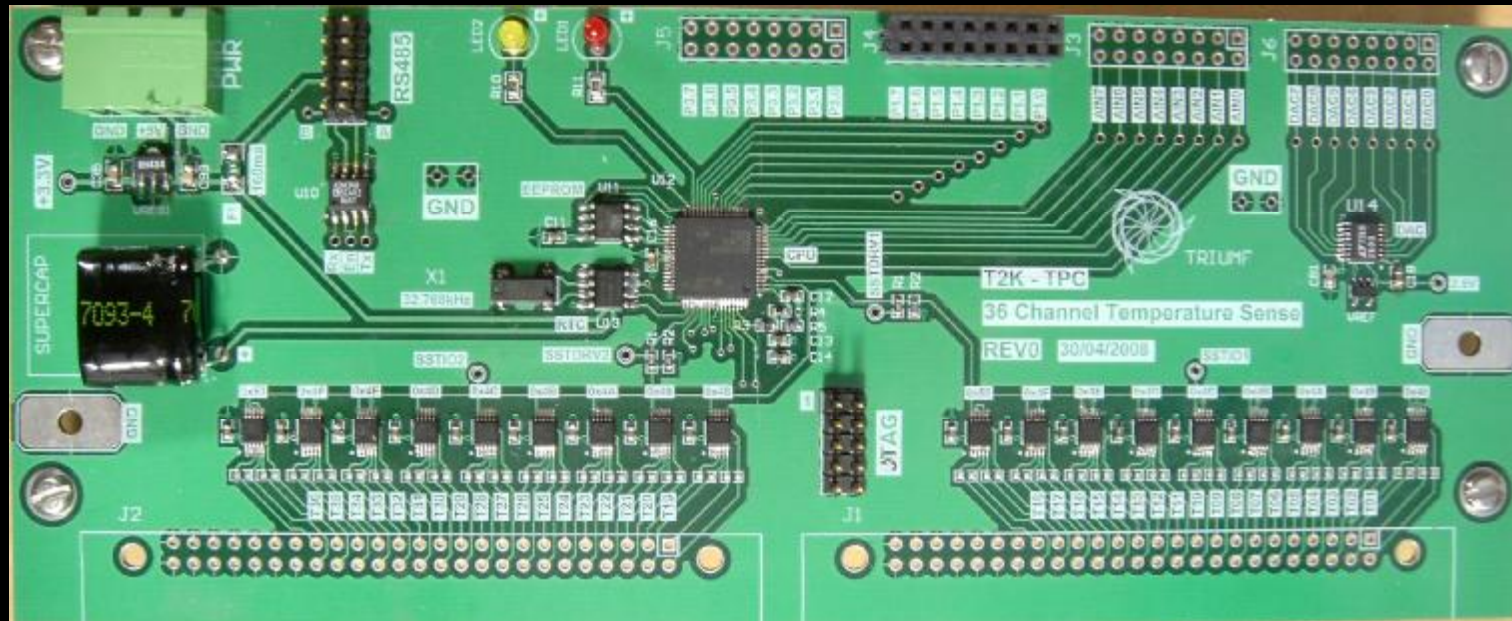


*TEMP 36*

## Summary of the Presentation

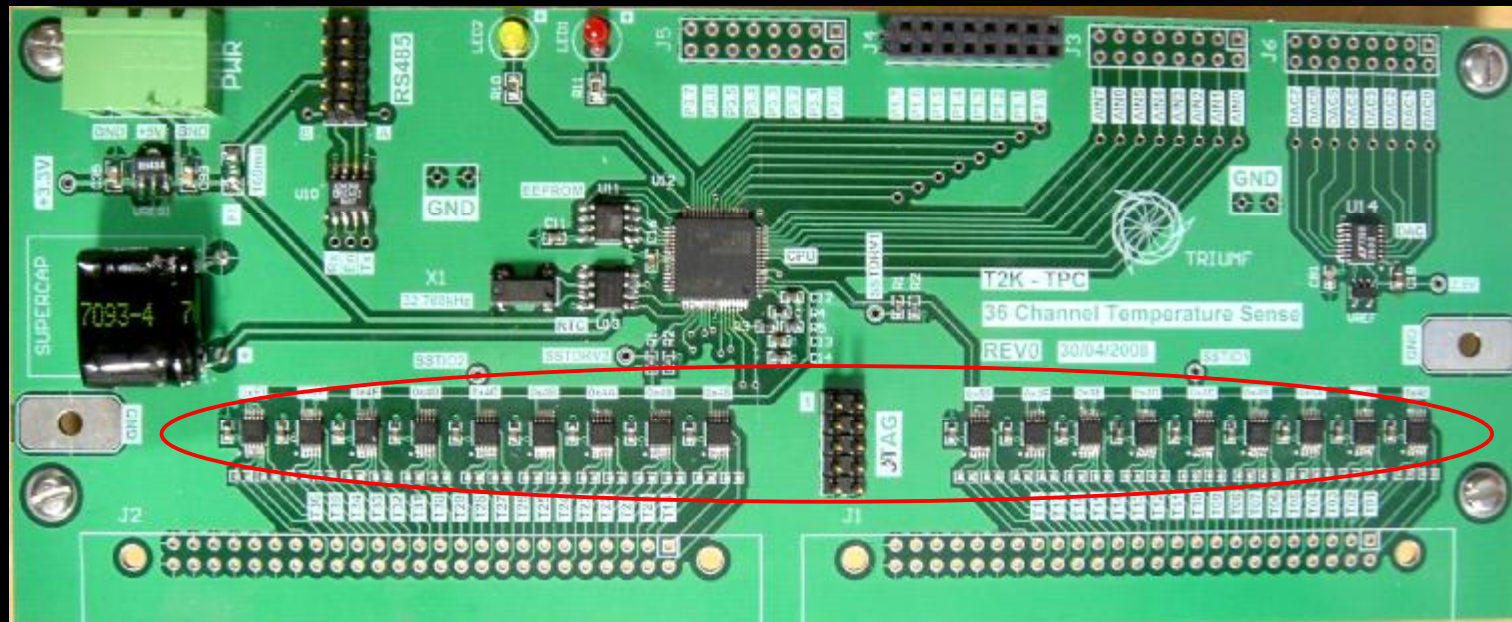
- Components on the temp36 board
- Temperature measurements with different cables

# Temp36



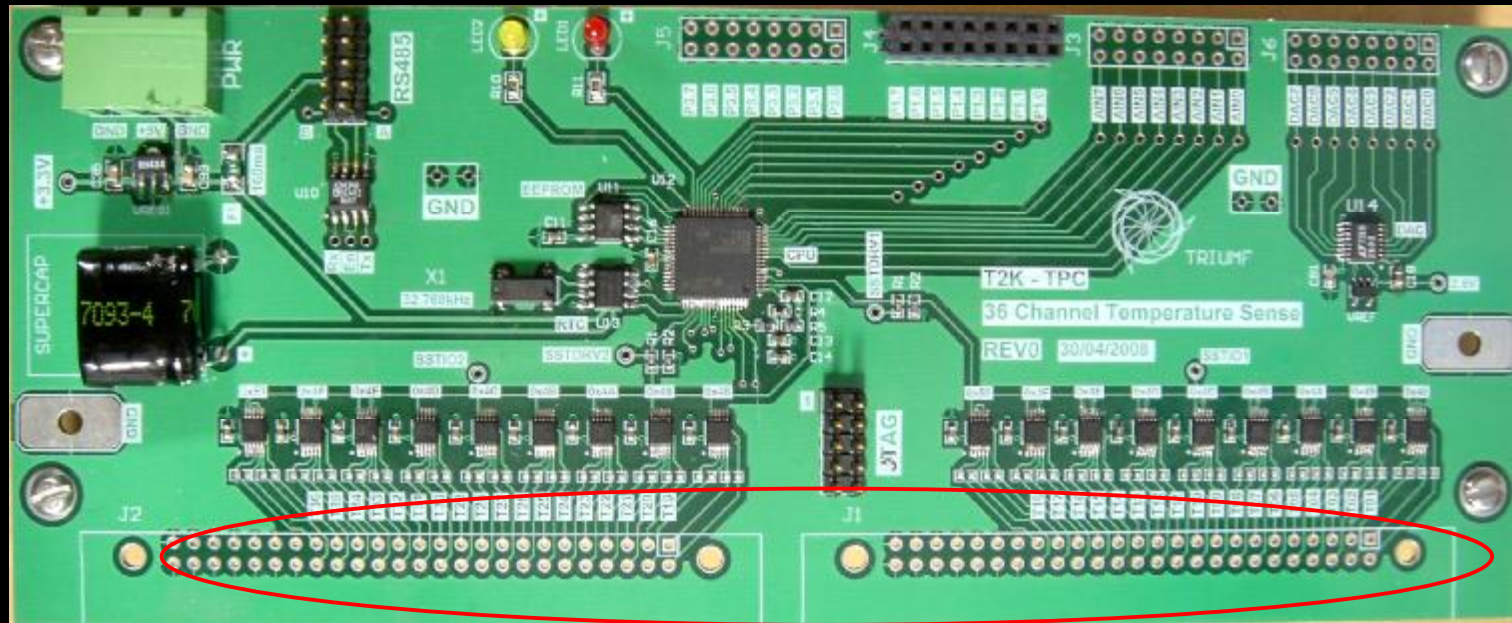
- Dimensions: 19 x 7.6 cm
- Main purpose: measures temperature at 36 locations
- Consists of a DAC, real time clock, 16 kb external memory, and humidity sensors

# Temp36

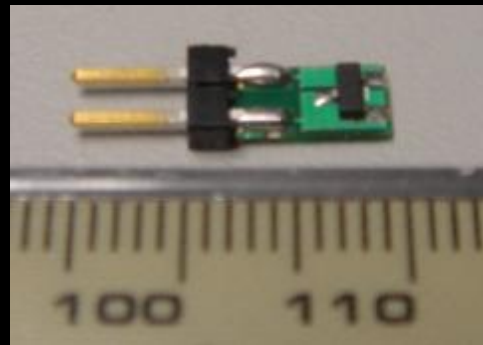


- 18 ADT7486A
  - digital temperature sensor chip with a resolution of 0.016 degrees Celsius
  - Consists of two channels connected to two transistors
  - Contains 2 internal registers to adjust the absolute temperature to within 0.25 degrees Celsius
  - Transmits temperature information to the MCU

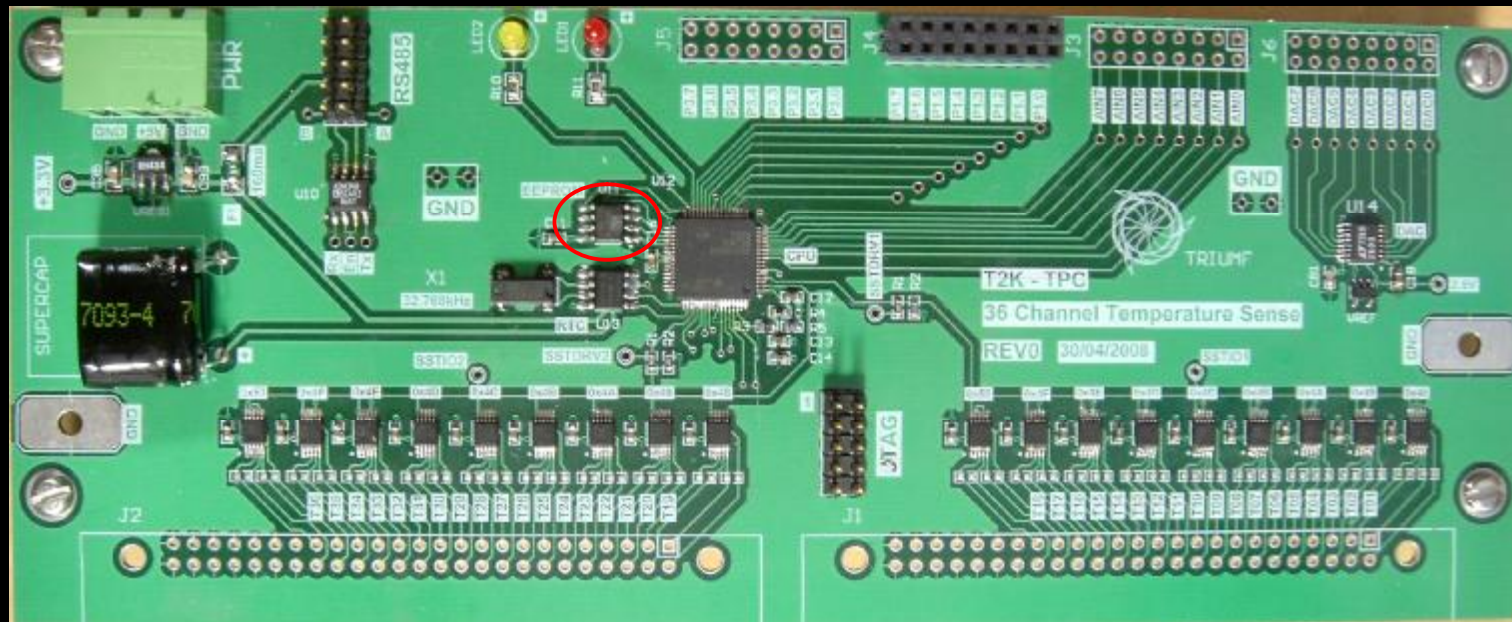
# Temp36



- 36 Transistors

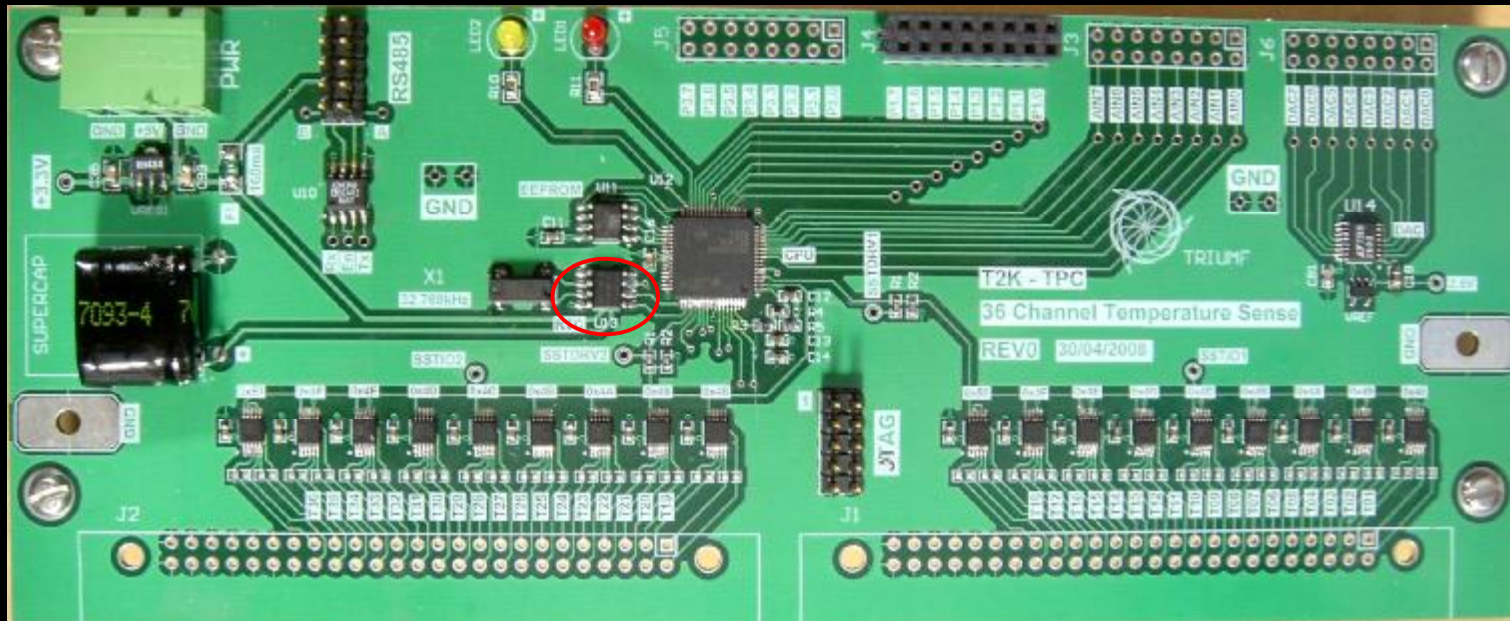


# Temp36



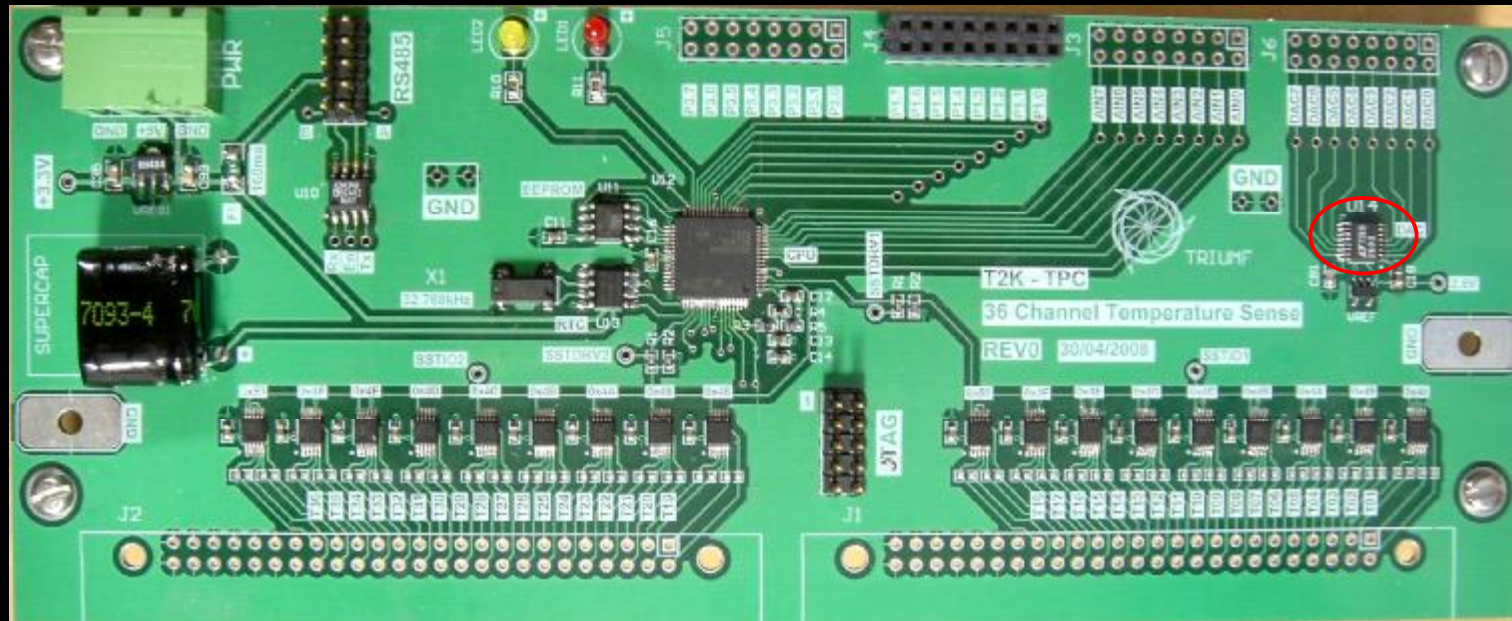
- AT25160AN
  - 16kb EEPROM chip
- 36 temperature offset values, humidity sensor control flag and serial number of the board are stored and will be loaded during the start-up of the MCU
- Consists of 6 equal sized sections of memory for modifications

# Temp36



- Real Time Clock
  - Can be synchronized with the clock on a local computer
- Powered with a super capacitor when the main power is turned off
  - Duration : ~1 month

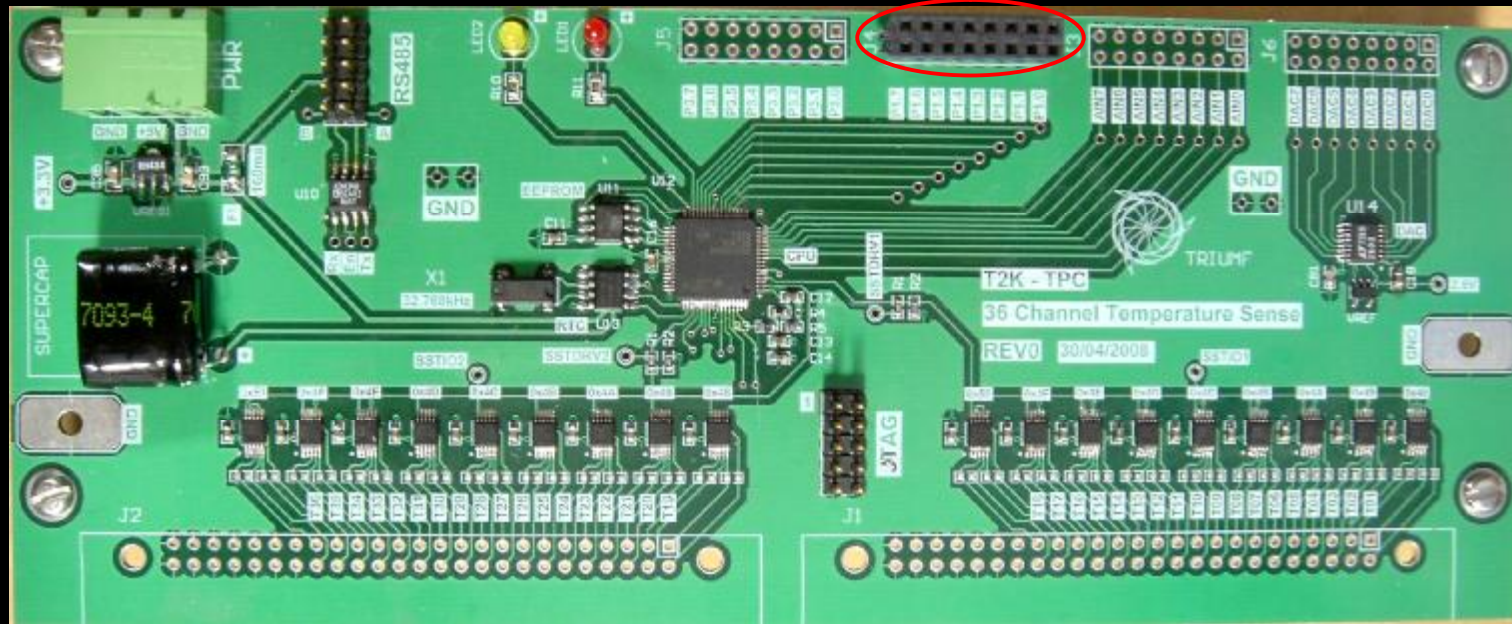
# Temp36



- LT1665CGN
  - 8..16 bit digital to analog converter

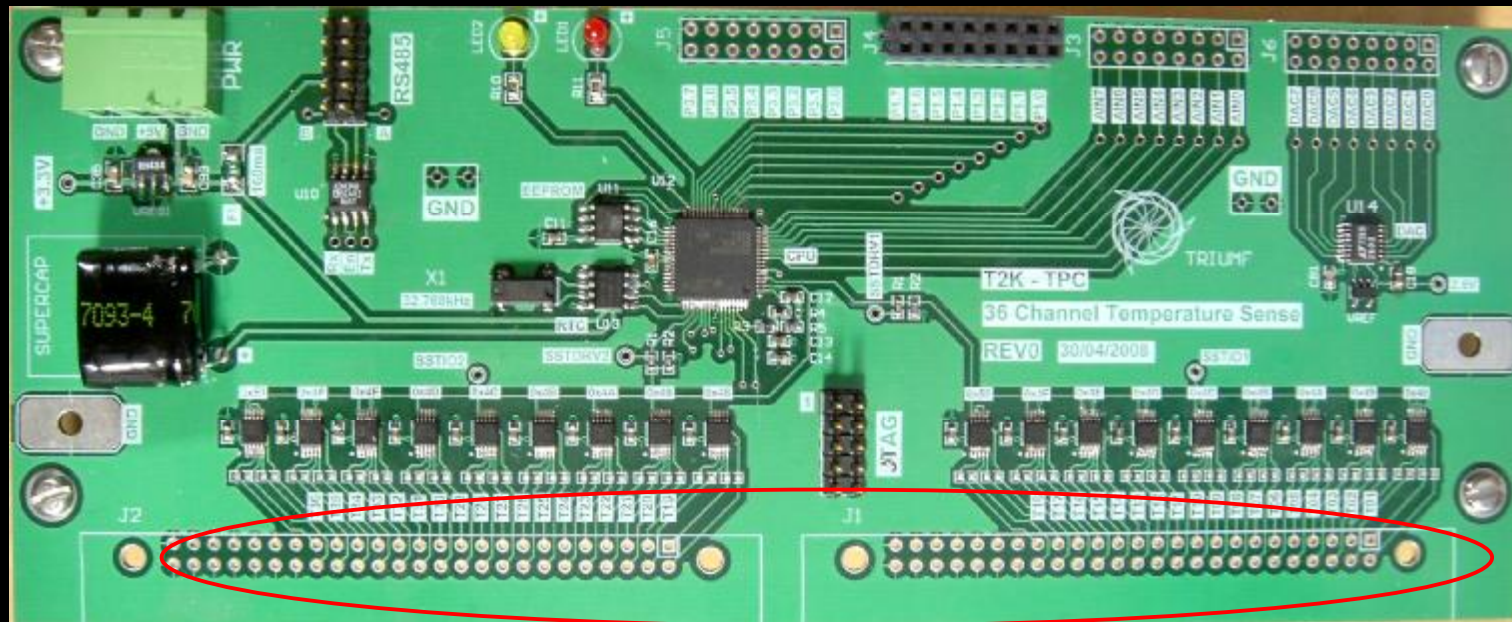


# Temp36

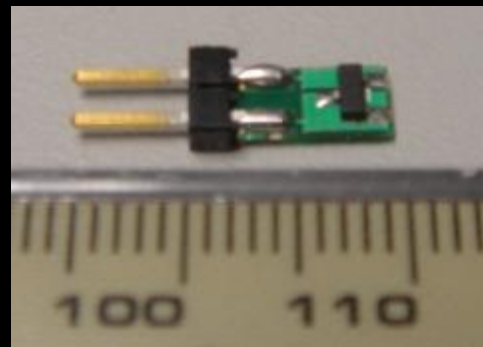


- SHT7x  
- Humidity and temperature sensors

# ADT7486A and Transistors-Cables



- Different cables can cause variations in temperature measurement

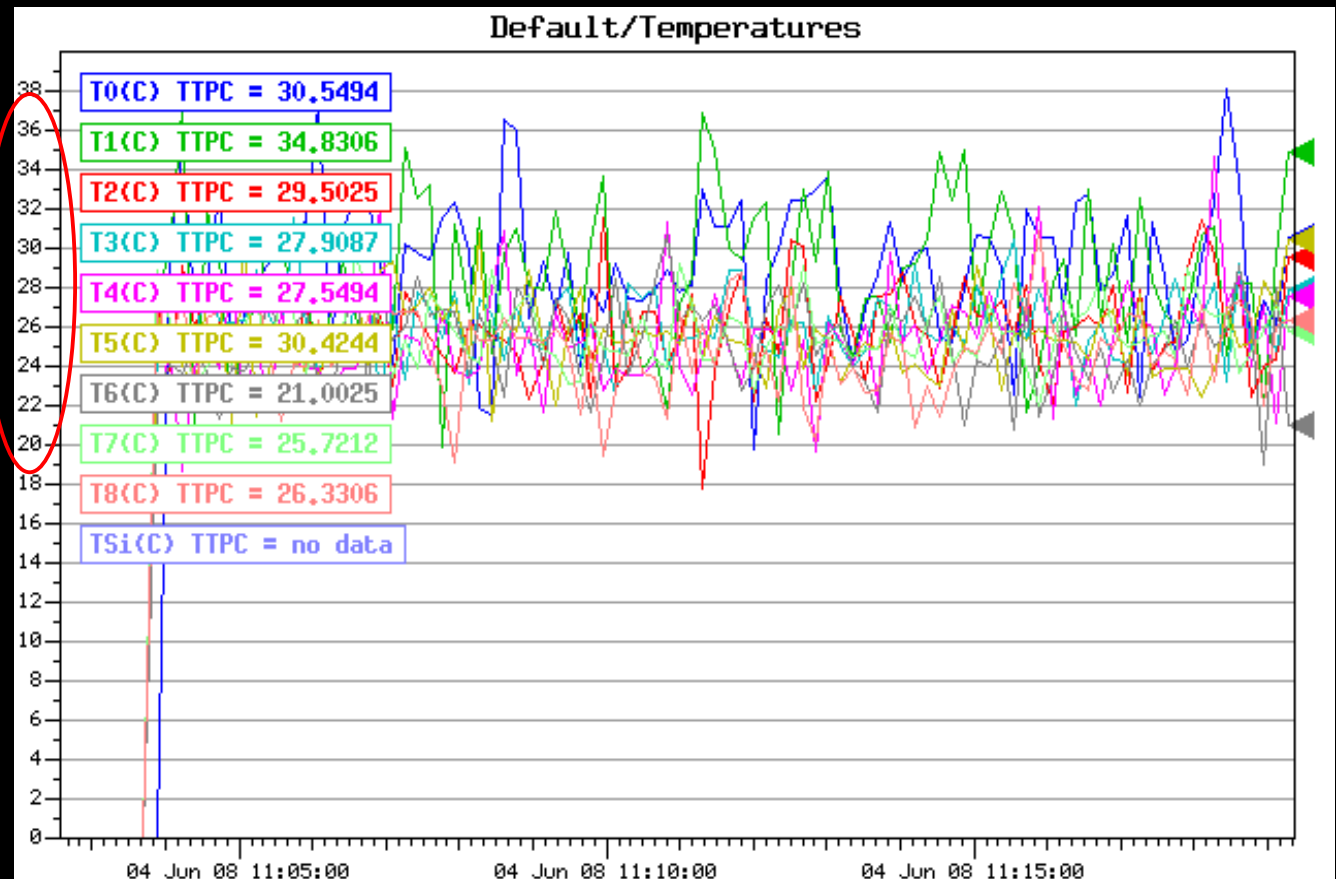


# ADT7486A-Problem with flat non-shielded Ribbon Cable

- Cable length ~4 feet

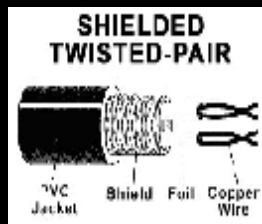


-Temperature fluctuates over 10 degrees Celsius

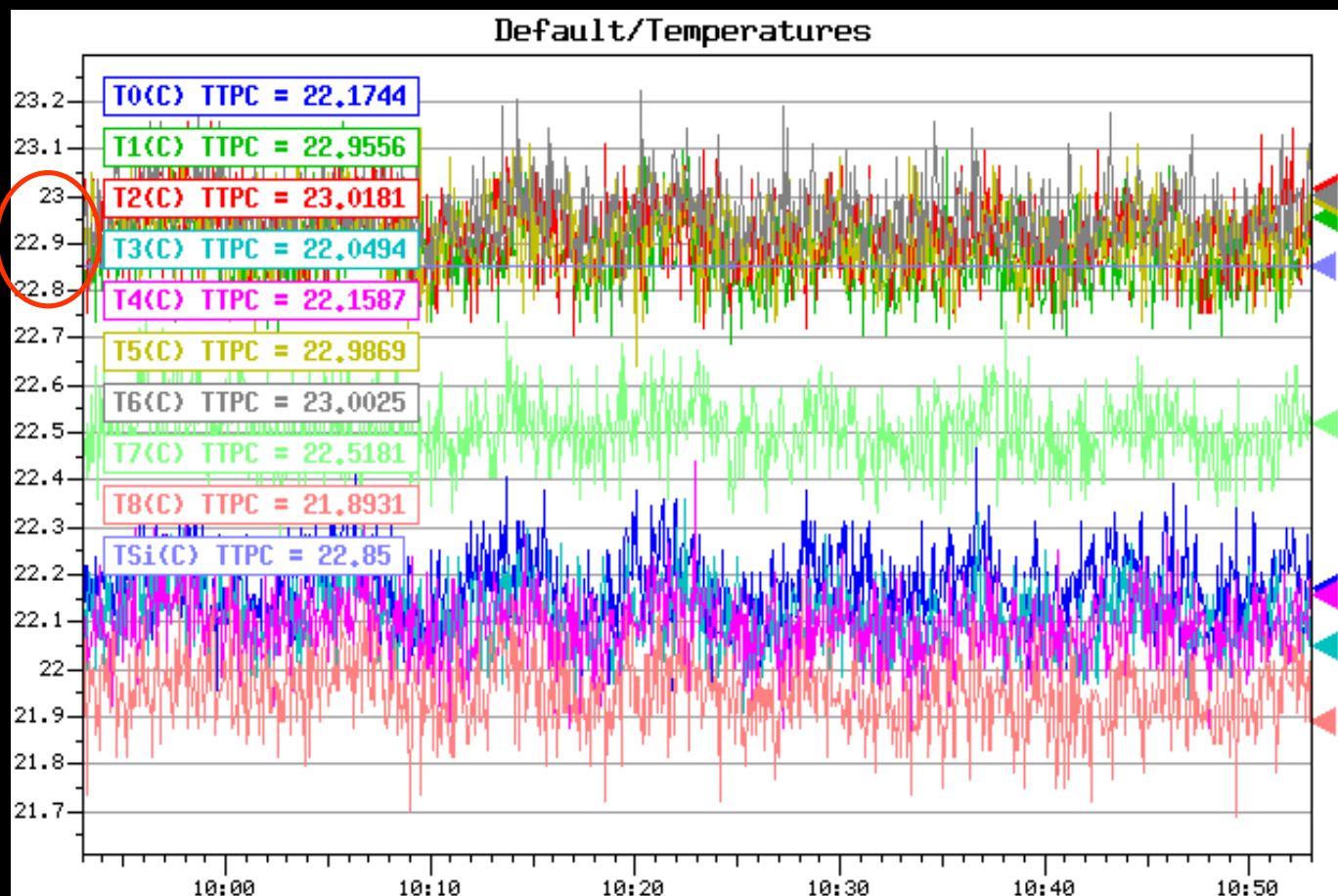


# ADT7486A-Solution: Shielded Twisted Pair Cable

- Cable length ~4 feet

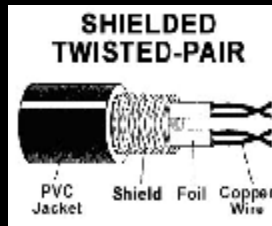


-Noise Improvement  
Temperature fluctuates within +/-0.1 degrees Celsius

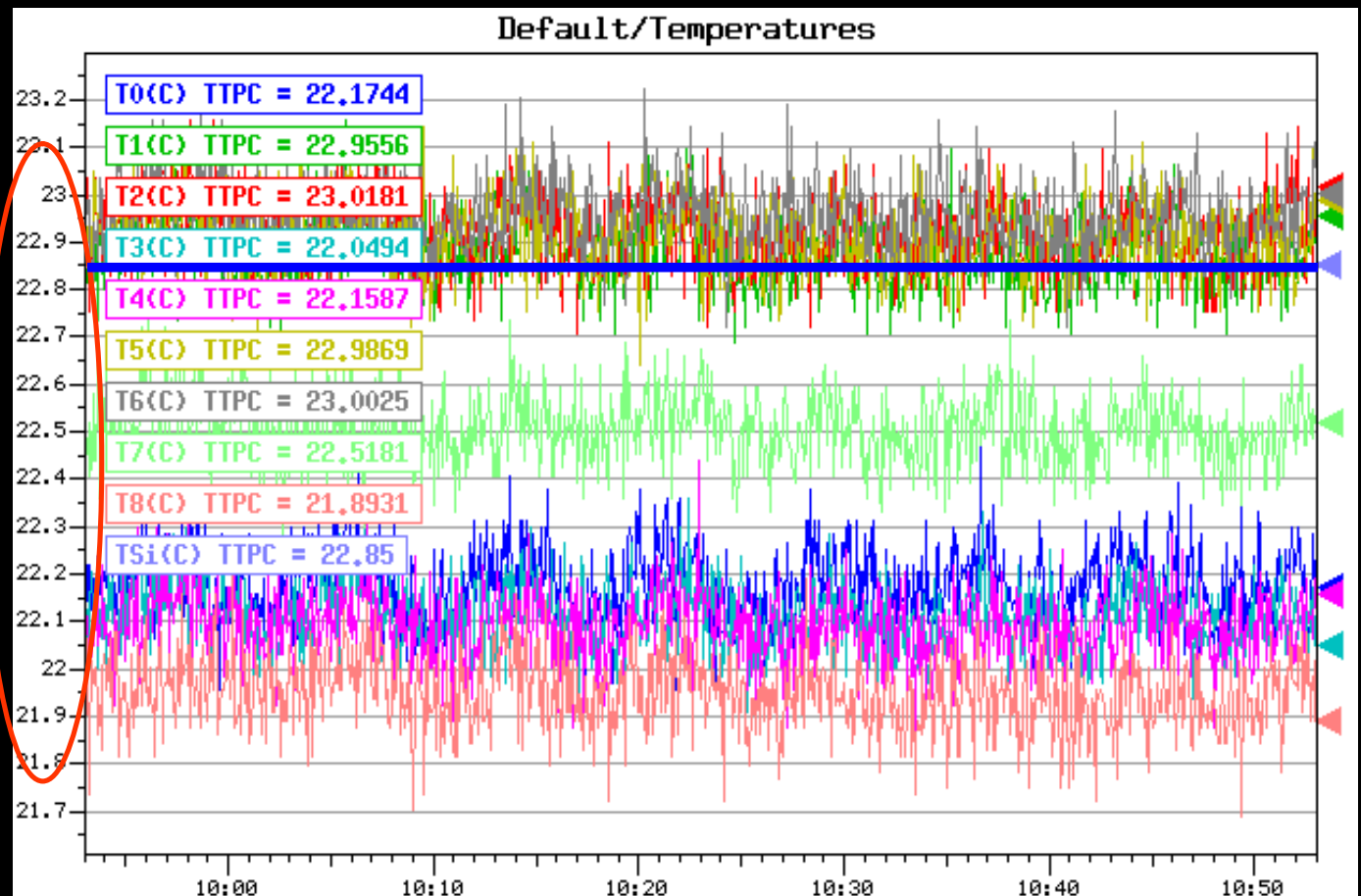


# ADT7486A- **Solution:** Shielded Twisted Pair Cable

- Cable length ~4 feet



-the channels are within one degree relative to each other

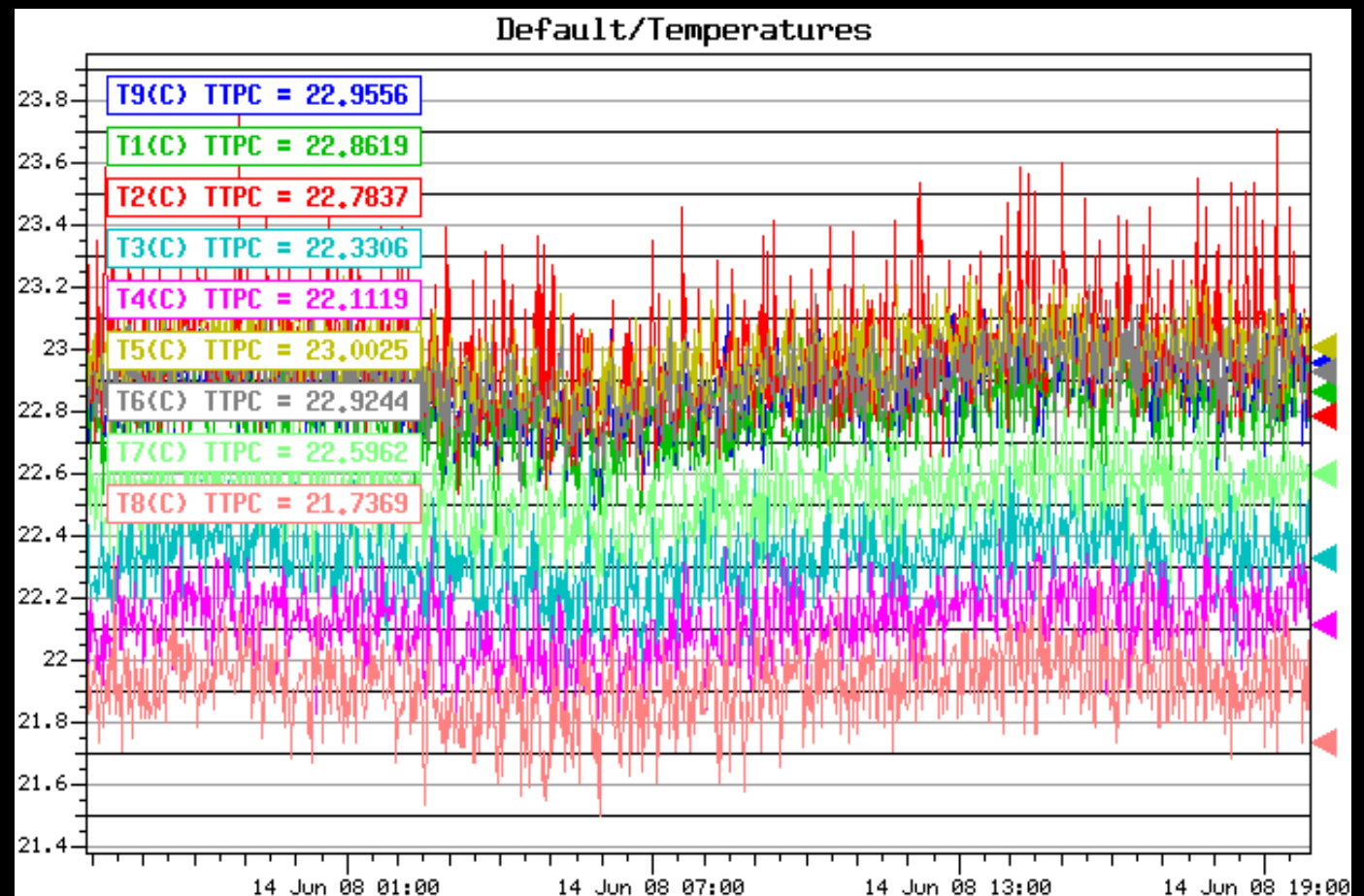


# ADT7486A- Unshielded Twisted Pair Cable

- Cable length ~4 feet

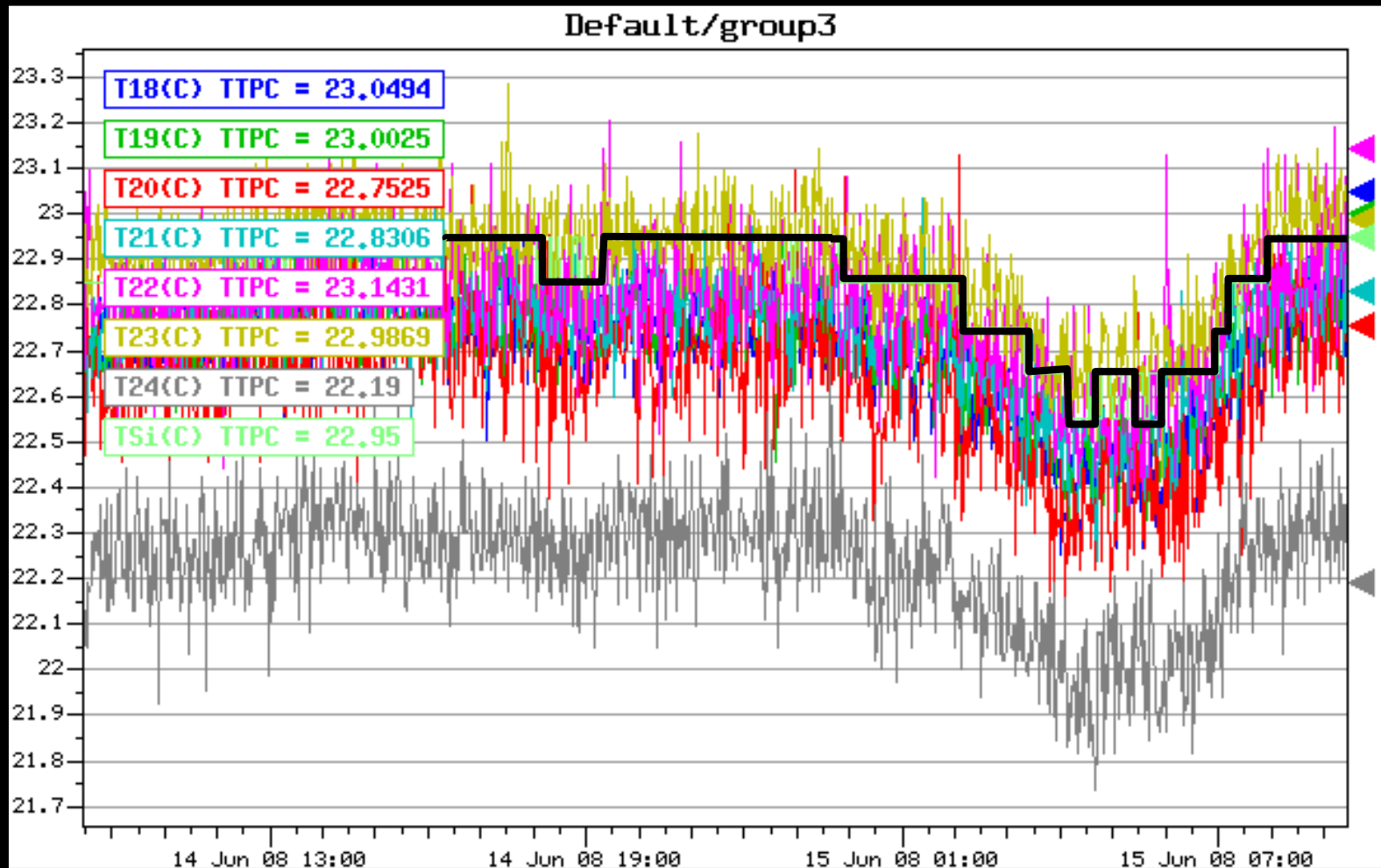


-Similar to shielded twisted pair



# Uncalibrated Temperature Measurement

- Difference is only in terms of absolute temperature comparing to the reference (in black)



## Absolute Temperature Offsets

- Different transistors contribute to less than ~0.2 degree Celsius
- ADT7486As contribute up to ~1 degree Celsius

## Recommendations

- Use unshielded twisted pair cable for length between 2 to 12 feet
- Use shielded twisted pair cable for length >>12 feet

## Suggested Calibration Procedure

- Use DetFac oven, Robert Openshaw thermocouple.
- Can calibrate multiple boards in a single run.
- Temperature range (10°C..40°C), using cycling heat source.
- Build temperature offset table based on chip/diode pair.