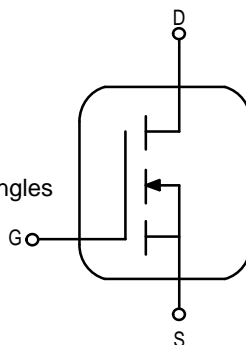


The RF MOSFET Line  
**RF Power**  
**Field Effect Transistors**  
N-Channel Enhancement-Mode Lateral  
MOSFETs

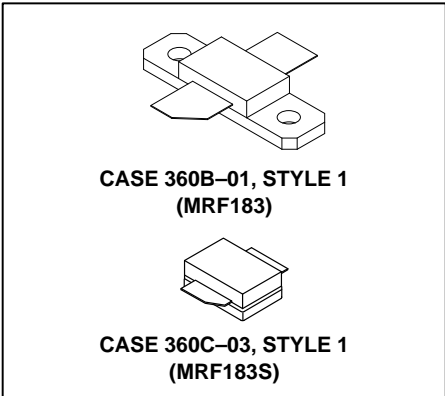
Designed for broadband commercial and industrial applications at frequencies to 1.0 GHz. The high gain and broadband performance of these devices makes them ideal for large-signal, common source amplifier applications in 28 volt base station equipment.

- Guaranteed Performance at 945 MHz, 28 Volts  
Output Power – 45 Watts PEP  
Power Gain – 11.5 dB  
Efficiency – 33%  
IMD – 28 dBc
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- S-Parameter Characterization at High Bias Levels
- Excellent Thermal Stability
- 100% Tested for Load Mismatch Stress at all Phase Angles with 5:1 VSWR @ 28 Vdc, 945 MHz, 45 Watts CW



**MRF183**  
**MRF183S**

**45 W, 1.0 GHz**  
**LATERAL N-CHANNEL**  
**BROADBAND**  
**RF POWER MOSFETs**



**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	65	Vdc
Drain-Gate Voltage (RGS = 1 Meg Ohm)	$V_{DGR}$	65	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$	Vdc
Drain Current – Continuous	$I_D$	5	Adc
Total Device Dissipation @ $T_C = 70^\circ\text{C}$ Derate above $70^\circ\text{C}$	$P_D$	86 0.67	W W/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	- 65 to +200	$^\circ\text{C}$
Operating Junction Temperature	$T_J$	200	$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5	$^\circ\text{C}/\text{W}$

**NOTE – CAUTION** – MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

**OFF CHARACTERISTICS**

Drain–Source Breakdown Voltage ( $V_{GS} = 0$ , $I_D = 50 \mu\text{A}$ )	$BV_{DSS}$	65	–	–	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 28 \text{ V}$ , $V_{GS} = 0$ )	$I_{DSS}$	–	–	1	$\mu\text{A}$
Gate–Source Leakage Current ( $V_{GS} = 20 \text{ V}$ , $V_{DS} = 0$ )	$I_{GSS}$	–	–	1	$\mu\text{A}$

**ON CHARACTERISTICS**

Gate Quiescent Voltage ( $V_{DS} = 28 \text{ Vdc}$ , $I_D = 250 \text{ mA}$ )	$V_{GS(Q)}$	3	–	5	Vdc
Drain–Source On–Voltage ( $V_{GS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$ )	$V_{DS(on)}$	–	0.7	–	Vdc
Forward Transconductance ( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 5 \text{ A}$ )	$g_{fs}$	–	2	–	S

**DYNAMIC CHARACTERISTICS**

Input Capacitance ( $V_{DS} = 28 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$ )	$C_{iss}$	–	82	–	pF
Output Capacitance ( $V_{DS} = 28 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$ )	$C_{oss}$	–	38	–	pF
Reverse Transfer Capacitance ( $V_{DS} = 28 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$ )	$C_{rss}$	–	4.5	–	pF

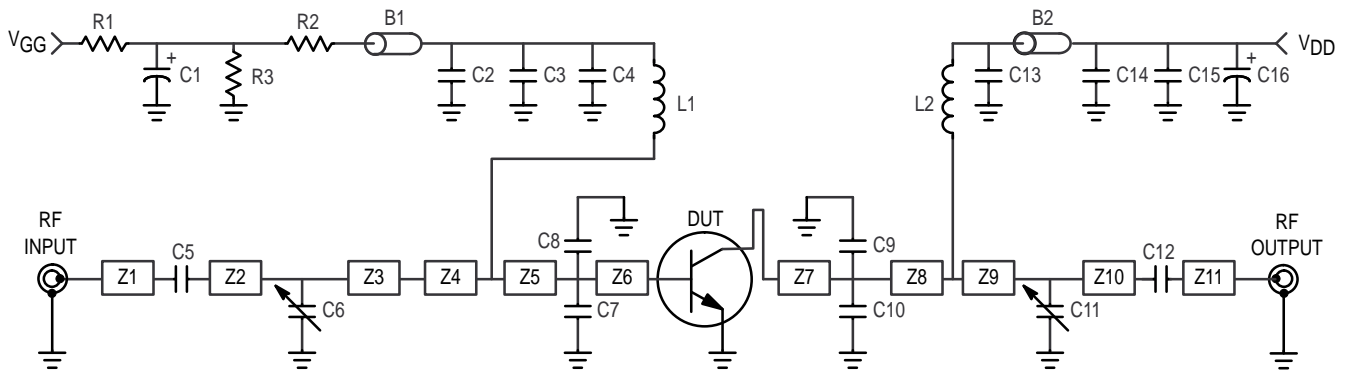
**FUNCTIONAL TESTS** (In Motorola Test Fixture)

( $V_{DD} = 28 \text{ Vdc}$ ,  $P_{out} = 45 \text{ Watts PEP}$ ,  $f_1 = 945.0$ ,  $f_2 = 945.1 \text{ MHz}$ ,  $I_{DQ} = 250 \text{ mA}$ )

Two–Tone Common Source Amplifier Power Gain	$G_{ps}$	11.5	13	–	dB
Two–Tone Drain Efficiency	$\eta$	33	36	–	%
3rd Order Intermodulation Distortion	IMD	–	–32	–28	dBc
Input Return Loss	IRL	9	14	–	dB

( $V_{DD} = 28 \text{ Vdc}$ ,  $P_{out} = 45 \text{ Watts PEP}$ ,  $f_1 = 930.0$ ,  $f_2 = 930.1 \text{ MHz}$ , and  $f_1 = 960.0$ ,  $f_2 = 960.1 \text{ MHz}$ ,  $I_{DQ} = 250 \text{ mA}$ )

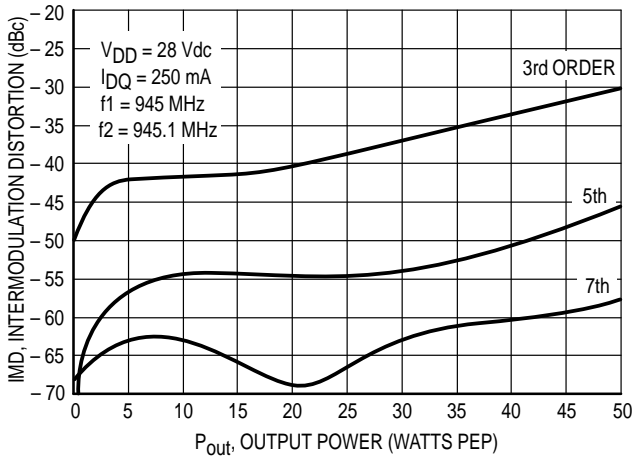
Two–Tone Common Source Amplifier Power Gain	$G_{ps}$	–	13	–	dB
Two–Tone Drain Efficiency	$\eta$	–	35	–	%
3rd Order Intermodulation Distortion	IMD	–	–32	–	dBc
Input Return Loss	IRL	–	12	–	dB
Output Mismatch Stress ( $V_{DD} = 28 \text{ Vdc}$ , $P_{out} = 45 \text{ Watts CW}$ , $I_{DQ} = 250 \text{ mA}$ , $f = 945 \text{ MHz}$ , VSWR 5:1 at All Phase Angles)	$\Psi$	No Degradation in Output Power Before and After Test			



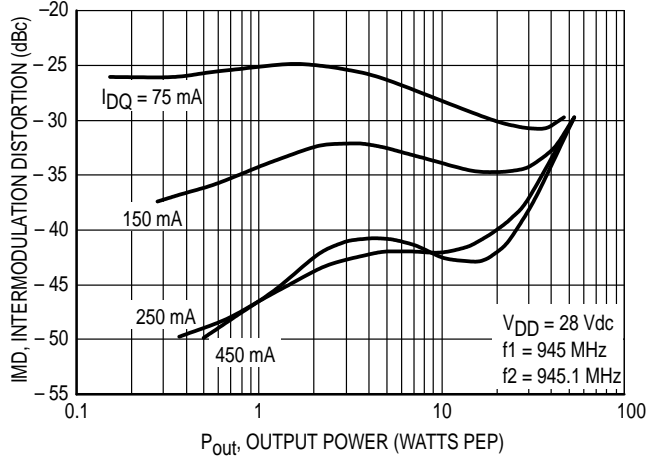
B1	Short Ferrite Bead	R3	4.7 M $\Omega$ , 1/4 W Carbon
B2	Long Ferrite Bead	Z1	T-Line, 0.200" x 0.080"
C1	10 $\mu$ F, 50 V Electrolytic Capacitor	Z2	T-Line, 0.570" x 0.120"
C2, C14	0.1 $\mu$ F Chip Capacitor	Z3	T-Line, 0.610" x 0.320"
C3	1000 pF Chip Capacitor	Z4	T-Line, 0.160" x 0.320" x 0.620"
C4, C13	47 pF Chip Capacitor	Z5	Tapered Line
C5, C12	47 pF Chip Capacitor	Z6	T-Line, 0.650" x 0.620"
C6, C11	0.8–8.0 pF Trim Capacitor	Z7	T-Line, 0.020" x 0.620"
C7, C8	10 pF Chip Capacitor	Z8	T-Line, 0.270" x 0.320"
C9, C10	10 pF Chip Capacitor	Z9	T-Line, 0.130" x 0.320"
C15	100 pF Chip Capacitor	Z10	T-Line, 0.370" x 0.080"
C16	250 $\mu$ F, 50 V Electrolytic Capacitor	Z11	T-Line, 1.050" x 0.080"
L1, L2	5 Turns, 24 AWG, ID 0.059"	Board	0.030" Glass Teflon, $\epsilon_r = 2.55$
R1	120 $\Omega$ , 1/4 W Carbon		ARLON-GX-0300-55-22
R2	18 k $\Omega$ , 1/4 W Carbon		

**Figure 1. MRF183S Two Tone Test Circuit Schematic**

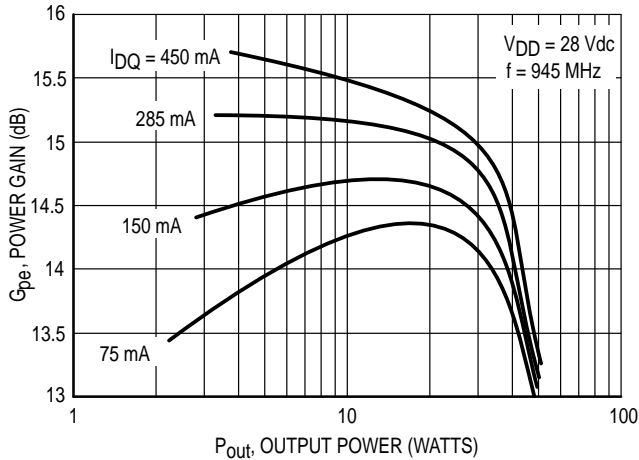
## TYPICAL CHARACTERISTICS



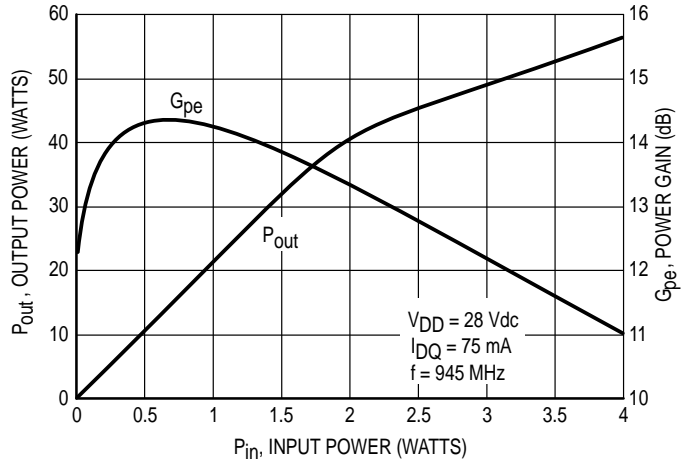
**Figure 2. Intermodulation Distortion versus Output Power**



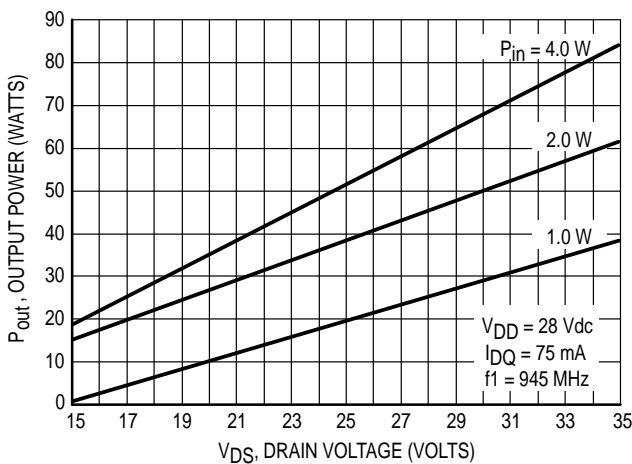
**Figure 3. Intermodulation Distortion versus Output Power**



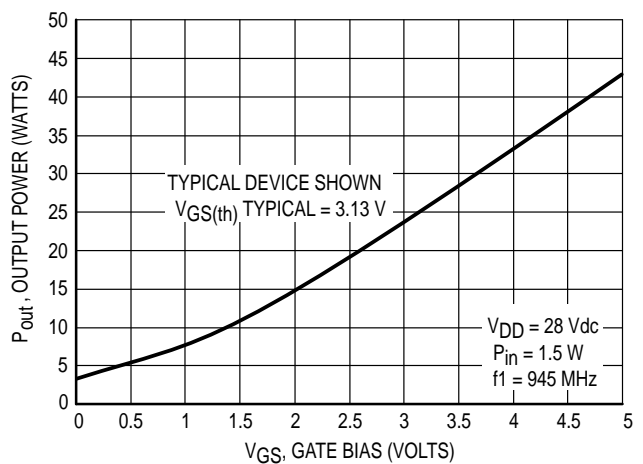
**Figure 4. Power Gain versus Output Power**



**Figure 5. Output Power versus Input Power**



**Figure 6. Output Power versus Drain Bias Supply Voltage**



**Figure 7. Output Power versus Gate Bias Supply Voltage**

## TYPICAL CHARACTERISTICS

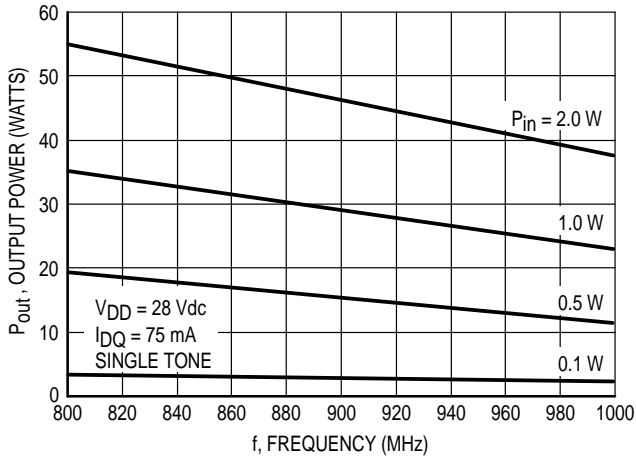


Figure 8. Output Power versus Frequency

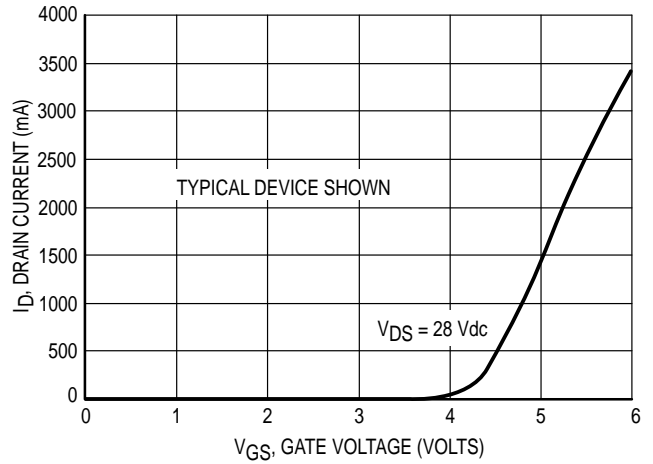


Figure 9. Drain Current versus Gate Voltage

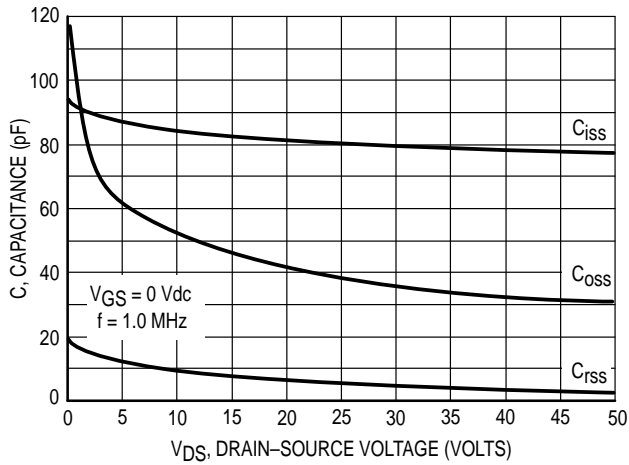


Figure 10. Capacitance versus Voltage

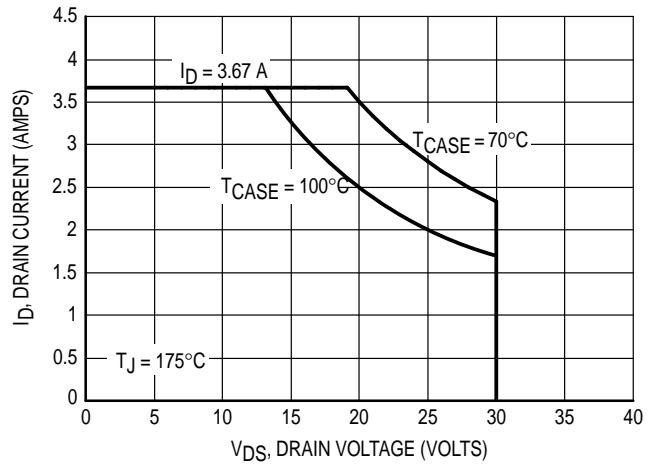


Figure 11. Class A Safe Operating Region

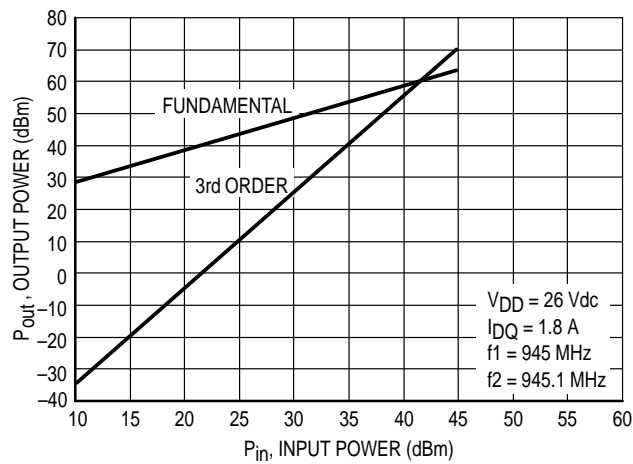


Figure 12. Class A Third Order Intercept Point

### TYPICAL CHARACTERISTICS

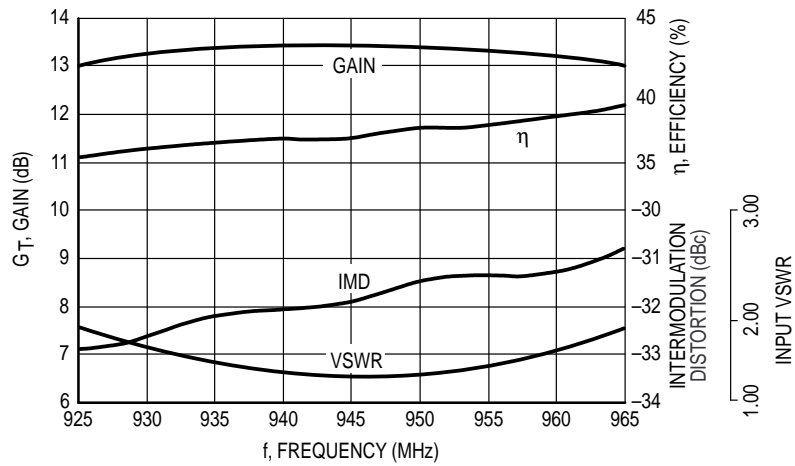


Figure 13. Broadband Power Performance of MRF183S

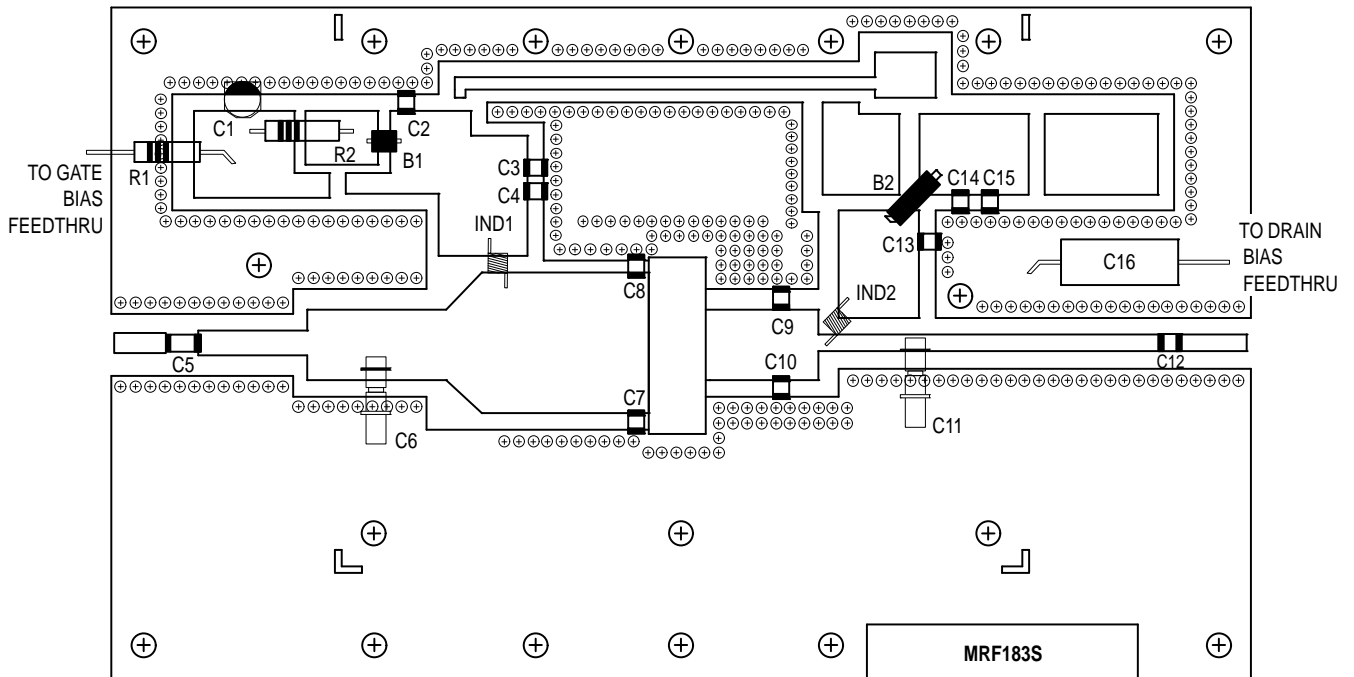
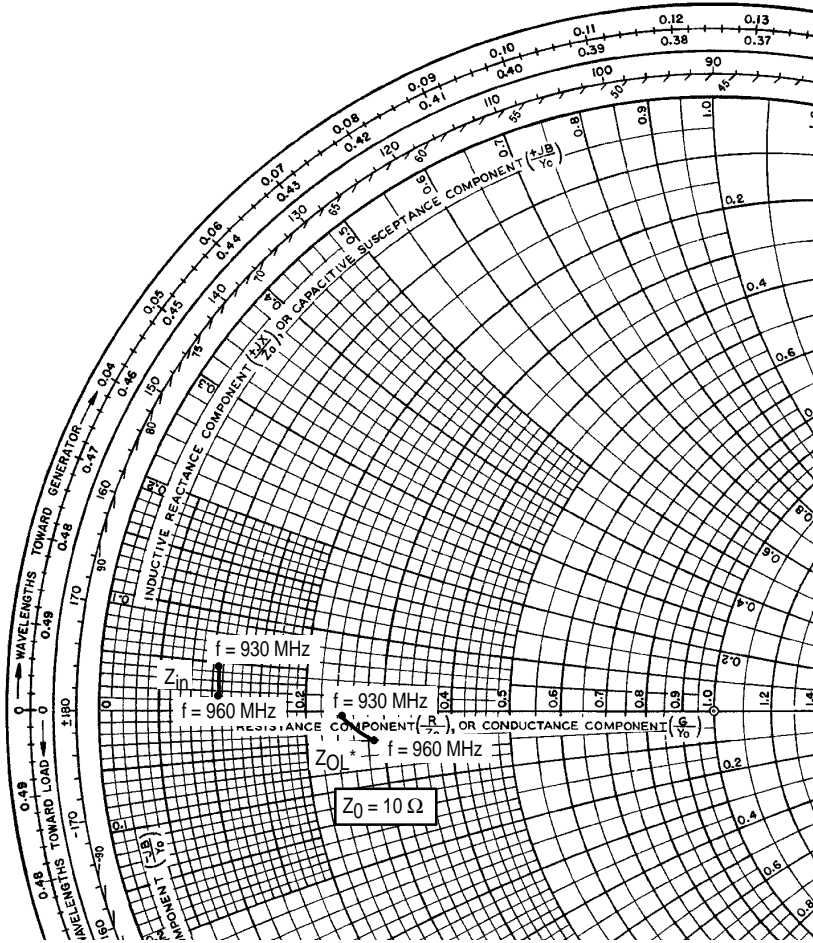


Figure 14. MRF183S Two Tone Test Circuit Component Parts Layout



$V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 250\text{ mA}$ ,  $P_{out} = 45\text{ W (PEP)}$

f MHz	$Z_{in}$ Ohms	$Z_{OL}^*$ Ohms
930	$1.10 + j0.93$	$2.60 - j0.13$
945	$1.10 + j0.78$	$2.70 - j0.28$
960	$1.10 + j0.60$	$2.80 - j0.42$

$Z_{in}$  = Conjugate of source impedance.

$Z_{OL}^*$  = Conjugate of the load impedance at given output power, voltage and current conditions.

Note:  $Z_{OL}^*$  was chosen based on tradeoffs between gain, output power, drain efficiency and intermodulation distortion.

**Figure 15. Series Equivalent Input and Output Impedance**

Table 1. Typical Common Source S-Parameters ( $V_{DS} = 13.5\text{ V}$ )

$I_D = 1.5\text{ A}$

f MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	S <sub>11</sub>	∠φ	S <sub>21</sub>	∠φ	S <sub>12</sub>	∠φ	S <sub>22</sub>	∠φ
20	0.954	-157	29.58	100	0.017	11	0.778	-161
30	0.941	-164	19.73	96	0.017	8	0.796	-168
40	0.922	-168	14.84	93	0.017	4	0.804	-170
50	0.907	-171	11.94	91	0.017	3	0.808	-172
60	0.903	-172	9.75	89	0.017	2	0.812	-173
70	0.899	-173	8.34	88	0.017	0	0.814	-174
80	0.898	-174	7.29	86	0.017	-1	0.816	-175
90	0.896	-175	6.49	85	0.017	-2	0.816	-175
100	0.897	-175	5.83	84	0.017	-2	0.817	-175
150	0.895	-177	3.82	79	0.017	-6	0.822	-176
200	0.898	-178	2.84	74	0.016	-9	0.828	-176
250	0.902	-178	2.24	70	0.016	-11	0.835	-176
300	0.908	-179	1.84	66	0.015	-14	0.842	-176
350	0.905	-179	1.55	62	0.015	-16	0.850	-176
400	0.913	-180	1.32	58	0.014	-18	0.861	-176
450	0.920	180	1.15	54	0.014	-18	0.865	-176
500	0.924	179	1.01	51	0.013	-20	0.874	-177
550	0.922	179	0.89	47	0.013	-21	0.881	-177
600	0.931	178	0.80	44	0.012	-21	0.889	-177
650	0.935	178	0.72	41	0.011	-20	0.895	-177
700	0.935	177	0.64	38	0.011	-17	0.901	-178
750	0.937	177	0.59	37	0.012	-18	0.905	-178
800	0.940	176	0.54	33	0.012	-20	0.913	-178
850	0.943	176	0.50	30	0.012	-29	0.919	-179
900	0.945	175	0.46	28	0.010	-33	0.924	-179
950	0.947	174	0.43	26	0.009	-34	0.930	-180
1000	0.947	174	0.40	24	0.008	-29	0.935	180
1050	0.947	173	0.37	21	0.007	-24	0.939	179
1100	0.952	172	0.35	19	0.007	-19	0.944	179
1150	0.949	172	0.32	17	0.007	-17	0.948	178
1200	0.946	171	0.30	14	0.006	-16	0.948	177
1250	0.954	170	0.28	12	0.006	-13	0.953	177
1300	0.952	170	0.27	9	0.006	-12	0.950	176
1350	0.949	169	0.26	9	0.006	-10	0.951	176
1400	0.948	168	0.23	8	0.005	-7	0.953	175
1450	0.948	168	0.22	6	0.004	4	0.948	174
1500	0.940	167	0.21	4	0.004	19	0.944	174



Table 2. Typical Common Source S-Parameters ( $V_{DS} = 28\text{ V}$ )

$I_D = 1.5\text{ A}$

f MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	S <sub>11</sub>	∠φ	S <sub>21</sub>	∠φ	S <sub>12</sub>	∠φ	S <sub>22</sub>	∠φ
20	0.968	-132	45.79	113	0.014	24	0.579	-145
30	0.953	-145	31.75	106	0.015	17	0.623	-157
40	0.921	-154	24.33	99	0.015	12	0.648	-161
50	0.904	-159	19.68	95	0.015	7	0.661	-164
60	0.898	-163	16.11	92	0.015	5	0.670	-166
70	0.890	-165	13.79	90	0.015	2	0.677	-167
80	0.886	-167	12.06	87	0.015	1	0.681	-168
90	0.886	-168	10.71	86	0.015	-1	0.684	-169
100	0.887	-169	9.61	84	0.015	-3	0.688	-169
150	0.886	-172	6.26	76	0.015	-9	0.706	-170
200	0.890	-174	4.59	69	0.014	-13	0.724	-170
250	0.898	-175	3.57	64	0.014	-17	0.744	-169
300	0.906	-176	2.88	59	0.013	-19	0.764	-169
350	0.908	-177	2.37	54	0.012	-23	0.785	-169
400	0.915	-178	2.00	49	0.011	-24	0.807	-170
450	0.924	-178	1.71	45	0.010	-25	0.821	-170
500	0.930	-179	1.48	41	0.010	-26	0.838	-171
550	0.928	-180	1.28	37	0.009	-26	0.851	-171
600	0.937	180	1.13	33	0.008	-25	0.865	-172
650	0.944	179	1.00	30	0.007	-22	0.878	-172
700	0.943	178	0.88	27	0.008	-14	0.888	-173
750	0.946	178	0.81	25	0.008	-15	0.895	-173
800	0.949	177	0.73	22	0.009	-17	0.906	-174
850	0.954	177	0.67	20	0.009	-28	0.912	-175
900	0.953	175	0.61	18	0.007	-34	0.919	-175
950	0.957	175	0.56	15	0.005	-32	0.927	-176
1000	0.957	174	0.51	13	0.004	-22	0.934	-177
1050	0.957	174	0.48	10	0.004	-11	0.939	-178
1100	0.962	173	0.45	8	0.004	-2	0.945	-178
1150	0.959	172	0.41	7	0.004	3	0.950	-179
1200	0.955	171	0.39	4	0.004	9	0.950	-180
1250	0.962	170	0.36	2	0.004	13	0.955	180
1300	0.959	170	0.33	0	0.004	17	0.953	179
1350	0.956	169	0.31	-1	0.004	25	0.954	178
1400	0.954	168	0.29	-4	0.004	32	0.957	177
1450	0.955	168	0.28	-6	0.004	46	0.952	177
1500	0.948	167	0.26	-7	0.004	56	0.948	176

## PACKAGE DIMENSIONS

**CASE 360B-01  
ISSUE O  
(MRF183)**

NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.790	0.810	20.07	20.57
B	0.220	0.240	5.59	6.09
C	0.125	0.175	3.18	4.45
D	0.205	0.225	5.21	5.71
E	0.050	0.070	1.27	1.77
F	0.004	0.006	0.11	0.15
G	.562 BSC		14.27 BSC	
H	0.070	0.090	1.78	2.29
K	0.215	0.255	5.47	6.47
N	0.350	0.370	8.89	9.39
Q	0.120	0.140	3.05	3.55

STYLE 1:  
PIN 1. DRAIN  
2. GATE  
3. SOURCE

**CASE 360C-03  
ISSUE B  
(MRF183S)**

NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.370	0.390	9.40	9.91
B	0.220	0.240	5.59	6.09
C	0.105	0.155	2.67	3.94
D	0.205	0.225	5.21	5.71
E	0.035	0.045	0.89	1.14
F	0.004	0.006	0.11	0.15
H	0.057	0.067	1.45	1.70
K	0.085	0.115	2.16	2.92
N	0.350	0.370	8.89	9.39

STYLE 1:  
PIN 1. DRAIN  
2. GATE  
3. SOURCE

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**HOME PAGE:** <http://motorola.com/sps/>



MRF183/D