Athermal Broadband Graphene Optical Modulator with 35 GHz Speed

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Abstract

Optical modulators with ultrahigh speed, small footprint, large bandwidth, robust athermal operation, and complementary metal-oxide semiconductor (CMOS) compatibility are important devices for optical communication and computing applications. Compared to the conventional optical modulators, graphene modulators have attracted great interest due to their large optical bandwidth with an ultracompact footprint. However, their practical applications are limited by the trade-off between speed and optical bandwidth, with a critical issue of temperature tolerance. In this work, we experimentally demonstrate an athermal graphene optical modulator with a 140 nm bandwidth in the entire optical communication regime (1500-1640 nm), with robust high-temperature operation. The device is based on a planar structure with double-layer graphene, leading to the high modulation speed, up to 35 GHz through reduction of the total resistance, and capacitance (9 fF). We observe speed stability in a wide range of temperatures (25-145 degrees C). The ultracompact footprint (18 mu m(2)) of the device promises the next generation of on-chip optical interconnections for efficient communication.

Keywords

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KeyWords Plus: SILICON; INTERCONNECTS; DEVICES; LIGHT

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