

Display Module SPECIFICATION

Model: MX122CTFH51M-Z01

Customer	
Customer NO.	
Approve By	

For Solution ---12.2 inch ;1600(W)×RGB×2400(H)

Version:

Document ID:

工厂地址：No. 29, Yingshan Highway, Huicheng District, Hui City,
Guangdong Province （广东省惠州市惠城区英山公路29号）

Approved by

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CONTENTS

1. Features & Mechanical Specifications 1

2. Dimensional Outline 2

3. Pin Description 3

4. Absolute Maximum Ratings 5

5. Electrical Characteristics 5

6. Backlight Characteristics 5

7. Electro-Optical Characteristics 5

8. ELECTRICAL CHARACTERISTICS 8

9. Quality Specifications 12

10. Reliability of LCM 11

1. Features & Mechanical Specifications

Item	Contents	Unit
	LCD	
LCD Type	TFT / Transmissive / Normally Black	--
Size	12.2	
Viewing direction	Full view	--
Backlight	White LED x 48	--
Interface	4 Lanes MIPI Interface	--
TLCM/Outline Dimension	187.94(W) × 274.30(H) × 2.8(T)	mm
LCM/Outline Dimension	177.5(W) × 266.18(H) × 1.92(T)	mm
Active area (W×H)	171.94(H)*257.9(V)	mm
Number of Dots	1600(RGB) × 2400	--
Operating Temperature	-10 ~ +50	°C
Storage temperature	-20 ~ +60	°C
LCD	BPC201JT1-1	--
IC	HX-83102J02PPD170A-SBGP	--
Polarizer	Top: IPS film	--
	Bottom: IPS film	

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REV.	DESCRIPTION OF MODIFY	MODIFY BY:	DATE
A0	1ST DESIGN		

测试点示意图

Pin No.	DESCRIPTION
1	NC
2	AVDD (+5.0V)
3	AVDD (+5.0V)
4	NC
5	AVDD (+5.0V)
6	AVDD (+5.0V)
7	AVDD (+5.0V)
8	AVDD (+5.0V)
9	AVDD (+5.0V)
10	AVDD (+5.0V)
11	AVDD (+5.0V)
12	AVDD (+5.0V)
13	AVDD (+5.0V)
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31	AVDD (+5.0V)
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34	AVDD (+5.0V)
35	AVDD (+5.0V)
36	AVDD (+5.0V)
37	AVDD (+5.0V)
38	AVDD (+5.0V)
39	AVDD (+5.0V)
40	AVDD (+5.0V)
41	AVDD (+5.0V)
42	AVDD (+5.0V)
43	AVDD (+5.0V)
44	AVDD (+5.0V)
45	AVDD (+5.0V)
46	AVDD (+5.0V)
47	AVDD (+5.0V)
48	AVDD (+5.0V)
49	AVDD (+5.0V)
50	AVDD (+5.0V)
51	AVDD (+5.0V)

LCD CIRCUIT DIAGRAM: SS8P-481D

Display Type	12.2 TFT	LCM Luminance		350cd/m²	White Color
	Normally BLCAL	Backlight		IF:144MA, VF:18V	
Number of pixels	1600RGB*2400				
Viewing Direction	80/80/80/80	Operating temperature		-10°C~50°C	
Drive IC	HIMAX 83102-J BGP	Storage temperature		-20°C~60°C	
LCD manufacure	CSOT	RoHS		YES	
Interface	MIPI SPI	Unspecified Tolerance		±0.2	

LCM NO.: MK122CTFH51M-Z01

SCALE: FIT

CHECKED BY:

APPROVED BY:

SHEET: 1 OF 1

UNIT: MM

DATE

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3. Pin Description

Pin No.	Symbol	Description	I/O
1	GND	Ground	P
2	NC	NC	-
3	AVDD	5.9V input power	P
4	AVDD	5.9V input power	P
5	NC	NC	-
6	AVEE	-5.9V input power	P
7	AVEE	-5.9V input power	P
8	NC	NC	-
9	GND	Ground	P
10	GND	Ground	P
11	D3-	MIPI differential data3 input (Negative)	I
12	D3+	MIPI differential data3 input (Positive)	I
13	GND	Ground	P
14	D0-	MIPI differential data0 input (Negative)	I
15	D0+	MIPI differential data0 input (Positive)	I
16	GND	Ground	P
17	CLK-	MIPI differential clock input (Negative)	I
18	CLK+	MIPI differential clock input (Positive)	I
19	GND	Ground	P
20	D1-	MIPI differential data1 input (Negative)	I
21	D1+	MIPI differential data1 input (Positive)	I
22	GND	Ground	P
23	D2-	MIPI differential data2 input (Negative)	I
24	D2+	MIPI differential data2 input (Positive)	I
25	GND	Ground	P
26	ID0	System Hardware ID0 Select(Pull Low to GND with 10K Ω)	O

Pin No.	Symbol	Description	I/O
27	ID1	System Hardware ID1 Select(Pull Low to GND with 10KΩ)	O
28	LEDPWM OUT	Output pin for PWM signal of LED driving.	O
29	M_TE	TE	I
30	S_TE	TE	I
31	REST	This signal will reset the device and must be applied properly to initialize the chip.	O
32	VDD18	Power Supply 1.8V	P
33	VDD18	Power Supply 1.8V	P
34	TP_INT	Interrupt signal for TP	O
35	TP_RST	The external reset input for TP	I
36	TP_SPI_CS	TP:SPI CS(TYP. 1.8V)	I
37	TP_SPI_SCLK	TP:SPI SCLK(TYP. 1.8V)	I
38	TP_SPI_SDO	TP:SPI SDO(TYP. 1.8V)	O
39	TP_SPI_SDI	TP:SPI SDI (TYP. 1.8V)	I
40	GND	Ground	P
41	FB1	Power for LED1 Cathode	P
42	FB2	Power for LED2 Cathode	P
43	FB3	Power for LED3 Cathode	P
44	FB4	Power for LED4 Cathode	P
45	FB5	Power for LED5 Cathode	P
46	FB6	Power for LED6 Cathode	P
47	NC	NC	-
48	VLEDA	Power for LED Anode	P
49	VLEDB	Power for LED Anode	P
50	NC	NC	-
51	GND	GND	P

4.Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Digital Supply Voltage	VDD1	-0.3 to +1.95	V
Operating Temperature range	TOP	-10 to +50	°C
Storage Temperature range	TST	-20 to +60	°C

5.Electrical Characteristics

DC Characteristics

Item	Symbol	Min.	Type.	Max.	Unit
Supply voltage for logic	VDD1	+1.7	+1.8	+1.9	V
Power supply voltage	VSP	+5.7	+5.8	+5.9	V
Power supply voltage	VSN	-5.9	-5.8	-5.7	V
Power supply Current	IVDDI	-	TBD	-	mA
	IVSP	-	TBD	-	mA
	IVSN	-	TBD	-	mA

6.Backlight Characteristics

(White LED ×8in series) ×6in Parallel

(Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=144mA	22.4	24	25.6	V
Uniformity	△Bp	-	75	80	-	%
LCM Luminance	Lv	IF=144mA	280	330	-	cd/m ²

7.Electro-Optical Characteristics

The test of optical specifications shall be measured in a dark room (ambient luminance 1lux and temperature = 25 ± 2°C) with the equipment of Luminance meter system (Gonio meter system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to $\theta\Phi=0^\circ (=0^\circ)$ as the 3 o'clock direction (the “right”), $\theta\Phi=90^\circ (=90^\circ)$ as the 12 O'clock direction (“upward”), $\theta\Phi=180^\circ (=180^\circ)$ as the 9 O'clock direction (“left”) and $\theta\Phi=270^\circ (=270^\circ)$ as the 6 O'clock direction (“bottom”). While scanning θ and/or Φ , the center of the measuring spot on the Display surface shall stay fixed.

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	$\theta=0^{\circ}$ Ta=25℃	-	25	30	ms	FIG 1.	4
Contrast ratio		Cr		1000	1500	-	-	FIG 2.	1
Luminance uniformity		δ WHITE		75	80	-	%	FIG 2.	3
Surface Luminance		LV		280	330	--	cd/m²	FIG 2.	2
Viewing angle range		Cr $\geq$ 10%	U	-	85	-	deg	FIG 3.	6
			D	-	85	-	deg	FIG 3.	
			L	-	85	-	deg	FIG 3.	
			R	-	85	-	deg	FIG 3.	
CIE(x,y) chromaticity For LCM	Red	x	$\theta=0^{\circ}$ Ta=25℃	TYP.-0 .03	TBD	TYP.+ 0.03	-	FIG 2.	5
		y			TBD				
	Green	x			TBD				
		y			TBD				
	Blue	x			TBD				
		y			TBD				
	White	x			TBD				
		y			TBD				
Flicker		amout	-	-	-	-30	dB		
colour temperature				6600	7800	9000	K		
NTSC				75	80		%		
GaMA				-	2..2	2.5			

ote 1. Contrast Ratio(CR) is defined mathematically by the following formula. Refer to the FIG 2.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1,P2~P8,P9)}}{\text{Average Surface Luminance with all black pixels (P1,P2~P8,P9)}}$$

Note 2. Surface luminance is the LCD surface luminance with all pixels displaying white. Refer to the FIG 2. Lv = Average Surface Luminance with all white pixels (P1,P2~P8,P9)

Note 3. Surface brightness uniformity, white picture, measure the brightness of 9 points, minimum brightness values divided by the maximum brightness of brightness values. Refer to the FIG 2.

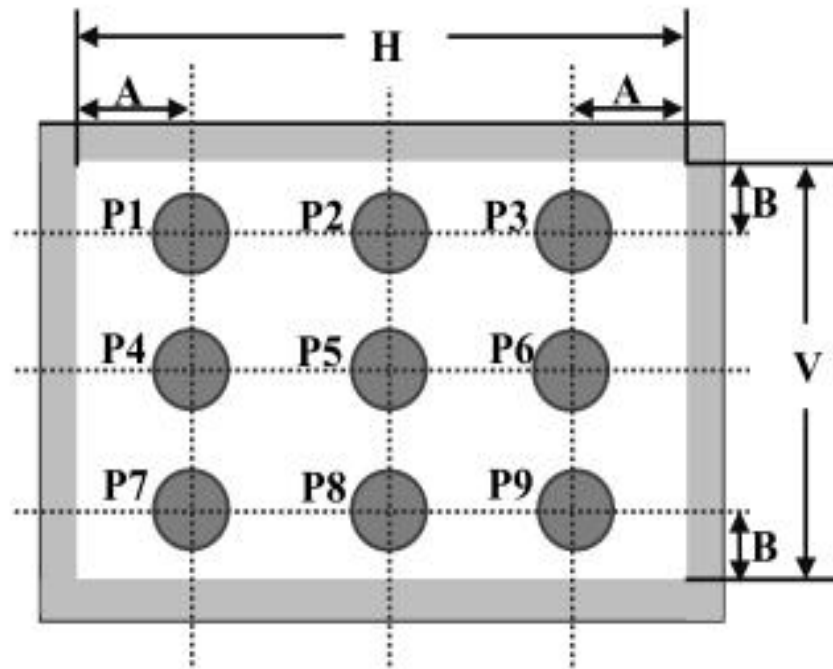
$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1,P2~P8,P9)}}{\text{Maximum Surface Luminance with all white pixels (P1,P2~P8,P9)}}$$

Note 4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). Refer to the FIG 1.

Note 5. CIE(x, y) chromaticity is the Center point (P5)value. Refer to the FIG 2.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than a specific value. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or yaxis with respect to the z axis which is normal to the LCD surface. Refer to the FIG 3.

Note7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity,CIE The test data is base on BM-7 photo detector.



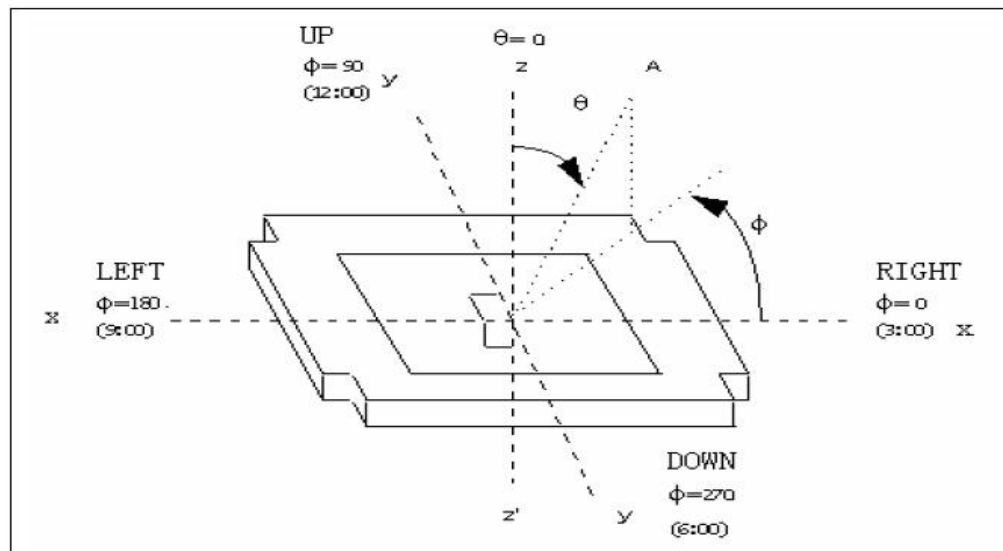
A: $1/6H$

B: $1/6V$

H,V : Active Area

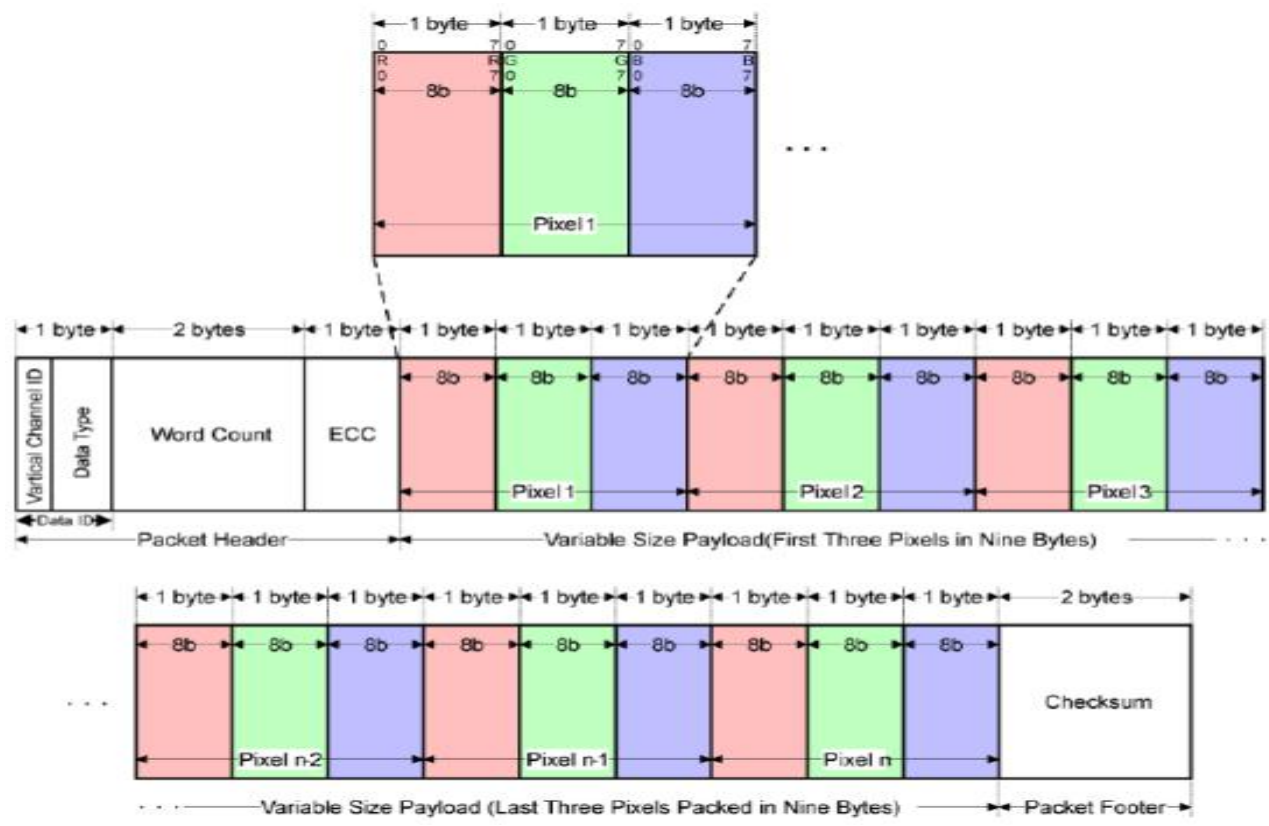
Light spot size =7mm, 500mm distance from the LCD surface to detector lens measurement instrument is luminance meter BM-7.

FIG. 3 The definition of viewing angle



8.0 MIPI Interface Characteristic

8.0.1 Data Format



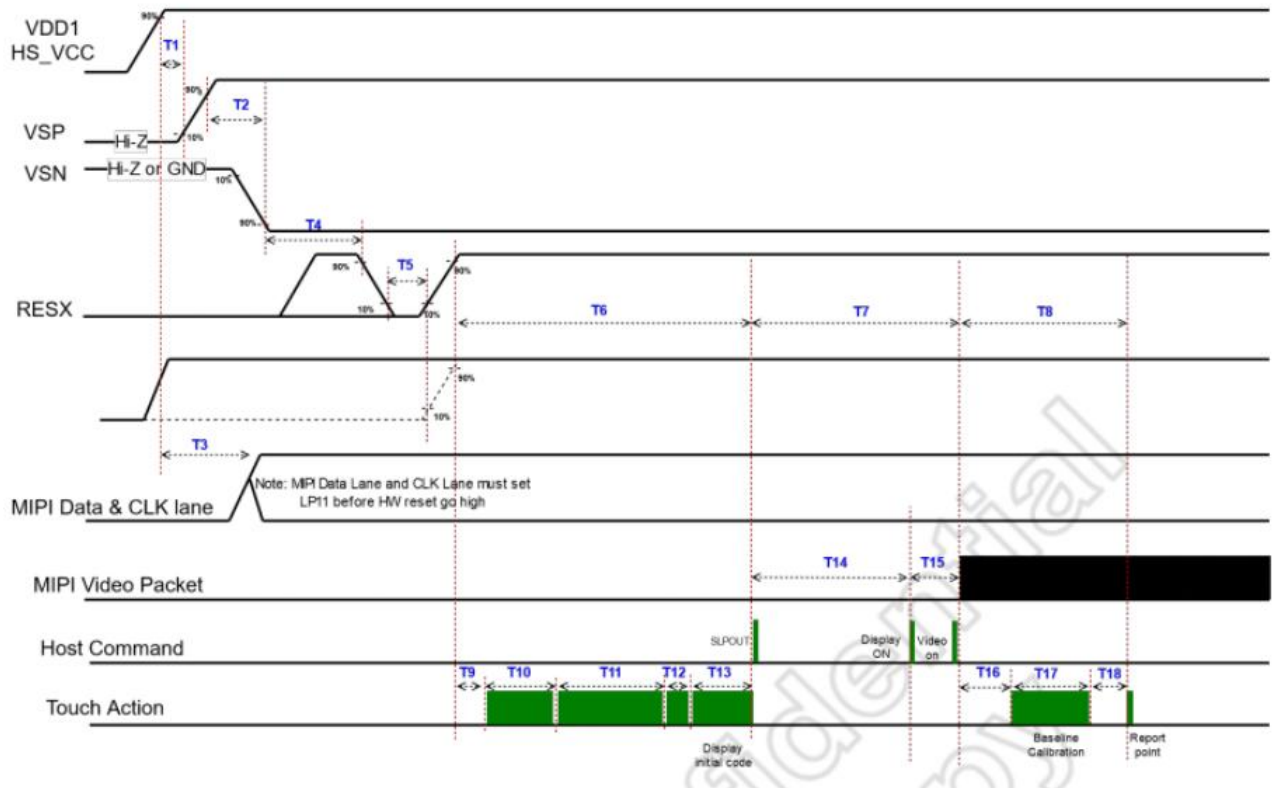
8.0.2 Timing Parameter

TBD

8.0.3 Input Signal and Display Color Table

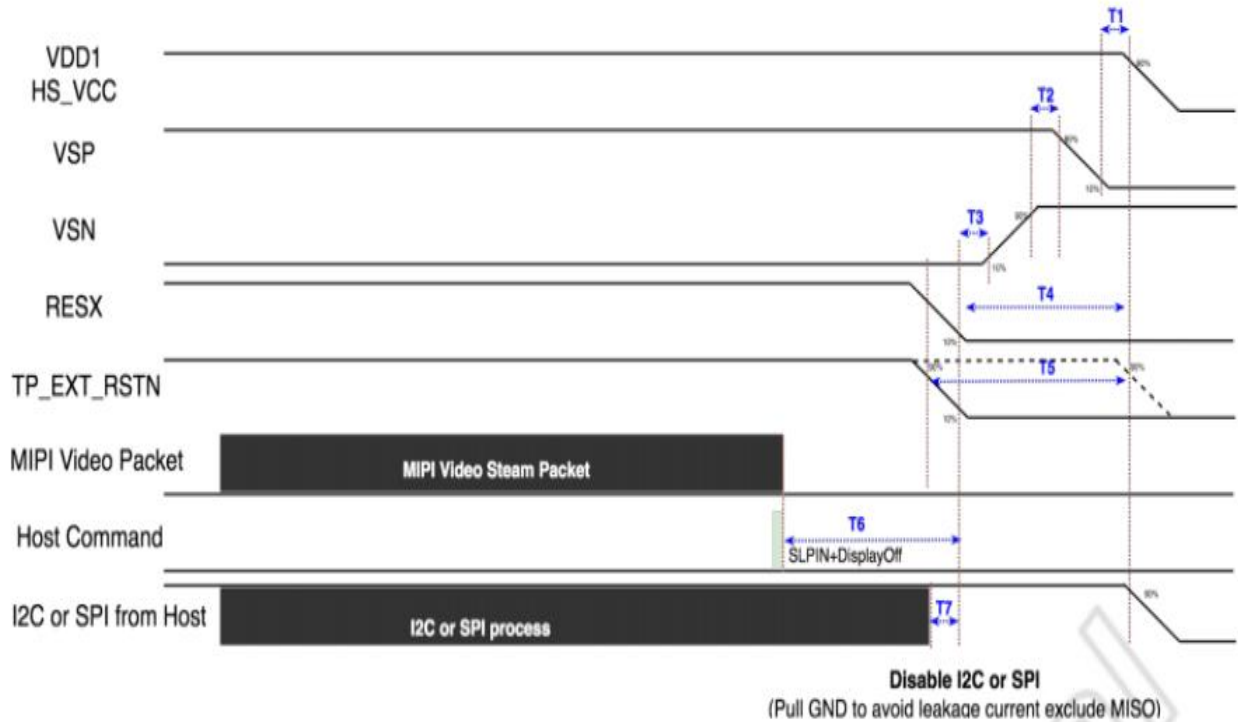
Color & Gray Scale		Input Data Signal																								
		Red Data								Green Data								Blue Data								
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Δ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Δ	↑								↑								↑								
	▽	↓								↓								↓								
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Δ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	Δ	↑								↑								↑								
	▽	↓								↓								↓								
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Δ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	Δ	↑								↑								↑								
	▽	↓								↓								↓								
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
Gray Scale of White	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Δ	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	
	Δ	↑								↑								↑								
	▽	↓								↓								↓								
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

8.0.4 Power/on Sequence



	Description	Min.	Typ.	Max.	Unit	Note
T1	VDD1 to VSP	1	2		ms	
T2	VSP to VSN	1	2		ms	
T3	VDD1 to MIPI Lane	1	2		ms	
T4	Power Ready to Global Reset	1	2		ms	
T5	Global Reset Keep Low	15			us	TP Reset is the same
T6	Global Reset to Sleep Out	156			ms	T9+T10+T11+T12+T13
T7	Sleep Out to IC Ready	140			ms	T14+T15
T8	Video on to First point	123.5			ms	T16+T17+T18
T9	Reset to Flash Reload	4	5		ms	
T10	Flash Reload to Master	40	40		ms	40ms@12.5MHz
T11	Master write to Slave	100			ms	default:8MHz
T12	Flash Reload to Master	6			ms	
T13	Display initial code by FW	1	3	5	ms	Initial code by AP/OTP refer to data sheet
T14	Sleep Out to Display On	120			ms	
T15	Display On to IC Ready	20			ms	
T16	Video on to Baseline Calibration	19			ms	
T17	Baseline Calibration	92	166		ms	
T18	Baseline Calibration to First point report	12.5			ms	
T19	TP reset Timing	0			ms	should before Reload flash command

8.0.5 Power/off Sequence



	Description	Min.	Typ.	Max.	Unit	Note
T1	VDD1 to VSP Power Off	0			ms	
T2	VSP to VSN Power Off	0			ms	
T3	Reset to VSN Start to Power Off	0			ms	
T4	Reset to VDD1 Start to Power Off	0			ms	
T5	TP Reset Timing	0			ms	Before or later than RESX, should not later than VDD1 falling
T6	(Sleep In + DisplayOff) to Reset	21.6			ms	Default: 2 Display frames +5ms
T7	Touch Interface to Reset	0			ms	

9. Quality Specifications

9.1.1 通常在 $22\pm 3^{\circ}\text{C}$ ， $50\pm 10\%\text{RH}$ 的环境，光强度 350-700Lux 下（20W 日光灯，40cm 距离左

右）检验员的眼睛与模块之间的距离为 $35\text{cm}\pm 5\text{cm}$ ，LCD下面用背光源来检查（见图4）

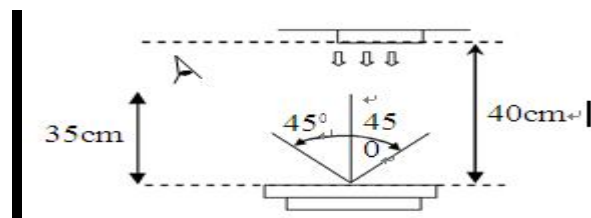


图 4)

9.1.2 模块目视检验方向，按图规定视角方向偏离 LCD 平面法线 45° ；

9.1.3 采用裸眼检查，检验者需戴好防静电手环、防静电手套；

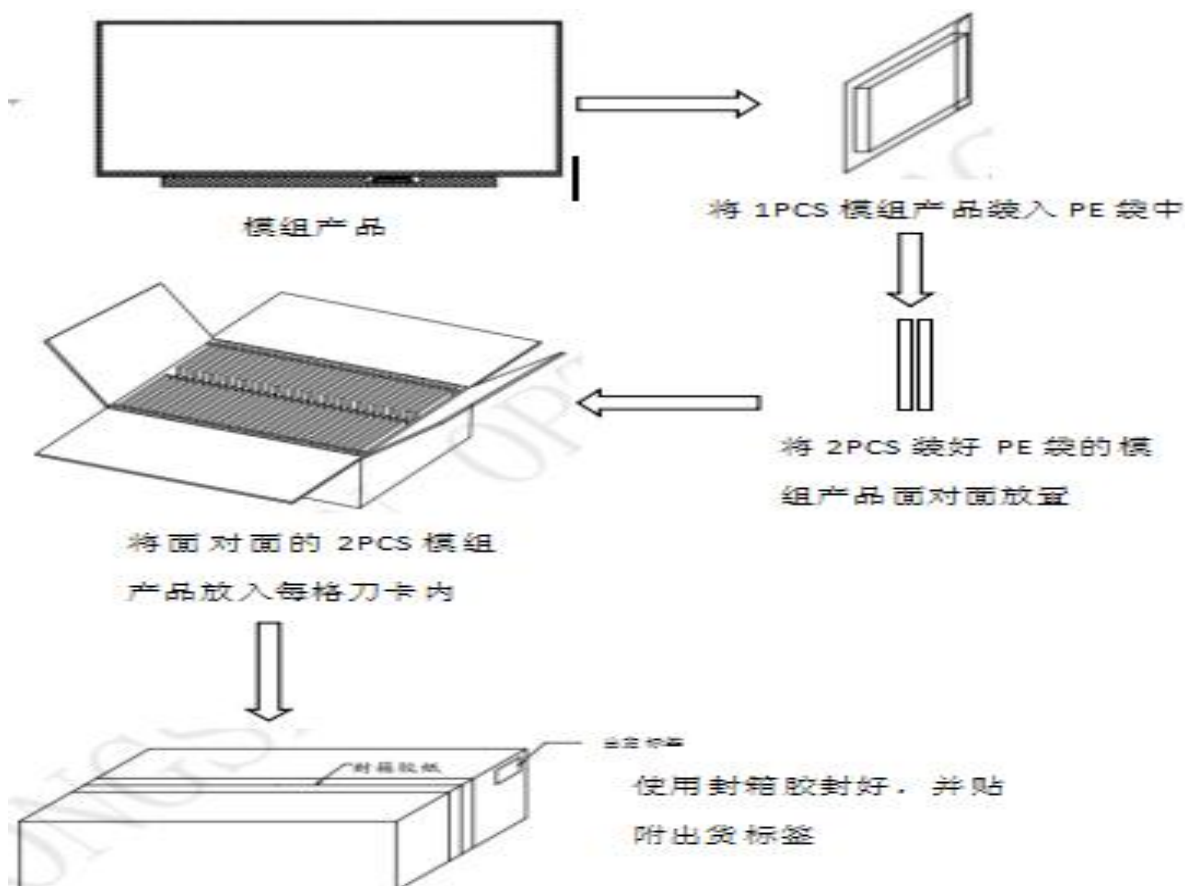
9.1.4 功能测试时，产品在正常显示时用棉签或手指轻轻按压 FPC 邦定处、电子元件处、背 光焊接处，检查是否存在不稳定现象。

9.1.5 相关IIS标准与双方协商确认；

9.2、包装

9.2.1 产品的内外包装方法参照图纸及设计要求来包装。

9.2.2 如客户有特殊的包装要求，按客户的要求执行。



10. Reliability of LCM

Reliability test condition:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	70°C	24	No abnormalities in functions and appearance
High temp. Operating	60°C	24	
Low temp. Storage	-20°C	24	
Low temp. Operating	-10°C	24	
Humidity	50°C/80%RH	24	
ESD touch/ ESD air	4K/8K	The whole machine test is a normal power-on test Good grounding, screen IC terminal 3 times	
Image Sticking	25 °C , OTP, checkerboard 10 * 10, change 50% gray pattern checkpoint: through point aging 4H, residual shadow 5min disappeared, no residue		

Note: the above experimental conditions need to assemble the finished product prototype in the experiment;

Recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature ($23 \pm 2^{\circ}\text{C}$), normal humidity (below 45%~75% RH), and in the area not exposed to direct sun light.

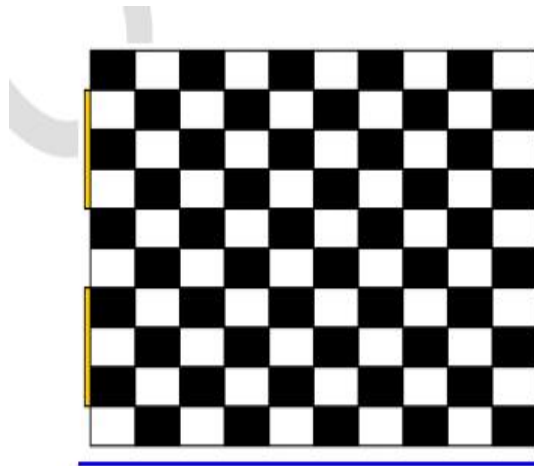


Figure 18 Image Sticking Test Pattern