

Keywords: shunt regulator, LDO, DC-DC converter, post regulator, NPN transistor

APPLICATION NOTE 1789

A Cheap, Tiny LDO Provides up to 2A Output Current

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Abstract: This design idea shows how to add an NPN transistor and few external components to a shunt regulator to create inexpensive LDO. The tiny LDO uses no output capacitors and provides up to 2A output current. The MAX8515 shunt regulator is featured.

The **MAX8515** programmable shunt regulator with a 0.6V feedback threshold features $\pm 0.5\%$ initial accuracy and a tiny 5-pin SC70 package. It can be used to build a cheap and tiny LDO using just an external NPN transistor and a few small external components. **Figure 1** shows the LDO circuit.

The input voltage ranges from 1.2V to 2.5V. The output voltage is 1.0V. The supply voltage for MAX8515 is 2.5V. The output current can be up to 2A.

The LDO circuit uses no output capacitors. This is possible because the compensation of the feedback loop of the LDO is separated from its output and the MAX8515 error amplifier has a wide bandwidth (800kHz zero cross frequency with $1\mu\text{F}$ compensation capacitor, C2). Therefore, small output ripple voltage and fast step load transient response can be achieved without the output capacitors.

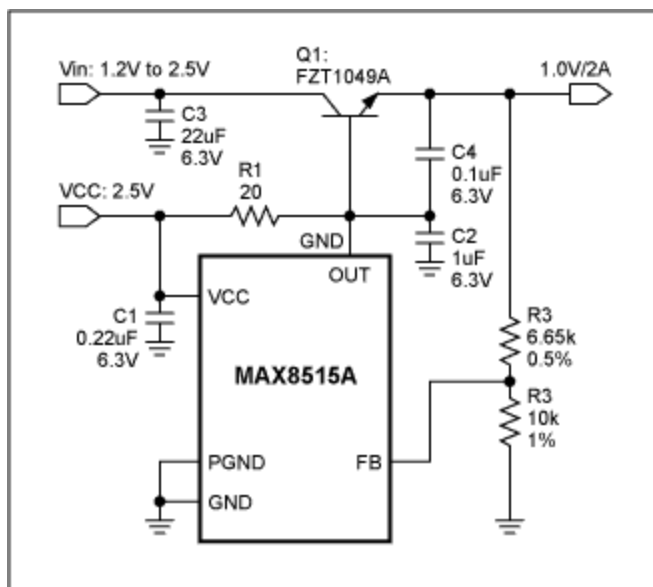


Figure 1. Schematics of a cheap and tiny LDO circuit using the MAX8515.

Figure 2 shows the step load transient response with 1.5A step load current (75% step load change). The transient response finishes within 4 μ s. For 25% step load change the maximum voltage deviation would be less than 40mV, meeting the \pm 5% requirement at 1.0V output.

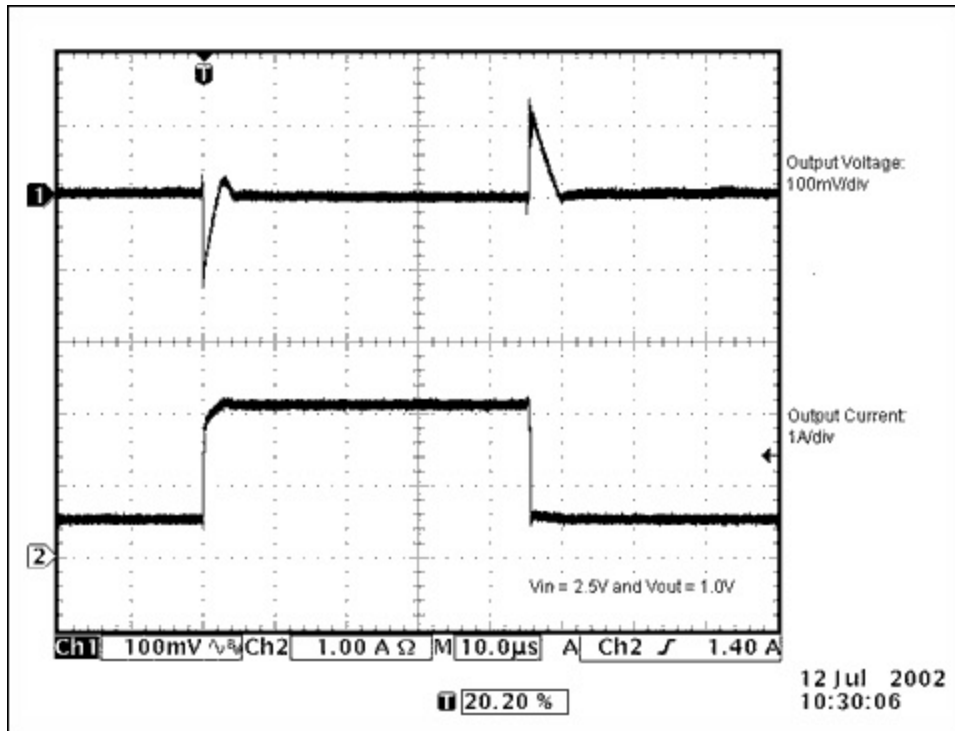


Figure 2. Step load transient response from 0.5A to 2.1A and back to 0.5A.

Figure 3 shows the output ripple voltage at 2.5V input and 2A of load current, where the peak-to-peak ripple voltage is less than 3mV.

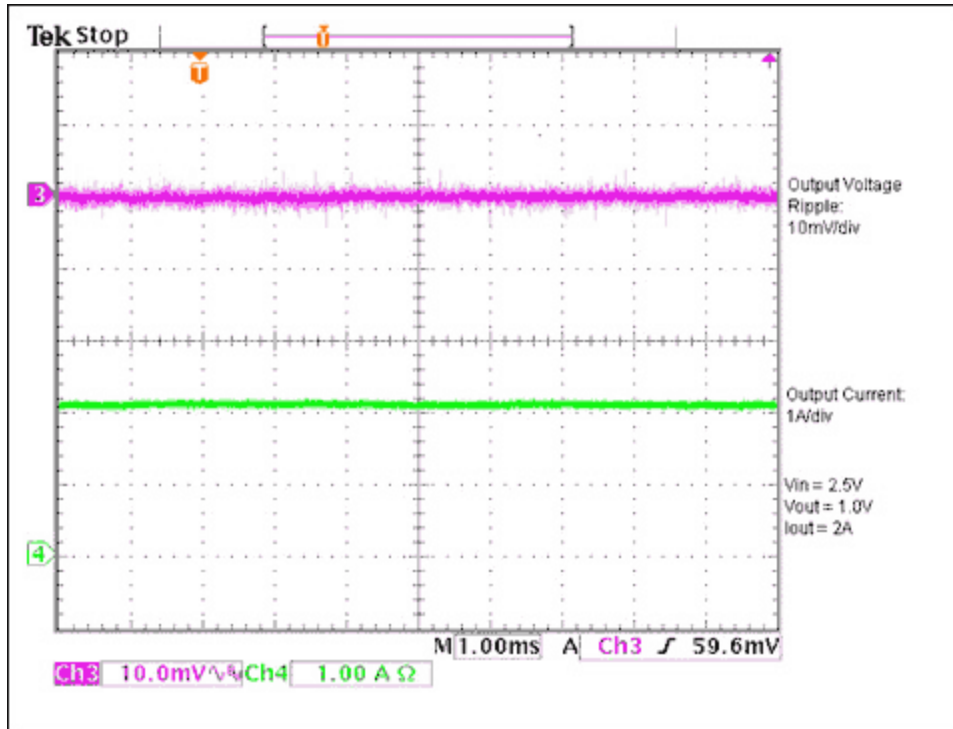


Figure 3. Output ripple voltage at 2A load current 2.5V input voltage.

It should be pointed out that the LDO shown in Figure 1 does not provide either short circuit or over load protection. Therefore it is recommended that the LDO be used as a post regulator after a DC-DC converter, which can provide short circuit protection. The tiny footprint and low cost make the LDO attractive where the board space and cost are especially important.

Related Parts

[MAX8515](#)

Wide-Input 0.6V Shunt Regulators for Isolated DC-DC Converters

[Free Samples](#)

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