# Overview

The PRM2141X-V is a member of the *Perspectus 60* module series which provides a complete USB 3.0 to IEEE 802.11ad module with advanced features for long range, outdoor applications. It utilizes the Peraso X720 IEEE 802.11ad 60 GHz phased array chipset which includes a baseband processor and a high-power mmWave beamforming transceiver RFIC.

The PRM2141X-V incorporates a 16-element phased array antenna which can be used with or without a dish reflector. The antenna is integrated into the PCB and provides uniform performance over the entire IEEE 802.11ad/ay band from 57 to 71 GHz.
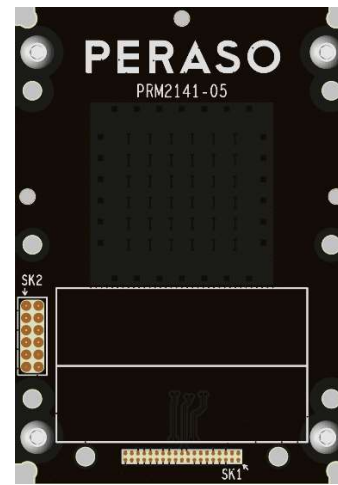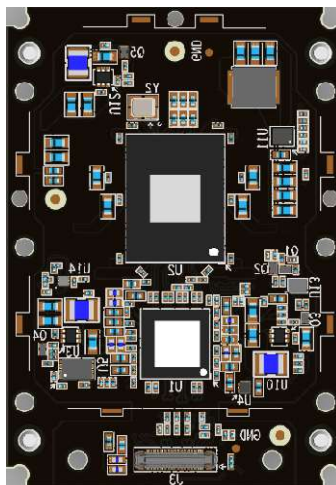
The Baseband processor is the PRS4601-B2E. This provides all MAC and PHY layer functionality necessary for IEEE 802.11ad operation and supports point-to-point or point-to-multipoint capability.

The PRS1165 RFIC provides 16 RF chains with high transmit power levels. It supports all 6 of the IEEE 802.11ad defined channels. Selectable RF filters allow it to also support ½ bandwidth channels.

Target Applications

- Point-to-multipoint Fixed Wireless Access Networks
- Point-to-Point Backhaul / Fiber alternative

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
- Automatic calibrations
- AES 128-bit data encryption
- WPA2 and WPA3 Authentication
- 1PPS synchronization support
- A- MSDU, A-MPDU data aggregation
- Peraso Directional Beam Scan and Connect
- (DBSC) for establishing long-range PtP links
- USB 3.0 data and control interface

- Integrated power management
- 16-element integrated phased array antenna
- -70 dBm receive sensitivity @MCS4, CH6
- 3Gbps maximum data rate
- 38 dBm EIRP with 16-elements active (higher gains supported using a dish reflector)
- Total system DC power:
- Tx: 11.75W (at QPSK, 16 elements active)
- Rx: 4.5W (at QPSK, 16 elements active)
- Tx 4.25W (at QPSK, 4 elements active)
- Rx 3.3W (at QPSK, 4 elements active)
- -40°C to 85°C operation
- Single 5V power supply input
- Compact 35mm x 50mm form factor

Block Diagram
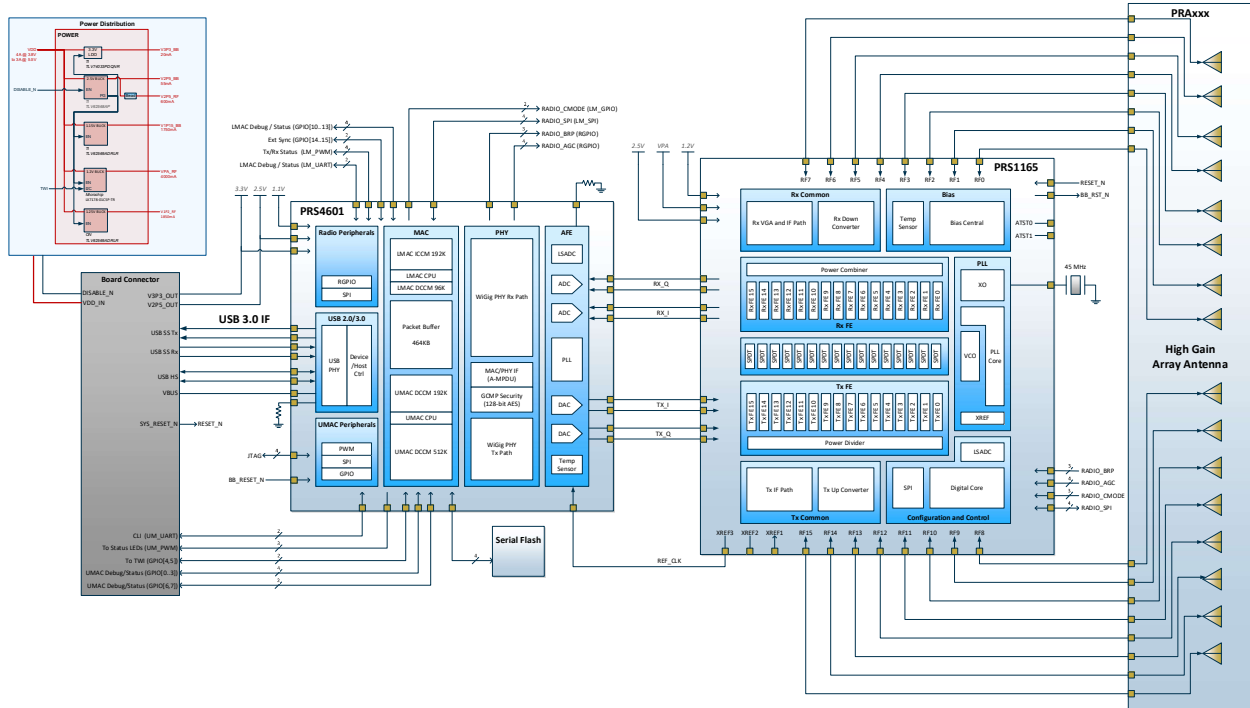
General Description

The PRM2141X-V high performance, 60GHz transceiver module provides full IEEE 802.11ad functionality from a USB data and control interface to an over-the-air antenna. The module has a compact 35mm x 50mm form factor.

The baseband connector provides the interface for USB3.0 data and additional control signals. The module is powered from a single 5-volt supply on the same connector.

The PRM2141X-V uses the PRS4601-B2E baseband processor, and the PRS1165 RFIC.

The PRS4601 IEEE 802.11ad Baseband incorporates the Analog Front End, BB PHY/ MAC, and two RISC CPU cores. It utilizes a highly flexible, dual CPU soft MAC integrates all 802.11ad MAC functions. This includes A-MSDU, A-MPDU, and WPA2 security.

This module operates in the unlicensed 57 to 71 GHz band and can be tuned to 2.16 and 1.08GHz channel bandwidths and spacing.

The PRM2141X-V utilizes a phased array antenna. This antenna can be used with a parabolic dish reflector, or in a stand-alone application. Peraso provides antenna sector tables that are preconfigured and optimized for each application. The PRM2141X-V antenna is capable of beamforming to optimize the wireless connection. In the stand-alone application, the antenna is capable of steering the beam +/-45 degrees in both the elevation and azimuth directions. When used in a dish, the beam steering is dependent on the characteristics of the dish reflector.

The PRM2141X-V is fully tested to an over-the-air antenna input/output specification, thus relieving OEMs from the complexities of ensuring the integrity of the mmWave RF performance.

Key Specifications

Parameter	Value		
Data Interface	USB3.0		
Air Protocol	IEEE 802.11ad		
Modulation Schemes	MCS 1 (BPSK) to MCS 12 (16QAM)		
Multiple Access Modes	CBAP, proprietary Long Range CBAP and Controlled Access protocols		
Security Modes	128-bit AES WPA3		
Networking Support	Infrastructure, peer-to-peer, standard WLAN		
	Conditions	**Value (Typ.)**	**Units**
RF Frequency		57 to 71	GHz
Channel bandwidth	IEEE 802.11ad Channels 1-6	2.16, or 1.08	GHz
Module size	Length x Width	50 x 35	mm
Operating Temperature Range		-40 to 85	°C
TX Parameters			
EIRP	T_{amb}=25˚C, Channel 4, MCS9	38	dBm
Total Radiated Power	T_{amb}=25˚C, Channel 4, MCS9,	19	dBm
RX Parameters			
Sensitivity	T_{amb}=25˚C, Channel 6, MCS4	-70	dBm
Beam Forming Parameters			
Azimuth Scan Range	-3dB edge, Channel 4	+/-45	deg
Elevation Scan Range	-3dB edge, Channel 4	+/-45	deg
DC Power Consumption			
16 antenna elements (QPSK)	TX DC Power	11.75	W
	RX DC power	4.5	W
4 antenna elements (QPSK)	TX DC Power	4.25	W
	RX DC power	3.3	W

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