The LM610 is a WiFi 11ac Dual Band Mini Card (PCIe), with a board size of just 50.82mm x 29.85mm.

It can be easily manufactured on SMT process and is highly suitable for a tablet PC, Ultra Book and consumer products.

It provides a PCIe interface for WiFi to connect with a host processor.

The WiFi throughput can go up to 1.3Gbps in theory by using 3x4 802.11a, b, g, n, ac MIMO technologies.

The LM610 uses Realtek’s RTL8814AR, a highly integrated single chip IEEE 802.11a/b/g/n/ac 3T4R PCIe WiFi controller.

It combines a WiFi MAC, a 3T4R capable WiFi baseband, and WiFi RF in a single chip. The RTL8814AR provides a complete solution for a high throughput performance integrated wireless LAN.

The RTL8814AR WiFi baseband implements Orthogonal Frequency Division Multiplexing (OFDM) with 3 transmit and 4 receive path and is compatible with the IEEE 802.11ac specification. Features include one spatial stream transmission, short guard interval (GI) of 400ns, spatial spreading, and transmission over 20MHz, 40MHz and 80MHz channel bandwidth.

Features

- IEEE 802.11 a, b, g, n, e, h, i, k, and ac standards.
- Operates in 2.4 GHz and 5 GHz Frequency bands
- PCI Express
- Linux, Windows, Android compatible
- Up to 288.9 Mbps High Speed Data Transfer Rate
- 20MHz / 40MHz / 80MHz bandwidth transmission
- OFDM with BPSK, QPSK, 16QAM, 64QAM and 256QAM modulation.
- Convolutional Coding Rate: 1/2, 2/3, 3/4, and 5/6
- Maximum PHY data rate up to 288.9 Mbps using 20MHz bandwidth, 600 Mbps using 40MHz, and 1.3 Gbps using 80MHz bandwidth
- Internal 5GHz WLAN COMS Power Amplifier (PA)
- Backward compatible with 802.11a/b/g devices while operating at 802.11n data rate
- RoHS, REACH and WEEE compliant
- See our website for this products certifications.

Overview

The LM610 WiFi 802.11 ac Dual Band 3T4R PCIe Minicard 2.4GHz & 5GHz ISM Band Mini PCI Express Card

2.4GHz & 5GHz ISM Band Mini PCI Express Card

Part No

Revised

Datasheet Version

See Last Page

04/JUL/2018

1.2

DRAFT DATASHEET

Downloaded from Arrow.com.
### General Specification

#### Wireless

<table>
<thead>
<tr>
<th>Wireless Standard</th>
<th>802.11 a, b, g, n, e, h, i, k, and ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Card Type</td>
<td>11ac Dual-Band 3T4R Minicard (PCI Express)</td>
</tr>
<tr>
<td>OS Compatibility</td>
<td>Linux, Windows, Android compatible</td>
</tr>
<tr>
<td>Security</td>
<td>WLAN: WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit &amp; 128bit, IEEE 802.11x, IEEE 802.11i</td>
</tr>
</tbody>
</table>

#### Chipset

- Realtek

#### Interfaces

- PCI Express 2.0 (PCIE)

### RF Characteristics

#### RF Output Power

- **WLAN**
  - 18dBm – 802.11b@11Mbps
  - 15dBm – 802.11g@54Mbps
  - 15dBm – 802.11a@54Mbps
  - 14dBm – 802.11n@MCS7_HT20
  - 14dBm – 802.11n@MCS7_HT40
  - 12dBm – 802.11ac@NSS1 MCS9_HT80

#### Receiver Sensitivity

- **WLAN**
  - -86dBm – 802.11b@11Mbps
  - -74dBm – 802.11g@54Mbps
  - -73dBm – 802.11a@54Mbps
  - -71dBm – 802.11n@MCS7_HT20
  - -68dBm – 802.11n@MCS7_HT40
  - -57dBm – 802.11ac@NSS1_MCS9_HT80

#### Frequency Range

- 2.4GHz and 5GHz ISM band (2.400GHz to 2.4835 GHz and 5.150GHz to 5.750GHz)

#### Spread Spectrum

- **WLAN** IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum)
- **WLAN** IEEE 802.11g/n: OFDM (Orthogonal Frequency Division Multiplexing)

#### Modulation Method

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

#### Data Transfer Rate

- **WLAN**
  - 802.11b: 11, 5.5, 2, 1 Mbps
  - 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
  - 802.11n: MCS0 to 7 for HT20MHz, MCS0 to 7 for HT40MHz
  - 802.11ac: MCS0 to 8 for HT20MHz, MCS0 to 9 for HT40MHz, NSS1 MCS0 to 9 for VHT80MHz
General Specification (Continued)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0°C to +60°C ambient temperature</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20°C to +70°C ambient temperature</td>
</tr>
<tr>
<td>Humidity</td>
<td>0% to 95% maximum (non-condensing)</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>50.82mm x 29.85mm</td>
</tr>
<tr>
<td>Weight</td>
<td>TBA +/- 0.25g tolerance</td>
</tr>
<tr>
<td>Certifications</td>
<td>See our website for this product’s certifications</td>
</tr>
<tr>
<td>Compliance</td>
<td>RoHS, REACH and WEEE</td>
</tr>
</tbody>
</table>

Block Diagram

Pin Assignments

<table>
<thead>
<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_WPAN#</td>
</tr>
<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>
<td>38</td>
<td>USB_D+</td>
<td>47</td>
<td>RESERVED</td>
</tr>
<tr>
<td>3</td>
<td>COEX1</td>
<td>12</td>
<td>UIM_CLK</td>
<td>21</td>
<td>GND</td>
<td>30</td>
<td>SMB_CLK</td>
<td>39</td>
<td>+3.3 Vaux</td>
<td>48</td>
<td>+1.5V</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>13</td>
<td>REFCLK+</td>
<td>22</td>
<td>PERST#</td>
<td>31</td>
<td>PETn0</td>
<td>40</td>
<td>GND</td>
<td>49</td>
<td>RESERVED</td>
</tr>
<tr>
<td>5</td>
<td>COEX2</td>
<td>14</td>
<td>UIM_RESET</td>
<td>23</td>
<td>PERn0</td>
<td>32</td>
<td>SMB_DATA</td>
<td>41</td>
<td>+3.3 Vaux</td>
<td>50</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>+1.5V</td>
<td>15</td>
<td>GND</td>
<td>24</td>
<td>+3.3 Vaux</td>
<td>33</td>
<td>PETp0</td>
<td>42</td>
<td>LED_WWAN#</td>
<td>51</td>
<td>W_DISABLE2#</td>
</tr>
<tr>
<td>7</td>
<td>CLKREQ#</td>
<td>16</td>
<td>UIM_VPP</td>
<td>25</td>
<td>PERp0</td>
<td>34</td>
<td>GND</td>
<td>43</td>
<td>GND</td>
<td>52</td>
<td>+3.3 Vaux</td>
</tr>
<tr>
<td>8</td>
<td>UIM_PWR</td>
<td>17</td>
<td>RESERVED</td>
<td>26</td>
<td>GND</td>
<td>35</td>
<td>GND</td>
<td>44</td>
<td>LED_WLAN#</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td>18</td>
<td>GND</td>
<td>27</td>
<td>GND</td>
<td>36</td>
<td>USB_D-</td>
<td>45</td>
<td>RESERVED</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dual Band MIMO 4x4 Solution
LM610 WiFi  802.11 ac Dual Band 3T4R PCIe Minicard
2.4GHz & 5GHz ISM Band Mini PCI Express Card

Diagrams

DC Characteristics

Power Supply Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD33</td>
<td>3.3V I/O Supply Voltage</td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>VD12</td>
<td>1.2V Core Supply Voltage</td>
<td>1.10</td>
<td>1.2</td>
<td>1.32</td>
<td>V</td>
</tr>
</tbody>
</table>

Digital IO Pin DC Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Minimum</th>
<th>Normal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIH</td>
<td>Input high voltage</td>
<td>2.0</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>VIL</td>
<td>Input low voltage</td>
<td>-</td>
<td>0</td>
<td>0.9</td>
<td>V</td>
</tr>
<tr>
<td>VOH</td>
<td>Output high voltage</td>
<td>2.97</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>VOL</td>
<td>Output low voltage</td>
<td>0</td>
<td>-</td>
<td>0.33</td>
<td>V</td>
</tr>
</tbody>
</table>

PS: 3.3V 1.2V ripple<100mV
PCIe Bus during Power On Sequence

- **Ton**: The main power ramp up duration
- **TPVCRL**: Power valid to CLKREQ# output active
- **TPVPGL**: Power valid to PERST# input inactive
- **TPERST#-CLK**: Reference clock stable before PERST# inactive

### The typical timing range

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ton</td>
<td>ms</td>
<td>-</td>
<td>1.5</td>
<td>5</td>
</tr>
<tr>
<td>TPVCRL</td>
<td>us</td>
<td>-</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>TPVPGL</td>
<td>ms</td>
<td>1</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>TPERST#-CLK</td>
<td>us</td>
<td>100</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
PCB Drying Conditions

Please refer below conditions for drying before solder reflow processes.

(Extracted from IPC/JEDEC J-STD-033B.1)

If your PCB was baked at the below temperatures, you should follow the below guidelines.

Reference Temperature Reflow Chart

1. If the system PCBA is double side design please reflow the side without this module first.
2. Don’t let the solder machine temperature over 250° or follow solder paste vendor’s recommended temperature.
3. The Ramp-up temperature speed is 1°4 oC per second, the Ramp-down temperature speed is 1°4 oC per second.
4. This temperature reflow chart is for reference only, it depends on the manufacturing machine’s characters requirement.

Datasheet Version Notes

v1.0 29 JAN 2018  Added version notes to datasheet.
v1.1 13 MAR 2018  Updated Packing Section.
v1.2 04 JUL 2018  Updated MSL information.
### LM610 Packaging Options

<table>
<thead>
<tr>
<th>Part No</th>
<th>Product Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>610-0610</td>
<td>PCIe Mini WiFi 802.11ac 8814 3T4R -20c 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)