





## ■データとコマンドのWRITE方法

LCDに対しては、書き込み (WRITE) のみ出来ます。読み込み (READ) は、出来ません。(I2CのACKはあります)。また、Busヤフラグ、内部のDDRAMアドレスカウンタは、読み取ることが出来ません。

スレーブアドレスは、0x7Cです。(アドレス01111110+0(RW))。コントロールバイトで「データ、コマンドの指定」RSと、「連続データ最終データの指定」Coを送信します。コマンドの場合RS=0、データはRS=1になります。データを複数送る場合Co=1で、最終データはCo=0です。

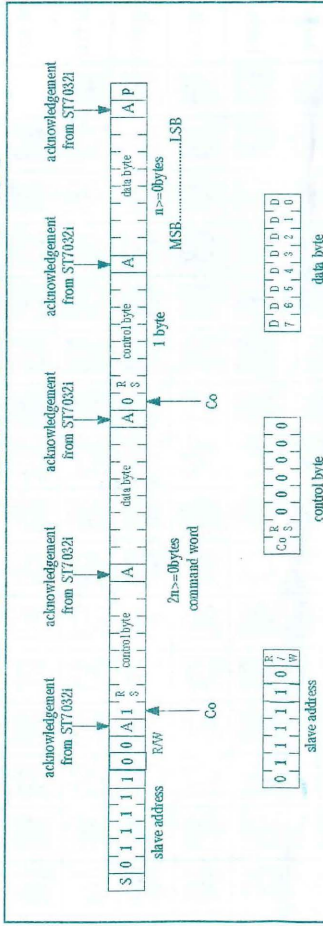


Figure 5. 2-line Interface protocol

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.
Co	1	Another control byte will follow the data byte unless a STOP condition is received.

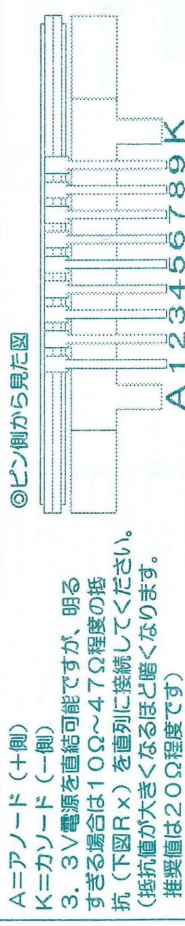
### Operation

RS/RW	Operation
L	Instruction Write operation (MPU writes Instruction code into IR)
H	Data Write operation (MPU writes data into DR)

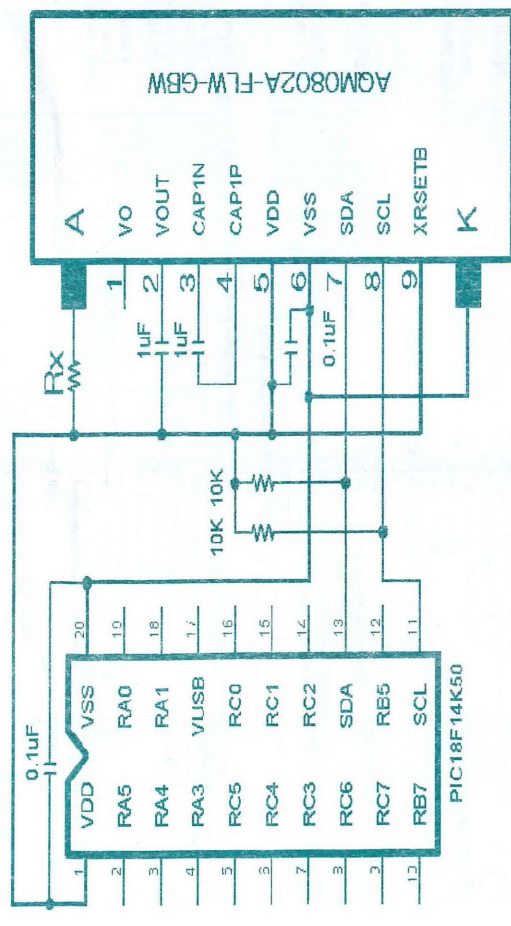
## ■使い方

1. 基本的なコマンドは、一般的なSC1602と同じです。
  2. コントラストは、外付けV<sub>R</sub>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。(■の連続も出ません。)
  3. コントラスト調整などの拡張コマンド (前頁DISPLY INSTRUCTIO N 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。
4. I2C端子のSDA、SCLは外部でプルアップする必要があります。
  5. リセット端子XRSETBは、通常VDDに接続します。電源立ち上がり時間などでうまくリセットされない場合は、マイコン I/Oに接続し、マイコンからソフトウェアでリセットします。
  6. VOUT (2番ピン)、CAP1NとCAP1P (3番ピンと4番ピン) には、コンデンサを付ける必要があります。VOUT 1uF CAP1N CAP1P 0.1~4.7uF
  7. コントラスト調整は、拡張コマンド「Power/CONtroll/Contrast set」のC5、C4と「Contrast set」のC3、C2、C1、C0で64段階で設定します。VDD=3Vの場合、C5=1,C4=0,C3=0,C2=0,C1=0,C0=0程度です。
- ## ■バックライトLEDの接続

◎ピン側から見た図



## ■接続例

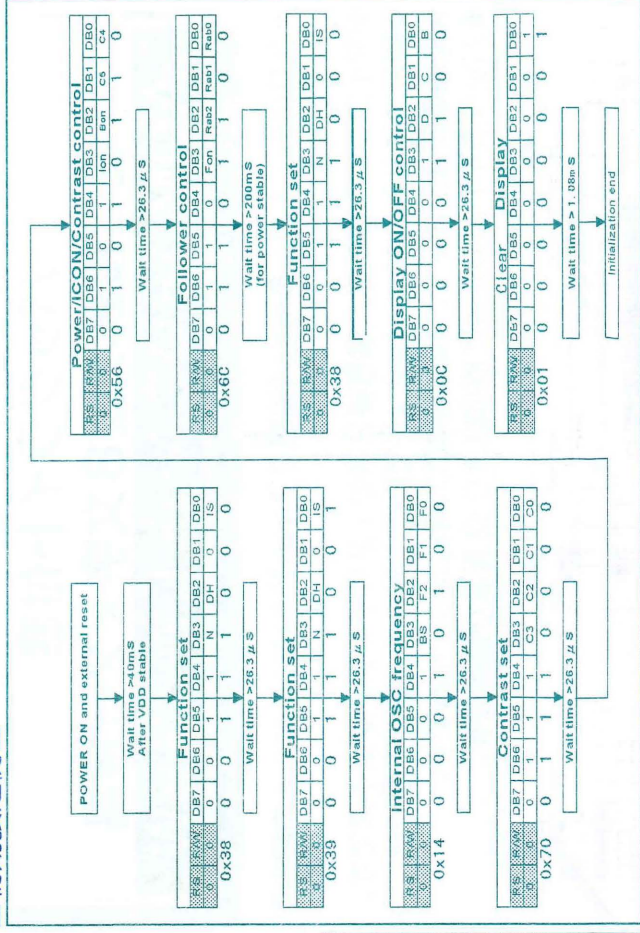


## ■液晶表示 DDRAMアドレス

1行目	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
2行目	0x40	0x41	0x42	0x43	0x44	0x45	0x46	0x47

★コントローラIC ST7032の詳しい資料は、弊社ホームページAQM0802のページに参考pdf資料がございます。

## ■初期設定例



## ■Instruction Description

### 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 the address counter. Return cursor to the original state, namely, bring the cursor to the left edge on first line of the display. Make entry mode increment (ID = "1").

### Return Home

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

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: Moving direction of cursor and display. 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.

S: Shift of entire display. When S = "High", when read from or write to CGRAM.

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
I	I	Shift the display to the left
I	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	0	1	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 I/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/O 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	0	1	S/C	R/L	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
L	L	Shift cursor to the left
L	H	Shift cursor to the right
H	L	Shift display to the left
H	H	Shift 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	C	B	S

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/O 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	0	1	S/C	R/L	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
L	L	Shift cursor to the left
L	H	Shift cursor to the right
H	L	Shift display to the left
H	H	Shift display to the right

### Function Set

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

N: Display mode select 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", it is forbidden.

When DH = "Low", it is normal (8x8 dot)

IS: normal/extension instruction select

When IS = "High", extension instruction is selected (refer extension instruction table)

When IS = "Low", normal instruction is selected (refer normal instruction table)