

Review Paper on RFID Systems: Embedded Software and Hardware Design Review

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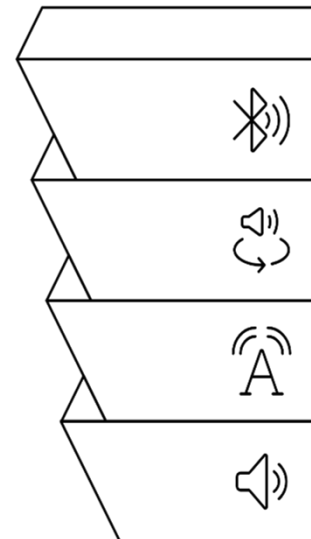
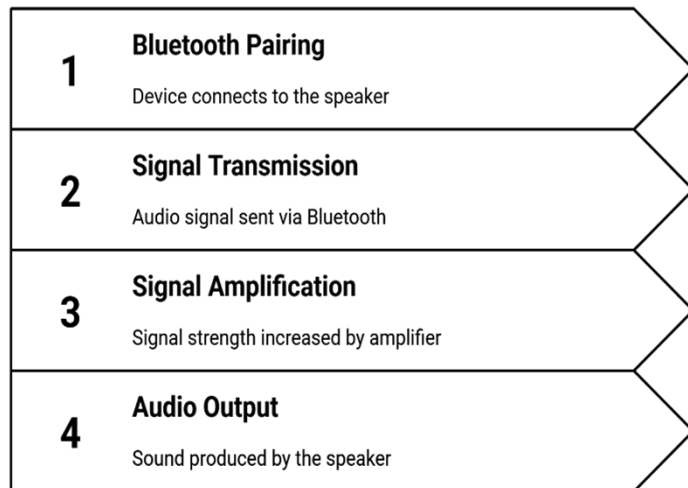
1. Introduction

- **Overview:** A DIY portable Bluetooth speaker built using low-cost, energy-efficient components and a custom-designed MDF enclosure.
- **Objective:** To create a functional, wireless audio device with sustainable materials and modular electronics.
- **Why Bluetooth?** Wireless convenience, compatibility, and low power consumption.



2. Materials & Components

- **Core Parts:**
 - **MP3 Bluetooth 4.1 Decoder Board:** Wireless audio reception.
 - **PAM8403 Amplifier:** Efficient audio signal boosting.



- **Speaker Unit:** Converts signals to sound.
- **Power Supply:** USB/adaptor or battery for flexibility.
- **MDF Casing:** Laser-cut enclosure (designed in **Cero software**).
- **Switch/Button:** Power control.

3. Working Principle

1. **Bluetooth Pairing:** Device connects to the speaker.
2. **Signal Flow:** Audio → Bluetooth module → Amplifier → Speaker.
3. **Block Diagram:** Visualizes signal path

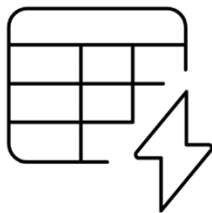
4. Circuit & Assembly

- **Wiring Diagram:** Step-by-step connections (e.g., Bluetooth → Amp → Speaker).
- **Safety:** Insulation, secure soldering, and polarity checks.
- **Enclosure:** Designed in **Cero**, cut via **laser machine**, and assembled with component mounts.

5. Power & Sustainability

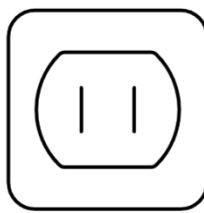
- **Efficiency:** PAM8403 amp and low-power Bluetooth reduce energy use.
- **Power Options:** USB (5V), 9V adapter, or battery for portability.
- **Eco-Friendly:** Recyclable MDF, reusable electronics, minimal e-waste.

Product Features



Efficiency

Low power consumption enhances battery life.



Power Options

Multiple power supply options enhance device mobility.



Eco-Friendly

Sustainable materials reduce environmental impact and waste.

6. Testing & Results

- **Bluetooth Pairing:** Successful with smartphones/laptops.
- **Audio Quality:** Clear output, minor distortion at max volume.
- **Power Stability:** Works reliably on USB/battery.

7. Applications & Future Upgrades

- **Uses:** Home, outdoor, or portable audio.
- **Future Ideas:**
 - Rechargeable battery.
 - Voice control (Alexa/Google Assistant).
 - Enhanced bass or RGB lighting.

8. Conclusion

- **Skills Gained:** Circuit design, CAD (Cero), laser cutting, troubleshooting.
- **Benefits:** Cost-effective, eco-friendly, customizable.

9. References

- Datasheets: PAM8403.
- [Make a Speaker by Wood Laser Cutting – Instructables](#)
(Used as a reference for the speaker casing design file)
-
- Tools: Cero software, laser cutter guides.

10 Team Collaboration & Innovation

- Ambati, Shivani. (2024). *"Teamwork & Innovation in Bluetooth Speaker Project."* LinkedIn Post.
- Retrieved from:
https://www.linkedin.com/posts/shivani-ambati-268a56288_teamwork-innovation-bluetoothspeaker-activity-7206369769371889664-RgLy
(Shared insights on collaborative design and prototyping stages.)