

PLASTIC SMT DOUBLER COVERS UP TO 6 GHz FEATURING THE HMC187MS8 / HMC188MS8

Wireless communications applications continue to evolve at a furious pace. New applications are emerging such as Wireless Local Loop (WLL) and Multipoint Multichannel Distribution System (MMDS). Wireless LAN is moving up from 900MHz to 2.4 GHz, with 5.2 GHz not far off. The digital microwave radio and VSAT products continue to thrive at traditional frequencies and are also moving up the frequency spectrum. All these applications are faced with the challenge of high performance while meeting small packaging, low power consumption and of course, low cost requirements. Frequency multiplication is often a cost-effective approach to create a local oscillator or for signal translation in these applications. Doublers are the most common multiplication building block at high frequencies and have long been offered in large connectorized packages. Until now, today's frequency doublers do not offer surface mount capability in industry standard IC packages.

The HMC187MS8 and HMC188MS8 GaAs MMIC frequency doublers answer these requirements. The devices are high performance, low cost and are supplied in the industry standard plastic 8-lead MSOP surface mount package. The HMC187MS8 and HMC188MS8 cover output frequency ranges of 1.7-4.0 GHz and 2.5-6.0 GHz, respectively.

The typical isolation performance of each device is illustrated in Figures 1a and 1b for a +15dBm drive level. The incident fundamental frequency, F_0 , is attenuated by at least 30 dB relative to the desired output frequency $2F_0$. The higher order signal isolation, $3F_0$ and $4F_0$, at the output of the HMC187MS8 is -37 and -25dBc, respectively at the output relative to $2F_0$.

The HMC188MS8 $3F_0$ and $4F_0$ isolation is -35 and -30dBc, respectively. These isolation specifications are the highest available in a surface mount package. The high isolation decreases the output filtering requirements for multiplier chains, saving board space and decreasing overall cost.

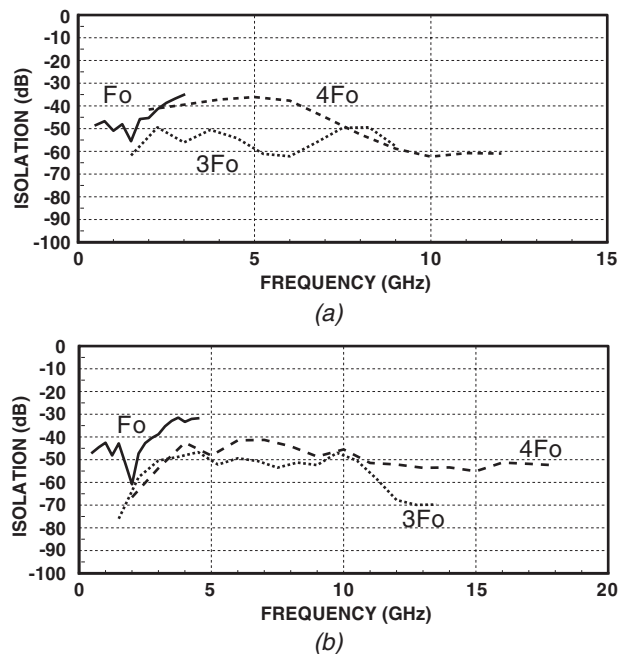


Figure 1. Isolation vs. Frequency for (a) HMC187MS8 and (b) HMC188MS8

The MSOP package saves greater than 50% of the board area versus SOIC or SOIC-like hybrid doubler solutions, easily meeting the stringent PCMCIA size constraints. The MSOP package occupies an area of 0.192 x 0.118 inches (3.0 x 4.8 mm), with a maximum height of 0.042 inches (1.07 mm). With a lead pitch of 25 mil (0.65 mm), standard surface mount manufacturing processes and equipment can be used with this package. Lead coplanarity is maintained to 3 mils (0.76mm).

The schematic for both devices is shown in Figure 2.

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GaAs MMIC technology enables the small size and has the additional benefit of very tight unit-to-unit consistency. The passive Schottky diode doublers require no DC bias and utilize on-chip baluns matched closely with the diode bridge, leveraged from Hittite Microwave mixer products covering the same frequency range. The technology yields no measurable additive phase noise onto the multiplied signal. This feature is particularly important for local oscillator doubler applications. Monolithic construction ensures reliability and repeatability for the life of the product.

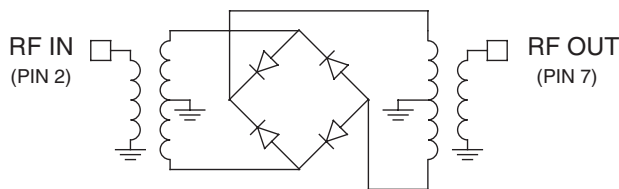


Figure 2. Schematic Diagram

Conversion loss is typically 15 dB at a drive level of +15dBm. The conversion loss remains less than 20 dB over the operating frequency range at drive levels down to 10 dBm. Both devices can be driven with up to 20 dBm. for minimum conversion loss. Figures 4a and 4b illustrate the conversion loss for the HMC187MS8 and HMC188MS8, respectively. The conversion loss varies only +/- 2 dB over the operating temperature and frequency ranges.

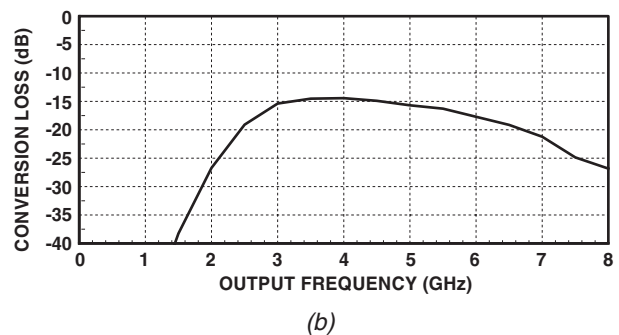
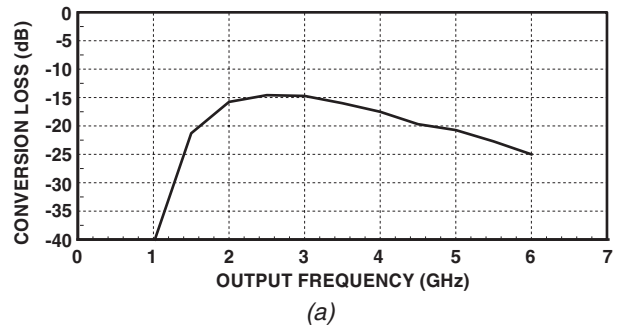


Figure 3. Conversion Loss vs. Frequency for (a) HMC187MS8 and (b) HMC188MS8

The MMIC doublers are rated for an operating temperature range of -40 to +85 degrees C and a storage range of -65 to +150 degrees C. The maximum input drive level is +27dBm. The HMC187/188MS8 doublers are currently available for sample and production orders. Tape and reel is available if required. Ceramic 8 pin packaged devices (Hittite C8 package) in the doubler product family are also available, covering output frequencies up to 8 GHz.

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