

**❖ Description**

■ The Model 1550 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 15 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 1550-M is a single pair of electrodes on a chip. The 1550-CD provides a differential interrogation format in which a single, common electrode services two distinct parts of the same device. The 1550-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

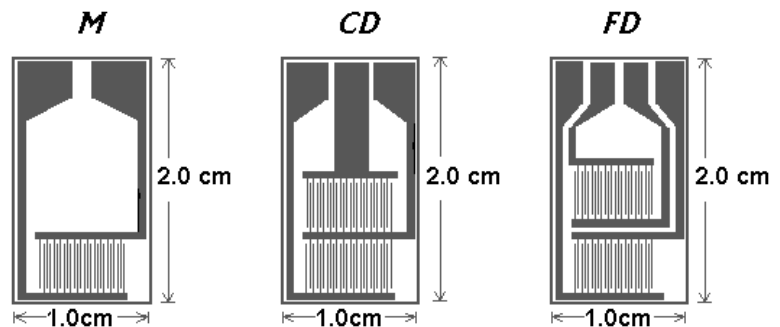
therefore serve as useful starting points for the fabrication of chemical and biological sensors.

**❖ 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 1550.5-M-Au or Pt  
IME 1550.5-CD-Au or Pt  
IME 1550.5-FD-Au or Pt



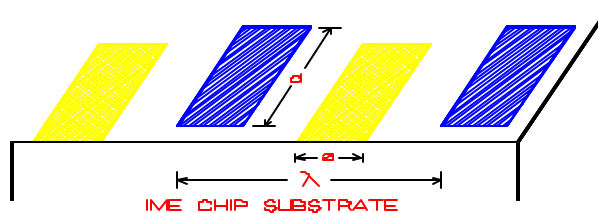
IME 1550 SERIES	GOLD	PLATINUM	ITO
Monolithic-un-packaged	IME 1550.5-Au-M-U	IME 1550.5-Pt-M-U	IME 1550.5-ITO-M-U
Monolithic-packaged	IME 1550.5-Au-M-P	IME 1550.5-Pt-M-P	IME 1550.5-ITO-M-P
Combined Differential-un-packaged	IME 1550.5-Au-CD-U	IME 1550.5-Pt-CD-U	IME 1550.5-ITO-CD-U
Combined Differential-packaged	IME 1550.5-Au-CD-P	IME 1550.5-Pt-CD-P	IME 1550.5-ITO-CD-P
Full Differential-un-packaged	IME 1550.5-Au-FD-U	IME 1550.5-Pt-FD-U	IME 1550.5-ITO-FD-U
Full Differential-packaged	IME 1550.5-Au-FD-P	IME 1550.5-Pt-FD-P	IME 1550.5-ITO-FD-P

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## ✦ Technical Specifications



### ■ Materials of Construction

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

### ■ Physical Dimensions & Constants

	1550-M	1550-CD	1550-FD
IME Chip Dimensions ( $l \times w \times t$ )			
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, ( $\mu\text{m}$ ):	4,985	4,985	4,985
Digit Width, a, ( $\mu\text{m}$ ):	15	15	15
Interdigit Space, a, ( $\mu\text{m}$ ):	15	15	15
Spatial Periodicity, $\lambda$ , ( $\mu\text{m}$ ):	60	60	60
Zaretsky <sup>1,2</sup> Meander Length, M:	24.93 cm	24.93 cm	24.93 cm
Center Line or Serpentine Length:	49.65 cm	49.65 cm	49.65 cm
Cell Constant <sup>3</sup> ( $\text{cm}^{-1}$ ):	0.040	0.040	0.040
Electrode Areas ( $\text{cm}^2$ )			
Analyte Specific ANA1 (Black):	0.0375	0.0375	0.0375
Common COM3 (Yellow):	- N/A -	- N/A -	0.0375
Common COM3 (Green):	0.0375	0.0750	0.0375
Analytical Reference REF2 (Red):	- N/A -	0.0375	0.0375
<b>ELECTROACTIVE METAL EXPOSED:</b>	<b>0.0750</b>	<b>0.1500</b>	<b>0.1500</b>

### ■ 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

## ✦ References and Notes

- Zaretsky, M. C.; Mouyad, L.; Melcher, J. R. *IEEE Trans. Electr. Insul.* **1988**, *23*, 897.
- The Zaretsky convention defines;  $M = N \cdot d$
- Sheppard, N. F.; Tucker, R. C.; Wu, C. "Electrical Conductivity Measurements Using Microfabricated Interdigitated Electrodes" *Anal. Chem.* **1993**, *65*, 1199.