Metered variable power supply using inexpensive modules

Many switchmode voltage regulator modules are available from various retailers and on eBay. Many switchmode voltage regulator modules available online use the National Semiconductor (now Texas Instruments) LM2596S "Simple Switcher" IC.

These modules are produced by several manufacturers, mostly in China, with manufacturer markings including "QSKJ", "HW-411" and "RD-086DY001".

All are similar, with only some minor component value variations and changes in auxiliary components. Usually, these modules have an output determined by the setting of a (typically 10kΩ) trimpot. If the trimpot is replaced by an external potentiometer, the module can form the basis of a quick and easy variable power supply. I used the "QSKJ" type module.

These can then be desoldered individually. You could heat the solder joints until the trimpot can be pulled off the board, but it's tricky heating all three joints at once.

However, the easiest way to remove it is to cut it into pieces with side-cutters to the point where only the 3 pins remain on the PCB.

Insulated wires can then be soldered to the PCB and taken to the new potentiometer. Replacing the 10kΩ trimpot with a 5kΩ pot reduces the upper limit of the output voltage range to about 15V. The lowest output voltage possible from these modules is the LM2596S reference voltage of 1.23V.

The actual output voltage is calculated as $V_{OUT} = V_{REF} \times (1 + R2 \div R1)$, where $V_{REF} = 1.23V$, R2 is the potentiometer resistance and R1 is the fixed feedback resistor (430Ω on my module).

The LM2596 is capable of output currents up to 3A, but these modules have no heatsink, so it is not a good idea to operate them at maximum current continuously.

I used a dual digital volt/amp panel meter to monitor the supply output voltage and current. I obtained one which can read up to 33V and 999mA. It does not have any manufacturer's identification or model number markings.

Many variants of such meters are available, with different connector types and wiring colour codes. The connection details shown should suit most similar meters, but check the instructions for yours to make sure.

Typically, such digital panel meters can be powered from the source they are measuring, but they require a minimum of about 4V.

If the regulator output is required to be taken below 4V, another supply for the panel meter must be provided. I simply used a second unmodified switchmode regulator module set to provide an appropriate voltage (12V). They're cheap enough.

I added a single-channel relay module to connect and disconnect the load, which is also powered from the 12V fixed supply.

This allows the output voltage to be varied and read by the panel meter without the load connected. The relay module I used lets you set the control input to active-high or active-low via an onboard jumper.

I set it to active-high working then used a panel-mounted push-on/push-off switch with internal LED to control it.

The switch and LED are connected in series from the 12V supply to the control input. No additional series resistor is required as one exists on the relay PCB.

The LM2596 needs an input supply about 3V higher than its maximum output, but no higher than 40V. Given the 15V maximum output determined by my use of a 5kΩ potentiometer, I used a recycled 19V 4A laptop charger as the power source. You can use a DC input socket to suit the plug on your power supply.

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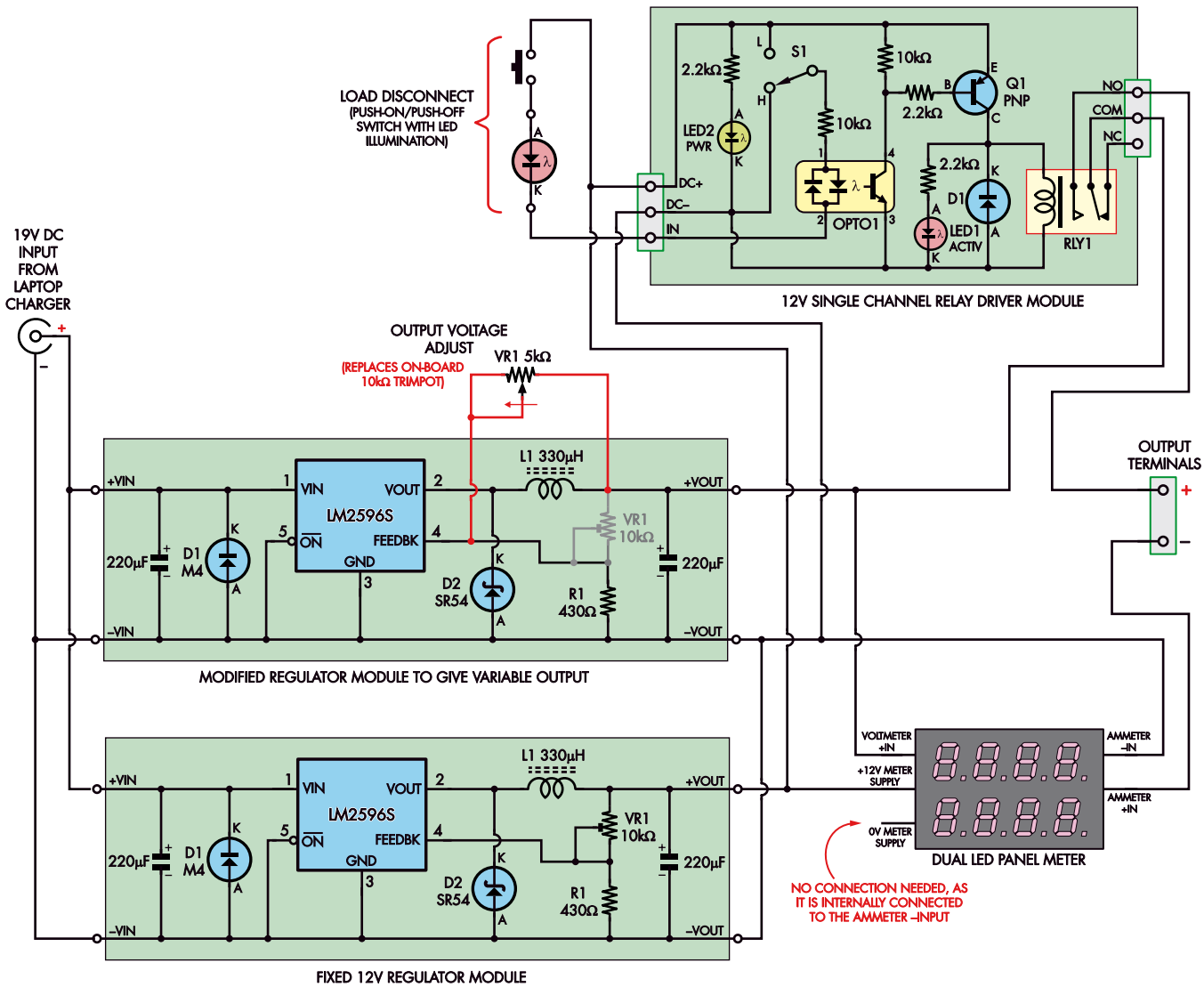
*Editor's note: we have a suitable LM2596-based module in our Online Shop (**siliconchip.com.au/Shop/7/4916**).*



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