SPECIFICATION
FOR
Flexible AMOLED Module

MODULE No:	KD065FPOIN003
CUSTOMER:	

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

Date	Rev. No.	Page	Summary
2024.12.09	V1.0	ALL	FIRST ISSUE
2025.04.25	V1.1	ALL	Change the AA area of the module

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* Description

This is a color active matrix Flexible AMOLED module using Low Temperature Poly-silicon Thin Film Transistors as active switching devices. This module has a 6.48 inch diagonally measured active area with 1080 horizontal by 2400 vertical 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.

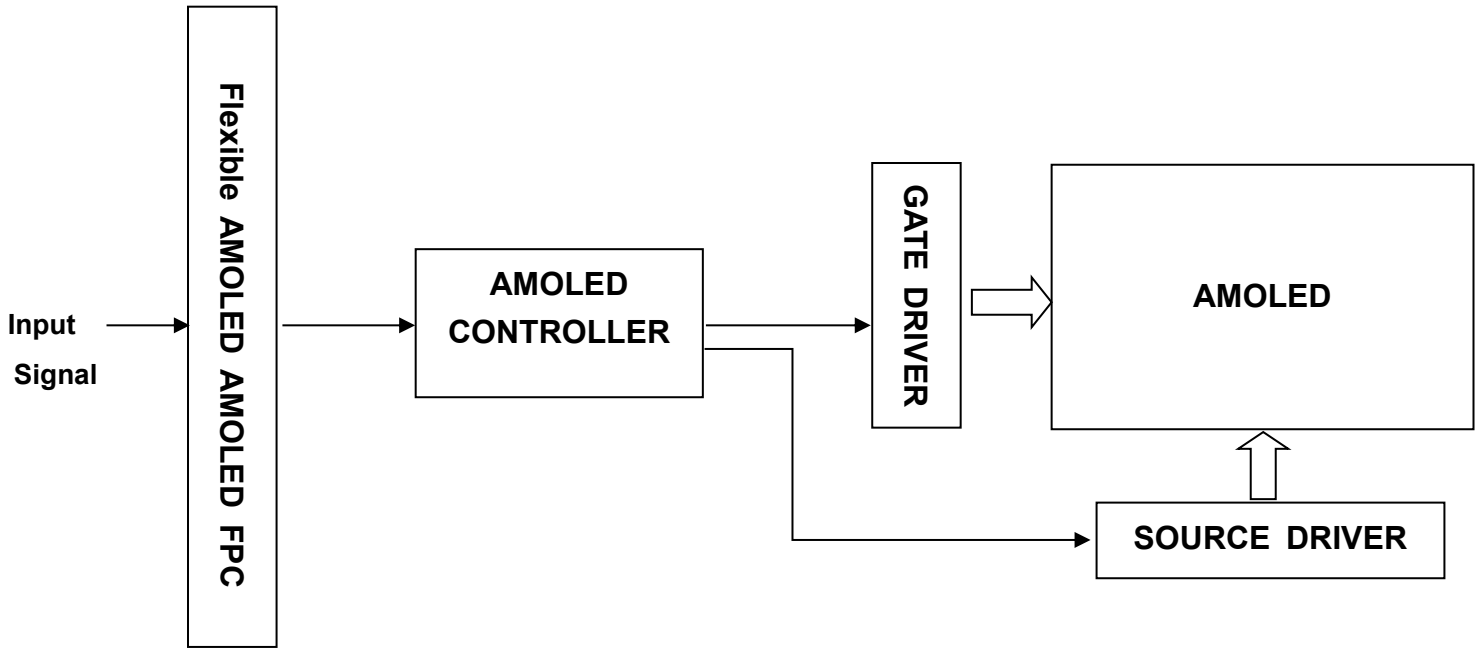
* Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	69.552(H)*154.560(V) (6.48 inch)	mm	
Driver element	active matrix	-	
Display colors	16.7M	colors	
Number of pixels	1080(RGB)*2400	dots	
Pixel pitch	0.064(H)*0.060(V)	mm	
Viewing angle	ALL	o'clock	
Controller IC	RM692E5	-	
Touch Controller IC	/	-	
LCM Interface	MIPI	-	
Display mode	Flexible AMOLED	-	
Operating temperature	-20～+70	℃	
Storage temperature	-40～+80	℃	

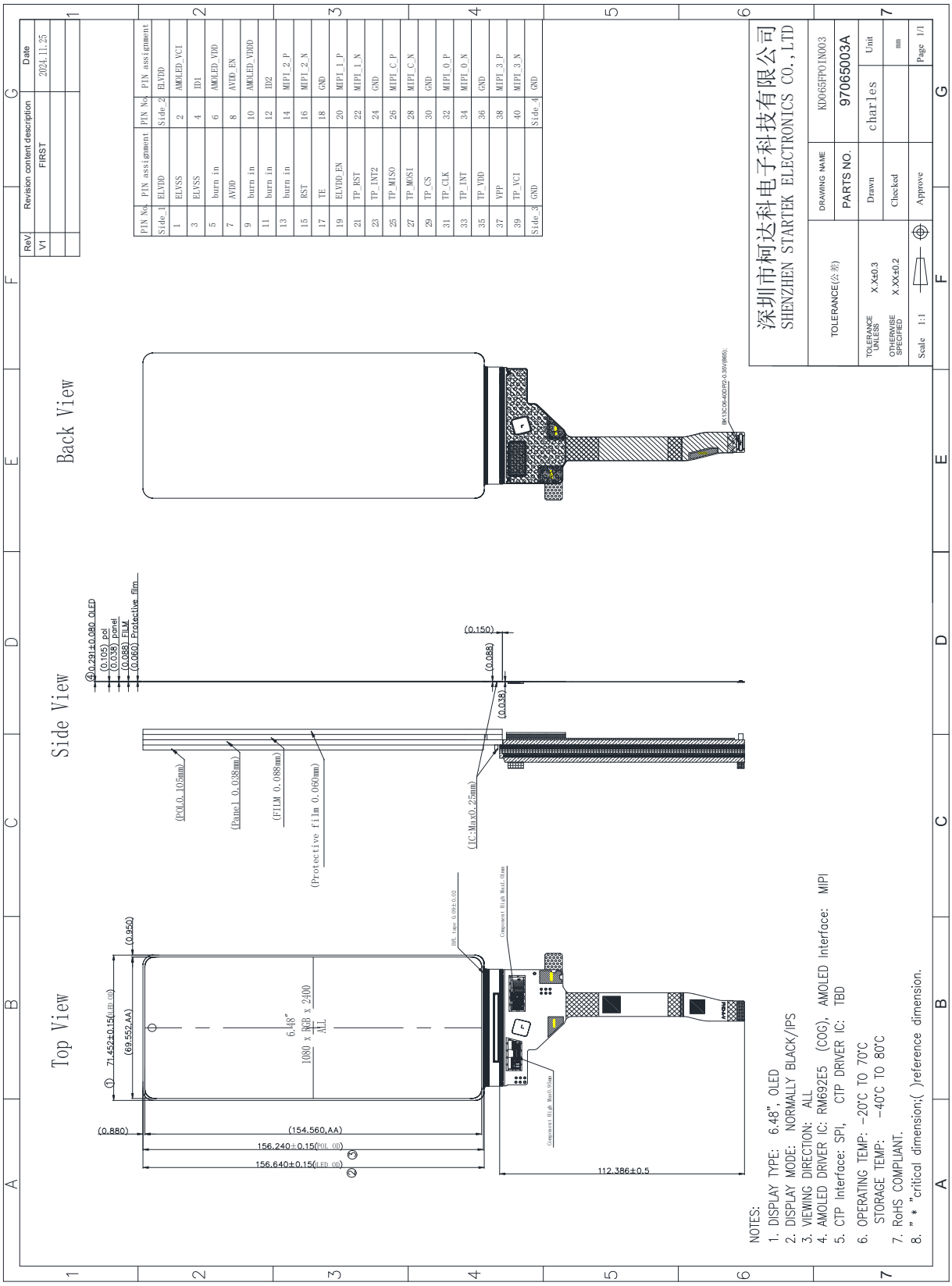
* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		71.452		mm	-
	Vertical(V)		156.64		mm	-
	Depth(D)		0.291		mm	-
Weight			TBD		g	-

1. Block Diagram



2. Outline dimension



PIN No.	PIN assignment	PIN No.	PIN assignment
Side_1	ELVDD	Side_2	ELVDD
1	ELVSS	2	AMOLED_VCI
3	ELVSS	4	ID1
5	burn in	6	AMOLED_VDD
7	AVDD	8	AVDD_EN
9	burn in	10	AMOLED_VDDD
11	burn in	12	ID2
13	burn in	14	MIPI_2_P
15	RST	16	MIPI_2_N
17	TE	18	GND
19	ELVDD_EN	20	MIPI_1_P
21	TP_RST	22	MIPI_1_N
23	TP_INT2	24	GND
25	TP_MISO	26	MIPI_C_P
27	TP_MOSI	28	MIPI_C_N
29	TP_CS	30	GND
31	TP_CLK	32	MIPI_0_P
33	TP_INT	34	MIPI_0_N
35	TP_VDD	36	GND
37	VPP	38	MIPI_3_P
39	TP_VCI	40	MIPI_3_N
Side_3	GND	Side_4	GND

Rev	Revision content description	Date
V1	FIRST	2024.11.25

3. Input terminal Pin Assignment

FPC connector: BK13C06-40DP/2-0.35V(865) (HIROSE).

Main board recommended connector: BK13C06-40DS/2-0.35V(865) (HIROSE).

NO.	SYMBOL	DISCRIPTION	I/O
side	ELVDD	AMOLED EL Negative power	P
1	ELVSS	AMOLED EL Negative power	P
3	ELVSS	AMOLED EL Negative power	P
5	Burn in	for Amoled demura used NC if not used;	I/O
5	AVDD	AMOLED charge pumping power for DDIC	P
7	Burn in	for Amoled demura used NC if not used;	I/O
9	Burn in		I/O
11	Burn in		I/O
13	Burn in		I/O
15	REST	Drive IC reset	I/O
17	TE	Tear Effect	I/O
19	ELVDD_EN	Enable Vpos(ELVDD) and Vneg(ELVSS) for DC/DC IC	I/O
21	TP_RST	Reset Pin for Touch Panel	I/O
23	TP_INT2	Touch INT Signal for Fingerprint	I/O
25	TP_MISO	Touch MISO for SPI I/F	I/O
27	TP_MISI	Touch MISI for SPI I/F	I/O
29	TP_CS	Touch chip select for SPI I/F	I/O
31	TP_CLK	Touch CLK for SPI I/F	I/O
33	TP_INT	Touch interrupt	I/O
35	TP_VDD	Touch logic power	P
37	VPP	OTP power supply; NC if not used;	P
39	TP_VCI	Touch analog power	P

Side	GND	Ground	P
2	AMOLED_VCI	AMOLED analog power for DDIC	P
4	ID1	ID1	I/O
6	AMOLED_VDD	AMOLED logic power for DDIC	P
8	REST	Drive IC reset	I/O
10	AMOLED_VDDD	AMOLED VDDD power for DDIC	P
12	GND	Ground	P
14	D2_P	MIPI Data Line	I/O
16	D2_N	MIPI Data Line	I/O
18	GND	Ground	P
20	D1_P	MIPI Data Line	I/O
22	D1_N	MIPI Data Line	I/O
24	GND	Ground	P
26	DC_P	MIPI CLOCK	I/O
28	DC_N	MIPI CLOCK	I/O
30	GND	Ground	P
32	D0_P	MIPI Data Line	I/O
34	D0_N	MIPI Data Line	I/O
36	GND	Ground	P
38	D3_P	MIPI Data Line	I/O
40	D3_N	MIPI Data Line	I/O
Side	GND	Ground	P

4. AMOLED Optical Characteristics

4.1 Optical specification

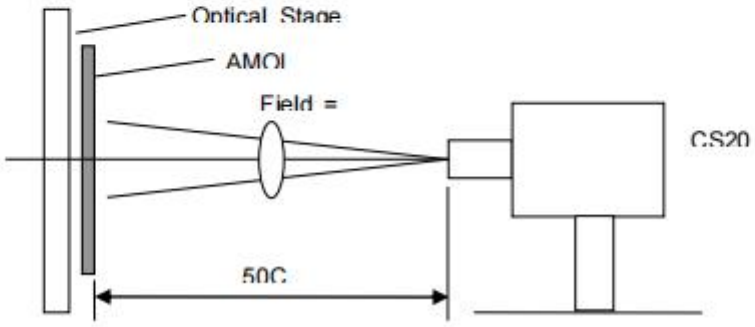
Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal	100,000	--	--		(1)(3)
LCM Luminance		LV	White Mode	450	500		cd/m2	(1)(7)
Color gamut		S(%)	vs. NTSC	--	99	--	%	(5)
Color Filter Chromacicity	White	W_X		-0.04	0.299	+0.04		(1)(4)
		W_Y			0.315			
	Red	R_X			0.685			
		R_Y			0.315			
	Green	G_X			0.250			
		G_Y			0.704			
	Blue	B_X			0.142			
		B_Y			0.005			
Uniformity		U		75	/	/	%	(1)(6)
OLED Life Time				--	30000	--	Hrs	
Option View		ALL						

Test Conditions:

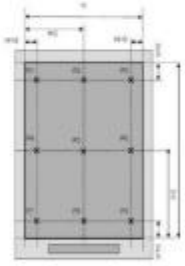
1. the ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

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.

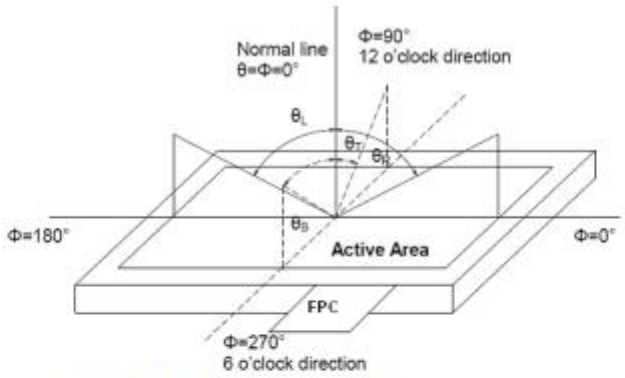


Optical Characteristic Measurement Equipment and Method



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

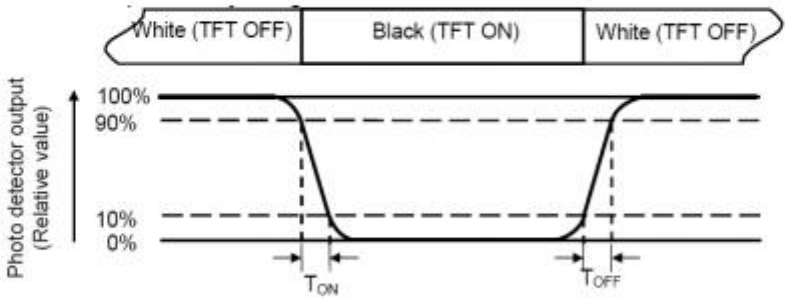
$$\text{Contrast ratio(CR)} = \frac{Luminance\ measured\ when\ AMOLED\ \text{is on the "white" state}}{Luminance\ measured\ when\ AMOLED\ is\ on\ the\ "Black"\ state}$$

"White state ": A state where the AMOLED should be driven by V_{white}.

"Black state": A state where the AMOLED should be driven by V_{black}.

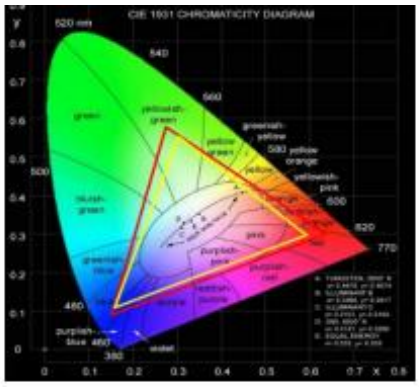
Note 4: Definition of response time

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.

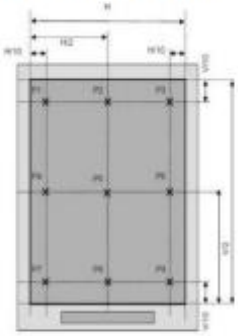


Note 6: Definition of luminance uniformity

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 7: Definition of luminance:

Measure the luminance of white state at center point.

Note 8: Cross Talk

There should be no visible cross-talk in normal direction of the display when the two "Cross-talk Test Patterns " below are loaded.

Measurement equipment: CS2000 or similar equipments

The point should be marked is, the background of Cross-talk Test Pattern-"gray " are defined as middle gray scale . For example, RGB 24bit "gray" defined as below:

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

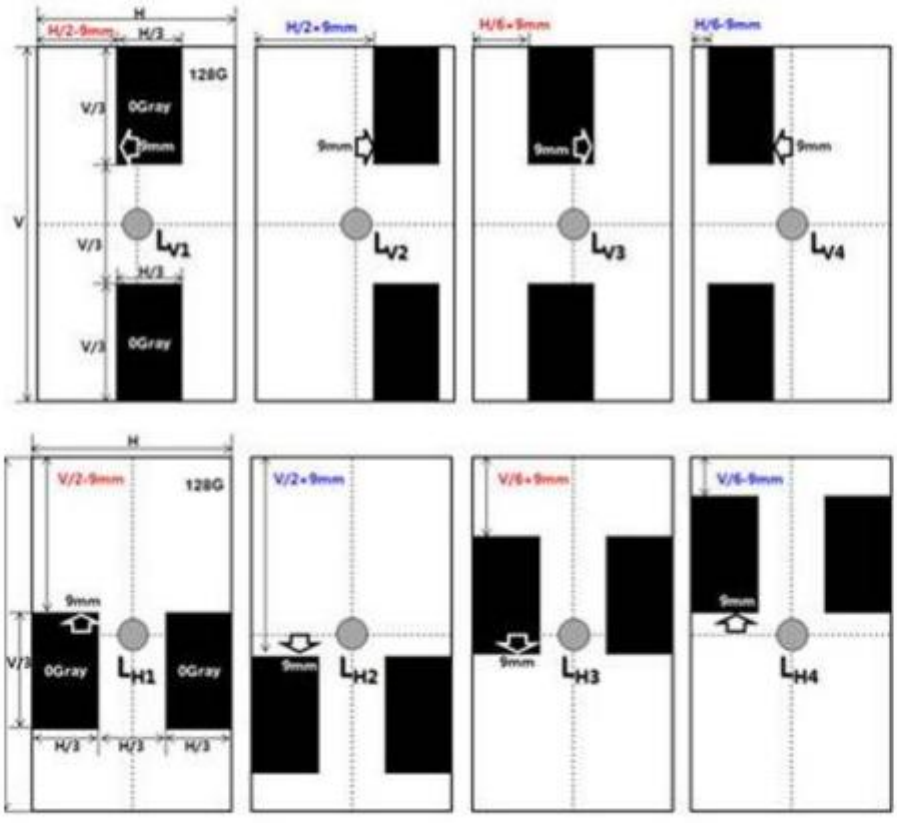
Test pattern follow below picture, the background is middle gray and with two black rectangle parts, each one is 1/9 of the AA size.

Calculate the crosstalk(V) and crosstalk(H) with the test formula below:

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

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

Then use the max value between Crosstalk(V) and Crosstalk(H) as the final crosstalk.



Note 9: Image stacking

Test conditions:

Test instruments: Fast imaging photometer

Figure 7.9-1 gray scale 48 picture

figure 7.9-2 black and white pattern

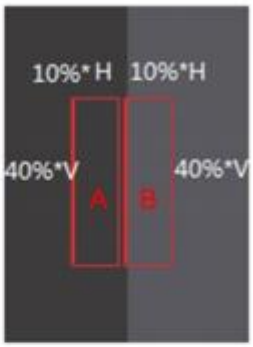


figure 7.9-3 calculation area

The test procedure for short time image sticking is as follows:

1) Display the 48 gray scale pattern in full screen, measure the brightness, and calculate the X value.

2) Switch to the black and white pattern and keep it for 10s.

3) Switch to the 48 gray scale pattern. Use the CCD to measure the luminance of the red frame. The exposure time of the CCD is 0.3s. The test is performed 60 times at an interval of 1s. The captured luminance values are as follows:

4) Calculate the X value.

$$IS(ST) = \left|\frac{I(t)_A - I(t)_B}{I(t)_A + I(t)_B} - \frac{I(0)_A - I(0)_B}{I(0)_A + I(0)_B}\right|$$

JND=IS(ST)/0.004

The test procedure for medium-term image sticking is as follows:

1) Display the 127 gray scale pattern in full screen, measure the brightness, and calculate the X value.

2) Switch to the black and white pattern and keep it for 10min.

3) Switch to the 127 gray scale pattern. Use the CCD to measure the luminance of the red frame. The exposure time of the CCD is 0.3s. The test is performed 3600 times at an interval of 1s. The captured luminance values are as follows:

4) Calculate the X value.

$$IS(ST) = \left| \frac{I(t)_A - I(t)_B}{I(t)_A + I(t)_B} - \frac{I(0)_A - I(0)_B}{I(0)_A + I(0)_B} \right|$$

JND=IS(ST)/0.004

Note 10: Flicker

1）Measurement equipment: CA-310 or similar equipment.

2）Measuring temperature: Ta=25℃.

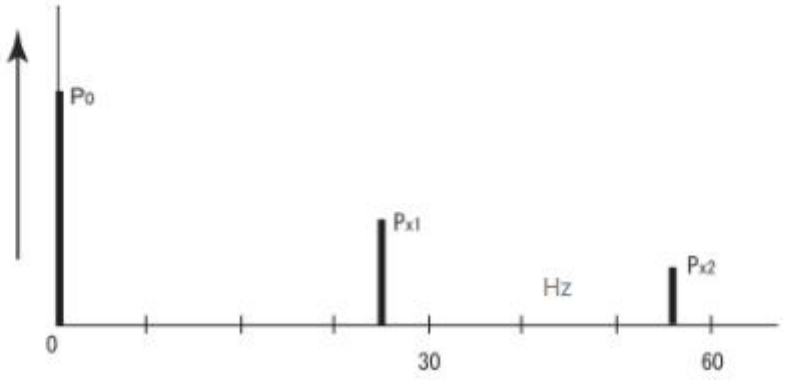
3）JEITA method can be used to supply software for CA310.

4）Test pattern: W255&W128&W32.

5）Frame Frequency Requirement：AOD\60Hz\90Hz\120Hz, etc. (The flicker at all frequency mode need to be tested)

6）Calculation formula Flicker = 10 × log （Px/P0）[dB]

Data processed by FFT analyzer



5. AMOLD Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Analog Power supply	VCI	--	5.5	V
Logic Power supply	VDDIO	--	5.5	V
Logic Power supply	DVDD	--	5.5	
Analog Power supply	AVDD	-0.3	8.4	V
Positive Power Input	ELVDD	4.0	5.0	V
Negative Power Input	ELVSS	-1.0	-5.0	V
Operating temperature	T_{OP}	-20	+70	℃
Storage temperature	T_{ST}	-40	+80	℃

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

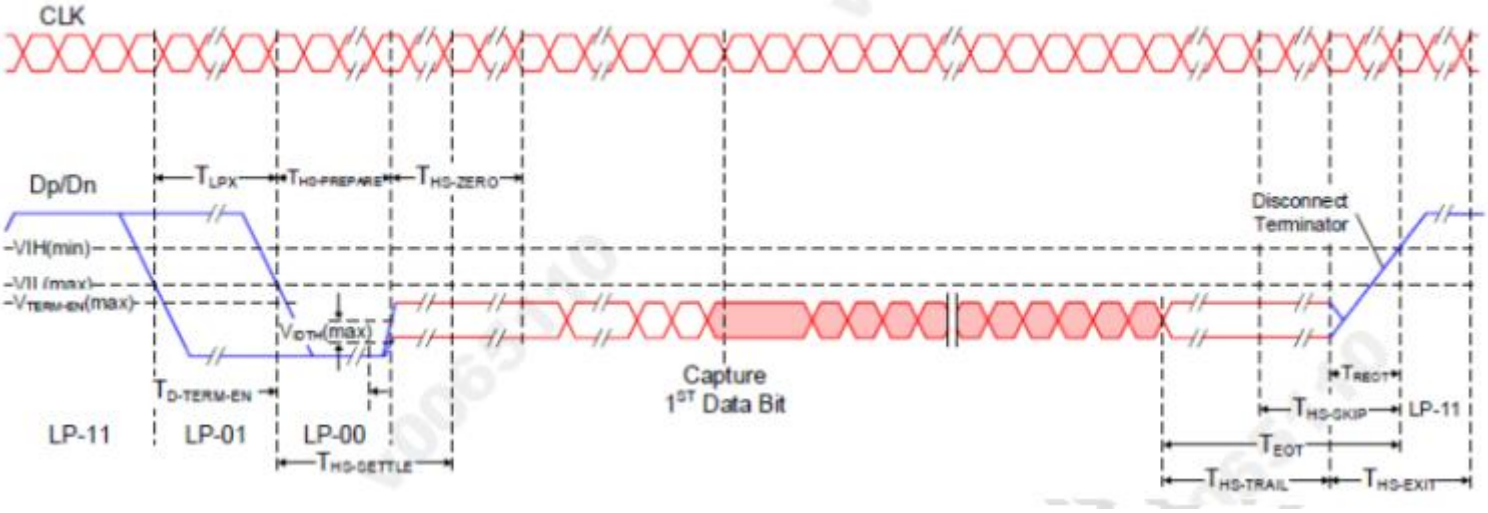
5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Power Supply	VDDIO	1.65	1.8	1.95	V	--
Analog Power Supply	VCI	2.6	3.0	3.6	V	--
Analog Power Supply	AVDD	--	7.6	--	V	--
Positive Output Voltage	ELVDD	--	4.6	--	V	--
Negative Output Voltage	ELVSS	--	-2.4	--	V	--
Level input voltage	V_{IH}	0.7*VDDIO	--	VDDIO	V	--
	V_{IL}	0	--	0.7*VDDIO	V	--
Level output voltage	V_{OH}	0.8*VDDIO	--	VDDIO	V	--
	V_{OL}	0	--	0.2*VDDIO	V	--

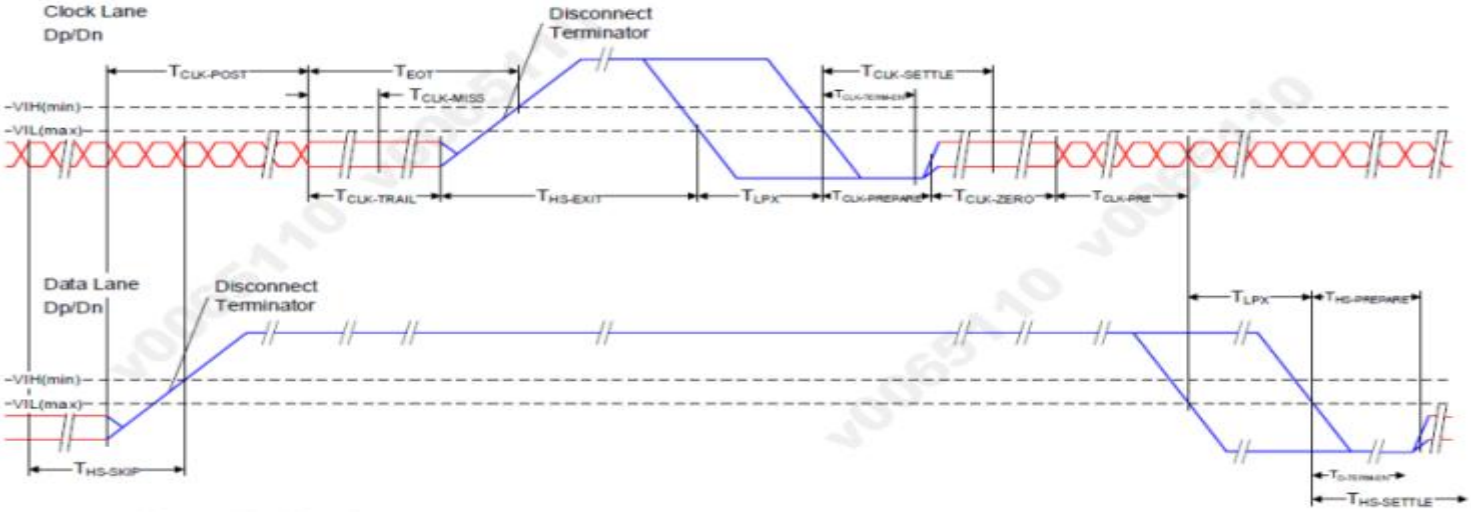
6. AC Characteristic

6.1 MIPI Interface Characteristics

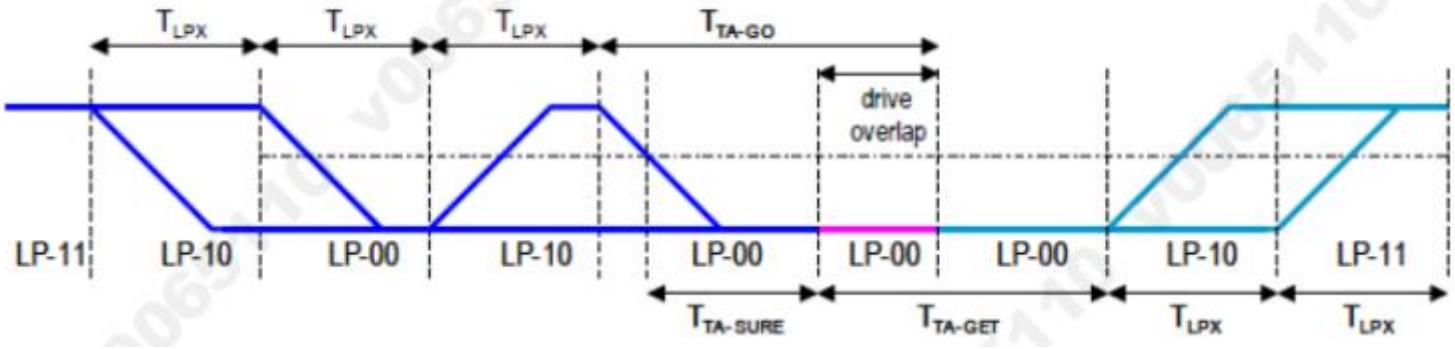
HS Data Transmission Burst



HS clock transmission



Turnaround Procedure



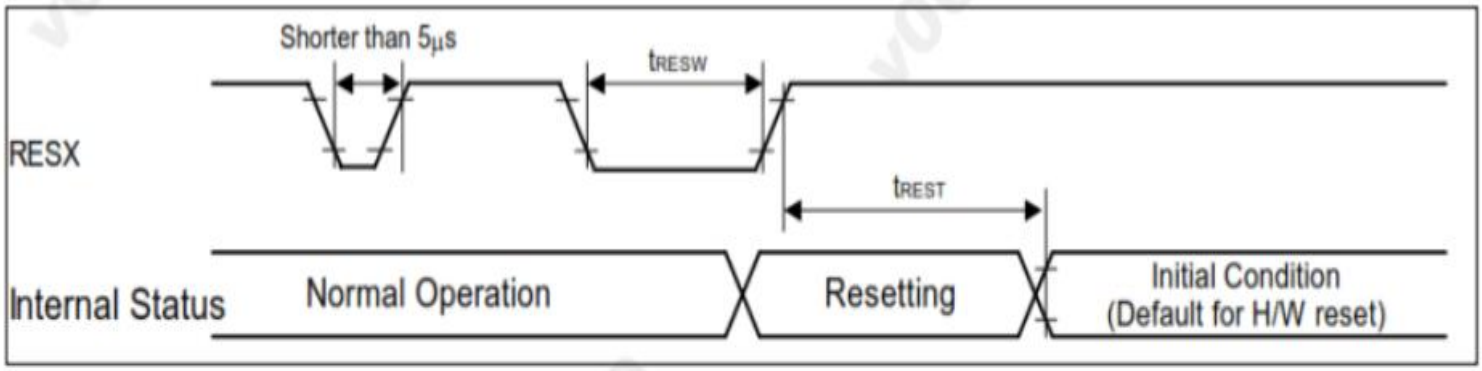
Timing Parameters:

Parameter	Description	Min	Typ	Max	Unit
$T_{CLK-POST}$	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 the beginning of $T_{CLK-TRAIL}$.	60ns + 52*UI			ns
$T_{CLK-TRAIL}$	Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.	60			ns
$T_{HS-EXIT}$	Time that the transmitter drives LP-11 following a HS burst.	**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 $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		38	ns
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.	38		95	ns
$T_{CLK-PRE}$	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8			UI
$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.	300			ns
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		35 ns +4*UI	
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission	40ns + 4*UI		85 ns + 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.**	**145ns + 10*UI**			**ns**
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	60ns + 4*UI			ns

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

6.2 Display RESET Timing Characteristics

Reset input timing:



Symbol	Parameter	Related Pins	Min.	Typ.	Max.	Note	Unit
tRESW	*1) Reset low pulse width	RESX	10	-	-	-	us
tREST	*2) Reset complete time				5	When reset applied during sleep in mode	ms
					120	When reset applied during Sleep out mode	ms

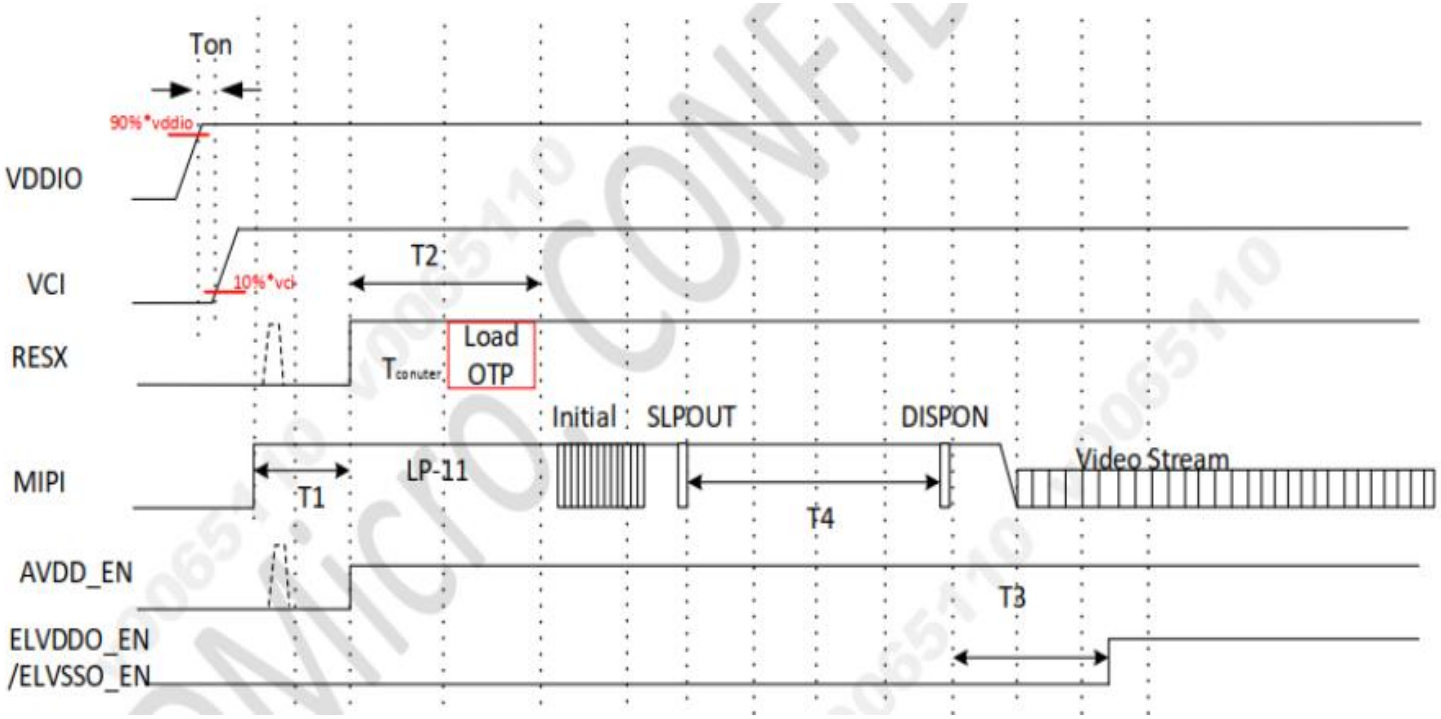
N

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

6.3 Power On Sequence

Timing Specification of Power On/Off Sequence

Sybol	Min	Typ	Max	Unit
Ton	0	-	-	ms
T1	1			ms
T2	12			ms
T3		3 frames		ms
T4	50			ms
T5	2 frames			ms
T6	50			ms
T7	1			ms



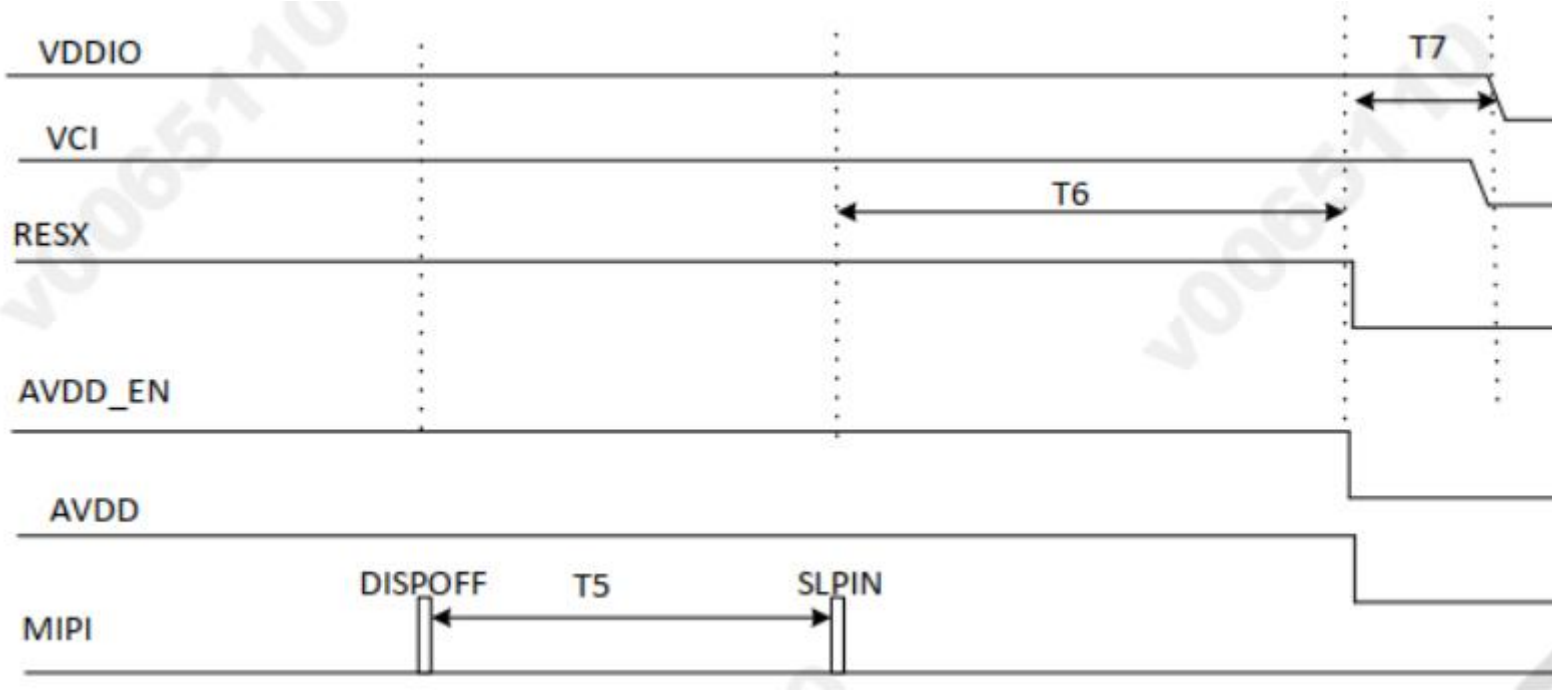
Note：1.Ton：The time between the VDDIO and the VCI power on, Ton≥0 ms

2.Dotted line is optional.

3. All the power supplies should be stable during display on status.

4. Current of VDDIO, VCI, AVDD should be less than 150mA respectively.

6.4 Power Off Sequence



6.5 INPUT TIMING

VCLK Active Edge	Video data is fetched at rising edge
H Total	1080
HBP	92
HFP	100
HSW	8
HS polarity	Inverted (active low)
Vertical resolution	2240
VBP	8
VFP	72
VSW	4
VS polarity	Inverted (active low)
VDEN polarity	Normal (active high)
MIPI mode	CMD mode

6.3 Initial Sequence

// ** Please send initial code in LP mode //

Initial code

```
MIPI.WRITE(0x39,0xfe,0x26)
MIPI.WRITE(0x39,0xa4,0x1f)
MIPI.WRITE(0x39,0x18,0x2b)
MIPI.WRITE(0x39,0xfe,0x40)
MIPI.WRITE(0x39,0xbd,0x00)
MIPI.WRITE(0x39,0xfe,0xa1)
MIPI.WRITE(0x39,0xcd,0x6b)
MIPI.WRITE(0x39,0xce,0xbb)
MIPI.WRITE(0x39,0xfe,0xd1)
MIPI.WRITE(0x39,0xb4,0x01)
MIPI.WRITE(0x39,0xfe,0x38)
MIPI.WRITE(0x39,0x17,0x0f)
MIPI.WRITE(0x39,0x18,0x0f)
MIPI.WRITE(0x39,0xfe,0x40)
MIPI.WRITE(0x39,0xc2,0x01)
MIPI.WRITE(0x39,0x05,0xe3)
MIPI.WRITE(0x39,0x06,0x5d)
MIPI.WRITE(0x39,0x07,0x90)
MIPI.WRITE(0x39,0xfe,0x40)
MIPI.WRITE(0x39,0x28,0x4a)
MIPI.WRITE(0x39,0xfe,0x40)
MIPI.WRITE(0x39,0x0f,0xc0)
```

```
MIPI.WRITE(0x39,0x10,0x08)
MIPI.WRITE(0x39,0xfe,0x62)
MIPI.WRITE(0x39,0x00,0x8c)
MIPI.WRITE(0x39,0x01,0x00)
MIPI.WRITE(0x39,0x02,0x00)
MIPI.WRITE(0x39,0x03,0x05)
MIPI.WRITE(0x39,0x04,0x00)
MIPI.WRITE(0x39,0x05,0x56)
MIPI.WRITE(0x39,0x06,0x05)
MIPI.WRITE(0x39,0x07,0x08)
MIPI.WRITE(0x39,0x08,0x00)
MIPI.WRITE(0x39,0xfe,0x60)
MIPI.WRITE(0x39,0x83,0xce)
MIPI.WRITE(0x39,0x84,0x00)
MIPI.WRITE(0x39,0x85,0x00)
MIPI.WRITE(0x39,0x86,0x0a)
MIPI.WRITE(0x39,0x87,0x00)
MIPI.WRITE(0x39,0x88,0x58)
MIPI.WRITE(0x39,0x89,0x05)
MIPI.WRITE(0x39,0x8a,0x08)
MIPI.WRITE(0x39,0x8b,0x80)
MIPI.WRITE(0x39,0xfe,0x16)
MIPI.WRITE(0x39,0x8a,0x06)
MIPI.WRITE(0x39,0xfe,0x00)
MIPI.WRITE(0x39,0xfa,0x07)
MIPI.WRITE(0x39,0xc2,0x08)
MIPI.WRITE(0x39,0x35,0x00)
MIPI.WRITE(0x39,0x51,0x0d,0xbb)
MIPI.WRITE(0x05,0x11)
Delay 120ms
MIPI.WRITE(0x05,0x29)
```

7. Touch Specification

7.1 Electrical Characteristics

7.1.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Note
TP power supply Input	TP_VDD	2.8	3.6	V	
TP power supply for logic circuits	TP_VCI	2.8	3.6	V	
Operating temperature	T_{OP}	-20	+70	℃	
Storage temperature	T_{ST}	-40	+80	℃	

7.1.2 DC Electrical Characteristics (Ta=25℃)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Touch logic power	TP_VDD	2.8	3.0	3.6	V	
Touch analog power	TP_VCI	2.8	3.0	3.6	V	

8. Quality Level

8.1 AMOLED Module of Characteristic Inspection

The environmental condition and visual inspection shall be conducted as below:

8.1.1 Inspection conditions

Test conditions: OLED is not light, cold white fluorescent lamp, illumination 1000 ± 200lux; OLED lighting source shall not be higher than 200lux, with black background around.

8.1.2 Inspection distance: the standard observation distance of all surfaces of the tested object is 30cm ± 5cm.

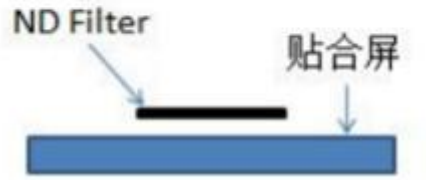
8.1.3 Inspection angle: the angle between the product and the horizontal plane is 45 °, and the eyes are perpendicular to the inspection plane. During inspection, the product needs to rotate 45 ° up, down, left and right. The observation line of sight needs to be within the half section of the cone. The observation angle is 45 ° with the vertical axis of the product apex. The central axis of the cone must be standard and perpendicular to the product surface and pass through the fluorescent lamp; For non-conventional display defects (including but not limited to local bright lines or local floodlights), the observation angle is 75 degrees from the normal of the product surface; Full visual angle of appearance.

8.1.4 Inspection time: the inspection time without lighting is at least 10-12 seconds; The time of OLED lighting inspection for each picture is 1~3 seconds. If the defect is still not visible within the specified time, the inspection piece is deemed to be qualified.

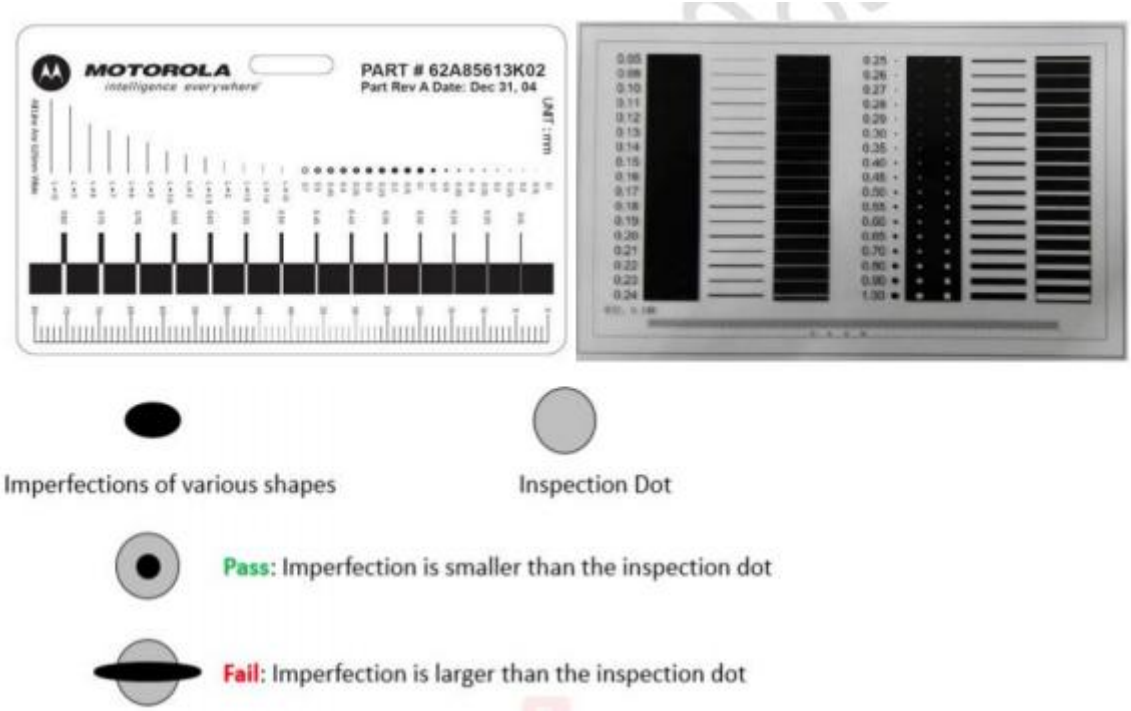
8.1.5 Test temperature: room temperature 15-35 ℃, ambient humidity: 20-75% RH.

8.1.6 Inspection tools:

ND Filter: The ND Filter is placed at a distance of 2-3 cm above the defect for 2-3s to judge whether the defect is visible. As Figure below: (ND Filter is used to test mura isochromatic and light unevenness)



Point gauge (point gauge in the figure below is recommended), determination method: as shown in the figure, the point gauge film can cover is pass, and the point gauge film can not cover is Fail。 For example, a maximum of 0.2mm same-color spot defect is allowed on the Class A surface, and the pass that can be covered by 0.2mm on the film，The one that can be covered is Fail.



Digital caliper: resolution 0.01mm.

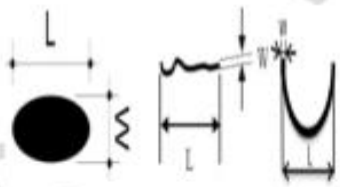
Projector: anime microscope, 3D projector.

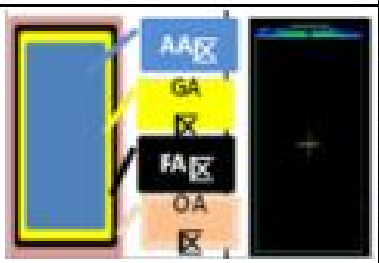
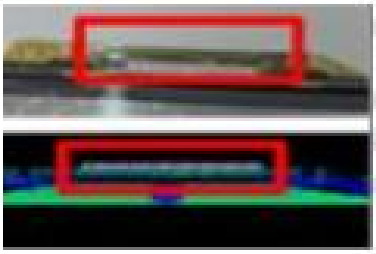
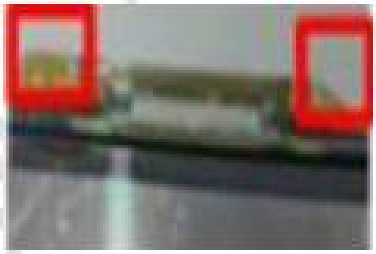
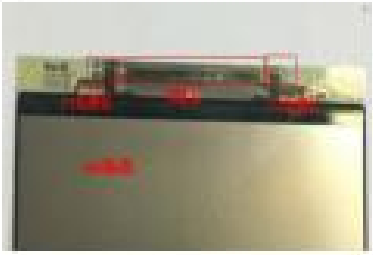
Judgment description

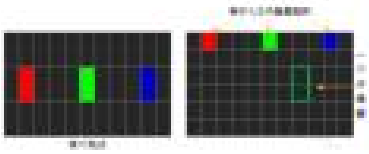
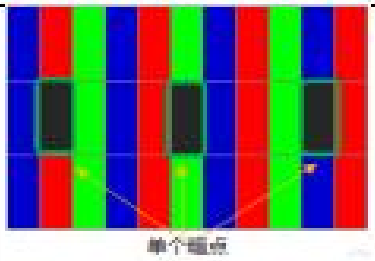
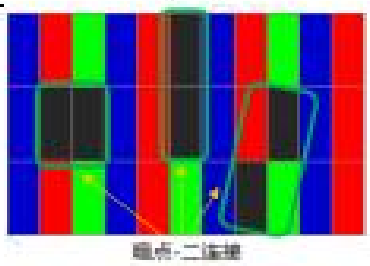
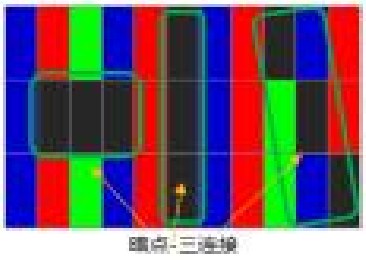
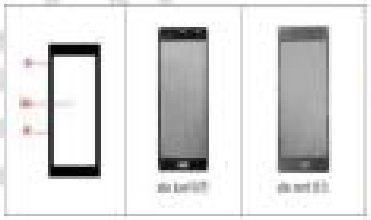
The measurement accuracy shall refer to the specification definition. When the measurement equipment accuracy is higher than the specification definition, the measured value needs to be rounded to the precision defined by the specificationthe. For example, the size of edge collapse is 0.20mm, and the thousandth is the reference position, which is rounded to 0.200mm~0.204mm is OK,>=0.205mm, it is judged as NG.

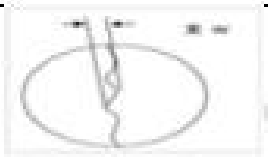
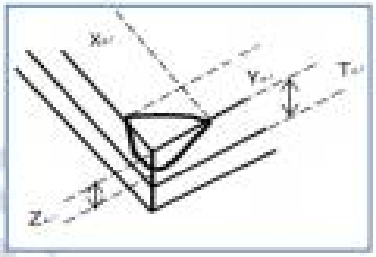
In addition to the tools used above, if additional inspection tools are needed to assist the judgment, they can only be carried out after the coordination of both parties.

Bad code and definition

Code and name		legend	explain
N	Number	-	Visually calculate the number; The statistics of the total number of defects does not include the completely "omitted" part. For the column defined as "omitted" and "omitted", it is not counted as the number of defects if it meets the requirements, otherwise it is calculated as an independent defect.
L	Length (mm)		Dot line distinguishing rule: L is the long side, W is the short side A. When L > 3W, handle as per line, otherwise handle as per point; B. When it is judged as line defect, S-shaped or C-shaped line appears, and the enclosed amount is less than 3/4 circle, it shall be treated as line defect; otherwise, it shall be treated as point defect, and the inner tangent circle shall simulate the size of point.
W	Width (mm)		
S	Area (mm^2)	-	Surface gauge
D	Diameter (mm) D=(L+W)/2	-	Point diameter calculation: calculated by half of the sum of the long side and the short side, that is,

			D=(L+W)/2, where D represents the diameter of the point, L is the long side, and W is the short side;
H	Depth (mm)	-	Digital micrometer
DS	Distance (mm)		Distance between two points or between two lines
Schematic diagram of screen area			AA area: display area; GA area: GIP circuit area; FA area: Frit area; OA area: outside FA area
Leader area			Screen GIP circuit area, screen data circuit area
PAD Bangding District			COG/FOG Bonding alignment mark and Bonding Pad on LTPS substrate
PAD Non-state area			Screen test pad, cutting area and lead-free area on LTPS substrate
CT crimping area			Pin end screen test pad

Highlights		A single sub-pixel (or red, or green, or blue) of one pixel is called a point; The definition of bright spot is that in the environment of 200 ± 50 Lux, the pixels or dots seen by employees with naked eyes are always bright, and the bright spot is checked under the black screen
Scotoma		A single sub-pixel (or red, or green, or blue) of one pixel is called a point; A dark point is defined as a point that is not bright in a single sub-pixel seen with naked eyes in a 100% white picture under the environment of 200 ± 50 Lux.
Dark spot - two connection		Two adjacent sub-pixels under the magnifying glass are not bright at the same time (horizontal, vertical and oblique)
Dark Spot - Three Links		The adjacent R, G and B sub-pixels under the magnifying glass are not bright at the same time (horizontal, vertical and oblique)
CG monomer area division		AA: Front visible area, black ink internal area; A: Black ink area; B: Cover plate edge; The front defect that runs through the AA area and the A area shall be judged according to the specification of the strictest area, and the back defect shall be judged according to whether the AA area is visible.
Foreign matter highlights	-	Due to the foreign matter in the polarizer, the phenomenon that appears as a bright spot is called a foreign matter bright spot

point defect		There are bright spots and black spots in local positions, including but not limited to the internal dirt of the screen itself, pinholes, serrations, concave-convex spots, color spots, tiny bubbles, white spots, stains on the fitting of the polarizer, poor polarizer itself and other spot-like defects. Point defects are judged by diameter.
Linear defect		Linear impurities in the screen, including filaments, fibers, polarizer fitting impurities in the screen, and scratches on the surface of polarizer, etc. Linear defects are judged by length and width. Sensible scratch: also known as hard scratch, is a deep scratch on the surface, which is felt by hand. Senseless scratch: also known as fine scratch, no deep scratch on the surface, no feeling when touching.
Serrated defect		W: Distance from sawtooth crest to trough
Edge collapse/angle collapse		In the process of screen production, especially in the process of molding and cutting, the small glass missing at the glass edge is caused. X direction: parallel to FOG Pad or glass edge; Y direction: perpendicular to FOG Pad or glass edge; Z direction: screen thickness direction; T : The thickness of single-layer glass;
Pitting	-	In the unit area of 10mm * 10mm, the defect point with D ≤ 0.1mm, DS ≥ 2mm, and the number N ≥ 5. If the customer has other requirements, follow the customer's requirements.

Dirty	-	Including handprints, oil stains, fingerprints, stains, white fog and other undesirable phenomena. It is divided into erasable dirt and non-erasable dirt. Use a dust-free cloth dipped in alcohol, which can not be erased as non-erasable dirt. Wipable dirt is determined as follows: A. Dry dust-free cloth can be directly erased; B. Wipe with clean cloth dipped with anhydrous alcohol Press the alcohol-stained dust-free cloth on the dry dust-free cloth twice to absorb excess alcohol; Wipe back and forth with a dust-free cloth twice, and the dirt can be removed.

8.2 Sampling Procedures for Each Item Acceptance Table

Critical Defect (CR): any defect that directly or indirectly affects human health and safety, or the function of the product is lost.

Major Defect (MA): directly or indirectly affect the product function, or make part of the product function lost, and other customers do not acceptable defects.

Minor Defect (MI): appearance defect that does not affect product function and can be accepted by customers.

Defect Type	Sampling Procedures	AQL
Critical Defect (CR)	Take the normal inspection solution of the sampling plan of GB/T2828.1-2012 Inspection levelⅡ	0.065
Major Defect (MA)	Take the normal inspection solution of the sampling plan of GB/T2828.1-2012 Inspection levelⅡ	0.65
Minor Defect (MI)	Take the normal inspection solution of the sampling plan of GB/T2828.1-2012 Inspection levelⅡ	1.0

8.3 Telecommunications Inspection Item

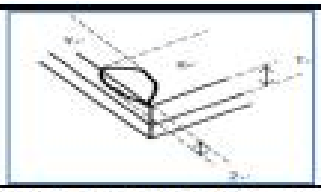
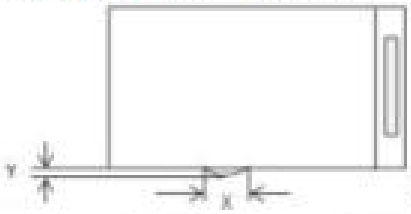
category	NO.	Inspection items	Inspection specification	test mode	defect type
	1	Display exception	not allow	visual	CR

Poor function	2	No display	not allow	visual	CR
	3	The picture flickers	not allow	visual	MA
TP function	4	TP test NG	not allow	visual	MA
Dot	5	Bright dot	not allow	visual	MI
	6	Partial Bright dot	ND6% or reference limit sample	visual	MI
	7	Dark dot	1.D≤0.15mm, ignored; 2.0.15mm < D≤ 0.2mm, DS ≥ 10mm, N ≤ 10; 3.D > 0.2mm,not allowed;	Visual inspection, Flinka	MI
Line	8	Bright line	not allow	visual	MA
	9	Dark line	not allow	visual	MA
	10	Slightly bright line	not allow	visual	MA
Mura	11	horizontal mura	No control under W64/127 screen; The 4%ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	12	vertical mura	No control under W64/127 screen; The 4% ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	13	White spot	No control under W64/127 screen; The 4% ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	14	Black spot	No control under W64/127 screen; The 4% ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	15	Color mura	4% ND Filter in W64/255 screen determines that the invisible is OK and the visible is NG	Visual ND Filter/limit sample	MI

	16	snowflake	No control under W64/127 screen; The 4% ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	17	Twill mura	No control under W64/127 screen; The 4% ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	18	Newtonian ring	No control under W64/127 screen; The 4% ND Filter on the 255 screen determines that the invisible is OK and the visible is NG.	Visual ND Filter/limit sample	MI
	19	Uneven transition	Reference homogeneity standard to assist in judgment; The 4% ND Filter in the W64/255 screen determines that the invisible product is OK and the visible product is NG.	Visual ND Filter/limit sample	MI
	1、 Mura all specify the screen judgment. For example, if the ELA mura judgment standard is 255, the ELA mura will only be judged on the W255 screen. 2、 Other types of mura have a low adverse effect rate and low incidence. According to the 4% ND Filter in the W64/255 screen, the invisible products are OK and the visible ones are NG.				
Dot/line of foreign material	20	Dot/line defects (foreign material, black white dot, scratch, bubble, etc.)	Same point/line specifications	Visual inspection/Flinka	MI

8.4 Appearance Inspection Item

NO.	Inspection items	Surface Area	Inspection specification	test mode	defect type
1	Broken glass	AA/OA	not allow	visual	MA
2	crack	AA/OA	not allow	visual	MA
3	Edge collapse/corner	AA/OA	1. Y ≤ 0.15mm, X and N are ignored; 2. 0.15 < Y ≤ 0.4mm, X ≤ 2mm, N is ignored; 3. Y > 0.4mm, not allowed; 4. Z ≤ t, without damage to Frit body;	Visual inspection, Flinka	MI

					
4	flange	AA/OA	1. Y ≤ 0.2mm, X is uncontrolled; 2. Y > 0.2mm, not allowed; 	Visual inspection, Flinka	MI
5	Glass warp	Whole area	 The product is placed horizontally on the front and back, and the lifting height at one end (plug gauge) ≤ 0.6mm	Visual inspection, Flinka	MI
6	Pin dirty	Bongding area	No control	visual	MI
7	Pin scratch	Bongding area	Scratches and whitening are found by visual inspection, and need to be rechecked with a microscope. The broken lead is not allowed, and the overlap is not allowed Note: CT pad area and pin non-bonding area are not controlled	visual	MI
8	PF film bump	LTPS	Touch is not allowed	visual	MI
9	PF film pinholes/pits	LTPS	No control	visual	MI
10	PF film scratch	LTPS	1. No scratch, no control; Scrape through, L<10mm; 2. The film shall be scraped through the exposed glass surface, referring to the lack of glue of PF film;	Visual inspection, Flinka	MI
11	PF film lacks glue	LTPS	50> 5mm, W>5mm not allowed	Visual inspection, Flinka	MI
12	PF membrane is dirty	LTPS	Wipable dirt needs to be wiped, and non-wipe dirt refers to the color difference of PF film;	visual	MI
13	PF film overflow	LTPS	1. Edge overflow W<0.2mm, acceptable; 2. W>0.2mm, not allowed;	Visual inspection, Flinka	MI

<table>
<tr><td>14</td><td>Color difference/stain (no convex touch)</td><td>LTPS</td><td colspan="4">No control</td><td>visual</td><td>MI</td></tr>
<tr><td>15</td><td>PF film gluing offset</td><td>LTPS</td><td colspan="4">1. Step area is not allowed;
2. Except for the step area, the rest shall be controlled by 0.5 ± 0.2mm;</td><td>Visual inspection, Flinka</td><td>MI</td></tr>
<tr><td>16</td><td>Screen body is dirty</td><td>LTPS</td><td colspan="4">1. The front can be wiped and the dirt can be wiped, and the polarizer of the dirt cover cannot be wiped;
2. The back is not controlled;</td><td>visual</td><td>MI</td></tr>
<tr><td rowspan="4">17</td><td rowspan="4">point defect</td><td rowspan="4">AA</td><td colspan="2">D (mm)</td><td colspan="2">DS (mm)</td><td>Acceptable number</td><td rowspan="4">Visual inspection, Flinka</td><td rowspan="4">MI</td></tr>
<tr><td colspan="2">D≤ 0.15mm</td><td colspan="2">/</td><td>Ignore</td></tr>
<tr><td colspan="2">0.15mm< D≤0.2mm</td><td colspan="2">DS≥10</td><td>N≤10</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="6">18</td><td rowspan="6">Linear defect/foreign matter linear/non-inductive scratch</td><td rowspan="6">AA</td><td>W (mm)</td><td>L (mm)</td><td>DS (mm)</td><td>Acceptable number</td><td rowspan="6">Visual inspection, Flinka</td><td rowspan="6">MI</td></tr>
<tr><td>W≤ 0.03</td><td>L≤5</td><td>≥10</td><td>ignore</td></tr>
<tr><td>0.03< W≤ 0.05</td><td>L≤2</td><td>≥10</td><td>ignore</td></tr>
<tr><td>0.03< W≤ 0.05</td><td>2 < L≤5</td><td>≥10</td><td>N≤4</td></tr>
<tr><td>W>0.05</td><td>-</td><td>/</td><td>Not allowed</td></tr>
<tr><td>-</td><td>L>5</td><td>/</td><td>Not allowed</td></tr>
<tr><td rowspan="4">19</td><td rowspan="4">Point/Line defects</td><td rowspan="4">Camera hole area/Blind hole area</td><td colspan="2">D(mm)</td><td colspan="2">Acceptable number</td><td rowspan="4">Visual inspection, Flinka</td><td rowspan="4">MI</td></tr>
<tr><td colspan="2">D≤0.15</td><td colspan="2">ignore</td></tr>
<tr><td colspan="2">0.15 < D≤0.2</td><td colspan="2">ignore</td></tr>
<tr><td colspan="4">D>0.2</td></tr>
<tr><td>20</td><td>Newton rings（Blind hole area）</td><td>Camera hole area/Blind hole area</td><td colspan="4">Not control</td><td>Visual inspection</td><td>MI</td></tr>
<tr><td>21</td><td>offset</td><td>Camera hole</td><td colspan="4">The metal ring extends inward 0.1mm ,ingore</td><td>Visual inspection</td><td>MI</td></tr>
</table>

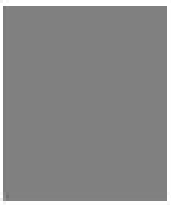
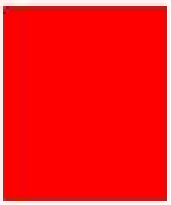
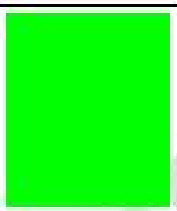
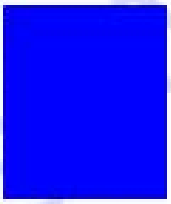
		area/Blind hole area			
22	Blind hole color bias(same color)	Camera hole area/Blind hole area	Functional requirements such as transmittance and PV value are met,not control appearance	Visual inspection	MI
23	Protective film scratch	Whole area	No control under no hurt boby	Visual inspection	MI
24	Protective film starved/overflow glue/burr	Whole area	No control under no hurt boby	Visual inspection	MI
25	Dirt inside the protective film	Whole area	Not allowed	Visual inspection	MI
26	Easy to tear	Cover front	Function is invalid, damaged, leaked not allowed Wrinkles, bumps, dirt, punching bad, burr, overflow glue is not controlled	Visual inspection	MI
27	Polarizer edge overflow	AA	W≤0.35mm , Not control; W>0.35mm, Not allowed.	Visual inspection, Flinka	MI
28	Polarizer concave convex point	AA	convex point: D ≤ 0.2mm or refer to limit sample concave point: D≤3mm, DS≥10mm, N≤3 or refer to limit sample	Visual inspection, Flinka	MI
29	Polarizer fold / indentation	AA	Does not affect the display as OK or refer to limit sample;	Visual inspection	MI
30	Polarizer chromatism	AA	No control	Visual inspection	MI
31	IC chip	IC	Not allowed	Visual inspection	MI
32	FPC body defect	FPC	1. The parts on the FPC must be consistent with the product BOM table, and there are incorrect, multiple, or missing parts, which are not allowed; Polarities such as capacitors and inductors should not be soldered backwards or crooked; 2. FPC scratches/scratches are based on the absence of exposed copper; 3. Creases/Indentations: Indentations in the circuit area should not cause the back of the	Visual inspection	MI

			covering film to turn white; Non line area indentation should not cause FPC damage 4. Except for the golden finger. FPC foreign object: a. Spot shape: D ≤ 0.5mm, N ≤ 3; b. Linear: length and width ≤ 0.3 * 5mm;		
33	FPC gold finger defect	Golden Finger Region	1. Golden finger cracking: The length and width of the crack/damage at the top of the golden finger ≤ the line width; 2. Gold finger copper leakage: W ≤ 1/3 line width, L ≤ line width, unlimited quantity 3. Gold finger gap W1 ≤ 1/3 line width W, length L1 ≤ 1/2 line width W, unlimited quantity, all of the above conditions are met and allowed; 4. Gold finger pressure/scratch should not expose copper, there should be no unevenness, and there should be no depth visible to the naked eye, which does not affect assembly and is acceptable; 5. Gold fingers should not have sharp creases or dead folds; 6. FPC gold fingers should not have oxidation, blackening, burns, or browning;	Visual inspection	MI
34	connector	connector	There should be no tin or residual solder beads on the connector, and there should be no tin connection on the connector pins; PIN deformation shall be controlled within 0.05mm; Does not affect the lighting function; Visual inspection of pin breakage, pin detachment, and deformation of the outer frame is not allowed;	Visual inspection	MI
35	Insulating tape	Bonding area	There must be no obvious wrinkles or bubbles	Visual inspection	MI
		Component area	1. Scratches and glue splashes are uncontrollable; 2. Do not wipe dirt or dirt; 3. The offset of the insulation tape should not exceed the edge of the product, and other requirements should be determined based on the drawing; 4. Burr edges, no control over glue overflow;		

			5. Damaged, incomplete, or missing labels are not allowed;		
36	Composite tape	All	1. It is not allowed for the composite tape to leak out of the edge of the screen body; 2. Folding of composite tape, light leakage during assembly, or affecting assembly and thickness are not allowed; 3. Damaged composite tape is not allowed; 4. The size of the composite tape cutting defect does not meet the requirements of the drawing and cannot be controlled; 5. Composite tape should not be wiped with dirt or foreign objects, and foreign objects should follow the dotted line standard; 6. The burrs of the composite tape should not exceed the edge of the screen body, regardless of control; 8. Composite adhesive tape with no control over glue splashes or overflow; 9. Composite tape bubbles: D ≤ 5mm, N not included; 10. Composite tape bumps: acute angle bumps D ≤ 0.3mm, N ≤ 3; Smooth concave convex points D ≤ 0.8mm, N ≤ 3; 11. Composite tape foreign object (foreign object between copper foil and blue film): D ≤ 0.3mm, N ≤ 3; 12. Edge sawtooth of composite tape: 0.5 * 3mm, N ≤ 3; 13. The color difference of the protective film in the composite tape is not controlled; 14. Copper foil indentation and dead bending in composite tape are not allowed, which does not affect assembly and thickness control; Or reference limit sample; 15. No control of foreign objects/dents in copper foil in composite tape;	Visual inspection	MI
37	OCA overflow	All	Not allowed within AA area; Externally visible: Control standard ≤ 0.15mm	Visual inspection	MI

38	Sealing glue	Pin	1. Broken adhesive is not allowed, and the circuit cannot be exposed. 2. The thickness of the colloid shall not be higher than the POL surface. 3. Bubble diameter<1mm. 4. Other: According to the drawings and work instructions.	Visual inspection	MI
39	Conductive cloth	All	1. Conductive cloth dirt: D ≤ 5mm, N ≤ 2; 2. Conductive cloth bubbles: D ≤ 2mm, N ≤ 2; 3. Conductive cloth foreign object: D ≤ 1mm, N ≤ 3; 4. Folding of conductive fabric: N ≤ 2;	Visual inspection	MI
40	Copper foil	All	Copper foil sticking is not allowed to leak out of the edge of the screen body; Abnormal color of copper foil refers to standard samples/sealed samples, and damage is not allowed. Soft scratches on the surface are not controlled.	Visual inspection	MI
41	QR code	QR code	It is not allowed to be unable to scan or difficult to scan (recognition can only be achieved after three consecutive scans), with a clear appearance, no blurring, missing printing, and other defects	Visual inspection	MI
42	Package	Other	Products should put into the anti-static trays, with non-overlapping, and the trays should be staggered placed. Different products cannot be mixed into the same inner package. The package should not have obvious deformation or breakage .The printing labels type and quantity are correct. The package should have QC signature. ROHS label is needed if the product is under ROHS control.	visual	-
43	Boundary dimension NG	Other	It is not allowed to exceed the dimensional tolerance required by the specifications and drawings	Calipers, measuring instruments	-

8.5 Inspection picture library

Serial number	picture	Picture name	Mainly judged as defective	remarks
1		W_ GRAD(64) 64 gray scale	Point/line type, foreign matter point/line, mura type	/
2		W_ GRAD(128) 128 gray scale	Point/line type, foreign matter point/line, mura type	/
3		WHITE white	Point/line type, foreign matter point/line, mura type	/
4		Black black	Bright spot, bright line, dark mura	/
5		RED red	Point type, line type, foreign matter point/line	/
6		GREEN green	Point type, line type, foreign matter point/line	/
7		BLUE blue	Point type, line type, foreign matter point/line	/

Note: The actual sequence and lock seconds of the screen can be adjusted according to the customer's requirements and the needs of the factory.

9. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	70℃,96H	IEC60068-2-2,GB2423.2
Low Temperature Operating	-20℃, 96HR	IEC60068-2-1 GB2423.1
High Temperature Storage	80℃, 96HR	IEC60068-2-2 GB2423.2
Low Temperature Storage	-40℃, 96HR	IEC60068-2-1 GB2423.1
High Temperature & High	+60℃, 90% RH ,96 hours.	IEC60068-2-78 GB/T2423.3
Thermal Shock (Non-operation)	-40℃,30 min ↔ 80℃,30 min, Change time:5min 20CYC.	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 Visionox standards.

10. Cautions and Handling Precautions

10.1 Handling Precautions:

(1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from height..
(2) Do not press down the screen or the adjoining areas too hard because the color tone may be shifted.
(3) The polarizer covering the display surface of the AMOLED module is soft and easily scratched. Handle this polarizer carefully.
(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.
(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.
(6) If the logic circuit power is off, do not apply the input signals.
(7) To prevent destruction from static electricity, be careful to maintain an optimum working environment.
(8) Be sure to make yourself in contact with the ground when handling with the AMOLED Modules.
(9) Tools required for assembly, such as soldering irons, must be properly ground.
(10) To reduce the generation of static electricity, do not conduct assembly or other work under dry conditions.
(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.

10.2 Storage Precautions.

(1) When storing the AMOLED modules, be sure that they are not directly exposed to the
sunlight or the light of fluorescent lamps.
(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%
(3) The AMOLED modules should be stored in the room without acid, alkali or harmful gas.

10.3 Transportation Precautions:

(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.

11. Packing

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