Features:
- Frequency Range: 6 – 22 GHz
- P1dB: 18.5 dBm @ Vds=5V
- Psat: 19.5 dBm @
- Gain: 14 dB
- Vdd =3 to 6 V
- Ids = 130 mA
- Input and Output Fully Matched to 50 Ω

Applications:
- Communication systems
- Microwave instrumentations
- ECM

Description:
The MMA-062020 is a broadband GaAs MMIC general purpose gain block for 20dBm saturated maximum output power and high gain over full 6 to 22GHz frequency range. This amplifier was optimally designed for broadband applications requiring flat gain with excellent input and output port matches.

Absolute Maximum Ratings: (Ta= 25 °C)*

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETERS</th>
<th>UNITS</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vd1, Vd2</td>
<td>Drain-Supply Voltage</td>
<td>V</td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td>Vg1</td>
<td>Optional Gate supply Voltage</td>
<td>V</td>
<td>-5</td>
<td>1</td>
</tr>
<tr>
<td>Vg2</td>
<td>Optional Gate supply Voltage</td>
<td>V</td>
<td>-10</td>
<td>1</td>
</tr>
<tr>
<td>Id1</td>
<td>Drain Supply Current</td>
<td>mA</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Id2</td>
<td>Drain Supply Current</td>
<td>mA</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Pin max</td>
<td>RF Input Power</td>
<td>dBm</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Toper</td>
<td>Operating Temperature</td>
<td>°C</td>
<td>-40 to +85</td>
<td></td>
</tr>
<tr>
<td>Tch</td>
<td>Channel Temperature</td>
<td>°C</td>
<td>+150</td>
<td></td>
</tr>
<tr>
<td>Tstg</td>
<td>Storage Temperature</td>
<td>°C</td>
<td>-55 to +165</td>
<td></td>
</tr>
<tr>
<td>Tmax</td>
<td>Max. Assembly Temp (60 sec max)</td>
<td>°C</td>
<td>+300</td>
<td></td>
</tr>
</tbody>
</table>

*Operation of this device above any one of these parameters may cause permanent damage.
### Electrical Specifications: \( \text{Vds}=5\,\text{V}, \text{Ids}=130\,\text{mA}, \text{Ta}=25\,^\circ\text{C}, \text{Zo}=50\,\text{ohm} \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Typical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency Range</strong></td>
<td>GHz</td>
<td>6 - 22</td>
</tr>
<tr>
<td><strong>Gain (Typ / Min)</strong></td>
<td>dB</td>
<td>14 / 13.5</td>
</tr>
<tr>
<td><strong>Gain Flatness (Typ / Max)</strong></td>
<td>+/- dB</td>
<td>0.8 / 1</td>
</tr>
<tr>
<td><strong>Input RL (Typ/Max)</strong></td>
<td>dB</td>
<td>8/7</td>
</tr>
<tr>
<td><strong>Output RL (Typ/Max)</strong></td>
<td>dB</td>
<td>10/8</td>
</tr>
<tr>
<td><strong>Output P1dB (Typ/Min)</strong></td>
<td>dBm</td>
<td>18.3/18</td>
</tr>
<tr>
<td><strong>Output PSat (Typ/Min)</strong></td>
<td>dBm</td>
<td>19.5/19</td>
</tr>
<tr>
<td><strong>Operating Current at P1dB (Typ/Max)</strong></td>
<td>mA</td>
<td>120 / 130</td>
</tr>
<tr>
<td><strong>Thermal Resistance</strong></td>
<td>°C / W</td>
<td>60</td>
</tr>
</tbody>
</table>

(1) Output IP3 is measured with two tones at output power of 0 dBm/tone separated by 20 MHz.
Typical RF Performance: \( V_{ds}=5V, I_{ds}=130mA, Z_0=50\ \text{ohm}, T_a=25^\circ\text{C} \)

- **S11[dB], S21[dB], and S22[dB] vs. Frequency**
- **IM3 level [dBc] vs. Output power/tone [dBm]**
- **P-1 and Psat vs. Frequency**
- **Pout[dBm], Gain[dB], and Ids[mA] vs. Input power [dBm]**
Typical Bias dependent RF Performance:

- Bias dependent P1 vs. Frequency
- S21(dB) over voltage
- Bias dependent P-3 vs. Frequency
- S11(dB) over Voltage
- S22(dB) over Voltage
Typical Over Temperature RF Performance: $V_{ds}=5\text{V}, I_{ds}=130\text{mA}, Z_0=50\text{ ohm, } T_a=25\ ^\circ\text{C}$

P1 over temperature

S21(dB) over temperature

S11(dB) over temperature

P-3 over temperature

S22(dB) over Voltage
Applications

The **MMA-062020** is a GaAS PHEMT amplifier designed for Class-A condition, flat gain performance from 6GHz to 22GHz. It is applicable for cascadable gain stage for EW amplifiers, buffer stages, LO drivers, and transmitter amplifiers used in commercial communication systems. This amplifier is provided as a bare die format in a Gel-pak.

**Biaseing and Operation**

The **MMA-062020** is normally biased with a single positive supply voltage connected to both Vd1 and Vd2 pins. The recommended drain supply voltages are 3 to 6 volts. RF input and output ports are DC decoupled internally. Typical DC supply connection with bi-passing capacitors for the **MMA-062020** is shown in following pages.

Optional gate pads (Vg1 and Vg2) are also provided to allow adjustments in gain, RF output power, and DC power dissipation, if necessary. No connection to the gate pads is needed for single drain-bias operation. However, for custom applications, the DC current flowing through the input and/or output gain stage may be adjusted by applying a voltage to the gate bias pad(s) as shown in Figure 5. A negative gate-pad voltage will decrease the drain current. The gate-pad voltage is approximately zero volts during operation with no DC gate supply. Refer to the absolute maximum rating table for allowing DC and thermal conditions.

**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.

---

**Figure 1 MMA062020 Simplified schematic**

MicroWave Technology, Inc., 4268 Solar Way, Fremont, CA 94538
510-651-6700 FAX 510-952-4000 WEB www.mwtinc.com
Data sheet is subject to change without notice. All rights reserved ©
Please visit MwT website www.mwtinc.com for information on other MwT MMIC products.
Page 6 of 9, Updated July 2017
Mechanical Information:  Top view

Units are in um.

Figure 2. Die outline and bonding pad locations
Application Circuit:

Figure 3 Application for single drain-bias operation
Recommended Assembly:

Figure 4 Assembly for single drain-bias operation

Figure 5 Assembly with gate bias connection