

**SPECIFICATIONS FOR  
LIQUID CRYSTAL DISPLAY MODULE**

**MODEL NO : SG12864ASLB-GB-G**

**CUSTOMER :**

**APPROVED SIGNATURE**

**DSGD :**

**CHKD : Gili Wang**

**APPD : Chuan-Lin Hsu**

**DATE :**

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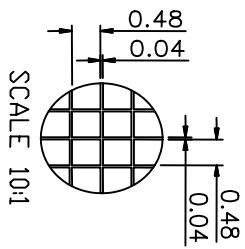
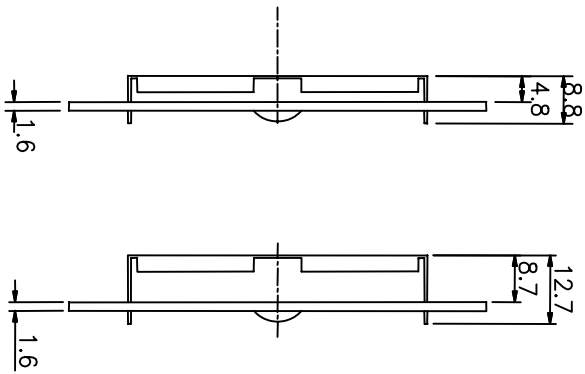
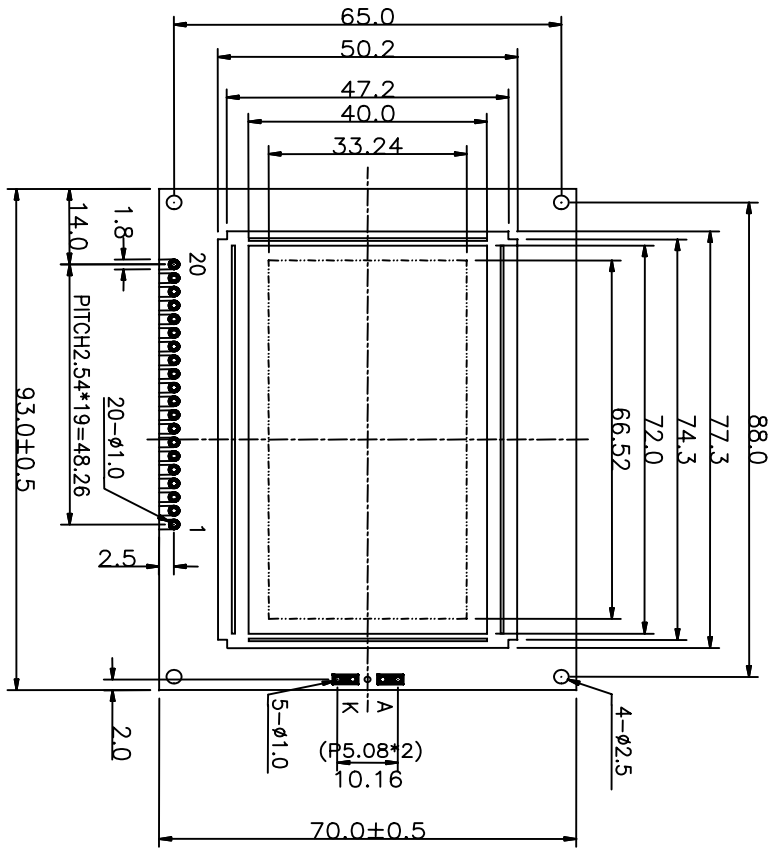


## GENERAL SPECIFICATION

ITEM	DESCRIPTION					
Product No	SG12864ASLB-GB-G					
LCD Type	STN Gray Positive	<input type="checkbox"/> STN Yellow Green Positive		<input type="checkbox"/> STN Blue Negative		
	<input type="checkbox"/> FSTN Negative White & Black		<input type="checkbox"/> FSTN Positive Black & White			
Rear Polarizer	<input type="checkbox"/> Reflective		Transflective		<input type="checkbox"/> Transmissive	
Backlight Type	<input type="checkbox"/> NO B/L		LED		<input type="checkbox"/> CCFL	<input type="checkbox"/> EL
Backlight Color	Yellow Green	<input type="checkbox"/> Green	<input type="checkbox"/> Amber		<input type="checkbox"/> White	<input type="checkbox"/> Other
View Direction	6 O'clock			<input type="checkbox"/> 12 O'clock		
Temperature Range	Normal			<input type="checkbox"/> Wide		
Frame	Black			<input type="checkbox"/> Silver		

### TO BE VERY CAREFUL !

The LCD driver ICs are made by CMOS process, which are very easy to be damaged by static charge, make sure the user is grounded when handling the LCM.



PIN NO	SIGNAL
1	VSS
2	VDD
3	VO
4	D/I
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	CS1
16	CS2
17	RST
18	VOUT
19	A
20	K

NOTE	ITEM	CONTENT	DATA	REV	TOLERANCE	SCALE	UNIT	DWYN	DATE	CUSTOMER APVL	TITLE	MODEL	DWG NO	PAGE
		CHANGE NUMBER	2004.03.01	0	X. ±0.30 X. ±0.20 .XX±0.05	1/1	mm	G111	2004.03.01		MODULE	SG12864A	A-A2-0007	1/1

## ABSOLUTE MAXIMUM RATING

### (1) Electrical Absolute Ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for Logic	$V_{DD}-V_{SS}$	-0.3	7.0	Volt	
Power Supply for LCD	$V_{DD}-V_{EE}$	0	14.0	Volt	
Input Voltage	$V_I$	-0.3	$V_{DD}$	Volt	
LED Power Dissipation	$P_{AD}$	-	2484	mW	
LED Forward current	$I_{AF}$	-	540	mA	
LED Reverse Voltage	$V_R$		8	V	

### (2) Environmental Absolute Maximum Ratings

Item	Normal Temperature				Wide Temperature			
	Operating		Storage		Operating		Storage	
	Min,	Max.	Min,	Max.	Min,	Max.	Min,	Max.
Ambient Temperature	0	+50	-20	+70	-20	+70	-30	+80
Humidity(without condensation)	Note 2,4		Note 3,5		Note 4,5		Note 4,6	

Note 2  $T_a = 50$  : 80% RH max

$T_a > 50$  : Absolute humidity must be lower than the humidity of 85%RH at 50

Note 3  $T_a$  at -20 will be <48hrs at 70 will be <120hrs when humidity is higher than 75%.

Note 4 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 5  $T_a = 70$  : 75RH max

$T_a > 70$  : absolute humidity must be lower than the humidity of 75%RH at 70

Note 6  $T_a$  at -30 will be <48hrs, at 80 will be <120hrs when humidity is higher than 75%.

## ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ	Max.	Unit	note
Power Supply for Logic	$V_{DD}-V_{SS}$	-	4.5	5.0	5.5	Volt	
Power Supply for LCD	$V_{EE}-V_{SS}$	-	-4.3	-4.8	-5.2	Volt	
Input Voltage	$V_{IL}$	L level	0	-	0.6	Volt	
	$V_{IH}$	H level	2.2	-	$V_{DD}$	Volt	
	$V_{DD}-V_O$	$T_a = 0$	-	-	-	Volt	
		$T_a = 25$	7.6	8.3	9.2		
$T_a = 50$		-	-	-			
Power Supply Current for LCM	$I_{DD}$	$V_{DD} = 5.0V$ $V_{DD}-V_O = 8.3V$	-	2.0	3.5	mA	
	$I_{EE}$		-	2.4	-		
LED Forward Voltage	$V_F$	$I_f = 360 \text{ mA}$	-	4.1	4.6	Volt	
LED Forward Current	$I_F$	-	-	360	-	mA	
LED Reverse Current	$I_R$	$V_R = 8V$	-	-	0.2	mA	

## OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ	Max.	Unit	note	
Viewing angle range	f(12 o'clock)	When Cr 1.4	-	20	-	Degree	9,10	
	b(6 o'clock)		-	40	-			
	l(9 o'clock)		-	30	-			
	r(3 o'clock)		-	30	-			
Rise Time	$T_r$	$V_{DD}-V_o = 8.3V$ $T_a = 25$	-	200	-	ms		
Fall Time	$T_f$		-	250	-			
Frame frequency	Frm		-	64	-	Hz		8,10
Contrast	Cr		-	4.5	-			7
The Brightness Of Backlight	L	IF=360 mA	140	180	-	$\text{cd/m}^2$		
Peak Emission Wavelength	P		567	570	577	nm		

# SUNLIKE DISPLAY

Model No :SG12864A

## MECHANICAL SPECIFICATION

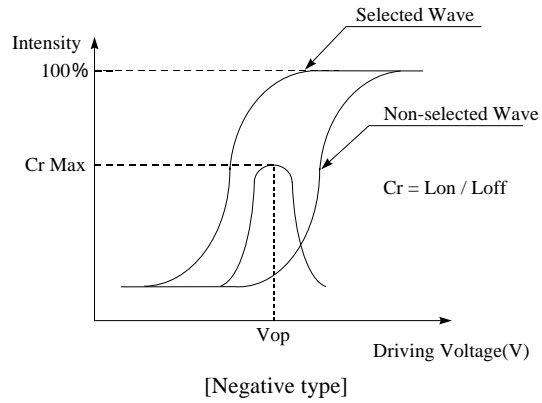
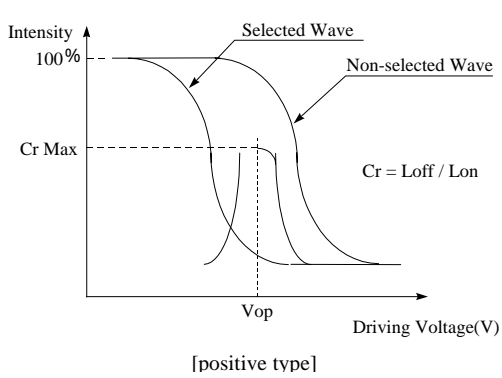
ITEM	DESCRIPTION
Product No.	SG12864A
Module Size	93.0 (W)mm×70.0 (H)mm×8.8(LED=12.7)(D)mm Max
Viewing Area	72.0(W)mm × 40.0(H)mm
Dot Size	0.48(W)mm×0.48(H)mm
Dot Pitch	0.52(W)mm×0.52(H)mm
Resolution	128(W)×64(H) Dots Matrix
Controller	SBN6400G
DC/DC Converter	With (Optional)

## INTERFACE PIN ASSIGNMENT

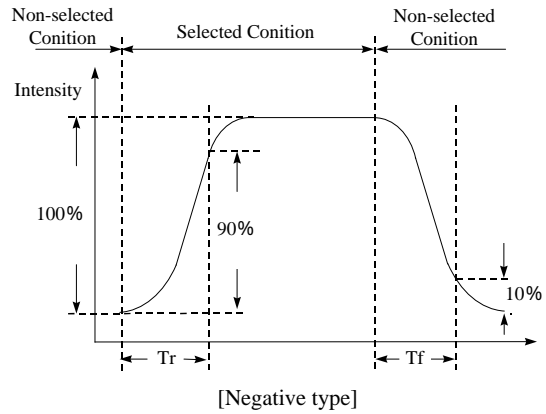
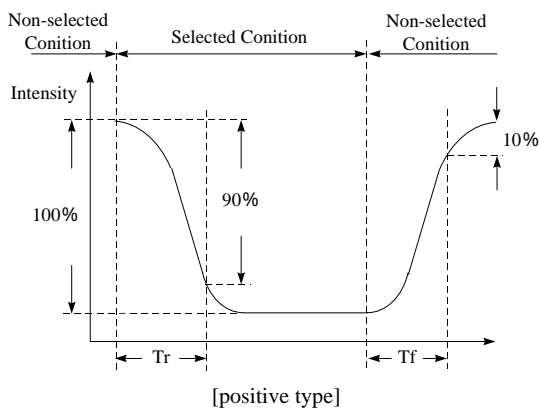
PIN NO.	PIN OUT	LEVEL	FUNCTION DESCRIPTION
1	V <sub>SS</sub>	0V	GND
2	V <sub>DD</sub>	5V	Logic supply voltage
3	V <sub>O</sub>	---	Contrast Adjustment voltage
4	D/I	H/L	H: Data, L: Instruction Code
5	R/W	H/L	H: Read / L: Write
6	E	H L	Enable Signal
7	DB0	H/L	Data Bus Line
8	DB1	H/L	
9	DB2	H/L	
10	DB3	H/L	
11	DB4	H/L	
12	DB5	H/L	
13	DB6	H/L	
14	DB7	H/L	
15	CS1	H	Chip Select Signal for IC1
16	CS2	H	Chip Select Signal for IC2
17	/RES	L	Reset Signal
18	V <sub>out</sub>	---	Power Supply Voltage for LCD
19	A	4.2V	LED Power (+)
20	K	0V	LED Power (-)



**[Note 7] Definition of Operation Voltage (Vop)**



**[Note 8] Definition of Response Time (Tr, Tf)**



**Conditions:**

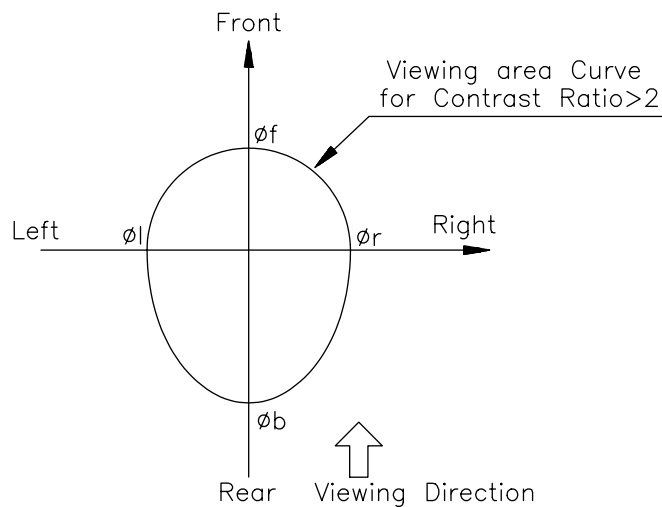
Operating Voltage : Vop

Frame Frequency : 64 Hz

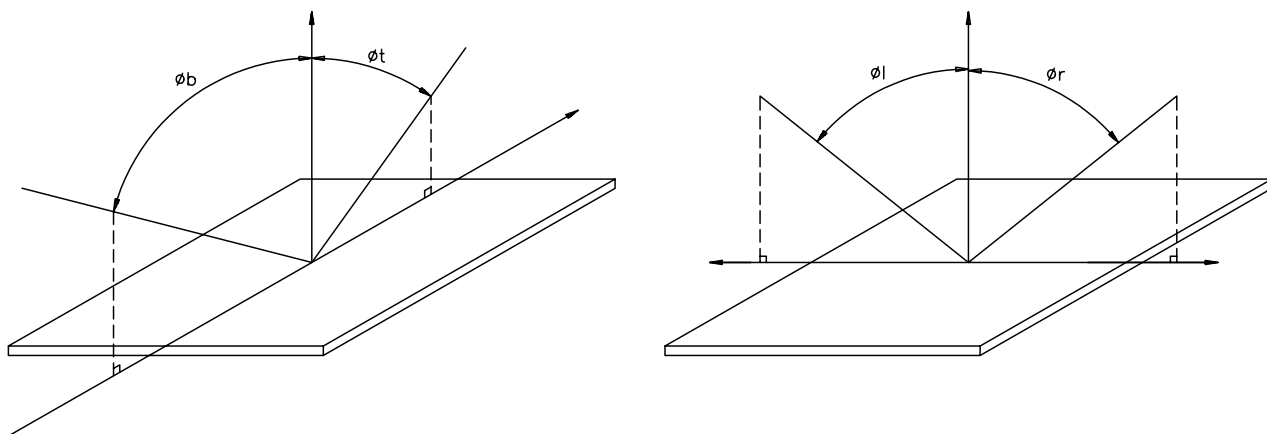
Viewing Angle ( , ): 0°, 0°

Driving Wave form : 1/N duty, 1/a bias

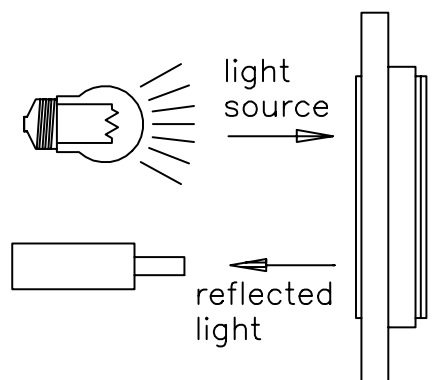
**[Note 9] Definition of Viewing Direction**



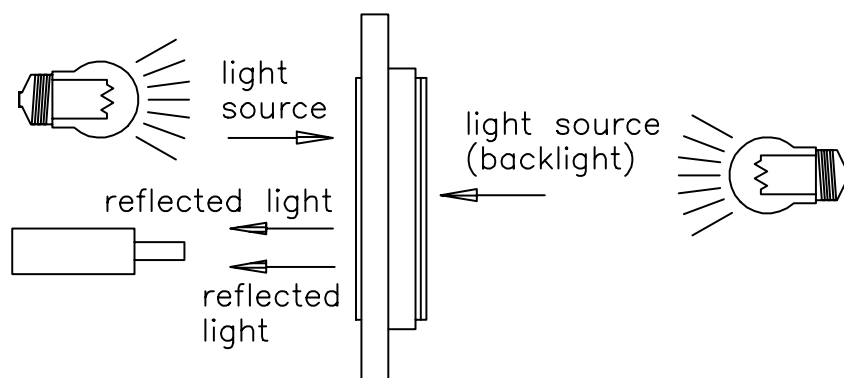
**[Note 10] Definition of viewing angle**



**[Note 11] Description of Measuring Equipment**

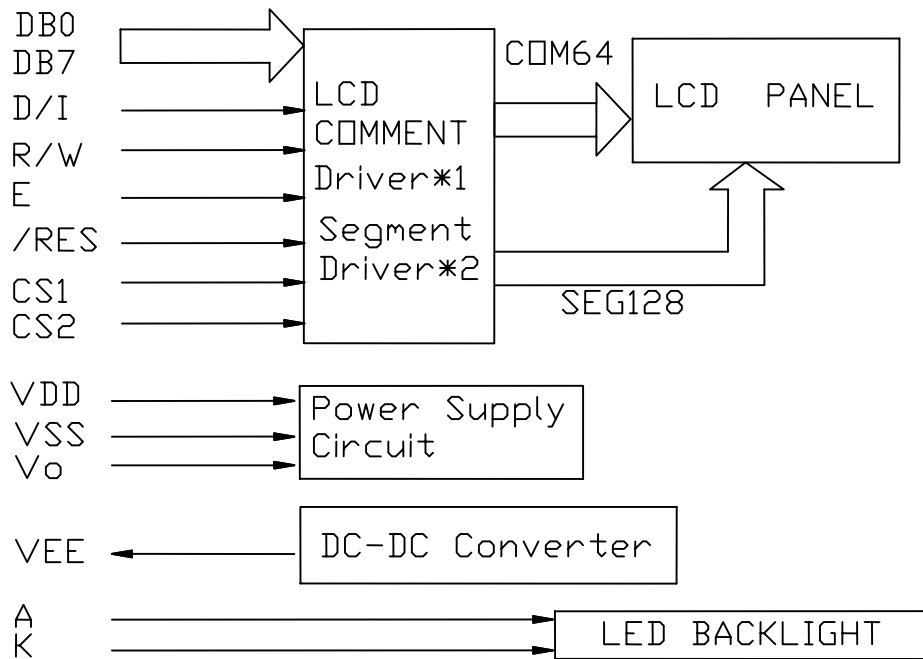


Reflective type

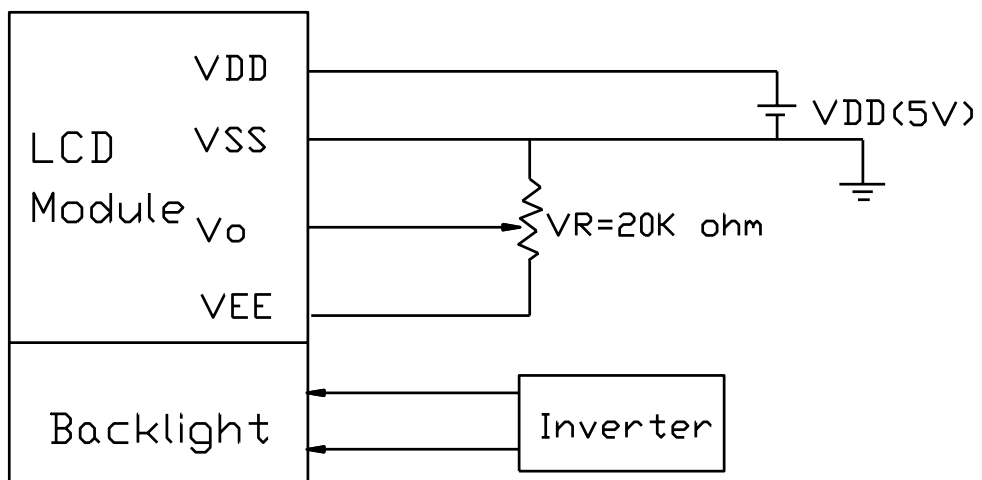


Transflective type

## BLOCK DIAGRAM



## POWER SUPPLY



## INSTRUCTION CODE

NO	Instruction	Code										Function
		D/I	R/W	D7	D6	D5	D4	D3	D2	D1	D0	
1	Display ON / OFF	0	0	0	0	1	1	1	1	1	1/0	Controls display ON/OFF. RAM data and internal status are not affected. 1: NO , 0: OFF
2	Display Start Line	0	0	1	1	Display start line (0-63)					Specifies the RAM line displayed at the top of the screen.	
3	Page Address Set	0	0	1	0	1	1	1	Page (0-7)			Sets the page (X address) of RAM at the page (X address) register.
4	Set Address	0	0	0	1	Column Address (0-63)					Sets the Column (Y address) in the Column (Y address) counter.	
5	Status Read	0	1	B U S Y	0	ON / OFF	R E S E T	0	0	0	0	Reads the status.  RESET    1: Reset 0: Normal  ON/OFF   1: Display OFF 0: Display ON  BUSY     1: Internal operation 0: Ready
6	Write Display Data	1	0	Write DATA								Write data DB0 to DB7 on the data bus into display RAM.
7	Read Display Data	1	1	Read DATA								Reads data DB0 to DB7 from the display RAM to the data bus.

\* Initialization at power-on is performed not by the reset Instruction but by a reset signal applied to the RES pin.

### Initialization

- ( a ) Display off .
- ( b ) Display start line register : First line .
- ( c ) Static drive off .
- ( d ) Column address counter : Address 0 .
- ( e ) Page address register : Page 0 .
- ( f ) Select duty : 1/64 duty

## Display Data Ram Addressing

Page Address cs1,cs2	Data	Display Pattern								Line Address
B8	D0									C0
	D1									C1
	D2									C2
	D3								0 Page	C3
	D4									C4
	D5									C5
	D6									C6
	D7									C7
B9	D0									C8
	D1									C9
	D2									CA
	D3								1 Page	CB
	D4									CC
	D5									CD
	D6									CE
	D7									CF
BA	D0									D0
	D1								2 Page	D1
	D2									D2
	D3									D3
	D4									D4
	D5									D5
BE	D6								6 Page	F6
	D7									F7
BF	D0									F8
	D1									F9
	D2									FA
	D3								7 Page	FB
	D4									FC
	D5									FD
	D6									FE
	D7									FF
Column address		40	41	42	43	44	45	46	7E	7F
Segment Term		1	2	3	4	5	6	7	63	64

Fig.1 Correspondence with display data RAM and address (For example the display start line is 10<sup>th</sup> and 1/64 duty)

**Microcontroller interface timing for writing**

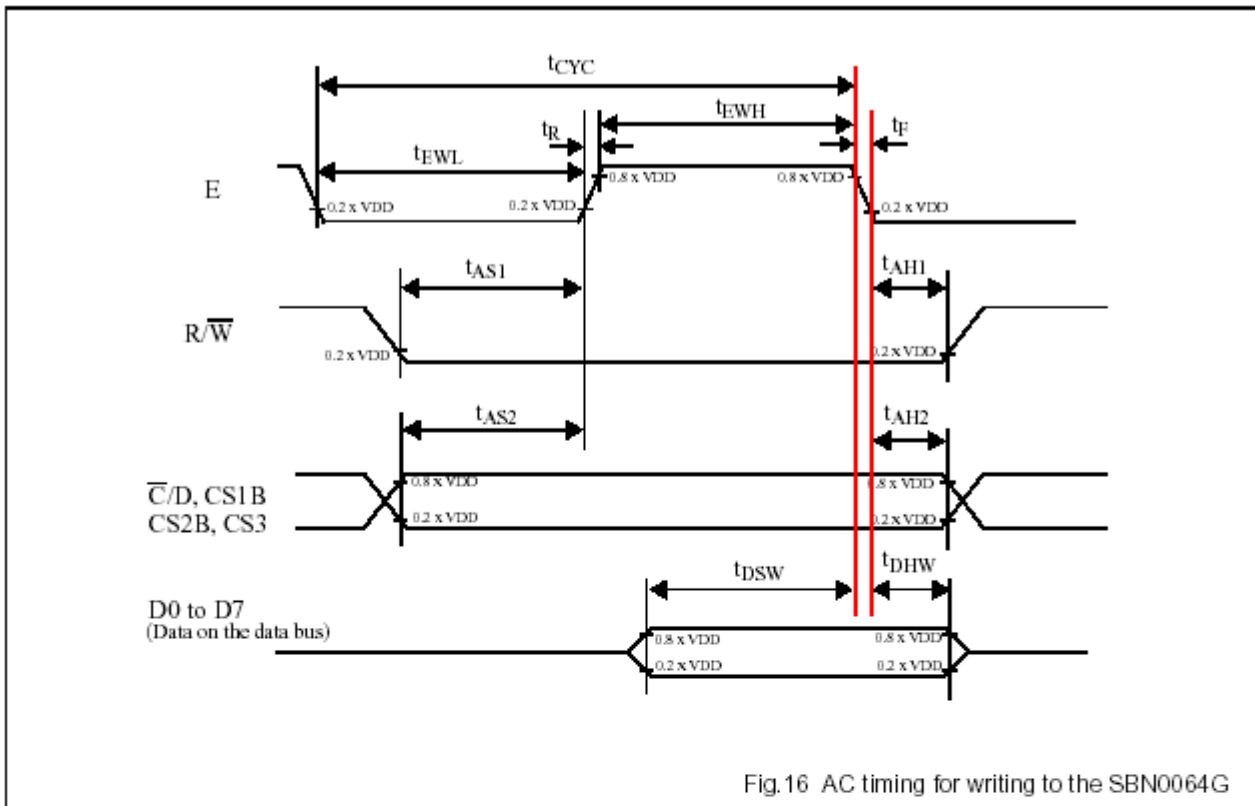


Fig.16 AC timing for writing to the SBN0064G

**Table 25** AC timing for writing to the SBN0064G

V<sub>DD</sub> = 5 V ±10%; V<sub>SS</sub> = 0 V; T<sub>amb</sub> = -20 °C to +75°C.

symbol	parameter	min.	max.	test conditions	unit
t <sub>cyc</sub>	Enable (E) cycle time	1000			ns
t <sub>EWL</sub>	Enable (E) LOW width	450			
t <sub>EWH</sub>	Enable (E) HIGH width	450			
t <sub>R</sub>	Enable (R) rise time		20		
t <sub>F</sub>	Enable (F) fall time		20		
t <sub>AS1</sub>	Write set-up time	140			
t <sub>AH1</sub>	Write hold time	10			
t <sub>AS2</sub>	C/D, CS1B, CS2B, CS3 set-up time	140			
t <sub>AH2</sub>	C/D, CS1B, CS2B, CS3 hold time	10			
t <sub>DSW</sub>	Data setup time (on the data bus)	200		The loading on the data bus is shown in Fig. 18.	
t <sub>DHW</sub>	Data hold time (on the data bus)	10			

## Reset

Reset can be initialized system by setting RES terminal at low level when turning power on. receiving instruction from MPU. When RES become low, following procedure is occurred.

1.Display OFF

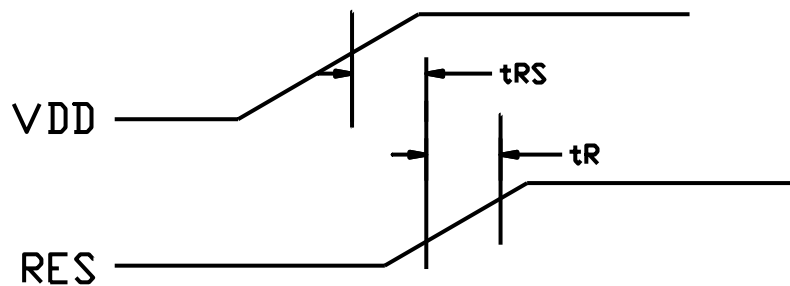
2.Display start line register become set by 0.

While RES is low, any instruction except status read can be accepted. Reset status appers at DB4. After DB4 is low, any instruction can be accepted.

The conditions of power supply at initial power up are shown in table 1.

Table 1. Power Supply Initial Conditions

Item	Symbol	Min	Typ	Max	Unit
Reset Time	t <sub>RS</sub>	1.0	--	--	us
Rise Time	t <sub>R</sub>	--	--	200	ns



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## HANDLING PRECAUTION

### 1. Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizes which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be taken when handling the LCD Modules.

### 2. Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and Wipe lightly.

-Isopropyl alcohol

-Ethyl alcohol

-Trichlorotriflorothane

Do not wipe the display surface with dry or hard materials that will damage the polarize surface.

Do not use the following solvent :

-Water

-Kettle

-Aromatics

### 3. Caution against static charge

The LCD Module use C-MOSLSI drivers, so we recommend end that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

### 4. Packaging

-Modules use LCD elements, and must be treated as such. Avoid in tense shock and falls from a height.

-To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.



## 5. Caution for operation

-It is indispensable to drive LCD's with in the specified voltage limit since the higher voltage than the limit shorten LCD life.

An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

-Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

-A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the relative condition of 40%RH or less is required.

## 6. Storage

In the case of storing for a long period of time (for instance. For years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.

- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.

-Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

## 7. Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol. Which should be burned up later.

- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

## RELIABILITY TEST

No	Item	Conditions		Note
1	High Temp. Operation	50	120HR	
2	High Temp. Storage	70	120HR	
3	Low Temp. Operation	0	120HR	
4	Low Temp. Storage	-20	120HR	
5	High Temp./Humid Storage	60	90%RH 120HR	
6	Thermal Shock	-20 ,30min +60 ,30min	10 cycle	

## APPEARANCE CHECK

CONDIITON OF APPEARANCE CHECK:

- (1)Specimen shall be checked by eyes in distance of 30cm under 40w-fluorescence lamp.
- (2)Checking direction shall be in 45 degree from perpendicular line op specimen surface.