



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

LM6800AFW-5

LCD Module User Manual

Prepared by: Cai Date: 2008-07-17	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Release Date
0.1	Preliminary New release	2008-07-17

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1. Basic Specifications

1.1 Display Specifications

- 1) LCD Display Mode : STN, Negative, Transmissive
- 2) Display Color : Display Data = "1" : Light Gray (*1)
: Display Data = "0" : Deep Blue (*2)
- 3) Viewing Angle : 6 H
- 4) Driving Method : 1/64 duty, 1/9bias
- 5) Back Light : White LED backlight

Note:

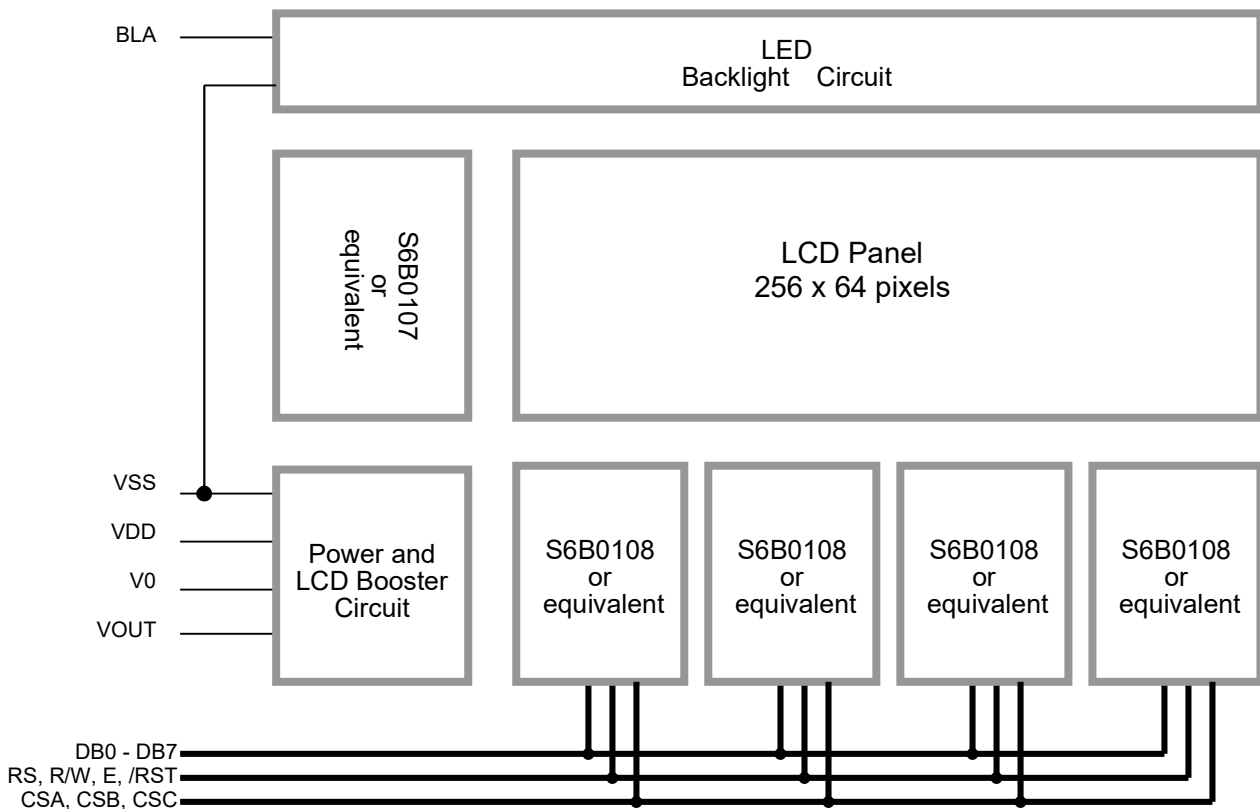
*1. Color tone may slightly change by Temperature and Driving Condition.

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

1.2 Mechanical Specifications

- 1) Outline Dimension : 137.0 x 39.6.0 x 11.3MAX
(see attached Outline Drawing for details)

1.3 Block Diagram



1.4 Terminal Functions

Pin No.	Pin Name	I/O	Descriptions																												
1	VSS	Power	Negative Power Supply, Ground (0V)																												
2	VDD	Power	Positive Power Supply																												
3	V0	Input	LCD Contrast reference																												
4	VOOUT	Output	Power Booster output for V0																												
5	RS	Input	RS = H; DB0 – DB7 = Display RAM data RS = L; DB0 – DB7 = Instruction data																												
6	R/W	Input	In read mode R/W = H; Data read from the LCD module, data appears at DB0 – DB7 and can be read by the host while, E = H and the device is being selected In write mode R/W = L; Data write to the LCD module, data appears at DB0 – DB7 will be written into the LCD module at E = H→L and device is being selected																												
7	E	Input																													
8	DB0	I/O	Data bus: Three state I/O terminal for display data or instruction data																												
:	:	:																													
15	DB7	I/O																													
16	CSA	Input	<table border="1"> <thead> <tr> <th colspan="4">Chip selection, enable access to each section of the LCD module</th> </tr> <tr> <th>CSC</th> <th>CSB</th> <th>CSA</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>Enable access of the Left-Most Section (64 column) of the LCD module</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>Enable access of the Middle-Left Section (64 column) of the LCD module</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Enable access to the Middle-Right Section (64 column) of the LCD module</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>Enable access to the Right-Most Section (64 column) of the LCD module</td> </tr> <tr> <td>1</td> <td>x</td> <td>x</td> <td>Disable all the access to the LCD module</td> </tr> </tbody> </table>	Chip selection, enable access to each section of the LCD module				CSC	CSB	CSA	Function	0	0	0	Enable access of the Left-Most Section (64 column) of the LCD module	0	0	1	Enable access of the Middle-Left Section (64 column) of the LCD module	0	1	0	Enable access to the Middle-Right Section (64 column) of the LCD module	0	1	1	Enable access to the Right-Most Section (64 column) of the LCD module	1	x	x	Disable all the access to the LCD module
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1	x	x	Disable all the access to the LCD module																												
17	CSB	Input																													
18	CSC	Input																													
19	/RST	Input	Reset signal /RST = L, Display off display start line register becomes 0 no command or instruction data could be accepted /RST = H, Normal running																												
20	BLA	Power	Positive Power Supply for LED backlight																												

2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	0	7.0	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

$V_{SS}=0V, V_{DD} =5V, T_{OP} =25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	V_{DD}	4.8	5.0	5.2	V	VDD
Input High Voltage	V_{IH}	3.5	-	V_{DD}	V	RS, R/W, E, DB0-DB7
Input Low Voltage	V_{IL}	0	-	0.4	V	CSA, CSB, CSC
Operating Current	I_{DD}	-	5	16	mA	VDD, VSS

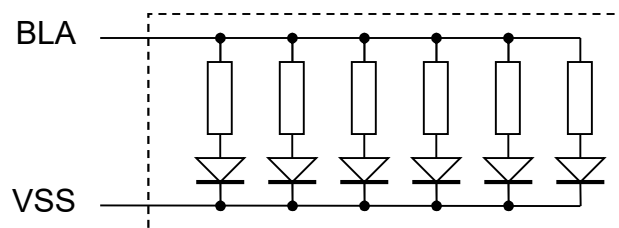
3.2 LED Backlight Circuit Characteristics

$V_{SS}=0V, I_{f_{BLA}}=54mA, T_{OP} =25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Forward Voltage	$V_{f_{BLA}}$	-	5.0	-	V	BLA
Forward Current	$I_{f_{BLA}}$	-	54	120	mA	BLA

Cautions:

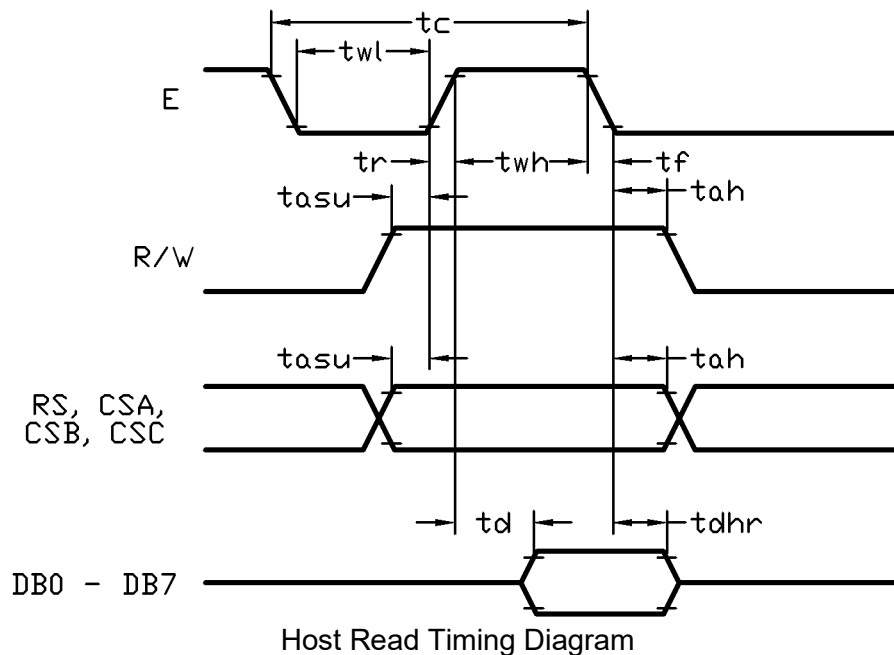
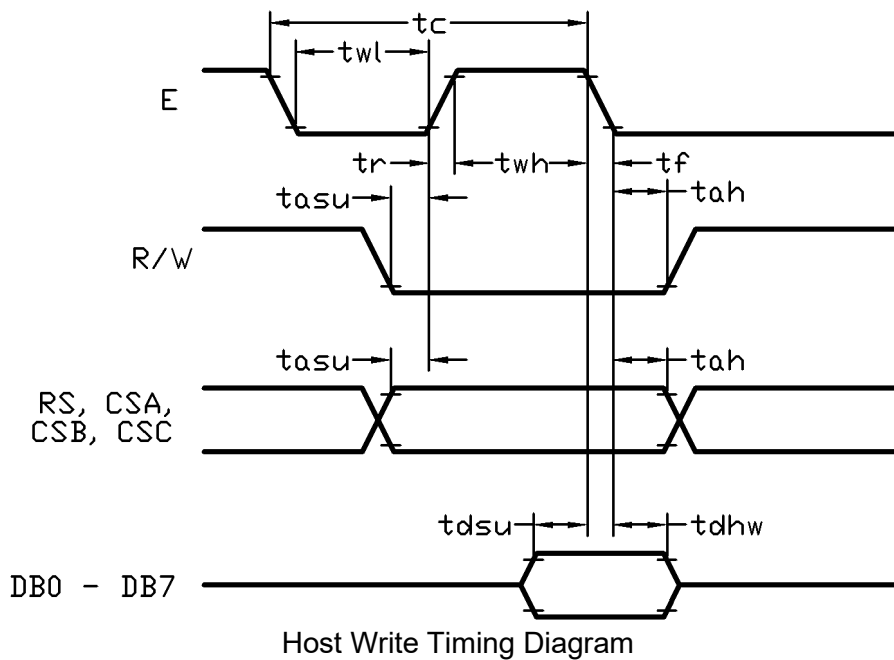
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



3.3 AC Characteristics

$V_{SS}=0V, V_{DD}=5V, T_{OP}=25^{\circ}C$

Item	Symbol	MIN.	TYP.	MAX.	Unit
E cycle time	tc	1500	-	-	ns
E high level width	twh	700	-	-	ns
E low level width	twl	700	-	-	ns
E rise time	tr	-	-	18	ns
E fall time	tf	-	-	18	ns
Address set-up time	tasu	240	-	-	ns
Address hold time	tah	50	-	-	ns
Data set-up time	tdsu	300	-	-	ns
Data delay time	td	-	-	480	ns
Data hold time (write)	tdhw	15	-	-	ns
Data hold time (read)	tdhr	30	-	-	ns



4. Function Specifications

4.1 Basic Setting

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

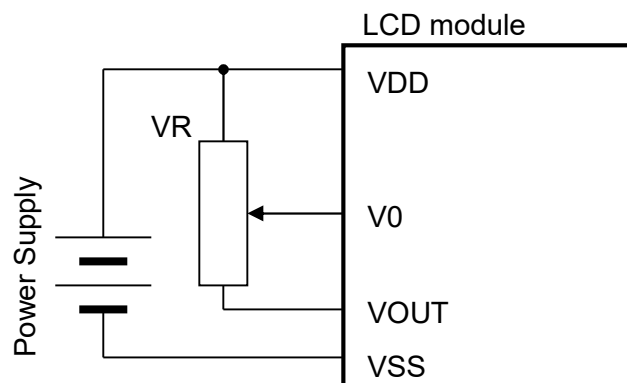
Display start line (Z address)= 0
 LCD Display = on

Note:

These setting/commands should issue to all controllers while start up.
 See the Display Control Instructions section for details.

4.2 Adjusting the LCD display contrast

A Variable-Resistor must be connected to the LCD module for providing a reference to V0. Adjusting the VR will result the change of LCD display contrast. The recommended value of VR is 25k to 50k



4.3 Resetting the LCD module

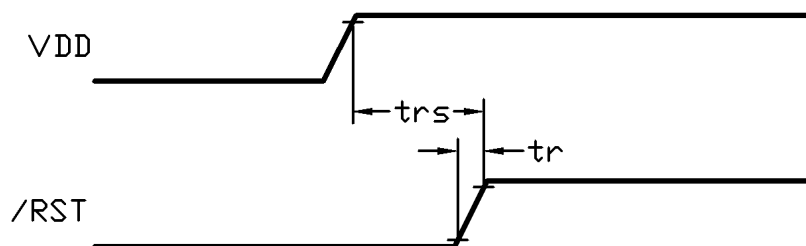
The LCD module should be initialized by setting /RST terminal at low level when turning the power on.

When /RST pull low, the LCD module will:

- Display off
- Display start line register becomes 0. (Z-address=0)

While /RST is low, no instruction can be accepted except status read. Therefore, execute other instructions after making sure that DB4=0 (clear /RST) and DB7=0 (ready) by status read instruction. The conditions of power supply at initial power up are as follow:

Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset time	trs	2.0	-	-	us
Rise time	tr	-	-	150	ns



4.4 Display Memory Map

Page (X) 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(Y) Address		00h → 3Fh	00h → 3Fh	00h → 3Fh	00h → 3Fh
Chip Select CSA		0	1	0	1
Chip Select CSB		0	0	1	1
Chip Select CSC		0	0	0	0

Note:

- 1) Display start line (Z address) = 0
- 2) The Display Data store separately in four drivers.

4.5 Internal Registers

There are three registers in each section of LCD module. Each of them could be controlled independently.

Page (X) Address Register

X address register designates pages of the internal display data RAM. Count function is not available. The address should set by instruction.

Column (Y) Address Counter

Y address counter designates address of the internal display data RAM. It could be set by instruction and increased by 1 automatically by read or write display data operations.

Display Start Line (Z) Register

Z address register indicates of display data RAM to LCD top line. It may be used for scrolling the display pattern on the LCD.

4.6 Display Control Instructions

Instructions	Code											Function
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Display on/off	0	0	0	0	1	1	1	1	1	1	1/0	Controls the display on or off. Internal status and display data in RAM is not affected 0=off, 1=on
Set Column (Y) Address	0	0	0	1	Y address (0-63)							Set the Column address into the Y address counter
Set Page (X) Address	0	0	1	0	1	1	1	X address (0-7)				Set the Page address into the X address register
Set Display Start Line (Z address)	0	0	1	1	Z address (0-63)							Indicates the display data RAM displayed at the top of the screen
Status Read	0	1	Busy	0	on/off	Reset	0	0	0	0		Read status Busy=L, Driver ready; Busy=H, Driver busy on/off=L, Display is on; on/off=H, Display is off Reset=L, Normal Running; Reset=H, reset
Write Display Data	1	0	Write data									Write display data into display data RAM, After writing instruction, Y address counter increased by 1 automatically
Read Display Data	1	1	Read data									Read display data form the display data RAM

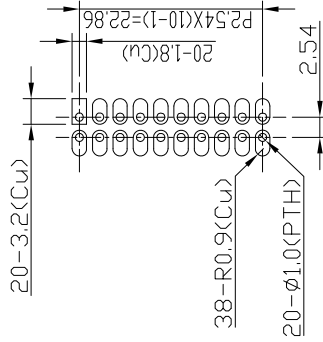
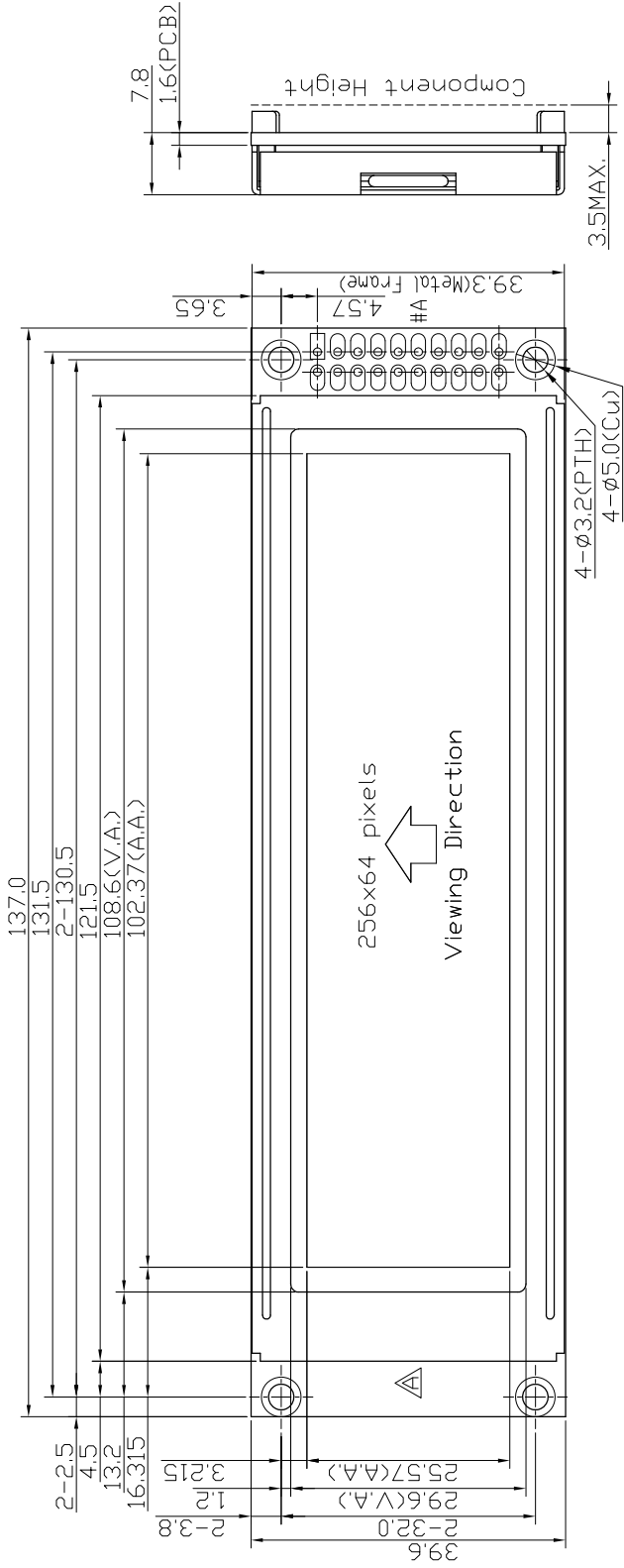
Note:

- *1. For the details of the Display Control Instructions, please refer to Samsung S6B0108 handbook.

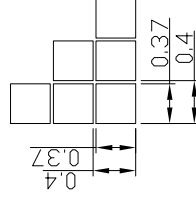
5. Design and Handling Precaution

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

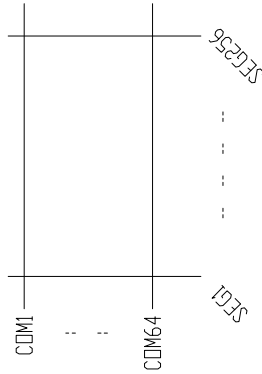
Terminal No.	Pin Name
1	VSS
2	VDD
3	V0
4	VOUT
5	RS
6	R/W
7	E
8	DB0
9	DB1
10	DB2
11	DB3
12	DB4
13	DB5
14	DB6
15	DB7
16	CSA
17	CSB
18	CSC
19	/RST
20	BLA



#A Details
Scale=3/2



Pixels Details
Scale=20/1



Panel Wiring Details
Scale=free

- Note:
- *1. LCD Display Type : STN-Blue , Negative , Transmissive
 - *2. Viewing Direction : 6H
 - *3. Duty : 1/64 , Bias : 1/9
 - *4. Backlight Color : White
 - *5. Backlight Supply : 5.0V TYP. B
 - *6. Operating Voltage : 5.0V
 - *7. Operating Temperature : -20°C ~ 70°C
 - *8. Storage Temperature : -30°C ~ 80°C
 - *9. An external VR(25K to 50K) must be connected for Contrast Control

C				
B	-Typing Correction	Li Jlang	2014-06-03	
A	-Revise Outline	Deng Junjie	2013-10-29	
Rev/Note		Date		
Dwg Title		LM6800AFV-5 Outline Dwg		
Dwg No.	MK-002518b-1-1	Date	2008-06-25	
Scale	3/2	Unit	mm	Paper Size A3
Approved	±0.5	Checked		
Drawn	Zhou Huifang			

TOPWAY