

LCD Meter DC Isolated Power Supply

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LCD panel meters are readily available, inexpensive, and applicable to many projects. There is one "catch" to these devices, however. The source of DC power for the meter unit must be isolated from the circuit being measured. This is because the ground potential of the meter power supply is not the same as the reference potential needed by the analog-to-digital converter IC.¹ A DC-to-DC converter with transformer isolation is an obvious solution.

For general use, a converter circuit should be easy to reproduce, reliable, and relatively efficient. The converter in Figure 1 satisfies these requirements. It provides two isolated 9 V outputs (each capable of supplying 10 mA) while drawing less than 45 mA under full load. Most LCD panel meters draw less than 2 mA.

The heart of the converter is an LM556 dual timer IC, U1. One section of the chip acts as a power multivibrator operating around 3.3 KHz (U1a), with the frequency of operation defined by R5, R6, and C12. The other section of the chip (U1b) acts as an inverting power amplifier. U1a and U1b directly drive the inverter transformer in a bridge-tied load (BTL) configuration.

T1 forms a 1:1 transformer, and the resulting output is doubled by D1, D2, C2, and C4 before being regulated by U2, a National LP2950CZ-3.3 high-efficiency low-drop-out regulator. R1 and R2 set the output voltage at 8.9 V. The control pin current for U2 is rated at 120 μ A maximum, so to provide stable regulation the current in R1 and R2 is set to about 1 mA. This causes a no-load draw of 1 mA from each regulator, which is much better than the 5 mA draw that would result from using a device such as the LM7809L (although the latter device can certainly be substituted with loss of efficiency). An identical circuit provides the second 9V isolated output.

Construction Hints

This circuit is non critical to construct. However, if both secondaries are to be used, make sure that the phase relationship of the secondaries is exactly as shown on the drawing. Failure to do this will induce extra 3 KHz noise upon the ground of each isolated supply, which will likely interfere with the LCD meter's operation.

If you hand-wire this circuit, wire the LM556 circuitry carefully. Mistakes in wiring are likely to cause high current to be drawn from the supply due to the low-impedance load of the transformer.

Additional efficiency may be had by substituting a CMOS 556. This has not been tried (no parts were available at the time of this writing.)

¹ In some cases, it might be possible to *translate* a meter-power-ground-referenced incoming voltage for the LCD meter by subtracting the ADC reference potential from the measurand. An external op-amp will be required for the subtraction.

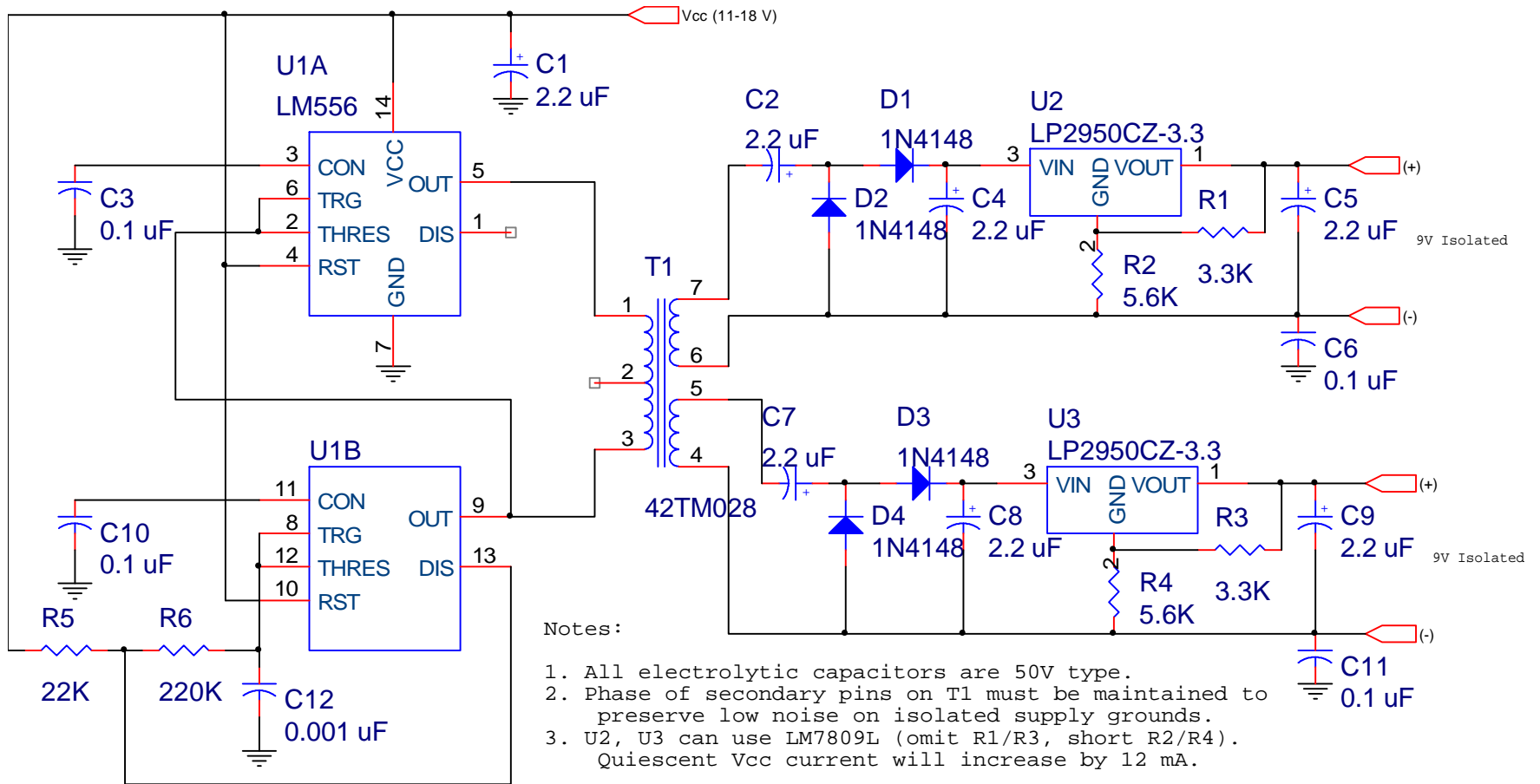


Figure 1: LCD Meter Isolated Power Supply