



MODEL NO. : TM017FDH48-00

ISSUED DATE: 2011-08-25

VERSION : Ver 2.0

- ☐ Preliminary Specification
☒ Final Product Specification

Customer : _____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2011-06-17	Preliminary Specification Release	Oliver Yang
2.0	2011-8-25	Final Product Specification	Oliver Yang



1 General Specifications

Feature		Spec
Display Spec.	Size	1.77 inch
	Resolution	128(RGB) x 160
	Interface	CPU 8bits
	Color Depth	65/262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.219x0.219
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Clear Type
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	34 x 47.2x 2.4
	Active Area(mm)	28.03 x 35.04
	With/Without TSP	Without TSP
	Weight (g)	5.45g
	LED Numbers	2 LED
Electronic	Driver IC	ST7735R

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 : +/- 5%



2 Input/Output Terminals

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Comment
1	ID	P	Connect IOVCC	
2	NCS	I	Chip select	
3	NRES	I	Reset Pin	
4	RS	I	-Display data/command selection pin in MCU interface. - RS ='1': display data or parameter. - RS ='0': command data.	
5	NWR	I	Write signal	
6	NRD	-	Read signal	
7	D0	I/O	Data Bus	
8	D1	I/O	Data Bus	
9	D2	I/O	Data Bus	
10	D3	I/O	Data Bus	
11	D4	I/O	Data Bus	
12	D5	I/O	Data Bus	
13	D6	I/O	Data Bus	
14	D7	I/O	Data Bus	
15	GND	P	Power Ground	
16	GND	P	Power Ground	
17	IOVCC	P	Power supply(1.8V)	
18	VCC	P	Power supply(2.8V)	
19	LED+	P	Back light anode	
20	LED1-	P	Back light cathode	
21	LED2-	P	Back light cathode	

Note1: I/O definition: I-----Input O---Output P----Power/Ground



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25°C

Item	Symbol	MIN	MAX	Unit	Remark
Logic Supply Voltage	IOVCC	-0.3	4.6	V	
Analog Supply Voltage	VCC	-0.3	4.6	V	
Input voltage	DB7~DB0,CS,RS,WR,RD RESETB	-0.3	IOVCC+0.3	V	
Back Light Forward Current	I _{LED}	-	25	mA	For each LED
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	



4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	1.8/2.8	3.3	V	
Analog Supply Voltage		VCI	2.3	2.8	3.3	V	
Input Signal Voltage	Low Level	V _{IL}	-0.3	--	0.2*IOVCC	V	Input Signal Voltage
	High Level	V _{IH}	0.8*IOVCC	--	IOVCC	V	
Output Signal Voltage	Low Level	V _{OL}	--	--	0.2*IOVCC	V	Output Signal Voltage
	High Level	V _{OH}	0.8*IOVCC	--	IOVCC	V	
(Panel+ LSI) Power Consumption		Sleeping Mode	--	0.065	--	mW	

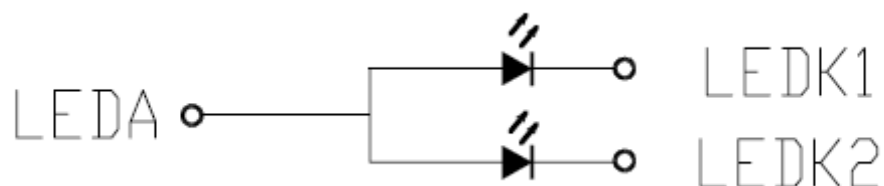


4.2 Driving Backlight

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	15	--	mA	1 LED
Forward Current Voltage	V_F	--	3.2	--	V	
Backlight Power Consumption	W_{BL}	--	96	--	mW	2 LEDS

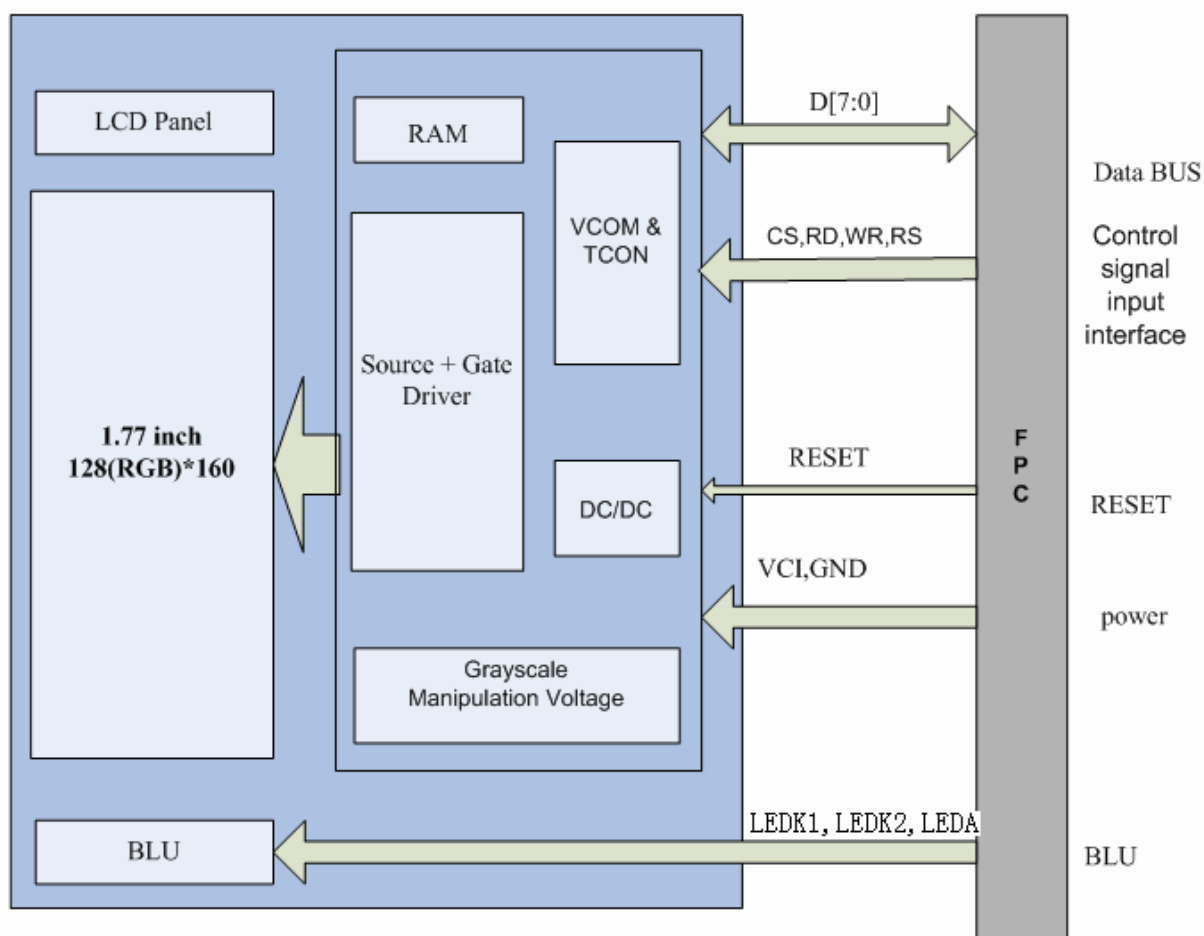
Note 1: The figure below shows the connection of backlight LED.



Note 2: One LED : $I_F = 15 \text{ mA}$, $V_F = 3.2 \text{ V}$



4.3 Block Diagram





5 Timing Chart

5.1 Timing Chart

5.1.1 Timing Parameter

Signal	Symbol	Parameter	Min	Max	Unit	Description
RS	TAST	Address setup time	0		ns	-
	TAHT	Address hold time (Write/Read)	10		ns	
CS	TCHW	Chip select "H" pulse width	0		ns	-
	TCS	Chip select setup time (Write)	15		ns	
	TRCS	Chip select setup time (Read ID)	45		ns	
	TRCSFM	Chip select setup time (Read FM)	355		ns	
	TCSF	Chip select wait time (Write/Read)	10		ns	
	TCSH	Chip select hold time	10		ns	
WR	TWC	Write cycle	66		ns	
	TWRH	Control pulse "H" duration	15		ns	
	TWRL	Control pulse "L" duration	15		ns	
RD (ID)	TRC	Read cycle (ID)	160		ns	When read ID data
	TRDH	Control pulse "H" duration (ID)	90		ns	
	TRDL	Control pulse "L" duration (ID)	45		ns	
RD (FM)	TRCFM	Read cycle (FM)	450		ns	When read from frame memory
	TRDHFM	Control pulse "H" duration (FM)	90		ns	
	TRDLFM	Control pulse "L" duration (FM)	355		ns	
DB[7:0]	TDST	Data setup time	10		ns	For CL=30pF
	TDHT	Data hold time	10		ns	
	TRAT	Read access time (ID)		40	ns	
	TRATFM	Read access time (FM)		340	ns	
	TODH	Output disable time	20	80	ns	

Table 5.1 timing parameter

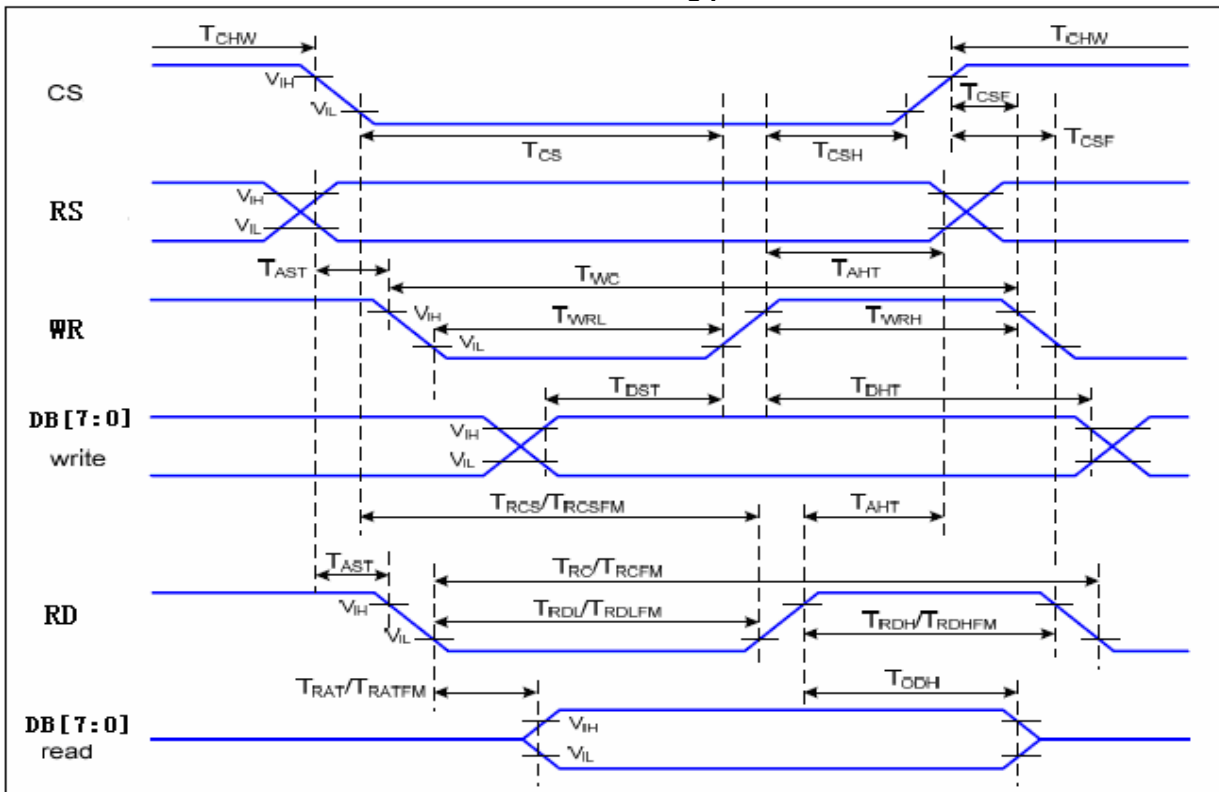
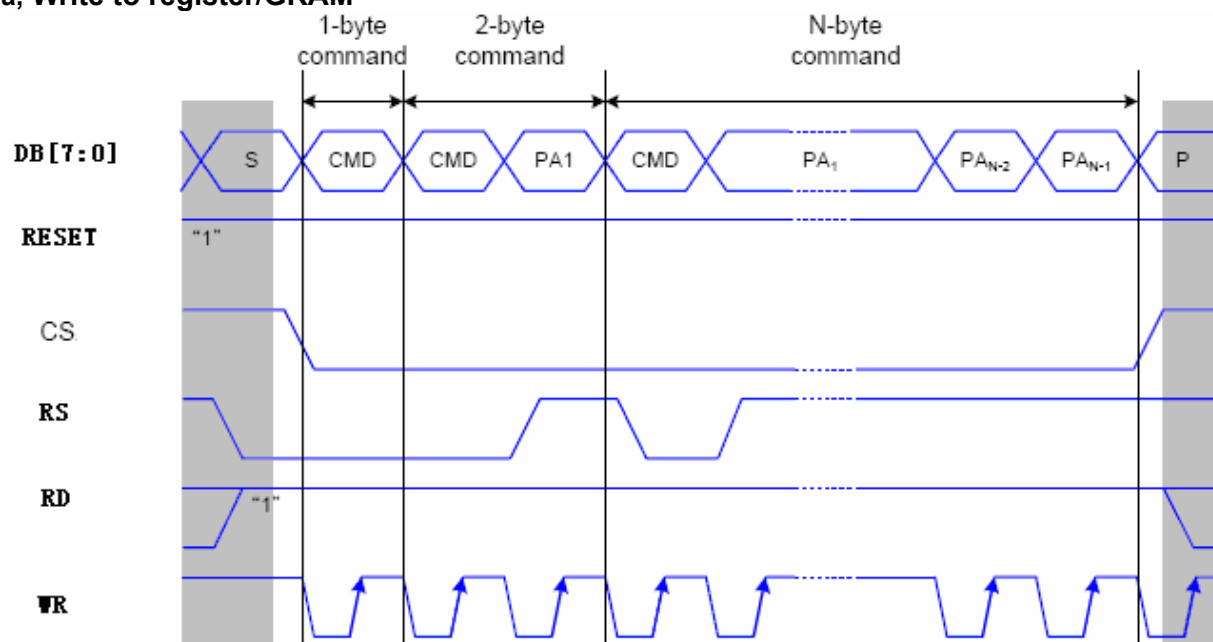


Figure 5.1 i80 System Bus Timing



5.1.2 Register write/read timing in I80 series system

a, Write to register/GRAM



b. Read from register/GRAM

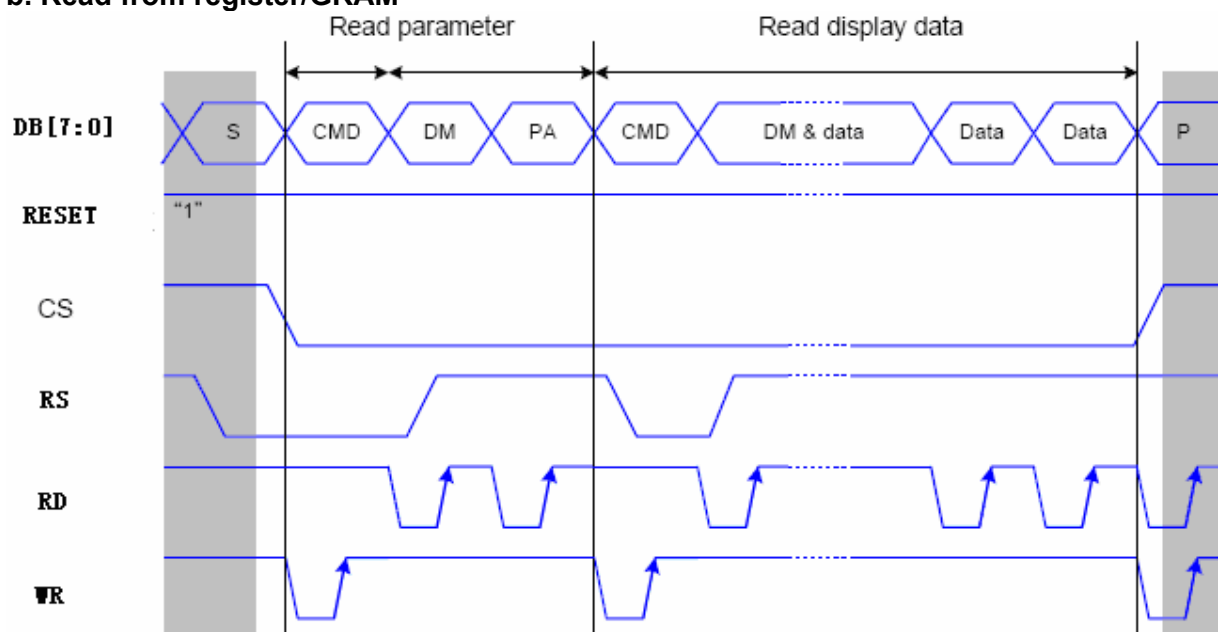


Figure 5.2 i80 18-bit System Bus Interface Timing



5.1.3.GRAM write/read timing in i80 series system

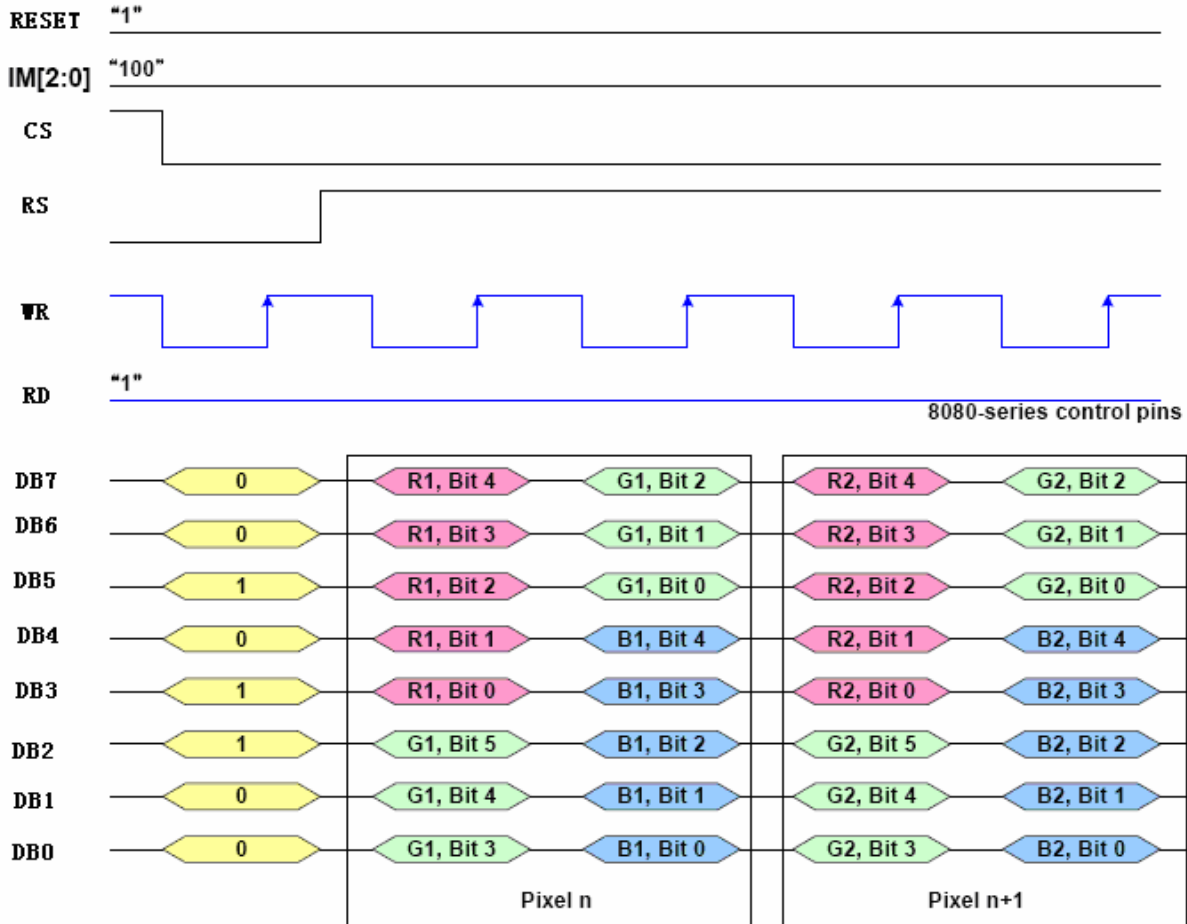
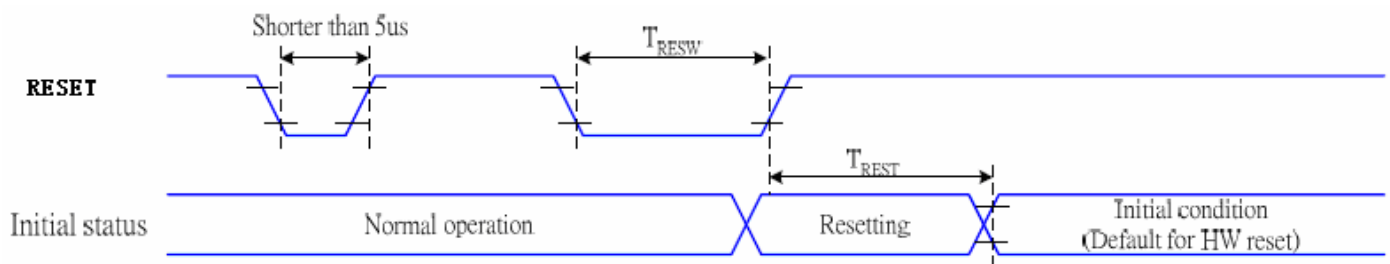


Table 5.3 GRAM Data and display data of 8-bit(65K Color) system interface



5.1.4 Reset Timing Characteristics

Ta=25°C



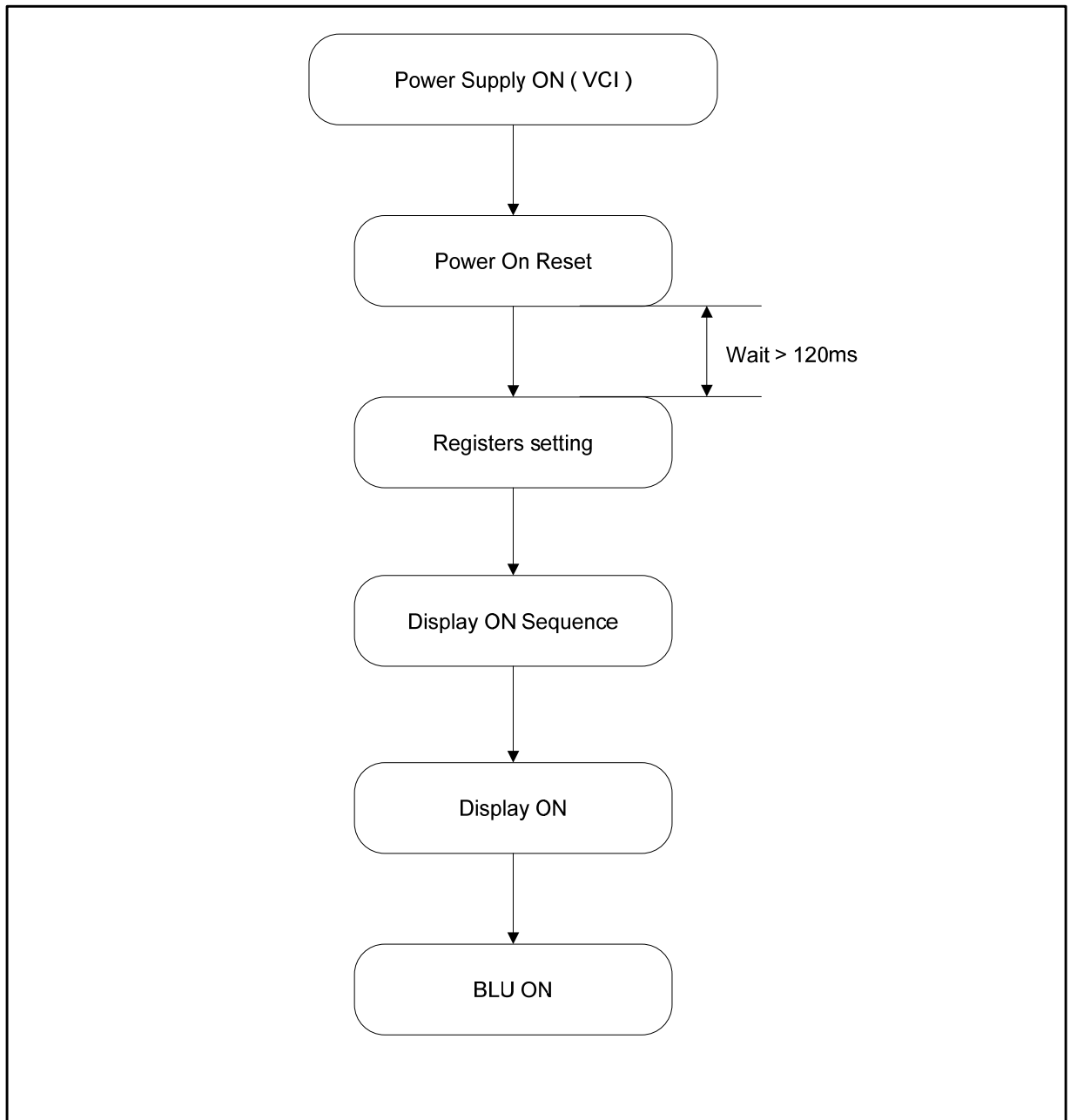
Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESET	tRESW	Reset pulse duration	10	-	us
	tREST	Reset cancel	-	5	ms
				120	ms

Figure 5.4 RESETB Timing



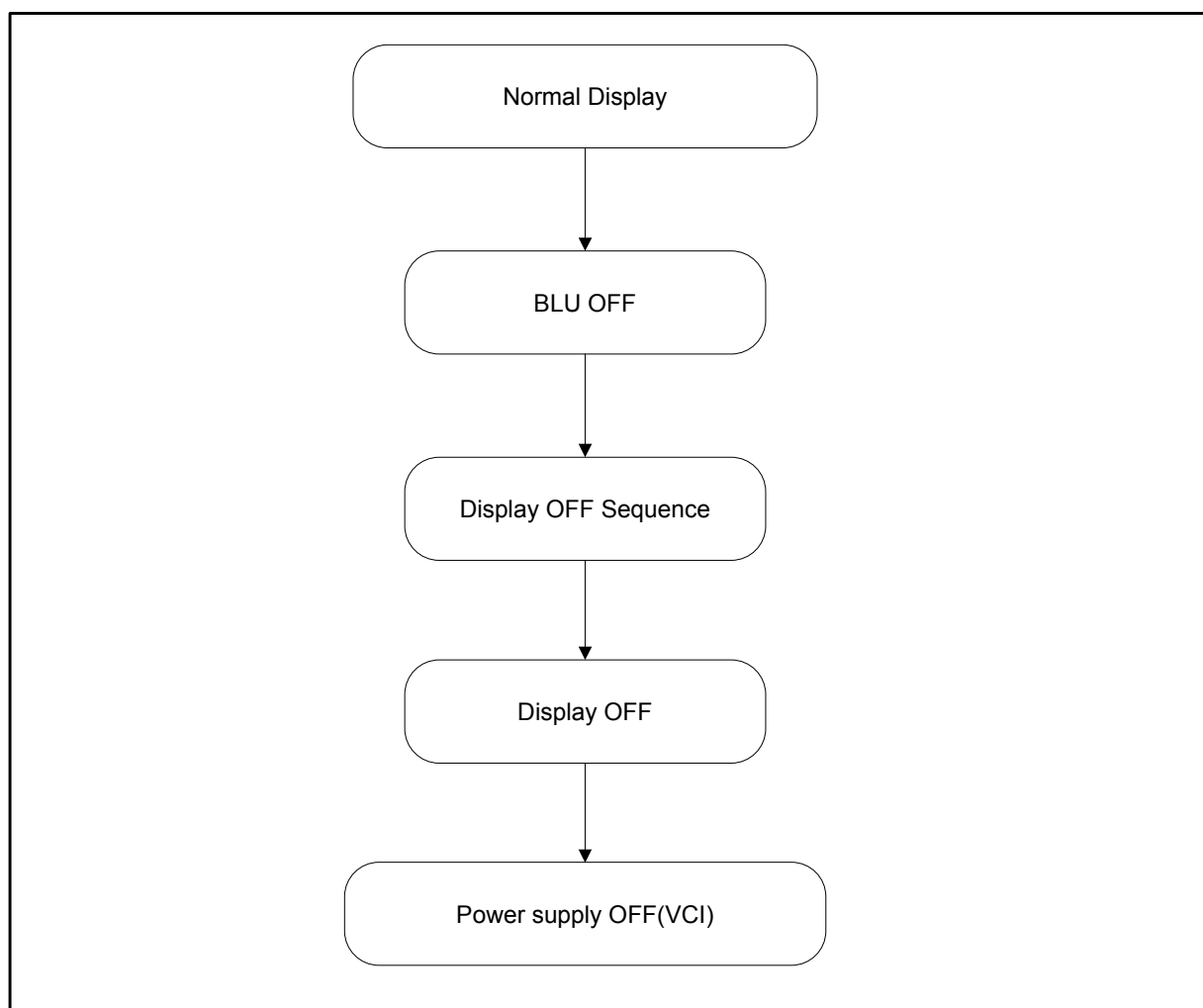
5.2 Power On/Off sequence

5.2.1 Power on Sequence





5.2.2 Power off Sequence





6 Optical Characteristics

Ta=25°C

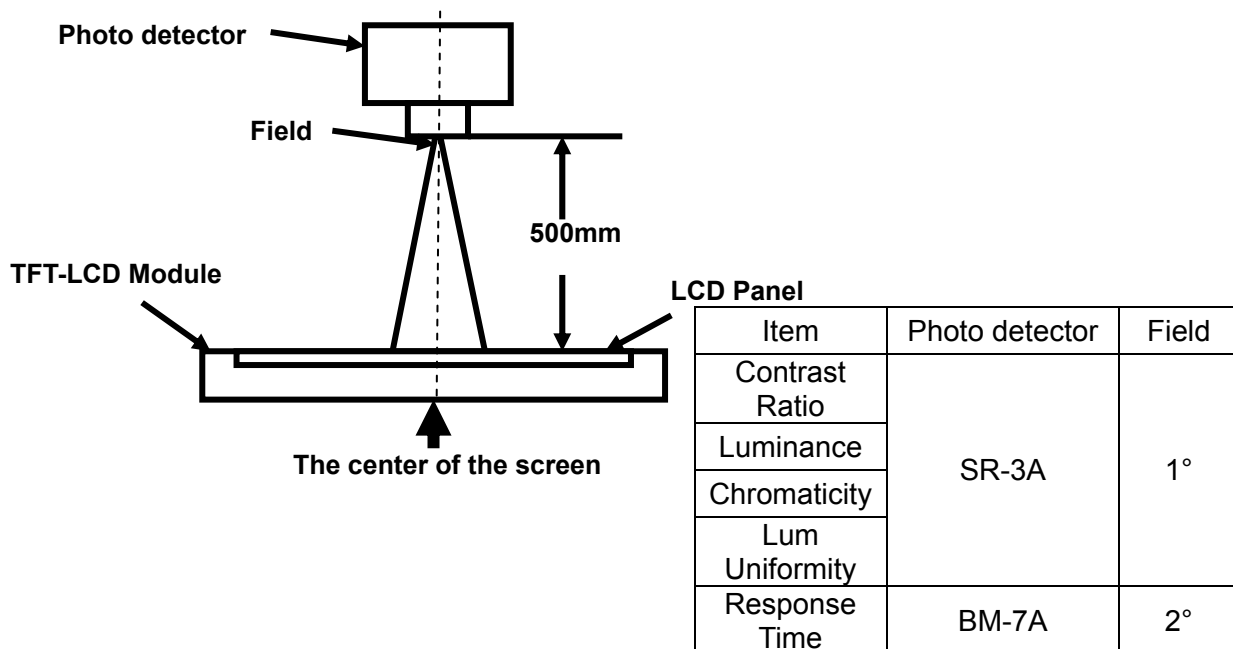
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note 2
		θB		50	60	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		T _{ON}	25℃	-	20	30	ms	Note1 Note4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.23	0.28	0.33	-	Note5 Note1
		y		0.25	0.30	0.35		
	Red	x		0.535	0.585	0.635		
		y		0.273	0.323	0.373		
	Green	x		0.295	0.345	0.395		
		y		0.531	0.581	0.631		
	Blue	x		0.102	0.152	0.202		
		y		0.044	0.094	0.144		
Uniformity		U	-	70	80	-	%	Note1 Note6
NTSC		-	-	-	50	-	%	Note 5
Luminance		L		200	250	-	cd/m ²	Note1 Note7

Test Conditions:

1. $V_F=3.2V$, $I_F=15mA$ (One LED current), 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.

**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).

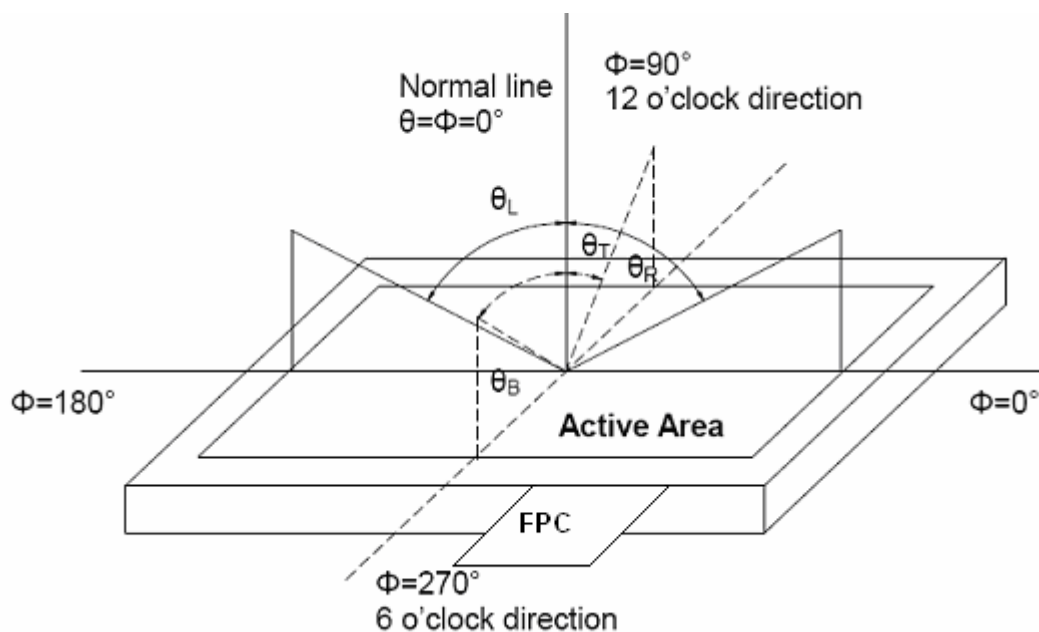


Fig. 1 Definition of viewing angle

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**Note 3: Definition of contrast ratio**

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

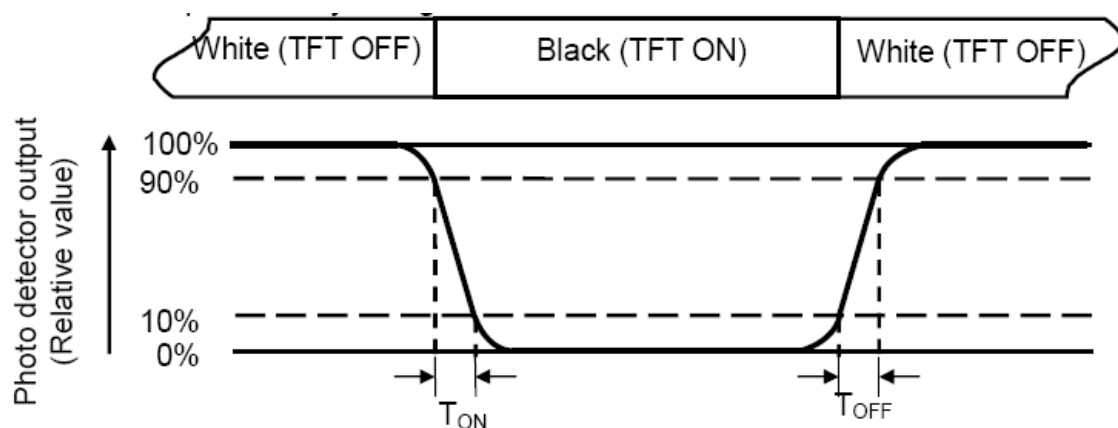
“White state “:The state is that the LCD should driven by Vwhite.

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

Vwhite: To be determined Vblack: 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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) 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.

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

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

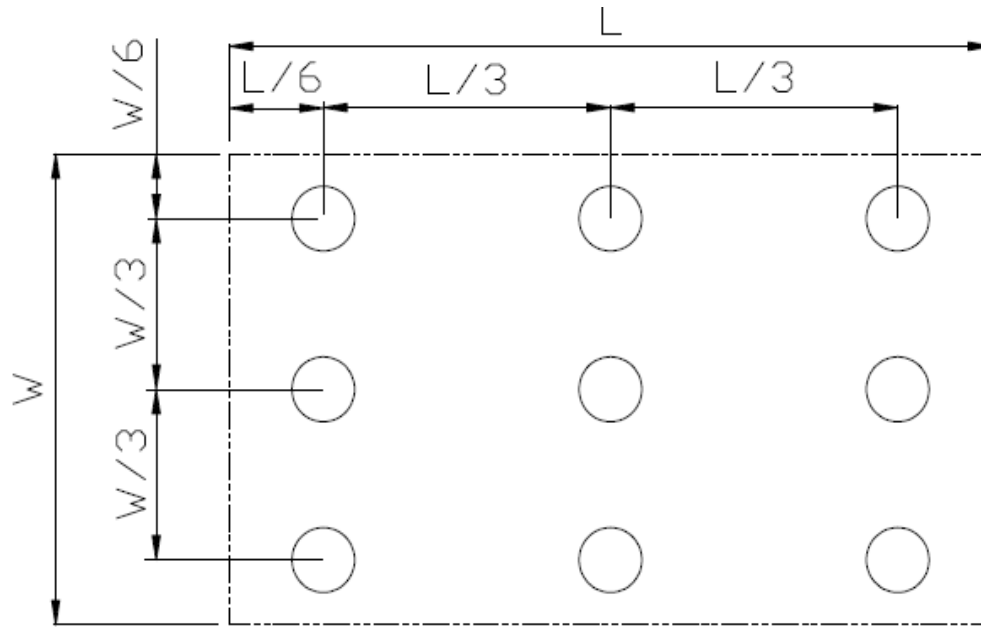


Fig. 2 Definition of uniformity

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.



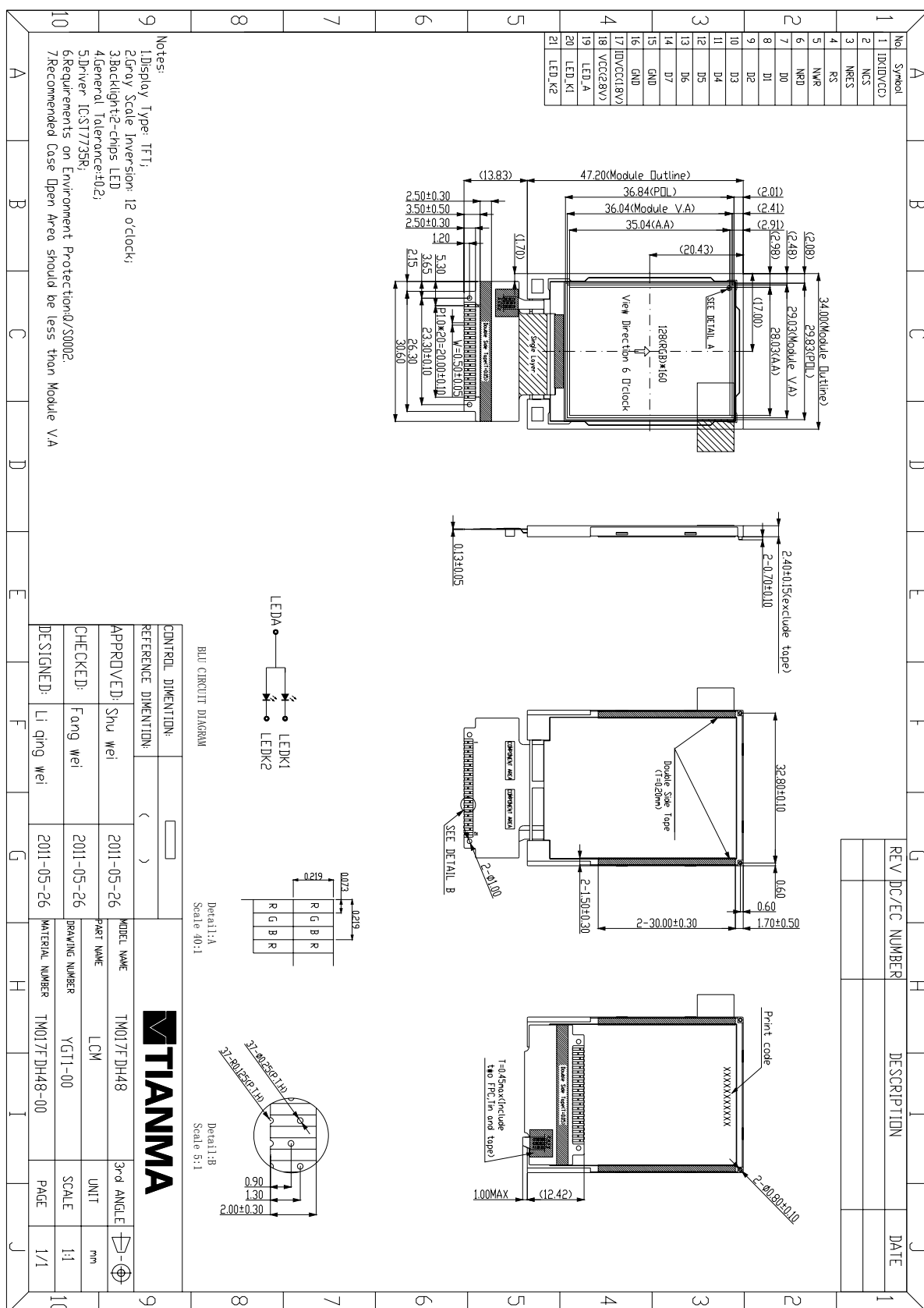
7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 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	High Temperature & High Humidity Storage	Ta=+60℃, 90% RH 240 hours	Note2 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,GB2423.22-2002
7	Electro Static Discharge (Operation)	C=150pF, R=330Ω,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 (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz hours for each direction of X.Y.Z. (6 hours for total)(Package condition)	2 IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (Non-operation)	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.

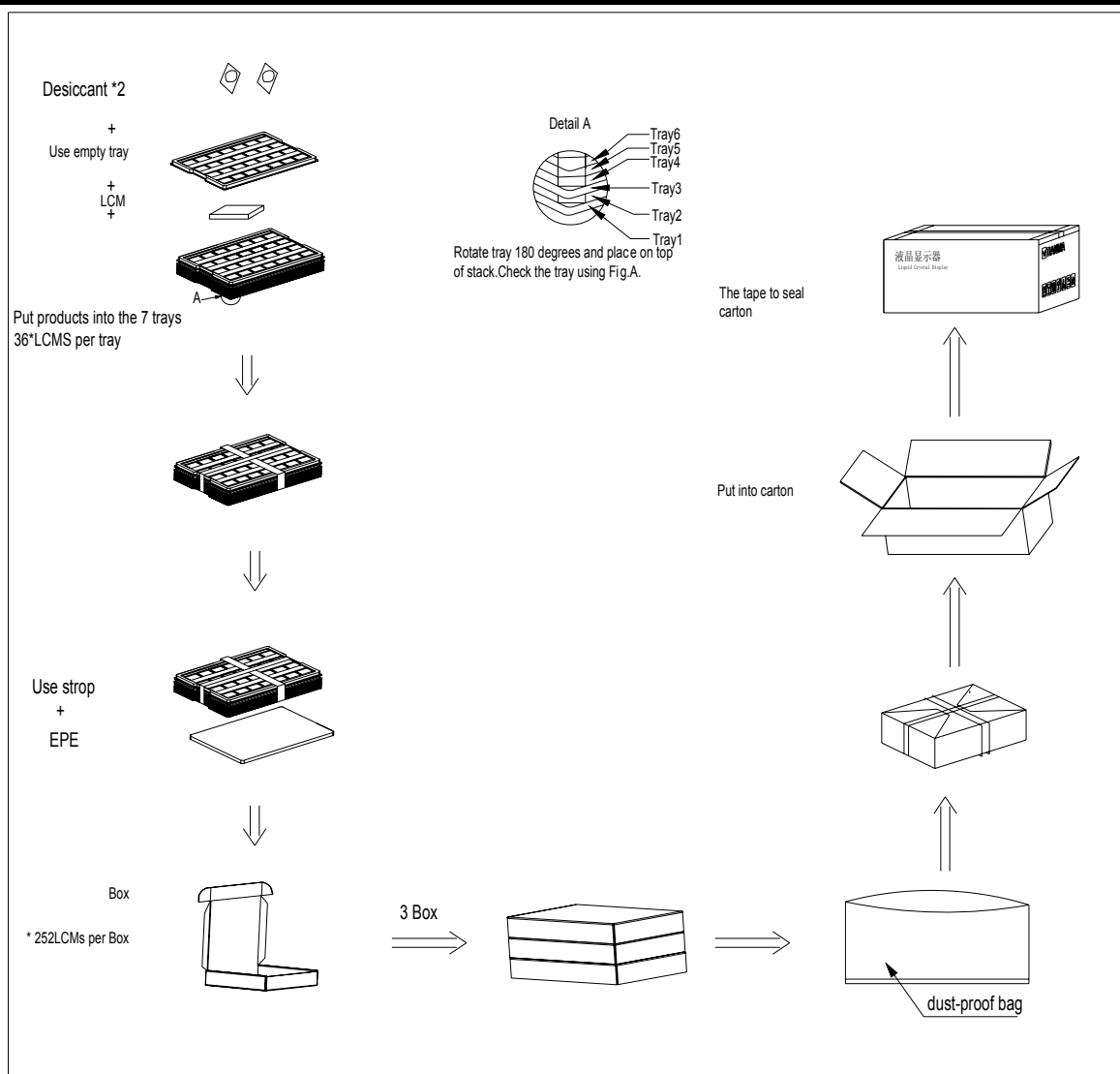
8 Mechanical Drawing





9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM017FDH48-00	34.0x 47.2x 2.4	0.00545	756	
2	Tray	PET (Transmit)	485×330×12	0.165	24	Anti-static
3	Dust-Proof Bag	PE	700×545	0.021	1	
4	BOX	CORRUGATED PAPER	520×345×74	0.227	3	
5	Desiccant	Desiccant	45×50	0.0035	6	
6	EPE	EPE	485×330×5	0.009	3	
7	Carton	CORRUGATED PAPER	544×365×250	1.01	1	
8	Total weight	9825g				





10 Precautions For Use of LCD Modules

10.1 Handling Precautions

- 10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 10.1.2 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.
- 10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 10.1.5 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

- 10.1.6 Do not attempt to disassemble the LCD Module.
- 10.1.7 If the logic circuit power is off, do not apply the input signals.
- 10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 10.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 10.1.8.4 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.

10.2 Storage precautions

- 10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 10.2.2 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%

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

10.3 Transportation Precautions

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