

# InP/InGaAs/InP DOUBLE HETEROJUNCTION BIPOLAR TRANSISTORS WITH 300 GHz $F_{max}$

S. Krishnan, M. Dahlstrom, T. Mathew, Y. Wei, D. Scott, M. Urteaga, M.J.W. Rodwell  
W.K. Liu<sup>1</sup>, D. Lubyshev<sup>1</sup>, X.M. Fang<sup>1</sup>, Y. Wu<sup>1</sup>

Department of ECE, University of California,  
Santa Barbara, CA 93106

<sup>1</sup> IQE Inc.,  
119 Technology Drive, Bethlehem, PA 18015

## ABSTRACT

We report InP/InGaAs/InP Double Heterojunction Transistors(DHBTs) with high breakdown voltages in a substrate transfer process. A device with a 400 Å thick graded base, a 500 Å chirped superlattice base-collector grade and a 2500Å thick InP collector exhibits  $f_{\tau} = 165$  GHz and  $f_{max} = 300$  GHz with breakdown voltage  $BV_{CEO} = 6V$  at a current density,  $J_e = 1 \cdot 10^5$  A/cm<sup>2</sup>. A device with a 400 Å thick graded base, a 500 Å chirped superlattice base-collector grade and a 1500Å thick InP collector exhibits  $f_{\tau} = 215$  GHz and  $f_{max} = 210$  GHz with breakdown voltage  $BV_{CEO} = 4V$  at a current density,  $J_e = 1 \cdot 10^5$  A/cm<sup>2</sup>.