PRODUCT SPECIFICATION FOR LCD MODULE

Revision: 1.0

Model No: LS0144T09-S-V1

Module Type: COG+FPC+B/L

APPROVED SIGNATURE

■ Approved Product Specification only
□ Approved Product Specification and Samples

Prepared By	Checked By	Approved By

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1. General Description

LS0144T09-S-V1 is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit and a backlight unit. The panel size is 1.44 inch and the resolution is 128(RGB)*128, the panel can display up to 262k colors.

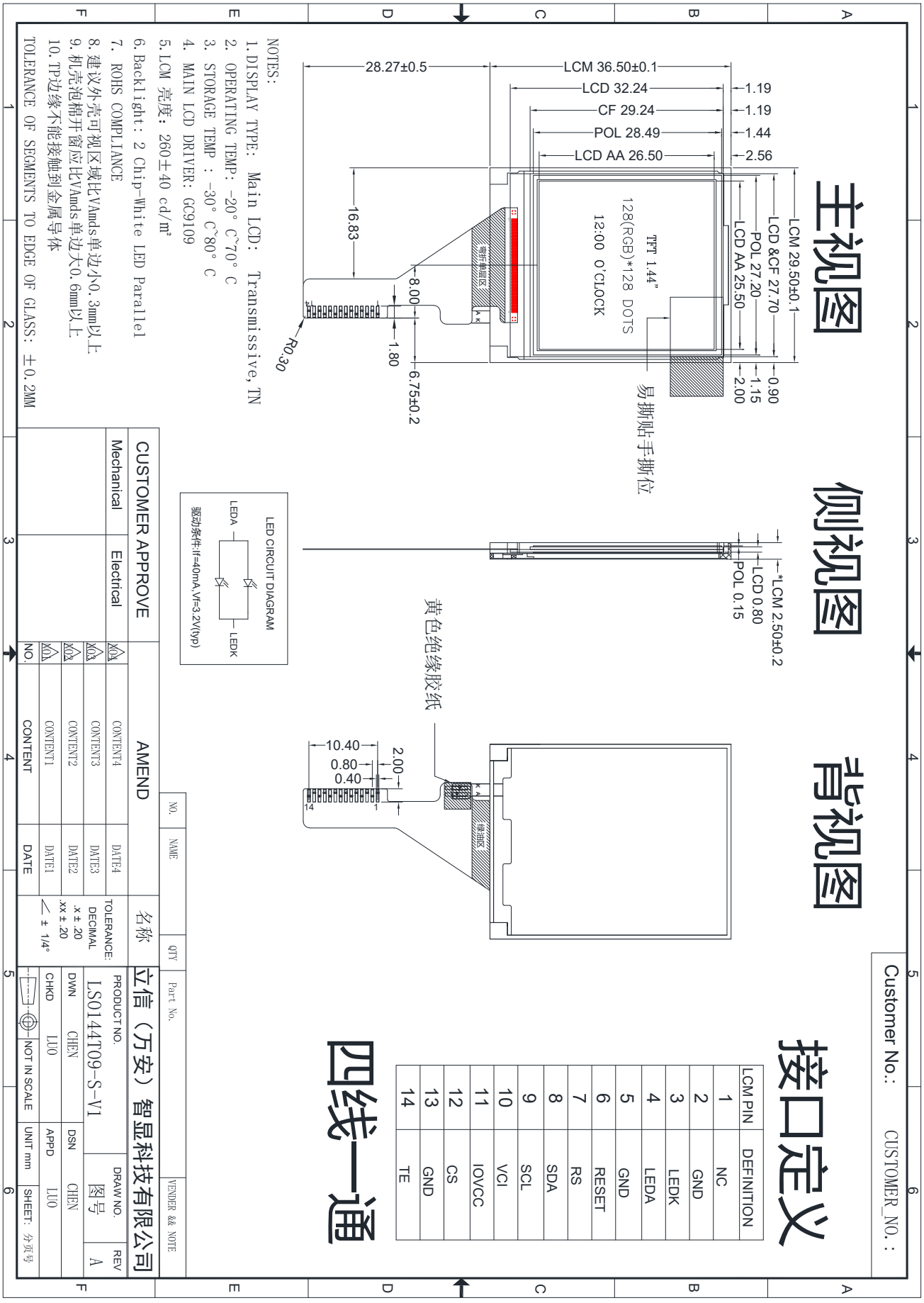
2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 128(RGB)×128 Dot-matrix
Input Data	4-line serial interface
Viewing Direction （Grayscale Inversion）	TN
Drive	GC9109

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	29.5 ×36.5 ×2.5	mm
Number of dots	128(RGB) ×128	pixel
Active area (H×V)	25.5×26.5	mm

4. Outline Dimension



LCM PIN	DEFINITION
1	NC
2	GND
3	LEDK
4	LEDA
5	GND
6	RESET
7	RS
8	SDA
9	SCL
10	VCI
11	IOVCC
12	CS
13	GND
14	TE

5. Absolute Maximum Ratings

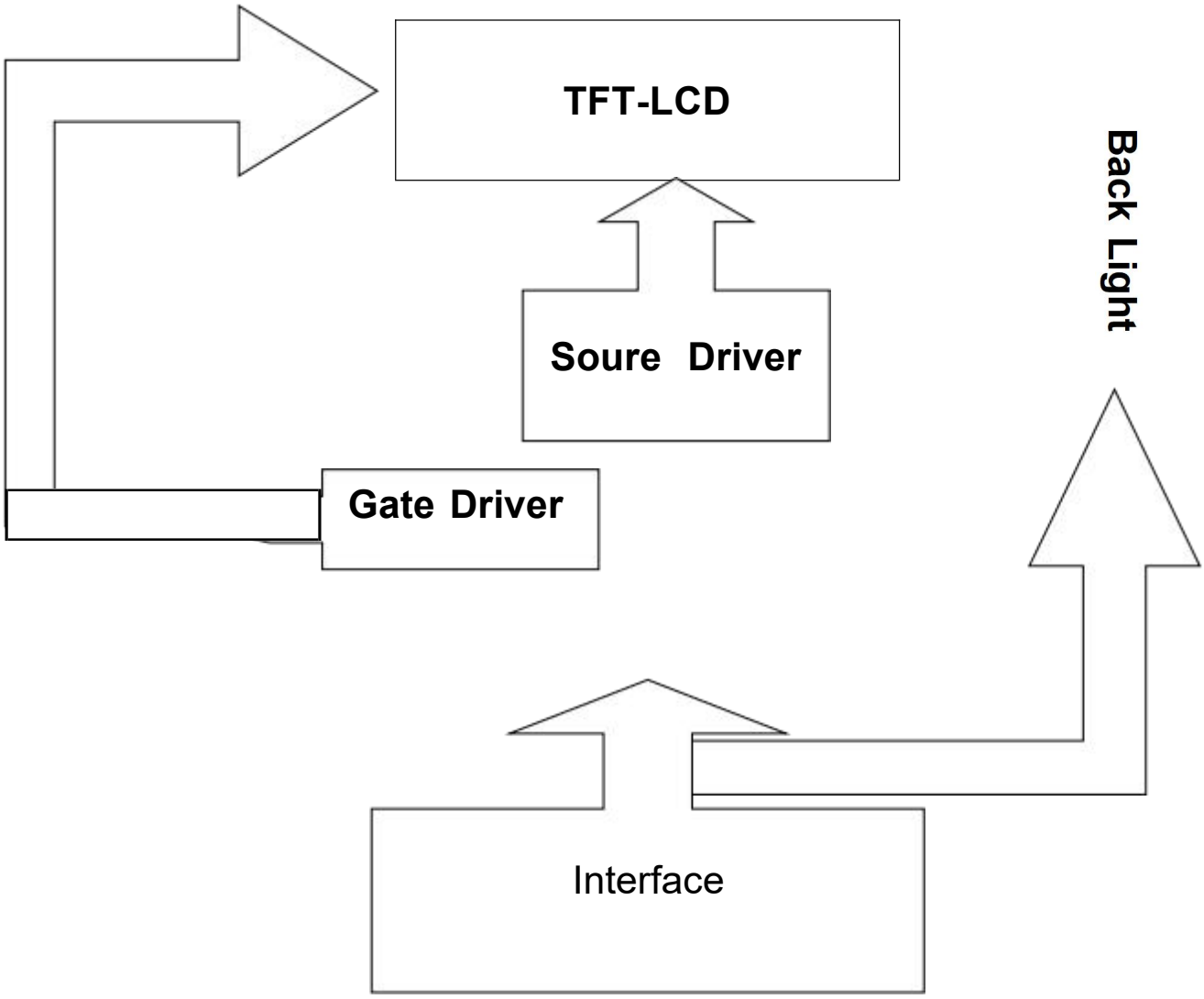
Item	Symbol	Min	Max	Unit	Remark
Supply voltage	VCC	-0.3	4.6	V	Note1 Note2
Supply voltage	IOVCC	-0.3	4.6	V	
Operating temperature	TOPR	-20	70	℃	
Storage temperature	TSTR	-30	80	℃	

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Supply voltage		VCC	2.6	2.8	3.3	V	Note1
Supply voltage		IOVCC	1.65	1.8	3.3	V	
Input Voltage	L level	VIL	0	---	0.3*IOVCC	V	
	H level	VIH	0.7*IOVCC	---	IOVCC	V	

7. Module Function Description

7-1. Block Diagram Of LCM



7-2. Pin Description

PIN NO.	Symbol	I/O	Description
1	NC		
2	GND	P	Ground .
3	LEDK	P	Power for LED backlight anode
4	LEDA	P	Power for LED backlight cathode
5	GND	P	Ground
6	RESET	I	This signal will reset the device and it must be applied to properly initialize the chip.
7	RS	I	Data/command selection pin in 4-line serial interface.
8	SDA	I/O	Serial input/output data.
9	SCL	I	Clock signa.
10	VCI	P	Power supply
11	IOVCC	P	Power supply
12	CS	I	Chip selection signal.
13	GND	P	Ground .
14	TE	O	Tearing effect output pin to synchronize MCU to frame writing

7-3 Timing Characteristics

8.3. Power ON/OFF Sequence

IOVCC and VCI can be applied in any order.
VCI and IOVCC can be power down in any order.

During power off, if LCD is in the Sleep Out mode, VCI and IOVCC must be powered down minimum

120msec after RESX has been released.

During power off, if LCD is in the Sleep In mode, IOVCC or VCI can be powered down minimum 0msec after RESX has been released.

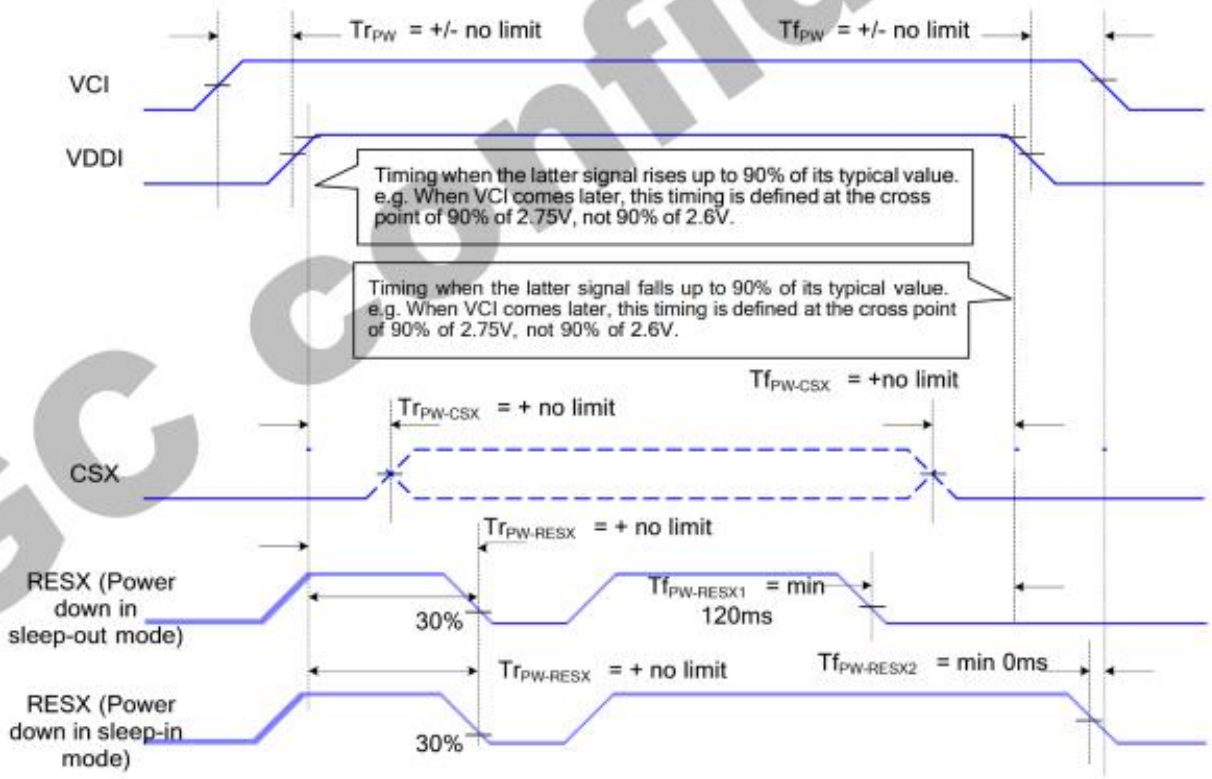
CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

Note 1: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

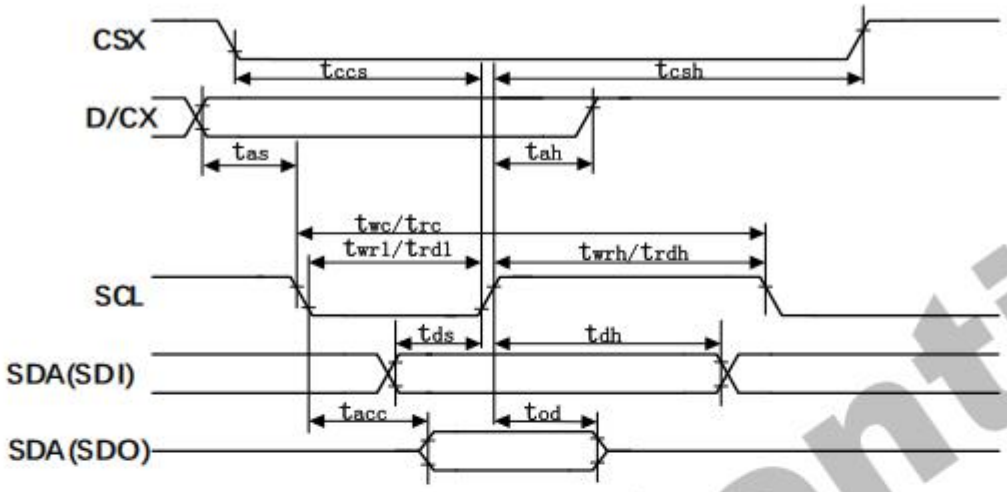
Note 2: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.

Note 3: If RESX line is not held stable by host during Power On Sequence as defined in the sequence below, 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.

The power on/off sequence is illustrated below

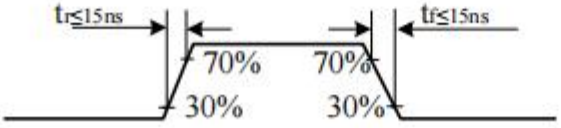


8.4.3. Display Serial Interface Timing Characteristics (4-line SPI system)



Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	20	-	ns	
	tcsh	Chip select hold time (Read)	40	-	ns	
SCL	twc	Serial Clock Cycle (Write)	12.5	-	ns	
	twrh	SCL "H" Pulse Width (Write)	6.25	-	ns	
	twrl	SCL "L" Pulse Width (Write)	6.25	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL "H" Pulse Width (Read)	60	-	ns	
	trdl	SCL "L" Pulse Width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-	ns	
	tah	D/CX hold time (Write/Read)	10	-	ns	
SDA/SDI (Input)	tds	Data setup time (Write)	5	-	ns	
	tdh	Data hold time (Write)	5	-	ns	
SDA/SD0 (Output)	tacc	Access time (Read)	10	-	ns	For maximum CL=30pF
	toh	Output disable time (Read)	20	50	ns	For minmum CL=8pF

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VDD=2.5V to 3.3V, AGND=VSSR=0V



Note: When the last pixel data ends, D/CX must be high.

8. Electro-Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr +Tf	θx = θy =0	---	---	32	ms	Note 1
Contrast Ratio		CR		400	600	---	---	Note 2
Transmittance		T%		---	17.5	---	%	
Color Chromaticity (CIE1931)	RED	R x	θx = θy =0	---	0.625	---	---	
		R y		---	0.313	---	---	
Viewing angle	θ_T		CR > 10	60	---	---	Deg.	Note 3
	θ_B			60	---	---		
	θ_L			60	---	---		
	θ_R			60	---	---		
Luminance ($I_F = 40mA$)		L		---	260	---	cd/m2	Note4

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).

2.Contrast measurements shall be made at viewing angle of Θ= 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 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 Pol.

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

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 Tr, and 90% to 10% is Tf.

Figure 1. Measurement Set Up

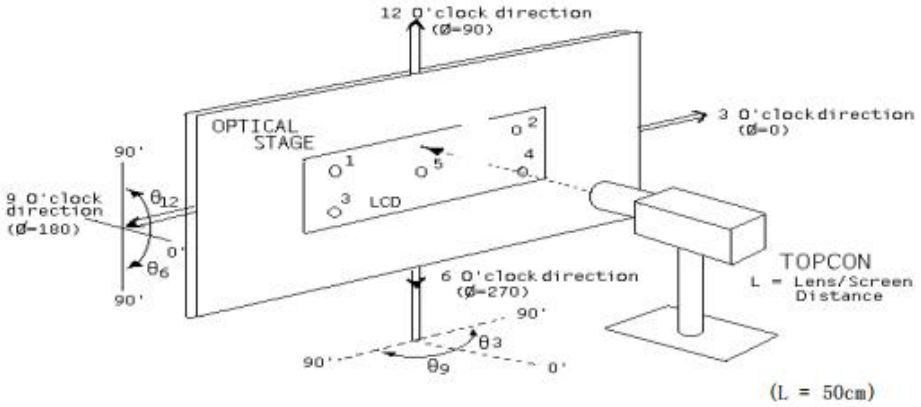
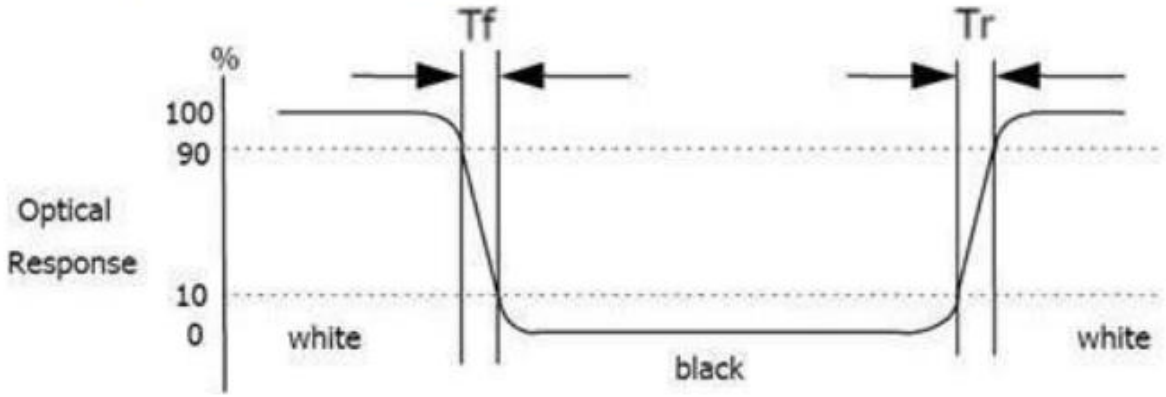


Figure 2. Response Time Testing



9.Records Of Version

Version	Revise Date	Page	Content
00	2026-1-14	ALL	New released