

**DISPLAY Elektronik GmbH**

# DATA SHEET

**LCD MODULE**

**DEM 08171 SBH-PW-N**

*Product Specification*

*Version : 4*

**07.03.2013**

# GENERAL SPECIFICATION

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MODULE NO. :

# DEM 08171 SBH-PW-N

CUSTOMER P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	Original Version	05.09.2012
1	Add Version	07.09.2012
2	Print P/N on the PCB	13.09.2012
3	Change PCB	23.02.2013
4	Change PCB	07.03.2013

PREPARED BY: LL

DATE: 07.03.2013

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DATE: 07.03.2013

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**1. FUNCTIONS & FEATURES**

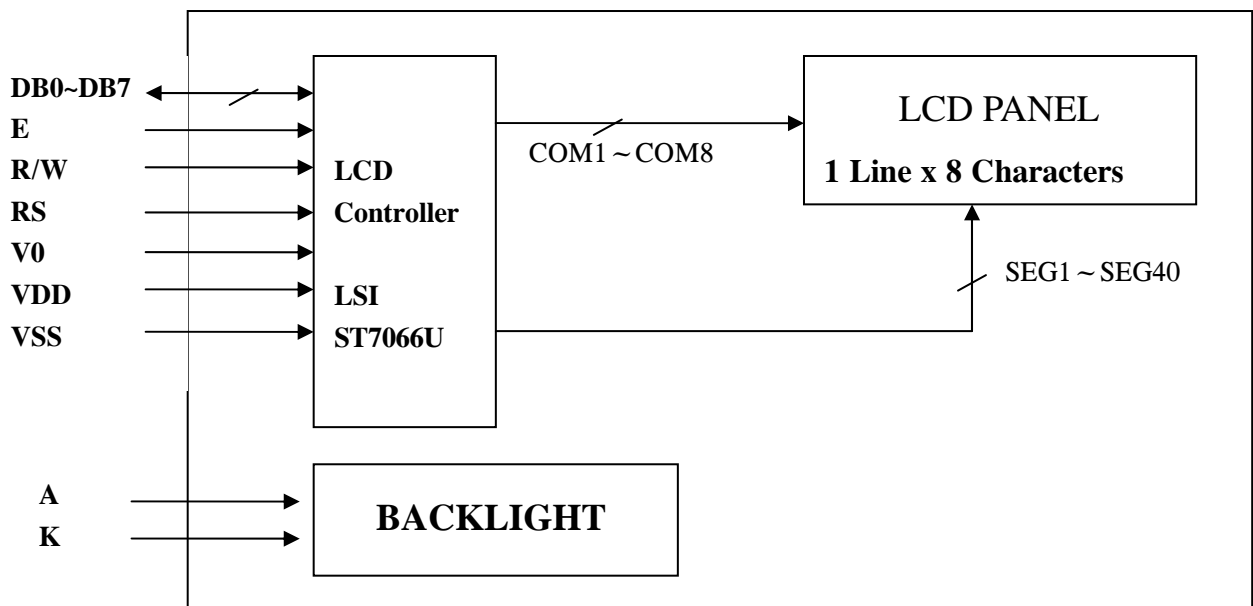
MODULE NAME	LCD TYPE
DEM 08171 SBH-PW-N	STN-BLUE Transmissive Negative Mode

- Viewing Direction : 6 o'clock
- Driving Scheme : 1/8 Duty Cycle, 1/4 Bias
- Power Supply Voltage : 5.0 Volt (typ.)
- Backlight Color : White Lightguide
- V<sub>LCD</sub> Adjustable for Best Contrast : 4.5 Volt (V<sub>DD</sub>-V<sub>0</sub>)
- Display contents : 8 x 1 Characters (5x8 dots, Format: 208 Kinds)
- Internal Memory : CGROM (10,080 bits )  
: CGRAM (64 x 8 bits )  
: DDRAM (80 x 8 bits for Digits)
- Interface : Easy Interface with a 4-bit or 8-bit MPU

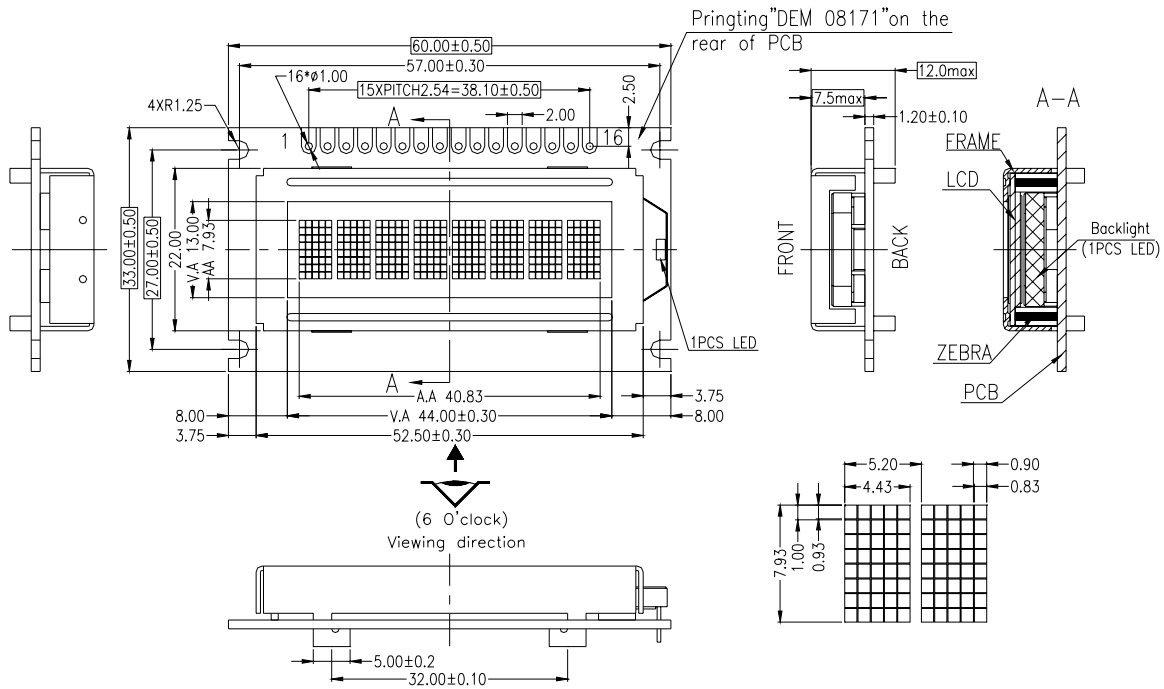
**2. MECHANICAL SPECIFICATIONS**

- Module Size : 60.00 x 33.00 x 12.00 mm
- Character Pitch : 5.20 x 7.93 mm
- Character Size : 4.43 x 7.93 mm
- Character Font : 5 x 8 dots
- Dot Size : 0.83 x 0.93 mm
- Dot Pitch : 0.90 x 1.00 mm
- Dot Gap : 0.07 mm

**3. BLOCK DIAGRAM**



4. EXTERNAL DIMENSIONS



Remarks:

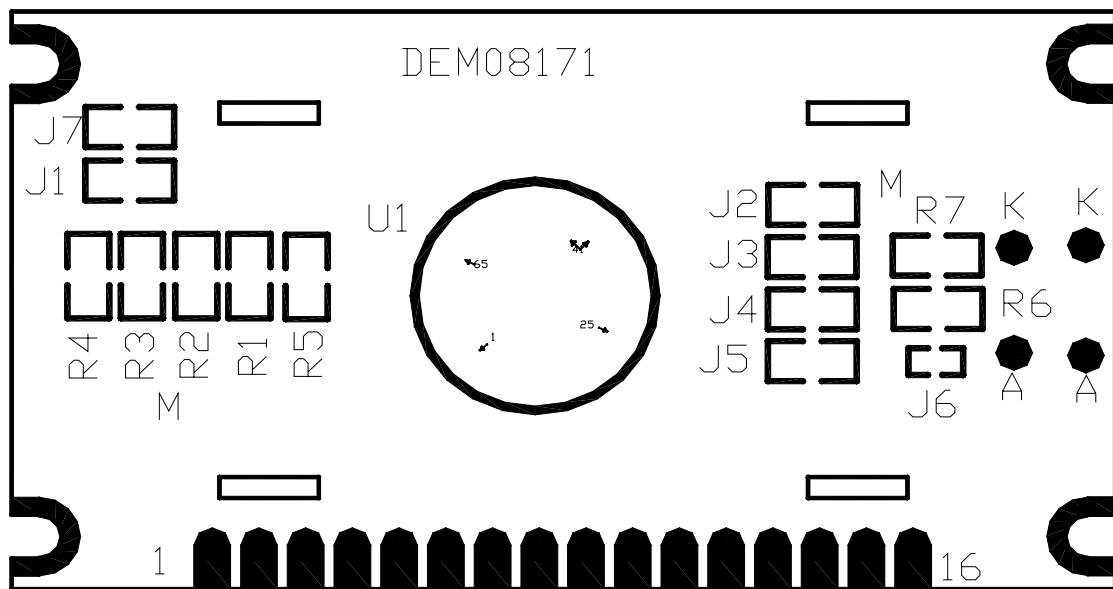
1. Unmarked tolerance is ±0.3
2. All materials comply with RoHs
3.  ...:critical dimension.

5. PIN ASSIGNMENT

Pin No.	Symbol	Function
1	V <sub>SS</sub>	Ground
2	V <sub>DD</sub>	Power supply
3	V <sub>0</sub>	Power Supply for LCD
4	RS	Select Display Data ("H") or Instructions ("L")
5	R/W	Read or Write Select Signal
6	E	Read/Write Enable Signal
7	DB0	Display Data Signal
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	Place also refer to 6.1 PCB Drawing and description
15	LED(K)	
16	LED(A)	

**6. PCB DRAWING AND DESCRIPTION**

TopLayer



Note: In application Module R1 ~ R4=2.2k, R5=91k.

**DESCRIPTION:**

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

J3,J5	J2, J4	LED Polarity	
		15 Pin	16 Pin
Each open	Each closed	Cathode	Anode
Each closed	Each open	Anode	Cathode

Note: In application module, J3=J5=open, J2=J4=closed ,J6=open.

**6-1-2. The J7 is metal-bezel GND to module GND and J1 is mounting holes GND to module GND.**

Note: In application module, J1 = J7=closed,

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

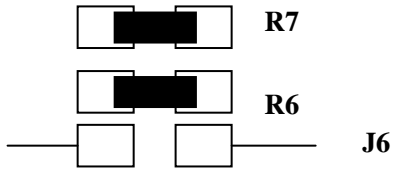
Note: In application module, J6=open

**6-1-4. The R6 and the R7 are the LED resistor.**

Note: In application module, R6=330Ω , R7=330Ω

**6.2 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.



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



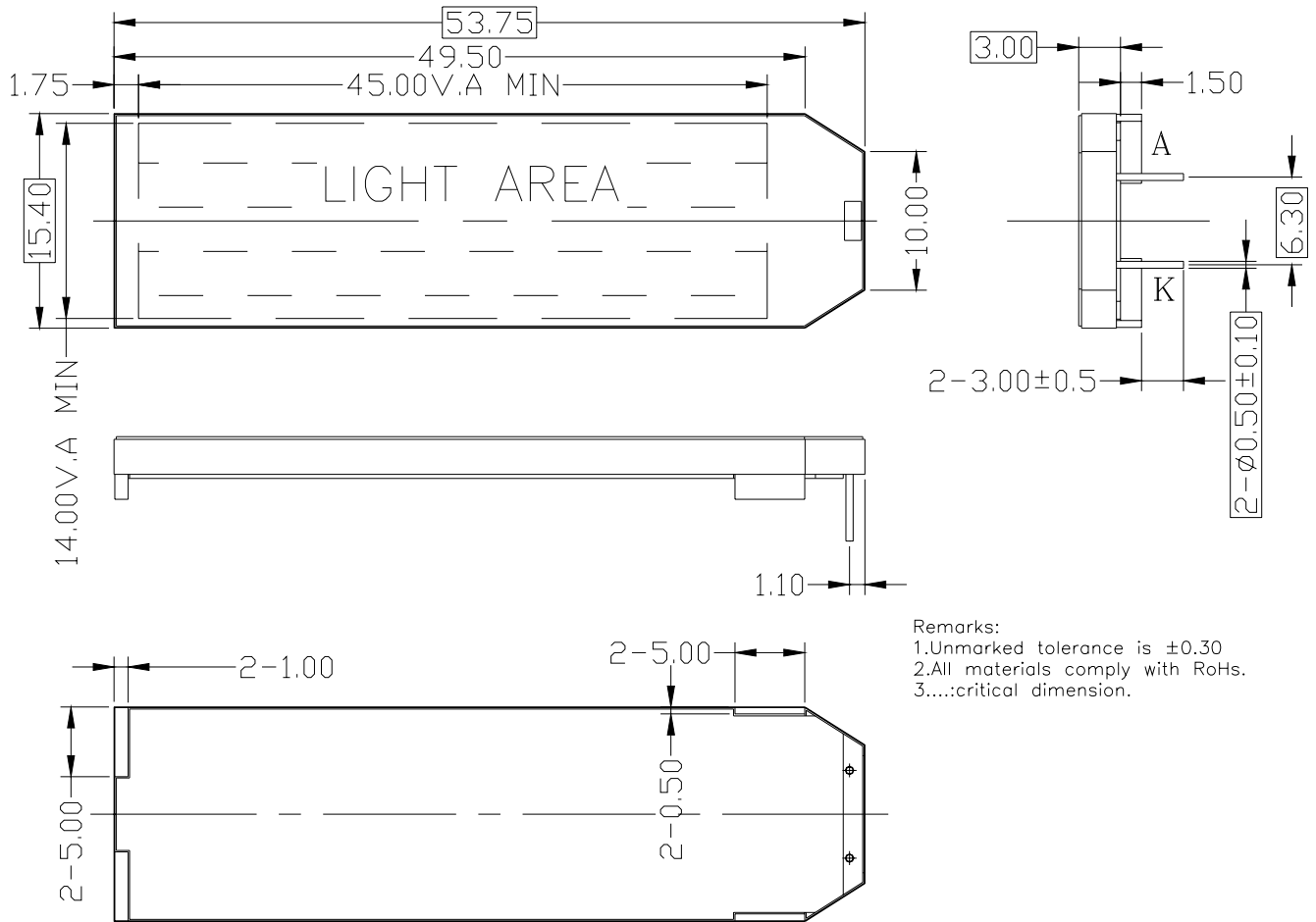
6-2-4. The metal-bezel is on ground as following.



**7. BACKLIGHT & SWITCH**

(Ta=-20~70°C)

Item	Symbol	MIN.	TYP	MAX.	Unit	Conditions
Forward Voltage	Vf	2.9	3.2	3.5	V	If= 15mA
Forward Current	If		15		mA	
Power Dissipation	Pd			0.053	W	If= 15mA
Reverse Voltage	VR			5.0	V	
Reverse Current	IR			0.1	mA	
Luminous Intensity	IV	180			cd/m <sup>2</sup>	If= 15mA
Luminous Uniformity		70			%	If= 15mA
Color Chromaticity	x	0.27		0.33		If= 15mA Ta=25°C Each chip
	y	0.27		0.34		



## 8. MAXIMUM ABSOLUTE LIMIT

Characteristics	Symbol	Value
Power Supply Voltage	VCC	-0.3 to +7.0
LCD Driver Voltage	VLCD	VCC-10.0 to VCC+0.3
Input Voltage	VIN	-0.3 to VCC+0.3
Operating Temperature	T <sub>OP</sub>	-20°C to + 70°C
Storage Temperature	T <sub>STO</sub>	-30°C to + 80°C



**9. ELECTRICAL CHARACTERISTICS**

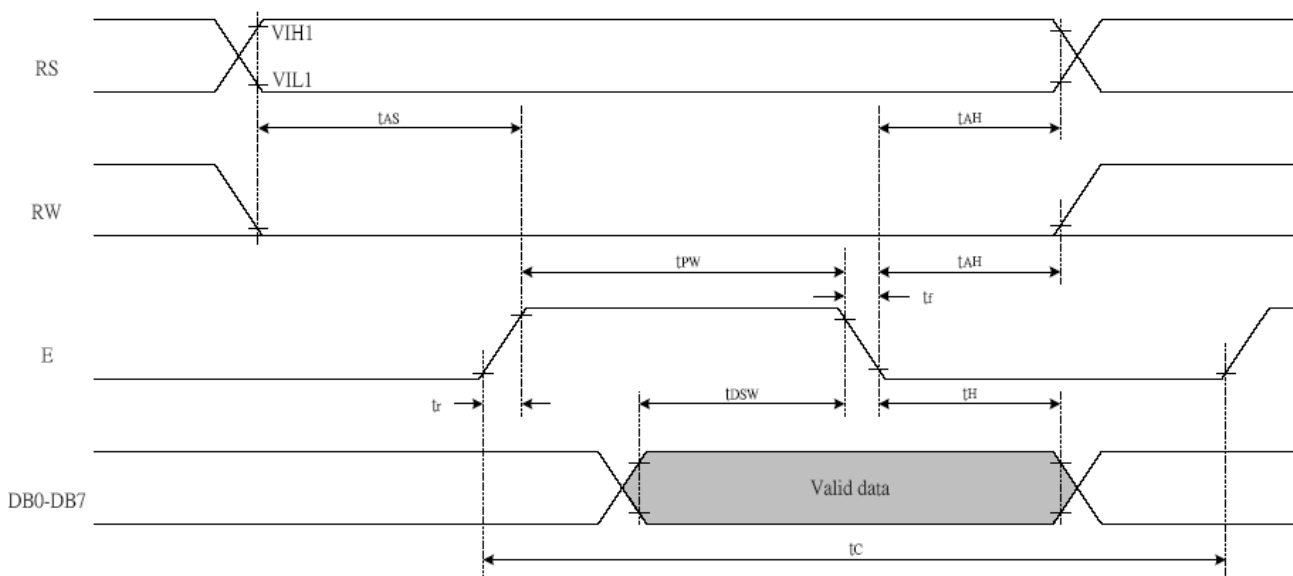
**9-1 DC Characteristics** ( $V_{DD}=4.5V\sim 5.5V$ ,  $T_a=-20\sim +70^{\circ}C$ )

Item	Symbol	Standard Value			Test Condition	Unit
		MIN	TYP	MAX		
Operating Voltage	$V_{DD}$	4.5	5	5.5	-----	V
Supply Current	$I_{DD}$	----	0.35	0.6	$V_{DD}=5V, f_{osc}=270kHz$	mA
LCD Driving Voltage	$V_{LCD}$	3.0	4.5	13.0	$V_{DD}-V_5$ (1/5, 1/4 Bias)	V

**9-2 AC Characteristics** ( $V_{DD}=4.5V\sim 5.5V$ ,  $T_a=-20\sim +70^{\circ}C$ )

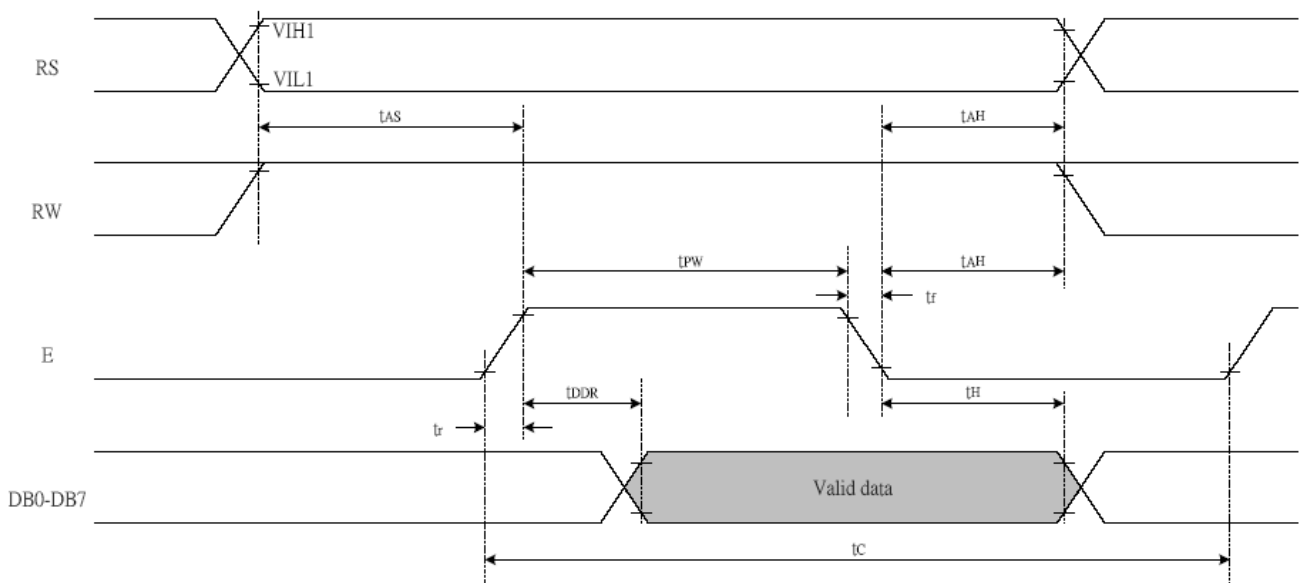
**9-2-1 Write mode (writing data from MPU to Module)**

TC	Enable Cycle Time	Pin E	1200	-	-	ns
TPW	Enable Pulse Width	Pin E	460	-	-	ns
TR,TF	Enable Rise/Fall Time	Pin E	-	-	25	ns
TAS	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
TAH	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
TDSW	Data Setup Time	Pins: DB0 - DB7	80	-	-	ns
TH	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns



**9-2-2 Read mode (reading data from Module to MPU)**

TC	Enable Cycle Time	Pin E	1200	-	-	ns
TPW	Enable Pulse Width	Pin E	480	-	-	ns
TR,TF	Enable Rise/Fall Time	Pin E	-	-	25	ns
TAS	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
TAH	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
TDDR	Data Setup Time	Pins: DB0 - DB7	-	-	320	ns
TH	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns



**10. CONTROL AND DISPLAY COMMAND**

Instruction	Instruction Code										Description	Description Time (270KHz)	
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Clear Display	0	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	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. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	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 DDRAM data.	37 us
Function Set	0	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0		Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0		Set DDRAM address in address counter	37 us
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.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0		Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0		Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:

Be sure the ST7066U is not in the busy state (BF = 0) 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.

11. STANDARD CHARACTER PATTERN

NO.7066-0A

b7-b4 b3-b0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)			0	1	2	3	4	5	6	7	8	9	A	B	C
0001	(2)	.	!	1	2	3	4	5	6	7	8	9	A	B	C	D
0010	(3)	"	#	4	5	6	7	8	9	A	B	C	D	E	F	G
0011	(4)	*	#	3	0	9	0	9	0	9	0	9	0	9	0	9
0100	(5)	*	4	D	T	d	t			\	1	1	1	1	1	1
0101	(6)	%	5	E	U	e	u			*	2	2	2	2	2	2
0110	(7)	&	6	F	V	f	v			7	7	7	7	7	7	7
0111	(8)	'	7	G	W	g	w			7	7	7	7	7	7	7
1000	(1)	(	8	H	X	h	x			4	4	4	4	4	4	4
1001	(2)	)	9	I	Y	i	y			5	5	5	5	5	5	5
1010	(3)	*	:	J	Z	j	z			6	6	6	6	6	6	6
1011	(4)	+	;	K	C	k	c			7	7	7	7	7	7	7
1100	(5)	,	<	L	*	l	l			8	8	8	8	8	8	8
1101	(6)	-	=	M	I	m	i			9	9	9	9	9	9	9
1110	(7)	.	>	N	^	n	^			0	0	0	0	0	0	0
1111	(8)	/	?	O	_	o	*			1	1	1	1	1	1	1

## **12. 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.

## **13. 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

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