Erebus Labs

STEM Sensor Budget

Date: 1/12/2013

Revision: 1.0

Development Costs

All costs are given in U.S. dollars. Development costs assume low enough quantities that there is no volume discount. Quantities assume two breadboard prototypes and two assembled PCB-based prototypes.

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| --- | --- | --- | --- | --- |
| Item | Cost (Ea) | Quantity | Ext. Cost | Cost Factors |
| Sensor | 1.00 – 25.00 | 5 – 8 | 5.00 – 50.001 | Type, Quantity of each type |
| μController | 1.00 – 5.00 | 5 – 8 | 5.00 – 40.00 | Onboard features2 |
| Batteries | 0.75 – 12.00 | 5 – 163 | 12.00 – 60.003 | Rechargeable, composition, form factor |
| Passives4 | 0.05 – 2.00 | 50 – 100 | 20.00 – 30.001 | Values and tolerances required |
| Interfaces5 | 0.50 – 8.00 | 16 - 25 | 8.00 – 50.00 | Wireless vs. Wired |
| PCBs6 | 4.00 – 18.00 | 4 - 6 | 24.00 – 48.00 | PCB Area, sensor requirements |
| Other SI7 | 0.50 – 2.00 | 16 – 30 | 8.00 – 50.001 | Battery selection, sensor output |
| Packaging | 3.00 – 75.00 | 2 – 3 | 9.00 – 225.00 | Materials: laser-cut acrylic vs. 3D-printer |
|  | | | | |
| Total: | | | | 100.00 – 500.00 |

Footnotes:

1. Extended cost does not scale linearly with quantity because it is assumed that the maximum quantity would not be entirely comprised of the most expensive components.
2. Onboard features include ADC, power conditioning, amount of memory, etc
3. Quantity and extended cost assume either a small amount of expensive rechargeable proprietary batteries, or a larger amount of cheap (AA or 9V) batteries.
4. Resistors, capacitors, inductors, LEDs
5. Antennas, transceivers, receivers, cable jacks
6. Assumes a PCB for the base unit as well as separate PCBs for the interchangeable sensors.

Example: Minimum extended cost is based on a 2in x 2in base unit PCB with two 1in x 1in sensor PCBs at $2.00 per square inch, x2 prototypes.

1. Other semiconductors: op-amps, voltage regulators, discrete transistors

BOM Cost

Low Price-point Example: one base unit with two external interchangeable sensors. Single unit cost assuming volume is low enough that there are no quantity discounts.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Cost (Ea) | Quantity | Ext. Cost | Notes |
| Sensor | 0.19, 5.99 | 2 | 6.18 | Temperature Sensor, CO sensor |
| μController | 1.36 | 1 | 1.36 | ATTiny84 – onboard ADC, 8KB flash |
| Batteries | 2.14 | 1 | 2.14 | Standard 9v Battery |
| Passives4 | 0.05 – 0.50 | 10 | 3.00 | Misc resistors, capacitors, LEDs |
| Interfaces5 | 0.50 | 4 | 2.00 | Generic jack for sensors, USB for base |
| PCBs6 | 4.00 – 8.00 | 3 | 16.00 | 2”x2” base PCB, 1”x2” PCB per sensor |
| Other SI7 | 0.50 | 0 | 0.00 | Assuming μC ADC can handle sensor output |
| Packaging | 3.00 | 1 | 3.00 | Laser-cut acrylic from EPL, hand assembled |
| Total: | | | | $33.68 |