

4.00" 480*480 IPS ST7701S 262K 18 Bit RGB FPC Connector 40 Pin CTP GT911



- ST7701S is driven with 18 bit color depth.
- LCD can display 262K Colors (8R:8G:8B).
 - 18 Bit RGB Interface(VS, HS, DOTCLK, ENABLE, DB[17:0], Sync and DE mode)
- ST7701S has Lower Power Consumption.
- Display Colors (Color Mode)
 - Reduced color mode: 262K colors.
 - Reduced color mode: 65K colors.
 - Idle Mode: 8-color, RGB=(111).
- Programmable Pixel Color Format (Color Depth) for Various Display Data input Format
 - 18-bit/pixel: RGB=(666)
 - 16-bit/pixel: RGB=(565)
- Display Features
 - Programmable Partial Display Duty.
 - CABC for saving current consumption.
 - Color enhancement.
- SPI + RGB interface
 - Supports SPI for registers
- Capacitive Touch
 - 5 point Multi-touch
 - Touch sensing report rate 100Hz
 - Touch Interface: I2C
- Normally black.
 - IPS, all view direction.
- Power Supply
 - VDD: 2.5V - 3.6V
 - VDDTP: 2.8V - 3.3V
- Brightness: 350 cd/m².
- FPC Connector.



Ordering &
Details



Support &
Community



Technical
Documentation

1 General Specifications

Feature		Specifications
Display Spec.	LCD type	4.00 inch
	Resolution (H*V)	480(RGB) x 480
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Normally Black
	Viewing Direction	ALL
	Gray Scale Inversion Direction	-
Mechanical Characteristics	Outline Dimensions (W x H x T) (mm)	84.2 x 84.2 x 3.3
	Active Area(mm)	71.86 x 70.18
	CTP View Area(mm)	/
	With /Without Touch screen	With CTP
	Connector Type	0.5 PITCH
	Backlight Type	LED
	Weight (g)	TBD
Electrical Characteristics	Display Interface	3SPI+RGB
	Touch Interface	I2C
	Number of color	262K
	Display Driver IC	ST7701S
	Touch Driver IC	GT911/GFF

Note 1: Viewing direction for best image quality is different from TFT definition. There is an 180 degree shift.

2 Electrical Characteristics

2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{DD}	-0.3	4.6	V
Touch Panel Power Supply Voltage	V_{DDTP}	2.66	3.47	
Operation Temperature	T_{opr}	-20	70	°C
Storage Temperature	T_{stg}	-30	80	°C

2.2 Driving TFT LCD Panel

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Operating Voltage	V_{DD}	2.8	3.3	3.6	V	-
Supply Current	I_{DD}	-	-	50	mA	$V_{DD}=2.8V, T_a=25^{\circ}C$
Input Voltage	V_{IH}	$0.8 \cdot V_{DD}$	-	V_{DD}	V	
	V_{IL}	0	-	$0.2 \cdot V_{DD}$	V	
Input leakage current	I_{IL}	-1.0	-	1.0	μA	V_{DD} or V_{SS}

Note: Voltage greater than above may damage the module.

All voltages are specified relative to $V_{SS}=0V$.

2.3 Driving Touch Panel

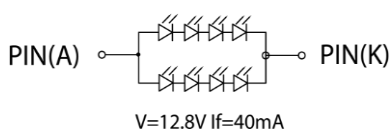
Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DDTP}	2.8	3.3	3.3	V
Working Temperature	-	-20	-	85	$^{\circ}C$
Normal Mode Operating Current	-	-	8	14.5	mA
Green Mode Operating Current	-	-	3.3	-	mA
Sleep Mode Operating Current	-	70	-	120	μA

2.4 Backlight Unit

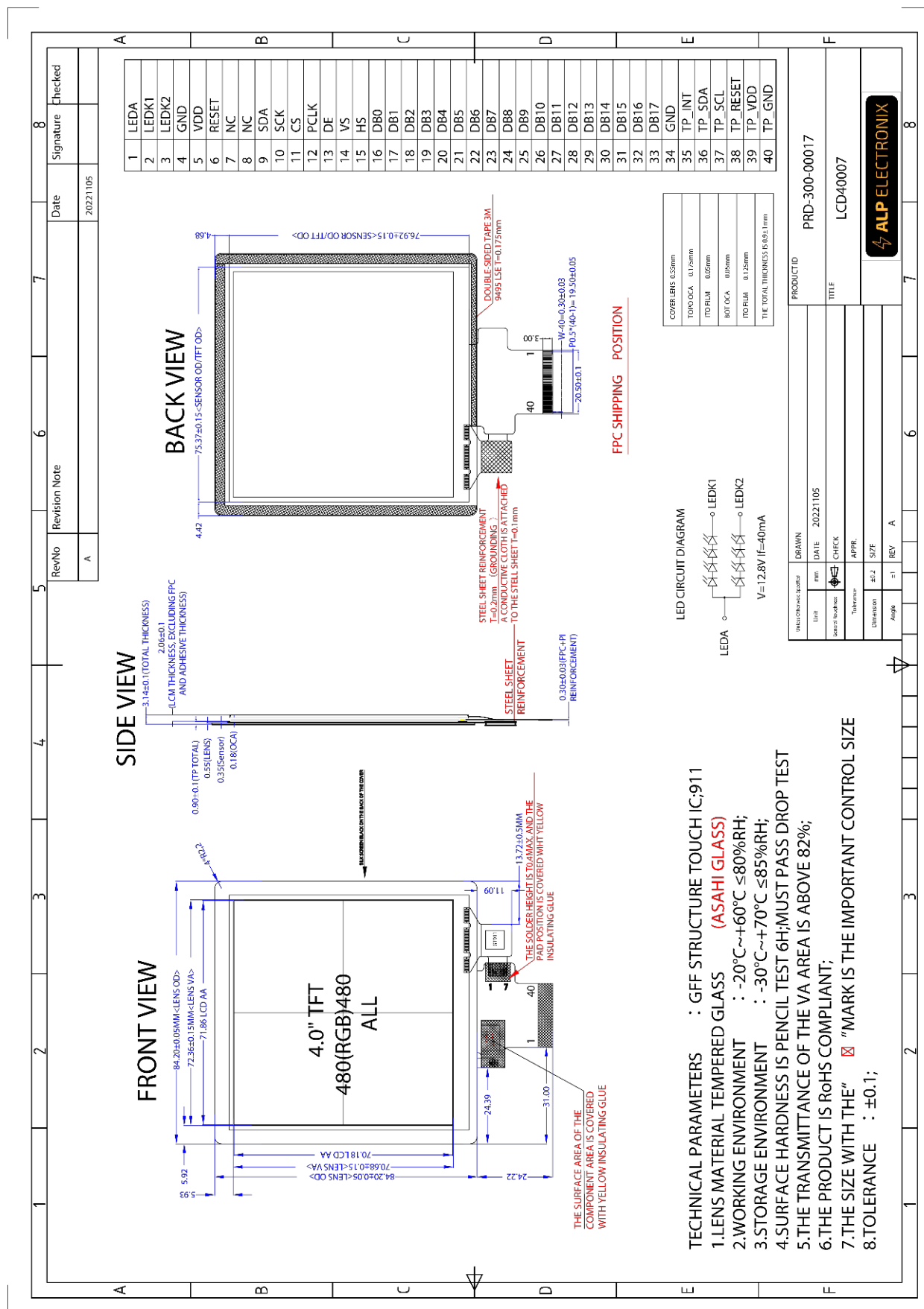
Parameter	Symbol	Min.	Typ.	Max.	Unit
Voltage for LED backlight	V_F	-	12.8V	-	V
Current for LED backlight	I_F	--	40	45	mA
Connection Mode		-	4S2P	--	
LED number		/	8	-	pcs

Note: Optical performance should be evaluated at $T_a=25^{\circ}C$ only .If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

LED CIRCUIT DIAGRAM



3 Mechanical Drawing



4 Pin Definition

Pin no.	Symbol	Description
1	LED _A	Backlight LED anode.
2	LED _{K1}	Backlight LED cathode.
3	LED _{K2}	Backlight LED cathode.
4	GND	Ground pin.
5	VDD	Power supply pin.
6	RESET	Reset signal. Active low.
7	NC	No connection.
8	NC	No connection.
9	SDA	SPI data signal.
10	SCK	SPI clock signal.
11	CS	SPI chip select signal. Active Low.
12	PCLK	RGB dot clock signal.
13	DE	RGB data enable signal.
14	VS	RGB frame synchronizing signal.
15	HS	RGB line synchronizing signal.
16-33	DB0-DB17	RGB data signal(DB0:BLUE LSB; DB5:BLUE MSB; DB6:GREEN LSB; DB11: GREEN, MSB; DB12:RED LSB; DB17:RED MSB).
34	GND	Ground pin.
35	TP_INT	Touch panel Interrupt.
36	TP_SDA	Touch panel I ² C data input and output.
37	TP_SCL	Touch panel I ² C clock input.
38	TP_RESET	Touch panel reset signal. Active low.
39	TP_VDD	Touch panel power supply.
40	GND	Ground pin.

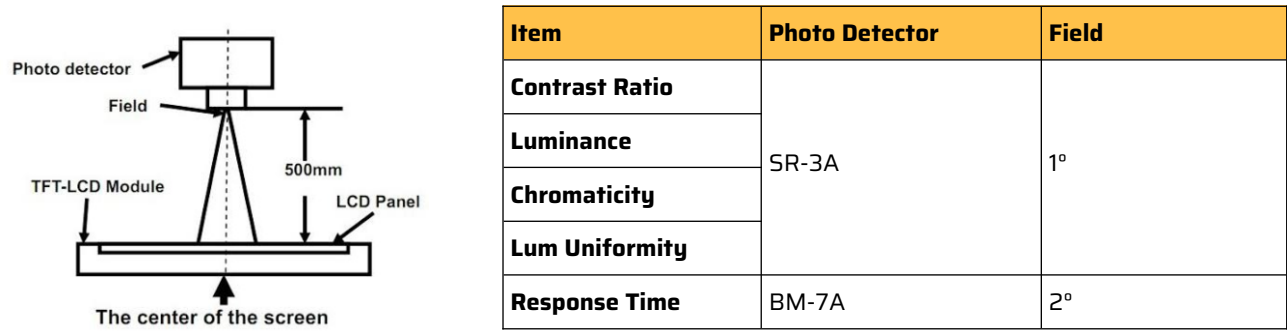
Note: 1:SPI+RGB interface

5 Optical Characteristics

Item	Symbol	Measuring Conditions	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	θ_T	CR \geq 10	-	80	-	Degree	Note 2
	θ_B		-	80	-		
	θ_L		-	80	-		
	θ_R		-	80	-		
Contrast Ratio	CT	$\Phi=0^\circ$	700	900	-	-	Note 1 Note 3
Response Time	T _{ON}	25°C	-	30	40	mS	Note 1
	T _{OFF}						Note 4
Uniformity	U	-	70	180	-	%	Note 1 Note 6
NTSC	-	-	-	70	-	%	Note 5
Luminance	L		420	450	-	cd/m ²	Note 1 Note 7

Notes:

1. 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.



2. Definition of Viewing Angle:
- viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

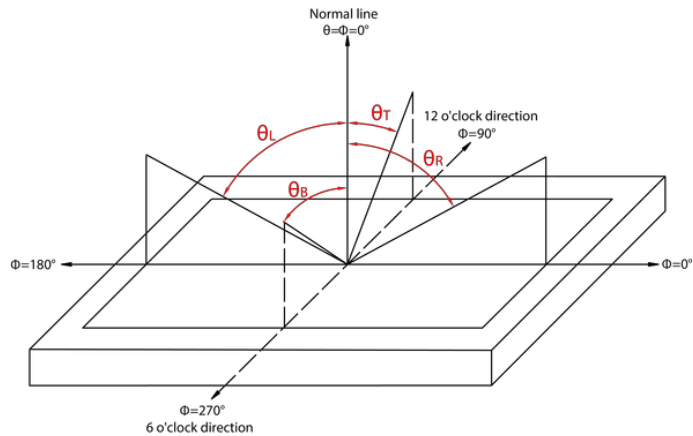


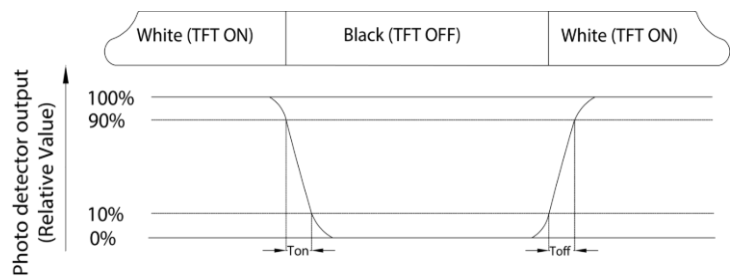
Fig. 1 Definition of viewing angle

3. Definition of Contrast Ratio (CR): measured at the center point of panel
- CR = Luminance with all pixels white / Luminance with all pixels black.

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

“White state “:The state is that the LCD should be driven by V_{white}.
“Black state”: The state is that the LCD should be driven by V_{black}.
V_{white}: To be determined V_{black}: To be determined.

4. Definition of Response Time: Sum of T_R and T_F



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

5. Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.
6. Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.
7. L=Active area length W=Active area width

$$\text{Luminance Uniformity}(U) = \frac{L_{min}}{L_{max}}$$

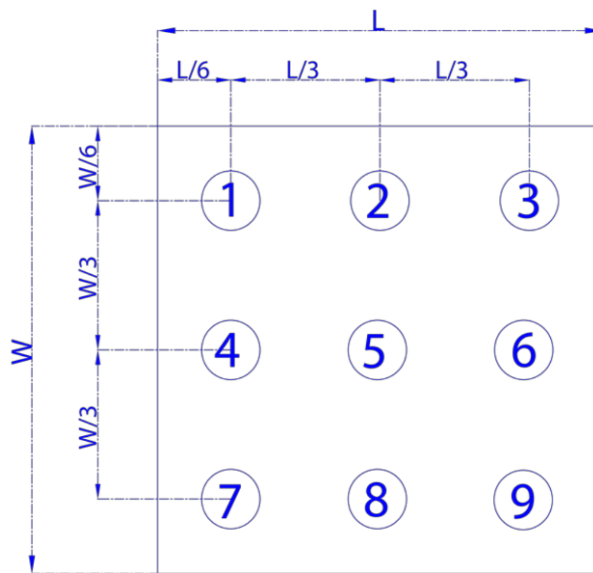


Fig. 2 Definition of uniformity

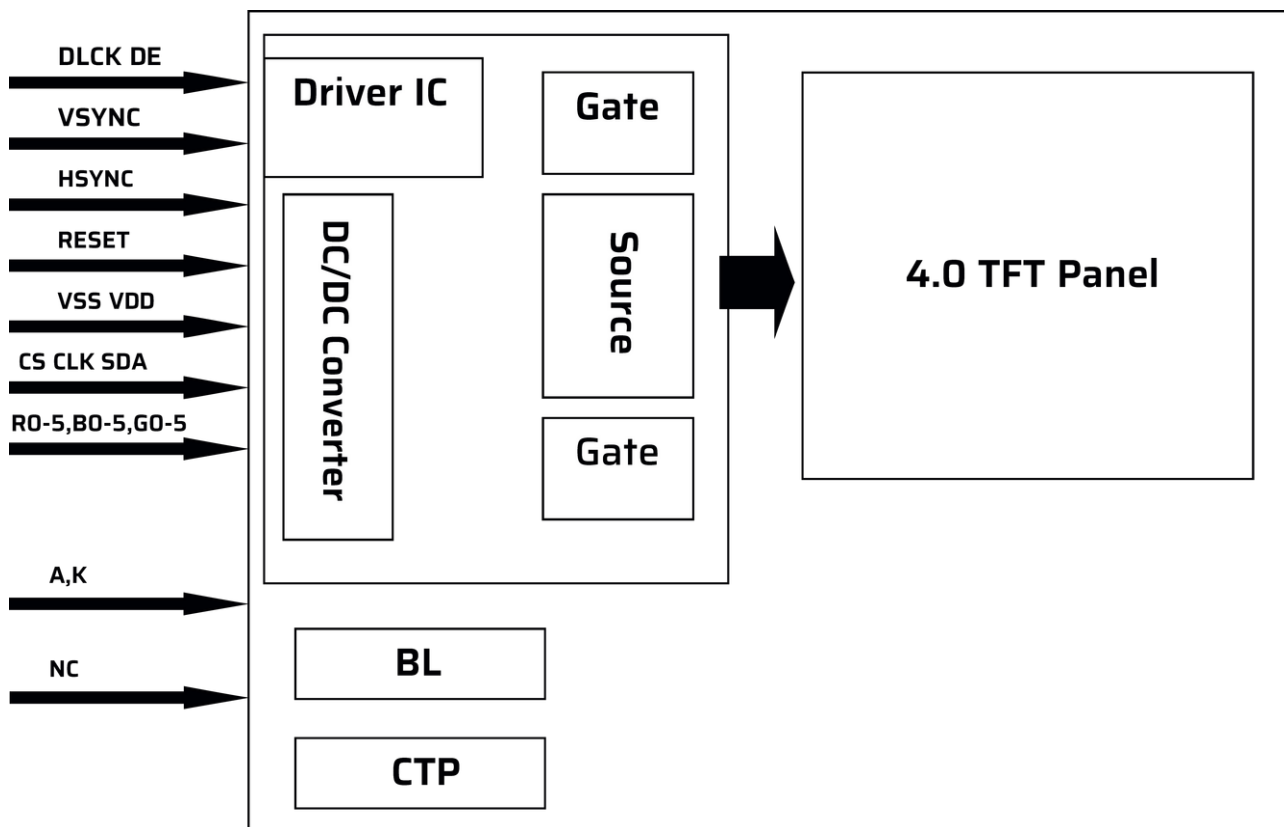
Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

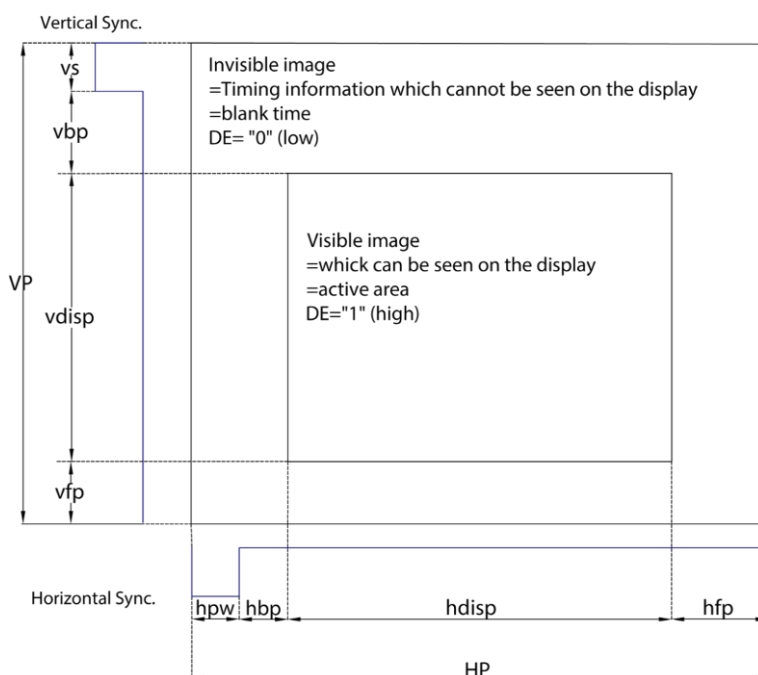
8. Definition of Luminance:
Measure the luminance of white state at center point.

6 Interface Timing

6.1 Block Diagram



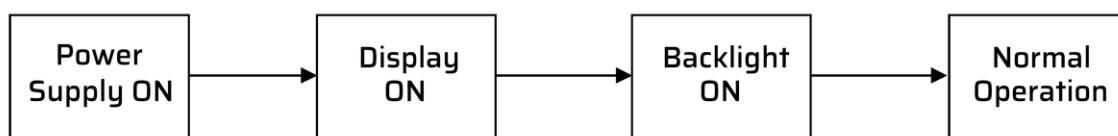
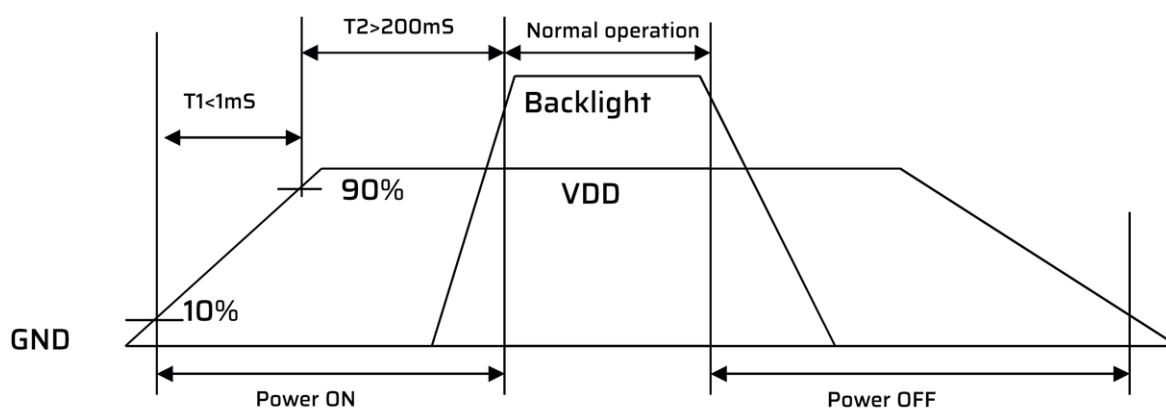
6.2 System Bus Read/Write Characteristics.



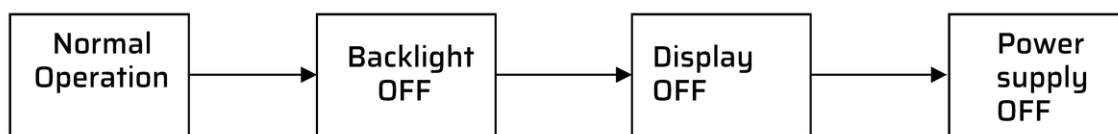
Parameter	Symbol	Min	Typ.	Max.	Unit
Horizontal Sync. Width	hpw	1	-	255	Clock
Horizontal Sync. Back Porch	hbp	1	--	255	Clock
Horizontal Sync. Front Porch	hfp	1	--	-	Clock
Vertical Sync. Width	vs	1	--	254	Line
Vertical Sync. Back Porch	vbp	1	--	254	Line
Vertical Sync. Front Porch	vfp	2	--	--	Line

Note: Typical value are related to the setting frame rate is 60Hz.

6.3 Power ON/OFF Timing



Power ON sequence



Power OFF sequence

7 Environmental / Reliability Test

No.	Item	Condition	Time (hrs)	Assessment
1	High temp. Storage	80°C	120	No abnormalities in functions and appearance
2	High temp. Operating	70°C	120	
3	Low temp. Storage	-30°C	120	
4	Low temp. Operating	-20°C	120	
5	Humidity	40°C / 90%RH	120	
6	Thermal Shock(Non-operation)	-20°C ← 25°C → 70°C (0.5 hour ← 5 min → 0.5 hour)	10cycles	

Remark:

1.The test samples should be applied to only one test item.

2.Sample size for each test item is 1~10pcs.

3.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

8 Precautions For Use of LCD Modules

8.1 Handling Precautions

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents
- Do not attempt to disassemble the LCD Module.
- If the logic circuit power is off, do not apply the input signals.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- Be sure to ground the body when handling the LCD Modules.
- Tools required for assembly, such as soldering irons, must be properly ground.
- To reduce the amount of static electricity generated, do not conduct assembly and other work

under dry conditions.

- The LCD Module is coated with a film to protect the display surface. Be careful when peeling off the protective film since static electricity may be generated.

8.2 Storage precautions

- When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:
- The LCD modules should be stored in the room without acid, alkali and harmful gas.

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9 Revision History

Revision	Details
1.0	Initial Release - 01.01.2023

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