VMP4

N-Channel Enhancement-Mode RF Power FETs

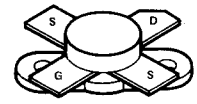
Siliconix

175 MHz
20-35 V
20 W
10 dB

FEATURES

- **Infinite VSWR**
- **No Thermal Runaway**
- **Broadband Capability**
- **Class A, B, C, D, E**
- **Low Noise Figure**
- **High Dynamic Range**
- **Simple Bias Circuitry**
- **S-Parameter Design**

Package Type S



.380 SOE Flange

See page 5-62 for Package Dimensions

ABSOLUTE MAXIMUM RATINGS (T_C = 25° C unless otherwise noted)

Gate-Source Voltage	40V	Total Device Dissipation	40W
Drain-Source Voltage	60V	Thermal Resistance, Junction to Case	4.4°C/W
Drain-Gate Voltage	60V	Junction Temperature	200°C
Drain Current (DC)	2A	Storage Temperature	−65°C to 150°C

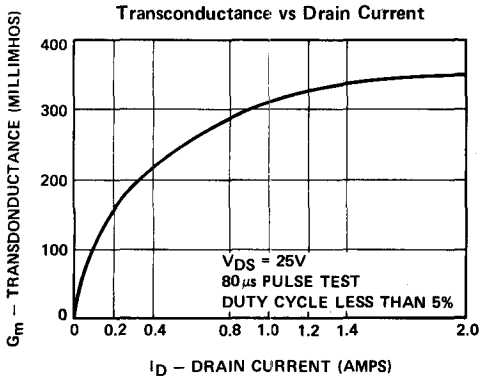
ELECTRICAL CHARACTERISTICS (T_C = 25° C unless otherwise noted)

Symbol	Characteristics	Min	Typ	Max	Unit	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	60			V	V_{GS} = 0V, I_D = 1.0 mA
I_{DSS}	Drain-Source Leakage Current			100	μA	V_{GS} = 0V, V_{DS} = 25V
I_{GSS}	Gate-Source Leakage Current			100	nA	V_{GS} = 40V, V_{DS} = 0V
g_m[1]	D.C. Forward Transconductance	0.2	0.3		mho	V_{DS} = 10V, I_D = 1A, ΔV_{GS} = 1.0V
$I_{D(on)}$[1]	On-State Drain Current	1.2	1.8		A	V_{DS} = 30V, V_{GS} = 10V
$V_{GS(th)}$	Gate Threshold Voltage	2		6	V	V_{GS} = V_{DS}, I_D = 100 mA
C_{iss}	Common-Source Input Capacitance		35	50	pF	V_{GS} = 0V, V_{DS} = 30V, f = 1.0 MHz
C_{oss}	Common-Source Output Capacitance		30	40	pF	V_{GS} = 0V, V_{DS} = 30V, f = 1.0 MHz
C_{rss}	Reverse Transfer Capacitance		5.0	7.5	pF	V_{GS} = 0V, V_{DS} = 30V, f = 1.0 MHz
G_{ps}	Common-Source Power Gain	10			dB	V_{DD} = 28V, Po = 20W, f = 175 MHz, I_{DQ} = 0.1A
η	Drain Efficiency		65		%	V_{DD} = 28V, Po = 20W, f = 175 MHz, I_{DQ} = 0.1A
V_{SWR}	Load Mismatch Tolerance	30:1				V_{DD} = 28V, Po = 20W, f = 175 MHz, I_{DQ} = 0.1A
N.F.	Noise Figure		5.6		dB	V_{DS} = 28V, I_D = 0.1A, f = 175 MHz

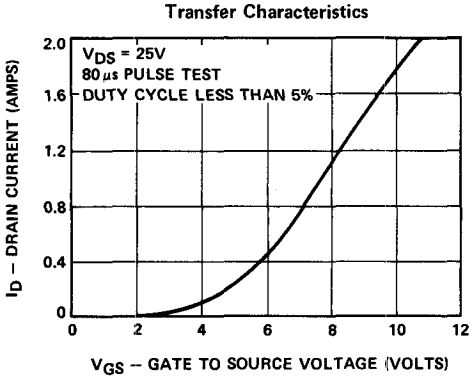
Note 1: Pulse Test—80μs to 300μs, 1% duty cycle

TYPICAL PERFORMANCE CURVES (25° C unless otherwise noted)

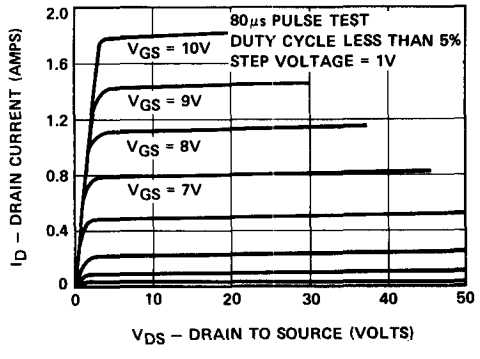
Transconductance vs Drain Current



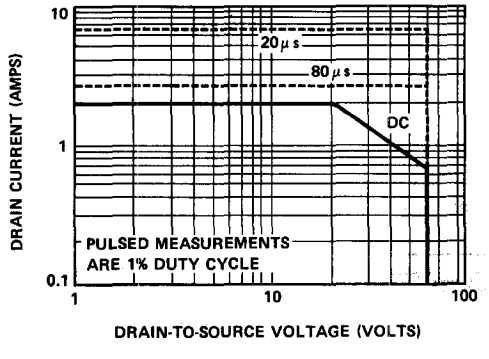
Transfer Characteristics



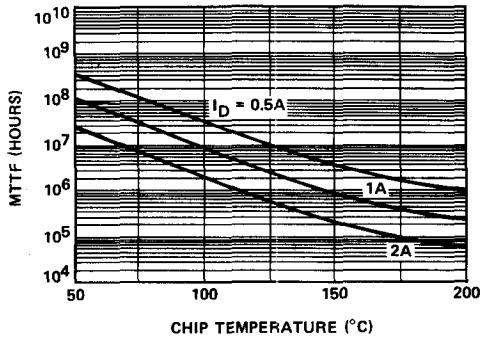
Output Characteristics



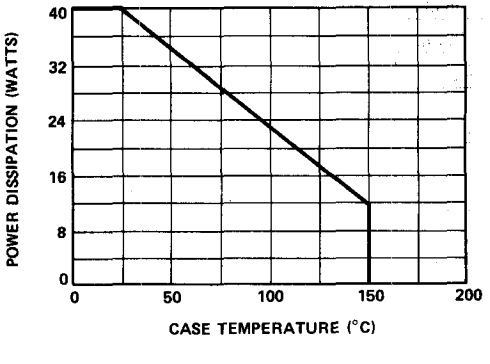
DC and Inductive Safe Operating Region T_C=25°C



MTTF vs Chip Temperature

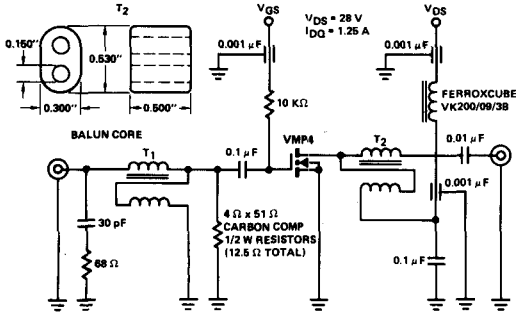


Power Dissipation vs Case Temperature



APPLICATIONS

28V WIDEBAND AMPLIFIER

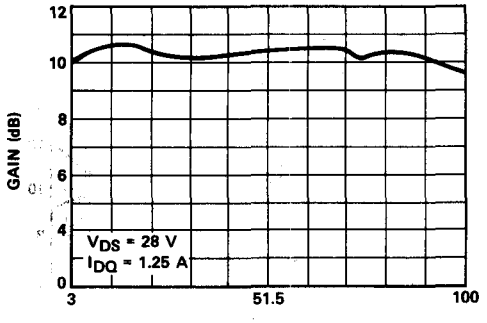


Parts List

T_1, 20 turns 30 Ω, #30 bifilar on micrometals T-50-6 Toroid

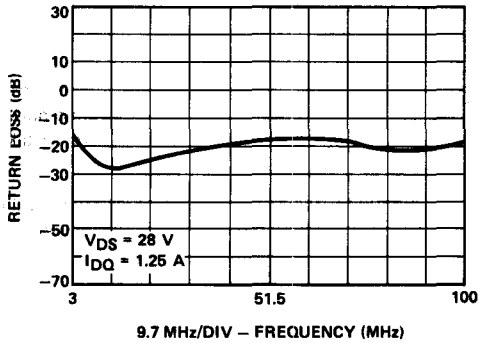
T_2, 1 turn of 2-50 Ω coax cables in parallel through 2 balun cores stackpole #57-9130 μo = 125

Gain vs Frequency
(Nominal P_{OUT}=19.4 W)



9.7 MHz/DIV – FREQUENCY (MHz)

Input Return Loss vs Frequency



9.7 MHz/DIV – FREQUENCY (MHz)

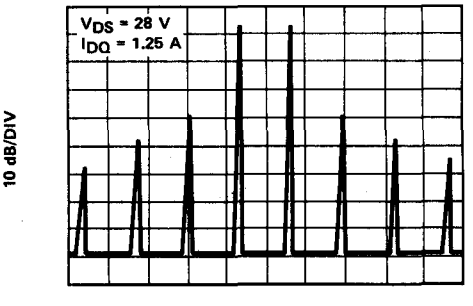
SMALL SIGNAL 2-PORT PARAMETERS

POLAR S-PARAMETERS VMP4 IN 50.0 OHM SYSTEM

Freq	S_{11}		S_{21}		S_{12}		S_{22}	
(MHz)	(Magn	Angl)	(Magn	Angl)	(Magn	Angl)	(Magn	Angl)
10	.93	−36	22.13	150	.03	63	.83	−35
20	.89	−67	18.84	134	.05	50	.78	−65
30	.84	−91	15.85	124	.06	41	.72	−85
40	.79	−107	12.59	113	.06	32	.69	−102
50	.76	−120	10.00	99	.07	19	.65	−114
60	.73	−129	8.41	91	.07	15	.62	−121
70	.72	−137	7.5	85	.07	12	.62	−128
80	.72	−142	6.31	80	.07	9	.62	−133
90	.72	−147	5.31	76	.06	8	.62	−139
100	.72	−151	5.01	73	.06	7	.62	−142
120	.73	−156	3.98	66	.06	6	.64	−148
140	.75	−162	3.35	61	.06	6	.66	−153
160	.76	−166	2.82	56	.06	7	.68	−157
180	.78	−169	2.37	53	.05	11	.71	−162
200	.79	−173	2.04	50	.05	14	.73	−165
225	.80	−175	1.78	45	.05	17	.78	−168
250	.81	180	1.51	40	.05	21	.78	−171
275	.82	175	1.29	37	.05	26	.79	−174
300	.82	173	1.12	35	.05	30	.80	−175
325	.83	171	.99	33	.05	36	.80	−176
350	.84	170	.87	31	.05	40	.81	−176
375	.84	169	.79	30	.06	45	.82	−177

Conditions: 28V @ 450 mA

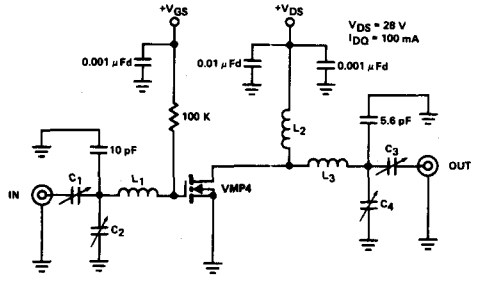
Intermodulation Distortion vs Frequency
(Nominal Power Output 12 W PEP)



TONE SPACING = 30 KHz

TEST FIXTURE

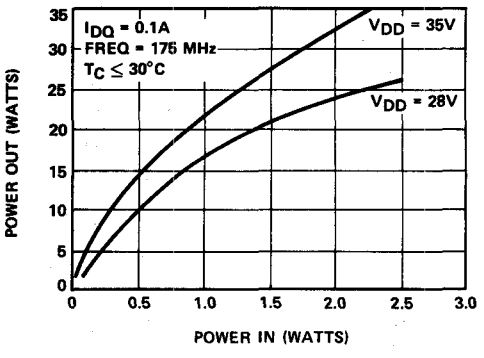
VMP4 175Hz



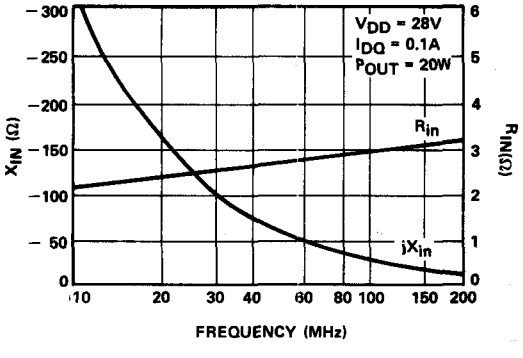
Parts List

C_1, C_3, 5-80 pFd
C_2, C_4, 3-30 pFd
L_1, L_3, 2 turns #20 enamel wire, close wound on 1/4" dia.
L_2, 7 turns #20 enamel wire, close wound on 1/4" dia.

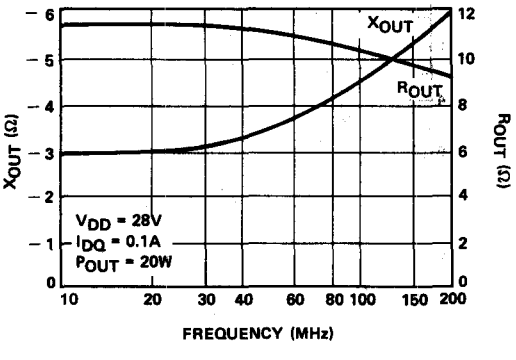
Typical Output Power vs Input Power



Series Equivalent Input Impedance vs Frequency



Series Equivalent Output Impedance vs Frequency



CAUTION: **Beryllium Oxide** – The top cap of this device is alumina which is harmless. However the ceramic portion between the leads and the metal flange is Beryllium Oxide, the dust of which is toxic. Care must therefore be taken during handling and mounting the device to prevent any damage to this area.

Steps must be taken to ensure that all those who may handle, use, or dispose of this device are aware of its nature and of these necessary safety precautions. In particular the transistor should never be thrown out with general industrial or domestic waste.