**LM511 WiFi 802.11ac Dual Band 2T2R PCIe Minicard**

2.4GHz & 5GHz ISM Band Mini PCI Express Card with RF IPEX Receptical

Overview

The LM511 WiFi PCIe Minicard, fully supports IEEE 802.11 e and I standards.

It supports up to 866.7Mbps high-speed wireless network connections and is designed to provide excellent performance with low power consumption.

It is designed to be a highly cost-effective module that offers superior performance, better power management applications above its competitors.

Features

- WiFi 802.11 ac (2x2 MIMO technology improves effective throughput and range over existing 802.11 a/b/g/n/ac products).
- PCI express & 2 x IPEX recepticals.
- Linux, Windows XP, Vista, 7, 8.1, 10 compatible.
- Up to 866.7 Mbps High Speed Data Transfer Rate.
- 802.11e-compatible bursting and I standards.
- BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM, DBPSK, DQPSK and CCK modulation schemes.
- WEP, TKIP, and AES hardware encryption Schemes.
- WiFi Direct supports wireless peer to peer applications.
- Complete 802.11n MIMO solution for 2.4GHz and 5Ghz band.
- Support 2.4Ghz and 5Ghz band channels.
- 2.4 GHz backward compatible with 802.11a/b/g devices while operating at 802.11n data rates.
- 5 GHz backward compatible with 802.11a/n devices while operating at 802.11ac data rates.
- Complies with PCI Express Base Specification Revision 1.1.
- 2T2R Two Transmit and Two Receive paths.
- RoHS, REACH and WEEE compliant.
- See our website for more information and certifications.

Shield Option

This card is also offered with or without a shielding cover. Please speak with our team for guidance when looking at this option.
**Features (Continued)**

**MAC Features**
- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- Low latency immediate High-Throughput Block Acknowledgement (HT-BA)
- Long NAV for media reservation with CF-End for NAV release
- PHY-level spoofing to enhance legacy compatibility
- MIMO power saving mechanism
- Channel management and co-existence
- Multiple BSSID feature allows the LM511 to assume multiple MAC identities when used as a wireless bridge
- Transmit Opportunity (TXOP) Short Inter-Frame Space (SIFS) bursting for higher multimedia bandwidth

**PHY Features**
- 2x2 MIMO technology for extended reception robustness and exceptional throughput. IEEE 802.11ac MIMO OFDM.
- IEEE 802.11n MIMO OFDM.
- 5MHz / 10MHz / 20MHz / 40MHz / 80MHz bandwidth transmission.
- Short Guard Interval (400ns).
- Sounding packet.
- Support STBC.
- Support LDPC.
- Selectable digital transmit and receiver FIR filters.
- Programmable scaling in transmitter and receiver to trade quantization noise against increased probability of clipping.
- Fast receiver Automatic Gain Control (AGC).
- On-chip ADC and DAC.
- Build-in both 2.4GHz and 5GHz PA.
- Build-in both 2.4GHz and 5GHz LNA.

**Other Features**
- Supports Wake-On-WLAN via Magic Packet and Wake-up frame
- Transmit Beamforming
- CCA on secondary through RTS/CTS handshake.
- Support TCP/UDP/IP checksum offload

**Peripheral Interfaces**
- Configurable Bluetooth Coexistence Interface (mux with GPIO pins)
- Single external power source 3.3v only.

**Standards Supported**
- IEEE 802.11a/b/g/n/ac Draft 2.0 compatible WLAN.
- IEEE 802.11e QoS Enhancement (WMM).
- IEEE 802.11i (WPA, WPA2), Open, shared key, and pair-wise key authentication services.
- IEEE 802.11h TPC, Spectrum Measurement.
- IEEE 802.11k Radio Resource Measurement.
- WAPI (Wireless Authentication Privacy Infrastructure) certified.
- Cisco Compatible Extensions (CCX) for WLAN devices.
## General Specification

### Wireless

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless Standard</td>
<td>802.11 a/b/g/n/ac</td>
</tr>
<tr>
<td>Card Type</td>
<td>11ac 2T2R Minicard (PCI express)</td>
</tr>
<tr>
<td>OS Compatibility</td>
<td>Linux, Windows XP, Vista, 7, 8.1, 10 compatible</td>
</tr>
<tr>
<td>Security</td>
<td>WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit &amp; 128bit, IEEE 802.11x, IEEE 802.11i</td>
</tr>
<tr>
<td>Network Architecture</td>
<td>Ad hoc mode (Peer-to-Peer), Infrastructure mode, Soft AP</td>
</tr>
</tbody>
</table>

### Data Rate

- **802.11b**: 11, 5.5, 2, 1 Mbps;
- **802.11g**: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
- **802.11n**: MCS 0 to 15 for HT20MHz; MCS 0 to 15 for HT40MHz
- **802.11ac**: MCS 0 to 8 for HT20MHz; MCS 0 to 9 for HT40MHz; MCS 0 to 9 for HT80MHz

### Media Access Control

CSMA/CA with ACK

### Hardware

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipset</td>
<td>Realtek</td>
</tr>
<tr>
<td>Antenna</td>
<td>2 x IPEX recepticals</td>
</tr>
<tr>
<td>Interfaces</td>
<td>PCI express (PCIe)</td>
</tr>
</tbody>
</table>

### RF Characteristics

#### Tx Output Power

- **802.11b@CCK 11Mbps**: 17dBm
- **802.11n@MCS7_HT20**: 13dBm
- **802.11n@MCS7_HT40**: 13dBm
- **802.11ac@NSS1_MCS9_BW20, BW40, BW80**: 10dBm

#### Rx Sensitivity

- **802.11b@11Mbps**: -82dBm
- **802.11n@MCS7_BW20**: -67dBm
- **802.11n@MCS7_BW40**: -57dBm
- **802.11ac@NSS1_MCS9_BW20**: -51dBm

#### Power Consumption

- Transmit: max. 533 mA (Maximum)
- Receive: max 391 mA (Maximum)

#### Operating Voltage

3.3v ±9% I/O supply voltage

### Frequency

- **802.11b**: 2.400GHz ~ 2.4835 GHz
- **802.11g/n/ac**: 5.1500GHz ~ 5.3500GHz
- **802.11ac**: 5.4700GHz ~ 5.7250GHz

### Modulation Scheme

- **802.11b**: CCK, DQPSK, DBPSK
- **802.11a/g/n**: 64 QAM, 16 QAM, QPSK, BPSK
- **802.11ac**: 256QAM, 64 QAM, 16 QAM, QPSK, BPSK

### Spread Spectrum

- **IEEE 802.11b**: CCK (Complimentary Code Keying)
- **IEEE 802.11g/n/a/ac**: OFDM (Orthogonal Frequency Division Multiplexing)
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General Specification (Continued)

Physical Characteristics
- Operating Temperature: 0°C to +70°C ambient temperature, Humidity: 5-90% (non-condensing)
- Storage Temperature: -55°C to +125°C ambient temperature, Humidity: 5-95% (non-condensing)
- Dimensions (L x W x H): 29.85mm x 26.65mm x 4.45mm
- Weight: 7g +/- 0.25g tolerance
- Certifications: See our website for this product's certifications.
- Compliance: RoHS, REACH and WEEE

Block Diagram

Frequency Bands

<table>
<thead>
<tr>
<th>Freq</th>
<th>Bands</th>
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<tbody>
<tr>
<td>2.4 GHz</td>
<td>2.412-2.472 GHz, 2.484 GHz</td>
</tr>
<tr>
<td>5 GHz</td>
<td>UNII1 5.18-5.825 GHz</td>
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Pin Assignments

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<tr>
<th>Pin</th>
<th>Pin Name</th>
<th>Pin</th>
<th>Pin Name</th>
<th>Pin</th>
<th>Pin Name</th>
<th>Pin</th>
<th>Pin Name</th>
<th>Pin</th>
<th>Pin Name</th>
<th>Pin</th>
<th>Pin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WAKE#</td>
<td>10</td>
<td>UIM_DATA</td>
<td>19</td>
<td>RESERVED</td>
<td>28</td>
<td>+1.5V</td>
<td>37</td>
<td>GND</td>
<td>46</td>
<td>LED_WLAN#</td>
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<tr>
<td>2</td>
<td>+3.3 Vaux</td>
<td>11</td>
<td>REFCLK-</td>
<td>20</td>
<td>W_DISABLE1#</td>
<td>29</td>
<td>GND</td>
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<td>USB_D+</td>
<td>47</td>
<td>RESERVED</td>
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<tr>
<td>3</td>
<td>COEX1</td>
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<td>UIM_CLK</td>
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<td>+1.5V</td>
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<td>4</td>
<td>GND</td>
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<td>REFCLK+</td>
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<td>PERST#</td>
<td>31</td>
<td>PETn0</td>
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<td>UIM_RESET</td>
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<td>6</td>
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<td>9</td>
<td>GND</td>
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<td>GND</td>
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<td>36</td>
<td>USB_D-</td>
<td>45</td>
<td>RESERVED</td>
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Diagrams

**TOP VIEW**

**BOTTOM VIEW**
IPEX Connector Dimensions

![Diagram of IPEX Connector Dimensions]
Datasheet Version Notes

v1.0 29 JAN 2018    Added version notes to datasheet.
v1.1 01 MAY 2019    Updated Draft status
v1.3 04 DEC 2019    New Page 1, 2 and 3. Plus Packing page updates.
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LM511 Packaging Options

<table>
<thead>
<tr>
<th>Part No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>511-0511</td>
<td>PCIe M2 WiFi 802.11ac RTL8812ae 2T2R REALTEK TRAY</td>
</tr>
</tbody>
</table>

See our website to download any applicable Product Software, Manuals and Notes - [http://www.lm-technologies.com/downloads](http://www.lm-technologies.com/downloads)