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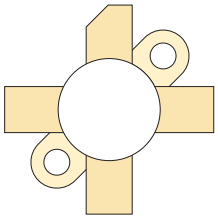
Microsemi
POWER PRODUCTS GROUP

VRF141
VRF141MP

28V, 150W, 175MHz

RF POWER VERTICAL MOSFET

The VRF141 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 $V_{(BR)DSS}$ = 80 V**
- **150W with 22dB Typical Gain @ 30MHz, 28V**
- **150W with 13dB Typical Gain @ 175MHz, 28V**
- **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 MRF141**
- **RoHS Compliant**

Maximum Ratings

All Ratings: T_C =25°C unless otherwise specified

Symbol	Parameter	VRF141(MP)	Unit
V_{DSS}	Drain-Source Voltage	80	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	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)	80			V
$V_{DS(ON)}$	On State Drain Voltage ($I_{D(ON)}$ = 10A, V_{GS} = 10V)		0.9	1.0	
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = 60V, V_{GS} = 0V)			1.0	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)	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

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V		400		pF
C_{oss}	Output Capacitance	V_{DS} = 28V		375		
C_{rss}	Reverse Transfer Capacitance	f = 1MHz		50		

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

050-4942 Rev D 9-2010

Functional Characteristics

VRF141(MP)

Symbol	Parameter	Min	Typ	Max	Unit
G_{PS}	f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 28V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}	16	20		dB
G_{PS}	f_1 = 175MHz, V_{DD} = 28V, I_{DQ} = 250mA, P_{out} = 150W		13		
η	f_1 = 30MHz, f_2 = 30.001MHz ,V_{DD} = 28V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}	40	45		%
$IMD_{(d3)}$	f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 28V, I_{DQ} = 250mA, P_{out} = 150W_{PEP} [1]		-30	-28	dB
$IMD_{(d11)}$	f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 28V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}		-60		
ψ	f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 28V, I_{DQ} = 250mA, P_{out} = 150W_{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} = 28V, I_{DQ} = 4.0A, P_{out} = 50W_{PEP}		23		dB
$IMD_{(d3)}$	f_1 = 30MHz, f_2 = 30.001MHz ,V_{DD} = 28V, I_{DQ} = 4.0A, P_{out} = 50W_{PEP}		-50		
$IMD_{(d9\text{-}d13)}$	f_1 = 30MHz, f_2 = 30.001MHz ,V_{DD} = 28V, I_{DQ} = 4.0A, P_{out} = 50W_{PEP}		-75		

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

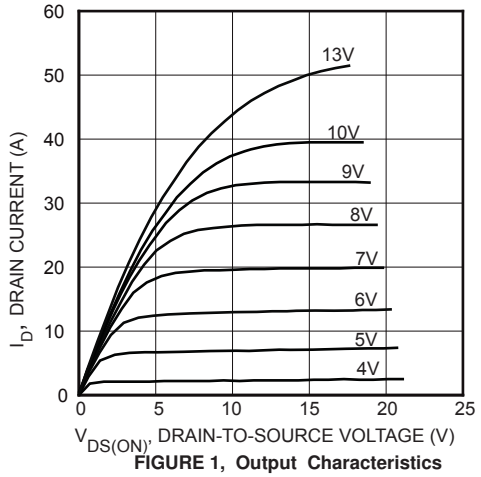


FIGURE 1, Output Characteristics

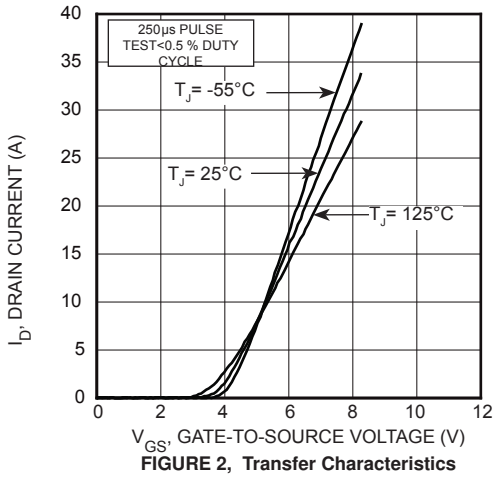


FIGURE 2, Transfer Characteristics

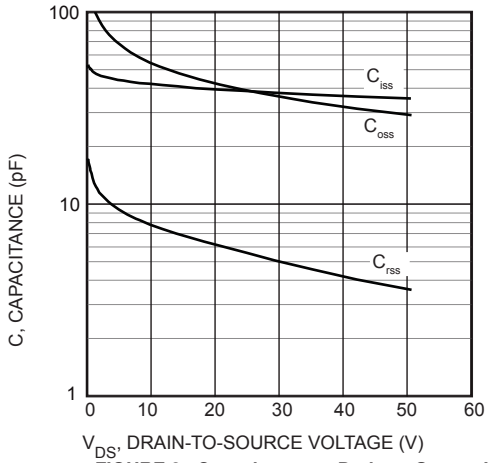


FIGURE 3, Capacitance vs Drain-to-Source Voltage

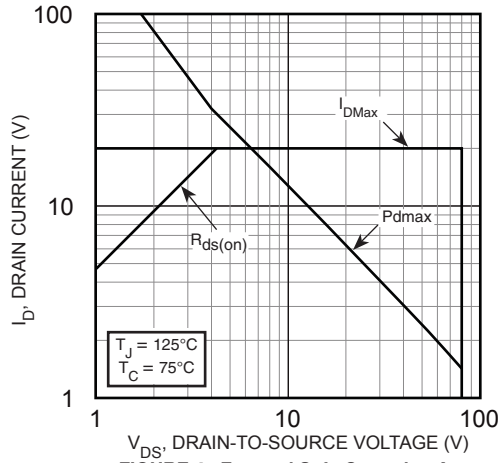


FIGURE 4, Forward Safe Operating Area

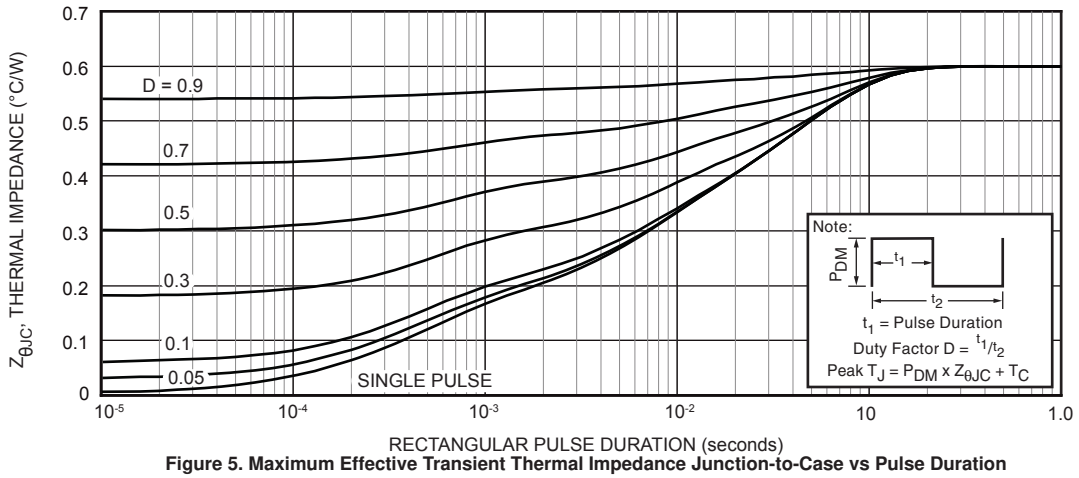


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

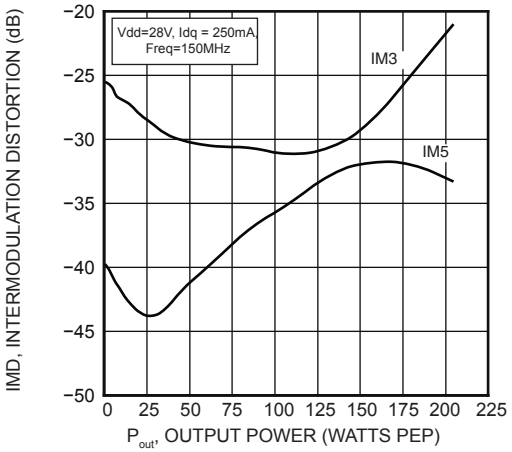


Figure 6. IMD versus P_{OUT}

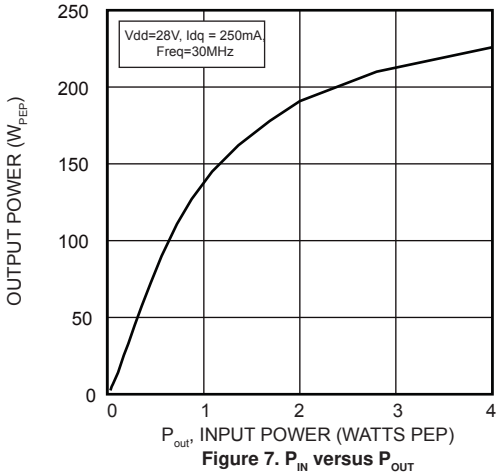


Figure 7. P_{IN} versus P_{OUT}

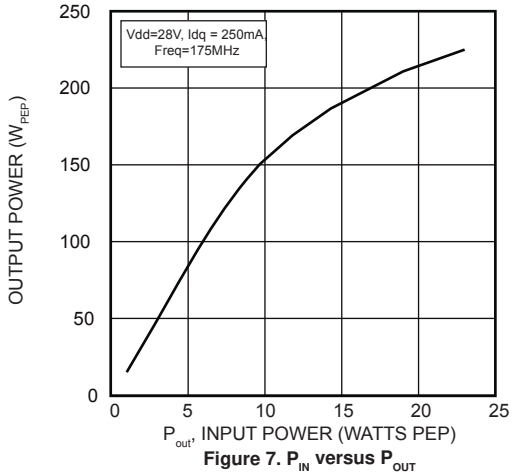
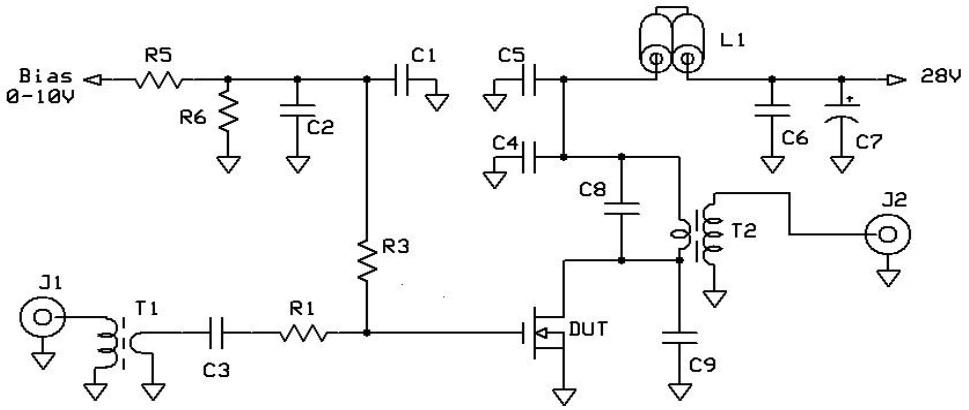


Figure 7. P_{IN} versus P_{OUT}

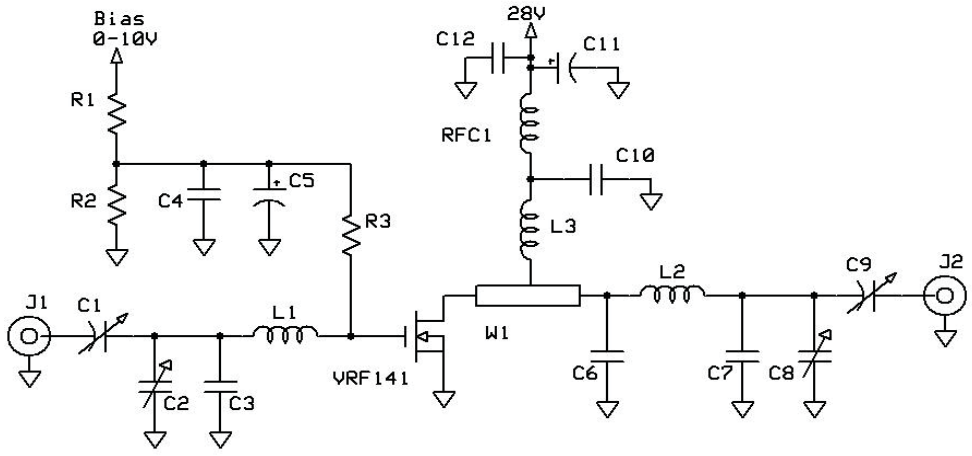
30 MHz test Circuit



C1 - 1uF 50V tantalum
C2-C6 - 0.1uF 100V SMT
C7 - 15uF 100V Elect
C8 - 820 pF ATC 100B
T1 - 16:1 bead/tube transformer
T2 = 1:25 bradband bead/tube transformer u=125

C9 - 100 pF ATC 100B
L1 - two ferrite beads on #18
R1 - 1 ohm 1 W SMT
R3 - 200 ohm 1/2 Carbn
R4 - 470 ohm 1W
R5 R6 - 2200 ohm 1/4W

175 MHz test Circuit



C1, 2, 8, 9 - ARCO 463
C3 C7 - 25 pF ATC 100B
C4 C10 C12 - 0.1uF 100V SMT
C5 - 1 uF 15WV tant
C6 - 270 pF ATC 100B
C10 - .05 100V 1206 SMT
C11 - 15uF 100V Elect

L1 - 3/4" #18 ga into Hairpin
W1 - printed line 0.23"W x 0.7" L
L2 - 2t #16 ga .25" dia x .25" ~ 35nH
L3 -2 turns #16 ga 5/16" ID tight. ~ 50nH
R1 R2 - 2.2k ohm 1/4W
R3 - 150 ohm 1/4W
RFC1 Fair-Rite 2961666631 (WK200-4B)

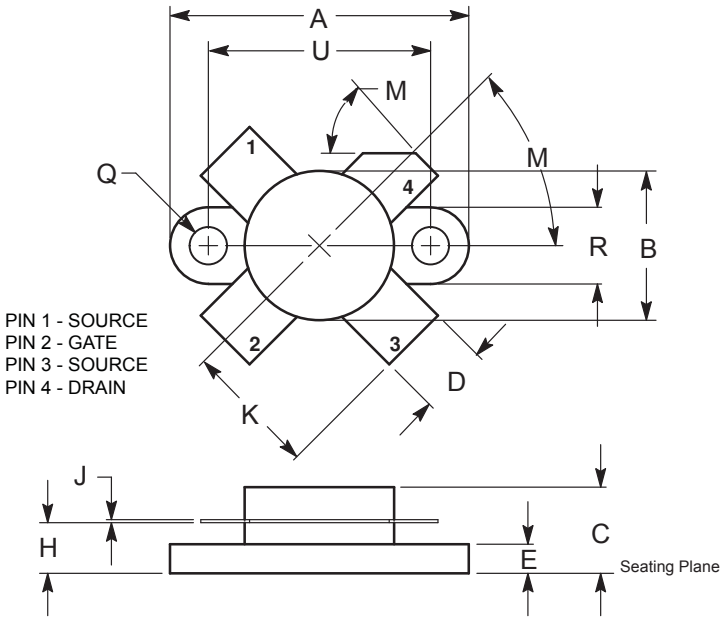
Adding MP at the end of P/N specifies a matched pair where $V_{GS(TH)}$ is matched between the two parts. V_{TH} values are marked on the devices per the following table.

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%.

M174 Package Outline .5" SOE

All Dimensions to be ±.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