Advancing high-volume GaN manufacturing: precision simulation of electrical and geometrical deviations through current spreading

By Fajri, FAA (Fajri, Faris Azim Ahmad) ; Kopp, F (Kopp, Fabian) ; Noorden, AFA (Noorden, Ahmad Fakhrurrazi Ahmad) ; Gomez-Iglesias, A (Gomez-Iglesias, Alvaro)

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Abstract Manufacturing process deviations pose significant challenges in GaN manufacturing especially when modern technologies demand extreme chip densities. More than a thousand of each of three distinct GaN-based flip-chips were manufactured where the

standard deviations of the measured voltages ranged from 13 to 23 mV. By integrating Monte Carlo and finite element methods in the simulations which relies on the theoretical models, the results were validated by comparing the voltage measurements of the three thousand manufactured chips. Validation was even successful considering the voltage deviations of the three distinct designs equivalently, i.e., affected each wafer's geometrical and electrical properties. In addition, comparing the three designs, Chip A emerged as the optimal choice for low current resistivity. Looking ahead, our theoretical modeling and simulation hold promise for high-accuracy predictions in high-volume GaN-based chip manufacturing, enhancing reliability and performance.

Keywords

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Addresses

[1] Ams OSRAM Grp, Kuala Lumpur, Malaysia

[2] Int Islamic Univ Malaysia, Ctr Adv Optoelect Res, Kuantan, Malaysia

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