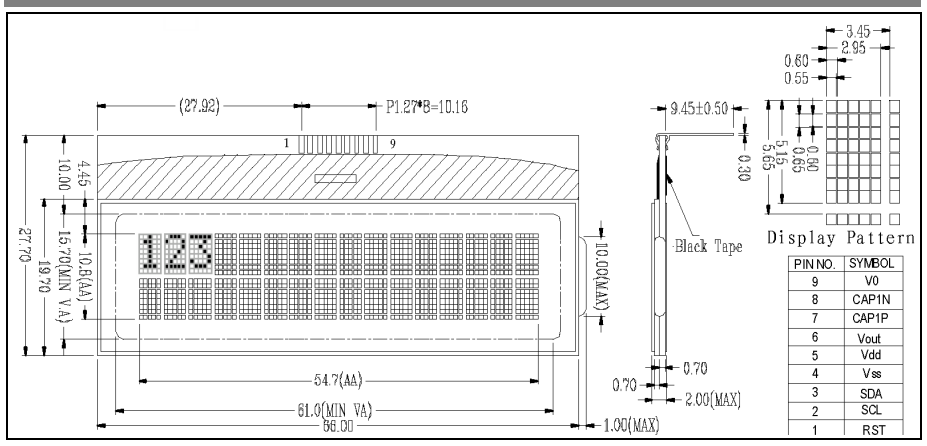
ZETTLER DISPLAYS **AQM1602XA-RN-GBW**

# Ｉ２Ｃ接続*薄型*１６文字ｘ２行液晶

***Sitronix ST7032 CONTROLED***

◆６６mmＸ２７．７mmＸ***２．０mm***の薄型サイズです。
（画面５４．７mmＸ１０．８mm）
◆画面コントラストはコマンドで設定しますので、外付けＶＲが不要です。
◆電源電圧は３．１Ｖ～５．５Ｖで、Ａｒｄｕｉｎｏ等との接続が可能です。
◆接続に便利な２．５４mmピッチへの変換基板付きです。
（セットによっては、変換基板は付属しない場合があります）
◆低消費電流です：１mA@３．３Ｖ
（液晶本体のみの消費電流　変換基板使用時のプルアップ 抵抗消費分を除く）

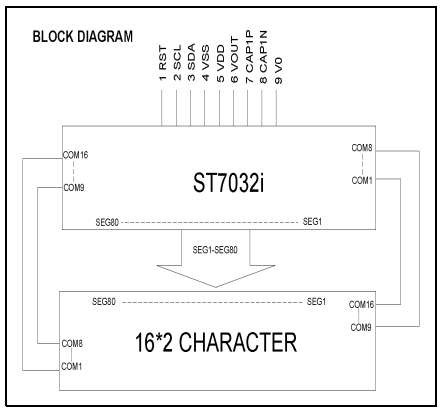



| PIN NO. | SYMBOL |
|---|---|
| 9 | V0 |
| 8 | CAP1N |
| 7 | CAP1P |
| 6 | Vout |
| 5 | Vdd |
| 4 | Vss |
| 3 | SDA |
| 2 | SCL |
| 1 | RST |

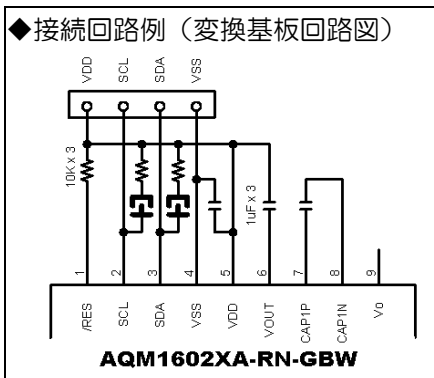
●ＬＣＤモジュールのピンを上側にして、左から１～９ピンになります。

## PIN ASSIGNMENT

| Pin No. | Symbol | Function |
|---|---|---|
| 1 | /RES | Reset signal |
| 2 | SCL | Clock input |
| 3 | SDA | Data input |
| 4 | VSS | Ground |
| 5 | VDD | Power Supply |
| 6 | VOUT | Voltage converter input/output pin |
| 7 | CAP1P | Capacitor 1 positive connection pin for voltage converter |
| 8 | CAP1N | Capacitor 1 negative connection pin for voltage converter |
| 9 | V0 | Power supply for LCD drive |




◆接続回路例（変換基板回路図）




## GENERAL SPECS

| | |
|---|---|
| 1. Display Format | 16*2 Character |
| 2. Power Supply | 3.3V |
| 3. Overall Module Size | 66.0mm(W) x 27.7mm(H) x max 2.0mm(D) |
| 4. Viewing Area(W*H) | 61.0mm(W) x 15.7mm(H) |
| 5. Dot Size (W*H) | 0.55mm(W) x 0.60mm(H) |
| 6. Dot Pitch (W*H) | 0.60mm(W) x 0.65mm(H) |
| 7. Character Size (W*H) | 2.95mm(W) x 5.15mm(H) |
| 8. Character Pitch (W*H) | 3.45mm(W) x 5.65mm(H) |
| 9. Viewing Direction | 6:00 O'Clock |
| 10. Driving Method | 1/16Duty,1/5Bias |
| 11. Controller IC | ST7032I-0D or compatible |
| 12. LC Fluid Options | STN(GRAY)/Positive/Reflective |
| 13. Backlight Options | NA |
| 14. Operating temperature | -20ºC ~ 60ºC |
| 15. Storage temperature | -30ºC ~70ºC |
| 16. RoHS | RoHS compliant |

## ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Operating temperature | Top | -20 | - | 60 | ºC |
| Storage temperature | Tst | -30 | - | 70 | ºC |
| Input voltage | Vin | 0.3 | -- | Vdd+0.3 | V |
| Supply voltage for logic | Vdd- Vss | -0.3 | - | 6.0 | V |
| Supply voltage for LCD driving | V0-Vss | Vss-0.3 | - | 7.0-Vss | V |

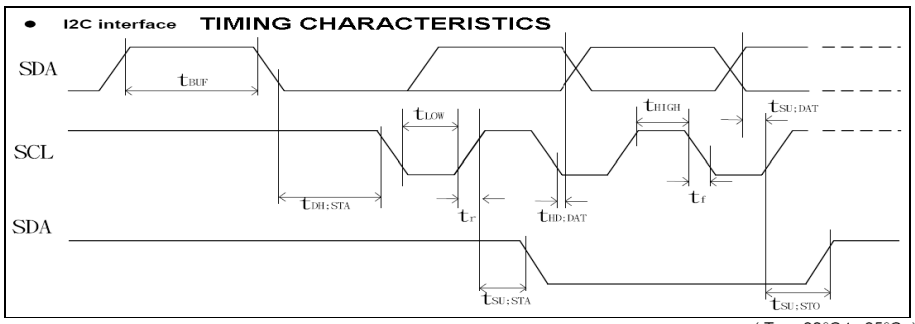
## Electrical Characteristics Of LCM

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Power Supply Voltage | Vdd | 25ºC | 3.1 | 3.3 | 3.5 | V |
| Power Supply Current | Idd | Vdd=3.3V | -- | 0.5 | 1.0 | mA |
| Input voltage (high) | Vih | Pins(SDA,SCL,RST) | 1.9 | -- | Vdd | V |
| Input voltage (low) | Vil | Vdd=3.3V | -0.3 | -- | 0.8 | V |
| Recommended LC Driving Voltage | V0-Vss | -20ºC | -- | -- | -- | V |
| | | 25ºC | 4.3 | 4.5 | 4.7 | |
| | | 70ºC | -- | -- | -- | |

## CHARACTER PATTERNS

| b7-b4 / b3-b0 | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0000 | CG RAM | | | | | | | | | | | | | | | |
| 0001 | | | | | | | | | | | | | | | | |
| 0010 | | | | | | | | | | | | | | | | |
| 0011 | | | | | | | | | | | | | | | | |
| 0100 | | | | | | | | | | | | | | | | |
| 0101 | | | | | | | | | | | | | | | | |
| 0110 | | | | | | | | | | | | | | | | |
| 0111 | | | | | | | | | | | | | | | | |
| 1000 | | | | | | | | | | | | | | | | |
| 1001 | | | | | | | | | | | | | | | | |
| 1010 | | | | | | | | | | | | | | | | |
| 1011 | | | | | | | | | | | | | | | | |
| 1100 | | | | | | | | | | | | | | | | |
| 1101 | | | | | | | | | | | | | | | | |
| 1110 | | | | | | | | | | | | | | | | |
| 1111 | | | | | | | | | | | | | | | | |

● I2C interface **TIMING CHARACTERISTICS**




( Ta =-30°C to 85°C )

| Item | Signal | Symbol | Condition | VDD=2.7 to 4.5V Rating Min. | VDD=2.7 to 4.5V Rating Max. | VDD=4.5 to 5.5V Rating Min. | VDD=4.5 to 5.5V Rating Max. | Units |
|---|---|---|---|---|---|---|---|---|
| SCL clock frequency | SCL | $f_{SCLK}$ | — | DC | 400 | DC | 400 | KHz |
| SCL clock low period | | $t_{LOW}$ | | 1.3 | — | 1.3 | — | us |
| SCL clock high period | | $t_{HIGH}$ | | 0.6 | — | 0.6 | — | |
| Data set-up time | SI | $t_{SU;DAT}$ | — | **180** | — | 100 | — | ns |
| Data hold time | | $t_{HD;DAT}$ | | 0 | 0.9 | 0 | 0.9 | us |
| SCL,SDA rise time | SCL, SDA | $t_r$ | — | 20+0.1$C_b$ | 300 | 20+0.1$C_b$ | 300 | ns |
| SCL,SDA fall time | | $t_f$ | | 20+0.1$C_b$ | 300 | 20+0.1$C_b$ | 300 | |
| Capacitive load represent by each bus line | | $C_b$ | — | — | 400 | — | 400 | pf |
| Setup time for a repeated START condition | SI | $t_{SU;STA}$ | — | 0.6 | — | 0.6 | — | us |
| Start condition hold time | | $t_{HD;STA}$ | — | 0.6 | — | 0.6 | — | us |
| Setup time for STOP condition | | $t_{SU;STO}$ | — | 0.6 | — | 0.6 | — | us |
| Bus free time between a Stop and START condition | SCL | $t_{BUF}$ | — | 1.3 | — | 1.3 | — | us |

## DISPLAY INSTRUCTION TABLE

➢ **instruction table at "Extension mode"**
(when "EXT" option pin connect to Vss, the instruction set follow below table)

| Instruction | RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Description | OSC= 380KHz | OSC= 540kHz | OSC= 700KHz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clear Display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Write "20H" to DDRAM. and set DDRAM address to "00H" from AC | 1.08 ms | 0.76 ms | 0.59 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. The contents of DDRAM are not changed. | 1.08 ms | 0.76 ms | 0.59 ms |
| Entry Mode Set | 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. | 26.3 us | 18.5 us | 14.3 us |
| Display ON/OFF | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | D=1:entire display on<br>C=1:cursor on<br>B=1:cursor position on | 26.3 us | 18.5 us | 14.3 us |
| Function Set | 0 | 0 | 0 | 0 | 1 | DL | N | DH | *0 | IS | DL: interface data is 8/4 bits<br>N: number of line is 2/1<br>DH: double height font<br>IS: instruction table select | 26.3 us | 18.5 us | 14.3 us |
| Set DDRAM address | 0 | 0 | 1 | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set DDRAM address in address counter | 26.3 us | 18.5 us | 14.3 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 | 0 | 0 |
| Write data to RAM | 1 | 0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data into internal RAM (DDRAM/CGRAM/ICONRAM) | 26.3 us | 18.5 us | 14.3 us |
| Read data from RAM | 1 | 1 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read data from internal RAM (DDRAM/CGRAM/ICONRAM) | 26.3 us | 18.5 us | 14.3 us |

***Note * : this bit is for test command , and must always set to "0"***

| Instruction table 0(IS=0) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cursor or Display Shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | x | x | S/C and R/L:<br>Set cursor moving and display shift control bit, and the direction, without changing DDRAM data. | 26.3 us | 18.5 us | 14.3 us |
| Set CGRAM | 0 | 0 | 0 | 1 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 | Set CGRAM address in address counter | 26.3 us | 18.5 us | 14.3 us |

| Instruction table 1(IS=1) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Internal OSC frequency | 0 | 0 | 0 | 0 | 0 | 1 | BS | F2 | F1 | F0 | BS=1:1/4 bias<br>BS=0:1/5 bias<br>F2~0: adjust internal OSC frequency for FR frequency. | 26.3 us | 18.5 us | 14.3 us |
| Set ICON address | 0 | 0 | 0 | 1 | 0 | 0 | AC3 | AC2 | AC1 | AC0 | Set ICON address in address counter. | 26.3 us | 18.5 us | 14.3 us |
| Power/ICON control/Contrast set | 0 | 0 | 0 | 1 | 0 | 1 | Ion | Bon | C5 | C4 | Ion: ICON display on/off<br>Bon: set booster circuit on/off<br>C5,C4: Contrast set for internal follower mode. | 26.3 us | 18.5 us | 14.3 us |
| Follower control | 0 | 0 | 0 | 1 | 1 | 0 | Fon | Rab 2 | Rab 1 | Rab 0 | Fon: set follower circuit on/off<br>Rab2~0:<br>select follower amplified ratio. | 26.3 us | 18.5 us | 14.3 us |
| Contrast set | 0 | 0 | 0 | 1 | 1 | 1 | C3 | C2 | C1 | C0 | Contrast set for internal follower mode. | 26.3 us | 18.5 us | 14.3 us |

## ◆データとコマンドのWRＩＴＥ方法

・ＬＣＤに対しては、書き込み（WRＩＴＥ）のみが出来ます。読み込み（ＲＥＡＤ）はできません。
（Ｉ２ＣのＡＣＫはあります）。
・ＲＥＡＤが不可なのでＢｕｓｙフラグ、内部のＤＤＲＡＭアドレスカウンタは読み取る事ができません。
・スレーブアドレスは０ｘ７Ｃ（７ｂｉｔアドレス）です。「アドレス０１１１１１０＋０（RW）」
（ＲＥＡＤが不可なので、RWは常に０になります）Ａｒｄｕｉｎｏ表現では０ｘ３Ｅになります。
・スレーブアドレスに続くコマンドワードは「コントロールバイト＋データバイト」で構成され、複数のコマンドワードが送られる場合のＣｏ＝１で、最終コマンドワードのＣｏ＝０です。
・コントロールバイトで「Ｃｏ（連続コマンドワード／最終コマンドワードの指定）」と「ＲＳ（液晶のインストラクションコード／液晶のデータ指定）」を送信します。
・コントロールバイトの後に続くデータバイトが「液晶のインストラクションコード」の場合ＲＳ＝０、「液晶の表示データ」あるいは「ＣＧＲＡＭのデータ」の場合はＲＳ＝１になります。

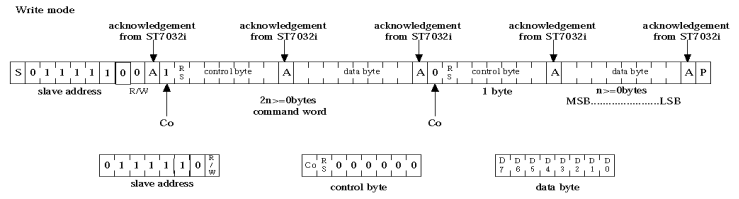



**Figure 5. 2-line Interface protocol**

| | | |
|---|---|---|
| Co | 0 | Last control byte to be sent. Only a stream of data bytes is allowed to follow. This stream may only be terminated by a STOP condition. |
| | 1 | Another control byte will follow the data byte unless a STOP condition is received. |

| RS | R/W | Operation |
|---|---|---|
| L | L | Instruction Write operation (MPU writes instruction code into IR) |
| H | L | Data Write operation (MPU writes data into DR) |

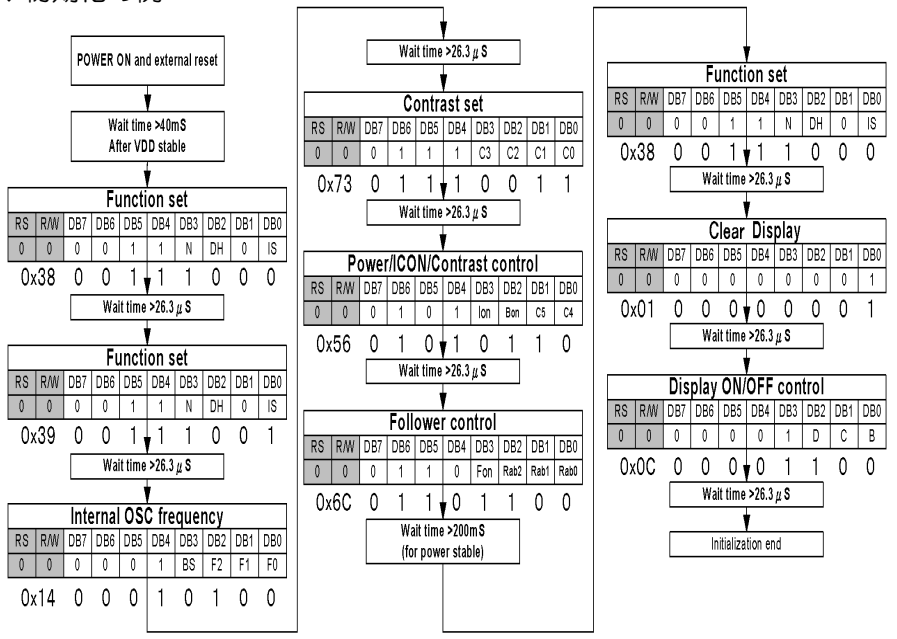
## ◆使い方

・接続はＩ２Ｃ接続です。ＳＤＡ、ＳＣＬをマイコン等と接続してください。
（ＶＤＤは３．１Ｖ～５．５Ｖです。ＳＤＡ、ＳＣＬはＶＤＤ以下の電圧でご使用ください）
・基本的なコマンドは、一般的なパラレル接続のＳＣ１６０２と同じです。
Ａｒｄｕｉｎｏでお使いの場合は、Ｗｉｒｅコマンドをお使いください。
・コントラストは、外付けＶＲではなく、拡張コマンドで設定します。設定前は表示が出ません。
（パラレル接続のＳＣ１６０２の様な■の連続も出ません）
・コントラスト調整などの拡張コマンド（前掲 DISPLAY INSTRUCTION TABLE のＩＳ＝１の表）が追加されています。
拡張コマンドを使用する場合は「Function Set」で「ＩＳ＝１」に指定します。拡張コマンド使用後は「Function Set」で「ＩＳ＝０」に戻します。
・Ｉ２Ｃ端子のＳＤＡ、ＳＣＬはプルアップする必要があります。変換基板をお使いの場合はソルダジャンパーを使用してプルアップしていただくか、あるいは基板外部にプルアップ抵抗を接続してください。
・変換基板を使用しない場合は接続回路例に示すようにＶＯＵＴ（６番ピン）、ＣＡＰ１Ｎ、ＣＡＰ１Ｐ（７，８番ピン）には、コンデンサを付ける必要があります。
・コントラスト調整は、拡張コマンド「Power/ICONcontrol/Contrast set」のＣ５、Ｃ４と「Contrast set」のＣ３～Ｃ０を使用し、６４段階で設定します。ＶＤＤ＝５Ｖの場合、Ｃ５＝１、Ｃ４＝０、Ｃ３＝０、Ｃ２＝０、Ｃ１＝１、Ｃ０＝１で少し濃い目ぐらいです。
・拡張コマンド「Power/ICONcontrol/Contrast set」の「Ｉｏｎ」ビットはアンテナやバッテリーなどのアイコン表示の為のビットです。この液晶にはアイコンがありませんので、０に設定してください。
・拡張コマンド「Power/ICONcontrol/Contrast set」の「Ｂｏｎ」ビットはＶＤＤ＝３．３Ｖの場合１に、ＶＤＤ＝５Ｖの場合０に設定してください。

## ◆液晶表示　ＤＤＲＡＭアドレス(液晶画面の表示アドレスです）１６進表記

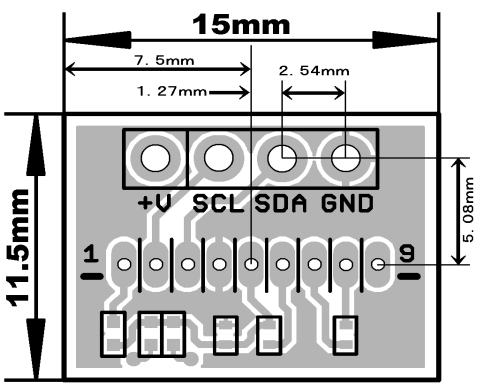
| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| １行目 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F |
| ２行目 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F |

## ◆初期化の例



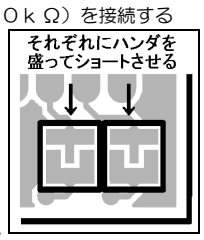

## ◆変換基板外形図（セットによっては基板は付属しておりません）

ピンヘッダ穴径０．９mm、LCDモジュールピン穴径０．６mm




## ◆変換基板裏面 ハンダジャンパーパッドの説明

ＳＣＬ、ＳＤＡ信号線に、この基板上のプルアップ抵抗（１０ｋΩ）を接続する場合は、右図のパッド２箇所にハンダを盛ってショートさせてください。（この２ヶ所同士はショートしないようお気を付け下さい）




変換基板外部にプルアップ抵抗を接続する場合は出荷時のままにしておいてください。
ハンダジャンパーは不要です。

**★液晶に内蔵のコントロールＩＣ「ＳＴ７０３２ｉ」の詳しい資料は、弊社ホームページのＡＱＭ１６０２のページに参考ｐｄｆ資料がございます。**

## ◆インストラクション（液晶への命令）

- **Clear Display**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Clear all the display data by writing "20H" (space code) to all DDRAM address, and set DDRAM address to "00H" into AC (address counter). Return cursor to the original status, namely, bring the cursor to the left edge on first line of the display. Make entry mode increment (I/D = "1").

- **Return Home**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | X |

Return Home is cursor return home instruction. Set DDRAM address to "00H" into the address counter. Return cursor to its original site and return display to its original status, if shifted. Contents of DDRAM do not change.

- **Entry Mode Set**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S |

Set the moving direction of cursor and display.

➢ **I/D : Increment / decrement of DDRAM address (cursor or blink)**
When I/D = "High", cursor/blink moves to right and DDRAM address is increased by 1.
When I/D = "Low", cursor/blink moves to left and DDRAM address is decreased by 1.
* CGRAM operates the same as DDRAM, when read from or write to CGRAM.

➢ **S: Shift of entire display**
When DDRAM read (CGRAM read/write) operation or S = "Low", shift of entire display is not performed. If S = "High" and DDRAM write operation, shift of entire display is performed according to I/D value (I/D = "1": shift left, I/D = "0" : shift right).

| S | I/D | Description |
|---|---|---|
| H | H | Shift the display to the left |
| H | L | Shift the display to the right |

- **Display ON/OFF**

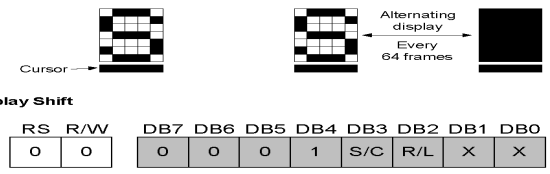
| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B |

Control display/cursor/blink ON/OFF 1 bit register.

➢ **D : Display ON/OFF control bit**
When D = "High", entire display is turned on.
When D = "Low", display is turned off, but display data is remained in DDRAM.

➢ **C : Cursor ON/OFF control bit**
When C = "High", cursor is turned on.
When C = "Low", cursor is disappeared in current display, but I/D register remains its data.

➢ **B : Cursor Blink ON/OFF control bit**
When B = "High", cursor blink is on, that performs alternate between all the high data and display character at the cursor position.
When B = "Low", blink is off.




- **Cursor or Display Shift**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | X | X |

➢ **S/C: Screen/Cursor select bit**
When S/C="High", Screen is controlled by R/L bit.
When S/C="Low", Cursor is controlled by R/L bit.

➢ **R/L: Right/Left**
When R/L="High", set direction to right.
When R/L="Low", set direction to left.

Without writing or reading of display data, shift right/left cursor position or display. This instruction is used to correct or search display data. During 2-line mode display, cursor moves to the 2nd line after 40th digit of 1st line. Note that display shift is performed simultaneously in all the line. When displayed data is shifted repeatedly, each line shifted individually. When display shift is performed, the contents of address counter are not changed.

| S/C | R/L | Description | AC Value |
|---|---|---|---|
| L | L | Shift cursor to the left | AC=AC-1 |
| L | H | Shift cursor to the right | AC=AC+1 |
| H | L | Shift display to the left. Cursor follows the display shift | AC=AC |
| H | H | Shift display to the right. Cursor follows the display shift | AC=AC |

- **Function Set**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | DL | N | DH | 0 | IS |

➢ **DL : Interface data length control bit**
When DL = "High", it means 8-bit bus mode with MPU.
When DL = "Low", it means 4-bit bus mode with MPU. So to speak, DL is a signal to select 8-bit or 4-bit bus mode.
When in 4-bit bus mode, it needs to transfer 4-bit data by two times.

➢ **N : Display line number control bit**
When N = "High", 2-line display mode is set.
When N = "Low", it means 1-line display mode.

➢ **DH : Double height font type control bit**
When DH = " High " and N= "Low", display font is selected to double height mode(5x16 dot),RAM address can only use 00H~27H.
When DH= "High" and N= "High", it is forbidden.
When DH = " Low ", display font is normal (5x8 dot).

➢ **IS : normal/extension instruction select**
When IS=" High", extension instruction be selected (refer extension instruction table)
When IS=" Low", normal instruction be selected (refer normal instruction table)

- **Set CGRAM Address**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |

Set CGRAM address to AC.
This instruction makes CGRAM data available from MPU.

- **Set DDRAM Address**

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | AC6 | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |

Set DDRAM address to AC.
This instruction makes DDRAM data available from MPU.
When 1-line display mode (N = 0), DDRAM address is from "00H" to "4FH".
In 2-line display mode (N = 1), DDRAM address in the 1st line is from "00H" to "27H", and DDRAM address in the 2nd line is from "40H" to "67H".

## ◆Ａｒｄｕｉｎｏとの接続（UNOの例。他機種はピン、VDDを確認してください）

・基本的なＷｉｒｅコマンドで制御できます。**・Ｉ２Ｃアドレスは０ｘ３Ｅです**
・Ａｒｄｕｉｎｏ UNOのA４（SDA）、A５（SCL）、５V、GNDを、液晶のSDA、SCL、VDD、GNDと接続します。

```
#include <Wire.h>
#define LCD_ADRS 0x3E
char moji[] ="AQM1602XA-RN-GBW";
//SCL=A5=LCDNo2  SDA=A4=LCDNo3
void setup() {
Wire.begin();
init_LCD();
}
void loop() {
  for(int i = 0; i < 16; i++) {
    writeData(moji[i]);
  }
writeCommand(0x40+0x80); // 2LINE TOP
  for(int i = 0; i < 16; i++) {
    writeData(i+0xb1);
  }
while(1){}//stop
}
//----main end----
```

```
//データ書き込み
void writeData(byte t_data)
{
  Wire.beginTransmission(LCD_ADRS);
  Wire.write(0x40);
  Wire.write(t_data);
  Wire.endTransmission();
delay(1);
}
//コマンド書き込み
void writeCommand(byte t_command)
{
  Wire.beginTransmission(LCD_ADRS);
  Wire.write(0x00);
  Wire.write(t_command);
  Wire.endTransmission();
delay(10);
}
```

```
//液晶初期化
void init_LCD() {
delay(100);
writeCommand(0x38);
delay(20);
writeCommand(0x39);
delay(20);
writeCommand(0x14);
delay(20);
writeCommand(0x73);
delay(20);
writeCommand(0x52);
delay(20);
writeCommand(0x6C);
delay(20);
writeCommand(0x38);
delay(20);
writeCommand(0x01);
delay(20);
writeCommand(0x0C);
delay(20);
}
```