**NEW FRACTIONAL SYNTHESIZER PRODUCT LINE!**

Fractional Synthesizer Features Ultra Low Phase Noise

The HMC700LP4E operates 100 MHz to 8 GHz and is designed to cover a wide range of applications particularly those sensitive to phase noise and signal jitter. This innovative fractional synthesizer features a 16 bit fractional divider, 24 bit delta-sigma modulator, 14 bit reference path divider, ultra low noise phase frequency detector (PFD), a precision controlled charge pump, as well as extensive control of modes of operation via a read/writable serial port. This designer friendly part delivers typical phase noise performance of -103 dBc/Hz in fractional mode at 6 GHz and a 20 kHz offset translating to a Figure of Merit (FOM) of -223 dBc. Integer operation at 6 GHz can achieve -108 dBc/Hz at 20kHz with a FOM of -227 dBc. Typical VCO step resolution is 3 Hz with a 50 MHz phase frequency detector in fractional mode.

The HMC700LP4E also provides excellent fractional spurious performance where reference spurious levels are typically <-130 dBc and in-band fractional boundary spurious are typically well below the integrated phase noise. Ultra low phase noise coupled with low spurious allows for wider loop bandwidths for faster frequency hopping.

(Continued on page 6)

**NEW DIGITAL INTERFACE PRODUCT LINE!**

Dual Mode Interface Enhances Switch, Attenuator & Phase Shifter Control

The HMC677LP5E 6-Bit Serial/Parallel Switch Driver/Controller is a multi-function BiCMOS control interface IC which is ideal for driving the gates of FET and pHEMT based MMIC control devices. This unique IC can be used to simplify the control of microwave and millimeterwave transmit/receive modules, military subsystems, and multi-throw/multi-port test and measurement equipment. The HMC677LP5E accepts TTL/CMOS logic data, in either 3-wire SPI or parallel format, and can drive up to 6 complementary sets of parallel outputs.

The HMC677LP5E provides additional functionality such as power-up state selection, adjustable output voltage levels, and a latched parallel input mode which allows multiple switch/drivers/controllers to share a common data bus. The HMC677LP5E is ideal for controlling digital phase shifters, digital attenuators, digital variable gain amplifiers, and switching matrices embedded in complex microwave and millimeterwave assemblies. Samples and evaluation boards are available from stock and can be ordered online.

**HITTITE’S FIRST SDLVA RELEASED!**

Hittite’s new HMC613LC4B Successive Detection Logarithmic Video Amplifier is the industry’s first SDLVA that combines full 0.1 to 20 GHz frequency range operation with extremely compact 4x4 mm surface mount packaging. The small size, and wideband performance make the HMC613LC4B ideal for designers with space, and power constrained applications. Traditional SDLVAs are often tuned over a narrow frequency range and packaged in much larger modular housings, consuming as much as 6W of DC power.

Ideal for system designers looking to capture pulsed signals with high amplitude accuracy, the HMC613LC4B SDLVA represents the first in a new family of broadband SDLVA devices from Hittite that convert RF signals at their input to an output voltage that is proportional to the logarithm of the RF input signal amplitude.

(Continued on page 6)
**HMC616 / 617 / 618LP3E** 

**Low Noise Amplifiers, 0.55 to 2.2 GHz**

**Features**
- Noise Figure to 0.5 dB
- Gain to 19 dB
- Output IP3 to +37 dBm
- Single Supply: +3V to +5V
- 50 Ohm Matched Input/Output
- QFN 3x3 mm SMT Packages

**High Linearity LNA Family**

The HMC616LP3E, HMC617LP3E & HMC618LP3E are GaAs PHEMT MMIC Low Noise Amplifiers that are ideal for Cellular/3G and LTE/ WiMAX/4G basestation front-end receivers operating between 550 and 2200 MHz. These amplifiers have been optimized to provide low noise figure, high gain and up to +37 dBm output IP3 from a single supply of +5V. Input and output return losses are excellent and the LNAs require minimal external matching and bias decoupling components.

**HMC604LP3E** 

**Low Noise Amplifier w/Bypass Mode, 4.8 - 6.0 GHz**

**Features**
- Noise Figure: 1.5 dB
- Output IP3: +26 dBm
- Gain: 15 dB
- Integrated Low Loss Bypass Path
- Single Supply: +3V or +5V
- QFN 3x3 mm SMT Package

**Dual Mode, Single Supply**

The HMC604LP3E is a high dynamic range GaAs MMIC Low Noise Amplifier that integrates a low loss LNA bypass mode on the IC. The amplifier is ideal for WiMAX & C-band Radio receivers operating between 4.8 and 6.0 GHz and provides 1.5 dB noise figure, 15 dB of gain and +26 dBm IP3 from a single supply of +5V @ 42mA. Input and output return losses are excellent, and a single control line is used to switch between LNA mode and a low loss bypass mode which reduces the bias current to 10 μA.

**HMC392LH5 & HMC392LC4** 

**Low Noise Amplifiers, 3.5 to 7.0 GHz**

**Features**
- High Gain: 15.4 dB
- Low Noise Figure: 2.5 dB
- Single Supply Voltage: +5V
- No External Matching Components Required
- DC Blocked & 50 Ohm Matched I/Os

**Low Noise Figure, Flat Gain**

The HMC392LC4 & HMC392LH5 are GaAs MMIC Low Noise Amplifiers which operate between 3.5 and 7.0 GHz. These amplifiers provide 16 dB of gain, 2.5 dB noise figure and 30 dBm IP3 from a +5V supply voltage and function well as low noise front ends or as driver amplifiers. The RF I/Os are DC blocked and matched to 50 Ohms for ease of use. The HMC392LC4 & HMC392LH5 allow the use of surface mount manufacturing techniques and are ideal for high reliability, military, test & measurement, space and industrial applications.
HMC682 / 683LP6CE

**Features**
- High Input IP3 to +25 dBm
- Conversion Gain to 7.5 dB
- Low LO Drive: 0 dBm
- High Channel to Channel Isolation
- QFN 6x6 mm SMT Packages

**Integrated LO Switch & IF Amps**

The HMC683LP6CE & HMC682LP6CE are high linearity, dual channel downconverters with integrated LO switches and amplifiers in 6x6 mm packages covering 0.7 - 1.0 and 1.7 - 2.2 GHz respectively. Excellent input IP3 performance of +25 dBm is provided at an LO drive of only 0 dBm. These highly integrated RFICs are ideal for high density GSM BTS applications. Conversion gain is 6 to 7.5 dB, while the 60 - 400 MHz IF frequency response will satisfy various infrastructure frequency plans.

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HMC684 / 686LP4E

**BiCMOS Mixer w/Integrated LO Amplifier, 0.7 to 1.0 GHz**

**Features**
- High Input IP3: +32 dBm
- Low Conversion Loss: 7 dB
- Low LO Drive: 0 dBm
- Upconversion & Downconversion Applications
- QFN 4x4mm SMT Packages

**High Side or Low Side LO**

The HMC684LP4E & HMC686LP4E are high dynamic range passive MMIC mixers with integrated LO amplifiers in 4x4 mm SMT QFN packages and cover low side LO and high side LO applications respectively. With an input 1 dB compression of +25 dBm, the RF port will accept a wide range of input signal levels. Conversion loss is 7 dB typical. The DC to 450 MHz IF frequency response will satisfy GSM/CDMA transmit or receive frequency plans. The HMC684LP4E is pin for pin compatible with the HMC685LP4E which is a 1.7 - 2.2 GHz mixer.

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HMC685 / 687LP4E

**BiCMOS Mixer w/Integrated LO Amplifier, 1.7 to 2.2 GHz**

**Features**
- High Input IP3: +35 dBm
- Low Conversion Loss: 8 dB
- Low LO Drive: 0 dBm
- Upconversion & Downconversion Applications
- QFN 4x4mm SMT Packages

**High Side or Low Side LO**

The HMC685LP4E & HMC687LP4E are high dynamic range passive MMIC mixers with integrated LO amplifiers in 4x4mm SMT QFN packages and cover low side LO and high side LO applications respectively. With an input 1 dB compression of +27 dBm, the RF port will accept a wide range of input signal levels. Conversion loss is 8 dB typical. The DC to 500 MHz IF frequency response will satisfy GSM/CDMA transmit or receive frequency plans. The HMC685LP4E is pin for pin compatible with the HMC684LP4E which is a 700 - 1000 MHz mixer.
**HMC460LC5**

**Wideband Low Noise Amplifier, DC - 20 GHz**

**Features**
- Noise Figure to 2.5 dB
- High Gain: 14 dB
- P1dB Output Power: +16.5 dBm
- Supply Voltage: +8V @ 75 mA
- Ceramic 5x5mm SMT Package

**Gain & Output IP3**

**Consistent Gain & Linearity**
The HMC460LC5 is a GaAs MMIC PHEMT Low Noise Distributed Amplifier in a leadless 5x5 mm ceramic surface mount package which operates from DC to 20 GHz. The amplifier provides 14 dB of gain, 2.5 dB noise figure and +16.5 dBm of output power at 1 dB gain compression while requiring only 75 mA from a +8V supply. Gain flatness is excellent and the amplifier I/Os are internally matched to 50 Ohms, making the HMC460LC5 ideal for EW, ECM, Radar and test equipment applications.

**HMC-C051**

**Double-Balanced Mixer Module, 11 - 20 GHz**

**Features**
- High LO/RF Isolation: 43 dB
- Passive Double Balanced Topology
- Low Conversion Loss: 7 dB
- Wide IF Bandwidth: DC - 6 GHz
- Robust 1KV ESD, Class 1C
- Hermetically Sealed Module

**Conversion Gain & Input IP3**

**Ideal for Laboratory Use**
The HMC-C051 is a general purpose double balanced mixer housed in a miniature hermetic module that can be used as an upconverter or downconverter between 11 and 20 GHz. This mixer is fabricated in a GaAs MESFET process, and requires no external components or matching circuitry. The HMC-C051 provides excellent LO to RF and LO to IF isolation due to optimized balun structures. The module features removable SMA connectors which can be detached to allow direct connection of the I/O pins to a microstrip or coplanar circuit.

**HMC598**

**x2 Active Multiplier, 22 - 46 GHz Output**

**Features**
- High Output Power: +15 dBm
- Low Input Power Drive: 0 to +6 dBm
- High Fo Isolation: 25 dBc @ Fout = 30 GHz
- No External Matching

**Output Power vs. Drive Level**

**Wideband, High Output Power**
The HMC598 is a x2 active broadband frequency multiplier chip utilizing GaAs PHEMT technology. The multiplier provides +15 dBm typical output power from 22 to 46 GHz and the Fo and 3Fo isolations are 25 dBc and 15 dBc respectively at 30 GHz. The HMC598 is ideal for use in LO multiplier chains for Point to Point and mmWave radios yielding reduced parts count versus traditional design approaches. The HMC598 requires no external components and only standard bias decoupling capacitors.
HMC656 / 657 / 658LP2E  
**Wideband Passive Fixed Attenuators, DC - 25 GHz**

**Features**
- 3 Attenuator Products: 10, 15, & 20 dB Fixed Attenuation Levels
- Wide Bandwidth: DC - 25 GHz
- Excellent Attenuation Accuracy
- Power Handling: +25 dBm
- DFN 2x2 mm SMT Packages

**Interchangeable SMT Pads**
The HMC656LP2E / 657 / 658LP2E are wideband fixed value SMT packaged 50 Ohm matched attenuators which offer relative attenuation levels of 10, 15 and 20 dB respectively. These passive attenuators are ideal for microwave radio, test equipment, and other wideband applications where extremely flat attenuation, and excellent VSWR vs. frequency are required. These wideband attenuators handle up to +25 dBm of input power, and are compatible with high volume surface mount manufacturing techniques.

HMC611  
**Logarithmic Detector / Controller, 0.001 - 10 GHz**

**Features**
- Wide Dynamic Range: Up to 73 dB
- High Accuracy: ±1 dB with 51 dB Range Up to 8 GHz
- Supply Voltage: +5V
- Excellent Stability over Temperature
- Also Available in QFN 4x4 mm SMT Package

**Excellent Accuracy to X-Band**
The HMC611 Logarithmic Detector/Controller generates a voltage that is proportional to the log of the RF power envelope presented to its input. The output of a series of on-chip square law detectors is summed, converted into voltage domain and buffered to drive the LOGOUT output. The HMC611 provides a nominal output slope of -25 mV/ dB. The HMC611 can also be used in the controller mode where an external voltage is applied to the VSET pin, to create an Automatic Power Control feedback loop.

HMC530 / 582 / 632LP5E  
**VCOs with Fo/2 & Divide-By-4, 9.5 to 15.65 GHz**

**Features**
- Multiple Output: Fo, Fo/2 & ÷4
- Pout up to +14 dBm
- SSB Phase Noise as low as -110 dBc/Hz @ 100 kHz Offset
- No External Resonator Needed
- 5x5 mm SMT Packages

**Wide Tuning Range**
The HMC530LP5E, HMC582LP5E and HMC632LP5E are GaAs InGaP Heterojunction Bipolar Transistor (HBT) MMIC VCOs which incorporate resonators, negative resistance devices and varactor diodes. These versatile VCOs features half frequency and divide-by-4 prescaler outputs and cover fundamental output frequencies from 9.5 to 15.65 GHz. These footprint compatible VCOs provide up to +14 dBm of output power, operate from a +5V supply and require no external matching components.
**New Fractional Synthesizer Product Line! ...** (continued from page 1)

and low microphonics. The HMC700LP4E supports Hittite’s extensive range of wideband VCOs with a built in charge pump or can operate with an external low noise op-amp for higher tuning voltages. Additional features include cycle slip prevention (CSP), a mode that allows faster frequency hopping than conventional PLLs and also allows the user to alter its output phase in ultra fine micro-degree discrete steps, and is capable of simple direct FSK modulation.

This versatile low phase noise fractional synthesizer provides the system designer with performance and features that will extend the limits of transceiver capability. Evaluation boards for the HMC700LP4E are available from stock, and include a USB controller, 50 MHz crystal reference, voltage regulators, loop filter, low noise op-amp (for high voltage VCOs) and available footprints for LP4 package style oscillators. A detailed datasheet for the HMC700LP4E may be found at www.hittite.com.

**Hittite’s First SDLVA Released! ...** (continued from page 1)

![Graph of phase noise vs. offset frequency for HMC700LP4E PLL](image)

HMC613LC4B exhibits frequency flatness of better than ±2 dB at -30 dBm input power, while logarithmic linearity is better than ±1 dB.

The HMC613LC4B also features tangential signal sensitivity (TSS) of better than -64 dBm at 25°C. The HMC613LC4B is specified for operation over the -40 to +85°C range, and consumes only 260 mW from a single +3.3V supply, making it ideal for a wide variety of applications including EW and ELINT receivers, DF radar, IFM systems and missile-guidance.

For applications requiring a hermetic connectorized solution, the HMC-C052 wideband SDLVA module is now available. The HMC-C052 operates from 1 to 20 GHz, provides a logging range of 59 dB, frequency flatness of ±2 dB at -30 dBm input power, and TSS of -66 dBm. The HMC-C052 is specified for operation from -55 to +85°C.

Detailed datasheets for the HMC613LC4B and the HMC-C052 may be found at www.hittite.com. Product, along with evaluation kits for the HMC613LC4B are available from stock.
**ENTER TO WIN A HMC-T2000!**

IEEE MTT-S, Atlanta, Georgia, June 17, 18 & 19, 2008

Hittite is pleased to announce our attendance at the 2008 IEEE MTT-S International Microwave Symposium and Exhibition to be held in Atlanta, Georgia on June 17, 18 and 19, 2008.

Hittite will feature over 20 new products introduced since the release of our 2008 Designer’s Guide catalog, including the new Interface and PLL product lines. Hittite will be conducting live demonstrations of the HMC613LC4B SDLVA, the HMC-T2000 Signal Generator and the HMC700LP4E PLL throughout the exhibition.

You may also enter for your chance to win a HMC-T2000 Signal Generator. For information about these products and more please visit us at Booth #1345 or visit www.hittite.com

**HITTITE ADDS 2 NEW REPRESENTATIVES**

Innovation Sales to Cover CO, ID, MT, UT, WY

With Headquarters in Colorado, Innovation Sales offers full support to Hittite customers in Colorado, Idaho, Montana, Utah and Wyoming. Innovation Sales may be contacted at:

**Innovation Sales**
Phone: 303-652-3030
E-mail: info@innovationrm.com

Zimmerman Sales to Cover Upstate NY

With headquarters in New York, Zimmerman Sales offers full support to Hittite customers in upstate New York. Zimmerman Sales may be contacted at:

**Zimmerman Sales**
Phone: 585-381-3186
E-mail: sales@zimmermansales.com

**NEW PRODUCT SELECTION GUIDE!**

Hittite Microwave Corporation is pleased to announce the release of the June 2008 Product Selection Guide which summarizes over 650 products. This popular publication is organized by product line as well as by market applications including: Automotive, Broadband, Cellular, Microwave & mmWave, Test & Measurement, Fiber Optic, Military & Space.

An updated version of the Designer’s Guide CD-ROM is also available. To request your copy of the June 2008 Selection Guide or CD-ROM, please visit www.hittite.com and select submit inquiry or contact your local Hittite sales representative.

**What We Do**

Hittite Microwave Corporation is an innovative designer and manufacturer of analog and mixed-signal ICs, modules, subsystems and instrumentation for RF, microwave and millimeterwave applications covering DC to 110 GHz. Our RFIC/MMIC products are developed using state-of-the-art GaAs, GaN, InGaP/GaAs, InP, SOI, SiGe, CMOS and BiCMOS semi-conductor processes utilizing MESFET, HEMT, pHEMT, nHEMT, HBT and PIN devices. Our broad product portfolio includes:

- Amplifiers
- Attenuators
- Data Converters
- Freq. Dividers & Detectors
- Freq. Multipliers
- High Speed Digital Logic
- Interface
- Mixers
- Mods. & Demodulators
- Passives
- Phase Shifters
- PLLs
- Power Detectors
- Sensors
- Switches
- Synthesizers
- VGAs
- VCOs & PLOs
- Automotives
- Telematics & Sensors
- Broadbands
- CATV, DBS, WiMAX, WLAN,
  Fixed Wireless & UWB
- Cellular Infrastructures
- GSM, GPRS, CDMA, WCDMA,
  UMTS & TD-SCDMA
- Fiber Optics
  OC-48 to OC-768
- Microwave & mmWave Communications
  Backhaul Radio Links
  Multi-Point Radios & VSAT
- Military
  C4I, ECM & EW
- Space
  Payload Electronics
- Test & Measurement
  Commercial / Industrial
  Sensors & Test Equipment

Every component is backed by Hittite Microwave’s commitment to total quality. HMC is ISO 9001:2000, AS9100 B and ISO/TS 16949:2002 certified. 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.

**Amplifiers**
**Attenuators**
**Data Converters**
**Freq. Dividers & Detectors**
**Freq. Multipliers**
**High Speed Digital Logic**
**Interface**
**Mixers**
**Mods. & Demodulators**
**Passives**
**Phase Shifters**
**PLLs**
**Power Detectors**
**Sensors**
**Switches**
**Synthesizers**
**VGAs**
**VCOs & PLOs**