



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : HG019WQ002

☐ 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

[illegible]



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1 Scope

2 DEFINITION OF TERM

Min.

Case of output value : The minimum value to occur by a mass production

Case of input value : The minimum value to satisfy the specification

Case of mechanical value : The minimum value to occur by a mass production

Min value is guaranteed value.

Typ.

Central value

Typ. Value is not guaranteed value.

Center.

Average value of mass production.

Max.

Case of output value : The maximum value to occur by a mass production

Case of input value : The maximum value to satisfy the specification

Case of mechanical value : The maximum value to occur by a mass production

Br000 to Br255 (Only AMOLED)

Adjustment level of the brightness.

B000 is min brightness, B255 is max brightness.

V000 to V255

Adjustment level of the White color gray scale.

V000 is min brightness, V255 is max brightness.

R000 to R255

Adjustment level of the Red color gray scale.

G000 is min brightness, G255 is max brightness.

G000 to G255

Adjustment level of the Green color gray scale.

G000 is min brightness, G255 is max brightness.

B000 to B255

Adjustment level of the Blue color gray scale.

B000 is min brightness, B255 is max brightness.

Worst case pattern

The test pattern that specification have worst.

Worst case condition

The test condition that specification have worst.

ALL angle

Omnidirectional angle

θ = 0deg. to 88deg.

ϕ = 0:00(12:00) to 12:00. *360degree.

Reference and limit sample list

Supplier necessary follow this reference and limit sample.

3 Features

3.1 Product Applications

Smart Phone

3.2 Product Features

- 1) Display color: 16.7M (RGB x 8bits)
- 2) Display format: 1.91”(240RGBx536)
- 3) Pixel arrangement: Real RGB arrangement
- 4) Interface: MIPI(1Lane)

4 Mechanical Specifications

Item	Specification	unit
LTPS Glass outline	22.40 x 51.32	mm
Number of dots	240(W) x RGB x 536(H)	dots
Active area	19.80x44.22	mm
Diagonal size	1.91	inch
Pixel pitch	82.5* 82.5	μm
Glass thickness (LTPS/Encap. glass)	0.3 / 0.2	mm
Weight	2.16	g (TYP)

5 Maximum Rating

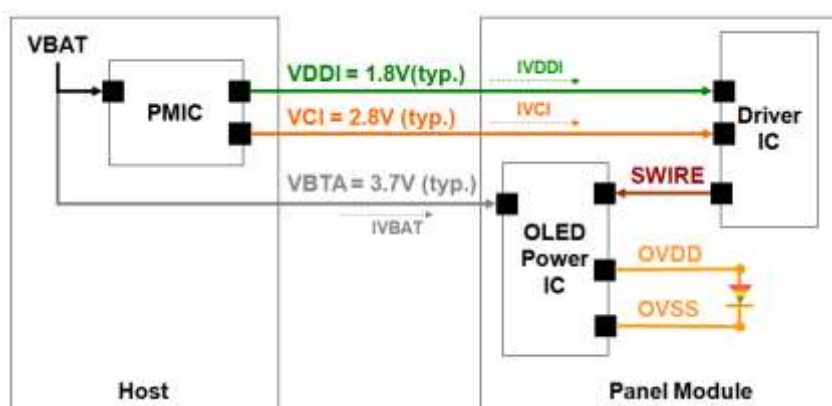
Parameter	Symbol	Conditions	Min.	Typ.	Max	Unit	Remark
Battery supply	VBAT		-0.3	-	6	V	
Power supply for Logic	VDDIO		-0.3	-	5.5	V	
Power supply for Analog	VCI		-0.3	-	5.5	V	

6 Electrical Specifications

6.1 Electrical Characteristics

6.1.1 Power Characteristic:

Parameter	Symbol	Conditions	Min.	Typ.	Max	Unit	Remark
Battery supply	VBAT		2.5	3.7	4.5	V	
Power supply for Logic	VDDIO		1.65	1.8	1.95	V	
Power supply for Analog	VCI		2.65	2.8	3.6	V	



1) Normal Mode

Power Supply: VDDIO=1.8V VCI=2.8V Vbat=3.7V

Frame Frequency: F_{frame} = 60HZ @ 25degC, Brightness 350 nits, Command Mode,

Parameter	Symbol	Conditions	Min.	Typ.	Max	Unit	Remark
Current for OLED	Ivbat		-	42	50.4	mA	
Current for VDDIO	Ivddio		-	6.5	7.8	mA	
Current for VCI	Ivci		-	12	14	mA	

2) Idle Mode

Power Supply: IOVCC=1.8V VCI=2.8V

Frame Frequency: F_{frame} = 15HZ @ 25degC, Brightness 50 nits,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
10% Pixel On 50 nits	Ivbat	-	-	-	mA	Supplied by Driver IC
	IVCI	-	6	7.2	mA	Ref
	IVDDIO	-	1	1.2	mA	Ref

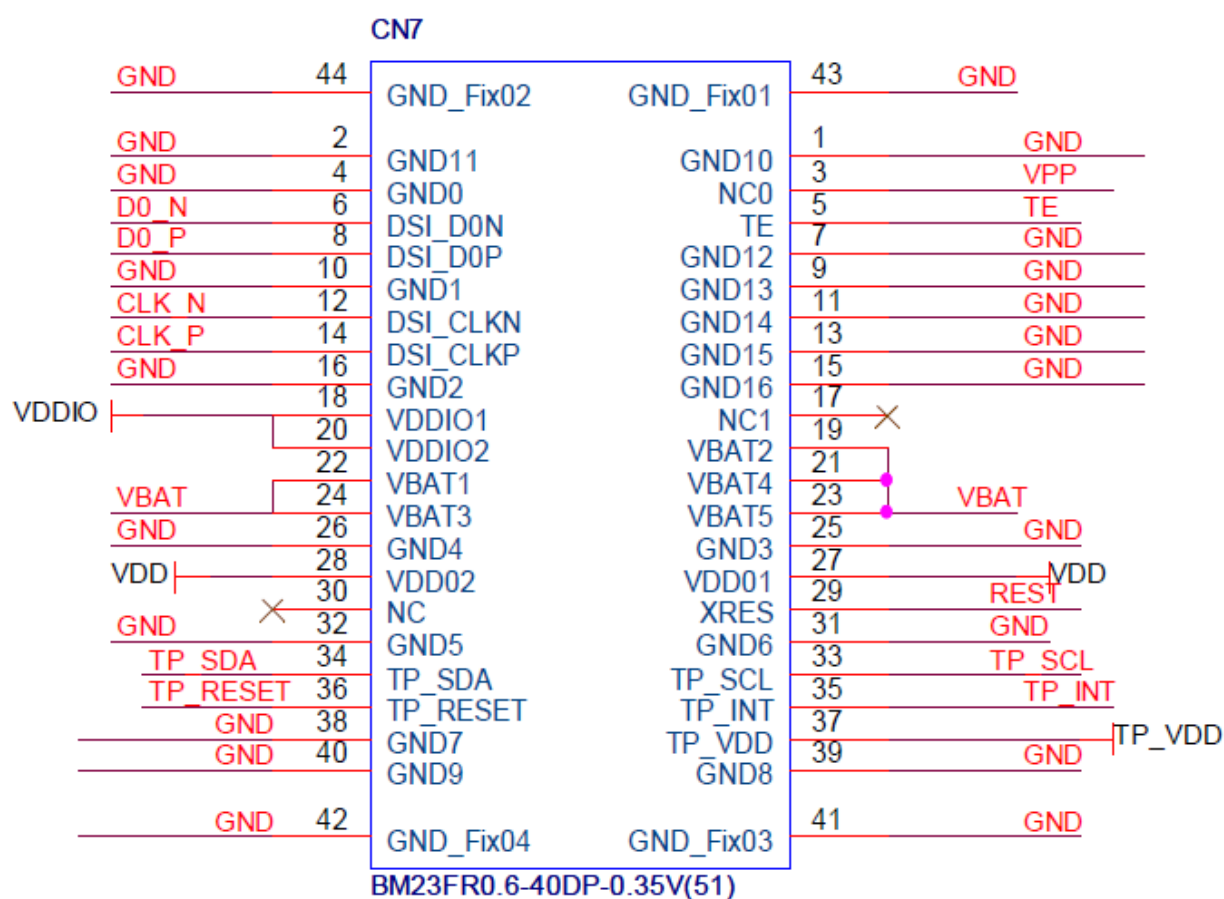
3) Sleep IN Mode

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Sleep IN Mode	IVCI	-	0.25	0.30	mA	-
	IVDDIO	-	0.10	0.12	mA	-

1) Deep Standby Mode

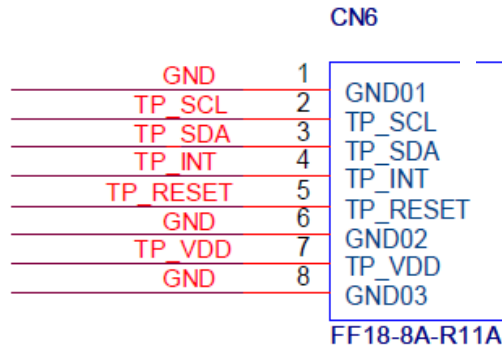
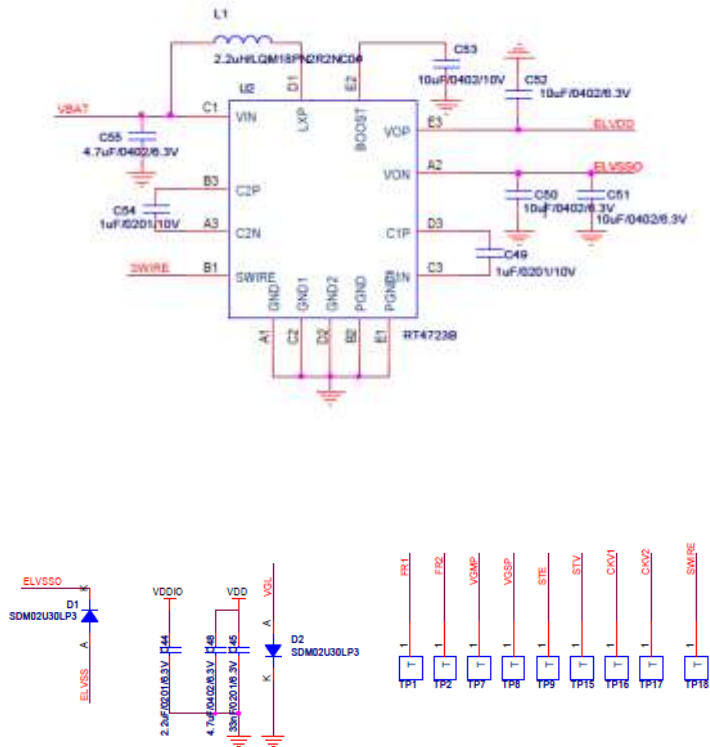
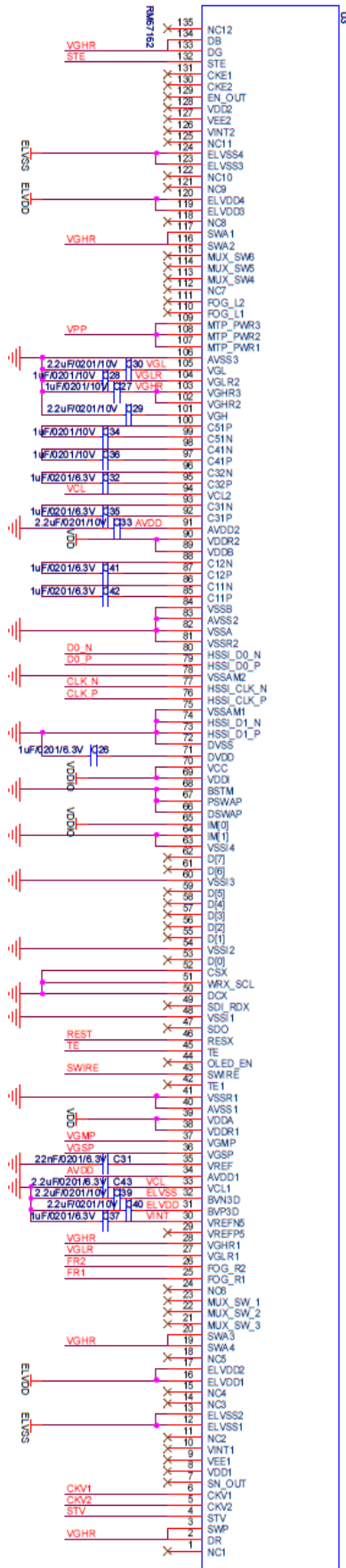
Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Deep Standby	IVCI	-	-	2	uA	-
	IVDDIO	-	-	1	uA	-

6.1.2 Inter face pin layout



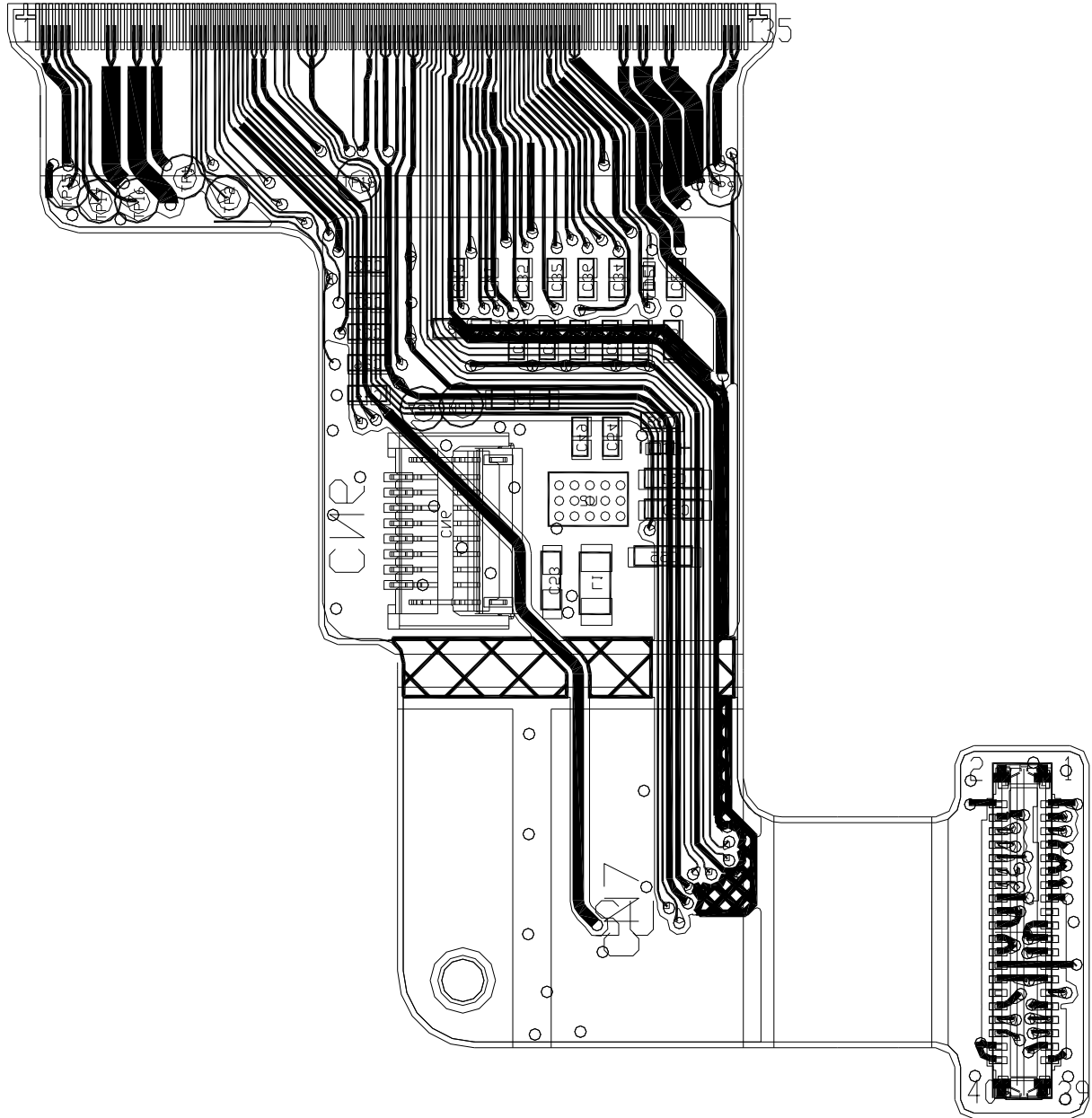


6.1.3 FPC 原理图



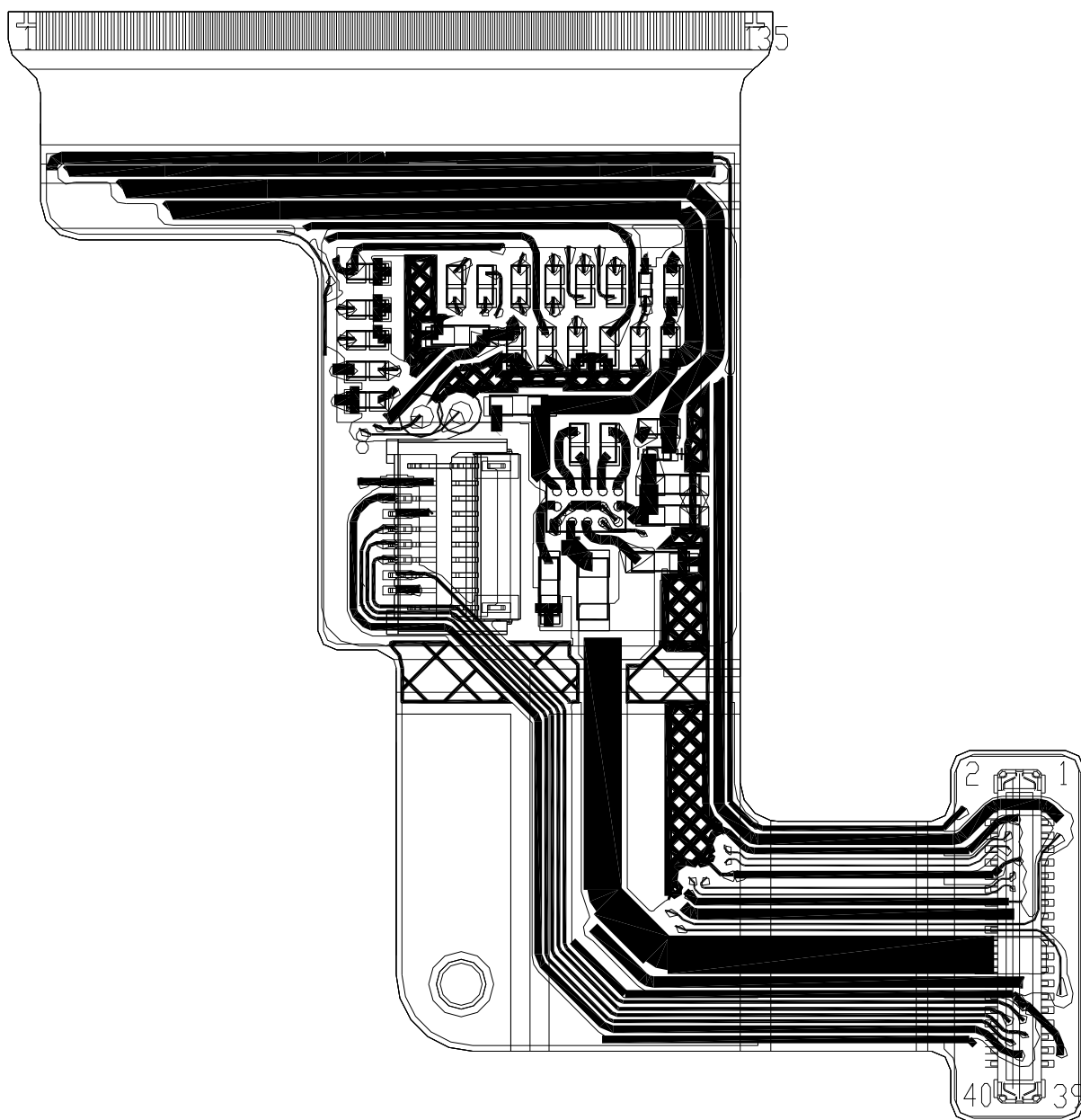
6.1.4 FPC Layout

TOP

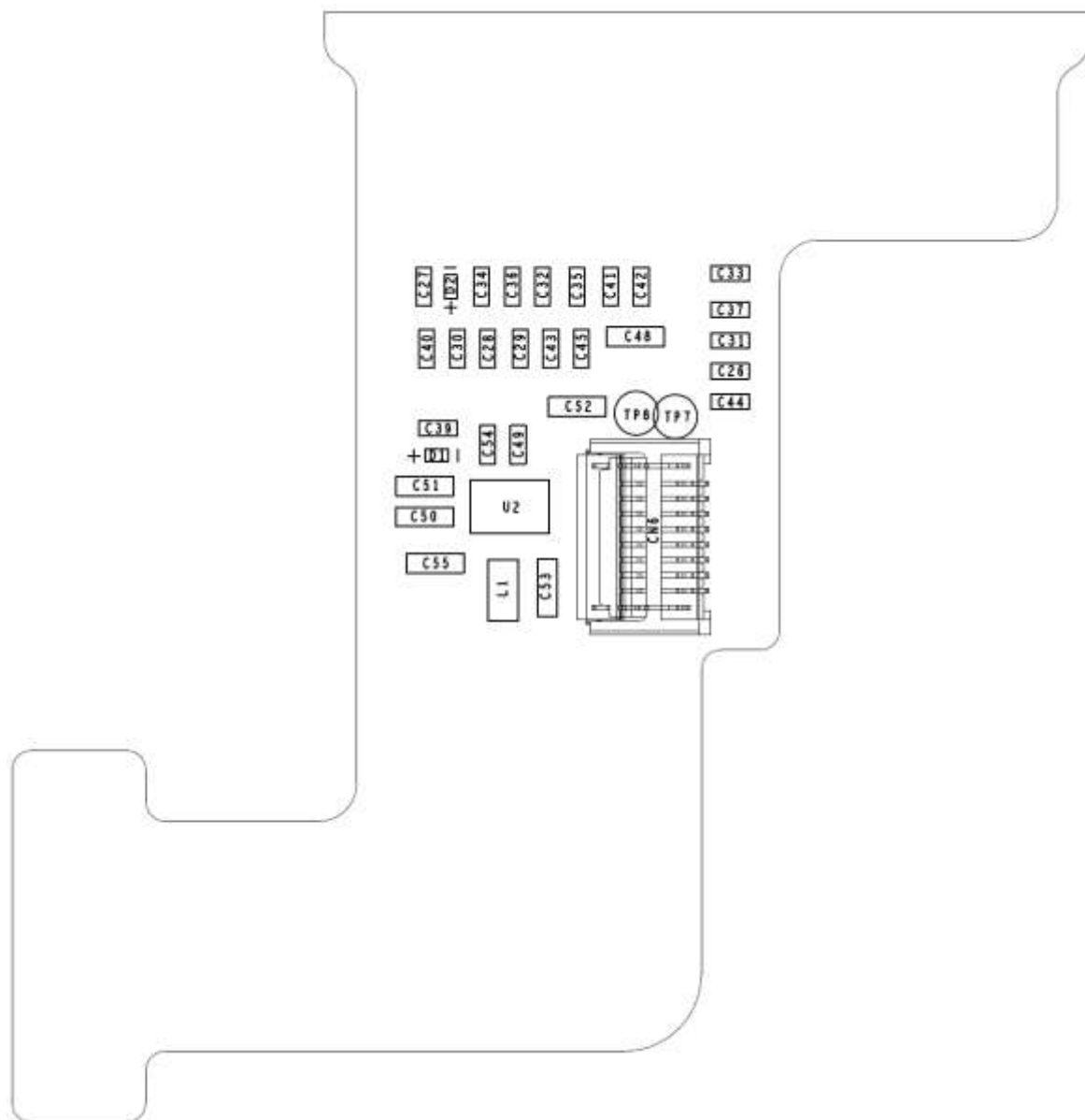




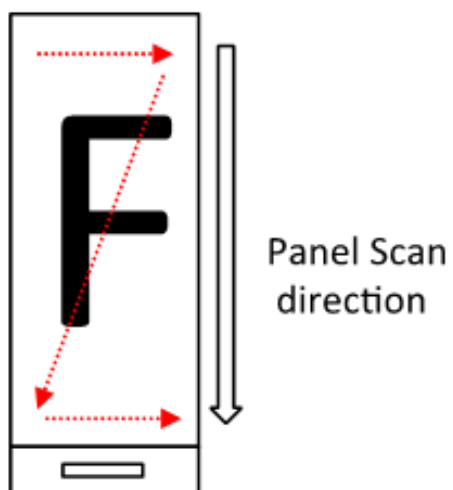
Bottom



元器件位置图



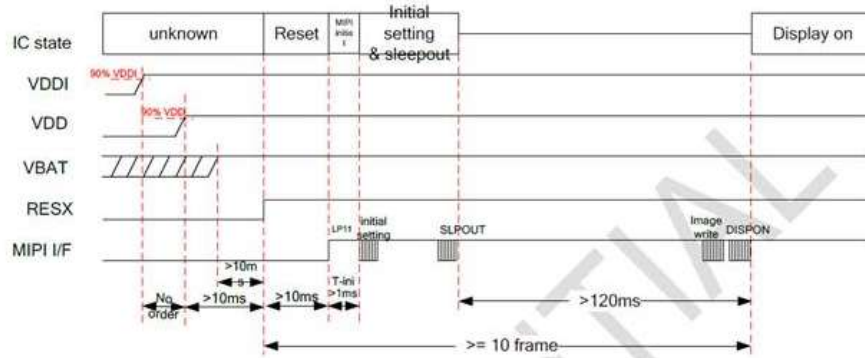
6.1.5 Graphic memory writing direction



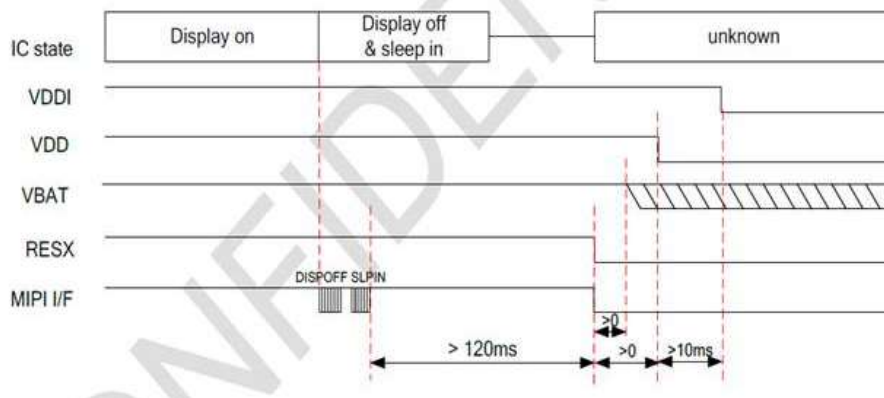


6.2 Recommended Operating Sequence

6.2.1 Power on sequence



6.2.2 Power off sequence





6.3 Initial code (客户平台)

RM67162-MEIZU-QVA2-VO4				
1. Power On Sequence				
W/R	Type	Register	Parameter	Description
				Turn on VDDIO
				Delay (No Limit)
				Turn on VCI
				Delay (No Limit)
				Turn on VBAT
				Delay >10ms
				Reset pin high
				Delay >10ms
				MIPI初始化
				Delay >1ms
w	0x15	0xFE	0x04	PAGE 3
w	0x15	0x6A	0x00	
w	0x15	0xFE	0x05	设定Page 4
w	0x15	0x05	0x00	ovss: -2.4 (根据power调整)
w	0x15	0xFE	0x07	Page6
w	0x15	0x07	0x4F	
w	0x15	0xFE	0x01	Page 0
w	0x15	0x2A	0x02	
w	0x15	0x2B	0x73	
w	0x15	0xFE	0x0A	Page9
w	0x15	0x29	0x10	
w	0x15	0xFE	0x00	设定user command
w	0x15	0x35	0x00	
w	0x15	0x51	0x00	2017/4/25在V04版上新增此行代码 (Only for 客户平台端), 即先设定亮度到最低
w	0x15	0x11	sleep out	
				Delay >120ms
w	0x15	0x29	display on	
2. Power Off Sequence				
W/R	Type	Register	Parameter	Description
w	0x15	0x28	0x00	Display Off
w	0x15	0x10	0x00	Sleep in
				Delay >120ms
				Reset pin low
				Dealy >0ms
				Turn off VBAT
				Delay >10ms
				Turn off VCI& VDDIO
3. Sleep In				
W/R	Type	Register	Parameter	Description
w	0x15	0x28	0x00	Display Off
w	0x15	0x10	0x00	Sleep in
				Delay >120ms
4. Sleep Out				
W/R	Type	Register	Parameter	Description
w	0x15	0x11	0x00	Sleep Out
				Delay >120ms
w	0x15	0x29	0x00	Display On

5. Idle mode In

W/R	Type	Register	Parameter	Description
w	0x15	0xFE	0x00	
w	0x15	0x39	0x00	Idle In

6. Idle mode Out

W/R	Type	Register	Parameter	Description
w	0x15	0xFE	0x00	
w	0x15	0x38	0x00	Idle Out

7. Deep standby In

W/R	Type	Register	Parameter	Description
w	0x15	0x4F	0x01	Pull CLK_P/N & D0_P/N to GND

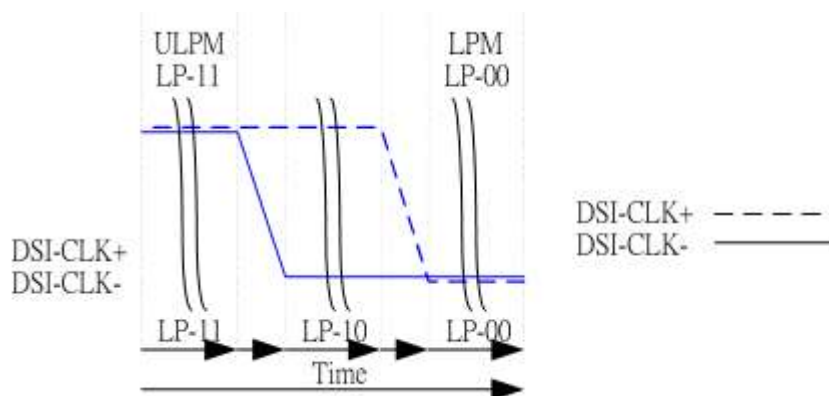
8. Deep standby Out

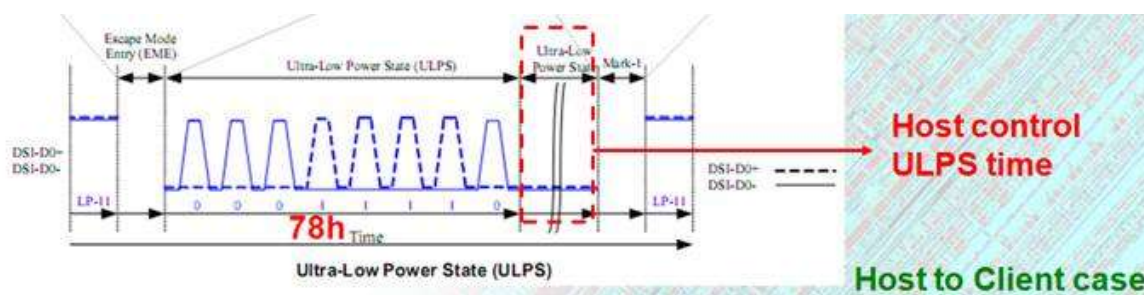
W/R	Type	Register	Parameter	Description
				Rset pin low
Delay >3ms				
				Rset pin high
				Power on Sequence

Note1: 进入 deep standby 之前不需要先进入 sleep in，下完 4F 01 即可把 MIPI CLK 和 Data 拉低，没有 delay 要求，进入 deep standby 之后 Reset 仍然是 high，VDDIO, VCI, Vbat 都不需要断开，进入 Deep Standby 的 Reset 前后变化图示：



Note2: 进入 ULPS 图示：





6.4 ID code request

	D7	D6	D5	D4	D3	D2	D1	D0	Remark
ID1	P17	P16	P15	P14	P13	P12	P11	P10	Read DAhRegister
ID2	P27	P26	P25	P24	P23	P22	P21	P20	Read DBh Register
ID3	P37	P36	P35	P34	P33	P32	P31	P30	Read DCh Register

ID1: Production code

P17-P16 Manufacture code

00: for EDO

01: for DPT

P15-P10 Production date

000000: Sample stage

000001: MP 1st week

000010: MP 2nd week

111111: MP 63th week

Serial number should be relate to ID1.

Note: a. MP 量产的第一周编码为 01 周

b. 若下一周(编码对应 02 周)没有生产, 则相应的周别码失效

c. 若下下周(编码对应 03 周)有生产, 则相应的周别码烧录成 03 周

ID2: Revision code

P27-P26 Factory code

Supplier proposal

P25 Sample stage

0: sample

1: MP

P24-20 Revision code

ID3: device information code

P37-P30 Production date

0000 1111: Line5(G2.5)

0000 1101: Line2(G3.5)

ID 变更管控 list:



Item	管控原因/项目	FPC上标记Mark	ID管控Code	管控数量	备注
1	200pcs不倒角专用UI (不倒角+New FPC) a. 烧录的ID code 为在0xDCh (ID3) 的值为0x0E b. 模组FPC钢片上写“E”标示, 外箱用A4纸标示“200PCS不切斜边管控批”字样		0xDCh (ID3) 的值为0x0E	200	1/13接MEIZU RD育丁通知1. 2K及后续产品色坐标变更 (Wx由0.30变更为0.295 Wy由0.31变更为0.315)
2	背面无Rear Tape泡棉的产品15pcs	NA	专用UI进行管控: 0xDCh (ID3) 的值为0x01, 包装上标注“无背胶”字样	15	昆山龙飞光电有限公司李鹏 昆山市综合保税区新巷路68号 手机: 18606207975/18361923730 (公司) 邮箱: bill.li@vicsz.com 顺丰快递单号: 925037499671
3	不要贴IC处的两个填充泡棉		专用UI进行管控: 0xDCh (ID3) 的值为0x02, 请在包装上标注“无填充泡棉”字样	97	惠州市惠阳区秋长镇白石塘井村伯恩工业园 惠州伯恩: PM伍勋焕收 (13430914885) 顺丰快递单号: 925037499680
4	整机开机黑屏验证 (方案1使用攔檢設定(調降治具前端驅動能力 LPTXDS[2:0]=000)做攔檢)		1. 外箱标识“黑屏拦检品” 2. 内包装/密封真空袋上标识“黑屏拦检品” 3. ID1->4C	40K	8/18 出货伯恩5040pcs 8/21 出货伯恩25200pcs 8/23 出货伯恩9740pcs 8/25~8/28其中22080pcs出货魅力
5	整机开机黑屏验证 (方案:IC出货- CP做Trim LPBIAS=11 燒錄)		1. 外箱标识“新IC验证批”、 2. 内包装/密封真空袋上标识“新IC验证批” 3. ID3使用0A	704	10/24出货伯恩, 10/25伯恩收到
6	转大线ID区分	NA	ID1: 00: for EDO 01: for DPT ID3: 0000 1111: Line5 (G2.5) 0000 1101: Line2 (G3.5)	Running change	Running change

7 Electro-Optical Specification

Optical characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Contrast Ratio	CR0	$\theta=0\text{deg.}$	10000	-	-	-	
Brightness ($\phi 12:00, 3:00, 6:00, 9:00$)	Br0	$\theta=0\text{deg.}$	315	350	385	cd/m2	
	Br45	$\theta=45\text{deg.}$	115	150	-		
NTSC Ratio	S0	$\theta=0\text{deg.}$	95	105	-	%	ICE1931
Adobe cover Ratio	S0R	ICE1931	92	100	-	%	Note 1
Color Temp	T		7000	7800	8600	K	
White chromaticity	X	$\theta=0\text{deg}$	0.275	0.295	0.315	-	
	Y	$\theta=0\text{deg}$	0.295	0.315	0.335		
Red chromaticity	X	$\theta=0\text{deg}$	0.635	0.665	0.695		
	Y	$\theta=0\text{deg}$	0.304	0.334	0.364		

Green chromaticity	X	-	$\theta=0\text{deg}$	0.18	0.22	0.26		
	Y	-	$\theta=0\text{deg}$	0.68	0.72	0.76		
Blue chromaticity	X	-	$\theta=0\text{deg}$	0.11	0.14	0.17		
	Y	-	$\theta=0\text{deg}$	0.01	0.04	0.07		
Brightness Uniformity			$\theta=0\text{ deg. Condition 1}$	90	-	-		Note 2
Color Uniformity		$\Delta u'$	$\theta=0\text{ deg. Condition 1}$	-	-	0.007	$\Delta u'$	Note 2
		$\Delta v'$				0.007	$\Delta v'$	
Crosstalk			-	-	-	4	%	Note 3
White Gamma		-	$\theta=0\text{ deg.}$	2.0	2.2	2.4		
White color shift		WAD	G255, 0 to 45 deg.	-	-	0.022	$\Delta u'v'$	Note 4
Flicker		-	60Hz, Worst pattern	-	-30	-	dB	
			30Hz, Worst pattern		-25		dB	
			15Hz, Worst pattern		-25		dB	

Measurement method.

Measurements condition as below, if not otherwise specified.

Include touch panel, OCA and Cover glass

Room temp: 25°C, Frame frequency=60Hz

Image Enhancement :OFF

Measurement points: Display center, $\theta=0\text{ deg.}$

Measurement instrument:

Uniformity & Crosstalk CS2000,

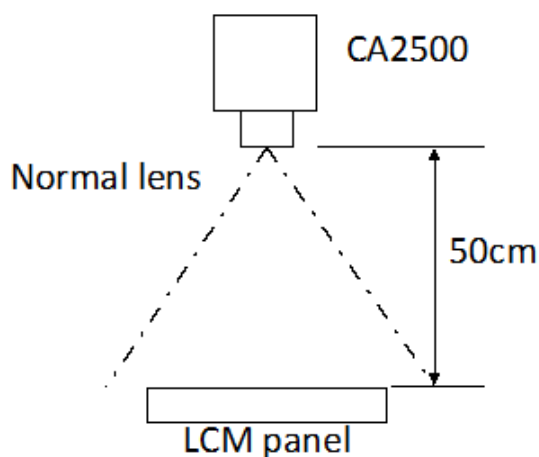
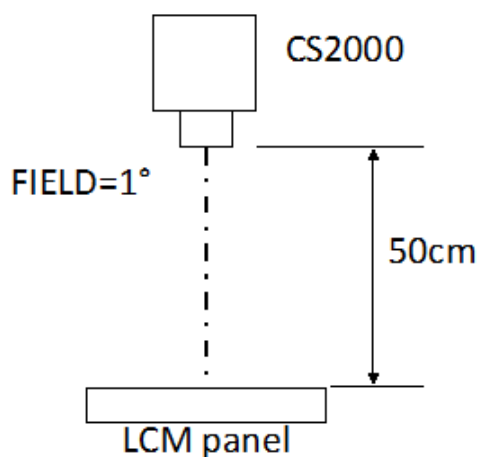
Flicker&Gamma CA310.

Other items CS2000 or CA310.

CS2000:To be measured on the center area of Panel with a viewing cone of 1° by luminance mater, after 15min operation

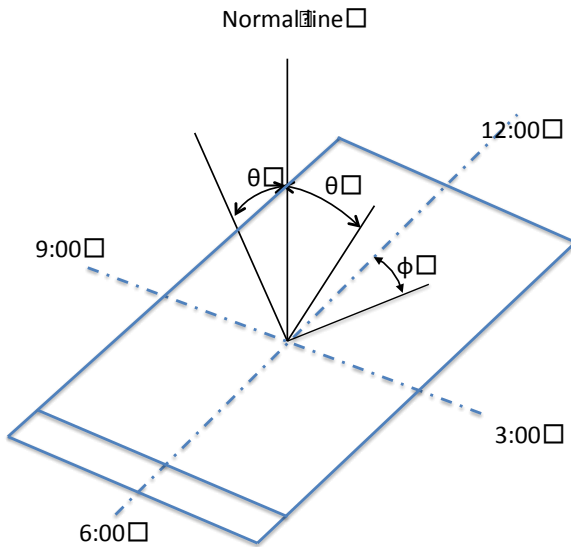
CA2500:To be measured on the Active area of Panel with a viewing cone of 35pixel/circle by luminance mater, after 15min operation

CA310: To be measured on "CA-P32/35" Probe





[Viewing angle]



Note1) Define of Adobe cover ratio

Green: RGB color chromaticity of this module

Rad : RGB color chromaticity of Adobe RGB

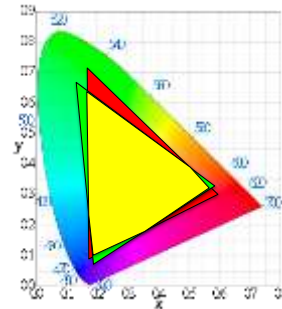
R: x0.64, y0.330

G: x0.21, y0.71

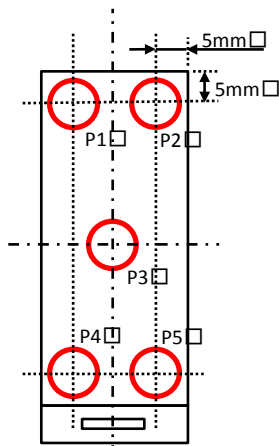
B: x0.15, y0.06

Yellow : The area where red and yellow are piled

Adobe RGB cover Ratio = Yellow / Rad *100[%]



Note2) Define of Brightness uniformity and Color uniformity



$$\text{Brightness uniformity} = \frac{\text{Minimum value}[P1:P5]}{\text{Maximum value}[P1:P5]}$$

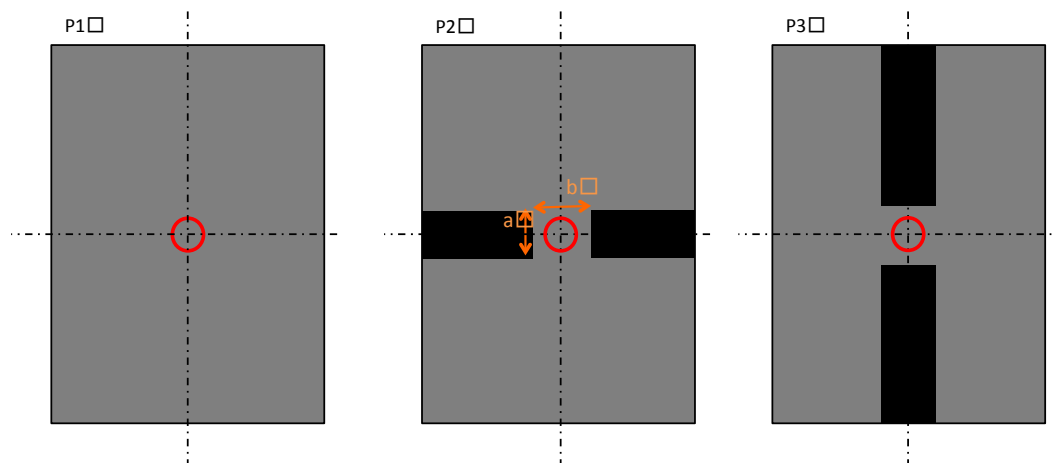
$$\text{Color uniformity} = \text{Maximum value}[P1:P5] - \text{Minimum value}[P1:P5]$$

Note3) Define of crosstalk

Base color : V127

Measurement area (a,b) : 144dots*144dots

Bar color : white, red, green, blue, Black.



$$\text{Cross talk ratio P2} = \frac{|P1-P2|}{P1}$$

$$\text{Cross talk ratio P3} = \frac{|P1-P3|}{P1}$$

Cross talk ratio : maximum value of cross talk P2 and P3

Note4) Define of White color shift

White color shift is Maximum value of Color shift WADu' and Color shift WADv'

$$WADu' = |u'_{0} - u'_{45}|$$

$$WADv' = |v'_{0} - v'_{45}|$$

$$\Delta u'v' = \sqrt{WADu'^2 + WADv'^2}$$

u'_{0}, v'_{0} : white color chromaticity at $\Theta=0\text{deg}$

u'_{45}, v'_{45} : white color chromaticity at $\Theta=45\text{deg}$ * (φ =all angle)

8 Life Time

Parameter	Symbol	Conditions	Min.	Center	Max	Unit	Remark
Life time (1)		Frame rate =60Hz	93	-	-	%	Note 1
Life time (2)		Frame rate =15Hz Brightness 50nit	98			%	
		Frame rate =30Hz Brightness 50nit					
Image sticking time		Frame rate =60Hz Brightness 350nit	24	-	-	h	Note 2
Image sticking time		Frame rate =30 or 15Hz Brightness 50nit	48			h	

Note1. Define Life time

The brightness after 240h

Room Temp : 25°C

Test pattern : all white

Life time = Center Brightness of after 240h / Center Brightness initial value *100[%]

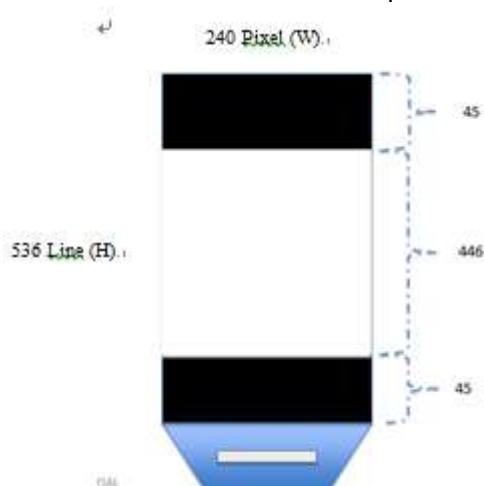
Note2. Define image sticking time

Time before 1% of brightness down from an initial value.

Room Temp. : 45°C

Test pattern : Base color is Black

Box color is Worst case pattern

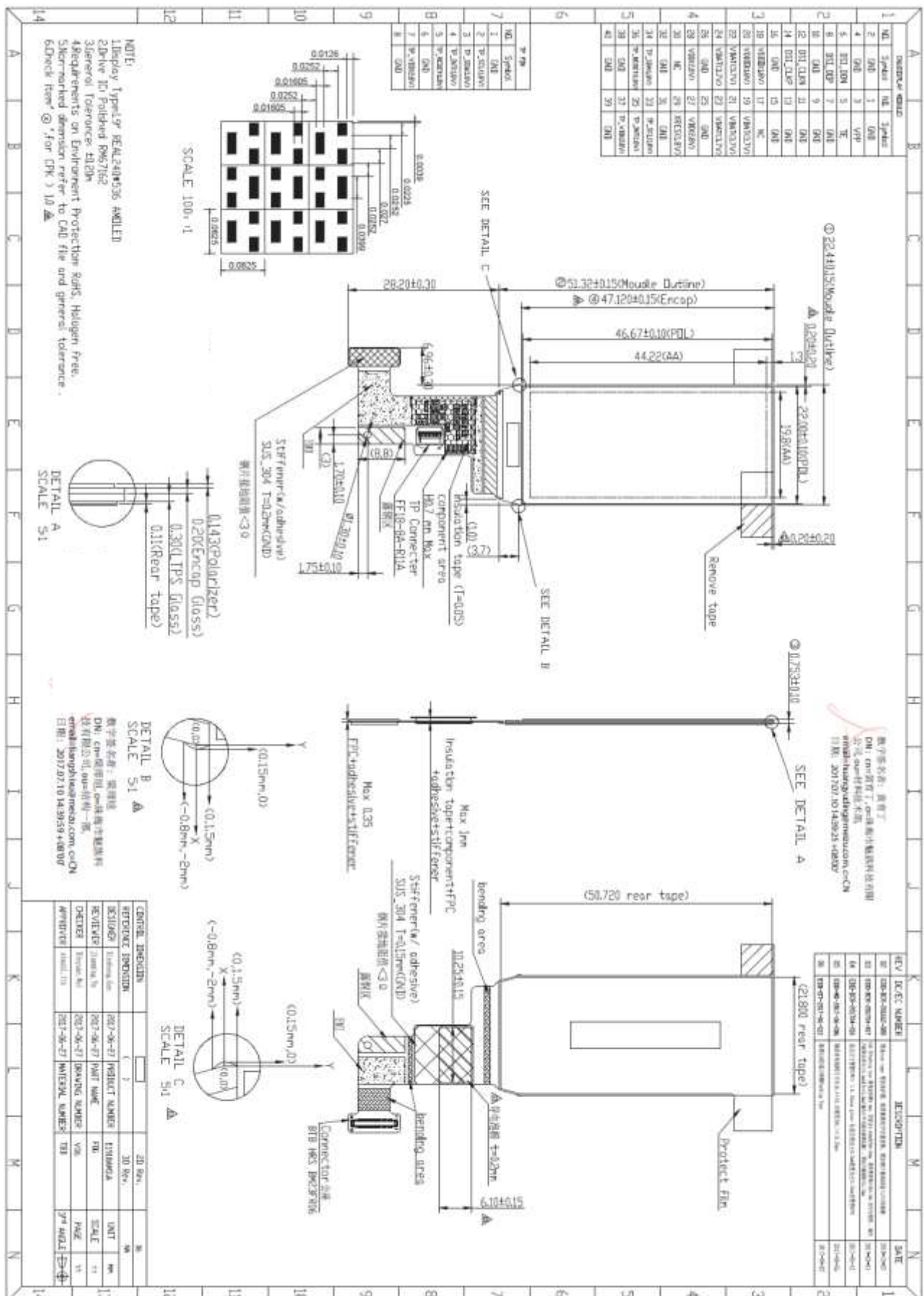


9 Reliability

Follow 魅族显示模组检验规范 OLED 小屏单体 -20170314-V2.0 MP 版。

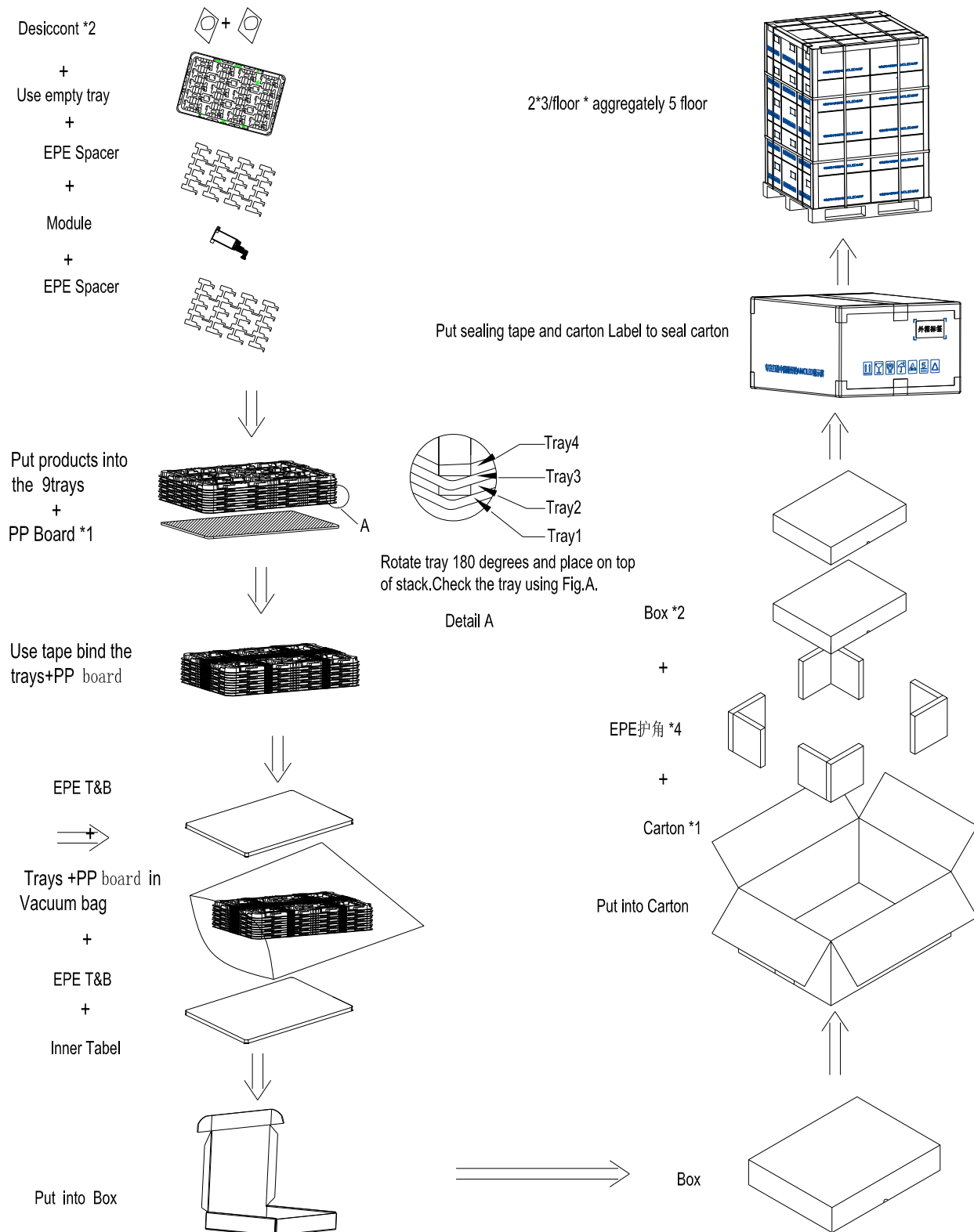


10 Outline Dimension Drawing





11 Packing Specification





12 附表

附表 1: Initial code

Initial code (客户平台)

RM67162-MEIZU-QVA2-V04				
1. Power On Sequence				
W/R	Type	Register	Parameter	Description
				Turn on VDDIO
				Delay (No Limit)
				Turn on VCI
				Delay (No Limit)
				Turn on VBAT
				Delay >10ms
				Reset pin high
				Delay >10ms
				MIPI初始化
				Delay >1ms
w	0x15	0xFE	0x04	PAGE 3
w	0x15	0x6A	0x00	
w	0x15	0xFE	0x05	设定Page 4
w	0x15	0x05	0x00	ovss: -2.4 (根据power调整)
w	0x15	0xFE	0x07	Page6
w	0x15	0x07	0x4F	
w	0x15	0xFE	0x01	Page 0
w	0x15	0x2A	0x02	
w	0x15	0x2B	0x73	
w	0x15	0xFE	0x0A	Page9
w	0x15	0x29	0x10	
w	0x15	0xFE	0x00	设定user command
w	0x15	0x35	0x00	
w	0x15	0x51	0x00	2017/4/25在V04版上新增此行代码 (Only for 客户平台端), 即先设定亮度到最低
w	0x15	0x11	sleep out	
			Delay >120ms	
w	0x15	0x29	display on	

HFP	20	VFP	20
HBP	40	VBP	12
HPW	20	VPW	4
HPX	240	VPX	536

HAA	HBP+HPX	VAA	VBP+VPX
HAL	HFP+HBP+HPX	VAL	VFP+VBP+VPX



2. Power Off Sequence

W/R	Type	Register	Parameter	Description
w	0x15	0x28	0x00	Display Off
w	0x15	0x10	0x00	Sleep in
Delay >120ms				
Reset pin low				
Dealy >0ms				
Turn off VBAT				
Delay >10ms				
Turn off VCI& VDDIO				

3. Sleep In

W/R	Type	Register	Parameter	Description
w	0x15	0x28	0x00	Display Off
w	0x15	0x10	0x00	Sleep in
Delay >120ms				

4. Sleep Out

W/R	Type	Register	Parameter	Description
w	0x15	0x11	0x00	Sleep Out
Delay >120ms				
w	0x15	0x29	0x00	Display On

9. Idle mode In

R/W	Type	Register	Parameter	Description
w	0x15	0xFE	0x00	
w	0x15	0x39	0x00	Idle In

10. Idle mode Out

R/W	Type	Register	Parameter	Description
w	0x15	0xFE	0x00	
w	0x15	0x38	0x00	Idle Out

11. Deep standby In

R/W	Type	Register	Parameter	Description
w	0x15	0x4F	0x01	
Pull CLK_P/N & D0_P/N to GND				

12. Deep standby Out

R/W	Type	Register	Parameter	Description
Rset pin low				
Delay >3ms				
Rset pin high				
Power on Sequence				

Initial code (OTP 全代码)

R/W	Data Type	Reg. hex.	Data hex.	NOTE
w	0x15	0xFE	0x04	Page 3
w	0x15	0x00	0xDC	



w	0x15	0x01	0x00	
w	0x15	0x02	0x02	
w	0x15	0x03	0x00	
w	0x15	0x04	0x00	
w	0x15	0x05	0x03	
w	0x15	0x06	0x16	
w	0x15	0x07	0x13	
w	0x15	0x08	0x08	
w	0x15	0x09	0xDC	
w	0x15	0x0A	0x00	
w	0x15	0x0B	0x02	
w	0x15	0x0C	0x00	
w	0x15	0x0D	0x00	
w	0x15	0x0E	0x02	
w	0x15	0x0F	0x16	
w	0x15	0x10	0x18	
w	0x15	0x11	0x08	
w	0x15	0x1B	0xDC	
w	0x15	0x1C	0x00	
w	0x15	0x1D	0x04	
w	0x15	0x1E	0x00	
w	0x15	0x1F	0x00	



w	0x15	0x20	0x03	
w	0x15	0x21	0x16	
w	0x15	0x22	0x18	
w	0x15	0x23	0x08	
w	0x15	0x24	0xDC	
w	0x15	0x25	0x00	
w	0x15	0x26	0x04	
w	0x15	0x27	0x00	
w	0x15	0x28	0x00	
w	0x15	0x29	0x01	
w	0x15	0x2A	0x16	
w	0x15	0x2B	0x18	
w	0x15	0x2D	0x08	
w	0x15	0x43	0x08	
w	0x15	0x44	0x00	
w	0x15	0x45	0x00	
w	0x15	0x46	0x00	
w	0x15	0x47	0x00	
w	0x15	0x48	0x00	
w	0x15	0x49	0x00	
w	0x15	0x4A	0x00	
w	0x15	0x4B	0x00	



w	0x15	0x4C	0x99	
w	0x15	0x4D	0x00	
w	0x15	0x4E	0x00	
w	0x15	0x4F	0x00	
w	0x15	0x50	0x01	
w	0x15	0x51	0x0A	
w	0x15	0x52	0x00	
w	0x15	0x53	0xde	
w	0x15	0x54	0x40	
w	0x15	0x55	0x02	
w	0x15	0x56	0x16	
w	0x15	0x58	0xD7	
w	0x15	0x59	0x01	
w	0x15	0x5A	0xE4	
w	0x15	0x5E	0x97	
w	0x15	0x5F	0x43	
w	0x15	0x60	0x77	
w	0x15	0x61	0x18	
w	0x15	0x62	0x70	
w	0x15	0x65	0x6E	
w	0x15	0x66	0x69	
w	0x15	0x67	0x00	



w	0x15	0x6A	0x00	
w	0x15	0x6C	0x04	
w	0x15	0x6D	0x02	
w	0x15	0x6F	0x00	
w	0x15	0x70	0x25	
w	0x15	0x71	0x05	
w	0x15	0x72	0x6D	
w	0x15	0xFE	0x05	Page 4
w	0x15	0x05	0x00	
w	0x15	0x51	0x83	
w	0x15	0x52	0xC4	
w	0x15	0x53	0x04	
w	0x15	0x54	0x02	
w	0x15	0x55	0xA8	
w	0x15	0x56	0x10	
w	0x15	0x57	0x04	
w	0x15	0x58	0x41	
w	0x15	0x59	0x02	
w	0x15	0x5A	0x8E	
w	0x15	0x5B	0x02	
w	0x15	0x5C	0x20	
w	0x15	0x5D	0x86	



w	0x15	0x5E	0xC0
w	0x15	0x5F	0x06
w	0x15	0x60	0x10
w	0x15	0x61	0xA6
w	0x15	0x62	0x02
w	0x15	0x63	0x04
w	0x15	0x64	0x02
w	0x15	0x65	0x01
w	0x15	0x66	0x80
w	0x15	0x67	0x00
w	0x15	0x68	0x26
w	0x15	0x69	0x48
w	0x15	0x6A	0x06
w	0x15	0x6B	0x04
w	0x15	0x6C	0x48
w	0x15	0x6D	0x02
w	0x15	0x6E	0x00
w	0x15	0x6F	0x10
w	0x15	0x70	0x02
w	0x15	0x71	0x48
w	0x15	0x72	0xA0
w	0x15	0x73	0x08



w	0x15	0x74	0x04
w	0x15	0x75	0x01
w	0x15	0x76	0x90
w	0x15	0x77	0x02
w	0x15	0x78	0x96
w	0x15	0x79	0x62
w	0x15	0x7A	0x00
w	0x15	0x7B	0x82
w	0x15	0x7C	0xE0
w	0x15	0x7D	0x02
w	0x15	0x7E	0x04
w	0x15	0x7F	0x02
w	0x15	0x80	0x01
w	0x15	0x81	0x80
w	0x15	0x82	0x00
w	0x15	0x83	0x20
w	0x15	0x84	0xCE
w	0x15	0x85	0x04
w	0x15	0x86	0x04
w	0x15	0x87	0x02
w	0x15	0x88	0x41
w	0x15	0x89	0x02



w	0x15	0x8A	0x10
w	0x15	0x8B	0x90
w	0x15	0x8C	0x60
w	0x15	0x8D	0x88
w	0x15	0x8E	0x02
w	0x15	0xAC	0x09
w	0x15	0xAD	0x04
w	0x15	0xAE	0x10
w	0x15	0xAF	0x90
w	0x15	0xB0	0x10
w	0x15	0xB1	0x08
w	0x15	0xB2	0x00
w	0x15	0xB3	0x10
w	0x15	0xB4	0xA0
w	0x15	0xB5	0x08
w	0x15	0xB6	0x04
w	0x15	0xB7	0x0A
w	0x15	0xB8	0x00
w	0x15	0xB9	0x08
w	0x15	0xBA	0x90
w	0x15	0xBB	0x20
w	0x15	0xBC	0x08



w	0x15	0xBD	0x04	
w	0x15	0xBE	0x02	
w	0x15	0xC2	0x03	
w	0x15	0xFE	0x07	Page 6
w	0x15	0x07	0x4F	
w	0x15	0xFE	0x01	Page 0
w	0x15	0x05	0x51	
w	0x15	0x06	0x86	
w	0x15	0x0E	0x89	
w	0x15	0x0F	0x89	
w	0x15	0x10	0x71	
w	0x15	0x11	0xB0	
w	0x15	0x12	0xB0	
w	0x15	0x14	0xA1	
w	0x15	0x15	0x82	
w	0x15	0x16	0x82	
w	0x15	0x18	0x77	
w	0x15	0x19	0x66	
w	0x15	0x1A	0x10	
w	0x15	0x1C	0x77	
w	0x15	0x1D	0x04	
w	0x15	0x1E	0x00	



w	0x15	0x25	0x02	
w	0x15	0x26	0x73	
w	0x15	0x2A	0x02	
w	0x15	0x2B	0x73	
w	0x15	0x30	0x43	
w	0x15	0x35	0x18	
w	0x15	0x36	0x11	
w	0x15	0x37	0x00	
w	0x15	0x3A	0x00	
w	0x15	0x3B	0x40	
w	0x15	0x3D	0x10	
w	0x15	0x3F	0x47	
w	0x15	0x40	0x10	
w	0x15	0x41	0x0B	
w	0x15	0x42	0x66	
w	0x15	0x43	0x33	
w	0x15	0x44	0x44	
w	0x15	0x45	0x11	
w	0x15	0x46	0x55	
w	0x15	0x47	0x22	
w	0x15	0x4C	0x66	
w	0x15	0x4D	0x33	



w	0x15	0x4E	0x44	
w	0x15	0x4F	0x11	
w	0x15	0x50	0x55	
w	0x15	0x51	0x22	
w	0x15	0x56	0x11	
w	0x15	0x58	0x44	
w	0x15	0x59	0x22	
w	0x15	0x5A	0x55	
w	0x15	0x5B	0x33	
w	0x15	0x5C	0x66	
w	0x15	0x61	0x11	
w	0x15	0x62	0x44	
w	0x15	0x63	0x22	
w	0x15	0x64	0x55	
w	0x15	0x65	0x33	
w	0x15	0x66	0x66	
w	0x15	0x6B	0x05	
w	0x15	0x6D	0x90	
w	0x15	0x6E	0x40	
w	0x15	0x70	0xA5	
w	0x15	0x72	0x04	
w	0x15	0x73	0x15	



w	0x15	0x74	0x0C	
w	0x15	0x75	0xF8	
w	0x15	0x76	0x90	
w	0x15	0xFE	0x02	Page 1
w	0x15	0x9B	0x10	
w	0x15	0x9C	0x90	
w	0x15	0x9D	0x20	
w	0x15	0xFE	0x0A	Page 9
w	0x15	0x29	0x10	
w	0x15	0xFE	0x00	User Command
w	0x15	0x35	0x00	enable TE
w	0x15	0x11		sleep out
delay 120ms				
w	0x15	0x29		display on



附表 2: QC Flow Chart

