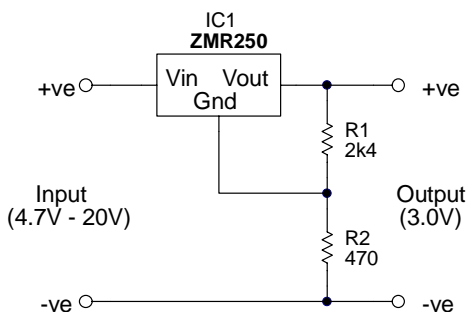


## Applications of the ZMR250 Miniature SOT23 Regulator

### Adjustable Regulator

There are many occasions when a power supply at a non-standard voltage is required, for which there are no off-the-shelf three terminal regulators available. A common technique of dealing with such requirements, is to use a standard regulator selected with an output voltage lower than needed and to add a potential divider connected to its ground pin to raise the output to the desired level. The power supply circuit shown in Figure 1 is an example of this technique.



**Figure 1**  
**Power Supply with Potential Divider;**  
**Designed to Deliver Non-Standard**  
**Output.**

A serious problem with this circuit, particularly for battery powered equipment, is the current drain of the output potential divider. The resistors selected for this potential divider must be chosen so as to pass around 50 times the quiescent current of the regulator if output accuracy is not to be degraded. Industry standard regulators such as the 78L series usually have quiescent currents in the region of 2mA typical, so to maintain accuracy a divider current of 100mA would be required. However, the quiescent current of the Zetex ZMR250 SOT23 miniature voltage regulator, is only 40 $\mu$ A maximum - even less than that of purpose designed adjustable regulators. Use of the ZMR250 in the above circuit allows the divider string current to be kept down to only 1mA without significantly compromising accuracy, making the power supply viable for even battery powered circuits where efficiency is important.

The output voltage given by the power supply circuit can be calculated using the following formula:-

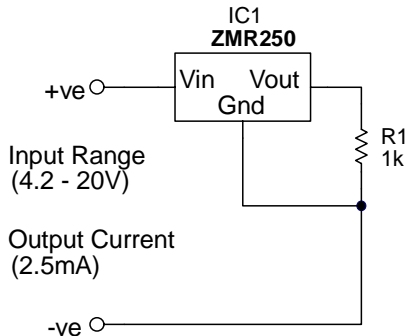
$$V_{out} = I_q \times R_2 + V_{reg} \frac{(R_1 + R_2)}{R_1}$$

Where  $I_q$  is the quiescent current of the ZMR250 (30 $\mu$ A typical) and  $V_{reg}$  is the normal output voltage of the ZMR250 (2.5V).

The power supply will operate with inputs from 4.7 to 20V and supply loads up to 50mA (maximum continuous load current may be restricted by package power dissipation).

### Current Generator

The low quiescent current rating of the ZMR250 also makes the device very useful for current source applications. Figure 2 shows all that is needed to use the ZMR250 as a current source. This circuit behaves as a two terminal device which passes a current independent of the voltage across it as long as this voltage is in the range of 4.2V to 20V.



**Figure 2**  
**Using the ZMR250 as a Current Source.**

The output current is set by resistor R1, following the relationship:-

$$I_{out} = I_q + \frac{V_{reg}}{R_1}$$

here  $I_q$  is the quiescent current of the ZMR250 (30 $\mu$ A typical) and  $V_{reg}$  is the normal output voltage of the ZMR250 (2.5V).

The output impedance of the current source is typically 7.75M $\Omega$  and by adjusting the value of resistor R1, the circuit can be configured to source currents in the range of 50 $\mu$ A to 50mA.