U80 Data Sheet V1.0

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1. Abstract

The U80 is a 77 GHz millimeter-wave radar developed by LuxWave Ltd., engineered specifically for UAV obstacle avoidance and low-altitude operations. Designed to deliver highly accurate and cost-effective solutions, the U80 radar excels in detecting obstacles in complex and dynamic environments, making it an ideal choice for personal aerial drones and UAV systems operating in challenging conditions.

With a wide field of view and high-resolution detection capabilities, the U80 ensures reliable obstacle detection, including detection of power lines and trees, even in low-visibility scenarios such as fog, smoke, or rain. The radar operates at a frequency range of 76.0 ~ 81.0 GHz, with a measurement range of 0.5m ~ 80m, offering resolution down to 0.15m and accuracy of 0.05m. It also provides precise distance measurement and high sensitivity, making it ideal for precise navigation and safety in UAV operations.

The U80 radar is compact, lightweight, and designed for low power consumption, making it suitable for integration into UAV systems where size, weight, and power efficiency are crucial. Its robust environmental resistance ensures reliable performance in diverse and challenging conditions, further enhancing its suitability for both industrial and personal drone applications. With versatile communication interfaces, including UART and CAN, the U80 provides seamless integration into UAV systems, offering a comprehensive, high-performance solution for modern aerial technologies.

2. Main Applications and Features

The U80 is a 77 GHz millimeter-wave radar developed by LuxWave Ltd. It is specifically engineered for UAV obstacle avoidance, delivering a highly accurate and cost-effective solution tailored for ultra-low altitude operations in the UAV industry.

The U80 is ideal for:

- Personal aerial drones requiring precise obstacle detection.
- UAV systems operating in challenging environments where high resolution, low power consumption, and sensitivity are essential.

Key Features

1. Wide Field of View and High-Resolution Detection
    Ensures accurate obstacle detection, including objects like power lines and trees.
2. Versatile Communication Interfaces
    Supports UART and CAN interfaces for seamless integration into UAV systems.
3. Exceptional Environmental Resistance
    Operates reliably under adverse conditions, such as smoke, fog, snow, rain, and even low-visibility scenarios.
4. Compact and Efficient Design
    Features a small form factor, high sensitivity, and low power consumption, making it ideal for UAV integration.
5. Precise Distance Measurement
    Offers outstanding accuracy for detecting obstacles in complex environments.

3. Technical Specifications

Parameter	Value
Frequency Range	76.0 – 81.0 GHz
Measurement Range	0.5m – 80m
Resolution	0.15m
Accuracy	0.05m
UAV Speed Range	±20 m/s
Data Refresh Rate	50Hz (Adjustable)
Power Supply	5V 1A DC input
Communication Interface	UART, CAN
Power Consumption	Average: < 2W, Peak: 5W
Operating Temperature	-40°C – +85°C
Board Weight	9±2g
Board Dimensions	50 x 50 x 5.5mm
Total Weight	32±2g
Storage Temperature	-40°C – 105°C

4. Product Structure

4.1 Physical Image

U80 radar image.

4.2 Interface Description

4.2.1 Communication Interface

- **UART Communication:** Baud rate: 115200 Bd.
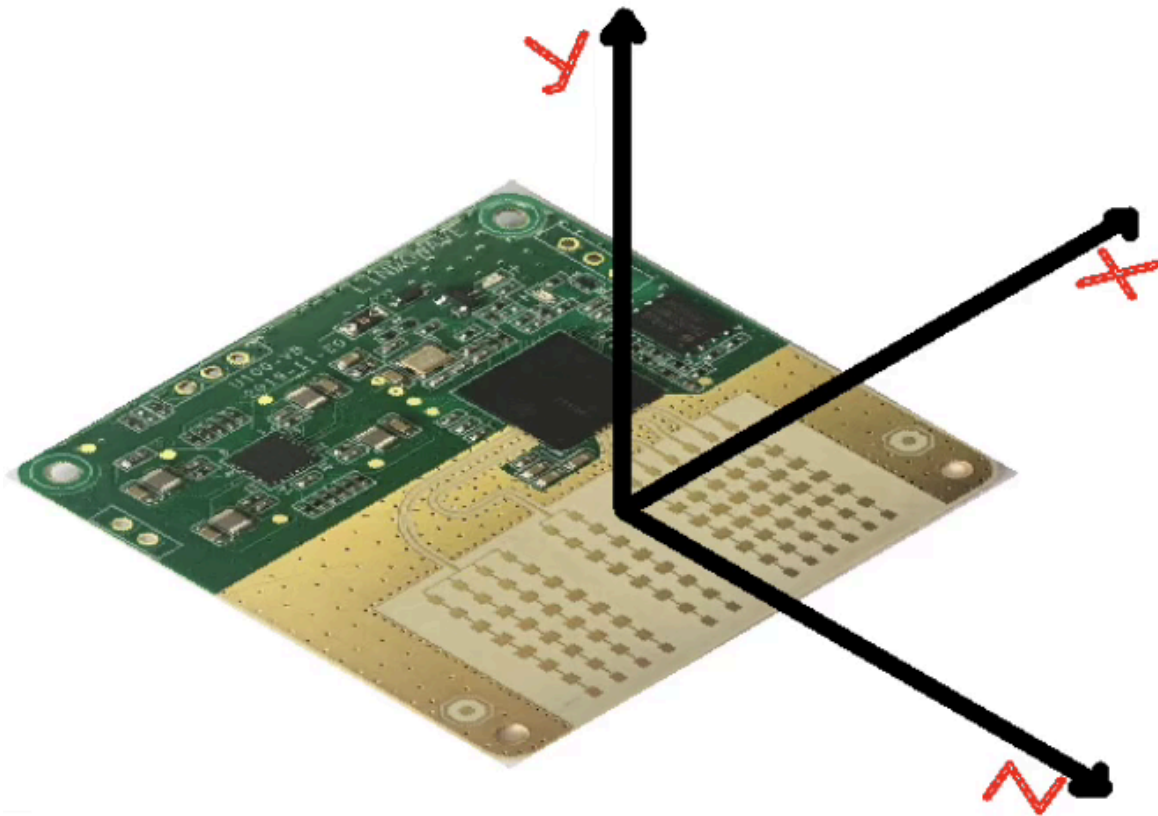- **CAN Communication:** Rate: 500K.

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 structure exists:		
40	Structure Type	Uint32	3
44	Structure Length	Uint32	16
48	Number of Targets	Uint16	1
50	Q Value	Uint16	Q format calculation: Actual Value = Q Format Value / (2^Q)
	The following six rows repeat 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	Signal-to-noise ratio output
62	Peak	int16	Peakval output

6. Safety Information

6.1 Electrostatic Protection

- Discharge static electricity before handling the radar.
- Use anti-static gloves or wristbands.

6.2 Usage Precautions

- Avoid covering the radar with metallic or conductive materials.
- Do not use multimeters directly on pins.
- Keep antennas free from physical obstructions.

6.3 Installation Instructions

- Ensure the antenna surface is clear of obstructions.
- Install the radar firmly to prevent accidental dislodgment.
- Avoid strong electrical interference near the antenna.

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

- Operate for a recommended lifespan of five years.
- Contact LuxWave for replacement if performance degradation is observed.

8.2 Self-Disposal Instructions

- Dispose of via professional recycling agencies.
- Ensure compliance with environmental regulations.

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.