



MODEL NO. : TM022HDH07

ISSUED DATE: 2009-01-04

VERSION : Ver 1.0

- 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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1 General Specifications

Feature		Spec
Display Spec.	Size	2.2 inch
	Resolution	240(RGB) x 320
	Interface	RGB 18 bits
	Color Depth	262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.1395 x 0.1395
	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)	40.10x55.20x2.10
	Active Area(mm)	33.48 x 44.64
	With /Without TSP	Without TSP
	Weight (g)	5.8
	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

No	Symbol	I/O	Description	Remark
1	VCC	P	Power	
2	VCC	P	Power	
3	GND	P	Ground	
4	GND	P	Ground	
5	/RESET	I	Reset	
6	VSYNC	I	Frame Sync	
7	HSYNC	I	Line sync	
8	DOTCLK	I	Dot Clock	
9	ENABLE	I	Data Enable	
10	GND	P	Ground	
11	D17	I	Data Bus	
12	D16	I	Data Bus	
13	D15	I	Data Bus	
14	D14	I	Data Bus	
15	D13	I	Data Bus	
16	D12	I	Data Bus	
17	D11	I	Data Bus	
18	D10	I	Data Bus	
19	D9	I	Data Bus	
20	D8	I	Data Bus	
21	D7	I	Data Bus	
22	D6	I	Data Bus	
23	D5	I	Data Bus	
24	D4	I	Data Bus	
25	D3	I	Data Bus	
26	D2	I	Data Bus	
27	D1	I	Data Bus	
28	D0	I	Data Bus	

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29	SCL	I	SPI Clock	
30	SDI	I	SPI Input	
31	SDO	O	SPI Output	
32	/CS	I	SPI chip select	
33	VCC	P	Power	
34	GND	P	Ground	
35	LED A	P	LED anode	
36	LED A	P	LED anode	
37	LED K1	P	LED cathode	
38	LED K2	P	LED cathode	
39	LED K3	P	LED cathode	
40	LED K4	P	LED cathode	

Note1: I/O definition.

I---Input, O---Output, P--- Power/Ground, N--- No connection



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Supply Voltage	VCC	-0.3	4.6	V	
Input Signal Voltage	DB0~DB17,/CS,SDI, SCL,/RESET,DOTCLK, VSYNC,HSYNC,ENABLE	-0.3	VCC+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	
Supply Voltage	VCC	1.65	2.8	3.3	V		
Input Signal Voltage	Low Level	V _{IL}	0	-	0.2xVCC	V	DB0~DB17,/CS,SDI,SCL,/RESET,DOTCLK,VSYNC,HSYNC,ENABLE
	High Level	V _{IH}	0.8xVCC	-	VCC	V	
Output Signal Voltage	Low Level	V _{OL}	0	-	0.3xVCC	V	SDO
	High Level	V _{OH}	0.7xVCC	-	VCC	V	
Power Consumption (Panel+ LSI)	Black Mode(60Hz)	-	TBD	-	mW	Frame rate 60Hz, VCC=2.8V,	
	Standby Mode	-	TBD	-	uW		
	Sleeping Mode	-	TBD	-	uW		

4.2 Driving Backlight

Ta=25°C

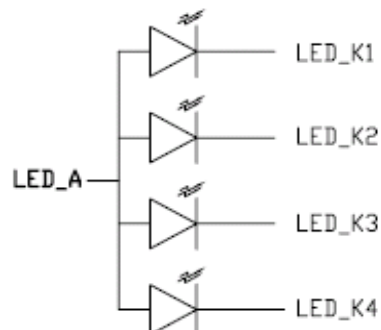
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I _F	-	72	100	mA	4 LEDs (in parallel)
Forward Voltage	V _F	-	3.2	3.5	V	
Power Consumption	W _{BL}	-	230	350	mW	

Note 1: The LED driving condition is defined for each LED module (4 LED Parallel) .

Note 2: $W_{BL} = I_{F1} \times V_{F1} + I_{F2} \times V_{F2} + I_{F3} \times V_{F3} + I_{F4} \times V_{F4}$

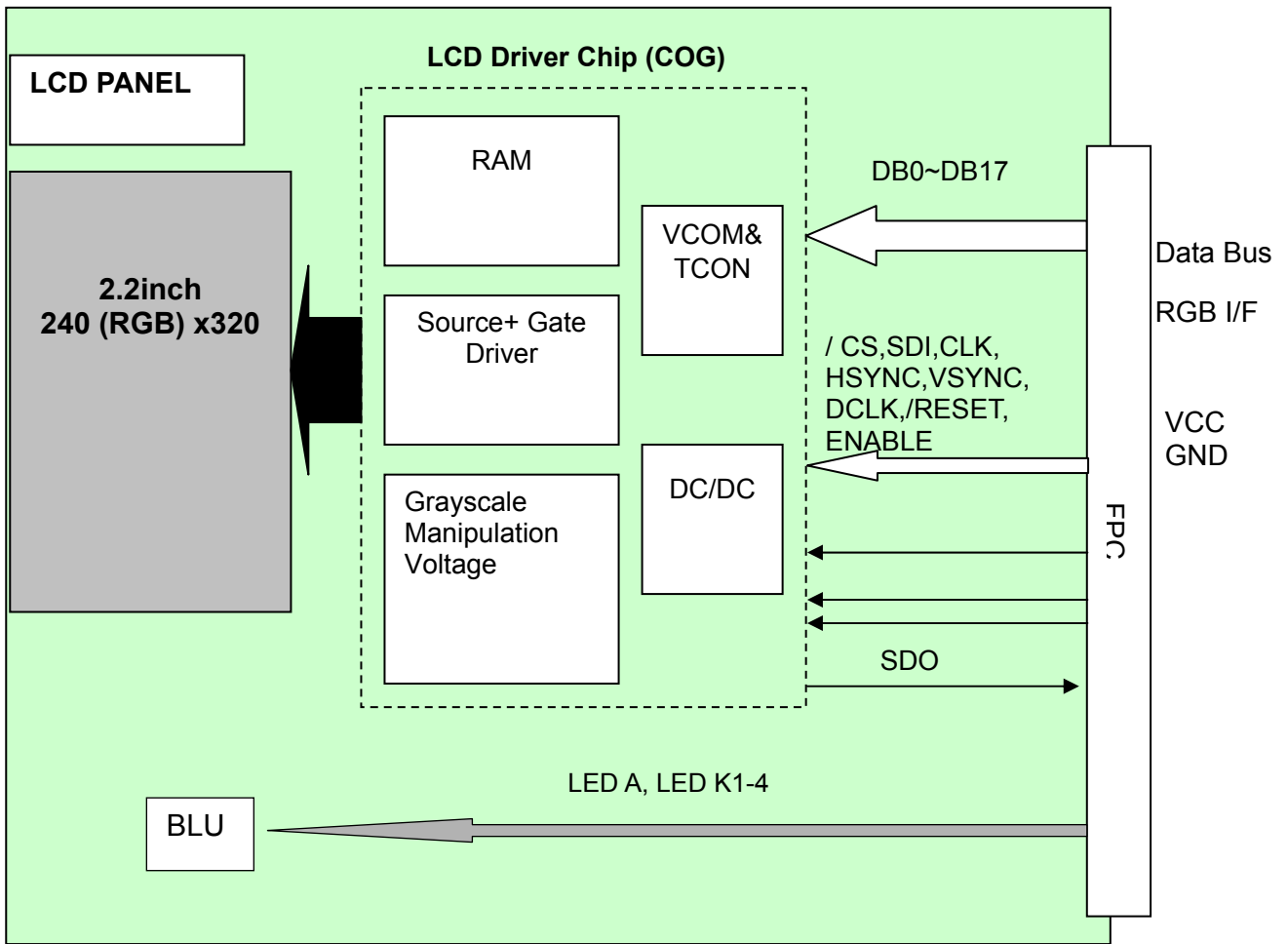
Note 3: The minimum life of LED is 20,000 hours, which is defined that the brightness becomes 50% of the original value under standard condition.

Note 4: The LED driving condition is defined for each LED module.





4.3 Block Diagram

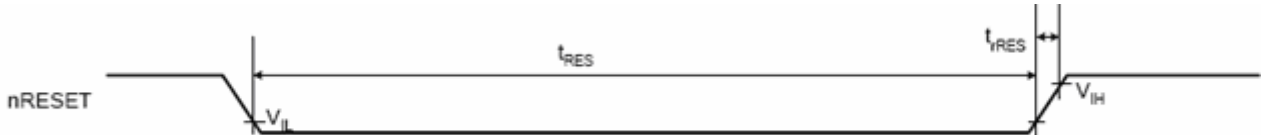




5 Timing Chart

5.1 Reset Timing Characteristics(VCC=1.65-3.3V)

Item	Symbol	Unit	Min	Typ	Max
Reset Low-level Width	t_{RES}	ms	1	-	-
Reset Rise Time	t_{rRES}	μ s	-	-	10

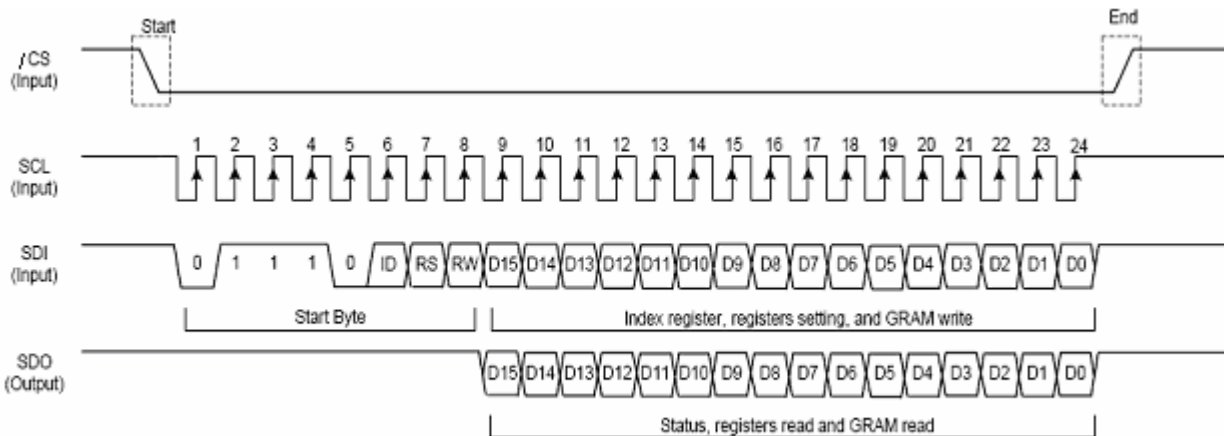


5.2 Serial Peripheral Interface

5.2.1 RS And R/W Bit Function

RS	R/W	Function
0	0	Set an index register
0	1	Read a status
1	0	Write a register or GRAM data
1	1	Read a register or GRAM data

5.2.2 The Data Format of Instruction is Serial 16bit



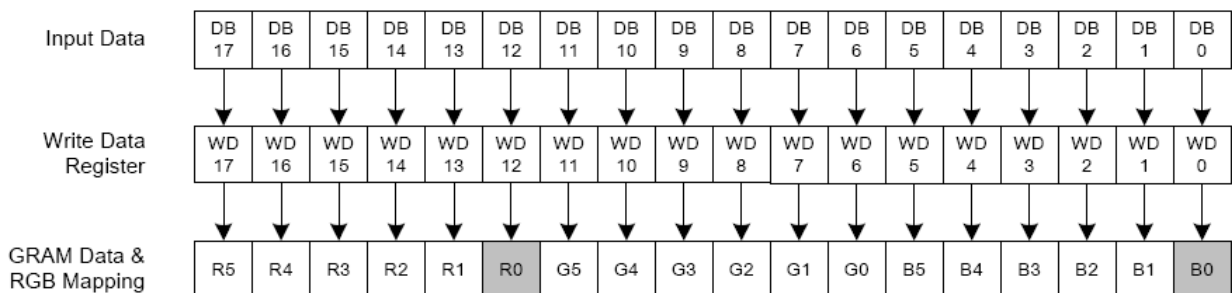


5.2.3 Serial Data Transfer Timing Characteristics

Item		Symbol	Unit	Min	Typ	Max
Serial clock cycle time	Write(received)	t_{SCYC}	μs	100	-	-
	Read(transmitted)	t_{SCYC}	μs	200	-	-
Serial clock high-level pulse width	Write(received)	t_{SCH}	ns	40	-	-
	Read(transmitted)	t_{SCH}	ns	100	-	-
Serial clock low-level pulse width	Write(received)	t_{SCL}	ns	40	-	-
	Read(transmitted)	t_{SCL}	ns	100	-	-
Serial clock rise/fall time		t_{SCr}, t_{SCf}	ns	-	-	5
Chip select set up time		t_{CSU}	ns	10	-	-
Chip select hold time		t_{CH}	ns	50	-	-
Serial input data set up time		t_{SISU}	ns	20	-	-
Serial input data hold time		t_{SIH}	ns	20	-	-
Serial output data set up time		t_{SOD}	ns	-	-	100
Serial output data hold time		t_{SOH}	ns	5	-	-

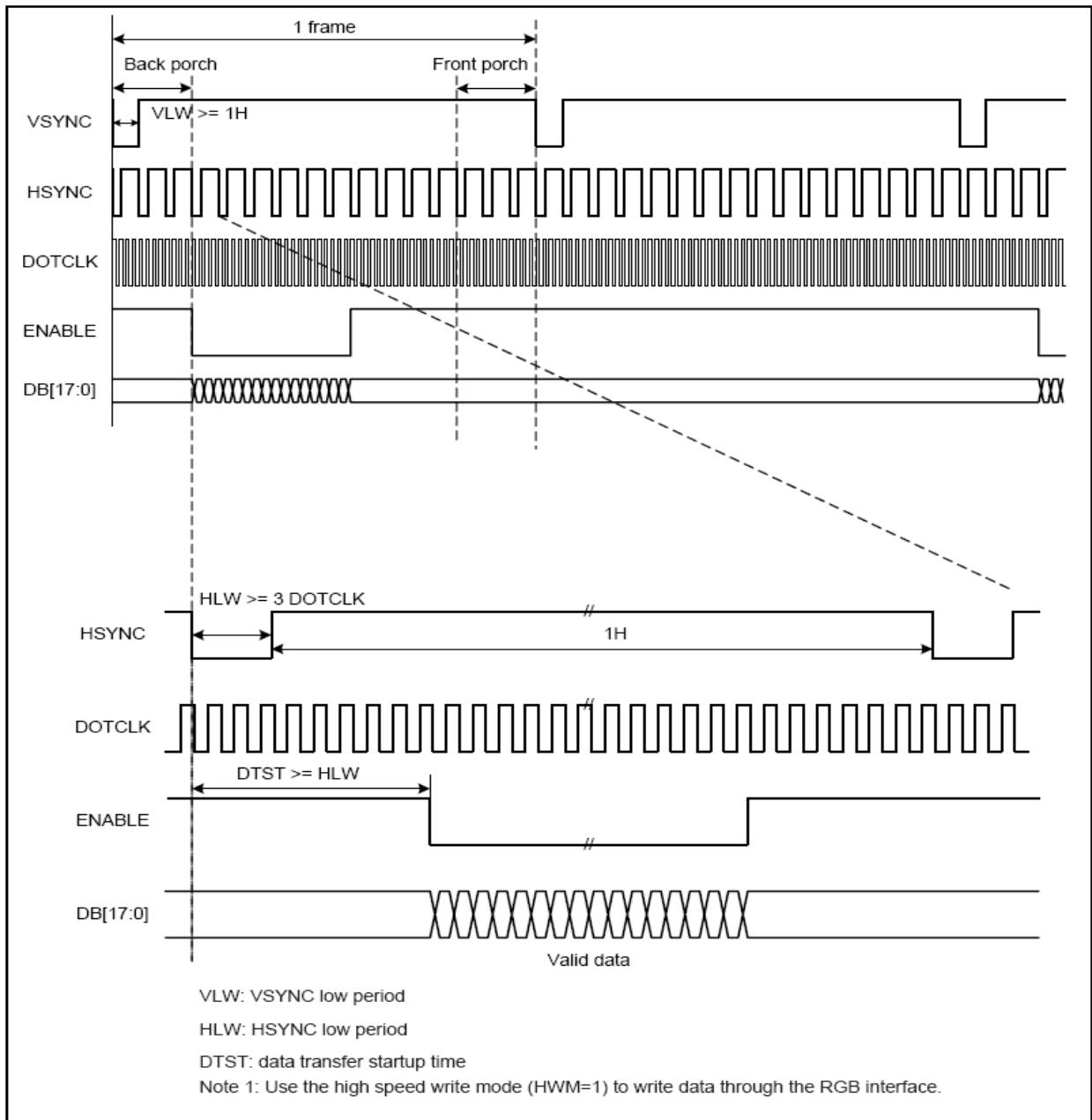
5.3 18bit RGB Interface

5.3.1 The Data Format for Picture is Parallel 18bit





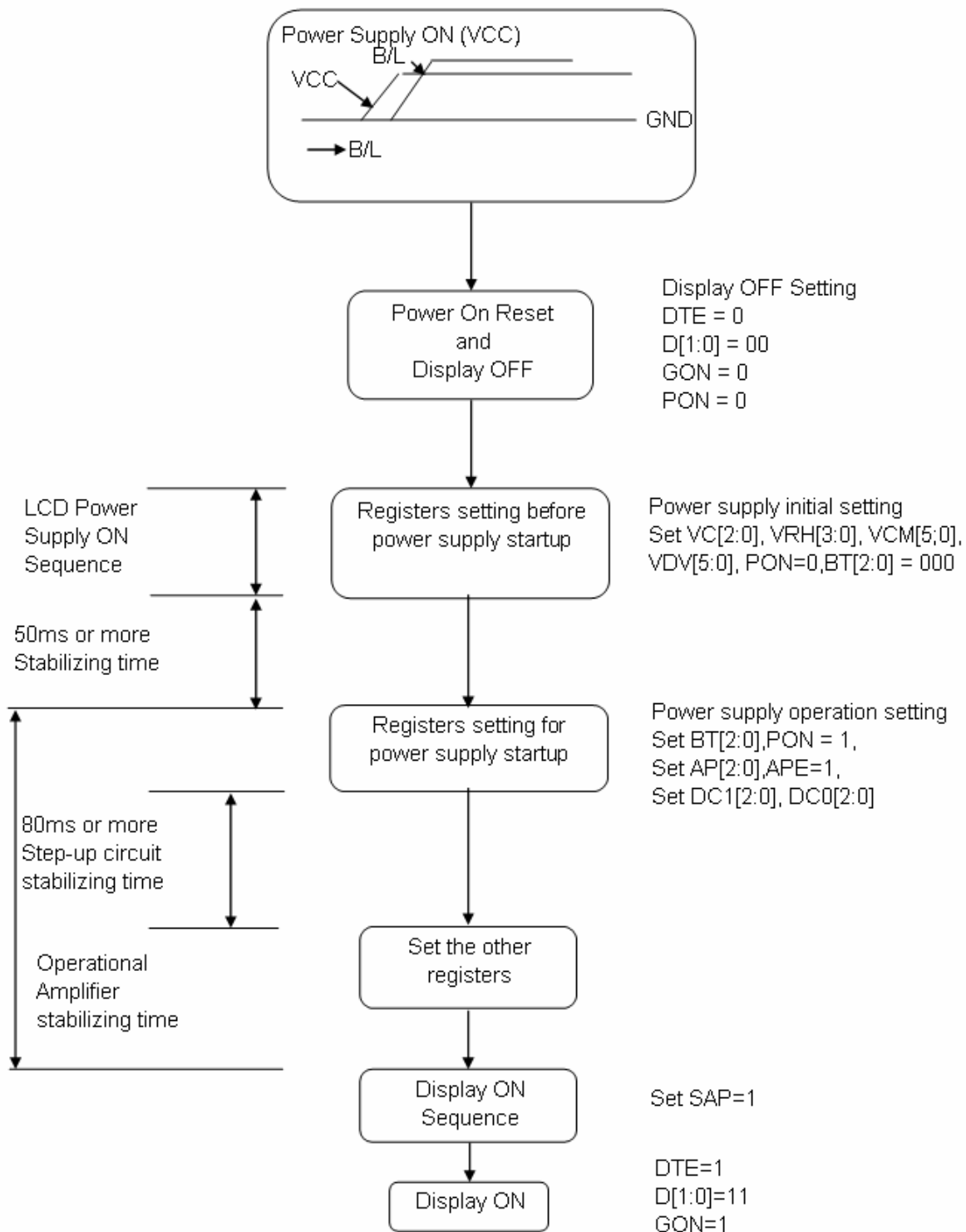
5.3.2 Time Chart of Signal 18bit RGB Interface Mode





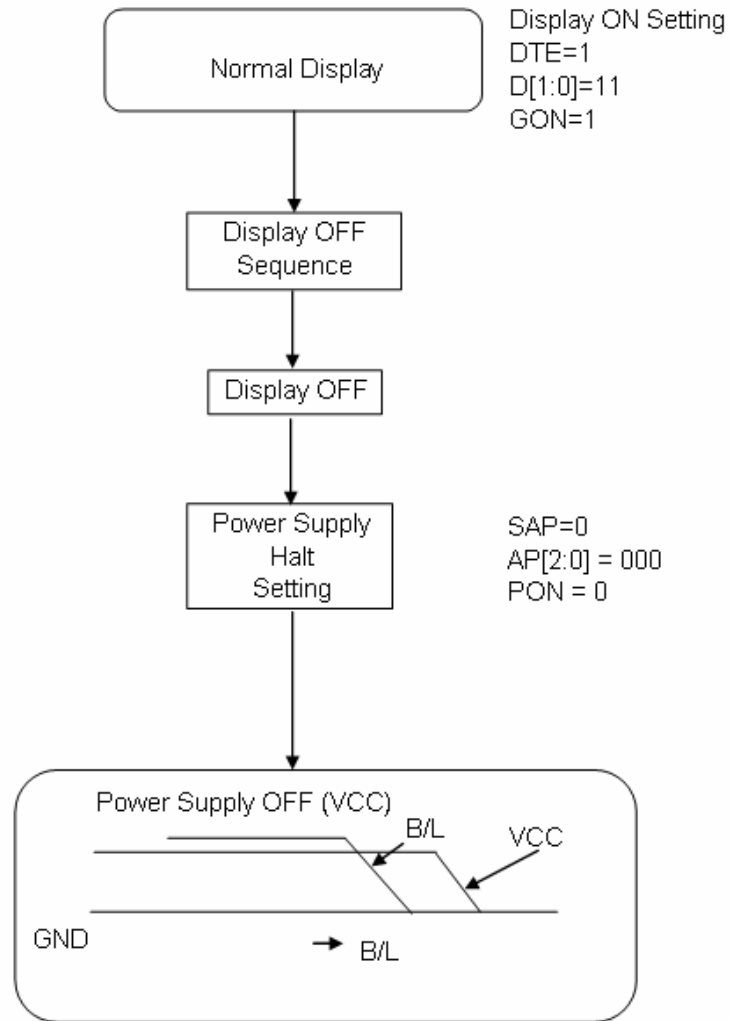
5.4 Power On/Off Sequence

5.4.1 Power on Sequence





5.4.2 Power off Sequence





6 Optical Characteristics

Optical Specification

Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	$CR \cong 10$	50	60	-	Degree	Note 2
	θB		30	40	-		
	θL		50	60	-		
	θR		50	60	-		
Contrast Ratio	CR	$\theta=0^\circ$	200	350	-		Note1,3
Response Time	T_{ON}	25°C	-	25	40	ms	Note1,4
	T_{OFF}						
Chromaticity	White	Backlight is on	x	0.245	0.295	0.345	Note1,5
			y	0.256	0.316	0.356	
	Red		x	0.558	0.608	0.658	
			y	0.279	0.329	0.379	
	Green		x	0.271	0.321	0.371	
			y	0.559	0.609	0.659	
	Blue		x	0.094	0.144	0.194	
			y	0.046	0.096	0.146	
Uniformity	U		75	80	-	%	Note1,6
NTSC			-	62	-	%	Note 5
Luminance	L		140	180	-	cd/m ²	Note1,7

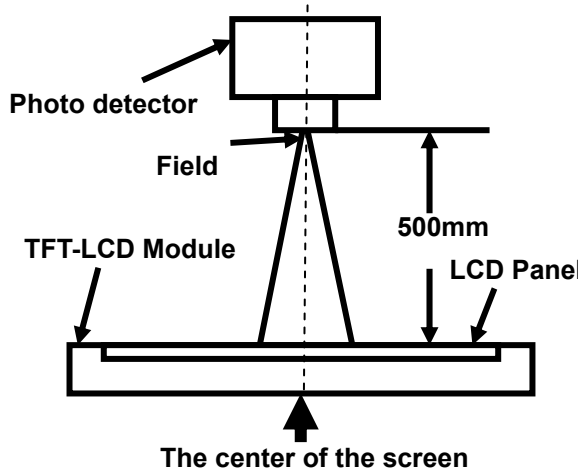
Test Conditions:

1. $V_F=3.2V$, $I_F=72mA$ (Backlight 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.

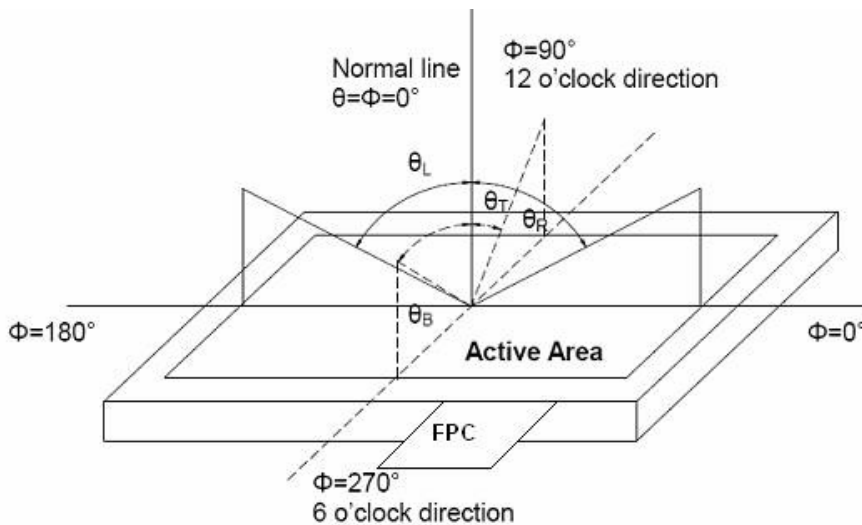
The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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

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

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

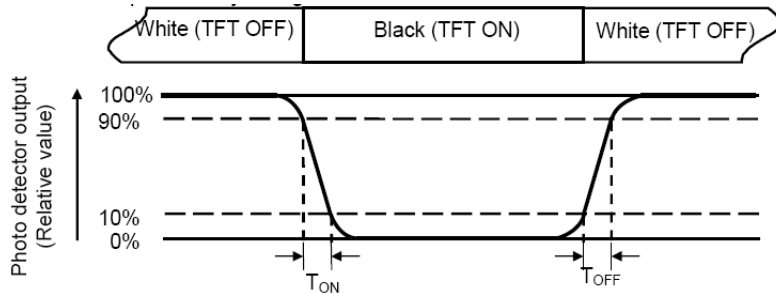
“Black state”: The state is that the LCD should be driven by Vblack.

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

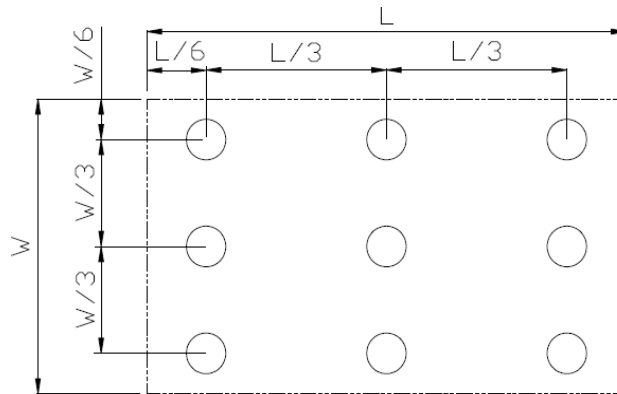


Fig. 2 Definition of uniformity

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.



7 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70°C, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	Low Temperature Operation	Ta=-20°C, 240hrs	IEC60068-2-1 GB2423.1—89
3	High Temperature Storage	Ta=+80°C, 240hrs	IEC60068-2-2, GB2423.2—89
4	Low Temperature Storage	Ta=-30°C, 240hrs	IEC60068-2-1 GB2423.1—89
5	High Temperature & High Humidity Storage	Ta=+60°C, 90% RH 240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°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:±6KV, 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

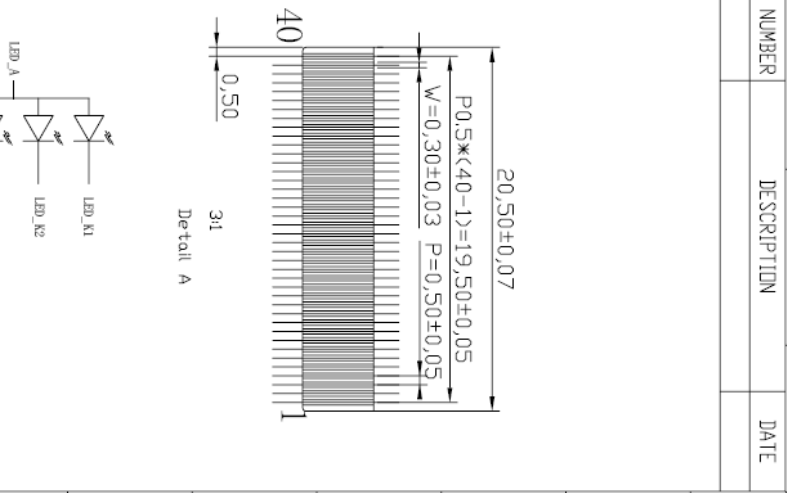
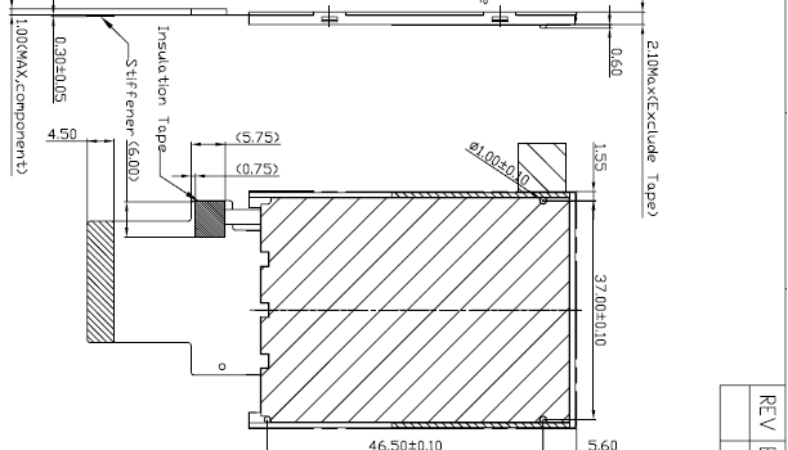
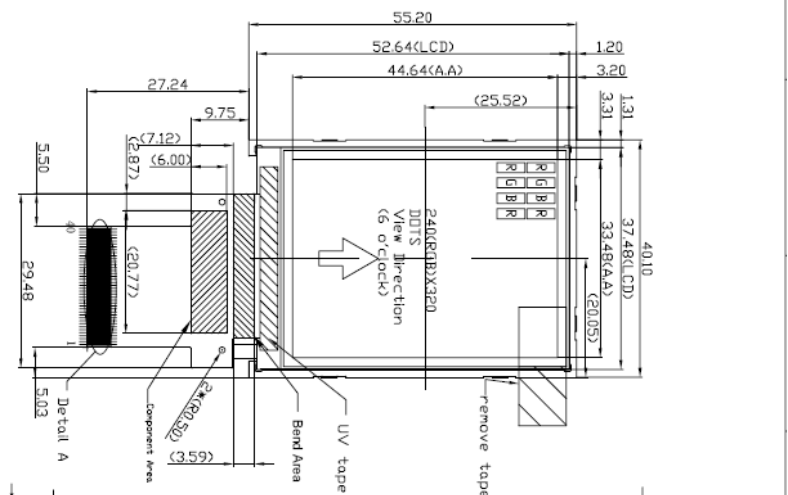
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.



8 Mechanical Drawing

No.	Symbol	
1	WCC	POWER
2	WCC	POWER
3	GND	GND/GND
4	GND	GND/GND
5	/RESET	Reset
6	HSYNC	Frame Sync
7	HSYNC	Line Sync
8	DOTCLK	Dot Clock
9	ENABLE	Data Enable
10	GND	Ground
11	017	
12	016	
13	015	
14	014	
15	013	
16	012	
17	011	
18	010	
19	009	
20	008	
21	007	
22	006	
23	005	
24	004	
25	003	
26	002	
27	001	
28	000	
29	SCL	SPI Clock
30	S01	SPI Input
31	S00	SPI Output
32	/CS	SPI Chip select
33	WCC	Power
34	GND	Ground
35	LED_A	LED Anode
36	LED_A	LED Anode
37	LED_K1	LED Cathode
38	LED_K2	LED Cathode
39	LED_K3	LED Cathode
40	LED_K1	LED Cathode



- Note:
1. This general tolerance: ±0.3
 2. The general tolerance of the active matrix
 3. Viewing Direction of clock
 4. IC: IL19225
 5. Display Mode: Transmissive
 6. Operating Temp: -30° C ~ 70° C
 7. Storage Temp: -30° C ~ 80° C

CONTROL DIMENTION:			
REFERENCE DIMENTION:	()		
APPROVED:	Maxiaoping	08.11.25	
CHECKED:	Huochunyan	08.11.25	
DESIGNED:	SaiYueFeng	08.11.25	
PRODUCT NUMBER	TM022HDH07-00		
DRAWING NUMBER	YGT1-00		
MATERIAL NUMBER	TM022HDH07-00		

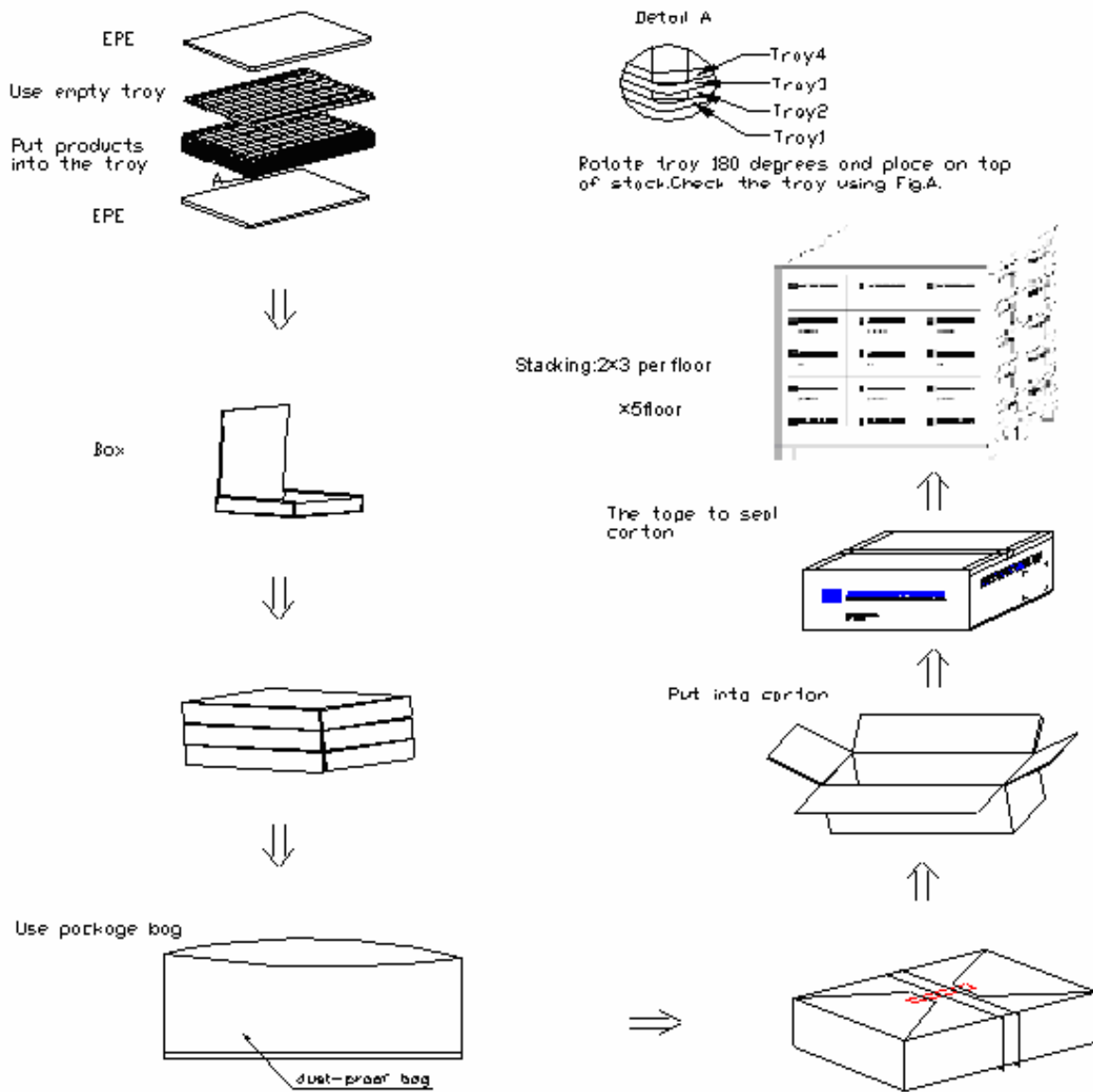
REV	EC NUMBER	DESCRIPTION	DATE

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9 Packing Drawing

No	Item	Model (Material)	Dimensions (mm)	Unit Weight (Kg)	Quantity	Remark
1	LCM module		40.10x55.20x2.10	0.006	420	
2	Tray	PET (Transmit)	485×330×12.8	0.170	18/420	Anti-static
3	Dust-proof Bag	PE	700×545	0.051	1/420	
4	Box	Corrugated Paper	520X345X74	0.382	3/420	
5	Carton	Corrugated Paper	544×365×250	1.030	1/420	
6	EPE	EPE	485X330X5	0.019	6/420	
7	Total Weight(kg)		7.834			



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10 Precautions for Use of LCD Modules

a) Handling Precautions

- i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
 - ii. 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.
 - iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
 - iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
 - v. 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
 - vi. Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
 - vii. Do not attempt to disassemble the LCD Module.
 - viii. If the logic circuit power is off, do not apply the input signals.
 - ix. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- b) Be sure to ground the body when handling the LCD Modules.
- c) Tools required for assembly, such as soldering irons, must be properly ground.
- d) To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
- e) 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.
- ### f) Storage precautions
- i. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
 - ii. 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:
 - g) Temperature : 0°C ~ 40°C Relatively humidity: ≤80%
 - i. The LCD modules should be stored in the room without acid, alkali and harmful gas.
 - ii. Transportation Precautions
 - h) The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.