

MODEL NO : LCDT397 IPS-2501-mipi

MODEL VERSION: 01

SPEC VERSION : 2.9

ISSUED DATE: 2015-12-08

- ☐ Preliminary Specification
☒ Final Product Specification

Customer : _____

App oved by	Notes

LCD Confirmed :

Prepared by	Checked by	Approved by
Tiantian.Zhao	Xiaoxing.Ding	Feng.Qin

This technical specification is subjected to change without notice

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Record of Revision

[illegible]

1 General Specifications

Feature		Spec
Display Spec.	Size	3.97"
	Resolution	480(RGB)x800
	Technology Type	a-si TFT
	Pixel Configuration	RGB Vertical Stripe
	Pixel pitch(mm)	0.180 x 0.180
	Display Mode	BOE,NW
	Surface Treatment	Clear Type
	Viewing Direction	ALL o'clock
	Gray Scale Inversion Direction	ALL o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	57.14x96.85x2.3
	Active Area(mm)	51.84x86.40
	With /Without TSP	With RTP
	Matching Connection Type	25pin-0.3mm
	LED Numbers	8
	Weight (g)	18
Electrical Characteristics	Interface	mipi
	Color Depth	262K
	Driver IC	OTM8019A

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: $\pm 5\%$

2 Input/Output Terminals

Matched connector: 25pin-0.3mm

Pin No.	Symbol	I/O	Function	Remark
1	GND	P	Power Ground	
2	DON	IO	Mipi Data Input Lane0 negative-end	
3	DOP	IO	Mipi Data Input Lane0 positive-end	
4	GND	P	Power Ground	
5	CKN	IO	Mipi Clock Input negative-end	
6	CKP	IO	Mipi Clock Input positive-end	
7	GND	P	Power Ground	
8	D1N	IO	Mipi Data Input Lane1 negative-end	
9	D1P	IO	Mipi Data Input Lane1 positive-end	
10	GND	P	Power Ground	
11	NC	P		
12	NC	P		
13	NC	P		
14	NC	P		
15	GND	P	Power Ground	
16	TE	IO	tearing effect	
17	RESET	IO	Lcd reset	
18	VDDIO	IO	IO voltage 3.3v	
19	VDD	IO	LCD voltage 3.3v	
20	GND	P	Power Ground	
21	LEDK1	P	Lcd back light GND	
22	LEDK2	P	Lcd back light GND	
23	LEDA1	P	Lcd back light source 3.3v	
24	LEDA2	P	Lcd back light source 3.3v	
25	GND	P	Power Ground	

Note1, Please add the FPC connector type and matched one if necessary .

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	4.6	V	Note1
Input voltage	V _{IN}	-0.3	4.6	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	
Relative Humidity Note2	RH	--	"95	%	Ta"40°C
		--	"85	%	40°C<Ta"50°C
		--	"55	%	50°C<Ta"60°C
		--	"36	%	60°C<Ta"70°C
		--	"24	%	70°C<Ta"80°C
Absolute Humidity	AH	--	"70	g/m*	Ta>70°C

Table 3 Absolute Maximum Ratings

Note1: Input voltage include R0~R5, G0~G5, B0~B5, Dotclk, Hsync, Vsync, Enable, R/L, U/D.

Note2: Ta means the ambient temperature.

It is necessary to limit the relative humidity to the specified temperature range.

Condensation on the module is not allowed.

4 Electrical Characteristics

4.1 LCD Module

Parameter	Symbol	Conditions	Specification			Unit	Notes
			MIN	TYP	MAX		
Power & Operation Voltage							
Analog Operating voltage	VDD	Operating Voltage	2.3	2.8/3.7	6	V	
Logic Operating voltage	VDDI	I/O supply voltage	1.75	1.8	3.6	V	
Digital Operating voltage	VCC	Digital supply voltage	2.3	2.8/3.7	6	V	
Hissi interface Operating voltage	VDDAM	MIPI supply voltage	2.3	2.8/3.7	6	V	
Input / Output							
Logic High level input voltage	VIH		0.7VDDI	-	VDDI	V	
Logic Low level input voltage	VIL	-	VSS	-	0.3VDDI	V	
Logic High level output voltage	VOH	IOH = -1.0mA	0.8VDDI	-	VDDI	V	
Logic Low level output voltage	VOL	IOL = +1.0mA	VSS	-	0.2VDDI	V	
Logic High level input current	IIH	Vin = VDDI or VDDAM			1	μA	
Logic Low level input current	IIL	Vin = VDDI or VDDAM	-1			μA	
VCOM Operation							
VCOMDC output voltage	VCOM		-3.475	-1.0	0	V	

Table 4.1 LCD module electrical characteristics

4.2 Backlight Unit

Ta=25?

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I _F	-	15	-	mA	One LED
Forward Voltage	V _F	(2.9)	3.2	(3.4)	V	One LED
Backlight Power Consumption	W _{BL}	-	192	-	mW	6 LEDs
Lifetime	T	-	20000	-	Hr	One LED

Table 4.2.1 backlight unit electrical characteristics

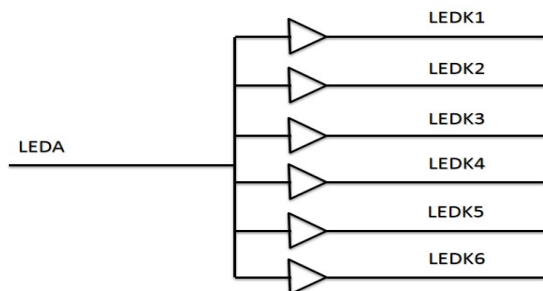
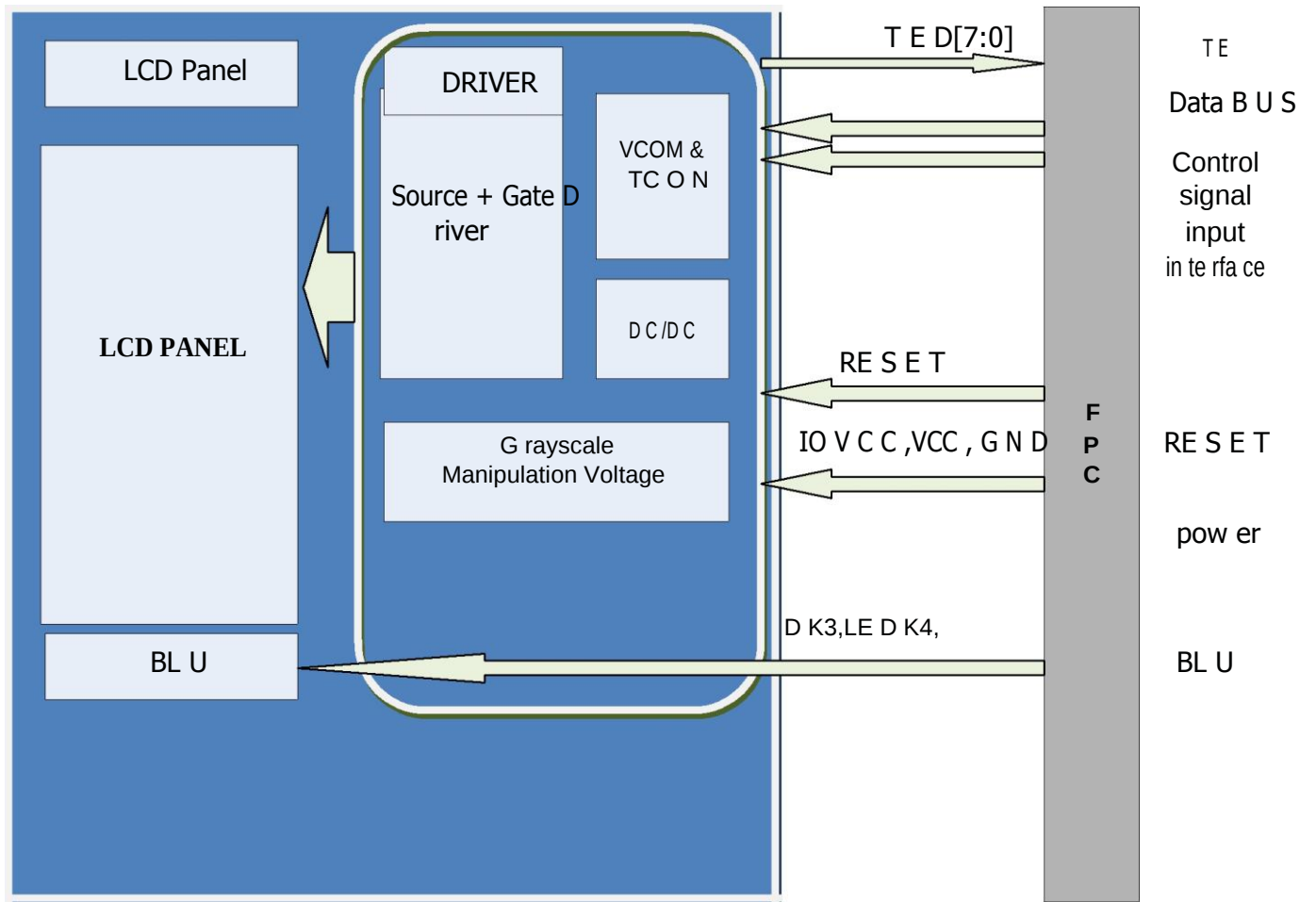


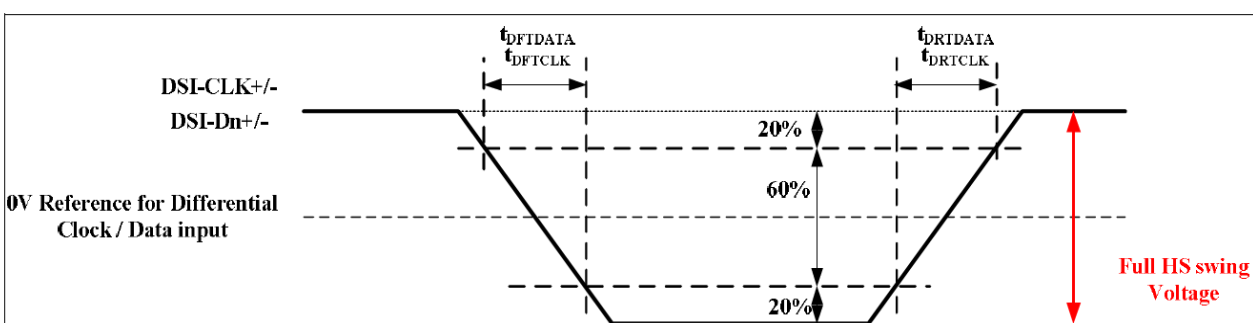
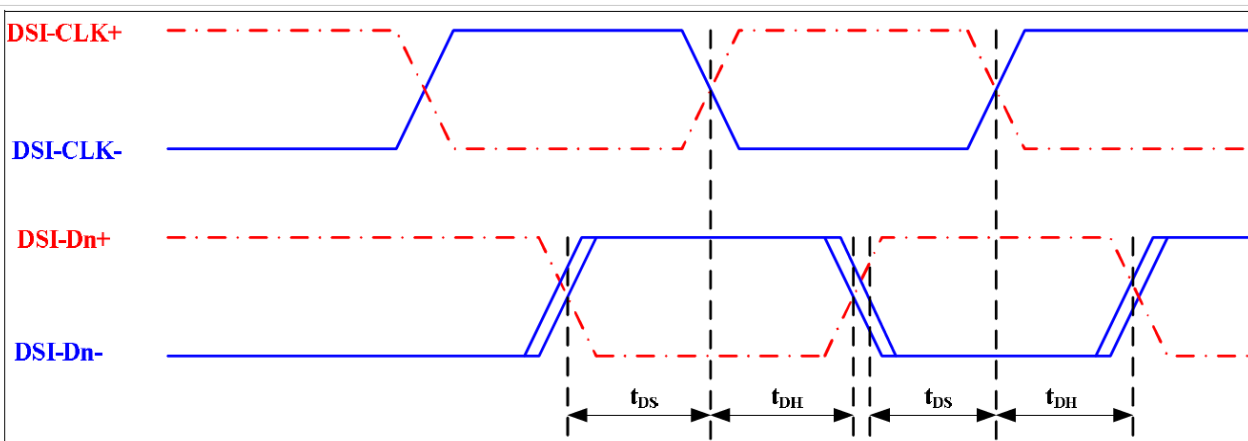
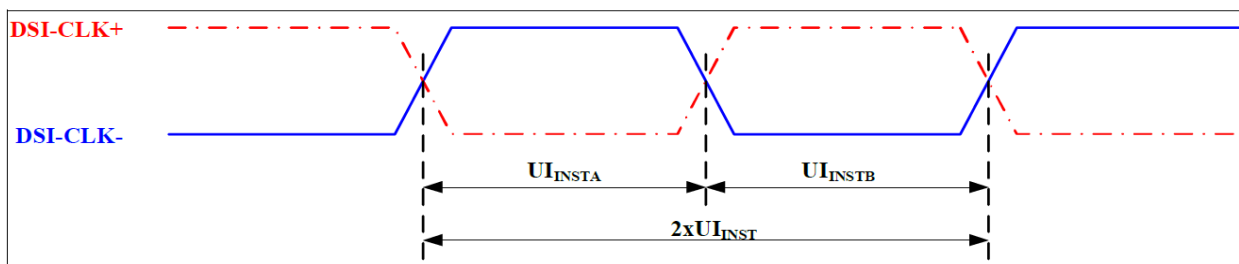
Figure 4.2.1 LED backlight circuit

4.3 Block Diagram



5 HIGH SPEED MODE

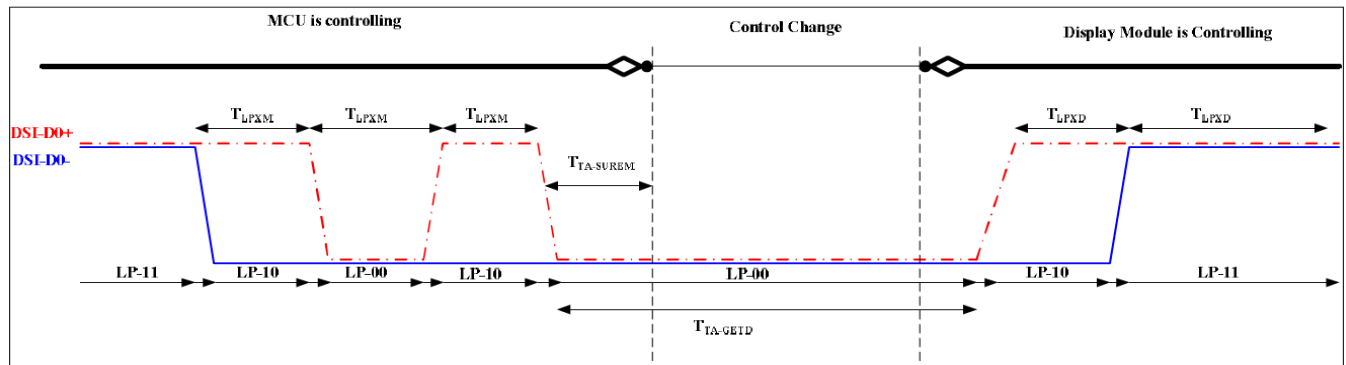
Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed mode						
DSI-CLK+/-	2xUI _{INST}	Double UI instantaneous	4	-	25	ns
DSI-CLK+/-	UI _{INSTA} , UI _{INSTB}	UI instantaneous Halfs	2	-	12.5	ns
DSI-Dn+/-	t _{DS}	Data to clock setup time	0.15	-	-	UI
DSI-Dn+/-	t _{DH}	Data to clock hold time	0.15	-	-	UI
DSI-CLK+/-	t _{DRTCLK}	Differential rise time for clock	150	-	0.3UI	ps
DSI-Dn+/-	t _{DRTDATA}	Differential rise time for data	150	-	0.3UI	ps
DSI-CLK+/-	t _{DFTCLK}	Differential fall time for clock	150	-	0.3UI	ps
DSI-Dn+/-	t _{DFTDATA}	Differential fall time for data	150	-	0.3UI	ps



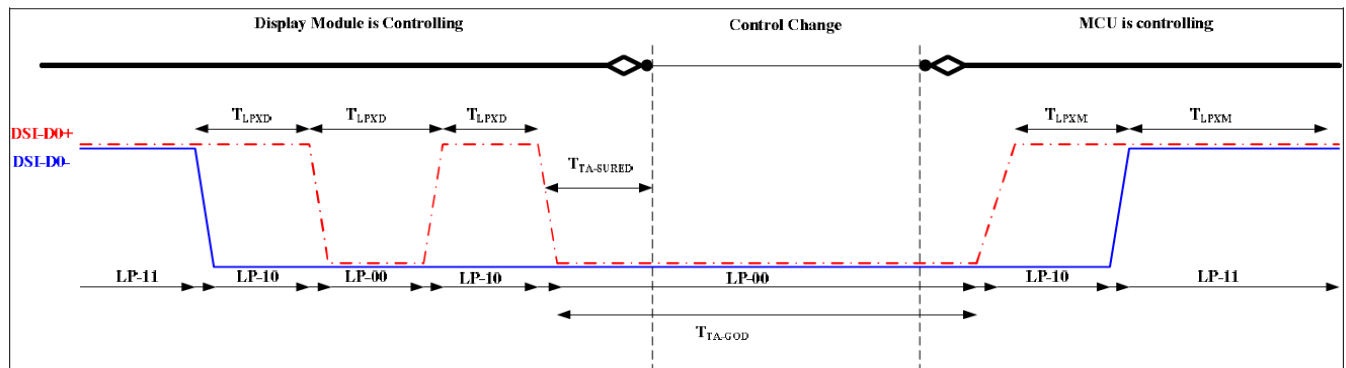
AC characteristics for MIPI-DSI High speed mode

5.1 LOW SPEED MODE

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Low Power mode						
DSI-D0+/-	T _{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU → Display Module	50	-	-	ns
DSI-D0+/-	T _{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module → MPU	58	-	-	ns
DSI-D0+/-	T _{TA-SURED}	Time-out before the MPU start driving	T _{LPXD}	-	2XT _{LPXD}	ns
DSI-D0+/-	T _{TA-GETD}	Time to drive LP-00 by display module	5XT _{LPXD}	-	-	ns
DSI-D0+/-	T _{TA-GOD}	Time to drive LP-00 after turnaround request - MPU	4XT _{LPXD}	-	-	ns
DSI-D0+/-	Ratio T _{LPX}	Ratio of T _{LPXM} / T _{LPXD} between MCU and display module	2/3	-	3/2	



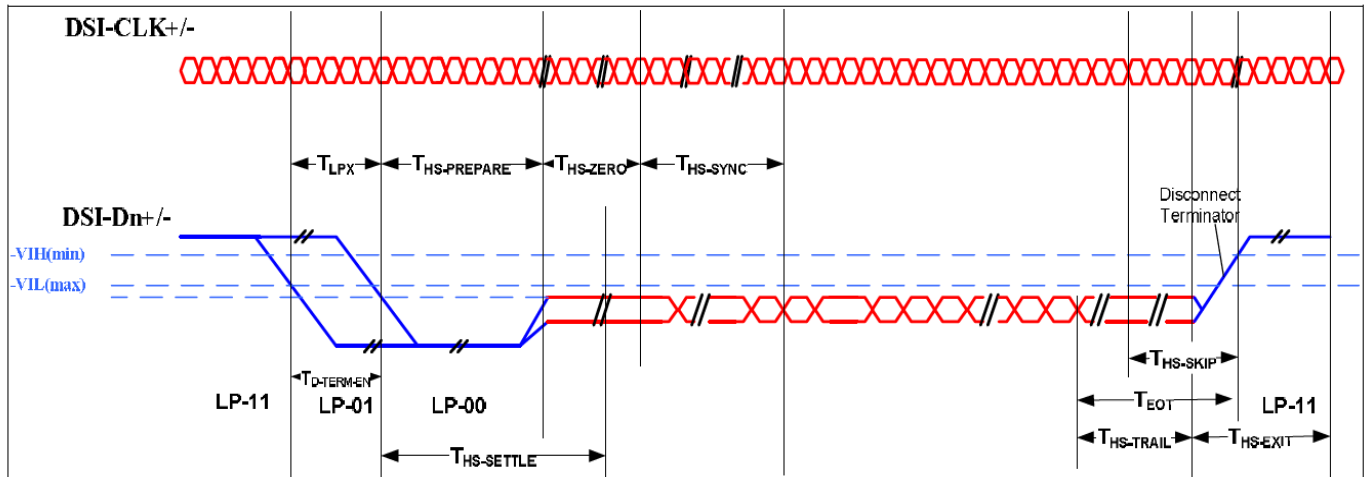
BTA from the MCU to the Display Module



BTA from the Display Module to the MCU

5.2 BURSTS

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Data Transmission Bursts						
DSI-Dn+/-	T _{LPX}	Length of any low-power state period	50	-	-	ns
DSI-Dn+/-	T _{HS-PREPARE}	Time to drive LP-00 to prepare for HS transmission	40ns + 4UI	-	85ns + 6UI	ns
DSI-Dn+/-	T _{HS-PREPARE} + T _{HS-ZERO}	T _{HS-PREPARE} + time to drive HS-0 before the sync sequence	145ns + 10UI	-	-	ns
DSI-Dn+/-	T _{D-TERM-EN}	Time to enable Data Lane receiver line termination measured from when Dn crosses V _{IL(max)}	Time for Dn to reach V _{TERM-EN}	-	35ns + 4UI	ns
DSI-Dn+/-	T _{HS-SKIP}	Time-out at RX to ignore transition period of EoT	40	-	55ns + 4UI	ns
DSI-Dn+/-	T _{HS-TRAIL}	Time to drive flipped differential state after last payload data bit of a HS transmission burst	max (8UI, 60ns+4UI)	-	-	ns
DSI-Dn+/-	T _{HS-EXIT}	Time to drive LP-11 after HS burst	100	-	-	ns
DSI-Dn+/-	T _{EoT}	Time from start of T _{HS-TRAIL} period to start of LP-11 state	-	-	105ns + 12UI	ns



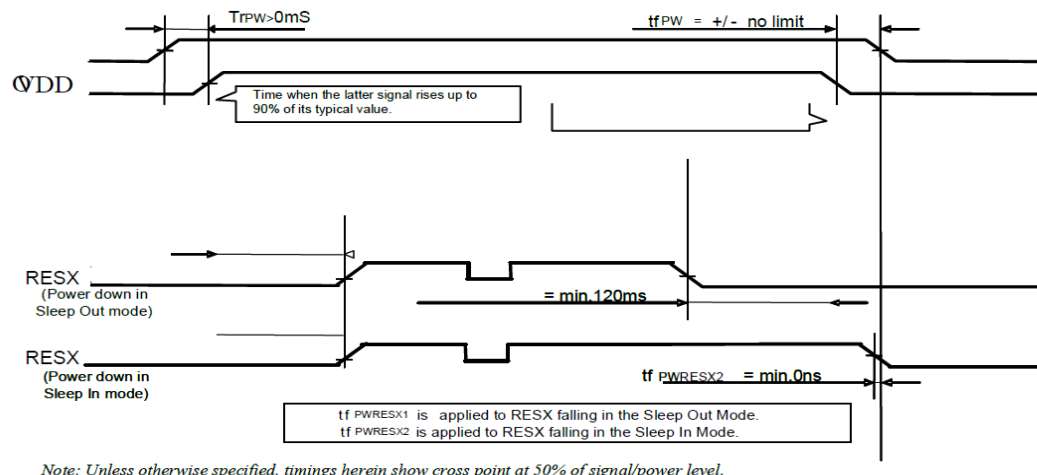
High Speed Data Transmission Bursts

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Switching the clock Lane between clock Transmission and Low Power Mode						
DSI-CLK+/-	T _{CLK-POST}	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	60ns + 52UI	-	-	ns
DSI-CLK+/-	T _{CLK-PRE}	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	8	-	-	UI
DSI-CLK+/-	T _{CLK-PREPARE}	Time to drive LP-00 to prepare for HS clock transmission	38	-	95	ns
DSI-CLK+/-	T _{CLK-TERM-EN}	Time to enable Clock Lane receiver line termination measured from when Dn crosses V _{IL(max)}	Time for Dn to reach V _{TERM-EN}	-	38	ns
DSI-CLK+/-	T _{CLK-PREPARE} + T _{CLK-ZERO}	T _{CLK-PREPARE} + time for lead HS-0 drive period before starting Clock	300	-	-	ns
DSI-CLK+/-	T _{CLK-TRAIL}	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	-	ns
DSI-CLK+/-	T _{EoT}	Time from start of T _{CLK-TRAIL} period to start of LP-11 state	-	-	105ns + 12UI	ns

5.3 CASE 1 : RESX LINE ISHELD LOW OR UNSTABLE BY HOST AT POWER ON

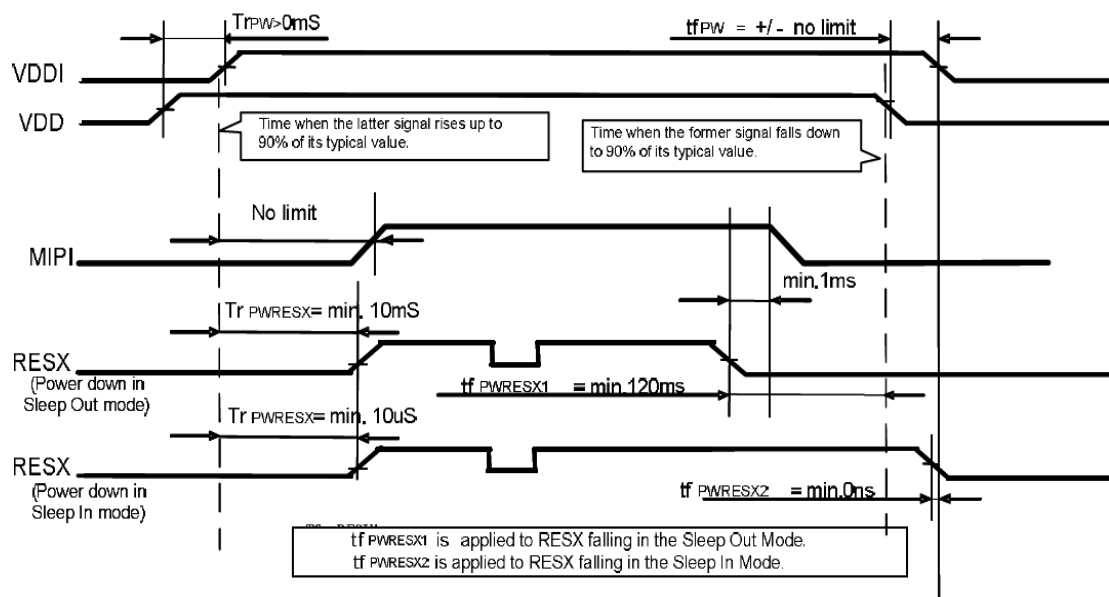
If RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for minimum 10msec after both VDD and VDDIO have been applied.

➤ Case 1 : VCC=VDDIO



Note: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

➤ Case 2 : VCC=VDD



Note: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

Figure 5.3 RESET Timing

The diagram illustrates the timing sequence for the display module, divided into two main sections: normal operation and sleep mode.

Normal Operation Section:

- VDDI:** Shows a transition from low to high with a note $TrpW = +/- \text{ no limit}$.
- VDD:** Shows a transition from low to high.
- D0P/N, D1P/N, CLKP/N:** These signals are active during the initial setup phase, including LP11, LP mode, LP/HS mode, and HS mode.
- Command:** Includes initial setting, sleep out, backlight on, display on, and write pattern commands.
- Reset:** A pulse is shown during the initial setup phase.
- Display:** Transitions from Display OFF (pink) to Display ON (green) after the display on command.

Sleep Mode Section:

- VDDI:** Shows a transition from high to low with a note $TrpW = +/- \text{ no limit}$.
- VDD:** Shows a transition from high to low.
- D0P/N, D1P/N, CLKP/N:** These signals are active during the sleep mode, including HS mode, LP11, LP/HS mode, and HS mode.
- Command:** Includes write pattern, sleep in, backlight off, and display off commands.
- Reset:** A pulse is shown during the sleep mode.
- Display:** Transitions from Display ON (green) to Display OFF (pink) after the display off command.

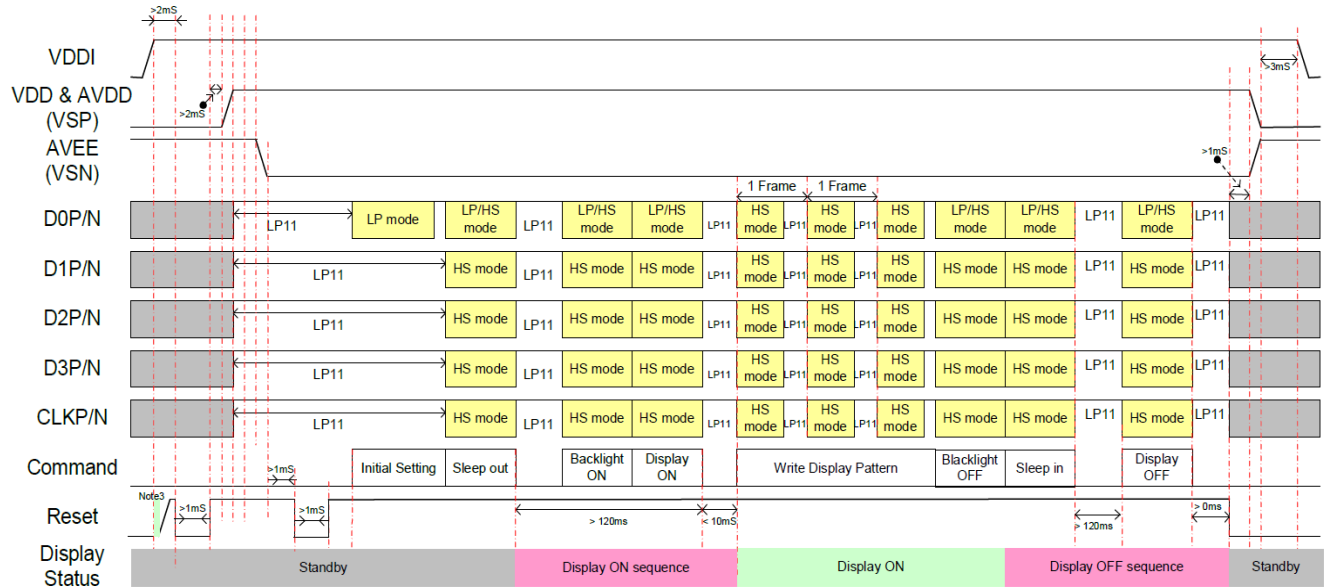
Key timing constraints and labels include:

- $TrpW = +/- \text{ no limit}$
- 1 Frame
- LP11
- LP mode
- LP/HS mode
- HS mode
- Initial setting
- Sleep out
- Backlight ON
- Display ON
- Write pattern
- Display OFF
- Display ON
- Sleep IN
- Backlight OFF
- Display OFF
- Display ON
- Display OFF

Note : We are propose using non-continue CLK with Burst mode

5.5: POWER ON/OFF Sequence for MIPI interface with three power mode

Power ON/OFF Sequence with 3 Power mode (External VDDI, VSP, VSN)



Note :

1. Propose using non-continuous CLK with Burst mode
2. For VDDI, VSP, VSN power, propose applying them separately and having 10 ms timing gap

6. Optical Characteristics

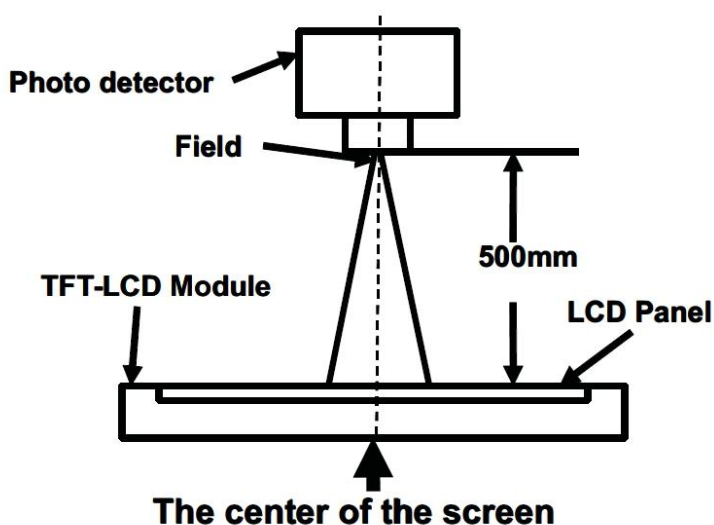
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		OT	CRŠ10	60	70	60	Degree	Note2,3
		OB		50	60	50		
		OL		60	70	60		
		OR		60	70	60		
Contrast Ratio		CR	0=0 ⁰	400	500	400		Note 3
Response Time		T _{ON}	25℃		20	30	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.236	0.286	0.336		Note 1,5
		y		0.261	0.311	0.361		
	Red	x		0.530	0.580	0.630		Note 1,5
		y		0.270	0.320	0.370		
	Green	x		0.288	0.338	0.388		Note 1,5
		y		0.531	0.581	0.631		
	Blue	x		0.101	0.151	0.201		Note 1,5
		y		0.048	0.098	0.148		
Uniformity		U		-	80%		%	Note 6
NTSC				-	50%		%	Note 5
Luminance		L		180	300		cd/m ²	Note 7

Test Conditions:

1. I_F= 60mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

Note 3: Definition of contrast ratio

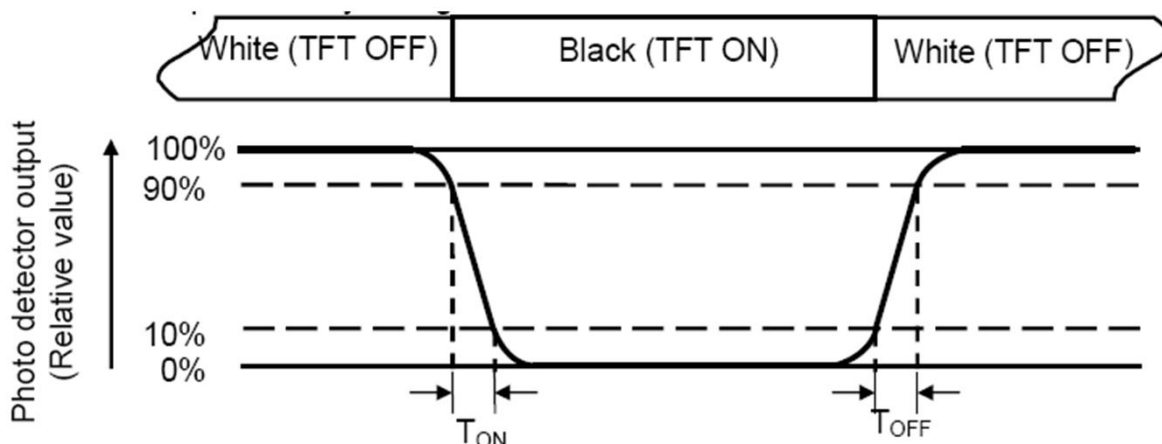
“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

V_{white}: To be determined V_{black}: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

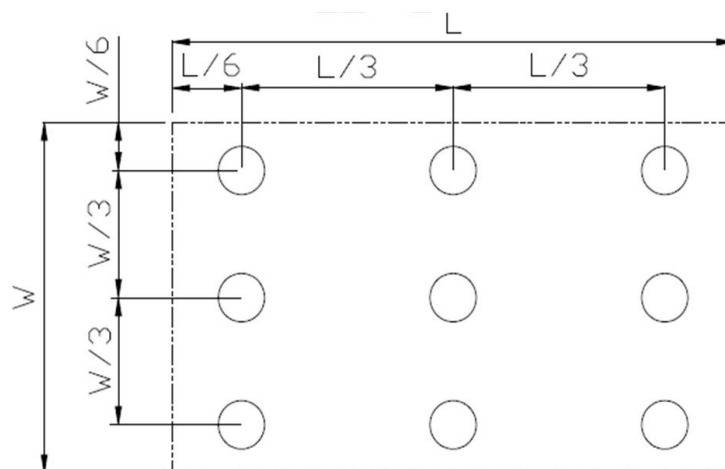
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = L_{min} / L_{max}

Active area length W ----- Active area width



L_{max}: The measured Maximum luminance of all measurement position.

L_{min}: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental I Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70℃ 240hrs	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta=+60℃, 90% RH 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	C=150pF, R=330K>5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; (Environment: 15℃~35℃, 30%~60%, 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)(Package condition)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

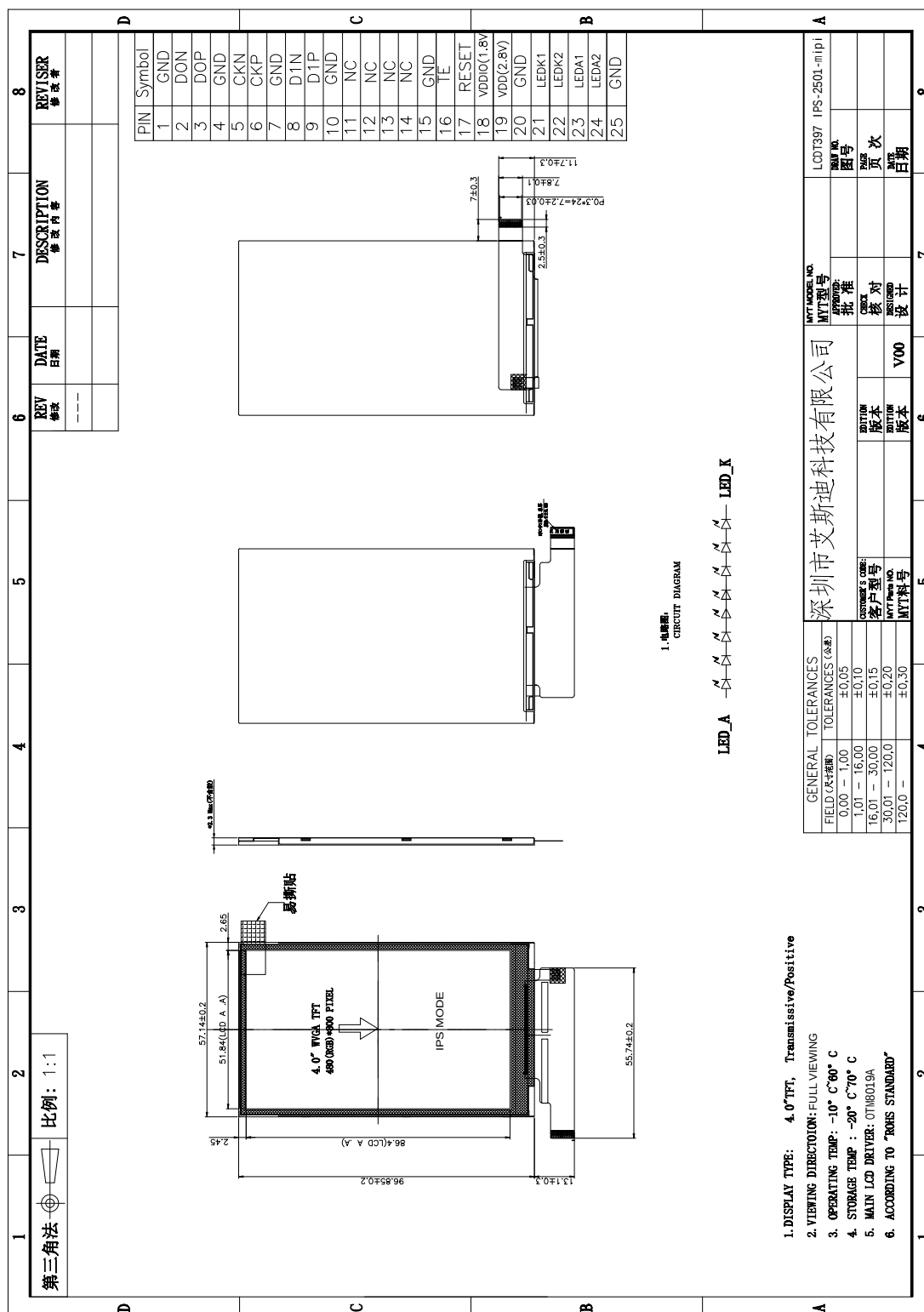
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8 Mechanical Drawing



9 Precautions for Use of LCD Modules

8.1 Handling Precautions

8.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

8.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

8.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

8.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

8.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol

— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

— Water

— Ketone

— Aromatic solvents

8.1.6 Do not attempt to disassemble the LCD Module.

8.1.7 If the logic circuit power is off, do not apply the input signals.

8.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

8.1.8.1 Be sure to ground the body when handling the LCD Modules.

8.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

8.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

8.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

8.2 Storage precautions

8.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

8.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0? ~ 40? Relatively humidity: “80%

8.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

8.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.