RFM6101 Wideband Microwave Transceiver

Versatile and scalable 6U OpenVPX™ and OpenRFM™ architecture compliant

- RF coverage from 6 - 18 GHz
- 2 Rx down-converter channels and 2 Tx up-converter channels
- 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

Mercury’s SpectrumSeries RFM6101 is an ultra-wideband microwave transceiver with versatile local oscillator (LO), low-phase noise and fast tuning speed, packaged in a low-SWaP 6U module. Each compact module contains 2 down-converters and 2 up-converter providing maximum flexibility. These versatile transceivers are open system architecture compliant in both the digital and RF processing domains through OpenVPX (VITA 65) and OpenRFM.

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.
- 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.
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 in to sophisticated EW processing subsystems that can be refreshed at the speed of technology.

Specifications

**Packaging**
- Format/size: 6U OpenVPX, single slot
- Power: 95W Maximum
- Control interface: 1GbE (consult factory for more options)
- Weight: <2kg (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 (16 dB max)
- Gain (max RF to IF): 20 dB
- Max RF (without damage): 20dBm
- OP1dB (with max gain): 15dBm
- OIP3 (with max gain): 27dBm
- Attenuation: 31dB in .5 dB steps
- Linear dynamic range: 91dB (with 1MHz BW)
- Single-tone, signal related spurious: -60dBc (@ -15dBm input)
- Single-tone, internally generated spurious: -80dBc (@ -15dBm input)
- IF output 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

**RF UP CONVERTER SPECIFICATIONS**
- RF output coverage: 6GHz to 18GHz
- Noise figure: 20dB typical
- 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/Hz

* 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.

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*** Phase noise is based upon a 100MHz clean reference, such as OCXOs used for system references.
Figure 1. RFM6101 Rx Filtering Block Diagram

Environmental Qualification Levels

<table>
<thead>
<tr>
<th>Environmental Qualification Levels</th>
<th>Commercial L0</th>
<th>Rugged L1</th>
<th>Rugged L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruggedness</td>
<td>-</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Moisture/dust protection</td>
<td>-</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating*</td>
<td>0°C to +40°C</td>
<td>-25°C to +55°C</td>
<td>-40°C to +71°C</td>
</tr>
<tr>
<td>Operating temperature</td>
<td></td>
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<tr>
<td>maximum rate of change</td>
<td>N/A</td>
<td>5°C/min</td>
<td>10°C/min</td>
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<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-40°C to +85°C</td>
<td>-55°C to +125°C</td>
<td>-55°C to +125°C</td>
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<tr>
<td>Humidity</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Operating*</td>
<td>10-90%, non-condensing</td>
<td>5-95%, non-condensing</td>
<td>5-95%, non-condensing, 100% condensing</td>
</tr>
<tr>
<td>Storage</td>
<td>10-90%, non-condensing</td>
<td>5-95%, non-condensing</td>
<td>5-95%, non-condensing, 100% condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating*</td>
<td>0-10,000ft</td>
<td>0-30,000ft</td>
<td>0-70,000ft</td>
</tr>
<tr>
<td>Storage</td>
<td>0-30,000ft</td>
<td>0-50,000ft</td>
<td>0-70,000ft</td>
</tr>
<tr>
<td>Vibration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Random</td>
<td>0.003 g²/Hz; 20-2000 Hz, 1 hr/axis</td>
<td>0.04 g²/Hz; 20-2000 Hz, 1 hr/axis</td>
<td>0.1 g²/Hz; 5-2000 Hz, 1 hr/axis</td>
</tr>
<tr>
<td>Sine</td>
<td>N/A</td>
<td>N/A</td>
<td>10 g peak; 5-2000 Hz, 1 hr/axis</td>
</tr>
<tr>
<td>Shock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z-axis: 20g, x and y-axes: 32g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(11ms ½-sine pulse, 3 positive, 3 negative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt/Fog</td>
<td>N/A</td>
<td>Contact Factory</td>
<td>10% NaCl</td>
</tr>
<tr>
<td>VITA 47</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Customer must maintain required cfm level. Consult factory for the required flow rates.

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 test is maintained for 2 hours. The product is then brought to the high storage temperature and 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-3961 approved storage containers. These tests are not performed in Mercury shipping containers, but in an unrestrained 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-830, and various IPC standards. Mercury’s inspection system has been certified in accordance with MIL-I-45208A.

Environmental Screening and Analysis Services

- Cold Start Testing
- Cold Soak Testing
- Custom Vibration
- CFD Thermal Analysis
- Finite Element Analysis
- Safety Margin Analysis
- Temperature Cycling
- Power Cycling
- Environmental Stress Screening

Optional Environmental Screening and Analysis Services

- Engineering Change Order (ECO) Notification
- ECO Control
- Custom Certificate of Conformity (CofC)
- Custom UID Labeling

Additional Services

- Alternate Mean Time Between Failure (MTBF) Calculations
- Hazmat Analysis
- Diminished Manufacturing Sources (DMS) Management
- Longevity of Supply (LOS)
- Longevity of Repair (LOR)

Contact factory for additional information