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Title:A comparative investigation on sub-micrometer InN and GaN Gunn diodes working at terahertz frequency
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Abstract:We report on a simulation for wurtzite-InN and GaN Gunn diodes with notch-doping and uniform-doping structural transit regions. Results show that 0.3-1.0 μm Gunn diodes with a diode area of 500 μm² can generate fundamental frequencies of around 0.2-0.8 THz and rf currents of several hundred mA. InN diodes exhibit more stable oscillations, whereas GaN diodes generate higher oscillation frequencies at both dipole-domain mode and accumulation-domain mode due to different negative differential resistance (NDR) characteristics of high-field transport. The sharp NDR region of InN makes it more suitable for short transit region Gunn diode. Higher I_{rf}/I_{av} and lower bias voltage in InN Gunn diode imply its conversion efficiency significantly higher than GaN diode.
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Inspec controlled terms:gallium compounds - Gunn diodes - III-V semiconductors - indium compounds - semiconductor device models - semiconductor doping - wide band gap semiconductors
Uncontrolled terms:submicrometre InN Gunn diodes - submicrometre GaN Gunn diodes - terahertz frequency - simulation - notch-doping - uniform-doping - structural transit regions - rf currents - oscillation frequencies - dipole-domain mode - accumulation-domain mode - NDR characteristics - high-field transport - sharp NDR region - short transit region - bias voltage - conversion efficiency - size 0.3 mum to 1 mum - frequency 0.2 THz to 0.8 THz
Inspec classification codes:B2560F Bulk effect devices - B2550B Semiconductor doping - B2560B Semiconductor device modelling and equivalent circuits
Numerical data indexing:size 3.0E-07 1.0E-06 m;frequency 2.0E+11 8.0E+11 Hz
Treatment:Practical (PRA); Theoretical or Mathematical (THR)
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