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Title: Dual-Functional On-Chip AlGaAs/GaAs Schottky Diode for RF Power Detection and Low-Power Rectenna Applications

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Abstract: A Schottky diode has been designed and fabricated on an n-AlGaAs/GaAs high-electron-mobility-transistor (HEMT) structure. Current-voltage (I-V) measurements show good device rectification, with a Schottky barrier height of 0.4349 eV for Ni/Au metallization. The differences between the Schottky barrier height and the theoretical value (1.443 eV) are due to the fabrication process and smaller contact area. The RF signals up to 1 GHz are rectified well by the fabricated Schottky diode and a stable DC output voltage is obtained. The increment ratio of output voltage vs input power is 0.2 V/dBm for all tested frequencies, which is considered good enough for RF power detection. Power conversion efficiency up to 50% is obtained at frequency of 1 GHz and input power of 20 dBm with series connection between diode and load, which also shows the device's good potential as a rectenna device with further improvement. The fabricated n-AlGaAs/GaAs Schottky diode thus provides a conduit for breakthrough designs for RF power detectors, as well as ultra-low power on-chip rectenna device technology to be integrated in nanosystems.