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### Product Data Sheets Available Online at:

www.hittite.com

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**1 Watt and 0.5 Watt Power Amplifiers at 1.9 GHz, 2.4 GHz, 3.5 GHz and 5.8 GHz Now Available!**

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Hittite is expanding its GaAs InGaP HBT product line by adding eight new power amplifiers, targeting systems that require output powers between 0.5W and 1W. The designs minimize the usage of external components on the output matching and bias networks, making them "user friendly". The designs employ low cost packaging that allows efficient heat transfer from the amplifier to an external heat sink.

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Low Cost Plastic MMIC VCOs Introduced! (continued from pg 1)

**MMIC VCOs Offer Higher Integration To Lower A Radio’s Component Count**

An X or Ku Band VCO requires a low noise, high frequency prescaler to bring its output frequency into the range of existing PLLs for phase locking. It is cost efficient to integrate the prescaler onto the VCO, and standard divide ratios (/2, /4, or /8) with single ended or differential outputs are available. The output power delivered from the prescaler is typically 0 to -3dBm, which is ample for most commercial PLLs. Additional buffer amplifiers can be eliminated if the VCO can produce enough drive to satisfy the mixers in the radio. Designing the VCOs with output powers between -6dBm and +13dBm should satisfy most systems. Finally, Hittite has integrated the tuning diode onto the MMIC, therefore eliminating the problems associated with external diodes. Integrating the prescaler, varactor diode and buffer amplifier eliminates three major components, and their supporting circuitry.

Hittite’s technology can scale between 3 and 30GHz. The above table summarizes the performance of three standard products that address a wide range of applications. Figure 1 shows a typical Ku band VCO mounted on an evaluation PCB. Figures 2 illustrates a functional block diagram of the HMC398QS16G and the HMC401QS16G.

**Benefits of Surface Mount MMIC VCO’s**

Using industry standard eight, ten and sixteen pin injection molded plastic packages through Ku band allows end users to reflow solder the VCO component onto the PCB. Standard plastic packages allow Hittite to practice tight quality control on die attach and wire bonding. In addition these package platforms support high-speed electrical test and automated visual inspection of lead co-planarity, and package marking, and orientation inside a tape and reel carrier. The packaging processes that Hittite is using for its VCO products have previously passed extensive qualification testing, including temperature cycling, autoclave, and solderability testing.

The accuracy and repeatability of micron level wafer processing eliminates all tuning at the VCO level and at the customer level, thus further reducing the total cost manufacturing. The center frequency of the VCO is set by the physical layout of the IC’s passive resonator structure. The end user needs no staking, tuning or adjustments to set the VCO center frequency. With the exception of a bypass capacitor on Vcc and Vtune lines, the MMIC VCOs requires no external components.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Output Frequency</th>
<th>Phase Noise @ 10K &amp; 100K Offsets</th>
<th>VCO Output Power</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC395MS8G</td>
<td>5.6 - 6.8 GHz</td>
<td>-10 dB/Hz (kHz)</td>
<td>&gt; +10 dBm</td>
<td>High output power with buffer amplifier, +3V operation, SMT package, no external components</td>
</tr>
<tr>
<td>HMC398QS16G</td>
<td>14.0 - 15.0 GHz</td>
<td>-110 dB/Hz (kHz)</td>
<td>+6 dBm</td>
<td>Buffer amplifier, differential divide-by-8 output, SMT package, no external components</td>
</tr>
<tr>
<td>HMC401QS16G</td>
<td>13.2 - 13.5 GHz</td>
<td>-110 dB/Hz (kHz)</td>
<td>&gt; -8 dBm</td>
<td>Differential divide-by-8 output, SMT package, no external components</td>
</tr>
</tbody>
</table>

![Figure 1](image-url)

**Synthesizer engineers design circuitry that establishes the bit error rate of the communication link. Loosing data during transmission because of phase transients can be devastating. Therefore, a main consideration in the synthesizer and VCO technology selection is reliability of performance. VCO technologies that are temperature sensitive, shock sensitive or environment sensitive will require addition mechanical ‘insulation’ to eliminate phase hits. Adding such mechanical protection translates to increased cost and size of the synthesizer. Alternatively, a MMIC VCO containing all active and passive components can minimize the problems associated with microphonics, vibrations, and temperature anomalies because it eliminates chip-to-chip interconnections between the resonator and the negative resistance element.**

**Low Phase Noise 14 GHz PLL Application of the Hittite HMC398QS16G MMIC VCO**

A low phase noise 14 GHz phase lock loop circuit was constructed using the Hittite HMC398QS16 VCO locked to a 218.75 MHz crystal reference oscillator. The block diagram for the complete circuit is shown in Figure 3.

Besides the VCO, two additional Hittite GaAs MMICs are used in the PLL circuit. The HMC403S8G MMIC is a DC to 1.3 GHz digital phase frequency detector. This device can operate directly with reference oscillators and RF input frequencies up to 1.3 GHz. This new device makes possible the phase comparison directly at frequencies considerably higher than most other digital phase frequency detectors. This feature allows lower phase noise designs by minimizing the division ratio needed with the reference oscillator. The 218.75 MHz reference oscillator is utilized directly without frequency division. Another new MMIC from Hittite Microwave Corporation used in this circuit is the programmable 2.2 GHz 5-bit counter. For this fixed frequency application, the counter is programmed for fixed division by eight. Note that for the fixed modulus 8 division requirement in this circuit, the Hittite HMC363S8G 12 GHz divide-by-eight prescaler could be substituted for the programmable counter.

These three new Hittite MMICs, all in SMT plastic packages, along with an active loop filter, and decoupling and DC blocking capacitors are all that is needed to construct this low phase noise PLL circuit. The low parts count design, including decoupling capacitors and loop filter, takes up less than 1 square inch of real estate on a printed wiring board. The plastic packaging of the microwave devices insures extremely low microphonics with a minimum of effort in the mechanical design of the circuit board.

Figure 4 shows the measured phase noise out of the 14 GHz PLL circuit designed around the Hittite HMC398QS16G. Also shown in the graph, for reference, is the measured phase noise of the free running VCO at 14 GHz.
HMC358MS8G

**General Description**

The HMC358MS8G is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCO with an integral output buffer amplifier. The HMC358MS8G contains a resonator, negative resistance device, varactor diode, and buffer amplifier. The VCO's phase noise performance is excellent over temperature, shock, and process due to the oscillator’s monolithic structure. Power output is >10 dBm from a 3.0V supply voltage. The voltage controlled oscillator is packaged in a low cost, surface mount 8 lead MSOP package with an exposed base for improved RF and thermal performance. This VCO is ideal for usage in the UNII, HiperLAN, Pt to Pt Radios and WLAN applications.

**Features**

- Pout: > 10 dBm
- SSB Phase Noise: -105 dBc/Hz @ 100 KHz
- No External Resonator Needed
- Integrated Buffer Amplifier
- MSOP8G SMT Package

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HMC398QS16G

**General Description**

The HMC398QS16G is a single chip GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCO with an integrated divide-by-8 prescaler. The VCO's phase noise performance is excellent over temperature, shock, and process due to the oscillator’s monolithic structure. Power output is > +6 dBm from a 5V supply voltage. The voltage controlled oscillator is packaged in a low cost, surface mount 16 leaded QSOP package with an exposed base for improved RF and thermal performance. The HMC398QS16G requires no external components. This VCO is ideal for usage in the LMDS, Pt to Pt Radios and VSAT applications.

**Features**

- Pout: > +6 dBm
- SSB Phase Noise: -110 dBc/Hz @ 100 KHz
- No External Resonator Needed
- Integrated Prescaler/Divider
- QSOP16G SMT Package

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HMC401QS16G

**General Description**

The HMC401QS16G is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCO with an integrated divide-by-8 prescaler. The VCO's phase noise performance is excellent over temperature, shock, and process due to the oscillator's monolithic structure. Power output is > -8 dBm from a 5V supply voltage. The voltage controlled oscillator is packaged in a low cost, surface mount 16 leaded QSOP package with an exposed base for improved RF and thermal performance. This VCO is ideal for usage in the LMDS, Pt to Pt Radios and VSAT applications.

**Features**

- Pout: > -8 dBm
- SSB Phase Noise: -110 dBc/Hz @ 100 KHz
- No External Resonator Needed
- Integrated Prescaler/Divider
- QSOP16G SMT Package
HMC327MS8G

GaAs InGaP HBT Power Amplifier, 3.0 - 4.0 GHz

General Description
The HMC327MS8G is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 3 and 4 GHz. The amplifier is packaged in a low cost, surface mount 8 leaded package with an exposed base for improved RF and thermal performance. The amplifier provides 21dB of gain, +30 dBm of saturated power at 45% PAE from a +5.0V supply voltage. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for usage as a power amplifier for wireless local loop applications in the 3.3 - 3.6 GHz frequency range.

Features
Gain: 21 dB
Saturated Power: +30 dBm
45% PAE
Supply Voltage: +5.0 V
Low Cost SMT: MSOP8G

HMC406MS8G

GaAs InGaP HBT MMIC Power Amplifier, 5.0 - 6.0 GHz

General Description
The HMC406MS8G is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 5 and 6 GHz. The amplifier is packaged in a low cost, surface mount 8 leaded package with an exposed base for improved RF and thermal performance. The amplifier provides 17 dB of gain, +29 dBm of saturated power at 38% PAE from a +5.0V supply voltage. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for usage as a power amplifier for Wireless Local Loop (WLL) applications at 3.4 to 3.6 GHz. The HMC327MS8G and HMC406MS8G target Wireless Local Loop (WLL) applications at 3.4 to 3.6 GHz. The HMC327MS8G and HMC409LP3 offer +30 and +32 dBm of saturated power from a +5V supply. These amplifiers, used in conjunction with the previously introduced HMC326MS8G will support the complete transmit amplifier line up.

The HMC413QS16G and the HMC414MS8G target platforms between 1.5 GHz and 3.2 GHz, including WCDMA, PCS and MMDS applications. These amplifiers provide 45 and 38% PAE while delivering +30 dBm and +29 dBm saturated power from a +3.6V rail. The gain of these amplifiers is 20 dB typical, and each also contains power down control functions.

Two new amplifiers target Wireless Local Loop (WLL) applications at 3.4 to 3.6 GHz. The HMC327MS8G and the HMC409LP3 deliver a saturated output power of +32 dBm at 25% PAE from a single +5.0V rail. The HMC408LP3 uses an industry standard leadless 3 mm x 3 mm leadless package, requires minimum external components, and features 20 dB of gain. The models HMC406MS8G and the HMC407MS8G both provide +29 dBm of saturated power, with the HMC407MS8G requiring no external matching elements. The Model HMC415MS8G provides 20 dB of gain and +26 dBm from a +3V supply, making this suitable for battery operated mobile platforms.

Features
Gain: 17 dB
Saturated Power: +29 dBm
38% PAE
Supply Voltage: +5.0 V
Power Down Capabilities
Low Cost SMT: MSOP8G

Power Compression @ 3.5 GHz

Power Compression @ 5.8 GHz
HMC407MS8G

GaAs InGaP HBT MMIC
Power Amplifier, 5.0 - 7.0 GHz

**General Description**

The HMC407MS8G is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 5 and 7 GHz. The amplifier requires no external matching to achieve operation and is thus truly 50 Ohm matched at input and output. The amplifier is packaged in a low cost, surface mount 8 leaded package with an exposed base for improved RF and thermal performance. The amplifier provides 15 dB of gain, +29 dBm of saturated power at 28% PAE from a +5.0V supply voltage. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for use as a driver amplifier for 5.0 - 6.0 GHz UNII and HiperLAN Applications.

HMC408LP3

GaAs InGaP HBT MMIC
Power Amplifier, 5.0 - 6.0 GHz

**General Description**

The HMC408LP3 is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 5 and 6 GHz. The amplifier is packaged in a leadless LP3 surface mount package with an exposed base for improved RF and thermal performance. The amplifier provides 20 dB of gain, +32 dBm of saturated power at 25% PAE from a +5.0V supply voltage. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for use as a power amplifier for 5.0 - 6.0 GHz UNII and HiperLAN Applications.

HMC409LP3

GaAs InGaP HBT MMIC
Power Amplifier, 3.0 - 4.0 GHz

**General Description**

The HMC409LP3 is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 3 and 4 GHz. The amplifier is packaged in a leadless LP3 surface mount package with an exposed base for improved RF and thermal performance. The amplifier provides 25 dB of gain, +32 dBm of saturated power at 25% PAE from a +5.0V supply voltage. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for usage as a power amplifier for wireless local loop applications in the 3.3 - 3.6 GHz frequency range.

**Features**

- **Gain**: 15 dB
- **Saturated Power**: +29 dBm
- **28% PAE**
- **Supply Voltage**: +5.0 V
- **Power Down Capabilities**
- **No External Matching Required**
- **Low Cost SMT: MSOP8G**

- **Gain**: 20 dB
- **Saturated Power**: +32 dBm
- **25% PAE**
- **Supply Voltage**: +5.0 V
- **Power Down Capabilities**
- **Leadless SMT: LP3**

- **Gain**: 25 dB
- **Saturated Power**: +32 dBm
- **25% PAE**
- **Supply Voltage**: +5.0 V
- **Power Down Capabilities**
- **Leadless SMT: LP3**
HMC413QS16G
GaAs InGaP HBT MMIC
Power Amplifier, 1.5 - 2.3 GHz

**General Description**

The HMC413QS16G is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 1.5 and 2.3 GHz. The amplifier is packaged in a low cost, surface mount 16 leaded QSOP package with an exposed ground slug for improved RF and thermal performance. The amplifier provides 20dB of gain, +30 dBm of saturated power at 45% PAE from a +5.0V supply voltage. The amplifier can also operate with a 3.6V supply. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for use as a power amplifier for cellular and mobile applications.

**Features**

- Gain: 20 dB
- Saturated Power: +30 dBm
- 45% PAE
- Supply Voltage: +3.6 V
- Power Down Capabilities
- Low Cost SMT: QSOP16G

HMC414MS8G
GaAs InGaP HBT MMIC
Power Amplifier, 2.1 - 3.2 GHz

**General Description**

The HMC414MS8G is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 2.1 and 3.2 GHz. The amplifier is packaged in a low cost, surface mount 8 leaded package with an exposed base for improved RF and thermal performance. The amplifier provides 20 dB of gain, +29 dBm of saturated power at 38% PAE from a +3.6V supply voltage. The amplifier can also operate with a 5.0V supply. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for use as a power amplifier for 2.2 - 2.7 GHz MMDS and BLUETOOTH applications.

**Features**

- Gain: 20 dB
- Saturated Power: +29 dBm
- 38% PAE
- Supply Voltage: +3.6 V
- Power Down Capabilities
- Low Cost SMT: MSOP8G

HMC415LP3
GaAs InGaP HBT MMIC
Power Amplifier, 5.0 - 6.0 GHz

**General Description**

The HMC415LP3 is a high efficiency GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC Power amplifier which operates between 5 and 6 GHz. The amplifier is packaged in a leadless LP3 surface mount package with an exposed base for improved RF and thermal performance. The amplifier provides 20 dB of gain, +26 dBm of saturated power at 35% PAE from a +3.0V supply voltage. Power down capability is available to preserve current consumption when the amplifier is not in use. This amplifier is ideal for use as a power amplifier for 5.0 - 6.0 GHz UNII and HiperLAN Applications.

**Features**

- Gain: 20 dB
- Saturated Power: +26 dBm
- 35% PAE
- Supply Voltage: +3.0 V
- Power Down Capabilities
- Leadless SMT: LP3
HMC322LP4
GaAs MMIC SP8T
Non-Reflective Switch, DC - 7.0 GHz

General Description
The HMC322LP4 is a broadband non-reflective GaAs MESFET SP8T switch in a low cost leadless surface mount package. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss and extends the frequency coverage of Hittite’s SP8T switch product line. This switch also includes an on board binary decoder circuit which reduces the required logic control lines to three. The switch operates using a negative control voltage of 0/-5 volts, and requires a fixed bias of -5v. This switch is suitable for usage in 50-Ohm or 75-Ohm system, and can service Broadband applications including test equipment, fiber optic switching applications, and various wireless standards below 8 GHz.

Features
- High Isolation: >30 dB @ 6 GHz
- Low Insertion Loss: 2.4 dB @ 6 GHz
- Non-Reflective Design
- LP4 SMT Package

HMC344LP3
GaAs MMIC SP4T
Non-Reflective Switch, DC - 8.0 GHz

General Description
The HMC344LP3 is a broadband non-reflective GaAs MESFET SP4T switch in a low cost leadless surface mount package. Covering DC to 8 GHz, this switch offers high isolation and low insertion loss and extends the frequency coverage of Hittite’s SP4T switch product line. This switch also includes an on board binary decoder circuit which reduces the required logic control lines to two. The switch operates using a negative control voltage of 0/-5 volts, and requires a fixed bias of -5v. This switch is suitable for usage in 50-Ohm or 75-Ohm system, and can service Broadband applications including test equipment, fiber optic switching applications, switched filter banks, and various wireless standards below 8 GHz.

Features
- High Isolation: 40 dB @ 6 GHz
- Low Insertion Loss: 1.8 dB @ 6 GHz
- Non-Reflective Design
- LP3 SMT Package

HMC347
GaAs MMIC SPDT
Non-Reflective Switch, DC - 20 GHz

General Description
The HMC347 is a broadband non-reflective GaAs MESFET SPDT MMIC chip. Covering DC to 25 GHz, the switch offers high isolation and low insertion loss. The switch features over 50 dB isolation at lower frequencies and over 40 dB at higher frequencies due to the implementation of on-chip via hole structures. The switch operates using two negative control voltage logic lines of -5/0V, requires no Vee and has no current consumption. The switch operates down to DC; making it suitable for systems operating below 100 KHz. The chip features coplanar I/Os that allow 100% RF testing prior to delivery to the customer. The HMC347 is ideal for Space, military, microwave radio, fiber optic and VSAT applications.

Features
- High Isolation: >40 dB @ 20 GHz
- Low Insertion Loss: 1.6 dB @ 15 GHz
- Non-Reflective Design
- Small Size: 0.8 x 1.3 x 0.04mm3
Hittite has again raised the level of integration on the mixer product line by offering a series of passive mixers with integrated LO amplifiers. The functional diagram in Figure 1 illustrates the topology of the HMC332, HMC333, HMC352MS8, and HMC353MS8. These products strike a balance between the level of integration, size, cost, and linearity performance. At the core of the design is a passive diode based mixer that offers excellent linearity, spurious performance and stability over temperature. This mixer core has been combined with a robust Local Oscillator (LO) driver amplifier to lower the overall drive level needed for converter operation to a range between -2 dBm and +2 dBm, depending on the model. The LO amplifier utilizes a mature MESFET technology, and have been designed to operate using minimal current and +3V bias, which is required for today’s portable platforms.

The new mixer products are offered in six, eight, and sixteen leaded plastic SMT packages. These designs generally require few external components for biasing the LO buffer amplifier, typically a bypass capacitor and bias inductor or resistor. No external components, baluns or matching, are necessary on the RF or IF ports. This allows the user to design simple RF interfaces in fifty Ohms on these two ports.

The HMC421QS16 model is designed specifically for down converter applications, and contains an LO and IF amplifier. This design supports WCDMA and PCS applications in the 1.7 GHz to 2.3 GHz bands. The device provides 8 dB of gain, an output IP3 of +28 dBm and consumes 160 mA of current. This design is unique to the market because of the low external component count, small size, and linearity performance. No external baluns, or complex RF matching is needed. The downconverter can be optimized for a specific IF frequency through a simple off-chip matching circuit placed on the IF port of the mixer (see Figure 2 Mixer Functional Diagram).

The HMC332, HMC333, HMC352MS8 and the HMC353MS8 designs may be used as up or down converters, supporting IF frequencies as high as 400 MHz. These designs have conversion loss of 7.5 dB to 8.5 dB typical and an input third order intercept point (IIP3) of +16 dBm.
**Mixer Product Line Expands!**

**HMC332**

*Mixer IC with Integrated LO Amplifier, 2.0 - 2.8 GHz*

**General Description**

The HMC332 is a single balanced mixer IC with an integrated LO amplifier. This converter IC can operate as an upconverter or downconverter between 2.0 GHz and 2.8 GHz. The integrated LO amplifier reduces the necessary LO drive levels to -2 dBm to +2 dBm, and requires only 6 mA from a single positive +3V rail. The mixer has 8 dB of conversion loss, an input 1 dBCP of 0 dBm and an input third order intercept point of +13 dBm. This device is suitable for MMDS, PCMCIA applications, WLAN and WCDMA micro-BTS applications.

**Features**

- Integrated LO Amplifier
- Conversion Loss: 8.0 dB
- Noise Figure: 8.0 dB
- Input IP3: +13 dBm
- Ultra Small
- SOT26 SMT Package

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**HMC333**

*Mixer IC with Integrated LO Amplifier, 3.0 - 3.8 GHz*

**General Description**

The HMC333 is a single balanced mixer IC with an integrated LO amplifier. This converter IC can operate as an upconverter or downconverter between 3.0 GHz and 3.8 GHz. The integrated LO amplifier reduces the necessary LO drive levels to -2 dBm to +2 dBm, and requires only 7 mA from a single positive +3V rail. The mixer has 8.5 dB of conversion loss, an input 1 dBCP of -1 dBm and an input third order intercept point of +10 dBm at 3.5 GHz. This device is suitable for broadband Wireless Local Loop (WLL) applications.

**Features**

- Integrated LO Amplifier
- Conversion Loss: 8.5 dB
- Noise Figure: 8.5 dB
- Input IP3: +10 dBm
- Ultra Small
- SOT26 SMT Package

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**HMC352MS8**

*Mixer IC with Integrated LO Amplifier, 1.7 - 2.5 GHz*

**General Description**

The HMC352MS8 is a single balanced mixer IC with an integrated LO amplifier. This converter IC can operate as an upconverter and downconverter between 1.7 GHz and 2.5 GHz. The integrated LO amplifier reduces the necessary LO drive levels to -2 dBm to +2 dBm, and requires only 6 mA from a single positive +3V rail. The mixer has 7 dB of conversion loss, an input 1 dBCP of +5 dBm and an input third order intercept point of >+13 dBm at 2 GHz. This device is suitable for MMDS, PCMCIA applications, WLAN and WCDMA micro-BTS applications.

**Features**

- Integrated LO Amplifier
- Conversion Loss: 7.0 dB
- Noise Figure: 7.0 dB
- Input IP3: >+13 dBm
- MSOP8 SMT Package
HMC353MS8

*Mixer IC with Integrated LO Amplifier, 0.8 - 1.2 GHz*

**General Description**

The HMC353MS8 is a single balanced mixer IC with an integrated LO amplifier. This converter can operate as an upconverter and downconverter between 1.7 GHz and 2.5 GHz. The integrated LO amplifier reduces the necessary LO drive levels to -2 dBm to +2 dBm, and requires only 6 mA from a single positive +3V rail. The mixer has 8 dB of conversion loss, an input 1 dBCP of +7 dBm and an input third order intercept point of +16 dBm at 1 GHz. The mixer is suitable for BTS applications between 800 MHz and 1200 MHz.

**Features**

- Integrated LO Amplifier
- Conversion Loss: 8.0 dB
- Noise Figure: 8.0 dB
- Input IP3: +16 dBm
- MSOP8 SMT Package

HMC412MS8G

*Double-Balanced Mixer, 9.0 - 15.0 GHz*

**General Description**

The HMC412MS8G is a passive double balanced mixer that operates between 9.0 GHz and 15 GHz. This mixer represents Hittite’s highest frequency mixer in a low cost injection molded plastic package. The HMC412MS8G operates with LO drive levels between +9 dBm and +13 dBm, and provides 8 dB conversion loss across the entire specified frequency band. This mixer is suitable for long haul radio platforms and high volume low cost VSAT and microwave radio platforms. This mixer requires no external components or bias.

**Features**

- Conversion Loss: 8.0 dB
- Noise Figure: 8.0 dB
- Input IP3: +18 dBm
- No External Components
- MSOP8G SMT Package

HMC421QS16

*Integrated Downcoverter IC with LO and IF Amplifier, 1.3 - 2.5 GHz*

**General Description**

The HMC421QS16 is a high linearity down-converter receiver IC suitable for cellular infrastructure applications. The receiver IC is designed to support WCDMA applications where high third order intercept point (OIP3) is required. A passive mixer coupled with a high dynamic range IF amplifier achieves an output intercept point (OIP3) of +28 dBm, and an input IP3 of +19 dBm. The converter provides a gain of 8 dB, and less than 10 dB single side band noise. The IC operates from positive +5V rails and consumes 60 mA of current. The design requires no external Baluns, and minimal off chip components. The mixer supports IF frequencies between 50 MHz and 400 MHz.

**Features**

- Integrated IF and LO Amplifier
- Conversion Gain: +8.0 dB
- Noise Figure: <10 dB
- Output IP3: +28 dBm
- QSOP16 SMT Package
New Website Supports E-Commerce!

In September 2001, Hittite Microwave Corporation announced the release of its new web site featuring E-Commerce giving our customers a convenient way to purchase Hittite components. The site contains the complete 2001 edition of the Hittite Microwave Designer’s Guide and Supplement with full data sheets, including S-Parameters of selected products in PDF format. Over 185 MMIC products are available covering DC - 40 GHz. A database for easier product searching by market, function, frequency range, package style, and product line has been created to enable more effective searching for a particular product. Newest additions to the web site include a new “Product Support”, “Product Reliability”, and “Latest Products” sections.

The new “Product Support” section contains a new and improved mixer spur chart calculator, our latest application note on Prescalers, and an updated, easy to fill out, Sample Request Form. Also located here is Application Support, Quality Assurance, and Product Reliability information. Our Application Support department provides technical support through all phases projects from Design to Production.

The new site outlines Hittite’s Quality Assurance program, which is modeled after the ISO 9001 quality systems standard. Hittite has been certified to ISO 9001 since 1997. The “Product Reliability” section, new to the site, is broken down into two categories, Semiconductor and Package Reliability. The Semiconductor Reliability section details performance over time, and the Package Reliability section explains how packaging semiconductors protects them from the environmental elements.

The “Latest Products” section is a showcase of new products that have been recently introduced. These new products include amplifiers, attenuators, frequency multipliers, mixers, prescalers, switches, and VCOs. The prescaler product line now totals 11 products, which includes divide by 2, 4, or 8 components that are available in packaged or chip form.

Other features of the web site include a company overview, career opportunities, contact information, and company news to keep customers informed of the latest happenings at Hittite Microwave Corporation. Anyone wishing to send an inquiry or would like to receive the Hittite newsletter, can access the appropriate form from anywhere on our website.

www.hittite.com

Hittite Opens Hittite Microwave Europe Ltd. & Expands Its Presence Worldwide!

June 12th marked the opening our first international office, Hittite Microwave Europe Ltd! Located 30 minutes South of London, Hittite Microwave Europe will take a key role in further penetrating and supporting the European Market. A United Kingdom based office will enable Hittite to provide better technical support and service for its European customers. Mr. Brian Letchford, our European Sales Manager, will work with all of our customers and Sales Representatives to grow the business into the new century. Mr. Letchford has joined Hittite with over a decade of microwave engineering and sales experience. In his new role, Mr. Letchford will coordinate all sales activity throughout Europe.

In September, Hittite Microwave Europe Ltd will attend the European Microwave Week exhibition in London. This show marks the first exhibition of Hittite Microwave Europe Ltd and will be the forum for 20 new product introductions.

If you would like to contact the European office, please see the below contact information:

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What We Do

Hittite Microwave Corporation designs and manufacturers high volume integrated circuit (IC) products to support the expanding needs of high-speed voice and data transfer systems. Hittite's product line of RF to millimeter wave components is recognized across the world because it offers a unique variety of functions and solutions for systems that operate between DC and 40 GHz.

All of Hittite's high performance ICs are manufactured using cutting edge semiconductor processes, including GaAs InGaP HBT, SiGe, PHEMT, and MESFET technology. When designing a product, we select the most appropriate semiconductor and package technology, and then uniquely balance digital and RF integration techniques to produce a result that is easy and cost effective for our customers to use.

Hittite will continue to focus on revolutionizing IC design concepts for a variety of markets. Our reputation of leading the industry with MMIC mixers, switches, and surface mount millimeter wave components has opened up new opportunities for our customers. Regardless of frequency, we apply high volume manufacturing techniques across our amplifier, switch, mixer, attenuator and frequency generation products groups. Each year Hittite breaks through new technology barriers, and then applies the technology to produce millions of integrated circuits to satisfy our customers. Our customers can then address their existing markets, and create new markets for their products.

Products from our standard catalog are shipped to factories that are located across Asia, Australia, North America, South America, and Europe. Our customers manufacture many different types of systems for the wireless and telecommunications world including:

- Broadband Wireless Systems for LAST MILE INTERNET Radio Platforms
- Broadband Two-way MMDS, UNII and HyperLAN Radios Platforms
- GSM, PCS, and 3G Cellular Platforms
- Microwave Radio Links
- Cable Modem Systems for CATV
- DBS Consumer Electronic Systems
- Fiber Optic Systems from OC-48 to OC-192
- Two-way Pager Systems

Our products are recognized by their uncompromising high quality and by their unique functionality & performance. Additionally, we have maintained a reputation of always meeting and exceeding our customer's requirements from a price, performance, and delivery.

Hittite Microwave Corporation

AUTUMN 2001 DATASHEETS AVAILABLE AT WWW.HITTITE.COM