

 HuaXin Display Technology Co.,Ltd	Module No:	ESHX037WQ0005A-A
	REV: V01	
SPEC TITLE DOCUMENT CONTROL SPECIFICATION	DATE:	2025-09-25

表单编码: ESHX-QR-RD-033A

LCD MODULE SPECIFICATION

PART NO: ESHX037WQ0005A-A

Approved	Checked	Prepared	Date Issued
XXQ	YYT	Xiao	2025-09-25

Customer Approval	☐ Approved ☐ Reject Comment:
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1. DOCUMENT REVISION HISTORY

Doc. Version	DATE	DESCRIPTION	CHECKED BY
V01	2025-09-25	First Release.	Xiao



2. CONTENTS

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3. GENERAL DESCRIPTION:

- 3.71”(TFT), 240×RGB×960dots, 16.7M colors, Transmissive, TFT LCD module.
- Viewing Direction: ALL
- Driving IC:AXS15231
- Interface :MIPI
- Power voltage: 2.8V (typ.)

4. MECHANICAL SPECIFICATIONS:

Item	Specifications	Unit
Outline Size	25.30x98.89x 2.05	mm
LCD active area	22.86x91.44	mm
Display format	240×RGB×960	dots
Color configuration	RGB stripes	mm
Pixel pitch	0.09525x 0.09525	mm
Operation Temp.	-20~+70	℃
Storage Temp.	-30~+80	℃



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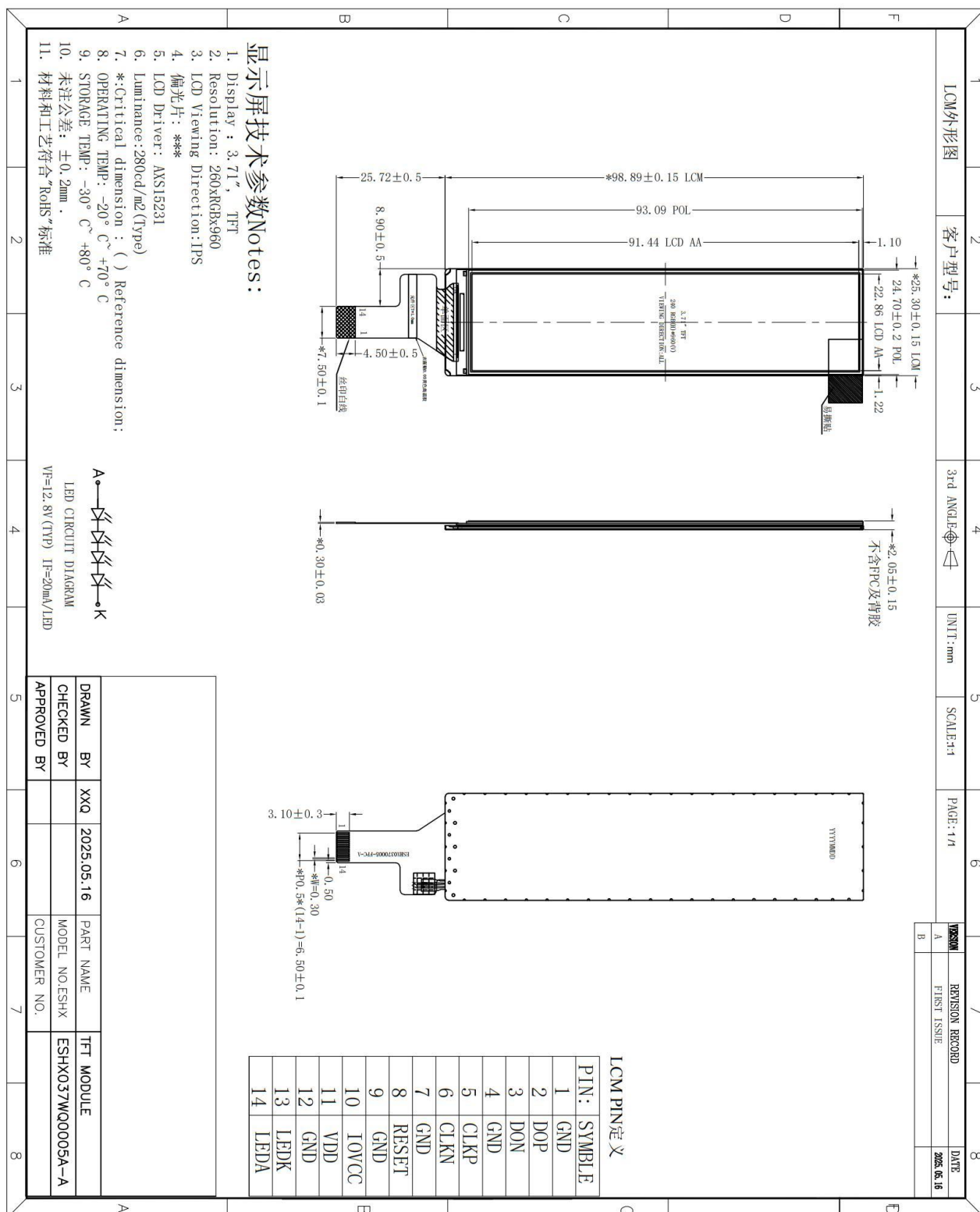
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5. OUTLINE DIMENSIONS



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6. PIN CONNECTIONS

NO.	PIN NAME	Description
1	GND	Ground
2	D0P	MIPI DSI differential data pair
3	D0N	MIPI DSI differential data pair
4	GND	Ground
5	CLKP	MIPI DSI differential clock pair.
6	CLKN	MIPI DSI differential clock pair.
7	GND	Ground
8	RESET	This signal will reset the device and it must be applied to properly initialize the chip
9	GND	Ground
10	IOVCC	I/O Supply Voltage (Logic) 1.8~3.3V
11	VDD	Supply Voltage 2.8V~3.3V
12	GND	Ground
13	LEDK	Backlight LED power supply (cathode)
14	LEDA	Backlight LED power supply (Anode)



7. MAXIMUM ABSOLUTE LIMIT:

ITEM	SYMBOL	MIN	MAX	UNIT
POWER SUPPLY	VCI	-0.3	4.0	V
POWER SUPPLY FOR Logic	VDDI	-0.3	4.0	V
Driver Supply Voltage	VGH-VGL	-0.3	+30	V
Logic Input Voltage Range	V _{in}	-0.3	4.0	V
POWER SUPPLY FOR LED	Vleda-Vledk	-0.3	13.6	V

Note: Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken.

They do not assure operations.

Note2: Background color changes slightly depending on ambient temperature. This Phenomenon is reversible.

T_a ≤ 70℃: 75%RH max

T_a > 70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note3: T_a at -20℃ will be <48hrs, at 70℃ will be <120hrs

8. ELECTRICAL CHARACTERISTICS

8.1 DC Characteristics (V_{DD}=2.8V, T_a=25℃)

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	VDD	2.7	2.8	3.3	V	-
Supply current	I _{VDD}	-	-	55	mA	V _{DD} =2.8V, T _a =25℃
Input voltage	V _{IH}	0.8VDDI	-	VDDI	V	-
	V _{IL}	0	-	0.2VDDI	V	

Note: Voltage greater than above may damage the module.

All voltages are specified relative to V_{SS}=0V.



8.2 Backlight Electrical-optical Characteristics

1. Stander Lamp Styles (Edge Lighting Type):

The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption:

2. The Main Advantages of the LED Backlight are as following:

2.1 The brightness of the backlight can simply be adjusted by a resistor or a potentiometer.

3. Data About LED Backlight:

Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition	Note
Supply Voltage	Vf	11.2	12.8	13.6	V	If=20mA	-
Supply Current	If	-	20	-	mA	-	-
Power dissipation	Pd	-	256	-	mW	-	-
Luminous Intensity for LCM	-	-	280	-	Cd/m ²	If=20 mA	-
Uniformity for LCM	-	80	-	-	%	If=20 mA	-
Backlight Color	White						

NOTE:

1. Uniformity = Min/Max * 100%

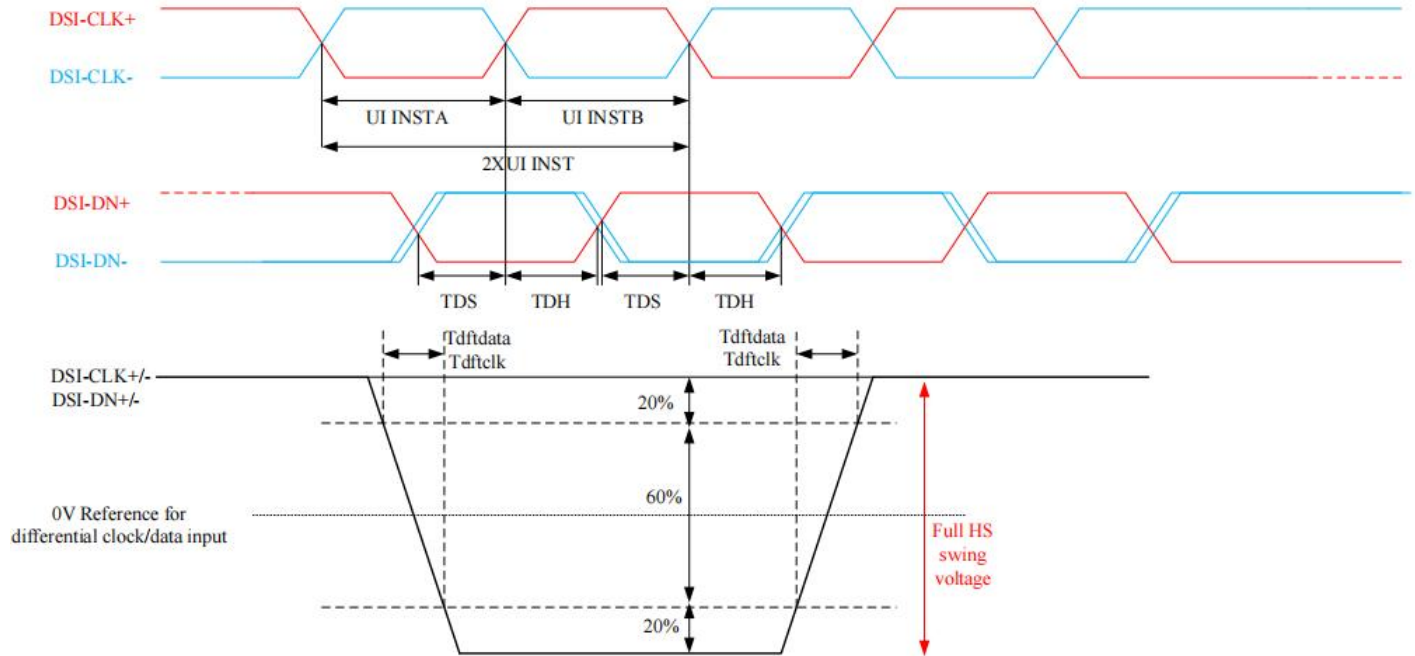
2. LED life time defined as follows:

The final brightness is at 50% of original brightness; Measured Method: (X*Y: Light Area);



9. AC CHARACTERISTICS

9.1 MIPI Interface Characteristics: High Speed Mode

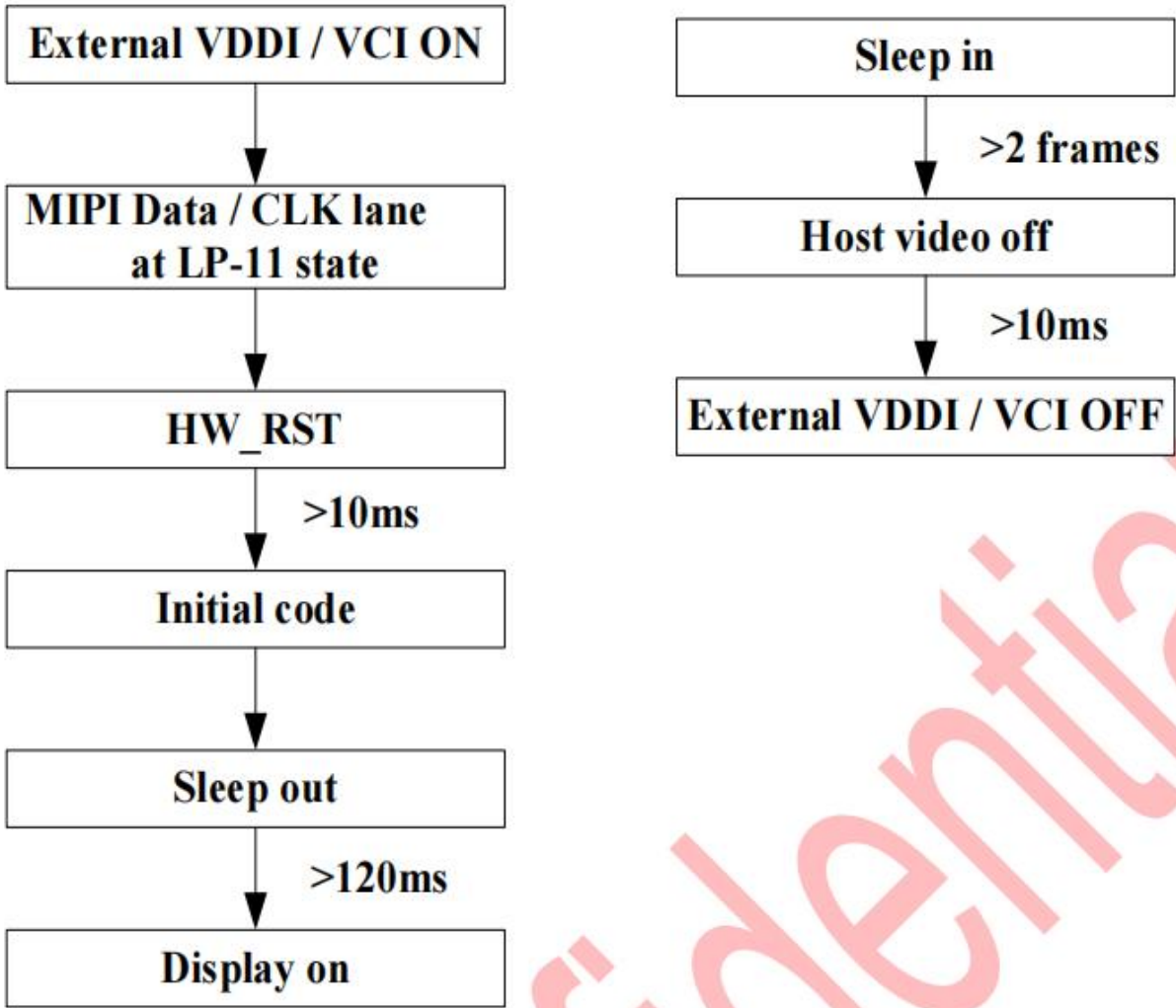


DSI clock channel timing

Parameter	Symbol	Parameter	Specification			Unit	Description
			MIN	TYP	MAX		
DSI-CLK+/-	$2xUI_{INSTA}$	Double UI instantaneous	4		25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halves	2		12.5	ns	$UI=UI_{INSTA}=UI_{INSTB}$
DSI-D0+/-	T_{DS}	Data to clock setup time	0.15	-		UI	
DSI-D0+/-	T_{DH}	Data to clock hold time	0.15	-		UI	

Mipi Interface- High Speed Mode Timing Characteristics

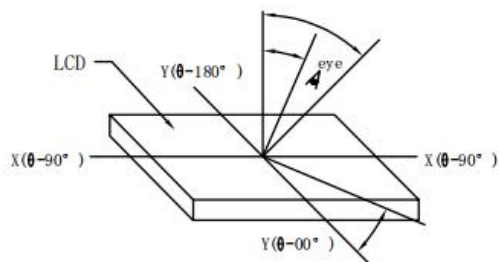
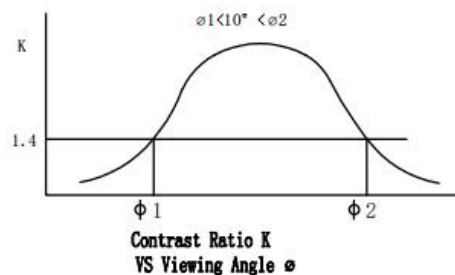
9.2 Power On Sequence



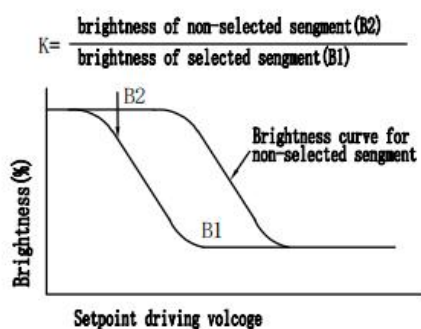


10. OPTICAL CHARACTERISTICS:

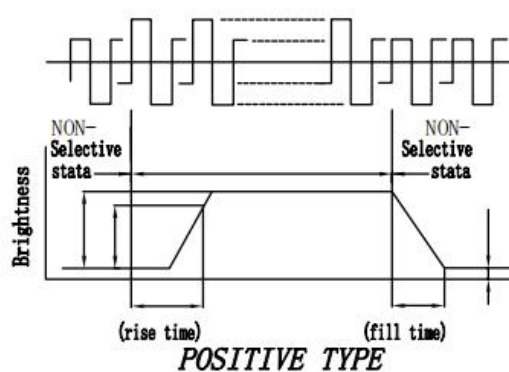
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle range	Horizontal	Θ_3	CR > 10	70	80	-	Deg.
		Θ_9		70	80	-	Deg.
	Vertical	Θ_{12}		70	80	-	Deg.
		Θ_6		70	80	-	Deg.
Contrast ratio		CR	$\Theta = 0_{\circ}$	1000	1500	-	
Transmittance		Tr.		3.25	3.7	-	%
White Chromaticity		x_w		0.292	0.312	0.332	
		y_w		0.347	0.367	0.387	
Reproduction of color (C light)	Red	R_x		0.621	0.641	0.661	
		R_y		0.323	0.343	0.363	
	Green	G_x		0.257	0.277	0.297	
		G_y		0.575	0.595	0.615	
	Blue	B_x		0.112	0.132	0.152	
		B_y		0.143	0.163	0.183	
Response Time (Rising + Falling)		$T_r + T_f$	Ta= 25_{\circ} C $\Theta = 0_{\circ}$	-	25	35	ms

10.1 Definition of angle θ and ϕ 10.2 Definition of viewing angle ϕ_1 and ϕ_2 

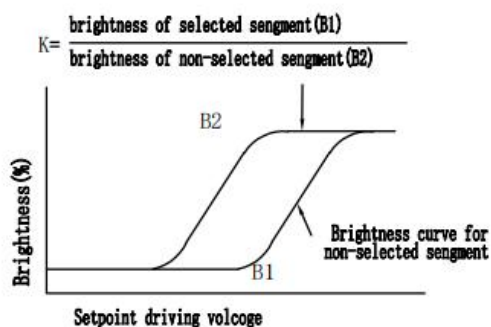
Definition of contrast "K"



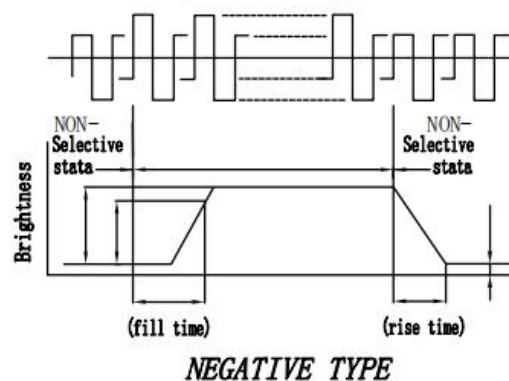
Definition of optical response



Definition of contrast "K"



Definition of optical response





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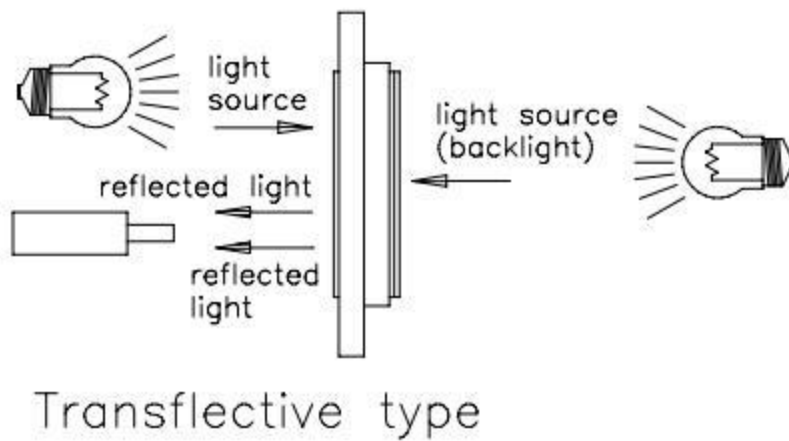
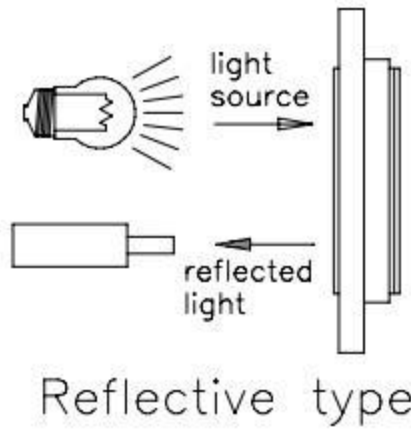
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10.3 DESCRIPTION OF MEASURING EQUIPMENT





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11. QUALITY LEVEL

11.1 STANDARD SPECIFICATION FOR RELIABILITY

Item	Condition	Time(hrs)	Assessment
High temp. Storage	80±2°C	96	No abnormalities in functions and appearance
High temp. Operating	70±2°C	96	
Low temp. Storage	-30±2°C	96	
Low temp. Operating	-20±2°C	96	
Humidity	60±2°C/ 90±3%RH	96	
Thermal Shock Temp. Cycle	-20±2°C ← 25±2°C → 70±2°C (0.5 hour ← 5 min → 0.5 hour)	10cycles	
ESD Test	Air Discharge: Apply ±4KV with 3 times ,150Pf/330 Ω Contact Discharge: Apply ±2KV with 3 times 150Pf/330 Ω	-	

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 30,000 hours under ordinary operating and storage conditions room temperature (25±10°C), normal humidity (45±20% RH), and in area not exposed to direct sun light. (Life time of backlight, please refer to Data about backlight.)

Testing Conditions and Inspection Criteria:

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in up Table, Standard specifications for Reliability have been executed in order to ensure stability.

Item	Test Model	In section Criteria
Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
Appearance	Visual inspection	Defect free.

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一、目的

制定本公司 TFT-LCM 成品的检验标准,确保我司产品最大限度地满足客户要求。

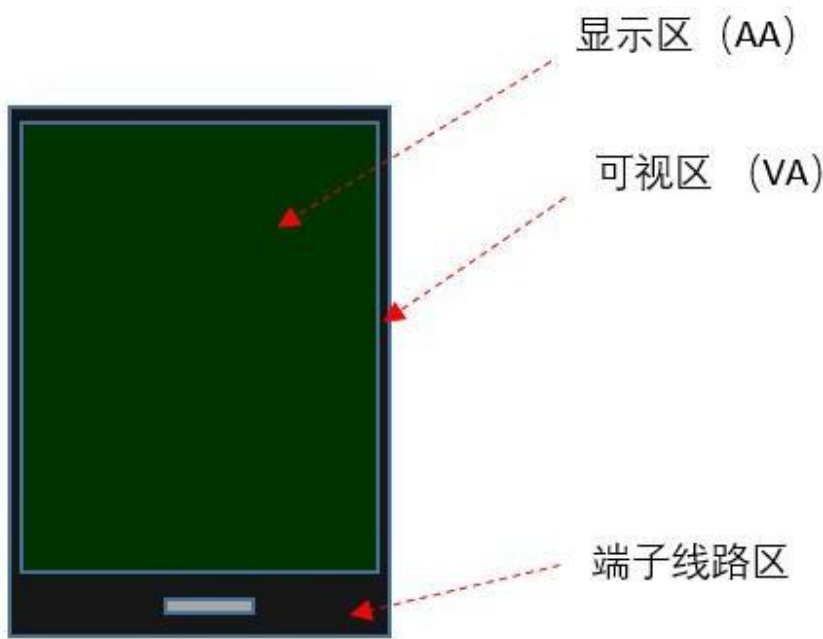
二、范围

本标准适用于 LCM 产品的出厂检验和生产过程检测时所对应检查项目的标准判定;如本标准与其它相关资料(标准)有冲突时,适用顺序为:
 用户标准、样品确认书、产品规格书、设计资料、本标准。

三、定义

3.1 液晶显示屏的区域划分

- 可视区 (VA 区): TFT-LCD 装机后可以目视到的区域;
- 显示区 (AA 区): TFT-LCD 显示图形的区域称为显示区。
- 非可视区: 装机后看不见的区域, 未进可视区判定OK。
- 端子线路区: IC Bonding 区域



3.2 缺陷等级划分

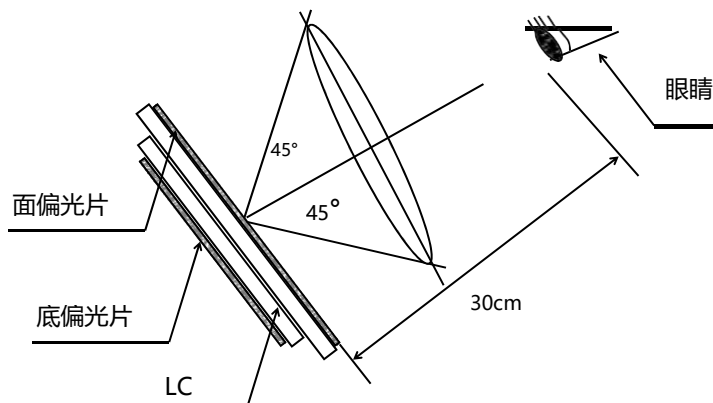
- 3.2.1 主要缺陷: 能引起失效或显著降低产品预期性能的缺陷。
- 3.2.2 次要缺陷: 不会显著降低产品的预期性能的缺陷, 偏离标准但只轻微影响产品的有效使用或操作的缺陷。

3.3 批的构成

由相同型号、相同设计、相同材料、相同制造工艺在同一周期内生产的一个或几个生产批构成。

四、检验条件

- 4.1 目测: 外观检查在台灯下进行,眼睛能清晰观察到所检查的项目即可。
- 4.2 电测: 电性检查设备为我司自制的工装,驱动电路(主板)安放在工装内。



4.3 检测距离: 30cm $\pm$ 5cm

4.4 视角方向

目视检验方向为图纸视角方向与 TFT-LCD法线夹角 0° —— 45° 的范围内 (如图示)

五、检验方案

5.1 检查水平: 正常生产情况下, 用一般检查水平 II。

5.2 抽样方案: 正常检查, 用一次抽样方案, 抽样方案为 GB/T2828.1-2012。

5.3 AQL: 主要缺陷---0.4; 次要缺陷---1.0。

5.4 主要缺陷: 影响客户装配, 不能使用的不良。

5.5 次要缺陷: 不影响客户使用的不良。

六、相关规定

6.1 本标准中未注明之单位均以 mm 为准;

6.2 如果不合格项目难以用文字描述, 则以批准的限度样板为判断依据。

6.3 客户接受水准: 上线作业不良率 $<1\%$ 不批退。

6.4 产品的有效期为一年, 车载、电表产品按照客户规格书要求。

6.5 次要电讯和外观不良检查时间为3秒, 3秒之内看不到判定OK。

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6.6缺陷定义

缺陷类别	定 义
重缺陷（MAJ）	显示或者功能缺陷，尺寸不符合设计，严重偏离规格，客户无法正常使用。
	严重外观缺陷，严重偏离规格，客户无法正常使用。
轻缺陷（MIN）	轻微偏离规格，产品（或组件）外观有小的差异，电讯不影响产品功能及客户正常使用

序号	检查项目	不良现像	缺陷程度
1	显示状态	无显、乱码、多划、少划、少画面、片视角错、闪烁、画面反、LCD 漏液晶、亮线、竖线、横线等不可接受；	重缺
		无法用文字描述的现象，必要时制定限度样品进行参考。如：显 示不均、显示浓淡、斜纹、Mura（雾状白团）等；（Mura（雾状白团）需采用ND6滤光片盖在表面来判定（无视即可）。	轻缺
		显示的颜色效果参照研发样品或限度样品判定。	轻缺
2	背光	LED 灯不亮不可接受；	重缺
		背光点亮后，显示屏有条纹滚动现象（LCD 显示正常）拒收；	重缺
		亮眼、漏光：进入 LCD 的 A、B 区不允许，必要时按限度样品做判定；组装脏点、毛线、组装偏位	轻缺
		背光颜色：根据样品、规格书判定；	轻缺
		亮度与发光均匀度参照客户、研发所签样品或限度样品判定。	轻缺

七、检查项目及判定水平

7.1电性检验 Function inspection:

序号	项 目		内 容	标 准	检查方法 及工具
7.1.1	动作及线缺陷及面缺陷	动作缺陷	目视不可见	不可有（Not Acceptable）	点亮、目测
7.1.2		线缺陷	目视不可见	不可有（Not Acceptable）	点亮、目测
7.1.3		残影	大于 5 秒	不可有（Not Acceptable）	点亮、目测
7.1.4		框线	正视不可遮挡	不可有（Not Acceptable）	点亮、目测
7.1.5		色差（Mura）	见限度样本（或者ND6% 后不可见允收）	无限度样本不可有（或者ND6% 后不可见允收）	点亮（灰阶画面）、目测



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序号	项 目	内 容 (content)		标 准				检 查 方 法 及 工 具
				<4.3	4.3≤ 尺寸<7.0	7.0≤ 尺寸<10.1	≥10.1	
7.1.6	点缺陷	點狀 缺陷 微小 亮點 /異物亮 / 微弱 亮/ 暗 点	$\Phi \leq 0.10\text{mm}$	忽略	忽略	忽略	忽略	点亮、 目测、 菲林片 比对
			$0.10\text{mm} < \Phi \leq 0.15\text{mm}$	2	2	忽略 (ignore)	忽略 (ignore)	
			$0.15\text{mm} < \Phi \leq 0.20\text{mm}$	1	2	2	3	
			$0.20\text{mm} < \Phi \leq 0.25\text{mm}$	0	1	2	2	
			$0.25\text{mm} < \Phi \leq 0.3\text{mm}$	0	0	1	1	
			$0.3\text{mm} < \Phi$	0	0	0	0	
			$0.10 < \Phi \leq 0.30\text{mm}$ 允收总数	2	2	2	3	
		暗亮点 总和	暗亮点总和	2	2	2	3	
		连续亮/ 暗点	亮点相连	0	0	0	0	
		其他点 (other dot)	同异物亮/细碎亮	同异物亮/细碎亮 (Particle/Small bright dot)				
		线状不 良	$W \leq 0.02\text{mm}$	忽略	忽略	忽略	忽略	
			$0.02\text{ mm} < W \leq 0.05\text{mm}$, 且 $L \leq 5\text{mm}$	1	2	忽略 (ignore)	忽略 (ignore)	
			$0.03\text{mm} < W \leq 0.05\text{mm}$, 且 $L \leq 3\text{mm}$	1	2	4	4	
			$W > 0.05\text{mm}$ 或 $L > 5\text{mm}$	0	0	0	0	
		备注 1 点缺陷亮点之间距离大于 10mm. 2 测试画面必须包含 红, 绿, 蓝, 白, 黑, 灰 3 正常日光灯环境下检测 (200~600LUX) 4 点不良数量比例不得超过单笔订单数量的 5% (之前没有这一条, 后面需要加进来)						

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7.2 外观检验 Outer appearance inspection

序号	项目		内容	标 准				检查方法 及工具
7.2.1	内容（content）			<4.3	4.3≤尺寸<7.0	7.0≤尺寸<10.1	≥10.1	--
7.2.2		异物/刮伤/气泡/凹凸等线状不良	W≤0.02mm	忽略	忽略	忽略	忽略	目视、菲林片
			0.02mm<W≤0.05mm, 且 L≤5mm	1	2	2	3	
			0.03mm<W≤0.05mm, 且 L≤3mm	1	2	2	2	
			W>0.05mm 或 L>5mm	0	0	0	0	
7.2.3	偏光片和背光缺陷 (polarizer&Backlight defect)	异物/刮伤/气泡/凹凸等点状不良	Φ≤0.10mm	忽略	忽略	忽略	忽略	目视、菲林片
			0.10mm<Φ≤0.15mm	1	1	忽略	忽略	
			0.15mm<Φ≤0.20mm	1	1	2	3	
			0.20mm<Φ≤0.25mm	0	0	2	2	
			0.25mm<Φ≤0.3mm	0	0	1	1	
			0.30mm<Φ	0	0	0	0	
			0.10<Φ≤0.30mm 允收总数	2	2	2	3	
7.2.4		备注： 1. 线缺陷包括盒内毛线，纤维，贴片杂质，偏光片划伤，玻璃划伤 2. 偏光片偏移不超出玻璃边缘，不可进入可视区 3. 检验照度 800~1200LUX（台灯下）						目视、菲林片
7.2.5	FPC 缺陷FPC defect	FPC 划伤/破损	不漏铜及未伤及线路	允许（Acceptable）				目视
7.2.6		FPC 折痕	死折或伤及电路	不可有（Not Acceptable）				目视
7.2.7		FPC 脏污残胶	金手指位置不可有，其他位置可擦除可接受	允许（Acceptable）				目视



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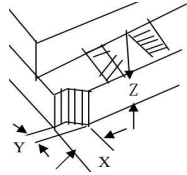
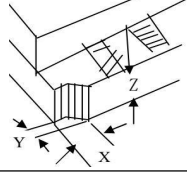
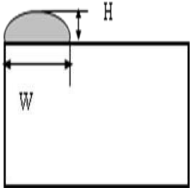
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7.2.8		金手指	残胶, 脏污, 氧化, 残锡, 破损	不可有 (Not Acceptable)	目视
7.2.9		焊接偏移	偏移量 $\leq 1/2$ pin 宽	允许 (Acceptable)	目视
7.2.10		FPC 贴付偏移	图面位置公差 $\leq 0.5\text{mm}$	允许 (Acceptable)	目视, 游标卡尺
7.2.11		FPC 手焊	PIN 腳焊點有毛刺, 不平整, 不光滑, FPC燒焦, 發黑	不允許 (Not Acceptable)	目视
7.2.12			少錫, PIN 腳處焊錫未完全覆蓋, PIN 腳孔隙, 殘錫, 測試點殘錫	不允許 (Not Acceptable)	目视
7.2.13		FPC 氣泡	非線路區	允许 (Acceptable)	目视
7.2.14		FPC 異物	橫跨 ≥ 3 根 Pin 或造成電氣(性)不良	不允許 (Not Acceptable)	目视
7.2.15		FPC 其它不良	少器件, 分層, 錫尖, 燒焦發黑, 殘錫	不允許 (Not Acceptable)	目视
7.2.16		補強板不良	髒汙, 剝離, 脫落	不允許 (Not Acceptable)	目视
7.2.17		FPC 绝缘胶带	未覆盖焊接区	不可有 (Not Acceptable)	目视
7.2.18		胶带超出边缘	胶带超出边缘 $\leq 0.2\text{mm}$	允许 (Acceptable)	目视, 游标卡尺
7.2.19	組裝缺 Assem by defect	注胶涂布不良	未完全覆盖ITO线路, 表面超出上偏光片	不可有 (Not Acceptable)	目视
7.2.20			破损, 气泡, 異物 $D \leq 2\text{mm}$, 且未露出线路	允许 (Acceptable)	目视
7.2.21		IC 破损	裂纹	不可有 (Not Acceptable)	目视
7.2.22			崩边 $\leq 0.2\text{mm}$	允许 (Acceptable)	目视, 游标卡尺



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7.2.23	易撕贴	上下倾斜不超过 30 度 贴付公差+/- 1mm	允许 (Acceptable)	目视, 游标卡尺
7.2.24	胶框不良	胶框变形造成外 观尺寸变化 $\geq$ 0.2mm	不可有 (Not Acceptable)	目视, 游标卡尺
7.2.25	定位柱	定位柱变形, 皮 损, 歪斜	不可有 (Not Acceptable)	目视
7.2.26	铁框变形	胶框变形造成外 观尺寸变化 $\geq$ 0.2mm	不可有 (Not Acceptable)	目视, 游标卡尺
7.2.27	铁框生锈	锈点直 径 $\geq$ 0.5mm	不可有 (Not Acceptable)	目视、 菲林片
7.2.28	喷码/标签	无喷码/标签, 模 糊, 错误	不可有 (Not Acceptable)	目视
7.2.29	玻璃缺陷 (glass defect)	裂痕 (Crack)	不可有 (Not Acceptable)	目视
7.2.30		崩边 (chipping)	 X=长度 (Length) (width) Z=厚度 (depth) Z不计, Y<1 mm , X 不计为单层玻璃厚度	目视, 游标卡尺
7.2.31		台阶缺角 (Steps chipping)	 Z 不计 Y* X <1*4mm 不 伤及走线	目视, 游标卡尺
7.2.32		凸缘	 $H \leq 0.2\text{mm}$, W 不计	目视 游标卡尺
7.2.33	logo 丝印		脏污不可有, 其他同点规格	目视, 菲林片
7.2.34	保护膜气泡		翘起面积小于 1/3 允收	目视, 游标卡尺

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7.3备注

7.3.1 Polarizer 由外往内 0.5mm 区域忽略 刮伤 / 气泡线 /线状缺陷/ 气泡 / 凹凸点/黑&白点、异物(含 B/L 异物)/压痕/烧伤/BM 波动/偏光片保护膜破损/折痕。

7.3.2 偏光片保护膜气泡(不夹异物)，不卡 （特殊要求另行规定）

7.3.3 FPC 表面脏污(silicon 胶或颗粒)：脏污颗粒可擦除 OK,不能擦除部份须 <0.1mm;FPCA 表面与补强板连接处不允许有 silicon 胶残留；FPC 表面贴黑胶连接处允许有 silicon 胶残留。

7.3.4 不可溢胶到 Panel 背面

7.3.5 成品保护膜内异物依点/线缺陷判定，气泡/可擦拭脏污不卡，不可擦拭脏污/残胶不可有。

7.3.6 成品尺寸（长,宽,厚 需要参照产品图纸用游标卡尺做量测）每批抽测 5 片。

补充：针对点状/线状不良，降级品的检验标准如下：

B级品 (点状)	$\Phi \leq 0.15$	不计
	$0.15 < \Phi \leq 0.20$	2, 两点间距离不小于5mm
	$0.20 < \Phi \leq 0.30$	1
	$0.30 < \Phi$	0

B级品 (线状)	$W \leq 0.03$	不计
	$0.03 < W \leq 0.05, L \leq 3.0$	3
	$0.05 < W$	按黑白点判定



12. PRECAUTIONS

Static charge

Since this LCD module contains CMOS LSI that are sensitive to static charge, care must be taken when handling it

Power on sequence

1. Input signals should not be applied to the LCD module before the logic system voltage has reached the specified voltage. If the above sequence is not kept, the LCD module might be permanently damaged.
2. When connecting the power supply, connect the LCD bias voltage after connecting the logic system voltage.
3. When disconnecting the power supply, disconnect the logic system voltage after the LCD bias voltage.
4. It is recommended to connect a serial resistor or fuse to the LCD bias power supply of the system as a current limiter. The value of the resistor depends on the kind of LCD used, but is typically 50~100 Ω

Operation

1. It is essential to drive the LCD within the specified voltage limits, since a higher driving voltage than allowed causes a shorter LCD lifetime. Under these circumstances, elector-chemical reactions will result in undesirable deterioration of the LCD.
2. The response time of the LC fluid is considerably longer at low temperature than in the normal operating temperature range. On the other hand, the LCD will show a dark blue color at high temperatures. Those phenomena do not indicate a malfunction or defect of the LCD. Back at normal temperatures, the LCD will return to its original behavior.
3. If the display area is pressed hard during operation, some abnormal display patterns might appear. However, the display will resume normal operation after turning the module off and on.
4. Moisture on the terminals could cause an elector-chemical reaction resulting in an open terminal connection. If the environmental temperature is higher than 50°C, it is required that the relative humidity is 50% or less.

Long-time storage

For long-term storage the following methods are highly recommended:

1. Store the product in a polyethylene bag with a sealed opening to prevent fresh air entering from the outside. Placing it with a desiccant is not necessary.
2. Store the product in a dark place, with the temperature in the range from -10°C to 50°C.
3. Keep the sensitive polarizer surface of the LCD panels clear of any contact. We recommend using the container that was used by HX to deliver the products.

Cleaning of product

To clean the product make sure to use absorbent cotton cloth or other soft material like chamois. Make sure to rub it gently and do not use chemicals when cleaning.

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13. PACKAGING INFORMATION(TBD)

Packaging Material				
No.	Item	Model	Dimensions (mm)	Quantity
1	LCM	-	-	--
2	POF	-	-	--
3	TRAY	-	-	--
4	SMALL BOX	-	-	--
5	BIG BOX	-	390.0×320.0×380.0	1