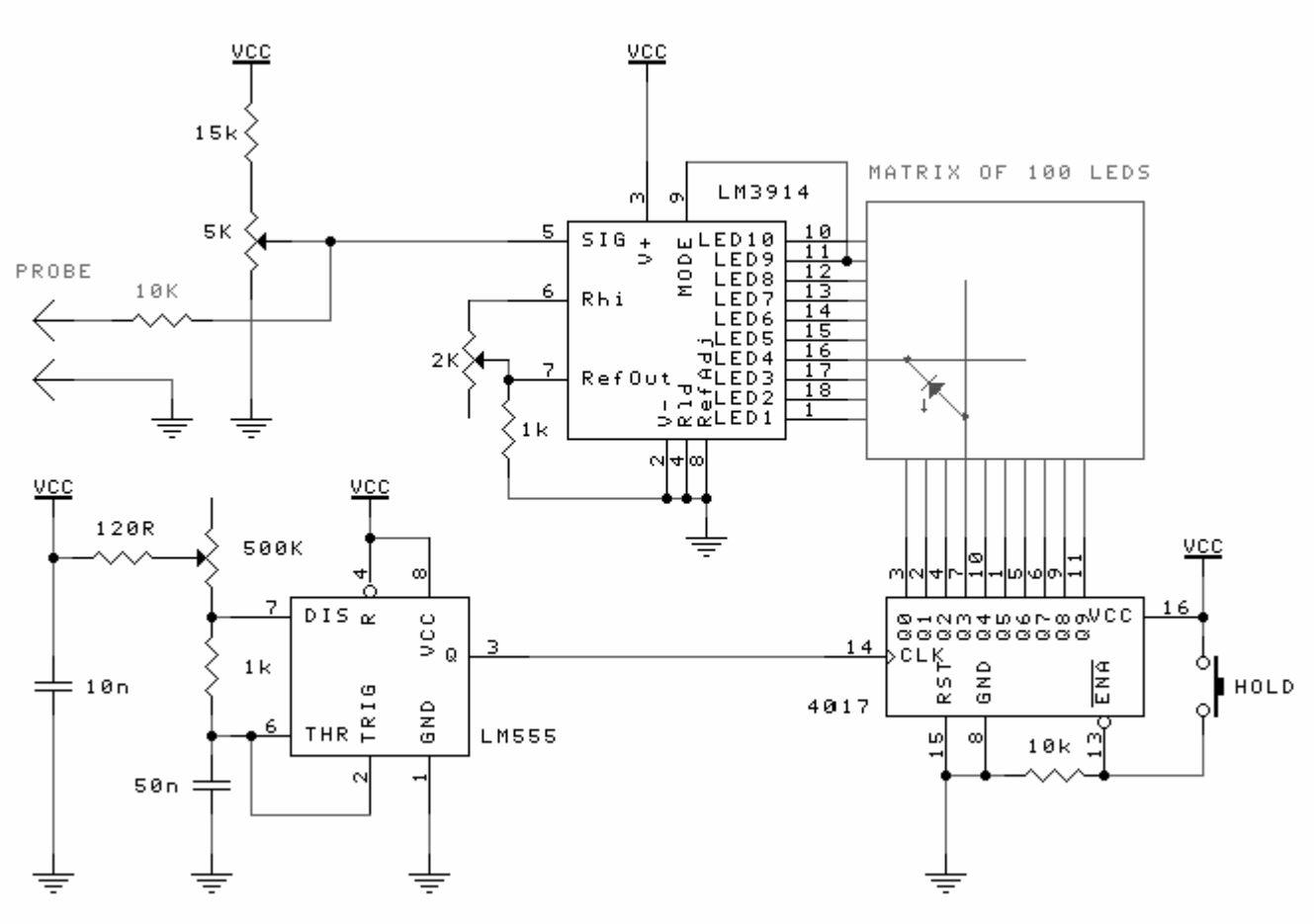
Solid State Oscilloscope

Electronics Today International, February 1987, p.25



New South Wales I

George Katz of Balgowlah Boys high in Sydney presented a solid state oscilloscope. He says "probably the best advantage is its very small size and the fact that it can run off the power supply of the circuit being tested. Although it has a low frequency range, it can still be used for most circuits. Its poor resolution will still allow for most waveforms to be visualized."

This was pretty much the judges' own assesment of Katz's project. It uses a matrix of 100 LED's for a display, and does suffer from being slow and having rather poor resolution. Still we could display a sine wave running at 500Hz without trouble, that that's not all that dissimilar to commercial solid state osscilloscopes.

The circuit displays an understanding of the mechanics of displaying an analogue waveform. The timebase is simply a 555 generating a horizontal sweep, while the vertical amplifier is 3914 with a trimpot on the front. It's extremely simple, but it works.

The LEDs are multiplexed by a 4017 driven by the timebase. This arrangement reduces the current requirements considerably, no mean consideration when operating from the power supply of the device under test.

With a device like this, making the unit as small as possible is obviously a consideration. Katz decided to make his own box out of perspex so that he could make it just as big as the circuit board, and no bigger. He was also able to give the thing a fancy shape rather like a bought one.

On the basis that this project had the highest combination of imagination, design ingenuity, construction and documentation, we made it the national winner.

You can see the circuit for this project on page 108 of **The Forrest Mims Engineer's Notebook**. It's published by LLH Technology Publishing (formerly HighText Publications) and is under $20.00. The ISBN number is 1-878707-03-5. This a 8.5"x11" soft cover manual. This book is full of circuits that the electronics hobbyist will want to try, using many common components. The circuit for this scope was published in August of 1979 in **Popular Electronics** magazine too, with more details than the book goes into.

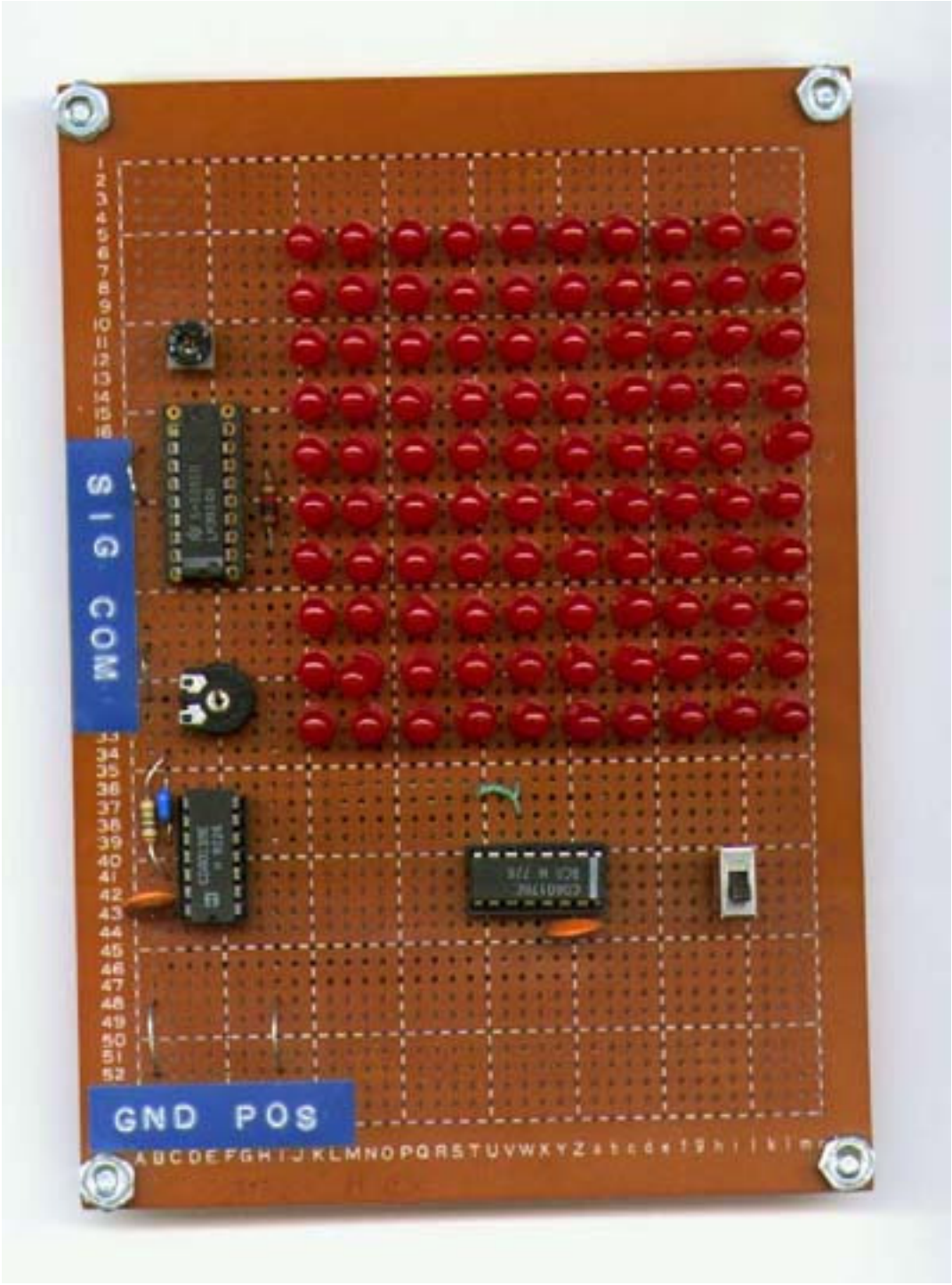
The part list:

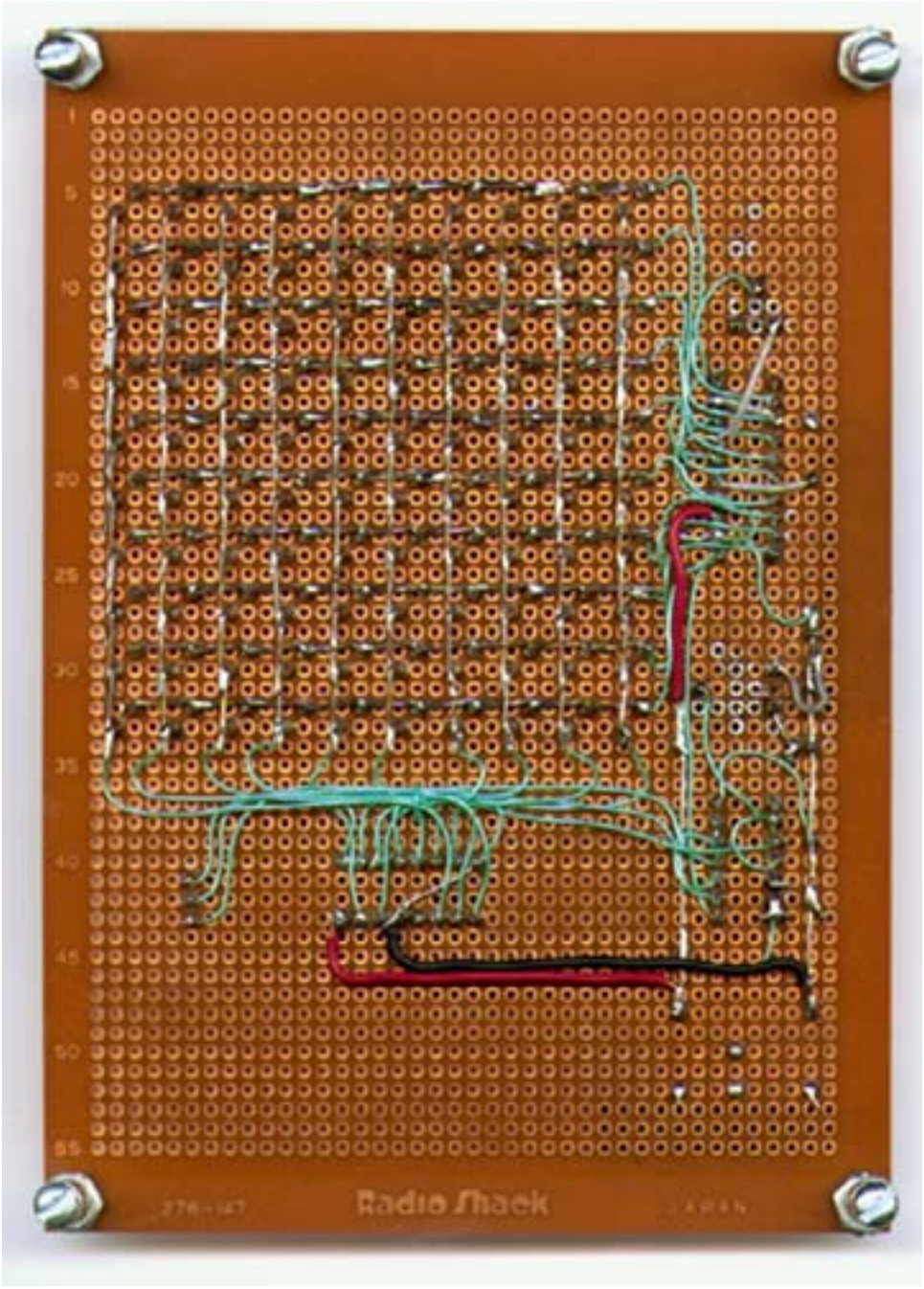
- PC Board (shown is RS 276-147, 4.5"x6.25")
- 14 pin dip IC socket
- 16 pin dip IC socket
- 20 pin dip IC socket (for the 18 pin LM3914)
- 100 Red LEDs
- LM3914 Dot/Bar Display Driver
- 4011 Quad Nand Gate
- 4017 Decade Counter/Divider
- 100K trimmer pot
- 1K trimmer pot
- SPDT switch
- 1K resistor
- 0.1µf capacitor
- 9V battery
- 9V battery snap
- small amount of wire, bus wire, & solder

I really didn't have anything else better to do when I spent a day bending LED legs over to make this very limited o-scope. I built a tiny function generator board to play with the o-scope more, and I tried this board out with a commercial function generator-- it worked ok. You are not going to see anything like what you'll find on a commercial oscilloscope, but you will be able to pick out a square wave or sine wave.

If you've ever thought about building such a circuit and wasn't sure how to go about it, I hope seeing this will help. My board is a bit oversized for the project, as you can see. If I had upped the LED count to 500 or so, I might have decent resolution, but I'd need a bigger board too! What I really use this for is watching audio output, kind of a funky looking bar graph type display. I've changed some values and added a resistor and a couple caps that weren't in the original schematic, but my board follows the book fairly closely.

So, if you happen to have a hundred LEDs laying around that you don't know what to do with...here's the project for you!


SIG COM
GND POS


Radio Shack