64D Short
- Total of 64 electrodes on 1 prong
- 25 µm vertical spacing
- 20 µm horizontal spacing
- Prong dimensions: $L \times w \times t = 3.5 \text{ mm} \times 85 \text{ µm} \times 23 \text{ µm}$
- Tip angle: 22°

64D Sharp
- Total of 64 electrodes on 1 prong
- 25 µm vertical spacing
- 20 µm horizontal spacing
- Prong dimensions: $L \times w \times t = 7 \text{ mm} \times 85 \text{ µm} \times 23 \text{ µm}$
- Tip angle: 22°

64E
- Total of 64 electrodes on 1 prong
- 50 µm vertical spacing
- 20 µm horizontal spacing
- Prong dimensions: $L \times w \times t = 7 \text{ mm} \times 85 \text{ µm} \times 23 \text{ µm}$
- Tip angle: 39°

64F
- Total of 64 electrodes on 2 prongs
- 25 µm vertical spacing
- 20 µm horizontal spacing
- Prong dimensions: $L \times w \times t = 7 \text{ mm} \times 65 \text{ µm} \times 23 \text{ µm}$
- Tip angle: 35°

All recording sites have dimensions 10 µm x 10 µm.
Total of 64 electrodes on 1 prong
25 µm vertical spacing
25 µm horizontal spacing
Prong dimensions:
$L \times w \times t = 8 \text{ mm} \times 90 \mu \text{m} \times 23 \mu \text{m}$
Tip angle: 38°

Total of 64 electrodes on 1 prong
25 µm vertical spacing
25 µm horizontal spacing
Prong dimensions:
$L \times w \times t = 10 \text{ mm} \times 90 \mu \text{m} \times 23 \mu \text{m}$
Tip angle: 38°

All recording sites have dimensions 10 µm x 10 µm.
64Jlft and 64Jrft

6.300 mm

Total of 64 electrodes on 1 prong
100 µm vertical spacing
Prong dimensions:
\[ L \times w \times t = 10 \text{ mm} \times 85 \mu\text{m} \times 23 \mu\text{m} \]
Tip angle: 39°

64Jlft

0.812 mm

64Jrft

1.188 mm

Prong dimensions:
\[ L \times w \times t = 10 \text{ mm} \times 85 \mu\text{m} \times 23 \mu\text{m} \]
Tip angle: 39°

64K

6.200 mm

Total of 64 electrodes on 2 prong
200 µm vertical spacing
Prong dimensions:
\[ L \times w \times t = 10 \text{ mm} \times 85 \mu\text{m} \times 23 \mu\text{m} \]
Tip angle: 39°

All recording sites have dimensions 10 µm x 10 µm.
Total of 128 electrodes on 2 prongs
25 µm vertical spacing
20 µm horizontal spacing
Prong dimensions:
$L \times w \times t = 7 \text{ mm} \times 86 \mu\text{m} \times 23 \mu\text{m}$
Tip angle: 39°

Total of 128 electrodes on 2 prongs
25 µm vertical spacing
20 µm horizontal spacing
Prong dimensions:
$L \times w \times t = 7 \text{ mm} \times 85 \mu\text{m} \times 23 \mu\text{m}$
Tip angle: 22°

All recording sites have dimensions 10 µm x 10 µm.
Total of 128 electrodes on 4 prongs
25 μm vertical spacing
20 μm horizontal spacing
Prong dimensions:
$L \times w \times t = 7 \text{ mm} \times 65 \text{ μm} \times 23 \text{ μm}$
Tip angle: 35°

All recording sites have dimensions 10 μm x 10 μm.
Total of 128 electrodes on 4 prongs
13.75 µm vertical spacing
22.5 µm horizontal spacing
Prong dimensions:
\[ L \times w \times t = 7 \text{ mm} \times 80 \mu\text{m} \times 23 \mu\text{m} \]
Tip angle: 62°

All recording sites have dimensions 10 µm x 10 µm.

Total of 128 electrodes on 4 prongs
15 µm vertical spacing
25 µm horizontal spacing
Prong dimensions:
\[ L \times w \times t = 6 \text{ mm} \times 85 \mu\text{m} \times 23 \mu\text{m} \]
Tip angle: 47°
128M

Total of 128 electrodes on 4 prongs
35 μm vertical spacing
20 μm horizontal spacing
Prong dimensions:
L x w x t = 7 mm x 65 μm x 23 μm
Tip angle: 35°

128P

Total of 128 electrodes on 2 prongs
25 μm vertical spacing
25 μm horizontal spacing
Prong dimensions:
L x w x t = 8 mm x 90 μm x 23 μm
Tip angle: 38°

All recording sites have dimensions 10 μm x 10 μm.
Total of 256 electrodes on 4 prongs
25 µm vertical spacing
20 µm horizontal spacing
Prong dimensions:
\( L \times w \times t = 6 \text{ mm} \times 86 \mu\text{m} \times 23 \mu\text{m} \)
Tip angle: 39°

All recording sites have dimensions 10 µm x 10 µm.
Assembly and packaging of UCLA silicon microprobes

64 channel package
(2 cm x 1 cm, 0.3 g)

128 channel package
(2.6 cm x 2.1 cm, 0.7 g)

256 channel package
(2.1 cm x 5.4 cm, 1.3 g)

► The Molex Slimstack connector is a 64-contact fine pitch connector (Molex # 5024306410).
► By default the connector is attached to the front side of the PCB (pictured above). However, if attaching an optical fiber there is an option to attach the connector to the back side to prevent blocking access to the fiber.
► By default the encapsulation epoxy is added to protect the bonded wires connecting the microprobe to the PCB. However, if attaching an optical fiber the epoxy should be added after fiber attachment.
► In terms of compatible hardware, Intan Technologies manufactures a head stage that directly plugs into our 64, 128, and 256 channel microprobe packages.
Wirebond pad dimensions

all 64 channel probes

all 128 channel probes

all 256 channel probes

Pad size: 169 μm x 61 μm
Pitch: 102 μm
How to encapsulate the wire bonds with epoxy

The wire bonds (inside the dashed red rectangle) are very fragile. They will break if touched, so they should be encapsulated with epoxy before the probe is used.
You will need:

1. Epoxy and plunger (Resinlab EP965 Black)

2. A small disposable weighing dish for mixing the epoxy

3. Wood applicator sticks for applying the epoxy

It is helpful to have a finer tip for the application, we break the sticks to get a pointed end. The EP965 epoxy is two parts that must be mixed together in a 1:1 ratio in order for it to cure properly. Mix it well, for a minute. Do not let it sit for more than 5 minutes before applying it. You want the epoxy to be less viscous, so it will drip off of the stick. The goal is to drop the epoxy onto the wire bonds and smear it over them without touching the wire bonds with the stick. NEVER touch the stick to the wire bonds, they WILL break. Cover the entire area of the wire bonds, being careful not to put epoxy too close to the connector as it will prevent the head stage from attaching. Cure overnight at room temperature (~16 hrs). It is NOT advisable to speed up curing time by increasing temperature because this will cause the epoxy to flow and cover a wider area than expected.
The edge of the epoxy should remain at least 1 mm from the edge of the connector, to prevent problems with plugging in the head stage.
Electroplating and cleaning the recording sites

Electroplating materials:
1. Non-cyanide gold solution (Sifco product # 80535500)
2. Platinum wire (WPI PTP201)
3. 128 ch electroplating system (Intan Technologies)
4. Probe holder and liquid well (machine shop & Thor Labs, pictured)

Suggested electroplating settings:
1. Connect the probe to the electroplating system as pictured.
2. Apply -2.2 to -2.5 V on the electrode in pulses of 1 to 5 s. Check impedance. Repeat until target impedance is reached. Recommended target impedance is 0.1 to 0.5 MΩ. Electrode is likely to be faulty if target impedance is not reached after 10 attempts.
3. Rinse probe in DI water.

Suggested cleaning procedure:
1. Immerse probe in undiluted Trypsin solution (Thermo Fisher # 15090046) for at least 20 min.
2. Rinse probe in DI water.
How to plug 2 Intan headstages into 256 channel silicon microprobes

1. Connectors on Top:

Channels: 128-256

Channels: 0-127

2. Connectors on Bottom:

Channels: 128-256

Channels: 0-127
Probe 32A

32 Ch PCB for freely moving animal recordings

Probe assembly with Omnetics Connector (# A79022-001)

mapping:
1 - IN32
2 - IN1
3 - IN31
4 - IN2
5 - IN30
6 - IN3
7 - IN29
8 - IN4
9 - IN28
10 - IN5
11 - IN27
12 - IN6
13 - IN26
14 - IN7
15 - IN25
16 - IN8
17 - IN24
18 - IN9
19 - IN23
20 - IN10
21 - IN22
22 - IN11
23 - IN21
24 - IN12
25 - IN20
26 - IN13
27 - IN19
28 - IN14
29 - IN18
30 - IN15
31 - IN17
32 - IN16
REF - REF
GND - GND

Electroplating adaptor

Omnetics to Slimstack Adaptor
(Omnetics # A79023-001 to Molex # 502430-6410)

Adaptor is compatible with Intan electroplating board (Part #C3180)