

## Abstract

A power supply is one of the basic instruments in any electronic lab, be it in a company or at home (for a hobbyist – as in my case). And since I was tired of my classic transformer – regulator – lots of wires - 5V power supply, I decided to take the challenge and design something more like a real tool. Priorities in this enterprise were complexity versus necessity, and price. The picture below shows the results.

### Features:

- output voltage: 0.6 to 20 V, resolution 8mV
- output current: 0 to 2.5 A, resolution 10mA
- short-circuit protection
- adjustable current limit (5ms response time)
- output ripple: 5mVpp max
- metering
  - display: 16x2 LCD
  - voltmeter range: 0.650 to 20.000V, resolution 2mV
  - ammeter range: 0.065 to 2.500A, resolution 10mA
- power requirements: 100V, 50Hz
- user friendliness
  - automatically adjustable setting speed
  - simple and intuitive user interface



### Few interesting aspects of this project are:

- technique to increase internal ADC resolution from 8 to 14 bits
- nice emulation of EEPROM memory into internal FLASH memory
- technique to drive the LCD using only 3 I/O lines, from which 2 are shared with other peripherals
- smart way of using integer arithmetic in order to save computational power and ROM
- simple and efficient preemptive-cooperative operating system

This programmable DC power supply is build around the HC908QT4 microcontroller. Its block diagram is presented below.

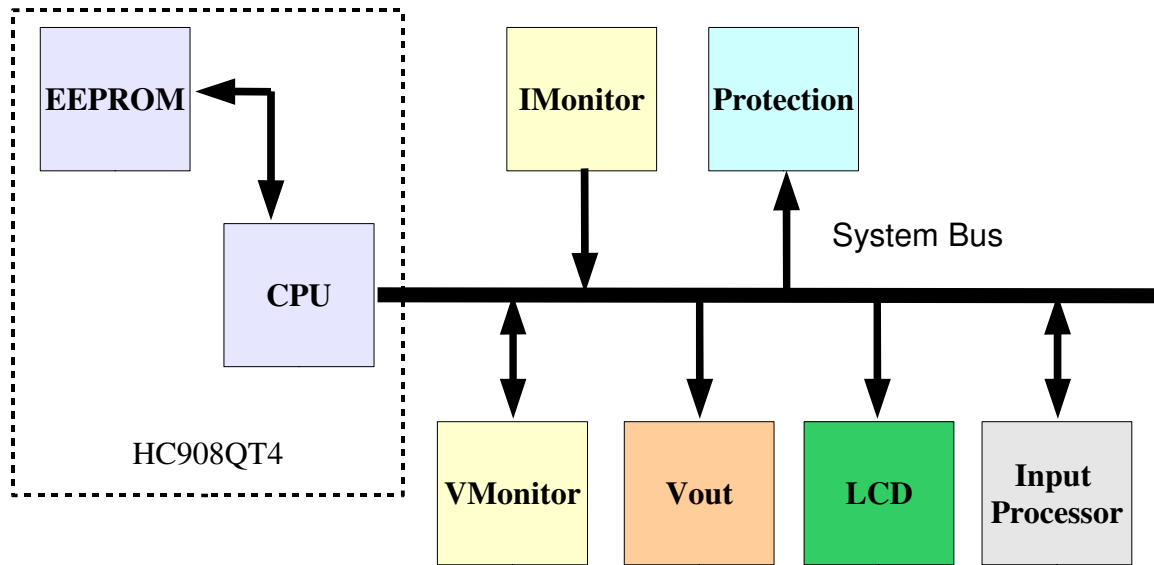


Fig. 1 – Block diagram

Few of the building blocks require explanations.

EEPROM memory is used to keep settings when the system is powered off. Protection block disables output in case the current drawn by the load exceeds the preset limit. Input Processor is responsible with decoding user input: button press or knob rotate.

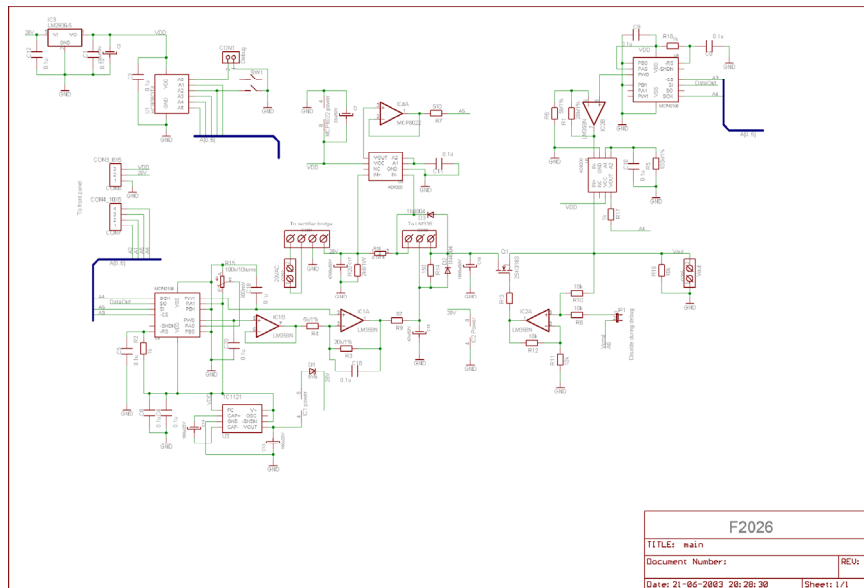
CPU I/O pins represent the system bus. They are shared between building blocks and most of them have more than one function.

A simple and efficient “operating system” takes care of resource sharing and avoids conflicts.

In a desperate attempt to avoid one of the most annoying realities of our days - 150 pages user manual for a wristwatch, 250 pages user guide for a cell phone and so on – I designed this power supply to be very easy to use.

At power on it is initialized with the previously saved settings or default values if it is powered for the first time.

Rotating the knob will display the menu and scroll through options. SET button will select the marked option and will allow altering of a certain setting (by knob). A second SET press will update the setting into the EEPROM and will return to the running mode using the new value. Alternatively, RESET button could be pressed to return to the running mode without altering any setting. RESET button has one more role – it will allow exit from ALARM state and resume the normal operation after a short occurred.



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