

TQTRx Process Cross-Section

General Description

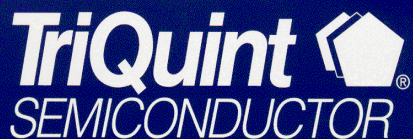
TriQuint's TQTRx is an advanced 0.6 μm enhancement/depletion mode MESFET process with an integrated power MESFET, general purpose D-Mode MESFET and Enhancement Mode MESFET. This process supports RF and mixed mode applications from RF to microwave frequencies. High density interconnections are accomplished with two thick global and one local metal interconnect layers. The three metal layers are encapsulated in a high performance dielectric that allows wiring flexibility and plastic packaging simplicity. Precision NiCr resistors and high value MIM capacitors are included. The TQTRx process is currently TriQuint's highest volume process and is manufactured on 150-mm (6 inch) wafers.

Features

- 0.6 μm Gate Length MESFET Process
- 4 Active Devices:
 - Power & Gain D-FETs
 - E-FET
 - Schottky-Barrier Diodes
- High Density Interconnects:
 - 2 Global and 1 local
 - 6 μm total thickness
- High-Q Passives
- Bulk & Thin Film Resistors
- High Value Capacitors
- Dielectric Encapsulated Metals
- Planarized Surface; simplified plastic packaging
- Substrate Vias Available
- Volume Production Process
- Validated Models and Design Support

Applications

- Flexible Process Supports:
 - Low Supply Voltage Capability
 - 3V PA's, Driver Amps, Upconverters
 - LNAs and Downconverters down to 1V
 - Integrated Transceivers: LNA + Sw + PA, UPC + PA
 - Fiber-Optic TIA and Laser Diode Drivers
- Mobile Phone Front End Blocks:
 - Cell Band
 - PCS Band
 - GSM Band
- WLAN:
 - ISM
 - HYPERLAN2
 - UNII



TQTRx

MESFET Foundry Service

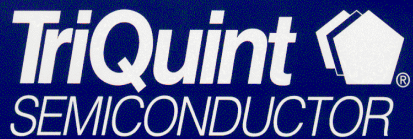
TQTRx Process Details

| Element | Parameter | Value | Units |
|---------------|----------------------------|-------|--------------------|
| Gate Length | (All FETs) | 0.6 | µm |
| E-FET; | Threshold Voltage | +0.15 | V |
| | I _{max} | 90 | mA/mm |
| | G _m | 225 | mS/mm |
| | Breakdown, V _{gd} | 22 | V |
| | F _{min} , 6 GHz | 0.90 | dB |
| D-FET | Pinchoff Voltage | -0.6 | V |
| | I _{dss} | 70 | mA/mm |
| | G _m | 200 | mS/mm |
| | Breakdown, V _{gd} | 18.5 | V |
| | F _{min} , 6 GHz | 0.54 | dB |
| G-FET | Pinchoff Voltage | -2.2 | V |
| | I _{dss} | 270 | mA/mm |
| | I _{max} | 400 | mA/mm |
| | G _m | 170 | mS/mm |
| | Breakdown, V _{gd} | 19 | V |
| | F _{min} , 6 GHz | 0.66 | dB |
| Interconnects | | 3 | Metal Layers |
| N+ Diode | V forward | 0.55 | V |
| MIM Caps | Values | 1200 | pF/mm ² |
| Resistors | NiCr | 50 | Ohms/Sq |
| | Bulk | 700 | Ohms/sq |
| Vias | | Yes | |
| Mask Layers | No Vias | 16 | |
| | With Vias | 18 | |

Maximum Ratings

| | | | |
|-----------------------------|-----------|-------------|-------|
| FET Operating Channel Temp | | -55 to +150 | Deg C |
| Capacitor Breakdown Voltage | - Design | 10 | V |
| | - Typical | 20 | V |

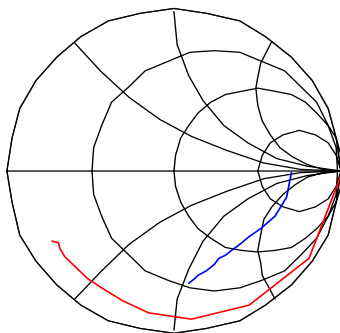
Specifications Subject to Change



TQTRx

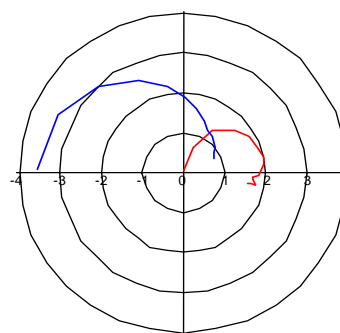
MESFET Foundry Service

GFET
 300 um
 Vds=3V
 50% Idss



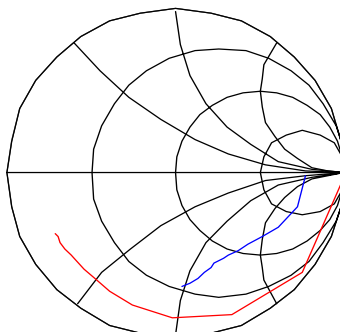
S11
S22

Freq (0.1GHz to 26.1GHz)



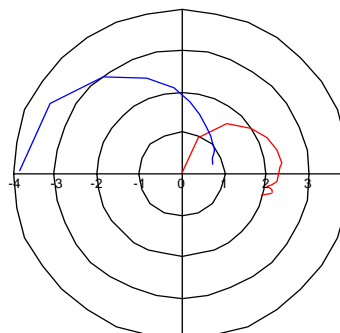
S12 / .05
S21

DFET
 300 um
 Vds=3V
 50% Idss



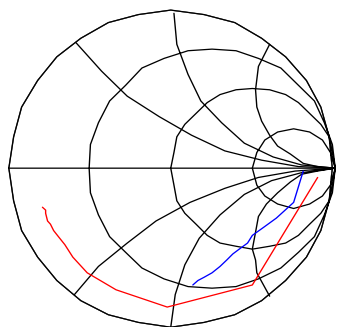
S11
S22

Freq (0.1GHz to 26.1GHz)



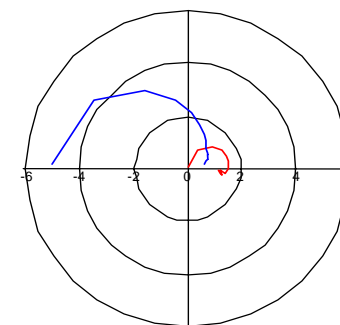
S12 / .05
S21

EFET
 300 um
 Vds=3V
 50% Idmax

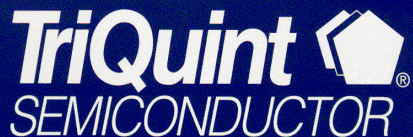


S11
S22

Freq (0.1GHz to 26.1GHz)



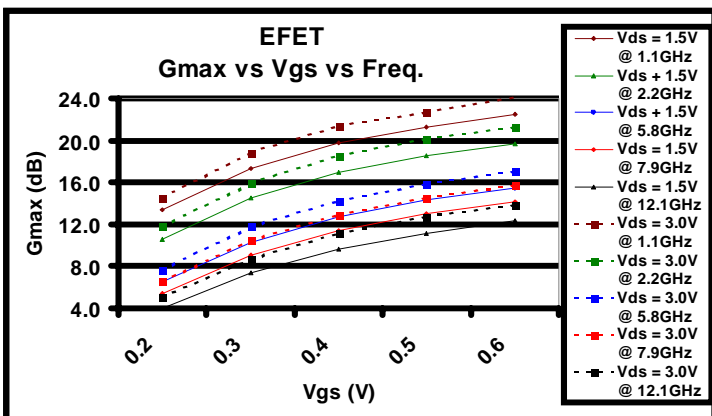
S12 / .05
S21



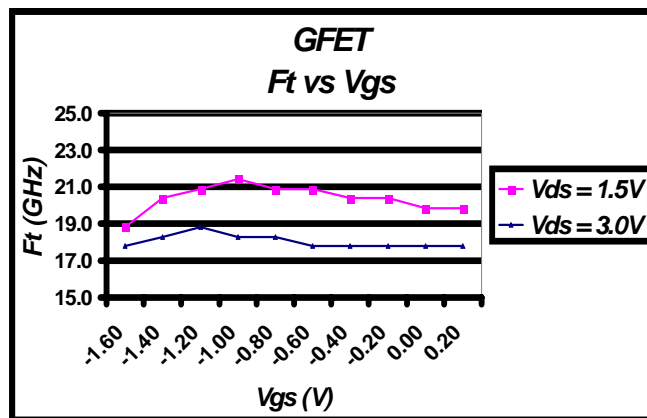
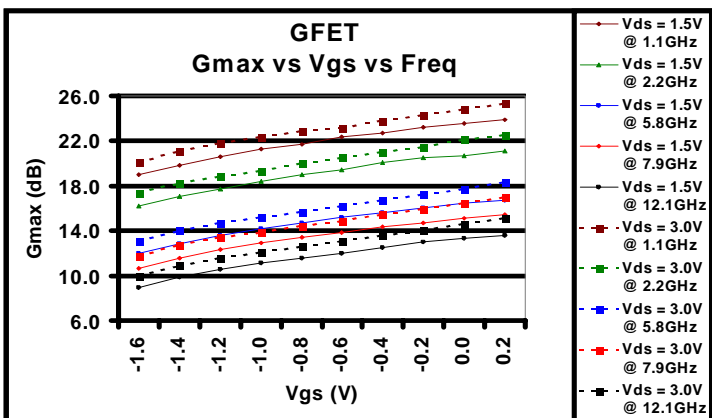
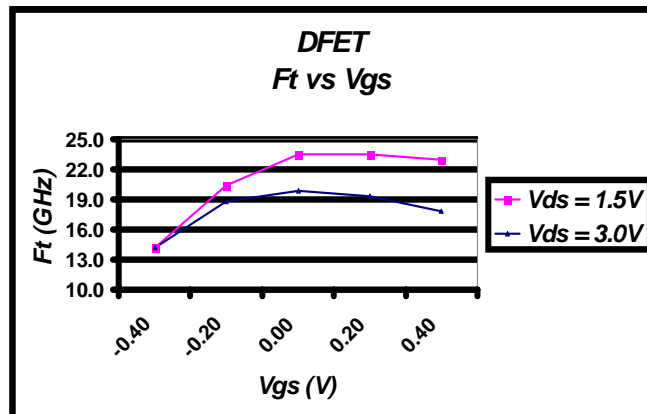
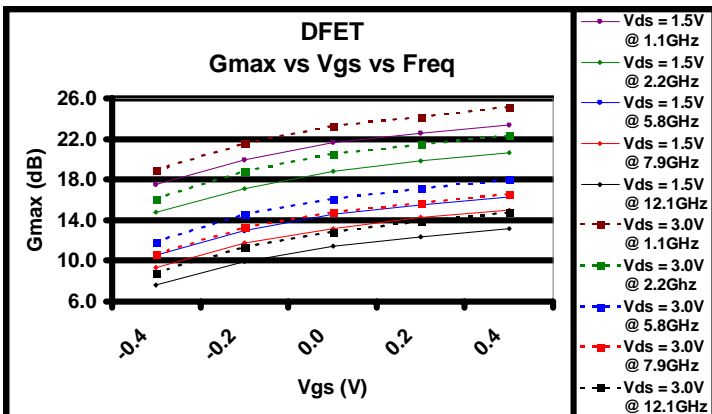
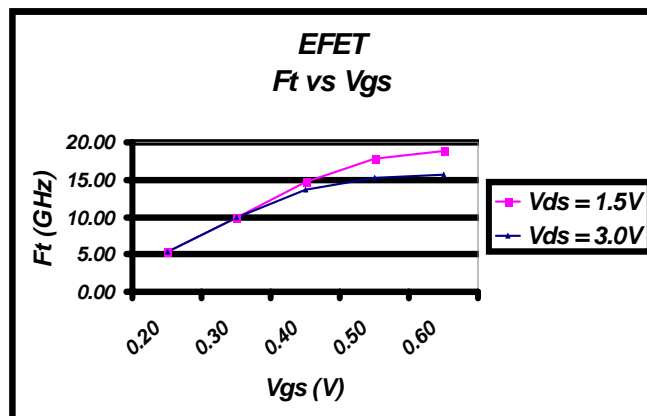
TQTRx

MESFET Foundry Service

Gmax vs Vgs vs Frequency
 300 um FETs; Three Types
 Vds = 1.5 & 3.0 V; T=27°C



Ft versus Vgs;
 300 um FETs; Three Types;
 Vds = 1.5 & 3.0 V; T=27°C

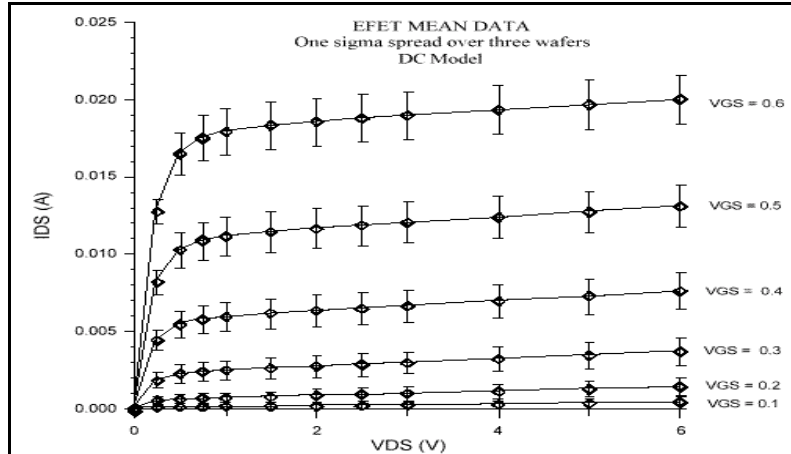




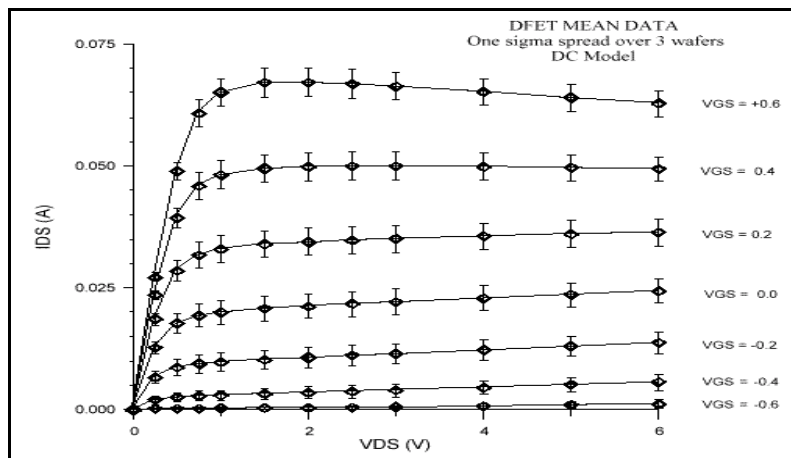
TQTRx

MESFET Foundry Service

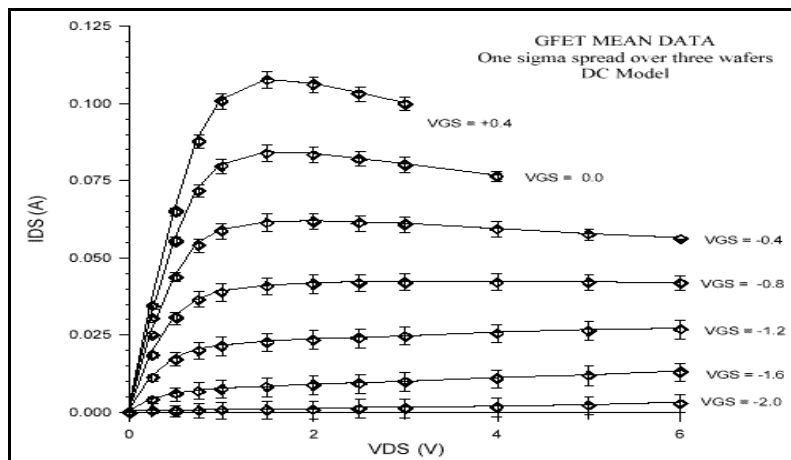
EFET
IV Curves
300 um



DFET
IV Curves
300 um



GFET
IV Curves
300 um



Applications Examples

TQ5M31; 3V Downconverter Mixer IC:

General purpose RFIC mixer downconverter; RF range = 500 to 2,500 MHz; IF output range 45 to 500 MHz; PCS, ISM, GPS, L-Band Satellite and WLAN applications.

| Parameter | Min | Typ | Max | Units |
|-------------------|-----|-----|-----|-------|
| Conversion Gain | | 4.0 | | dB |
| Noise Figure | | 8.5 | | dB |
| Input 3OIP | | 9.0 | | dB |
| DC Supply Current | | 6.2 | | mA |

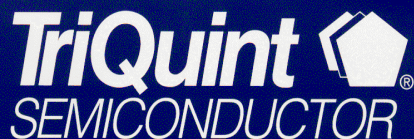
(Full Datasheet at: www.tqs.com/Wireless/Products/TQ5M31/TQ5M31.pdf)

TQ3M31; Dual Band LNA:

For Cellular and PCS band CDMA/AMPS applications; IS-95 and AMPS compliant; On-Chip switches for mode selection.

| Parameter | Typ @ 881 MHz | Typ@ 1960 MHz | Units |
|-------------------|---------------|---------------|-------|
| Gain 881 MHz | 13.0 | 13.5 | dB |
| Noise Figure | 1.4 | 1.5 | dB |
| Input 3OIP | 12.5 | 9.0 | dBm |
| DC Supply Current | 10.0 | 11.0 | mA |

(Full Datasheet at: www.tqs.com/Wireless/Products/TQ3M31/TQ3M31.pdf)



TQTRx

MESFET Foundry Service

Prototyping and Development

- Prototype Development QuickTurn (PDO):
 - 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 Sensitivity Test (DST) Wafer Run
 - Yield Analysis
 - Design Sensitivity to Process Variation
 - 14 Wafer Start; Spread of Vp Values

Design Tools Available

- Device Library of Circuit Elements: FETs, Diodes, Thin Film and Implanted Resistors, Capacitors, Inductors
- Parameters for "TriQuint's Own Model" (TOM)
- Agilent ADS Design Kit Available Now
- PSPICE and MWO Models Available Now
- Layout Libraries Available for ICED, Cadence and MWO Now
- Verification Kit for ICEeditors 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 & PDO Schedules, please visit: www.triquint.com/foundry/

Process Qualification Status

- TQTRx is fully released and qualified
- Reliability Reports:
 - TQTRx Process Qualification
 - High Power Product Qualification
 - TQTRx Element Qualification Report
- For more information on Quality and Reliability, contact TriQuint or visit www.tqs.com/Manufacturing/OR/bdy_qr-pubs.htm.

Applications Support Services

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

Manufacturing Services

- Mask Making
- Production 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 or Foundry Services Staff for additional information:

E-mail: sales@triquint.com Phone: (503) 615-9000 Fax: (503) 615-8905