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Custom Display

Production Custom designs Installation

Mechanical design



MODEL NO : ET030NV01-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2021-04-01

☐ 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 360xRGBx640.

As to basic specification of the driver IC, refer to the IC (GalaxyCore :GC9503V) 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

360dot-segment and 640 dot-common outputs;

16.7M Color can be selected by software;

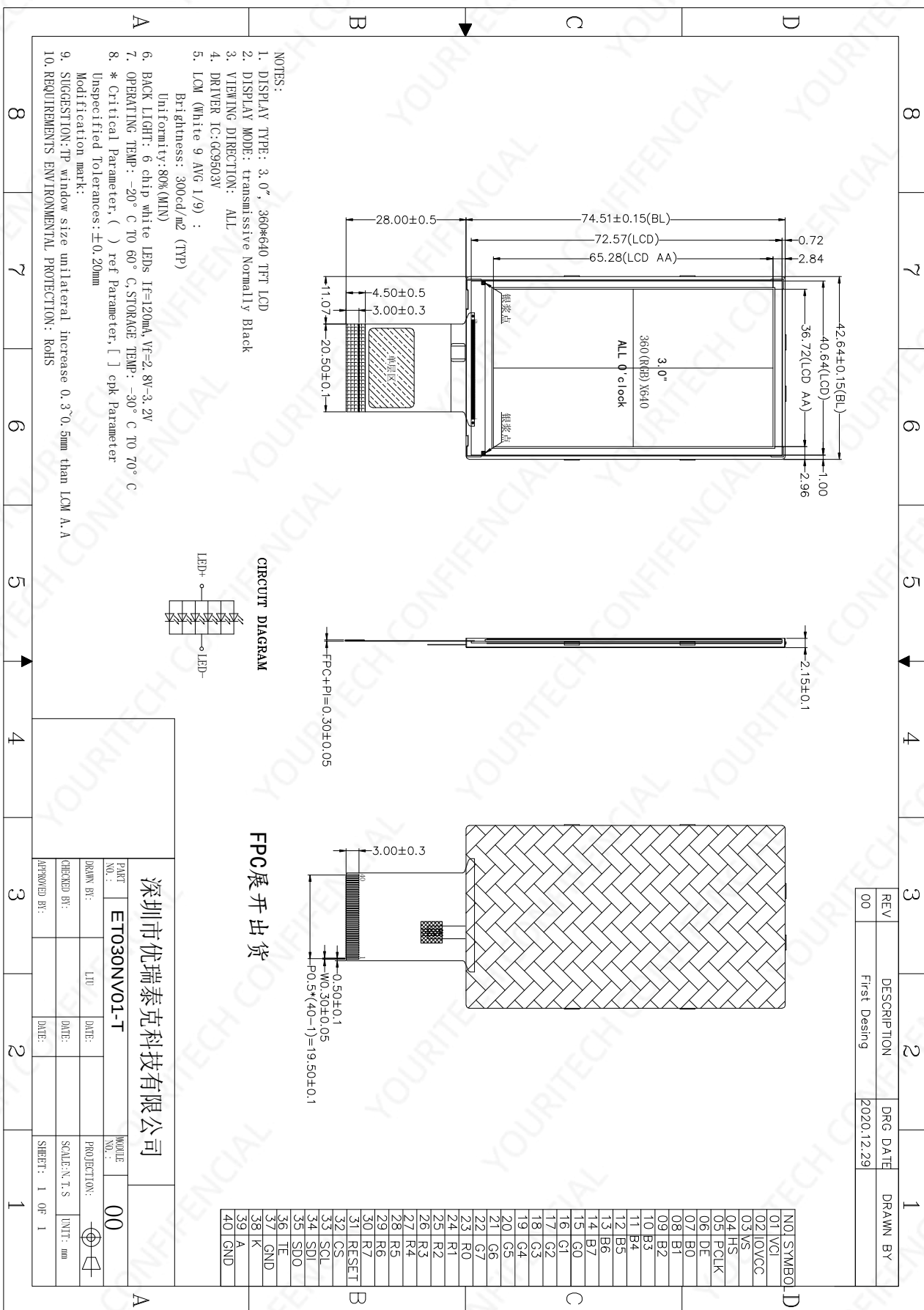
White LED back light;

24bit RGB interface

1.3 Applications:

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	360*3RGB(H)X640(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (H*V)	0.102(H) x0.102(V)	mm
Active area	36.72(H) x65.28(V)	mm
Viewing direction	ALL O'CLOCK	--
TFT Driver IC	GC9503V	--
TFT interface	24bit RGB interface	--
Approx. Weight	TBD	g
LCM Size(W*H*T)	42.64W) x 74.51(H) x2.15(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	2.5	2.8	3.3	V
Supply Voltage for(DC/DC)	AVDD	--	--	--	V
Supply Voltage for(DC/DC)	AVEE	--	--	--	V

4.2Back-Light Unit Characeristics

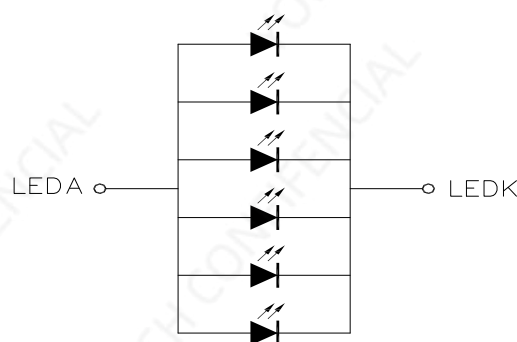
The back-light system is an edge-lighting type with 6 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	2.8	--	3.2	V	--
Forward current	I _F	--	120	--	mA	--
Luminance(With LCD)	L _v	--	300	--	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	VCI	Power supply: 2.5V ~ 3.3V	
2	IOVCC	I/O Power supply: 1.65V ~ 3.3V	
3	VSYNC	Vertical (Frame) synchronizing input signal for RGB interface operation.	
4	HSYNC	Horizontal (Line) synchronizing input signal for RGB interface operation.	
5	PCLK	Dot clock signal for RGB interface operation.	
6	DE	Data enable signal for RGB interface operation.	
7~14	B0~B7	RGB interface data bus.	
15~22	G0~G7		
23~30	R0~R7		
31	RESET	Reset signal input terminal. Active at 'L'.	
32	CS	Chip select signal input pin	
33	SCL	Serial interface clock	
34	SDI	Input signal pin	
35	SDO	Output signal pin	
36	TE	Tearing effect signal is used to synchronize MCU to frame memory	
37	GND	Power Ground	
38	LEDK	Power supply for backlight cathode input terminal.	
39	LEDA	Power supply for backlight anode input terminal.	
40	GND	Power Ground	

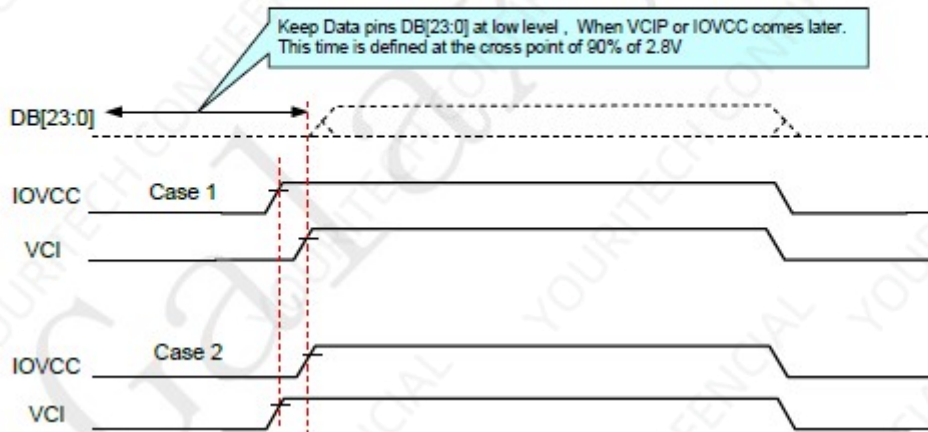
6. Timing Characteristics

Power ON/OFF Sequence

IOVCC and VCI can be applied (or powered down) in any order. During the power off sequences, if LCD is in the Sleep Out mode, VCI and IOVCC must be powered down with minimum 120msec, and if LCD is in the Sleep In mode, VCI and IOVCC can be powered down with minimum 0msec after RESX has been released. CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

Note:

1. There will be no damage to GC9503V if the power sequences are not met.
2. There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.
3. There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.
4. If RESX line is not held stable by host during Power On Sequence as defined in Sections 7.1 and 7.2, then it will be necessary to apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.
5. Keep data pins DB[23:0] at low level, when VCIP or IOVCC comes later



RGB Interface Characteristics :

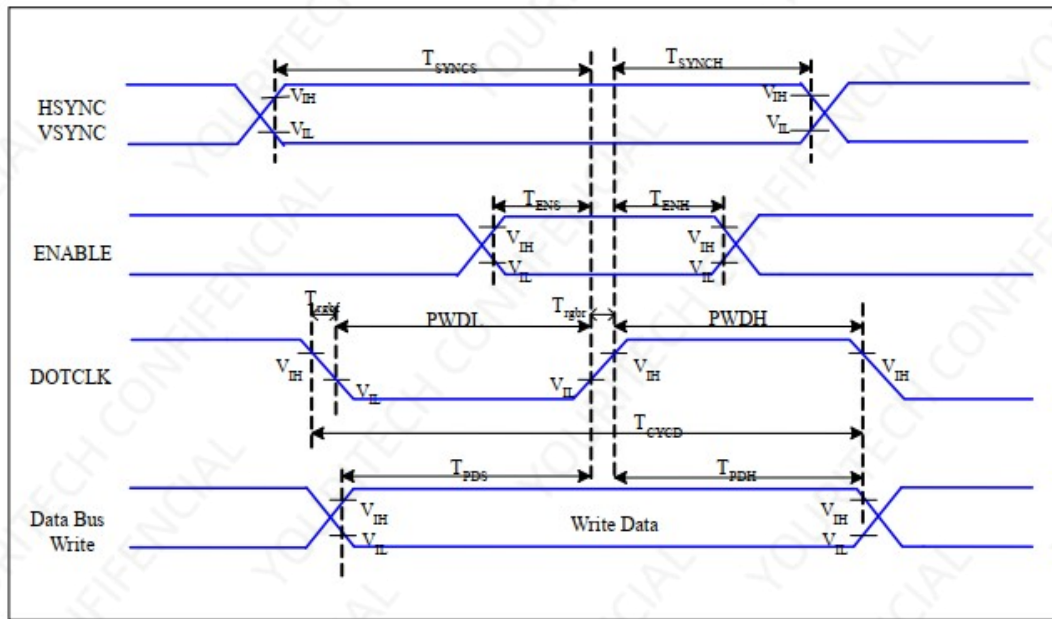


Figure 3 RGB Interface Timing Characteristics

VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCs}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CVCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

Table 6 18/16 Bits RGB Interface Timing Characteristics

Reset Timing:

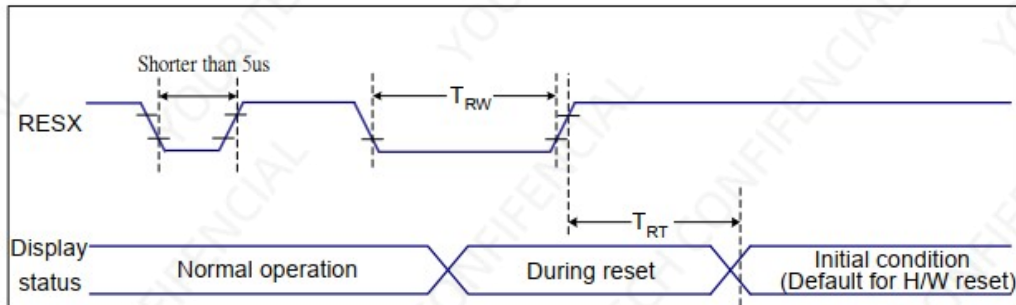


Figure 9 Reset Timing

VDDI=1.8, VDD=2.8, AGND=DGND=0V, Ta=25 °C

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

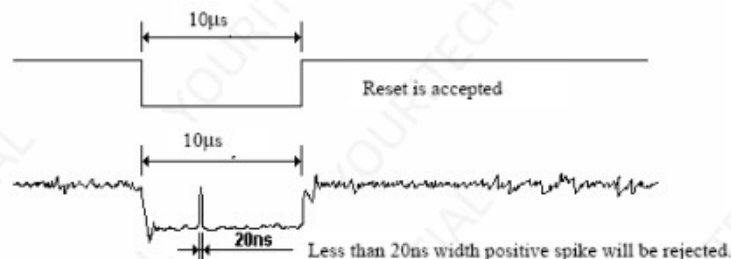
Notes:

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 (%)	Θ=0 Normal viewing angle	(3.3)	(3.7)	—	%	Measuring with normal polarizer , Reference Only
Transmittance (without Polarizer)		T (%)		(11.2)	(12.4)	—	%	
Contrast Ratio		CR		600	800	—	—	(1)(2)
Response Time	Rising	T _R		—	30	45	msec	(1)(3)
	Falling	T _F						
Color Gamut	(%)			54	60	—	%	C-light
Color Chromaticity (CIE1931)	White	W _x		(0.276)	(0.296)	(0.316)	—	(1)(4) CF glass C-light
		W _y		(0.305)	(0.325)	(0.345)		
	Red	R _x		(0.627)	(0.647)	(0.667)	—	
		R _y		(0.309)	(0.329)	(0.349)		
	Green	G _x	(0.259)	(0.279)	(0.299)	—		
		G _y	(0.530)	(0.550)	(0.570)			
	Blue	B _x	(0.114)	(0.134)	(0.154)	—		
		B _y	(0.103)	(0.123)	(0.143)			
Viewing Angle	Hor.	Θ _L	CR>10	—	80	—	—	(1)(4) Measuring with normal polarizer , Reference Only
		Θ _R		—	80	—		
	Ver.	Θ _U		—	80	—		
		Θ _D		—	80	—		
Optima View Direction		Free						(5)

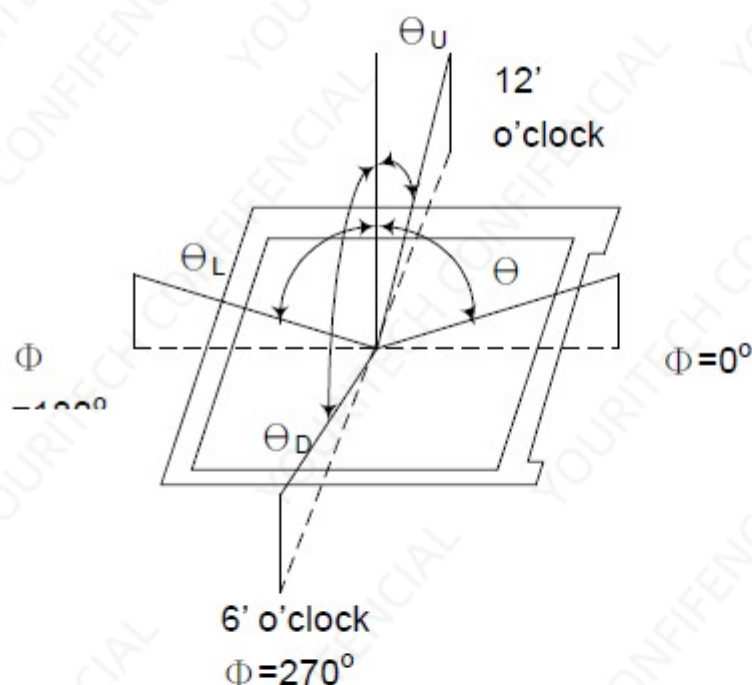
Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25 \pm 2^{\circ}\text{C}$
- 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.

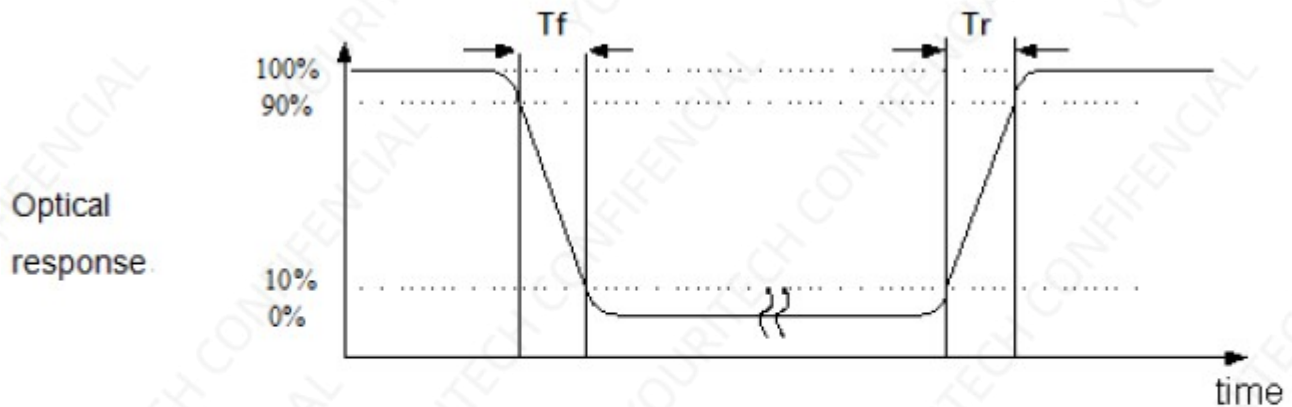
Note (1) Definition of Viewing Angle:



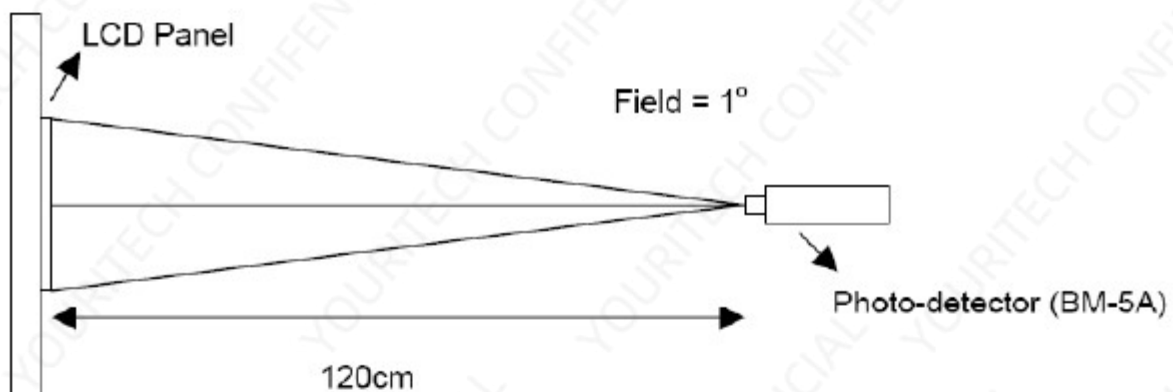
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

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

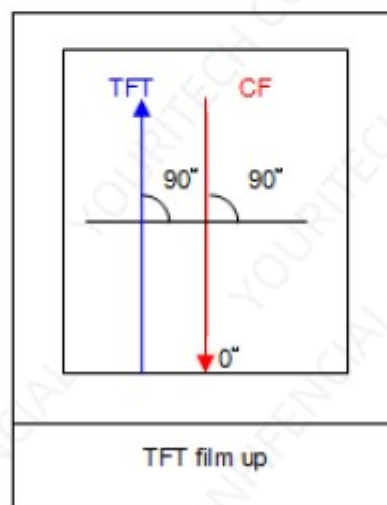
Note (3) Definition of Response Time : Sum of T_R and T_F



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) ~70°C (30min), 50 cycles	

9. Packing Method----TBD

- END -