晶 發 科 技 有 限 公 司
GI FAR TECHNOLOGY CO.,LTD
No. 11, Lane 249, Sec. 2, Chung Shan Rd., Shulin City, Taipei Hsien, Taiwan, R.O.C.

SPECIFICATIONS

CUSTOMER : _____

SAMPLE CODE : GFT035AB320240

DRAWIG NO. : _____

DATE : 2008.12.22

CERTIFICATION : ROHS

Customer Sign	Sales Sign	Approved By	Prepared By
		GIFAR 2008.12.22 KEVIN	GIFAR 2008.12.22 HAZEL

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Revision Record

Data(y/m/d)	Ver.	Description	Note	page
2008.12.22	00	New		

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1. SUMMARY

This technical specification applies to 3. 5“color TFT-LCD panel. The 3.5“ color TFT-LCD panel is designed for GPS, camcorder, digital camera application and other electronic products which require high quality flat panel displays.
This module follows RoHS.

2. FEATURES

High Resolution: 230,400 Dots (320 RGB x 240). GFT035AB320240 is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs, FPC and a backlight unit. The following table described the features of TS35ND25-01.

3. GENERAL SPECIFICATIONS

Parameter		Specifications	Unit
Screen size		3.5(Diagonal)	inch
Display Format		320 RGB x 240	Dot
Active area		70.08(H) x 52.56(V)	mm
Dot size		73x 219	um
Pixel Configuration		RGB-Stripe	
Outline dimension		76.9(W) x 63.9(H) x 3.3(D)	mm
Display Mode		Normally white/Transmissive	
Display Garmut		NTSC 50%	
Input Interface		Digital 24-bit RGB	
Weight		(31)	g
View Angle direction		6 o’clock	
Temperature Range	Operation	-30~85	℃
	Storage	-40~85	℃

GFT035AB320240

4. ABSOLUTE MAXIMUM RATINGS

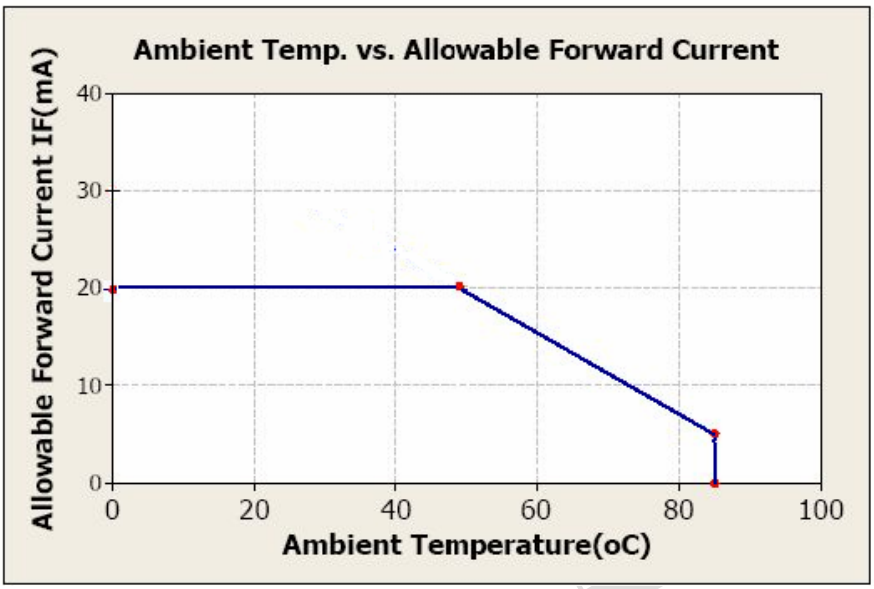
Item	Symbol	Condition	Min.	Max.	Unit	Remark
ower Voltage	DVDD,AVDD	GND=0	-0.3	7.0	V	
Input Signal Voltage	Vin	GND=0	-0.3	VDD+0.3	V	NOTE
Logic Output Voltage	VOUT	GND=0	-0.3	VDD+0.3	V	NOTE

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≤ 60℃, 90% RH MAX.

Temp. ＞ 60℃, Absolute humidity shall be less than 90% RH at 60℃

2.



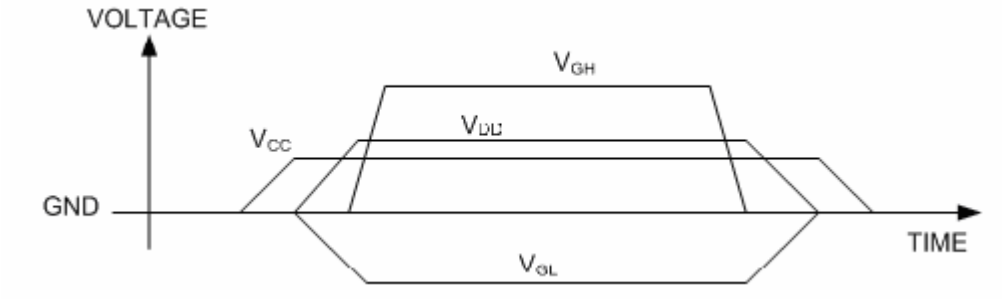
5. ELECTRICAL CHARACTERISTICS

5.1. Operating conditions:

Item	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
Power Voltage	VCC	3.0	3.3	3.6	V	
Digital Operation Current	Icc	-	1.85	-	mA	
Analog Power Supply	VDD	4.8	5	5.5	V	
Analog Operation Current	Idd	-	5.28	-	mA	
Gate On Power	VGH	14	15	18	V	
Gate Off Power	VGL	-11	-10	-8	V	
Vcom High Voltage	VcomH		3.5		v	
Vcom Low Voltage	VcomL		-1.6		v	
Vcom DC	VCDC		0.97		v	

Note1. VcomH& VcomL_Adjust the color with gamma data. Vp-p should be higher then 4V.(Option 5V)

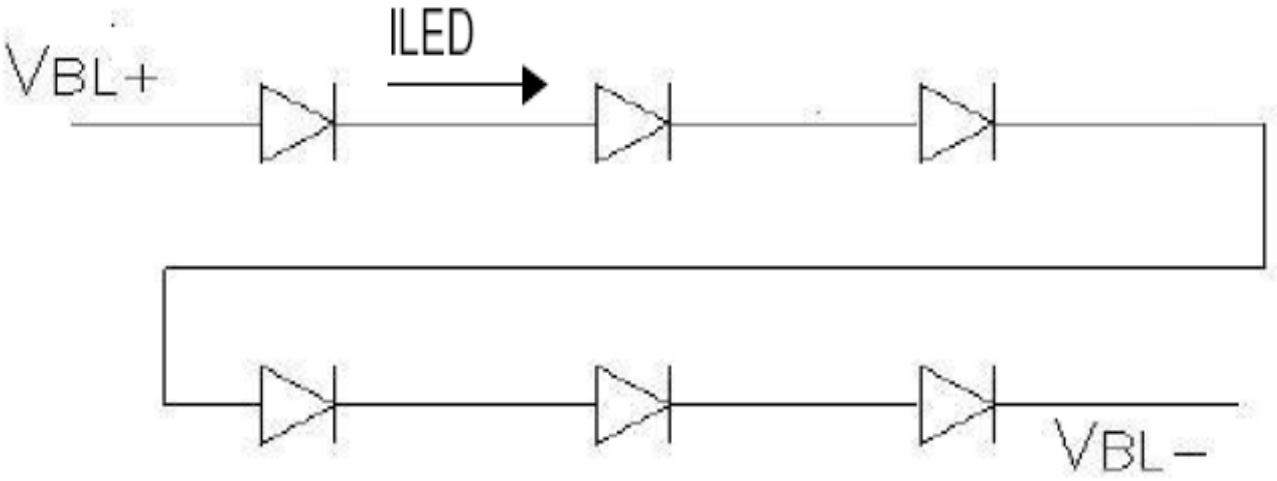
Note: Please power on following the sequence VCC → VDD and V0~V13. Reverse the sequence to shut down.



5.2 LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	-	-	20	30	mA	-
Power Consumption	-	-	400	420	mW	-
LED voltage	VBL+	18.6	19.8	21	V	Note 1
LED Life Time	-	-	(50,000)	-	Hr	Note 2,3

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25℃

Note 3 : Brightess to be decreased to 50% of the initial value

6. DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Low level input voltage	V_{IL}	0	-	0.3VCC	V	
Hight level input voltage	V_{IH}	0.7VCC	-	VCC	V	

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7. AC CHARATERISTICS

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
Dclk	Frequency	Dclk	-	6.4	-	MHz
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tds	12	-	-	ns
	Hold Time	Tdh	12	-	-	ns
Hsync	Period	TH	-	408	-	DCLK
	Pulse Width	Thp	5	30		DCLK
	Back-Porch	Thb	-	38	-	DCLK
	Display Period	Thd	-	320	-	DCLK
	Front-Porch	Thf	-	20	-	DCLK
Vsync	Period	TV	-	262	-	TH
	Pulse Width	Tvp	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: 1. Thp + Thb = 68, the user is make up by yourself.

2. Tv = Tvp + Tvb + Tvd + Tvf , the user is make up by yourself.

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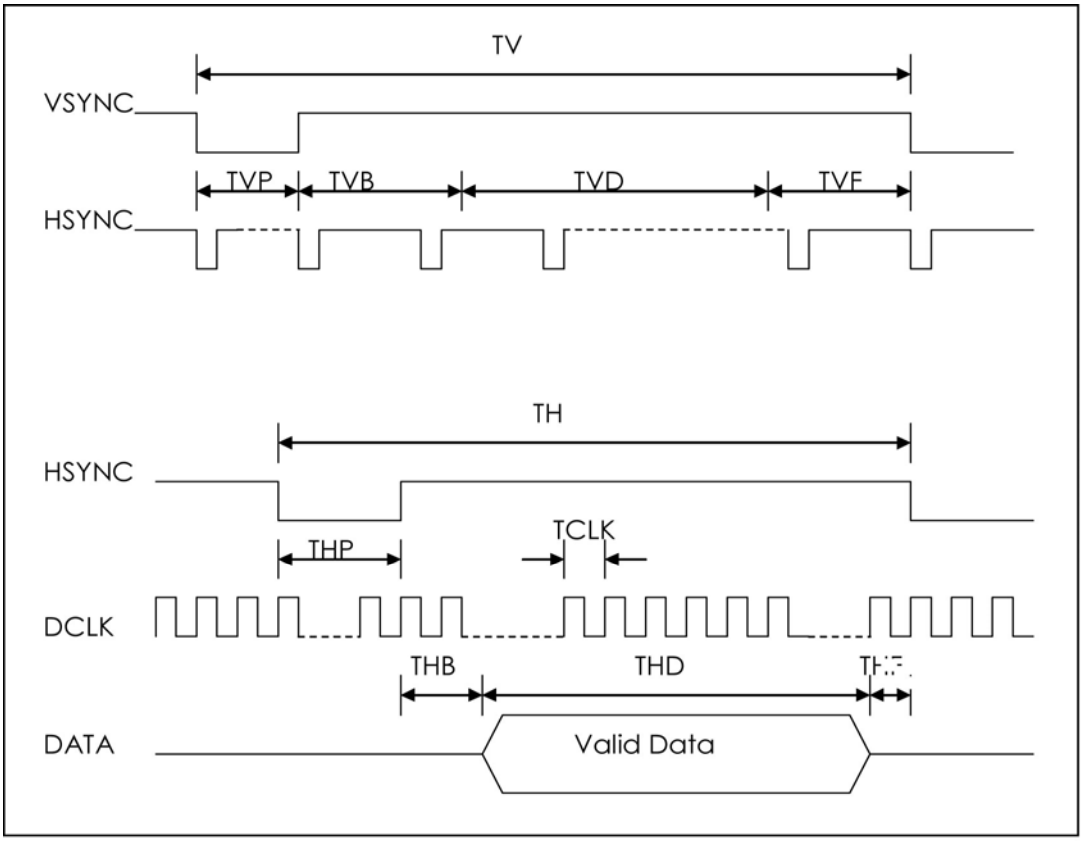
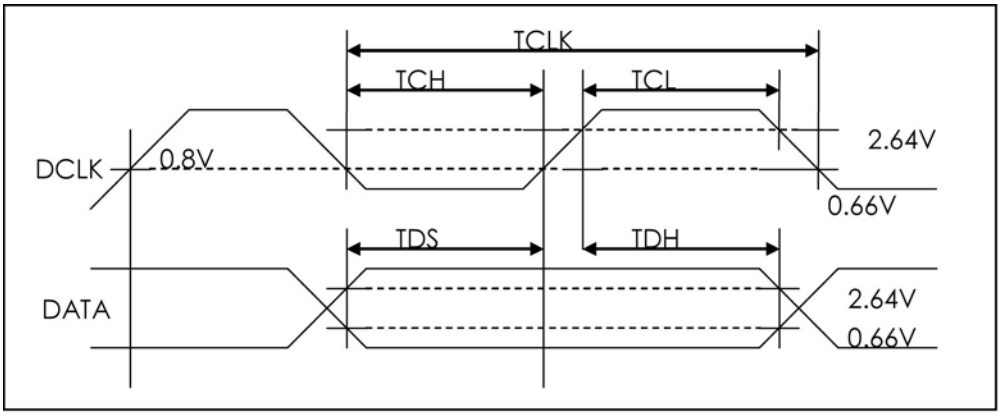
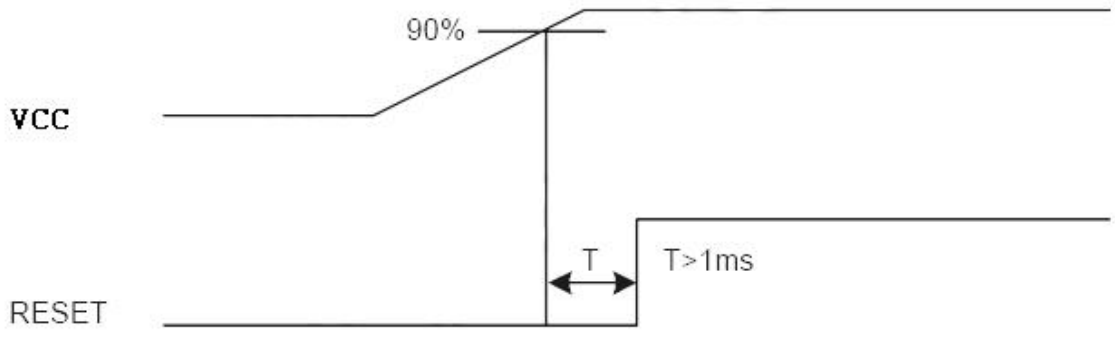




7.1 Reset Timing Chart

The RESET input must be held at least 1ms after power is stable



Reset timing

8. OPTICAL CHARATERISTIC

Ta=25±2℃, ILED=20mA

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
Response time		TR	θ=0°、Φ=0°	-	10	-	ms	Note 3,5
		TF		-	15	-	ms	
Contrast ratio		CR	At optimized Viewing angle	200	300	-	-	Note 4,5
Color Chromaticity	White	Wx	θ=0°、Φ=0°	(0.26)	(0.31)	(0.36)	-	Note 2,6,7
		Wy		(0.28)	(0.33)	(0.38)		
Viewing Angle	Hor	ΘR	CR≧10	(50)	(60)	-	Deg.	Note 1
		ΘL		(50)	(60)	-		
	Ver	ψH		(40)	(50)	-		
		ψL		(45)	(55)	-		
Brightness		-	-	-	250	-	cd/m2	Center of display

Ta=25±2℃, IL=20mA

Note 1: Definition of viewing angle range

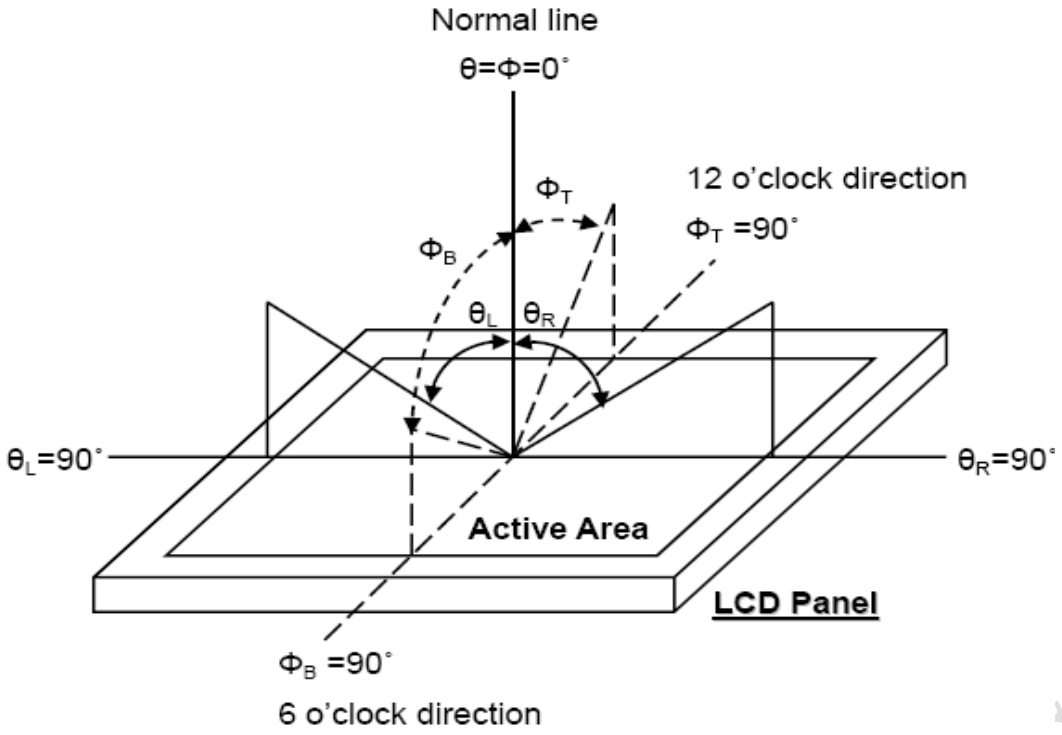


Fig. 8-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

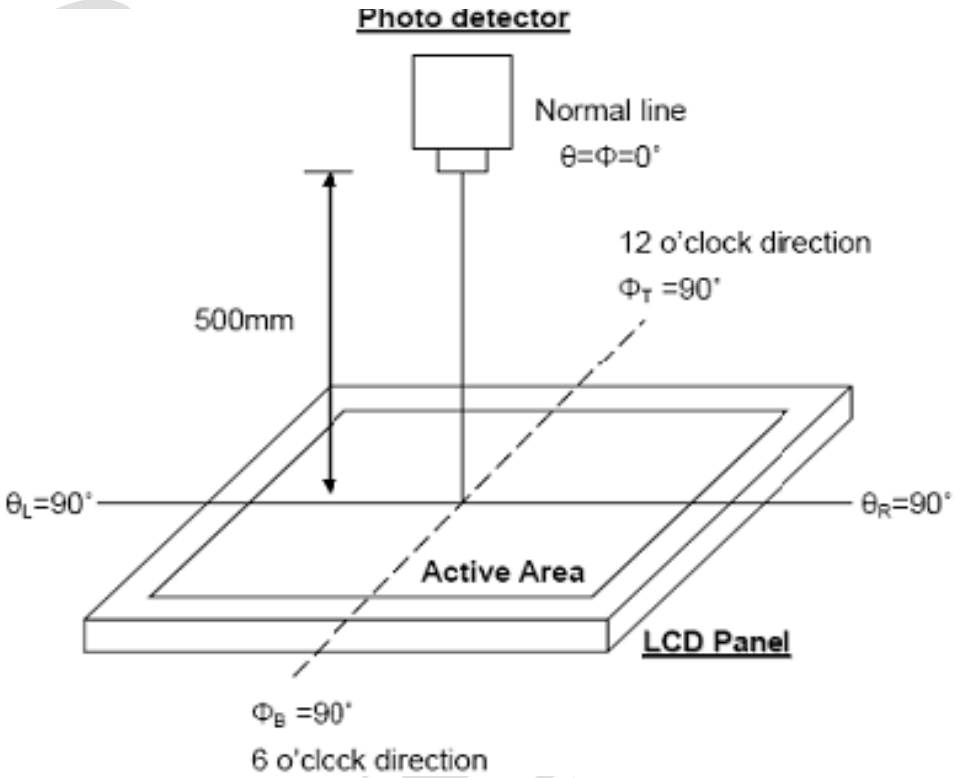


Fig. 8-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and“Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90% to 10% . And fall time, Tf, is the time between photo detector output intensity changed from10% to 90% .

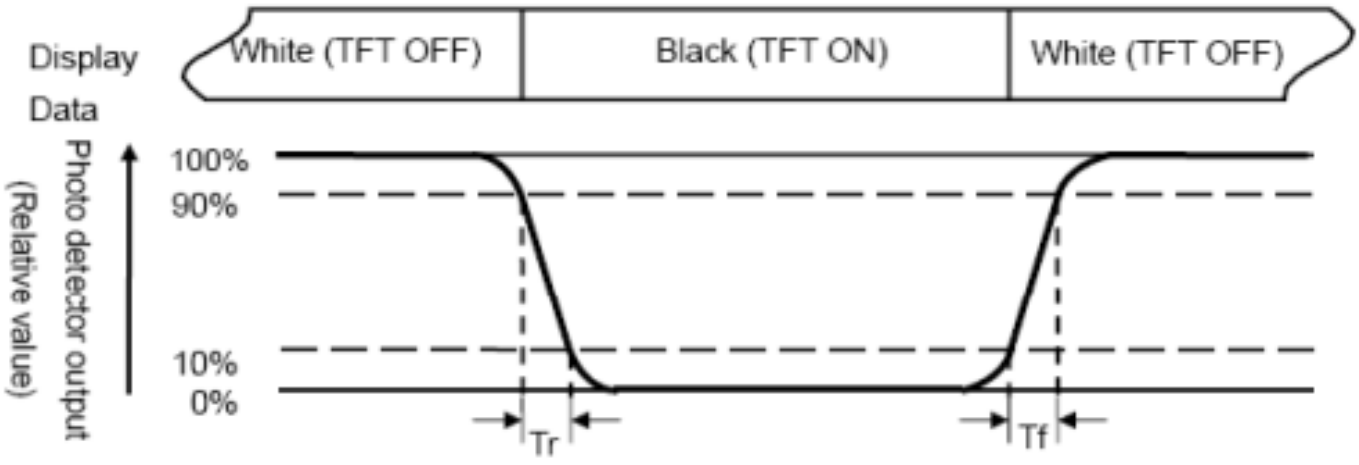


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Note 5: White Vi = $V_{i50} \pm 1.5V$

Black Vi = $V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$\text{Note 8 : Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

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9. INTERFACE

9.1. LCM PIN Definition

Pin	Symbol	I/O	I/O Function	Remark
1	LED-	I	Backlight LED Ground	
2	LED-	I	Backlight LED Ground	
3	LED+	I	Backlight LED Power	
4	LED+	I	Backlight LED Power	
5	Y1	I	Not Use	
6	X1	I	Hardware Reset	
7	POL	O	Polarity Signal Connect to Vcom driving circuit	Note 1, 4
8	/RESET	I	Hardware Reset	
9	SPENA	I	SPI Interface Data Enable signal	
10	SPCLK	I	SPI Interface Data Clock	
11	SPDAT	I	SPI Interface Data	
12	B0	I	Blue Data Bit 0	
13	B1	I	Blue Data Bit 1	
14	B2	I	Blue Data Bit 2	
15	B3	I	Blue Data Bit 3	
16	B4	I	Blue Data Bit 4	
17	B5	I	Blue Data Bit 5	
18	B6	I	Blue Data Bit 6	
19	B7	I	Blue Data Bit 7	
20	G0	I	Green Data Bit0	
21	G1	I	Green Data Bit1	
22	G2	I	Green Data Bit2	
23	G3	I	Green Data Bit3	
24	G4	I	Green Data Bit4	
25	G5	I	Green Data Bit5	
26	G6	I	Green Data Bit6	
27	G7	I	Green Data Bit7	
28	R0	I	IRed Data Bit0	
29	R1	I	Red Data Bit1	
30	R2	I	Red Data Bit2	
31	R3	I	Red Data Bit3	
32	R4	I	Red Data Bit4	
33	R5	I	Red Data Bit5	
34	R6	I	Red Data Bit6	

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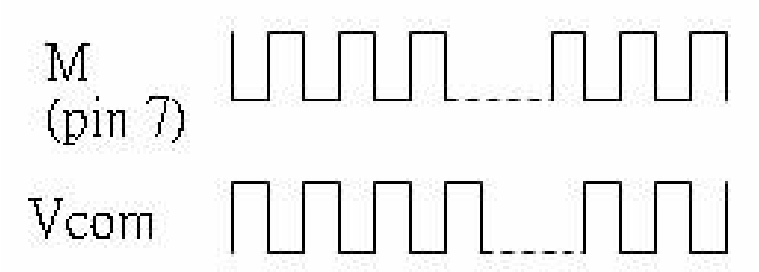
35	R7	I	Red Data Bit7	
36	HSYNC	I	Horizontal Sync Input	
37	VSYNC	I	Vertical Sync Input	
38	DCLK	I	Dot Data Clock	
39	VDD	I	Analog Power	
40	VDD	I	Analog Power	
41	VCC	I	Digital Power	
42	VCC	I	Digital Power	
43	Y2	I	Bottom electrode	Note 3
44	X2	I	Left electrode	
45	VGL	I	Gate OFF Power	
46	NC	-	Not Use	
47	VGH	I	Gate ON Power	
48	NC	-	Not Use	
49	NC	-	Not Use	Note 3
50	NC	-	Not Use	
51	VCOM	I	Driving Input	Note 1, 4
52	DEN	I	Data Enable Input	Note 2
53	AVSS	I	Ground	
54	DGND	I	Ground	

Note:

1. The polarity of Vcom (Pin 51) should be generated from POL (Pin 7).
2. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If ENB signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used.
3. Pin 9、Pin 10 usually pull high.
4. The phase of POL (pin 7):



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9.2 Basic Display Color and Gray Scale

Color		Input Color Data																							
		Red								Green								Blue							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) Bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(0) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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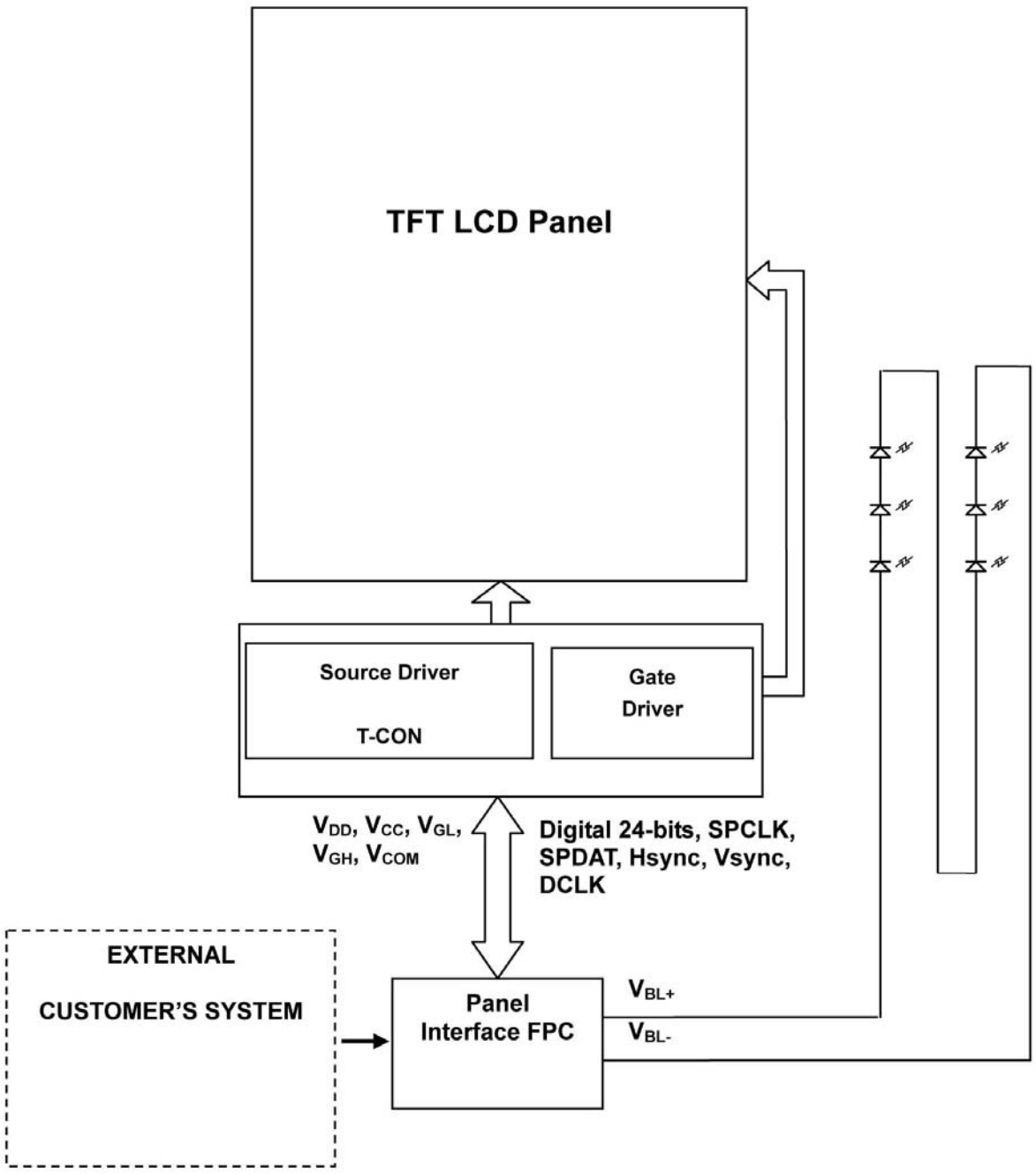
10. BLOCK DIAGRAM



11.QUALITY ASSURANCE

No.	Test Item	Test Condition	REMARK
1	High Temperature Storage Test	Ta=85℃ Dry 240h	
2	Low Temperature Storage Test	Ta=-40℃ Dry 240h	
3	High Temperature Operation Test	Ta=85℃ Dry 240h	
4	Low Temperature Operation Test	Ta=-30℃ Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60℃ 90%RH 240h	
6	Electro Static Discharge Test	Panel surface / top case. Contact / Air_±8KV / ±15KV， 150pF，330Ω	Non-operating
7	Sh Shock Test (non-operating)	Shock Level : 100G Waveform : Half Sinusoidal Wave Shock Time : 6ms Number of Shocks : 3 times for each ±X, ±Y, ±Z direction	
8	Vibration Test (non-operating)	Sweep : 8Hz ~ 33.3Hz Stoke：1.3mm Sweep : 2.9G, 33.3~400Hz Vibration : Sinusoidal Wave, 4Hrs for Y direction. 2Hrs for each direction of X,Z	
9	Thermal Shock Test	-30℃(0.5h) ~ 85℃(0.5h) / 200 cycles	

***** Ta= Ambient Temperature

Note:

1. The test samples have recovery time for 2 hours at room temperature before the function check. In the standard conditions, there is no display function NG issue occurred.
2. All the cosmetic specifications are judged before the reliability stress.

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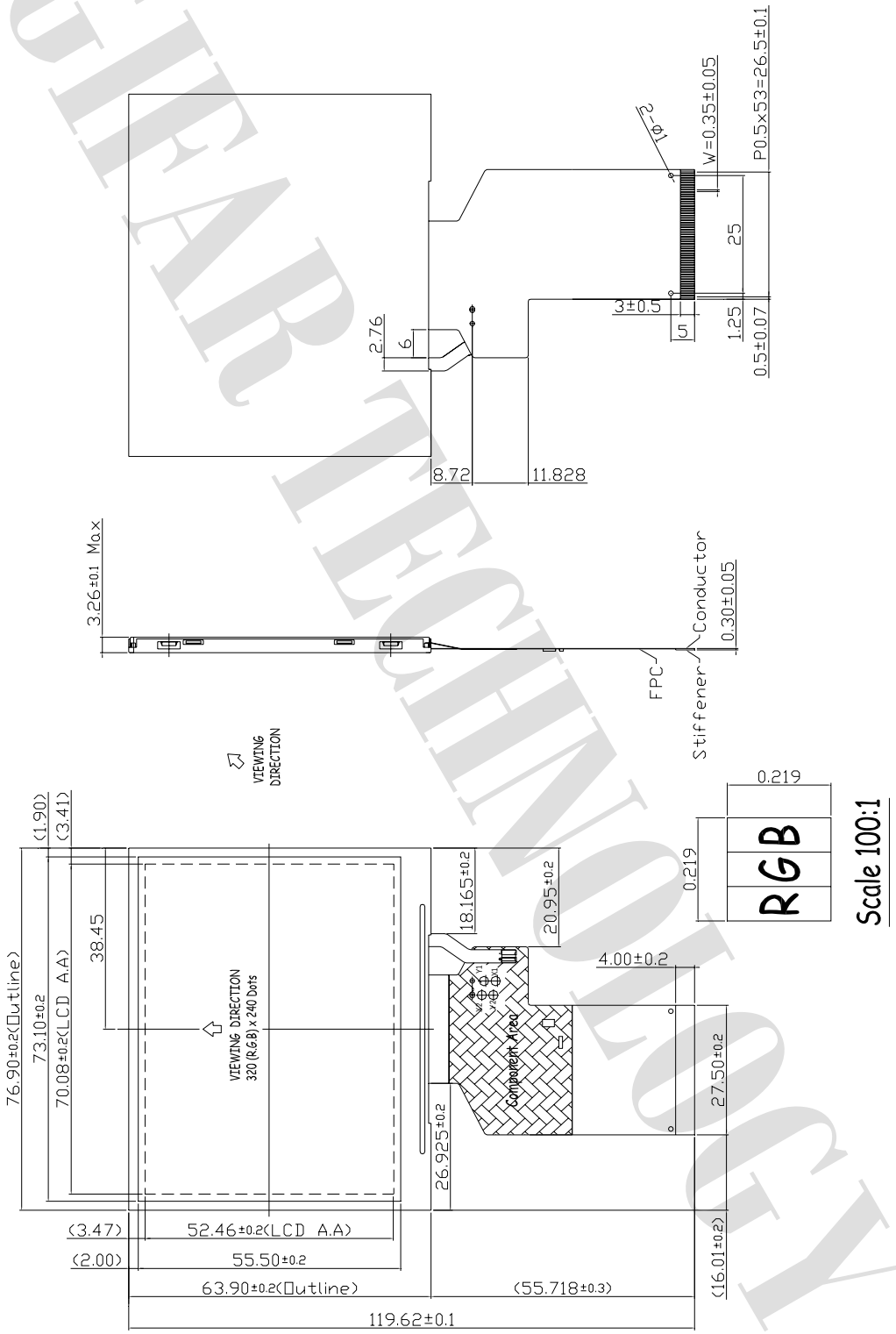
12.OUTLINE DRAWING



PIN DESCRIPTION

NO.	NAME	NO.	NAME
1	LED-	28	R0
2	LED-	29	R1
3	LED+	30	R2
4	LED+	31	R3
5	Y1	32	R4
6	X1	33	R5
7	PDL	34	R6
8	/RESET	35	R7
9	SPENA	36	HSYNC
10	SPCLK	37	VSYNC
11	SPDAT	38	DCLK
12	B0	39	VDD
13	B1	40	VDD
14	B2	41	VCC
15	B3	42	G1
16	B4	43	Y2
17	B5	44	X2
18	B6	45	VGL
19	B7	46	NC
20	G0	47	VGH
21	G1	48	NC
22	G2	49	NC
23	G3	50	NC
24	G4	51	VCOM
25	G5	52	DEN
26	G6	53	AVSS
27	G7	54	DGND

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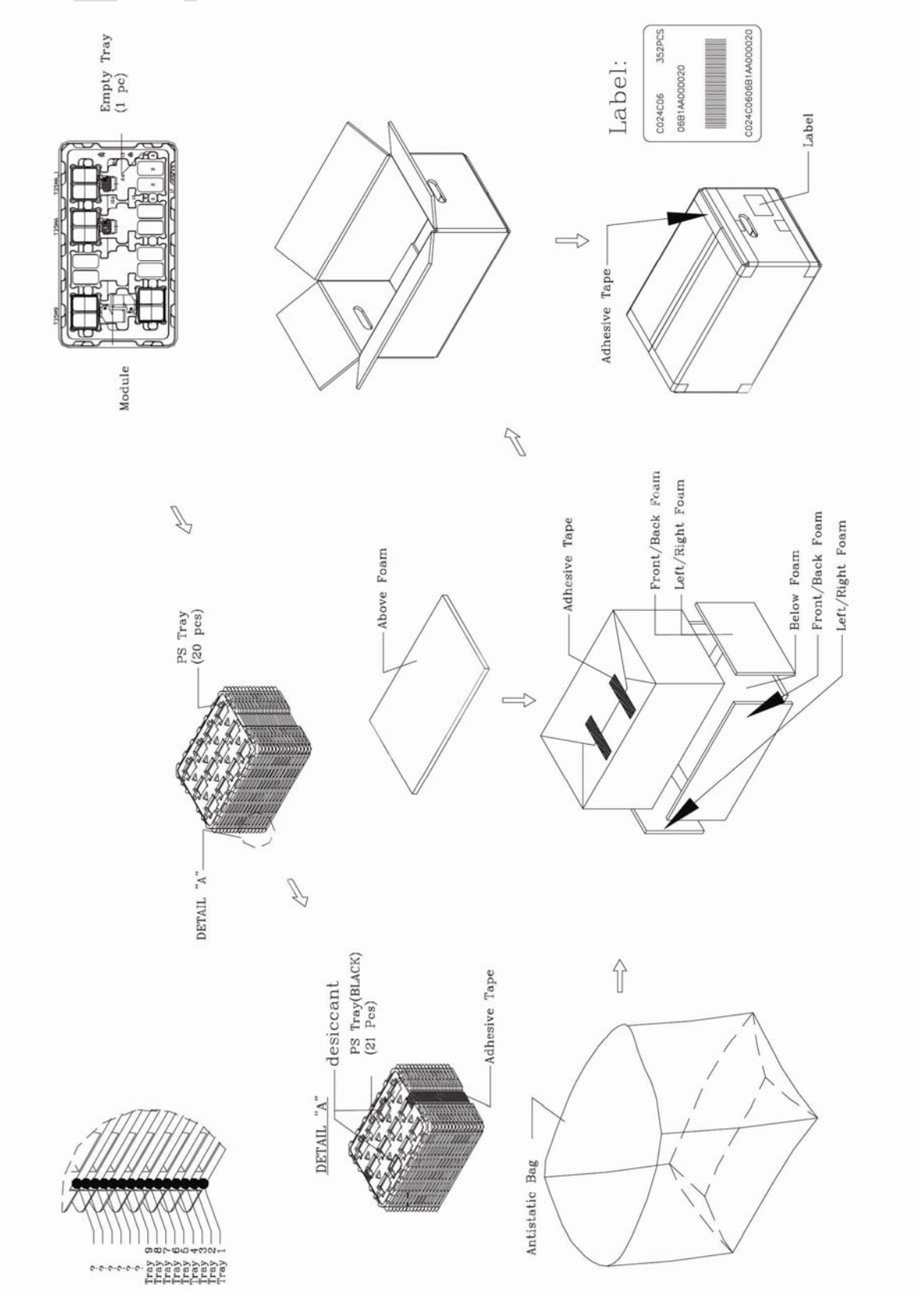
13.PACKAGE INFORMATION



14. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD module.

14.1 MOUNTING PRECAUTIONS

(1) You must mount a module using arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are determined to the polarizer)
(7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

14.2 OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage_V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods

may be important to minimize the interference.

14.3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

14.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

14.5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

14.6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) The protection film is attached to the polarizer with a small amount of glue. Is apt to remain on the polarizer.Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.

(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

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