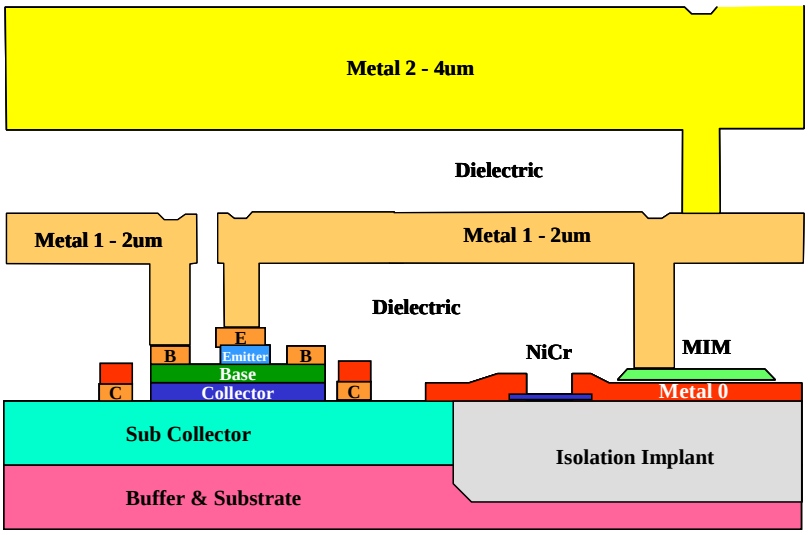
TQHBT

InGaP HBT Foundry Service



TQHBT Process Cross-Section

General Description

TriQuint's TQHBT process is a highly reliable InGaP HBT process with three levels of interconnecting metal. Thick metal interconnects and high quality passives promote integration. The thick metal interconnects, which promote enhanced thermal management, and high density capacitors keep die sizes small. MOCVD epitaxial processes are utilized to grow the active layers. A carbon-doped Base and InGaP Emitter are utilized for high RF performance consistent with high reliability. Precision NiCr resistors and high value MIM capacitors are included. The three metal layers are encapsulated in a high performance dielectric that allows wiring flexibility and plastic packaging simplicity.

Features

- InGaP Emitter Process for High Reliability and Thermal Stability
- Base Etch Stop for Uniformity
- MOCVD Epitaxy
- High Linearity in PA applications
- High Density Interconnects;
  - 2 Global, 1 Local
  - Over 6 µm Total Thickness
  - Dielectric Encapsulated Metals
- Thick Metal Interconnects:
  - Enhanced Thermal Management
  - Minimum Die Size
- Effective Base Ballasting for Maximum Gain
- 150 mm Wafers
- High-Q Passives
- NiCr Thin Film Resistors
- High Value Capacitors
- Backside Vias Optional
- Validated Models and Design Support

Applications

- Power Amplifiers
- Driver Amplifiers
- Wideband, General Purpose Amplifiers
- Gilbert Cell Mixers
- VCOs
- Single Supply and Easy Biasing

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TQHBT Process Details

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Element	Parameter	Value	Units
HBT Transistor	Emitter Periphery	3 @ 3 x 45	µm
	For Standard Cells	1 @ 3 x 45	µm
	(Coming Soon:)	3 @ 2 x 45	µm
	Vbe	1.25	V
	Beta	75	
	Ft	28	GHz
	Fmax	46	GHz
	BVcbo	21	V
	BVebo	7	V
	BVceo	12	V
Interconnect	Metal Layers	3	
MIM Caps	Value	1200	pF/mm2
Inductors	Q @ 2 GHz	>20	
Resistors	NiCr	50	
Vias	Yes		
Mask Layers	No Vias	15	
	With Vias	17	

Maximum Ratings

HBT Storage Temperature Range	-65 to +150	Deg C
HBT Operating Junction Temperature Range	-55 to +150	Deg C
Junction Current Denstity	20	kA/cm^2
Capacitor	10	V

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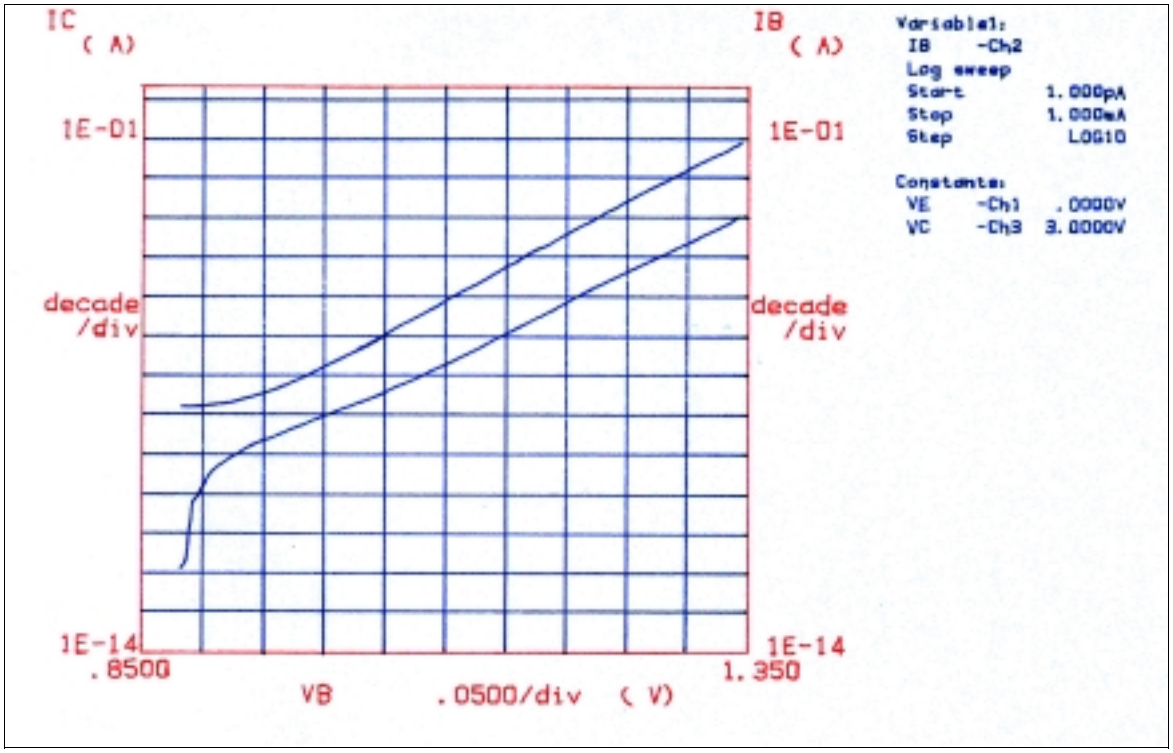
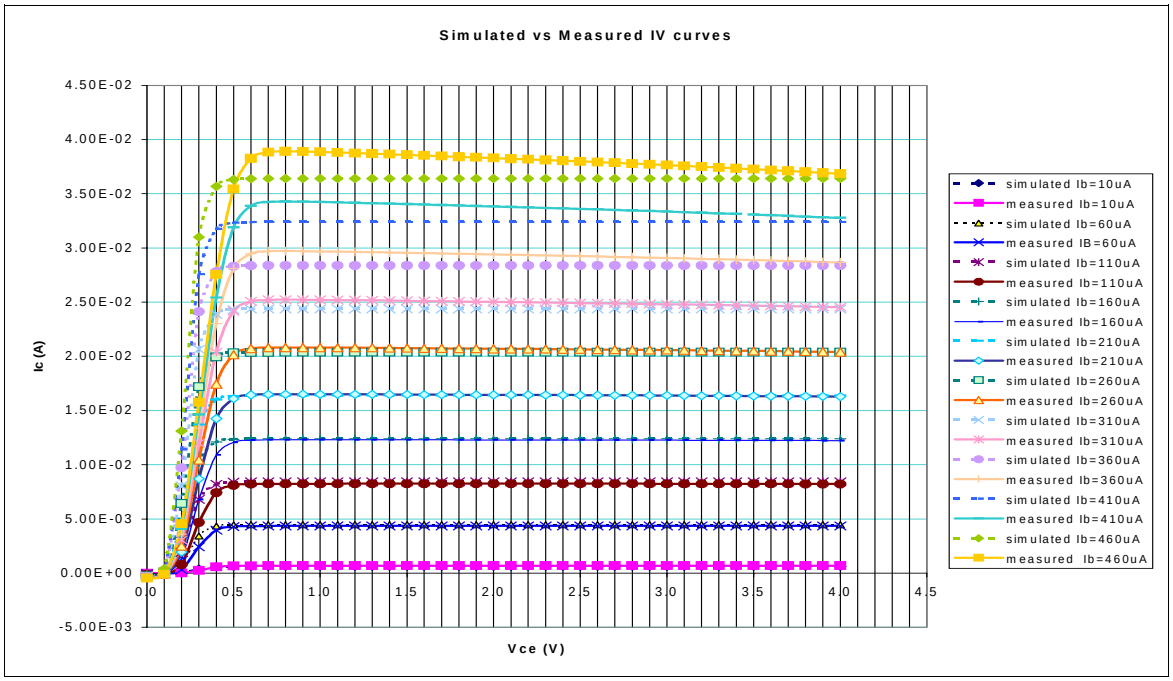
Three Finger 3x45 µ HBT Gummel Plot



Three Finger 3x45 µ HBT I-V Characteristics



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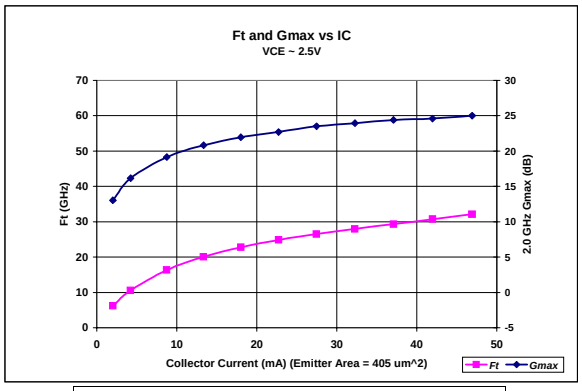
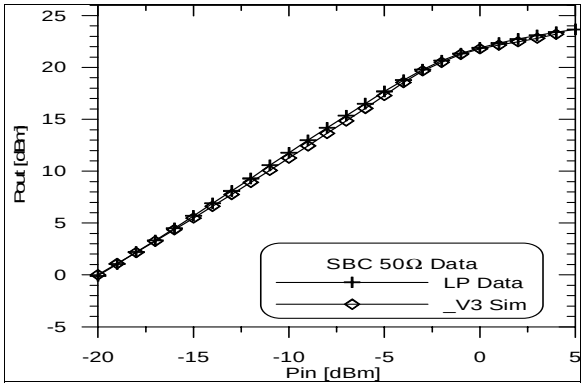
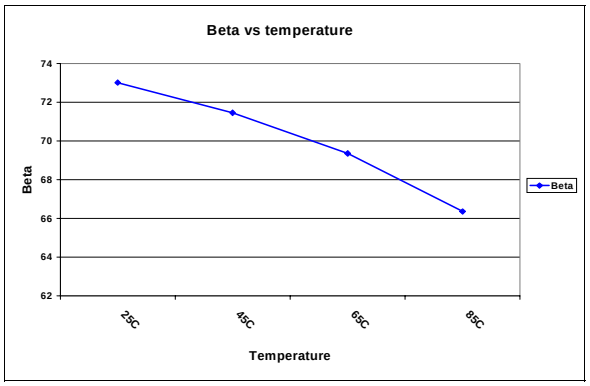


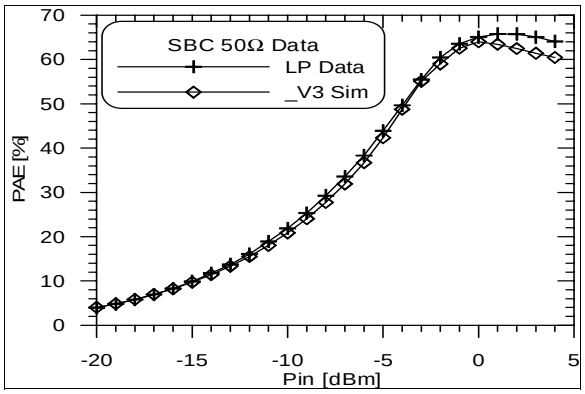
Ft and Gmax versus Collector Current



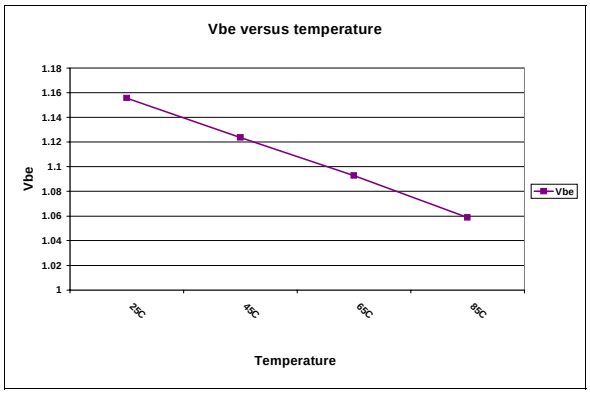
Compression- Modeled vs Measured



Beta versus Junction Temperature



Efficiency– Modeled vs. Measured



Vbe versus Junction Temperature

TQHBT

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Prototyping and Development

- Prototype Development QuickTurn (PDQ):
  - Shared Mask Set;
  - Run Monthly
  - Hot Lot Cycle Time
  - Via and Non-Via Options
- Prototype Wafer Option (PWO):
  - Customer-specific Masks, Customer Schedule
  - 2 wafers delivered
  - Hot Lot Cycle Time
  - With thinning and sawing; optional backside vias

Design Tool Status

- Design Manual
- Device Library of Circuit Elements: Transistors, Diodes, Thin Film Resistors, Capacitors, Inductors
- Parameters for Gummel-Poon Model
  - Agilent ADS Now
  - MWO and PSPICE Now
- Process Corner Models Planned
- Layout Files Available for:
  - Cadence, MWO, & ICED Now
- Layout Rule Sets for Design Rule & Layout versus Schematic Check Now
- Qualified Package Models for Supported Package Styles

Training

- GaAs Design Classes:
  - Half Day Introduction; Upon Request
  - Four Day Technical Training; Fall & Spring at TriQuint Oregon facility
- For Training & PDQ Schedules please visit: www.triquint.com/foundry/

Process Qualification Status

- Mature Process based on 10 GHz, 8V Vdd Process for Military Phased-Array Radar Applications.
- Over 10 Years of Reliability Data Collected.
- Process Qualification Program complete.
- 150mm Wafer Conversion Qualification underway.
- For more information on Quality & Reliability, contact TriQuint or visit: www.triquint.com/manufacturing/QR/

Applications Support Services

- Tiling of GDSII Stream Files including PCM
- Design Rule Check Services
- Layout versus Schematic Check Services
- Packaging Development Engineering
- Test Development Engineering:
  - On-Wafer
  - Packaged Parts
- Thermal Analysis Engineering
- Yield Enhancement Engineering
- Part Qualification Services
- Failure Analysis

Manufacturing Services

- Mask Making
- Pre-Production 100 & 150 mm Wafer Fab
- Wafer Thinning
- Wafer Sawing
- Substrate Vias
- DC Die Sort Testing
- RF On-Wafer Testing
- Plastic Packaging
- RF Packaged Part Testing

Please contact your local TriQuint Semiconductor Representative/ Distributor or Foundry Services Division Marketing for Additional information:
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