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MODEL NO : ET035WV02-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2022-04-11

☐ 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 480xRGBx800.

As to basic specification of the driver IC, refer to the IC (Sitronix:ST7701S) 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

480dot-segment and 800 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

24 bit 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	480*3RGB(H)X800(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (H*V)	0.0945(H) x0.0945(V)	mm
Active area	45.36(H) x 75.60(V)	mm
Viewing direction	ALL O'CLOCK	--
TFT Driver IC	ST7701S	--
TFT interface	24 bit RGB Interface	--
Approx. Weight	TBD	g
LCM Size(W*H*T)	50.10W) x 85.80(H) x2.10(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
Supply Voltage for(DC/DC)	AVDD	--	--	--	V
Supply Voltage for(DC/DC)	AVEE	--	--	--	V

4.2 Back-Light Unit Characteristics

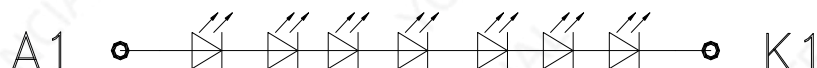
The back-light system is an edge-lighting type with white 7 LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	19.6	--	22.4	V	--
Forward current	I _F	--	20	--	mA	--
Luminance(With LCD)	L _v	--	500	--	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	LCM_LEDK	Power supply for backlight cathode input terminal.	
2	LCM_LEDA	Power supply for backlight anode input terminal.	
3	GND	Power Ground	
4	VCC 2.8v	Power Supply For LCD.(2.7~3.3V)	
5~13	GND	Power Ground	
14	VS	Frame synchronous signal for RGB interface operation.	
15	HS	Line synchronous signal for RGB interface operation.	
16	DCLK	Dot clock signal for RGB interface operation.	
17	DE	Data enable signal for RGB interface operation.	
18~22	B0~B4	Blue data	
23~28	G0~G5	Green data	
29~33	R0~R4	Red data	
34	RST	Reset Signal input pin.	
35	CS	Chip selection signal pin.	
36	SCL	Serial clock signal pin.	
37	SDA	Serial data input/output pin.	
38	IOVCC	Power Supply For I/O.(1.65~3.3V)	
39	GND	Power Ground	
40	IOVCC	Power Supply For I/O.(1.65~3.3V)	

6. Timing Characteristics

POWER ON/OFF SEQUENCE

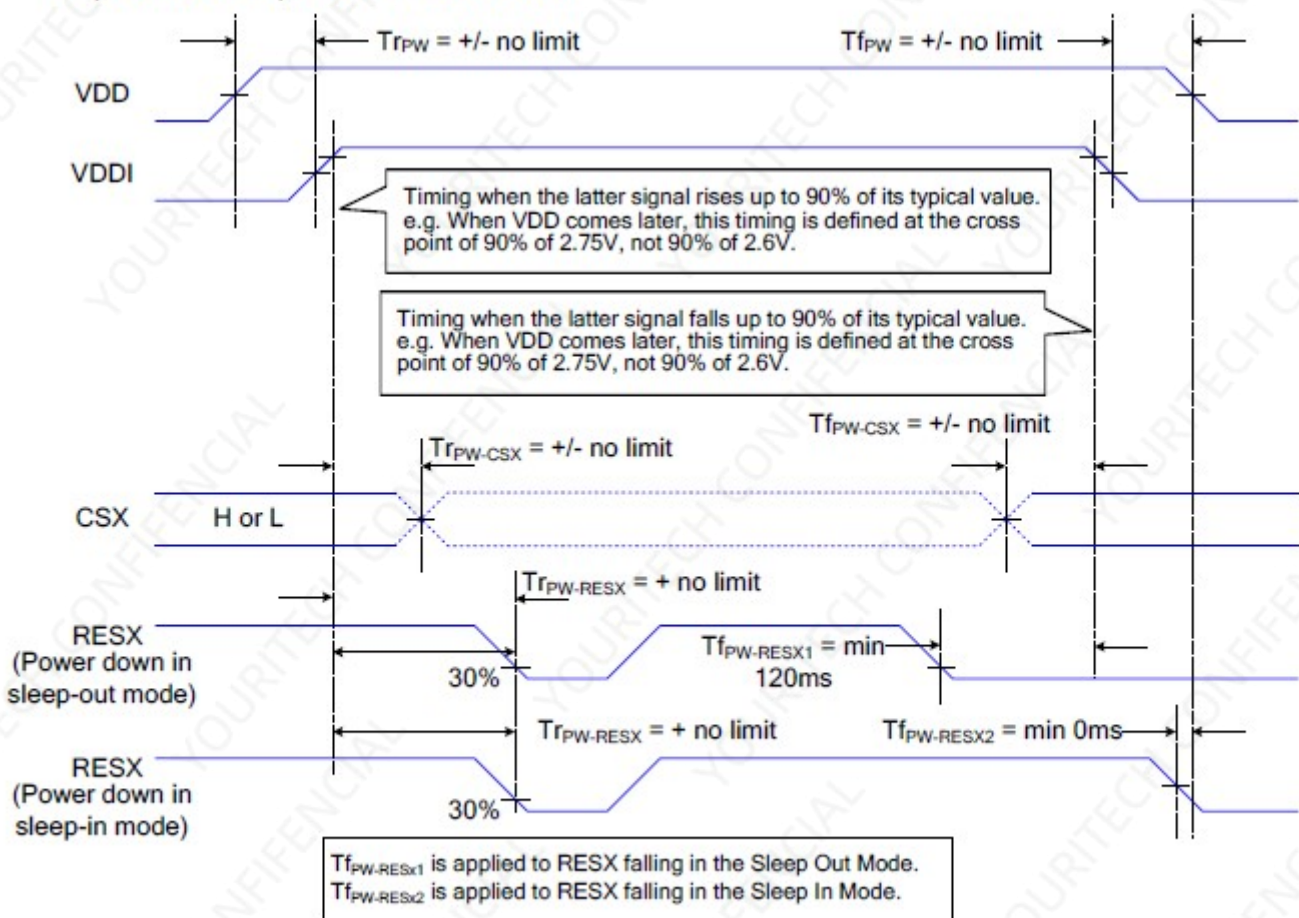
VDDI and VDDA can be applied or powered down in any order. During the Power Off sequence, if the LCD is in the Sleep Out mode, VDDA and VDDI must be powered down with minimum 120msec. If the LCD is in the Sleep In mode, VDDA and VDDI can be powered down with minimum 0msec after the RESX is released.

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





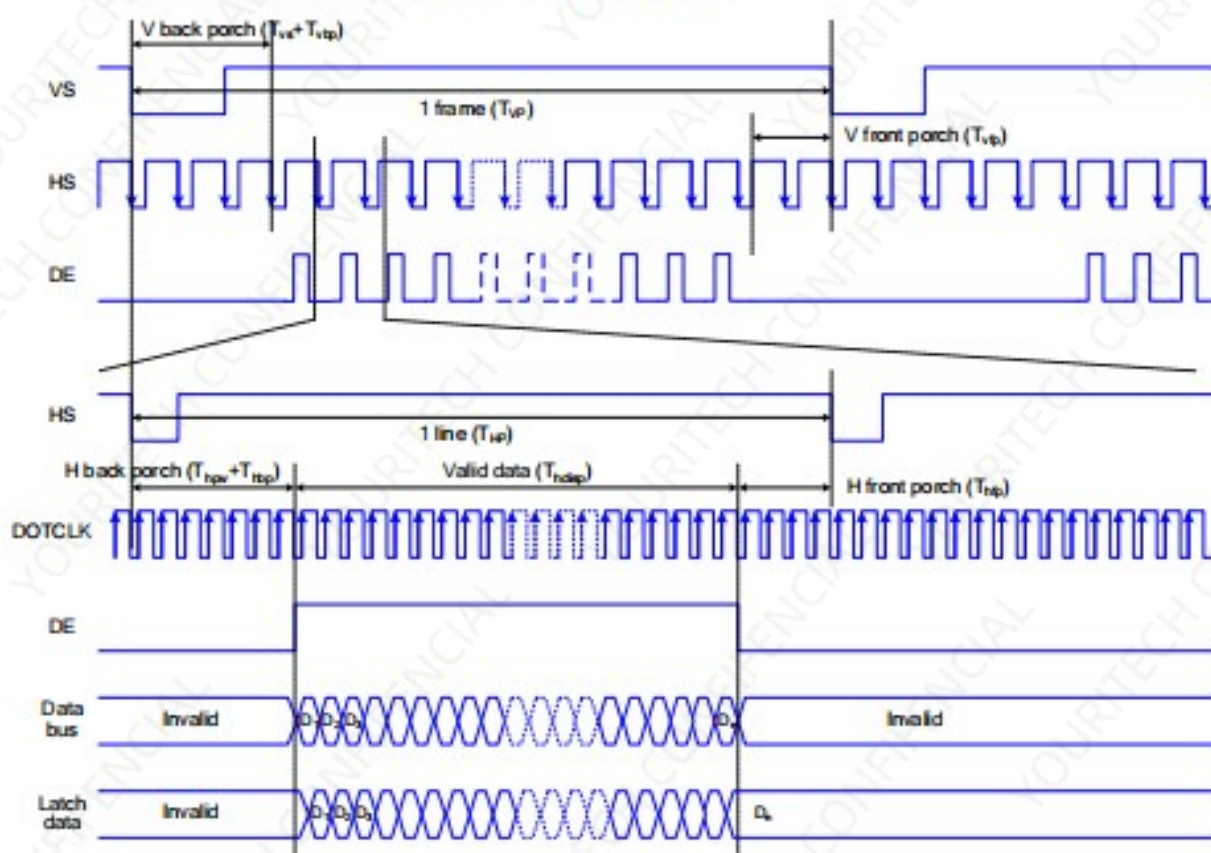
RGB Interface Mode Selection

ST7701S supports two kinds of RGB interface, DE mode and HV mode. The table shown below uses command C3h to select RGB interface mode.

DE/Sync	RGB Mode
0	DE mode
1	HV mode

8.6.4 RGB Interface Timing

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

Figure 23 Timing Chart of Signals in RGB Interface DE Mode

The timing chart of RGB interface HV mode is shown as follows.

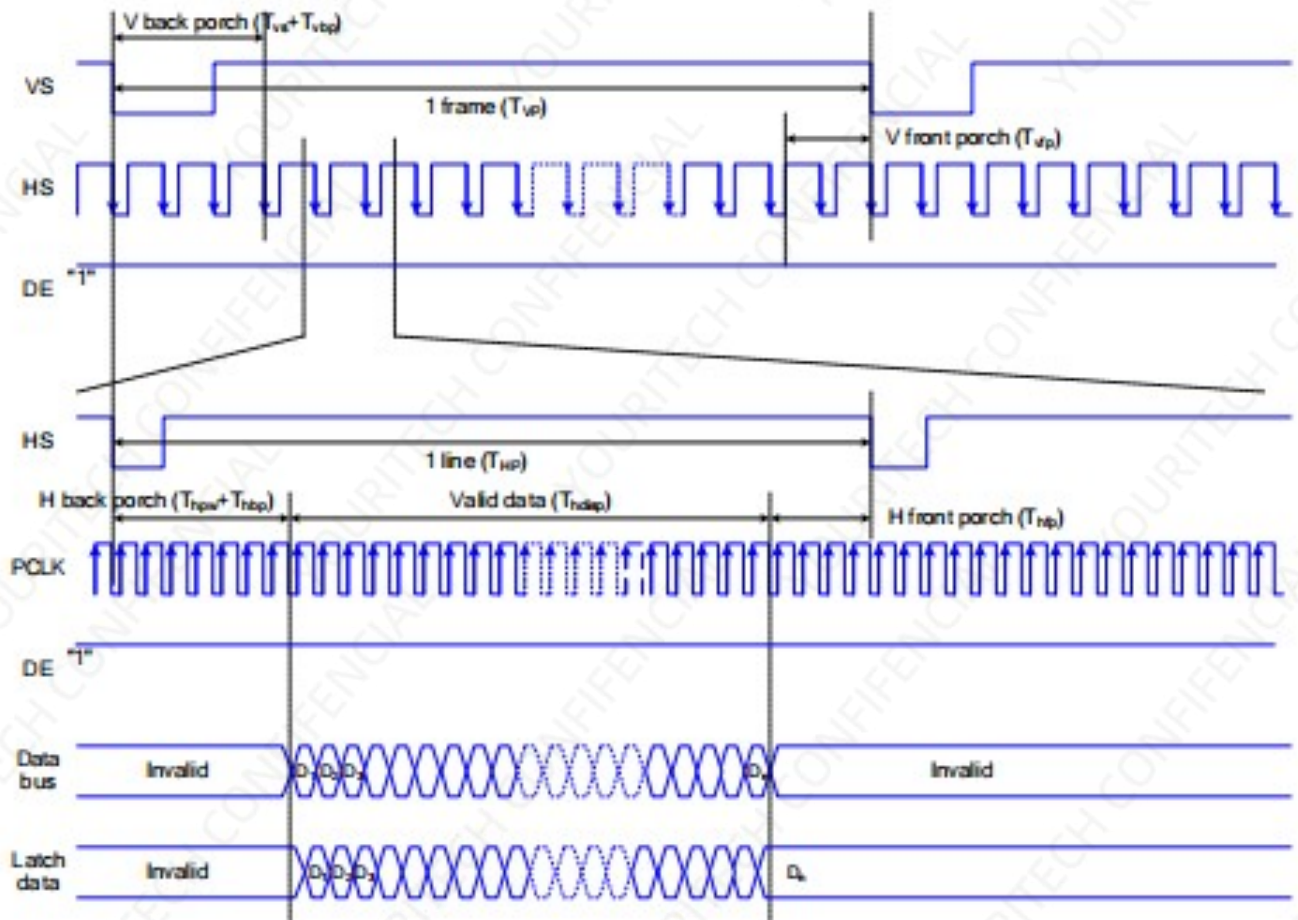


Figure 24 Timing chart of RGB interface HV mod

Reset Timing

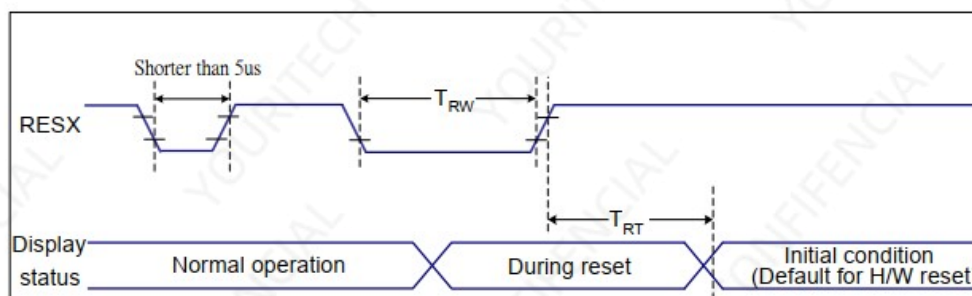


Figure 9 Reset Timing

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

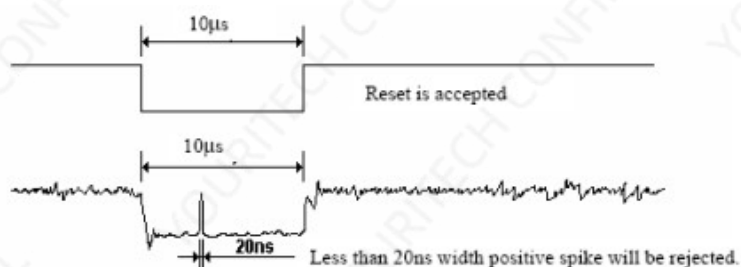
Notes:

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

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Horizontal	Θ3	CR>10	80	85		°	Note 1
		Θ9		80	85		°	
	Vertical	Θ12		80	85		°	
		Θ6		80	85		°	
Contrast Ratio		CR	Θ= 0°	800	1000			Note 2
Transmittance		T(%)	Θ= 0°	4.05	4.5			Note 3
NTSC		%	Θ= 0°	64	69			
Reproduction Of color	Red	Rx	Θ= 0°	0.645	0.660	0.675		Note 4 *Color filter Glass(with OC)
		Ry		0.312	0.327	0.342		
	Green	Gx		0.287	0.302	0.317		
		Gy		0.576	0.591	0.606		
	Blue	Bx		0.123	0.138	0.153		
		By		0.089	0.104	0.119		
Response Time		Tr+Tf	Θ= 0°		-	35	ms	Note 5

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing 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 FIG.1). Viewing angle measuring is based on WV Pol attached.

2. Contrast measurements shall be made at viewing angle of $\Theta = 0^\circ$ 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 FIG. 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.

4. The color chromaticity coordinates specified in Table1 shall be calculated from The spectral data measured with all pixels first in red, green, blue and white.

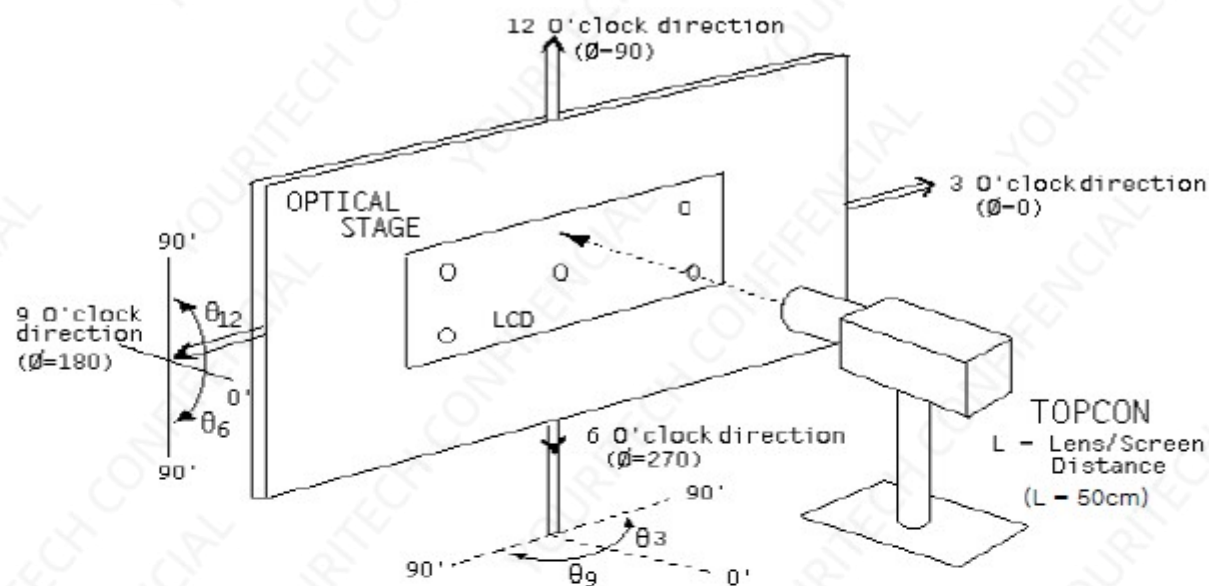
Measurements shall be made at the center of the C/F.

Measurement condition is C - light source & Halogen Lamp

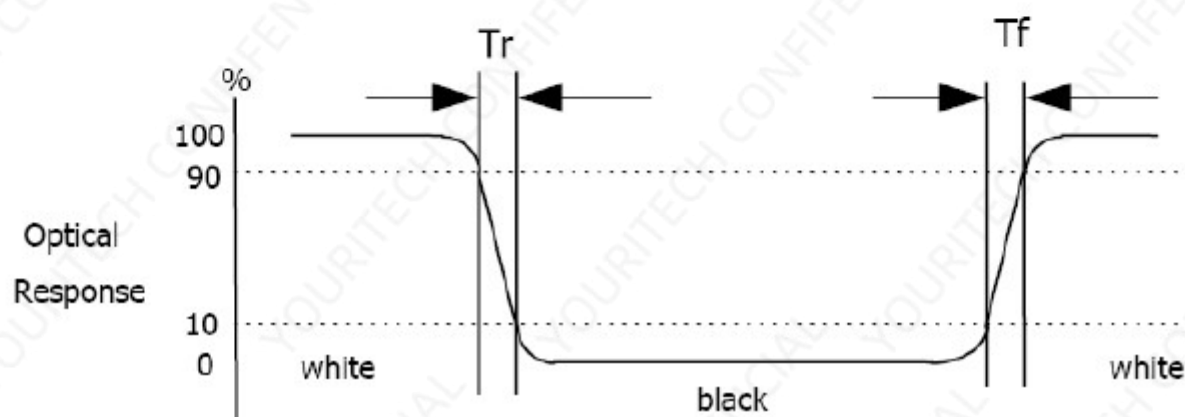
5. The electro-optical response time measurements shall be made as FIG.2 by switching the "data" input signal ON and OFF.

The times needed for the luminance to change from 10% to 90% is Tf, and 90% to 10% is Tr.

Figure 1. Measurement Set Up



Figure



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	70°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 -