

# High-k gate dielectric challenges as 32 nm looms

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- Leading-edge foundries are just beginning to ramp their 45-nanometer processes, but vendors are already looking to the next challenge--perhaps their biggest to date: the race to develop and ship high-k dielectrics and metal gates for the 32-nm node.
- IBM Corp. and its joint development partners--Advanced Micro Devices, Chartered Semiconductor Manufacturing, Freescale Semiconductor, Infineon and Samsung--have not formally announced their 32-nm process. But at last week's International Electron Devices Meeting (IEDM) in Washington, IBM disclosed that it had devised a high-k gate-first technology for the node. The technology will be available to IBM and its alliance partners...in the second half of 2009.
- Rival foundry giant Taiwan Semiconductor Manufacturing Co. Ltd. is quietly readying its own high-k/metal gate technology but has not announced a timetable for release. TSMC has said its general 32-nm process is slated for "risk production" by the third or fourth quarter of 2009.

*Source: EE Times, Dec. 17, 2007,*

*"High-k push brings high anxiety as 32 nm looms"* 42

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- Other leading-edge foundries, including Fujitsu, Semiconductor International Manufacturing Corp. (SMIC), Toshiba and United Microelectronics Corp. (UMC), are separately developing high-k/metal-gate solutions.
- But with the foundries' hands full ramping their complex 45-nm processes, do they have what it takes to bring high-k and metal-gate technologies into production at 32 nm? High-k development is complex, costly and difficult. At the 32-nm node, overall process-development costs could hit \$3 billion--twice the cost seen at 65 nm, according to Gartner Inc.
- Thus far, only Intel Corp. and NEC Electronics Inc. have announced they are shipping logic devices equipped with high-k materials. Intel is shipping processors based on high-k and metal gates at the 45-nm node. NEC has delivered ASICs based on high-k at 55 nm.