MODEL NO. : TM014FDH01

ISSUED DATE: 2009-06-16

VERSION : Ver 1.0

■Preliminary Specification
□Final Product Specification

Customer :_____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by
2009.6.16	2009.06.17	09'6/17

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2009-06-16	Preliminary Release	Enhao Li

1 General Specifications

Feature		Spec
Display Spec	Size	1.45 inch
	Resolution	128(RGB) x 128
	Interface	CPU 8 bits
	Color Depth	65/262k
	Technology Type	a-Si
	Pixel Pitch (mm)	0.203x 0.203
	Pixel Configuration	R.G.B Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Clear Type (3H)
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	33.35x41.64x2.40
	Active Area(mm)	26.035x26.035
	With /Without TSP	Without TSP
	Weight (g)	4.52
	LED Numbers	1 LED
Electronic	Driver IC	HX8353-C

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: RoHS

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Remark
1	LED_A	P	Back light anode	
2	LED_K	P	Back light cathode	
3	VSS	P	Ground	
4	NC	-	Not Connected	
5	NC	-	Not Connected	
6	/CS	I	Chip select signal , low: chip can be accessed	
7	/RETB	I	Reset Signal	
8	RS	I	Command/Data select signal, low: instruction; high: data	
9	WRB	I	Write signal	
10	RDB	I	Read signal	
11	D0	I	Data input	
12	D1	I	Data input	
13	D2	I	Data input	
14	D3	I	Data input	
15	D4	I	Data input	
16	D5	I	Data input	
17	D6	I	Data input	
18	D7	I	Data input	
19	VSS	P	Ground	
20	VDD	P	Power supply	

Note2-1: I/O definition：

I-----Input O---Output P----Power/ Ground NC--- Not Connected

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Logic Supply Voltage	VDD	2.3	3.3	V	
Analog Supply Voltage	VDD	2.3	3.3	V	
Input Signal Voltage	D0~D7,/CS,RS,WRB, RDB,/RETB	-0.3	VDD +0.3	V	
Back Light Forward Current	I_{LED}	--	25	mA	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

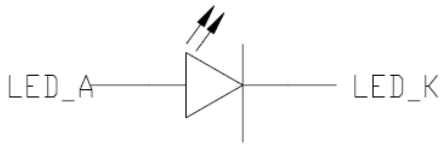
Item		Symbol	Min	Typ	Max	Unit	Remark
Logic Supply Voltage		VDD	2.3	2.8	3.3	V	
Analog Supply Voltage		VDD	2.3	2.8	3.3	V	
Input Signal Voltage	Low Level	V_{IL}	0	--	0.2xVDD	V	D0~D7,/CS,RS,WRB, RDB,/RETB
	High Level	V_{IH}	0.8xVDD	--	VDD	V	
Output Signal Voltage	Low Level	V_{OL}	--	--	0.2xVDD	V	
	High Level	V_{OH}	0.8xVDD	--	VDD	V	
(Panel+ LSI) Power Consumption		Black Mode (60Hz)	--	TBD	--	mW	
		Sleeping Mode	--	TBD	--	uW	

Note: We will provide the power consumption after we test the samples.

4.2 Driving Backlight Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	20	25	mA	
Forward Voltage	V_F	--	3.2	--	V	1 LED
Power Consumption	W_{BL}	--	64	--	mW	

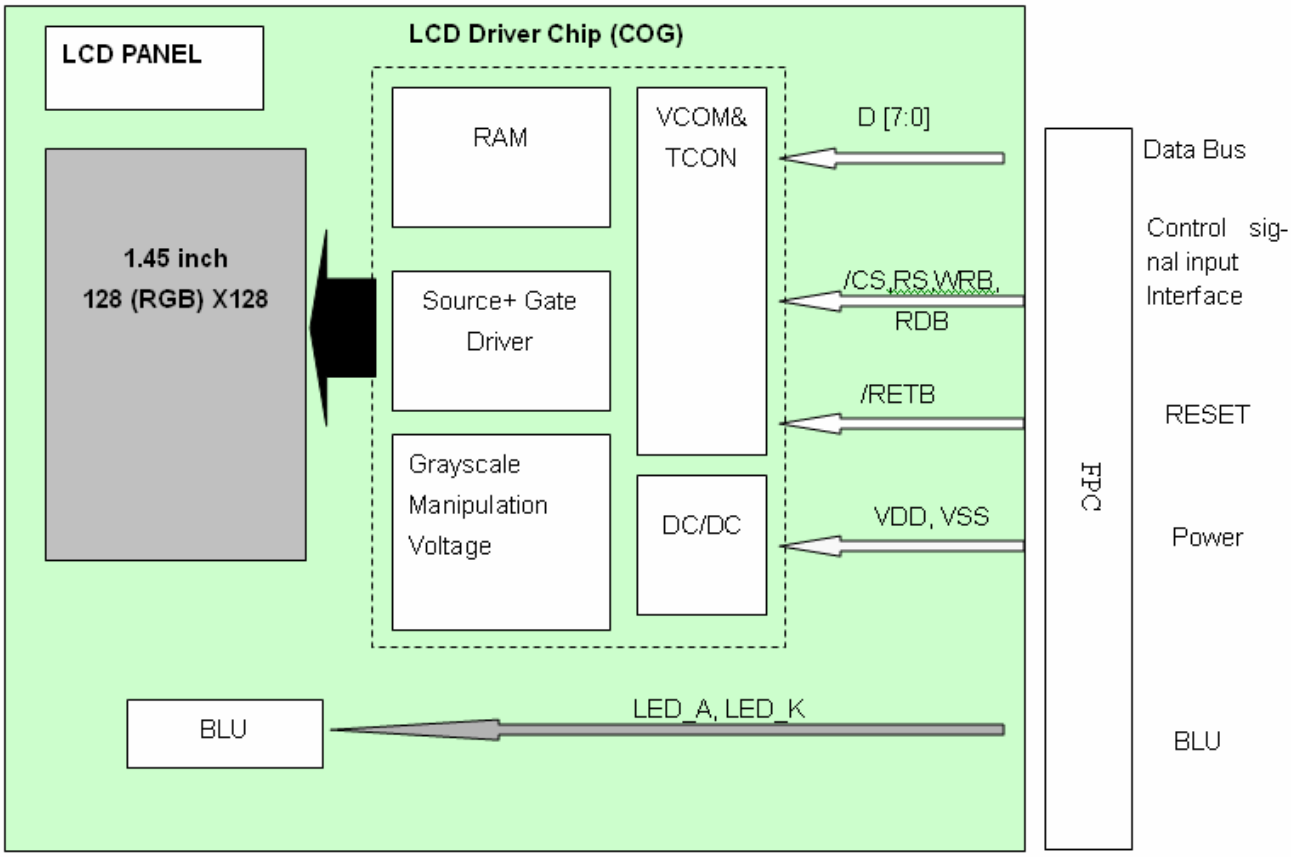
Note1: Figure below shows the connection of backlight LED.



Note 2: One LED: I_F =20 mA, V_F =3.2V

Note 3: The life of LED: 20,000 hours

4.3 Block Diagram



5 Timing Chart

5.1 Interface Characteristics

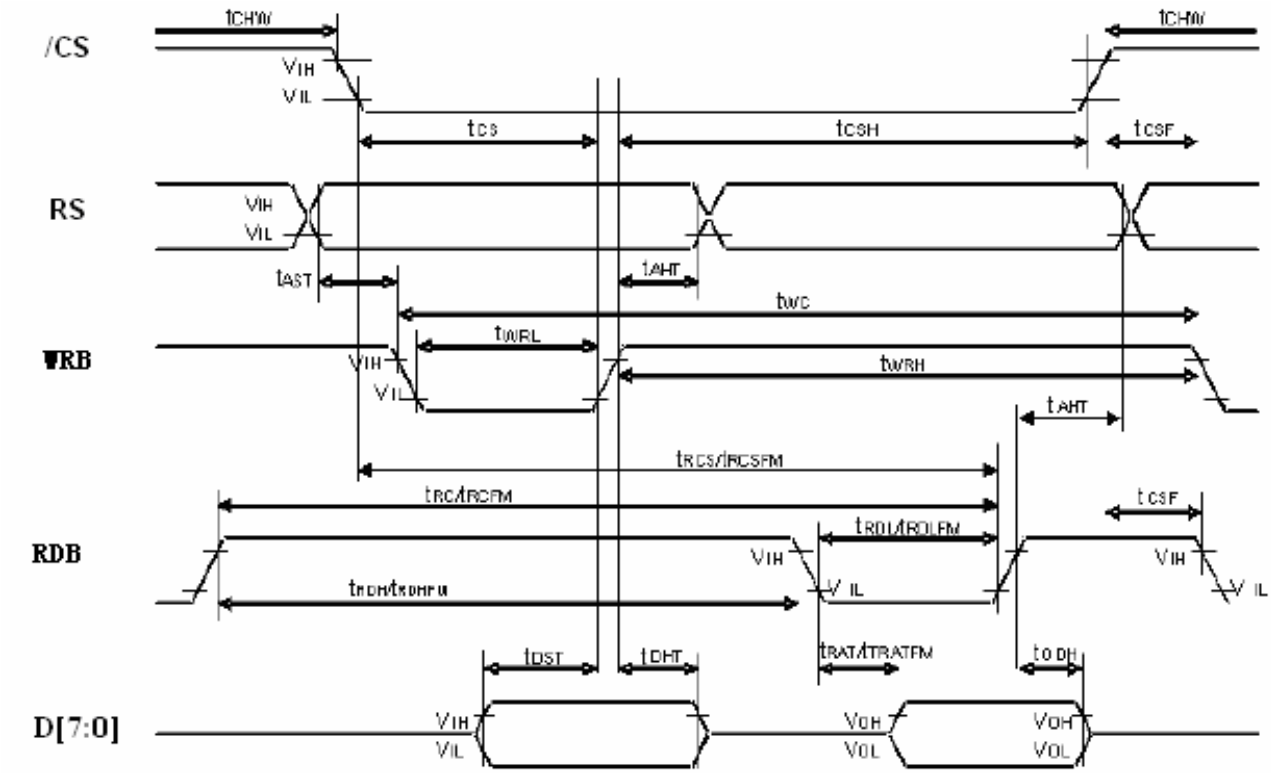


Figure 5.1 CPU Interface Characteristics

5.2 Timing Parameter

Normal Write Mode：

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
RS	t_{AST}	Address setup time	0	-	ns	-
	t_{AHT}	Address hold time (Write/Read)	10	-		
/CS	t_{CHW}	Chip select "H" pulse width	0	-	ns	-
	t_{CS}	Chip select setup time (Write)	15	-		
	t_{RCS}	Chip select setup time (Read ID)	45	-		
	t_{RCSFM}	Chip select setup time (Read FM)	355	-		
	t_{CSF}	Chip select wait time (Write/Read)	10	-		
WRB	t_{WC}	Write cycle	66	-	ns	-
	t_{WRH}	Control pulse "H" duration	15	-		
	t_{WRL}	Control pulse "L" duration	15	-		
RDB	t_{RC}	Read cycle (ID)	160	-	ns	When read ID data
	t_{RDH}	Control pulse "H" duration (ID)	90	-		
	t_{RDL}	Control pulse "L" duration (ID)	45	-		
RDB (FM)	t_{RCFM}	Read cycle (FM)	450	-	ns	When read from frame memory
	t_{RDHFM}	Control pulse "H" duration (FM)	90	-		
	t_{RDLFM}	Control pulse "L" duration (FM)	355	-		
D7 to D0	t_{DST}	Data setup time	10	-	ns	For maximum C_L=30pF For minimum C_L=8pF
	t_{DHT}	Data hold time	10	-		
	t_{RAT}	Read access time (ID)	-	40		
	t_{RATFM}	Read access time (FM)	-	340		
	t_{ODH}	Output disable time	20	80		

Table 5.1 CPU Interface Timing Parameter

5.3 Register Write/Read Timing

5.3.1 System Bus Interface Register Write Timing

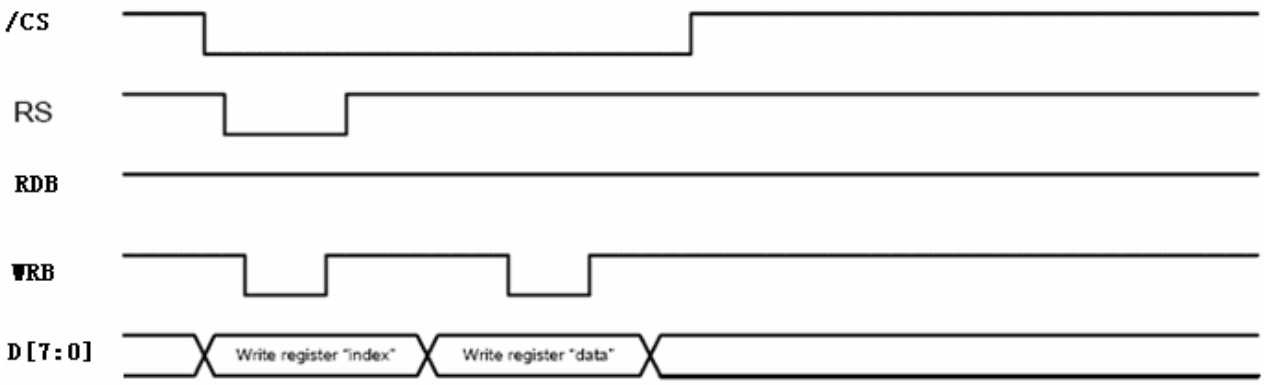


Figure 5.3.1 System Bus Interface Write Register Timing

5.3.2 System Bus Interface Register Read Timing

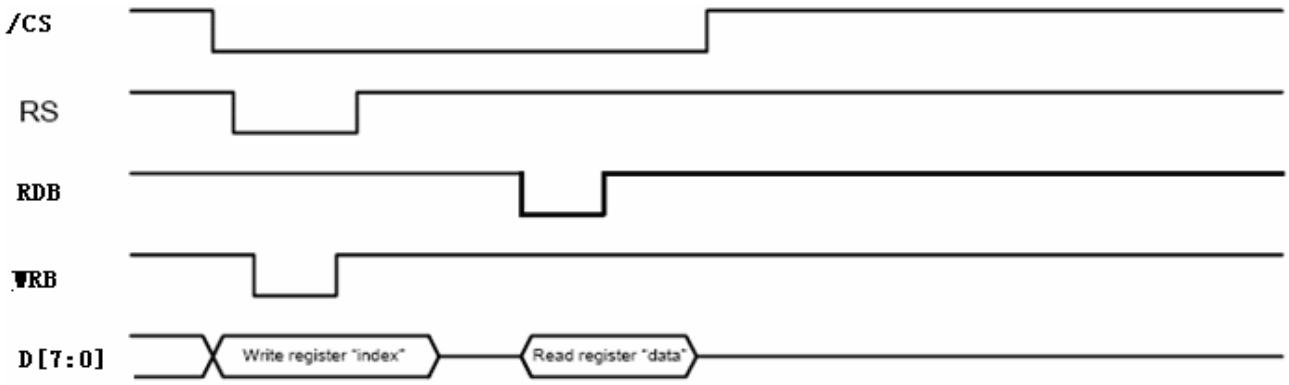


Figure 5.3.2 System Bus Interface Read Register Timing

5.4 GRAM Write/Read Data Format

65k Color Data	DNC/ RS	D7	D6	D5	D4	D3	D2	D1	D0	GRAM Write
MEMWR	0	GRAM Write command code								-
1st write	1	R14	R13	R12	R11	R10	G15	G14	G13	-
2nd write	1	G12	G11	G10	B14	B13	B12	B11	B10	1st pixel (R1/G1/B1)
3rd write	1	R24	R23	R22	R21	R20	G25	G24	G23	-
4th write	1	G22	G21	G20	B24	B23	B22	B21	B20	2nd pixel (R2/G2/B2)

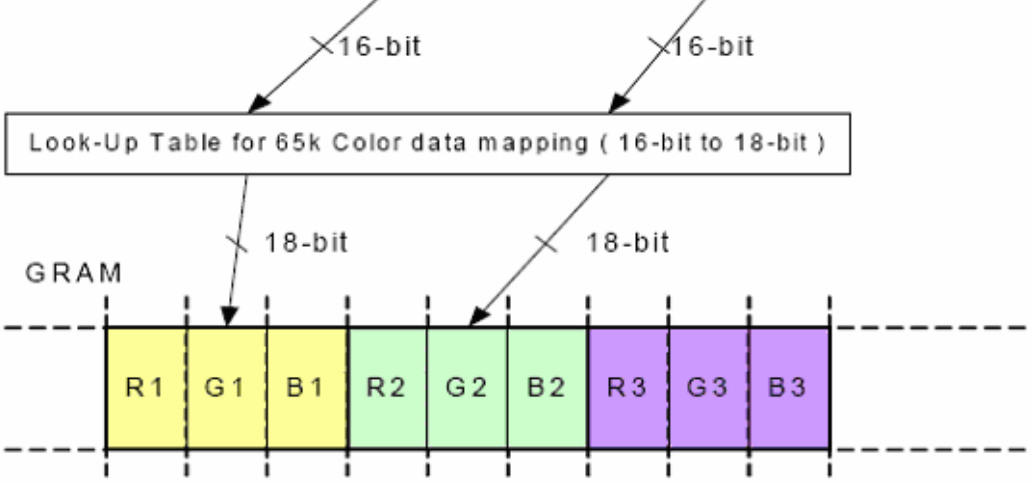
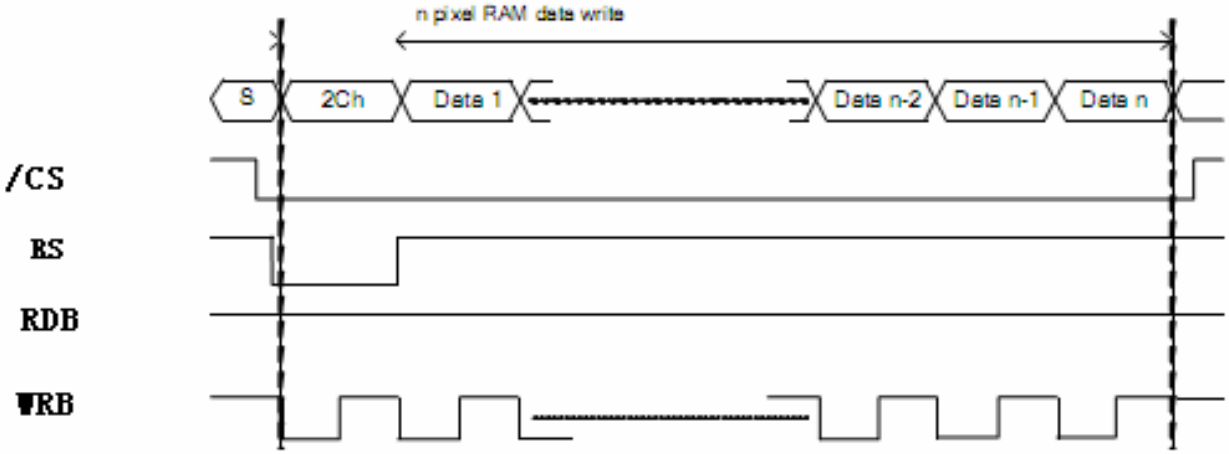


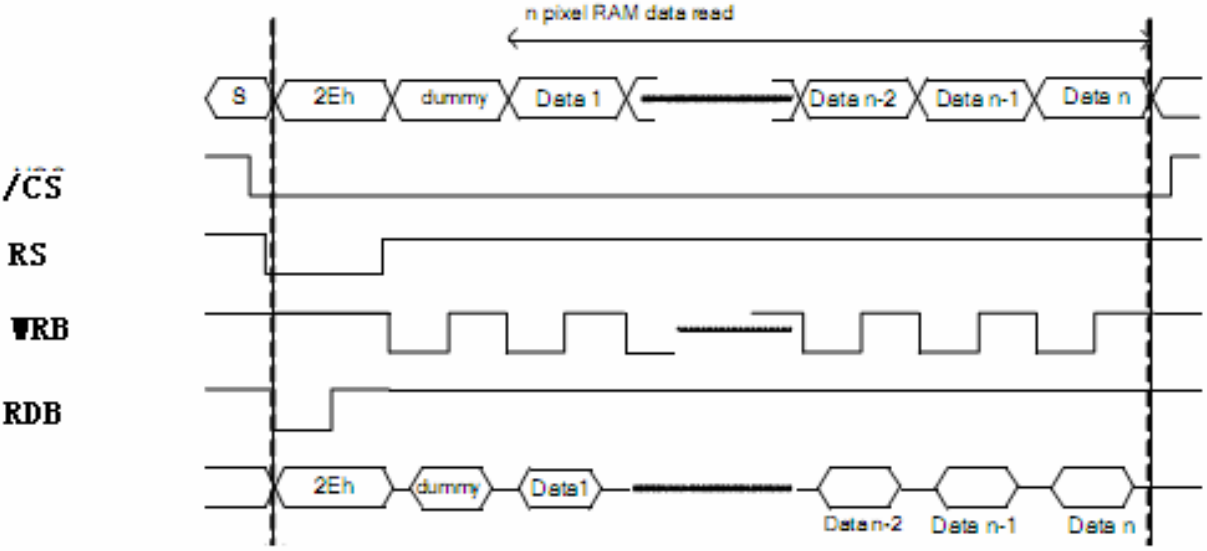
Figure 5.4 8-bit Data Bus GRAM Write/Read Data Format (65K)

5.5 GRAM Write/Read Timing

Write to GRAM



Read from GRAM



5.6 Reset Timing Characteristics

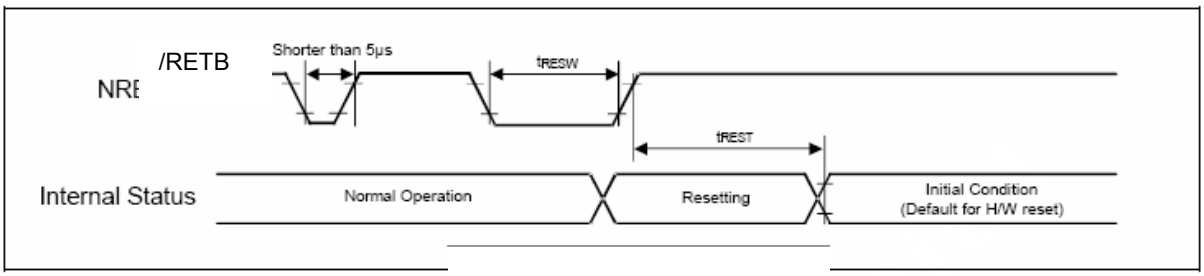


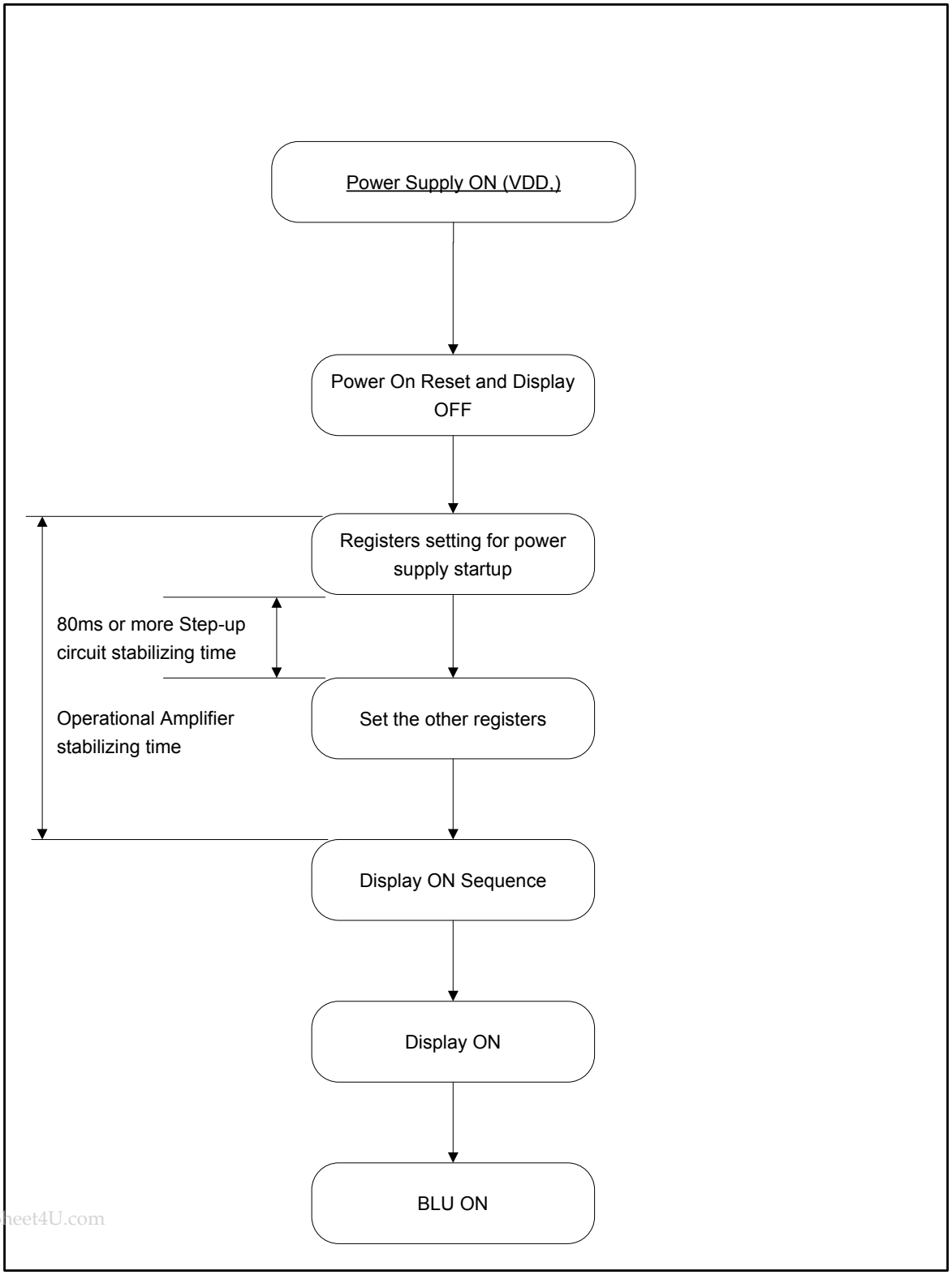
Figure 7. 6 Reset Input Timing

Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width(1)	NRESET	10	-	-	-	µs
tREST	Reset complete time(2)	-	-	-	5	When reset applied during Sleep In mode	ms
		-		-	120	When reset applied during Sleep Out mode	ms

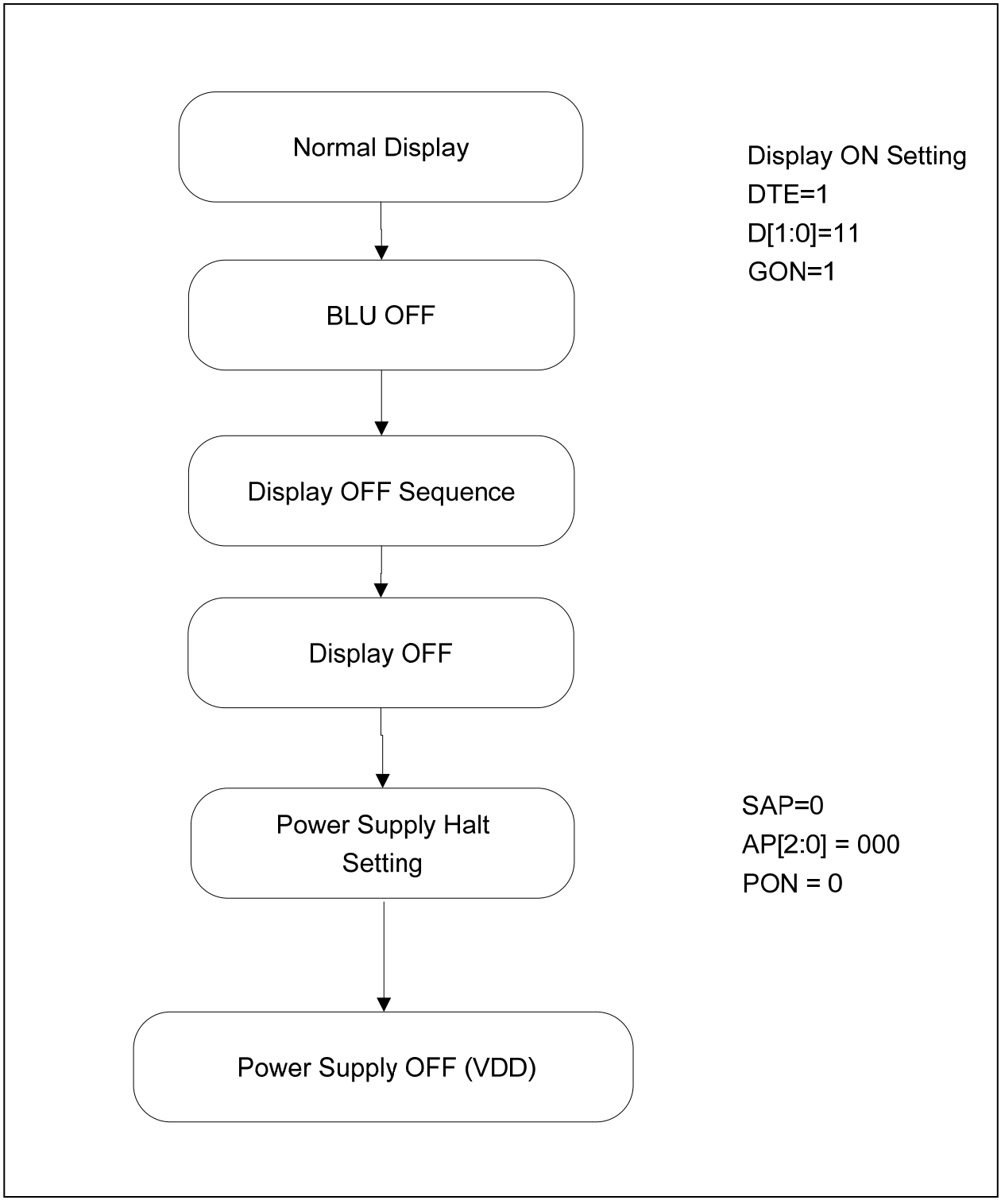
Figure Reset Timing

6 Power On/Off Sequence

6.1 Power on Sequence



6.2 Power Off Sequence



7 Optical Characteristics

Ta=25℃

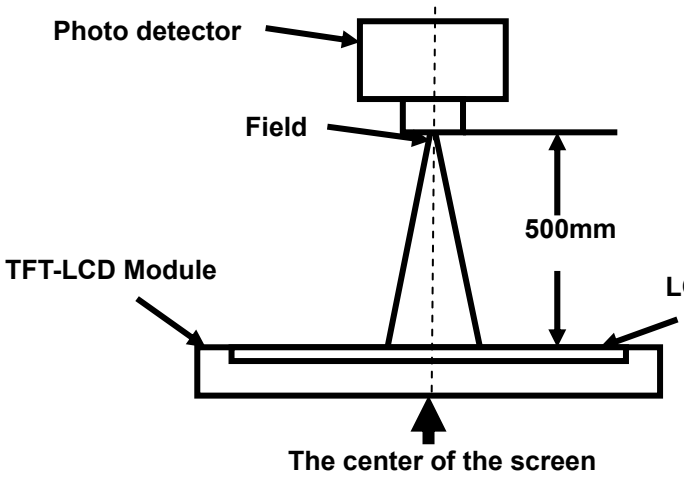
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	40	45	-	Degree	Note 2
		θB		15	20	-		
		θL		40	45	-		
		θR		40	45	-		
Contrast Ratio		CR	θ=0°	300	350	-		Note1 Note3
Response Time		Ton	25℃	-	25	40	ms	Note1 Note4
		Toff						
Chromaticity	White	x	Backlight is on	0.245	0.295	0.345		Note5, Note1
		y		0.257	0.307	0.357		
	Red	x		0.529	0.589	0.679		
		y		0.295	0.345	0.395		
	Green	x		0.283	0.333	0.383		
		y		0.511	0.561	0.611		
	Blue	x		0.110	0.160	0.210		
		y		0.056	0.086	0.156		
Uniformity		U		-	80	-	%	Note1 Note6
NTSC				-	50	-	%	Note 5
Luminance		L		160	180	-	cd/m^2	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=20mA, the ambient temperature is 25℃.
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)。

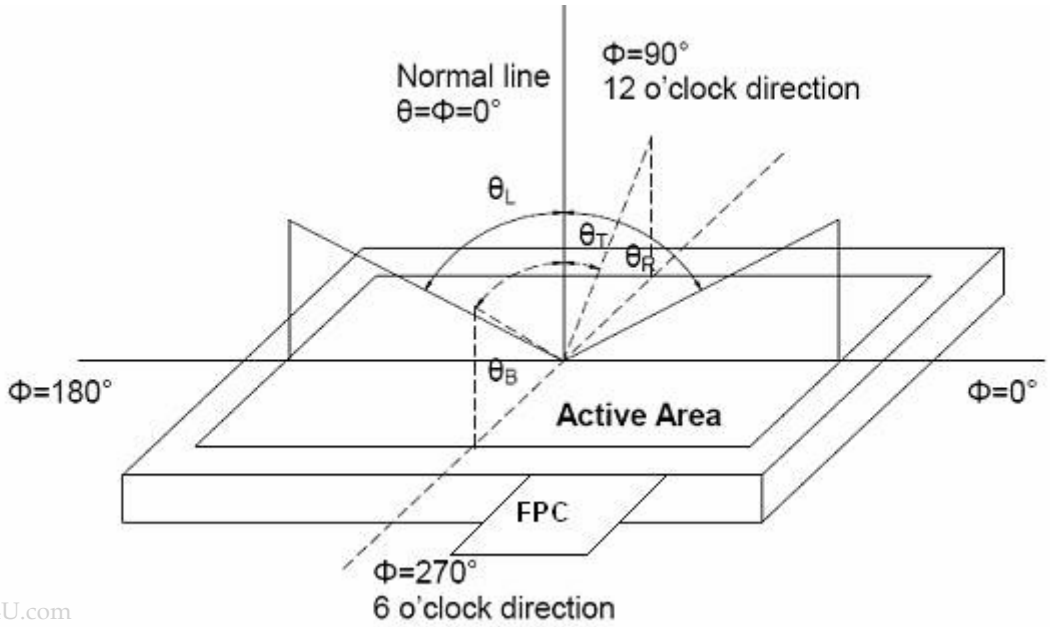


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

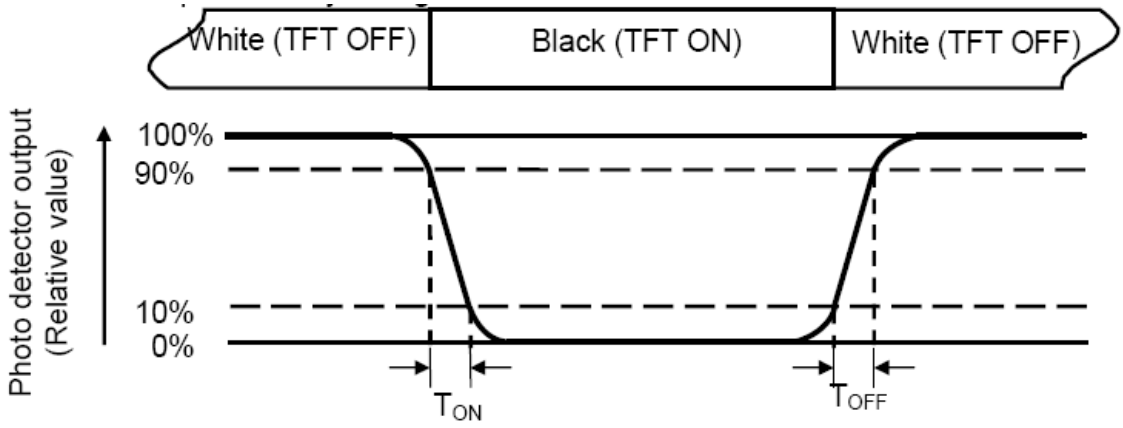
“White state “:The state is that the LCD should driven by Vwhite.

“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.

Luminance Uniformity(U) = Lmin/ Lmax

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

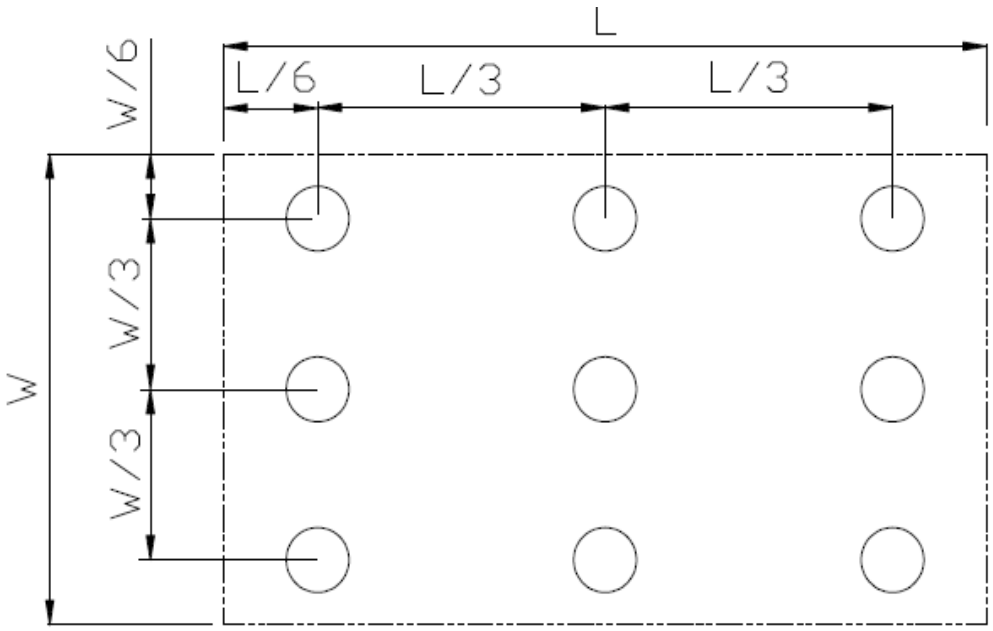


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

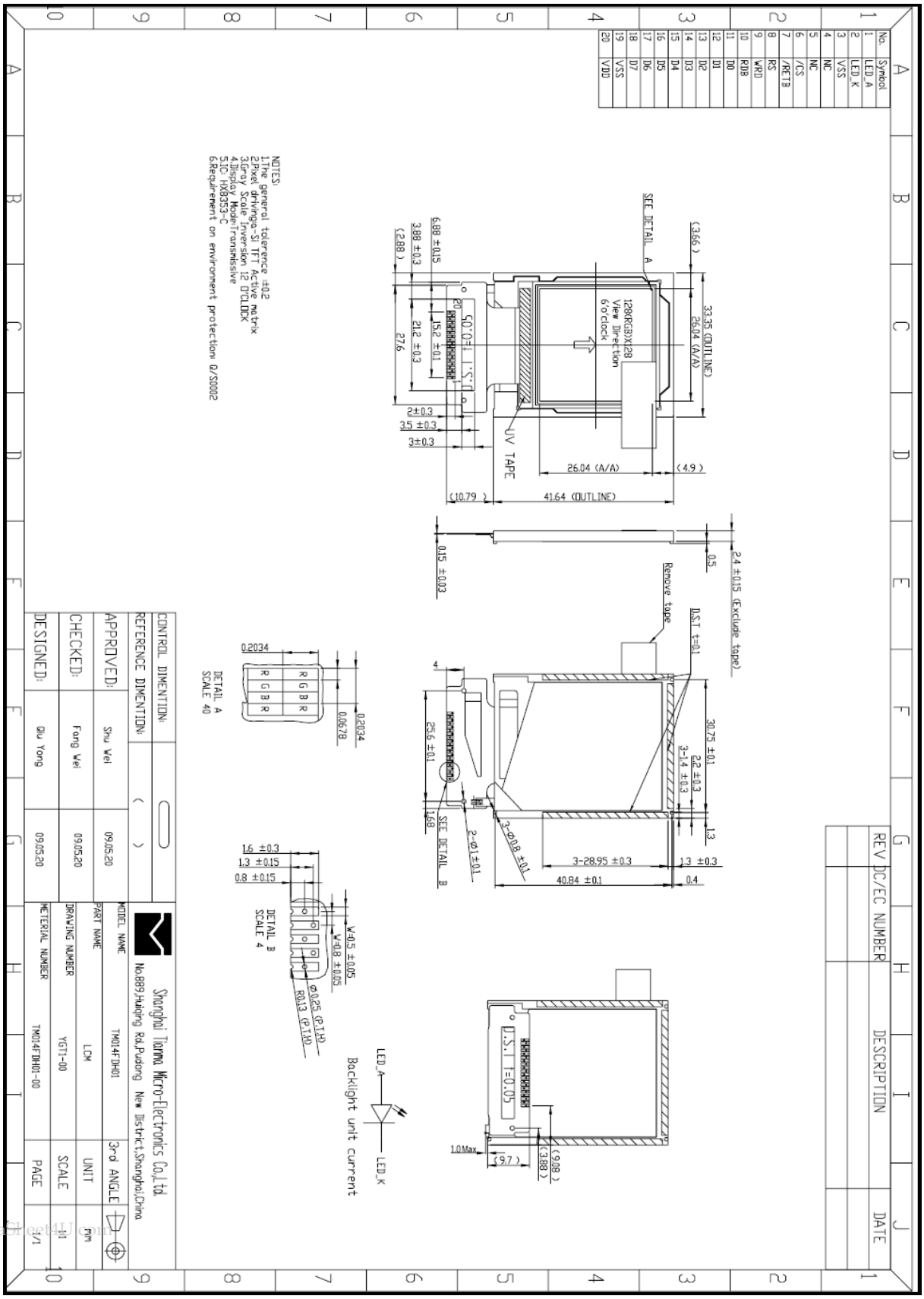
8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1 GB2423.1—89
3	High Temperature Storage	Ta=+80℃, 240hrs	IEC60068-2-2, GB2423.2—89
4	Low Temperature Storage	Ta=-30℃, 240hrs	IEC60068-2-1 GB2423.1—89
5	High Temperature & High Humidity Storage	Ta=+60℃, 90% RH 240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
6	Thermal Shock (Non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 50 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22—87
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 GB/T17626.2—1998
8	Vibration (Non-operation)	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 GB/T2423.10—1995
9	Shock (Non-operation)	100G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8—1995

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

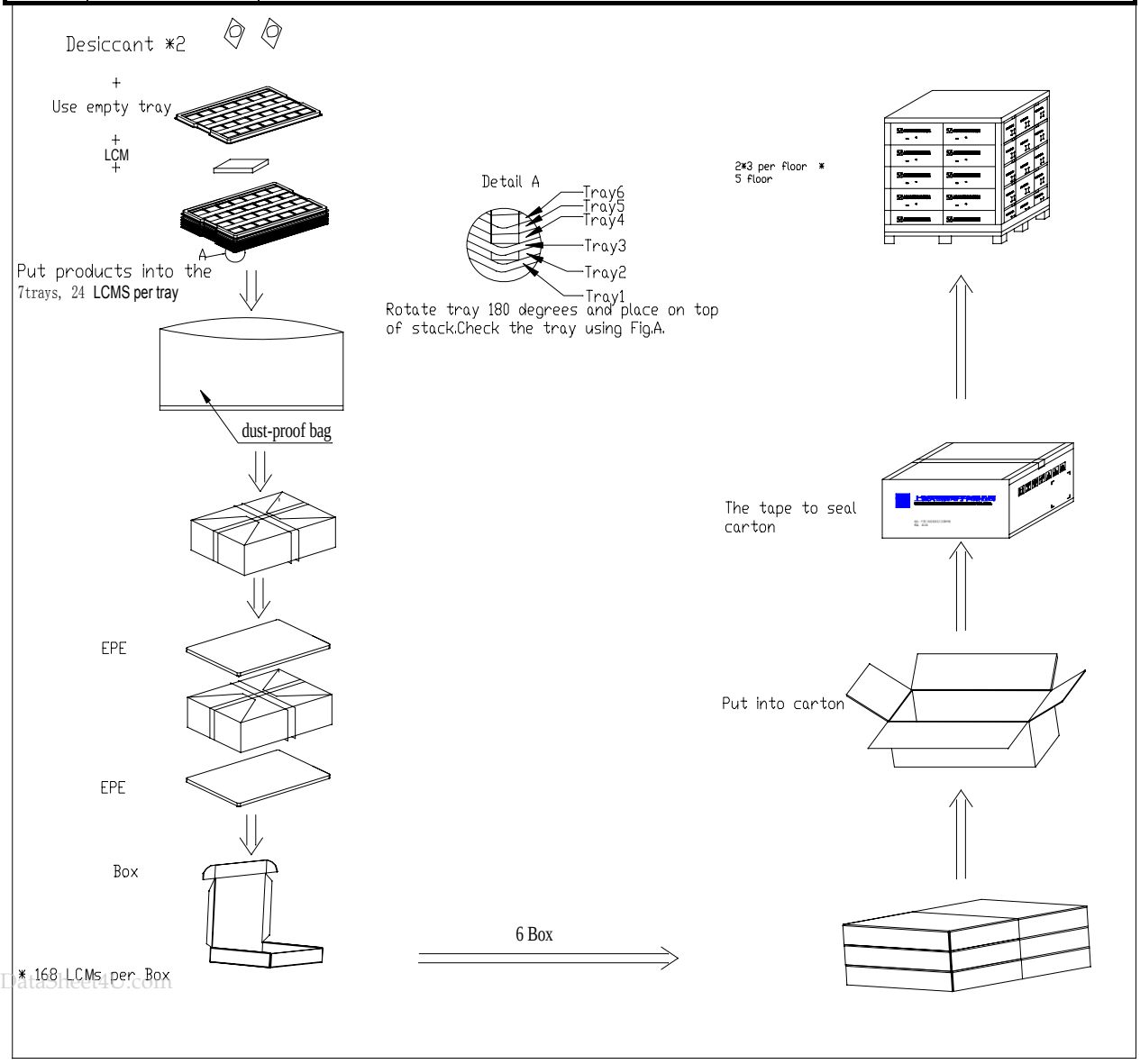
Note2: Ta is the ambient temperature of sample.

9 Mechanical Drawing



10 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity
1	LCM module	TM014FDH01	33.35×41.64×2.4	4.52	1008
2	Tray	PET（Transmit）	315×247×10.3	TBD	48
3	EPE	EPE	315×247×5	0.009	12
4	Anti-static bag	PE	327×440	0.021	6
5	BOX	CORRUGATED PAPER	345×260×70	0.227	6
6	Desiccant	Desiccant	45×50	0.0035	12
7	Carton	CORRUGATED PAPER	544×365×250	1.01	1
8	Total weight	TBD			



11 Precautions for Use of LCD Modules

11.1 Handling Precautions

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

11.1.2 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.

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

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

11.1.5 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

11.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

11.1.8.4 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.

11.2 Storage precautions

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

11.2.2 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%

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

11.3 Transportation Precautions:

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