# RF Power Modules

# DATA HANDBOOK

BOOK SC09 1994

Philips Semiconductors

PHILIPS

## QUALITY ASSURED

Our quality system focuses on the continuing high quality of our components and the best possible service for our customers. We have a three-sided quality strategy: we apply a system of total quality control and assurance; we operate customer-oriented dynamic improvement programmes; and we promote a partnering relationship with our customers and suppliers.

## PRODUCT SAFETY

In striving for state-of-the-art perfection, we continuously improve components and processes with respect to environmental demands. Our components offer no hazard to the environment in normal use when operated or stored within the limits specified in the data sheet.

Some components unavoidably contain substances that, if exposed by accident or misuse, are potentially hazardous to health. Users of these components are informed of the danger by warning notices in the data sheets supporting the components. Where necessary the warning notices also indicate safety precautions to be taken and disposal instructions to be followed. Obviously users of these components, in general the set-making industry, assume responsibility towards the consumer with respect to safety matters and environmental demands.

All used or obsolete components should be disposed of according to the regulations applying at the disposal location. Depending on the location, electronic components are considered to be 'chemical', 'special' or sometimes 'industrial' waste. Disposal as domestic waste is usually not permitted.

# RF Power Modules

## CONTENTS

## DEFINITIONS

| **Data Sheet Status** | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| **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

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

# INDEX

# RF Power Modules

# Index

Types added to the range since the last issue of Handbook SC09 (1991 issue) are shown in bold print.

## SELECTION GUIDE

# RF Power Modules — Selection guide

## VHF CAR MOBILE

| $V_S$ (V) | $P_L$ (W) | f (MHz) | $G_p$ (dB) | PACKAGE | TYPE NUMBER | PAGE |
|---|---|---|---|---|---|---|
| 12.5 | 13 | 148 to 174 | 19.4 | SOT132B | BGY43 | 33 |
| | 13 | 146 to 174 | 19.4 | SOT132B | BGY143 | 157 |
| | 18 | 68 to 88 | 22.6 | SOT132B | BGY32 | 23 |
| | 18 | 80 to108 | 22.6 | SOT132B | BGY33 | 23 |
| | 18 | 132 to156 | 20.8 | SOT132B | BGY35 | 23 |
| | 18 | 148 to 174 | 20.8 | SOT132B | BGY36 | 23 |
| | 18 | 68 to 88 | 22.6 | SOT132B | BGY132 | 141 |
| | 18 | 80 to108 | 22.6 | SOT132B | BGY133 | 141 |
| | 18 | 132 to 156 | 20.8 | SOT132B | BGY135 | 149 |
| | 18 | 146 to174 | 20.8 | SOT132B | BGY136 | 149 |
| | 28 | 146 to 174 | 19.7 | SOT183A | BGY145B | 171 |
| | 29 | 68 to 88 | 22.9 | SOT183A | BGY145A | 164 |

## UHF PORTABLE

| $V_S$ (V) | $P_L$ (W) | f (MHz) | $G_p$ (dB) | PACKAGE | TYPE NUMBER | PAGE |
|---|---|---|---|---|---|---|
| 7.5 | 7 | 400 to 440 | 38.5 | SOT288D | BGY113A | 81 |
| | 7 | 430 to 470 | 38.5 | SOT288D | BGY113B | 81 |
| | 7 | 470 to 520 | 38.5 | SOT288D | BGY113C | 81 |
| 9.6 | 1.4 | 400 to 440 | 15 | SOT181 | BGY46A | 41 |
| | 1.4 | 430 to 470 | 15 | SOT181 | BGY46B | 47 |
| | 3.2 | 400 to 440 | 18 | SOT181 | BGY47A | 53 |
| | 3.2 | 460 to 520 | 18 | SOT181 | BGY47B | 61 |

**SHF PORTABLE**

| $V_S$ (V) | $P_L$ (W) | f (MHz) | $G_p$ (dB) | PACKAGE | TYPE NUMBER | PAGE |
|---|---|---|---|---|---|---|
| 4.8 | 1.2 | 824 to 849 | 27.8 | SOT321 | BGY118A | 129 |
| | 1.2 | 872 to 905 | 27.8 | SOT321 | BGY118B | 129 |
| | 1.2 | 898 to 928 | 27.8 | SOT321 | BGY118D | 129 |
| | 1.2 | 824 to 849 | 27.8 | SOT359 | BGY119A | 138 |
| | 1.2 | 872 to 905 | 27.8 | SOT359 | BGY119B | 138 |
| | 1.4 | 890 to 915 | 28.4 | SOT321 | BGY118C | 129 |
| | 1.4 | 890 to 915 | 28.4 | SOT359 | BGY119C | 138 |
| 6 | 1.2 | 824 to 849 | 27.8 | SOT321 | BGY115A | 107 |
| | 1.2 | 872 to 905 | 27.8 | SOT321 | BGY115B | 107 |
| | 1.2 | 902 to 928 | 27.8 | SOT321 | BGY115D | 107 |
| | 1.6 | 890 to 915 | 29.0 | SOT321 | BGY115C | 107 |
| 7.2 | 1.7 | 824 to 849 | 32.3 | SOT246 | BGY110D | 68 |
| | 1.7 | 872 to 905 | 32.3 | SOT246 | BGY110E | 68 |
| | 1.7 | 890 to 915 | 32.3 | SOT246 | BGY110F | 68 |
| | 1.7 | 902 to 928 | 32.3 | SOT246 | BGY110G | 68 |

**SHF CAR MOBILE**

| $V_S$ (V) | $P_L$ (W) | f (MHz) | $G_p$ (dB) | PACKAGE | TYPE NUMBER | PAGE |
|---|---|---|---|---|---|---|
| 12.5 | 6 | 800 to 870 | 37.8 | SOT278A | BGY114D | 98 |
| | 6 | 800 to 870 | 37.8 | SOT278B | BGY116D | 120 |
| | 6 | 824 to 849 | 37.8 | SOT278A | BGY114A | 86 |
| | 6 | 872 to 905 | 37.8 | SOT278A | BGY114B | 86 |
| | 6 | 890 to 950 | 37.8 | SOT278A | BGY114E | 98 |
| | 6 | 890 to 950 | 37.8 | SOT278B | BGY116E | 120 |
| | 8 | 890 to 915 | 39.0 | SOT278A | BGY114C | 86 |

**GSM**

| $V_S$ (V) | $P_L$ (W) | f (MHz) | $G_p$ (dB) | PACKAGE | TYPE NUMBER | PAGE |
|---|---|---|---|---|---|---|
| 4.8 | 3.5 | 880 to 915 | 32.5 | SOT321B | BGY204 | 206 |
| 6 | 1.4 | 880 to 915 | 28.5 | SOT321 | BGY202 | 192 |
| | 3.5 | 880 to 915 | 35.5 | SOT342 | BGY203 | 199 |
| | 3.5 | 880 to 915 | 32.5 | SOT321B | BGY205 | 209 |
| 7.2 | 3.5 | 890 to 915 | 35.5 | SOT350 | BGY200 | 178 |
| 12.5 | 14.0 | 890 to 915 | 41.5 | SOT278A | BGY201 | 185 |

# GENERAL

## TOTAL QUALITY MANAGEMENT

Philips Semiconductors is a Quality Company, renowned for the high quality of our products and service. We keep alive this tradition by constantly aiming towards one ultimate standard, that of zero defects. This aim is guided by our Total Quality Management (TQM) system, the basis of which is described in the following paragraphs.

### Quality assurance

Based on ISO 9000 standards, customer standards such as Ford Q1 and IBM MDQ, and the CECC system of conformity. Our factories are certified to ISO 9000 and CECC by external inspectorates.

### Partnerships with customers

PPM co-operations, design-in agreements, and ship-to-stock, just-in-time and self-qualification programmes.

### Partnerships with suppliers

Ship-to-stock, statistical process control and ISO 9000 audits.

### Quality improvement programme

Continuous process and system improvement, design improvement, complete use of statistical process control, realization of our final objective of zero defects, and logistics improvement by ship-to-stock and just-in-time agreements.

## ADVANCED QUALITY PLANNING

During the design and development of new products and processes, quality is built-in by advanced quality planning. Through failure-mode-and-effect analysis the critical parameters are detected and measures taken to ensure good performance on these parameters. The capability of process steps is also planned in this phase.

## PRODUCT CONFORMANCE

The assurance of product conformance is an integral part of our quality assurance (QA) practice. This is achieved by:

- Incoming material management through partnerships with suppliers.
- In-line quality assurance to monitor process reproducibility during manufacture and initiate any necessary corrective action. Critical process steps are 100% under statistical process control.
- Acceptance tests on finished products to verify conformance with the device specification. The test results are used for quality feedback and corrective actions. The inspection and test requirements are detailed in the general quality specifications.
- Periodic inspections to monitor and measure the conformance of products.

## PRODUCT RELIABILITY

With the increasing complexity of OEM (original equipment manufacturer) equipment, component reliability must be extremely high. Our research laboratories and development departments study the failure mechanisms of semiconductors. Their studies have resulted in design rules and process optimization for the highest built-in product reliability. Highly accelerated tests are applied to the products reliability evaluation. Rejects from reliability tests and from customer complaints are submitted to failure analysis, to result in corrective action.

## CUSTOMER RESPONSES

Our quality improvement depends on joint action with our customer. We need our customer's inputs and we invite constructive comments on all aspects of our performance. Please contact our local sales representative.

## LIMITING VALUES (RATINGS)

The rating systems recommended by the International Electrotechnical Commission (IEC) in publication IEC 134 are reproduced below. The limiting values (or ratings) given in the data sheets are defined in accordance with the Absolute Maximum Rating System.

### Definitions of terms used

ELECTRONIC DEVICE

An electronic tube or valve, transistor or other semiconductor device. This definition excludes inductors, capacitors, resistors and similar components.

CHARACTERISTIC

A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

BOGEY ELECTRONIC DEVICE

An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics that are directly related to the application.

RATING

A value that establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms. Limiting conditions may be either maxima or minima.

RATING SYSTEM

The set of principles upon which ratings are established and which determine their interpretation. The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

### Absolute maximum rating system

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type, as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout the life of the device, no absolute maximum value for the intended service is exceeded with any device, under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

### Design maximum rating system

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout the life of the device, no design maximum value for the intended service is exceeded with a bogey electronic device, under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

**Design centre rating system**

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

## LETTER SYMBOLS

The letter symbols for transistors detailed in this section are based on IEC publication number 148.

### Basic letters

In the representation of currents, voltages and powers, lower-case letter symbols are used to indicate all instantaneous values that vary with time. All other values are represented by upper-case letters.

Electrical parameters[1] of external circuits and of circuits in which the device forms only a part are represented by upper-case letters. Lower-case letters are used for the representation of electrical parameters inherent in the device. Inductances and capacitances are always represented by upper-case letters.

The following is a list of basic letter symbols used with semiconductor devices:

| | |
|---|---|
| B, b | susceptance (imaginary part of an admittance) |
| C | capacitance |
| G, g | conductance (real part of an admittance) |
| H, h | hybrid parameter |
| I, i | current |
| L | inductance |
| P, p | power |
| R, r | resistance (real part of an impedance) |
| V, v | voltage |
| X, x | reactance (imaginary part of an impedance) |
| Y, y | admittance |
| Z, z | impedance. |

### Subscripts

Upper-case subscripts are used for the indication of:

- continuous (DC) values (without signal), e.g. $I_B$
- instantaneous total values, e.g. $i_B$
- average total values, e.g. $I_{B(AV)}$
- peak total values, e.g. $I_{BM}$
- root-mean-square total values, e.g. $I_{B(RMS)}$.

Lower-case subscripts are used for the indication of values applying to the varying component alone:

- instantaneous values, e.g. $i_b$
- root-mean-square values, e.g. $I_{b(rms)}$
- peak values, e.g. $I_{bm}$
- average values, e.g. $I_{b(av)}$.

The following is a list of subscripts used with basic letter symbols for semiconductor devices:

| | |
|---|---|
| A, a | anode |
| amb | ambient |
| (AV), (av) | average value |
| B, b | base |
| (BO) | breakover |
| (BR) | breakdown |
| case | case |
| C, c | collector |
| C | controllable |
| D, d | drain |
| E, e | emitter |
| F, f | fall, forward (or forward transfer) |
| G, g | gate |
| H | holding |
| I, i | input |
| j-a | junction to ambient |
| j-mb | junction to mounting base |
| K, k | cathode |
| L | load |
| M, m | peak value |
| min | minimum |
| max | maximum |
| mb | mounting base |
| O, o | as third subscript: the terminal not mentioned is open-circuit |
| (OV) | overload |
| P, p | pulse |
| Q, q | turn-off |

(1) For the purpose of this publication, the term 'electrical parameters' applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

| | |
|---|---|
| R, r | as first subscript: reverse (or reverse transfer), rise. As second subscript: repetitive, recovery. As third subscript: with a specified resistance between the terminal not mentioned and the reference terminal |
| (RMS), (rms) | root-mean-square value |
| S, s | as first subscript: series, source, storage, stray, switching. As second subscript: surge (non-repetitive). As third subscript: short circuit between the terminal not mentioned and the reference terminal |
| stg | storage |
| th | thermal |
| TO | threshold |
| tot | total |
| W | working |
| X, x | specified circuit |
| Z, z | reference or regulator (zener) |
| 1 | input (four-pole matrix) |
| 2 | output (four-pole matrix). |

### Applications and examples

TRANSISTOR CURRENTS

The first subscript indicates the terminal carrying the current (conventional current flow from the external circuit into the terminal is positive).

Examples: $I_B$, $i_B$, $i_b$, $I_{bm}$.

TRANSISTOR VOLTAGES

A voltage is indicated by the first two subscripts: the first identifies the terminal at which the voltage is measured and the second the reference terminal or the circuit node. The second subscript may be omitted when there is no possibility of confusion.

Examples: $V_{BE}$, $v_{BE}$, $v_{be}$, $V_{bem}$.

SUPPLY VOLTAGES OR CURRENTS

Supply voltages or supply currents are indicated by repeating the appropriate terminal subscript.

Examples: $V_{CC}$, $I_{EE}$.

A reference terminal is indicated by a third subscript.

Example: $V_{CCE}$.

DEVICES WITH MORE THAN ONE TERMINAL OF THE SAME KIND

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal, followed by a number. Hyphens may be used to avoid confusion in multiple subscripts.

Examples:

| | |
|---|---|
| $I_{B2}$ | continuous (DC) current flowing into the second base terminal |
| $V_{B2\text{-}E}$ | continuous (DC) voltage between the terminals of second base and emitter. |

MULTIPLE DEVICES

For multiple unit devices, the subscripts are modified by a number preceding the letter subscript. Hyphens may be used to avoid confusion in multiple subscripts.

Examples:

| | |
|---|---|
| $I_{2C}$ | continuous (DC) current flowing into the collector terminal of the second unit |
| $V_{1C\text{-}2C}$ | continuous (DC) voltage between the collector terminals of the first and second units. |

ELECTRICAL PARAMETERS

The upper-case variant of a subscript is used for the designation of static (DC) values.

Examples:

| | |
|---|---|
| $h_{FE}$ | static value of forward current transfer ratio in common-emitter configuration (DC current gain) |
| $R_E$ | DC value of the external emitter resistance. |

The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript is used for the designation of small-signal values.

Examples:

| | |
|---|---|
| $h_{fe}$ | small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration |
| $Z_e = R_e + jX_e$ | small-signal value of the external impedance. |

If more than one subscript is used, subscripts for which a choice of style is allowed, the subscripts chosen are all upper-case or all lower-case.

Example: $h_{FE}$, $y_{RE}$, $h_{fe}$.

FOUR-POLE MATRIX PARAMETERS

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer.

Examples: $h_i$ (or $h_{11}$), $h_o$ (or $h_{22}$), $h_f$ (or $h_{21}$), $h_r$ (or $h_{12}$).

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: $h_{fe}$ (or $h_{21e}$), $h_{FE}$ (or $h_{21E}$).

DISTINCTION BETWEEN REAL AND IMAGINARY PARTS

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts are used. If basic symbols for the real and imaginary parts exist, these may be used.

Examples: $Z_i = R_i + jX_i$, $y_{fe} = g_{fe} + jb_{fe}$.

If such symbols do not exist or are not suitable, the notation shown in the following examples is used.

Examples:

Re ($h_{ib}$) etc. for the real part of $h_{ib}$

Im ($h_{ib}$) etc. for the imaginary part of $h_{ib}$.

## S-PARAMETER DEFINITIONS

The S-parameter symbols in this section are based on IEC publication 747-7.

S-parameters (return losses or reflection coefficients) of a module can be defined as the $S_{11}$ and the $S_{22}$ of a two-port network (see Fig.1).

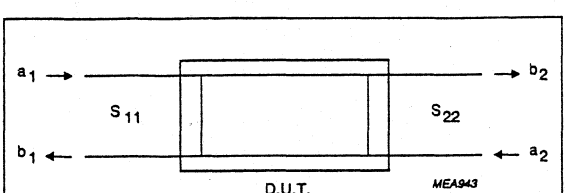



Fig.1 Two-port network with reflection coefficients $S_{11}$ and $S_{22}$.

$$b_1 = S_{11} \cdot a_1 + S_{12} \cdot a_2 \quad (1)$$

$$b_2 = S_{21} \cdot a_1 + S_{22} \cdot a_2 \quad (2)$$

where

$$a_1 = \frac{1}{2 \cdot \sqrt{Z_o}} \cdot (V_1 + Z_o \cdot i_1) = \text{signal into port 1} \quad (3)$$

$$a_2 = \frac{1}{2 \cdot \sqrt{Z_o}} \cdot (V_2 + Z_o \cdot i_2) = \text{signal into port 2} \quad (4)$$

$$b_1 = \frac{1}{2 \cdot \sqrt{Z_o}} \cdot (V_1 + Z_o \cdot i_1) = \text{signal out of port 1}$$

$$b_2 = \frac{1}{2 \cdot \sqrt{Z_o}} \cdot (V_2 + Z_o \cdot i_2) = \text{signal out of port 2}$$

From (1) and (2) formulae for the return losses can be derived:

$$S_{11} = \frac{b_1}{a_1} \mid a_2 = 0 \quad (5)$$

$$S_{22} = \frac{b_2}{a_2} \mid a_1 = 0 \quad (6)$$

In (5), $a_2 = 0$ means output port terminated with $Z_o$ (derived from formula (4)).

In (6), $a_1 = 0$ means input port terminated with $Z_o$ (derived from formula (3)).

### Measurement

The return losses are measured with a network analyzer after calibration, where the influence of the test jig is eliminated. The necessary termination of the other port with $Z_o$ is done automatically by the network analyzer.

The network analyzer must have a directivity of at least 40 dB to obtain an accuracy of 0.5 dB when measuring return loss figures of 20 dB. A full two-port correction method can be used to improve the accuracy.

## MOUNTING

### General

The modules are manufactured using a ceramic substrate soldered to a copper flange or mounting base; this causes a small thermal mismatch between these two components. A further thermal mismatch will exist between the mounting base and the heatsink to which it is mounted. Because of these mismatches, precautions must be taken to avoid unnecessary mechanical stresses being applied to the ceramic substrate and other components within the module resulting from variations in temperature during operating cycles.

### Design of heatsink

To ensure that the maximum specified mounting base temperature will not be exceeded under maximum fault conditions, the module should always be mounted on a heatsink of suitable thermal resistance.

The mounting area of the heatsink should be flat and free from burrs. Particular attention should be paid to the mounting hole areas. The maximum amount of bowing along the plane of the module should not exceed 0.1 mm. Where anodizing is used, the area under the module should be milled clean as the presence of anodizing under the module can result in high resistance earth paths, leading to oscillation and early failure, in addition to poor thermal contact.

The heatsink should be rigid and not prone to bowing under thermal cycling conditions. The thickness of a solid heatsink should not be less than 5 mm, to ensure a rigid assembly. On finned heatsinks, the module should be mounted along a plane parallel to the fins.

### Mounting of module

To ensure a good thermal contact and to prevent mechanical stresses when bolted down, the flatness of the mounting base is designed to be typically better than 0.02 mm.

The module should be mounted to the heatsink using 3 mm bolts with flat washers, tightened to a maximum torque of 0.5 Nm. Over-tightening can result in bowing of the mounting base. Locking washers should not be used.

A thin, even layer of thermal compound should be used between the mounting base and the heatsink to achieve the best possible contact thermal resistance, which should be in the order of 0.2 K/W. Excessive use of thermal compound will result in an increase in thermal resistance and possible bowing of the mounting base; too little will also result in poor thermal resistance.

### Electrical connections

The main earth return path of all modules is via the mounting base; it is therefore important that the heatsink is well earthed and that return paths are kept as short as possible. Failure to ensure this may result in loss of output power or oscillation, which in turn will have a detrimental effect on the module life.

The RF output connection should be to correctly-designed 50 Ω terminations. Failure to do this will result in a mismatch being presented to the module, with a resulting reduction in module life.

### CAUTION

| |
|---|
| Under no circumstances must the maximum specified operating or storage temperatures be exceeded, even for short periods. |

## SOLDERING

RF power modules in SOT321, SOT342 and SOT359 metal can, SMD envelopes are intended for automatic soldering. The following soldering recommendations apply for these types:

Advised solder types are types with a melting point below 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 as much as possible because the soldering iron tip can exceed the maximum permitted temperature of 250 °C and damage the module.

The maximum mounting base temperature profile and solder time are indicated as follows (see Fig.1):

t = 350 s at 100 °C

t = 300 s at 125 °C

t = 200 s at 150 °C

t = 100 s at 175 °C

t = 50 s at 200 °C

t = 5 s at 250 °C (maximum temperature).

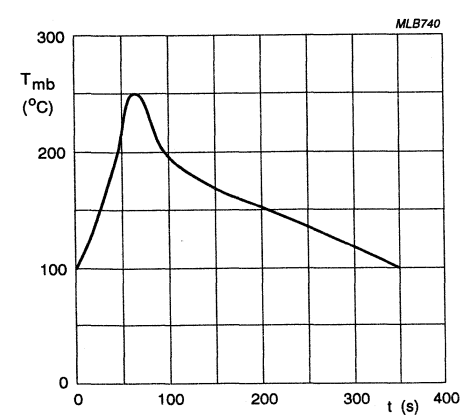



Fig.1 Maximum allowable temperature profile.

### Cleaning

The following may be used for cleaning:

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

No ultrasonic cleaning should be used since this can cause serious damage to the product.

# MODULE DATA

In alphanumeric sequence

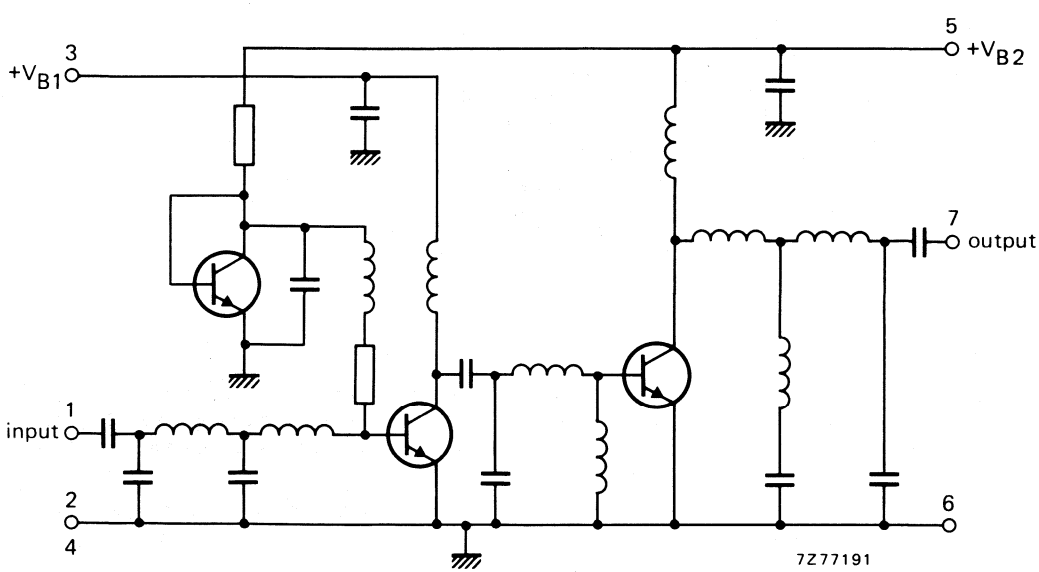
# VHF POWER AMPLIFIER MODULES

A range of broadband amplifier modules designed for mobile communications equipments, operating directly from 12 V vehicle electrical systems. The devices will produce 18 W output into a 50 Ω load. The modules consist of a two stage RF amplifier using npn transistor chips, together with lumped-element matching components.

## QUICK REFERENCE DATA

| type number | mode of operation | frequency range f (MHz) | nominal supply voltages $V_{B1} = V_{B2}$ (V) | drive power $P_D$ (mW) | load power $P_L$ (W) | nominal input impedance $z_i$ (Ω) | nominal load impedance $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| **BGY32** | cw | 68 to 88 | 12.5 | 100 | > 18 typ 23 | 50 | 50 |
| **BGY33** | cw | 80 to 108 | 12.5 | 100 | > 18 typ 22 | 50 | 50 |
| **BGY35** | cw | 132 to 156 | 12.5 | 150 | > 18 typ 22 | 50 | 50 |
| **BGY36** | cw | 148 to 174 | 12.5 | 150 | > 18 typ 21 | 50 | 50 |

## CIRCUIT DIAGRAM

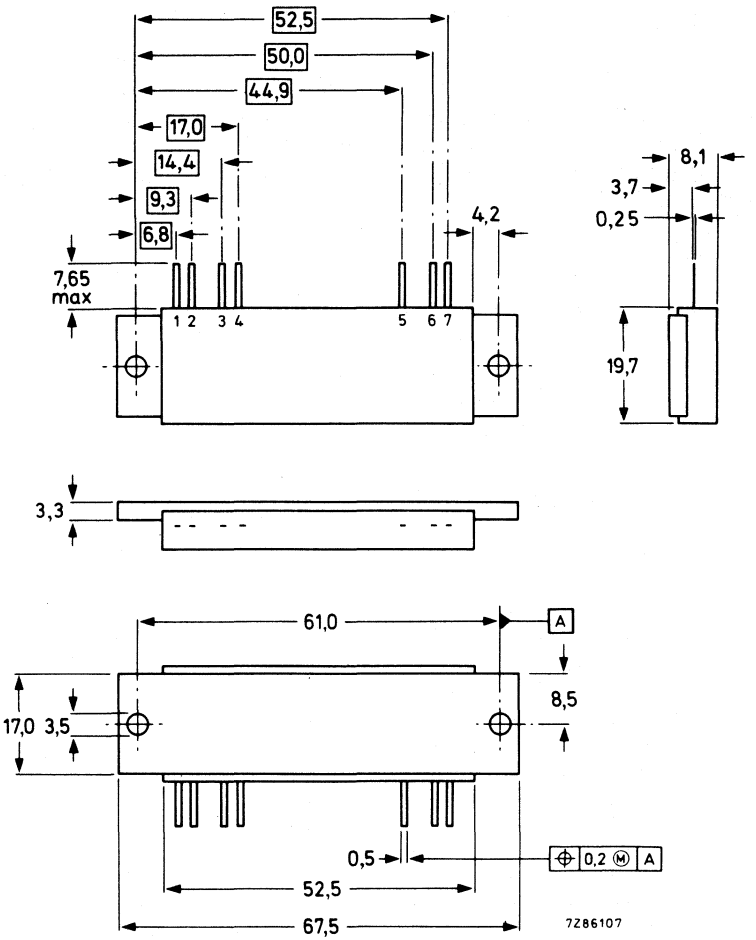



**PRODUCT SAFETY This device incorporates beryllium oxide, the dust of wich is toxic. The device is entirely safe provided that the BeO disc is not damaged.**

## MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT132B.




**Lead reference**

1 = Input
2 = Earth
3 = Supply $+V_{B1}$
4 = Earth
5 = Supply $+V_{B2}$
6 = Earth
7 = Output

**Mounting and soldering recommendations**

To ensure good thermal transfer the module should be mounted using heatsink compound onto a heatsink with a flat surface; if an isolation washer is used heatsink compound should be used on both sides of the insulator. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to torques of 0,5 Nm minimum.

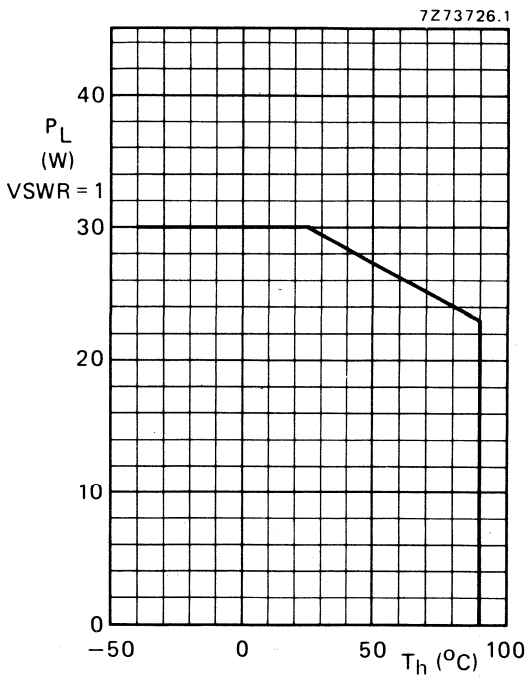
Devices may be soldered directly into a circuit with a soldering iron at maximum iron temperature of 245 °C for 10 seconds at least 1 mm from the plastic.

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

**DC voltages** (with respect to flange)

| | | | |
|---|---|---|---|
| DC supply terminals | $V_{B1}$ and $V_{B2}$ | max | 15 V |
| RF input terminal | $\pm V_I$ | max | 25 V |
| RF output terminal | $\pm V_O$ | max | 25 V |
| Input drive power BGY32 and BGY33 | $P_D$ | max | 200 mW |
| Input drive power BGY35 and BGY36 | $P_D$ | max | 300 mW |
| Load power | $P_L$ | max | 30 W |




| | | | |
|---|---|---|---|
| Storage temperature range | $T_{stg}$ | −40 to 100 | °C |
| Operating heatsink temperature | $T_h$ | max 90 | °C |

## CHARACTERISTICS

$T_h$ = 25 °C

| | | | BGY32 | BGY33 | BGY35 | BGY36 | |
|---|---|---|---|---|---|---|---|
| **Quiescent current** | | | | | | | |
| $V_{B1} = V_{B2}$ = 12,5 V; $P_D$ = 0; $R_S = R_L$ = 50 Ω | $I_{BQ1}$ | typ | 6 | 6 | 6 | 6 | mA |
| | $I_{BQ2}$ | typ | 13 | 13 | 13 | 13 | mA |
| **Frequency range** | f | > | 68 | 80 | 132 | 148 | MHz |
| | | < | 88 | 108 | 156 | 174 | MHz |
| **Load power** | | | | | | | |
| $V_{B1} = V_{B2}$ = 12.5 V; $R_S = R_L$ = 50 Ω | $P_L$ | > | 18 | 18 | – | – | W |
| **BGY32** and **BGY33**; $P_D$ = 100 mW | | typ | 23 | 22 | | | W |
| | $\eta$ | > | 40 | 40 | – | – | % |
| | | typ | 50 | 50 | | | % |
| | $P_L$ | > | – | – | 18 | 18 | W |
| **BGY35** and **BGY36**; $P_D$ = 150 mW | | typ | | | 22 | 21 | W |
| | $\eta$ | > | – | – | 40 | 40 | % |
| | | typ | | | 50 | 50 | % |
| **Harmonic output** | Any single harmonic will be at least 25 dB down relative to carrier | | | | | | |
| **Input VSWR** with respect to 50 Ω | | typ | 1,5 | | | | |

### Stability

The module is stable with a load VSWR up to 3 : 1 (all phases) when operated within the following conditions: $V_{S1}$ = 6 to 15 V; $V_{S2}$ = 10 to 15 V; $V_{S1} \leqslant V_{S2}$; $P_D$ = 50 to 200 mW; frequency within operating frequency range, provided the maximum ratings of the module are not exceeded.

### Ruggedness

The modules are capable of withstanding load mismatch of up to 50 VSWR for short period overload conditions, with $P_D$, $V_{B1}$ and $V_{B2}$ at maximum values providing the combination does not result in the matched RF output power rating being exceeded.

## APPLICATION INFORMATION

### Supply

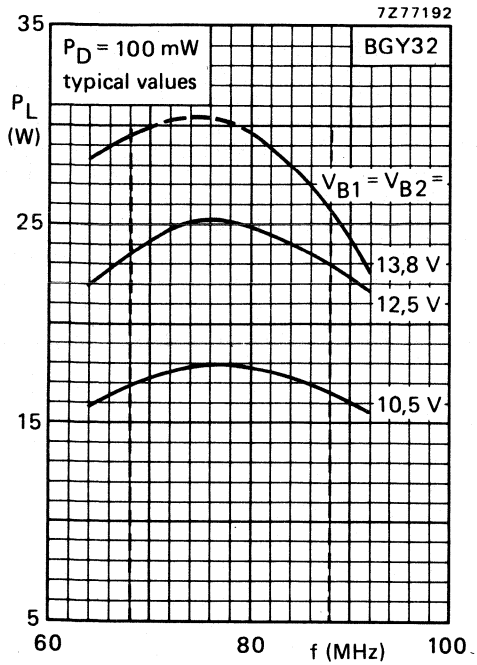
An electrolytic capacitor of 10 μF (25 V), in parallel with a polyester capacitor of 100 nF to earth, is recommended as decoupling arrangement for each power supply pin.

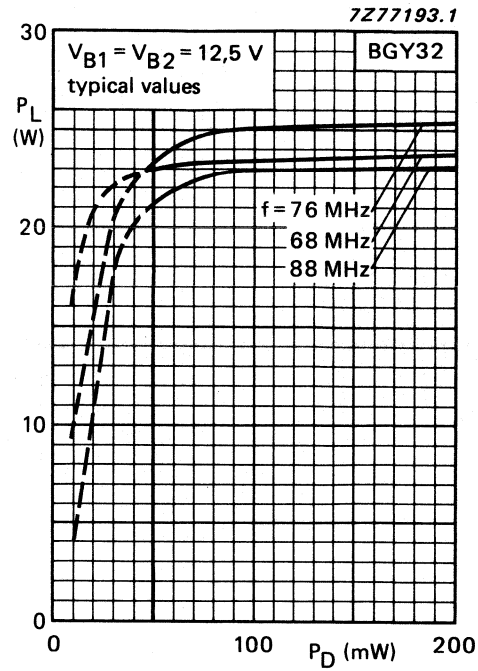
### Power rating

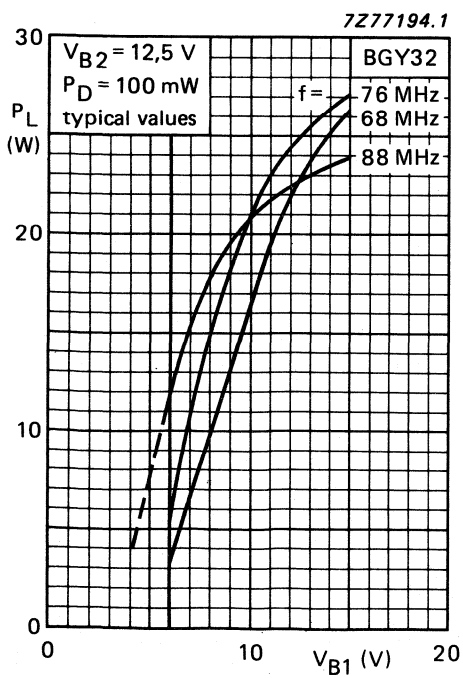
In general it is recommended that the output power from the module under nominal design conditions should not exceed 23 W in order to provide adequate safety margin under fault conditions.

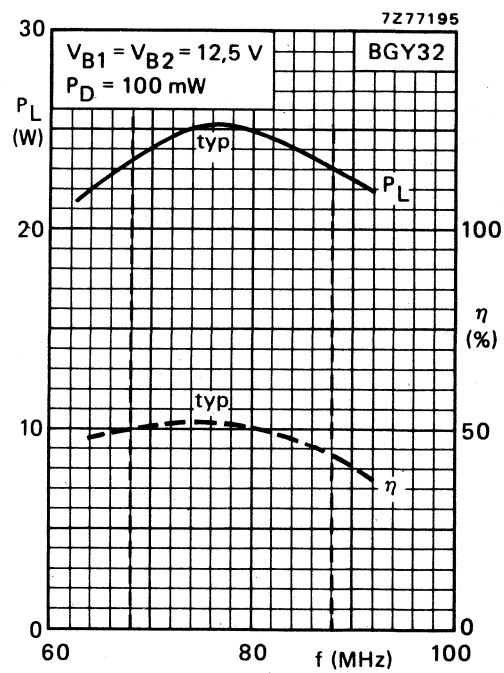
### Output power control

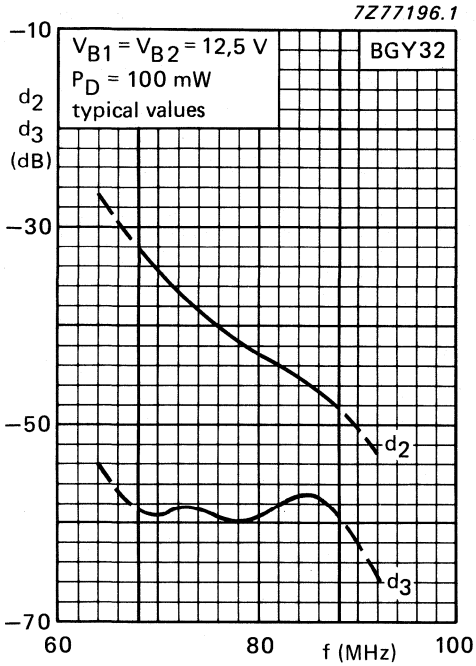
The module is not designed to be operated over a large range of output power levels. The purpose of the output power control is to set the nominal output power level. The preferred method of output power control is by varying the drive power between 50 and 200 mW. The next option is by varying $V_{S1}$ between 6 and 12.5 V.

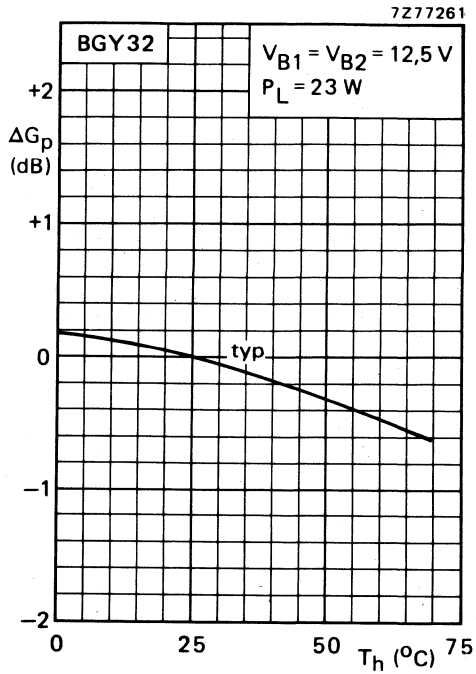

7Z77192
$P_D$ = 100 mW
typical values
BGY32
$P_L$ (W)
$V_{B1} = V_{B2}$ =
13,8 V
12,5 V
10,5 V
35
25
15
5
60
80
f (MHz)
100

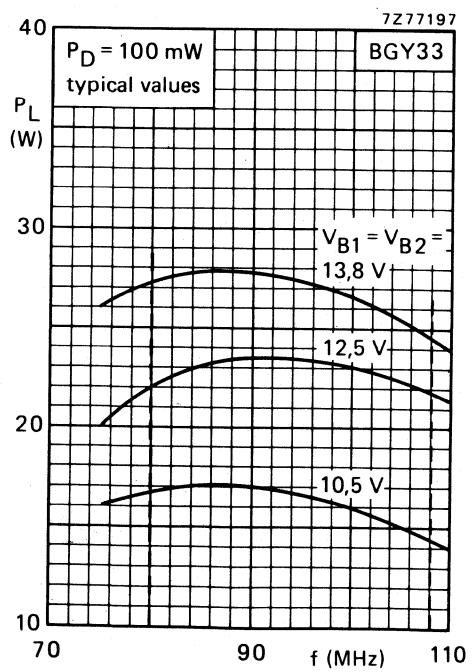

7Z77193.1
$V_{B1} = V_{B2}$ = 12,5 V
typical values
BGY32
$P_L$ (W)
f = 76 MHz
68 MHz
88 MHz
30
20
10
0
0
100
$P_D$ (mW)
200

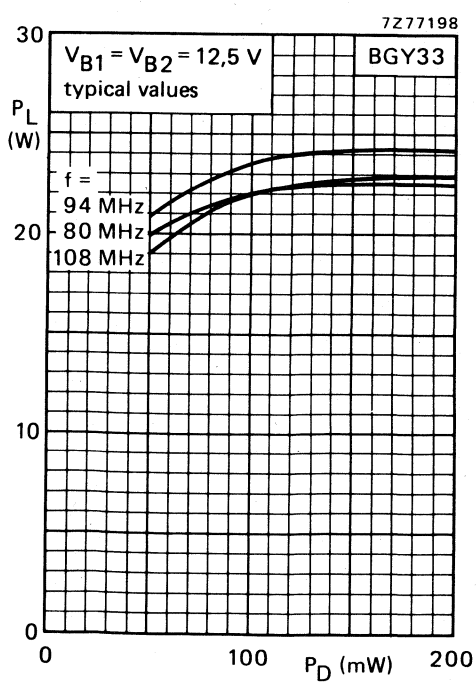

7Z77194.1
$V_{B2}$ = 12,5 V
$P_D$ = 100 mW
typical values
BGY32
$P_L$ (W)
f =
76 MHz
68 MHz
88 MHz
30
20
10
0
0
10
$V_{B1}$ (V)
20


7Z77195
$V_{B1} = V_{B2}$ = 12,5 V
$P_D$ = 100 mW
BGY32
$P_L$ (W)
typ
$P_L$
typ
$\eta$
30
20
10
0
100
$\eta$ (%)
50
0
60
80
f (MHz)
100

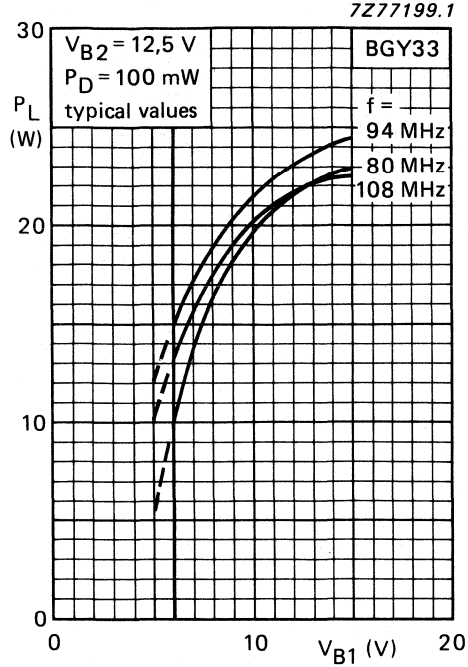

7Z77196.1
BGY32
$V_{B1} = V_{B2} = 12,5$ V
$P_D = 100$ mW
typical values
$d_2$
$d_3$
(dB)
−10
−30
−50
−70
60
80
f (MHz)
100


7Z77261
BGY32
$V_{B1} = V_{B2} = 12,5$ V
$P_L = 23$ W
$\Delta G_p$
(dB)
+2
+1
0
−1
−2
typ
0
25
50
$T_h$ (°C)
75

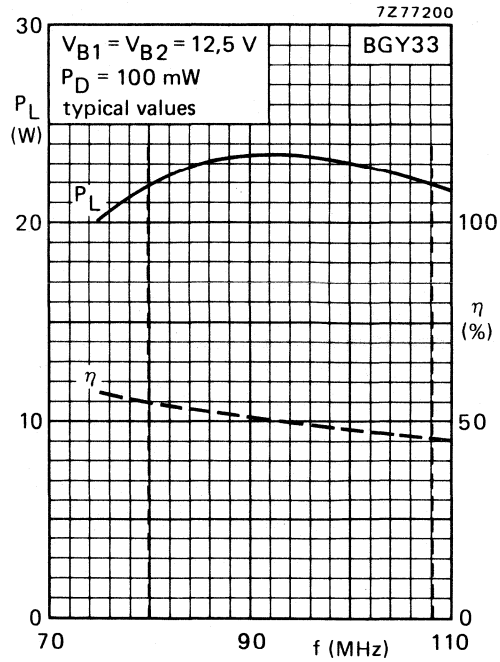

7Z77197
BGY33
$P_D = 100$ mW
typical values
$P_L$
(W)
40
30
20
10
$V_{B1} = V_{B2} =$
13,8 V
12,5 V
10,5 V
70
90
f (MHz)
110


7Z77198
BGY33
$V_{B1} = V_{B2} = 12,5$ V
typical values
$P_L$
(W)
30
20
10
0
f =
94 MHz
80 MHz
108 MHz
0
100
$P_D$ (mW)
200

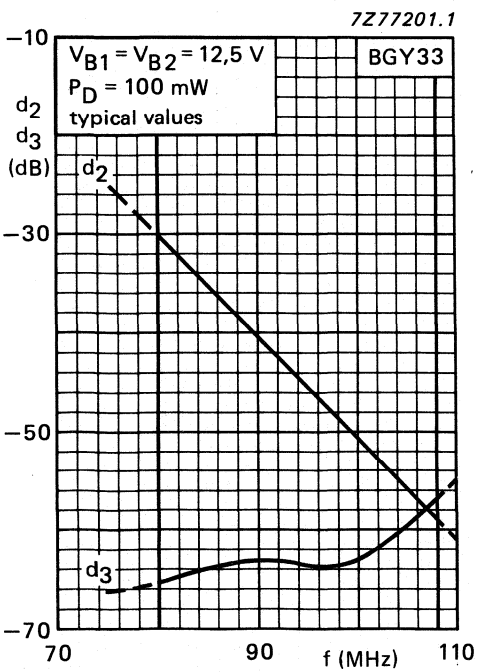
7Z77199.1



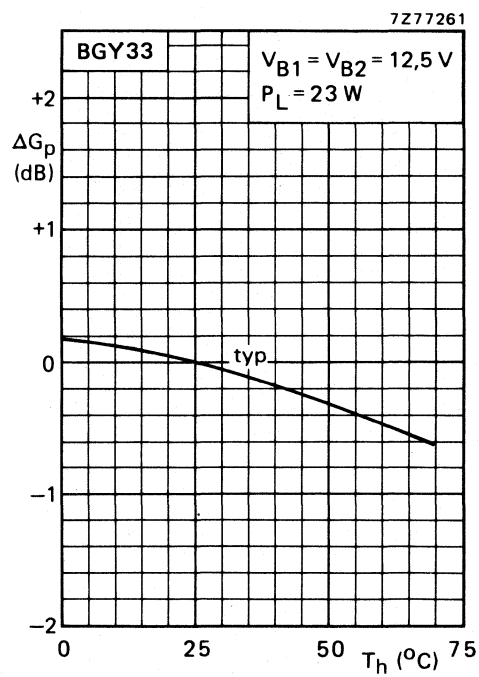

7Z77200

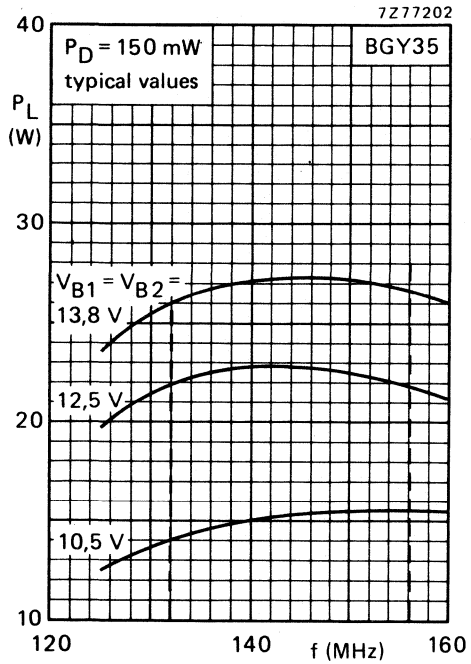


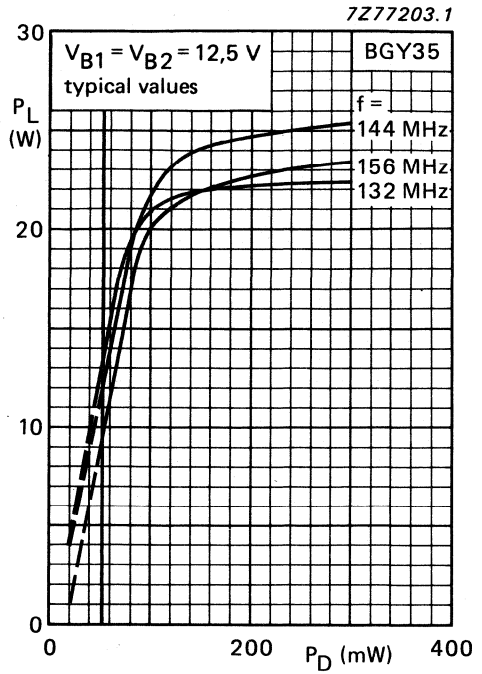

7Z77201.1

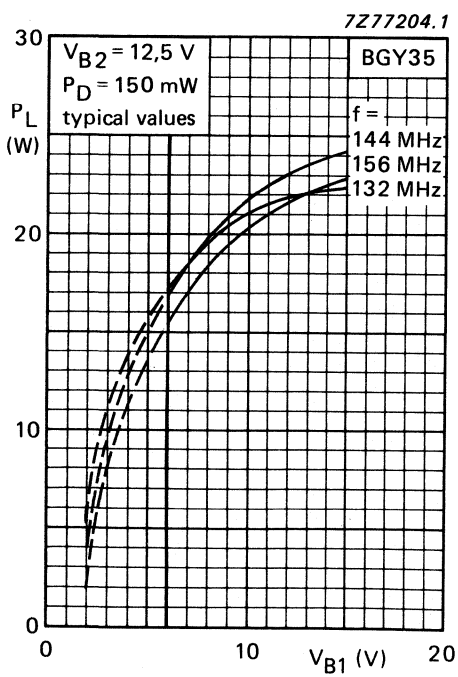


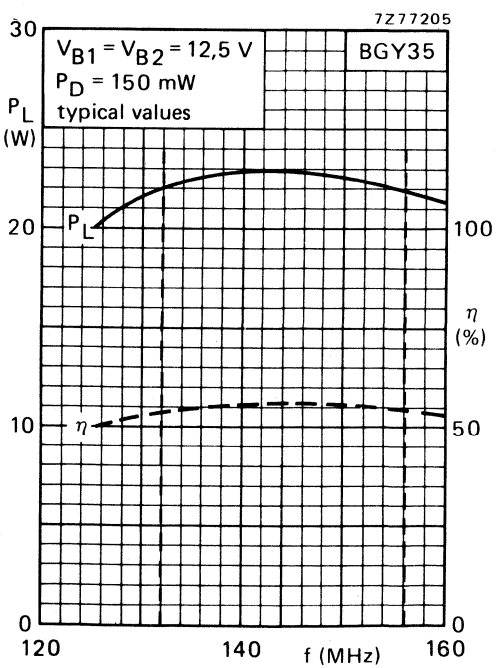

7Z77261



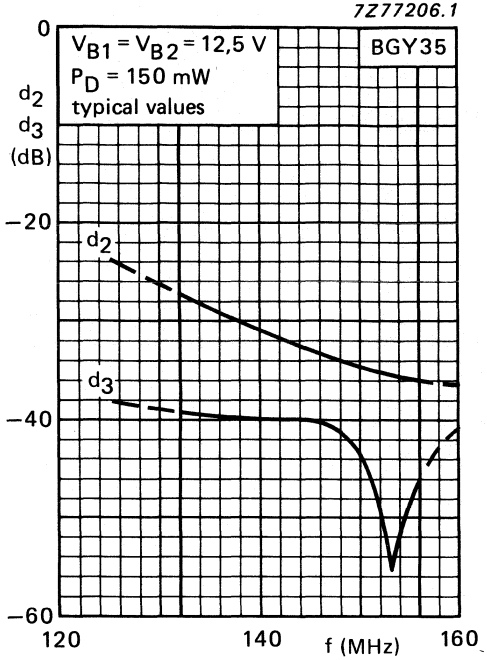

7Z77202
BGY35
$P_D$ = 150 mW
typical values
$P_L$ (W)
$V_{B1} = V_{B2}$ =
13,8 V
12,5 V
10,5 V
40
30
20
10
120
140
160
f (MHz)


7Z77203.1
BGY35
$V_{B1} = V_{B2}$ = 12,5 V
typical values
$P_L$ (W)
f =
144 MHz
156 MHz
132 MHz
30
20
10
0
0
200
400
$P_D$ (mW)

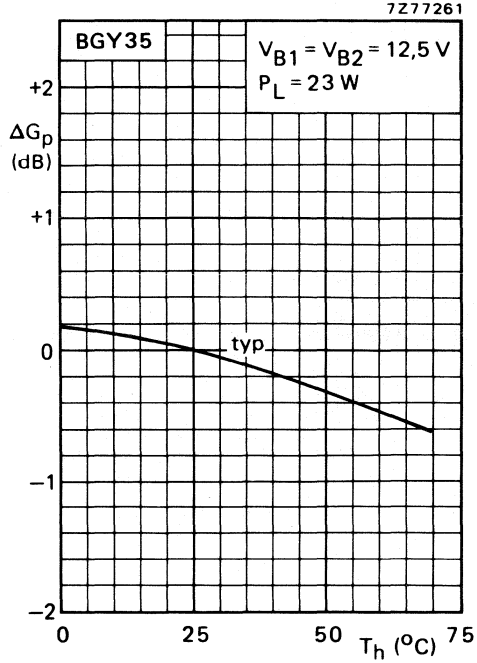

7Z77204.1
BGY35
$V_{B2}$ = 12,5 V
$P_D$ = 150 mW
typical values
$P_L$ (W)
f =
144 MHz
156 MHz
132 MHz
30
20
10
0
0
10
20
$V_{B1}$ (V)


7Z77205
BGY35
$V_{B1} = V_{B2}$ = 12,5 V
$P_D$ = 150 mW
typical values
$P_L$ (W)
$P_L$
$\eta$
$\eta$ (%)
30
20
10
0
100
50
0
120
140
160
f (MHz)

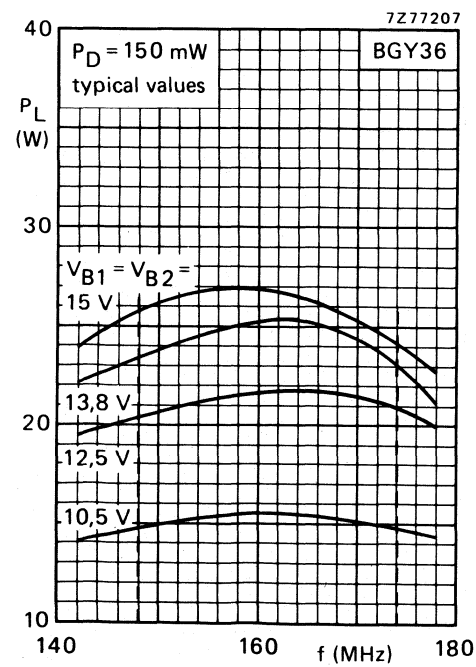
7Z77206.1



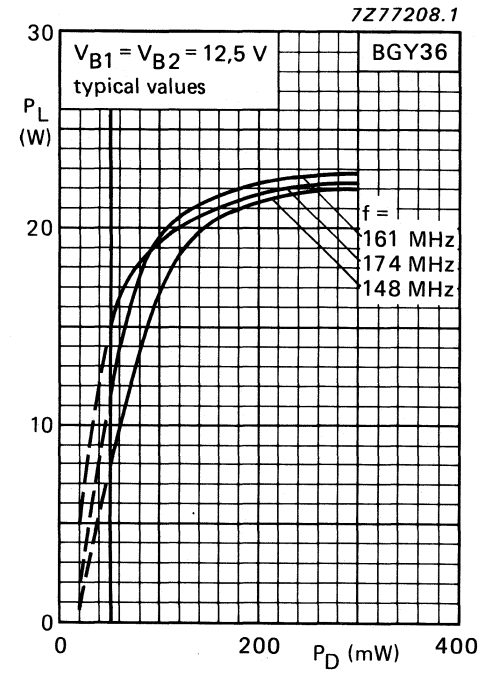

7Z77261



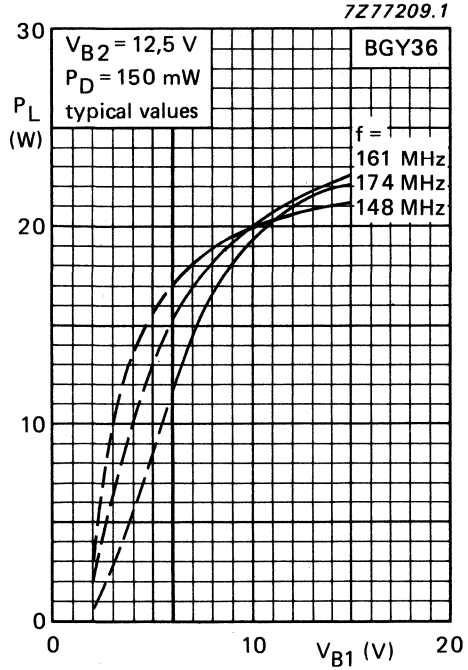

7Z77207



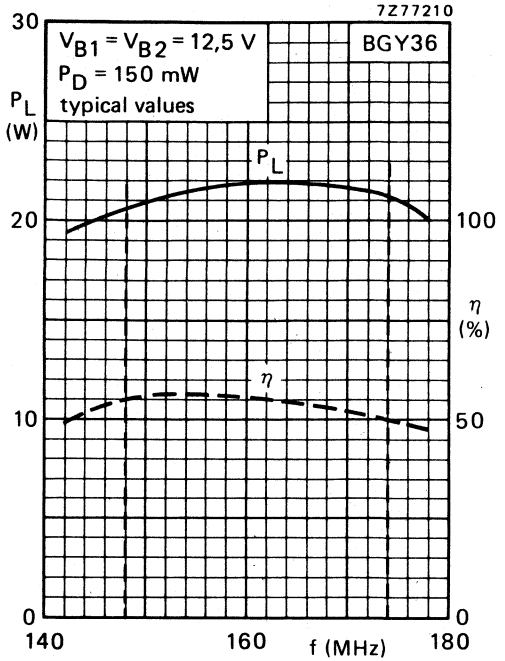

7Z77208.1



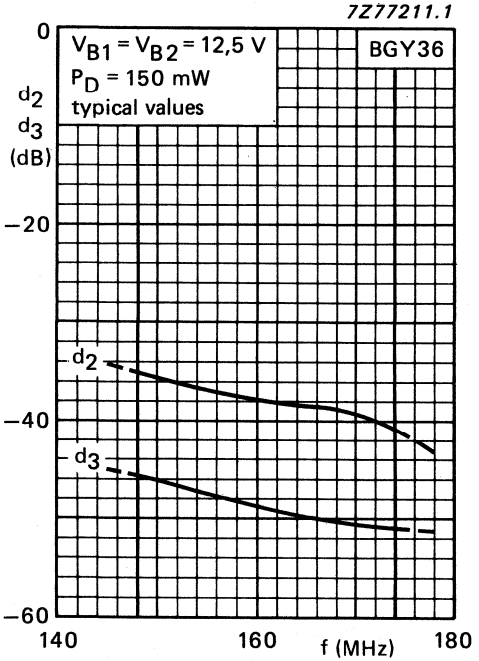
7Z77209.1



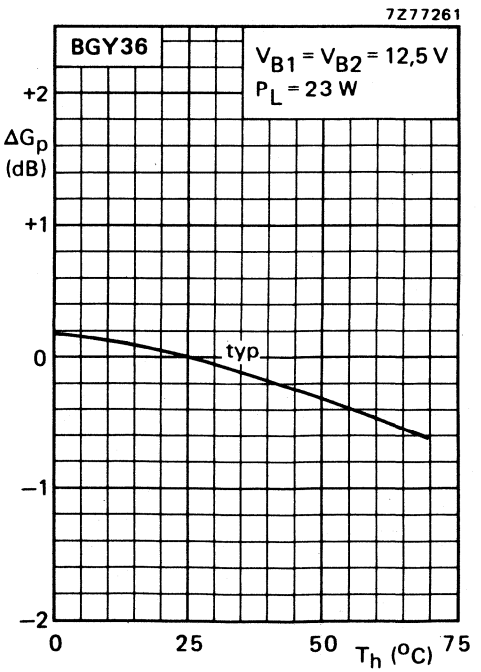

7Z77210




7Z77211.1




7Z77261



# VHF POWER AMPLIFIER MODULE

A broadband VHF amplifier module primarily designed for mobile communications equipment, operating directly from 12 V electrical systems. The module will produce a minimum output of 13 W into a 50 Ω load over the frequency range 148 to 174 MHz.
The module consists of a two stage RF amplifier using npn transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

## QUICK REFERENCE DATA

| | | | | |
|---|---|---|---|---|
| Mode of operation | | | c.w. | |
| Frequency range | f | | 148 to 174 | MHz |
| Drive power | $P_D$ | max. | 150 | mW |
| | $P_D$ | typ. | 80 | mW |
| Load power | $P_L$ | > | 13 | W |
| Supply voltages | $V_{S1}$ and $V_{S2}$ | nom. | 12.5 | V |
| Input impedance | $z_i$ | nom. | 50 | Ω |
| Output load impedance | $Z_L$ | nom. | 50 | Ω |

## MECHANICAL DATA (see Fig. 10)

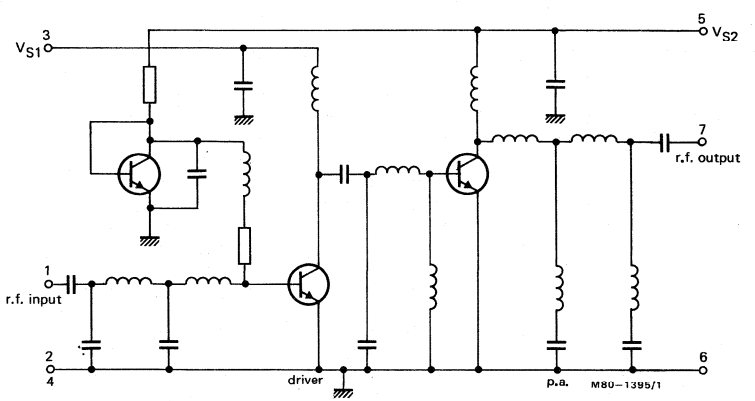



Fig. 1 Circuit of the VHF module.

**PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.**

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

**Voltages** (with respect to flange)

| | | | | |
|---|---|---|---|---|
| DC supply terminals | $V_{S1}$ and $V_{S2}$ | max. | 16.5 | V |
| RF input terminal | $\pm V_i$ | max. | 25 | V |
| RF output terminal | $\pm V_o$ | max. | 25 | V |
| Load power (see below) | $P_L$ | max. | 18 | W |
| Input drive power | $P_D$ | max. | 300 | mW |
| Storage temperature range | $T_{stg}$ | | −40 to +100 | °C |
| Operating heatsink temperature | $T_h$ | max. | 90 | °C |

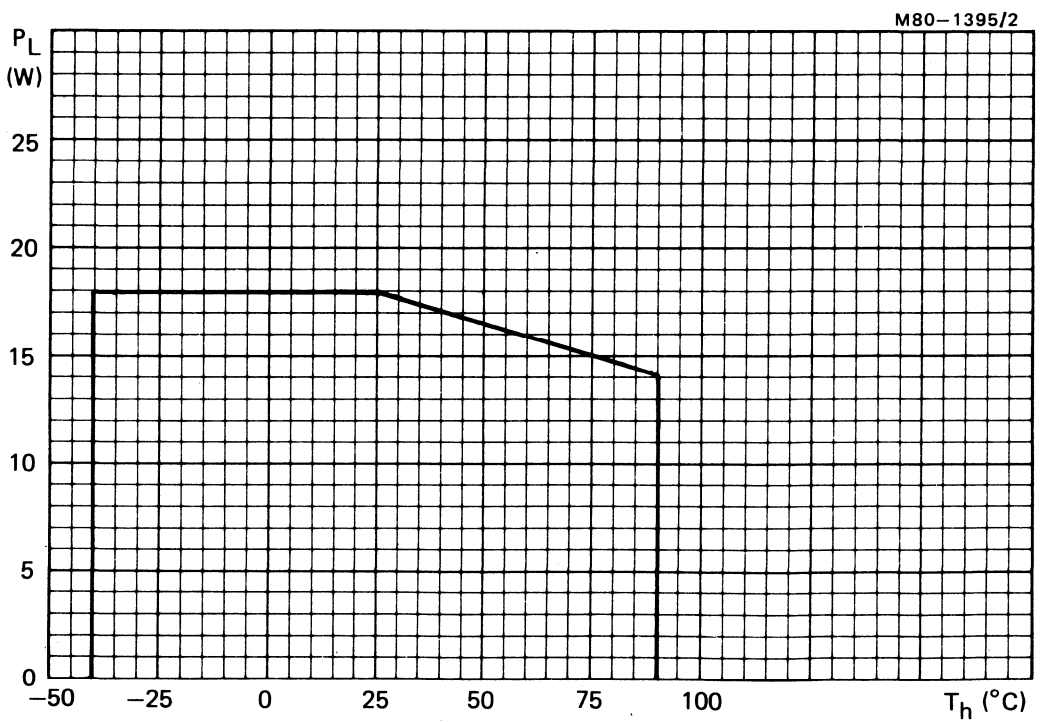



Fig.2 Load power derating; VSWR = 1

## CHARACTERISTICS

$T_h$ = 25 °C unless otherwise specified

$V_{S1} = V_{S2}$ = 12.5 V; $R_S$ = 50 Ω; frequency range 148 to 174 MHz; $R_L$ = 50 Ω

**Quiescent currents**

| | | | | |
|---|---|---|---|---|
| $P_D$ = 0 | $I_{Q1}$ | typ. | 5 | mA |
| | $I_{Q2}$ | typ. | 15 | mA |

**RF drive power**

| | | | | |
|---|---|---|---|---|
| $P_L$ = 13 W | $P_D$ | < | 150 | mW |
| | $P_D$ | typ. | 80 | mW |

**Efficiency**

| | | | | |
|---|---|---|---|---|
| $P_L$ = 13 W | $\eta$ | > | 40 | % |
| | $\eta$ | typ. | 48 | % |

**Harmonic output** — Any single harmonic will be at least 25 dB down from the carrier, with typical rejection of 34 dB.

**Input VSWR** (with respect to 50 Ω) — typ. 1.5

### Stability

The module is stable with load VSWR up to 3 (all phases) when operated with:

$V_{S1} = V_{S2}$ = 10 to 16.5 V; f = 148 to 174 MHz; $P_D$ = 30 to 300 mW; $P_L \leqslant$ 18 W (matched)

### Ruggedness

The modules will withstand load VSWR of 50 for short period overload conditions, with $P_D$, $V_{S1}$ and $V_{S2}$ at maximum values, providing the combination does not result in the matched RF output power rating being exceeded.

### Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface, with heat conducting compound between module and heatsink. If an isolation washer is used, heatsink compound should be applied to both sides of the washer. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to a torque of 0.5 Nm.
Devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

## APPLICATION INFORMATION

A technical publication (M80–0056) entitled 'Transmitter design using VHF broadband amplifier modules' is available on request.

### Power rating

In general it is recommended that the output power from the module under nominal conditions should not exceed 16 W in order to provide adequate safety margin under fault conditions.

### Output power control

The module is not designed to be operated over a large range of output power levels. The purpose of the output power control is to set the nominal output power level. The preferred method of output power control is by varying the drive power between 30 and 200 mW. The next option is by varying $V_{S1}$ between 6 and 12.5 V.

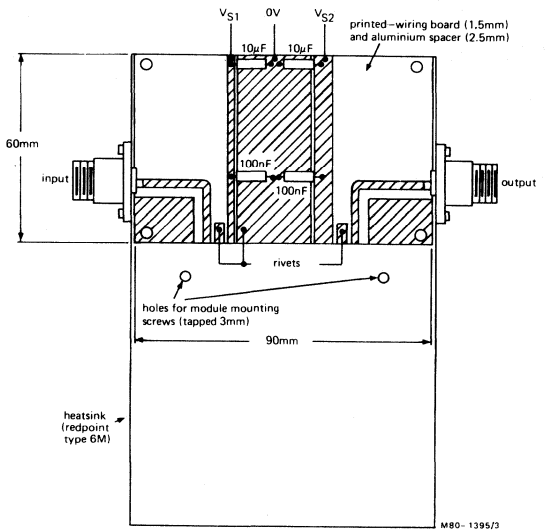



Fig.3 Test jig for VHF modules

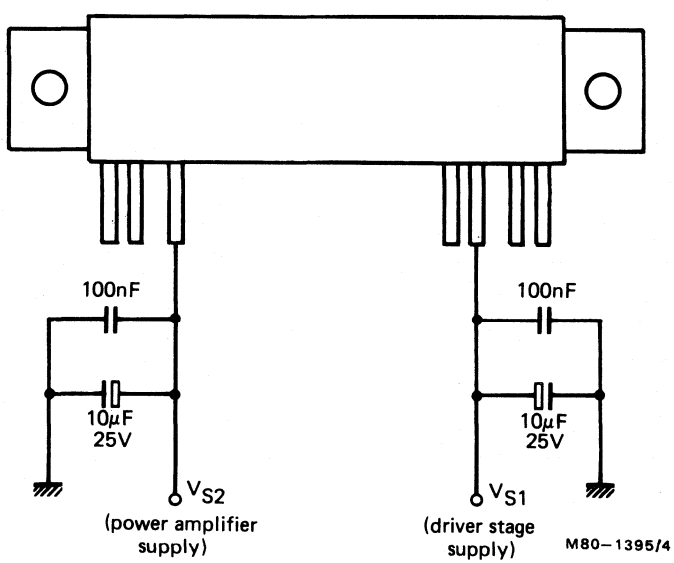



Fig.4 Recommended decoupling arrangement

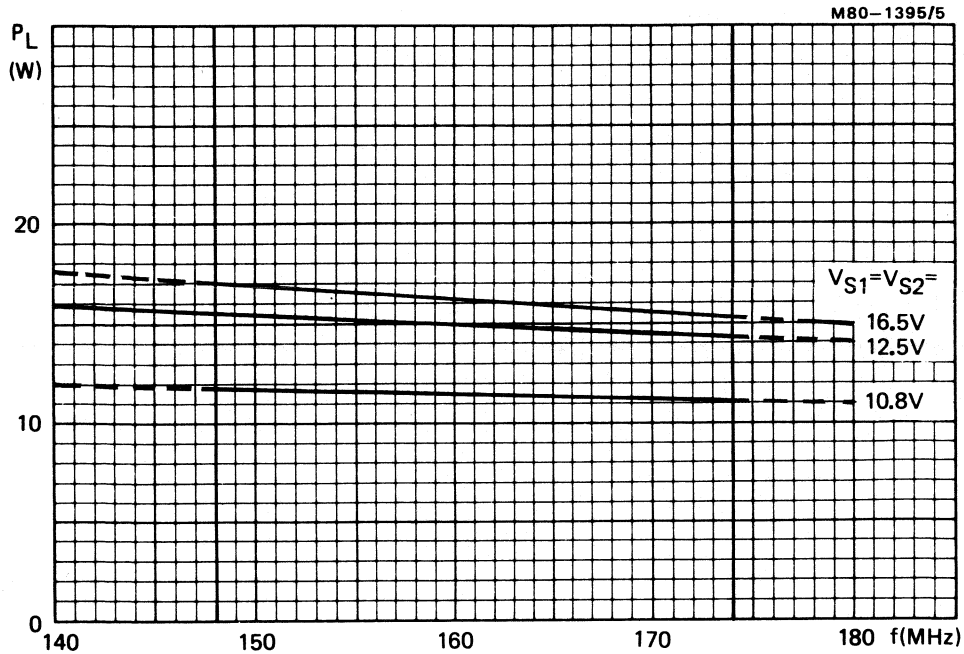



Fig.5 Typical values; $P_D$ = 150 mW

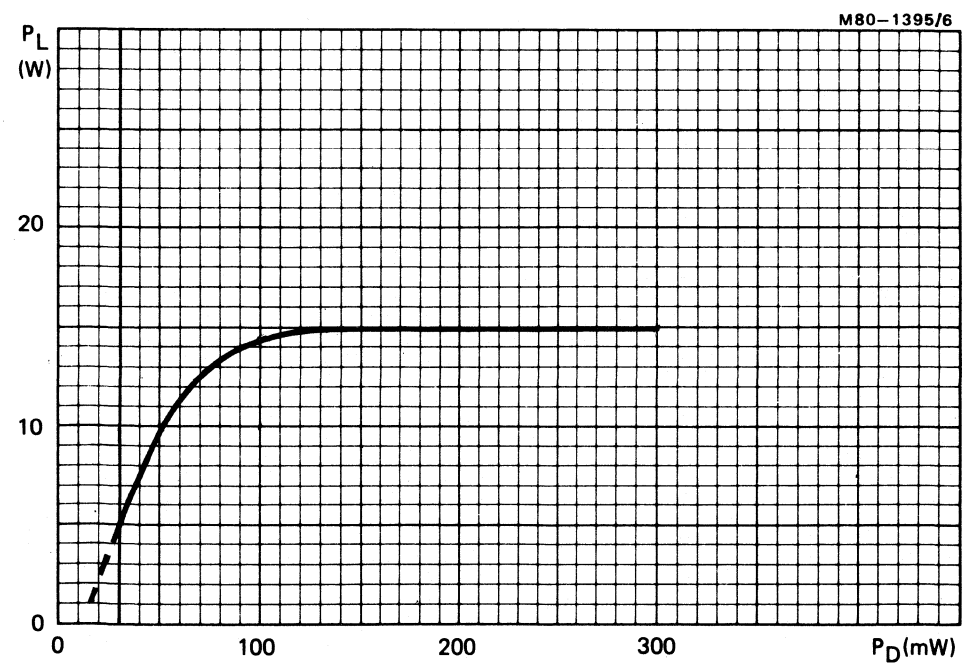



Fig.6 Typical values; $V_{S1} = V_{S2}$ = 12.5 V; f = 160 MHz

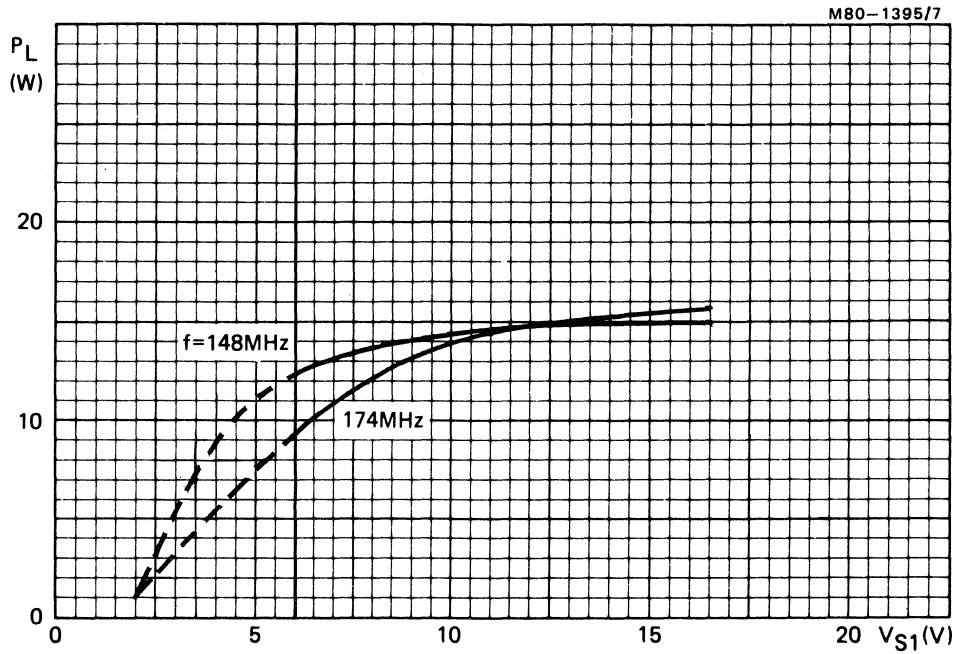



Fig.7 Typical values; $V_{S2}$ = 12.5 V; $P_D$ = 150 mW

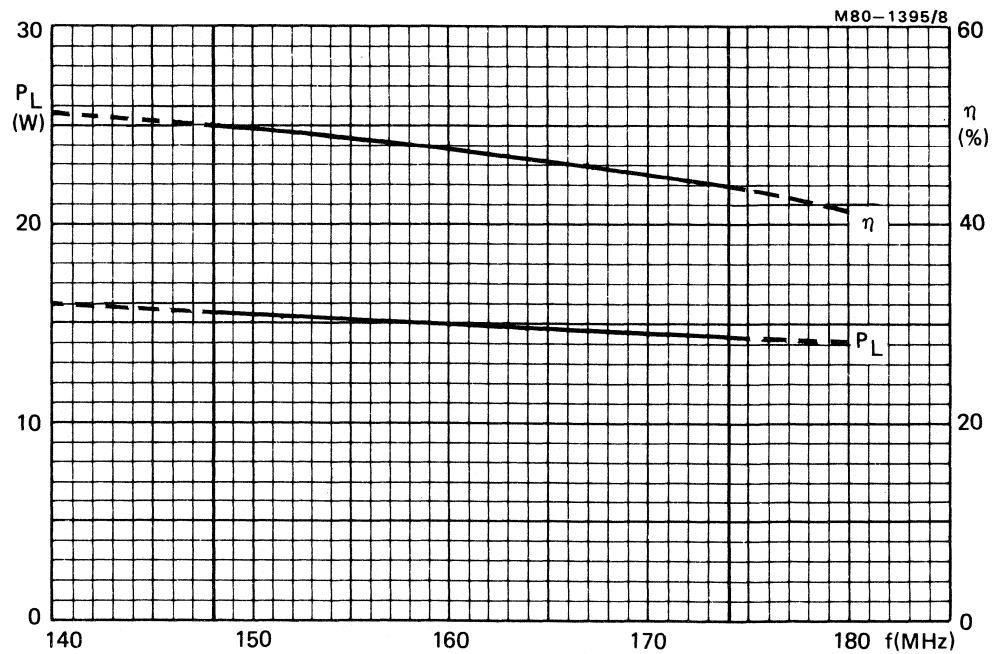



Fig.8 Typical values; $V_{S1}$ = $V_{S2}$ = 12.5 V; $P_D$ = 150 mW

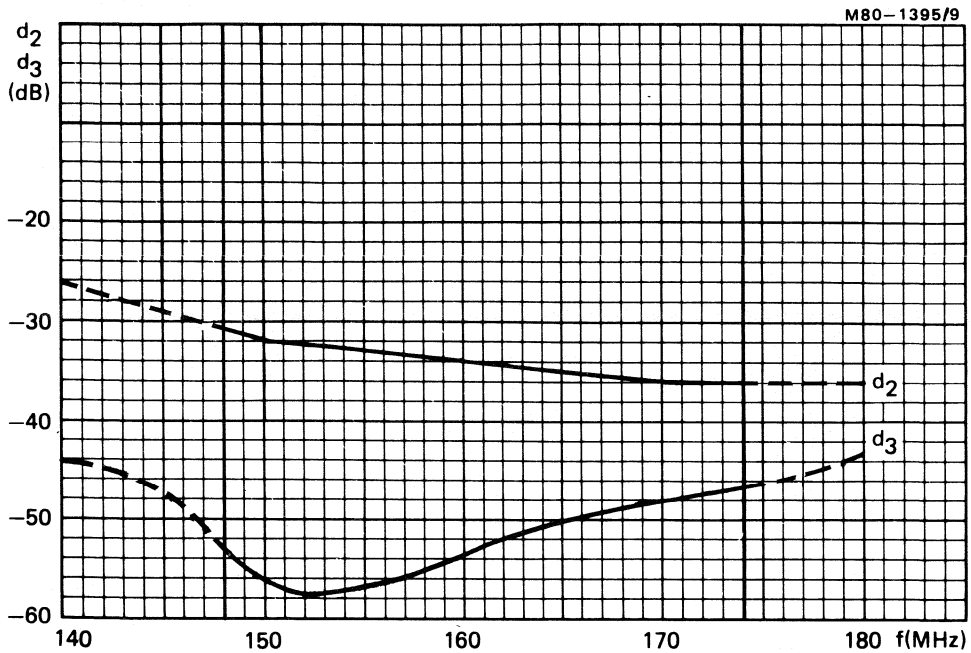
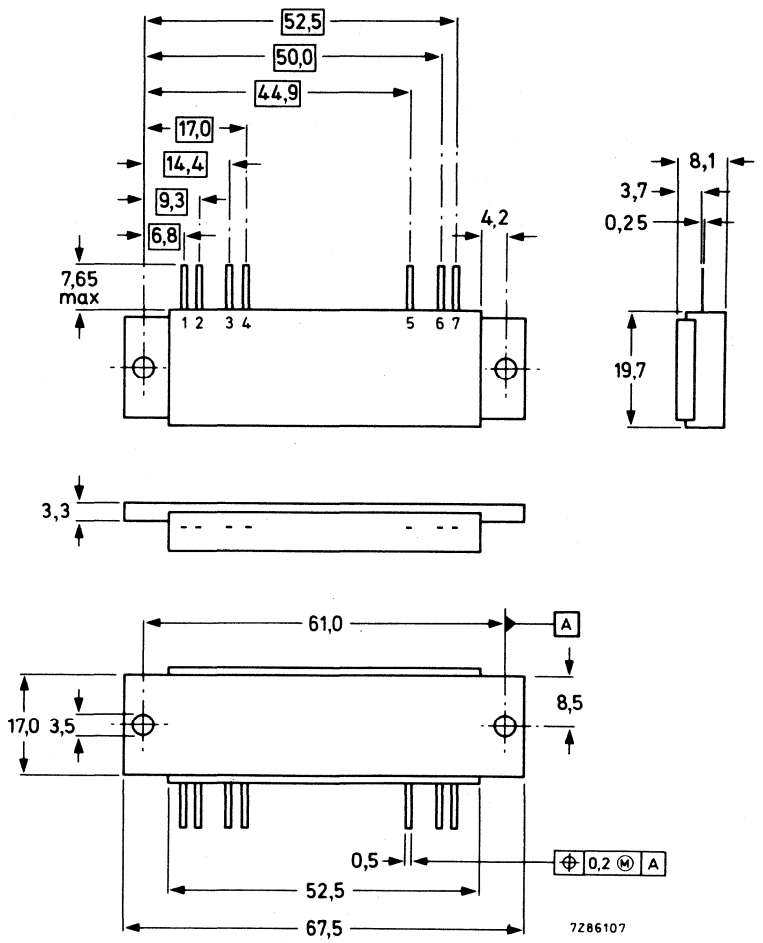



Fig.9 Typical values; $V_{S1} = V_{S2} = 12.5$ V; $P_D = 150$ mW

## MECHANICAL DATA

Dimensions in mm

Fig. 10 SOT-132B.




**Lead reference**

1 = Input
2 = Earth
3 = $V_{S1}$
4 = Earth
5 = $V_{S2}$
6 = Earth
7 = Output

# UHF POWER AMPLIFIER MODULE

UHF broadband amplifier module designed for use in mobile communication equipment operating directly from a 9.6 V electrical supply. The module will produce a minimum of 1.4 W into a 50 Ω load over the frequency range 400 to 440 MHz.

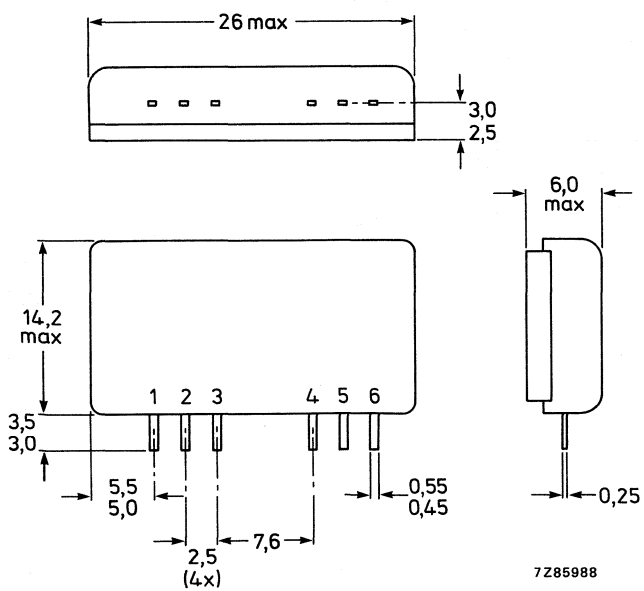
The module consists of a two-stage RF amplifier using npn transistor chips with lumped element matching components in a SOT-181 plastic encapsulation. The negative supply is internally connected to the flange.

## QUICK REFERENCE DATA

| | | | |
|---|---|---|---|
| Mode of operation | | continuous wave | |
| Frequency range | | 400 to 440 | MHz |
| DC supply voltage (terminal 3) | $V_{S1}$ | nom. 7.5 | V |
| DC supply voltage (terminal 4) | $V_{S2}$ | nom. 9.6 | V |
| RF drive power | $P_D$ | < 45 | mW |
| RF load power | $P_L$ | min. 1.4 | W |
| Efficiency | $\eta$ | typ. 42 | % |

## MECHANICAL DATA

Dimensions in mm




**Lead reference**

1. RF input
2. Earth
3. $V_{S1}$
4. $V_{S2}$
5. Earth
6. RF output

Flange connected to earth.

Fig. 1 SOT-181.

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| | | | |
|---|---|---|---|
| DC supply terminal voltages* | $V_{S1}$, $V_{S2}$ | max. | 12 V* |
| RF input terminal voltage* | $\pm V_i$ | max. | 25 V* |
| RF output terminal voltage* | $\pm V_o$ | max. | 25 V* |
| Load power (see Fig. 2) | $P_L$ | max. | 2.5 W |
| Drive power | $P_D$ | max. | 90 mW |
| Storage temperature range | $T_{stg}$ | | −40 to 100 °C |
| Operating heatsink temperature range | $T_h$ | | −30 to 90 °C |

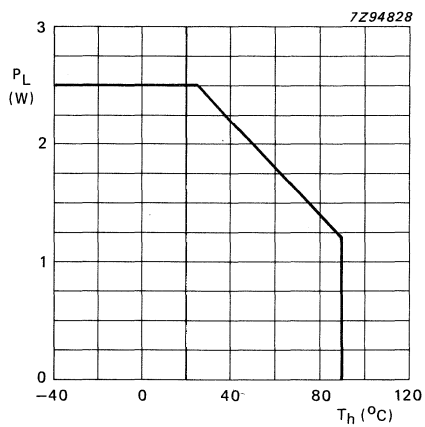



Fig. 2 Load power derating.

## CHARACTERISTICS

$V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $R_S = R_L$ = 50 Ω; f = 400 to 440 MHz; $T_h$ = 25 °C

| | | | |
|---|---|---|---|
| Quiescent currents | | | |
| $P_D$ = 0 | $I_{Q1}$ | < | 7.0 mA |
| | $I_{Q2}$ | < | 0.1 mA |
| RF drive power | | | |
| $P_L$ = 1.4 W | $P_D$ | < | 45 mW |
| Efficiency | | | |
| $P_L$ = 1.4 W | $\eta$ | > | 40 % |
| | | typ. | 42 % |
| Harmonic output | any harmonic | min. | 30 dB |
| | | typ. | 40 dB |
| Input VSWR with respect to 50 Ω | | < | 2 : 1 |

* With respect to earth pins.

### Stability

The module is stable with a load VSWR up to 5 : 1 (all phases) when operated within the following conditions:

$V_{S1} = V_{S2} = 5.0$ V to 11.2 V; $P_D = 17$ to 90 mW; f = 400 to 440 MHz; $P_L < 2.5$ W (matched).

### Ruggedness

The module will withstand a load mismatch VSWR of 50 : 1 (all phases) for short period overload conditions, with $P_D \leqslant 90$ mW, $V_{S1} \leqslant V_{S2} \leqslant 12$ V, $P_L < 2.5$ W (matched), $T_h \leqslant 90$ °C.

## APPLICATION INFORMATION

### Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound applied between module and heatsink. The module is designed to be pressed against the heatsink by a sheet spring applying up to 50 N to the top surface of the module encapsulation. The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

### Power rating

In general, it is recommended that the output power from the module under nominal conditions should not exceed 1.5 W in order to provide an adequate safety margin under fault conditions.

### Output power control

The module is designed to be operated at a constant output power of 1.4 W. The module is adjusted to produce nominal output by reducing the first stage supply voltage $V_{S1}$. If the module is to be used over a range of output power levels below 1.4 W, the first stage supply voltage should not be reduced below 5 V. If further reductions in power are needed, this may be achieved by varying the drive power $P_D$. For stable operation however, care must be taken to avoid operating the module outside the published stability conditions.

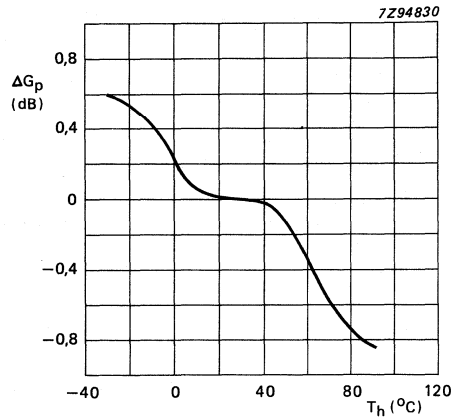



Fig. 3 Power gain as a function of temperature; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

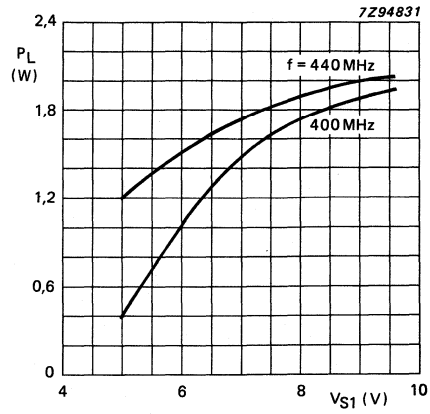



Fig. 4 Load power as a function of supply voltage $V_{S1}$; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

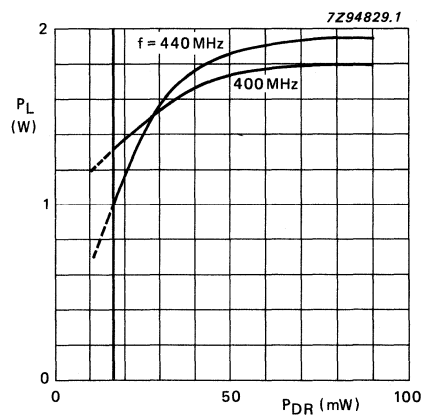



Fig. 5 Load power as a function of drive power; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; typical values.

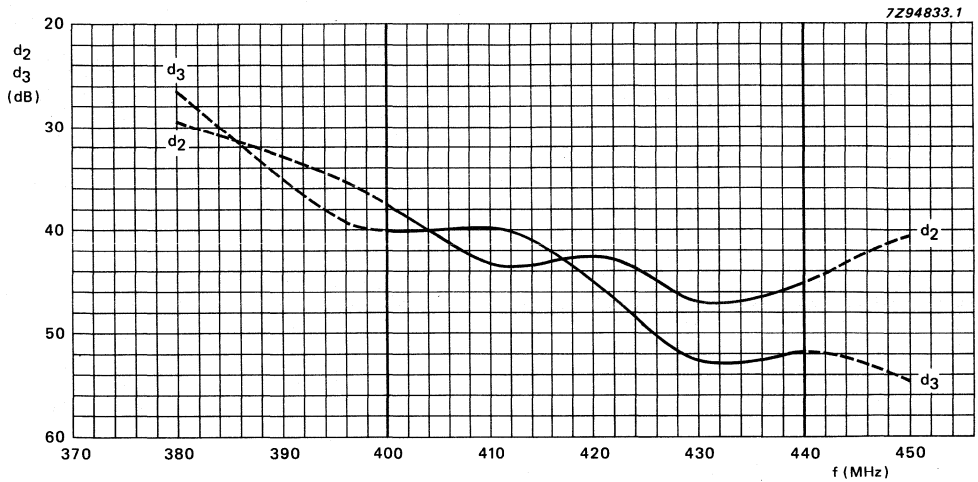



Fig. 6 Second and third harmonic distortions as a function of frequency; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

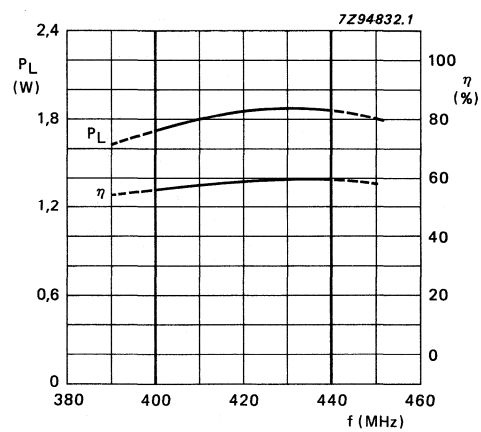



Fig. 7 Load power and efficiency as functions of frequency; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

# UHF POWER AMPLIFIER MODULE

UHF broadband amplifier module designed for use in mobile communication equipment operating directly from a 9.6 V electrical supply. The module will produce a minimum of 1.4 W into a 50 Ω load over the frequency range of 430 to 470 MHz.

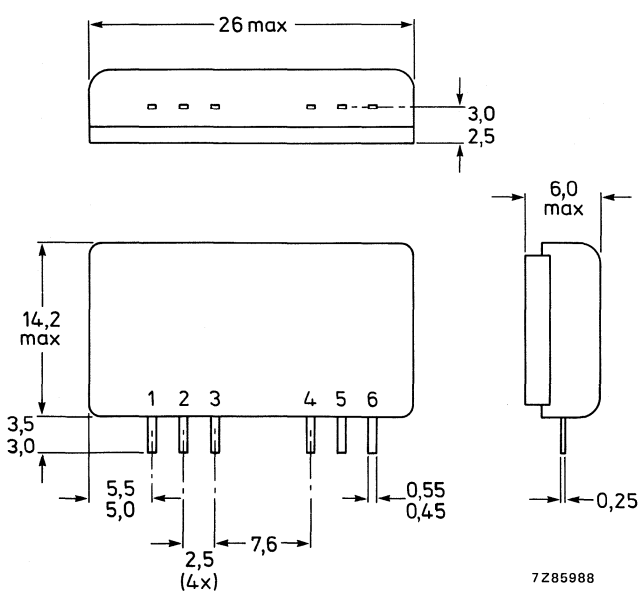
The module consists of a two-stage RF amplifier using npn transistor chips with lumped element matching components in a SOT-181 plastic encapsulation. The negative supply is internally connected to the flange.

## QUICK REFERENCE DATA

| | | | |
|---|---|---|---|
| Mode of operation | | continuous wave | |
| Frequency range | | 430 to 470 | MHz |
| DC supply voltage (terminal 3) | $V_{S1}$ | nom. 7.5 | V |
| DC supply voltage (terminal 4) | $V_{S2}$ | nom. 9.6 | V |
| RF drive power | $P_D$ | < 45 | mW |
| RF load power | $P_L$ | min. 1.4 | W |
| Efficiency | $\eta$ | typ. 45 | % |

## MECHANICAL DATA

Dimensions in mm




**Lead reference**

1. RF input
2. Earth
3. $V_{S1}$
4. $V_{S2}$
5. Earth
6. RF output

Flange connected to earth.

Fig. 1 SOT-181.

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| | | | |
|---|---|---|---|
| DC supply terminal voltages* | $V_{S1}$, $V_{S2}$ | max. | 12 V* |
| RF input terminal voltage* | $\pm V_i$ | max. | 25 V* |
| RF output terminal voltage* | $\pm V_o$ | max. | 25 V* |
| Load power (see Fig. 2) | $P_L$ | max. | 2.5 W |
| Drive power | $P_D$ | max. | 90 mW |
| Storage temperature range | $T_{stg}$ | | −40 to + 100 °C |
| Operating heatsink temperature | $T_h$ | max. | 90 °C |

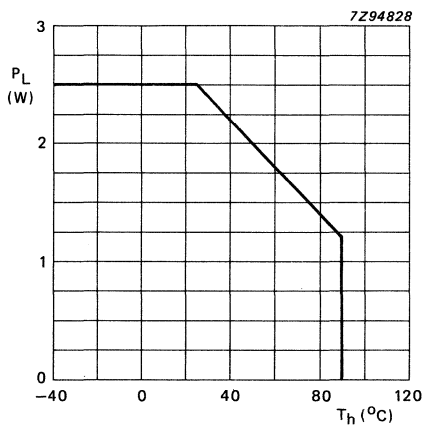



Fig. 2 Load power derating; VSWR = 1 : 1.

## CHARACTERISTICS

$V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $R_S$ = $R_L$ = 50 Ω; f = 430 to 470 MHz; $T_h$ = 25 °C

| | | | |
|---|---|---|---|
| Quiescent currents | | | |
| $P_D$ = 0 | $I_{Q1}$ | < | 7.0 mA |
| | $I_{Q2}$ | < | 0.1 mA |
| RF drive power | | | |
| $P_L$ = 1.4 W | $P_D$ | < | 45 mW |
| Efficiency | | | |
| $P_L$ = 1.4 W | $\eta$ | > | 40 % |
| | | typ. | 45 % |
| Harmonic output | any harmonic | min. | 30 dB |
| | | typ. | 40 dB |
| Input VSWR | | | |
| with respect to 50 Ω | | < | 2 : 1 |

* With respect to the earth pins.

### Stability

The module is stable with a load VSWR up to 5 : 1 (all phases) when operated within the following conditions:

$V_{S1} \leqslant V_{S2}$ = 5.0 V to 11.2 V; $P_D$ = 17 to 90 mW; f = 430 to 470 MHz; $P_L < 2.5$ W (matched).

### Ruggedness

The module will withstand a load mismatch VSWR of 50 : 1 (all phases) for short period overload conditions, with $P_D \leqslant 90$ mW, $V_{S1} \leqslant V_{S2} \leqslant 12$ V, $P_L < 2.5$ V (matched), $T_h < 90$ °C.

## APPLICATION INFORMATION

### Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound applied between module and heatsink. The module is designed to be pressed against the heatsink by a sheet spring applying up to 50 N to the top surface of the module encapsulation. The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

### Power rating

In general, it is recommended that the output power from the module under nominal conditions should not exceed 1.5 W in order to provide an adequate safety margin under fault conditions.

### Output power control

The module is designed to be operated at a constant output power of 1.4 W. The module is adjusted to produce nominal output by reducing the first stage supply voltage $V_{S1}$. If the module is to be used over a range of output power levels below 1.4 W, the first stage supply voltage should not be reduced below 5 V. If further reductions in power are needed, this may be achieved by varying the drive power $P_D$. For stable operation however, care must be taken to avoid operating the module outside the published stability conditions.

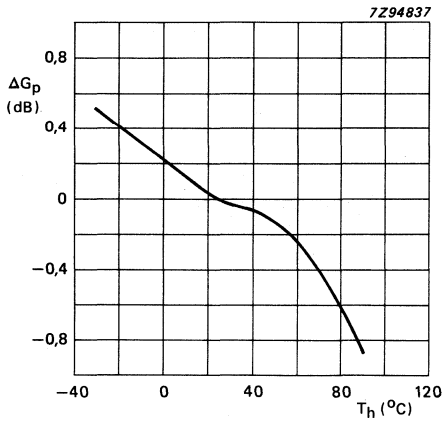



Fig. 3 Power gain as a function of temperature; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

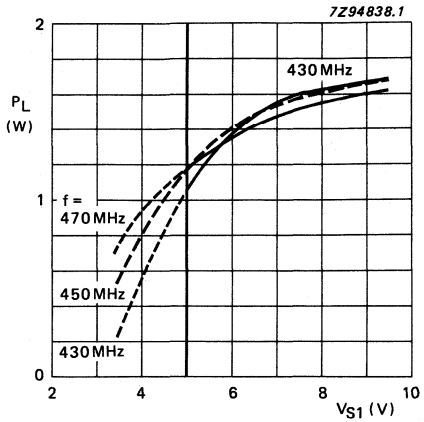



Fig. 4 Load power as a function of supply voltage $V_{S1}$; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

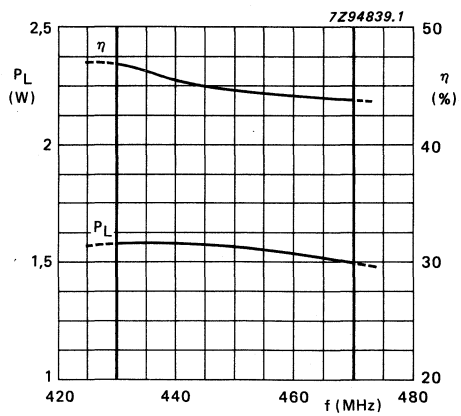



Fig. 5 Load power and efficiency as functions of frequency; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

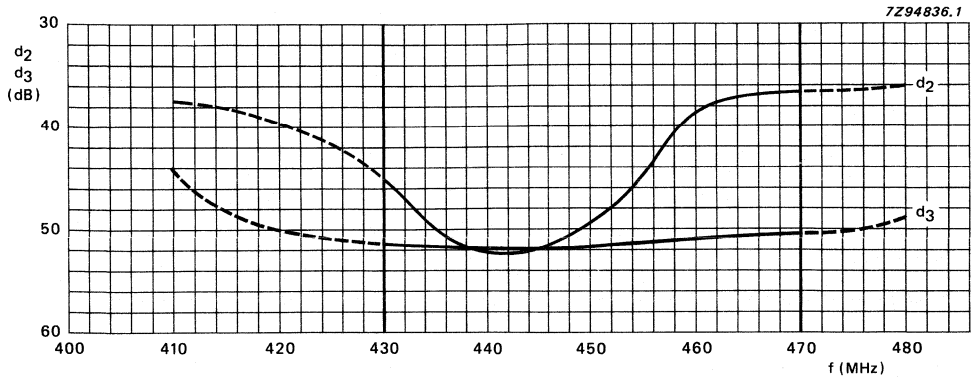



Fig. 6 Second and third harmonic distortions as a function of frequency; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; $P_D$ = 45 mW; typical values.

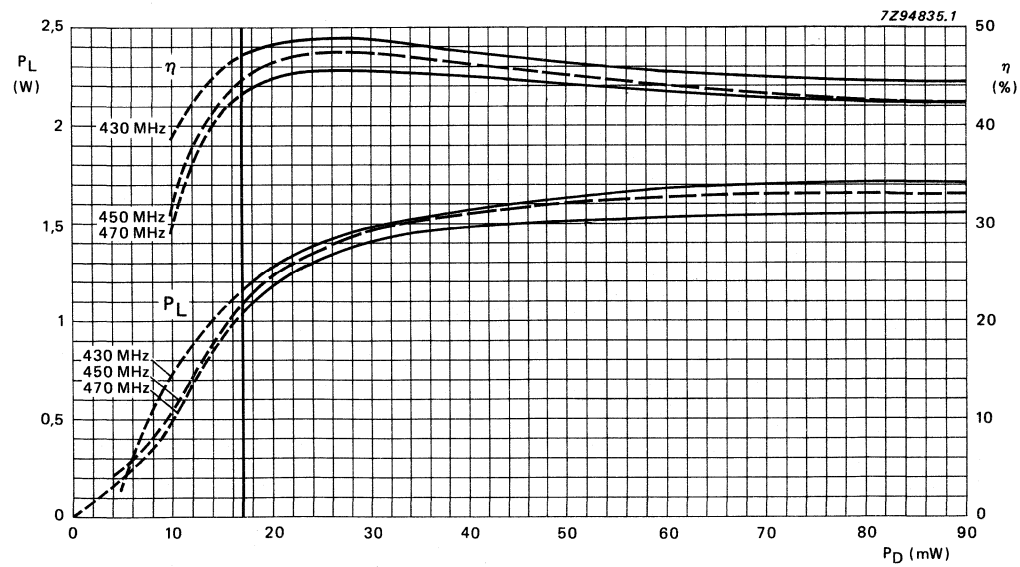



Fig. 7 Load power and efficiency as functions of drive power; $V_{S1}$ = 7.5 V; $V_{S2}$ = 9.6 V; typical values.

# UHF POWER AMPLIFIER MODULE

A broadband UHF amplifier module primarily designed for mobile communications equipment, operating directly from 7.5 V or 9.6 V electrical systems. The module will produce a minimum output of 2.0 W or 3.2 W into a 50 Ω load over the frequency range 400 to 470 MHz.

The module consists of a two-stage RF amplifier, using npn transistor chips with lumped-element matching components in a plastic stripline encapsulation (SOT181). The negative supply is internally connected to the flange.

## QUICK REFERENCE DATA

| | | | |
|---|---|---|---|
| Mode of operation | | | CW |
| Frequency range | | | 400 to 470 MHz |
| DC supply voltage (terminal 3) | $V_{S1}$ | | 7.5 or 9.6 V |
| DC supply voltage (terminal 4) | $V_{S2}$ | | 7.5 or 9.6 V |
| RF drive power | $P_D$ | max. | 50 mW |
| RF load power | $P_L$ | min. | 2.0 or 3.2 W |
| Efficiency | $\eta$ | typ. | 44 % |

## MECHANICAL DATA

Dimensions in mm

**Lead reference**

1 = RF input
2 = Earth
3 = $V_{S1}$
4 = $V_{S2}$
5 = Earth
6 = RF output
Flange = earth

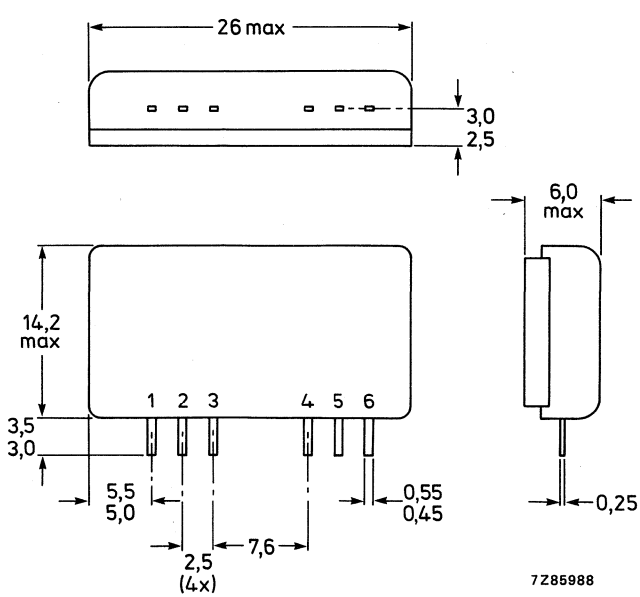



Fig.1 SOT181.

## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| | | | |
|---|---|---|---|
| DC supply terminal voltages* | $V_{S1}$, $V_{S2}$ | max. | 12 V |
| RF input terminal voltage* | $\pm V_i$ | max. | 25 V |
| RF output terminal voltage* | $\pm V_o$ | max. | 25 V |
| Load power | $P_L$ | max. | 5.0 W |
| Drive power | $P_D$ | max. | 90 mW |
| Storage temperature range | $T_{stg}$ | | −40 to 100 °C |
| Operating heatsink temperature | $T_h$ | max. | 90 °C |

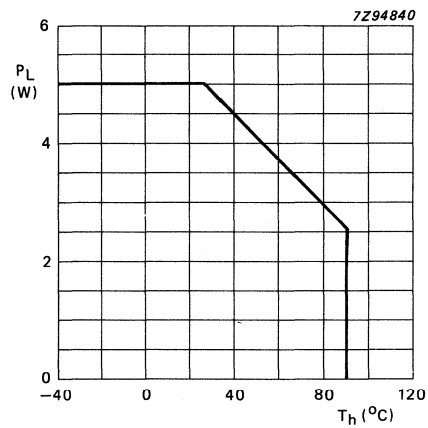



Fig.2 Load power derating; VSWR = 1 : 1.

* With respect to the earth pins.

## CHARACTERISTICS

$Z_S = Z_L = 50\ \Omega$; frequency range = 400 to 470 MHz; $T_h = 25\ ^oC$ unless otherwise specified.

| | | | |
|---|---|---|---|
| Quiescent currents | | | |
| $V_{S1} = V_{S2} = 7.5$ V or 9.6 V; $P_D = 0$ | $I_{Q1}$ | max. | 7.0 mA |
| | $I_{Q2}$ | max. | 0.1 mA |
| Efficiency | | | |
| $P_L = 2.0$ W or $P_L = 3.2$ W | $\eta$ | min. | 40 % |
| | $\eta$ | typ. | 44 % |
| RF drive power | | | |
| $P_L = 2.0$ W; $V_{S1} = V_{S2} = 7.5$ V | $P_D$ | max. | 50 mW |
| $P_L = 3.2$ W; $V_{S1} = V_{S2} = 9.6$ V | $P_D$ | max. | 50 mW |
| Harmonic output | any harmonic | min. | −30 dB |
| | | typ. | −40 dB |
| Input VSWR | | | |
| with respect to 50 Ω | VSWR | max. | 2:1 |

### Stability

The module is stable with a load VSWR up to 5:1 (all phases) when operated within the following conditions:

$V_{S1} \leqslant V_{S2} = 5.0$ V to 11.2 V; $P_D = 25$ to 90 mW; f = 400 to 470 MHz; $P_L < 5.0$ W (matched)

### Ruggedness

The module will withstand a load mismatch VSWR of 50:1 (all phases) for short period overload conditions, with $P_D$, $V_{S1}$ and $V_{S2}$ at maximum values, providing the combination does not cause the matched RF output power rating to be exceeded.

### Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound applied between module and heatsink. The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of a least 1 mm from the plastic.

### Power rating

In general it is recommended that the output power from the module under nominal conditions should not exceed 4 W in order to provide an adequate safety margin under fault conditions.

### Output power control

The module is not designed to be operated over a large range of output power levels. The aim of the output power control is to set the nominal output power level. The preferred method of output power control is by varying the drive power between 25 and 50 mW. The next option is by varying $V_{S1}$ between 5.0 and 9.6 V.

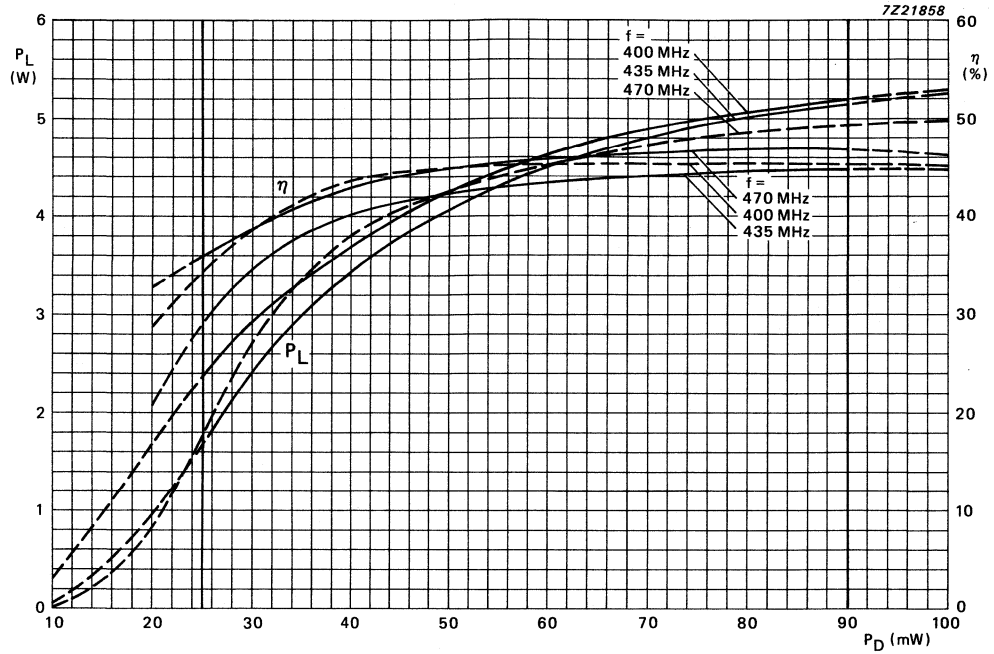



Fig.3 Load power and efficiency as functions of drive power; $V_{S1} = V_{S2} = 9.6$ V; typical values.

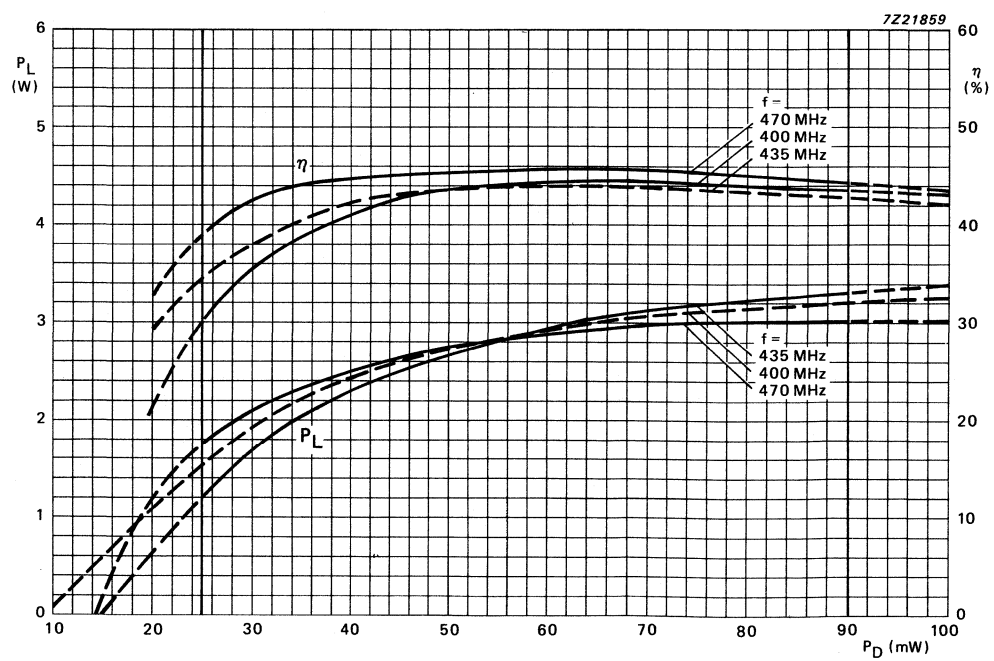



Fig.4 Load power and efficiency as functions of drive power; $V_{S1} = V_{S2} = 7.5$ V; typical values.

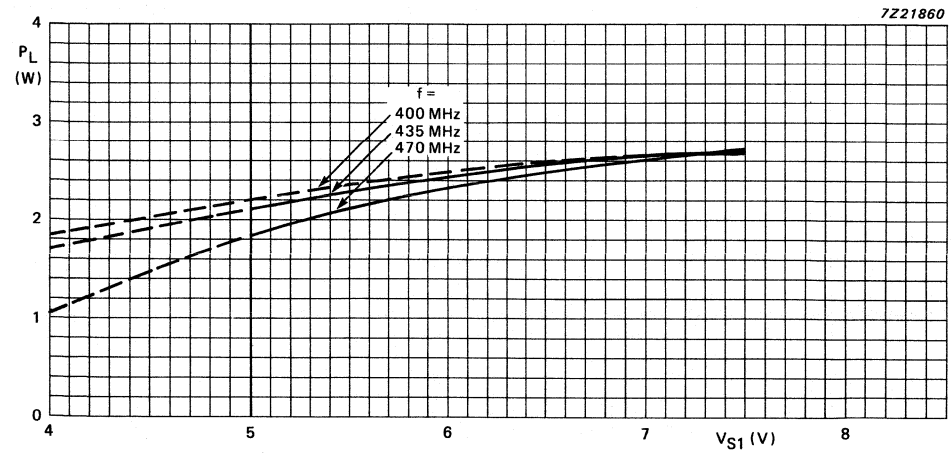



Fig.5 Load power as a function of $V_{S1}$; $V_{S2}$ = 7.5 V; $P_D$ = 50 mW; typical values.

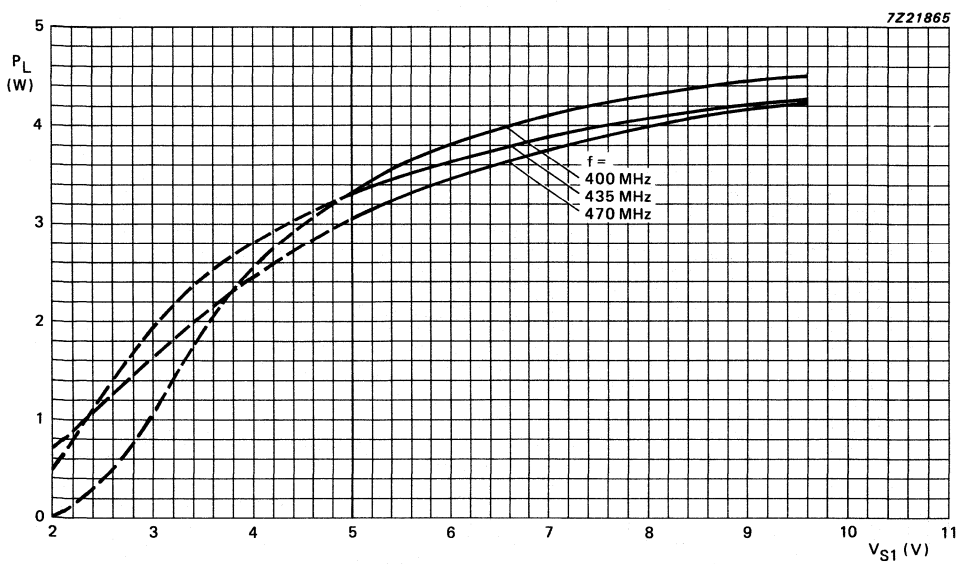



Fig.6 Load power as a function of $V_{S1}$; $V_{S2}$ = 9.6 V; $P_D$ = 50 mW; typical values.

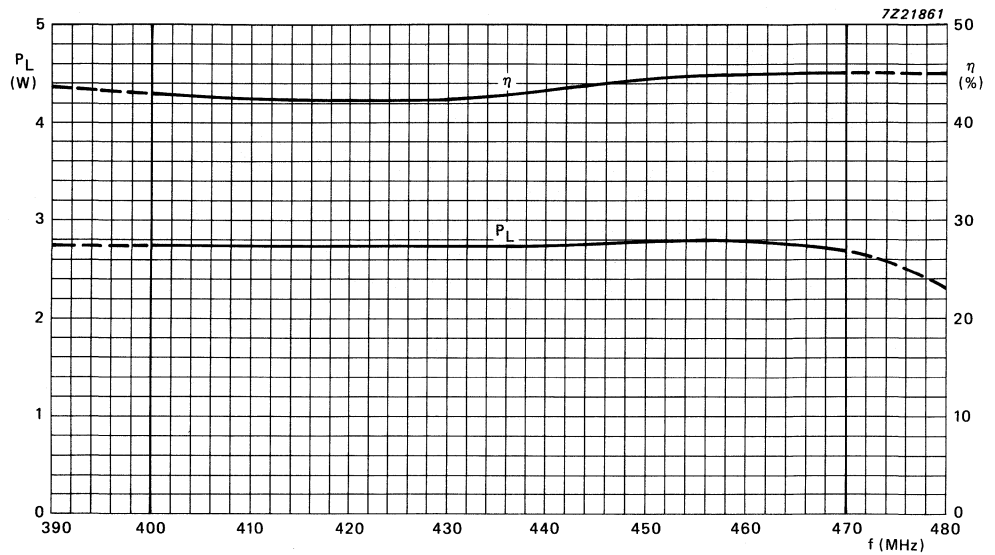



Fig.7 Load power and efficiency as functions of frequency; $V_{S1} = V_{S2} = 7.5$ V; $P_D = 50$ mW; typical values.

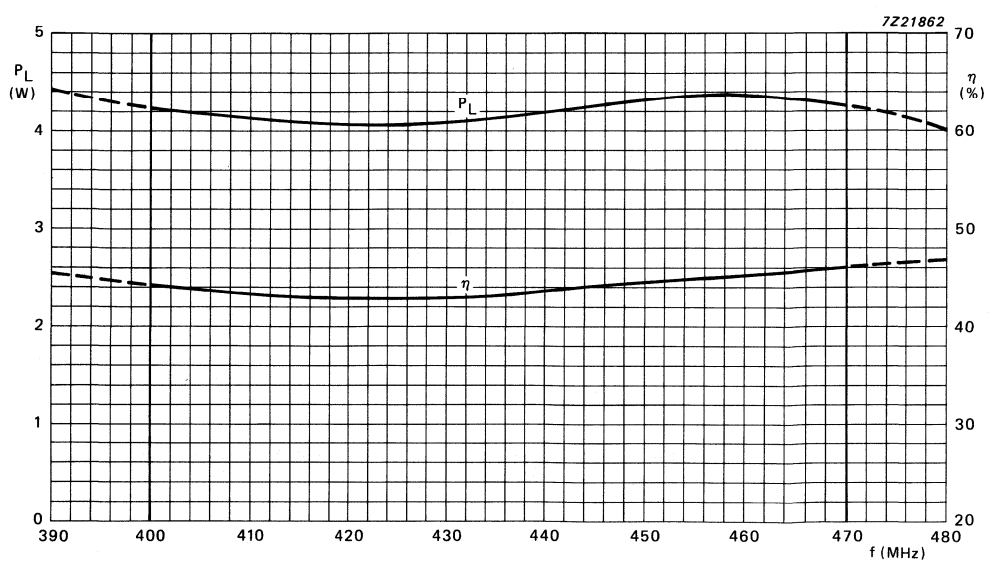



Fig.8 Load power and efficiency as functions of frequency; $V_{S1} = V_{S2} = 9.6$ V; $P_D = 50$ mW; typical values.

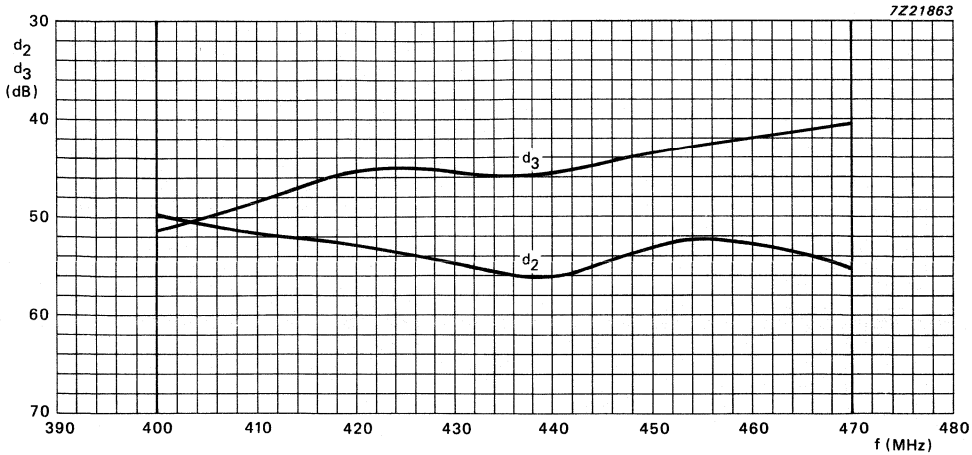



Fig.9 Second and third harmonic distortions as functions of frequency; $V_{S1} = V_{S2} = 7.5$ V; $P_D = 50$ mW; typical values.

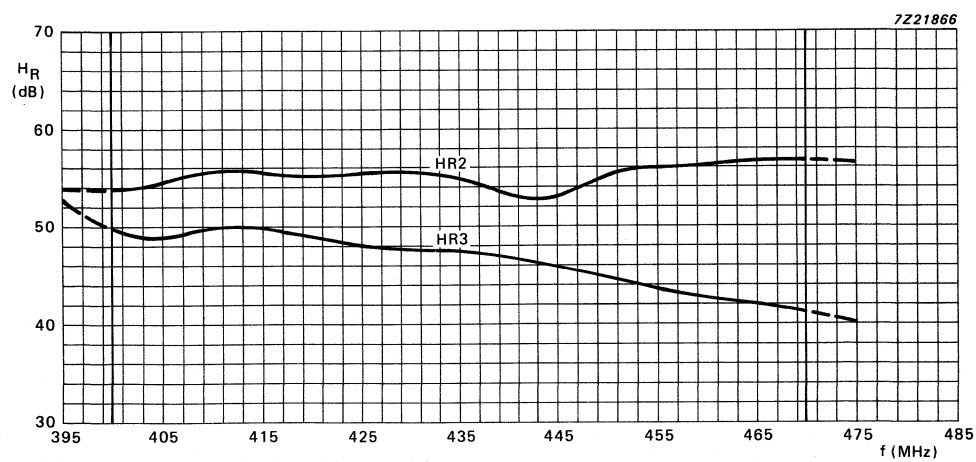



Fig.10 Second and third harmonic distortions as functions of frequency; $V_{S1} = V_{S2} = 9.6$ V; $P_D = 50$ mW; typical values.

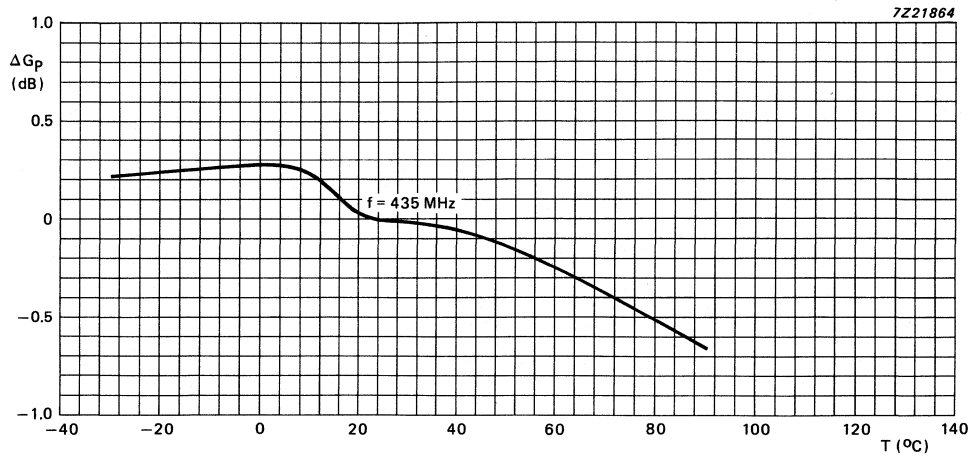



Fig.11 Power gain as a function of temperature; $P_D$ = 50 mW; $V_{S1} = V_{S2}$ = 7.5 V; typical values.

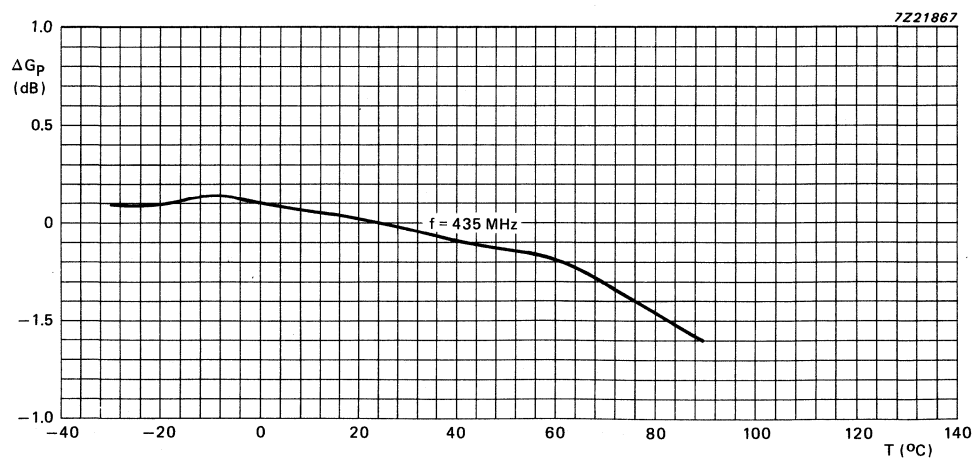



Fig.12 Power gain as a function of temperature; $P_D$ = 50 mW; $V_{S1} = V_{S2}$ = 9.6 V; typical values.

# UHF amplifier module BGY47B

## FEATURES

- 7.5 V or 9.6 V nominal supply voltage
- 2 W or 3.2 W output power
- Easy control of output power by DC voltage.

## APPLICATIONS

- Mobile communication equipment operating in the 460 to 520 MHz frequency range.

## PINNING - SOT181

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | ground |
| 3 | $V_{S1}$ |
| 4 | $V_{S2}$ |
| 5 | ground |
| 6 | RF output |
| mounting base | ground |

## DESCRIPTION

The BGY47B is a two-stage UHF amplifier module.

It consists of two NPN silicon planar transistor chips mounted together with matching and bias circuitry on a metallized ceramic substrate.

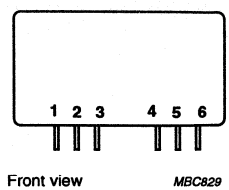



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

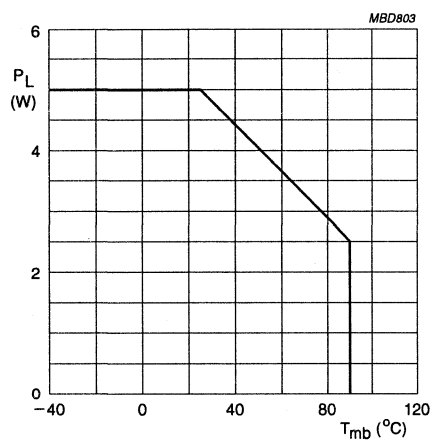
RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_{S1}$; $V_{S2}$ (V) | $P_L$ (W) | $G_p$ (dB) | η (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|
| CW | 460 to 520 | 7.5 | 2 | ≥16 | typ. 47 | 50 |
| CW | 460 to 520 | 9.6 | 3.2 | ≥18 | typ. 47 | 50 |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 12 | V |
| $V_{S2}$ | DC supply voltage | – | 12 | V |
| $P_D$ | input drive power | – | 90 | mW |
| $P_L$ | load power | – | 5 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +90 | °C |




VSWR = 1 : 1.

Fig.2 Power derating curve.

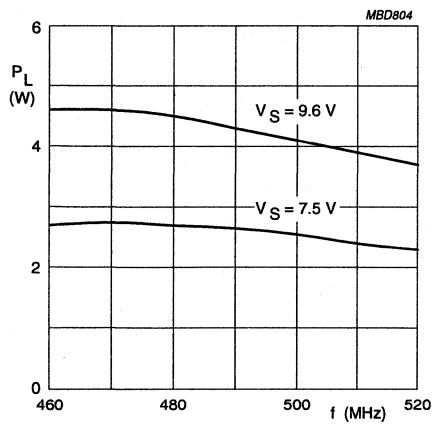
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 50 mW; f = 460 to 520 MHz; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | $V_{S1} = V_{S2}$ = 7.5 V | 2 | 2.4 | – | W |
| | | $V_{S1} = V_{S2}$ = 9.6 V | 3.2 | 4 | – | W |
| $G_p$ | power gain | $V_{S2}$ = 7.5 V; note 1 | 16 | 16.8 | – | dB |
| | | $V_{S2}$ = 9.6 V; note 2 | 18 | 19 | – | dB |
| $\eta$ | efficiency | $V_{S2}$ = 7.5 V; note 1 | 40 | 47 | – | % |
| | | $V_{S2}$ = 9.6 V; note 2 | 40 | 47 | – | % |
| $H_2$ | second harmonic | $V_{S2}$ = 7.5 V; note 1 | – | –40 | –30 | dBc |
| | | $V_{S2}$ = 9.6 V; note 2 | – | –40 | –30 | dBc |
| $H_3$ | third harmonic | $V_{S2}$ = 7.5 V; note 1 | – | –40 | –30 | dBc |
| | | $V_{S2}$ = 9.6 V; note 2 | – | –40 | –30 | dBc |
| $VSWR_{in}$ | input VSWR | $V_{S2}$ = 7.5 V; note 1 | – | – | 2 : 1 | |
| | | $V_{S2}$ = 9.6 V; note 2 | – | – | 2 : 1 | |
| $I_{Q1}$ | stage 1 leakage current | $V_{S1} = V_{S2}$ = 7.5 V or 9.6 V | – | – | 7 | mA |
| $I_{Q2}$ | stage 2 leakage current | $P_D$ = 0 | – | – | 0.1 | mA |
| | stability | $P_L \leq 5$ W; $V_{S1} \leq V_{S2}$ = 5 to 11.2 V; $P_D$ = 25 to 90 mW; VSWR ≤ 5 : 1 through all phases | – | – | –60 | dBc |
| | ruggedness | $P_L \leq 5$ W; $V_{S1} = V_{S2}$ = 12 V; VSWR ≤ 50 : 1 through all phases | no degradation | | | |

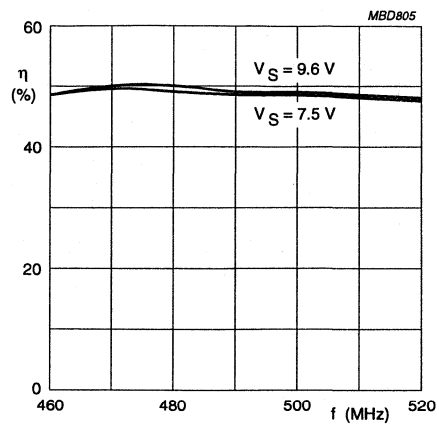
**Notes**

1. Adjust $V_{S1}$ for $P_L$ = 2 W.
2. Adjust $V_{S1}$ for $P_L$ = 3.2 W.



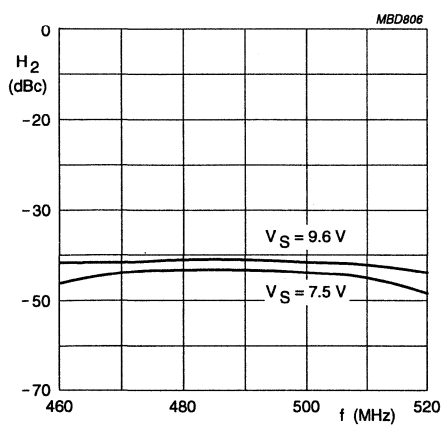

$Z_S = Z_L = 50\ \Omega$.
$P_D = 50$ mW.
$T_{mb} = 25$ °C.

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



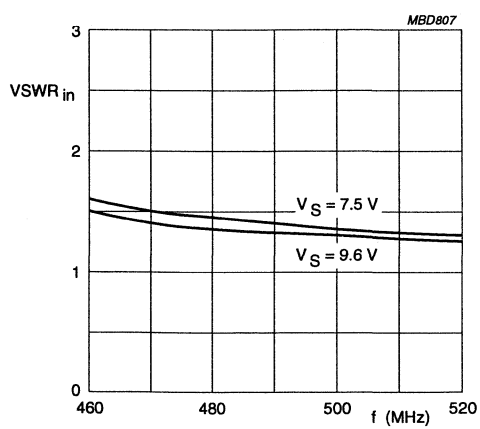

$Z_S = Z_L = 50\ \Omega$.
$P_D = 50$ mW.
$T_{mb} = 25$ °C.

Fig.4 Efficiency as a function of frequency; typical values.




$Z_S = Z_L = 50\ \Omega$.
$P_D = 50$ mW.
$T_{mb} = 25$ °C.

Fig.5 Second harmonic as a function of frequency; typical values.




$Z_S = Z_L = 50\ \Omega$.
$P_D = 50$ mW.
$T_{mb} = 25$ °C.

Fig.6 Input return losses as a function of frequency; typical values.

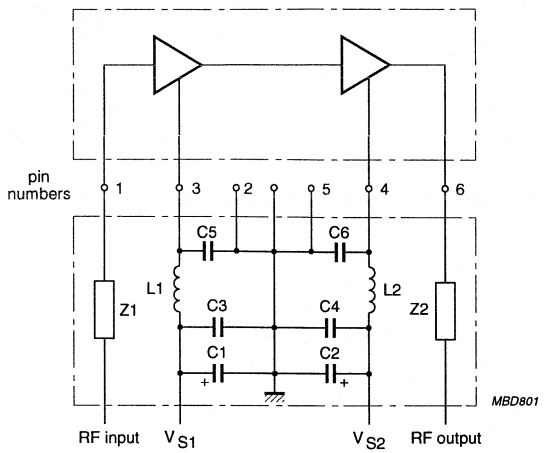
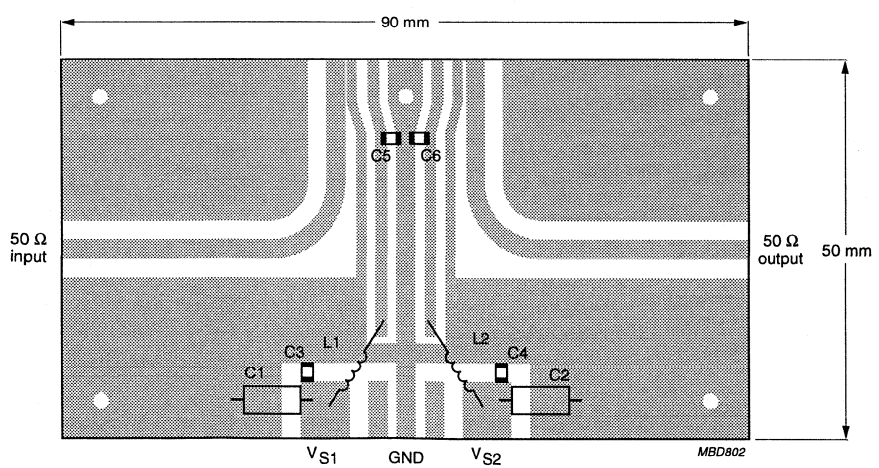



Fig.7 Test circuit.




Earth connections are made by plated through holes.

Fig.8 Printed-circuit board layout.

**List of components (see Fig.7)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1, C2 | electrolytic capacitor | 6.8 μF | – |
| C3, C4 | multilayer ceramic chip capacitor | 100 nF | 2222 852 47104 |
| C5, C6 | multilayer ceramic chip capacitor | 1 nF | 2222 861 12102 |
| L1, L2 | Ferroxcube RF choke | 5 μH | 3112 108 20153 |
| Z1, Z2 | stripline; note 1 | 50 Ω | – |

**Note**

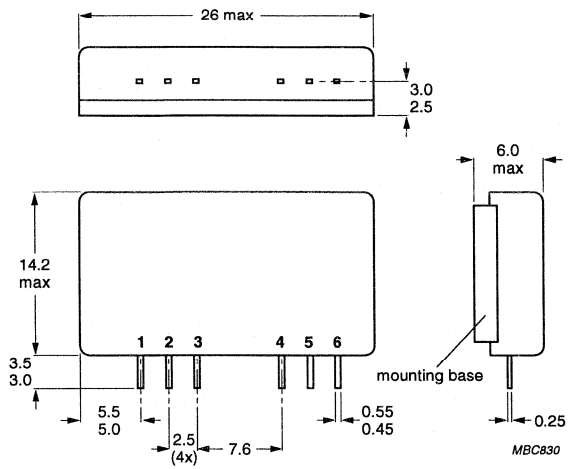
1. The striplines are on a double copper-clad printed-circuit board with epoxy dielectric ($\varepsilon_r = 4.9$); thickness $1/16$ inch.

## MOUNTING AND SOLDERING

To ensure good thermal transfer, mount the module on the flat surface of a heatsink with heatsink compound applied between mounting base and heatsink.

Solder the leads of the device directly to the circuit. Use a soldering iron with a maximum temperature of 245 °C; apply for not more than 10 seconds at a distance of at least 1 mm from the plastic.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.9 SOT181.

# UHF amplifier modules

# BGY110D; BGY110E; BGY110F; BGY110G

## DESCRIPTION

The BGY110 is a four-stage UHF amplifier module, primarily designed for hand-held transmitting equipment operating from a nominal 7.2 V power supply.

The module consists of four npn silicon planar transistor chips, mounted on a metallized ceramic substrate, together with matching and bias circuitry.

The BGY110D, 110E, 110F and 110G produce an output power of 1.7 W into a 50 Ω load over the frequency bands 824 - 849 MHz, 872 - 905 MHz, 890 - 915 MHz and 902 - 928 MHz, respectively. The output power can be controlled by means of a DC voltage ($V_C$).

## PINNING - SOT246

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input/$V_C$ |
| 2 | $V_{S1}$ |
| 3 | $V_{S2}$ |
| 4 | $V_{S3}$ |
| 5 | RF output |
| flange | earth |

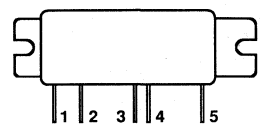



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_S$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | η (%) | $Z_i/Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|---|
| BGY110D | c.w. | 824 - 849 | 7.2 | 4.5 | 1.7 | > 32.3 | > 39 | 50 |
| BGY110E | c.w. | 872 - 905 | 7.2 | 4.5 | 1.7 | > 32.3 | > 39 | 50 |
| BGY110F | c.w. | 890 - 915 | 7.2 | 4.5 | 1.7 | > 32.3 | > 39 | 50 |
| BGY110G | c.w. | 902 - 928 | 7.2 | 4.5 | 1.7 | > 32.3 | > 39 | 50 |

## LIMITING VALUES

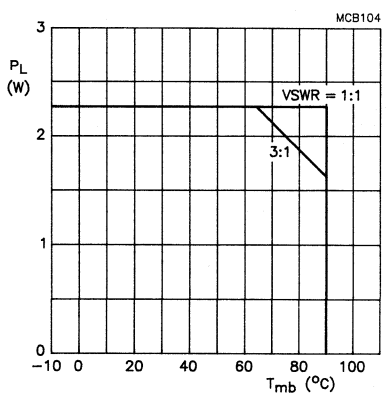
In accordance with the Absolute Maximum System (IEC 134).

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$; $V_{S2}$; $V_{S3}$ | DC supply voltage | – | 10 | V |
| $V_C$ | DC control voltage | – | 4.5 | V |
| $+V_O$ | RF output terminal voltage | – | 25 | V |
| $P_L$ | load power | – | 2.25 | W |
| $P_D$ | drive power | – | 3 | mW |
| $T_{stg}$ | storage temperature range | –40 | 100 | °C |
| $T_{mb}$ | mounting base temperature | – | 90 | °C |

## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_i = Z_L$ = 50 Ω; $V_{S1} = V_{S2} = V_{S3}$ = 7.2 V; $V_C$ = 4.5 V, unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency range | | | | | |
| | BGY110D | | 824 | – | 849 | MHz |
| | BGY110E | | 872 | – | 905 | MHz |
| | BGY110F | | 890 | – | 915 | MHz |
| | BGY110G | | 902 | – | 928 | MHz |
| $I_{C2} + I_{C3}$ | leakage current | $V_{S1} = V_C = 0$ | – | – | 200 | μA |
| $P_L$ | load power | $P_D$ = 1 mW | 1.7 | – | – | W |
| η | efficiency | $P_L$ = 1.7 W | 39 | – | – | % |
| $H_2$ | second harmonic rejection | $P_L$ = 1.7 W | 40 | – | – | dB |
| $H_3$ | third harmonic rejection | $P_L$ = 1.7 W | 45 | – | – | dB |
| | input VSWR | $P_L$ = 1.7 W | – | – | 2:1 | |
| $\Delta G_p$ | gain control | $V_C$ = 0 - 4.5 V; $P_D$ = 1 mW | 30 | – | – | dB |
| $P_L$ | output switching power | $V_{S1} = V_C$ = 0; $P_D$ = 1 mW | – | – | –20 | dBm |
| | noise power | 30 kHz bandwidth; $P_L$ = 1.7 W; 45 MHz above $f_O$ | – | –84 | –80 | dBm |




$V_{S1} = V_{S2} = V_{S3}$ = 9 V max.

Fig.2 Power derating curve.

## STABILITY

All non-harmonically related outputs shall be at least 60 dB down when the module is operated with a load mismatch up to VSWR = 6:1 under the following conditions:

$V_{S1-2-3}$ = 6 - 9 V; $V_C$ = 0 - 4.5 V; $P_D$ = 0.5 - 2 mW and $P_L$ < 2 W.

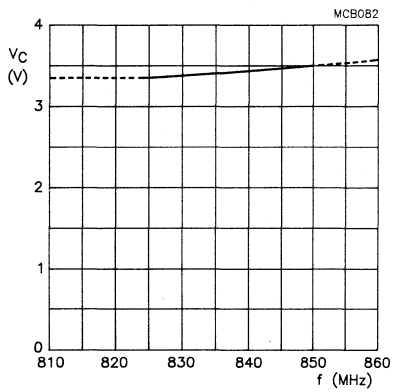
### Ruggedness

The BGY110 is capable of withstanding a load mismatch corresponding to VSWR = 10:1, through all phases, under the following conditions:

$V_{S1-2-3}$ = 9 V; $P_D$ = 1 mW and $P_L \leq$ 1.8 W.

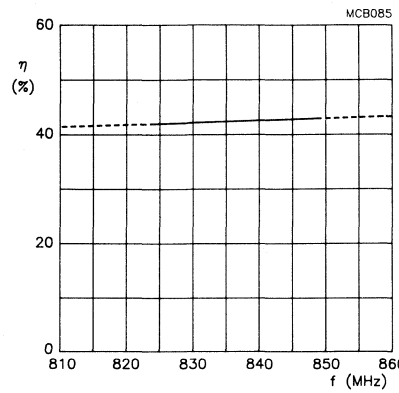
## APPLICATION INFORMATION

$T_{mb}$ = 25 °C; $P_D$ = 1 mW; $P_L$ = 1.7 W; $V_{S1} = V_{S2} = V_{S3}$ = 7.2 V, unless otherwise specified; typical values.



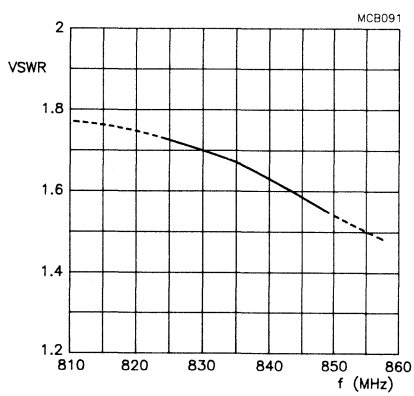

**BGY110D**

Fig.3 Control voltage as a function of frequency.



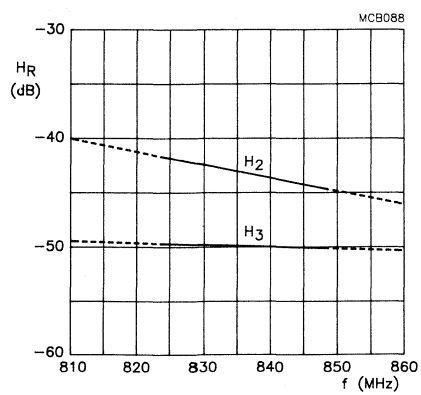

**BGY110D**

Fig.4 Efficiency as a function of frequency.



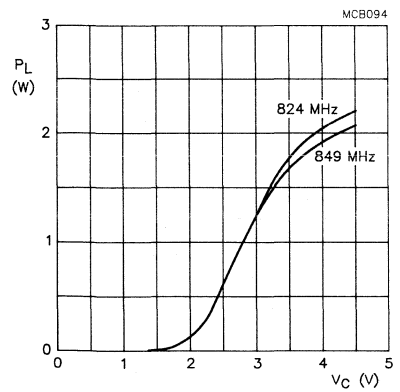

**BGY110D**

Fig.5 VSWR input as a function of frequency.



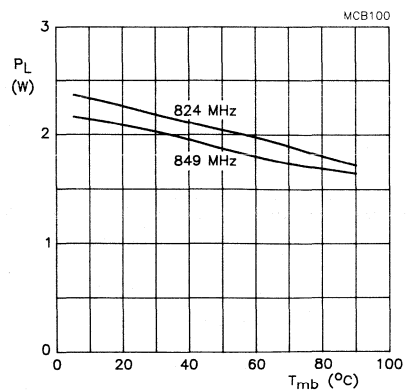

**BGY110D**

Fig.6 Harmonics as a function of frequency.




**BGY110D**

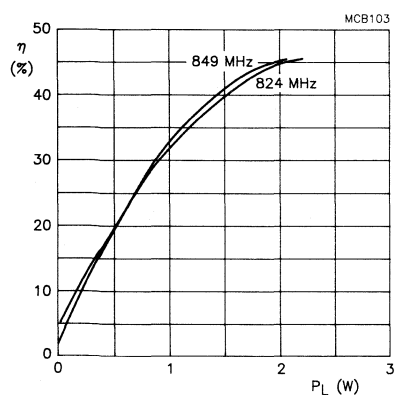
Fig.7 Load power as a function of control voltage.




**BGY110D**

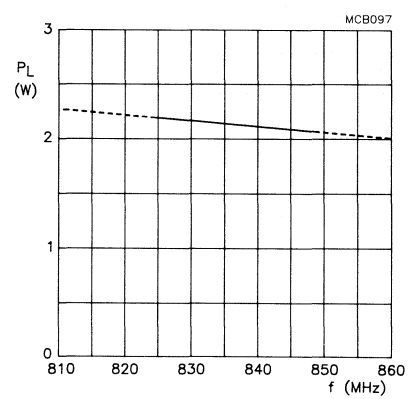
$V_C$ = 4.5 V.

Fig.8 Load power as a function of temperature.




**BGY110D**

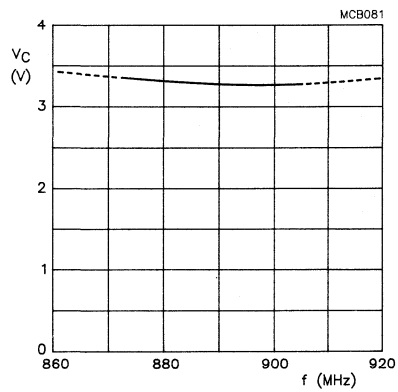
Fig.9 Efficiency as a function of load power.




**BGY110D**

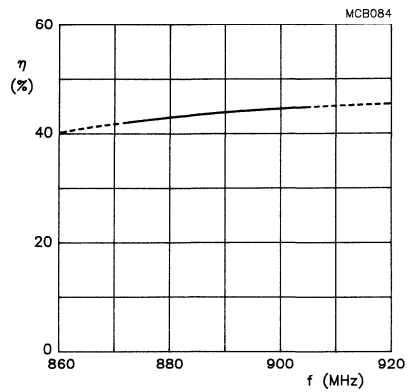
$V_C$ = 4.5 V.

Fig.10 Load power as a function of frequency.



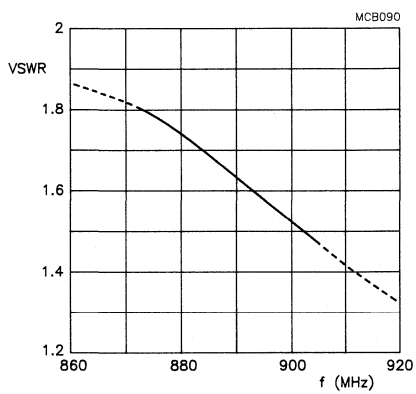

**BGY110E**

Fig.11 Control voltage as a function of frequency.



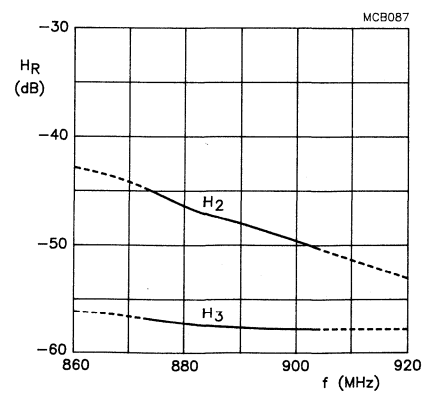

**BGY110E**

Fig.12 Efficiency as a function of frequency.



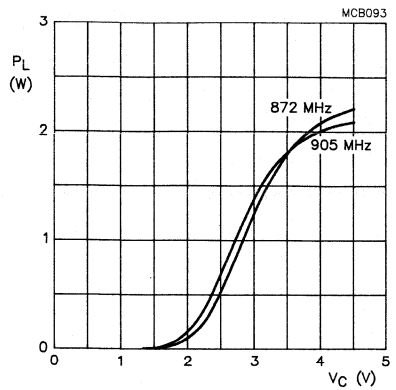

**BGY110E**

Fig.13 VSWR input as a function of frequency.



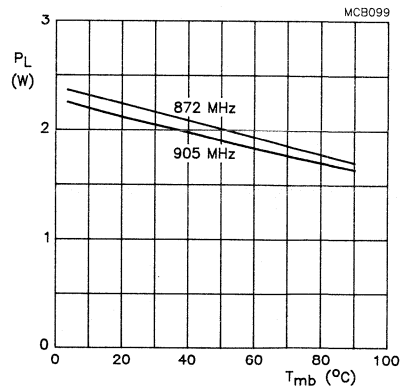

**BGY110E**

Fig.14 Harmonics as a function of frequency.




**BGY110E**

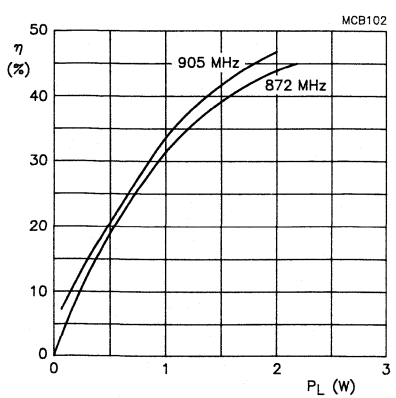
Fig.15 Load power as a function of control voltage.




**BGY110E**

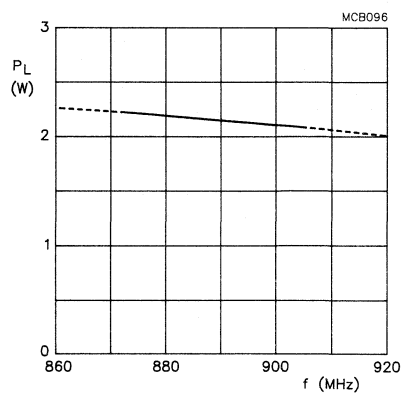
$V_C$ = 4.5 V.

Fig.16 Load power as a function of temperature.




**BGY110E**

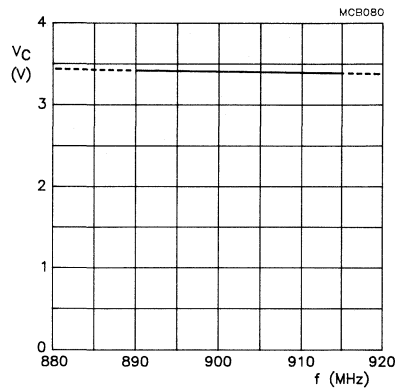
Fig.17 Efficiency as a function of load power.




**BGY110E**

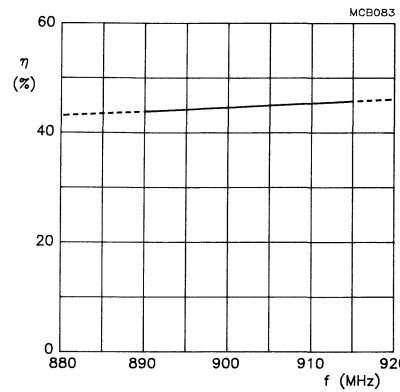
$V_C$ = 4.5 V.

Fig.18 Load power as a function of frequency.



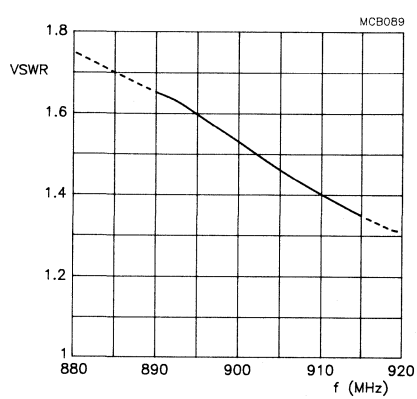

**BGY110F**

Fig.19 Control voltage as a function of frequency.



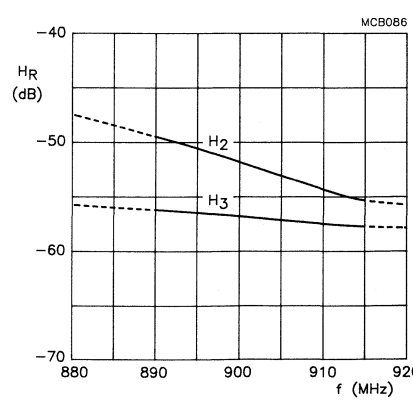

**BGY110F**

Fig.20 Efficiency as a function of frequency.



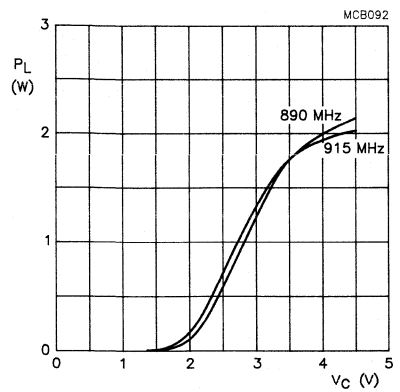

**BGY110F**

Fig.21 VSWR input as a function of frequency.



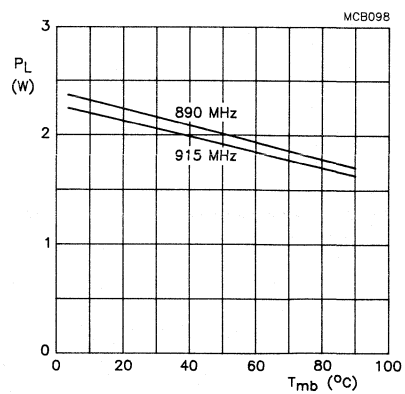

**BGY110F**

Fig.22 Harmonics as a function of frequency.




**BGY110F**

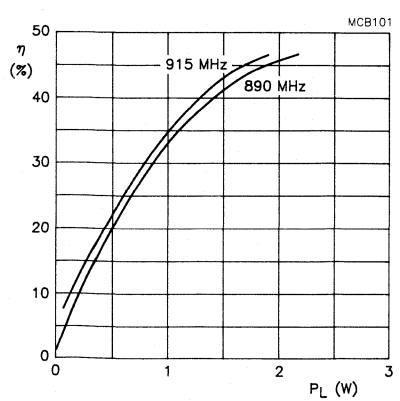
Fig.23 Load power as a function of control voltage.




**BGY110F**

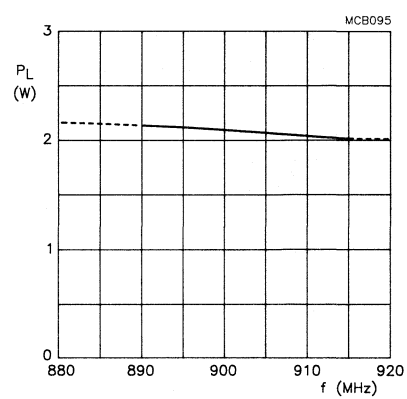
$V_C$ = 4.5 V.

Fig.24 Load power as a function of temperature.




**BGY110F**

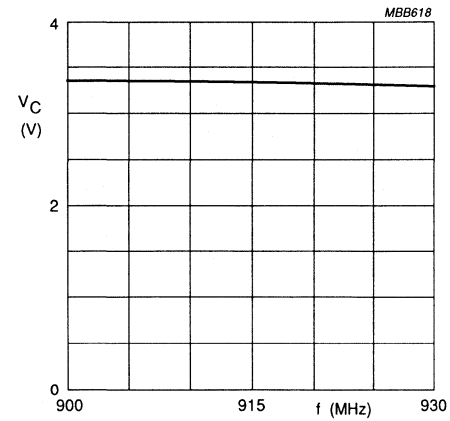
Fig.25 Efficiency as a function of load power.




**BGY110F**

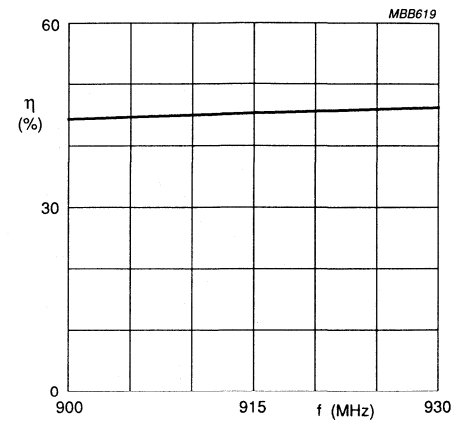
$V_C$ = 4.5 V.

Fig.26 Load power as a function of frequency.



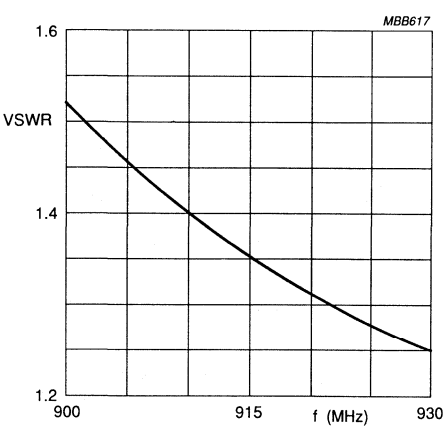

**BGY110G**

Fig.27 Control voltage as a function of frequency.



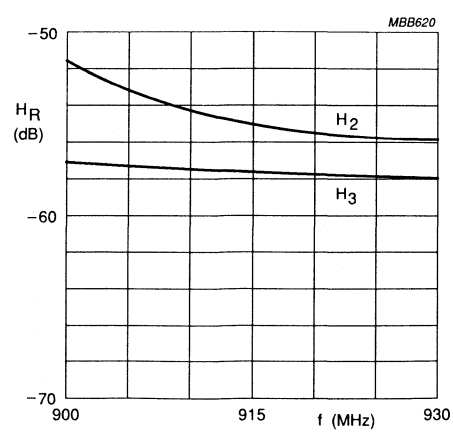

**BGY110G**

Fig.28 Efficiency as a function of frequency.



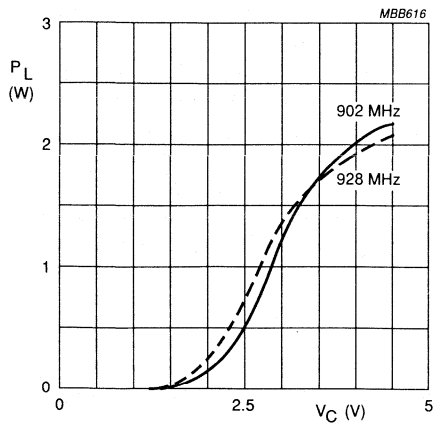

**BGY110G**

Fig.29 VSWR input as a function of frequency.



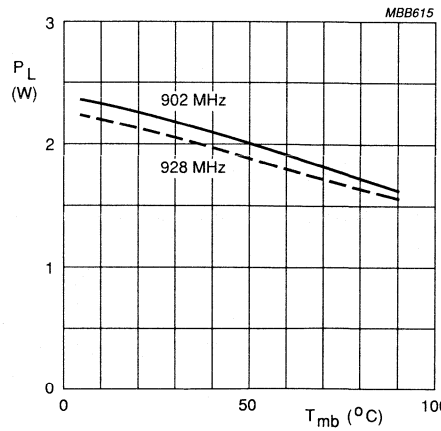

**BGY110G**

Fig.30 Harmonics as a function of frequency.




**BGY110G**

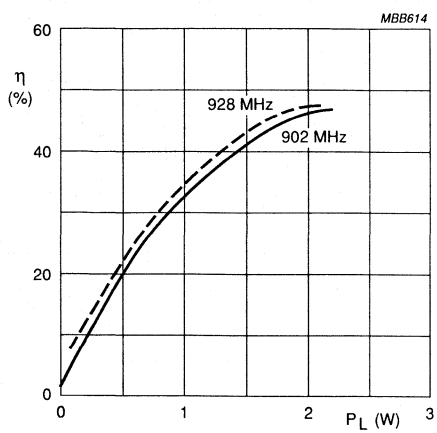
Fig.31 Load power as a function of control voltage.




**BGY110G**

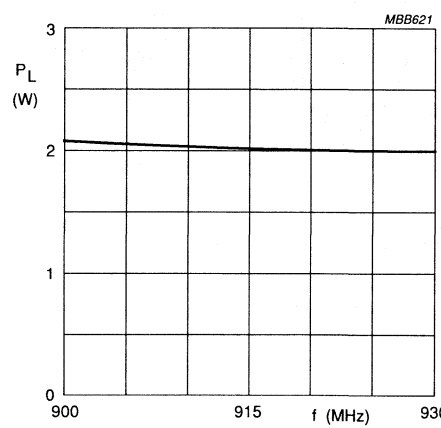
$V_C$ = 4.5 V.

Fig.32 Load power as a function of temperature.




**BGY110G**

Fig.33 Efficiency as a function of load power.




**BGY110G**

$V_C$ = 4.5 V.

Fig.34 Load power as a function of frequency.

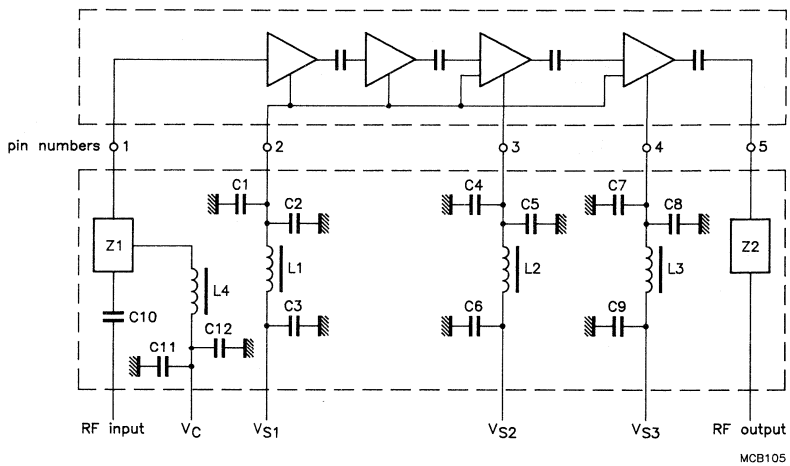



Fig.35 Test circuit.

**List of components (see test circuit)**

| DESIGNATION | DESCRIPTION | VALUE | DIMENSIONS | CATALOGUE NO. |
|---|---|---|---|---|
| C1, C4, C7 | multilayer chip capacitor | 100 nF | | |
| C2, C5, C8 | tantalum capacitor | 2.2 µF | | |
| C3, C6, C9 | multilayer chip capacitor | 33 pF | | |
| C10, C11 | multilayer chip capacitor | 1 nF | | |
| C12 | tantalum capacitor | 1 µF | | |
| L1, L2, L3 | RF choke, 1 turn copper wire on grade 3B core | 2.2 µH | 0.4 mm | 4330 030 32221 |
| L4 | Ferroxcube coil | 5 µH | | 3122 108 20153 |
| Z1, Z2 | stripline (note 1) | 50 Ω | | |

**Note**

1. The striplines (Z1 and Z2) are on a double copper-clad printed circuit board with PTFE dielectric ($\varepsilon_r = 2.2$), thickness 1/16 inch.

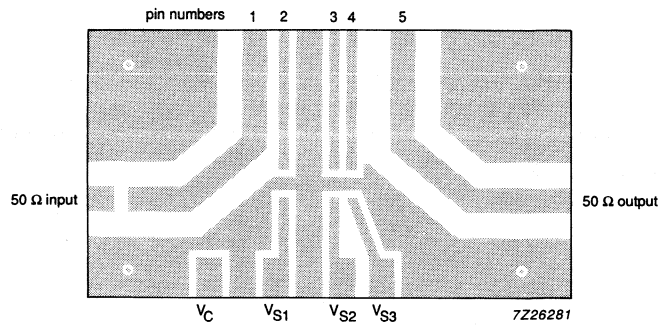
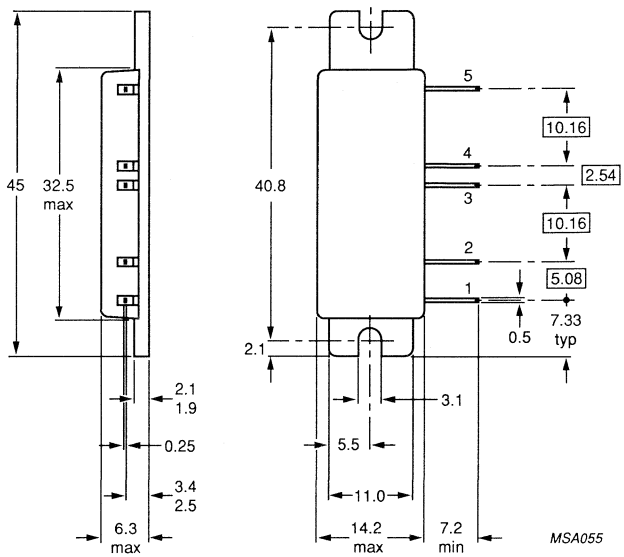



Fig.36 Printed circuit board layout.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.37 SOT246.

# UHF amplifier modules BGY113A; BGY113B; BGY113C

## FEATURES

- 7.5 V nominal supply voltage
- 7 W output power
- Easy gain control by DC voltage.

## APPLICATIONS

- Portable communications equipment operating in the 400 to 440 MHz, 430 to 470 MHz and 470 to 520 MHz frequency ranges.

## DESCRIPTION

The BGY113A, BGY113B and BGY113C are UHF power amplifier modules.

Each module consists of four NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

## PINNING - SOT288D

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_{S1}$ |
| 3 | $V_C$ |
| 4 | $V_{S2}$ |
| 5 | $V_{S3}$ |
| 6 | $V_{S4}$ |
| 7 | RF output |
| flange | ground |

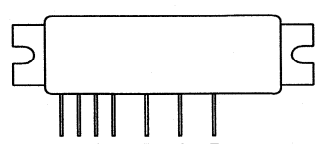



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_S$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| BGY113A | CW | 400 to 440 | 7.5 | ≥7 | ≥38.5 | typ. 45 | 50 |
| BGY113B | CW | 430 to 470 | 7.5 | ≥7 | ≥38.5 | typ. 45 | 50 |
| BGY113C | CW | 470 to 520 | 7.5 | ≥7 | ≥38.5 | typ. 40 | 50 |

## WARNING

| Product and environmental safety - toxic materials |
|---|
| This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste. |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 9 | V |
| $V_{S2}$ | DC supply voltage | – | 9 | V |
| $V_{S3}$ | DC supply voltage | – | 9 | V |
| $V_{S4}$ | DC supply voltage | – | 9 | V |
| $V_C$ | DC control voltage | – | 7.5 | V |
| $P_D$ | input drive power | – | 5 | mW |
| $P_L$ | load power | – | 9 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +90 | °C |

## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 1 mW; $V_{S1} = V_{S2} = V_{S3} = V_{S4}$ = 7.5 V; $V_C \leq$ 7.5 V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency range | | | | | |
| | BGY113A | | 400 | – | 440 | MHz |
| | BGY113B | | 430 | – | 470 | MHz |
| | BGY113C | | 470 | – | 520 | MHz |
| $I_{Q3} + I_{Q4}$ | leakage current | $V_{S1} = V_{S2} = V_C$ = 0; $P_D$ = 0 | – | – | 0.2 | mA |
| $P_L$ | load power | | 7 | – | – | W |
| $G_p$ | power gain | $P_L$ = 7 W; note 1 | 38.5 | – | – | dB |
| η | efficiency | $P_L$ = 7 W; note 1 | | | | |
| | BGY113A, BGY113B | | 40 | 45 | – | % |
| | BGY113C | | 35 | 40 | – | % |
| $H_2$ | second harmonic | $P_L$ = 7 W; note 1 | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L$ = 7 W; note 1 | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 7 W; note 1 | – | – | 2 : 1 | |
| ΔG | gain control | $P_D$ = 1 mW; $V_C$ = 0 to 7.5 V | 10 | – | – | dB |
| | stability | $V_{S1} = V_{S2} = V_{S3} = V_{S4}$ = 6 to 9 V; $P_D$ = 0.5 to 2 mW; $P_L \leq$ 9 W; VSWR ≤ 6 : 1; note 1 | – | – | –60 | dBc |
| | ruggedness | $V_{S1} = V_{S2} = V_{S3} = V_{S4}$ = 9 V; VSWR = 50 : 1; $P_L$ < 9 W; note 1 | no degradation | | | |

**Note**

1. Adjust $V_C$ for specified $P_L$.

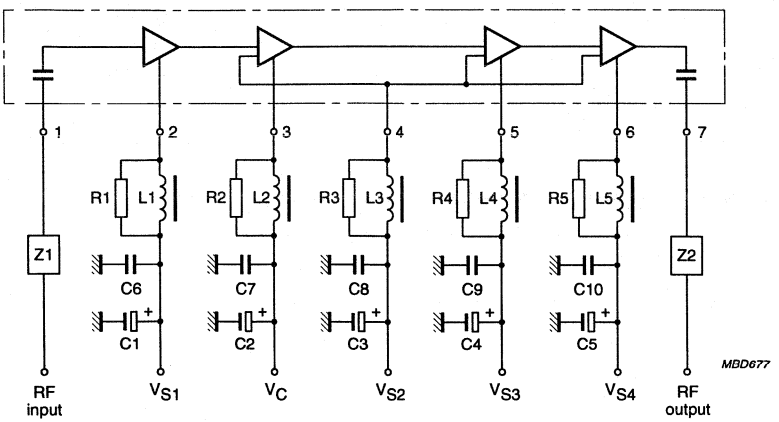



Fig.2 Test circuit.

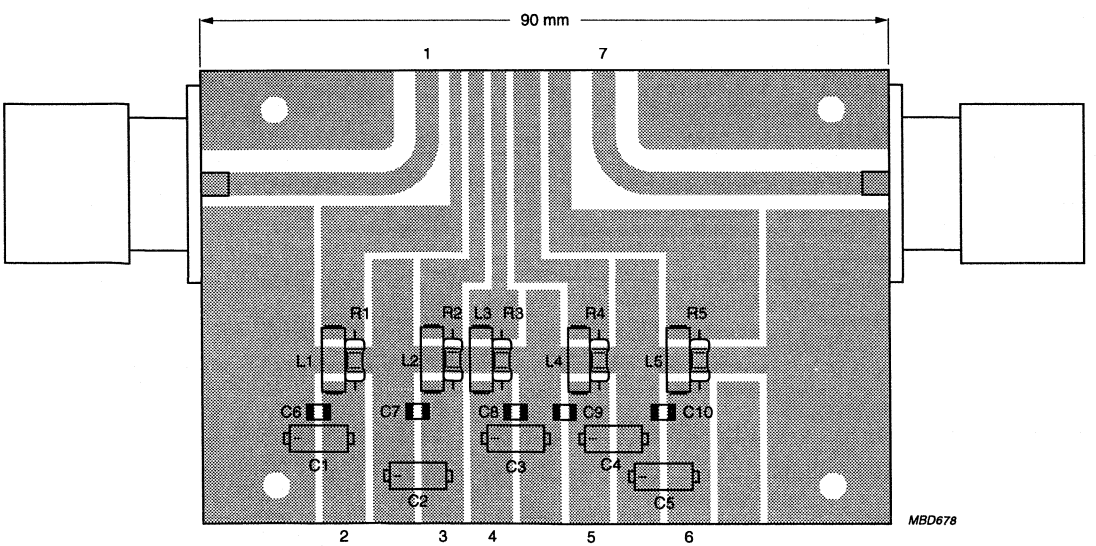



Fig.3 Printed-circuit board layout.

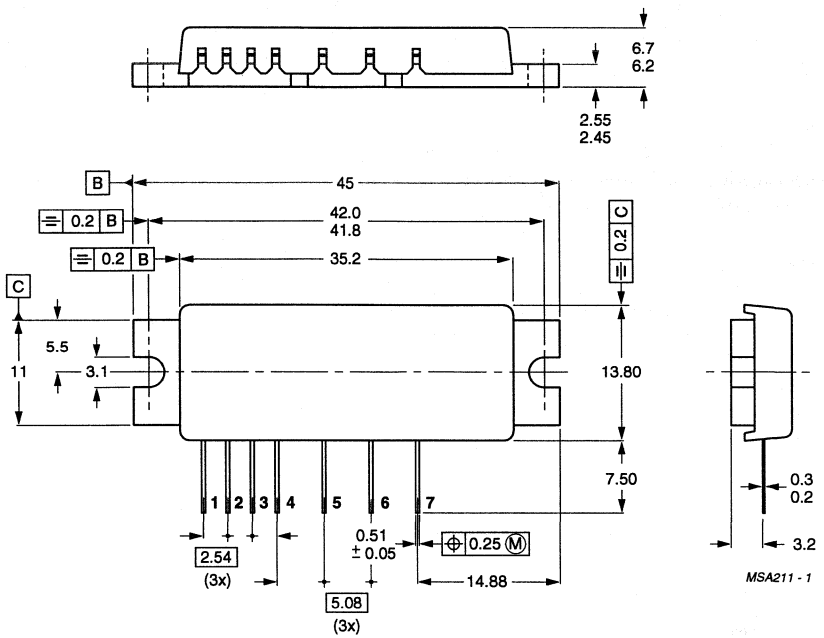
**List of components (see Fig.2)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1, C2, C3, C4, C5 | electrolytic capacitor | 1 μF | – |
| C6, C7, C8, C9, C10 | multilayer ceramic chip capacitor | 18 nF | – |
| L1, L2, L3, L4, L5 | Ferroxcube chip bead; grade 4S2 | – | 4330 030 36300 |
| R1, R2, R3, R4, R5 | metal film resistor | 10 Ω | – |
| Z1, Z2 | stripline; note 1 | 50 Ω | – |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with epoxy dielectric ($\varepsilon_r = 4.5$); thickness $1/16$ inch.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.4 SOT288D.

# UHF amplifier modules BGY114A; BGY114B; BGY114C

## FEATURES

- 12.5 V nominal supply voltage
- 6 W output power (BGY114A and BGY114B)
- 8 W output power (BGY114C)
- Easy control of output power by DC voltage.

## APPLICATIONS

- Mobile cellular transmitting equipment operating in the 824 to 849 MHz (AMPS), 872 to 905 MHz (ETACS) and 890 to 915 MHz (NMF) frequency ranges.

## PINNING - SOT278A

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_{S1}$ |
| 3 | $V_C$ |
| 4 | $V_{S2}$ |
| 5 | RF output |
| flange | ground |

## DESCRIPTION

The BGY114A, BGY114B and BGY114C are five-stage amplifier modules.

Each module comprises five NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

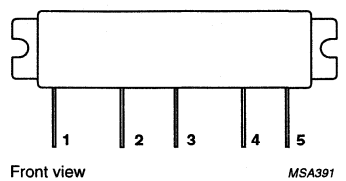



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_{S1}$ (V) | $V_{S2}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|---|
| BGY114A | CW | 824 to 849 | 8 | 12.5 | 6 | ≥37.8 | typ. 40 | 50 |
| BGY114B | CW | 872 to 905 | 8 | 12.5 | 6 | ≥37.8 | typ. 40 | 50 |
| BGY114C | CW | 890 to 915 | 8 | 12.5 | 8 | ≥39 | typ. 40 | 50 |

## WARNING

**Product and environmental safety - toxic materials**

This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 9 | V |
| $V_{S2}$ | DC supply voltage | – | 16 | V |
| $V_C$ | DC control voltage | – | 9 | V |
| $P_D$ | input drive power | – | 3 | mW |
| $P_L$ | load power | – | 10 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

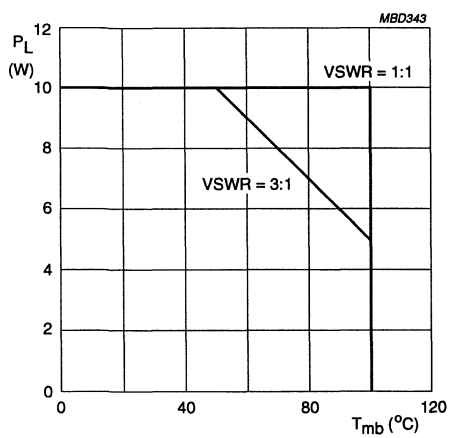



Fig.2 Power derating curve.

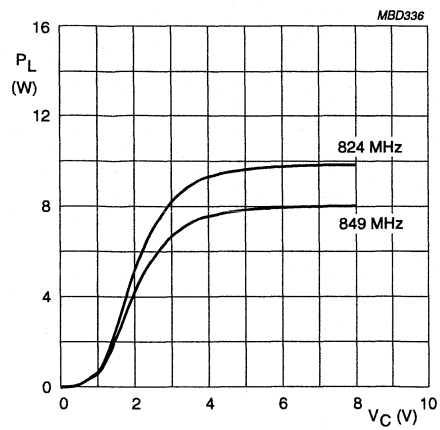
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 1 mW; $V_{S1}$ = 8 V; $V_{S2}$ = 12.5 V; $V_C \leq$ 8 V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency | | | | | |
| | BGY114A | | 824 | – | 849 | MHz |
| | BGY114B | | 872 | – | 905 | MHz |
| | BGY114C | | 890 | – | 915 | MHz |
| $I_{Q5}$ | final stage leakage current | $V_{S1} = V_C = 0$; $P_D = 0$ | – | – | 1 | mA |
| $P_L$ | load power | | | | | |
| | BGY114A | | 6 | – | – | W |
| | BGY114B | | 6 | – | – | W |
| | BGY114C | | 8 | – | – | W |
| $G_p$ | power gain | note 1 | | | | |
| | BGY114A | | 37.8 | – | – | dB |
| | BGY114B | | 37.8 | – | – | dB |
| | BGY114C | | 39 | – | – | dB |
| $\eta$ | efficiency | note 1 | 35 | 40 | – | % |
| $H_2$ | second harmonic | note 1 | – | – | –35 | dBc |
| $H_3$ | third harmonic | note 1 | – | – | –35 | dBc |
| $VSWR_{in}$ | input VSWR | note 1 | – | – | 2 : 1 | |
| $\Delta G$ | gain control | $V_C$ = 0 to 8 V | 30 | – | | dB |
| | stability | $V_C$ = 0 to 8 V; VSWR ≤ 3 : 1; $V_{S2}$ = 10 to 16 V; note 2; $P_D$ = –3 to +3 dBm | – | – | –60 | dBc |
| | ruggedness | $V_{S2}$ = 16 V; VSWR ≤ 20 : 1; note 2 | no degradation | | | |

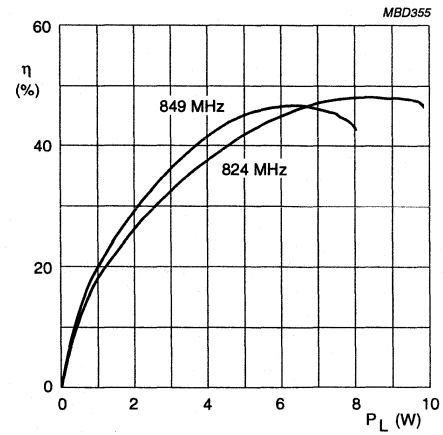
**Notes**

1. Adjust $V_C$ for $P_L$ = 6 W (BGY114A, BGY114B); $P_L$ = 8 W (BGY114C).
2. Adjust $V_C$ for $P_L \leq$ 7 W (BGY114A, BGY114B); $P_L \leq$ 9 W (BGY114C).



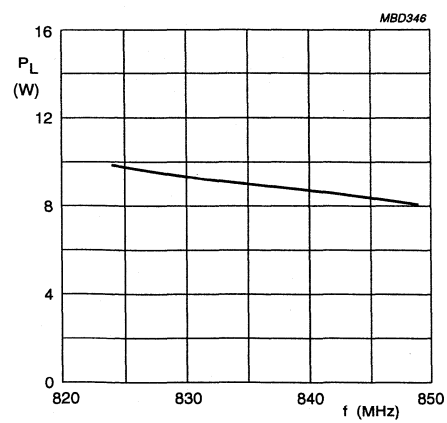

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.3 Load power as a function of control voltage; BGY114A; typical values.



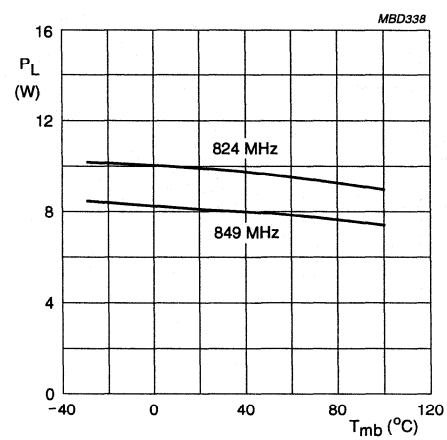

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.4 Efficiency as a function of load power; BGY114A; typical values.



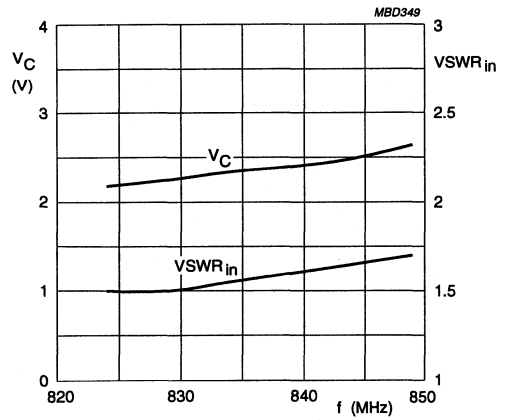

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.5 Load power as a function of frequency; BGY114A; typical values.



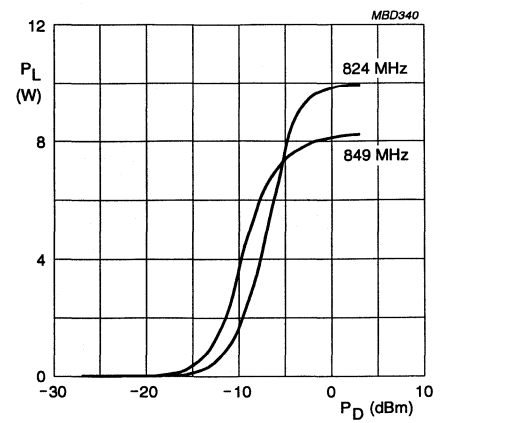

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V.

Fig.6 Load power as a function of mounting base temperature; BGY114A; typical values.



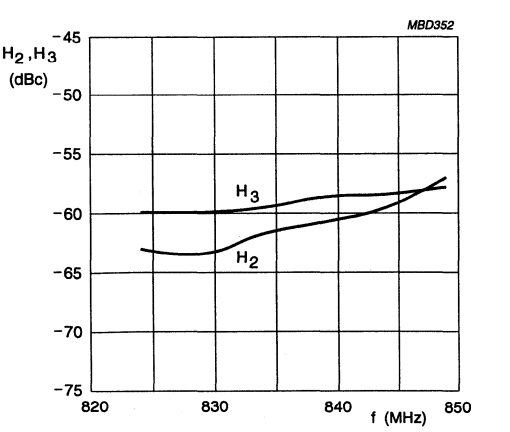

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $P_L = 6$ W; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.7 Control voltage and VSWR input as functions of frequency; BGY114A; typical values.



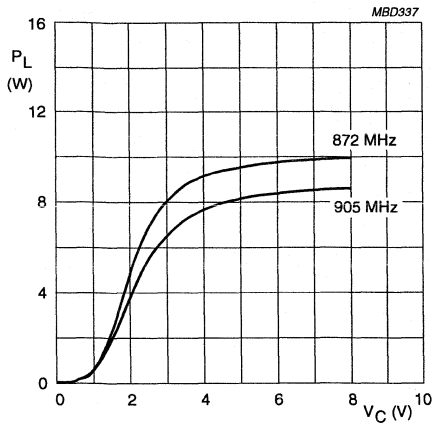

$Z_S = Z_L = 50\ \Omega$; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.8 Load power as a function of drive power; BGY114A; typical values.



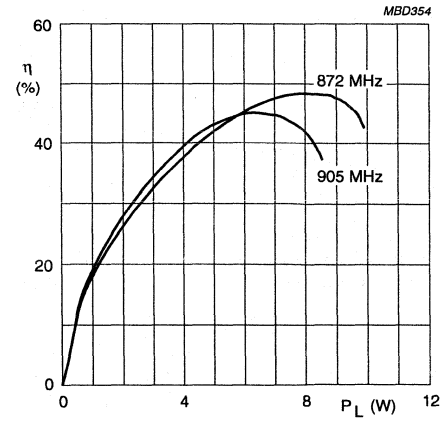

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $P_L = 6$ W; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.9 Harmonics as functions of frequency; BGY114A; typical values.



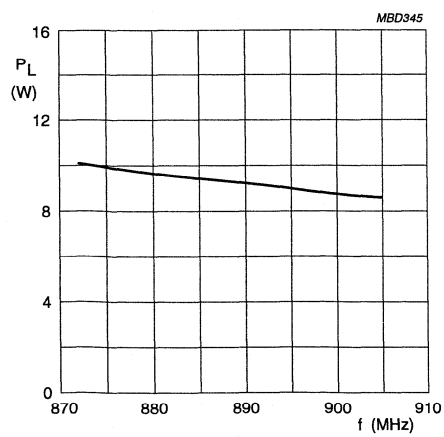

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C.

Fig.10 Load power as a function of control voltage; BGY114B; typical values.



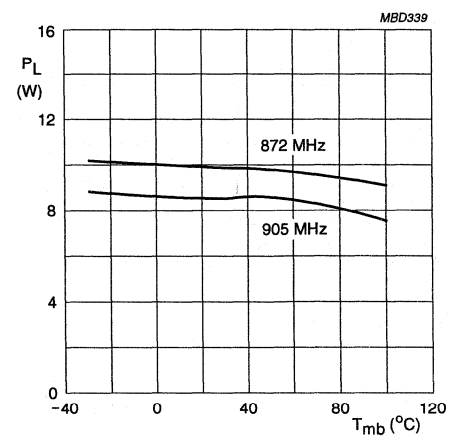

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C.

Fig.11 Efficiency as a function of load power; BGY114B; typical values.



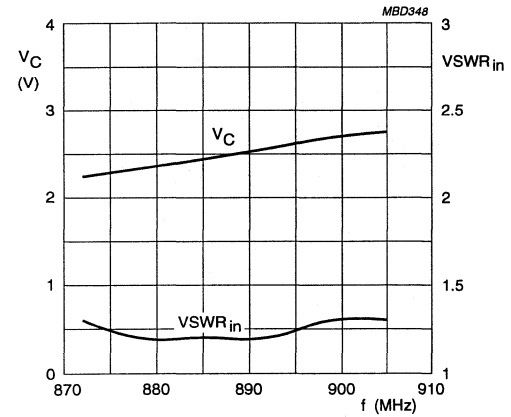

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C.

Fig.12 Load power as a function of frequency; BGY114B; typical values.



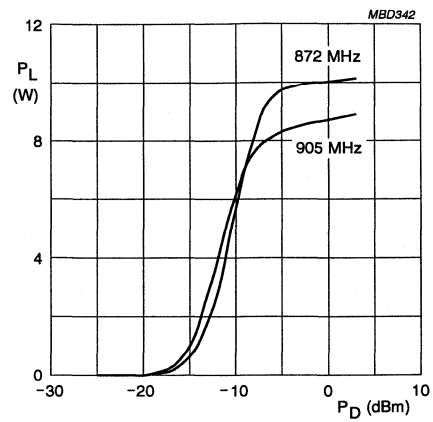

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V.

Fig.13 Load power as a function of mounting base temperature; BGY114B; typical values.



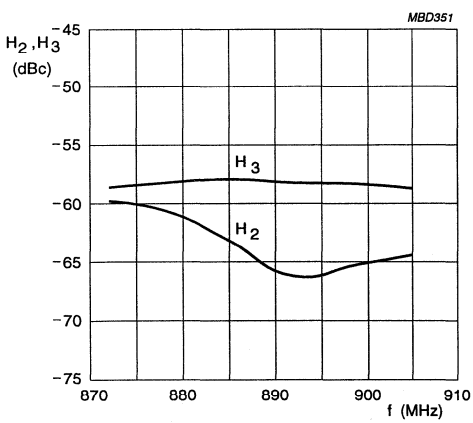

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $P_L = 6$ W; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.14 Control voltage and VSWR input as functions of frequency; BGY114B; typical values.



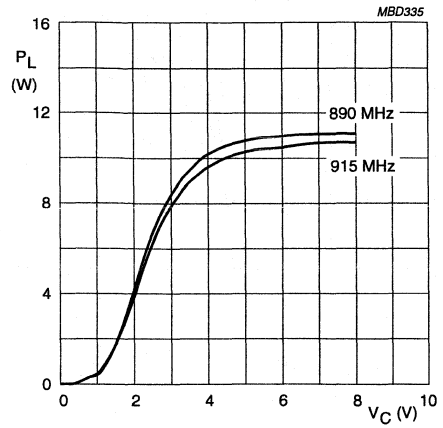

$Z_S = Z_L = 50\ \Omega$; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.15 Load power as a function of drive power; BGY114B; typical values.



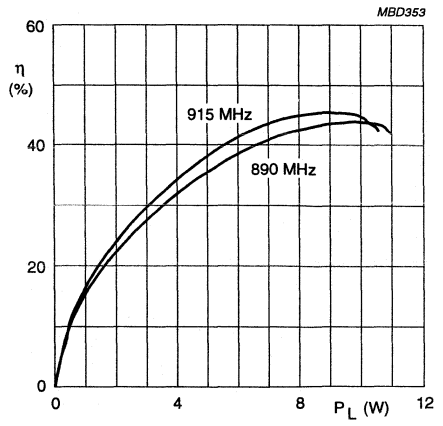

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $P_L = 6$ W; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.16 Harmonics as functions of frequency; BGY114B; typical values.



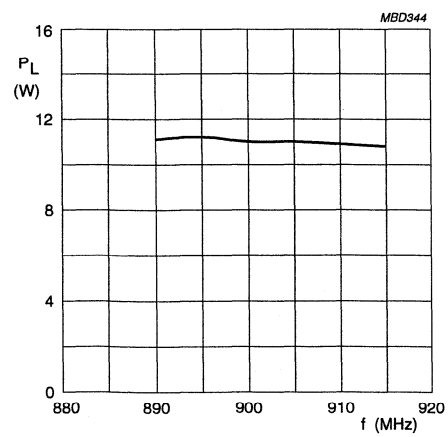

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.17 Load power as a function of control voltage; BGY114C; typical values.



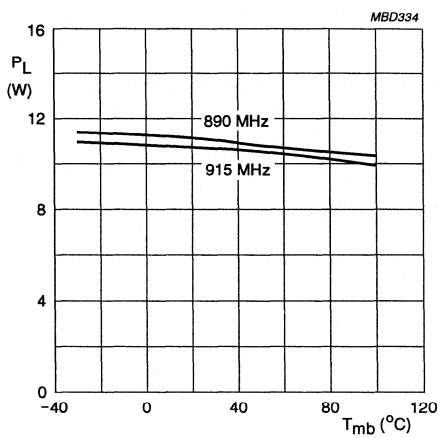

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.18 Efficiency as a function of load power; BGY114C; typical values.



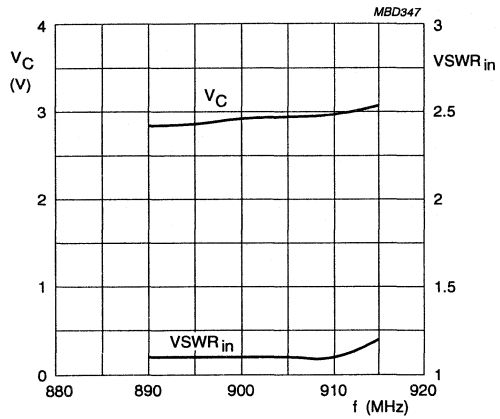

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.19 Load power as a function of frequency; BGY114C; typical values.



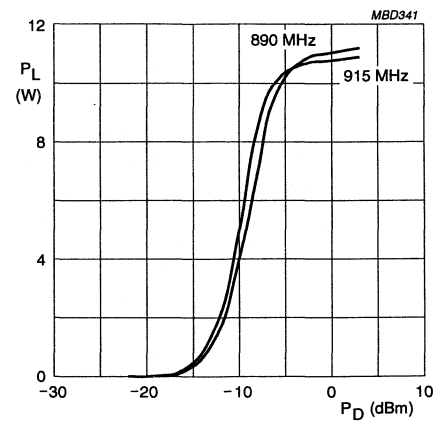

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V.

Fig.20 Load power as a function of mounting base temperature; BGY114C; typical values.



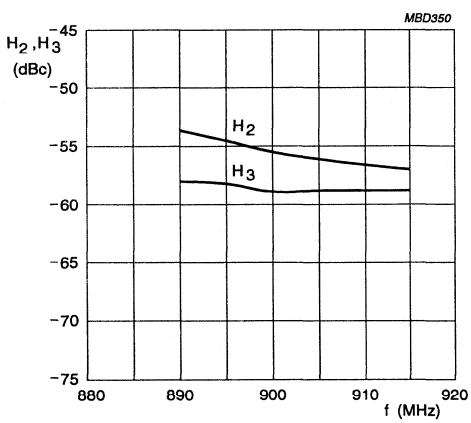

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $P_L = 6$ W; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.21 Control voltage and VSWR input as functions of frequency; BGY114C, typical values.




$Z_S = Z_L = 50\ \Omega$; $V_C = 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.22 Load power as a function of drive power; BGY114C, typical values.




$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $P_L = 6$ W; $V_C \leq 8$ V; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$.

Fig.23 Harmonics as functions of frequency; BGY114C, typical values.

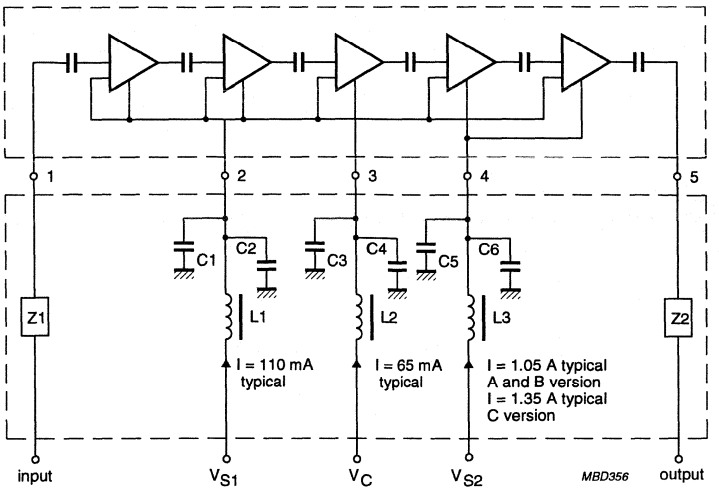
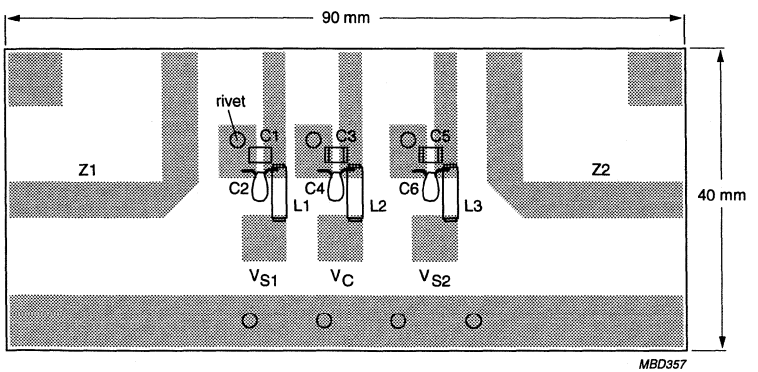



Fig.24 Test circuit.




Dimensions in mm.

Fig.25 Printed-circuit board layout.

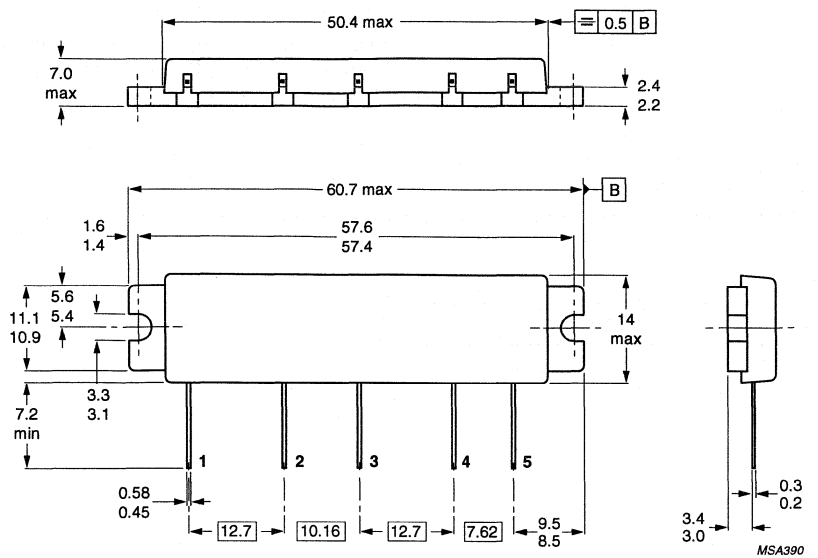
**List of components (Figs 24 and 25)**

| COMPONENT | DESCRIPTION | VALUE | DIMENSION | CATALOGUE NO. |
|---|---|---|---|---|
| C1, C3, C5 | multilayer ceramic chip capacitor; note 1 | 1 nF | – | – |
| C2, C4, C6 | tantalum capacitor | 1 μF; 35 V | – | – |
| L1, L2, L3 | Ferroxcube chip bead; grade 4S2 | – | – | 4330 030 36300 |
| Z1, Z2 | stripline; note 2 | 50 Ω | width 4.7 mm | – |

**Notes**

1. ATC capacitor type 100B or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $^1/_{16}$ inch.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.26 SOT278A.

# UHF amplifier modules BGY114D; BGY114E

## FEATURES

- 12.5 V nominal supply voltage
- 6 W output power
- Easy control of output power by DC voltage.

## APPLICATIONS

- Personal Mobile Radio (PMR) equipment operating in the 800 to 870 MHz and 890 to 950 MHz frequency ranges.

## PINNING - SOT278A

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_{S1}$ |
| 3 | $V_C$ |
| 4 | $V_{S2}$ |
| 5 | RF output |
| flange | ground |

## DESCRIPTION

The BGY114D and BGY114E are five-stage UHF amplifier modules.

Each module consists of 5 NPN silicon planar transistor chips mounted together with matching and bias circuitry on a metallized ceramic substrate.

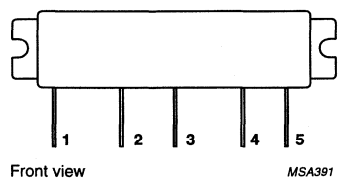



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_{S1}$ (V) | $V_{S2}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|---|
| BGY114D | CW | 800 to 870 | 8 | 12.5 | 6 | ≥37.8 | typ. 40 | 50 |
| BGY114E | CW | 890 to 950 | 8 | 12.5 | 6 | ≥37.8 | typ. 40 | 50 |

## WARNING

| Product and environmental safety - toxic materials |
|---|
| This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste. |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 9 | V |
| $V_{S2}$ | DC supply voltage | – | 16 | V |
| $V_C$ | DC control voltage | – | 9 | V |
| $P_D$ | input drive power | – | 3 | mW |
| $P_L$ | load power | – | 10 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

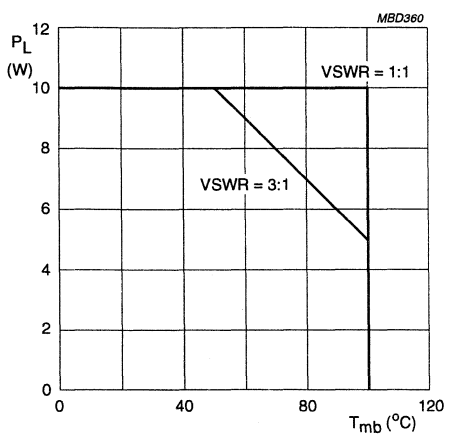



Fig.2 Power derating curve.

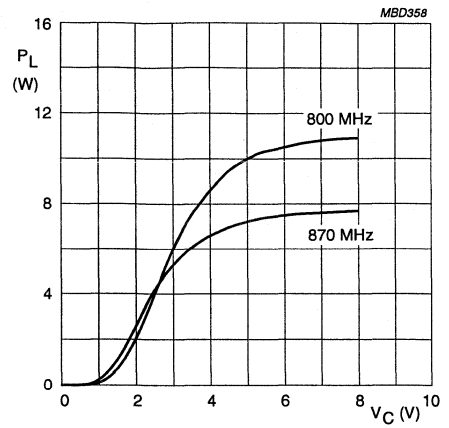
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 1 mW; $V_{S1}$ = 8 V; $V_{S2}$ = 12.5 V; $V_C \leq$ 8 V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency | | | | | |
| | BGY114D | | 800 | – | 870 | MHz |
| | BGY114E | | 890 | – | 950 | MHz |
| $I_{Q3}$ | leakage current | $V_{S1} = V_C = 0$; $P_D = 0$ | – | – | 1 | mA |
| $P_L$ | load power | | 6 | – | – | W |
| $G_p$ | power gain | $P_L$ = 6 W; note 1 | 37.8 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 6 W; note 1 | 30 | 40 | – | % |
| $H_2$ | second harmonic | $P_L$ = 6 W; note 1 | – | – | –35 | dBc |
| $H_3$ | third harmonic | $P_L$ = 6 W; note 1 | – | – | –35 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 6 W; note 1 | – | – | 3 : 1 | |
| $\Delta G$ | gain control | $V_C$ = 0 to 8 V | 30 | – | – | dB |
| | stability | $V_C$ = 0 to 8 V; VSWR ≤ 3 : 1; $P_L \leq$ 7 W; $V_{S2}$ = 10 to 16 V; $P_D$ = –3 to +3 dBm; note 1 | – | – | –60 | dBc |
| | ruggedness | $V_{S2}$ = 16 V; VSWR ≤ 20 : 1; $P_L \leq$ 7 W during 1 minute; note 1 | no degradation | | | |

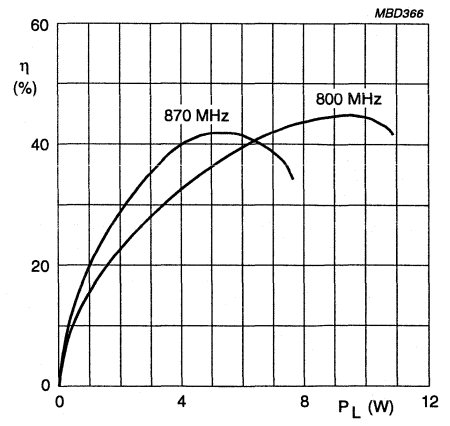
**Note**

1. Adjust $V_C$ for specified $P_L$.



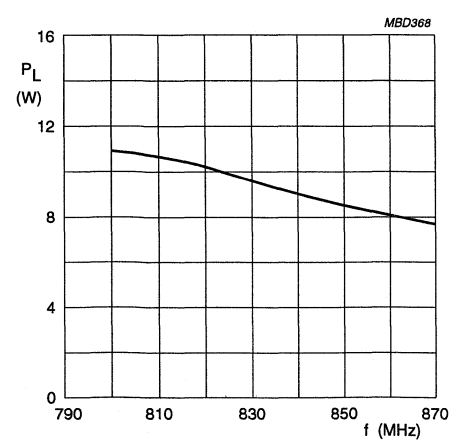

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C.

Fig.3 Load power as a function of control voltage; BGY114D; typical values.



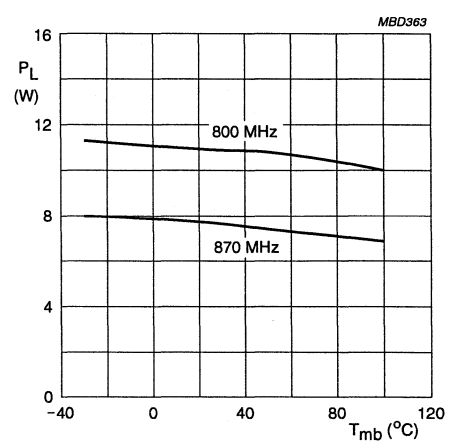

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C; $V_C \leq 8$ V.

Fig.4 Efficiency as a function of load power; BGY114D; typical values.



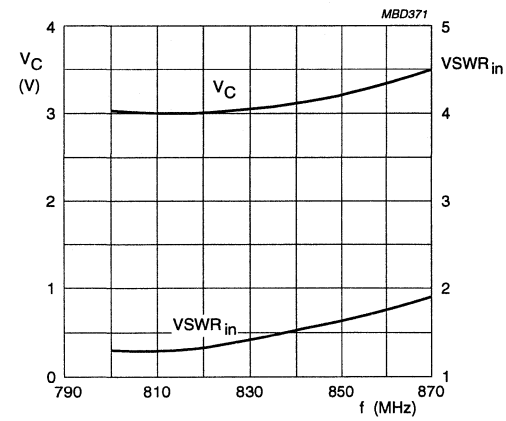

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C; $V_C = 8$ V.

Fig.5 Load power as a function of frequency; BGY114D; typical values.



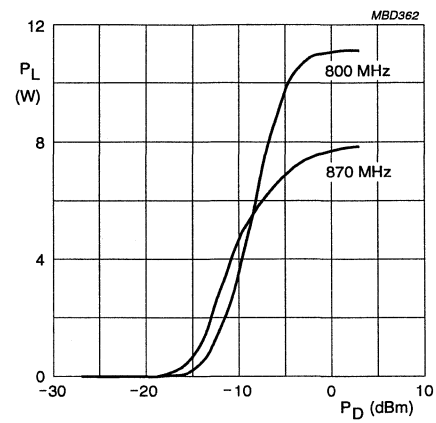

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $V_C = 8$ V.

Fig.6 Load power as a function of temperature; BGY114D; typical values.



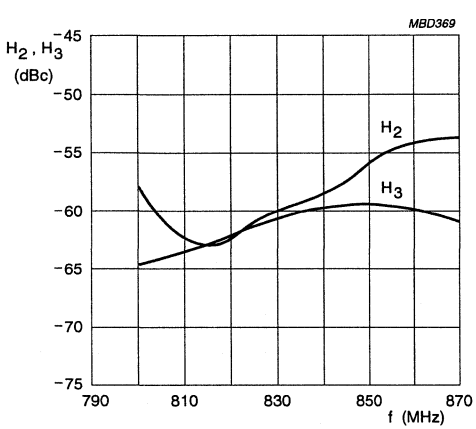

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $P_L = 6$ W.

Fig.7 Control voltage and VSWR input as functions of frequency; BGY114D; typical values.



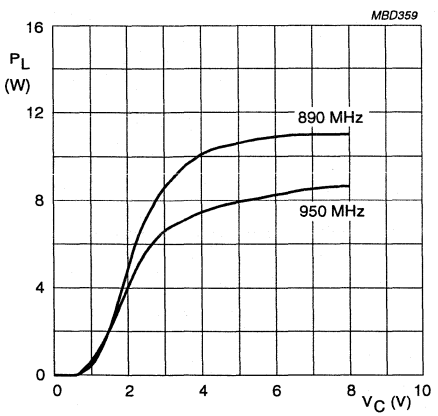

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $V_C = 8$ V.

Fig.8 Load power as a function of drive power; BGY114D; typical values.



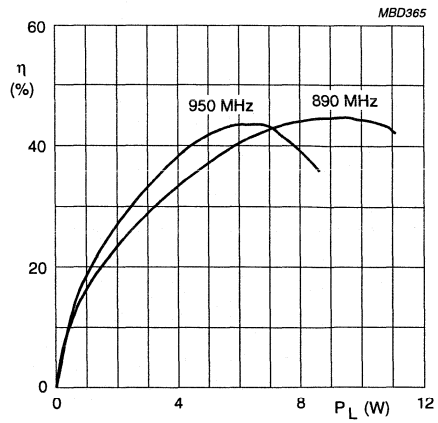

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $V_C \leq 8$ V; $P_L = 6$ W.

Fig.9 Harmonics as functions of frequency; BGY114D; typical values.



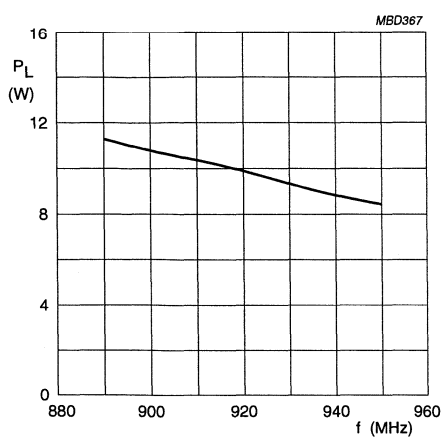

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C.

Fig.10 Load power as a function of control voltage; BGY114E; typical values.



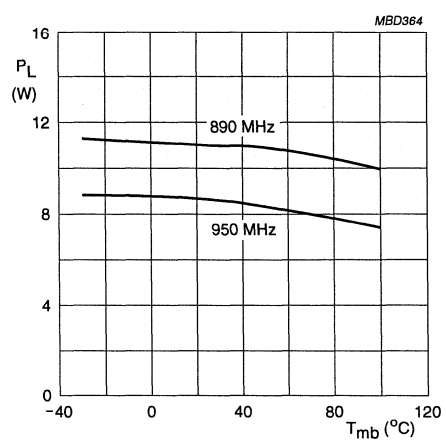

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C; $V_C \leq 8$ V.

Fig.11 Efficiency as a function of load power; BGY114E; typical values.



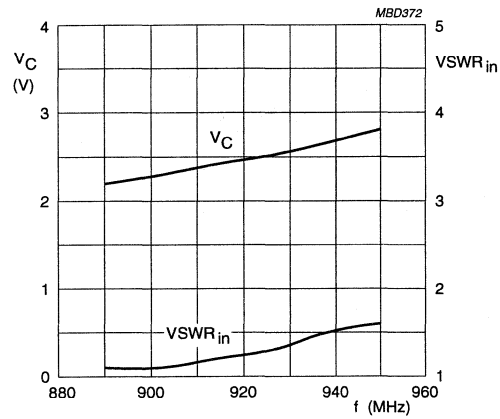

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25$ °C; $V_C = 8$ V.

Fig.12 Load power as a function of frequency; BGY114E; typical values.



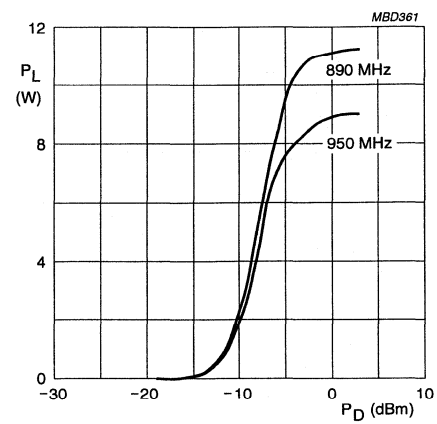

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $V_C = 8$ V.

Fig.13 Load power as a function of temperature; BGY114E; typical values.



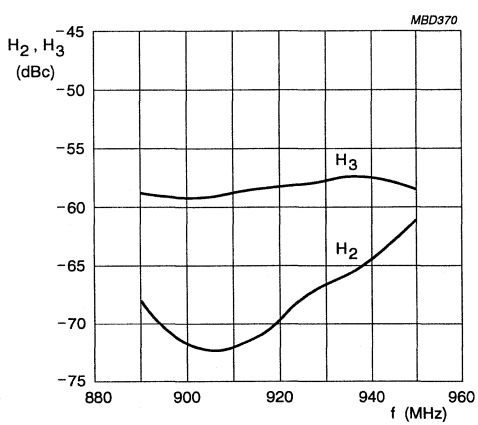

$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $P_L = 6$ W.

Fig.14 Control voltage and VSWR input as functions of frequency; BGY114E; typical values.




$Z_S = Z_L = 50\ \Omega$; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $V_C = 8$ V.

Fig.15 Load power as a function of drive power; BGY114E; typical values.




$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = 8$ V; $V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $V_C \leq 8$ V; $P_L = 6$ W.

Fig.16 Harmonics as functions of frequency; BGY114E; typical values.

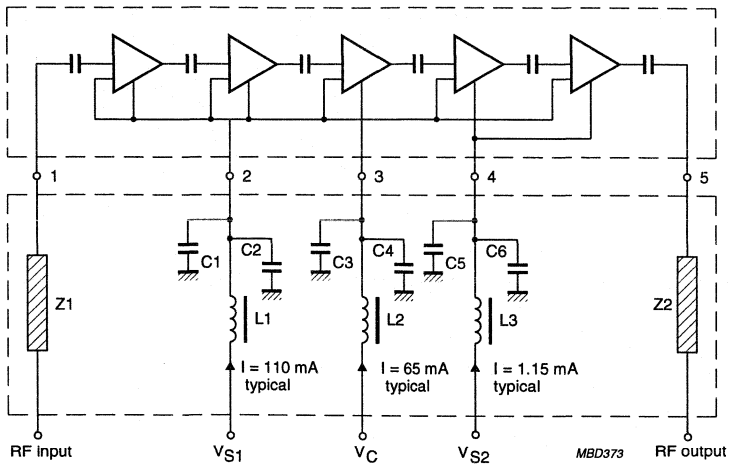



Fig.17 Test circuit.

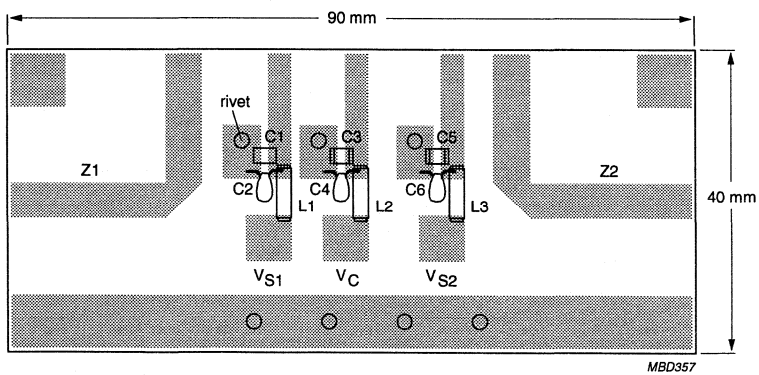



Fig.18 Printed-circuit board layout.

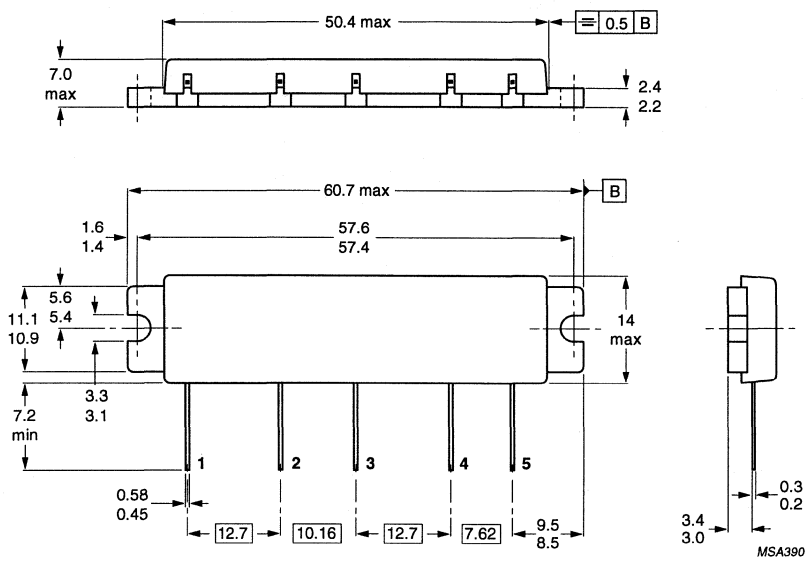
**List of components (see Fig.17)**

| COMPONENT | DESCRIPTION | VALUE | DIMENSION | CATALOGUE NO. |
|---|---|---|---|---|
| C1, C3, C5 | multilayer ceramic chip capacitor; note 1 | 1 nF | – | – |
| C2, C4, C6 | tantalum capacitor | 1 μF; 35 V | – | – |
| L1, L2, L3 | Ferroxcube chip bead; grade 4S2 | – | – | 4330 030 36300 |
| Z1, Z2 | stripline; note 2 | 50 Ω | width 4.7 mm | – |

**Notes**

1. ATC capacitor type 100B or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $1/16$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.19 SOT278A.

# UHF amplifier modules

# BGY115A; BGY115B BGY115C; BGY115D

## FEATURES

- 6 V nominal supply voltage
- 1.2 W output power (BGY115A, BGY115B and BGY115D)
- 1.6 W output power (BGY115C)
- Easy control of output power by DC voltage
- SMD outline.

## APPLICATIONS

- Hand-held transmitting equipment operating in the 824 to 849 MHz, 872 to 905 MHz, 890 to 915 MHz and 902 to 928 MHz frequency ranges.

## PINNING - SOT321

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

The BGY115A, BGY115B, BGY115C and BGY115D are three-stage UHF amplifier modules.

Each module consists of three NPN silicon planar transistor chips mounted together with matching and bias circuitry on a metallized ceramic substrate.

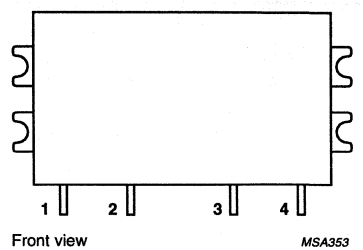



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_S$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| BGY115A | CW | 824 to 849 | 6 | 1.2 | ≥27.8 | typ. 50 | 50 |
| BGY115B | CW | 872 to 905 | 6 | 1.2 | ≥27.8 | typ. 50 | 50 |
| BGY115C | CW | 890 to 915 | 6 | 1.6 | ≥29 | typ. 50 | 50 |
| BGY115D | CW | 902 to 928 | 6 | 1.2 | ≥27.8 | typ. 50 | 50 |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_S$ | DC supply voltage | – | 8.5 | V |
| $V_C$ | DC control voltage | – | 4 | V |
| $P_D$ | input drive power | – | 5 | mW |
| $P_L$ | load power | | | |
| | BGY115A, BGY115B, BGY115D | – | 1.6 | W |
| | BGY115C | – | 1.8 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

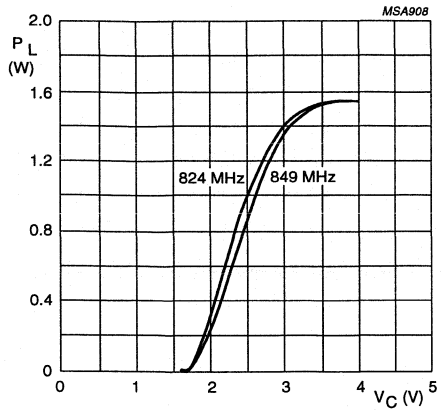
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 2 mW; $V_S$ = 6 V; $V_C \leq$ 3.5 V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency | | | | | |
| | BGY115A | | 824 | – | 849 | MHz |
| | BGY115B | | 872 | – | 905 | MHz |
| | BGY115C | | 890 | – | 915 | MHz |
| | BGY115D | | 902 | – | 928 | MHz |
| $I_Q$ | total quiescent current | $V_C$ = 0; $P_D$ < –60 dBm | – | – | 100 | μA |
| $I_C$ | control current | note 1 | – | – | 500 | μA |
| $P_L$ | load power | | | | | |
| | BGY115A, BGY115B, BGY115D | | 1.2 | – | – | W |
| | BGY115C | | 1.6 | – | – | W |
| $G_p$ | power gain | note 1 | | | | |
| | BGY115A, BGY115B, BGY115D | | 27.8 | – | – | dB |
| | BGY115C | | 29 | – | – | dB |
| η | efficiency | note 1 | 45 | 50 | – | % |
| $H_2$ | second harmonic | note 1 | – | – | –40 | dBc |
| $H_3$ | third harmonic | note 1 | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | note 1 | – | – | 3 : 1 | |
| $P_n$ | noise power | bandwidth = 30 kHz; 45 MHz above $f_0$; note 1 | – | – | –90 | dBm |
| | isolation | $V_C$ = 0 | – | – | –40 | dBm |
| | stability | $V_C$ = 0 to 3.5 V; $V_S$ = 4.8 to 8.5 V; $P_D$ = 0 to +6 dBm; VSWR ≤ 6 : 1 through all phases; note 2 | – | – | –60 | dBc |
| | ruggedness | $V_S$ = 8.5 V; VSWR ≤ 10 : 1; note 3 | no degradation | | | |

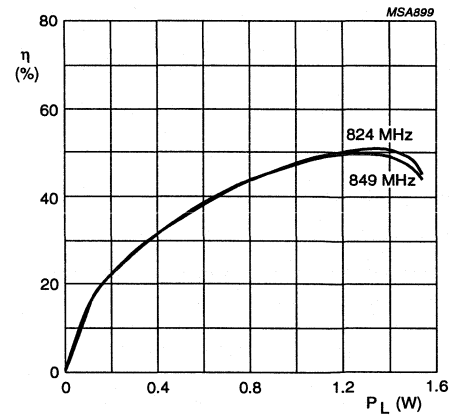
**Notes**

1. Adjust $V_C$ for $P_L$ = 1.2 W (BGY115A, BGY115B and BGY115D); $P_L$ = 1.6 W (BGY115C).
2. Adjust $V_C$ for $P_L \leq$ 1.2 W (BGY115A, BGY115B and BGY115D); $P_L \leq$ 1.6 W (BGY115C).
3. Adjust $V_C$ for $P_L$ = 1.6 W (BGY115A, BGY115B and BGY115D); $P_L$ = 1.8 W (BGY115C).



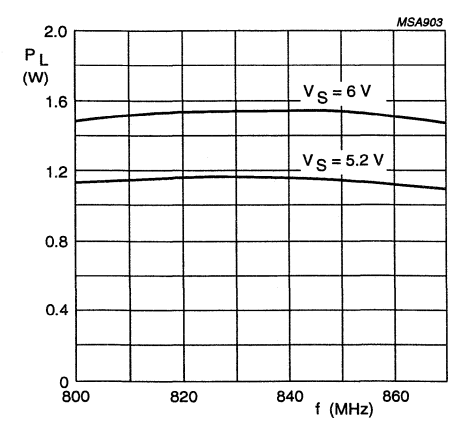

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.2 Load power as a function of control voltage; BGY115A, typical values.



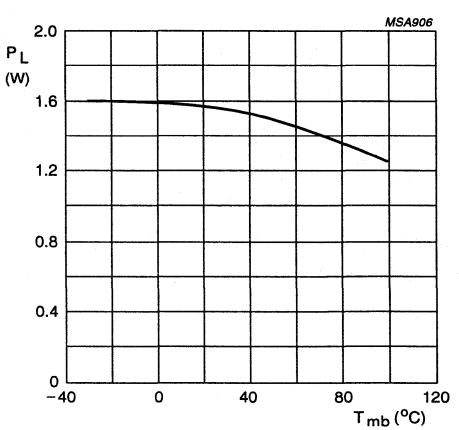

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.3 Efficiency as a function of load power; BGY115A, typical values.



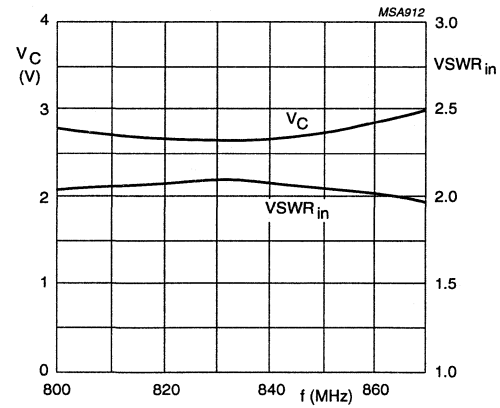

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.4 Load power as a function of frequency; BGY115A, typical values.



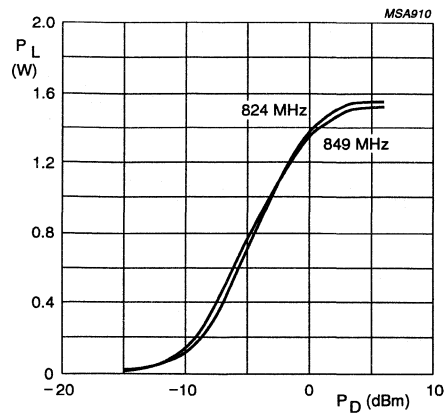

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$V_C = 3.5$ V.
f = 835 MHz.

Fig.5 Load power as a function of mounting base temperature; BGY115A, typical values.



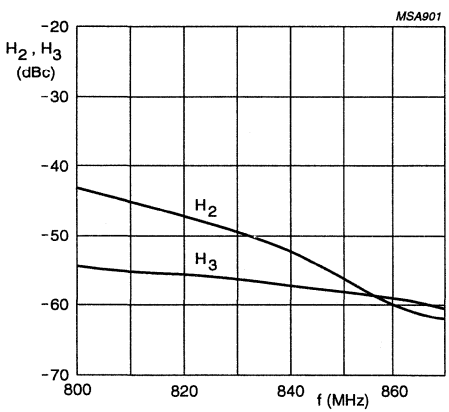

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.2$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.6 Control voltage and VSWR input as functions of frequency; BGY115A, typical values.



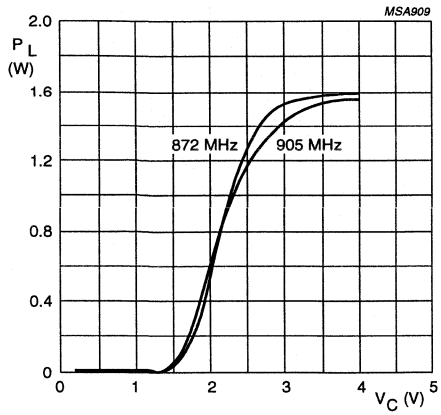

$Z_S = Z_L = 50\ \Omega$.
$V_S = 6$ V.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.7 Load power as a function of drive power; BGY115A, typical values.



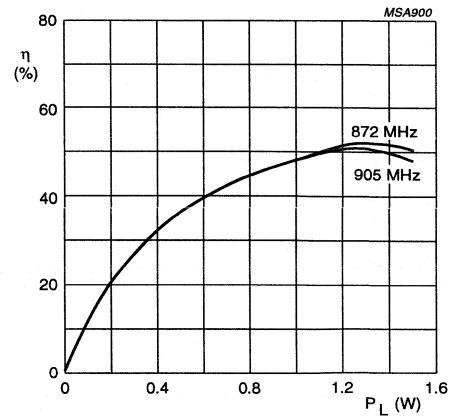

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.2$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.8 Harmonics as functions of frequency; BGY115A, typical values.



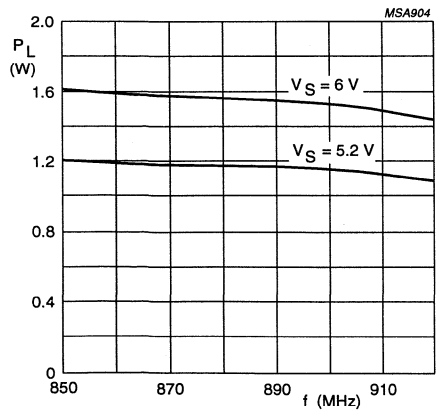

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.9 Load power as a function of control voltage; BGY115B, typical values.



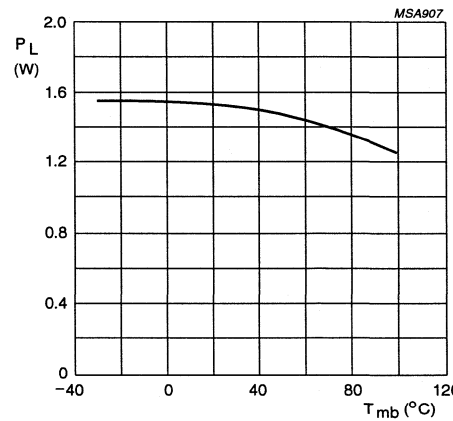

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.10 Efficiency as a function of load power; BGY115B, typical values.



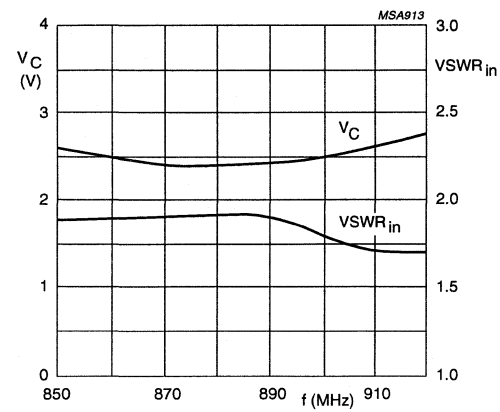

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.11 Load power as a function of frequency; BGY115B, typical values.



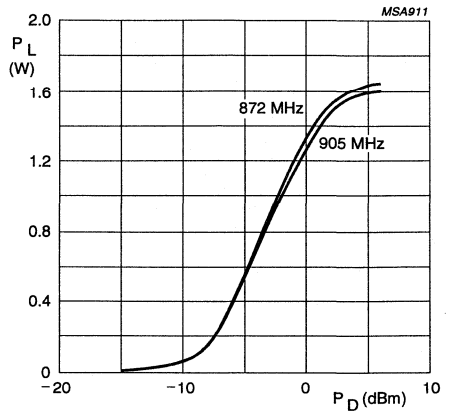

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$V_C = 3.5$ V.
f = 890 MHz.

Fig.12 Load power as a function of mounting base temperature; BGY115B, typical values.



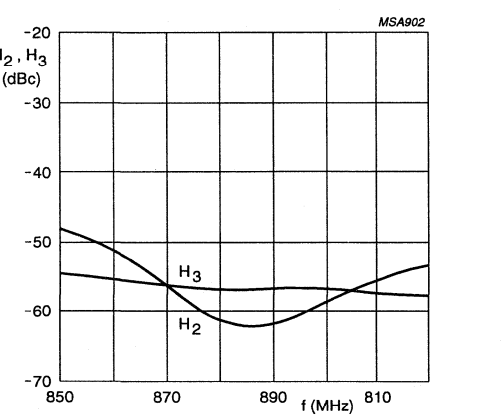

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.2$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.13 Control voltage and VSWR input as functions of frequency; BGY115B, typical values.



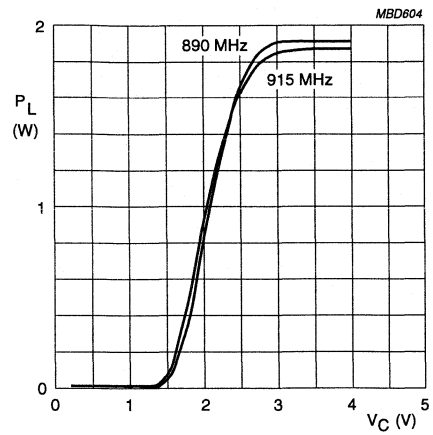

$Z_S = Z_L = 50\ \Omega$.
$V_S = 6$ V.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.14 Load power as a function of drive power; BGY115B, typical values.



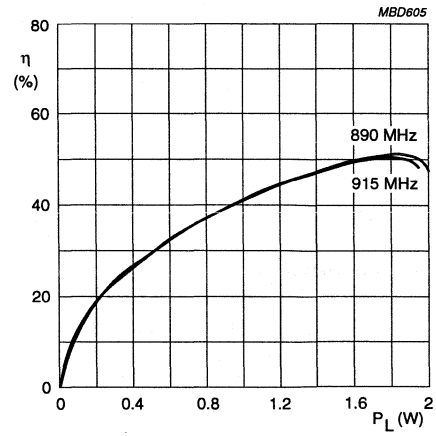

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.2$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.15 Harmonics as functions of frequency; BGY115B, typical values.



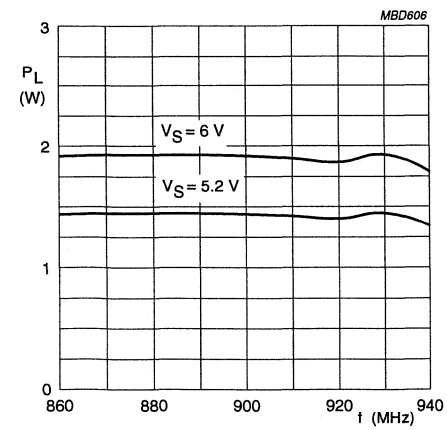

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.16 Load power as a function of control voltage; BGY115C, typical values.



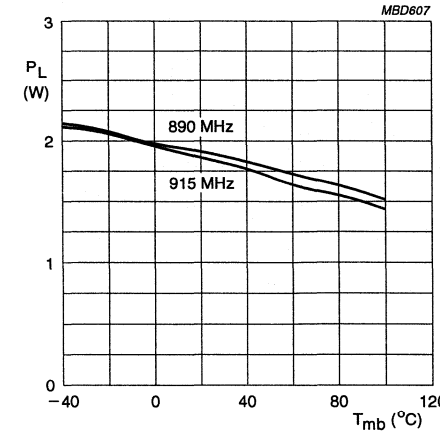

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.17 Efficiency as a function of load power; BGY115C, typical values.



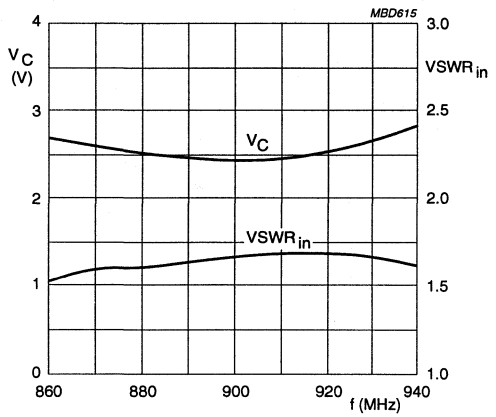

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.18 Load power as a function of frequency; BGY115C, typical values.



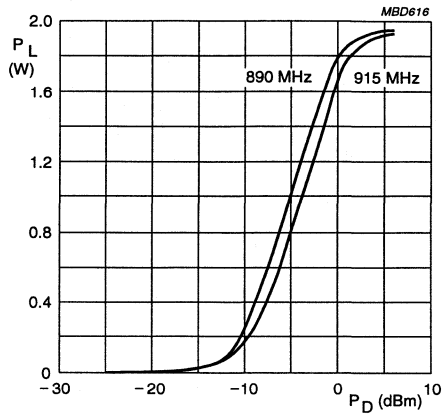

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$V_C = 3.5$ V.

Fig.19 Load power as a function of mounting base temperature; BGY115C, typical values.



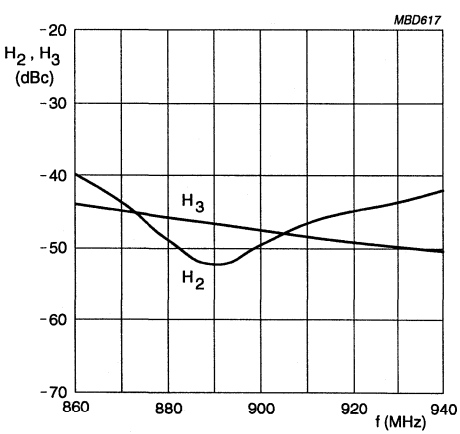

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.6$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.20 Control voltage and VSWR input as functions of frequency; BGY115C, typical values.



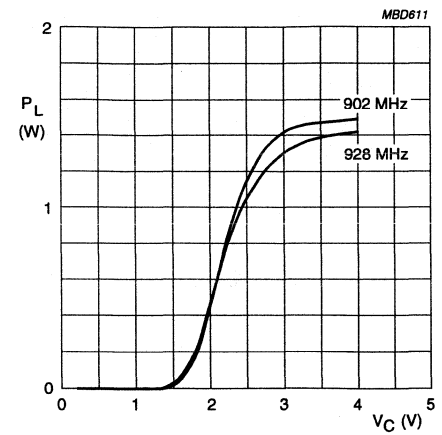

$Z_S = Z_L = 50\ \Omega$.
$V_S = 6$ V.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.21 Load power as a function of drive power; BGY115C, typical values.



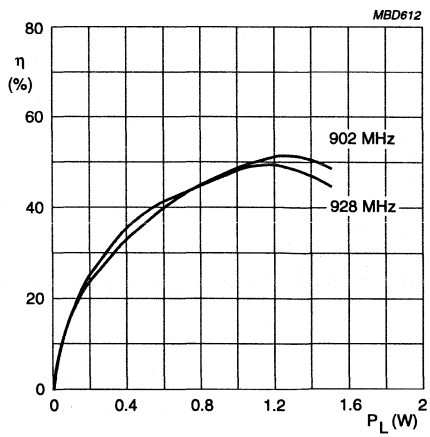

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.6$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.22 Harmonics as functions of frequency; BGY115C, typical values.



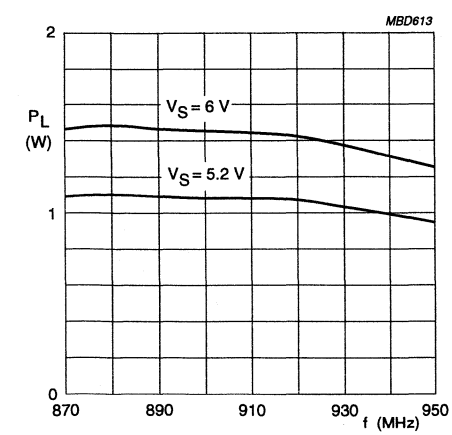

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.23 Load power as a function of control voltage; BGY115D, typical values.



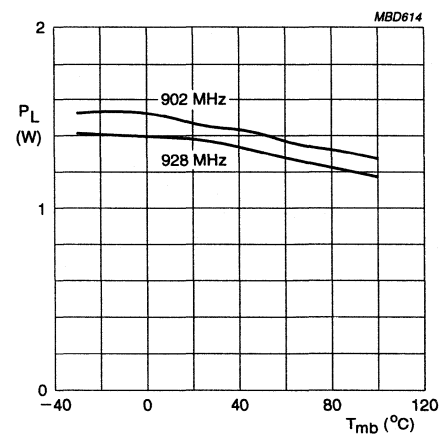

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.24 Efficiency as a function of load power; BGY115D, typical values.



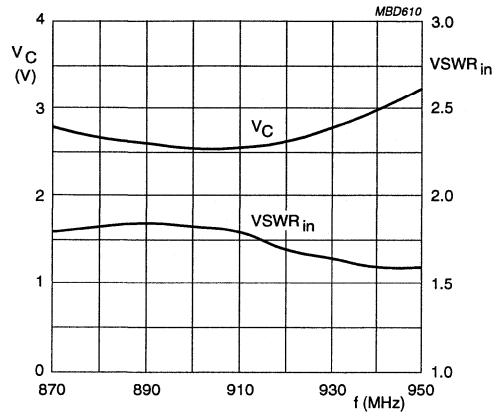

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.25 Load power as a function of frequency; BGY115D, typical values.



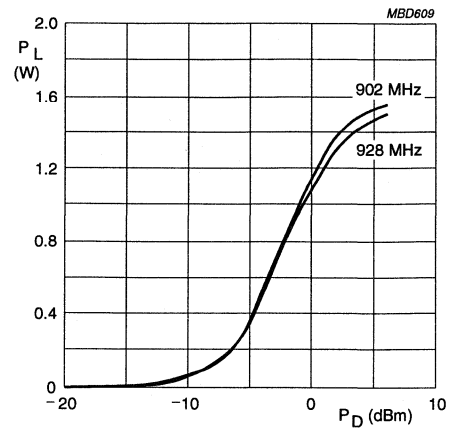

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 6$ V.
$V_C = 3.5$ V.

Fig.26 Load power as a function of mounting base temperature; BGY115D, typical values.



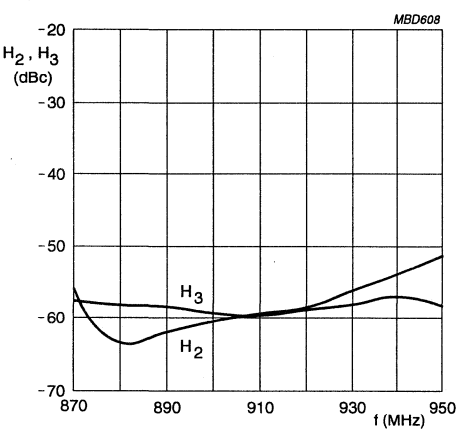

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.2$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.27 Control voltage and VSWR input as functions of frequency; BGY115D, typical values.




$Z_S = Z_L = 50\ \Omega$.
$V_S = 6$ V.
$V_C = 3.5$ V.
$T_{mb} = 25$ °C.

Fig.28 Load power as a function of drive power; BGY115D, typical values.




$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$P_L = 1.2$ W.
$V_S = 6$ V.
$T_{mb} = 25$ °C.

Fig.29 Harmonics as functions of frequency; BGY115D, typical values.

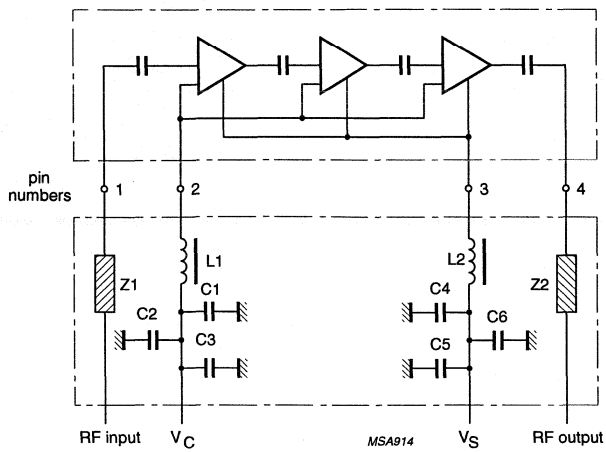



Fig.30 Test circuit.

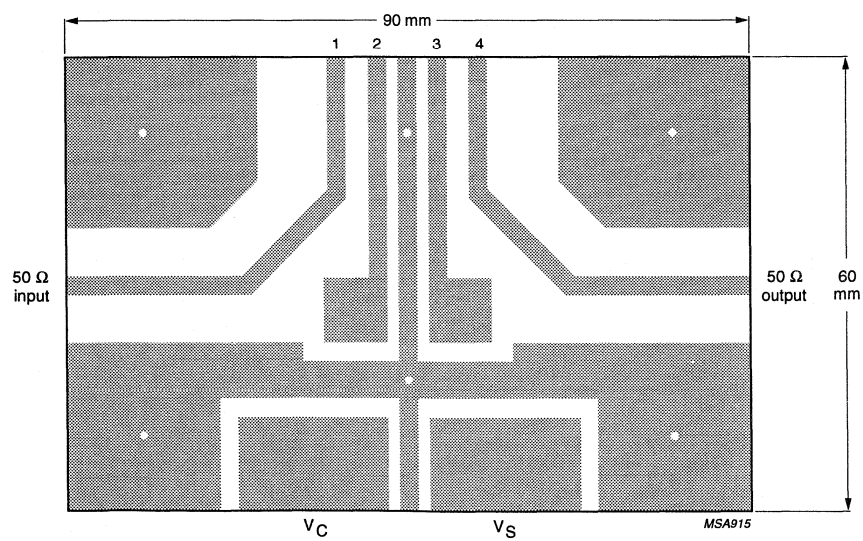



Fig.31 Printed-circuit board layout.

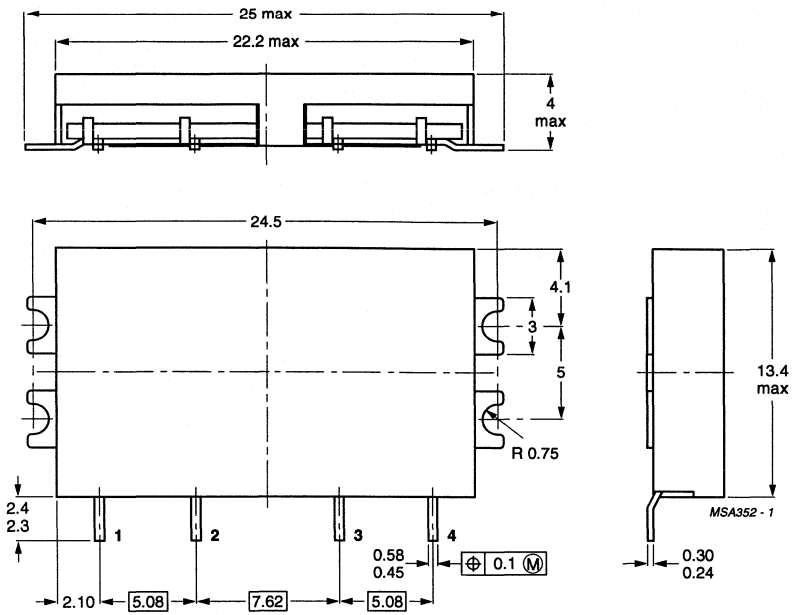
**List of components (see Fig. 30)**

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

**Note**

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $1/32$ inch.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.32 SOT321.

# UHF amplifier modules BGY116D; BGY116E

## FEATURES

- 12.5 V nominal supply voltage
- 6 W output power
- Easy control of output power by DC voltage.

## APPLICATIONS

- Mobile Radio equipment operating in the 800 to 870 and 890 to 950 MHz frequency ranges.

## PINNING - SOT278B

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

The BGY116D and BGY116E are five-stage UHF amplifier modules.

Each module consists of 5 NPN silicon planar transistor chips mounted together with matching and bias circuitry on a metallized ceramic substrate.

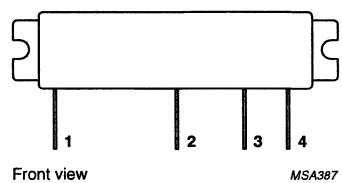



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_S$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| BGY116D | CW | 800 to 870 | 12.5 | 6 | ≥37.8 | typ. 40 | 50 |
| BGY116E | CW | 890 to 950 | 12.5 | 6 | ≥37.8 | typ. 40 | 50 |

## WARNING

| Product and environmental safety - toxic materials |
|---|
| This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste. |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_S$ | DC supply voltage | – | 16 | V |
| $V_C$ | DC control voltage | – | 8 | V |
| $P_D$ | input drive power | – | 10 | mW |
| $P_L$ | load power | – | 10 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

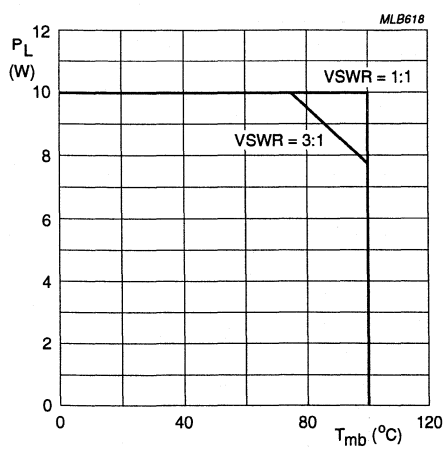



Fig.2 Power derating curve.

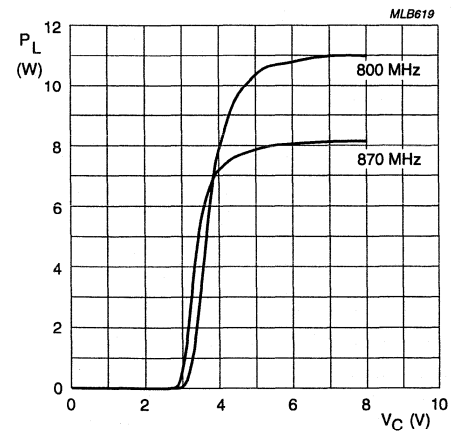
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 0 dBm; $V_S$ = 12.5 V; $V_C \leq$ 6 V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency | | | | | |
| | BGY116D | | 800 | – | 870 | MHz |
| | BGY116E | | 890 | – | 950 | MHz |
| $I_Q$ | total leakage current | $V_C$ = 0; $P_D$ = 0 mW | – | – | 1 | mA |
| $I_C$ | control current | | – | – | 0.5 | mA |
| $P_L$ | load power | | 6 | – | – | W |
| $G_p$ | power gain | $P_L$ = 6 W; note 1 | 37.8 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 6 W; note 1 | 33 | 40 | – | % |
| $H_2$ | second harmonic | $P_L$ = 6 W; note 1 | – | – | –35 | dBc |
| $H_3$ | third harmonic | $P_L$ = 6 W; note 1 | – | – | –35 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 6 W; note 1 | – | – | 3 : 1 | |
| | isolation | $V_C$ = 0 | – | –50 | –40 | dBm |
| | stability | $V_C$ = 0 to 6 V; VSWR ≤ 6 : 1; $P_L \leq$ 7 W; $V_S$ = 10 to 16 V; $P_D$ = –3 to +3 dBm; note 1 | – | – | –60 | dBc |
| | ruggedness | $V_S$ = 16 V; VSWR ≤ 20 : 1; $P_L$ = 7 W | no degradation | | | |

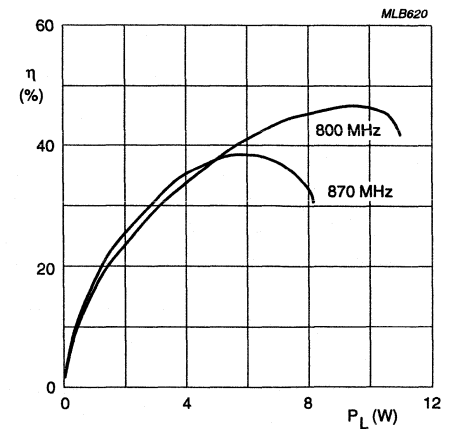
**Note**

1. Adjust $V_C$ for specified $P_L$.



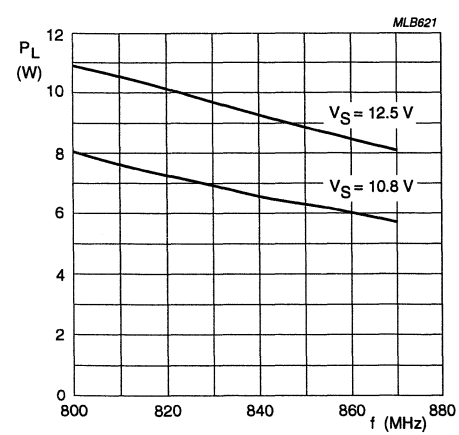

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.

Fig.3 Load power as a function of control voltage; BGY116D; typical values.



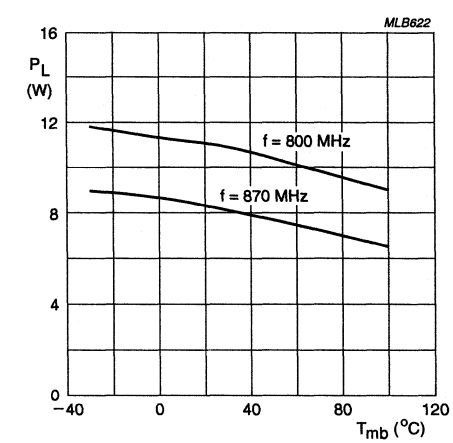

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.

Fig.4 Efficiency as a function of load power; BGY116D; typical values.



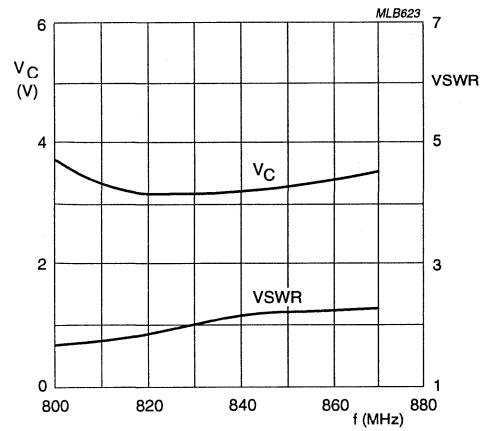

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$T_{mb} = 25\ ^\circ C$.
$V_C = 6$ V.

Fig.5 Load power as a function of frequency; BGY116D; typical values.



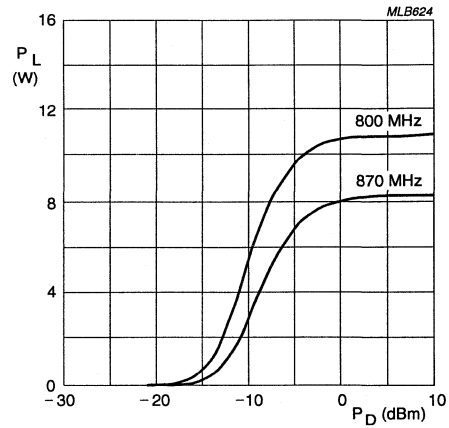

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$V_C = 6$ V.

Fig.6 Load power as a function of mounting base temperature; BGY116D; typical values.



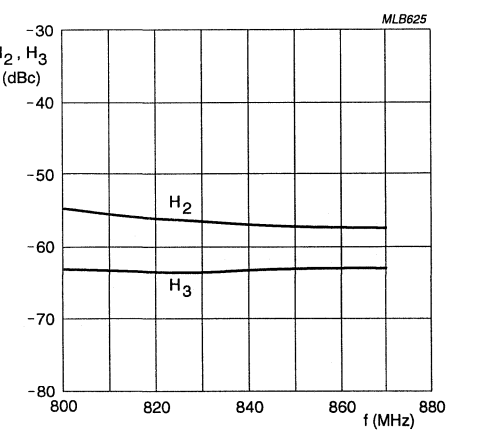

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 6$ W.

Fig.7 Control voltage and VSWR input as functions of frequency; BGY116D; typical values.



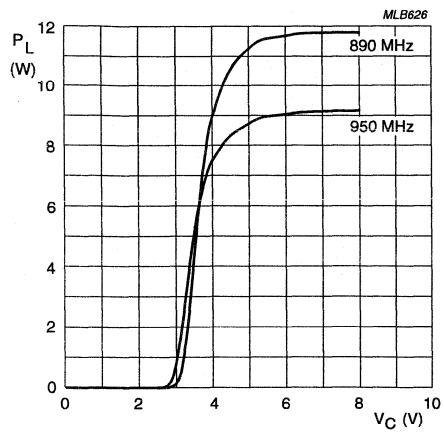

$Z_S = Z_L = 50\ \Omega$.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.
$V_C = 6$ V.

Fig.8 Load power as a function of drive power; BGY116D; typical values.



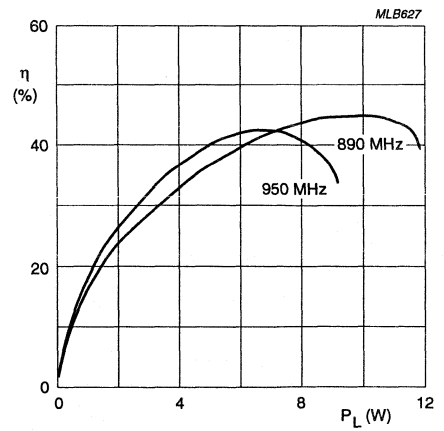

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 6$ W.

Fig.9 Harmonics as functions of frequency; BGY116D; typical values.



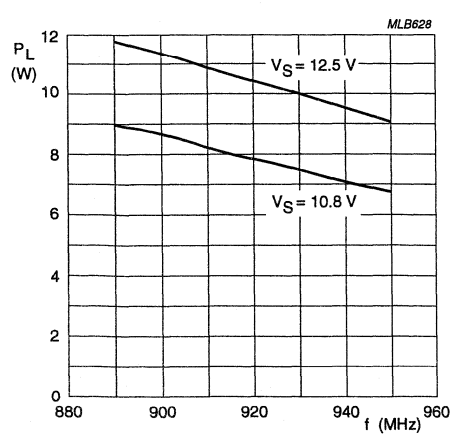

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ °C$.

Fig.10 Load power as a function of control voltage; BGY116E; typical values.



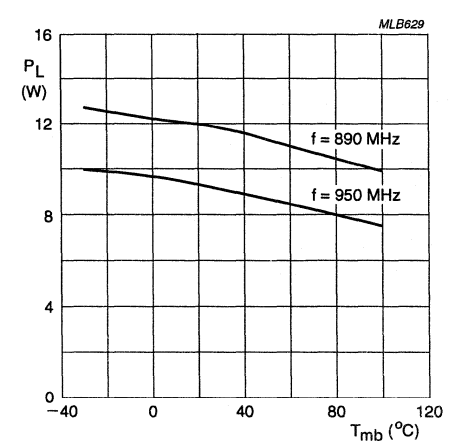

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ °C$.

Fig.11 Efficiency as a function of load power; BGY116E; typical values.



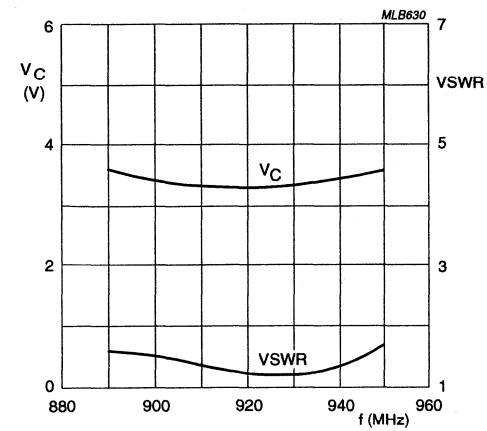

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$T_{mb} = 25\ °C$.
$V_C = 6$ V.

Fig.12 Load power as a function of frequency; BGY116E; typical values.



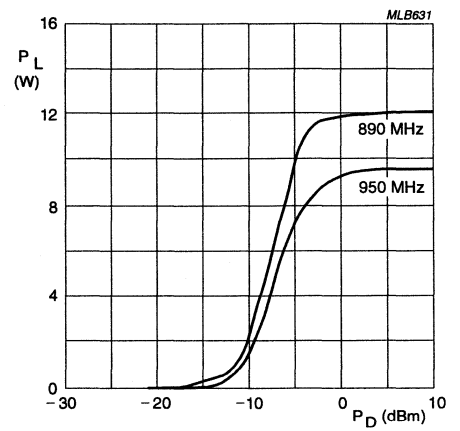

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$V_C = 6$ V.

Fig.13 Load power as a function of mounting base temperature; BGY116E; typical values.



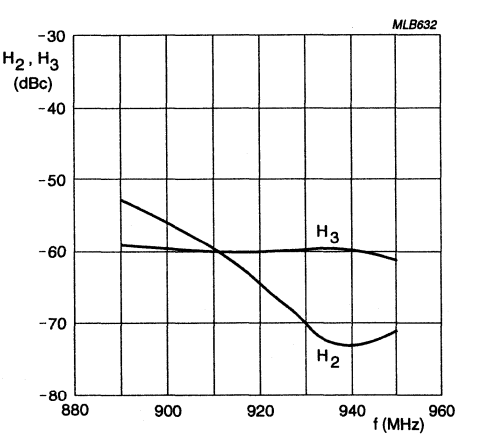

$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 6$ W.

Fig.14 Control voltage and VSWR input as functions of frequency; BGY116E; typical values.




$Z_S = Z_L = 50\ \Omega$.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.
$V_C = 6$ V.

Fig.15 Load power as a function of drive power; BGY116E; typical values.




$Z_S = Z_L = 50\ \Omega$.
$P_D = 0$ dBm.
$V_S = 12.5$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 6$ W.

Fig.16 Harmonics as functions of frequency; BGY116E; typical values.

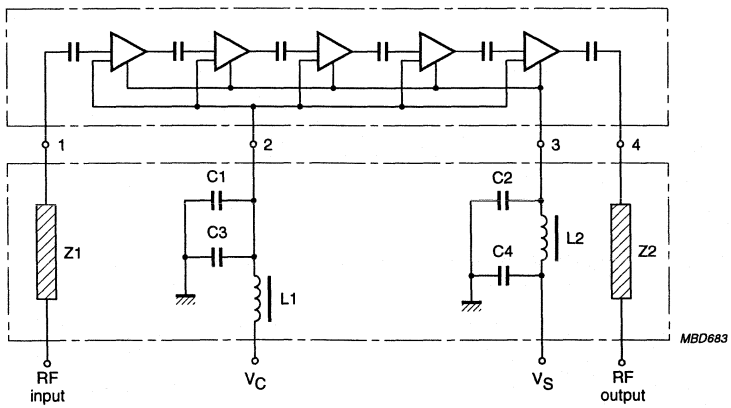



Fig.17 Test circuit.

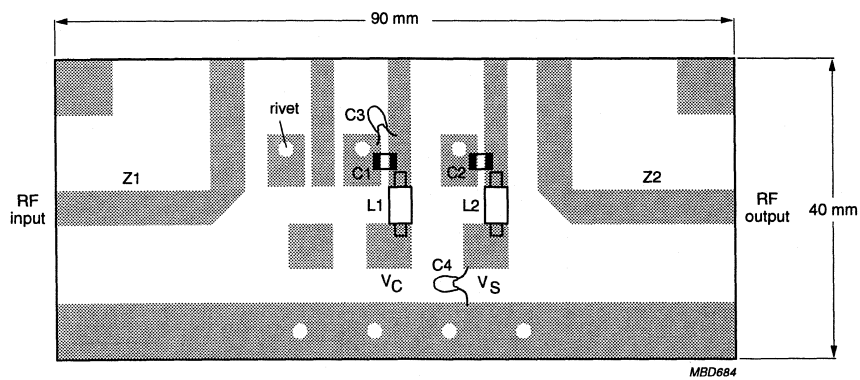



Fig.18 Printed-circuit board layout.

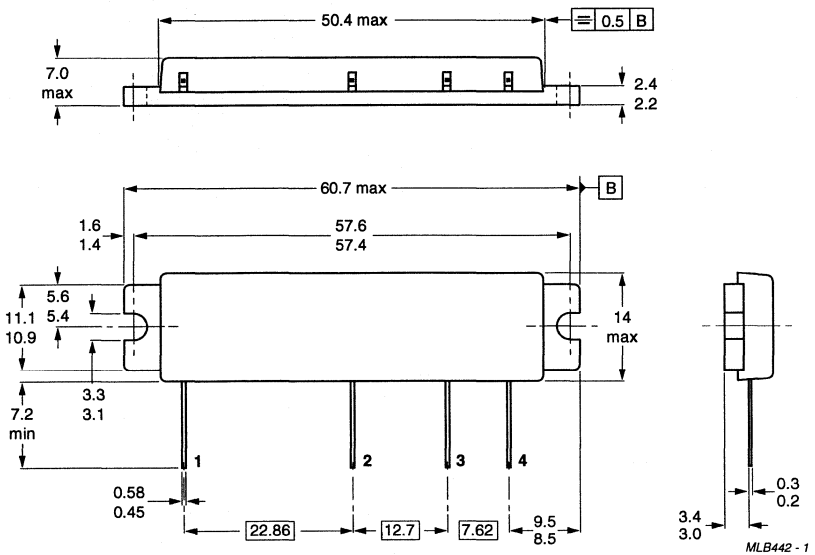
**List of components (see Fig. 17)**

| COMPONENT | DESCRIPTION | VALUE | DIMENSION | CATALOGUE NO. |
|---|---|---|---|---|
| C1, C2 | multilayer ceramic chip capacitor | 1 nF | – | – |
| C3, C4 | 35 V tantalum capacitor | 4.7 μF | – | – |
| L1, L2 | micro choke | 1 μH | – | 3122 108 20153 |
| Z1, Z2 | stripline; note 1 | 50 Ω | width 4.7 mm | – |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $1/16$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.19 SOT278B.

# UHF amplifier modules

# BGY118A; BGY118B BGY118C; BGY118D

## FEATURES

- 4.8 V nominal supply voltage
- 1.2 W output power (BGY118A, BGY118B and BGY118D)
- 1.4 W output power (BGY118C)
- Easy control of output power by DC voltage.

## APPLICATIONS

- Hand-held transmitting equipment operating in the 824 to 849 MHz, 872 to 905 MHz, 890 to 915 MHz and 898 to 928 MHz frequency ranges.

## PINNING - SOT321

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

The BGY118A, BGY118B, BGY118C and BGY118D are three-stage UHF amplifier modules.

Each module consists of 3 NPN silicon planar transistor chips mounted on a metallized ceramic substrate, together with matching and bias circuitry.

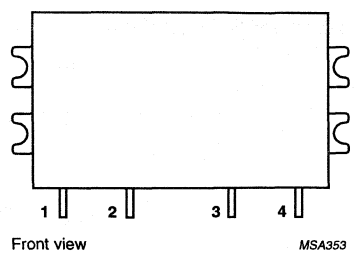



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_S$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| BGY118A | CW | 824 to 849 | 4.8 | 1.2 | ≥27.8 | typ. 55 | 50 |
| BGY118B | CW | 872 to 905 | 4.8 | 1.2 | ≥27.8 | typ. 55 | 50 |
| BGY118C | CW | 890 to 915 | 4.8 | 1.4 | ≥28.4 | typ. 55 | 50 |
| BGY118D | CW | 898 to 928 | 4.8 | 1.2 | ≥27.8 | typ. 55 | 50 |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_S$ | DC supply voltage | – | 7 | V |
| $V_C$ | DC control voltage | – | 3.5 | V |
| $P_D$ | input drive power | – | 5 | mW |
| $P_L$ | load power | | | |
| | BGY118A, BGY118B, BGY118D | – | 1.6 | W |
| | BGY118C | – | 1.7 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

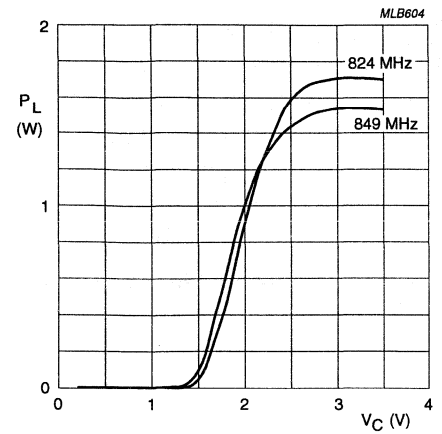
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 2 mW; $V_S$ = 4.8 V; $V_C \leq 3$ V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency | | | | | |
| | BGY118A | | 824 | – | 849 | MHz |
| | BGY118B | | 872 | – | 905 | MHz |
| | BGY118C | | 890 | – | 915 | MHz |
| | BGY118D | | 898 | – | 928 | MHz |
| $I_Q$ | total quiescent current | $V_C$ = 0; $P_D$ < –60 dBm | – | – | 100 | μA |
| $I_C$ | control current | note 1 | – | – | 0.5 | mA |
| $P_L$ | load power | | | | | |
| | BGY118A, BGY118B, BGY118D | | 1.2 | – | – | W |
| | BGY118C | | 1.4 | – | – | W |
| $G_p$ | power gain | note 1 | | | | |
| | BGY118A, BGY118B, BGY118D | | 27.8 | – | – | dB |
| | BGY118C | | 28.4 | – | – | dB |
| η | efficiency | note 1 | 50 | 55 | – | % |
| $H_2$ | second harmonic | note 1 | – | – | –40 | dBc |
| $H_3$ | third harmonic | note 1 | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | note 1 | – | – | 3 : 1 | |
| $P_n$ | noise power | bandwidth = 30 kHz; note 2 | – | – | –90 | dBm |
| | isolation | $V_C$ = 0 | – | – | –40 | dBm |
| | stability | $V_C$ = 0 to 3 V; $V_S$ = 4 to 6.5 V; $P_D$ = 0 to +6 dBm; VSWR ≤ 6 : 1 through all phases; note 3 | – | – | –60 | dBc |
| | ruggedness | $V_S$ = 6.5 V; VSWR = 10 : 1; note 4 | no degradation | | | |

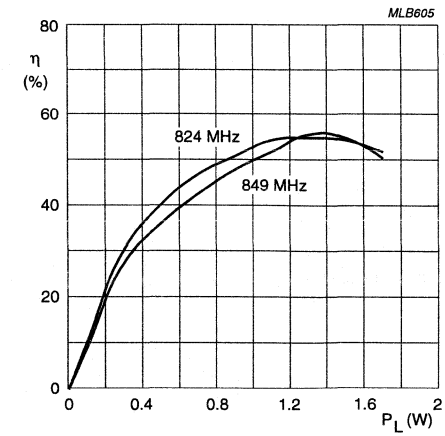
**Notes**

1. Adjust $V_C$ for $P_L$ = 1.2 W (BGY118A, BGY118B, BGY118D); $P_L$ = 1.4 W (BGY118C).
2. Adjust $V_C$ for $P_L \leq 1.2$ W; $f_n = f_o + 45$ MHz (BGY118A, BGY118B); $P_L \leq 1.4$ W; $f_n = f_o + 45$ MHz (BGY118C); $P_L \leq 1.2$ W; $f_n = f_o - 55$ MHz (BGY118D).
3. Adjust $V_C$ for $P_L \leq 1.2$ W (BGY118A, BGY118B, BGY118D); $P_L \leq 1.4$ W (BGY118C).
4. Adjust $V_C$ for $P_L$ = 1.4 W (BGY118A, BGY118B, BGY118D); $P_L$ = 1.6 W (BGY118C).



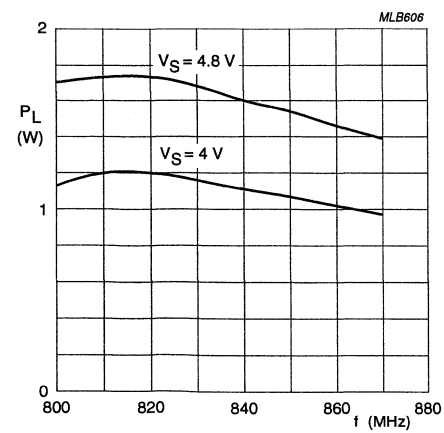

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.

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



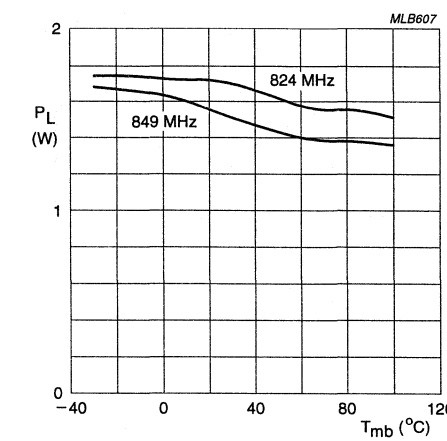

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.

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



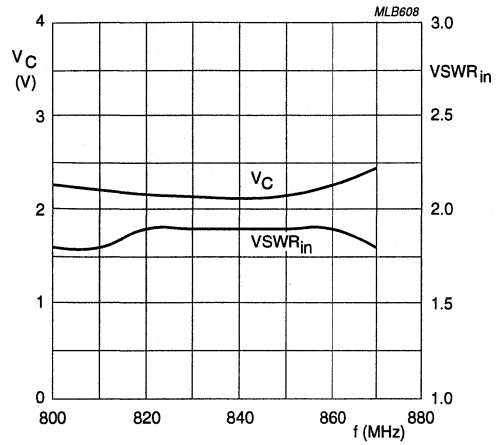

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$T_{mb} = 25\ ^\circ C$.
$V_C = 3$ V.

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



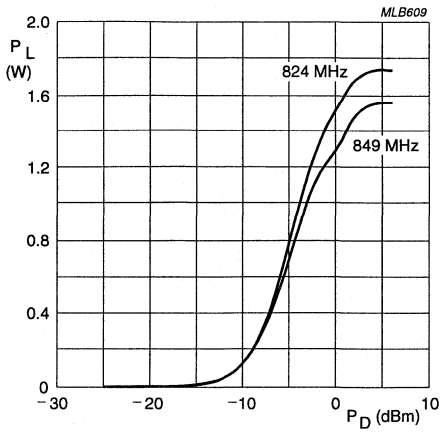

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$V_C = 3$ V.

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



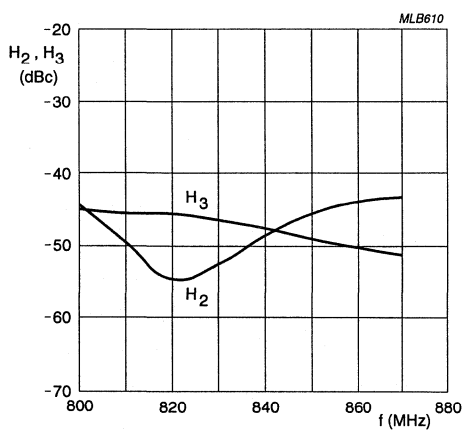

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 1.2$ W.

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



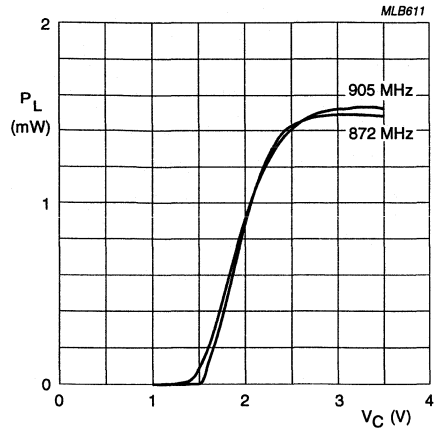

$Z_S = Z_L = 50\ \Omega$.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.
$V_C = 3$ V.

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



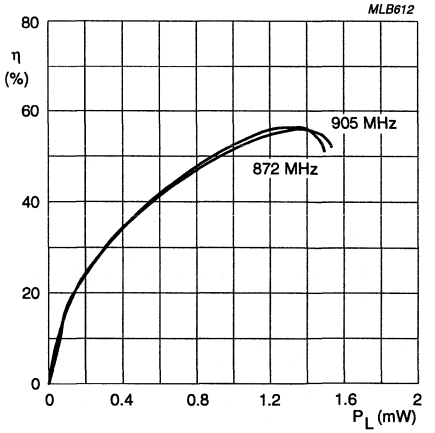

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 1.2$ W.

Fig.8 Harmonics as functions of frequency; BGY118A; typical values.



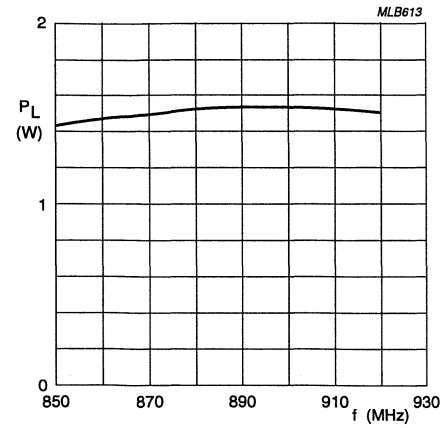

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25$ °C.

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



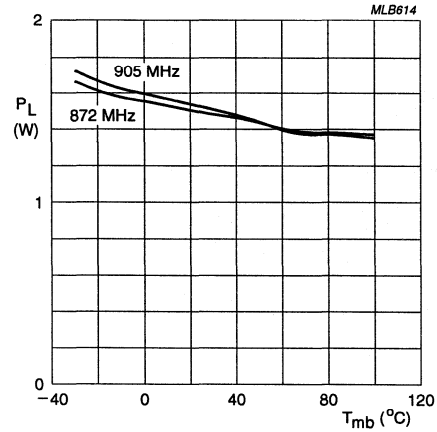

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25$ °C.

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



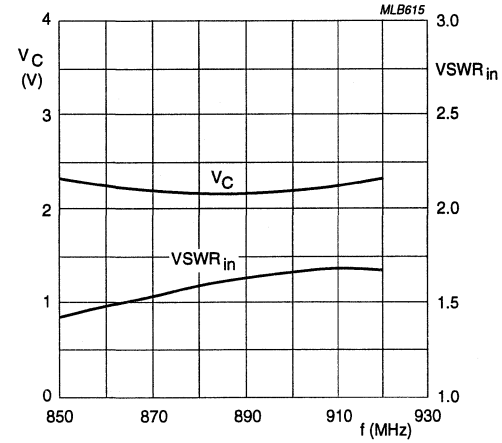

$Z_S = Z_L = 50\ \Omega$.
$V_S = 4.8$ V.
$T_{mb} = 25$ °C.
$V_C = 3$ V.

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



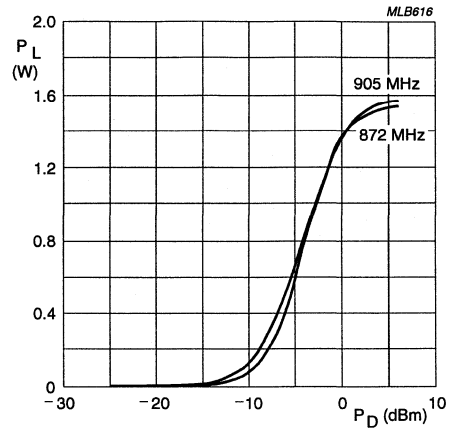

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$V_C = 3$ V.

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



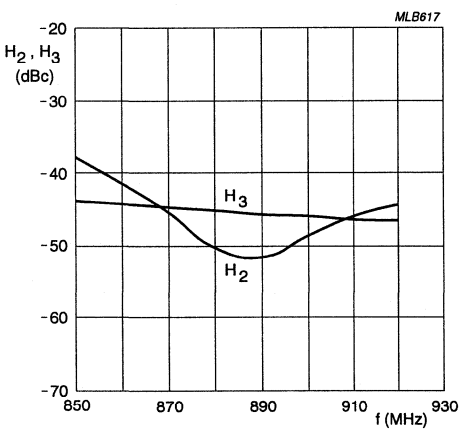

$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 1.2$ W.

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




$Z_S = Z_L = 50\ \Omega$.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.
$V_C = 3$ V.

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




$Z_S = Z_L = 50\ \Omega$.
$P_D = 2$ mW.
$V_S = 4.8$ V.
$T_{mb} = 25\ ^\circ C$.
$P_L = 1.2$ W.

Fig.15 Harmonics as functions of frequency; BGY118B; typical values.

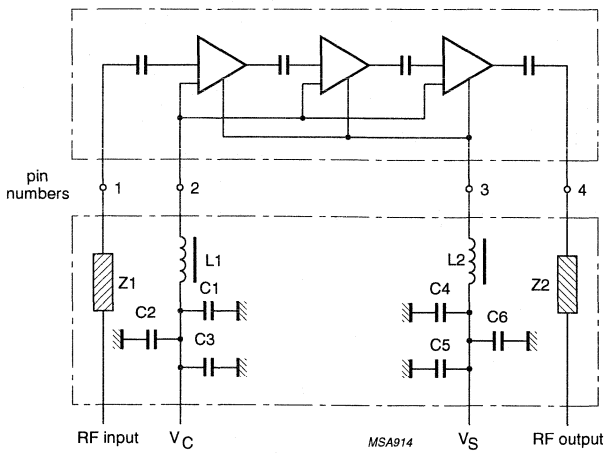



Fig.16 Test circuit.

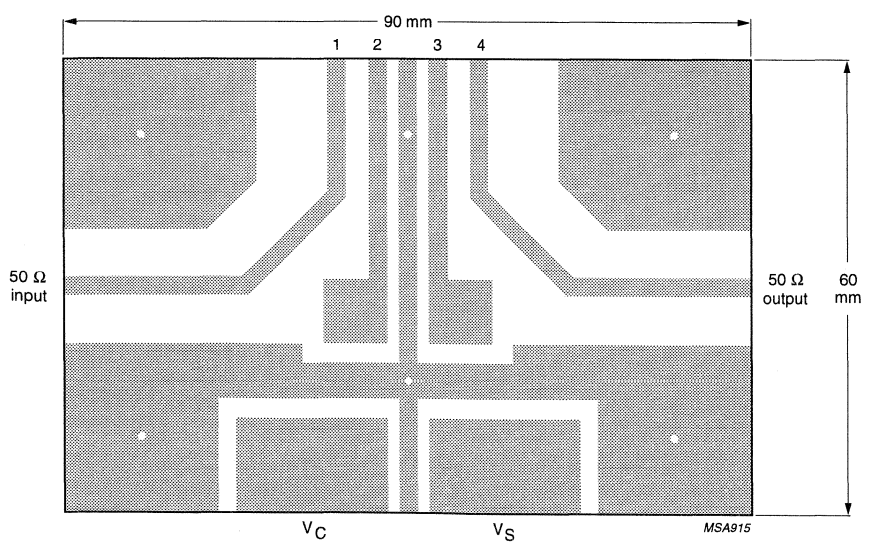



Fig.17 Printed-circuit board layout.

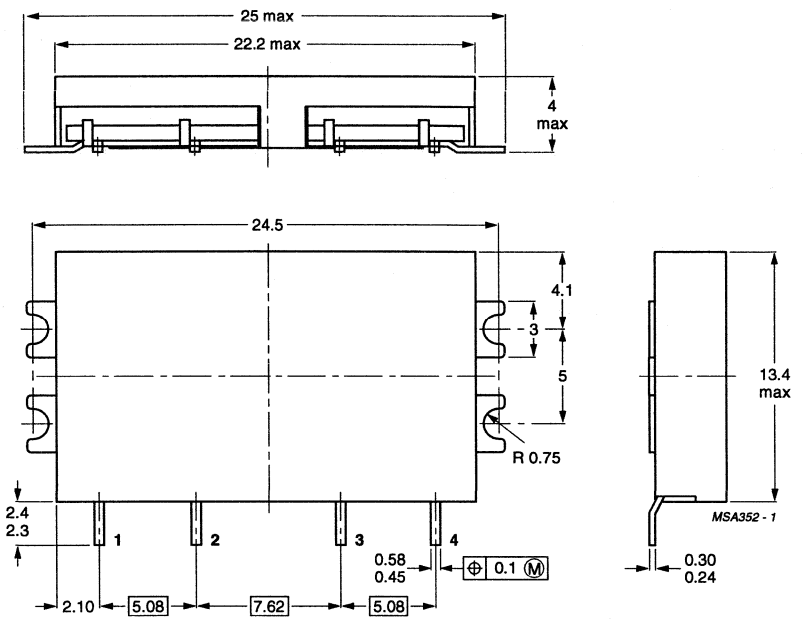
**List of components (see Fig.16)**

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

**Note**

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $1/32$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.18 SOT321.

# UHF amplifier modules BGY119A; BGY119B; BGY119C

## FEATURES

- 4.8 V nominal supply voltage
- 1.2 W output power (BGY119A and BGY119B)
- 1.4 W output power (BGY119C)
- Easy control of output power by DC voltage
- High efficiency (typical 55 %).

## APPLICATIONS

- Hand-held transmitting equipment operating in the 824 to 849 MHz, 872 to 905 MHz and 890 to 915 MHz frequency ranges.

## PINNING - SOT359

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

The BGY119A, BGY119B and BGY119C are three-stage UHF amplifier modules.

Each module consists of three NPN silicon planar transistor chips mounted together with matching and bias circuitry on a metallized ceramic substrate.

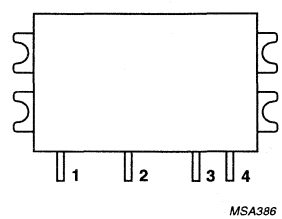



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_S$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| BGY119A | CW | 824 to 849 | 4.8 | 1.2 | ≥27.8 | typ. 55 | 50 |
| BGY119B | CW | 872 to 905 | 4.8 | 1.2 | ≥27.8 | typ. 55 | 50 |
| BGY119C | CW | 890 to 915 | 4.8 | 1.4 | ≥28.4 | typ. 55 | 50 |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_S$ | DC supply voltage | – | 7 | V |
| $V_C$ | DC control voltage | – | 3.5 | V |
| $P_D$ | input drive power | – | 5 | mW |
| $P_L$ | load power | | | |
| | BGY119A; BGY119B | – | 1.6 | W |
| | BGY119C | – | 1.7 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

## CHARACTERISTICS

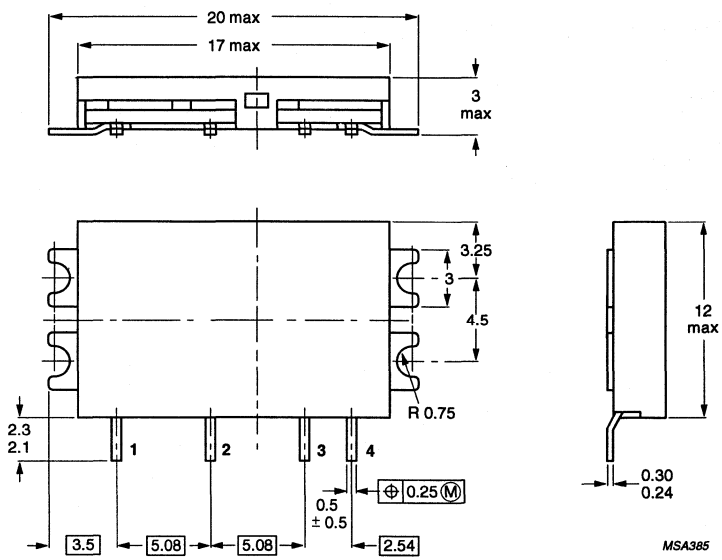
$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 2 mW; $V_C \leq 3$ V; $V_S$ = 4.8 V unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency range | | | | | |
| | BGY119A | | 824 | – | 849 | MHz |
| | BGY119B | | 872 | – | 905 | MHz |
| | BGY119C | | 890 | – | 915 | MHz |
| $I_Q$ | total leakage current | $V_C$ = 0; $P_D$ < –60 dBm | – | – | 100 | μA |
| $I_C$ | control current | note 1 | – | – | 500 | μA |
| $P_L$ | load power | | | | | |
| | BGY119A, BGY119B | | 1.2 | – | – | W |
| | BGY119C | | 1.4 | – | – | W |
| $G_p$ | power gain | note 1 | | | | |
| | BGY119A, BGY119B | | 27.8 | – | – | dB |
| | BGY119C | | 28.4 | – | – | dB |
| η | efficiency | note 1 | 50 | 55 | – | % |
| $H_2$ | second harmonic | note 1 | | – | –40 | dBc |
| $H_3$ | third harmonic | note 1 | | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | note 1 | – | – | 3 : 1 | |
| $P_n$ | noise power | bandwidth = 30 kHz; 45 MHz above $f_0$; note 1 | – | – | –90 | dBm |
| | isolation | $V_C$ = 0 | – | – | –40 | dBm |
| | stability | $V_C$ = 0 to 3 V; $V_S$ = 4 to 6.5 V; $P_D$ = 0 to +6 dBm; VSWR ≤ 6 : 1 through all phases; note 2 | – | – | –60 | dBc |
| | ruggedness | $V_S$ =6.5 V; VSWR = 10 : 1; note 3 | no degradation | | | |

**Notes**

1. Adjust $V_C$ for $P_L$ = 1.2 W (BGY119A and BGY119B); $P_L$ = 1.4 W (BGY119C).
2. Adjust $V_C$ for $P_L \leq 1.2$ W (BGY119A and BGY119B); $P_L \leq 1.4$ W (BGY119C).
3. Adjust $V_C$ for $P_L$ = 1.4 W (BGY119A and BGY119B); $P_L$ = 1.6 W (BGY119C).

## PACKAGE OUTLINE




Dimensions in mm.

Fig.2 SOT359.

# VHF amplifier modules BGY132; BGY133

## FEATURES

- Broadband VHF amplifiers
- 18 W output power
- Operate directly from 12 V vehicle electrical systems
- Output power control over a 10 dB range by drive power.

## DESCRIPTION

The BGY132 and BGY133 are two stage amplifier modules. Each module comprises two NPN silicon planar transistor chips together with lumped-element matching components.

## APPLICATIONS

- Mobile communication equipment.

## PINNING - SOT132B

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | ground |
| 3 | $V_{S1}$ |
| 4 | ground |
| 5 | $V_{S2}$ |
| 6 | ground |
| 7 | RF output |
| flange | ground |

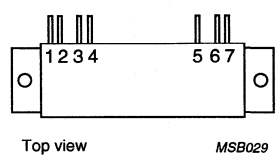



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_{S1}$; $V_{S2}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| BGY132 | CW | 68 to 88 | 12.5 | ≥18 | ≥22.6 | typ. 45 | 50 |
| BGY133 | CW | 80 to 108 | 12.5 | ≥18 | ≥22.6 | typ. 45 | 50 |

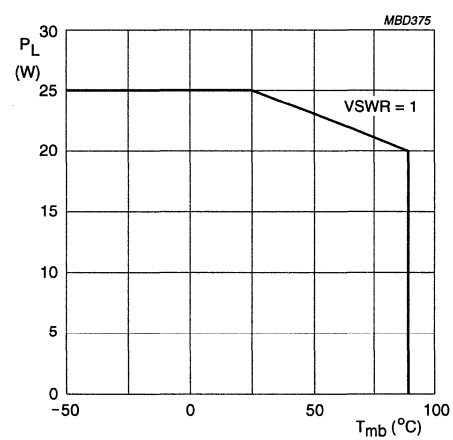
## WARNING

| Product and environmental safety - toxic materials |
|---|
| This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste. |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 15.6 | V |
| $V_{S2}$ | DC supply voltage | – | 15.6 | V |
| $V_i$ | RF input terminal voltage | – | 25 | V |
| $V_o$ | RF output terminal voltage | – | 25 | V |
| $P_D$ | input drive power | – | 200 | mW |
| $P_L$ | load power | – | 25 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –20 | +90 | °C |




$V_{S1} = V_{S2} = 12.5$ V.

Fig.2 Power derating curve.

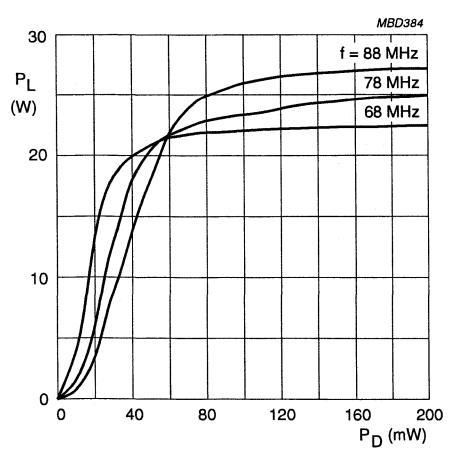
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 100 mW; $V_{S1} = V_{S2}$ = 12.5 V; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency | | | | | |
| | BGY132 | | 68 | – | 88 | MHz |
| | BGY133 | | 80 | – | 108 | MHz |
| $I_{Q2}$ | leakage current | $V_{S1}$ = 0; $P_D$ = 0 | – | – | 10 | mA |
| $P_L$ | load power | | 18 | – | – | W |
| $G_p$ | power gain | $P_L$ = 18 W; note 1 | 22.6 | – | – | dB |
| η | efficiency | $P_L$ = 18 W; note 1 | 38 | 45 | – | % |
| $H_2$ | second harmonic | $P_L$ = 18 W; note 1 | – | – | –25 | dBc |
| $H_3$ | third harmonic | $P_L$ = 18 W; note 1 | – | – | –25 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 18 W; note 1 | – | 1.5 : 1 | 3 : 1 | |
| | stability | VSWR ≤ 3 : 1; $P_L$ = 2 to 20 W; $V_{S1} = V_{S2}$ = 10.8 to 15.6 V; note 1 | – | – | –60 | dBc |
| | ruggedness | VSWR = 50 : 1; $V_{S1} = V_{S2}$ = 15.6 V; $P_L$ < 25 W during 1 minute; note 1 | no degradation | | | |

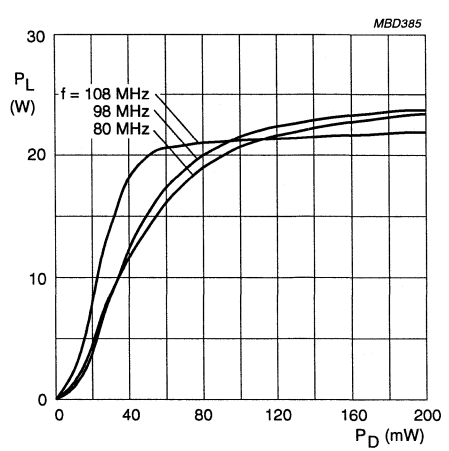
**Note**

1. Adjust $P_D$ for specified $P_L$.



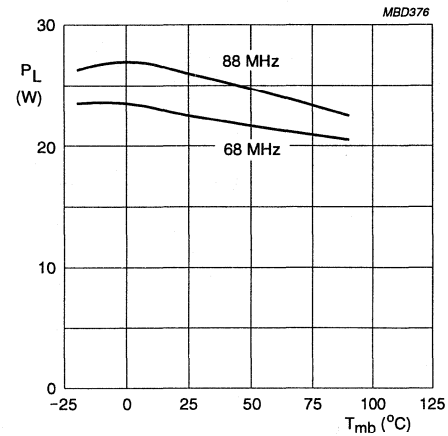

$Z_S = Z_L$ = 50 Ω.
$V_{S1} = V_{S2}$ = 12.5 V.
$T_{mb}$ = 25 °C.

Fig.3 Load power as a function of drive power; BGY132; typical values.



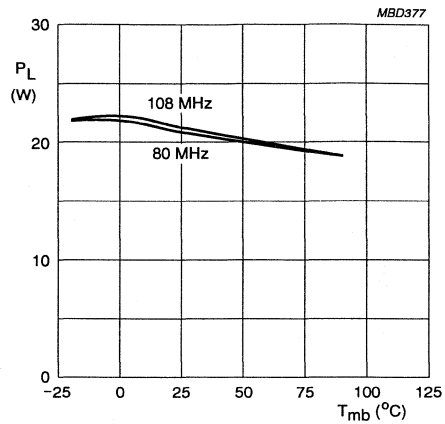

$Z_S = Z_L$ = 50 Ω.
$V_{S1} = V_{S2}$ = 12.5 V.
$T_{mb}$ = 25 °C.

Fig.4 Load power as a function of drive power; BGY133; typical values.



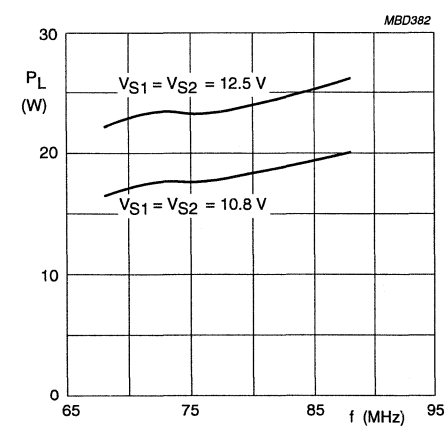

$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$V_{S1} = V_{S2} = 12.5$ V.

Fig.5 Load power as a function of mounting base temperature; BGY132; typical values.



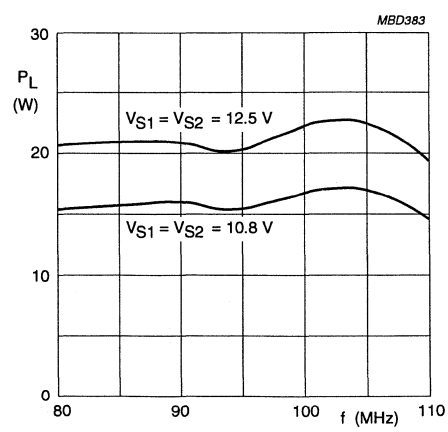

$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$V_{S1} = V_{S2} = 12.5$ V.

Fig.6 Load power as a function of mounting base temperature; BGY133; typical values.



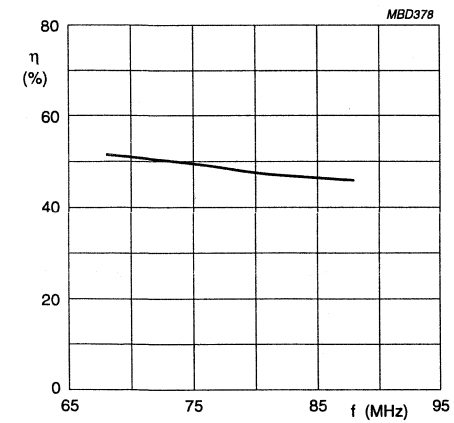

$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$T_{mb} = 25$ °C.

Fig.7 Load power as a function of frequency; BGY132; typical values.



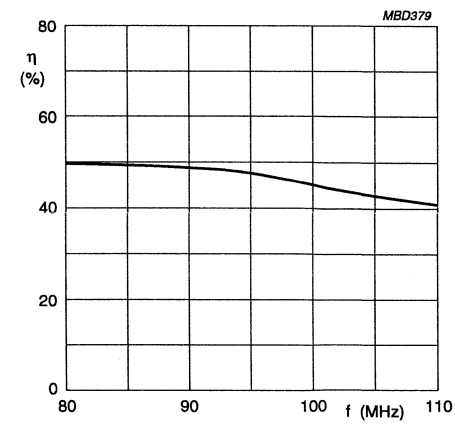

$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$T_{mb} = 25$ °C.

Fig.8 Load power as a function of frequency; BGY133; typical values.



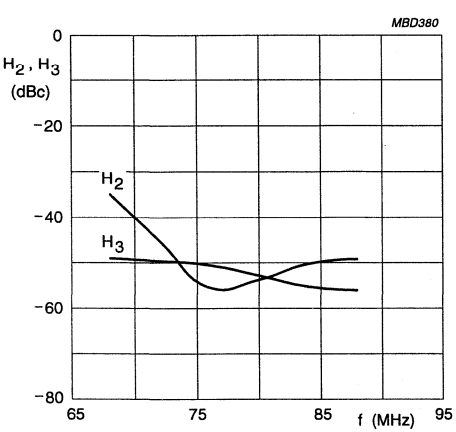

$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$V_{S1} = V_{S2} = 12.5$ V.
$T_{mb} = 25$ °C.
$P_L = 18$ W.

Fig.9 Efficiency as a function of frequency; BGY132; typical values.



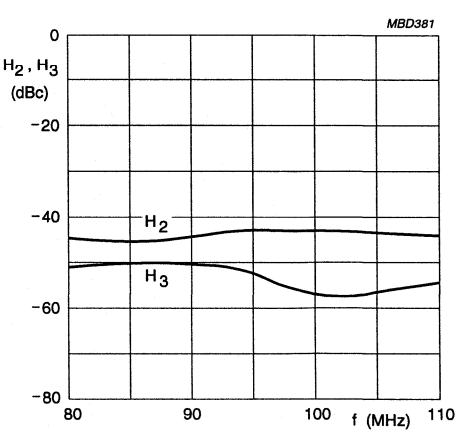

$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$V_{S1} = V_{S2} = 12.5$ V.
$T_{mb} = 25$ °C.
$P_L = 18$ W.

Fig.10 Efficiency as a function of frequency; BGY133; typical values.




$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$V_{S1} = V_{S2} = 12.5$ V.
$T_{mb} = 25$ °C.
$P_L = 18$ W.

Fig.11 Harmonics as functions of frequency; BGY132; typical values.




$Z_S = Z_L = 50\ \Omega$.
$P_D = 100$ mW.
$V_{S1} = V_{S2} = 12.5$ V.
$T_{mb} = 25$ °C.
$P_L = 18$ W.

Fig.12 Harmonics as functions of frequency; BGY133; typical values.

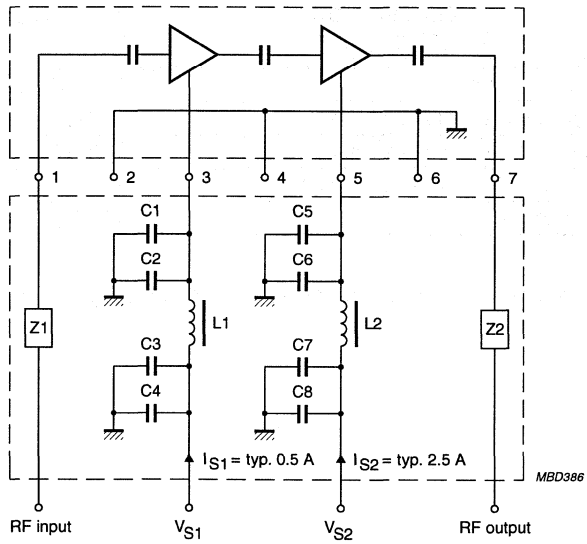



Fig.13 Test circuit.

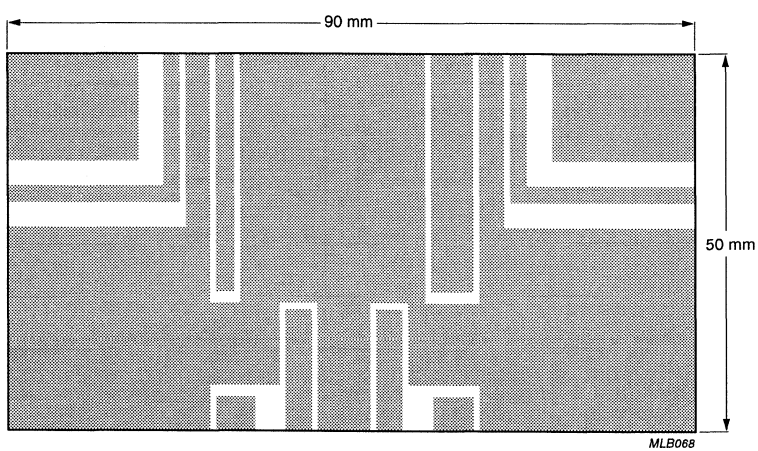



Fig.14 Printed-circuit board layout.

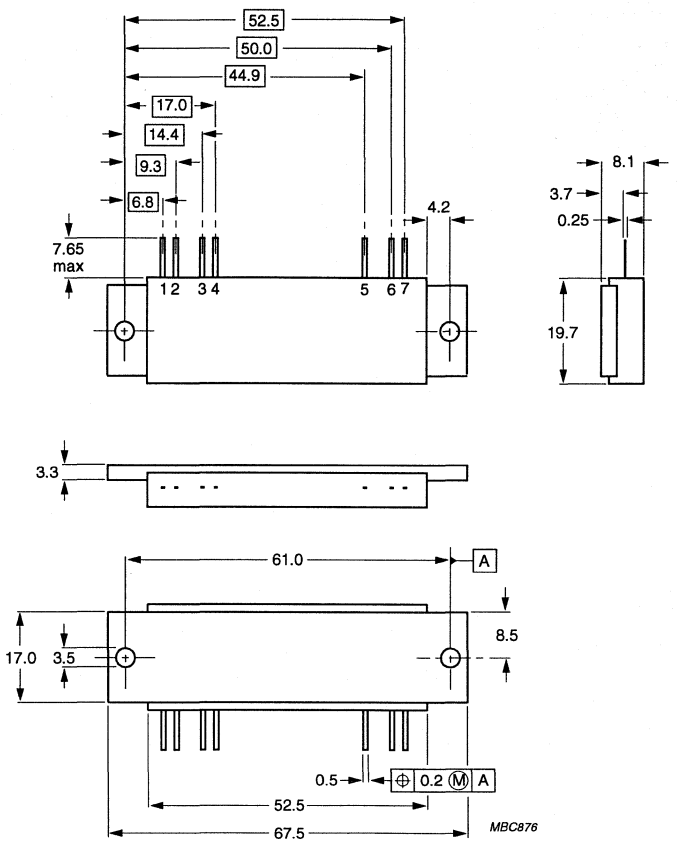
**List of components (see Fig.13)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1, C5 | multilayer ceramic chip capacitor | 1 nF | 4822 590 06614 |
| C2, C6 | tantalum capacitor | 6.8 μF; 35 V | 2022 001 00067 |
| C3, C7 | multilayer ceramic chip capacitor | 10 nF | 2222 852 47103 |
| C4, C8 | multilayer ceramic chip capacitor | 100 nF | 2222 852 47104 |
| L1, L2 | 1 turn 0.5 mm Cu wire on ferrite coil | 1 μH | 3122 108 20153 |
| Z1, Z2 | stripline; note 1 | 50 Ω | |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with epoxy dielectric ($\varepsilon_r = 4.7$); thickness $1/16$ inch.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.15 SOT132B.

# VHF power amplifier modules BGY135; BGY136

## DESCRIPTION

Broadband amplifier modules, designed for mobile communications equipments operating directly from 12 V vehicle electrical systems. The modules consist of a two stage RF amplifier using NPN transistor chips together with lumped-element matching components.

## PINNING - SOT132B

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | ground |
| 3 | $V_{S1}$ |
| 4 | ground |
| 5 | $V_{S2}$ |
| 6 | ground |
| 7 | RF output |
| flange | ground |

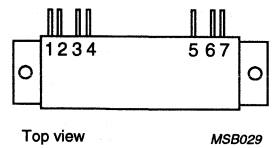



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

| TYPE NUMBER | MODE OF OPERATION | f (MHz) | $V_{S1}$; $V_{S2}$ (V) | $P_D$ (mW) | $P_L$ (W) | $Z_i$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|
| BGY135 | CW | 132 to 156 | 12.5 | 150 | ≥18 | 50 |
| BGY136 | CW | 146 to 174 | | | | |

## WARNING

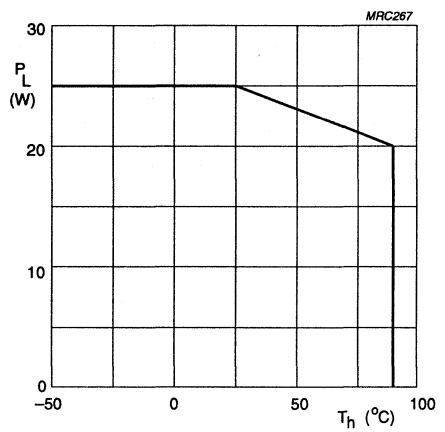
**Product and environmental safety - toxic materials**

This product contains beryllium oxide. The product is entirely safe provided that the BeO inserts are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$; $V_{S2}$ | DC supply voltage | – | 15.6 | V |
| $V_i$ | RF input terminal voltage | – | 25 | V |
| $V_o$ | RF output terminal voltage | – | 25 | V |
| $P_D$ | input drive power | – | 300 | mW |
| $P_L$ | load power | – | 25 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_h$ | heatsink operating temperature | –20 | +90 | °C |




VSWR = 1.

$V_{S1} = V_{S2} \leq 12.5$ V.

Fig.2 Load power derating.

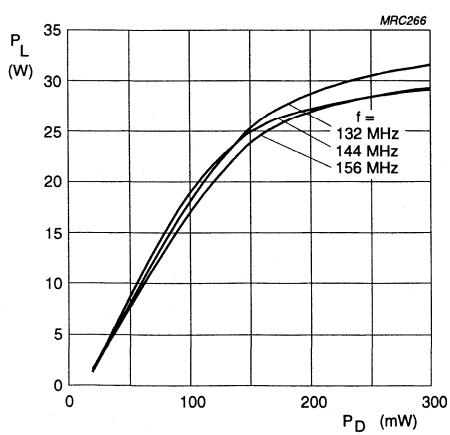
## CHARACTERISTICS

$T_h$ = 25 °C; $V_{S1} = V_{S2}$ = 12.5 V; $Z_i = Z_L$ = 50 Ω; $P_D$ = 150 mW.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{Q2}$ | leakage current | $V_{S1}$ = 0; $P_D$ = 0 | – | – | 1 | mA |
| f | frequency range | | | | | |
| | BGY135 | | 132 | – | 156 | MHz |
| | BGY136 | | 146 | – | 174 | MHz |
| $P_L$ | load power | | 18 | – | – | W |
| η | efficiency | $P_L$ = 18 W; note 1 | 38 | 45 | – | % |
| $H_2$; $H_3$ | harmonic rejection | $P_L$ = 18 W; note 1 | 25 | – | – | dB |
| $VSWR_{in}$ | input VSWR | $P_L$ = 18 W; note 1 | – | 1.5 | 3 | |
| | stability | VSWR = 3 : 1; $P_L$ = 2 to 20 W; $V_{S1} = V_{S2}$ = 10.8 to 15.6 V | – | – | –60 | dBc |
| | ruggedness | VSWR = 50 : 1; $P_L$ < 25 W; $P_D \leq$ 300 mW; $V_{S1} = V_{S2}$ = 15.6 V duration 5 s | no degradation | | | |

**Note**

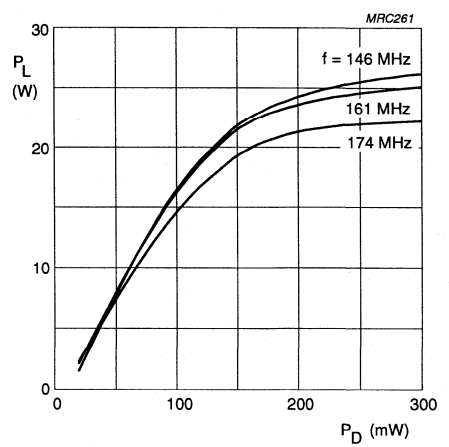
1. Adjust $P_D$ for specified $P_L$.




**BGY135**

$V_{S1} = V_{S2}$ = 12.5 V.

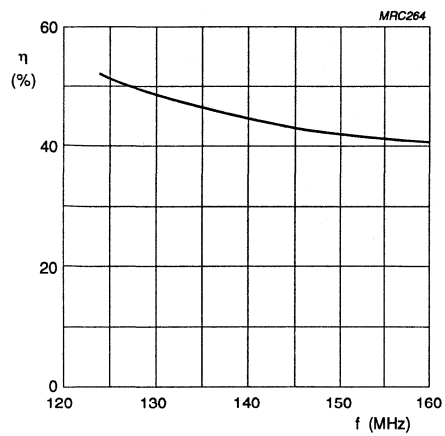
Fig.3 Load power as a function of drive power; typical values.




**BGY136**

$V_{S1} = V_{S2}$ = 12.5 V.

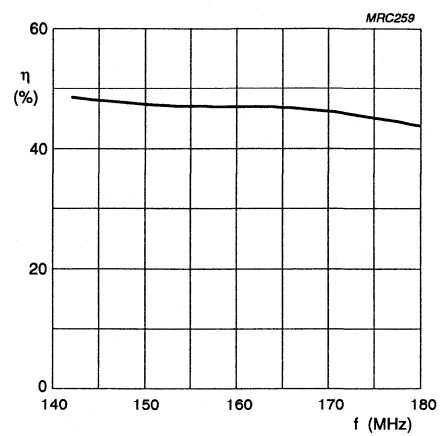
Fig.4 Load power as a function of drive power; typical values.




**BGY135**

$P_L$ = 18 W; $V_{S1} = V_{S2}$ = 12.5 V.

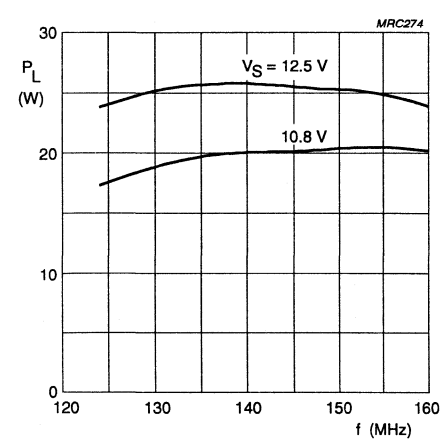
Fig.5 Efficiency as a function of frequency; typical values.




**BGY136**

$P_L$ = 18 W; $V_{S1} = V_{S2}$ = 12.5 V.

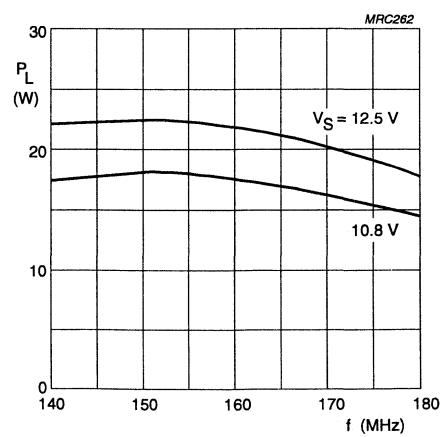
Fig.6 Efficiency as a function of frequency; typical values.




**BGY135**

$P_D$ = 150 mW.

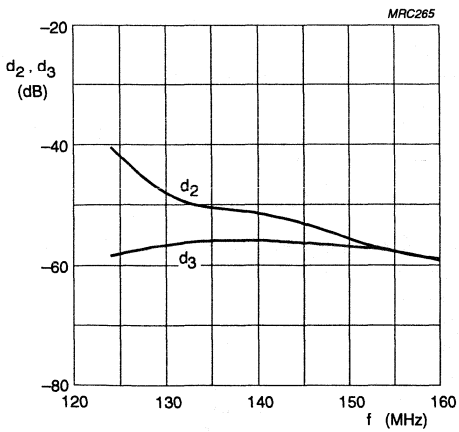
Fig.7 Load power as a function of frequency; typical values.




**BGY136**

$P_D$ = 150 mW.

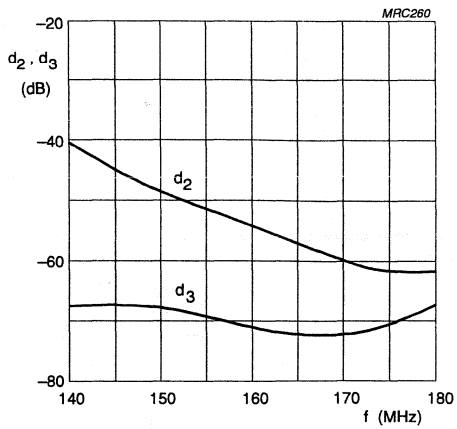
Fig.8 Load power as a function of frequency; typical values.




**BGY135**

$P_L$ = 18 W; $V_{S1} = V_{S2}$ = 12.5 V.

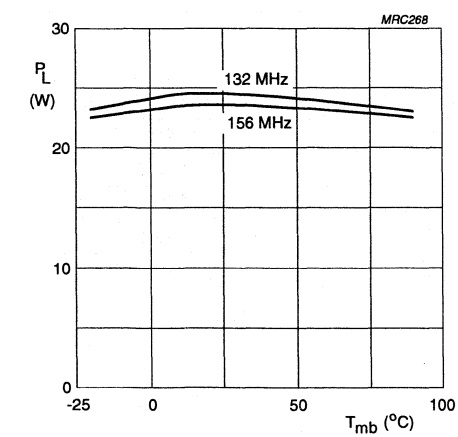
Fig.9 Harmonics as functions of frequency; typical values.




**BGY136**

$P_L$ = 18 W; $V_{S1} = V_{S2}$ = 12.5 V.

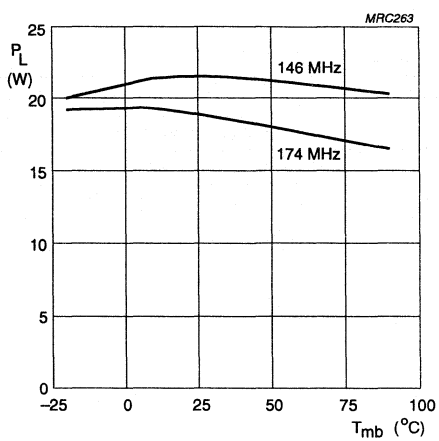
Fig.10 Harmonics as functions of frequency; typical values.




**BGY135**

$P_D$ = 150 mW; $V_{S1} = V_{S2}$ = 12.5 V.

Fig.11 Load power as a function of mounting base temperature; typical values.




**BGY136**

$P_D$ = 150 mW; $V_{S1} = V_{S2}$ = 12.5 V.

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

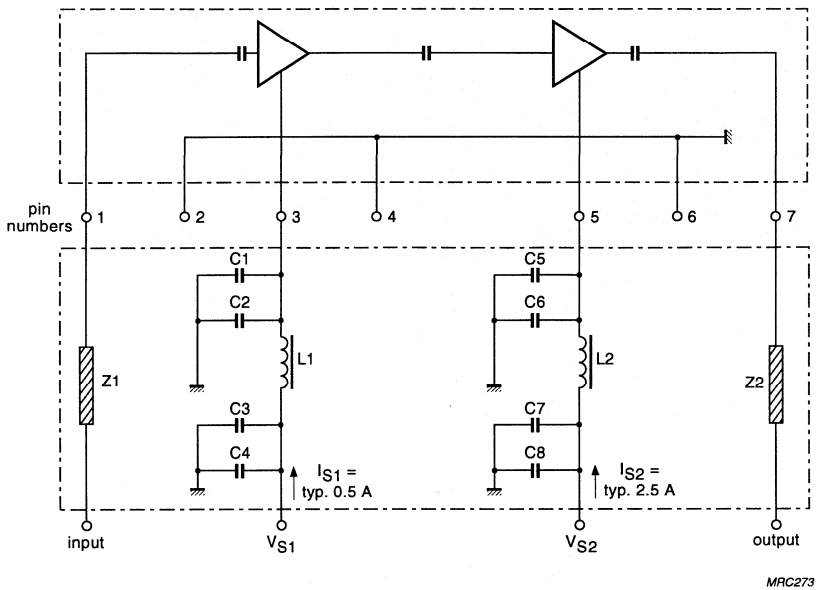



Fig.13 Test circuit.

**List of components (see Fig.13)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1, C5 | multilayer chip capacitor | 1 nF | 4822 590 06614 |
| C2, C6 | tantalum capacitor | 6.8 µF, 35 V | 2022 001 00067 |
| C3, C7 | multilayer chip capacitor | 10 nF | 2222 852 47103 |
| C4, C8 | multilayer chip capacitor | 100 nF | 2222 852 47104 |
| L1, L2 | 1 turn 0.5 mm copper wire on ferrite coil | 1 µH | 3122 108 20153 |
| Z1, Z2 | stripline (note 1) | 50 Ω | |

**Note**

1. The striplines are on a double copper-clad printed-circuit board, with epoxy dielectric ($\varepsilon_r = 4.7$), thickness 1/16 inch.

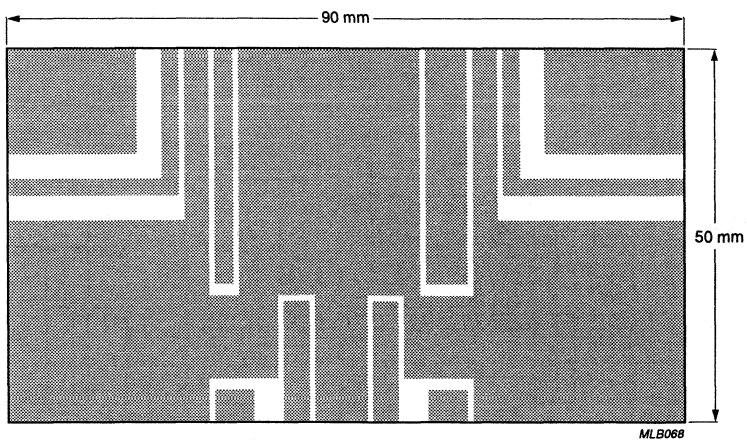
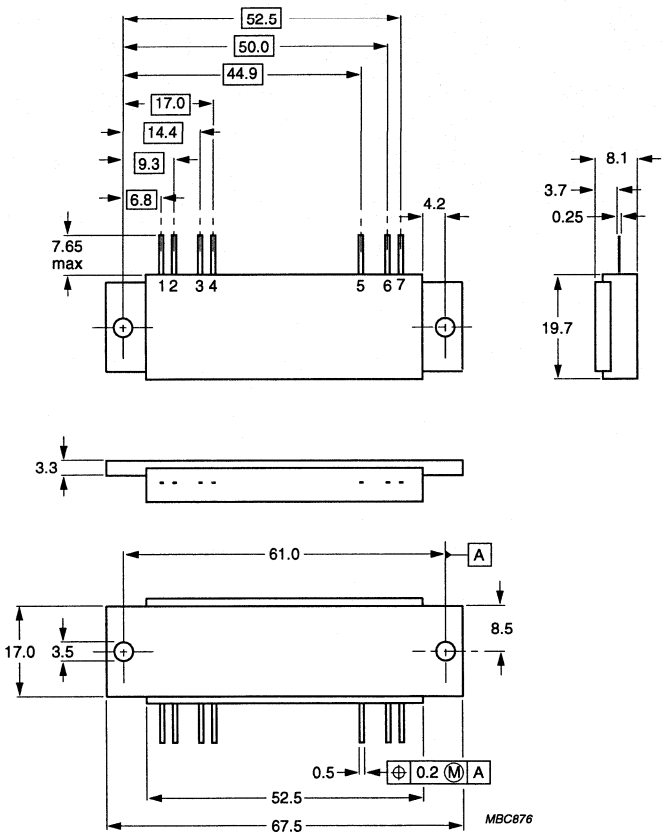



Fig.14 Layout for test circuit.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.15 SOT132B.

# VHF power amplifier module BGY143

## DESCRIPTION

Broadband amplifier module, designed for mobile communications equipment operating directly from 12 V electrical systems.
The module consists of a two stage RF amplifier using NPN transistor chips together with lumped-element matching components.

## PINNING - SOT132B

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | ground |
| 3 | $V_{S1}$ |
| 4 | ground |
| 5 | $V_{S2}$ |
| 6 | ground |
| 7 | RF output |
| flange | ground |

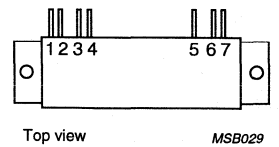



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

| MODE OF OPERATION | f (MHz) | $V_{S1}$; $V_{S2}$ (V) | $P_D$ (mW) | $P_L$ (W) | $Z_i$; $Z_L$ (Ω) |
|---|---|---|---|---|---|
| CW | 146 to 174 | 12.5 | 150 | ≥13 | 50 |

## WARNING

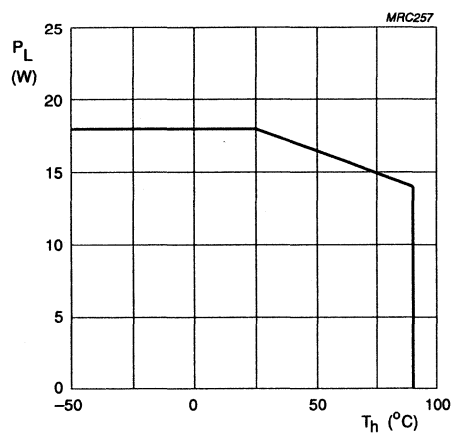
**Product and environmental safety - toxic materials**

This product contains beryllium oxide. The product is entirely safe provided that the BeO inserts are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

## LIMITING VALUES

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

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$; $V_{S2}$ | DC supply voltage | – | 15.6 | V |
| $V_i$ | RF input terminal voltage | – | 25 | V |
| $V_o$ | RF output terminal voltage | – | 25 | V |
| $P_D$ | input drive power | – | 300 | mW |
| $P_L$ | load power | – | 18 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_h$ | heatsink operating temperature | –20 | +90 | °C |




VSWR = 1.

$V_{S1} = V_{S2} \leq 12.5$ V.

Fig.2 Load power derating.

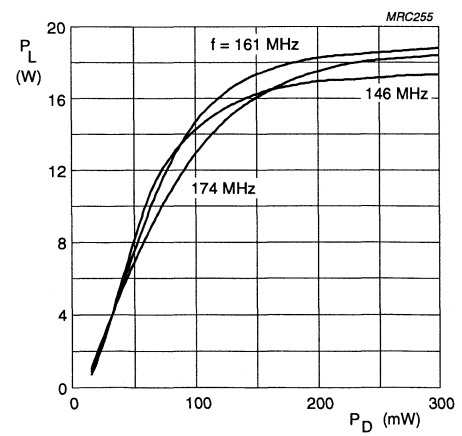
## CHARACTERISTICS

$T_h$ = 25 °C; $V_{S1} = V_{S2}$ = 12.5 V; $Z_i = Z_L$ = 50 Ω; $P_D$ = 150 mW.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{Q2}$ | leakage current | $V_{S1}$ = 0; $P_D$ = 0 | – | – | 10 | mA |
| f | frequency range | | 146 | – | 174 | MHz |
| $P_L$ | load power | | 13 | – | – | W |
| η | efficiency | $P_L$ = 13 W; note 1 | 40 | 48 | – | % |
| H | harmonic rejection | $P_L$ = 13 W; note 1 | 25 | 34 | – | dB |
| $VSWR_{in}$ | input VSWR | $P_L$ = 13 W; note 1 | – | 1.5 | 3 | |
| | stability | VSWR = 3 : 1; $P_L$ = 1 to 15 W; $V_{S1} = V_{S2}$ = 10.8 to 15.6 V | – | – | –60 | dBc |
| | ruggedness | VSWR = 50 : 1; $P_L$ < 18 W; $P_D \leq$ 300 mW; $V_{S1} = V_{S2}$ = 15.6 V; duration 5 s | no degradation | | | |

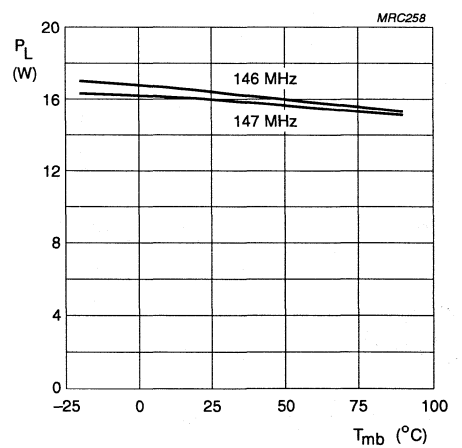
**Note**

1. Adjust $P_D$ for specified $P_L$.




$V_{S1} = V_{S2}$ = 12.5 V.

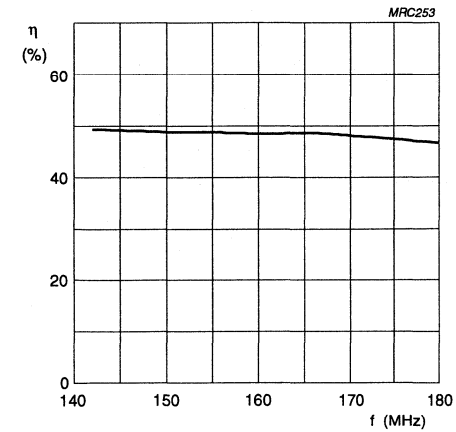
Fig.3 Load power as a function of drive power; typical values.




$P_D$ = 150 mW.

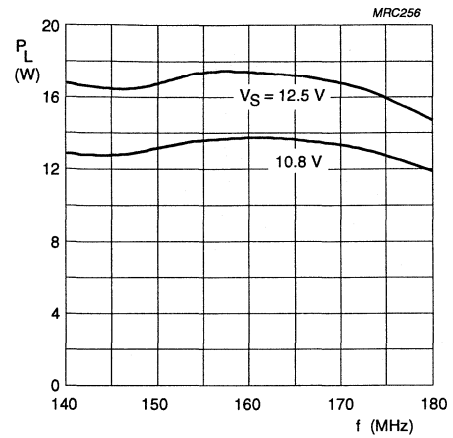
$V_{S1} = V_{S2}$ = 12.5 V.

Fig.4 Load power as a function of mounting base temperature; typical values.



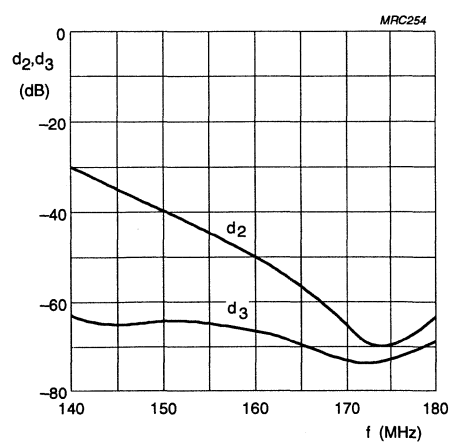

$P_L$ = 13 W.
$V_{S1} = V_{S2}$ = 12.5 V.

Fig.5 Efficiency as a function of frequency; typical values.




$P_D$ = 150 mW.

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




$P_L$ = 13 W.
$V_{S1} = V_{S2}$ = 12.5 V.

Fig.7 Harmonics as functions of frequency; typical values.

**List of components (see Fig.8)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1, C5 | multilayer chip capacitor | 1 nF | 4822 590 06614 |
| C2, C6 | tantalum capacitor | 6.8 μF, 35 V | 2022 001 00067 |
| C3, C7 | multilayer chip capacitor | 10 nF | 2222 852 47103 |
| C4, C8 | multilayer chip capacitor | 100 nF | 2222 852 47104 |
| L1, L2 | 1 turn 0.5 mm copper wire on ferrite coil | 1 μH | 3122 108 20153 |
| Z1, Z2 | stripline; note 1 | 50 Ω | |

**Note**

1. The striplines are on a double copper-clad printed-circuit board, with epoxy dielectric ($\varepsilon_r = 4.7$), thickness 1/16 inch.

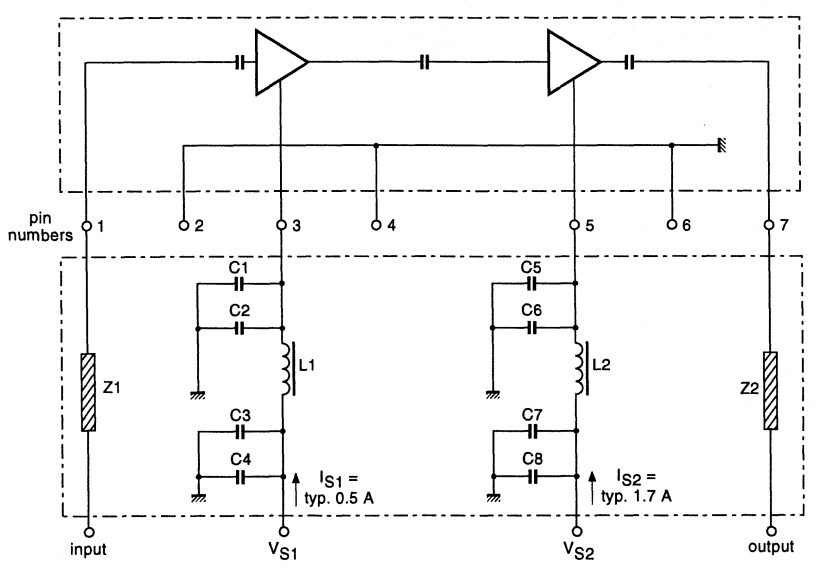



Fig.8 Test circuit.

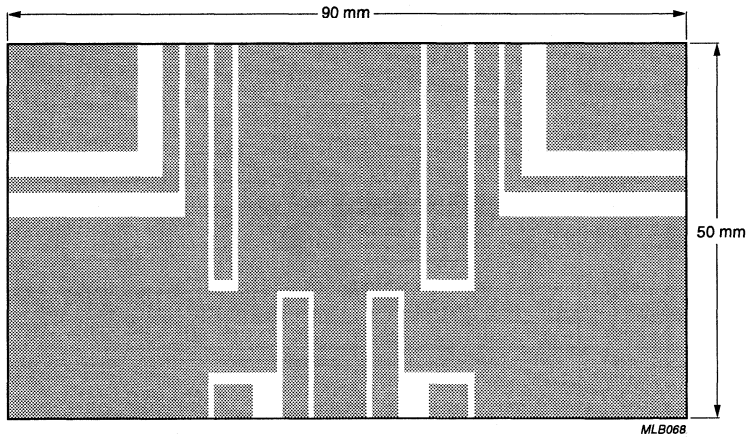
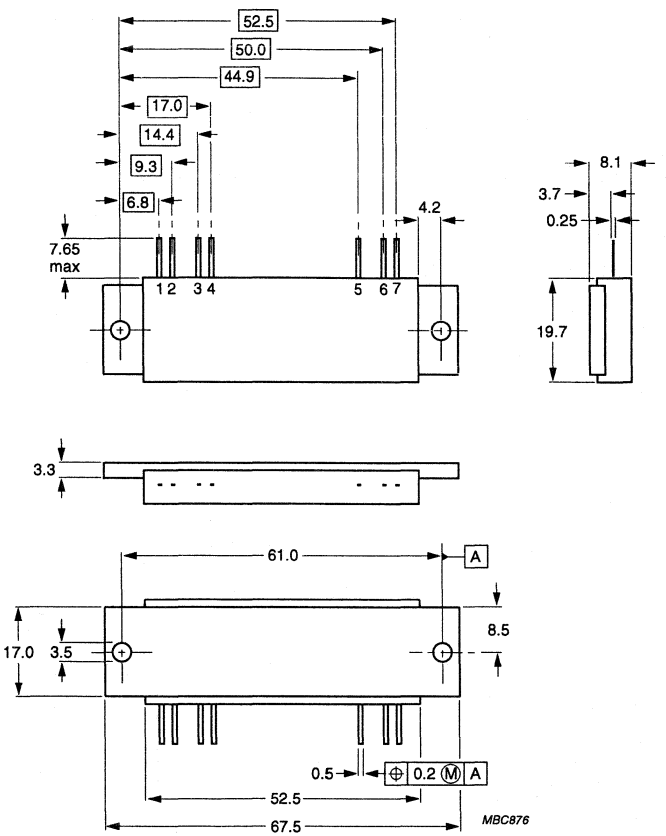



Fig.9 Layout for test circuit.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.10 SOT132B.

# VHF amplifier module BGY145A

## DESCRIPTION

The BGY145A is a RF amplifier module, designed for use in transmitters of mobile communications equipment powered by vehicles with 12.5 V battery supplies.

The module is a two-stage transistor amplifier and consists of two RF npn transistors mounted on a ceramic substrate, together with surface mounted components that make up the matching and bias circuits.

The module will provide 29 W RF power into a 50 Ω load, when operated at nominal conditions within the frequency range of 68 to 88 MHz.

## PINNING - SOT183A

| PIN | DESCRIPTION |
|---|---|
| 1 | output |
| 2 | $V_{S2}$ |
| 3 | $V_{S1}$ |
| 4 | input |
| flange | ground |

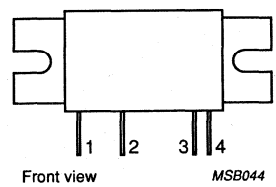



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

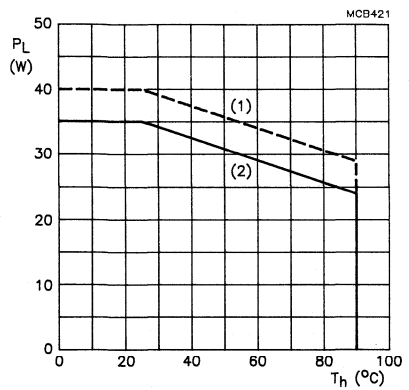
Mode of operation: continuous wave.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency range | | 68 | – | 88 | MHz |
| $P_D$ | RF output power | $P_D$ = 150 mW | 29 | – | – | W |
| $G_p$ | RF power gain | $P_L$ = 29 W | 22.9 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 29 W | 37 | – | – | % |
| $V_{S1}$, $V_{S2}$ | DC supply voltage | | – | 12.5 | – | V |
| $Z_i$ | input impedance | | – | 50 | – | Ω |
| $Z_L$ | output load impedance | | – | 50 | – | Ω |

## LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$, $V_{S2}$ | DC supply voltage | – | 15 | V |
| $\pm V_i$ | RF input terminal voltage | – | 25 | V |
| $\pm V_o$ | RF output terminal voltage | – | 25 | V |
| $P_D$ | RF input power | – | 300 | mW |
| $P_L$ | RF output power (see Fig.2) | – | 40 | W |
| $T_{stg}$ | storage temperature range | –30 | 100 | °C |
| $T_h$ | heatsink operating temperature | – | 90 | °C |




(1) Matched.

(2) 3:1 mismatch.

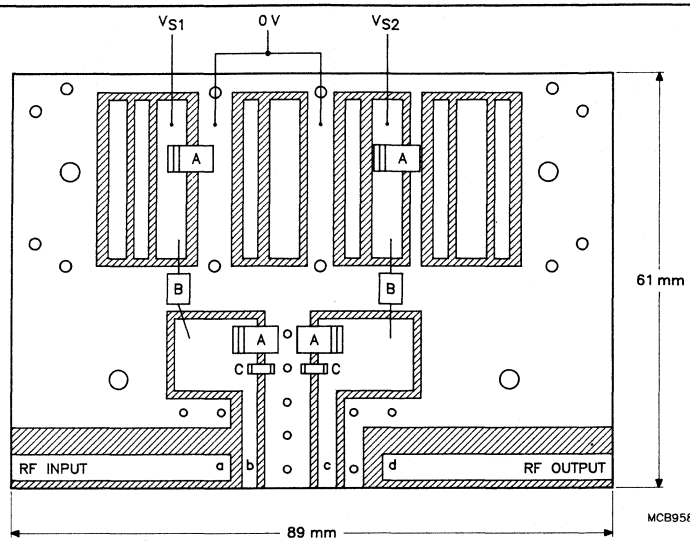
Fig.2 Load power derating.

## CHARACTERISTICS

$T_h$ = 25 °C; $V_{S1}$ = $V_{S2}$ = 12.5 V; $R_S$ = $R_L$ = 50 Ω; frequency range = 68 to 88 MHz.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{Q1}$ | quiescent current | $P_D$ = 0 | – | 10 | 25 | mA |
| $I_{Q2}$ | quiescent current | $P_D$ = 0 | – | – | 35 | mA |
| $P_L$ | RF output power | $P_D$ = 150 mW | 29 | – | – | W |
| $G_p$ | RF power gain | $P_L$ = 29 W | 22.9 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 29 W | 37 | – | – | % |
| $H_{R2}$ | 2nd harmonic output | $P_L$ = 29 W | – | – | –30 | dBc |
| | input VSWR with respect to 50 Ω | $P_L$ = 29 W | – | – | 2:1 | |

## APPLICATION INFORMATION




Epoxy fibre-glass board, 1/16 inch thick, $\varepsilon_r = 4.5$.

A: 10 µF, 16 V, tantalum chip capacitor.

B: 2 turns FX1115 Ferroxcube bead.

C: 0.1 µF, 60 V, ceramic multilayer chip capacitor.

Track widths 'a' and 'd' (50 Ω) = 4 mm.

Track width 'b' = 2.5 mm.

Track width 'c' = 3 mm.

Circles indicate the positions of through rivets.

Fig.3 Test jig.

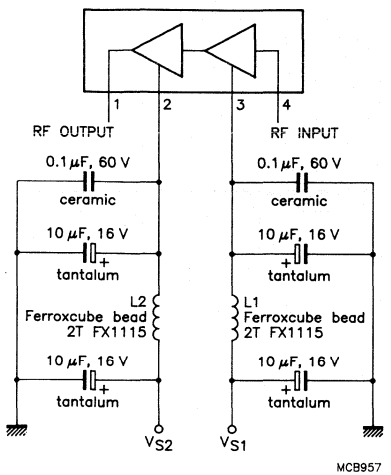



Fig.4 Decoupling arrangement.

## STABILITY

The module is stable when operated into a load of 3:1 at all phases, under the following conditions, providing maximum ratings are not exceeded:

$P_D$ 30 to 300 mW; $P_L \leq 40$ W; $V_{S1}$ = 6 to 15 V; $V_{S2}$ = 10 to 15 V and $V_{S1} < V_{S2}$.

## RUGGEDNESS

The output power of the module into a 50 Ω load will be unchanged after one minute of operation into a load mismatch of 20:1 (any phase), providing maximum ratings are not exceeded.

$V_{S1}$, $V_{S2} \leq 15$ V; $T_h \leq 90$ °C; $P_L \leq 40$ W; $P_D < 300$ mW.

## RF POWER CONTROL

The module is not designed to be operated over a wide range of output levels. The aim of the output power control is to set the nominal output level. The preferred method of output power control is by varying the drive power between 30 and 200 mW. Another option is to vary $V_{S1}$ between 6 and 12.5 V.

## CAUTIONS

The main earth return path for this module is via the flange. Therefore, it is important that the heatsink is well earthed and that the return paths are kept as short as possible. Failure to do this may result in loss of output power or oscillation, which will have a detrimental effect upon the life of the module.

The RF output connection should be made to correctly designed 50 Ω terminals. Failure to do so will result in a mismatch being presented to the module, with a resultant reduction in module life.

The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C, for not more than 10 seconds at a distance of at least 1 mm from the plastic.

Under no circumstances must the maximum specified operating or storage temperatures be exceeded, even for short periods.

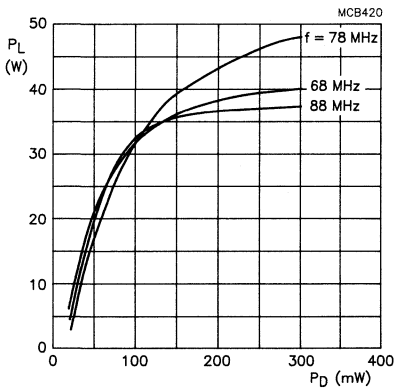



Fig.5 Load power as a function of drive power; $V_{S1} = V_{S2} = 12.5$ V; typical values.

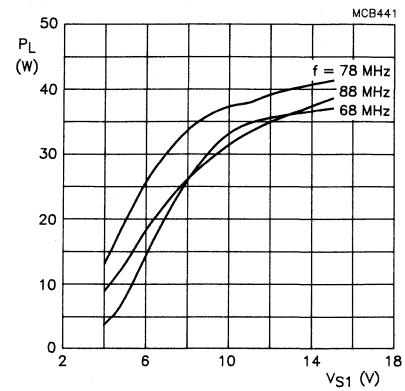



Fig.6 Load power as a function of supply voltage $V_{S1}$; $P_D = 150$ mW; typical values.

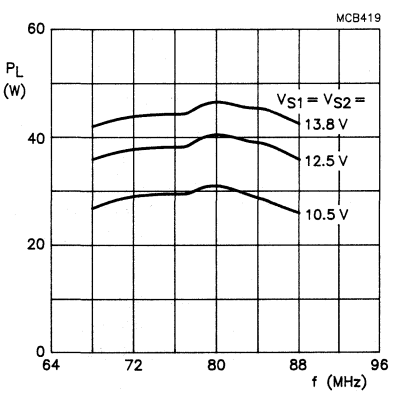



Fig.7 Load power as a function of frequency; $P_D = 150$ mW; typical values.

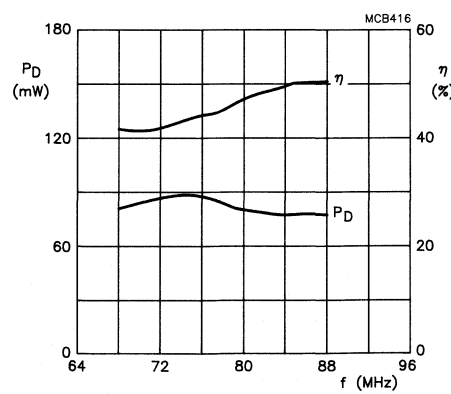



Fig.8 Efficiency and drive power as functions of frequency; $P_L = 29$ W; $V_{S1} = V_{S2} = 12.5$ V; typical values.

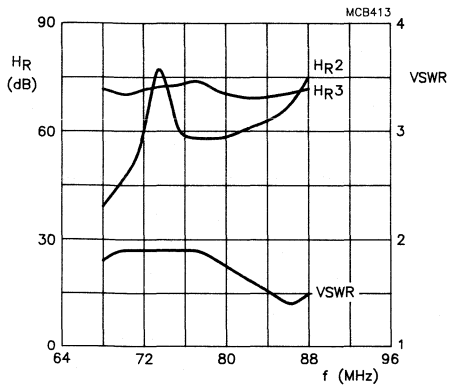
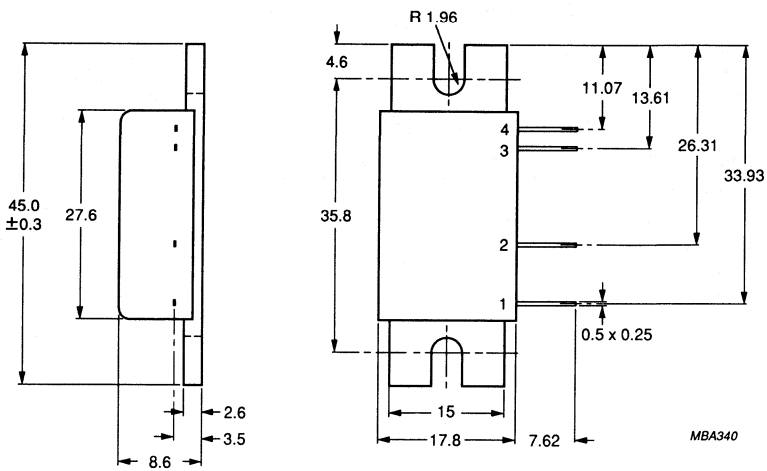



Fig.9 Second and third harmonic rejection as a function of frequency; $P_L$ = 29 W; $V_{S1} = V_{S2}$ = 12.5 V; typical values.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.10 SOT183A.

# VHF amplifier module BGY145B

## DESCRIPTION

The BGY145B is a RF amplifier module, designed for use in transmitters of mobile communications equipment powered by vehicles with 12.5 V battery supplies.

The module is a two-stage transistor amplifier and consists of two RF npn transistors mounted on a ceramic substrate, together with surface mounted components that make up the matching and bias circuits.

The module will provide 28 W RF power into a 50 Ω load, when operated at nominal conditions within the frequency range of 146 to 174 MHz.

## PINNING - SOT183A

| PIN | DESCRIPTION |
|---|---|
| 1 | output |
| 2 | $V_{S2}$ |
| 3 | $V_{S1}$ |
| 4 | input |
| flange | ground |

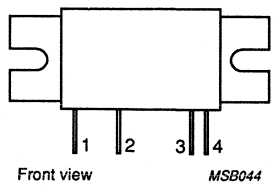



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

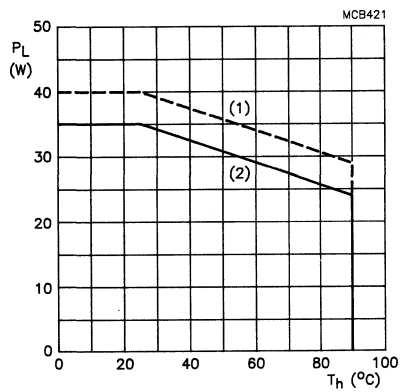
Mode of operation: continuous wave.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency range | | 146 | – | 174 | MHz |
| $P_D$ | RF output power | $P_D$ = 300 mW | 28 | – | – | W |
| $G_p$ | RF power gain | $P_L$ = 28 W | 19.7 | – | – | dB |
| η | efficiency | $P_L$ = 28 W | 40 | – | – | % |
| $V_{S1}$, $V_{S2}$ | DC supply voltage | | – | 12.5 | – | V |
| $Z_i$ | input impedance | | – | 50 | – | Ω |
| $Z_L$ | output load impedance | | – | 50 | – | Ω |

## LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$, $V_{S2}$ | DC supply voltage | – | 15.5 | V |
| $\pm V_i$ | RF input terminal voltage | – | 25 | V |
| $\pm V_o$ | RF output terminal voltage | – | 25 | V |
| $P_D$ | RF input power | – | 450 | mW |
| $P_L$ | RF output power (see Fig.2) | – | 40 | W |
| $T_{stg}$ | storage temperature range | –30 | 100 | °C |
| $T_h$ | heatsink operating temperature | – | 90 | °C |




(1) Matched.

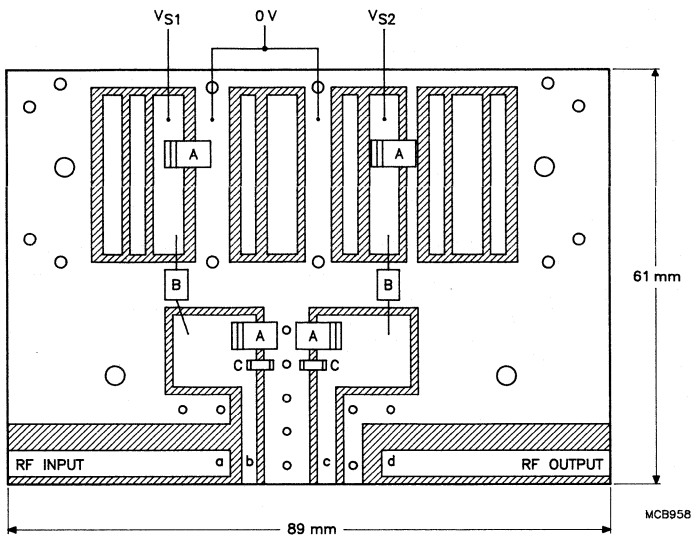
(2) 3:1 mismatch.

Fig.2 Load power derating.

## CHARACTERISTICS

$T_h$ = 25 °C; $V_{S1} = V_{S2}$ = 12.5 V; $R_S = R_L$ = 50 Ω; frequency range = 146 to 174 MHz.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $I_{Q1}$ | quiescent current | $P_D$ = 0 | – | 10 | 25 | mA |
| $I_{Q2}$ | quiescent current | $P_D$ = 0 | – | – | 35 | mA |
| $P_L$ | RF output power | $P_D$ = 300 mW | 28 | – | – | W |
| $G_p$ | RF power gain | $P_L$ = 28 W | 19.7 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 28 W | 40 | – | – | % |
| $H_{R2}$, $H_{R3}$ | 2nd & 3rd harmonic outputs | $P_L$ = 28 W | – | – | –30 | dBc |
| | input VSWR with respect to 50 Ω | $P_L$ = 28 W | – | – | 2:1 | |




Epoxy fibre-glass board, 1/16 inch thick, $\varepsilon_r = 4.5$.

A: 10 µF, 16 V, tantalum chip capacitor.

B: 2 turns FX1115 Ferroxcube bead.

C: 0.1 µF, 60 V, ceramic multilayer chip capacitor.

Track widths 'a' and 'd' (50 Ω) = 4 mm.

Track width 'b' = 2.5 mm.

Track width 'c' = 3 mm.

Circles indicate the positions of through rivets.

Fig.3 Test jig.

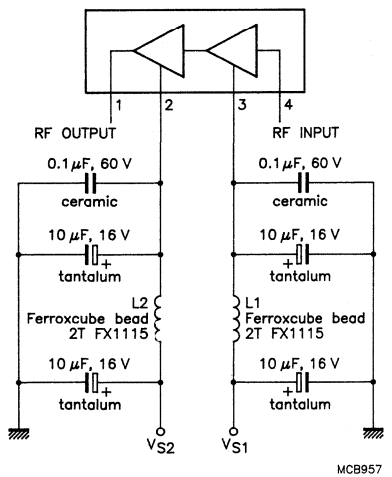



Fig.4 Decoupling arrangement.

## STABILITY

The module is stable when operated into a load of 3:1 at all phases, providing the operating conditions are as follows:

$P_D$ 30 to 450 mW; $P_L \geq 3$ to $\leq 40$ W;
$V_{S1}$ = 3 to 15.5 V;
$V_{S2}$ = 10.5 to 15.5 V and $V_{S1} < V_{S2}$.

## RUGGEDNESS

The output power of the module into a 50 Ω load will be unchanged after one minute of operation into a load mismatch of 20:1 (any phase), providing maximum ratings are not exceeded.

$V_{S1}$, $V_{S2} \leq 15.5$ V; $T_h \leq 90$ °C;
$P_L \leq 40$ W; $P_D < 450$ mW.

## RF POWER CONTROL

The module is designed to be operated at constant output power. However, the module may be operated over a range of output power levels by varying the input drive power level, $P_{IN}$. For stable operation, care must be taken to maintain conditions within the specified range:

$P_D$ 30 to 450 mW; $V_{S1}$ = 3 V to $V_{S2}$;
$P_L$ = 3 to 28 W.

## CAUTIONS

The main earth return path for this module is via the flange. Therefore, it is important that the heatsink is well earthed and that the return paths are kept as short as possible. Failure to do this may result in loss of output power or oscillation, which will have a detrimental effect upon the life of the module.

The RF output connection should be made to correctly designed 50 Ω terminals. Failure to do so will result in a mismatch being presented to the module, with a resultant reduction in module life.

The leads of the devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C, for not more than 10 seconds at a distance of at least 1 mm from the plastic.

Under no circumstances must the maximum specified operating or storage temperatures be exceeded, even for short periods.

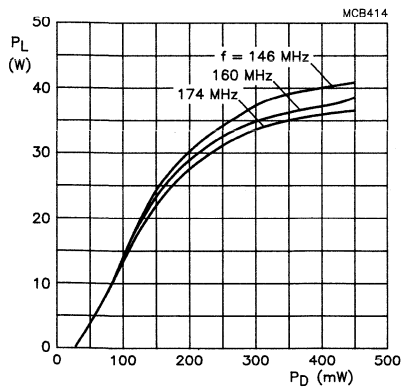



Fig.5 Load power as a function of drive power; $V_{S1} = V_{S2} = 12.5$ V; typical values.

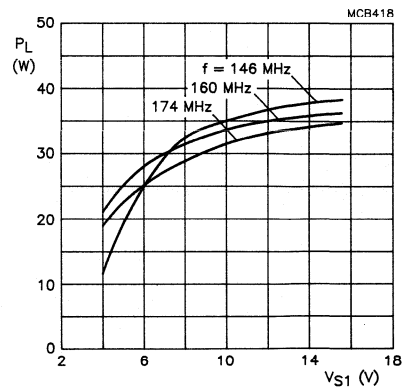



Fig.6 Load power as a function of supply voltage $V_{S1}$; $P_D = 300$ mW; $V_{S2} = 12.5$ V; typical values.

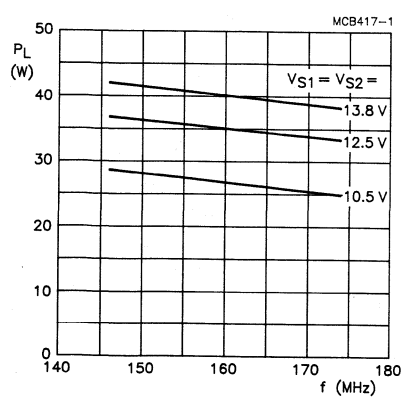



Fig.7 Load power as a function of frequency; $P_D = 300$ mW; typical values.

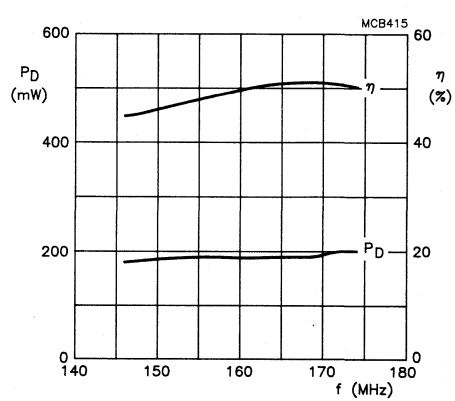



Fig.8 Efficiency and drive power as functions of frequency; $P_L = 28$ W; $V_{S1} = V_{S2} = 12.5$ V; typical values.

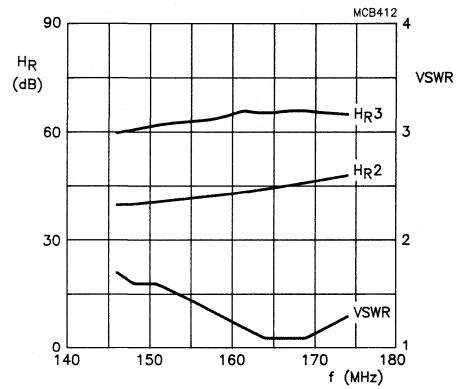
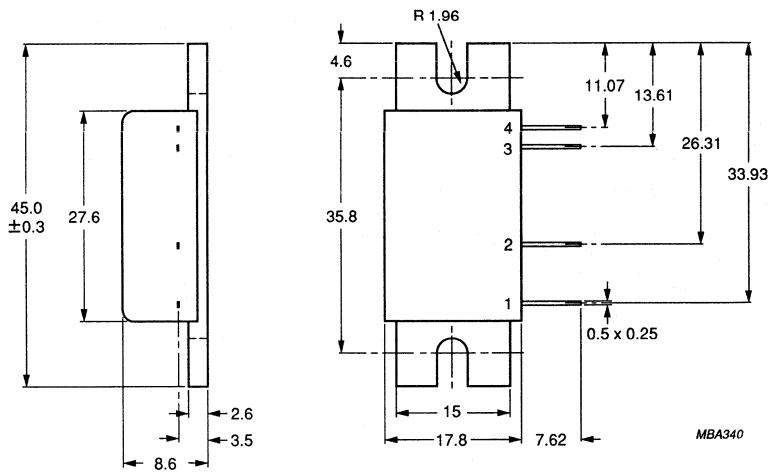



Fig.9 Second and third harmonic rejection as a function of frequency; $P_L$ = 28 W; $V_{S1} = V_{S2}$ = 12.5 V; typical values.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.10 SOT183A.

# UHF amplifier module BGY200

## FEATURES

- 7.2 V nominal supply voltage
- 3.5 W output power
- Easy control of output power by DC voltage.

## APPLICATIONS

- Digital cellular radio systems (GSM systems) operating in the 890 to 915 MHz frequency range.

## PINNING - SOT350

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_{S1}$ |
| 4 | $V_{S2}$ |
| 5 | RF output |
| mounting base | ground |

## DESCRIPTION

The BGY200 is a four-stage UHF amplifier module. It consists of four NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

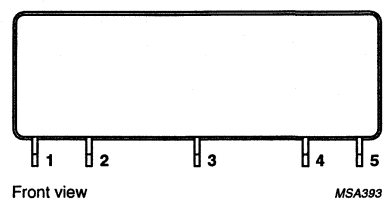



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_{S1}$; $V_{S2}$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| pulsed; $\delta$ = 1 : 8 | 890 to 915 | 7.2 | 4 | ≥3.5 | ≥35.5 | typ. 43 | 50 |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | $V_C \leq 4$ V | – | 10 | V |
| $V_{S2}$ | DC supply voltage | $V_C \leq 4$ V | – | 10 | V |
| $V_C$ | DC control voltage | | – | 4.5 | V |
| $P_D$ | input drive power | | – | 2 | mW |
| $P_L$ | load power | | – | 4 | W |
| $T_{stg}$ | storage temperature | | –40 | +100 | °C |
| $T_c$ | case temperature | | –30 | +100 | °C |

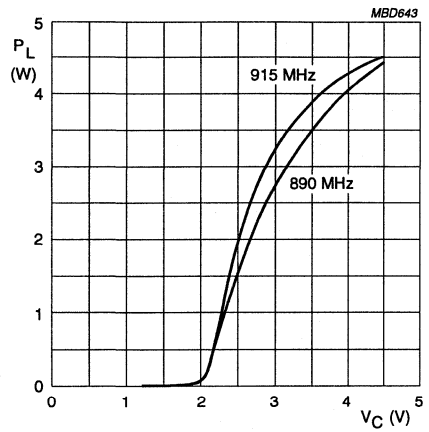
## CHARACTERISTICS

$T_{mb} = 25$ °C; $Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 4$ V; $V_{S1} = V_{S2} = 7.2$ V; f = 890 to 915 MHz; $\delta = 1 : 8$; $t_p = 575\ \mu$s; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | | 3.5 | – | – | W |
| $P_L$ | load power | $V_{S1} = V_{S2} = 6.2$ V | 2.5 | – | – | W |
| $G_p$ | power gain | $P_L = 3.5$ W; note 1 | 35.5 | – | – | dB |
| $\eta$ | efficiency | $P_L = 3.5$ W; note 1 | 40 | 43 | – | % |
| $H_2$ | second harmonic | $P_L = 3.5$ W; note 1 | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L = 3.5$ W; note 1 | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L = 3.5$ W; note 1 | – | – | 2 : 1 | |
| $I_C$ | control current | | – | – | 0.5 | mA |
| $I_{Q1} + I_{Q2}$ | total leakage current | $V_C < 0.5$ V | – | – | 200 | µA |
| | isolation | $V_C < 0.5$ V | – | – | –36 | dBm |
| | stability | VSWR ≤ 6 : 1 through all phases; $P_L \leq 3.5$ W; $P_D = 0.7$ to 2 mW; $V_{S1} = V_{S2} = 6$ to 9 V; $V_C = 0$ to 4 V | – | – | –60 | dBc |
| | control bandwidth | | 1 | – | – | MHz |
| $P_n$ | noise power | $P_L \leq 3.5$ W; notes 1 and 2; bandwidth = 30 kHz; 20 MHz above transmitter band | – | –80 | – | dBm |
| | ruggedness | VSWR ≤ 10 : 1 through all phases; $V_{S1} = V_{S2} = 9$ V; $P_L = 4$ W; note 1 | no degradation | | | |

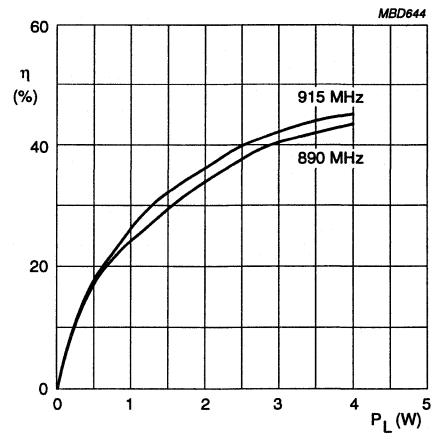
**Notes**

1. Adjust $V_C$ for specified $P_L$.
2. Measured under CW conditions.



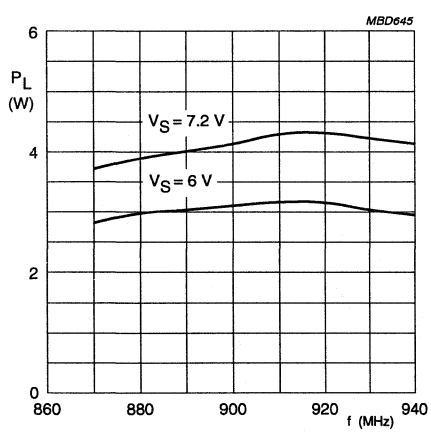

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 7.2$ V; $T_{mb} = 25\ ^\circ C$; $P_D = 1$ mW.
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



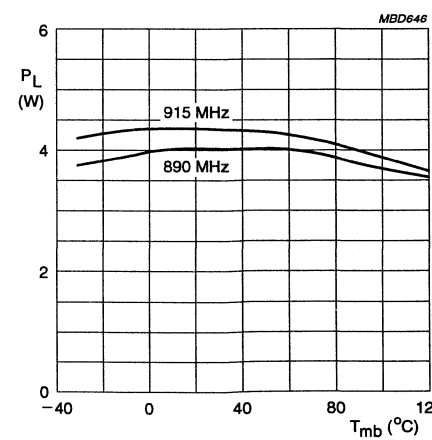

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 7.2$ V; $T_{mb} = 25\ ^\circ C$; $P_D = 1$ mW.
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



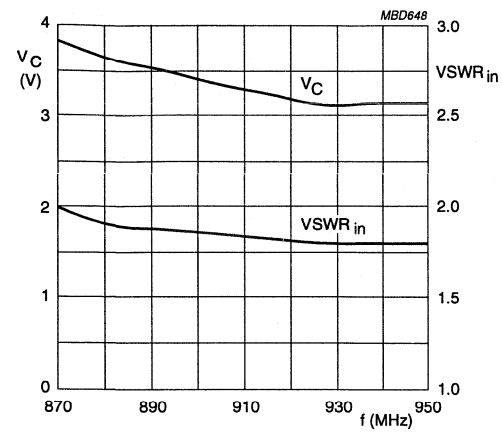

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $T_{mb} = 25\ ^\circ C$; $P_D = 1$ mW;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



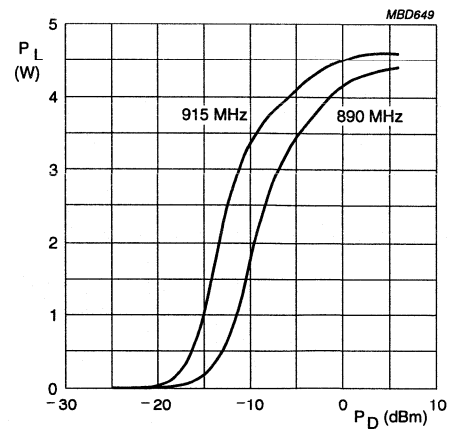

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $V_{S1} = V_{S2} = 7.2$ V; $P_D = 1$ mW.
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



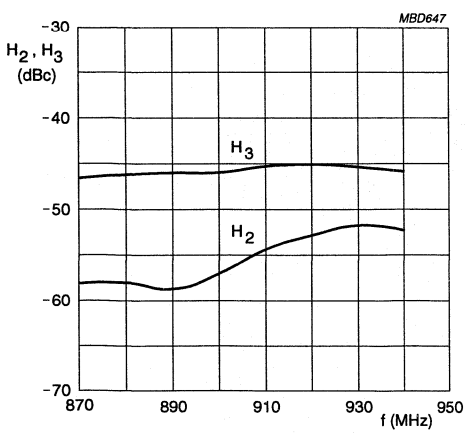

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 7.2$ V; $T_{mb} = 25$ °C; $P_L = 3.5$ W; $P_D = 1$ mW; $\delta = 1:8$; $t_p = 575$ µs.

Fig.6 Control voltage and VSWR input as functions of frequency; typical values.



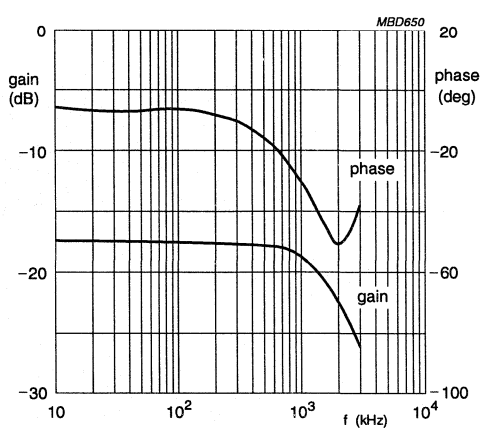

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $V_{S1} = V_{S2} = 7.2$ V; $T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575$ µs.

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




$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 7.2$ V; $T_{mb} = 25$ °C; $P_L = 3.5$ W; $P_D = 1$ mW. $\delta = 1:8$; $t_p = 575$ µs.

Fig.8 Harmonics as functions of frequency; typical values.




$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 7.2$ V; $T_{mb} = 25$ °C; $P_L = 35$ dBm; $P_D = 1$ mW; $\delta = 1:8$; $t_p = 575$ µs.

Fig.9 Control bandwidth in terms of gain and phase-shift as functions of frequency; typical values.

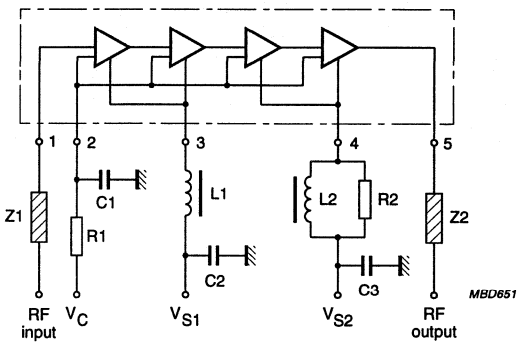



Fig.10 Test circuit.

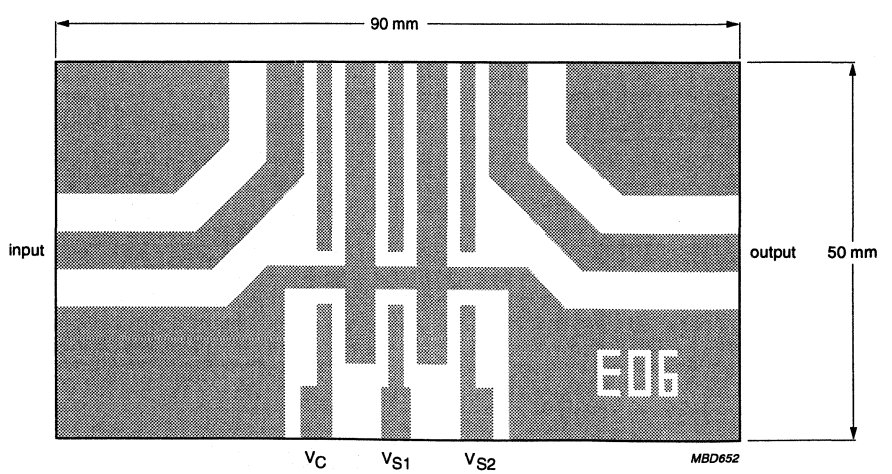



Fig.11 Printed-circuit board layout.

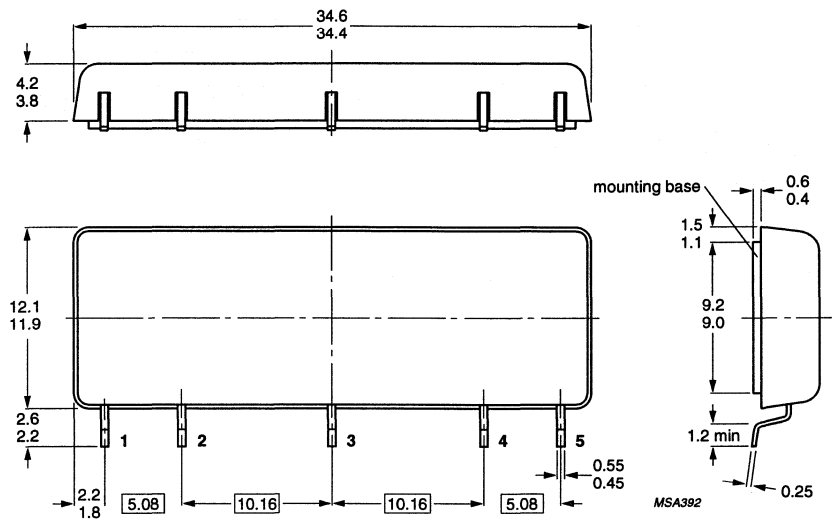
**List of components (see Fig.10)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1 | multilayer ceramic chip capacitor | 470 pF | 2222 861 12471 |
| C2 | tantalum capacitor | 2.2 μF | – |
| C3 | electrolytic capacitor | 68 μF | – |
| L1, L2 | 1 turn 0.4 mm copper wire on grade 3B core | 0.9 μH | 4330 030 32221 |
| Z1, Z2 | stripline; note 1 | 50 Ω | – |
| R1 | metal film resistor | 78 Ω; 0.4 W | – |
| R2 | metal film resistor | 5 Ω; 0.4 W | – |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.2$); thickness $1/16$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.12 SOT350.

# UHF amplifier module BGY201

## FEATURES

- 12.5 V nominal supply voltage
- 14 W output power
- Easy control of output power by pulsed DC voltage.

## APPLICATIONS

- Digital cellular radio systems with Time Division Multiple Axis (TDMA) operation (GSM systems) in the 890 to 915 MHz frequency range.

## PINNING - SOT278A

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_{S1}$ |
| 4 | $V_{S2}$ |
| 5 | RF output |
| flange | ground |

## DESCRIPTION

The BGY201 is a five-stage UHF amplifier module. It consists of five NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

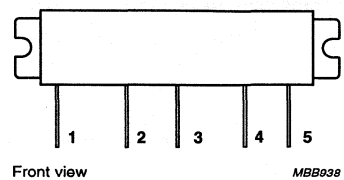



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_{S1}$;$V_{S2}$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| pulsed; $\delta$ = 1 : 8 | 890 to 915 | 12.5 | ≤4 | 14 | ≥41.5 | typ. 38 | 50 |

## WARNING

**Product and environmental safety - toxic materials**

This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

## LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | $V_C$ = 4 V | – | 15.6 | V |
| $V_{S2}$ | DC supply voltage | $V_C$ = 4 V | – | 15.6 | V |
| $V_C$ | DC control voltage | | – | 5 | V |
| $P_D$ | input drive power | | – | 2 | mW |
| $P_L$ | load power | | – | 16 | W |
| $T_{stg}$ | storage temperature | | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | | –30 | +90 | °C |

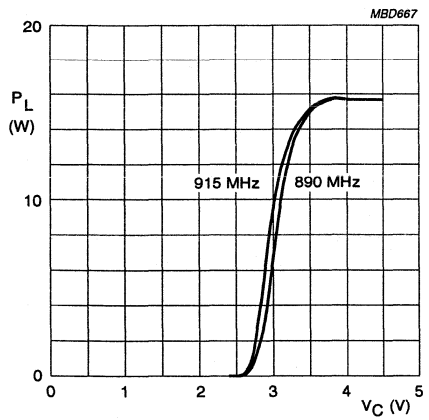
## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 1 mW; $V_C$ = 4 V; $V_{S1} = V_{S2}$ = 12.5 V; f = 890 to 915 MHz; δ = 1 : 8; $t_p$ = 575 µs; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | | 14 | – | – | W |
| $G_p$ | power gain | $P_L$ = 14 W; note 1 | 41.5 | – | – | dB |
| η | efficiency | $P_L$ = 14 W; note 1 | 35 | 38 | – | % |
| $H_2$ | second harmonic | $P_L$ = 14 W; note 1 | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L$ = 14 W; note 1 | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 14 W; note 1 | – | – | 2 : 1 | |
| $I_C$ | control current | $P_L$ = 14 W; note 1 | – | – | 1 | mA |
| $I_{Q2}$ | leakage current | $V_{S1} = V_C$ = 0 | – | – | 1 | mA |
| | isolation | $V_C$ < 0.5 V | – | – | –36 | dBm |
| | stability | VSWR ≤ 6 : 1 through all phases; $P_L$ ≤ 14 W; $P_D$ = –3 to +3 dBm; $V_{S1} = V_{S2}$ = 10 to 15.6 V; $V_C$ = 0 to 4 V | – | – | –60 | dBc |
| $t_r$ | rise time | | – | – | 1 | µs |
| | AM-AM conversion | $P_D$ with 1% AM; $P_L$ ≤ 14 W | – | – | 3 | |
| | control bandwidth | $P_L$ ≤ 14 W | 1 | – | – | MHz |
| | ruggedness | VSWR ≤ 10 : 1 through all phases; $V_{S1} = V_{S2}$ = 15.6 V; $P_L$ = 16 W; note 1 | no degradation | | | |

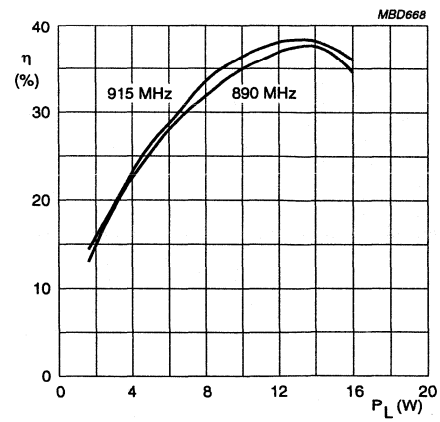
**Note**

1. Adjust $V_C$ for specified $P_L$.



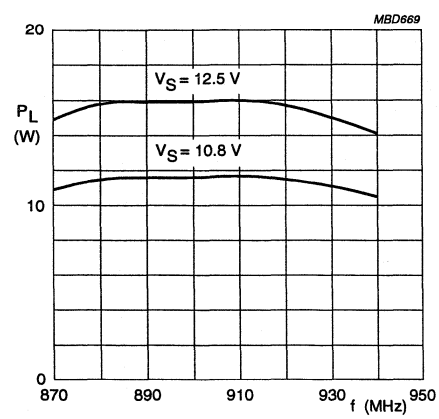

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ$C; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu$s.

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



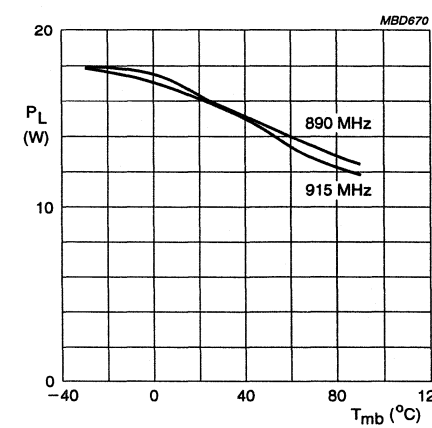

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ$C; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu$s.

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



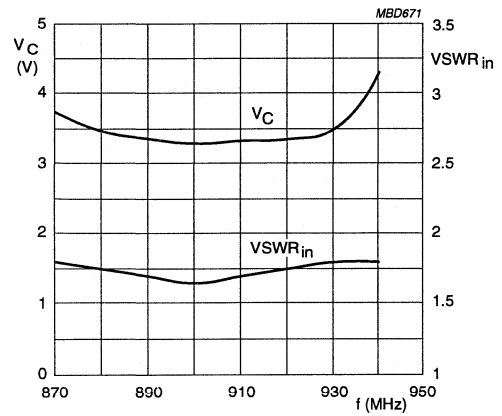

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $T_{mb} = 25\ ^\circ$C; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu$s.

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



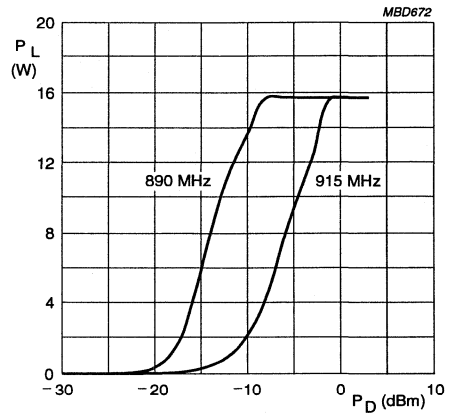

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $V_{S1} = V_{S2} = 12.5$ V; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu$s.

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



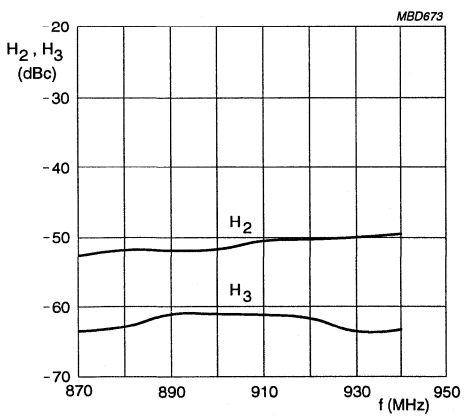

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $P_L = 14$ W; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.6 Control voltage and VSWR input as functions of frequency; typical values.



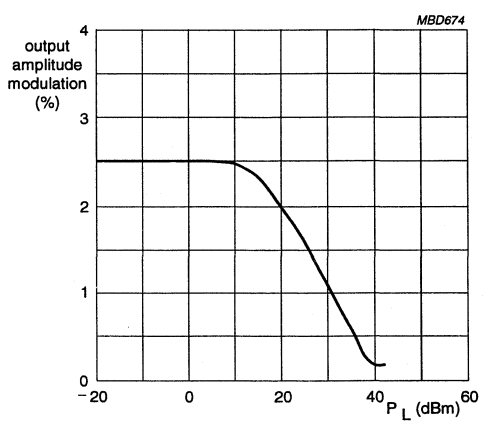

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $V_{S1} = V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

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




$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; $P_L = 14$ W; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.8 Harmonics as functions of frequency; typical values.




$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 12.5$ V; $T_{mb} = 25\ ^\circ C$; f = 900 MHz; input amplitude modulation = 1%; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.9 Output amplitude modulation as a function of load power; typical values.

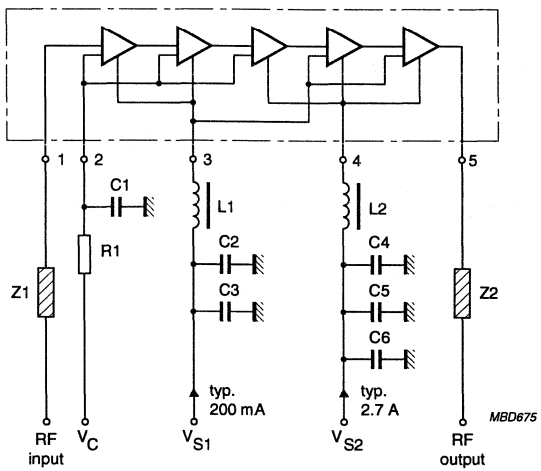



Fig.10 Test circuit.

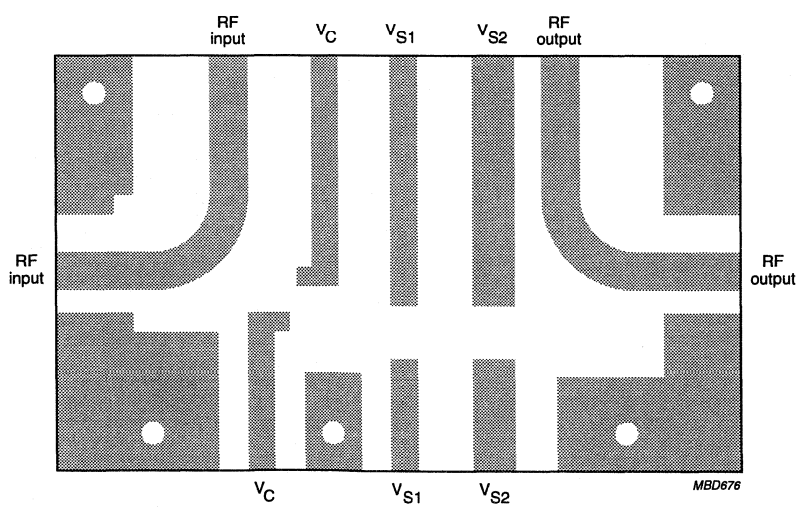



Fig.11 Printed-circuit board layout.

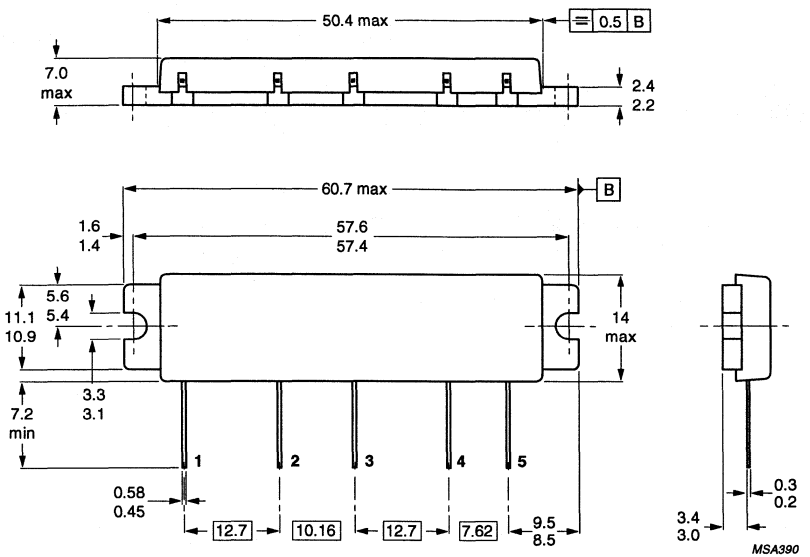
**List of components (see Fig.10)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1 | tantalum capacitor; note 1 | 560 pF | – |
| C2, C4 | tantalum capacitor; note 1 | 2.2 μF | – |
| C3, C5 | electrolytic capacitor; note 1 | 22 μF | – |
| C6 | electrolytic capacitor; note 1 | 220 μF | – |
| L1, L2 | RF choke, 0.5 turn 0.8 mm copper wire on grade 3B core | 1 μH | 4330 030 32221 |
| Z1, Z2 | stripline; note 2 | – | – |
| R1 | metal film resistor | 100 Ω; 0.4 W | – |

**Notes**

1. The capacitors are for external supply decoupling and optimum pulse shape.
2. The striplines are on a double copper-clad printed-circuit board with PTFE fibreglass dielectric ($\varepsilon_r = 2.2$); thickness $1/16$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.12 SOT278A.

# UHF amplifier module BGY202

## FEATURES

- Single 6 V nominal supply voltage
- 1.4 W output power
- Easy control of output power by DC voltage
- High efficiency (typically 50 %).

## APPLICATIONS

- Digital cellular radio systems (GSM systems) in the 890 to 915 MHz frequency range.

## PINNING - SOT321

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

The BGY202 is a three-stage UHF amplifier module. It consists of three NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

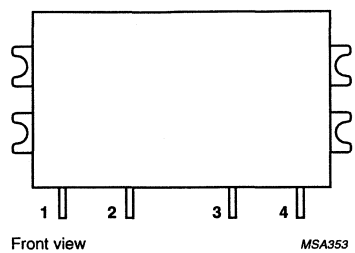



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_S$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| pulsed; $\delta$ = 1 : 8 | 890 to 915 | 6 | 3.5 | ≥1.4 | ≥28.5 | typ. 50 | 50 |

## LIMITING VALUES

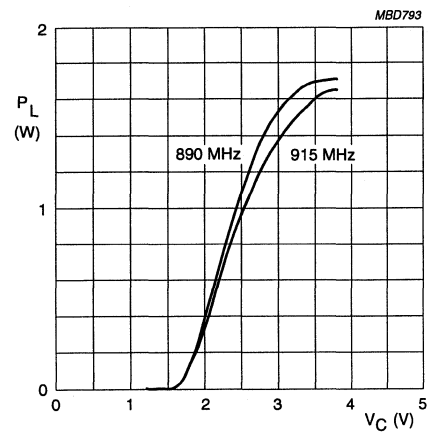
In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_S$ | DC supply voltage | | – | 8.5 | V |
| $V_C$ | DC control voltage | | – | 4 | V |
| $P_D$ | input drive power | | – | 5 | mW |
| $P_L$ | load power | $\delta = 1:8$; $t_p = 575\ \mu s$ | – | 1.8 | W |
| $T_{stg}$ | storage temperature | | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | | –30 | +100 | °C |

## CHARACTERISTICS

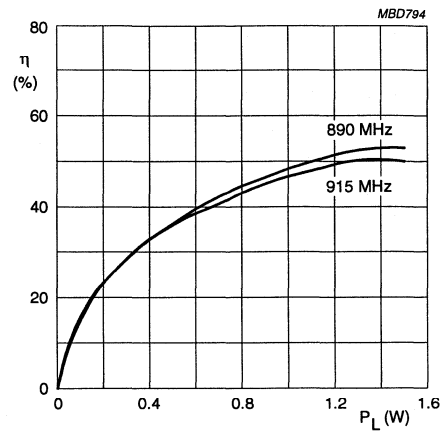
$T_{mb} = 25$ °C; $Z_S = Z_L = 50\ \Omega$; $P_D = 2$ mW; $V_C \leq 3.5$ V; $V_S = 6$ V; f = 890 to 915 MHz; $\delta = 1:8$; $t_p = 575\ \mu s$; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | $V_C = 3.5$ V | 1.4 | – | – | W |
| $G_p$ | power gain | $P_L = 1.4$ W | 28.5 | – | – | dB |
| $\eta$ | efficiency | $P_L = 1.4$ W | 45 | 50 | – | % |
| $H_2$ | second harmonic | $P_L = 1.4$ W | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L = 1.4$ W | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L = 1.4$ W | – | – | 3 : 1 | |
| $I_C$ | control current | | – | – | 0.5 | mA |
| $I_Q$ | leakage current | $V_C = 0$; $P_D \leq -60$ dBm | – | – | 0.1 | mA |
| | isolation | $V_C = 0$ | – | – | –36 | dBm |
| | stability | VSWR ≤ 6 : 1 through all phases; $V_S = 4.8$ to 8.5 V; $V_C = 0$ to 3.5 V; $P_L \leq 1.4$ W; $P_D = 0$ to 6 dBm | – | – | –60 | dBc |
| | control bandwidth | | 1 | – | – | MHz |
| $P_n$ | noise power | $P_L = 1.4$ W; bandwidth = 30 kHz; 20 MHz above $f_o$ | – | – | –85 | dBm |
| | AM-AM conversion | $P_D$ with 1% AM; $P_L \leq 1.4$ W | – | 5 | – | % |
| | ruggedness | VSWR ≤ 10 : 1 through all phases; $V_S = 8.5$ V; $P_L = 1.6$ W | no degradation | | | |



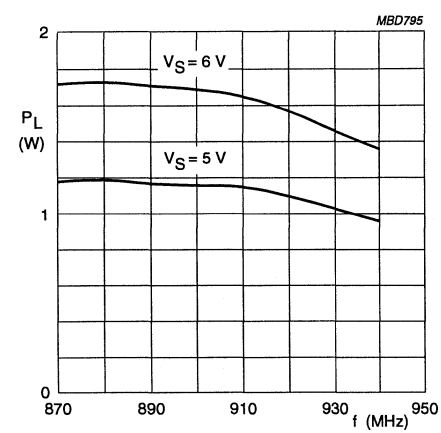

$Z_S = Z_L = 50\ \Omega$; $T_{mb} = 25$ C; $P_D = 2$ mW; $V_S = 6$ V;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



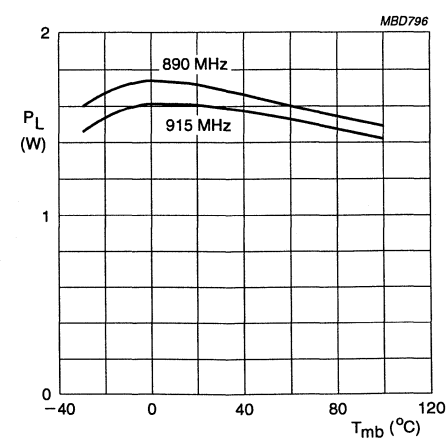

$Z_S = Z_L = 50\ \Omega$; $T_{mb} = 25$ C; $P_D = 2$ mW; $V_S = 6$ V;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



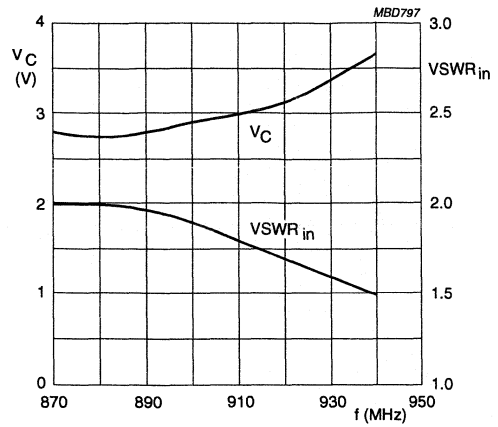

$Z_S = Z_L = 50\ \Omega$; $V_C = 3.5$ V; $T_{mb} = 25$ °C; $P_D = 2$ mW;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



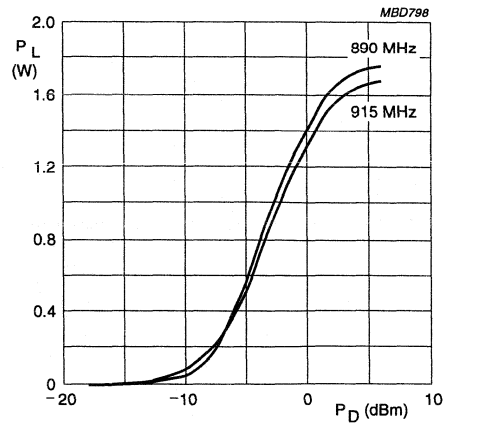

$Z_S = Z_L = 50\ \Omega$; $V_C = 3.5$ V; $V_S = 6$ V; $P_D = 2$ mW;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



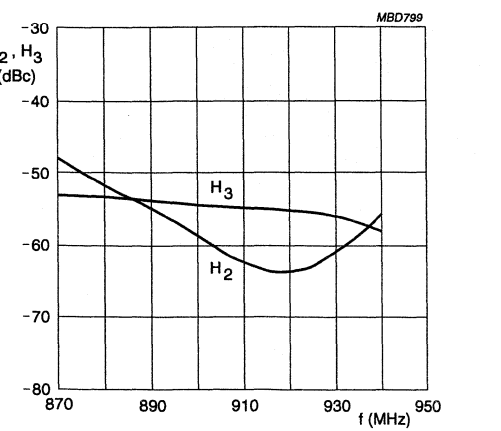

$Z_S = Z_L = 50\ \Omega$; $V_S = 6$ V; $T_{mb} = 25$ °C; $P_L = 1.4$ W; $P_D = 2$ mW; $\delta = 1:8$; $t_p = 575\ \mu s$.

Fig.6 Control voltage and VSWR input as functions of frequency; typical values.



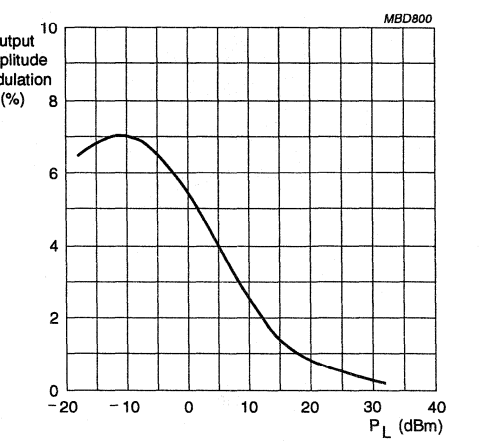

$Z_S = Z_L = 50\ \Omega$; $V_C = 3.5$ V; $V_S = 6$ V; $T_{mb} = 25$ °C; $\delta = 1:8$; $t_p = 575\ \mu s$.

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




$Z_S = Z_L = 50\ \Omega$; $V_S = 6$ V; $T_{mb} = 25$ °C; $P_L = 1.4$ W; $P_D = 2$ mW; $\delta = 1:8$; $t_p = 575\ \mu s$.

Fig.8 Harmonics as functions of frequency; typical values.




$Z_S = Z_L = 50\ \Omega$; $T_{mb} = 25$ C; $V_S = 6$ V; input amplitude modulation = 1%; $f = 900$ MHz; $\delta = 1:8$; $t_p = 575\ \mu s$.

Fig.9 Output amplitude modulation as a function of load power; typical values.

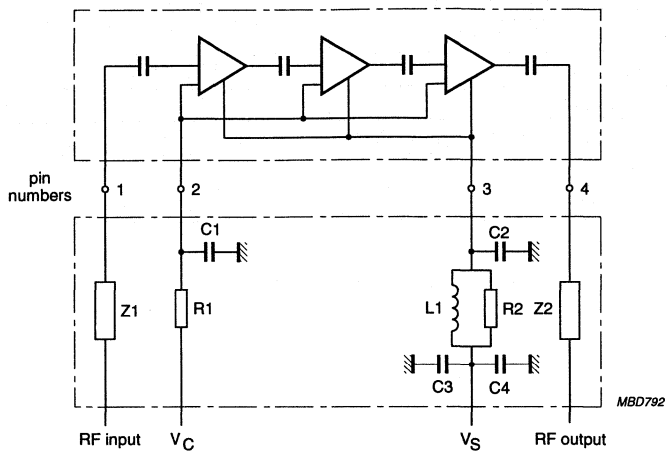



Fig.10 Test circuit.

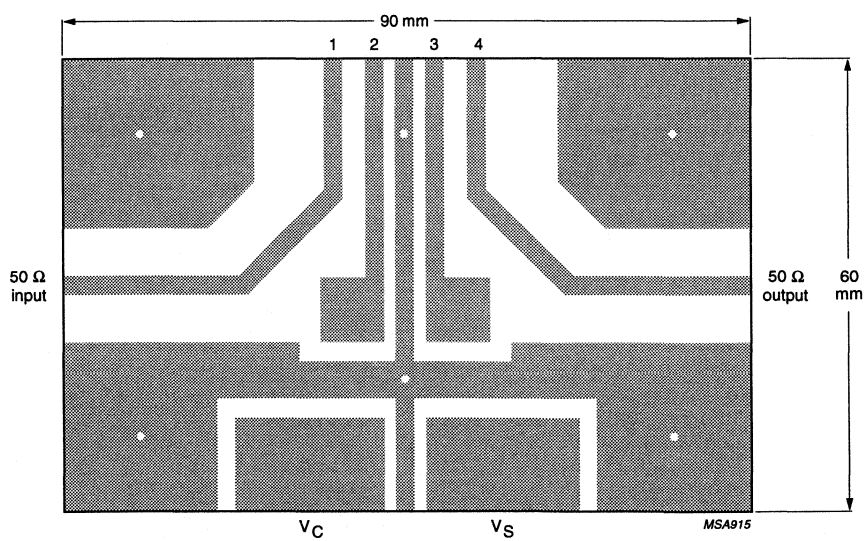



Fig.11 Printed-circuit board layout.

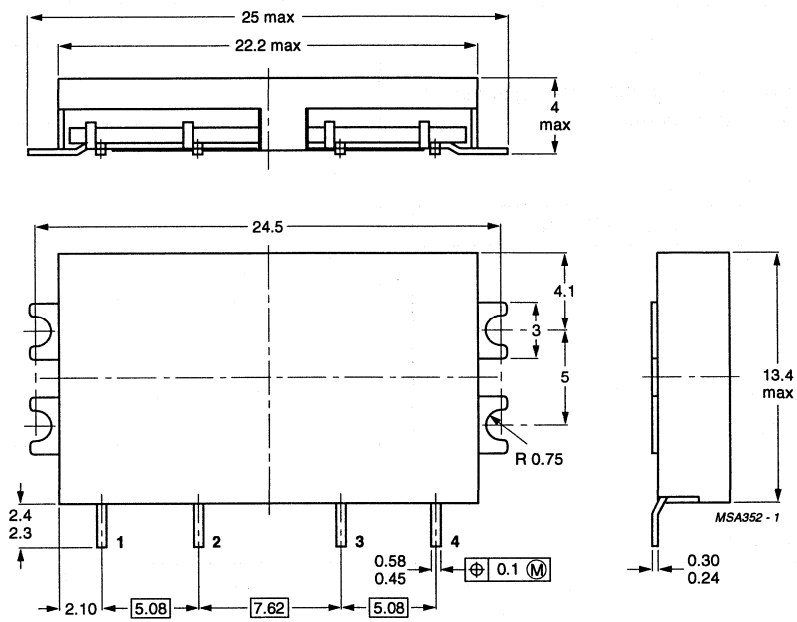
**List of components (see Fig.10)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1 | multilayer ceramic chip capacitor | 33 pF | – |
| C2 | multilayer ceramic chip capacitor | 1 nF | – |
| C3 | tantalum capacitor | 2.2 μF; 35 V | – |
| C4 | electrolytic capacitor | 68 μF | – |
| L1 | 1 turn 0.4 mm copper wire on grade 3B core | 0.9 μH | 4330 030 32221 |
| Z1, Z2 | stripline; note 1 | 50 Ω | – |
| R1, R2 | metal film resistor | 10 Ω; 0.4 W | – |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibreglass dielectric ($\varepsilon_r = 2.2$); thickness $1/32$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.12 SOT321.

# UHF amplifier module BGY203

## FEATURES

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

## APPLICATIONS

- Digital cellular radio systems (GSM systems) in the 880 to 915 MHz frequency range.

## DESCRIPTION

The BGY203 is a four-stage UHF amplifier module. It consists of four NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

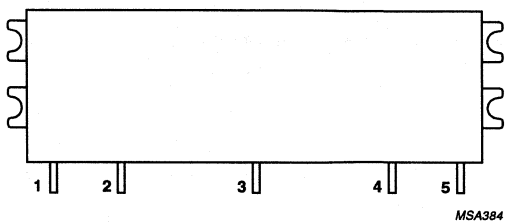



Fig.1 Simplified outline.

## PINNING - SOT342

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_{S1}$ |
| 4 | $V_{S2}$ |
| 5 | RF output |
| flange | ground |

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_{S1}$; $V_{S2}$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| pulsed; $\delta$ = 1 : 8 | 880 to 915 | 6 | ≤4 | 3.5 | ≥35.5 | ≥40 | 50 |

## LIMITING VALUES

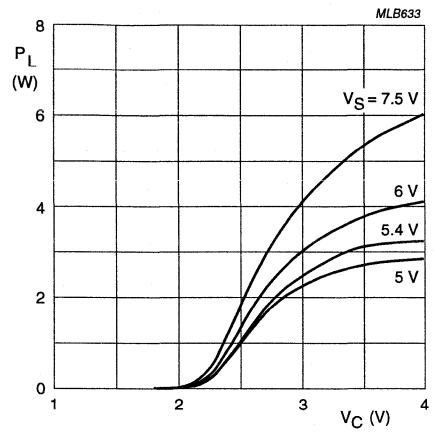
In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 8.5 | V |
| $V_{S2}$ | DC supply voltage | – | 8.5 | V |
| $V_C$ | DC control voltage | – | 4.5 | V |
| $P_D$ | input drive power | – | 2 | mW |
| $P_L$ | load power | – | 4 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

## CHARACTERISTICS

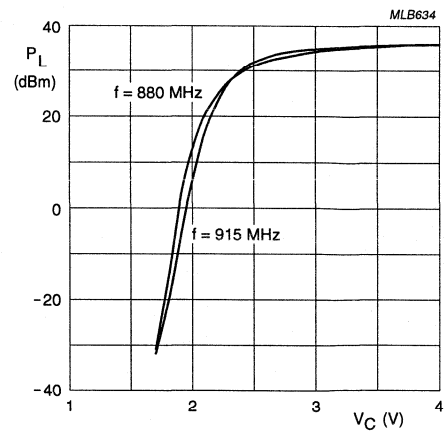
$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 1 mW; $V_C \leq 4$ V; $V_{S1} = V_{S2}$ = 6 V; f = 880 to 915 MHz; δ = 1 : 8; $t_p$ = 575 µs; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | $V_C$ = 4 V | 3.5 | – | – | W |
| $G_p$ | power gain | $P_L$ = 3.5 W | 35.5 | – | – | dB |
| η | efficiency | $P_L$ = 3.5 W | 40 | – | – | % |
| $H_2$ | second harmonic | $P_L$ = 3.5 W | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L$ = 3.5 W | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 3.5 W | – | – | 2 : 1 | |
| $I_C$ | control current | | – | – | 0.5 | mA |
| $I_{Q1} + I_{Q2}$ | total leakage current | $V_C \leq 0.5$ V | – | – | 0.2 | mA |
| | isolation | $V_C \leq 0.5$ V | – | – | –36 | dBm |
| | stability | VSWR ≤ 6 : 1 through all phases; $P_L \leq 3.5$ W; $P_D$ = 0.5 to 2 mW; $V_{S1} = V_{S2}$ = 5 to 8.5 V; $V_C$ = 0 to 4 V | – | – | –60 | dBc |
| | control bandwidth | | 1 | – | – | MHz |
| $P_n$ | noise power | $P_L$ = 3.5 W; bandwidth = 30 kHz; 20 MHz above transmitter band | – | – | –85 | dBm |
| | ruggedness | VSWR ≤ 10 : 1 through all phases; $V_{S1} = V_{S2}$ = 8.5 V; $P_L$ = 3.5 W | no degradation | | | |



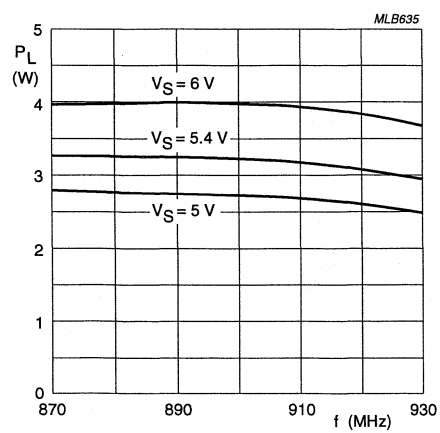

$Z_S = Z_L = 50\ \Omega$; $T_{mb} = 25$ C; $P_D = 1$ mW; f = 902 MHz;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



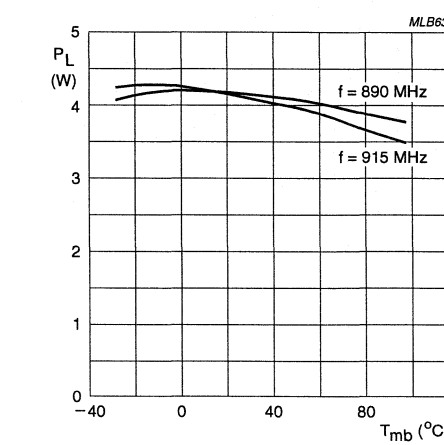

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 6$ V; $T_{mb} = 25$ °C; $P_D = 1$ mW;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



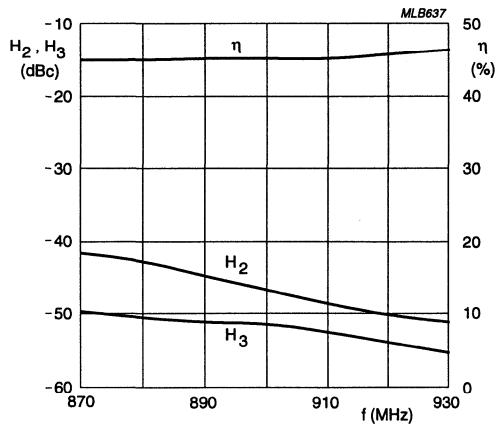

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $T_{mb} = 25$ °C; $P_D = 1$ mW;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



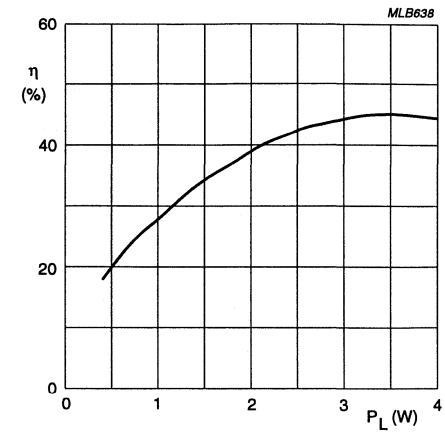

$Z_S = Z_L = 50\ \Omega$; $V_C = 4$ V; $V_{S1} = V_{S2} = 6$ V; $P_D = 1$ mW;
$\delta = 1 : 8$; $t_p = 575\ \mu s$.

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



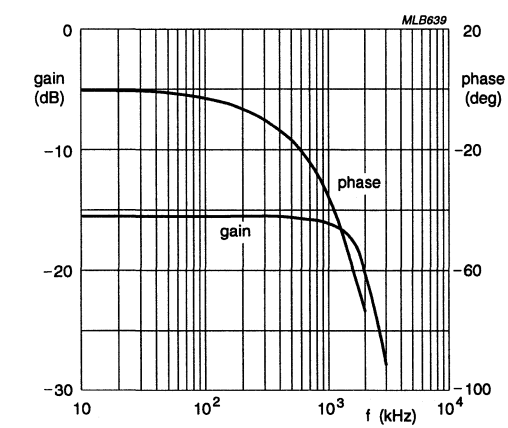

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 6$ V; $T_{mb} = 25$ °C; $P_L = 3.5$ W; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.6 Harmonics and efficiency as functions of frequency; typical values.



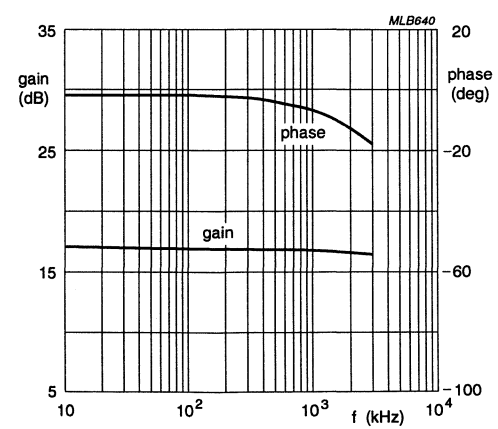

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 6$ V; $T_{mb} = 25$ °C; $P_D = 1$ mW; $f = 902$ MHz; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.7 Efficiency as a function of load power; typical values.




$P_L = 35$ dBm; $Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 6$ V; $T_{mb} = 25$ °C; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.8 Control bandwidth in terms of gain and phase shift as functions of frequency; typical values.




$P_L = 15$ dBm; $Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 6$ V; $T_{mb} = 25$ °C; $P_D = 1$ mW; $\delta = 1 : 8$; $t_p = 575\ \mu s$.

Fig.9 Control bandwidth in terms of gain and phase shift as functions of frequency; typical values.

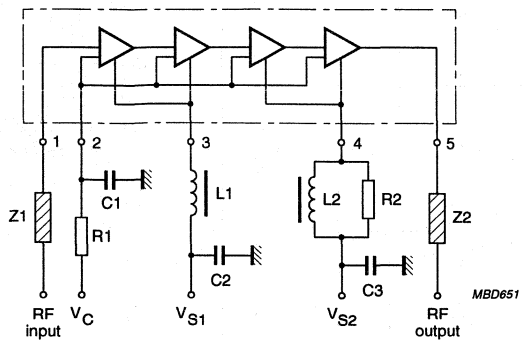



Fig.10 Test circuit.

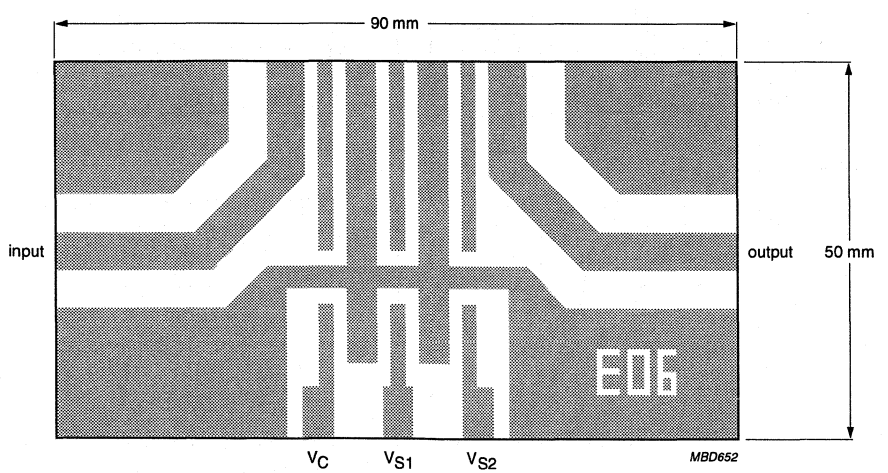



Fig.11 Printed-circuit board layout.

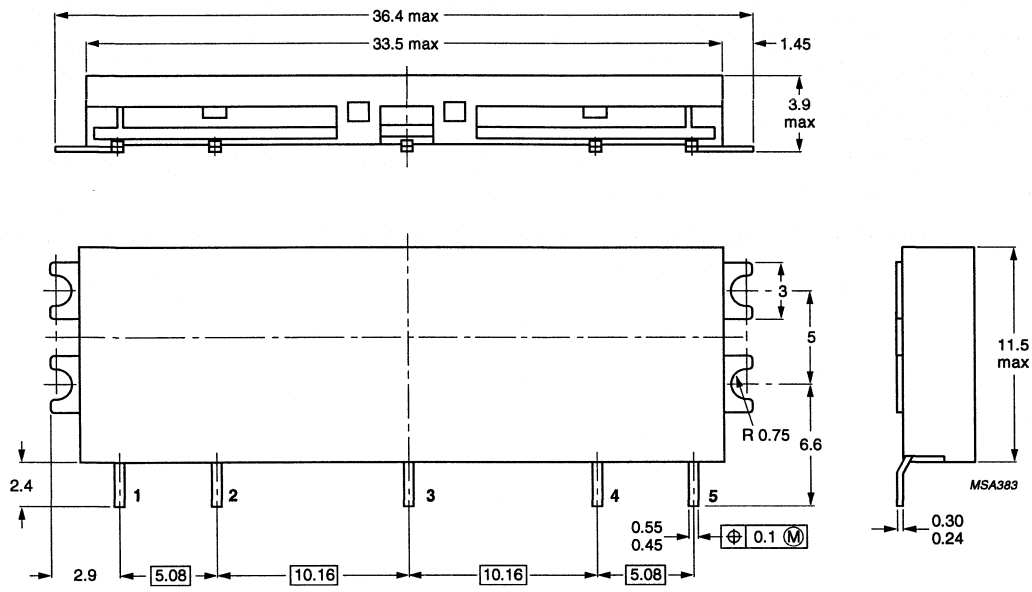
**List of components (see Fig.10)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1 | multilayer ceramic chip capacitor | 470 pF | 2222 861 12471 |
| C2 | tantalum capacitor | 2.2 μF | – |
| C3 | electrolytic capacitor | 68 μF | – |
| L1, L2 | 1 turn 0.4 mm copper wire on grade 3B core | 0.9 μH | 4330 030 32221 |
| Z1, Z2 | stripline; note 1 | 50 Ω | – |
| R1 | metal film resistor | 80 Ω; 0.4 W | – |
| R2 | metal film resistor | 5 Ω; 0.4 W | – |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with PTFE fibreglass dielectric ($\varepsilon_r = 2.2$); thickness $1/16$ inch.

## PACKAGE OUTLINE




Dimensions in mm.

Fig.12 SOT342.

# UHF amplifier module BGY204

## FEATURES

- Single 4.8 V nominal supply voltage
- 3.5 W output power
- Easy output power control by DC voltage.

## APPLICATIONS

- Digital cellular radio systems (GSM systems) in the 880 to 915 MHz frequency range.

## PINNING - SOT321B

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

The BGY204 is a four-stage UHF amplifier module. It consists of four NPN silicon planar transistor chips mounted together with matching and bias circuit components on a metallized ceramic substrate.

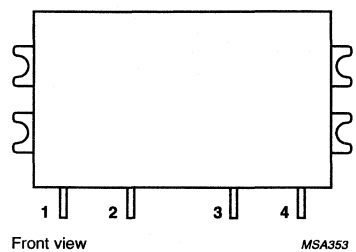



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_S$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| pulsed; $\delta$ = 1 : 8 | 880 to 915 | 4.8 | ≤4 | 3.5 | ≥32.5 | typ. 45 | 50 |

## LIMITING VALUES

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

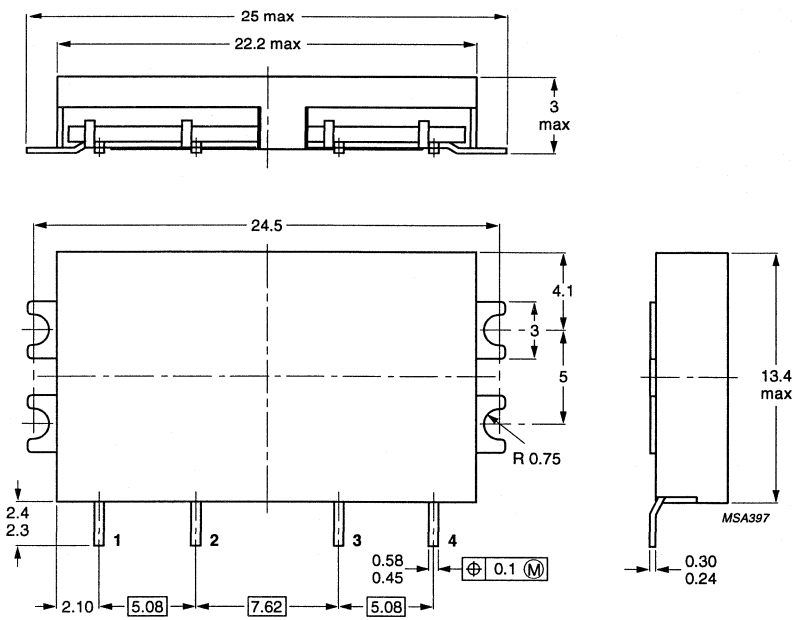
| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_S$ | DC supply voltage | – | 7 | V |
| $V_C$ | DC control voltage | – | 4.5 | V |
| $P_D$ | input drive power | – | 7 | mW |
| $P_L$ | load power | – | 4 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 3 mW; $V_C \leq 4$ V; $V_S$ = 4.8 V; f = 880 to 915 MHz; $\delta$ = 1 : 8; $t_p$ = 575 µs; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | $V_C$ = 4 V | 3.5 | – | – | W |
| $G_p$ | power gain | $P_L$ = 3.5 W | 32.5 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 3.5 W | – | 45 | – | % |
| $H_2$ | second harmonic | $P_L$ = 3.5 W | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L$ = 3.5 W | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 3.5 W | – | – | 2 : 1 | |
| $I_C$ | control current | $P_L$ = 3.5 W | – | – | 0.5 | mA |
| $I_Q$ | leakage current | $V_C$ = 0.5 V | – | – | 0.2 | mA |
| | isolation | $V_C$ = 0.5 V | – | – | –36 | dBm |
| | stability | VSWR ≤ 6 : 1 through all phases; $P_L \leq 3.5$ W; $P_D$ = 1 to 6 mW; $V_S$ = 4 to 7 V; $V_C$ = 0 to 4 V | – | – | –60 | dBc |
| | control bandwidth | | 1 | – | – | MHz |
| $P_n$ | noise power | $P_L$ = 3.5 W; bandwidth = 30 kHz; 20 MHz above transmitter band | – | – | –85 | dBm |
| | ruggedness | VSWR ≤ 10 : 1 through all phases; $V_S$ = 7 V; $P_L$ = 3.5 W | no degradation | | | |

## PACKAGE OUTLINE




Dimensions in mm.

Fig.2 SOT321B.

# UHF amplifier module BGY205

## FEATURES

- Single 6 V nominal supply voltage
- 3.5 W output power
- Easy output power control by DC voltage.

## APPLICATIONS

- Digital cellular radio systems (GSM systems) in the 880 to 915 MHz frequency range.

## PINNING - SOT321B

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_C$ |
| 3 | $V_S$ |
| 4 | RF output |
| flange | ground |

## DESCRIPTION

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

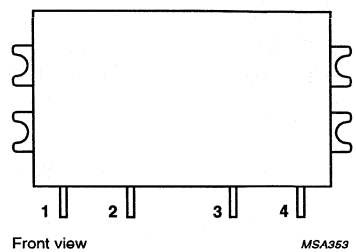



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_S$ (V) | $V_C$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta$ (%) | $Z_S$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|---|
| CW; $\delta$ = 1 : 8 | 880 to 915 | 6 | ≤4 | 3.5 | 32.5 | typ. 45 | 50 |

## LIMITING VALUES

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

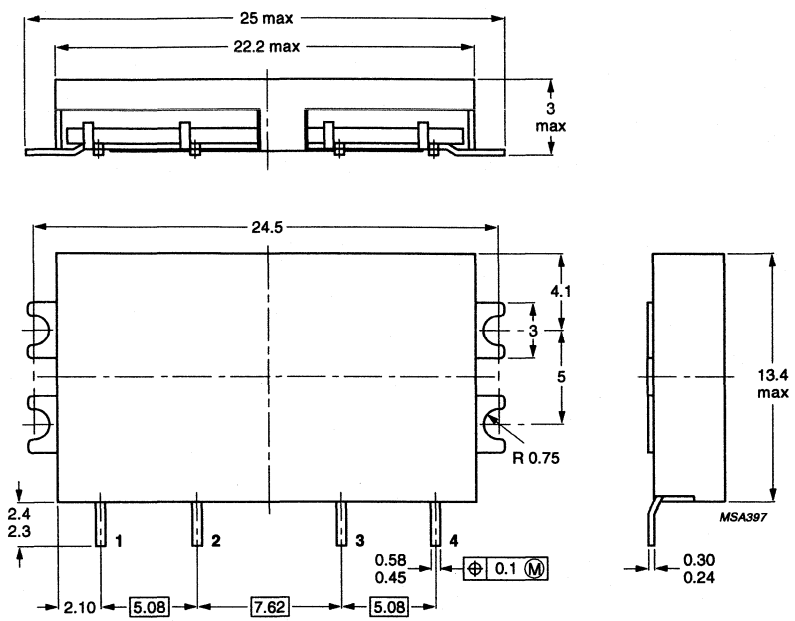
| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_S$ | DC supply voltage | – | 8.5 | V |
| $V_C$ | DC control voltage | – | 4.5 | V |
| $P_D$ | input drive power | – | 7 | mW |
| $P_L$ | load power | – | 4 | W |
| $T_{stg}$ | storage temperature | –40 | +100 | °C |
| $T_{mb}$ | operating mounting base temperature | –30 | +100 | °C |

## CHARACTERISTICS

$T_{mb}$ = 25 °C; $Z_S = Z_L$ = 50 Ω; $P_D$ = 3 mW; $V_C \leq 4$ V; $V_S$ = 6 V; f = 880 to 915 MHz; $\delta$ = 1 : 8; $t_p$ = 575 µs; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $P_L$ | load power | $V_C$ = 4 V | 3.5 | – | – | W |
| $G_p$ | power gain | $P_L$ = 3.5 W | 32.5 | – | – | dB |
| $\eta$ | efficiency | $P_L$ = 3.5 W | – | 45 | – | % |
| $H_2$ | second harmonic | $P_L$ = 3.5 W | – | – | –40 | dBc |
| $H_3$ | third harmonic | $P_L$ = 3.5 W | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | $P_L$ = 3.5 W | – | – | 2 : 1 | |
| $I_C$ | control current | $P_L$ = 3.5 W | – | – | 0.5 | mA |
| $I_Q$ | leakage current | $V_C$ = 0.5 V | – | – | 0.2 | mA |
| | isolation | $V_C$ = 0.5 V | – | – | –36 | dBm |
| | stability | VSWR ≤ 6 : 1 through all phases; $P_L \leq 3.5$ W; $P_D$ = 1 to 6 mW; $V_S$ = 5 to 8.5 V; $V_C$ = 0 to 4 V | – | – | –60 | dBc |
| | control bandwidth | | 1 | – | – | MHz |
| $P_n$ | noise power | $P_L$ = 3.5 W; bandwidth = 30 kHz; 20 MHz above transmitter band | – | – | –85 | dBm |
| | ruggedness | VSWR ≤ 10 : 1 through all phases; $V_S$ = 8.5 V; $P_L$ = 3.5 W | no degradation | | | |

## PACKAGE OUTLINE




Dimensions in mm.

Fig.2 SOT321B.

# DATA HANDBOOK SYSTEM

# Data handbook system

## DATA HANDBOOK SYSTEM

Philips Semiconductors data handbooks contain all pertinent data available at the time of publication and each is revised and reissued regularly.

Loose data sheets are sent to subscribers to keep them up-to-date on additions or alterations made during the lifetime of a data handbook.

Catalogues are available for selected product ranges (some catalogues are also on floppy discs).

Our data handbook titles are listed here.

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| *Book* | *Title* |
|---|---|
| IC01 | Semiconductors for Radio and Audio Systems |
| IC02 | Semiconductors for Television and Video Systems |
| IC03 | Semiconductors for Telecom Systems |
| IC04 | CMOS HE4000B Logic Family |
| IC05 | Advanced Low-power Schottky (ALS) Logic Series |
| IC06 | High-speed CMOS Logic Family |
| IC08 | 100K ECL Logic Family |
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| IC15 | FAST TTL Logic Series |
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### Professional components

| | |
|---|---|
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| PC06 | Circulators and Isolators |

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| DC02 | Monochrome Monitor Tubes and Deflection Units |
| DC03 | Television Tuners, Coaxial Aerial Input Assemblies |
| DC05 | Flyback Transformers, Mains Transformers and General-purpose FXC Assemblies |

### magnetic products

| | |
|---|---|
| MA01 | Soft Ferrites |
| MA03 | Piezoelectric Ceramics<br>Specialty Ferrites |
| MA04 | Dry-reed Switches |

### passive components

| | |
|---|---|
| PA01 | Electrolytic Capacitors |
| PA02 | Varistors, Thermistors and Sensors |
| PA03 | Potentiometers |
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### professional components

| | |
|---|---|
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