Project No. 项目编号	TXW154028S0
Customer 客户名称	
Module No. 客户型号	
Product type 产品内容	**Standard LCD Module** **TFT：240*RGBx240Dots** **1.54TFT LCD**

客户确认Customer Approval	
项目负责人Project Manager	
品质主管Director of Quality	
采购工程师Purchasing Engineer	

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1. Introduction

1.1 Scope of application

This specification applies to the LCD module that is supplied by Tian Xian Wei Technology CO., LTD.
LCD specification: Dots 240xRGBx240.
As to basic specification of the driver IC, refer to the IC (ST7789V2) specification and data book.
All material & processing of the LCD module should be Lead Free.

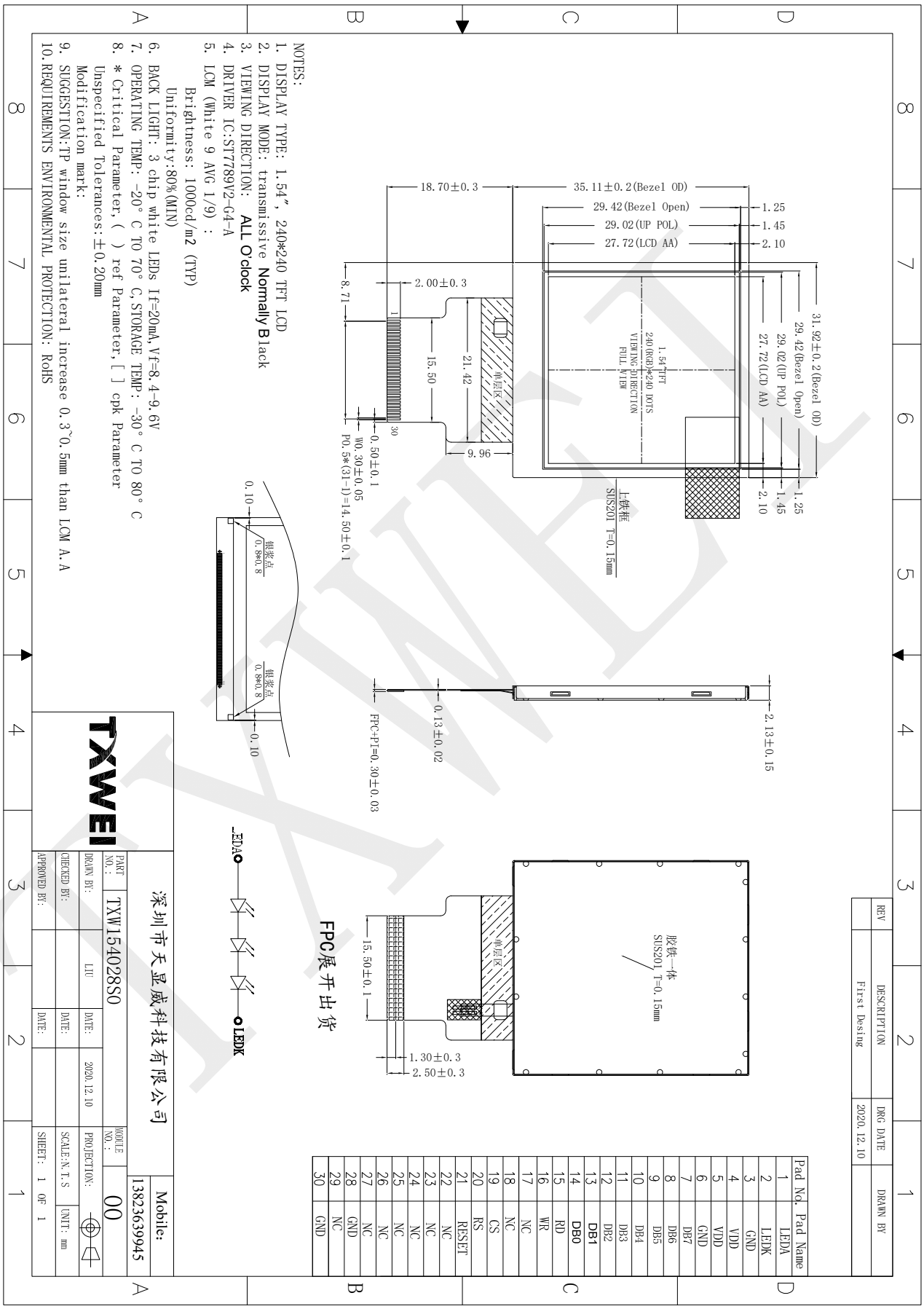
1.2 TFT features:

Structure: TFT PANNEL+IC +FPC+BL;
IPS Type LCD
240dot-segment and 240 dot-common outputs;
65K Color can be selected by software;
White LED back light;
8bit MCU interface

1.3 Applications:

2. LCM General specification

ITEM	Sandard value	Unit
LCD Type	Normally Black	--
Drive element	TFT active matrix	--
Number of pixels	240*3RGB(H)X240(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (W*H)	0.1155(W) × 0.1155(H)	mm
Active area	27.72(W) ×27.72 (H)	mm
Viewing direction	ALL O'CLOCK	-
TFT Driver IC	ST7789V2	
TFT interface	8bit MCU interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	31.92(W) ×35.11(H) ×2.13(T)	mm
Touch structure	--	
Touch Driver IC	--	-
Touch Interface	--	



Pad No.	Pad Name
1	LEDA
2	LEDK
3	GND
4	VDD
5	VDD
6	GND
7	DB7
8	DB6
9	DB5
10	DB4
11	DB3
12	DB2
13	DB1
14	DB0
15	RD
16	WR
17	NC
18	NC
19	CS
20	RS
21	RESET
22	NC
23	NC
24	NC
25	NC
26	NC
27	NC
28	GND
29	NC
30	GND

REV	DESCRIPTION	DRG DATE	DRAWN BY
	First Desing	2020.12.10	

深圳市天显威科技有限公司

PART NO.:	TXW154028S0	MODULE NO.:	00
DRAWN BY:	LIU	DATE: 2020.12.10	PROJECTION:
CHECKED BY:		DATE:	SCALE:N.T.S
APPROVED BY:		DATE:	SHEET: 1 OF 1

Mobile: 13823639945

UNIT: mm

3.Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T_{OPR}	-20	+70	°C
LCM Storage Temperature	T_{STG}	-30	+80	°C
Humidity	RH	-	90	%

4.Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage for I/O	VDDIO	--	--	--	V
Supply Voltage for(DC/DC)	VDD	2.5	2.8	3.6	V
Supply Voltage for(DC/DC)	AVDD				V
Supply Voltage for(DC/DC)	AVEE				V

4.2 Back-Light Unit Characeristics

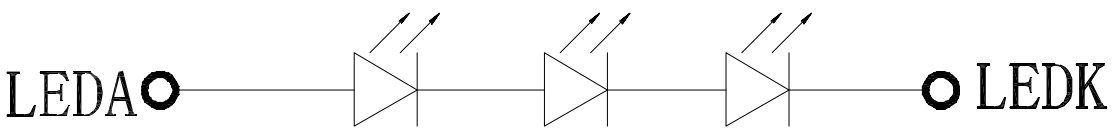
The back-light system is an edge-lighting type with 3 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V_F	8.4	--	9.6	V	-
Forward current	I_F	--	20	-	mA	-
Luminance(With LCD)	Lv		1000	--	cd/m^2	-
LED life time	N/A	----	30,000	--	Hr	Note 1

Note:

(1) The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_L=20mA/LED. The LED life time could be decreased if operating I_L is larger than 25mA/LED.

Backlight circuit diagram shown in below:



5. Module Function Description

Pin No.	Symbol	LCM Description
1	LEDA	BACKLIGHT +
2	LEDK	BACKLIGHT-
3	GND	System Ground
4	VDD	POWER SUPPLY 2.5V ~ 3.3V
5	VDD	POWER SUPPLY 2.5V ~ 3.3V
6	GND	System Ground
7-14	DB7-DB0	MCU PARALLEL INTERFACE DATA BUS
15	RD	Read enable in 8080 MCU parallel interface.
16	WR	WRITE ENABLE IN MCU PARALLEL INTERFACE
17-18	NC	NC
19	CS	Chip selection pin
20	RS	Display data/command selection pin
21	RESET	Hardware reset
22-27	NC	NC
28	GND	System Ground
29	NC	NC
30	GND	System Ground

6. Timing Characteristics

8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus

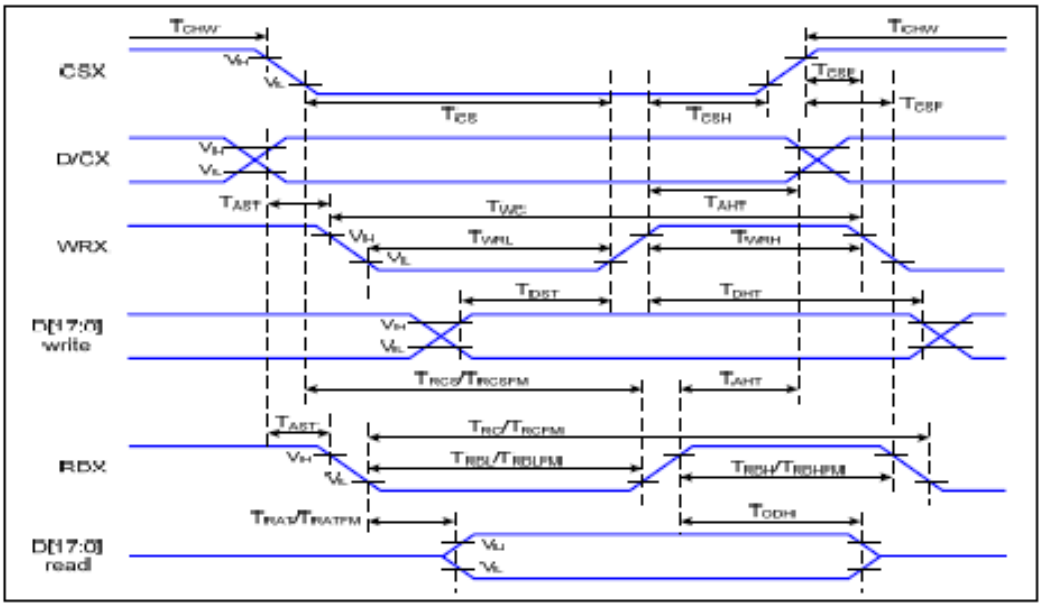


Figure 1 Parallel Interface Timing Characteristics (8080-Series MCU Interface)

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25℃

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
WRX	T_{WC}	Write cycle	66		ns	
	T_{WRH}	Control pulse "H" duration	15		ns	
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
D[17:0]	T_{DST}	Data setup time	10		ns	For CL=30pF

	T_{DHT}	Data hold time	10		ns	
	T_{RAT}	Read access time (ID)		40	ns	
	T_{RATFM}	Read access time (FM)		340	ns	
	T_{ODH}	Output disable time	20	80	ns	

Table 4 8080 Parallel Interface Characteristics

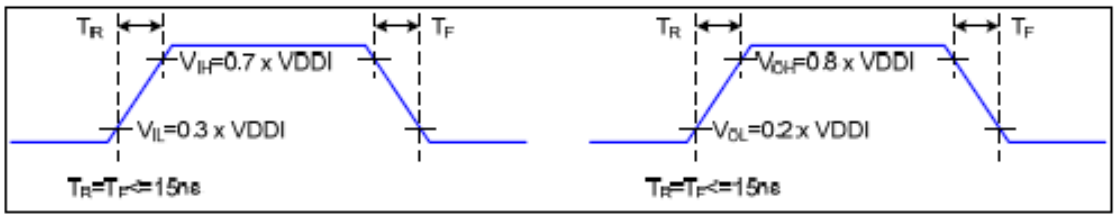


Figure 2 Rising and Falling Timing for I/O Signal

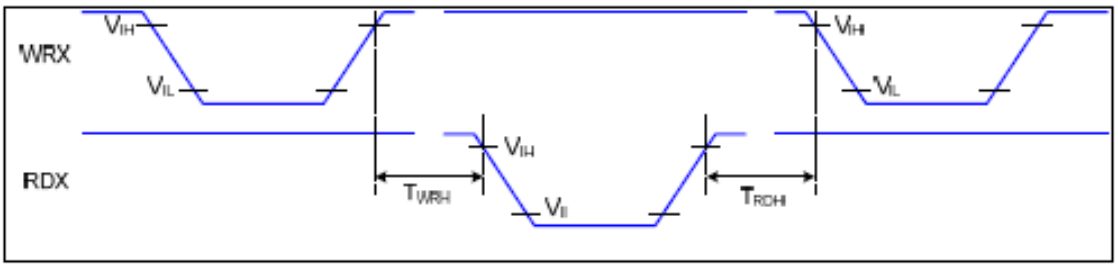


Figure 3 Write-to-Read and Read-to-Write Timing

Note: The rising time and falling time (Tr, Tf) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Reset Timing:

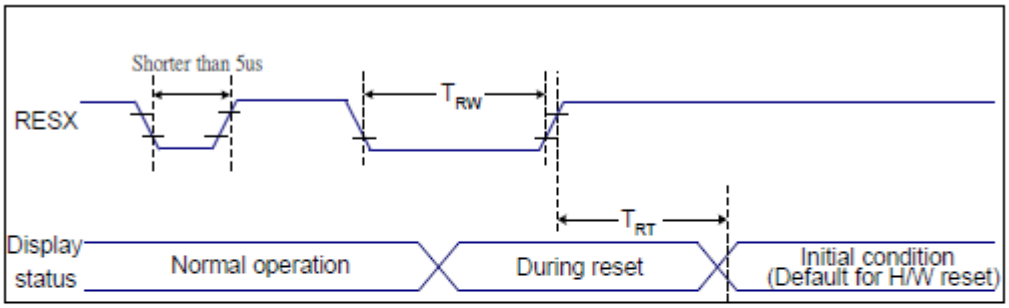


Figure 7 Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Table 9 Reset Timing

Notes:

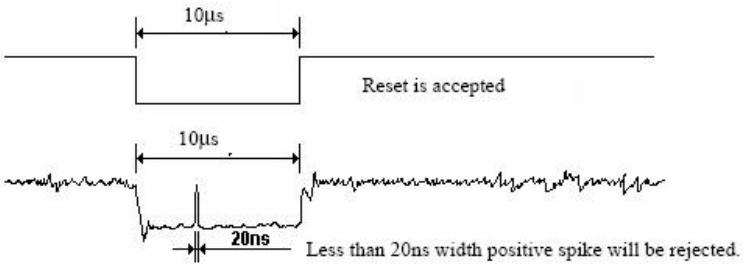
1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.

4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset applied during Sleep In Mode.

6. When Reset applied during Sleep Out Mode.

7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7.Optical Characteristics

Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer)		T(%)	–		5	–	%	
Transmittance (without Polarizer)		T(%)	–		16.5	–	%	
Contrast Ratio		CR	Θ=0 Normal viewing angle		800	–	–	(1)(2)
Response Time		T_R+T_F		–	30	40	msec	(1)(3)
Color Gamut		S(%)			50	–	%	
Color Chromaticity (CIE1931)	White	W_x		0.283	0.303	0.323		(1)(4) CF glass
		Wy		0.305	0.325	0.345		
	Red	Rx		0.600	0.620	0.640		
		Ry		0.312	0.332	0.352		
	Green	Gx		0.264	0.284	0.304		
		Gy		0.514	0.534	0.554		
	Blue	Bx		0.126	0.146	0.166		
		By		0.109	0.129	0.149		
Viewing Angle	Hor.	$Θ_L$	CR>10	–	80	–		Viewing Angle base on using Normal Polarizer, Reference Only
		$Θ_R$		–	80	–		
	Ver.	$Θ_U$		–	80	–		
		$Θ_D$		–	80	–		
Optima View Direction		ALL						(5)

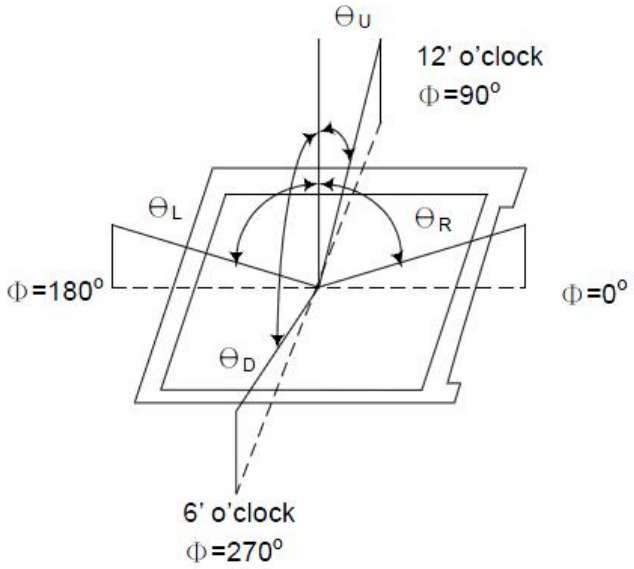
Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

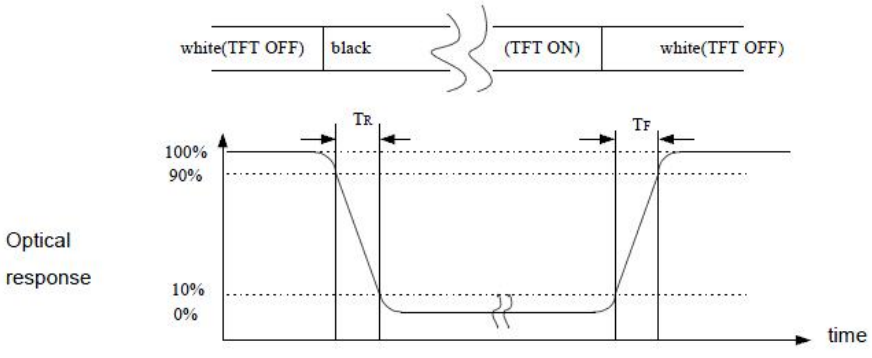
Note (1) Definition of Viewing Angle:



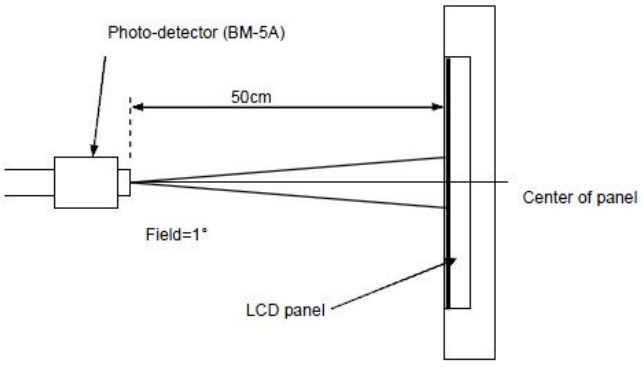
Note (2) Definition of Contrast Ratio (CR):
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

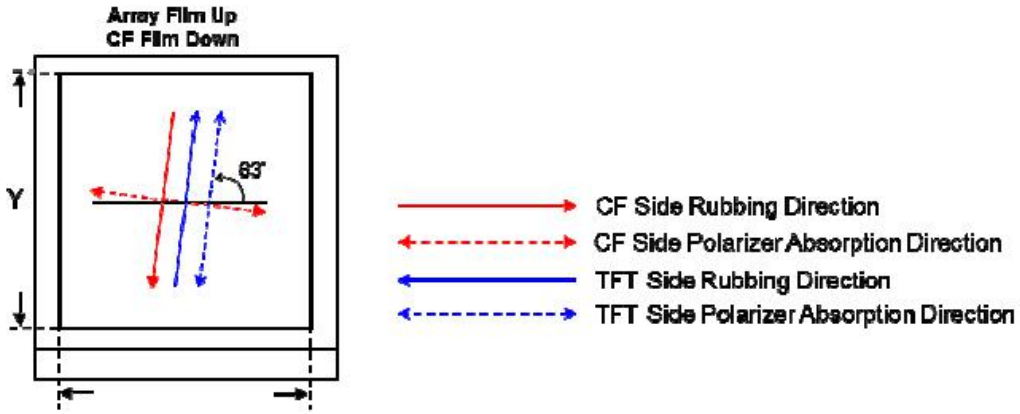
Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Definition of optical measurement setup

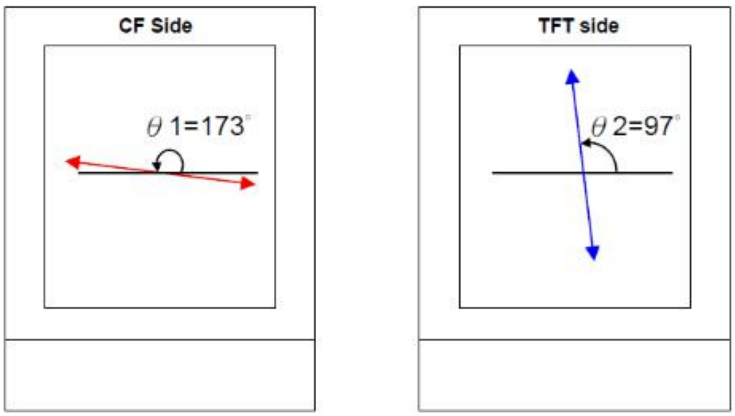


Note (5) Rubbing Direction & Polarizer Absorption Direction



Item	*Specifications*	Unit	Note
Rubbing Direction	*83°(TFT) / 263°(CF)*	degree	1-domain IPS-pro
Absorption axis of Polarizer	*83°(TFT) / 173°(CF)*	degree	Array Film Up CF Film Down

CF side polarizing absorption angle θ 1=173° (Protective film on top, glue layer face down)
TFT side polarizing absorption angle θ 2=97° (Protective film on top, glue layer face down)



8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+80°C / 96H	1. Functional test isOK. Missing Segment,short, unclear segment non-display,display abnormally and liquid crystal leakare un-allowed. 2. No low temperature bubbles,end seal loose andfall, frame rainbow.
2	Low Temp. Storage	-30°C / 96H	
3	High Tempe. Operating	+70°C / 96H	
4	Low Tempe. Operating	-20°C / 96H	
5	High Temperature /Humidity storage	50°C x 90%RH /96H	
6	Thermal and cold shock	Static state， -20℃（30min） ~60℃（30min），50 cycles	

9. Packing Method----TBD

- END -