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Title:Characteristics of p-i-n terahertz and infrared photodiodes based on multiple graphene layer structures
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Abstract:We calculate the responsivity and dark-current-limited detectivity of terahertz and infrared interband detectors based on p-i-n junctions in the multiple graphene layer structures proposed recently. It is demonstrated that the interband tunneling can be an essential limiting mechanism of the ultimate values of detectivity. To achieve the ultimate detectivity, the optimization of the device structure and the proper choice of the temperature and the bias voltage are required. We show that owing to high values of the quantum efficiency and relatively low rates of thermogeneration, the detectors under consideration can exhibit high responsivity and detectivity at elevated temperatures (in particular, at room temperature) in a wide radiation spectrum and can substantially surpass other detectors.