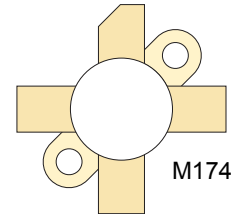



## RF POWER VERTICAL MOSFET

The VRF151 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  $V_{(BR)DSS} = 170V$
- 150W with 22dB Typical Gain @ 30MHz, 50V
- 150W with 14dB Typical Gain @ 175MHz, 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
- High Voltage Replacement for MRF151
- RoHS Compliant 

### Maximum Ratings

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


| Symbol    | Parameter                                     | VRF151(MP) | Unit |
|-----------|---|------------|------|
| $V_{DSS}$ | Drain-Source Voltage                          | 170        | V    |
| $I_D$     | Continuous Drain Current @ $T_c = 25^\circ C$ | 16         | A    |
| $V_{GS}$  | Gate-Source Voltage                           | $\pm 40$   | V    |
| $P_D$     | Total Device dissipation @ $T_c = 25^\circ C$ | 300        | W    |
| $T_{STG}$ | Storage Temperature Range                     | -65 to 150 | °C   |
| $T_J$     | Operating Junction Temperature                | 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 ( $I_{D(ON)} = 10A, V_{GS} = 10V$ )       |     | 2.0 | 3.0 |         |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{DS} = 100V, V_{GS} = 0V$ ) |     |     | 1   | mA      |
| $I_{GSS}$     | Gate-Source Leakage Current ( $V_{GS} = \pm 20V, V_{DS} = 0V$ )  |     |     | 1.0 | $\mu A$ |
| $g_{fs}$      | Forward Transconductance ( $V_{DS} = 10V, I_D = 5A$ )            | 5.0 |     |     | 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 |     |     | 0.60 | °C/W |

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

## Dynamic Characteristics

VRF151(MP)

| Symbol    | Parameter                    | Test Conditions                                | Min | Typ | Max | Unit |
|-----------|------------------------------|--|-----|-----|-----|------|
| $C_{iss}$ | Input Capacitance            | $V_{GS} = 0V$<br>$V_{DS} = 150V$<br>$f = 1MHz$ |     | 375 |     | pF   |
| $C_{oss}$ | Output Capacitance           |  |     | 200 |     |      |
| $C_{rss}$ | Reverse Transfer Capacitance |  |     | 12  |     |      |

## Functional Characteristics

| Symbol              | Parameter   | Min                            | Typ | Max | Unit |
|---------------------|---|--------------------------------|-----|-----|------|
| $G_{PS}$            | $f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}^1$                                      | 18                             | 22  |     | dB   |
| $G_{PS}$            | $f = 175MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W$  |                                | 14  |     |      |
| $\eta_D$            | $f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}^1$                                      |                                | 50  |     | %    |
| IMD <sub>(dB)</sub> | $f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}^1$                                      |                                | -30 |     | dBc  |
| $\psi$              | $f_1 = 50MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W$ CW<br>70:1 VSWR - All Phase Angles, 0.2mSec X 20% Duty Factor | No Degradation in Output Power |     |     |      |

1. To MIL-STD-1311 Version A, test method 2204B, Two Tone, Reference Each Tone

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

## Typical Performance Curves

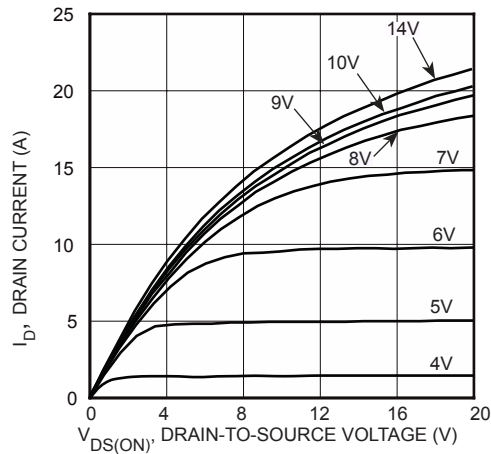


FIGURE 1, Output Characteristics

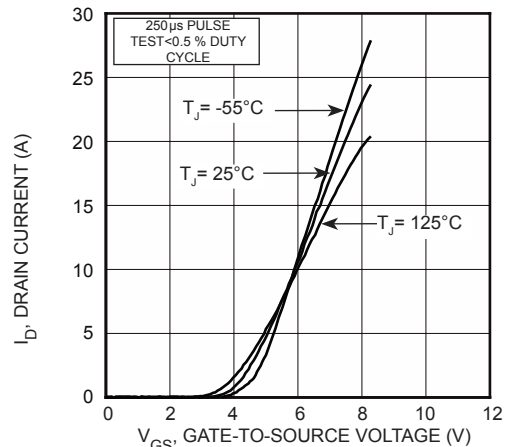


FIGURE 2, Transfer Characteristics

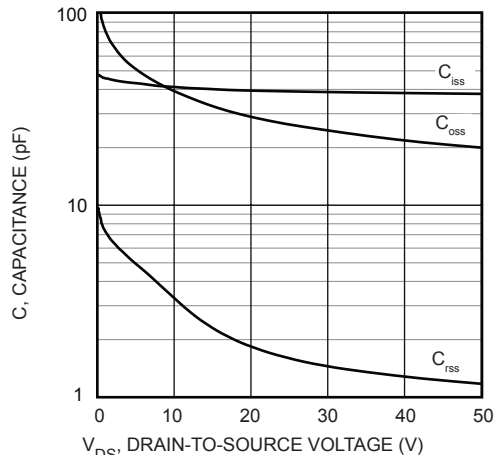


FIGURE 3, Capacitance vs Drain-to-Source Voltage

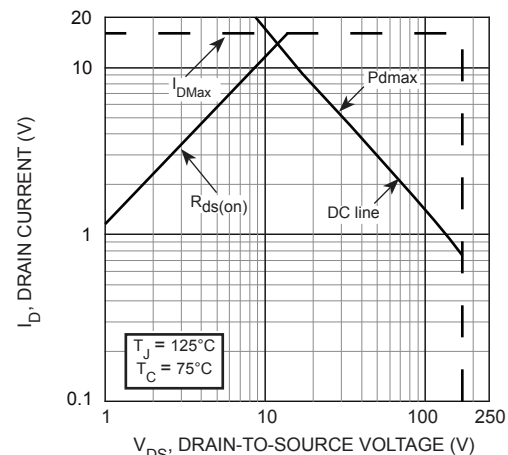


FIGURE 4, Forward Safe Operating Area

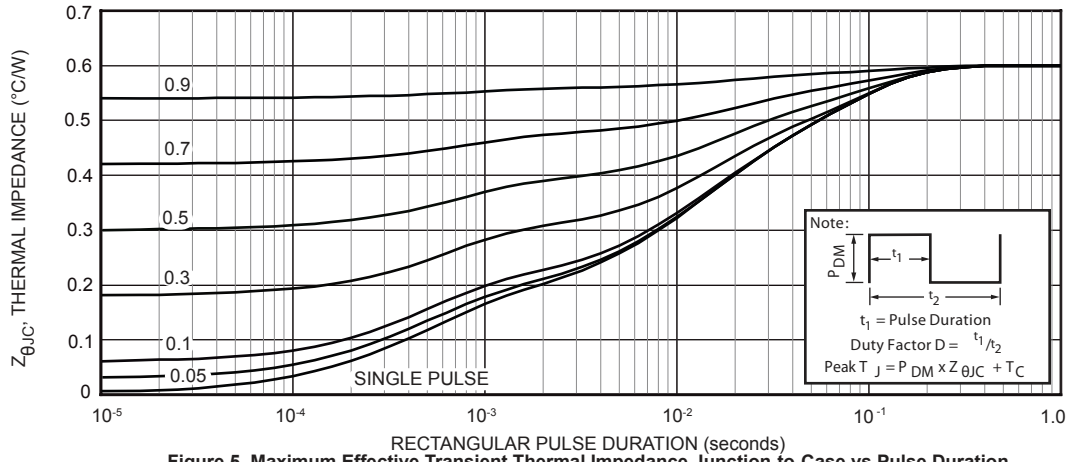


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

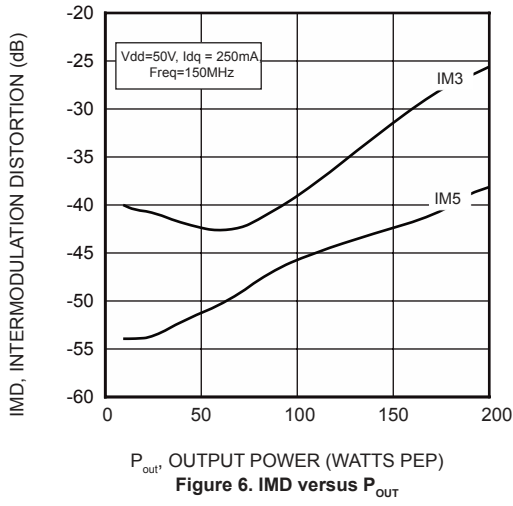


Figure 6. IMD versus  $P_{OUT}$

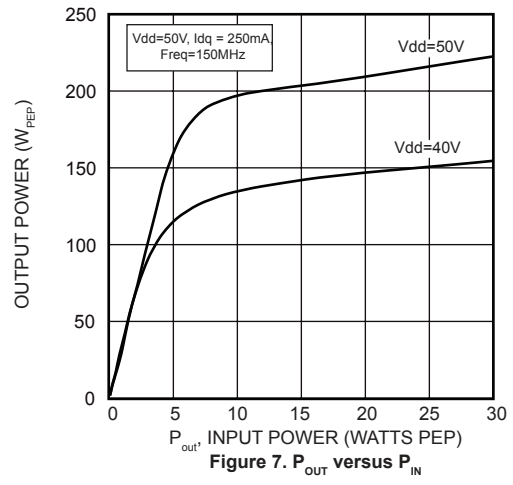
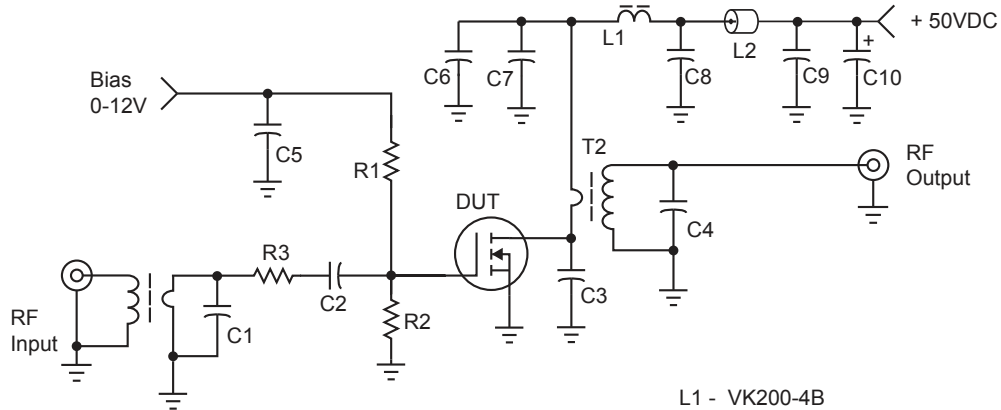


Figure 7.  $P_{OUT}$  versus  $P_{IN}$

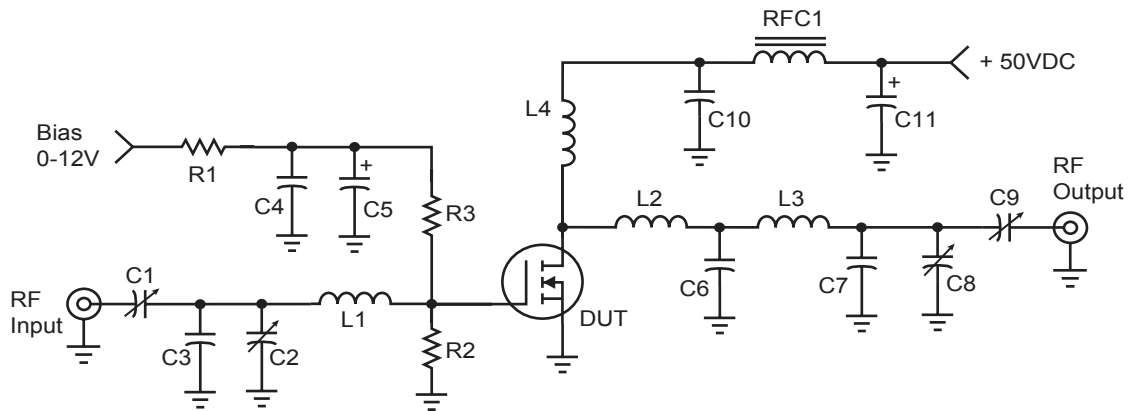
30 MHz test Circuit



- C1 -- 470 pF Dipped Mica
- C2, C5, C6 - C9 -- 0.1uF SMT
- C3 -- 200pF ATC 700C
- C4 -- 15pF, ATC 700C
- C10 -- 10uF, 100V Electrolytic

- L1 - VK200-4B
- L2 -- 2 Ferrite beads, 2.0 uH
- R1, R2 -- 51 Ω, 1 W Carbon
- R3 -- 3.3 Ω, 1 W Carbon
- T1 -- 9:1 Transformer
- T2 -- 1:9 Transformer

175 MHz test Circuit



- C1, C2, C8 -- Arco 463 or equivalent
- C3 -- 25pF, Unelco
- C4 -- 0.1uF, Ceramic
- C5 -- 1.0 uF, 15 WV Tantalum
- C6 -- 250pF, Unelco J101
- C7 -- 25pF, Unelco J101
- C9 -- Arco 262 or equivalent
- C10 -- 0.05uF, Ceramic
- C11 -- 15uF, 60WV Electrolytic

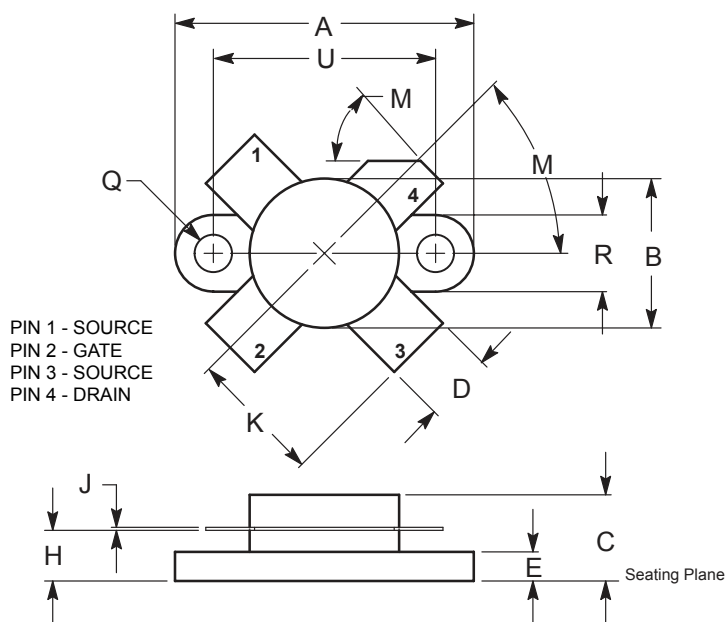
- L1 -- 3/4", #18 into Hairpin
- L2 -- Printed Line, 0.200" W x 0.500" L
- L3 -- 1", #16 into Hairpin approx 16nH
- L4 -- 2 turns #16, 5/16" ID
- RFC1 - VK200-4B
- R1 -- 150 Ω, 1/2W Carbon
- R2 -- 10k Ω, 1/2W Carbon
- R3 -- 120 Ω, 1/2W Carbon

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%.

**.5" SOE Package Outline**  
**All Dimensions are  $\pm .005$**



| DIM | INCHES  |       | MILLIMETERS |       |
|-----|---------|-------|-------------|-------|
|     | MIN     | MAX   | MIN         | MAX   |
| A   | 0.096   | 0.990 | 24.39       | 25.14 |
| B   | 0.465   | 0.510 | 11.82       | 12.95 |
| C   | 0.229   | 0.275 | 5.82        | 6.98  |
| D   | 0.216   | 0.235 | 5.49        | 5.96  |
| E   | 0.084   | 0.110 | 2.14        | 2.79  |
| H   | 0.144   | 0.178 | 3.66        | 4.52  |
| J   | 0.003   | 0.007 | 0.08        | 0.17  |
| K   | 0.435   |       | 11.0        |       |
| M   | 45° NOM |       | 45° NOM     |       |
| Q   | 0.115   | 0.130 | 2.93        | 3.30  |
| R   | 0.246   | 0.255 | 6.25        | 6.47  |
| U   | 0.720   | 0.730 | 18.29       | 18.54 |

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