

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



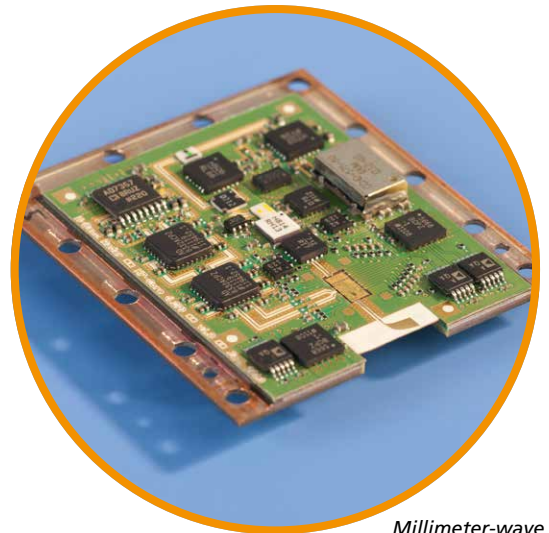


## 94 GHz FMCW RADAR

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

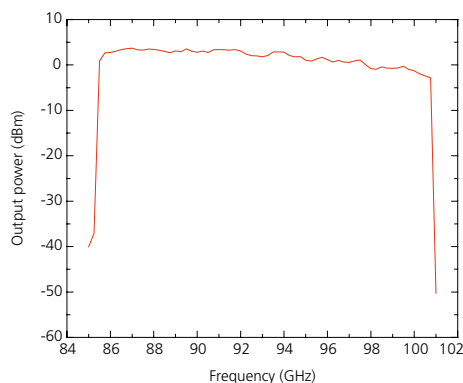


*Millimeter-wave printed circuit board.*

## APPLICATIONS

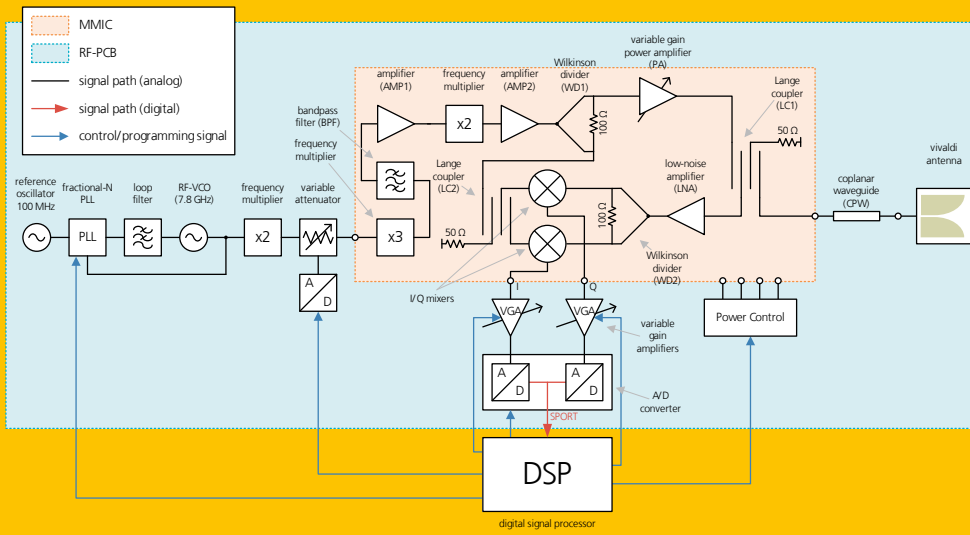
- **Air safety:** landing aid for helicopters
- **Industrial sensors:** precise distance measurements under limited visibility conditions
- **Logistics:** collision avoidance
- **Medical technology:** intelligent medical devices
- **Transportation:** railway technology

## 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.

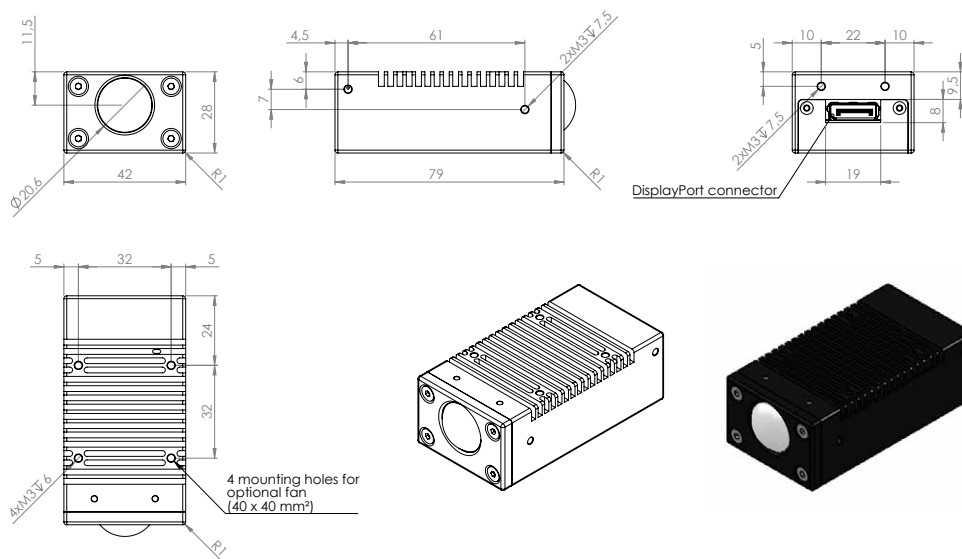


Functional block diagram of the 94 GHz FMCW radar module.

## SPECIFICATIONS

Parameter/ Function	Mnemonic/ Symbol	Min	Typ	Max	Unit	Test Conditions/ Comments
<b>Measurement performance</b>						
Resolution		1			cm	15 GHz bandwidth
Accuracy			0.5		µm	Single target, 50 cm distance
<b>RF characteristics</b>						
Output frequency	$f_{out}$	85		100	GHz	
Bandwidth	BW			15	GHz	
Output power	$P_{out}$		5	10	dBm	
Output power dynamic	$\Delta P_{out}$		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	
<b>Antenna characteristics</b>						
Aperture angle	FWHM		10		°	Adjustable by lens
Antenna gain	$G_{ant}$		20		dBi	For 10° FWHM
<b>Power supplies</b>						
Voltage supply	$V_{supply}$	7.5	15	18	V	
Power dissipation	$P_{supply}$		4.5	5.5	W	Fully powered, no shutdown
<b>Components</b>						
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	
<b>Digital interface</b>						
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

## CONTACT



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