

TABLE OF CONTENTS

	<i>Page</i>
SESSION I – Functional Components	
Chairman: Mr. A. Brodzinsky, NRL	
Alt. Chairman: Dr. H. Sobol, RCA	
The Future of DC Brushless Electromechanical Devices	1
F. O. Simons, Jr. – University of Florida	
Temperature Compensated Strain Gage for Biomedical Instrumentation	8
J. S. Jackson and R. E. Puckett – University of Kentucky	
A Hybrid Linear Power Amplifier	15
L. Balents, R. D. Gold and F. S. Kamp – RCA	
400 Ampere Hybrid Switch	24
H. Meisel, J. Rivera, J. Pepling and E. Hausman – RCA	
Microminiature Microwave Integrated Receivers	33
L. I. Kent, J. F. Joy and J. E. Templeton – Airborne Instruments Lab	
A Vanadium Oxide “Film Switching” Element	39
F. M. Collins – Airco Speer; T. N. Kennedy – RPI	
 SESSION II – Interconnections	
Chairman: Mr. R. Farquharson, RCA	
Integrated Aluminum Connections	46
T. Neuhuys – M.B.L.S.	
Multilayer Alumina Circuit Boards	52
G. R. Cole, W. R. Keller, F. E. Pirigyi, J. P. Budd and E. I. DuPont	
A Survey of Chip Joining Techniques	60
L. F. Miller – IBM	
*An Advanced Technique for Complex Electronic Components Based on SLT Technology	77
G. B. Cherniack and W. R. Arnold – IBM	
Crossovers for Interconnections on Substrates	78
H. Basseeches and A. Pfahl – BTL, Allentown	
 SESSION III – Filters & Networks	
Chairman: Mr. D. Feldman, BTL, Murray Hill	
Transmission Line Characteristics of Conductors Buried in Ceramic	83
S. A. Sands and D. L. Wilcox – IBM	
A Micro-Strip Delay Line	87
D. C. Howe and G. A. Senf – Sprague Electric Company	
Wideband 3-dB Directional Coupler with Quadrature Phase Using Lumped Circuits	93
J. Moroney – Westinghouse Electric	

**Extended abstract—complete manuscript not available at time of publication.*

	<i>Page</i>
Filter Building Blocks Using Tantalum and Silicon Integrated Circuits	100
G. S. Moschytz, D. G. Medill and C. J. Steffen – BTL, Holmdel	
Distributed RC Network Tuning	111
J. J. Golembeski – BTL, Murray Hill	
HF & VHF Inductorless Filters for Microelectronic Systems	115
R. C. Smythe – Piezo Technology, Inc.	
High Frequency Hybrid Filters	120
W. R. Froyles, and B. E. Amazeen – Sprague Electric Company	

SESSION IV – Packaging
Chairman: Mr. M. Ohanian, Oak Electronics

Flip Chip Microcircuit Bonding Systems	131
T. R. Myers – IIT Research Institute	
“Fold” TM A Packaging Technique for LSI and Hybrid MSI Assemblies	145
C. B. Hord, EMR-Telemetry – EMR Division of Weston Instruments, Inc.	
Interconnection Techniques for Multilayer Hybrid Microcircuit Packages	152
F. A. Lindberg – Westinghouse; J. A. Roach – Naval Air Development Center; A. D. Klein – Naval Air Systems Command; and S. J. Ponemone – Westinghouse	
High Reliability Aluminum Wire Bonding	157
C. Plough, D. Davis and H. Lawler – Fairchild Semiconductors	
Thermal Analysis of Substrates and Integrated Circuits	166
V. L. Hein and V. D. Lenzi – BTL, Reading	
Macro Assembly—Complex Multi-Chip LSI	178
R. F. Bader – Fairchild Semiconductors	

SESSION V – Passive Components I
Chairman: Mr. E. Moss, Mallory
Alt. Chairman: Mr. E. Johnson, G.I.

1969 Trimming Potentiometers	185
S. A. Johnston, R. M. Healy and J. H. Healy – Amphenol	
A New Generation of Trimmer Capacitors and Their Application to Critical Circuitry	195
R. Newman – Voltronics Corporation	
A New Electrostatic Capacitor Employing Aluminum Oxide-Resin Dielectric.	204
L. A. Landry and J. M. Booé – A. R. Mallory & Co.	
Improved Tantalum Chip Capacitors for Hybrid Circuits	211
D. E. Maguire – Union Carbide Corp.	
Sulfuric Acid Electrolyte Tantalum Capacitors with Platinized Gold Cathodes	218
P. Bourgault and G. Fraser – J.M.&M. Co.; G. A. Voyles and J. M. Booé – Mallory	
Non-Conventional Applications for Multilayer Ceramic Capacitors.	223
D. W. Hamer – Erie Technological Products	

SESSION VI – Thick Films
Chairman: Mr. D. Burks, Sprague Electric
Alt. Chairman: Mr. E. Layer, CTS

Commercial Application of Thick Film Hybrid Microelectronic Packaging	231
R. C. Abbe – Microtek Electronics Inc. and A. P. Mandel – Raytheon Company	
A Low Cost Master Pattern & Screen Making Technique	242
L. Jacobson – General Electric	
Use of Metal Masks to Improve the Printing of Thick Film Geometries	247
W. C. Littell, Jr. – Fairchild Semiconductors	
Ultrasonic Bonding of Integrated Circuits to Thick Film Pedestals on Ceramic Substrates	254
T. J. Matcovich and R. L. Coren – Drexel Institute; D. G. Kelemen and R. J. Galli – DuPont	
Living with a Thick Film Resistor Ink Series	276
H. R. Isaak – McDonnell-Douglas	
A Thick-Film Resistor Glaze of Precision Properties	285
P. R. Van Loan – Airco Speer	
Thick-Film RF Circuitry	289
P. Fosco – Sylvania	

SESSION VII – Materials
Chairman: Dr. G. Goodman, Globe-Union
Alt. Chairman: Dr. D. Ulrich, GE

Stress Failures and Joining Considerations in Hybrid Circuits	298
S. S. Cole, Jr. and A. E. Kroehs – Alpha Metals, Inc.	
Investigation of Microcircuit Surface Metallurgy	304
R. S. Buritz, A. Fafarman, R. F. McGowan and S.L. Webster – Hughes Aircraft	
Compatibility of Glassy Materials for Monolithic Packaging	322
J. B. Finn – Owens, Illinois	
Factors Affecting Solder Welding & Resistance Drift in Thick Film Circuits	329
L. H. Fanelli, W. L. Robinson and V. J. Leggio – Autonetics Div., Rockwell Corp.	
*Solder as a Structural Member for Chip Joining	334
D. Jeannette – IBM	

SESSION VIII – Thin Films
Chairman: Dr. D. Gerstenberg, BTL-Allentown
Alt. Chairman: Mr. G. Shirn, Sprague Electric

Thin Film Dielectric Properties of RF Sputtered Oxides	335
I. H. Pratt – U.S. Army Electronics Command	

*Extended abstract—complete manuscript not available at time of publication.

	<i>Page</i>
Transition Metal Oxide Thin Film Microelectronic Components	345
C. C. Wang and K. H. Zaininger — RCA Labs.	
Analysis of Bipolar Interdigitated Thin Film Capacitor	350
R. W. Wyndrum, Jr., P. D. Stark, S. C. Lee, and F. P. Pelletier — BTL, Murray Hill	
Reproducibility of Precision Nichrome Thin Film Resistors	359
M. Nagata, M. Oishi, A. Aritomo and K. Utino — Fujitsu Limited	
Control of Temperature Coefficient of Resistance by Reactive Sputtering of Tantalum with Nitrogen and Oxygen Simultaneously	367
G. I. Parisi — BTL, Murray Hill	
Component Properties of Co-Sputtered Ta-Al Alloy Films	372
C. A. Steidel and D. Gerstenberg — BTL, Allentown	

SESSION IX — Passive Components II

Chairman: Mr. W. Randolph, MEPCO
 Alt. Chairman: Mr. N. Lesh, BTL

A Thin Film Resistance Element, Tailored by Thermal Oxidation	378
H. R. Smith and A. Herczog — Corning Glass	
Microminiature Electronic Thermal Sensing Devices	380
R. A. Delaney — IBM	
Miniature Single Hermetic Seal Liquid Porous Anode Capacitors with Continuous Reverse Voltage Capability	386
J. B. Buice, H. T. Cannon and P. W. Boyle — General Electric	
Beam-Leaded, Tantalum Thin-Film Capacitors	393
W. E. Wesolowski and M. Tierman — Sprague	
Total Design Concept for "Monolithic" Multi-Layer Ceramic Capacitors	399
L. A. Liebowitz — Nytronics, Inc.	

SESSION X — Physical Effects on Interconnections

Chairman: Mr. W. Martin, Zenith
 Alt. Chairman: Mr. S. Stuhlbarg, Raytheon

Optimizing Cyclic Fatigue Life of Controlled Collapse Chip Joints	404
L. S. Goldmann — IBM	
Control of Electromigration in Aluminum Interconnections	424
R. Shield and T. H. Ramsey — TI	
Parametric Study of Temperature Distributions in Chips—Joined by Controlled Chip Collapse Techniques	429
S. Oktay — IBM	
High Reliability Magnetic Components for Space Applications	453
H. K. Inao and M. E. Lippman — Hughes	