Smart Energy
Advanced Metering Infrastructure (AMI) & Zigbee
Front-End Module Portfolio
Front-End Modules for High-Performance AMI & Zigbee Applications

The Qorvo® portfolio of single-chip integrated front-end modules (FEMs) is developed for high-performance AMI and Zigbee applications in the 2.4 GHz to 2.5 GHz, 915/868 MHz, 433 MHz and 169 MHz ISM bands. The RFFM69xx, RFFM65xx and RFFM64xx series are specifically designed to address the need for aggressive size reduction in a typical 802.15.4 front-end designs and offer a reduced footprint and minimized component count, outside of the core chipset.

The RF65x9 series integrates a 915/868 MHz high power amplifier (HPA) with transmit (Tx) filtering, a low noise amplifier (LNA) with or without bypass functionality and a remarkably complex combination of double-pole double-throw (DPDT), single-pole double-throw (SPDT) and single-pole three-throw (SP3T) switches. This configuration allows for a high power design capable of antenna diversity. The pin out of the FEM enables users to implement additional receive (Rx) filtering external to the module, if needed.

The RF6555 integrates a 2.4 GHz PA, Tx filtering, input and output switches, a Tx or Rx attenuation path, and an LNA with or without bypass mode. The RF65x4 and RFFM64x integrate a 470 MHz HPA with Tx filtering and an SP2T switch. This configuration allows for a high power design with minimal loss in the Rx path. The RFFM6500 integrates a 169 MHz HPA with Tx filtering and a SPDT switch.

Each of our AMI front-end modules meets or exceeds the RF front-end needs for 802.15.4 AMI/Zigbee RF systems and is fully DC- and RF-tested.

### Specifications

<table>
<thead>
<tr>
<th>Freq Range (MHz)</th>
<th>Architecture</th>
<th>Gain (dB)</th>
<th>Average $P_{out}$ (dBm)</th>
<th>$V_{cc}$ (V)</th>
<th>Current at $P_{out}$ (mA)</th>
<th>Package (mm)</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>168 to 171</td>
<td>PA, SPDT</td>
<td>30.0</td>
<td>27.0</td>
<td>2.7 to 4.2</td>
<td>325</td>
<td>6x6x1.2</td>
<td>RFFM6500</td>
</tr>
<tr>
<td>408 to 455</td>
<td>PA, SP3T, SP2T, LNA</td>
<td>25.0</td>
<td>31.0</td>
<td>2.5 to 4.2</td>
<td>825</td>
<td>6x6x0.975</td>
<td>RFFM6406</td>
</tr>
<tr>
<td>430 to 450</td>
<td>PA, SP2T, LNA</td>
<td>25.0</td>
<td>27.5</td>
<td>2.5 to 4.5</td>
<td>350</td>
<td>6x6x0.975</td>
<td>RFFM6404</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>LNA, DP2T</td>
<td>14.0</td>
<td>–</td>
<td>3.3 to 4.0</td>
<td>8</td>
<td>4x3 LGA</td>
<td>RFFM6909</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, DP2T, SP2T, LNA</td>
<td>30.0</td>
<td>27.0</td>
<td>2.7 to 4.4</td>
<td>215</td>
<td>6x6x0.12</td>
<td>RF6849</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, 2-SPDT, LNA</td>
<td>42.0</td>
<td>28.0</td>
<td>2.7 to 4.3</td>
<td>337</td>
<td>6x6 LGA</td>
<td>RF6559</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, SP3T, SP2T, LNA</td>
<td>25.0</td>
<td>30.0</td>
<td>2.5 to 4.2</td>
<td>850</td>
<td>6x6x0.12</td>
<td>RFFM6903</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, DP2T, LNA</td>
<td>27.0</td>
<td>30.0</td>
<td>3.1 to 3.8</td>
<td>750</td>
<td>5x5.5x1.2</td>
<td>RFFM6906</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, DP2T, LNA</td>
<td>30.0</td>
<td>30.0</td>
<td>2.8 to 4.2</td>
<td>600</td>
<td>6x6x0.12</td>
<td>RFFM6901</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, 2-SP3T, LNA</td>
<td>31.0</td>
<td>30.0</td>
<td>2.7 to 3.6</td>
<td>740</td>
<td>8x8x1.2</td>
<td>RF6509</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, DP2T</td>
<td>13.0</td>
<td>30.5</td>
<td>2.8 to 4.0</td>
<td>550</td>
<td>5x5.5x1.2</td>
<td>RFFM6907</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, LNA, SP2T, SP3T</td>
<td>20.0</td>
<td>30.5</td>
<td>3.0 to 4.0</td>
<td>650</td>
<td>6x6x0.975</td>
<td>RFFM6900</td>
</tr>
<tr>
<td>902 to 928, 868</td>
<td>PA, DP2T, LNA</td>
<td>30.0</td>
<td>33.5*</td>
<td>3.2 to 4.5</td>
<td>700</td>
<td>8x8x1.2</td>
<td>RF6849</td>
</tr>
<tr>
<td>2400 to 2500</td>
<td>PA, SP3T x 2, LNA</td>
<td>15.0</td>
<td>13.0</td>
<td>2.0 to 4.0</td>
<td>20</td>
<td>2.5x2.5x0.4</td>
<td>RF6204</td>
</tr>
<tr>
<td>2400 to 2500</td>
<td>PA, SP2T x 2, LNA</td>
<td>12.0</td>
<td>14.0</td>
<td>2.0 to 4.0</td>
<td>20</td>
<td>2.5x2.5x0.4</td>
<td>RF6205</td>
</tr>
<tr>
<td>2400 to 2500</td>
<td>PA, SP2T, DP2T, LNA</td>
<td>25.0</td>
<td>18.0</td>
<td>2.0 to 3.6</td>
<td>70</td>
<td>5x5x1</td>
<td>RF6555</td>
</tr>
</tbody>
</table>

* At PA OUT

---

**RFFM6500**
PA, Tx filtering, SP2T switch

**RFFM6406**
PA, Tx filtering, LNA w/bypass, SP2T and SP3T switches

**RFFM6404**
PA, Tx filtering, LNA w/bypass, SPDT switch
**RFFM6909**
LNA, Rx balun and Tx/Rx
SPDT switch

**RF6549**
PA, Tx filtering, Tx bypass, LNA
w/bypass, DPDT/SPDT switch

**RF6559**
PA, Tx filtering, Tx bypass, LNA
w/bypass, SPDT switch

**RFFM6903**
PA, Tx filtering, LNA w/bypass,
SPDT and SP3T switches

**RFFM6906**
PA, Tx filtering, LNA w/limiter,
DPDT switch

**RFFM6901**
PA, Tx filtering, LNA w/bypass,
DPDT switch

**RF6509**
PA, Tx filtering, Tx bypass,
LNA w/bypass, 2-SP3T switch

**RFFM6907**
PA, Tx filtering, Tx/Rx,
DPDT switch

**RFFM6900**
PA, Tx filtering, Tx thru path,
LNA w/bypass, SPDT/SP3T switch
RFFM6904
PA, Tx filtering, LNA w/bypass, DPDT switch

RFFM6204
PA, Tx filtering, LNA, thru path and 2x SP3T

RFFM6205
PA, Tx filtering, LNA, thru path and 2x SP3T

RFFM6555
PA, Tx filtering, LNA w/bypass, SPDT/DPDT switch

W-MBUS Extended Range Reference Design
+28.5 dBm output power for 169 MHz ISM band