Components and Subsystems for Defense & Security
Building the world’s largest and most advanced high frequency portfolio.

microsemi RF Integrated Solutions

Introducing Microsemi RF Integrated Solutions

With the acquisition of Endwave Defense and Security products in 2009, Microsemi Corporation created its new RF Integrated Solutions group, an organization having an industry leading portfolio ranging from components to subsystems and spanning frequencies to 110 GHz. Combined with its new defense and security system products, Microsemi RFIS technologies also support a wide range of high reliability discrete RF/microwave components and high power RF power transistors.

Defense & Security Products

These subsystems deliver integrated modules that fit seamlessly into your system architecture. They utilize advanced, custom-designed semiconductors to provide optimized solutions for our customer applications. Our subsystem packaging technologies encompass SMT, discrete hybrid MIC circuits, custom MMICs and bare die COB.

Our program experience includes:
- Millimeter Wave Personnel Imagers & Perimeter “Fences”
- Unmanned Aerial Vehicles (UAV)
- Airborne Surveillance Platforms
- Radar Warning Receivers (RWR)
- Missile Front-ends, Exciters, and Fuses
- “Intelligent Battlefield” Communications
- Automatic Landing Guidance (ALG) Systems
- Phased-Array, Monopulse and Fire Control Radar

Microsemi RF Integrated Solutions combines products, technologies, experience and resources of the world’s premier RF components suppliers. Today, our portfolio is unmatched in both breadth and depth, providing incomparable capabilities for our RF customers.

www.microsemi-rfis.com
Log Amplifiers

FEATURES AND SPECIFICATIONS

- Searchable design library to 75 GHz, or customize to 110 GHz
- Broadband & narrowband models
- Low Noise Amplifiers (LNAs)
  - 1 GHz NF < 0.5 dB typ.
  - Ka-Band NF < 3 dB typ.
- Medium Power Amplifiers (MPAs)
  - +15 dBm < P1dB < +27 dBm
- High Power Amplifiers (HPAs)
  - Models up to +30 Watts
  - Ka-Band NF < 6 dB typ.
  - Rack mount & module types
- General Purpose/Gain Blocks
  - Octave & multi-octave BW
- Specialty Amplifiers
  - Limiting & Low Phase Noise Models
- MIC and MMIC technology
- Single-ended & balanced topologies
- All waveguide sizes (WR19-WR90)
- All coax types (SMA, K, 2.4 mm, 2.9 mm, GPO)
- Internally regulated ESD controls
- Environmental testing to Mil-Std 202
- Workmanship based on Mil-Std 883 & IPC-A-610
- Internal laser weld, fine/gross leak
- -55º to +95º C temp range, typ.
- 2-4 Week standard delivery

At the core of Microsemi’s RF component capability lies a comprehensive line of solid-state amplifier products up to 110 GHz, merging our own organic innovations with the acquired design libraries from ICA Technology, ALC Microwave, and TRW Milliwave. With a creative, experienced engineering team and the most modern analytical and simulation tools available, Microsemi’s customization capability is limitless.

Employing the latest advancements in thin-film technology, eutectic attachment, ultrasonic/thermo-compression bonding and high-precision automated assembly techniques, our amplifiers achieve extremely high-performance and impeccable unit-to-unit consistency. As an ISO9001:2000/AS9100 certified manufacturer with workmanship standards based on Mil-Std 883 and IPC-A-610, Microsemi is a favorite amongst top tier defense contractors. They look to us when applications call for an LNA to establish the lowest possible noise figure on radar front-ends, Ka-Band high-power amplifiers to separate VSAT transmitters from the pack, or a limiting amplifier to protect receiver electronics from ECM jamming signals. Allow us to establish the same confidence with you.

Options:
- Matched sets (Gain/Phase Tracking)
- Bias-T
- Temperature compensation
- Variable gain control
- Isolators, filters, limiters
- Power detector
- Additional power stage

Building upon the heritage from ALC Microwave, Inc. we have developed high performance log amplifiers for use in early warning radar receivers, threat detection equipment, electronic countermeasures, and missile guidance systems. A log amplifier has an output voltage that is proportional to the logarithm of its input voltage, allowing for a more usable format for pulse radars by effectively compressing a large input dynamic range into smaller, more manageable blocks. Detector Log Video Amplifiers (DLVA) are single detector devices employing wideband post-detection logarithmic amplification. These devices provide fast and accurate measurements of pulsed (and CW) RF signals up to 50 dB in dynamic range. Microsemi DLVAs are highly ruggedized to meet the most stringent mil-spec environments.

For those applications where extended dynamic range up to 60-75 dB is necessary, high-gain limiting amplifier/detector sections are cascaded to create a high-performance Successive Detector Log Video Amplifier, or SDLVA. These designs offer signal sensitivity approaching the thermal noise floor while maintaining excellent thermal stability.

Microsemi’s log amplifiers offer log accuracy and log linearity that are best in class—and our capability extends well into the millimeter wave range where others fall short.
Microsemi frequency multipliers include a comprehensive line of doublers, triplers, quaduplers, and higher order multiplication schemes up to N = 80. Narrowband passive diode-based models provide superior phase noise to within 1 dB of the theoretical limit of 20 Log N. Active models using FETs or HEMTs typically have broader bandwidth and slightly higher phase noise, but allow the multiplier module to also provide gain, if necessary. Options include operating voltages from +5V to +24V, and DC bias can be configured for minimal current drain when battery operation is required. Our capability provides multiplier output frequencies from 4 GHz up to 110 GHz. Depending on desired filtering and amplification, output power levels can exceed 2 watts.

### Features and Specifications

#### Multipliers

- 4 to 110 GHz output frequency capability.
- Multiplication factors from X2 to X80.
- Broadband models: octave plus bandwidth.
- Narrowband models: 5 to 20% bandwidth.

### Up / Down Converters

- Up/down-converters to 110 GHz.
- IF coverage to 20 GHz.
- Super-heterodyne, image/LO reject, and sub-harmonic topologies.
- Up-converter output power to +2W.
- Down-converter noise figure to < 3 dB.

#### Up-converter Saturated Output Power

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Active</th>
<th>Passive</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Frequency GHz</td>
<td>20 – 40</td>
<td>10 – 20</td>
<td>6.6 – 10</td>
</tr>
<tr>
<td>Output Frequency GHz</td>
<td>40 – 80</td>
<td>20 – 40</td>
<td>26 – 40</td>
</tr>
<tr>
<td>Input Power dBm</td>
<td>+10</td>
<td>+15</td>
<td>+10</td>
</tr>
<tr>
<td>Output Power dBm</td>
<td>+15</td>
<td>+1</td>
<td>+15</td>
</tr>
<tr>
<td>DC Supply V/MA</td>
<td>+12/240</td>
<td>0/0</td>
<td>+12/410</td>
</tr>
</tbody>
</table>

#### Down-converter Noise Figure Capability

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Active</th>
<th>Passive</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO Start Freq GHz</td>
<td>6.05</td>
<td>6.65</td>
<td>7.05</td>
</tr>
<tr>
<td>LO Stop Freq GHz</td>
<td>7.05</td>
<td>7.05</td>
<td>7.25</td>
</tr>
<tr>
<td>IF Freq GHz</td>
<td>7.25</td>
<td>7.25</td>
<td>2.45</td>
</tr>
<tr>
<td>Conversion Gain dB</td>
<td>22</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>Flatness (50 MHz) dB</td>
<td>±0.25</td>
<td>±0.25</td>
<td>±0.25</td>
</tr>
<tr>
<td>Noise Figure dB</td>
<td>5.5</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Intercept Point dBm</td>
<td>-7</td>
<td>-7</td>
<td>-7</td>
</tr>
<tr>
<td>LO Input Power dBm</td>
<td>-5</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

### Options:

- Single-ended or balanced design configurations.
- Passive, diode-based designs.
- Active, FET or HEMT-based designs.
- Output power amplification to > 2W.
- Tailored input drive level.
- Gain control.
- Output filtering.
- Built-in test (BIT).
- I/O connector options include coax, waveguide, GPO.
- Lower cost, non-hermetic packaging.

### Up / Down Converters

- On-board LO source or multipliers.
- Input limiters.
- Output detector.
- Receiver signal level (RSL)/receive signal strength indicator (RSSI).
- RF or IF gain control.
- I/O isolators.
- Lower cost, non-hermetic packaging.
Transceivers

**FEATURES AND SPECIFICATIONS**

- **Frequency capability** up through 110 GHz
- **Integrated transmit, receive, and LO circuitry**
- **Embedded microcontroller enables "adaptive modulation"**
- **LO multiplication factor, XN (N = 1 to 12)**
- **Receiver noise figures to 2 dB**
- **Transmit output power to 2W**
- **Linear or non-linear operation**
- **Low spurious emissions**
- **Environmentally sealed and tested at temperatures from -54°C to +100°C**

Sample integrated transceiver specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Receiver</th>
<th>Transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Frequency</td>
<td>GHz</td>
<td>X-Band</td>
<td>–</td>
</tr>
<tr>
<td>LO Frequency</td>
<td>GHz</td>
<td>S-Band</td>
<td>–</td>
</tr>
<tr>
<td>IF Frequency</td>
<td>dBm</td>
<td>S-Band</td>
<td>–</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>2.6</td>
<td>–</td>
</tr>
<tr>
<td>Conversion Gain</td>
<td>dB</td>
<td>30</td>
<td>–</td>
</tr>
<tr>
<td>LO Input Power</td>
<td>dBm</td>
<td>+2</td>
<td>+2</td>
</tr>
<tr>
<td>Output Frequency</td>
<td>GHz</td>
<td>–</td>
<td>Q-Band</td>
</tr>
<tr>
<td>Input Frequency</td>
<td>GHz</td>
<td>–</td>
<td>S-Band</td>
</tr>
<tr>
<td>Multiplication Factor</td>
<td>X16</td>
<td>–</td>
<td>X16</td>
</tr>
<tr>
<td>Input Power</td>
<td>dBm</td>
<td>–</td>
<td>+33</td>
</tr>
<tr>
<td>Output Power</td>
<td>dBm</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

**Popular T/R Frequency Bands:**

- **C-Band:** 5.9 to 8.5 GHz
- **K-Band:** 10.7 to 12.7 GHz
- **Ka-Band:** 17.7 to 26.5 GHz
- **L-Band:** ≥ 1.0 GHz
- **S-Band:** ≥ 1.0 GHz
- **V-Band:** 54 to 55 GHz
- **W-Band:** 93 to 95 GHz

Multi-Function Assemblies

**FEATURES AND SPECIFICATIONS**

- **Custom Microsemi designs, or build-to-print manufacturing services**
- **Frequency capability** up to 110 GHz
- **Combine RF, LO, IF, and digital electronics**
- **Integrated RF Subsystems:**
  - Amplifier networks
  - Filtering & equalization
  - RF power distribution
  - Frequency conversion
  - Frequency generation
  - Switches, limiters, detectors
  - Programmable attenuators
  - Microcontroller based subsystems
  - SMT, MMC, MIC packaging technologies and bare die COB
- **Automated assembly and test**
- **Design for manufacturability (DFM)**
- **W/G and coax connector options**
- **Environmental screening (ESS)**
- **Hermetic packaging**

If you can imagine it, and the laws of physics allow it—we can custom design it for you. Armed with an unparalleled library of circuit building-blocks at our fingertips, Microsemi combines multiple components into a single, efficient, high-performance Multi-Function Assembly (MFA). Take an amplifier, a multiplier, a down-converter from Microsemi’s vast product portfolio— and build from there. Integrate other functionality, such as filter banks, equalizers, power detectors, and digitally controlled attenuators. The power of integration— removing cables, complicated interconnects, packaging, and cost from your system electronics. From wide dynamic range limiting amplifier distribution systems, to complete RF front-ends, our custom MFA capability positions Microsemi as your one-stop shop for all of your RF to millimeter-wave electronics.

In addition to unsurpassed design capability, we also provide our customers with build-to-print assembly and test services of their proven MFA designs. Our high-volume business base enables us to amortize overhead expenses over a large number of units, leverage our materials purchasing power, and reduce manufacturing costs of your MFA. Take advantage of our automation, innovation, and experience by letting us put our contract manufacturing resources to work for you.