APPROVAL SHEET
承 认 书

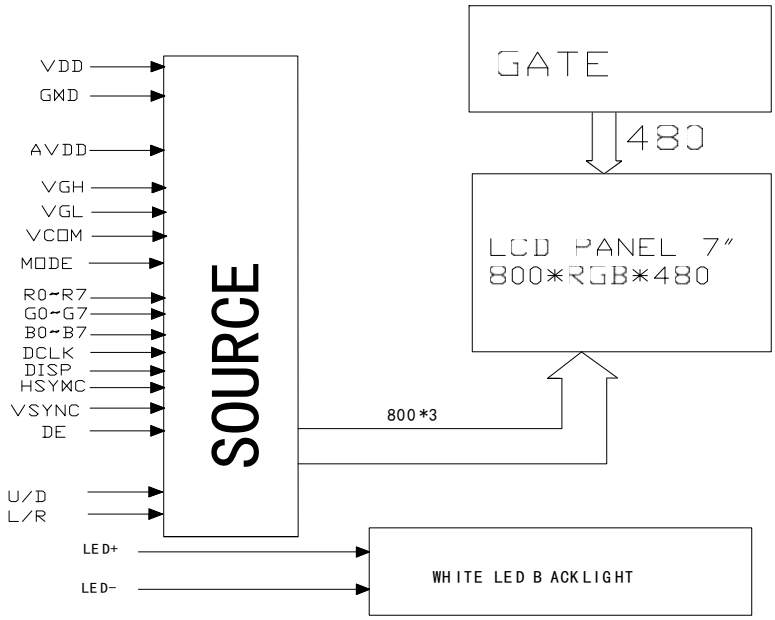
Customer 客户名称	
Part NO. 产品型号	RP78540B-B3RT
Product type 产品内容	Mode: Transmissive type .Normally white. TFT LCD Module LCD Module: Graphic 800RGB*480Dot-matrix
Remarks 备注栏	☐APPROVAL FOR SEPCIFICATIONS ONLY ■APPROVAL FOR SEPCIFICATIONS AND SAMPLE
Signature by Customer: 客户确认签章	

Issued by	Checked by	Approved by

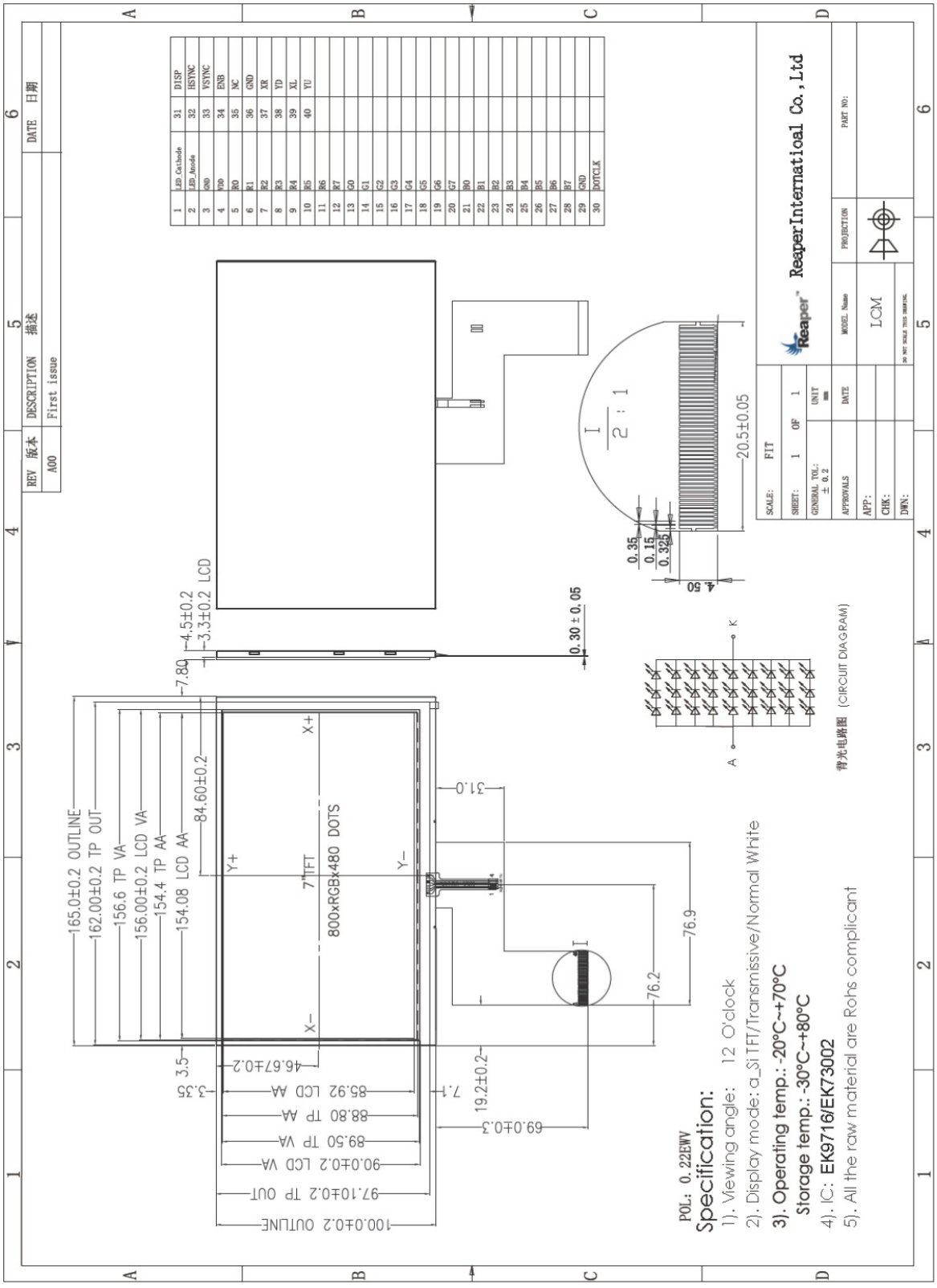
1. PHYSICAL DATA

Item	Contents	Unit
LCD type	TFT TRANSMISSIVE	---
Viewing direction	12	o'clock
Module size (W×H×T)	165 x 100 x 4.5	mm^3
Active area(W×H)	154.08×85.92	mm^2
Number of dots(W×H)	800*RGB* × 480	dots
Pixel Pitch(W×H))	0.0632xRGB×0.1790	mm
Driver IC	EK9716/EK73002	---
Colors	16.7M	---
Backlight Type	27 white leds 9.6V /100mA	---
Interface Type	RGB	---

2. BLOCK DIAGRAM



3. Mechanical Dimension



4. Pin Descriptions

Pin.No	Symbol	Function
1	LEDK	back light power supply negative
2	LEDA	back light power supply positive
3	GND	Ground
4	VCC	Power supply
5-12	R0-R7	Red Data
13-20	G0-G7	Green Data
21-28	B0-B7	Blue Data
29	GND	Ground
30	CLK	Colock signal
31	DISP	Display on/off
32	HSYNC	Horizontal sync input in RGB mode(short to GND if not used)
33	VSYNC	Vertical sync input in RGB mode(short to GND if not used)
34	DE	Data enable
35	NC	No Connection
36	GND	Ground
37	XR	touch panel X-right
38	YD	touch panel Y-bottom
39	XL	touch panel X-left
40	YU	touch panel Y-up

5. ABSOLUTE MAXIMUM RATINGS

5.1 (GND=AGND=0V)

Parameter	Symbol	Min	Max	Unit
Power supply1	V_{DD}	-0.6	+3.6	V
Power supply2	Avdd	-0.5	+14.85	V
Operating temperature	T_{OPR}	-20	70	℃
Storage temperature	T_{STG}	-30	80	℃

5.2 Input voltage for BOE LCD

parameter	Typ	Unit	remark
VGH	18	V	Temperture: 25 ℃
VGL	-8	V	
AVDD	10.3	V	
* VCOM	3.2	v	

Note:

Vcom voltage for reference only, according detail display for adjust no flicker

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6. DC ELECTRICAL CHARACTERISTICS FOR RGB

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Low level input voltage	Vil	For the digital circuit	0	-	0.3×VDD	V
High level input voltage	Vih	For the digital circuit	0.7×VDD	-	VDD	V
Input leakage current	Ii	For the digital circuit	-	-	±1	μA
High level output voltage	Voh	Ioh= -400 μA	VDD-0.4	-	-	V
Low level output voltage	Vol	Iol= +400 μA	-	-	VSS+0.4	V
Pull low/high resistor	Ri	For the digital input pin @ VDD=3.3V	200K	250K	300K	ohm
Digital Operation current	Idd	Fclk=50 MHz, FLD=48KHz, VDD=3.3V	-	14	18	mA
Digital Stand-by current	Ist1	Clock and all functions are stopped	-	10	50	μA
Analog Operating Current	Idda	No load, Fclk=50MHz, FLD=48KHz @ VDDA=10V,V1=8V, V14=0.4V	-	7	12	mA
Analog Stand-by current	Ist2	No load, Clock and all functions are stopped	-	10	50	μA
Input level of V1 ~ V7	Vref1	Gamma correction voltage input(Cascade Mode)	0.4*VDDA	-	VDDA-1	V
Input level of V8 ~ V14	Vref2	Gamma correction voltage input(Cascade Mode)	VSSA+1	-	0.6*VDDA	V
Input level of V1 ~ V7	Vref3	Gamma correction voltage input(Dual Gate Mode)	0.4*VDDA	-	VDDA-0.1	V
Input level of V8 ~ V14	Vref4	Gamma correction voltage input(Dual Gate Mode)	VSSA+0.1	-	0.6*VDDA	V
Output Voltage deviation	Vod1	Vo = VSSA+0.1V ~ VSSA+0.5V and Vo = VDDA-0.5V ~ VDDA-0.1V	-	±20	±35	mV
Output Voltage deviation	Vod2	Vo = VSSA+0.5V ~ VDDA-0.5V	-	±15	±20	mV
Output Voltage Offset between Chips	Voc	Vo = VSSA+0.5V ~ VDDA-0.5V	-	-	±20	mV
Dynamic Range of Output	Vdr	SO1 ~ SO1200	0.1	-	VDDA-0.1	V
Sinking Current of Outputs	IOLy	SO1 ~ SO1200; Vo=0.1V v.s 1.0V , VDDA=13.5V	80	-	-	uA
Driving Current of Outputs	IOHy	SO1 ~ SO1200; Vo=13.4V v.s 12.5V , VDDA=13.5V	80	-	-	uA
Resistance of Gamma Table	Rg	Rn: Internal gamma resistor	0.7*Rn	1.0*Rn	1.3*Rn	ohm

7. RGB MODE AC ELECTRICAL CHARACTERISTICS

(Detail please refer IC data sheet)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
VDD Power On Slew rate	T_{POR}	From 0V to 90% VDD	-	-	20	ms
RSTB pulse width	T_{RST}	CLKIN = 50MHz	50	-	-	us
CLKIN cycle time	Tcph	-	20	-	-	ns
CLKIN pulse duty	Tcwh	-	40	50	60	%
VSD setup time	Tvst	-	8	-	-	ns
VSD hold time	Tvhd	-	8	-	-	ns
HSD setup time	Thst	-	8	-	-	ns
HSD hold time	Thhd	-	8	-	-	ns
Data set-up time	Tdsu	DR[7:0], DG[7:0], DB[7:0] to CLKIN	8	-	-	ns
Data hold time	Tdhd	DR[7:0], DG[7:0], DB[7:0] to CLKIN	8	-	-	ns
DEN setup time	Tesu	-	8	-	-	ns
DEN hold time	Tehd	-	8	-	-	ns
Output stable time	Tsst	10% to 90% target voltage. CL=120pF, R=10K ohm	-	-	6	us

8. Data input format for RGB

8.1 For 24-Bit RGB input

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
CLKIN Frequency	Fclk	VDD = 1.71V ~3.6V	-	40	50	MHz
CLKIN Cycle Time	Tclk	-	20	25	-	ns
CLKIN Pulse Duty	Tcwh	Tclk	40	50	60	%
Time from HSD to Source Output	Thso		-	46	-	CLKIN
Time from HSD to LD	Thld		-	46	-	CLKIN
Time from HSD to STV	Thstv	-	-	2	-	CLKIN
Time from HSD to CKV	Thckv	-	-	20	-	CLKIN
Time from HSD to OEV	Thoev	-	-	4	-	CLKIN
LD Pulse Width	Twld			10		CLKIN
CKV Pulse Width	Twckv	-	-	66	-	CLKIN
OEV Pulse Width	Twoev	-	-	74	-	CLKIN

Vertical input Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Vertical display area	tvd		480		H	
VSD period time	tv	517	525	712	H	tvpw+tvb=32H Is fixed
VSD pulse width	tvpw	1	1	3	H	
VSD Back Porch (Blanking)	tvb	31	31	29	H	
VSD Front Porch	tvfp	5	13	200	H	

Horizontal input Timing

Parameter	Symbol	Value			Unit	Note
Horizontal display area	thd	800			DCLK	
DCLK frequency	fclk	Min.	Typ.	Max		
		20	33.3	50	MHz	
1 Horizontal Line	th	908	928	1088	DCLK	thb+thpw=88 DCLK is fixed.
HSD pulse width	thpw	1	48	87		
HSD Back Porch (Blanking)	thb	87	40	1		
HSD Front Porch	thfp	20	40	200		

9. Backlight Characteristic

Item	Symbol	Min	Typical	Max	Unit
LED module Forward voltage	V_{LED}	--	9.6	--	V
LED module current	I_{LED}	--	180	--	mA
L/G Surface Luminance ★1	L_S	--	tbd	--	mcd
LCM Surface brightness uniform ★2	L_D	80	--	--	%

★ 1 Test condition is:

(a) Center point on active area.

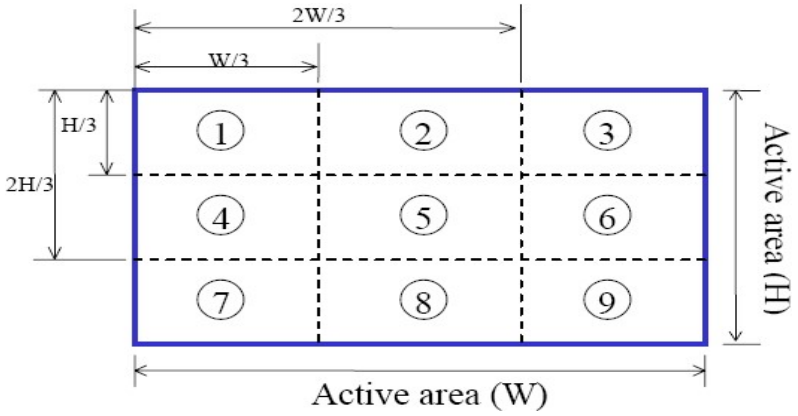
(b)Best Contrast.

★2 Uniform measure condition:

(1) Measure 9 point. Measure location show below;

(2)Uniform=(Min. brightness /Max. brightness)*100%

(3)Best Contrast.

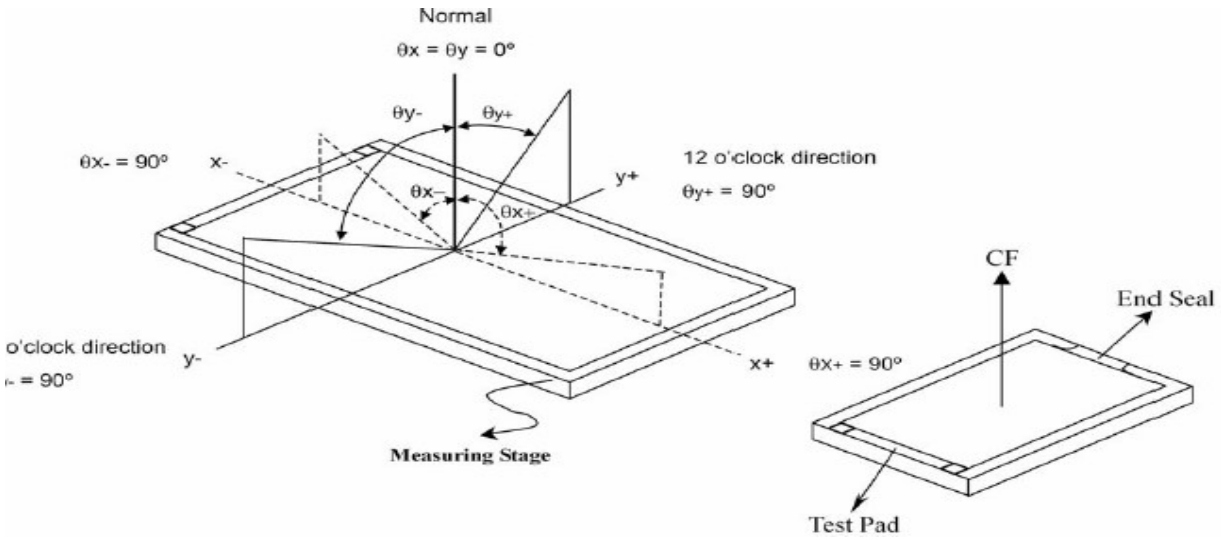


10.Electro-optical Characteristics

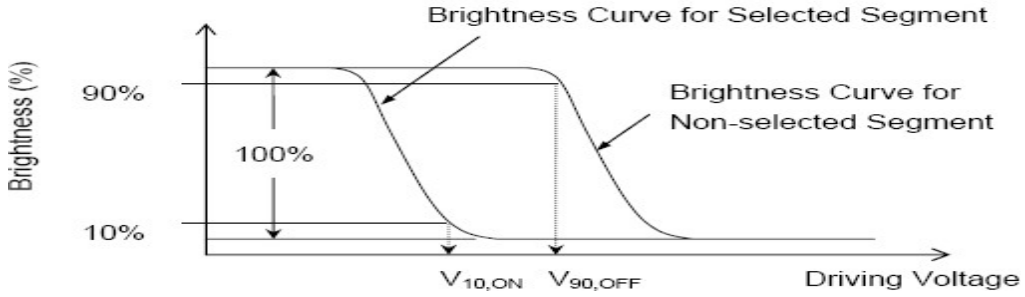
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Hor.	Φ3	CR≥10	60	70		Deg.	Note 3
		Φ9		60	70		Deg.	
	Ver.	Φ12		50	60		Deg.	
		Φ6		60	70		Deg.	
Color gamut(C light)					50		%	
Luminance Contrast ratio		T(%)	Φ0°	350	500			Note 4
Response Time		TRT	Temp=25°C		25		ms	Note 2
Color coordinate	white	Wx	Φ0°	0.271	0.286	0.341		
		Wy		0.281	0.304	0.361		
	red	Rx		0.521	0.548	0.562		
		Ry		0.311	0.321	0.331		
	green	Gx		0.301	0.345	0.366		
		Gy		0.551	0.565	0.575		
	blue	Bx		0.135	0.151	0.163		
		By		0.091	0.101	0.111		

● For panel only

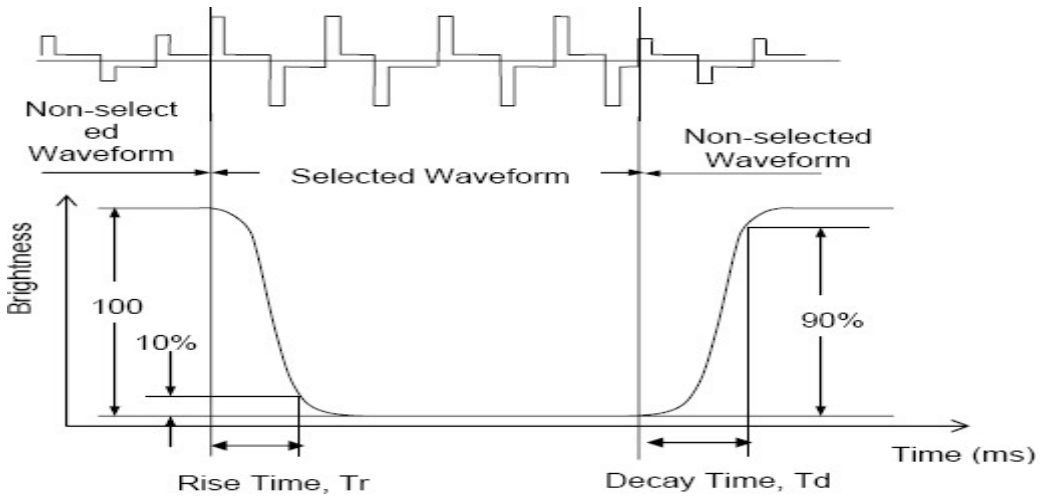
● Electro-Optical Characteristics Test Method



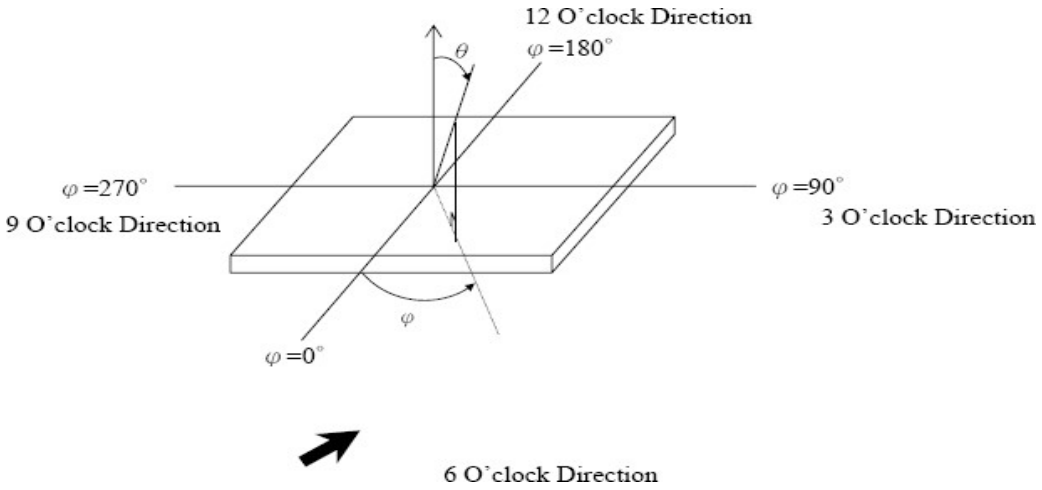
$$Vop = (V_{10,ON} + V_{90,OFF})/2$$



.Note2.Definition of Optical Response Time:

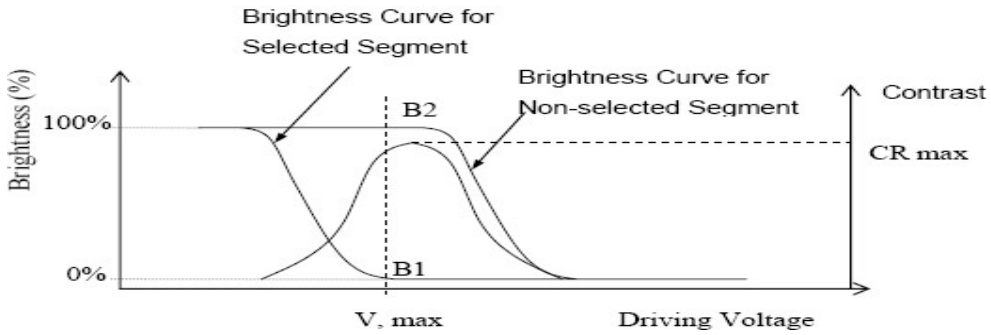


.Note3.Definition of Viewing Angle θ and ϕ :



Note4.Definition of Contrast ratio (CR):

$$CR = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$



11. Reliability

11.1 Mtbf

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

11.2 Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80℃*240Hrs	。No Defect Of Operational Function In Room Temperature Are Allowable
2	Low Temperature Non-Operating Test	-30℃*240Hrs	
3	High Temperature/Humidity Non Operating Test	60℃*90%RH*240Hrs	
4	High Temperature Operating Test	70℃*240Hrs	
5	Low Temperature Operating Test	-20℃*240Hrs	

6	Thermal Shock Test	-20℃(30Min) ~ 70℃(30Min) *10CYCLES	。 IDD of LCM in Pre-and Post-Test Should Follow Specification

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.

12. Inspection standards

1. AQL(Acceptable Quality Level

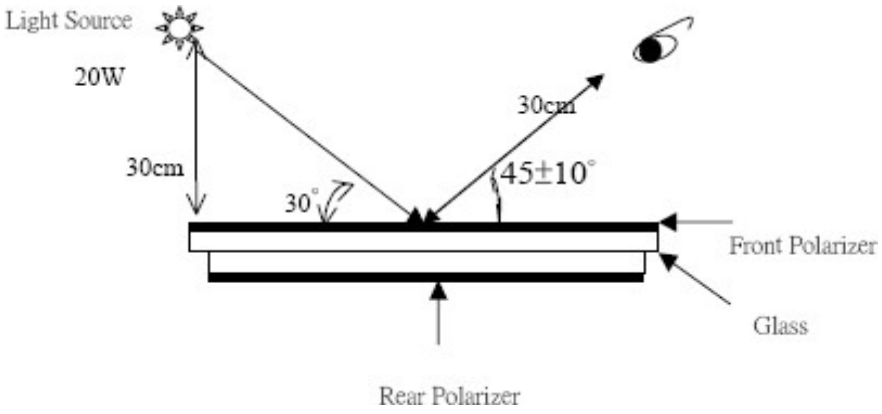
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.5

2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000±200.(Darkroom's lux: 100±50),About an angle of incidence 30,a distance of 30 cm with an angle of 45 degree to check the products without uncovering the film!

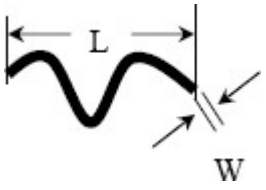
(As shown below)

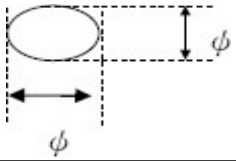


3. Inspection item and criteria

3.1 Visual inspection criterion in immobility

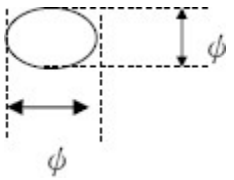
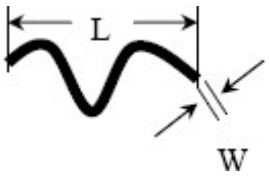
3.1.1LCD appearance defect(View area)

NO	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1:L: Length, W: Width note2: disregard if out of AA 
		W≦0.03mm	disregard	
		0.03mm<W≦0.05mm; L≦3.0mm	2	
		0.05mm<W≦0.1mm; L≦3.0mm	1	
		W>0.1mm;L>3.0mm	0	

2	Polarizer bubble、concave and convex (minor defect)	Φ ≦0.2mm	disregard	note1: Φ=(L+W)/2, L:Length, W :Width note2:disregard if out of AA
		0.2mm< Φ ≦0.3mm	2	
		0.3mm< Φ ≦0.5mm	1	
		0.5mm< Φ	0	
3	Black dots、dirty dots、impurities、eye winker (minor defect)	Φ ≦0.15mm	disregard	note2:disregard if out of AA 
		0.15mm< Φ ≦0.25mm	2	
		0.25mm< Φ ≦0.3mm	1	
		0.3mm< Φ	0	
4	Polarizer prick (minor defect)	Φ ≦0.1mm	disregard	note1: Φ=(L+W)/2, L=Length, W=Width note2:the distance between two dots>5mm
		0.1mm< Φ ≦0.25mm	3	
		Φ >0.25mm	0	

3.2 Electrical criteria

NO	Defect item	Criteria	Remark	
1	No display (major defect)	No display 【Reject】		
2	Missing line (major defect)	Missing line 【Reject】		
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Reject】	ND filter 2% test	
4	No display in immobility (major defect)	No display in immobility 【Reject】		
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Reject】		
6	Mura (major defect)	ND filter 2%test		
7	Over current (major defect)	Over current 【Reject】		
8	Voltage out of specification (major defect)	Voltage out of specification 【Reject】		
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Reject】		
10	Dark light, Flicker (major defect)	Dark light, Flicker 【Reject】		
11	Black/white dots 、 Dirty dots、eye winker	Specification	Allowable	Note1:disregard if out of AA

	(major defect)	ϕ ≦0.15mm	disregard	
		0.15mm< ϕ ≦0. 25mm	2	
		0.25mm< ϕ ≦0. 3mm	1	
		0.3mm< ϕ	0	
12	Fiber、glass crutch、Polarizer scratch/folded (major defect)	W≦0.03mm	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA 
		0.03mm<W≦0. 0. 05mm L≦3. 0mm	2	
		0.05mm<W≦0. 1mm L≦3. 0mm	1	
		W>0.1mm;L>3.0mm	0	

13. Precautions for using LCD modules.

13.1 Safety

(1)Do mot swallow any liquid crystal ,even if there is no proof that liquid crystal is poisonous.
(2)If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
(3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

13.2 Storage Conditions

(4) Store the panel or module in a dark place where the temperature is 23±5℃and the humidity is below 45±20%RH.
(5) Store in anti-static electricity container.
(6) Store in clean environment, free from dust, active gas, and solvent.
(7) Do not place the module near organics solvents or corrosive gases.
(8))Do not crush, shake, or jolt the module.

13.3 Handling Precautions

(9) Avoid static electricity, which can damage the CMOS LSI.
(10) The polarizing plate of the display is very fragile, please handle if very carefully.
(11) Do not give external shock.
(12) DO mot apply excessive force on the surface.
(13) Bo not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
(14) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
(15) Do not operate it above the absolute maximum rating.
(16) Do not remove the panel or frame from the module.

13.4 Warranty

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