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Integrated Pyroelectric Sensor Array of $NaNO_2$ on Silicon

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The properties of pyroelectric matrix sensor arrays integrated with the readout electronics on a Si chip are evaluated on the basis of a 2 × 2 matrix of $NaNO_2$ sensors on Si. The test array is designed to be extendible to larger sizes and our results can be scaled accordingly. A readout circuit is proposed which allows readout rates of 3×10^6/s. The noise and the thermal properties of the array are discussed. Although the specific detectivity is only 8×10^6 cm $Hz^{1/2}/W$ due to the intimate thermal contact of the pyroelectric layer and Si chip, noise equivalent temperature differences are 0.02 K for F = 1 optics at a modulation frequency of 50 Hz.

1. Introduction

An IR-sensor matrix array translates the temporal and spatial variations of incident radiation into a sequence of electrical signals. For known emissivity of the emitting scene, these signals allow the extraction of the spatial temperature distribution of the scene and its temporal evolution.

When pyroelectric sensors are used, they need not be cooled although the ultimately achievable detectivity is, of course, limited by the thermal radiation in the sensor cavity itself. A pyroelectric sensor array may be realized by a vidicon[1] or by the integration of pyroelectric sensor elements into a circuit in a Si substrate,

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