

Search Sticker - Full Working Plan

1) Concept & Target Use Cases

A low-cost adhesive 'search sticker' with BLE + IR sensor, powered by coin cell. Target sectors: Offices (asset finding), Factories (tool tracking), Luxury shops (anti-tamper).

2) High-Level Components

- BLE SoC (nRF52 family)
- IR sensor (reflective or PIR)
- CR2032 button cell
- Thin PCB + adhesive laminate
- Optional LED indicator

3) Electronics & Firmware

- Deep sleep default, wake on IR interrupt
- Event-driven BLE adverts
- Battery measurement via ADC
- Firmware optimizations for μ A consumption

4) Power & Lifespan

CR2032 ~225 mAh:

- 5 μ A avg \rightarrow ~5 years
 - 20 μ A avg \rightarrow ~1.2 years
 - 100 μ A avg \rightarrow ~3 months
- => Optimize with sleep + pulsed IR + short BLE

5) Mobile App

- Scan & list stickers
- Show battery %, last seen, RSSI
- 'Find' feature triggers LED blink
- Optional cloud logging via Firebase

6) Mechanical Design

- Thin sticker SKU with industrial adhesive
- Rugged SKU with polycarbonate housing
- Tamper-resistant options for luxury shops

7) Costs (excluding app)

Prototype (10 units): ~■640/unit

Pilot (200 units): ~■370/unit

Mass production (10k units): ~■210/unit

8) Risks & Drawbacks

Battery limits, IR false triggers, BLE range issues, sticker fragility, maintenance overhead, security/privacy, compliance costs, competition.

9) Solutions

Deep sleep firmware, tiered SKUs, better adhesives, gateways for BLE, rotating IDs for privacy, ROI case studies, pre-certified modules.

Drawbacks vs. Solutions

Drawback	Solution	Impact
Battery life limitation	Deep-sleep firmware, fewer adverts, bigger cell, replacement schedule	High
Limited power for features	Phone app alerts, low-power LEDs, rechargeable SKU	Medium
IR false positives	Pulsed IR, debounce, alternative sensors	High
BLE range/interference	Adaptive TX power, BLE-WiFi gateways, antenna tuning	High
Sticker fragility	Rugged SKU, strong adhesive, mounting clips	High
Maintenance overhead	Battery alerts, service kits, mesh/gateway	High
Security/privacy risks	BLE bonding, rotating IDs, minimal PII	High
Cost vs. value mismatch	Tiered pricing, ROI case studies	Medium
Certification costs	Pre-certified modules, EMS partners	Medium
Competition	Ultra-thin design, tamper logs, system integration	Medium