

LASER ANNEALING SYSTEMS AND METHODS WITH ULTRA-SHORT DWELL TIMES

ABSTRACT

Laser annealing systems and methods for annealing a semiconductor wafer with ultra-short dwell times are disclosed. The laser annealing systems can include one or two laser beams that at least partially overlap. One of the laser beams is a pre-heat laser beam and the other laser beam is the annealing laser image scanning beam. The annealing laser beam scans sufficiently fast so that the dwell times is in the range from about 1 μ s to about 100 μ s or from 100 μ s to 1 ms and peak annealing temperatures of between 350 to 1250 °C or 300 to 400 °C depending on application. These ultra-short dwell times are useful for annealing product wafers formed from thin device wafers because they prevent the device side of the device wafer from being damaged by heating during the annealing process. Embodiments of single-laser-beam annealing systems and methods are also disclosed. Applications include dopant activation annealing of implanted dopants with controlled thermal diffusion and photoresist annealing. A controller can control the power of the second laser beam to within a determined temperature range. This is done the basis of reflected light and a sensor measuring the power of the secondary laser beam to determine the temperature.

(Figure 4)