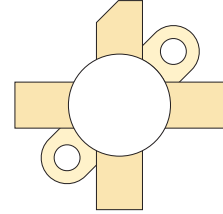



## RF POWER VERTICAL MOSFET

The VRF148A 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  $V_{(BR)DSS} = 170V$
- 30W with 20dB Typical Gain @ 30MHz, 50V
- 30W with 16dB Typical Gain @ 175MHz, 50V
- Excellent Stability & Low IMD
- Common Source Configuration
- Available in Matched Pairs
- 30:1 Load VSWR Capability at Specified Operating Conditions
- Nitride Passivated
- Refractory Gold Metallization
- High Voltage Replacement for MRF148A
- RoHS Compliant 

### Maximum Ratings

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


Symbol	Parameter	VRF148A(MP)	Unit
$V_{DSS}$	Drain-Source Voltage	170	V
$I_D$	Continuous Drain Current @ $T_c = 25^\circ C$	6	A
$V_{GS}$	Gate-Source Voltage	$\pm 40$	V
$P_D$	Total Device dissipation @ $T_c = 25^\circ C$	115	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 ( $V_{GS} = 0V, I_D = 1mA$ )	170			V
$V_{DS(ON)}$	On State Drain Voltage ( $I_{D(ON)} = 2.5A, V_{GS} = 10V$ )		3.0	5.0	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 100V, V_{GS} = 0V$ )			0.1	mA
$I_{GSS}$	Gate-Source Leakage Current ( $V_{DS} = \pm 20V, V_{GS} = 0V$ )			1.0	$\mu A$
$g_{fs}$	Forward Transconductance ( $V_{DS} = 10V, I_D = 2.5A$ )	0.8			mhos
$V_{GS(TH)}$	Gate Threshold Voltage ( $V_{DS} = 10V, I_D = 10mA$ )	2.9	3.6	4.4	V

### Thermal Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
$R_{\theta JC}$	Junction to Case Thermal Resistance			1.52	°C/W

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

## Dynamic Characteristics

VRF148A(MP)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		160		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 50V$		40		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		2.6		

## Functional Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$G_{PS}$	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 100mA, P_{out} = 30W$		18		dB
$G_{PS}$	$f_1 = 175MHz, V_{DD} = 50V, I_{DQ} = 100mA, P_{out} = 30W$		16		
$\eta$	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 100mA, 30 W_{PEP}$		40		%
$\eta$	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 100mA, 30 W_{CW}$		50		
IMD <sub>(d3)</sub>	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 100mA, P_{out} = 30W_{PEP}^1$		-35	-28	dB
IMD <sub>(d11)</sub>	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 100mA, P_{out} = 30W_{PEP}$		-60		
$\psi$	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 100mA, P_{out} = 300W_{PEP}$ 30:1 VSWR - All Phase Angles	No Degradation in Output Power			

## Class A Characteristics

Symbol	Test Conditions	Min	Typ	Max	Unit
$G_{PS}$	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 1.0A, P_{out} = 10W_{PEP}$		20		dB
IMD <sub>(d3)</sub>	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 1.0A, P_{out} = 10W_{PEP}$		-50		
IMD <sub>(d9-d13)</sub>	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 1.0A, P_{out} = 10W_{PEP}$		-70		

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

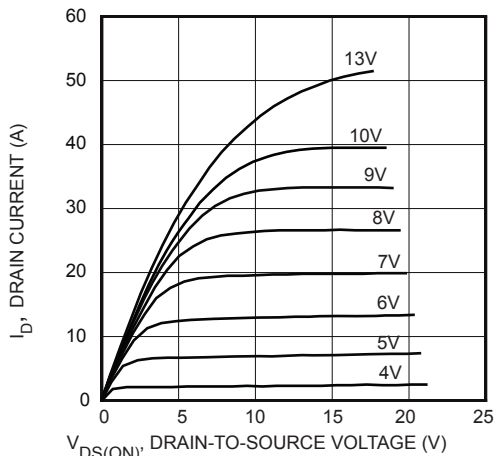


FIGURE 1, Output Characteristics

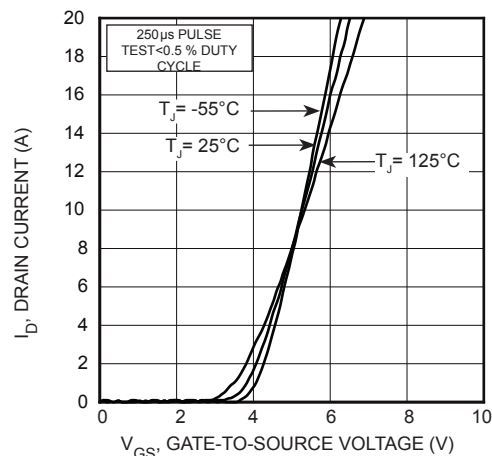


FIGURE 2, Transfer Characteristics

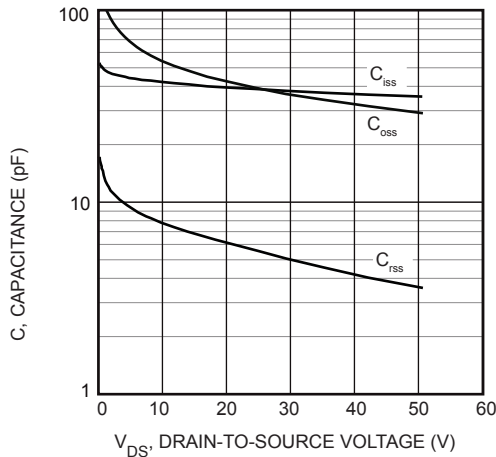


FIGURE 3, Capacitance vs Drain-to-Source Voltage

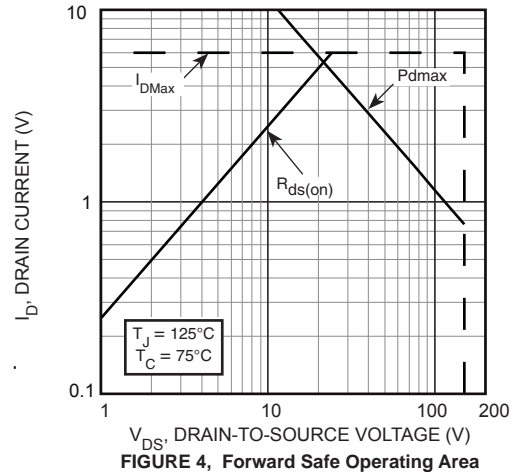


FIGURE 4, Forward Safe Operating Area

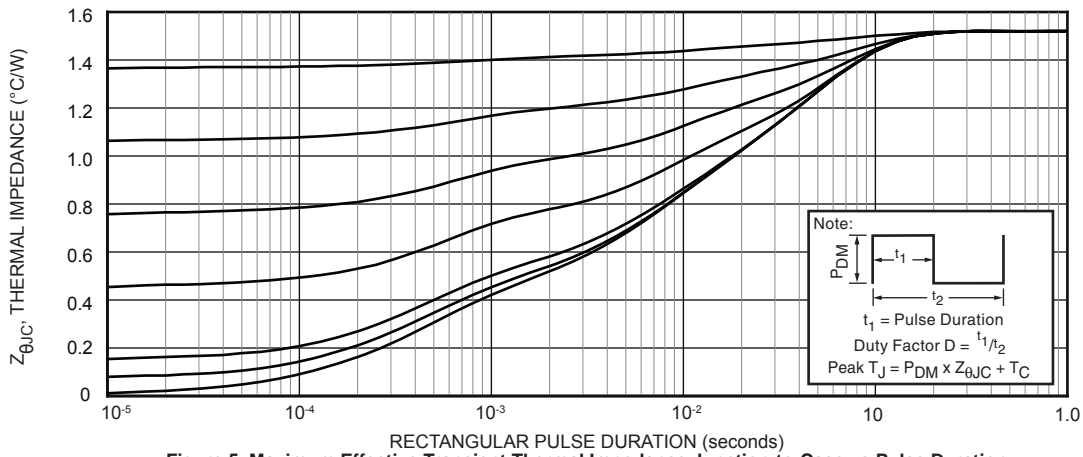


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

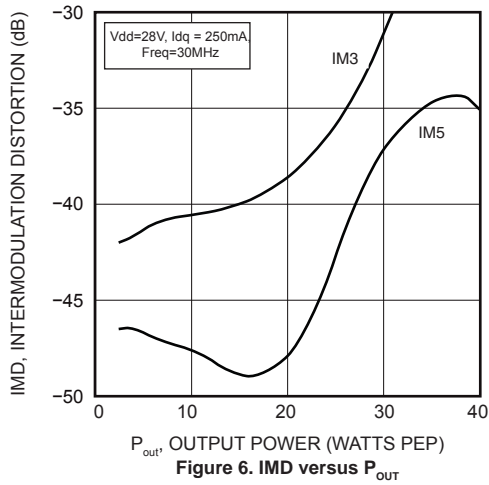


Figure 6. IMD versus  $P_{OUT}$

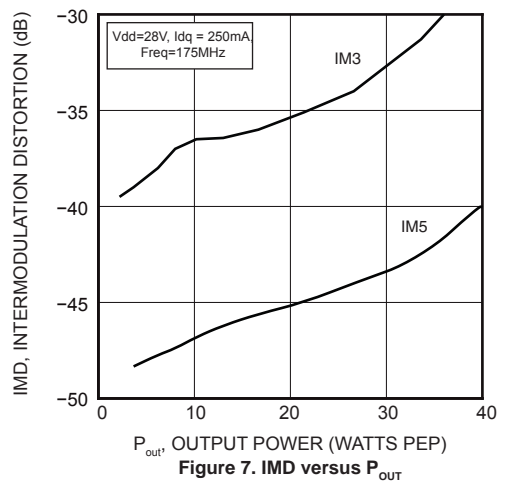


Figure 7. IMD versus  $P_{OUT}$

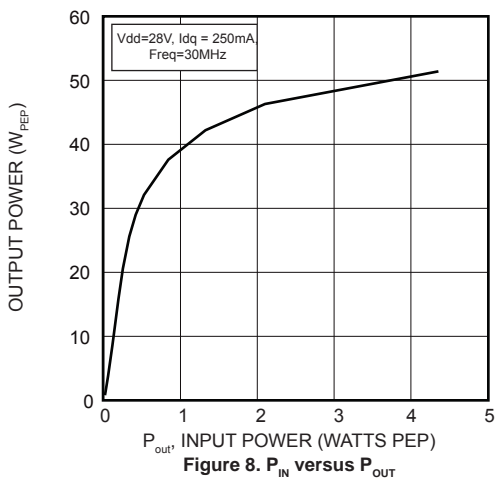


Figure 8.  $P_{IN}$  versus  $P_{OUT}$

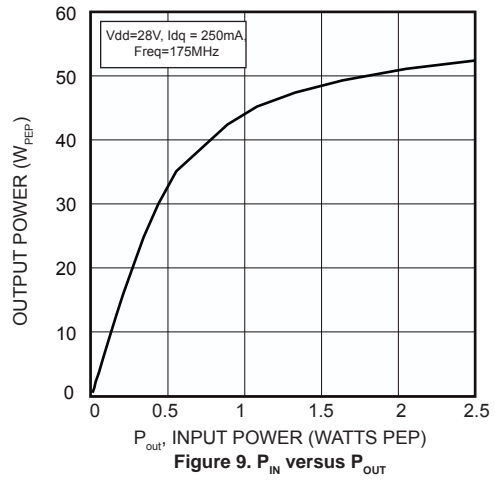
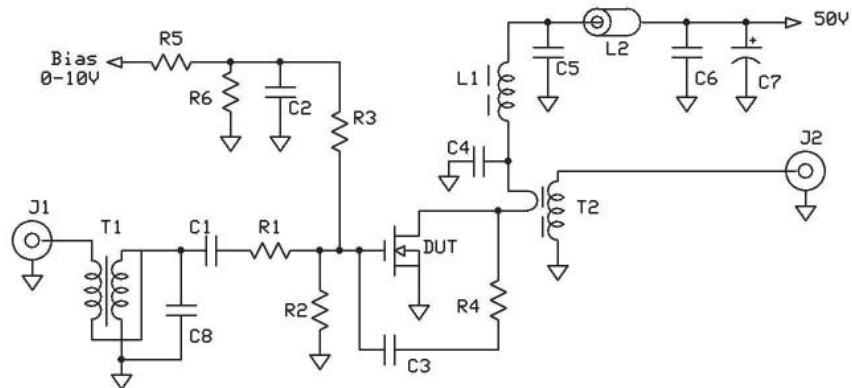


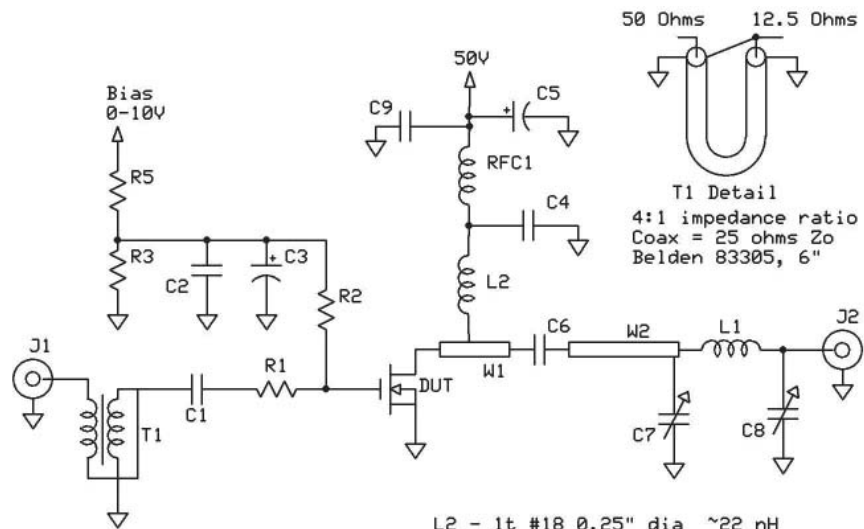
Figure 9.  $P_{IN}$  versus  $P_{OUT}$

30 MHz test circuit



- |   |                                    |
|---|------------------------------------|
| C1-C6 - 0.1uF 100V SMT                          | L1 Fair-Rite 2961666631 (VK200-4B) |
| C7 - 15uF 100V Elect                            | L2 - two ferrite beads on #18      |
| C8 - 100 pF ATC 100B                            | R1 - 4.7 ohm 1/4W                  |
| T1 - 4:1 transformer                            | R2 R3 - 200 ohm 1/2 Carbn          |
| T2 = 2:3 turns ratio on two ferrite beads u=125 | R4 - 470 ohm 1W                    |
|   | R5 R6 - 2200 ohm 1/4W              |

175 MHz test circuit



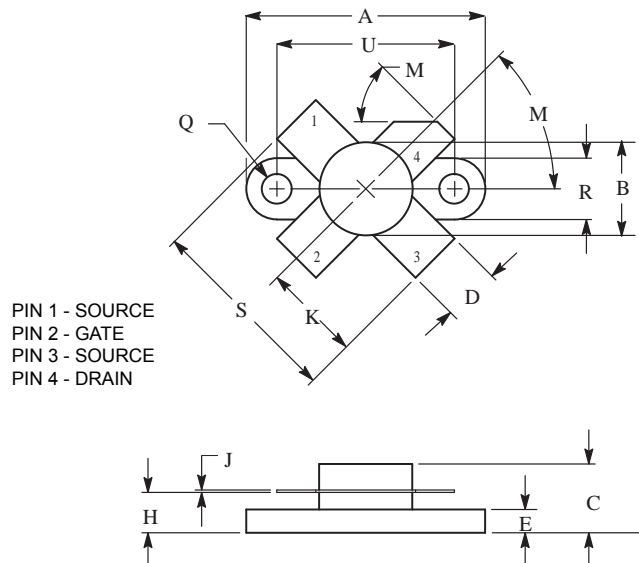
- |                                |                                      |
|--------------------------------|--------------------------------------|
| C1 - 91pF ATC 100B             | L2 - 1t #18 0.25" dia ~22 nH         |
| C2,4,6,9 - 0.1uF 100V 1206 SMT | R1 - 1 ohm 1/4W                      |
| C3 - 1 uF 50 WV tant           | R2 R3 R5 - 2200 ohm 1/4W             |
| C5 - 15uF 100V Elect           | RFC1 Fair-Rite 2961666631 (VK200-4B) |
| C7 C8 - ARCO 404 ~20pF         | T1 - 4:1 transformer                 |
| L1 - 1t #18 0.25" dia ~25nH    | W1 Stripline .23 x 0.50"             |
|                                | W2 Stripline 1.2" x .122" (50 ohm)   |

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%.

**M113 Package Outline .375" SOE**  
All Dimensions to be  $\pm 0.005$



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.096	0.990	24.39	25.14
B	0.370	0.390	9.40	9.90
C	0.229	0.281	5.82	7.13
D	0.215	0.235	5.47	5.96
E	0.085	0.105	2.16	2.66
H	0.150	0.108	3.81	4.57
J	0.004	0.006	0.11	0.15
K	0.395	0.405	10.04	10.28
M	40	50	40	50
Q	0.113	0.130	2.88	3.30
R	0.245	0.255	6.23	6.47
S	0.790	0.810	20.07	20.57
U	0.720	0.730	18.29	18.54