

## **Impacts of High Modulus Ultra Low-k/Cu 300 mm-wafer Integration for 65 nm Technology Node and Beyond**

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A Robust low-k material ( $k < 2.3$ )/Cu multilevel interconnects are integrated using optimized 300 mm-wafer processes for 65 nm node and beyond. Hybrid-structure low-k ILD of porous MSQ ( $k = 2.3$ )/fluorinated-arylene (F.A.,  $k = 2.2$ ) films reduces the effective k value ( $k_{eff}$ ) to 2.6 and shows good electrical characteristics. Improved mechanical properties of low-k materials (Modulus~10 GPa) greatly increase a process compatibility with 300 mm-wafer manufacturing technology such as low pressure CMP and plasma treatments during low-k integration.