

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LS028I23-S-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

LSC028I23-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 2.83 inch and the resolution is 240(RGB)*320, the panel can display up to 262 k colors.

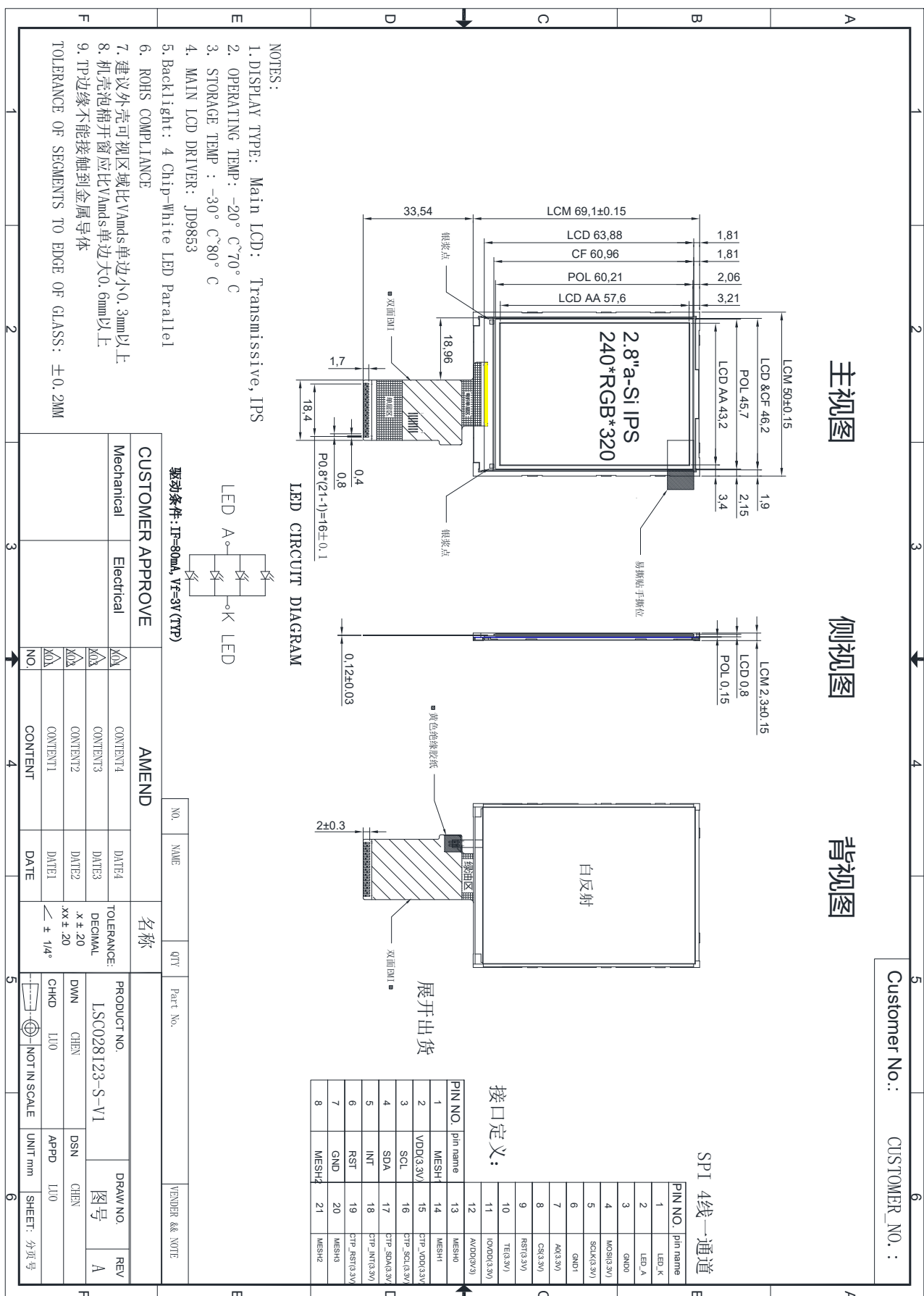
2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 240(RGB)×320 Dot-matrix
Input Data	SPI
Viewing Direction (Grayscale Inversion)	Free (IPS)
Drive	JD9853

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	50.0×69.1×2.3	mm
Number of dots	240(RGB) × 320	pixel
Active area (H×V)	43.2×57.60	mm

4. Outline Dimension LCM



5. Absolute Maximum Ratings

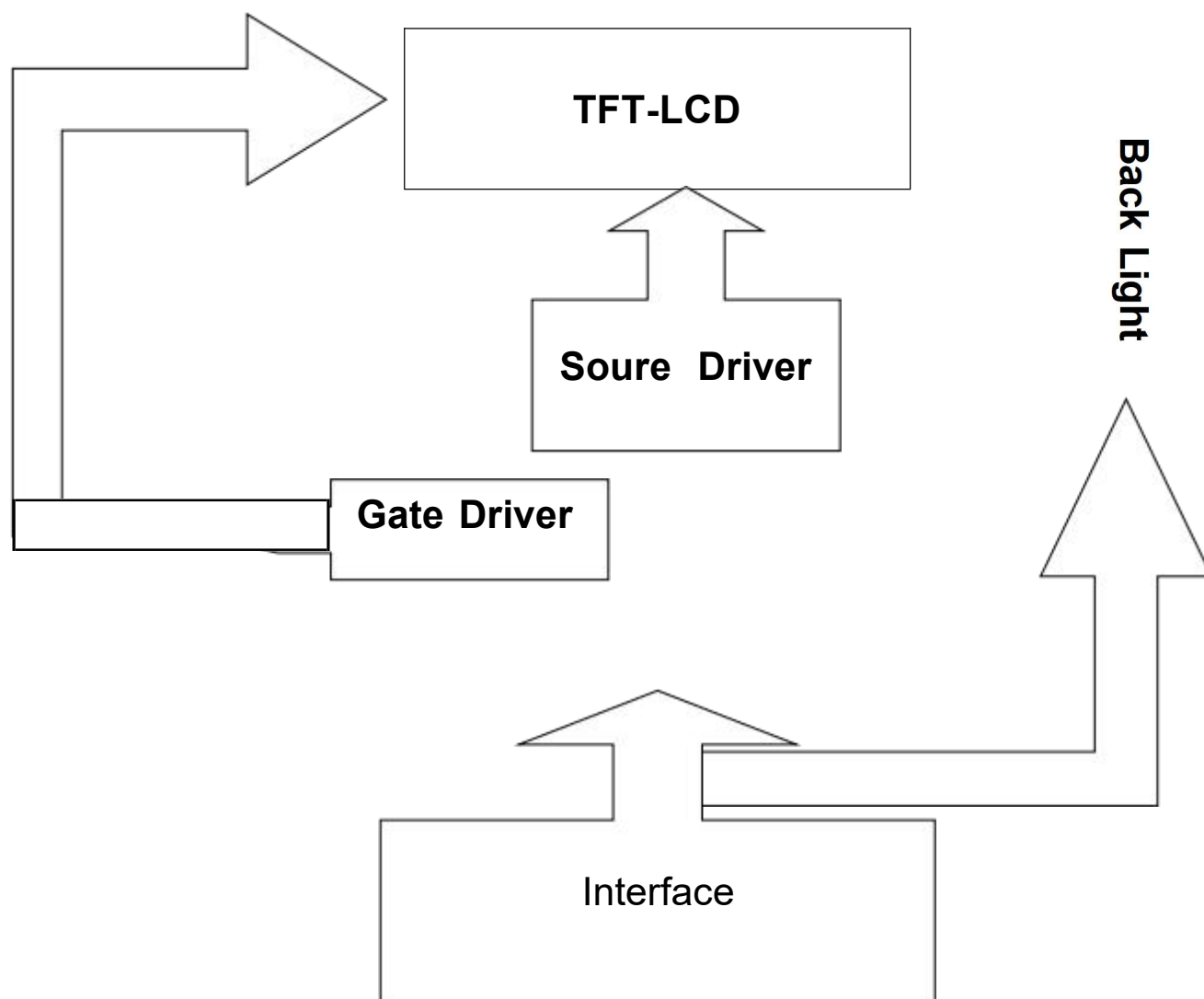
Item	Symbol	Min	Max	Unit	Remark
Supply voltage	VCC	-0.3	3.6	V	Note1 Note2
Supply voltage	IOVCC	-0.3	3.6	V	
Operating temperature	TOPR	-20	70	°C	
Storage temperature	TSTR	-30	80	°C	

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Supply voltage		VCC	2.6	2.8	3.53	V	Note1
Supply voltage		IOVCC	1.65	2.8	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	LED_K	P	Power for LED backlight cathode
2	LED_A	P	Power for LED backlight anode
3	GND	P	Ground
4	MOSI	I/O	Serial data input
5	SCLK	I	serial interface clock
6	GND	P	Ground
7	A0	I	Display data/command selection pin
8	CS	I	Chip select pin
9	RST	I	Reset signal
10	TE	O	-Tearing effect output pin to synchronize MPU to frame writing,activated by S/ command.
11	IOVCC	P	Power Supply
12	VDD	P	Power Supply
13	MESH0		NC
14	MESH1		NN
15	CTP_VDD	P	Power Supply
16	CTP_SCL	I	SCL pin for TP
17	CTP_SDA	I/O	SDA pin for TP
18	CTP_INT	I	Interrupt signal for TP
19	CTP_RST	I	Reset Pin for TP
20	MESH3		NC
21	MESH2		NC

7-3 Timing Characteristics

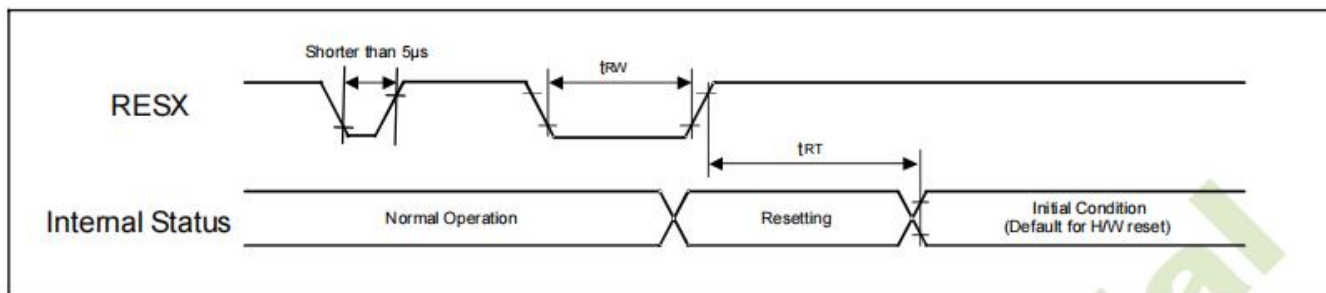


Figure. 10.7 Reset input timings

Symbol	Parameter	Related pins	Min.	Max.	Unit
t_{RW}	Reset pulse width ⁽²⁾	RESX	10	-	μs
t_{RT}	Reset complete time ⁽³⁾	-	-	5 (Note 5)	ms
		-	-	120 (Note 6, 7)	ms

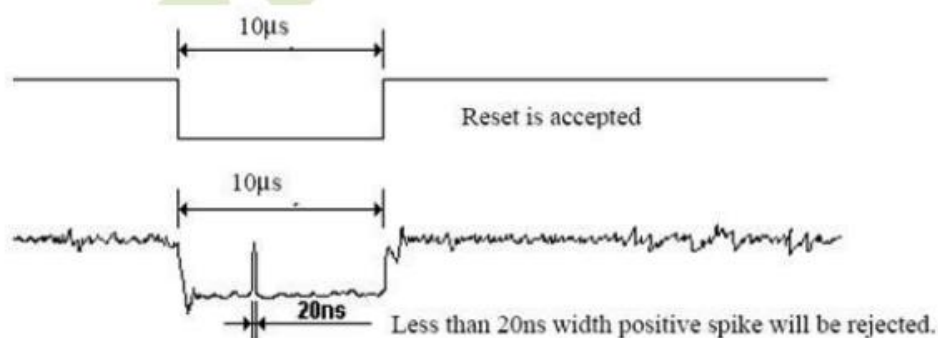
Note: (1) The reset complete time also required time for loading ID bytes from OTP to registers. This loading is done every time when there is HW reset cancel time (t_{RT}) within 5 ms after a rising edge of RESX.

(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 5 μs	Reset Rejected
Longer than 10 μs	Reset
Between 5 μs and 10 μs	Reset Start

(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 returns to Default condition for H/W reset.

(4) Spike Rejection also applies during a valid reset pulse as shown below:



(5) When Reset is applied during Sleep In Mode.

(6) When Reset is 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.

Serial Interface Timing Characteristics (4-line SPI)

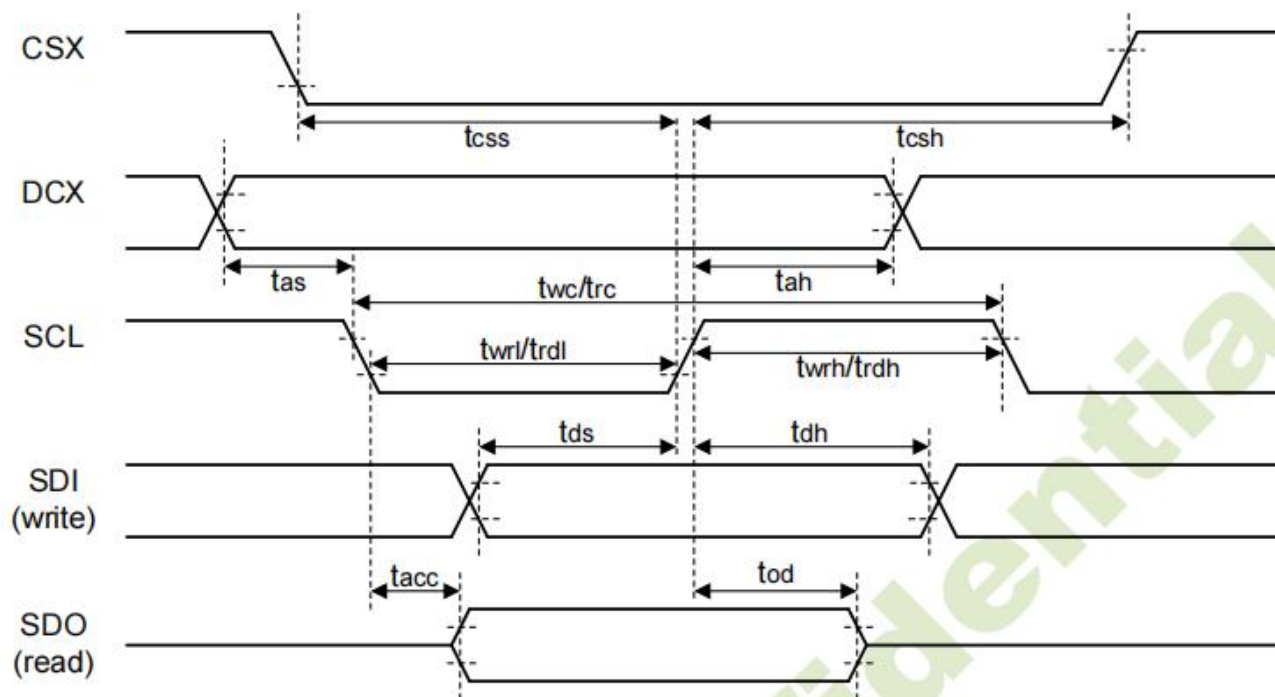


Figure. 10.4 4-line Serial Interface Timing Characteristics

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	t_{css}	Chip select setup time (Write)	15		ns	
	t_{csh}	Chip select setup time (Write)	15		ns	
	t_{css}	Chip select hold time (Read)	60		ns	
	t_{csh}	Chip select hold time (Read)	65		ns	
DCX	t_{as}	Address setup time	10		ns	
	t_{ah}	Address hold time (Write/Read)	10		ns	
SCL (write)	t_{wc}	Write cycle	16		ns	
	t_{wrh}	Control pulse "H" duration	7		ns	
	t_{wrl}	Control pulse "L" duration	7		ns	
SCL (read)	t_{rc}	Read cycle	150		ns	
	t_{rdh}	Control pulse "H" duration	60		ns	
	t_{rdl}	Control pulse "L" duration	60		ns	
SDI/SDO (write)	t_{ds}	Data setup time	7		ns	
	t_{dt}	Data hold time	7		ns	
SDI/SDO (read)	t_{acc}	Read access time	20		ns	
	t_{od}	Output disable time	25		ns	

8. Electro-Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr +Tf	$\theta_x = \theta_y = 0$	---	--	35	ms	Note 1
Contrast Ratio		CR		1000	1500	---	---	Note 2
Transmittance		T%		4.5	4.8	---	%	
Color Chromaticity (CIE1931)	White	W x	$\theta_x = \theta_y = 0$	---	0.302	---	---	
		W y		---	0.320	---	---	
Viewing angle	θ_T		CR > 10	---	85	---	Deg.	Note 3
	θ_B			---	85	---		
	θ_L			---	85	---		
	θ_R			---	85	---		

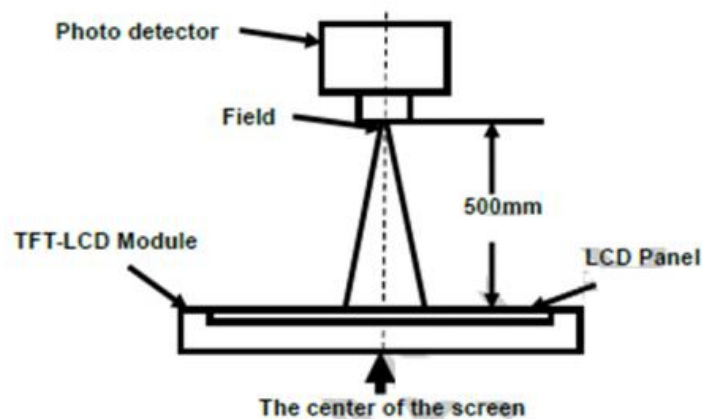
Note 1: Measuring Conditions:

The optical characteristics are determined after the unit has been 'ON' and stable at the maximum brightness, in a dark environment at an ambient temperature at $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

Note 2: Definition of optical measurement system.

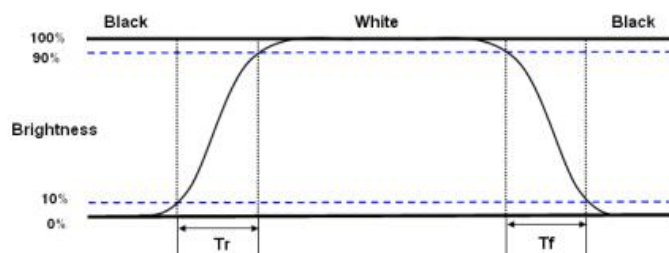
The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Transmittance		
Chromaticity	LCF-2100M	1°
Response Time	TRD-100	2°



Note 3: 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_r) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_f) is the time between photo detector out intensity changed from 90% to 10%.

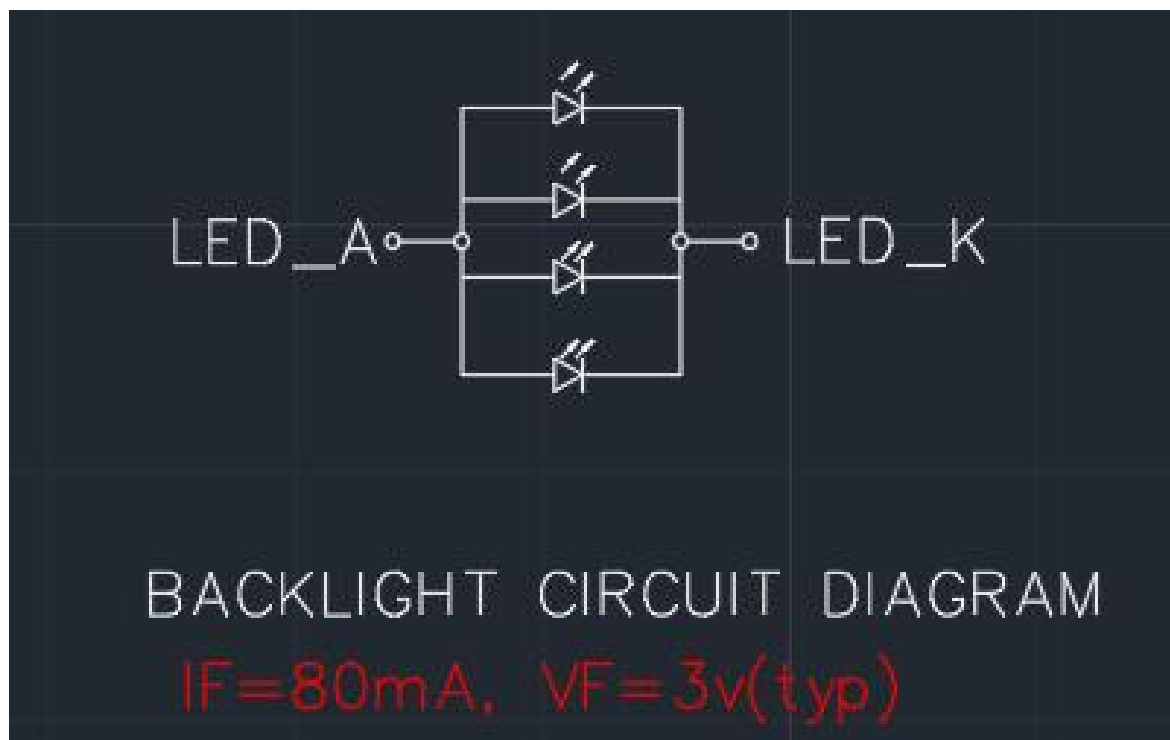


Note 4: Definition of contrast ratio:

Contrast ratio is measured at the center point of LCD and calculated by the following formula:

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

Note(4) Backlight circuit



9.Records Of Version

Version	Revise Date	Page	Content
00	2025-10-30	ALL	New released