

## Microwave and Millimeter Wave QWITT Diode Oscillator

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We present dc, microwave, and millimeter wave characteristics of different quantum well injection transit time (QWITT) diodes. Small-signal and large-signal device models are used to provide physical device design parameters to maximize output power density. A peak output power of 1 mW in the frequency range of 5-8 GHz has been obtained from a planar QWITT oscillator. This is the highest output power obtained from any quantum well oscillator at any frequency. This result also represents the first planar circuit implementation of a quantum well oscillator. Millimeter wave oscillations at 28-31GHz in a full-height waveguide circuit with an output power of 30  $\mu$ W have been obtained. In addition, we present results on improving device efficiency by optimizing the design of the drift region through the use of a doping spike. By optimizing the doping concentration and width of the doping spike, an increase in efficiency from 2% to 5% is obtained, without compromising on output power at X-band.

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