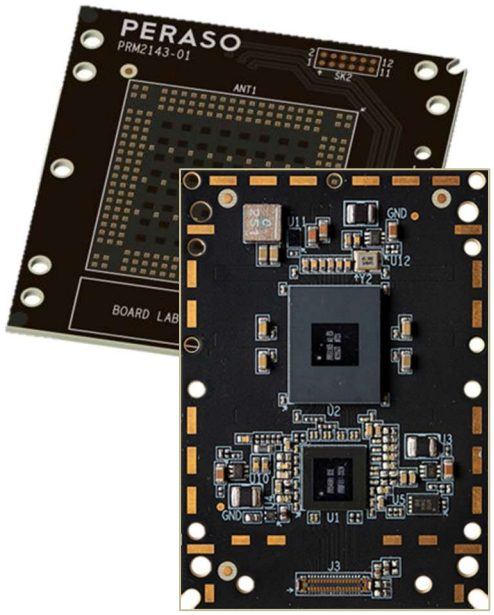
mmWave Products

Peraso is a global leader in the development and high-volume deployment of semiconductor solutions for the unlicensed 60 GHz (mmWave) spectrum. With a focus on high-performance, scalable wireless technologies, Peraso serves a diverse range of markets, including fixed wireless access (FWA), tactical communications, wireless video and transportation. Peraso has been a leader in providing RF solutions for more than 10 years, has made essential contributions to the IEEE 802.11ad/ay standard and holds several patents in the field. The company's IC products include baseband ICs and various mmWave RFICs. When combined with its patented antenna technology, the result is two compelling families of module products. Peraso offers its Perspectus and Versatus module series for the 60 GHz band. These modules offer low latency, high reliability, multi-gigabit throughput.



60 GHz Modules Overview

Peraso's mmWave modules provide complete USB 3.0 to IEEEE 802.11ad solutions for high-speed wireless applications. The modules utilize the Peraso X720 and X130 60 GHz phased-array chipsets which include a baseband processor and mmWave beamforming transceiver RFICs. The modules incorporate phased array antennas which offer a variety of gain and field-of-view options. The antenna is integrated into the PCB and provides uniform performance over the entire license-free 60GHz band. The Baseband processor, the PRS4601-B2E, provides MAC and PHY layer functionality necessary for IEEE 802.11ad operation and supports point-to-point or point-to-multipoint capability. Peraso offers a variety of software/firmware versions which are optimized for common applications.

Common Module Features

- Operates in the unlicensed 57 to 71 GHz band
- Full and ½ channel support
- MCS 1 (BPSK) to MCS 12 (16QAM) support
- Fully integrated MAC, PHY, radio, and antenna
- IEEE 802.11ad MAC and PHY compliance
- Automatic rate adaptation
- Dynamic beamforming
- AES 128-bit data encryption
- Automatic calibrations
- WPA2 and WPA3 Authentication
- 1PPS synchronization support*
- A-MSDU, A-MPDU data aggregation
- USB 3.0 data and control interface
- Integrated power management
- Up to 3.5 Gbps bidirectional TCP/UDP throughput
- Single 5V power supply input

* Optional firmware enabled feature. Contact Peraso sales support for more information.

Perspectus Series

The Perspectus series of modules utilize Peraso's high power X720 chipset. The modules are supported by Peraso's Perspectus Infrastructure software and firmware packages.

The PRS1165 RFIC provides 16 RF chains with high transmit power levels and supports all 6 of the IEEE 802.11ad/ay defined channels. Channels 5 and 6 are outside the oxygen absorption band thereby allowing for long range operation. Selectable RF filters allow it to also support ½ bandwidth channels.

With a variety of integrated antenna options, and the ability to add a high gain parabolic reflector, the Perspectus system can achieve gigabit data rates at ranges exceeding 20 km.

Target Applications

- Point-to-multipoint Fixed Wireless Access Networks
- Secure communication networks
- Point-to-Point Backhaul / Fiber alternative
- Industrial Automation

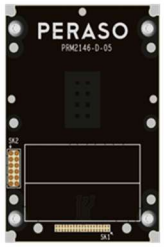
Features

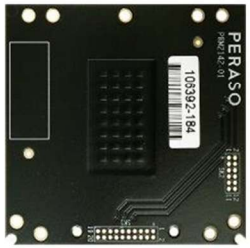
- Operates in the unlicensed 57 to 71 GHz band
- Full and ½ channel support
- High-power 16 RF chains
- 16 to 128 element antenna arrays
- MCS 1 (BPSK) to MCS 12 (16QAM) support
- Fully integrated MAC, PHY, radio, and antenna
- IEEE 802.11ad MAC and PHY compliance
- Automatic rate adaptation
- Dynamic beamforming
- AES 128-bit data encryption
- Automatic calibrations
- WPA2 and WPA3 Authentication
- ATPC- Automatic Transmit Power Control
- 1PPS synchronization support
- A-MSDU, A-MPDU data aggregation
- USB 3.0 data and control interface
- Integrated power management
- Up to 3.5 Gbps bidirectional TCP/UDP throughput
- -40°C to 85°C operation
- Single 5V power supply input

Perspectus Module Comparison Table

	PRM2146X-D	PRM2141X-V	PRM2142X-V	PRM2143X-V	PRM2144X-V
Antenna Array	8-element dual-polarized (H/V)	16-element patch array	32-element patch array	64-element patch array	128-element patch array
Max EIRP[1]	37 dBm	40 dBm	46 dBm	48 dBm	50 dBm
Antenna Gain	15 dBi (H) / 13.5 dBi (V)	15.5 dBi	20 dBi	23 dBi	24 dBi
Scan range[2]	±45° azimuth ±45° elevation	±45° azimuth ±45° elevation	±45° azimuth ±25° elevation	±20° azimuth ±15° elevation	±10° azimuth ±20° elevation
Power consumption	Tx: 8.1 W Rx: 4.9 W	Tx: 4.25 - 11.75 W Rx: 3.3 - 4.5 W	Tx: 11.75 W Rx: 4.5 W	Tx: 11.75 W Rx: 4.5 W	Tx: 11.75 W Rx: 4.5 W
Size	35mm × 50mm	35mm × 50mm	50mm × 50mm	50mm × 50mm	55mm × 55mm
Additional information	For challenging dynamic and high-mobility deployments	Dish (reflector) antenna supported	Higher gain for AP in PtMP configuration	Higher gain for STA in PtMP configuration	Highest gain for STA or PtP.

Typical Specifications
Notes:
1) Boresight channel
2) -3dB





Notes:

1. EIRP may be limited for regulatory compliance. 2. Antenna gain referenced to Channel 5, boresight. 3. Azimuth -3dB beamwidth. Varies over channels; low channels wider than upper channels. 4. Azimuth, boresight sidelobe.

Versatus Module

The Versatus module is targeted for enterprise, industrial and consumer applications which demand reliable, low latency, multi-gigabit data rates. The modules incorporate antenna arrays which can switch between vertical and horizontal polarizations to match any installation or operational scenario. The modules are supported by Peraso's Software and Firmware packages which include features such as roaming and the ability to service up to 30 associated and active STA.

Target Applications

- Consumer electronics
- Wireless video
- AR/VR
- Secure/tactical communications

Module Features

- Operates in the unlicensed 57 to 66 GHz band
- Full and ½ channel support
- 16-element dual-polarized PCB integrated antenna
- MCS 1 (BPSK) to MCS 12 (16QAM) support
- Fully integrated MAC, PHY, radio, and antenna
- IEEE 802.11ad MAC and PHY compliance
- 31 dBm EIRP with 8-elements active
- Total system DC power
  - Tx: 3.2W
  - Rx: 2.9 W
- Automatic rate adaptation
- Dynamic beamforming
- AES 128-bit data encryption
- Automatic calibrations
- WPA2 and WPA3 Authentication
- 1PPS synchronization support*
- Multi-user support up to 30 STA
- A-MSDU, A-MPDU data aggregation
- USB 3.0 data and control interface
- Integrated power management
- -82dBm receive sensitivity @MCS1**
- Up to 3.5 Gbps bidirectional TCP/UDP throughput
- -20°C to 70°C operation
- Single 5V power supply input
- Compact 45mm x 22mm form factor

* Optional firmware enabled feature. Contact Peraso sales support for more information.** incident at the module antenna

Versatus Module

PRM2136X	
Status	In Production
Application	Consumer electronics, AR/VR, tactical communications
Antenna Array	8+8 dual-polarized patch
Max EIRP	31 dBm
Antenna Gain	13 dBi
Scan Range	+/- 45° azimuth +/- 40° elevation
Boresight Beamwidth (-3dB)	40° azimuth 25° elevation
Bore Side Lobe	-15 dB max. azimuth -15 dB max. elevation
Coverage (-6dB)	+/- 60° azimuth +/- 60° elevation
Power Consumption	Tx: 3.2 W Rx: 2.9 W
Size	45mm x 22mm
Interface	36-pin Hirose board-to-board

Module Total Solution: Eliminates Risk - Shortens Time to Market

Peraso's Module solutions focus on *eliminating the time and cost* of designing a module that must be manufactured in high volume and is of high quality and reliability. Modules allow system companies to focus on their competitive advantage with the confidence of using a proven RF module. The Result: *Short Time to Revenue*.

Peraso modules benefits are:

- Matched set of components from one supplier (RFIC, Baseband IC, Integrated Antenna)
- Single supplier, single point of support
- Eliminates high frequency board design challenges
- Proven manufacturability for quality, reliability and volume
- Operating test coverage and testing time
- Pre-scanned for compliance with FCC regulations
- Allow customers to focus on the application not the RF connectivity

And, when the market, application or configuration requirements change, that can be solved by selecting a different module. No need to go back to the design drawing board.

The competitive advantage of a Peraso Module, in addition to meeting stringent FCC qualification:

- Integrated antenna
  - Patented technology
  - Reduces transition losses
  - Eliminates costly LTCC component
- RF
  - Antenna and RFIC were co-designed to optimize performance over wide frequency band
  - Field-proven beamforming with selective antenna matching to provide a range of performance
  - Multiple application-specific software offerings for point-to-point and point-to-multipoint
- Baseband
  - Co-designed to work with Peraso RFIC
  - Highly programmable for complex beamforming
  - Easy to use USB 3.0 interface
- Module
- Eliminates design risks in the mmWave frequency range which require specialized skills
- Solves the difficult issues of high-volume module manufacturing
- Eliminates a requirement to build complex RF testing systems
- Golden units and automated test systems available for in-house testing

SUMMARY

Peraso's modules eliminate the RF design concerns that come with using different component suppliers, component matching, trying to minimize power transition losses, board reliability and quality, difficulty of testing to specific RF power and beamforming performance, etc. Peraso modules allow you to focus on what you do best, delivering on your system and product's Value Propositions.

The module's antenna, RFIC, Baseband IC, board (substrate) are all from Peraso, providing a single source for all key elements.

Module designs utilize the technology, design techniques, and manufacturing flows of modules that are already in production at Tier 1 customers.

Modules eliminate risks and shorten your time to Revenue

Peraso modules can help you quickly create compelling 5G products