深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LM6082CCW

LCD Module User Manual

Prepared by:	Checked by:	Approved by:
Tony		
Date:2016-10-22	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Prelimiay release	2016-10-22

Table of Content

1. Basic Specifications

1.1 Display Specifications

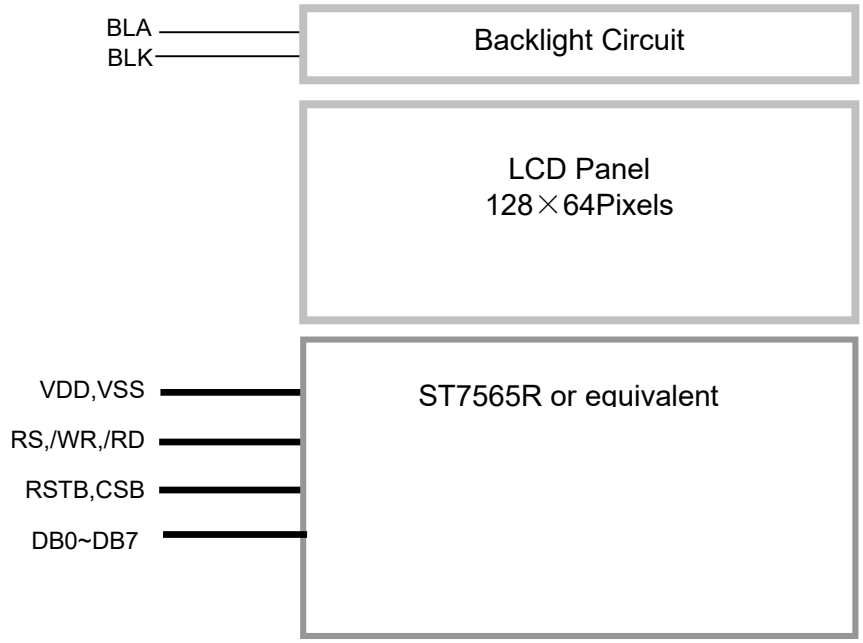
1) LCD Display Mode : FSTN, Postive, Transflective
2) Display Color : Display Data = “1” : Dark Gray(*1)
: Display Data = “0” : Light Gray (*2)
3) Viewing Angle : 6H
4) Driving Method : 1/65 duty, 1/9 bias
5) Backlight : White LED backlight

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 : 78.0 x 70.0 x11.6mm (Max)
(See attached Outline Drawing for details)

1.3 Block Diagram



1.4 Terminal Functions

PIN NO	PIN Name	I/O	Descriptions		
			8-bit parallel 8080 mode (Default)	8-bit parallel 6800 mode	4-wire Serial mode
1	NC		No connection(leave open)		
2	CSB	Input	Chip Select CSB=L, enable access to the LCD module CSB=H, disable access to the LCD module		
3	VSS	Supply	Negative power supply,0V		
4	VDD	Supply	Positive power supply		
5	NC		No connection(leave open)		
6	RS	Input	Register Select RS = H, Transferring the Display Data RS = L, Transferring the Control Data		
7	/WR (R/W)	Input	/WR=L→H, /RD=H; Data or Instruction latch into the LCD module	R/W=H,E=H; Data or Status read form the LCD module R/W=L,E=H→L; Data or Status latch into the LCD module	Not used, Leave open or pull Hi
8	/RD (E)	Input	/WR=H, /RD=L; Data or Status read form the LCD module		
9	DB0	I/O	8-bit Data bus; Three state I/O terminal for display data or instruction data when /CS=H, DB0~DB7=High Impedance		Not used, Leave open
:	:	I/O			
14	DB5	I/O			
15	DB6(SCLK)	I/O			Serial clock input
16	DB7(SDA)	I/O			Serial data input
17	BLA	Power	Positive power supply for LED backlight		
18	BLK	Power	Negative power supply for LED backlight, 0V		
19	RSTB	Input	Reset signal RSTB = L, Initialization is executed RSTB= H, Normal running.		
20	NC		No connection(leave open)		

Interface setting:

Setting	8-bit parallel 6800 mode	8-bit parallel 8080 mode (Default)	4-wire Serial mode
JP3	OPEN	OPEN	CLOSE
JP4	CLOSE	CLOSE	OPEN
JP5	OPEN	CLOSE	—
JP6	CLOSE	OPEN	—

Cautions:
"—" indicates fixed to either "OPEN" or to "CLOSE"

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	0	+3.6	V	V_{SS} = 0V
Input Voltage	V_{IN}	0	+3.3	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°C

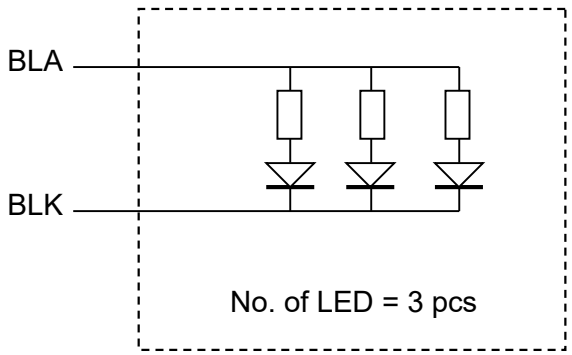
Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition / Application Pin
Operating Voltage	V_{DD}	2.7	-	3.3	V	VDD
Input High Voltage	V_{IH}	0.7xV_{DD}	-	V_{DD}	V	RSTB, CSB, RS SDA, SCLK
Input Low Voltage	V_{IL}	V_{SS}	-	0.3xV_{DD}	V	
Operating Current	I_{DD}	-	0.33	2.5	mA	VDD

3.2 LED Backlight Circuit Characteristics

BLK=0V,BLA=3.3V, T_{OP} =25°C

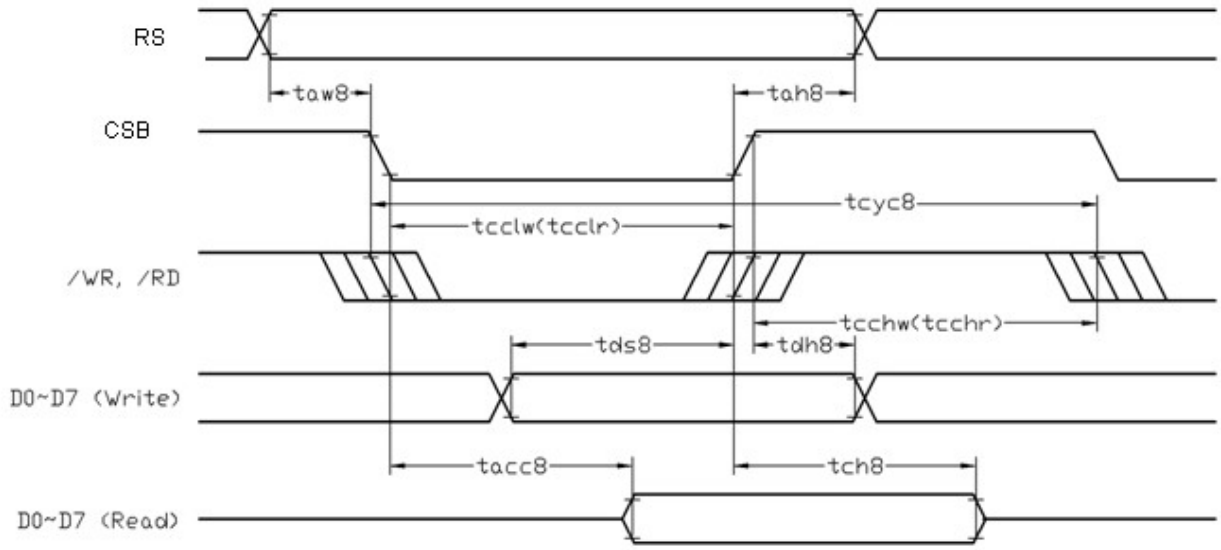
Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	BLA	-	3.3	-	V	BLA
Forward Current	I_{BLA}	-	32	60	mA	BLA

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



3.3 AC Characteristics

3.3.1 8080 Mode System Bus Timing

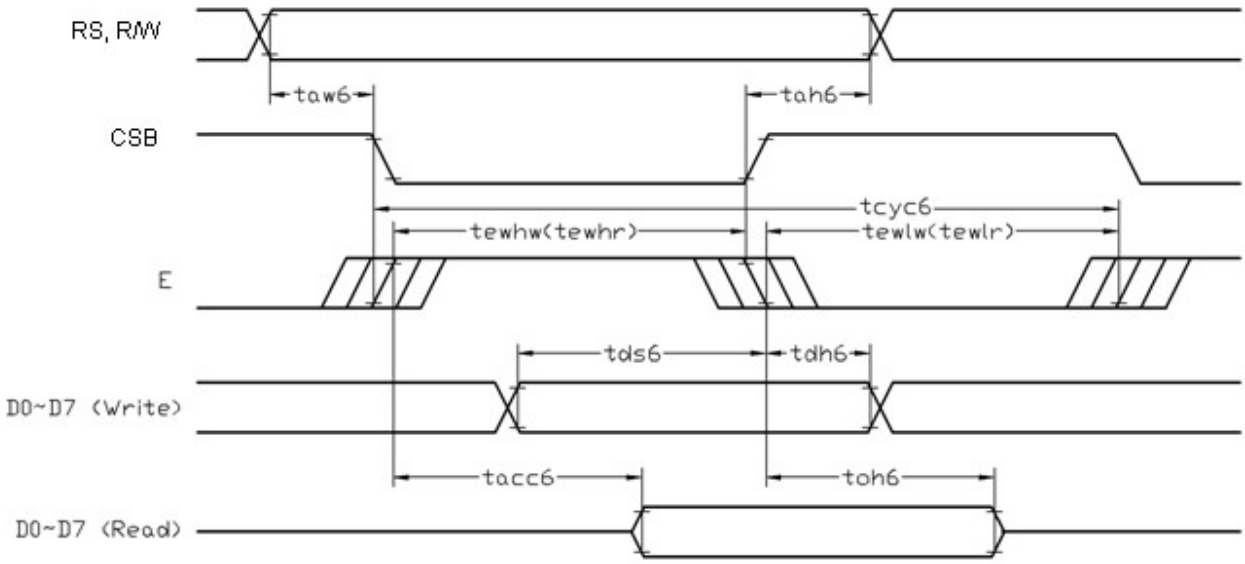


V_{SS}=0V,V_{DD}=3.3V,T_{OP}=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
System cycle time	tcyc8	312	-	-	ns
Address setup time (RS)	taw8	10	-	-	ns
Address hold time (RS)	tah8	13	-	-	ns
Control LOW pulse width (RD)	tcclr	182	-	-	ns
Control LOW pulse width (WR)	tcclw	104	-	-	ns
Control HIGH pulse width (RD)	tcchr	104	-	-	ns
Control HIGH pulse width (WR)	tcchw	104	-	-	ns
Data setup time	tds8	52	-	-	ns
Data hold time	tdh8	13	-	-	ns
/RD access time (*2)	tacc8	-	-	91	ns
Output disable time (*2)	tch8	7	-	65	ns

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.

3.3.2 6800 Mode System Bus Timing

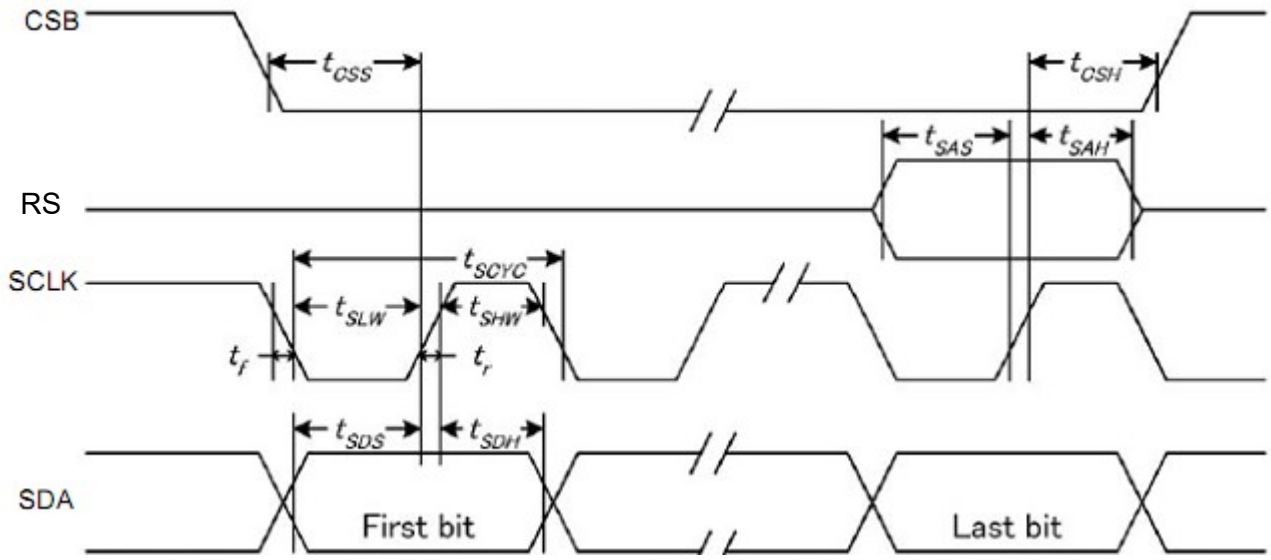


V_{SS}=0V,V_{DD}=3.3V,T_{OP}=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
System cycle time	tcyc6	312	-	-	ns
Address setup time (RS)	taw6	13	-	-	ns
Address hold time (RS)	tah6	13	-	-	ns
Control LOW pulse width (E)	tewlr	104	-	-	ns
Control LOW pulse width (E)	tewlw	104	-	-	ns
Control HIGH pulse width (E)	tewhr	182	-	-	ns
Control HIGH pulse width (E)	tewhw	104	-	-	ns
Write data setup time	tds6	52	-	-	ns
Write data hold time	tdh6	13	-	-	ns
/RD access time (*2)	tacc6	-	-	91	ns
Output disable time (*2)	tch6	7	-	65	ns

Note:
*1. Input signal rise/fall time should be less than 15ns .
*2. CL=100pF
*3.All timing is using 20% and 80% of VDD as the reference.

3.3.3 Serial Mode Interface

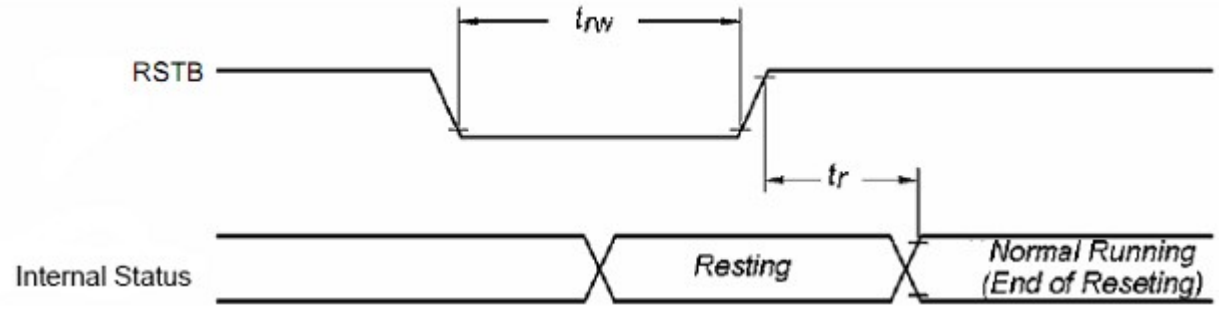


V_{SS}=0V,V_{DD}=3.3V,T_{OP}=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Serial Clock Period	tscyc	65	-	-	ns
SCLK “H” pulse width	tshw	33	-	-	ns
SCLK “L” pulse width	tslw	33	-	-	ns
Address setup time (RS)	tsas	26	-	-	ns
Address hold time (RS	tsah	13	-	-	ns
Data setup time	tsds	26	-	-	ns
Data hold time	tsdh	13	-	-	ns
CSB-SCL time	tcss	26	-	-	ns
CSB-SCL time	tcsh	52	-	-	ns

Note:
*1. Input signal rise/fall time should be less than 15ns .
*2. CL=100pF
*3.All timing is using 20% and 80% of VDD as the reference.

3.3.4 Reset Timing



V_{SS}=0V, V_{DD}=3.3V, T_{OP}=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	tr	-	-	2.5	μs
Reset LOW pulse width	trw	2.5	-	-	μs

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

4. Function specifications

4.1 Adjusting the Display Contrast

- This LCD module equipped with latest digital contrast adjustment function.
- Its display contrast could be adjusted by MCU command. (please see the command tables for details)
- It is recommended to provide a contrast adjustment interface for end-user, where the best display result could meet the individual preference in mass production.

4.2 Basic Setting

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

- ADC = 0 (normal)
- SHL select = 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
- Booster Set = 4x
- 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 RSTB terminal.
While turning on the VDD and VSS power supply, maintain RSTB terminal at LOW level. After the power supply stabilized, release the reset terminal (RSTB=HIGH)

4.4 Display Memory Map

Page address	data	LCD Display (front view)
0	DB0 : DB7	
1	DB0 : DB7	
: : :	: : :	128x64 pixels
6	DB0 : DB7	
7	DB0 : DB7	
Column Address		00h → 7Fh

Note:
*1. ADC = 0 (normal)
*2. SHL Selection = 1 (reverse)
*3. Initial Display Line = 0

4.5 Display Commands

No.	Instructions	Code											Function
		A0	/RD	/WR	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
1	Display ON/OFF	0	1	0	1	0	1	0	1	1	1	DON	DON=0, display off DON=1, display on
2	Set Start Line	0	1	0	0	1	S5	S4	S3	S2	S1	S0	Sets the display RAM display start line address
3	Set Page Address	0	1	0	1	0	1	1	Y3	Y2	Y1	Y0	Set the display RAM page address
4	Set Column Address (Upper-4-bits)	0	1	0	0	0	0	1	X7	X6	X5	X4	Set the upper-4-bit of column address counter
	Set Column Address (Lower-4-bits)	0	1	0	0	0	0	0	X3	X2	X1	X0	Set the lower-4-bit of column address counter
5	Read Status	0	0	1	Status				0	0	0	0	Read the status data
6	Write Data	1	1	0	Write data								Write data into the display RAM
7	Read Data	1	0	1	Read Data								Read data form the display RAM
8	ADC Select	0	1	0	1	0	1	0	0	0	0	ADC	Sets the display RAM address SEG output correspondence ADC= 0, normal. ADC=1, reverse
9	Normal/Reverse Display	0	1	0	1	0	1	0	0	1	1	REV	REV=0, Normal display REV=1, Reverse display
10	Entire Display ON/OFF	0	1	0	1	0	1	0	0	1	0	EON	EON=0, Normal display EON=1, Entire display ON
11	Set LCD Bias	0	1	0	1	0	1	0	0	0	1	BIAS	Set the LCD driving voltage bias BIAS=0, 1/9 BIAS BIAS=1, 1/7 BIAS
12	Set Read-Modify-Write	0	1	0	1	1	1	0	0	0	0	0	Enter the “Read-Modify-Write” mode column address counter will increase in each “Write Display Data”, and will not increase in each “Read Display Data command”
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	SHL Select	0	1	0	1	1	0	0	SHL	*	*	*	Set the COM scanning direction SHL=0, Normal display SHL=1, Flipped in y direction * = don’t care terms
16	Power Control Set	0	1	0	0	0	1	0	1	VC	VR	VF	Set the power circuit operation mode VF: LCD Supply Voltage Follower VR: LCD Supply Voltage Regulator VC: LCD Supply Voltage Converter (1=ON, 0=OFF)
17	Regulator Resistor Select	0	1	0	0	0	1	0	0	Radio setting			Set the built-in resistor ratio (R1/R2)

4.5Display Commands (continue)

No.	Instructions	Code											Function
		A0	/RD	/WR	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
18	Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set reference voltage mode
	Electronic volume register set	0	1	0	*	*	EV5	EV4	EV3	EV2	EV1	EV0	Set reference voltage register (Display contrast value)
19	Booster Ratio Set	0	1	0	1	1	1	1	1	0	0	0	Select booster ratio
		0	1	0	0	0	0	0	0	0	step		00=2x, 3x, 4x; 01=5x. 11=6x
20	Power Save	-	-	-	-	-	-	-	-	-	-	-	Compound Instruction: Display OFF + Entire Display ON
21	NOP	0	1	0	1	1	1	0	0	0	1	1	No operation

Note: *1. Do not use any other command not listed, or the system malfunction may result.
*2. For the details of the Display Commands, please refer to ST7565R data sheet.

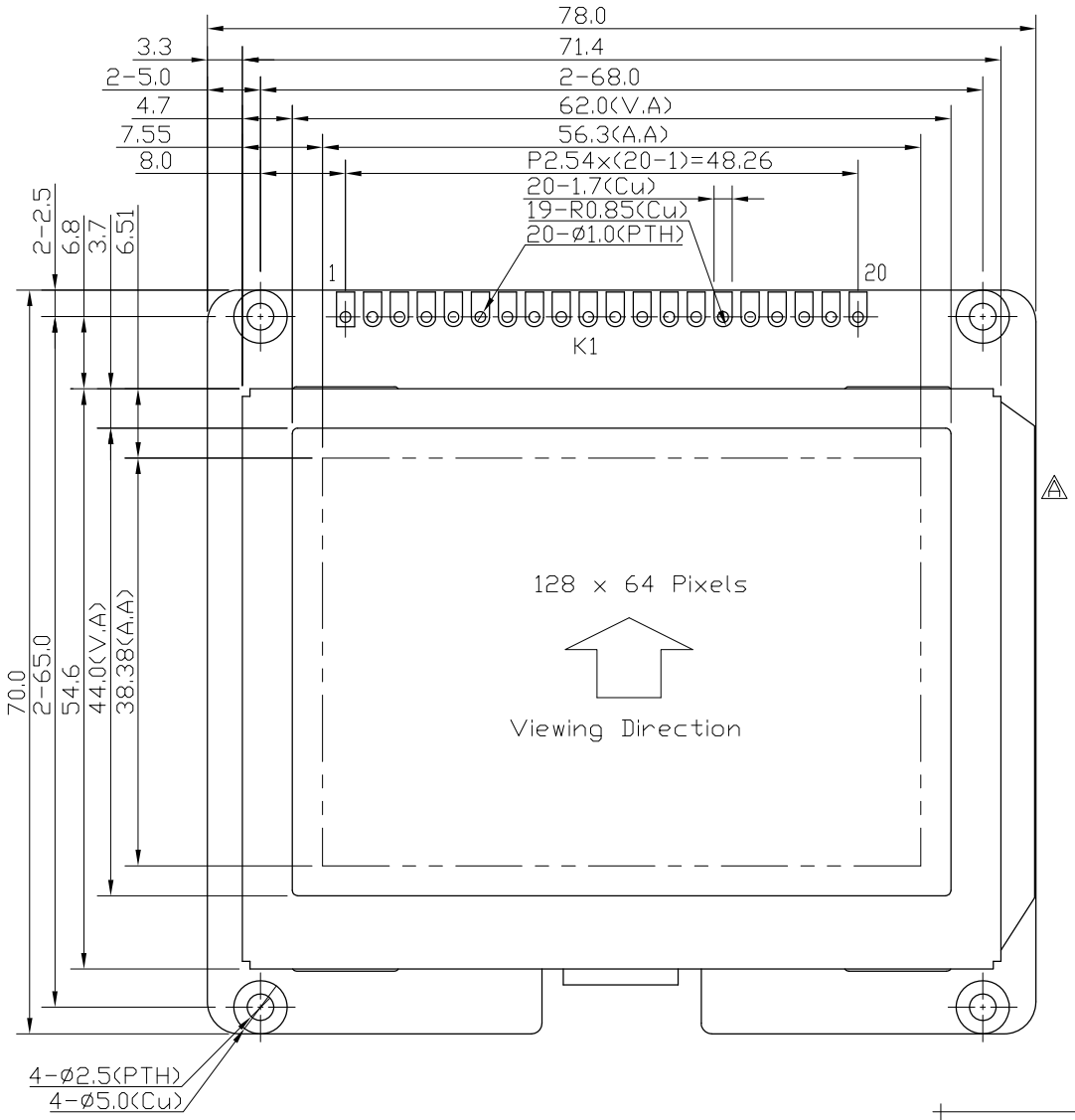
4.5.1 Power off the LCD Module

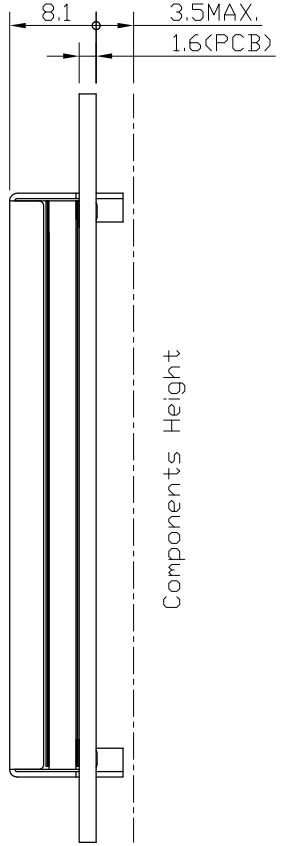
It recommends that enter Sleep Mode before power off the LCD module.

4.5.2 Refreshing The LCD Module

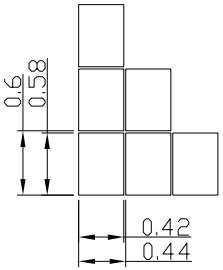
It recommends that the operating modes and display contents be refreshed periodically to prevent the effect of unexpected noise.

5. Design and Handling Precaution

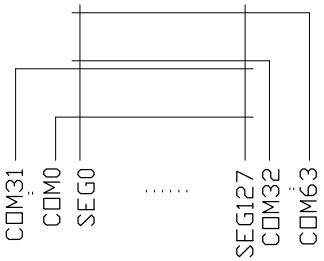




K1 Terminal	
No.	Pin Name
1	NC
2	CSB
3	VSS
4	VDD
5	NC
6	RS
7	/WR(R/W)
8	/RD(E)
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6(SCLK)
16	DB7(SDA)
17	BLA
18	BLK
19	RSTB
20	NC



Pixels Details
Scale=20/1



Panel Wiring Details
Scale=free

Note:
*1. LCD Display Type : FSTN, Positive, Transflective
*2. Viewing Direction : 6H
*3. Duty : 1/65, Bias : 1/9
*4. Operating Voltagte : 3.3V
*5. Backlight Color : White
*6. Backlight Supply : 3.3V TYP.
*7. Operating Temperature : -20°C ~ 70°C
*8. Storage Temperature : -30°C ~ 80°C

Rev	Note	Date
C		
B		
A	Revise BLU	Qiu Shaoping 2017-04-06

Dwg Title	LM6082CCW Outline Dwg			
Dwg No.	MK-005753a-1-1			Date 2016-10-22
Scale 2/1	Tol. ±0.5	Unit mm	Paper Size A3	
Approved		Checked	Drawn	Qiu Shaoping

TOPWAY