1-wire BAE0910 tinyboard user manual

Description

This very tiny board integrates the BAE0910 multifunction 1-wire chip with all related features from this chip in a useful form factor.

- 13x36mm size, with two 3mm fixation holes
- the five functions pins of the chip are directly available on the 0.1" spaced 5 x 3 pin header.
- the pin header also provide GND and +5V signals in an arrangement compatible with R/C servo's.
- Led indication for power and for OUT[1] state
- Connection to 1wire bus via a 0.15" spaced 3 screw terminal bloc GND, +5Vdc and DQ.
- 470 Ω resistors have been added in serie to allow direct use of the output to drive small loads as leds, buzzers, small dil relays, etc...
- sensitive pins are protected by a schottky diode. (DQ and COUNTER)
- Zener 5.1v diode protect the chip again spikes.

Standard BAE0910 features:

Five I/O pins allows various functions:

- One to four 16 bit PWM: two hardware (PWM1 & 2) + two software(PWM3 & 4)
- One 8 bit ADC input 0 to 5V
- One 32 bit counter
- One strong digital output (sink up to 20mA)
- One PIO, software selectable as INPUT or OUTPUT (20ma)

Compatibility with 1-wire protocol:

- Standard speed operation: protocol implemented with low latency interrupts in background.
- Support every standard ROM commands: read rom, match rom, search rom, skip rom, resume rom, conditional search
- Unique serial number

Physical characteristics:

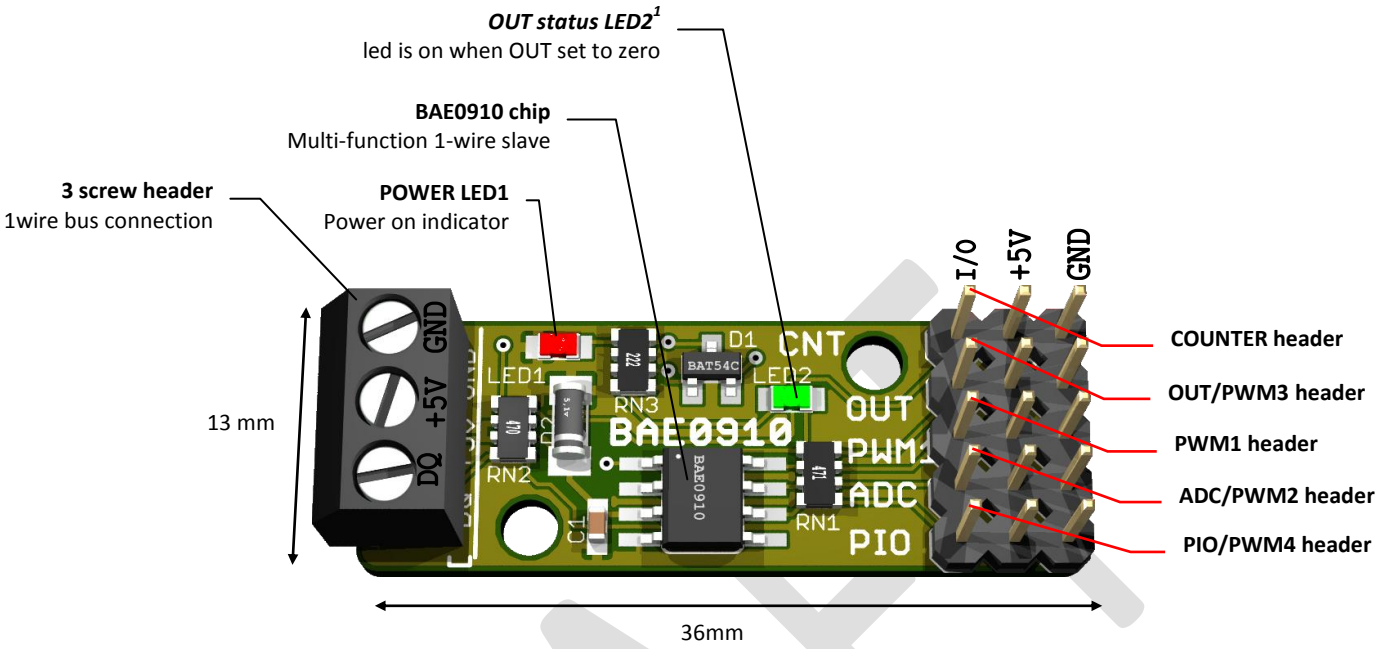
- Single chip microcontroller based solution in an 8-pin SOIC.
- 5.0V supply voltage, 8mA typical consumption
- powerful 32MHz operation
- Fully functional without additional external components

Additional features

- **Firmware upgradable via 1-wire bus.**
  The chip firmware is contained in FLASH and can be upgraded directly from 1-wire bus.
- **Automation Engine: embed your programs in the device.**
  This new feature allows to define powerful autonomous behavior of the chip
- 32 bit RTC clock incrementing each second.
- PIO has configurable internal pull-up / pull-down resistor
- Counter is configurable on rising/falling edge
- 8192 bit of EEPROM storage
- 32 byte user RAM

[1] ERRATA LED2 is not installed on tinyboard revision 1.01

General presentation.



Connector's pinouts:

1-wire interface: 3 screw connector

This board require 5Vdc stabilized power. Chip require only 8mA, however, connected devices may require more power.

ADC/PWM2

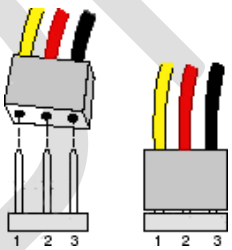
1	ADC/PWM2 (20mA max)
2	5V
3	GND

COUNTER

1	COUNTER input (6,6K pull up)
2	5V
3	GND

OUT/sPWM3

1	OUT/PWM3 (Sink only)
2	5V
3	GND



PIO/sPWM4

1	IN/OUT/PWM4 (20mA max)
2	5V
3	GND

PWM1

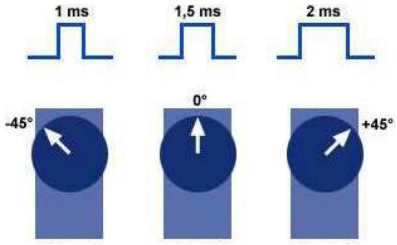
1	PWM1 (20mA max)
2	5V
3	GND

[1] ERRATA LED2 is not installed on tinyboard revision 1.01

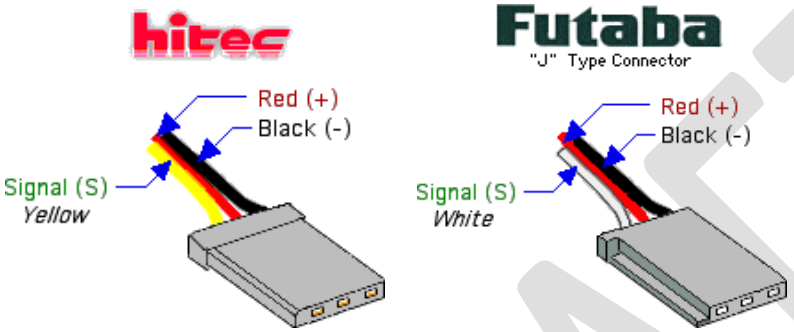
R/C Servomotor control example

BAE0910 chip is able to control up to four servo motors independently.

A servo motor requires a 5Vdc supply and a control signal in the form of a repeated pulse every 20ms. The width of the pulse defines the shaft position. Such signal is easily produced by PWM function.



The are various servo connectors, however the more frequently used are shown below:



On the demo board, such servos are directly connectible to the pin headers. PWM1, 2, 4

Always check with your specific servo brand if the wiring is respected.

Configuration of the device for a servo connected on PWM1:

1. Set register configuration to
   TPM1=4 → 1MHz clock,
   PERIOD1=20000 → period of 20000µs = 50Hz
   DUTY1=1500 → duration of the pulses (1500 =center position for servo)

2. Connect the servo on PWM1 header

3. Vary DUTY1 register from 1000 to 2000 to turn servo
   Depending on servo model, the range for DUTY could be larger (700 to 2400)

To turn off the servo, set DUTY1=0

Controls more servo's with other available PWM, PERIOD1 is common for PWM1 & PWM3 and PERIOD2 is for PWM2 & PMW4. The DUTY registers are available for each PWM output.

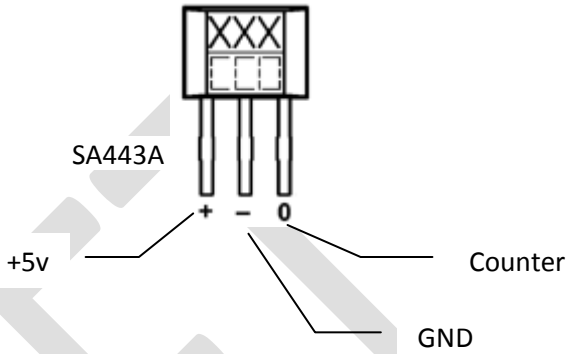
Water COUNTER example

Many sensors are providing pulse output. Measuring such signals is easily done with COUNTER function.

Here is an example of flow sensor:
http://www.gemssensors.com/uploadedFiles/Literature/Spec_Sheets/FT110.pdf

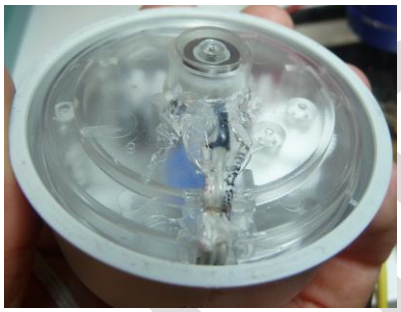
Alternatively, you can hack a mechanical water counter (not you official one) to obtain good results:

Most of water counter found in DIY stores are designed with a rotating magnet inducting movement to the gears. It is possible to measure the rotation of the magnetic field with a hall-effect sensor (ex. SA443A).



The easiest method is to remove the plastic part and place the sensor in the center blind hole of the copper body.

However, it is possible keep a fully functional counter if you carefully install the sensor in the plastic body.

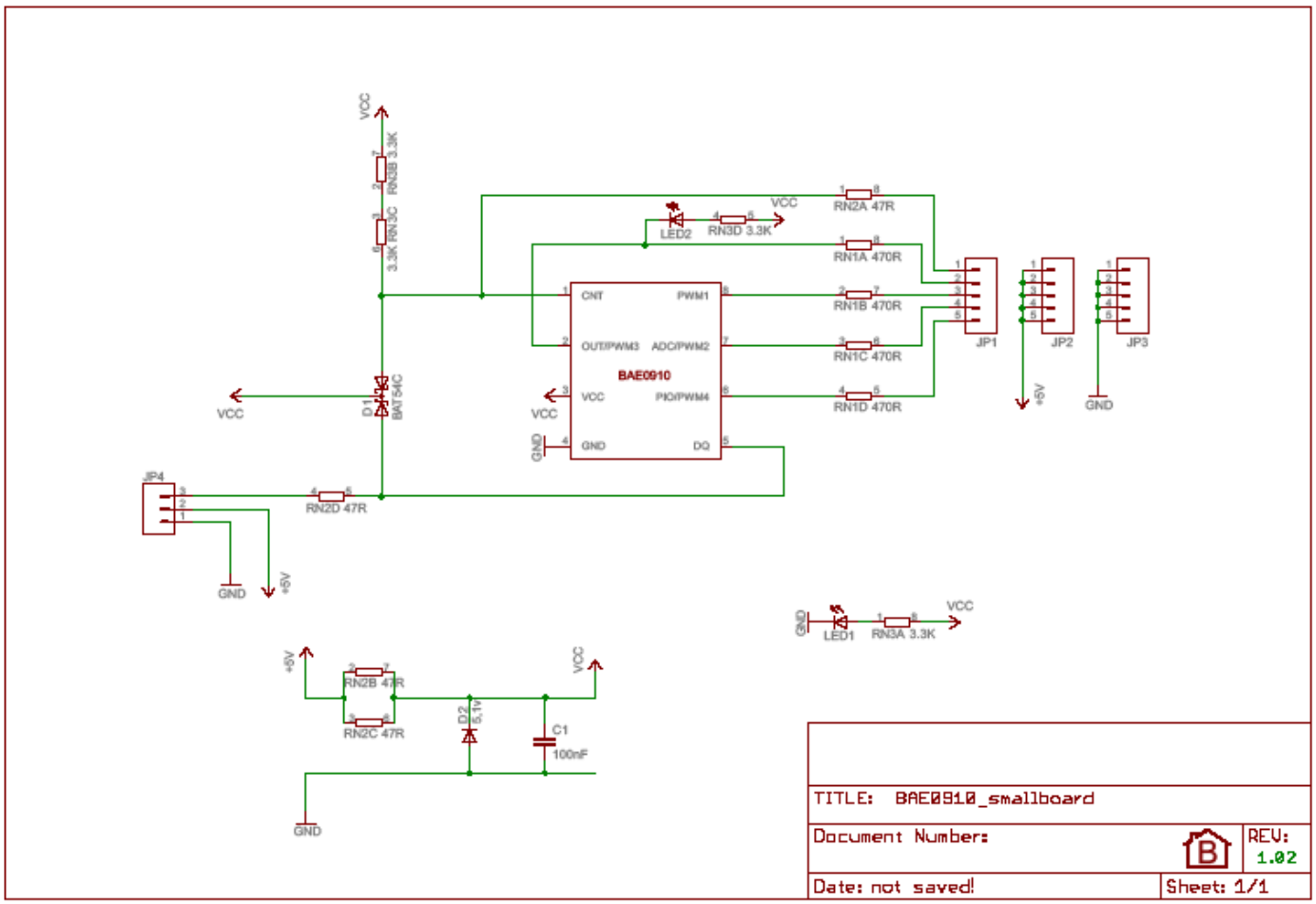


The model pictured here produce 38 pulses / liter.

The tinyboard has already a 3,3KΩ pullup resistor, you only have to connect the sensor to the CNT header respecting sensor pinout shown above.
Configure BAE0910 register CNTC=0 for falling edge, counting is active
Reading COUNTER register provide number of pulse produced.

Of course you have to calculate the number of pulse per volume your counter is producing to convert to real world units.

Schematic of the BAE0910 tinyboard.



Support

Online support is available via the forum on www.brain4home.eu

Availability

Chips and boards can be ordered online on www.brain4home.eu

Condition of use

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About the author

Pascal Baerten is primarily an IT consultant with technical background in automation. He followed A2 technical studies until 1985 where he played with CNC machines and pneumatic automates. Graduated in Computer Sciences from the Robert Shuman High school in Belgium in 1989, his thesis was titled “A terminal emulator” where he mastered serial communication and networking programming.

His first computer was a Sinclair ZX81, where he learned the basics of exploiting very constrained computing resources in assembler. Later, a Commodore 64 opened the way to interfacing computers with electronic toys.

Since 1990 he developed network based resource sharing solutions in assembler and C.: Telex server, Minitel server, mainframe front end, mail server, print server, text2speech telephone server, database gateway, IM server …

As skilled networking/server architect, he is working as IT consultant for large financial companies since 1997.

In parallel, developments in home automation have contributed to accumulate some experience with microcontrollers and embedded computing.

Revision history

Revision #	Date	Description
0.1	Jan 3, 2010	Initial draft
0.2	Feb 8, 2010	Updated presentation
0.21	Feb 11, 2010	Small corrections PERIOD, pullup in example.
0.22	Feb 18, 2010	Correction for rev 1.02 boards