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Single-Mode Distributed-Feedback “W” Diode and Interband Cascade Lasers in the Mid-Infrared CHUL SOO KIM, MIJIN KIM, CHADWICK CANEDY, WILLIAM BEWLEY, JAMES LINDLE, IGOR VURGAFTMAN, JERRY MEYER, Code 5613, Naval Research Laboratory, Washington DC 20375 — To obtain spectrally pure output, we have fabricated narrow index-guided ridges with lateral distributed-feedback (DFB) line gratings on both “W” diode and interband cascade lasers. The “W” diode structure containing a GaSb *p*-SCH etch-stop layer was chemically etched into a 5 μm ridge and a first-order DFB grating constructed on both side walls of the ridge. For the interband cascade laser, a first-order top DFB grating was patterned on top of a chemically-etched ridge that was 15 μm wide. The low-loss DFB mode was roughly resonant with the gain peak at $T = 165$ K for the “W” diode and at $T = 110$ K for the interband cascade laser. The sidemode suppression ratios were definitely > 20 dB for both devices, and all of the features above 30 dB appeared to result from instrument noise rather than actual parasitic modes. Just beyond the stop band on the long-wavelength side of the “W” diode DFB, a series of longitudinal modes became apparent at > 30 dB suppression. For the narrow-ridge waveguide DFB devices, the temperature ranges over which single-mode lasing were successfully obtained were 140-162 K for the “W” diode, for which $\lambda = 3.195 \sim 3.202 \mu\text{m}$ (0.29 nm/K), and 110-125 K for the interband cascade laser, for which $\lambda = 3.452 \sim 3.456 \mu\text{m}$ (0.27 nm/K).

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