Advanced MMIC Technology For Fixed Wireless Access

By Steven Daly, Hitttite Microwave Corporation
The demand for broadband fixed wireless access equipment is challenging semiconductor suppliers to produce integrated circuit (IC) components at frequencies above established GSM and PCS bands. New broadband systems operate at frequency between 3.4 - 3.7 GHz, 5.25 - 5.85 GHz, and 27.5 - 32 GHz. Hittite Microwave's MMIC product line provides mixer, multiplier, switch, attenuator, amplifier, and prescalar solutions for these designated bands. This article discusses selected surface mount MMIC solutions that simplify the design and manufacturing processes required by subsystem and component integrators.

WLL Markets

The licensed 3.4 to 3.7 GHz spectrum is established to address the high-speed Internet access and voice telephony market. Service providers secure this spectrum for deploying low cost radio systems to provide fast Internet connections, up to 3 Mbps per subscriber and up to 54 Mbps per base station. The fast data transfer capability and the fast deployment times of these turnkey FWA systems give service providers a competitive advantage over traditional wired systems, which run slower data rates and take longer to install. Systems are deployed in a cellular network format, with cell radius up to 15 Km, allowing for a scalable deployment. Hittite's HMC326MS8G can service this market. This medium power amplifier is fabricated in an InGaP Heterojunction Bipolar Transistor (HBT) process and is packaged in a 3 &#215 5 mm, 8 lead plastic package. The amplifier requires 6 external surface mount passives. The part features an OIP3 of 36 dBm, an output 1 dB compression point of 23.5 dBm and a saturated power output of 25.5 dBm. It achieves a peak efficiency of 42% while operating from a single positive 5.0 V supply. An additional DC port can be used to power down the amplifier when not in use. The amplifier has been designed with manufacturing tolerances taken into account as demonstrated by the broadband characteristics shown in Figure 1. A gain of more than 20 dB is achieved from 3 to 4.5 GHz and a peak efficiency of over 40% is maintained from 3.3 to 4.6 GHz.

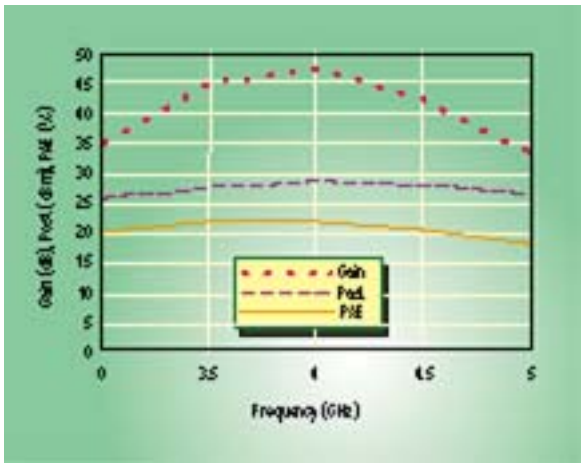

Figure 1. HMC326MS8G Gain, PAE, and Psat

This amplifier provides high gain and delivers medium power levels. It can be used

as the output stage, or as a driver stage for a high power output stage.

UNII and HyperLAN Markets

System Operators that wish to deploy unlicensed radio systems select the UNII bands, due to the high bandwidth that is available. Broadband systems being deployed today produce Internet connections at data rates as high as 54 Mbps. Hittite supplies front-end integrated and single function components including mixer, switch, frequency doubler, and power amplifier products. Hittite's unique designs use low cost, high volume, robust and established technologies.

One area of difficulty for C-band radio designers is reducing the losses between the PA and the antenna. Any excess loss after the PA reduces the transmission power, therefore reducing overall radio efficiency. The HMC224MS8 T/R switch can help reduce insertion loss between the front end amplifiers (LNA and PA) and antenna port. Figures 2 and 3 contain insertion loss and isolation histogram data from a sample of 1200 production HMC224MS8 switches that were tested at 5.8 GHz.

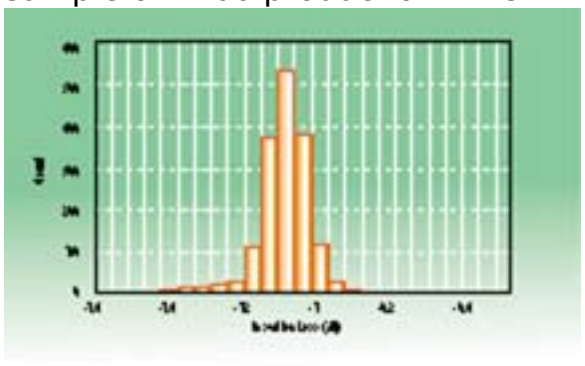

Figure 2. 5.8 GHz HMC224MS8 Insertion Loss

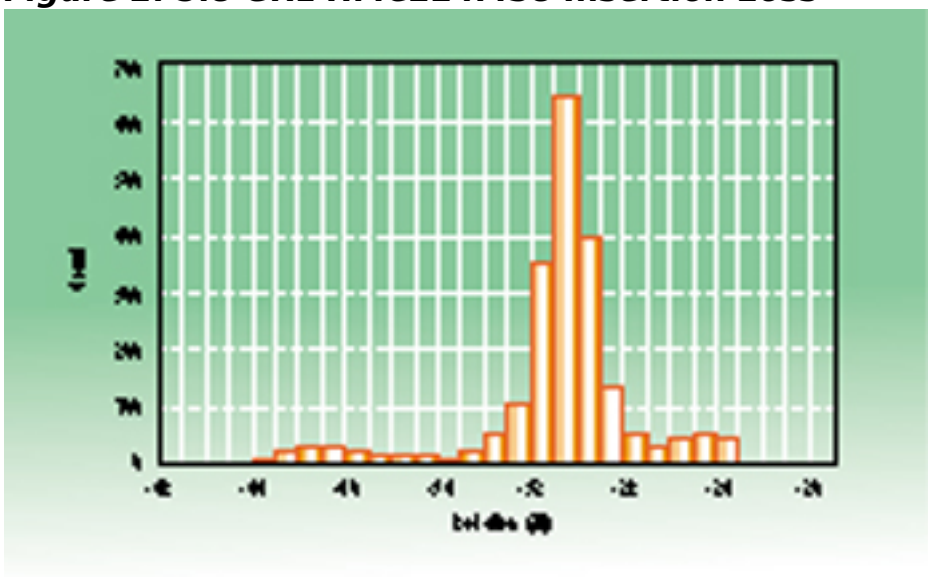

Figure 3. 5.8 GHz HMC224MS8 Isolation

The new HMC393MS8G diversity switch integrates two T/R switches 'back to back' inside an eight-leaded MSOP8G package. It reduces the area required to create the diversity function. The insertion loss and isolation at mid-band of the HMC393MS8G diversity switch is 1.2 dB and 20 dB respectively.

Millimeter Wave & LMDS Market

Hittite also supplies surface mount millimeter wave MMICs. The new HMC300LM1 amplifier takes advantage of new SMT package technology and operates from 25.5 to 33.0 GHz. The design provides 15 dB of gain and 24 dBm of saturated power. Surface mount LNA and PA amplifiers in conjunction with the HMC264CB1 (20 - 30

GHz) and HMC265CB1 (20 - 31 GHz) mixers allow OEMs to use high volume reflow assembly processes in manufacturing rather than complex chip and wire hybrid assembly techniques.

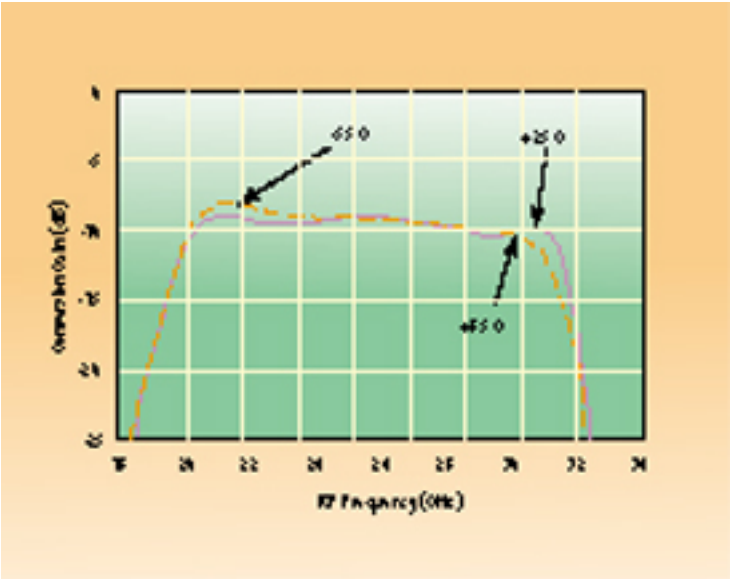

Figure 4. HMC264CB1 Conversion Loss vs. Temperature

Hittite Microwave Corporation will continue to focus on revolutionizing IC design concepts for a variety of markets.

More information on the Hittite products mentioned in this article is available at www.hittite.com.

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