



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

# LM3092ACW

## LCD Module User Manual

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Rev.	Descriptions	Release Date
0.1	Preliminary New release	2017-07-24
0.2	Update Terminal Functions	2017-08-15

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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 : 1/32 duty, 1/6bias
- 5) Back Light : White LED backlight

Note:

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

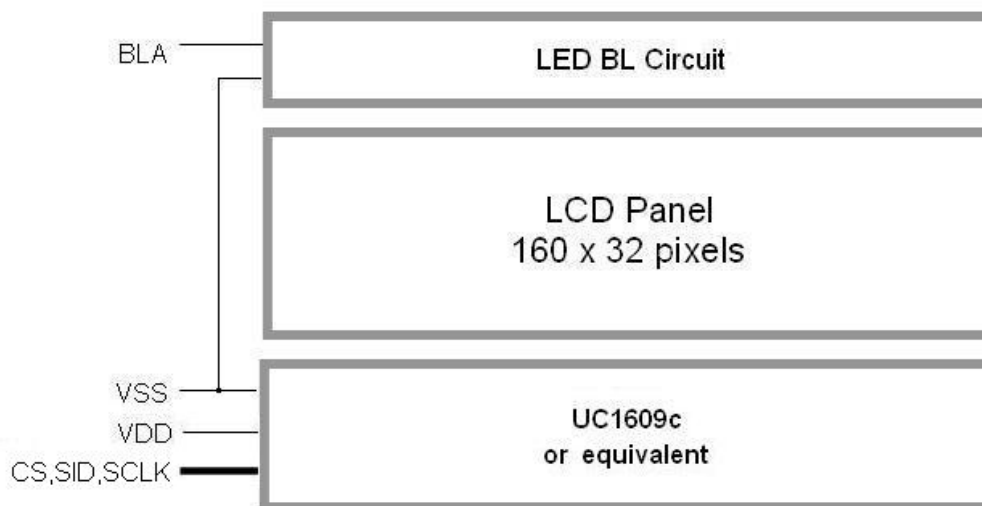
\*2. The Color is defined as the inactive / background color

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

## 1.2 Mechanical Specifications

- 1) Outline Dimension : 116.0 x 35.0 x 12.4MAX  
(see attached Outline Drawing for details)

## 1.3 Block Diagram



**1.4 Terminal Functions**

Pin No. K1&K2	Pin Name	I/O	Descriptions	
			Serial mode <default>	Parallel mode
1	VSS	Power	Negative Power Supply, Ground (0V)	
2	VDD	Power	Positive Power Supply	
3	BLA (NC)	Power	Positive Power Supply for LED backlight	No Connection should leave open
4	CS (RS)	Input	Chip Select CS=H,enable access to the LCD module CS=L, disable access to the LCD module	Register Select RS=H; Display data RS=L; Control data
5	SID (R/W)	Input	Serial Data Input	Read write control R/W =H; data or status read R/W =L; data or commmand read
6	SCLK (E)	Input	Serial Clock Input	Enable trigger
7	NC (DB0)	I/O	Connection to VSS, leave open	data bus: Three state I/O terminal for display data or instruction data
:	:	:		
14	NC (DB7)	I/O		
15	BLA	Power	Positive Power Supply for LED backlight	
16	NC (BLK)	-	No Connection should leave open	Negative Power Supply for LED backlight

**Interface setting:**

Interface	Setting			
	close	open	install	delete
<b>3Line SPI mode(Default)</b>	JP2,JP4~JP8	JP1,JP3	R7~R11=100R C1=C7=C8=0R	RP1,RP2,R1~R6
<b>6800 mode</b>	JP3,JP4	JP1,JP2,JP5~JP8	RP1,RP2,R1~R4	R5~R11

## 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	$V_{SS} = 0V$
LCD Driving Voltage	$V_0$	-0.3	13.2	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

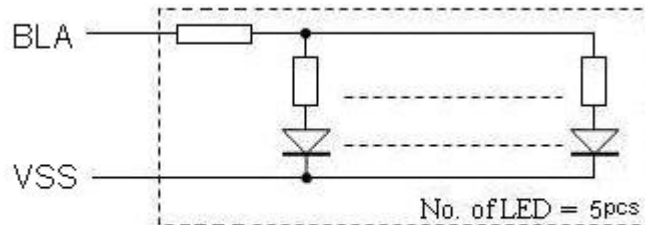
$V_{SS}=0V, V_{DD} =3.3V, T_{OP} =25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	$V_{DD}$	2.6	3.3	3.6	V	VDD
Input High Voltage	$V_{IH1}$	$0.9V_{DD}$	-	$V_{DD}$	V	RS,R/W,E,DB0~DB7
Input Low Voltage	$V_{IL1}$	$V_{SS}$	-	$0.1V_{DD}$	V	
Operating Current	$I_{DD}$	-	0.31	1.0	mA	VDD, VSS

### 3.2 LED Backlight Circuit Characteristics

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

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	BLA	-	3.3	-	V	BLA
Forward Current	$I_{BLA}$	-	37.5	100	mA	BLA

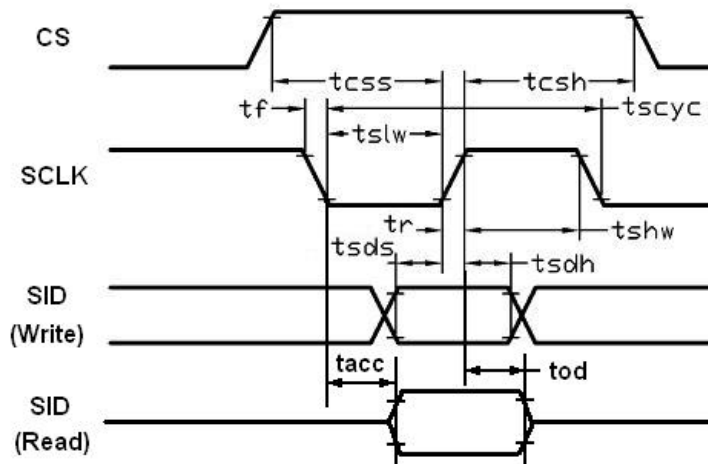


**3.3 AC Characteristics**

**3.3.1 Serial Mode Interface(3Line SPI mode)**

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

Item	Symbol	MIN. (Read/Write)	TYP.	MAX.	Unit
Clock cycle	tscyc	247/104	-	-	ns
CS setup time	tcss	13			ns
CS hold time	tcsch	13			ns
SCLK high pulse width	tshw	104/33	-	-	ns
SCLK low pulse width	tslw	104/33	-	-	ns
SCLK rise time	tr	-	-	15	ns
SCLK fall time	tf	-	-	15	ns
SID data setup time	tads	33	-	-	ns
SID data hold time	tadh	13	-	-	ns
Read access time	tacc	-	-	104	ns
Output disable time	tod	-	-	21	ns

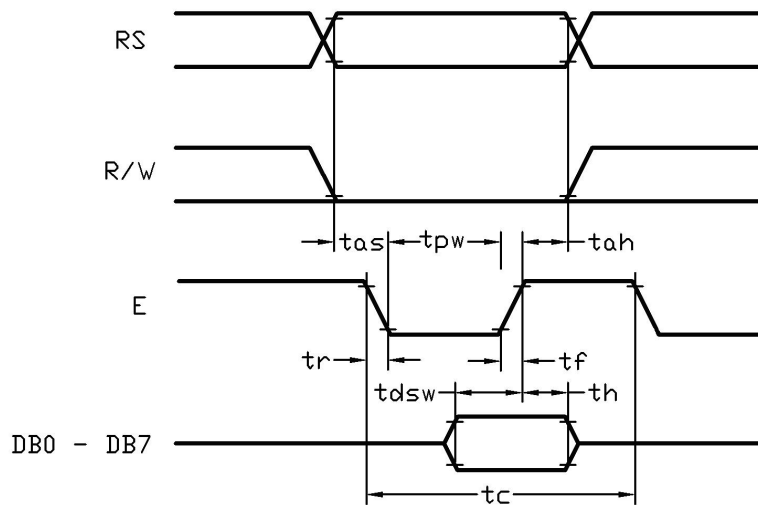


**Host Write Timing Diagram (Serial Mode)**

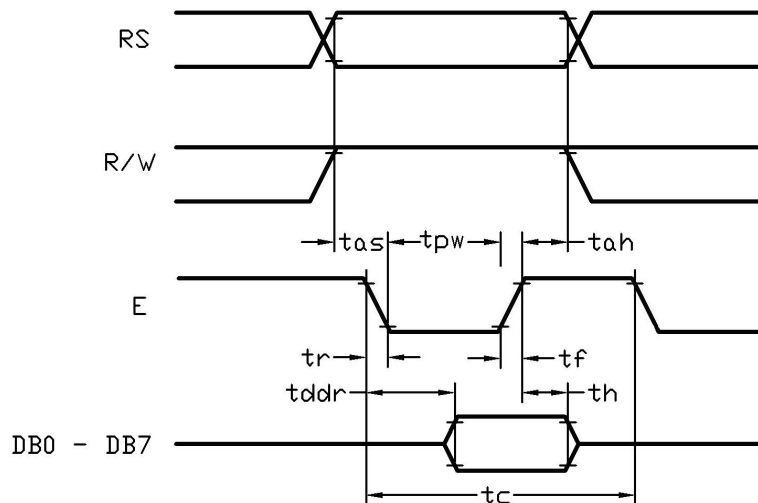
**3.3.2 Parallel Mode Interface(6800 mode)**

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

Item	Symbol	MIN. (Read/Write)	TYP.	MAX.	Unit
E cycle time	tc	221/143	-	-	ns
E high level width	tpw	91/52	-	-	ns
E rise time	tr	-	-	15	ns
E fall time	tf	-	-	15	ns
Address set-up time	tas	7	-	-	ns
Address hold time	tah	13	-	-	ns
Data set-up time	tdsw	46	-	-	ns
Data delay time	tddr	-	-	91	ns
Data hold time	th	-	-	28	ns



**Host Write Timing Diagram (Parallel Mode)**



**Host Read Timing Diagram (Parallel Mode)**

## 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 Display Data RAM (DDRAM)

Page address	data	LCD Display (front view)	
0	D0 : D7		
1	D0 : D7		
2	D0 : D7		
3	D0 : D7		
Column Address		10h	→ AFh

Note:

- \*1. DC(0) = 0 (normal)
- \*2. MX = 0 (normal)
- \*3. MY = 1 (mirror)
- \*4. Start Column Address = 0x10



4.3 Display Commands

[C/D]: 0/1 – Control / Data      [W/R]: 0/1 – Write / Read Cycle      [D7~D0]: # Useful Data bits, – Don't Care

No	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default
1.	Write Data Byte	1	0	#	#	#	#	#	#	#	#	Write 1 byte	N/A
2.	Read Data Byte	1	1	#	#	#	#	#	#	#	#	Read 1 byte	N/A
3.	Get Status	0	1	ID	MX	MY	WA	DE	WS	MD	MS	Get Status PMO[5:0]	N/A
				VER	POR	#	#	#	#	#	#		
4.	Set Column Address LSB	0	0	0	0	0	0	#	#	#	#	Set CA [3:0]	0
	Set Column Address MSB	0	0	0	0	0	1	#	#	#	#	Set CA [7:4]	0
5.	Set Temp. Compensation	0	0	0	0	1	0	0	1	#	#	Set TC[1:0]	00b
6.	Set Power Control	0	0	0	0	1	0	1	#	#	#	Set PC[2:0]	110b
7.	Set Adv. Program Control (double-byte command)	0	0	0	0	1	1	0	0	R	R	Set APC[R][7:0], R = 0~3	N/A
				#	#	#	#	#	#	#	#		
8.	Set Scroll Line	0	0	0	1	#	#	#	#	#	#	Set SL[5:0]	0
9.	Set Page Address	0	0	1	0	1	1	#	#	#	#	Set PA[3:0]	0
10.	Set V <sub>BIAS</sub> Potentiometer (double-byte command)	0	0	1	0	0	0	0	0	0	1	Set PM[7:0]	49H
				#	#	#	#	#	#	#	#		
11.	Set Partial Display Control	0	0	1	0	0	0	0	1	0	#	Set LC[5]	0b
12.	Set RAM Address Control	0	0	1	0	0	0	1	#	#	#	Set AC[2:0]	001b
13.	Set Frame Rate	0	0	1	0	1	0	0	0	#	#	Set LC[4:3]	01b
14.	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0b
15.	Set Inverse Display	0	0	1	0	1	0	0	1	1	DC(0)	Set DC[0]	0b
16.	Set Display Enable	0	0	1	0	1	0	1	1	1	#	Set DC[2]	0b
17.	Set LCD Mapping Control	0	0	1	1	0	0	0	MY	MX	0	Set LC[2:1]	00b
18.	System Reset	0	0	1	1	1	0	0	0	1	0	System Reset	N/A
19.	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
20.	Set Test Control (double-byte command)	0	0	1	1	1	0	0	1	TT		For testing only. Do not use.	N/A
				#	#	#	#	#	#	#	#		
21.	Set LCD Bias Ratio	0	0	1	1	1	0	1	0	#	#	Set BR[1:0]	11b: 9
22.	Set COM End	0	0	1	1	1	1	0	0	0	1	Set CEN[5:0]	63D
				--	--	#	#	#	#	#	#		
23.	Set Partial Display Start	0	0	1	1	1	1	0	0	1	0	Set DST[5:0]	0
				--	--	#	#	#	#	#	#		
24.	Set Partial Display End	0	0	1	1	1	1	0	0	1	1	Set DEN[5:0]	63D
				--	--	#	#	#	#	#	#		
25.	Set MTP Operation Control	0	0	1	1	1	1	1	0	0	0	Set MTPC[4:0]	00H
				--	--	--	#	#	#	#	#		
26.	Set MTP Write Mask	0	0	1	1	1	1	1	0	0	1	Set MTPM[5:0]	0
				--	--	#	#	#	#	#	#		
27.	Set V <sub>MTP1</sub> Potentiometer	0	0	1	1	1	1	0	1	0	0	Set VMTP1[7:0]	N/A
				#	#	#	#	#	#	#	#		
28.	Set V <sub>MTP2</sub> Potentiometer	0	0	1	1	1	1	0	1	0	1	Set VMTP2[7:0]	N/A
				#	#	#	#	#	#	#	#		
29.	Set MTP Write Timer	0	0	1	1	1	1	0	1	1	0	Set MTPWT[7:0]	N/A
30.	Set MTP Read Timer	0	0	1	1	1	1	0	1	1	1	Set MTPRT[7:0]	N/A
				#	#	#	#	#	#	#	#		
<b>Serial Read Command (Enabled only in S8/S9 mode )</b>													
31.	Get Status	0	0	1	1	1	1	1	1	1	0	Get Status PMO[5:0]	N/A
		0	1	ID	MX	MY	WA	DE	WS	MD	MS		
32.	Read Data	0	0	1	1	1	1	1	1	1	1		FFH
		1	1	#	#	#	#	#	#	#	#		

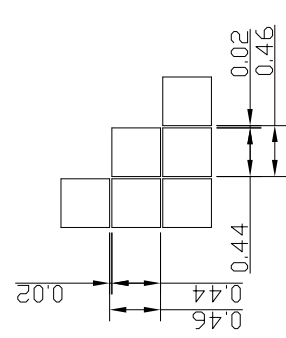
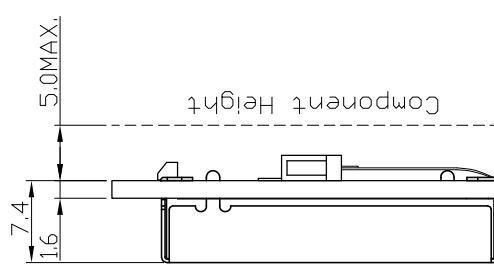
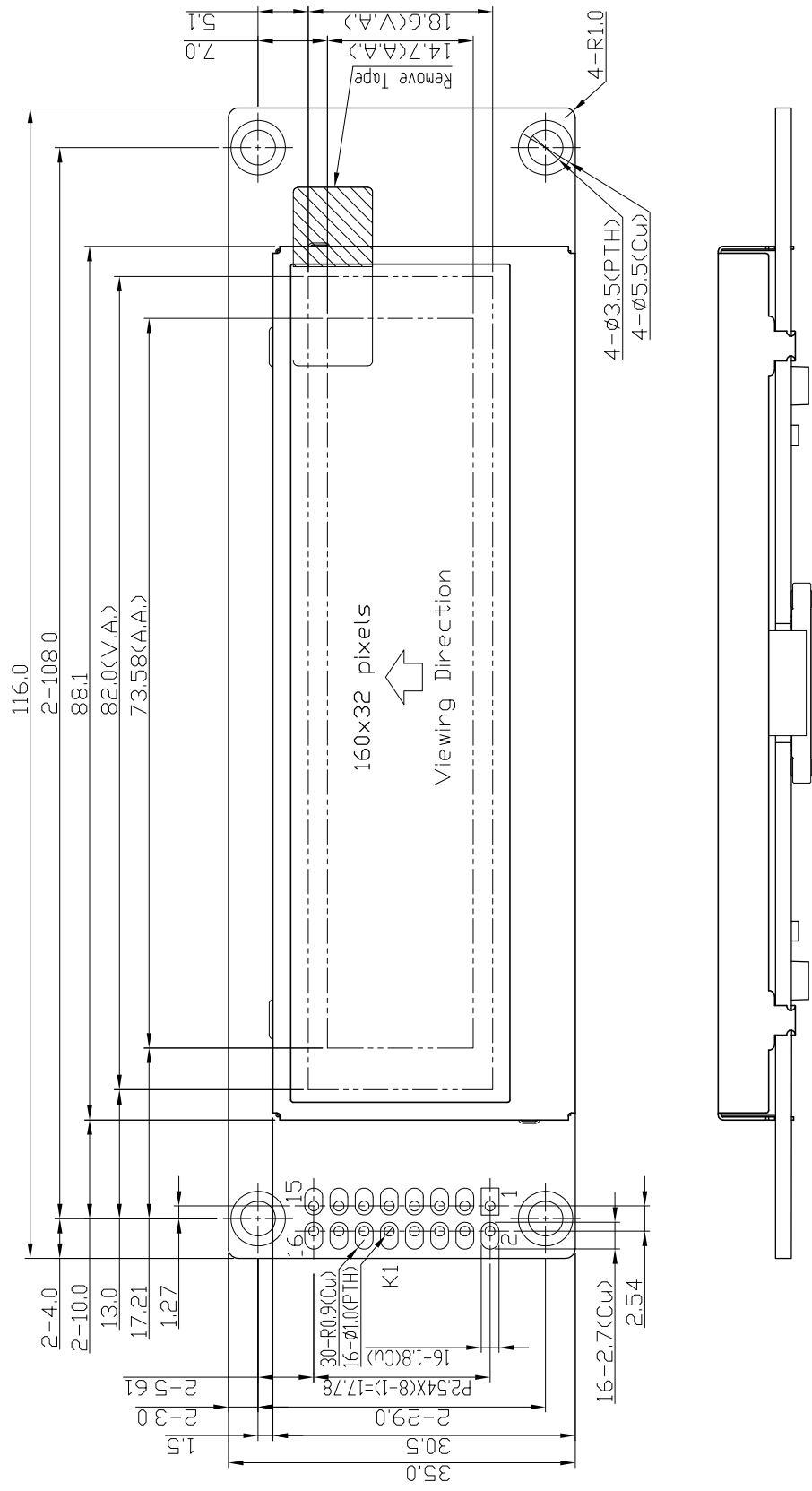
Note:

\*1. For the details of the Display Control Instructions, please refer to UC1609c series datasheet.

## **5. Design and Handling Precaution**

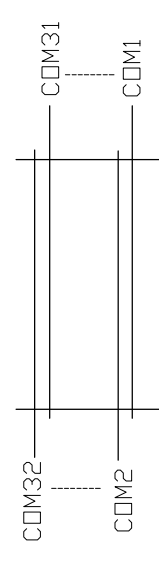
Please refer to "LCD-Module-Design-Handling-Precaution.pdf".

K1 Terminal No.	Pin Name
1	VSS
2	VDD
3	BLA(NC)
4	CS(RS)
5	SID(R/W)
6	SCLK(E)
7	NC(DB0)
8	NC(DB1)
9	NC(DB2)
10	NC(DB3)
11	NC(DB4)
12	NC(DB5)
13	NC(DB6)
14	NC(DB7)
15	BLA
16	NC(BLK)



Pixels\_Details  
Scale=20/1

C					
B					
A	Refine K1 Terminal	Luo Lin	2017-08-15		
Rev/Note					
Dwg Title	LM3092ACW Outline Dwg				
Dwg No.	MK-005975a-1-1	Date	2017-03-10		
Scale	2/1	Unit	mm	Paper Size	A3
Approved	±0.5	Checked		Drawn	Luo Lin



SEG17 ----- SEG176

Wiring\_Details  
Scale=free

- Note:
- \*1. LCD Display Type : FSTN, Positive, Transflective
  - \*2. Viewing Direction : 6H
  - \*3. Duty : 1/32, Bias : 1/6
  - \*4. Operating Voltage : 3.3V
  - \*5. Backlight Supply : 3.3V TYP.
  - \*6. Backlight Color : White
  - \*7. Operating Temperature : -20°~70°
  - \*8. Storage Temperature : -30°~80°