Port Expander

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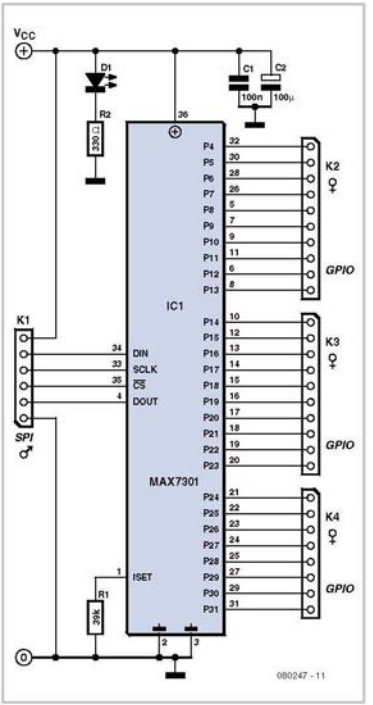
It can sometimes happen that even when using the largest version of a microcontroller for a particular design application there are just not enough I/O port pins to handle all the inputs and outputs. This can be the case when for example several LCDs are driven in parallel or when it is necessary to input values from a large number of switches and pushbuttons.

The circuit shown here solves the problem using the I/O port expander IC type MAX7301 from Maxim [1]. This device can be powered from a supply between 2.5 V and 5 V which makes it suitable for use with both 3.3 V and 5 V controllers (the value of resistor shown as R2 is suitable operation from a 3.3 V supply).
The port expander uses the SPI interface so it only requires four microcontroller pins: Data In, Data Out, Clock and Slave Select. Many microcontrollers have an SPI interface already implemented on-chip but if not it should be relatively easy to implement the function in software. We have sacrificed four pins on the interface but this port expander now gives us 28 general purpose I/O pins (GPIOs) which can be configured as either inputs (with or without pull-ups) or outputs. Providing the microcontroller is fast enough the GPIOs can be switched at a rate of 26 MHz.



The project page of this article [2] includes full listings (in the form of a small C library) of the author's software implementation. This allow the ports to be configured as inputs or outputs and the value of the input port pins to be read or output pins to be set.

The instruction

```
io_max7301(0xF, Portpins);
```

selects port pins used as outputs. A macro expression such as PCONF8_11 is used for Portpins to refer to port pins 8 to 11. The instruction

```
io_max7301(0x0, Portpins);
```

configures port pins as inputs. To output data from the port pins use

```
set_max7301(data, Portpins);
```

where *data* = binary data. And the instruction

```
data = get_max7301(Portpins);
```

reads the binary value of input data.

(080247)

Internet Links

[1] http://datasheets.maxim-ic.com/en/ds/MAX7301.pdf

[2] www.elektor.com/080247

Download

Software

080247-11 source code, from [2]