

# Michael Lee Schuette

205 Dreese Laboratories, 2015 Neil Ave. ▪ Columbus, OH 43210 ▪ 740 272 3177 ▪ schuette@ieee.org

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## OBJECTIVE

Semiconductor device research position where I can use my proven talents in advanced fabrication and characterization, while assembling and driving resources to push through innovative barriers

## DEGREES

**The Ohio State University (OSU)**, Columbus, OH

M.S. and Ph.D. in Electrical Engineering (Aug. 2005 and Dec. 2009)

**Ohio Northern University (ONU)**, Ada, OH

B.S. in Electrical Engineering, with distinction (May 2002)

(minors in Computer Science, Applied Mathematics, and Business Administration)

## AWARDS, HONORS, & FUNDING

- **Best Poster**, OSU Institute of Materials Research Materials Week Student Poster Session (2008)
- **Best Student Paper**, 49<sup>th</sup> Intl. Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication (2005)
- **Graduate Research Associateship**, OSU (2007-present)
- **Nanoscale Science & Engineering Center (NSEC) Fellowship**, OSU (2006-2007)
- **National Science Foundation GK-12 Graduate Fellowship** (2005-2006)
- **Graduate Teaching Associateship**, OSU (2003-2005)
- **National Science Foundation “Research Experiences for Undergraduates”** (2001)
- **Engineering Scholarship**, ONU (2000-2002)
- **Dean’s Scholarship**, ONU (1997-2000)

## RESEARCH HIGHLIGHTS

**Scaling of (GaN)/AlGaIn/GaN high-electron mobility transistors (HEMTs)**, OSU

- Pushed limits of electron-beam lithography and plasma etching to realize dielectrically-defined, sub-50-nm recessed-gate HEMTs
- Demonstrated record sub-threshold characteristics

**Low-temperature ohmic contacts to GaN and AlGaIn/GaN**, OSU

- Designed copper germanide ohmic contact to *n*-GaN and AlGaIn/GaN with improved process latitude and thermal budget, compared to titanium-aluminum-based contacts
- Confirmed contributions of diffusion at metal-semiconductor interface, as well as crystalline phase evolution, to physical mechanism for ohmic behavior of contact system

**Nanoscale metal-dielectric-metal crossbars for surface plasmon studies**, OSU/Kent State University

**Characterization of imaging through scattering media**, University of Michigan (2001)

## EXPERIMENTAL & FABRICATION TECHNIQUES

**Materials & device processing:** electron-beam lithography, plasma etching (responsible for user training), photolithography, thermal processing, metal evaporation, atomic layer deposition

**On-wafer electrical measurements:** load-pull, microwave noise, small-signal, dynamic (pulsed) current-voltage, temperature-dependent measurements, capacitance-voltage

**Materials characterization:** x-ray and ultraviolet photoelectron spectroscopy, x-ray diffraction, scanning electron microscopy, atomic-force microscopy

## PUBLICATIONS

### Journal Articles

- **M. L. Schuette**, H. Kim, J. Song, and W. Lu, “0.2  $\mu\text{m}$  AlGaIn/GaN HEMTs with 67 mV/dec subthreshold swing and  $10^{10}$  on/off ratio,” submitted to IEEE Electron Device Letters, August 2009.
- **M. L. Schuette** and W. Lu, “A simple technique for beam focusing in electron beam lithography on optically transparent substrates,” Journal of Vacuum Science & Technology B., vol. 27, 2009.
- **M. L. Schuette** and W. Lu, “Highly selective zero-bias plasma etching of GaN over AlGaIn,” Journal of Vacuum Science & Technology B., vol. 25, pp. 1870-1874, 2007.

- **M. L. Schuette** and W. Lu, “Electrical transport in the copper germanide-*n*-GaN system: experiment and numerical model,” *Journal of Applied Physics*, vol. 101, 113702, 2007.
- **M. L. Schuette** and W. Lu, “Compositional study of copper-germanium ohmic contact to *n*-GaN,” *Journal of Electronic Materials*, vol. 36, pp. 420-425, 2007.
- H. Kim, **M. L. Schuette**, J. Lee, W. Lu, and J. C. Mabon, “Passivation of surface and interface states in AlGaIn/GaN HEMT structures by annealing,” *Journal of Electronic Materials*, vol. 36, pp. 1149-1155, 2007.
- H. Kim, **M. L. Schuette**, H. Jung, J. Song, J. Lee, and W. Lu, “Passivation effects in Ni/AlGaIn/GaN Schottky diodes by annealing,” *Applied Physics Letters*, vol. 89, 053516, 2006.
- **M. L. Schuette** and W. Lu, “Copper germanide ohmic contact on *n*-type gallium nitride using silicon tetrachloride plasma,” *Journal of Vacuum Science & Technology B.*, vol. 23, pp. 3143-3147, 2005.
- J. Lee, D. Liu, H. Kim, **M. L. Schuette**, W. Lu, J. Flynn, and G. Brandes, “Fabrication of self-aligned T-gate AlGaIn/GaN high electron mobility transistors,” *Intl. Journal of High Speed Electronics and Systems*, vol. 14, pp. 181-185, 2005.
- J. Lee, D. Liu, H. Kim, **M. L. Schuette**, W. Lu, J. Flynn, and G. Brandes, “Self aligned AlGaIn/GaN high electron mobility transistors,” *Electronics Letters*, vol. 40, pp. 1227-1228, 2004.

#### Conference Presentations

- **M. L. Schuette** and W. Lu, “A simple technique for beam focusing in electron beam lithography on optically transparent substrates,” *53<sup>rd</sup> Intl. Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication in Marco Island, Florida* (May 26-29, 2009).
- **M. L. Schuette** and W. Lu, “Zero-bias N<sub>2</sub>/Cl<sub>2</sub>/O<sub>2</sub> selective dry etching of GaN over AlGaIn for HEMT gate recessing,” *7<sup>th</sup> Intl. Conference of Nitride Semiconductors in Las Vegas, Nevada* (Sept. 16-21, 2007).
- **M. L. Schuette** and W. Lu, “Investigation of a low-temperature Cu<sub>3</sub>Ge ohmic contact to *n*-GaIn,” *48<sup>th</sup> Electronic Materials Conference in University Park, Pennsylvania* (Jun. 28-30, 2006).
- H. Kim, **M. L. Schuette**, H. Jung, J. Song, J. Lee, W. Lu, and J. Mabon “EBIC and XPS study of post-annealing process on AlGaIn/GaN Schottky diodes,” *48<sup>th</sup> Electronic Materials Conference in University Park, Pennsylvania* (Jun. 28-30, 2006).
- **(invited) M. L. Schuette** and W. Lu, “RIE-enhanced low-temperature copper germanide ohmic contact to *n*-GaIn and AlGaIn/GaN heterostructures,” *31<sup>st</sup> Intl. Conference on Micro- and Nano-Engineering in Vienna, Austria* (Sept. 19-22, 2005).
- **M. L. Schuette** and W. Lu, “Copper germanide Ohmic contact on *n*-type gallium nitride using silicon tetrachloride plasma,” *49<sup>th</sup> Intl. Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication in Orlando, FL* (May 31 – June 3, 2005).
- S. Ezekiel and **M. L. Schuette**, “Magnetic resonance image segmentation technique by using Hurst coefficients,” *2<sup>nd</sup> IASTED Intl. Conference on Visualization, Imaging, and Image Processing in Benalmadena, Malaga, Spain* (Sept. 9-12, 2002).

#### OTHER EMPLOYMENT EXPERIENCE

**PECO II, Inc.**, Worthington, OH – Electrical Engineering Intern (2002)

- Supported development of telecommunications power conditioning equipment
- Developed tests and modifications for new and exploratory products

**Ohio Northern University**, Ada, OH – Electrical Engineering Laboratory Technician and Bibliographer (2000-2001), Physics Laboratory Teaching Assistant (1999-2000)

**The Ohio State University**, Columbus, OH – Graduate Teaching Associate (2002-2005)

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| ▪ Solid State Microelectronics Laboratory        | ▪ Intro. to Radio Frequency Integrated Circuits |
| ▪ Physics of Semiconductor Devices               | ▪ Electromagnetics I                            |
| ▪ Intro. to Materials for Electrical Engineering | ▪ Electrical Circuits Laboratory                |

#### AFFILIATIONS & SERVICE

**Electrical Engineering Delegate**, Ohio State Council of Graduate Students (2003-2004)

**Governmental Relations Committee**, Ohio State Council of Graduate Students (2003-2004)

**Institute of Electrical and Electronics Engineers (IEEE)** (1998-present)