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Superconducting Proximity Effect in Semiconductor Films - Device Theory MICHAEL VISSERS, SOREN FLEXNER, PAUL WELANDER, KEVIN INDERHEES, JIM ECKSTEIN, University of Illinois at Urbana-Champaign — A new three terminal device architecture is introduced and analyzed for studying the superconducting proximity effect. It consists of a narrow superconducting injector line that injects current into a thin normal film. The current is extracted from one side of the injector line by a superconducting drain electrode that is many normal state coherence lengths "downstream" of the injector. A third voltage tap is provided on the other or "upstream" side of the injector. We present a theory showing how measurements made in various voltage sensing configurations can be combined to provide enough information to extract the two dimensional sheet resistance of the normal metal under the superconductor, as well as the specific contact conductance between the superconducting and normal parts of the device. This theory has been used to characterize the proximity effect in thin heavily doped InGaAs layers. A transition from fluctuating to phase stiff pair correlations in the normal layer has been observed at temperatures below Tc of the superconductor.

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