Electrical Properties of Individual Semiconducting Oxide Nanobelt and Their Applications* YI CHENG, P. XIONG, Department of Physics and MARTECH, Florida State University, L. FIELDS, J.P. ZHENG, FAMU/FSU College of Engineering, R. YANG, Z.L. WANG, Georgia Institute of Technology — Field-effect transistors (FETs) with multi-terminal electrical contacts were fabricated on individual oxide (SnO$_2$ and ZnO) nanobelts. Simultaneous two-terminal and four-terminal measurements enable direct correlation of the FET characteristics with the nature of the contacts. Nanobelt FETs with Schottky contacts were found to exhibit n-channel, p-channel or ambipolar characteristics transistors depending on the properties of the contacts. In contrast, low-resistance ohmic contacts on the nanobelts lead to high-performance n-channel depletion mode FETs with well-defined linear and saturation regimes, “on/off” ratio as high as 10$^7$ at ambient conditions$^{[1]}$. The electron concentration and effective carrier mobility of the nanobelts in different gases at various temperatures were determined from FET measurements on the channel-limited devices. Sensitive electrical response of the SnO$_2$ nanobelt FETs to gas flow containing 0.2-2% H$_2$ was observed at room temperature$^{[2]}$. The effort to utilize the channel-limited nanobelt FETs for protein detection will also be reported. *Supported by NSF NIRT grant ECS-0210332. $^{[1]}$Y. Cheng et al., Appl. Phys. Lett. 89, 093114 (2006). $^{[2]}$L.L. Fields et al., Appl. Phys. Lett. 88, 263102 (2006).