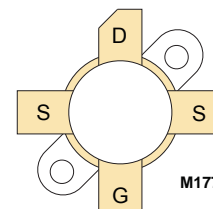



RF POWER VERTICAL MOSFET

The VRF2933 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 $V_{(BR)DSS} = 170V$
- 300W with 22dB Typ. Gain @ 30MHz, 50V
- Excellent Stability & Low IMD
- Common Source Configuration
- Available in Matched Pairs
- **NOW** 14% lower $V_{DS(ON)}$
- 70:1 Load VSWR Capability at Specified Operating Conditions
- Nitride Passivated
- Refractory Gold Metallization
- Improved Replacement for SD2933
- 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 @ $T_c = 25^\circ C$ | 42 | A |
| V_{GS} | Gate-Source Voltage | ± 40 | V |
| P_D | Total Device dissipation @ $T_c = 25^\circ C$ | 648 | 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 ($I_{D(ON)} = 20A, V_{GS} = 10V$) | | 1.8 | 2.4 | |
| 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 ($V_{DS} = 10V, I_D = 20A$) | 8 | | | 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 | | | 0.27 | $^\circ C/W$ |



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

Dynamic Characteristics

VRF2933(MP)

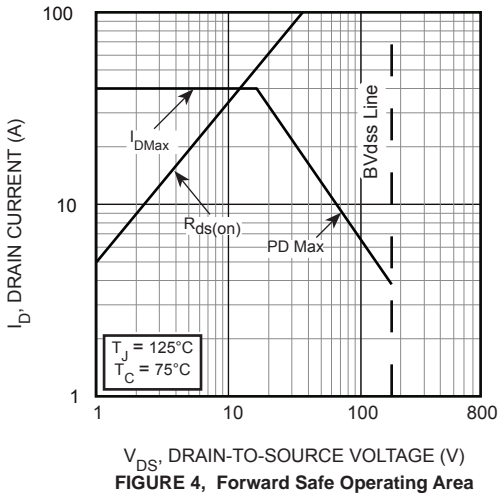
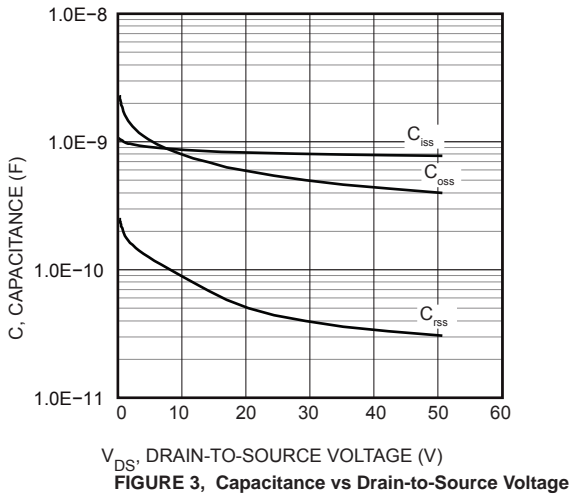
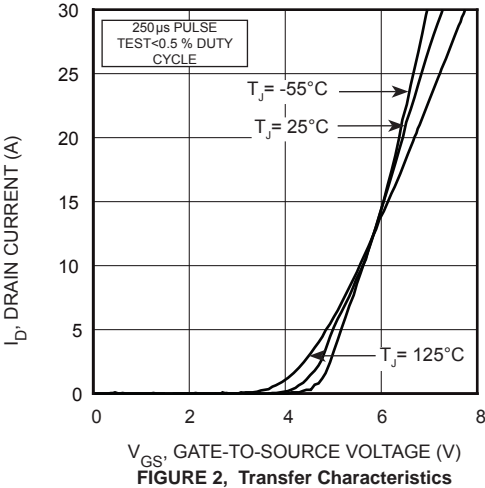
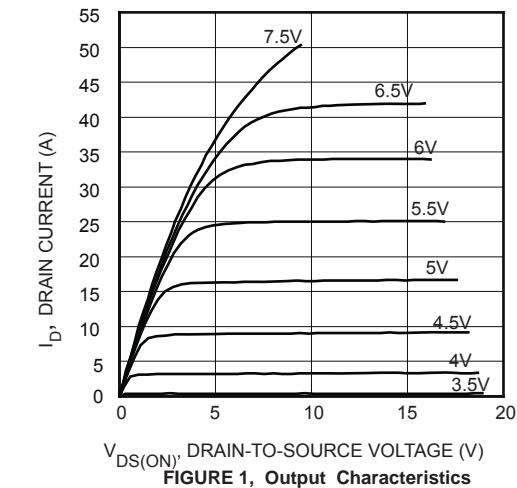
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|-----------|------------------------------|---|-----|-----|-----|------|
| C_{iss} | Input Capacitance | $V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1MHz$ | | 740 | | pF |
| C_{oss} | Output Capacitance | | | 400 | | |
| C_{rss} | Reverse Transfer Capacitance | | | 32 | | |

Functional Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|---|--------------------------------|-----|-----|------|
| G_{PS} | $f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 300W$ | 20 | 25 | | dB |
| η_D | $f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 300W$ CW | | 50 | | % |
| ψ | $f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 300W$ CW, 70:1 VSWR - All Phase Angles, 0.2 mSec 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



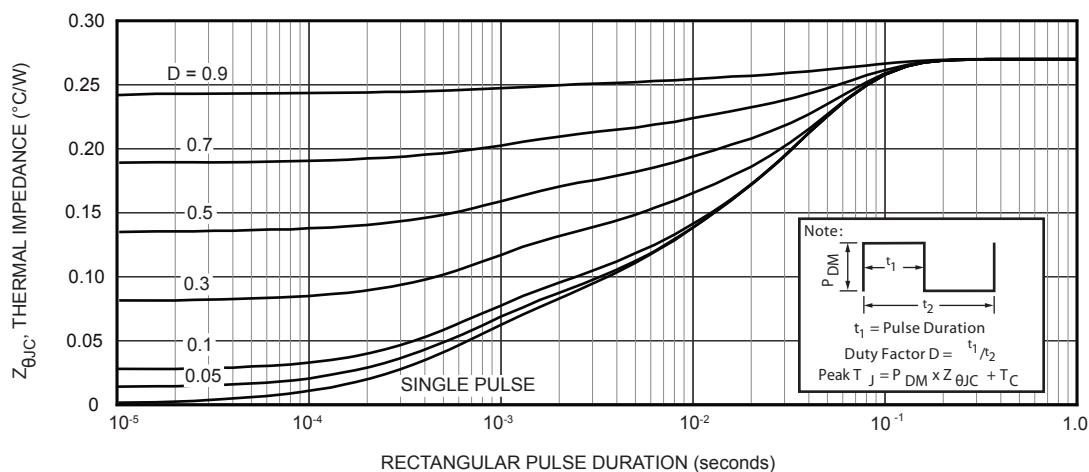


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

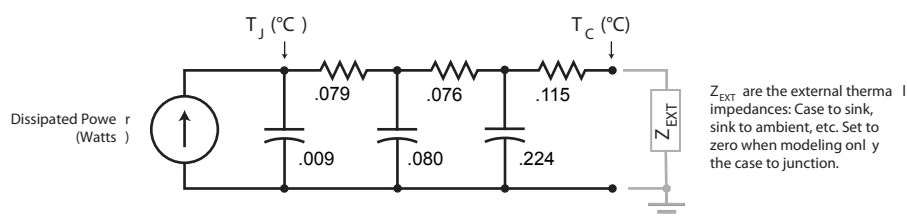


FIGURE 5b, TRANSIENT THERMAL IMPEDANCE MODEL

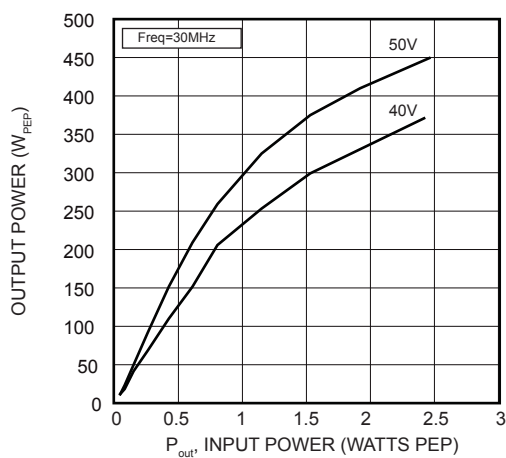
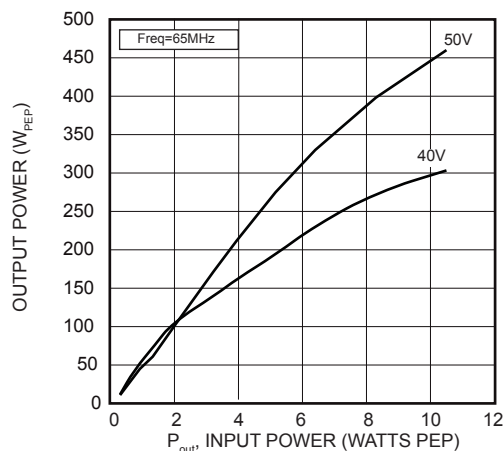
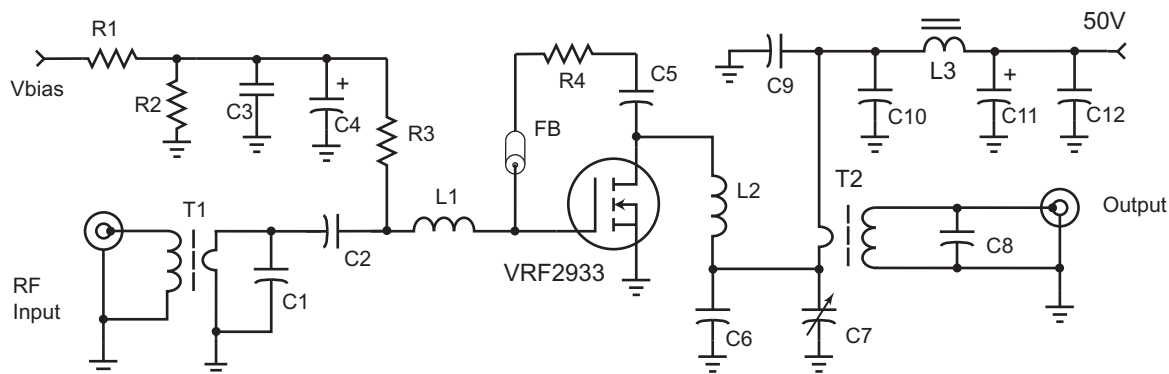
Figure 6. P_{OUT} versus P_{IN} Figure 7. P_{OUT} versus P_{IN}

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

| Freq. (MHz) | Z_{in} | Z_{out} |
|-------------|---------------|--------------|
| 2 | 23.6 - j 5.5 | 4.0 - j 0.1 |
| 13.5 | 7.6 - j 10.1 | 3.9 - j 0.6 |
| 27.1 | 3.5 - j 6.0 | 3.7 - j 1.1 |
| 40.7 | 2.5 - j 4.0 | 3.3 - j 1.5 |
| 65 | 1.95 - j 2.07 | 2.6 - j 1.9 |
| 100 | 1.8 - j 0.66 | 1.76 - j 0.2 |
| 150 | 1.78 + j 0.5 | 1.03 + j 1.7 |

 Z_{IN} - Gate shunted with 25 Ω $I_{dq} = 250\text{mA}$ Z_{OL} - Conjugate of optimum load for 300 Watts output at $V_{dg}=50\text{V}$

30 MHz Test Circuit



C1 1800pF ATC100B ceramic
 C2, C3, C5, C9, C10, C12 0.1uF 100V
 C6 680 pF metal clad 500V mica
 C7 ARCO 467 mica trimmer
 C8 100 pF ATC 100E ceramic
 C4, C11 10uF 100V Electrolytic
 FB small ferrite bead $\mu_i = 125$
 L1 20 nH 2t #18 0.188"d .2"l
 L2 38 nH - 2.5t #14 enam. .25" dia.

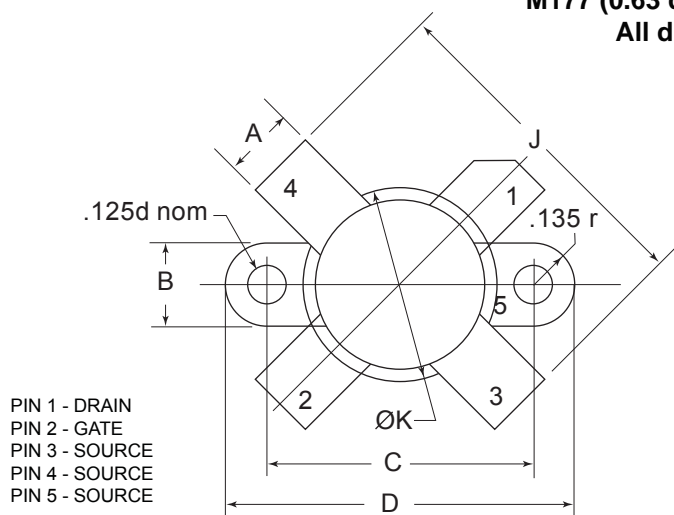
L3 2t #16 on 2x 267300081 .5" bead
 R1-R2 1k Ohm 1/4W
 R3 100 Ohm 1W
 R4 470 Ohm "low inductance" 3W
 T1 16:1 transformer 4t #20 teflon on
 RF Parts Co. T1/2 transformer core
 T2 9:1 transformer 3t #16 teflon on
 RF Parts Co. T1 transformer core

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 ± 0.005



| 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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