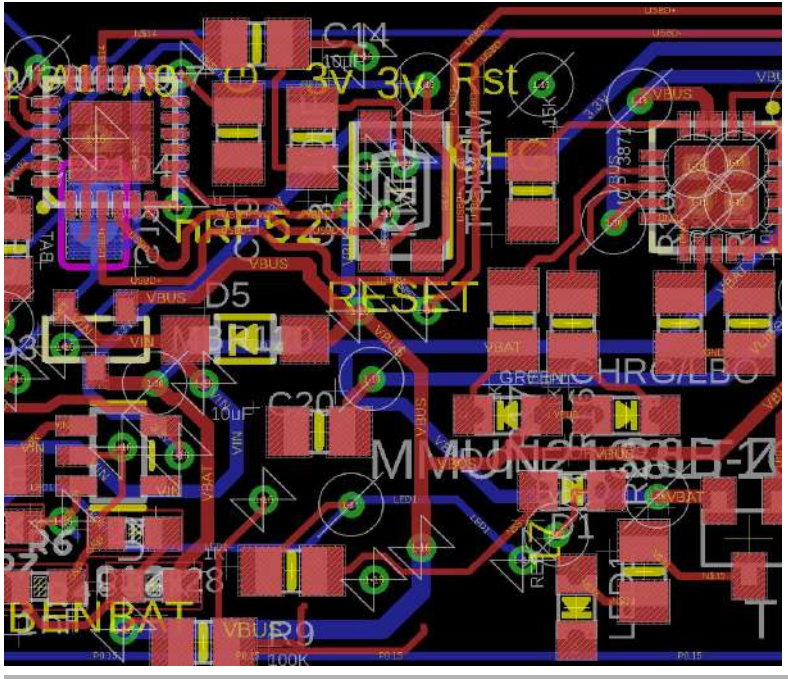
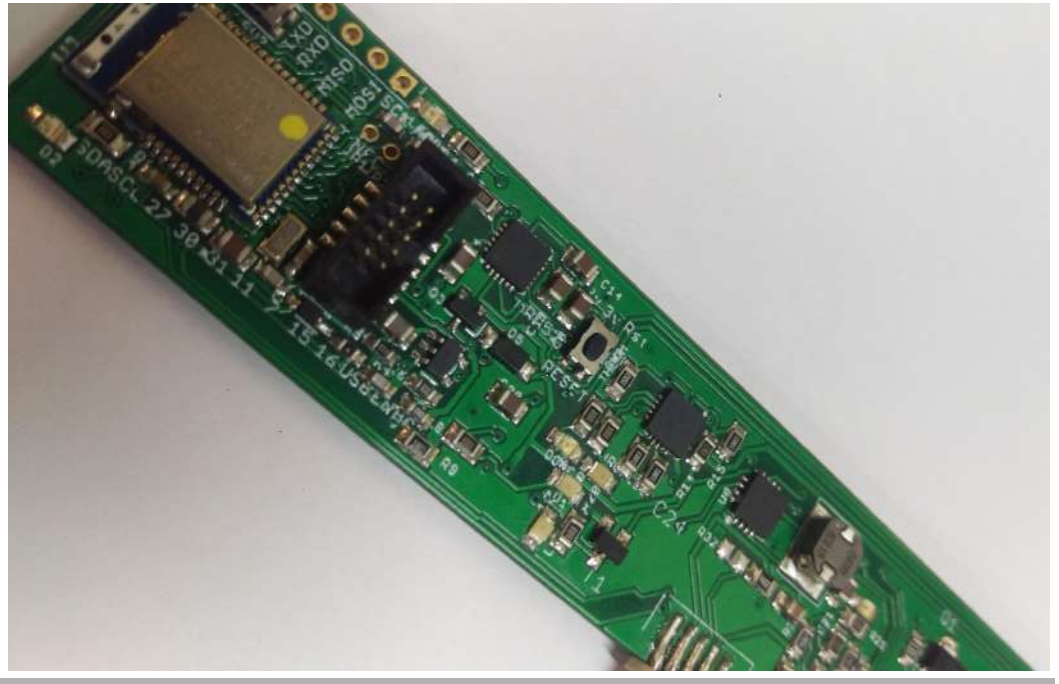
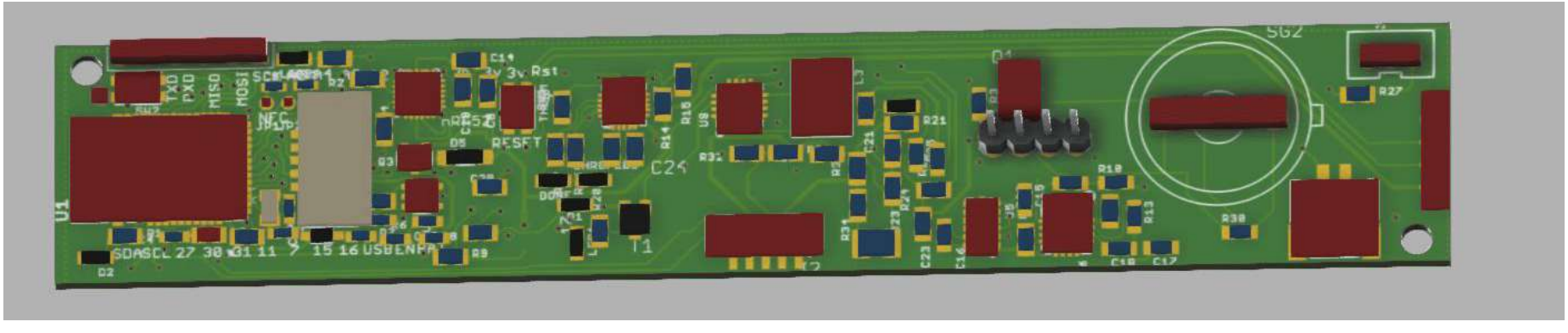
Soldering basics

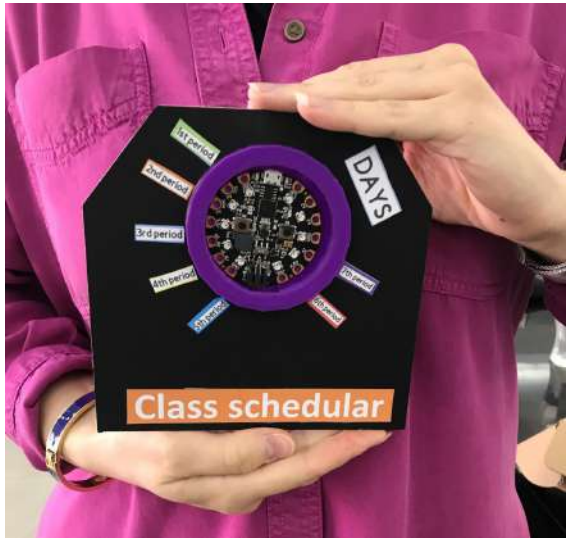
Duaa Alaali - Fab Lab Bahrain

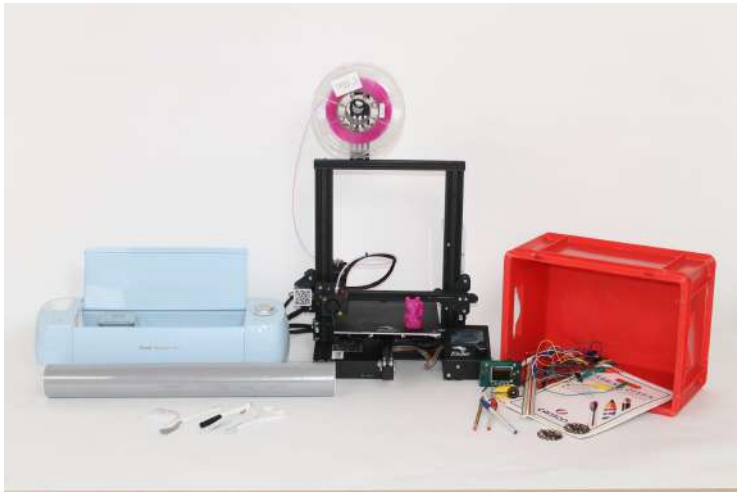

C14
3v
3v
Rst
RESET
D5
VBUS
VBAT
BENBAT
10uF
100K


TXD
RXD
MISO
MOSI
SDA
SCL
27
30
31
11
7
15
16
USBENB
3v
Rst
RESET
C24
T1

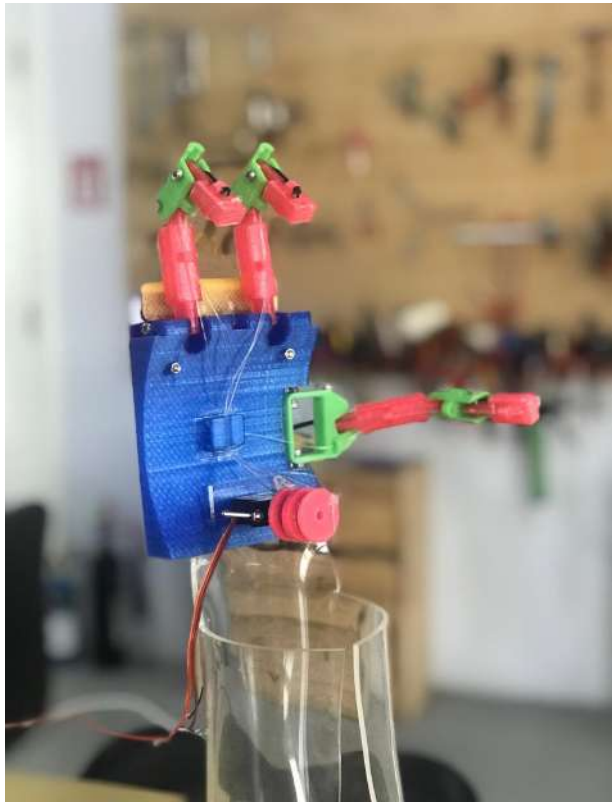

TXD
RXD
MISO
MOSI
3v
Rst
RESET
C24
T1
U1
D1
SG2
R27
R21
R18
R30
SDA
SCL
27
30
31
11
7
15
16
USBENB


REQUIRED MATERIALS

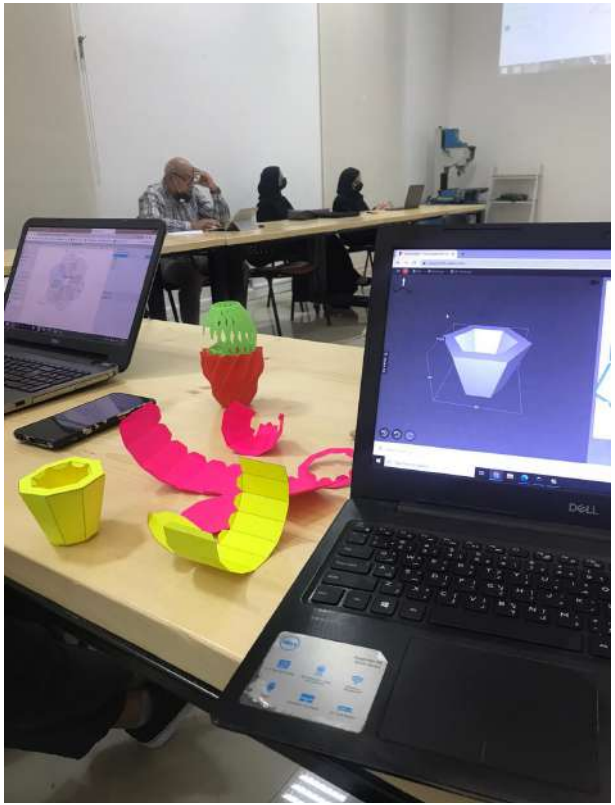

1st period
2nd period
3rd period
4th period
5th period
6th period
7th period
DAYS
Class schedular



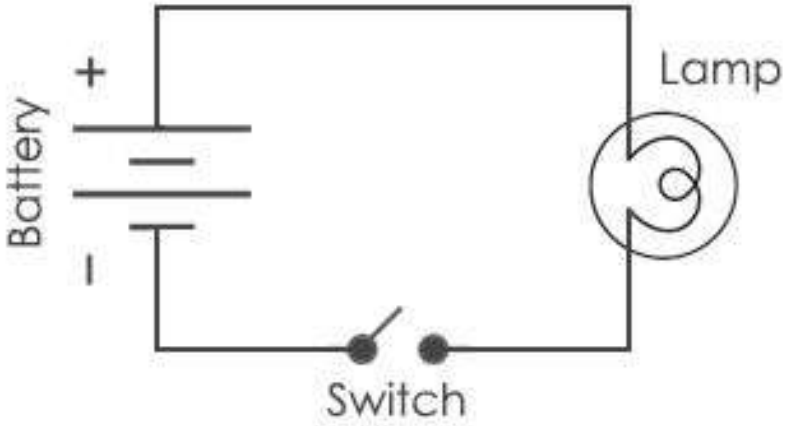

بالضيوف الكرام



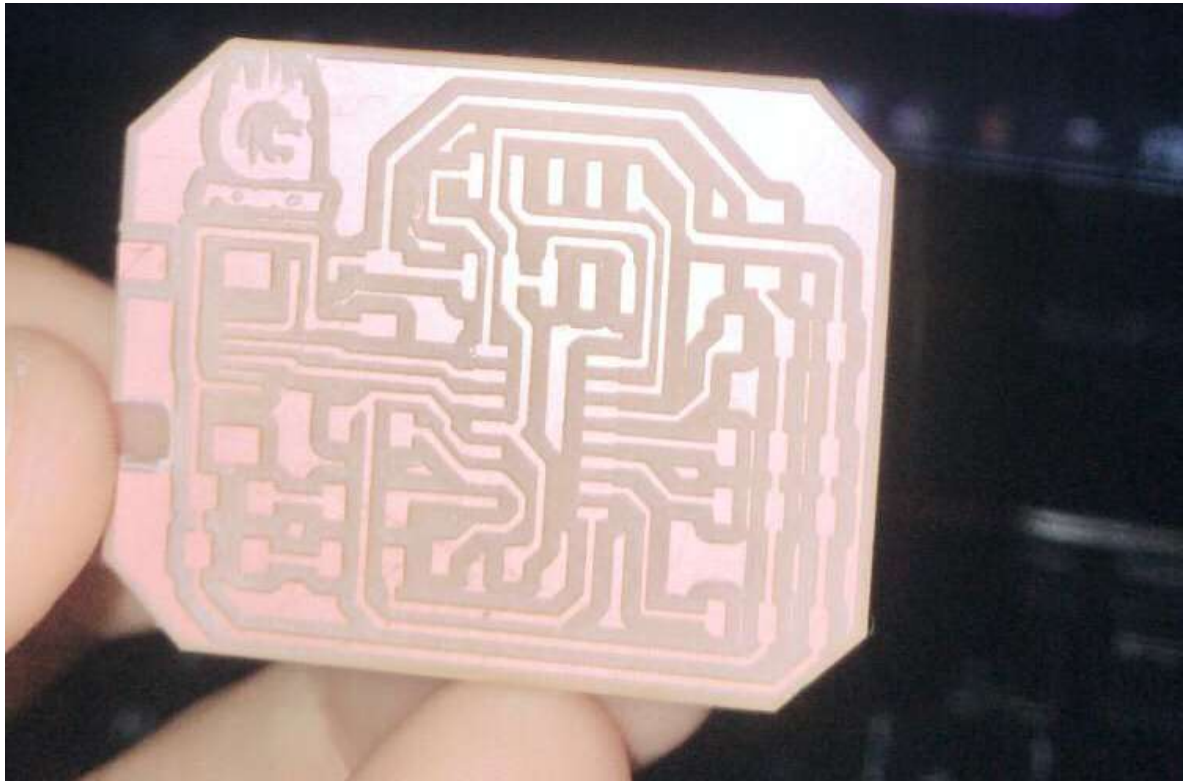

FABLAB BAHRAIN
FAB ACADEMY


DELL

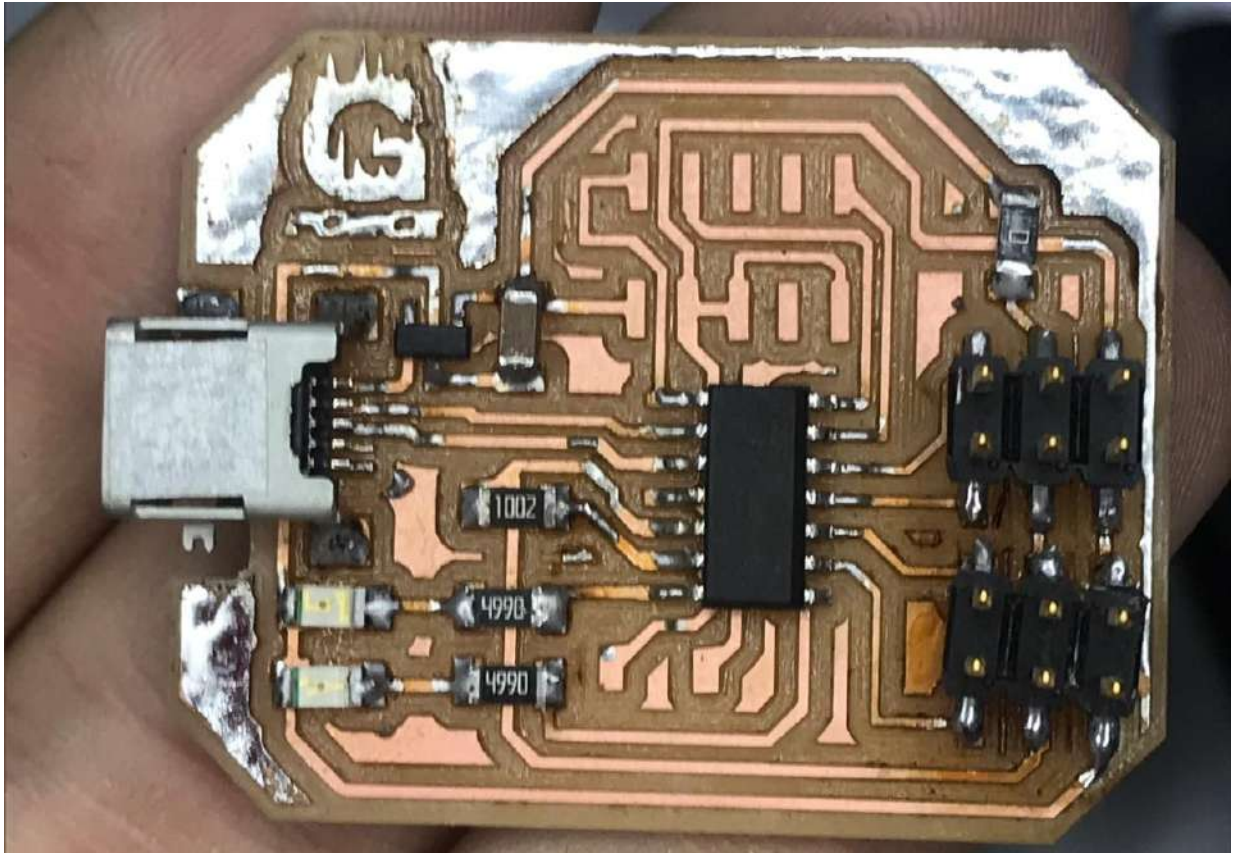
What is soldering


Battery
+
−
Lamp
Switch


+
BATTERY



By abdalgfor-ismail: http://fabacademy.org/2020/labs/bahrain/students/abdalgfor-ismail/assignments/week07/



By abdalgfor-ismail: http://fabacademy.org/2020/labs/bahrain/students/abdalgfor-ismail/assignments/week07/

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The tools

Soldering iron

The most important part. An iron will heat up to melt the solder. Some have temperature control and some don't. 25 watt iron minimum is recommended

By Weller® - Apex Tool Group

Solder tip

The point of contact with the solder. There are different types for different purposes. Generally you need a fine tip for accurate soldering.

By Weller® - Apex Tool Group

Stand

a safe place to rest the hot iron between uses. It will keep your iron from rolling around and protect both you and your work surface from burns.

By Weller® - Apex Tool Group

Tip cleaners

To keep the soldering tip clean while soldering.

Use it after every use

Wet sponge

Distilled water

Deionized water

Tap water

Drinking water

Soure: https://www.eptac.com/ask/type-of-water-to-use-on-soldering-sponges/

brass pad

Solder wire

Image shown is a representation only. Exact specifications should be obtained from the product data sheet.

SMDSWLF.020 4OZ

Digi-Key Part Number	SMDSWLF.0204OZ-ND
Manufacturer	Chip Quik Inc.
Manufacturer Product Number	SMDSWLF.020 4OZ
Supplier	Chip Quik Inc.
Description	SLD WIRE NO-CLEAN 96.5/3/.5 4OZ.
Manufacturer Standard Lead Time	3 Weeks
Detailed Description	Lead Free No-Clean, Water Soluble Wire Solder Sn96.5Ag3Cu0.5 (96.5/3/0.5) 24 AWG, 25 SWG Spool, 4 oz (113.40g)
Customer Reference	Customer Reference
Datasheet	Datasheet

Soure: https://www.digikey.com/en/products/detail/chip-quik-inc/SMDSWLF-020-4OZ/2177058

Sn96.5/Ag3.0/Cu0.5
Tin/Silver/Copper

Product Attributes

TYPE	DESCRIPTION
Category	Soldering, Desoldering, Rework Products Solder
Mfr	Chip Quik Inc.
Series	-
Package	Spool
Part Status	Active
Type	Wire Solder
Composition	Sn96.5Ag3Cu0.5 (96.5/3/0.5)
Diameter	0.020" (0.51mm)
Melting Point	423 ~ 428°F (217 ~ 220°C)
Flux Type	No-Clean, Water Soluble
Wire Gauge	24 AWG, 25 SWG
Process	Lead Free

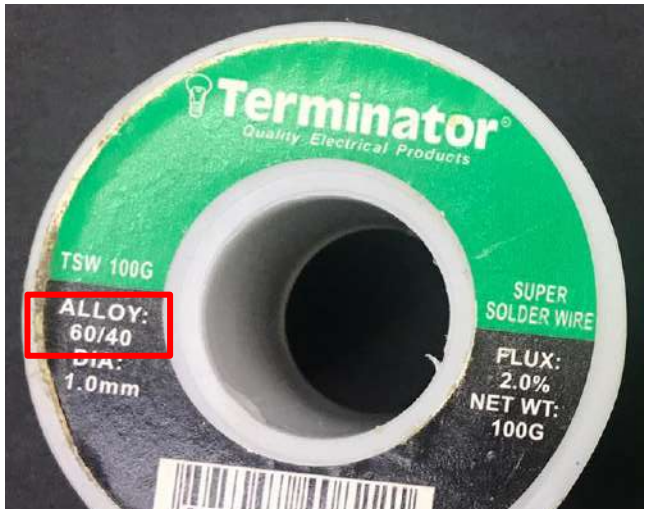
Soure: https://www.digikey.com/en/products/detail/chip-quik-inc/SMDSWLF-020-4OZ/2177058


Terminator
Quality Electrical Products
TSW 100G
ALLOY:
60/40
DIA:
1.0mm
SUPER
SOLDER WIRE
FLUX:
2.0%
NET WT:
100G
895058 408221
Made in Taiwan
BAKU
DIA
0.4mm
RMA
2.0%
BK-10004
ADVANCED SOLDERING WIRE
Real Materials International Technology Brand HongKong Made in China

Leaded solder

63% tin to 37% lead

60% tin to 40% lead



Lead free Solder

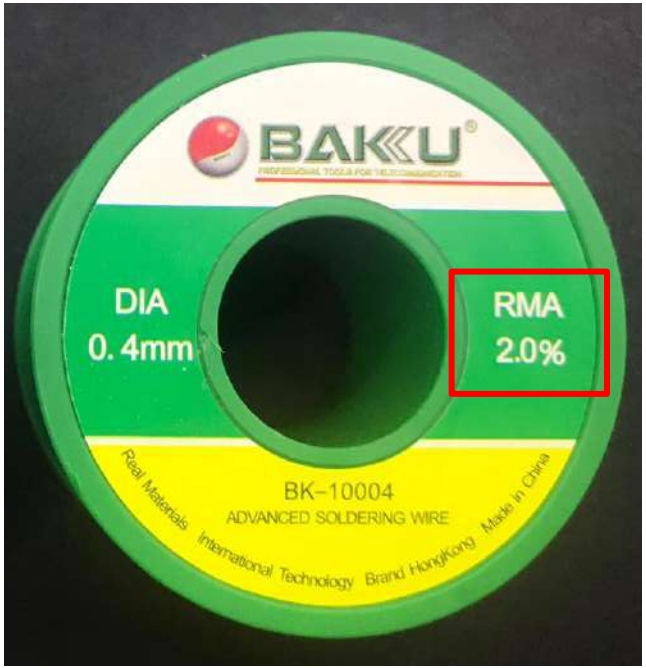
different compositions of metals with Tin being the main element

Sn96.5/Ag3.0/Cu0.5

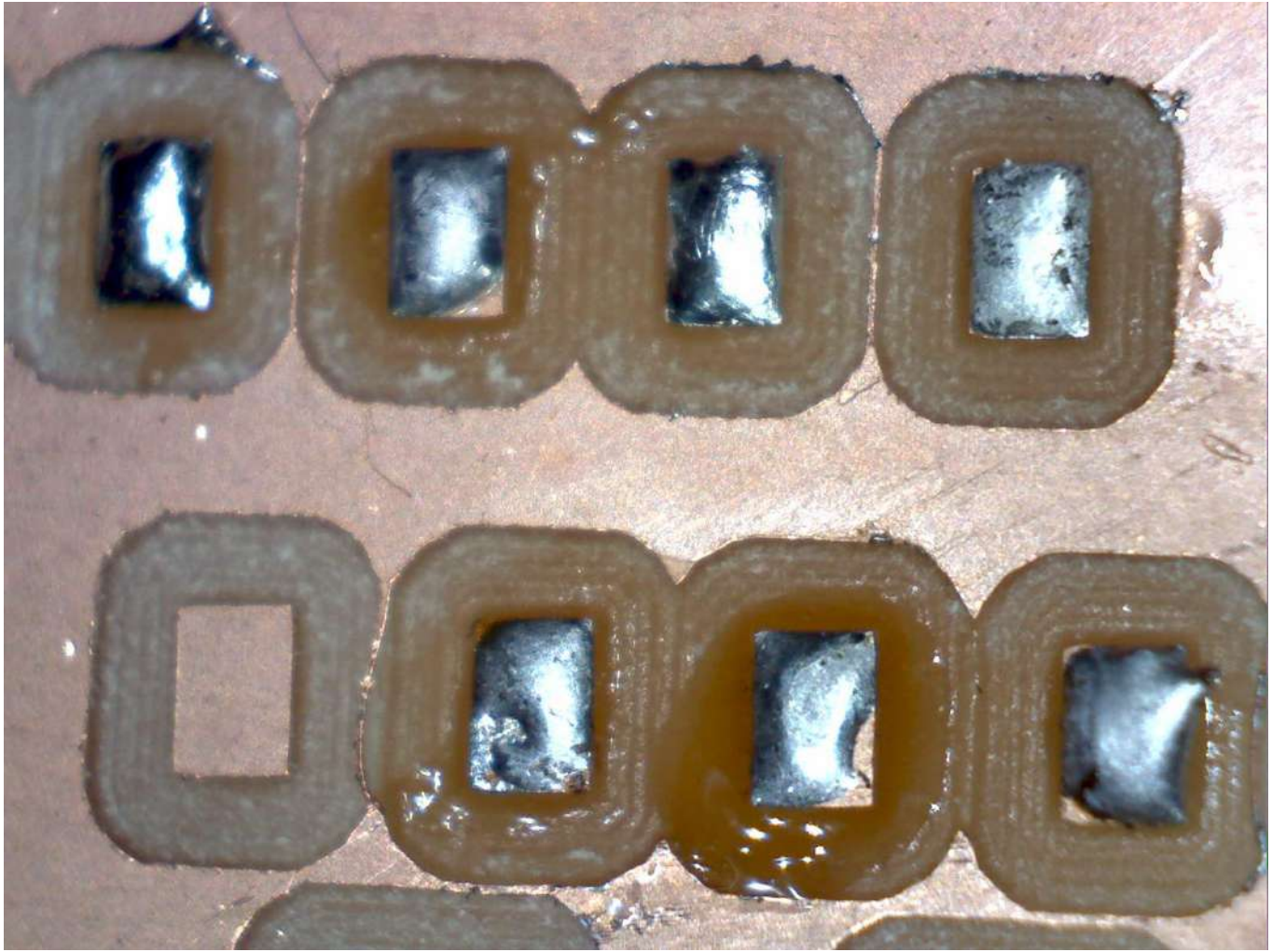
Tin/Silver/Copper

Rosin core

flux prepares the metal surfaces for soldering by cleaning and removing any oxides and impurities. The flux also protects the metal surfaces from re-oxidation during soldering and helps the soldering process by altering the surface tension of the molten solder.




SOLDER
SUPER
BAKU
DIA
0.4mm
RMA
2.0%
SOLDER
LEAD WIRE
60/40
1.0mm
CF-10
20574
SOLDER

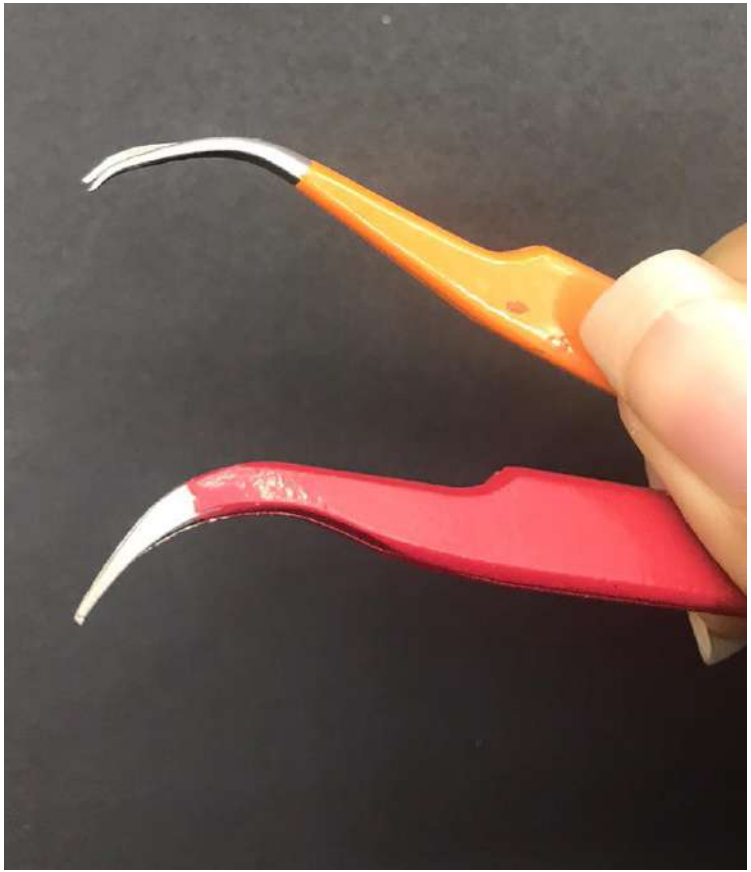


Flux pen (optional)

The flux is the substance that prevents beading of the solder and helps the solder flow cleanly onto the parts you are soldering

tweezers

Necessary for holding small components without burning your hands



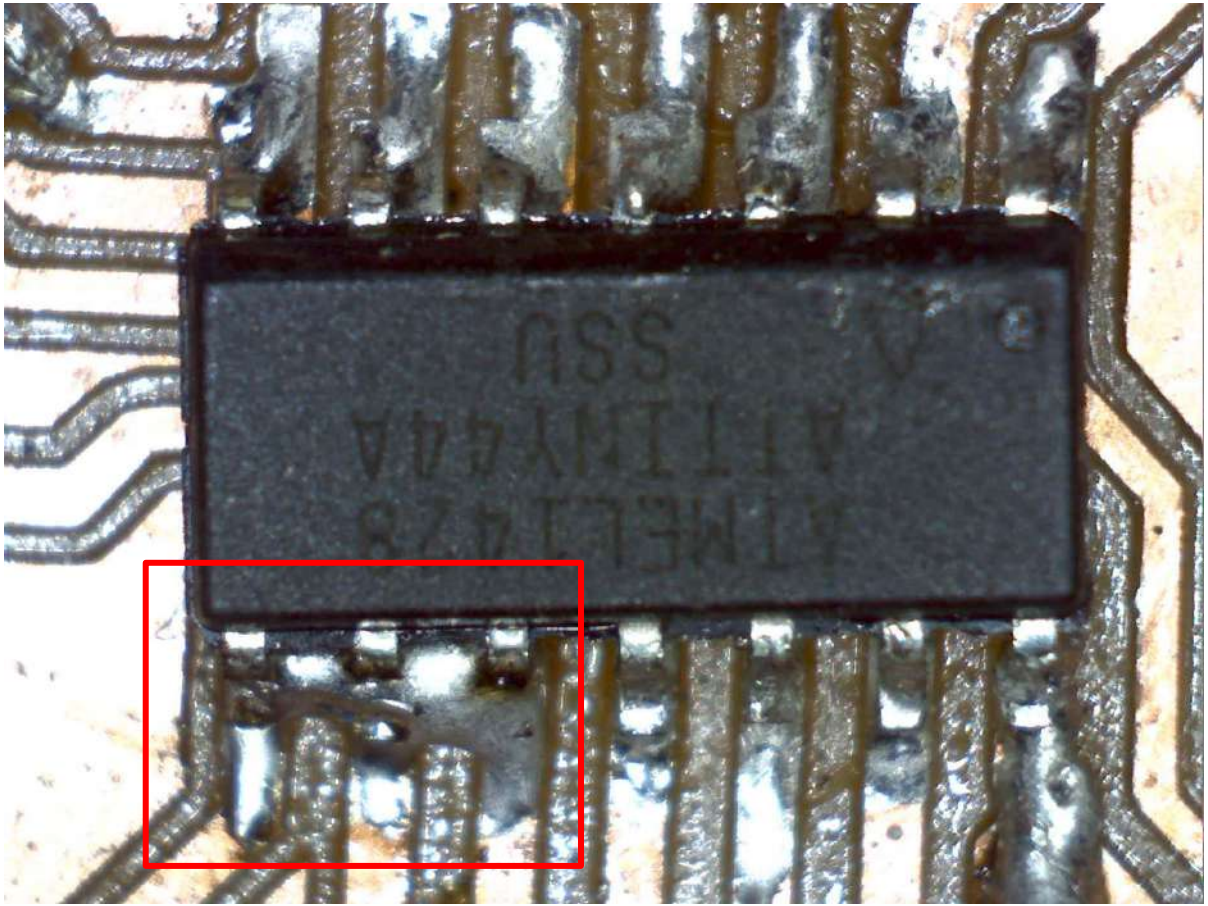
Vise (optional)

keeps your electronic board in place while you solder

Third Hand (optional)

keeps your electronic board in place while you solder and helps you see your solder joints better

Digital microscope (optional)



Solder Sucker

Great for desoldering.
Sucks the solder out from the joint

Solder wix

Great for desoldering. Absorbs the solder out from the joint


FOR SOLDERING
ON CIRCUIT BOARDS

Safety

SOLDERING

Never leave the soldering iron on any surface other than its holder.

Never touch the metal part of the soldering iron

—

Always wash your hands after handling lead based solder wire.

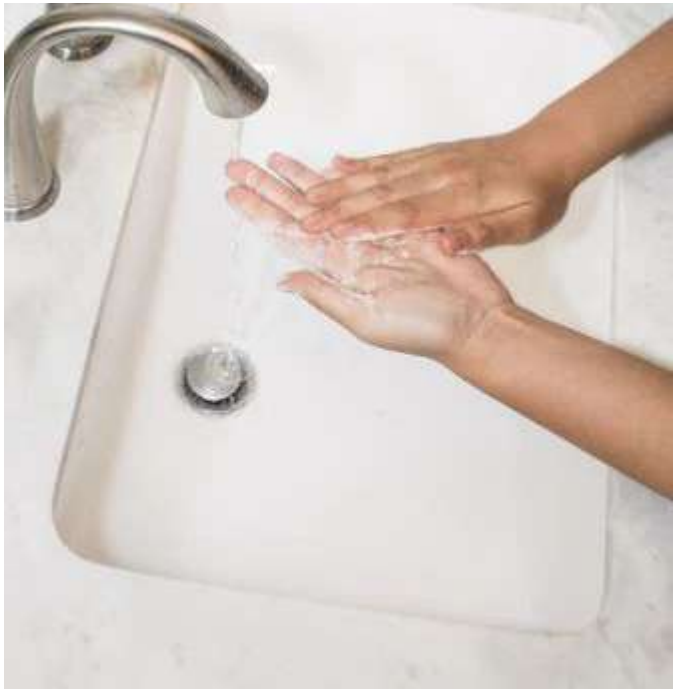
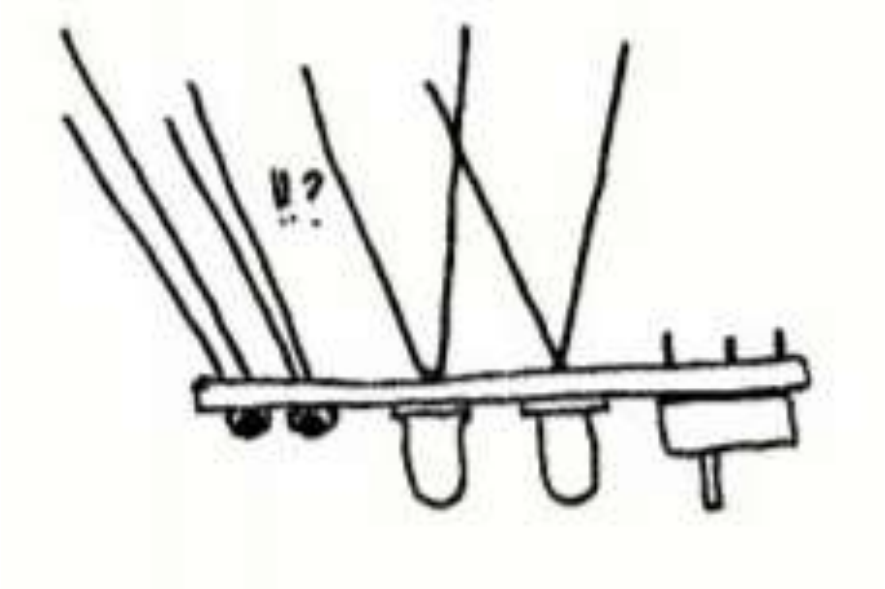


Photo by Curology on Unsplash

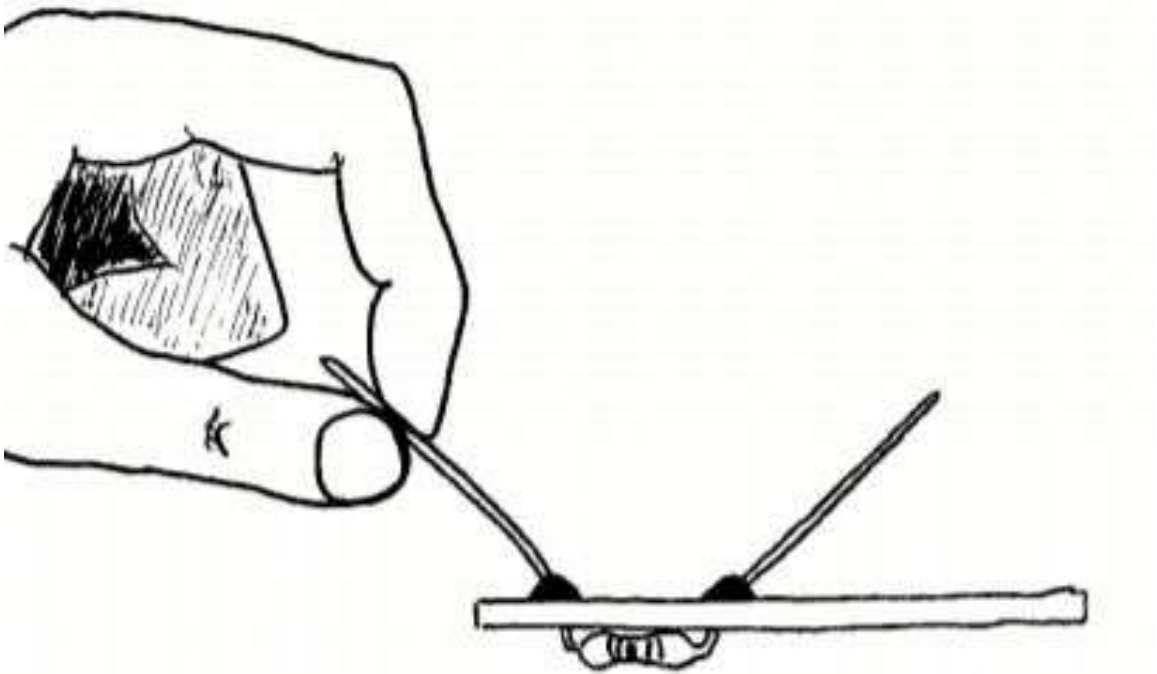
Make sure you are in a well ventilated area. Avoid inhalation of soldering smoke/fumes

—

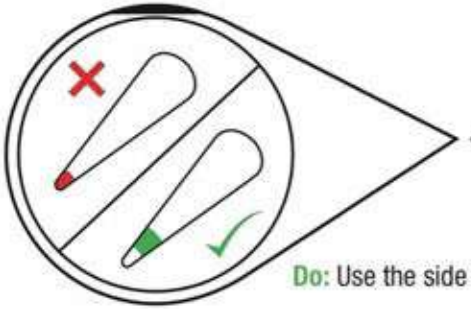
Always cut the long leads of your components so they dont short each other out by creating a connecting where there shouldn't be one

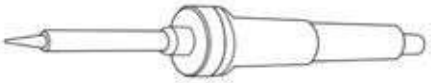


Always hold the lead you are cutting with your other hand. If it flies away it can get in your eyes



Through hole soldering



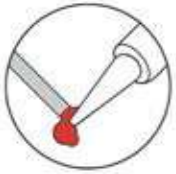


Don't: Use the very tip of the iron.

Do: Use the side of the tip of the iron, "The Sweet Spot."

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.

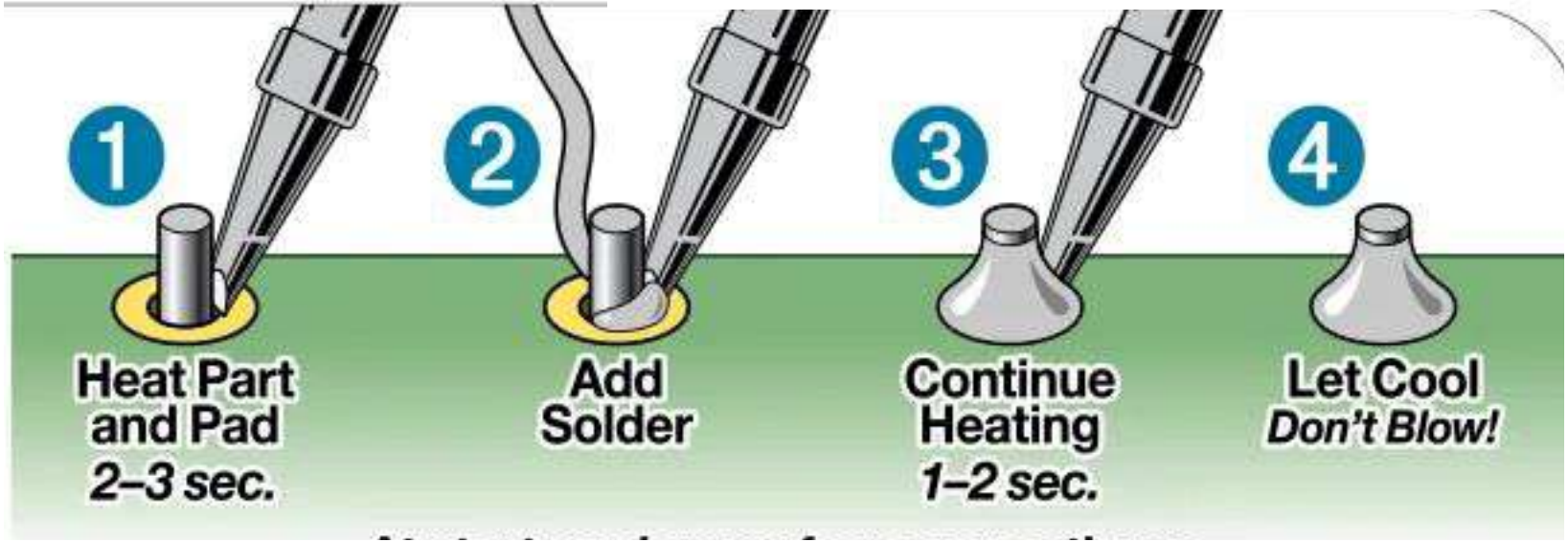


Don't: Glob the solder straight onto the iron and try to apply the solder with the iron.

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

Pointed tip

chisel tip


1
Heat Part and Pad
2–3 sec.
2
Add Solder
3
Continue Heating
1–2 sec.
4
Let Cool
Don't Blow!

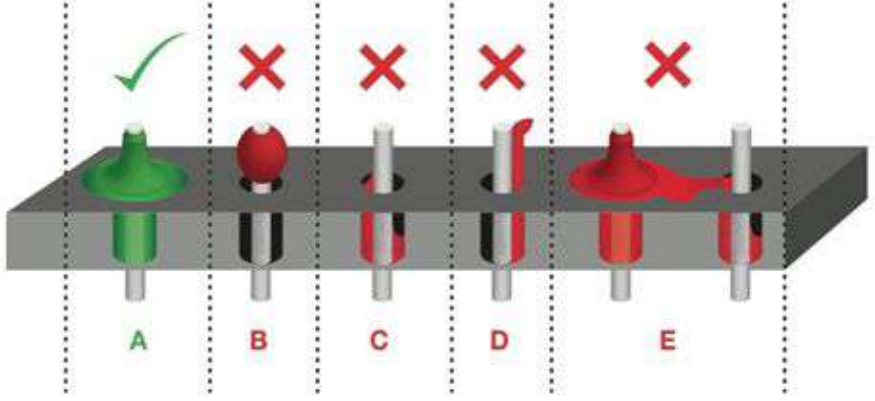
A Solder flows around the leg and fills the hole - forming a volcano-shaped mound of solder.

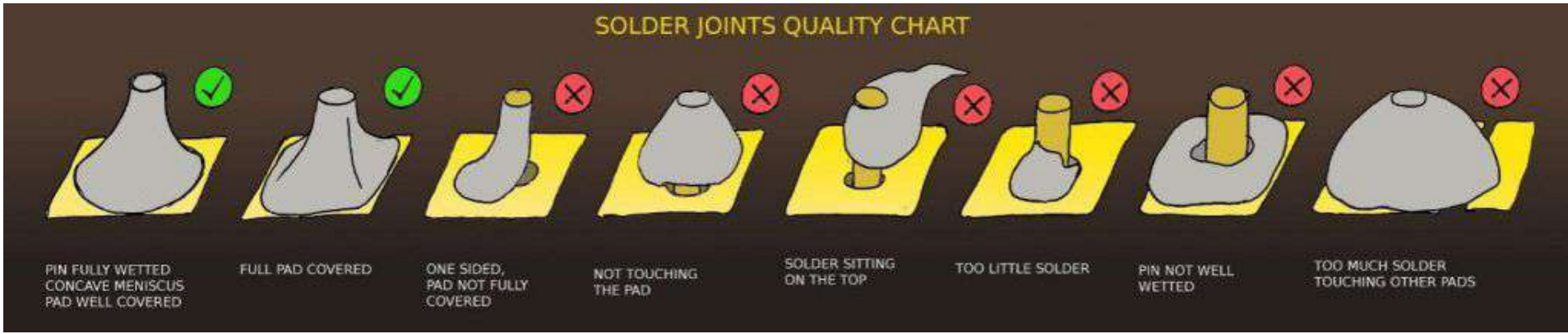
B Error: Solder balls up on the leg, not connecting the leg to the metal ring.
Solution: Add flux, then touch up with iron.

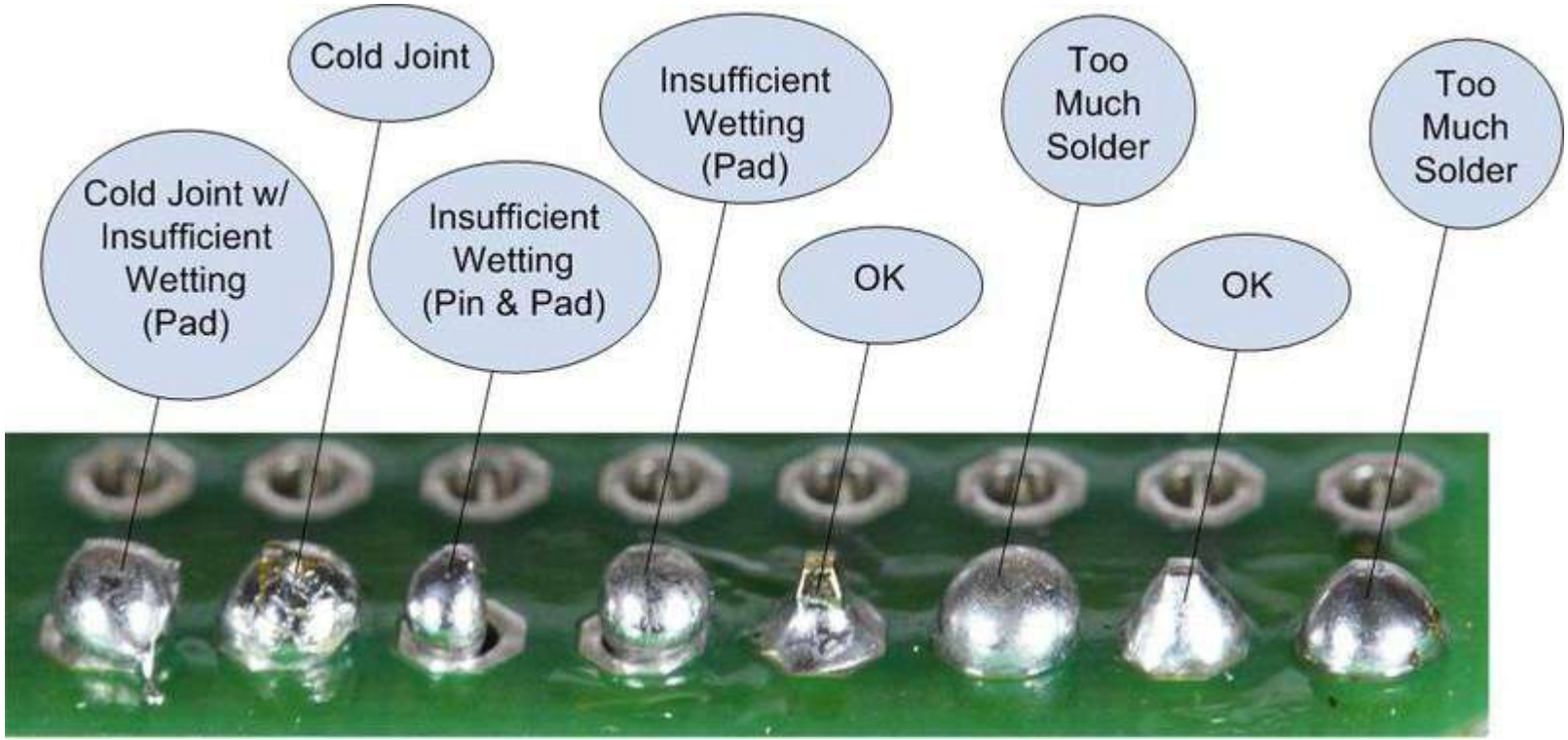
C Error: Bad Connection (i.e. it doesn't look like a volcano)
Solution: Flux then add solder.

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

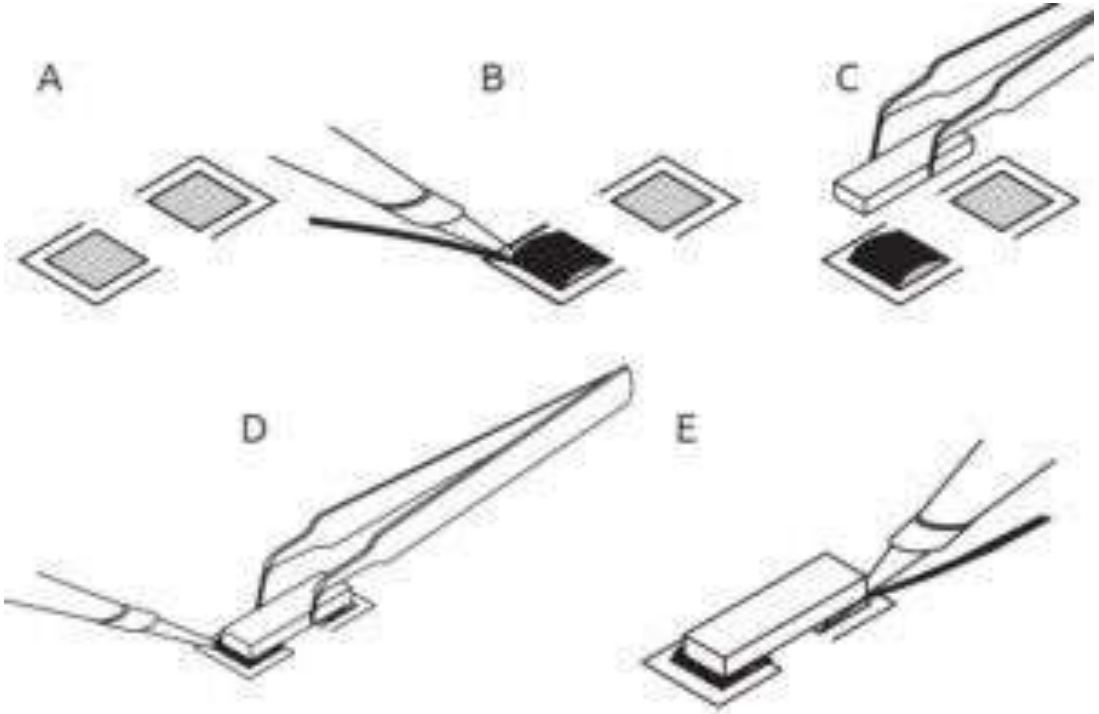
E Error: Too much solder connecting adjacent legs (aka a solder jumper).
Solution: Wick off excess solder.

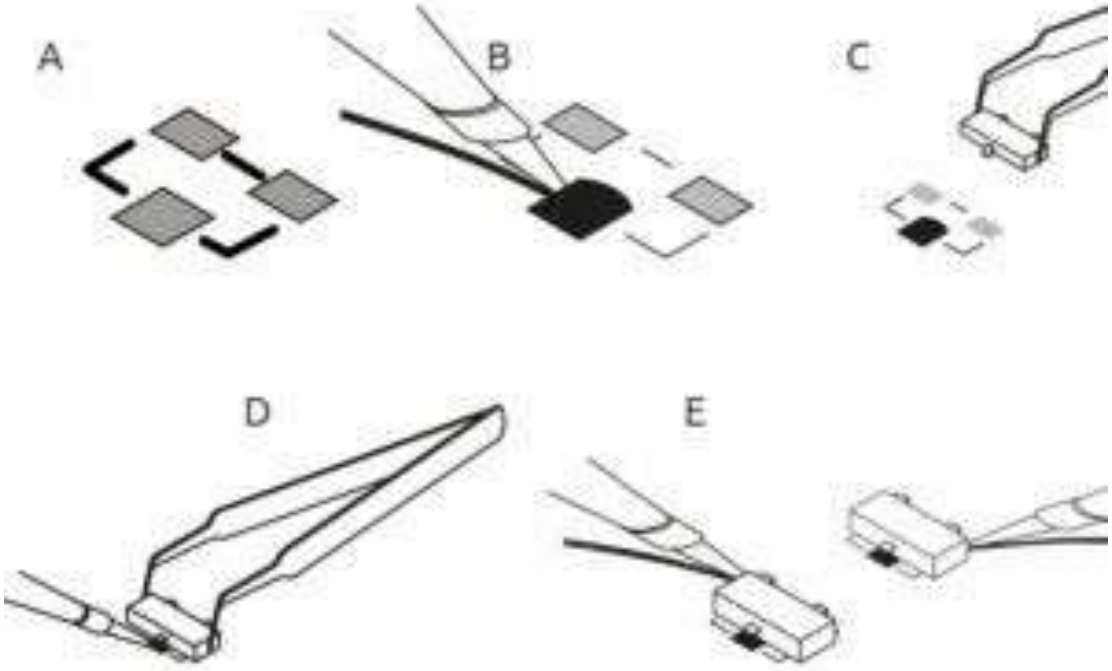



SOLDER JOINTS QUALITY CHART
PIN FULLY WETTED
CONCAVE MENISCUS
PAD WELL COVERED
FULL PAD COVERED
ONE SIDED,
PAD NOT FULLY
COVERED
NOT TOUCHING
THE PAD
SOLDER SITTING
ON THE TOP
TOO LITTLE SOLDER
PIN NOT WELL
WETTED
TOO MUCH SOLDER
TOUCHING OTHER PADS


Cold Joint w/ Insufficient Wetting (Pad)
Cold Joint
Insufficient Wetting (Pin & Pad)
Insufficient Wetting (Pad)
OK
Too Much Solder
OK
Too Much Solder

SMD soldering


A
B
C
D
E


A
B
C
D
E

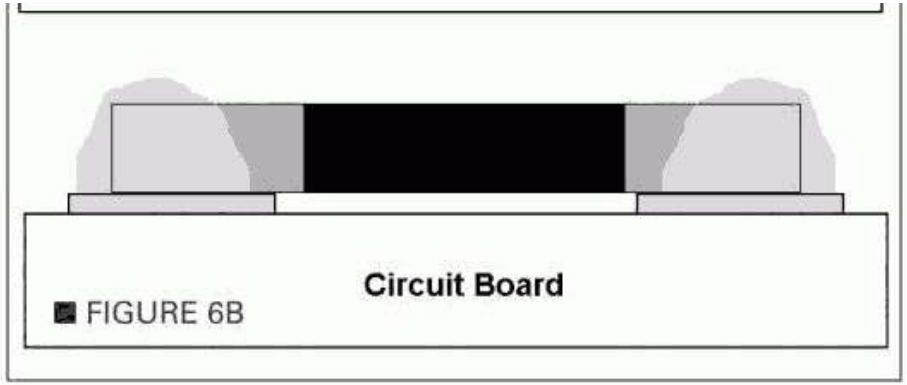


FIGURE 6B

X

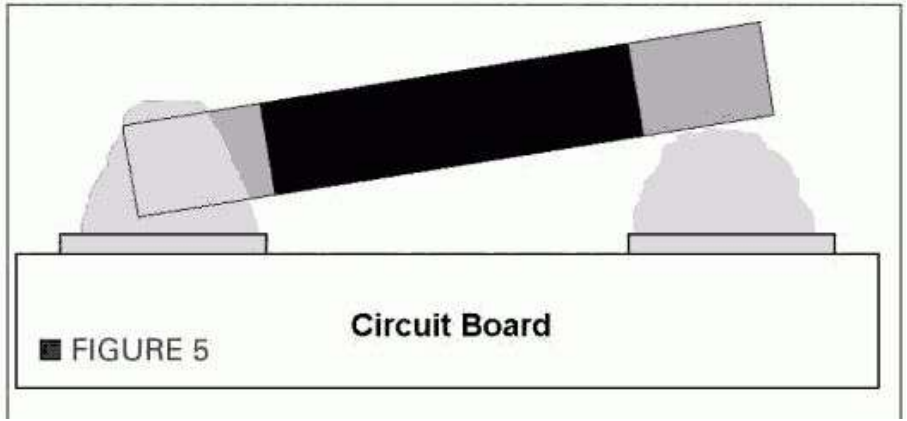
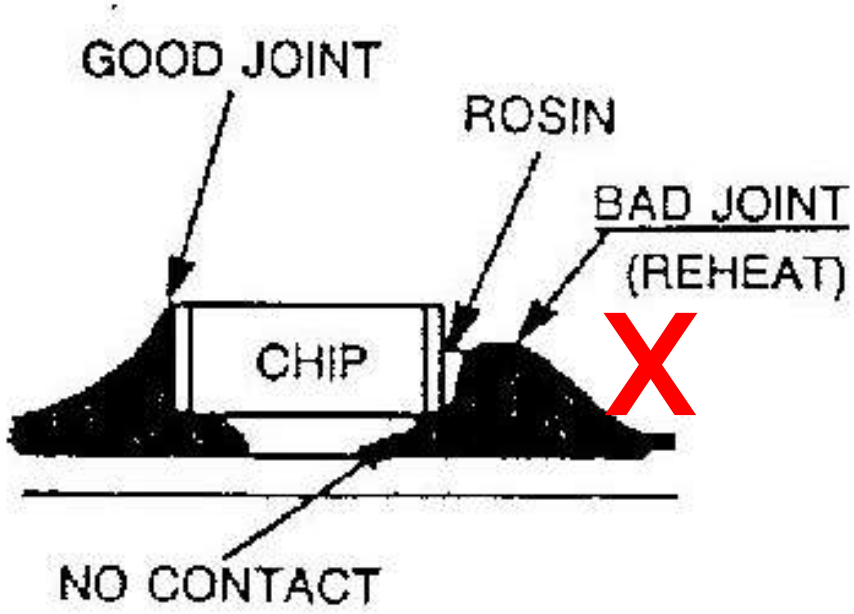
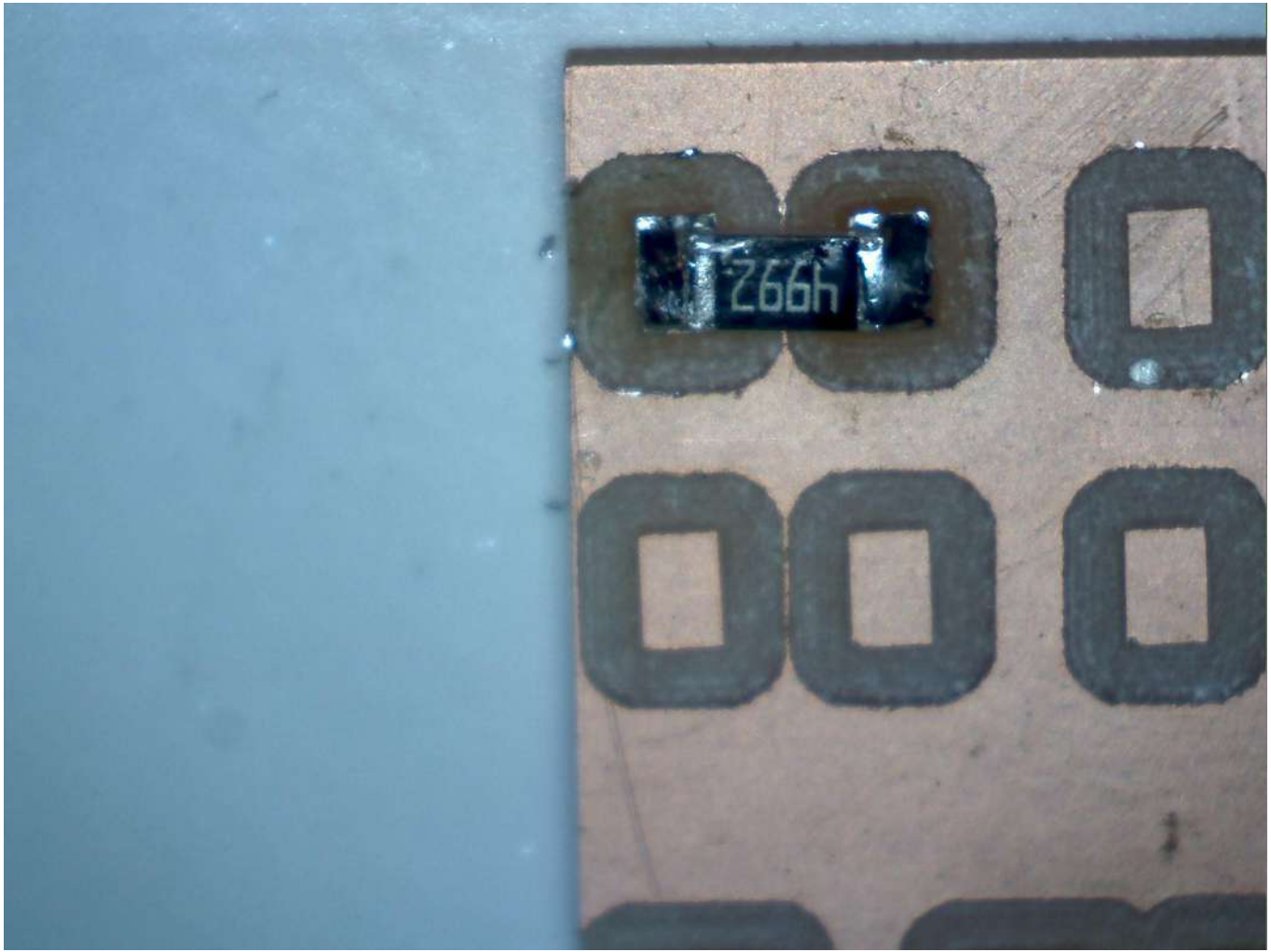
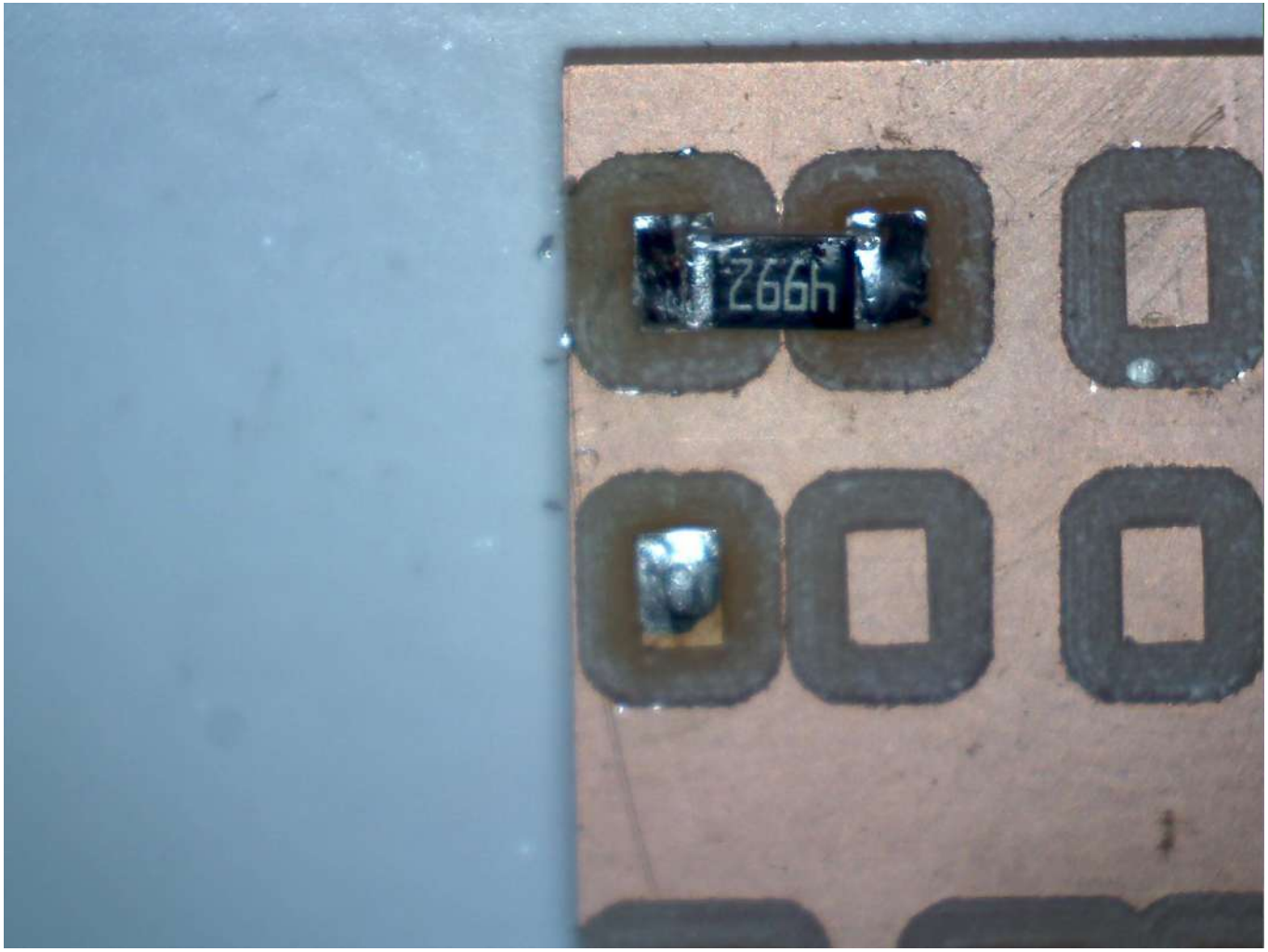
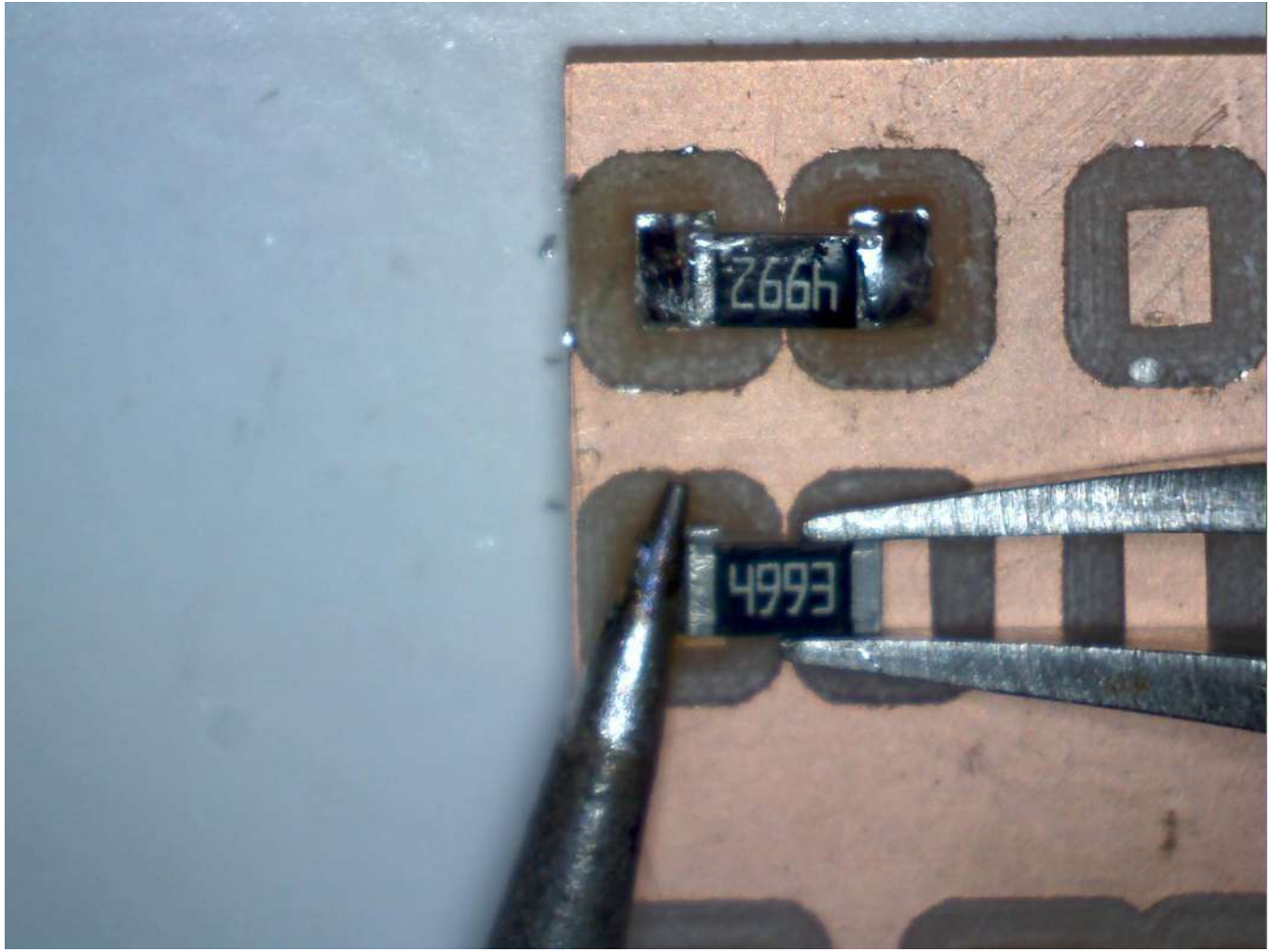


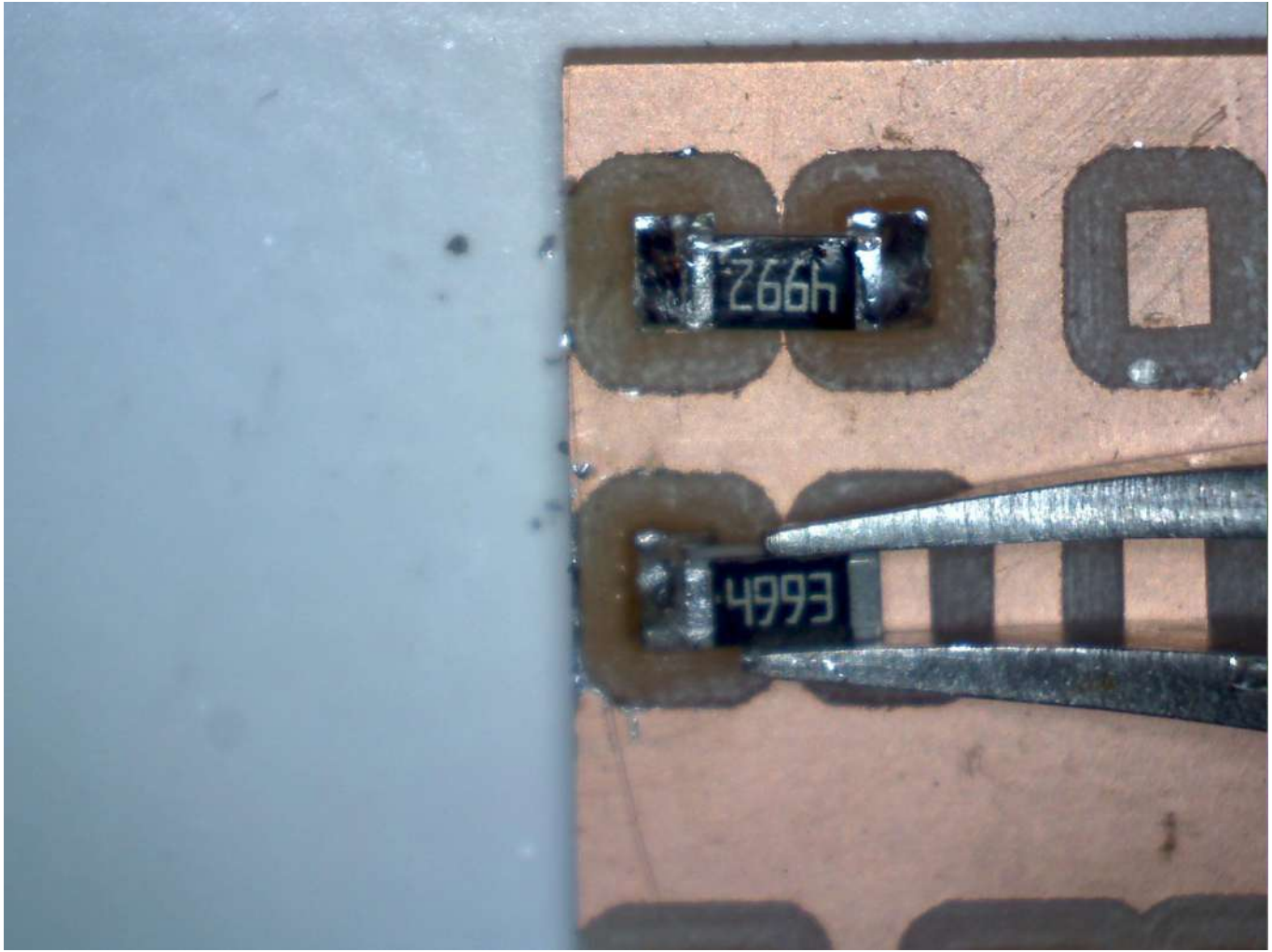
FIGURE 5

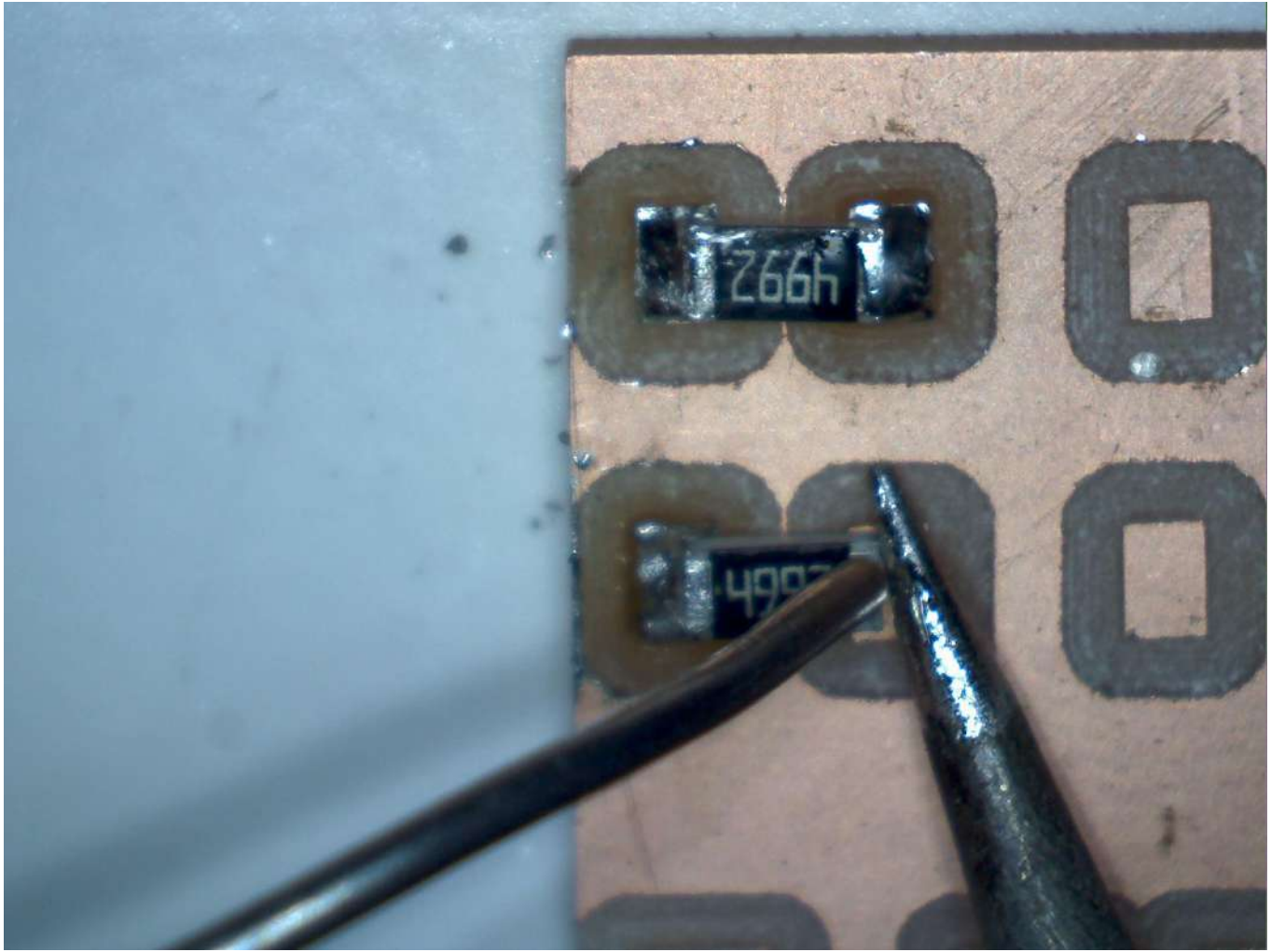

GOOD JOINT
ROSIN
BAD JOINT
(REHEAT)
CHIP
X
NO CONTACT

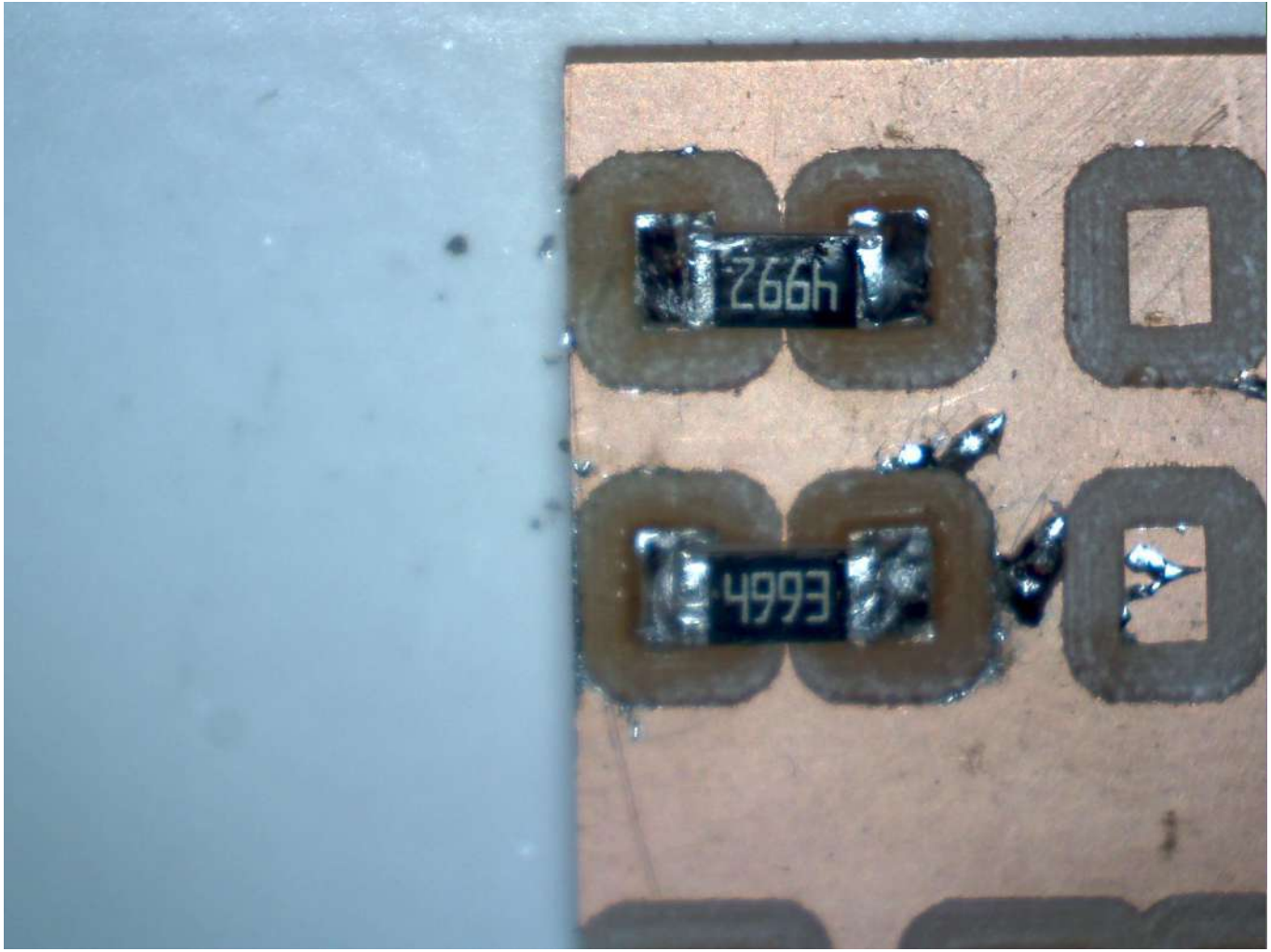

Z66h


266h


Z66H
4993


Z66h
4993


Z66h


Z66h
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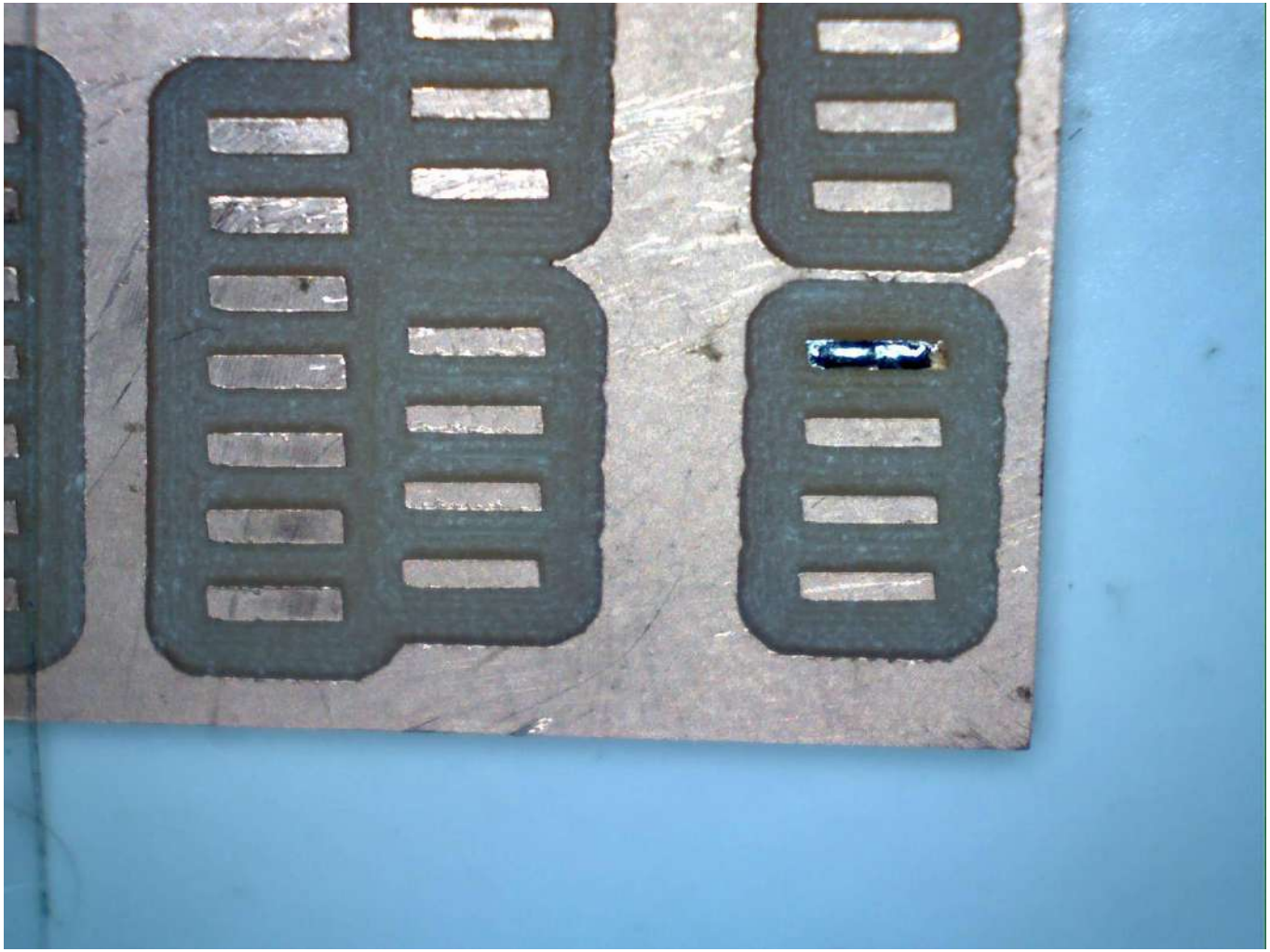
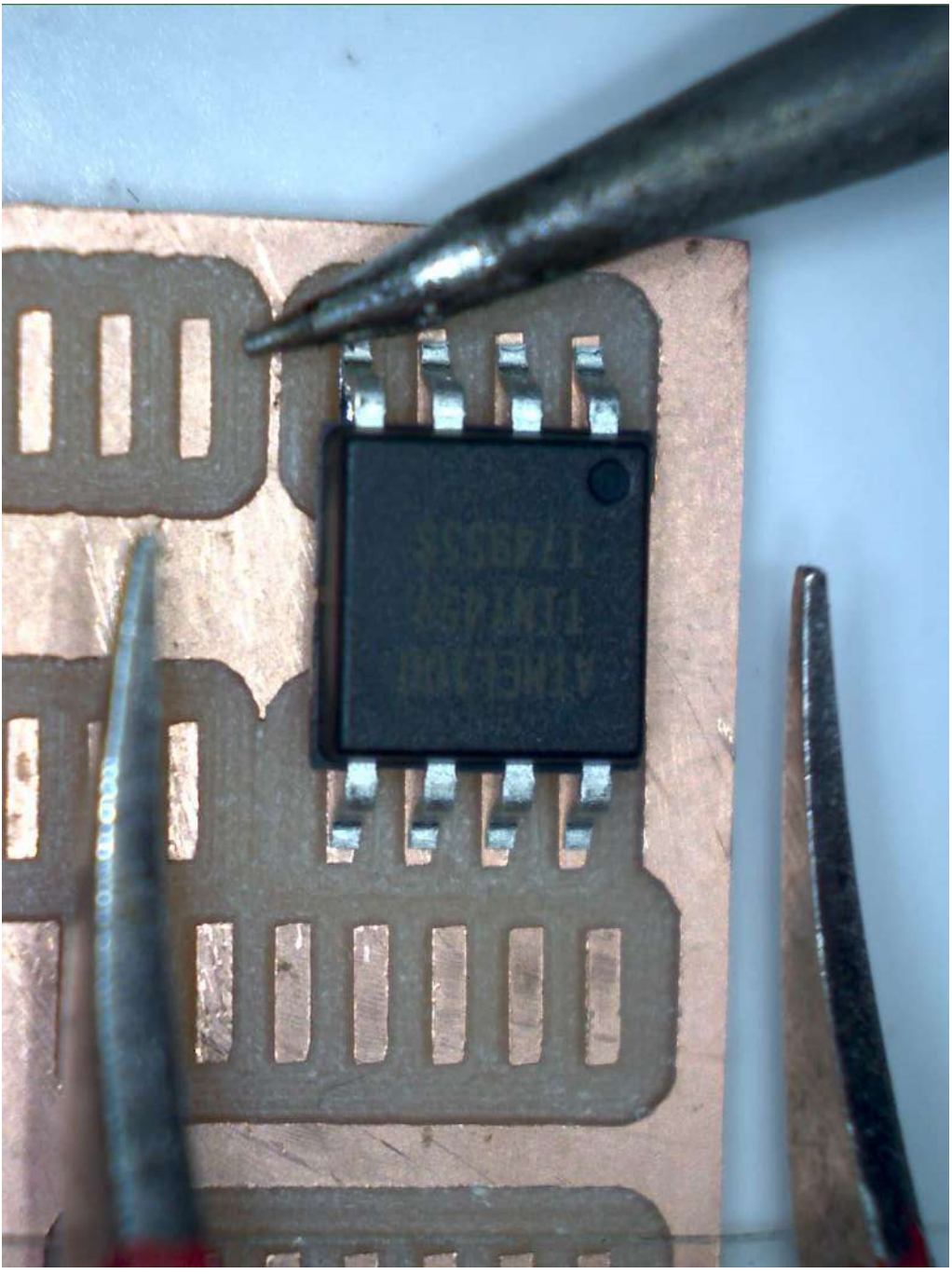
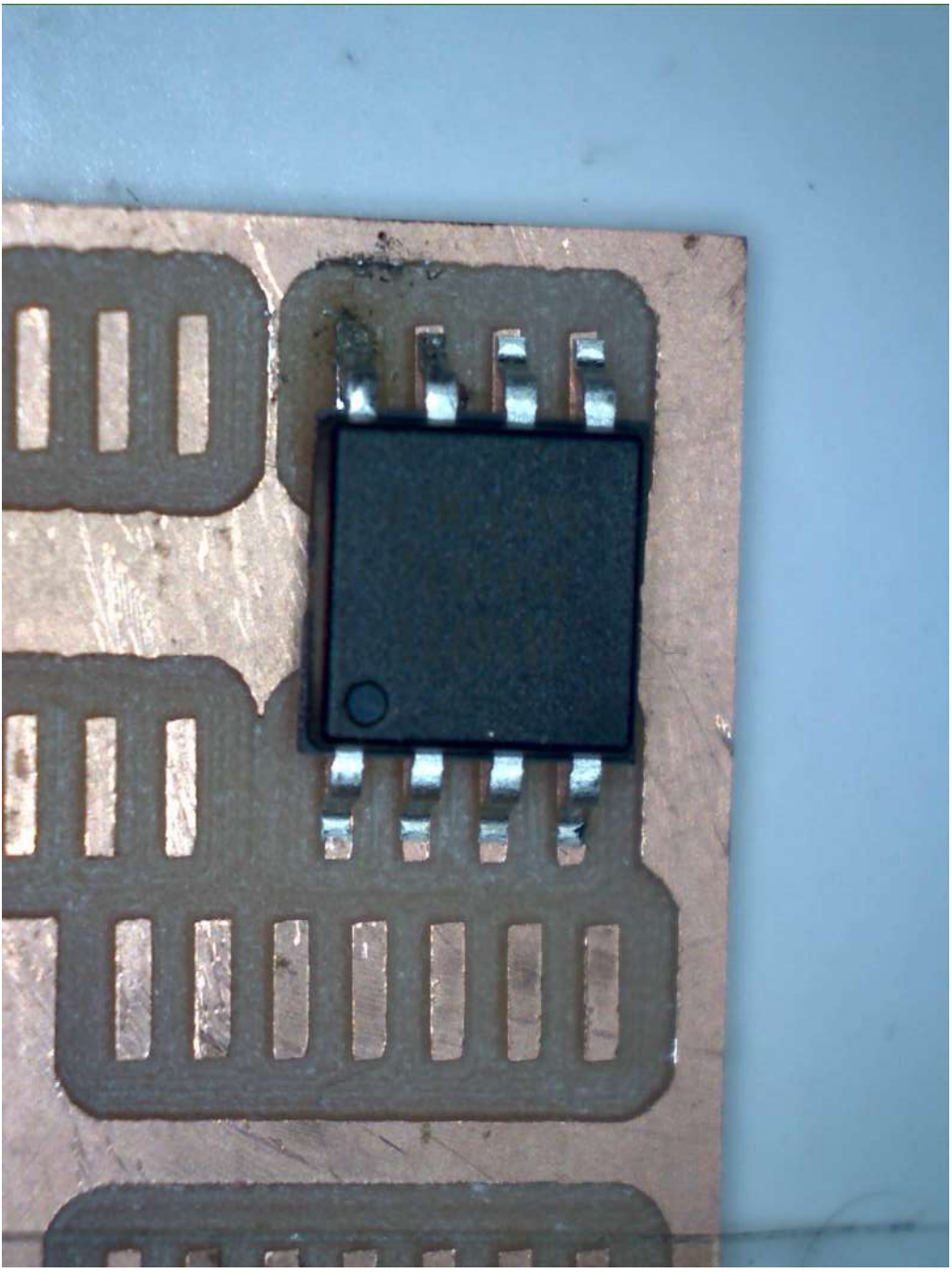
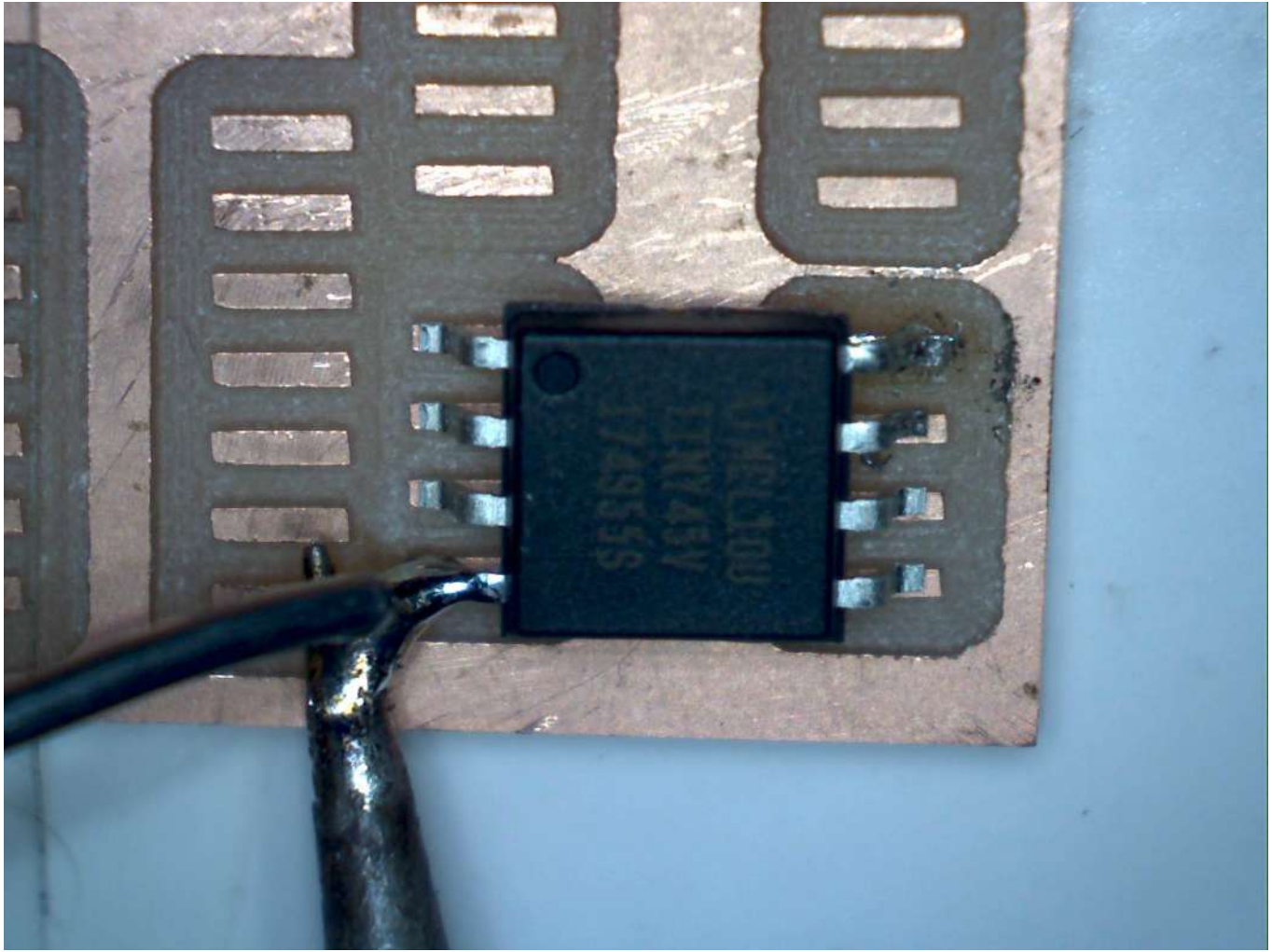
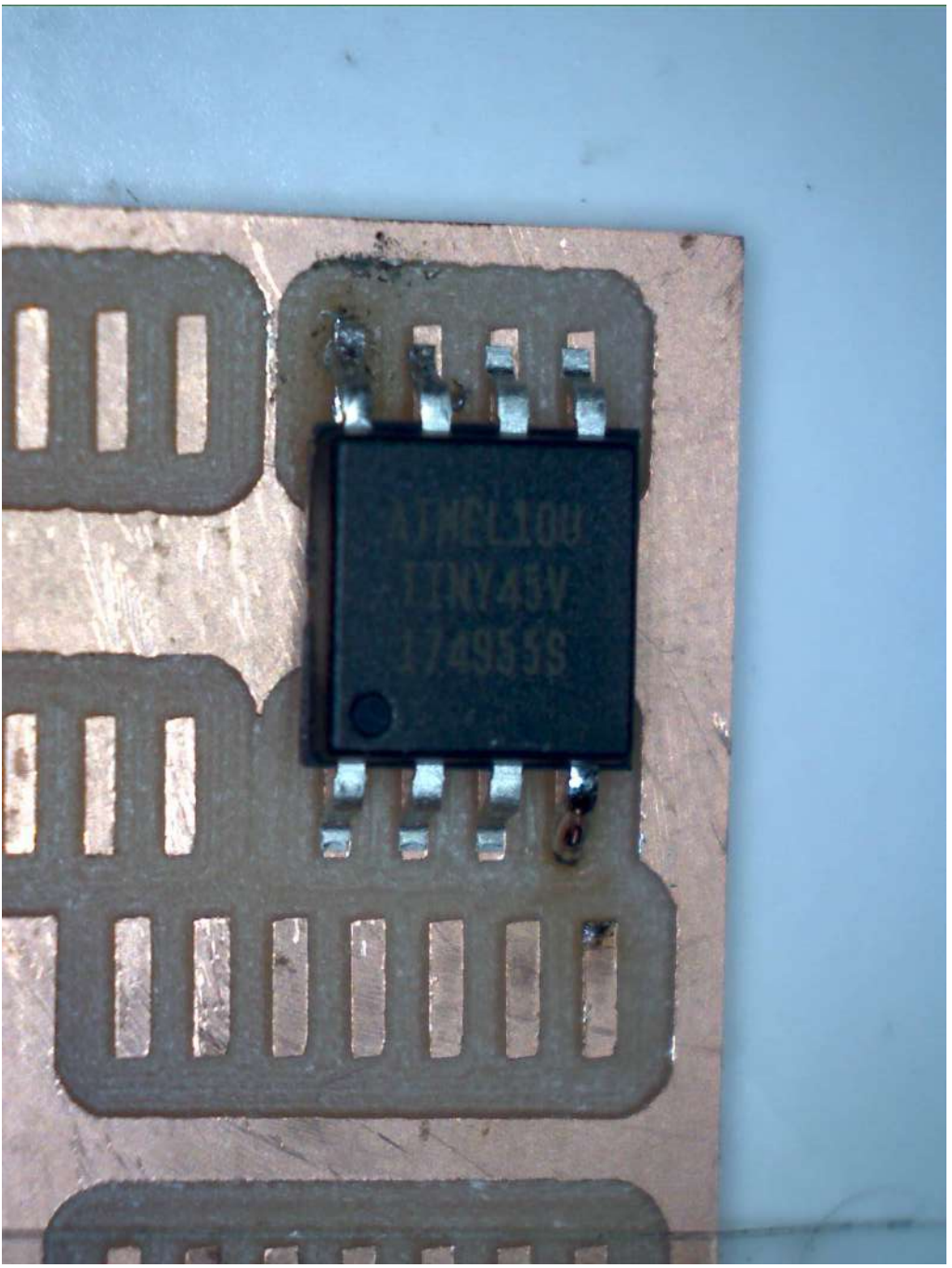
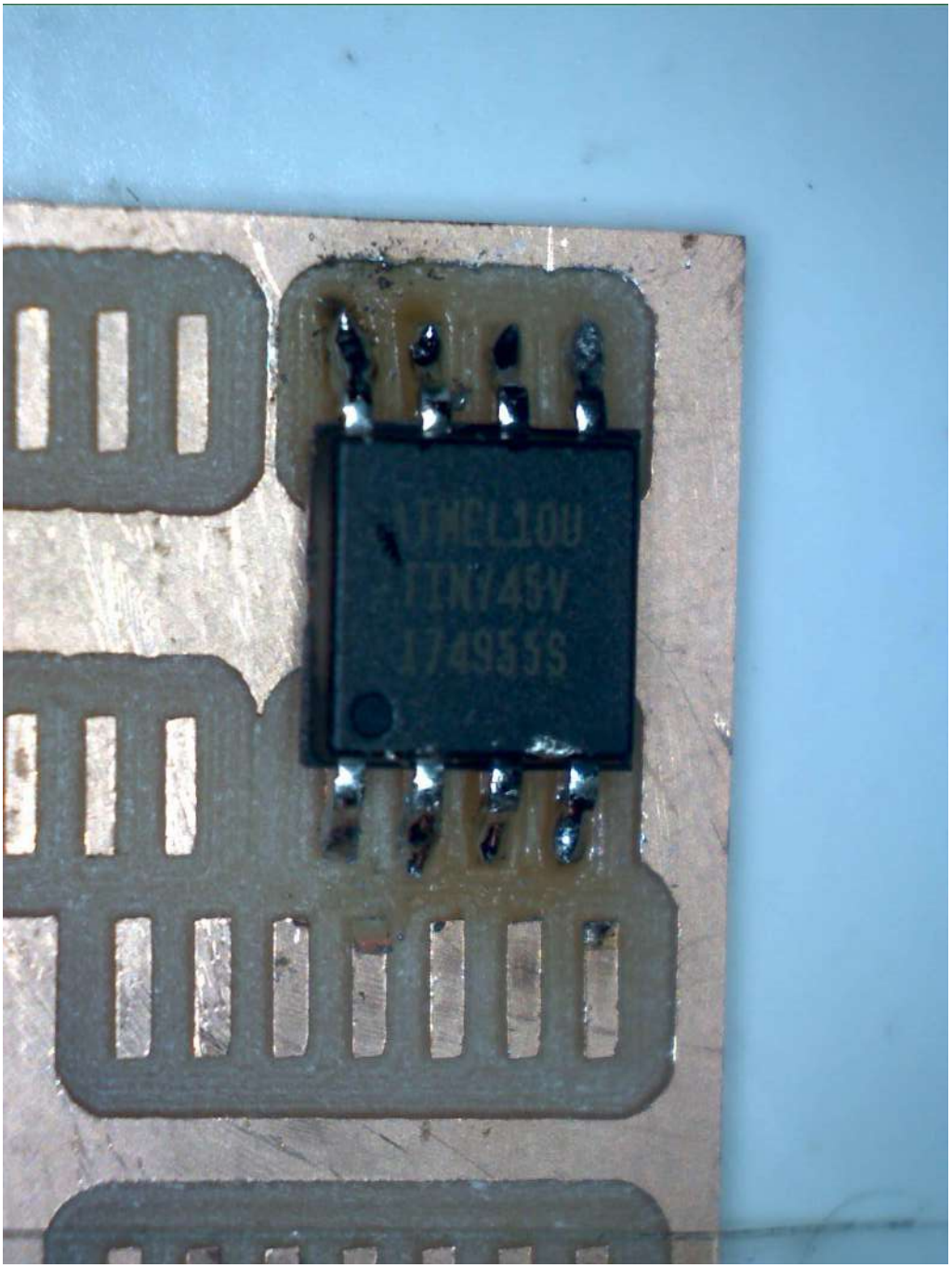


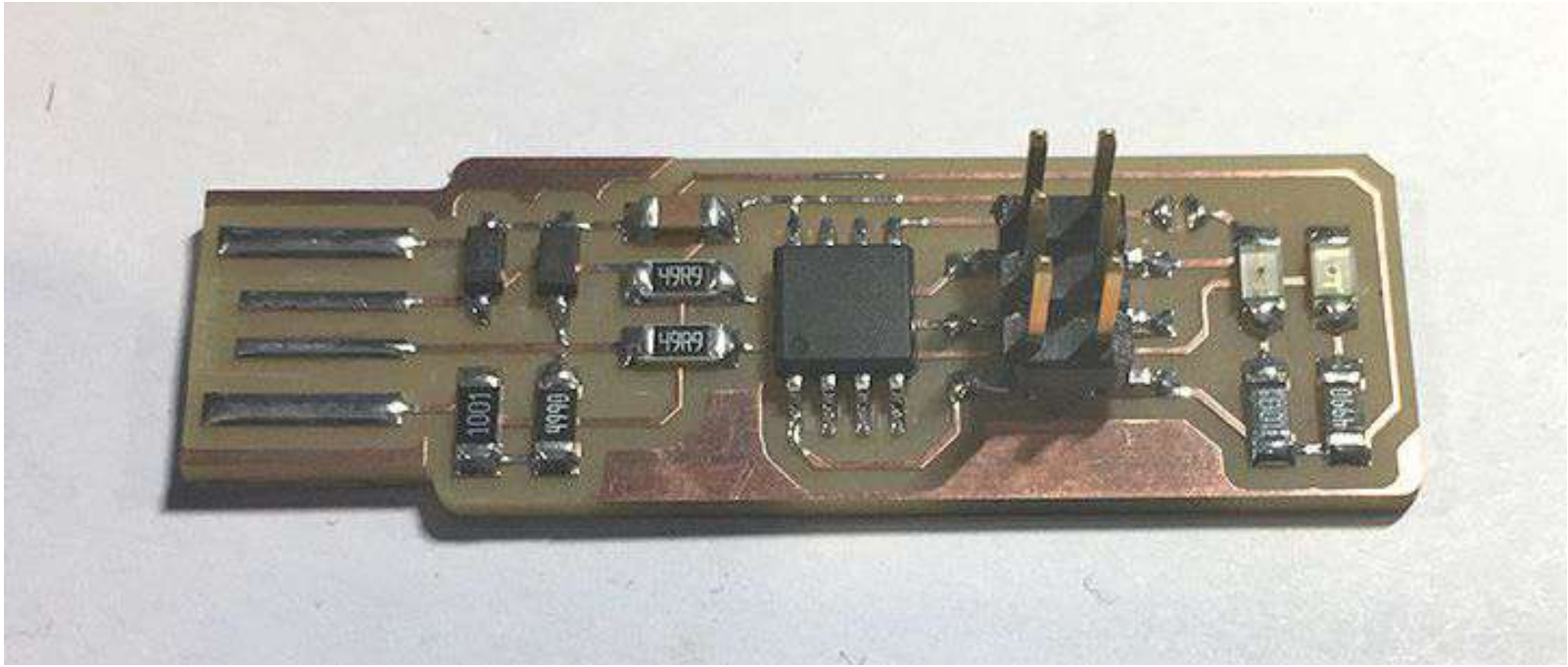






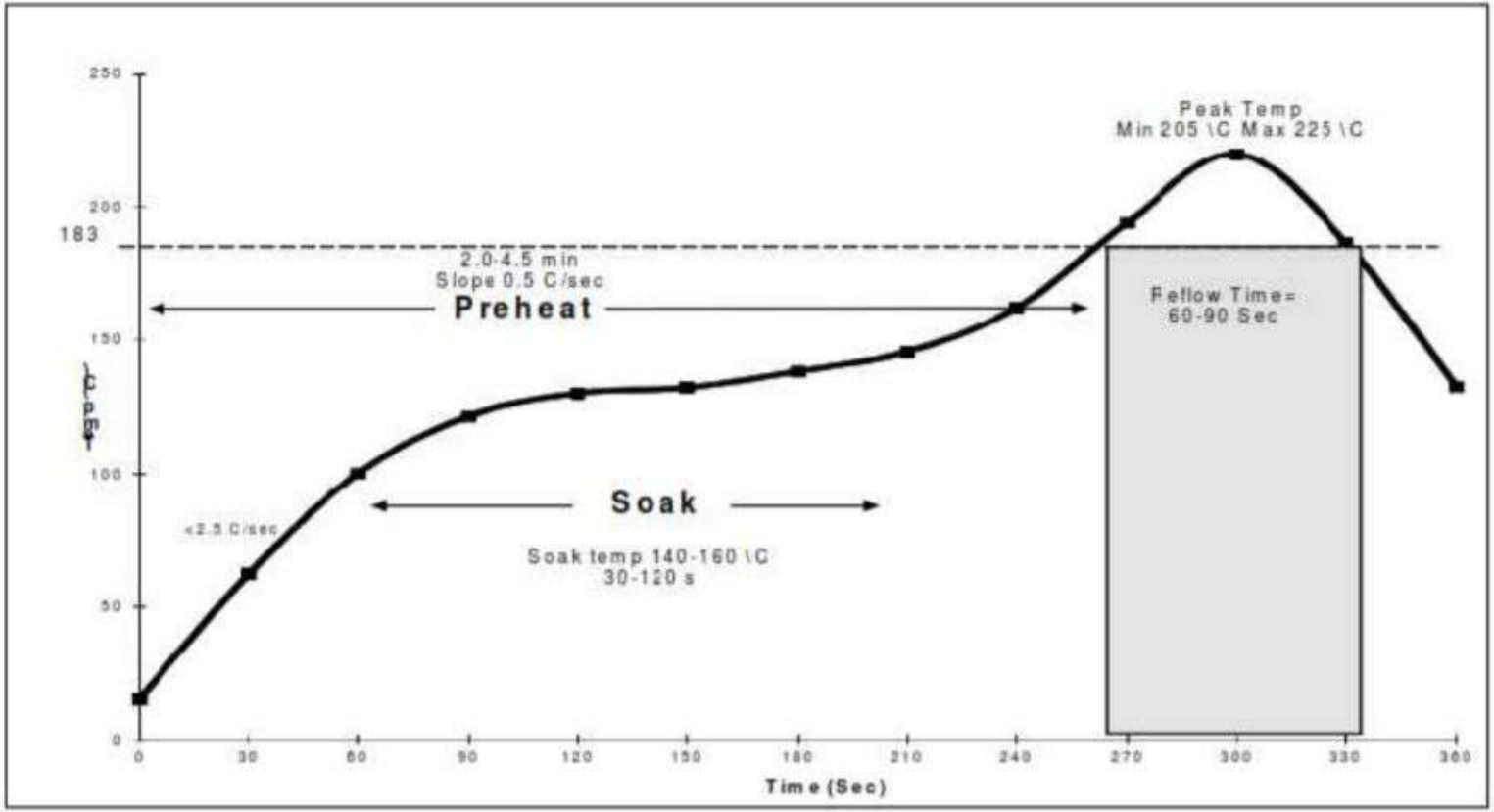

ATMEL10U
TTNY45V
1749555


ATMEL10U
TTN745V
1749555



By Brian: http://fab.cba.mit.edu/classes/863.16/doc/projects/ftsmin/index.html

Reflow soldering


Peak Temp
Min 205 \C Max 225 \C
183
2.0-4.5 min
Slope 0.5 C/sec
Preheat
Reflow Time=
60-90 Sec
Soak
<2.5 C/sec
Soak temp 140-160 \C
30-120 s
Temp
Time (Sec)
250
200
150
100
50
0
0
30
60
90
120
150
180
210
240
270
300
330
360


INFRARED IC HEATER
T-962


YIHUA 858D
300

Picture from: https://www.amazon.com/TOAUTO-Soldering-Conversion-Temperature-Correction/dp/B08L8YGYQZ?th=1

Image shown is a representation only. Exact specifications should be obtained from the product data sheet.

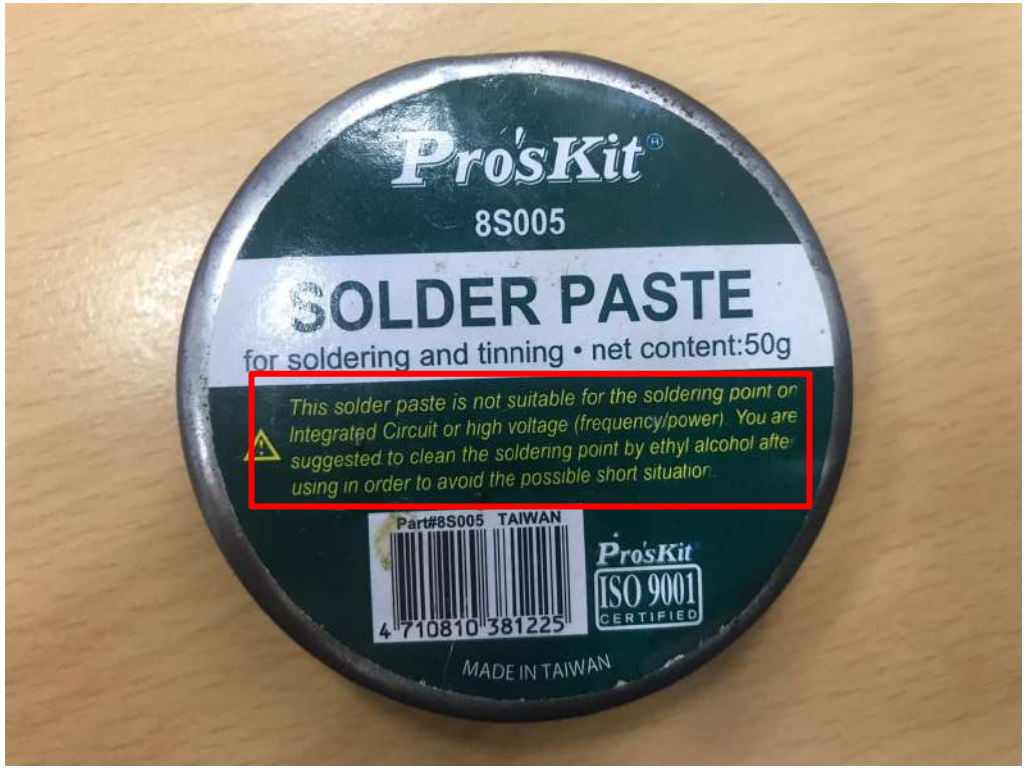
TS391SNL

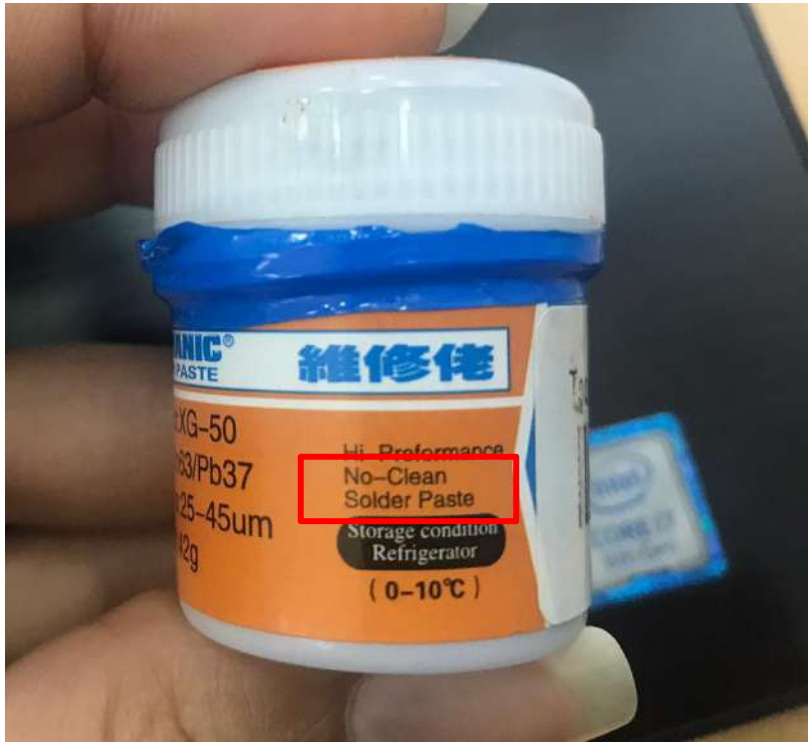
Digi-Key Part Number	TS391SNL-ND
Manufacturer	Chip Quik Inc.
Manufacturer Product Number	TS391SNL
Supplier	**Chip Quik Inc.**
Description	THERMALLY STABLE SOLDER PASTE NO
Manufacturer Standard Lead Time	3 Weeks
Detailed Description	Lead Free No-Clean Solder Paste Sn96.5Ag3Cu0.5 (96.5/3/0.5) - Syringe, 0.53 oz (15g), 5cc
Customer Reference	Customer Reference

Screenshot from: https://www.digikey.com/en/products/detail/chip-quik-inc/TS391SNL/7802215

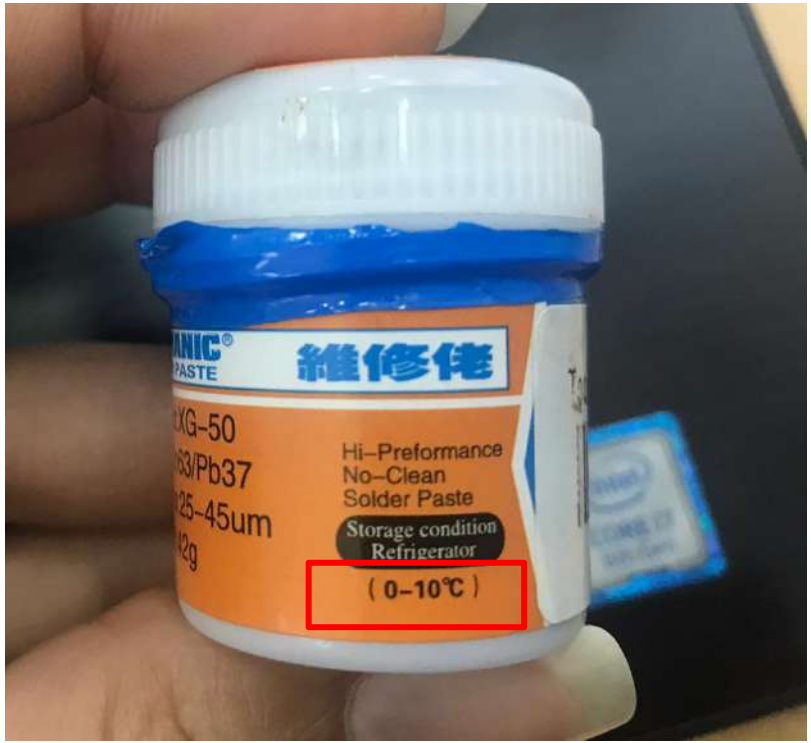
Composition	Sn96.5Ag3Cu0.5 (96.5/3/0.5)
Diameter	-
Melting Point	423 ~ 428°F (217 ~ 220°C)
Flux Type	No-Clean
Wire Gauge	-
Mesh Type	4
Process	Lead Free
Form	Syringe, 0.53 oz (15g), 5cc
Shelf Life	12 Months
Shelf Life Start	Date of Manufacture
Storage/Refrigeration Temperature	68°F ~ 77°F (20°C ~ 25°C)

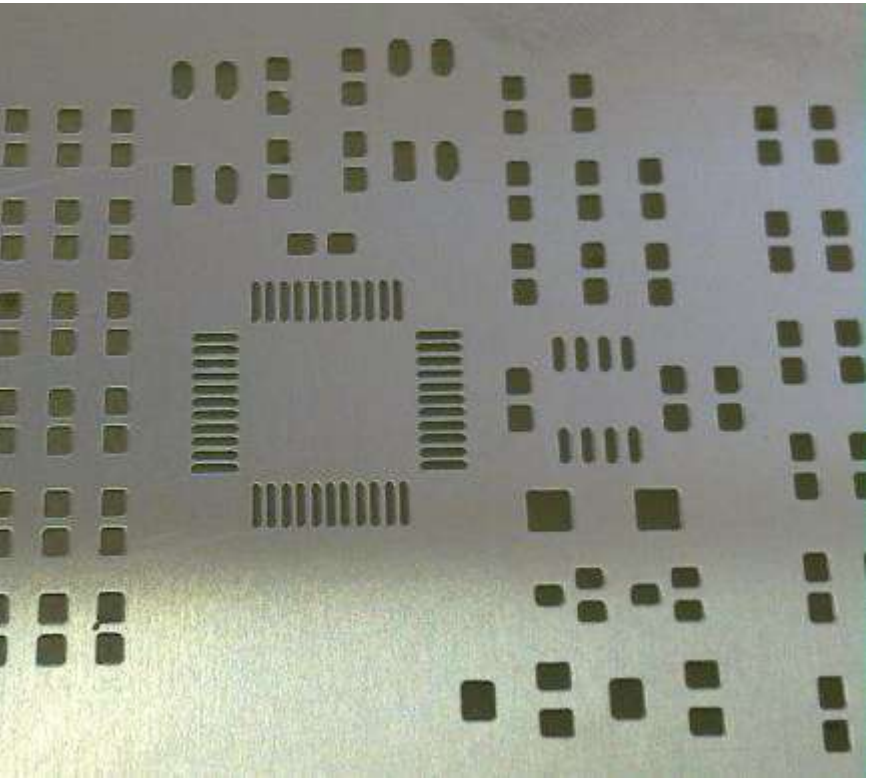
Screenshot from: https://www.digikey.com/en/products/detail/chip-quik-inc/TS391SNL/7802215

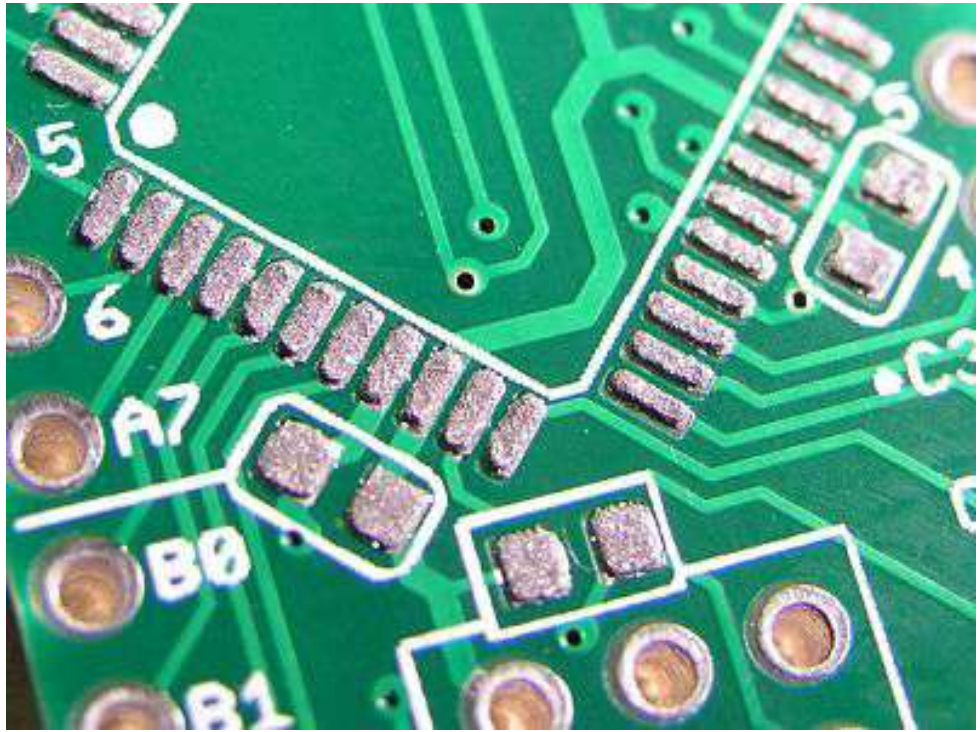

ProsKit
8S005
SOLDER PASTE
for soldering and tinning • net content:50g
This solder paste is not suitable for the soldering point or Integrated Circuit or high voltage (frequency/power). You are suggested to clean the soldering point by ethyl alcohol after using in order to avoid the possible short situation.
Part#8S005 TAIWAN
4 710810 381225
ProsKit
ISO 9001
CERTIFIED
MADE IN TAIWAN


維修佬
No-Clean
Solder Paste
Storage condition
Refrigerator
(0-10℃)

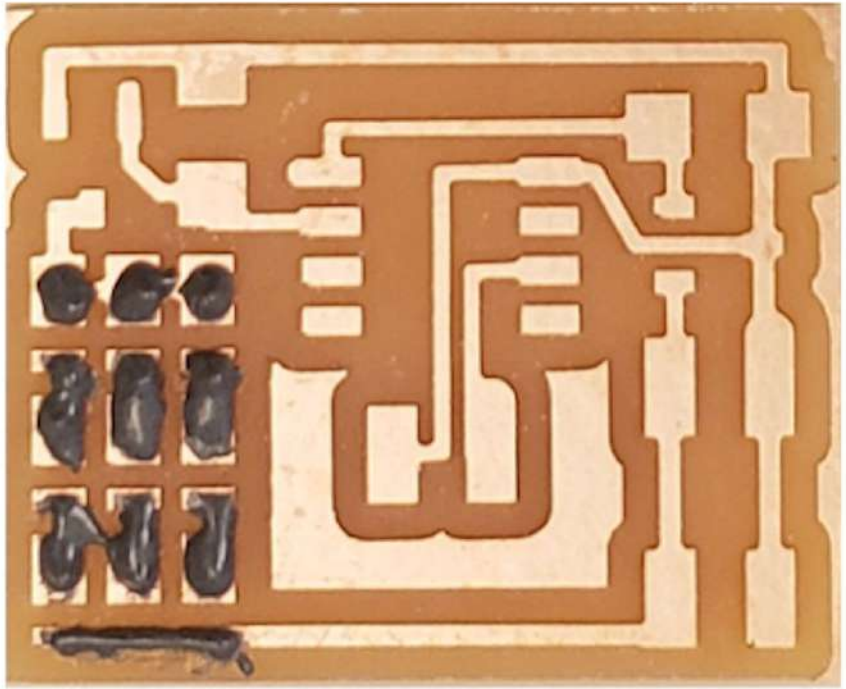

HKMECHANIC,SP50
MFG:13/12/2015.2
SHELF-LIFE:1YEA

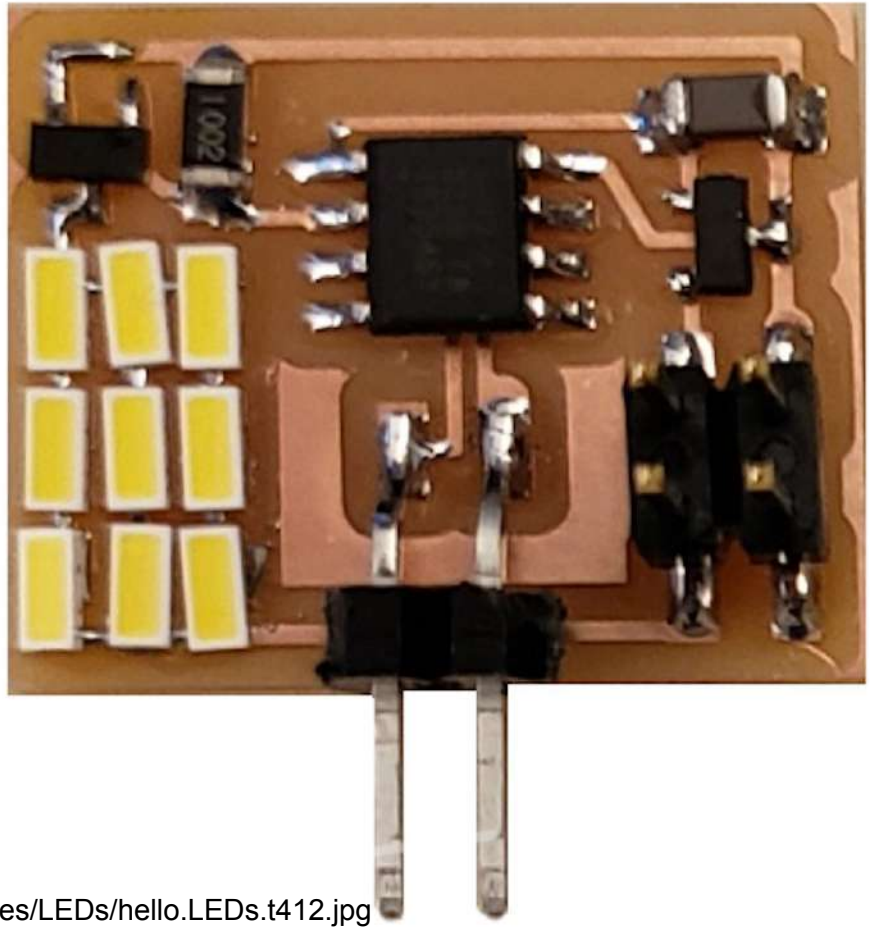

維修佬
XG-50
Hi-Preformance
No-Clean
Solder Paste
Storage condition
Refrigerator
(0-10℃)



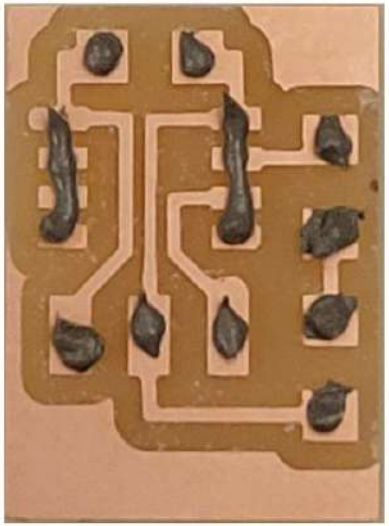
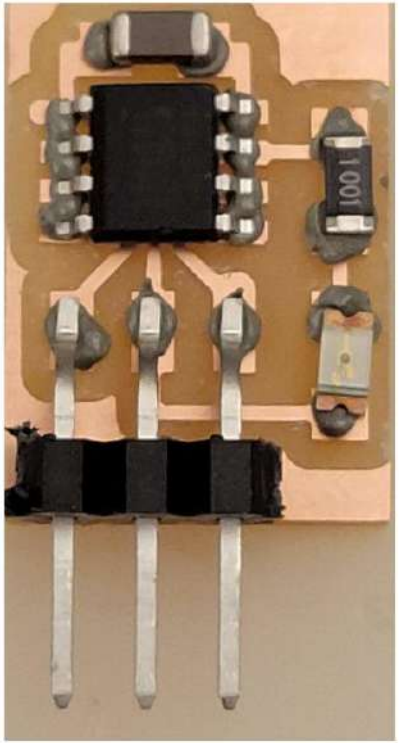
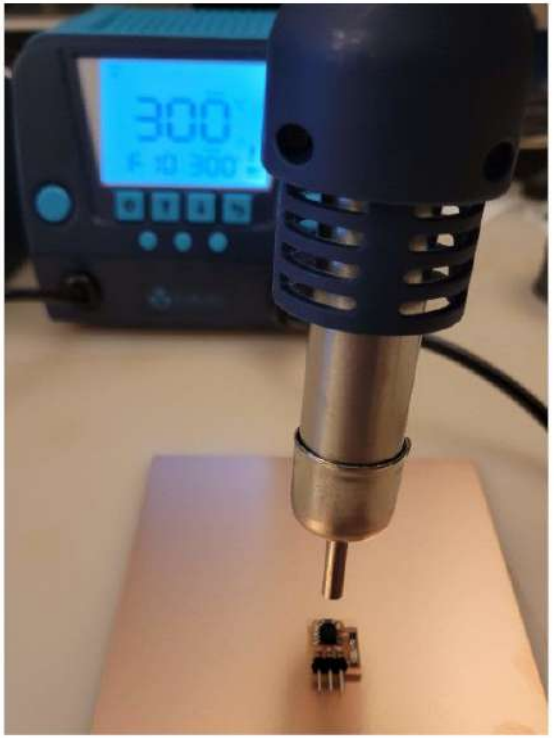

5
6
A7
B0
B1

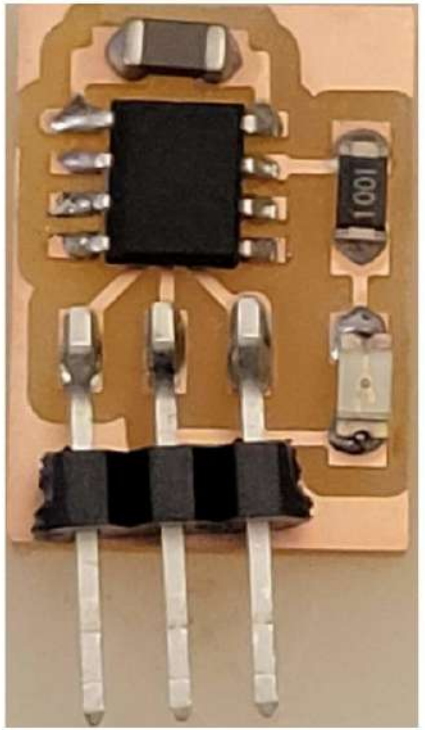

R6
U3



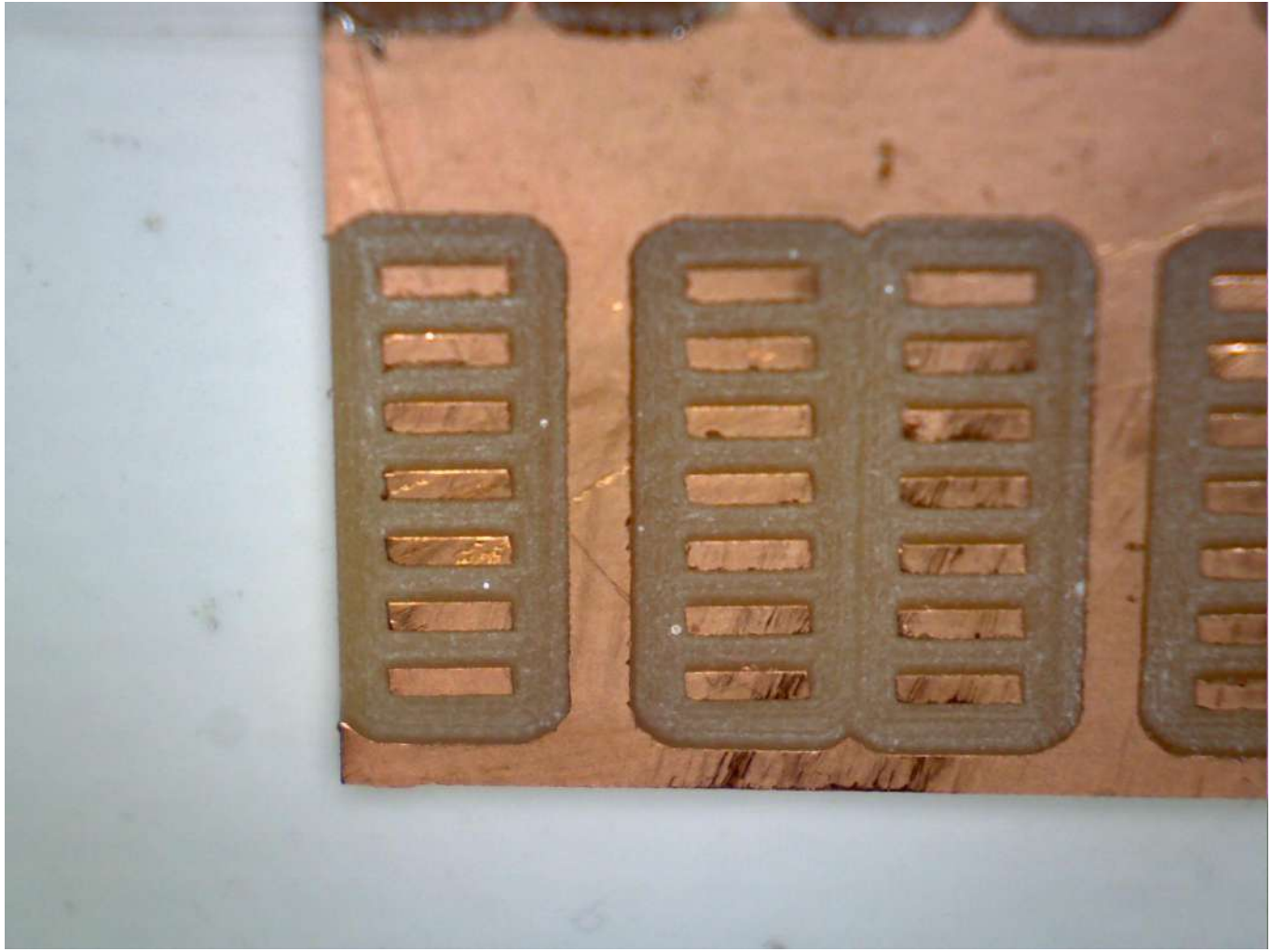


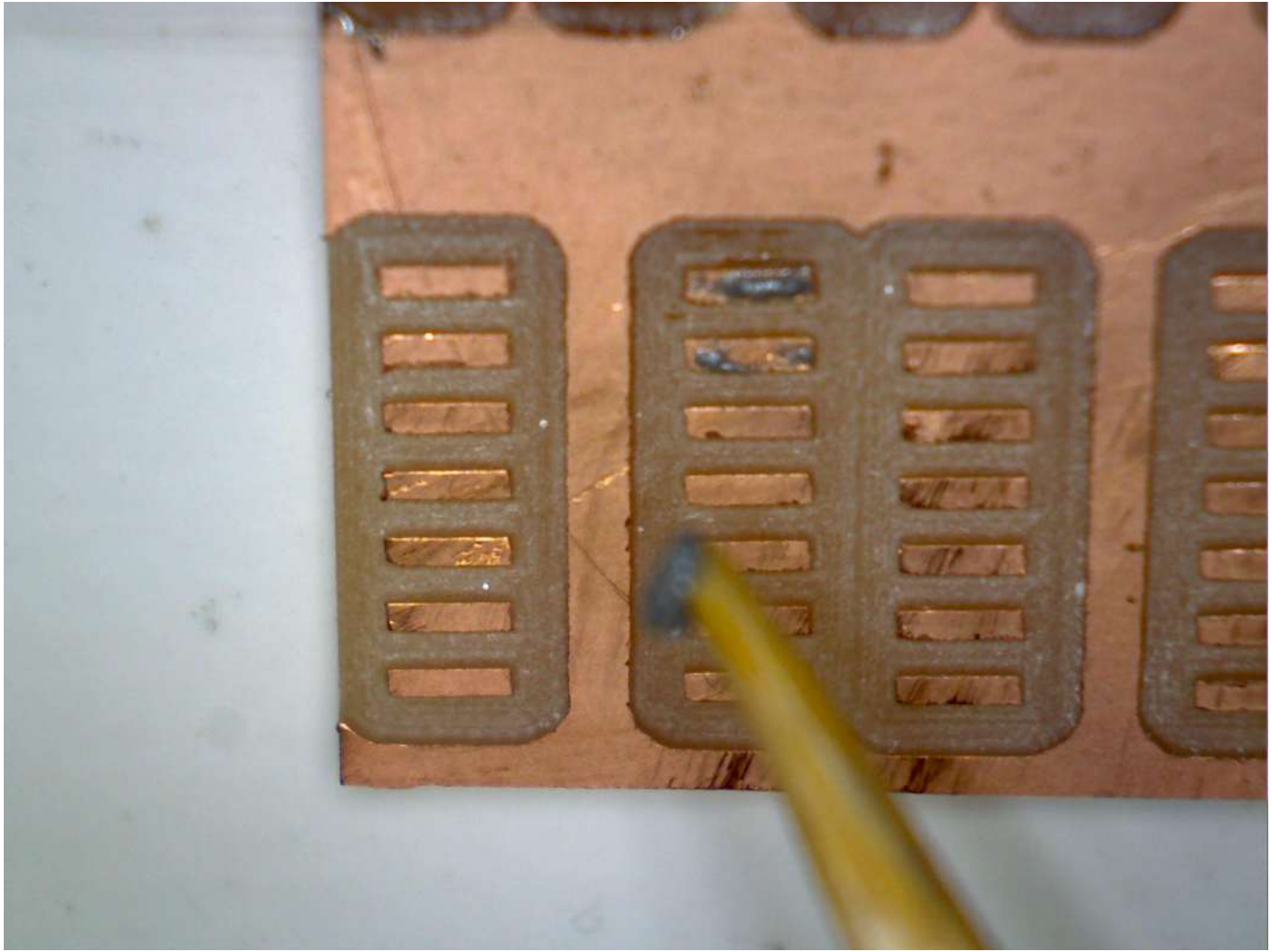
By Neil Gershenfeld: http://academy.cba.mit.edu/classes/output_devices/LEDs/hello.LEDs.t412.jpg

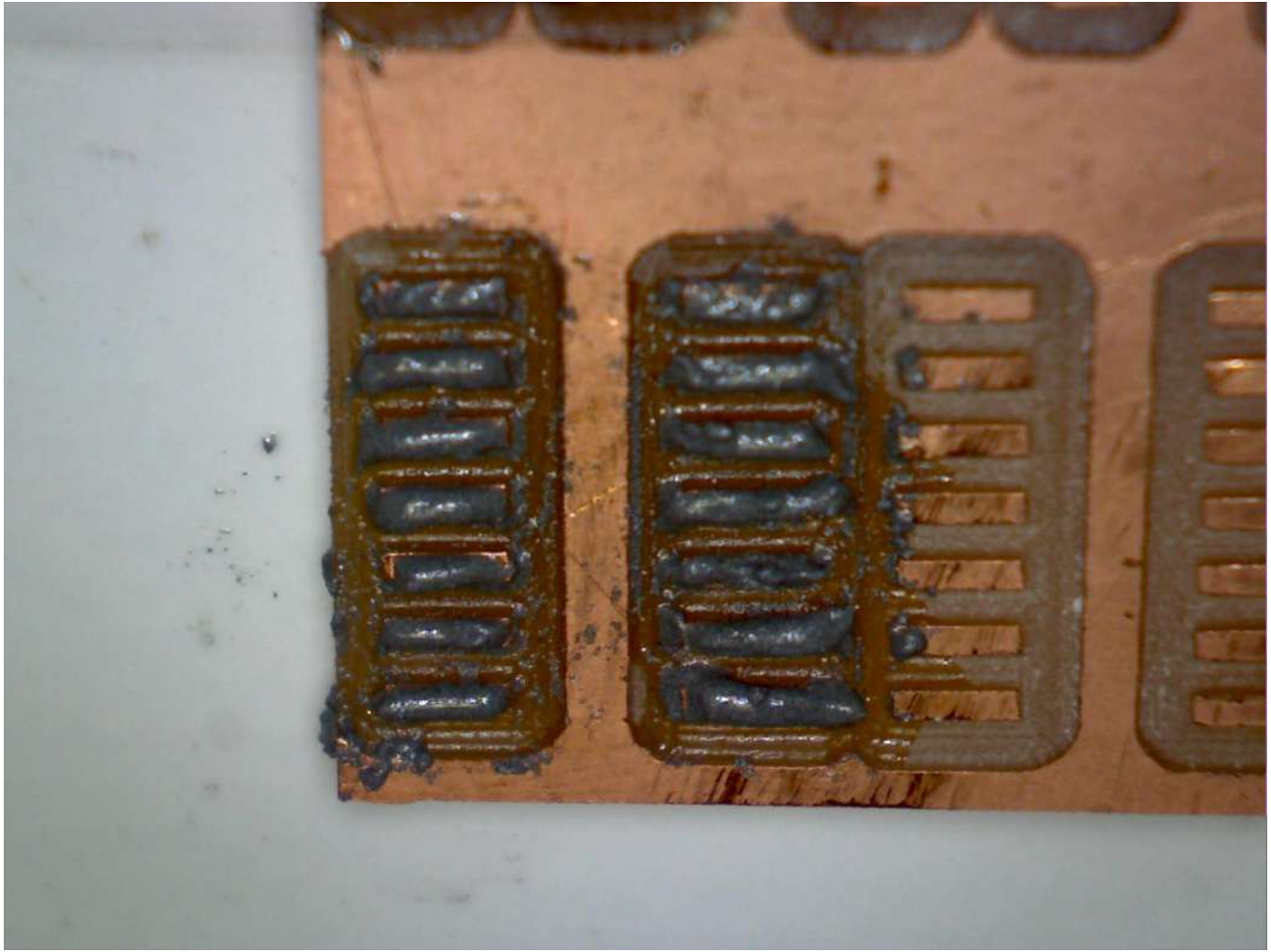




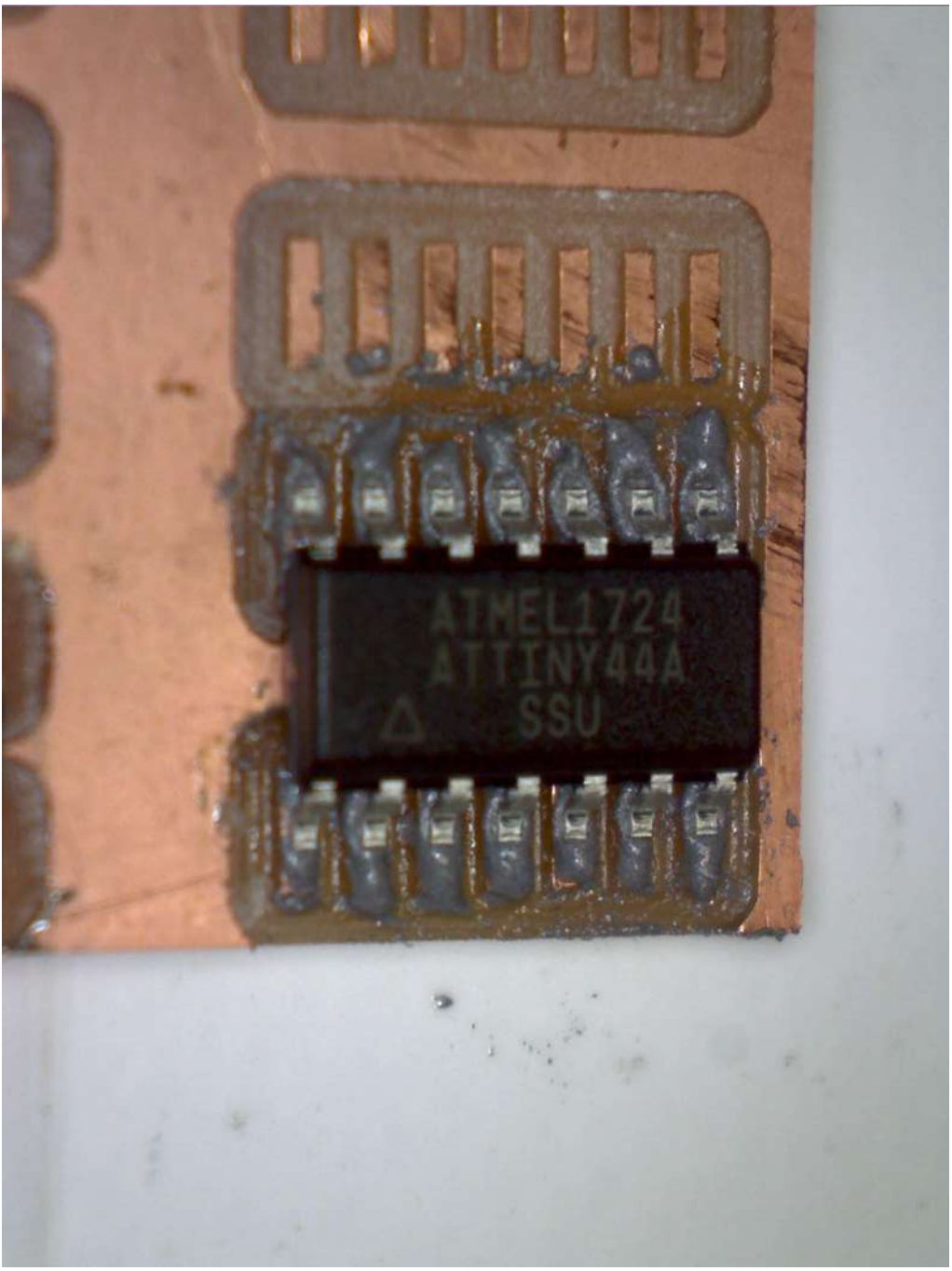


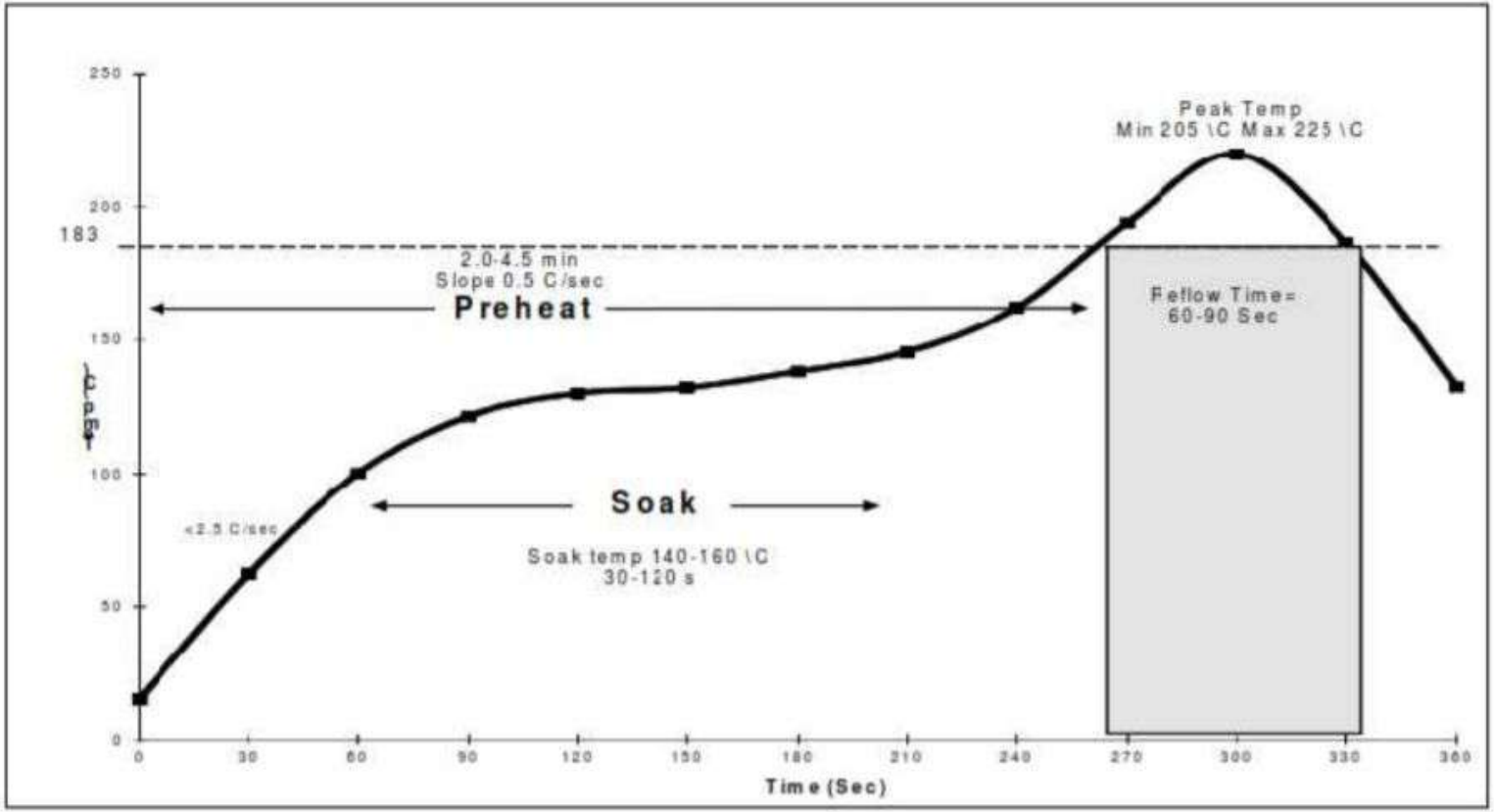
By Neil Gershenfeld: http://academy.cba.mit.edu/classes/electronics_production/hotair.jpg



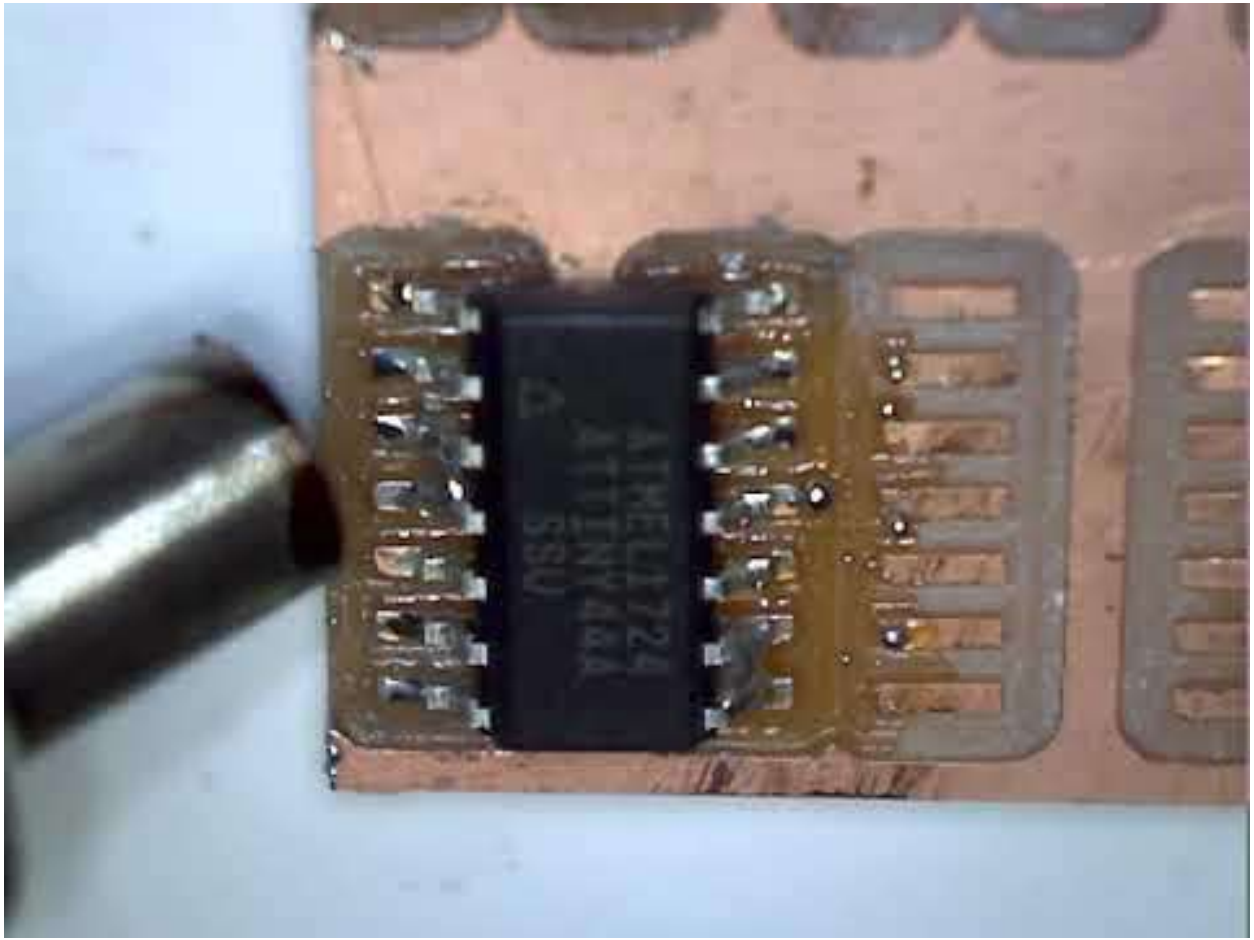


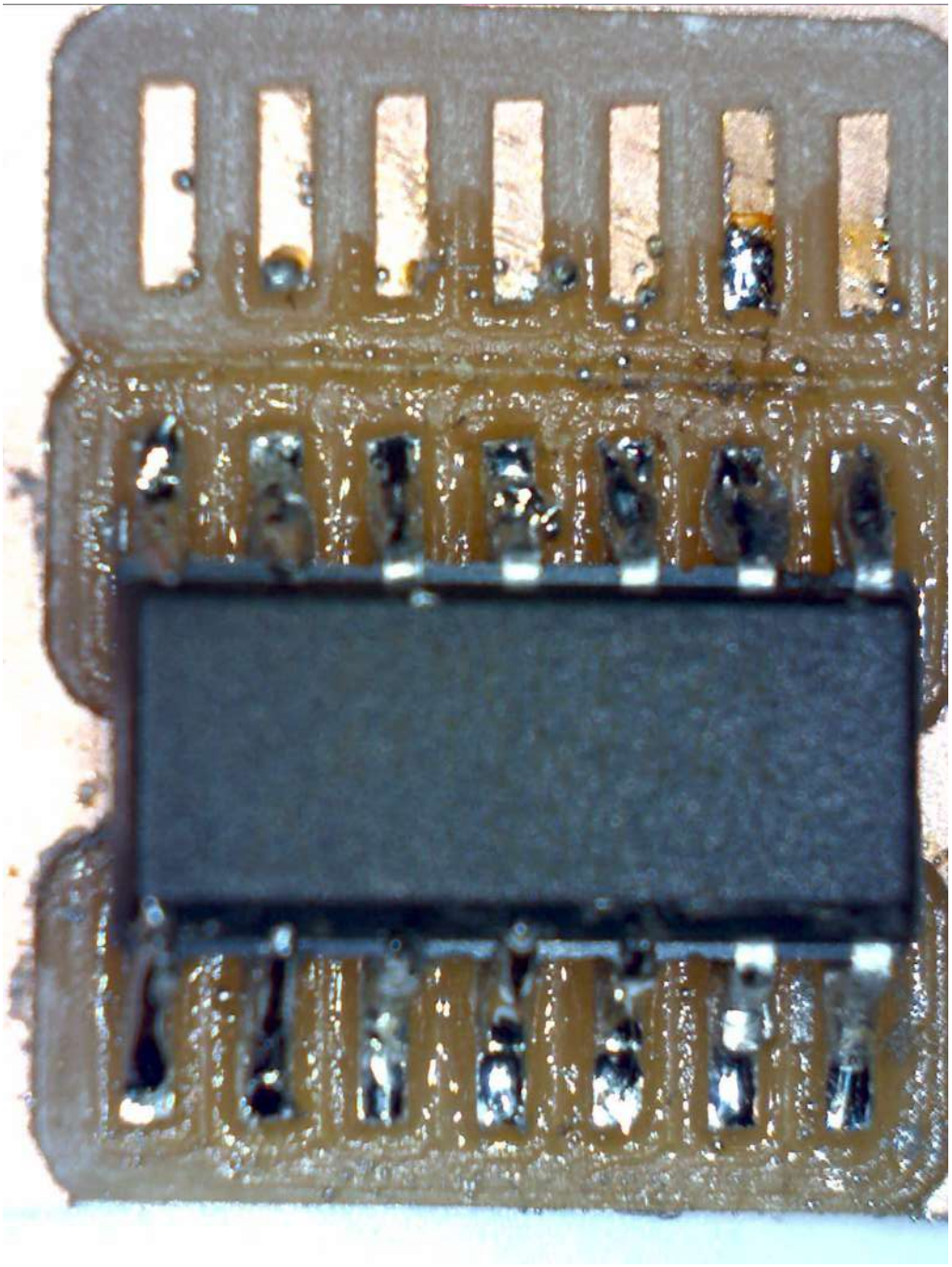


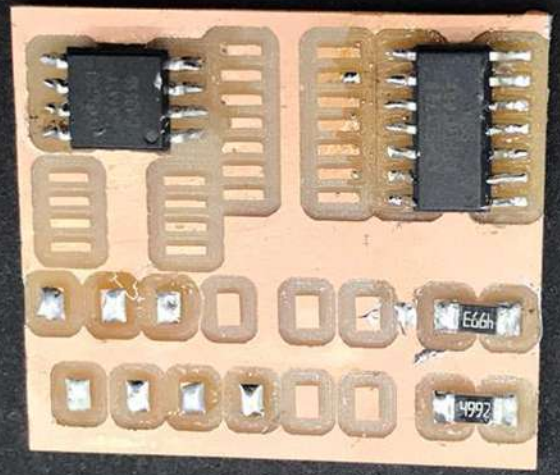

ATMEL1724
ATTINY44A
SSU

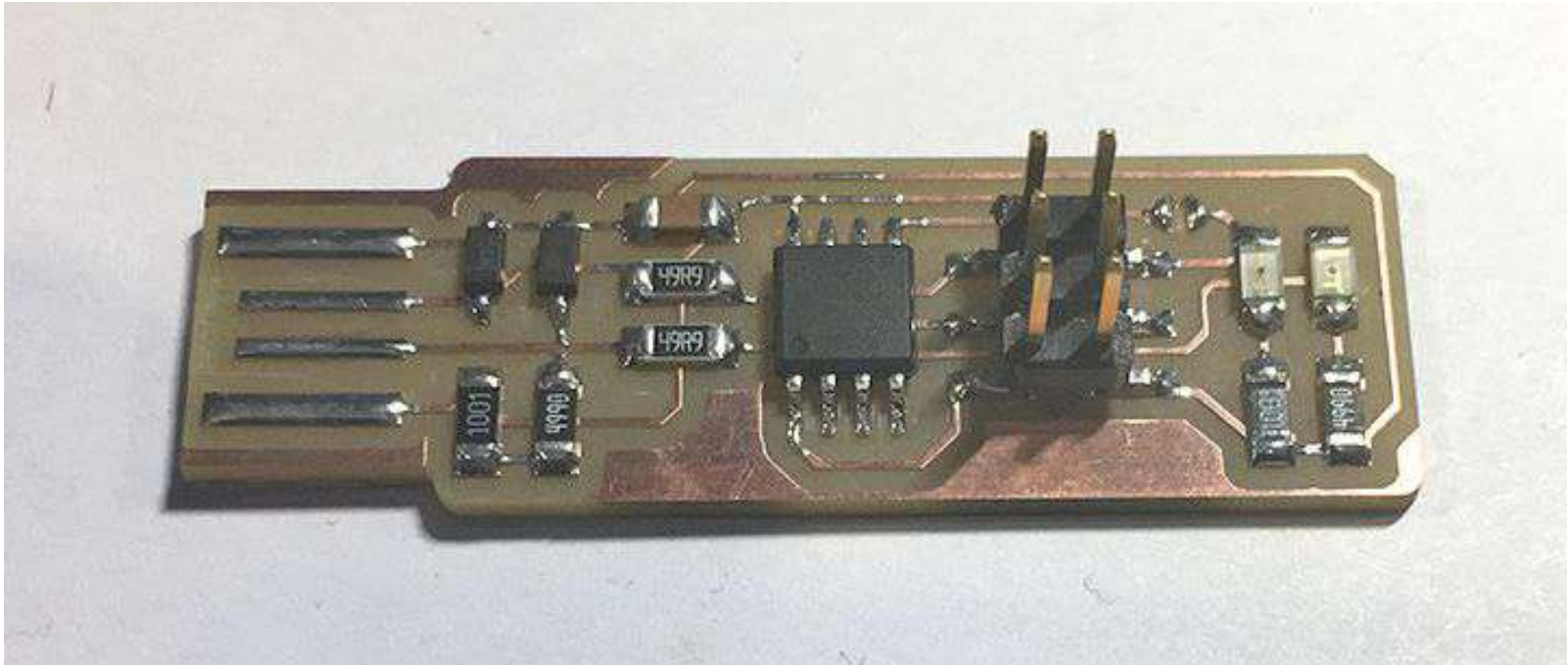

Peak Temp
Min 205 \C Max 225 \C
183
2.0-4.5 min
Slope 0.5 C/sec
Preheat
Reflow Time=
60-90 Sec
Soak
<2.5 C/sec
Soak temp 140-160 \C
30-120 s
Temp
Time (Sec)
250
200
150
100
50
0
0
30
60
90
120
150
180
210
240
270
300
330
360


METCAL
HCT2-120
260



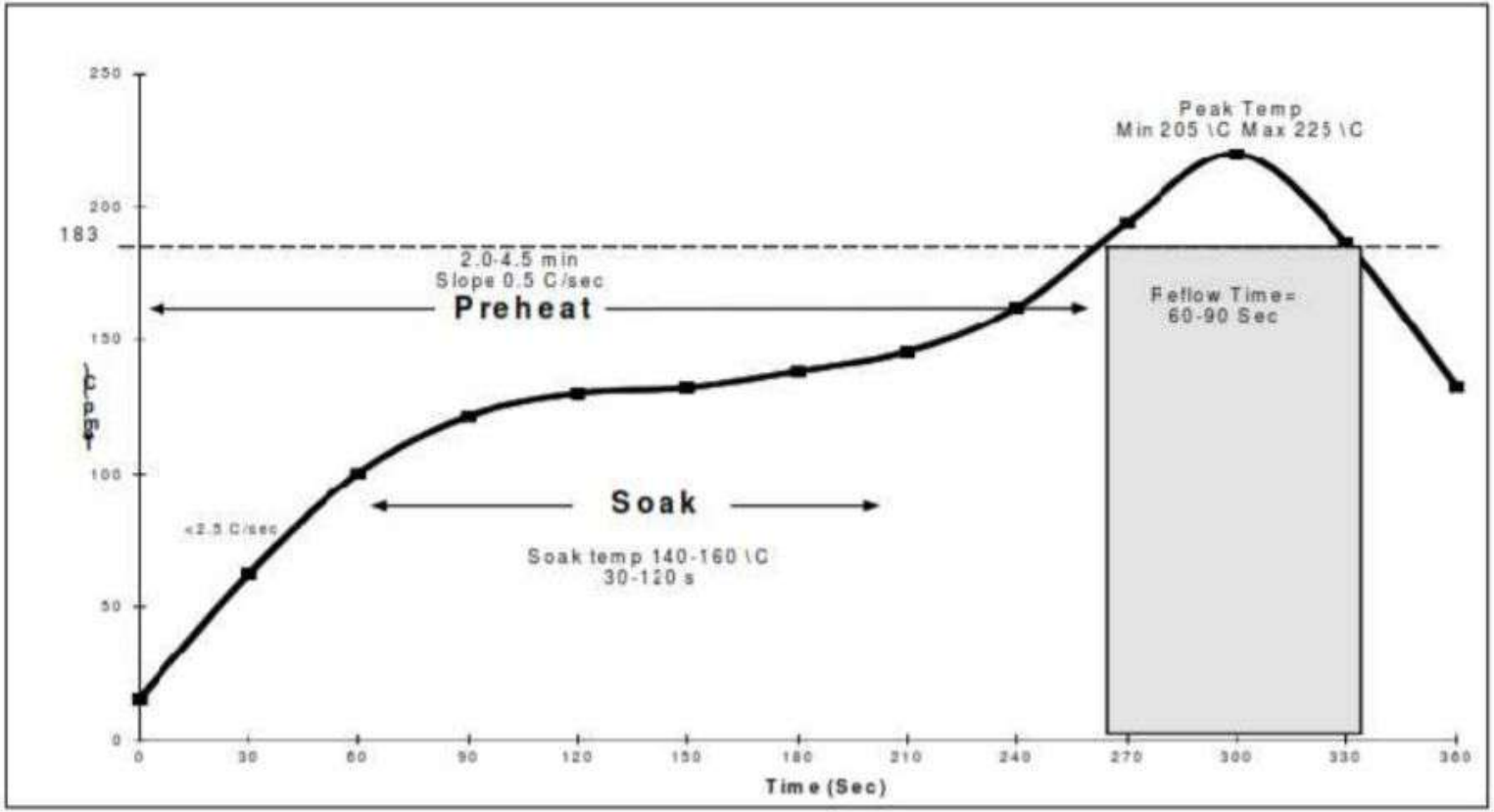



E66h
4992



By Brian: http://fab.cba.mit.edu/classes/863.16/doc/projects/ftsmin/index.html

Picture from: https://www.amazon.com/SainSmart-Soldering-Preheating-Preheater-Intelligent/dp/B08R6XFPKR?th=1


Peak Temp
Min 205 \C Max 225 \C
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2.0-4.5 min
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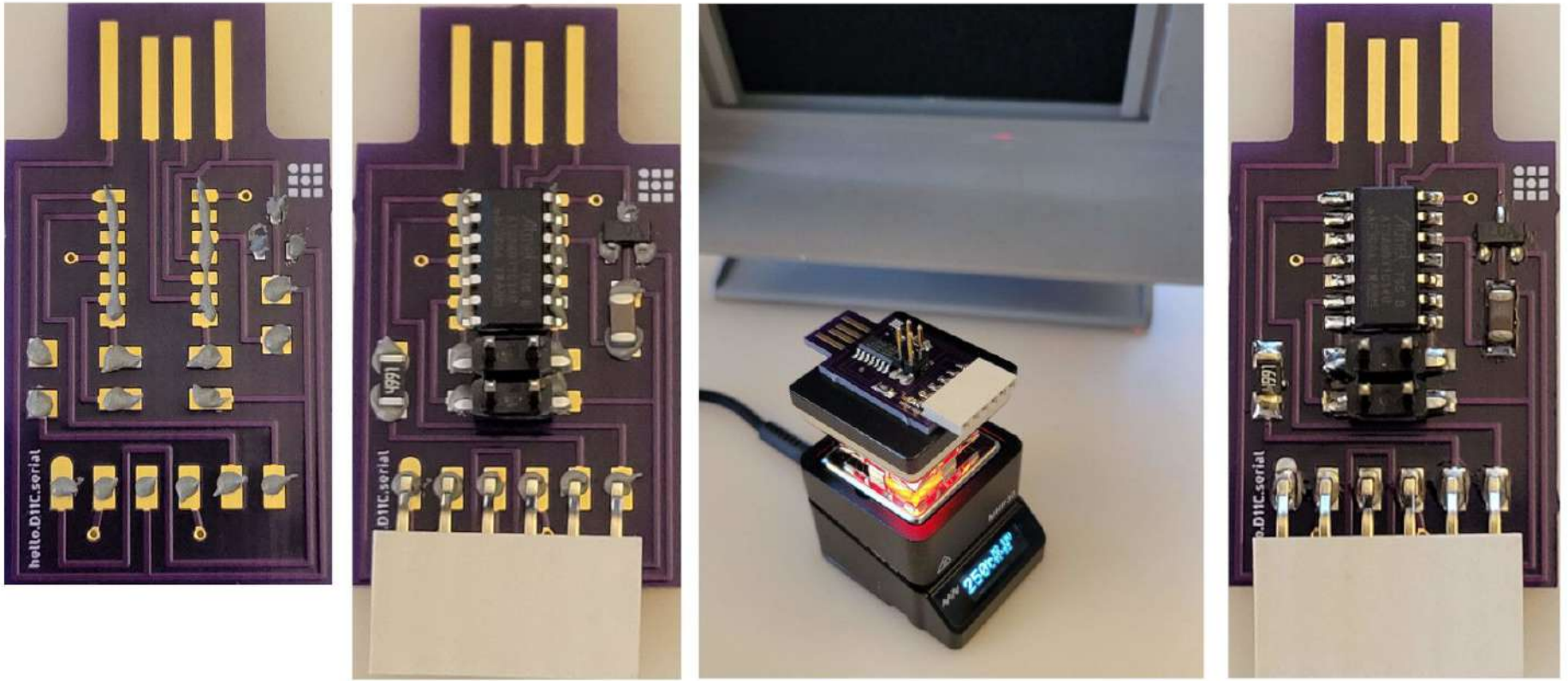
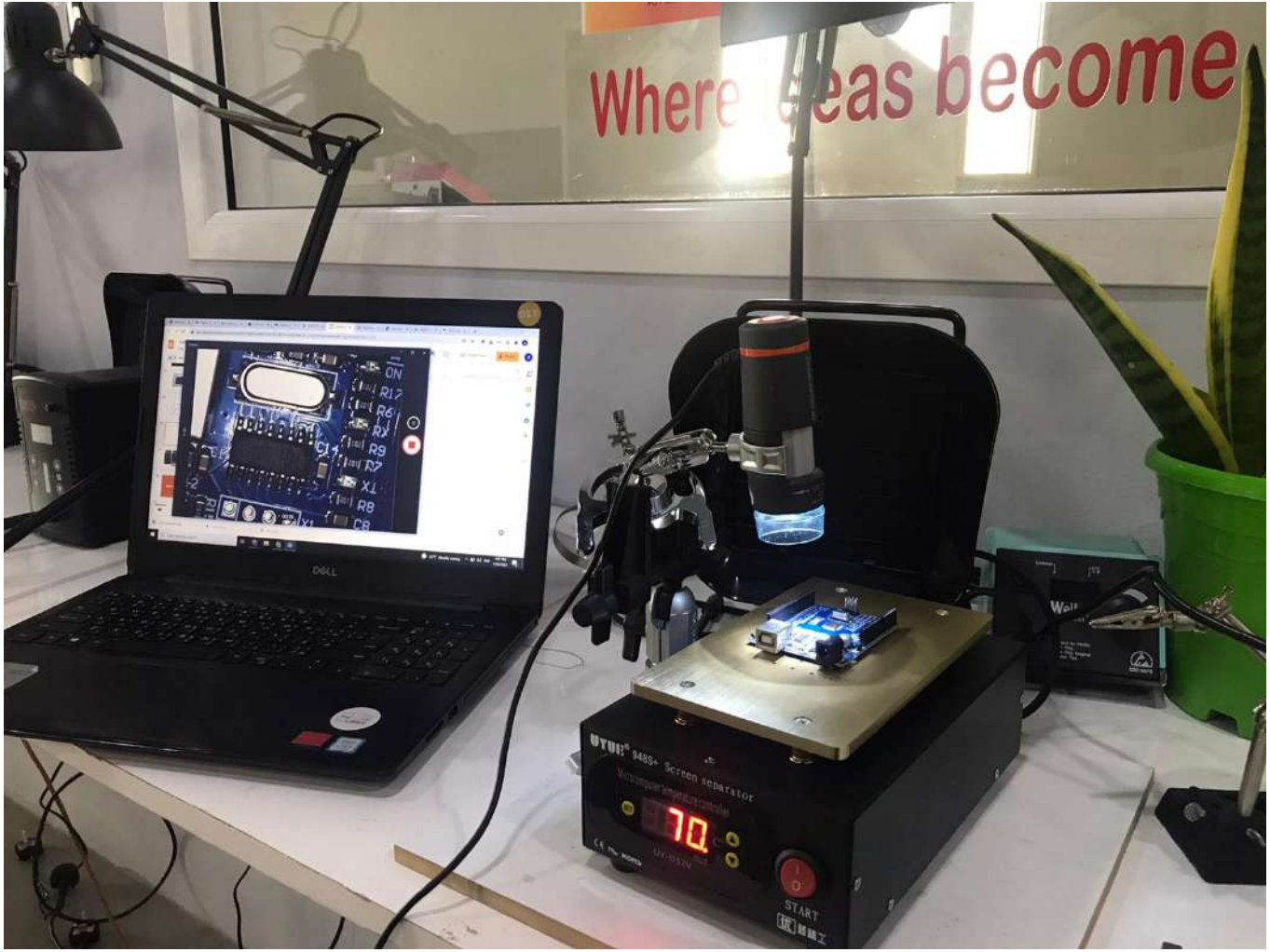
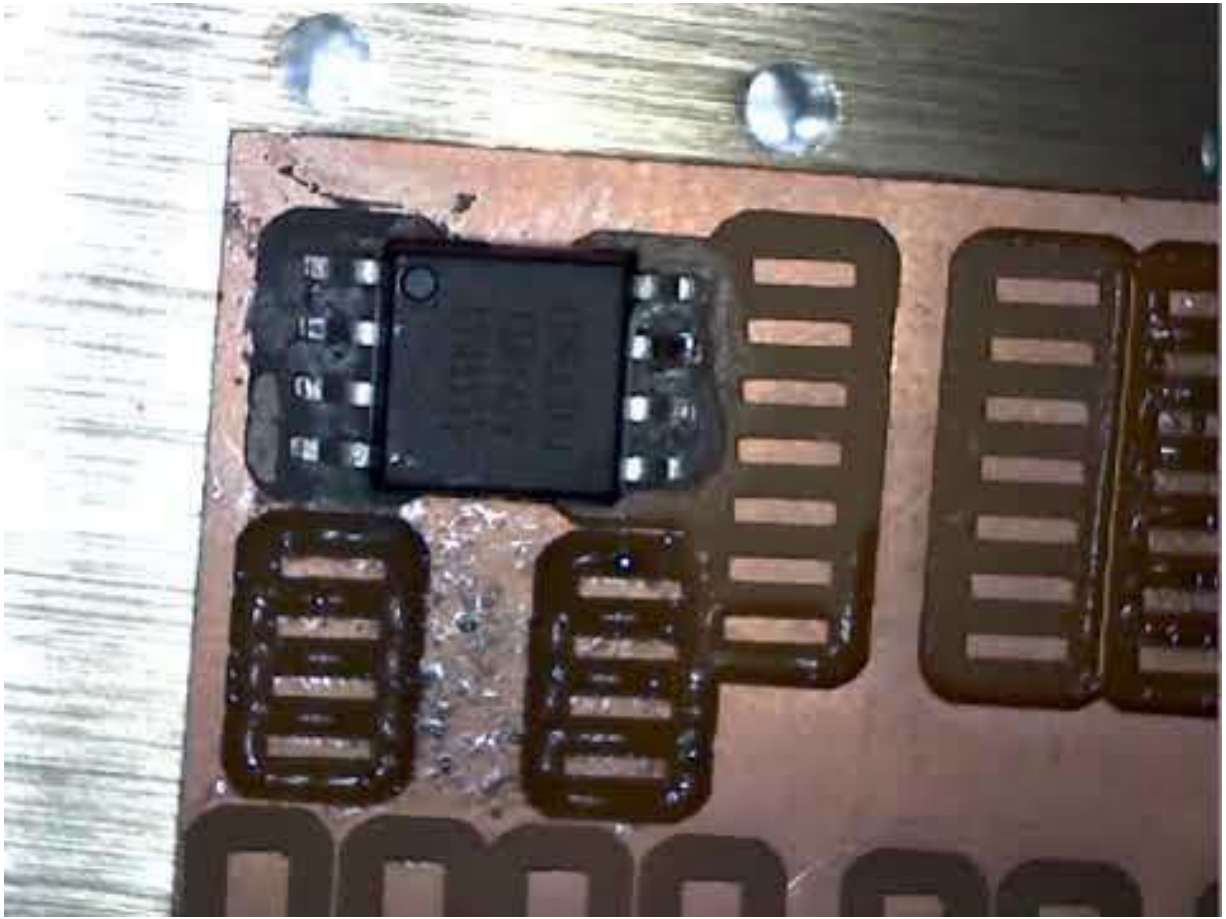
<2.5 C/sec
Soak temp 140-160 \C
30-120 s
Temp
Time (Sec)
250
200
150
100
50
0
0
30
60
90
120
150
180
210
240
270
300
330
360

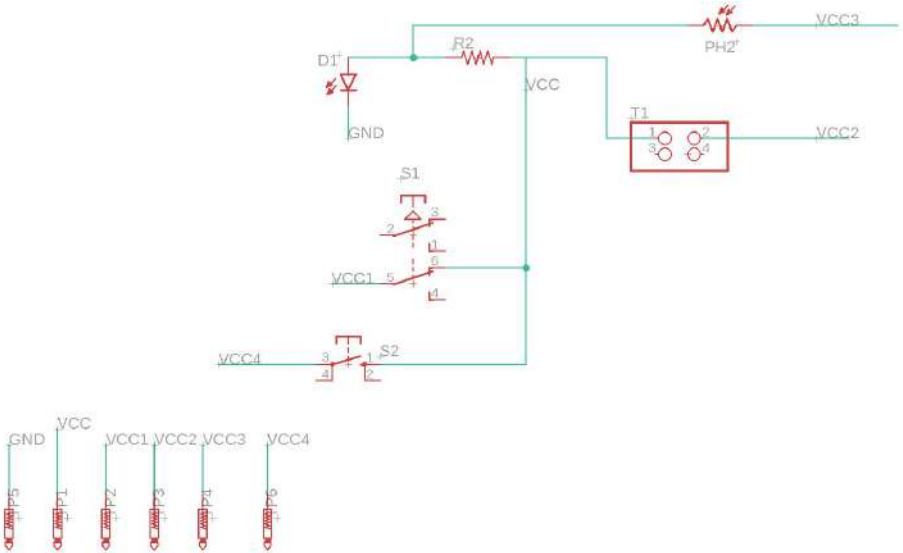


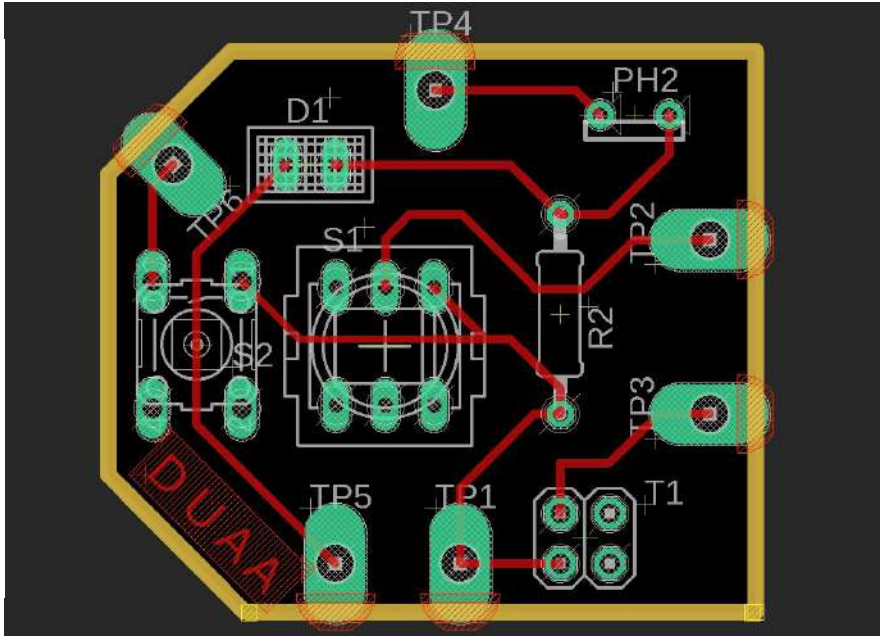
By Neil Gershenfeld: http://academy.cba.mit.edu/classes/electronics_production/hotplate.jpg

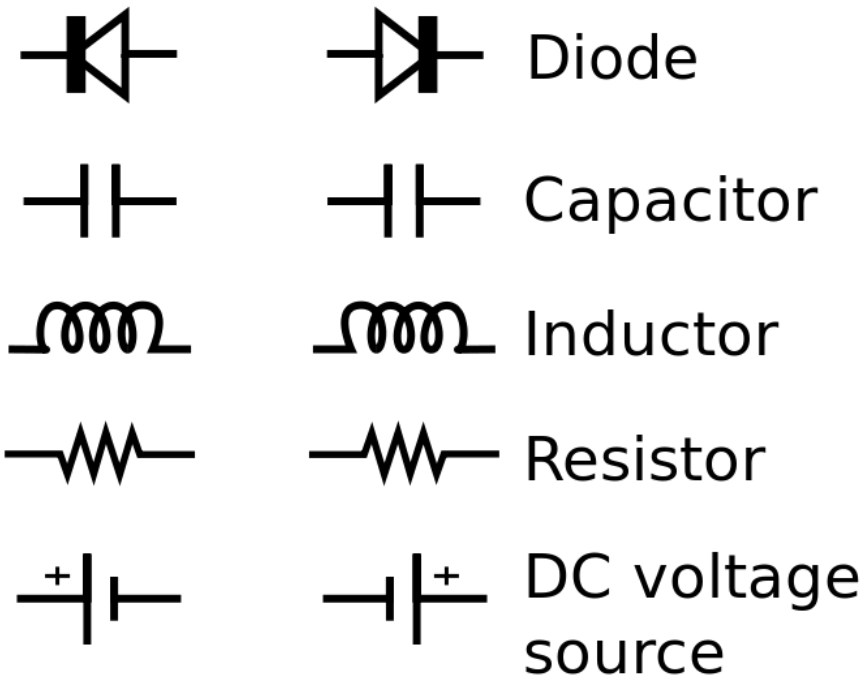

Where
eas become
DELL
UYUE 948S+ Screen separator
70
START



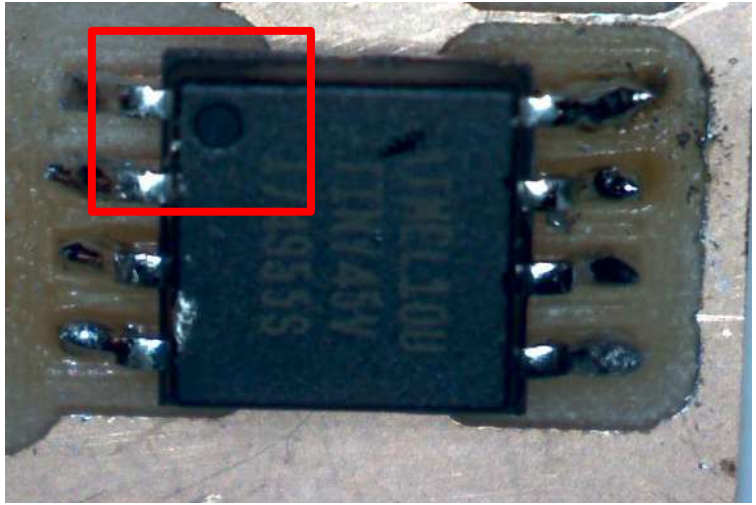
What to solder where?

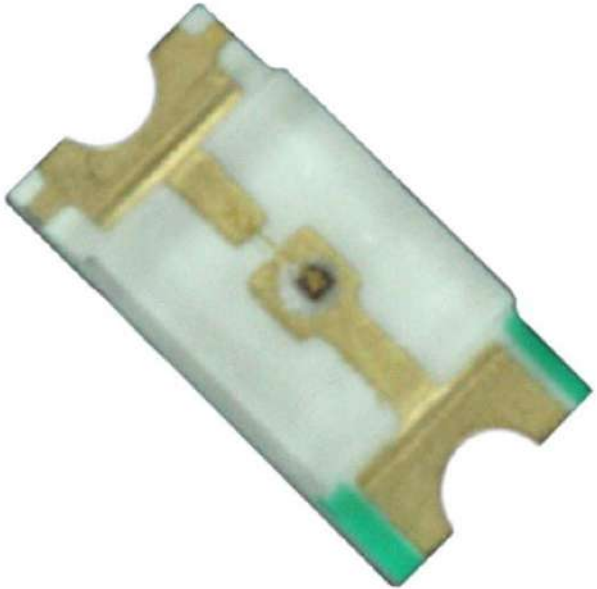

VCC3
PH2
R2
D1
VCC
GND
T1
VCC2
S1
VCC1
VCC4
S2
GND
VCC
VCC1
VCC2
VCC3
VCC4


TP4
PH2
D1
TP6
S1
TP2
S2
R2
TP3
DUAA
TP5
TP1
T1

<


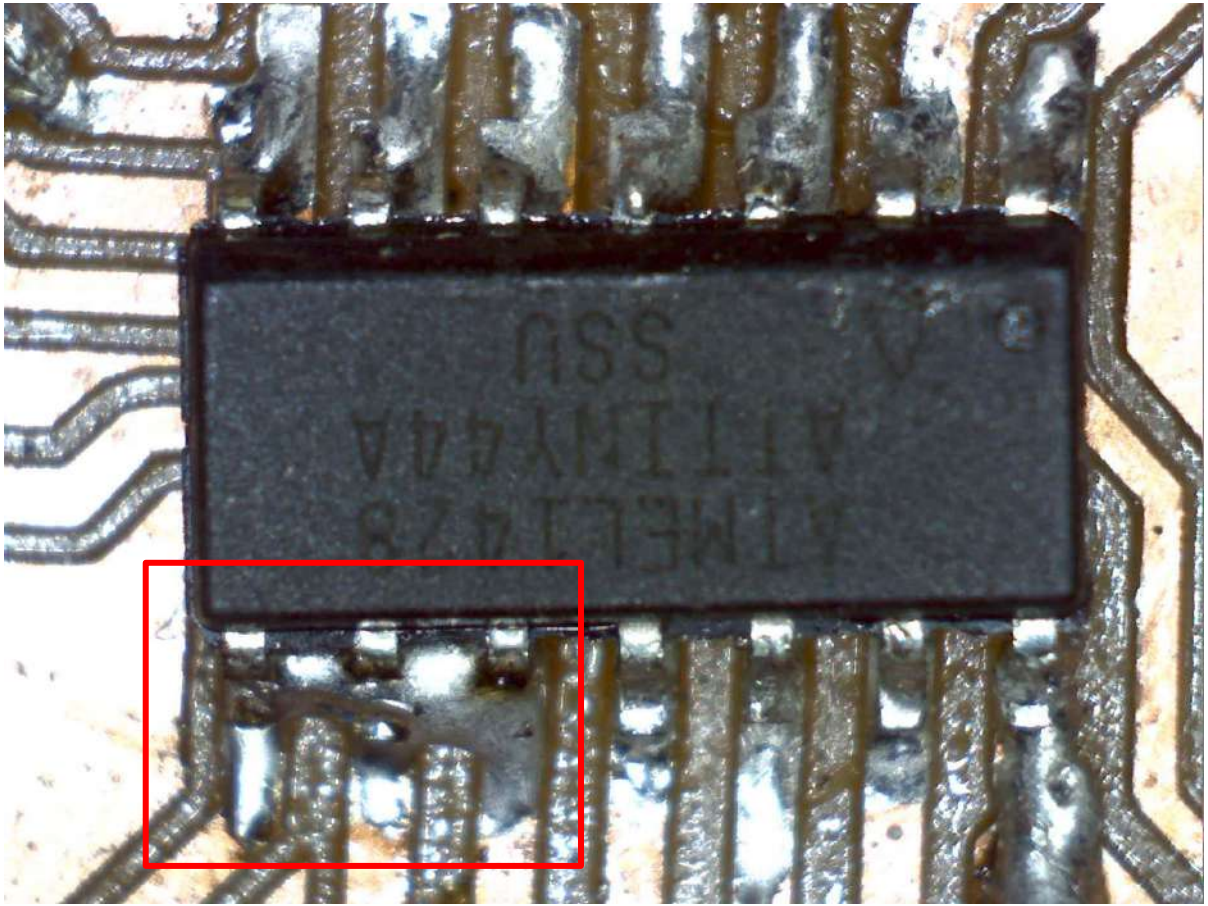
Circuit elements.png By Jleedev https://commons.wikimedia.org/wiki/File:Circuit_elements.svg





https://www.digikey.com/en/products/detail/dialight/5990230007F/9385417

Desoldering



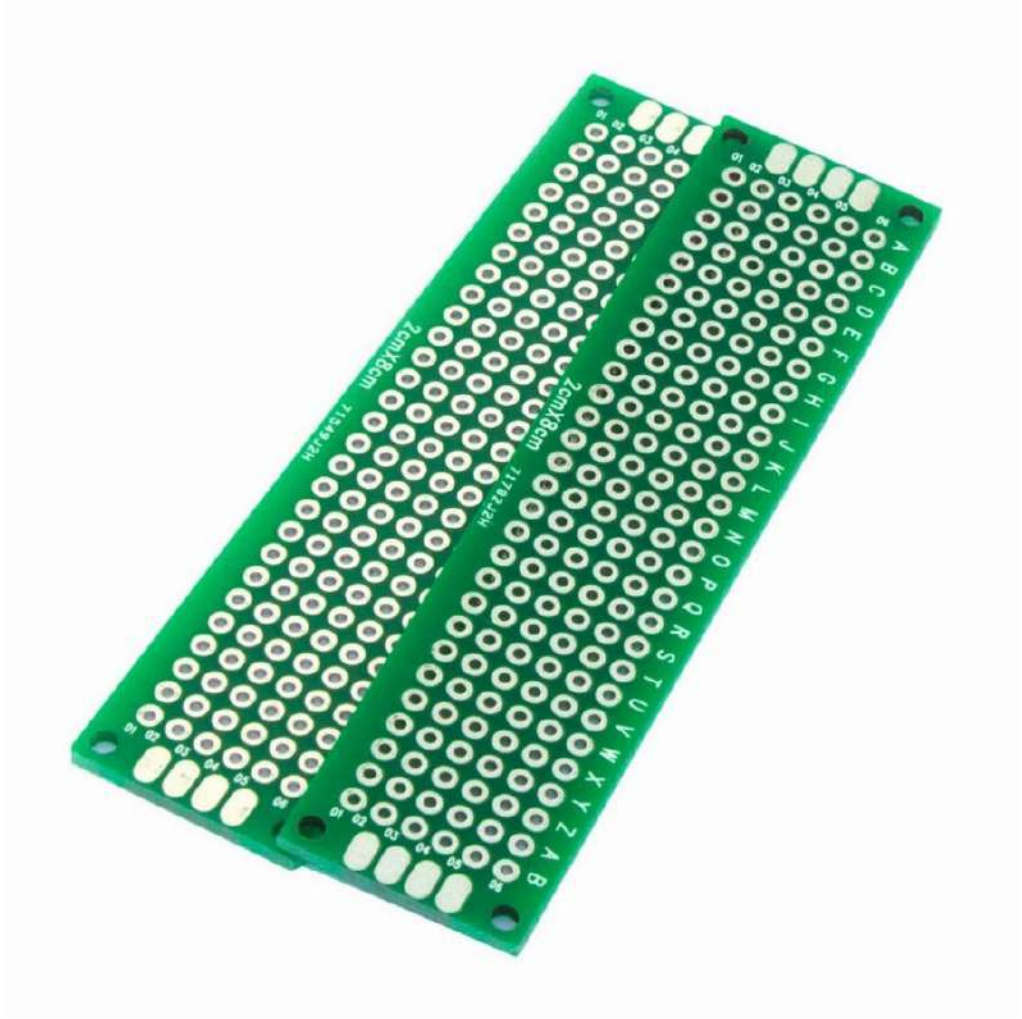
Solder Sucker

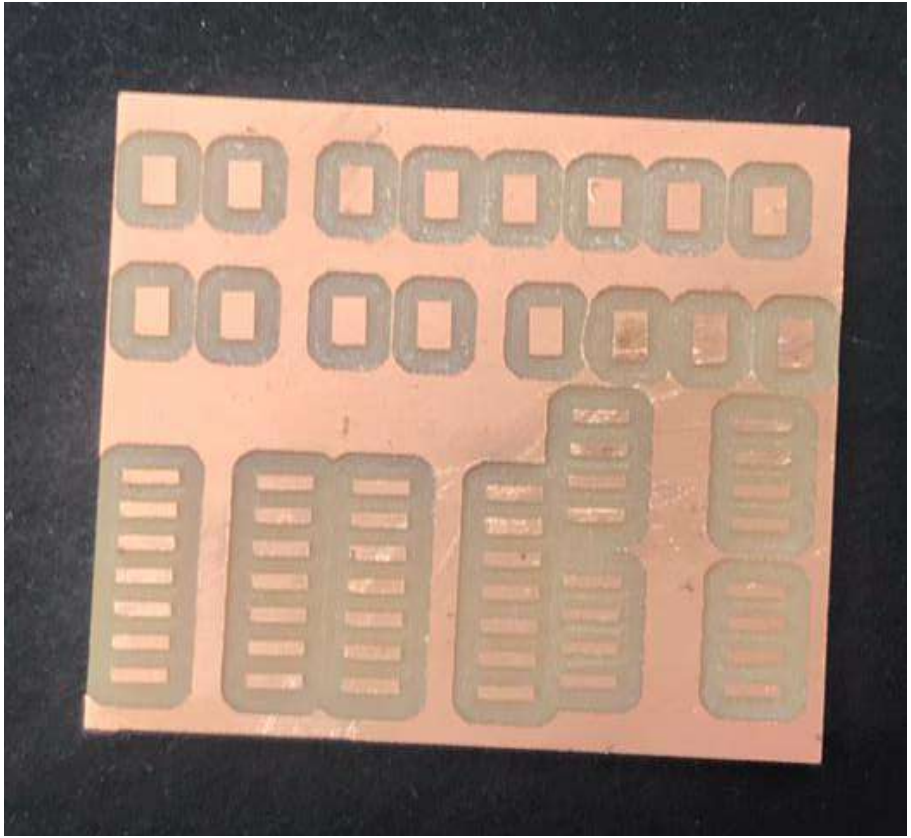
Great for desoldering.
Sucks the solder out from the joint

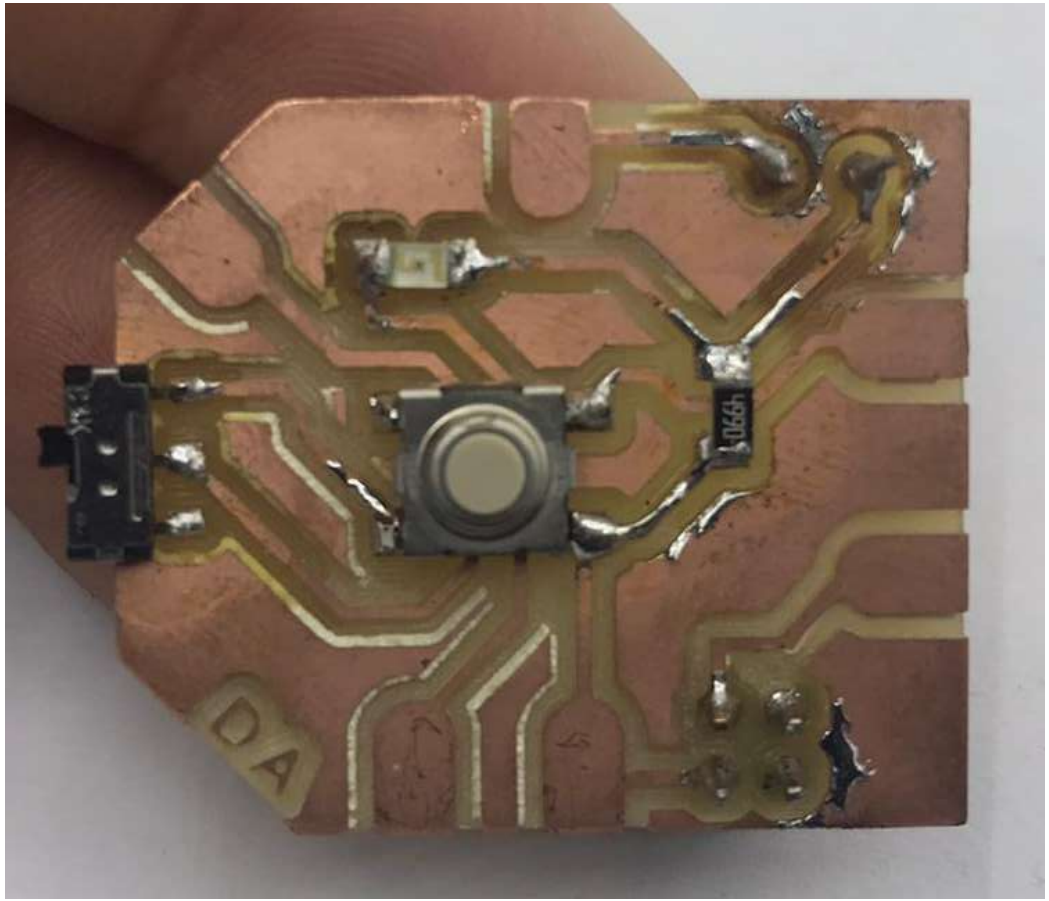
Solder wix

Great for desoldering. Absorbs the solder out from the joint

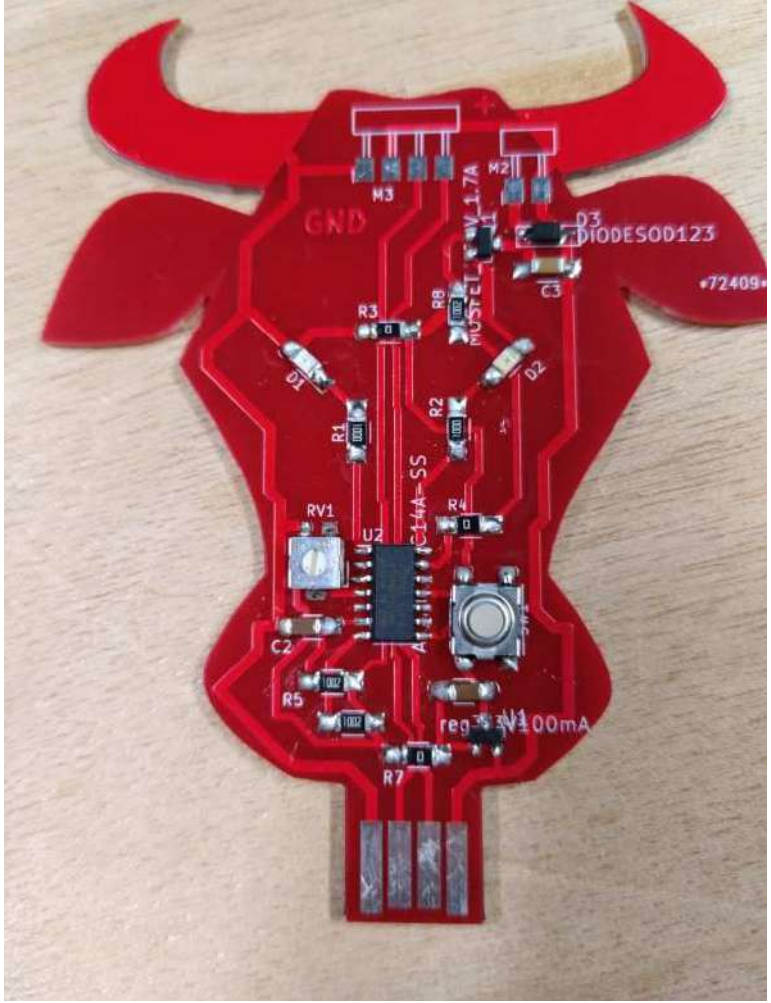
How to get better


2cmX8cm
2cmX8cm

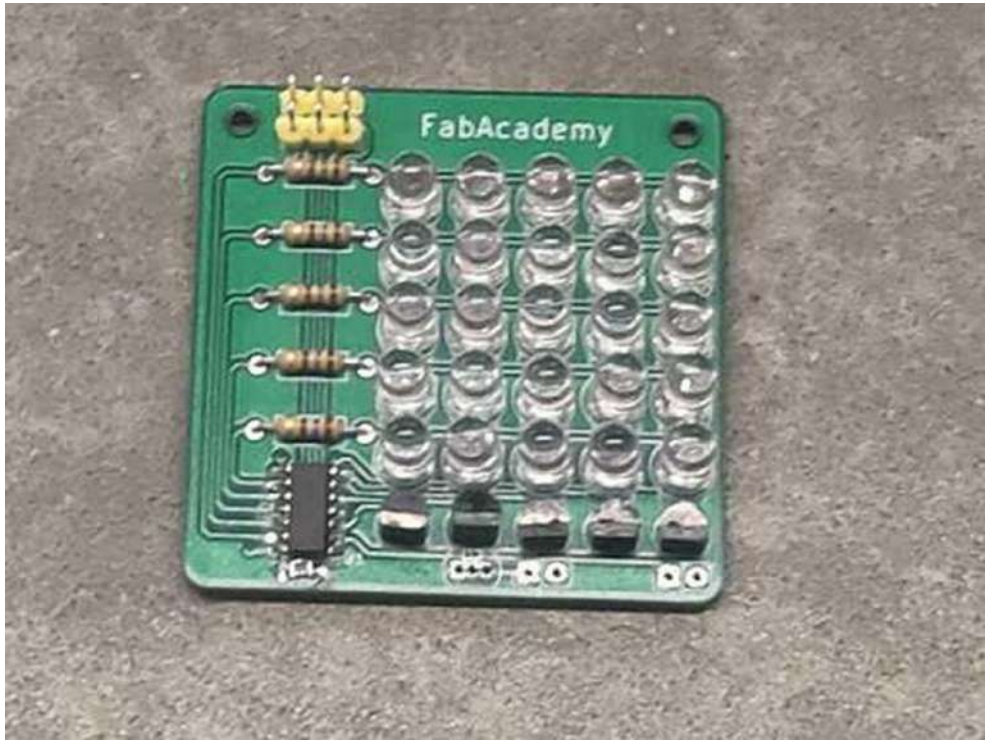



DA

By Luc Hanneuse:
https://gitlab.fabcloud.org/academany/fabacademy/2021/bootcamp/students-bootcamp/-/raw/master/AgriLab/Electronics-level0/board.jpg



By Luc Hanneuse:
https://fabacademy.org/2021/labs/agrilab/cowduino2022/



By Erwin Kooi
https://fabacademy.org/2021/labs/waag/students/kooi-erwin/course-2022/solder-exercise/