

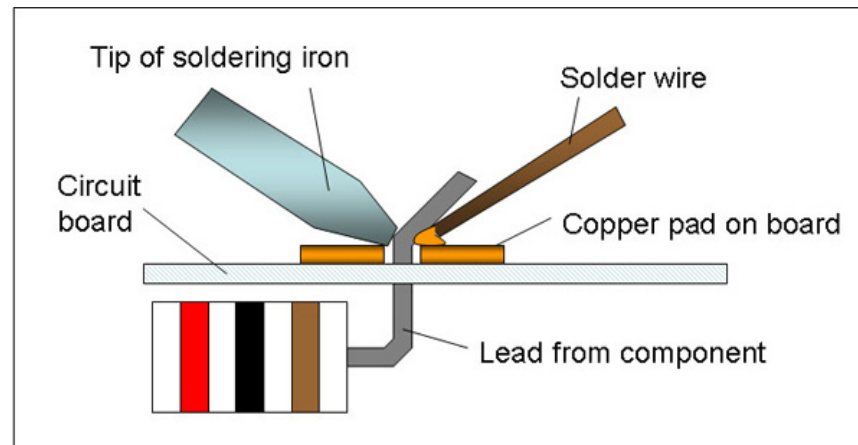
# **Soldering Techniques and Safety**

Lecture 1

Engineering World Health

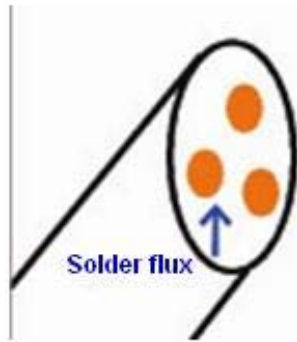
# What is Soldering?

- Joining electrical components to printed circuit boards (PCBs) using a filler metal that has a relatively low melting temperature (several hundred °F)
- Creates a strong electrical and mechanical connection, although the former is more important



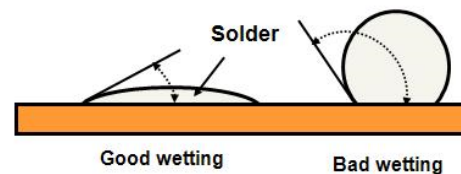
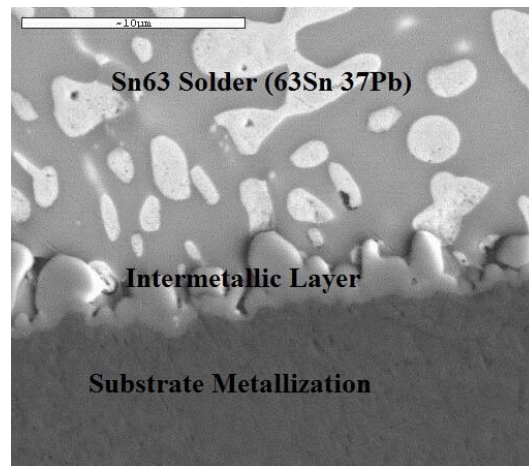
# Solder Wire

- Consists of two main components
  - Metal alloy: 60% tin and 40% lead (60/40 Sn/Pb), 63/37 Sn/Pb, or 99.3% tin and 0.7% copper (99.3/0.7 Sn/Cu)
  - Rosin core flux: “cleans” by removing oxide contaminants, allowing the molten metal to flow freely



# Soldering Process

- Metal solvent action (i.e., intermetallic bonding) between the solder and PCB pad
  - Alloy consisting of tin (from solder) and copper (from PCB)
- Having good wettability maximizes contact area.



# Soldering Safety Tips

- Safety glasses are also a good idea.



# Tinning the Tip

- Apply a thin layer of solder to the tip of the soldering iron.
  - Protects the soldering tip from oxidizing
  - Oxidation causes poor heat transfer and interferes with solder adherence.
- Tin the tip whenever you are not using the soldering iron.



<http://www.makerbot.com/docs/openvolver/>

<https://blog.adafruit.com/2010/05/04/post-a-photo-of-damagedoxidizedcorroded-soldering-iron-and-win/>

# Thermal Linkage

- Molten solder flows towards heat!
- Make sure the soldering iron is touching both the component lead and the PCB pad.
  - Otherwise, you will get poor thermal linkage between the component and the PCB. Solder will not flow properly around the component lead and on the PCB pad, creating a poor electrical connection.



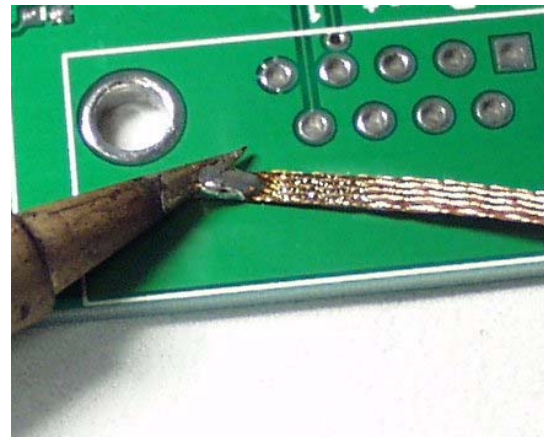
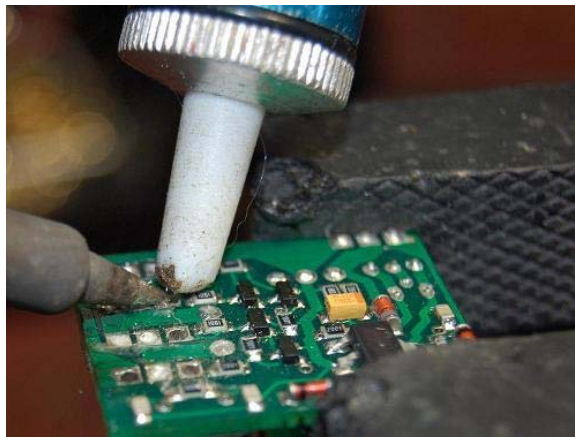
Bad!



Good!

# Desoldering

- Used to remove a poor solder joint
- Commonly done with solder wicks or solder suckers
- Reheat (melt) the solder joint and then apply the desoldering tool.

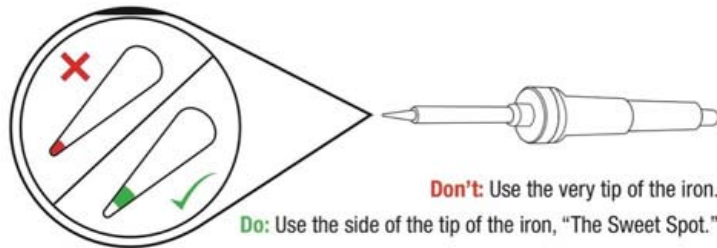


<https://www.rmgsailwinch.com.au/rmg/pages/How-To-Replace-FETs.html>

<http://www.electronic-discount.be/product-details/hq-des-pump01/shop.htm?lng=en>



# Soldering Techniques Summary



**Do:** Touch the iron to the component leg and metal ring at the same time.



**Do:** While continuing to hold the iron in contact with the leg and metal ring, feed solder into the joint.



**Don't:** Glob the solder straight onto the iron and try to apply the solder with the iron.



**Do:** Use a sponge to clean your iron whenever black oxidization builds up on the tip.



**A** Solder flows around the leg and fills the hole - forming a volcano-shaped mound of solder.



**B** **Error:** Solder balls up on the leg, not connecting the leg to the metal ring.  
**Solution:** Add flux, then touch up with iron.



**C** **Error:** Bad Connection (i.e. it doesn't look like a volcano)  
**Solution:** Flux then add solder.



**D** **Error:** Bad Connection...and ugly...oh so ugly.  
**Solution:** Flux then add solder.



**E** **Error:** Too much solder connecting adjacent legs (aka a solder jumper).  
**Solution:** Wick off excess solder.

