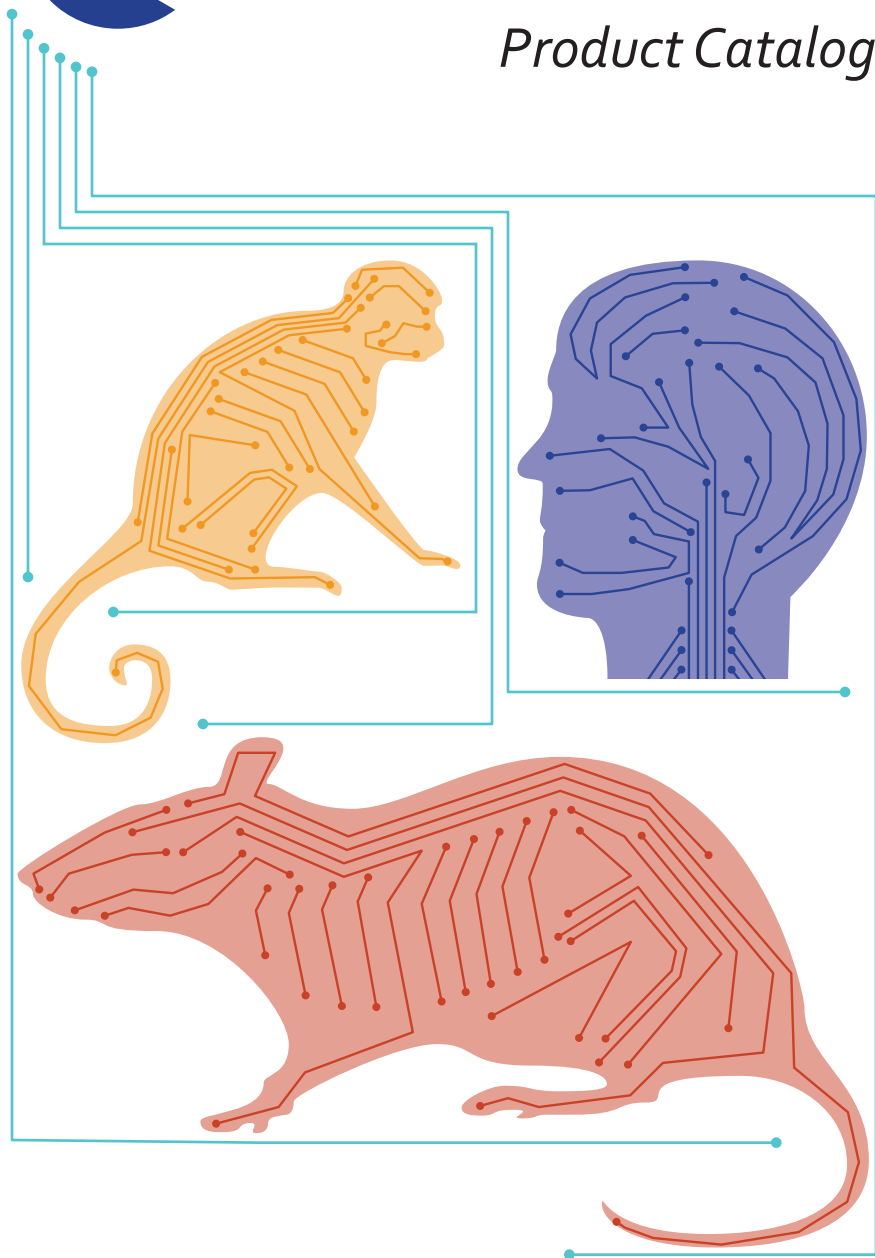




*Product Catalog*



# A Word from Qualia Labs

At Qualia Labs, we are focused on supplying softening neural interfaces for research applications. We have developed a series of devices fabricated on shape memory polymer (SMP) substrates. We use standard semiconductor fabrication processes that enable high quality repeatability in devices. Additionally, our SMP gives our devices the necessary mechanical stiffness for surgical handling but also softens after implantation by orders of magnitude to reduce tissue strain. This results in improved tissue response and device performance.






Qualia Labs' range of devices includes nerve cuffs, softening brain probes, blanket devices, epicortical arrays, intrafascicular probes, and spinal cord devices. We also offer the option to work with our research engineers to develop custom electrode designs suited to your particular research application.

We have worked with researchers across the US and world to develop our current designs, and we strive to continue tackling unmet needs in the research community. Thank you for your interest in our devices. We look forward to working together with you to advance the fields of neuroscience and bioelectronic medicine.



Qualia Labs, an affiliate of Qualia, Inc.

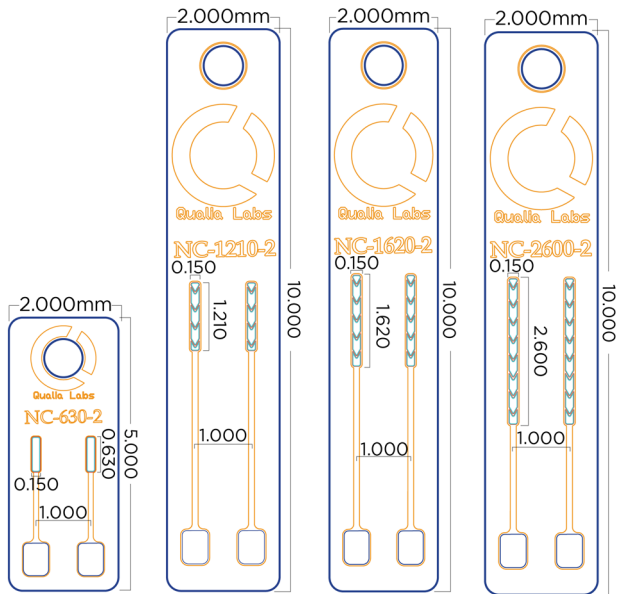
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## 2-Channel Nerve Cuffs

Qualia Labs has designed a new class of nerve cuffs on softening substrates for interfacing with various nerves. These research-grade cuffs are designed for reliable recording and/or stimulation for peripheral nerves in both acute and chronic applications. Our 2-channel nerve cuffs are available in multiple electrode lengths to accommodate a range of peripheral nerve sizes.



	NC-630-2	NC-1210-2	NC-1620-2	NC-2600-2
Device length	5.000 mm	10.000 mm	10.000 mm	10.000 mm
Device width	2.000 mm	2.000 mm	2.000 mm	2.000 mm
Device thickness	30 ± 5 µm	30 ± 5 µm	30 ± 5 µm	30 ± 5 µm
Electrode length	0.630 mm	1.210 mm	1.620 mm	2.600 mm
Electrode width	0.150 mm	0.150 mm	0.150 mm	0.150 mm
Electrode area	0.095 mm <sup>2</sup>	0.182 mm <sup>2</sup>	0.243 mm <sup>2</sup>	0.390 mm <sup>2</sup>
Electrode sites	2	2	2	2
Electrode spacing	1.000 mm	1.000 mm	1.000 mm	1.000 mm
Standard electrode material*	TiN	TiN	TiN	TiN
Connector options	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics

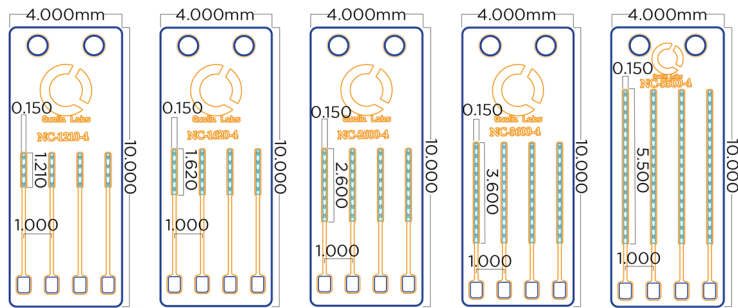
\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF





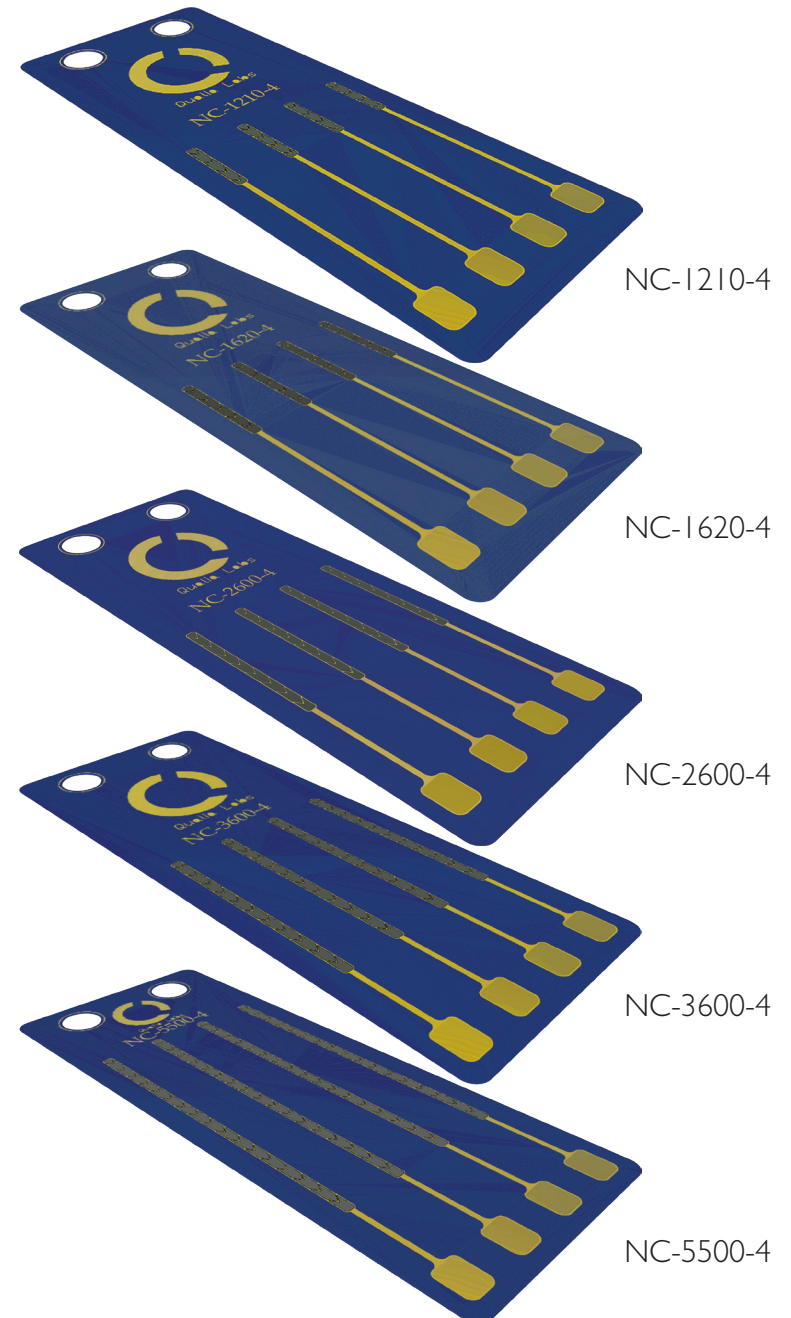
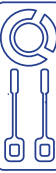
## 4-Channel Nerve Cuffs

Qualia Labs also produces a series of 4-channel nerve cuffs on softening substrates. Electrode lengths on these cuffs range from 1.21-5.50 mm to accommodate larger peripheral nerves. These research-grade cuffs are designed for reliable recording and/or stimulation in both acute and chronic applications.



	NC-1210-4	NC-1620-4	NC-2600-4	NC-3600-4	NC-5500-4
Device length	10,000 mm	10,000 mm	10,000 mm	10,000 mm	10,000 mm
Device width	4,000 mm	4,000 mm	4,000 mm	4,000 mm	4,000 mm
Device thickness	30 ± 5 µm	30 ± 5 µm	30 ± 5 µm	30 ± 5 µm	30 ± 5 µm
Electrode length	1.210 mm	1.620 mm	2.600 mm	3.600 mm	5.500 mm
Electrode width	0.150 mm	0.150 mm	0.150 mm	0.150 mm	0.150 mm
Electrode area	0.182 mm²	0.243 mm²	0.390 mm²	0.540 mm²	0.825 mm²
Electrode sites	4	4	4	4	4
Electrode spacing	1,000 mm	1,000 mm	1,000 mm	1,000 mm	1,000 mm
Standard electrode material*	TiN	TiN	TiN	TiN	TiN
Connector options	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics

\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF

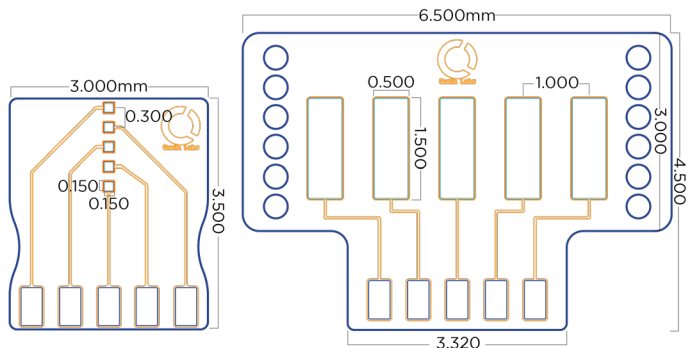






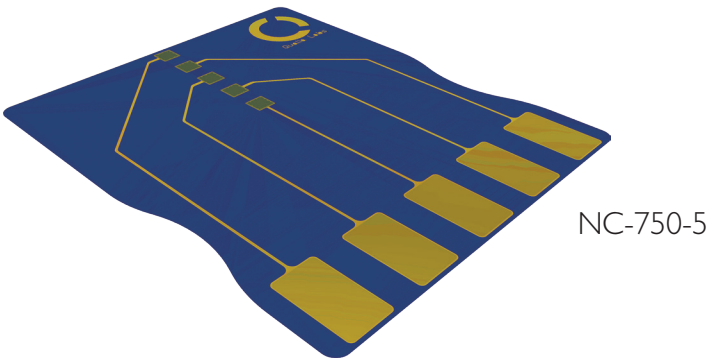
# 5-Channel Nerve Cuffs

We offer two different styles of five-channel nerve cuffs on our softening substrates for recording, stimulation, and/or blocking in peripheral nerves. Our NC-750-5 design offers smaller square electrodes and is available with optional suture holes.

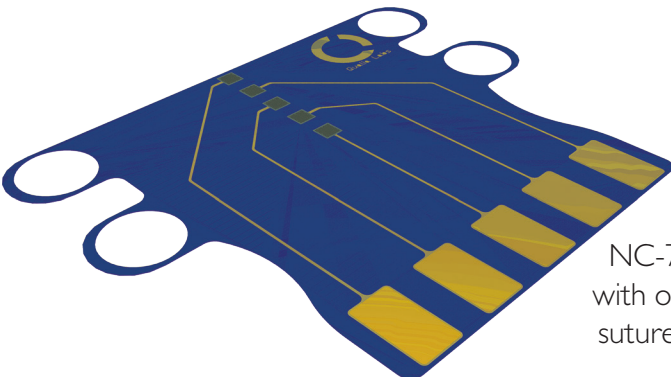


	NC-750-5	NC-2250-5
Device length	3.500 mm	4.500 mm
Device width	3.000 mm	6.500 mm
Device thickness	30 ± 5 µm	30 ± 5 µm
Electrode length	0.150 mm	1.500 mm
Electrode width	0.150 mm	0.500 mm
Electrode area	0.023 mm²	0.750 mm²
Electrode sites	5	5
Electrode spacing	0.300 mm	1.000 mm
Standard electrode material*	TiN	TiN
Connector options	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics

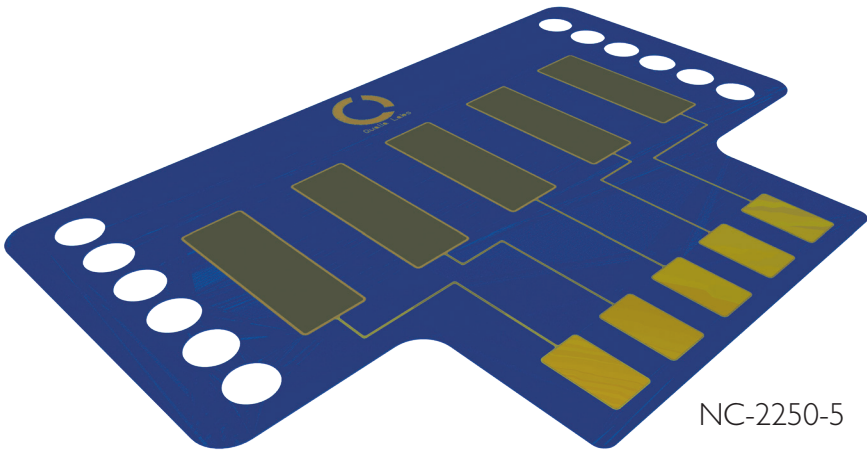
\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF



NC-750-5



NC-750-5 with optional suture holes

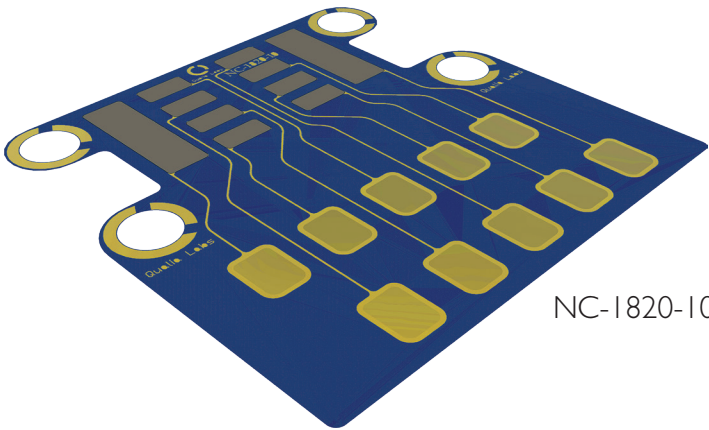


NC-2250-5

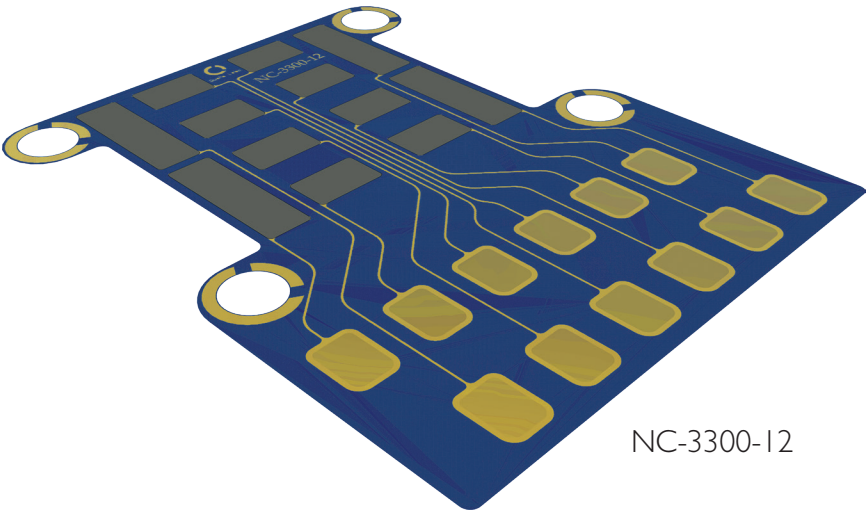


# 10- and 12-Channel Nerve Cuffs

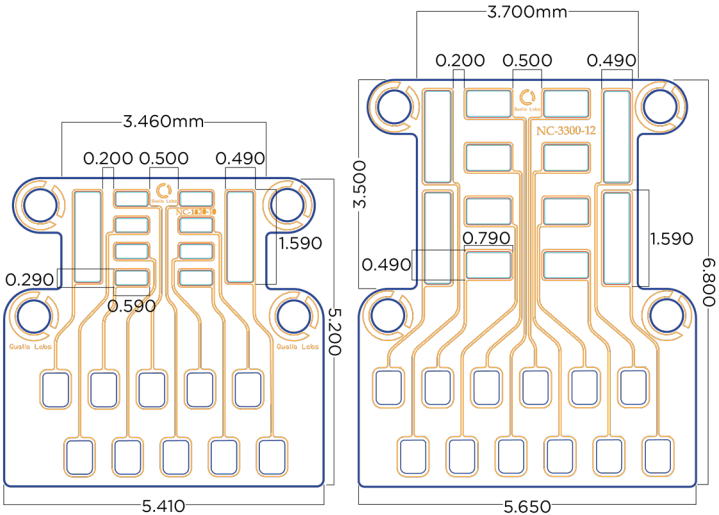
For researchers interested in higher channel count cuffs, we offer our NC-1820-10 and NC-3300-12. These cuffs are designed with two or four larger electrodes on each end of the cuff and eight smaller electrodes in between the larger electrodes.



NC-1820-10



NC-3300-12



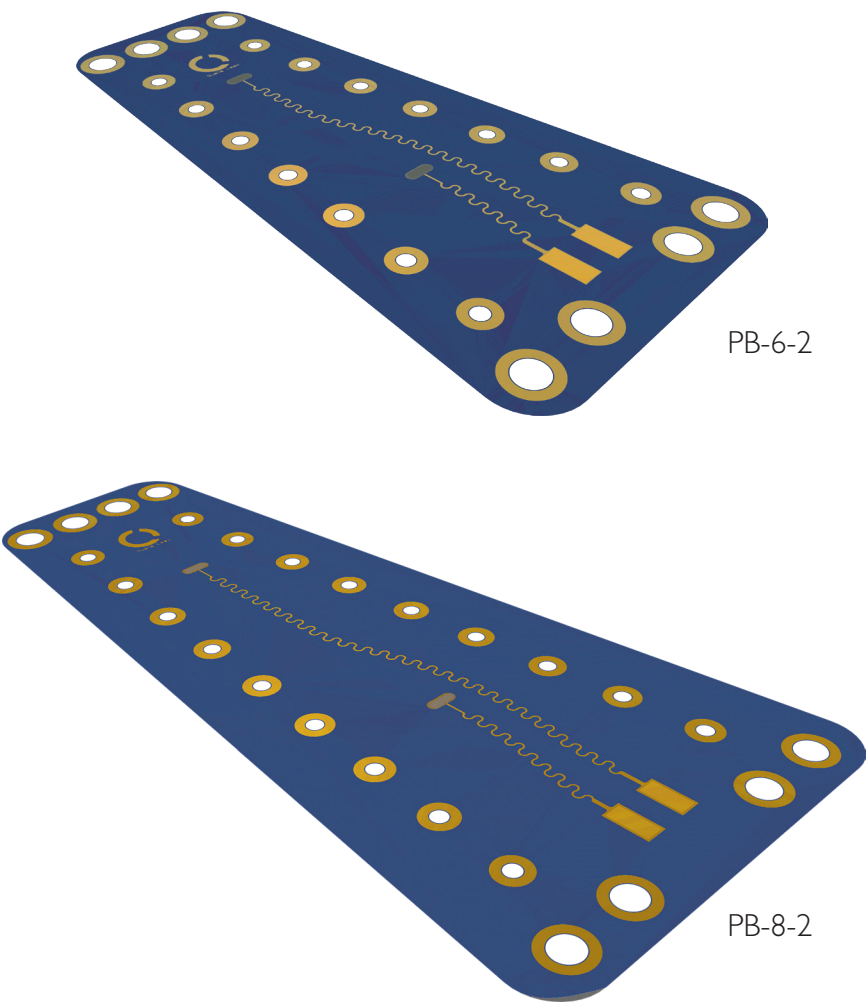
	NC-1820-10	NC-3300-12
Device length	5.200 mm	6.800 mm
Device width	5.410 mm	5.670 mm
Device thickness	30 ± 5 µm	30 ± 5 µm
Large electrode size	1.590 x 0.490 mm	1.590 x 0.490 mm
Large electrode area	0.777 mm <sup>2</sup>	0.777 mm <sup>2</sup>
Small electrode size	0.590 x 0.290 mm	0.790 x 0.490 mm
Small electrode area	0.171 mm <sup>2</sup>	0.387 mm <sup>2</sup>
Electrode sites	10	12
Electrode spacing	0.500, 0.200 mm	0.200, 0.500 mm
Standard electrode material*	TiN	TiN
Connector options	Bare wires, Plastics One, Omnetics	Bare wires, Plastics One, Omnetics

\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF



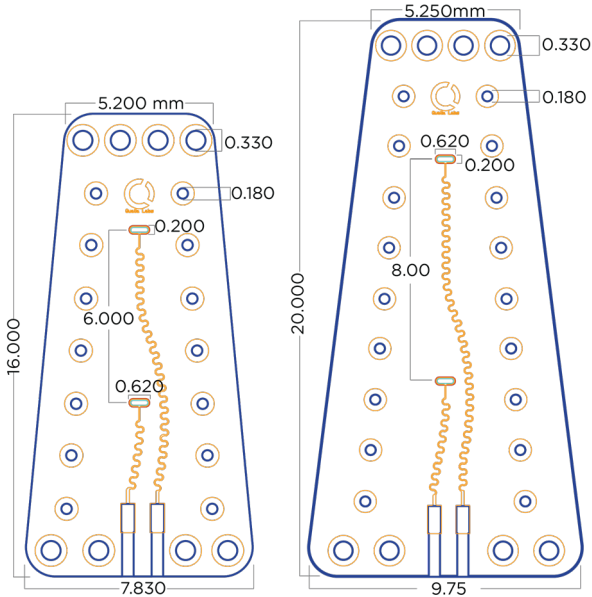
# Blankets

Qualia Labs has designed a new class of patch devices on softening substrates for reliable recording and/or stimulation of various organs in both acute and chronic applications. Two different sizes offer a choice in distance between electrodes to accommodate various nerve plexi.



PB-6-2

PB-8-2

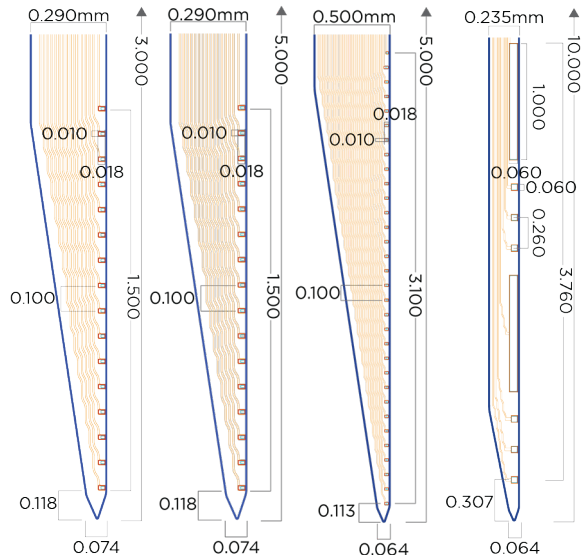
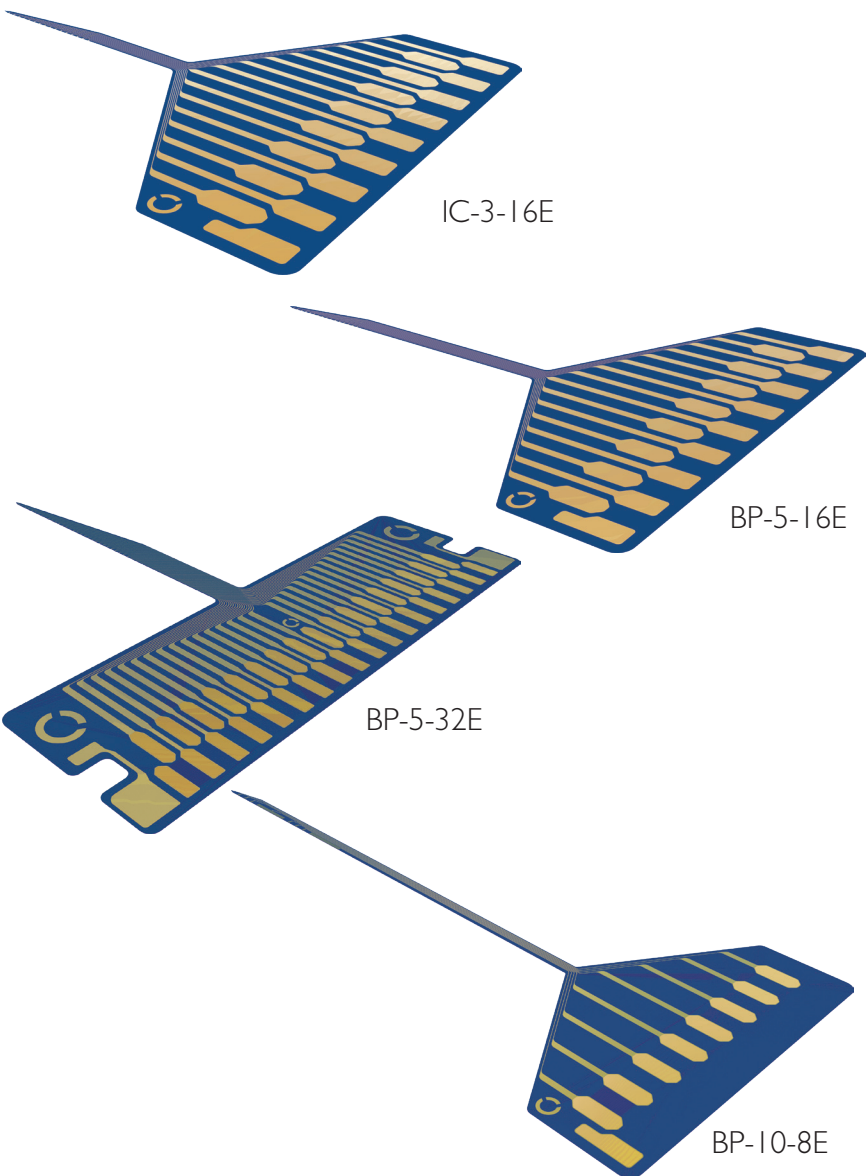


	PB-6-2	PB-8-2
Device length	16.000 mm	20.000 mm
Device width (narrow-wide)	5.200 - 7.830 mm	5.250 - 9.750 mm
Device thickness	30 ± 5 µm	30 ± 5 µm
Electrode length	0.200 mm	0.200 mm
Electrode width	0.620 mm	0.620 mm
Electrode area	0.117 mm²	0.117 mm²
Electrode sites	2	2
Electrode spacing	6.000 mm	8.000 mm
Standard electrode material*	TiN	TiN
Connector options	Bare wires	Bare wires

\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF

# Single-Shank Probes

Qualia Labs has designed a class of softening brain probes for reliable recording and/or stimulation in both acute and chronic applications. Our single shank probes are available with 8, 16, or 32 electrodes on 3-10 mm long shanks.



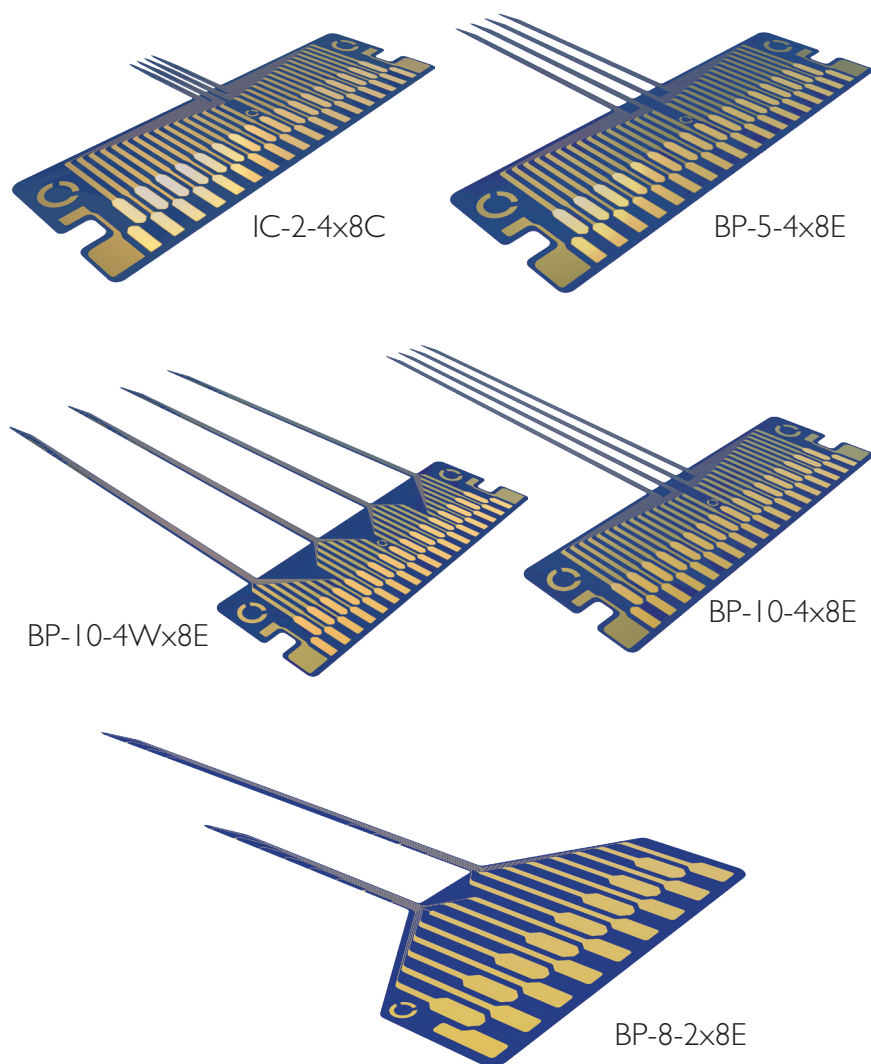
	IC-3-16E	BP-5-16E	BP-5-32E	BP-10-8E
Shank length	3.000 mm	5.000 mm	5.000 mm	10.000 mm
Shank width	0.290 mm	0.290 mm	0.500 mm	0.235 mm
Electrode pitch	0.100 mm	0.100 mm	0.100 mm	0.260 mm
Electrode size	18 x 10 $\mu$ m	18 x 10 $\mu$ m	18 x 10 $\mu$ m	60 x 60 $\mu$ m 1000 x 75 $\mu$ m
Electrode area	180 $\mu$ m <sup>2</sup>	180 $\mu$ m <sup>2</sup>	180 $\mu$ m <sup>2</sup>	360 $\mu$ m <sup>2</sup> 7500 $\mu$ m <sup>2</sup>
Electrode span	1.500 mm	1.500 mm	3.100 mm	3.760 mm
Shank tip width	0.074 mm	0.074 mm	0.064 mm	0.064 mm
First electrode distance from tip	0.118 mm	0.118 mm	0.113 mm	0.307 mm
Thickness	45 $\pm$ 5 $\mu$ m	45 $\pm$ 5 $\mu$ m	35 $\pm$ 5 $\mu$ m	50 $\pm$ 5 $\mu$ m
Standard electrode material*	SIROF	SIROF	SIROF	SIROF
Connector	Omnetics	Omnetics	Omnetics	Omnetics

\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF

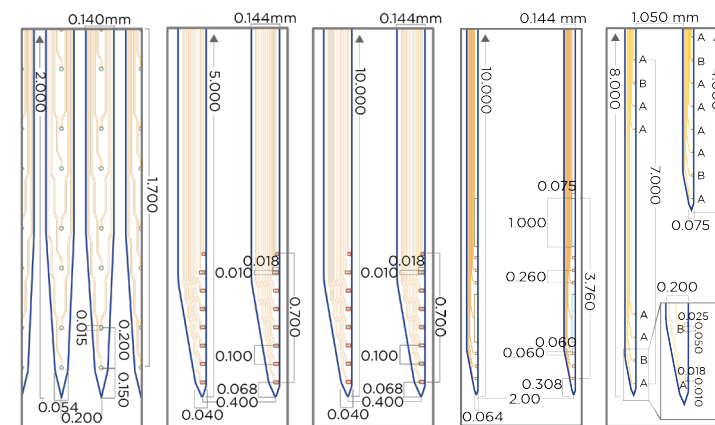


## Multi-Shank Probes

Our multi-shank softening brain probes have 4 to 8 electrodes on each of four shanks. Shank lengths range from 2-10 mm, with longer shanks offering improved compatibility with histology.



## Undergoing Testing

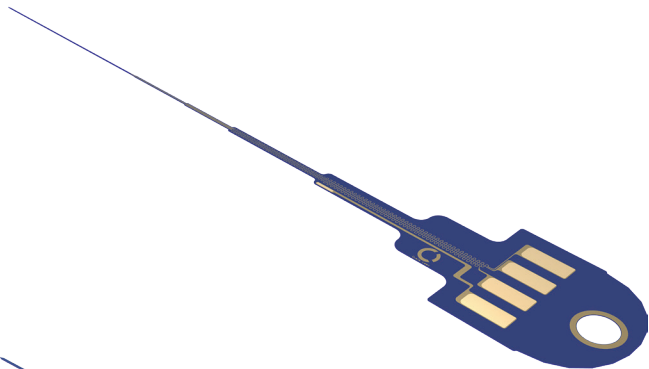


	IC-2-4x8C	BP-5-4x8E	BP-10-4x8E	BP-10-4Wx8E	BP-8-2x8E
Shank length	2.000 mm	5.000 mm	10.000 mm	10.000 mm	8.000 mm 4.000 mm
Shank width	0.140 mm	0.144 mm	0.144 mm	0.235 mm	0.200 mm
Shank spacing	0.200 mm	0.400 mm	0.400 mm	2.000 mm	1.050 mm
Electrode pitch	0.200 mm	0.100 mm	0.100 mm	0.260 mm	0.500 mm 4.000 mm
Electrode size	15 $\mu$ m diameter	18 x 10 $\mu$ m	18 x 10 $\mu$ m	60 x 60 $\mu$ m 1000 x 75 $\mu$ m	18 x 10 $\mu$ m 25 x 50 $\mu$ m
Electrode area	177 $\mu$ m <sup>2</sup>	180 $\mu$ m <sup>2</sup>	180 $\mu$ m <sup>2</sup>	360 $\mu$ m <sup>2</sup> 7500 $\mu$ m <sup>2</sup>	180 $\mu$ m <sup>2</sup> 1250 $\mu$ m <sup>2</sup>
Electrode span	1.700 mm	0.700 mm	0.700 mm	3.760 mm	7.000 mm 3.500 mm
Shank tip width	0.054 mm	0.040 mm	0.040 mm	0.064 mm	0.075 mm
First electrode distance from tip	0.150 mm	0.068 mm	0.068 mm	0.308 mm	0.800 mm 0.307 mm
Thickness	35 $\pm$ 5 $\mu$ m	35 $\pm$ 5 $\mu$ m	35 $\pm$ 5 $\mu$ m	50 $\pm$ 5 $\mu$ m	50 $\pm$ 5 $\mu$ m
Standard electrode material*	SIROF	SIROF	SIROF	SIROF	SIROF
Connector	Omnetics	Omnetics	Omnetics	Omnetics	Omnetics

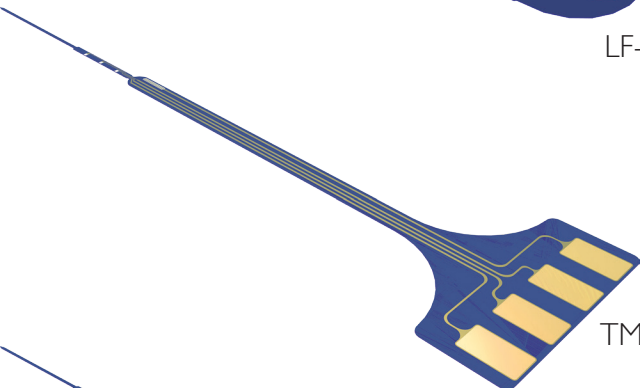
\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF

# Intrafascicular Devices

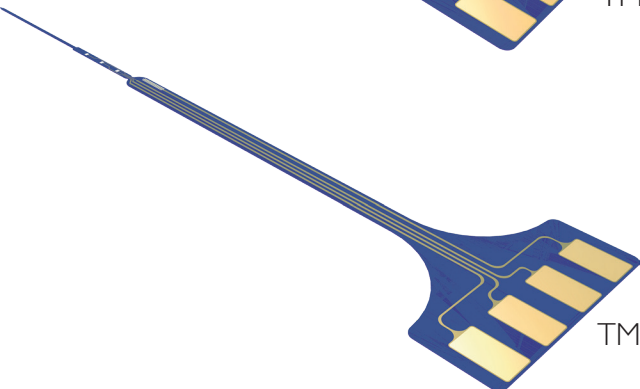
Qualia Labs has developed a host of intrafascicular probes to reliably record and/or stimulate from larger peripheral multifascicular nerves. Designs include both longitudinal and transverse intrafascicular probes with one ground electrode and 3 electrodes positioned along the center or edge of the device.



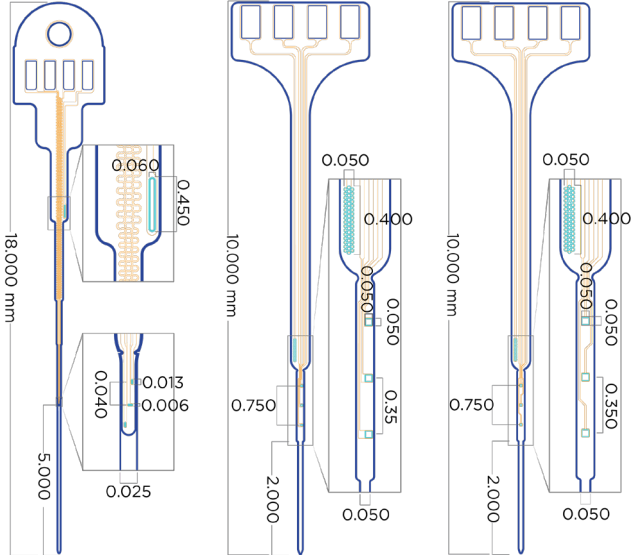
LF-13-3C



TM-50-3E



TM-50-3C



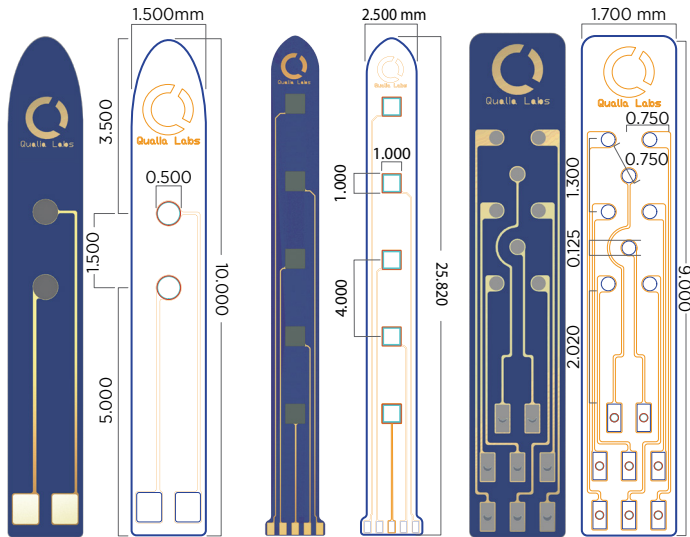
	LF-13-3C	TM-50-3E	TM-50-3C
Device length	18.000 mm	10.000 mm	10.000 mm
Needle size	0.025 x 5.000 mm	0.050 x 2.000 mm	0.050 x 2.000 mm
Electrode sites	1 ground electrode 3 electrodes	1 ground electrode 3 electrodes	1 ground electrode 3 electrodes
Ground electrode size	0.060 x 0.450 mm	0.050 x 0.400 mm	0.005 mm x 0.400 mm
Ground electrode area	0.027 mm <sup>2</sup>	0.200 mm <sup>2</sup>	0.200 mm <sup>2</sup>
Electrode size	13 x 6 μm	50 x 50 μm	50 x 50 μm
Electrode area	78 μm <sup>2</sup>	2500 μm <sup>2</sup>	2500 μm <sup>2</sup>
Electrode pitch	0.040 mm	0.350 mm	0.350 mm
Electrode span	0.086 mm	0.750 mm	0.750 mm
Thickness	25 ± 5 μm	25 ± 5 μm	25 ± 5 μm
Standard electrode material*	SIROF	SIROF	SIROF
Connector	Bare Wires/ Plastics One/Omnetics	Bare Wires/ Plastics One/Omnetics	Bare Wires/ Plastics One/Omnetics

\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF



# Spinal Cord Devices

We have worked with collaborators to develop a host of spinal cord stimulators, including the SS-500-2, SS-1000-5, and SS-1250-8 devices.

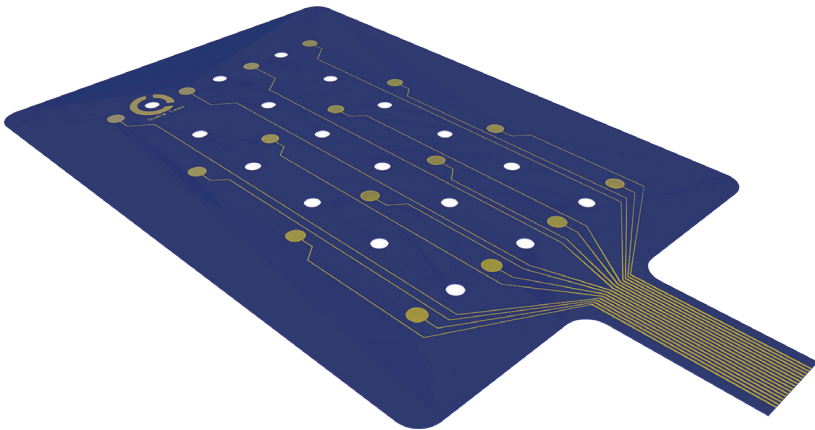


	SS-500-2	SS-1000-5	SS-1250-8
Device length	10.00 mm	25.820 mm	25.820 mm
Device width	1.500 mm	2.500 mm	2.500 mm
Device thickness	50 ± 5 μm	100 ± 5 μm	50 ± 5 μm
Electrode size	0.500 mm diameter	1.000 mm x 1.000 mm	0.125 mm diameter
Electrode area	0.196 mm <sup>2</sup>	1.000 mm <sup>2</sup>	0.012 mm <sup>2</sup>
Electrode sites	2	5	8
Electrode spacing	1.500 mm	4.000 mm	0.750 mm
Standard electrode material*	Pt	Pt	Pt
Connector options	Bare Wires	Bare wires, Plastics One, Omnetics	Bare Wires, Plastics One, Omnetics

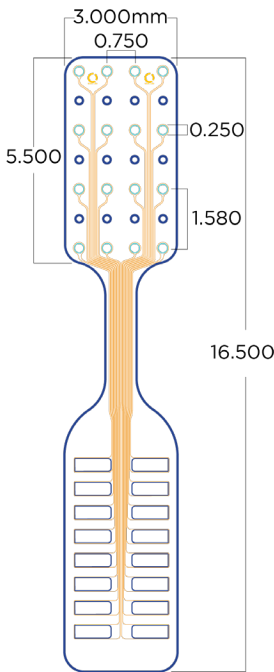
\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF

# Epicortical Arrays

Qualia Labs has developed a variety of epicortical arrays. The EC-250-16 is designed with 16 electrodes to record neural signals from a 3 mm x 5.50 mm area of the brain.



	EC-250-16
Device length	16.500 mm
Device width	3.000 mm
Device thickness	50 ± 5 μm
Electrode diameter	0.250 mm
Electrode area	0.049 mm <sup>2</sup>
Electrode span	3.000 x 5.500 mm
Electrode sites	16
Electrode spacing	0.750, 1.580 mm
Standard electrode material*	TiN
Connector options	Omnetics



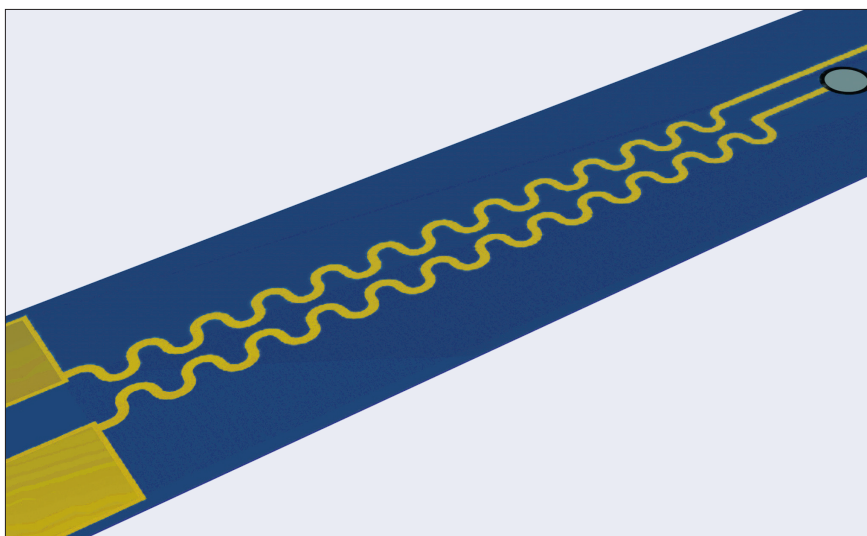
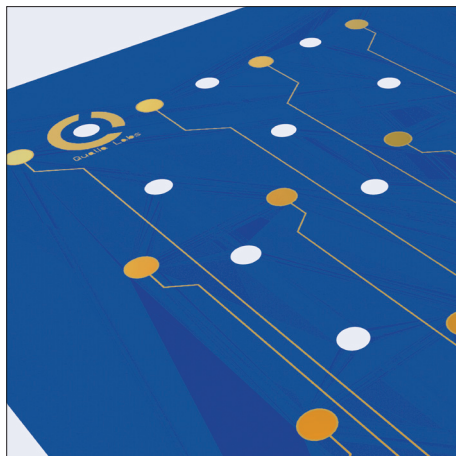
\*All device electrodes can be custom-made using TiN, Au, Pt, or SIROF

## A Glimpse of the Future

Bioelectronic medicines are poised to change the way we do healthcare. Taking drugs is like giving someone a fish: they can eat for a day. Training their nervous system with implantable bioelectronics is like teaching someone to fish: they can eat for a lifetime.

Qualia Labs promotes a return to a high quality of life via targeted neural therapies. We are trying to teach the body how to re-regulate biological processes, innervate end organs, and move information across the body to improve health.

Qualia Labs and its suite of research tools are helping neuroscientists and leading companies unlock the power and potential of the body's nervous system to change how we live.



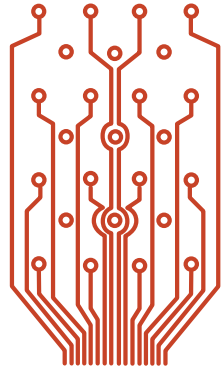
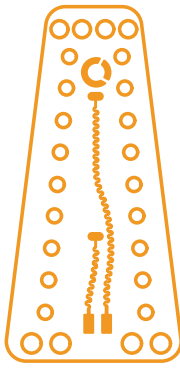
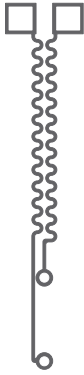
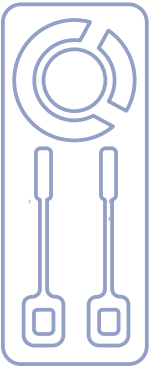
## About Our Technology



Electronics, sensors, and neural interfaces have traditionally been fabricated on rigid and planar substrates including silicon and engineering thermoplastics. Numerous benefits exist for planar electronics processing methods, which enable the production of robust, repeatable high quality components at low cost. However, this processing paradigm is inherently two dimensional and rigid, and many applications call for electronics, interfaces, sensors, and sensing systems that are both soft and 3D. Soft, flexible electronic microdevices are typically composed of insulating, conducting, and semiconducting materials, fabricated in layer thicknesses of 2 nm to 2  $\mu\text{m}$  on polymer substrates 1  $\mu\text{m}$  to 50  $\mu\text{m}$  thick.

Qualia Labs' design paradigm builds upon a fundamental understanding of the mechanisms underlying interfacial failure in thermosetting, low polymerization stress, strain-tolerant flexible electronics. We will continue to investigate penetrating, wrapping, and hugging neural devices based on softening substrates and high electrochemical surface area electrodes fabricated through full photolithography. Our SMP substrates are particularly appealing due to their orders-of-magnitude softening upon insertion into the body, ability to withstand solvents and high temperatures involved in photolithography, and chemical tunability through polymer synthesis.

Qualia Labs was started in 2017 to focus on the commercialization of these softening neural devices for nonclinical applications and to further enable research that will advance the field of bioelectronics. Parent company Qualia, Inc. was founded in 2015 and continues to pursue implantable medical applications of these softening, reliably-processed, thin film devices and to expand this work into multiple disease fronts.



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