The RF MOSFET Line

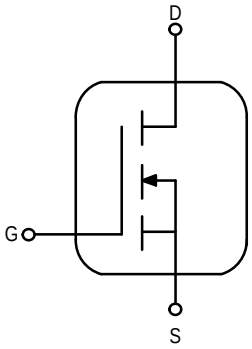
RF Power Field Effect Transistors

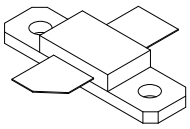
N–Channel Enhancement–Mode Lateral MOSFETs

MRF183
MRF183S

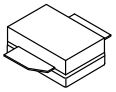
- High Gain, Rugged Device
- Broadband Performance from HF to 1 GHz
- Bottom Side Source Eliminates DC Isolators, Reducing Common Mode Inductances

45 WATTS, 1.0 GHz,
28 VOLTS
LATERAL N–CHANNEL
BROADBAND RF
POWER MOSFET





CASE 360B–01, STYLE 1



CASE 360C–02, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DSS}	65	Vdc
Gate–Source Voltage	V_{GS}	±20	Vdc
Storage Temperature Range	T_{stg}	– 65 to +150	°C
Operating Junction Temperature	T_J	200	°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	140 0.80	W W/°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25	°C/W

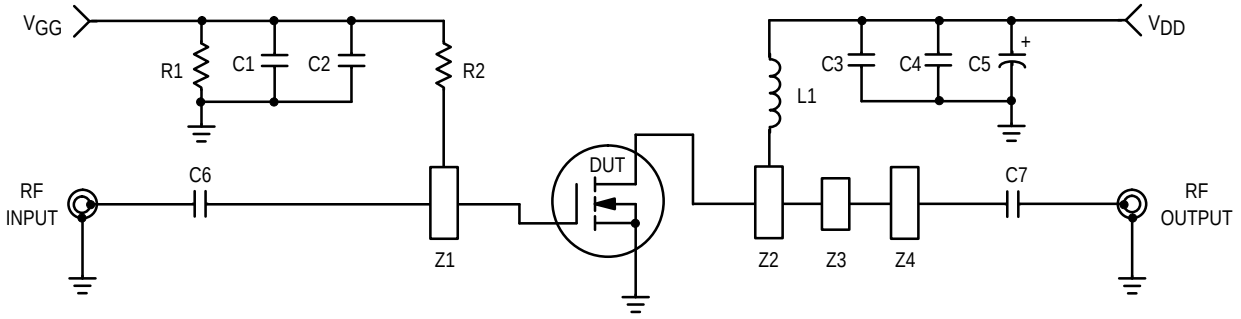
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (V_{GS} = 0, I_D = 250 μA)	$V_{(BR)DSS}$	65	–	–	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 28 V, V_{GS} = 0)	I_{DSS}	–	–	1	mAdc
Gate–Source Leakage Current (V_{GS} = 20 V, V_{DS} = 0)	I_{GSS}	–	–	1	μAdc

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

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = 10 V, I_D = 75 mA)	$V_{GS(th)}$	1	3	5	Vdc
Drain–Source On–Voltage (V_{GS} = 10 V, I_D = 1 A)	$V_{DS(on)}$	–	0.23	–	Vdc
Forward Transconductance (V_{DS} = 10 V, I_D = 3 A)	g_{fs}	2	2.6	–	S
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 28 V, V_{GS} = 0, f = 1 MHz)	C_{iss}	–	82	–	pF
Output Capacitance (V_{DS} = 28 V, V_{GS} = 0, f = 1 MHz)	C_{oss}	–	38	–	pF
Reverse Transfer Capacitance (V_{DS} = 28 V, V_{GS} = 0, f = 1 MHz)	C_{rss}	–	3.8	–	pF
FUNCTIONAL CHARACTERISTICS					
Common Source Power Gain (V_{DD} = 28 Vdc, P_{out} = 45 W, I_{DQ} = 75 mA, f = 1 GHz)	G_{ps}	11	13	–	dB
Drain Efficiency (V_{DD} = 28 Vdc, P_{out} = 45 W, I_{DQ} = 75 mA, f = 1 GHz)	η	45	55	–	%
Series Equivalent Input Impedance (V_{DD} = 28 Vdc, P_{out} = 45 W, I_{DQ} = 75 mA, f = 1 GHz)	Z_{in}	–	0.52 + j1.29	–	Ω
Series Equivalent Output Impedance (V_{DD} = 28 Vdc, P_{out} = 45 W, I_{DQ} = 75 mA, f = 1 GHz)	Z_{out}	–	1.49 – j1.65	–	Ω



C1, C3 — 0.1 μF Ceramic Capacitor
C2, C4 — 240 pF 0.1″ Chip Capacitor
C5 — 150 μF, 50 V Electrolytic Capacitor
C6, C7 — 220 pF 0.1″ Chip Capacitor
L1–3T, #18 AWG 1/8″ ID 0.285″ Long
R1 — 1 KΩ, 1/4 W
R2 — 10 KΩ, 1/4 W
Z1–Z4 — Microstrip

Figure 1. Test Circuit Schematic

TYPICAL CHARACTERISTICS

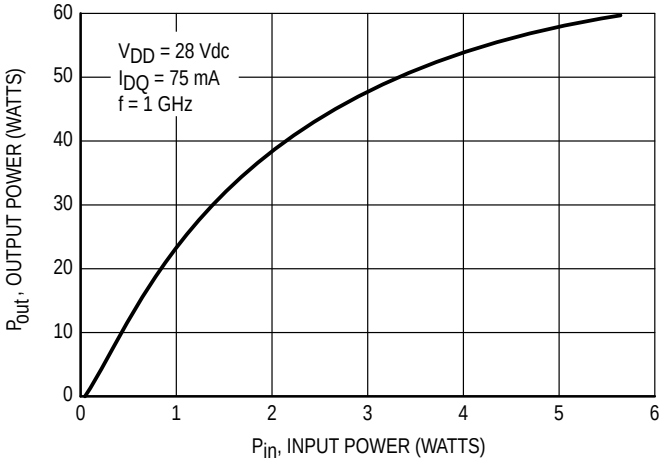


Figure 2. Output Power versus Input Power at 1 GHz

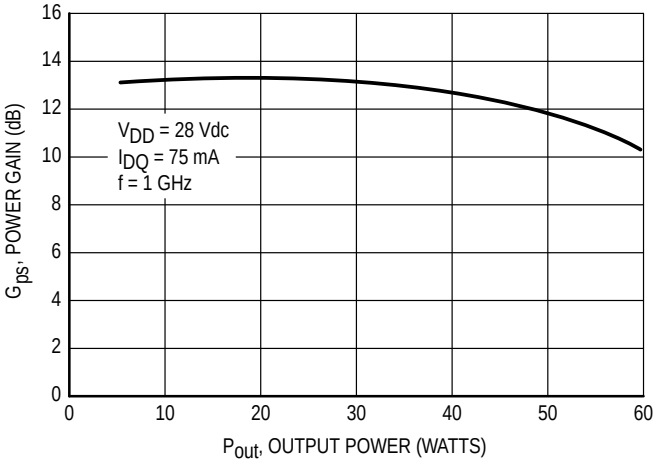


Figure 3. Power Gain versus Output Power at 1 GHz

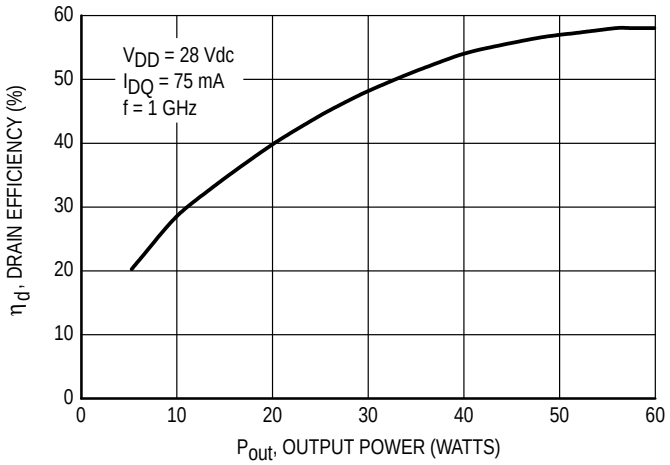


Figure 4. Drain Efficiency versus Output Power at 1 GHz

Table 1. Typical Common Source S–Parameters (V_{DS} = 13.5 V)

I_D = 1.5 A

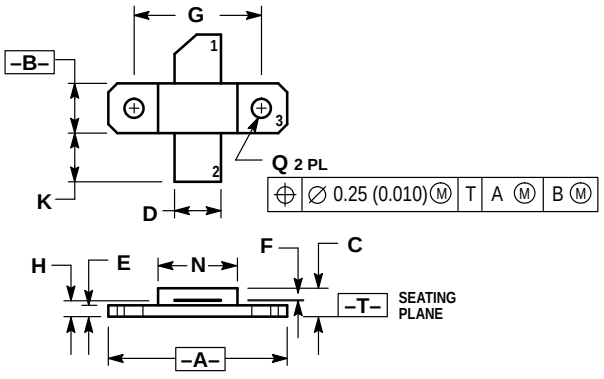
f	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	$\|S_{11}\|$	∠ϕ	$\|S_{21}\|$	∠ϕ	$\|S_{12}\|$	∠ϕ	$\|S_{22}\|$	∠ϕ
20	0.954	–156.5	29.575	100.0	0.0167	11.3	0.778	–161.2
30	0.941	–163.6	19.733	96.4	0.0169	8.3	0.796	–167.6
40	0.922	–168.2	14.838	92.9	0.0168	4.1	0.804	–170.4
50	0.907	–170.6	11.936	90.5	0.0168	2.8	0.808	–172.0
60	0.903	–172.3	9.754	88.7	0.0168	1.8	0.812	–173.2
70	0.899	–173.3	8.340	87.5	0.0167	0.2	0.814	–173.9
80	0.898	–174.1	7.293	86.4	0.0167	–0.9	0.816	–174.5
90	0.896	–174.6	6.485	85.1	0.0167	–1.8	0.816	–174.8
100	0.897	–175.3	5.830	84.0	0.0167	–2.4	0.817	–175.2
150	0.895	–176.6	3.823	78.8	0.0166	–5.7	0.822	–176.0
200	0.898	–177.6	2.838	73.9	0.0161	–8.6	0.828	–176.1
250	0.902	–178.0	2.240	69.6	0.0157	–11.3	0.835	–176.1
300	0.908	–178.6	1.840	65.5	0.0153	–13.9	0.842	–176.1
350	0.905	–179.2	1.545	61.7	0.0148	–16.1	0.850	–176.0
400	0.913	–179.7	1.323	57.6	0.0143	–17.8	0.861	–176.1
450	0.920	179.9	1.148	54.2	0.0135	–18.2	0.865	–176.4
500	0.924	179.3	1.006	50.6	0.0131	–20.1	0.874	–176.6
550	0.922	178.8	0.888	47.3	0.0126	–20.7	0.881	–176.7
600	0.931	178.2	0.798	43.7	0.0118	–21.4	0.889	–177.0
650	0.935	178.0	0.720	40.7	0.0112	–19.9	0.895	–177.3
700	0.935	177.0	0.639	37.7	0.0114	–16.5	0.901	–177.7
750	0.937	176.5	0.593	36.6	0.0120	–18.0	0.905	–178.0
800	0.940	176.2	0.538	33.1	0.0119	–19.6	0.913	–178.4
850	0.943	175.6	0.498	30.1	0.0124	–28.5	0.919	–178.9
900	0.945	174.7	0.461	27.7	0.0100	–32.5	0.924	–179.2
950	0.947	174.2	0.428	25.6	0.0087	–34.3	0.930	–179.6
1000	0.947	173.6	0.398	23.8	0.0076	–28.6	0.935	179.7
1050	0.947	172.8	0.371	21.0	0.0072	–23.5	0.939	179.1
1100	0.952	172.1	0.347	19.3	0.0071	–19.2	0.944	178.7
1150	0.949	171.6	0.319	17.3	0.0067	–17.3	0.948	178.0
1200	0.946	171.0	0.304	14.3	0.0064	–15.7	0.948	177.3
1250	0.954	170.1	0.282	12.0	0.0060	–12.8	0.953	176.9
1300	0.952	169.8	0.270	9.4	0.0058	–11.7	0.950	176.1
1350	0.949	169.1	0.255	8.6	0.0056	–10.3	0.951	175.5
1400	0.948	168.0	0.233	7.9	0.0048	–6.7	0.953	174.8
1450	0.948	167.5	0.218	5.9	0.0042	3.7	0.948	174.4
1500	0.940	166.7	0.205	3.8	0.0039	19.4	0.944	173.7

Table 2. Typical Common Source S–Parameters (V_{DS} = 28 V)

I_D = 1.5 A

f MHz	S_{11}		S_{21}		S_{12}		S_{22}	
	$\|S_{11}\|$	∠ϕ	$\|S_{21}\|$	∠ϕ	$\|S_{12}\|$	∠ϕ	$\|S_{22}\|$	∠ϕ
20	0.968	–131.6	45.785	112.7	0.0143	24.0	0.579	–145.3
30	0.953	–145.3	31.747	105.5	0.0149	16.6	0.623	–156.7
40	0.921	–154.4	24.333	99.1	0.0152	11.5	0.648	–161.4
50	0.904	–159.4	19.676	94.9	0.0151	7.2	0.661	–164.2
60	0.898	–162.8	16.109	91.8	0.0152	4.5	0.670	–166.1
70	0.890	–165.1	13.788	89.5	0.0151	2.4	0.677	–167.3
80	0.886	–166.7	12.060	87.4	0.0152	0.5	0.681	–168.2
90	0.886	–168.0	10.714	85.5	0.0150	–0.9	0.684	–168.6
100	0.887	–169.3	9.606	83.7	0.0151	–2.9	0.688	–168.9
150	0.886	–172.3	6.260	76.0	0.0147	–8.5	0.706	–169.8
200	0.890	–174.3	4.594	69.4	0.0141	–12.6	0.724	–169.5
250	0.898	–174.9	3.570	63.6	0.0135	–16.5	0.744	–169.3
300	0.906	–175.9	2.876	58.5	0.0128	–18.9	0.764	–169.3
350	0.908	–176.8	2.367	53.5	0.0120	–22.5	0.785	–169.3
400	0.915	–177.6	1.996	48.5	0.0111	–24.1	0.807	–169.5
450	0.924	–178.1	1.708	44.5	0.0105	–24.6	0.821	–170.0
500	0.930	–178.8	1.475	40.6	0.0098	–26.1	0.838	–170.5
550	0.928	–179.7	1.277	37.3	0.0091	–25.9	0.851	–171.0
600	0.937	179.6	1.128	33.4	0.0083	–25.4	0.865	–171.6
650	0.944	179.2	0.999	30.1	0.0074	–22.2	0.878	–172.2
700	0.943	178.3	0.878	26.6	0.0077	–14.4	0.888	–172.9
750	0.946	177.6	0.806	25.3	0.0083	–15.3	0.895	–173.4
800	0.949	177.0	0.730	22.1	0.0086	–17.1	0.906	–174.1
850	0.954	176.5	0.670	19.6	0.0090	–28.3	0.912	–174.8
900	0.953	175.4	0.608	17.6	0.0068	–33.7	0.919	–175.4
950	0.957	174.9	0.557	15.1	0.0051	–31.6	0.927	–176.0
1000	0.957	174.4	0.512	12.8	0.0042	–22.0	0.934	–176.8
1050	0.957	173.5	0.475	9.7	0.0040	–10.7	0.939	–177.6
1100	0.962	172.6	0.447	8.0	0.0040	–2.3	0.945	–178.2
1150	0.959	172.2	0.413	6.7	0.0041	3.4	0.950	–178.9
1200	0.955	171.3	0.391	4.2	0.0040	9.1	0.950	–179.8
1250	0.962	170.4	0.355	2.3	0.0042	12.5	0.955	179.6
1300	0.959	170.1	0.332	0.0	0.0039	17.2	0.953	178.8
1350	0.956	169.3	0.310	–1.4	0.0041	25.2	0.954	178.0
1400	0.954	168.3	0.291	–4.4	0.0035	32.0	0.957	177.2
1450	0.955	168.0	0.277	–5.9	0.0037	45.5	0.952	176.7
1500	0.948	167.1	0.261	–6.8	0.0042	56.1	0.948	176.0

PACKAGE DIMENSIONS

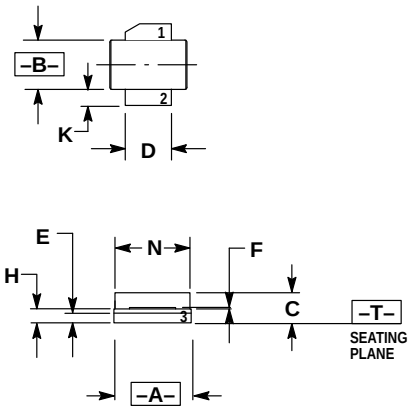


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	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	0.562 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 360B–01
ISSUE O



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

	INCHES		MILLIMETERS	
DIM	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	0.030	0.050	0.76	1.27
F	0.004	0.006	0.11	0.15
H	0.050	0.070	1.27	1.78
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

CASE 360C–02
ISSUE A

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