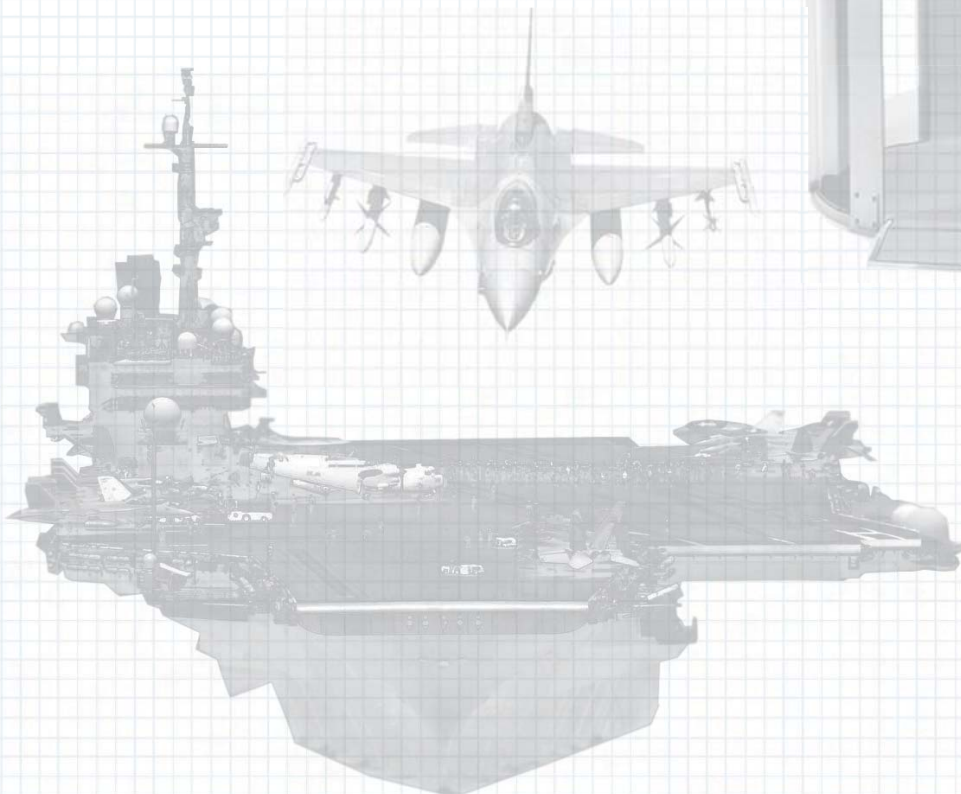




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***Components and Subsystems for Defense & Security***



*Building the world's largest and most advanced high frequency portfolio.*



*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.*

## Introducing **Microsemi RF Integrated Solutions**

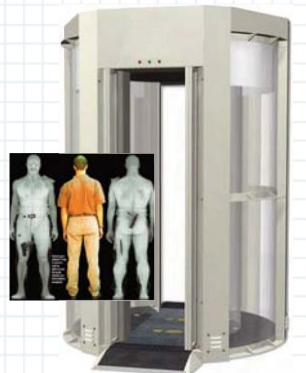
With the acquisition of Endwave Defense and Security products in 2009, Microsemi Corporation created its new RF Integrated Solutions group, an organization having an industry leading portfolio ranging from components to subsystems and spanning frequencies to 110 GHz. Combined with its new defense and 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





Amplifiers



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 JCA 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.

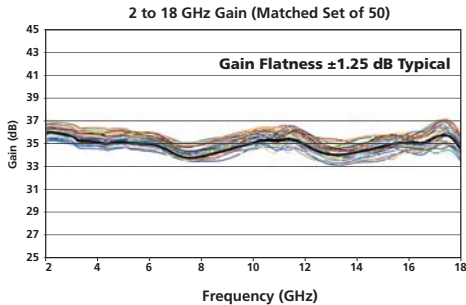
Employing the latest advancements in thin-film technology, eutectic attachment, ultrasonic/thermo-compression bonding and high-precision automated assembly techniques, our amplifiers achieve extremely high-performance and impeccable unit-to-unit consistency. As an ISO9001:2000/AS9100 certified manufacturer 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)
- Temperature compensation
- Variable gain control
- Isolators, filters, limiters
- Power detector
- Additional power stage
- Bias-T
- Various I/O connectors
- Hermetic/non-hermetic packages
- TTL switching

FEATURES AND SPECIFICATIONS

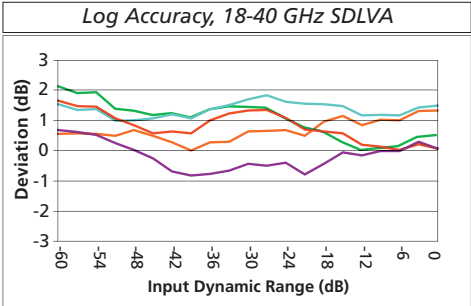
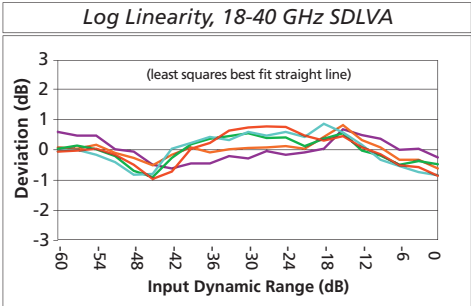
- Searchable design library to 75 GHz, or customize to 110 GHz
- Broadband & narrowband models
- **Low Noise Amplifiers (LNAs)**  
1 GHz NF < 0.5 dB typ.  
Ka-Band NF < 3 dB typ.
- **Medium Power Amplifiers (MPAs)**  
+15 dBm < P1dB < +27 dBm
- **High Power Amplifiers (HPAs)**  
Models up to +30 Watts  
Gain 30-50 dB typ.  
Ka-Band NF < 6 dB typ.  
Rack mount & module types
- **General Purpose/Gain Blocks**  
All popular bands covered  
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
- ISO9001:2000 & AS9100:2004 certified
- Environmental testing to Mil-Std 202
- Workmanship based on Mil-Std 883 & IPC-A-610
- Internal laser weld, fine/gross leak
- -55° to +95° C temp range, typ.
- 2-4 Week standard delivery



FEATURES AND SPECIFICATIONS

DLVA and SDLVA Models:

- Log linearity  
0.5 to 18.5 GHz: ±1.3 dB  
18 to 40 GHz: ±1.0 dB
- Log accuracy  
0.5 to 18.5 GHz: ±2.0 dB  
18 to 40 GHz: ±1.5 dB
- Tangential sensitivity (Tss)  
0.5 to 18.5 GHz: -70 dBm  
18 to 40 GHz: -68 dBm  
(more sensitivity available upon request)
- Rise time  
0.5 to 18.5 GHz: 10 ns  
18 to 40 GHz: 8 ns
- Dynamic range:  
70 dB (SDLVA), 50 dB (DLVA)
- Recovery time: 50 ns, typ.
- CW to 70 MHz video bandwidth
- Ask about "CW Immunity" options
- VSWR: 2.5:1 in/out
- Temperature range: -45° C to + 85° C
- Packaging: hermetic, laser sealed aluminum housings



GHz 18.0 24.0 29.0 34.0 40.0

Log Amplifiers

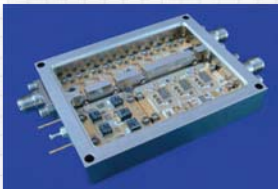


Building upon the heritage from ALC Microwave, Inc. we have developed high performance log amplifiers for use in early warning radar receivers, threat detection equipment, electronic countermeasures, and missile guidance systems. A log amplifier has an output voltage that is proportional to the logarithm 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.

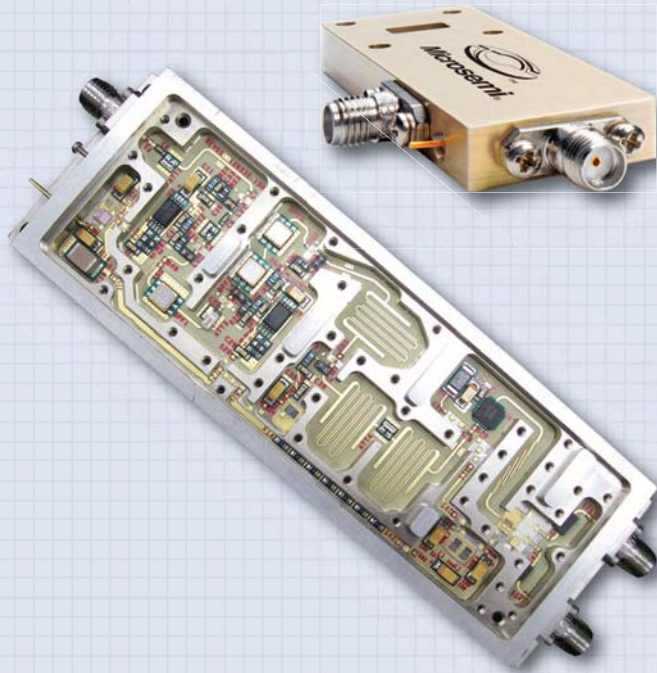
Microsemi's log amplifiers offer log accuracy and log linearity that are best in class—and our capability extends well into the millimeter wave range where others fall short.



18 to 40 GHz DLVA



Multipliers



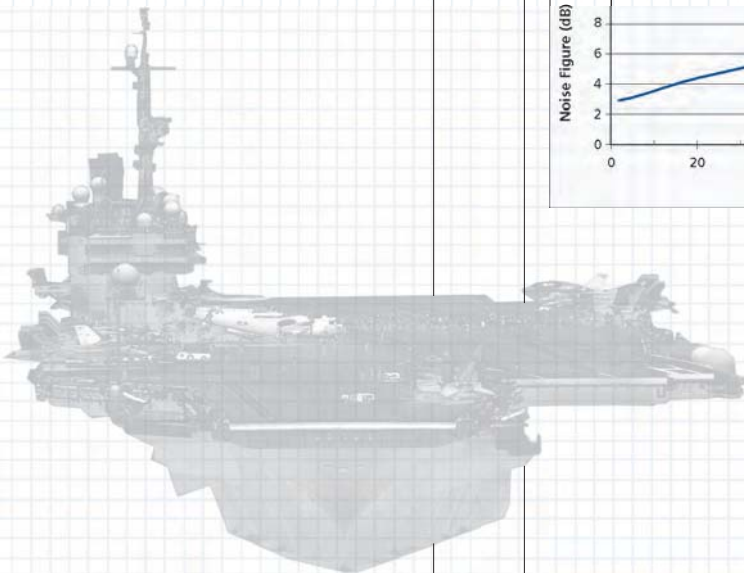
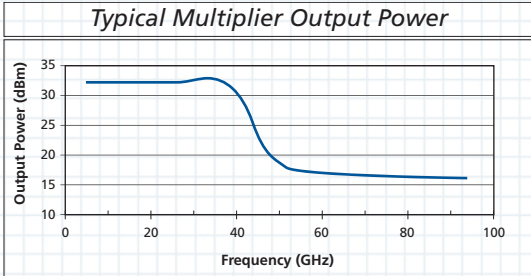
- 4 to 110 GHz output frequency capability
- Multiplication factors from X2 to X80
- Broadband models: octave plus bandwidth
- Narrowband models: 5 to 20% bandwidth
- Popular output bands (GHz): 18-26.5, 26-40, 40-60

Parameter	Unit	Doubler Active	Tripler Passive	Quadrupler Active
Input Frequency	GHz	10–20	4.5–5	6.6–10
Output Frequency	GHz	20–40	13.5–15	26–40
Input Power	dBm	+10	+15	+10
Output Power	dBm	+10	+1	+15
Harmonics	dBc	-20	-20	-15
DC Supply	V/mA	+12/240	0/0	+12/410

Options:

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

Microsemi frequency multipliers include a comprehensive line of doublers, triplers, quadruplers, 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 PHEMTs 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

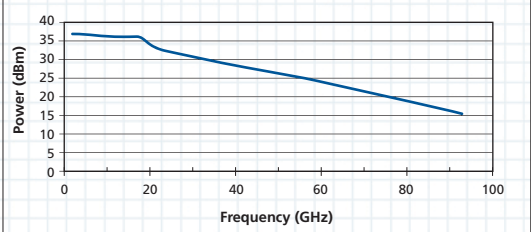
FEATURES AND SPECIFICATIONS

- 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

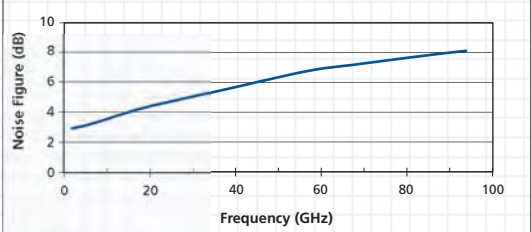
Typical converter performance

Parameter	Unit	Down-converter	Up-converter
RF Start Freq	GHz	21.2	22.4
RF Stop Freq	GHz	22.4	23.6
LO Start Freq	GHz	6.65	6.65
LO Stop Freq	GHz	7.05	7.05
IF Freq	GHz	1.25	2.45
Conversion Gain	dB	22	29
Flatness (50 MHz)	dB	± 0.25	± 0.25
Noise Figure	dB	5.5	18
Intercept Point	dBm	-7 (input)	32 (output)
Input VSWR	:1	1.92	2.0
Output VSWR	:1	1.75	1.8
LO Input Power	dBm	5	8

Up-converter Saturated Output Power



Down-converter Noise Figure Capability



Up / Down Converters



Microsemi's up/down-converter capability spans a wide range of RF & LO frequencies up through 110 GHz, with IF coverage to 20 GHz. A typical lineup for an integrated down-converter assembly includes an RF chain consisting of a low-noise amplifier (LNA), image reject filter, a mixer, and an IF output amplifier stage. Similarly, a typical up-converter lineup begins with an IF pre-amplifier and filter, a mixer, followed by an LO-reject filter and power amplifier chain on the RF output. Various LO configurations are available, and mixer options include single-balanced, double-balanced, triple-balanced, image reject, and sub-harmonic configurations. An optional phase locked source can also be integrated to provide a self-contained on-board synthesizer for generating the LO signal. The complete assemblies are housed in a compact hermetic case and configured with either coaxial or waveguide connectors.

Options:

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



Transceivers



You need a transmitter. You need a receiver. And you need them combined into a high-performance, reliable T/R module solution that makes integration into your overall system architecture a breeze. We’ve become experts in eliminating cross-talk between transmit and receive electronics—avoiding noise figure degradation due to digital logic, modulation, and control signal interference—and suppressing LO leakage that might otherwise weigh down your transmitter linearity. When you need that extra level of precision and accuracy, Microsemi will embed digital “smarts” with a micro-controller for automatic adjustment of transceiver parameters. Transceivers are our business, and they exemplify our dedication to providing truly superior integrated modules for high-frequency applications. They are delivered to your exact specifications and come in a variety of form factors.

Options:

- Integrated LO synthesizers
- Transmitter power detection (accuracy to ± 1 dB)
- Transmitter gain control options, up to 50 dB
- Receiver gain control options, up to 30 dB
- Receiver limiter protection
- Receiver signal level (RSL) monitoring
- TX to RX loopback diagnostics
- Multiple DC power & I/O options (coax, waveguide, multi-pin headers)

FEATURES AND SPECIFICATIONS

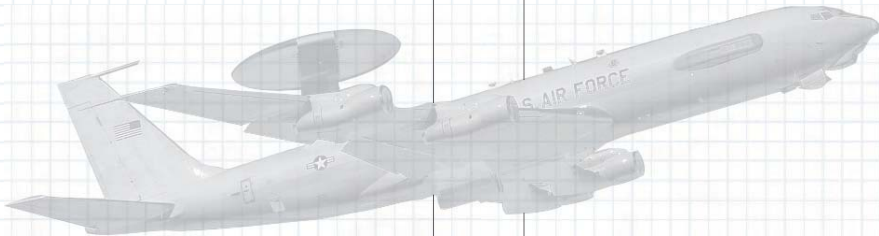
- Frequency capability up through 110 GHz
- Integrated transmit, receive, and LO circuitry
- Embedded micro-controller enables “adaptive modulation”
- LO multiplication factor, XN (N = 1 to 12)
- Receiver noise figures to 2 dB
- Transmit output power to +2W
- Linear or non-linear operation
- Low spurious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

Sample integrated transceiver specifications

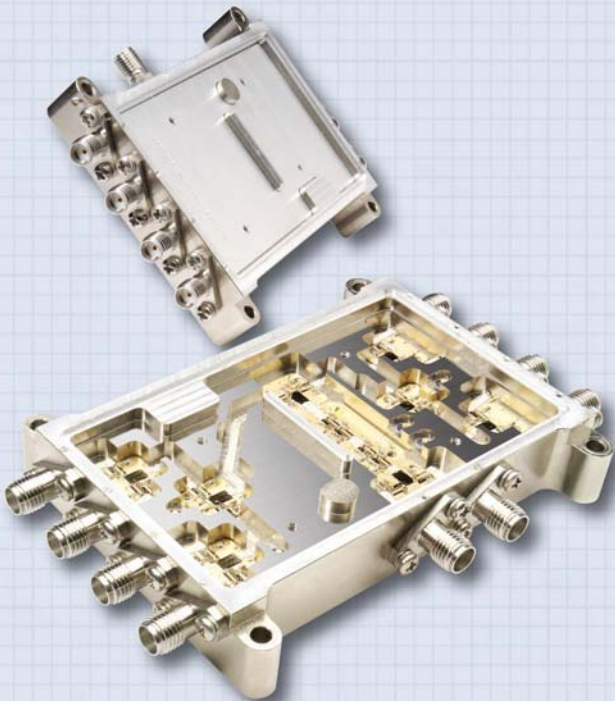
Parameter	Unit	Receiver	Transmitter
RF Frequency	GHz	K-Band	–
LO Frequency	GHz	S-Band	–
IF Frequency	dBm	L-Band	–
Rx IIP3	dBm	-35	–
Noise Figure	dB	2.6	–
Conversion Gain	dB	50	–
LO Input Power	dBm	+2	+2
Output Frequency	GHz	–	Q-Band
Input Frequency	GHz	–	S-Band
Multiplication Factor	–	–	X16
Input Power	dBm	–	0
Output Power	dBm	–	+33

Popular T/R Frequency Bands:

C-Band:	5.9 to 8.5 GHz
X-Band:	10.7 to 11.7 GHz
Ku-Band:	12.75 to 15.25 GHz
Lower K-Band:	17.7 to 19.7 GHz
Upper K-Band:	21.2 to 26.5 GHz
Lower Ka-Band:	27.5 to 33.4 GHz
Upper Ka-Band:	36 to 40 GHz
V-Band:	57 to 64 GHz
E-Band:	71 to 86 GHz
W-Band:	93 to 95 GHz



Multi-Function Assemblies



FEATURES AND SPECIFICATIONS

- Custom Microsemi designs, or build-to-print manufacturing services
- Frequency capabnility 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
  - Micro-controller based subsystems
- SMT, MMIC, 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 MFAs. Take advantage of our automation, innovation, and experience by letting us put our contract manufacturing resources to work for you.





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