

[Home](#) > [Journal of Applied Physics](#) > [Volume 102, Issue 4](#) > [10.1063/1.2772530](https://doi.org/10.1063/1.2772530)

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Forward current-voltage characteristics of an AlGaInP light-emitting diode

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ABSTRACT

This work discusses the temperature-dependent forward current-voltage characteristics of an AlGaInP light-emitting diode. From 300 to 470 K, all curves have the same ideality factor of $n = 1.58$. The temperature-dependent saturation currents are in excellent agreement with the thermal activation behavior over ten decades of current and with an activation energy of $E_a = 1.405 \text{ eV}$. Based on the discussion of the barrier for forward current flow, nE_a corresponds to the band gap of the active layer. Various mechanisms of current flow for pnpn junctions and Schottky diodes were examined and verified. Therefore, the $nE_a = 2.22 \text{ eV}$ of the sample corresponds to the band gap of the barriers in the active layer. This value is consistent with the band gap of $(\text{Al}_x\text{Ga}_{1-x})_{0.5}\text{In}_{0.5}\text{P}$ for $x > 0.58$.

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