

# Sensitive Buildings 2012

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# Plan for Today

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- Focus Groups review
- I/O Mode
- Voltage Dividers
- Fun with Data
  - data
  - measurement
  - estimation
- Readings & Assignments

# Focus Groups Review



I/O Mode

# Direct, Indirect, Subtext

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- What data can we sense directly?
- How about inferences that we can make from the data?
- What's the subtext of the data? What can we infer from the inference?

# I/O Intro: ZigBee

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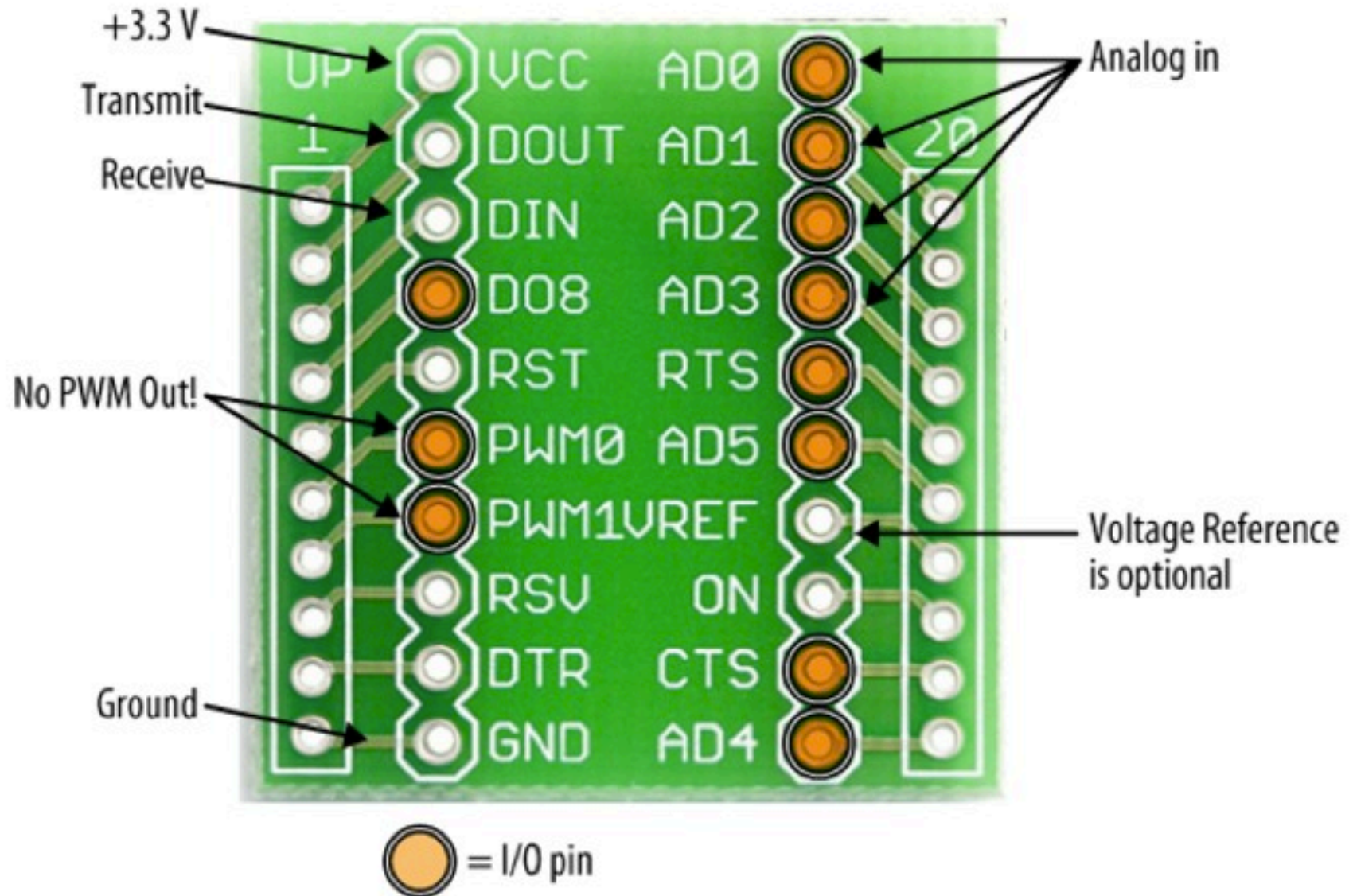
- For simple input and/or output
- Ten digital input/outputs
- Four analog inputs
- No analog outputs on ZigBee
- But not all at once! Pins are shared.

# I/O Why

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- Why:
  - Save space, save power, save weight and save money
  - Reduce complications
- Why not:
  - Limited inputs/outputs
  - No access to logic
  - No analog output on ZigBee radios

# Input/Output Wiring: ZigBee





# Setting I/O Pins

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- ATDx 0 Disabled
- ATDx 1 Built-in Function (sometimes)
- ATDx 2 Analog Input (sometimes)
- ATDx 3 Digital Input
- ATDx 4 Digital Output, low to start with
- ATDx 5 Digital Output, high to start with
  - ...so ATD32 would set which pin to which mode?

# I/O AT Commands: ZigBee

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- ATD0...D7 -> configure pins for I/O (D8 and D9 not supported yet)
- ATP0...P1 -> configure pins 10 - 11 for I/O (P3 not supported yet)
- ATIR -> sample rate
- samples before transmit is always 1
- destination address receives sample info
- ALL PINS READ BETWEEN 0 AND 1.2 VOLTS ONLY

# Example Configuration

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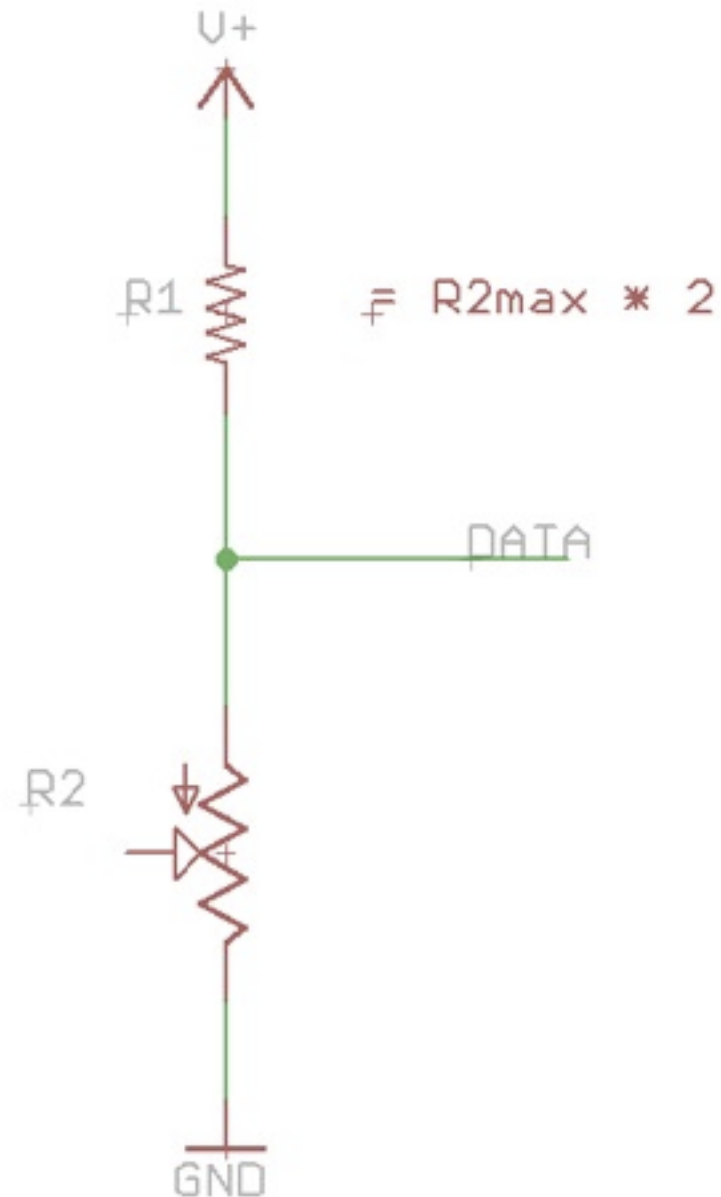
- SENDER:
  - ATID3456 (PAN ID)
  - ATDH -> set to SH of partner radio
  - ATDL -> set to SL of partner radio
  - ATJV1 -> rejoin with coordinator on startup
  - ATD02 pin 0 in analog in mode
  - ATD13 pin 1 in digital in mode
  - ATIR64 sample rate 100 millisecs (hex 64)
- RECEIVER
  - ATID3456 (PAN ID)
  - ATDH -> set to SH of partner radio
  - ATDL -> set to SL of partner radio

I/O Demo

XBee ZigBees inputs are 1.2V range

# Voltage Divider to map 3.3V range to 1.2V range

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Fun with Data

# 10-minutes of Data

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- Get some data!
  - You have 10 minutes to collect some data and return with it
  - Use your own definitions of data, we'll talk about that after your return



# Readings and Assignments

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- Readings
  - Building Wireless Sensor Networks, Chapter 5
- Assignments
  - Simple Sensor Network