



AMOLED

Product Specification

Model Name: E191AM8M0

Description: 1.91" (240x536) AMOLED

Doc. Version: 03

Customer: A61

- Approved for Preliminary Specification
- Approved for Final Specification
- Approved for Final Specification & Sample

Prepared	Checked	Approved
Teng Fei		

Customer's Approval



Contents

Contents 3

1 Scope..... 4

2 DEFINITION OF TERM..... 4

3 Features 5

 3.1 Product Applications..... 5

 3.2 Product Features 5

 3.3 Model Name: E191AM8M 5

4 Mechanical Specifications..... 5

5 Maximum Rating..... 5

6 Electrical Specifications..... 6

 6.1 Electrical Characteristics 6

 6.2 Recommended Operating Sequence 11

 6.3 Initial code 12

 6.4 ID code request..... 13

7 Electro-Optical Specification 14

8 Reliability..... 18

 8.1 Environmental Test..... 18

 8.2 Life Time 19

9 Outline Dimension Drawing 20

10 Packing Specification..... 21

More Display Panels On www.panoxdisplay.com



1 Scope

This Specification defines AMOLED manufactured by EverDisplay Optonics(Shanghai) Limited, from here on refer as EDO. In the case of any unspecified item, it may require both EDO and the party designs this module into its product to work out a solution.

2 DEFINITION OF TERM

Min.

Case of output value : The minimum value to occur by a mass production
Case of input value : The minimum vale 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 vale 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
 $\theta = 0\text{deg. to } 88\text{deg.}$
 $\phi = 0:00(12:00) \text{ to } 12:00. *360\text{degree.}$



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	

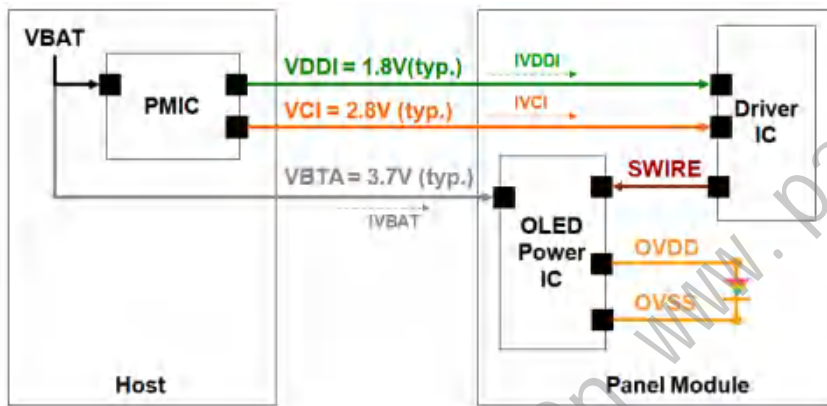
Power supply for Analog	VCI		-0.3	-	5.5	V	
-------------------------	-----	--	------	---	-----	---	--

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: $F_{frame}=60\text{HZ}$ @ 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: $F_{frame}=15\text{HZ}$ @ 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

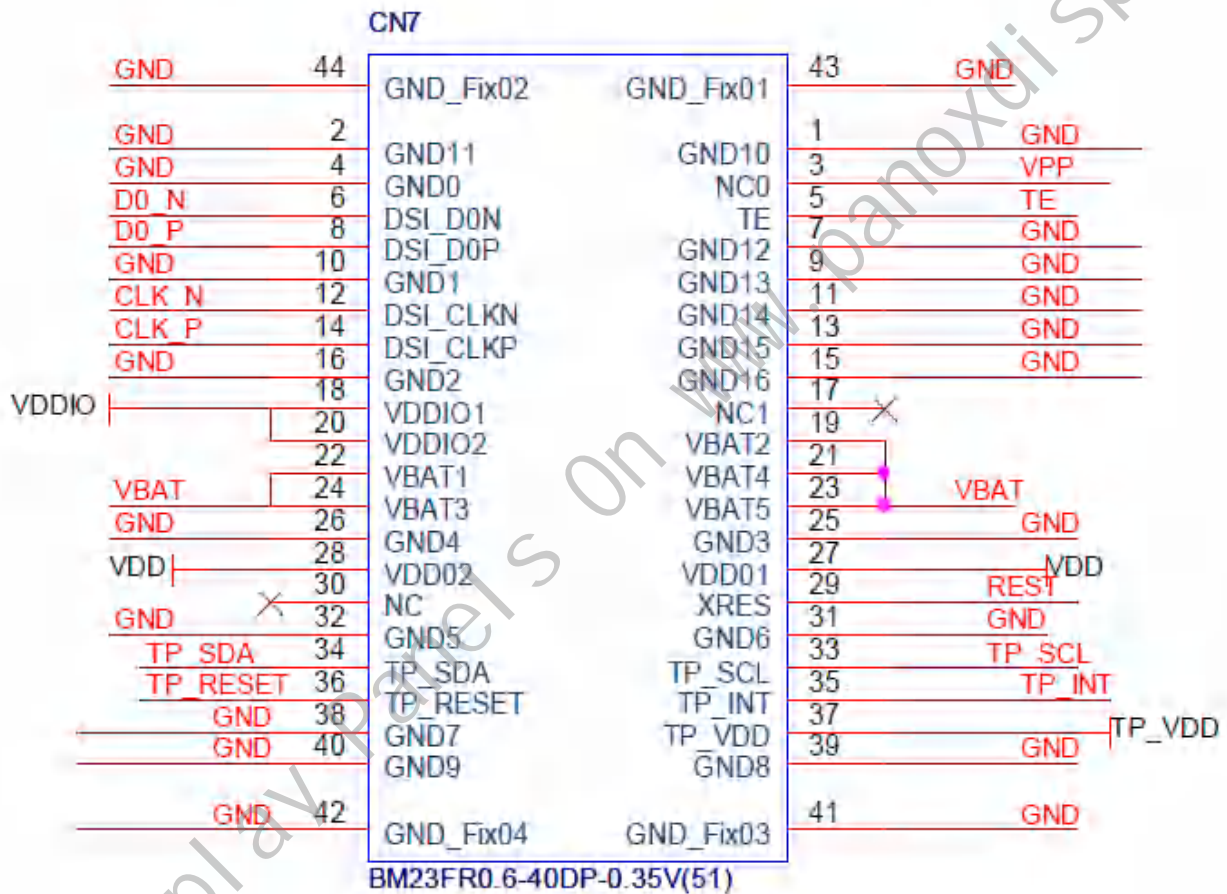


Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Sleep IN Mode	IVCI	-	0.25	0.30	mA	-
	IVDDIO	-	0.10	0.12	mA	-

1) Deep Standby Mode

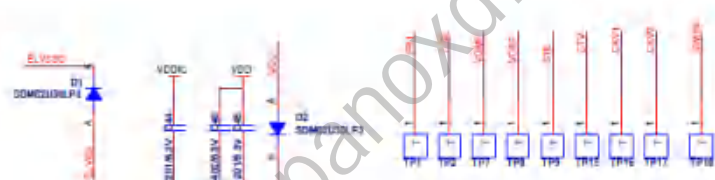
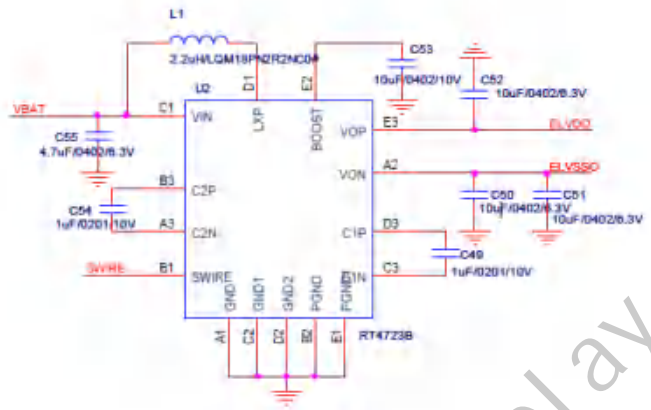
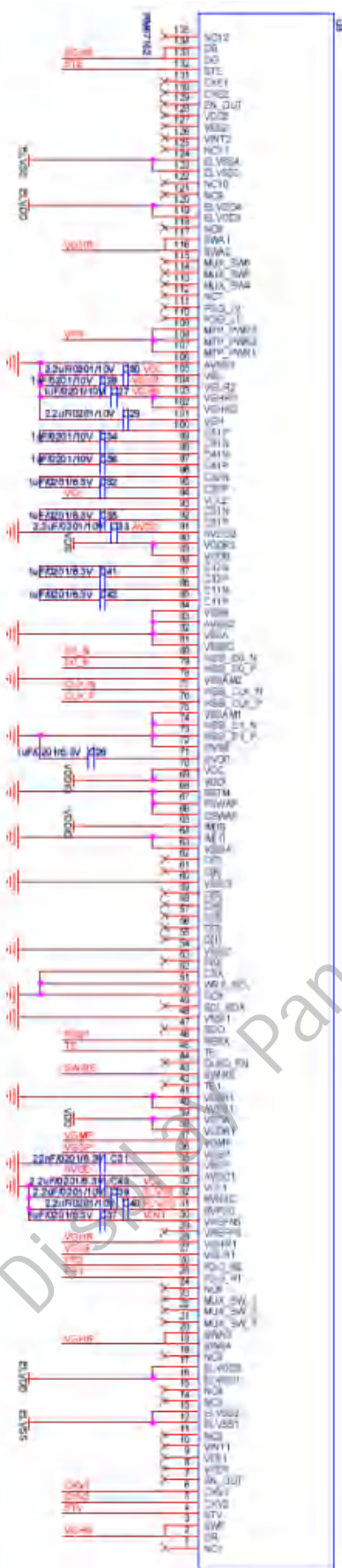
Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Deep Standby	IVCI	-	-	2	uA	-
	IVDDIO	-	-	1	uA	-

6.1.2 Inter face pin layout





6.1.3 FPC 原理图



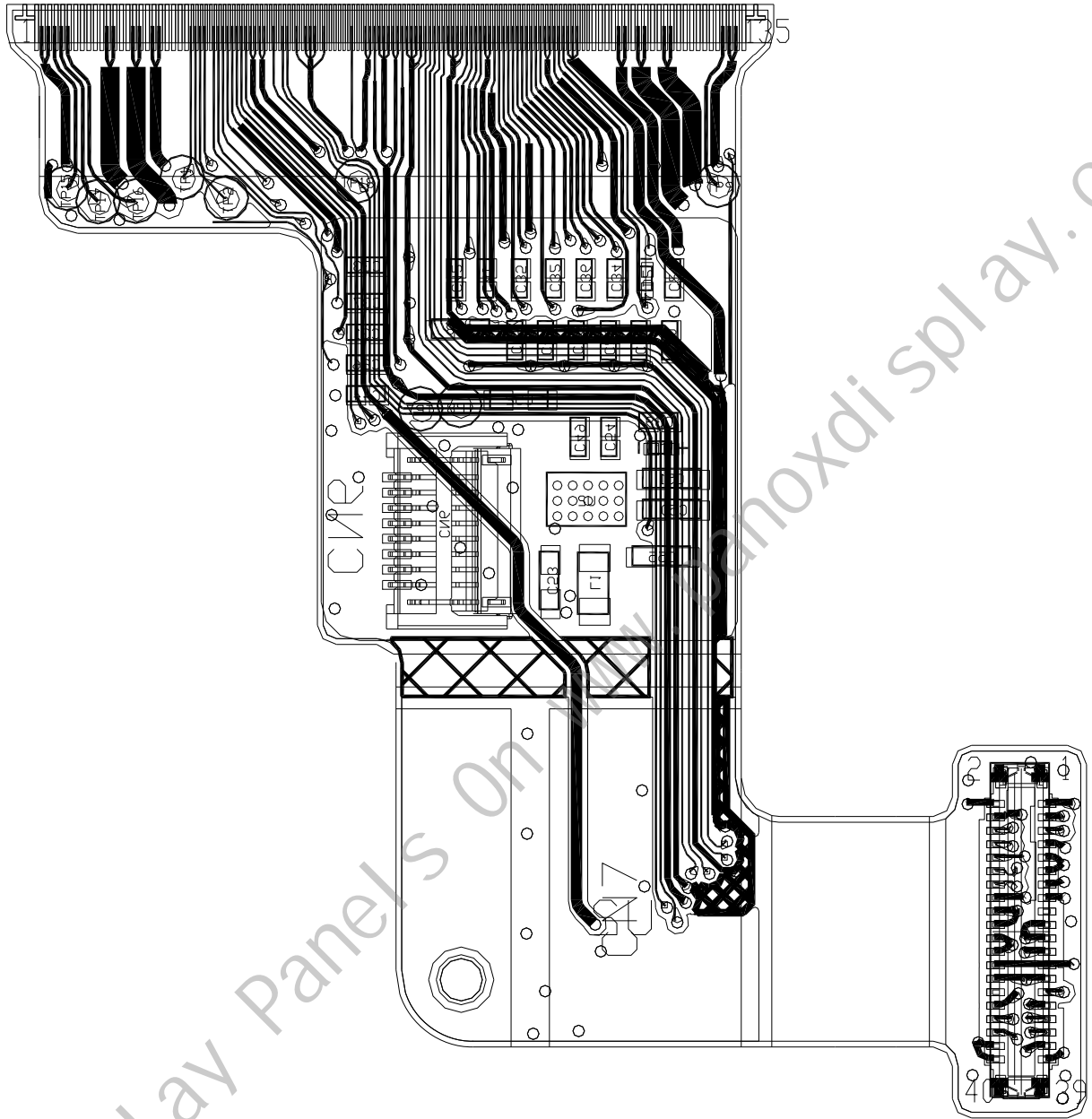
CN6	
GND	1
TP_SCL	2
TP_SDA	3
TP_INT	4
TP_RESET	5
GND	6
TP_VDD	7
GND	8

FF18-8A-R11A



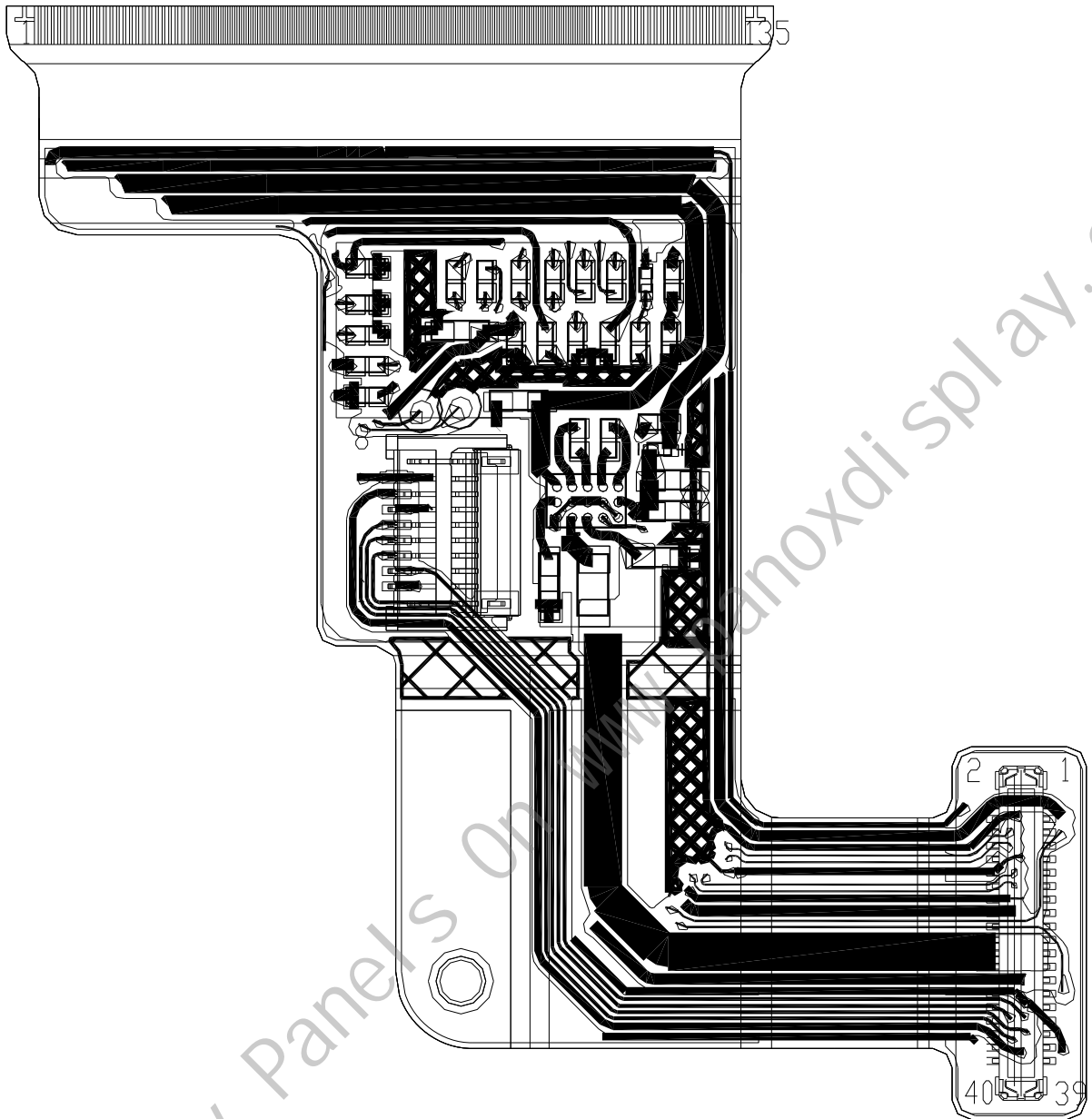
6.1.4 FPC Layout

TOP

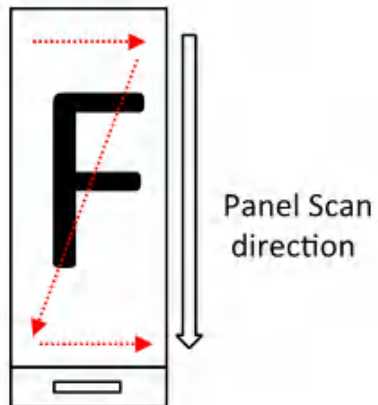




Bottom

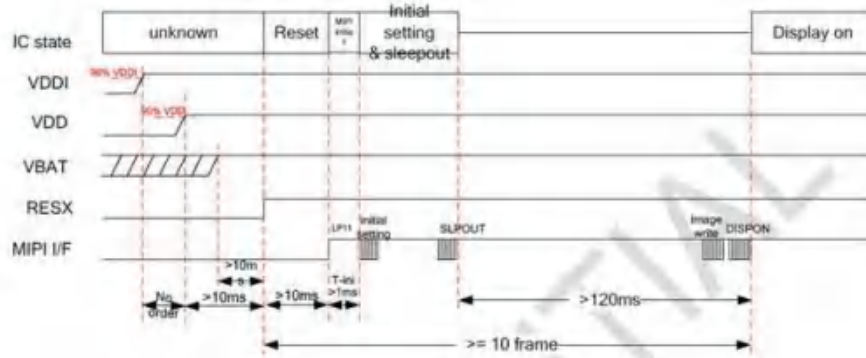


6.1.5 Graphic memory writing direction

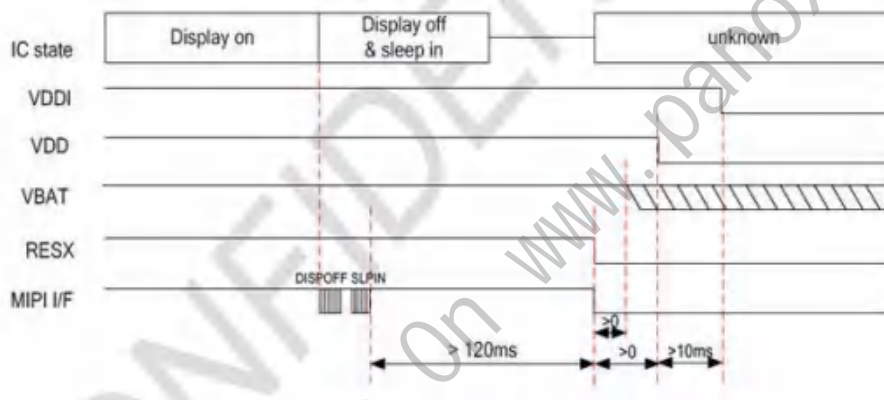


6.2 Recommended Operating Sequence

6.2.1 Power on sequence



6.2.2 Power off sequence





6.3 Initial code

RM67162-MEIZU-QVA2-V04				
R/W	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	0x79	
w	0x15	0xFE	0x0A	Page9
w	0x15	0x29	0x10	
w	0x15	0xFE	0x00	设定User command
w	0x15	0x35	0x00	
w	0x15	0x11		sleep out
				Delay >120ms
w	0x15	0x29		display on

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

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

4. Sleep Out				
R/W	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

Note: 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。

6.4 ID code request

	D7	D6	D5	D4	D3	D2	D1	D0	Remark
ID1	P17	P16	P15	P14	P13	P12	P11	P10	Read DAh Register
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

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:

- MP 量产的第一周编码为 01 周
- 若下一周(编码对应 02 周)没有生产, 则相应的周别码失效
- 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

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 不削治专用UI (不削治+New-FPC) a. 原来的ID code 为在 OxDCh (IDS) 的值为0x0E b. 模组FPC钢片上面“ E”标识, 外箱用A4纸标 示“200PCS不削治专 控机”字样		OxDCh (IDS) 的 值为0x0E	200	1/13款M11D 屏背了通知1.2K及后续 产品 值业特变更 (Wa由0.30变更为0.33E Wa去0.31变更为0.315)
2	背面无Rear Tape泡棉 的产品18pcs		专用UI进行管控, OxDCh (IDS) 的值为 0x01, 包装上标注“ 无背胶”字样	18	
3	不要贴IC处的两个填充 泡棉		专用UI进行管控, OxDCh (IDS) 的值为 0x02, 现在包装上标 注“无填充泡棉”字 样	91	

7 Electro-Optical Specification

Test condition: IOVCC=1.8V, VCI=2.8V, Ta=25°C

Item	Symbol	Condition	Value			Unit	Remark
			Min	Typ	Max		
Luminance (ϕ 12:00,3:00,6:00,9:00)	Br0	$\theta=0\text{deg.}$	315	350	385	cd/m ²	
	Br45	$\theta=45\text{deg.}$	95	105	-		
Uniformity			85	90	-	%	Note 2
Contrast Ratio	CR	$\theta=0^\circ$	10000	-	-	-	
Color Temp	T		7000	7800	8600		
Adobe cover Ratio	SOR	ICE1931	-	100	-	%	Note 1
Color Coordinate of CIE1931	Red	X	0.635	0.665	0.695	-	
		Y	0.304	0.334	0.364		
	Green	X	0.18	0.22	0.26		
		Y	0.68	0.72	0.76		
	Blue	X	0.11	0.14	0.17		
		Y	0.01	0.04	0.07		
	White	X	0.275	0.295	0.315		
		Y	0.295	0.315	0.335		
Color Uniformity	$\Delta u'$	$\theta=0\text{ deg. Condition 1}$	-	-	0.007	$\Delta u'$	Note 2
	$\Delta v'$				0.007	$\Delta v'$	
Flicker	-	60Hz, Worst pattern	-	-30	-	dB	
	-	30Hz, Worst pattern		-25		dB	
White Gamma	-	$\theta=0\text{ deg.}$	2.0	2.2	2.4		
Crosstalk		-	-	-	10	%	Note 3
White color shift	WAD	G255, 0 to 45 deg.	-	-	0.022	$\Delta u'v'$	Note 4

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, $\Theta=0$ deg.

Measurement instrument:

Uniformity CA2500,

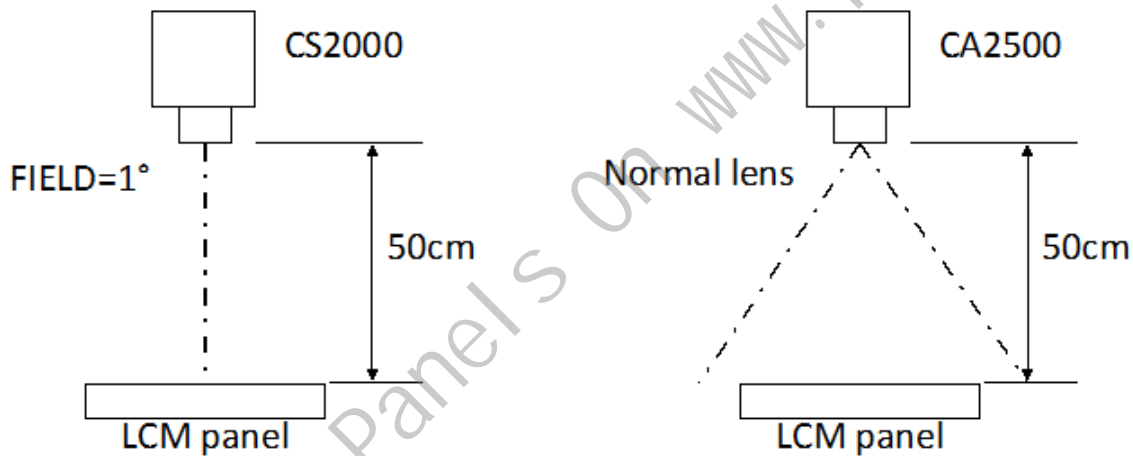
Flicker CA310 or equivalent device.

Other items CS2000

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

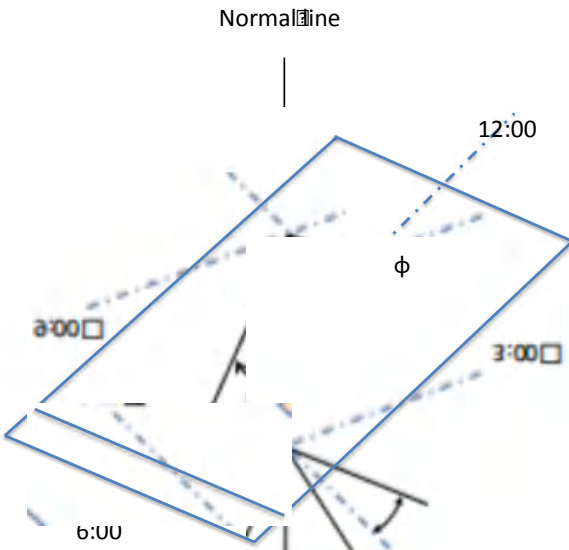
CA2500:To be measured on the Active area of Panel with a viewing cone of 35pixel/circle by luminance mater, after 15min operation

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

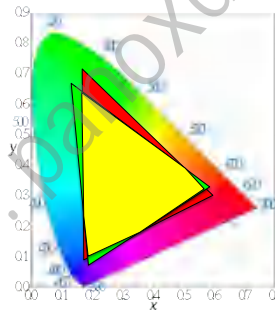
R: x0.64, y0.330

G: x0.21, y0.71

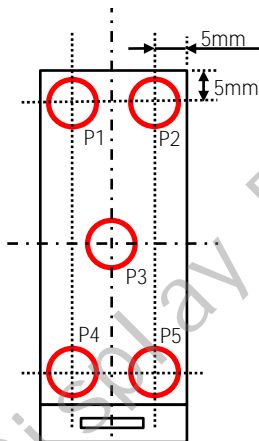
B: x0.15, y0.06

Yellow : The area where red and yellow are piled

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



Note2) Define of Brightness uniformity and Color uniformity



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

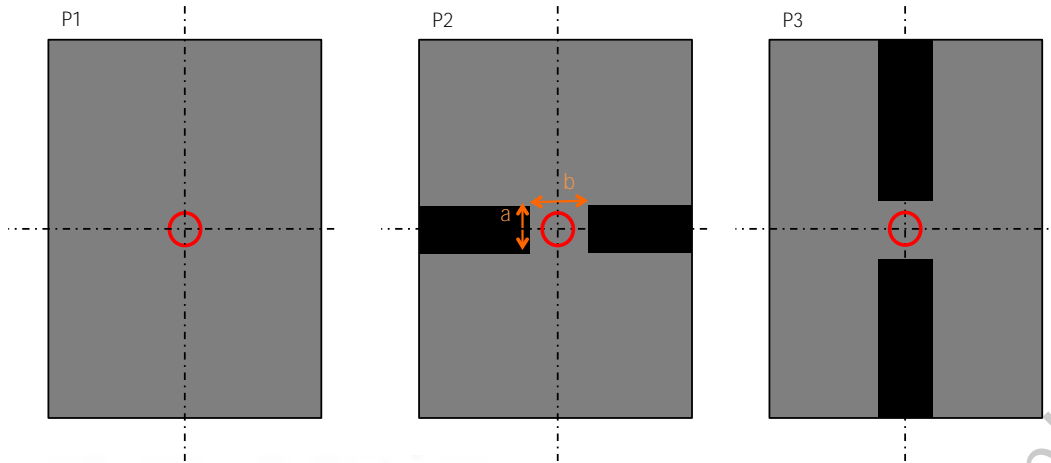
$$\text{Color uniformity} = \text{Maximum value}[P1:P5] - \text{Minimum value}[P1:P5]$$

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)

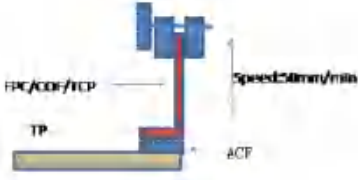


8 Reliability

8.1 Environmental Test

序号	实验项目	实验方法和条件	判定标准	实验数量	频率
1	静态低温存储	将样品放置于温度试验箱内，设置温度-30℃，240小时，试验完毕在常温下静置2小时	外观，显示功能正常	5pcs	1次/月
2	静态高温存储	将样品放置于温度试验箱内80℃，240小时，试验完毕在常温下静置2小时	外观，显示功能正常	5pcs	1次/月
3	动态低温存储	将样品放置于温度试验箱内，设置温度-20℃，240小时，试验完毕在常温下静置2小时	外观，显示功能正常	5pcs	1次/月
4	动态高温存储	将样品放置于温度试验箱内，设置温度70℃，240小时，试验完毕在常温下静置2小时	外观，显示功能正常	5pcs	1次/月
5	静态高温高湿	将样品放置于高温高湿箱内，设置温度60℃，93±5%RH、240小时，试验完毕在常温下静置2小时	外观，显示功能正常	5pcs	1次/月
6	动态高温高湿	将样品放置于高温高湿箱内，设置温度60℃，93±5%RH、120小时，试验完毕在常温下静置2小时	外观，显示功能正常	5pcs	1次/月
7	静态冷热冲击	将样品放入温度冲击试验箱中：先在-40℃±3℃的低温环境下保持30min，然后将温度切换到70℃±3℃的高温环境下保持30min，共做100个循环，常温下恢复2H进行检验，温度转换时间5min.	外观，显示功能正常	5pcs	1次/月
8	ESD测试	1. ESD测试标准：（点亮状态下）； 2. 测试OLED边缘均匀分布的6个点（4个角落，长边2个中心点），每个点打十次； 3. 接触放电：±2KV、±4KV 4. 空气放电：±2KV、±4KV、±6KV；	Class C：空气放电后，发生黑屏现象，但需要重新充电点亮；	5pcs	1次/月
9	ENCAP和LTPS分离力	分别固定ENCAP和LTPS拉拔，如下图所示，采用19.2*19.2mm治具，Speed：10mm/min。 	分离力 ≥ 2.5kgf	10pcs	1次/月
10	BTB 公母座插拔测试	Sample 外观和电性能需OK 测试条件： a. 测试前室验品需做电性及外观检测，确认为良品； b. 将室验品之Connector 压合致对应的Connector 公座或母座，重复插拔20次。	不得有任何电性不良及BTB有明显的塌陷、破损、变形（显微镜下）	5pcs	1次/月
11	FPC 抗弯折测	用1mm回形针卡在bonding区域，组装方向180度，30次，组装的反方向90度，5次。	FPC无明细折弯泛白、折断	5pcs	1次/月



	试		痕迹, LCD显示功能正常		
12	FPC 拉拔力测试	拉力>5N/CM, 测试方式: 90° 垂直拉扯, 如下图。 	FPC/ACF 不能剥离, 功能无异常	5pcs	1次/月

注: RA 测试频度每月 1 次为量产后的 ORT 抽测方案, 新品验证阶段以阶段安排测试。

8.2 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			%	
Image sticking time		Frame rate =60Hz Brightness 350nit	24	-	-	h	Note 2
Image sticking time		Frame rate =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[%]

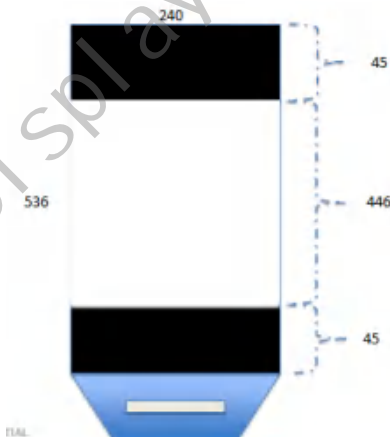
Note2. Define image sticking time

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

Room Temp. : 45°C

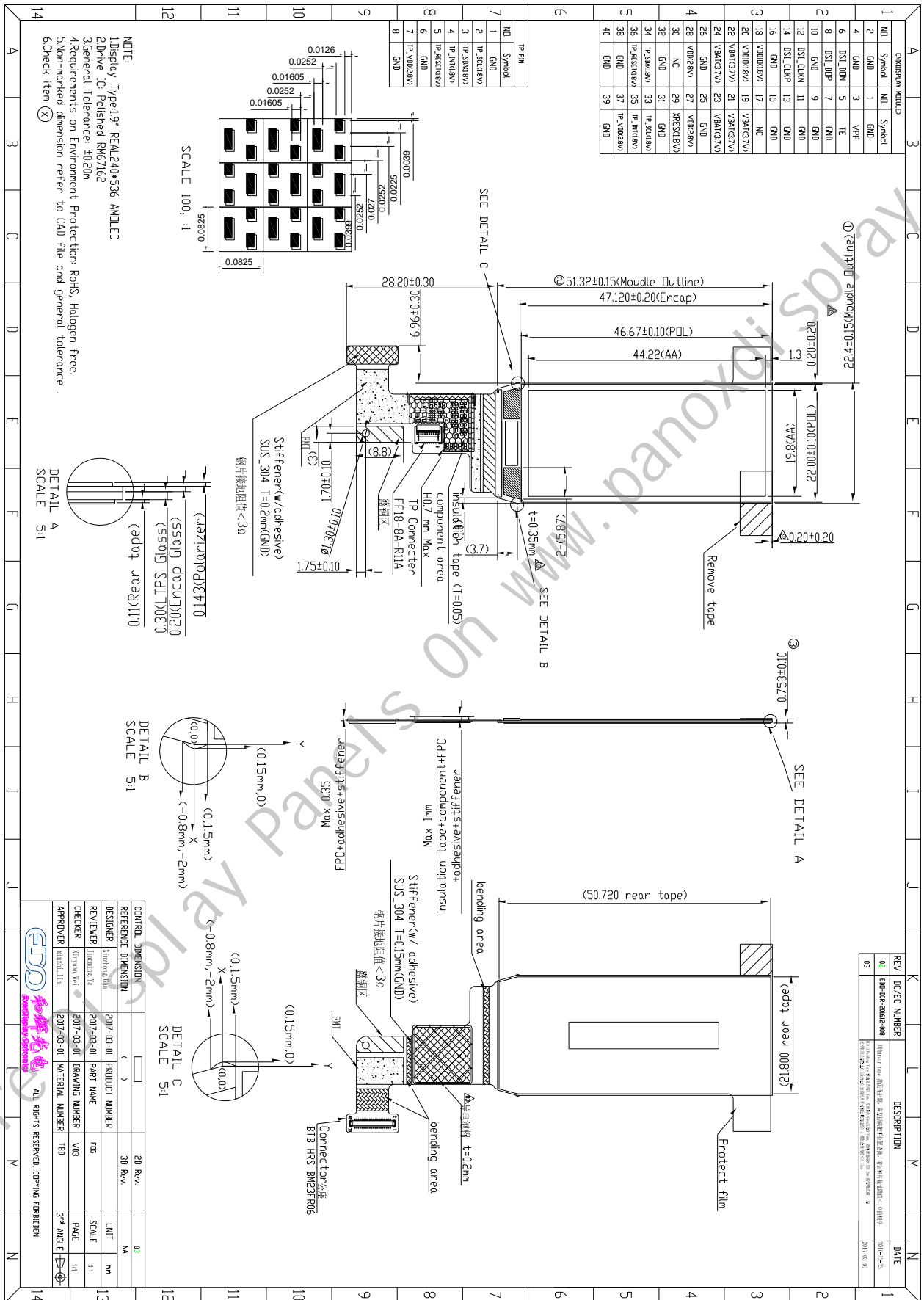
Test pattern : Base color is Black

Box color is Worst case pattern





9 Outline Dimension Drawing





10 Packing Specification

1. 装箱材料说明						
No	料号	品名	材料	尺寸/mm	数量/个	备注
1	TBD	E1910AM3. A	PCB	79.52*29.36*1.27	360	
2	16.13001.010/020	外箱标签	纸	52*100*0.1	1	
3	16.13002.010/020	内箱标签	纸	52*100*0.075	2	
4	21.13141.010/020	吸塑盘	PBT	455*290*14	20	
5	21.13142.010/020	EPB-Spacer	EPB	391.37*230.8*1	36	
6	21.13011.010/020	EPB填充物(规格G)	EPB	457*292*10	4	
7	21.13003.010/020/30	纸箱	纸	516*338*248	1	
8	21.13004.010/020/30	纸盒	纸	459*294*115	2	
9	21.13005.010/020	干燥剂	干燥剂	55*75	4	
10	21.13006.010/020/30	静电防尘袋	PE	600*440*0.25	2	
11	21.13010.010/020/30	PP板	PP	457*292*5	2	
12	21.13012.010/020/30	EPB护角	EPB	120*244*100	4	
13	TBD	栈板	木材	TBD	1/30	
2. 塑托板产品数量说明						
(1)	整个吸塑盘的产品数量	每列的产品数量4个*每行的产品数量5个=20个				
(2)	整个纸盒的产品数量	整个吸塑盘的产品数量20个*包装产品的吸塑盘数量9个(不包括最上方的空盒)=180个				
(3)	整个纸箱的产品数量	整个纸盒的产品数量180个*包装产品的纸盒数量9个=360个				
(3)	整个栈板的产品数量	整箱产品数量360个*纸箱的数量30个=10800个				