

0.35- μ m 3MI Process Cross Section

General Description

The 0.35- μ m Power pHEMT 3MI (3-metal-interconnect) process utilizes delta gates in conjunction with a pHEMT material structure. This process offers the highest power density of any TriQuint pHEMT process without sacrificing efficiency or gain through 20 GHz. This process is capable of handling drain voltages up to 12V. Passives include 3 thick-metal interconnect layers, precision TaN resistors, GaAs resistors, through-substrate vias and 3 MIM capacitance densities. The via-under-cap process aids in size compaction and offers excellent grounds at higher frequencies. Air bridges produce minimal interconnect capacitance. The protective overcoat layer provides environmental robustness.

Features

- 0.35- μ m amplifier transistors
- 0.35- μ m switch transistors
- 0.35- μ m, 2- μ m and 4- μ m diodes
- High-Q passives
- 3 MIM capacitance densities
- TaN resistors
- GaAs resistors
- High-density interconnects
- 3 metal layers
- Air bridges
- Substrate vias
- Protective overcoat
- Operation up to $V_d = 12$ V

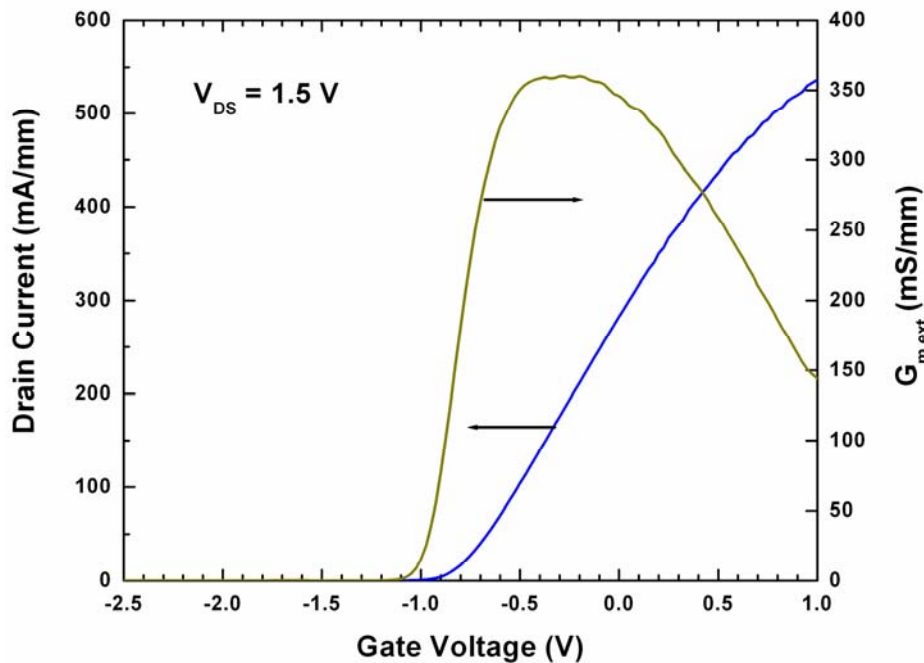
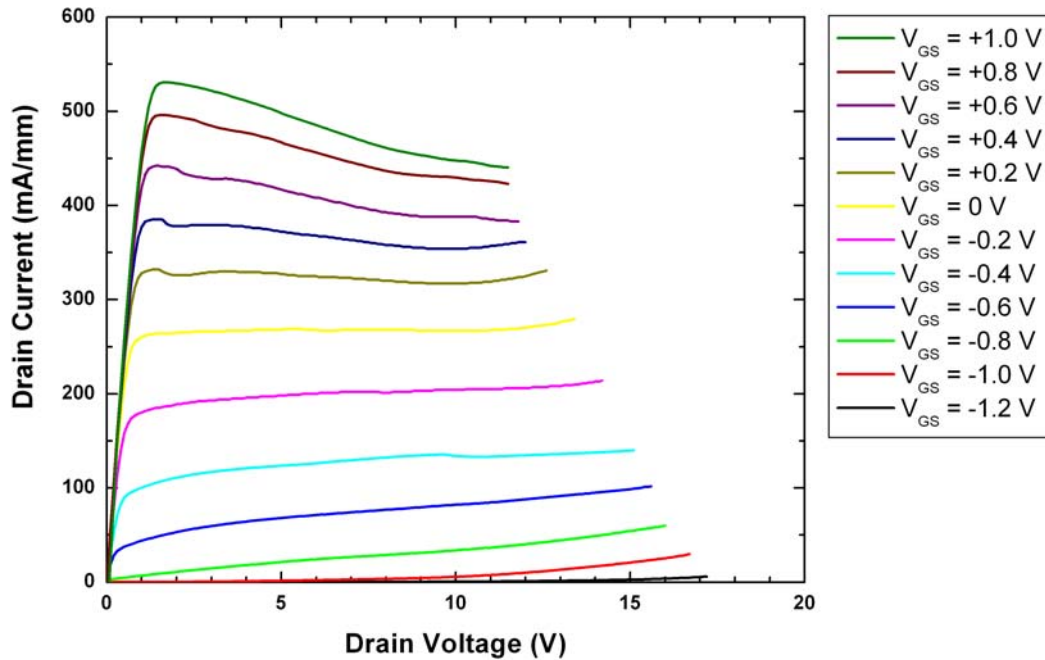
Applications

- Up to 20 GHz
- Communications
- Military
- Power amplifiers
- Driver amplifiers
- Low-noise amplifiers
- AGC amplifiers
- Limiting amplifiers
- Transimpedance amplifiers
- Differential amplifiers
- Digital and analog phase shifters
- Digital and analog attenuators
- Mixers (up and down converters)
- Multipliers
- Switches
- Oscillators

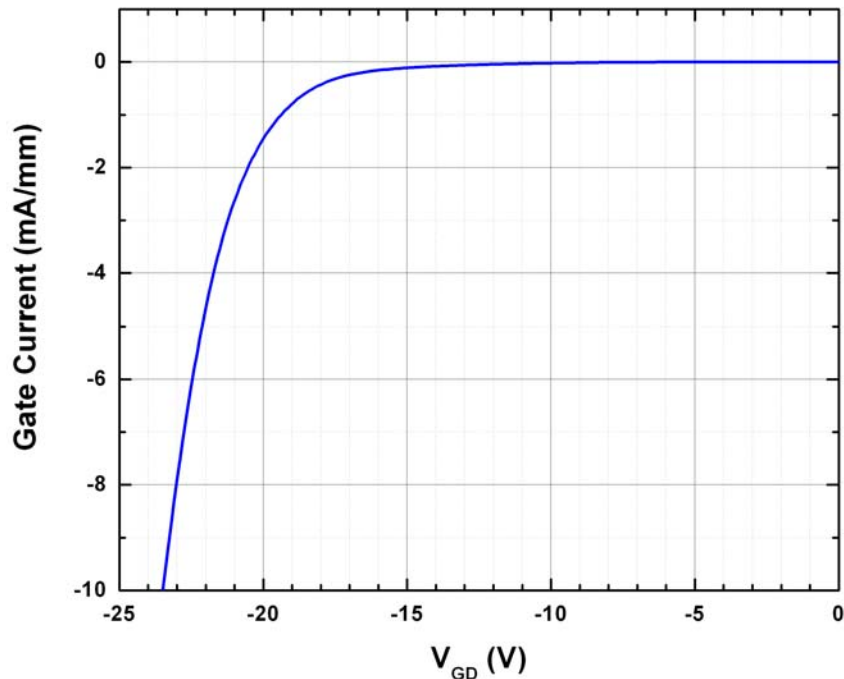
0.35- μm pHEMT 3MI Process Details			
Element	Parameter	Typical Value	Units
FETs	I_{dss}	300	mA/mm
	G_{m}	375	mS/mm
	V_{bd}	-22	V
	V_{p}	-1	V
MIM capacitors	density	240	pF/mm ²
		300	pF/mm ²
		1200	pF/mm ²
Capacitors over vias		yes	
TaN resistors	sheet resistance	50	Ohms/sq
GaAs resistors	sheet resistance	160	Ohms/sq
Vias		yes	
Substrate	thickness	100	μm

FET Models Available		
Gate Pitch (μm)	Gate Fingers	FET Sizes (μm)
26 26	4	300
26 26	10	800 & 1200
32 32	8	640 & 1200
32 32	10	800 & 1200
32 32	12	960, 1440 & 1800
37 37	12	1800

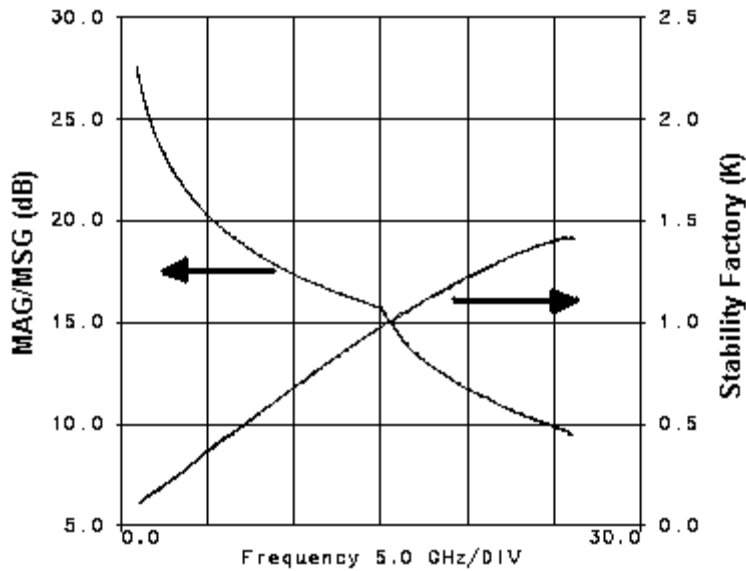
0.35- μ m Power pHEMT 3MI
DC Characteristics



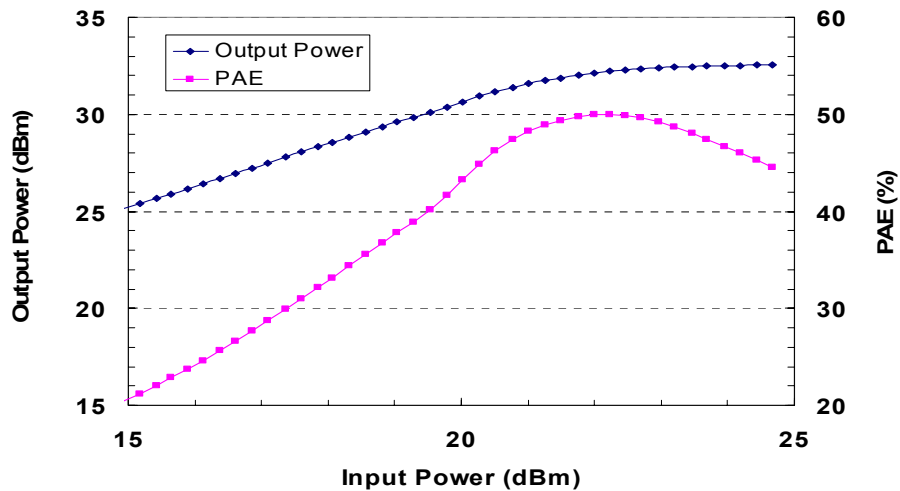
0.35- μ m Power pHEMT 3MI
DC Breakdown Characteristics



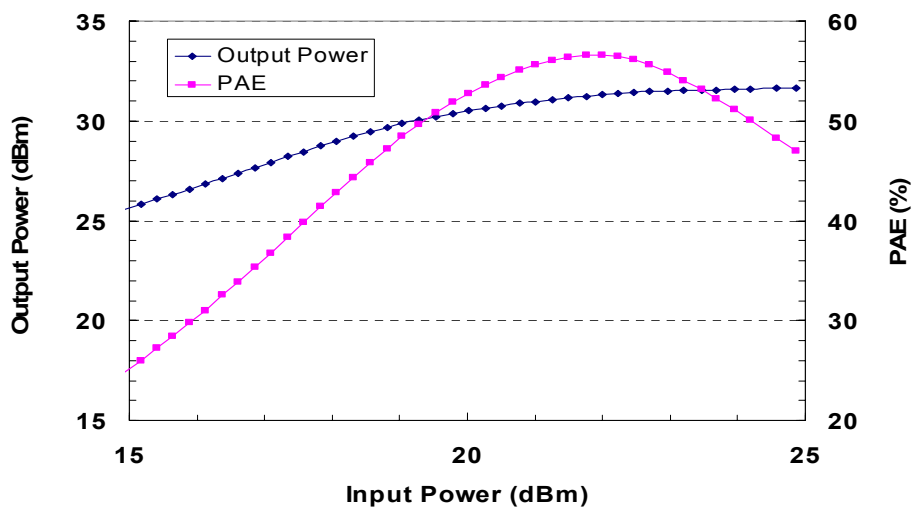
0.35- μ m Power pHEMT 3MI
Maximum Available Gain/Stable Gain (MAG/MSG)
4 x 75 μ m FET @ 12 Volts, 75 mA/mm



0.35- μ m Power pHEMT 3MI
Power Tuned Load
1200 μ m FET @ 12 Volts, 90 mA, 10 GHz



0.35- μ m Power pHEMT 3MI
Efficiency Tuned Load
1200 μ m FET @ 12 Volts, 90 mA, 10 GHz



Prototyping and Development

- Prototype Chip Option (PCO)
 - Shared mask set
 - Run often
 - Backside via process included
 - PCM (process control monitor) qualified wafers
 - For PCO schedules, please visit http://www.triquint.com/prodserv/divisions/foundry/new/proto_sched_pco.cfm
- Prototype Wafer Option (PWO)
 - Customer-specific masks
 - Customer schedule
 - 2 wafers delivered
 - Backside vias included
 - PCM (process control monitor) qualified wafers

Design Tools

- Device libraries of circuit elements:
 - FETs
 - Thin-film and implanted resistors
 - Capacitors
 - Inductors
- Agilent ADS design kit
- MASC Library
- AWR Microwave Office library

Training

- GaAs design classes:
 - Half-day introduction upon request
 - 3 day technical training upon request at the TriQuint Texas facility

Process Status

- 0.35- μ m Power pHEMT 3MI is fully released and qualified
- Contact TriQuint or visit <http://www.triquint.com/company/quality/> for more information on quality and reliability.

Applications Services

- Tiling of GDSII stream files including PCM (process control monitor)
- Design rule checking
- Layout versus schematic checking
- Engineering:
 - On-wafer DC test
 - On-wafer RF test
 - Thermal analysis
 - Yield enhancement
- Part qualification
- Failure analysis

Manufacturing Services

- Mask making
- Wafer thinning
- Wafer dicing
- Substrate vias
- DC die-sort testing
- RF on-wafer testing
- Final visual testing