SHENZHEN TECHSTAR ELECTRONICS CO.,LTD

SPECIFICATION
FOR
LCD Module
TS7335E

MODULE:	TS7335E
CUSTOMER:	

TZD	INITIAL	DATE
PREPARED BY	覃光亮	2014.4.14
CHECKED BY	覃锦伟	2014.4.14
APPROVED BY	罗教平	2014.4.14

CUSTOMER	INITIAL	DATE
APPROVED BY		

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2014.4.14	-	First Issued.	Ling

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1. General Description

* DESCRIPTION

TS7335E is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 3.5" TFT-LCD contains 320 x 480 pixels, and can display up to 16.7M colors.

* Features
-Low Input Voltage: VCC: 2.5~3.3V; IOVCC: 1.65~3.3V
-Display Colors of TFT LCD: 16.7M colors
- Interface:MIPI-1 Lane
-Internal Power Supply Circuit.

General Information Items	Specification Main Panel	Unit	Note
Display area(AA)	48.96(H) *73.44(V) (3.5 inch)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	320(RGB) *480	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.153(H) *0.153(V)	mm	-
Viewing angle	6：00	o'clock	-
Drive IC	ILI9488	-	-
Display mode	Normally White	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

Mechanical Information

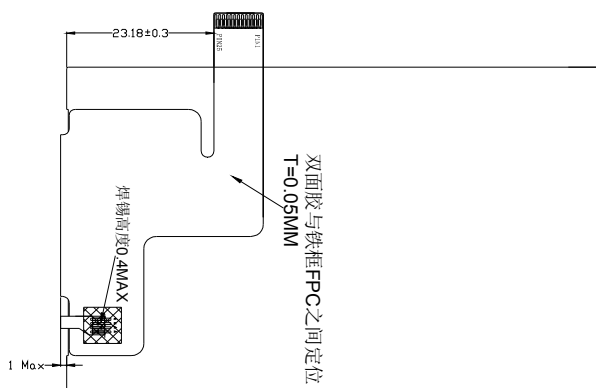| Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	54.06	-	mm	-
	Vertical(V)	-	84.04	-	mm	-
	Depth(D)	-	-	2.10	mm	-
Weight		-	TBD	-	g	-

2. MECHANICAL SPECIFICATION

1、 Display type:TFT/Normal white
2、 Display mode:Transmissive
3、 Interface: MIPI / Driver IC: ILI9488
4、 The best Viewing direction: 6:00
5、 Backlight: White LED (6-LED) / V=16.8~19.2V / I=20mA
6、 LCM Luminance:220cd/m Typ
7、 Operating temprature: -20°C ~ +70°C
8、 Storage temprature: -30°C ~ +80°C
9、 建议泡棉视窗单边小于LCD CF 0.4mm
10、 FPC connector:FH26-25S-0.3 SHW
11、 ROHS REQUEST

84.04
77.24 LCD CF
73.44 LCD AA
0.50
2.30
52.96 LCD CF
48.96 LCD AA
54.06
0.55
2.55

3.5" TFT
320*RGB*480 DOTS
VIEWING DIRECTION:
6 O'clock

**9.01±0.5
3.50±0.3
2.50±0.3

0.13±0.03(FPC) double layer
0.2±0.03(FPC+PI)

2.40 Max LCM+FPC
**2.10±0.1 without FPC

23.18±0.3
双面胶与铁框FPC之间固定
T=0.05MM
焊锡高度0.4MAX
1 Max
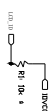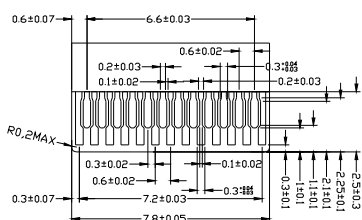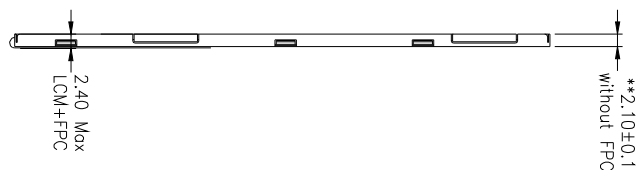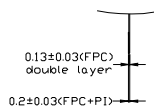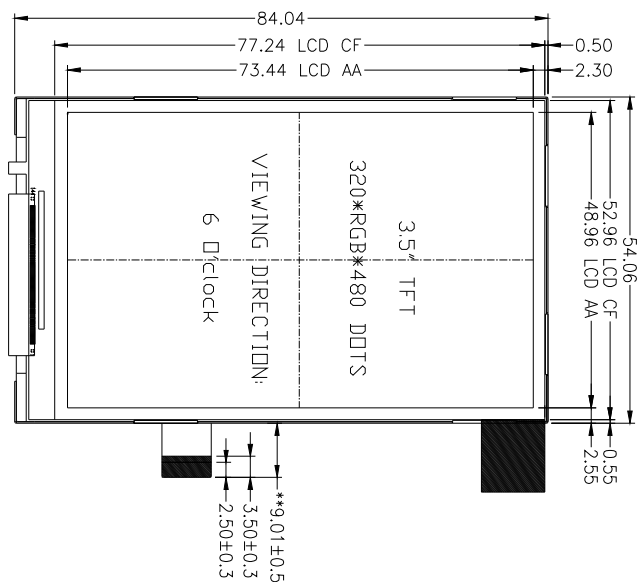
LED CIRCUIT DIAGRAM:
A K

PIN	SYMBOL
1	GND
2	LCD-ID
3	NC
4	NC
5	NC
6	RESET
7	TE
8	NC
9	NC
10	GND
11	GND
12	1.8V
13	2.8V
14	GND
15	DON
16	DOP
17	GND
18	NC
19	NC
20	GND
21	CLKN
22	CLKP
23	GND
24	A
25	K

深圳市天正达电子有限公司
TECHSTAR ELECTRONICS CO.,LTD.

Rev	Revision content description	Date			
A	据客户设计	2014.03.07			

TOLERANCE UNLESS ±0.2
UNIT mm
Mod.Name TS7335E
PART.Name ///
DESIGNED(structure)
DESIGNED(electron)
APPROVED
SCALE 1/2
SHEET
FIT
DRAWING NAME LCM

3. PIN DESCRIPTION

Pin NO.	Symbol	Level	Function
1	GND	L	Ground
2	LCD-ID	H	Read ID
3-5	NC	/	Not Connect
6	RESET	L	Hardware reset pin
7	TE	H/L	Tearing effect output
8-9	NC	/	Not Connect
10	GND	L	Ground
11	NC	/	Not Connect
12	1.8V	H	Power supply. (1.65-3.3V)
13	2.8V	H	Power supply(2.5-3.3V)
14	GND	L	Ground
15	D0N	H/L	HSSI_D0- are differential data signal line.
16	D0P	H/L	HSSI_D0+ are differential data signal line.
17	GND	L	Ground
18-19	NC	/	Not Connect
20	GND	L	Ground
21	CLKN	H/L	HSSI_CLK- are differential data signal line.
22	CLKP	H/L	HSSI_CLK+ are differential data signal line.
23	GND	L	Ground
24	A	H	Backlight+
25	K	L	Backlight-

4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Logic circuit	IOVCC	1.65	3.3	V	
Supply Voltage for analog circuit	VCI	2.5	3.3	V	

4.2 DC ELECTRICAL CHARACTERISTICS

4.2.1 OPERATING CONDITIONS

Typical Operating Conditions (Ta=25℃)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Power Supply	VCI	2.5	2.8	3.3	V	
Power Supply	IOVCC	1.65	1.8	3.3	V	
Normal mode Current consumption	Icc	-	13	-	mA	V_{CC}=2.8V
TFT Gate ON Voltage	V_{GH}	10	-	20	V	
TFT Gate OFF Voltage	V_{GL}	-15	-	-6.0	V	

4.2.2 BACKLIGHT UNIT (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Forward supply Voltage	V_f	16.8	-	19.2	V	
Forward supply Current	I_f	-	20	-	mA	
LCM Luminance	L_V	–	220	–	cd/m2	I_B=20mA
Uniformity	/	80			%	-

4.3 TIMING CHARACTERISTICS

4.3 .1 High Speed Mode – Clock Channel Timing
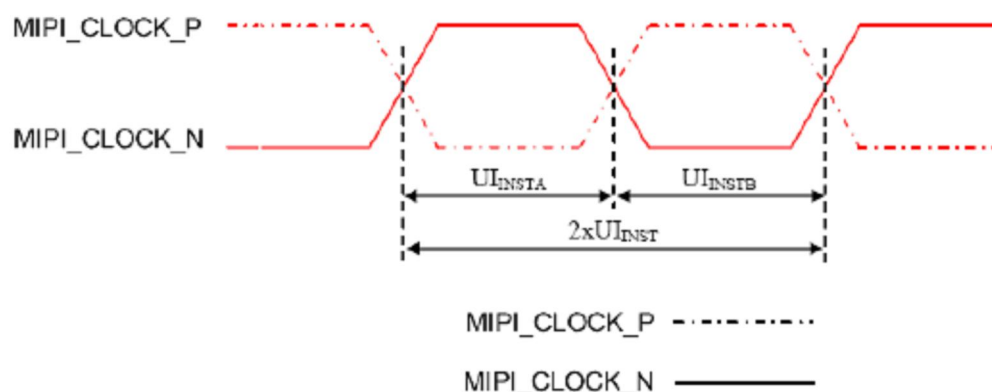
Figure 147: DSI Clock Channel Timing

Table 44: DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
MIPI_CLOCK_P/N	$2 \times UI_{INST}$	Double UI instantaneous	4	25	ns
MIPI_CLOCK_P/N	UI_{INSTA}, UI_{INSTB} (Note 1)	UI instantaneous Half	2 (Note 2)	12.5	ns

Notes:

1. $UI = UI_{INSTA} = UI_{INSTB}$

2. See Table 45 for the minimum value of 24 UI per Pixel.

Table 45: Clock Channel Speed Limited

Data type	One Lanes speed	Unit
Data Type = 00 1110 (0Eh), RGB 565, 16 UI per Pixel	500M	bps
Data Type = 01 1110 (1Eh), RGB 666, 18 UI per Pixel	500M	bps
Data Type = 10 1110 (2Eh), RGB 666 Loosely, 24 UI per Pixel	500M	bps
Data Type = 11 1110 (3Eh), RGB 888, 24 UI per Pixel	500M	bps

4.3.2

High Speed Mode – Data Clock Channel Timing
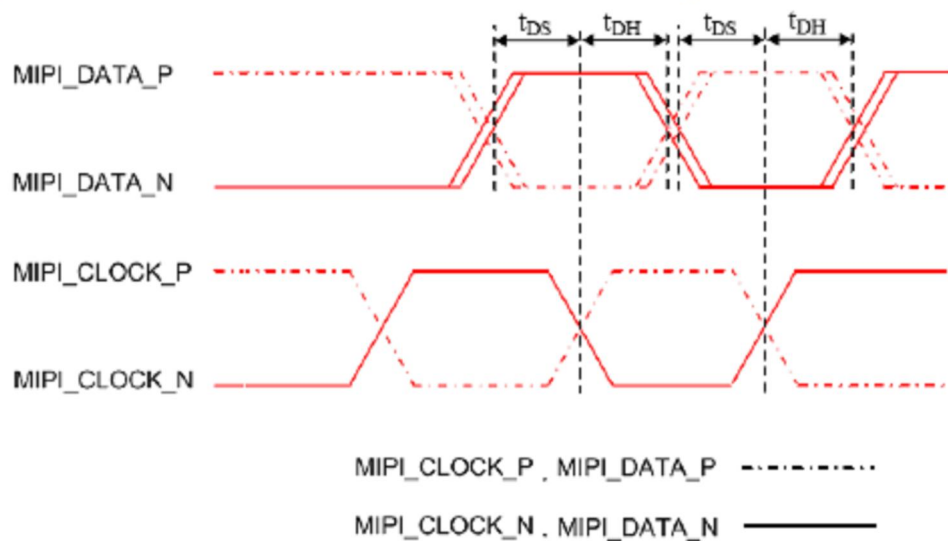
Signal	Symbol	Parameter	Min	Max	Unit
MIPI_DATA_P/N	t_{DS}	Data to Clock Setup time	0.15xUI	-	ps
MIPI_DATA_P/N	t_{DH}	Clock to Data Hold Time	0.15xUI	-	ps

4.3.3 High Speed Mode – Rising and Falling Timings
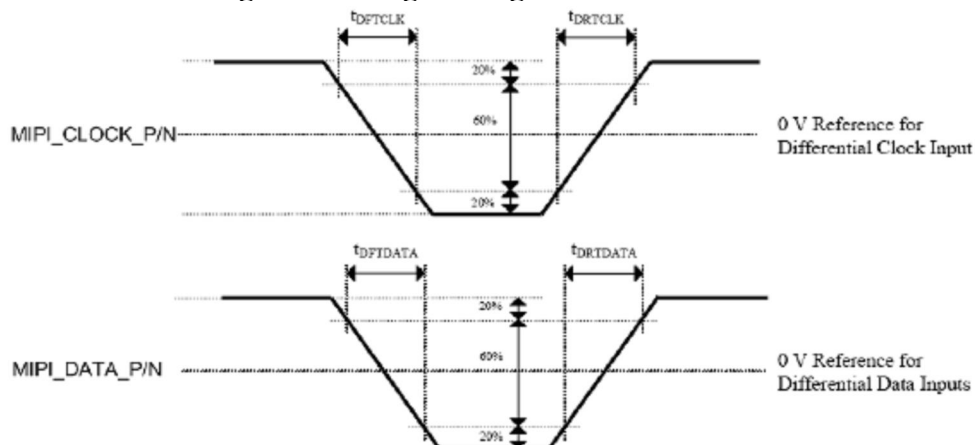
**Figure 148: Rising and Falling Timings on Clock and Data Channels**

Table 46: Rising and Falling Timings on Clock and Data Channels

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Differential Rise Time for Clock	t_{DRTCLK}	MIPI_CLOCK_P/N	-	-	900	ps
Differential Rise Time for Data	$t_{DRTDATA}$	MIPI_DATA_P/N	-	-	900	ps
Differential Fall Time for Clock	t_{DFTCLK}	MIPI_CLOCK_P/N	-	-	900	ps
Differential Fall Time for Data	$t_{DFTDATA}$	MIPI_DATA_P/N	-	-	900	ps

Note: The display module has to meet timing requirements, which are defined for the transmitter (MCU) on MIPI D-Phy standard.

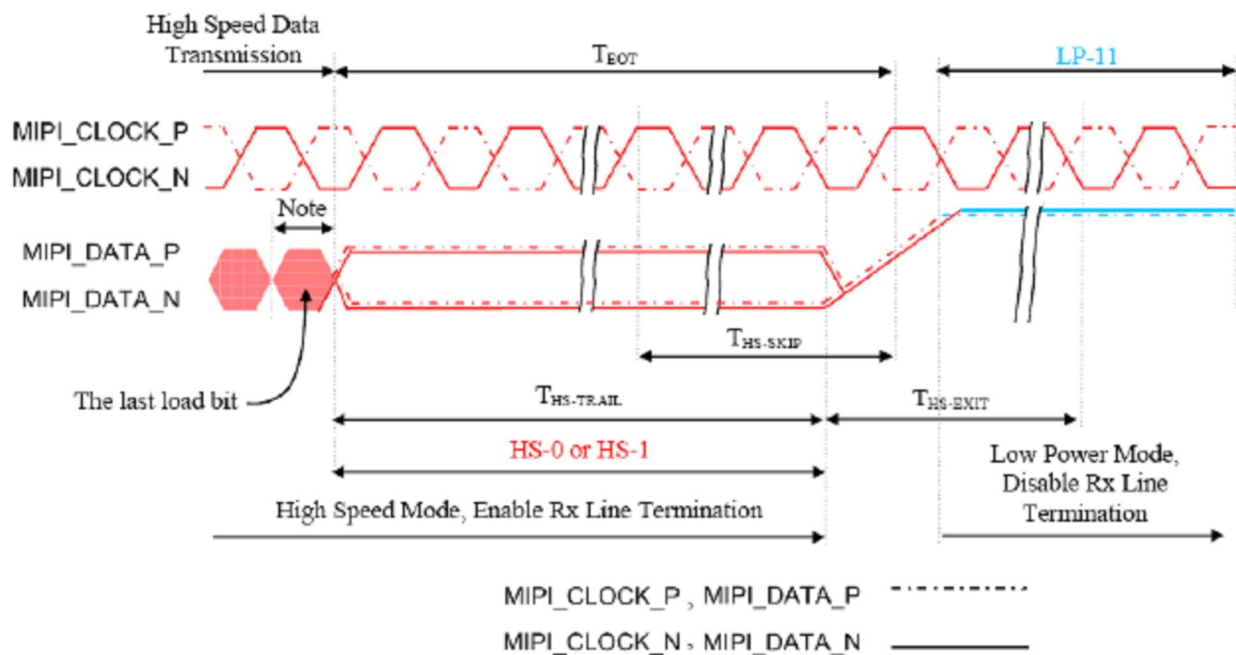## Data Lanes from Low Power Mode to High Speed Mode
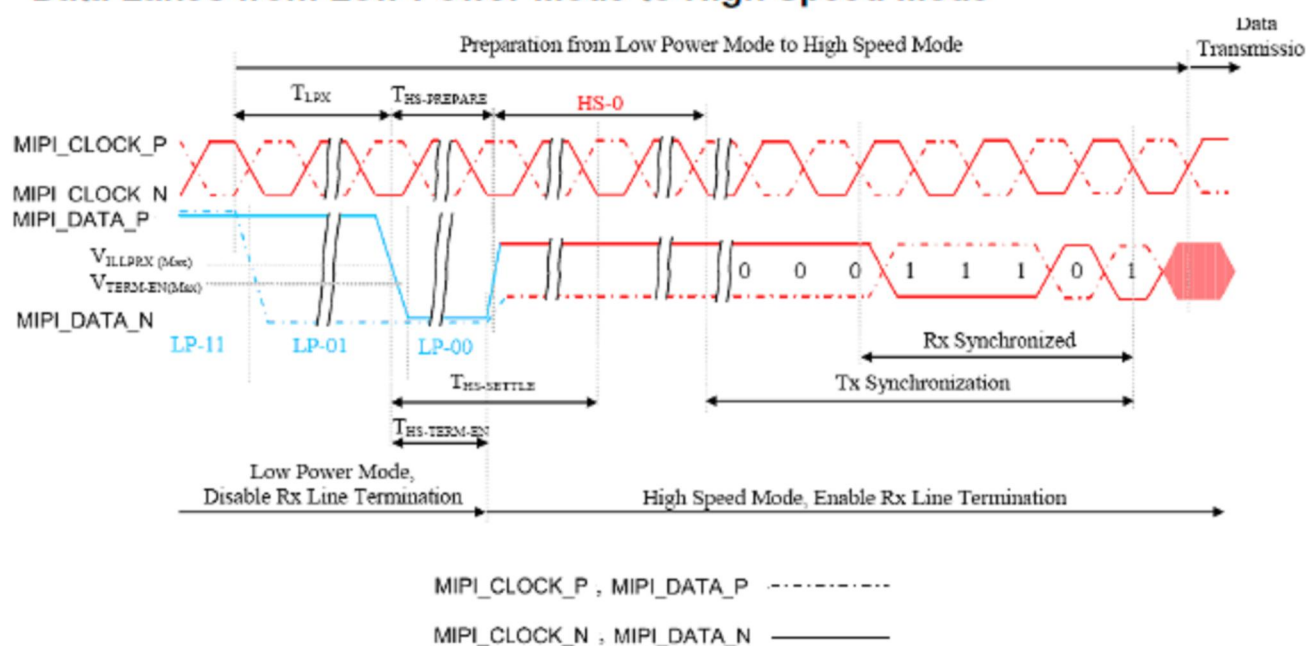
Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_DATA_P/N)	T_{LPX}	Length of any Low Power State Period	50	-	ns
Input (MIPI_DATA_P/N)	$T_{HS-PREPARE}$	Time to Drive LP-00 to prepare for HS Transmission	40+4xUI	85+6xUI	ns
Input (MIPI_DATA_P/N)	$T_{HS-TERM-EN}$	Time to enable Data Lane Receiver line termination measured from when D_n crosses V_{ILMAX}	-	35+4xUI	ns

Note: $UI = UI_{INSTA} = UI_{INSTB}$
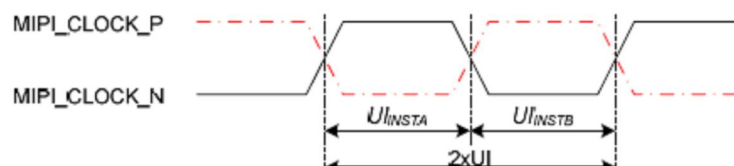
Data Lanes from High Speed Mode to Low Power Mode

Figure 152: Data Lanes – High Speed Mode to Low Power Mode Timings

Note:
If the last load bit is HS-1, the transmitter changes from HS-1 to HS-0.
If the last load bit is HS-0, the transmitter changes from HS-0 to HS-1.

Table 50: Data Lanes – High Speed Mode to Low Power Timings

Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_DATA_P/N)	$T_{HS-SKIP}$	Time-out at the ILI9488 to Ignore Transition Period of EoT	40	50+4xUI	ns
Input (MIPI_DATA_P/N)	$T_{HS-EXIT}$	Time to Driver LP-11 after HS burst	100	-	ns

5. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note.1.

Response Time			30 (Typ.)	ms	With IVO requirement driving condition, Refer to Section Note A,B
Contrast Ratio			500 (Typ.)	-	
Viewing Angle			Up-down : 70/60 (Typ.), Left-right : 70/70 (Typ.)	deg.	Viewing Angle base on Using EWV polarizer Reference Only
Chromaticity	NTSC Ratio		60% (Typ.)	%	With reference backlight spectrum, see in 12(with reference polarizer)
CF only Chromaticity	Red	Rx	0.637 ±0.02	-	Under C light (Viewing normal angle $\Theta_X = \Theta_Y = 0°$)
		Ry	0.338 ±0.02		
	Green	Gx	0.289 ±0.02		
		Gy	0.589 ±0.02		
	Blue	Bx	0.136 ±0.02		
		By	0.143 ±0.02		
	White	Wx	0.300±0.02		
		Wy	0.340±0.02		
Panel Transmittance			5.1%(min) 5.5% (Typ.)	%	
Color Filter Structure			Stripe RGB	-	-

Note: A. Definition Of Response Time (T$_R$, T$_F$)

Figure 1 Definition of Response Time
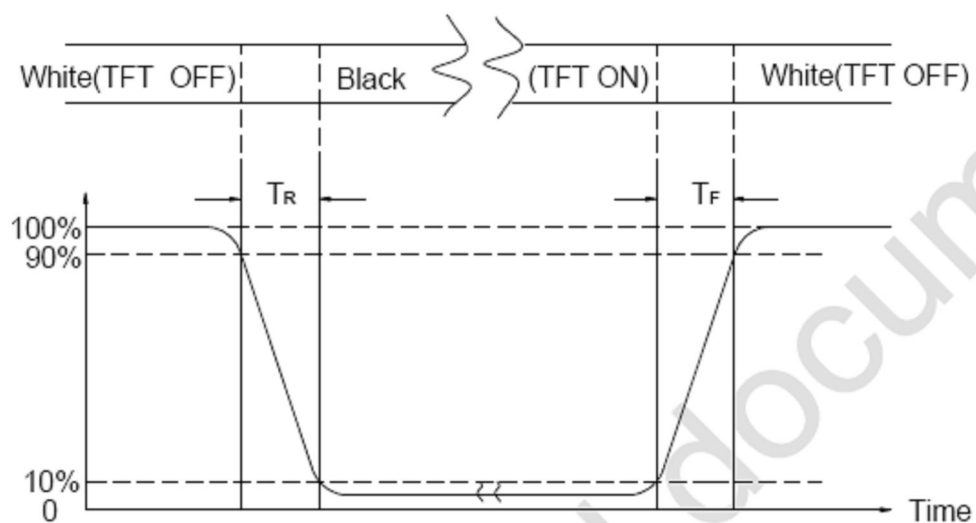
6. QUALITY SPECIFICATIONS

6.1 INSPECTION CONDITION

(1) Inspect under 300~500Lux fluorescent light, leaving 30~35cm between panels and eyes, and between panels and lights.

(2) Inspection condition is 23±5°C, 50±20%RH maximum.
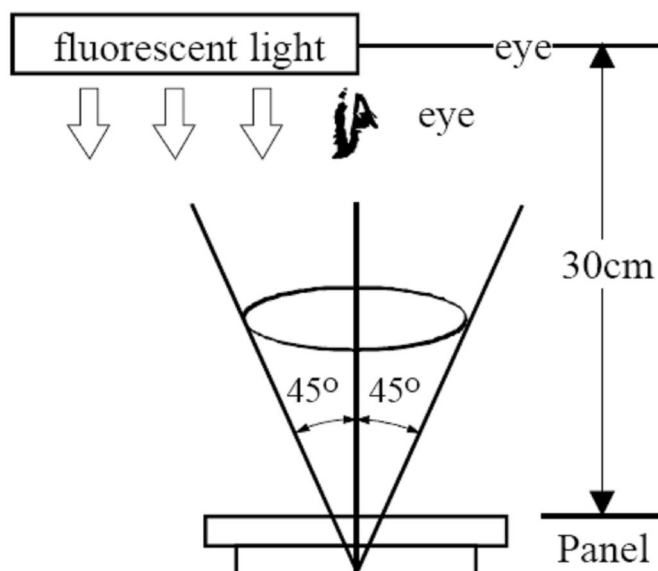
6.2 DEFINITION OF AREA
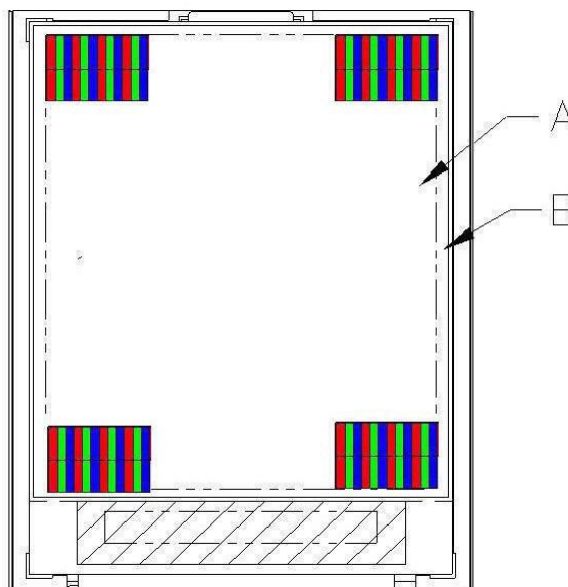
A Area : Viewing area.
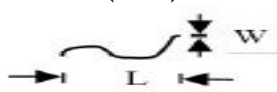
B Area : Out of viewing.(outside viewing area)
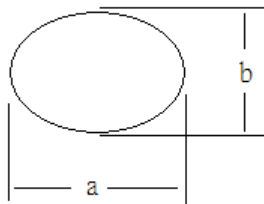
6.3 INSPECTION SPECIFICATION

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing	**1-1 sub pixel classification** ● Sub Pixel: Number of sub pixel doesn't exceed one dot. Sub Pixel (Dot) **a> Dark dot ----one Allowed** **b> Bright dot ---- one Allowed** ● Pixel : Three dots link together doesn't exceed ones **Pixel** **1-2 Leakage to light** ● Leakage to light be not allowed. **1-3 Picture to shake** ● Picture had shake, twinkle and noise etc. instable of defect that be not allowed. **1-4 Function** ● No display or No function. ● Source Line, Gate Line. ● Contrast Ratio ● Current consumption exceeds product specifications. ● Display malfunction.	$N \leqq 1$ $N \leqq 0$ N=0 N=0 N=0
2	Mechanical Dimension	2-1 Mechanical Dimension exceeds product specifications. 2-2 Out of frame and boss of plastic changed shape that be not allowed.	N=0

NO	Item	Acceptable specification	Judgment Criterion
3	Cosmetic Inspection	(see below)	

3-1 Blemish: Line shapes of defect

Length	Width	Acceptable number	Mini. space
---	W≦0.03	Ignore	
L≦2.5	0.03<W≦0.05	3	5 m m
L≦2.5	0.05<W≦0.1	2	
--	W>0.1	Not allowed	---

L: length(mm)
W: width(mm)

3-2 Blemish: dot shapes of defect.

Dimension	Acceptable number	Mini. Space
Φ≦0.10	Ignore	---
0.10<Φ≦0.15	2	5 m m
0.15<Φ≦0.25	1	
Φ>0.25	0	---

3-3 Polarizer Bubble

Dimension	Acceptable number	Mini. Space
Φ≦0.20	Ignore	---
0.20<Φ≦0.30	2	15 m m
Φ>0.30	0	---

Foreign Substances

$Φ=(a+b)/2$

NO	Item	Acceptable specification	Judgment Criterion
3	**Cosmetic Inspection**	**3-4 Scratch** ● Sensate scratch not allowed. ● Impassive scratch as below. Unit:mm See table below	
4	**Package**	4-1 Mixed product types 4-2 Shipping q'ty should be the same as "shipping notice form" q'ty. 4-3 Outer box can't broken.	N=0

Scratch table (Unit:mm):

Length	Width	Acceptable number	Mini. space
-----	W≦0.03	Ignore	5 m m
L≦2.5	0.03<W≦0.05	3	
L≦2.5	0.05<W≦0.1	2	
----	0.1<W	Not allowed	---
L>2.5	----	Not allowed	

7. RELIABILITY

Test Item	Test Condition
High Temperature Operation	70℃ for 96 hours
Low Temperature Operation	-20℃ for 96 hours
High Temperature Storage	80℃ for 96 hours
Low Temperature Storage	-30℃ for 96 hours
High Temperature Operation Humidity Operation	60℃, 90%RH for 96 hours
Thermal Shock	-20℃(30min) ~+25℃(5min)~ +70℃(30min) for 10 cycles
Vibration Test (No Operation)	Frequency: 10~55Hz Amplitude:1.0mm Sweep Time: 11min Test Period: 6 Cycles for each direction of X, Y, Z

8. HANDLING PRECAUTION

8.1 SAFETY

(1) Do not swallow any liquid crystal, even if there is no proof that liquid stal is poisonous.
(2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
(3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

8.2 STORAGE CONDITIONS

(1) Store the panel or module in a dark place where the temperature is 23±5℃ and thehumidity is below 50±20%RH.
(2) Store in anti-static electricity container.
(3) Store in clean environment, free from dust, active gas, and solvent.
(4) Do not place the module near organics solvents or corrosive gases.
(5) Do not crush, shake, or jolt the module.

8.3 HANDLING PRECAUTIONS

(1) Avoid static electricity which can damage the CMOS LSI.
(2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
(3) Do not give external shock.
(4) Do not apply excessive force on the surface.
(5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
(6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with acleaning naphtha solvent.
(7) Do not operate it above the absolute maximum rating.
(8) Do not remove the panel or frame from the module.

8.4 WARRANTY

The period is within twelve months since the date of shipping out under normal using and storage conditions.