
Measurement of Four Cell Voltages and Temperatures

1. Scope

This application note describes how to measure the cell voltage and the temperature in four different cells.

2. Temperature Measurement Description

As described in the datasheet, the ATA6870 has two temperature channels.

To measure more than two temperatures, it is possible to attach additional temperature sensors at the cell voltage measurement inputs.

[Figure 2-1 on page 2](#) shows the measurement configuration for 4 cell voltages and 4 temperatures.

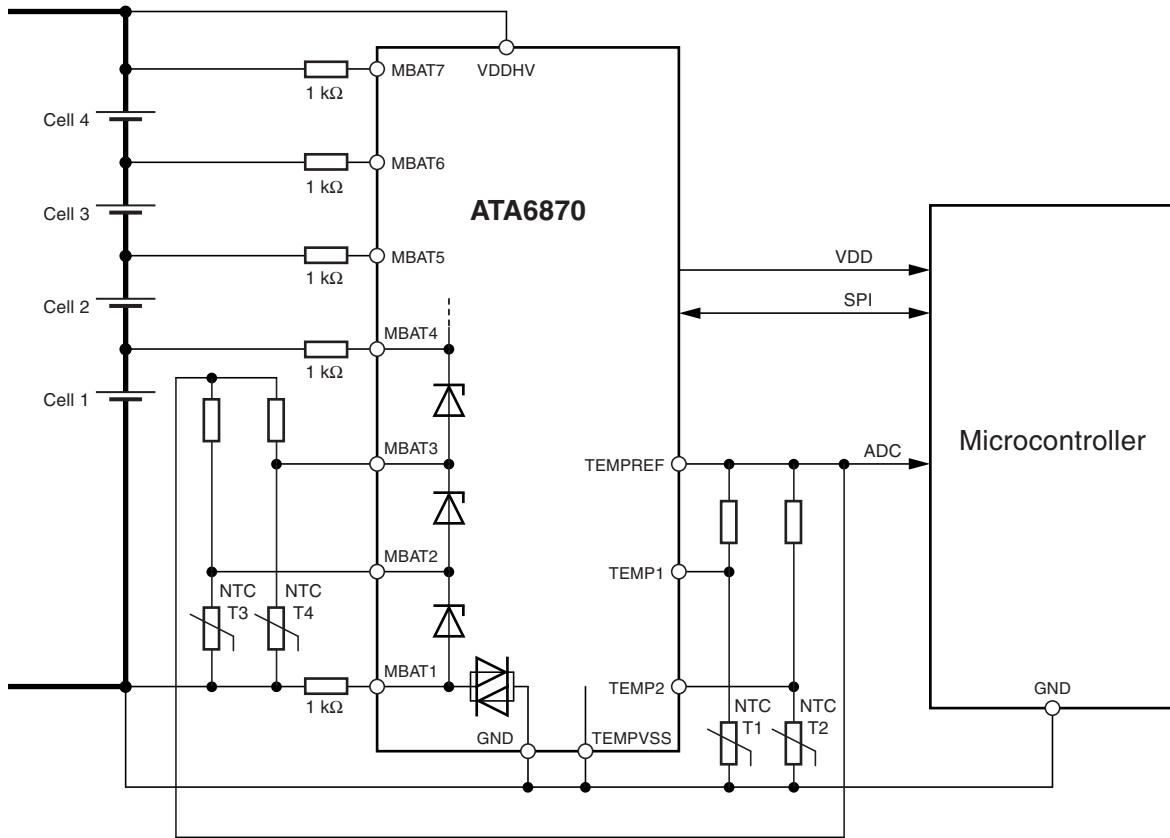


ATA6870

Application Note



Figure 2-1. Schematic 4 Temperature Sensors and 4 Cell Voltages



The temperature voltages for T3 and T4 can be defined according to the formulas below:

$$(1) \quad V(T3) = V(\text{MBAT3-MBAT2}) + V(\text{MBAT2-MBAT1}).$$

$$(2) \quad V(T4) = V(\text{MBAT2-MBAT1})$$

To avoid that the TEMPREF output voltage variation causes any issues, the internal ATA6870 temperature measurement ADC is always related to TEMPREF.

This, however, does not apply to T3, T4 measurements. In these cases, it is recommended to measure the TEMPREF voltage with the microcontroller's ADC to eliminate the TEMPREF variation.

The cell voltage of cell 1 needs to be calculated as the sum of the voltages of MBAT2, MBAT3 and MBAT4:

$$(3) \quad V(\text{cell1}) = V(\text{MAT4-MBAT3}) + V(\text{MBAT3-MBAT2}) + V(\text{MBAT2-MBAT1})$$

3. Restrictions

- Each measurement input pin MBAT(x) is protected with a Zener diode. Hence, the voltage at pin MBAT(x) cannot be higher than the voltage at MBAT(x+1) plus a forward diode.
- These voltage inputs cannot be used for simultaneous temperature and cell voltage measurement.
- For the dimensioning of the temperature measurement resistors, the maximum output current of TEMPREF is 2 mA.



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