

MODULE NO. : IE-TFT-0508048-RTP-06

DRAWING BY : QSC

DATE : 2011-07-15

APPROVED BY : _____

REVISION : V1.0

FOR CUSTOMER'S APPROVAL

CHECK BY: _____

DATE : _____

APPROVED BY: _____

DATE : _____

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COMMENT:

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2011.07.15	-	First Issued.	

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1. GENERAL DESCRIPTION

1.1 DESCRIPTION

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 TFTLCD panel, driver ICs, FPC and Backlight.

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	5"	inch
2	Number of Pixels	800(W) x 3(RGB) x480(H)	pixels
3	Active Area	108.00(H) x 64.8(V)	mm
4	Pixel Pitch	0.135(W) x 0.135(H)	mm
5	Outline Dimension	120.70(W) x75.80(H) x3.05(T)	mm
6	Pixel arrangement	RGB vertical stripe	-
7	Display Mode	Normally white	-
8	Viewing Direction	6 o'clock	-
9	Display Color	16.7M	-
10	Luminance(cd/m2)	300(TYP)	nit
11	Contrast Ratio	450(Min)	-
12	Surface Treatment	Antiglare, Hard-Coating (3H)	-
13	Interface	24-bit TTL	-
14	Backlight	White LED	-
15	Drive IC	HX8264-D02、HX8664-B	-
16	Operation Temperature	-20~70	°C
17	Storage Temperature	-30~80	°C
18	Weight	-	g

3. PIN DESCRIPTION

FPC connector is used for electronics interface.

The recommended model is FH19SC-40S-0.5SH (51) manufactured by HIROSE.

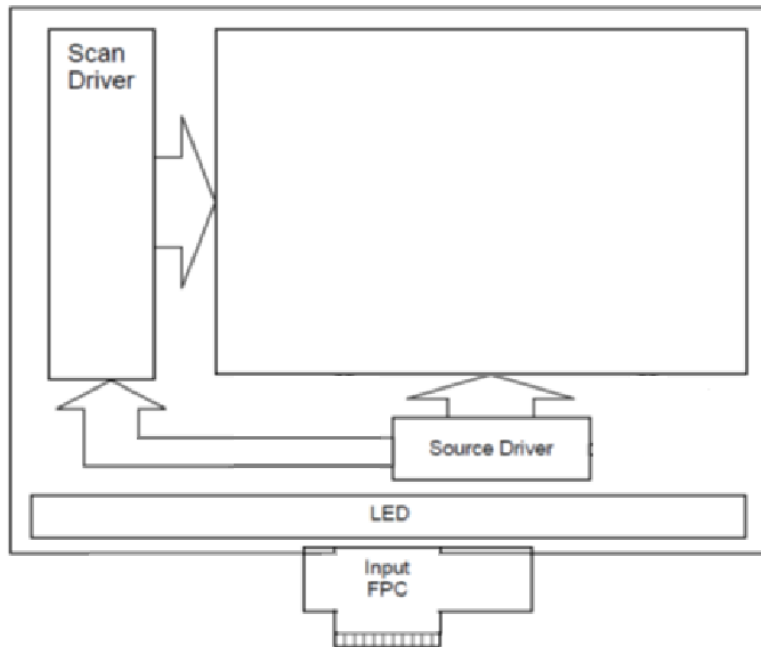
No.	Symbol	I/O	Function	Remark
1	VLED-	P	Power for LED backlight cathode	
2	VLED+	P	Power for LED backlight anode	
3	GND	P	Power ground	
4	VDD	P	Power voltage	
5	R0	I	Red data (LSB)	
6	R1	I	Red data	
7	R2	I	Red data	
8	R3	I	Red data	
9	R4	I	Red data	
10	R5	I	Red data	
11	R6	I	Red data	
12	R7	I	Red data (MSB)	
13	G0	I	Green data (LSB)	
14	G1	I	Green data	
15	G2	I	Green data	
16	G3	I	Green data	
17	G4	I	Green data	
18	G5	I	Green data	
19	G6	I	Green data	
20	G7	I	Green data (MSB)	
21	B0	I	Blue data (LSB)	
22	B1	I	Blue data	
23	B2	I	Blue data	
24	B3	I	Blue data	
25	B4	I	Blue data	
26	B5	I	Blue data	
27	B6	I	Blue data	
28	B7	I	Green data (MSB)	
29	DGND	I	Digital ground	
30	DCLK	I	Pixel clock	
31	DISP	I	Display on/ off	*1
32	Hsync	I	Horizontal sync signal	
33	Vsync	I	Vertical sync signal	
34	DE	I	Data enable	
35	NC	-	No Connect	
36	GND	P	Power ground	
37	X1	I/O	Right electrode - differential analog	
38	Y1	I/O	Bottom electrode - differential analog	
39	X2	I/O	Left electrode - differential analog	
40	Y2	I/O	Top electrode - differential analog	

I/O: I: input, O: output, P: power

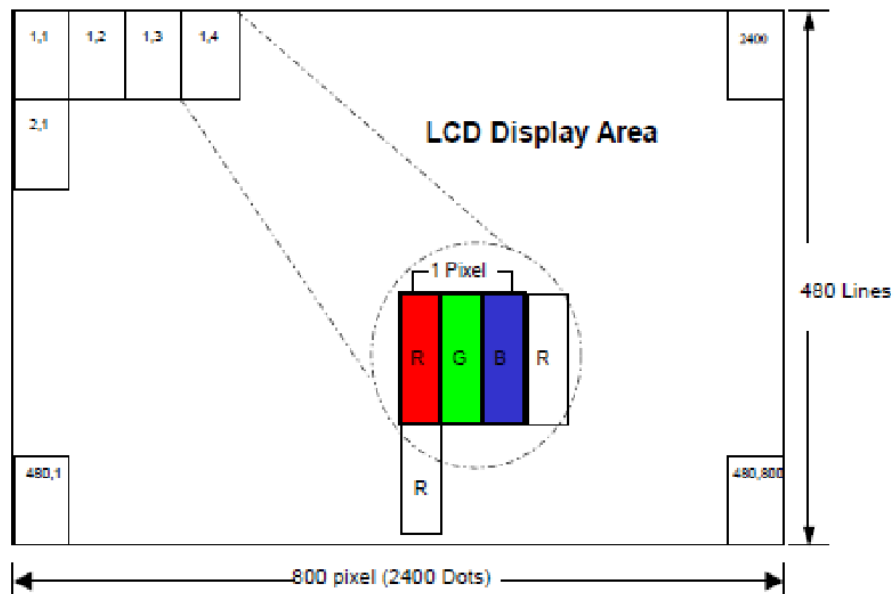
*1 : DISP=0;Sourcedriver will turn off. DISP =1;Normally operation

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 PIXEL FORMAT



5. ELECTRICAL CHARACTERISTICS

5.1 ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Voltage	VDD	-0.5	5	V	-
	VGH	-0.3	40	V	-
	VGL	-20	0.3	V	-
	VGH-VGL	-0.3	40	V	-

5.2 DC CHARACTERISTICS

5.2.1 Operating Conditions

Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
TFT Gate On Voltage	VGH	21	22	23	
TFT Gate Off Voltage	VGL	-6	-7	-8	
TFT Common Electrode Voltage	Vcom	2.5	-	2.9	

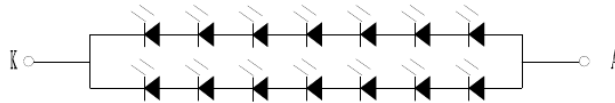
5.2.2 Current Consumption

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Gate on Current	IVGH	VGH = 21.8 V	-	9.7	-	mA	
Gate off Current	IVGL	VGL = -7.7 V	-	11.7	-	mA	
Digital Current	IDVDD	DVDD = 3.3V	-	141.2	-	mA	
Analog Current	IAVDD	AVDD = 12.55V	-	25.2	-	mA	

5.3 BACKLIGHT UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Current	Iled		40		mA	14LEDS
Forward Voltage	VF	21	23.2	25.2	V	IF=40mA
Reverse Current	IR			100	μA	VR=35V, 14LEDS
Luminous Tolerance	IV-M	75	80		%	(MIN/MAX) × 100
Power Dissipation	Pd		1008		mW	14LEDS
Peak Forward Current	I _{fp}		60		mA	14LEDS
Reverse Voltage	VR		35		V	14LEDS

5.3.1 Internal Circuit Diagram



CURRENT $I_F=40\text{mA}$
 $2 * 20 = 40\text{mA}$

5.4 POWER SEQUENCE

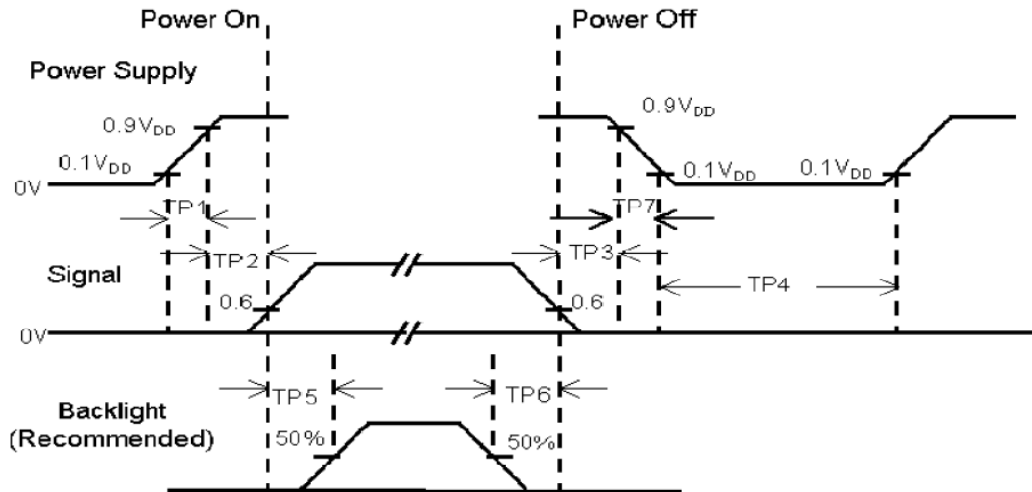
Power On Sequence

To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

Power ON: VDD, VSS → AVDD, VSSA → V1 to V14

Power OFF: V1 to V14 → AVDD, VSSA → VDD, VSS

5.4.1 Power on/off control



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	msec	

Note :

(1) The supply voltage of the external system for the module input should be the same as the definition of VDD.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns

on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

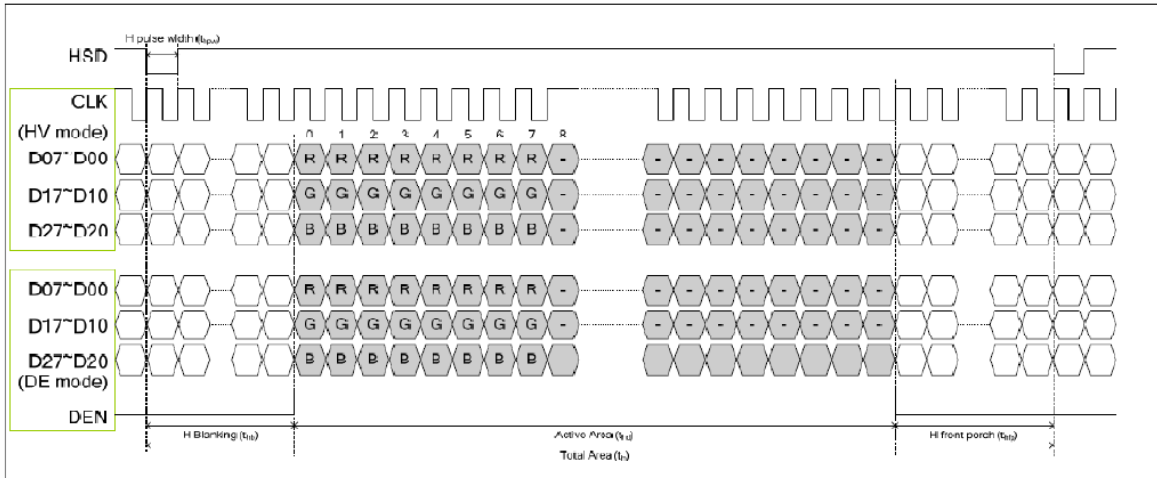
(4) TP4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

6.INPUT SIGNAL TIMING**6.1 AC CHARACTERISTICS**

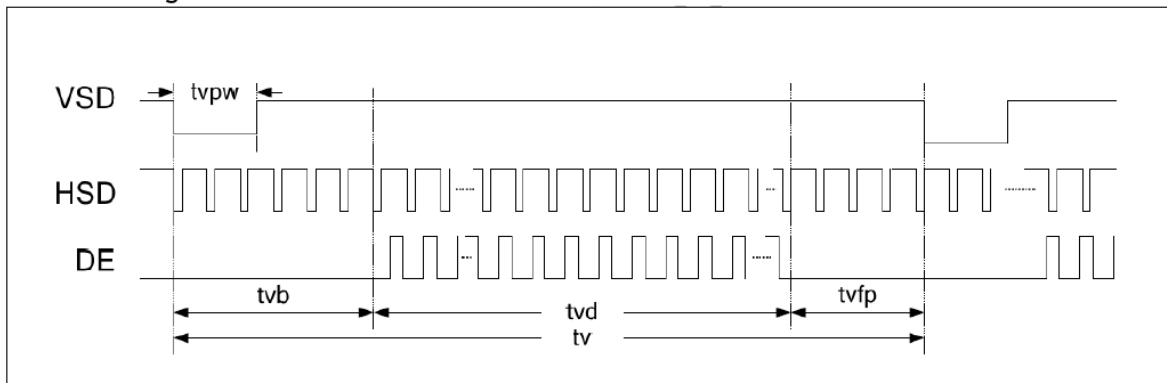
Parameters	Symbol	Spec.			Unit	Conditions
		Min.	Typ.	Max.		
HS setup time	Thst	8	-	-	ns	
HS hold time	Thhd	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hold time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hold time	Tehd	8	-	-	ns	
VDD Power On Slew rate	TPOR	-	-	20	ms	
RSTB pulse width	TRst	10	-	-	us	
CLKIN cycle time	Tcph	20	-	-	ns	
CLKIN pulse duty	Tcwh	40	50	60	%	
Output stable time	Tsst	-	-	6	us	

6.2 DATA INPUT FORMAT
Horizontal timing



Parameters	Symbol	Spec.			Unit	Conditions
		Min.	Typ.	Max.		
Horizontal Display Area	thd	800			DCLK	
DCLK frequency	fclk	-	30	50	MHz	
One Horizontal Line	th	889	928	1143	DCLK	
HS pulse width	thpw	1	48	255	DCLK	
HS Back Porch (Blanking)	thb	88			DCLK	
HS Front Porch	thfp	1	40	255	DCLK	
DE mode Blanking	th-thd	85	128	512	DCLK	

Vertical timing



Parameters	Symbol	Spec.			Unit	Conditions
		Min.	Typ.	Max.		
Vertical Display Area	tvd	480			TH	
VS period time	tv	513	525	767	TH	
VS pulse width	tvpw	3	3	255	TH	
VS Back Porch (Blanking)	tvb	32			TH	
VS Front Porch	tvfp	1	13	255	TH	
DE mode Blanking	tv-tvd	4	45	255	TH	

6.3 TIMING WAVEFORM TABLE

6.3.1 Parallel 24-bit RGB mode

Parameters	Symbol	Spec.			Unit	Conditions
		Min.	Typ.	Max.		
CLKIN Frequency	Fclk	-	40	50	MHz	VDD=3.0V-3.6V
CLKIN Cycle Time	Tclk	20	25	-	ns	-
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	64			CLKIN	-
Time from HSD to LD	Thld	64			CLKIN	-
Time from HSD to STV	Thstv	2			CLKIN	-
Time from HSD to CKV	Thckv	20			CLKIN	-
Time from HSD to OEV	Thoev	4			CLKIN	-
LD Pulse Width	Twld	10			CLKIN	-
CKV Pulse Width	Twckv	66			CLKIN	-
OEV Pulse Width	Twoev	74			CLKIN	-

7. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	*1)	450		-	--	Note3	
Brightness	B		250	300	-	cd/m2		
Response Time	TON	25°C	-	20	25	ms	Note4	
	TOFF							
Color Chromaticity	Red	Rx	$\theta=\phi=0^\circ$	0.570	0.600	0.630	-	Note3 Note6 Note7
		Ry		0.320	0.350	0.380	-	
	Green	Gx	$\theta=\phi=0^\circ$	0.290	0.320	0.350	-	
		Gy		0.570	0.600	0.630	-	
	Blue	Bx	$\theta=\phi=0^\circ$	0.110	0.140	0.170	-	
		By		0.070	0.100	0.130	-	
White	Wx	$\theta=\phi=0^\circ$	0.250	0.290	0.330	-		
	Wy		0.290	0.330	0.370	-		
View angle	θT	$CR \geq 10$	40	50	-	deg.	Note5	
	θB		60	70	-			
	θL		60	70	-			
	θR		60	70	-			
NTSC				54		%		

Note1: Ambient condition: 25°C±2°C, 60±10%RH, under 10 Lux in the darkroom.

Note2: Definition of viewing angle

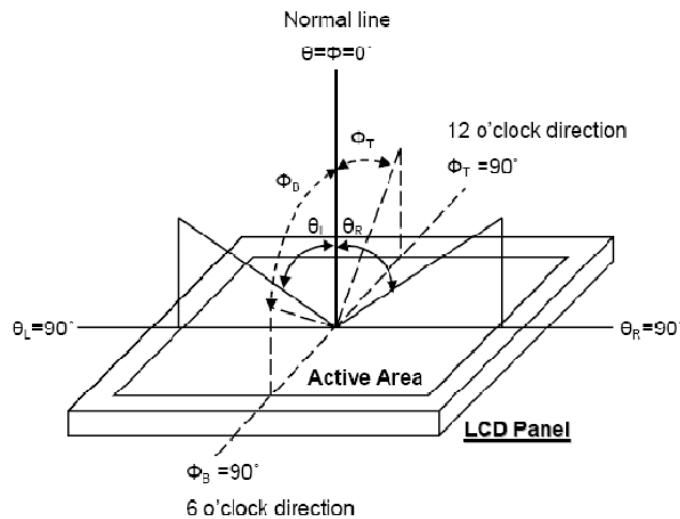


Fig. 6-1 Definition of viewing angle

Note3: 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 ofview at a distance of 50cm and normal direction.

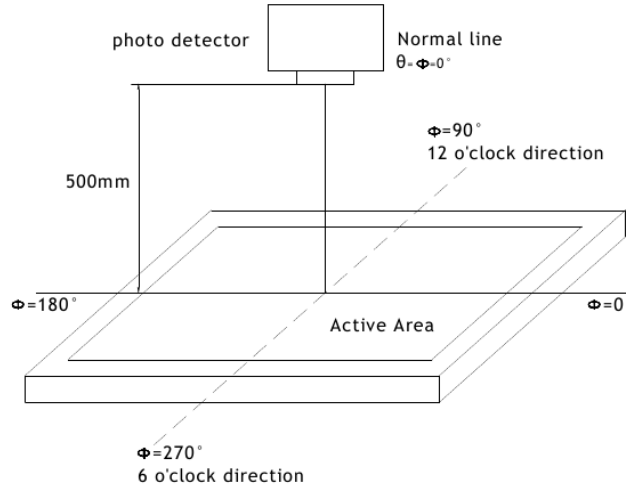


Fig. 6-2 Optical measurement system setup

Note4: 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_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%

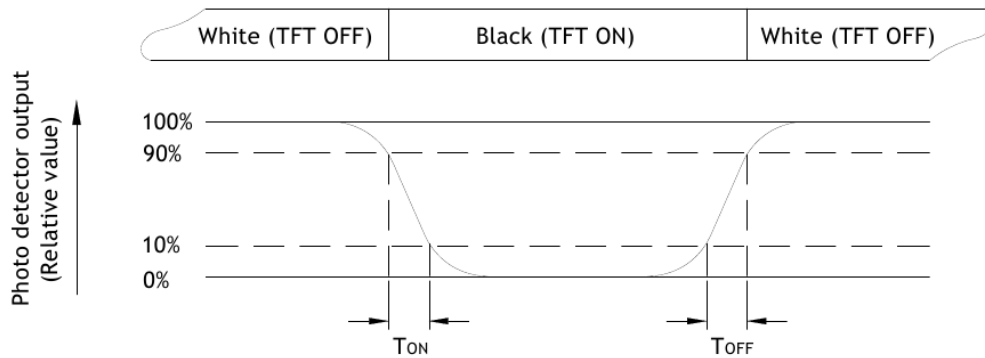


Fig. 6-3 definition of response time

Note5: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Note6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

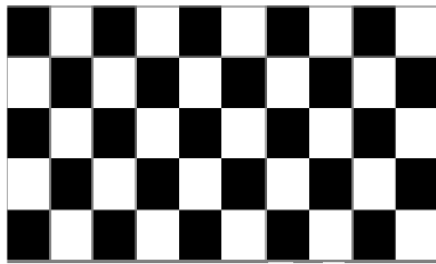
8. QUALITY ASSURANCE SYSTEM

8.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
HighTemperatureStorage	Ta=80°C; 240hrs	
Low Temperature Storage	Ta=-30°C; 240hrs	
High Temperature Operation	Ta=70°C , 240Hrs	
LowTemperatureOperation	Ta=-20°C; 240hrs	
HighTemperatureHighHumidity Operation	Ta=60°C , 90%RH , 240Hrs(no condensation)	
Thermal Shock	-20°C (0.5h) ~ 70°C (0.5h) / 100cycles	
Image Sticking	25°C ; 4hrs	Note1

Note1:Condition of image sticking test :25°C±2°C

Operation with test pattern sustained for 4hrs,then change to gray pattern immediately.after5 mins,themura must be disappeared completely



(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

8.2 VIBRATION&SHOCK

Test item	Conditions
Packing Shock (non-operation)	980m/s2,6ms, ±x,y,z 3times for direction
Packing Vibration (non-operation)	Frequency range:10 HZ~50HZ Stroke:1.0mm,sweep:10 HZ ~50HZ x,y,z 2 hours for each direction

8.3ESD

Test item	Conditions	Note
Electro Static Discharge Test (non-operation)	150pF , 330Ω , Contact:±4KV,Air:±8KV	1
	200pF , 0Ω , ±200V contact test	2

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins

9. PRECAUTION RELATING PRODUCT HANDLING

9.1 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 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.

9.2 OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage $V = \pm 200\text{mV}$ (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.

9.3 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.

9.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9.5 STORAGE

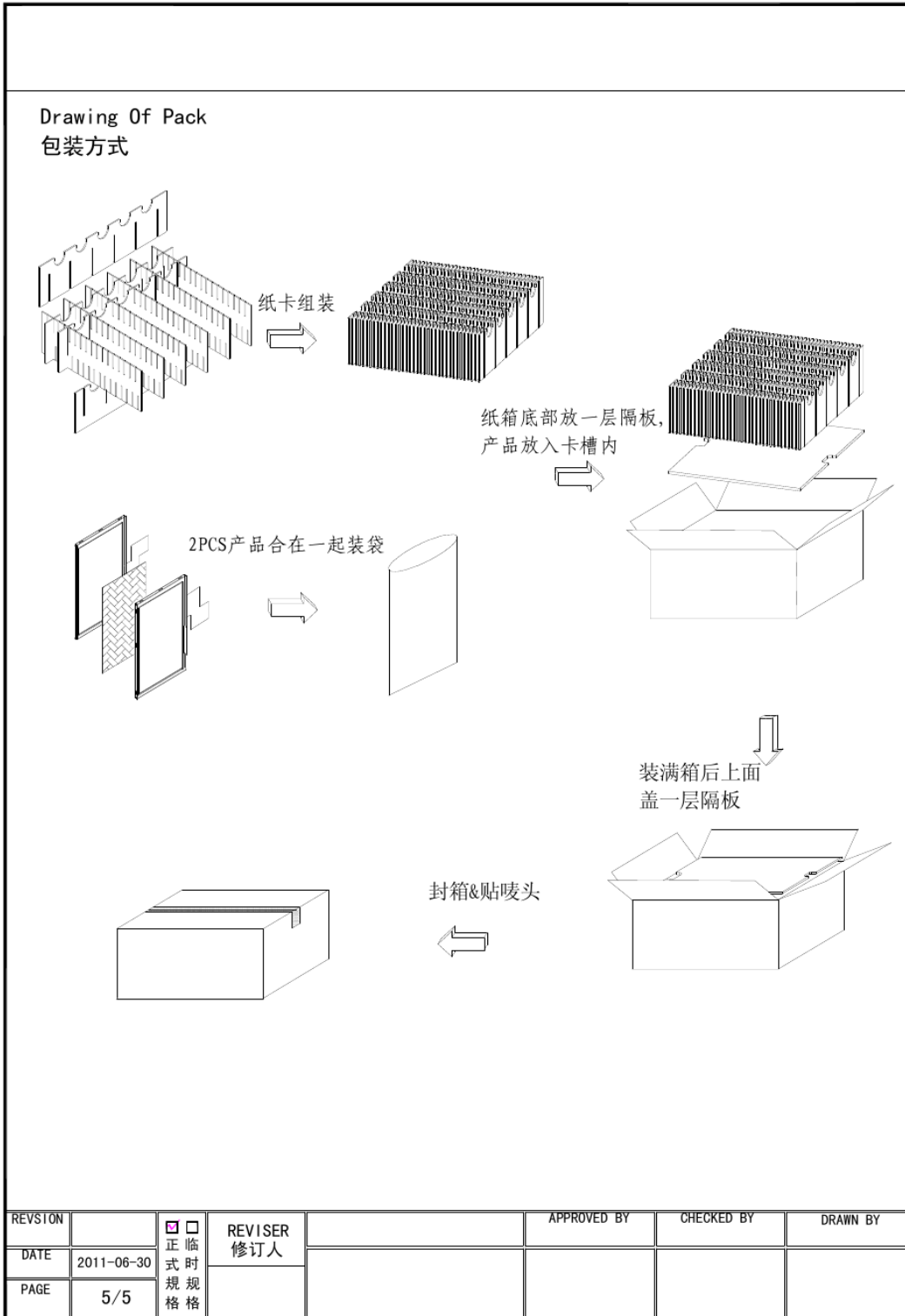
When storing modules as spares for a long time, the following precautions are necessary.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5 and 35 °C 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.

9.6 HANDLING PRECAUTION 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.

10. PACKAGE DRAWING



INCOMING INSPECTION STANDARDS

MODEL: IE-TFT-0508048-RTP-06

<◇> PRELIMINARY SPECIFICATION

<◆> APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
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1. INCOMING INSPECTION RIGHT

(1) The Incoming Inspection Standard will be agreed and signed by both sides (Customer and Starry) .

2. INSPECTION CONDITIONS IS AS FOLLOWS:

- (1) Viewing distance is approximately 35 ~ 40 cm
- (2) Viewing angle is normal to the LCD panel as Fig -1(30°)
- (3) Ambient temperature is approximately $25 \pm 5^\circ\text{C}$
- (4) Ambient humidity is $60 \pm 5\% \text{ RH}$
- (5) Ambient illuminance is from 300 ~ 500 Lux.
- (6) Input signal timing should be typical value.
- (7) Mura & Light leakage inspection at ND-Filter 5%

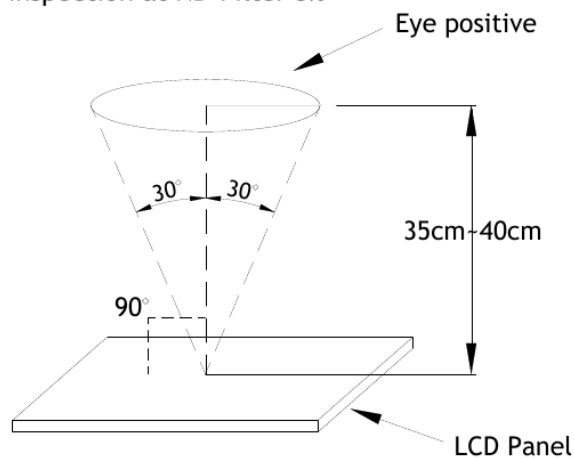


Fig-1

3. SPECIAL CONDITION

- (1) Viewing distance is close for inspection of adjacent dots and distance between defect dots.
- (2) Viewing condition of “Shot block non-uniformity from oblique angle” is as Fig-2.
- (3) Exceptional case: View angle $\pm 40^\circ$ while inspected image-sticking.

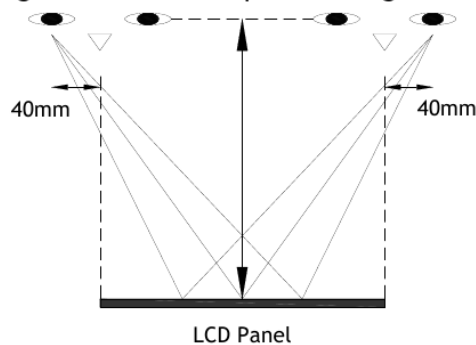
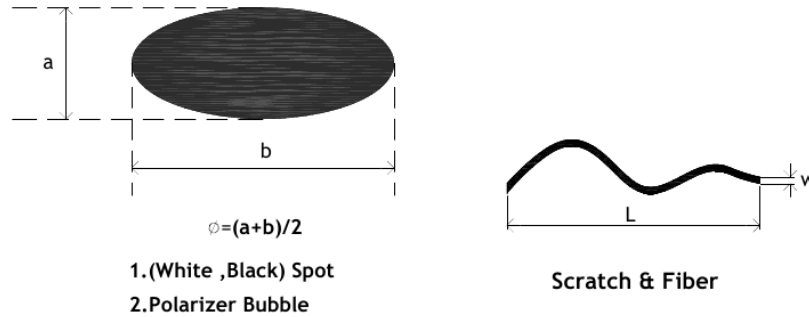


Fig-2

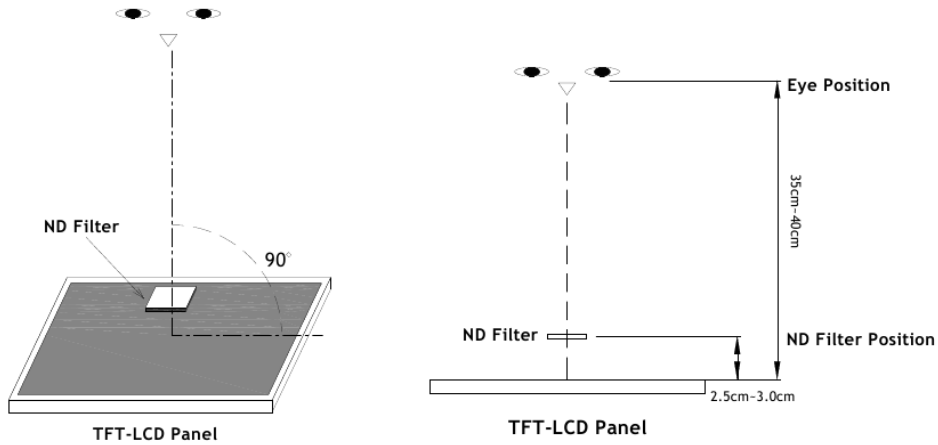
4. INSPECTION CRITERIA

Defecttype		Limit			Note	
Visual defect	Scratch (in active area)	$W \leq 0.05\text{mm}$		Ignore	Note1	
		$0.05\text{mm} \leq w \leq 0.1\text{mm}$ $L \leq 10\text{mm}$		$N \leq 4$		
		$10\text{mm} < L, 0.1\text{mm} < w$		$N=0$		
	Internal	Spot	$\Phi < 0.2\text{mm}$		Ignore	Note1
			$0.2\text{mm} \leq \varphi \leq 0.3\text{mm}$		$N \leq 3$	
			$0.3\text{mm} < \varphi$		$N=0$	
		Fiber	$W \leq 0.03$		Ignore	Note1
			$0.03 < W \leq 0.04$ $L \leq 5.0$		$N \leq 4$	
			$0.04 < W, L > 5.0$		$N=0$	
		Polarizer bubble	$\Phi < 0.2\text{mm}$		Ignore	Note1
			$0.2\text{mm} \leq \varphi \leq 0.3\text{mm}$		$N \leq 1$	
			$0.3\text{mm} < \varphi$		$N=0$	
	Dent	$\Phi < 0.1\text{mm}$		Ignore	Note1	
$0.1\text{mm} \leq \varphi \leq 0.25\text{mm}$		$N \leq 2$				
Mura & Gap		Not visible through 5% ND filter				
Electrical Defect	Bright dot	C Area	O Area	Total	Note2 Note3	
		$N \leq 0$	$N \leq 1$	$N \leq 1$		
		$N \leq 1$	$N \leq 2$	$N \leq 3$		
	Total dot	$N \leq 1$	$N \leq 3$	$N \leq 3$	Note4	
	Two adjacent dot	Not allowed				
	Three or more adjacent dot	Not allowed				
Line defect	Not allowed			-		
(1) one pixel consists of 3 sub-pixels, including r, g, and b dot. (sub-pixel = dot) (2) panel is acceptable if distance between 2 dot defects are greater or equal to 15mm.						

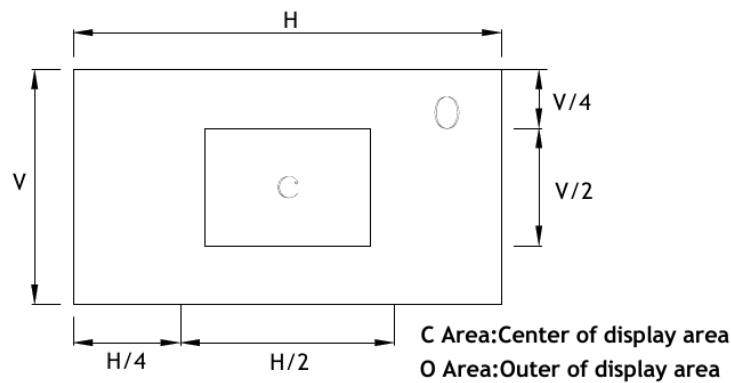
Note1 : W : Width[mm], L : Length[mm], N : Number, ϕ : Average Diameter



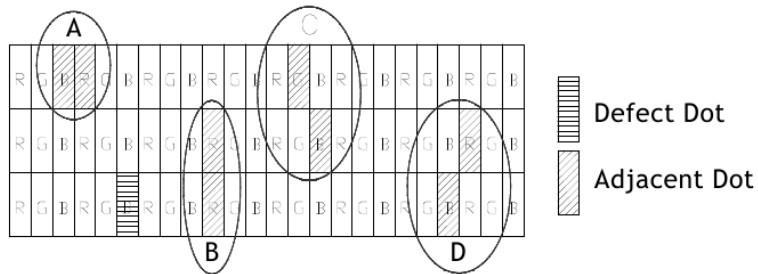
Note2 : Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.



Note3 :



Note4 : Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2defect dots in total quantity.



Note5 : Other condition

(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

5. HANDLING PRECAUTION

- (1) Don't disassemble and reassemble the module by self.
- (2) Acid, alkali, alcohol or touched directly by hand will damage the display.
- (3) Static electricity will damage the module. Please configure grounding device.
- (4) The strong vibration, shock, twist or bend will cause material damage, even module broken.
- (5) It is easy to cause image sticking while displaying the same pattern for very long time.
- (6) The response time, brightness and performance will vary from different temperature.
- (7) 12 months of the product term, the starry shipment date began to count.