

GaN Light-Emitting Diodes

Herbert Paul Maruska

November, 1973

GALLIUM NITRIDE LIGHT-EMITTING DIODES

A DISSERTATION

SUBMITTED TO THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

AND THE COMMITTEE ON GRADUATE STUDIES

OF STANFORD UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

By

Herbert Paul Maruska

November 1973

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

David A. Stevenson  
(Principal Adviser)

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Richard B. Bube

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Gerard L. Pearson  
(Electrical Engineering)

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

James F. Gibbons  
(Electrical Engineering)

Approved for the University Committee  
on Graduate Studies:

Lincoln E. Moses  
Dean of Graduate Studies

To Jacques I. Pankove, whose dedicated  
interest in science has been a source of  
inspiration to me.

## ACKNOWLEDGMENTS

I would like to thank the following individuals for their contributions to this dissertation:

Professor David A. Stevenson, principal advisor, for guidance, helpful discussions, and continuing interest.

Professor Richard H. Bube, Professor James F. Gibbons, and Professor Gerald L. Pearson, members of the thesis reading committee, for helpful suggestions and discussions.

Dr. Jacques I. Pankove of RCA Laboratories for starting me on a career in scientific research and for his lasting friendship.

Dr. Robert A. Burmeister, Jr. and Dr. Egon E. Loebner of Hewlett Packard for a critical review of the manuscript.

Dr. Wally Rhines of Texas Instruments for experimental assistance and many creative and stimulating discussions while he was at Stanford, and continuing friendship.

Dr. Troy W. Barbee and Professor Robert H. Huggins for valuable suggestions and discussions.

Mr. William L. Larson for much appreciated experimental assistance and good friendship.

Mr. Steve Chiang, Dr. Alan L. Fahrenbruch, Mr. Bruce E. Liebert, Mr. John McKenzie, and Mr. Yves Verhelle for helpful discussions and friendship.

Mr. Perfecto Mary for preparing the drawings and illustrations.

Mrs. Valerie Faulkenburg for typing the original and final manuscripts.

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.