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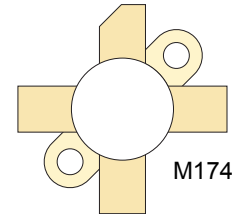
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RF POWER VERTICAL MOSFET

The VRF161 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 $V_{(BR)DSS} = 170V$
- 200W with 24dB Typical Gain @ 30MHz, 50V
- 200W with 14dB Typical Gain @ 150MHz, 50V
- Excellent Stability & Low IMD
- Available in Matched Pairs
- 70:1 Load VSWR Capability at Specified Operating Conditions
- Nitride Passivated
- Refractory Gold Metallization
- High Power Replacement for MRF151
- RoHS Compliant 

Maximum Ratings

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


Symbol	Parameter	VRF161(MP)	Unit
V_{DSS}	Drain-Source Voltage	170	V
I_D	Continuous Drain Current @ $T_c = 25^\circ C$	20	A
V_{GS}	Gate-Source Voltage	± 40	V
P_D	Total Device dissipation @ $T_c = 25^\circ C$	350	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 ($I_{D(ON)} = 10A, V_{GS} = 10V$)		1.7	2.0	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 100V, V_{GS} = 0V$)			1	mA
I_{GSS}	Gate-Source Leakage Current ($V_{DS} = \pm 20V, V_{GS} = 0V$)			1.0	μA
g_{fs}	Forward Transconductance ($V_{DS} = 10V, I_D = 5A$)	6.0	8.1		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			0.50	°C/W

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

Dynamic Characteristics

VRF161(MP)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$		500		pF
C_{oss}	Output Capacitance	$V_{DS} = 150V$		180		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		20		

Functional Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
G_{PS}	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 200W$	20	24		dB
G_{PS}	$f = 150MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 200W$		14		
η_D	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 200W$		50		%
IMD _(d3)	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 200W_{PEP}^1$		-30		dBc
ψ	$f = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 200W$ CW 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

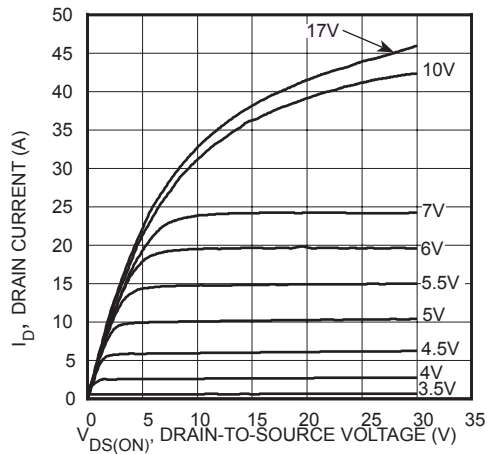


FIGURE 1, Output Characteristics

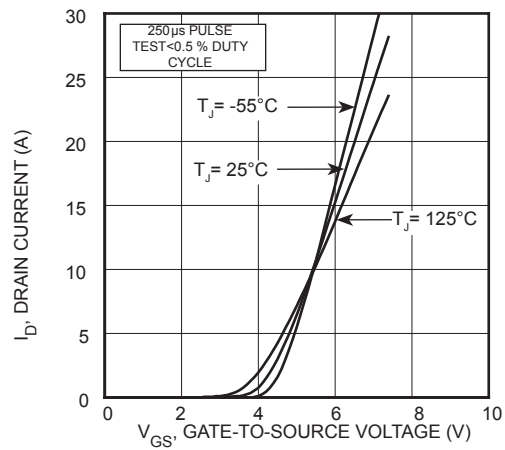


FIGURE 2, Transfer Characteristics

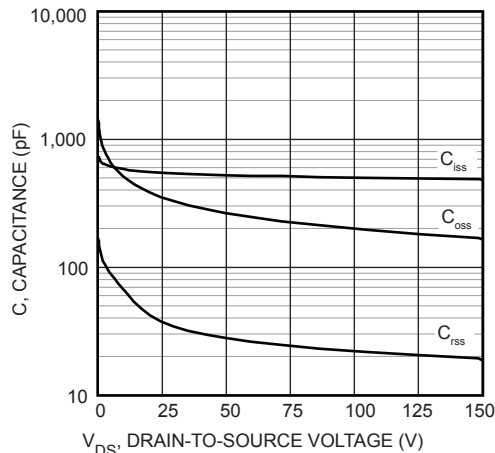


FIGURE 3, Capacitance vs Drain-to-Source Voltage

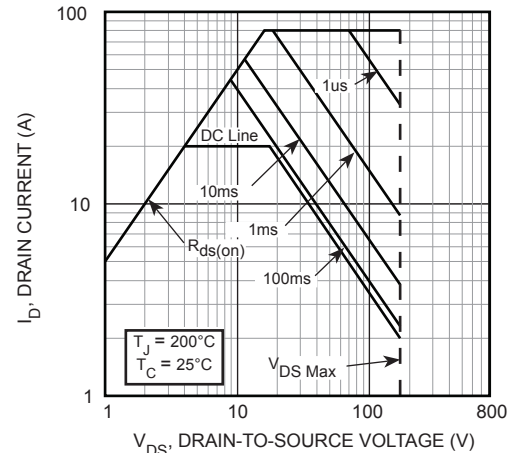


FIGURE 4, Forward Safe Operating Area

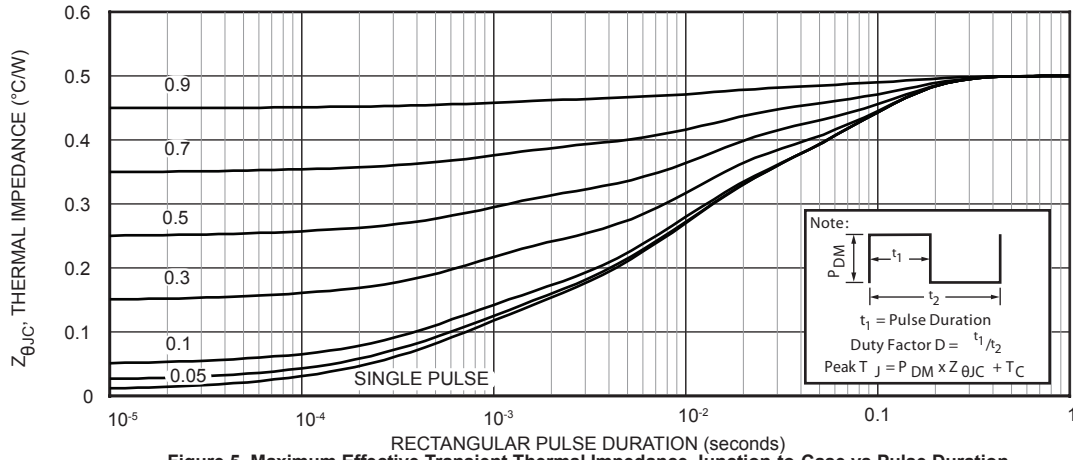


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

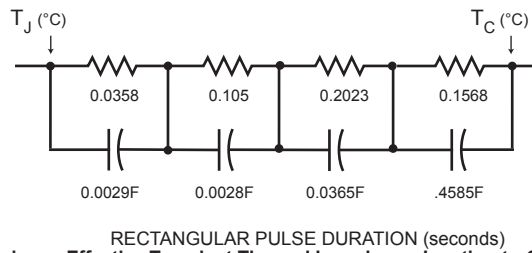


Figure 5a. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

Table 1. Typical Class AB Large Signal Impedances

freq	Zin*	Zout*
2.00MHz	24- j4.01	6.15-j0.13
13.56MHz	11.3- j10.6	6.11-j0.9
30MHz	5.36- j6.7	5.68-j1.81
100MHz	3.5- j2.91	2.35-j4.12
150MHz	3.45- j1.83	1.81-j2.99

Zin - gate shunted with 25 ohms Idq = .25A Zol = conj of opt load for 200w out at Vdd = 50V

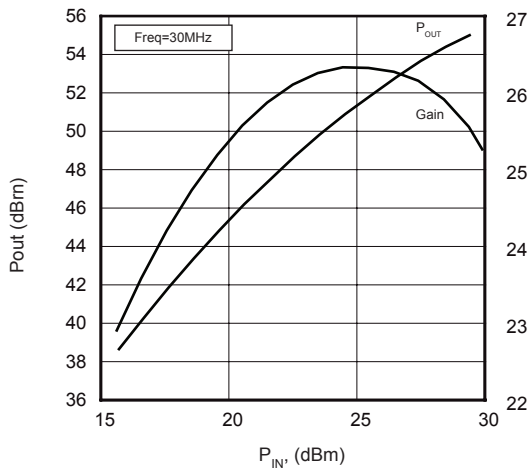


Figure 6. P_{OUT} and Gain vs P_{IN}

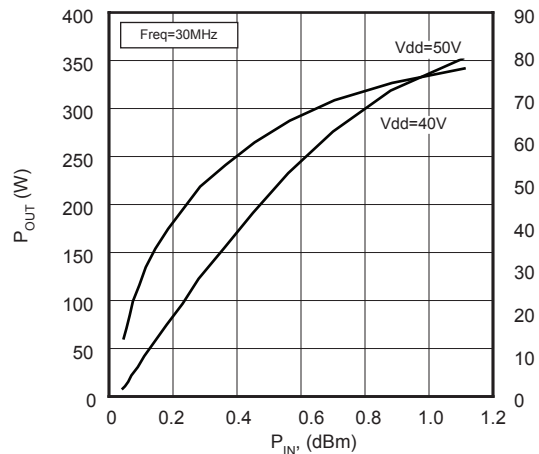
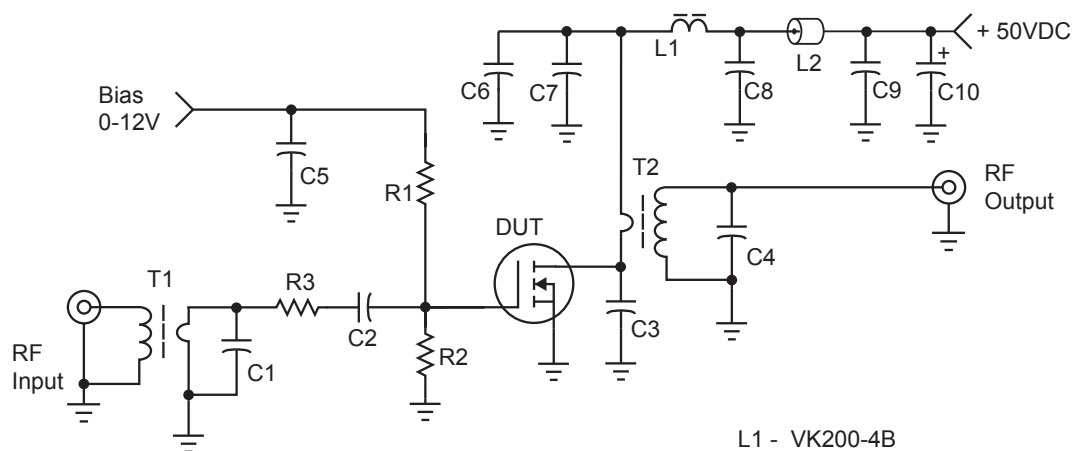


Figure 7. Eff and P_{OUT} vs. P_{IN}

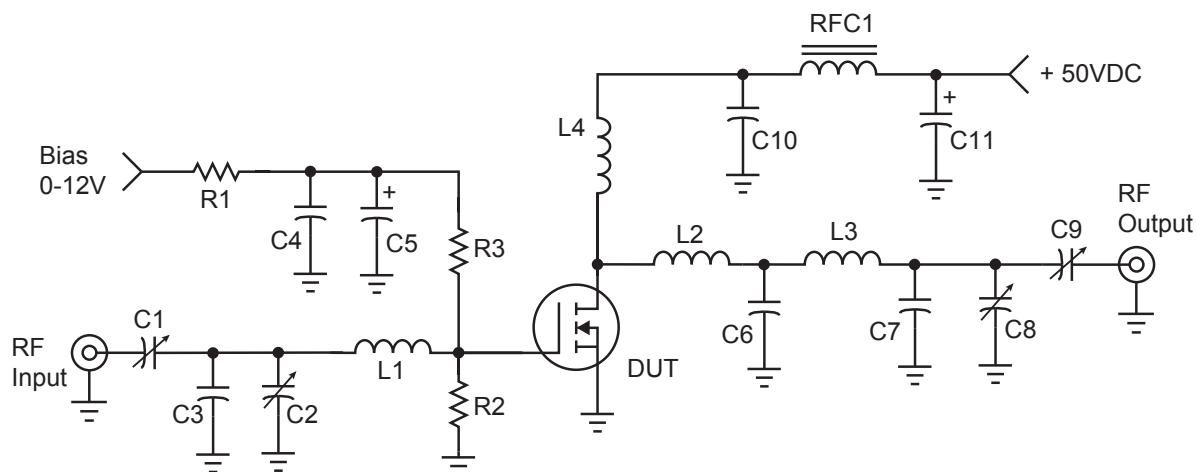
30 MHz test Circuit



C1 -- 470 pF ATC 700B
 C2, C5, C6 - C9 -- 0.1uF 100V
 C3 -- 220pF clad mica
 C4 -- 15pF, ATC 700B
 C10 -- 10uF, 100V Electrolytic

L1 - VK200-4B
 L2 -- 2 Ferrite beads, 2.0 uH
 R1, R2 -- 100Ω, 2W SMT
 R3 -- 1Ω, 2W SMT
 T1 -- 9:1 Transformer
 T2 -- 1:9 Transformer

150 MHz test Circuit



C1, C2, C8 -- Arco 463 or equivalent
 C3 -- 25pF, Unelco
 C4 -- 0.1uF, Ceramic SMT 50V
 C5 -- 1.0 uF, 15 WV Tantalum
 C6 -- 250pF, Unelco J101
 C7 -- 25pF, Unelco J101
 C9 -- Arco 262 or equivalent

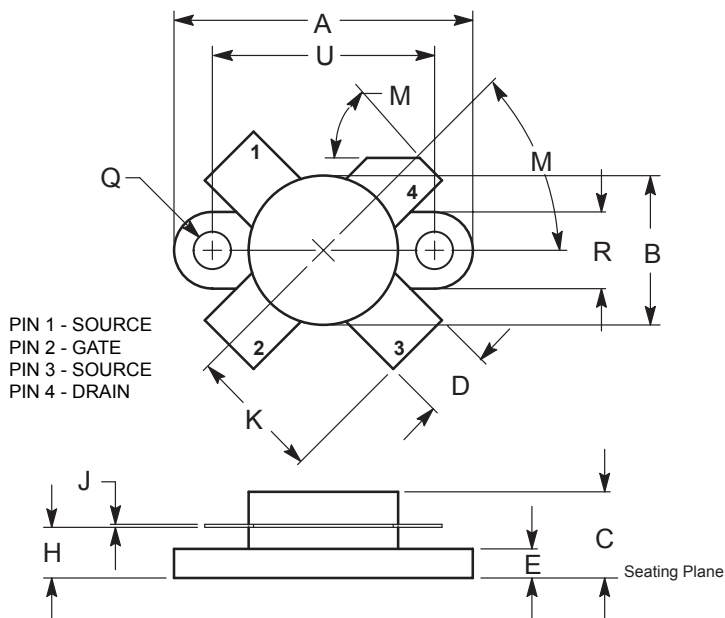
C10 -- 50nF, Ceramic SMT 100V
 C11 -- 15uF, 63WV Electrolytic
 L1 -- 3/4", #18 into Hairpin
 L2 -- Printed Line, 0.200" W x 0.500" L
 L3 -- 1", #16 into Hairpin approx 16nH
 L4 -- 2 turns #16, 5/16" ID
 RFC1 - VK200-4B
 R1-R3 -- 330 Ω, 1/4W Carbon

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	0.960	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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