Features:

- Frequency Range: 17 – 43 GHz
- P1dB: 21 dBm
- Psat: 22 dBm
- Gain: 22 dB
- Vdd = 5 V (3 V to 5 V)
- Ids = 200 mA (150mA to 300mA)
- Input and Output Fully Matched to 50 Ω
- 2x and 3x Frequency multiplier applications

Applications:

- Communication systems
- Microwave instrumentations

Description:

The MMA-174321 is a broadband GaAs MMIC general purpose gain block for 0.1-Watt maximum output power and high gain over full 17 to 43GHz frequency range. This amplifier is able to use as 2x and 3x Frequency multipliers when biased under class-B condition for the first stage.

Electrical Specifications:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Typical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>GHz</td>
<td>17-43</td>
</tr>
<tr>
<td>Gain (Typ / Min)</td>
<td>dB</td>
<td>22 / 20</td>
</tr>
<tr>
<td>Gain Flatness (Typ / Max)</td>
<td>+/-dB</td>
<td>2.0 / 2.5</td>
</tr>
<tr>
<td>Input RL(Typ/Max)</td>
<td>dB</td>
<td>8/6</td>
</tr>
<tr>
<td>Output RL(Typ/Max)</td>
<td>dB</td>
<td>8/6</td>
</tr>
<tr>
<td>Output P1dB(Typ/Min)</td>
<td>dBm</td>
<td>21/19.5</td>
</tr>
<tr>
<td>Output IP3 (1)</td>
<td>dBm</td>
<td>26</td>
</tr>
<tr>
<td>Output Psat(Typ/Min)</td>
<td>dBm</td>
<td>22/20.5</td>
</tr>
<tr>
<td>Operating Current at P1dB (Typ/Max)</td>
<td>mA</td>
<td>240 / 250</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>°C /W</td>
<td>30</td>
</tr>
</tbody>
</table>

(1) Output IP3 is measured with two tones at output power of 5 dBm/tone separated by 20 MHz.
Typical RF Performance: $V_{ds}=5V$, $V_{gs}=-0.7V$, $I_{ds}=200mA$, $Z_0=50\,\text{ohm}$, $T_a=25\,^\circ\text{C}$

S11(dB), S21(dB), and S22(dB) vs. Frequency

K-factor vs. Frequency

P-1 and Psat vs. Frequency

IM3 level [dBc] vs. Input power [dBm/tone]
Frequency 2x and 3x multiplier Data:

Measured 2x multiplier data: Pin=9dBm, Vd1=5V, Vd2=5V, Vg1=-1.4V, Vg2=-0.7V, Id1=1mA, and Id2=163mA

Measured 3x multiplier data: Pin=9dBm, Vd1=1V, Vd2=5V, Vg1=-0.75V, Vg2=-0.75V, Id1=21mA, and Id2=144mA
Applications
The MMA174321 MMIC general purpose amplifier is designed for use as a gain stage amplifier in microwave transmitters. It is ideally suited for 17 to 43GHz band applications requiring a flat gain response and excellent power performance. This amplifier is provided as a bare die format in a Gel-pak.

Biasing and Operation
The recommended bias conditions for best performance for the MMA174321 are VDD = 5.0V, Idsq = 200mA. Performance improvements are possible depending on applications. The drain bias voltage range is 3 to 6V and the quiescent drain current biasing range is 150mA to 250mA. Vg1 is connected to first stages of gate, and Vg2 is connected to following three stages of gates. Muting can be accomplished by setting Vg1 and Vg2 to the pinched-off voltage (Vp=-2V). The gate voltages (Vg1 and Vg2) should be applied prior to the drain voltages (Vd1 and Vd2) during power up and removed after the drain voltages during power down. The RF input port is connected internally to the 50Ω load for ESD protection purpose; therefore, an input decoupling capacitor is needed if the preceding output stage has DC present. The RF output is DC decoupled internally. Typical DC supply connection with bi-passing capacitors for the MMA174321 is shown in following pages.

Frequency x2 and x3 Multiplier Applications:
The MMA174321 is able to use as a frequency x2 multiplier when biased under Vd1=5V, Vd2=5V, Vg1=-1.4V, Vg2=-0.7V, Id1=1mA, and Id2=163mA. Optimum input RF power level is +9dBm. Typical measured data is shown in previous page. The MMA174321 is also able to use as a frequency x3 multiplier when biased under Vd1=1V, Vd2=5V, Vg1=-0.75V, Vg2=-0.75V, Id1=21mA, and Id2=144mA. Optimum input RF power level is +9dBm. Typical measured data is shown in previous page.

Assembly Techniques
GaAs MMICs are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly. MMIC ESD precautions, handling considerations, die attach and bonding methods are critical factors in successful GaAs MMIC performance and reliability.
Mechanical Information:  *Top view*

Units are in um.
Application Circuit:
Assembly example: