

# I<sup>2</sup>C接続小型LCDモジュール

## (バックライト付) 用ピッチ変換基板

K-12238

[AE-AQM0802A-BL]

I<sup>2</sup>C接続小型LCDモジュール（バックライト付）を、使いやすい2.54mmピッチに変換する基板です。バックライトのアノード、カソードの端子は基板上でVDD,VSSに接続できるようになっていますので、従来のバックライト非搭載のモジュールからそのまま置き換えることができます。

### 実装済部品

部品番号	型番	数量
C1-C3	1608サイズ 0.1μF 50V	3
R1,R2	1608サイズ 10kΩ±5%	2
R3	1608サイズ 20Ω±5%	1

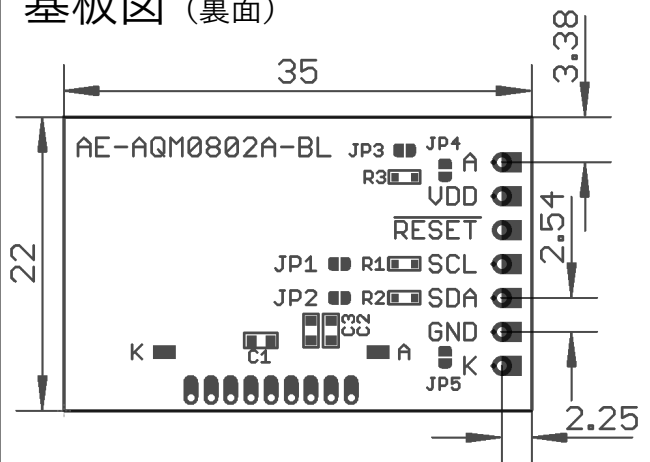
### 定格電圧・消費電流

LCD	バックライト
入力電圧:3.3V	入力電圧:3.3V
消費電流:1mA(最大)	消費電流:60mA(最大)

### セット内容

ピッチ変換基板	×1
LCDモジュール[P-09422]	×1
細ピンヘッダ1×7[C-04393]	×1

### 基板図 (裏面)



### 基板上ジャンパの設定

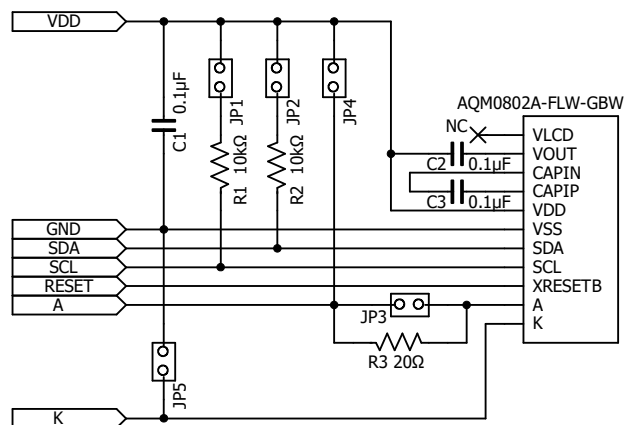
JP1	SCLプルアップ有効 (10kΩ)
JP2	SDAプルアップ有効 (10kΩ)
JP3	R3 (LEDの電流制限抵抗) 短絡
JP4	VDDとLEDのアノード(A)を接続
JP5	GNDとLEDのカソード(K)を接続

JP1,JP2はSCL,SDAのプルアップの有効・無効を決定します。短絡することによりVDDへ10kΩを通し接続されます。

JP3はバックライト電圧3.3Vで使用する場合は基本的に短絡して使用します。明る過ぎる場合は開放します。バックライト電圧5Vで使用する場合は開放して使用します。

JP4,JP5はVDD,GNDよりバックライト電圧を供給する場合に短絡します。

### 回路図



コントローラであるST7032iの仕様書もあわせてご覧ください。  
<http://akizukidenshi.com/download/ds/sitronix/st7032.pdf>

# データとコマンドのWRITE方法

LCDに対しては書き込み(WRITE)のみができます。読み込み(READ)はできません。(I<sup>2</sup>CのACKはあります。)また、Busyフラグと内部のDDRAMアドレスカウンタは読み取ることができません。

スレーブアドレスは0x7Cです。(0111110+0)

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。コマンドはRS=0,データはRS=1です。データを複数送る場合Co=1で、最終データはCo=0です。

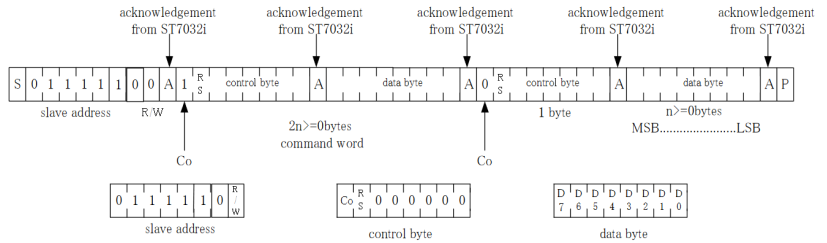


Figure 5. 2-line Interface protocol

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.

## 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 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.

### Power/ICON control/Contrast set(high byte)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	0	1	Ion	Bon	C5	C4

#### Ion: set ICON display on/off

When Ion = "High", ICON display on.

When Ion = "Low", ICON display off.

#### Bon: switch booster circuit

Bon can only be set when internal follower is used (OPF1=0, OPF2=0).

When Bon = "High", booster circuit is turn on.

When Bon = "Low", booster circuit is turn off.

#### C5,C4 : Contrast set(high byte)

C5,C4,C3,C2,C1,C0 can only be set when internal follower is used (OPF1=0,OPF2=0).They can more precisely adjust the input reference voltage of V0 generator. The details please refer to the supply voltage for LCD driver.

### Contrast set(low byte)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	1	1	C3	C2	C1	C0

#### C3,C2,C1,C0:Contrast set(low byte)

C5,C4,C3,C2,C1,C0 can only be set when internal follower is used (OPF1=0,OPF2=0).They can more precisely adjust the input reference voltage of V0 generator. The details please refer to the supply voltage for LCD driver.

### 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 = "High", 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).

N	DH	EXT option pin connect to high		EXT option pin connect to low	
		Display Lines	Character Font	Display Lines	Character Font
L	L	1	5x8	1	5x8
L	H	1	5x8	1	5x16
H	L	2	5x8	2	5x8
H	H	2	5x8	Forbidden	

### Bias selection/Internal OSC frequency adjust

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	1	BS	F2	F1	F0

#### BS: bias selection

When BS="High", the bias will be 1/4

When BS="Low", the bias will be 1/5

BS will be invalid when external bias resistors are used (OPF1=1, OPF2=1)

#### F2,F1,F0 : Internal OSC frequency adjust

When CLS connect to high, that instruction can adjust OSC and Frame frequency.

Internal frequency adjust			Frame frequency (Hz) (2 line mode)	
F2	F1	F0	VDD = 3.0 V	VDD = 5.0 V
0	0	0	122	120
0	0	1	131	133
0	1	0	144	149
0	1	1	161	167
1	0	0	183	192
1	0	1	221	227
1	1	0	274	277
1	1	1	347	347

