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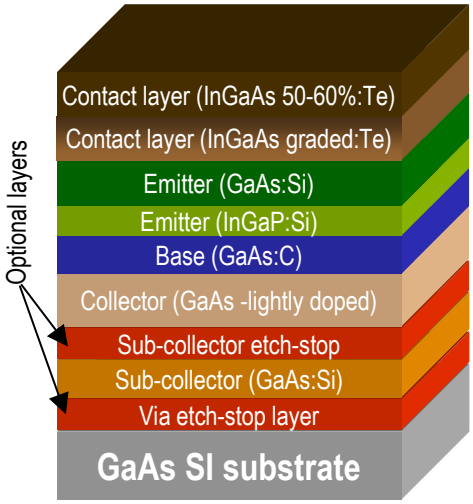
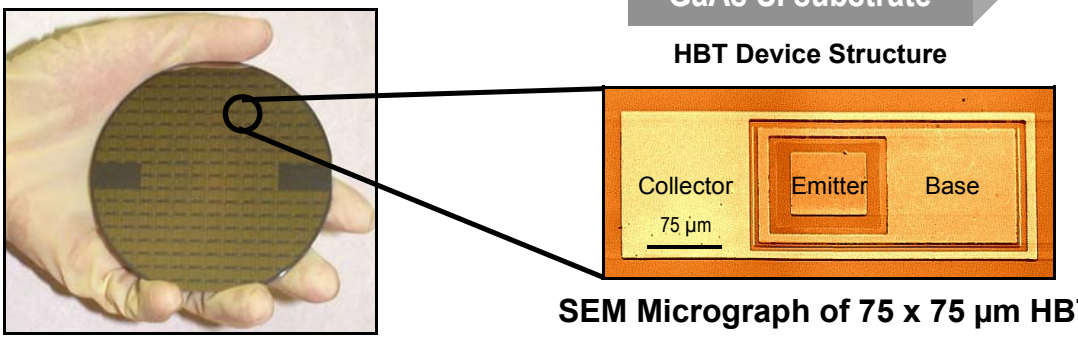
GaInP/GaAs Heterojunction Bipolar Transistor Epitaxial Wafers

General Description & Features

- High quality GaInP/GaAs Heterojunction Bipolar Transistor (HBT) epitaxial wafers grown on semi-insulating GaAs substrates by Metal Organic Vapor Phase Epitaxy (MOVPE).
- High throughput dedicated MOVPE manufacturing infrastructure.
- Wafer size: 4" and 6".
- Fast delivery and product turn-around time.
- Flexible HBT structure design based on customer furnished specifications.
- Internal device fabrication capability (quick lot) for process monitoring and control.



HBT Device Structure



SEM Micrograph of 75 x 75 µm HBT

HBT Device Parameters

Parameters	Performance	Comments
DC Gain (ß)	30 - 360	Measured @ 1KA/cm²
Base Sheet Resistance (R_{sb})	110 - 560 Ω / sq.	Measured for Base thickness ~ 500 - 1400 Å; doping ~ 1-6E19 cm^{-3}
Emitter Sheet Resistance	< 30 Ω / sq.	Tellurium Doped InGaAs contact layer
ß/R_{sb} ratio	0.3 - 0.6	For R_{sb} range of 110 - 560 Ω/sq.
B-E ideality factor	1.1 - 1.15	Measured on Gummel plot
C-B ideality factor	1.05 - 1.1	Measured on Gummel plot
Cut-off frequency (ft)	63 GHz	RF testing on 6.5 x 3 µm devices. Base= 4E19 cm^{-3}, 500Å. Current Density 4E4 A/ cm^2
Max. Frequency of Oscillation (Fmax)	131 GHz	RF testing on 6.5 x 3 µm devices. Base= 4E19 cm^{-3}, 500Å. Current Density 4E4 A/ cm^2
BV_{CEO}	> 8 V	Measured on small area devices
BV_{CBO}	> 16 V	Measured on small area devices
BV_{EBO}	> 5 V	Measured on small area devices

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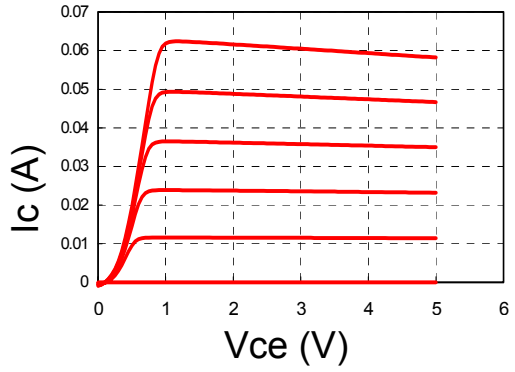
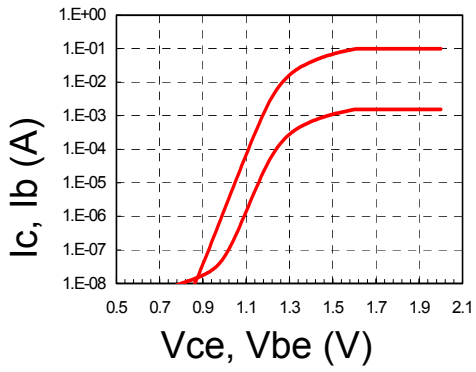
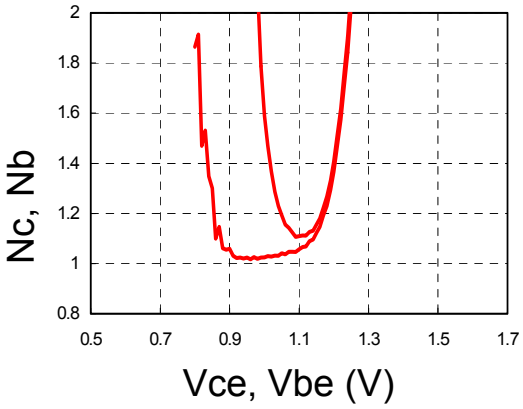
I-V Plot of 75x75 µm Device



Gummel Plot



Collector and Base Ideality Factor



Gain vs. Collector Current

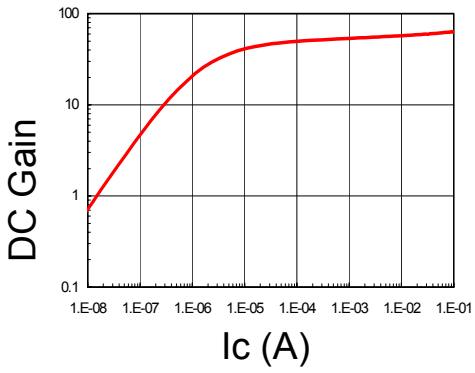
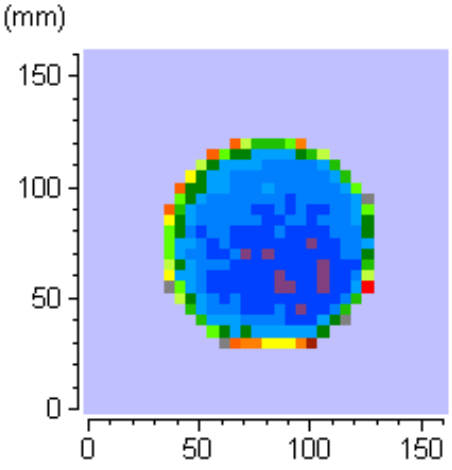
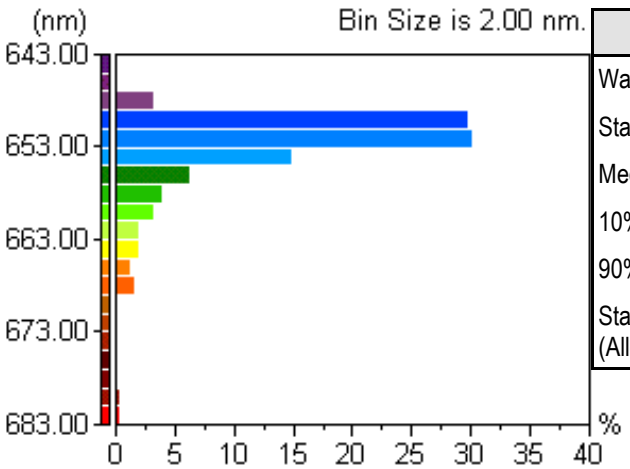


Photo-Luminescence Map & Distribution For GaInP Epitaxial Film *(4" Substrate)*





Statistical Summary	
Wavelenght Average	653 nm
Standard Deviation	4.7 nm
Median	652 nm
10% Point	649 nm
90% Point	660 nm
Standard Deviation (Alloy Composition)	< 1%

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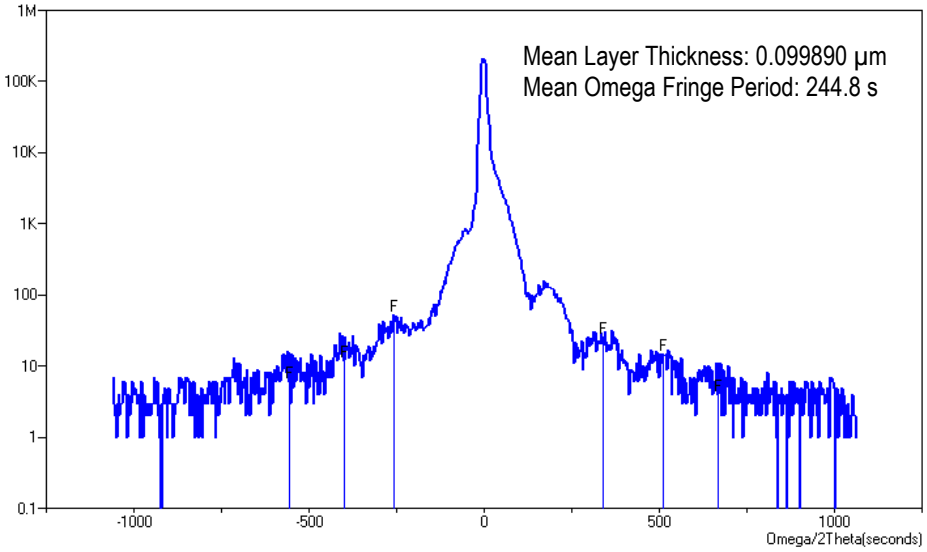
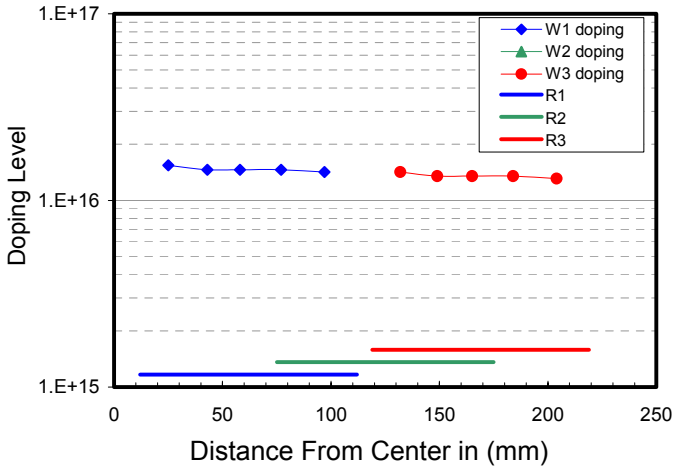
GaInP X-ray Material characterization

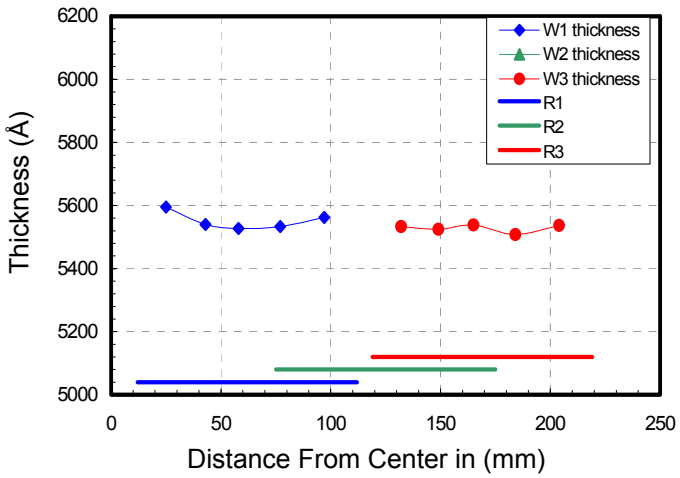


Reactor Uniformity and Reproducibility Data

Doping Uniformity vs. Distance



Thickness Uniformity vs. Distance



Uniformity Over the Entire MOVPE Platter (12 x 4" Wafers)

Doping		Thickness	
Average	1.41 E+16 cm^{-3}	Average	5539.8 Å
Standard Deviation	7.1 E+14 cm^{-3}	Standard Deviation	23.66 Å
Uniformity	± 5%	Uniformity	± 2%
Max-Min / Avg	± 10%	Max-Min / Avg	± 5%

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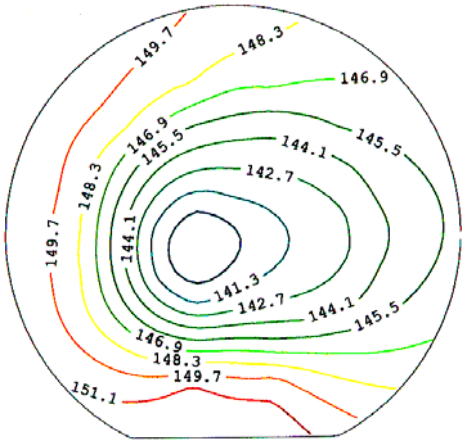
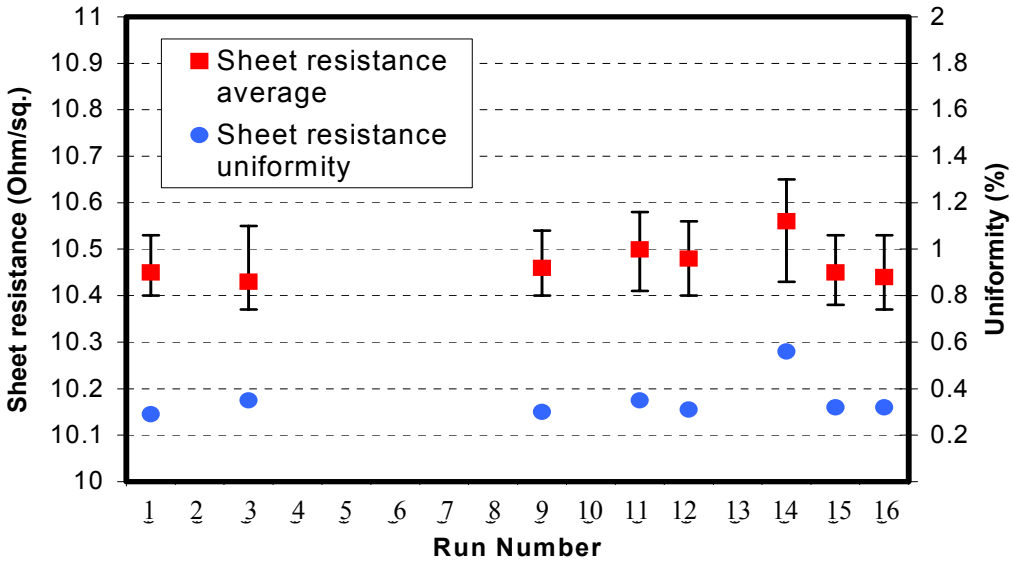
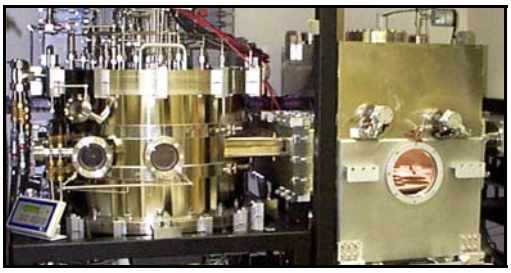
Base Sheet Resistance Uniformity - 4" Epitaxial Wafer



Number of test points	55
Average value	144.6 Ω / sq.
Maximum value	151.7 Ω / sq.
Minimum value	137.8 Ω / sq.
Sample spread (%)	10.11
Std Dev value	3.1 Ω / sq.
Wafer uniformity value (%)	2.12
Base doping (cm^{-3})	4E19
Base thickness (Å)	1400

Reactor Reproducibility For 16 Consecutive Runs (Device Wafers)





Photograph of One of the Large Area Reactors Used for the HBT Wafer Epitaxy

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The information contained on this sheet is for reference only. Actual specifications for delivered products may vary. 1/5/01

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