

Vol. 52 • No. 5

May 2009

Microwave Journal



www.mwjjournal.com

ELECTRONICA
005

h horizon
h house

Founded in 1958

BOSTON

MTT-S IMS Show Issue

Microwave Journal

MAY 2009 VOL. 52 • NO. 5

2009 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM & EXHIBITION

24 **IMS in Boston: Reflections from the Past**

Ted Saad, Harlan Howe, Jr., Peter Staecker, Glen Thoren, Former IMS Chairmen; Fred Schindler, IMS Chairman 2009

A look back at over 40 years of the International Microwave Symposium in Boston, along with a preview of this year's show

54 **Tracking the 2009 Technical Program**

David Vye, Editor, Microwave Journal

Overview of this year's International Microwave Symposium's technical program

56 **73rd ARFTG Conference**

Charles Wilker, Conference Chair

Preview of the 73rd Automatic Radio Frequency Techniques Group (ARFTG) Conference, to be held in Boston, Friday, June 12th

58 **2009 RFIC Symposium**

Tina Quach, General Chair

Introduction to the 2009 IEEE Radio Frequency Integrated Circuits Symposium, to be held in Boston, Sunday, June 7th to Tuesday, June 9th

60 **2009 MicroApps: Learning from the Experts**

Barry Alcorn, Agilent Technologies Inc.

Introduction to a forum designed for participating exhibitors to present the technology and capabilities behind their products

62 **Please Come to Boston in the Springtime**

David Vye, Editor, Microwave Journal

An overview of Boston's historical legacy in the microwave industry, in addition to its role as host of the 2009 IEEE MTT-S International Microwave Symposium and Exhibition

66 **The IMSider's Guide to Boston**

A primer on Boston and the surrounding area, including what to see and where to eat

82 **2009 IMS Exhibitors**

An alphabetical listing of companies participating in the Microwave Week exhibition and their respective booth numbers

90 **Exhibitor Profiles**

Profiles from advertising IMS exhibitors



Microwave Journal (USPS 396-250) (ISSN 0192-6225) is published MAYly by Horizon House Publications Inc., 685 Canton St., Norwood, MA 02062. Periodicals postage paid at Norwood, MA 02062 and additional mailing offices.

Photocopy Rights: Permission to photocopy for internal or personal use, or the internal or personal use of specific clients, is granted by *Microwave Journal* for users through Copyright Clearance Center provided that the base fee of \$5.00 per copy of the article, plus \$1.00 per page, is paid directly to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923 USA (978) 750-8400. For government and/or educational classroom use, the Copyright Clearance Center should be contacted. The rate for this use is 0.03 cents per page. Please specify ISSN 0192-6225 *Microwave Journal* International. *Microwave Journal* can also be purchased on 35 mm film from University Microfilms, Periodic Entry Department, 300 N. Zeeb Rd., Ann Arbor, MI 48106 (313) 761-4700. Reprints: For requests of 100 or more reprints, contact Wendelyn Bailey at (781) 769-9750.

POSTMASTER: Send address corrections to *Microwave Journal*, PO Box 3256, Northbrook, IL 60065-3256 or e-mail mwj@omeda.com. Subscription information: (847) 291-5216. This journal is issued without charge upon written request to qualified persons working in that part of the electronics industry, including governmental and university installation, that deal with VHF through light frequencies. Other subscriptions are: domestic, \$120.00 per year, two-year subscriptions, \$185.00; foreign, \$200.00 per year, two-year subscriptions, \$370.00; back issues (if available) and single copies, \$10.00 domestic and \$20.00 foreign. Claims for missing issues must be filed within 90 days of date of issue for complimentary replacement.

©2009 by Horizon House Publications Inc.

Posted under Canadian international publications mail agreement #0738654

TECHNICAL FEATURES

160 Frequency Generation and Synthesis: Cost-effective & Power-efficient Solutions

Ulrich L. Rohde and Ajay K. Poddar, Synergy Microwave Corp.

Description of compact frequency synthesizers that leverage voltage-controlled oscillator technology for emerging wireless communications systems

193 Development Report of Power FETs for Solid-state Power Amplifiers from GaAs to GaN

Homayoun Ghani, Toshiba America Electronic Components Inc.

Summarization of the development status of GaN devices designed to expand solid-state power amplifier applications in microwave and millimeter-wave bands

210 A Reconfigurable Microstrip Antenna with Frequency and Polarization Diversities

Junying Liu, Dongjin Wang, Shengzhao Xiang, Weidong Wang and Sheng Zhang, University of Science and Technology of China

Presentation of a microstrip patch antenna with both frequency and polarization reconfigurabilities

SPECIAL REPORTS

220 Focus on Research

Richard Mumford, International Editor, Microwave Journal

A historical look at Nokia Corp., along with an in-depth look at the company's present-day research facilities across the globe

224 The New MWJournal.com Resources Section

Introduction to the enhanced multi-media and interactive web capabilities found in the new resources section at www.mwjjournal.com

PRODUCT FEATURES

228 A New 13 Gbps, +3.3 V High Speed Logic Family

Hittite Microwave Corp.

Introduction to seven +3.3 V logic devices with fast rise times, fixed or programmable output voltages and industry-compatible pinouts

236 Portable 6.4 GHz RF Signal Generator

AnaPico AG

Introduction to a portable radio frequency signal generator covering the frequency bands between 5 and 6 GHz

242 Redefining Efficiency for High Power Wideband RF Design

TriQuint Semiconductor Design Center

Development of a discrete radio frequency transistor device portfolio that achieves output power levels from 10 through 50 W over broad bands

250 Multi-mode, Multi-band PA Module for LTE

Skyworks Solutions Inc.

Design of a power amplifier module for LTE TDD Bands 38 and 40

DEPARTMENTS

19 ...Mark Your Calendar
20 ...Coming Events
141 ...Defense News
145 ...International Report
149 ...Commercial Market
152 ...Around the Circuit

256 ...New Products
282 ...The Book End
284 ...Ad Index
288 ...Sales Reps
290 ...MWJ Puzzler

STAFF

PUBLISHER: CARL SHEFFRES

EDITOR: DAVID VYE

MANAGING EDITOR: KEITH W. MOORE

TECHNICAL EDITOR: PATRICK HINDLE

ASSOCIATE TECHNICAL EDITOR: DAN MASSÉ

STAFF EDITOR: JENNIFER DiMARCO

EDITORIAL ASSISTANT: BARBARA WALSH

CONSULTING EDITOR: HARLAN HOWE, JR.

CONSULTING EDITOR: FRANK BASHORE

CONSULTING EDITOR: PETER STAECKER

CONSULTING EDITOR: DAN SWANSON

WEB EDITOR: SAMANTHA BOOKMAN

CIRCULATION MANAGER: MICHELLE FRAZIER

TRAFFIC MANAGER: EDWARD KIESSLING

DIRECTOR OF PRODUCTION & DISTRIBUTION:

ROBERT BASS

MULTIMEDIA DESIGNER: GREG LAMB

WEB SITE PRODUCTION DESIGNER:

MICHAEL O'BRIEN

DTP COORDINATOR: JANICE LEVENSON

GRAPHIC DESIGNER: SACHIKO STIGLITZ

FREELANCE OFFICE SUPPORT SPECIALIST:

SUNDAY O'BRIEN

EUROPE

INTERNATIONAL EDITOR: RICHARD MUMFORD

OFFICE MANAGER: EUGENIE HARDY

CORPORATE STAFF

CHAIRMAN: WILLIAM BAZZY

CEO: WILLIAM M. BAZZY

PRESIDENT: IVAR BAZZY

VICE PRESIDENT: JARED BAZZY

EDITORIAL REVIEW BOARD

Dr. I.J. Bahl	Dr. J.C. Lin
D.K. Barton	Dr. S. Maas
F.M. Bashore	Dr. R.J. Mailloux
Dr. E.F. Belohoubek	S. March
Dr. C.R. Boyd	Dr. G.L. Matthaei
N.R. Dietrich	Dr. D.N. McQuiddy
Dr. Z. Galani	Dr. J.M. Osepchuk
Dr. F.E. Gardiol	Dr. J. Rautio
G. Goldberg	Dr. U. Rohde
M. Goldfarb	Dr. G.F. Ross
Dr. P. Goldsmith	M. Schindler
Dr. M.A.K. Hamid	Dr. P. Staecker
J.L. Heaton	F. Sullivan
Dr. C. Heiter	D. Swanson
N. Herscovici	Dr. R.J. Trev
Dr. W.E. Hord	G.D. Vendelin
H. Howe, Jr.	C. Wheatley
Dr. T. Itoh	Dr. J. Wiltse
Dr. J. Lasker	Prof. K. Wu
Dr. L. Lewin	

EXECUTIVE EDITORIAL OFFICE:

685 Canton Street, Norwood, MA 02062

Tel: (781) 769-9750

FAX: (781) 769-5037

e-mail: mwj@mwjournal.com

EUROPEAN EDITORIAL OFFICE:

16 Sussex Street, London SW1V 4RW, England

Tel: Editorial: +44 207 596 8730 Sales: +44 207 596 8740

FAX: +44 207 596 8749

www.mwjjournal.com

Printed in the USA