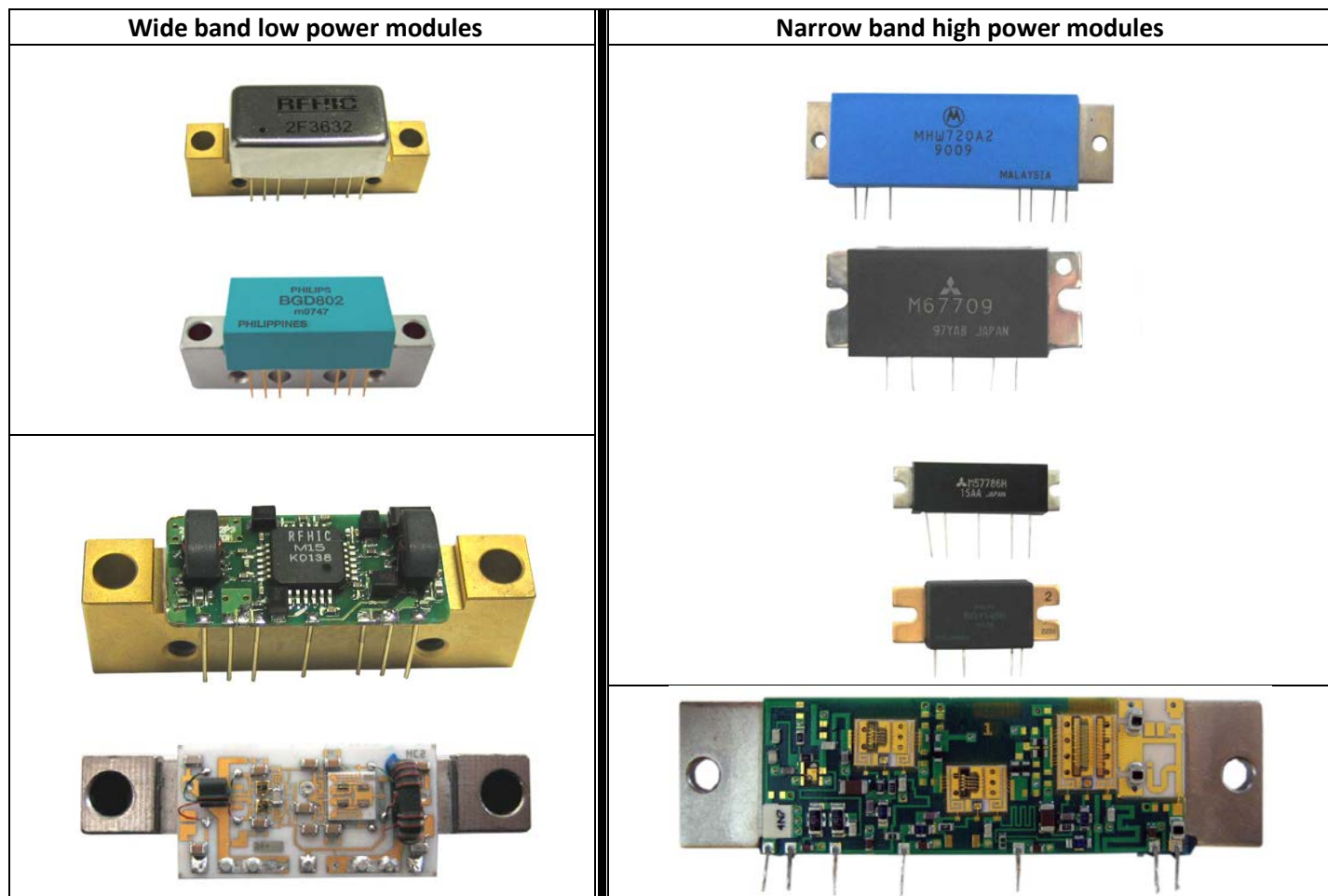


The power modules are components suitable for RF signal amplification in order to achieve a high power level, the important feature is a moderate simultaneous wide bandwidth without any tuning which is up to 1000 MHz for the low power modules and 20 to 60 MHz for modules with higher power. It means that into this bandwidths the power module can work without any tuning due to the internal wide band matching circuits. They are precisely built to ease the design work for radio equipment base stations, in fact to achieve a wide bandwidth and a high power is not always easy, they mainly solve the problem of tuning of power final stages because all these modules do not require any kind RF tuning.



Thanks to a careful project, thick film technology and the use of high quality materials such as alumina substrates, high Q capacitors, coils on micro strip etc..., they have a high repeatability and reach a remarkable quality at reasonable prices. The use of power modules is made easier for the following characteristics:

- The input and the output impedance is already matched to 50 Ω and dc block capacitors are already included, so no matching is required, the output pin can be directly connected to the antenna.
- The internal substrate with its transistor is safely secured to a small metal plate (which has to be placed on a bigger heat sink) greatly easing the thermal dissipation.

The implementation of these modules is very easy, just comply with two rules:

1. Place and secure the module on a heat sink to properly dissipate heat using thermal paste too.
2. Respect the most basic rules that all RF technicians know, for example, use bypass capacitors and chokes on the power supply pin, use only short leads on RF connections (input - output) and on bypass capacitors, don't cross over the RF output cable with the RF input cable, don't approach RF output cable to the input pin to avoid the risk of self-oscillations, for the same reason avoid to put the output antenna too close to the module itself. No filter, RF matching circuit or tuning is necessary.

Wide band ultra linear low power modules

The broadband power modules provide power from 0.3 to 1.5W for CW and FM emission modes and slightly less for AM and SSB. For emissions that require the use of ultralinear A Class, such as the TV in AM, the power changes depending on the number of TV channels, from about +65 dBmV per TV channel up to 44dBmV for 110 simultaneous channels (standard DIN -60dBc distortion).

These modules are often used for laboratory applications, for example, to be driven by a simple RF generator, to provide a medium power, to measure EMI susceptibility or IMD, when it is required more power than that provided by our RF generator. Especially for 2-tone IMD measures, it is necessary that the 2 generators are very insulated to avoid returns and distortions of the generator itself, these broadband amplifiers typically have a reverse isolation > 35 dB.

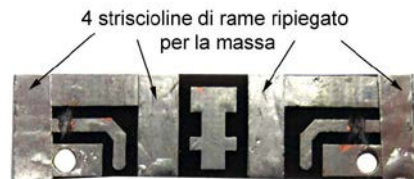
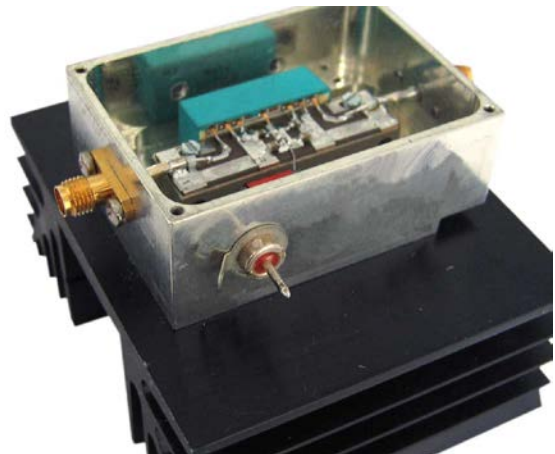
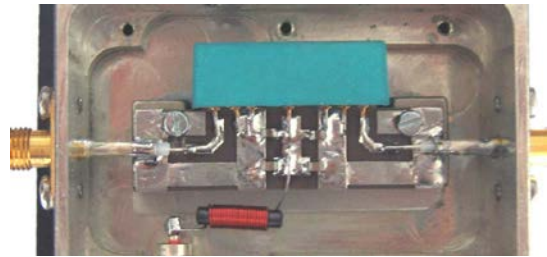
Other non laboratory applications are for example the construction of repeaters to serve small rural villages or mountain valleys that are not covered by the TV or radio service, or they are used for two-way amplifiers for radio or mobile phone services or for the distribution of radio coverage in tunnels.

Another typical application is to amplify TV signals in AM, where the linearity and low intermodulation are important prerequisites. For example they can be used as the final stage to distribute the signal to switchboards or CATV.

We conclude with the description of a very particular application, thanks to their high dynamic they are also very good low noise front-end amplifiers with an excellent intermodulation distortion against interfering signals associated to a noise figure of about 3.5 - 5 dB and IP3 dynamic between +40 and +46 dBm.

The required power supply is 24V for all models with an absorption which ranges by module type from 200 to 400mA, being polarized in A class there is always absorption even in the absence of RF drive so the heat sink should be of appropriate size.

Please note that these types of modules are less subject to damage in case of high VSWR output.



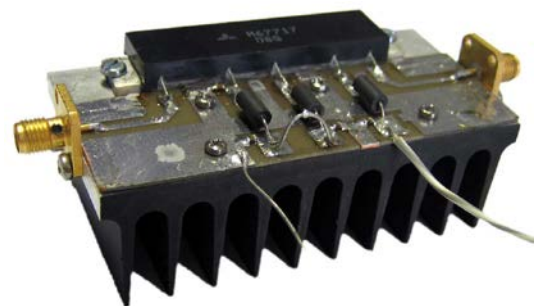
test p.c. board circuit example

Narrow band high power modules

The narrow-band power modules provide higher power (2 to 30 W), they are often used as final in transmitters, radio base stations, and transceivers either vehicular and portable.



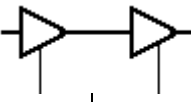

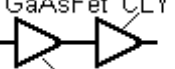
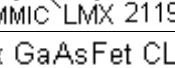
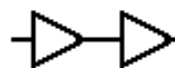
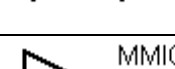





The power supply voltage depends on the model, usually from 6 to 9.6 V for lower power models and 12V for higher power models. These modules have also very often a pin for output power control, which can be connected directly to the power supply if you are not interested in its function.

Almost all models are operating in C class (FM and CW) so the absorption is very low, 1 to 50 mA without a driver, this greatly reduce the size of the heat sink in those cases where the power transmission is not continuous. Models operating in linear AB class have always a stand-by current of about 50 - 100 mA.



Wide band amplifiers up to 2.5 GHz

This page groups several examples of wide or very wide band amplifier stages with a moderate output power. The examples could be useful as inspiration or idea for other projects, it is easy to understand that the possible combinations are many more than those shown here. The output power is intended to be P1dB (except the TV A Class), the band width is at -2 dB. Additional specifications are shown on the page regarding the single device.

| this column shows the simultaneous band width | | | | | | |
|---|---|--|---|--|---|---------------|
| this column shows the min and max operating frequency | | | | min | ↓ max | |
| version | device | power | gain | | | |
| below 1 GHz | modulo di potenza  BGD 802 | 0.6 W | 18 dB | 5 - 900 MHz | | |
| | | 0.9 - 1.3W | 18 dB | 10 - 800 MHz | | |
| | modulo di potenza BGD  BGD 802 | 0.6 W | depending on MMIC as 1 st stage | 5 - 900 MHz | | |
| | MMIC vari tipi disponibili | 0.9 - 1.3W | from 24 to 30 dBG | 10 - 800 MHz | | |
| TV band A class ultra- linear |  I.C. OM... various types or MMIC MAALSS 0034 | power I.C. various types e.g. BGD802 | up to 61.5 dBmV at -60dB IMD | from 30 to 40 dB depending on the used types | 1° - 5° TV band 40 - 860 MHz | |
| 500 2600 MHz | MMIC  LMX 2119 | 200 - 300 mW | 20 dBG | 1.5 - 2.5 GHz | 600 MHz | |
| | GaAsFet  CLY 10 | 1 W | wide band 28 dBG | 1.5 - 2.5 GHz | 600 MHz | |
| | MMIC  LMX 2119 | 1.3 W | narrow band 30 dBG | | 300 MHz | |
| | 2 x GaAsFet  CLY 10 | 1 W | wide band 18 dBG | fino 2.3 GHz | 1.4 - 1.7 GHz | |
| |  | 1.2 W | narrow band | 20 dBG | +/- 2.4 GHz | 200 - 500 MHz |
| | | 1.6 W | | > 20 dBG | +/- 1.3 GHz | |
| |  MMIC VNA 25 | 60 mW | wide band | 14-17 dBG | 100 - 2500 MHz see description ahead | |
|  MMIC ERA 5 | 50 mW | | 23 dBG | total band up to 2.6 GHz | | |
|  MMIC MSA 0436  MMIC LMX 2119  MMIC MSA 0436 | 200 - 300 mW | | 25 dBG | 1.5 - 2.5 GHz | 600 MHz | |