PRODUCT SPECIFICATION

TFT MODULE

MODEL: LT-020176220-C01N Rev A

CUSTOMER APPROVAL	
SIGNATURE	DATE

PREPARED	CHECKED	APPROVED

Leader Time Srl - via IV Novembre, 8 - 36042 Breganze (VI) - TEL.+39 0445 300722 - FAX +39 0445 300530
E-mail: g.roman@leadertime.it - P.IVA 02540780240 – R.I. Vicenza n. 172212/96 – cap. €. 25.823 I.V.

RECORDS OF REVISION

Date	Rev.	Description	Note	Page
2015-7-1	A	Preliminary		

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Contents

Note : For detailed information please refer to IC datasheet : ILITEK—ILI9225G.

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1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	176*(R,G,B)*220 Dots
LCD Type	Color TFT , Transmissive ,Positive
Screen Size(inch)	2.0(Diagonal)
Viewing Direction	12 O'clock
Backlight	White LED B/L
Weight	16.5g
Interface	SPI4 interface
Other(controller/driver IC)	**ILITEK** __ILI9225G

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	41.42(W) *51.60 (H) *3.4 (T)	mm
Viewing Area	32.08(W)*40.0(H)	mm
LCD Active Area	31.68 (W) * 39.6 (H)	mm
Dots Pitch	0.180(W)X0.180(H)	mm

Note : For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V_{DD}		-0.3	4.6	V
Operating Temperature	T_{OP}		-20	70	°C
Storage Temperature	T_{ST}		-30	80	°C
Storage Humidity	H_D		20	90	%RH

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1.4 DC Electrical Characteristics

Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}	-	2.5	3.3	3.4	V
LCM Driver voltage	VCC		-	3.3V	-	
"H" Input Voltage	V_{IH}	-	0.8 V_{DD}	-	V_{DD}	V
"L" Input Voltage	V_{IL}	-	V_{SS}	-	0.2 V_{DD}	V
"H" Output Voltage	V_{OH}	-	0.8 V_{DD}	-	V_{DD}	V
"L" Output Voltage	V_{OL}	-	V_{SS}	-	0.2 V_{DD}	V
Supply Current	I_{DD}	V_{DD} = 3.3V，Pattern=Black	-	9.5		mA
Power Consumption (panel+LSI)	Black mode	V_{DD} = 3.3V	-	31.35		mW

1.5 Optical Characteristics

Ta = 25°C

Item		Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	TOP	Θ T	CR≥10	-	45°	-	Notes 1 & 2
	BOTTOM	Θ B		-	20°	-	
	LEFT	Θ L		-	45°	-	
	RIGHT	Θ R		-	45°	-	
CIE *1	WHITE	X	TA=25° Θx, ΘY=0°	0.237	0.270	0.323	
		Y		0.273	0.300	0.345	
	RED	X		0.550	0.560	0.646	
		Y		0.313	0.330	0.379	
	GREEN	X		0.257	0.320	0.360	
		Y		0.559	0.590	0.619	
	BLUE	X		0.122	0.140	0.162	
		Y		0.050	0.080	0.142	
Contrast Ratio		C	θY = 5°, ∅ = 0°	150	300	-	Note 3
Response Time(rise+ fall)		Tr+ Tf	θ = 5°, ∅ = 0°	-	30ms	50 ms	Note 2

*1: This value will be changed while mass product.

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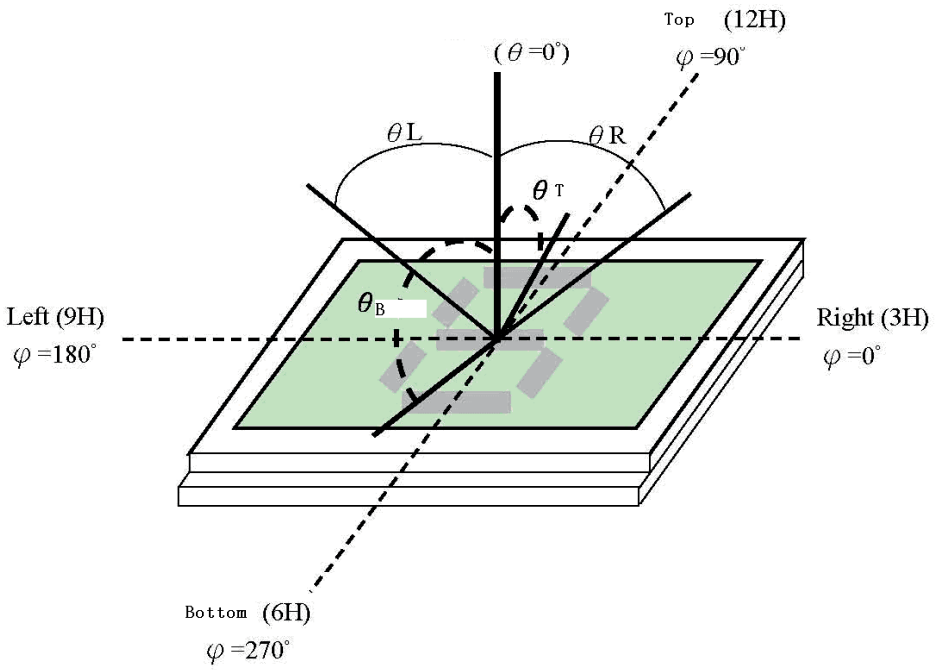
Note 1.

Optical characteristics-2

Viewing angle



Viewing angle

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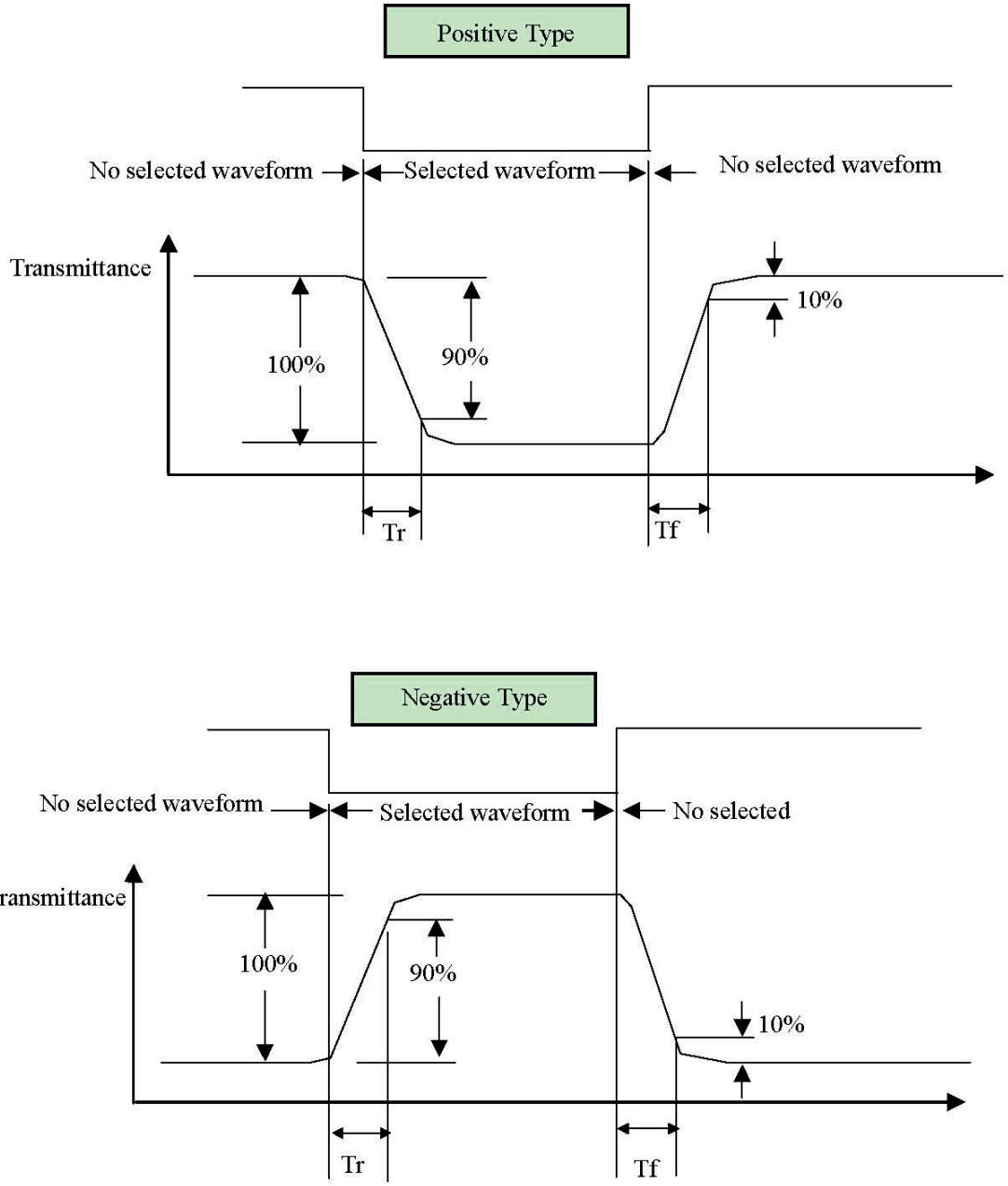
Note 2.

Optical characteristics-3

Fig.2 Definition of response time



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Electrical characteristics-2

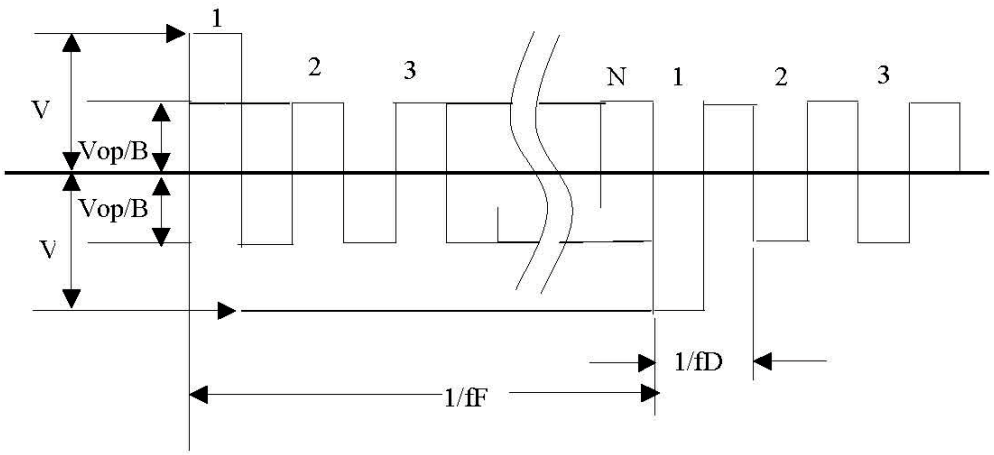
※2 Drive waveform

Vop: Drive voltage fF: Frame frequency

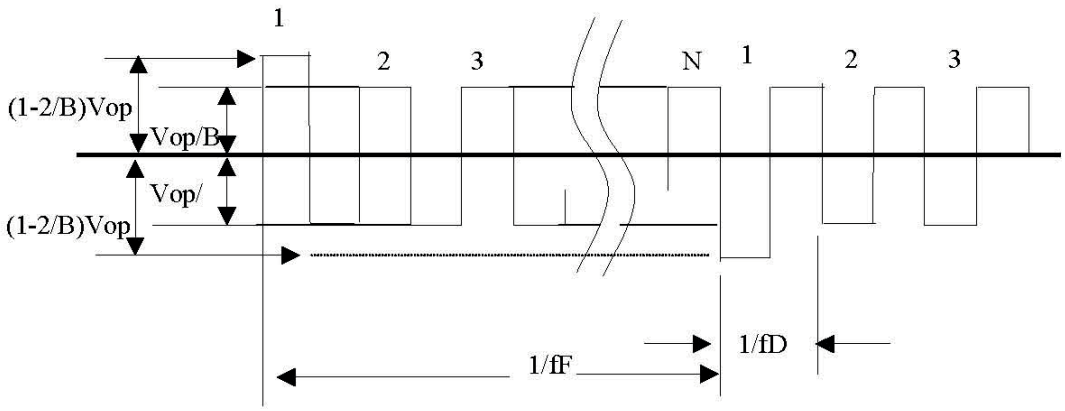
1/B: Bias fD :Drive frequency

N: Duty

(1) Selected waveform



(2) Non- Selected wave form



Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak /2 = 1 period

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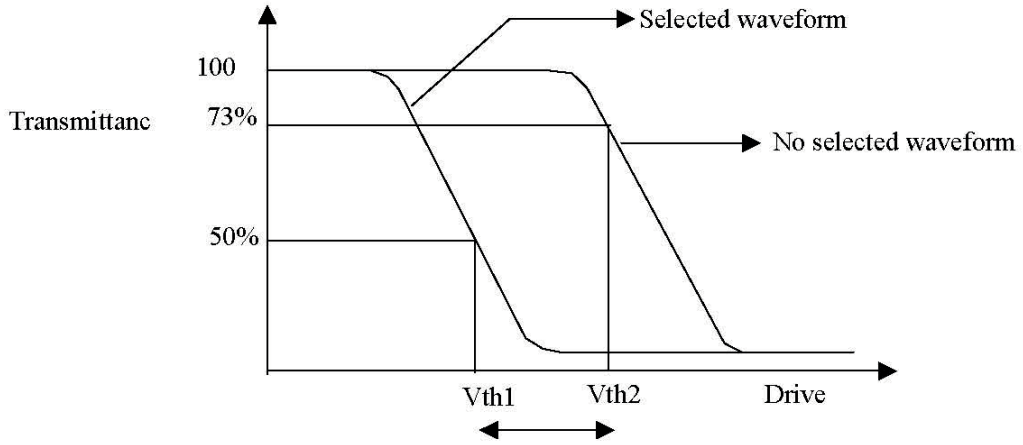
Note 3. : Definition of Vth

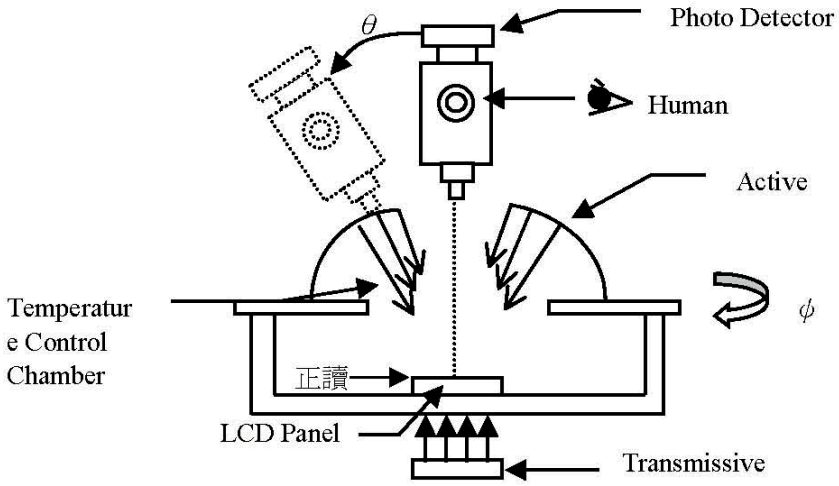


Active voltage range

	Vth1	Vth2
View direction	10°	40°
Drive waveform	(Selected waveform)	(No selected waveform)
Transmittance	50%	73%

※1 Contrast ratio
= (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System



Measuring System: Autronic DMS-803

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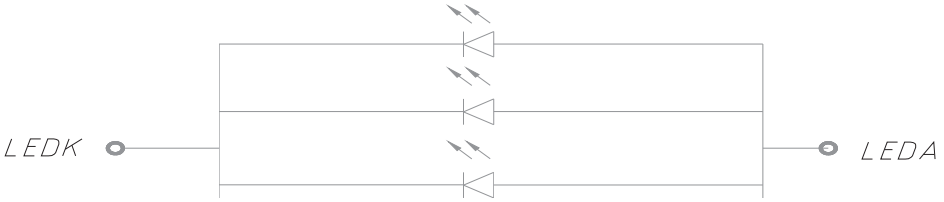
1.6 Backlight Characteristics

LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Current	I_F	Ta =25°C	--	--	75	mA
Power Dissipation	P_d	Ta =25°C	--	--	262.5	mW
Forward Voltage	V_F	I_F=60 mA	2.65	3.0	3.5	V
Reverse voltage	V_R				5	V
Average Brightness (without LCD &TP)	I_V	I_F=60 mA	3500	4200	5600	cd/m^2
Operating Temperature	T_{OP}	-	-20	--	70	°C
Storage Temperature	T_{ST}	-	-30	--	80	°C



LCD Module Electrical / Optical Characteristics

Ta =25°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Average Brightness (With LCD)	I_V	I_F=60 mA	100	150	--	cd/m^2
Uniformity (Without LCD)	U	I_F=60 mA	70	--	--	%
CIE Color Coordinate (Without LCD)	X	I_F=60 mA	0.250	0.270	0.295	-
	Y		0.250	0.270	0.295	
Color	White					

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2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.2 Interface Pin Description

Pin No.	Symbol	Function
1	LEDA	LED Backlight anode
2	LEDK	LED Backlight cathode
3	VDD	Display Module Analog Power 3.3V
4	SCL	SPI CLOCK
5	RESET	Active Low Signal to Reset TFT Driver
6	CS	Chip selection
7	SDI	SPI DATA INPUT
8	RS	REGISTER SELECT
9	VSS	Display Module Ground
10	VDDI	Display Module Digital Power 3.3V
11	NC(X-)	No Connection
12	NC(Y-)	No Connection
13	NC(X+)	No Connection
14	NC(Y+)	No Connection

*1: For SPI4, IM3->0,IM2->1,IM1->1,IM0->1;

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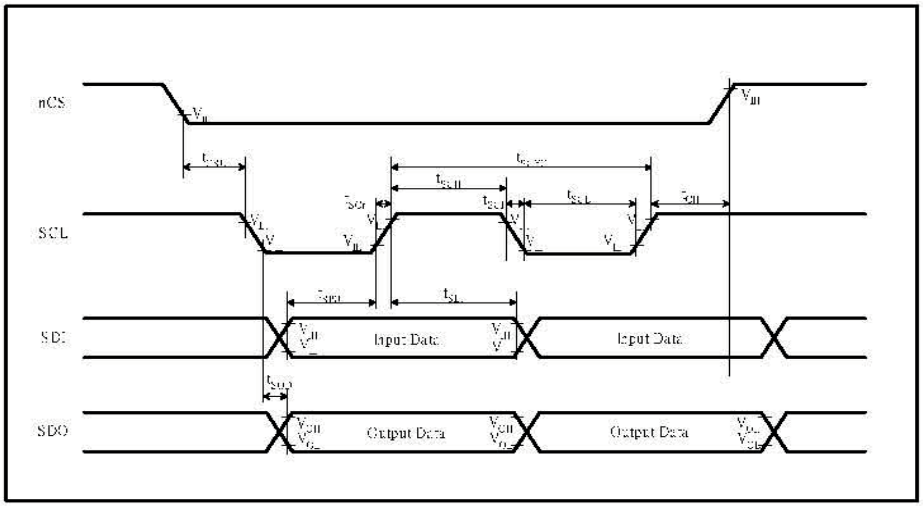
2.3 Timing Characteristics

(IOVCC= 1.65~3.3V and VCI=2.5~3.3V)

Item		Symbol	Unit	Min.	Max.	Test Condition
Serial clock cycle time	Write (received)	t_{SCYC}	ns	80	-	IOVCC=1.65~2.8V
	Write (received)	t_{SCYC}	ns	25		IOVCC=2.8~3.3V
	Read (transmitted)	t_{SCYC}	ns	200	-	
Serial clock high – level pulse width	Write (received)	t_{SCH}	ns	40	-	IOVCC=1.65~3.3V
	Read (transmitted)	t_{SCH}	ns	90	-	
Serial clock low – level pulse width	Write (received)	t_{SCL}	ns	40	-	IOVCC=1.65~3.3V
	Read (transmitted)	t_{SCL}	ns	90	-	
Serial clock rise / fall time		t_{SCr}, t_{SCf}	ns	-	5	
Chip select set up time		t_{CSU}	ns	10	-	
Chip select hold time		t_{CH}	ns	10	-	
Serial input data set up time		t_{SISU}	ns	5	-	
Serial input data hold time		t_{SIH}	ns	5	-	
Serial output data set up time		t_{SOD}	ns	-	200	
Serial output data hold time		t_{SOH}	ns	10	-	



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2.4 Display Command

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
IR	Index	W	0	0	0	0	0	0	0	0	0	ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0
00h	Driver Code Read	R	1	1	0	0	1	0	0	1	0	0	0	1	0	0	1	1	0
01h	Driver Output Control	W	1	VSPL (0)	HSPL (0)	DPL (0)	EPL (0)	0	SM (0)	GS (0)	SS (0)	0	0	0	NL4 (1)	NL3 (1)	NL2 (1)	NL1 (0)	NL0 (0)
02h	LCD AC Driving Control	W	1	0	0	0	0	0	0	INV1 (0)	INV0 (1)	0	0	0	0	0	0	0	FLD (0)
03h	Entry Mode	W	1	0	0	0	BGR (0)	0	0	MDT1 (0)	MDT0 (0)	0	0	ID1 (1)	ID0 (1)	AM (0)	0	0	0
07h	Display Control 1	W	1	0	0	0	TEMON (0)	0	0	0	0	0	0	0	GON (0)	CL (0)	REV (0)	D1 (0)	D0 (0)
08h	Blank Period Control 1	W	1	0	0	0	0	FP3 (1)	FP2 (0)	FP1 (0)	FP0 (0)	0	0	0	0	BP3 (1)	BP2 (0)	BP1 (0)	BP0 (0)
0Bh	Frame Cycle Control	W	1	NO3 (0)	NO2 (0)	NO1 (1)	NO0 (1)	SDT3 (0)	SDT2 (0)	SDT1 (0)	SDT0 (1)	0	0	0	0	RTN3 (0)	RTN2 (0)	RTN1 (0)	RTN0 (0)
0Ch	Interface Control	W	1	0	0	0	0	0	0	0	RIM (0)	0	0	0	DM (0)	0	0	RIM1 (0)	RIM0 (0)
0Fh	Oscillation Control	W	1	0	0	0	0	FOSC3 (0)	FOSC2 (1)	FOSC1 (1)	FOSC0 (1)	0	0	0	0	0	0	0	OSC_ON(1)
10h	Power Control 1	W	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	STB (0)
11h	Power Control 2	W	1	0	0	0	APON (0)	0	0	0	0	0	1	0	0	0	0	0	1
12h	Power Control 3	W	1	0	BT2 (0)	BT1 (1)	BT0 (0)	0	0	0	0	0	0	0	1	0	0	1	0
13h	Power Control 4	W	1	0	0	0	0	0	0	0	0	0	GVD6 (1)	GVD5 (1)	GVD4 (0)	GVD3 (0)	GVD2 (1)	GVD1 (1)	GVD0 (0)
14h	Power Control 5	W	1	VCOMG (0)	VCM6 (1)	VCM5 (0)	VCM4 (1)	VCM3 (0)	VCM2 (0)	VCM1 (0)	VCM0 (1)	0	VML6 (1)	VML5 (1)	VML4 (0)	VML3 (1)	VML2 (0)	VML1 (0)	VML0 (1)
20h	RAM Address Set 1	W	1	0	0	0	0	0	0	0	0	AD7 (0)	AD6 (0)	AD5 (0)	AD4 (0)	AD3 (0)	AD2 (0)	AD1 (0)	AD0 (0)
21h	RAM Address Set 2	W	1	0	0	0	0	0	0	0	0	AD15 (0)	AD14 (0)	AD13 (0)	AD12 (0)	AD11 (0)	AD10 (0)	AD9 (0)	AD8 (0)
22h	Write Data to GRAM	W	1	WD[17:0]: Pin assignment varies according to the interface method.															
22h	Read Data to GRAM	R	1	RD[17:0]: Pin assignment varies according to the interface method.															

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No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
30h	Gate Scan Control	W	1	0	0	0	0	0	0	0	0	0	0	0	SCN4 (0)	SCN3 (0)	SCN2 (0)	SCN1 (0)	SCN0 (0)
31h	Vertical Scroll Control 1	W	1	0	0	0	0	0	0	0	0	SEA7 (1)	SEA6 (1)	SEA5 (0)	SEA4 (1)	SEA3 (1)	SEA2 (0)	SEA1 (1)	SEA0 (1)
32h	Vertical Scroll Control 2	W	1	0	0	0	0	0	0	0	0	SSA7 (0)	SSA6 (0)	SSA5 (0)	SSA4 (0)	SSA3 (0)	SSA2 (0)	SSA1 (0)	SSA0 (0)
33h	Vertical Scroll Control 3	W	1	0	0	0	0	0	0	0	0	SST7 (0)	SST6 (0)	SST5 (0)	SST4 (0)	SST3 (0)	SST2 (0)	SST1 (0)	SST0 (0)
34h	Partial Driving Position -1	W	1	0	0	0	0	0	0	0	0	SE17 (1)	SE16 (1)	SE15 (0)	SE14 (1)	SE13 (1)	SE12 (0)	SE11 (1)	SE10 (1)
35h	Partial Driving Position -2	W	1	0	0	0	0	0	0	0	0	SS17 (0)	SS16 (0)	SS15 (0)	SS14 (0)	SS13 (0)	SS12 (0)	SS11 (0)	SS10 (0)
36h	Horizontal Window Address -1	W	1	0	0	0	0	0	0	0	0	HEA7 (1)	HEA6 (0)	HEA5 (1)	HEA4 (0)	HEA3 (1)	HEA2 (1)	HEA1 (1)	HEA0 (1)
37h	Horizontal Window Address -2	W	1	0	0	0	0	0	0	0	0	HSA7 (0)	HSA6 (0)	HSA5 (0)	HSA4 (0)	HSA3 (0)	HSA2 (0)	HSA1 (0)	HSA0 (0)
38h	Vertical Window Address -1	W	1	0	0	0	0	0	0	0	0	VEA7 (1)	VEA6 (1)	VEA5 (0)	VEA4 (1)	VEA3 (1)	VEA2 (0)	VEA1 (1)	VEA0 (1)
39h	Vertical Window Address -2	W	1	0	0	0	0	0	0	0	0	VSA7 (0)	VSA6 (0)	VSA5 (0)	VSA4 (0)	VSA3 (0)	VSA2 (0)	VSA1 (0)	VSA0 (0)
50h	Gamma Control 1	W	1	0	0	0	0	KP13 (0)	KP12 (0)	KP11 (0)	KP10 (0)	0	0	0	0	KP03 (0)	KP02 (0)	KP01 (0)	KP00 (0)
51h	Gamma Control 2	W	1	0	0	0	0	KP33 (1)	KP32 (0)	KP31 (0)	KP30 (0)	0	0	0	0	KP23 (1)	KP22 (0)]	KP21 (0)	KP20 (0)
52h	Gamma Control 3	W	1	0	0	0	0	KP53 (1)	KP52 (0)	KP51 (0)	KP50 (0)	0	0	0	0	KP43 (1)	KP42 (0)	KP41 (1)	KP40 (0)
53h	Gamma Control 4	W	1	0	0	0	0	RP13 (0)	RP12 (0)	RP11 (0)	RP10 (0)	0	0	0	0	RP03 (1)	RP02 (0)	RP01 (1)	RP00 (0)
54h	Gamma Control 5	W	1	0	0	0	0	KN13 (1)	KN12 (0)	KN11 (1)	KN10 (0)	0	0	0	0	KN03 (1)	KN02 (0)	KN01 (0)	KN00 (0)
55h	Gamma Control 6	W	1	0	0	0	0	KN33 (1)	KN32 (0)	KN31 (0)	KN30 (0)	0	0	0	0	KN23 (1)	KN22 (0)	KN21 (0)	KN20 (0)
56h	Gamma Control 7	W	1	0	0	0	0	KN53 (0)	KN52 (0)	KN51 (0)	KN50 (0)	0	0	0	0	KN43 (0)	KN42 (0)	KN41 (0)	KN40 (0)
57h	Gamma Control 8	W	1	0	0	0	0	RN13 (1)	RN12 (0)	RN11 (1)	RN10 (0)	0	0	0	0	RN03 (0)	RN02 (0)	RN01 (0)	RN00 (0)

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
58h	Gamma Control 9	W	1	0	0	0	VRP14 (0)	VRP13 (0)	VRP12 (1)	VRP11 (1)	VRP10 (1)	0	0	0	VRP04 (1)	VRP03 (0)	VRP02 (0)	VRP01 (0)	VRP00 (0)
59h	Gamma Control 10	W	1	0	0	0	VRN14 (0)	VRP13 (0)	VRP12 (1)	VRP11 (1)	VRP10 (1)	0	0	0	VRN04 (1)	VRN03 (0)	VRN02 (0)	VRN01 (0)	VRN00 (0)
60h	NV Memory Data Programming	W	1	0	0	0	0	0	0	0	0	NVM_ D7	NVM_ D6	NVM_ D5	NVM_ D4	NVM_ D3	NVM_ D2	NVM_ D1	NVM_ D0
61h	NV Memory Control	W	1	0	0	0	0	0	0	0	VCM_ SEL	0	0	0	0	0	0	ID_PGM_ EN	VCM_ PGM_EN
62h	NV Memory Status	W	1	0	0	PGM_ CNT2	PGM_ CNT1	0	0	0	0	0	VCM_ D6	VCM_ D5	VCM_ D4	VCM_ D3	VCM_ D2	VCM_ D1	VCM_ D0
63h	NV Memory Protection Key	R		KEY 15	KEY 14	KEY 13	KEY 12	KEY 11	KEY 10	KEY 9	KEY 8	KEY 7	KEY 6	KEY 5	KEY 4	KEY 3	KEY 2	KEY 1	KEY 0
65h	ID Code	R		0	0	0	0	0	0	0	0	0	0	0	0	ID3	ID2	ID1	ID0
66h	SPI Read/Write Control	R		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R/WX (0)

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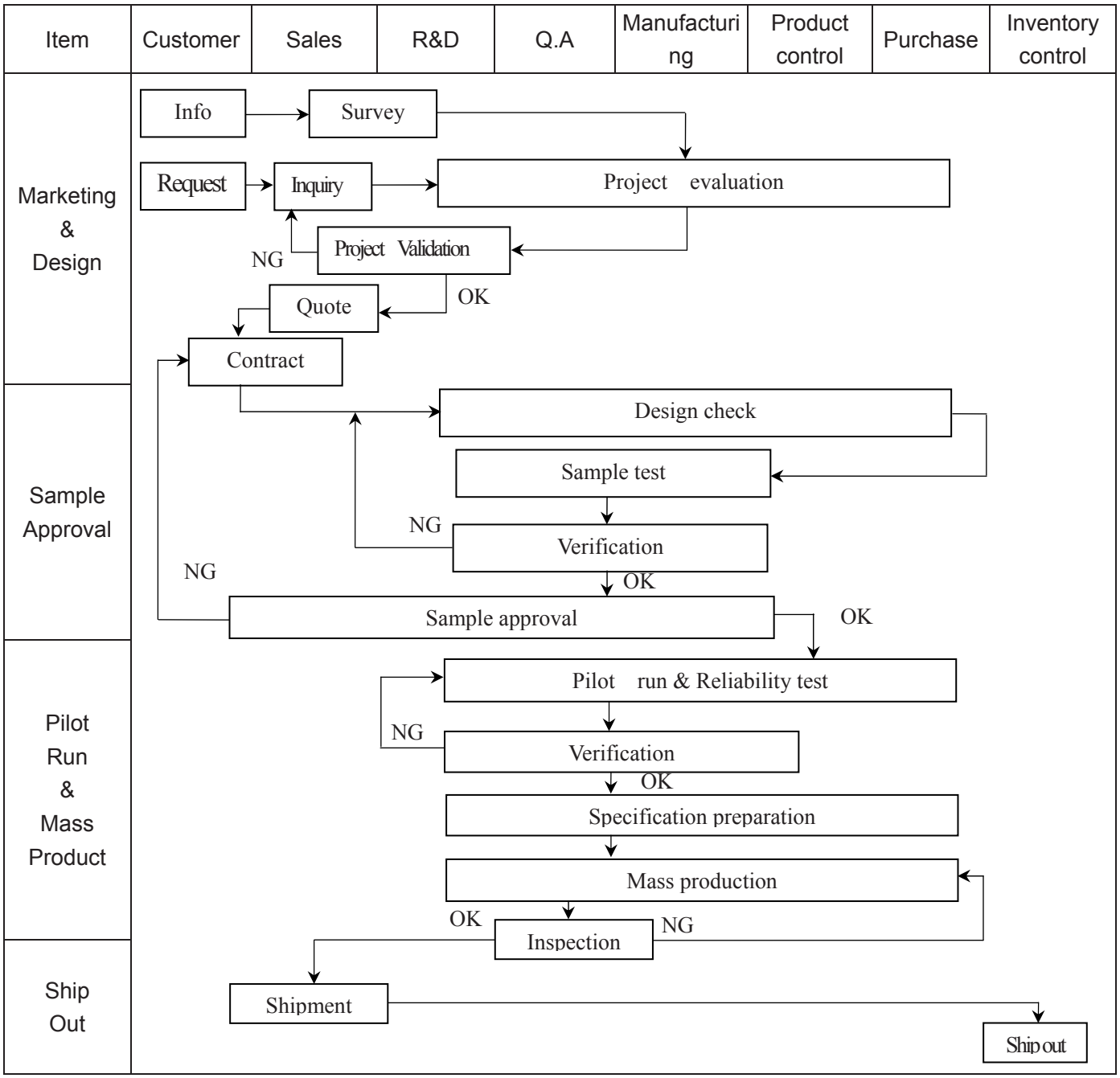
3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



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3.2 Inspection Specification

Electrical inspection failure

Defect	Define/description	Criteria
1. 开路/不显示（主要） open circuit/no displaying (maj)	线路断开造成缺划或不显 missing or no displaying due to Circuit open	拒收 reject
2. 短路（主要） short circuit (maj)	线路短接 Circuit short	拒收 reject
3.光暗 (主要) Dim (maj)	部分笔划比正常状态明显显示淡 part of figures display dim than normal obviously	拒收 reject
4.显示淡（主要） all display dim （maj）	比样板明显显示淡 all the figure display dimmer than sample	如有特殊要求参考样板范围 if required strictly, refer to the signed sample limit. 一般情况下，｜Vth,产品-Vth,样品｜≤0.05V. Normally, ｜Vth,product-Vth,sample｜≤0.05V.
5. 鬼影（主要） ghost (maj)	不该显示的部分显示 the figures in Voff state display	如有特殊要求参考样板范围 if required strictly, refer to the signed sample limit. 一般情况下，｜Vth,产品-Vth,样品｜≤0.05V. Normally, ｜Vth,product-Vth,sample｜≤0.05V.
6. 大电流（主要） Large current (maj)	功耗大于规范 the current larger than the engineer SPEC.	不允许 Reject
7. 反应慢（主要） Response slow (maj)	响应速度超出规范 The response time is longer than the Spec.	不允许 Reject
8. 视角方向错（主要） Wrong viewing angle (maj)	视角方向与工程规定不一致 Viewing angle different from spec. (Or sample)	不允许 Reject

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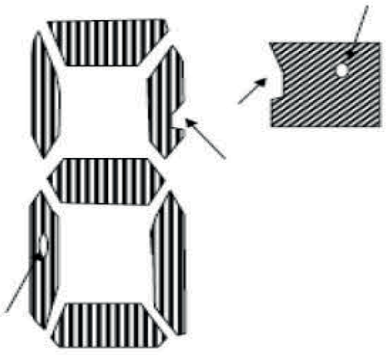
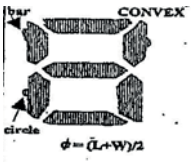
<table>
<tr><td>9. 扭字（主要）
Twist segment (maj)</td><td>个别字体或笔划的视角方向与正常方向不一致。
Some segments displaying with the wrong viewing angle.</td><td>不允许
Reject</td></tr>
<tr><td>10. 化字（主要）
Segment pervasion (maj)</td><td>字体像浸水似的扩散
The displaying segment pervasion</td><td>不允许
Reject</td></tr>
<tr><td>11. 多余线路（主要）
Extra lines (maj)</td><td>不该显示的 ITO 走线在通电时显示出了来
Displaying the extra lines than the Spec</td><td>不允许
Reject</td></tr>
<tr><td>12. 针孔、白点（次要）
Pinhole、white spots（min）</td><td>针孔、图白、图缺
PIN hole 、lack
 
ψ= (L+W)/</td><td>
<table>
<tr><td>规格
Specification</td><td>允许个数
acceptable number</td></tr>
<tr><td>ψ ≦ 0.1 mm</td><td>无视(不可密集) disregard(no gathering)</td></tr>
<tr><td>0.10mm＜ψ≦0.2 mm</td><td>3</td></tr>
<tr><td colspan="2">(两点距离需 ≧5 mm)
(The distance between two points ≧5mm)</td></tr>
<tr><td>0.2mm＜ψ≦0.25 mm</td><td>1</td></tr>
<tr><td>ψ＞ 0.25mm</td><td>0</td></tr>
<tr><td>ψ＞ 1/3 字节宽
ψ>1/3 width of the character</td><td>0</td></tr>
<tr><td>0.10 mm＜ ψ≦ 0.15mm</td><td>2</td></tr>
<tr><td colspan="2">(单片LCD之总个数需≦3个,两点距離≧5mm).
total amount on single LCD sheet≦3,The distance between two points ≧5mm</td></tr>
</table>
</td></tr>
<tr><td>13. 突點:(次要)
Bar（min）</td><td> 
ψ= (L+W)/2</td><td>
<table>
<tr><td>规格
Specification</td><td>允许个数
acceptable number</td></tr>
<tr><td>ψ＞ 0.25mm</td><td>0</td></tr>
<tr><td>ψ＞ 1/3 字節寬
ψ>1/3 width of the character</td><td>0</td></tr>
<tr><td colspan="2">接收标准:1个字最多1個, 全部最多3 個
Acceptable case: per character, not more than 1 per cell, not more than 3.</td></tr>
</table>
</td></tr>
</table>

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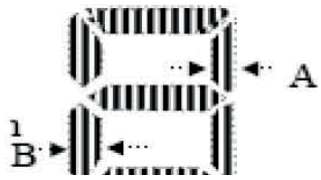
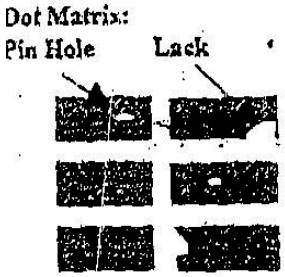
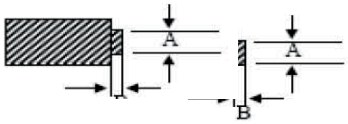
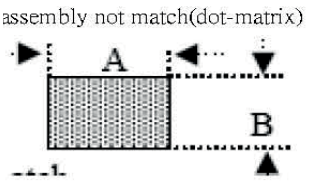
14.14. 組合歪 （次要） assembly not match （min）	 ψ= (L+W)/2	1. B—A ＞ 0.25mm 拒收 (reject) 2. A/B ≦ 3/4 拒收 (reject)	
15. 点阵针孔\缺口（次要） Dot Matrix Pin Hole Lack（min）		规格 Specification	允许个数 Acceptable number
		∮≤0.1mm	Disregard
		0.1mm＜∮≤0.2mm (Distance between two points≥10mm)	3
		0.2mm＜∮≤0.25mm	1
		∮＞0.25mm	0
		∮ ＞ 1/3width of the character	0
16. 图凸（次要） Convex（min）		1.A＞0.25mm 2.B＞0.05mm	拒收 Reject
17. 点距阵组合歪（次要） assembly not match （min）		1. A 变形：｜A-规格值｜/规格值≤15% Distortion of A：｜A-define｜/define ≤15% 2. B 变形;｜A-规格值｜/规格值≤15% : Distortion of B : ｜B-define｜/define ≤15%	允许 Accept
18. 显示黑点(斑)（次要） Black spot（min）	显示时出现点状或斑状更黑的部位 Black spots in displaying	正常显示时对比不明显，接收。明显时按点状缺陷看 if not clear in normal state of working, regardless. If defect clear, according to item of black/white spot.	

Appearance Inspection

不良项目 Items	内容或图示 Description	判定标准 Judge
1. 漏液(主要) Leakage (maj)	盒内液晶漏出 LC in the cell leaks out.	不允许 Reject
2. 玻璃裂痕(主要) Cracks (maj)	玻璃破裂	不允许

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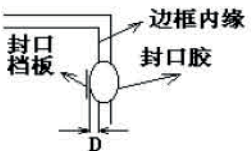
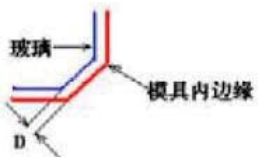
	ITO glass crack	Reject
3. 排列不良 Misalignment	LC 排列不良，在不通电下颜色与正常不一致。 Different color from normal due to misalignment	点状或线状的参照点状或线状不良标准 Refer to the standard of spots and lines.
4. 封口宽、高(次要) End sealant over height, over width (min)		超出在产品资料规定尺寸范围，不允许； According to engineering spec.
5. 封口胶（次要） Permeating resin (min)		有封口挡板：超出封口档板不允许； Baffle: not overstep baffle 无封口档板：不允许超出 C 区； No baffle: The resin exceed the C zone, reject.
6. 边框肥大/偏细（次要） seal line larger/smaller （min）	边框胶的宽度比规定粗或细 The width of the seal larger or smaller than the define.	1.参照规范。Refer to the Spec. 2.一般情况： A：实测值 the measurement value B: 规范值（样品值）Spec.(or Value of sample) ｜A-B｜/B≦1/3
7. 彩虹（次要） Rainbow (min)	同一个 LCD 有两种或以上的颜色 Different color in one panel	在规定的视角范围内观察明显，拒收； In the viewing angle, if the rainbow is obvious, reject. 对客户有特殊要求，以双方确认的样板为准； If required strictly, sign and refer to the limited samples.
8. ITO 底影（次要） ITO lines appear	不通电时能请楚地看到 ITO 图形或走线 Design shows without voltage input	拒收 Reject（if required strictly, sign and refer to the limited samples.）
9. 磨角 （次要） Cutting defect （min）		1.尺寸不能超出产品设计值 2.不能损伤胶边 3.玻璃崩裂参考相关规定 1. Dimension refers to engineering spec. 2. Not allowed to damage the Epoxy.

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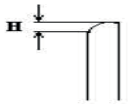
		3. Glass damage refers the related spec.
10.磨边 （次要 Grind off edge defect（min）		磨损高度 H≤0.10 mm ；具体要求的见限度样板 The damaged height: H≤0.10 mm, according to the limited sample
11. 钻 孔 （ 次 要 ） Drilling (min)		1. 孔径和位置参照设计规范。 Diameter and position according to engineering spec. 2. 崩裂玻璃：不允许损伤胶边 Not allow damaging Epoxy, and referring to related Spec.
12.玻璃边麻点（次要） Dirty spot of ITO glass（min）		边框以外的麻点不计边框以内的麻点按 03 项黑/白 要求判定 A: outside seal expose, disregard B: inside seal epoxy, according to black spot
13.油墨丝印 Back print（min）	丝印断线、针孔，凸点,起毛(次要) Broken line; pinhole; convex; fuzz（min）	A：丝印断线，针孔，凸点按点状，线状不良标准 B：丝印毛边 1/4 丝印宽度 A: Broken line; pinhole; convex refer to item of black/white spot or linear B: fuzz of printing over 1/4 spec reject
	丝印缺划，多印，印反（主要）（主要） Some printing missing; extra printing; printing on wrong face; invert printing (maj)	不允许 Reject
	尺寸和位置（主要） Position and dimension	尺寸超过规定不允许 Refer to the engineer spec
14.偏光片 Polarizer attaching	偏光片品种贴错（主要） Wrong polarizer type (maj)	不允许 Reject
	偏光片贴反（主要） Attaching on the wrong face (maj)	不允许 Reject

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	偏光片损伤(次要）polarizer damage (min)		不允许穿孔，按点状或线状缺陷 Not allow perforation of polarizer. Refer to the standard of spots and lines
	偏光片贴歪（次要） Polarizer slanting (min)		偏光片须覆盖所有的边框内缘且不能超出玻璃外边。 Polarizer should touch all the inner sealing side and not exceeding outside of the glass.
15.装 PIN 脚 Pin defect	尺寸和位置 Dimensions		尺寸偏差不超过设计尺寸公差 According to engineering spec
	装 PIN 脚歪斜 Pin tilt		歪斜角度＞5 ° 则拒收 Tilt angle ＞ 5 ° reject
	少（多）脚断脚（主要），则不允许 not allow the more or less number of metal pin		
	UV 胶污染偏光片或渗入偏光片与玻璃之间则不允许 UV glue permeates inside polarizer or polarizer surface is polluted by UV glue reject		
	UV 胶超出上偏光片之高度（次）则拒收； The height of UV glue over the front polarizer. Reject		
	PIN 脚或两脚间无胶不允许； There is no glue on the Pin or between two pins. Reject.		
	装 PIN 脚夹头之间距 Pitch of pins D 标准间距(spec) E 实际间距(actual)	Standard	Accept
		｜D-E｜<1/6D	无视 disregard
		1/6D≤｜ D-E｜ ≤1/3D	2
		｜D-E｜>1/3D	0
16.热压斑马纸 Heat seal connector Defect	对位尺寸（次要） Dimension (min)	超出规范 Out of the Spec	拒收 Reject
	斑马纸断裂 (主要) Connector broken（maj）	斑马纸断裂造成缺划或光暗 Connector broken cause missing or dim	拒收 Reject
	拉 力（主要） Peel strength (major)	F≥ 2N/cm	接受 Accepted

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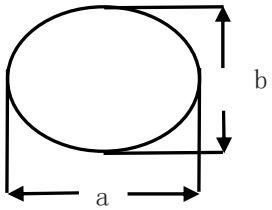
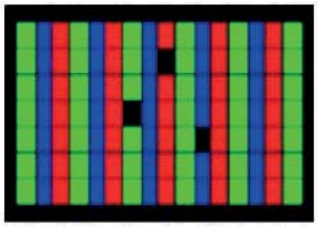
	碳粉脱落（主要） Carbon layer fall off	造成开路，光暗 Cause missing or dim	不允许 Reject
	保护膜贴歪，贴皱，气泡(次要) Protecting film adhering defect.bubble、crumple etc	不影响客户使用或客户特殊要求， 1.Not affect the use of customer. 2.meet the requirement of customer	接受 Accept

Standard for spot、line、Cutting breaking defect

<table>
<tr><th>不良项目</th><th>内容或图示</th><th colspan="5">判定标准</th></tr>
<tr><td rowspan="8">1. 黑白点（次要）
Black/white spots(min)</td><td rowspan="8"> 

Φ=(a+b)/2
在10mm范围内不允许有两个
Not allow 2 defects within 10 mm</td><td rowspan="2">Φ(mm)</td><td colspan="2">面积≥35cm2
S ≥35cm</td><td colspan="2">普通
normal</td></tr>
<tr><td>A区</td><td>B区</td><td>A区</td><td>B区</td></tr>
<tr><td>Φ≤0.10</td><td>不计
disregard</td><td>不计
disregard</td><td>不计
disregard</td><td>不计
disregard</td></tr>
<tr><td>0.10<Φ≤0.15</td><td>不计
disregard</td><td>不计
disregard</td><td>2</td><td>3</td></tr>
<tr><td>0.15<Φ≤0.20</td><td>3</td><td>4</td><td>1</td><td>2</td></tr>
<tr><td>0.20<Φ≤0.30</td><td>2</td><td>3</td><td>0</td><td>1</td></tr>
<tr><td>0.30<Φ≤0.50</td><td>1</td><td>2</td><td>0</td><td>0</td></tr>
<tr><td>Φ>0.50</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2. Electrical Dot Defect,Inspection pattern:
Full white,Full black,Red,Green and blue screens</td><td>Bright dot define
 

Black dot define
  </td><td colspan="3">Item</td><td colspan="2">Acceptable Quantity</td></tr>
<tr><td colspan="3">Bright dot</td><td colspan="2">0</td></tr>
<tr><td colspan="3">Black dot</td><td colspan="2">2</td></tr>
<tr><td colspan="3">Total dot</td><td colspan="2">2</td></tr>
</table>

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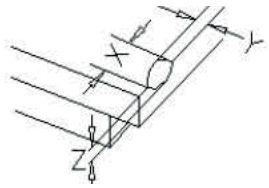
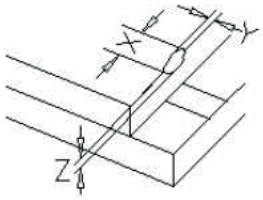
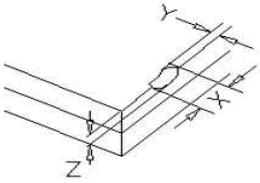
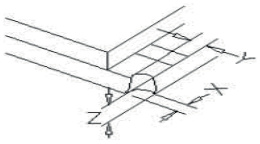
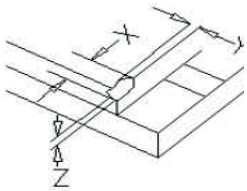
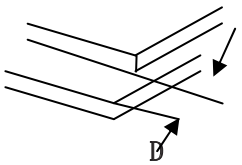
<table>
<tr><td>3 . Mini dot defect,less than 50% single sub-pixel area</td><td></td><td>Judged by 6%ND Filter,
in 30cm distancs</td><td>Not Accepted</td></tr>
<tr><td rowspan="3">4. 玻璃崩边（次要）
LCD side damage (min)
X: Length
Y: Width
Z: Depth</td><td>  </td><td colspan="2">X ≤2.0mm
Y ≤K1 /3
Z ≤T ACC NO.≤2
装管脚的型号: X 的尺寸不计,缺陷数不计
Products with pins disregard</td></tr>
<tr><td>  </td><td colspan="2">X ≤2.0mm
Y ≤边框的外缘
Y: not reach the seal line
Z ≤T 允许两处
ACC NO.≤2</td></tr>
<tr><td>  </td><td colspan="2">X ≤2.0mm
Y ≤边框的外缘
Y: not reach the seal line
Z ≤T</td></tr>
<tr><td rowspan="2">5. 玻璃崩角
Corner damage(min)</td><td>  </td><td colspan="2"><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>3cm</td><td>≤K1/3</td><td>≤T</td></tr></table></td></tr>
<tr><td>  </td><td colspan="2">X: ≤2.0mm 且未崩到银点
X: ≤2.0mm and not reach the common point
Y: 不允许银点外露
Y: not allow common point appear outside.
Z: ≤T</td></tr>
<tr><td>6. 玻璃突出 （次要）
Poor cutting</td><td>  </td><td colspan="2">1.D≤0.2mm 且 D ≤K1/4
2.不允许超出设计尺寸
2.according to engineering diagram</td></tr>
</table>

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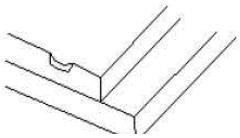
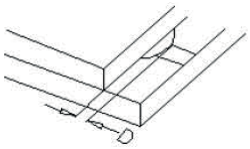
<table>
<tr><td rowspan="2"></td><td>  </td><td colspan="4">不允许超出设计尺寸
According to engineering diagram</td></tr>
<tr><td>  </td><td colspan="4">1.D≤ 0.25 且 D≤ K1/4
2.不允许超出设计尺寸
2.according to engineering diagram</td></tr>
<tr><td rowspan="6">7. 线状缺陷（次要）
Linear defect</td><td rowspan="6"></td><td>长 L（mm）</td><td>宽 W（mm）</td><td>A 区</td><td>B 区</td></tr>
<tr><td>L≤3.0</td><td>W≤0.02</td><td>不计
disregard</td><td>不计
disregard</td></tr>
<tr><td>L≤3.0</td><td>W≤ 0.03</td><td>2</td><td>3</td></tr>
<tr><td>L≤3.0</td><td>0.03<W≤0.05</td><td>1</td><td>2</td></tr>
<tr><td>L≤3.0</td><td>W>0.05</td><td>0</td><td>0</td></tr>
<tr><td>L>3.0</td><td>W≤0.05</td><td>0</td><td>0</td></tr>
<tr><td rowspan="6">8. 贴片气泡 （次要）</td><td rowspan="6">因贴片操作引出的气泡</td><td colspan="2">尺寸</td><td colspan="2">允许个数</td></tr>
<tr><td colspan="2">Φ≤0.3 mm</td><td colspan="2">不计</td></tr>
<tr><td colspan="2">0.3 mm≤Φ≤0.5 mm</td><td colspan="2">1</td></tr>
<tr><td colspan="2">0.5 mm<Φ</td><td colspan="2">0</td></tr>
<tr><td colspan="4">Φ ≤0.3mm 之场合每 cm2 不超过 2 个</td></tr>
<tr><td colspan="4">注Φ = （长+宽）/2 以上状况于可视区外可忽略不计</td></tr>
</table>

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4. RELIABILITY TEST

NO	Item	Test Condition
1	High Temperature Storage	Storage at 80 ± 2°C 120 hrs Surrounding temperature, then storage at normal condition 4hrs
2	Low Temperature Storage	Storage at -30 ± 2°C 120 hrs Surrounding temperature, then storage at normal condition 4hrs
3	High Temperature Operation	Operation at 70 ± 2°C 120 hrs
4	Low Temperature Operation	Operation at -20 ± 2°C 120 hrs
5	High Temperature /Humidity Storage	1.Storage 120 hrs 60 ± 2°C, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer).or 2.Storage 120 hrs 40 ± 2°C, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.
6	Temperature Cycling	-20°C → 25°C → 70°C → 25°C (30mins) (5mins) (30mins) (5mins) 10 Cycle
7	Mechanical Test	Freq.: 10-55Hz Max. Acceleration: 5G X.Y.X. each direction For 10 mines.
		Drop them through 50cm height to strike horizontal plane
8	ESD Test	Air Discharge: Apply 4KV with 5 times Discharge for each polarity +/- / Contact Discharge: Apply 2KV with 5 times Discharge for each polarity +/-
		1. Temperature ambiance: 15°C~35°C 2. Humidity relative: 30%~60% 3. Energy Storage Capacitance(Cs+Cd): 150pF+/-10% 4. Discharge Resistance(Rd): 330Ω +/-10% 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication: +/-5%)

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5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

5.1.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.

5.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by Using soap and water.

5.2 HANDLING

5.2.1 Avoid any strong mechanical shock which can break the glass.

5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the Module, be sure to ground your body and any electrical equipment you may be using.

5.2.3 Do not remove the panel or frame from the module.

5.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

5.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

5.2.6 Do not touch the display area with bare hands , this will stain the display area.

5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8 To control temperature and time of soldering is 280 ± 10°C and 3-5 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM

5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C And the humidity is below 65% RH.

5.3.2 Do not place the module near organics solvents or corrosive gases.

5.3.3 Do not crush, shake, or jolt the module.

5.4 TERMS OF WARRANTY

5.4.1 Applicable warrant period

The period is within thirteen months since the date of shipping out under normal using and storage conditions.

5.4.2 Unaccepted responsibility

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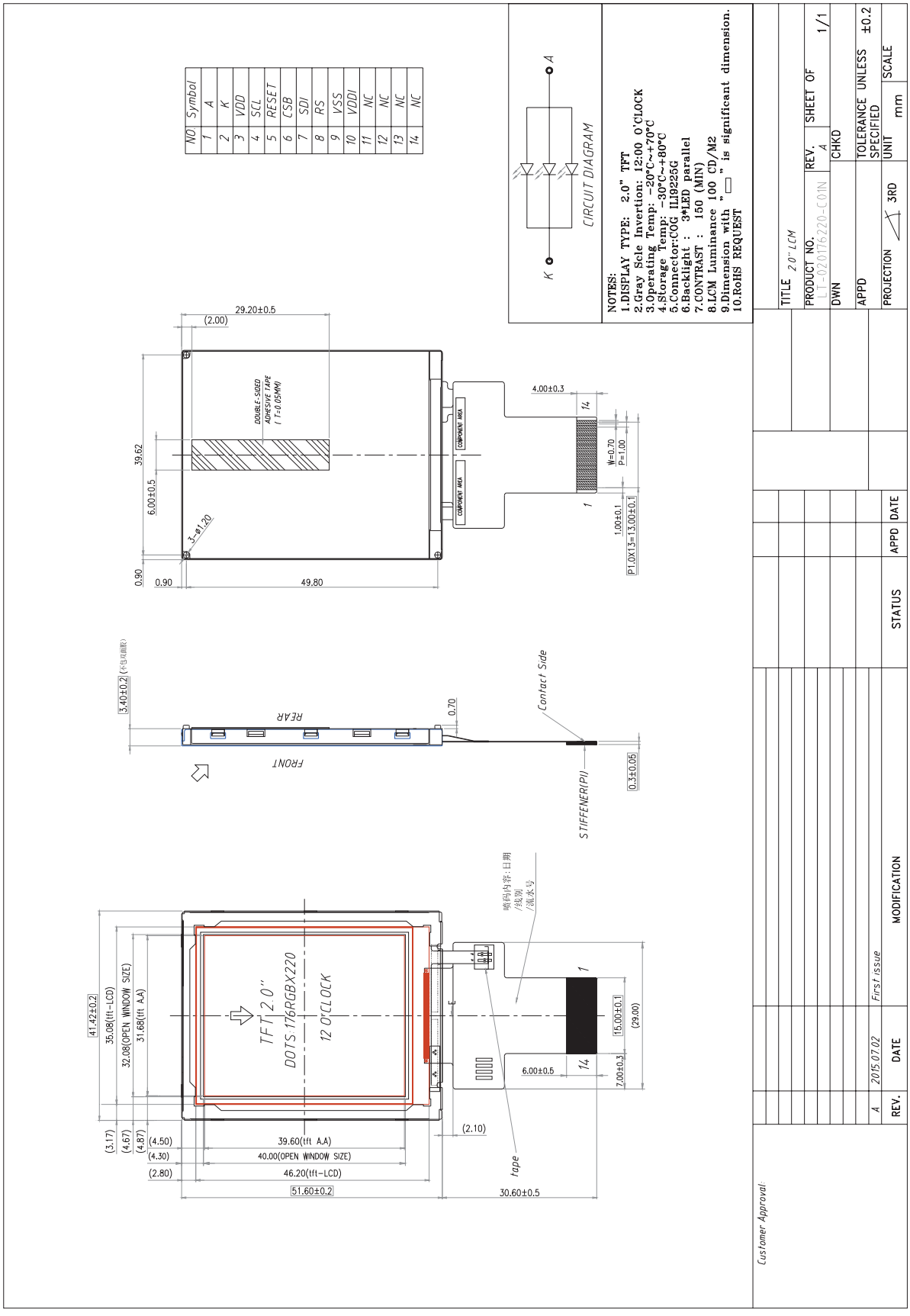

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