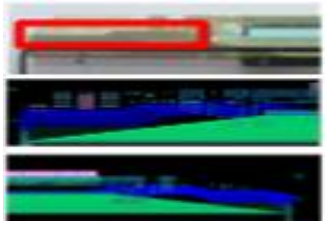
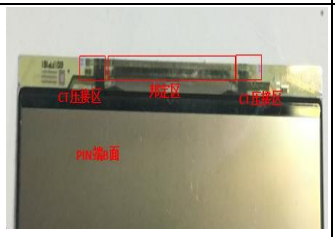
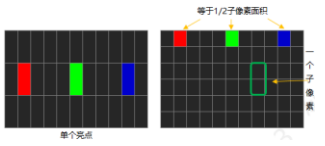
11.4.3.8 判定说明

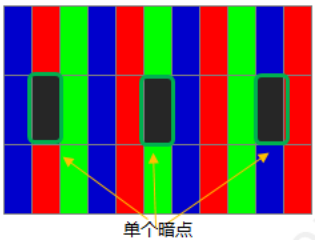
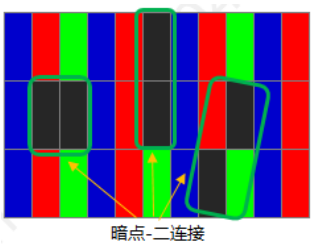
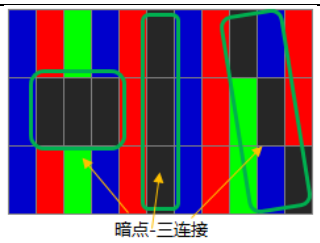
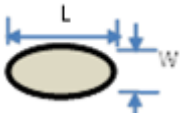
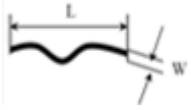
11.4.3.8.1 测量精度应参考规格定义，当测量设备精度高于规格定义时，测量值需要四舍五入到规格定义的精度。例如，崩边规格是 0.20mm,千分位属于参考位，按照四舍五入，即 0.200mm~0.204mm 为 OK, >=0.205mm 判定 NG。

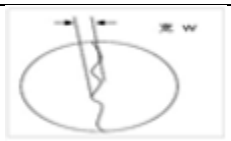
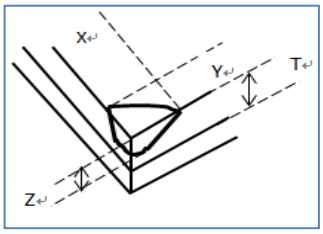
11.4.3.8.2 除以上使用工具外若要新增检验工具辅助判定，需双方协调一致后才可进行。

11.4.3.8.3 不良代码及定义

代码及名称		图例	说明
N	数目（个）	-	目视计算个数; 缺陷总个数的统计不包含完全“不计”部分，针对定义为“不计” “忽略”栏，满足要求时不计为缺陷数，否则按独立缺陷计算。
L	长度（mm）		点线区分规则：L 为长边，W 为短边 a.当 L > 3W 时按线处理，否则按点处理; b.当判定为线缺陷时，出现 S 形或 C 型线时,围合量小于 3/4 圆时,按线缺陷处理 ,否则按点缺陷处理,以内切圆模拟点大小。
W	宽度（mm）		
S	面积 (mm^2)	-	面规
D	直径（mm） D=(L+W)/2	-	点直径计算：按长边短边之和的二分之一计算，即 D=（L+W）/2，其中 D 代表点的直径，L 为长边，W 为短边;
H	深度（mm）	-	数显千分尺
DS	距离（mm）		两点之间距离或两线之间距离

屏体区域示意图		AA 区：显示区； GA 区：GIP 电路区； FA 区：Frit 区； OA 区：FA 区外区
引线区		屏体 GIP 电路区、屏体 Data 电路区
PAD 邦定区		LTPS 基板上 COG/FOG 邦定对位 mark 及邦定 Pad
PAD 非邦定区		LTPS 基板上屏体测试 Pad、切割区、无引线区域
CT 压接区		Pin 端屏体测试 pad
亮点		1 个像素的单个子像素（或红，或绿，或蓝）称为点；亮点的定义是在 200±50 Lux 的环境下，员工裸眼看到的像素或点常亮，亮点在黑色画面下检查

暗点		1 个像素的单个子像素（或红，或绿，或蓝）称为点；暗点定义是在 200±50 Lux 的环境下，100% 白画面下裸眼看到的单个子像素不亮的点。
暗点-二连接		放大镜下相邻的两个子像素同时不亮（横、纵、斜）
暗点-三连接		放大镜下相邻的 R、G、B 子像素同时不亮（横、纵、斜）
CG 单体区域划分		AA：正面可视区，黑色油墨内部区域； A：黑色油墨区； B：盖板边缘； 贯穿 AA 区和 A 区的正面缺陷，按最严区域规格，背面缺陷按 AA 区是否可见部分判断。
异物亮点	-	由于偏光片异物等，表现为亮点的现象称为异物亮点
点状缺陷		在局部位置出现亮点、黑点包括但不限于屏幕本身的内污、针孔、锯齿、凹凸点、色点、微小气泡、白点、偏光片贴合污点、偏光片本身不良等点状缺陷。点状缺陷以直径判断。
线状缺陷		屏幕内线状杂质、包括屏幕内毛丝、纤维、偏光片贴合杂质，偏光片表面划伤等。线状缺陷以长度和宽度判断。

		有感刮伤: 又称硬划伤就是表面有深度的划痕, 手摸有感。 无感刮伤：又称细划伤，表面无深度的划痕，手摸无感。
锯齿状缺陷		W：锯齿波峰到波谷的距离
崩边/崩角		在屏制作过程中，特别是在仿型、切割等过程中，导致的玻璃边缘出现的细小状玻璃缺失等。 X 方向：与 FOG Pad 或玻璃边缘平行方向； Y 方向：与 FOG Pad 或玻璃边缘垂直方向； Z 方向：屏体厚度方向； T：单层玻璃的厚度；
麻点	-	在 10mm*10mm 的单位面积内，D≤0.1mm 的缺陷点，DS≥2mm，且数量 N≥5。如客户有其他要求，则按照客户要求。
脏污	-	包括手印、油渍、指纹、污迹、白雾等不良现象。分为可擦除脏污和不可擦除脏污。用无尘布蘸酒精不可擦除为不可擦除脏污。可擦拭脏污判定如下: a. 干无尘布可直接擦除； b. 用无尘布沾无水酒精擦除 沾酒精的无尘布在干无尘布上按压两次，吸取多余酒精； 无尘布来回擦拭两次，脏污可以清除;

11.4.3.9 检验标准

11.4.3.9.1 电讯检验标准

类别	序号	检查项目	区域	检验规格	检验方式	缺陷类型

功能不良	1	显示异常	AA	不允许	目视	致命
	2	无显	AA	不允许	目视	致命
TP 功能	3	TP 测试 NG	AA	不允许	目视	主缺
点类	4	亮点	AA	不允许	目视	主缺
	5	暗点	AA	1、D≤0.15mm，DS≥5mm，忽略； 2、0.15＜D≤0.2mm，DS≥10mm，N≤4 个； 3、D＞0.2mm，不允许；	目视/目镜/菲林卡	次缺
线类	6	亮线	AA	不允许	目视	致命
	7	暗线	AA	不允许	目视	主缺
	8	微亮线	AA	不允许	目视	主缺
光学不良	9	光学测试 NG	AA	不满足白平衡/规格书/承认书等光学测试要求不允许	光学测试仪	主缺
Mura 类	10	条纹 mura（横向/竖向/斜向）	AA	1、 R/G/B/白/64 灰阶 ND5%判定，不可见为 OK，可见为 NG。 2、 参考限样（生产时收集边缘规格样品同客户议定(标样 2pcs 及规格外样品)）。	目视、限样	次缺
	11	白斑	AA			
	12	黑斑	AA			
	13	彩色 mura	AA			
	14	牛顿环 mura	AA			

	15	过渡不均	AA			
	16	其他 mura	AA			
	注：1、mura 类指定画面判定；2、有限样优先参考限样。					
异物点/线类	17	点状缺陷（异物，黑白点，划伤，气泡等）	AA	1、D≤ 0.15 mm，DS≥5mm，忽略； 2、 0.15 mm ＜D ≤0.20mm，N≤4，DS>10mm； 3、D ＞ 0.2mm，不允许；	目视、菲林卡	次缺
	18	线状缺陷（异物线，划伤，气泡等）	AA	1、W≤0.03mm，L≤5mm，DS≥5mm，不计； 2、0.03mm<W≤0.05mm，L＜2mm，DS≥5mm，不计； 3、0.03mm<W≤0.05mm，2mm<L≤5mm，DS≥5mm，N≤4； 4、W>0.05mm 或 L>5mm，不允许；	目视、菲林卡	次缺

11.4.3.9.2 外观检验标准

类别	序号	检查项目	区域	检验标准	检验方式	缺 陷类型
Panel	1	屏体脏污/笔迹	All	1、正面（B 面）可擦拭脏污擦除，不可擦拭脏污不允许 ； 2、背面（A 面）不管控；	目视	次缺
	2	崩边/角	PAD 非 bonding 区	1、Y≤0.1mm，X&N 不计； 2、0.1mm≤Y≤0.4mm，X≤2mm，N 不计； 3、Z≤t；B 面即正面不可伤及 mark；	目视/菲林卡	次缺
			PAD	1、切割未整体伤及 Pad 和线路；		

			bonding 区	2、Y 不伤及 Pad 1/4，X&N 不计； 3、模组绑定后玻璃背面崩缺在不影响功能、性能、可靠性等情况下，背面（非线路区面）表崩 Y≤0.4mm，Z≤T ，X&N 不计；		
			OA 区	1、Y≤0.15mm，X 和 N 不计； 2、0.15＜Y≤0.4mm，X≤2mm，N 不计； 3、Y＞0.4mm，不允许； 4、Z≤T。		
	3	凸点	AA	有触感不允许	目视	次缺
	4	凸缘	OA	符合设计图纸规范情况下： 1、Y≤0.1mm，X 不管控； 2、Y＞0.1mm，不允许；	目视、菲林卡	次缺
	5	Mark 缺损	Pin 端	影响到机台对位的 mark 缺损不允许	目视	次缺
	6	破片	All	不允许	目视	次缺
	7	裂纹	All	不允许	目视	次缺
	8	屏体翘曲	All	产品正面和反面分别平放一端翘起高度（塞规）≤0.6mm	目视/塞规	次缺
异物点/线类	9	点状缺陷（异物，黑白点，划伤，气泡等）	All	1、D≤ 0.15 mm，忽略；密集麻点不允许 2、 0.15 mm ＜D ≤0.25mm，N≤4，DS>10mm； 3、0.25 mm ＜D ≤0.30mm，N≤1； 3、D ＞ 0.3mm，不允许；	目视、菲林卡	次缺

	10	线状缺陷（异物线，划伤，气泡等）	All	1、W≤0.03mm，L≤5mm，DS≥5mm，不计； 2、0.03mm<W≤0.05mm，L＜2mm，DS≥5mm，不计； 3、0.03mm<W≤0.05mm，2mm<L≤5mm，DS≥5mm，N≤4； 4、W>0.05mm 或 L>5mm，不允许；	目视、菲林卡	次缺
保护膜	11	保护膜本体不良	All	CG 保护膜、摄像孔保护膜、焊盘保护膜、撕离把手： 1、不允许翘起、脱落、功能无效、破损、漏贴不允许； 2、划伤、刮伤、刺伤、褶皱、凹凸点：不伤及本体不管控，伤及本体按点线类标准； 3、脏污、毛边、溢/缺胶、气泡等不管控； 4、FPC 上电子元器件保护膜，正视看不漏元器件，脱落不允许，不超出屏幕外形。	目视	次缺
	12	偏位	All	满足设计图纸等规格，且外观检目视不超出屏幕外形	目视	次缺
偏光片	13	偏光片边缘溢胶	AA	1、W≤0.2mm，不管控； 2、W＞0.2mm，不允许；	目视/菲林卡	次缺
	14	偏光片划伤	AA	未伤及本体不管控，伤及本体按点线类标准	目视	次缺
	15	偏光片凹凸点	AA	贴合后不可见 OK，贴合后可见参照点规，有限度样时参照限度样	目视/菲林卡	次缺
	16	偏光片气泡线	All	AA 区以外 0.25mm 以内不允许	目视/菲林卡	次缺
	17	偏光片折/压痕	AA	不影响显示为 OK 或参考限样	目视	次缺
	18	偏光片边缘溢缺胶导致翘曲	AA	不可延伸至 AA 区	目视	次缺
IC/COF	19	IC 破损	All	目视可见不允许；不影响功能	目视	主缺
	20	COF PI 面划伤	COF PI	1、 PI 面划伤不得影响正面线路(如变形、损伤、折痕)，不影响功能性能为 OK。	目视	次缺

				2、 PI 面表面折痕、压痕、压伤不允许不影响功能性能为 OK。		
	21	IC/COF 其他	All	参考 IC/COF 设计图纸及材料规格书	目视	主缺
FPC	22	FPC 本体不良	All	1、FPC 上之零件需与产品 BOM 表一致，有错件、多件、少件，不允许；电容电感等极性不能焊反、焊歪； 2、FPC 划伤/划痕以不露铜为据； 3、折痕/压痕: 线路区压痕不可导致覆盖膜背面发白; 非线路区压痕不可导致 FPC 破损 4、除金手指外 FPC 异物：a．点状：D≤0.5mm，N≤3；b. 线状：长宽≤0.3*5mm； 5、其他：不影响功能为 OK	目视、菲林卡	次缺
	23	FPC 金手指不良	金手指区域	1、金手指龟裂：金手指顶端龟裂/破损的长度和宽度≤线宽； 2、金手指漏铜：W≤1/3 线宽，L≤线宽，数量不限 3、金手指缺口 W1≤1/3 线宽 W，长度 L1≤1/2 线宽 W，数量不限，以上条件全部满足允许； 4、金手指压伤/划伤不可露铜，不可有凹凸感，肉眼目视无深度，不影响组装，可接受； 5、金手指不可有锐角褶皱及死折现象； 6、其他：不影响功能为 OK	目视、菲林卡	次缺
	24	连接器	连接器	1、连接器上不能有沾锡现象、连接器焊脚不能有连锡现象； 2、PIN 变形量按不超过 0.05mm 管控； 3、不影响点亮功能； 4、目视观看 pin 折、pin 脱落、外框挤压变形不允	目视、菲林卡	次缺

				许；		
组装&其他	25	绝缘胶带	邦定区	不可有明显褶皱和气泡	目视	次缺
			元器件区	1、刮伤，胶花不管控； 2、不可擦拭脏污不允许； 3、绝缘胶带偏移不可超出产品边缘，其它以图纸要求为判定依据； 4、毛边，溢胶不管控； 5、破损，残缺，漏贴不允许；	目视	次缺
	26	复合胶带/泡棉	All	1、漏出屏体边缘不允许； 2、褶皱/折痕/压痕/印迹/异物/凹点、组装产生漏光：影响组装及厚度不允许； 3、破损：背胶边到破损边不超过 2mm，禁止贯穿；有限样优先参考限样 4、冲切不良尺寸符合图纸要求不管控； 5、脏污、异物不可擦拭不允许，异物按照点线标准执行； 6、毛边不超出屏体边缘不管控； 8、胶带胶花、溢胶不管控； 9、气泡：D≤5mm，N 不计； 10、凸点：锐角凸点 D≤0.3mm，N≤3 个；平滑凸点 D≤0.8mm，N≤3 个； 11、复合胶带异物（异物在铜箔和蓝膜之间）：D≤0.3mm，N≤3； 12、复合胶带边缘锯齿：0.5*3mm，N≤3； 13、复合胶带中保护膜色差不管控；	目视/菲林卡	次缺

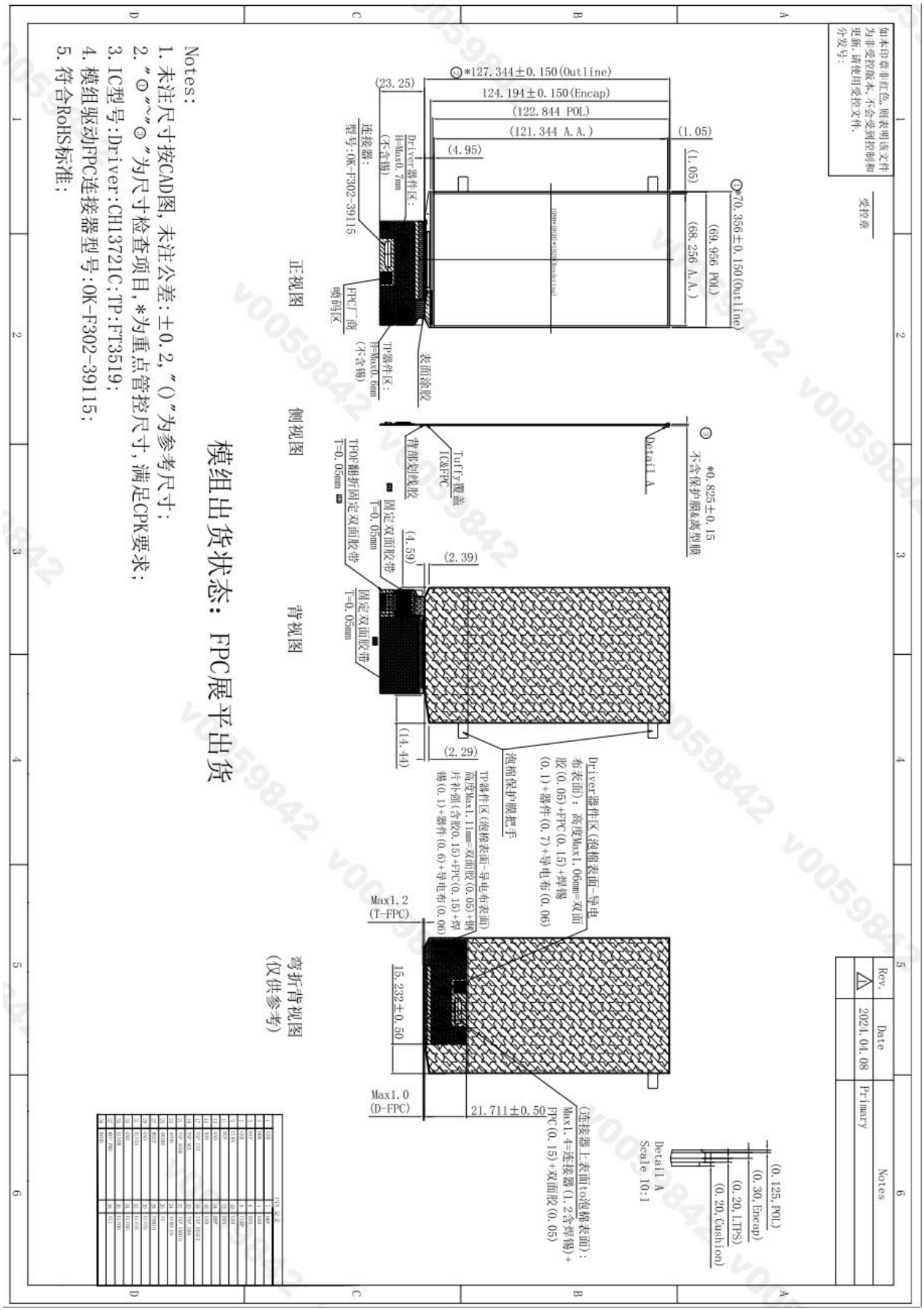
				14、颜色异常参考标准样/封样、漏贴不允许。表面软划伤不卡控。		
	27	封点胶	涂胶区域	1、绑定区域：断胶不可有，IC 和 FPC 上气泡不管控，胶体厚度以不高出 POL 面为准； 2、其它区域：线路区断胶不允许，不可裸露线路，气泡直径＜1mm，胶体厚度以不高出 POL 面为准； 3、IC 本体、FPC 本体：需完全覆盖、不能出现宽度大于 1mm 带状胶体或者直径大于 2mm 的点状胶体；	目视/菲林卡	次缺
	28	FPC 背面补强胶	涂胶区域	FPC 背面补强胶宽度不超过 1mm，高度不可超过 LTPS 面；	目视/菲林卡	次缺
	29	硅酮胶/高温胶	All	1.硅酮胶溢胶不可超出 0.2mm。 2.高温胶可超出 FPC，但不可上离型膜。	目视/菲林卡	次缺
	30	导电布	All	1、导电布脏污：D≤5mm，N≤2； 2、导电布气泡：D≤2mm，N≤2； 3、导电布异物：D≤1mm，N≤3； 4、导电布褶皱：无翘起、脱落，允许；	目视/菲林卡	次缺
	31	铜箔	All	铜箔贴付漏出屏体边缘不允许；铜箔颜色异常参考标准样/封样、破损不允许。表面软划伤不卡控。	目视/菲林卡	次缺
	32	ACF 贴附	All	ACF 贴附长度超出 FPC 两端 0.2~1.0mm，不可超出屏体边缘，引线区 ACF 有效搭接宽度大于 2/3FPC 金手指宽度，无气泡，褶皱	目视/菲林卡	次缺
	33	翻折后翘起	All	FPC 与气泡棉间翘起高度≤0.5mm；	目视/菲林卡	次缺

	34	二维码	二维码	不允许无法扫描或不易扫描(连续三次扫描以上方能识别)，外观清晰，无模糊，印刷缺失等不良	扫码器/目视	次缺
外包装缺陷	35	混料	/	所有产品、标签不允许	-	-
	36	脏污、笔迹	All	笔迹残留和笔迹印痕不允许；水/油污残留等不允许	-	-
	37	包装	All	参考包装式样书和工艺 SOP 等规定	-	-
外形尺寸	38	外形尺寸 NG	/	超出规格书图纸要求尺寸及公差 不允许	--	-

11.4.3.9.3 未定义的项目或新出现的不良的处理方式：有图纸等设计标准则按照设计标准管控。针对模组资材类缺陷，没有的不良项，则参考原材单体规格书。

11.4.3.9.4 Mura 类需注意检验画面和判定画面的区别，检验画面详情见检验画面库；判定画面详情见 mura 各缺陷的判定标准。如注明指定画面判定，则只在规定的判定画面进行判定，例如：条纹 mura 判定标准为 W64/255 按照限样判定，则条纹 mura 只在 W64 和 W255 2 个画面判定。

12 Mechanical Drawing



Packing Drawing

Packing Condition	Contents
Packing Type	TRAY + Carton packing type
TRAY material model	TBD
Tray packing type	TBD
Number of panels per tray	TBD
Number of Tray per carton	TBD
Number of panels per carton	TBD

13 Precautions for Use of AMOLED Modules

13.1 Handling Precautions:

13.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from height.

13.1.2 Do not press down the screen or the adjoining areas too hard because the color tone may be shifted.

13.1.3 The polarizer covering the display surface of the AMOLED module is soft and easily scratched. Handle this polarizer carefully.

13.1.4 If the display surface is contaminated, blow on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear, moisten the cloth with ethyl alcohol.

13.1.5 Solvents may damage the polarizer. Do not use water, ketone or aromatic solvents except ethyl alcohol.
Do not attempt to disassemble the AMOLED Module.

13.1.6 If the logic circuit power is off, do not apply the input signals.

13.1.7 To prevent destruction from static electricity, be careful to maintain an optimum working environment.

13.1.8 Be sure to make yourself in contact with the ground when handling with the AMOLED Modules.

13.1.9 Tools required for assembly, such as soldering irons, must be properly ground.

13.1.10 To reduce the generation of static electricity, do not conduct assembly or other work under dry conditions.

13.1.11 To protect the display surface, the AMOLED Module is coated with a film. Be careful when peeling off this protective film, because static electricity may generate.

13.2 Storage Precautions:

13.2.1 When storing the AMOLED modules, be sure that they are not directly exposed to the sunlight or the light of fluorescent lamps.

13.2.2 The AMOLED modules should be stored under the storage temperature range. If the

AMOLED modules will be stored for a long time, the recommended condition is:
Temperature: 0℃~40℃ Relatively humidity: ≤80%

13.2.3 The AMOLED modules should be stored in the room without acid, alkali or harmful gas.

13.3 Transportation Precautions:

13.3.1 The AMOLED modules should not be suffered from falling and violent shocking during transportation. Besides, excessive press, water, damp and sunshine, should be avoided.