

SESSION 10 – IOLANI I-IV Analog Techniques
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Thursday, June 15, 3:25 p.m.

Chairpersons: A. Abidi, University of California, Los Angeles  
K. Agawa, Toshiba Corp.

**10.1 – 3:25 p.m.**

**A 300 nW, 12 ppm/°C Voltage Reference in a Digital 0.35  $\mu$ m CMOS Process**, G. De Vita, G. Iannaccone, P. Andreani\*, Università di Pisa, Pisa, Italy, \*Technical University of Denmark, Lyngby, Denmark

A voltage reference has been implemented in a standard 0.35  $\mu$ m CMOS process. A temperature coefficient of 12 ppm/°C is achieved in virtue of a complete suppression of the temperature dependence of the carrier mobility. The line sensitivity is 0.46 %/V and the maximum supply current, measured at 80 °C, is 130 nA. The PSSR at 100 Hz and 10 MHz is -59 dB and -52 dB, respectively.

**10.2 – 3:50 p.m.**

**A 1.4-V Supply CMOS Fractional Bandgap Reference**, R.T. Perry, S.H. Lewis, A.P. Brokaw\*, T.R. Viswanathan\*\*, University of California, Davis, CA, \*Analog Devices Inc., \*\*University of Texas, Dallas, TX

A low-voltage bandgap reference that outputs a fraction of the bandgap voltage was fabricated in 0.35- $\mu$ m CMOS. With a 1.4-V supply, the reference dissipates 162 mW; the average output is 858 mV, and the output varies by 1.28 mV from -20 °C to 100 °C.

**10.3 – 4:15 p.m.**

**An Integrated 1.8V to 3.3V Regulated Voltage Doubler using Active Diodes and Dual-Loop Voltage Follower for Switch-Capacitive Load**, Y.-H. Lam, W.-H. Ki, C.-Y. Tsui, Hong Kong University of Science and Technology, Hong Kong, China

An integrated 1.8V to 3.3V regulated voltage doubler is presented. Active diodes realized by MOS transistors only are employed to prevent reverse charge transfer. The switching low dropout regulator consists of a dual-loop voltage follower that could drive a large switch-capacitive load and achieves a fast load transient of less than 5 $\mu$ s for a 140mA current step. The regulated doubler was fabricated in a 0.35 $\mu$ m CMOS process occupying an area of 0.74mm<sup>2</sup>.

**10.4 – 4:40 p.m.**

**0.9-V Rail-to-Rail Operational Amplifiers with Adaptive Threshold Voltage Control**, T. Adachi, K. Takasuka, Asahi Kasei Microsystems, Kanagawa, Japan

Rail-to-rail operational amplifiers with an adaptive threshold voltage control circuit are designed at low supply voltage of 0.9-V. The control circuit using a bulk bias effect acts to keep enough drain-source voltage for the current source transistor connected with sources of the input transistors. Two types of operational amplifier are fabricated in a 0.35- $\mu$ m CMOS process. Experimental results show that the developed control circuits improve input common-mode voltage range.