Tailorpixels

A Professional Manufacturer of Display

Manufacturer Certificated

9001 CERT. No.: 282Q19070712006

14001 CERT. No.: 282E19070712007

Product Specification

Model: TOQ544XVT-01C

5.44″AMOLED Display Module(1080*1920）

This module uses RoHS material

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REVISION HISTORY

Rev	Description	Page	Date
1.0	Initial Release	All	2020/03/11

1. GENERAL DESCRIPTION

1.1 DESCRIPTION

TOQ544XVT-01C is a transmissive type color active matrix AMOLED liquid crystal display that uses amorphous silicon AMOLED as a switching device. This model is composed of a AMOLED module (AMOLED panel, driver IC, Touch FPC and FPC). The resolution of 5.44″ contains 1080 RGB X1920 pixels and can display up to 16.7M colors.

1.2 GENERAL INFORMATION

Items	Specification	Unit	Note
Display mode	AMOLED	-	-
Drive element	-	-	-
LCM outline size	69.74(V) X 126.6(H) X 0.82(T)	mm	Note (1)(2)
Active area	67.82(V) X 120.58(H)	mm	-
Number of pixels	1080 RGB X 1920	pixels	-
Pixel arrangement	RGB stripe	-	-
Pixel size	31.4(H) X 62.8(V)	μm	-
Display color	16.7M	color	-
Viewing direction	ALL	-	-
Controller / Driver	RM67199	-	-
Data interface	MIPI	-	-
Backlight	-	-	-
Weight	-	g	-

Notes:

(1) FPC no included. (Refer to the module outline dimension for further information). Please see module specification drawing in Page10 for more details.

2. Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Notes
Analog/boost power voltage	VCI	-0.3	5.5	V	-
VCI I/O Voltage	VCI_IF	-0.3	5.5	V	-
I/O Voltage	VDDIO	-0.3	5.5	V	-
VSP Voltage	VSP	-0.3	6.6	V	-
VPP(OTP power)	VPP	-	8.64	V	-
Operating temperature	TOP	-40	85	℃	
Storage temperature	Tstg	-55	125	℃	

3. Electrical Specifications

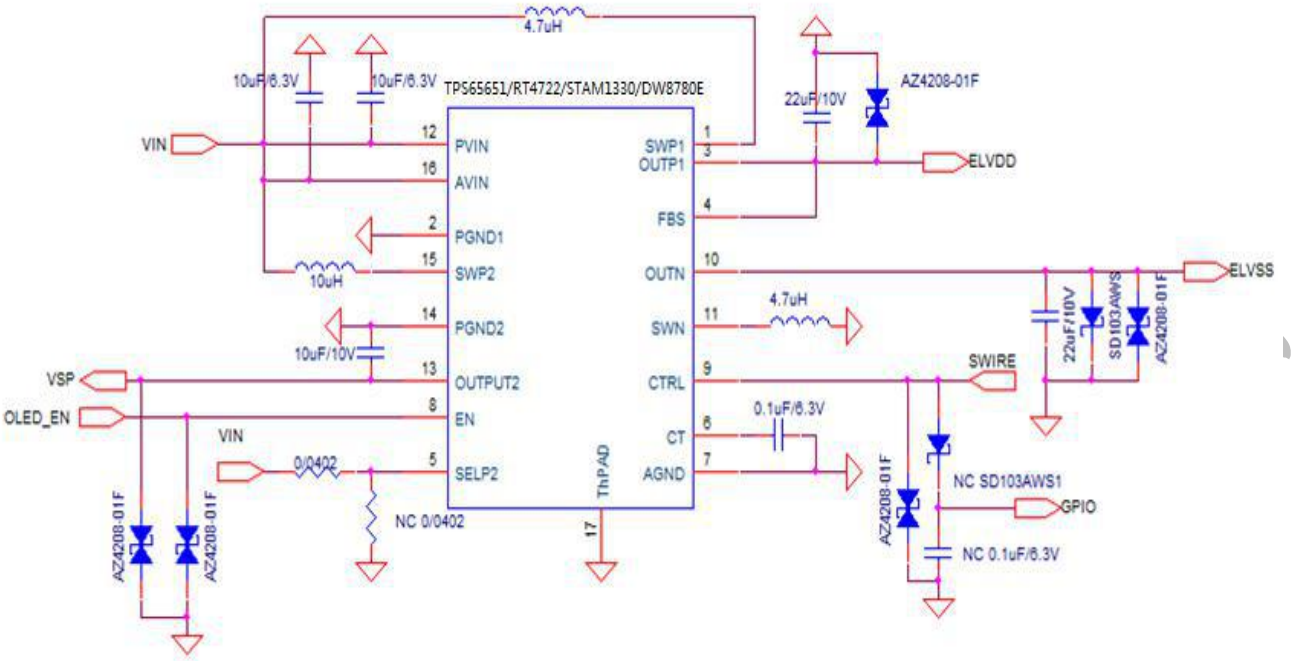
3.1 Electrical Specification

3.1.1 Current Characteristic:

Item	Symbol	Min.	Typ.	Max.	Unit	Notes
AMOLED Power positive	ELVDD	-	4.6	-	V	-
AMOLED Power Negative	ELVSS	-	-2.5	-	V	-
Gamma Voltage	VSP	6.3	6.4	6.5	V	-
Digital Power Supply	VDDI	1.65	1.8	3.6	V	-
Analog Power Supply	VPP	-		8.64	V	-

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Notes
350 nits @Gray 255	IELVDD/ ELVSS	VELVDD=4.6V VELVSS=-2.5V VCI=3.3V VDDIO=1.8V VSP=6.4V	-	190	230	mA	-
	IVCI		-	2	3	mA	-
	IVDDIO		-	50	55	mA	-
	IVSP		-	15	150	mA	-

3.1.2 Application circuit:



4. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room.

Measuring equipment: BM-5AS, BM-7, EZ-Contrast.

(Ta=25±2° C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center point)		C/R	-	6000		-	-	BM-7 Note(2)
Luminance of white (Center point)		L_w	B/L on	315	350	385	cd/m^2	CA-210
Luminance uniformity		U_w	θ = 0. Normal viewing angle B/L On Note(1)	75	-	-	%	BM-7 Note(3)
Response Time		Tr + Tf		-	-	-	ms	BM-5AS Note(4)
Color Chromaticity (CIE 1931)	White	W_X		0.275	0.295	0.315	-	CA-210 Note(5)
		W_y		0.285	0.305	0.325		
	Red	R_X		0.66	0.69	0.72		
		R_Y		0.28	0.31	0.34		
	Green	G_X		0.195	0.235	0.275		
		G_y		0.68	0.72	0.76		

	Blue	B_X		0.113	0.143	0.173		
		B_Y		0.014	0.044	0.074		
Viewing Angle	Hor.	θ_L	C/R≥10	80	–	–	Deg	EZ Contrast Note(6)
		θ_R		80	–	–		
	Ver.	θ_U		80	–	–		
		θ_D		80	–	–		
Color shift		@ 45 degree				4.5	JNCD	
Cross-talk		4% black or white window, 127 gray scale		–	–	2	%	
Gamma		Full White		2.0	2.2	2.4	–	
Response time				–	–	2	ms	
Color Temperature				6456	7356	8256	K	
Flicker		Normal Θ=Φ=0°				-40	dB	
Image Retention						3	min	
Color Uniformity		Full White u' v'				0.012		
Gray CCT		L64-L255				±300K		
Gray duv		L64-L255				0.006		

Note1: Temp.25℃, (Angle、distance)

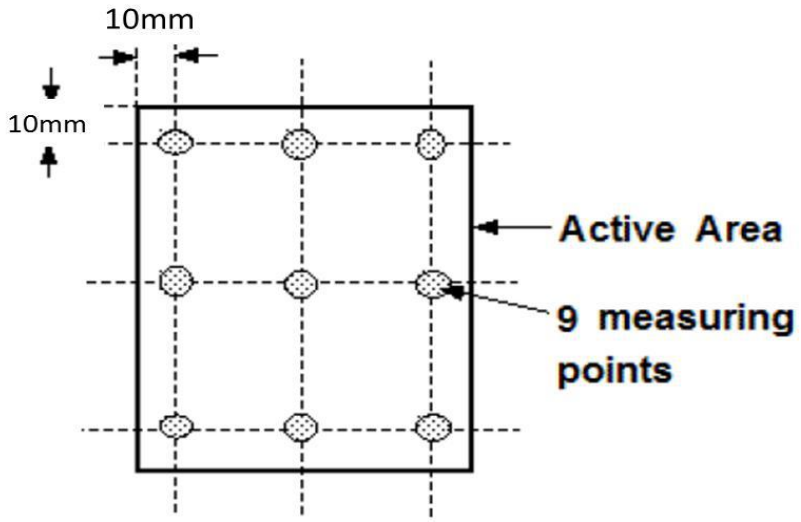
Environmental conditions: Temp.25℃±3℃, 65±20%RH, Dark Room.

Distance of OLED display center to measuring machine is 50cm.

Note2: Brightness Uniformity definition

Measure 9 points of Display Brightness,

Brightness Uniformity=L_{min}/L_{Max}×100%



Note3: Contrast Ratio

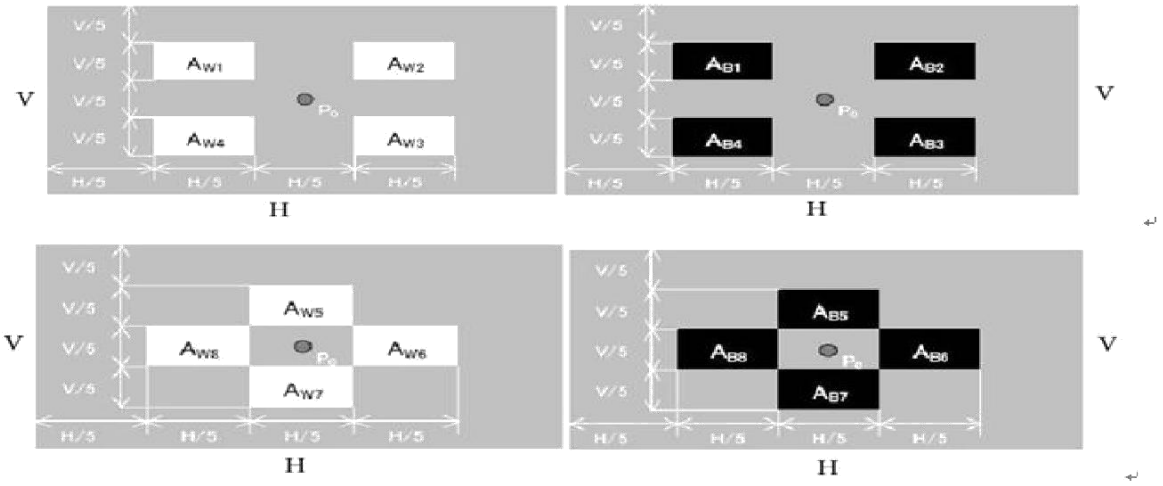
Dark Room C.R=LW/LB

LW: full white brightness of display center P0;

LB : full black brightness of display center P0.

Note4: Cross-talk

4% black or white window , 127 gray background.



$$LW\_OFF = \frac{L_{W1} + L_{W2} + L_{W3} + L_{W4}}{4}$$

$$LB\_OFF = \frac{L_{B1} + L_{B2} + L_{B3} + L_{B4}}{4}$$

$$CT = \frac{|L_{Wi\_ON} - L_{W\_OFF}|}{L_{W\_OFF}} \times 100\% (i=5 \text{ to } 8)$$

For white windows AWi (i = 5 to 8), and

$$CT = \frac{|L_{Bi\_ON} - L_{B\_OFF}|}{L_{B\_OFF}} \times 100\% (i=5 \text{ to } 8)$$

For black windows ABi (i = 5 to 8).

The maximum cross-talk value shall be noted in the measurement report.

Note5: Response Time

Response time=Pixel turn on and turn off time (White<=>Black).

It is measuring transition time from 10% to 90% of luminance.

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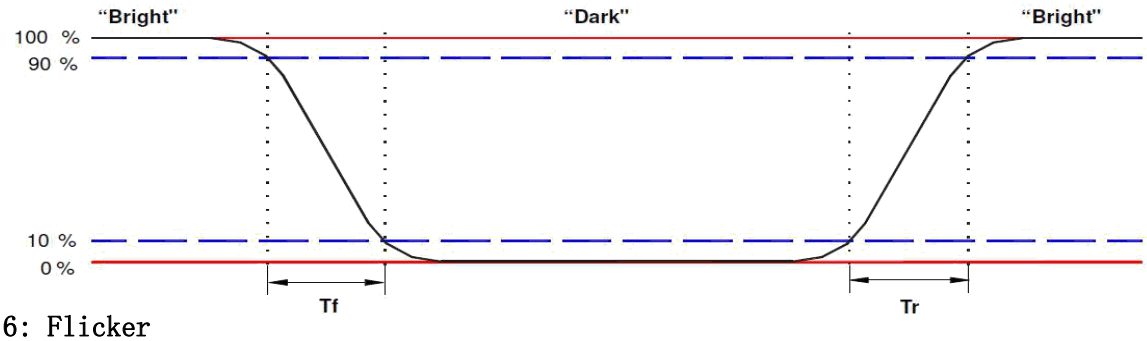
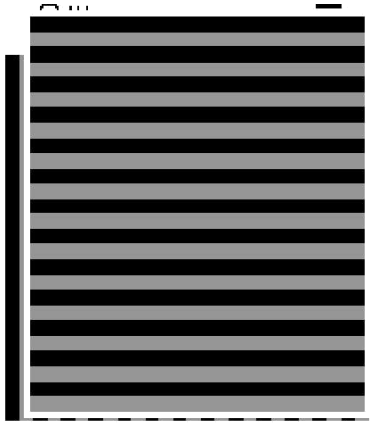
Response time=Pixel turn on and turn off time (White<=>Black).

It is measuring transition time from 10% to 90% of luminance.



Note 6: Flicker

Suggested Instruments: **Konica Minolta CA-310** or **Klein Instruments K-8**



Odd row : **L0** Black
Even row : **L186** gray level

Flicker Test Pattern

The flicker level is defined by **Fast Fourier Transformation (FTT)** as follows:

$$Flicker = 20\log_{10}\left(2\frac{f_{FFTC}(n)}{f_{FFTC}(0)}\right) + FS(Hz) \quad \text{(dB)}$$

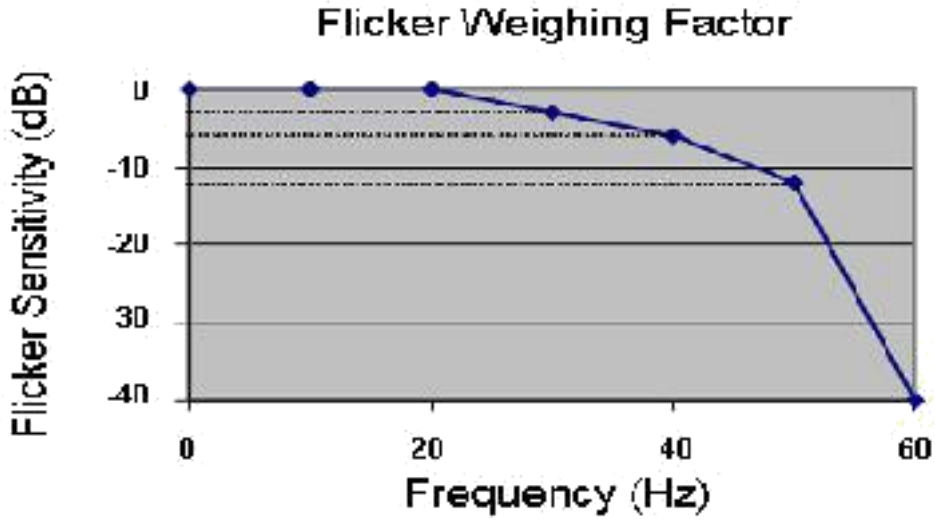
Where

fFFTC(n) is the n-th FFT coefficient.

fFFTC(0) is the 0-th FFT coefficient which is DC component.

FS(Hz) is the flicker sensitivity as a function of frequency.

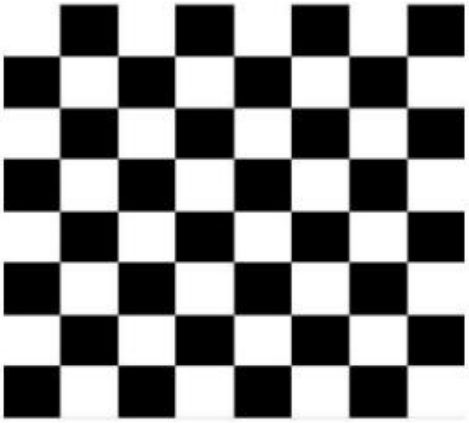
The peak flicker level shall be reported based on the calculation using above formula in which FS(Hz) is determined by the flicker weighing factor shown below.



Note7: Image Retention

Using chessboard pattern (8 * 8) light on 1hr, and switch to 127 gray.

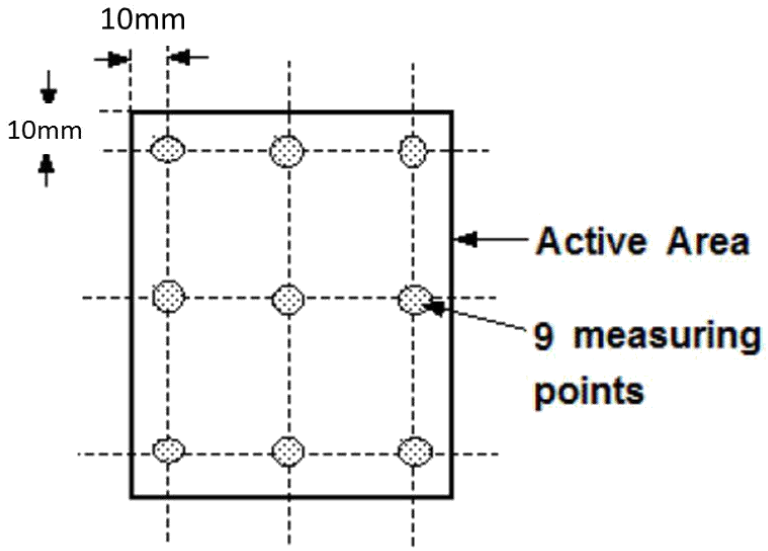
The Image retention should not be seen after 3 mins.



Note8: Color Uniformity

Total 9 measure points should set as shown in the following figures. The CIE 1967 Standards shall be used.The color difference is calculated by using following formula:

Max（△u'v'）（the max △u'v' value between two random point of 9 point）



精度测试	参照图 1 所示的区域对 13 个圆形区域用接地的标准铜柱Φ 6mm 进行触摸，测试触摸要 20 次以上，每次触摸 100ms， 然后抬起 500ms。记录下 TP 报出的坐标，图 1 中区域划分 成 4×4，长宽计算如图所示（W-5）/4 和（H-5）/4，青色 为非边缘区（触摸点 1、2、3、4、5），蓝色为边缘区（触 摸点 6、7、8、9、10、11、12、13）	记录下的坐标有无超 出±1mm（非边缘区）， ±1.5mm（边缘区）， 超出结论为 NG，不超 出结论为 OK。
抖动	参照图 1 所示，对每个点用接地标准铜柱Φ6mm 进行触摸， 不动放置 5S，记录下坐标。	记录下坐标有无超出 ±1mm（非边缘区）， ±1.5mm（边缘区）， 超出结论为 NG，不超 出结论为 OK。
SNR 测试	在 AMOLED R\G\B 画面切换状态下分别测试表面 9 个点（如 图 1 中的 6.7.8.13.3.9.12.11.10point）的 SNR.	SNR 值应大于 30

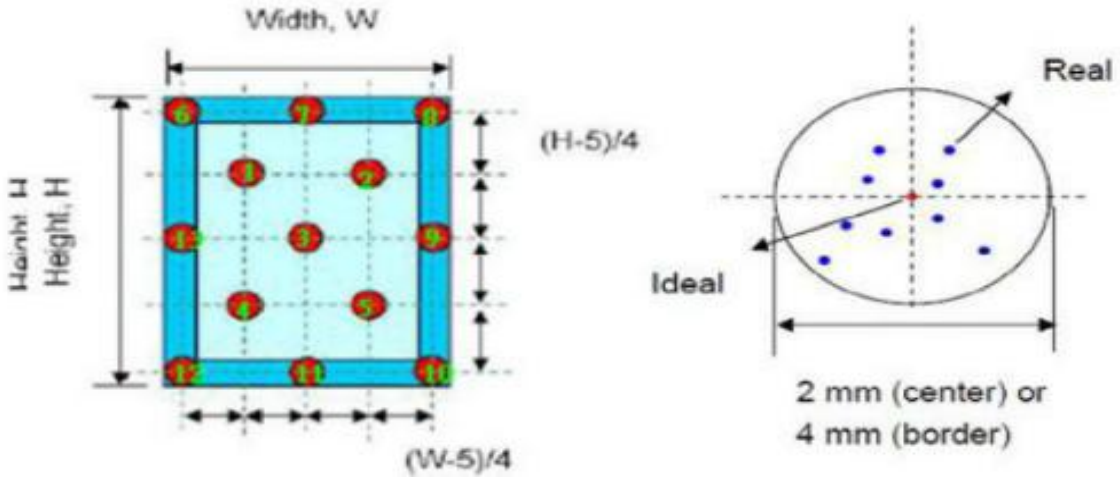


图 1、精度测试区域示意图

线性度	参照图 2 中左边三个所示的路径用接地标准铜柱 Φ6mm， 分别以 5mm/s 和 50mm/s 画线，记录下坐标的偏离度，其中 竖线路径从左到右分别为竖 1 到竖 5，从上到下为横 1 到横 5，从左上角到右下角为左对角，从右上角到左下角为右对 角。	坐标的偏离度如图 2 所示偏离超出±1mm （非边缘区），± 1.5mm（边缘区）超出结论为 NG，不超出 结论为 OK。
两指最小间距	使用两个接地标准铜柱Φ6mm,在 TP 上、中、下三部分区域 逐渐接近至两点合为 1 点，然后又逐渐分离至 2 点，记录下 最小的两点物理间距	最小的两点间距应小于 10mm（横向/竖 向）
防水测试	TP 屏上滴上一滴 10mm 直径水滴，在 TP Development Kit 的 Points 中看是否有触摸点报出；将屏上的水擦拭干后， 看是否有残留点；在屏上喷上一层水雾，在 Graph 中测试是 否有触摸点报出和画线是否有断线；带着约 10mm 直径水滴 画线看是否有断线和飞线	不应有误报点、断线 和残留点

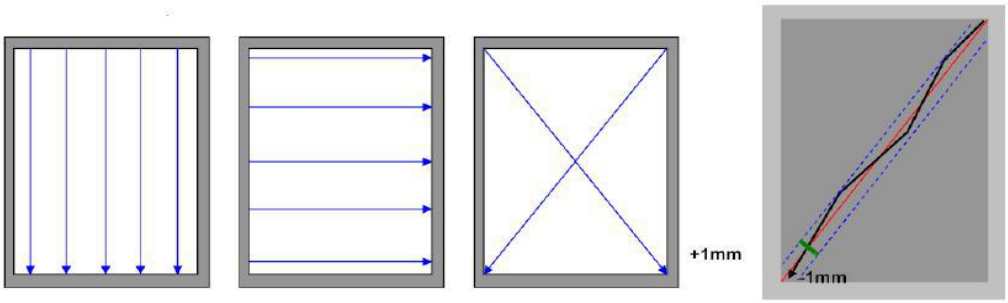


图 2、线性度路径示意图

	灵敏度	参照图 3 对 TP 屏幕进行划分 Nx×Ny，Nx=W/Xmm，Ny=H/Ymm，按所示的路径用接地标准铜柱φ6mm 以 5mm/s 画线，记录下坐标的偏离度。(Nx、Ny>=5)	不应有断线，坐标的偏离度如超出划分所属区域则 NG，否则 OK	

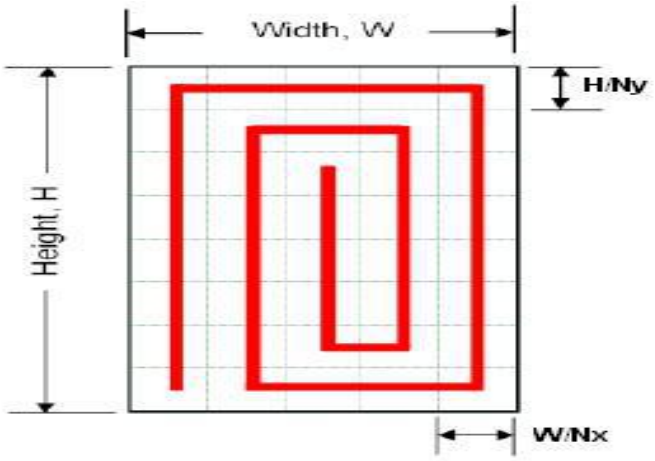
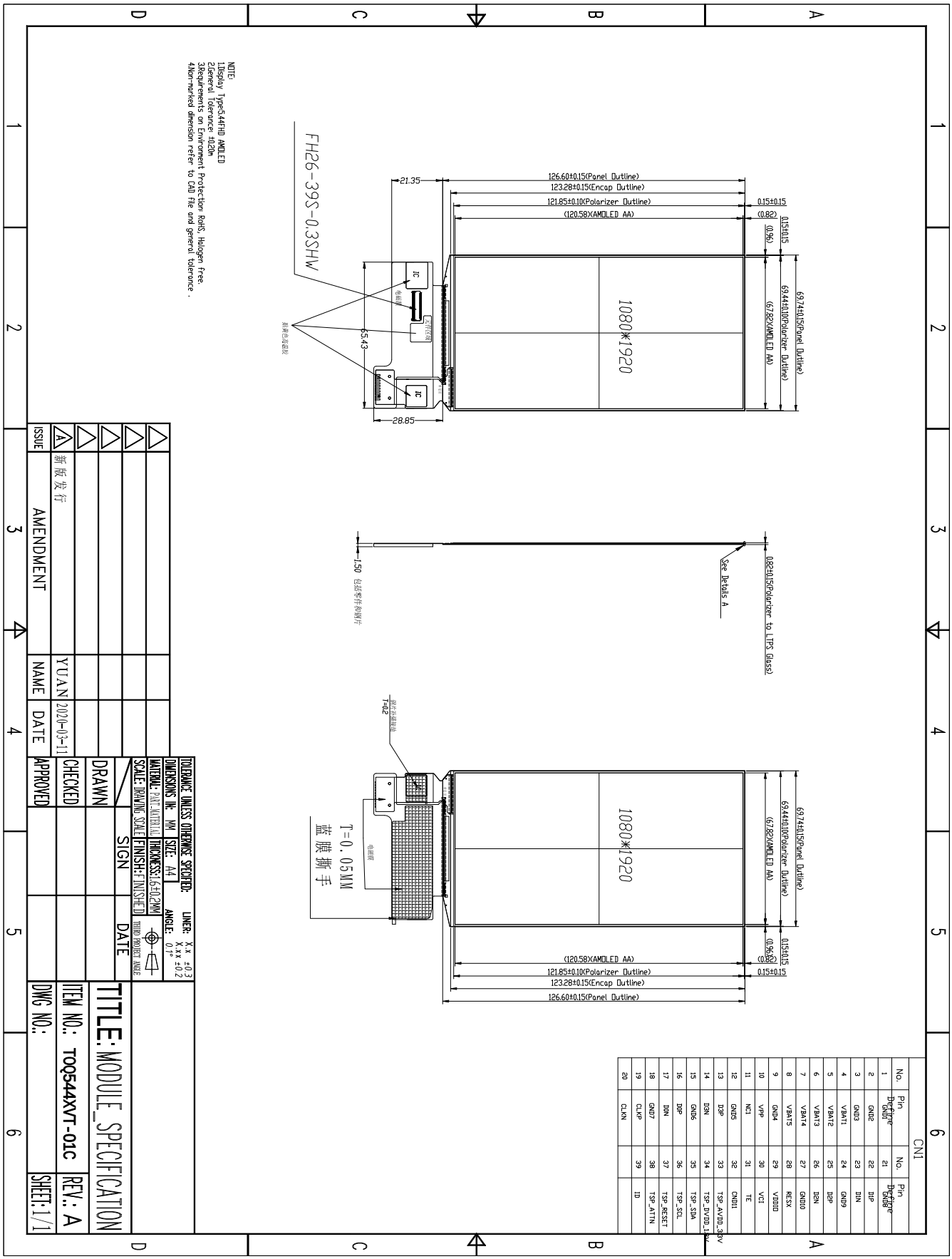


图 3、灵敏度测试路径示意图

微短路阻抗	Weak Short-circuit Test CG_MIN:1200(K 奥姆)，CG 表示通道对地短路电阻 CC_MIN:1200(K 奥姆)，CC 表示通道短路电阻	此微短路阻抗规格以敦泰 FTxxxx IC 及敦泰 AP 测试为准

5. MODULE OUTLINE DIMENSION



6. MODULE INTERFACE DESCRIPTION

Pin No.	Symbol	Function
1~3	GND1~GND3	Ground.
4~8	VBAT1~VBAT5	VBAT POWER 5V.
9	GND4	Ground.
10	VPP	NC
11	NC1	NC.
12	GND5	Ground.
13	D3P	MIPI data input pin.
14	D3N	MIPI data input pin.
15	GND6	Ground.
16	D0P	MIPI data input pin.
17	D0N	MIPI data input pin.
18	GND7	Ground.
19	CLKP	MIPI clock input pin.
20	CLKN	MIPI clock input pin.
21	GND8	Ground.
22	D1P	MIPI data input pin.
23	D1N	MIPI data input pin.
24	GND9	Ground.
25	D2P	MIPI data input pin.
26	D2N	MIPI data input pin.
27	GND10	Ground.
28	RESX	RESET DATA
29	VDDIO	Digital circuit I/O power supply
30	VCI	Power supply for interface system except MIPI interface pin,VDDIN=3.3V MIPI interface pin,VDDIN=3.3V
31	TE	Tearing Effect pin.
32	GND11	Ground.
33	TSP_AVDD_3.3V	TP Power supply for analog system.
34	TSP_AVDD_1.8V	TP Power supply for analog system.
35	TSP_SDA	TP SPI data input.
36	TSP_SCL	TP SPI clock input.
37	TSP_RESET	TP Reset signal
38	TSP_ATTN	TP INT DATA.
39	ID	NC

7. REFERENCE APPLICATION CIRCUIT

Please consult our technical department for detail information.

8. RELIABILITY TEST CONDITIONS

No.	Test Item	Test Condition	Notes
1	High Temperature Storage	+85±2° C /240hrs	Inspection after 2~4h storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Seal leak; 3. Non-display; 4. Missing segments; 5.Glass crack; 6. The surface shall be free from damage. 7. The electrical characteristics requirements shall be satisfied.
2	Low Temperature Storage	-40±2° C /240hrs	
3	High Temperature Operating	70±2° C /120hrs	
4	Low Temperature Operating	-20±2° C /240hrs	
5	Temperature Cycle	Ta=-40℃~85℃,32 Cycle,per30min	
6	High Temperature /Humidity storage	60℃, 93%RH / 240hrs	
7	Vibration Test	Frequency: 10Hz~55Hz~10Hz Amplitude:1.5mm, 2 hours for each direction of X, Y, Z	
8	Packing Drop Test	Drop to the ground from 1m height, 1 corner, 3 edges, 6 surfaces.	
9	ESD test	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	

Remarks:

(1) The test samples should be applied to only one test item.

(2) Sample size for each test item is 5~10pcs.

(3) For High Temperature/Humidity storage test, pure water (resistance>10MΩ) should be used.

(4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.

(5) Failure judgment criterion: basic specification, electrical characteristic, mechanical characteristic, optical characteristic.

9. PACKING SPECIFICATION

TBD.

10. Quality Assurance

10.1 Sample Method

Unless otherwise agreed upon in writing,the sample inspection shall be applied to the Customer's incoming inspection.

11.1.1. Lot size :Quantity per shipment lot

11.1.2. sampling type :Normal inspection,Single sampling

11.1.3. inspection level :11

11.1.4. Sampling table :MIL-STD-105E

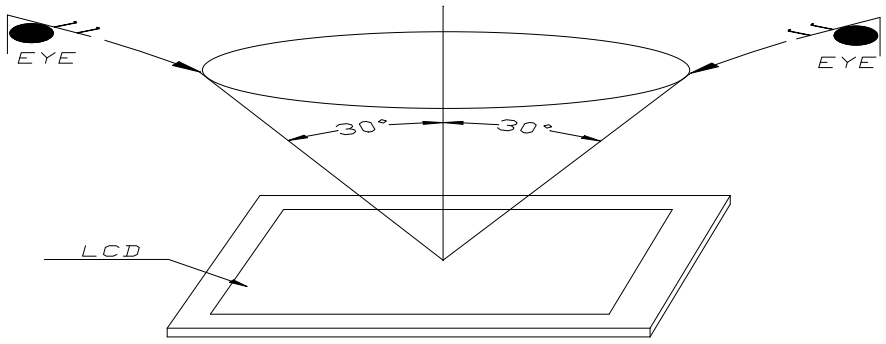
11.2 Appearance Inspection

Appearance inspection should be done under the following condition.

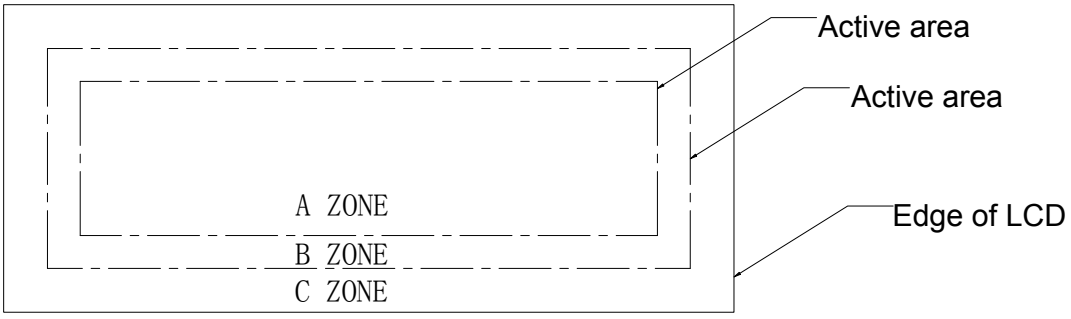
(1) In the dark room.

(2) The distance from eyes to LCD must be 30cm.

(3) Viewing direction must be within 30 degrees to vertical line of LCD center.



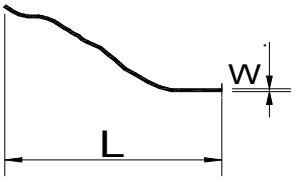
11.3 Definition of A zone,B zone and C zone

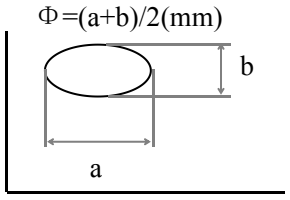


11.4 Appearance Criterion

Customer and supplier should hold a discussion when there is any problem about standard quality assurance or special quality assurance is needed.

NO.	Item	Criterion	Zone	AQL

<table>
<tr>
<td>1</td>
<td>Stains Black spots Foreign particles</td>
<td>Line shape:
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Qty</th></tr>
<tr><td>-</td><td>W<=0.03</td><td>Disregard</td></tr>
<tr><td>L≤5</td><td>W≤ 0.05mm,L ≤5mm</td><td>3</td></tr>
</table>


Round shape:
<table>
<tr><th>Diameter</th><th>Acceptable Q, ty</th></tr>
<tr><td>D<=0.15</td><td>Disregard</td></tr>
<tr><td>0.15<D<0.25</td><td>3</td></tr>
</table>


Any defect wiped out easily is acceptable.</td>
<td>A,B</td>
<td>1.0</td>
</tr>
<tr>
<td>2</td>
<td>Scratch</td>
<td>
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Qty</th></tr>
<tr><td>-</td><td>W<=0.03</td><td>Disregard</td></tr>
<tr><td>L≤5</td><td>W≤0.05mm,L≤ 5mm</td><td>3</td></tr>
</table>
</td>
<td>A,B</td>
<td>1.0</td>
</tr>
<tr>
<td>3</td>
<td>Bubbles</td>
<td>
<table>
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<tr><td>0.25<D<0.4</td><td>3</td></tr>
</table>
</td>
<td>A</td>
<td>1.0</td>
</tr>
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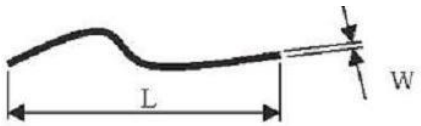
<td>4</td>
<td>Dent</td>
<td>
<table>
<tr><th>Diameter</th><th>Acceptable Qty</th></tr>
<tr><td>D<=0.25</td><td>Disregard</td></tr>
<tr><td>0.25<D<0.5</td><td>3</td></tr>
</table>
</td>
<td>A,B</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>Display quality</td>
<td>● Viewing angle defect.
● Contrast ratio defect.
● Missing lines.
● Malfunction.
● Power consumption exceeds specification.</td>
<td>A</td>
<td>0.65</td>
</tr>
<tr>
<td>6</td>
<td>Color tone Color uniformity</td>
<td>To be judged by Arima Display Corporation.</td>
<td>A</td>
<td>0.65</td>
</tr>
</table>

<table>
<tr><td>7</td><td>Bright Dot
Dark Dot</td><td>
<table>
<tr><th>Type</th><th>Acceptable Qty</th><th>Distance Between Defect Dot</th></tr>
<tr><td>Bright Dot</td><td>2</td><td>≥15mm</td></tr>
<tr><td>Dark Dot</td><td>2</td><td>≥10mm</td></tr>
<tr><td>Total Bright and Dark Dot</td><td>4</td><td>≥10mm</td></tr>
</table>
</td><td>A,B</td><td>1.0</td></tr>
<tr><td>8</td><td>Light guide</td><td>Criterion is same as No.1</td><td>A,B</td><td>1.0</td></tr>
</table>

<table>
<tr><td rowspan="11">9</td><td rowspan="11">CTP Inspection standard</td><td colspan="2">Scratches</td></tr>
<tr><td>Standard</td><td>Definition of acceptance inspection</td></tr>
<tr><td>W≤0.03mm</td><td>L≤2mm, Negligible</td></tr>
<tr><td>0.03mm＜W≤0.05mm</td><td rowspan="2">L≤5mm And the distance from another scratch.
A. ≥15mm，ALLOW 2。
L≤5mm And the distance from another scratch.
B. ＜15mm， NG。
C. L＞5mm， NG。</td></tr>
<tr><td>  </td></tr>
<tr><td>＞0.05mm</td><td>NG</td></tr>
<tr><td colspan="2">Granular debris（white/black dots）</td></tr>
<tr><td>Standard</td><td>Definition of acceptance inspection</td></tr>
<tr><td>D≤0.15mm</td><td>Lgnore， Dense point is not allowed (the distance between three points defined by dense point is less than 15mm)
）</td></tr>
<tr><td>0.15＜D≤0.25mm</td><td>ALLOW 1</td></tr>
<tr><td>D＞0.25mm</td><td>NG</td></tr>
<tr><td colspan="2">Linear debris</td></tr>
</table>

		Standard	Definition of acceptance inspection
		L＜2mm	Lgnore
		W≤0.03mm,L≤5mm	ALLOW 2
		0.03＜W＜0.05mm，L＜5mm	Spacing＞15mm,ALLOW 1
		0.05＜W，L＞5mm	NG
		Bumps、dents、bubbles	
		Standard	Definition of acceptance inspection
		D≤0.2mm	Lgnore
		0.2mm＜D≤0.5.mm	Spacing＞15mm,ALLOW 1
		D＞0.5mm	NG
		The glass breakage standard shall be in accordance with Article 8 above	
		Surface color, pattern and font, shading	Acceptance: 1. There is no obvious color difference (E ± 5) between the color and the standard sample 2. The font and pattern shall be clear and conform to the sample, and the line thickness ≤ 0.20mm is allowed. 3. Font light transmittance ≤ 0.15mm allowed 4. The allowable deviation of template alignment is less than 0.20mm. 5.Each edition has good concealment.

		Surface Spoils	Acceptance: 1. The erasable dirt and dust on the surface account for the number of samples Less than 1 / 5. Not allow: 1. The erasable dirt and dust on the surface account for the number of samples More than 1 / 5. Indelible dirt, white spots, black spots, etc.
		FPC	1. There shall be no oxidation, missing plating, hole fracture, dirt, etc. 2. Fold it 5 times in the same direction at 1 / 4~1 / 3 of TP, and check with a 40 times magnifying glass, no crack.
		Size	Meet the requirements of finished product inspection drawings
		TP functional test	100% full inspection of raw materials / finished products

11. GENERAL PRECAUTIONS

12.1 HANDING

(1) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bent the module.

(2) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that display modules are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, straining and discoloration may occur.

(5) If the display module surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, should be wiped by moisten cloth with isopropyl alcohol or ethyl alcohol solvents, DO NOT with water, ketone type

materials (e.g. acetone), aromatic, toluene, ethyl acid or methyl chloride, and so on.

(6) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(7) Use finger-stalls with sort gloves in order to keep display clean during the incoming inspection and assembly process.

(8) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(9) Do not touch directly conductive parts such as the CMOS LSI pad and the interface terminals with bare hands, therefore operations should be grounded whenever he/she comes into contact with the modules.

(10) Do not exceed the absolute maximum rating value. (The supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on), otherwise the module may be damaged.

12.2 SOLDERING

(1) Use soldering irons with proper grounding and no leakage.

(2) For No RoHS Product: soldering temperature is 290~350° C, soldering time is 3~5s; for RoHS Product: soldering temperature is 340~370° C, soldering time is 3~5s.

(3) If soldering flux is used, be sure to remove any remaining flux after soldering (This does not apply in the case of a non-halogen type of flux).

12.3 STORAGE

(1) DO NOT leave the module in high temperature and high humidity for a long times, keep the temperature from 0° C to 35° C and relative humidity of less than 60%.

(2) It is highly recommended to store the module in a dark place. The Liquid crystal is deteriorated by ultraviolet, DO NOT leave it in direct sunlight and strong ultraviolet ray for many hours.

(3) The polarizer surface should not come in contact with any other objects.