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Temperature-Dependent Polarization Effects in Methylammonium Lead Iodide Field Effect Transistors JOHN LABRAM, DOUGLAS FABINI, ERIN PERRY, HAYDEN EVANS, RAM SESHADRI, MICHAEL CHABINYC, University of California, Santa Barbara — The recent progress in organo-metallic hybrid perovskite solar cells can be viewed as a highly significant historic event. The peak reported power conversion efficiency (PCE) has increased at an unprecedented rate, to a value now in excess of 22%,[1] However many aspects of device operation remain poorly understood. Despite high reported carrier mobilities, easily-accessible conduction and valence band energies and previous reports employing other organo-metallic hybrid perovkistes,[2] field-effect transistors (FETs) based on methylammonium lead iodide ($MAPbI_3$) have been scarcely studied. Using various electronic measurements, we here present a body of experimental evidence consistent with the existence of a mobile ionic species within the $MAPbI_3$ perovskite. Temperature-dependent FET measurements reveal operating devices only below 210K. This is attributed to ionic screening of the semiconductor-dielectric interface. Temperature-dependent pulsed gate experiments, reveal a time-dependent source-drain current behavior consistent with this interpretation. Capacitors exhibit a decreasing low-frequency capacitance with temperature and a temperature-independent capacitance at higher frequencies. [1]www.nrel.gov/ncpv/images/efficiency_chart.jpg [2]C. R. Kagan, et. al. Science 1999, **286**, 945.

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