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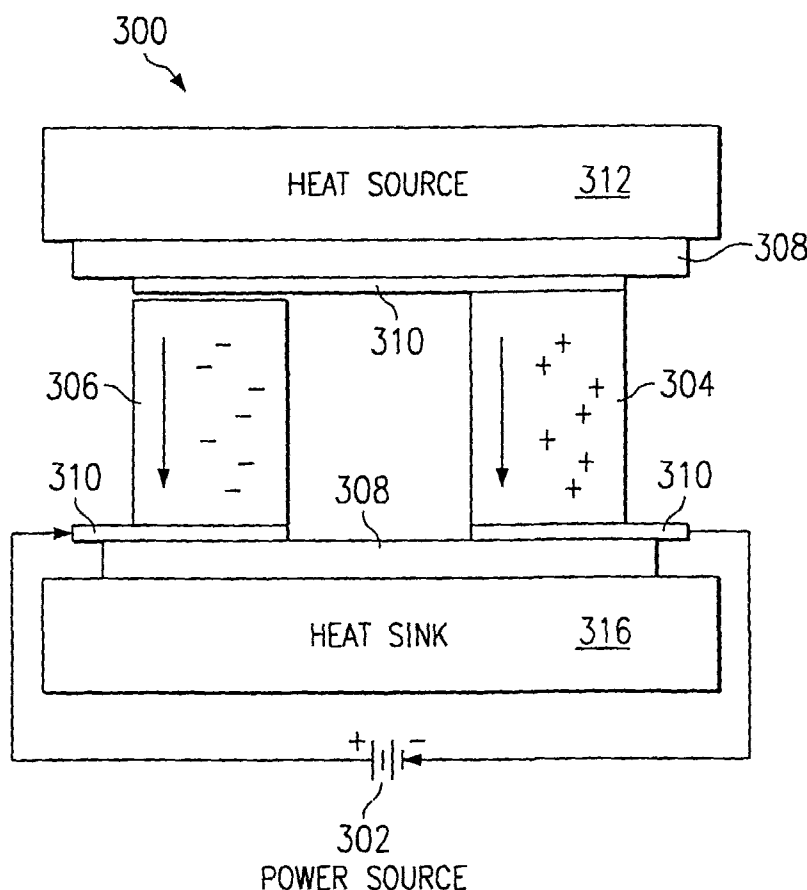
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(54) Title: THERMOELECTRIC SPOT COOLERS FOR RF AND MICROWAVE COMMUNICATION INTEGRATED CIRCUITS



(57) Abstract: An apparatus for cooling selected elements within an integrated circuit, such as active transistors or passive circuit elements used in a radio frequency integrated circuit is provided. In one embodiment, the cooling apparatus includes a cold plate thermally coupled to the region proximate the integrated circuit element, a thermoelectric cooler thermally coupled to the cold plate; and a hot plate thermally coupled to the thermoelectric cooler. Heat is removed from the integrated circuit element through the cold plate and transmitted to the hot plate through the thermoelectric cooler. In one form, the hot plate is located or coupled to an exterior surface of an integrated circuit, such that heat transmitted to the ambient from the integrated circuit element is dissipated into the atmosphere surrounding the integrated circuit. In another form, the hot plate is embedded in the integrated circuit substrate to locally cool elements of the integrated circuit while dumping the heat into the substrate.

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