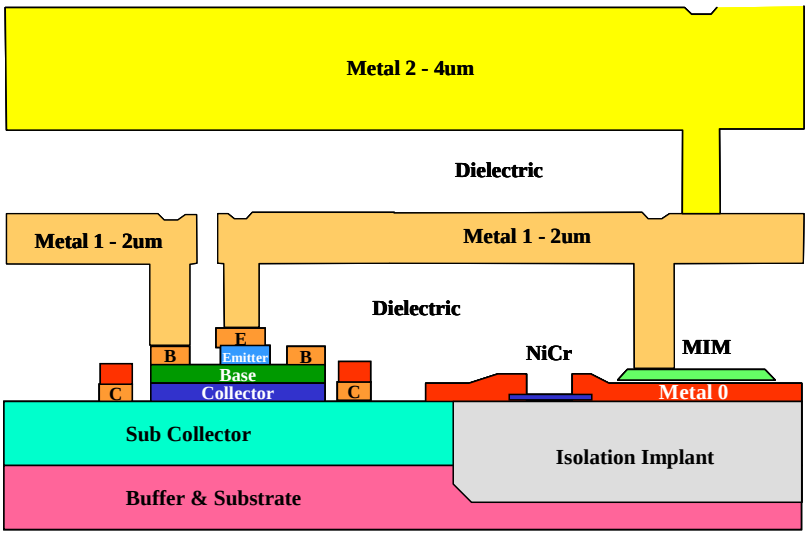
TQHBT3

InGaP HBT Foundry Service



TQHBT3 Process Cross-Section

General Description

TriQuint's new TQHBT3 process is a highly reliable InGaP HBT process with three levels of interconnecting metal and state-of-the-art device performance. 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. Designs utilizing the 3-um emitter width have the performance of previous 2-um emitters, but with the reliability and ruggedness associated with wider emitters. 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

- 2– and 3-um emitter widths
- >22 dB MAG @ 6 GHz; with 3-um emitters
- Amplifier Ruggedness: VSWR 70:1 @ 5 V supply
- High Linearity in PA applications
- InGaP Emitter Process for High Reliability and Thermal Stability
- Base Etch Stop for Uniformity
- MOCVD Epitaxy
- 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 & Stacked Capacitors
- Backside Vias Optional
- Validated Models and Design Support

Applications

- Power Amplifiers
- Driver Amplifiers
- Wideband, General Purpose Amplifiers

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TQHBT3 Process Details

TQHBT3 Process Details			
Element	Parameter	Value	Units
HBT Transistor	Emitter Periphery (Standard Cell)	3 x 3 x 30	µm
	2um emitters are also available!		
	Vbe	1.15	V
	Beta	130	
	Ft	40	GHz
	Fmax	65	GHz
	BVcbo	24	V
	BVbeo	7	V
	BVceo	14	V
Interconnect	Metal Layers	3	
MIM Caps (Top Stacked Cap)	Value	1200	pF/mm2
Bottom Stacked Cap	Value	625	pF/mm2
Inductors	Q @ 2 GHz	>20	
Resistors	NiCr	50	Ohms/sq
	Bulk	350	Ohms/sq
Vias	Yes		
Mask Layers	No Vias	14	
	With Vias	16	

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
MIM Capacitor	20	V

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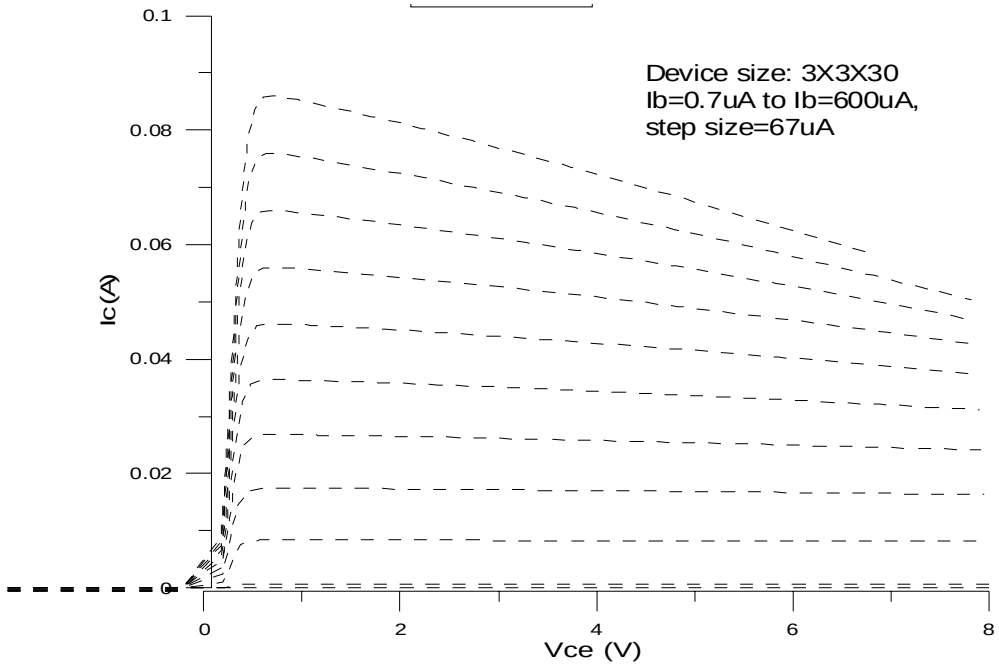
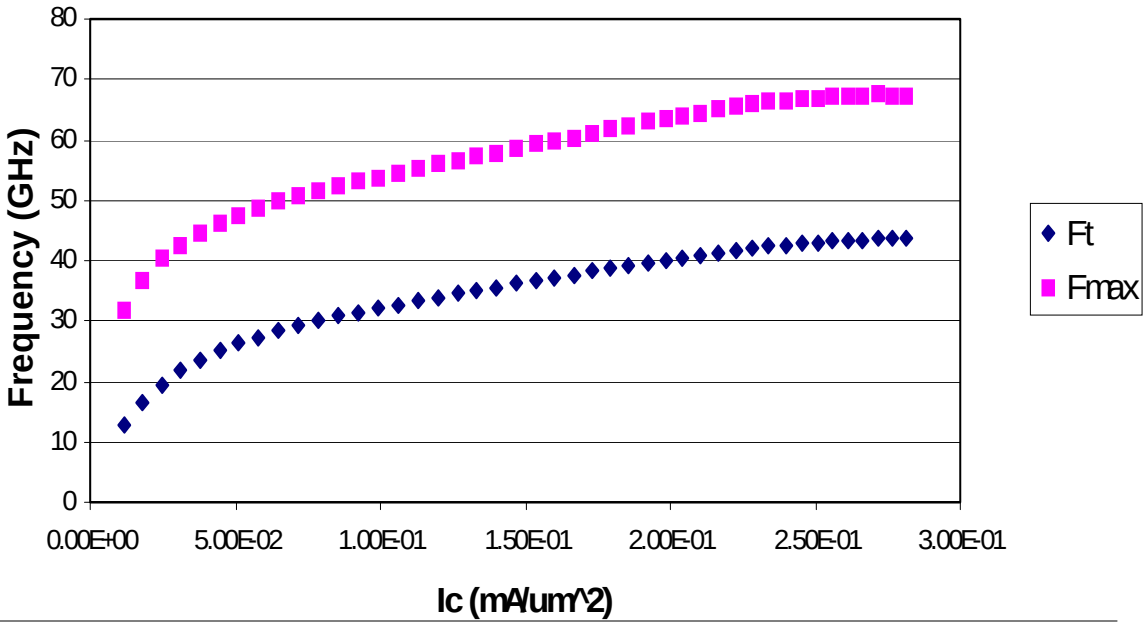
TQHBT3
DC I—V Plot



Ft, Fmax vs Ic
@Vce=3.5V



TQHBT3

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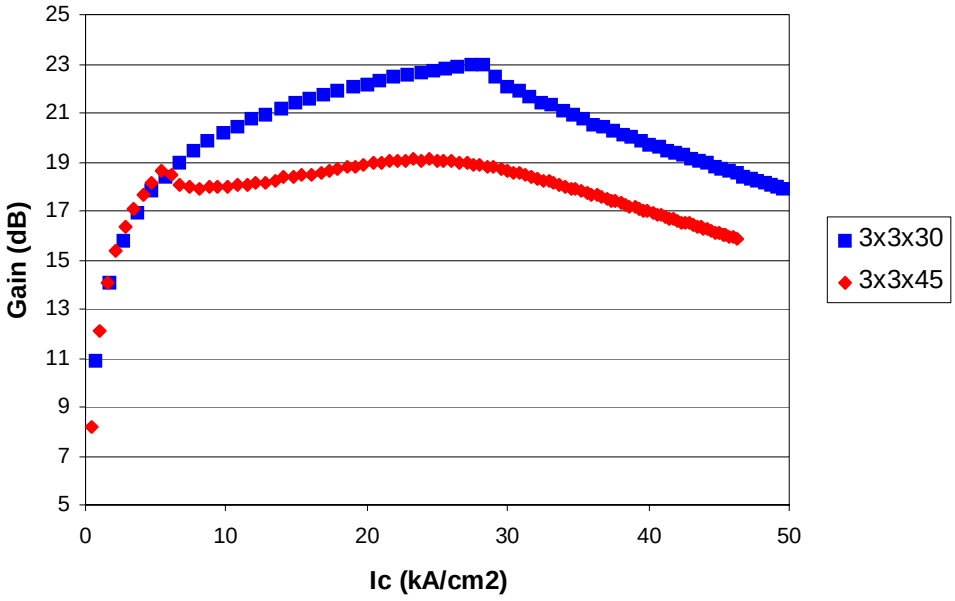
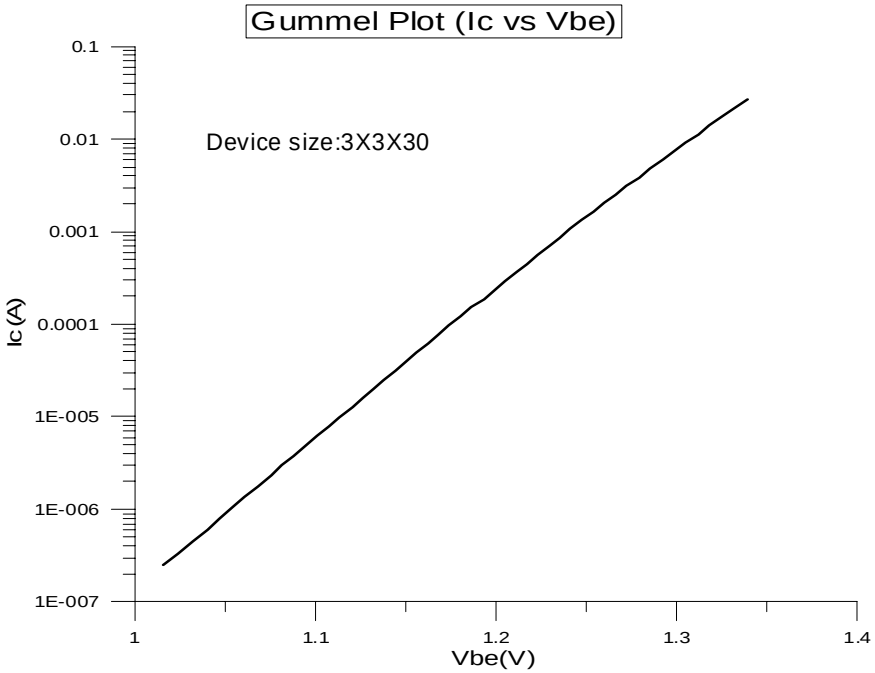
Gain at 6.1 GHz Versus Current Density



Gummel Plot of TQHBT3



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TQHBT3

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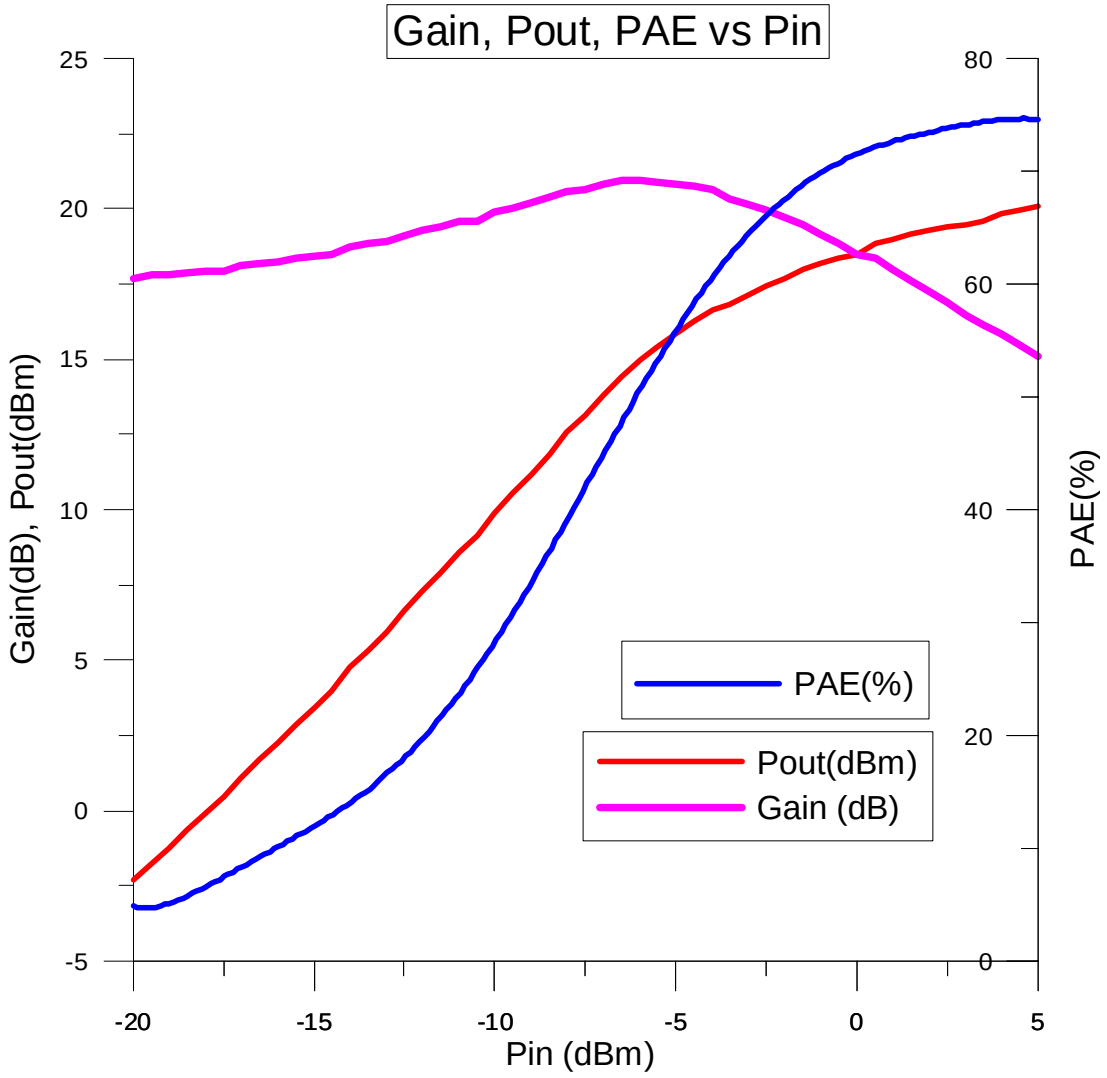
CW
@ 1.9 GHz



Device size: 3X3X30
Freq=1.9GHz
Vce=3.4V, Ic=3.3mA
Load Gamma @ 1.9GHz = 0.43<24.7
Source Gamma @ 1.9GHz = 0.62<164.7
Load Gamma @ 3.8GHz = 0.59<-171.6
Source Gamma @ 3.8GHz = 0.71<17.1

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TQHBT3

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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
  - 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 2nd-generation, TriQuint-Modified Gummel-Poon Model Available Now
  - Agilent ADS & AWR MWO
- Process Variation Models available now
- Layout Files Available for:
  - ICED & Cadence
- Layout Rule Sets for Design Rule & Layout versus Schematic Check Available:
  - ICED & Cadence
- 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

- Process based on TQHBT2.5 production process.
- Full wafer level, process and packaged part qualification complete for TQHBT3. Contact TriQuint for relevant reports.
- 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
- 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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