Sensor Node Schematic (sensor_v1.pdf)
Title: IoT Air Quality Sensor v1.0
Author: Aditya K. Mishra
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Block Diagram

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| 5V Power Supply  |---->| Voltage Regulator |--->| ESP32 Microcontroller |
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| PMS5003 Sensor   |<--UART-->| GPIO16/17    |   | LoRaWAN Module   |
| (PM2.5/PM10)     |    |    (RX/TX)      |<->| (SPI Interface)  |
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| MQ-135 Sensor    |<--Analog->| GPIO34 (ADC1)  |   | Status LEDs      |
| (CO2/NOx)        |    |               |   | (Power/Transmit) |
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```

Circuit Details

1. **Power Supply**
   - Input: 5V DC (USB/MicroUSB)
   - Voltage Regulator: AMS1117-3.3V
   - Decoupling Capacitors: 10µF (Input), 0.1µF (Output)
2. **ESP32 Connections**

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PMS5003 <-> ESP32:
- VCC -> 5V
- GND -> GND
- TX  -> GPIO17 (RX)
- RX  -> GPIO16 (TX)

MQ-135 <-> ESP32:
- VCC -> 3.3V
- GND -> GND
- OUT -> GPIO34 (ADC1_CH6)

LoRaWAN Module (RAK4631):
- MOSI -> GPIO23
- MISO -> GPIO19
- SCK  -> GPIO18
- NSS  -> GPIO5
- RST  -> GPIO14
```

3. **Additional Components**
    - Status LEDs:
        - Power: Red LED (330Ω resistor to 3.3V)
        - Data Transmit: Blue LED (GPIO2 + 330Ω resistor)
    - Reset Button: GPIOEN pin to GND

Design Notes

1. PCB Layout Guidelines:
    - Keep analog/digital sections separated
    - 20mm clearance around antenna for LoRaWAN
    - Use 0603 SMD components for compact design
2. Power Consumption:
    - Sleep Mode: 10μA
    - Active Mode: 120mA (peak during transmission)
3. Environmental Protection:
    - IP65-rated enclosure
    - Nano-coating for moisture resistance