**Logarithmic Detector/Controller Sets New Benchmark**

Hittite Microwave is pleased to announce the new Power Detector Product Line. The HMC600LP4(E) is the first of a family of leading edge power detector products to be introduced.

The HMC600LP4(E) Logarithmic Detector /Controller converts RF signals at its differential input, to a proportional output DC voltage. The HMC600LP4(E) delivers extremely high dynamic range and conversion accuracy over an input RF frequency range of 50 to 3000 MHz.

For example, the HMC600LP4(E) features a dynamic range of 74 dB with an input frequency of 900 MHz and a dynamic range of 67 dB at 2500 MHz, with excellent stability over it’s operating temperature range of -40°C to +85°C. In logarithmic detection mode the HMC600LP4(E) provides a nominal logarithmic slope of 19 mV/dB.

With an input signal bandwidth of 4.5 GHz and a clock rate of 1GHz, the HMC660LC4 demonstrates an impressive 9-bit track-and-hold mode linearity. This level of performance is essential for designers looking to improve and expand the capability of existing commercially available high speed analog-to-digital converters (ADCs).

The HMC660LC4 Wideband Track-and-Hold may (Continued on page 6)
**HMC550(E)**

**GaAs MMIC SPST Failsafe Switch, DC - 6 GHz**

**Ideal for Tags & Portables!**

The HMC550(E) are low-cost SPST Failsafe Switches in 6-lead SOT26 plastic packages. These devices can control signals from DC to 6.0 GHz and are especially suited for IF and RF applications including RFID, ISM, automotive and battery powered tags and portables. RF1 and RF2 are reflective opens when “Off”. The failsafe topology results in the switch being normally “On”, i.e. low insertion loss from RF1 to RF2, when no DC bias is applied.

**Features**

- Failsafe Operation - “On” When Unpowered
- Single Control: 0/+2.2V to +0.5V
- Very Low Current: < 1μA
- Low Insertion Loss: 0.7 dB
- High IP3: +52 dBm

**HMC544(E) / 545(E)**

**4 & 8 Watt T/R Switches, DC - 4.0 GHz**

**Ultra Low Insertion Loss!**

The HMC544(E) & HMC545(E) are low cost SPDT switches in 6-lead SOT26 packages for use in transmit-receive applications which require very low insertion loss at medium power levels. These devices can control signals from DC to 4.0 GHz and are especially suited for 450, 900, 1900, 2300, 2700 and 3500 MHz applications with <0.5 dB insertion loss. These GaAs PHEMT designs deliver up to +39 dBm 1dB compression point and +65 dBm third order intercept.

**Features**

- Insertion Loss as low as 0.25 dB
- Up to +65 dBm Input IP3
- Up to +39 dBm Input P1dB
- Positive Control: 0/+3V to 0/+8V
- Compact SOT26 SMT Packages

**HMC546LP2E**

**10 Watt T/R Switch, 0.2 - 2.7 GHz**

**Ideal for LNA Protection!**

The HMC546LP2E is a low-cost SPDT switch in 2x2 mm leadless surface mount package. This switch is ideal for use in transmit-receive, failsafe bypass, and LNA protection applications in cellular boosters, PMR, automotive telematic, and WiMAX / WiBro applications. The design provides exceptional P0.1dB of +40 dBm and +65 dBm IIP3 on the Transmit (Tx) port. Only a single positive supply and a single control input are required for normal operation.

**Features**

- Failsafe Operation
  - +40 dBm P0.1dB
- Single Positive Control
- 0.4 dB Insertion Loss
- 2x2 mm SMT Package

*Tuned for 2.6 GHz
**HMC542LP4(E)**

**6-BIT Digital Attenuator w/ Serial Control, DC - 3.0 GHz**

**Features**
- 0.5 dB LSB Steps to 31.5 dB
- TTL/CMOS Compatible Serial Data Interface
- SPI Compatible Serial Output
- ± 0.25 dB Typical Step Error
- Single +5V Supply

**Typical Performance @ midband**

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>HMC542</th>
<th>HMC551/552</th>
<th>HMC564/565/566</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 - 13.5</td>
<td>17</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>6 - 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 - 36</td>
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<td></td>
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<tr>
<td>Gain (dB)</td>
<td>1.8</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Noise Figure (dB)</td>
<td>24</td>
<td>20</td>
<td>23.5</td>
</tr>
<tr>
<td>Output IP3 (dBm)</td>
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**Step Error**

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<thead>
<tr>
<th>FREQUENCY (GHz)</th>
<th>STEPS (dB)</th>
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<tbody>
<tr>
<td>0.8</td>
<td>0</td>
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<tr>
<td>1.2</td>
<td>-0.2</td>
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<tr>
<td>1.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>1.8</td>
<td>-0.6</td>
</tr>
<tr>
<td>2.2</td>
<td>-0.8</td>
</tr>
<tr>
<td>2.4</td>
<td>-1</td>
</tr>
<tr>
<td>2.6</td>
<td>-1.2</td>
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<tr>
<td>2.8</td>
<td>-1.4</td>
</tr>
<tr>
<td>3</td>
<td>-1.6</td>
</tr>
</tbody>
</table>

**31.5 dB Range & Serial Control!**
The HMC542LP4(E) are broadband 6-bit GaAs IC digital attenuators with CMOS compatible serial to parallel drivers in low cost leadless packages. Covering DC to 3.0 GHz, the insertion loss is less than 1.5 dB typical. The attenuator bit values are 0.5 (LSB), 1, 2, 4, 8, and 16 dB for a total attenuation of 31.5 dB. Attenuation accuracy is excellent at ± 0.25 dB typical step error with an IIP3 of +45 dBm. A six bit serial control word is used to select each attenuation state.

---

**HMC551LP4(E) / 552LP4(E)**

**Linear Mixers w/ LO Amps, 0.8 to 3.0 GHz**

**Features**
- Input IP3: +25 dBm
- Low Input LO Drive: -4 to +4 dBm
- LO to RF Isolation: 30 dB
- Low Conversion Loss: 8 dB
- Single Supply: +5V @ 62 mA

**Conversion Gain**

<table>
<thead>
<tr>
<th>FREQUENCY (GHz)</th>
<th>CONVERSION GAIN (dB)</th>
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<tbody>
<tr>
<td>0.8</td>
<td>-20</td>
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<tr>
<td>1.2</td>
<td>-15</td>
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<tr>
<td>1.4</td>
<td>-10</td>
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<td>1.6</td>
<td>-5</td>
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<tr>
<td>1.8</td>
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<td>2</td>
<td>5</td>
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<td>2.2</td>
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<td>2.6</td>
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<tr>
<td>2.8</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
</tbody>
</table>

**0 dBm LO Drive, 30 dB Isolation!**
The HMC551LP4(E) & HMC552LP4(E) are Double-Balanced Converter ICs that operate from 0.8 to 1.2 GHz and 1.6 to 3.0 GHz, respectively. The LO amplifier outputs and high dynamic range mixer inputs are positioned so that an external LO filter can be placed in series between them. These converters provide up to 30 dB of LO to RF isolation and are ideal for upconverter and downconverter applications. Each mixer operates from a single +5V supply and accepts a LO drive level of -4 to +4 dBm.

---

**HMC564 / 565 / 566**

**GaAs PHEMT MMIC Low Noise Amplifiers, 6 to 36 GHz**

**Features**
- Single Supply: +3V
- DC Blocked RF I/Os
- Positive Gain Slope
- No External Matching

**Typical Performance @ midband**

<table>
<thead>
<tr>
<th>FREQUENCY RANGE</th>
<th>HMC564</th>
<th>HMC565</th>
<th>HMC566</th>
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<tbody>
<tr>
<td>7 - 13.5</td>
<td>17</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>6 - 20</td>
<td></td>
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<td>29 - 36</td>
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<tr>
<td>Gain (dB)</td>
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</tr>
<tr>
<td>Noise Figure (dB)</td>
<td>24</td>
<td>20</td>
<td>23.5</td>
</tr>
<tr>
<td>Output IP3 (dBm)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Compact, Self-Biased LNAs!**
The HMC564, HMC565 & HMC566 are high dynamic range GaAs PHEMT MMIC Low Noise Amplifier (LNA) die which cover 6 to 36 GHz. These LNAs feature extremely flat small signal gain, noise figure and high output IP3 performance across their operating bands. The HMC564, HMC565 and HMC566 LNAs are ideal for hybrid and MCM assemblies due to their compact size, consistent output power, single +3V supply operation, and DC blocked RF I/O’s.
HMC-C027

Low Noise Amplifier Module, 29 - 36 GHz

+3V Supply, Positive Gain Slope!
The HMC-C027 is a GaAs MMIC PHEMT Low Noise Amplifier in a miniature, hermetic module which operates between 29 and 36 GHz. This high dynamic range amplifier module provides 20 dB of gain, 2.9 dB noise figure and up to +22 dBm of output IP3 from a single +3V supply. The RF I/Os are internally matched to 50 Ohms and DC blocked for robust performance. This module features a positive gain slope, and consistent noise figure and output power performance.

Features
- Low Noise Figure: 2.9 dB
- High Gain: 20 dB
- DC Blocked RF I/Os
- Hermetically Sealed Module

HMC-C019

100 dB Isolation SPST Switch Module, DC - 20.0 GHz

High Isolation, Fast Switching!
The HMC-C019 is a high speed, high isolation GaAs SPST Switch housed in a miniature hermetic module with field replaceable SMA connectors. Covering DC to 20 GHz, the switch features 100 dB isolation up to 4 GHz and 65 dB isolation up to 20 GHz. CMOS interface allows a positive +5V bias voltage at very low DC currents. This non-reflective switch exhibits very fast switching speeds, and very low switching transients making it ideal for high speed RF pulse modulation applications.

Features
- Up to 100 dB Isolation
- Fast Switching For RF Pulse Modulator Applications
- Non-Reflective Topology
- Hermetically Sealed Module

HMC-C018

6-BIT Serial Control Attenuator Module, DC - 13 GHz

Serial Control, ±0.3 dB Accuracy!
The HMC-C018 is a DC to 13 GHz 6-bit GaAs IC Digital Serial Control Attenuator housed in a miniature hermetic module. This wideband attenuator features +38 dBm input IP3, and bit values of 0.5 (LSB), 1, 2, 4, 8, and 16 dB for a total attenuation of 31.5 dB. Attenuation accuracy is excellent with ±0.3 dB typical bit error. A six bit CMOS compatible serial control word is used to select each attenuation state and a single VDC bias of -5V allows operation at frequencies down to DC.

Features
- 0.5 dB LSB Steps to 31.5 dB
- CMOS Compatible Serial Data Interface
- ±0.3 dB Typical Bit Error
- Hermetically Sealed Module
HMC553 (LC3B) / 554 (LC3B)  
**MMIC Double-Balanced Mixers, 7 to 20 GHz**

**Features**
- Passive DBL-BAL Topology
- Up to 50 dB LO to RF Isolation
- 7 dB Conversion Loss
- Die & RoHS SMT Packages Available

**Typical Performance**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>RF Freq. (GHz)</th>
<th>Conv. Gain (dB)</th>
<th>LO / RF Iso. (dB)</th>
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</thead>
<tbody>
<tr>
<td>HMC553</td>
<td>7 - 14</td>
<td>-7</td>
<td>48</td>
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<tr>
<td>HMC553LC3B</td>
<td>7 - 14</td>
<td>-7</td>
<td>50</td>
</tr>
<tr>
<td>HMC554</td>
<td>11 - 20</td>
<td>-7</td>
<td>46</td>
</tr>
<tr>
<td>HMC554LC3B</td>
<td>11 - 20</td>
<td>-7</td>
<td>46</td>
</tr>
</tbody>
</table>

**Rx & Tx Applications!**

The HMC553 (LC3B) and HMC554 (LC3B) wideband passive double-balanced GaAs MMIC Mixers are available as bare die or in leadless RoHS compliant SMT 3x3 mm packages and can be used as upconverters or downconverters between 7 and 20 GHz. These passive mixers are fabricated in a GaAs MESFET process, and require no external components. The HMC553 (LC3B) and HMC554 (LC3B) provide excellent LO to RF and LO to IF isolation, and operate with LO drive levels as low as +9 dBm.

HMC560 / 560LM3  
**MMIC Double-Balanced Mixers, 24 - 40 GHz**

**Features**
- IF Bandwidth: DC - 18 GHz
- Input IP3: +21 dBm
- High LO/RF Isolation: 35 dB
- Passive DBL-BAL Topology
- Die & RoHS SMT Packages Available

**IF Bandwidth**

**DC - 18 GHz IF Bandwidth!**

The HMC560 and HMC560LM3 are 24 - 40 GHz wideband passive, double-balanced GaAs MMIC Mixers offered in bare die and a 3x3 mm SMT leadless RoHS compliant packages. These mixers are fabricated in a GaAs MESFET process, and can be used as downconverters or upconverters. The wide operating bandwidth allows this device to be used across multiple radio bands with a common platform. Excellent isolations are provided by on-chip baluns. The HMC560 and HMC560LM3 require no external components and no DC bias.

HMC555 / 556  
**MMIC I/Q Mixers, 31 to 41 GHz**

**Features**
- IF Bandwidth: DC - 3.5 GHz
- High Image Rejection: 15 dB
- High LO to RF Isolation: 50 dB
- High Input IP3: +20 dBm

**Image Rejection**

**Ideal for Microwave Radio!**

The HMC555 and HMC556 are GaAs MMIC I/Q Mixers with RF/LO coverage of 31 to 38, and 36 to 41 GHz respectively. These mixers utilize two double-balanced mixer cells and a 90 degree hybrid, and be used as either Image Reject Mixers or Single Sideband Upconverters. The HMC555 and HMC556 offer a more compact alternative to hybrid assemblies, and are ideal for microwave radio applications.
Seven new Active x2 Multipliers have been added to Hittite’s broad line of active and passive frequency multiplier products. These new active doublers extend the Product Line’s output frequency coverage, and increased the output power capability of the product line.

The HMC576, HMC578, and HMC579 Active x2 Frequency Multipliers are offered in bare die form and are comprised of an input amplifier, a low conversion loss frequency doubler, and an output buffer amplifier. By using these three Active x2 Multipliers, radio designers can achieve continuous output frequency coverage from 18 to 46 GHz.

For applications where a SMT RoHS compatible package is required, the HMC575LP4(E), HMC576LC3B, HMC577LC4, and the HMC578LC3B Active x2 Multipliers provide output frequencies from 5 to 33 GHz. Each of these products provides excellent fundamental and subharmonic suppression, and are ideal for point-to-point, point-to-multi-point, VSAT, and military applications. The table below summarizes the performance for Hittite’s complete active x2 multiplier products.

Designers will welcome the increased output power capability of these new multipliers which ranges from +12 to +21 dBm, and enable them to directly drive many of Hittite’s Double-Balanced and I/Q MMIC Mixer products. For example, the HMC578LC3B, is ideal for driving the LO port of the new HMC560LM3 24 to 40 GHz Double-Balanced Mixer. The HMC578LC3B also provides several dB of output power margin, allowing the designer to place a bandpass filter between the two components if required. Each of these new MMIC multipliers are available from stock and complete data sheets can be found at www.hittite.com.
**Hittite Adds New Representative**

RFM Marketing to Cover AL, GA, MS, NC, SC & TN

RFM Marketing specializes in RF/Microwave devices and represents a full line of active, passive, mechanical, and test & measurement equipment. With headquarters in Monroe, Georgia, RFM Marketing offers full support to customers in Alabama, Georgia, Mississippi, North and South Carolina and Tennessee.

RFM Marketing can be contacted via telephone at 770-267-1295, via fax at 770-207-4752, or email at brianjackson1@alltel.net.

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**2006 Designer’s Guide Released!**

Hittite has released the 11th edition Designer’s Guide catalog for 2006. This popular publication includes 80 new RFIC and MMIC product data sheets, as well as quality/reliability, application and packaging/layout information. New for 2006 is a two volume catalog format: Volume 1 - Amplifiers and Control Devices and Volume 2 - Frequency Generation, Mixers and Modulators. Design engineers will find that each volume is conveniently organized into chip component, SMT packaged and connectorized module sections.

The 2006 Designer’s Guide provides full specifications for 398 products. To request your 2006 catalog two volume set, please visit us on-line at www.hittite.com and select the “Submit Inquiry” button. Quantities are limited - order today!

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**New Summer 2006 Selection Guide!**

Hittite Microwave is pleased to announce the release of the Summer 2006 Product Selection Guide which summarizes over 420 products, including more than 25 new products for Q206. The selection guide is organized by product line as well as by market applications including: Automotive, Broadband, Cellular, Microwave & mmWave, Test & Measurement, Fiber Optic, Military and Space.

Request your copy of the new Summer 2006 Selection Guide at www.hittite.com by selecting the “Submit Inquiry” button. An updated version of Hittite’s CD-ROM is also available. New product data sheets can be found on-line.

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**Sales Contact Information:**

Hittite Microwave Corporation  
USA Corporate Headquarters  
Phone: 978-250-3343  
Fax: 978-250-3373  
hmsales@hittite.com

Hittite Microwave Corporation  
Eastern N. American Sales Office  
Phone: (610) 998-1470  
Fax: (610) 998-1473  
usa-east@hittite.com

Hittite Microwave Europe Limited  
Phone: +44 1256-817000  
Fax: +44 1256-817111  
europe@hittite.com

Hittite Microwave Deutschland GmbH  
Phone: +49 8031-97654  
Fax: +49 8031-98883  
germany@hittite.com

Shanghai Office  
Phone: (86-21) 62376717  
Fax: (86-21) 62376716  
china@hittite.com

Beijing Office  
Phone: (86-10) 5867-2486  
Fax: (86-10) 5867-2436  
beijing@hittite.com

Shenzhen Office  
Phone: (86) 755-9829-1278  
Fax: (86) 755-8829-1279  
shenzhen@hittite.com

**North America**

**Canada:**  
Ontario & Montreal:  
Repswave: Scietech  
+613-270-9811  
Toronto:  
Repswave: Scietech  
+905-465-1584

**USA North East & Mid-Atlantic:**  
CT, MA, ME, NH, RI & VT:  
dBm Technical Sales  
978-256-7100  
So. CT, Metro NY/Li & No. NJ:  
Comp Tech  
201-288-7400  
E. PA, So. NJ & Upstate NY:  
Brooks Associates  
732-875-1900  
DC, DE, MD, VA & WV:  
Vincent Pirro Electronics  
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**USA Midwest:**  
IA, MN & E. OH:  
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800-672-5746  
IN, KS, KY, M, MO, NE  
W. OH, So. IL & WI:  
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610-998-1470  
No. IL:  
TX Technologies Inc.  
847-991-7163  
USA South East:  
FL:  
Spartech South  
321-727-6045  
GA, NC, SC, TN, AL & MS:  
RFM Marketing Inc.  
770-267-1295

**USA South West:**  
TX, OK, LA & AR:  
NW Sales, LP  
817-483-5676  
AZ & NM:  
Saguaro Technical Sales, Inc.  
480-947-3724  
USA West:  
No. CA & NV:  
Custom & Wireless Sales  
408-371-0222

---

**Europe, Mid-East & Africa**

Benelux, Finland, Greece & Sweden:  
Hittite Microwave Europe Limited  
+44 1256-817000

France:  
Sales SA  
+33-1-69-02-2560  
Germany, Austria, Denmark, Latvia, Lithuania, Estonia, Poland, Czech Republic, Slovakia, Hungary, & Switzerland:  
Hittite Microwave Deutschland GmbH  
+49 8031-97654

Norway:  
Bredengen AS  
+47-2100-9100  
Spain & Portugal:  
Altafik Electronics S.A.L  
+34-91-636-39-39  
South Africa:  
RF Design Laboratory CC  
+27-21-955-8400  
United Kingdom & Ireland:  
Link Microtek Ltd  
+44-1256-355-771

**Asia & South Pacific**

Australia:  
ASD Technology Pty Ltd  
+61-2-9884-7486  
China & Hong Kong:  
Secom Telecom Co., LTD.  
+86-755-2515888  
Taiwan:  
Wai Tat Electronics Ltd.  
+886-2-26572615

**North America Distribution:**

Bandtek International Co., Ltd.  
Taiwan R.O.C.  
+886-2-26572615  
ENS Engineering  
Korea  
+82-2-562-9819

**Sales Contact Information:**

So. CA:  
Acetec  
858-784-0990  
OR & WA:  
Sea-Port Technical Sales  
425-702-8300  
CO & UT:  
W. Howard Associates, Inc.  
303-766-6735

**Europe, Mid-East & Africa**

Benelux, Finland, Greece & Sweden:  
Hittite Microwave Europe Limited  
+44 1256-817000

France:  
Sales SA  
+33-1-69-02-2560  
Germany, Austria, Denmark, Latvia, Lithuania, Estonia, Poland, Czech Republic, Slovakia, Hungary, & Switzerland:  
Hittite Microwave Deutschland GmbH  
+49 8031-97654

Norway:  
Bredengen AS  
+47-2100-9100  
Spain & Portugal:  
Altafik Electronics S.A.L  
+34-91-636-39-39  
South Africa:  
RF Design Laboratory CC  
+27-21-955-8400  
United Kingdom & Ireland:  
Link Microtek Ltd  
+44-1256-355-771

**Asia & South Pacific**

Australia:  
ASD Technology Pty Ltd  
+61-2-9884-7486  
China & Hong Kong:  
Secom Telecom Co., LTD.  
+86-755-2515888  
Taiwan:  
Wai Tat Electronics Ltd.  
+886-2-26572615

**Europe, Mid-East & Africa**

Benelux, Finland, Greece & Sweden:  
Hittite Microwave Europe Limited  
+44 1256-817000

France:  
Sales SA  
+33-1-69-02-2560  
Germany, Austria, Denmark, Latvia, Lithuania, Estonia, Poland, Czech Republic, Slovakia, Hungary, & Switzerland:  
Hittite Microwave Deutschland GmbH  
+49 8031-97654

Norway:  
Bredengen AS  
+47-2100-9100  
Spain & Portugal:  
Altafik Electronics S.A.L  
+34-91-636-39-39  
South Africa:  
RF Design Laboratory CC  
+27-21-955-8400  
United Kingdom & Ireland:  
Link Microtek Ltd  
+44-1256-355-771

**North America Distribution:**

Future Electronics  
800-Future-1  
Ext. 2754, Americas  
www.FutureElectronics.com/rf

**RFM Marketing can be contacted via telephone at 770-267-1295, via fax at 770-207-4752, or email at brianjackson1@alltel.net.**
What We Do

Hittite Microwave Corporation is an innovative designer and manufacturer of analog and mixed-signal ICs, modules and subsystems 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 and BiCMOS semiconductor processes utilizing MESFET, pHEMT, mHEMT and HBT devices. Our products include:

- Power Amplifiers
- Gain Blocks
- Driver Amplifiers
- LNAs
- Wideband Amps
- Attenuators
- Phase Shifters
- Switches
- Transceivers
- Power Detectors
- Mixers
- Converters
- IRMs
- Modulators
- Track-and-Hold Amplifiers
- VCOs
- Freq. Dividers
- Freq. Detectors
- Freq. Multipliers
- PLOs / PLLs

We also design and supply highly integrated custom ICs, modules and subsystems that combine multiple functions for specific requirements. We select the most appropriate semiconductor and package technologies, uniquely balancing digital and analog integration techniques.

Our custom and standard products support a wide range of wireless / wired communications and radar applications for the following markets:

- **Automotive**
  - Telematics & Sensors

- **Broadband**
  - CATV, DBS, WiMAX, WLAN, Fixed Wireless & UWB

- **Cellular / PCS / 3G**
  - Infrastructure & Mobile

- **Fiber Optic**
  - OC-48 to OC-768

- **Microwave & mmWave Communications**
  - Pt to Pt / Multi-Pt 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 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.