

W-BAND RADAR MODULES
FOR SENSORS, AUTOMATION, AND SECURITY



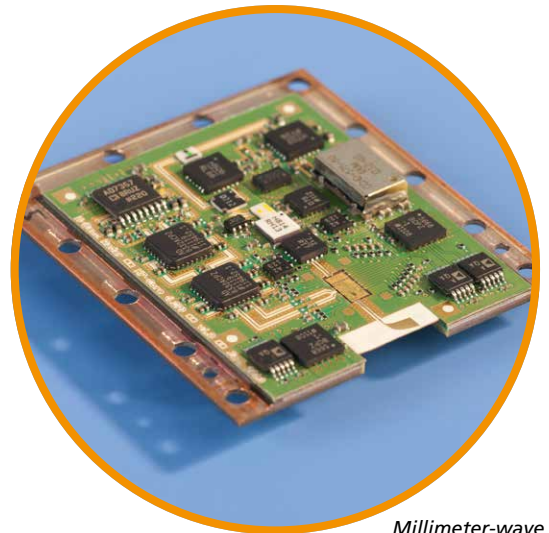


94 GHz FMCW RADAR

The frequency range of 75 – 110 GHz (W-band) is ideal for radars to detect small objects from a distance, even in highly reduced visibility. This compact and modular W-band FMCW radar sensor can be used diversely and flexibly.

FEATURES AND BENEFITS

- Super-linear chirp generation
- Ultra-low phase noise
- Parameters defined by software
- Single supply voltage
- Integrated transmitter and receiver antenna
- Integrated microcontroller unit
- Ethernet and serial interface, ready for Industry 4.0
- Distance measurements up to 30 m
- Small and lightweight package
- Single channel module (see photo at the top of the page)
- Multi channel module (see cover photo) for additional azimuthal direction determination

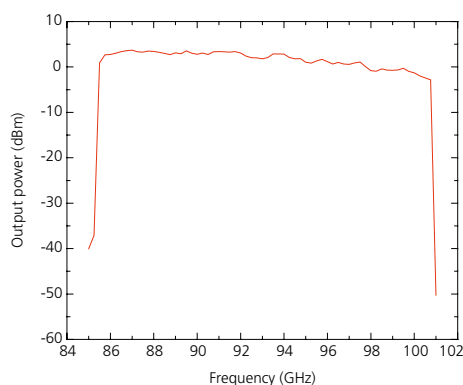


Millimeter-wave printed circuit board.

APPLICATIONS

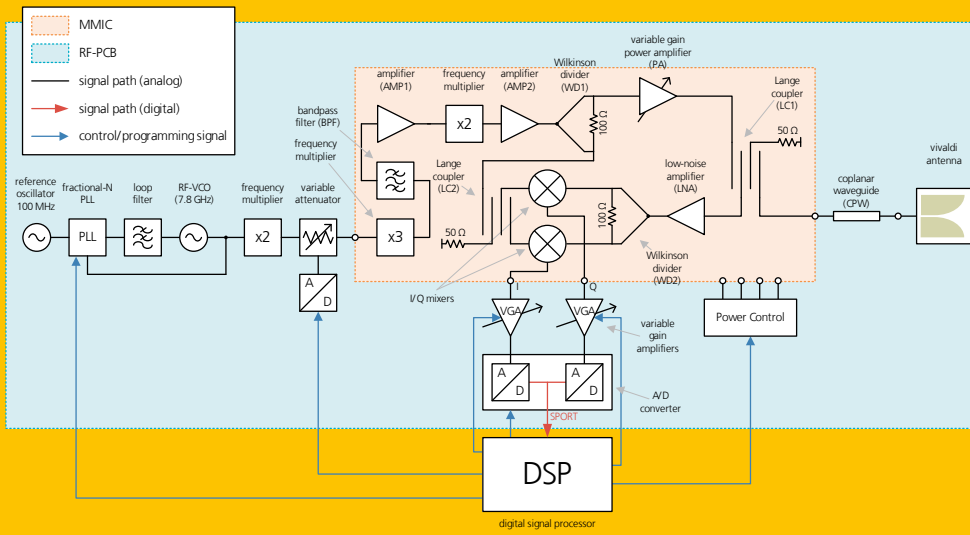
- **Air safety:** landing aid for helicopters
- **Industrial sensors:** precise distance measurements under limited visibility conditions
- **Logistics:** collision avoidance
- **Medical technology:** intelligent medical devices
- **Transportation:** railway technology

TYPICAL PERFORMANCE



Typical trace of the module's output power

A maximum bandwidth of at least 15 GHz (about 85 – 100 GHz) can be covered. The internal parameters of the module (e. g. frequency range, sweep duration, output power, etc.) can be defined by software. The output power can be adjusted over a dynamic range of 30 dB.

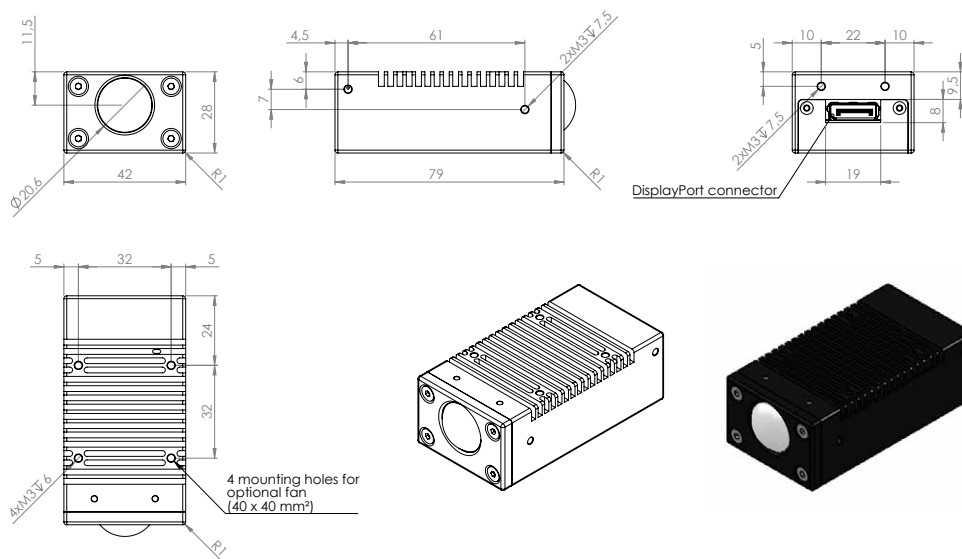


Functional block diagram of the 94 GHz FMCW radar module.

SPECIFICATIONS

| Parameter/ Function | Mnemonic/ Symbol | Min | Typ | Max | Unit | Test Conditions/ Comments |
|--|------------------|--------|------|-----|--------|-------------------------------|
| Measurement performance | | | | | | |
| Resolution | | 1 | | | cm | 15 GHz bandwidth |
| Accuracy | | | 0.5 | | µm | Single target, 50 cm distance |
| RF characteristics | | | | | | |
| Output frequency | f_{out} | 85 | | 100 | GHz | |
| Bandwidth | BW | | | 15 | GHz | |
| Output power | P_{out} | | 5 | 10 | dBm | |
| Output power dynamic | ΔP_{out} | | 30 | | dB | |
| Phase noise | \mathcal{L} | | -78 | | dBc/Hz | at 1 kHz offset |
| | | | -84 | | dBc/Hz | at 10 kHz offset |
| | | | -84 | | dBc/Hz | at 100 kHz offset |
| | | | -100 | | dBc/Hz | at 1 MHz offset |
| | | | -115 | | dBc/Hz | at 10 MHz offset |
| Chirp rate | CR | | | 200 | THz/s | |
| Antenna characteristics | | | | | | |
| Aperture angle | FWHM | | 10 | | ° | Adjustable by lens |
| Antenna gain | G_{ant} | | 20 | | dBi | For 10° FWHM |
| Power supplies | | | | | | |
| Voltage supply | V_{supply} | 7.5 | 15 | 18 | V | |
| Power dissipation | P_{supply} | | 4.5 | 5.5 | W | Fully powered, no shutdown |
| Components | | | | | | |
| Reference oscillator ▶ Frequency stability | | | ±50 | | ppm | |
| LNA ▶ Gain | G_{LNA} | | 6 | 10 | dB | |
| ▶ Noise figure | NF | | 4 | | dB | |
| IQ mixer ▶ Conversion gain | G_C | -15 | | 0 | dB | |
| IF VGA ▶ Gain | G_{VGA} | -28 | | 92 | dB | |
| IF ADC ▶ Resolution | | | | 14 | Bits | |
| ▶ Sampling rate | | | | 4 | MSPS | |
| Digital interface | | | | | | |
| Ethernet | | | | 100 | Mbit/s | |
| Serial | | 115200 | | | Baud | Optional: USB 2.0 |

MODULE OUTLINE DIMENSIONS



Dimension:

42 x 28 x 79 mm

Weight:

158 g

Housing material:

Aluminum, milled
Optional: anodized

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