



SHENZHEN APTUS TECHNOLOGY CO., LIMITED

PRODUCT SPECIFICATION

10.1" TFT-LCD MODULE

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FOR CUSTOMER	
CUSTOMER APPROVED	

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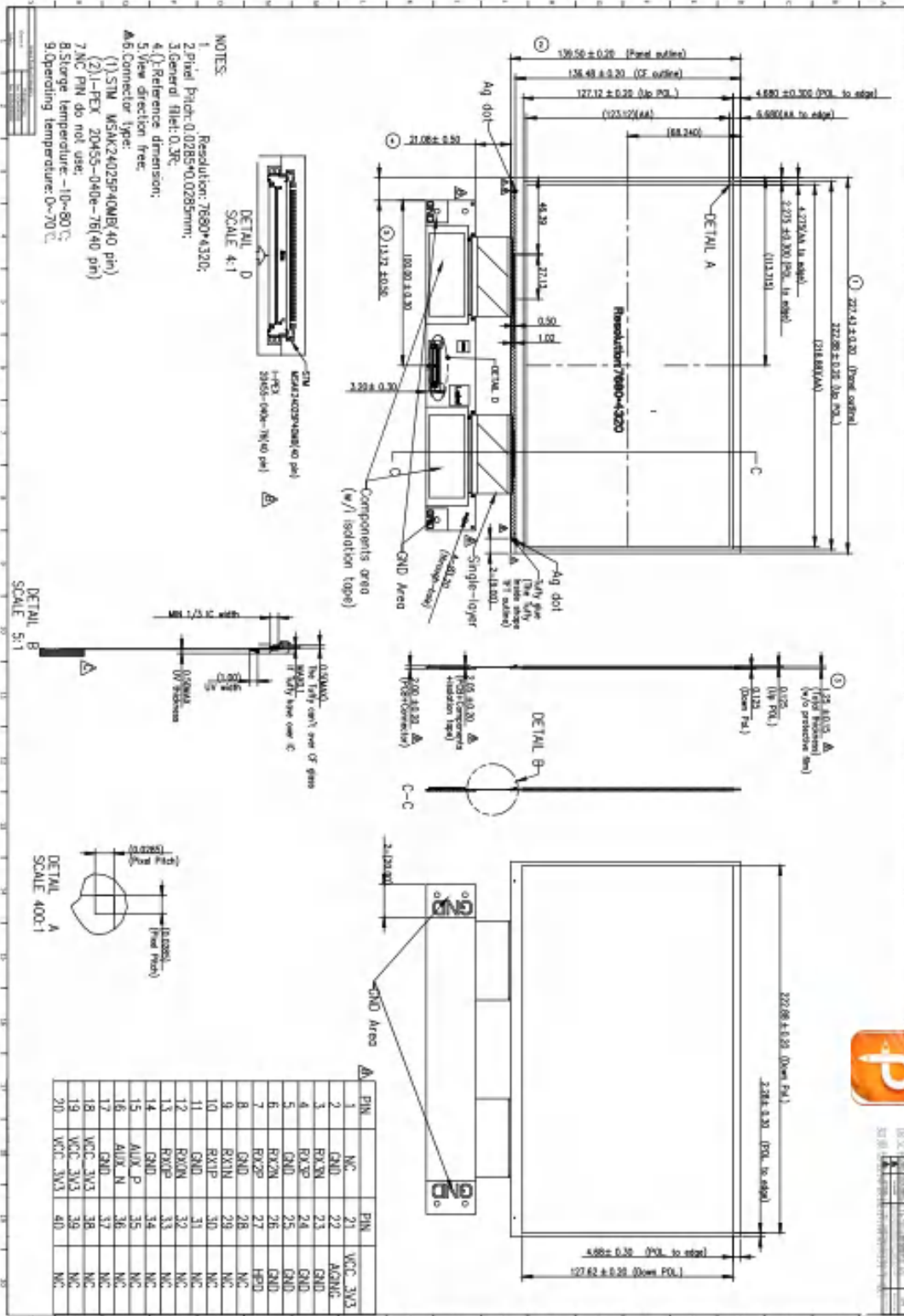
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2. OutLine Drawing



3. Mechanical Specifications

Parameter	Specifications	Unit
Size	10.1"	—
Outline dimensions	227.43 (W) x 139.50 (H)	mm
LCD active area	218.88 (W) x 123.12 (H)	mm
Display format	7680 x 4320	dots
Color configuration	MONO	—
Technology	LTPS	—
Display Mode	Normal Black	—
Dot pitch	0.0285 (W) x 0.0285 (H)	mm
Viewing Direction	FREE	—
Frame Rate	25 (max)	Hz
Interface	EDP1.2	—
Contrast Ratio	≥400	—
Panel Transmittance (w/I POL)	≥5%	—

4. Interface signals

Pin No.	Symbol	Function	Description I/O	Pin No.	Symbol	Function	Description I/O
1	NC	-	NC	21	VCC_3V3	P	Power Supply (3.3V typ.)
2	GND	P	Ground	22	AGING	I	AGING/bist mode
3	RX3N	I	DP Rx lane 3, negative	23	GND	P	Ground
4	RX3P	I	DP Rx lane 3, positive	24	GND	P	Ground
5	GND	P	Ground	25	GND	P	Ground
6	RX2N	I	DP Rx lane 2, negative	26	GND	P	Ground
7	RX2P	I	DP Rx lane 2, positive	27	HPD	O	Hot plug detect output
8	GND	P	Ground	28	NC	-	GND for innolux
9	RX1N	I	DP Rx lane 1, negative	29	NC	-	GND for innolux
10	RX1P	I	DP Rx lane 1, positive	30	NC	-	GND for innolux
11	GND	P	Ground	31	NC	-	GND for innolux
12	RX0N	I	DP Rx lane 0, negative	32	NC	-	NC
13	RX0P	I	DP Rx lane 0, positive	33	NC	-	NC
14	GND	P	Ground	34	NC	-	SDA innolux for test
15	AUX_P	I/O	DP AUX CH, positive	35	NC	-	SCL innolux for test
16	AUX_N	I/O	DP AUX CH, negative	36	NC	-	NC
17	GND	P	Ground	37	NC	-	NC
18	VCC_3V3	P	Power Supply (3.3V typ.)	38	NC	-	NC
19	VCC_3V3	P	Power Supply (3.3V typ.)	39	NC	-	NC
20	VCC_3V3	P	Power Supply (3.3V typ.)	40	NC	-	NC

5. ABSOLUTE MAXIMUM RATINGS

5.1 ELECTRICAL ABSOLUTE RATINGS

5.1.1 TFT LCD MODULE

|

Item	Symbol	Unit	Value
Supply Voltage	V _{ccs}	V	-0.3~+4.0

6. ELECTRICAL CHARACTERISTICS

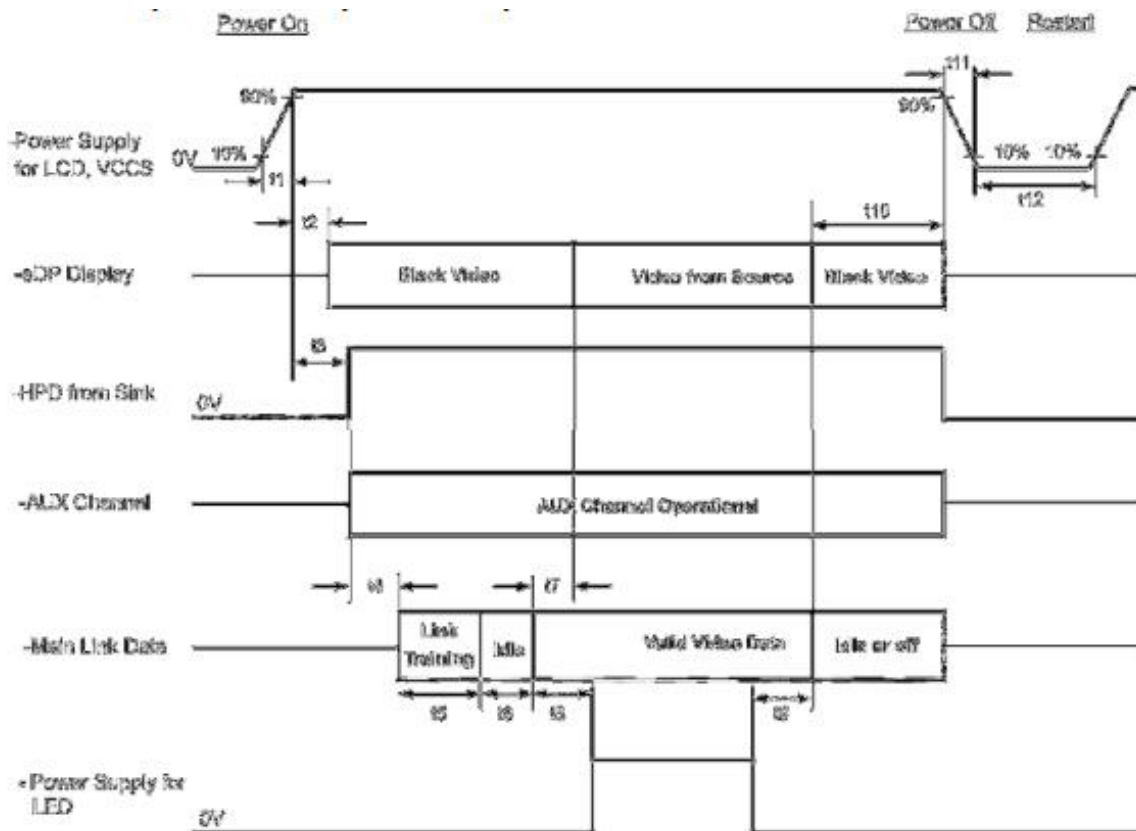
6.1 LCD PARAMETER

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VCCS	3.0	3.3	3.6	V	
Current for Power	Ivccs	TBD	TBD	TBC	mA	

(GND=0V, TA=25 °C)

6.2 POWER SEQUENCE

The power sequence specifications are shown as the following table and diagram.



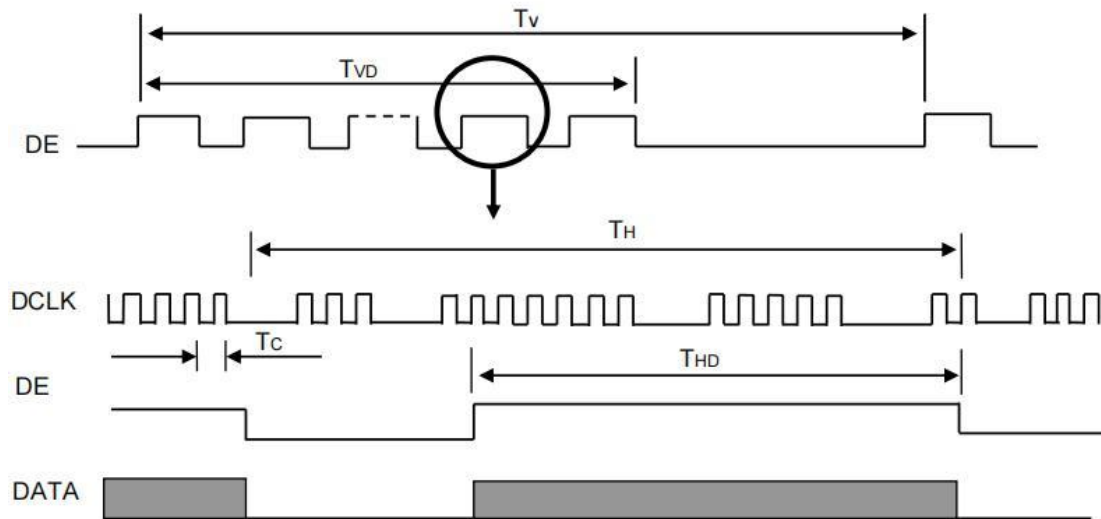
Symbol	Description	Value		Unit
		Min	Max	
t1	Power rail rise time, 10% to 90%	0.5	10	ms
t2	Delay from LCD,VCCS to black video generation	0	200	ms
t3	Delay from LCD,VCCS to HPD high	0	200	ms
t4	Delay from HPD high to link training initialization	0	500	ms
t5	Link training duration	0	500	ms
t6	Link idle	0	500	ms
t7	Delay from valid video data from Source to video on display	0	50	ms
t8	Delay from valid video data from Source to backlight on	80	500	ms
t9	Delay from backlight off to end of valid video data	50	500	ms
t10	Delay from end of valid video data from Source to power off	0	500	ms
t11	VDD power rail fall time, 90% to 10%	0.5	10	ms
t12	VDD Power off time	500	-	ms

6.3 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Item	Symbol	Typical (@25Hz)	Unit	Note
DCLK Frequency	1/Tc	316	MHz	-
Vertical Total Time	TV	4374	TH	-
Vertical Active Display Period	TVD	4320	TH	-
Vertical Active Blanking Period	TVB	54	TH	-
Horizontal Total Time	TH	2890	Tc	-
Horizontal Active Display Period	THD	2560	Tc	-
Horizontal Active Blanking Period	THB	330	Tc	-

INPUT SIGNAL TIMING DIAGRAM



7. Optical Characteristics

Remark: All exception items are marked by () and YZ reserves the right to update after amount of measured data.

Ta=25 ° C

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	$CR \geq 10$	80	-	-	degree	Note 1,2,1,9,11
	Right	θ_R		80	-	-		
	Top	θ_T		80	-	-		
	Bottom	θ_B		80	-	-		
Response Time		$T_{on}+T_{off}$	Normal $\theta=\phi=0^\circ$	-	-	30	ms	Note 2.1,3,9,11
Contrast Ratio		CR		300	-	-	-	Note 2.2, 4,10,11
Transmittance Uniformity		-		85%	-	-	-	Note 2.1,5.2, 7,9,11
Crosstalk		CT		-	-	2%	-	Note 2.1,8,9
Gamma Curve				1.9	2.2	2.5	-	Note 2.1,9,12
Flicker		-		-	-	(-30)	dB	Note 2.1,6,9,11
Transmittance		T%		-	9.63%	-	-	Note 2.1,5.2, 9,11
				3.34%	4.28%	-		Note 2.2, 5.1,10,11

7.1 Definition of Optical Characteristics

Note 1: Definition of viewing angle range

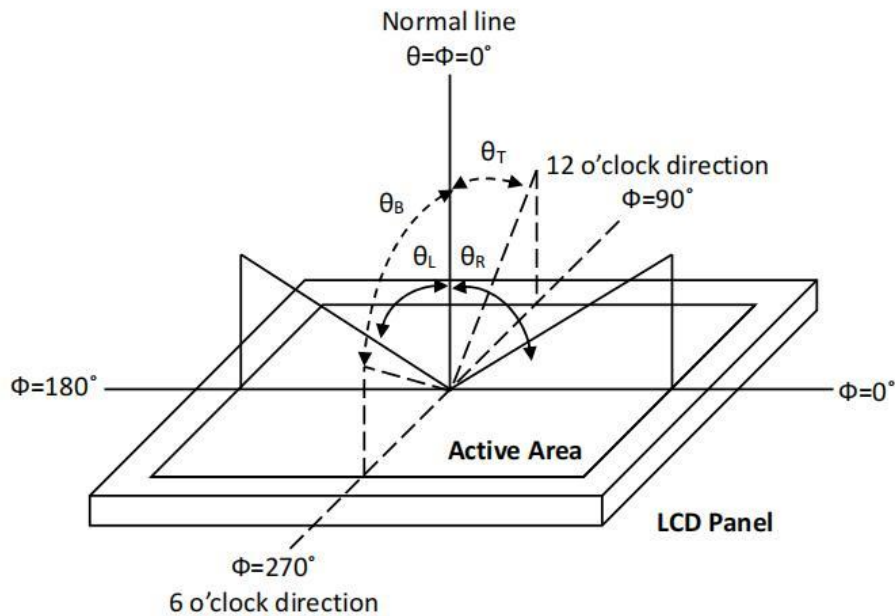


Fig. 2 Definition of viewing angle

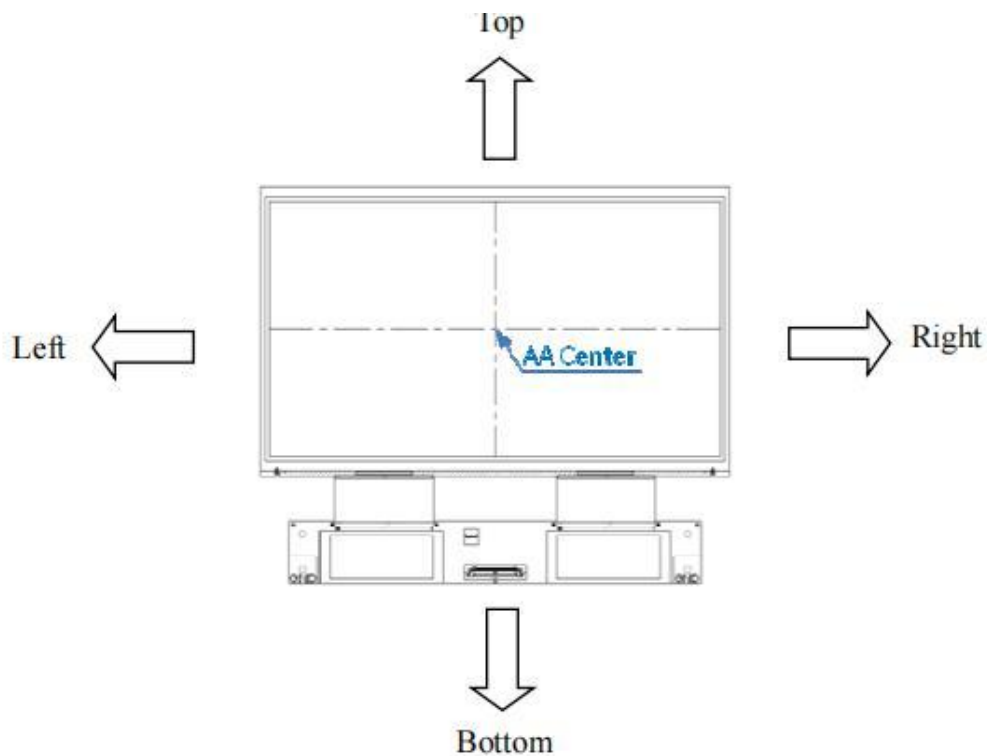


Fig.1 Definition of viewing angle for display

Note 2: Definition of optical measurement system

Note 2.1 The optical characteristics should be measured in a dark room with ambient temperature $T_a=+25^{\circ}\text{C}$. The optical properties are measured at the center point of the LCD screen after 5 minutes operation. The light on method and tooling is based on YZ instruction. (Equipment: CS2000)

Note 2.2 The optical characteristics should be measured in a dark room with ambient temperature $T_a=+25^{\circ}\text{C}$. The optical properties are measured at the center point of the LCD screen after 1 minute' s operation. The light on method and tooling is based on YZ instruction. (Equipment: UV Light Meter)

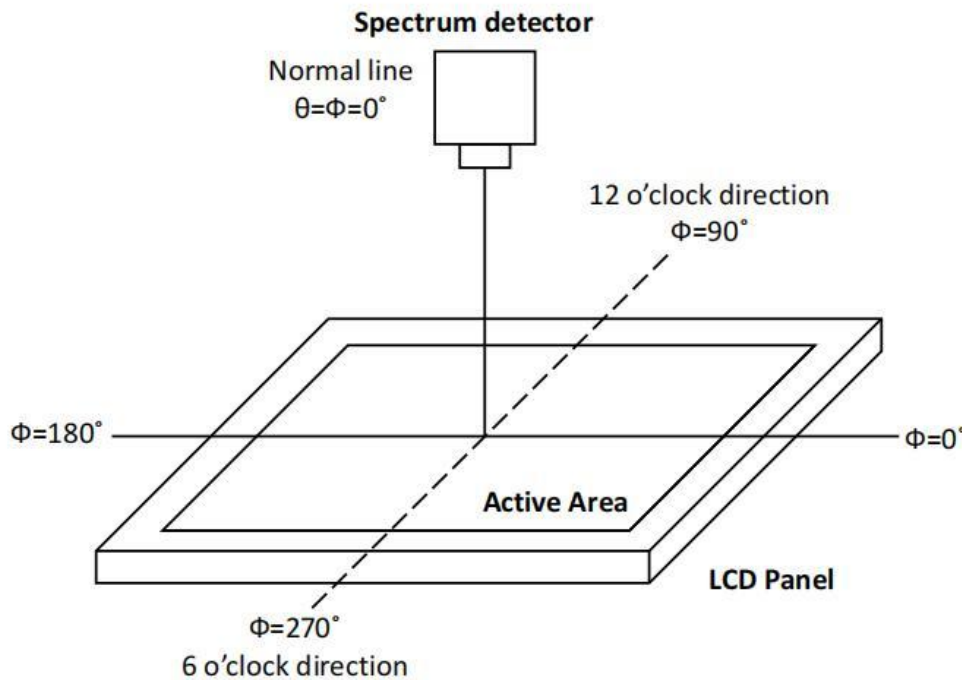


Fig.3 Optical measurement system setup

Note 3: Definition of response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{on}) is the time between photo detector output intensity changed from 10% to 90%, and fall time (T_{off}) is the time between photo detector output intensity changed from 90% to 10%.

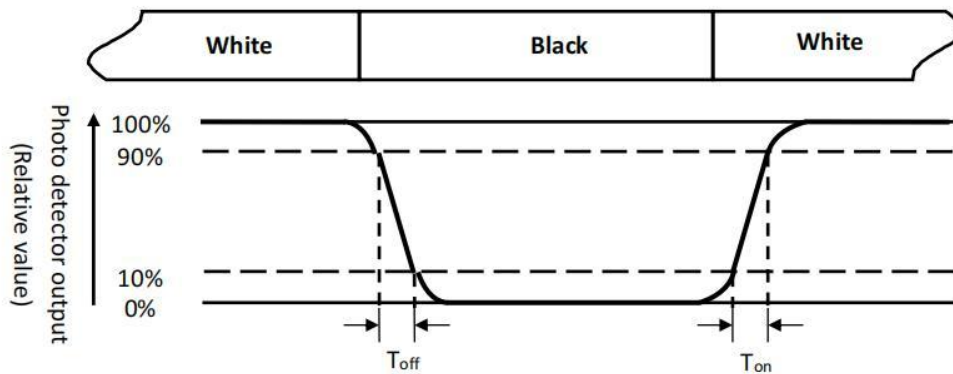


Fig.4 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{P data measured when LCD on the "White" state}}{\text{P data measured when LCD on the "Black" state}}$$

Note 5: Definition of Transmittance

Note 5.1: Definition of Transmittance Typ.4.28%

$$\text{Transmittance (T\%)} = \frac{\text{P data measured when LCD on the "White" state}}{\text{P data of customer's 405nm BLU}}$$

Note 5.2: Definition of Transmittance Typ.9.63%

Transmittance = $\frac{\text{Luminance measured when LCD on the "white" state}}{\text{Luminance of YZ's IIS BLU}}$

Luminance of YZ's IIS BLU

Note 6: Definition of flicker

Flicker test pattern is column inversion of gray 127.

Note 7: Definition of transmittance uniformity

To test for uniformity, the tested area is divided into 3 rows and 3 columns. The measurement spot is placed at the center of each circle as below.

$$\text{Transmittance Uniformity} = \frac{\text{Transmittance}_{\min}}{\text{Transmittance}_{\max}}$$

Transmittance max : The measured maximum Transmittance of all measurement position.

Transmittance min : The measured minimum Transmittance of all measurement position.

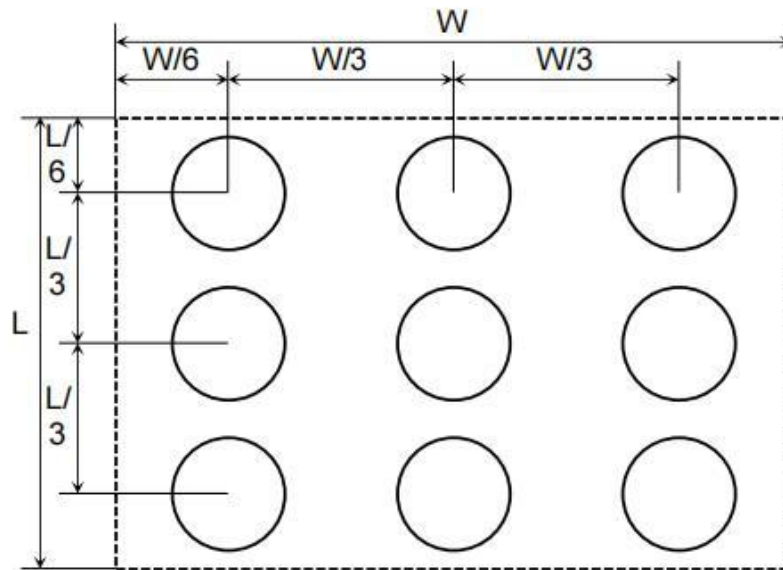


Fig. 5 Definition of luminance uniformity

L-----Active area length

W----- Active area width

Note 8: Definition of crosstalk

Fig.6.1 : Cross talk test pattern is full of gray 127, but the middle area is full of gray 0.

Fig.6.2 : Cross talk test pattern is full of gray 127.

Crosstalk (PN) = $\frac{| \text{Luminance BN} - \text{Luminance GN} |}{\text{Luminance GN}} \times 100\%$ (N=1~4)

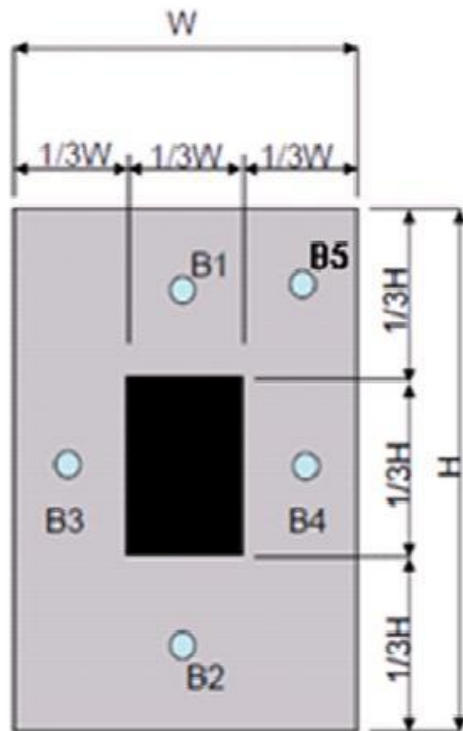


Fig.6.1

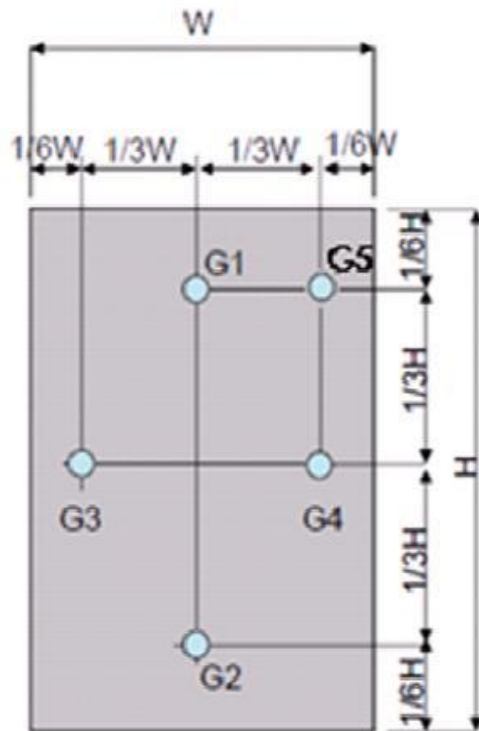


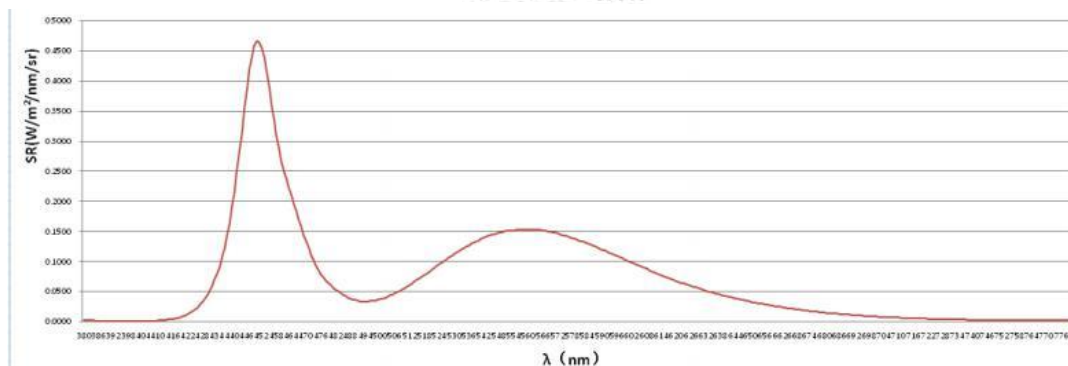
Fig.6.2

Fig. 6 Definition of crosstalk

Note 9: Definition of YZ' s IIS BLU spectrum

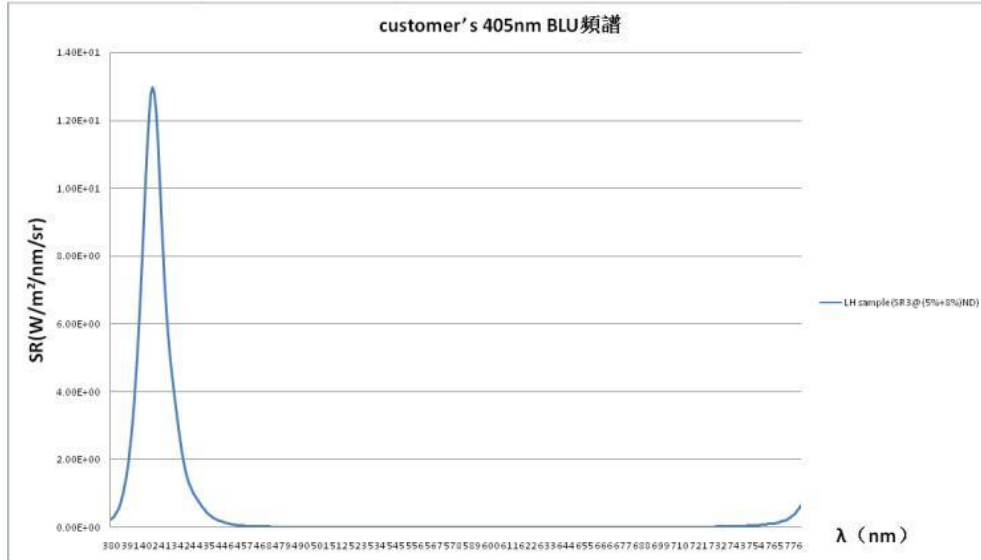
Viewing Angle Range, Response Time , Flicker and Transmittance Typ. 9.63% Spec. is based on YZ' s IIS BLU

YZ IIS BLU 频谱



Note 10: Definition of customer' s 405nm BLU spectrum

Contrast Ratio and Transmittance Typ. 4.28% Spec. is based on customer' s 405nm BLU



Notel1:

All test points are the center of the panel, except transmittance uniformity and crosstalk

Notel2: gamma curve control

The gamma value tolerance ± 0.3 , test the gray scale below:

0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120, 128, 136, 144, 152, 160, 168, 176, 184, 192, 200, 208, 216, 224, 232, 240, 248, 255, total 33 pictures.

Find the optimal value of γ so that the curve of $(n/255)^\gamma$

γ is closest to the measured curve:

$(L_n - L_0) / (L_{255} - L_0)$,

L_n : Brightness of Gray level n ,

n : Gray level n , $n = 0 \sim 255$.

γ should control within 2.2 ± 0.3

4. INSPECTION CRITERIA

4.1 检验条件及环境

- 1) 在自然光或 60W-100w(照度达 600~800Lux)冷白荧光灯照明条件下检验。
- 2) 观察距离:300-350mm
- 3) 观察角度:水平方位 $45^{\circ} \pm 15^{\circ}$
- 4) 检验时按正常要求的距离和角度扫描整个被检测面:10S $\pm$ 5S
- 5) 检验人员裸视或矫正视力 1.0 以上, 不能有色盲、色弱者。

4.2 抽样标准

抽样检验依 GB2828-2003 标准, 取一般检验水平 II。

AQL:A 类缺陷为 0

B 类缺陷为 0.4

C 类缺陷为 1.0

特殊项目(尺寸、可靠性)抽样方案为:S-1 或具体规定数量, Ac=0, Re=1

4.3 检验步骤及项目

项目	检 查 内 容	判定标准		检 验 工 具	缺陷等级	
外包装	进料标签	进料标签上必须有供应商名称，产品 名称，产品型号，产品料号，产品数 量，生产日期，并应有厂商的检验合格章		目测	CR	
	厂商、规格 核对	厂商和规格应和 BOM 中要求的相符		目测	CR	
	外包装	包装材料应设计合理，无包装破损， 变形，受潮等不良		目测	CR	
	ROHS 符合性	ROHS 物料需要有合格的 ROHS 测试 报告，外箱应贴有 RoHS 标示		目测	CR	
外观	金手指	折断、折痕、缺损、氧化不允许		目测	MA	
	保护膜	不允许漏贴，保护膜翘起、贴尘		目测	MI	
	脏污	金手指和屏表面不允许有		目测	MI	
	FPC	FPC 折弯处不允许有断裂		目测	MI	
	点状不良	黑点、颗粒、异物点	尺寸	允许个数	目测、菲林卡	MI
			D≤0.1mm（不允许密集）	忽略不计		
			0.1<D≤0.2mm，ds>10mm	2		
			D>0.2mm NG	0		

	白点、LCD 亮点	尺寸		允许个数		
		$D \leq 0.1\text{mm}$ 不计(不允许密集)		忽略不计		
		$0.1 < D \leq 0.3\text{mm}$, $ds > 10\text{mm}$		2		
		$0.3 < D \leq 0.5\text{mm}$, $ds > 10\text{mm}$		1		
		$D > 0.5\text{mm}$		0		
	LCD 划 伤、刮 伤、线状 异物	尺寸		允许个数	目测、菲 林卡	MI
		$W \leq 0.02\text{mm}$, $L \leq 2\text{mm}$		不计		
		$0.02 < W \leq 0.05\text{mm}$		1		
		$W > 0.05\text{mm}$		0		
	缺角	缺角伤到线路、框边 NG			目测	MA
	裂痕	不允许			目测	MA
	破片	不允许			目测	MA
结 构	尺寸	按照规格书上的图纸检验			卡尺	MA
	对样	1. 颜色:胶框、双面胶、FPC、屏幕和样品不可有明显差异 2. 胶框、FPC、双面胶、支架等结构和组装方式、位置不可有变化 3. 材质:通过手感、软硬程度、厚薄度、颜色、表面效果判定是否和样品一致			样品	MA
功 能 测 试	亮点、暗 点	点亮测试后屏幕有点缺陷, 依点状不良判定			测试架、 目测、菲 林卡	MI
	亮线	点亮测试后屏幕有线缺陷(垂直或水平亮线、暗线)			测试架、 目测	MA
	显 示 异 常	点亮测试后屏幕少显示、多显示、画面跳动, 画面应流畅, 无拖影			测试架、 目测	MA
	显 示 不 均	点亮后同样的驱动条件下, 同一画面下, 同样的观察条件下, 屏幕部分显示亮暗差异现象。			测试架、 目测	MA
	色差	点亮后同样的驱动条件下, 同一画面下, 同样的观察条件下, 产品显示偏白或偏红或偏兰或偏绿等, 以限度样品 判定。			测试架、 目测	MA

5. Precautions for Use of LCD Modules

5.1 Handling Precautions

5.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

5.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

5.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

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

5.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol

— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer.

Especially, do not use the following:

— Water

— Ketone

— Aromatic solvents

5.1.6 Do not attempt to disassemble the LCD Module.

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

5.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

a. Be sure to ground the body when handling the LCD Modules.

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

ground.

c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

d. The LCD Module is coated with a film to protect the display surface.

Be care when peeling off this protective film since static electricity may be generated.

5.2 Storage precautions

5.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

5.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ~ 40℃

Relatively humidity: ≤80%

5.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

5.3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

10. Reliability Test

Test Items	Test Conditions	Remark
High Temperature Storage	80℃ , 240 hours	Note(1)(2)(3)
Low Temperature Storage	-10℃ , 240 hours	Note(1)(2)(3)
High Temperature Operation	70℃ , 240 hours	Note(1)(2)(3)
Low Temperature Operation	0℃ , 240 hours	Note(1)(2)(3)
Operate at High Temperature and Humidity	60℃, 90%RH , 240 hours	Note(1)(2)(3)
Thermal Shock (Non-operation)	-10℃/30min ~ 80℃/min , 100 cycles	Note(1)(2)(3)

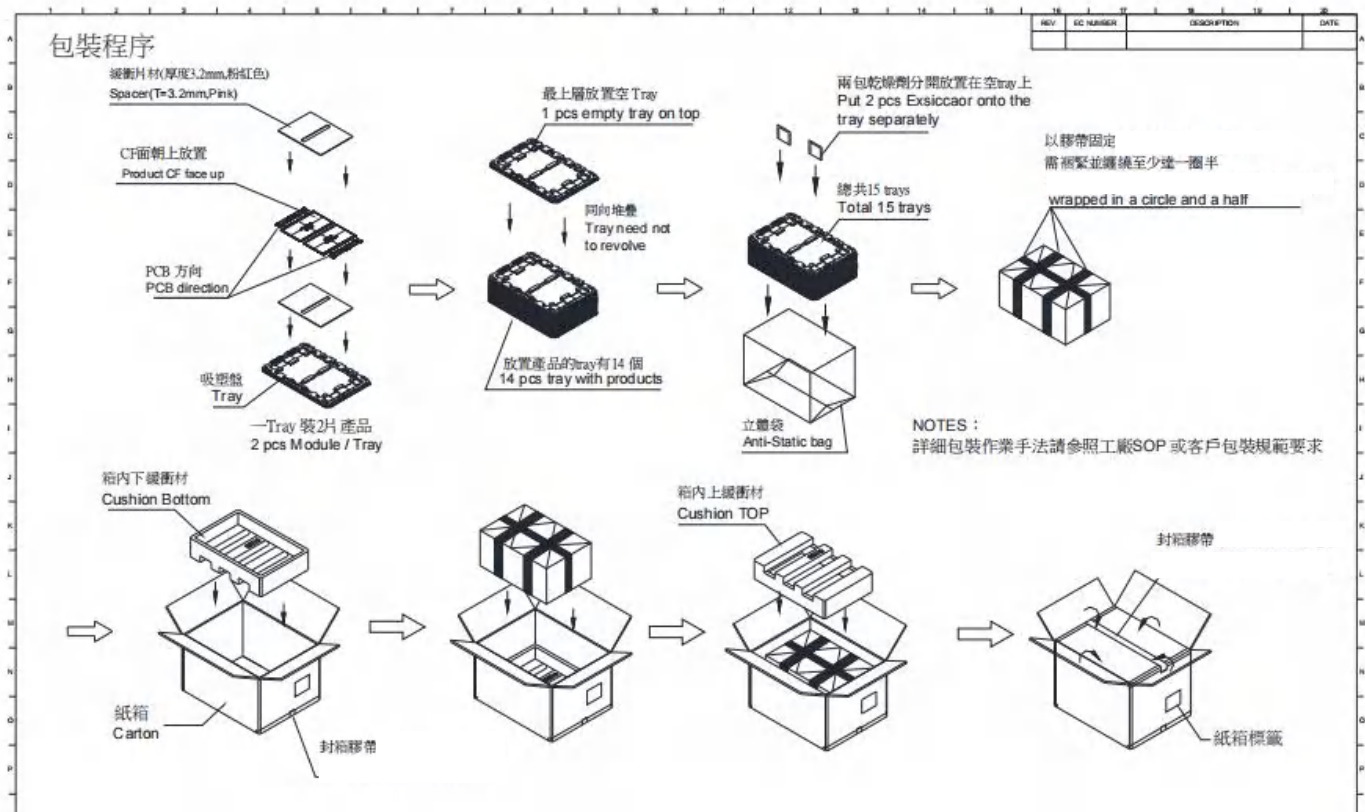
Note:

Note1. The test samples have recovery time need more than 2 hours at room temperature before the function check. In the standard conditions, there is no abnormal display function occurred.

Note2. After the reliability test, the product only guarantees operational function, but don't guarantee all of the cosmetic specification.

Note3. Under no condensation of dew.

11. Packing Drawing



(1) Carton Dimensions : 530 (L)*367 (W)*260 (H)

(2) 28 Panels/Carton