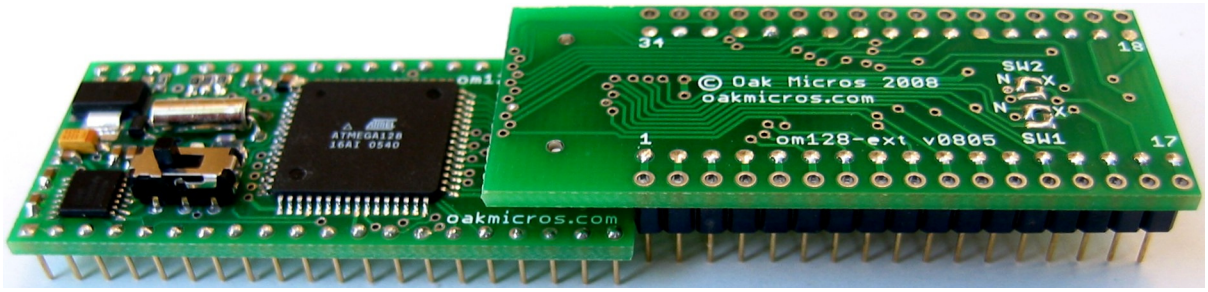
Oak Micros

I/O Extension User Guide and Reference (om128-ext)

for ATmega128/ATmega1281 devices

Version 1.0



I/O extension plugged into an om128

July 1, 2008

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Document History

Version 1.0	July 1, 2008	Initial version

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1 Introduction

The Oak Micros om128-ext is a plug in I/O extension board for the following ATmega128 and ATmega1281 based devices:

- om128
- ZX-128e
- ZX-128ne
- ZX-1281e
- ZX-1281ne

The om128-ext supports two types of usage. The om128-ext allows access to 18 additional I/O pins (Port A, Port C, and pins 0 and 1 of port G) available on the ATmega128 and ATmega1281 microcontrollers. In addition it carries 128K bytes of RAM that can be bank-switched or not used at all. The om128-ext also has an additional 8 output only pins that are latched through Port A.

The om128-ext provides full access to the buffered 16-bit address, 8-bit data, and control lines that are used by the ATmega devices for extended memory. With the 34-pin extension socket it is possible to build a plug in daughter card for kinds of memory-mapped I/O devices.

The XRAM example program available in the Oak Micros software download can be used with extended RAM and the om128-ext. Similarly ZBasic programs that use extended memory will also work with the appropriate ZBasic device and the om128-ext.

Section 2 of this manual explains how to get started with the om128-ext. Section 3 gives examples on how to connect the om128-ext and section 4 lists the function of each of the 34 pins. Appendix A shows the schematic for the om128-ext.

2 Getting Started

This chapter explains how to quickly get started with the om128-ext. The other chapters in this manual should be consulted for more details on the hardware and support software.

2.1 Unpacking and Installing the om128-ext

The om128-ext is delivered in an ESD protective box. It may also be delivered together with one of the Oak Micros devices that it can be plugged into. It is recommended that the om128-ext be left in the conductive black foam when not in use. The om128-ext can be used on a breadboard or any other circuit that has 0.1" hole spacing such as veroboard (also known as stripboard) or a custom PCB. The picture below shows an om128 and om128-ext before the two devices are plugged together.

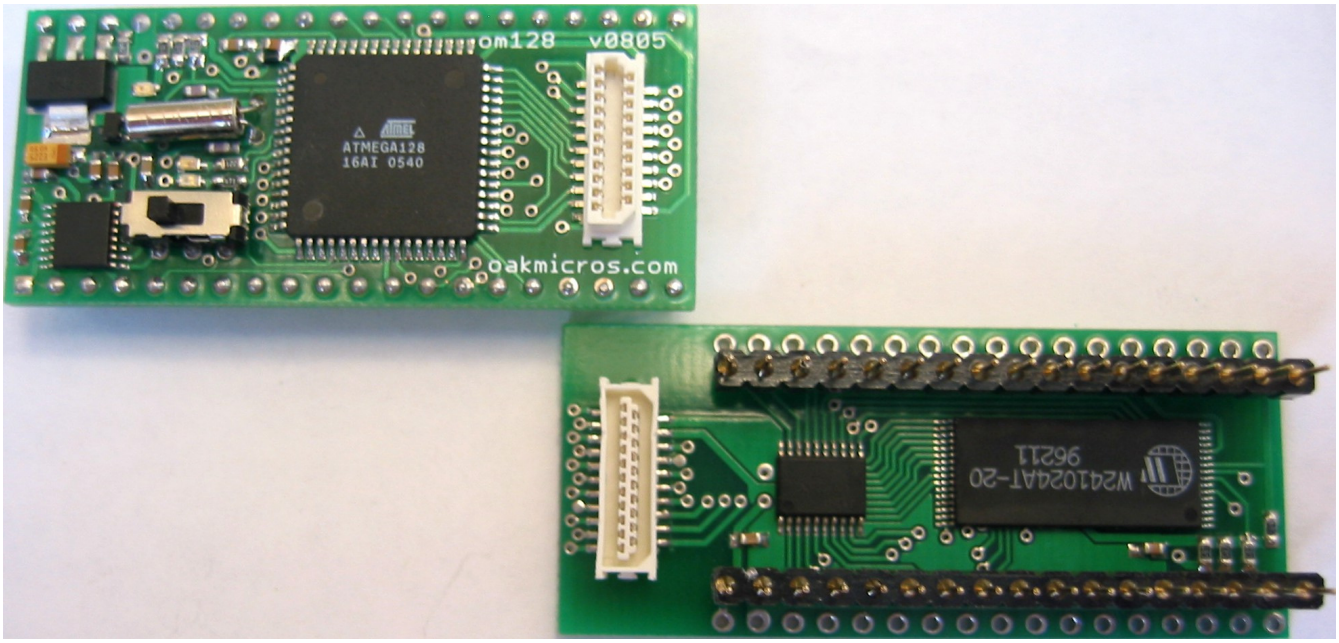

Figure 1: om128 and om128-ext showing plug and socket

The plug on the om128-ext can only be oriented one way. The plug on the om128-ext should line up exactly with the socket. Here is a side view of the two boards plugged together. Note in the picture below how the last pin of the host device and the first pin on om128-ext are 0.1" apart.

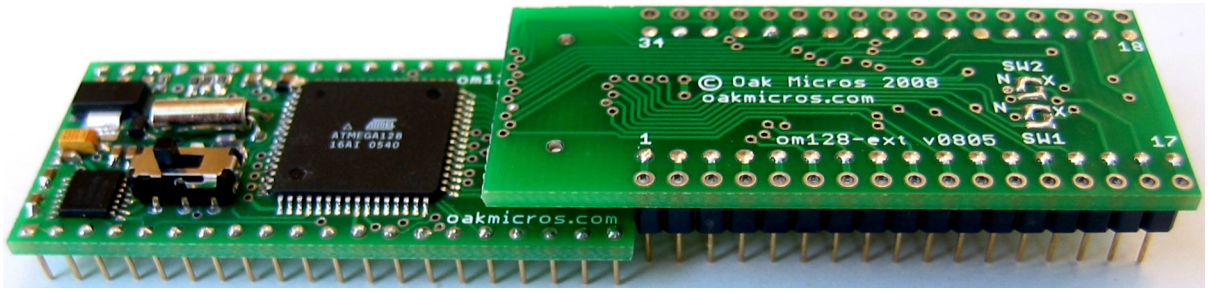

Figure 2: om128 and om128-ext plugged together

It is recommended that the host device (om128, ZX-128e, ZX-128ne, ZX-1281e, or ZX-1281ne) is inserted into the breadboard first and then the om128-ext is inserted as shown in the left hand picture below. The total number of pins on one side is 37 so make sure you allow enough room.

To remove the two boards you should first carefully lever up the om128-ext. The arrows in the right hand picture below show where to lever up the board. Note that the side position is just behind the plug. This position gives the most leverage. In the picture below you should be able to just see the tip of a flat screwdriver inserted all the way underneath the board as a way to help lever it out of the breadboard.

Warning: You should be gentle inserting and removing the om128-ext so as not to abuse the plug and socket connectors.

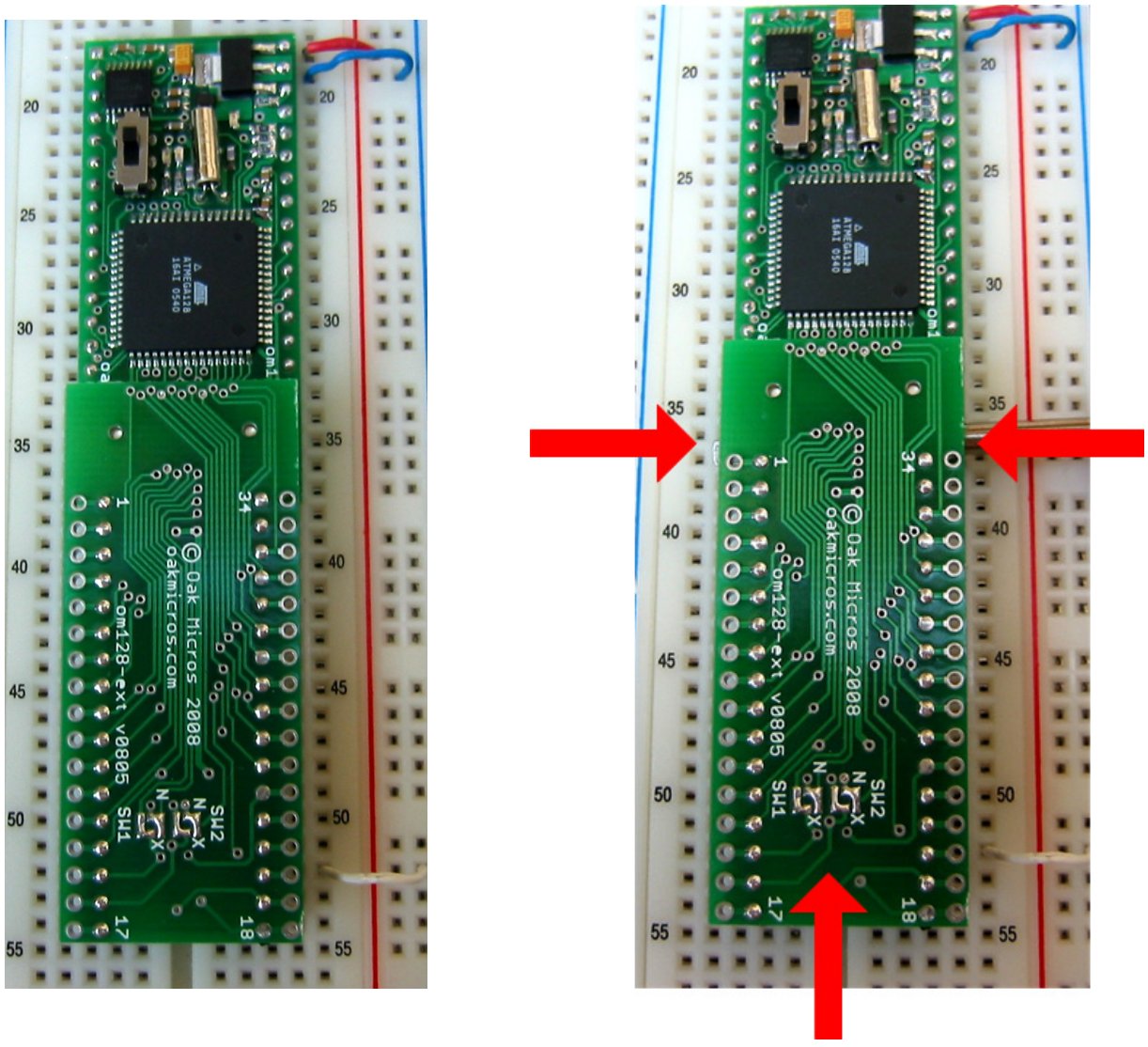

Figure 3: Using the om128-ext with a Breadboard

3 Using the om128-ext

This chapter describes the hardware features of the om128-ext device.

The om128-ext is packaged in a 34-pin DIL style package that nominally measures 2.1 inches long by 0.9 inches wide. This is wider than a regular 40-pin package and the device pins are positioned 0.6” apart

Pin 1 for the device is denoted on the top of the circuit board as shown in the picture to the right.

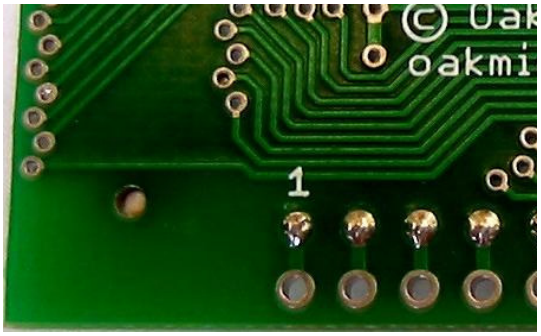

Figure 4: Locating Pin 1

3.1 Using the I/O pins

To start using the I/O pins for Port A, Port C, PG0 and PG1, just simply plug in the om128-ext into an om128, ZX-128e, ZX-128ne, ZX-1281e, or ZX-1281ne device. The layout of the pins is shown in figure 6 on 10. Be careful not to get confused about Port A pins and the RAM addressing pins.

3.2 Using Bank-switched RAM

To use the RAM on the om128-ext it is first necessary to enable the RAM by connecting pin 20 to ground. The white wire near the bottom of figure 3 on page 6 shows that connection.

Unlike the RAM daughterboard for the om128, ZX-128e, ZX-128ne, ZX-1281e, or ZX-1281ne, it is also possible to bank switch the RAM and use the other 64K of the total 128K available. This is achieved by connecting pin 17 (address line A16) to ground.

3.3 Using the 8 Latched Outputs

As an additional feature of the om128-ext circuitry it is possible to use an additional 8 output only pins that are labeled A0 through A7 on the pin layout shown in figure 5 on page 10. These outputs are available by setting the values on Port A and then sending a positive pulse on G.2. Afterwards it is necessary to set Port A back to the normal operating mode. You should not use this feature if the output on Port A is critical.

An example use of this feature would be to connect 8 buttons and 8 LEDs to port A and then use the output latch feature to display the result of the buttons on the LEDs. Here is a snippet of code that shows how to enable the latch and store output on A0 through A7:

```
uint8_t actualA;

actualA = PORTA;
PORTG |= _BV(PG2);
PORTA = val;
```

```
        PORTG &= ~_BV(PG2);
        PORTA = actualA;
```

3.4 Using other memory I/O devices

The om128-ext board contains an additional set of holes on the outside of the board and each of these is connected to the 34 pins on the om128-ext. Using the appropriate sockets, it is possible to mount a daughter board on top of the om128-ext that also uses memory I/O. The simplest example is to have another 128K of RAM and use some address logic to determine which RAM board to enable. Another example is an Ethernet device such as the WIZnet 5100 that can address up to 32K of memory.

4 Device Pin Configuration

Below is the schematic representation of om128-ext.

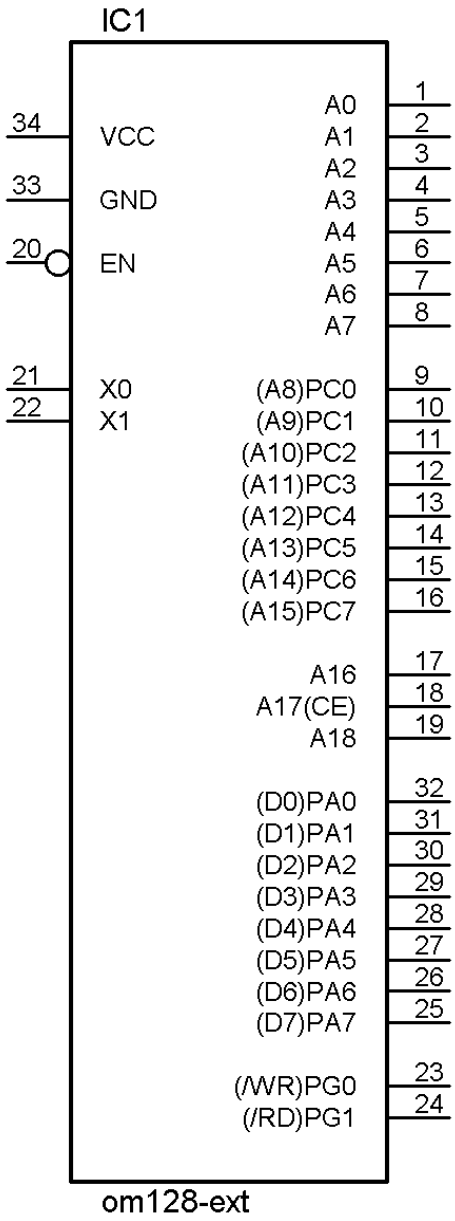

Figure 5: Schematic Representation of om128-ext

The om128-ext has 34 male pins, numbered 1 through 34 in a 0.8” DIL configuration. Pin 1 is at the bottom left of the annotated photograph and is also indicated by a silk-screened number 1 on the top of the circuit board. Labels for pins 17, 18, and 34 are silk-screened on the top as well. The “cross-bar” switches SW1 and SW2 should not be altered.

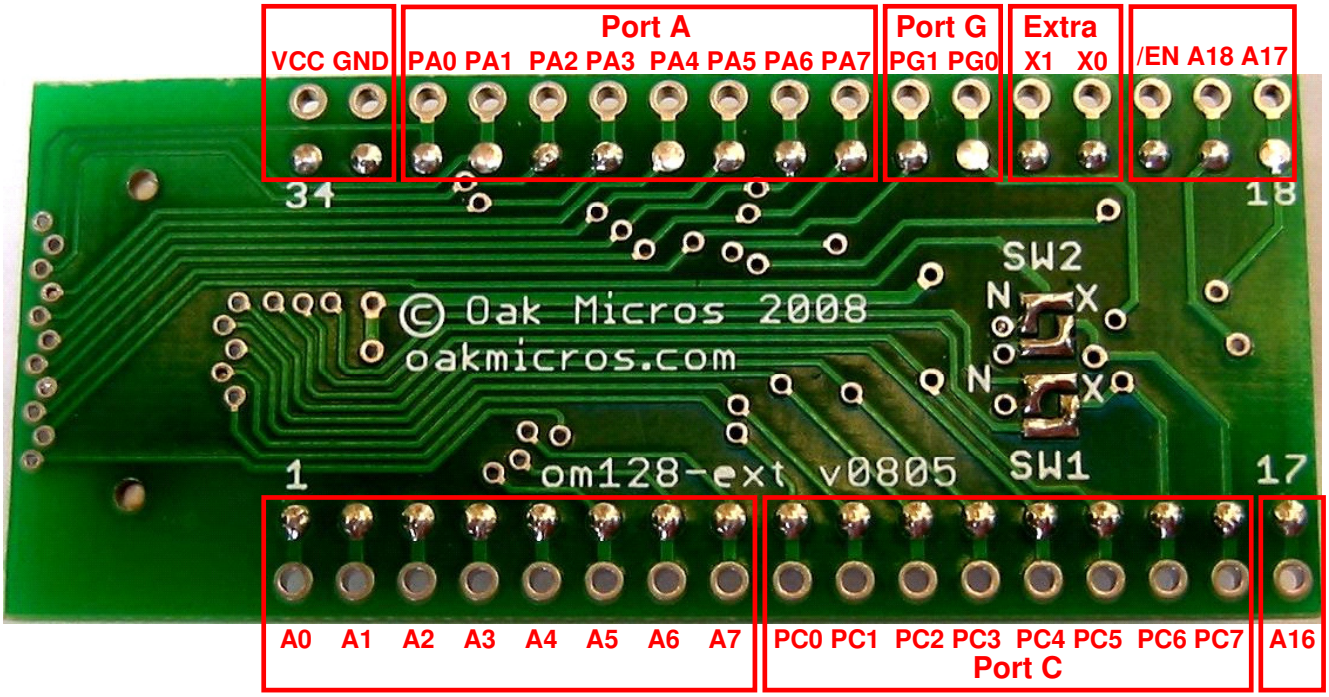

Figure 6: Device Pin Configuration

The following table describes the function of each pin on the om128-ext.

Pin	Name	Description
1	A0	This is address line 0 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
2	A1	This is address line 1 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
3	A2	This is address line 2 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
4	A3	This is address line 3 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
5	A4	This is address line 4 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
6	A5	This is address line 5 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
7	A6	This is address line 6 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
8	A7	This is address line 7 for the RAM. When the RAM is not being used, this pin can also be used as an output that is latched in using G.2.
9	PC0	This is address line 8 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 0 on Port C.

Pin	Name	Description
10	PC1	This is address line 9 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 1 on Port C.
11	PC2	This is address line 10 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 2 on Port C.
12	PC3	This is address line 11 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 3 on Port C.
13	PC4	This is address line 12 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 4 on Port C.
14	PC5	This is address line 13 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 5 on Port C.
15	PC6	This is address line 14 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 6 on Port C.
16	PC7	This is address line 15 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 7 on Port C.
17	A16	This is address line 16 for the RAM and by default is pulled up to 5V to select the “upper” 64K bank. When connected to ground, the “lower” 64K bank is selected.
18	A17	This is the active high enable line for the RAM and by default is pulled up to 5V to enable the RAM. This pin can be tied to ground to disable RAM or can also be used as address line 17 for other memory devices.
19	A18	This pin is not connected to the RAM and by default is pulled up to 5V. This pin can be used as address line 18 for other memory devices.
20	/EN	This is the active low enable line for the RAM and by default is pulled up to 5V. This pin needs to be connected to ground to enable the RAM.
21	X0	This pin is not connected but can be used as a through-feed to an om128-ext daughter board. An example usage might be a Reset pin.
22	X1	This pin is not connected but can be used as a through-feed to an om128-ext daughter board. An example usage might be an Interrupt connection back to the om128.
23	PG0	This is write strobe for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 0 on Port G.
24	PG1	This is read strobe for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 1 on Port G.
25	PA7	This is data line 7 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 7 on Port A.
26	PA6	This is data line 6 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 6 on Port A.
27	PA5	This is data line 5 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 5 on Port A.

Pin	Name	Description
28	PA4	This is data line 4 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 4 on Port A.
29	PA3	This is data line 3 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 3 on Port A.
30	PA2	This is data line 2 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 2 on Port A.
31	PA1	This is data line 1 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 1 on Port A.
32	PA0	This is data line 0 for the RAM. When the RAM is not being used, this pin can also be used as an I/O pin 0 on Port A.
33	GND	This is ground and is connected to the ground on the host device. It can be used as a through-feed to an om128-ext daughter board.
34	VCC	This is 5V and is connected to the 5V on the host device. It can be used as a through-feed to an om128-ext daughter board. **Warning**: It is recommended that a separate 5V regulator be used as the om128-ext can exceed the 200mA specification of the regulator on the host device.

5 Getting Support

Support for the om128-ext is provided by Oak Micros on a best effort basis through forums on our website (see http://oakmicros.com). You can also send an email to support@oakmicros.com.

Appendix A: Schematic

For reference purposes the diagram below shows the schematic for the om128-ext.

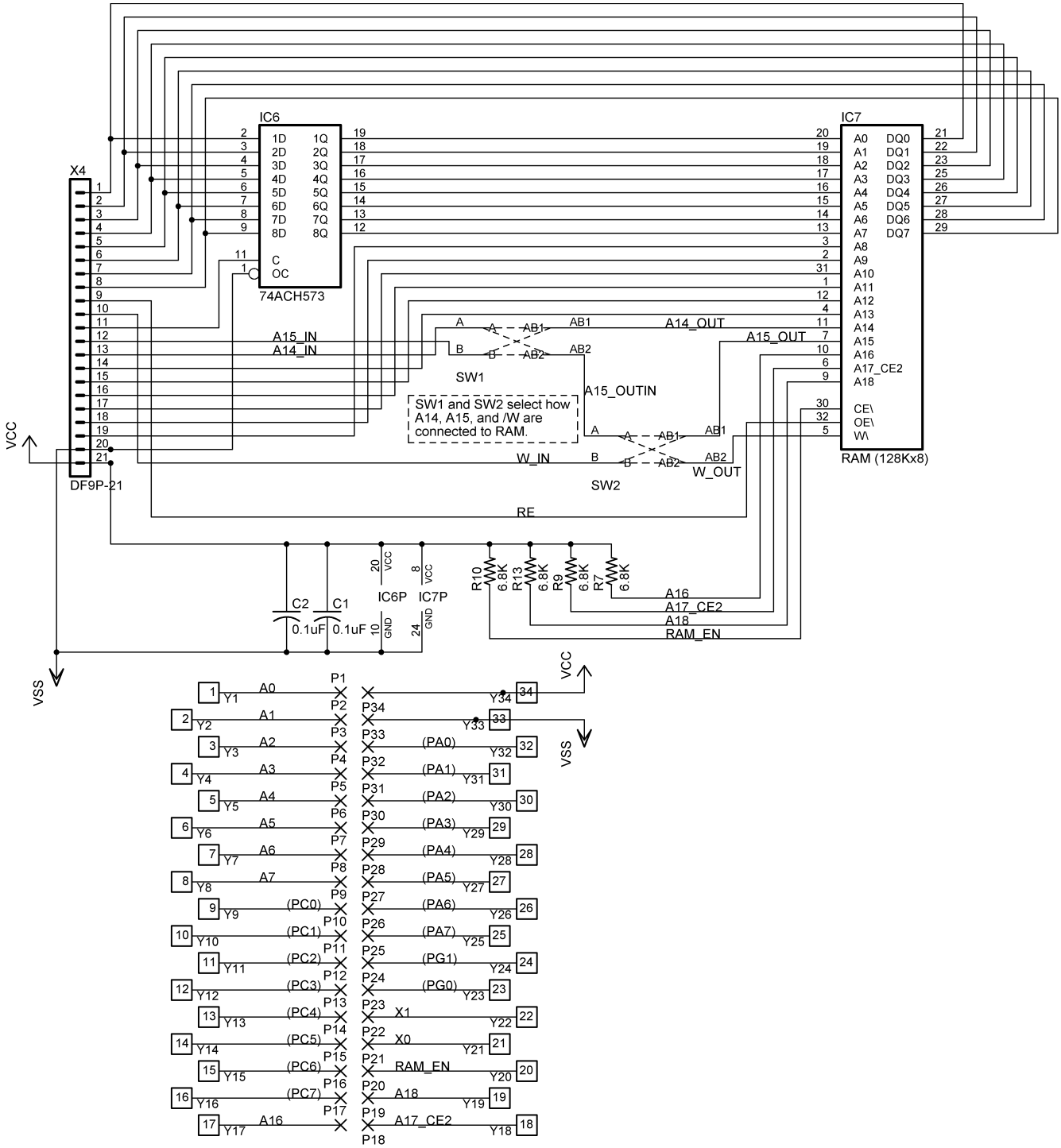

Figure 7: Schematic for om128-ext