The LX5503 is a power amplifier optimized for the FCC Unlicensed National Information Infrastructure (U-NII) band and HiperLAN2 applications in the 5.15-5.85GHz frequency range. The PA is implemented as a two-stage monolithic microwave integrated circuit (MMIC) with active bias and input/output pre-matching. The device is manufactured with an InGaP/GaAs Heterojunction Bipolar Transistor (HBT) IC process (MOCVD). It operates at a single low voltage supply of 3.3V with +25dBm of P1dB and 22dB power gain between 5.15-5.35GHz and 18dB gain up to 5.85GHz.

For +18dBm OFDM output power (64QAM, 54Mbps), the PA provides a very low EVM (Error-Vector Magnitude) of 4%, and consumes less than 200mA total DC current.

The LX5503 is available in a 16-pin 3mmx3mm micro-lead package (MLP). The compact footprint, low profile, and excellent thermal capability of the MLP package makes the LX5503 an ideal solution for broadband, medium-gain power amplifier requirements for IEEE 802.11a, and HiperLAN2 portable WLAN applications.

**KEY FEATURES**
- Advanced InGaP HBT
- 5.15-5.85GHz Operation
- Single-Polarity 3.3V Supply
- Low Quiescent Current Icq ~100mA
- P1dB ~ +25dBm across 5.15-5.85GHz
- Power Gain ~ 22dB at 5.25GHz & Pout=18dBm
- Power Gain ~ 18dB at 5.85GHz & Pout=18dBm
- Total Current < 200mA for Pout=18dBm
- EVM ~ 4% for 64QAM/ 54Mbps & Pout=18dBm
- Excellent Temperature Performance
- Simple Input/Output Match
- Minimal External Components
- Small Footprint: 3x3mm²
- Low Profile: 0.9mm

**APPLICATIONS/BENEFITS**
- FCC U-NII Wireless
- IEEE 802.11a
- HiperLAN2

**PRODUCT HIGHLIGHT**

**PACKAGE ORDER INFO**

<table>
<thead>
<tr>
<th>LQ</th>
<th>Plastic 16-Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>LX5503LQ</td>
<td>RoHS Compliant / Pb-free Transition DC: 0418</td>
</tr>
</tbody>
</table>

Note: Available in Tape & Reel (3K parts per reel). Append the letters "TR" to the part number. (i.e. LX5503LQ-TR)

This device is classified as ESD Level 1 in accordance with MIL-STD-883, Method 3015 (HBM) testing. Appropriate ESD procedures should be observed when handling this device.
**ABSOLUTE MAXIMUM RATINGS**

- DC Supply Voltage, RF off: 6V
- Collector Current: 500mA
- Total Power Dissipation: 3 W
- RF Input Power: 10dBm
- Operation Ambient Temperature: -40 to +85°C
- Storage Temperature: -65 to +150°C
- Peak Package Solder Reflow Temp: 260°C (+0,-5)

Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

**PACKAGE PIN OUT**

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
```

LQ PACKAGE
(Bottom View)

RoHS / Pb-free 100% Matte Tin Lead Finish

---

**FUNCTIONAL PIN DESCRIPTION**

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>Pin Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF IN</td>
<td>2, 3</td>
<td>RF input for the power amplifier. This pin is DC-shorted to GND but AC-coupled to the transistor base of the first stage. For 5.15-5.35GHz this pin is pre-matched to 50Ω.</td>
</tr>
<tr>
<td>Vb1</td>
<td>6</td>
<td>Bias current control voltage for the first stage.</td>
</tr>
<tr>
<td>Vb2</td>
<td>7</td>
<td>Bias current control voltage for the second stage. The VB2 pin can be connected with the first stage control voltage (VB1) into a single reference voltage (referred to as Vref) through an external resistor bridge(R1/R2).</td>
</tr>
<tr>
<td>Vcc</td>
<td>9</td>
<td>Supply voltage for the bias reference and control circuits. The VCC feed line should be terminated with a 1 μF bypass capacitor as close to the device as possible. This pin can be combined with both VC1 and VC2 pins, resulting in a single supply voltage (referred to as Vc).</td>
</tr>
<tr>
<td>RF OUT</td>
<td>10, 11</td>
<td>RF output for the power amplifier. This pin is AC-coupled and does not require a DC-blocking capacitor.</td>
</tr>
<tr>
<td>Vc1</td>
<td>15</td>
<td>Power supply for first stage amplifier. The VC1 feedline should be terminated with a 220pF bypass capacitor as close to the device as possible, followed by a 1μF bypass capacitor at the supply side. This pin can be combined with VC2 and VCC pins, resulting in a single supply voltage (referred to as Vc).</td>
</tr>
<tr>
<td>Vc2</td>
<td>14</td>
<td>Power supply for second stage amplifier. The VC2 feedline should be terminated with a 220pF bypass capacitor as close to the device as possible, followed by a 1 μF bypass capacitor at the supply side. This pin can be combined with VC1 and VCC pins, resulting in a single supply voltage (referred to as Vc).</td>
</tr>
<tr>
<td>GND</td>
<td></td>
<td>The center metal base of the MLP package provides both DC and RF ground as well as heat sink for the power amplifier.</td>
</tr>
</tbody>
</table>
## ELECTRICAL CHARACTERISTICS

Test conditions: \( V_{cc}=3.3\,\text{V}, \, V_{ref}=2.86\,\text{V}, \, I_{cq}=100\,\text{mA}, \, T_x=25^\circ\text{C}. \)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td></td>
<td>f</td>
<td>5.15</td>
<td>5.35</td>
<td>5.7</td>
<td>5.85</td>
<td>GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Power at 1dB Compression</td>
<td></td>
<td>Pout</td>
<td>24</td>
<td>25</td>
<td>24</td>
<td>25</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Gain at Pout=18dBm</td>
<td></td>
<td>Gp</td>
<td>20</td>
<td>22</td>
<td>16</td>
<td>18</td>
<td>dB</td>
<td></td>
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<tr>
<td>EVM at Pout=18dBm</td>
<td>64QAM/54Mbps</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>%</td>
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<tr>
<td>Total Current at Pout=18dBm</td>
<td></td>
<td>Ic_total</td>
<td>200</td>
<td></td>
<td>180</td>
<td>100</td>
<td>mA</td>
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<td>Quiescent Current</td>
<td></td>
<td>Icq</td>
<td>100</td>
<td></td>
<td>100</td>
<td></td>
<td>mA</td>
<td></td>
<td></td>
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<tr>
<td>Bias Control Reference Current</td>
<td>For ( I_{cq}=100,\text{mA} )</td>
<td>Iref</td>
<td>1.6</td>
<td></td>
<td>1.6</td>
<td></td>
<td>mA</td>
<td></td>
<td></td>
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<tr>
<td>Small-Signal Gain</td>
<td></td>
<td>S21</td>
<td>21</td>
<td></td>
<td>17</td>
<td></td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>Over 100MHz</td>
<td>( \Delta S21 )</td>
<td>+/-0.2</td>
<td></td>
<td>+/-0.5</td>
<td></td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain Variation Over Temperature</td>
<td>-40 to +85°C</td>
<td>( \Delta S21 )</td>
<td>+/-1</td>
<td></td>
<td>+/-1</td>
<td></td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Return Loss</td>
<td></td>
<td>S11</td>
<td>-15</td>
<td>-10</td>
<td>-12</td>
<td>-10</td>
<td>dB</td>
<td></td>
<td></td>
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<tr>
<td>Output Return Loss</td>
<td></td>
<td>S22</td>
<td>-9</td>
<td></td>
<td>-10</td>
<td></td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse Isolation</td>
<td></td>
<td>S12</td>
<td>-40</td>
<td></td>
<td>-40</td>
<td></td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second Harmonic</td>
<td>Pout = 18dBm</td>
<td></td>
<td>-45</td>
<td></td>
<td>-42</td>
<td></td>
<td>dBc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third Harmonic</td>
<td>Pout = 18dBm</td>
<td></td>
<td>-37</td>
<td></td>
<td>-37</td>
<td></td>
<td>dBc</td>
<td></td>
<td></td>
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<tr>
<td>Noise Figure</td>
<td></td>
<td>NF</td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td>dB</td>
<td></td>
<td></td>
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<tr>
<td>Ramp-On Time</td>
<td>10~90%</td>
<td>tON</td>
<td>100</td>
<td></td>
<td>100</td>
<td></td>
<td>ns</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All measured data was obtained on a 5 mil GETEK evaluation board without heat sink.
Typical Power Sweep Data at Room Temperature
(Vc=3.3V, Vref=2.86V, Icq=100mA)

- Freq.=5.15GHz

- Freq.=5.25GHz

- Freq.=5.85GHz
Typical EVM & Total Current vs. Output Power
(Vc=3.3V, Vref=2.86V, Icq=100mA, 64QAM/54Mbps)

Freq.=5.15GHz

Freq.=5.25GHz

Freq.=5.85GHz
Typical S-Parameter Data at Room Temperature

- **Vc=3.3V**
- **Vref=2.81V**
- **Icq=80mA**

- **Vc=3.3V**
- **Vref=2.86V**
- **Icq=100mA**

- **Vc=3.3V**
- **Vref=2.98V**
- **Icq=160mA**
CHARTS

Quiescent Current vs. Vref
(VC1=VC2=VCC=VC=3.3V)

InGaP HBT 5-6GHz Power Amplifier

Power Down Isolation
(Vc=3.3V, Vref=0 to 1V, Icq<2µA)
CHARTS

Power, EVM & Current for Low Quiescent Current
(Recommended for High Efficiency Operation)
\(V_c=3.3\,\text{V},\, V_{\text{ref}}=2.81\,\text{V},\, I_{\text{cq}}=80\,\text{mA},\, \text{Freq.}=5.25\,\text{GHz}\)

**Power & Gain vs. Pout**

**EVM & Total Current vs. Pout**
**CHARTS**

**Power, EVM & Current for High Quiescent Current**
(Recommended for High Gain Operation)
(Vc=3.3V, Vref=2.98V, Icq=160 mA, Freq.=5.25GHz)

**Power & Gain vs. Pout**

- **Pin (dBm)**
- **Pout (dBm), Gain (dB)**

**EVM & Total Current vs. Pout**

- **Pout (dBm)**
- **EVM (%)**
- **Ictotal (mA)**
**CHARTS**

**S-Parameter Variation Over Temperature**
(Vc=3.3V, Vref=2.98V, Icq=160mA at Room Temperature)

-40°C
+25°C
+85°C

**Power & Gain Variation Over Temperature**
(Vc=3.3V, Vref=2.86V, Icq=100mA at Room Temperature, Freq.=5.25GHz)

-40°C
+25°C
+85°C
CHARTS

Small-Signal Gain vs. Supply Voltage
(Vref=2.86V, Icq=100mA for Vc=3.3V)

P1dB vs. Supply Voltage
(Vref=2.86V, Icq=100mA for Vc=3.3V)
### MECHANICAL DRAWING

**LQ** 16-Pin MLPQ 3x3

![Mechanical Drawing](image)

#### Dim | MILLIMETERS | INCHES
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.80</td>
<td>0.31</td>
</tr>
<tr>
<td>A1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A3</td>
<td>0.20 REF</td>
<td>0.008 REF</td>
</tr>
<tr>
<td>b</td>
<td>0.18</td>
<td>0.007</td>
</tr>
<tr>
<td>D</td>
<td>3.00 BSC</td>
<td>0.118 BSC</td>
</tr>
<tr>
<td>E</td>
<td>3.00 BSC</td>
<td>0.118 BSC</td>
</tr>
<tr>
<td>e</td>
<td>0.50 BSC</td>
<td>0.020 BSC</td>
</tr>
<tr>
<td>D2</td>
<td>1.30</td>
<td>0.051</td>
</tr>
<tr>
<td>E2</td>
<td>1.30</td>
<td>0.051</td>
</tr>
<tr>
<td>K</td>
<td>0.2</td>
<td>0.008</td>
</tr>
<tr>
<td>L</td>
<td>0.35</td>
<td>0.012</td>
</tr>
<tr>
<td>L1</td>
<td>-</td>
<td>0.006</td>
</tr>
</tbody>
</table>

**Note:**
1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm (0.006") on any side. Lead dimension shall not include solder coverage.
2. Due to multiple qualified assembly subcontractors either package (with different pin indicators) may be shipped. Package type will be consistent within the smallest individual container.