

INSIDE.....

23 NEW PRODUCTS
RELEASED!

Product Showcase

2 Watt Power Amplifiers



HMC591 & HMC591LP5(E)

- 6 - 10 GHz Bandwidth
- +43 dBm Output IP3
- Die and SMT Offered

See Page 2

High Linearity IF Gain Block



HMC580ST89(E)

- DC - 1.0 GHz Bandwidth
- +37 dBm Output IP3
- Single +5V Supply

See Page 3

SMT Active x2 Multiplier



HMC573LC3B

- 8 - 22 GHz Fout
- +12 dBm Output Power
- -134 dBc/Hz @ 100 kHz Offset

See Page 3

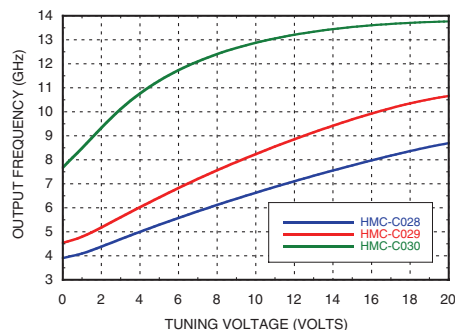
Divide-by-5 & Divide-by-10 Prescaler Modules

See Page 5

WIDEBAND VCO MODULES ACHIEVE LOW PHASE NOISE

3 New VCOs Cover 4 to 12.5 GHz in Rugged, RoHS Compliant Modules

Complementing our extensive line of SiGe and InGaP MMIC Voltage Controlled Oscillators and Phase Locked Oscillators, Hittite is pleased to introduce three new wideband VCOs which are offered in a connectorized hermetic module format. These rugged, RoHS compliant modules uniquely combine the attributes of low phase noise, high output power and wide tuning bandwidth, making them ideal for Test and Measurement, Military, Industrial, and Laboratory applications from 4 to 12.5 GHz.



HMC-C028, HMC-C029 & HMC-C030
Output Frequency vs. Tuning Voltage

The HMC-C028, HMC-C029 and HMC-C030 Wideband VCO Modules offer a complete solution by incorporating the resonator, negative resistance device, varactor diode and DC voltage regulator. These wideband VCO modules exhibit SSB Phase Noise as low

(Continued on page 6)

HITTITE EXPANDS POWER DETECTOR PRODUCT LINE

Two New Power Detectors Cover Applications from 1 MHz to 8 GHz



Hittite Microwave is pleased to announce two new high performance product additions to the current family of Power Detectors. These new power detectors offer improved video bandwidth (HMC601LP4E) and improved dynamic range as well as RF input bandwidth from 1 MHz to 8 GHz (HMC602LP4E).

The HMC602LP4(E) Logarithmic Detector/Controller delivers extremely high dynamic range and conversion accuracy over an input RF frequency range of 1 MHz to 8 GHz. The HMC602LP4(E) converts RF signals at its differential input, to a proportional output DC voltage. Featuring ± 1 dB dynamic range of 59 dB with an input frequency of 900 MHz and a ± 3 dB dynamic range of 58 dB at 8 GHz, the HMC602LP4(E) offers excellent stability over its operating temperature range of -40°C to $+85^{\circ}\text{C}$. In logarithmic detection mode the

(Continued on page 6)

NEW INTEGRATED MIXER COMBINES HIGH IP3 & LOW SPURS FOR CELLULAR/3G & WIMAX

A new GaAs MMIC Mixer with Integrated LO Amplifier is targeted to applications in the Cellular/3G, Broadband, WiBro and WiMAX bands from 1.7 to 4.0 GHz.

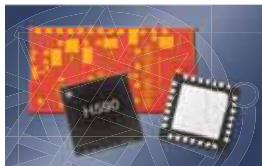
The HMC215LP4(E) is a high linearity Mixer with Integrated LO Amplifier, which delivers +25 dBm input IP3, and accepts an LO drive level between +2 and +6 dBm. This versatile mixer is ideal for upconverter and downconverter applications, providing 32 dB of LO to RF isolation and conversion loss as low as 7 dB. The HMC215LP4(E) consumes only 56 mA from a single +5V supply, and requires no external matching components

The HMC215LP4(E) is housed in a RoHS compliant, leadless 4x4 mm QFN "E" package, and is pin for pin compatible with the HMC551LP4(E) and the HMC552LP4(E) family of low LO drive mixers which operate from 0.8 to 4.0 GHz.



Order On-line at: www.hittite.com

HMC590 & HMC590LP5(E) GaAs PHEMT 1 Watt Power Amplifier, 6 to 10 GHz



Features

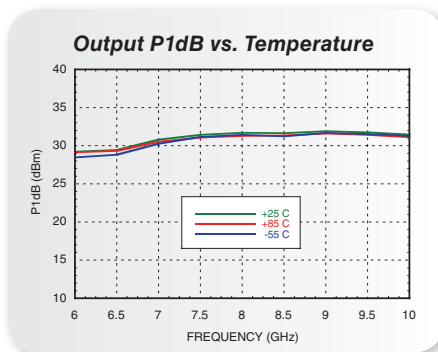
Saturated Output Power:
+31.5 dBm @ 25% PAE

Output IP3: +40 dBm

Gain: 25 dB

DC Supply: +7.0V @ 820mA

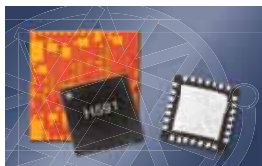
50 Ohm Matched Input/Output



High Gain & Output Power

The HMC590 & HMC590LP5(E) are high dynamic range GaAs PHEMT MMIC 1 Watt Power Amplifiers which operate from 6 to 10 GHz. These amplifiers provide 25 dB of gain, +31.5 dBm of saturated output power and 25% PAE from a +7.0V supply. Output IP3 is +40 dBm typical. The RF I/Os are DC blocked and matched to 50 Ohms. The HMC590 is ideal for Multi-Chip-Modules (MCMs) and Hybrid assemblies, while the HMC590LP5(E) is intended for SMT applications.

HMC591 & HMC591LP5(E) GaAs PHEMT 2 Watt Power Amplifier, 6 to 10 GHz



Features

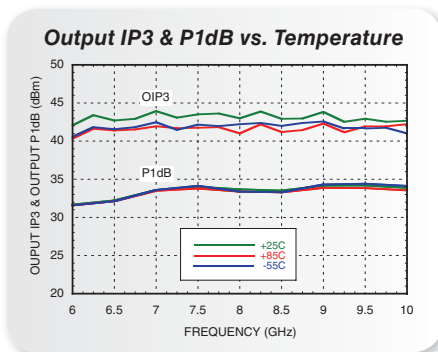
Saturated Output Power:
+34 dBm @ 27% PAE

Output IP3: +43 dBm

Gain: 23.5 dB

DC Supply: +7.0V @ 1340mA

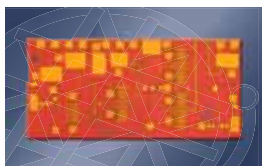
50 Ohm Matched Input/Output



High Efficiency, High Output IP3

The HMC591 & HMC591LP5(E) are high dynamic range GaAs PHEMT MMIC 2 Watt Power Amplifiers which operate from 6 to 10 GHz. These amplifiers provide 23.5 dB of gain, +34 dBm of saturated power, and 27% PAE from a +7.0V supply. Output IP3 is +43 dBm typical and the RF I/Os are DC blocked and matched to 50 Ohms. The HMC591 is ideal for Multi-Chip-Modules (MCMs) and Hybrid assemblies, while the HMC591LP5(E) is intended for SMT applications.

HMC592 GaAs PHEMT 1 Watt Power Amplifier, 10 - 13 GHz



Features

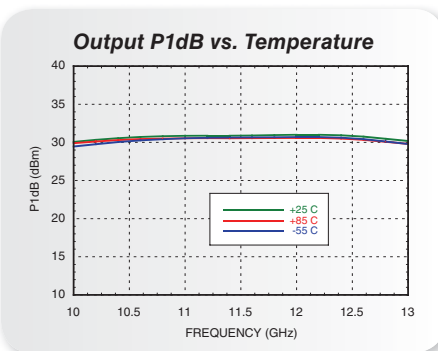
Saturated Output Power:
+30.5 dBm @ 23% PAE

Output IP3: +38 dBm

Gain: 20 dB

DC Supply: +7.0V @ 820mA

50 Ohm Matched Input/Output



No External Matching Required

The HMC592 is a high dynamic range GaAs PHEMT MMIC 1 Watt Power Amplifier which operates from 10 to 13 GHz. This amplifier die provides 20 dB of gain, +30.5 dBm of saturated power, and 23% PAE from a +7.0V supply. Output IP3 is +38 dBm typical. The RF I/Os are DC blocked and matched to 50 Ohms for ease of integration into Multi-Chip-Modules (MCMs). All data is taken 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).

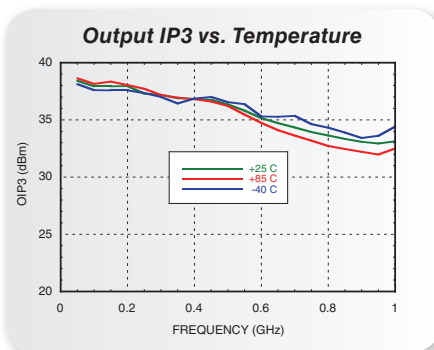
HMC580ST89(E)

InGaP HBT Gain Block MMIC Amplifier, DC - 1.0 GHz



Features

P1dB Output Power: +22 dBm
Gain: 18 dB
Output IP3: +37 dBm
Cascadable 50 Ohm I/Os
Single Supply: +5V @ 88mA



High IP3 IF Amplifier

The HMC580ST89(E) is an InGaP Hetero-junction Bipolar Transistor (HBT) Gain Block MMIC SMT amplifier. The gain block can be used as a cascadable 50 Ohm RF or IF gain stage as well as a PA or LO driver with up to +26 dBm output power. The HMC580ST89(E) offers 22 dB of gain with a +37 dBm output IP3 at 250 MHz, and can operate directly from a +5V supply. The HMC580ST89(E) exhibits excellent gain and output power stability over temperature, while requiring no external matching components.

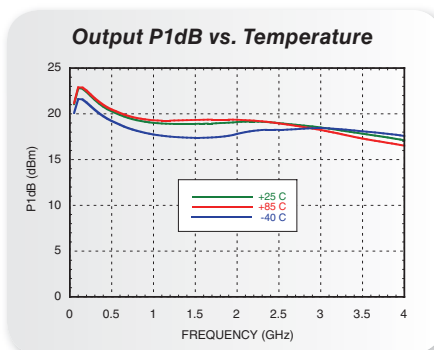
HMC589ST89(E)

InGaP HBT Gain Block MMIC Amplifier, DC - 4.0 GHz



Features

P1dB Output Power:
+19 dBm to 2.5 GHz
Gain: 21 dB @ 1 GHz
19 dB @ 2 GHz
Output IP3: +33 dBm
Single Supply: +5V @ 82mA



Ideal for Cellular/3G/WiMAX

The HMC589ST89(E) is an InGaP HBT Gain Block MMIC SMT amplifier covering DC to 4 GHz and packaged in an industry standard SOT89. The amplifier can be used as a cascadable 50 Ohm RF or IF gain stage as well as a LO or PA driver with up to +19 dBm P1dB output power. The HMC589ST89(E) offers 20 dB gain and +33 dBm output IP3 at 1 GHz while requiring only 82 mA from a single positive supply. The HMC589ST89(E) InGaP HBT gain block offers excellent output power and gain stability over temperature.

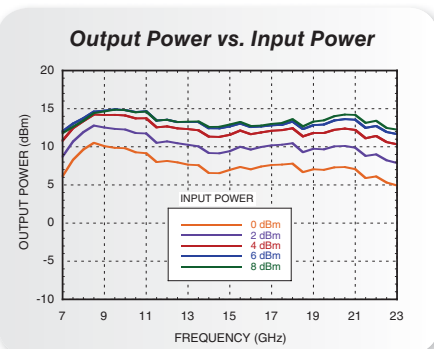
HMC573LC3B

GaAs MMIC x2 Active Freq. Multiplier, 8 - 22 GHz Output



Features

High Output Power: +12 dBm
Low Input Power Drive:
0 to +6 dBm
Fo Isolation: >20 dBc @
Fout = 16 GHz
SSB Phase Noise:
-134 dBc/Hz @ 100 kHz

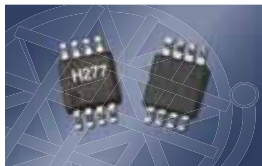


Consistent Output Power

The HMC573LC3B is a x2 active broadband frequency multiplier utilizing GaAs PHEMT technology in a leadless RoHS compliant SMT package. When driven by a +5 dBm signal, the multiplier provides +12 dBm typical output power from 8 to 22 GHz. The Fo and 3Fo isolations are >20 dBc and >25 dBc respectively at 16 GHz. The HMC573LC3B is ideal for use in LO multiplier chains yielding reduced parts count vs. traditional approaches. The low additive SSB Phase Noise helps maintain good system noise performance.

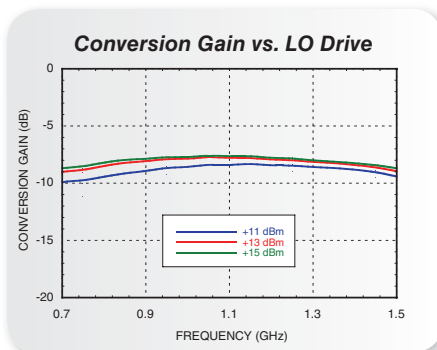
HMC277MS8(E)

GaAs MMIC Single-Balanced Mixer, 0.7 - 1.2 GHz



Features

- Passive Topology
- High LO/RF Isolation: 26 dB
- Input IP3: +21 dBm
- Conversion Loss: 8 dB
- RoHS Compliant MSOP-8 Package



Upconversion or Downconversion

The HMC277MS8(E) general purpose single-balanced mixer in a 8 lead plastic surface mount Mini Small Outline Package (MSOP). This passive MMIC mixer is constructed of GaAs Schottky diodes and a novel planar transformer balun on the chip. The HMC277MS8(E) requires no external matching components, and is ideal for upconverter and downconverter applications. This product is pin-for-pin compatible with the HMC272MS8(E) single-balanced mixer, which operates from 1.7 to 3.0 GHz.

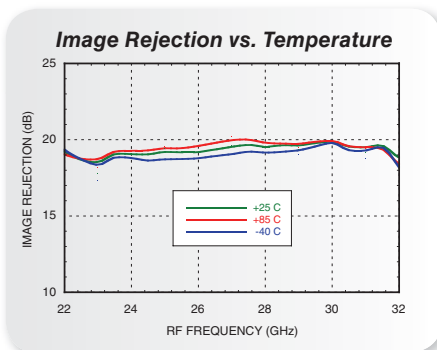
HMC524LC3B

GaAs MMIC I/Q Mixer, 22 - 32 GHz



Features

- Wideband IF Bandwidth: DC - 4.5 GHz
- Image Rejection: 20 dB
- LO to RF Isolation: 45 dB
- High Input IP3: +20 dBm

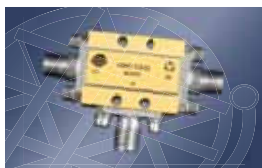


Excellent Image Rejection

The HMC524LC3B is a compact I/Q MMIC mixer which can be used as either an Image Reject Mixer or a Single Sideband Upconverter. The chip utilizes standard Hittite mixer cells and a 90 degree hybrid fabricated in a GaAs MESFET process. This product is a much smaller alternative to hybrid style Image Reject mixers and single sideband upconverter assemblies. The wide IF bandwidth and high isolation enable various Tx and Rx frequency plans.

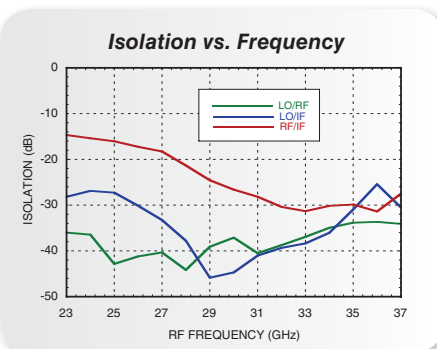
HMC-C035

GaAs MMIC Double-Balanced Mixer Module, 23 - 37 GHz



Features

- Wide IF Bandwidth: DC - 13 GHz
- Input IP3: +19 dBm
- LO/RF Isolation: 35 dB
- Hermetically Sealed Module
- Field Replaceable Coaxial Connectors



Ultra-Wide IF Bandwidth

The HMC-C035 is a wideband double-balanced mixer which can be used as an upconverter or downconverter between 23 and 37 GHz. The HMC-C035 provides excellent, LO to RF, and LO to IF suppression due to optimized balun structures. The passive mixer operates with LO drive levels from +11 to +15 dBm and requires no DC bias. The HMC-C035 may also be used as a Bi-Phase Modulator/Demodulator or phase comparator. Removable coaxial connectors can be detached for drop-in microstrip or coplanar circuit applications.

HMC-C039 / C040

GaAs HBT Frequency Divider Modules to 18 GHz



Features

- Ultra Low SSB Phase Noise
- Wide Input Power Range
- Single DC Supply: +5V
- Hermetically Sealed Module
- Field Replaceable
- SMA connectors
- 55 to +85°C Operation

Applications

- Pt to Pt / Multi-Pt Radios
- VSAT Radios
- Military & Space
- Test Instrumentation
- Fiber Optics

New Prescalers Provide Rare Divide-by-5 & Divide-by-10 Functionality!

The HMC-C039 is a Divide-by-5 Prescaler Module which operates from 500 MHz to 7 GHz, and the HMC-C040 is a Divide-by-10 Prescaler Module which operates from 500 MHz to 17 GHz.

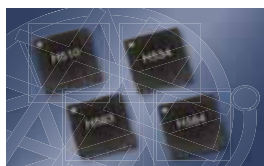
The HMC-C039 and the HMC-C040 are low noise, static frequency dividers which accept a wide input power range of -15 dBm to +10 dBm at midband, and deliver -1 dBm of Output Power. Both of these divider modules exhibit very low additive single sideband phase noise of -155 dBc/Hz at 100 kHz offset, making them ideal for use in high frequency Phase Locked Loops (PLL), and in Local Oscillator (LO) applications in military EW/ECM, space, test equipment, wideband telecom, microwave radio and industrial bands from 0.5 to 17 GHz.

These unique divider modules utilize InGaP GaAs HBT technology, and operate from a single supply of +5V. The HMC-C039 and HMC-C040 are footprint compatible with the previously released, HMC-C005, HMC-C006 and HMC-C007 prescaler modules which offer divide ratios of 2, 4 and 8 respectively.

Hittite Frequency Divider Module Family Typical Performance

Part Number	Function	Frequency (GHz)	Input Power (dBm)	Output Power (dBm)	100 kHz SSB Phase Noise (dBc/Hz)
HMC-C005	Divide-by-2	0.5 - 18	-15 to +10	-4	-150
HMC-C006	Divide-by-4	0.5 - 18	-15 to +10	-4	-150
New! HMC-C039	Divide-by-5	0.5 - 7	-15 to +10	-1	-155
HMC-C007	Divide-by-8	0.5 - 18	-15 to +10	-4	-150
New! HMC-C040	Divide-by-10	0.5 - 17	-15 to +10	-1	-155

HMC510 / 534 / 583 / 584LP5(E) MMIC VCOs w/ Fo/2 & ÷4, 8.45 to 13.9 GHz



Features

- Fo, Fo/2 & ÷4 Outputs
- Pout: +10 to +15 dBm
- Low SSB Phase Noise: -116 dBc/Hz @ 100 kHz typ.
- No External Resonator Required
- RoHS Compliant 5x5 mm QFN Leadless SMT Packages

Applications

- VSAT Radio
- Point-to-Point & Multi-Point Radio
- Test Equipment & Industrial Sensors
- Military Systems

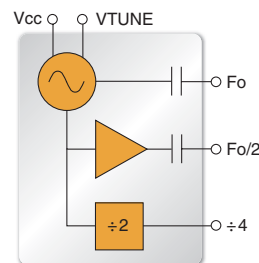
Versatile InGaP HBT MMIC VCOs Feature Multiple Outputs!

Four new InGaP HBT MMIC VCOs have been added to our extensive VCO product line. Ideal for Test Equipment, Industrial Control, VSAT, Point-to-Point/Point-to-Multi-Point Radio and Military applications from 8.45 to 13.9 GHz, these MMIC VCOs are packaged in footprint compatible leadless QFN 5 x 5 mm surface mount packages, and require no external matching components.

The HMC510LP5(E), HMC534LP5(E), HMC583LP5(E) and HMC584LP5(E) are fully integrated VCOs featuring SSB phase noise as low as -116 dBc/Hz for Fo output, with half frequency (Fo/2) and divide-by-4 outputs. These VCO products integrate resonators, negative resistance devices, and varactor diodes, and exhibit excellent phase noise performance over temperature, shock, and process variations due to the oscillator's monolithic structure. The power output from these MMIC VCOs is typically between +10 dBm and +13 dBm from a +5V supply and the divide-by-4 function can be disabled to reduce bias current by approximately 20% when not required.

New MMIC VCO Family Typical Performance

Part Number	Fo Frequency (GHz)	Fo/2 Frequency (GHz)	Fo Output Power (dBm)	Fo/2 Output Power (dBm)
HMC510LP5(E)	8.45 - 9.55	4.23 - 4.78	+13	+6.5
HMC534LP5(E)	10.6 - 11.8	5.3 - 5.9	+11	+5.5
HMC583LP5(E)	11.5 - 12.8	5.75 - 6.4	+11	+5.5
HMC584LP5(E)	12.5 - 13.9	6.25 - 6.95	+10	+5



VCO Functional Diagram

WIDEBAND VCO MODULES ACHIEVE LOW PHASE NOISE ... (continued from page 1)

Hittite Wideband Connectorized VCO Typical Performance

Part Number	Frequency (GHz)	Tuning Voltage (V)	Output Power (dBm)	10kHz SSB Phase Noise (dBc/Hz)	100kHz SSB Phase Noise (dBc/Hz)	Frequency Pushing (MHz/V)	Bias Supply
HMC-C028	4 - 8	0 to +18	+20	-65	-93	0.2	+8V to +15V @ 185mA
HMC-C029	5 - 10	0 to +20	+21	-63	-92	0.2	+8V to +15V @ 195mA
HMC-C030	8 - 12.5	0 to +13	+21	-59	-83	0.2	+8V to +15V @ 195mA



as -93 dBc/Hz at 100 kHz offset, and deliver up to +21 dBm of output power with ± 0.5 dB variation across the entire tuning bandwidth.

Each of these wideband VCO modules are integrated with internal DC voltage regulation, allowing them to operate from a single supply between +8V and +15V. Each module consumes less than 200 mA of current, and provides a single ended RF output which is matched to 50 Ohms. The Vtune ports of these VCO modules accept analog tuning voltages of up to +20 volts,

and can accommodate very fast tuning bandwidths.

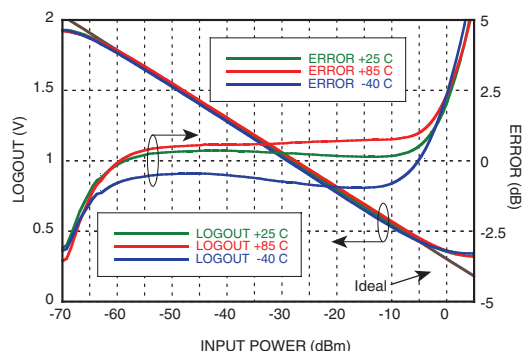
Hittite Microwave is well known for providing high performance frequency generation and distribution products including: dividers, multipliers, dynamic prescalers, VCOs, phase locked oscillators (PLOs) and complete synthesizers. Hittite's Wideband VCO Modules are rated for operation over the temperature range of -55°C to +85°C, and feature removable coaxial connectors for drop-in microstrip and coplanar circuit applications. These VCOs can also be up-screened for military and space end-use. Please contact Hittite with your custom VCO requirements.

HITTITE EXPANDS POWER DETECTOR PRODUCT LINE ... (continued from page 1)

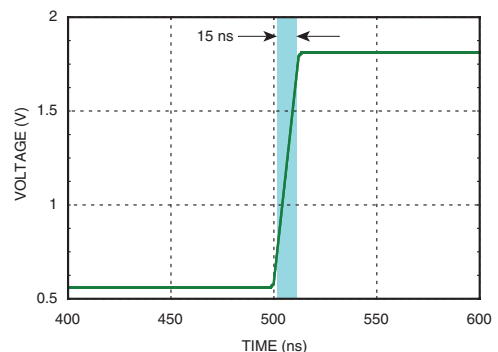
HMC602LP4(E) provides a nominal logarithmic slope of -25 mV/dB. The HMC602LP4(E) is ideal for RSSI measurement in cellular, broadband, test equipment, and wideband communications. As well as RF transmitter setpoint control and level monitoring in those applications.

The RF input is internally matched to 50 Ohms, and the device operates with a supply voltage of +5V, consuming 102 mA. A power down feature may be used to reduce the power consumption to less than 1.5 mW. The HMC602LP4(E) also features a buffered temperature sensor output which allows for additional system monitoring.

The HMC601LP4(E) is a 70 dB Logarithmic Detector/Controller which maintains a very high degree of log conformance over signal frequencies from 10 MHz to 3 GHz, with acceptable characteristics up to 4 GHz at reduced dynamic range.



HMC602LP4(E) Output Voltage and Error vs. Input Power @ 3.6 GHz



HMC601LP4(E) Output Rise Time

For example, the HMC601LP4(E) provides a ± 3 dB dynamic range of 76 dB with an input frequency of 900 MHz, and a ± 3 dB dynamic range of 73 dB at 1900 MHz.

The HMC601LP4(E) is pin-compatible with the recently released HMC600LP4(E), but provides much wider video bandwidth, exhibiting an output rise time of 15 ns, and an output fall time in the order of 34 ns. These rise/fall times make the HMC601LP4(E) particularly suitable for detection of RF bursts in applications requiring pulse rates up to 20 MHz. The HMC601LP4(E) RF input is internally matched to 50 Ohms, and operates with a supply voltage range of +2.7 to +5.5V, consuming only 30 mA.

The HMC600LP4(E), HMC601LP4(E) and HMC602LP4(E) are housed in 4x4 mm plastic leadless surface mount packages, are specified for operation over -40°C to +85°C temperature range, and are available from stock. Detailed datasheets for these products may be found at www.hittite.com.

HITTITE OPENS NEW DESIGN CENTER!

Hittite is pleased to introduce the establishment of an integrated circuit (IC) design center located in Ottawa, Ontario, Canada. The center is operational and staffed with a team of engineers who bring a complementary design capability which will immediately contribute to our product expansion plan.

FIRST EDITION MICROWAVE MODULES & SUBSYSTEMS CATALOG!

Hittite's connectorized module products are now conveniently featured in a new Microwave Modules and Subsystems catalog as well as our website. This first edition Microwave Modules and Subsystems Catalog features full specifications on 42 RF/microwave components and synthesizers which are ideal for Test and Measurement, Telecom, Military and Space applications.



The catalog is organized by product line and includes Amplifiers, Attenuators, Frequency Dividers/ Multipliers, Mixers, Phase Shifters, Switches, Synthesizers and VCOs. Request your copy of the new Microwave Modules and Subsystems catalog at www.hittite.com by selecting the "Submit Inquiry" button.

HITTITE ADDS 2 NEW REPRESENTATIVES!

TEQ Sales to Cover IL & WI

TEQ Sales now offers full support to Hittite's growing customer base in Illinois and Wisconsin. TEQ Sales in Illinois can be contacted at 847-742-3767, 847-742-3947 (fax) or at TEQSalesIL@teqsales.com. TEQ Sales in Wisconsin can be contacted at 262-780-0340, 262-780-0342 (fax) or at TEQSalesWI@teqsales.com.

Schillinger Associates to Cover IN, KY, MI & OH

Schillinger Associates, Inc. now offers full support to Hittite's growing customer base in Indiana, Kentucky, Michigan and Ohio. Schillinger Associates, Inc. can be contacted at 765-457-7241, 765-457-7732 (fax) or administrator@sai-rep.com.

CONNECTORIZED MODULE PRODUCTS ARE RoHS COMPLIANT!

Hittite is committed to meeting the Restriction of Hazardous Substances (RoHS) European Union directive. We are pleased to announce that all of our Connectorized Microwave Modules are now RoHS or RoHS-5 compliant, while also meeting stringent military solder material requirements. Please see the RoHS Compliant Components section at www.hittite.com.



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