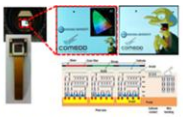
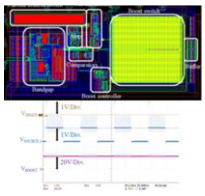
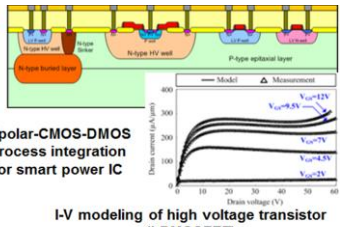
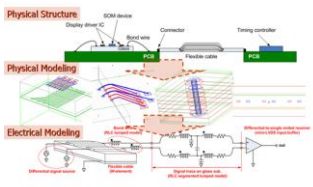
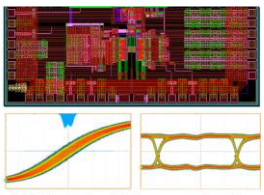
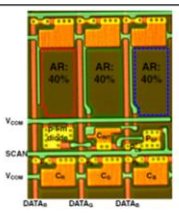
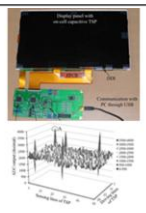
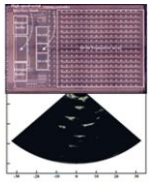
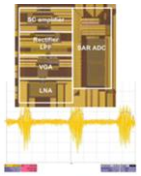
Integrated Electronic Laboratory (Professor Oh-Kyong Kwon)

Homepage: http://ielab.hanyang.ac.kr/

Our research interests are classified into five fields of display electronics, power electronics, high-speed interface, sensor readout technologies, and bio-medical electronics. We have developed driving technologies for various kinds of displays such as PDP, LCD, and OLED (Organic LED). Recently, we are studying pixel circuits and driving methods for high image quality AMOLED and OLED-on-Silicon (OLEDoS) displays. We are also investigating about transparent and flexible displays using IGZO TFTs and nanowire transistors. To implement power-efficient systems, we have been researching power electronics such as power and battery management ICs and smart LED backlight driver ICs. We are investigating high efficiency single input multiple output (SIMO) DC-DC converters for mobile applications and AC-DC converters for LED lightings. In addition, we investigate most power-efficient interface systems using a phase-locked loop, a delay-locked loop, a clock- and data-recovery, and an equalizer while achieves signal and power integrity. More recently, we have focused on human interface technologies dealing with the five senses of human beings. They include sensor technologies such as CMOS image sensors and touch screen sensors and bio-medical electronics such as CMOS X-ray detectors for computerized and positron emission tomography, ultrasound transceiver ICs, and bio-signal monitoring systems.

Fields	Research Topics	Recent research results
Display electronics	· Display driver IC · Pixel circuits and driving methods for high image quality AMOLED display · OLEDoS microdisplay · Transparent and flexible display using IGZO TFTs and nanowire transistors · Smart LED driver IC and local dimming algorithm for LCD TVs using LED backlight	 14.1-in WXGA AMOLED  0.6-in XGA OLEDoS display  90% power efficiency LED backlight driver IC
Power electronics	· Single input multiple output (SIMO) DC-DC converter for mobile applications · AC-DC converter for LED lighting · High efficiency power and battery management ICs (PMIC and BMIC) · High-voltage (HV) devices and process integration of BCDMOS technology	 High efficiency power Management IC  Bipolar-CMOS-DMOS process integration for smart power IC I-V modeling of high voltage transistor (LDMOSFET)
High speed interface	· Signal and power integrity for high-speed data transmission · Phase locked loop and delay locked loop for low-jitter clock generation · Clock and data recovery circuit for mobile DRAM and display applications · High speed transmitter and receiver circuit	 Interconnect line modeling and signal integrity for high-speed data transmission for display application  7.5 Gb/s clock and data recovery circuit for mobile DRAM applications
Sensor readout technology	· High speed and high bit-depth CMOS image sensor for consumer and professional electronics such as digital single-lens reflex (DSLR) application · Touch screen panel and readout circuit for smart phone and notebook applications · Ambient light sensors for mobile applications	 2Mpixels 150 frames/s CMOS Image Sensor  AMLCD pixel with photo sensor using p-i-m diode  13.3-in capacitive touch screen sensor
Bio-medical electronics	· Ultrasound interface IC for 3D ultrasound imaging system · CMOS X-ray detector for medical CT applications · Bio-signal monitoring system for medical and human interface applications	 3-side buttable 128 × 64 CMUT array ultrasound Interface IC  CMOS X-Ray detector using column-parallel 14.3-bit extended counting ADCs  Low-power EMG signal readout front-end circuit