

# INSIDE THE BALDENGINEER'S



## VIRTUAL TOOLBOX

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# INTRODUCTION

I am often asked about the tools I use in my electronics work. This eBook contains the top tools I currently use. Some of them aren't really "in my toolbox", but they are on my bench. Over time, I will update this guide.

Find updates at: [www.baldengineer.com](http://www.baldengineer.com)

You can also follow me on [Twitter](#), [Facebook](#), and [Google+](#).

Please Note:

For all products, I have provided either an Amazon Affiliate or Adafruit link for your convenience.



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# RIGOL DS1052E

Oscilloscopes are the Swiss-Army Knife of measurement tools. A few seconds of looking at a scope trace can save hours of debugging.

This 2 channel oscilloscope with 50MHz of analog bandwidth from RIGOL is a great addition to any electronics bench. Each channel samples plenty fast for 50MHz with rates up to 1Ga/s (every 100ps).

Unless your project specifically needs more than 100MHz of bandwidth, the 50MHz model will be plenty for most projects.


Don't settle for difficult to use "pocket" or PC-based scopes, especially at the price you can get this full-sized scope.

### Pros:

- Automated Measurements
- USB Thumb Drive Support
- Vernier control knobs

### Cons:

- Limited number of math functions
- Saving screenshot is cumbersome
- Lack of dedicated CH1/CH2 Knobs

 Buy from **amazon.com**



# MASTECH HY3005F-3

Two variable voltage and variable current outputs along with a single 5V 3A fixed output.

The variable outputs run up to 30V and 5A each. They can be put in parallel or series with each other.


Current limiting outputs are great for turning on a circuit for the first time.

## Pros:

- High output voltage and current
- Stable Outputs
- Independent Volt/Amp Display (per channel)

## Cons:

- Must cycle power to turn off output
- Knobs don't allow precise control
- No built-in "short" for setting current limit

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# FESTOOL SYS-1

Interlocking storage containers make organization and transportation a snap.

The SYS-1 is good for storing components, especially when combined with the SMD Storage containers.


For bulkier tools like wire strippers and multimeters the deeper SYS-2 is better.

## Pros:

- Variety of form factors available
- Form factors all interlock
- Slots for custom labels

## Cons:

- Locking plastic plate sometimes pops off

 Buy from **amazon.com**



# BREADBOARD & WIRES

Breadboards provide the fastest and easiest way to connect up a circuit.


Combine them with some male-to-male (or male-to-female) jumpers to make wiring between an Arduino and IC simple.

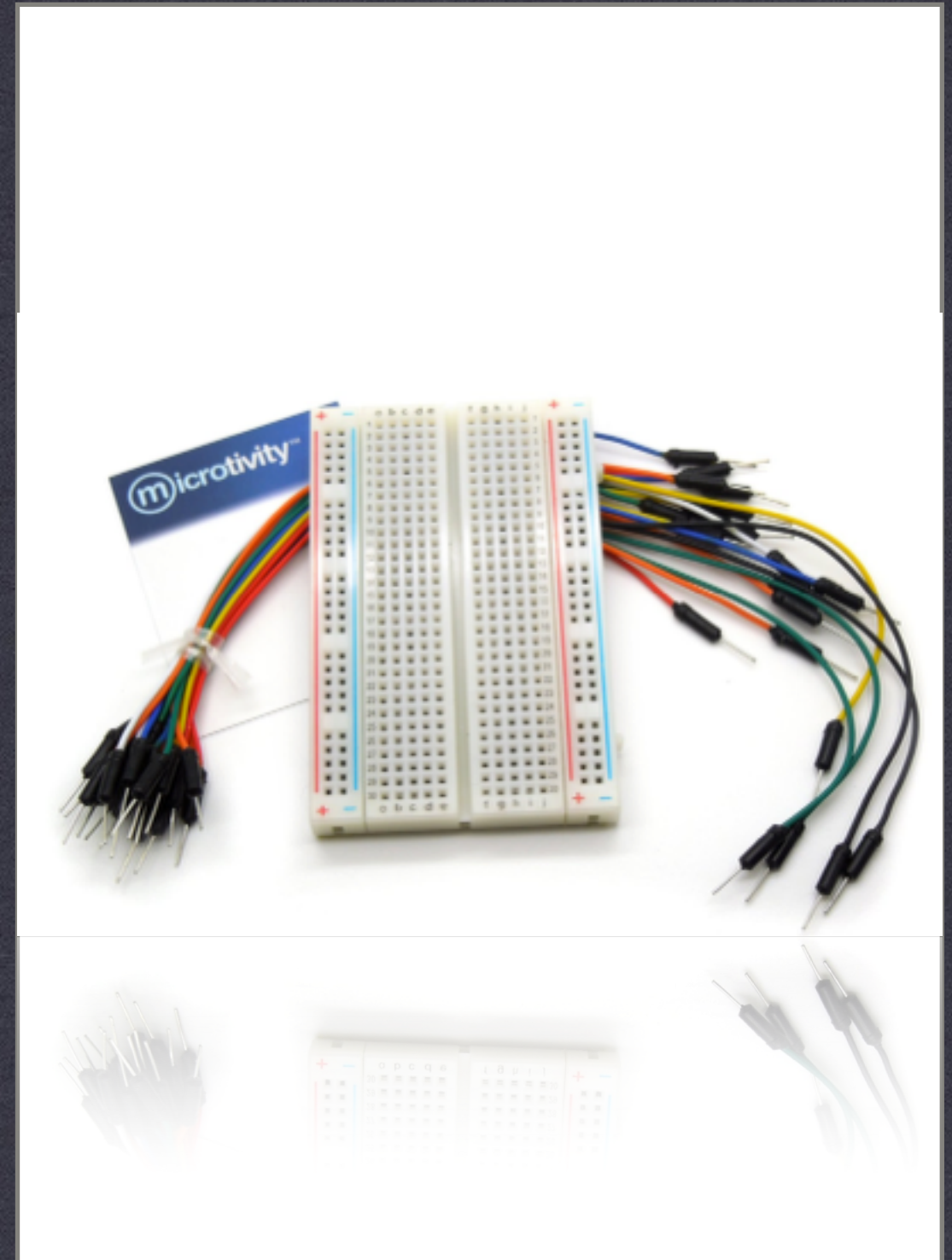
## Pros:

- Standard Layouts
- Variety of Sizes
- Fast and Easy to use

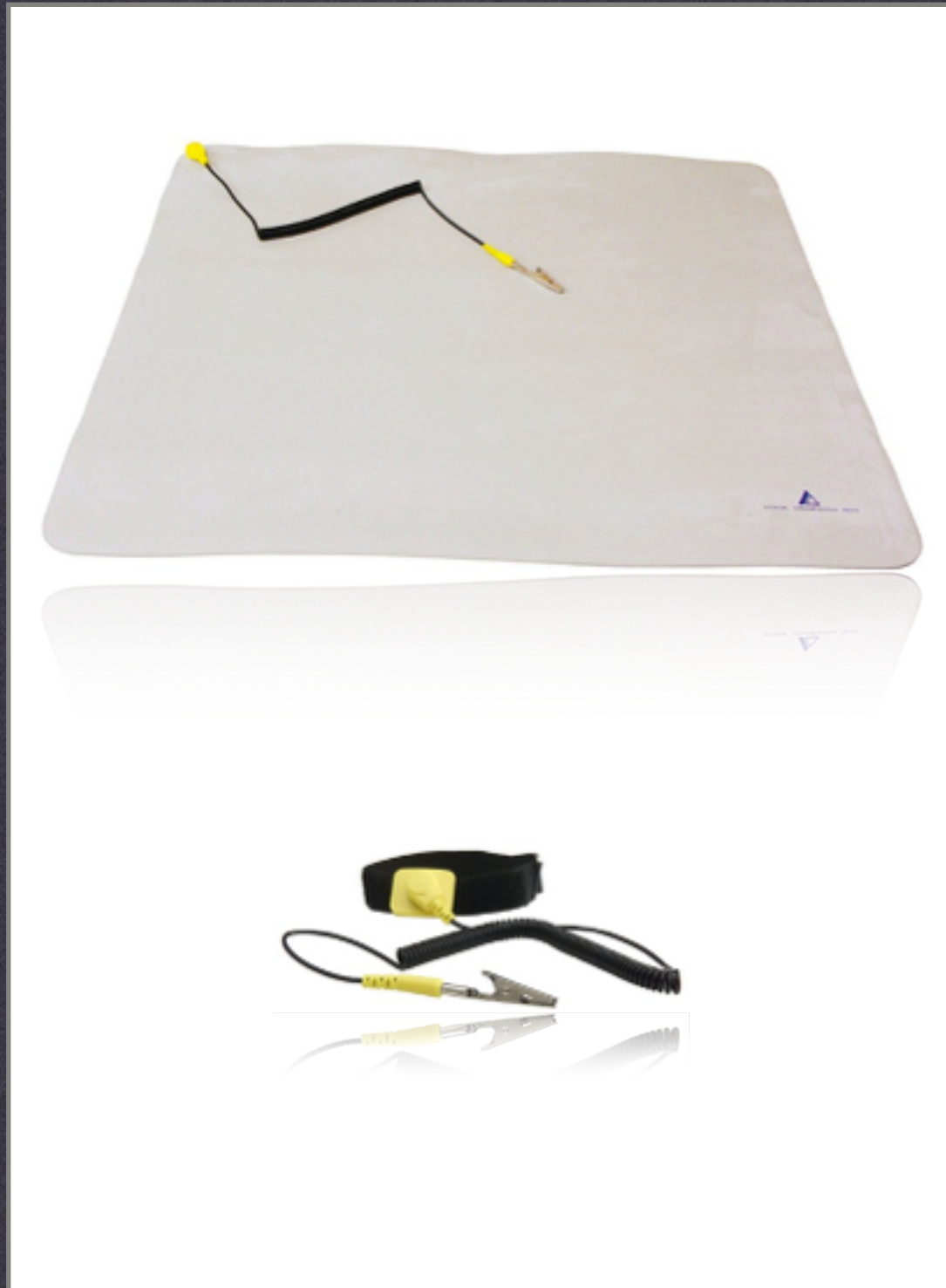
## Cons:

- Connections wear out over time
- Sometimes difficult to make “good” connection

 Buy from [amazon.com](https://www.amazon.com)







# ANTI-STATIC MAT & STRAP

Components like ICs and MOSFETs are very sensitive to electrostatic discharges (ESD).

Using this mat, when properly grounded, will help protect them from this type of damage.


This is only a mat. I also use a wrist-strap, which I connect to the mat while working.

## Pros:

- Covers big work area
- Back has slight adhesive

## Cons:

- Doesn't have snap for wrist strap
- Gets dirty easily

 Buy from **amazon.com**



# HAKKO FX-888

Having gone through a number of soldering irons in my career, my favorite reasonably priced iron is the FX-888 from Hakko. It heats up fast, recovers quickly, and has a variety of tips available.

The holder comes with a sponge and brass pad. I never use the sponge because the brass pad works awesome.

## Pros:


- Fast heat-up and recovery
- Robust holding station

## Cons:

- LED is a little confusing
- Tip included with iron is rather large

*Note: The older analog model is pictured, which is what I have, but may not be available any more.*



 Buy from [amazon.com](https://www.amazon.com)





# FLUKE 115

No toolbox is complete without a multimeter. They make a multitude of measurements. Hence the “multi” part of their name.

Make sure your multimeter can measure the basics: Voltage, Current, Resistance, Diodes, and Continuity. Additional functions that are nice to have: Frequency, Transistor, Temperature and Capacitance.

Some people swear by Fluke and they are some of the nicest on the market. If you want a Fluke, the 115 is good for general purpose electronics. Check out the 114 and 117 for Electrician work.

#### Pros:

- Fluke’s legendary build quality and ruggedness
- Auto-ranging (with manual available)
- Capacitance & Frequency measurement

#### Cons:

- Doesn’t include a thermocouple amp (temperature)
- Carrying case is sold separately ([http://bit.ly/fluke\\_case](http://bit.ly/fluke_case))

 Buy from **amazon.com**









# SMD STORAGE BOXES

Keeping track of parts is an endless battle. One of the systems I use for loose parts is a variety of SMT storage boxes from [Adafruit](#). I snap these together and place inside of a [SYS-1 Container](#).

[Adafruit](#) has a number of sizes available, I'd suggest buying a couple of each size on one order, figure out what you need, then order more!

## Pros:

- Tight seal, no parts slip out
- Snap-together design, lets you customize
- Variety of sizes available

## Cons:

- Limited Label Space (label covers the stuff inside)





# HAKKO CSP-30-1

Stripping a wire's insulation without damaging the copper wire is critical. Good quality wire strippers pay for themselves by saving in frustration. These strippers from Hakko have convenient notches for different wire gauges. This gives a clean cut every time.

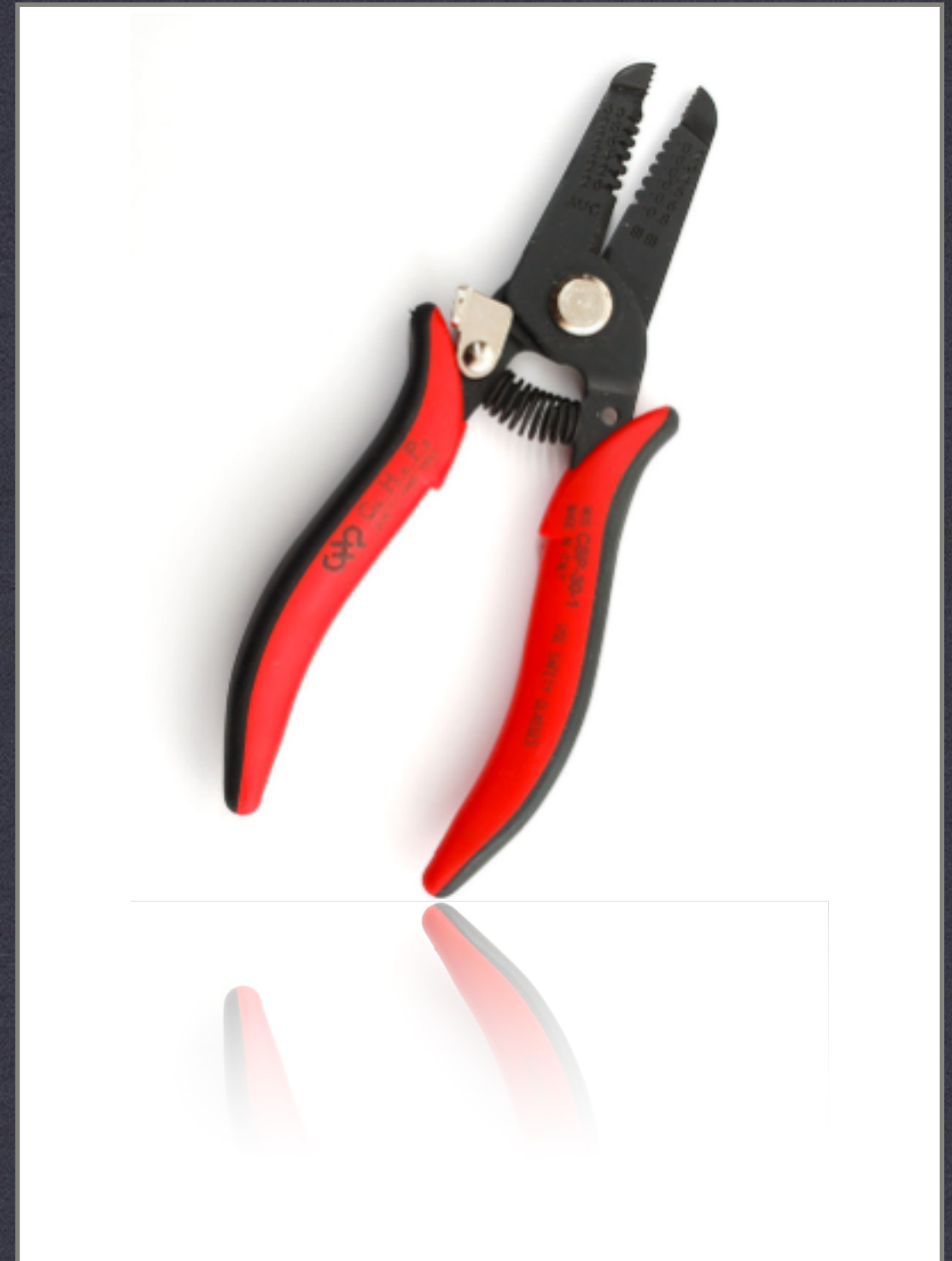
Also, the cutting blades double as an actual wire cutter.

## Pros:

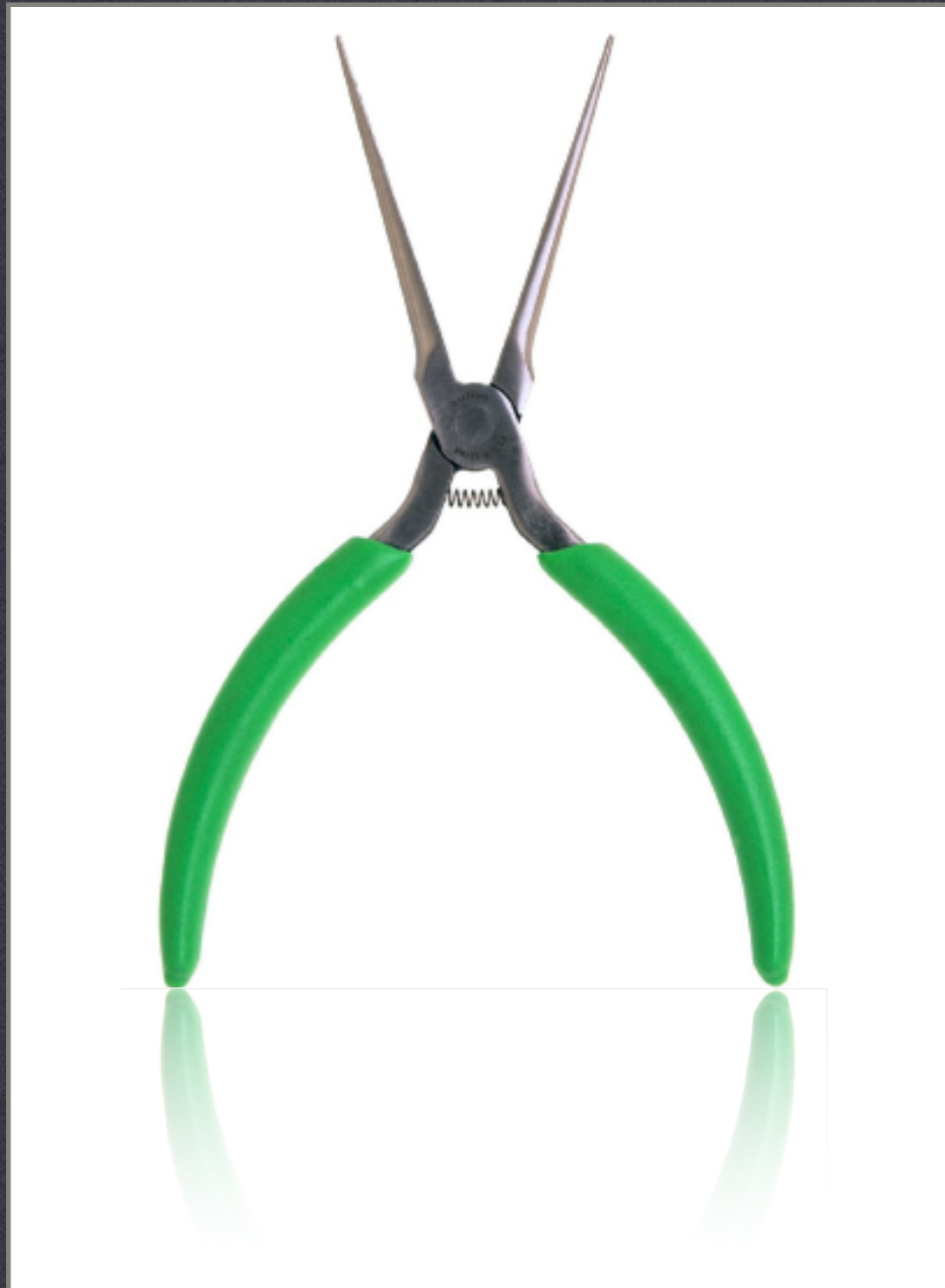
- Pre-determined gauge size
- Good quality grip material

## Cons:

- Spring can wear-out if abused







# XCELITE NN7776V

Dropping a component, screw or nut can be maddening. Needle nose pliers are invaluable as placement tools, chip removers, and as a “hold a part while I solder it” tool.

A serrated jaw is helpful but not usually required. These from Xcelite are 6” long, which give plenty of leverage for most situations.

I’m a fan of the cushion grip on these, especially if you’re using them to place SMD components.

#### Pros:

- Long jaw length
- Great cushion

#### Cons:

- Tips can be bent if mishandled

 Buy from **amazon.com**



# MITUTOYO

## 500-196-30

Precision measurements need precision tools. I tried low-cost calipers from eBay and found them inaccurate and finicky.


The Mitutoyo are the best calipers I have ever used. Measurements are always spot on. There's no fussing around.

### Pros:

- Highest accuracy at this price range
- Near-instant measurement updates
- On/Off Switch actually works

### Cons:

- Included case is kind of cheap
- Everyone in your shop will ask to borrow them! :)

 Buy from [amazon.com](https://www.amazon.com)





“Men have become the tools of their tools.”

*–Henry David Thoreau*