Lab Notes

An occasional series in which we discuss interesting circuit techniques, circuits we have tried in our own laboratory but not developed as a project, practical notes on projects, measurement techniques for hobbyists etc.

The ETI-III IC power supply revisited

WE RECENTLY received a letter from a reader who had built a number of our ETI-111 IC Power Supply projects (keen lad . . . Ed.). Now this versatile little unit was first published in our November 1972 issue and subsequently in our 25 Top Projects and Test Gear books.

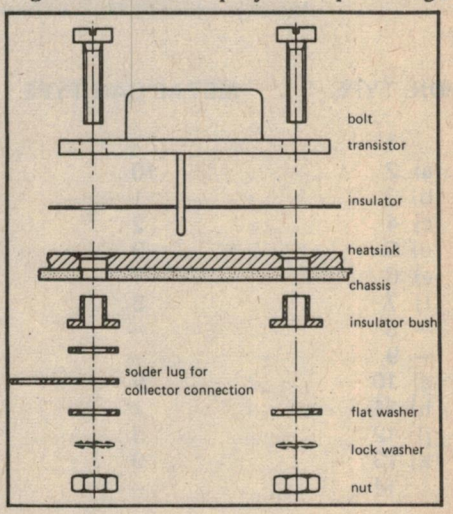
Based on the common 723 regulator IC, the supply is variable between 1.5 and 15 volts and will deliver up to 1A maximum current. It was designed to be simple to construct with a number of optional configurations (fixed, variable or preset output) and has surprisingly good performance.

Our reader, Mr. T.J. Greenfield, has pointed out a number of drawbacks in the original design – which we think justified in the light of developments since 1972 – which he set out to correct.

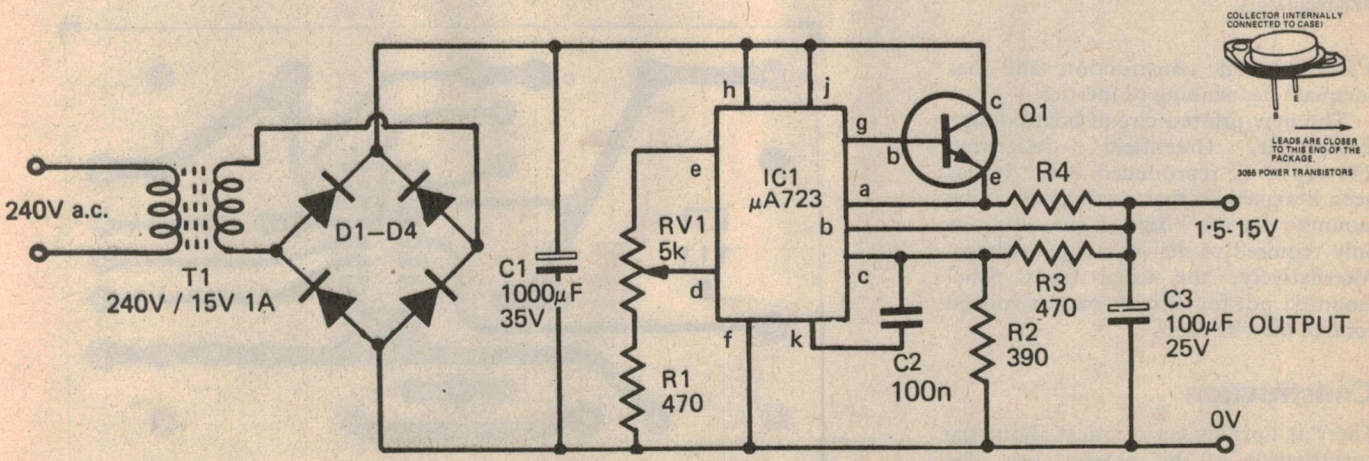
The original design called for a regulator IC in a metal can encapsulation. This happened to be the most commonly available type of encapsulation for 723s at that time. These are now as scarce as tail feathers from a Dodo (or hen's teeth, whichever is the lesser), so Mr. Greenfield has designed another printed circuit to accommodate the standard 14-pin dual-in-line (DIL) package in which 723s are commonly supplied these days.

In addition, the 1972 design had the main 'series pass' transistor, a 2N3055, mounted on a heatsink, which assembly was mounted to the pc board instead of mounting the transistor on the case, but insulated from it. This construction method prevented accidental short-circuiting of the 2N3055 – and subsequent destruction – certainly a consideration, being mindful of the 'universal' nature of the supply and that the project would likely be built by many newcomers to electronics.

Mr. Greenfield has made provision for the 2N3055 (or similar) series pass transistor to be mounted off the pc board. This allows a number of more flexible configurations for the power supply. The flat-pack style TIP3055, in the TO-220 package, may now be pressed into service – these were not generally available until quite recently, and are very handy for applications such as this. A series pass transistor in this package may be mounted on the case which you might use for this project – providing ▶



General mounting details for a TO-3 2N3055.



Pin numbers are not shown on the circuit diagram for the regulator IC as either DIL or CAN type packages can be used. A table for pin connections is shown on page 70.

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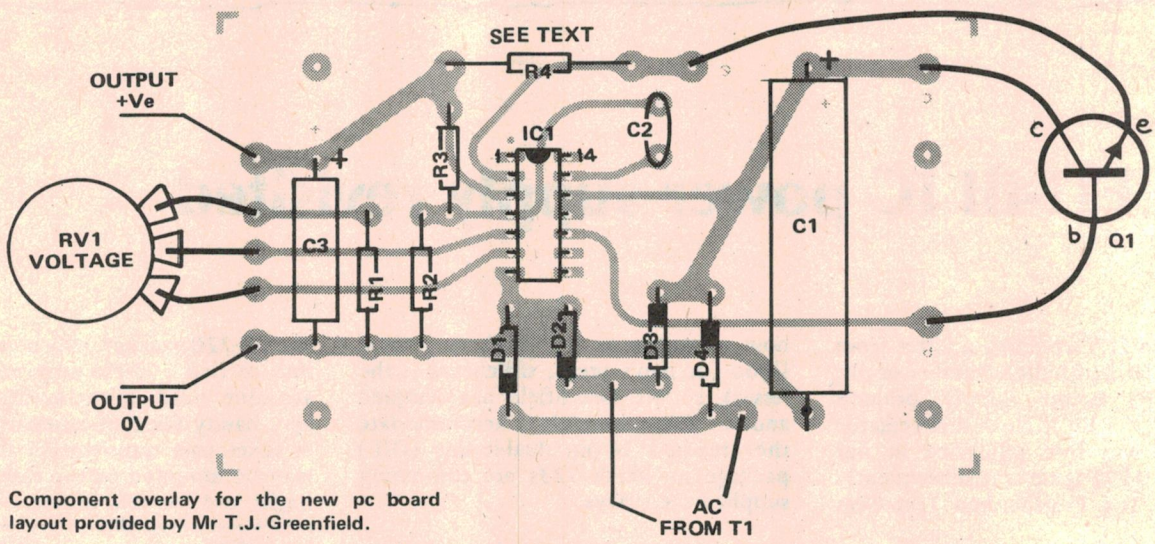


Component overlay for the new pc board layout provided by Mr T.J. Greenfield.

DIL TYPE	METAL CAN TYPE
1	–
a) 2	10
b) 3	1
c) 4	2
d) 5	3
e) 6	4
f) 7	5
– 8	–
– 9	–
g) 10	6
h) 11	7
j) 12	8
k) 13	9
14	–

Pin cross connections for DIL and CAN TYPE 723 regulators.

it's of metal construction and has adequate heatsinking properties.

The new printed circuit board design from Mr. Greenfield, designated ETI-111B, is reproduced here. It has been designed so that a trimpot may be mounted on the board if the supply is only required to deliver a fixed voltage. Alternatively, the usual front panel mounted pot for variable output voltage control may be used.

Construction

There is nothing very critical about the construction of this project. Just take the usual precautions and see that the polarity of the diodes and electrolytic capacitors is correct. Also, ensure that the series pass transistor (Q1) is correctly connected.

If less than the rated 1A current is all that is required, almost any small metal case used to house the unit should be more than adequate. Even the metal panel of a 'zippy' or 'jiffy' box would be adequate for currents of 300 mA or so.

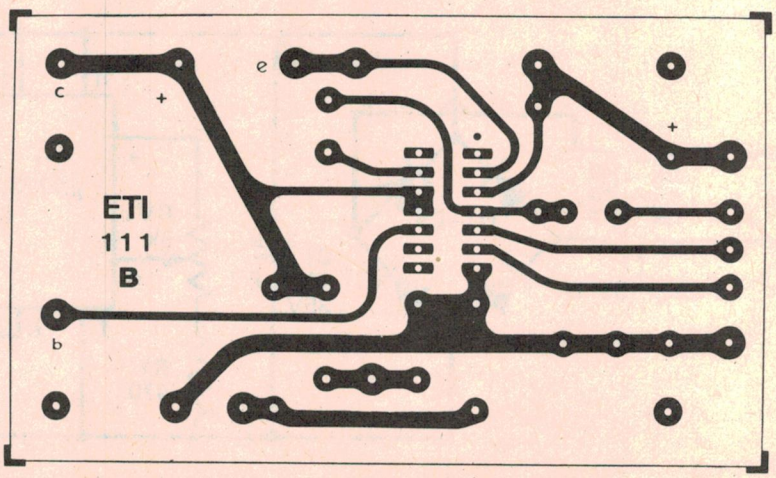
The 723 alone will deliver as much as 150 mA which is more than adequate for a host of small projects and circuits.

When mounting a TO-220 flat pack series-pass transistor, take care to insulate it electrically – use one of the insulator/mounting kits available (refer to the diagram to see how it's assembled). See that the mounting bolt, if exposed, is insulated from the metal part of the package to avoid the possibility of a short circuit (the rectifier would be shorted – which may not be good for its health).

Details for mounting a TO-3 style 2N3055 are also given here.

Selecting the current limit

By developing a voltage across pins 10 and 1 of the 723, its output voltage can be made to 'fold back' at a selected load current. That is, the voltage output starts to fall when the limit is



Full size printed circuit board artwork.

PARTS LIST - ETI 111B

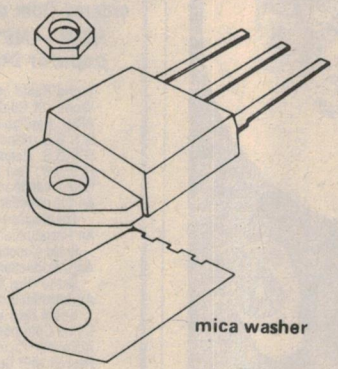
Resistors all ½W, 5%
R1 . . . . . 470R
R2 . . . . . 390R
R3 . . . . . 470R
R4 . . . . . Shunt resistor - see text

RV1 . . . . . 5k lin pot

Capacitors
C1. . . . . 1000μ 35V electro
C2. . . . . 100n greencap
C3. . . . . 100μ 25V electro

Semiconductors
D1–D4. . . . . EM4001 or sim 1A power diode
Q1 . . . . . 2N3055
IC1 . . . . . 723 Regulator IC

Miscellaneous
T1. . . . . 15V 1A transformer - Ferguson Type PL30/ 15VA or sim
Box to suit, ETI 111B pc board, terminals, mica insulation and insulating bushes for transistor, power cord and plug.



TO220 PACKAGE
Insulator and bolt assembly diagram

approached, finally falling to zero and hence protecting the power supply against destruction from overload.

By changing the value of R4 the 'foldback current' can be varied. If the resistor is switched, a number of current ranges may be included in the power supply. If you are testing a circuit which should only draw say 100 mA, the limit can be set just above this current to protect the circuit.

The table gives current limit values for common resistors.

R4	Limit
10R	65 mA
1R	650 mA
0.5R (1/2 ohm)	1.4 A
0.2R (1/5 ohm)	3.2 A

Mr. Greenfield says he has used his ETI-111 projects for: a slot car power supply, mini drill supply, a trickle charger and a general purpose power supply.