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1. GENERAL DESCRIPTION

KGM529A0 is a 240 x RGB x 320 dots matrix TFT LCD module. It has a TFT panel composed of 720 sources and 320 gates. The LCM can be easily accessed by micro-controller 8080-16-bit parallel interface.

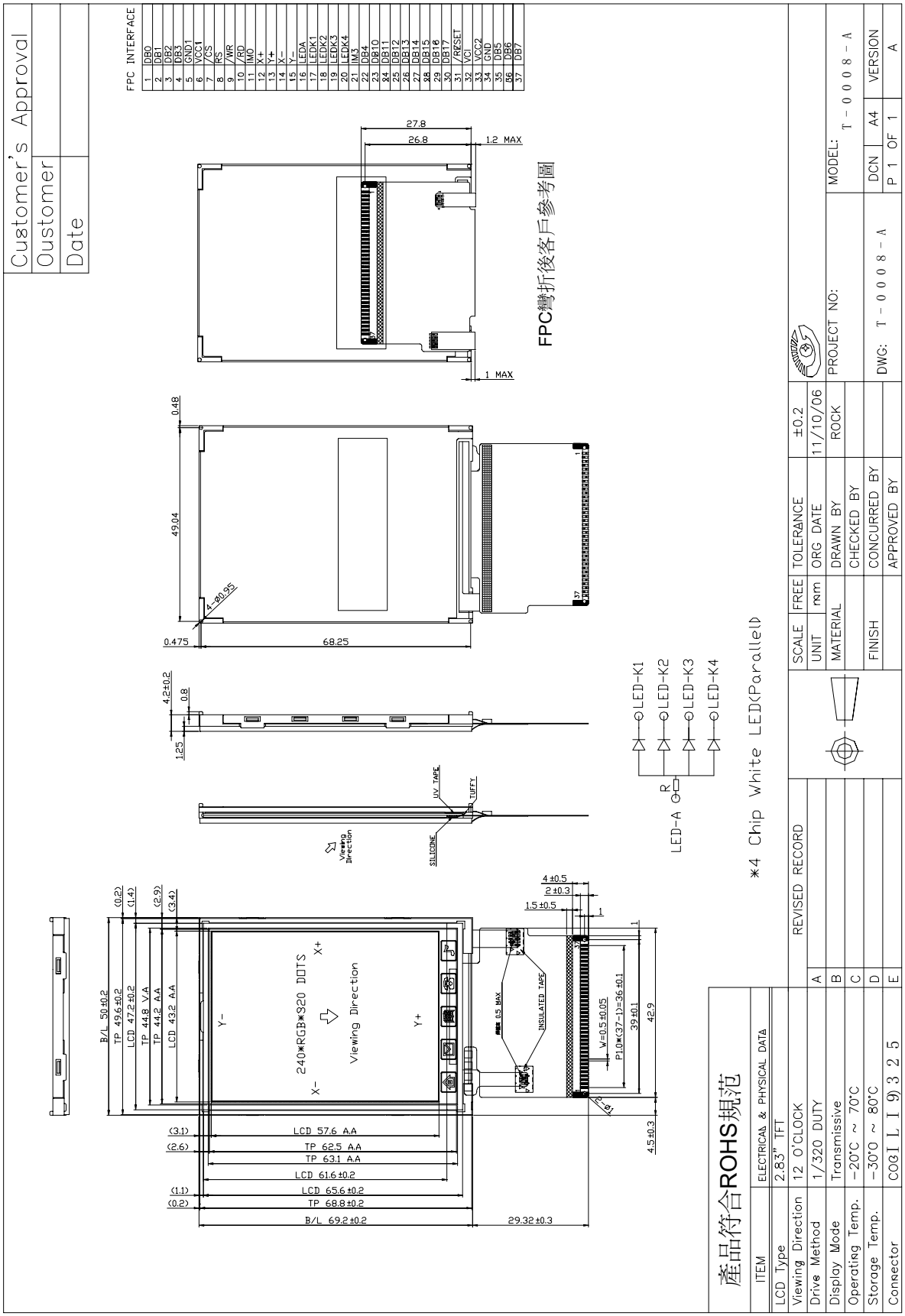
2. FEATURES

Display Mode	TFT LCD MODE
	Active matrix TFT, Transmissive type.
Display Format	RGB Stripe
Colors	262 K Color
Input Data	16-bit parallel interface by 8080 MPU
Viewing Direction	12 O'clock
Drive	ILI9325

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Dimensional outline	50(W)×69.2 (H) ×4.2(T)	mm
Resolution	240x RGB x 320	dots
Active area	43.2 (W)×57.6 (H)	mm
Pixel size	180(W)×180(H)	um

4. MECHANICAL DIMENSION



5. MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Note
Supply voltage	V_{DD}	-0.4	4.0	V	
Input Voltage	V_{IN}	-0.4	VDD+0.4	V	
Operating temperature	T_{OPR}	-20	70	℃	
Storage temperature	T_{STR}	-30	80	℃	
Humidity	---	---	90	%RH	

6. ELECTRICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	VDD	---	2.9	3.0	3.1	V
Input Voltage	H level	V_{IH}	---	$0.7V_{DD}$	---	V_{DD}	V
	L level	V_{IL}		0	---	$0.3V_{DD}$	
Current Consumption		I_{DD}	With internal voltage generation; V_{DD}=3.0V; T_{amb}=25℃;	---	---	20	mA
LCD Driving Voltage		VOP		---	TBD	---	V

7. BACKLIGHT CHARACETRISTIC

Item	Symbol	Min.	Typical	Max.	Unit
LED module Forward voltage	V_{LED}	3.0	----	3.4	V
LED module current	I_{LED}	----	80	----	mA
L/G Surface Luminance ★1	L_S	3200	-------	4500	Cd/㎡
LCM Surface brightness uniform ★2	L_D	80	----	----	%

★1 Test condition is：

(a) Center point on active area

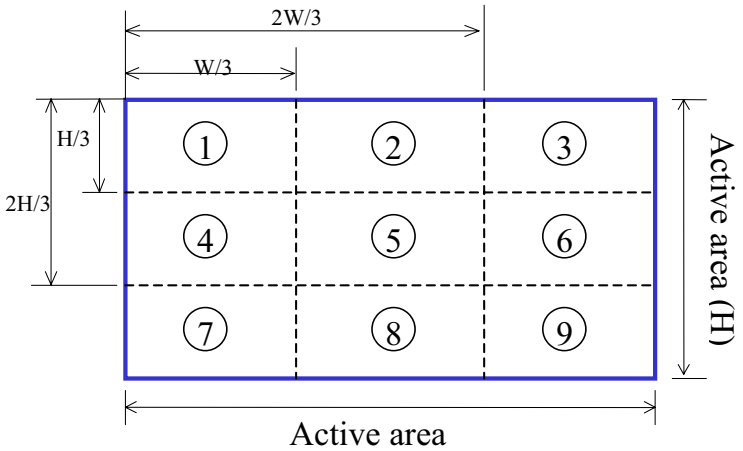
(b) Best Contrast

★2 Uniform measure condition：

(1)Measure 9 point. Measure location is show below：

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

(3)Best Contrast.

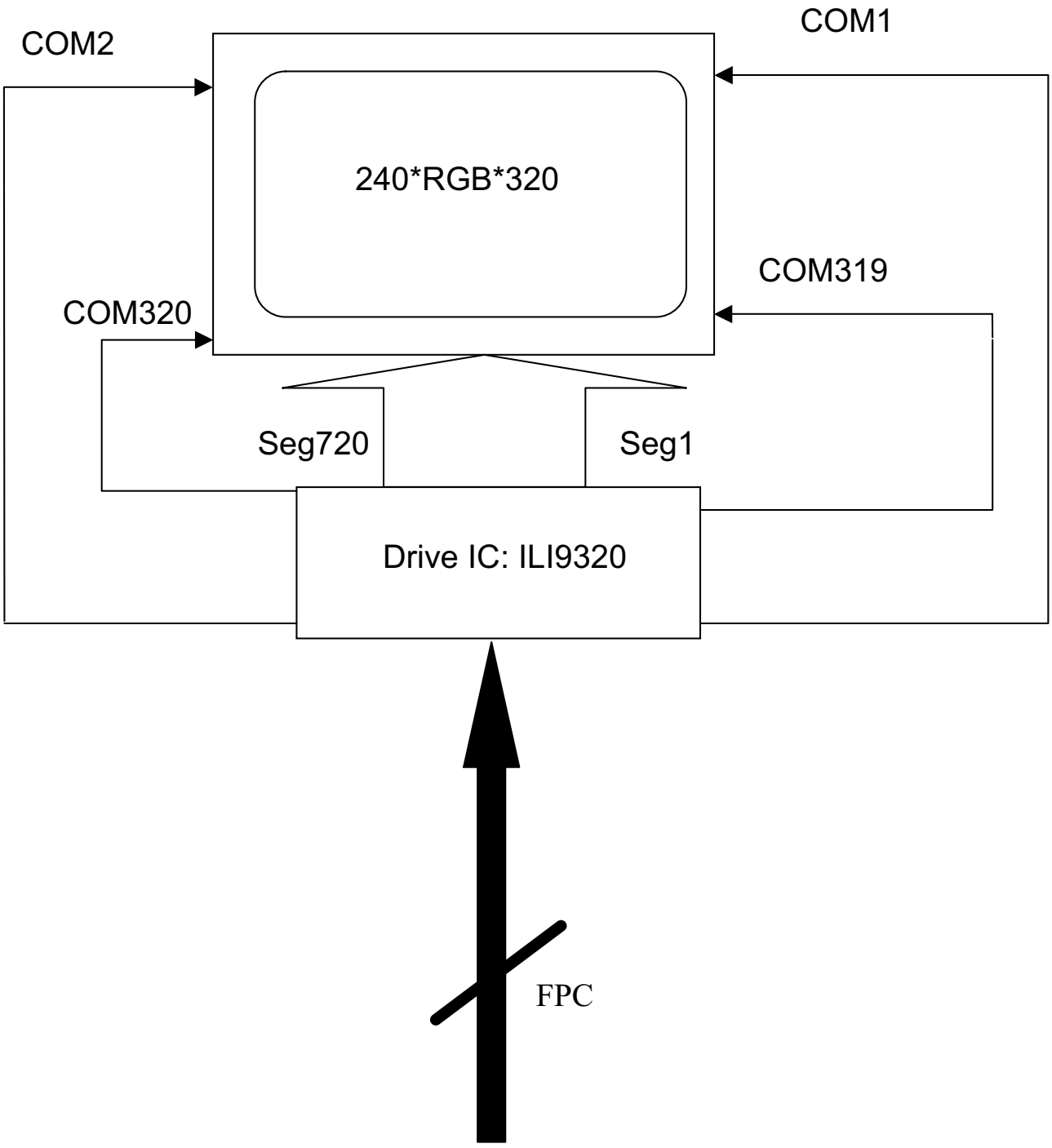


8. MODULE FUNCTION DESCRIPTION

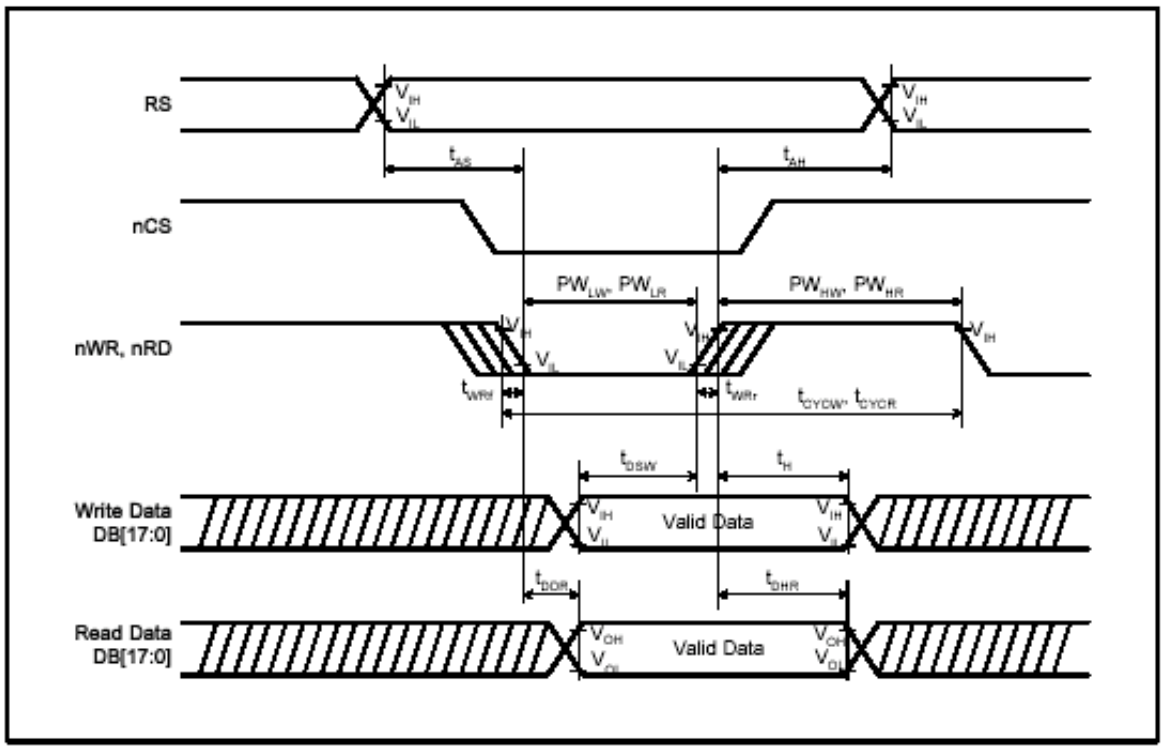
8.1. PIN DESCRIPTION

Pin No	Symbol	Function	Notes
1	DB0	Data bus	
2	DB1		
3	DB2		
4	DB3		
5	GND1	Ground level	
6	VCC1	Power supply for analog circuit	
7	/CS	LCD station read enable. “Low” active.	
8	RS	“Low”: command. “High”: display data.	
9	/WR	LCD driver write enable. “Low” active.	
10	/RD	LCD station read enable. “Low” active.	
11	IM0	Interface Selection, "H" 8bit, "L" 16bit	
12	X+	Touch panel control pin.	
13	Y+		
14	X-		
15	Y-		
16	LEDA	Anode for back light power supply.	
17	LEDK1	Cathode for back light power supply.	
18	LEDK2	Cathode for back light power supply.	
19	LEDK3	Cathode for back light power supply.	
20	LEDK4	Cathode for back light power supply.	
21	IM3	Interface Selection,	
22	DB4	Data bus	
23 ~ 30	DB10 ~ DB17		
31	/RESET	RESET PIN	
32	VCI	Power supply for analog circuit	
33	VCC2	Power supply for system.	
34	GND	Ground level	
35	DB5	Data bus	
36	DB6		
37	DB7		

8.2. BLOCK DIAGRAM OF LCM



8.3. TIMING CHARACTERISTICS



(IOVCC= 1.653.3V and VCC=2.4~3.3V)

Item		Symbol	Unit	Min.	Typ.	Max.	Test Condition
Serial clock cycle time	Write (received)	t_{SCYC}	ns	100	-	-	
	Read (transmitted)	t_{SCYC}	ns	200	-	-	
Serial clock high – level pulse width	Write (received)	t_{SCH}	ns	40	-	-	
	Read (transmitted)	t_{SCH}	ns	100	-	-	
Serial clock low – level pulse width	Write (received)	t_{SCL}	ns	40	-	-	
	Read (transmitted)	t_{SCL}	ns	100	-	-	
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	50	-	-	
Serial input data set up time		t_{SISU}	ns	20	-	-	
Serial input data hold time		t_{SIH}	ns	20	-	-	
Serial output data set up time		t_{SOD}	ns	-	-	100	
Serial output data hold time		t_{SOH}	ns	5	-	-	

9. ELECTRO-OPTICAL CHARACTERISTICS

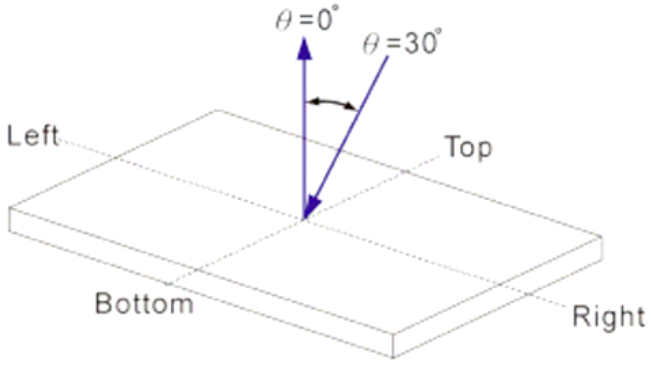
Item	Symbol	Condition	Temp	Min	Typ	Max	Units	Note
Response Time	Rise Time (Tr)	$\theta = \phi = 0$	25℃	---	10	30	msec	NOTE2
	Decay Time (Td)			---	30	40		

Viewing Angle Range	ϕ = 0° (6")	ϕ = 90° (3")	ϕ =180° (12")	ϕ =270° (9")	NOTE4
θ (25℃) CR≥10	50	45	60	45	NOTE1

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 12O'clock.

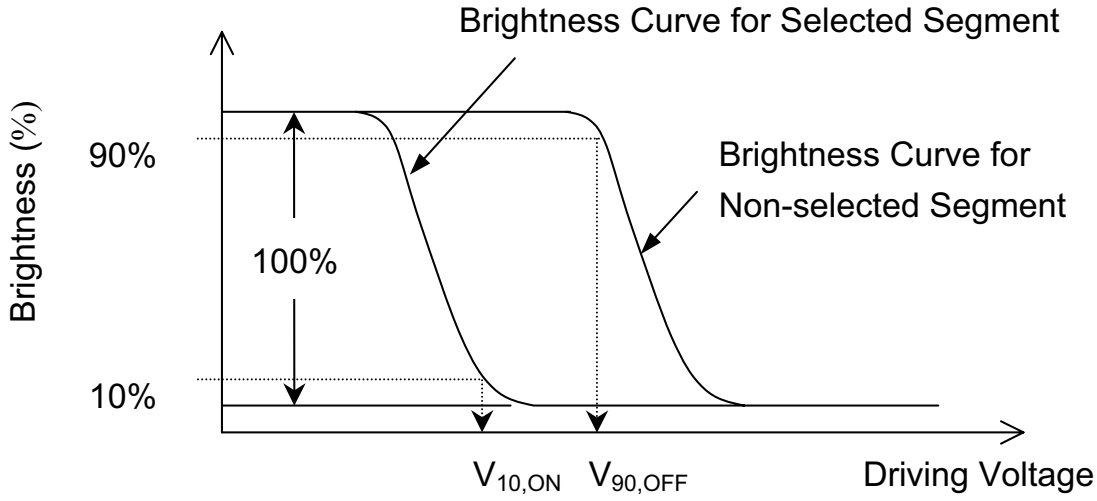
● For panel only

●Electro-Optical Characteristics Test Method

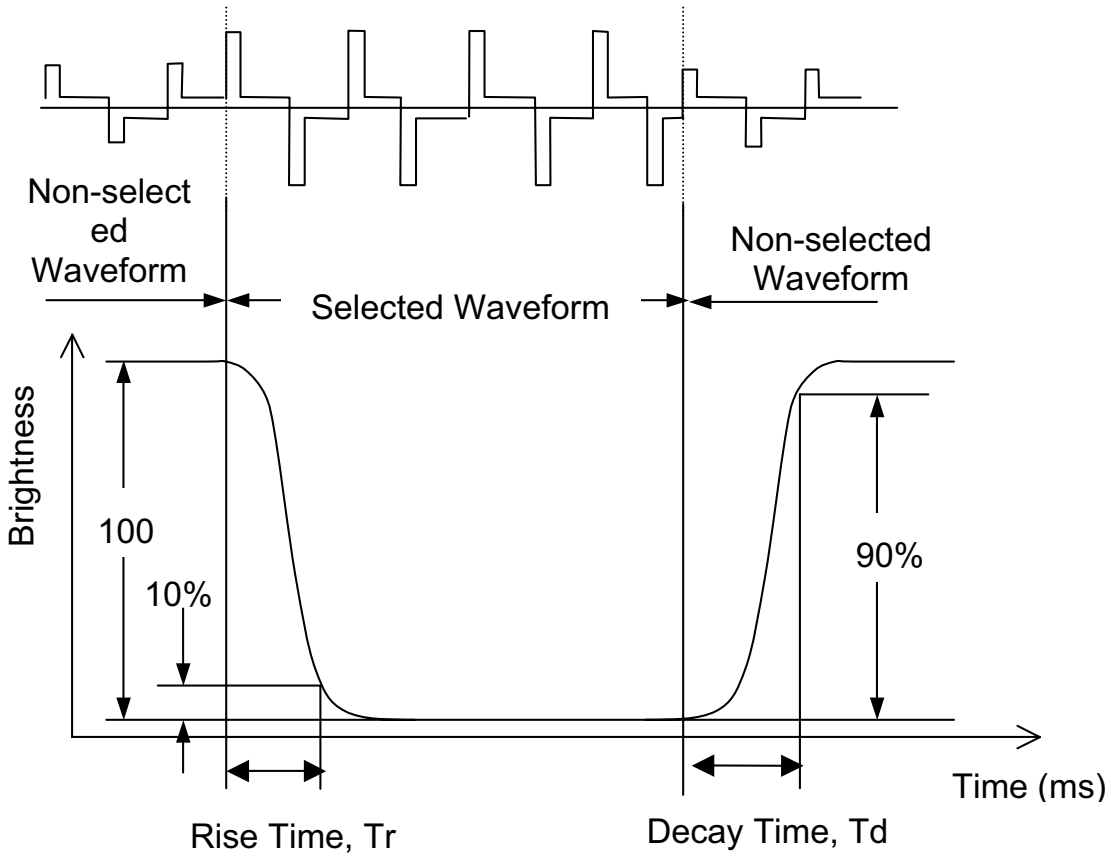


• Note 1. Definition of Driving Voltage(Vop) :

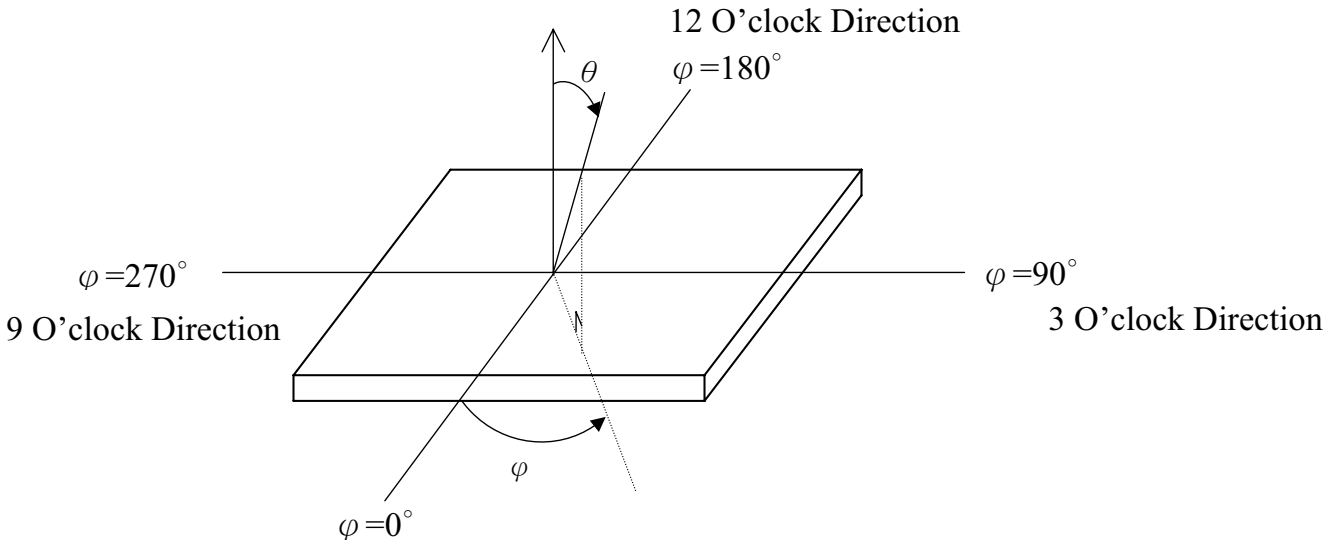
$$Vop = (V_{10,\,ON} + V_{90,\,OFF})/2$$



• Note 2. Definition of Optical Response Time :

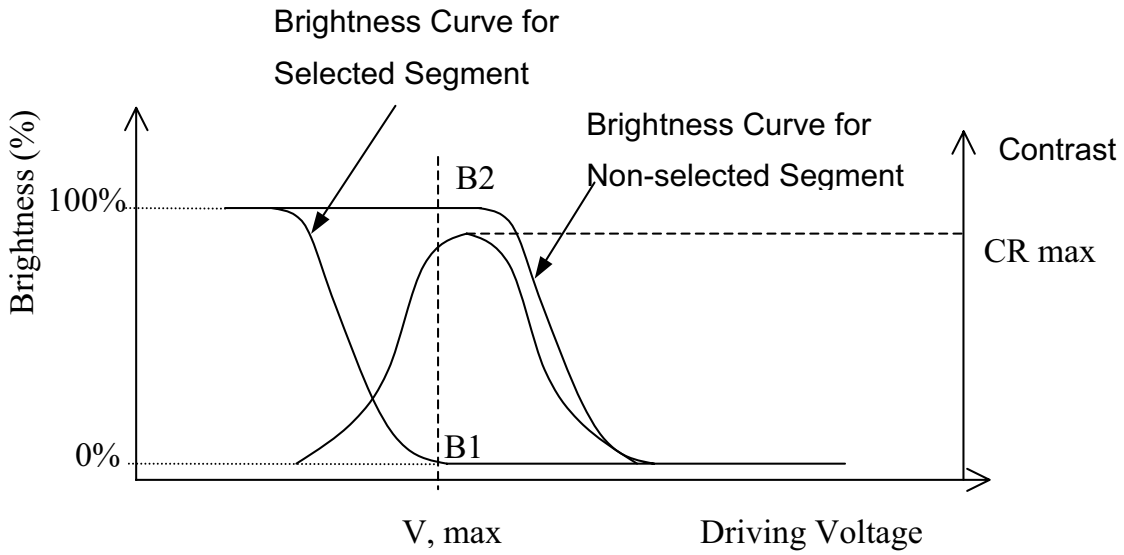


• Note 3. Definition of Viewing Angle θ and ϕ :



• Note 4. Definition of Contrast ratio(CR):

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



10. RELIABILITY

10.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal. (25°C in the room without sunlight)

10.2. Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80℃ * 240Hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable. ◦ IDD of LCM in Pre-and Post-Test Should Follow Specification
2	Low Temperature Non-Operating Test	-30℃ * 240Hrs	
3	High Temperature/Humidity Non-Operating Test	50℃ * 90%RH * 240 Hrs	
4	High Temperature Operating Test	70℃ * 240Hrs	
5	Low Temperature Operating Test	-20℃ * 240Hrs	
6	Thermal Shock Test	-20℃(30Min)↔ 70(30Min)* 10 CYCLES	

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.

11. Inspection standards

1. AQL (Acceptable Quality Level)

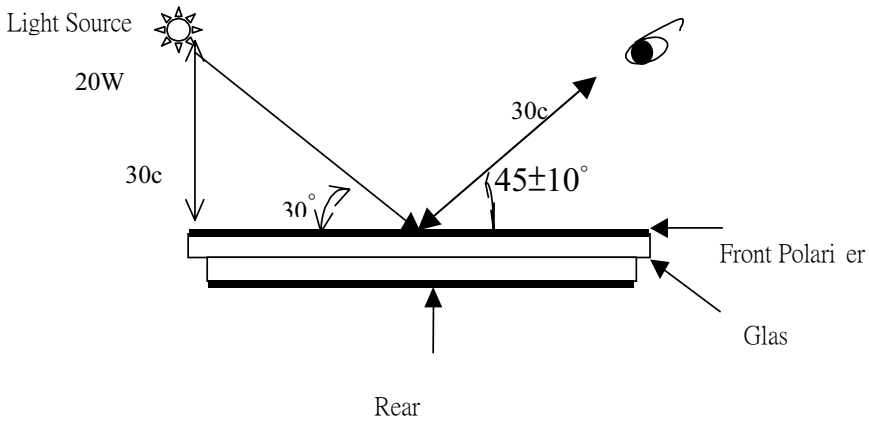
AQL of major and minor defect

	MAJOR DEFECT	MINOR DEFECT	MAJOR+MINOR
APPEARANCE	0.40%	1.0%	1.0%
ELECTRIC-OPTICAL	0.15%	0.15%	0.15%

2. 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 distence of 30 cm with normal eye.with an angle of 45 degree to check the products without uncovering the film!

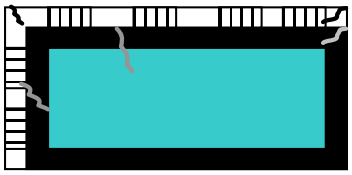
(As shown below).

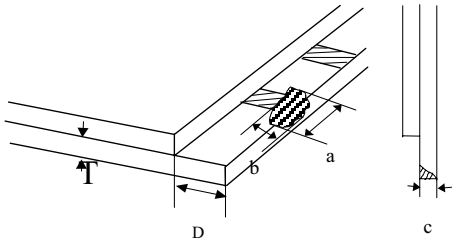
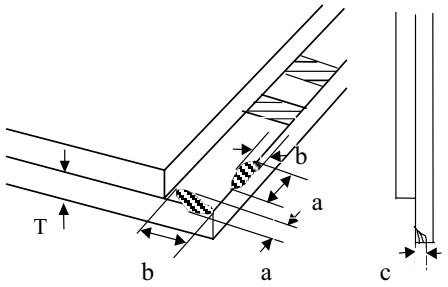
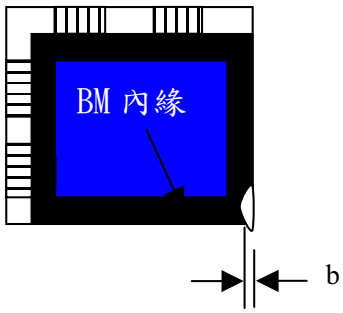


3. Inspection item and criteria

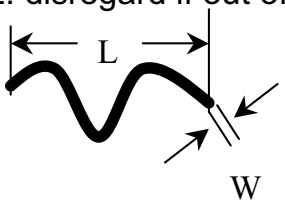
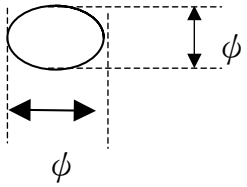
3.1 Visual inspection criterion in immobility

3.1.1 Glass defect

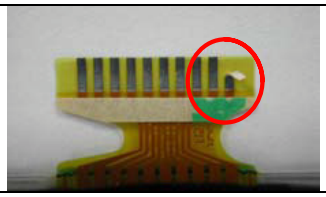
No	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	1.Linear cracks on panel 【Reject】 2. Nonlinear crack contrast by limited sample	

No	Defect item	Criteria	Remark
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage 1) b≦1/3Pin width(non bonding area) 【Accept】 2) bonding area≦0.5mm 【Accept】	a:Length, b:Width
4	Pin-side，conductive area damaged (minor defect)	(a c：disregards) b≦ 1/3 of 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≦BM 1/3 of 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 1/3 BM 【Reject】 c=T b not touch the seal glue 【Reject】	c ： Thickness b: width of damage 

3.1.2 LCD appearance defect (View area)

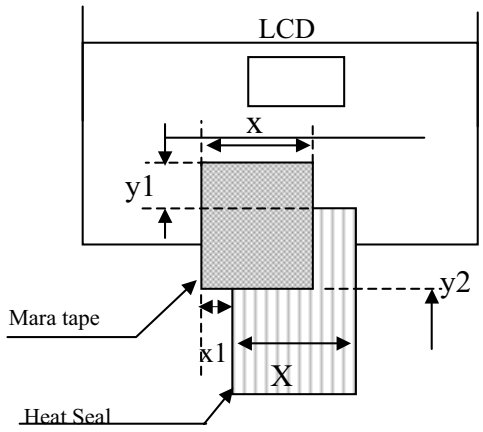
No	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1: L：Length，W：Width note2: disregard if out of AA 
		W≦0.03mm	disregard	
		0.03mm<W≦0.05mm ; L≦3.0mm	2	
		0.05mm<W≦0.1mm; L≦3.0mm	1	
		W>0.1mm ; L>3.0mm	0	
2	Polarizer bubble、concave and convex (minor defect)	ϕ ≦0.2mm	disregard	note 1:ψ=(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、eyewinker (Major defect)	ϕ ≦0.1mm	disregard	note2: disregard if out of AA 
		0.1mm< ϕ ≦ 0.15mm	2	
		0.15mm< ϕ < 0.20mm	1	
		0.2mm ≦ ϕ	0	
4	Polarizer prick (Major defect)	ψ≦0.1mm	disregard	note1:ψ=(L+W)/2 ；L=Length，W=Width note2: the distance between two dots ＞5mm
		0.1mm<ψ≦0.25mm	3	
		ψ＞0.25mm	0	

3.1.3 .FPC

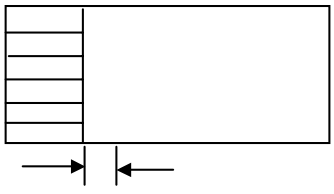
No	Defect item	Criteria		Remark
1	Copper screen peel (Major defect)	Copper screen peel 【Reject】		
2	No release tape or peel (Major defect)	No release tape or peel 【Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	note1: Cannot have stride ITO impurities
		ψ≦0.25mm	2	
		ψ>0.25	0	

3.1.4 Black tape & Mara tape

No	Defect item	Criteria	Remark

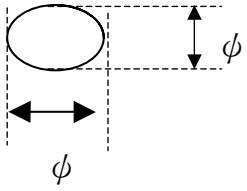
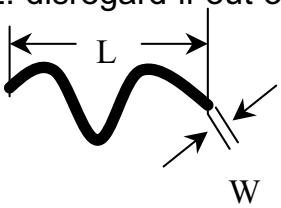
No	Defect item	Criteria	Remark
1	FPC or H/S black tape shift (minor defect)	1.shift spec: 1)glue to the polarize 【Reject】 2) IC bare 【Reject】 2. left-and-right spec: 1) exceed of FPC edge or H-S edge 【Reject】 2)IC bare 【Reject】	
2	No black tape (Major defect)	No black tape 【Reject】	
3	Tape position mistake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

4.1.5 Silicon and Tuffy glue

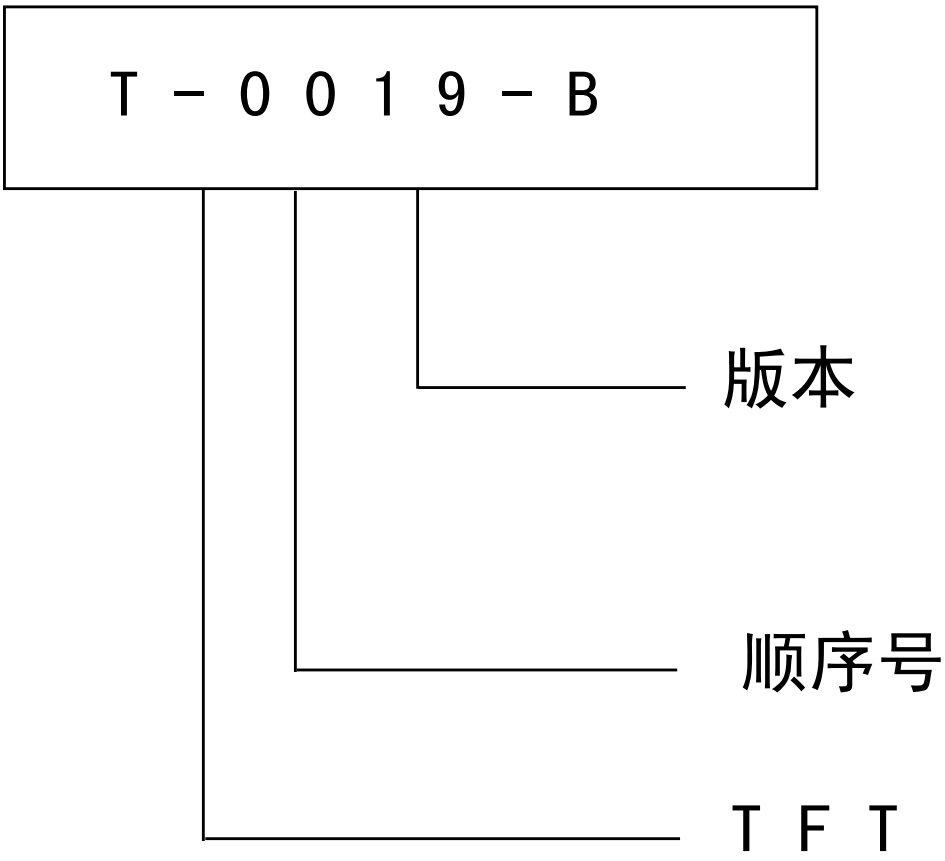
No	Defect item	Criteria	Remark
1	Quantity of silicon (minor defect)	Uncover the ITO and circuit area. 【Reject】	note: compared by engineering drawing.
2	Tuffy glue (minor defect)	1. Uncover the reveal copper area 【Reject】 2. Cover layer 0.3mm(Min) ~ 3.0mm(Max) 【accept】	note:if customer has special requirement , refer to the technical document.  3.0mm(Max)
3	Depth of glue covering (minor defect)	Depth of glue covering overtop front Polarizer 【Reject】	Except of the special requirement。

3.2 Electrical criteria

No	Defect item	Criteria	Remark

<table>
<tr><th>No</th><th>Defect item</th><th>Criteria</th><th colspan="2">Remark</th></tr>
<tr><td>1</td><td>No display
(Major defect)</td><td>No display
【Reject】</td><td colspan="2"></td></tr>
<tr><td>2</td><td>Missing line
(Major defect)</td><td>Missing line
【Reject】</td><td colspan="2"></td></tr>
<tr><td>3</td><td>Seg-com light and dark
(Major defect)</td><td>Seg-com light and dark
【Reject】</td><td colspan="2">ND filter 2% test</td></tr>
<tr><td>4</td><td>No display in immobility
(Major defect)</td><td>No display in immobility
【Reject】</td><td colspan="2"></td></tr>
<tr><td>5</td><td>Flicker of Pattern
(Major defect)</td><td>Flicker of Pattern
【Reject】</td><td colspan="2"></td></tr>
<tr><td>6</td><td>Mura (Major defect)</td><td>ND filter 2% test</td><td colspan="2"></td></tr>
<tr><td>7</td><td>Over current
(Major defect)</td><td>Over current
【Reject】</td><td colspan="2"></td></tr>
<tr><td>8</td><td>Voltage out of specification
(Major defect)</td><td>Voltage out of specification
【Reject】</td><td colspan="2"></td></tr>
<tr><td>9</td><td>Pattern blur ,error code
(Major defect)</td><td>Pattern blur ,error code
【Reject】</td><td colspan="2"></td></tr>
<tr><td>10</td><td>Dark light, Flicker
(Major defect)</td><td>Dark light, Flicker
【Reject】</td><td colspan="2"></td></tr>
<tr><td rowspan="5">11</td><td rowspan="5">Black/White dots 、Dirty dots、eyewinker
(Major defect)</td><td>Specification</td><td>Allowable</td><td rowspan="5">Note1: disregard if out of AA
 
</td></tr>
<tr><td>$\phi \leqq 0.1$mm</td><td>disregard</td></tr>
<tr><td>0.1mm$< \phi \leqq$ 0.15mm</td><td>2</td></tr>
<tr><td>0.15mm$< \phi <$ 0.20mm</td><td>1</td></tr>
<tr><td>0.2mm $\leqq \phi$</td><td>0</td></tr>
<tr><td rowspan="4">12</td><td rowspan="4">Fiber、glass cratch、polarizer scratch/folded
(minor defect)</td><td>W$\leqq$0.03mm</td><td>disregard</td><td rowspan="4">note1: L：Length，W：Width
note2: disregard if out of AA
 
</td></tr>
<tr><td>0.03mm<W$\leqq$0.05mm ;
L$\leqq$3.0mm</td><td>2</td></tr>
<tr><td>0.05mm<W$\leqq$0.1mm;
L$\leqq$3.0mm</td><td>1</td></tr>
<tr><td>W>0.1mm ; L>3.0mm</td><td>0</td></tr>
</table>

12. ILLUSTRATION OF LCM DATE CODE



13. PRECAUTIONS FOR USING LCD MODULES

13.1. Safety

(1) Do not swallow any liquid crystal, even if there is no proof that 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 are thoroughly with alcohol or soap.

13.2. Storage Conditions

(1) Store the panel or module in a dark place where the temperature is $23\pm5°C$ and the humidity is below $45\pm20\%RH$.
(2) Store in anti-static electricity container.
(3) Store in clean environment, free from dust, active gas, an solvent.
(4) Do not place the module near organics solvents or corrosive gases.
(5) Do not crush, shake, or jolt the module.

13.3. Handing precautions

(1) Avoid static electricity, which can damage the CMOS LSI.
(2) The polarizing plate of the display is very fragile. So, please handle if very carefully.
(3) Do not give external shock.
(4) Do not apply excessive force on the surface.
(5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
(6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
(7) Do not operate it above the absolute maximum rating.
(8) 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.