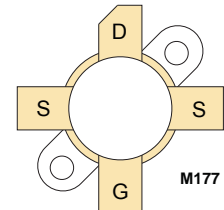



## RF POWER VERTICAL MOSFET

The VRF2933 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  $V_{(BR)DSS} = 170V$
- 300W with 22dB Typ. Gain @ 30MHz, 50V
- Excellent Stability & Low IMD
- Common Source Configuration
- Available in Matched Pairs
- **NOW** 14% lower  $V_{DS(ON)}$
- 70:1 Load VSWR Capability at Specified Operating Conditions
- Nitride Passivated
- Refractory Gold Metallization
- Improved Replacement for SD2933
- Thermally Enhanced Package
- RoHS Compliant 

### Maximum Ratings

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


Symbol	Parameter	VRF2933(MP)	Unit
$V_{DSS}$	Drain-Source Voltage	170	V
$I_D$	Continuous Drain Current @ $T_c = 25^\circ C$	42	A
$V_{GS}$	Gate-Source Voltage	$\pm 40$	V
$P_D$	Total Device dissipation @ $T_c = 25^\circ C$	648	W
$T_{STG}$	Storage Temperature Range	-65 to 150	°C
$T_J$	Operating Junction Temperature Max	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 ( $I_{D(ON)} = 20A, V_{GS} = 10V$ )		1.8	2.4	
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 100V, V_{GS} = 0V$ )			2.0	mA
$I_{GSS}$	Gate-Source Leakage Current ( $V_{DS} = \pm 20V, V_{GS} = 0V$ )			2.0	$\mu A$
$g_{fs}$	Forward Transconductance ( $V_{DS} = 10V, I_D = 20A$ )	8			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			0.27	°C/W

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

## Dynamic Characteristics

VRF2933(MP)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1MHz$		740		pF
$C_{oss}$	Output Capacitance			400		
$C_{rss}$	Reverse Transfer Capacitance			32		

## Functional Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$G_{PS}$	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 300W$	20	25		dB
$\eta_D$	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 300W$ CW		50		%
$\psi$	$f_1 = 30MHz, V_{DD} = 50V, I_{DQ} = 250mA, P_{out} = 300W$ CW, 70:1 VSWR - All Phase Angles, 0.2 mSec X 20% Duty Factor	No Degradation in Output Power			

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

## Typical Performance Curves

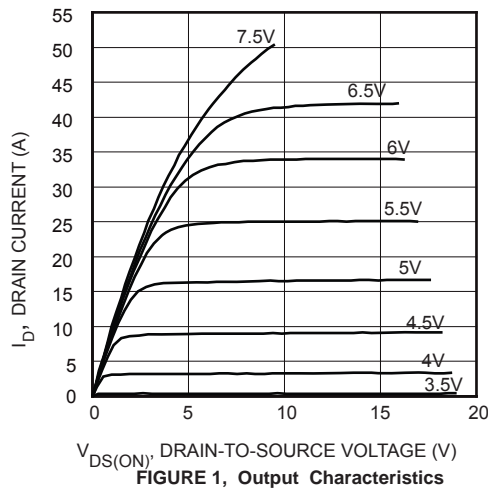


FIGURE 1, Output Characteristics

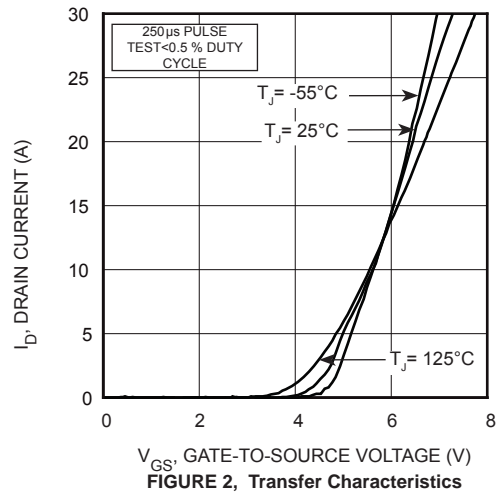


FIGURE 2, Transfer Characteristics

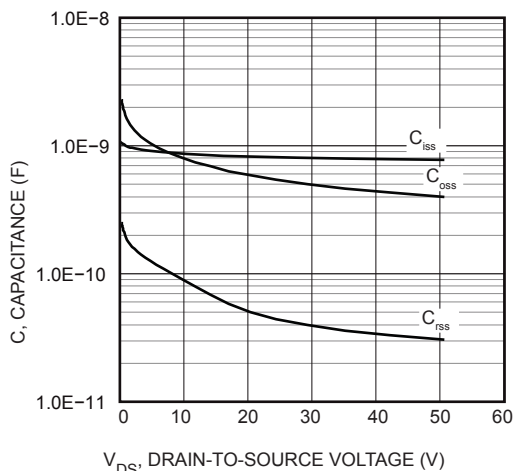


FIGURE 3, Capacitance vs Drain-to-Source Voltage

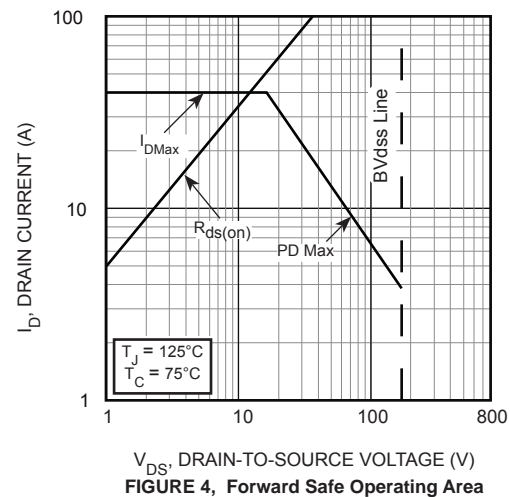


FIGURE 4, Forward Safe Operating Area

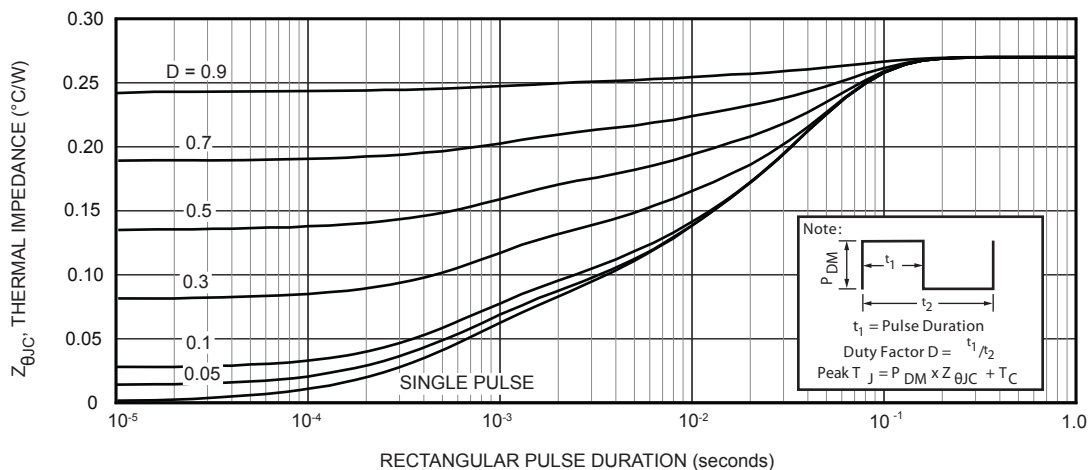


Figure 5. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

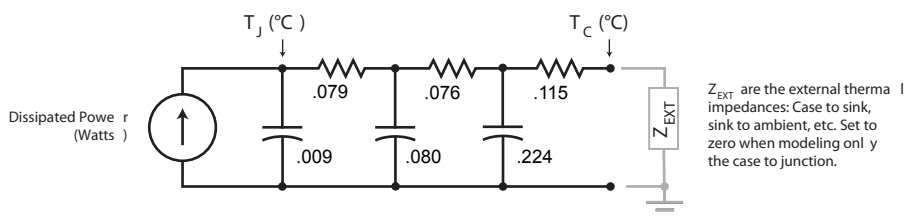


FIGURE 5b, TRANSIENT THERMAL IMPEDANCE MODEL

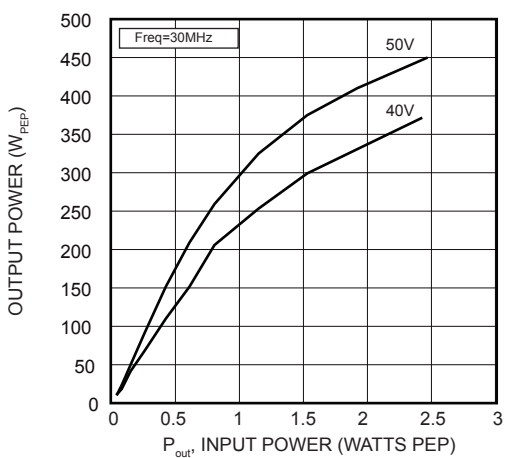


Figure 6. P<sub>OUT</sub> versus P<sub>IN</sub>

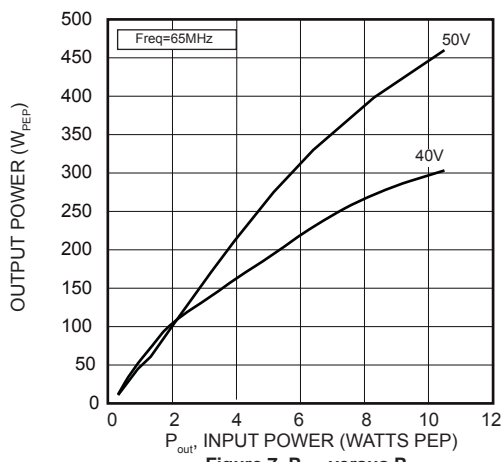


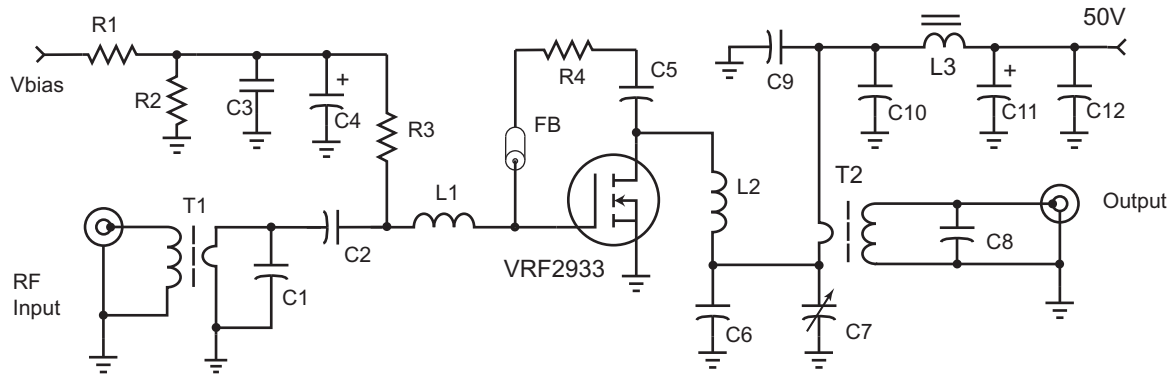
Figure 7. P<sub>OUT</sub> versus P<sub>IN</sub>

Table 1 - Typical Class AB Large Signal Input - Output Impedance

Freq. (MHz)	Z <sub>in</sub>	Z <sub>out</sub>
2	23.6 - j 5.5	4.0 - j 0.1
13.5	7.6 - j 10.1	3.9 - j 0.6
27.1	3.5 - j 6.0	3.7 - j 1.1
40.7	2.5 - j 4.0	3.3 - j 1.5
65	1.95 - j 2.07	2.6 - j 1.9
100	1.8 - j 0.66	1.76 - j 0.2
150	1.78 + j 0.5	1.03 + j 1.7

Z<sub>IN</sub> - Gate shunted with 25Ω I<sub>dq</sub> = 250mA  
 Z<sub>OL</sub> - Conjugate of optimum load for 300 Watts output at V<sub>dq</sub> = 50V

## 30 MHz Test Circuit



C1 1800pF ATC100B ceramic  
 C2, C3, C5, C9, C10, C12 0.1uF 100V  
 C6 680 pF metal clad 500V mica  
 C7 ARCO 467 mica trimmer  
 C8 100 pF ATC 100E ceramic  
 C4, C11 10uF 100V Electrolytic  
 FB small ferrite bead  $\mu_r = 125$   
 L1 20 nH 2t #18 0.188"d .2"l  
 L2 38 nH - 2.5t #14 enam. .25" dia.

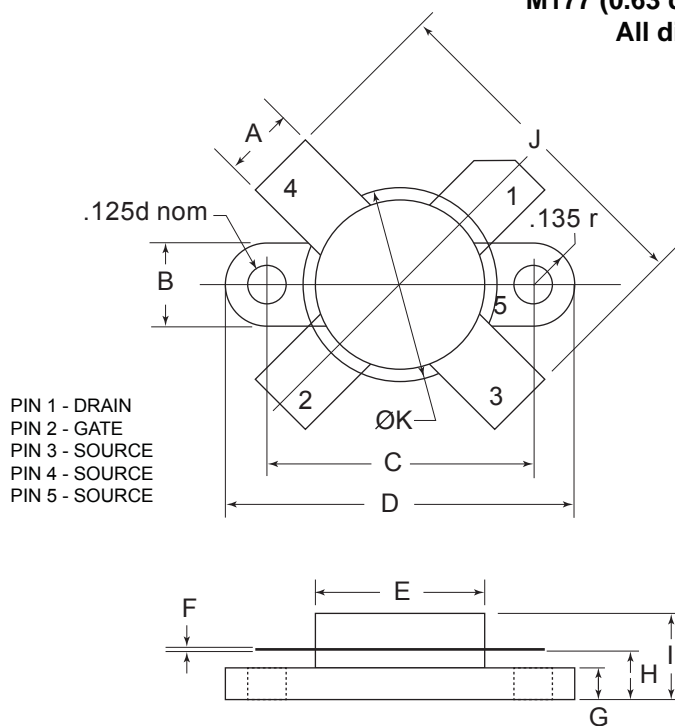
L3 2t #16 on 2x 267300081 .5" bead  
 R1-R2 1k Ohm 1/4W  
 R3 100 Ohm 1W  
 R4 470 Ohm "low inductance" 3W  
 T1 16:1 transformer 4t #20 teflon on  
 RF Parts Co. T1/2 transformer core  
 T2 9:1 transformer 3t #16 teflon on  
 RF Parts Co. T1 transformer core

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%.

**M177 (0.63 dia. SOE) Mechanical Data**  
**All dimensions are  $\pm 0.005$**



DIM	MIN	TYP	MAX
A	0.225	0.230	0.235
B	0.265	0.270	0.275
C	0.860	0.865	0.870
D	1.130	1.135	1.140
E	0.545	0.550	0.555
F	0.003	0.005	0.007
G	0.098	0.103	0.108
H	0.150	0.160	0.170
I			0.280
J	1.080	1.100	1.120
K	0.625	0.630	0.635

**HAZARDOUS MATERIAL WARNING:** The ceramic portion of the device below the lead plane is beryllium oxide. Beryllium oxide dust is highly toxic when inhaled. Care must be taken during handling and mounting to avoid damage to this area. These devices must never be thrown away with general industrial or domestic waste. BeO substrate weight: 0.703g. Percentage of total module weight which is BeO: 9%.

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