

HMMC-3040 Multiplier Operation

Product Note #15

MWTC Marketing
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The HMMC-3040 can be used as a harmonic multiplier/mixer in many digital radio applications. This product note is intended to aid designers who are considering the HMMC-3040 in a harmonic mixing application.

The HMMC-3040 mixer incorporates a double balanced diode network fabricated in a PHEMT process. This diode network provides good mixed frequency conversion and low conversion loss over a limited LO drive range (15 to 22 dBm). The optimum LO drive level for these diodes is ~18 dBm.

When considering the HMMC-3040 in harmonic multiplier applications a good starting point is HP application note #50, "HMMC-5040 as a 20-40 GHz Multiplier." The integrated amplifier used in the HMMC-3040 is similar in design to the HP HMMC-5040 MMIC amplifier. Most performance considerations included in this AN50 apply to the HMMC-3040 mixer/amplifier.

Biasing of the first stage of the amplifier is key to multiplier operation, as explained in AN50. The first stage bias ports are available on the HMMC-3040 amplifier to provide optimum harmonic conversion. AN50 will provide a first order view of harmonic performance for different multiplier configurations and frequency ranges.

Two examples of effective harmonic conversion using the HMMC-3040 are provided. The MMIC was mounted in a 2.4mm connectorized package. Package losses are not removed from the measurements.

Additional data may be available through MWTC's Application Engineering at 707-577-3120.

Example 1: 2X Up Conversion to 24.5 GHz

$F_{LO} = 11$ GHz Biasing: $V_{D1} = 2$ V

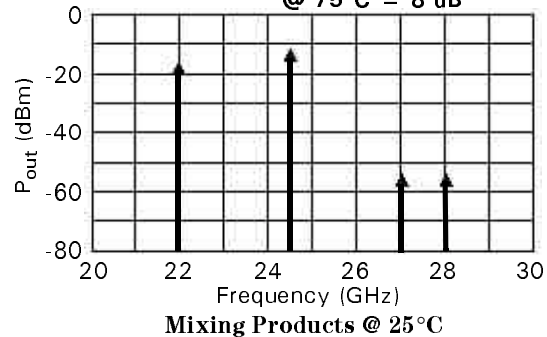
$P_{LO} = +14$ dBm $I_{D1} = 37$ mA

$F_{IF} = 2.5$ GHz $V_{D2} = 4.5$ V

$P_{IF} = -5$ dBm $I_{D2} = 230$ mA

Conversion Loss @ 25°C = 6.5 dB

@ 75°C = 8 dB



Example 2: 3X Up Conversion to 31.3 GHz

$F_{LO} = 8.85$ GHz Biasing: $V_{D1} = 1.3$ V

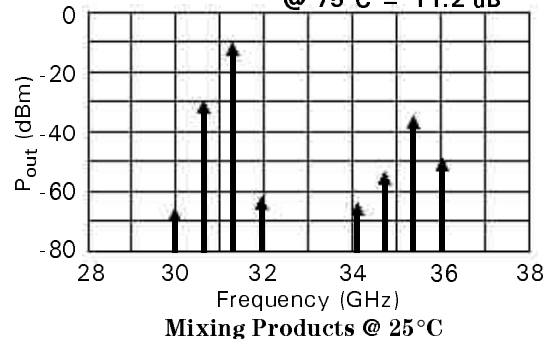
$P_{LO} = +14$ dBm $V_{G1} = -1.3$ V

$F_{IF} = 4.75$ GHz $V_{D2} = 4.5$ V

$P_{IF} = 0$ dBm $I_{D2} = 130$ mA

Conversion Loss @ 25°C = 10.3 dB

@ 75°C = 11.2 dB



Note: This product note provides supplemental information not included in the product data sheet. The purpose of supplemental data is to provide the end user with useful product-specific information to aid in the design process. The information provided does not represent or imply additional product specifications. Every attempt has been made to provide accurate data on typical products.

Notes: