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## 24 / 23 cm-Band Linear Power Amplifier Module M 57762

The linear final amplifier described in this article consists of two Mitsubishi M 57762 hybrid amplifiers, in RF isolation from each other, feeding the common output. A one-module version will also be described which may either be used "bare-foot" or as a PA driver stage.

In particular, the parallel PA stage is characterized by its simplicity and unproblematical drive requirements. The construction requires no special PCB materials, such as PTFE, and also no special components. It can, in fact, be constructed, as soon as the two M 57762 modules have been obtained, from materials available from most radio amateur workshops.

### 1. SINGLE-MODULE PA

A single-module stage will be described first as this is the basic module which can be used to drive the double-module PA (formed also from the same circuits). See figures 1 to 4.

A proprietary tin-plate box dimensioned 37 x 74 x 50 mm is used to house the module. No cut-outs should be provided in the cover for the module as unfavourable earth connections could be formed, which could encourage oscillations, thus diminishing the output power. The lower cover of the tin-plate box should be soldered

completely around its perimeter, to the walls of the box, in order to achieve a good electrical and mechanical contact. The ground tabs of the hybrid module are secured with two M4 screws to the enclosure cover and the heat sink fitted.

The supply voltage is introduced via feed-through capacitors. The capacitors C1 comprise small 5 x 5 mm (approx.) pieces of two-sided PCB material which serve as HF terminal points as well as a decoupling capacitor. They are soldered directly to the bottom cover of the enclosure. The capacitors marked C are made from a combination of 1 nF ceramic plate capacitors soldered to the bottom cover directly under the module connections 2, 3 and 4, and a 4.7 nF and 10  $\mu$ F tantalum capacitor.

For AM-ATV and SSB working, C2 and C3 (tantalum capacitors) should also be added to the

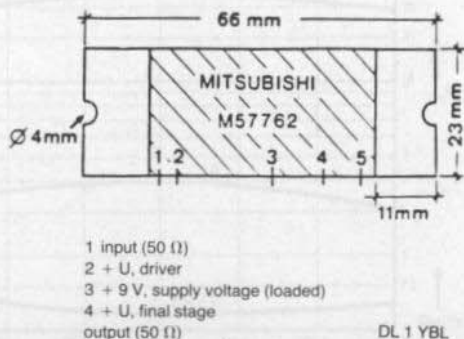


Fig. 1: Module dimensions



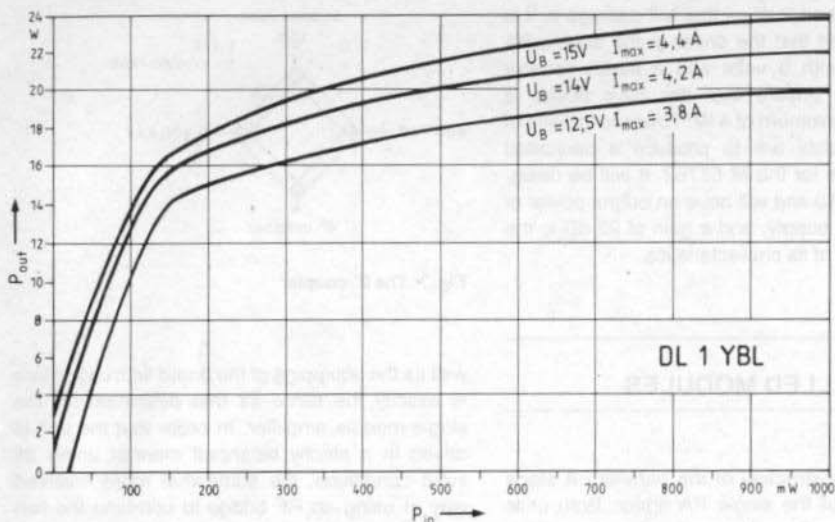


Fig. 5: Characteristic of a MM 57762 single-module amplifier (freq. = 1260 MHz)

de-coupling. The input and output matching is so good that the usual series preset capacitor used for this purpose may be dispensed with.

### 1.1. Power Characteristics

The data of the power amplifier, which was constructed in accordance with the information given here, is shown in fig. 5. It may be seen that

the maximum peak input driving power for SSB working is 200 mW. The maximum amplification in the linear region and at 14 volts supply, is approximately 20 dB. If the amplifier is required for FM-ATV etc. it can be run into the saturation region with a power output up to 22 W without any fear of any ratings being exceeded.

When using this module as a driver for a double PA, it is to be ensured that the input drive power

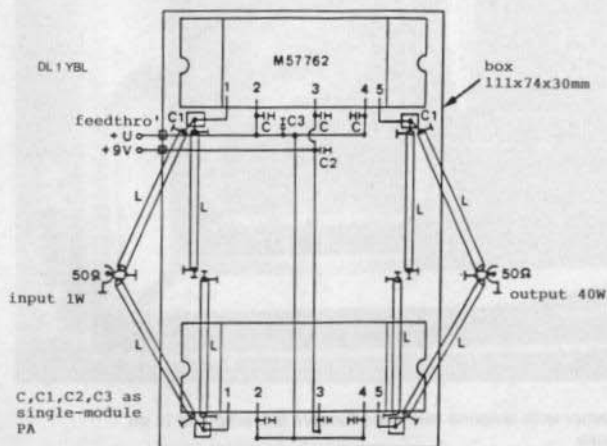


Fig. 6: Parallel final amplifier



does not exceed 2 W as this will damage it. It is for this reason that the driver in the double PA is supplied with 9 volts and a series resistor employed to ensure that the drive power is limited to a maximum of 4 W. Towards the end of 1988, Mitsubishi are to produce a dedicated driver module for the M 57762. It will be designated M 67715 and will have an output power of 2 W at 7.2 V supply, and a gain of 22 dB in the linear portion of its characteristics.

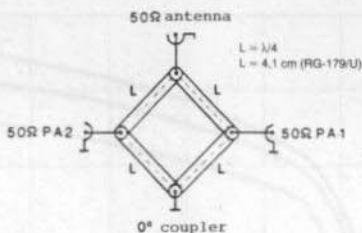


Fig. 7: The 0°-coupler

## 2. PARALLELED MODULES

The basic construction of the parallel PA stage follows that of the single PA driver. Both units are housed in the proprietary box 111 x 74 x 30 mm (fig. 6). The wiring of the supply voltage as

well as the equipping of the board with capacitors is exactly the same as that described for the single-module amplifier. In order that the unit is driven in a strictly balanced manner under all input conditions, the somewhat more involved way of using an RF bridge to combine the two module elements was employed. The so-called 0°-coupler (fig. 7) offers a very simple con-

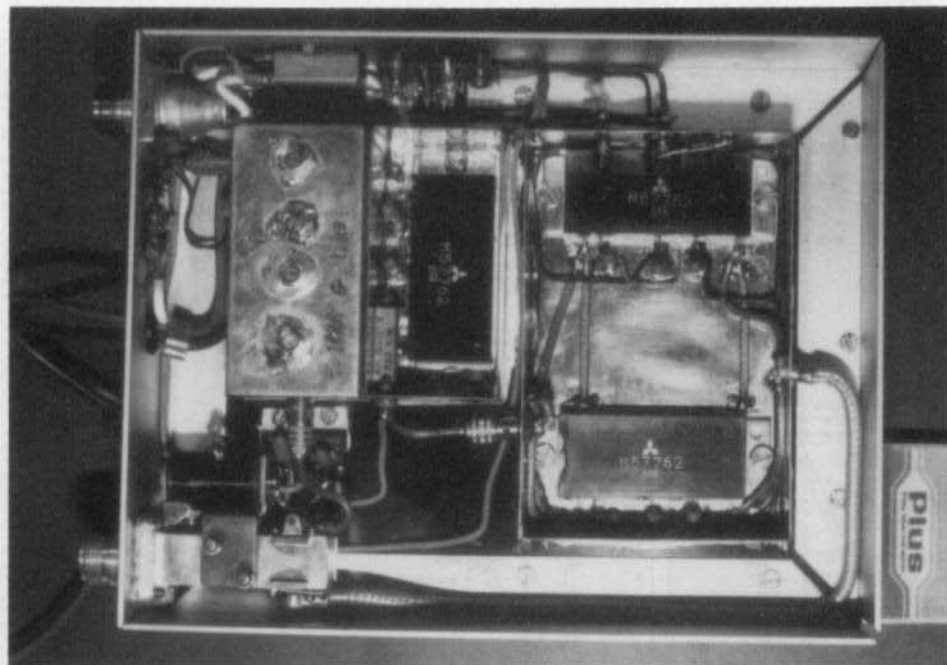


Fig. 8: Both the described amplifiers together with antenna relay and receive pre-amplifier in an aluminium frame on a large heat-sink



struction with sufficient isolation between the two branch amplifiers PA 1 and PA 2, for amateur purposes. The transformation is effected by means of four  $\lambda/4$  lengths of 75  $\Omega$  cable (RG-179/U or similar). The author used 4.1 cm lengths of thin PTFE cable which are soldered directly on to the tin-plate box.

Under no account should ordinary wire be employed for this purpose as spurious oscillations are sure to occur.

### 2.1. Performance Data for the Double PA

The double PA constructed by the author required 2 W input power to drive it to 40 (or 48 W as required) at a supply voltage of 14 volts.

The efficiency is not particularly high, all examples having, however, more than 30 % efficiency. With a power output of 40 W and a DC supply power of 120 W, a large heat-sink must be employed. The big advantage of this PA stage is that it covers the whole of the 24 cm band without tuning being required and with no need to adjust the drive.

The unit is very robust and will withstand a VSWR of 16 : 1 at full output power. The maximum supply voltage is 17 volts and the second harmonic suppression is 30 dB, the third harmonic suppression is being 35 dB.

### 2.2. Operational Experience

The final amplifier, as shown in **fig. 8**, has been used by the author in FM relay and in SSB working for over a year now with no problems whatsoever. The advantage of the unit lies in its wideband characteristics and in its robustness.

The prototype of the double PA has been in constant use for over a year in a 23 cm FM-relay operation. It sometimes occurs that it is overdriven for periods of more than 10 hours at powers of 45 W but, as yet, with no problems. If the construction is carried out exactly in accordance with this article, there is nothing to prevent an entirely successful operation with this unit. Again, do not use any cut-outs in the housing cover.

**A must for all active and technically minded Radio Amateurs!**

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