SPECIFICATIONS FOR LCD MODULE

MODEL NO.
BC1602AI series
VER.04

FOR MESSRS:

_____

ON DATE OF:

_____

APPROVED BY:

_____

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History of Version

Version	Contents	Date	Note
01	NEW VERSION	2012/09/04	SPEC.
02	Modify Handling Instruction	2013/01/24	Page 6
03	Modify Interface Pin Function、Quality Assurance and Reliability	2013/07/04	Page 11、14、16
04	Modify Handling Instruction、Electrical Characteristics	2014/02/26	Page 6、8

C O N T E N T S

1. Numbering System

	B	C	1602	AI	-	-	-	-	-	xxx
	0	1	2	3	4	5	6	7	8	9
0	Brand			Bolymin						
1	Module Type			C= character type G= graphic type P= TAB/TCP type				O= COG type F= COF type L=PLED/OLED		
2	Format			2002=20 characters, 2 lines 12232= 122 x 32 dots						
3	Version No.			A type						
4	LCD Color			G=STN/gray Y=STN/yellow-green C=color STN				B=STN/blue F=FSTN T=TN		
5	LCD Type			R=positive/reflective P=positive/transflective				M=positive/transmissive N=negative/transmissive		
6	Backlight type/color			L=LED array/ yellow-green H=LED edge/white R=LED array/red G=LED edge/yellow-green F=RGB Q=LED edge/red A=LED edge/amber N=No backlight				D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white Y=LED Bottom/yellow O=LED array/orange K=LED edge/green A=LED edge/amber		
7	CGRAM Font (applied only on character type)			J=English/Japanese Font E=English/European Font G=Chinese(simple) F=Chinese(traditional)				C=English/Cyrillic Font H=English/Hebrew Font A=English/Arabic Font		
8	View Angle/ Operating Temperature			B=Bottom/Normal Temperature H=Bottom/Wide Temperature U=Bottom/Ultra wide Temperature				T=Top/Normal Temperature W=Top/Wide Temperature C=9H/Normal Temperature E=Top/ultra wide temperature		
9	Special Code			3=3.3 volt logic power supply n=negative voltage for LCD c=cable/connector xxx=to be assigned on datasheet				t=temperature compensation for LCD p=touch panel		

2. Handling Instruction

2.1 Precaution in use of LCD Module

2.1.1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure on the surface of display area.

2.1.2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isopropyl alcohol, ethyl alcohol, do not use water, ketone or aromatics and never scrub hard.

2.1.3. Store the panel or module in a dark place where the temperature is 20℃±5℃ and the humidity is below 60% RH.

2.1.4. Keep LCD panels away from direct sunlight, also avoid them in high-temperature & high humidity environment for a long period.

2.1.5. Do not input any signal before power is turned on.

2.1.6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.

2.1.7. To control temperature and time of soldering is 320±10℃ and 3-5 sec.

2.1.8. EL manufactured from the organic film, and easily affected by temperature, humidity and other environmental impact. Long-term placement in a place will cause low quality of the case. Therefore, unpack the cartons and start the production with the LCM within three months after the reception of them.

2.2 Static Electricity Precautions:

2.2.1. The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection equipment to prevent ESD hurt on products.

2.2.2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.

2.2.3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.

2.2.4. The modules should be kept in anti-static bags or trays for storage.

2.2.5. Only properly grounded soldering irons should be used.

2.2.6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

2.2.7. The normal static prevention measures should be observed for work clothes and working benches.

2.2.8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

2.3 Operation Precautions:

2.3.1. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.

2.3.2. Driving voltage should be kept within specified range; excess voltage will shorten display life.

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

2.4 Safety:

2.4.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

2.5 WARRANTY POLICY

Bolymin . Will provide one-year warranty for the products only if under specification operating conditions.
If there are functional defects found during the period of warranty, the defective products would be replaced on a one-to-one basis.
Bolymin would not be responsible for any direct/indirect liabilities consequential to any parties.

2.6 MTBF

2.6.1 .By specific test condition, MTBF based on 30 ℃normal operation temperature is 50,000hours.

2.6.2 Test Condition:

2.6.2.1 Supply Voltage for LCM: Typical Vdd

2.6.2.2 CC (Constant Current) mode and typical current is applied for LED.

2.6.2.3 Run-Patterns: by Bolymin's test program that has defined patterns and cyclic period.

2.6.2.4 Humidity: 60%RH

2.6.3 Test Criteria:

Attenuation of average brightness: ≦ 50%

Increasing of current consumption for LCM/Backlight: ≦ 20%

Display function at room temperature: Normal

Appearance: Normal

3.Features

(1) COB with metal frame.

(2) 5x7 dots with cursor.

(3) +5.0V single power supply.

(4) Support 3-types of serial mode input interface.

(5) I2C & SPI serial modes while data transmitting rate up to 100 KHz-clock rate.

(6) Support RS232 (5.0V TTL signal).

(7) Auto demo mode.

(8) Software functionally adjusts LCD contrast & backlight luminance .

(9) Changeable I2C slave address for multi-module control.

(10) USB optional (*).

(*)This module provides a stand-alone USB to RS232(TTL) serial converter, which enables USB connectivity in applications that have a RS232(TTL) interface.

4.General Specification

(1) Mechanical Dimension

Item	Dimension	Unit
Number of Characters	16 characters×2 Lines	–
Module dimension (L x W x H)	87.5 x 36.0 x 12.7 – LED B/L 87.5 x 36.0 x 8.9 – No B/L	mm
View area	66.0 x 16.0	mm
Active area	56.2 x 11.5	mm
Dot size	0.55 x 0.65	mm
Dot pitch	0.60 x 0.70	mm
Character size (L x W)	2.95 x 5.55	mm
Character pitch (L x W)	3.55 x 5.95	mm

(2) Controller IC: **ST7066U (or Equivalent) controller**

(3)Backlight: LED Series

(4) Temperature Range

	Normal	Wide
Operating	0 ~+50℃	-20 ~+70℃
Storage	-10 ~+60℃	-30 ~+80℃

5. Absolute Maximum Rating

5.1 Electrical Absolute Maximum Ratings

(Vss=0V, Ta=25℃)

Item	Symbol	Min	Max	Unit
Supply Voltage (Logic)	Vdd-Vss	-0.3	7	V
Supply Voltage (LCD Driver)	Vdd-Vo	-0.3	Vdd+0.3	V
Wide Temperature Type	Top	-20	+70	℃
	Tstg	-30	+80	℃
Normal Temperature Type	Top	0	+50	℃
	Tstg	-10	+60	℃

6.Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	Vdd-Vss	-	-	5.0	-	V
Input High Volt.	V_{IH}	-	0.7*Vdd	-	Vdd	V
Input Low Volt.	V_{IL}	-	-0.3	-	0.6	V
Supply Current	Idd	Vdd=5V	-	-	130(*)	mA

***: Backlight 100% turn on.(Array LED)**

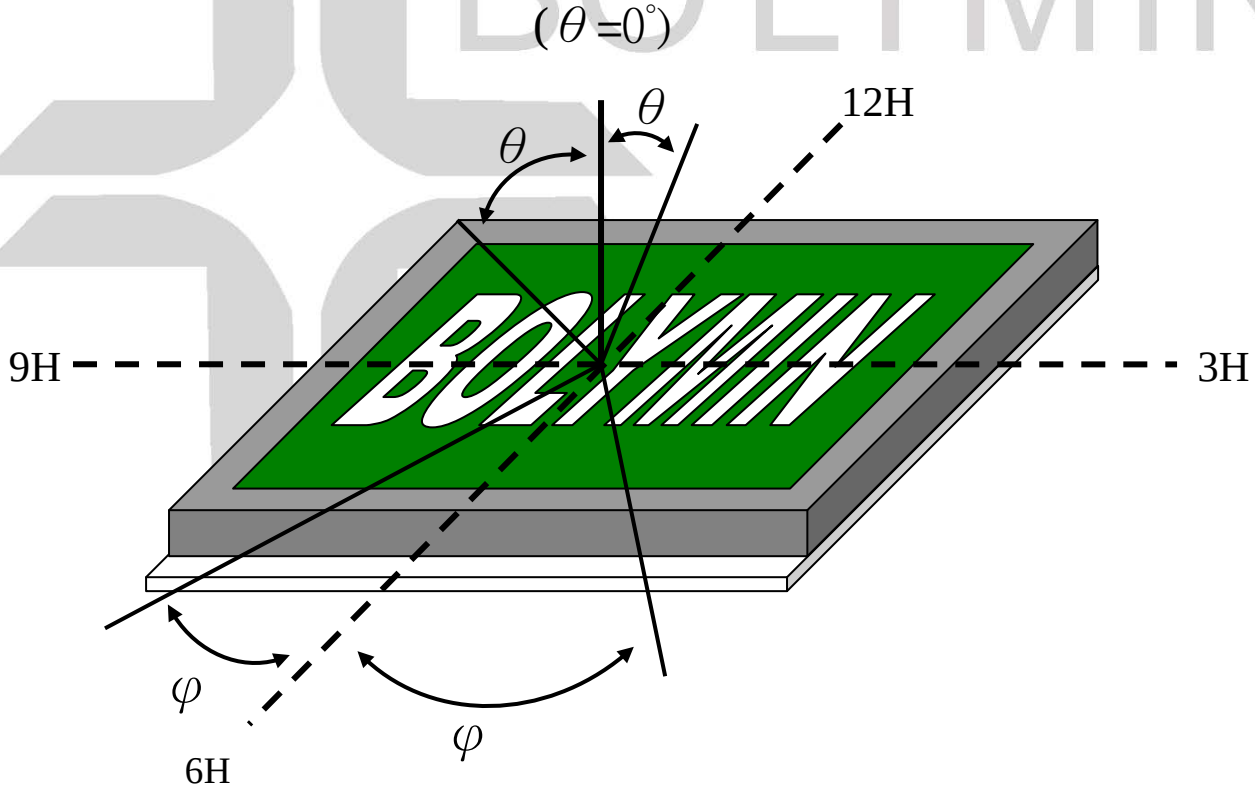
7.Optical Characteristics

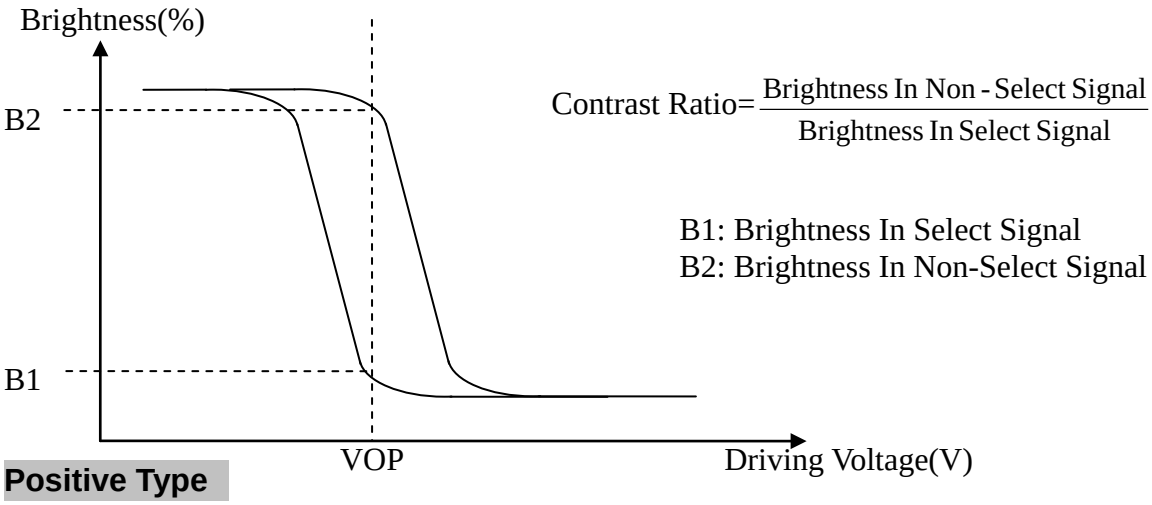
a. STN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	CR≧2	10	-	45	deg
	(H) φ	CR≧2	-30	-	30	deg
Contrast Ratio	CR	-	-	3	-	-
Response Time 25℃	T rise	-	-	200	350	ms
	T fall	-	-	250	400	ms

b. FSTN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	CR≧3	10		60	deg
	(H) φ	CR≧3	-45		45	deg
Contrast Ratio	CR	—		5		—
Response Time 25℃	T rise	—		200	400	ms
	T fall	—		250	400	ms

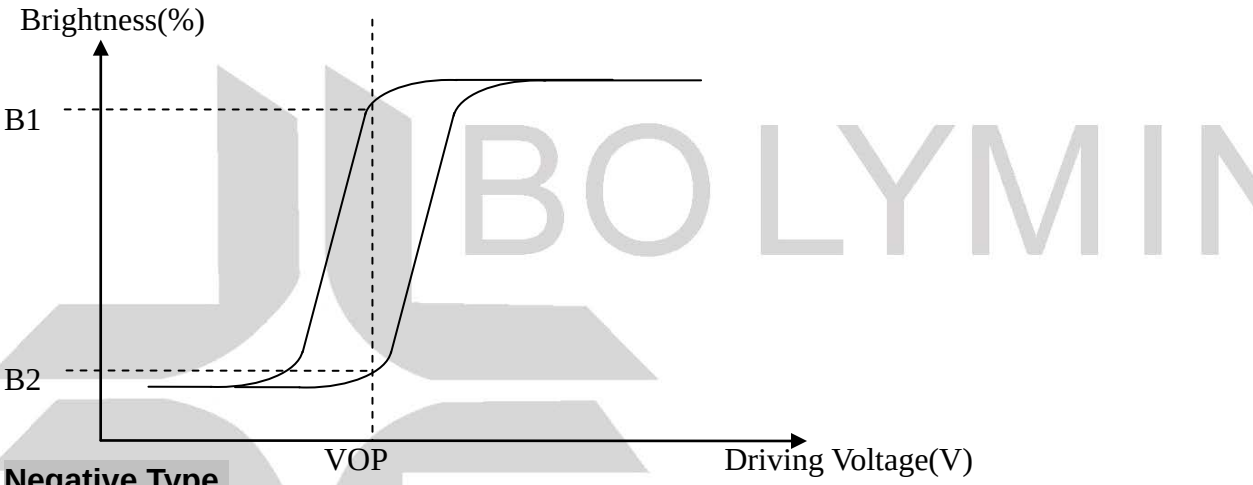




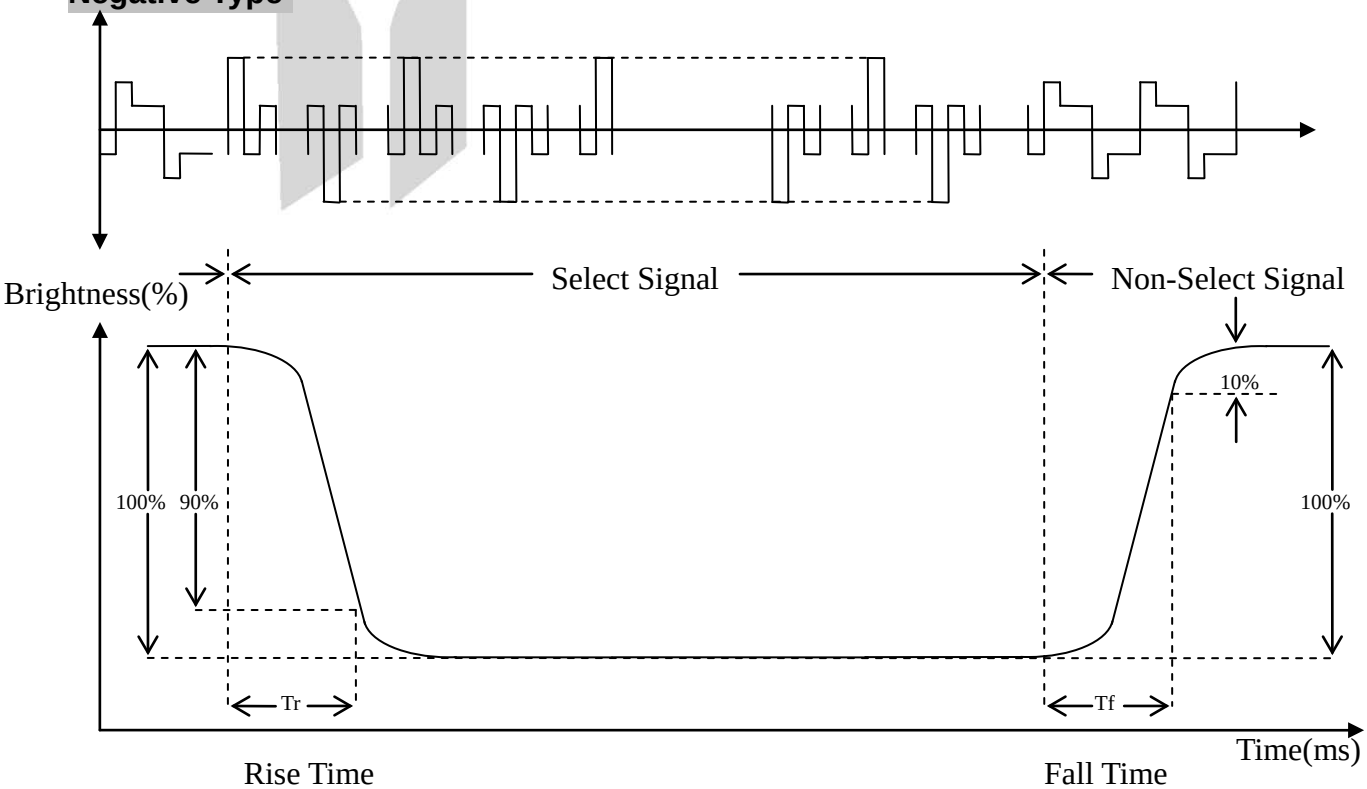
$$\text{Contrast Ratio} = \frac{\text{Brightness In Non - Select Signal}}{\text{Brightness In Select Signal}}$$

B1: Brightness In Select Signal
B2: Brightness In Non-Select Signal

Positive Type



Negative Type



8.Interface Pin Function

8.1 Pin Description

Pin No.	Symbol	Level	Description
1	TX	-	RS-232 level output port.
2	RX	-	RS-232 level input port
3	VSS	0V	Ground.
4	VDD	5V	System power supply input.
5	SDA	H/L	I2C:Data Input/output for the I2C SPI:Serial data Input .
6	SCL	H/L	I2C:Clock Input for I2C SPI:Serial Clock Input .
7	SDO	H/L	SPI:Serial data output
8	/CS	H/L	SPI:Chip select

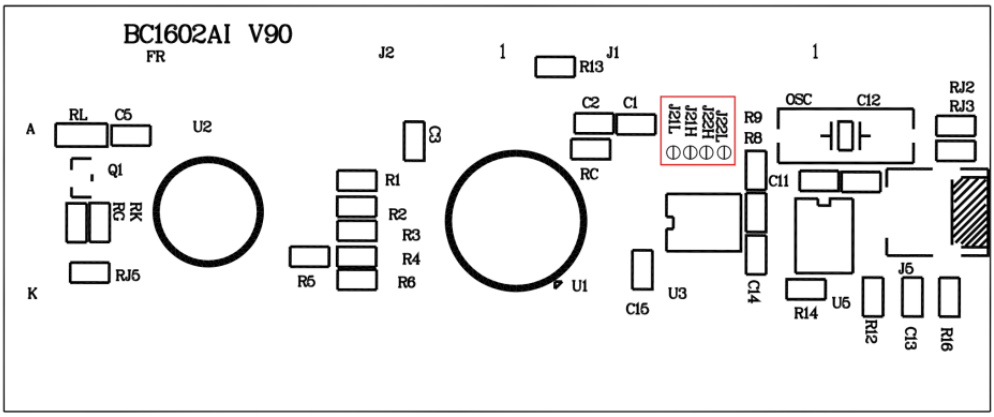
8.2 Jumper selection for communication

Protocol	J21H	J21L	J22H	J22L	Description
I2C	short	*	*	short	**100KHz max clock**
SPI	*	short	*	short	**100KHz max clock**
RS232	*	short	short	*	**5V, TTL signal**
DEMO	short	*	short	*	**Self-test**

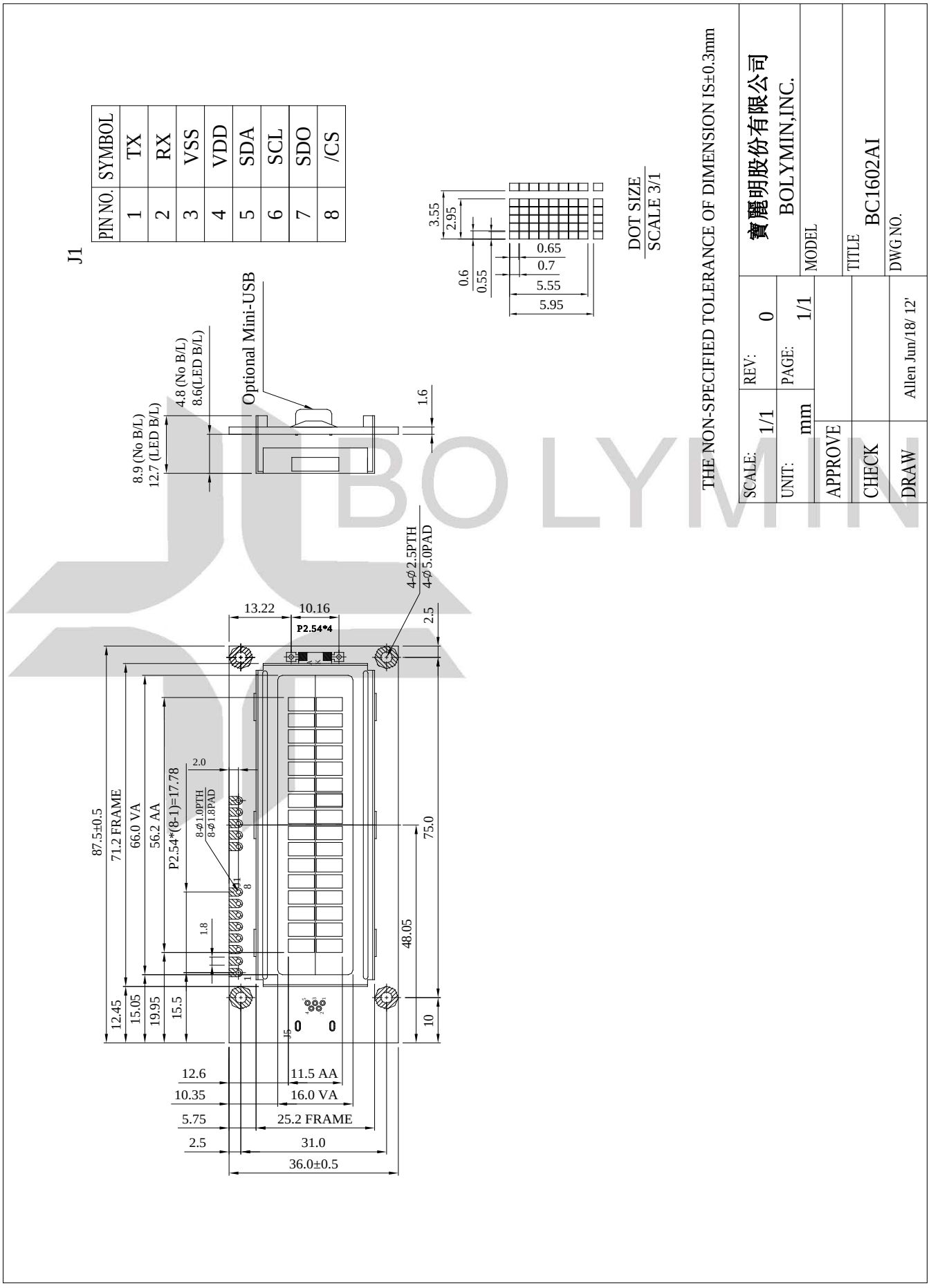
*** : Open**

*** : Default mode=I2C**

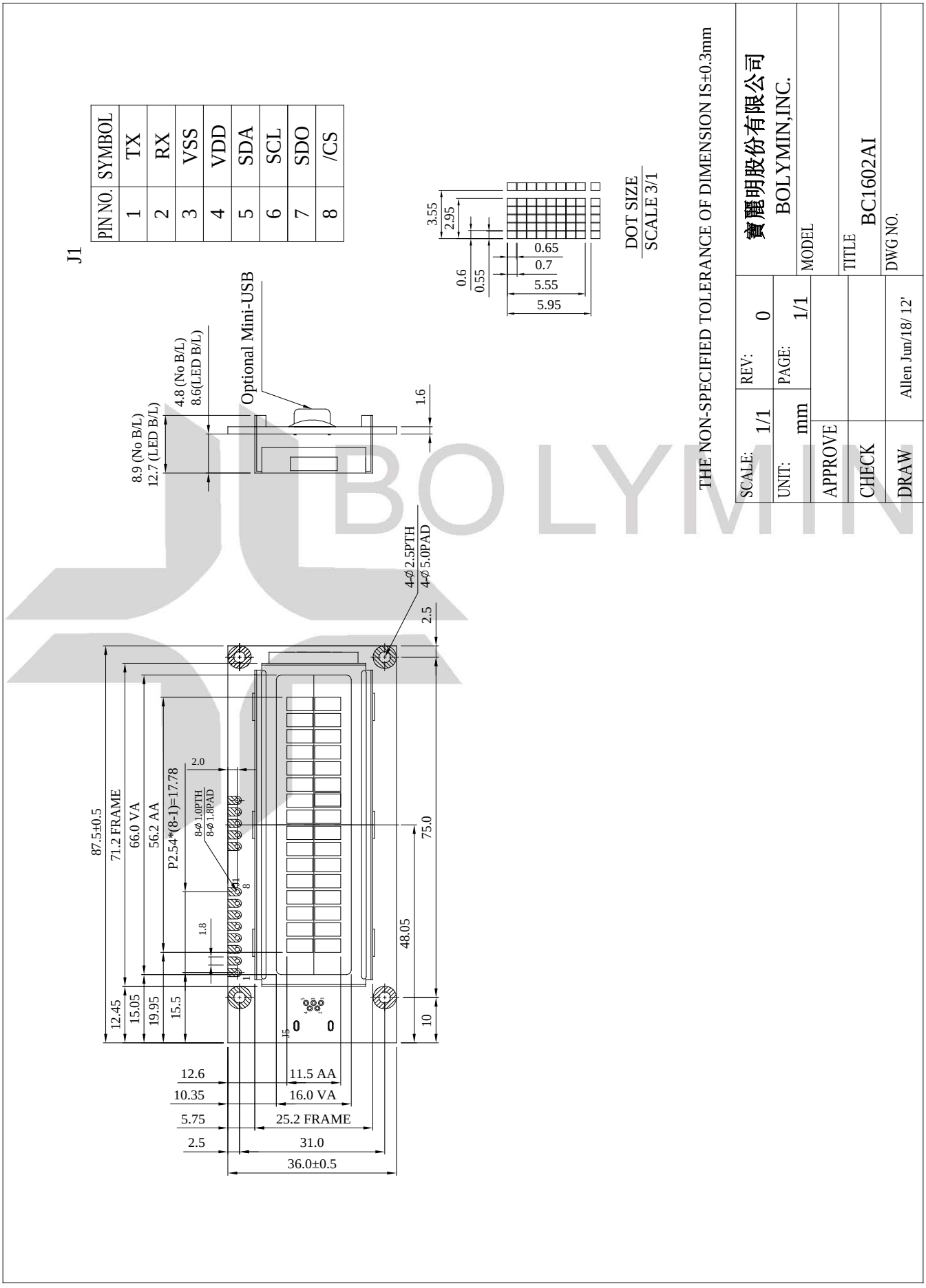
8.3 Jumper location



9. Drawing


J1
PIN NO. SYMBOL
1 TX
2 RX
3 VSS
4 VDD
5 SDA
6 SCL
7 SDO
8 /CS
DOT SIZE
SCALE 3/1
THE NON-SPECIFIED TOLERANCE OF DIMENSION IS±0.3mm
Optional Mini-USB
4.8 (No B/L)
8.6(LED B/L)
8.9 (No B/L)
12.7 (LED B/L)
1.6
3.55
2.95
0.6
0.55
0.65
0.7
5.55
5.95
4-Ø2.5PTH
4-Ø5.0PAD
13.22
10.16
P2.54*4
2.5
2.0
8-Ø1.0PTH
8-Ø1.8PAD
P2.54*(8-1)=17.78
87.5±0.5
71.2 FRAME
66.0 VA
56.2 AA
75.0
48.05
1.8
12.45
15.05
19.95
15.5
10
12.6
11.5 AA
10.35
16.0 VA
5.75
25.2 FRAME
2.5
31.0
36.0±0.5
SCALE: 1/1
UNIT: mm
REV: 0
PAGE: 1/1
APPROVE
CHECK
DRAW
Allen Jun/18/ 12'
寶麗明股份有限公司
BOLYMIN,INC.
MODEL
TITLE
BC1602AI
DWG NO.

LED-Edge White



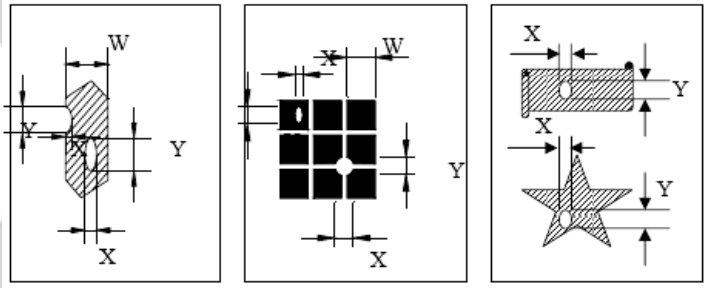
10. Quality Assurance

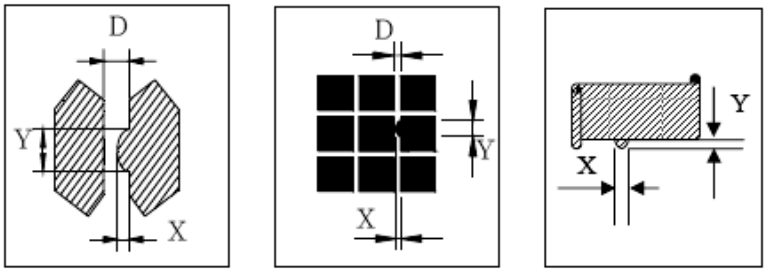
10.1 **Inspection conditions**

1. The LCD shall be inspected under 20~40W white fluorescent light.
2. Checking Direction shall be in the 40 degree from perpendicular line of specimen surface.
3. Checker shall see over 30 cm.
4. Inspect about 5 seconds for each side.

10.2 **Inspection Parameters**

<table>
<tr><th>NO.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black or White spots</td><td>
<table>
<tr><th>Zone / Dimension</th><th>Acceptable Number</th><th>Class Of Defects</th><th>Acceptable Level</th></tr>
<tr><td>D≦0.10</td><td>Disregard</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>0.10＜D≦0.2</td><td>4</td></tr>
<tr><td>0.2＜D≦0.3</td><td>2</td></tr>
<tr><td>0.3＜D</td><td>0</td></tr>
</table>
D=(Long + Short)/2
Total defects should not exceed 5/module
Defect that is located at outside of AA and doesn’t affect function is ignored.
</td></tr>
<tr><td>2</td><td>Scratch, Substances</td><td>
<table>
<tr><th colspan="2">Zone</th><th rowspan="2">Acceptable Number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">Acceptable Level</th></tr>
<tr><th>X(mm)</th><th>Y(mm)</th></tr>
<tr><td>—</td><td>0.05≧W</td><td>Disregard</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>4.0≧L</td><td>0.05≧W</td><td>4</td></tr>
<tr><td>3.0≧L</td><td>0.1≧W</td><td>2</td></tr>
<tr><td>—</td><td>0.1＜W</td><td>0</td></tr>
</table>
X: Length Y: Width
Total defects should not exceed 5/module
Defect that is located at outside of AA and doesn’t affect function is ignored.
</td></tr>
</table>

<table>
<tr>
<td>3</td>
<td>Air Bubbles (between glass & polarizer)</td>
<td>
<table>
<tr><th>Zone / Dimension</th><th>Acceptable Number</th><th>Class Of Defects</th><th>Acceptable Level</th></tr>
<tr><td>D≦0.2</td><td>Disregard</td><td rowspan="3">Minor</td><td rowspan="3">2.5</td></tr>
<tr><td>0.2＜D≦0.5</td><td>3</td></tr>
<tr><td>0.5＜D</td><td>0</td></tr>
</table>
Total defects shall not excess 3/module.
Defect that is located at outside of AA and doesn’t affect function is ignored.
Bobble is sawn only under reflection light is disregarded.
</td>
</tr>
<tr>
<td>4</td>
<td>Displaying Pattern</td>
<td>
1. Incomplete or broken line is not allowed.
2. Pinholes
<table>
<tr><th>Dimension Φ(mm)</th><th>Criteria</th><th>Class Of Defects</th><th>Acceptable Level</th></tr>
<tr><td>Φ＜0.1</td><td>Disregard</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>0.1＜Φ≦0.2</td><td>2</td></tr>
<tr><td>0.2＜Φ≦0.25</td><td>1</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table>


Ø=(X+Y)/2
3. Deformation
<table>
<tr><th>Dimension Φ(mm)</th><th>Criteria</th><th>Class Of Defects</th><th>Acceptable Level</th></tr>
<tr><td>Φ＜0.15</td><td>Disregard</td><td rowspan="3">Minor</td><td rowspan="3">2.5</td></tr>
<tr><td>Φ≦0.25 and X≦1/2D</td><td>3</td></tr>
<tr><td>Φ＞0.25and X＞1/2D</td><td>0</td></tr>
</table>


D：間距 Ø=(X+Y)/2
</td>
</tr>
</table>

Other Inspection standard reference Bolymin standard.

11.Reliability

■Content of Reliability Test

Environmental Test				
No	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 168 hrs	——
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 168 hrs	——
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 168 hrs	——
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 168 hrs	——
5	Humidity Test	Endurance test applying the high humidity storage for a long time.	40℃,90%RH 96 hrs	——
6	Temperature cycle (Non-operation)	Endurance test applying the low and high temperature cycle. -30℃ 80℃ 30min 30min 1 cycle	-30℃/80℃ 10 cycles	——
7	Vibration test	Endurance test applying the vibration during transportation and using.	Total Fixed Amplitude:1.5mm Vibration Frequency :10~55Hz One cycle 60 seconds to 3 direction of X,Y,Z for each 15minutes	——

※Assess after placing at normal temperature and humidity for 4 hour。No abnormalities in functions and appearance。

12.Appendix (Communication Information)

12-1Communication Information

This module uses PIC16F690 micro controller for serial communication.

12.1.1 I2C protocol

The I2C interface is able to receive data up to 100KHz-clock rate.

Default slave address of this module is 0xA0.The address could be changed to any 8-bit value by instruction function, but the LSB (least significant bit) must always be '0'. Once the slave address has been changed, the value will be stored in system memory. The slave address that has been changed will be restored to default value when input mode changes to other modes.

12.1.2 SPI protocol

The SPI interface is able to receive data at up to 100KHz-clock rate.

SPI mode has a normally high level idle clock. When /CS is LOW, data input is sampled on the rising edge of the Serial clock line (SCL).

12.1.3 RS232 protocol

The RS232 signal must be 5V TTL compatible. Communication format is 8-bit data, 1 Stop bit, no parity, no handshaking. Default BAUD rate is 9600, and is changeable with a command function. Once the BAUD rate has been changed, the value will be stored in system memory. The BAUD rate
that has been changed will be restored to default value when input mode changes to other modes.

Jumper selection for communication:

Protocol	J21H	J21L	J22H	J22L	Description
I2C	**short**	*	*	**short**	**100KHz max clock**
SPI	*	**short**	*	**short**	**100KHz max clock**
RS232	*	**short**	**short**	*	**5V, TTL signal**
DEMO	**short**	*	**short**	*	**Self -test**

*** : Open**

12.1.4 Instruction table

Prefix	CMD	Parameter	Description
0xFE	0x41	None	Display on.
0xFE	0x42	None	Display off.
0xFE	0x45	1 byte	Set cursor.
0xFE	0x46	None	Cursor home.
0xFE	0x47	None	Cursor on.
0xFE	0x48	None	Cursor off.
0xFE	0x49	None	Cursor shift to the left one position.
0xFE	0x4A	None	Cursor shift to the right one position.
0xFE	0x4B	None	Cursor Blink ON.
0xFE	0x4C	None	Cursor Blink OFF.
0xFE	0x4E	None	Backspace.
0xFE	0x51	None	Clear display.
0xFE	0x52	1 byte	Contrast setting.
0xFE	0x53	1 byte	Backlight brightness setting.
0xFE	0x54	9 bytes	Custom character generate.
0xFE	0x55	None	Shift Display to the Left
0xFE	0x56	None	Shift Display to the Right.
0xFE	0x61	1 byte	Change RS232 BAUD rate.
0xFE	0x62	1 byte	Change I2C slave address.
0xFE	0x70	None	Display firmware version number.
0xFE	0x71	None	Display RS232 BAUD rate.
0xFE	0x72	None	Display I2C address.
0xFE	0x73	Dummy byte	Read Data.

12.1.5 Instruction Description

Display on				
Syntax	hexadecimal	0xFE	0x41	
Parameter	Parameter	Length	Description	
	None	None	None	
Description	Entire display is turned on.			

Display off				
Syntax	hexadecimal	0xFE	0x42	
Parameter	Parameter	Length	Description	
	None	None	None	
Description	Entire display is turned off, but display data is remained in DDRAM			

Set Cursor				
Syntax	hexadecimal	0xFE	0x45	[pos]
Parameter	Parameter	Length	Description	
	[pos]	1 byte	Put cursor at location specified by [pos]	
Description	This command uses to set the cursor to specific position where the character will be displayed. The typical cursor position for a 2-line display is show below; a cursor position out of these ranges will not be viewable.			
Default	After a reset, the cursor is on position 0x00.			

	Column1	Column16	Column17(hidden)	Column40(hidden)
Line1	0x00	0x0F	0x10	0x27
Line2	0x40	0x4F	0x50	0x67

Cursor Home				
Syntax	hexadecimal	0xFE	0x46	
Parameter	Parameter	Length	Description	
	None	None	None	
Description	This command sets the cursor return to line 1, column 1 of the LCD screen.			

Cursor on			
Syntax	hexadecimal	0xFE	0x47
Parameter	Parameter	Length	Description
	None	None	None
Description	Cursor is turned on		
Default	The underline cursor is off.		

Cursor off			
Syntax	hexadecimal	0xFE	0x48
Parameter	Parameter	Length	Description
	None	None	None
Description	Cursor is disappeared in current display, but I/D register remains its data		
Default	The underline cursor is off.		

Cursor shift to the left one position.			
Syntax	hexadecimal	0xFE	0x49
Parameter	Parameter	Length	Description
	None	None	None
Description	Cursor shift to the left one position.		
Default	None		

Cursor shift to the right one position.			
Syntax	hexadecimal	0xFE	0x4A
Parameter	Parameter	Length	Description
	None	None	None
Description	Cursor shift to the right one position.		
Default	None		

Cursor Blink ON			
Syntax	hexadecimal	0xFE	0x4B
Parameter	Parameter	Length	Description
	None	None	None
Description	Cursor blink is on, the character is also blink on this position.		
Default	Cursor blink is on.		

Cursor Blink OFF			
Syntax	hexadecimal	0xFE	0x4C
Parameter	Parameter	Length	Description
	None	None	None
Description	Cursor blink is off.		

Back Space			
Syntax	hexadecimal	0xFE	0x4E
Parameter	Parameter	Length	Description
	None	None	None
Description	This command is destructive backspace, the cursor is moved back one space and the character on the cursor is deleted.		
Default	None.		

Clear display			
Syntax	hexadecimal	0xFE	0x51
Parameter	Parameter	Length	Description
	None	None	None
Description	This command clears the entire display and place the cursor at line 1 column 1.		
Default	None.		

Contrast setting				
Syntax	hexadecimal	0xFE	0x52	[contrast]
Parameter	Parameter	Length	Description	
	[contrast]	1 byte	Set the display contrast, value between 1 to 50	
Description	This command sets the LCD character display contrast, the contrast setting is between 1 to 50, where 50 is the highest contrast.			
Default	Default contrast value is 44.			

Backlight Brightness setting				
Syntax	hexadecimal	0xFE	0x53	[brightness]
Parameter	Parameter	Length	Description	
	[brightness]	1 byte	Set the LCD backlight brightness level, value between 1 to 8	
Description	This command set the LCD display backlight brightness level, the value is between 1 to 8.			
Default	Default brightness value is 8.			

Custom character generate				
Syntax	hexadecimal	0xFE	0x54	[addr] [d0 …d7]
Parameter	Parameter	Length	Description	
	[addr]	1 byte	Custom character address, 0 – 7	
	[d0 …d7]	8 bytes	Custom character pattern bit map	
Description	This command used to generate custom character. The custom character pattern is bit mapped into 8 bytes, the bit map for Spanish character '¿' is shown in table below, to display the custom character, user simply enter the address of the character (0 to 8).			
Default	None.			

Addr	Bit	7	6	5	4	3	2	1	0	Hex
0x00	Byte	0	0	0	0	0	1	0	0	0x04
0x01	Byte	0	0	0	0	0	0	0	0	0x00
0x02	Byte	0	0	0	0	0	1	0	0	0x04
0x03	Byte	0	0	0	0	1	0	0	0	0x08
0x04	Byte	0	0	0	1	0	0	0	0	0x10
0x05	Byte	0	0	0	1	0	0	0	1	0x11
0x06	Byte	0	0	0	0	1	1	1	0	0x0E
0x07	Byte	0	0	0	0	0	0	0	0	0x00

EX: Send 0xFE 0x54 0x00 0x04 0x00 0x04 0x08 0x10 0x11 0x0E 0x00

Shift Display to the Left			
Syntax	hexadecimal	0xFE	0x55
Parameter	Parameter	Length	Description
	None	None	None
Description	This command shifts the display one place to the left, the cursor position also moves with the display.		

Shift Display to the Right			
Syntax	hexadecimal	0xFE	0x56
Parameter	Parameter	Length	Description
	None	None	None
Description	This command shifts the display one place to the right, the cursor position also moves with the display.		

Display position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Line 1 address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
Line 2 address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

For shift left	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10
	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50

For shift right	27	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E
	67	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E

Change RS232 BAUD Rate				
Syntax	hexadecimal	0xFE	0x61	[baud]
Parameter	Parameter	Length	Description	
	[baud]	1 byte	New RS232 BAUD Rate, 1 - 8	
Description	This command sets the RS232 BAUD rate, the single byte parameter select the desired BAUD rate as in the table below. The new BAUD rate requires 20 ms to take effect, therefore, the subsequent input must have an appropriate delay. The default BAUD rate can be restored if I2C or SPI is selected as the communication mode. Illegal parameter input will be discarded.			
Default	9600 BAUD			

Parameter	BAUD
1	**300**
2	**1200**
3	**2400**
4	**9600**
5	**14400**
6	**19.2K**
7	**57.6K**
8	**115.2K**

Change I2C Slave Address				
Syntax	hexadecimal	0xFE	0x62	[adr]
Parameter	Parameter	Length	Description	
	[adr]	1 byte	New I_2C address, 0x00 – 0xFE The LSB is always '0'.	
Description	This command sets the I2C address, the address must be an even number, (LSB = 0). The address change requires 20 microseconds to take effect; therefore, the subsequent input must have an appropriate delay. The default I2C address can be restored if SPI or RS232 is selected as the communication mode.			
Default	0x80			

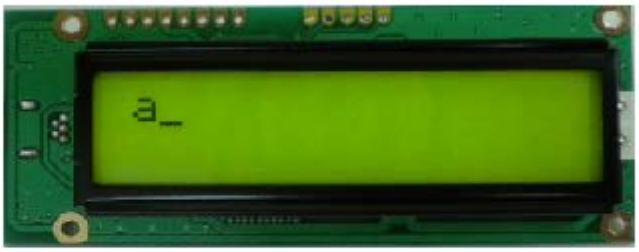
Display Firmware Version Number			
Syntax	hexadecimal	0xFE	0x70
Parameter	Parameter	Length	Description
	None	None	None
Description	This command displays the micro-controller firmware version number.		

Display RS232 Baud Rate			
Syntax	hexadecimal	0xFE	0x71
Parameter	Parameter	Length	Description
	None	None	None
Description	This command displays the current RS232 BAUD rate.		

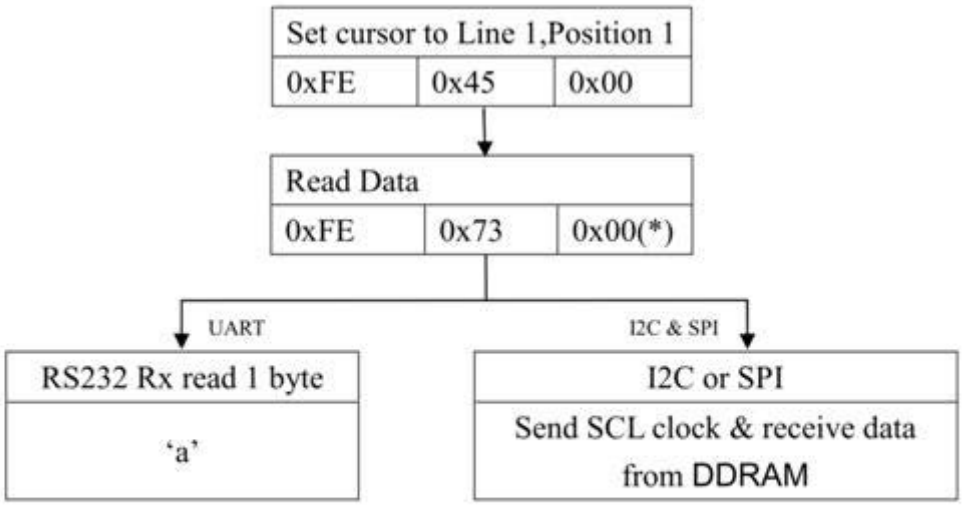
Display I2C Address			
Syntax	hexadecimal	0xFE	0x72
Parameter	Parameter	Length	Description
	None	None	None
Description	This command displays the current I2C slave address.		

Read Data			
Syntax	hexadecimal	0xFE	0x73
Parameter	Parameter	Length	Description
	dummy	1 byte	Last data byte is a dummy byte
Description	This command read LCD data.		

Ex:



In order to read the character "a", displayed on line1, position1
The read sequence is show below:



(*) 0x00 is dummy byte; this byte could be any value from 0x00 to 0xFF.

12.1.6 Font Table

Code E: English –European Font

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

Code J: English - Japanese Font

Upper 4 bit / Lower 4 bit	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)															

CodeC: English - Cyrillic Font

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