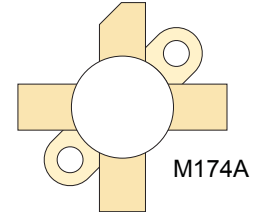



## RF POWER VERTICAL MOSFET

The VRF152E is a thermally-enhanced version of the VRF152. It 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

- Enhanced Package for 30% higher  $P_D$
- Improved Ruggedness  $V_{(BR)DSS} = 130V$
- 150W with 22dB Typical Gain @ 30MHz, 50V
- 150W with 14dB Typical Gain @ 175MHz, 50V
- Excellent Stability & Low IMD
- Available in Matched Parts
- 30:1 Load VSWR Capability at Specified Operating Conditions
- Nitride Passivated
- Refractory Gold Metallization
- Drop in Replacement for SD2941-10
- RoHS Compliant 

### Maximum Ratings

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


Symbol	Parameter	VRF152E(MP)	Unit
$V_{DSS}$	Drain-Source Voltage	130	V
$I_D$	Continuous Drain Current @ $T_c = 25^\circ C$	20	A
$V_{GS}$	Gate-Source Voltage	$\pm 40$	V
$P_D$	Total Device dissipation @ $T_c = 25^\circ C$	390	W
$T_{STG}$	Storage Temperature Range	-65 to 150	$^\circ C$
$T_J$	Operating Junction Temperature	200	

### Static Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 50mA$ )	130			V
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>1</sup> ( $V_{GS} = 10V, I_D = 10A$ )		0.13	0.20	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 100V, V_{GS} = 0V$ )			50	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current ( $V_{DS} = \pm 20V, V_{GS} = 0V$ )			1.0	$\mu A$
$g_{fs}$	Forward Transconductance ( $V_{DS} = 10V, I_D = 5A$ )	5.0	6.2		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			0.45	$^\circ C/W$

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

## Dynamic Characteristics

VRF152E(MP)(G)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		383		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 50V$		215		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		20		

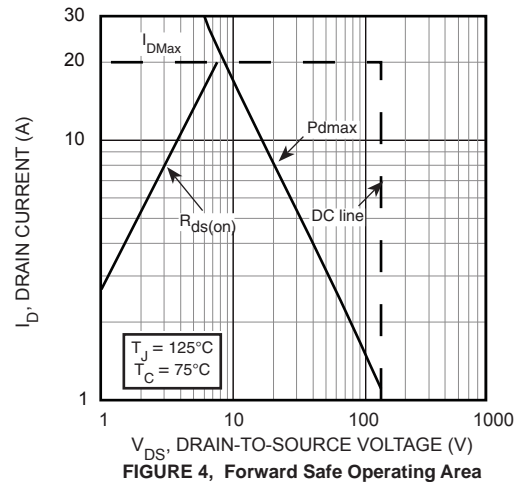
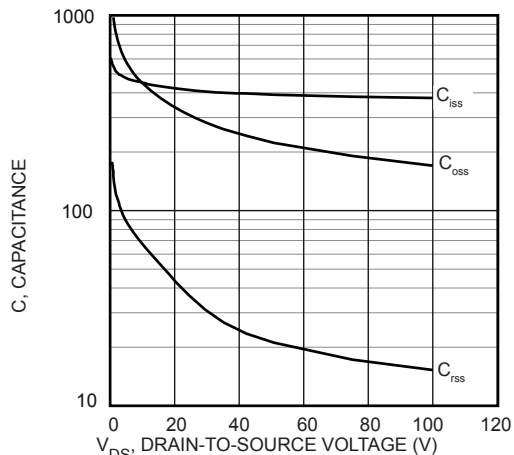
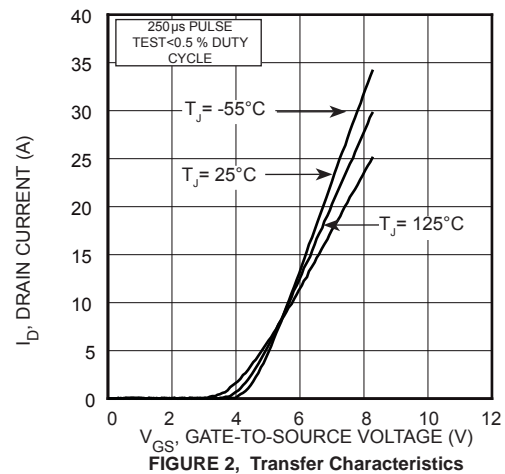
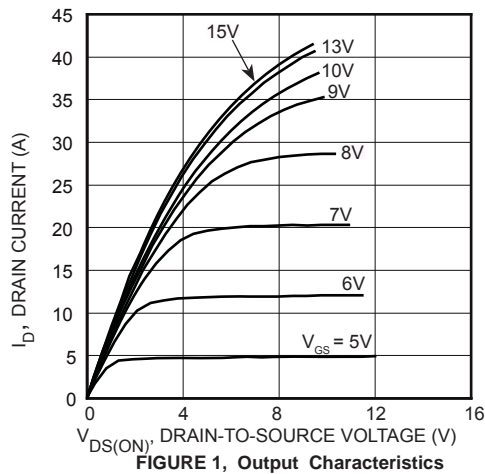
## Functional Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$G_{PS}$	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}$	18	22		dB
$G_{PS}$	$f = 175MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W$		14		
$\eta_D$	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}$		50		%
IMD <sub>(d3)</sub>	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}^1$		-30		dBc
IMD <sub>(d11)</sub>	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}$		-60		
$\Psi$	$f_1 = 30MHz, f_2 = 30.001MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 150W_{PEP}$ 30:1 VSWR - All Phase Angles	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



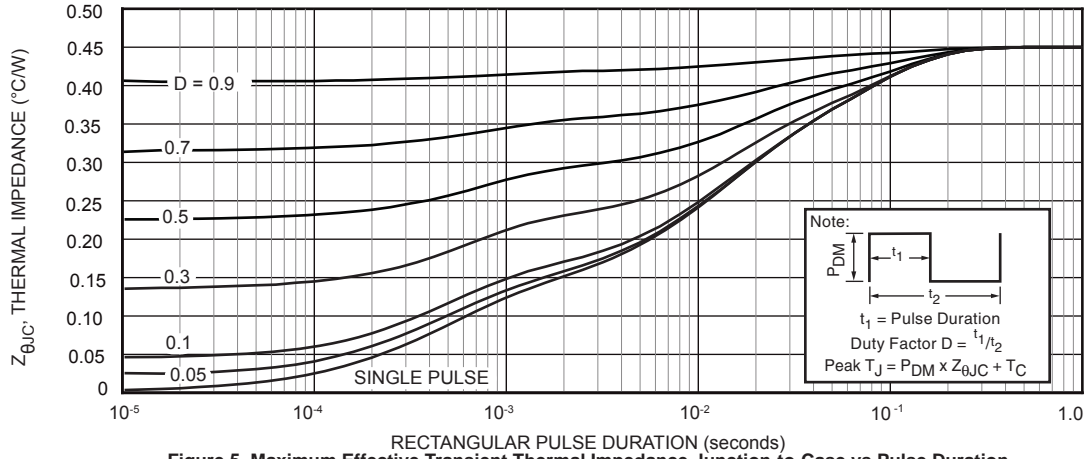


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

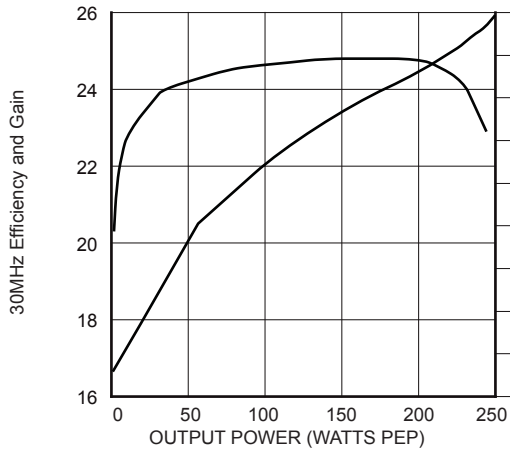


Figure 6. Gain and Efficiency vs  $P_{out}$

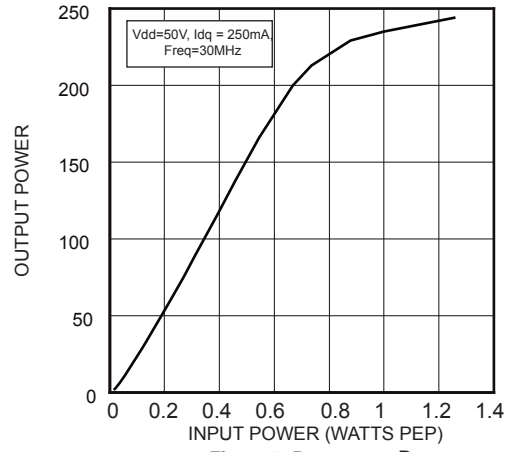


Figure 7.  $P_{out}$  versus  $P_{in}$

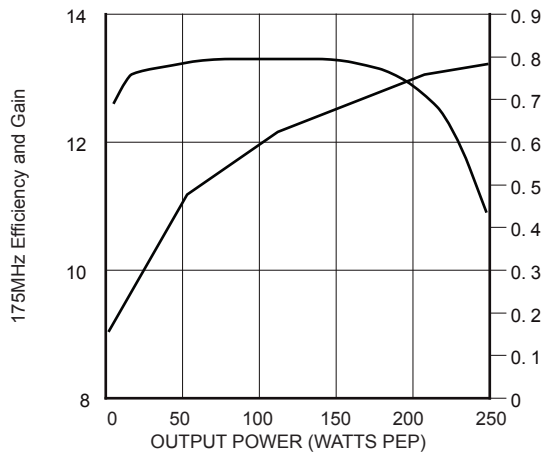


Figure 8. Gain and Efficiency vs  $P_{out}$

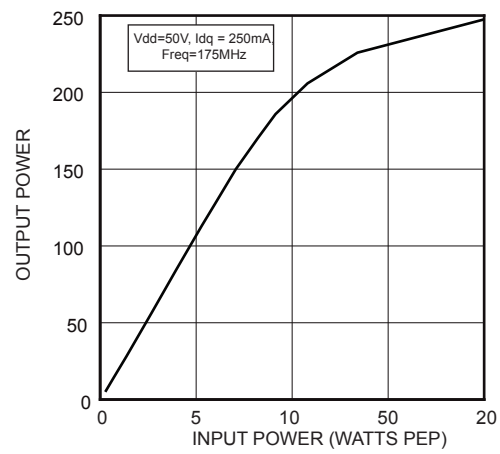
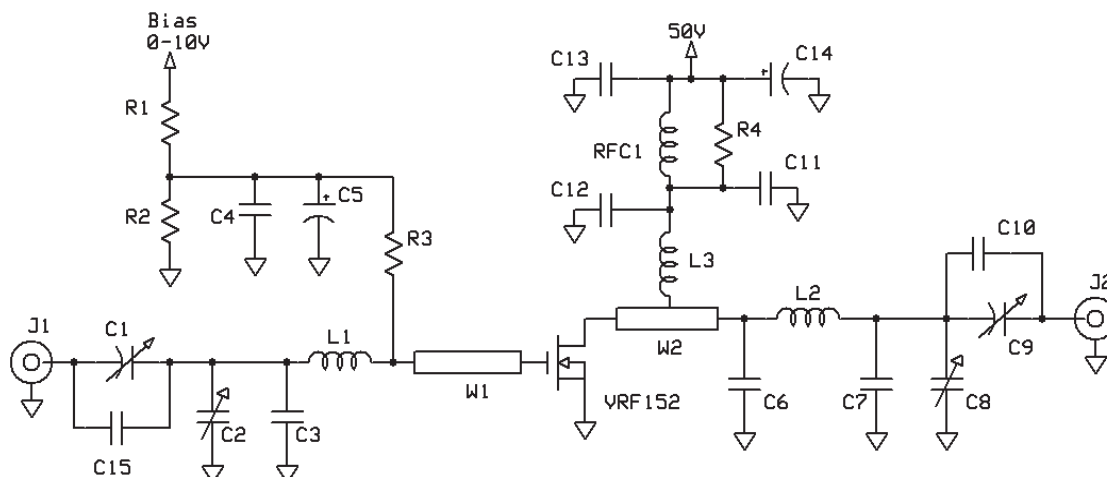


Figure 9.  $P_{out}$  versus  $P_{in}$

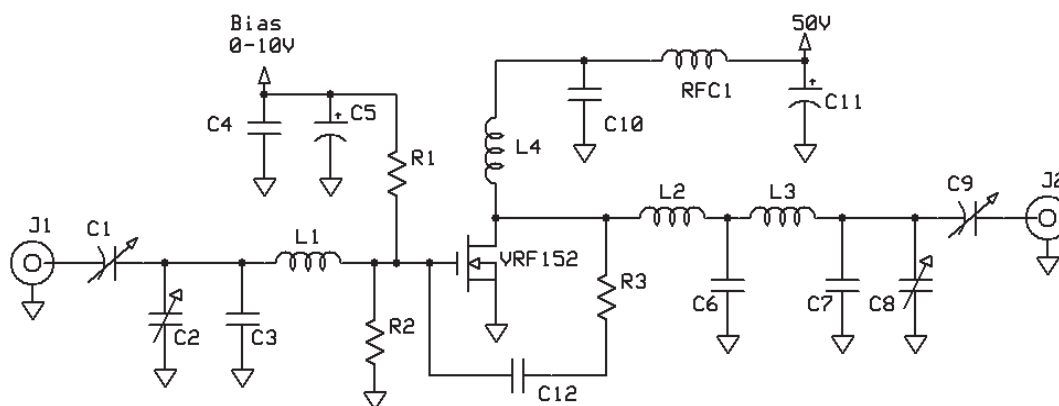
## 30 MHz test Circuit



C1,2,8,9 - ARCO 463 20-180pF  
 C3,7 - 120 pF ATC 100B  
 C4,11-13 - 0.1uF 100V SMT  
 C5 - 1 uF 15WV tant  
 C6, C15 - 47pF ATC 100B  
 C10 - 150pF ATC 100B  
 C14 - 15uF 100V Elect  
 W1 W2 - printed line 0.23"x 0.7"

L1 - 4t #20 ga .25"d x .16"L ~120nH  
 L2 - 5t #14 ga .312" dia x .45" ~135nH  
 L3 - 7 turns #16 ga 5/16" ID tight. ~250nH  
 R1 R2 - 2.2k ohm 1/4W  
 R3 - 22 ohm 1W SMT  
 R4 - 2.2 ohm 2W  
 RFC1 Fair-Rite 2961666631 (VK200-4B)  
 PCB = FR-4 fiberglass-epoxy er = 4.6

## 175 MHz test Circuit



C1 C2 C8 - ARCO 463  
 C3 C7 - 25 pF ATC 100B  
 C4 C10 C12 - 0.1uF 100V SMT  
 C5 - 1 uF 15WV tant  
 C6 - 250 pF ATC 100B  
 C9 - ARCO 462  
 C11 - 15uF 100V Elect

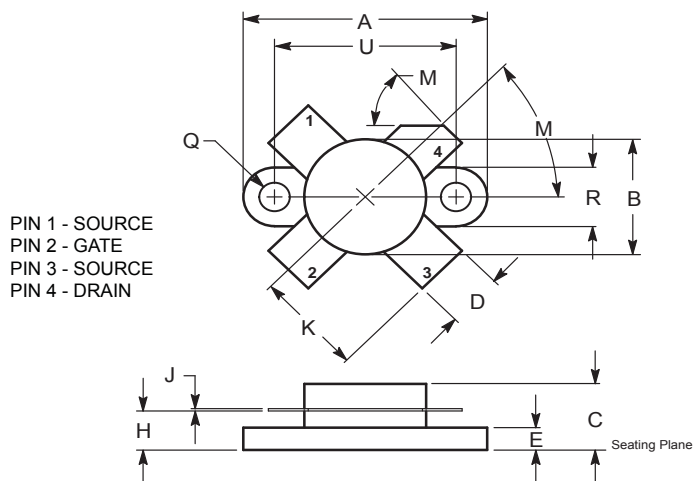
L1 - 3/4" #18 ga into Hairpin  
 L2 - printed line 0.2"W x 0.5" L  
 L3 - 1" #16 ga into Hairpin  
 L4 - 2 turns #16 ga. 5/16" ID  
 R1 R2 - 150 ohm 1W  
 R3 - 470 ohm 3W, Panasonic ECG  
 RFC1 Fair-Rite 2961666631 (VK200-4B)

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%.

**.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