

Eight LEDs make a 100-division voltmeter

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The circuit in this Design Idea makes a voltmeter that reads to 0.99V. The idea uses a counter IC to drive two sets of four LEDs (Figure 1). Each of these two sets represents a BCD (binary-coded-decimal) value. With all of the LEDs off, the voltmeter reads 0V. With all of the LEDs on, the reading is 0.99V. Op amp IC_{1A} generates a predictable voltage ramp.

You use op amp IC_{1B} as a comparator to compare the ramp to an input signal.

The higher the input voltage, the longer the output pulse from IC_{1B} is. You use this pulse to gate free-running oscillator IC_{2B}. A potentiometer on this multivibrator circuit allows you to adjust the full-range count. The voltmeter has a maximum input of 1V and uses three dual-part packages. You make output counter IC₃ work as a two-digit counter by strapping the enable pin of the IC_{3B} part to the MSB (most-significant-bit) output of the IC_{3A} part.

DI Inside

52 Simple circuit controls the rate of voltage change across a capacitor or another load

54 LED bar-graph display represents two digits

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A dual op amp is used to create the comparator function and the ramp generator. The design also uses a dual 555-type timer chip. You use IC_{2A} to

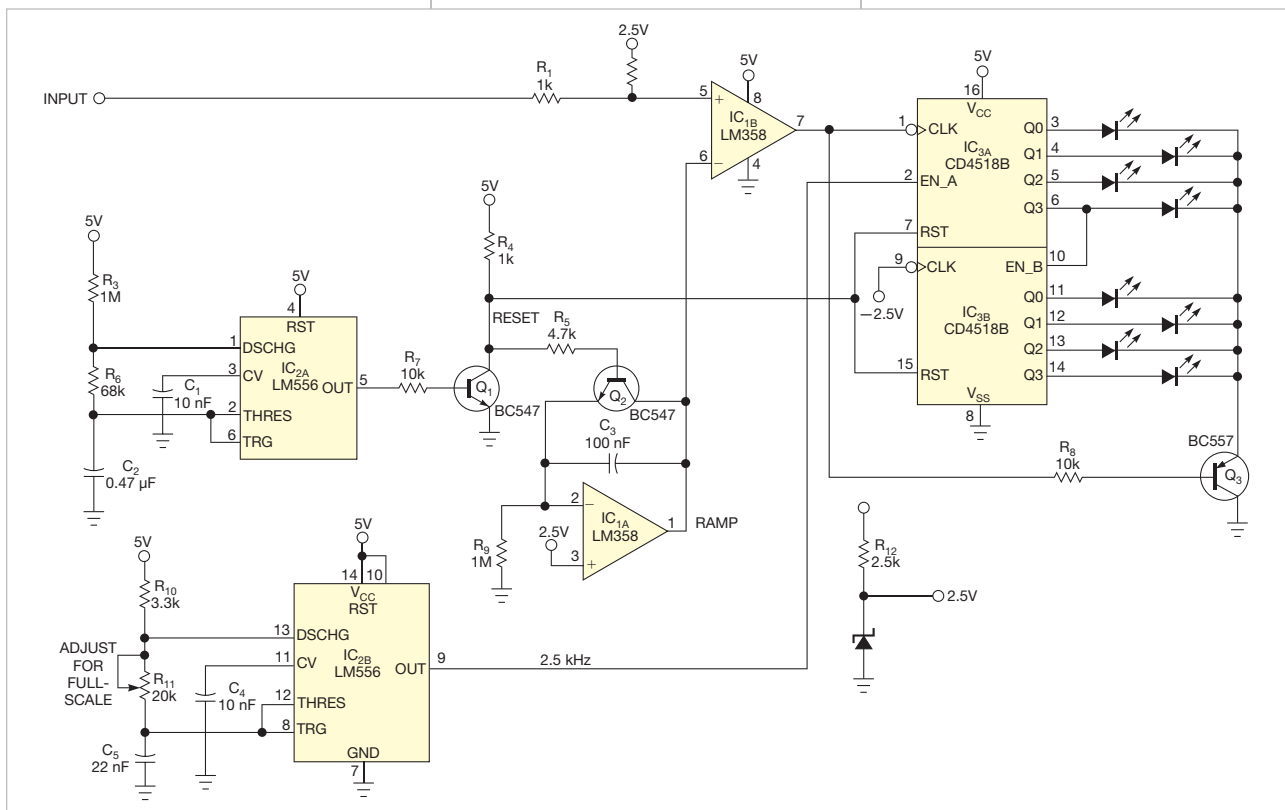


Figure 1 This 100-division voltmeter uses three simple chips.

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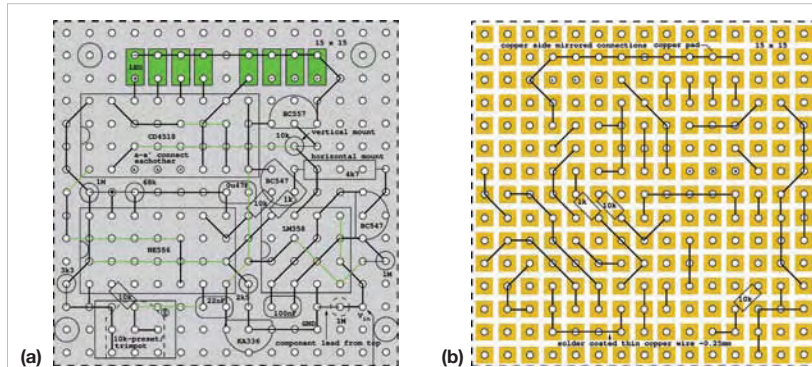


Figure 2 A top view of a 15×15-hole prototype board shows component placement and connections on the top (green) and bottom (black) for the voltmeter circuit (a). A bottom view of the board shows the connection on the bottom, along with three resistors (b). For a full-size view of this figure, go to www.edn.com/110922dia.

create the ramp and to reset it and the output counter, and you use IC_{2B} as a free-running oscillator that drives the counter chip. To blank the output LEDs when the chip is counting, Q₃ disables drive current to the LEDs when IC₃ is incrementing. You use IC₄ to derive a reference of 2.5V.

Tests of the design use TL084 op amps, but you can also use an LM358. A top view of the 15×15-hole prototype board shows component placement (**Figure 2a**). **Figure 2b** shows a bottom view of the board, with the connection and three resistors. You might use flat-green LEDs with the sides painted black or covered with black-plastic sleeves for good visibility.**EDN**