DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 16216 SYH-LY-CYR22

Product   specification   *Version :1*

22/Feb/2006

GENERAL SPECIFICATION

MODULE NO. :
DEM 16216 SYH-LY-CYR22

CUSTOMER   P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	ORIGINAL VERSION	17/02/2006
1	CHANGED LCD AND DDRAM	22/02/2006

PREPARED BY : HZZ   DATE: 22/02/2006

APPROVED BY: MH   DATE: 09/05/2006

CONTENTS

1. FUNCTIONS & FEATURES

- LCD type :

MODULE	LCD TYPE	REMARK
DEM 16216 SYH-LY-CYR22	STN Yellow Green Transflective Positive Mode	Cyrillic Character Font

- Viewing Direction   : 6 o'clock
- Driving Scheme   : 1/16 Duty Cycle, 1/5 Bias
- Backlight   : LED (Yellow/Green, Lightbox)
- Power Supply Voltage   : 5.0 Volt (typ.)
- V_{LCD} Adjustable For Best Contrast   : 4.5 Volt (typ.)
- Display contents   : 16 x 2 Characters (5 x 8 dots, Format : 192 Kinds)
- Internal Memory   : CGROM (10,080 bits)
                            : DDRAM (64 x 8 bits)
- CGROM   : CGROM for the S6A0069-22 (Cyrillic)
- Interface   : Easy Interface with a 4-bit or 8-bit MPU

2. MECHANICAL SPECIFICATIONS

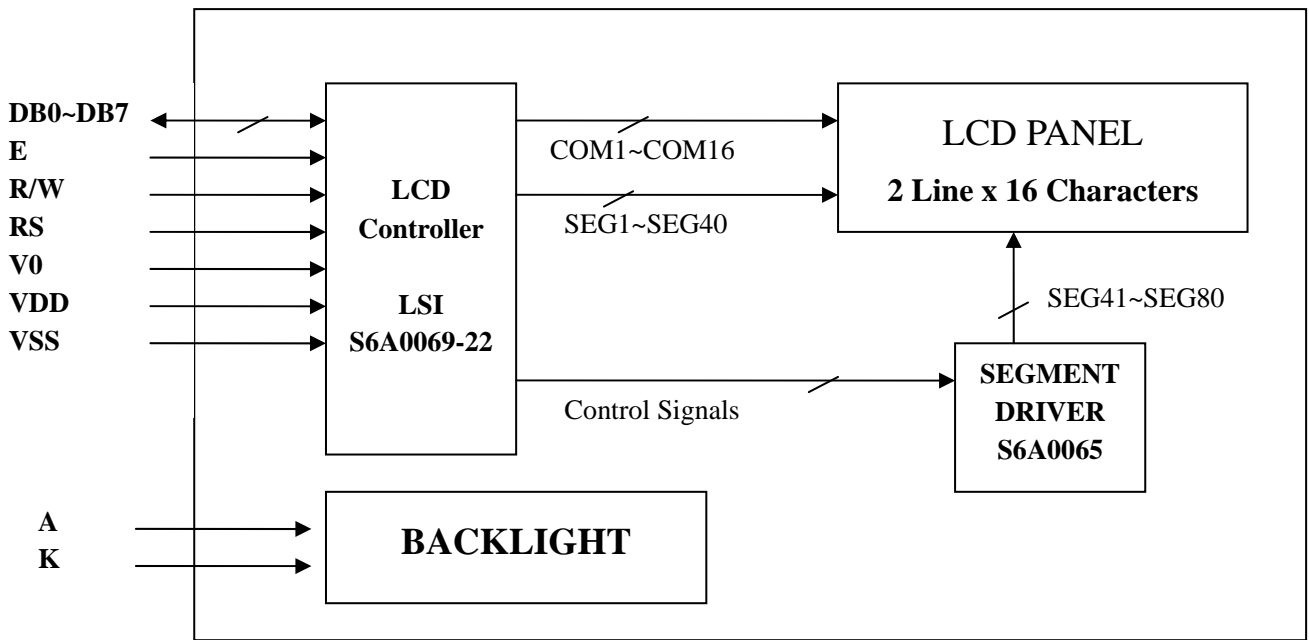- Module Size   : 80.0 x 36.0 x 11.9 mm (max.)
- Character Pitch   : 3.55 x 5.95 mm
- Character Size   : 2.95 x 5.55 mm
- Character Font   : 5 x 8 dots
- Dot Size   : 0.55 x 0.65 mm
- Dot Pitch   : 0.60 x 0.70 mm
- Dot Gap   : 0.05 mm

3. EXTERNAL DIMENSIONS
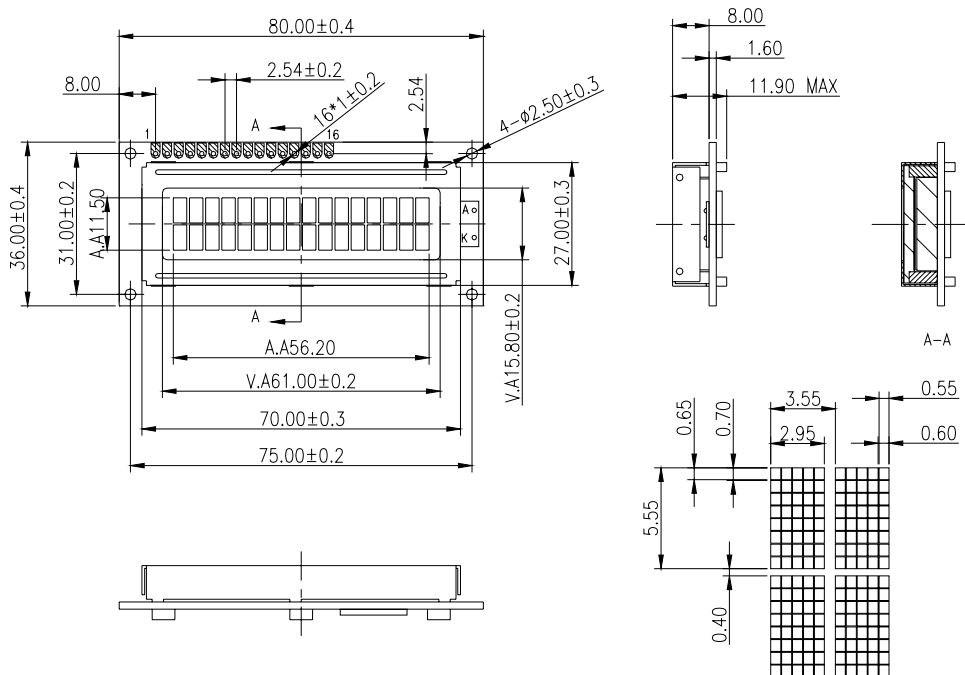
REMARKS:
1,UNMARKED TOLERANCE IS ±0.4,
2,THE MATERIALS COMPLY WITH ROHS.

4. BLOCK DIAGRAM

5. PIN ASSIGNMENT

Pin No.	Symbol	Function
1	VSS	Ground terminal of module.
2	VDD	Supply 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	Enable
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)	Please also refer to 6. PCB drawing and description.

6. PCB DRAWING AND DESCRIPTION
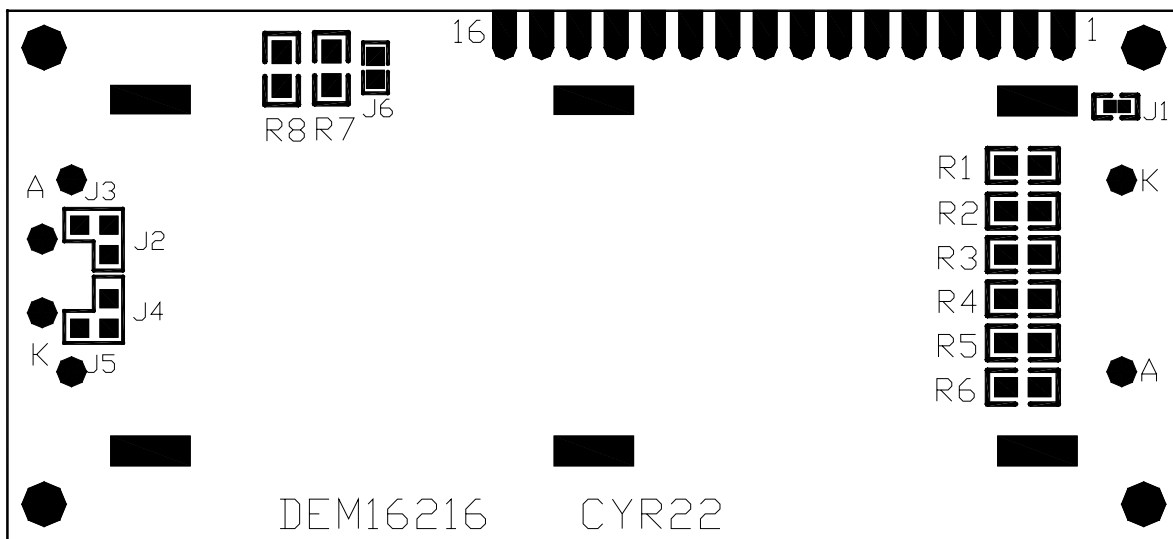
6.1 DESCRIPTION:

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

※ in application module, J3=J5=closed, J2=J4=open

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

※ In application module, J1=closed

6-1-3. The mounting holes are set on ground when the J7 is closed.

※ In application module, J7=closed

6-1-4.The LED resistor can be bridged when the J6 is closed.

※ In application module, J6=open

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

※ In application module, R7=10 Ohm, R8=Open

6.2 Example application

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

R8

R7

J6
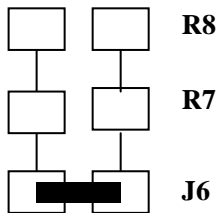
6-2-2. The 15 pin is the anode and the 16 pin is the cathode as following.

J3

J2

J5

J4

6-2-3.The 15 pin is the cathode and the 16 pin is the anode as following.

J3

J2

J5

J4

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

J1

6.3 The module No.   DEM16216   and   CYR22   is printed on the PCB.

16   1

A   K

K   A

DEM16216   CYR22
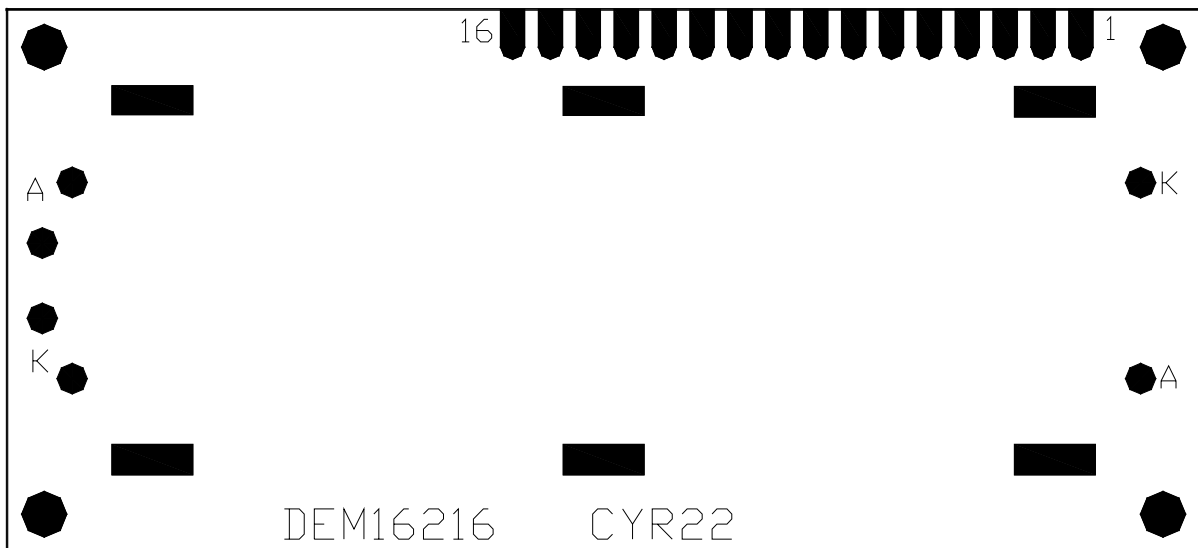
7. BACKLIGHT & SWITCH(Ta-20~+70°C)

7.1 Backlight (Yellow-Green – Lightbox)

Item	Symbol	Standard Value	Unit	Applicable Terminal
Backlight Voltage	V	~ 5.0	V	LED+ / LED-
Backlight Current	I	~ 97	mA	

NOTES:
1. FORWARD VOLTAGE 4.2V
2. FORWARD CURRENT 150 mA
3. LUMINOUS INTENSITY 250cd/m2
4. COLOR IS Yellow-Green.
UNSPECIFIED TOLERANCE IS ±0.25
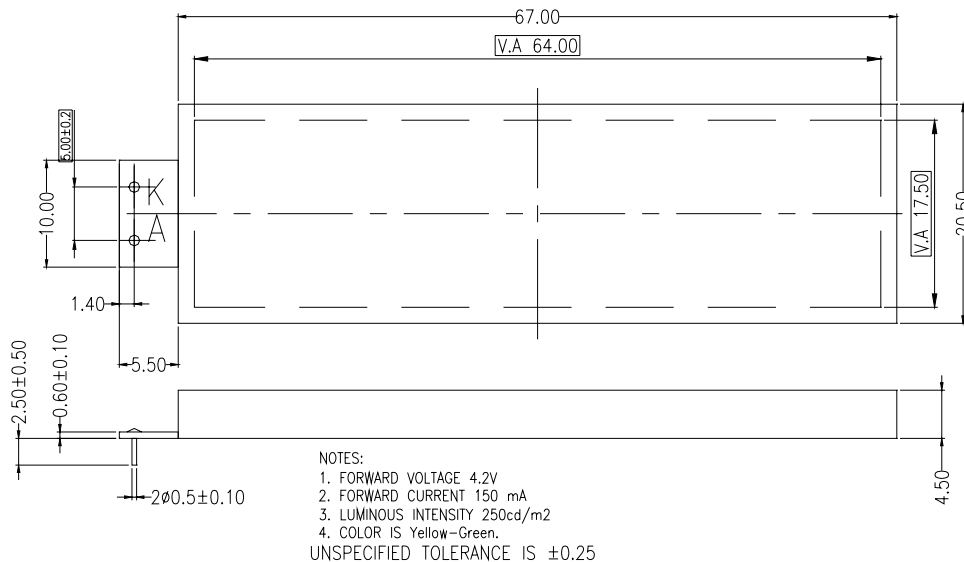
8. DISPLAY DATA RAM (DDRAM)
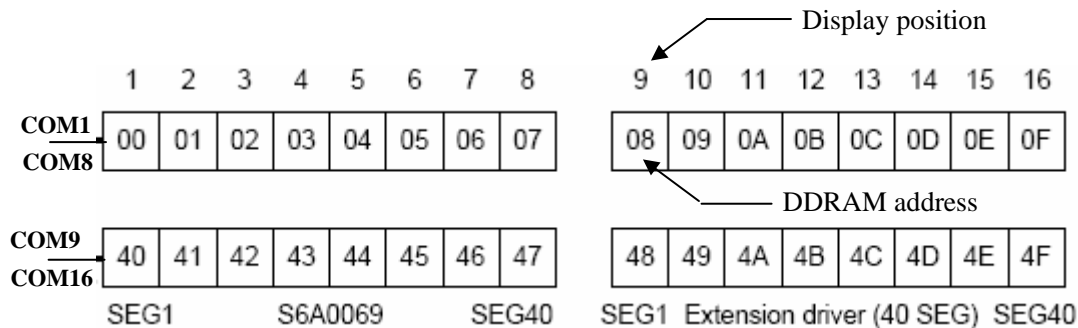
9. MAXIMUM ABSOLUTE POWER RATINGS

Item	Symbol	Standard value	Unit
Power supply voltage(1)	V_{DD}	-0.3~+7.0	V
Power supply voltage(2)	V_{LCD}	V_{DD}-15.0~V_{DD}+0.3	V
Input voltage	V_{IN}	-0.3~V_{DD}+0.3	V
Operating temperature	T_{opr}	-20~+70	°C
Storage temperature	T_{stg}	-25~+75	°C

10. ELECTRICAL CHARACTERISTICS

10 -1 DC Characteristics(VDD=4.5V~5.5V,Ta=-20~+70℃)

Item	Symbol	Standard Value			Test Condition	Unit
		MIN	TYP	MAX		
Operating Voltage	V_{DD}	4.5	5.0	5.5	-------	V
Supply Current	I_{DD}	----	TBD	----		
LCD Driving Voltage	V_{LCD}	3.0	4.5	13	$V_{DD}-V_5$(1/5Bias)	V

10-2 AC Characteristics (VDD=4.5V~5.5V, Ta=-20~70℃)

10-2-1. Write mode

Characteristic	Symbol	Min	Type	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
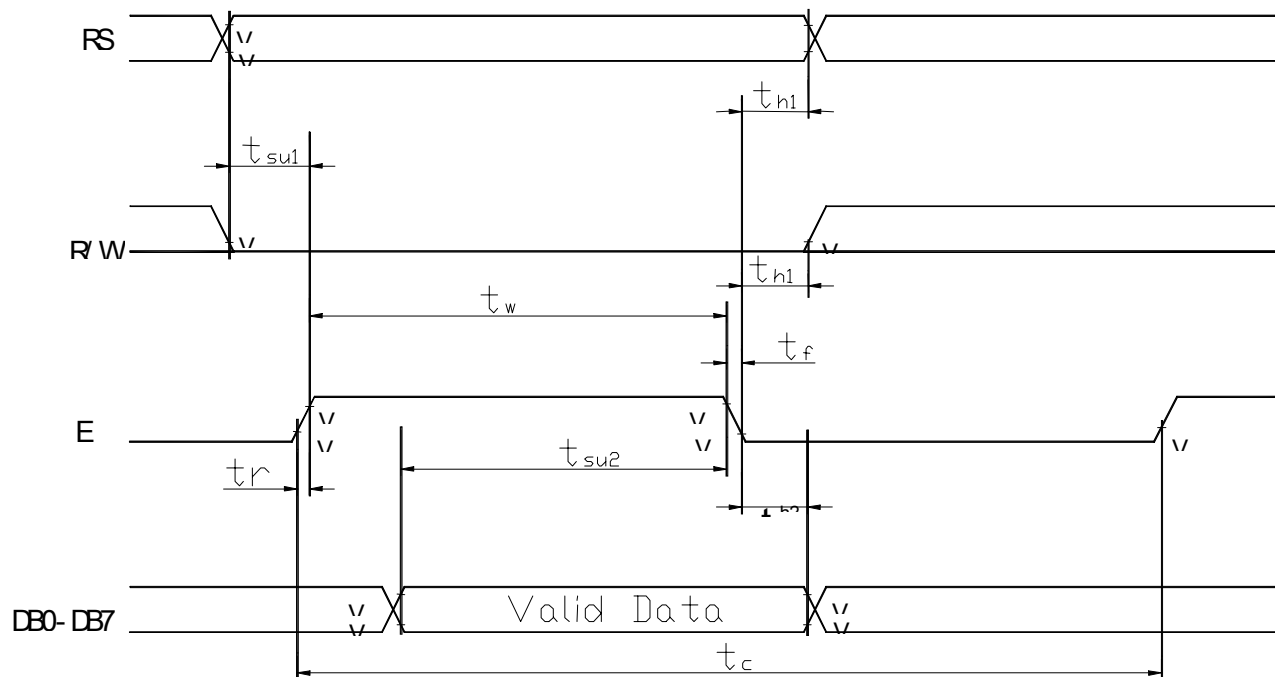
10-2-2.Read mode

Characteristic	Symbol	Min	Type	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_{DH2}	5	---	---	ns	DB0~DB7
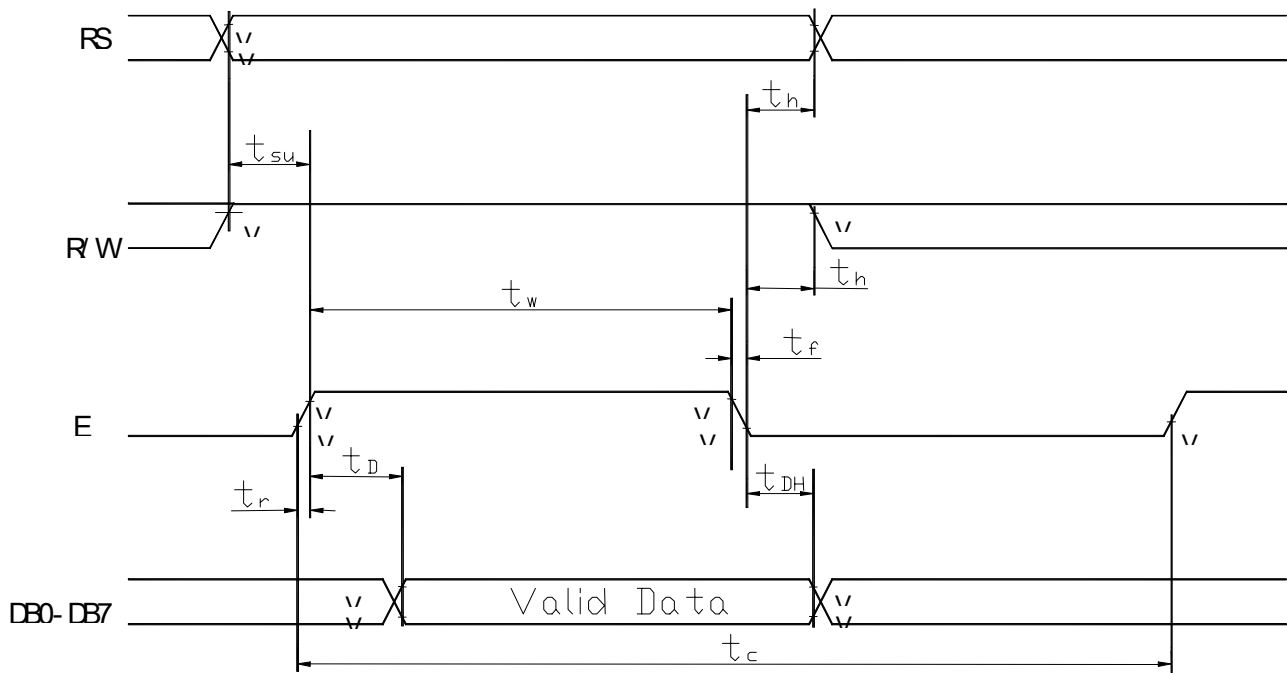
11. CONTROL AND DISPLAY COMMAND

Instruction	Instruction Code										Description Instruction Code	Execution time (fosc= 270kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM and set DDRAM address to "00H" from AC.	1.53 ms
Return Home	0	0	0	0	0	0	0	0	1	X	Set DDRAM address to "00H"from AC and return cursor to its original position if shifted.	1.53ms
Entry Mode set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39us
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor(C), and blinking of cursor (B) on/off control bit.	39us
Cursor or Display shift	0	0	0	0	0	1	S/C	R/L	X	X	Set cursor moving and display shift control bit, and the direction without changing of DRAM data.	39us
Function set	0	0	0	0	1	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:0 5 x 8 dots; F:1 5 x 11 dots)	39us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39us
Set CGRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39us
Read busy flag and address	0	1	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	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43us
Read data to RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data into internal RAM (DDRAM/CGRAM).	43us

NOTE: when you make an MPU program with checking the busy flag (DB7), it must be necessary 1/2 Fosc for executing the next instruction by the falling edge of the 'E' signal after the Busy Flay (DB7) goes to "0"

12. LCM INITIALIZING BY INSTRUCTION

12-1. 8-bit interface mode

Power on

↓

Wait for more than 30ms
after V_{DD} rises to 4.5v

Condition: fosc=270khz

↓

Function set

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

N	0	1-line mode
	1	2-line mode

F	0	5 x 8 font
	1	5 x 11 font

↓

Wait for more than 39us

↓

Display on/off control

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

D	0	display off
	1	display on

C	0	cursor off
	1	cursor on

↓

Wait for more than 39us

B	0	blink off
	1	blink on

↓

Display clear

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

↓

Wait for more than 1.53ms

I/D	0	decrement mode
	1	increment mode

↓

Entry mode set

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

SH	0	entire shift off
	1	entire shift on

↓

Initialization end

12-2. 4-bit interface mode

Power on

↓

Wait for more than 30ms after V$_{DD}$ rises to 4.5v
Wait for more than 40ms after V$_{DD}$ rises to 2.7v

Condition: fosc=270khz

↓

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

DL	0	4-bit mode
	1	8-bit mode
N	0	1-line mode
	1	2-line mode
F	0	5 x 8 font
	1	5 x 11 font

↓

Wait for more than 39us

↓

Display on/off control									
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

↓

Wait for more than 39us

↓

Display clear									
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

↓

Wait for more than 1.53ms

↓

Entry mode set									
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

↓

Initialization end

13. CHARACTER GENERATOR ROM (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)			0	@	P	·	p			Б	Ю	Ч	.		
LLLH	(2)	!		A	Q	a				Г	Я	Ц	I		
LLHL	(3)			2	B	R	b				Е	Ь	U		
LLHH	(4)	#	3	C	S	c					И	Н				
LHLL	(5)		4	D	T	d	t			Й	Л		6		
LHLH	(6)		5	E	U	e	U				Н				
LHHL	(7)		6	F	V	f	V								
LHHH	(8)		7	G	W	g	W								
HLLL	(1)		8	H	X		X								
HLLH	(2)		9	I	Y	i									
HLHL	(3)		:	J	Z	j									
HLHH	(4)			K											
HHLL	(5)														
HHLH	(6)			M											
HHHL	(7)			N											
HHHH	(8)			O											

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