Abstract
Amorphous/crystalline n–n-isotype Si heterojunctions are made by a pulsed Q-switched second harmonic generation Nd:YAG laser. The process includes melting and subsequently fast resolidification of a thin front layer of monocrystalline Si by laser pulses to create an amorphous layer (phase transition). Different laser energy densities are used to form the amorphous layer on a monocrystalline Si substrate, the results of the electrical characteristics of the heterojunctions are dependent strongly on the laser energy density. Optoelectronic properties such as current–voltage, capacitance–voltage, and spectral sensitivity are measured in a-Si/c-Si heterojunctions (in the absence of anti-reflecting coating and frontal grid contact) prepared by different laser energy densities. The built-in-potential values extracted from current–voltage measurements are close to the published results of (n-p) amorphous/crystalline heterojunction made by glow discharge and plasma enhanced chemical vapour deposition. Furthermore, examination of the formation of amorphous pattern on Si surface is carried out with the help of optical microscopy. Best photovoltaic performance is recognized to be at 5.6 J/cm2. The photodetector shows a wide spectral response, and the peak response is at 780 nm. On the other hand, this peak is independent of laser energy.