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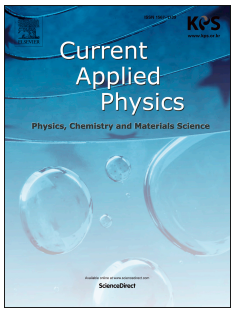

Study on the measurement accuracy of circular transmission line model for low-resistance Ohmic contacts on III-V wide band-gap semiconductors

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Study on the Measurement Accuracy of Circular Transmission Line Model for Low-Resistance Ohmic Contacts on III-V Wide Band-Gap Semiconductors

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Abstract

The accuracy and error propagation for determining the low specific contact resistance of Ohmic contacts on III-V wide band-gap semiconductors based on the circular transmission line model have been analyzed and the validity of this method is discussed in detail. The accuracy is more susceptible to the factors including data fitting method, electrical measurement technique and contact area correction. By using the equations of the original circular transmission line model to extract the fitting parameters, the calculation accuracy is much improved and the inapplicability of the linear least-square fitting is prevented. To further improve the accuracy, a four-probe current-voltage measurement technique was adopted to reduce the parasitic series resistances and the uncertainty bound, especially for the Ohmic contact with low sheet resistance of the semiconductor. Moreover, we have studied the size effect of contact pads of patterns and demonstrated that contact area correction is necessary for the semiconductor with high sheet resistance. A comprehensive error analysis is also performed to fully understand all the impact factors on this advanced method of specific contact resistance measurement, which is benefit for device performance evaluation and failure analysis.