

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LS050I41-MP-V1

Module Type: COG+FPC+B/L

APPROVED SIGNATURE

- Approved Product Specification only
- Approved Product Specification and Samples

<u>Prepared By</u>	<u>Checked By</u>	<u>Approved By</u>

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1. General Description

LS050I41-MP-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 4.96inch and the resolution is 480(RGB)*854, the panel can display up to 16.7 M colors.

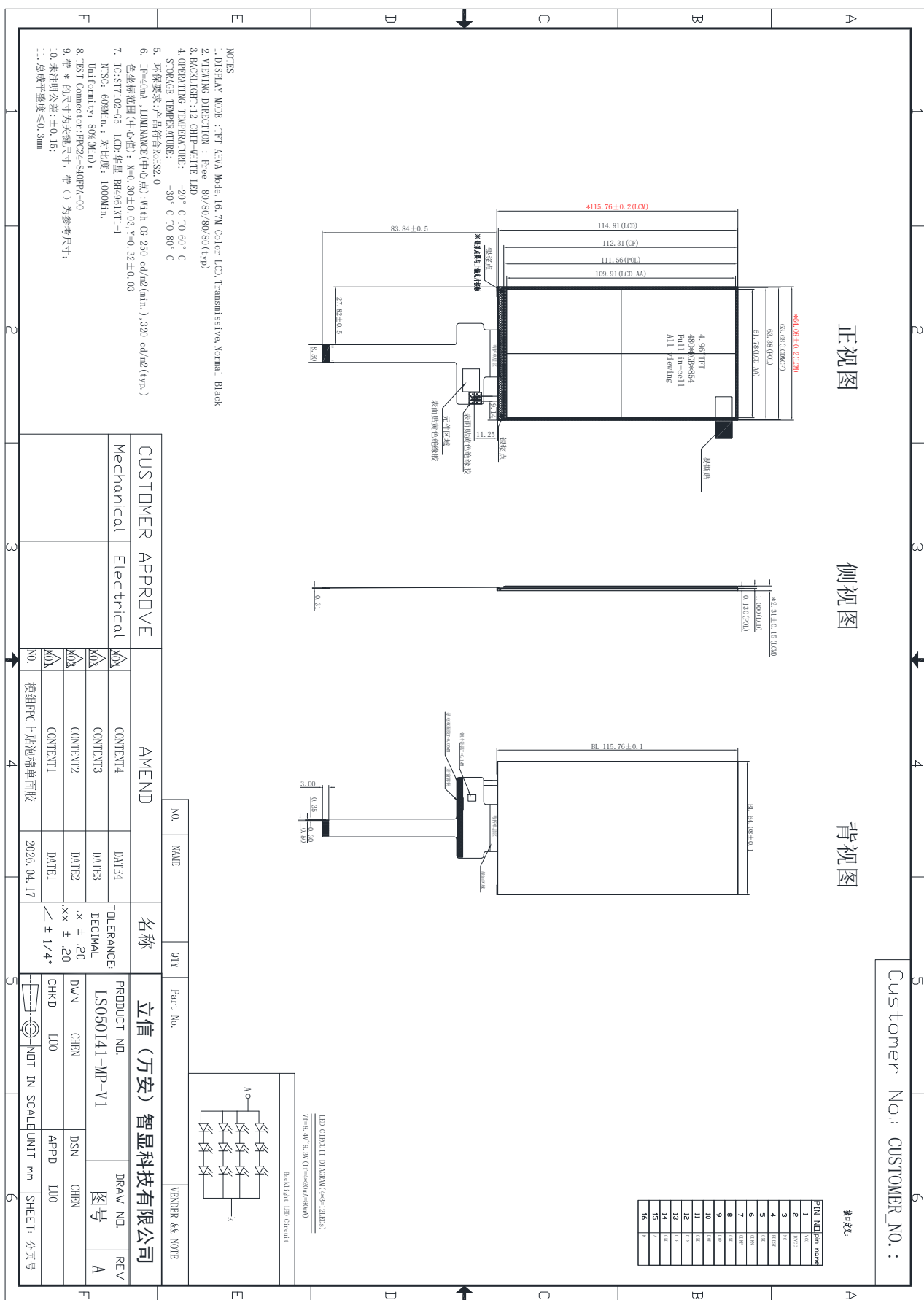
2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 480(RGB)×854 Dot-matrix
Input Data	MIPI
Viewing Direction (Grayscale Inversion)	Free (IPS)
Drive	ST7102

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	64.08 ×115.76 ×2.31	mm
Number of dots	480(RGB) × 854	pixel
Active area (H×V)	61.78×109.91	mm

4. Outline Dimension



5. Absolute Maximum Ratings

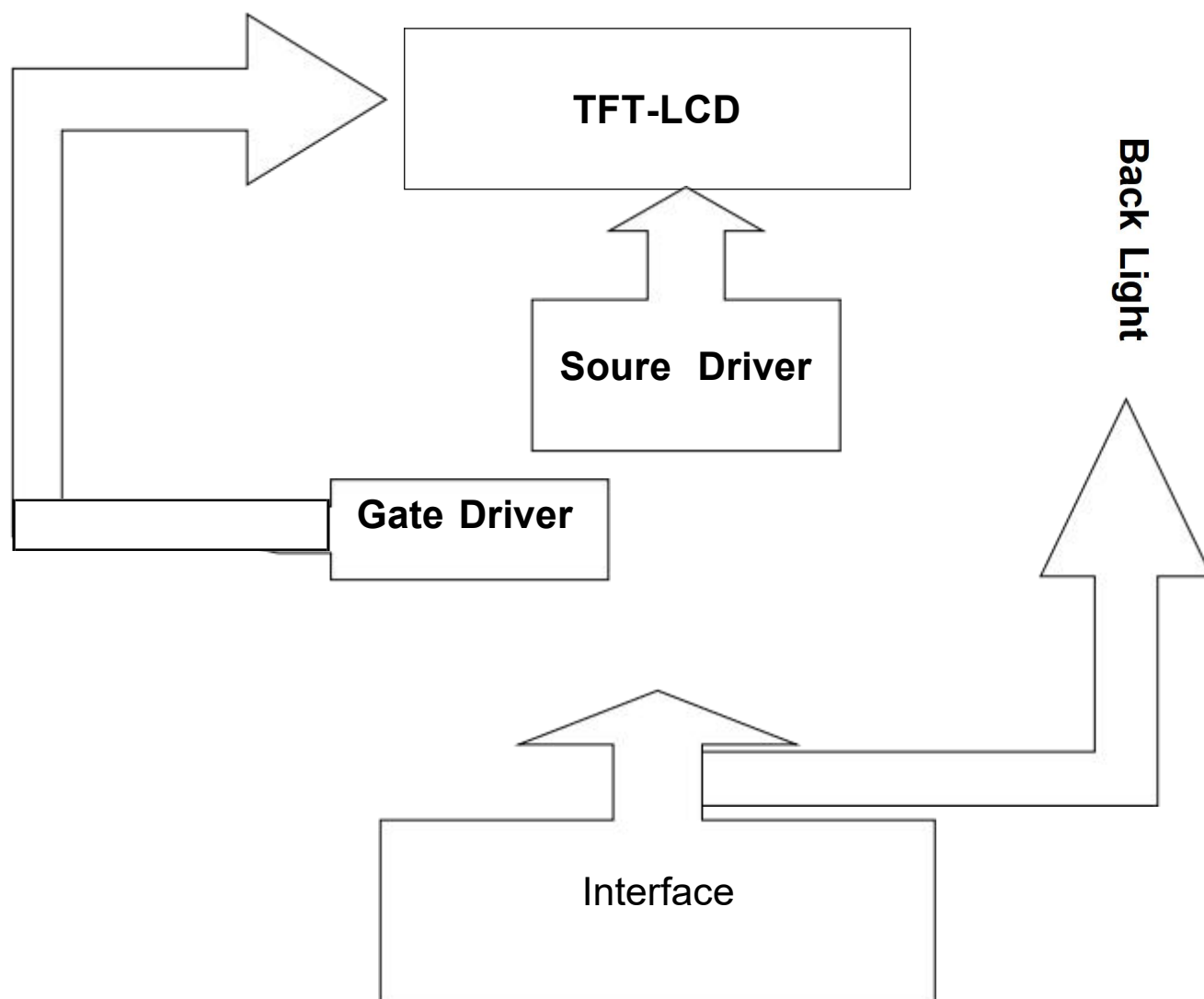
Item	Symbol	Min	Max	Unit	Remark
Supply voltage	VCC	-0.3	+3.3	V	Note1 Note2
Supply voltage	IOVCC	-0.3	+3.3	V	
Operating temperature	TOPR	-20	60	°C	
Storage temperature	TSTR	-30	80	°C	

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Supply voltage		IOVCC	--	1.8	3.3	V	Note1
Supply voltage		VCC	--	3.3	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	VCC	P	power supply
2	IOVCC	P	power supply
3	NC		
4	RESET	I	Reset pin.
5	GND	P	Ground
6	CLKN	I	MIPI DSI differential clock pair
7	CLKP	I	MIPI DSI differential clock pair
8	GND	P	Ground
9	D0N	I	MIPI DSI differential data pair. (Data lane 0)
10	D0P	I	MIPI DSI differential data pair. (Data lane 0)
11	GND	P	Ground
12	D1N	I	MIPI DSI differential data pair. (Data lane 1)
13	D1P	I	MIPI DSI differential data pair. (Data lane 1)
14	GND	P	Ground
15	A	P	Power for LED backlight anode
16	K	P	Power for LED backlight cathode

7-3 Timing Characteristics

MIPI DC Characteristic

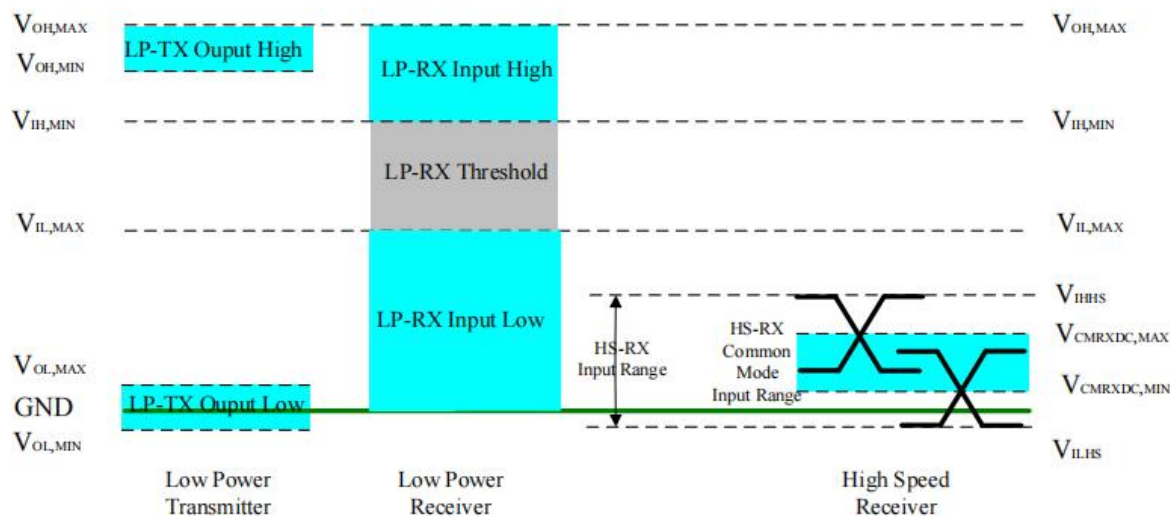


Figure 76 MIPI Signaling Voltage Levels

Parameter	Symbol	Specification			Unit
		MIN	TYP	MAX	
Operation Voltage for MIPI Receiver					
Low power mode operating voltage	VLPH	-	1.2	-	V
MIPI Characteristics for High Speed Receiver					
Single-ended input low voltage	VILHS	-40	-	-	mV
Single-ended input high voltage	VIHHS	-	-	460	mV
Common-mode voltage	VCMRXDC	70	-	330	mV
Differential input impedance	ZID	80	100	125	ohm
MIPI Characteristics for Low Power Mode					
Pad signal voltage range	VI	-50	-	1350	mV
Logic 0 input threshold	VIL	0	-	550	mV
Logic 1 input threshold	VIH	880	-	-	mV
Output low level	VOL	-50	-	50	mV
Output high level	VOH	1.1	1.2	1.3	V

7.3.1 MIPI Timing

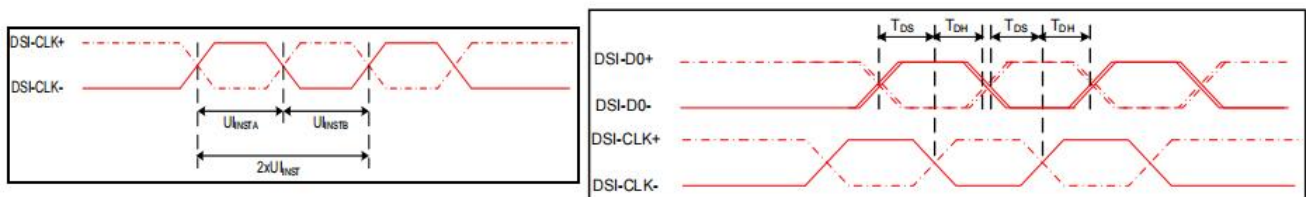


Figure 77 High Speed Mode – Clock Channel Timing

Signal	Symbol	Parameter	Specification			Unit	Description
			MIN	TYP	MAX		
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	1.6	-	10	ns	
DSI-CLK+/-	UI_{INSTA}, UI_{INSTB}	UI instantaneous half	0.8	-	5	ns	
$f_{DSI-CLK+/-}$	F_{DSICLK}	DSI-CLK+/- frequency	100	-	625	MHz	
DSI-Dn+/-	T_{DS}	Data to clock setup time	0.15	-	-	UI	
DSI-Dn+/-	T_{DH}	Data to clock hold time	0.15	-	-	UI	

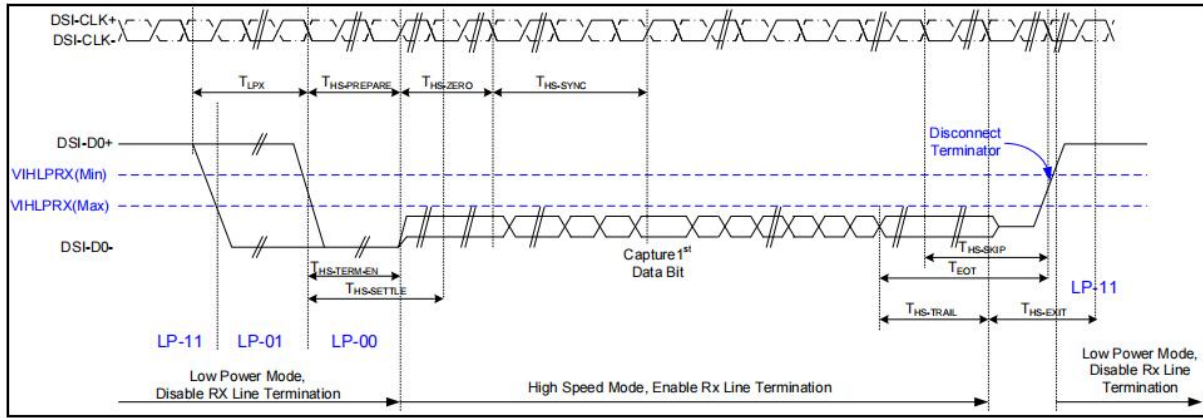


Figure 78 High-Speed Data Transmission

Parameter	Symbol	Specification			Unit
		MIN	TYP	MAX	
Time to drive LP-00 to prepare for HS transmission	$T_{HS-PREPARE}$	40+4UI	-	85+6UI	ns
Time from start of $t_{HS-TRAIL}$ or $t_{CLK-TRAIL}$ period to start of LP-11 state	T_{EOT}	-	-	105+12UI	ns
Time to enable data receiver line termination measured from when D_n crosses V_{ILMAX}	$T_{HS-TERM-EN}$	-	-	35+4UI	ns
Time to drive flipped differential state after last payload data bit of a HS transmission	$T_{HS-TRAIL}$	60+4UI	-	-	ns
Time-out at RX to ignore transition period of EoT	$T_{HS-SKIP}$	40	-	145+10UI	ns
Time to drive LP-11 after HS burst	$T_{HS-EXIT}$	100	-	-	ns
Length of any Low-Power state period	T_{LPX}	50	-	-	ns
Sync sequence period	$T_{HS-SYNC}$	-	8UI	-	ns
Minimum lead HS-0 drive period before the Sync sequence	$T_{HS-ZERO}$	105+6UI	-	-	ns
Time interval during which the HS receiver should ignore any Clock Lane HS transitions, starting from the beginning of $T_{CLK-PREPARE}$	$T_{CLK-SETTLE}$	95	-	300	ns
Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of $T_{HS-PREPARE}$. The HS receiver shall ignore any Data Lane transitions before the minimum value, and the HS receiver shall respond to any Data Lane transitions after the maximum value.	$T_{HS-SETTLE}$	85+6UI	-	145+10UI	ns


$$4\text{-Lane, } 600\text{Mbps: } n = (1000 / 600 * 8 * 39 - T_{HS_TRAIL} - 60) / (1000/600) = 236$$

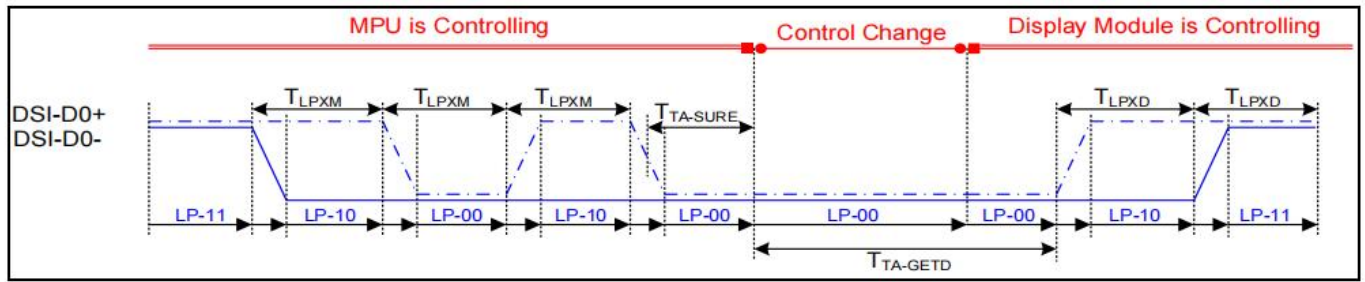


Figure 80 Bus Turn-around Procedure

Parameter	Symbol	Specification			Unit
		MIN	TYP	MAX	
Length of any Low-Power state period : Master side	T_{LPX}	50	-	75	ns
Length of any Low-Power state period : Slave side	T_{LPX}	47.5	-	52.5	ns
Ratio of T_{LPX} (MASTER)/ T_{LPX} (SLAVE) between Master and Slave side	Ratio T_{LPX}	2/3	-	2/3	
Time-out before new TX side start driving	$T_{TA-SURE}$	T_{LPX}	-	$2 T_{LPX}$	ns
Time to drive LP-00 by new TX	T_{TA-GET}	-	$5 T_{LPX}$	-	ns
Time to drive LP-00 after Turnaround Request	T_{TA-GO}	-	$4 T_{LPX}$	-	ns

7.3.6 Reset Timing

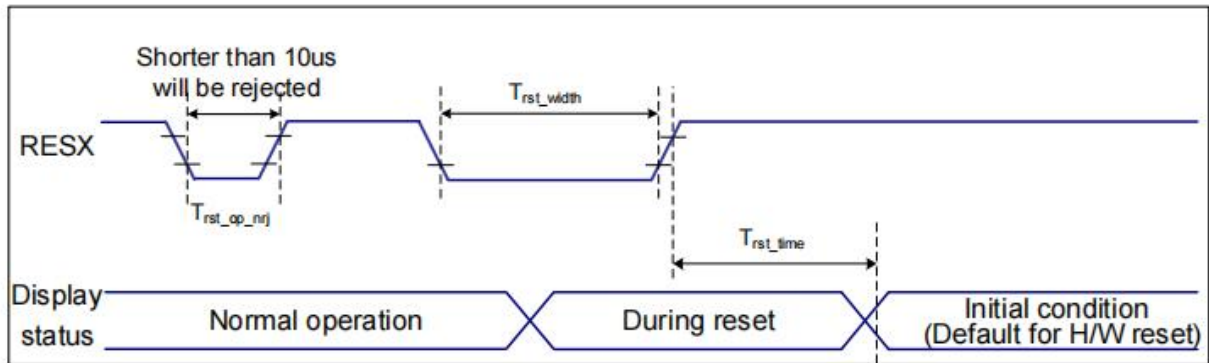


Figure 81 Reset Operation

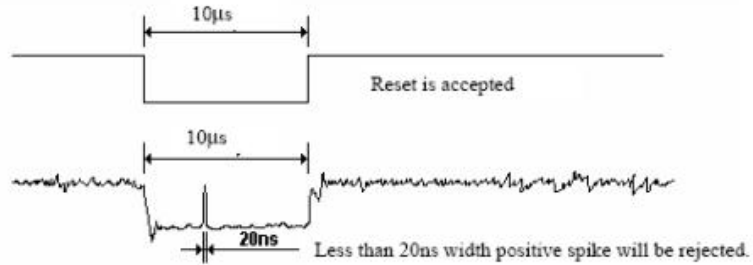


Figure 82 Reset Noise Rejected Diagram

Reset Timing Characteristics IOVCC=1.8v Ta=25°C

Parameter	Symbol	Specification			Unit
		Min.	Typ.	Max.	
Reset low width	Trst_width	1	-	-	ms
Reset time	Trst_time	120	-	-	ms
OP noise reject	Trst_op_nrj	-	-	10	us

- During the reset period, the display will be blanked, then return to default condition for IC initialization

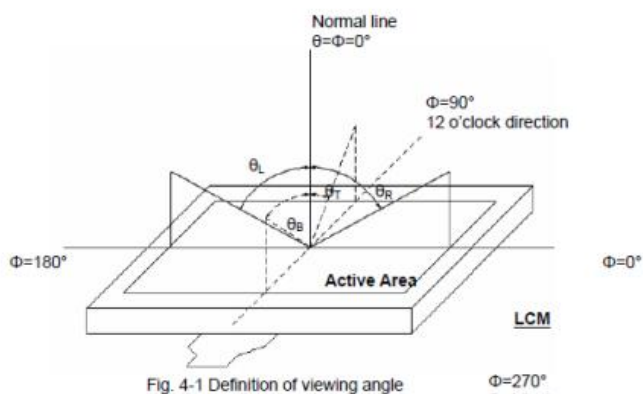
8. Electro-Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr +Tf	$\theta_x = \theta_y = 0$	---	25	30	ms	Note 1
Contrast Ratio		CR		1000	1200	---	---	Note 2
Transmittance		T%		--	4.68	---	%	
Color Chromaticity (CIE1931)	White	W x	$\theta_x = \theta_y = 0$	---	0.301	---	---	
		W y		---	0.329	---	---	
Viewing angle	θ_T		CR > 10	---	80	---	Deg.	Note 3
	θ_B			---	80	---		
	θ_L			---	80	---		
	θ_R			---	80	---		
Luminance ($I_F = 40mA$)		L		--	320	---	cd/m2	Note4

①the ambient temperature is 25°C.

②The test systems refer to Note 2.

Note 1: Definition of viewing angle range



Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen.

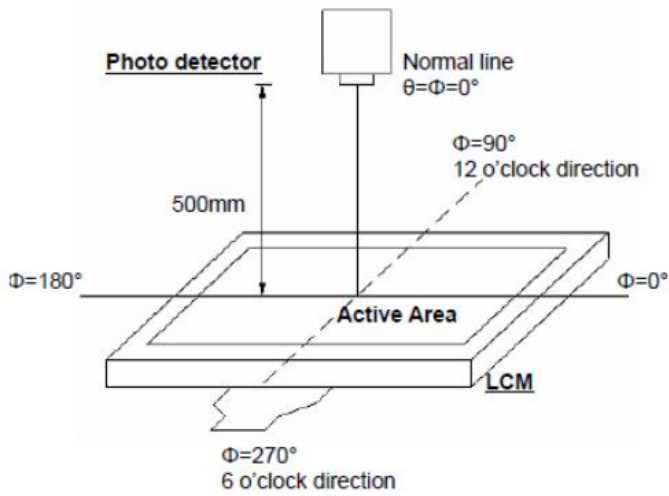
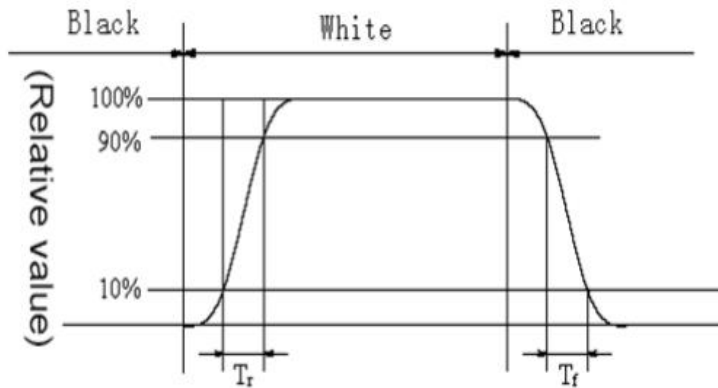


Fig. 4-2 Optical measurement system setup

Note 3: Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rising time (T_r) is the time between photo detector output intensity changed from 10% to 90%. And falling time (T_f) is the time between photo detector output intensity changed from 90% to 10%.



Note 4: Definition of contrast ratio

Contrast Ratio (CR) = Luminance measured when LCD on the "White" state/ Luminance measured when LCD on the "Black" state

Note 5: Definition of color chromaticity

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=21\text{mA/ LED}$.

Note 7: The transmittance is measured with full white pattern(Gray 255)

$$\text{Center Transmittance}(Tr\%) = \frac{\text{Luminance of LCD module}}{\text{Luminance of Backlight}}$$

Note 8: Definition of Brightness uniformity

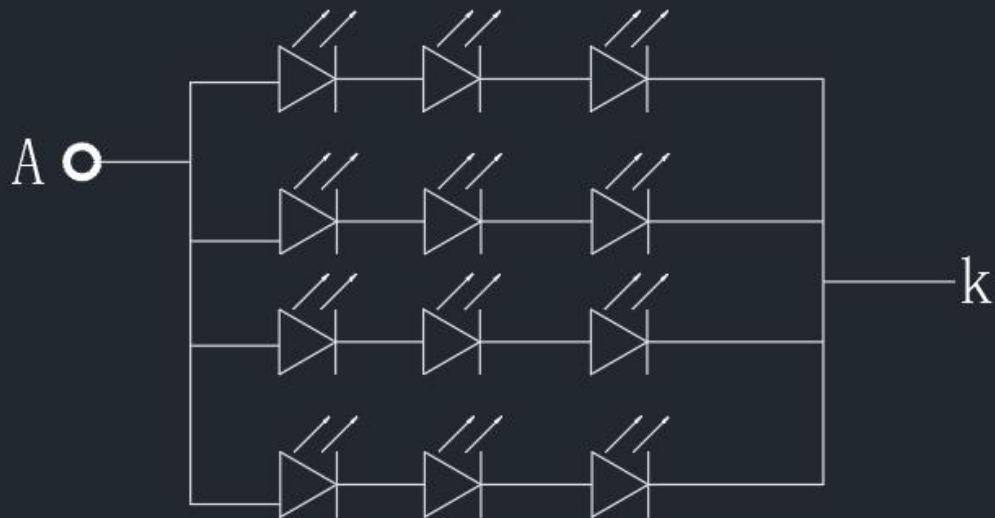
Brightness uniformity = $\text{Luminance}(\text{MIN})/\text{Luminance}(\text{MAX}) \times 100\%$

Luminance(MAX) and Luminance(MIN) are the maximum and minimum luminance value measure at the position "1-13" on the screen.

Note(4) Backlight circuit

LED CIRCUIT DIAGRAM(4*3=12LEDs)

$V_f=8.4V \sim 9.3V$ ($I_f=4*20mA=80mA$)



9.Records Of Version

Version	Revise Date	Page	Content
00	2026-9-10	ALL	New released