FEATURES

• 6 V nominal supply voltage
• 3.5 W pulsed output power
• Easy control of output power by DC voltage.

APPLICATIONS

• Digital cellular radio systems with Time Division Multiple Access (TDMA) operation (GSM systems) in the 880 to 915 MHz frequency range.

DESCRIPTION

The BGY205 is a four-stage UHF amplifier module in a SOT321B package. The module consists of four NPN silicon planar transistor dies mounted together with matching and bias circuit components on a metallized ceramic substrate.

QUICK REFERENCE DATA

RF performance at $T_{mb} = 25 \, ^\circ C$.

<table>
<thead>
<tr>
<th>MODE OF OPERATION</th>
<th>$f$ (MHz)</th>
<th>$V_S$ (V)</th>
<th>$V_C$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_p$ (dB)</th>
<th>$\eta$ (%)</th>
<th>$Z_S; Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulsed; $\delta = 1 : 8$</td>
<td>880 to 915</td>
<td>6</td>
<td>≤4</td>
<td>3.5</td>
<td>≥32.5</td>
<td>≥40</td>
<td>50</td>
</tr>
</tbody>
</table>

PINNING - SOT321B

<table>
<thead>
<tr>
<th>PIN</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RF input</td>
</tr>
<tr>
<td>2</td>
<td>$V_C$</td>
</tr>
<tr>
<td>3</td>
<td>$V_S$</td>
</tr>
<tr>
<td>4</td>
<td>RF output</td>
</tr>
<tr>
<td></td>
<td>Flange</td>
</tr>
<tr>
<td></td>
<td>ground</td>
</tr>
</tbody>
</table>
**UHF amplifier module**

**BGY205**

**LIMITING VALUES**
In accordance with the Absolute Maximum Rating System (IEC 134).

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_S</td>
<td>DC supply voltage</td>
<td>–</td>
<td>8.5</td>
<td>V</td>
</tr>
<tr>
<td>V_C</td>
<td>DC control voltage</td>
<td>–</td>
<td>4.5</td>
<td>V</td>
</tr>
<tr>
<td>P_D</td>
<td>input drive power</td>
<td>–</td>
<td>7</td>
<td>mW</td>
</tr>
<tr>
<td>P_L</td>
<td>load power</td>
<td>–</td>
<td>4</td>
<td>W</td>
</tr>
<tr>
<td>T_stg</td>
<td>storage temperature</td>
<td>–40</td>
<td>+100</td>
<td>°C</td>
</tr>
<tr>
<td>T_mb</td>
<td>operating mounting base temperature</td>
<td>–30</td>
<td>+100</td>
<td>°C</td>
</tr>
</tbody>
</table>

**CHARACTERISTICS**

Z_S = Z_L = 50 Ω; P_D = 3 dBm; V_S = 6 V; V_C ≤ 4 V; f = 880 to 915 MHz; T_mb = 25 °C; δ = 1 : 8; t_p = 575 µs; unless otherwise specified.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_Q</td>
<td>leakage current</td>
<td>V_C = 0.5 V</td>
<td>–</td>
<td>–</td>
<td>100</td>
<td>µA</td>
</tr>
<tr>
<td>I_C</td>
<td>control current</td>
<td>adjust V_C for P_L = 3.5 W</td>
<td>–</td>
<td>–</td>
<td>500</td>
<td>µA</td>
</tr>
<tr>
<td>P_L</td>
<td>load power</td>
<td>V_C = 4 V</td>
<td>3.5</td>
<td>–</td>
<td>–</td>
<td>W</td>
</tr>
<tr>
<td>G_p</td>
<td>power gain</td>
<td>adjust V_C for P_L = 3.5 W</td>
<td>32.5</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>η</td>
<td>efficiency</td>
<td>adjust V_C for P_L = 3.5 W</td>
<td>40</td>
<td>45</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>H_2</td>
<td>second harmonic</td>
<td>adjust V_C for P_L = 3.5 W</td>
<td>–</td>
<td>–</td>
<td>–40</td>
<td>dBc</td>
</tr>
<tr>
<td>H_3</td>
<td>third harmonic</td>
<td>adjust V_C for P_L = 3.5 W</td>
<td>–</td>
<td>–</td>
<td>–40</td>
<td>dBc</td>
</tr>
<tr>
<td>VSWR_in</td>
<td>input VSWR</td>
<td>adjust V_C for P_L = 3.5 W</td>
<td>–</td>
<td>–</td>
<td>2 : 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stability</td>
<td>P_D = 0 to 6 dBm; V_S = 5 to 8.5 V; V_C = 0 to 4 V; P_L ≤ 3.5 W; VSWR ≤ 6 : 1 through all phases</td>
<td>–</td>
<td>–</td>
<td>–60</td>
<td>dBc</td>
</tr>
<tr>
<td></td>
<td>isolation</td>
<td>V_C = 0.5 V</td>
<td>–</td>
<td>–</td>
<td>–36</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>control bandwidth</td>
<td>R1 = 0; C1 = 0; see Fig.16</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>MHz</td>
</tr>
<tr>
<td></td>
<td>AM-AM conversion</td>
<td>P_D with 3% AM; f = 100 kHz; P_L = 3.5 mW to 3.5 W</td>
<td>–</td>
<td>–</td>
<td>12</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>noise power</td>
<td>P_L = 3.5 W; bandwidth = 30 kHz; 20 MHz above transmitter band</td>
<td>–</td>
<td>–</td>
<td>–85</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>ruggedness</td>
<td>V_S = 8.5 V; adjust V_C for P_L = 3.5 W; VSWR ≤ 10 : 1 through all phases</td>
<td>no degradation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Product specification

UHF amplifier module

BGY205

Fig.2 Load power as a function of control voltage; typical values.

\[
Z_S = Z_L = 50 \, \Omega; \quad P_D = 3 \, \text{dBm}; \quad V_S = 6 \, \text{V};
\]

\[
T_{mb} = 25 \, ^\circ \text{C}; \quad \delta = 1 : 8; \quad t_p = 575 \, \mu\text{s}.
\]

Fig.3 Load power as a function of drive power; typical values.

\[
Z_S = Z_L = 50 \, \Omega; \quad V_S = 6 \, \text{V}; \quad P_L = 3.5 \, \text{mW};
\]

\[
T_{mb} = 25 \, ^\circ \text{C}; \quad \delta = 1 : 8; \quad t_p = 575 \, \mu\text{s}.
\]

Fig.4 Output amplitude modulation as a function of load power; typical values.

\[
Z_S = Z_L = 50 \, \Omega; \quad P_D = 3 \, \text{dBm}; \quad V_S = 6 \, \text{V};
\]

\[
T_{mb} = 25 \, ^\circ \text{C}; \quad \delta = 1 : 8; \quad t_p = 575 \, \mu\text{s}; \quad \text{input amplitude modulation} = 3\%.
\]

Fig.5 Efficiency as a function of load power; typical values.

\[
Z_S = Z_L = 50 \, \Omega; \quad P_D = 3 \, \text{dBm}; \quad V_S = 6 \, \text{V};
\]

\[
T_{mb} = 25 \, ^\circ \text{C}; \quad \delta = 1 : 8; \quad t_p = 575 \, \mu\text{s}.
\]
UHF amplifier module

Fig. 6 Load power as a function of frequency; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 3 \, \text{dBm}; \, V_S = 6 \, \text{V}; \, V_C = 4 \, \text{V}; \, T_{mb} = 25 \, ^\circ \text{C}; \, \delta = 1 : 8; \, t_p = 575 \, \mu\text{s}. \]

Fig. 7 Control voltage as a function of frequency; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 3 \, \text{dBm}; \, V_S = 6 \, \text{V}; \, P_L = 3.5 \, \text{W}; \, T_{mb} = 25 \, ^\circ \text{C}; \, \delta = 1 : 8; \, t_p = 575 \, \mu\text{s}. \]

Fig. 8 Harmonics as a function of frequency; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 3 \, \text{dBm}; \, V_S = 6 \, \text{V}; \, P_L = 3.5 \, \text{W}; \, T_{mb} = 25 \, ^\circ \text{C}; \, \delta = 1 : 8; \, t_p = 575 \, \mu\text{s}. \]

Fig. 9 Control loop phase as a function of frequency on the control pin; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 3 \, \text{dBm}; \, V_S = 6 \, \text{V}; \, P_L = 15 \, \text{to} \, 35.4 \, \text{dBm}; \, f = 880 \, \text{to} \, 915 \, \text{MHz}; \, T_{mb} = 25 \, ^\circ \text{C}; \, \delta = 1 : 8; \, t_p = 575 \, \mu\text{s}; \, R_1 = 0; \, C_1 = 0. \]
Fig.10 Control loop voltage gain as a function of frequency on the control pin; typical values.

Fig.11 Control loop voltage gain as a function of frequency on the control pin; typical values.

Fig.12 Control loop voltage gain as a function of frequency on the control pin; typical values.

Fig.13 Control loop voltage gain as a function of frequency on the control pin; typical values.
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Fig.14 Control voltage as a function of mounting base temperature; typical values.

\[ f = 880 \text{ MHz} \]
\[ Z_S = Z_L = 50 \; \Omega; \; P_D = 3 \; \text{dBm}; \; V_S = 6 \; V; \; \delta = 1 : 8; \; t_p = 575 \; \mu s. \]

Fig.15 Control voltage as a function of mounting base temperature; typical values.

\[ f = 915 \text{ MHz} \]
\[ Z_S = Z_L = 50 \; \Omega; \; P_D = 3 \; \text{dBm}; \; V_S = 6 \; V; \; \delta = 1 : 8; \; t_p = 575 \; \mu s. \]

Fig.16 Test circuit.

\[ V_S \]
\[ V_C \]
\[ Z_1 \]
\[ Z_2 \]

MBG732

MBG733

1996 May 21
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UHF amplifier module  

BGY205

List of components (see Fig.16)

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
<th>VALUE</th>
<th>DIMENSIONS</th>
<th>CATALOGUE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2</td>
<td>multilayer ceramic chip capacitor</td>
<td>680 pF</td>
<td></td>
<td>2222 851 11681</td>
</tr>
<tr>
<td>C3</td>
<td>tantalum capacitor</td>
<td>2.2 µF; 35 V</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>C4</td>
<td>electrolytic capacitor</td>
<td>47 µF; 40 V</td>
<td></td>
<td>2222 030 37479</td>
</tr>
<tr>
<td>L1</td>
<td>Grade 4S2 Ferroxcube bead</td>
<td></td>
<td></td>
<td>4330 030 36300</td>
</tr>
<tr>
<td>Z1, Z2</td>
<td>stripline; note 1</td>
<td>50 Ω</td>
<td>width = 2.33 mm</td>
<td>–</td>
</tr>
<tr>
<td>R1</td>
<td>metal film resistor</td>
<td>100 Ω; 0.6 W</td>
<td></td>
<td>2322 156 11001</td>
</tr>
</tbody>
</table>

Note
1. The striplines are on a double copper-clad printed-circuit board with PTFE fiberglass dielectric \( \varepsilon_r = 2.2 \); thickness \( \frac{1}{32} \) inch.

Fig.17 Printed-circuit board layout.

Dimensions in mm.
SOLDERING

The indicated temperatures are those at the solder interfaces.

Advised solder types are types with a liquidus less than or equal to 210 °C.

Solder dots or solder prints must be large enough to wet the contact areas.

Footprints for soldering should cover the module contact area +0.1 mm on all sides.

Soldering can be carried out using a conveyor oven, a hot air oven, an infrared oven or a combination of these ovens.

Hand soldering must be avoided because the soldering iron tip can exceed the maximum permitted temperature of 250 °C and damage the module.

The maximum temperature profile and soldering time is indicated as follows (see Fig.18):

\[
\begin{align*}
    t &= 350 \text{ s at } 100 \degree C \\
    t &= 300 \text{ s at } 125 \degree C \\
    t &= 200 \text{ s at } 150 \degree C \\
    t &= 100 \text{ s at } 175 \degree C \\
    t &= 50 \text{ s at } 200 \degree C \\
    t &= 5 \text{ s at } 250 \degree C \text{ (maximum temperature).}
\end{align*}
\]

Cleaning

The following fluids may be used for cleaning:

- Alcohol
- Bio-Act (Terpene Hydrocarbon)
- Triclean B/S
- Acetone.

Ultrasonic cleaning should not be used since this can cause serious damage to the product.
PACKAGE OUTLINE

Fig. 19  SOT321B.

Dimensions in mm.
DEFINITIONS

Data sheet status

<table>
<thead>
<tr>
<th>Data sheet status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective specification</td>
<td>This data sheet contains target or goal specifications for product development.</td>
</tr>
<tr>
<td>Preliminary specification</td>
<td>This data sheet contains preliminary data; supplementary data may be published later.</td>
</tr>
<tr>
<td>Product specification</td>
<td>This data sheet contains final product specifications.</td>
</tr>
</tbody>
</table>

Limiting values

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

LIFE SUPPORT APPLICATIONS

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