AI04 LCD

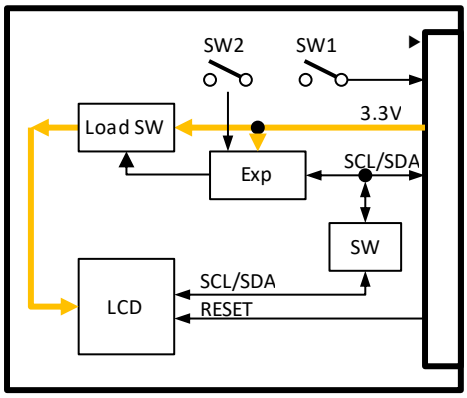
1. Description

The leaf is equipped a character LCD and 2 switched. LCD is connected to I2C pins in MCU leaf. Switches are connected to digital input pin and I2C IO expander.

For saving power consumption, LCD power supply can be turned on/off by I2C expander.

2. Leaf specification

2-1. Block diagram



2-2. Power supply specification

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Power Supply Voltage	–	3.1V	3.3V	3.5V
Idd	Operating current	Active	-	500uA	-
		Sleep	-	1uA	-

2-3. Main parts

Reference No.	Part name	Part number	Vendor name	note
A440	LCD ユニット	AQM0802A-RN-GBW	Xiamen Zettler Electronics	–
IC440	I2C Expander	PCA9557RGVR	Texas Instruments	–
IC441	Load Switch	XC8102AA01NR-G	TOREX	–
IC442	Analog Switch	TS3A4751RUCR	Texas Instruments	–

2-4. Appearance

Top Side	Back Side
	

Pinout

Name	Function
SCL	I2C Clock
SDA	I2C Data
RESET	Reset
D2	Switch input L: ON H: OFF (The pin can be set to D5 by changing chip resistance)
3V3	3.3V
GND	GND

2-5. Switch

Item	Reference No.	Description
SW1	S440	Connected to pin 2
SW2	S441	Connected to I2C Expander P1 pin

3. LCD (AQM0802A-RN-GBW) Specifications

3-1. Description

Item	Description
Display Format	8x2 Character
Viewing Area (WxH)	27x10.5mm
Dot Size (WxH)	0.45x0.5mm
Dot Pitch (WxH)	0.5x0.55mm
Character Size (WxH)	2.45x4.35mm
Character Pitch (WxH)	2.95x4.9mm
Viewing Direction	6:00 O'Clock
Driving Method	1/16Duty,1/5Bias
Controller IC	ST7032I-0D(Sitronix) or compatible
Display Mode	STN (Gray)/Positive/Reflective
Interfaces	I2C

3-2. Electrical characteristics

3-2-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-20℃ to +70℃
Maximum Operation Voltage	5.5V

3-2-2. Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	supply voltage	25℃	3.1V	3.3V	3.5V
Idd	Supply current	Vdd=3.3V	-	500uA	1000uA

3-3. Link destination of data sheet

http://akizukidenshi.com/catalog/g/gP-06669/

4. Main functions and libraries

4-1. LCD

include file:ST7032.h

https://github.com/tomozh/arduino_ST7032

Definition	Description
lcd.begin(cols, lines)	Initialize LCD 【Arguments】 cols : columns count (8) lines : lines count (2) 【Return】 None
lcd.setContrast(cont)	Set contrast 【Arguments】 cont : contrast value (0～63) 【Return】 None
lcd.clear()	Clear all display and set cursor position zero 【Arguments】 None 【Return】 None
lcd.print(" text")	Display text 【Arguments】 text : text 【Return】 None
lcd.setCursor(col, row)	Set cursor position 【Arguments】 col : column row : row 【Return】 None
lcd.blink()	Blink display 【Arguments】 None 【Return】 None
lcd.noBlink()	Stop blink display 【Arguments】 None 【Return】 None

5. I2C Expander (PCA9557RGVR) Specifications

5-1. Description

Item	Description
Type	Parallel Port Expander
GIO Port	8Port
IO	5V Tolerant
Interfaces	I2C

5-2. Electrical characteristics

5-2-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	6.0V

5-2-2. Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	2.3V	-	5.5V
Idd	Operating mode	3.6V 100kHz	-	1uA	4uA
	Standby mode	3.6V Vi=Vcc or GND, Io=0	-	0.25uA	0.9uA

5-3. Link destination of data sheet

http://www.tij.co.jp/product/jp/PCA9557/

5-4. Register

Name	D7	D6	D5	D4	D3	D2	D1	D0
Control Register	0	0	0	0	0	0	B1	B0

Control Register Field Descriptions

B1	B0	REGISTER
0	0	Input Port
0	1	Output Port
1	0	Polarity Inversion
1	1	Configuration

Name	Control	D7	D6	D5	D4	D3	D2	D1	D0
Input Port	00h	I7	I6	I5	I4	I3	I2	I1	I0

Input Port Register Field Descriptions

Field	Description
I[7:0]	The input port register (register 0) reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by the configuration register. It only acts on read operation. Writes to these registers have no effect. The default value, X, is determined by the externally applied logic level. Before a read operation, a write transmission is sent with the command byte to signal the I2C device that the input port register will be accessed next.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Output Port	01h	O7	O6	O5	O4	O3	O2	O1	O0

Output Port Register Field Descriptions

Field	Description
O[7:0]	The output port register (register 1) shows the outgoing logic levels of the pins defined as outputs by the configuration register. Bit values in this register have no effect on pins defined as inputs. In turn, reads from this register reflect the value that is in the flip-flop controlling the output selection, not the actual pin value.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Polarity Inversion	02h	N7	N6	N5	N4	N3	N2	N1	N0

Polarity Inversion Register Field Descriptions

Field	Description
N[3:0]	The polarity inversion register (register 2) allows polarity inversion of pins defined as inputs by the configuration register. If a bit in this register is set (written with 1), the corresponding port pin's polarity is inverted. If a bit in this register is cleared (written with a 0), the corresponding port pin's original polarity is retained.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Configuration	03h	C7	C6	C5	C4	C3	C2	C1	C0

Configuration Register Field Descriptions

Field	Description
C[7:0]	The configuration register (register 3) configures the directions of the I/O pins. If a bit in this register is set to 1, the corresponding port pin is enabled as an input with high impedance output driver. If a bit in this register is cleared to 0, the corresponding port pin is enabled as an output.

6. Load Switch(XC8102AA01NR-G) Specifications

6-1. Description

Item	Description
Protection Cirtuit	Current limit circuit and Fold-back protection circuit equiped

6-2. Electrical characteristics

6-2-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	6.5V

6-2-2. Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	1.2V	-	6.0V
Ron	ON resistance	2.9V	-	0.35Ω	0.475Ω
Ilim	Current limitation	VIN≧2.9V, VOUT = VIN -0.8V	400mA	480mA	-
Ishort	Short-circuit current	VCE=VIN, VOUT=0V	-	30mA	75mA
Idd	Operating mode	4.0V	-	3.8uA	6.5uA
	Standby mode	6V	-	0.01uA	0.10uA

6-3. Link destination of data sheet

https://www.torex.co.jp/products/load-switches/series/?name=xc8102

7. Analog Switch(TS3A4751RUCR) Specifications

7-1. Electrical characteristics

7-1-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	4V

7-1-2. 定格

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	1.65V	-	3.6V
Ron	ON resistance	2.7V	-	0.7Ω	1.1Ω
Idd	supply current	3.6V	-	-	0.75uA

7-2. Link destination of data sheet

http://www.tij.co.jp/product/jp/ts3a4751

7-3. Power saving control

LCD power supply can be turned on/off by Load SW with controlling I2C IO expander.

8. Revision history

Rev A1.0: First edition, August 2019