

❖ Description

■ The Model 1050 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 10 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 1050-M is a single pair of electrodes on a chip. The 1050-CD provides a differential interrogation format in which a single, common electrode services two distinct parts of the same device. The 1050-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

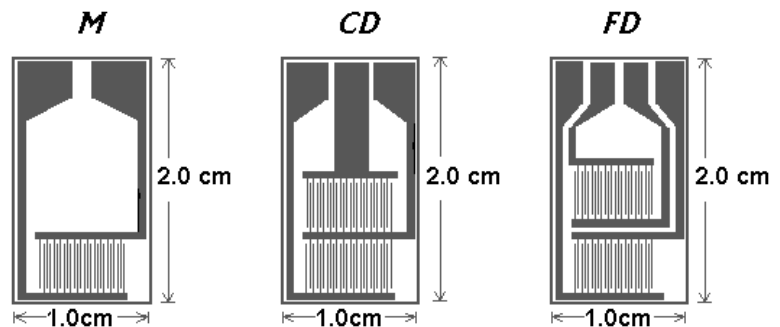
therefore serve as useful starting points for the fabrication of chemical and biological sensors.

❖ 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 1050.5-M-Au or Pt
- IME 1050.5-CD-Au or Pt
- IME 1050.5-FD-Au or Pt



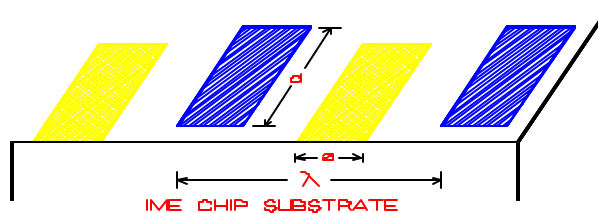
IME 1050 SERIES	GOLD	PLATINUM	ITO
Monolithic-un-packaged	IME 1050.5-Au-M-U	IME 1050.5-Pt-M-U	IME 1050.5-ITO-M-U
Monolithic-packaged	IME 1050.5-Au-M-P	IME 1050.5-Pt-M-P	IME 1050.5-ITO-M-P
Combined Differential-un-packaged	IME 1050.5-Au-CD-U	IME 1050.5-Pt-CD-U	IME 1050.5-ITO-CD-U
Combined Differential-packaged	IME 1050.5-Au-CD-P	IME 1050.5-Pt-CD-P	IME 1050.5-ITO-CD-P
Full Differential-un-packaged	IME 1050.5-Au-FD-U	IME 1050.5-Pt-FD-U	IME 1050.5-ITO-FD-U
Full Differential-packaged	IME 1050.5-Au-FD-P	IME 1050.5-Pt-FD-P	IME 1050.5-ITO-FD-P

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For Further Information
Customer Service

and Support
Tel.: +001.804.783.7829
Fax.: +001.804.783.7830

✦ Technical Specifications



■ Materials of Construction

Substrate:	Schott D263 Borosilicate Glass	
	Dielectric Constant, ϵ_r , at 1 MHz	6.7
	Dielectric Loss Angle, $\tan \delta$, at 1 MHz	61×10^{-4}
	Electrical Resistivity (50 Hz) (250°C)	$1.6 \times 10^8 \Omega \text{ cm}$
	Coefficient of Linear Thermal Expansion, α 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

	1050-M	1050-CD	1050-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, (μm):	4,990	4,990	4,990
Digit Width, a, (μm):	10	10	10
Interdigit Space, a, (μm):	10	10	10
Spatial Periodicity, λ , (μm):	40	40	40
Zaretsky ^{1,2} Meander Length, M:	24.93 cm	24.93 cm	24.93 cm
Center Line or Serpentine Length:	49.55 cm	49.55 cm	49.55 cm
Cell Constant ³ (cm^{-1}):	0.040	0.040	0.040
Electrode Areas (cm^2)			
Analyte Specific ANA1 (Black):	0.0250	0.0250	0.0250
Common COM3 (Yellow):	- N/A -	- N/A -	0.0250
Common COM3 (Green):	0.0250	0.0500	0.0250
Analytical Reference REF2 (Red):	- N/A -	0.0250	0.0250
ELECTROACTIVE METAL EXPOSED:	0.0500	0.1000	0.1000

■ 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.