

INDUSTRIAL STRENGTH... Start Your Application From **YOURITECH**

Integration support

Obsolescence Management

PCAP

Embedded Systems

Human Machine Interface

Touch Solutions

Software

Production Custom designs Installation

Quality Management

Open Frame Monitors

LCD Controller

Research & Development

Firmware

EMC tests

on-site service

In-house Manufacturing

Optical Bonding

Cover glass

System solutions

OEM Solutions

Custom Display

Mechanical design



MODEL NO : ET030FW02-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2023-07-29

☐ 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

This specification applies to the LCD module

LCD specification: Dots 480xRGBx854

As to basic specification of the driver IC, refer to the IC (Sitronix: ST7701SN) 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;

ALL Viewing Type LCD

480 dot-segment and 854 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

2lane MIPI interface

1.3 Applications:

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally Black	--
Drive element	TFT active matrix	--
Number of pixels	480*3RGB(H)X854(V)	Dots
Pixel arrangement	RGB Vertical Stripe	--
Pixel Pitch (W*H)	0.0765(H) x 0.07644 (V)	mm
Active area	36.72(H) x 65.28(V)	mm
Viewing direction	ALL Viewing	--
TFT Driver IC	ST7701SN	--
TFT interface	2lane MIPI Interface	--
Approx. Weight	TBD	g
LCM Size(W*H*T)	42.70(W) ×74.40(H) ×2.20(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

4.2 Back-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	16.8	--	19.2	V	--
Forward current	I _F	--	20	--	mA	--
Luminance(With LCD)	L _V	--	--	--	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	TP_RST(NC)	No Connection.	
2	TP_SDA(NC)	No Connection.	
3	TP_SCL(NC)	No Connection.	
4	TP_INT(NC)	No Connection.	
5	GND	Power Ground	
6	TP_VDD2.8V(NC)	No Connection.	
7	LEDK	Power supply for backlight cathode input terminal.	
8	LEDA	Power supply for backlight anode input terminal.	
9	NC	No Connection.	
10	GND	Power Ground	
11	CLKP	Positive polarity of low voltage differential clock signal	
12	CLKN	Negative polarity of low voltage differential clock signal	
13	GND	Power Ground	
14	D0P	Positive polarity of low voltage differential data 0 signal	
15	D0N	Negative polarity of low voltage differential data 0 signal	
16	GND	Power Ground	
17	D1P	Positive polarity of low voltage differential data 1 signal	
18	D1N	Negative polarity of low voltage differential data 1 signal	
19	GND	Power Ground	
20	RESET	Reset Signal input pin.	
21	TE	Frame head pulse for tearing effect.	
22	IOVCC1.8V	Power Supply For I/O.	
23	VDD2.8V	Power Supply For LCD.	
24	GND	Power Ground	
25	GND	Power Ground	

6. Timing Characteristics

POWER ON/OFF SEQUENCE

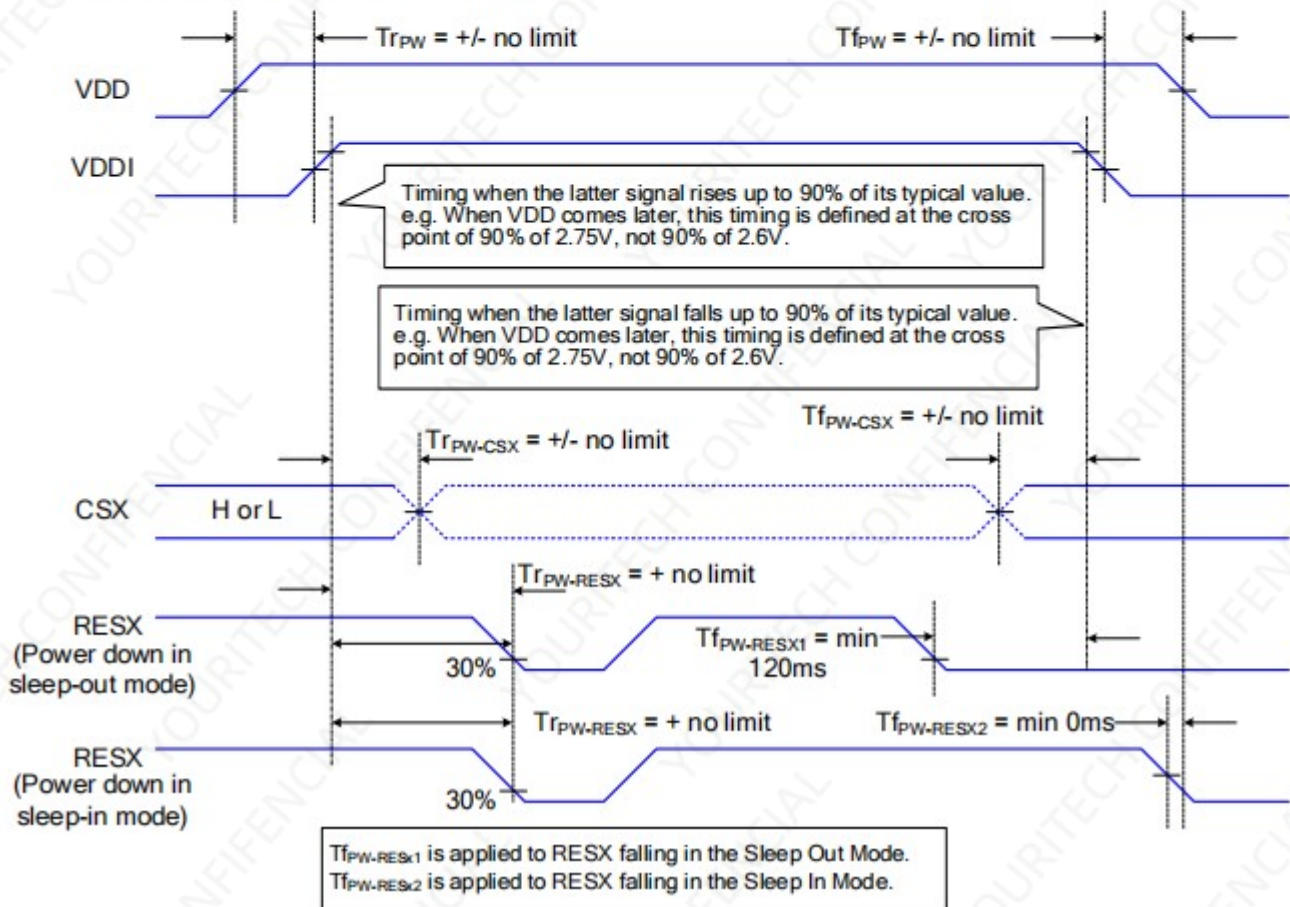
VDDI and VDDA can be applied or powered down in any order. During the Power Off sequence, if the LCD is in the Sleep Out mode, VDDA and VDDI must be powered down with minimum 120msec. If the LCD is in the Sleep In mode, VDDA and VDDI can be powered down with minimum 0msec after the RESX is released.

CSX can be applied at any timing or can be permanently grounded. RESX has high priority over CSX.

Notes:

1. There will be no damage to the ST7701S 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 the end of Power On Sequence and before receiving the Sleep Out command, and also between receiving the Sleep In command and the Power Off Sequence.
4. If the RESX line is not steadily held by the host during the Power On Sequence as defined in Sections 9.1 and 9.2, then it will be necessary to apply the Hardware Reset (RESX) after the completion of the Host Power On Sequence to ensure correct operations. Otherwise, all the functions are not guaranteed.

The power on/off sequence is illustrated below



MIPI Interface Characteristics: High Speed Mode

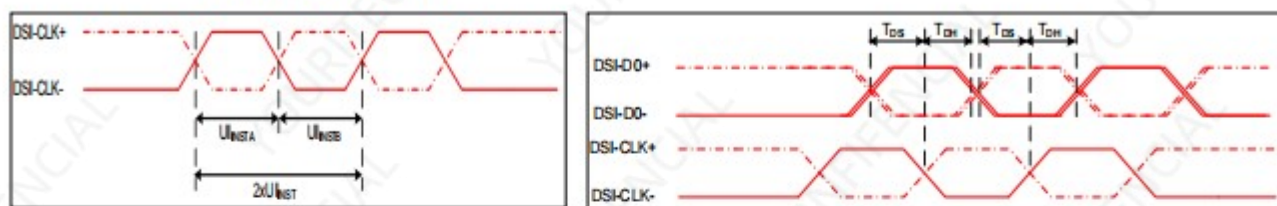


Figure 4 DSI clock channel timing

Figure 5 Rising and falling time on clock and data channel

$V_{DDI}=1.8, V_{DD}=2.8, AGND=DGND=0V, T_a=25\text{ }^{\circ}\text{C}$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2xU_{INSTA}$	Double UI instantaneous	2.5	25	ns	
DSI-CLK+/-	U_{INSTA} U_{INSTB}	UI instantaneous halves	1.25	12.5	ns	$UI = U_{INSTA} = U_{INSTB}$
DSI-Dn+/-	t_{DS}	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	t_{DH}	Data to clock hold time	0.15	-	UI	

Table 7 Mipi Interface- High Speed Mode Timing Characteristics

Low Power Mode

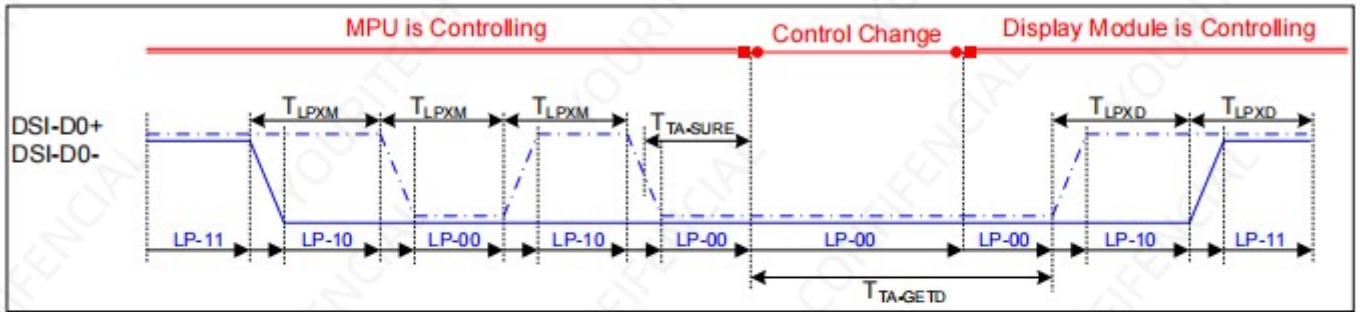


Figure 6 Bus Turnaround (BTA) from display module to MPU Timing

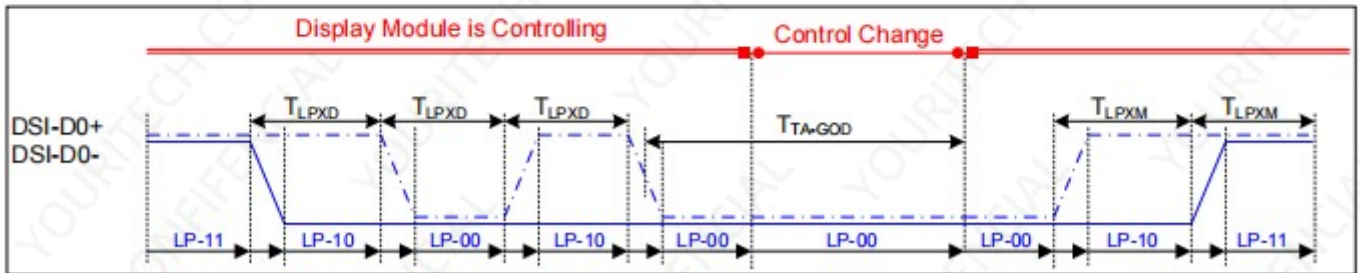


Figure 7 Bus Turnaround (BTA) from MPU to display module Timing

$VDDI=1.8, VDD=2.8, AGND=DGND=0V, T_a=25^\circ C$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	T_{LPXD}	$2 \times T_{LPXD}$	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	$5 \times T_{LPXD}$		ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request-MPU	$4 \times T_{LPXD}$		ns	Output

Table 8 Mipi Interface Low Power Mode Timing Characteristics

DSI Bursts Mode

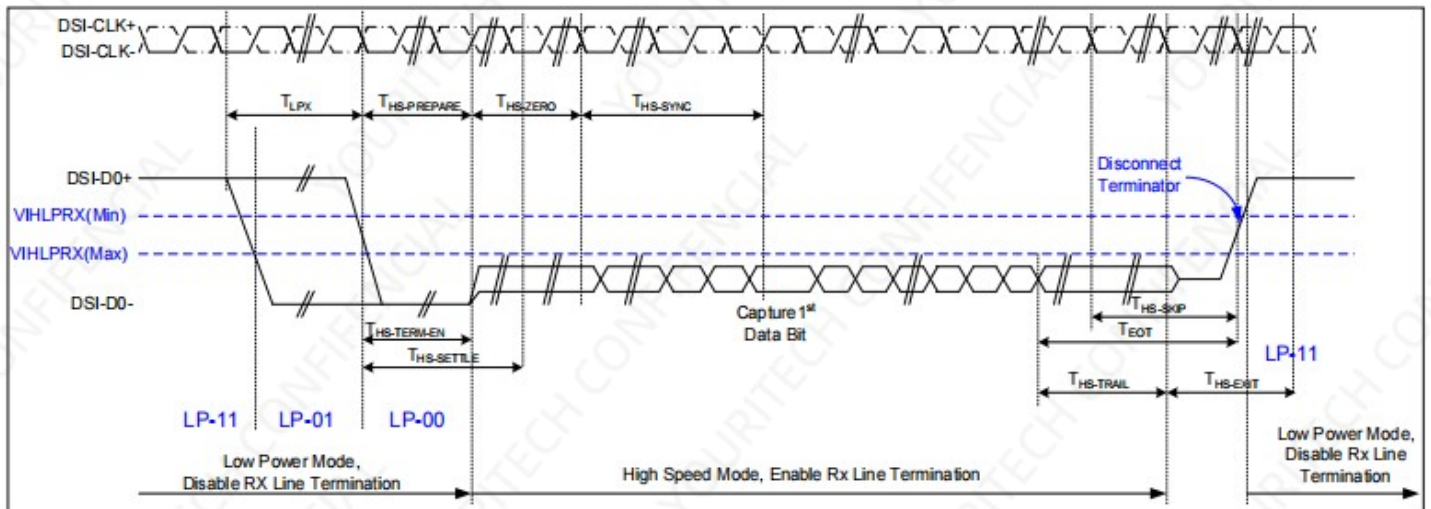


Figure 7 Data lanes-Low Power Mode to/from High Speed Mode Timing

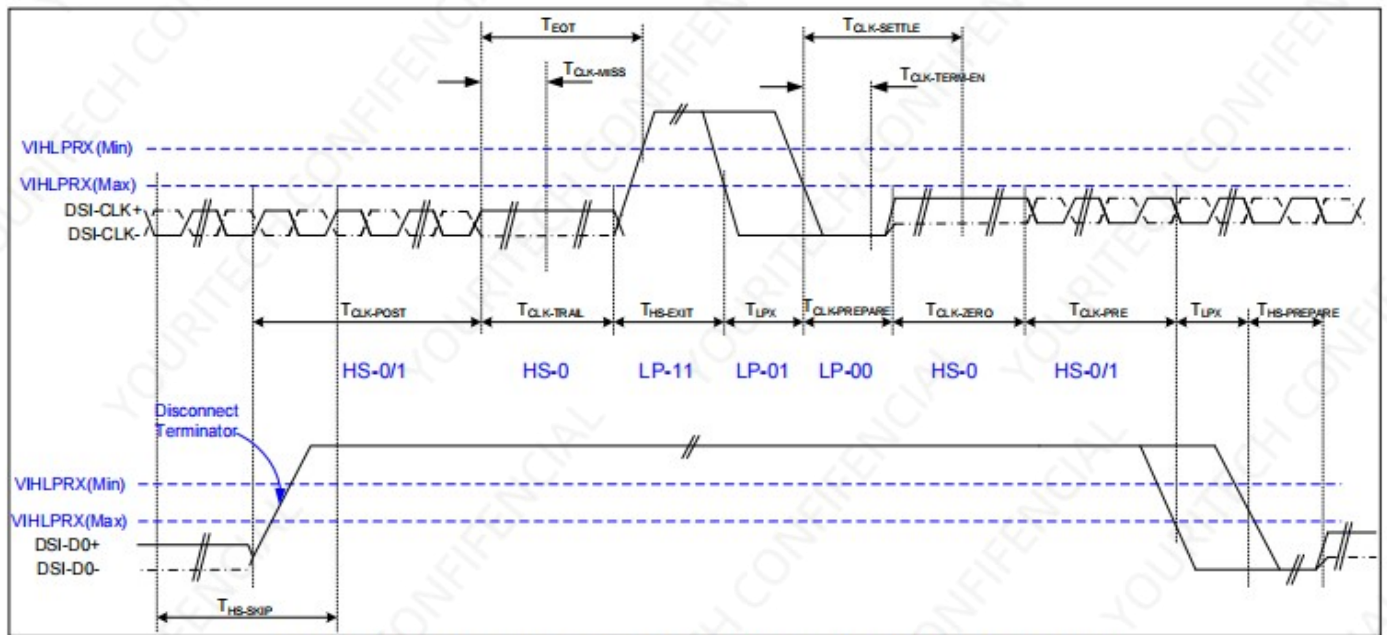


Figure 8 Clock lanes - High Speed Mode to/from Low Power Mode Timing

Reset Description:

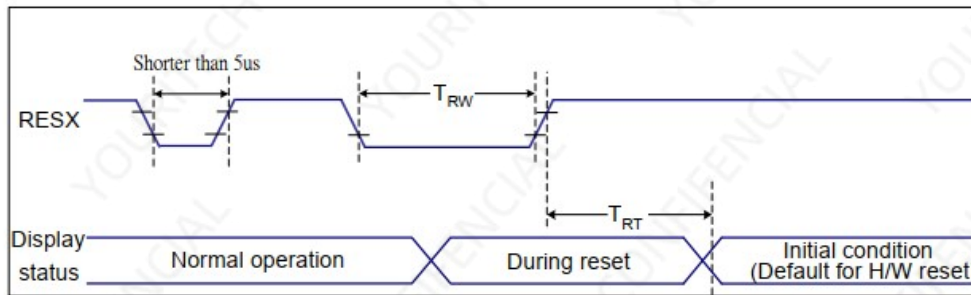


Figure 9 Reset Timing

VDDI=1.8, VDD=2.8, AGND=DGND=0V, $T_a=25^\circ\text{C}$

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

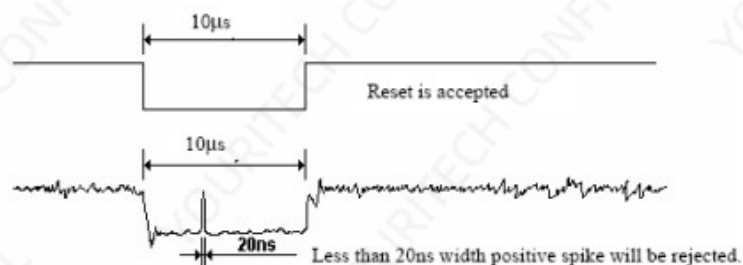
Notes:

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 (t_{RT}) 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

<Table 4. Optical Specifications >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	$\Theta 3$	CR>10	70	80	-	Deg.	Note1
		$\Theta 9$		70	80	-	Deg.	
	Vertical	$\Theta 12$		70	80	-	Deg.	
		$\Theta 6$		70	80	-	Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$	1000	1200	-		Note2
Transmittance		Tr		3.06	3.6	-	%	Note3 W/O APF
Color Gamut		CG		55	60	-	%	

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
White Chromaticity	Wx	Wy	$\Theta = 0^\circ$	0.287	0.317	0.347		CF@C Light
	Wy			0.316	0.346	0.376		
Response Time (Rising + Falling)		$T_r + T_f$	Ta= 25° C $\Theta = 0^\circ$	-	30	40	ms	Note 5

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (see FIGUR 1)
Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value without APF and without CG.
4. The color chromaticity coordinates specified in the above table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
5. The electro-optical response time measurements shall be made as FIGURE 2 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_f .

Figure1 Measurement Set Up

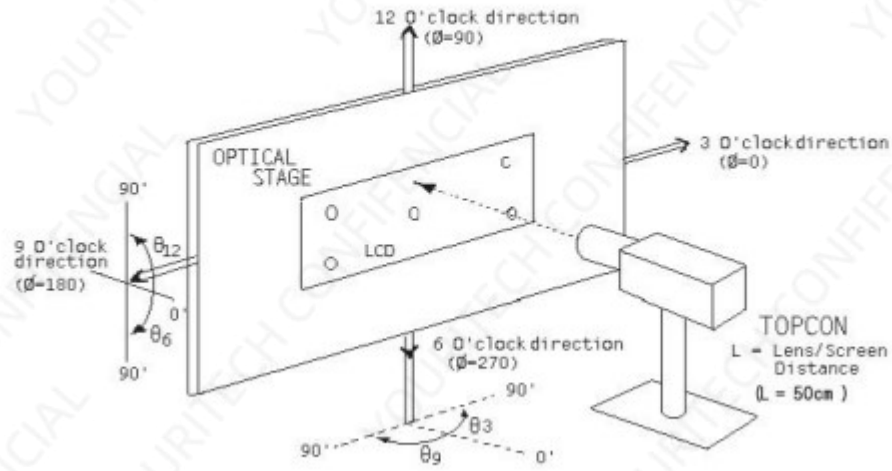
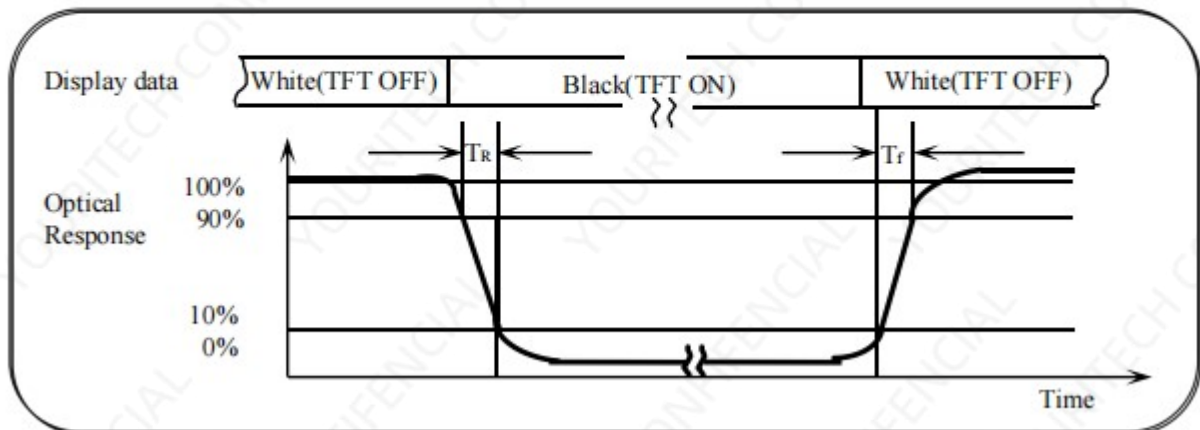


Figure2 Response Time Testing



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), 10 cycles	

9. Packing Method----TBD

- END -