KISEOK SONG
(Ph. D.)

CONTACT INFORMATION

Affiliation	Semiconductor System Laboratory, Korea Advanced Institute of Science and Technology (KAIST)
Address	#1233, E3-2 (Department Of Electrical Engineering), KAIST, Daejeon, Republic of Korea
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RESEARCH INTERESTS

- **Bio-medical System-on-Chip (SoC) Design**
  - Bio-feedback electrical stimulator SoC design
  - Low-power wearable bio-signal sensor SoC design
- **Bio-medical Closed-loop Controlled Electrical Stimulator System Design and Verification**
  - Mobile and wearable bio-feedback electrical stimulation system design
  - Bio-medical system verification with *in-vitro* and *in-vivo* experiment
  - Low-power wearable sensor system design
  - Low-power wireless body area network (human body communication) channel characteristics analysis

EDUCATION

Ph.D. in EE — **Korea Advanced Institute of Science and Technology (KAIST)**
03/2011 – 02/2015
Advisor: Hoi-Jun Yoo
Thesis title: *Closed-loop controlled electrical stimulation system for wearable healthcare*

M.S. in EE — **Korea Advanced Institute of Science and Technology (KAIST)**
08/2009 - 02/2011
Advisor: Hoi-Jun Yoo
Thesis title: *Wirelessly-powered Electro-acupuncture with Adaptive Pulse Width Stimulation*
GPA : 3.5/4.3

B.S. in EE — **Korea Advanced Institute of Science and Technology (KAIST)**
03/2005 - 08/2009
Advisor: Hoi-Jun Yoo
GPA : 3.93/4.3 *Summa Cum Laude*

WORK EXPERIENCE

09/2010 - 02/2010 — **Graduate Student Research Assistant /Teaching Assistant**
Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea, 305-701
▪ EE466 (*Introduction to Biomedical Electronics*)

RESEARCH PROJECTS (4 SoCs for Top Architect, 3 SoCs for Block Designer)

Gluco-scope — **Multi-modal Spectroscopy SoC for Non-invasive Glucose Monitoring**
03/2013 – *Present* *(Top Architect)*
▪ Impedance and near-infrared spectroscopy SoC for non-invasive glucose estimation
▪ Artificial neural network data combining for high accuracy
➔ *IEEE Symposium on VLSI circuits (S. VLSI)*, Jun. 2014.
➔ *IEEE Journal of Solid-State Circuits (JSSC)*, Apr. 2015.

Smart Ionto. — **Dual-impedance Feedback Iontophoresis SoC for Transdermal Drug Delivery Patch**
03/2012 - *Present* *(Top Architect)*
▪ Load and tissue impedance feedback electrical stimulator SoC for transdermal drug delivery
▪ Fabric patch type system implementation for efficient and safe transdermal drug delivery
▪ *In-vitro* and *in-vivo* experiment verification with smartphone application environment
➔ *IEEE International Solid-State Circuits (ISSCC)*, Feb. 2013.
➔ *IEEE Journal of Solid-State Circuits (JSSC)*, Jan. 2014.

Smart EA — **Multi-modal Feedback Electrical Stimulator SoC for Electro-Acupuncture Patch**

04/2011 - 03/2012	▪ EMG and skin temperature feedback electrical stimulator SoC for electro-acupuncture
(Top Architect)	▪ Fabric patch type system implementation for efficient and safe electro-acupuncture treatment
	➔ *IEEE International Solid-State Circuits (ISSCC)*, Feb. 2012.
	➔ *IEEE Transactions on Biomedical Circuits and Systems (T-BioCAS)*, Dec. 2012.
WiPEA	**Wirelessly-powered Electrical Stimulator SoC for Wireless Electro-acupuncture**
12/2010 - 04/2011	▪ 433MHz ISM band wirelessly powered electrical stimulator SoC for electro-acupuncture
(Top Architect)	➔ *IEEE International Symposium on Circuits and Systems (ISCAS)*, Jun. 2010.
	➔ *IEEE Transactions on Biomedical Circuits and Systems (T-BioCAS)*, Apr. 2011.
MSM	**EEG Processor and Transcranial Stimulator SoC for Mental Health Monitoring**
12/2012 - 08/2013	▪
(Block Designer)	➔ *IEEE International Solid-State Circuits (ISSCC)*, Feb. 2013.
	➔ *IEEE Transactions on Biomedical Circuits and Systems (T-BioCAS)*, Dec. 2014.
Biocle-IV	**Low-energy Human Body Communication Transceiver for Wireless Body Area Network**
02/2010 - 06/2010	▪ Energy-efficient and WBAN standard compatible body channel transceiver design
(Block Designer)	▪ Human body communication channel characteristics analysis
	▪ Electrode contact impedance sensor circuit design for enhancing channel characteristics
	➔ *IEEE International Solid-State Circuits (ISSCC)*, Feb. 2011. (Second Author)
	➔ *IEEE Journal of Solid-State Circuits (JSSC)*, Jan. 2012. (Second Author)
Smart Poultice	**Body Impedance and ECG Monitoring SoC for Daily Cardiac Healthcare**
03/2009 - 06/2009	▪ Thoracic impedance variation and ECG monitoring SoC for continuous cardiac monitoring
(Block Designer)	▪ Poultice type wearable cardiac monitoring system implementation
	▪ 13.56MHz inductive communication transceiver design for remote start-up module
	➔ *IEEE International Solid-State Circuits (ISSCC)*, Feb. 2010. (Co-author)
	➔ *IEEE Journal of Solid-State Circuits (JSSC)*, Jan. 2011. (Co-author)

HONORS AND AWARDS

- 2014 *Paul Balan Marconi Society Young Scholar Award* 10/2014
- 2014 Kim Choong-Ki Award: *Research Excellence Award* 06/2014
- 2013 ISSCC Academic Demo Session 02/2013
- 2012 ISSCC Academic Demo Session 02/2012
- 2012 CICC Student Scholarship Award: *Intel/Helic/CICC Student Scholarship Award* 09/2012
- 2012 Kim Choong-Ki Award: *Research Excellence Award* 04/2012
- 2008 KAIST Undergraduate Research Program Award (2nd place) 03/2008
- 2009 KAIST Graduation: *Summa Cum Laude* 08/2009
- National Science & Technology Scholarship 03/2005-08/2009

PRESS RELEASE

- Co. Exist: A New High-Tech Upgrade To Acupuncture Lets You See It's Working In Real Time 02/2013 (http://www.fastcoexist.com/1680166/a-new-high-tech-upgrade-to-acupuncture-lets-you-see-its-working-in-real-time)

PROFESSIONAL ACTIVITIES

Research Activities

- The 8th KAIST-Keio-Tsinghua (KKT) VLSI Design and SoC Workshop: *General Chair* 08/2012
- The 5th KAIST-Keio-Tsinghua (KKT) VLSI Design and SoC Workshop: *Presenter* 08/2009

Peer Reviewer Services

- Reviewer, *IEEE Transactions on Biomedical Engineering (TBME)* 2012
- Reviewer, *IEEE Transactions on Biomedical Circuits and Systems (T-BioCAS)* 2012
- Reviewer, *IEEE Transactions on Circuits and Systems II (TCAS-II)* 2011, 2012
- Reviewer, *IEEE Asia Pacific Conference on Circuits and Systems (APCCAS)* 2010

Professional Memberships

- Member, *Institute of Electrical and Electronics Engineers (IEEE)*
- Member, *IEEE Solid-State Circuits Society (SSCS)*

PUBLICATIONS

Journals (*10 Papers in Total – 4 First-authored Papers, and 6 Co-authored Papers***)**

[1] **JSSC 2015** **"An Impedance and Multi-wavelength Near-infrared Spectroscopy IC for Non-invasive Blood Glucose Estimation"**
Kiseok Song, Unsoo Ha, Seongwook Park, and Hoi-Jun Yoo
IEEE Journal of Solid-State Circuits (JSSC), Apr. 2015. (Accepted)

[2] **JSSC 2014** **"An 87mA·min Iontophoresis Controller IC with Dual-mode Impedance Sensor for Patch-type Transdermal Drug Delivery System"**
Kiseok Song, Unsoo Ha, Jaehyuk Lee, Kyeongryeol Bong, and Hoi-Jun Yoo
IEEE Journal of Solid-State Circuits (JSSC), Jan. 2014.

[3] **T-BioCAS 2012** **"A Sub-10nA DC-balanced Adaptive Stimulator IC with Multi-modal Sensor for Compact Electro-acupuncture Stimulation"**
Kiseok Song, Hyungwoo Lee, Sunjoo Hong, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE Transactions on Biomedical Circuits and Systems (T-BioCAS), Dec. 2012.

[4] **T-BioCAS 2011** **"A Wirelessly Powered Electro-acupuncture Based on Adaptive Pulsewidth Monophase Stimulation"**
Kiseok Song, Long Yan, Seulki Lee, Jerald Yoo, and Hoi-Jun Yoo
IEEE Transactions on Biomedical Circuits and Systems (T-BioCAS), Apr. 2011.

[5] **T-BioCAS 2014** **"A Wearable Neuro-feedback System with EEG-based Mental Status Monitoring and Transcranial Electrical Stimulation"**
Taehwan Roh, **Kiseok Song**, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE Transactions on Bio-medical Circuits and Systems (T-BioCAS) 2014. (Accepted)

[6] **JSSC 2012** **"A Low Energy Crystal-less Double-FSK Sensor Node Transceiver for Wireless Body-area-network"**
Joonsung Bae, **Kiseok Song**, Hyungwoo Lee, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE Journal of Solid-State Circuits (JSSC), Nov. 2012.

[7] **JSSC 2012** **"A 0.24-nJ/b Wireless Body-area-network Transceiver With Scalable Double-FSK Modulation"**
Joonsung Bae, **Kiseok Song**, Hyungwoo Lee, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE Journal of Solid-State Circuits (JSSC), Jan. 2012.

[8] **TMTT 2012** **"The Signal Transmission Mechanism on the Surface of Human Body for Body Channel Communication"**
Joonsung Bae, Hyunwoo Cho, **Kiseok Song**, Hyungwoo Lee, and Hoi-Jun Yoo
IEEE Transactions on Microwave Theory (TMTT), Mar. 2012.

[9] **JSSC 2011** **"A 3.9 mW 25-electrode Reconfigured Sensor for Wearable Cardiac Monitoring System"**
Long Yan, Joonsung Bae, Seulki Lee, Taehwan Roh, **Kiseok Song**, and Hoi-Jun Yoo
IEEE Journal of Solid-State Circuits (JSSC), Jan. 2011.

[10] **JSSC 2010** **"A Low-energy Inductive Coupling Transceiver With Cm-range 50-Mbps Data Communication in Mobile Device Applications"**
Seulki Lee, **Kiseok Song**, Jerald Yoo, and Hoi-Jun Yoo
IEEE Journal of Solid-State Circuits (JSSC), Nov. 2010.

Conferences *(21 Papers in Total – 9 First-authored Papers and 12 Co-authored Papers)*

[1] **ISSCC 2013** **"An 87mA·min Iontophoresis Controller IC with Dual-mode Impedance Sensor for Patch Type Transdermal Drug Delivery System"**
Kiseok Song, Unsoo Ha, Jaehyuk Lee, Kyeongryeol Bong, and Hoi-Jun Yoo
IEEE International Solid-State Circuits Conference (ISSCC), 2013.

[2] **ISSCC 2012** **"A Sub-10nA DC-balanced Adaptive Stimulator IC with Mulimodal Sensor for Compact Electro-acupuncture System"**
Kiseok Song, Hyungwoo Lee, Sunjoo Hong, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE International Solid-State Circuits Conference (ISSCC), 2012.

[3] **S. VLSI 2014** **"An Impedance and Multi-wavelength Near-infrared Spectroscopy IC for Non-invasive Blood Glucose Estimation"**
Kiseok Song, Unsoo Ha, Seongwook Park, and Hoi-Jun Yoo
IEEE Symposium on VLSI Circuits and Technology (S. VLSI), 2014. *(Accepted)*

[4] **A-SSCC 2012** **"A Dynamic Electrode Impedance Matched Acupuncture-type Diagnosis System with Concurrent Feedback of Physiological Signals"**
Kiseok Song, Sunjoo Hong, Taehwan Roh, Unsoo Ha, and Hoi-Jun Yoo
IEEE Asian Solid-State Circuits Conference (A-SSCC), 2012.

[5] **CICC 2011** **"A 20μW Contact Impedance Sensor for Wireless Body-area-network Transceiver"**
Kiseok Song, Joonsung Bae, Long Yan, and Hoi-Jun Yoo
IEEE Custom Integrated Circuits Conference (CICC), 2011.

[6] **EMBC 2012** **"The Compact Electro-acupuncture System for Multi-modal Feedback Electro-acupuncture Treatment"**
Kiseok Song, Hyungwoo Lee, Sunjoo Hong, Hyunwoo Cho, and Hoi-Jun Yoo
International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2012.

[7] **BioCAS 2013** **"Bio-feedback Iontophoresis Patch for Controllable Transdermal Drug Delivery"**
Kiseok Song, Unsoo Ha, Jaehyuk Lee, and Hoi-Jun Yoo
IEEE Biomedical Circuits and Systems (BioCAS), 2013.

[8] **BioCAS 2012** **"Compact Electro-acupuncture System for Multi-Modal Feedback Stimulation"**
Kiseok Song, Hyungwoo Lee, Sunjoo Hong, Hyunwoo Cho, Kwonjoon Lee, and Hoi-Jun Yoo
IEEE Biomedical Circuits and Systems (BioCAS), 2012.

[9] **ISCAS 2010** **"A Wirelessly-powered Electro-acupuncture based on Adaptive Pulse Width Mono-phase Stimulation"**
Kiseok Song, Seulki Lee, and Hoi-Jun Yoo
IEEE International Symposium on Circuits and Systems (ISCAS), 2010.

[10] **ISSCC 2014** **"A 2.14mW EEG Neuro-feedback Processor with Transcranial Electrical Stimulation for Mental Health Management"**
Taehwan Roh, **Kiseok Song**, Hyunwoo Cho, Dongjoo Shin, Unsoo Ha, Kwonjoon Lee, and Hoi-Jun Yoo
IEEE International Solid-State Circuits Conference (ISSCC), 2014.

[11] **ISSCC 2013** **"A 5.5mW IEEE 802.15.6 Wireless Body Area Network Standard Transceiver for Multi-channel Electro-acupuncture Application"**
Hyungwoo Lee, Kwonjoon Lee, Sunjoo Hong, **Kiseok Song**, Taehwan Roh, Joonsung Bae, and Hoi-Jun Yoo
IEEE International Solid-State Circuits Conference (ISSCC), 2013.

[12] **ISSCC 2011** **"A 0.24nJ/b Wireless Body-area-network Transceiver with Scalable Double-FSK Modulation"**
Joonsung Bae, **Kiseok Song**, Hyungwoo Lee, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE International Solid-State Circuits Conference (ISSCC), 2011.

[13] **ISSCC 2010** **"A 3.9mW 25-electrode Reconfigured Thoracic Impedance/ECG SoC with Body-Channel Transponder"**
Long Yan, Joonsung Bae, Seulki Lee, Binhee Kim, Taehwan Roh, **Kiseok Song**, and Hoi-Jun Yoo
IEEE International Solid-State Circuits Conference (ISSCC), 2010.

[14] **A-SSCC 2011** **"A Low Energy Crystal-less Double-FSK Transceiver for Wireless Body-area-network"**
Joonsung Bae, **Kiseok Song**, Hyungwoo Lee, Hyunwoo Cho, and Hoi-Jun Yoo
IEEE Asian Solid-State Circuits Conference (A-SSCC), 2011.

[15] **A-SSCC 2009** **"A 1.3pJ/b Inductive Coupling Transceiver with Adaptive Gain Control for Cm-range 50Mbps Data Communication"**
Seulki Lee, Jerald Yoo, **Kiseok Song**, and Hoi-Jun Yoo
IEEE Asian Solid-State Circuits Conference (A-SSCC), 2009.

[16] **ISMICT 2012** **"An Energy-efficient Body Channel Communication based on Maxwell's Equations Analysis of On-body Transmission Mechanism"**
Joonsung Bae, **Kiseok Song**, Hyunwoo Cho, Hyungwoo Lee, and Hoi-Jun Yoo
International Symposium on Medical Information and Communication Technology, 2014.

[17] **MWSCAS 2011** **"A 5.3μW Contact Monitoring Sensor with BCC Electrode and MICS Antenna for Energy Efficient Unified WBAN Transceiver"**
Hyunwoo Cho, Joonsung Bae, **Kiseok Song**, and Hoi-Jun Yoo
IEEE International Midwest Symposium on Circuits and Systems (MWSCAS), 2011.

[18] **ISCAS 2011** **"A 2.4μW 400nC/s Constant Charge Injector for Wirelessly-powered Electro-acupuncture"**
Hyungwoo Lee, **Kiseok Song**, Long Yan, and Hoi-Jun Yoo
IEEE International Symposium on Circuits and Systems (ISCAS), 2011.

[19] **ISCAS 2014** **"3.8 mW Electrocardiogram (ECG) Filtered Electrical Impedance Tomography IC using I/Q Homodyne Architecture for Breast Cancer Diagnosis"**
Yongsu Lee, Unsoo Ha, **Kiseok Song**, and Hoi-Jun Yoo
IEEE International Symposium on Circuits and Systems (ISCAS), 2014. *(Accepted)*

[20] **ISCAS 2008** **"An ultra low power UHF RFID tag front-end for EPC global Gen2 with novel clock-free decoder"**
Sung-Jin Kim, Min-Chang Cho, Joonhyun Park, **Kisuk Song**, Yul Kim, and SeongHwan Cho
IEEE International Symposium on Circuits and Systems (ISCAS), 2008.

[21] **APCCAS 2010** **"A Combined Method to Reduce Motion Artifact and Power Line Interference for Wearable Healthcare Systems"**
Sunjoo Hong, **Kiseok Song**, Long Yan, and Hoi-Jun Yoo
IEEE Asia Pacific Conference on Circuits and Systems (APCCAS), 2010.

Patents *(10 Korea Patents in Total – 7 Registered Patents and 3 Applied Patents)*

[1] **KR 2013** *(applied)* **"Electro-acupuncture System"**
NO. 10-2013-0016312

[2] **KR 2012** *(applied)* **"Iontophoresis Patch"**
NO. 10-2012-0124752

[3] **KR 2012** *(applied)* **"Attachable Electro-acupuncture Platform"**
NO. 10-2012-0023564

[4] **KR 2011** *(registered)* **"Electro-acupuncture Platform and the Method for Generating Electric-stimulus using Thereof"**
NO. 10-1242553-00-00

[5] **KR 2012** *(registered)* **"Apparatus for Initializing Wearable Systems Remotely"**
NO. 10-1064230-00-00

[6] **KR 2012** *(registered)* **"Power Supply Apparatus of Wearable Systems"**
NO. 10-1101867-00-00

[7] **KR 2012** *(registered)* **"Electrical Needles Therapy Apparatus"**
No. 10-1128867-00-00

[8] **KR 2012** *(registered)* **"Electro Acupuncture Stimulator System"**
No. 10-1201296-00-00

[9] **KR 2011** *(registered)* **"Electric Needle Therapy Apparatus with Compensation for Human-body Load"**
No. 10-1068087-00-00

[10] **KR 2011** *(registered)* **"Electro-acupuncture Stimulator and Medical Treatment Device using Thereof"**
No. 10-10676720-00-00

INVITED TALKS

- Qualcomm Technical Talk : *Wearable Healthcare in KAIST and Closed-loop Controlled Electrical Stimulation Systems*
  San Jose, CA, Feb. 2014.
  Santa Clara, CA, Feb. 2014.
- Qualcomm Technical Talk : *Closed-loop Controlled Electrical Stimulation Systems*

San Diego, CA, Feb. 2013.

- KAIST- KEIO -TSINGHUA (KKT) workshop: *A 490μW Fully MICS Compatible FSK Transceiver for Implantable Devices*

KAIST, Korea, 2009.

SKILLS

- System Level Simulator: Matlab
- Circuit Level Simulator: Synopsis Hspice, Cadence Virtuoso Spectre
- Logic Level Design Tool: Verilog HDL
- Layout Tool: Cadence Virtuoso
- Workstation: UNIX (Solaris OS)

LANGUAGES

- Native Korean / Fluent English