DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 40271 SYH-LY-CYR22

Product specification ***Version : 0***

02/Mar/2007

GENERAL SPECIFICATION

MODULE NO. :

DEM 40271 SYH-LY-CYR22

CUSTOMER P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	ORIGINAL VERSION	02/03/2007

PREPARED BY: LMM DATE: 02/03/2007

APPROVED BY: MH DATE: 05/06/2007

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1. FUNCTIONS & FEATURES

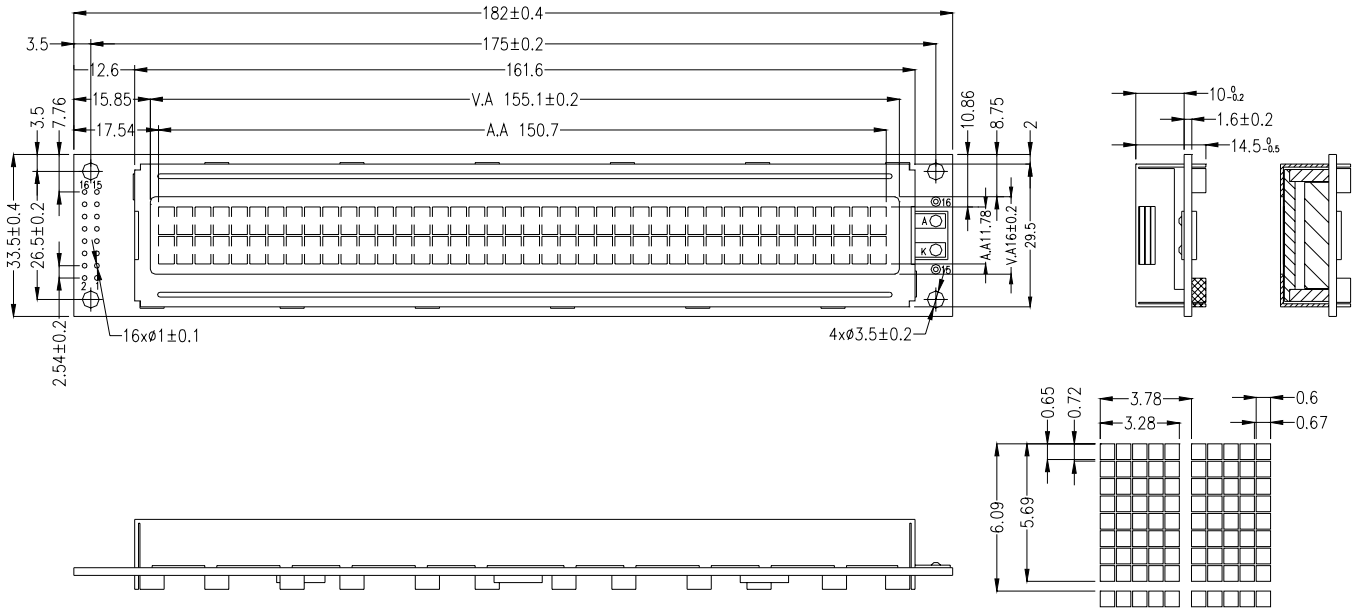
MODULE	LCD TYPE
DEM 40271 SYH-LY-CYR22	STN Yellow Green Transflective Positive Mode

- Viewing Direction : 6 o'clock
- Driving Scheme : 1/16 Duty Cycle, 1/5 Bias
- Power Supply Voltage : 5.0 Volt (typ.)
- V_{LCD} Adjustable For Best Contrast : 4.5 V (typ.)
- Display contents : 40 x 2 Characters
- Operating Temperature : -20°C to +70°C
- Storage Temperature : -30°C to +80°C
- IC : Samsung, S6A0069-22 (Cyrillic)
- Internal Memory : CGROM (10,080 bits)
  : CGRAM (64 x 8 bits)
  : DDRAM (80 x 8 bits)
- Interface : Easy Interface with 4-bit or 8-bit MPU

2. MECHANICAL SPECIFICATIONS

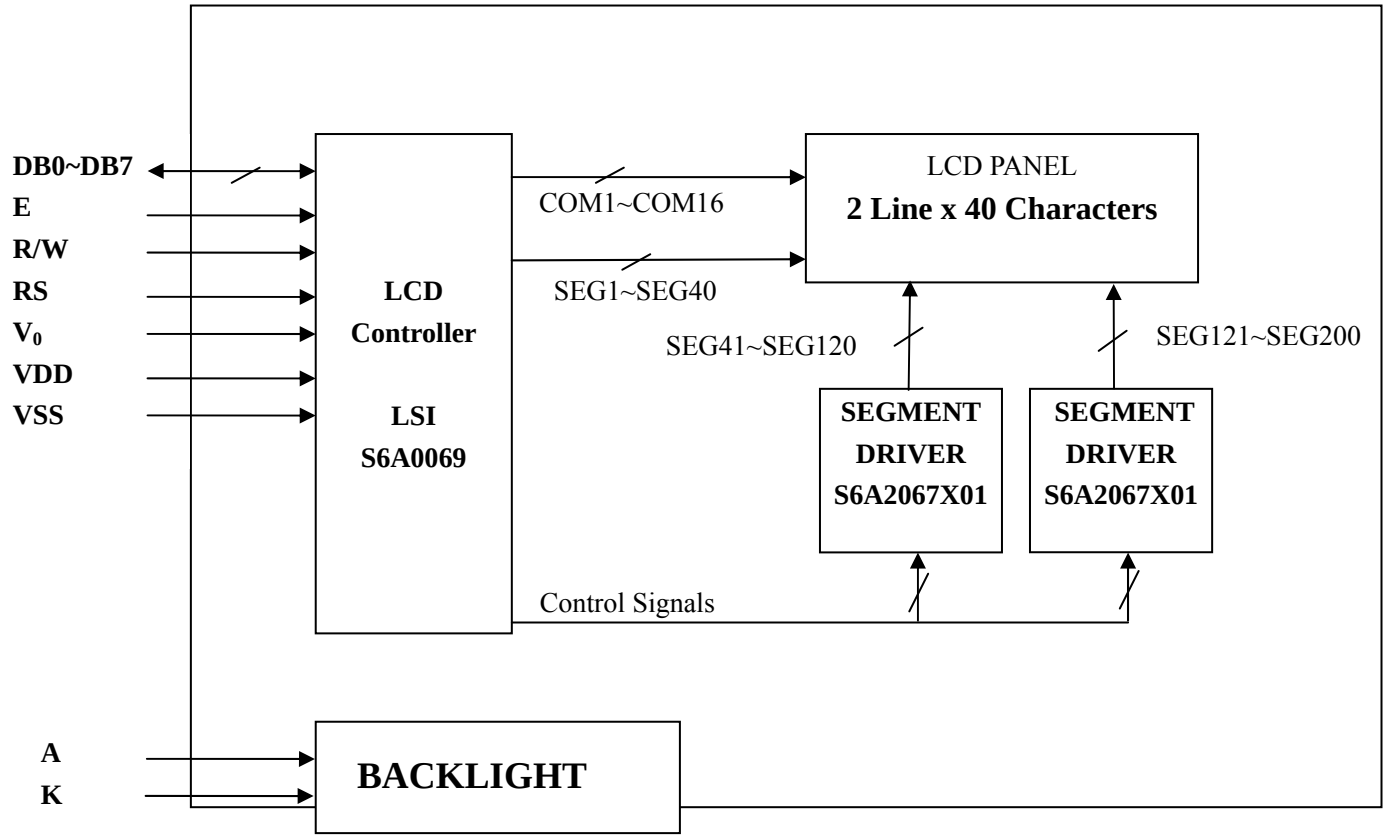
- Module Size : 182.00 x 33.50 x 14.5 mm (max.)
- Character Pitch : 3.78 x 6.09 mm
- Character Size : 3.28 x 5.69 mm
- Character Font : 5 x 8 dots
- Dot Size : 0.60 x 0.65 mm
- Dot Pitch : 0.07 mm

3. EXTERNAL DIMENSIONS



REMARKS:
UNMARKED TOLERANCE IS ±0.4,
2,THE MATERIAL IS LEAD-FREE.

4. BLOCK DIAGRAM

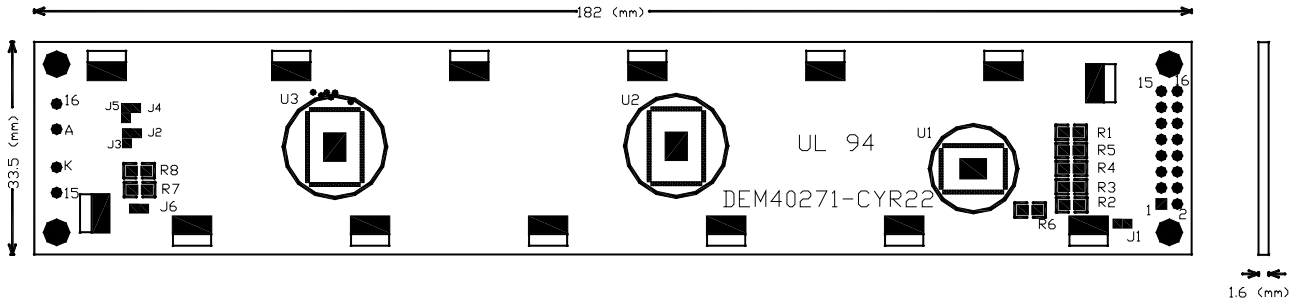


5. PIN ASSIGNMENT

Pin No.	Symbol	Function
1	VSS	Ground terminal of module.
2	VDD	Power terminal of module 5.0 Volt.
3	V0	Power Supply for liquid crystal drive.
4	RS	Register select RS = 0 (Instruction register) RS = 1 (Data register)
5	R/W	Read /Write R/W = 1 (Read) R/W = 0 (Write)
6	E	Read/Write Enable Signal
7	DB0	Bi-directional data bus, data transfer is performed once, thru DB0 to DB7, in the case of interface data. Length is 8-bits; and twice, thru DB4 to DB7 in the case of interface data length is 4-bits. Upper four bits first then lower four bits.
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	LED – (K)	Please also refer to 6. PCB drawing and description.
16	LED + (A)	

6. PCB DRAWING AND DESCRIPTION

6.1 PCB DRAWING



6.2 DESCRIPTION:

6-1-1.The polarity of the pin 15 and the pin 16 :

symbol	symbol state	J3,J5	J2,J4	LED Polarity	
				15 Pin	16 Pin
J2,J4	Each solder-bridge	Each open	Each closed	Anode	Cathode
J3,J5	Each solder-bridge	Each closed	Each open	Cathode	Anode

Note : In application, J3=J5=0 Ohm , and J2 ,J4 should be open.

6-1-2.The metal-bezel is set be on ground when the J1 is closed . .

Note: In application , J1= 0 Ohm

6-1-3.The LED resistor should can be bridged when the J6 is closed.

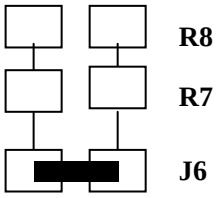
Note: In application J6 should be opened.

6-1-4.The R7 and the R8 are the LED resistor.

Note: In application, R7=R8=10 Ohm

6.3 Example application

6-2-1. The LED resistor should be bridged as following.

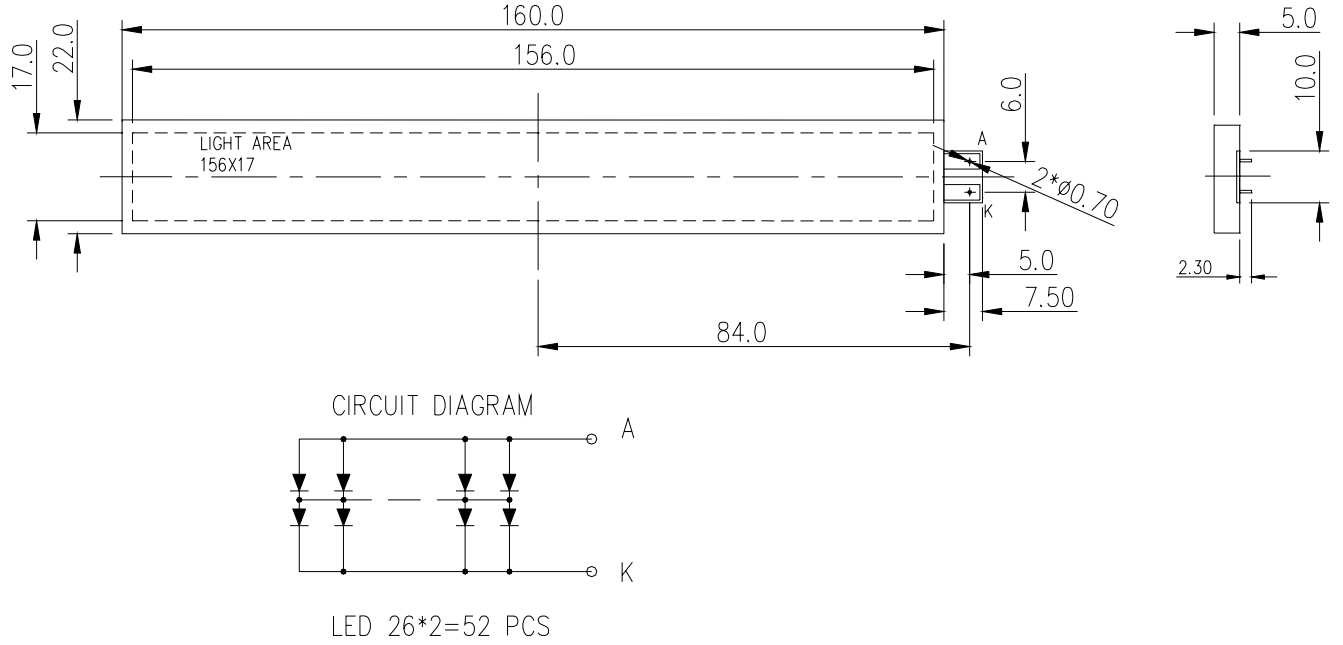


6-2-2. The 15 pin is the anode and the 16 pin is the cathode as following.

6-2-4. The metal-bezel is on ground as following.

7. BACKLIGHT VOLTAGE & CURRENT

Item	Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Forward Voltage	Vf		4.1	4.6	V	If=250mA
Forward Current	If		260	520	mA	
Power Dissipation	Pd		1.066		W	If=250mA
Reverse Voltage	VR		10.0		V	
Reverse Current	IR		0.20		mA	
Luminous Intensity	L		150		cd/m^2	If=250mA
Luminous Uniformity	ΔL		75		%	If=250mA
Emission Wavelength	λp		572		nm	If=10mA, Ta=25°C
Spectral Range	Δλ		35			Each chip



8. MAXIMUM ABSOLUTE POWER RATINGS

Item	Symbol	Standard value	Unit
Power supply voltage (1)	V_{DD}	-0.3~+7.0	V
Power supply voltage (2)	V_0	V_{DD}-15.0~V_{DD}+0.3	V
Input voltage	V_{IN}	-0.3~V_{DD}+0.3	V
Operating temperature	Topr	-20~+70	°C
Storage temperature	Tstg	-30~+80	°C

9. ELECTRICAL CHARACTERISTICS

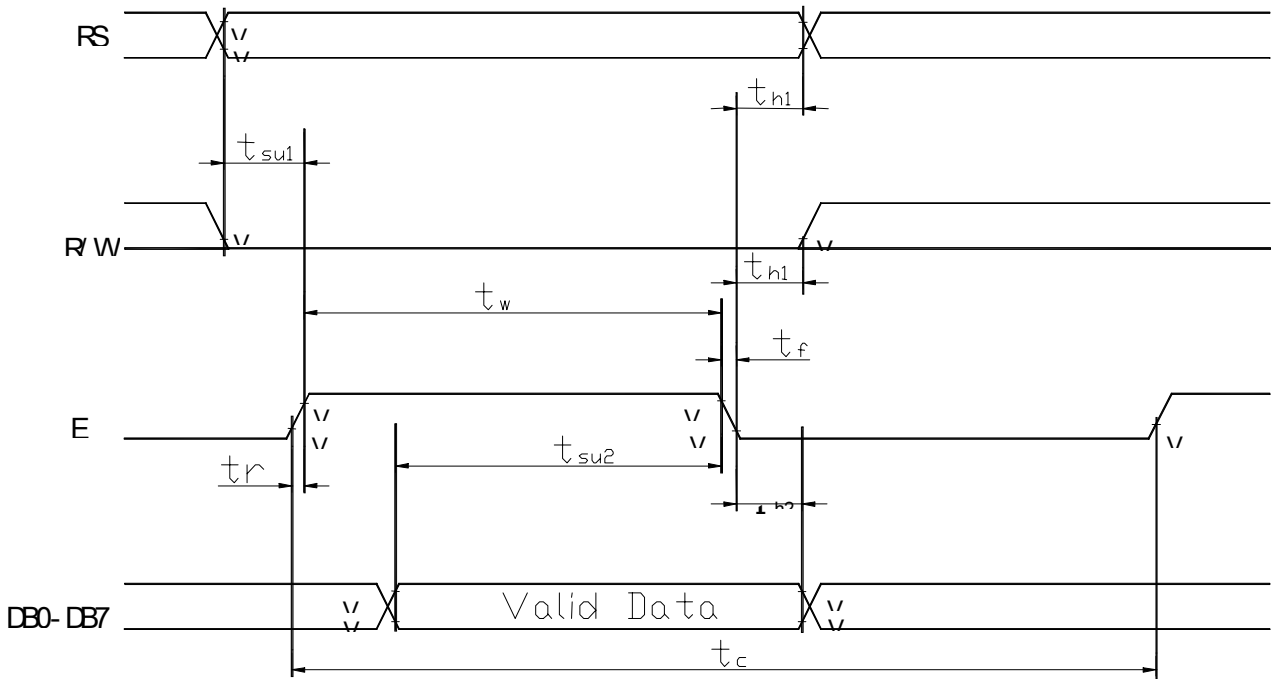
9-1 DC Characteristics (V_{DD} = 4.5V ~ 5.5V)

Item	Symbol	Standard Value			Test Condition	Unit
		MIN	TYP	MAX		
Operating Voltage	V_{DD}	4.5	5	5.5	-------	V
Supply Current	I_{DD1}	----	0.35	0.6	V_{DD}=5V,fosc=270kHz	mA
LCD Driving Voltage	VLCD	3.0	4.6	13.0	VDD-V5 (1/5,1/4 Bias)	V

9-2 AC Characteristics (V_{DD}=4.5V~5.5V)

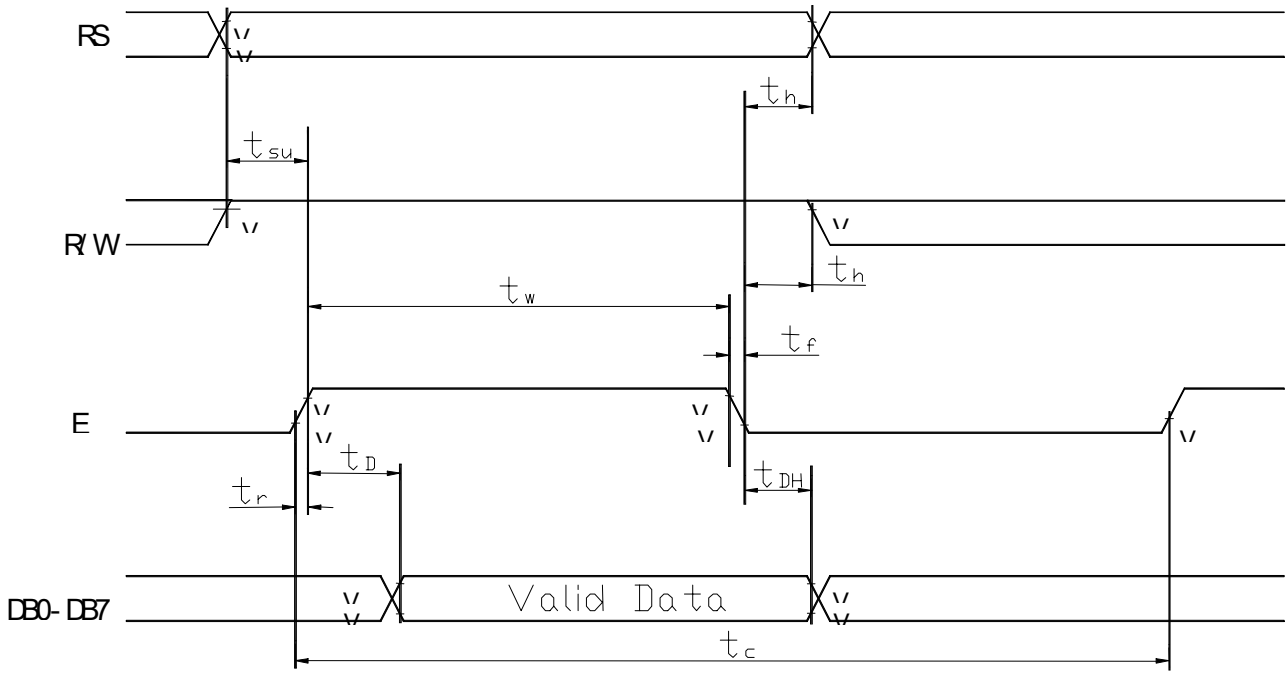
9-2-1. Write mode (writing data from MPU to module)

Characteristic	Symbol	Min	Typ	Max	Unit	Test PIN
E Cycle Time	t_C	500			ns	E
E Rise Time	t_R			20	ns	E
E Fall Time	t_F			20	ns	E
E Pulse width (High, Low)	t_W	230			ns	E
R/W and RS Set-up Time	t_{SU1}	40			ns	R/W, RS
R/W and RS Hold Time	t_{H1}	10			ns	R/W, RS
Data Set-up Time	t_{SU2}	80			ns	DB0~DB7
Data Hold Time	t_{H2}	10			ns	DB0~DB7



9-2-2.Read mode (Reading data from module to MPU)

Characteristic	Symbol	Min	Typ	Max	Unit	Test PIN
E Cycle Time	t_C	500			ns	E
E Rise Time	t_R			20	ns	E
E Fall Time	t_F			20	ns	E
E Pulse width (High, Low)	t_W	230			ns	E
R/W and RS Set-up Time	t_{SU}	40			ns	R/W, RS
R/W and RS Hold Time	t_H	10			ns	R/W, RS
Data output Delay Time	t_D			120	ns	DB0~DB7
Data Hold Time	t_{DH}	5			ns	DB0~DB7



10. INSTRUCTION DESCRIPTION

Instruction table

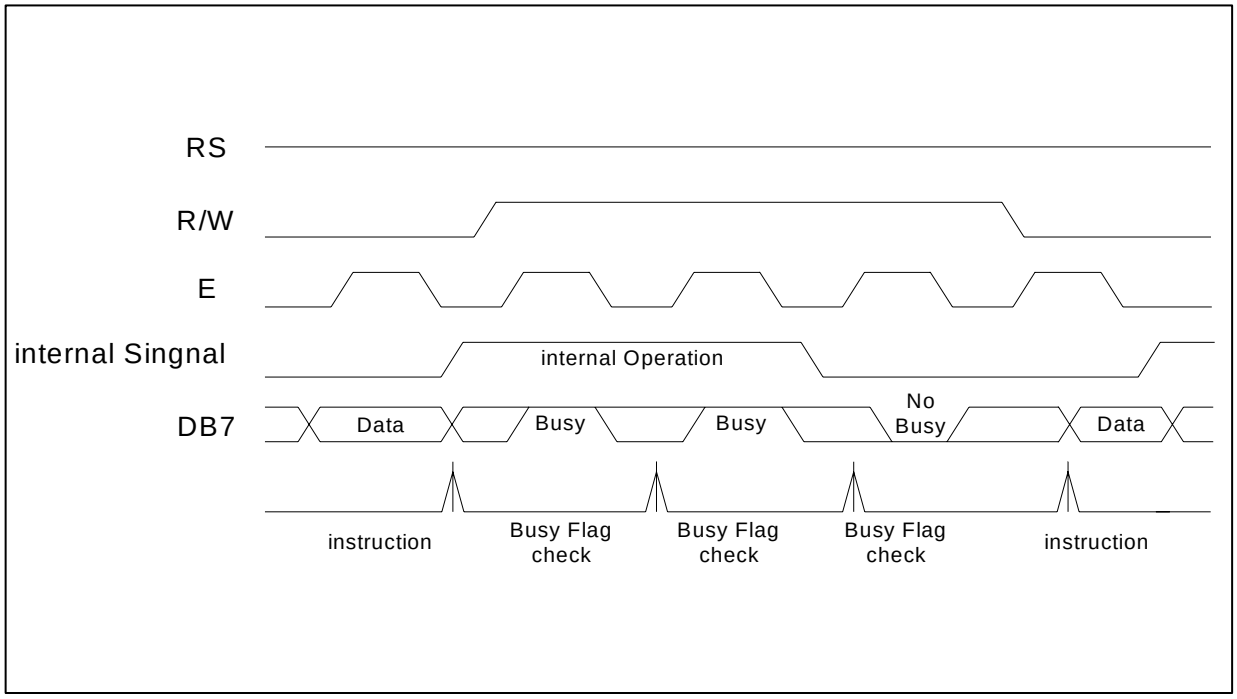
Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description Instruction Code	Execution time (fosc=270KHz)
Clear Display	L	L	L	L	L	L	L	L	L	H	Write “20H” to DDRAM and DDRAM address to “00H” for AC	1.53ms
Return home	L	L	L	L	L	L	L	L	H	X	Set DDRAM address to “00H” form AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.53ms
Entry mode set	L	L	L	L	L	L	L	H	I/D	SH	Assign cursor moving direction and make shift of entire display enable.	39us
Display on/off control	L	L	L	L	L	L	H	D	C	B	Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.	39us
Cursor Display Shift	L	L	L	L	L	H	S/C	R/L	---	---	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	39us
Function Set	L	L	L	L	H	DL	N	F	X-	X	Set interface data length (DL: 4-bit/8-bit), numbers of display line (N: 1-line/2-line), display font type(F: 5×8 dots/5×11 dots)	39us
Set CGRAM address	L	L	L	H	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39us
Set DDRAM address	L	L	H	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39us
Read busy Flag and Address	L	H	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0us
Write data to RAM	H	L	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal ARM (DDRAM/CGRAM).	43us
Read data from RAM	H	H	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal ARM (DDRAM/CGRAM).	43us

11. INTERFACE WITH MPU IN BUS MODE

11.1Interface with 8-bit MPU

When interfacing data length are 8-bit, transfer is performed all at once through 8-ports, from DB0 to DB7.

An example of the timing sequence is shown below.



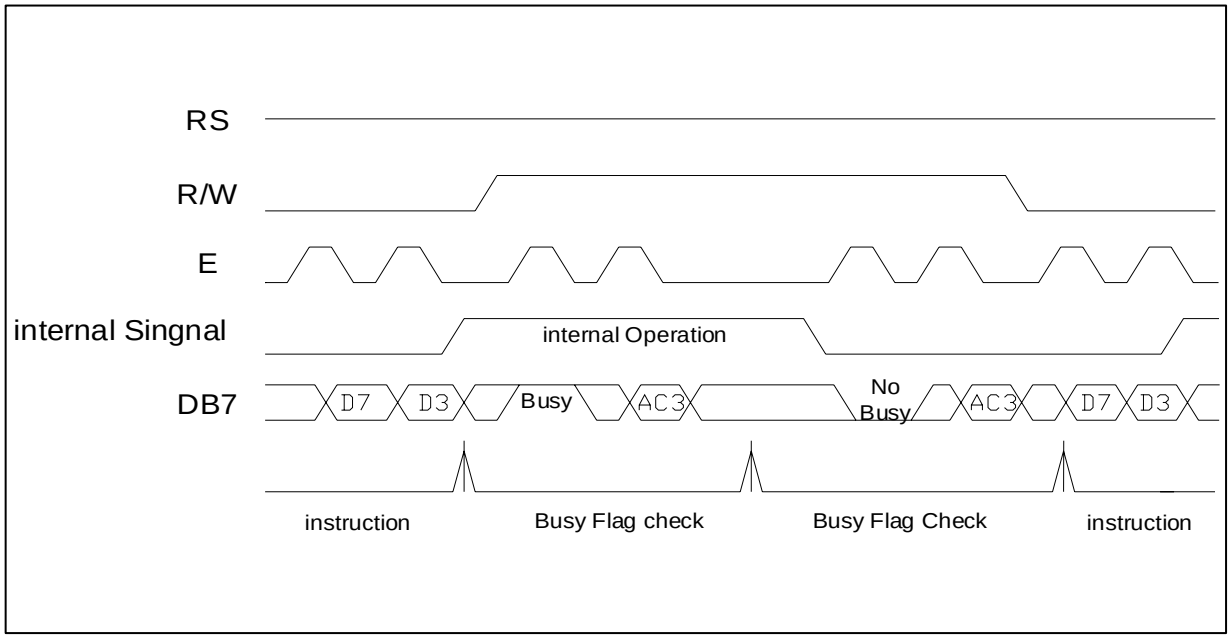
Example of 8-bit bus mode timing diagram

11.2Interface with 4-bit MPU

When interfacing data length are 4-bit, only 4 ports, from DB4 to DB7, are used as data bus.

At first, higher 4-bit (in case of 8-bit bus mode, the contents of DB4 to DB7) are transferred, and then the lower 4-bit (in case of 8-bit bus mode, the contents of DB0 to DB3) are transferred. So transfer is performed in two parts. Busy flag outputs"1"after the second transfer are ended.

Example of timing sequence is shown below.



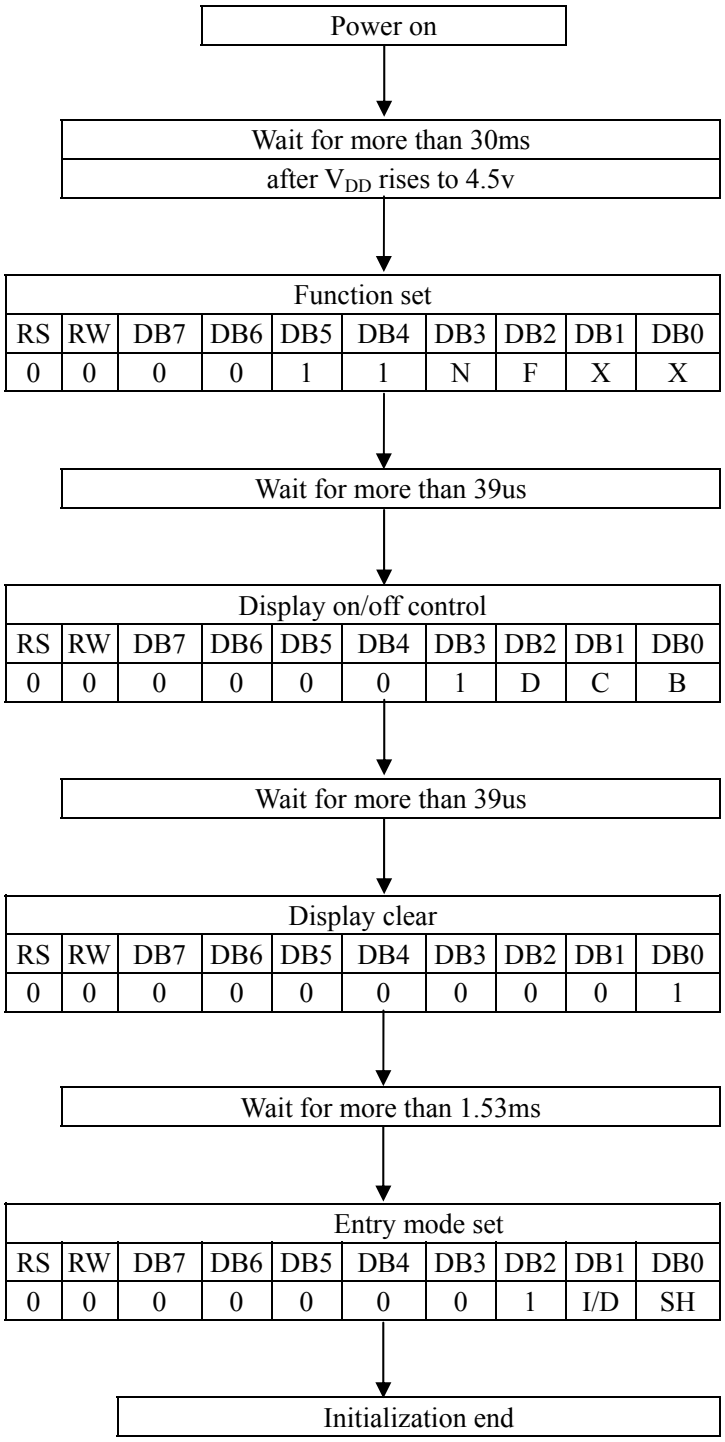
Example of 4-bit bus mode timing diagram

12. STANDARD CHARACTER PATTERN (S6A0069-22)

Upper(4bit) / Lowerr(4bit)	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)															
LLLH	(2)															
LLHL	(3)															
LLHH	(4)															
LHLL	(5)															
LHLH	(6)															
LHHL	(7)															
LHHH	(8)															
HLLL	(1)															
HLLH	(2)															
HLHL	(3)															
HLHH	(4)															
HHLL	(5)															
HHLH	(6)															
HHHL	(7)															
HHHH	(8)															

13. LCM INITIALIZING BY INSTRUCTION

13-1. 8-bit interface mode



Condition : fosc=270khz

N	0	1-line mode
	1	2-line mode

F	0	5 x 8 dots
	1	5 x 11 dots

D	0	display off
	1	display on

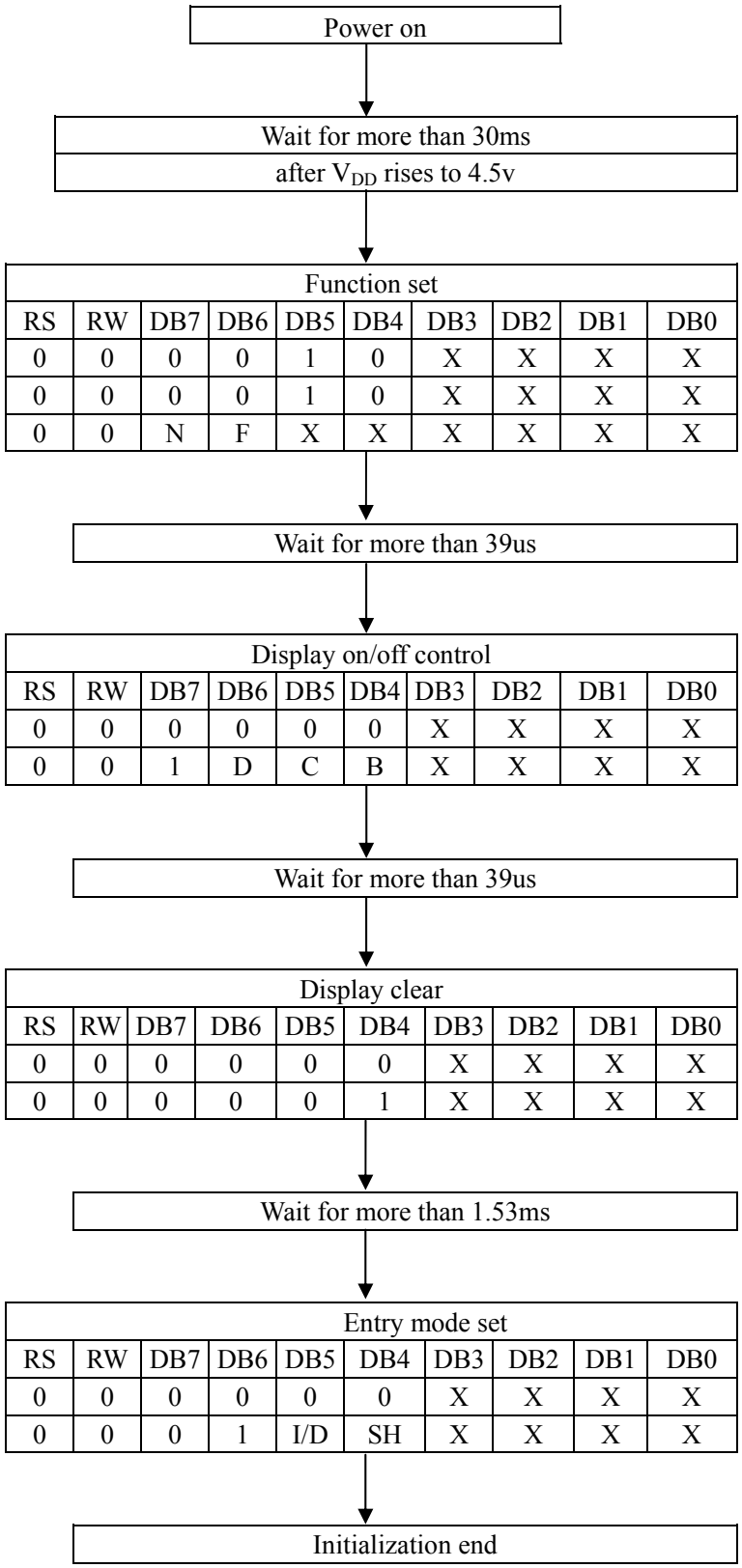
C	0	cursor off
	1	cursor on

B	0	blink off
	1	blink on

I/D	0	decrement mode
	1	increment mode

SH	0	entire shift off
	1	entire shift on

13-2. 4-bit interface mode



Condition : fosc=270khz

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	X	X	X	X
0	0	0	0	1	0	X	X	X	X
0	0	N	F	X	X	X	X	X	X

N	0	1-line mode
	1	2-line mode
F	0	5 x 8 dots
	1	5 x 11 dots

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	1	D	C	B	X	X	X	X

D	0	display off
	1	display on
C	0	cursor off
	1	cursor on
B	0	blink off
	1	blink on

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	1	X	X	X	X

RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	1	I/D	SH	X	X	X	X

I/D	0	decrement mode
	1	increment mode
SH	0	entire shift off
	1	entire shift on

14. LCD MODULES HANDLING PRECAUTIONS

- Please remove the protection foil of polarizer before using.

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.

- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

15. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.

- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.

- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections