Pipe Freeze Detection System

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Problem Description

The primary problem we are attempting to solve is the issue of pipes freezing within the student dorms.

- This can damage the rooms themselves including furniture,
- It can also destroy student items within the room such as clothing and even electronics.

Root cause of this issue:

- The combination of cold weather and students leaving their windows open.

Proposed Solution

A temperature sensing system that can alert students through wireless communication. System has three functional components:

- Temperature Sensors
  - Attached to the pipes with adhesive mounting mechanism
  - Transmit measurement data to microcontroller through SPI or I2C
- Control Unit
  - Power Source
    - Battery pack that powers the temperature sensors, microcontroller, and wireless communication devices
  - Microcontroller
    - Collects data from temperature sensors and determines specific warnings / alerts that need to be sent.
    - Communicates with wireless communication devices through SPI or I2C
- Wireless Communication
  - Used to send either email or SMS alerts to students through a WIFI connection

Demonstrated Features

Temperature Sensing:

- Two sensors that send independent temperature measurements

Control Unit / Alert System

- Performs four operations
  - Moderate temperature threshold warning
  - Critical temperature threshold warning (repeated until resolved)
  - Maintenance alert
  - Low-battery alert

Available Technologies

- Printed board with 44 Pin PIC32MX1xx2xx
  - SPI and I2C communication
- Wifi chip such as ATWILC1000-IC
  - located on board
- Temperature sensor such as AT30TS750A
  - located offboard

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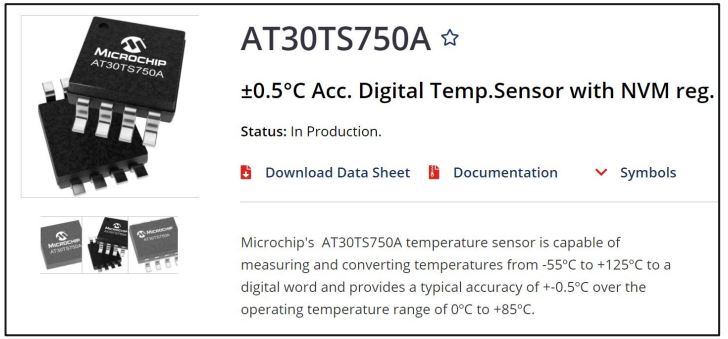
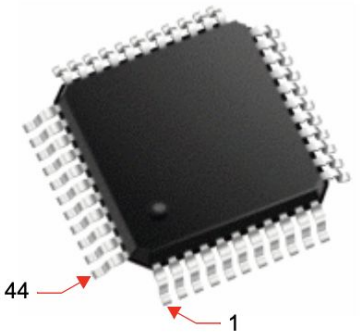


Available Technologies

44-PIN TQFP (TOP VIEW)[1,2,3,5]

PIC32MX110F016D
PIC32MX120F032D
PIC32MX130F064D
PIC32MX130F256D
PIC32MX150F128D
PIC32MX170F256D



SPI/SDIO to Wi-Fi Module

ATWILC1000 ☆

SPI/SDIO to Wi-Fi Module

Status: In Production. **Alternate Products:** atwilc3000, atwinc1500, atwinc3400, atwilc1000-ic

Download Data Sheet Documentation View Comparisons Symbols

Engineering Content

- Eagle
  - Board Design
- MPLAB / Wireless Interface
  - Programming the microcontroller
  - Developing software to notify students
- CAD
  - Constructing mounting mechanism
- Soldering / Board Manufacturing
  - Putting the designed board together
  - Manually soldering mistakes in the design (if needed)

Conclusions

Next Steps:

- Conduct testing for viable methods to effectively measure the pipe's temperature and notify the student with an adequate amount of time to correct the issue.
- Designing the board
- Ordering the technology
- Assembling the system