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1 General Specifications

	Feature	Spec
Display Spec.	Size	2.83 inch
	Resolution	240(RGB) x 320
	Interface	CPU 18bits
	Color Depth	262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.180x0.180
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Clear Type(3H)
	Surface Treatment(TSP)	Clear Type(3H)
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	50.20x69.30x3.65
	Active Area(mm)	43.20 x 57.60
	With/Without TSP	With TSP
	Weight (g)	21.1
	LED Numbers	4 LEDs
Electronic	Driver IC	ILI9325

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

Matching connector of Hirose:FH26-45S-0.3SHW

No	Symbol	I/O	Description	Remarks
1	FLM	O	Frame head pulse signal	
2	GND	P	Ground	
3	YD	P	Touch Panel Y(6 Clock Side)	
4	XR	P	Touch Panel X(Right Side)	
5	YU	P	Touch Panel Y(12 Clock Side)	
6	XL	P	Touch Panel X(Left Side)	
7	GND	P	Ground	
8	PS2	I	Select 8/9/16/18 bit signal	Note 2-2
9	PS3	I	Select 8/9/16/18 bit signal	Note 2-2
10	IOVCC	P	Power Supply of Digital Circuit	
11	VCI	P	Power Supply of Analog Circuit	
12	VCI	P	Power Supply of Analog Circuit	
13	NC	-	No connection	
14	D17	I	Data input	
15	D16	I	Data input	
16	D15	I	Data input	
17	D14	I	Data input	
18	D13	I	Data input	
19	D12	I	Data input	
20	D11	I	Data input	
21	D10	I	Data input	
22	D9	I	Data input	
23	D8	I	Data input	
24	D7	I	Data input	
25	D6	I	Data input	
26	D5	I	Data input	
27	D4	I	Data input	
28	D3	I	Data input	
29	D2	I	Data input	
30	D1	I	Data input	
31	D0	I	Data input	
32	RESET	I	A RESET signal, active low	
33	RD	I	A read strobe signal and enables an operation to read out data when the signal is low.	
34	WR	I	A write strobe signal and enables an operation to write data when the signal is low.	
35	RS	I	A register select signal	
36	CS	I	A chip select signal, active low	
37	GND	P	Ground	
38	LEDA1	P	LED anode	
39	LEDA2	P	LED anode	
40	LEDA3	P	LED anode	

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41	LEDA4	P	LED anode	
42	NC	-	No connection	
43	NC	-	No connection	
44	LEDK	P	LED cathode	
45	LCM_ID	-	LCM Identify pin	

Note2-1: I/O definition:

I----Input O---Output P----Power/Ground

Note2-2: 8/9/16/18 bit interface selection

LCD DATA	18 bit interface	16 bit interface	9 bit interface	8 bit interface
D0	DATA0-17	GND	GND	GND
D1-8		DATA0-7	GND	GND
D9		GND	DATA0	GND
D10-17		DATA 8-15	DATA1-8	DATA0-7
PS2	GND	GND	IOVCC	IOVCC
PS3	IOVCC	GND	IOVCC	GND



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Analog Supply Voltage	VCI	-0.3	4.6	V	
Logic Supply Voltage	IOVCC	-0.3	4.6	V	
Input voltage	D0~D17,CS,RS,WR,RD RESET,PS2,PS3	-0.3	IOVCC +0.3	V	
Touch Panel Pin Voltage	XR,YD,XL,YU	-	7	V	
Back Light Forward Current	I _{LED}	--	25	mA	For each LED
Operating Temperature	T _{OPR}	-20	60	°C	
Storage Temperature	T _{STG}	-30	70	°C	

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark	
Analog Supply Voltage	VCI	2.5	2.8	3.3	V		
Logic Supply Voltage	IOVCC	2.5	2.8	3.3	V		
Input Signal Voltage	Low Level	V _{IL}	0	--	0.2x IOVCC	V	D0~D17,CS,RS,WR,RD RESET,PS2,PS3
	High Level	V _{IH}	0.8x IOVCC	--	IOVCC		
Output Signal Voltage	Low Level	V _{OL}	0	--	0.2x IOVCC	V	FLM
	High Level	V _{OH}	0.8x IOVCC	--	IOVCC		
(Panel+LSI) Power Consumption	Black Mode (60Hz)	--	15.4	--	mW		
	8 color Mode	--	70	--	μW		
	Sleeping Mode	--	196	--	μW		

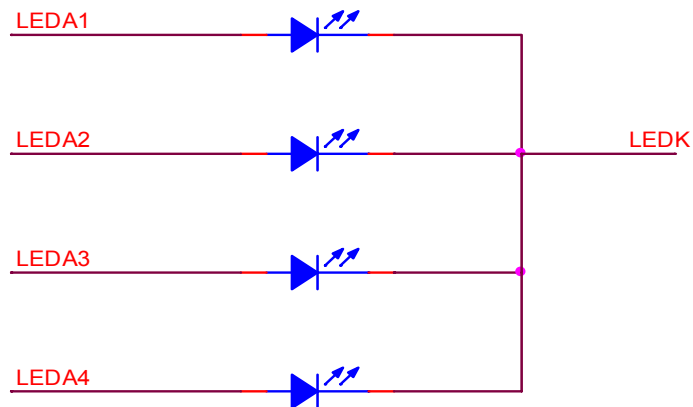


4.2 Driving Backlight

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	15	--	mA	For each LED
Forward Current Voltage	V_F	--	3.2	--	V	
Backlight Power Consumption	W_{BL}	--	192	--	mW	

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

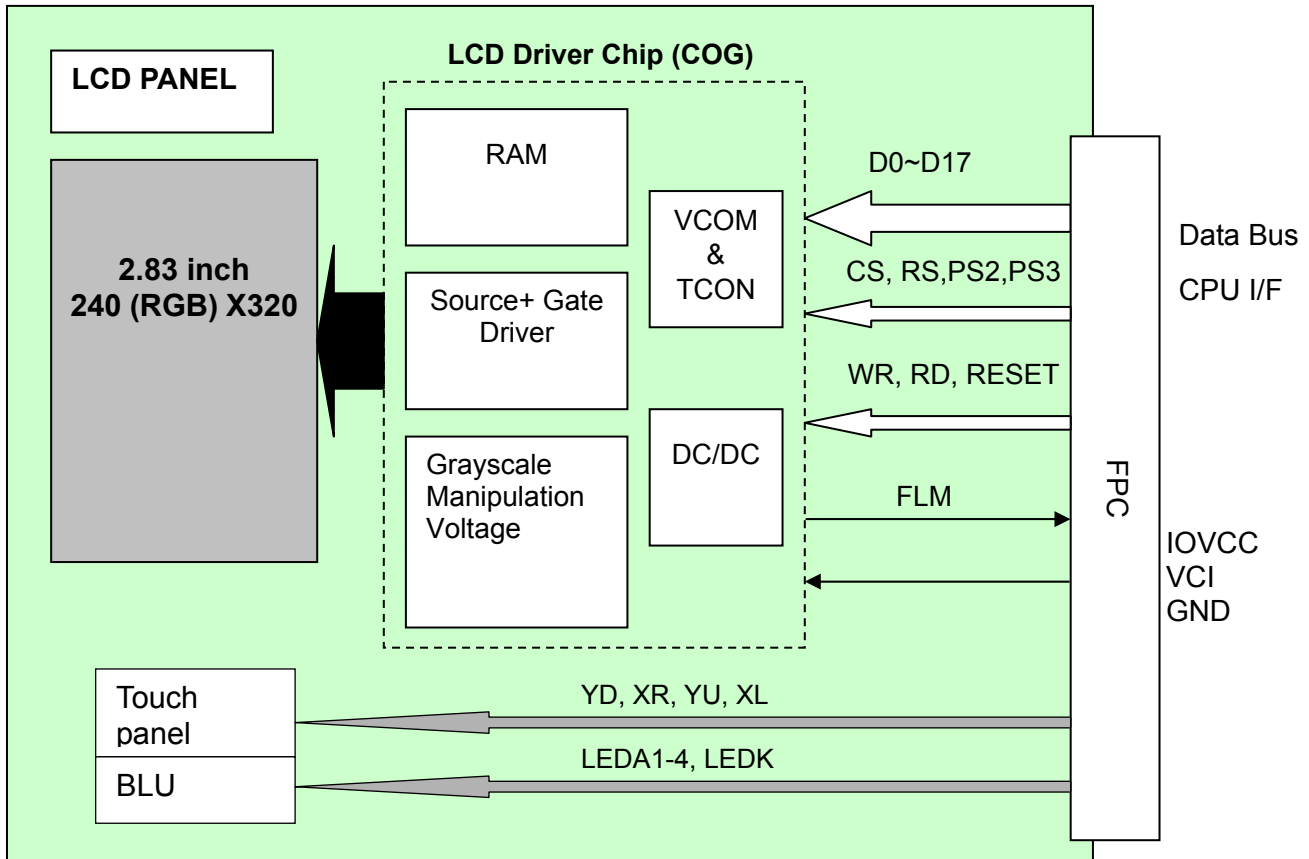


Note 2: One LED : $I_F = 15 \text{ mA}$, $V_F = 3.2 \text{ V}$

Note 3: The Minimum Life of LED : 20,000 hours



4.3 Block Diagram





5 Timing Chart

5.1 Timing Parameter

Item		Symbol	Unit	Min	Typ	Max
Bus cycle time	Write	t_{CYCW}	ns	100	-	-
	Read	t_{CYCR}	ns	300	-	-
Write low-level pulse width		PW_{LW}	ns	50	-	500
Write high-level pulse width		PW_{HW}	ns	50	-	-
Read low-level pulse width		PW_{LR}	ns	150	-	-
Read high-level pulse width		PW_{HR}	ns	150	-	-
Write / Read rise / fall time		t_{WRr} / t_{WRf}	ns	-	-	25
Setup time	Write (RS to CS, WR)	t_{AS}	ns	10	-	-
	Read (RS to CS, RD)			5	-	-
Address hold time		t_{AH}	ns	5	-	-
Write data set up time		t_{DSW}	ns	10	-	-
Write data hold time		t_H	ns	15	-	-
Read data delay time		t_{DDR}	ns	-	-	100
Read data hold time		t_{DHR}	ns	5	-	-

Table 5.1 timing parameter

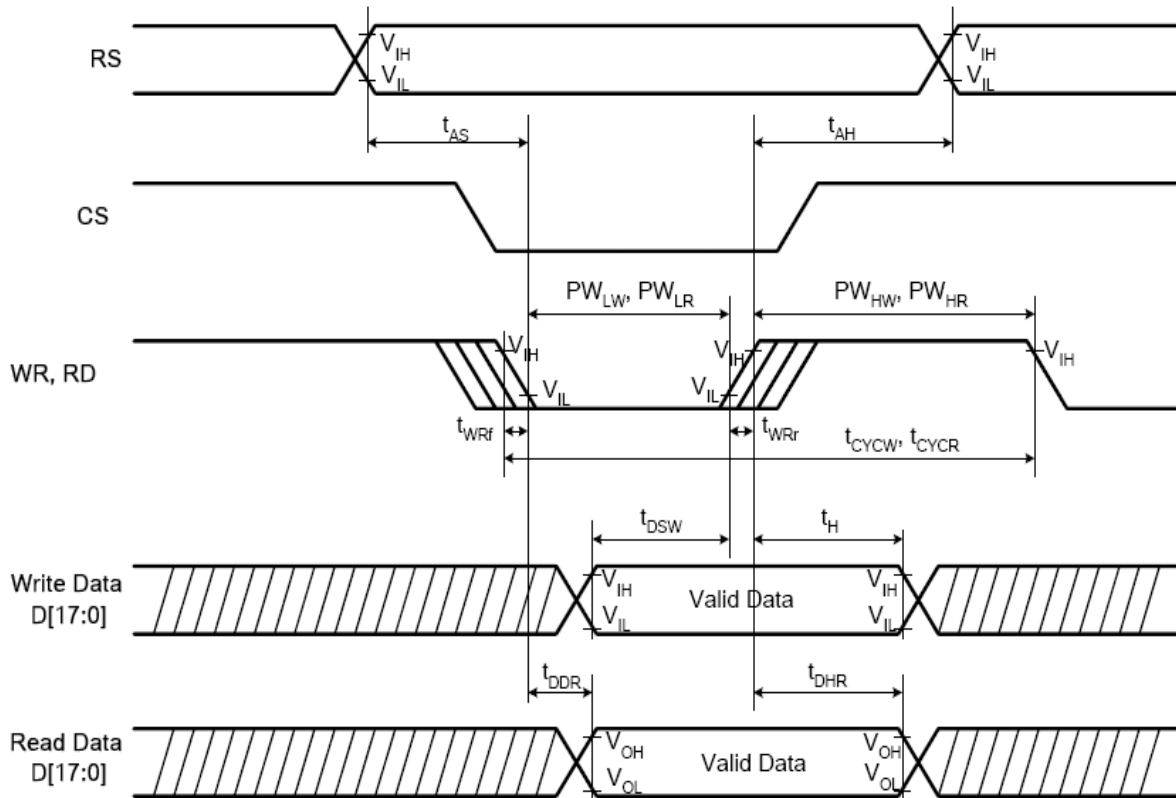
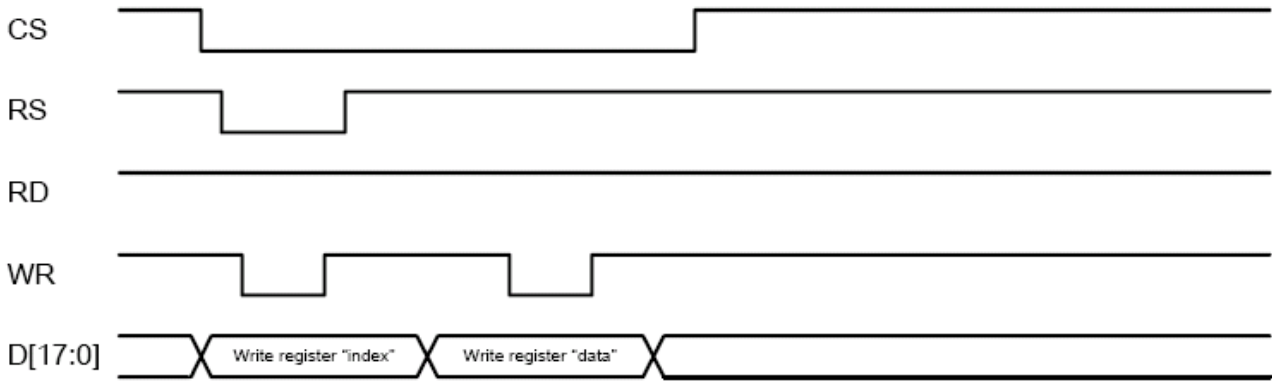


Figure 5.1 i80 System Bus Timing

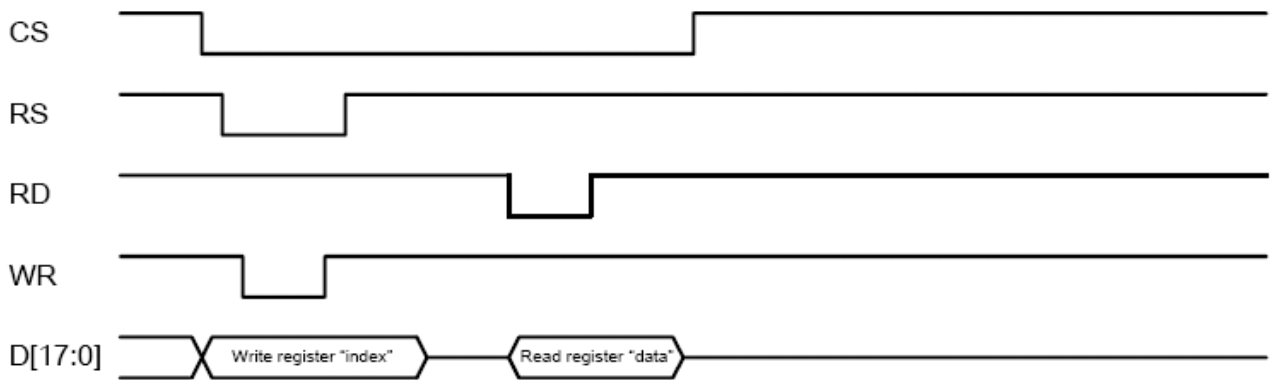


5.2 Register write/read timing in I80 series system

a, Write to register



b. Read from register



5.3 GRAM write timing in i80 series system

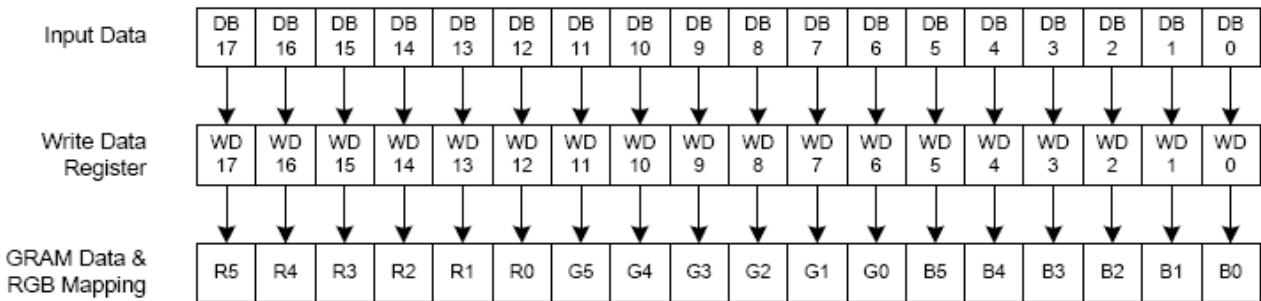
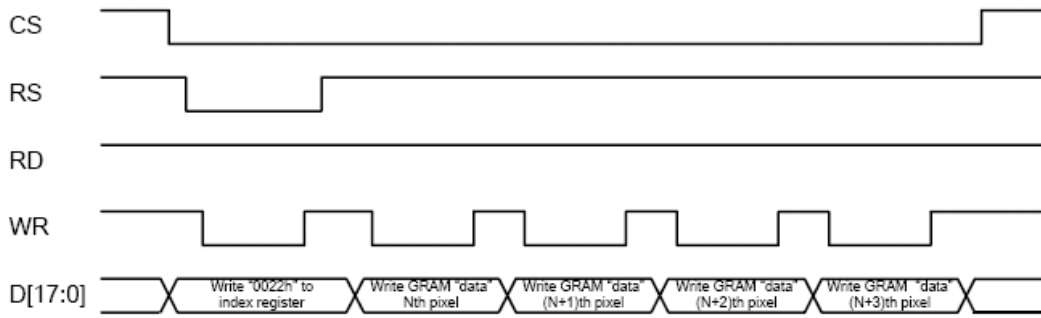


Table 5.3 GRAM Data and display data of 18-bit system interface

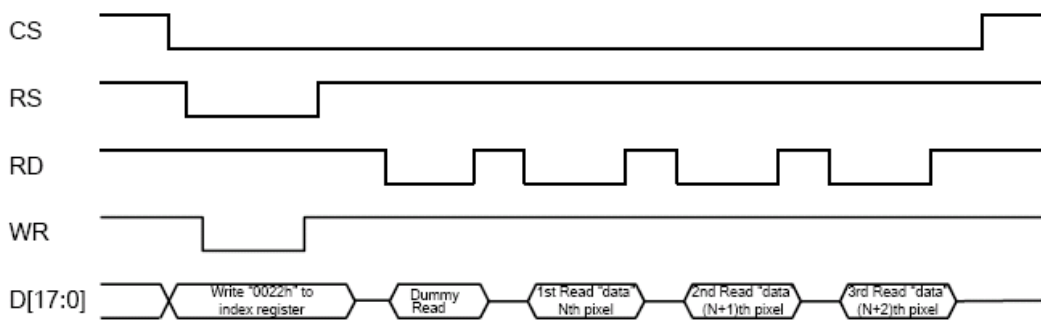


GRAM Read/Write Timing

(a) Write to GRAM



(b) Read from GRAM



5.4 Reset Timing Characteristics

Ta=25°C

Item	Symbol	Unit	Min	Typ	Max
Reset low-level width	t _{RES}	ms	1	-	-
Reset rise time	t _{rRES}	μs	-	-	10

Table 5.4 RESET Timing Parameter

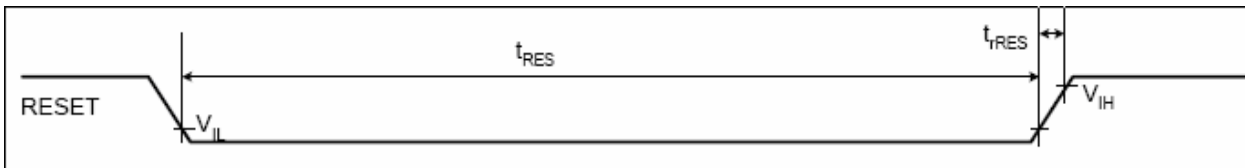
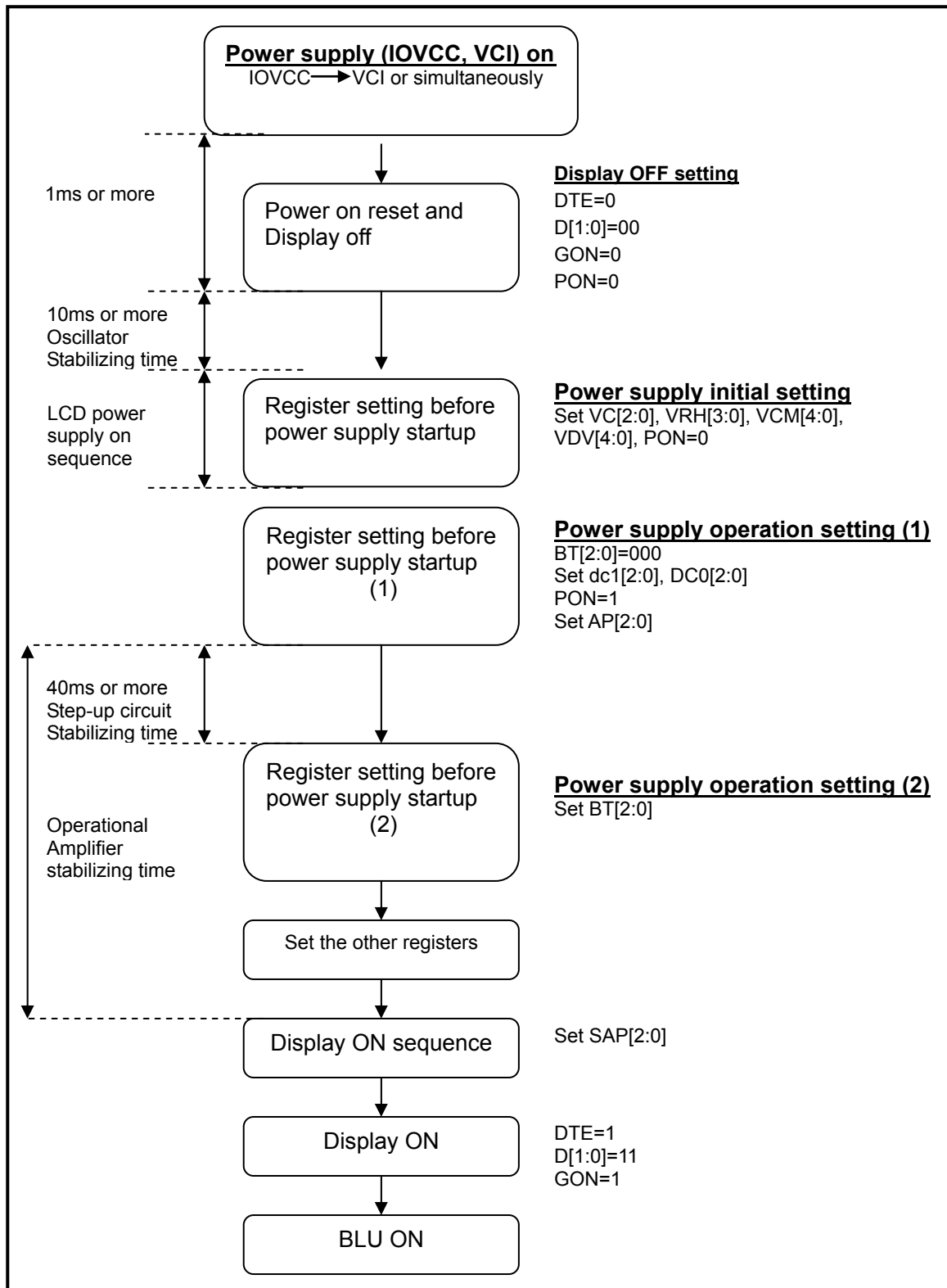


Figure 5.4 RESET Timing

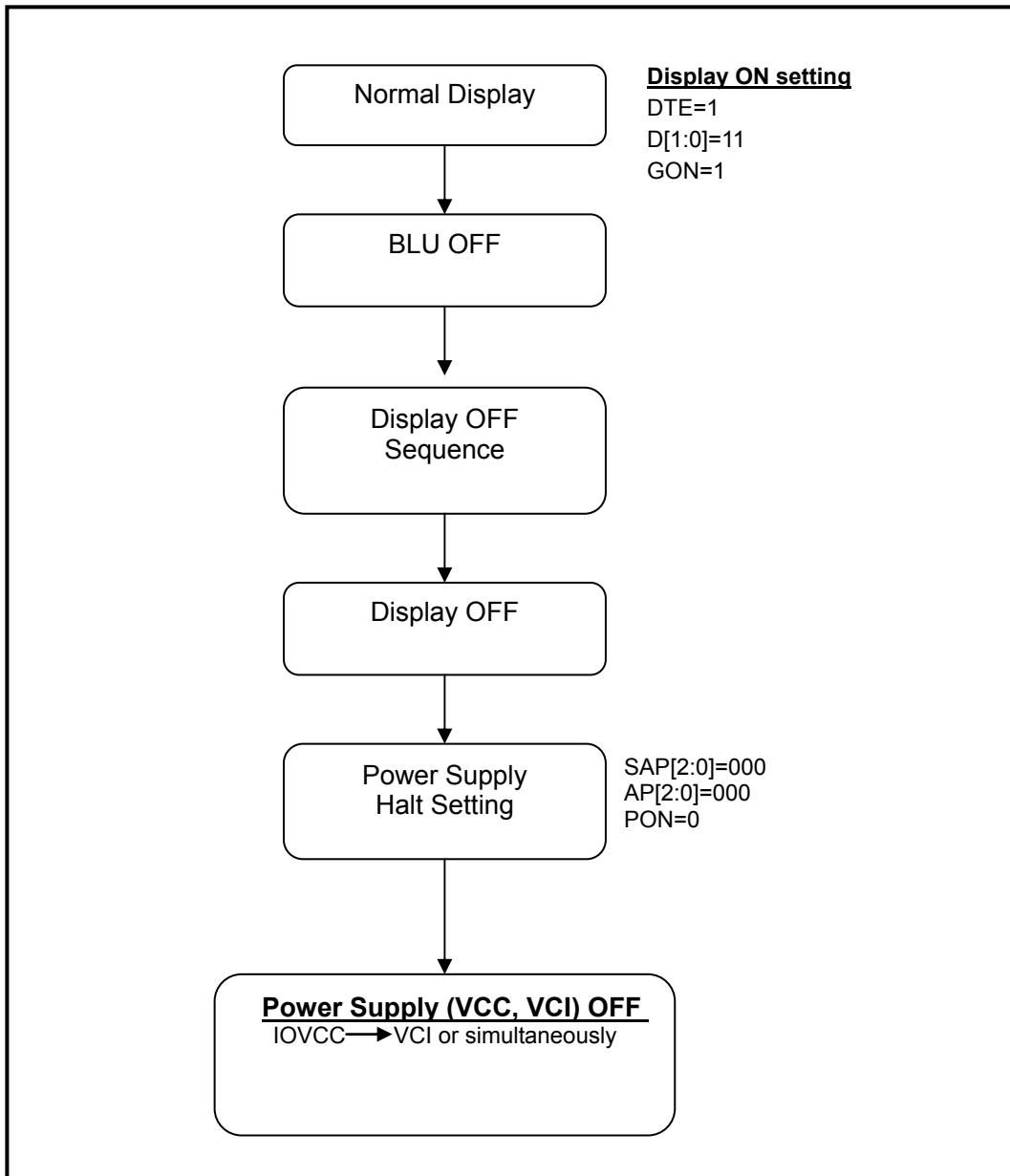


5.5 Power On/Off sequence
5.5.1 Power on Sequence





5.5.2 Power off Sequence





6 Optical Characteristics

Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
View Angles	θT	$CR \geq 10$	65	70	-	Degree	Note 2	
	θB		50	55	-			
	θL		65	70	-			
	θR		65	70	-			
Contrast Ratio	CR	$\theta=0^\circ$	300	400	-	-	Note1 Note3	
Response Time	T_{ON}	25°C	-	25	40	ms	Note1	
	T_{OFF}						Note4	
Chromaticity	White	Backlight is on	x	0.230	0.280	0.330	-	Note5 Note1
			y	0.250	0.300	0.350		
	Red		x	0.564	0.614	0.664		
			y	0.321	0.371	0.421		
	Green		x	0.284	0.334	0.384		
			y	0.547	0.597	0.647		
	Blue		x	0.091	0.141	0.191		
			y	0.060	0.110	0.160		
Uniformity	U	-	75	85	-	%	Note1 Note6	
NTSC	-	-	-	55	-	%	Note 5	
Luminance(TSP)	L		210	240	-	cd/m ²	Note1 Note7	

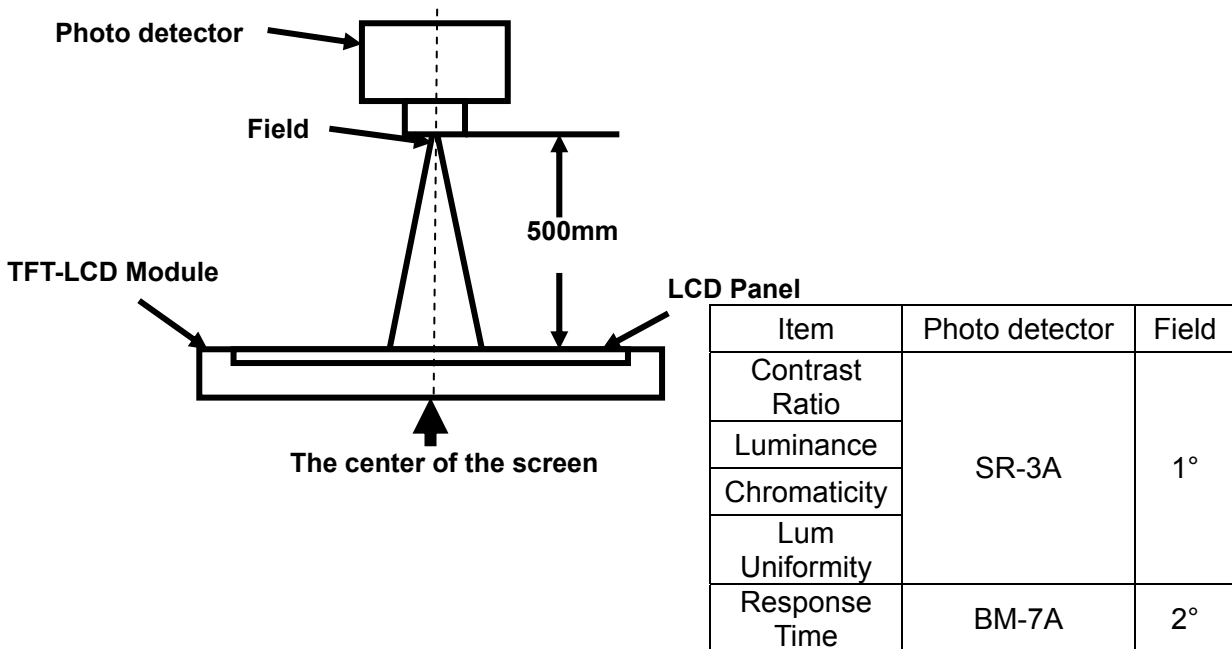
Test Conditions:

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).

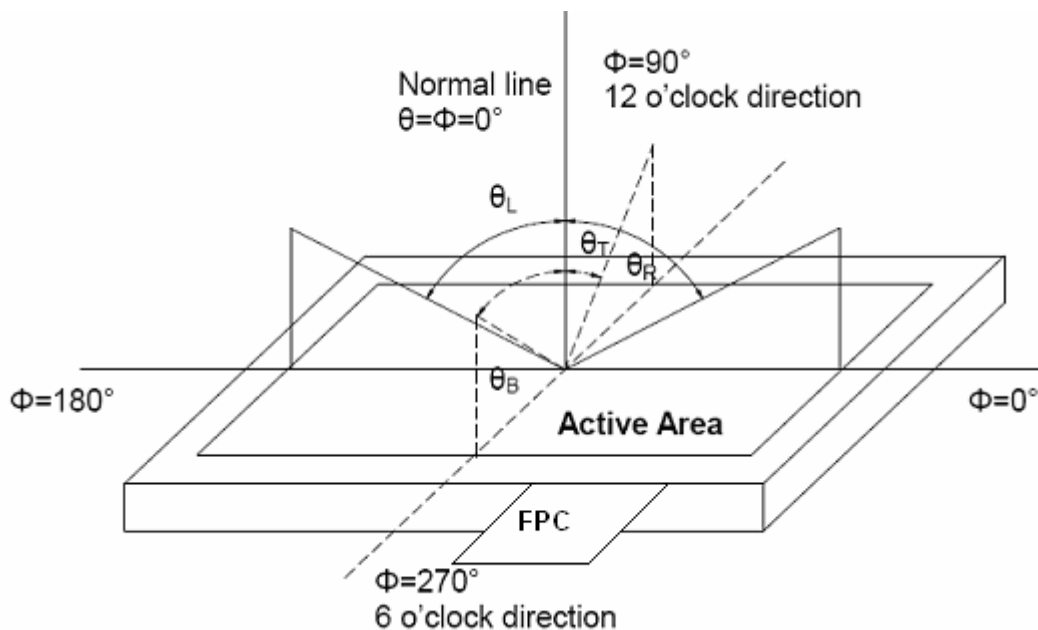


Fig. 1 Definition of viewing angle

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Note 3: Definition of contrast ratio

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

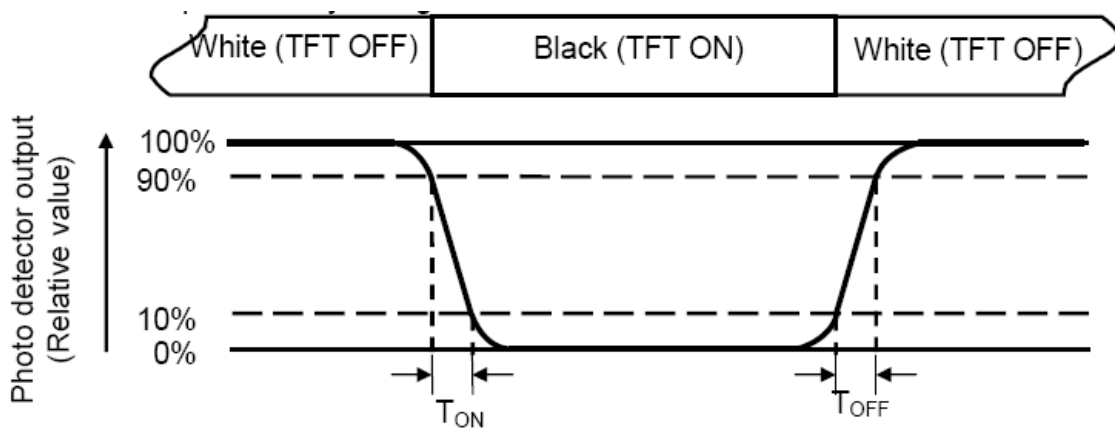
“White state “:The state is that the LCD should driven by V_{white} .

“Black state”: The state is that the LCD should driven by V_{black} .

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.

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

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

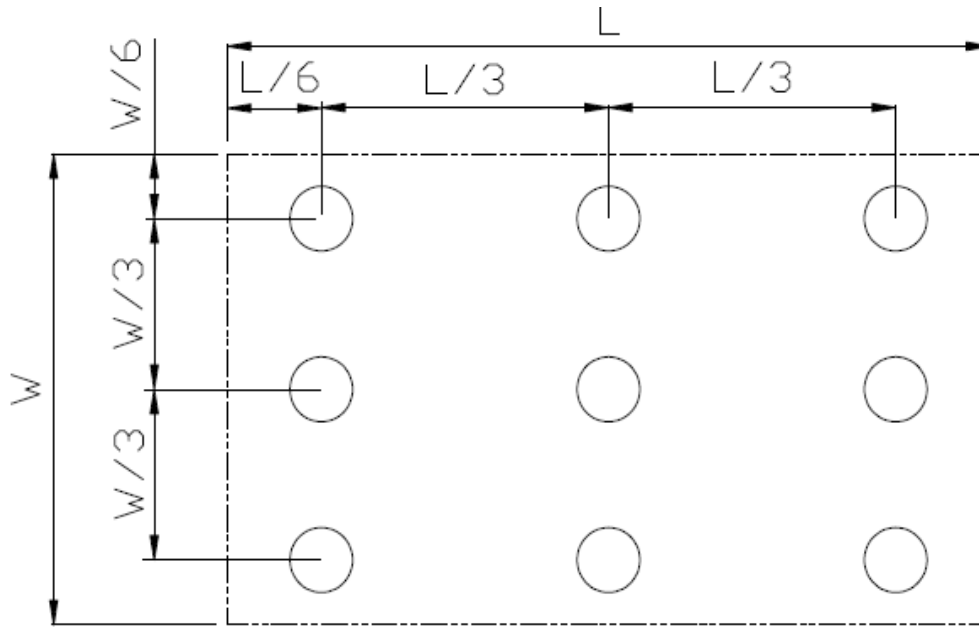


Fig. 2 Definition of uniformity

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.



7 Environmental / Reliability Test

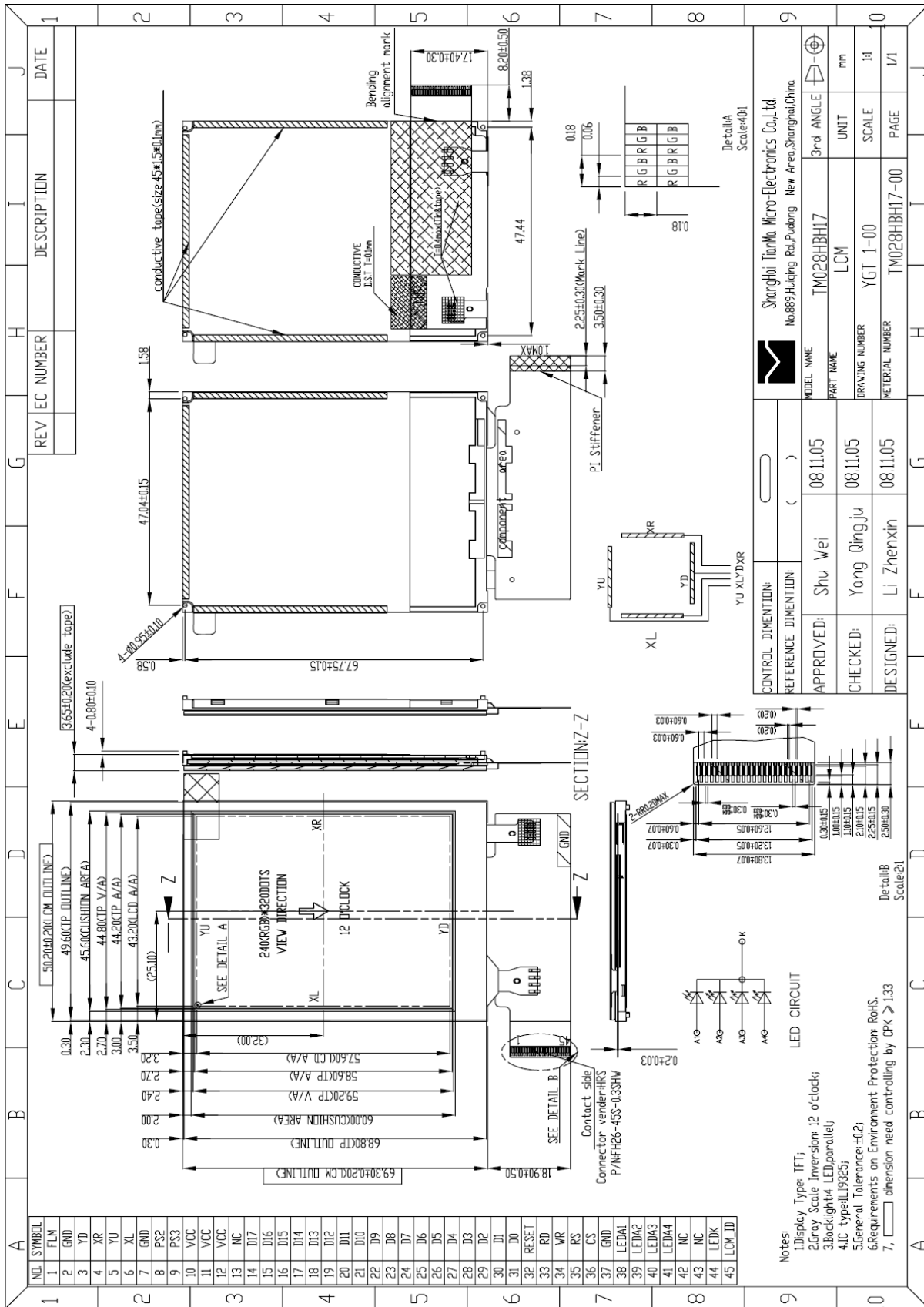
No	Test Item	Condition	Remark
1	High Temperature Operation	T _s =+60°C, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	Low Temperature Operation	T _a =-20°C, 240hrs	IEC60068-2-1 GB2423.1—89
3	High Temperature Storage	T _a =+70°C, 240hrs	IEC60068-2-2, GB2423.2—89
4	Low Temperature Storage	T _a =-30°C, 240hrs	IEC60068-2-1 GB2423.1—89
5	High Temperature & High Humidity Storage	T _a =+60°C, 90% RH 240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
6	Thermal Shock (Non-operation)	-30°C 30 min~+70°C 30 min, Change time:5min, 20 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°C ~ 35°C, 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)	60G 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: T_s is the temperature of panel's surface.

Note2: T_a is the ambient temperature of sample.



8 Mechanical Drawing



REV	EC NUMBER	DESCRIPTION	DATE

CONTROL DIMENSION:	()	MODEL NAME	TM028HBH17	3rd ANGLE	
REFERENCE DIMENSION:	()	PART NAME	LCM	UNIT	mm
APPROVED:	Shu Wei	DRAWING NUMBER	YGT 1-00	SCALE	1:1
CHECKED:	Yang Qingju	MATERIAL NUMBER	TM028HBH17-00	PAGE	1/1
DESIGNED:	Li Zhenxin				

Notes:

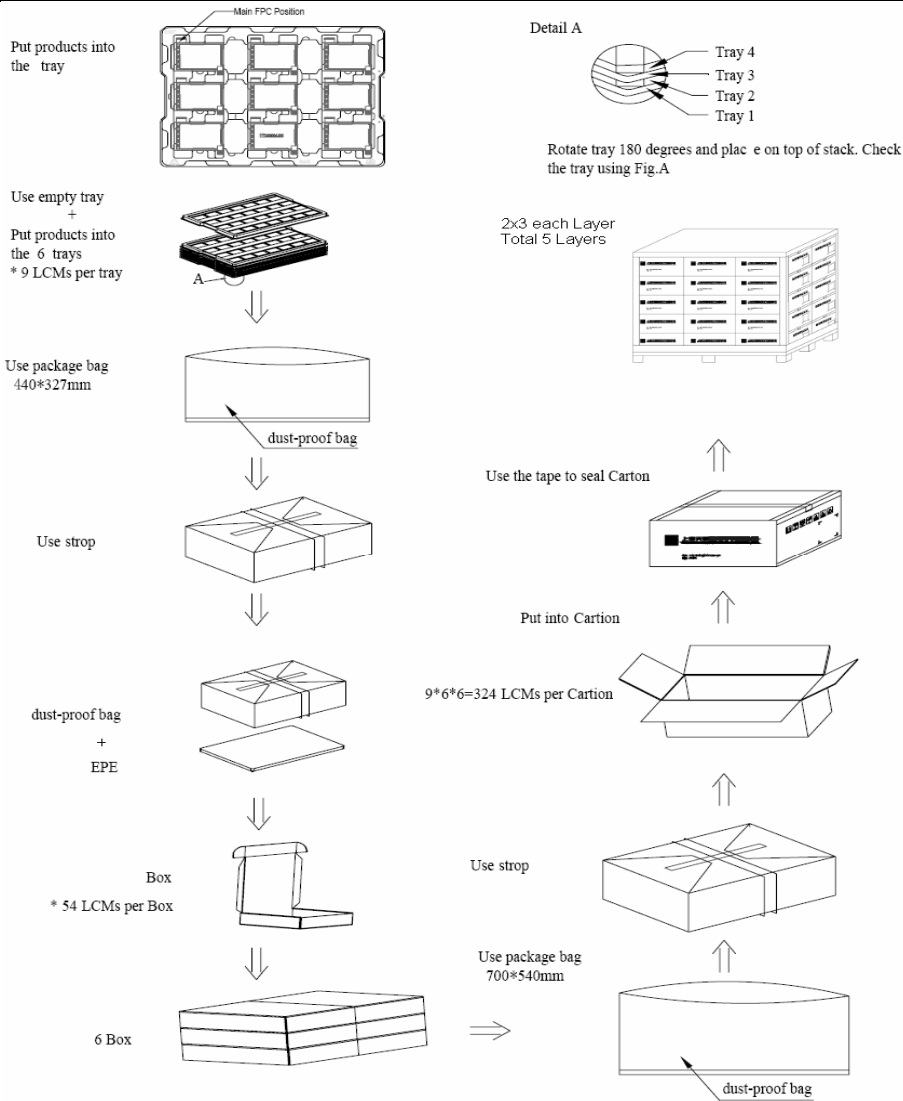
1. Display Type: TFT;
2. Grey Scale Inversion: 12 o'clock;
3. Backlight: 4 LED, parallel;
4. IC type: IL19325;
5. General Tolerance: ±0.2;
6. Requirements on Environment Protection: RoHS;
7. dimension need controlling by CPK > 1.33

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9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark	
1	LCM module	TM028HBH17	50.20x69.30x3.65	0.021	324		
2	Tray	PET(Transmit)	315×247×11.6	0.079	42	Anti-static	
3	EPE	EPE	315×247×5	0.009	6		
4	Dust-proof BAG	PE	700×545	0.046	1		
5	Anti-static bag	PE	327×440	0.021	6		
6	BOX	Corrugated Paper	345×260×70	0.227	6		
7	Carton	Corrugated Paper	544×365×250	1.01	1		
8	Total weight(Kg)	12.8					



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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°C ~ 40°C 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.