Mercury’s SpectrumSeries RFM3101 is an ultra-wideband microwave transceiver with versatile local oscillator (LO), low-phase noise and fast tuning speed, packaged in a low-SWaP 3U module. These versatile transceivers are open system architecture compliant in both the digital and RF processing domains through OpenVPX (VITA 65) and OpenRFM.

Open system architecture for RF processing - OpenRFM

The challenges of digital and RF convergence, spectrum-fusion and maneuverability, complementary system interoperability and affordability are solved with OpenRFM. This open architecture approach standardizes and streamlines the design, integration, and testing of RF and digital capabilities within embedded processing subsystems. OpenRFM design principles are compatible with prevailing embedded computing industry standards.

**OpenRFM™**

- standardizes the electromechanical, software, control plane and thermal interfaces used by integrated microwave assemblies (IMAs) to streamline the design and integration of RF and digital capabilities.
- is both modular and scalable in its approach to design, test, and control plane practices for interfacing RF and digital subsystems within embedded architectures and is wholly interoperable with ANSI/VITA standards including 3U and 6U OpenVPX and VME/VXS.

**RFM3101 Wideband Microwave Transceiver**

- Rugged, compact and full open systems compliance
- Wideband - Excellent phase noise - High dynamic range
- Built-in LO generation - System lockable via external reference inputs
- External LOs capability for EW versatility

- defines standard interfaces and leverages IP re-use across applications to drive overall investment value, efficient SWaP-C utilization and expedited time-to-solution/market.

**SpectrumSeries subsystem building blocks**

Mercury’s SpectrumSeries OpenRFM transceivers, processing and A/D conversion building blocks are easily integrated into low-risk, turnkey, real-time signal processing subsystems. These subsystems comprise of complete receiver/analysis solutions for communication and electronic intelligence enabling practitioners to react quickly from resulting information.

*SpectrumSeries™*
Signal collection, digitization and processing domain expertise
Mercury leverages 35 years of high-frequency, wide-bandwidth signal acquisition, digitizing and decimation experience to produce performance optimized and balanced RF processing subsystems. We commit our proven hardware and software expertise to interoperable, scalable open system building blocks that minimize risk and leverage the best commercial technology to drive performance and affordability. Our application and system engineers integrate these proven building blocks into sophisticated EW processing subsystems that can be refreshed at the speed of technology.

Specifications

**Packaging**
Format/size: 3U OpenVPX, single slot  
Power: 45W Maximum  
Control interface: 1GbE (consult factory for more options)  
Weight: <1kg (rugged air-cooled)  
Commercial and rugged air-cooled or rugged conduction cooled

OpenRFM interoperability

**RF Down converter specifications**
- RF input coverage: 6GHz to 18GHz  
- Noise figure: 14 dB typical (17 dB max)  
- Gain (max RF to IF): 25 dB  
- Max RF (without damage): 20 dBm  
- OP1dB (with max gain): 16 dBm  
- OIP3 (with max gain): 30 dBm  
- Attenuation: 31 dB in .5 dB steps  
- Linear dynamic range: 91 dB (with 1MHz BW)  
- Single-tone, signal related spurious: -60 dBc (@ -15 dBm Input)  
- Single-tone, internally generated spurious: -80 dBc (@ -15dBm Input)  
- IF output center frequency*: 1.875GHz  
- IF bandwidth: 1.375GHz to 2.375GHz  
- IF band flatness: +/-1.5dB typical  
- Tuning speed: 25 µsecs typical (To within 10 kHz)  
- Tuning resolution: 10MHz  
- VSWR (In/out): 2:1  

**RF Up converter specifications**
- RF output coverage: 6GHz to 18GHz  
- Noise figure: 23 dB typical (26 dB max)  
- Gain (max IF to RF): 20dB  
- OP1dB (with max gain): 21dBm  
- OIP3 (with max gain): 30dBm  
- Attenuation: 31dB in 0.5dB steps  
- Single-tone, signal related spurious: -55dBc (@ -10dBm input and max gain)  
- Single-tone, internally generated spurious: -80dBm(@ -10dBm input and max gain)  
- IF input center frequency**: 1.875GHz  
- IF bandwidth: 1.375GHz to 2.375GHz  
- IF band flatness: +/-1.5dB  
- Tuning speed: 25 µsecs typical (To within 10 kHz)  
- Tuning resolution: 10MHz  
- VSWR (In/out): 2:1

**Native LO generation specifications**
Reference Input: 10MHz – 100MHz; 100MHz preferred  
Composite phase noise***  
- 100 Hz: -70 dBc/Hz  
- 1 kHz: -80 dBc/Hz  
- 10 kHz: -90 dBc/Hz  
- 100 kHz: -95 dBc/Hz  
- 1 MHz: -99 dBc/Hz  
- 10 MHz: -125 dBc/Hz  
- 20 MHz: -130 dBc/Hz  
- 100 MHz: -133 dBc/H

* The IF output has a direct mode that allows 100MHz to 6 GHz to be routed directly to the IF output bypassing the RF translation chain and IF Filters.  
** The IF input has a direct mode that allows 100MHz to 6 GHz to be routed directly to the RF output bypassing the RF translation chain and IF Filters.  
*** Phase noise is based upon a 100MHz clean reference, such as OCXOs used for system references.

EA transceiver configuration
With RF down and up conversion, the SpectrumSeries RFM3101 is ideally suited to EW applications. Fig 1 illustrates a 3U OpenVPX RFM3101 electronic attack (EA) setup.
### Environmental Qualification Levels

<table>
<thead>
<tr>
<th></th>
<th>Air-cooled</th>
<th>Rugged L1</th>
<th>Rugged L3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ruggedness</strong></td>
<td>•</td>
<td>••</td>
<td>•••</td>
</tr>
<tr>
<td><strong>Moisture/dust protection</strong></td>
<td>•</td>
<td>••</td>
<td>•••</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>Operating*</td>
<td>0°C to +40°C</td>
<td>-25°C to +55°C</td>
</tr>
<tr>
<td><strong>Operating temperature maximum rate of change</strong></td>
<td>N/A</td>
<td>5°C/min</td>
<td>10°C/min</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>Operating*</td>
<td>10-95%, non-condensing</td>
<td>5-95%, non-condensing</td>
</tr>
<tr>
<td><strong>Altitude</strong></td>
<td>Operating*</td>
<td>0-10,000ft</td>
<td>0-30,000ft</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>Random</td>
<td>0.003 g/Hz; 2-2000 Hz, 1 hr/axis</td>
<td>0.04 g/Hz; 2-2000 Hz, 1 hr/axis</td>
</tr>
<tr>
<td><strong>Shock</strong></td>
<td></td>
<td>z-axis: 20g; x and y-axes: 32g; (11ms ½-sine pulse, 3 positive, 3 negative)</td>
<td>z-axis: 50g; x and y-axes: 80g; (11ms ½-sine pulse, 3 positive, 3 negative)</td>
</tr>
<tr>
<td><strong>Salt/Fog</strong></td>
<td>N/A</td>
<td>Contact Factory</td>
<td>10% NaCl</td>
</tr>
</tbody>
</table>

* Customer must maintain required cfm level. Consult factory for the required flow rates.
** Card edge should be maintained below 71°C

Storage Temperature is defined per MIL-STD-810F, Method 502.4, para 4.5.2, where the product under non-operational test is brought to an initial high temperature cycle to remove moisture. Then the unit under non-operational test will be brought to the low storage temperature. The low temperature test is maintained for 2 hours. The product is then brought back to ambient temperature. All temperature transitions are at a maximum rate of 10°C/min. One cold/hot cycle constitutes the complete non-operational storage temperature test. This assumes that the board level products are individually packaged in accordance with ASTM-D-3951 approved storage containers. These tests are not performed in Mercury shipping containers, but in an unrestricted condition. Please consult the factory if you would like additional test details.

All products manufactured by Mercury meet elements of the following specifications: MIL-STD-454, MIL-STD-883, MIL-HDBK-217F, and MIL-I-46058 or IPC-CC-630, and various IPC standards. Mercury’s inspection system has been certified in accordance with MIL-I-45208A.

### Additional Services

<table>
<thead>
<tr>
<th>Optional Environmental Screening and Analysis Services</th>
<th>Standard Module, Optional Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cold Start Testing</td>
<td>• Engineering Change Order (ECO) Notification</td>
</tr>
<tr>
<td>• Cold Soak Testing</td>
<td>• Diminished Mean Time Between Failure (MTBF) Calculations</td>
</tr>
<tr>
<td>• Safety Margin Analysis</td>
<td>• Hazmat Analysis</td>
</tr>
<tr>
<td>• Custom Vibration</td>
<td>• Diminished Manufacturing Sources (DMS) Management</td>
</tr>
<tr>
<td>• CFD Thermal Analysis</td>
<td>• Longevity of Supply (LOS)</td>
</tr>
<tr>
<td>• Finite Element Analysis</td>
<td>• Longevity of Repair (LOR)</td>
</tr>
</tbody>
</table>

*Contact factory for additional information*

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**Need more help? Need a variant of this product?**

Contact Mercury’s Mixed Signal Engineering team at: [digital.rf@mrcy.com](mailto:digital.rf@mrcy.com) or visit [www.mrcy.com/mixed-signal-processing](http://www.mrcy.com/mixed-signal-processing) for a detailed listing of OpenVPX products.