DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 16217 SYH-LY

Product Specification ***Version : 5.1.4***

06/May/2010

GENERAL SPECIFICATION

MODULE NO :

DEM 16217 SYH-LY

CUSTOMER P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	ORIGINAL VERSION	10.02.2001
1	ADDING VERSION	20.02.2001
2	ADDING VERSION	12.06.2001
3	CANCEL VERSION	15.08.2001
4	ADDING VERSION	11.03.2003
5	CANCEL VERSION	26.03.2003
5.1.1	CHANGE IC	03.12.2007
5.1.2	UPDATE PCB DESCRIPTION	05.02.2009
5.1.3	UPDATE BACKLIGHT DESCRIPTION	07.04.2009
5.1.4	UPDATE PCB DRAWING	06.05.2010

PREPARED BY: LX DATE: 06.05.2010

APPROVED BY: MHO DATE: 06.05.2010

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1. FUNCTIONS & FEATURES

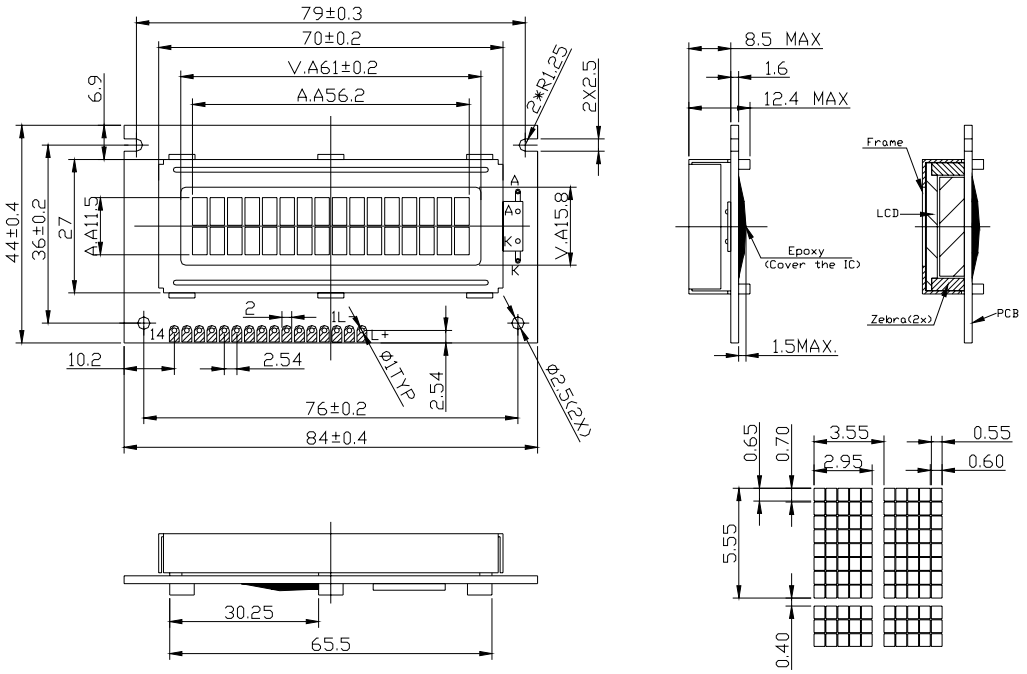
MODULE NAME	LCD TYPE
DEM 16217 SYH-LY	STN Green Transflective Positive Mode

- Viewing Direction : 6 o'clock
- Driving Scheme : 1/16 Duty Cycle, 1/5 Bias
- Power Supply Voltage : 5.0 Volt (typ.)
- VLCD Adjustable For Best Contrast : 4.5V (typ.)
- Display Format : 16 x 2 Characters (5x8 dots, Format : 192 Kinds)
- Backlight : LED, Yellow-Green, Lightbox
- Internal Memory : CGROM (8,320 bits)
  : CGRAM (64 x 8 bits)
  : DDRAM (80 x 8 bits for 80 Digits)
- CGROM : CGROM of the ST7066U-0A-B (Sitronix)
- Interface : Easy Interface with a 4-bit or 8-bit MPU
- Operating Temperature : -20°C to +70°C
- Storage Temperature : -30°C to +80°C

2. MECHANICAL SPECIFICATIONS

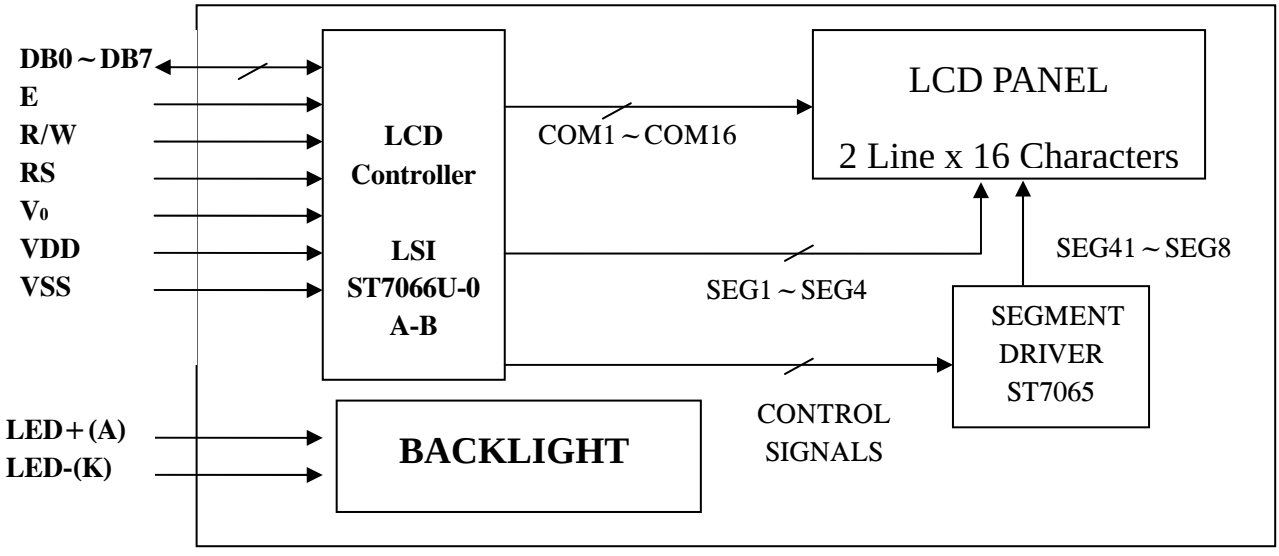
- Module Size : 84.00 x 44.00 x 12.4 mm
- Character Pitch : 3.55 x 5.95 mm
- Character Size : 2.95 x 5.55 mm
- Character Font : 5 x 8 dots
- Dot Size : 0.55 x 0.65 mm
- Dot Pitch : 0.60 x 0.70 mm
- Dot Gap : 0.05 mm

3. EXTERNAL DIMENSIONS (unit: mm)



Remarks:
UNMARKED IS TOLERANCE ±0.5mm.
All MATERIAL comply with RoHs.

4. BLOCK DIAGRAM

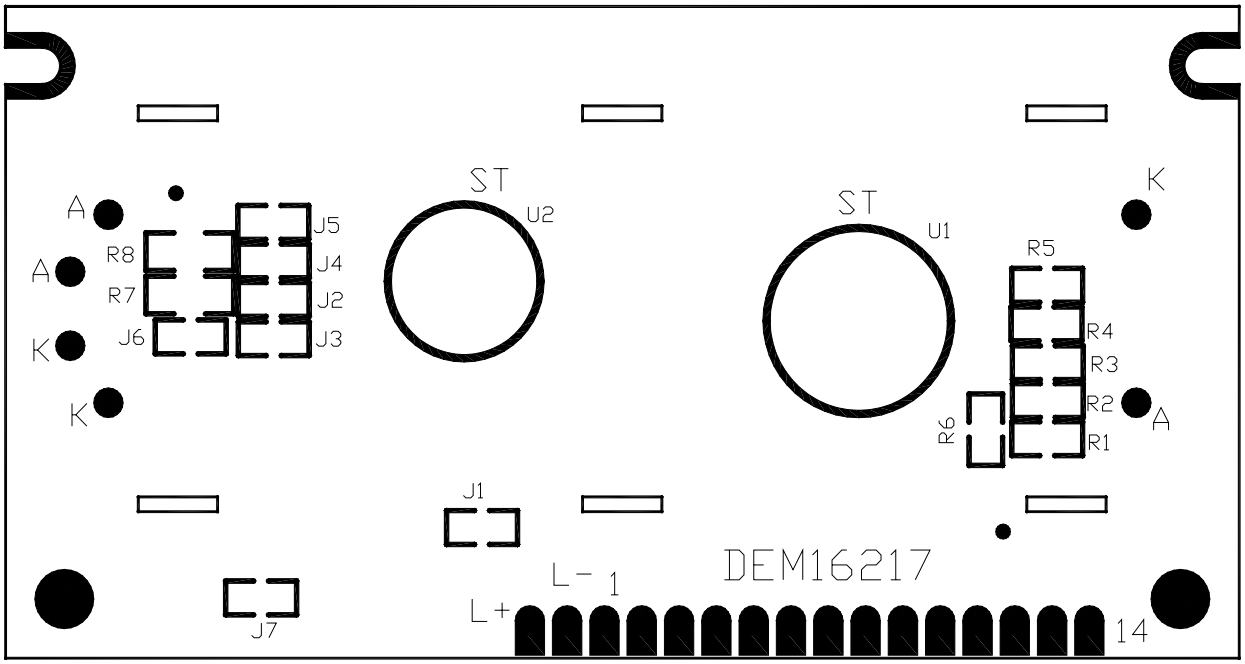


5. PIN ASSIGNMENT

Pin No.	Symbol	Function
1	VSS	Ground terminal of module.
2	VDD	Supply terminal of module 2.7V to 5.5V(option 5.0V).
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	
L-	LED – (K)	Please also refer to 6.1 PCB drawing and description.
L+	LED + (A)	Please also refer to 6.1 PCB drawing and description.

6. PCB DRAWING AND DESCRIPTION

PCB Drawing



Note: The part no. DEM16217 is printed on the PCB.

DESCRIPTION:

6-1-1.The polarity of the pin L- and the pin L+:

LED Polarity(1)	
L- Pin	L+Pin
Anode	Cathode
J3=J5=open J2=J4=closed	

LED Polarity(2)	
L- Pin	L+ Pin
Cathode	Anode
J3=J5= closed J2=J4= open	

Note: In application module, J2=J4= open and J3=J5=closed

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

Note: In application module, J1=0 Ω

6-1-3. The mounting-holes should on ground when the J7 is close.

Note: In application module, J7=0 Ω

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

Note: In application module, J6=open

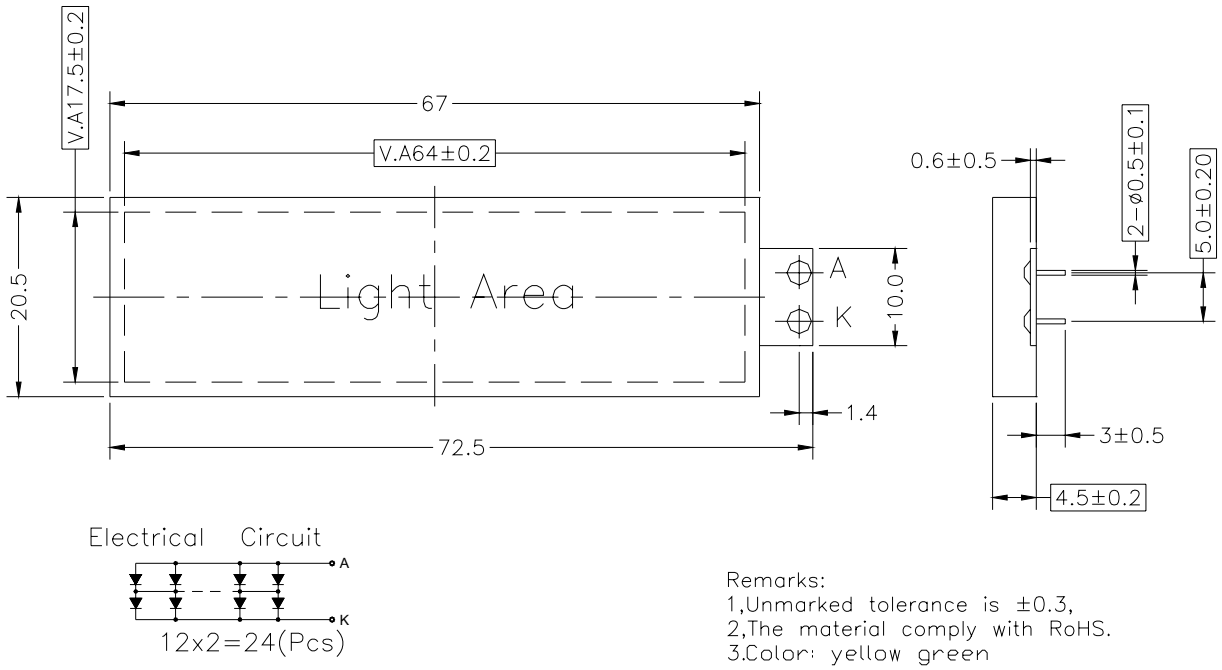
6-1-5.The R7 and the R8 are the LED resistor.

Note: R7=8.2 Ω, R8=open

7. BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATIONS

	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Forward Voltage	V_f	--	4.2	4.6	V	If = 150 mA
Forward Current	I_f	--	150	240	mA	
Power Disdipation	P_d	--	0.63	--	W	If = 150 mA
Reverse Voltage	V_R	--	10.0	--	V	
Reverse Current	I_R	--	0.2	--	mA	
Luminous Intensity	I_V	180	240	360	cd/m ^{2}	If = 150 mA
Luminous Uniformity	Lv	70	--	--	%	If = 150 mA
Emission Wavelength	λ_P	569	572	575	nm	If=10mA Ta=25° C
Spectral Range	$\Delta\lambda$	--	30	--	nm	Each chip

	SYMBOL	RATINGS
Operating Temperature	Topr	-20° C to +75° C
	Tsty	-30° C to +80° C



Electrical Circuit

12x2=24(Pcs)

Remarks:
1,Unmarked tolerance is ±0.3,
2,The material comply with RoHS.
3.Color: yellow green

8. DISPLAY DATA RAM (DDRAM)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	←DISPLAY POSITION
FIRST LINE	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	← DDRAM ADDRESS
SECOND LINE	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	

9. MAXIMUM ABSOLUTE POWER RATINGS (Ta=25°C)

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	T_{opr}	-20~+70	°C
Storage temperature	T_{stg}	-30~+80	°C

*Voltage greater than above may damage to the Circuit.

VDD > V1 > V2 > V3 > V4 > V5

10. ELECTRICAL CHARACTERISTICS

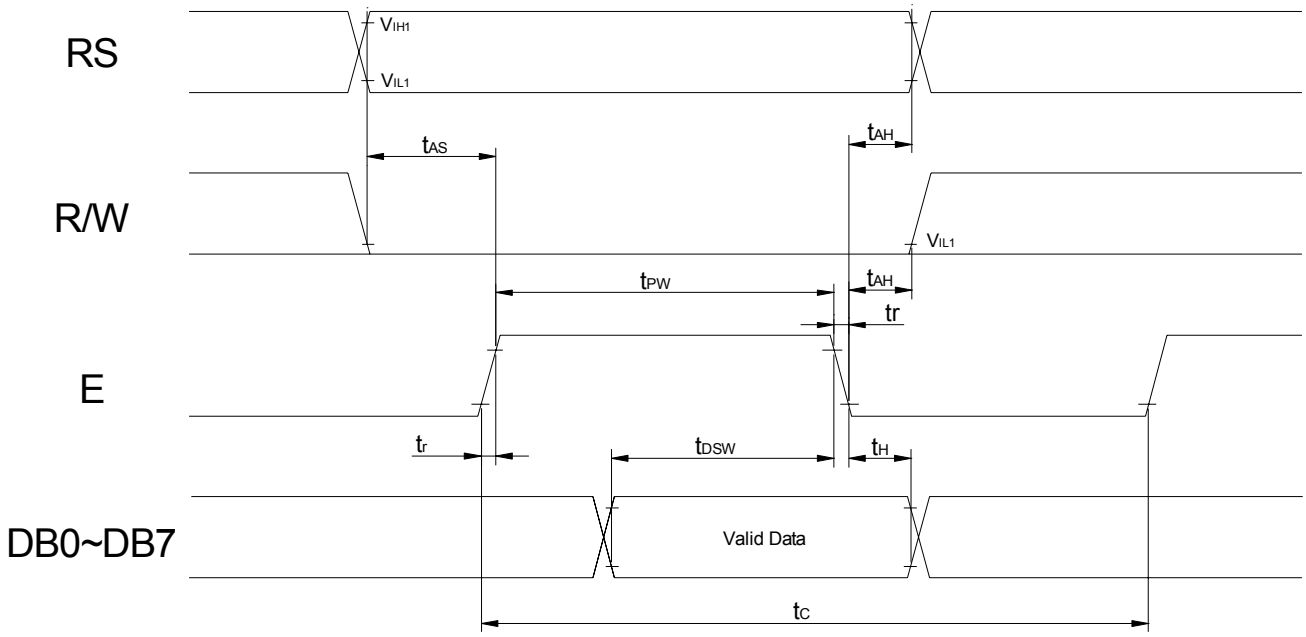
10-1 DC Characteristics (V_{DD}=4.5V~5.5V,Ta=-20~+70°C)

Item	Symbol	Standard Value			Test Condition	Unit
		MIN	TYP	MAX		
Operating Voltage	V_{DD}	4.5	5	5.5	-------	V
LCD Driving Voltage	V_{LCD}	3.0	4.5	13.0	V_{DD}-V_5	V
Supply Current	I_{DD}	----	0.35	0.6	V_{DD}=5V,fosc=270kHz	mA

10-2 AC Characteristics (V_{DD}=4.5V~5.5V , Ta=-20~+70°C)

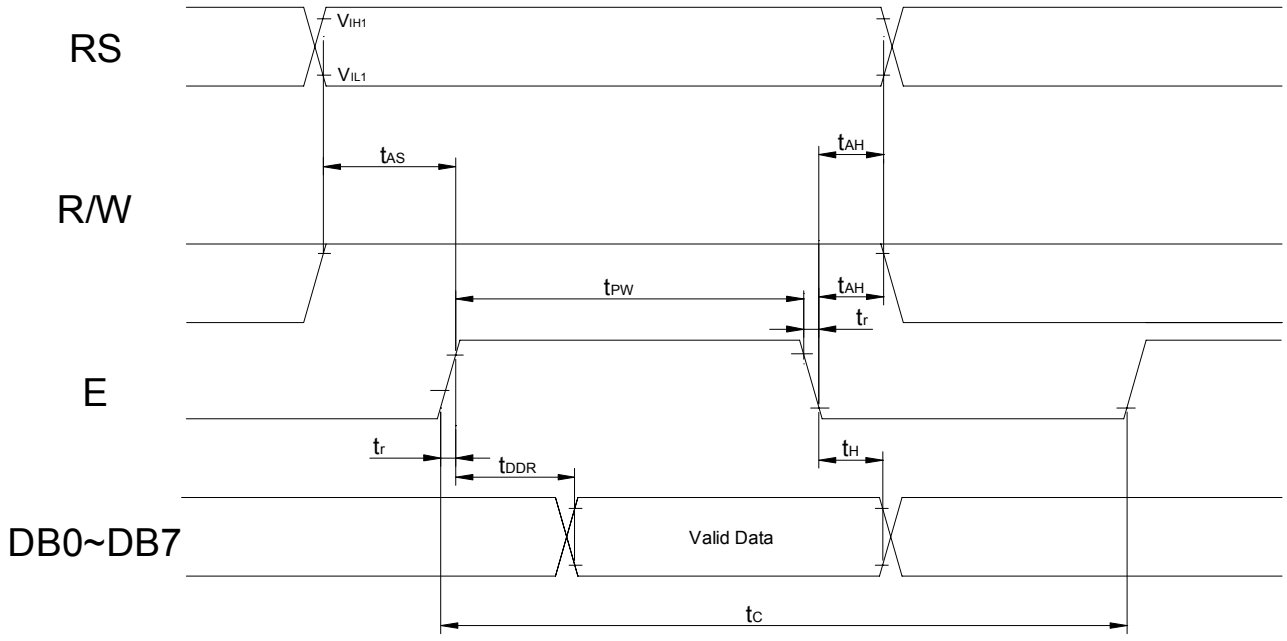
10-2-1 Write mode (writing data from MPU to module)

Characteristic	Symbol	Min	Type	Max	Unit	Test PIN
E Cycle Time	t_C	1200	---	---	ns	E
E Rise Time	t_R	---	---	25	ns	E
E Fall Time	t_F	---	---	25	ns	E
E Pulse width	t_W	140	---	---	ns	E
Address Setup Time	t_{SU1}	0	---	---	ns	R/W,RS,E
Address Hold Time	t_{H1}	10	---	---	ns	R/W,RS,E
Data Set-up Time	t_{SU2}	40	---	---	ns	DB0~DB7
Data Hold Time	t_{H2}	10	---	---	ns	DB0~DB7



10-2-2 Read Mode (Reading Data from module to MPU)

Characteristic	Symbol	Min	Type	Max	Unit	Test PIN
E Cycle Time	t_C	1200	---	---	ns	E
E Rise Time	t_R	---	---	25	ns	E
E Fall Time	t_F	---	---	25	ns	E
E Pulse width	tp_W	140	---	---	ns	E
Address Setup Time	t_{AS}	0	---	---	ns	R/W,RS,E
Address Hold Time	t_{AH}	10	---	---	ns	R/W,RS,E
Data Setup Time	t_{DDR}	---	---	100	ns	DB0~DB7
Data Hold Time	t_H	10	---	---	ns	DB0~DB7



11. CONTROL AND DISPLAY COMMAND

Command	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Execution time (fosc=270KHz)	Remark
Clear Display	0	0	0	0	0	0	0	0	0	1	1.52ms	Write"20H" to DDRAM. And set DDRAM address to "00H" from AC
Return home	0	0	0	0	0	0	0	0	1	x	1.52ms	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.
Entry mode Set	0	0	0	0	0	0	0	1	I/D	S	37us	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.
Display on/off control	0	0	0	0	0	0	1	D	C	B	37us	D=1: entire display on C=1: cursor on B=1: cursor position on
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	37us	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.
function Set	0	0	0	0	1	DL	N	F	x	x	37us	DL: interface data is 8/4 bits N: number of line is 2/1 F: font size is 5x11/5x8
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	37us	Set CGRAM address in address counter
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	37us	Set DDRAM address in address counter
Read busy flag& address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	0us	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	37us	Write data into internal RAM (DDRAM/CGRAM)
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	37us	Read data from internal RAM (DDRAM / CGRAM)

Note:

Be sure the ST7066U is not in the busy state (BF=00 before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to instruction table for the list of each instruction execution time.

12. STANDARD CHARACTER PATTERN (ST7066U-0A-B)

Upper(4bit) / Lower(4bit)	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	10010	1011	1100	1101	1110	1111
0000	CG RAM (1)															
0001	(2)															
0010	(3)															
0011	(4)															
0100	(5)															
0101	(6)															
0110	(7)															
0111	(8)															
1000	(1)															
1001	(2)															
1010	(3)															
1011	(4)															
1100	(5)															
1101	(6)															
1110	(7)															
1111	(8)															

13. 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.

14. 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