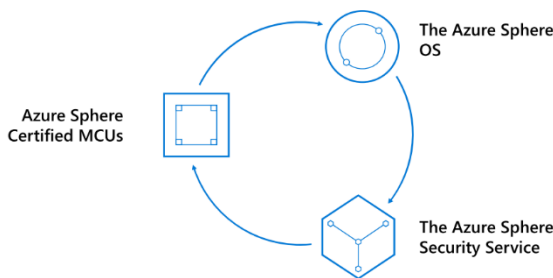




## Azure Sphere



### Main Features

- Wi-Fi 4 : 2.4/5G
- EmWatch Configure Tool
- 3 x GPIO for Remote control
- USB signal with full-size Mini PCIe Card Interface
- Wi-Fi Protected Access: WEP, WPA, WPA2

### Specifications

#### USB

- Frequency Band: 2.4G/5GHz
- Max Output Power: 16dBm
- Sensitivity: -90dBm

#### USB

- 1 x USB 2.0, FTDI Debug

#### I/O Interface-Rear

- 3 x GPIO

#### Power Requirements

- DC Connector Input voltage: 3.3 V DC @ 0.5A

#### Environmental

- Operating temperature: Ambient with air flow: -40°C to 85°C
- Storage temperature: -40°C to 80°C
- Operating humidity: 5%~95% relative humidity, non-condensing

#### Dimension

- Dimensions: 59.6 × 50.95 mm

#### Regulatory Approvals

- CE
- FCC



**Defense in depth** provides multiple layers of protection to help guard devices against and respond to threats



**Deployment flexibility** helps you secure existing equipment and build protection into new IoT investments



**Over-the-air (OTA) updates** make it easy to add new features and improve performance throughout device lifecycles



**Error reporting and automatic security updates** help you stay ahead of new and evolving threats

## Wi-Fi Radio Characteristics

### 2.4GHz RF Receiver Specification

Parameter	Description	Performance				
		MIN	TYP		MAX	Unit
			Main	Aux		
Frequency range	Center channel frequency	2412			2484	MHz
RX sensitivity	DBPSF, 1 Mbps DSSS	-	-94.6	-97.1	-90.0	dBm
	DQPSF, 2 Mbps DSSS	-	-91.6	-94.1	-87.0	dBm
	DQPSF, 5.5 Mbps CCK	-	-89.6	-92.1	-85.0	dBm
	DQPSF, 11 Mbps CCK	-	-86.6	-89.1	-82.0	dBm
	BPSK rate 1/2, 6 Mbps OFDM	-	-91.6	-94.1	-87.0	dBm
	BPSK rate 3/4, 9 Mbps OFDM	-	-89.3	-91.8	-86.0	dBm
	QPSK rate 1/2, 12 Mbps OFDM	-	-88.5	-91.0	-84.0	dBm
	QPSK rate 3/4, 18 Mbps OFDM	-	-86.1	-88.6	-82.0	dBm
	16QAM rate 1/2, 24 Mbps OFDM	-	-82.8	-85.3	-81.0	dBm
	16QAM rate 3/4, 36 Mbps OFDM	-	-79.4	-81.9	-78.0	dBm
	64QAM rate 1/2, 48 Mbps OFDM	-	-75.2	-77.7	-73.0	dBm
	64QAM rate 3/4, 54 Mbps OFDM	-	-73.9	-76.4	-71.0	dBm
RX Sensitivity BW=20MHz Mixed mode 800ns Guard Interval Non-STBC	MCS 0, BPSK rate 1/2	-	-90.9	-93.4	-87.0	dBm
	MCS 1, QPSK rate 1/2	-	-87.7	-90.2	-86.0	dBm
	MCS 2, QPSK rate 3/4	-	-85.3	-87.8	-84.0	dBm
	MCS 3, 16QAM rate 1/2	-	-82.3	-84.8	-81.0	dBm
	MCS 4, 16QAM rate 3/4	-	-78.8	-81.3	-77.0	dBm
	MCS 5, 64QAM rate 2/3	-	-74.4	-76.9	-74.0	dBm
	MCS 6, 64QAM rate 3/4	-	-73.0	-75.5	-71.0	dBm
	MCS 7, 64QAM rate 5/6	-	-71.8	-74.3	-69.0	dBm
Maximum Receive Level	1 Mbps DSSS	-20	-10		-	dBm
	11 Mbps CCK	-20	-10		-	dBm
	6 Mbps OFDM	-20	-10		-	dBm
	54 Mbps OFDM	-20	-10		-	dBm
	HT20 MCS0	-20	-10		-	dBm
	HT20 MCS7	-20	-20		-	dBm
Receive Adjacent Channel Rejection	BPSK rate 1/2, 6 Mbps OFDM	16	34		-	dBm
	BPSK rate 3/4, 9 Mbps OFDM	15	31		-	dBm
	QPSK rate 1/2, 12 Mbps OFDM	13	30		-	dBm
	QPSK rate 3/4, 18 Mbps OFDM	11	27		-	dBm
	16QAM rate 1/2, 24 Mbps OFDM	8	25		-	dBm
	16QAM rate 3/4, 36 Mbps OFDM	4	23		-	dBm
	64QAM rate 1/2, 48 Mbps OFDM	0	22		-	dBm
	64QAM rate 3/4, 54 Mbps OFDM	-1	22		-	dBm
	MCS 0, BPSK rate 1/2	16	33		-	dBm
	MCS 1, QPSK rate 1/2	13	29		-	dBm
	MCS 2, QPSK rate 3/4	11	26		-	dBm
	MCS 3, 16QAM rate 1/2	8	24		-	dBm
	MCS 4, 16QAM rate 3/4	4	20		-	dBm
		MCS 5, 64QAM rate 2/3	0	18		-
MCS 6, 64QAM rate 3/4		-1	17		-	dBm
MCS 7, 64QAM rate 5/6		-2	15		-	dBm
Receiver Residual PER	All rates, -50dBm input power	-	-		0.005	%

## 5GHz RF receiver specifications

Parameter	Description	Performance				
		MIN	TYP		MAX	Unit
			Main	Aux		
Frequency range	Center channel frequency	5180	-		5825	MHz
RX sensitivity	BPSK rate 1/2, 6 Mbps OFDM	-	-90.0	-91.5	-86.0	dBm
	BPSK rate 3/4, 9 Mbps OFDM	-	-87.7	-89.2	-85.0	dBm
	QPSK rate 1/2, 12 Mbps OFDM	-	-87.0	-88.5	-83.0	dBm
	QPSK rate 3/4, 18 Mbps OFDM	-	-84.5	-86.0	-81.0	dBm
	16QAM rate 1/2, 24 Mbps OFDM	-	-81.3	-82.8	-75.0	dBm
	16QAM rate 3/4, 36 Mbps OFDM	-	-78.0	-79.5	-72.0	dBm
	64QAM rate 1/2, 48 Mbps OFDM	-	-73.6	-75.1	-70.0	dBm
	64QAM rate 3/4, 54 Mbps OFDM	-	-72.2	-73.7	-68.0	dBm
RX Sensitivity BW=20MHz HT Mixed mode 800ns Guard Interval Non-STBC	MCS 0, BPSK rate 1/2	-	-89.3	-90.8	-86.0	dBm
	MCS 1, QPSK rate 1/2	-	-86.3	-87.8	-84.0	dBm
	MCS 2, QPSK rate 3/4	-	-83.8	-85.3	-82.0	dBm
	MCS 3, 16QAM rate 1/2	-	-80.8	-82.3	-76.0	dBm
	MCS 4, 16QAM rate 3/4	-	-77.3	-78.8	-74.0	dBm
	MCS 5, 64QAM rate 2/3	-	-72.8	-74.3	-72.0	dBm
	MCS 6, 64QAM rate 3/4	-	-71.4	-72.9	-70.0	dBm
	MCS 7, 64QAM rate 5/6	-	-70.2	-71.7	-66.0	dBm
Maximum Receive Level	6 Mbps OFDM	-30	-10		-	dBm
	54 Mbps OFDM	-30	-20		-	dBm
	MCS0	-30	-15		-	dBm
	MCS7	-30	-20		-	dBm
Receive Adjacent Channel Rejection	BPSK rate 1/2, 6 Mbps OFDM	16	24		-	dBm
	BPSK rate 3/4, 9 Mbps OFDM	15	23		-	dBm
	QPSK rate 1/2, 12 Mbps OFDM	13	21		-	dBm
	QPSK rate 3/4, 18 Mbps OFDM	11	19		-	dBm
	16QAM rate 1/2, 24 Mbps OFDM	8	15		-	dBm
	16QAM rate 3/4, 36 Mbps OFDM	4	10		-	dBm
	64QAM rate 1/2, 48 Mbps OFDM	0	5		-	dBm
	64QAM rate 3/4, 54 Mbps OFDM	-1	3		-	dBm
	MCS 0, BPSK rate 1/2	16	24		-	dBm
	MCS 1, QPSK rate 1/2	13	21		-	dBm
	MCS 2, QPSK rate 3/4	11	19		-	dBm
	MCS 3, 16QAM rate 1/2	8	16		-	dBm
	MCS 4, 16QAM rate 3/4	4	12		-	dBm
	MCS 5, 64QAM rate 2/3	0	7		-	dBm
	MCS 6, 64QAM rate 3/4	-1	5		-	dBm
	MCS 7, 64QAM rate 5/6	-2	3		-	dBm
Receiver Residual PER	All rates, -50dBm input power	-	-		0.005	%

## 2.4GHz RF Transmitter Specifications

Parameter	Description	Performance			
		MIN	TYP	MAX	Unit
Frequency range		2412	-	2484	MHz
Output power with spectral mask and EVM compliance	1 Mbps DSSS	-	16 <sup>(1)</sup>	-	dBm
	11 Mbps CCK	-	16 <sup>(1)</sup>	-	dBm
	6 Mbps OFDM	-	16 <sup>(1)</sup>	-	dBm
	54 Mbps OFDM	-	16 <sup>(1)</sup>	-	dBm
	HT20 MCS 0	-	16 <sup>(1)</sup>	-	dBm
	HT20 MCS 7	-	16 <sup>(1)</sup>	-	dBm
Output power with spectral mask and EVM compliance (at -40°C and 85°C)	1 Mbps DSSS	-	15 <sup>(1)</sup>	-	dBm
	11 Mbps CCK	-	15 <sup>(1)</sup>	-	dBm
	6 Mbps OFDM	-	15 <sup>(1)</sup>	-	dBm
	54 Mbps OFDM	-	15 <sup>(1)</sup>	-	dBm
	HT20 MCS 0	-	15 <sup>(1)</sup>	-	dBm
	HT20 MCS 7	-	15 <sup>(1)</sup>	-	dBm
TX EVM	1 Mbps DSSS	-	-	-10	dB
	11 Mbps CCK	-	-	-10	dB
	6 Mbps OFDM	-	-	-5	dB
	54 Mbps OFDM	-	-	-25	dB
	HT20, MCS 0	-	-	-5	dB
	HT20, MCS 7	-	-	-28	dB
Output power variation <sup>(2)</sup>	TSSI closed-loop control across all temperature range and channels and VSWR $\leq$ 1.5:1.	-1.5	-	1.5	dB
Carrier suppression		-	-	-30	dBc
Harmonic Output Power	2nd Harmonic	-	-45	-43	dBm/MHz
	3rd Harmonic	-	-45	-43	dBm/MHz

## 5GHz RF Transmitter Specifications

Parameter	Description	Performance			
		MIN	TYP	MAX	Unit
Frequency range		5180	-	5825	MHz
Output power with spectral mask and EVM compliance	6 Mbps OFDM	-	14 <sup>(1)</sup>	-	dBm
	54 Mbps OFDM	-	14 <sup>(1)</sup>	-	dBm
	HT20, MCS 0	-	14 <sup>(1)</sup>	-	dBm
	HT20, MCS 7	-	14 <sup>(1)</sup>	-	dBm
Output power with spectral mask and EVM compliance (at -40°C and 85°C)	6 Mbps OFDM	-	13 <sup>(1)</sup>	-	dBm
	54 Mbps OFDM	-	13 <sup>(1)</sup>	-	dBm
	HT20 MCS 0	-	13 <sup>(1)</sup>	-	dBm
	HT20 MCS 7	-	13 <sup>(1)</sup>	-	dBm
TX EVM	6 Mbps OFDM	-	-	-5	dB
	54 Mbps OFDM	-	-	-25	dB
	HT20, MCS 0	-	-	-5	dB
	HT20, MCS 7	-	-	-28	dB
Output power variation <sup>(2)</sup>	TSSI closed-loop control across all temperature range and channels and VSWR $\leq$ 1.5:1.	-1.5	-	1.5	dB
Carrier suppression		-	-	-30	dBc
Harmonic Output Power	2nd Harmonic	-	-45	-43	dBm/MHz
	3rd Harmonic	-	-45	-43	dBm/MHz