Thin Film Transistor LCD MODULE
MODEL: AWT-800480T50P05
Customer's No.:

Acceptance

10 -1 Floor, No.192, Tahtung Road,
Sec. 3, Hsi-Chih City,
Taipei Hsien, Taiwan

Approved and Checked by

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REVISION STATUS

Version	Revised Date	Page	Content	Modified by
A	2012/8/30	--	1. First Issued	TOM
B	2013/11/06	-- 21	1. FPC R3 to changed 1.96K, R4 to changed 1.07K. 2. Changed 8.6 Incoming Inspection Standards.	TOM
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D	2014/02/07	5	Changed 2. MECHANICAL SPECIFICATION.	TOM

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1. GENERAL DESCRIPTION

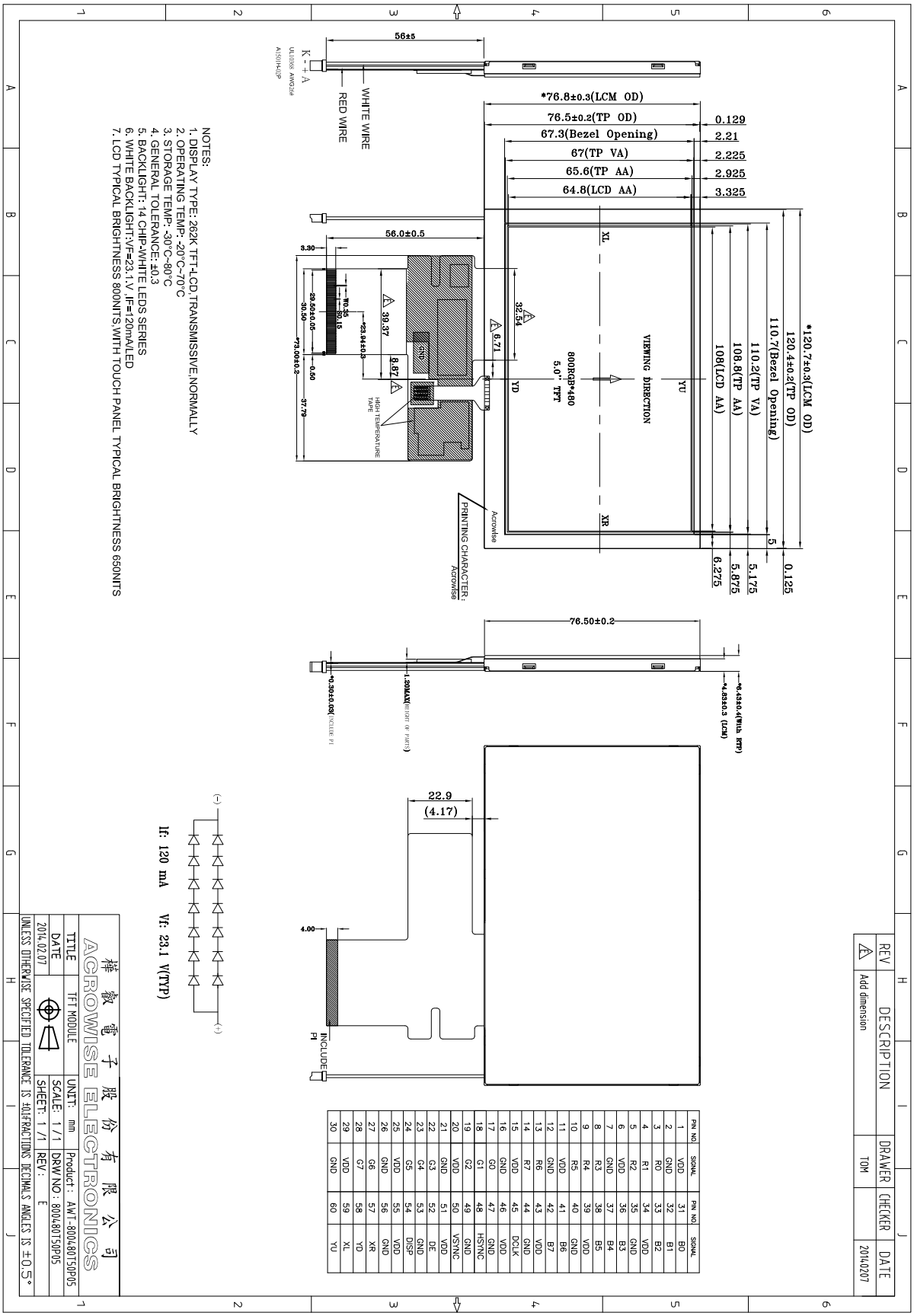
1.1 Description

The specifications is model AWT-800480T50P05 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system and a touch panel. This TFT LCD has a 5.0 (16:9) inch diagonally measured active display area with WQVGA (800 horizontal by 480 vertical pixel) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	5.0”	Inch
2	Number of Pixels	800 (W) x RGB x 480 (H)	Pixels
3	Active Area	108.00 (W) × 64.80 (H)	mm
4	Pixel Pitch	0.135 (W) x 0.135 (H)	mm
5	Outline Dimension	120.70 (W) × 76.80 (H) × 6.43 (T)	mm
6	Number of Colors	8-bit color depth with 256 gray-scale	--
7	Display Mode	TN / Normally White / Transmissive	--
8	Optima View Direction	6 o’clock	--
9	Display Format	RGB vertical stripe	--
10	Surface Treatment	Anti-Glare and Hard-coating 3H	--
11	Contrast Ratio	600 (typical)	--
12	Luminance (cd/㎡)	650 (typical)	nit
13	Interface	Parallel 24-bit RGB data input	--
14	Backlight	White LED	--
15	Driver IC	ILI6123H X 2 ILI5480 X 1	pcs
16	Operation Temperature	-20 ~ 70	°C
17	Storage Temperature	-30 ~ 80	°C
18	Weight	--	g

2. MECHANICAL SPECIFICATION



PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	VDD	31	B0
2	GND	32	B1
3	R0	33	B2
4	R1	34	VDD
5	R2	35	GND
6	VDD	36	B3
7	GND	37	B4
8	R3	38	B5
9	R4	39	VDD
10	R5	40	GND
11	VDD	41	B6
12	GND	42	B7
13	R6	43	VDD
14	R7	44	GND
15	VDD	45	DCLK
16	GND	46	VDD
17	G0	47	GND
18	G1	48	HSYNC
19	G2	49	GND
20	VDD	50	VSYNC
21	GND	51	VDD
22	G3	52	DE
23	G4	53	GND
24	G5	54	DISP
25	VDD	55	VDD
26	GND	56	GND
27	G6	57	XR
28	G7	58	YD
29	VDD	59	XL
30	GND	60	YU

3. PIN DESCRIPTION

3.1 Pin Assignment

No.	Symbol	I/O	Function	Remark
1	VDD	P	Power Voltage	
2	GND	P	Power Ground	
3	R0	I	Data Input (LSB)	
4	R1	I	Data Input	
5	R2	I	Data Input	
6	VDD	P	Power Voltage	
7	GND	P	Power Ground	
8	R3	I	Data Input	
9	R4	I	Data Input	
10	R5	I	Data Input	
11	VDD	P	Power Voltage	
12	GND	P	Power Ground	
13	R6	I	Data Input	
14	R7	I	Data Input (MSB)	
15	VDD	P	Power Voltage	
16	GND	P	Power Ground	
17	G0	I	Data Input (LSB)	
18	G1	I	Data Input	
19	G2	I	Data Input	
20	VDD	P	Power Voltage	
21	GND	P	Power Ground	
22	G3	I	Data Input	
23	G4	I	Data Input	
24	G5	I	Data Input	
25	VDD	P	Power Voltage	
26	GND	P	Power Ground	
27	G6	I	Data Input	
28	G7	I	Data Input (MSB)	
29	VDD	P	Power Voltage	
30	GND	P	Power Ground	
31	B0	I	Data Input (LSB)	
32	B1	I	Data Input	
33	B2	I	Data Input	
34	VDD	P	Power Voltage	
35	GND	P	Power Ground	
36	B3	I	Data Input	
37	B4	I	Data Input	
38	B5	I	Data Input	
39	VDD	P	Power Voltage	

40	GND	P	Power Ground	
41	B6	I	Data Input	
42	B7	I	Data Input (MSB)	
43	VDD	P	Power Voltage	
44	GND	P	Power Ground	
45	DCLK	I	Pixel Clock	
46	VDD	P	Power Voltage	
47	GND	P	Power Ground	
48	HSD	I	Horizontal sync Signal	
49	GND	P	Power Ground	
50	VSD	I	Vertical sync signal	
51	VDD	P	Power Voltage	
52	DE	I	Data Enable	
53	GND	P	Power Ground	
54	DISP	I	Display on/ off	
55	VDD	P	Power Voltage	
56	GND	P	Power Ground	
57	XR	I/O	Right electrode - differential analog	
58	YD	I/O	Bottom electrode - differential analog	
59	XL	I/O	Left electrode - differential analog	
60	YU	I/O	Top electrode - differential analog	

3.2 Backlight

No.	Symbol	I/O	Function	Remark
1	-K	P	Power for LED backlight cathode	
2	+A	P	Power for LED backlight anode	

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

Item	Symbol	Values		Unit	Note
		Min.	Max.		
Power supply voltage	VDD	-0.5	5.0	V	GND=0
Logic Signal Input Level	Vi	-0.3	VDD+0.3	V	

4.1.2 Backlight Unit (GND=0V)

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
LED current	IL	--	120	--	mA	(1)(2)(3)
LED voltage	VL	19.6	23.1	24.5	V	

Note

(1). Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2). Ta =25±2°C

(3). Test Condition: LED current 120 mA. The LED lifetime could be decreased if operating IL is larger than 120mA.

4.1.3 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-20		70	°C	
Storage Temperature	Tstg	-30		80	°C	

5. ELECTRICAL CHARACTERISTICS

5.1 DC Electrical Characteristics

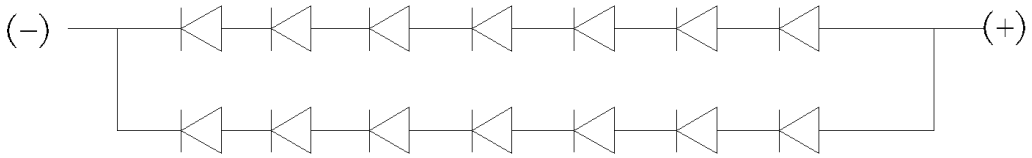
Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Supply voltage	VDD	3.0	3.3	3.6	V	
Input signal voltage	ViH	0.7 VDD	-	VDD	V	Note (1)
	ViL	GND	-	0.3 VDD	V	Note (2)
Current of power supply	IDD	-	-	220	mA	VDD = 3.3V

Note (1): HSYNC, VSYNC, DE, R/G/B Data

Note (2): GND=0V

5.2 Back-Light Unit

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
LED Voltage	VL	19.6	23.1	24.5	V	IF=120mA 14LEDs
B/L Average luminous Intensity	LCD	600	650	--	cd/㎡	
Luminous Tolerance	Iv-m	80		-	%	(min/max)*100
LED life time	Hr	20000	—	—	Hour	Note (1) (2)



BACKLIGHT CIRCUIT DIAGRAM

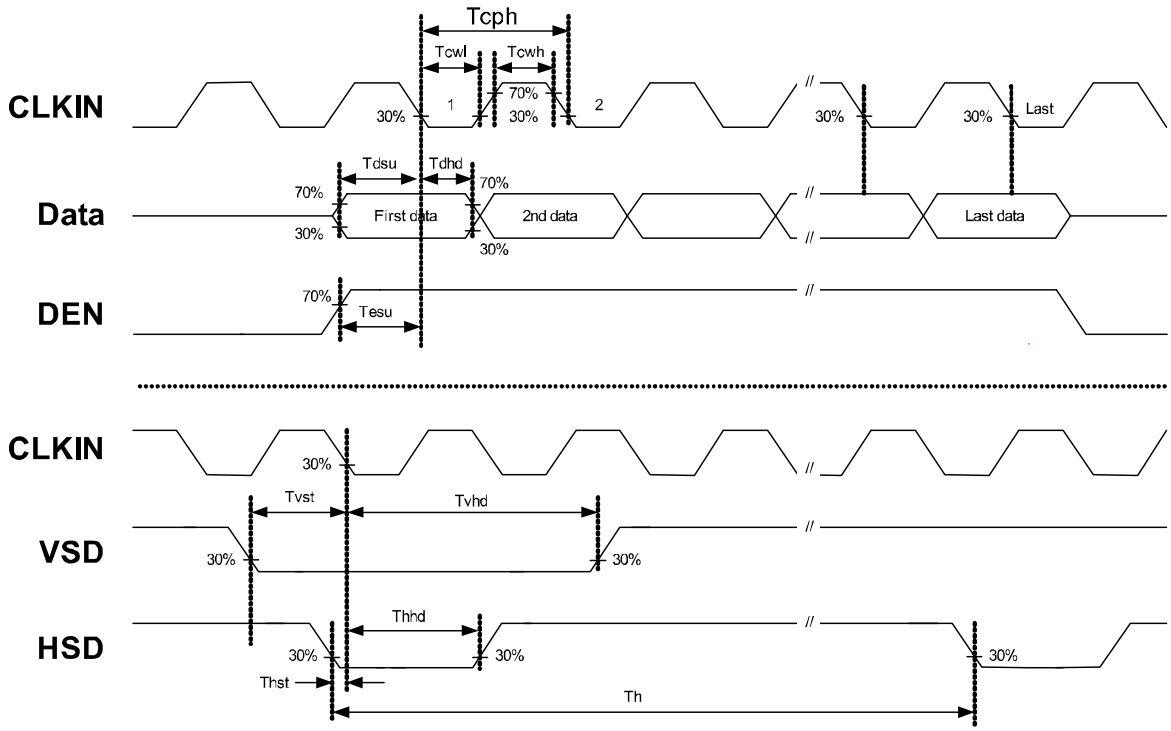
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3°C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=120mA. The LED lifetime could be decreased if operating IL is larger than 120mA. The constant current driving method is suggested.

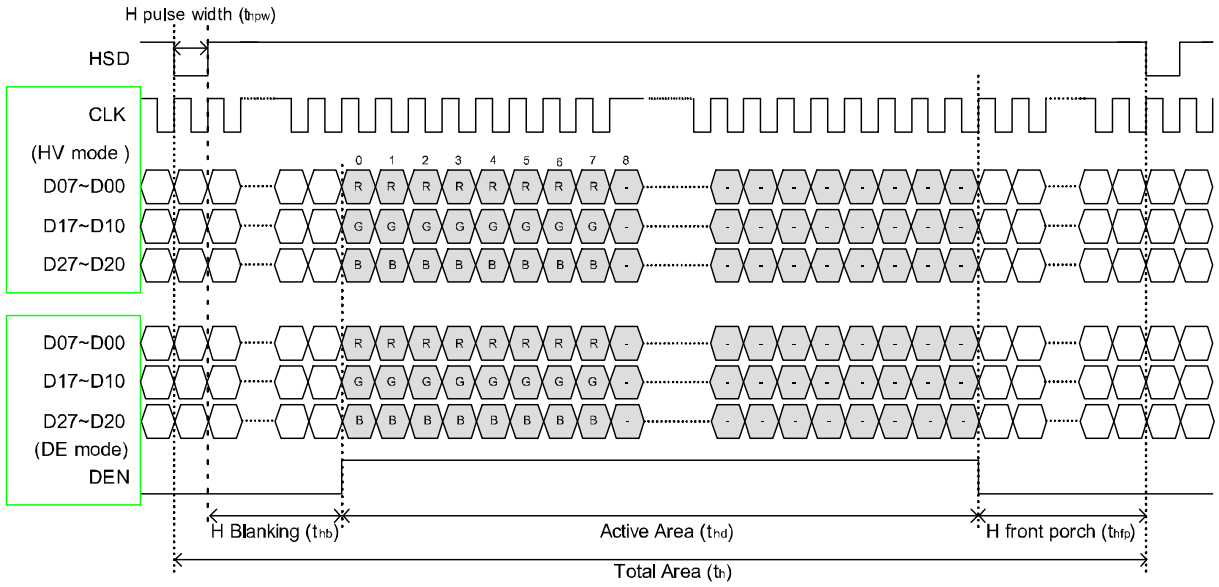
5.3 AC Characteristics

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN cycle time	Tclk	25			ns	
CLKIN frequency	fclk		33	40	MHz	
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 setup time	Tdasu	8			ns	
Data hold time	Tdahd	8			ns	
DE setup time	Tdesu	8			ns	
DE hold time	Tdehd	8			ns	
Horizontal display area	Thd	800			Tcph	
HSD period time	Th	928			Tcph	
HSD width	Thwh	1	48		Tcph	
HSD back porch	Thbp	40			Tcph	
HSD front porch	Thfp	40			Tcph	
Vertical display area	Tvd	480			th	
VSD period time	Tv	525			th	
VSD width	Tvwh	3			th	
VSD back porch	Tvbp	29			th	
VSD front porch	Tvfp	13			th	

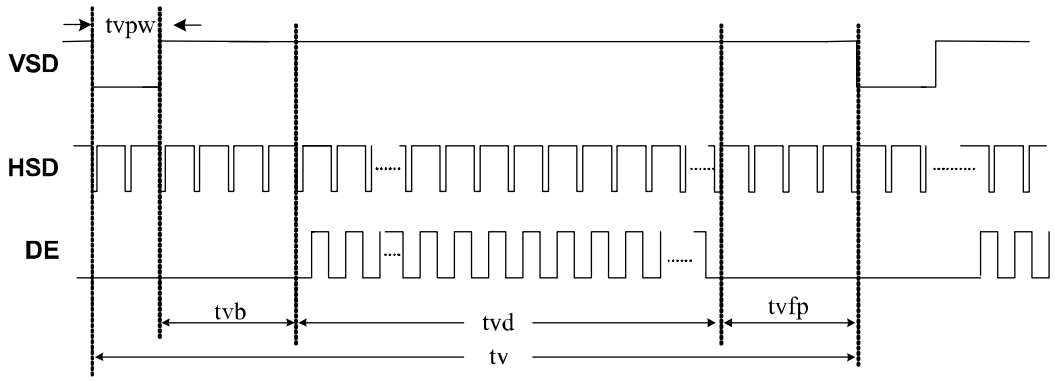
5.4 Timing Diagram of Interface Signal



Sampling clock timing



Horizontal display timing range



Vertical timing

5.5 Power Sequence

Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	msec	

Note：

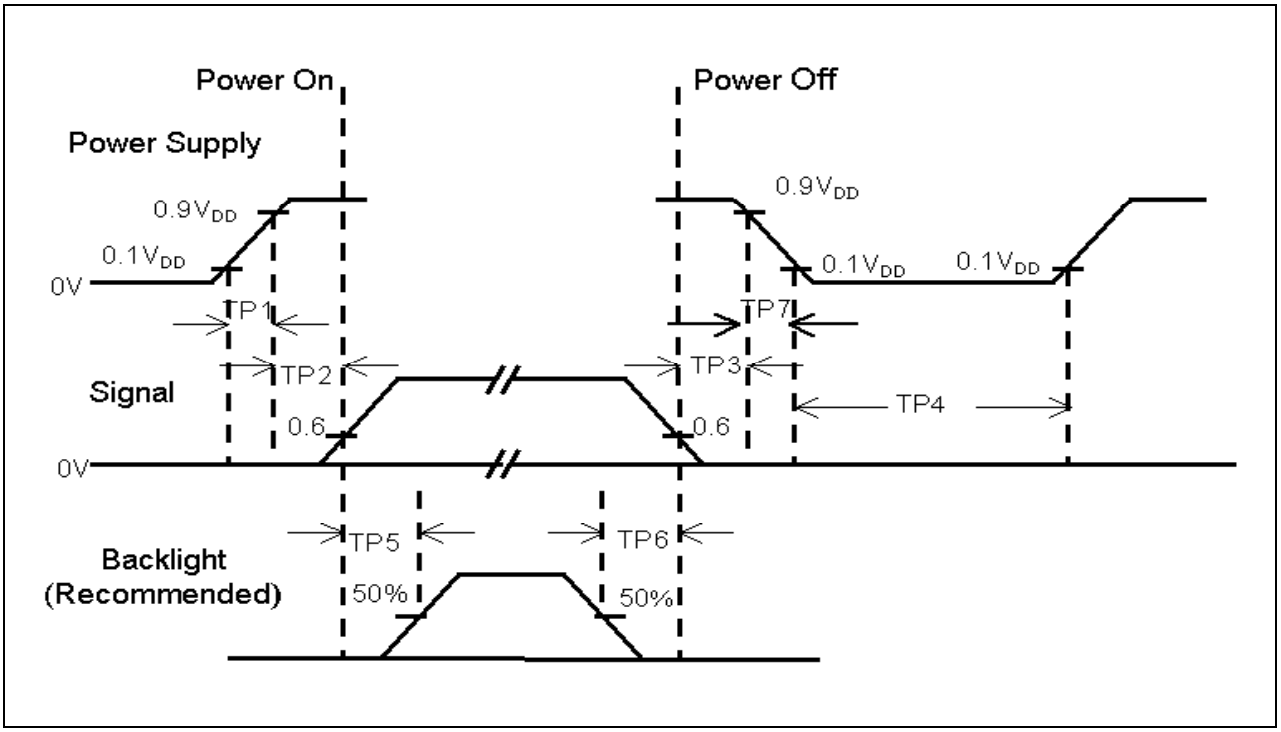
(1) The supply voltage of the external system for the module input should be the same as the definition of VDD.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.



6. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--	Note 1, Note 3, ($\theta = 0^\circ$, Normal Viewing Angle)	600	650	--	cd/㎡
Contrast Ratio		CR		480	600	--	--
Response Time		Tr		--	2	4	ms
		Tf		--	6	12	ms
Color Chromaticity	White	Wx		0.26	0.31	0.36	
		Wy		0.32	0.37	0.42	
View angle	Horizontal	ϕ L	Note2, CR≥10	--	65	75	
		ϕ R		--	65	75	
	Vertical	θ U		--	60	70	
		θ L		--	50	60	

Note：• These items are measured by BM-5A (TOPCON) or CA-1000 (MINOLTA) in the dark room. (no ambient light) Measuring point：Fig.6-1 Measuring-point：1~9 points Measuring Viewing Angle：Fig.6-2：$\theta = \phi = 0^\circ$

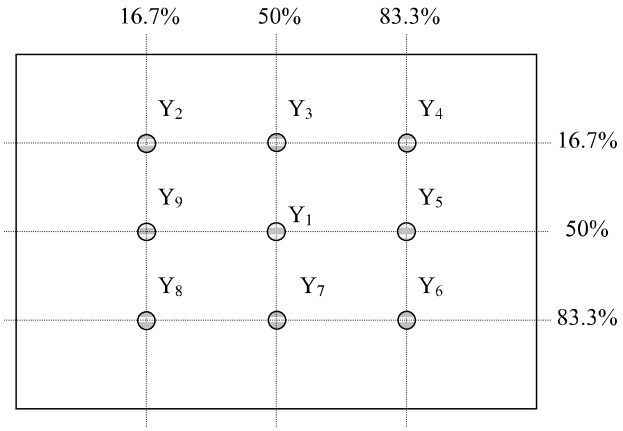


Fig.6-1 Measuring point

Note 1： Definition of contrast ratio： Measure contrast ratio on the 5 points (refer to figure 6-1, # 1~# 9 point) Contrast ratio is calculated with the following formula ：Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF

Note 2：Definition of Viewing Angle(θ , ϕ),refer to Fig.6-2 as below：

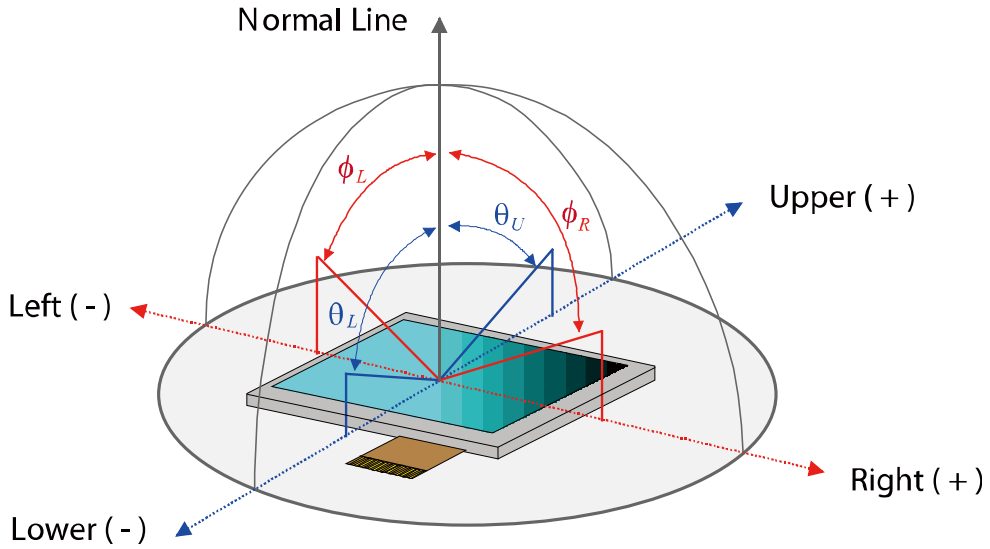


Fig.6-2 Definition Of Viewing Angle

Note 3： Definition of Response Time.

The response time is defined as the time interval between the 10% and 90% amplitudes. Refer to figure 6-3 as below

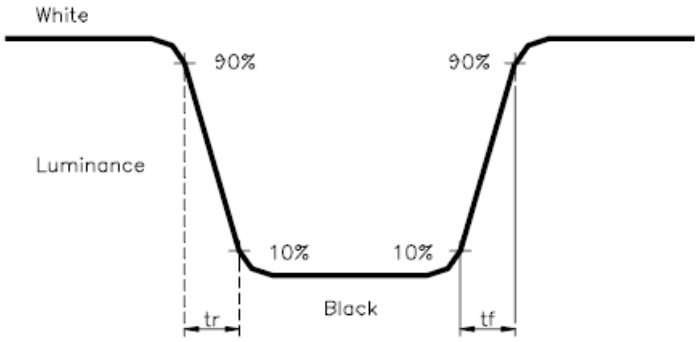
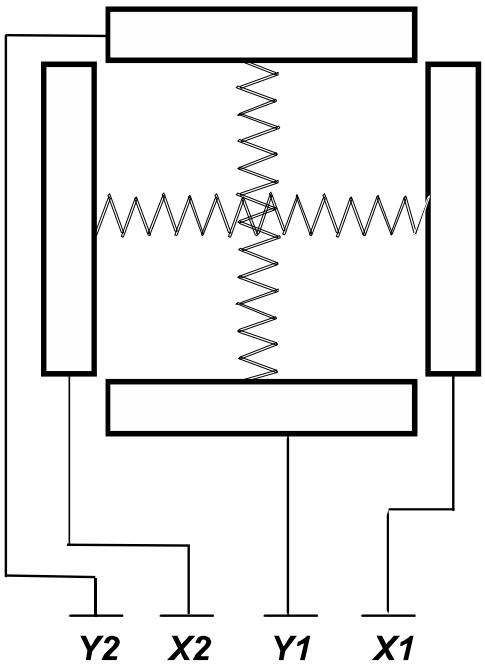


Fig.6-3 Definition of Response Time

7. Touch Screen Panel Specification

7.1 Block Diagram



Top View

X: Upper electrode

Y: Lower electrode

Pin No.	Symbol	I/O	Function
1	XR	Right	Right electrode - differential analog
2	YD	Bottom	Bottom electrode - differential analog
3	XL	Left	Left electrode - differential analog
4	YU	Top	Top electrode - differential analog

7.2 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Terminal resistance	400	-	1000	Ω	X (Film Side)
	100	-	450	Ω	Y (Glass Side)
Line Linearity	-	-	1.5	%	X Direction
	-	-	1.5	%	Y Direction
Insulation resistance	20	-	-	MΩ	DC 25V
Input voltage	-	5	10	V	
Chattering	-	-	15	ms	100KΩ pull-up
Transparency	-	75	-	%	JISK7105

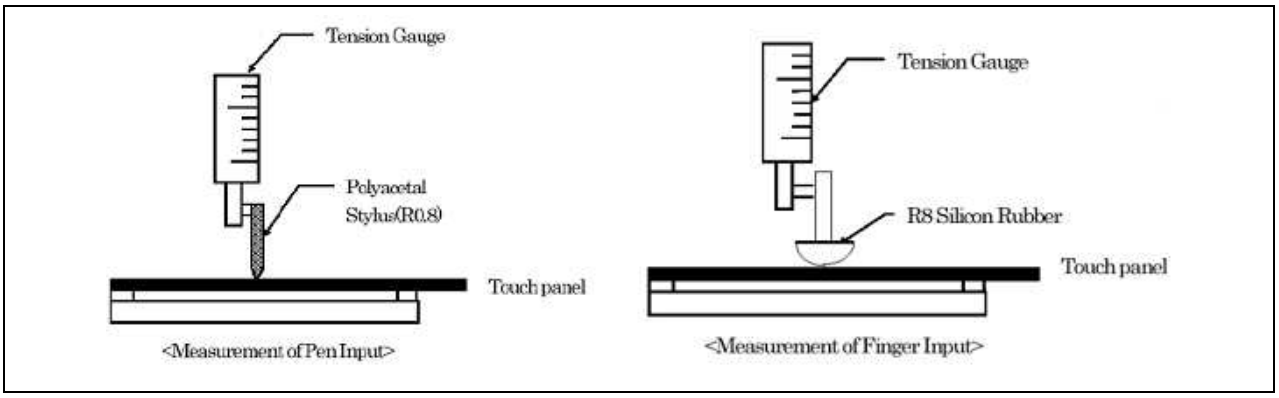
Note: Avoid operating with hard or sharp material such as a ballpoint pen or a mechanical pencil except a polyacetal pen (tip R0.8mm or less) or a finger.

7.3 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Activation force	80	-	-	gf	(1)
Durability –surface scratching	Write 100,000	-	-	Characters	(2)
Durability –surface pitting	1,000,000	-	-	touches	(3)
Surface hardness	3	-	-	H	JIS K5400

Note (1) Activation Force Test Condition

1. Input DC 5V on X direction, drop off polyacetal stylus (R0.8), until output voltage stabilized.
2. R0.8mm silicon rubber for finger activation force test.
3. Test points: 9 points.



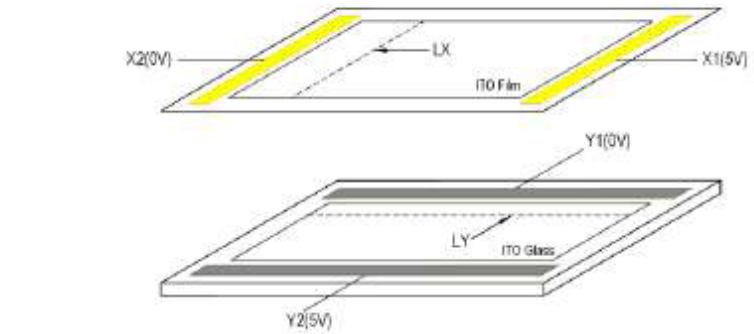
Note (2) Measurement for surface area (Scratching)

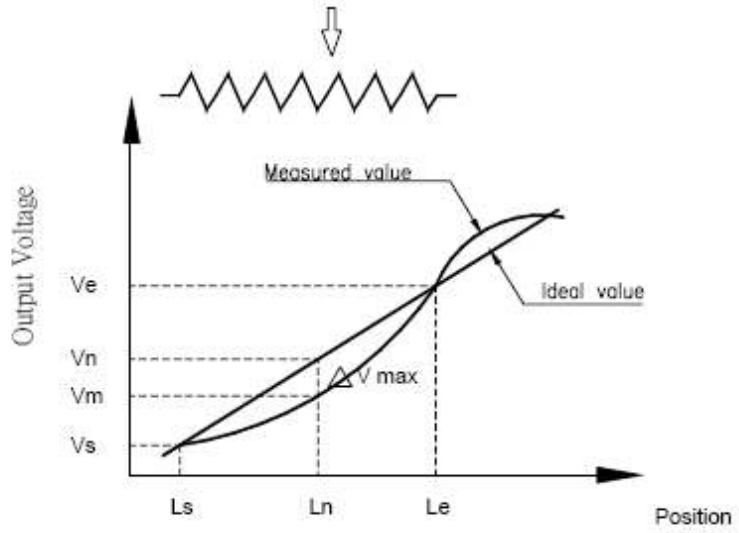
1. Scratch 100,000 times straight line on the film with a stylus change every 20,000 times.
2. Force: 250 gf.
3. Speed: 60 mm/sec.
4. Stylus: R0.8 polyacetal tip.

Note (3) Measurement for surface area (Pitting)

1. Pit 1,000,000 times on the film with a R8 silicon rubber.
2. Force: 250 gf.
3. Speed: 2 times/sec.

7.4 Linearity Definition





$$\text{Linearity} = \frac{\triangle V\ max}{(Ve\text{-}Vs)} \times 100\%$$

8. RELIABILITY

8.1 MTTF

The LCD module shall be designed to meet a minimum MTTF value of 20,000 hours with normal condition. (25°C in the room without sunlight; not include life time of backlight)

8.2 Tests

No.	Item	Condition	Criterion
1	High Temperature Operating	60°C, 240 hrs	* No Defect Of Operational Function In Room Temperature Are Allowable. * IDD of LCD in Pre-and post-test should follow specification
2	Low Temperature Operating	-10°C, 240 hrs	
3	High Temperature/Humidity Non-Operating	50, 90%RH,240 hrs	
4	High Temperature Non-Operating	70°C, 240 hrs	
5	Low Temperature Non-Operating	-20°C, 240 hrs	
6	Temperature Shock Non-Operating	-30°C ←---------→ 80°C (60min)----(5min)----(60min) 10 Cycles	
7	Electro-static Discharge	HBM: ±2kv	

Note:

1. Test after 24 hours in room temperature.
2. The sampling above is individually for each reliability testing condition.
3. The color fading of polarizing filter should not care.
4. All of the reliability testing chamber above, is using D.I. water. (Min value: 1.0 M3-cm)
5. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after software resetting, it would be judged as a good part.

8.3 Color Performance

No.	Item	Criterion (initial)
1	Luminance	>50%
2	NTSC	>70%
3	Contrast Ratio	>50%

8.4 Shock & Vibration

Test items	Conditions
Shock (non-penetration)	Shock level:980m/s(equal to 100G) · Waveform: half sinusoidal wave,6ms ·Number of shock: one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs
Vibration (non-penetration)	Frequency range:8~33.3Hz ·Stoke: 1.3mm ·Vibration: sinusoidal wave, perpendicular axis (both x ,z axis: 2Hrs, and y axis: 4Hrs) ·Sweep: 2.9G,33.3Hz ~ 400Hz ·Cycle:15min

8.5 Judgment Standard

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

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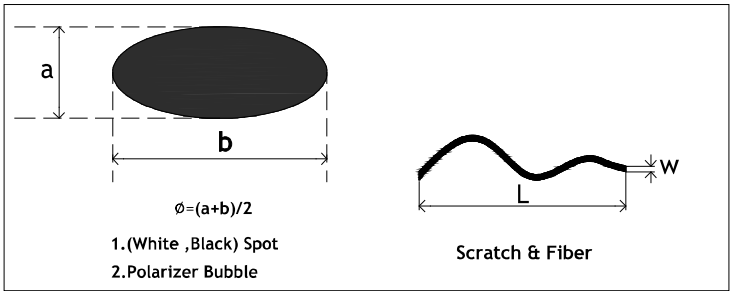
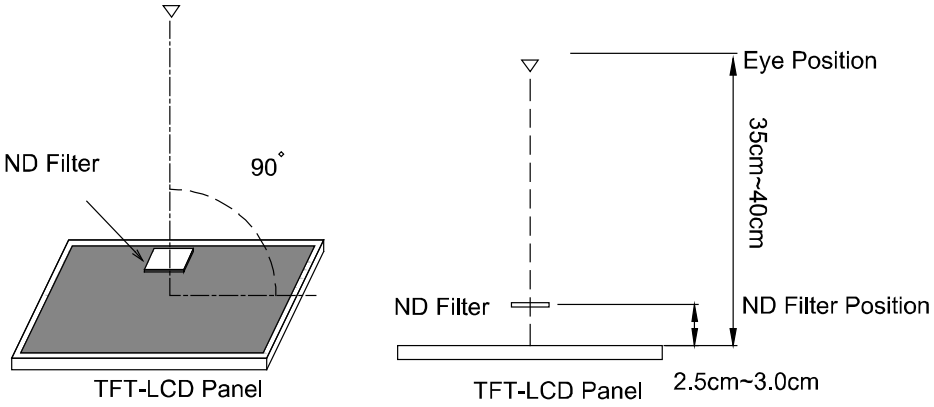
8.6 Incoming Inspection Standards

Defect type			Limit			Note
Visual defect	Scratch		W≦0.03mm		Ignore	Note1
			0.03mm＜W≦0.05mm,L≦2.5mm		N≦1	
			5.0mm＜l, 0.05mm＜W		N=0	
	Internal	Spot	φ ≦0.10mm		Ignore	Note1
			0.10mm＜ φ ≦0.15mm		N≦2	
			0.15mm＜ φ ≦0.25mm		N≦1	
			0.25mm＜ φ		N=0	
		Fiber	W≦0.05mm, l≦2.5mm		N≦4	Note1
			0.05mm＜W, 2.5mm＜l		N=0	
		Polarizer bubble	φ ＜0.25mm		Ignore	Note1
			0.25mm≦ φ ≦0.5mm		N≦2	
			0.5mm＜ φ		N=0	
		Dent	φ ＜0.25mm		Ignore	Note1
			0.25mm≦ φ ≦0.5mm		N≦3	
			0.50mm＜ φ		N=0	
Electrical defect	Bright dot		C area	O area	Total	Note2 Note3
			N≦1	N≦1	N≦2	
	Dark dot		N≦1	N≦2	N≦3	
	Total dot		N≦1	N≦2	N≦3	
	Two adjacent dot		N≦0	N≦0	N≦0	
	Zero bright dot		90%			Note4
	Three or more adjacent dot		Not allowed			
	Line defect		Not allowed			--
(1) one pixel consists of 3 sub-pixels, including r, g, and b dot. (sub-pixel = dot) (2) panel is acceptable if distance between 2 dot defects are greater or equal to 15mm.						

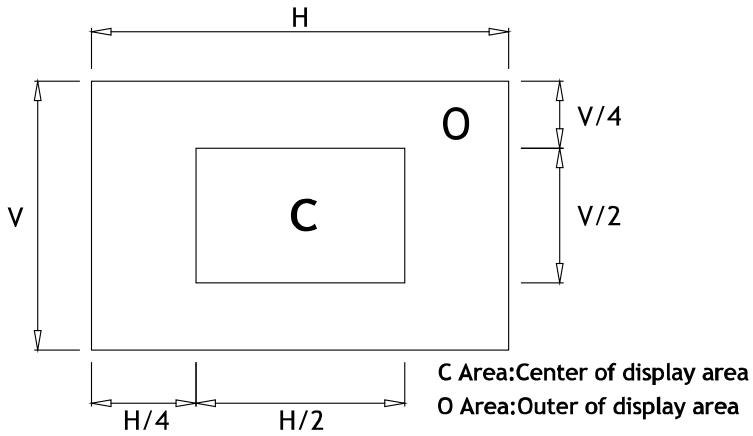
Note1： W : Width [mm], L : Length [mm], N : Number, φ : Average Diameter



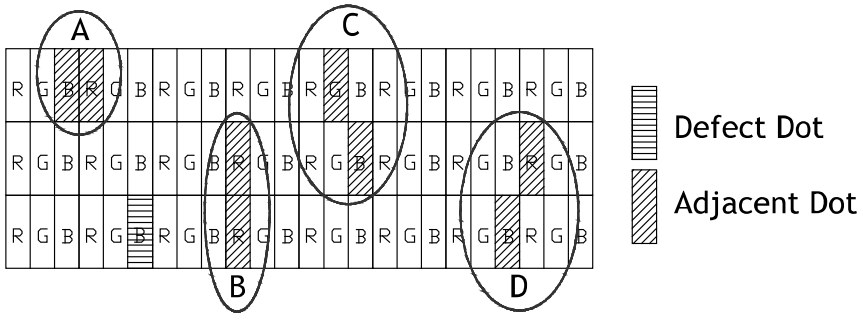
Note2： Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.



Note3：



Note4：Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



Note5：Other condition

(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

9. PRECAUTION RELATING PRODUCT HANDLING

9.1 Safety

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

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

9.2 Handling

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

9.2.2 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.

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

9.2.4 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.)

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

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

9.2.7 Do not use ketone solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

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

9.2.9 To avoid liquid (include organic solvent) stained on LCM.

9.3 Storage

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

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

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