ABSTRACT

MIM AND METAL RESISTOR FORMATION AT CU BEOL

USING ONLY ONE EXTRA MASK

An improved process for fabricating simultaneously high capacitance, less than 0.13 micron metal-insulator-metal capacitors, metal resistors and metal interconnects, has been developed using single or dual damascene processing. The key advantage is the use of only one additional mask reticle to form both MIM capacitor and resistor, simultaneously. Several current obstacles that exist in BEOL, back end of line, are overcome, namely: (a) the use of two or more photo-masks to make <0.13um MIM capacitors, (b) undulated copper surfaces, when dielectrics are deposited directly upon it, (c) particles generation concerns during etching, when attempting an etch stop on the bottom MIM plate layers, and finally, (d) dishing during CMP occurs when large copper MIM plates are required, with subsequent capacitance matching problems. The integrated method overcomes the above obstacles and simultaneously forms MIM capacitors, metal resistors and metal interconnects using damascene processing. In addition, the method of forming the MIM capacitors, described herein, can also be used to form anti-fuse devices, in field-programmable gate arrays, FPGA.

FIGURE 16