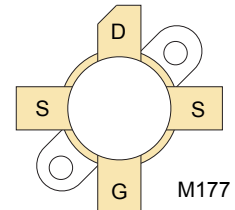



RF POWER VERTICAL MOSFET

The VRF2944 is a gold-metallized silicon n-channel RF power transistor designed for broadband commercial and military applications requiring high power and gain without compromising reliability, ruggedness, or inter-modulation distortion.



FEATURES

- Improved Ruggedness $V_{(BR)DSS} = 170V$
- 400W with 22dB Typ. Gain @ 30MHz, 50V
- Excellent Stability & Low IMD
- Common Source Configuration
- Available in Matched Pairs
- 70:1 Load VSWR Capability at Specified Operating Conditions
- Nitride Passivated
- Refractory Gold Metallization
- Higher Power Version of VRF2933
- Thermally Enhanced Package
- RoHS Compliant 

Maximum Ratings

All Ratings: $T_c = 25^\circ C$ unless otherwise specified

| Symbol | Parameter | VRF2933(MP) | Unit |
|-----------|---|-------------|------------|
| V_{DSS} | Drain-Source Voltage | 170 | V |
| I_D | Continuous Drain Current @ $T_c = 25^\circ C$ | 50 | A |
| V_{GS} | Gate-Source Voltage | ± 40 | V |
| P_D | Total Device dissipation @ $T_c = 25^\circ C$ | 795 | W |
| T_{STG} | Storage Temperature Range | -65 to 150 | $^\circ C$ |
| T_J | Operating Junction Temperature Max | 200 | |

Static Electrical Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|---------------|--|-----|-----|-----|---------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 100mA$) | 170 | 180 | | V |
| $V_{DS(ON)}$ | On State Drain Voltage ($I_{D(ON)} = 25A, V_{GS} = 10V$) | | 1.7 | 2.1 | |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{DS} = 100V, V_{GS} = 0V$) | | | 2.0 | mA |
| I_{GSS} | Gate-Source Leakage Current ($V_{DS} = \pm 20V, V_{GS} = 0V$) | | | 2.0 | μA |
| g_{fs} | Forward Transconductance ($V_{DS} = 10V, I_D = 20A$) | 10 | | | mhos |
| $V_{GS(TH)}$ | Gate Threshold Voltage ($V_{DS} = 10V, I_D = 100mA$) | 2.9 | 3.6 | 4.4 | V |

Thermal Characteristics

| Symbol | Characteristic | Min | Typ | Max | Unit |
|-----------------|-------------------------------------|-----|-----|------|--------------|
| $R_{\theta JC}$ | Junction to Case Thermal Resistance | | | 0.22 | $^\circ C/W$ |

 **CAUTION:** These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Dynamic Characteristics

VRF2944(MP)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|-----------|------------------------------|---|-----|------|-----|------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1MHz$ | | 1050 | | pF |
| C_{oss} | Output Capacitance | | | 520 | | |
| C_{rss} | Reverse Transfer Capacitance | | | 62 | | |

Functional Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|---|--------------------------------|-----|-----|------|
| G_{PS} | $f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 400W$ | 23 | 25 | | dB |
| η_D | $f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 400W$ | | 50 | | % |
| ψ | $f = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 400W$ CW 70:1 VSWR - All Phase Angles, 0.2mSec X 20% Duty Factor | No Degradation in Output Power | | | |

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

Typical Performance Curves

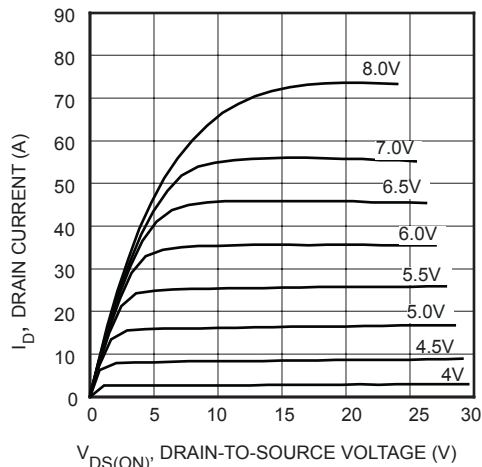


FIGURE 1, Output Characteristics

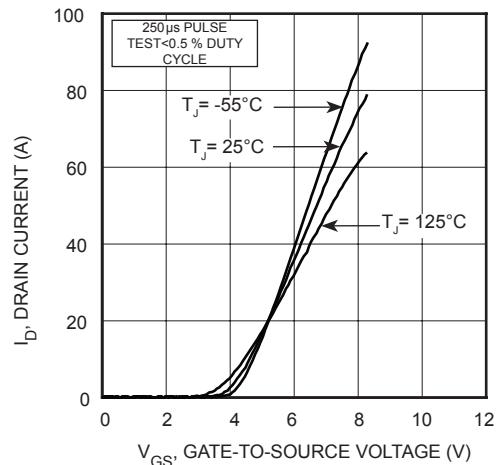


FIGURE 2, Transfer Characteristics

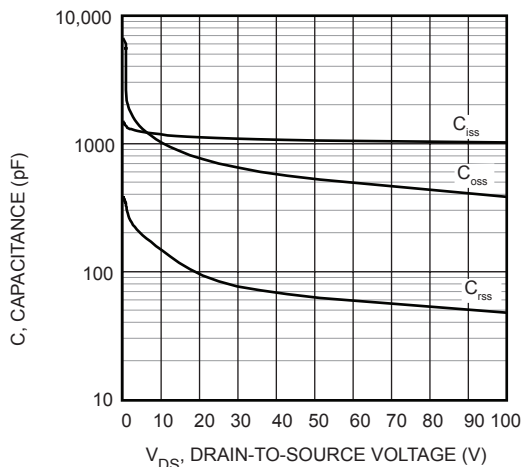


FIGURE 3, Capacitance vs Drain-to-Source Voltage

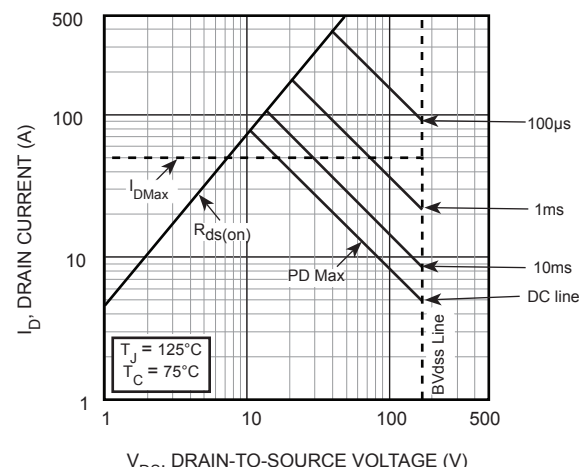


FIGURE 4, Forward Safe Operating Area

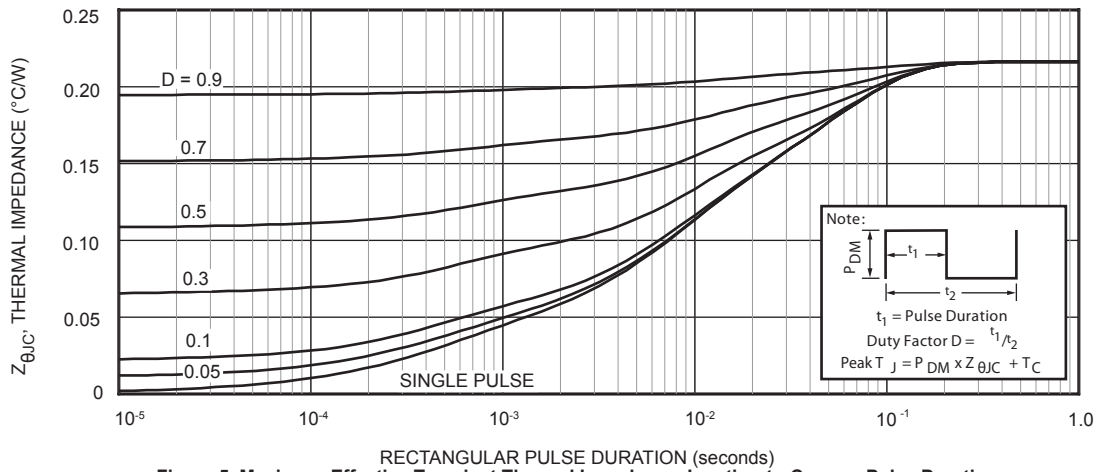


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

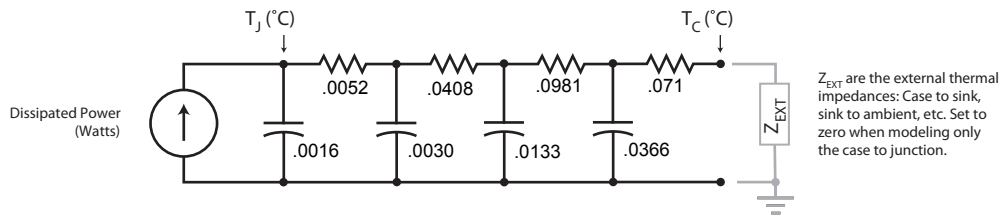


FIGURE 5b, TRANSIENT THERMAL IMPEDANCE MODEL

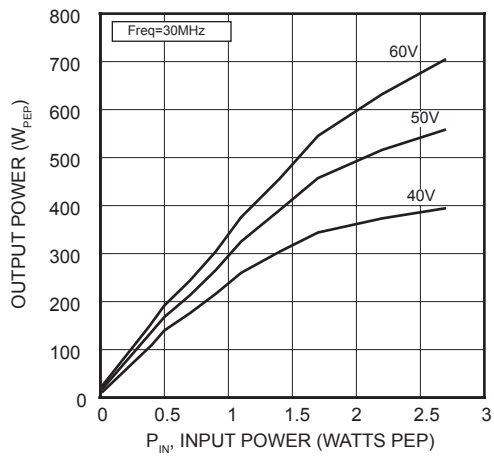


Figure 6. P_{OUT} versus P_{IN}

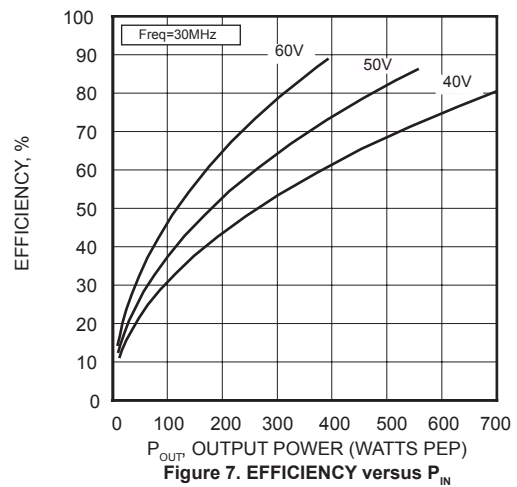


Figure 7. EFFICIENCY versus P_{IN}

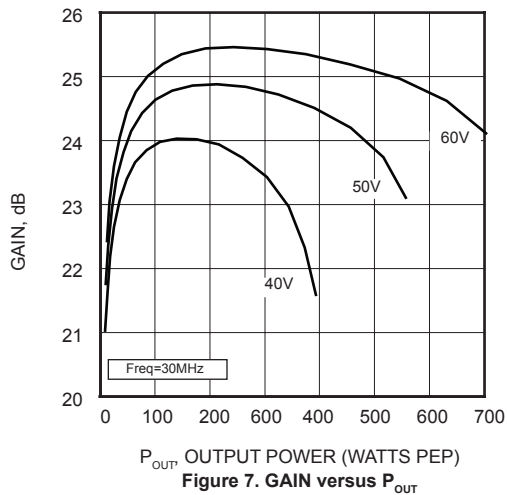


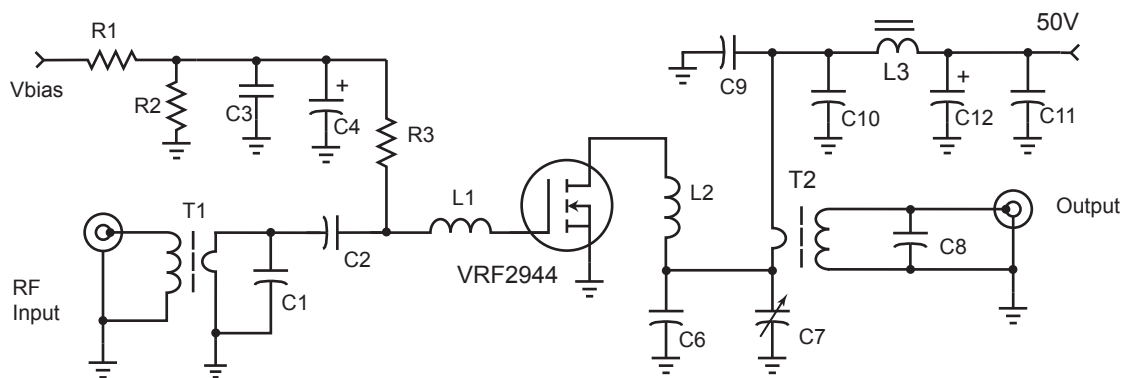
Figure 7. GAIN versus P_{OUT}

Table 1 - Typical Class AB Large Signal Input - Output Impedance

| Freq. (MHz) | Z_{in} | Z_{out} |
|-------------|---------------|-----------------|
| 30 | $4.5 - j 2.5$ | $2.15 - j 2.71$ |

$I_{dq} = 100\text{mA}$ Z_{ol} - Conjugate of optimum load for 400 Watts output at $V_{dd}=150\text{V}$

30 MHz Test Circuit



C1 1200pF ATC100B ceramic
 C2, C3 0.1uF 100V 1206 SMT
 C9-C11 .047uF NPO 100V 1218 SMT
 C6 180 pF metal clad mica
 C7 ARCO 465 mica trimmer
 C8 100 pF ATC 100E ceramic
 C4, C12 10uF 100V Electrolytic
 L1 25 nH - 2t #18 0.2"d .2"l

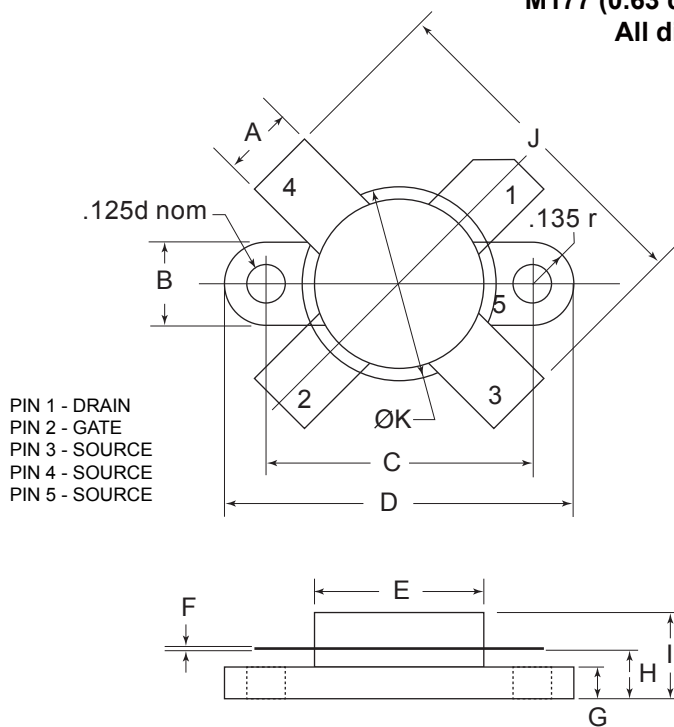
L2 26 nH - 1.5t #12 0.31"d2
 L3 2t #16 on 2x 267300081 .5" bead
 R1-R2 1k Ω 1/4W
 R3 100 Ω 1W
 T1 16:1 transformer 4t #24 teflon on
 RF Parts Co. T1/2 transformer core
 T2 9:1 transformer 3t 2-ply #16 teflon on
 RF Parts Co. T1 transformer core

Adding MP at the end of P/N specifies a matched pair where $V_{GS(TH)}$ is matched between the two parts. V_{TH} values are marked on the devices per the following table.

| Code | Vth Range | Code 2 | Vth Range |
|------|---------------|--------|---------------|
| A | 2.900 - 2.975 | M | 3.650 - 3.725 |
| B | 2.975 - 3.050 | N | 3.725 - 3.800 |
| C | 3.050 - 3.125 | P | 3.800 - 3.875 |
| D | 3.125 - 3.200 | R | 3.875 - 3.950 |
| E | 3.200 - 3.275 | S | 3.950 - 4.025 |
| F | 3.275 - 3.350 | T | 4.025 - 4.100 |
| G | 3.350 - 3.425 | W | 4.100 - 4.175 |
| H | 3.425 - 3.500 | X | 4.175 - 4.250 |
| J | 3.500 - 3.575 | Y | 4.250 - 4.325 |
| K | 3.575 - 3.650 | Z | 4.325 - 4.400 |

V_{TH} values are based on Microsemi measurements at datasheet conditions with an accuracy of 1.0%.

M177 (0.63 dia. SOE) Mechanical Data
All dimensions are $\pm .005$



| DIM | MIN | TYP | MAX |
|-----|-------|-------|-------|
| A | 0.225 | 0.230 | 0.235 |
| B | 0.265 | 0.270 | 0.275 |
| C | 0.860 | 0.865 | 0.870 |
| D | 1.130 | 1.135 | 1.140 |
| E | 0.545 | 0.550 | 0.555 |
| F | 0.003 | 0.005 | 0.007 |
| G | 0.098 | 0.103 | 0.108 |
| H | 0.150 | 0.160 | 0.170 |
| I | | | 0.280 |
| J | 1.080 | 1.100 | 1.120 |
| K | 0.625 | 0.630 | 0.635 |

HAZARDOUS MATERIAL WARNING: The ceramic portion of the device below the lead plane is beryllium oxide. Beryllium oxide dust is highly toxic when inhaled. 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. BeO substrate weight: 0.703g. Percentage of total module weight which is BeO: 9%.

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