POINT NINE
Technologies, Inc.

# D1018 TetraFET

## *100W - 28V - 500MHz*
## GOLD METALIZED MULTI-PURPOSE SILICON DMOS RF FET

### FEATURES

- **METAL GATE**
- **EXTRA LOW Crss**
- **BROAD BAND**
- **SIMPLE BIAS CIRCUITS**
- **LOW NOISE**
- **HIGH GAIN**

### APPLICATIONS

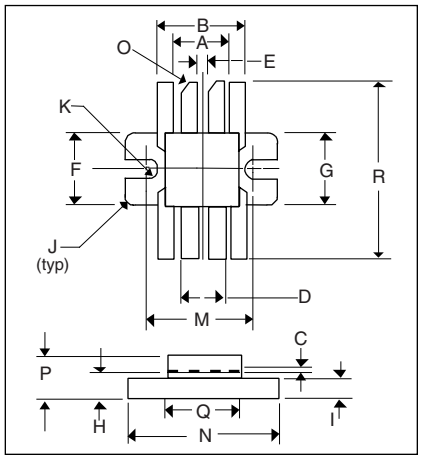
- **HF/VHF/UHF COMMUNICATIONS from DC to 500MHz**

| ABSOLUTE MAXIMUM RATINGS ($T_{CASE}$ = 25°C unless otherwise stated) | | |
|---|---|---|
| $P_D$ | Power Dissipation | 250W |
| $BV_{DSS}$ | Drain-source breakdown voltage | 70V |
| $V_{GSS}$ | Gate-source voltage | ±20V |
| $I_D$ | Drain Current | 15A |
| $T_{stg}$ | Storage temperature | -65 to 150°C |
| $T_j$ | Maximum operating junction temperature | 200°C |
| $R_{THj\text{-}case}$ | Thermal resistance junction-case | Max. 0.7°C/W |

### ELECTRICAL CHARACTERISTICS ($T_{CASE}$ = 25°C unless otherwise stated)

| Parameter | | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| | | PER SIDE | | | | |
| $BV_{DSS}$ | Breakdown voltage, drain source | $V_{GS}$=0 $I_D$=100mA | 70 | | | Vdc |
| $I_{DSS}$ | Drain leakage current | $V_{DS}$=28V $V_{GS}$=0 | | | 3 | mAdc |
| $I_{GSS}$ | Gate leakage current | $V_{GS}$=20V $V_{DS}$=0 | | | 1 | µAdc |
| $V_{GS(th)}$ | Gate threshold voltage | $I_D$=10mA $V_{DS}$=$V_{GS}$ | 1 | | 7 | Vdc |
| gfs | Transconductance (300µs pulse) | $V_{DS}$=10V $I_D$=3A | 2.4 | | | Mhos |
| | | TOTAL DEVICE | | | | |
| $G_{PS}$ | Common source power gain | $P_O$=100W | 10 | | | dB |
| η | Drain efficiency | $V_{DS}$=28V $I_{DQ}$=1.2A | 50 | | | % |
| VSWR | Load mismatch tolerance | f=500MHz | 20:1 | | | |
| | | PER SIDE | | | | |
| $C_{iss}$ | Input capacitance | $V_{DS}$=0V $V_{GS}$=-5V f=1MHz | | | 180 | pF |
| $C_{oss}$ | Output capacitance | $V_{DS}$=28V $V_{GS}$=0 f=1MHz | | | 90 | pF |
| $C_{rss}$ | Reverse transfer capacitance | $V_{DS}$=28V $V_{GS}$=0 f=1MHz | | | 7.5 | pF |

### DIMENSIONS




| DM | Millimeter | TOL | Inches | TOL |
|---|---|---|---|---|
| A | 9.14 | .13 | .360 | .005 |
| B | 12.70 | .13 | .500 | .005 |
| C | 0.13 | .03 | .005 | .001 |
| D | 6.86 | .13 | .270 | .005 |
| E | 0.76 | .13 | .030 | .005 |
| F | 9.78 | .13 | .385 | .005 |
| G | 10.16 | .13 | .400 | .005 |
| H | 4.19 | .13 | .165 | .005 |
| I | 3.18 | .13 | .125 | .005 |
| J | 1.52R | .13 | .060R | .005 |
| K | 1.65R | .13 | .065R | .005 |
| M | 16.51 | .13 | .650 | .005 |
| N | 22.86 | .13 | .900 | .005 |
| O | 45° | 5° | 45° | 5° |
| P | 6.35 | .64 | .250 | .025 |
| Q | 10.77 | .13 | .424 | .005 |
| R | 19.05 | .25 | .750 | .010 |

**HAZARDOUS MATERIAL WARNING**

The ceramic portion of the device between leads and metal flange is beryllium oxide. Beryllium oxide dust is highly toxic and care must be taken during handling and mounting to avoid damage to this area. THESE DEVICES MUST NEVER BE THROWN AWAY WITH GENERAL INDUSTRIAL OR DOMESTIC WASTE.

U.S. PATENTS 5,121,176 & 5,179,032
GLOBAL PATENTS PENDING

2697 Lavery Court #8 • Newbury Park, CA 91320 • (805) 375-6600 • Fax: (805) 375-6602 • www.point9.com • www.rfmosfet.com

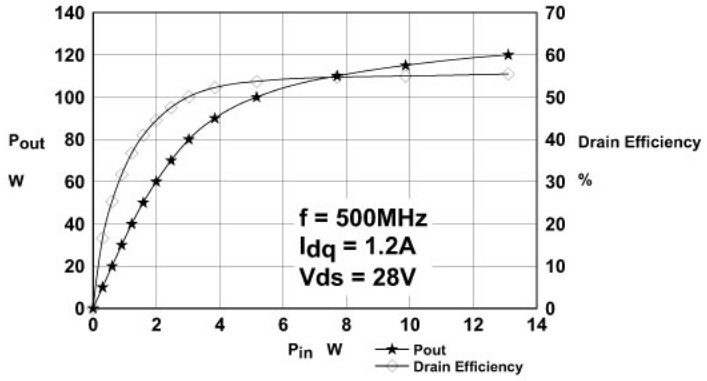



**Figure 1**
Power Output and Efficiency vs Input Power

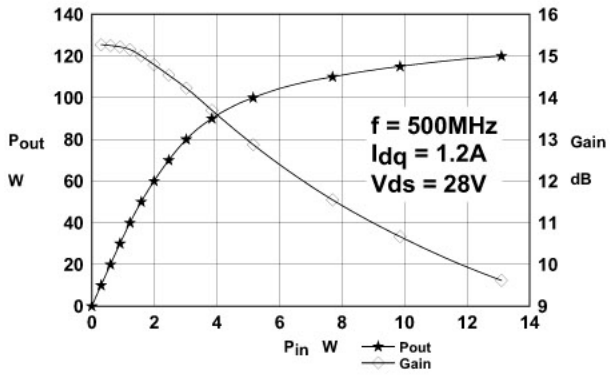



**Figure 2**
Power Output and Gain vs Input Power

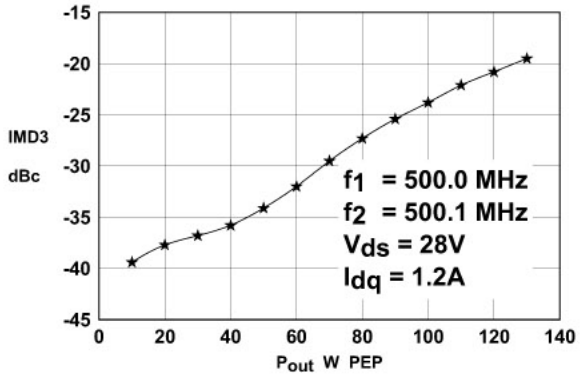



**Figure 3**
IMD vs. Output Power

## OPTIMUM SOURCE AND LOAD IMPEDANCE

| Frequency MHz | $Z_S$ Ω | $Z_L$ Ω |
|---|---|---|
| 500 | 2.0 - j2.2 | 2.6 - j0.6 |

**N.B. Impedances measured terminal to terminal**

## Typical S Parameters

! Vds=28V, Idq=0.3A
# MHZ S MA R 50

| !Freq | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| !MHz | mag | ang | mag | ang | mag | ang | mag | ang |
| 100 | 0.86 | -157.3 | 5.98 | 55.7 | 0.01 | 20.3 | 0.73 | -139.7 |
| 150 | 0.9 | -163.2 | 3.22 | 43.1 | 0.01 | 78 | 0.82 | -149.7 |
| 200 | 0.93 | -167.9 | 1.98 | 36.9 | 0.02 | 98.2 | 0.88 | -156.3 |
| 250 | 0.95 | -170.4 | 1.39 | 31 | 0.03 | 101 | 0.91 | -160.2 |
| 300 | 0.95 | -172.7 | 1.1 | 29.6 | 0.05 | 103.7 | 0.93 | -163.6 |
| 350 | 0.96 | -174.5 | 0.82 | 23.9 | 0.06 | 99.9 | 0.94 | -166.1 |
| 400 | 0.96 | -176.2 | 0.69 | 23.9 | 0.08 | 100.2 | 0.95 | -168.1 |
| 450 | 0.97 | -177.5 | 0.55 | 22.1 | 0.09 | 98.3 | 0.96 | -170.1 |
| 500 | 0.97 | -179.4 | 0.51 | 21 | 0.11 | 95.6 | 0.97 | -171.6 |
| 550 | 0.97 | 179.8 | 0.43 | 19.1 | 0.13 | 90.8 | 0.97 | -173.3 |
| 600 | 0.96 | 178.8 | 0.4 | 15.1 | 0.15 | 82 | 0.97 | -174.5 |
| 650 | 0.98 | 177.5 | 0.35 | 15.8 | 0.17 | 83.5 | 0.98 | -175.7 |
| 700 | 0.99 | 175.4 | 0.31 | 11 | 0.19 | 76.8 | 1 | -178.4 |
| 750 | 0.99 | 173 | 0.27 | 14.2 | 0.21 | 75.1 | 1.01 | 178.8 |
| 800 | 1 | 170.5 | 0.24 | 16.6 | 0.22 | 71.5 | 1 | 176.1 |
| 850 | 0.99 | 168.1 | 0.24 | 22.7 | 0.25 | 72.6 | 0.99 | 173.3 |
| 900 | 1 | 166.1 | 0.24 | 23.7 | 0.3 | 68.8 | 0.99 | 170.6 |
| 950 | 1 | 163.9 | 0.25 | 23.2 | 0.34 | 62.7 | 0.97 | 167.7 |
| 1000 | 0.99 | 161.6 | 0.25 | 21.7 | 0.37 | 56.4 | 0.96 | 166.1 |

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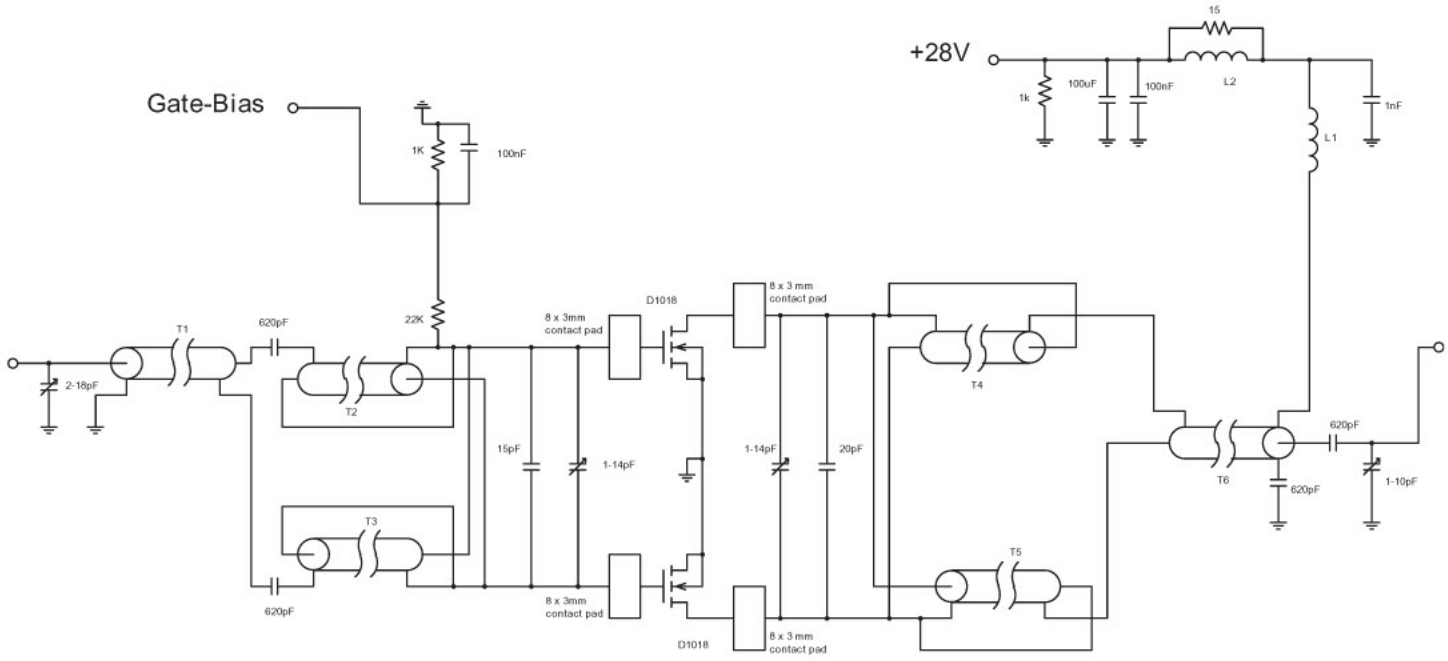


## 500MHz TEST FIXTURE

| | |
|---|---|
| **T1,6** | **65mm 50ohm UT85 semi-rigid coax** |
| **T2,3,4,5** | **75mm 15 ohm UT85-15 semi-rigid coax** |
| **L1** | **6 turns 21 swg enamelled copper wire, 3mm id.** |
| **L2** | **8.5 turns 19swg enamelled copper wire on Fair-Rite FT82-43 core** |
| **T6** | **Placed through Ferronics 12-360-K ferrite bead** |

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*D1018

*PSPICE MODEL FOR POINT NINE RF N-CHANNEL VERTICAL DMOS POWER FET
*May 2004


*                  ____GATE
*                  I   ____DRAIN
*                  I   I   ____SOURCE
*                  I   I   I
.SUBCKT D1018  10  20  30
*Cin1,Cin2 & Lin model the input side of the package
Cin1   10    30    0.47p
Lin    10    11    0.67n
Cin2   11    30    0.47p
LG     11    12    0.6n         ;Gate bond wire inductance
CGS    12    13    138p         ;Gate-source capacitance
MOS    14    12    13     13    D1018 L=0.9U W=0.168    ;D G S B LEVEL1
JFET   16    13    14           D1018                   ;D G S
DBODY  13    16                 D1018                   ;P N
LS     13    30    0.3n         ;Source bond wire inductance
CGD    12    16    3p           ;Gate-drain feedback capacitance
*Cout1,Cout2 & Lout model the output side of the package

Cout1   16    30    0.77p
Lout    16    20    1.19n
Cout2   20    30    0.70p

.MODEL D1018  NMOS (VTO=4.76 KP=2.811E-5 LAMBDA=0.032 RD=0.025 RS=0.102)
.MODEL D1018  NJF  (VTO=-4.3 BETA=0.75 LAMBDA=0.54)
.MODEL D1018  D    (CJO=246.6P RS=0.25 VJ=0.7 M=0.35 BV=75)


.ENDS
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