◁ Description

■ The Model 0550 Series of Interdigitated Microsensor Electrodes (IMEs) are inert, array microelectrodes designed for the simultaneous interrogation of the electrical, electrochemical and optical properties of thin polymeric films and coatings.

■ Microfabricated from magnetron sputtered gold or platinum or ITO on an insulating ceramic substrate, these devices have 5 µm line and space dimensions and occur in three configurations; Monolith (M), Combined Differential (CD), and Full Differential (FD). IMEs may be ordered as packaged (outfitted with an electrode body, attached leadwires and encapsulated) or as un-packaged devices.

The 0550-M is a single pair of electrodes on a chip. The 0550-CD provides a differential interrogation format in which a single, common electrode services two distinct parts of the same device. The 0550-FD provides two separate devices on the same chip. Both designs permit a lower analyte specific interdigit area and an upper analytical reference interdigit area. These devices therefore serve as useful starting points for the fabrication of chemical and biological sensors.

◁ Applications

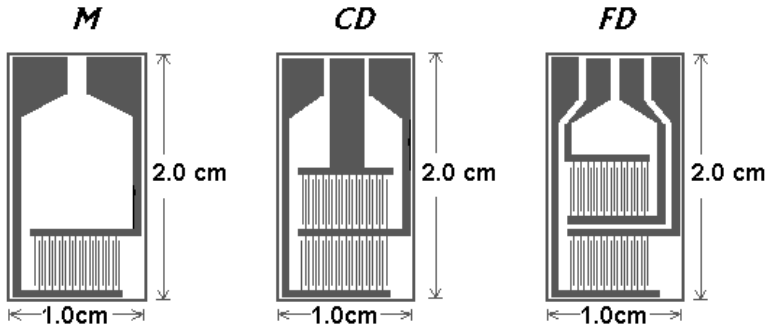
■ Applications in research and development include:

- ➢Chemical sensors and biosensors based on electroactive polymers as with EPSIS™.
- ➢Electrochemical Impedance Spectroscopy (EIS) of organic thin films and coatings.
- ➢Capacitance probes; e.g. of Langmuir-Blodgett films during deposition.
- ➢Dielectric spectroscopy of insulating films and coatings during cure, degradation, or environmental exposure.
- ➢Modern microelectrochemistry.

■ Films may be applied to IME devices by dip coating, spin casting, spray painting, brush painting, or by electropolymerization.

◁ General Ordering Information

IME 0550.5-M-Au or Pt or ITO
IME 0550.5-CD-Au or Pt or ITO
IME 0550.5-FD-Au or Pt or ITO



IME 0550 SERIES	GOLD	PLATINUM	ITO
Monolithic-un-packaged	IME 0550.5-M-Au-U	IME 0550.5-M-Pt-U	IME 0550.5-M-ITO-U
Monolithic-packaged	IME 0550.5-M-Au-P	IME 0550.5-M-Pt-P	IME 0550.5-M-ITO-P
Combined Differential-un-packaged	IME 0550.5-CD-Au-U	IME 0550.5-CD-Pt-U	IME 0550.5-CD-ITO-U
Combined Differential-packaged	IME 0550.5-CD-Au-P	IME 0550.5-CD-Pt-P	IME 0550.5-CD-ITO-P
Full Differential-un-packaged	IME 0550.5-FD-Au-U	IME 0550.5-FD-Pt-U	IME 0550.5-FD-ITO-U
Full Differential-packaged	IME 0550.5-FD-Au-P	IME 0550.5-FD-Pt-P	IME 0550.5-FD-ITO-P

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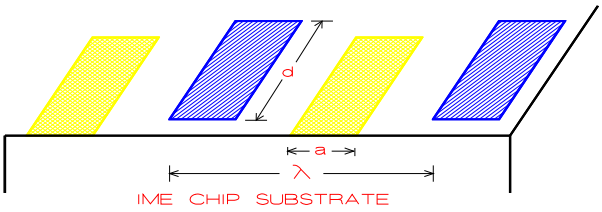


◁ Technical Specifications

■ **Materials of Construction**

Substrate:	Schott D263 Borosilicate Glass	
	Dielectric Constant, ε_r, at 1 MHz	6.7
	Dielectric Loss Angle, tan δ, at 1 MHz	61 x 10^{-4}
	Electrical Resistivity (50 Hz) (250°C)	1.6 x 10^{8} Ω cm
	Coefficient of Linear Thermal Expansion, $\alpha_{20\text{-}300}$,	7.2 x 10^{-6} K^{-1}
	Refractive Index at 20°C, n_e (λ = 546.1 nm)	1.5249
Metallization:	100 Å Ti / 1000 Å Au or Pt	
*Electrode Body:	Delrin	
*Encapsulant:	Epoxy header. Silicon Nitride packaged chip.	
*Leadwires:	Color coded, 30AWG stranded copper, shielded, and PVC jacketed.	

■ **Physical Dimensions & Constants**

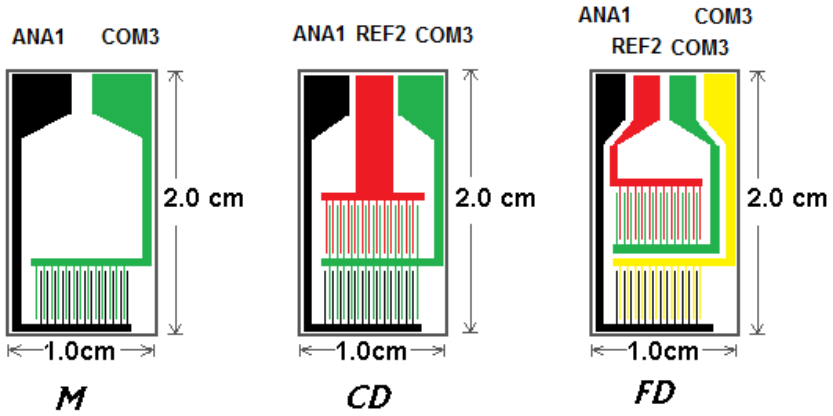
	0550-M	**0550-CD**	**0550-FD**
IME Chip Dimensions (*l* x *w* x *t*)			
Un-packaged Die (cm)	2.00 x 1.00 x 0.05	2.00 x 1.00 x 0.05	2.00 x 1.00 x 0.05
Packaged Electrode* (cm)	12.3 x 1.38 x 0.7	12.8 x 1.38 x 0.7	13.2 x 1.38 x 0.7
No. of Digits per Electrode Bus	50	50	50
No. of Spaces per Electrode Bus	49	49	49
Digits Pairs, N, per Electrode	50	50	50
Digit Length, d, (μm):	4,995	4,995	4,995
Digit Width, a, (μm):	5	5	5
Interdigit Space, a, (μm):	5	5	5
Spatial Periodicity, λ, (μm):	20	20	20
Zaretsky[1,2] Meander Length, M:	24.93 cm	24.93 cm	24.93 cm
Center Line or Serpentine Length:	49.45 cm	49.45 cm	49.45 cm
Cell Constant[3] (cm^{-1}):	0.040	0.040	0.040
Electrode Areas (cm^2)			
Analyte Specific ANA1 (Black):	0.0125	0.0125	0.0125
Common COM3 (Yellow):	- N/A -	- N/A -	0.0125
Common COM3 (Green):	0.0125	0.0250	0.0125
Analytical Reference REF2 (Red):	- N/A -	0.0125	0.0125
ELECTROACTIVE METAL EXPOSED:	**0.0250**	**0.0500**	**0.0500**

◁ References and Notes

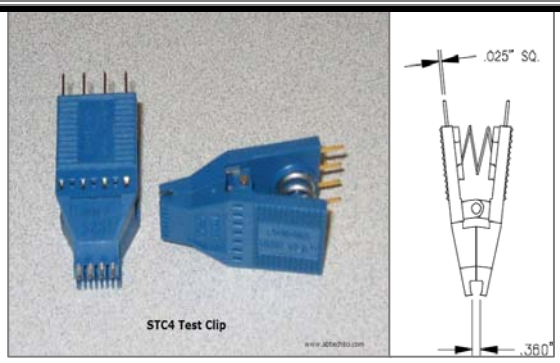
1. Zaretsky, M. C.; Mouyad, L.; Melcher, J. R. "Continuum properties from interdigitated electrode dielectrometry" *IEEE Trans. Electr. Insul.* **1988**, *23*, 897.
2. The Zaretsky convention defines; M = N•d
3. Sheppard, N. F.; Tucker, R. C.; Wu, C. "Electrical Conductivity Measurements Using Microfabricated Interdigitated Electrodes" *Anal. Chem.* **1993**, *65*, 1199.
4. Anthony Guiseppi-Elie, Matthew Lesho and Norman F. Sheppard, Jr. "Electrical Impedance Properties of Chemically Responsive Hydrogels" **In** *Electrical and Optical Polymer Systems: Fundamentals, Methods, and Applications*, D. L. Wise, G. E. Wnek, D. J. Trantolo, J. D. Gresser, and T. M. Cooper, Eds.; Marcel Dekker, New York, **1998. Chapter 34**, pp. 1187-1211.
5. Liju Yang and Anthony Guiseppi-Elie "Impedimetric Biosensors for Nano and Microfluidics" **In** Encyclopedia of Microfluidics and Nanofluidics, (**2008**) Ed. Dongqing Li, Springer-Verlag GmbH Berlin Heidelberg. **Vol 2**, pp 811-823. ISBN: 978-0-387-32468-5.

6. Louise Lingerfelt, James Karlinsey, James Landers and Anthony Guiseppi-Elie (**2007**) "Impedimetric Detection for DNA Hybridization Within Microfluidic Biochips" **In** Microchip-Based Assay Systems *Methods in Molecular Biology*, Pierre N. Floriano, Ed.; Royal Society of Chemistry. Humana Press, New Jersey. vol. **385**, **Chapter 8**, pp 103-120. 276p ISBN: 978-1-58829-588-0.
7. Anthony Guiseppi-Elie, Sean Brahim and Ann Wilson "Biosensors Based on Electrically Conducting Polymers" **In** *Handbook of Conducting Polymers: Conjugated Polymer Processing and Applications*; 3rd Edition (**2007**); T. Skotheim and J. R. Reynolds Eds.; Taylor and Francis, New York. **Chapter 12**, pp 12:1 – 12:45. ISBN: 978-1-42004-360-0.

Color Coding			
Analyte Specific Channel ANA1:	Black	Black	Black
Common Electrode COM3:	- N/A -	- N/A -	Yellow
Common Electrode COM3:	Green	Green	Green
Analyte Reference Channel REF2:	- N/A -	Red	Red

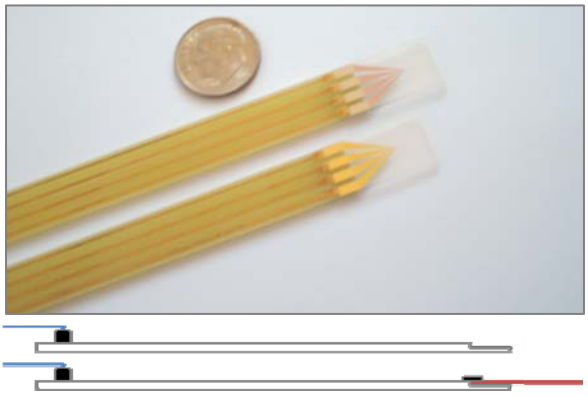


IME Accessories



STC4 IME Test Clip: The STC4 IME Test Clip is designed for easy make and break electrical connections to unpackaged IME chips. The spring loaded clip open and close action assures a positive connect to all chip leads and provides for hands free testing of IMES.

- The upper contacts are 0.025" sq. pins that are spaced at 0.100" on centers. Pins are perfect for sq. pin receptacles, wire-wrap or jumper leads.
- Gold plated lower contacts to the IME assure reliable, noise free connections.
- Between each contact there are molded barriers that prevent shorts and allow connections to be made on live chips without accidental shorting to adjacent chip leads.



4C Chip Carrier: The 4C Chip Carrier is an 11.4 cm (4.5") long printed circuit board wand outfitted with pins at the upper end and bonding pads at the lower end.

- The upper contacts are 0.025" sq. pins that are spaced at 0.100" on centers. Pins are perfect for sq. pin receptacles, wire-wrap or jumper leads.
- Gold plated lower bonding pads allow low temperature (ca. 650 – 700 ºC) solder or conductive epoxy connections to the corresponding bonding pads of the IME chip to assure reliable, noise free connections.
- Contact may then be encapsulated using a suitable packaging resin.