

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0`

Model No: LS028T22-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>

Contents

目录

1. General Description	3
2. Physical Features	3
3. Mechanical Specification	3
4. Outline Dimension	4
5. Absolute Maximum Ratings	5
6. Electrical Characteristics	5
7. Module Function Description	6
8. Electro-Optical Characteristics	10
9. Records Of Version	12

1. General Description

LS028T22-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 2.8 inch and the resolution is 240(RGB)*320, the panel can display up to 262k colors.

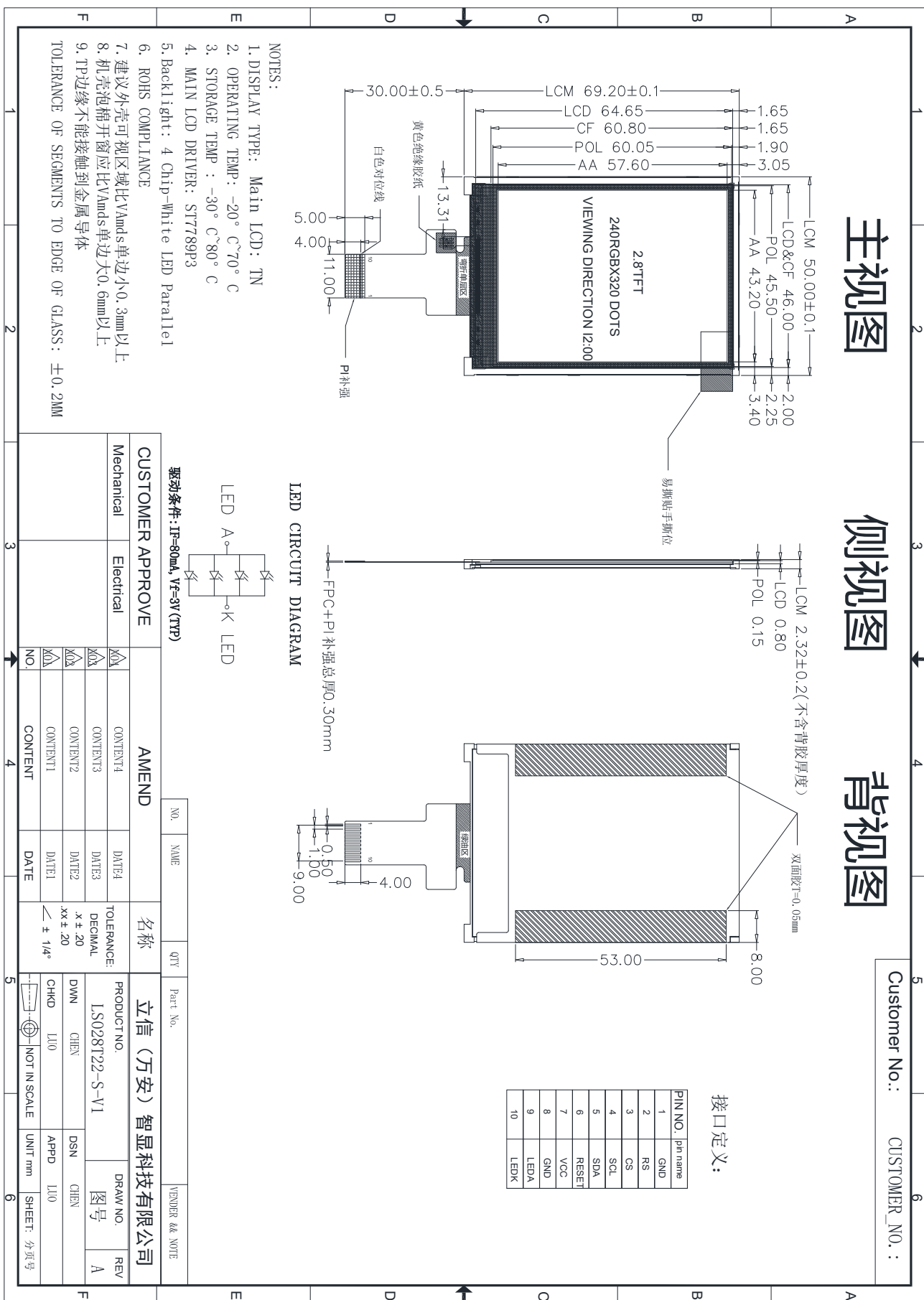
2. Physical Features

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)	TN
Drive	ST7789P3

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	50.0 ×69.2 ×2.32	mm
Number of dots	240(RGB) ×320	pixel
Active area (H×V)	43.2×57.6	mm

4. Outline Dimension



5. Absolute Maximum Ratings

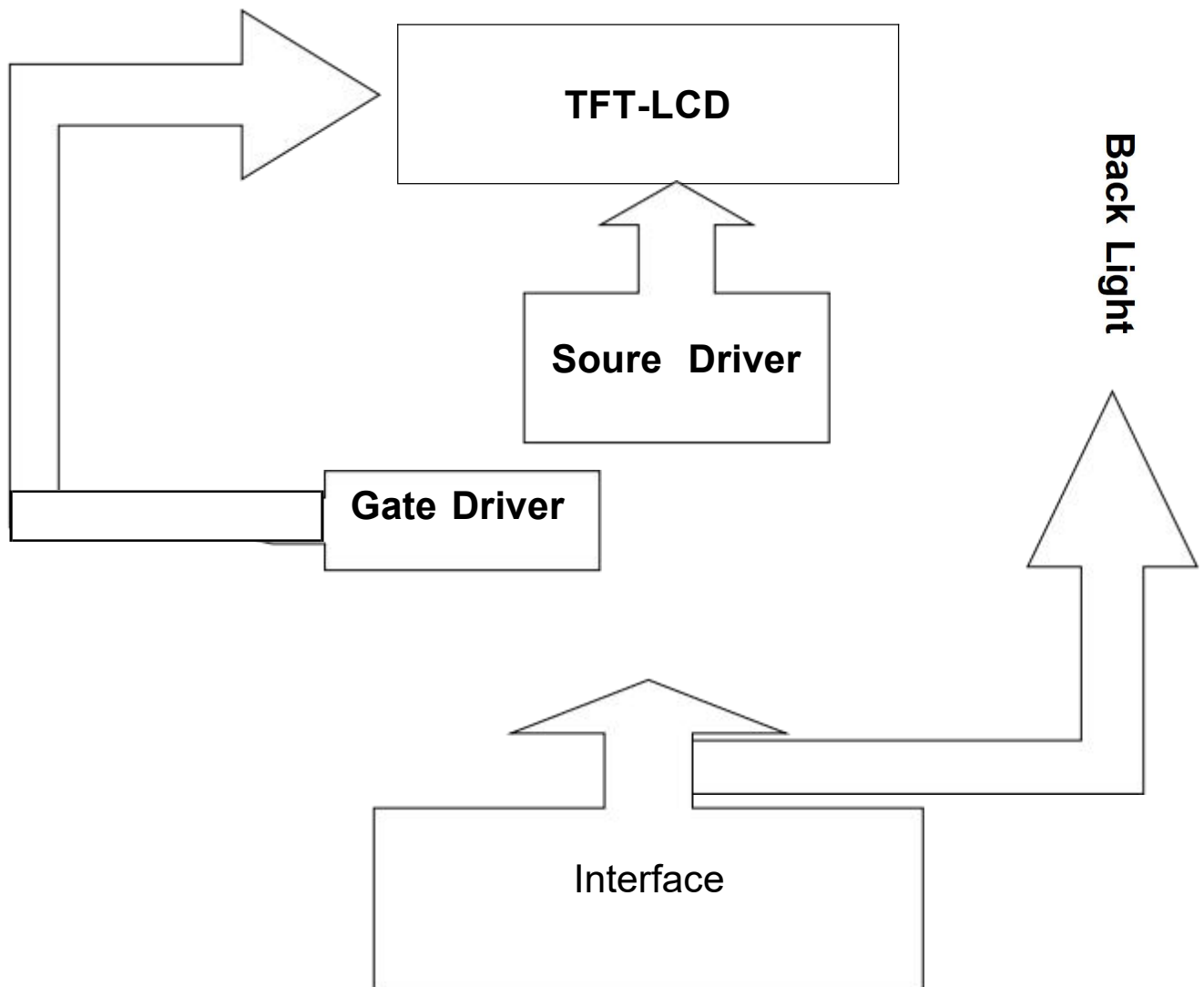
Item	Symbol	Min	Max	Unit	Remark
Supply voltage	VCC	-0.3	4.6	V	Note1 Note2
Operating temperature	TOPR	-20	70	°C	
Storage temperature	TSTR	-30	80	°C	

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Supply voltage		VCC	2.4	2.75	3.3	V	Note1
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 Descrip

PIN NO.	Symbol	I/O	Description
1	GND	P	Ground
2	RS	I	Command and Data select pin
3	CS	I	Chip select pin
4	SCL	I	Serial clock pin
5	SDA	I/O	Serial data input/output PIN
6	RESET	I	Reset pin.
7	VCC	P	power supply
8	GND	P	Ground
9	LEDA	P	Power for LED backlight anode
10	LEDK	P	Power for LED backlight cathode

7-3 Timing Characteristics

7.4.3 Serial Interface Characteristics (4-line serial):

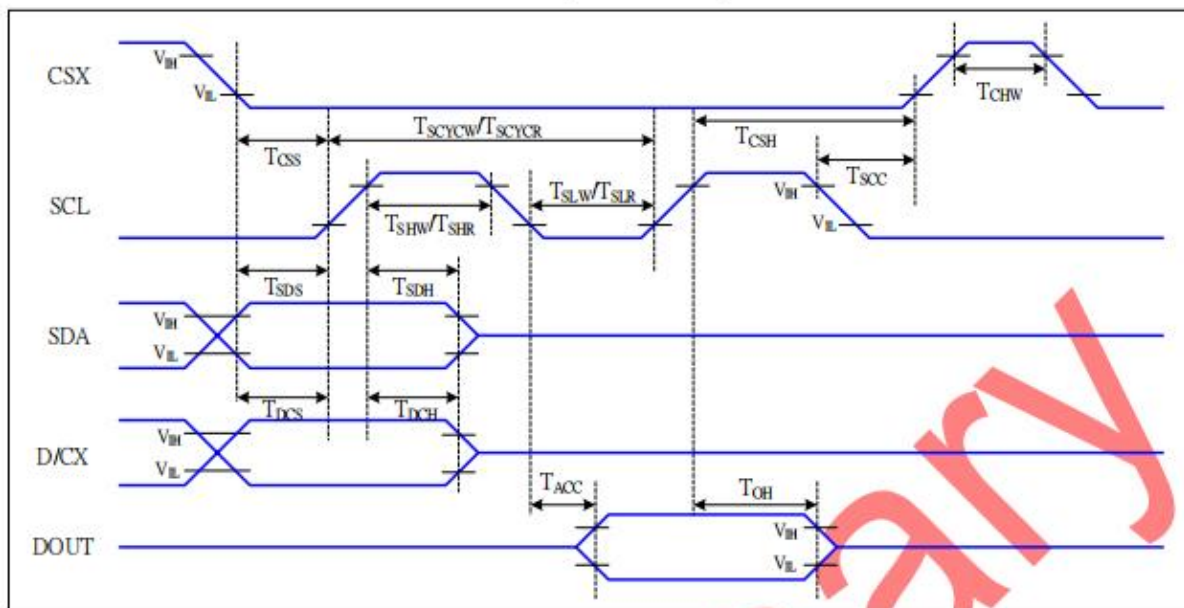


Figure 5 4-line serial Interface Timing Characteristics

$V_{DDI}=1.65$ to $3.3V$, $V_{DD}=2.4$ to $3.3V$, $AGND=DGND=0V$, $T_a=25^{\circ}C$

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	TBD	-	ns	
	T_{CSH}	Chip select hold time (write)	TBD	-	ns	
	T_{CSS}	Chip select setup time (read)	TBD	-	ns	
	T_{SCC}	Chip select hold time (read)	TBD	-	ns	
	T_{CHW}	Chip select "H" pulse width	TBD	-	ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	TBD	-	ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	TBD	-	ns	
	T_{SLW}	SCL "L" pulse width (Write)	TBD	-	ns	
	T_{SCYCR}	Serial clock cycle (Read)	TBD	-	ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	TBD	-	ns	
	T_{SLR}	SCL "L" pulse width (Read)	TBD	-	ns	
D/CX	T_{DCS}	D/CX setup time	TBD	-	ns	
	T_{DCH}	D/CX hold time	TBD	-	ns	
SDA (DIN)	T_{SDS}	Data setup time	TBD	-	ns	
	T_{SDH}	Data hold time	TBD	-	ns	
DOUT	T_{ACC}	Access time	TBD	TBD	ns	For maximum $CL=30pF$
	T_{OH}	Output disable time	TBD	TBD	ns	For minimum $CL=8pF$

Table 6 4-line serial Interface Characteristics

Note 1 : The rising time and falling time (T_r , T_f) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of V_{DDI} for Input signals.

7.4.5 Reset Timing:

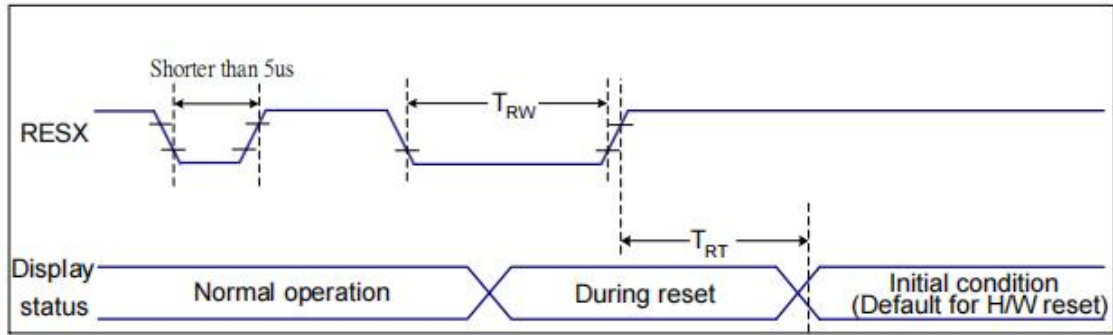


Figure 7 Reset Timing

$VDDI=1.65$ to $3.3V$, $VDD=2.4$ to $3.3V$, $AGND=DGND=0V$, $Ta=25^{\circ}C$

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

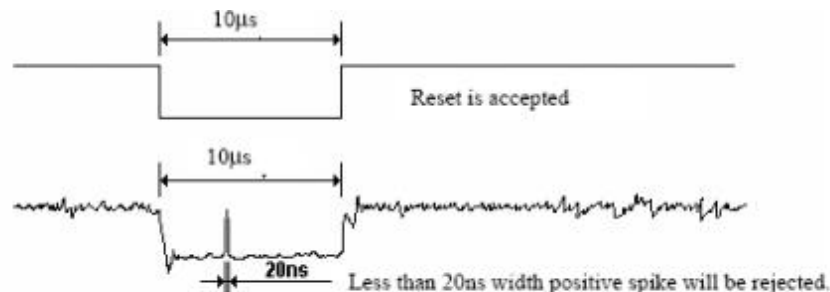
Notes:

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.

8. Electro-Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Tr +Tf	$\theta_x = \theta_y = 0$	---	16	---	ms	Note 1
Contrast Ratio	CR		---	500	---	---	Note 2
Transmittance	T%		---	6.4	---	%	
Color Chromaticity (CIE1931)	White	W x	---	0.301	---	---	
		W y	---	0.337	---	---	
Viewing angle	θ_T	CR > 10	---	50	---	Deg.	Note 3
	θ_B		---	20	---		
	θ_L		---	45	---		
	θ_R		---	45	---		

Note 1: Ambient temperature = 25°C.

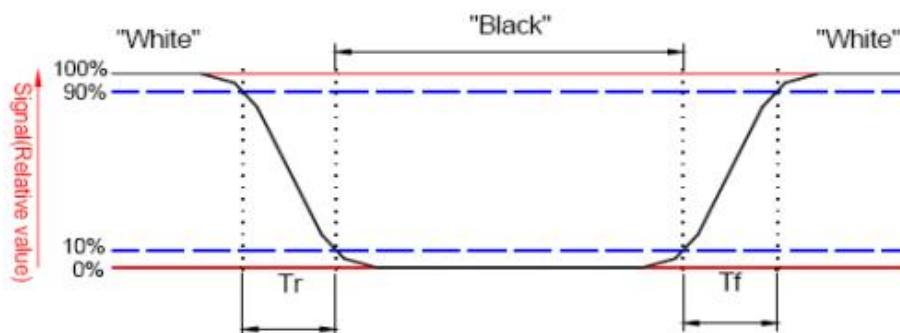
Note 2: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer.
The tolerance of Transmittance is $\pm 10\%$.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.

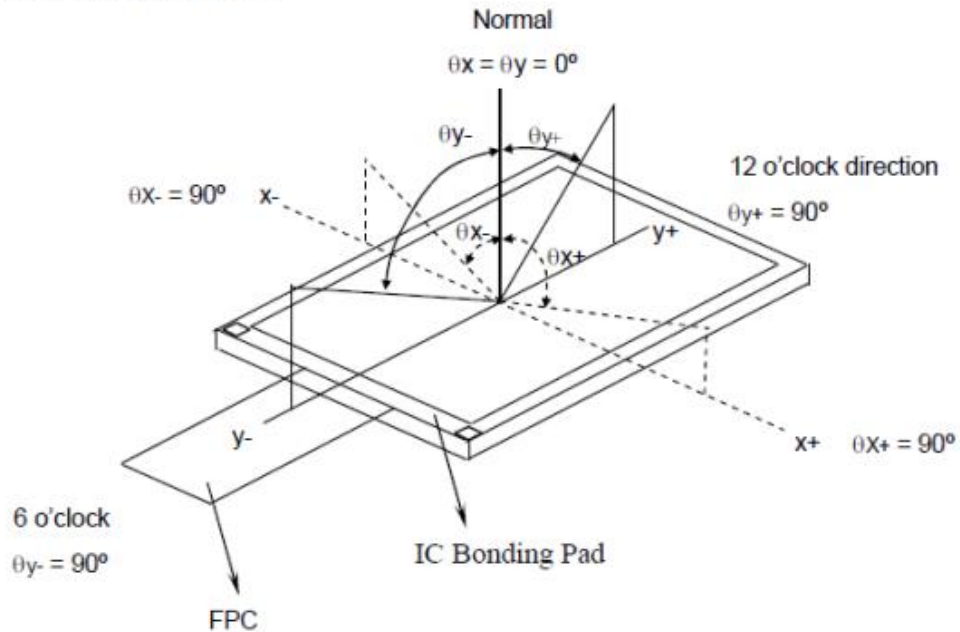


Note 6: Definition of contrast ratio:

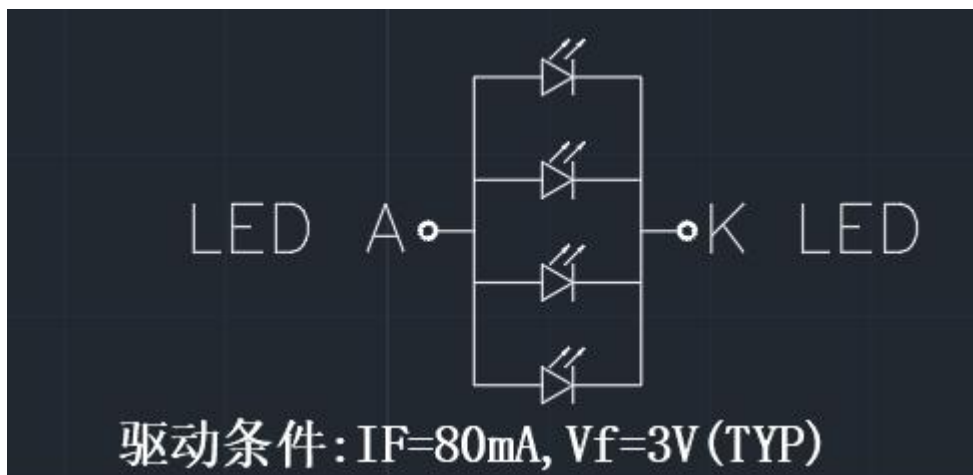
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 7: Definition of viewing angle



Backlight circuit



9.Records Of Version

Version	Revise Date	Page	Content
00	2025-12-12	ALL	New released