



U20 Data Sheet V1.0

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Jan. 5, 2025

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1. Abstract

The U20 is a 60 GHz millimeter-wave radar developed by LuxWave Ltd., designed for industrial applications such as robotics, automotive, and smart infrastructure. Offering high precision and reliability, the U20 radar is an optimal solution for various sensor-based applications that require accurate detection in dynamic environments. With a wide field of view, the radar ensures precise obstacle detection even in challenging conditions, including smoke, fog, and precipitation.

The U20 radar is particularly suited for scenarios where low power consumption, compact size, and robust performance are essential. It is engineered for use in both indoor and outdoor environments and provides reliable detection at close to medium ranges with excellent angular resolution. The U20 operates at a frequency range of 60.0 ~ 64.0 GHz, with a measurement range of 0.2m ~ 40m, and offers a resolution of 0.04m and accuracy of 0.01m.

The radar's compact form factor, along with its resistance to environmental factors, makes it highly adaptable for integration into portable and autonomous systems. It is designed to meet the rigorous demands of modern robotics, industrial automation, and autonomous vehicles, delivering a cost-effective and high-performance solution for advanced industrial applications. The U20 radar balances performance, size, and power efficiency, making it a reliable choice for industries seeking reliable sensor technology for obstacle detection and environmental awareness.

2. Main Applications and Features

The U20 is a 60 GHz millimeter-wave radar product developed by LuxWave Ltd., designed primarily for industrial applications such as robotics, automotive, and smart infrastructure. It offers a highly accurate and cost-effective solution for various sensor-based applications.

The U20 radar is equipped with a wide field of view, allowing it to detect obstacles with high resolution in various environmental conditions. It is particularly suited for applications where low power consumption, compact size, and reliable performance are essential. The radar is resistant to environmental challenges such as smoke, fog, and precipitation, making it ideal for use in both outdoor and indoor environments.

Key features of the U20 include:

- Wide field of view with horizontal and vertical angle measurements.
- Low power consumption and compact form factor, ideal for integration into portable devices.
- Resistance to challenging environmental factors such as smoke, fog, and rain.
- High accuracy with fine angular resolution, ensuring reliable detection of objects at close and medium ranges.
- Cost-effective solution with robust performance suitable for various industrial applications.

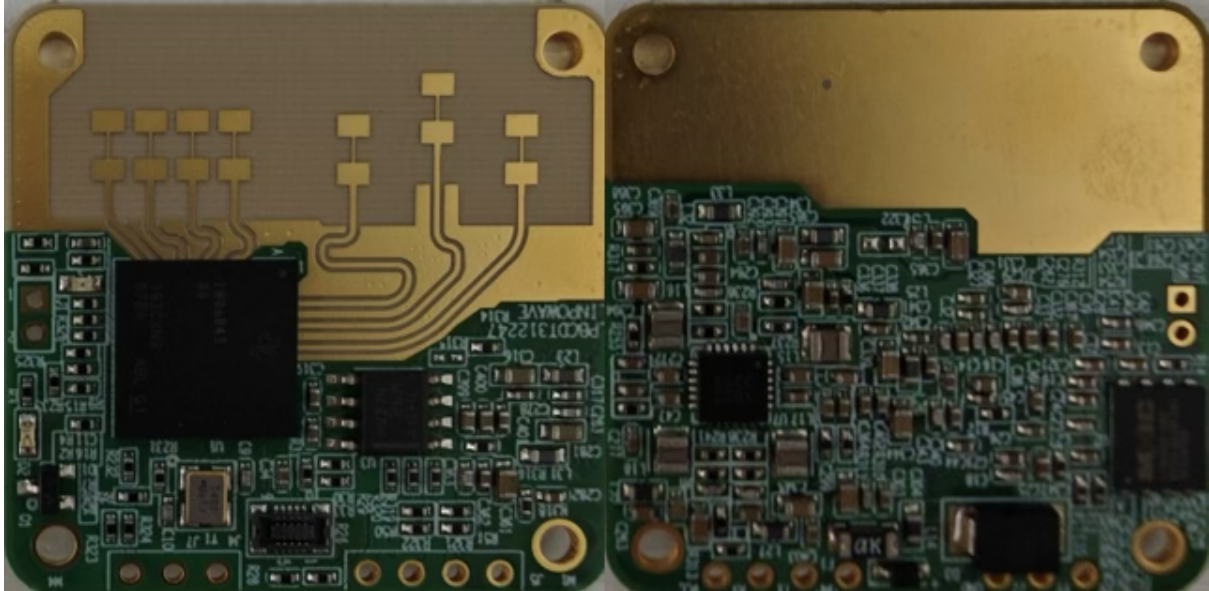
The U20 is designed to meet the rigorous demands of modern robotics, industrial automation, and autonomous systems, offering an optimal balance between performance, size, and power efficiency.

3. Technical Specifications

Parameter	Value
Frequency Range	60.0 ~ 64.0 GHz
Measurement Range	0.2m ~ 40m
Resolution	0.04m
Accuracy	0.01m
Applicable Speed Range	±20 m/s
Field of View (FOV)	Horizontal: ±50°, Vertical: ±30°
Angle Measurement Accuracy	Azimuth: 0.5°, Pitch: 1°
Power Supply	5V 1A DC Input
Communication Interface	TTL
Power Consumption	Average: < 2W, Peak: 5W
Operating Temperature	-40°C ~ +70°C, Humidity: 5% ~ 90% RH
Board Weight	5±1g
Dimensions	35 x 35 mm
Storage Environment	-40°C ~ 105°C, Humidity < 90% RH

4. Product Structure

4.1 Physical Image



U20 Product Image

4.2 Interface Description

4.2.1 Communication Interface

RS-422 Serial Communication: Baud rate 921600 Bd.

4.3 Power Interface

- DC power input: 4.7V to 5.2V with a minimum power requirement of 5W.
- Observe correct polarity when connecting the power supply.

5. User Instructions

5.1 Radar Coordinate System

Refer to the radar coordinate system diagram for understanding orientations.

5.2 Communication Protocol

The radar supports UART and CAN interfaces. After a 10-second boot-up, data output begins in a fixed protocol format. Example data packets are detailed below:

ID	Field Name	Format	Calculation Formula or Description
0	Synchronization Header	Uint16*4	0x0102, 0x0304, 0x0506, 0x0708
8	Software Version	Uint32	
12	Total Packet Length	Uint32	Total byte count including the frame header (excluding 2 bytes for CRC)
16	Hardware Version	Uint32	
20	Frame Sequence Number	Uint32	Current frame sequence number
24	CPU Time	Uint32	CPU time
28	Reserved	Uint32	Reserved
32	Output Structure Count	Uint32	Number of output target types (default is 1)
36	Subframe Sequence Number	Uint32	0

If the output structure count > 0, the following structures are included:

40	Structure Type	Uint32	3
44	Structure Length	Uint32	12 * Number of Targets + 4
48	Number of Targets	Uint16	Number of detected targets
50	Q Value	Uint16	Q format calculation: Actual Value = Q Format Value / (2 ^Q)

The following six rows are repeated in sequence:

52	x	int16	Q format
54	y	int16	Q format
56	x-direction Velocity	int16	Q format
58	y-direction Velocity	int16	Q format
60	SNR	int16	SNR value
62	Peak	int16	Peak value

If total length is not a multiple of 32, padding is added with 0x0F.

6. Safety Information

6.1 Electrostatic Protection

In dry environments, the human body can easily accumulate static electricity. Adequate electrostatic protection must be applied during the radar's transportation, storage, operation, and handling. Particularly before touching a powered-on millimeter-wave radar, be sure to discharge any static electricity by touching other metal objects or wearing anti-static gloves or wristbands.

- When handling unintegrated modules, static protection should begin as soon as the module is removed from its sealed anti-static packaging. Never touch or grasp the radar antenna surface or connector pins; only touch the edges or corners of the module.
- **Recommendation:** Always wear anti-static gloves when operating radar sensors.

6.2 Usage Precautions

- Do not wrap the millimeter-wave radar in metallic foil or any metallic parts.
- Do not directly measure the pins with a multimeter, as this may cause damage.
- Do not spray any paint or varnish on the antenna structure.
- Do not wrap the antenna with conductive carbon fiber sheets (CFK).
- Avoid letting metals or corrosive materials come into contact with the antenna structure.
- Avoid direct contact with the antenna surface using hands or other objects.

6.3 Installation Instructions

When installing the millimeter-wave radar, please pay attention to the following points:

- Ensure that the antenna surface is free of ice particles or water vapor.
- Avoid soldering activities near the radar.
- Only use a lint-free cotton cloth to wipe the radar surface; do not scratch or damage the surface.
- Perform regular checks before use to ensure the radar functions properly.
- Ensure that the radar is securely fixed during installation to prevent it from falling.
- Keep strong electrical cables away from the radar antenna.
- Ensure that there are no obstacles in front of the radar that could block electromagnetic wave transmission (e.g., metal materials).

7. PCB Storage and Handling Recommendations

To ensure the longevity and optimal performance of the PCB, follow these recommendations:

- **Storage:** Keep the PCB in an anti-static bag and store it in a controlled environment with low humidity and room temperature.
- **Handling:** Always use an anti-static wristband or gloves when handling the PCB.
- **Cleaning:** Use a soft, lint-free cloth to remove dust and debris. Avoid using liquids or abrasive materials.
- **Environment:** Avoid exposure to corrosive gases or high humidity, as these can lead to oxidation and performance degradation.
- **Precautions:** Handle the PCB by its edges and avoid contact with the circuit traces or connectors.

8. Device Disposal Information

8.1 Disposal Instructions

The U20 radar device is designed for a long operational life. However, at the end of its life, it must be disposed of responsibly to minimize environmental impact. Ensure the device is taken to a professional recycling facility that can handle electronic components.

- Devices used for more than five years should be evaluated for performance degradation before continued use.
- Contact authorized LuxWave facilities for recycling support if required.

8.2 Self-Disposal Instructions

This device contains recyclable materials and electronic components that must not be discarded in general waste.

- Separate the electronic components from recyclable materials.
- Follow local regulations and guidelines for disposing of electronic waste.
- For assistance, reach out to local waste management authorities or LuxWave support.

9. Disclaimer

Before use, please carefully and thoroughly read the following disclaimers and strictly follow the instructions in this manual for the installation and use of this product. If any issues arise during usage that cannot be resolved, please contact LuxWave staff for assistance. We are happy to serve you!

- If the device is not used for an extended period, please disconnect the power.
- Prevent any liquid from entering the device, as it may cause electrical short circuits or fire hazards.
- Before cleaning or maintaining the millimeter-wave radar, disconnect the power and all connected cables. Use a cloth to wipe the surface and avoid water from entering the device.
- Before powering the millimeter-wave radar, ensure that a suitable power supply (within the required specifications) is used. The warranty does not cover damages caused by the use of non-compliant power supplies.
- All signal interfaces of the radar have strict usage requirements. Do not use them indiscriminately, especially avoid connecting power to any signal interfaces, as it could damage the device.

No warranty is provided for damages caused by violation of the above guidelines.