LCM Specification

(√) Preliminary Specification
( ) Final Specification

2.0" TFT

Customer:	
Part NO:	T020HL005 - 37A
Product type:	Mode: Transmissive type .Normally white. TFT LCD Module LCD Module: Graphic 176RGB*220Dot-matrix
Remarks:	□APPROVAL FOR SEPCIFICATIONS ONLY ■APPROVAL FOR SEPCIFICATIONS AND SAMPLE
Signature by Customer: 客户确认签章	

ORGANIZED BY	CHECKED BY	APPROVED BY

2. Features

Display Mode	Transmissive type
	2.0" Active matrix TFT-LCD
Display Format	Graphic 176RGB*220 Dot-matrix
Driver IC	ILI9225G
Display color	262K colors
Luminance	120 cd/m^2 (Typ)
Interface	8 bits parallel interface by 8080 MPU
Viewing Direction	6 O'CLOCK (Gray Scale Reverse)
Back Light	Light Emitting Diode (LED), 3 LEDs connected in parallel

3. Mechanical Specification

Item	Specifications	Unit	Remarks
Dimensional Outline	41.50(W)*49.10(H)*2.2MAX	mm	FPC not include
Resolution	176(RGB)(W)*220(H)pixels	dots	
LCD Active Area	31.68(W)*39.60(H)	mm	
Pixel Size	0.180(W)*0.180(H)	mm	
Weight	T.B.D	g	

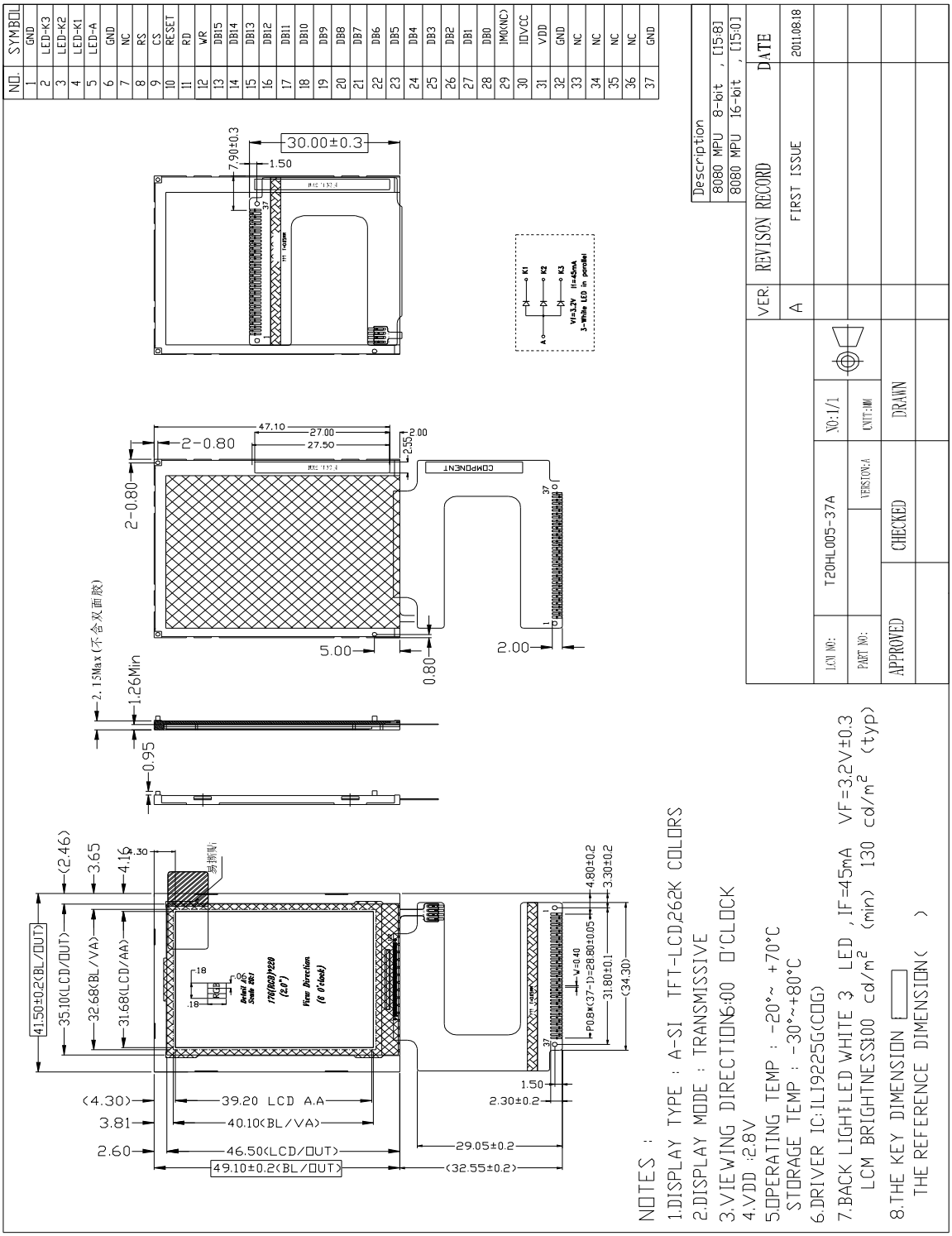
4.Electrical Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Remarks
Power Supply	Analog	VDD	2.5	2.8	3.3	V	
	Logic	VDDIO	1.65	2.8	3..3	V	
Current for LCD		IVDD	-	-	15	mA	
LEDs Forward Voltage		VF	2.9	3.2	3.5	V	
LEDs Forward Current		IF	-	45	60	mA	3LEDs in parallel,45mA
Frame Frequency		FFRAME		80		Hz	Frame Inversion
Storage temperature		TOPR	-20	-	70	℃	
Storage temperature		TSTR	-30	-	80	℃	

5. Revision history

Version	Revise record	Date
A	Original version	2011-9-04

6. **Outline Dimension**



7. Pin Descriptions

Pin No.	Signal	Discription
1	GND	Ground
2	LED-K1	Power supply for backlight cathode input terminal.
3	LED-K2	Power supply for backlight cathode input terminal.
4	LED-K3	Power supply for backlight cathode input terminal.
5	LED-A	Power supply for backlight anode input terminal.
6	GND	Ground
7	NC	NC
8	RS	Display data/Command select signal input terminal
9	CS	Chip select signal input terminal
10	RESET	Chip reset pin, low active.
11	RD	Read control signal input, active at 'L'.
12	WR	Write control signal input, active at 'L'.
13	DB15	Data bus
14	DB14	Data bus
15	DB13	Data bus
16	DB12	Data bus
17	DB11	Data bus
18	DB10	Data bus
19	DB09	Data bus
20	DB08	Data bus
21	DB07	Data bus
22	DB06	Data bus
23	DB05	Data bus
24	DB04	Data bus
25	DB03	Data bus
26	DB02	Data bus
27	DB01	Data bus
28	DB00	Data bus
29	IM0<NC>	DB15-DB8(IM0 1), DB15-DB0(IM0 0)
30	IOVCC	Power supply for interface(compatible 1.8V and 2.8V)
31	VCC	Power supply pin
32	GND	Ground
33	NC	NC
34	NC	NC
35	NC	NC
36	NC	NC
37	GND	Ground

8. OPTICAL SPECIFICATIONS(Ta=25℃)

Item		Symbol	Min	Typical	Max	Unit	Remarks
LED module Forward voltage		VLED	3.0	3.2	3.4	V	
LED module current		VLED	-	45	60	mA	
LCM Surface brightness uniform ★2		LD		80		%	
Response Time		Tr+Tf	-	30	40	ms	
Color Coordinate	RED	X_R	0.579	0.609	0.639		IBL=45mA Full White Pattern
		Y_R	0.302	0.332	0.360		
	GREEN	X_G	0.270	0.300	0.330		
		Y_G	0.536	0.566	0.569		
	BULE	X_B	0.112	0.142	0.172		
		Y_B	0.082	0.112	0.142		
	WHITE	X_W	0.275	0.305	0.335		
		Y_W	0.299	0.329	0.359		

★ 1Test condition is:

(a) Center point on active area.

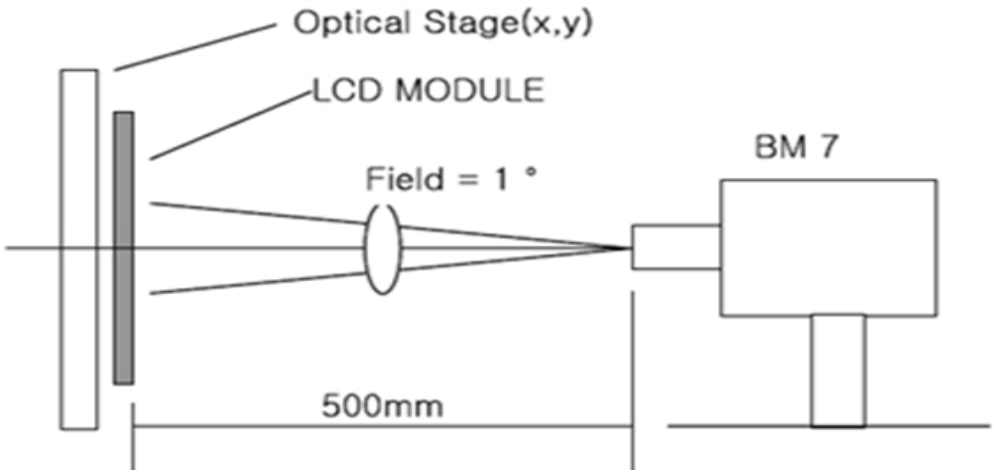
(b)Best Contrast.

★2Uniform measure condition:

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

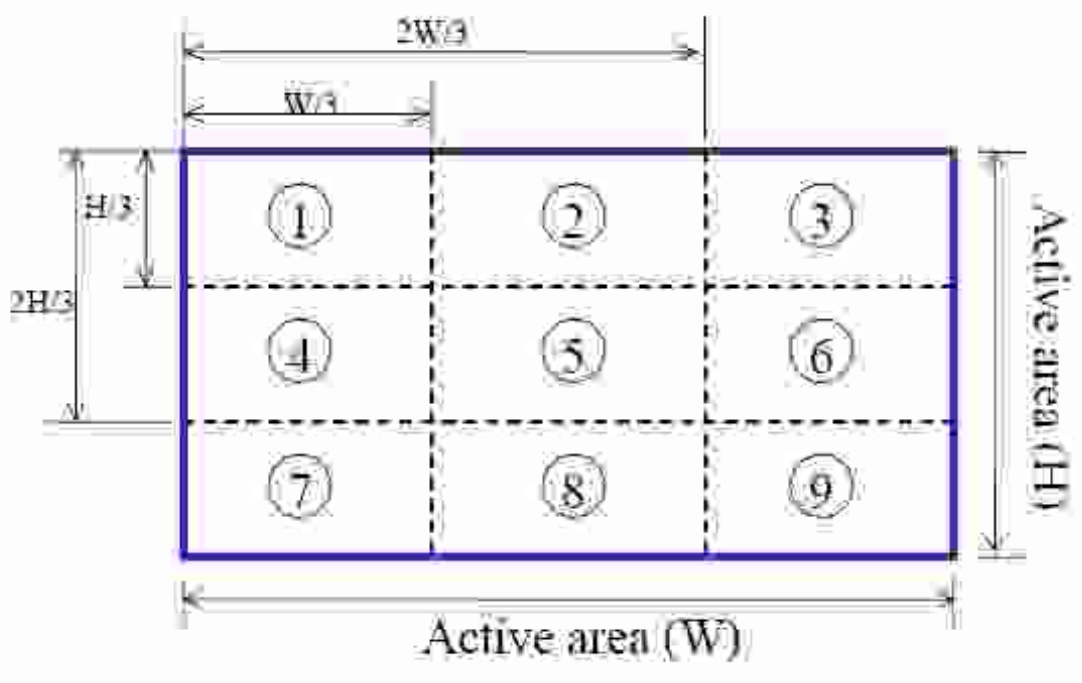
(2)Uniform=(Min. brightness /Max. brightness)*100%

(3)Best Contrast.



<Transmissive Mode>

Optical Characteristic Measurement Equipment and method



Main Measuring point

9.Timing characteristics.

Item		Symbol	Unit	Min.	Typ.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	100			
	Read	t_{CYCR}	ns	300			
Write low-level pulse width		PW_{LM}	ns	50		-	
Write high-level pulse width		PW_{HW}	ns	50			
Read low-level pulse width		PW_{LR}	ns	150			
Read high -level pulse width		PW_{HR}	ns	150			
Write/ Read rise/fall time		t_{WRr} /t_{WRt}	ns			25	
Setup time	Write(RS to nCS,E/nWR)	ns	ns	10			
	Read (RS to nCS,E/nWR)	ns	ns	5			
Address hold time		T_{AII}	ns	5			
Write data set up time		t_{osw}	ns	10			
Write data hold time		t_H	ns	15			
Read data set up time		t_{DDR}	ns			100	
Read data hold time		t_{OHR}	ns	5			

Note:I80-System Interface Timing Characteristics

Normal Wrote Mode(IOVCC=1.65~3.3V,Vcc=2.4~3.3V)

10.Read Timing Characteristics

Reset Timing Characteristics(VCC=1.8~3.3V.IOVCC=1.65~3.3V)

Item	Symbol	Unit	Min.	Typ..	Max	Remarks
Reset low-level width	t_{RES}	ms	1			
Reset rise time	t_{RES}	μ s			10	

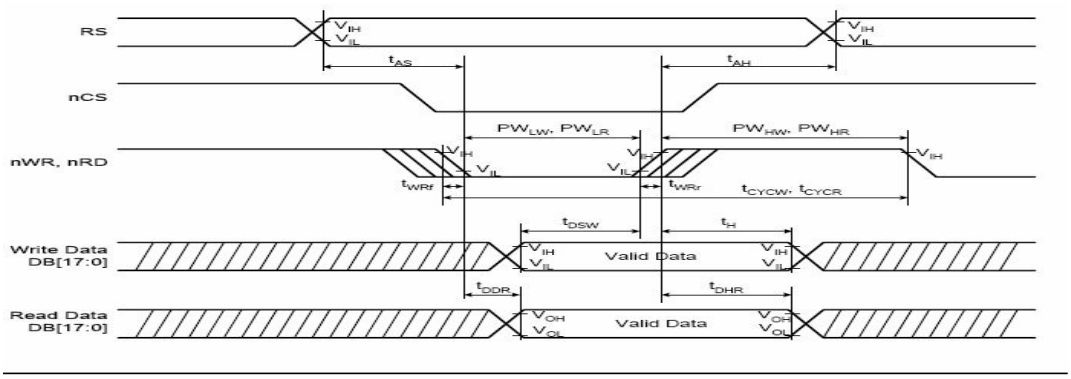
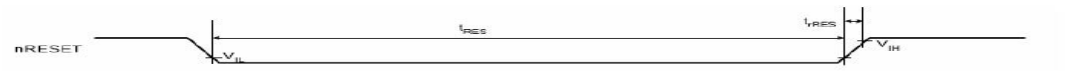


Figure 51 i80-System Bus Timing



Reset Timing

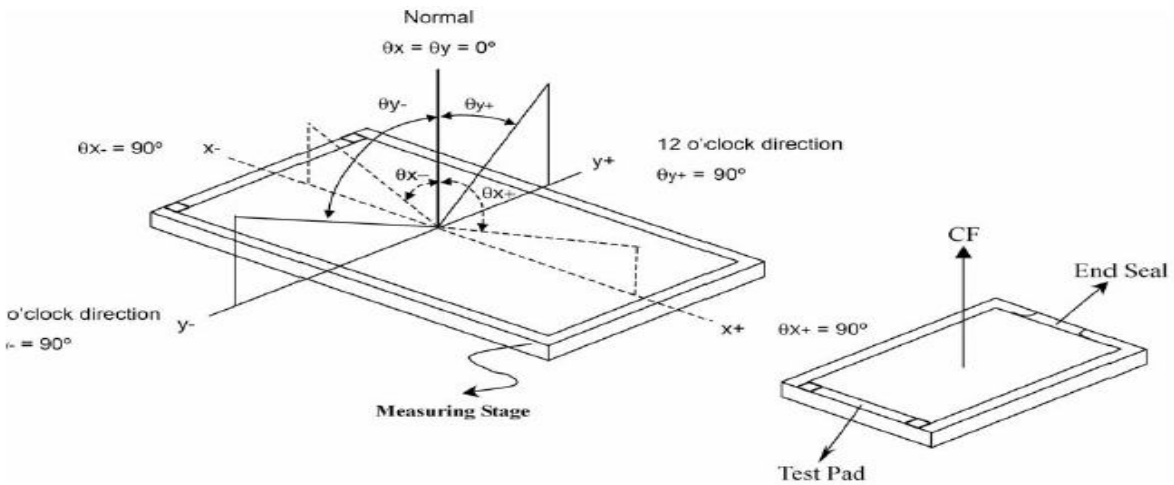
11.Electro-optical Characteristics

Item	Symbol	Conditions	Temp	Min.	Typ.	Max.	Unit	Note
Response Time	T_R	θ = ϕ =0	25℃		TBD	TBD	msec	NOTE1
	T_F				TBD	TBD		
Viewing Angle Range	ϕ=0°(6”)	ϕ=90°(3”)	ϕ=180°(12”)			ϕ=270°(9”)		NOTE2
θ(25℃) CR≥10	TBD	TBD	TBD			TBD		NOTE3

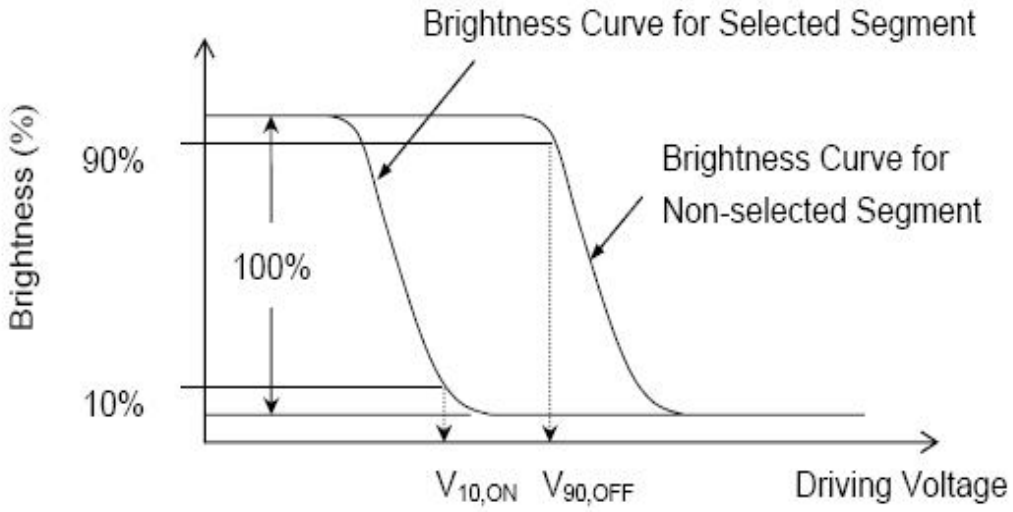
The above “viewing angle” is the measuring position with the largest contrast ratio. Not for good image quality. Viewing direction for good image quality is 12 O’clock.

●For panel only

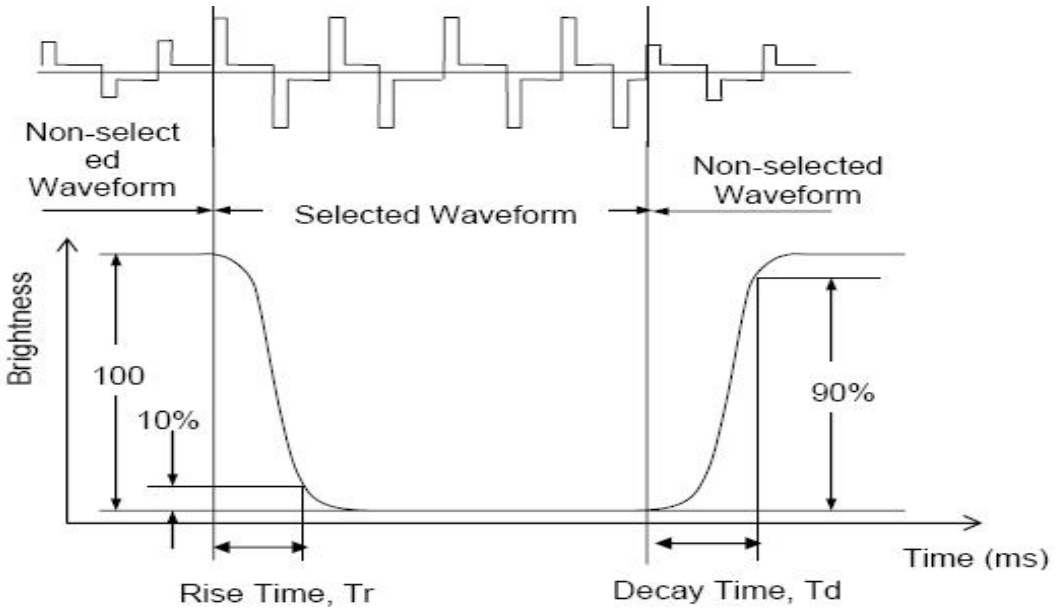
●Electro-Optical Characteristics Test Method



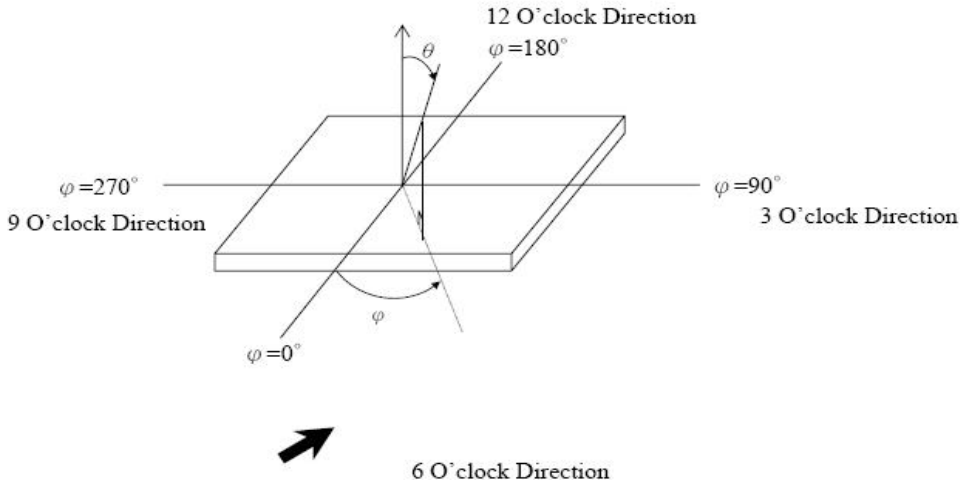
$Vop = (V_{10, ON} + V_{90, OFF})/2$



.Note1:Definition of Optical Response Time:

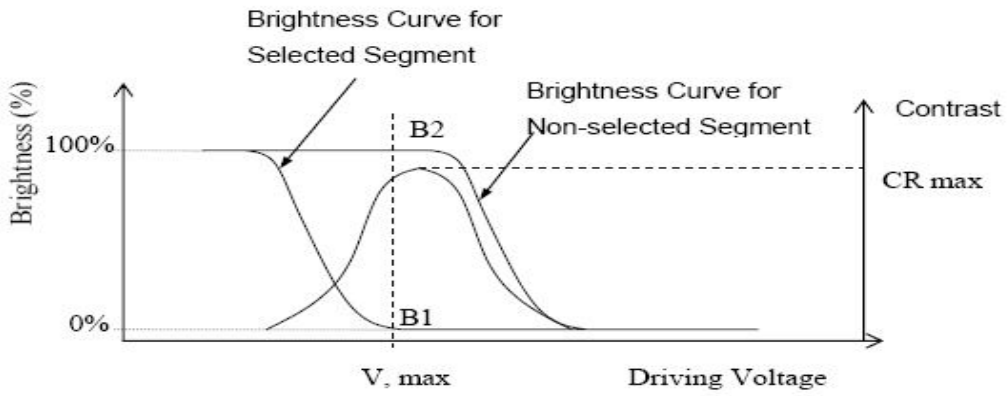


.Note2:Definition of Viewing Angle θ and ϕ :



Note3.Definition of Contrast ratio (CR):

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



12. Reliability

Item NO.	TEST Item	CONDITION	CRITERION
1	Humidity Temperature	40℃±2℃, 95%RH, 240 hrs	Placed 2 hours in normal temperature,then inspect the function and cosmetic after test. After testing, cosmetic defects should not happen. Contrast ratio should not happen lower than 10% of initial value.Total current consumption should not be over 10% of initial value.Polarizers may fail in humidity test, but only this failure is allowable.
2	Thermal shock test	25℃±2℃→-40℃±2℃→25℃±2℃ →70℃±2℃ 5(min) 120(min) 5(min) 120(min)， 60cycle	
3	High temperature operating	60℃±2℃ 90%RH*240Hrs	
4	Low temperature operating	-30℃±2℃ 240 hrs	
5	High temperature storage	70℃±2℃ 240Hrs	
6	Low temperature storage	-20℃±2℃240Hrs	
7	Packing drop test	1 corner 3 edges six faces, with carton packing, 1m height, concrete ground	After testing, inspect the packing and product Packing broken length<2cm, LCD visual and function check
8	LCM drop test	0.5m height, top and bottom sides, each side 5 times.	After testing, inspect the LCM, Function and cosmetic defects should not happen
9	ESD	150 pF 330Ω ±8KV 10 times air discharge （with Phone test)	After testing, cosmetic and electrical defects should not happen. Total current consumption should be below double of initial value.
10	Solderability test	245±5℃ ,3-5s ,by magnifier	last tin degree≥95% ;The pinhole or empty caves can't concentrate a place or don't exceed 5% of the total area.
11	Tin-adhesion test	non-Pb soldering, 360℃ ,5 cycles to solder and strip	copper is whole
12	LCD FPC bending test	Put 1mm diameter pole at fold line,fold the FPC cable as +/- 90 degree or+/-180degree from PCB side to connector side; 100 times.	After testing, inspect the LCD,function and cosmetic defects should not happen.
13	Hydrostatic test	Put the LCM on the plate , Use the 10mm diameter pole to press the center of the LCM with the velocity 10mm/min, when the LCM crush,	pressure > 300N is OK.
14	Vibration test	10～55～10Hz amplitude : 1.5mm 2hrs for each direction(X, Y, Z)	Not allowed cosmetic and electrical defects. test will be performed at state of carton box,not each of the modules

15	LCD bending test	Put the LCM on the plate like the picture , Use the 10mm diameter pole to press the center of the LCM with the velocity 10mm/min , until the force is 70N and keep 5s ,(X, Y direction both)	After testing, inspect the LCD,Not allowed crush and transmutation.

13.Inspection standards

1.AQL(Acceptable Quality Level

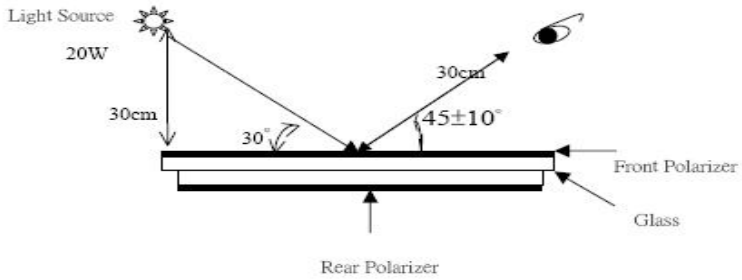
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.0

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)

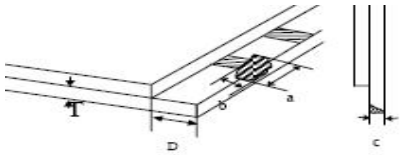
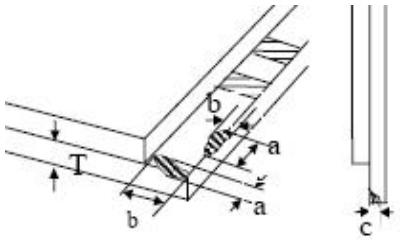
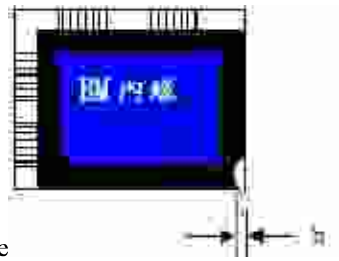


3.Inspection item and criteria

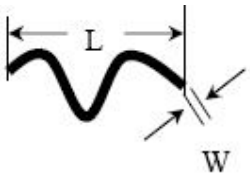
3.1 Visual inspection criterion in immobility

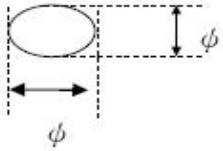
3.1.1Glass defect

NO	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	1. Linear cracks panel 【Reject】 2. Nonlinear crack contrast by limited sample	
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage. 1) b≤1/3Pin width(non bonding area)	A: Length, b: Width

		【Accept】 2)bonding area≤0. 5mm 【Accept】	
4	Pin-side ,conductive area damaged (minor defect)	(a c: disregards) b≤1/3of effective length for bonding electrode 【Accept】	a: length, b: Width, c: Thickness 
5	Pin-side,non-conductive area damaged (minor defect)	1)Damage area don't touch the ITO (Inclueling contraposition mark, except scribing mark) 【Accept】 2)C<T b≦BM1/3of width 【Accept】 3)c=T b not touch the seal glue 【Accept】 4)a disregards	a: Length, b: Width c: Thickness 
6	Non-pin-side damage (minor defect)	c<T 1)b exceeds 1/3Bm 【Reject】 c=T b not touch the seal glue 【Reject】	c: Thickness b: width of  damage

3.1.2LCD appearance defect(View area)

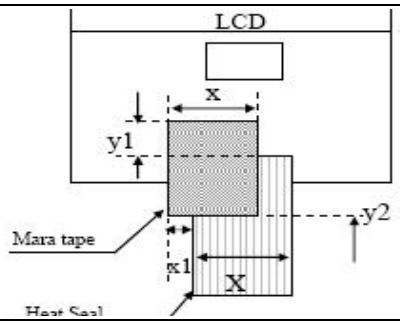
NO	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1:L: Length, W: Width note2: disregard if out of AA 
		W≦0.03mm	disregard	
		0.03mm<W≦0. 05mm; L≦3. 0mm	2	
		0.05mm<W≦0. 1mm; L≦3. 0mm	1	
		W>0.1mm;L>3.0mm	0	
2	Polarizer bubble、concave 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	Φ≦0.15mm	disregard	note2:disregard if out of AA
		0.15mm<Φ≦0. 25mm	2	

	(minor defect)	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	

3.1.3FPC

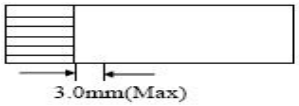
NO	Defect item	Criteria		Remark
1	Copper screen peel (minor defect)	Copper screen peel 【Reject】		
2	No release tape or peel	No release tape or peel 【Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	Note1: Cannot have stride ITO impurities
		ϕ ≦0.25mm	2	
		ϕ >0. 25	0	

3.1.4Black tape &Mara tape

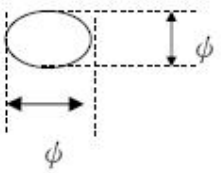
NO	Defect item	Criteria	Remark
1	FPC or H/S black tape (minor defect)	1. shift spec: 1) glue to the polarize 【Reject】 2) IC bare 【Reject】 2. left-and-right spec: 1)exceed of FPC edge or H-S edge【Reject】 2) IC bare 【Reject】	
2	No black tape (major defect)	No black tape 【Reject】	
3	Tape position mistake (minor defect)	Not by engineering drawing	
4	Mara tape defect (minor defect)	Peel before pulling the protecting film 【Reject】	

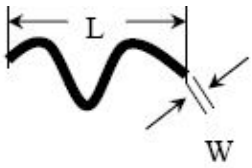
3.1.5Silicon and Taffy glue

NO	Defect item	Criteria	Remark

1	Quantity of silicon (major defect)	Uncover the ITO and circuit area 【Reject】	note: compared by engineering
2	Taffy glue (major defect)	1.Uncover the reveal copper area 【Reject】 2.Cover layer 0.3mm(Min)~3.0mm(Max) 【Reject】	note: if customer has special requirement, refer to the technical document 
3	Depth of glue covering (major defect)	Depth of glue covering overtop front Polarizer 【Reject】	Except of the special requirement

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 (major defect)	Specification	Allowable	Note1:disregard if out of AA 
		ϕ ≦0.15mm	disregard	
		0.15mm< ϕ ≦0. 25㎜	2	
		0.25mm< ϕ ≦0. 3㎜	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	

14.Precautions for using LCD modules.

14.1 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.

14.2Srorang 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.

14.3 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.

14.4 Warranty

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