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High-power mid-infrared interband cascade lasers MIJIN KIM, CHUL SOO KIM, CHADWICK CANEDY, WILLIAM BEWLEY, JAMES LINDLE, IGOR VURGAFTMAN, JERRY MEYER, Code 5613, Naval Research Laboratory, Washington DC 20375 — We have grown and fabricated interband cascade lasers (ICLs) with “W” active regions. The ICL structures were etched into 140- μm -wide ridges, with 100- μm -wide metal strips deposited in the middle, and operated epitaxial-side-up. Initial devices displayed lasing thresholds as low as 12 A/cm² at 78 K, series resistance as low as 0.21 m Ω ·cm², and a voltage efficiency of 96%. Cavity length studies on a series of ICLs with 5, 10, and 15 stages determined that the internal losses at 78 K were 16, 27, and 37 cm⁻¹, respectively, while the internal efficiencies were \approx 80% in all cases. Pulsed operating temperatures as high as 300 K were obtained, and a 5-stage device with 0.5 mm cavity length had a wallplug efficiency per facet of \approx 20% without facet coatings. A 3-mm-long laser with high-reflection (95%) and anti-reflection (5%) coatings produced >1.1 W of cw output power at 78 K.

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