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Title

A 280-GHz Schottky Diode Detector in 130-nm Digital CMOS

Source

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Abstract

A 2 x 2 array of 280-GHz Schottky-barrier diode detectors with an on-chip patch antenna (255 x 250 mu m(2)) is fabricated in a 130-nm logic CMOS process. The series resistance of diode is minimized using poly-gate separation (PGS), and exhibits a cut-off frequency of 2 THz. Each detector unit can detect an incident carrier with 100-Hz similar to 2-MHz amplitude modulation. At 1-MHz modulation frequency, the estimated voltage responsivity and noise equivalent power (NEP) of the detector unit are 250 V/W and 33 pW/Hz(1/2), respectively. An integrated low-noise amplifier further boosts the responsivity to 80 kV/W. At supply voltage of 1.2 V, the entire chip consumes 1.6 mW. The array occupies 1.5 x 0.8 mm(2). A set of millimeter-wave images with a signal-noise ratio of 48 dB is formed using the detector. These suggest potential utility of Schottky diode detectors fabricated in CMOS for millimeter wave and sub-millimeter wave imaging.