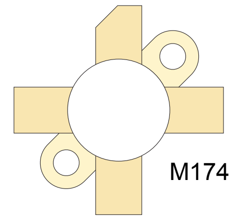
![Microsemi]

VRF161(MP)

50V, 200W, 150MHz

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.



M174

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°C unless otherwise specified

Symbol	Parameter	VRF161(MP)	Unit
V_{DSS}	Drain-Source Voltage	170	V
I_D	Continuous Drain Current @ T_C = 25°C	20	A
V_{GS}	Gate-Source Voltage	±40	V
P_D	Total Device dissipation @ T_C = 25°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} = ±20V, V_{DS} = 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

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

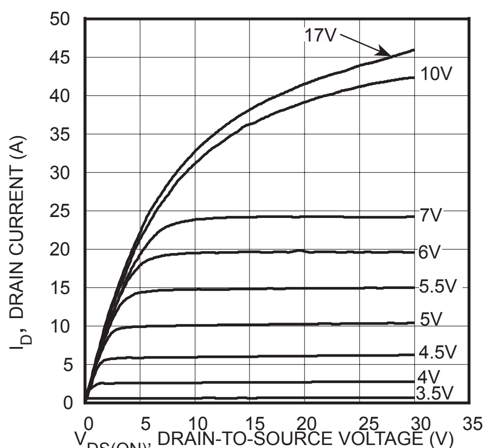


FIGURE 1, Output Characteristics

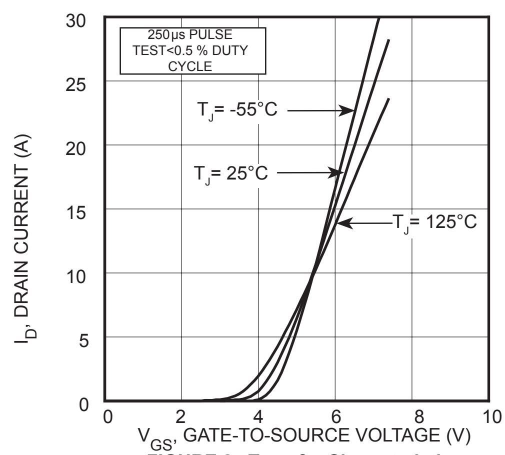


FIGURE 2, Transfer Characteristics

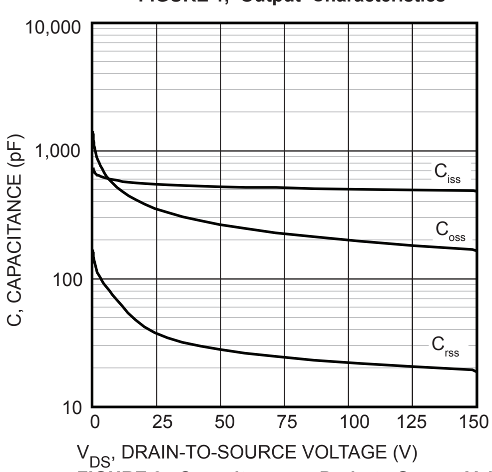


FIGURE 3, Capacitance vs Drain-to-Source Voltage

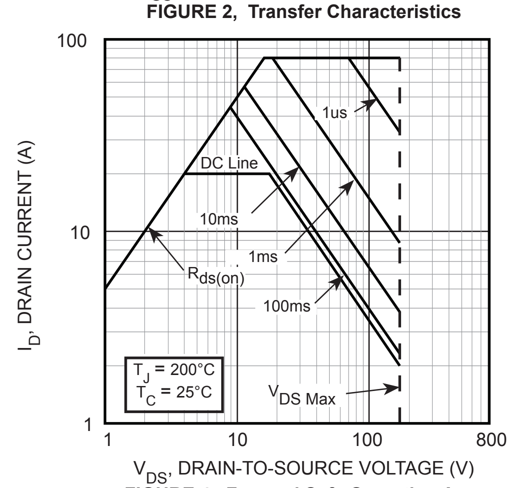


FIGURE 4, Forward Safe Operating Area

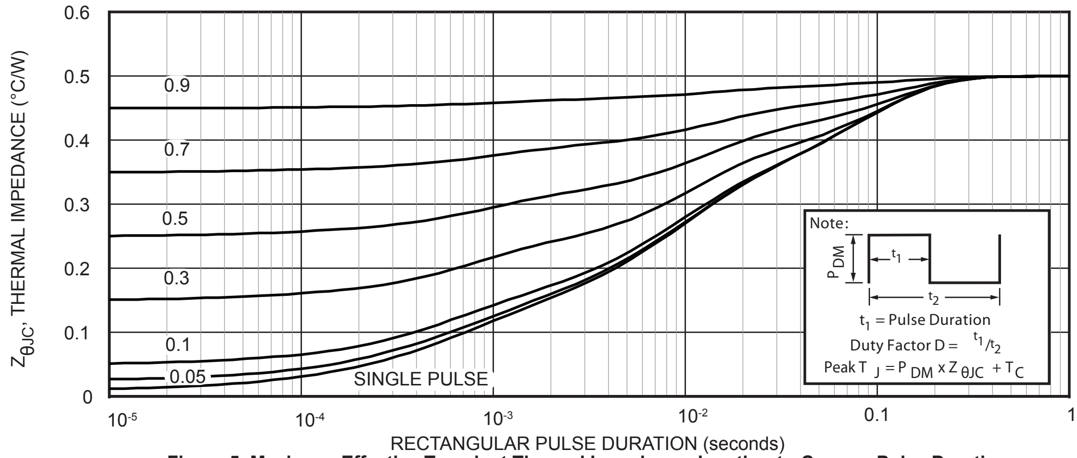
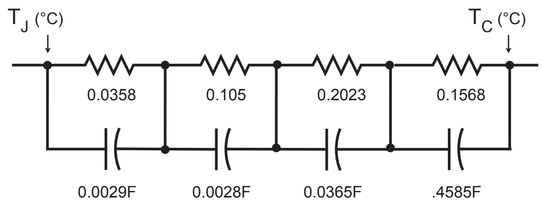


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration



RECTANGULAR PULSE DURATION (seconds)

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

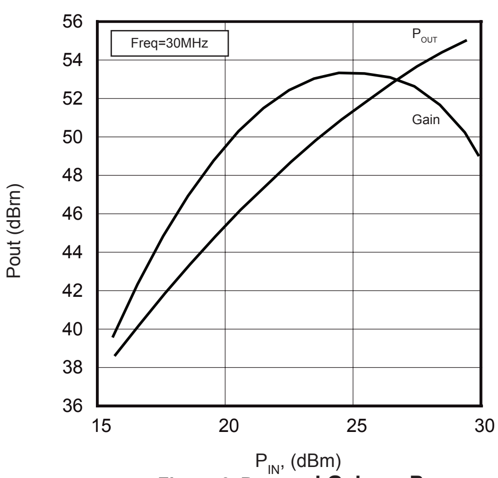


Figure 6. P_{OUT} and Gain vs P_{IN}

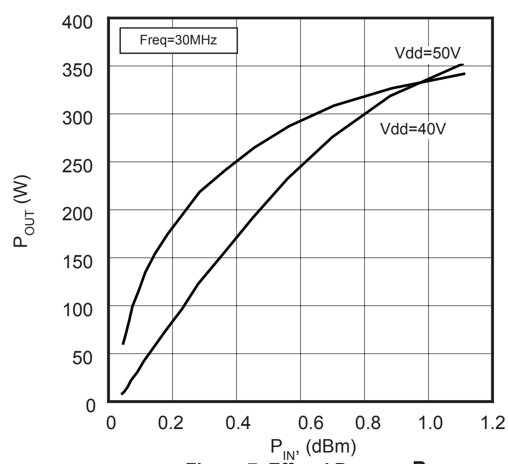
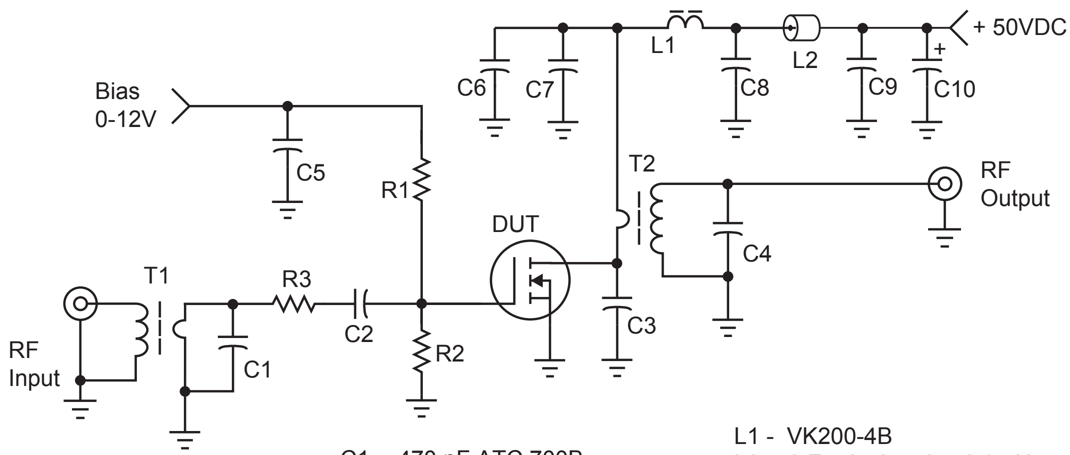


Figure 7. Eff and P_{OUT} vs. P_{IN}

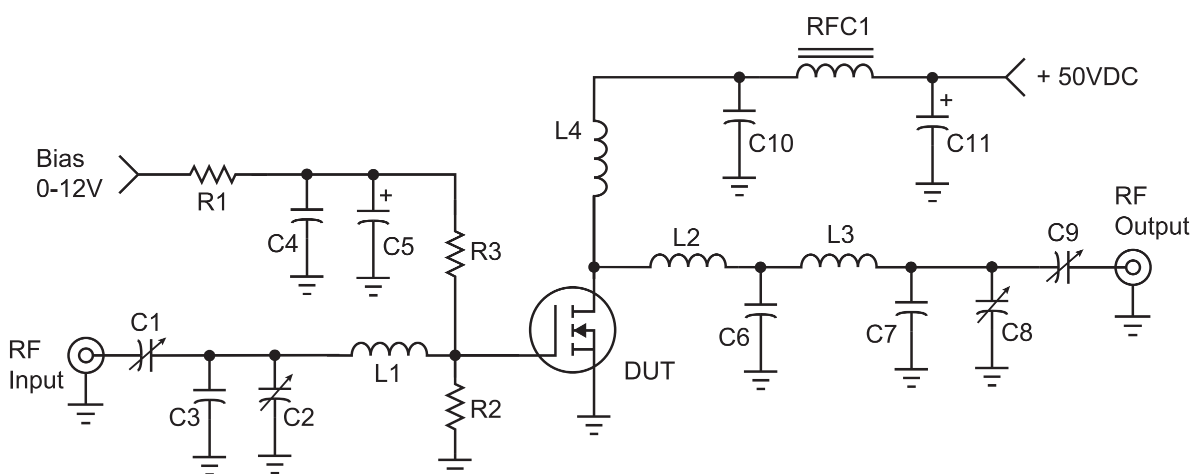
30 MHz test Circuit



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

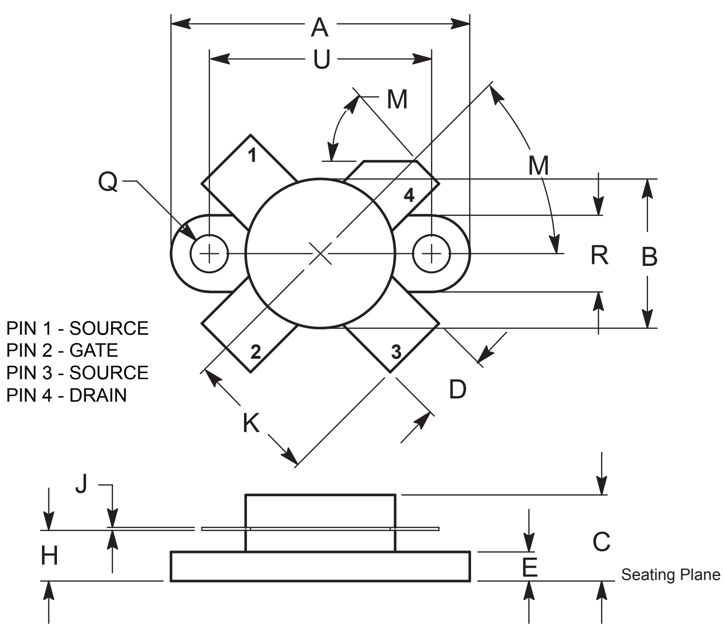
C10 -- 50nF, Ceramic SMT 100V
C11 -- 15uF, 63WV Electrolytic
L1 -- 3/4", #18 into Hairpin
L2 -- Printed Line, 0.200" W x 0.500" L
L3 -- 1", #16 into Hairpin approx 16nH
L4 -- 2 turns #16, 5/16" ID
RFC1 - VK200-4B
R1-R3 -- 330 Ω, 1/4W Carbon

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 ± .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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Disclaimer:

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