



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LM6059BCW-A

LCD Module User Manual

Prepared by: Wangxiao Date: 2024-12-23	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Edit	Release Date
0.1	Preliminary release	Gonghuimei	2021-12-20
0.2	Update 1.4 Terminal Functions, 3.3 AC Characteristics and Outline Dwg	Wangxiao	2024-12-23

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1. Basic Specifications

1.1 Display Specifications

- 1) LCD Display Mode : FSTN , Positive, Transflective
- 2) Display Color : Display Data = "1" : Dark Gray (*1)
: Display Data = "0" : Light Gray (*2)
- 3) Viewing Angle : 6H
- 4) Driving Method : 1/65 duty, 1/9 bias
- 5) Backlight : White LED backlight

Note:

*1. Color tone may slightly change by Temperature and Driving Condition.

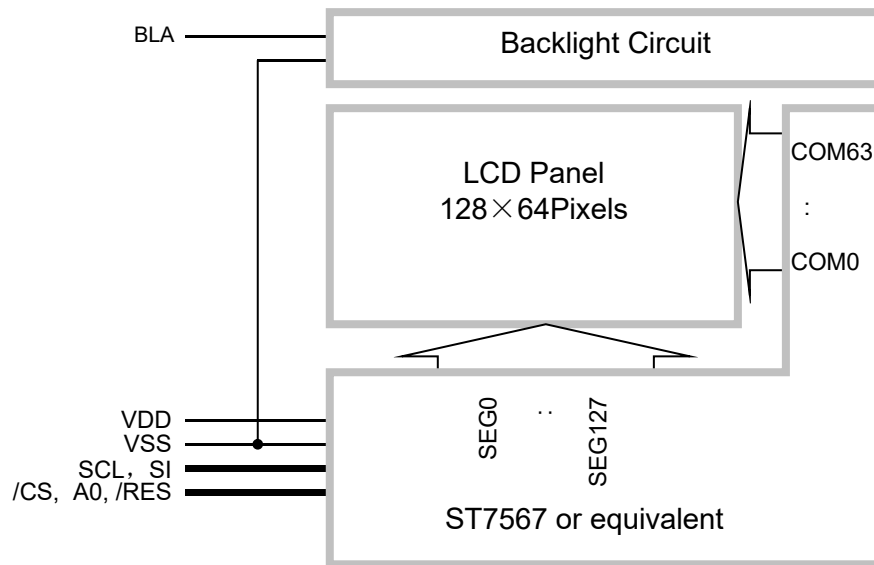
*2. The Color is defined as the inactive / background color

*3. Fine Contrast adjustment function is necessary in the application design for optimal display result

1.2 Mechanical Specifications

- 1) Outline Dimension : 50.9x 40.9 x 8.7 (mm) (exclude FPC)
(See attached Outline Drawing for details)

1.3 Block Diagram



1.4 Terminal Functions

Pin No.	PIN Name	I/O	Descriptions	
			Serial mode(default)	6800 mode
1	/CS	Input	Chip Select /CS=L, enable access to the LCD module /CS=H, disable access to the LCD module	
2	/RES	Input	Reset signal /RES = L, Initialization is executed /RES = H, Normal running.	
3	A0	Input	Register Select A0 = H, Transferring the Display Data A0 = L, Transferring the Control Data	
4	NC(R/W)	Input	Not used, Leave open	R/W=H,E=H; Data or Status read from the LCD module
5	NC(E)	Input		R/W=L,E=H→L; Data or Status latch into the LCD module
6	NC(D0)	I/O	Connect to VDD	8-bit Data bus; Three state I/O terminal for display data or instruction data when /CS=H, D0~D7=High Impedance
:	:			
11	NC(D5)			
12	SCL(D6)			
13	SI(D7)		Serial clock input	
14	VDD	Power	Poitive Power Supply	
15	VSS	Power	Negative power supply,0V	
16	BLA	Power	Positive power for LED backlight	
17	NC	--	No connection, leave open	
:	:	:		
32	NC	--		

1.5 Jumper Functions

Interface selection is available by the jumper on the back side of the LCD module

JP1	JP2	Interface Mode
OPEN	CLOSE	Serial Mode (default)
CLOSE	OPEN	6800 Mode

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+4.0	V	$V_{SS} = 0V$
Input Voltage	V_{IN}	-0.3	$V_{DD}+0.3$	V	$V_{SS} = 0V$
Operating Temperature	T_{OP}	-20	+70	°C	No Condensation
Storage Temperature	T_{ST}	-30	+80	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

3. Electrical Characteristics

3.1 DC Characteristics

$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	V_{DD}	3.0	3.3	3.6	V	VDD
Input High Voltage	V_{IH}	$0.7 \times V_{DD}$	-	V_{DD}	V	/RES, /CS, A0,
Input Low Voltage	V_{IL}	V_{SS}	-	$0.3 \times V_{DD}$	V	SCL, SI
Output High Voltage	V_{OH}	$0.8 \times V_{DD}$	-	V_{DD}	V	SCL, SI
Output Low Voltage	V_{OL}	V_{SS}	-	$0.2 \times V_{DD}$	V	SCL, SI
Operating Current	I_{DD}	-	0.2	1	mA	VDD

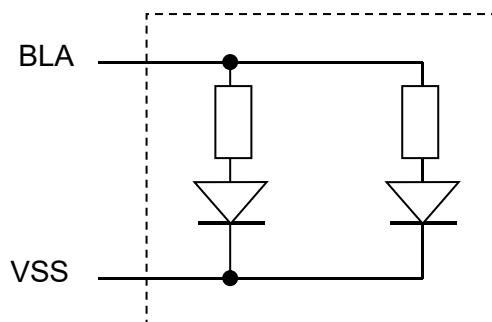
3.2 LED Backlight Circuit Characteristics

$BLA=3.3V, T_{OP} = 25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	V_{fBLA}	-	3.3	-	V	BLA
Forward Current	I_{fBLA}	-	34	40	mA	BLA

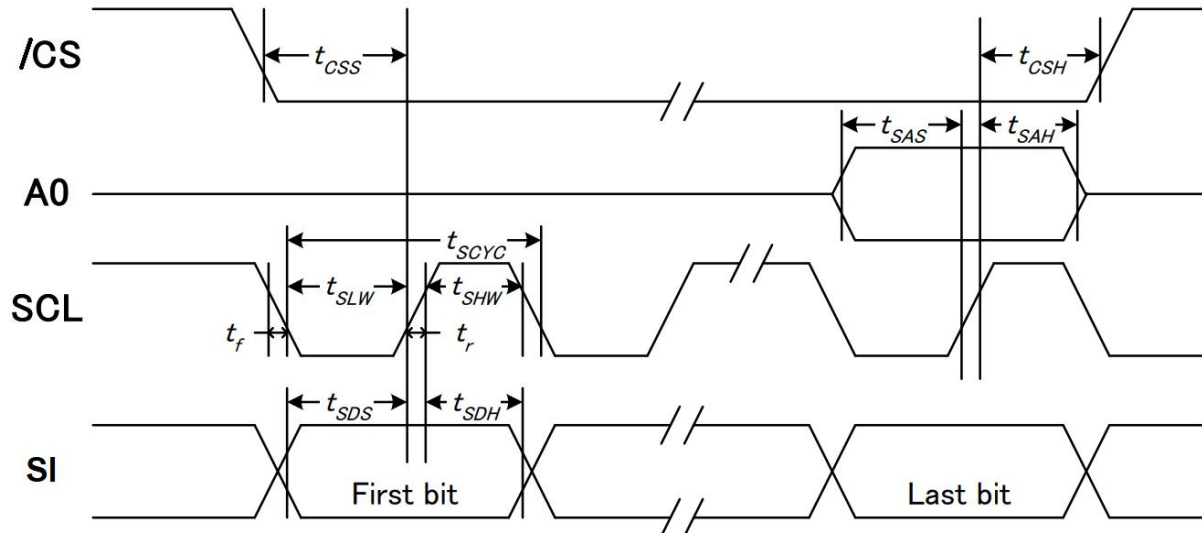
Cautions:

Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



3.3 AC Characteristics

3.3.1 Serial Mode System Bus Timing



$V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25^{\circ}C$

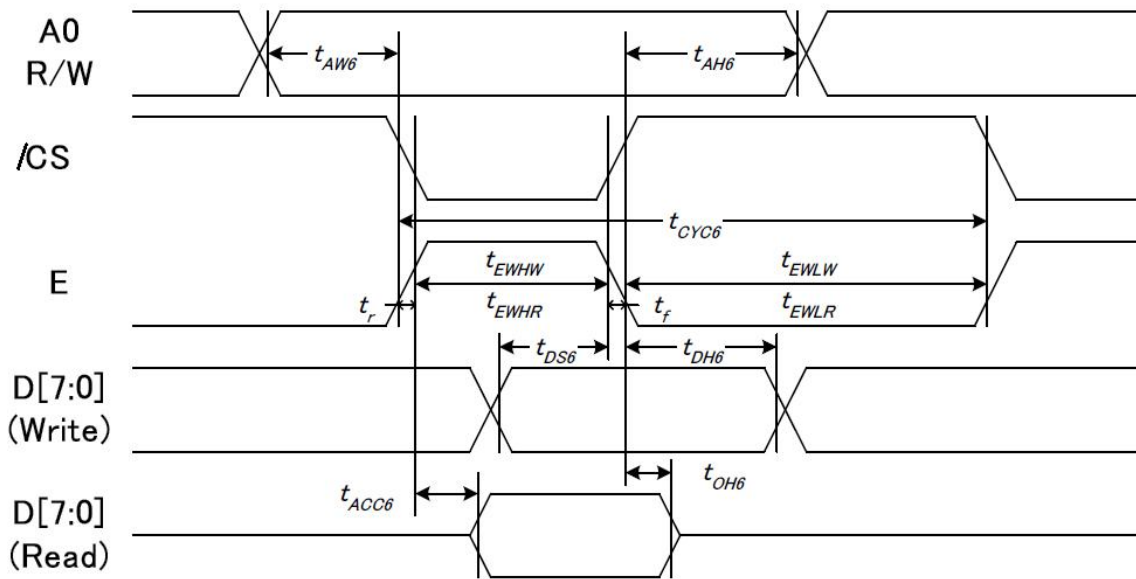
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period		t_{SCYC}	-	50	-	ns
SCL "H" pulse width	SCL	t_{SHW}	-	25	-	
SCL "L" pulse width		t_{SLW}	-	25	-	
Address setup time		A0	t_{SAS}	-	20	
Address hold time	t_{SAH}		-	10	-	
Data setup time	SI	t_{SDS}	-	20	-	
Data hold time		t_{SDH}	-	10	-	
/CS-SCL time	/CS	t_{CSS}	-	20	-	
/CS-SCL time		t_{CSH}	-	40	-	

Note:

*1 The input signal rise and fall time (t_r, t_f) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of VDD as the standard.

3.3.2 6800 Mode System Bus Timing



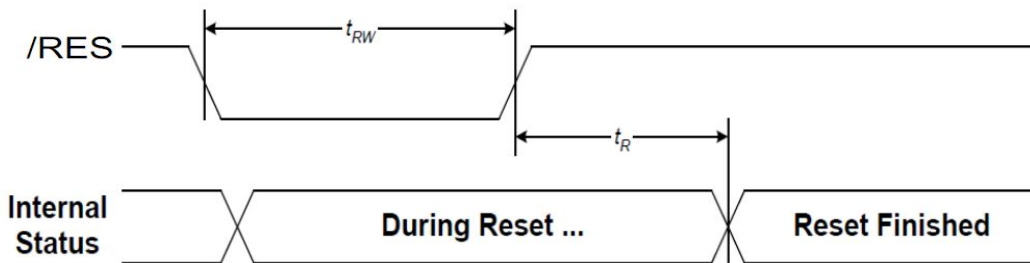
V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25°C

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	t _{AW6}	-	0	-	ns
Address hold time		t _{AH6}	-	13	-	
System cycle time	E	t _{CYC6}	-	312	-	
Enable L pulse width(WRITE)		t _{EHLW}	-	104	-	
Enable H pulse width(WRITE)		t _{EHWLW}	-	104	-	
Enable L pulse width(READ)		t _{EWHW}	-	182	-	
Enable H pulse width(READ)	D[7:0]	t _{EWHR}	-	182	-	
Write Data setup time		t _{DS6}	-	52	-	
Write Data hold time	D[7:0]	t _{DH6}	-	13	-	
Read access time		t _{ACC6}	CL = 16pF	-	91	
Read data output disable time		t _{OH6}	CL = 16pF	3	65	

Note:

- *1. Input signal rise/fall time should be less than 15ns .
- *2. All timing is using 20% and 80% of VDD as the reference.
- *3 t_{EHLW} and t_{EHLR} are specified as the overlap between /CS being “L” and E.

3.3.4 Reset Timing



V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	t _r	-	-	2.5	μs
Reset LOW pulse width	t _{rw}	2.5	-	-	μs

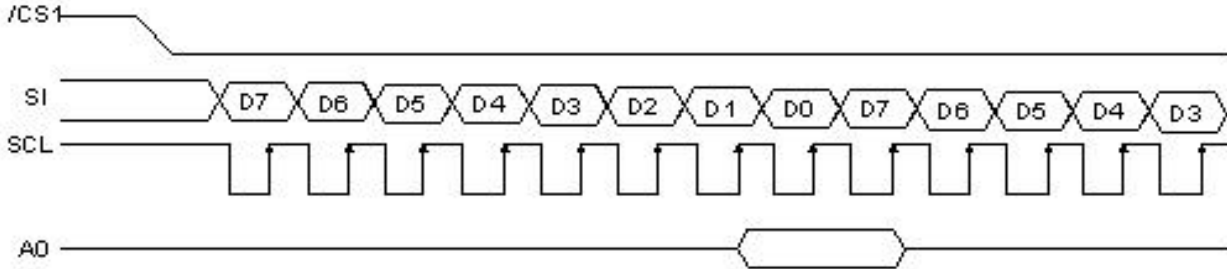
Note:

- *1.All timing is using 20% and 80% of VDD as the reference.

4. Function specifications

4.1 The Serial Interface

When the serial interface has been selected then when the chip is in active state the serial data input(SI) and the serial clock(SCL) can be received. The serial data is read from the serial data input pin in the rising edge of the serial clock . When "A0"="H", the data is display data, and when "A0"="L", the data is command.



4.2 Basic Setting

To drive the LCD module correctly and provide normally display, please use the following setting

- MX = 0 (normal)
- MY = 1 (reverse)
- LCD Bias Select = 1/9
- Initial Display Line = 0
- Entire Display ON/OFF = OFF (normal)
- Reverse Display ON/OFF = OFF (normal)
- Set Power Control Set:
 - voltage follower = ON, voltage converter = ON, voltage regulator = ON
- Display ON/OFF = ON

Note:

*1. These setting/commands should issue the LCD module while start up.

*2. See the Display Commands section for details.

4.3 Resetting the LCD module

The LCD module should be initialized by using /RES terminal.

While turning on the VDD and VSS power supply, maintain /RES terminal at LOW level. After the power supply stabilized, release the reset terminal (/RES=HIGH)

4.4 Display Memory Map

Page address	data	LCD Display (front view)	
0	D0 ⋮ D7		
1	D0 ⋮ D7		
2	D0 ⋮ D7		
3	D0 ⋮ D7		
4	D0 ⋮ D7		
5	D0 ⋮ D7		
6	D0 ⋮ D7		
7	D0 ⋮ D7		
Column Address		00h	7Fh

Note:

- *1. MY = 0 (normal)
- *2. MX = 1 (reverse)
- *3. Initial Display Line = 0

4.5 Display Commands

INSTRUCTION	A0	/RD	/WR	COMMAND BYTE								DESCRIPTION
				D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	1	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	1	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4) Set Column Address	0	1	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	1	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	0	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	1	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	1	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	1	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	1	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	1	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	1	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	1	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	1	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	1	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	1	0	0	0	1	0	0	RP1	RP1	RP0	Select regulation resistor ratio
(18) Set EV	0	1	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	1	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	1	0	1	1	1	1	1	0	0	0	Double command!! Set booster level: BL=0: 4X BL=1: 5X
	0	1	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	1	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	No operation
(22) Test	0	1	0	1	1	1	1	1	1	1	1	Test Command Mode TE=0: releasing test command mode TE=1: entering test command mode

Note: *1. Symbol “-” means this bit can be “H” or “L”.
*2. For the details of the Display Commands, please refer to ST7567 data sheet.

4.5.1 Power off the LCD Module

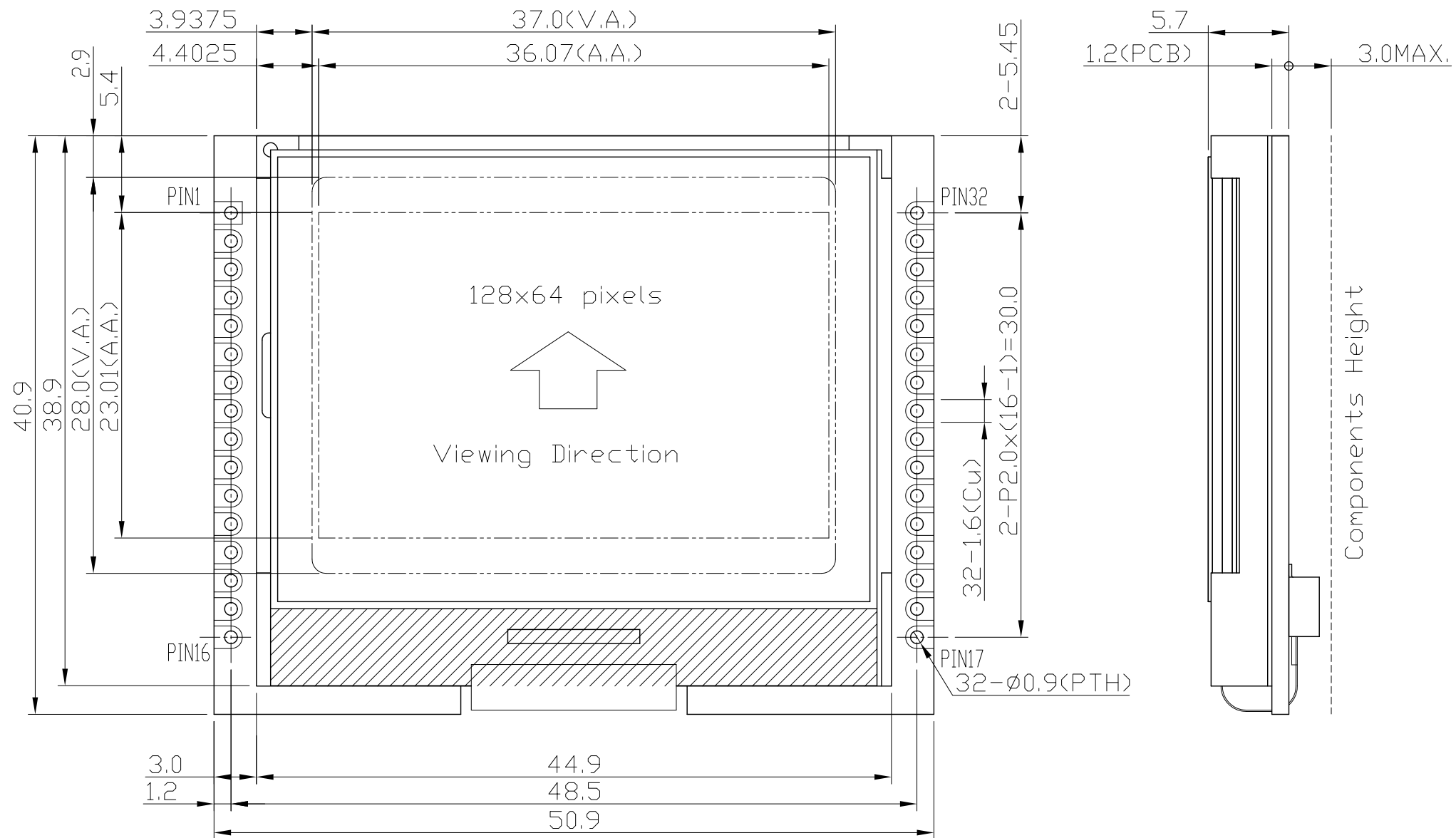
It recommends that enter Sleep Mode before power off the LCD module.

4.5.2 Refreshing The LCD Module

It recommends that the operating modes and display contents be refreshed periodically to prevent the effect of unexpected noise.

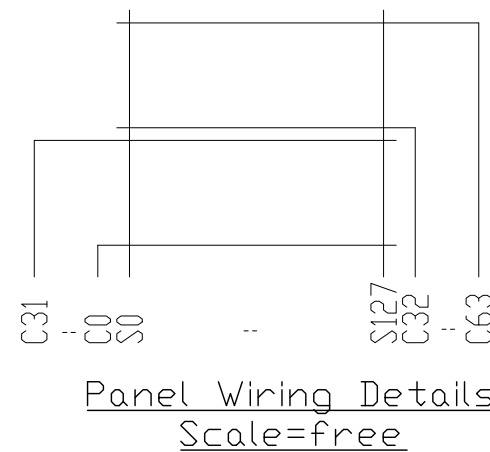
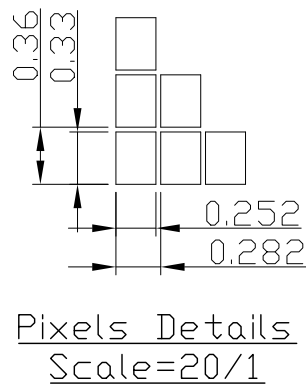
5. Design and Handling Precaution

1. The LCD panel is made by glass. Any mechanical shock (eg. dropping from high place) will damage the LCD module.
2. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
3. The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
4. Never attempt to disassemble or rework the LCD module.
5. Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
6. When mounting the LCD module, make sure that it is free from twisting, warping and distortion.
7. Ensure to provide enough space (with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result.
8. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
9. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
10. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
11. When peeling off the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
12. Take care and prevent get hurt by the LCD panel sharp edge.
13. Never operate the LCD module exceed the absolute maximum ratings.
14. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
15. Never apply signal to the LCD module without power supply.
16. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
17. LCD module reliability may be reduced by temperature shock.
18. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module.



Terminal No.	Pin Name
1	/CS
2	/RES
3	A0
4	NC(R/W)
5	NC(E)
6	NC(D0)
7	NC(D1)
8	NC(D2)
9	NC(D3)
10	NC(D4)
11	NC(D5)
12	SCL(D6)
13	SI(D7)
14	VDD
15	VSS
16	BLA
17	NC
:	:
32	NC

- Note:
- *1. Display Type : FSTN, Positive, Transflective
 - *2. Viewing Direction : 6H
 - *3. Duty : 1/65, Bias : 1/9
 - *4. Backlight Color : White
 - *5. Backlight Supply : 3.3V TYP.
 - *6. Operating Voltage : 3.3V
 - *7. Operating Temperature : -30°C~80°C
 - *8. Storage Temperature : -30°C~85°C



C		
B		
A	Revise Terminal	LuoLin 2024-12-21
Rev/Note		Date
Dwg Title		LM6059BCW-A Outline Dwg
Dwg No.	MK-007317a-1-1	Date 2021-09-10
Scale	Tol. ±0.3	Unit mm Paper Size A3
5/2		
Approved	Checked	Drawn Luo Lin

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