HMC ADDS SiGe & InGaP HBT GAIN BLOCK AMPLIFIERS!

Standard SOT89 Packaging, Competitive Price & Performance to 6 GHz

Hittite announces the release of three new SiGe and InGaP HBT Gain Block MMIC Amplifiers which are ideal for wireless infrastructure/handhelds, test equipment, microwave radio and military COTS applications from DC to 6 GHz. Two of these products, HMC479ST89 and HMC481ST89, are SOT89 packaged versions of two SiGe Gain Blocks released by Hittite in “micro-X” (MP86) plastic packages last October. The HMC311ST89 is a SOT89 version of the HMC311LP3 3x3mm QFN packaged GaAs InGaP Gain Block previously released. SOT89 packaged Gain Blocks from Hittite provide RF/microwave system designers with a quality choice to existing competitor products.

The HMC311ST89, HMC479ST89 and HMC481ST89 are fabricated on a volume production, qualified GaAs InGaP and SiGe HBT processes. The industry standard SOT89 is an easy to use, reliable package for linear gain block amplifiers. Like their “micro-X” (MP86) and QFN (LP3) counterparts, these new +5 to +12V gain blocks are cascadable, require no external matching and use a minimal number of DC components.

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2004 DESIGNER’S GUIDE RELEASED!

New Catalog Details Over 250 RFIC/MMIC Products

New for Q1 2004, Hittite’s 9th edition Designer’s Guide catalog includes 54 new RFIC and MMIC product data sheets, as well as quality/reliability, application and packaging/layout information on over 1900 pages. New features for 2004 include 10 new product & application notes making this guide an essential reference for RF/Microwave Design Engineers. The guide is conveniently organized into SMT packaged and chip component sections. Full specifications are provided for over 250 components including: Power & Linear Amplifiers, Gain Blocks, LNAs, Attenuators, Frequency Dividers/Multipliers, Mixers, Modulators, Switches, and VCOs. These components are well-suited to a wide variety of Cellular, Broadband, Microwave/Millimeterwave, Fiber Optic and Military/Space applications. The 2004 Designer’s Guide is also available on CD-ROM. To request your hardcopy or CD-ROM catalog visit us on-line at www.hittite.com and select the “Submit Inquiry” button.

NEW PARAMETRIC PRODUCT SEARCH TOOL RELEASED!

Match Your Requirements to Specify HMC Components

Hittite Microwave Corporation introduces a new parametric product search tool specifically designed for the RF engineer. This new web tool allows the design engineer to specify the important parameters of the required product and view the three Hittite products that come closest to their requirement in a specification-compliance format. Unlike conventional search engines which eliminate products that narrowly fall outside of specification, the parametric product search tool can show these products thereby allowing the engineer to make intelligent design tradeoff decisions.

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HMC490

**+26 dBm Medium Power LNA, 12 - 17 GHz**

*Delivers Power with Little Noise!*

The HMC490 is a high dynamic range GaAs PHEMT MMIC Low Noise Amplifier which operates between 12 and 17 GHz. The HMC490 provides 27 dB of gain, 2 dB noise figure and an output IP3 of 35 dBm from a +5.0V supply voltage. The amplifier chip can easily be integrated into Multi-Chip-Modules (MCMs) due to its small size. All data is measured with the chip in a 50 Ohm test fixture connected via 0.025mm (1 mil) diameter wire bonds of minimal length 0.31mm (12 mils).

**Features**
- 2 dB Noise Figure
- +26 dBm P1dB
- 27 dB Gain
- +35 dBm Output IP3
- +5V Supply Voltage
- 50 Ohm Matched I/O’s

HMC498

**+27 dBm Power Amplifier, 17 - 24 GHz**

*Combines High Gain & Linearity!*

The HMC498 is a high dynamic range GaAs PHEMT MMIC Power Amplifier which operates between 17 and 24 GHz. The HMC498 provides 24 dB of gain, +27 dBm of saturated power and 25% PAE from a +5.0V supply voltage. The HMC498 amplifier can easily be integrated into Multi-Chip-Modules (MCMs) due to its small size. All data is measured with the chip in a 50 Ohm test fixture connected via 0.025mm (1 mil) diameter wire bonds of minimal length 0.31mm (12 mils).

**Features**
- +34 dBm Output IP3
- 24 dB Gain
- Saturated Power: +27 dBm @ 25% PAE
- +5V Supply Voltage
- 50 Ohm Matched I/O’s

HMC499

**+24 dBm Medium Power Amplifier, 21 - 32 GHz**

*Efficient mmWave Power!*

The HMC499 is a high dynamic range GaAs PHEMT MMIC Medium Power Amplifier which operates between 21 and 32 GHz. The HMC499 provides 16 dB of gain, and an output power of +24 dBm at 1 dB compression from a +5.0V supply voltage. The HMC499 amplifier can easily be integrated into Multi-Chip-Modules (MCMs) due to its small size. All data is measured with the chip in a 50 Ohm test fixture connected via 0.025mm (1 mil) diameter wire bonds of minimal length 0.31mm (12 mils).
LOW NOISE FREQUENCY MULTIPLIERS & DIVIDERS

HMC368LP4

GaAs PHEMT Amp – Doubler – Amp, 9 - 16 GHz Fout

Features
+15 dBm Output Power
0 to +10 dBm Wide Input Power Range
100 kHz SSB Phase Noise: -140 dBc/Hz
+5V @ 75 mA Supply

Drives Mixers Directly!
The HMC368LP4 is a miniature amp-doubler-amp utilizing GaAs PHEMT technology in a 4 mm x 4 mm leadless surface mount package. When driven by a +2 dBm signal, the multiplier provides +15 dBm typical output power from 9 to 16 GHz. The Fo and the 3Fo isolations are 18 dB typical. The low additive SSB phase noise of -140 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance. The HMC368LP4 is ideal for use in LO multiplier chains allowing reduced parts count vs. traditional approaches.

HMC369LP3

GaAs HBT x2 Active Multiplier, 9.9 - 12.7 GHz Fout

Features
+4 dBm Output Power
30 dBc Sub-Harmonic Suppression
100 kHz SSB Phase Noise: -142 dBc/Hz
+5V @ 46 mA Supply

OC192 Clock Recovery!
The HMC369LP3 is an active miniature InGaP HBT x2 frequency multiplier in a 3 x 3mm leadless QFN SMT package. Power output is +4 dBm typical from a single +5V supply and varies little vs. input power, temperature and supply voltage. Suppression of undesired fundamental and sub-harmonics is 30 dBc typical with respect to output signal level. The low additive 100kHz SSB phase noise of -142 dBc/Hz helps the user maintain good system noise performance. The HMC369LP3 is ideal for use in LO multiplier chains and OC-192 clock recovery, allowing reduced parts count versus traditional approaches.

HMC426MS8

SiGe HBT Divide-by-4 Prescaler, DC - 4 GHz

Features
+3.5 dBm Output Power
Wide Input Power Range: -15 to +10 dBm
Ultra Low SSB Phase Noise: -146 dBc/Hz
+3V @ 13 mA
Single DC Supply

Low Noise, Low Current & Low Cost!
The HMC426MS8 is a low noise Divide-by-4 Static Divider utilizing SiGe technology in an 8 lead surface mount plastic package. This device operates from DC (with a square wave input) to 4.0 GHz input frequency while operating from a single +3V supply at only 13 mA. The low additive SSB phase noise of -146 dBc/Hz at 100 kHz offset helps the user maintain excellent system noise performance.
MIXERS, VCOs & SWITCHES FOR BROADBAND

HMC340LP5  Configurable I/Q Mixer or IRM, 1.7 - 4.5 GHz

Features
- L-R Isolation, 45 dB
- Input IP3, +20 dBm
- Conv. Gain Balance, 0.1 dB
- 5x5 mm QFN Package
- Ideal for Fixed Wireless/WLL

Versatile, Broadband Dual Mixer!
The HMC340LP5 is a double-balanced dual mixer covering 1.7 - 4.5 GHz RF/LO range. This passive MMIC mixer is constructed of GaAs Schottky diodes and on-chip baluns. The device can be used as an upconverter, downconverter, biphase (de)modulator, or phase comparator. The mixer symmetry of the HMC340LP5 also makes it an ideal candidate for single sideband or image rejection applications. A low cost, leadless 5x5 mm QFN surface mount package (LP5) houses the dual MMIC mixer IC.

HMC386LP4 & HMC416LP4  MMIC VCOs for Fixed Wireless/WLL Cover 2.6 to 3 GHz

Features
- Low Phase Noise
- +5 dBm Output Power
- Single +3V Bias
- Standard Pinout
- 4x4 mm QFN Package
- Ideal for Fixed Wireless/WLL

No External Components Required!
Introducing two new SMT packaged MMIC VCOs with integrated buffer amplifiers that complement HMC’s existing line of monolithic VCOs by filling the frequency bands between 2.6 to 3 GHz. The HMC386LP4 covers 2.6 to 2.8 GHz while the HMC416LP4 covers 2.75 to 3 GHz. Both operate from a single +3V supply and integrate the varactor, negative resistance circuit, resonator & buffer amplifier on a single HBT MMIC. A standard 3x3 mm (LP3) QFN SMT plastic package houses the ICs. Hittite also offers custom designed MMIC VCOs, PLOs & complete synthesizer modules for specific customer requirements.

HMC232LP4  High Isolation GaAs SPDT Switch, DC - 12 GHz

Features
- Isolation: 60 dB @ 3 GHz
- 52 dB @ 6 GHz
- +27 dBm Input P1dB
- Insertion Loss: 1.5 dB Typ. @ 6 GHz
- Non-Reflective Design

Excellent For Instrumentation!
The HMC232LP4 is a broadband high isolation non-reflective GaAs MESFET SPDT switch in a leadless 3x3 mm QFN surface mount plastic package. Covering DC to 12 GHz, the switch features >60 dB isolation up to 3 GHz and >42 dB isolation up to 12 GHz. Input P1dB compression is +27 dBm typical, while input IP3 is +50 dBm. The switch operates using complementary negative control voltage logic lines of -5/0V and requires no bias supply.
**HMC308**

**Improved Amplifier Offers Extended Performance, 0.8 - 3.8 GHz**

**Features**
- Gain: 18 dB
- P1dB Output Power: +17 dBm @ +5V
- Single Supply: +3V or +5V
- No External Components
- SOT26 Package, 9 mm²

Low Cost 50 Ohm Driver!

Hittite has improved the HMC308 and extended the bandwidth from 1.3 - 3.0 GHz to 0.8 - 3.8 GHz. The surface mount SOT26 amplifier can be used as a broadband amplifier stage or used with external matching for optimized narrow band applications. With Vdd biased at +5V, the HMC308 offers 18 dB of gain and +20 dBm of saturated output power while requiring only 53 mA of current. This product is ideal as a driver amplifier for transmitters or for use as a local oscillator (LO) amplifier to increase drive levels for passive mixers.

**HMC473MS8**

**+3.3V GaAs MMIC Voltage Variable Attenuator, 0.45 - 2.2 GHz**

**Features**
- 0 to +3V Control
- High Attenuation Range: 48 dB @ 0.9 GHz
- High Input IP3: +20 dBm Any State
- Replaces HMC173MS8

Covers All Cellular / 3G Bands!

The HMC473MS8 is an absorptive VVA in an 8-lead MSOP package. The device operates with a +3.3V supply voltage and a 0 to +3V control voltage. Unique features include a high dynamic attenuation range of up to 48 dB and excellent power handling performance of +15 dBm through all attenuation states. The HMC473MS8 is ideal for operation in wireless applications from 0.45 to 2.2 GHz. Operation from 1.7 to 2.2 GHz is possible with a reduced maximum attenuation of 29 to 32 dB.

**HMC484MS8G**

**10 Watt Transmit /Receive PHEMT Switch, DC - 3 GHz**

**Features**
- High RF Power Handling: > +40 dBm
- High Third Order Intercept: > +70 dBm
- Single Positive Supply: +3 to +10 Vdc
- Low Insertion Loss: 0.4 to 0.6 dB

Rugged, Compact & +V Bias!

The HMC484MS8G is a low-cost SPDT switch in an 8-lead MSOPG package for use in transmit-receive applications which require very low distortion at high input signal power levels, through 10 watts (+40 dBm). The device can control signals from DC to 3.0 GHz. The design provides exceptional intermodulation performance; > +70 dBm third order intercept at +5 volt bias. RF1 and RF2 are reflective shorts when “OFF”. On-chip circuitry allows single positive supply operation from +3 Vdc to +10 Vdc at very low DC current with control inputs compatible with CMOS and most TTL logic families.
Table 1 summarizes the typical performance of the three new gain blocks. Across the product line small signal gain ranges from 15 to 20 dB at 1 GHz and 13 to 17 dB at 2 GHz. Output P1dB performance ranges from -15 to +20 dBm at frequencies less than 2.4 GHz and +12 to +15 dBm above 2.4 GHz. Output third order intercepts as high as +34 dBm are offered. Both return loss and reverse isolation are excellent over each amplifier’s working bandwidth.

Hittite’s HBT gain block products are based upon a Darlington feedback pair topology which results in a broad gain versus frequency response and reduced sensitivity to process variations. As shown in Figure 1, the amplifiers operate from a single positive supply voltage (Vs), ranging from +5 to +12V, applied through a series resistor (Rbias) and RF bias choke (L1) connected to the RF output. The value of this choke is dependent on the frequency of operation. Depending on the supply voltage (Vs) available to the designer, the series resistor value is chosen from a data sheet table. The use of a resistor in series with the supply voltage (Vs) reduces the voltage to the device as the temperature rises. This technique counteracts the inherent positive temperature coefficient of the device collector current and results in consistent and reliable amplifier performance over temperature.

The HMC311ST89, HMC479ST89 and HMC481ST89 InGaP and SiGe Gain Blocks are ideal for applications as driver amplifiers, IF gain blocks, high IP3 receive chain amplifiers and LO buffer amplifiers to drive Hittite Mixers. They are form, fit and functional replacements for competitor SOT89 packaged gain block amplifiers.

Data sheets are available at www.hittite.com and list guaranteed min/max limits for key parameters such as gain and P1dB through their complete frequency ranges up to 6000 MHz. These new MMIC Gain Blocks are available from stock for sampling or sale.
Hittite Microwave has opened a fifth international sales office, Hittite Microwave CO. Ltd. located in Beijing, P.R.C.. This office will increase Hittite’s presence to better serve our expanding customer base in Northern China.

Mr. Caper Cao (Cao Li) is Hittite’s District Sales Manager for Northern China based in Beijing. He has design, applications and sales experience in the wireless telecommunication system and components industry. He reports to Mr. Hualiang Xiong, China Country Manager, who is located in the Hittite Shanghai, China office.

The new HMC office will support sales and application engineering inquiries both directly and through Hittite’s China and Hong Kong representative Wai Tat Electronics, Ltd. Mr. Cao can be contacted at (+86-10) -8775 6717 phone, (+86-10) -8775 6899 fax or by email: china@hittite.com.

Hittite Microwave Adds Two New International Representatives

Saint Technology will support Hittite’s expanding customer base in Japan

Saint Technology Corp. headquartered in Tokyo, Japan, was established in 1998 to act as a specialist Japanese representative for electronic component manufacturers and provide the best technical solution for targeted application market areas.

Saint will support Hittite’s direct sales channel in Japan by focusing promotion on a select group of key customers and supplementing Hittite’s current representative, SEKI Technotron. Saint’s experience, product knowledge and reputation make them an exceptional addition to Hittite’s network of representatives. Saint Technology can be contacted via telephone at +81-3-3820-1716, via fax at +81-3-5330-6411, via email at info@saint-tec.co.jp.

MRC will support Hittite’s expanding customer base in Northern Germany

MRC Components OHG, headquartered in Freising, Germany, was established in 1997 to act as a specialist European representative for electronic component manufacturers from the USA and Far East. MRC will supplement Hittite’s direct sales channel in Germany by focusing their efforts on customers located in Northern Germany. Hittite Microwave Deutschland GmbH will focus on servicing customers in Southern Germany, Austria and Switzerland. MRC’s experience, product knowledge and reputation make them an exceptional addition to Hittite’s network of representatives. MRC can be contacted via telephone at +49-8161-9848-14, via fax at +49-8161-9848-20 or email at info@mrccomponents.de.
What We Do

Hittite Microwave Corporation is an innovative designer and manufacturer of analog/digital ICs and MIC module assemblies for RF and microwave applications covering DC to 110 GHz. Hittite’s RFIC/MMIC products are developed using state-of-the-art GaAs, InGaP/GaAs, InP, SOI and SiGe semiconductor processes utilizing MESFET, PHEMT, MHEMT and HBT devices. Our products include:

- Power Amplifiers
- Attenuators
- Mixers
- VCOs
- Gain Blocks
- Phase Shifters
- Converters
- Dividers/Detectors
- Driver Amplifiers
- Switches
- IRMs
- Multipliers
- LNAs
- Transceivers
- Modulators
- PLOs / PLLs

We also design and supply highly integrated custom ICs, MCMs and sub-assembly hybrids that combine multiple functions for specific requirements. We select the most appropriate semiconductor and package technologies, uniquely balancing digital and RF integration techniques, to produce a product that is easy and cost effective for our customers to use.

Our custom and standard products support a wide range of wireless and wired communications applications including those listed below:

- **Broadband**: 802.11a/b/g, BLUETOOTH, UNII, MMDS, WLL, CATV, DBS
- **Cellular**: GSM, W-CDMA, PCS & UMTS 3G, PLMR, & Telematics
- **Microwave / Millimeterwave**: P2P / P2MP / VSAT Radios, Test Equipment & Sensors
- **Fiber Optic**: OC-48 to OC-192
- **Military & Space**: RF to Millimeterwave Applications

Every component is backed by Hittite Microwave’s commitment to total quality. HMC is ISO 9001:2000 certified, and every Hittite employee and subcontractor is responsible for maintaining the highest level of quality. We are constantly working towards improvement of our procedures and processes, thus providing our customers with products that meet or exceed all requirements, are delivered on-time and function reliably throughout their useful life.