

Industry First SP8T GaAs MMIC Switch

Designed for “Smart” Base Station Applications

Cellular and PCS equipment providers are designing increasingly sophisticated base station equipment. Three sector antenna configurations are common in the industry. The trend is now towards “smart” base stations with 12 to 16 sectors, providing increased coverage and capacity versus 3 sector implementations. Smart base stations adaptively control antenna receive paths to improve reverse path sensitivity, based on real time usage needs in any one sector. These designs must rapidly provide switching capability to selectively combine receive channels. High performance multithrow switches are an important component in these designs.

The HMC183QS24 SP8T switch offers major benefits for this adaptive switching function, particularly a savings in overall circuit size. Its operating frequency range of DC to 2 GHz covers all the cellular and PCS bands (AMPS, PDC, GSM, DCS1800, PCS1900, CDMA, etc). Multithrow designs made use of multiple PIN diodes or hybrid multithrow switches prior to the introduction of GaAs MMIC switches by Hittite Microwave and others several years ago. To achieve an 8 throw capability, a minimum of 8 PIN diodes and numerous control circuit components were required. Alternatively, cascaded multithrow hybrid switches can also provide the function. These approaches result in numerous control lines and components, with a relatively large complex board layout. A more contemporary SP8T approach uses one SPDT and two SP4T

GaAs MMIC switches, requiring 10 to 18 control lines and associated logic drive circuitry.

Hittite Microwave’s SP8T switch provides a single chip solution, saving a minimum of 60% in board space over other alternatives. This is achieved through on-chip functional integration and the use of a small plastic surface mount (SMT) package. The SP8T has an integral 3 to 8 decoder, requiring only 3 control lines, versus 8 or more for other design approaches. Hittite Microwave pioneered the integral decoder concept on GaAs MMIC switches in 1995, with the introduction of our HMC165S14 SP4T MMIC switch. This on-chip decoder saves costs in several ways - component cost, board area and design time. Our SP8T GaAs MMIC switch provides high reliability, consistency and the performance of a monolithic solution, in a low cost, compact plastic package.

Electrical Performance

The electrical performance of the HMC183QS24 is exceptional out to 2 GHz. Parameters are guaranteed over the operating temperature range of -40 to +85C. Isolation is 40 dB at 1 GHz and 32 dB at 2 GHz, as shown in Figure 1. Figure 2 illustrates insertion loss specifications of 1.3 dB at 1 GHz and 1.7 dB at 2 GHz. The HMC183QS24 can also be used up to 3 GHz for designs tolerant of lower isolation and higher insertion loss specifications. The input power level at the 1 dB compression point (P1dB) is 20 dBm. The input third order intercept (IP3) is 40 dBm, ensuring minimal distortion of low level receive signals. Switching rise and fall times are 25ns typical, allowing rapid channel selection.

PRODUCT FEATURE HMC183QS24

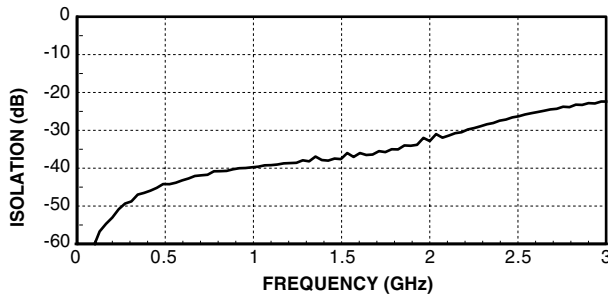


Figure 1. Isolation vs. Frequency

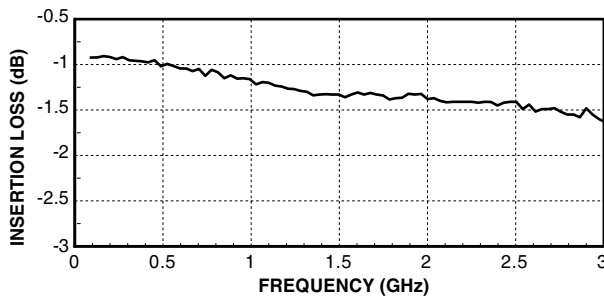


Figure 2. Insertion Loss vs. Frequency

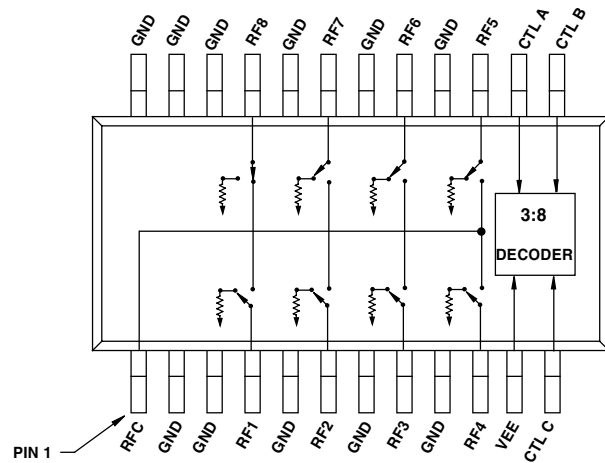


Figure 3. Functional Diagram

Figure 3 illustrates the functional pinout for the HMC183QS24. A single -5 volt Vee and three 0 to -5 volt control inputs are all that is required to power and control the eight switches. The Vee bias current is only 4 mA typical and control signals require approximately 1 mA. The switch will function down to 3 volts if required. The HMC183QS24 can easily be driven by TTL or CMOS logic through a simple, low cost interface circuit.

The product is offered in a 24 pin QSOP package. This plastic surface mount package is a low cost, industry standard package. The 24 pin QSOP package is essentially the same size as a 14 pin SOIC package, saving valuable board space. Each of the eight outputs is terminated into 50 Ohm in the "off" state.

Latest Member of Hittite's MMIC Switch Family

The HMC183QS24 is the latest addition to Hittite Microwave's family of plastic packaged GaAs MMIC switches. It is currently available for sampling and orders. SPDT, SP4T and SP6T switches are also available to meet a variety of multithrow design needs. All switches are housed in industry standard plastic surface mount packages and are available in tape and reel. Low cost, mature MESFET processes are used to fabricate these devices. Hittite Microwave also offers SPDT switches out to 9 GHz in ceramic packages and to 15 GHz in die form. All these products benefit from Hittite Microwave's decades of GaAs MMIC design experience, ranging from single function to highly integrated MMIC chipsets.

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