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Firmware

EMC tests

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In-house Manufacturing

Optical Bonding

Cover glass

System solutions

OEM Solutions

Custom Display

Mechanical design



MODEL NO : ET023HV01-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2021-11-18

☐ Preliminary Specification

☒ Final Product Specification

Customer : _____

Approved by	Notes

Youri Confirmation

Prepared by	Reviewed by	Approved by
John	Johnny	Wang

1. Introduction

1.1 Scope of application

LCD specification: Dots 320xRGBx240

As to basic specification of the driver IC, refer to the IC (ILI9342C) 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;

12 O'CLOCK Type LCD

320 dot-segment and 240 dot-common outputs;

262K Color can be selected by software;

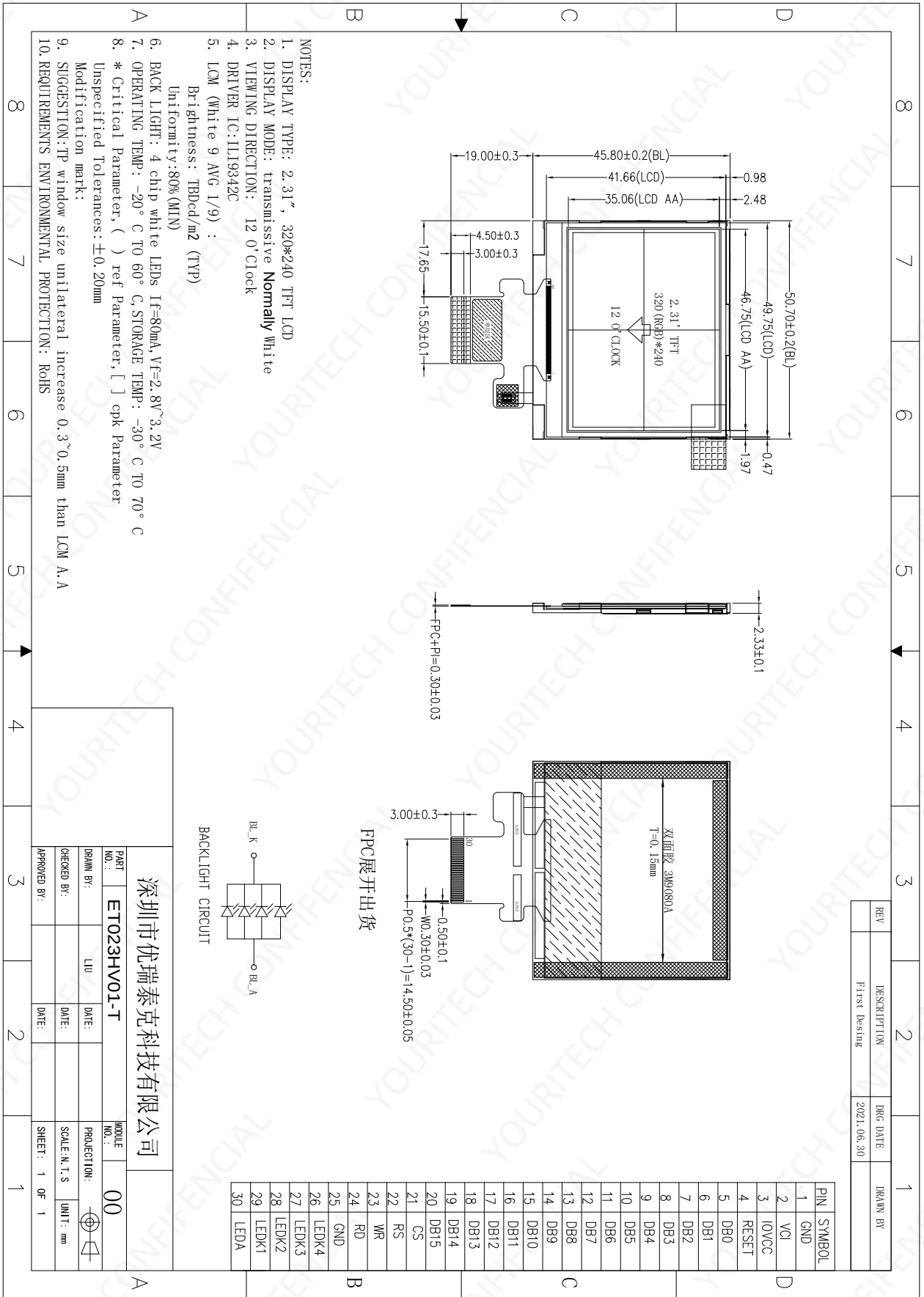
White LED back light;

16bit MCU interface

1.3 Applications:

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally White	--
Drive element	TFT active matrix	--
Number of pixels	320*3RGB(H)X240(V)	Dots
Pixel arrangement	RGB Vertical Stripe	--
Pixel Pitch (W*H)	0.1461(H) X 0.1461(V)	mm
Active area	46.752(H) x 35.064(V)	mm
Viewing direction	12 O'CLOCK	-
TFT Driver IC	ILI9342C	
TFT interface	16bit MCU interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	50.70(W) ×45.80(H) ×2.33(T)	mm
Touch structure	--	
Touch Driver IC	--	-
Touch Interface	--	



3.Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T _{OPR}	-20	+60	°C
LCM Storage Temperature	T _{STG}	-30	+70	°C
Humidity	RH	-	90	%

4.Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage for I/O	VDDIO	1.65	1.8	3.3	V
Supply Voltage for(DC/DC)	VDD	2.7	2.8	3.3	V
Current Consumption	I _{DD}	--	--	50	mA
	I _{DD-SLEEP}	--	80	160	uA

4.2 Back-Light Unit Characteristics

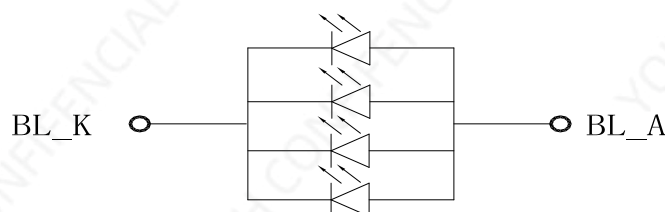
The back-light system is an edge-lighting type with 4 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	2.8		3.2	V	-
Forward current	I _F	--	80	-	mA	-
Luminance(With LCD)	L _v		TBD	--	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:

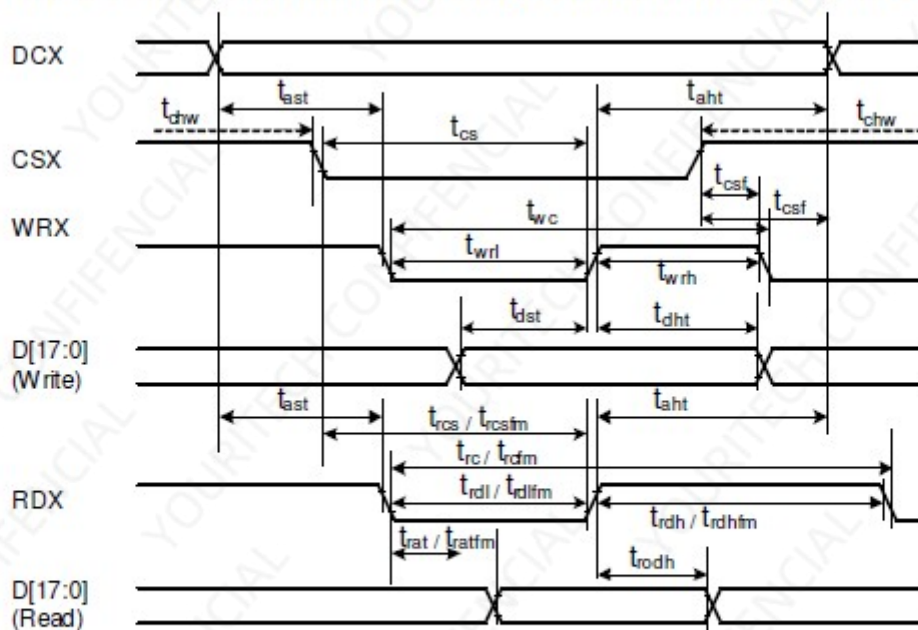


5. Module Function Description

Pin No.	Symbol	LCM Functional	Notes
1	GND	Power Ground	
2	VCI2.8V	power supply for DC/DC circuit	
3	IOVCC1.8V	power supply for the I/O circuit	
4	RESET	Reset pin. Setting either pin low initializes the LSI	
5~20	DB0~DB15	Data bus	
21	CS	Chip select signal input pin	
22	RS	Register select signal.	
23	WR	Write strobe signal	
24	RD	Read data at the rising edge.	
25	GND	Power Ground	
26	LEDK4	Power supply for backlight cathode input terminal.	
27	LEDK3	Power supply for backlight cathode input terminal.	
28	LEDK2	Power supply for backlight cathode input terminal.	
29	LEDK1	Power supply for backlight cathode input terminal.	
30	LEDA	Power supply for backlight anode input terminal.	

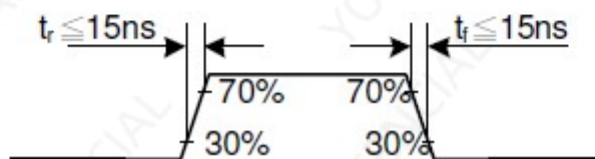
6. Timing Characteristics

Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080-system)

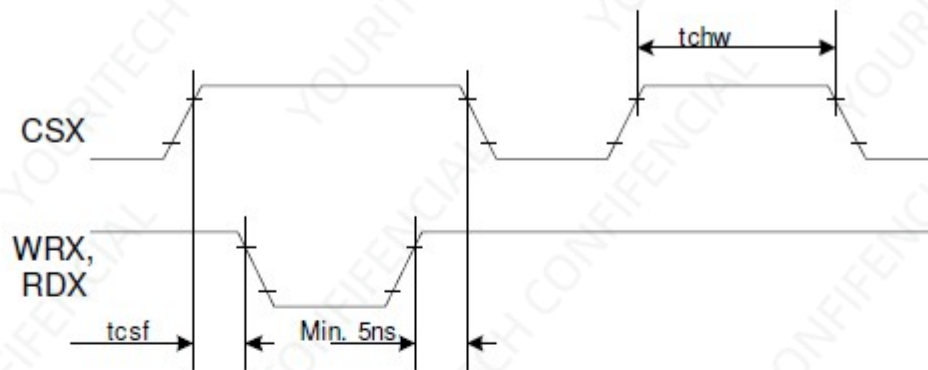


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t_{ast}	Address setup time	0	-	ns	
	t_{ahh}	Address hold time (Write/Read)	10	-	ns	
CSX	t_{chw}	CSX "H" pulse width	0	-	ns	
	t_{cs}	Chip Select setup time (Write)	15	-	ns	
	t_{rcs}	Chip Select setup time (Read ID)	45	-	ns	
	t_{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	
	t_{csf}	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	t_{wc}	Write cycle	66	740	ns	
	t_{wrh}	Write Control pulse H duration	15	-	ns	
	t_{wrl}	Write Control pulse L duration	15	-	ns	
RDX (ID)	t_{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t_{rdh}	Read Control pulse H duration	90	-	ns	
	t_{rdl}	Read Control pulse L duration	45	-	ns	
RDX (FM)	t_{rcfm}	Read Cycle (FM)	450	-	ns	When read from the frame memory
	t_{rdhfm}	Read Control H duration (FM)	90	-	ns	
	t_{rdlfm}	Read Control L duration (FM)	355	-	ns	
DB[17:0], DB[15:0], DB[8:0], DB[7:0]	t_{dst}	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	t_{dht}	Write data hold time	10	-	ns	
	t_{rat}	Read access time	-	40	ns	
	t_{ratfm}	Read access time	-	340	ns	
	t_{rod}	Read output disable time	20	80	ns	

Note: $T_a = -40$ to 85°C , $IOVCC=1.65\text{V}$ to 3.3V , $V_{CI}=2.3\text{V}$ to 4.8V , $DGND=0\text{V}$

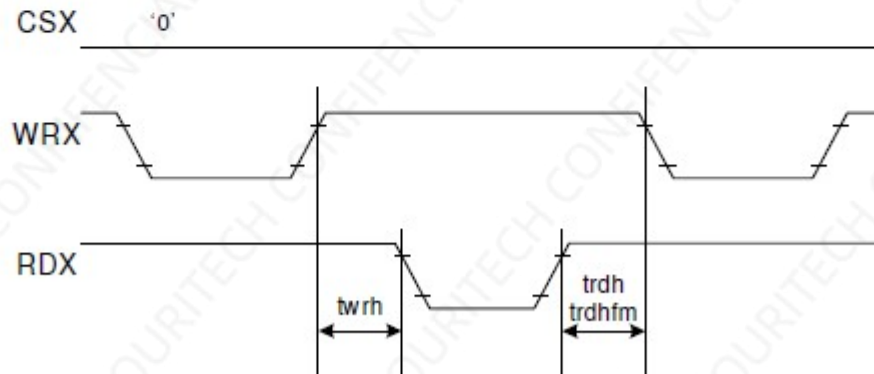


CSX timings :



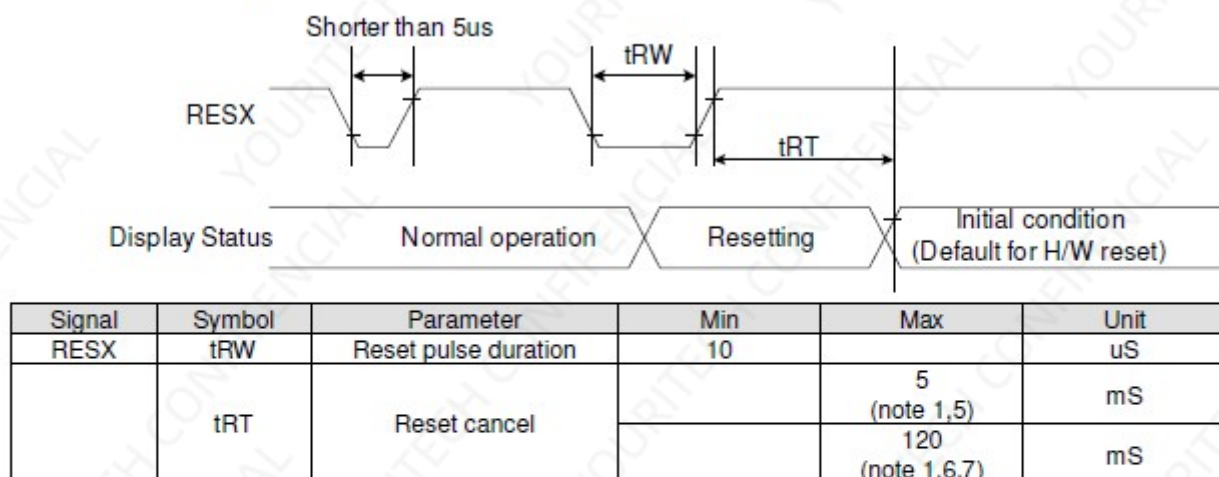
Note: Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

Write to read or read to write timings:



Note: Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

Reset Timing



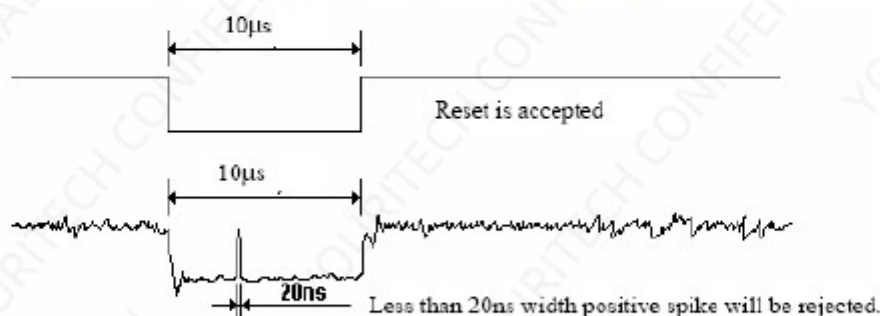
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (t_{RT}) within 5 ms after a rising edge of RESX.

Note 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 10us	Reset
Between 5us and 10us	Reset starts

Note 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.

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



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 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

7.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (without Polarizer)		T(%)	—	—	15.31%	—	—	
Contrast Ratio		CR	$\theta=0$	400	500	—	—	(1)(2)
Response time	Rising	T _R	Normal viewing angle	—	4	8	msec	(1)(3)
	Falling	T _F		—	12	20		
				—				
Color gamut		S(%)			50		%	
Color chromaticity (CIE1931)	White	W _x		0.283	0.303	0.323		(1)(4) CF glass
		W _y		0.304	0.324	0.344		
	Red	R _x		0.589	0.609	0.629		
		R _y		0.310	0.330	0.350		
	Green	G _x		0.267	0.287	0.307		
		G _y		0.507	0.527	0.547		
	Blue	B _x		0.127	0.147	0.167		
		B _y		0.118	0.138	0.158		
Viewing angle	Hor.	θ_L	CR>10	40	50	—		Viewing Angle base on using TV Polarizer , Reference Only
		θ_R		40	50	—		
	Ver.	θ_U		40	50	—		
		θ_D		35	45	—		
Optima View Direction		12 O'clock						(5)

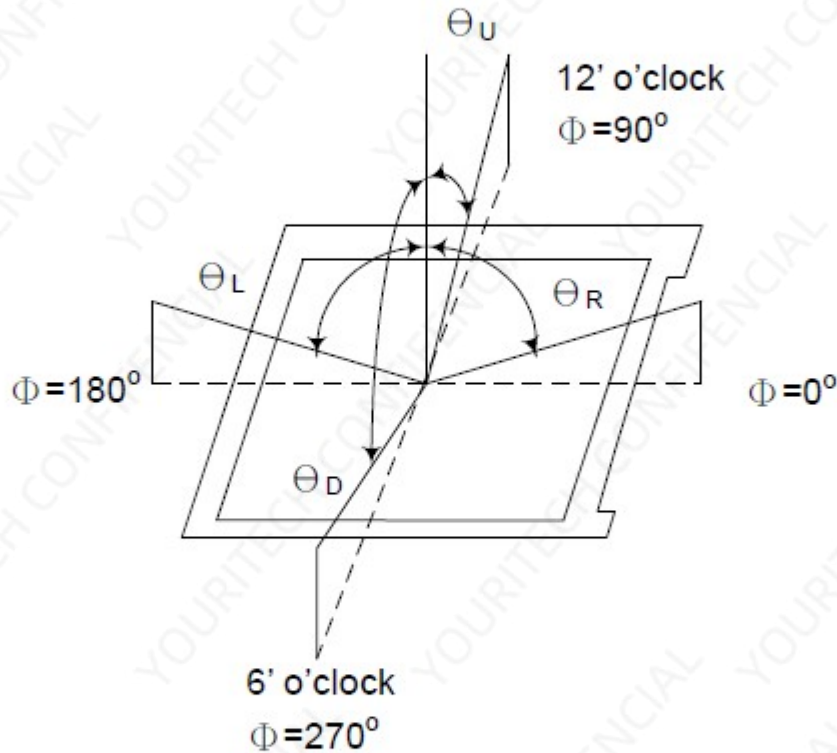
7.2 Measuring Condition

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

7.3 Measuring Equipment

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

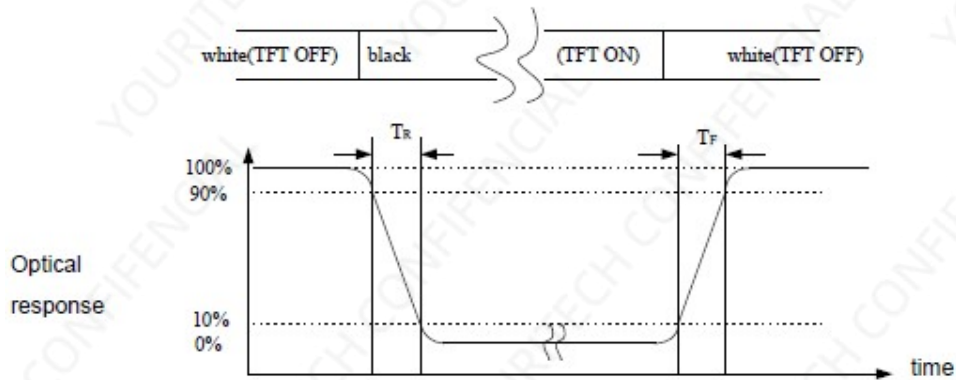
Note (1) Definition of Viewing Angle :



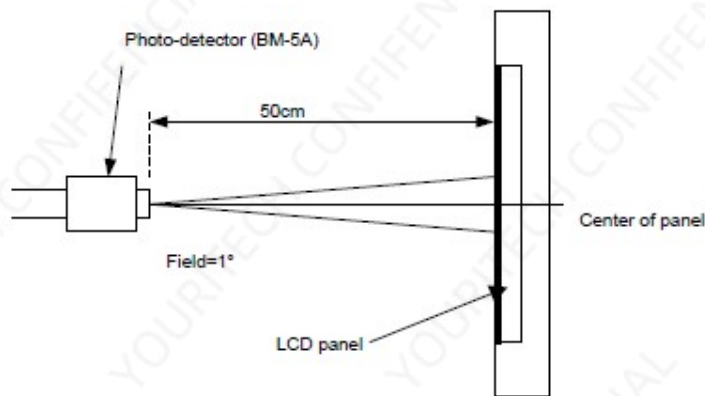
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

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

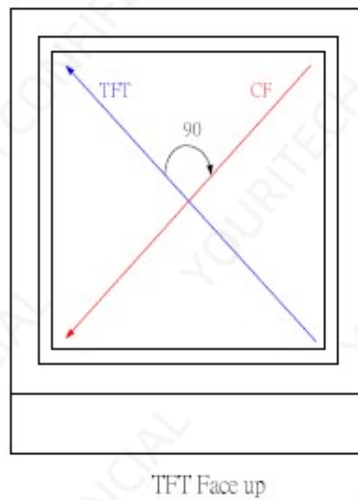
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)



8. Reliability Test Item

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

9. Packing Method----TBD

- END -