Circuit Cellar – 2004 AVR Design Contest

Abstract Description

Battery sAVR – Entry # A3746

Most technical people will know that the "capacity" (as rated in mAh) of both primary and rechargeable batteries depends upon many factors. These include the type of load (resistive, constant power, constant current etc), load current, cutoff voltage, age, type and amount of charging, and the ambient temperature. The variability in these factors makes the traditional mAh hour rating nothing more than a rough ballpark figure at best.

It is often required in both consumer and industrial applications to know more precisely what the capacity and/or performance of a particular battery will be in a particular application. The battery datasheets do not help much in this respect, as they at best only give "typical" performance curves for select test conditions.

So how do you actually measure, or often more importantly, graph the capacity of a battery under your own test conditions? You can do it the traditional and messy way by wiring up the required load circuit and fiddling around with a data-logger until you get the results you need. Or you can do it the easy, cheap and efficient way with the new Battery sAVR!

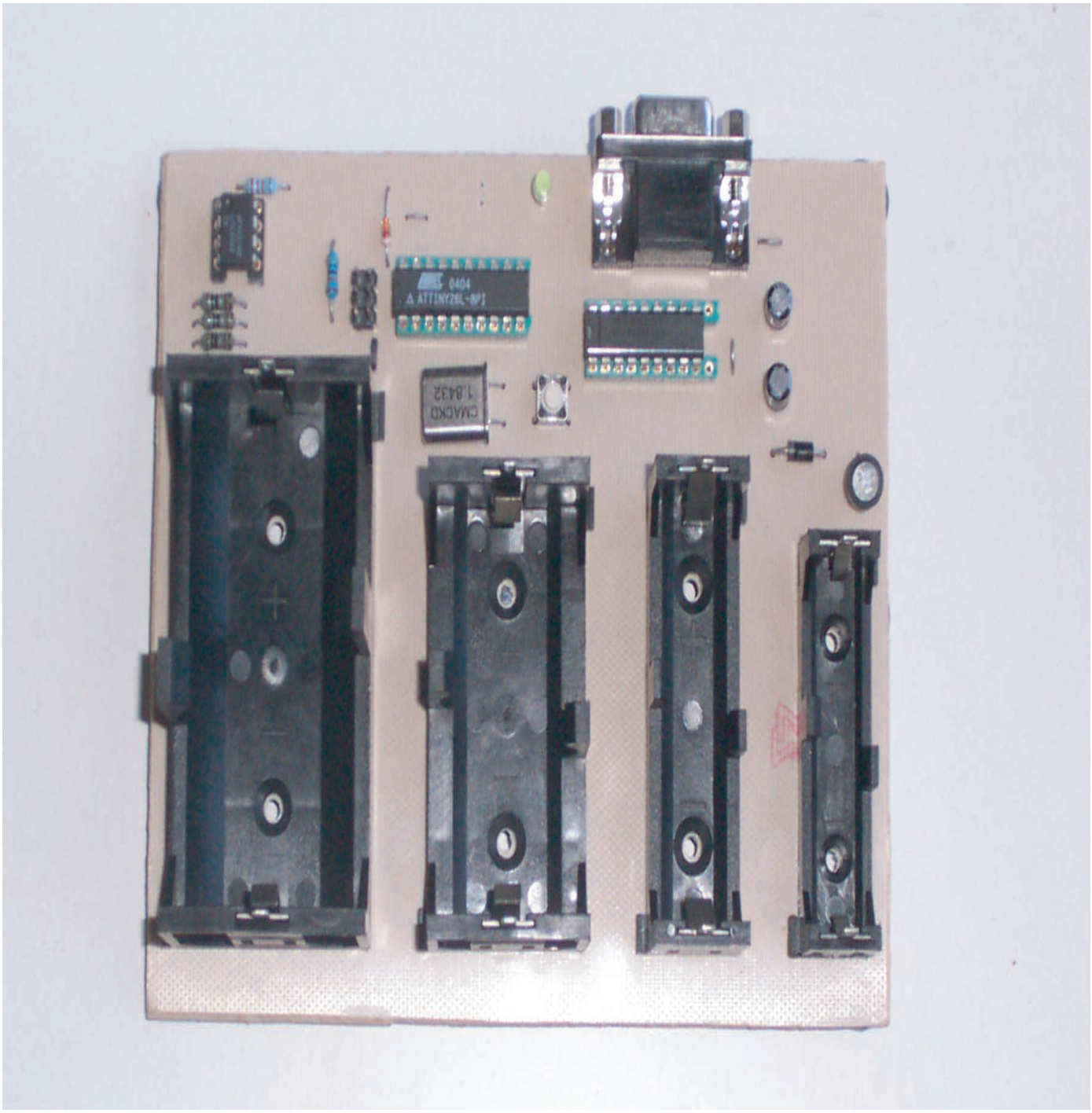
The Battery sAVR is an intelligent "Battery Capacity Meter" that will log the discharge of a single primary or secondary cell over a period of time. But it's more than a dummy load and data logger, it's smart! Thanks to an Atmel ATtiny26 AVR microcontroller, the Battery sAVR can emulate 3 different types of loads in real-time - Constant Current, Constant Power, and Constant Resistance. The user can also define a cutoff voltage down to 0.8V.

What's more, the Battery sAVR is powered completely from the battery under test. It also dynamically compensates for its own current consumption thanks to the unique differential ADC in the ATtiny26 device. Amazingly, all of this is achieved within the 1Kword memory of the low cost ATtiny26, and in the easy to maintain C language.

The data (time, voltage, and current) is stored in the internal EEPROM memory of the ATtiny26, which is automatically fully utilized regardless of the cutoff voltage or discharge time. The data can be exported via a PC serial port into CSV format for easy graphing in your own spreadsheet.

It is also self-contained, being easily "missioned" via the PC and disconnected for standalone logging in a thermal chamber for instance. All without messy wiring, as D, C, AA, and AAA battery holders are on board, making testing quick and easy. It is suitable for single 1.5V primary cells (Alkaline, Carbon-Zinc etc) and rechargeable NiCd and NiMh batteries.

Suitable for industrial battery applications, the Battery sAVR is also very low in cost, so it can be used by consumers who want to know more about the real capacity of their batteries. It allows you to optimize your battery selection, compare different brands and models of batteries, test suspect cells, and evaluate the effectiveness of battery chargers.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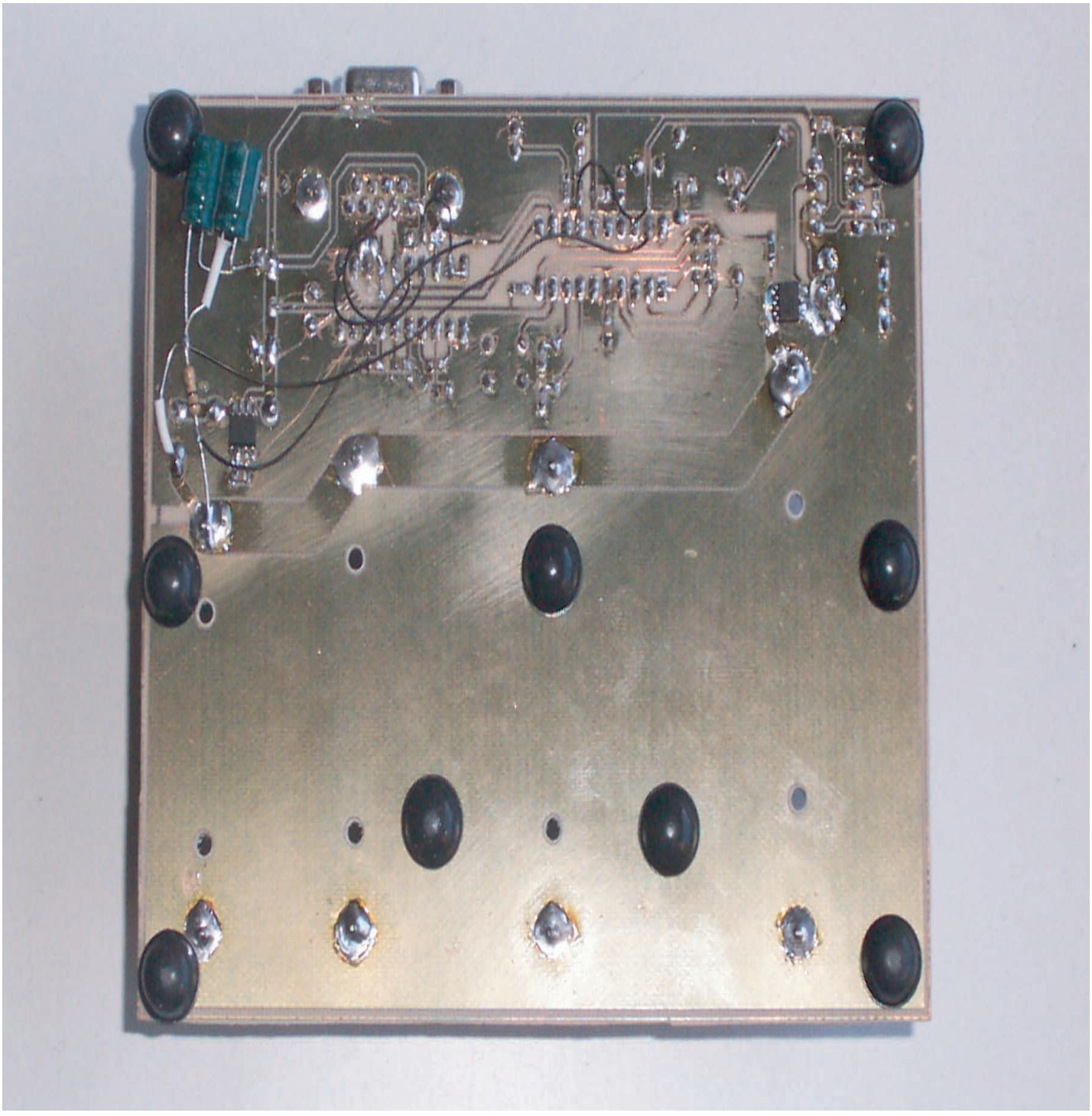
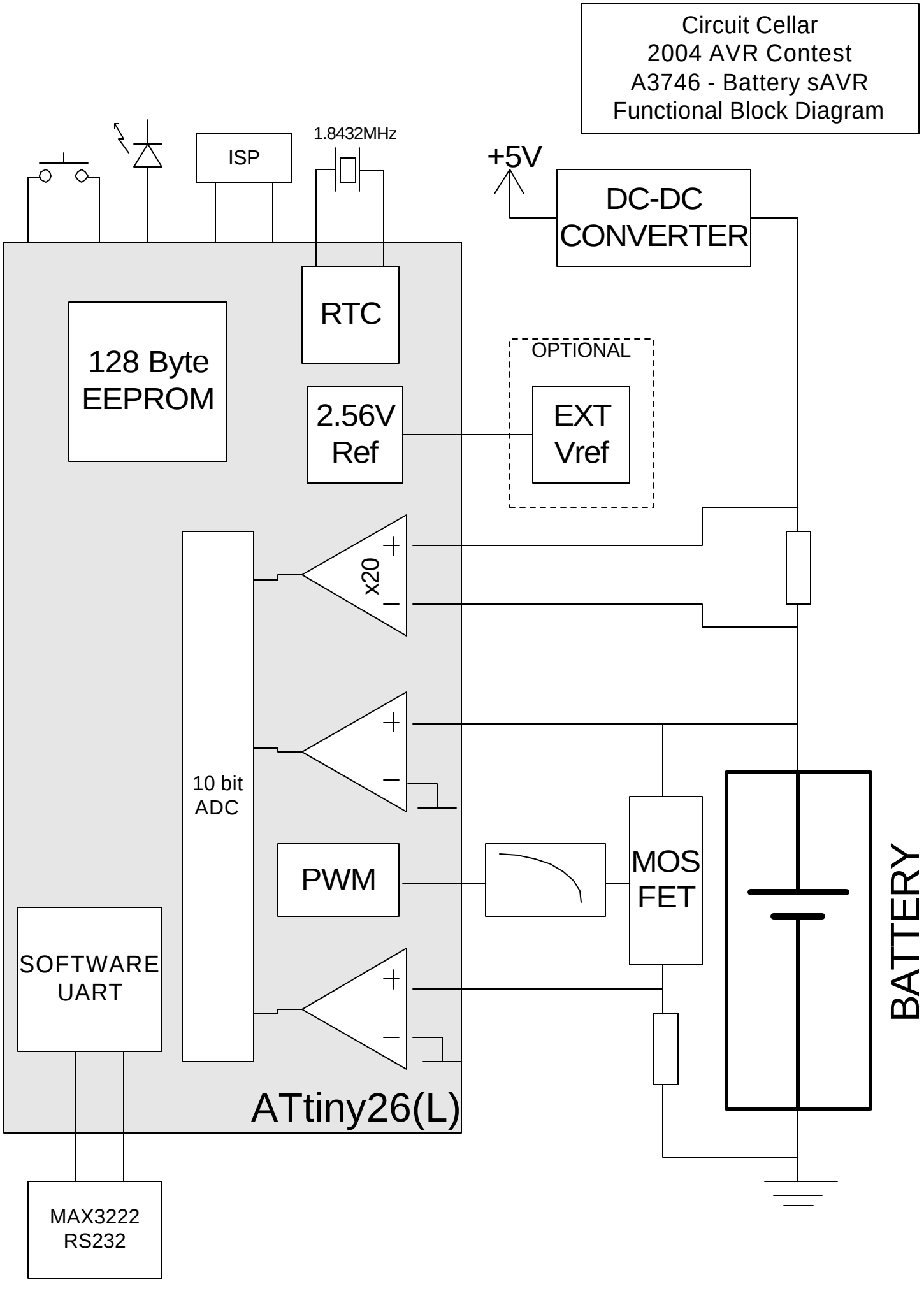
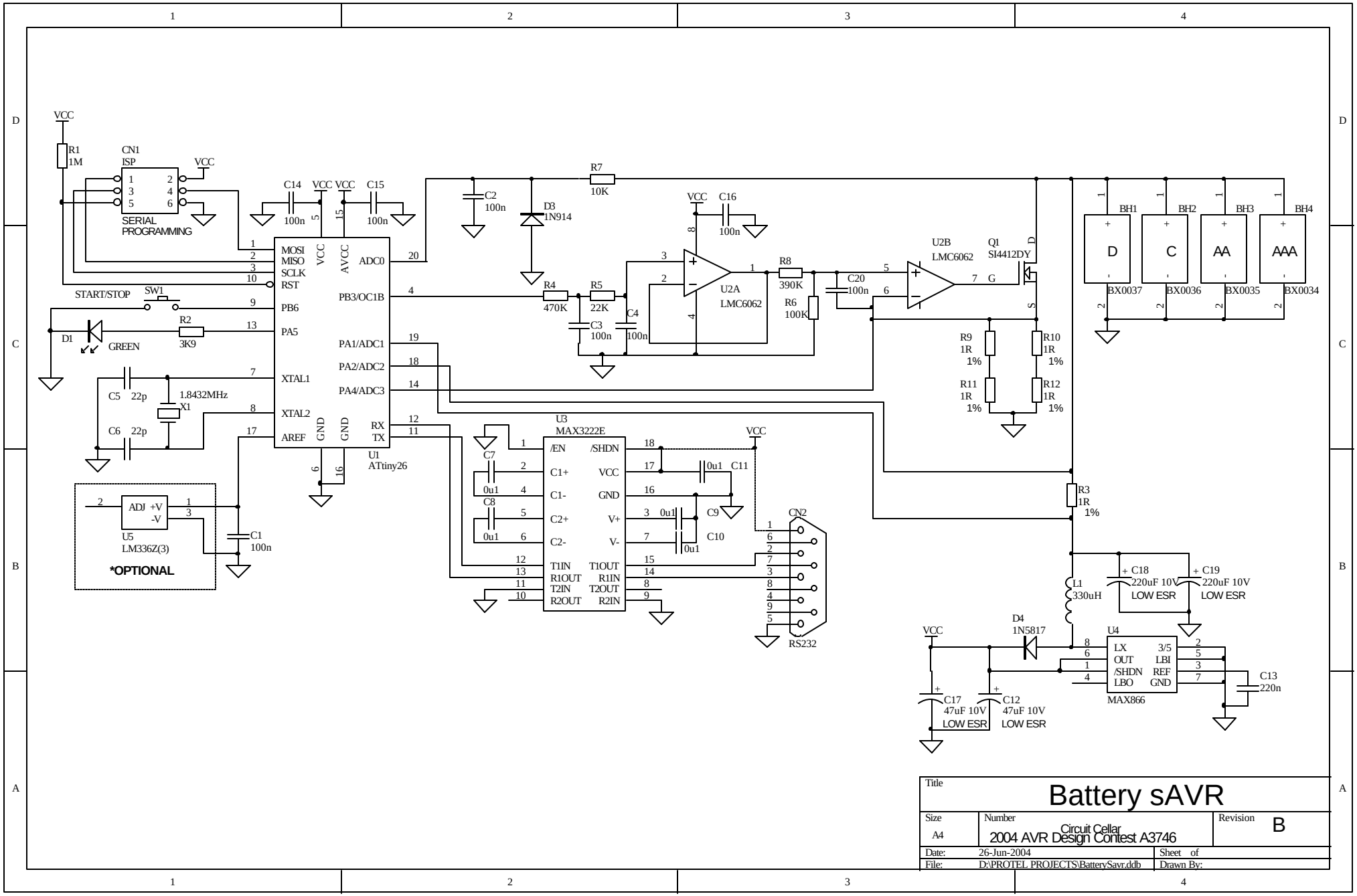



Circuit Cellar
2004 AVR Contest
A3746 - Battery sAVR
Functional Block Diagram
ISP
1.8432MHz
+5V
DC-DC
CONVERTER
RTC
128 Byte
EEPROM
OPTIONAL
2.56V
Ref
EXT
Vref
x20
10 bit
ADC
PWM
MOS
FET
BATTERY
SOFTWARE
UART
ATtiny26(L)
MAX3222
RS232



Title	Battery sAVR		
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