DATA SHEET

BGY118A; BGY118B; BGY118D
UHF amplifier modules

Product specification
Supersedes data of April 1994
File under Discrete Semiconductors, SC09

1996 May 21
**FEATURES**
- Single 4.8 V nominal supply voltage
- 1.2 W output power
- Easy output power control by DC voltage
- Very high efficiency (typ. 55 %)
- Silicon bipolar technology
- Standby current less than 100 µA.

**APPLICATIONS**
- Hand-held transmitting equipment operating in the 824 to 849 MHz, 872 to 905 MHz and 898 to 928 MHz frequency ranges respectively.

**DESCRIPTION**
The BGY118A, BGY118B and BGY118D are three-stage UHF amplifier modules in a SOT321A package. Each module consists of three NPN silicon planar transistor chips 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>TYPE</th>
<th>MODE OF OPERATION</th>
<th>$f$ (MHz)</th>
<th>$V_S$ (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>BGY118A</td>
<td>CW</td>
<td>824 to 849</td>
<td>4.8</td>
<td>1.2</td>
<td>≥27.8</td>
<td>typ. 55</td>
<td>50</td>
</tr>
<tr>
<td>BGY118B</td>
<td>CW</td>
<td>872 to 905</td>
<td>4.8</td>
<td>1.2</td>
<td>≥27.8</td>
<td>typ. 55</td>
<td>50</td>
</tr>
<tr>
<td>BGY118D</td>
<td>CW</td>
<td>898 to 928</td>
<td>4.8</td>
<td>1.2</td>
<td>≥27.8</td>
<td>typ. 55</td>
<td>50</td>
</tr>
</tbody>
</table>
UHF amplifier modules

BGY118A; BGY118B; BGY118D

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>7</td>
<td>V</td>
</tr>
<tr>
<td>$V_C$</td>
<td>DC control voltage</td>
<td>–</td>
<td>3.5</td>
<td>V</td>
</tr>
<tr>
<td>$P_D$</td>
<td>input drive power</td>
<td>–</td>
<td>5</td>
<td>mW</td>
</tr>
<tr>
<td>$P_L$</td>
<td>load power</td>
<td>–</td>
<td>1.6</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
$Z_S = Z_L = 50 \, \text{W}; \; P_D = 2 \, \text{mW}; \; V_S = 4.8 \, \text{V}; \; V_C \leq 3 \, \text{V}; \; T_{mb} = 25 \, \text{°C}$; 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>$f$</td>
<td>frequency</td>
<td>BGY118A</td>
<td>824</td>
<td>–</td>
<td>849</td>
<td>MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGY118B</td>
<td>872</td>
<td>–</td>
<td>905</td>
<td>MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BGY118D</td>
<td>898</td>
<td>–</td>
<td>928</td>
<td>MHz</td>
</tr>
<tr>
<td>$I_Q$</td>
<td>total leakage current</td>
<td>$V_C = 0; ; P_D &lt; -60 , \text{dBm}$</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 $P_L = 1.2 , \text{W}$</td>
<td>–</td>
<td>–</td>
<td>500</td>
<td>µA</td>
</tr>
<tr>
<td>$P_L$</td>
<td>load power</td>
<td>1.2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>W</td>
</tr>
<tr>
<td>$G_P$</td>
<td>power gain</td>
<td>adjust $V_C$ for $P_L = 1.2 , \text{W}$</td>
<td>27.8</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>$\eta$</td>
<td>efficiency</td>
<td>adjust $V_C$ for $P_L = 1.2 , \text{W}$</td>
<td>50</td>
<td>55</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>$H_2$</td>
<td>second harmonic</td>
<td>adjust $V_C$ for $P = 1.2 , \text{W}$</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 $P_L = 1.2 , \text{W}$</td>
<td>–</td>
<td>–</td>
<td>–40</td>
<td>dBc</td>
</tr>
<tr>
<td>$\text{VSWR}_{in}$</td>
<td>input VSWR</td>
<td>adjust $V_C$ for $P_L = 1.2 , \text{W}$</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3:1</td>
</tr>
<tr>
<td>$P_n$</td>
<td>noise power</td>
<td>adjust $V_C$ for $P_L = 1.2 , \text{W}$; bandwidth = 30 kHz; note 1</td>
<td>–</td>
<td>–</td>
<td>–90</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>ruggedness</td>
<td>$V_S = 6.5 , \text{V}; ; \text{adjust } V_C$ for $P_L = 1.4 , \text{W}$; $\text{VSWR} \leq 10 : 1$ through all phases</td>
<td>–</td>
<td>–</td>
<td>no degradation</td>
<td></td>
</tr>
</tbody>
</table>

Note
1. BGY118A, BGY118B: $f_n = f_0 + 45 \, \text{MHz}$.
   BGY118D: $f_n = f_0 - 55 \, \text{MHz}$.
UHF amplifier modules BGY118A; BGY118B; BGY118D

Fig.2 Load power as a function of control voltage; BGY118A; typical values.

$$Z_S = Z_L = 50 \, \Omega; \ P_D = 2 \, \text{mW}; \ V_S = 4.8 \, \text{V}; \ T_{mb} = 25 \, ^\circ\text{C}. $$

Fig.3 Efficiency as a function of load power; BGY118A; typical values.

$$Z_S = Z_L = 50 \, \Omega; \ P_D = 2 \, \text{mW}; \ V_S = 4.8 \, \text{V}; \ T_{mb} = 25 \, ^\circ\text{C}. $$

Fig.4 Load power as a function of frequency; BGY118A; typical values.

$$Z_S = Z_L = 50 \, \Omega; \ P_D = 2 \, \text{mW}; \ V_C = 3 \, \text{V}; \ T_{mb} = 25 \, ^\circ\text{C}. $$

Fig.5 Load power as a function of mounting-base temperature; BGY118A; typical values.

$$Z_S = Z_L = 50 \, \Omega; \ P_D = 2 \, \text{mW}; \ V_S = 4.8 \, \text{V}; \ V_C = 3 \, \text{V}; \ T_{mb} = 25 \, ^\circ\text{C}. $$
**UHF amplifier modules**

**BGY118A; BGY118B; BGY118D**

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**Fig. 6** Control voltage and VSWR input as function of frequency; BGY118A; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 2 \, \text{mW}; \, P_L = 1.2 \, \text{W}; \, T_{mb} = 25 \, ^\circ\text{C}. \]

**Fig. 7** Load power as a function of drive power; BGY118A; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 2 \, \text{mW}; \, V_C = 3 \, \text{V}; \, T_{mb} = 25 \, ^\circ\text{C}. \]

**Fig. 8** Harmonics as a function of frequency; BGY118A; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 2 \, \text{mW}; \, P_L = 1.2 \, \text{W}; \, T_{mb} = 25 \, ^\circ\text{C}. \]
UHF amplifier modules

Fig. 9 Load power as a function of control voltage; BGY118B; typical values.

\[ P_L = 2 \text{ mW}; \quad V_S = 4.8 \text{ V}; \quad T_{mb} = 25^\circ C. \]

Fig. 10 Efficiency as a function of load power; BGY118B; typical values.

\[ Z_S = Z_L = 50 \Omega; \quad P_D = 2 \text{ mW}; \quad V_S = 4.8 \text{ V}; \quad T_{mb} = 25^\circ C. \]

Fig. 11 Load power as a function of frequency; BGY118B; typical values.

\[ Z_S = Z_L = 50 \Omega; \quad P_D = 2 \text{ mW}; \quad V_C = 3 \text{ V}; \quad T_{mb} = 25^\circ C. \]

Fig. 12 Load power as a function of mounting-base temperature; BGY118B; typical values.

\[ Z_S = Z_L = 50 \Omega; \quad P_D = 2 \text{ mW}; \quad V_S = 4.8 \text{ V}; \quad V_C = 3 \text{ V}; \quad T_{mb} = 25^\circ C. \]
UHF amplifier modules

BGY118A; BGY118B; BGY118D

Fig. 13 Control voltage and VSWR input as function of frequency; BGY118B; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 2 \, \text{mW}; \, P_L = 1.2 \, \text{W}; \, T_{mb} = 25 \, ^\circ \text{C}. \]

Fig. 14 Load power as a function of drive power; BGY118B; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 2 \, \text{mW}; \, V_C = 3 \, \text{V}; \, T_{mb} = 25 \, ^\circ \text{C}. \]

Fig. 15 Harmonics as a function of frequency; BGY118; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \, P_D = 2 \, \text{mW}; \, P_L = 1.2 \, \text{W}; \, T_{mb} = 25 \, ^\circ \text{C}. \]
**UHF amplifier modules**

**BGY118A; BGY118B; BGY118D**

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**Fig. 16** Load power as a function of control voltage; BGY118D; typical values.

\[ Z_S = Z_L = 50 \Omega; \ P_D = 2 \text{ mW}; \ V_S = 4.8 \text{ V}; \ T_{mb} = 25 \degree \text{C}. \]

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**Fig. 17** Efficiency as a function of load power; BGY118D; typical values.

\[ Z_S = Z_L = 50 \Omega; \ P_D = 2 \text{ mW}; \ V_S = 4.8 \text{ V}; \ T_{mb} = 25 \degree \text{C}. \]

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**Fig. 18** Load power as a function of frequency; BGY118D; typical values.

\[ Z_S = Z_L = 50 \Omega; \ P_D = 2 \text{ mW}; \ V_S = 4.8 \text{ V}; \ V_C = 3 \text{ V}; \ T_{mb} = 25 \degree \text{C}. \]

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**Fig. 19** Load power as a function of mounting-base temperature; BGY118D; typical values.

\[ Z_S = Z_L = 50 \Omega; \ P_D = 2 \text{ mW}; \ V_C = 3 \text{ V}; \ T_{mb} = 25 \degree \text{C}. \]
UHF amplifier modules

**Fig. 20** Control voltage and VSWR input as function of frequency; BGY118D; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \quad P_D = 2 \, \text{mW}; \quad P_L = 1.2 \, \text{W}; \quad T_{mb} = 25 \, ^\circ\text{C}. \]

**Fig. 21** Load power as a function of drive power; BGY118D; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \quad P_D = 2 \, \text{mW}; \quad V_C = 3 \, \text{V}; \quad T_{mb} = 25 \, ^\circ\text{C}. \]

**Fig. 22** Harmonics as a function of frequency; BGY118D; typical values.

\[ Z_S = Z_L = 50 \, \Omega; \quad P_D = 2 \, \text{mW}; \quad P_L = 1.2 \, \text{W}; \quad T_{mb} = 25 \, ^\circ\text{C}. \]
Fig. 23 Test circuit.

Fig. 24 Printed-circuit board layout.

Dimensions in mm.
# UHF amplifier modules

## Philips Semiconductors Product specification

**BGY118A; BGY118B; BGY118D**

### List of components (See Fig.23)

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
<th>VALUE</th>
<th>CATALOGUE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C4</td>
<td>multilayer ceramic chip capacitor</td>
<td>100 nF</td>
<td>2222 852 47104</td>
</tr>
<tr>
<td>C2, C5</td>
<td>tantalum capacitor</td>
<td>2.2 µF; 35 V</td>
<td>2222 851 13339</td>
</tr>
<tr>
<td>C3, C6</td>
<td>multilayer ceramic chip capacitor</td>
<td>33 pF</td>
<td>2222 851 13339</td>
</tr>
<tr>
<td>L1, L2</td>
<td>Ferroxcube coil</td>
<td>5 µH</td>
<td>3122 108 20153</td>
</tr>
<tr>
<td>Z₁, Z₂</td>
<td>stripline; note 1</td>
<td>50 Ω</td>
<td></td>
</tr>
</tbody>
</table>

### Note

1. The striplines are on a double copper-clad PCB with PTFE fibre-glass dielectric ($e_r = 2.2$); thickness 1/32 inch.
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. 25):

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

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.
UHF amplifier modules  BGY118A; BGY118B; BGY118D

PACKAGE OUTLINE

Fig.26  SOT321A.

Dimensions in mm.
DEFINITIONS

<table>
<thead>
<tr>
<th>Data sheet status</th>
<th></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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