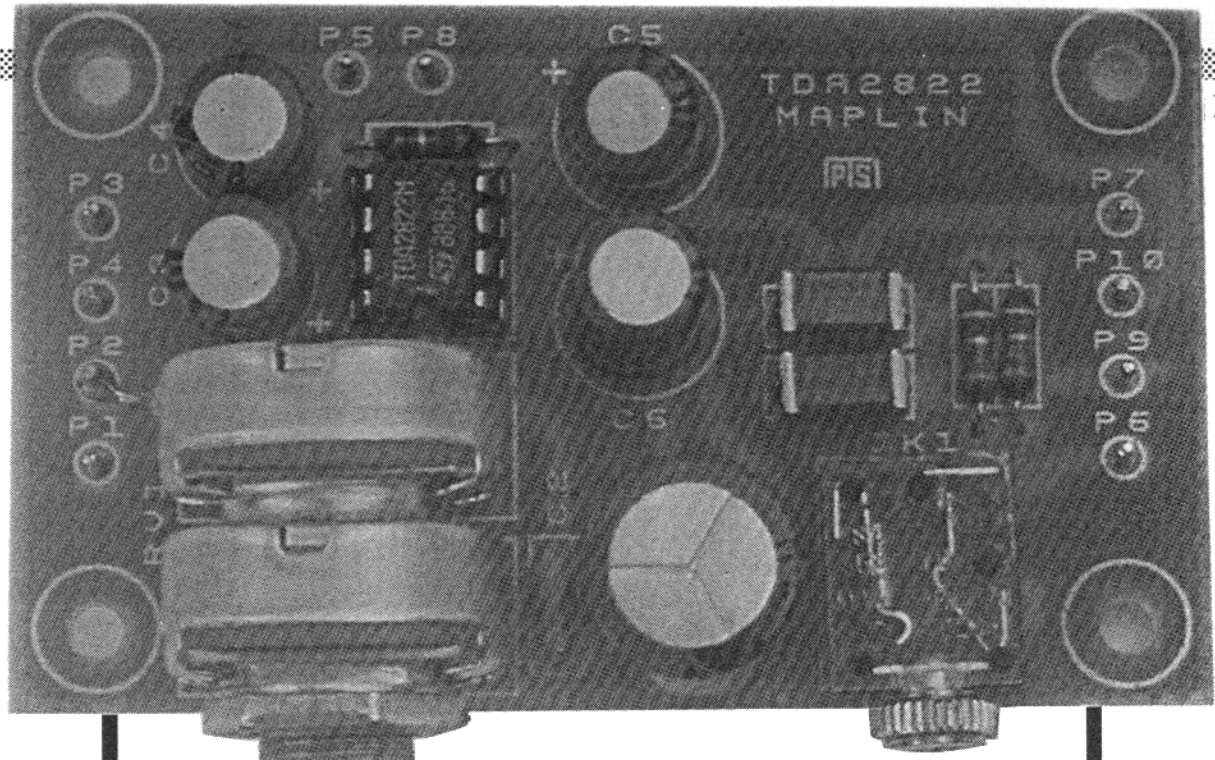

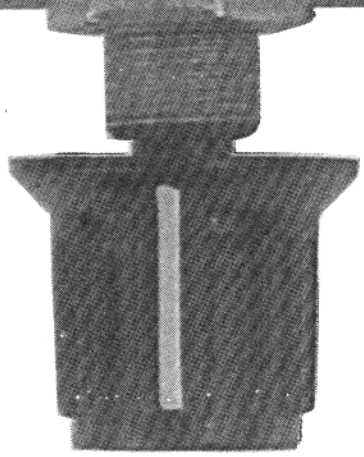

- ★ Easy to build
- ★ Low quiescent current
- ★ Low crossover distortion
- ★ Supply voltage down to 3V
- ★ Stereo headphone jack socket

Specifications of Prototype

Test conditions:	PSU = 9V Output load = 8Ω
Input sensitivity:	26mV RMS
Input impedance:	47kΩ at 1kHz
Quiescent current:	8mA
Maximum volume (stereo):	260mA
Output power (each channel):	650mW RMS
Power bandwidth:	40Hz to 150kHz (−3dB)
Distortion:	0.9% THD
Output noise:	40μV RMS

TDA2822M STEREO AMPLIFIER

by Chris Barlow

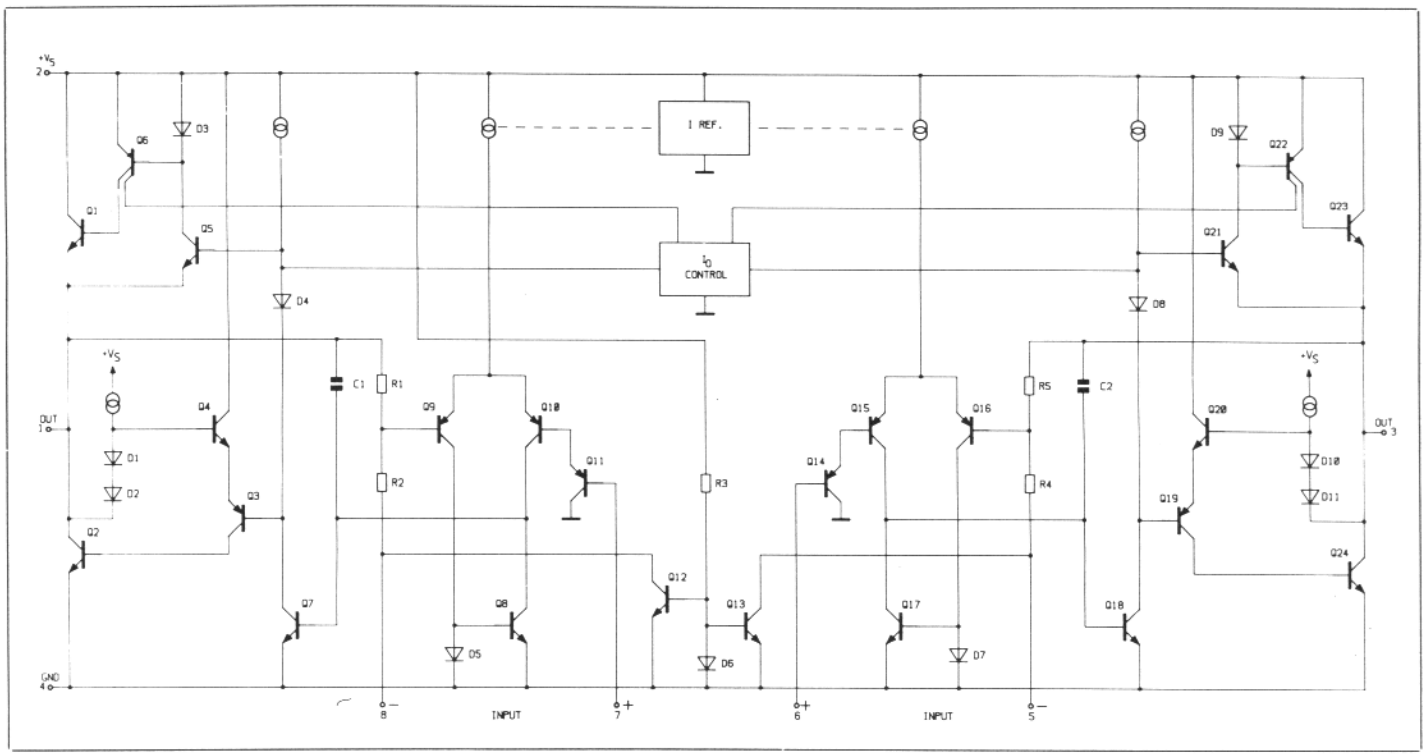

Figure 1. TDA2822M pin configuration.

The TDA2822M is a monolithic integrated circuit (IC) and with the rest of the components on the printed circuit board, it offers a small yet powerful stereo amplifier module. Because of its wide supply voltage range (3V to 15V) it is well suited for portable battery use.

As can be seen from Figure 1, the IC has only eight pins, which are assigned in the manner shown in Table 1.

The manufacturer of the IC has produced a series of response curves showing its electrical characteristics, see Figure 2. In addition, Table 2 lists the parameters, test conditions and expected results. The specification of the Maplin prototype gives a more practical set of results as it takes into account all the components in the completed circuit.

1 = Output one	(Left channel)
2 = DC supply voltage	(+3V to +15V)
3 = Output two	(Right channel)
4 = Ground	(0V)
5 = Inverting (−) input two	(Right channel)
6 = Non-inverting (+) input two	(Right channel)
7 = Non-inverting (+) input one	(Left channel)
8 = Inverting (−) input one	(Left channel)

Table 1. Pin assignments.

The Circuit

Only a few external components are required to provide the correct working environment for the TDA2822M, see Figure 3. The DC supply entering the unit on P5 and P8 must have the correct polarity, otherwise damage may occur to IC1. Electrical noise on the supply rail is suppressed by the decoupling capacitors, C1,C2 and resistor R3.

The left and right input signals are applied to P1 and P3, which are connected to the top end of RV1a and RV1b. This control is used to set the

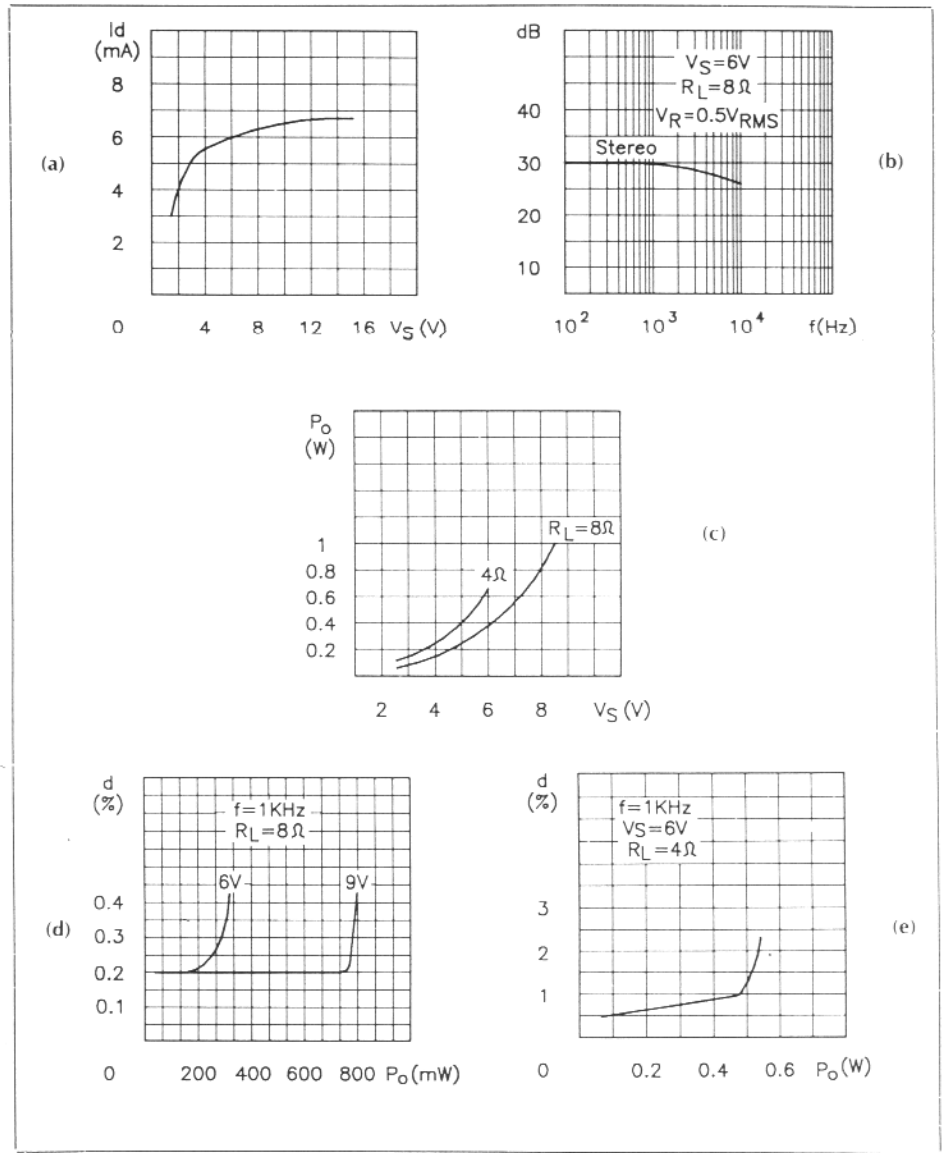

Figure 2. Electrical characteristics. (a) Quiescent current vs Supply voltage. (b) Supply voltage rejection vs Frequency. (c) Output power vs Supply voltage (THD = 10%, f = 1kHz stereo). (d) Distortion vs Output power (stereo). (e) Distortion vs Output power (stereo).

volume of the amplifier by tapping off the signal on its wiper which is connected to the non-inverting inputs of IC1 (pins 6 and 7). The inverting inputs of IC1 (pins 5 and 8) are AC grounded by C3 and C4.

The signal outputs of IC1 (pins 1 and 3) have a DC potential, so two blocking capacitors, C5 and C6, are used to feed the loudspeakers or headphones, with two Zobel networks comprising of C7, R1 and C8, R2 connected to the 0V ground. A PCB mounting 3.5mm stereo jack socket, JK1, is used to switch out the speakers when the headphones are inserted. The left channel speaker is connected to P6 and P9, while the right speaker connects to P7 and P10.

PCB Assembly

The PCB is a single-sided fibre glass type and has a printed legend to assist you in correctly positioning each item, see Figure 4. Removal of a misplaced component is quite difficult, so please double-check each component type, value and its polarity where appropriate, before soldering! The sequence in which the components are fitted is not critical. However, it is easier to start with the smaller components. When installing the electrolytic capacitors the positive lead must go to the plus sign (+) on the legend. However, on some capacitors the polarity is designated by a negative symbol (−), in which case the lead nearest this symbol goes away from the positive sign on the legend. When fitting the IC socket ensure that you match the notch with the block on the legend. Next install IC1 making certain that all the pins go into the socket and the pin one marker is at the notched end. Install the pins at the 'P' connection points P1 to P10 ensuring that you push them fully into the board. When fitting the volume control RV1 and the headphone socket JK1, make certain that they are pushed down firmly on to the surface of the PCB. Additional input screening can be implemented by grounding the metal body of the volume control, see Photo 1.

This completes the assembly of the PCB and you should now check your work very carefully, making sure that all the solder joints are sound. It is also very important that the solder side of the circuit board does not have any trimmed component leads standing proud by more than 3mm, as this may result in a short circuit. Further information on soldering and assembly techniques can be found in the 'Constructors Guide' included in the kit.

Wiring

Carefully follow the wiring shown in Figure 5. The stereo input cable must be the screened type (XR15R) and no more than three metres in length. The power supply and loudspeaker connections can be made using different coloured hook-up wires.

Testing

All the tests can be made with an

ELECTRICAL CHARACTERISTICS

(V_s = 6V, T_{amb} = 25°C, unless otherwise specified)

	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_s	Supply voltage			1.8		15	V
V_o	Quiescent output voltage				2.7		V
		V_s = 3V			1.2		V
I_d	Quiescent drain current				6	9	mA
I_b	Input bias current				100		nA
P_o	Output power (each channel) (f = 1kHz, d = 10%)	R_L = 32Ω	V_s = 9V V_s = 6V V_s = 4.5V V_s = 3V V_s = 2V	90 15	300 120 60 20 5		mW
		R_L = 16Ω	V_s = 6V	170	220		mW
		R_L = 8Ω	V_s = 9V V_s = 6V	300	1000 380		mW
		R_L = 4Ω	V_s = 6V V_s = 4.5V V_s = 3V	450	650 320 110		mW
d	Distortion (f = 1kHz)	R_L = 32Ω	P_o = 40mW		0.2		%
		R_L = 16Ω	P_o = 75mW		0.2		%
		R_L = 8Ω	P_o = 150mW		0.2		%
G_v	Closed loop voltage gain	f = 1kHz		36	39	41	dB
ΔG_v	Channel balance					±1	dB
R_i	Input resistance	f = 1kHz		100			kΩ
e_N	Total input noise	R_s = 10kΩ	B = Curve A		2		μV
			B = 22Hz to kHz		2.5		
SVR	Supply voltage rejection	f = 100Hz	C1 = C2 = 100μF	24	30		dB
C_s	Channel separation	f = 1kHz			50		dB

THERMAL DATA

$R_{th\,j\text{-}amb}$	Thermal resistance junction-ambient	max	100	°C/W
$R_{th\,j\text{-}case}$	Thermal resistance junction-pin (4)	max	70	°C/W

Table 2. TDA2822M specification.

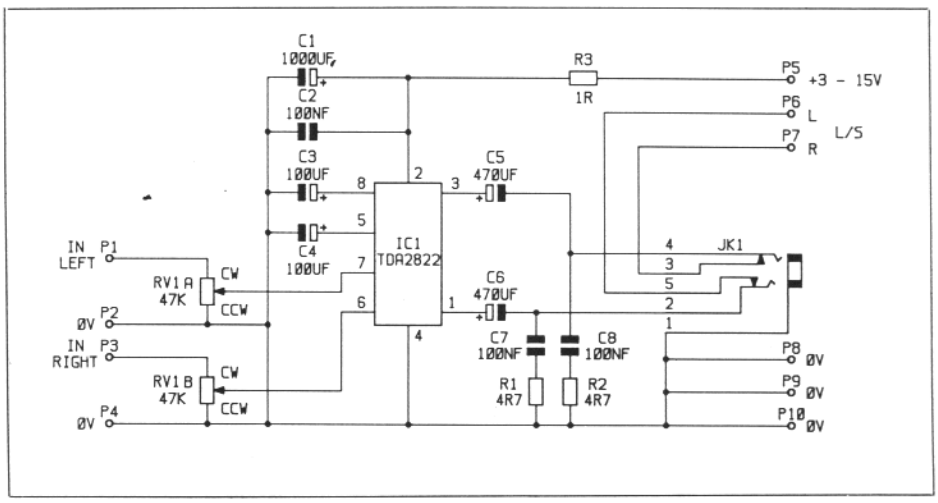

Figure 3. Circuit diagram.

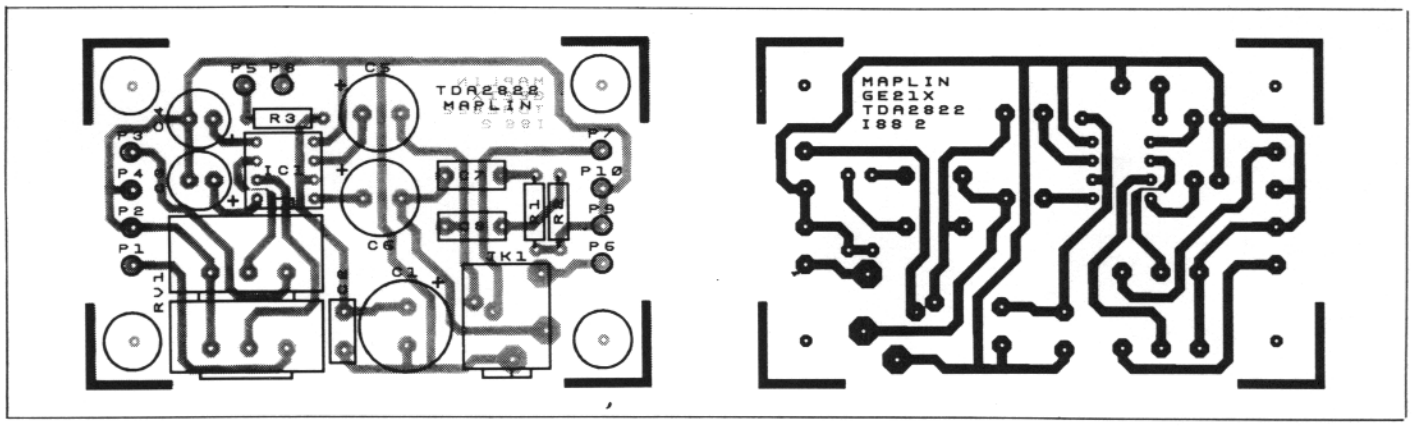

Figure 4. PCB track and legend.

electronic digital, or analogue moving coil, multimeter. The following test results were obtained from the prototype using a digital multimeter and a 9V power supply unit.

The first test is to ensure that there are no short circuits before you connect the power supply. Set your meter to read OHMS on its resistance range and connect the probes to P5 and P8. The reading obtained with the probes either way round should be greater than 500Ω.

Set the volume control to the fully anticlockwise position (minimum volume). Next monitor the supply current; set your meter to read DC mA and place it

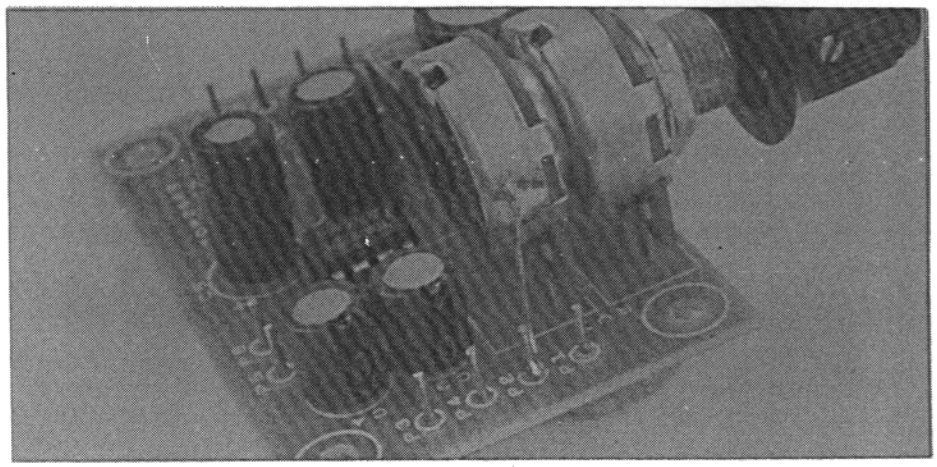

Photo 1. Earthing the case of RV1.

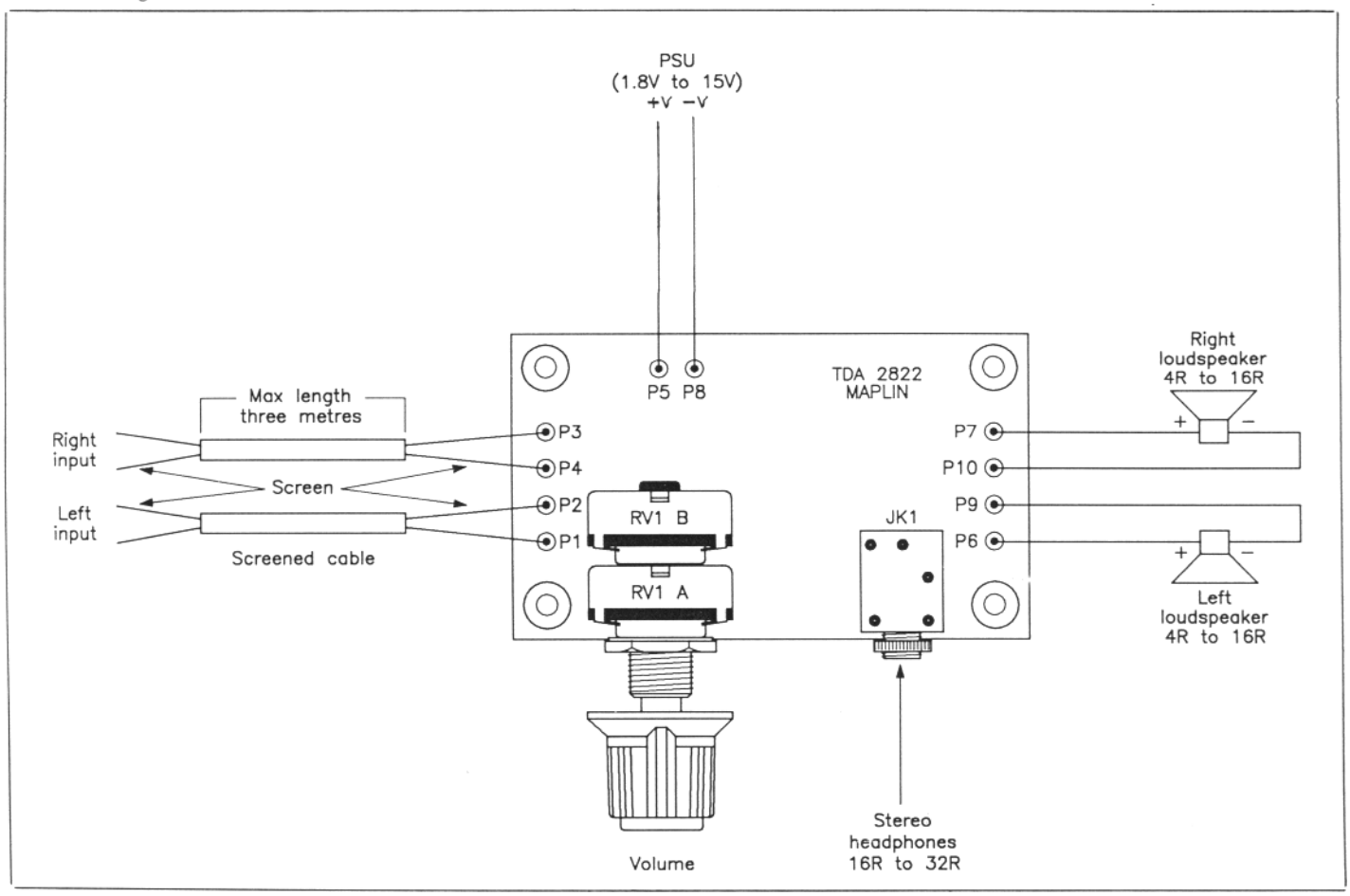

Figure 5. Wiring.

DC voltage	Speaker impedance/power (RMS)
3V to 6V	4Ω 1W
7V to 9V	8Ω 1W
10V to 15V	16Ω 1W

Table 3. Selecting a speaker.

in the positive power line to the PCB (P5). When the supply is switched on a current reading of approximately 8mA should be seen. When an audio signal is applied to the inputs this current will increase as the volume control is advanced and at loud settings the current may exceed 260mA.

This completes the testing of the TDA2822M stereo amplifier, now disconnect the multimeter from the unit.

Using the Amplifier

The unit can be used over a wide range of supply voltages and loudspeaker impedances. Table 3 should assist you in choosing the speaker for a given DC supply.

When using the amplifier with headphones, the 32Ω 'Walkman' type are recommended as most come with a stereo 3.5mm jack plug already fitted.

TDA2822M STEREO POWER AMP PARTS LIST

RESISTORS: All 0.6W 1% Metal Film

R1,2	4R7	2	(M4R7)
R3	1R	1	(M1R)
RV1	47k Dual Pot Log	1	(FX11M)

CAPACITORS

C1	1000μF 16V PC Electrolytic	1	(FF17T)
C2	100nF Minidisc	1	(YR75S)
C3,4	100μF 16V Minelect	2	(RA55K)
C5,6	470μF 16V PC Electrolytic	2	(FF15R)
C7,8	100nF Polylayer	2	(WW41U)

SEMICONDUCTORS

IC1	TDA2822M	1	(UJ38R)

MISCELLANEOUS

JK1	3.5mm PCB Jack Socket	1	(FK20W)
	Constructors Guide	1	(XH79L)
	PC Board	1	(GE21X)
	Pins 2145	1 Pkt	(FL24B)
	DIL Socket 8 Pin	1	(BL17T)
	Knob KB4	1	(RW87U)

A complete kit of all parts is available:
Order As LP03C (TDA2822M Stereo Amp Kit)

The PCB is also available separately.
TDA2822M PCB **Order As GE21X**

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