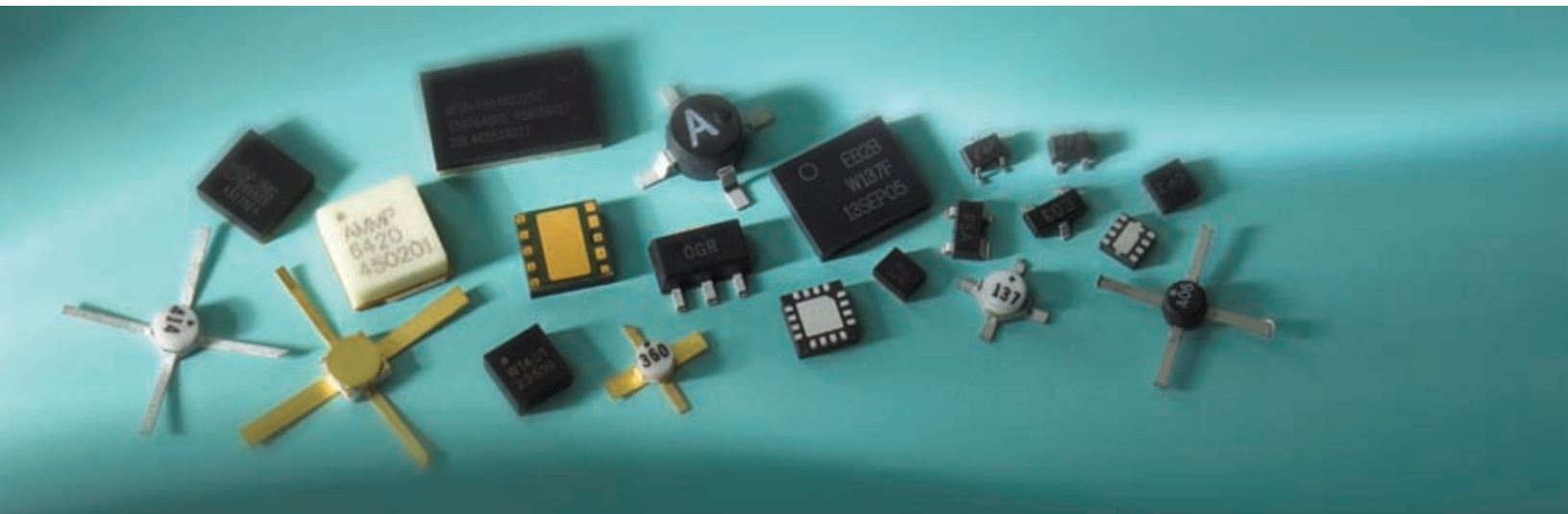


Wireless Semiconductor Solutions for RF and Microwave Communications



Selection Guide



Your Imagination, Our Innovation
Sense • Illuminate • Connect

Accelerating Progress in Wireless Communications

Mobile communications are changing the way industries and individuals manage their lives, homes, offices and businesses. Avago Technologies is leading the wireless revolution with the industry's broadest range of mobile connectivity and wireless solutions, and is the partner of choice for leading wireless manufacturers and service providers worldwide. Avago's products add value to every stage in the wireless production cycle.

RF Component Solutions



Avago Technologies' tiny RFICs have helped lead to smaller wireless products with increased battery life.

Avago Technologies' RF component innovations have been instrumental in driving the wireless revolution. Avago's Enhancement-mode pHEMT, CoolPAM™ and Film Bulk Acoustic Resonator (FBAR) technologies have set new benchmarks for battery life, size and performance. Avago pioneered the introduction of tiny RFICs, leading to the drastic reduction in end-product size that has helped the wireless market's rapid growth.

Avago combines its technology and design expertise in system, protocol and regulatory understanding drawn from three decades of microwave and RF experience. Avago can help customers meet the most demanding technical specifications and the most difficult regulatory tests around the world.

Manufacturing Technologies

- Film Bulk Acoustic Resonator
- Gallium Arsenide
 - pHEMT
 - Enhancement-Mode pHEMT
- Silicon

Product Offerings

- Filters/Duplexers
- GSM, CDMA and W-CDMA Power Amplifier Modules
- Front End Module
- RFICs
- Schottky and PIN Diodes
- Field Effect and Bipolar Transistors
- Millimeter Wave MMICs



Film Bulk Acoustic Resonator (FBAR) Filters, Duplexers and Multiplexers

One of the most important considerations in mobile handset design is size. Avago Technologies' innovative FBAR technology dramatically shrinks the size of duplexers and filters in mobile handsets.

Avago's breakthrough FBAR technology is revolutionary because it allows filters to be manufactured using low-cost silicon semiconductor processes. This enables size reduction and allows integration with other radio components.

This FBAR technology produces devices with better electrical performance than competing ceramic or SAW filters, in a miniature form factor.

Avago introduced FBAR devices based on a bonded-wafer chip-scale packaging known as "WaferCap." The FBAR filters measure only 1 x 1 x 0.3 mm, and are ideal for integration into low-cost molded chip on-board products in industry-standard and smaller footprints.

FBAR TX Full Band Filters

| Part No. | Standard | Passband | Package Size |
|-----------|---------------|---------------|--------------------|
| ACPF-7002 | UCS PCS | 1850-1910 MHz | 2.0 x 1.6 x 0.9 mm |
| ACPF-7003 | UCS PCS | 1850-1910 MHz | 2.0 x 1.6 x 0.9 mm |
| ACPF-7004 | UCS PCS (A-G) | 1850-1915 MHz | 2.0 x 1.6 x 0.9 mm |

FBAR Duplexers

| Part No. | Standard | Rx Band | Tx Band | Package Size |
|-----------|----------|---------------|---------------|----------------|
| ACMD-7402 | US PCS | 1930-1990 MHz | 1850-1910 MHz | 3.8x3.8x1.3 mm |
| ACMD-7403 | US PCS | 1930-1990 MHz | 1850-1910 MHz | 3.0x3.0x1.2 mm |
| ACMD-7602 | UMTS B1 | 2110-2170 MHz | 1920-1980 MHz | 3.0x2.5x1.2 mm |
| ACMD-7612 | UMTS B1 | 2110-2170 MHz | 1920-1980 MHz | 3.0x2.5x1.2 mm |
| ACMD-7605 | UMTS B8 | 925-960 MHz | 880-915 MHz | 3.0x3.0x1.2 mm |

FBAR Multiplexers

| Part No. | Standard | GPS Band | Cellular Rx Band | PCS Rx Band | Cellular Tx Band | PCS Tx Band | Package Size |
|-----------|-----------------------------|-------------------|------------------|---------------|------------------|---------------|----------------|
| ACFM-7102 | US PCS, Cellular, GPS | 1574.4-1576.4 MHz | 869-894 MHz | 1930-1990 MHz | 824-849 MHz | 1850-1910 MHz | 5.0x8.0x1.2 mm |
| ACFM-7103 | US PCS, Cellular, GPS | 1574.4-1576.4 MHz | 869-894 MHz | 1930-1990 MHz | 824-849 MHz | 1850-1910 MHz | 4.0x7.0x1.1 mm |
| ACFM-7104 | US PCS (A-G), Cellular, GPS | 1574.4-1576.4 MHz | 869-894 MHz | 1930-1995 MHz | 824-849 MHz | 1850-1915 MHz | 4.0x7.0x1.1 mm |

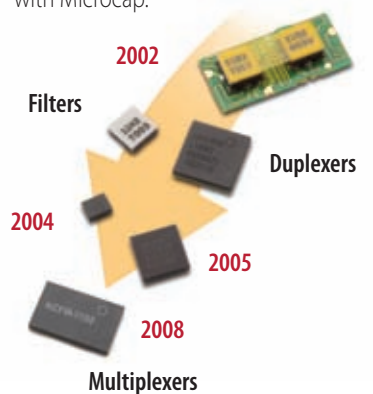
Features

- Steep roll-off
- Low insertion loss
- Bulk Structure
- Low temperature coefficient
- Broad frequency range (400 MHz to 10 GHz)

Benefits

- High close-in rejection
- Extended battery life; network efficiency
- Reliable high power handling
- Can be co-located with "hot" PAs and ICs
- Can support multiple standards

Avago Technologies created a new filter technology with FBAR, and made it even smaller for integration with Microcap.



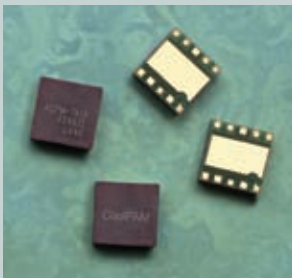
FBAR – the de facto standard for USPCS Duplexers

Power Amplifier Modules

Battery life is one of the most important issues facing designers of next-generation mobile handsets. Not only is it inconvenient to frequently recharge the battery, but lower power consumption also gives the designer flexibility to add more features.

Avago Technologies has over 15 years of design and manufacturing expertise in power products, resulting in smaller size and higher performance. Avago offers power amplifier modules for CDMA and W-CDMA applications, and is a high volume manufacturer of custom-designed GSM power amplifiers.

The power amplifier in a phone uses more power than any other component. Avago has developed a technology called Enhancement mode-pseudomorphic High Electron Mobility Transistor (E-pHEMT) to address this issue.



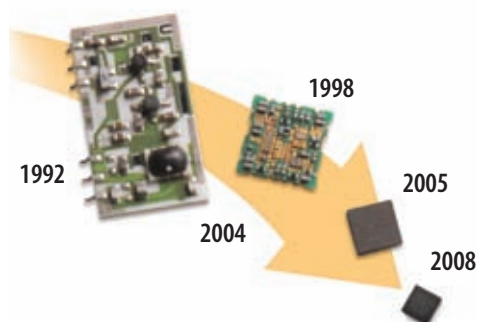
Avago Technologies' CoolPAM and E-pHEMT power amplifiers offer the industry's best power-added efficiency.

Avago's E-pHEMT power amplifiers offer the industry's best power-added efficiency (the measure of how much power is needed to achieve a given amount of amplification). They can yield as much as 15 percent more battery life than competing products, and have resulted in an increase in talk time of 45 minutes in some handsets. Avago's patented CoolPAM power amplifier circuit technology also reduces battery power consumption and allows for CDMA and W-CDMA handsets to run cooler.

Front End Modules

Avago has combined its industry-leading FBAR, E-pHEMT and CoolPAM technologies to offer a front-end module (FEM) solution. Our FEM solution offers the benefits of both FBAR and E-pHEMT, and provides the important benefit of optimized integration between the two devices. This means that designers get their products to market faster and with less risk, and enjoy maximized performance based on Avago's expert device matching.

Avago Technologies has more than 15 years of design and manufacturing expertise in power products resulting in smaller size and higher performance.



Typical Power-Added Efficiency Performance by Process

| Process Technology | CDMA 800/1900 MHz | W-CDMA | GSM 900/1800/1900 MHz |
|--------------------|-------------------|--------|-----------------------|
| Silicon | 25% | NA | 48% / 40% |
| E-pHEMT | 42% | 46% | 60% / 56% / 56%* |
| GaAs HBT | 38% | 40% | 55% / 52% / 52% |
| InGaP HBT | 40% | 40% | 55% / 50% / 50% |

Notes: * Tested at 25% duty cycle.

CDMA/W-CDMA Power Amplifiers

| Features | Benefits |
|-------------------------------------|--|
| High PAE | Longer battery life |
| Low Idq with single control voltage | Longer battery life, ease of system design |
| Superior low-voltage operation | Better performance in voltage-limited environments |
| Small size package | Ease of layout |
| Few external SMT components | Ease of layout, lower cost |
| Worldwide applications support | Faster response to questions |

CDMA Power Amplifier Modules

| Part No. | Standard | Frequency | Package Size | PAE |
|-----------|-----------|---------------|--------------------|-------|
| ACPM-7813 | CDMA/AMPS | 824-849 MHz | 4mm x 4mm x 1.1 mm | 40% |
| ACPM-7821 | JCDMA | 898-925 MHz | 4mm x 4mm x 1.1 mm | 41.2% |
| WS1102 | CDMA/AMPS | 824-849 MHz | 3mm x 3mm x 1.4 mm | 40% |
| ACPM-7833 | US PCS | 1850-1910 MHz | 4mm x 4mm x 1.1 mm | 40% |

W-CDMA Power Amplifier Modules

| Part No. | Standard | Frequency | Package Size | PAE |
|-----------|-----------------|------------------------------|--------------------|-------|
| WS2111 | UMTS Band V | 824-849 MHz | 4mm x 4mm x 1.4 mm | 37% |
| WS2411 | UMTS Band II | 1850-1910 MHz | 4mm x 4mm x 1.4 mm | 41.5% |
| WS2512 | UMTS Band I | 1920-1980 MHz | 4mm x 4mm x 1.4 mm | 37% |
| ACPM-7311 | UMTS Band V | 824-849 MHz | 4mm x 4mm x 1.1 mm | 40.3% |
| ACPM-7331 | UMTS Band II | 1850-1910 MHz | 4mm x 4mm x 1.1 mm | 33.2% |
| ACPM-7381 | UMTS Band I | 1920-1980 MHz | 4mm x 4mm x 1.1 mm | 39.8% |
| ACPM-7391 | UMTS Band IV/IX | 1710-1755 MHz / 1750-1785MHz | 4mm x 4mm x 1.1 mm | 40.3% |
| ACPM-7881 | UMTS Band I | 1920-1980 MHz | 4mm x 4mm x 1.1 mm | 46% |

W-CDMA Front End Module

| Part No. | Standard | Frequency | Package Size | RF Performance |
|-----------|-------------|--|--------------------|--|
| AFEM-7780 | UMTS Band I | TX: 1920-1980 MHz RX: 2110-2170 MHz | 4mm x 7mm x 1.1 mm | 340mA typ @ $P_{out}=24.5dBm$ RxIL: 2.5dB max |

Products for Multiple Applications

In addition to products designed specifically for wireless handsets, wireless LANs and base stations, Avago offers a wide range of RF and microwave products for wireless data, WLL, Radio links and Fiber Optics (OC-192 and OC-768 systems) and other applications ranging from DC to 50 GHz

and beyond. Avago’s discrete and RFIC products leverage high-volume manufacturing, extensive R&D resources and worldwide distribution networks to provide affordable, high-performance solutions.

RF and Microwave Product Selection Guide

| Market | Application | Product | Key Differentiator |
|----------------------|--|---------------------------------------|--|
| 2.4 GHz Systems | Detector | HSMS-282x family | Price performance |
| | | HMPS-282x family | Ultra small size |
| | | HSMS-285x family | Zero Bias detector |
| | PA | MGA-22003 | High Linear Output Power, Low Current |
| | | MGA-412P8 | Low Current, High Linearity Output Power, Small Package |
| | | MGA-545P8 | High Output Power, Low Current, Low Cost |
| | | MGA-83563 | Easy to use RFIC |
| | | MGA-82563 | Easy to use RFIC |
| | Driver AMP | MGA-81563 | Easy to use RFIC |
| | LNA | MGA-21108 | Broadband 1.5 - 8.0 GHz LNA, 2.5 x 2.5 x 0.55 mm package |
| | | MGA-85563 | Easy to use RFIC |
| | | MGA-87563 | Easy to use RFIC, Very Low Current |
| | | MGA-665P8 | Easy to use RFIC |
| | Dual Band LNA | ATF-551xx family | Single Voltage E-pHEMT, Low Noise |
| | Dual Band LNA | ALM-2812 | 2.4 GHz & 5 - 6 GHz Dual Band LNA |
| LNA with bypass | MGA-645T6 | LNA with bypass switch | |
| | MGA-71543 | LNA with bypass | |
| Switch | HSMP-386x/389x families | Price-performance | |
| LO Buffer | HMPP-386x/389x families | Ultra small size | |
| | ABA-5x563 family | High Gain, Flat Broadband, High Power | |
| Downconverter | MGA-85563 | Easy to use RFIC | |
| IAM-91563 | Easy to use RFIC | | |
| 5-6 GHz Systems | Detector | HSMS-285x family | Zero Bias detector |
| | | HSMS-286x family | High frequency performance |
| | PA | MGA-25203 | High Linear Output Power, Low Current |
| | | MGA-545P8 | High Output Power, Low Current, Low Cost |
| | | MGA-82563 | Easy to use RFIC |
| | | ATF-541xx family | Single Voltage E-pHEMT Power Efficient 3V Device, Low Noise, High Linearity, High P1dB |
| | Driver AMP | MGA-81563 | Easy to use RFIC |
| | | ATF-541xx family | Single Voltage E-pHEMT Power Efficient 3V Device, Low Noise, High Linearity, High P1dB |
| | LNA | MGA-21108 | Broadband 1.5 - 8.0 GHz LNA, 2.5 x 2.5 x 0.55 mm package |
| | | MGA-85563 | 3V Device, Low Noise, High Gain |
| | | MGA-86563 | Very High Gain |
| | | ATF-551xx family | Single Voltage E-pHEMT, Low Noise |
| | Dual Band LNA | MGA-675T6 | 5 - 6 GHz LNA in Thin Package |
| | Dual Band LNA | MGA-665P8 | Easy to use RFIC |
| | Downconverter | ALM-2812 | 2.4 GHz & 5 - 6 GHz Dual Band LNA |
| Downconverter | IAM-91563 | Easy to use RFIC | |
| Switch | HSMP-389x family | Price-performance | |
| LO Buffer | HMPP-389x family | Ultra small size | |
| | MGA-81563 | Easy to use RFIC | |
| MGA-545P8 | High Output Power, Low Current, Low Cost | | |
| Microwave Links | LNA | AMMC/P-62xx | Flexibility LNA or driver, Package |
| | | AMMC-5023 | Flexibility LNA or driver |
| | Switch | AMMC-2008 | Broadband performance |
| | | AMMC-3040/3041 | Performance |
| | Mixer | AMMC/P-6530 | Image Reject / Package |
| | | AMMP-6545/6546 | Sub-Harmonic Mixer |
| | | AMMC-6550 | Image Reject |
| | | AMMP-6522 | Image Reject Mixer + LNA |
| | | AMMP-6532 | Image Reject Mixer + LNA |
| | Wideband PA | AMMC/P-5024/5026 | Broadband Performance / Package |
| | PA/ Driver AMP | AMMC/P-5618 | Performance / Price / Package |
| | | AMMC/P-5620 | Performance / Price / Package |
| | | AMMC-5040 | Performance / Price |
| | | AMMC/P-6333 | Performance |
| | | AMMC-6345 | Performance / Price |
| AMMC/P 6408 | | Performance / 1W PA / Package | |
| AMMC/P-64xx | | Performance / 1W PA / Package | |
| AMMP-6441 | | 36-40GHz, 1/2W PA / Package | |
| AMMC-5033 | | Performance / Price | |
| Attenuator | AMMC/P-66xx | Broadband Performance / Package | |
| Frequency Multiplier | AMMC/P-6120 | Performance / Price / Package | |
| | AMMC-6140 | Performance / Price | |

RF and Microwave Product Selection Guide

| Market | Application | Product | Key Differentiator |
|---|---|---|--|
| Handsets | Detector | HSMS-282x family | Price-performance |
| | | HSMS-282x family | Ultra small size |
| | | HSMS-285x family | Zero Bias detector |
| | Switch | HSMP-389x family | Price-performance |
| | | HMP-389x family | Ultra small size |
| | | HSMP-386x family | Low harmonics |
| | LNA | HMP-386x family | Ultra small size |
| | | ALM-1106 | GPS LNA Module |
| | | ALM-1412 | GPS LNA with integrated FBAR Filter, miniature 3.3 x 2.1 x 1.1 mm package |
| | | ALM-1612 | High gain GPS LNA with integrated FBAR Filter, 3.3 x 2.1 x 1.0 mm package |
| | | ALM-1712 | GPS LNA with pre & post FBAR Filters, 4.5 x 2.2 x 1.0 mm package |
| | | ALM-1812 | High gain GPS LNA with pre & post FBAR Filters, 4.5 x 2.2 x 1.0 mm package |
| | | ALM-2412 (Halogen Free) | GPS LNA with integrated FBAR Filter, 3.3 x 2.1 x 1.1 mm package |
| | | ALM-2506 (Halogen Free) | GPS LNA Module, 2.0 x 2.0 x 1.1 mm package |
| | | ATF-551xx family | Single voltage E-pHEMT, low noise |
| | | MGA-21108 | Broadband 1.5-8.0 GHz LNA, 2.5 x 2.5 x 0.55 mm package |
| | | MGA-231T6 | High gain GPS LNA in thin package, 2.0 x 1.3 x 0.4 mm package |
| | | MGA-635T6 | Thin package GPS LNA |
| | | MGA-645T6, MGA-655T6 | WiFi, WiBro, WiMAX LNA with bypass switch |
| | | MGA-675T6 | WiFi 5 - 6GHz LNA |
| | | MGA-685T6 | 0.1 - 1.5 GHz Thin Package LNA |
| | MGA-725xx family, MGA-785T6 | 0.1 - 1.5GHz LNA with bypass | |
| | Driver AMP | ATF-541xx family | Single voltage E-pHEMT, low noise, high linearity |
| | | MGA-81563 | Easy to use RFC |
| | CDMA 800 (Cell/AMPS) Power Module | ACPM-7813 | Superior low voltage operation, high PAE |
| | CDMA 1900 (PCS) Power Module | WS1102 | Small (3 x 3 x 1.4 mm), high PAE |
| | | ACPM-7833 | Superior low voltage operation, high PAE |
| | CDMA 1900 (PCS) TX Filter | ACPF-7002 | Small (1.6 x 2 x 0.9 mm), high performance, fullband operation |
| | | ACPF-7003 | Small (1.6 x 2 x 0.9 mm), high performance, fullband operation |
| | W-CDMA UMTS Band V (UMTS) Power Module | WS2111 | Premium PAE and linearity, low quiescent current, small (4 x 4 x 1.4 mm) |
| | W-CDMA UMTS Band II (UMTS) Power Module | WS2411 | Premium PAE and linearity, low quiescent current, small (4 x 4 x 1.4 mm) |
| | W-CDMA UMTS Band I (UMTS) Power Module | WS2512 | Premium PAE and linearity, low quiescent current, small (4 x 4 x 1.4 mm) |
| | WiMAX 3.3 - 3.8GHz Power Amplifier | ACPM-7881 | Premium PAE and linearity, low quiescent current, small (4 x 4 x 1.1 mm) |
| WiMAX, WiBro 2.3 - 2.7GHz Power Amplifier | ALM-42316 | 3.3V WiMAX PA | |
| | ALM-42216 | 3.3V WiMAX, WiBro PA | |
| CDMA 1900 (PCS) Duplexer | ACMD-7402 | Ultra small (3.8 x 3.8 x 1.3mm) excellent power handling | |
| Detector | HSMS-282x family | Price-performance | |
| | HSMP-389x family | Price-performance | |
| | ALM-40220 | High Power SPDT switch for TD-SCDMA | |
| Switch | ALM-31x22 | 1 Watt High Linearity Amp | |
| | ALM-32x20 | 2 Watt High Linearity Amp | |
| | ATF-5x1P8 family | Single voltage E-pHEMT, low noise, high linearity, high power | |
| | MGA-13516 | 2-Stage LNA | |
| | MGA-14516 | 2-Stage LNA | |
| | MGA-30x16 | 1/2 Watt High Linearity Amp | |
| | MGA-30489 | High linearity 0.25W driver amplifier | |
| | MGA-30689 | Broadband high linearity and flat gain 0.25W Gain Block | |
| | MGA-545P8 | High output power, low current, low cost | |
| | MGA-53543 | High linearity, low cost | |
| | MGA-52543 | High linearity, low cost | |
| | MGA-61563 | Smart Bias RF AMP | |
| MGA-81563 | Easy to use RFC | | |
| MGA-82563 | Easy to use RFC | | |
| IF AMP | ABA-5x563 family | High gain, flat broadband, high power | |
| | ADA-4x43 family | Price-performance | |
| | ADA-4789 | Price-performance, industry standard SOT-89 package | |
| | MGA-30689 | Broadband high linearity and flat gain 0.25W Gain Block | |
| Multi-carrier PA | MGA-62563 | Smart Bias IF AMP | |
| | ATF-5x1P8 family | Single Voltage E-pHEMT, low noise, high linearity | |
| Tower Mounted LNA | MGA-30489 | High linearity 0.25W driver amplifier | |
| | ALM-1222 | Fully integrated (50ohm) balanced amplifier module, ultra low noise, high linearity | |
| | ALM-1322 | Fully integrated (50ohm) balanced amplifier module, ultra low noise, low current | |
| | ALM-31x22 | 1 Watt High Linearity Amp | |
| | ALM-32x20 | 2 Watt High Linearity Amp | |
| | ATF-541xx family | Single Voltage E-pHEMT, low noise, high linearity | |
| | ATF-5x1P8 family | Single Voltage E-pHEMT, low noise, high linearity | |
| | MGA-12516 | Balanced LNA | |
| | MGA-16516, 17516 | Ultra low noise balanced LNA | |
| | MGA-30x16 | 1/2 Watt High Linearity Amp | |
| Radio Card LNA | ALM-31x22 | 1 Watt High Linearity Amp | |
| | ALM-32x20 | 2 Watt High Linearity Amp | |
| | ATF-5x1P8 family | Single Voltage E-pHEMT, low noise, high linearity | |
| | MGA-12516 | Balanced LNA | |
| | MGA-13516 | 2-Stage LNA | |
| | MGA-14516 | 2-Stage LNA | |
| | MGA-16516, 17516 | Ultra low noise balanced LNA | |
| | MGA-30x16 | 1/2 Watt High Linearity Amp | |
| | MGA-53543 | High linearity, low cost | |
| | MGA-52543 | High linearity, low cost | |
| Variable Attenuator | MGA-63xP8 family | Integrated active bias circuit | |
| | ALM-38140 | Broadband variable attenuator module | |
| Variable Gain Amplifier | HSMP-381x family | Very Low Distortion/Harmonics | |
| | HSMP-386x family | Low Harmonics | |
| LO Buffer | ALM-80110, 80210 | High dynamic range 0.25W VGA | |
| | ABA-5x563 family | High gain, flat broadband, high power | |
| | ADA-4x43 family | Price-performance | |
| | ADA-4789 | Price-performance, industry standard SOT-89 package | |
| Mixer | MGA-545P8 | High output power, low current, low cost | |
| | MGA-52543 | High linearity, low cost | |
| | IAM-9x516 family | High linearity, low cost | |
| Discretes | AT-320xx | Price-performance | |
| | VMMK-1225 | Ultra small package, performance | |
| | VMMK-1218 | Ultra small package, performance | |

About Avago Technologies

Avago Technologies is a leading supplier of analog interface components for communications, industrial and consumer applications. By leveraging its core competencies in III-V compound and silicon semiconductor design and processing, the company provides an extensive range of analog, mixed signal and optoelectronics components and subsystems to more than 40,000 customers. Backed by strong customer service support, the company's products serve four diverse end markets: industrial and automotive, wired infrastructure, wireless communications, and computer peripherals. Avago has a global employee presence and heritage of technical innovation dating back 40 years to its Hewlett-Packard roots. Information about Avago is available on the Web at www.avagotech.com

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