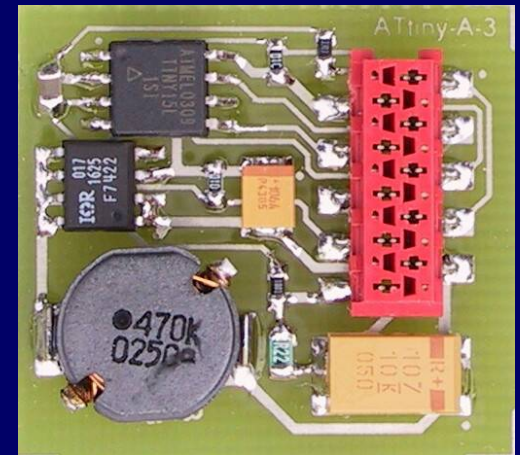


Making Surface-mount (SMT) boards at home

8 November 2003, July 2005

Mike Cowlshaw
Speleogroup



Overview

- ATtiny-A Caving Lamp
- Designing the board
- Making the PCB
- Population (mounting the components)

ATtiny-A Caving Lamp

- 1-Watt LED lamp:

Slow-fail (no sudden loss of light)

Microprocessor is
Atmel ATtiny-15L
(8-pin device)

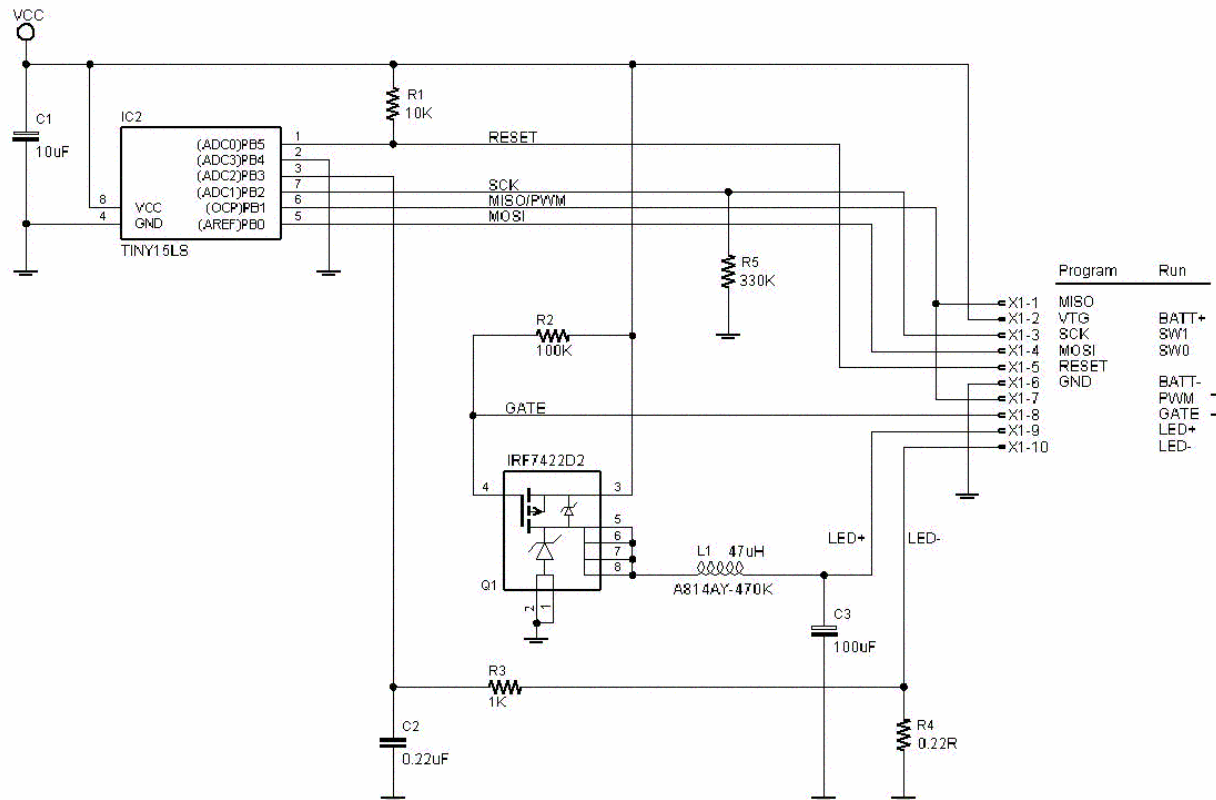


See: <http://www.spelogroup.org/attinya.html>

Designing the board

- Plenty of choices
- I used CadSoft Eagle
 - full-featured (professional output options, coupled schematic/PCB editors, auto-router, multi-layer, very programmable, *etc.*)
 - free for up to 4"x3", two-layer, 1-sheet
 - responsive support (newsgroup)

Schematic



Atmel Tiny15L microcontrolled constant-current source for Luxeon 1W Star/O LED caving lamp/torch.

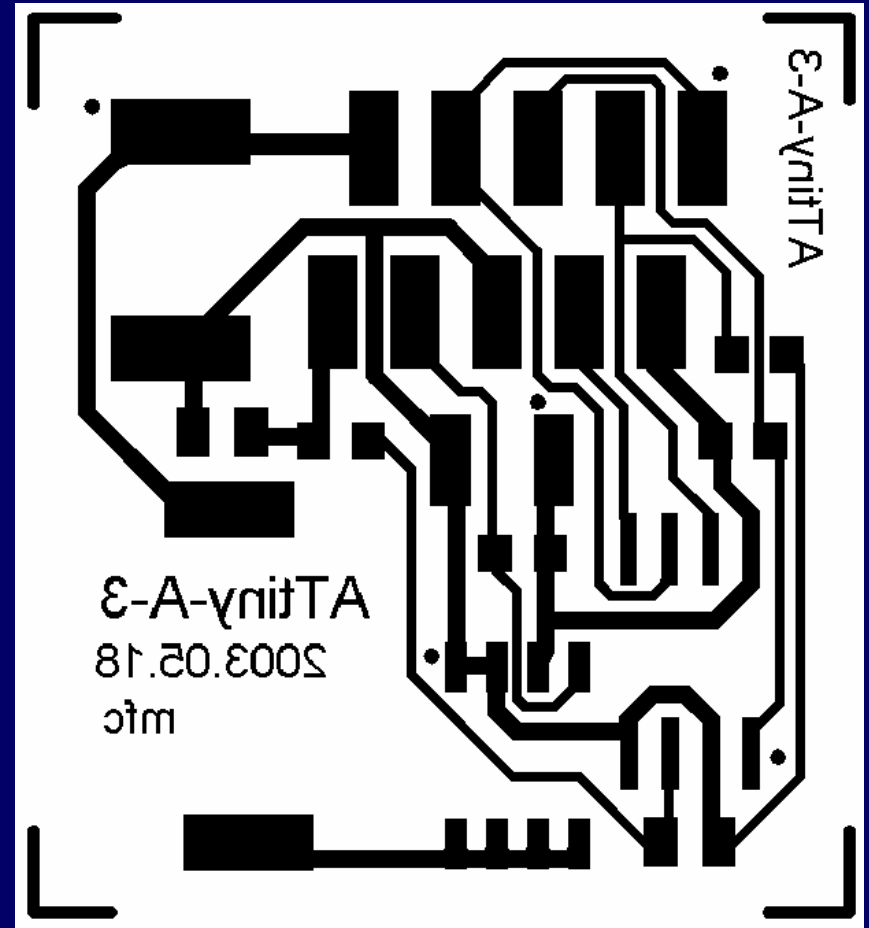
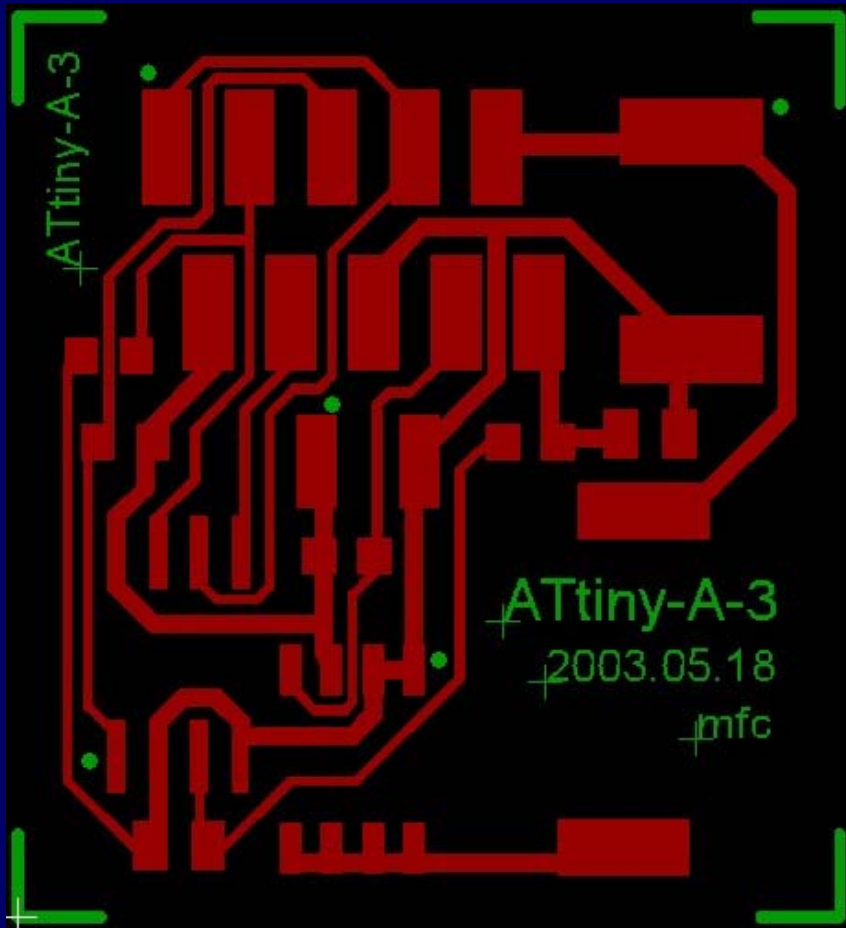
A Tiny-A-3

25/05/2003 18:16:41

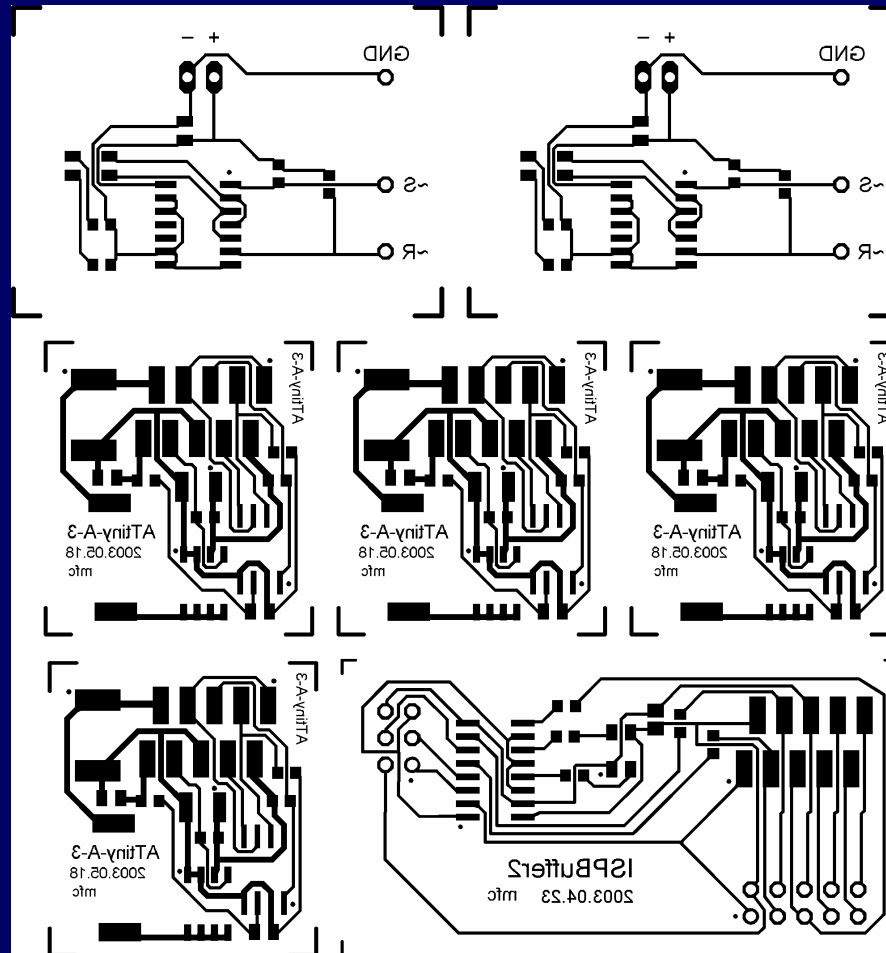
Author: mfc

Sheet: 1/1

PCB layout (single-sided)



Imposition



(A simple Rexx program was used to concatenate .bmp images.)

Board-making process

- Print (UV-transparent film, *etc.*), 600 dpi
- Expose photo-resist PCB (3 minutes)
- Develop (1 minute)
- Etch (10 minutes, agitating)
- Strip photoresist mask (< 1 minute)
- Chemical tin-plate (10 minutes)
- Cut into separate PCBs (5 minutes)

Cost: about \$5 per full board, or 50 cents per mini-board

Seno Etch-in-bag

**Removable
seal strips**

**Ferric
Chloride**
(from pellets)



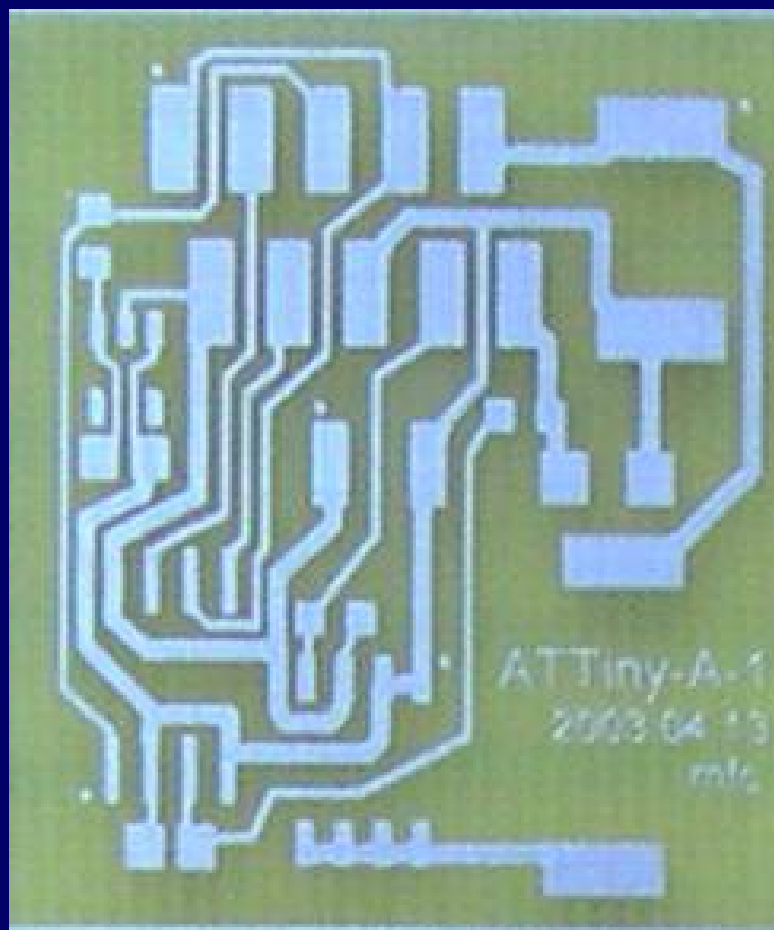
**12"
30cm**

Table-mounted jigsaw



(Ceramic tile-cutter blade to cut fibreglass.)

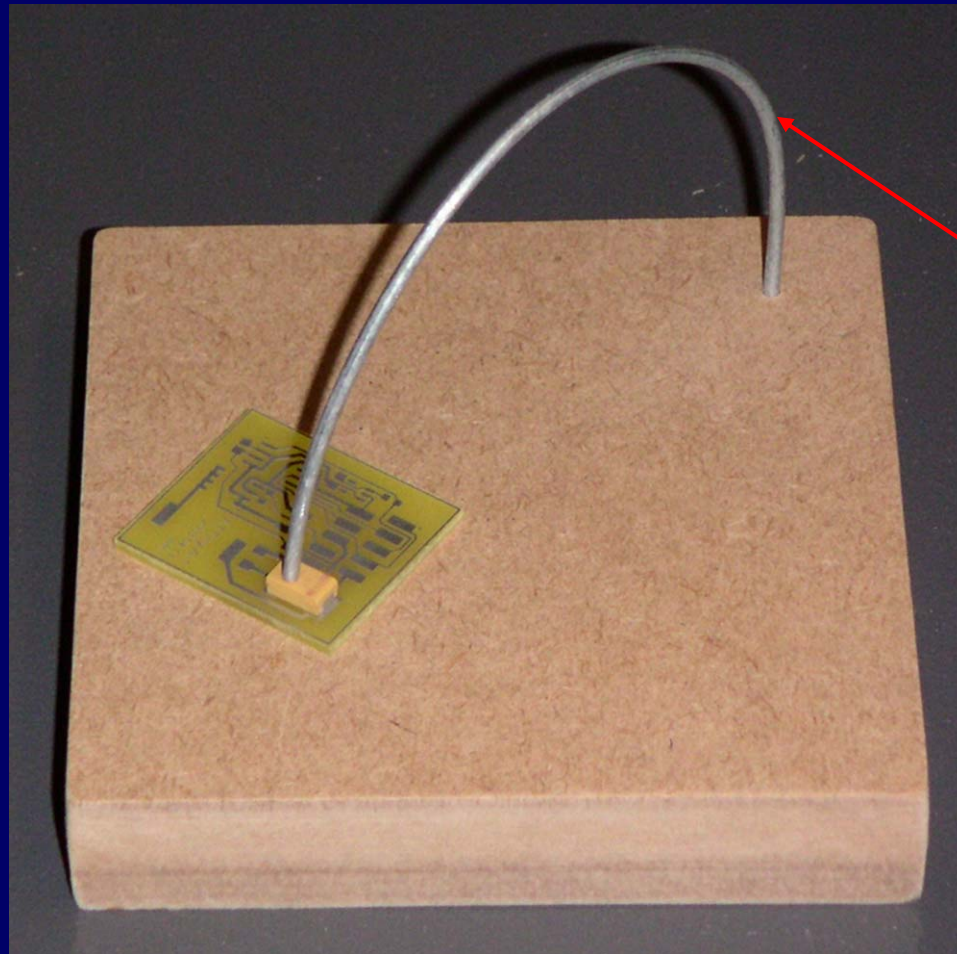
Finished PCB



Soldering

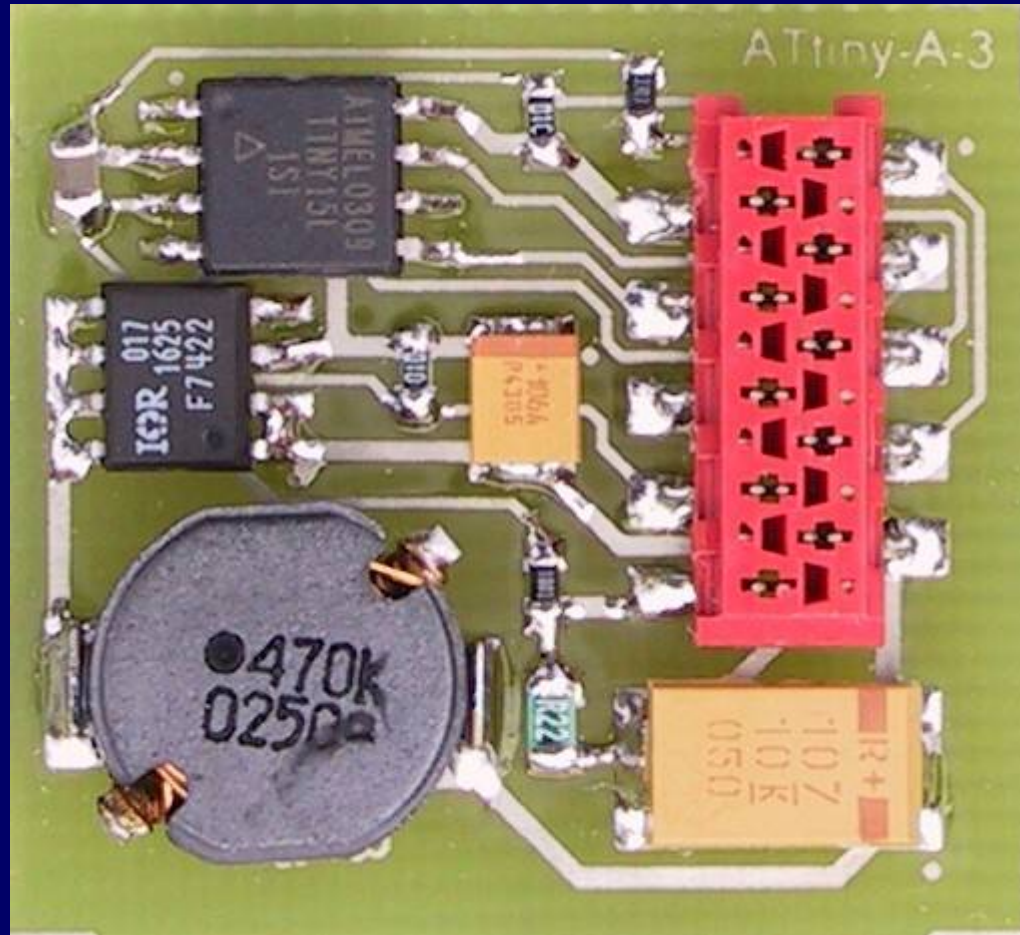
- Need to hold four things in one place
 - Small PCB (*e.g.*, 1" x 1")
 - SMT component, as small as 0.06" x 0.03"
[1.5mm x 0.75mm]
 - solder (Electronic Silver Solder)
 - soldering iron (needle tip)
- I don't have four hands, so...

... the SMT 'secret weapon'



Coat-hanger
wire

Completed board



Finished board in use

