

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LS101I15-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

LS101I15-MP-V1 is a color active matrix thin film transistor (TFT) IPS liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC, FPC and Backlight.

2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 1200(RGB)×1920 Dot-matrix
Input Data	MIPI
Viewing Direction (Grayscale Inversion)	Free (IPS)
IC	HX8279

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	143 ×228.6 ×4.2	mm
Number of dots	1200(RGB) ×1920	pixel
Active area (H×V)	135.36×216.576	mm

4. Outline Dimension

[illegible]

5. Absolute Maximum Ratings

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	VCC	-0.3	+5.0	V
Backlight forward current	I _{LED}	0	25	mA(For each LED)
Input Signal Voltage	V _I	-0.3	VCC	V
Operation Temperature	T _{OP}	-10	50	°C
Storage Temperature	T _{ST}	-20	60	°C

6. Electrical Characteristics

Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power Voltage	VCC	2.7	3.3	3.6	V
Current Consumption	I _{VCC}	-	--	TBD	mA
	I _{LED}	--			

7. LED Back Light Specification (24 White Chips)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V _f	I _f =90mA	22.4	24	25.6	
Uniformity (with L/G)	Δ B _p	I _f =90mA	75	80	-	%
Luminance for LCM	/			280		cd/m ²

8.ELECTRICAL SPECIFICATION

Item	Symbol	Specification			Unit
		Min.	Typ.	Max.	
TFT gate on voltage	V _{GH}		(21)		V
TFT gate on voltage	V _{GL}		(-7)		V
TFT common electrode voltage	V _{com} (DC)		3.57		V

Note: (1) V_{com} must be adjusted to optimize display quality: cross-talk, contrast ratio and etc.

(2) V_{GH} is TFT gate operating voltage

(3) V_{GL} is TFT gate operating voltage

(4) Environmental condition: 25±5

(5) Reference waveform for panel light on is as below: (release after sample output)

	White	Black	G25%	G50%	G75%
V _H	4.5V	0.3V	1.2V	2.1V	3.3V
V _L	-4.5V	-0.3V	-1.2V	-2.1V	-3.3V

V_{com} 0.3V

STV 21V~ -7V

Reset 21V~ -7V

CK# 21V~ -7V

VDD1 -7V

VDD2 21V

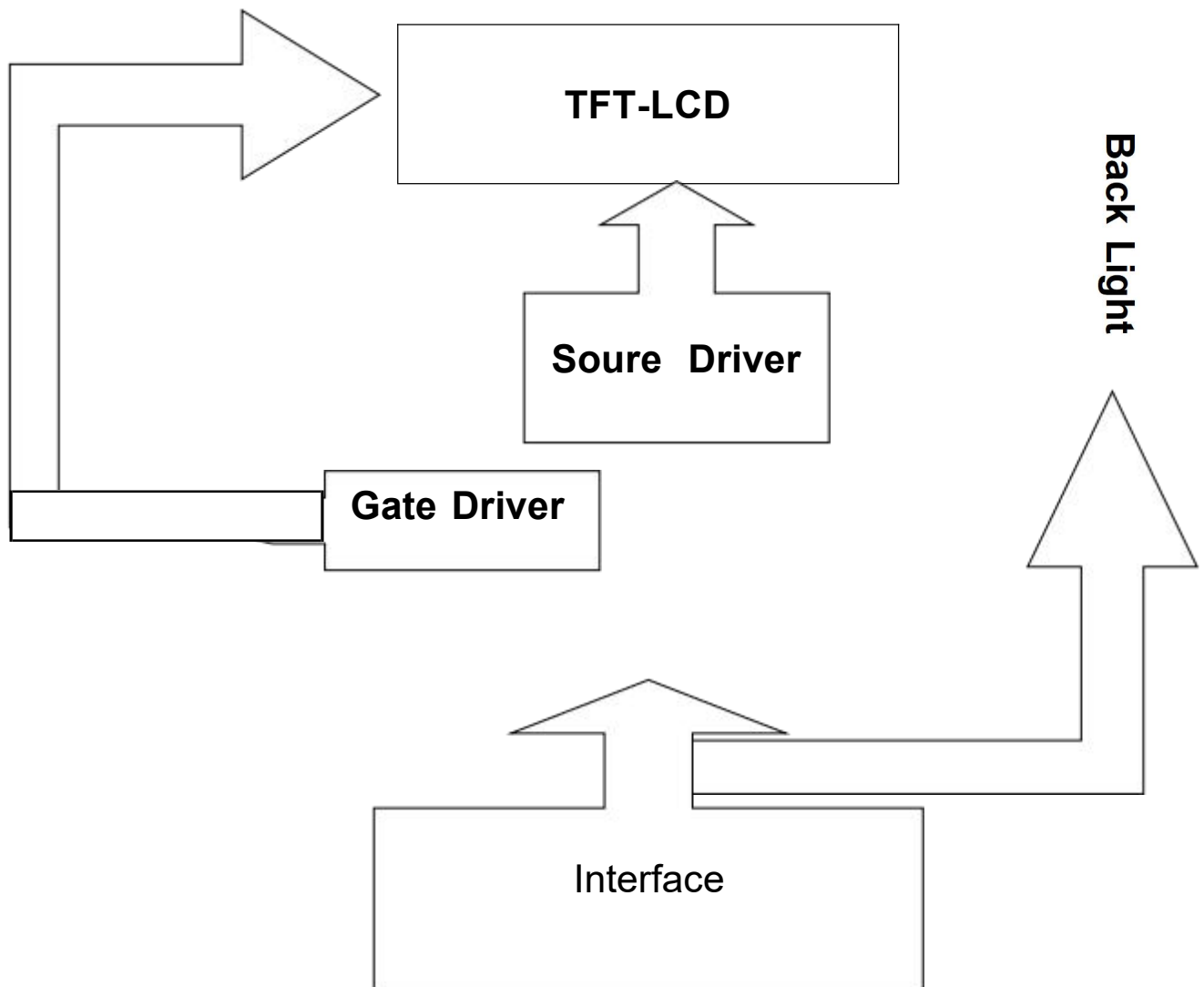
VSSA -7V

VSSG -7V

VGG 30V

9. Module Function Description

9- 1. Block Diagram Of LCM



9-2. Pin Description

PIN NO.	Symbol	Description
1	NC	No connection
2	VDD	3.3V
3	VDD	3.3V
4	GND	Ground
5	Reset	Global reset pin 3.3V
6	NC	No connection
7	GND	Ground
8	MIPI_0N	-MIPI differential data input
9	MIPI_0P	+MIPI differential data input
10	GND	Ground
11	MIPI_1N	-MIPI differential data input
12	MIPI_1P	+MIPI differential data input
13	GND	Ground
14	MIPI_CKN	-MIPI differential clock input
15	MIPI_CKP	+MIPI differential clock input
16	GND	Ground
17	MIPI_2N	-MIPI differential data input
18	MIPI_2P	+MIPI differential data input
19	GND	Ground
20	MIPI_3N	-MIPI differential data input
21	MIPI_3P	+MIPI differential data input
22	GND	Ground
23	NC	No connection
24	NC	No connection
25	GND	Ground
26	NC	No connection
27	PWMO	PWM control signal for LED driver(CABC)
28	NC	No connection
29	NC	No connection
30	GND	Ground

31	LED-	LED Cathode
32	LED-	LED Cathode
33	NC	No connection
34	NC	No connection
35	NC	No connection
36	NC	No connection
37	NC	No connection
38	NC	No connection
39	LED+	LED Anode
40	LED+	LED Anode

9-3 Timing Characteristics

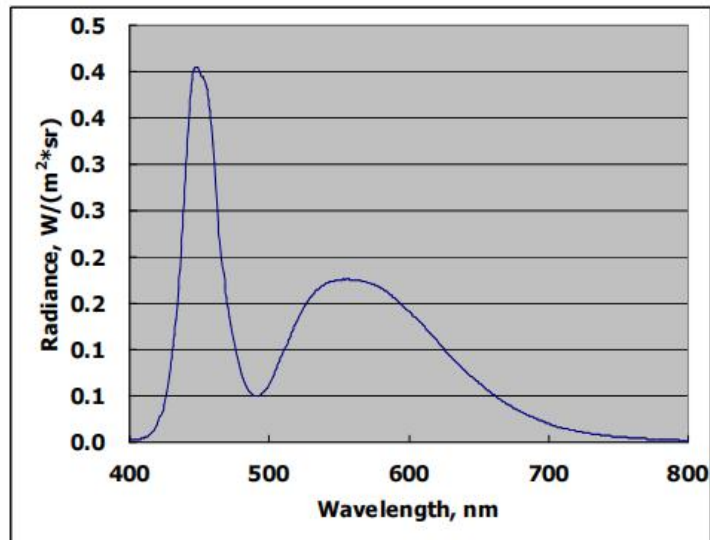
1200RGBx1920 (4 Data Lanes)

Parameter	Symbol	Min.	Typ.	Max.	Unit
MIPI data frequency	FDATA	955	999	1000	Mbps
Horizontal display area	THD	1200			pixel
HS period time	TH	1275	1341	1342	pixel
HS pulse width	THPW	1	1	1	pixel
HS back porch	THBP	32	60	60	pixel
HS front porch	THFP	42	80	81	pixel
Vertical display area	TVD	1920			H
VS period time	TV	1981	1981	1982	H
VS pulse width	TVPW	1	1	1	H
VS back porch	TVBP	25			H
VS front porch	TVFP	35	35	36	H

10. Electro-Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr +Tf	$\theta_x = \theta_y = 0$	---	25	---	ms	Note 1
Contrast Ratio		CR		800	1000	---	---	Note 2
Transmittance		T%		3.53	4.04	---	%	
Color Chromaticity (CIE1931)	White	W x	$\theta_x = \theta_y = 0$	---	0.3	---	---	
		W y		---	0.325	---	---	
Viewing angle	θ_T		CR > 10	---	85	---	Deg.	Note 3
	θ_B			---	85	---		
	θ_L			---	85	---		
	θ_R			---	85	---		
Luminance		L		--	400	---	cd/m2	Note4

*Note(1) INX LED BLU Spectrum:



***Note (2) Definition of Contrast Ratio (CR):**

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

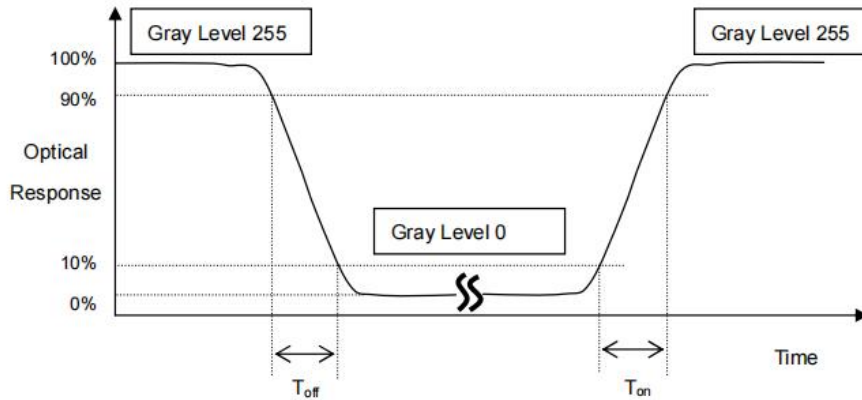
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

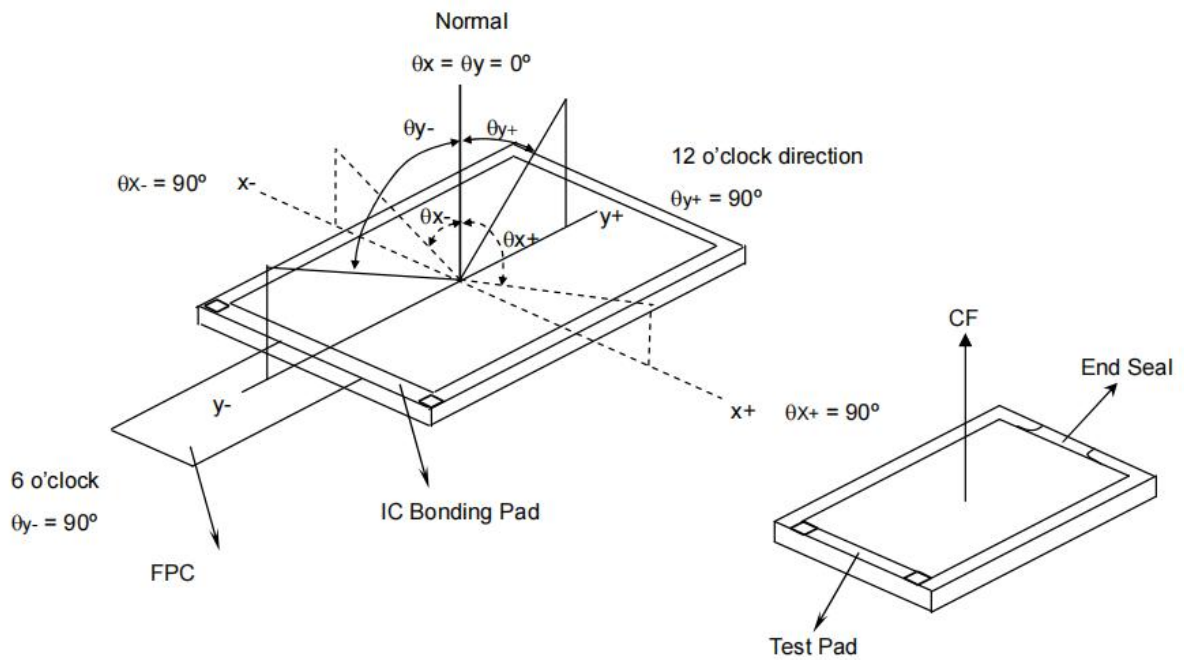
$$CR = CR(5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

***Note (3) Definition of Response Time (T_{on} , T_{off}):**

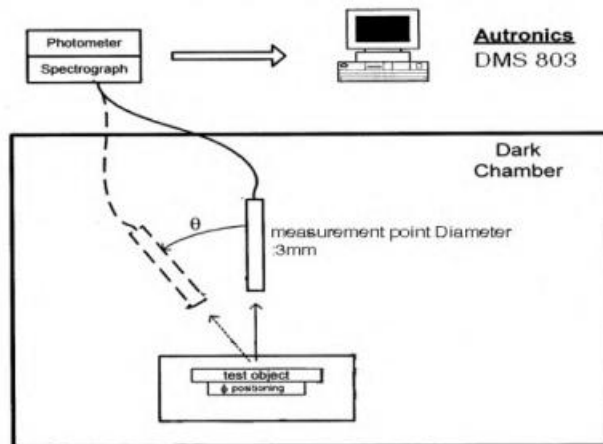


***Note(4) Definition of Viewing Angle**



***Note (5) Measurement Set-Up:**

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note 6: 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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm ,Response time is measured by Photo detector TOPCON BM-5A, other items are measured by BM-7A/Field of view: 1° /Height: 500mm.)

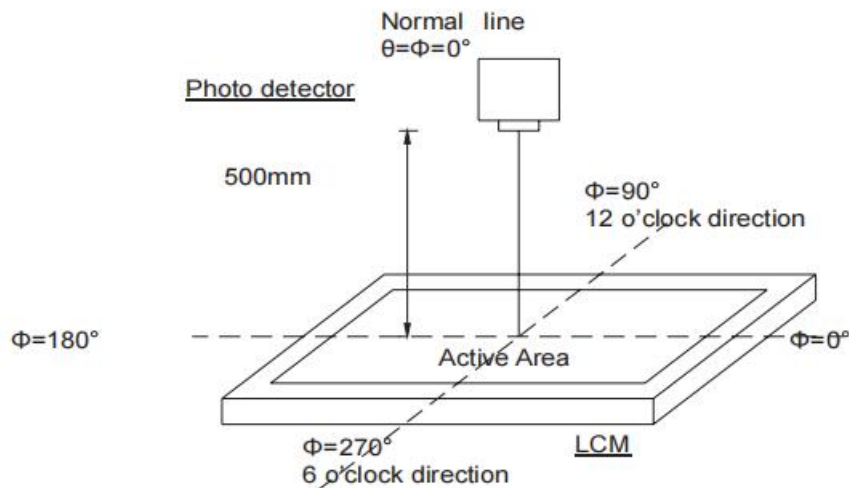


Fig. 4-2 Optical measurement system setup

Note 7: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo

detector output intensity changed from 10% to 90%.

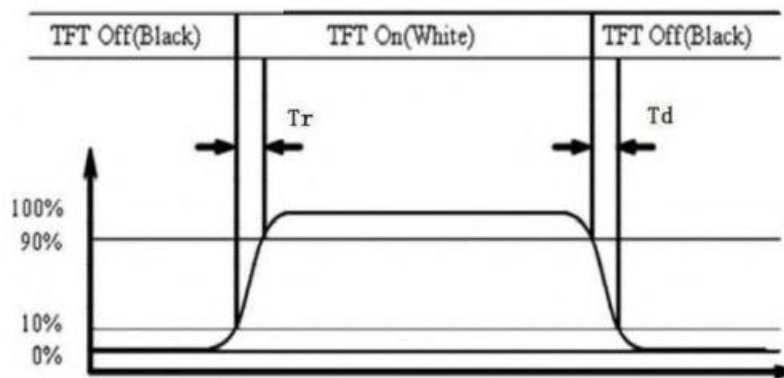


Fig. 4-3 Definition of response time

Note 8: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 9: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 10: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_{LED}=140\text{mA}$.

Note 11: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length W----- Active area width

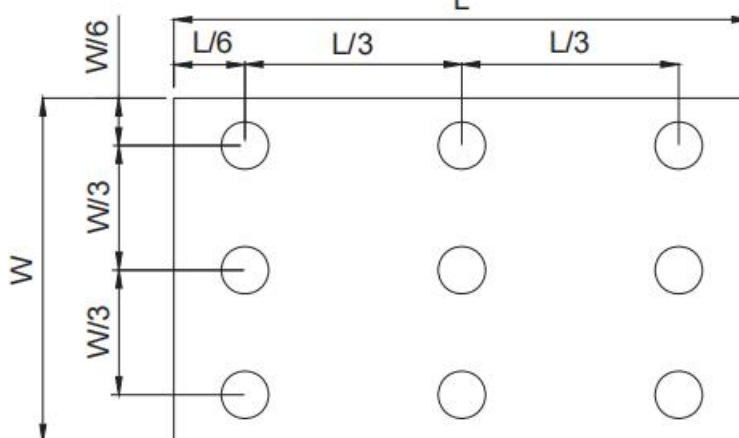


Fig. 4-4 Definition of measuring points

B_{max} : The measured maximum luminance of all measurement position.

B_{min} : The measured minimum luminance of all measurement position.

11.Records Of Version

Version	Revise Date	Page	Content
00		ALL	New released