MWC-441 Antenna Datasheet

Revision 2412

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1. Introduction

1.1 Summary

The MWC-441 comprises a highly integrated 60 GHz chipset compliant with the IEEE 802.11ad specifications. This platform utilizes a USB 3.0 interface for data and control.

The MWC-441 utilizes a phased array high-gain antenna, which is capable of beam steering 290^0 in azimuth plane.

This module contains the PRS4601 baseband IC, and PRS1145 radio IC. These ICs provide all of the radio and baseband functionality necessary for 802.11ad operation.

1.2 Features

- 57 to 66GHz operation
- 16-element dual-polarized PCB integrated antenna
- 25 dBm EIRP with 6-elements array
- 20 dBm EIRP with 4-elements array
- Total system DC power
  - Tx 3.2W
  - Rx 2.9W
- Automatic rate adaptation
- Dynamic beamforming
- Automatic calibrations
- Integrated power management
- 802.11ad MAC and PHY compliance
- 3Gbps maximum data rate
- pi/2-BPSK, p/2-QPSK and 16-QAM modulation support
- AES 128 bit data encryption
- A- MSDU, A-MPDU data aggregation

1.3 Applications

- Enterprise networking
- Untethered AR/VR
- Multi-AP and STA networks with fast roaming
- Factory automation
- In-room wireless display (including full HD/4K video streaming and secondary display)
- Wireless docking and I/O

1.4 Abbreviations and Acronym Definitions

Acronym	Definition
EIRP	Equivalent Isotropic Radiated Power
BPSK	Binary phase shift key modulation
QPSK	Quadrature phase shift key modulation
QAM	Quadrature Amplitude Modulation
DMG-TM / DMG	Directional Multi-Gigabit Test Mode

1.5 Common RF Parameters

The MWC-441 can be tuned WiGig Channels 1-4.

Refer to Table 1-1 for the channels and center frequencies.

Table 1-1: IEEE 802.11ad/ay channels

Channel	Center Frequency (GHz)	Frequency Range (GHz) Full-channel Bandwidth
Channel 1	58.32	57.24 – 59.40
Channel 2	60.48	59.40 – 61.56
Channel 3	62.64	61.56 – 63.72
Channel 4	64.80	63.72 – 65.88

Table 1-2:Modulation Code and raw PHY data rates

MCS Index	Modulation	Code Rate	PHY Data Rate (Mbps)
MCS0	DBPSK	1/2	27.5
MCS1	Π/2 BPSK	1/2	385
MCS2	Π/2 BPSK	1/2	770
MCS3	Π/2 BPSK	5/8	962.5
MCS4	Π/2 BPSK	3/4	1155
MCS5	Π/2 BPSK	13/16	1251.25
MCS6	Π/2 QPSK	1/2	1540
MCS7	Π/2 QPSK	5/8	1925
MCS8	Π/2 QPSK	3/4	2310
MCS9	Π/2 QPSK	13/16	2502.5
MCS10	Π/2 QAM	1/2	3080
MCS11	Π/2 QAM	5/8	3850
MCS12	Π/2 QAM	3/4	4620

2. Product Overview

2.1 General Description

The MWC-441 operates from a single 5V supplied through the USB connector. This module provides all of the functionality of a multi-gigabit wireless transceiver compliant with the 802.11ad standard, supporting the complete solution from SuperSpeed USB connectivity to 60GHz wireless functionality.

The integrated 16-element antenna performs beamforming. This antenna consists of a 4x1 array and two 6x1 arrays.

No factory calibration is required, as all calibration is performed at run-time.

This module meets the compliance requirements of European Union Directive 2011/65/EU (RoHS)

2.3 Antenna Description

The MWC-441 incorporates an antenna with a broad frequency response that encompasses IEEE 802.11ad channels 1 to 4 (57 GHz to 66 GHz).

This antenna consists of a 4x1 array and two 6x1 arrays, for a total of 16 antenna elements. Referring to Figure 2-2, ARRAY 1 is the 6x1 element array, and ARRAY 2 is the 4x1 element array.

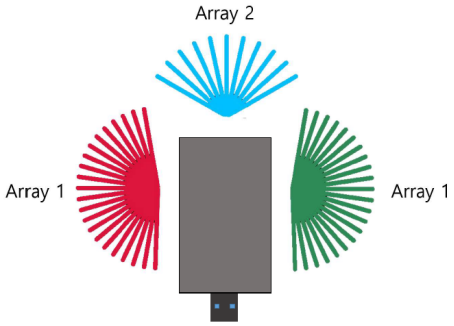

Figure 2-2: Diagram of the MWC-441 antenna

3. Specifications

Unless noted otherwise, all specifications are under typical conditions, 25 °C ambient, 65 °C junction temperature, and nominal VDD.

3.1 Transmitter Specifications

Table 3-1 and Table 3-2 show the key transmitter performance parameters.

Table 3-1: Key Antenna Specifications for the 6-element sub-array

Parameter	Specification
EIRP	Max. 25 dBm
3dB Beamwidth in H-Plane	> 135°
3dB Beamwidth in E-Plane	16°
End-fire Gain	10 dBi
Gain Variation over the Entire Bandwidth	< 1 dB
Beam Steering Range in E-Plane	±55° with maximum 1 dB gain drop

Table 3-2: Key Antenna Specifications for the 4-element sub-array

Parameter	Specification
EIRP	Max. 21 dBm
3dB Beamwidth in H-Plane	> 130°
3dB Beamwidth in E-Plane	20°
End-fire Gain	9 dBi
Gain Variation over the Entire Bandwidth	< 1 dB
Beam Steering Range in E-Plane	±35° with maximum 1 dB gain drop

3.2 Receiver Specifications

Table 3-3 and Table 3-4 list the typical sensitivities at different MCS and channels.

Table 3-3: Receive Sensitivity per MCS for 6-element sub-array (dBm)

Channel	MCS0	MCS4	MCS9	MCS10
1	-74.6	-67.5	-59.7	-58.0
2	-73.2	-67.1	-59.8	-57.1
3	-74.8	-68.4	-61.2	-57.6
4	-77.4	-70.8	-62.5	-61.3

Table 3-4: Receive Sensitivity per MCS for 4-element sub-array (dBm)

Channel	MCS0	MCS4	MCS9	MCS10
1	-76.6	-69.7	-62.2	-60.0
2	-73.8	-66.8	-59.9	-57.0
3	-74.9	-67.8	-60.7	-57.2
4	-75.9	-68.6	-60.1	-58.7

These sensitivity values do not include the antenna gain.

3.3 ESD Caution

Electrostatic charge readily accumulates on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD (electrostatic discharge) protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.