

# **DISPLAYTRONIC**

*XIAMEN ZETTLER ELECTRONICS CO., LTD.*

## **SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY**

<b>CUSTOMER APPROVAL</b>			
※ PART NO. : <u>AGM16032C-FLW-FBH</u>			
<b>APPROVAL</b>		<b>COMPANY CHOP</b>	
<b>CUSTOMER COMMENTS</b>			

<b>DISPLAYTRONIC ENGINEERING APPROVAL</b>		
<b>DESIGN BY</b>	<b>CHECKED BY</b>	<b>APPROVED BY</b>

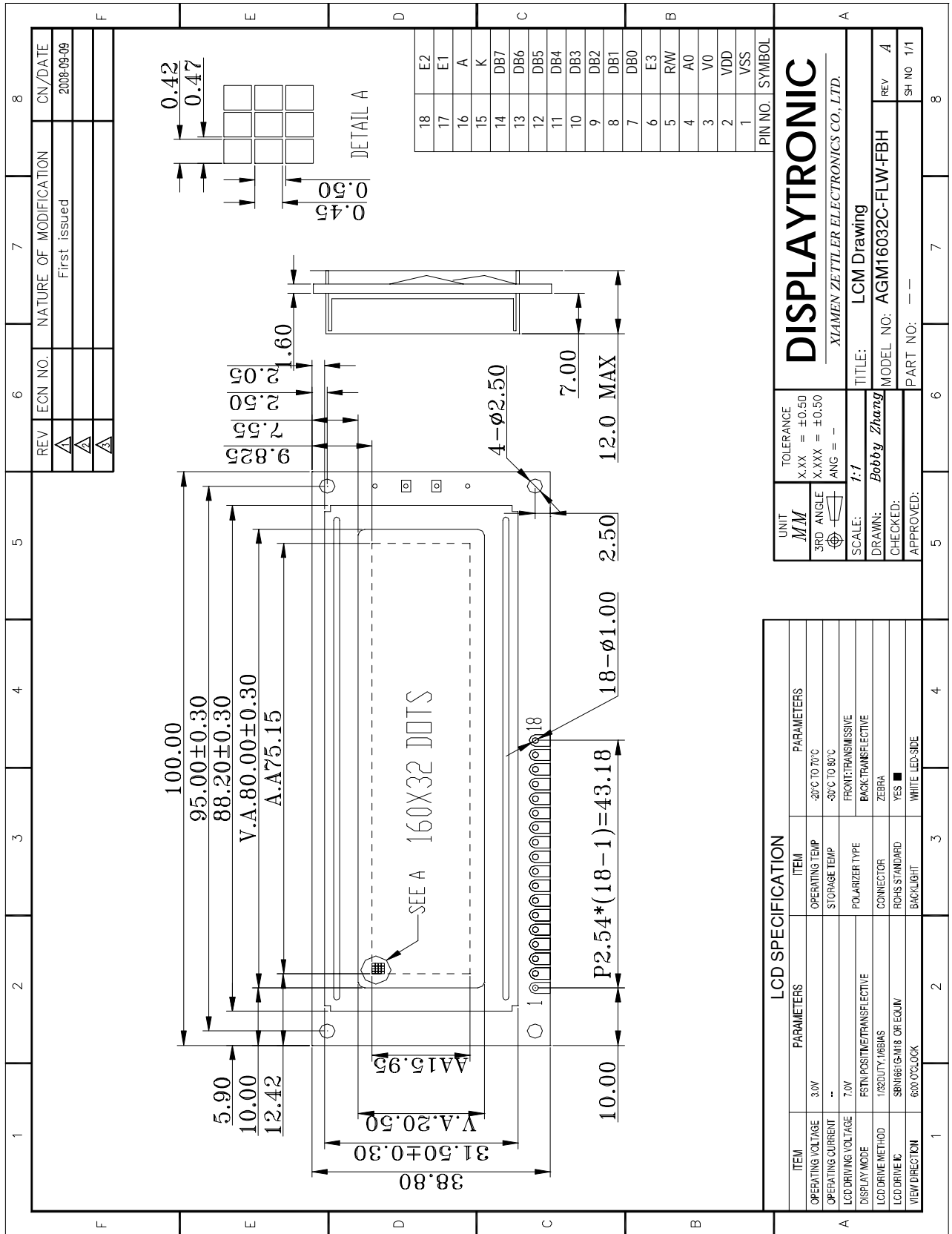
**REVISION RECORD**

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1.0 MECHANICAL DIAGRAM



## 2.0 MECHANICAL SPECS

1. Display Format	160*32 DOTS
2. Power Supply	3.0V
3. Overall Module Size	100.0mm(W) x38.8mm(H) x max12.0mm(D)
4. Viewing Area(W*H)	80.0 x 20.5mm
5. Dot Size (W*H)	0.42mm(W) x0.45mm(H)
6. Dot Pitch (W*H)	0.47mm(W) x0.50mm(H)
7. Viewing Direction	6:00 Clock
8. Driving Method	1/32duty,1/6bias
9. Controller IC	SBN1661G-M18 OR EQU
10. LC Fluid Options	FSTN/POSITIVE
11. Polarizer Options	TRANSFLECTIVE
12. Backlight Options	LED-SIDE (WHITE)
13. Operating temperature	-20°C ~ 70°C
14. Storage temperature	-30°C ~ 80°C
15. ROHS	ROHS compliant

## 3.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Typ	Max	Unit
Operating temperature (Wide temperature)	Top	-20	-	70	°C
Storage temperature (Wide temperature)	Tst	-30	-	80	°C
Input voltage	Vin	Vss		Vdd	V
Supply voltage for logic	Vdd- Vss	-0.3	-	7.0	V
Supply voltage for LCD drive	Vdd- Vo	3.5		13.0	V

## 4.0 ELECTRICAL CHARACTERISTICS

### 4.1 Electrical Characteristics Of LCM

Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply For Logic	VDD	25°C		3.0		V
Power Supply Current	Idd	Vdd=3.0V	-	0.6	1.0	mA
Input voltage (high)	Vih	H level	0.8Vdd	-	Vdd	V
Input voltage (low)	Vil	L level	0	-	0.2Vdd	V
Recommended LC Driving Voltage	Vdd -Vo	-20°C	-		8.0	V
		25°C		7.0	-	
		70°C	6.0		-	

**4.2 The Characteristics Of LED Backlight**

Item	Symbol	Condition	Min	Typ	Max	Unit
Operate Current	IF	VF=6.4±0.2V	--	20	--	mA
Luminance	Lv	IF= 20 mA	370	400	--	cd/m <sup>2</sup>
Peak wave length	λ p	IF= 20 mA				nm
Coordinate range	x, y	IF= 20 mA	x=0.27~0.29, y=0.28~0.30 ,			

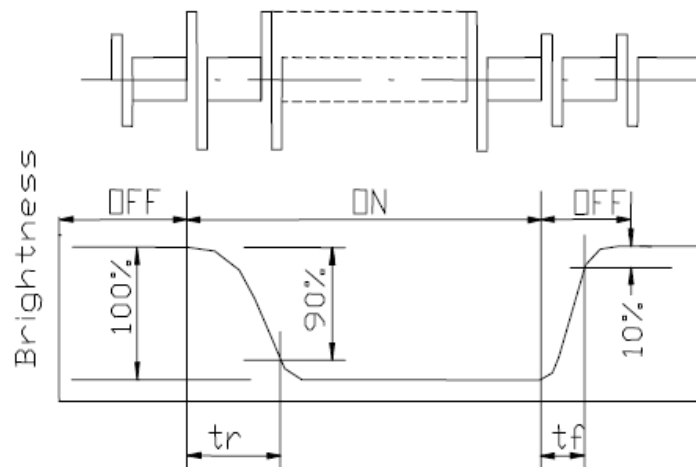
**Note:** i. Luminance means the backlight brightness without glass.

ii. VF means the voltage between 'A' and 'K' when the BL current is 20 mA.

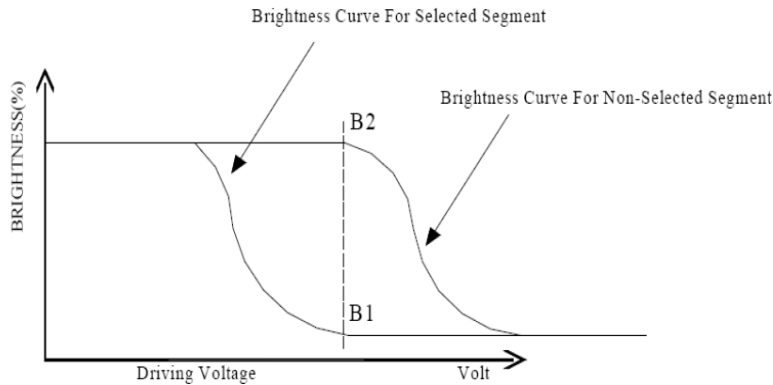
**5.0 OPTICAL CHARACTERISTICS**

Item	Symbol	Condition	Min	Typ	Max	Unit
Viewing angle (horizontal)	θ	Cr ≥ 2.0	-35	-	35	deg
Viewing angle (vertical)	φ	Cr ≥ 2.0	-25	-	40	deg
Contrast Ratio	Cr	φ=0°, θ=0°	-	7	-	
Response time (rise)	Tr	φ=0°, θ=0°	-	180	300	ms
Response time (fall)	Tf	φ=0°, θ=0°	-	150	250	ms

**(1). Definition of Optical Response Time**

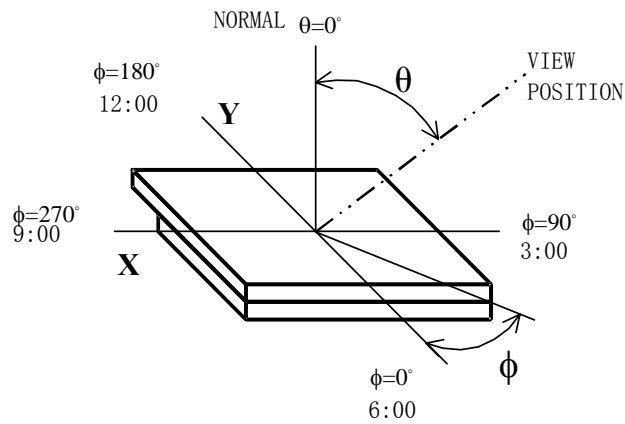


## (2). Definition of Contrast Ratio

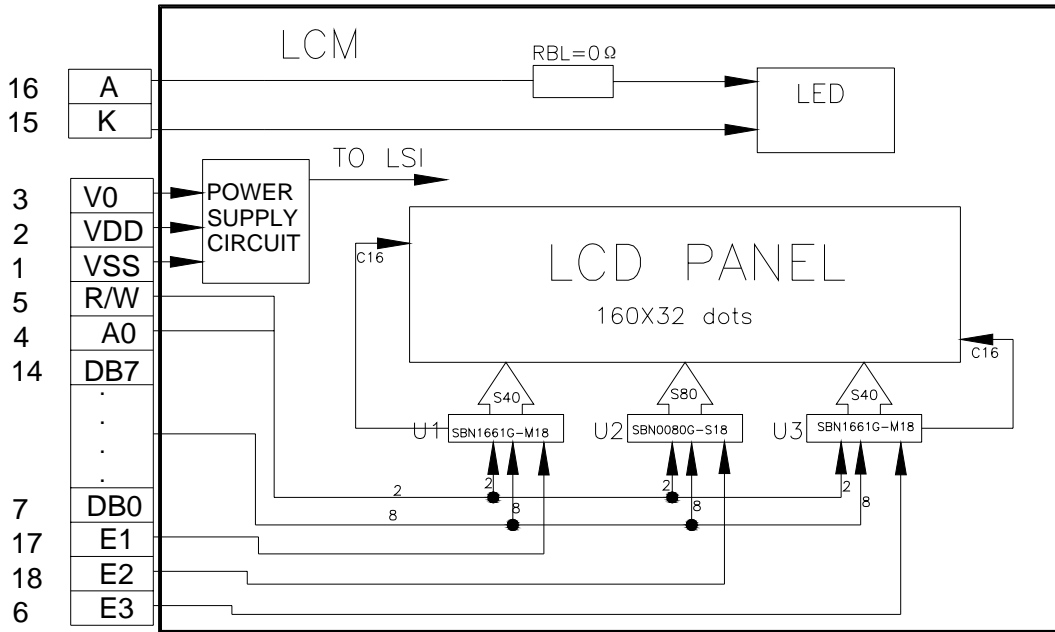


$$Cr = \frac{\text{Brightness of Non-selected Segment}(B2)}{\text{Brightness of selected Segment}(B1)}$$

## (3). Definition of Viewing Angle $\theta$ and $\Phi$



## 6.0 BLOCK DIAGRAM

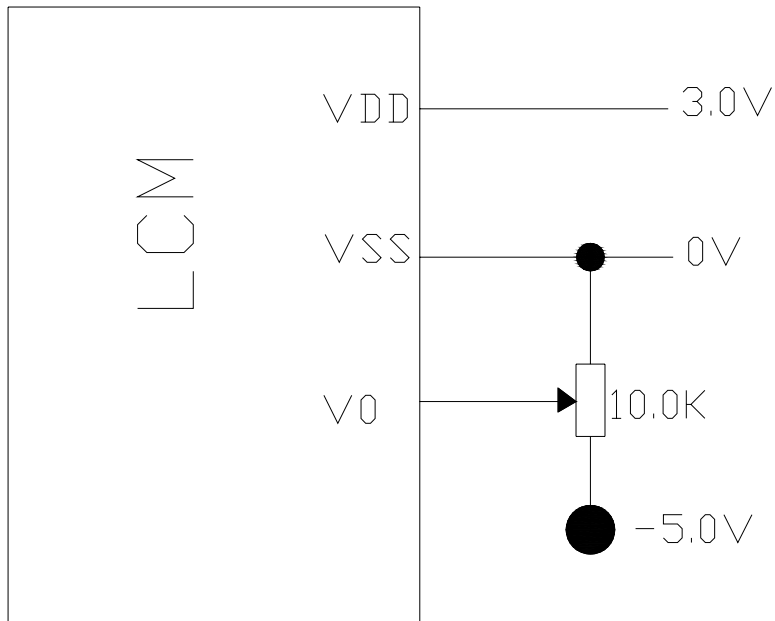


## 7.0 PIN ASSIGNMENT

Pin No.	Symbol	Function	Level
1	Vss	Ground	0 (V)
2	Vdd	Power Supply For Logic Circuit	3.0 (V)
3	V0	Power Supply For LCD Driving	0V~5.0V
4	A0	Instruction/Data	H/L
5	R/W	H: Data read L: Data write	H/L
6	E3	Enable for U3	H/L
7	DB0	Data bit 0	H/L
8	DB1	Data bit 1	H/L
9	DB2	Data bit 2	H/L
10	DB3	Data bit 3	H/L
11	DB4	Data bit 4	H/L
12	DB5	Data bit 5	H/L
13	DB6	Data bit 6	H/L
14	DB7	Data bit 7	H/L
15	K	Power Supply for LED-	0V
16	A	Power Supply for LED+	6.4V
17	E1	Enable for U1	H/L
18	E2	Enable for U2	H/L



## 8.0 POWER SUPPLY

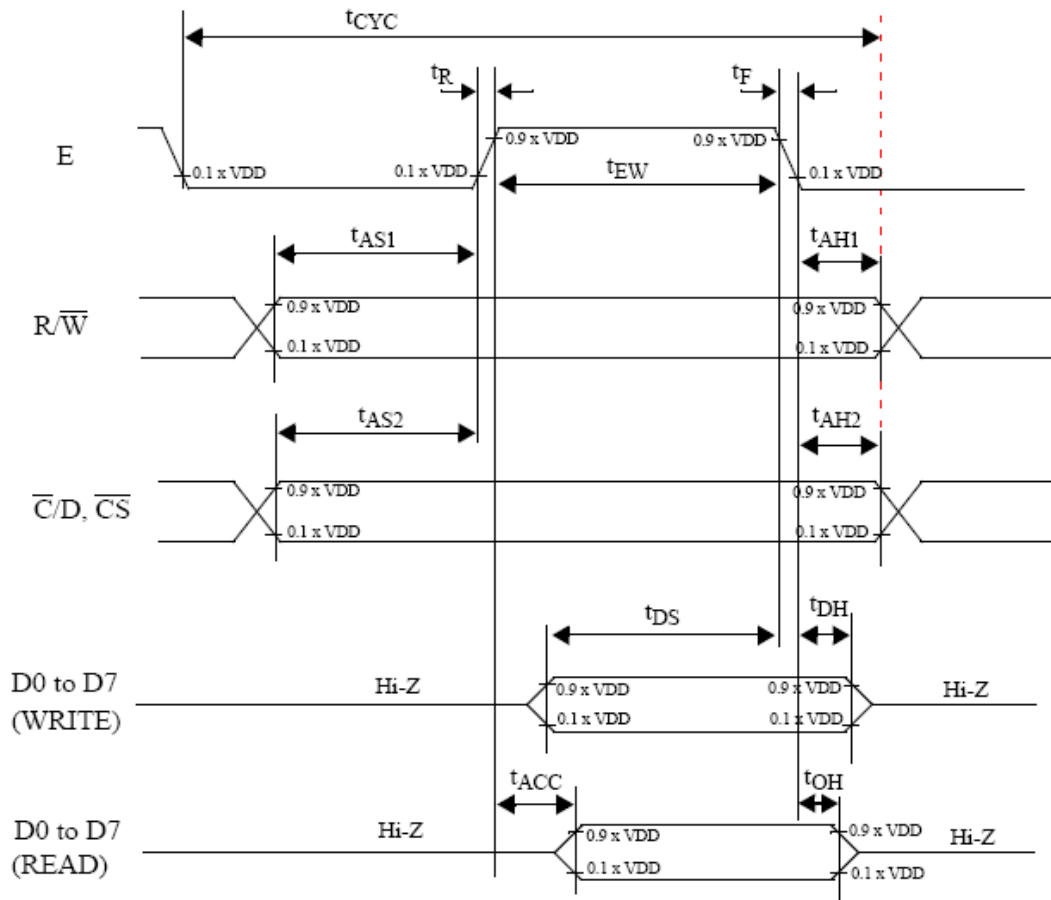


## 9.0 TIMING CHARACTERISTICS

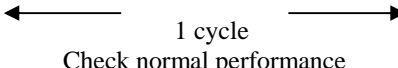
symbol	parameter	min.	max.	test conditons	unit
$t_{AS1}$	Address set-up time with respect to $R/\overline{W}$	40			ns
$t_{AS2}$	Address set-up time with respect to $\overline{C/D}, \overline{CS}$	40			ns
$t_{AH1}$	Address hold time with respect to $R/\overline{W}$	20			ns
$t_{AH2}$	Address hold time respect with to $\overline{C/D}, \overline{CS}$	20			ns
$t_F, t_R$	Enable (E) pulse falling/rising time		15		ns
$t_{CYC}$	System cycle time	2000		Note 1	ns
$t_{EWR}$	Enable pulse width for READ	200			ns
$t_{EWW}$	Enable pulse width for WRITE	160			ns
$t_{DS}$	Data setup time	160			ns
$t_{DH}$	Data hold time	20			ns
$t_{ACC}$	Data access time		180	CL= 100 pF.	ns
$t_{OH}$	Data output hold time	20	120	Refer to Fig. 23.	ns

**Note:**

- The system cycle time( $t_{CYC}$ ) is the time duration from the time when Chip Enable is enabled to the time when Chip Select is released.



**10.0 RELIABILITY TEST**

NO	Test Item	Description	Test Condition	Remark	
1	Environmental Test	High temperature/High Humidity Storage	Applying the high storage temperature Under high humidity for a long time Check normal performance	90% RH 40°C 96hrs	
2		Low temperature storage	Applying the low storage temperature Under normal humidity for a long time Check normal performance	-30°C 96hrs	
3		High temperature Operation	Apply the electric stress(Voltage and current) Under high temperature for a long time	70°C 96hrs	Note1
4		Low temperature Operation	Apply the electric stress Under low temperature for a long time	-20°C 96hrs	Note1 Note2
5		Temperature Cycle	Apply the low and high temperature cycle -30°C <> 25°C <> 80°C <> 25°C 30min 10min 30min 10min  Check normal performance	-30°C/80°C 10 cycle	
6	Mechanical Test	Vibration test(Package state)	Applying vibration to product check normal performance	Freq:10-55Hz Max Acceleration 5G 1 cycle time: 1min time X.Y.Z direction for 15 mins	
7		Shock test(package state)	Applying shock to product check normal performance	Drop them through 70cm height to strike horizontal plane	
8	Other				

**Remark**

Note1:Normal operations condition (25°C±5°C).

Note2:Pay attention to keep dewdrops from the module during this test.

## 11.0 DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the SBN1661G-M18. Instructions are received from MPU to SBN1661G-M18 for the display control.

INSTRUCTION	A0	RD	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	DESCRIPTION
Display ON/OFF	0	1	0	1	0	1	0	1	1	1	1/0	Turns display on or off. 0: OFF. 1:ON
Set Page Address	0	1	0	1	0	1	1	1	0	Page (0~3)		Sets display RAM Page in Page address register
Set Column (Segment address)	0	1	0	0	Column address (0~79)						Sets display RAM column address in column address register	
Display Start Line	0	1	0	1	1	0	Display start line (0~31)					Indicates the display data RAM displayed at the top of the screen.
Status Read	0	0	1	BUSY	ADC	ON/OFF	RESET	0	0	0	0	Reads the following status: BUSY 0: Ready 1: Busy ADC 1: CW output 0: CCW output ON/OFF 0: Display on 1: Display off RESET 0: Normal 1: Being Reset
Write Display Data	1	1	0	Write Data								Writes data DB0~DB7 from bus into display data RAM.
Read Display Data	1	0	1	Read Data								Reads data DB0~DB7 from display data RAM onto the data bus.
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0: CW output, 1: CCW output
Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	1: Static drive, 0: Normal driving
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Select LCD duty cycle 1:1/32, 0: 1/16
Read-Modify-Wreti	0	1	0	1	1	1	0	0	0	0	0	Read-Modify-write ON
END	0	1	0	1	1	1	0	1	1	1	0	Read-Modify-write OFF
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset

## **12.0 PRECAUTION FOR USING LCM**

1. When design the product with this LCD Module, make sure the viewing angle matches to its purpose of usage.
2. As LCD panel is made of glass substrate, Dropping the LCD module or banging it against hard objects may cause cracking or fragmentation. Especially at corners and edges.
3. Although the polarizer of this LCD Module has the anti-glare coating, always be careful not to scratch its surface. Use of a plastic cover is recommended to protect the surface of polarizer.
4. If the LCD module is stored at below specified temperature, the LC material may freeze and be deteriorated. If it is stored at above specified temperature, the molecular orientation of the LC material may change to Liquid state and it may not revert to its original state. Excessive temperature and humidity could cause polarizer peel off or bubble. Therefore, the LCD module should always be stored within specified temperature range.
5. Saliva or water droplets must be wiped off immediately as those may leave stains or cause color changes if remained for a long time. Water vapor will cause corrosion of ITO electrodes.
6. If the surface of LCD panel needs to be cleaned, wipe it swiftly with cotton or other soft cloth. If it is not still clean enough, blow a breath on the surface and wipe again.
7. The module should be driven according to the specified ratings to avoid malfunction and permanent damage.  
Applying DC voltage cause a rapid deterioration of LC material. Make sure to apply alternating waveform by continuous application of the M signal. Especially the power ON/OFF sequence should be kept to avoid latchup of driver LSIs and DC charge up to LCD panel.

### **8. Mechanical Considerations**

- a) LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.
- b) Do not tamper in any way with the tabs on the metal frame.
- c) Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
- d) Do not touch the elastomer connector; especially insert a backlight panel (for example, EL).
- e) When mounting a LCM makes sure that the PCB is not under any stress such as bending or twisting.  
Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
- f) Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

### **9. Static Electricity**

#### **a) Operator**

**Wear the electrostatics shielded clothes because human body may be statically charged if not wear shielded clothes.**

**Never touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface**

**terminals**

**with any parts of the human body.**

#### **b) Equipment**

There is a possibility that the static electricity is charged to the equipment, which has a function of peeling or friction

action (ex: conveyer, soldering iron, working table). Earth the equipment through proper resistance (electrostatic

earth: 1x10<sup>8</sup> ohm).

Only properly grounded soldering irons should be used.

If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

The normal static prevention measures should be observed for work clothes and working benches; for the latter

conductive (rubber) mat is recommended.

### c) Floor

**Floor is the important part to drain static electricity, which is generated by operators or equipment.**

There is a possibility that charged static electricity is not properly drained in case of insulating floor. Set the electrostatic earth (electrostatic earth: 1x10<sup>8</sup> ohm).

### d) Humidity

Proper humidity helps in reducing the chance of generating electrostatic charges. Humidity should be kept over

50%RH.

### e) Transportation/storage

**The storage materials also need to be anti-static treated because there is a possibility that the human body or storage**

**materials such as containers may be statically charged by friction or peeling.**

The modules should be kept in antistatic bags or other containers resistant to static for storage.

### f) Soldering

Solder only to the I/O terminals. Use only soldering irons with proper grounding and no leakage.

Soldering temperature : 280° C ± 10° C

Soldering time: 3 to 4 sec.

Use eutectic solder with resin flux fill.

If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

### g) Others

**The laminator (protective film) is attached on the surface of LCD panel to prevent it from scratches or stains. It should**

**be peeled off slowly using static eliminator.**

Static eliminator should also be installed to the workbench to prevent LCD module from static charge.

## 10. Operation

a) Driving voltage should be kept within specified range; excess voltage shortens display life.

b) Response time increases with decrease in temperature.

c) Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".

d) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

11. If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. The toxicity is extremely low but caution should be exercised at all the time.

12. Disassembling the LCD module can cause permanent damage and it should be strictly avoided.

## **AGM16032C-FLW-FBH GRAPHIC MODULE VER1.0**

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13. LCD retains the display pattern when it is applied for long time (Image retention). To prevent image retention, do not apply the fixed pattern for a long time. Image retention is not a deterioration of LCD. It will be removed after display pattern is changed.
14. Do not use any materials, which emit gas from epoxy resin (hardener for amine) and silicone adhesive agent (dealcohol or deoxym) to prevent discoloration of polarizer due to gas.
15. Avoid the exposure of the module to the direct sunlight or strong ultraviolet light for a long time.
16. The brightness of LCD module may be affected by the routing of CCFL cables due to leakage to the chassis through coupling effect. The inverter circuit needs to be designed taking the level of leakage current into consideration. Thorough evaluation is needed for LCD module and inverter built into its host equipment to ensure specified brightness.