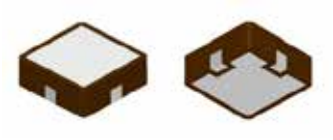
High Frequency Ceramic Solutions

Automotive Directional Antenna 2.4GHz RHCP



P/N 2440AT62B0085002U

Introduction:

JOHANSON Technology's P/N 2440AT62B0085002U is a high-performance, directional, right-hand circularly polarized (RHCP) surface-mount RF ceramic chip antenna optimized for 2.4 GHz wireless applications. Built using Low-Temperature Co-fired Ceramic (LTCC) technology, this compact 12×12×4 mm (0.472×0.472×0.157 in) antenna offers stable RF performance and high detuning resilience across varying environmental conditions.

This directional antenna is specifically designed for applications that require a focused radiation pattern, improving signal strength and reliability in targeted communication links. It is intended to be used with JOHANSON's 2450CH15A0100002E hybrid coupler to achieve proper RHCP functionality in single-feed designs, making it ideal for Security Access, AoA (angle of arrival), Channel Sounding, Bluetooth, WiFi, Zigbee, ANT+, ISM, LoRa, and other positioning applications.

Typical Applications:

This directional antenna is ideal for RF applications requiring targeted signal transmission and enhanced communication range:

1. Zigbee and Thread
2. MIMO & IoT Devices
3. ANT+ and ISM Band Devices
4. WiFi (IEEE 802.11 b/g/n/ac/ax)
5. Bluetooth & Bluetooth Low Energy (BLE)
6. LoRa and Low-Power Wireless Networks
7. Positioning Systems: Angle of Arrival (AoA), Phase Difference of Arrival (PDoA)
8. Security Access, AoA (angle of arrival), Channel Sounding
9. Automotive and Industrial Wireless Solutions (AEC-Q200 Qualified)

Key Features:

- **Axial Ratio** 3.0 dB max
- **Antenna Type** Directional
- **Power Capacity** 1 W (CW)
- **Efficiency** 55% @ 2.44 GHz
- **Operational Frequency** 2.4 - 2.485 GHz
- **Peak Gain** 2.6 dBi (max), 2.1 dBi (typical)
- **Operating Temperature** -40°C to +105°C
- **Polarization** Right Hand Circular Polarization
- **PCB Mounting Options** Edge, Corner, or Center

Directional Radiation Pattern & Benefits:

Unlike omni-directional antennas, **2440AT62B0085002U** antenna focuses energy in a specific direction, making it ideal for applications where a stronger signal is needed in a targeted direction.

Advantages of a Directional Antenna:

- **Increases signal strength in the desired direction for improved wireless communication**
- **Reduces interference from unwanted directions, minimizing multi-path effects**
- **Improves overall system efficiency by concentrating RF energy where it's needed**

Due to its directional characteristics, it is recommended to carefully evaluate PCB placement for optimal performance

RHCP Functionality with Hybrid Coupler:

P/N 2440AT62B0085002U is a dual-feed antenna, requiring JOHANSON'S **2450CH15A0100002E** hybrid coupler to function properly in single-feed RF systems. The hybrid coupler ensures a 90° phase shift between the two feeds, enabling correct RHCP operation.

Why RHCP Matters?

- **Reduces multipath fading in environments with reflections**
- **Enhances performance in positioning and tracking systems**
- **Ensures consistent communication in mobile and IoT applications**

For single-feed chipset implementations, Johanson strongly recommends using this antenna with the hybrid coupler to ensure optimal RHCP and directional performance.

Mounting Guidelines:

2440AT62B0085002U antenna can be mounted in different locations on a PCB while maintaining directional radiation performance. Recommended placements include:

- **Edge Mounting:** Ideal for applications requiring focused radiation along the PCB's edge.
- **Corner Mounting:** Useful when PCB space is constrained.
- **Center Mounting:** Ensures symmetric radiation and uniform signal coverage. For best results, maintain at least a 3 mm clearance from the PCB edge.

Recommended Evaluation Board: JOHANSON'S **2440AT62B0085001CE1**, integrating this antenna with the **2450CH15A0100002E** hybrid coupler for optimized RHCP functionality.

Design Considerations:

1. **Directional Radiation Optimization**: To fully utilize the directional properties of **2440AT62B0085002U**, the PCB design must be optimized for:
   - A clear transmission path in the primary radiation direction
   - Minimized ground plane obstructions that may cause reflections
2. **Hybrid Coupler Integration**: For single-feed applications, JOHANSON'S **2450CH15A0100002E** ensures the proper 90° phase shift between feeds, enabling optimal RHCP performance.
3. **Antenna Tuning & Matching:** PCB layout, enclosure materials, and surrounding components can affect antenna performance. JOHANSON provides tuning and validation services to optimize real-world efficiency.
4. **PCB Layout Best Practices**
   - Use a solid ground plane for impedance stability
   - Keep transmission lines at 50Ω to prevent mismatch losses
   - Position the antenna to maximize radiation efficiency
   - Follow JOHANSON'S soldering profile for proper assembly

Performance & Test Data

JOHANSON'S evaluation board provides the following key performance metrics at 2.44 GHz:

- Return Loss: -15.5 dB
- Axial Ratio: ≤ 3 dB
- Peak Gain: 2.6 dBi
- Efficiency: 55%

2440AT62B0085002U has been tested in various PCB configurations, demonstrating consistent directional radiation and impedance characteristics.

For further RF studies on this product, contact our Applications Engineering Team.

Ordering Information

Part Number	Description	Packaging
2440AT62B0085002U	2.44 GHz Directional RHCP RF Chip Antenna	600 pcs/reel (Tape & Reel)
2440AT62B0085002B	Bulk Packaging	Loose pcs
2440AT62B0085001CE1	Evaluation Board (Includes Antenna & Coupler)	1 unit

Conclusion

Johanson Technology's 2440AT62B0085002U is a compact, high-efficiency directional RHCP antenna designed for 2.4 GHz wireless applications. Its directional properties make it an excellent choice for applications requiring focused signal transmission, such as IoT, industrial, automotive, and RF positioning systems.

For single-feed systems, Johanson strongly recommends using this antenna with the 2450CH15A0100002E hybrid coupler to achieve optimal RHCP performance.

With robust AEC-Q200 qualification, multiple PCB mounting options, and compatibility with IoT and wireless tracking applications, this antenna is a top choice for next-generation RF designs.

Solve Your Design Challenges - Contact Us Today

- Contact Applications Engineering Team for design support, PCB layout reviews, or custom antenna tuning.
- Request a Sample
- Request a Quote

Additional Resources:

- Antenna product page
- Johanson tuning services
- Recommended soldering profile

Additional Resources:

- Antenna 2440AT62B0085002U Product Page
- Hybrid Coupler 2450CH15A0100002E Product Page
- Antenna Tuning & Validation Services
- Soldering Profile & MSL Information
- Tape & Reel Packaging Details
- Press Release: Optimize Automotive Wireless Systems with Johanson's Directional RHCP Antenna