



# RF Power Field Effect Transistors

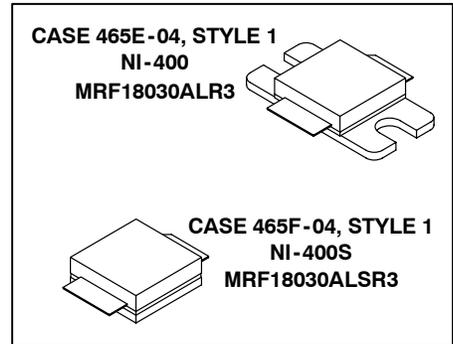
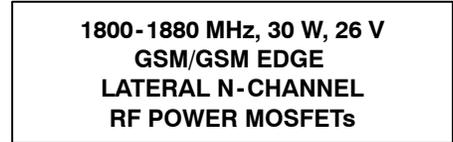
## N-Channel Enhancement-Mode Lateral MOSFETs

Designed for GSM and EDGE base station applications with frequencies from 1800 to 2000 MHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications. Specified for GSM 1805-1880 MHz.

- Typical GSM Performance:  
 Power Gain - 14 dB (Typ) @ 30 Watts  
 Efficiency - 50% (Typ) @ 30 Watts
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 30 Watts CW Output Power

### Features

- Internally Matched for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Low Gold Plating Thickness on Leads, 40μ" Nominal.
- RoHS Compliant
- in Tape and Reel. R3 Suffix = 250 Units per 32 mm, 13 inch Reel.



**Table 1. Maximum Ratings**

Rating	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	-0.5, +65	Vdc
Gate-Source Voltage	V <sub>GS</sub>	-0.5, +15	Vdc
Total Device Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	83.3 0.48	W W/°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Case Operating Temperature	T <sub>C</sub>	150	°C
Operating Junction Temperature	T <sub>J</sub>	200	°C

**Table 2. Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	2.1	°C/W

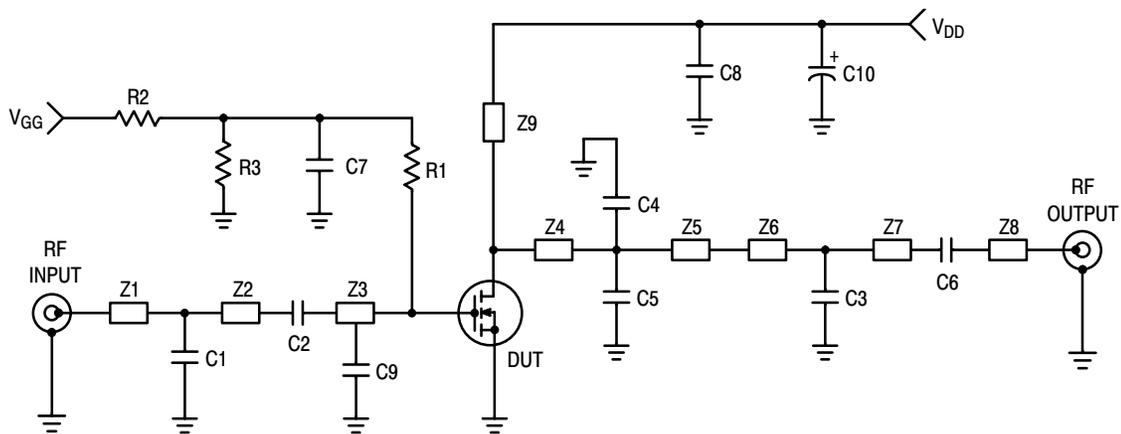
**Table 3. ESD Protection Characteristics**

Test Conditions	Class
Human Body Model	2 (Minimum)
Machine Model	M3 (Minimum)

**Table 4. Electrical Characteristics** ( $T_C = 25^\circ\text{C}$ , 50 ohm system unless otherwise noted)

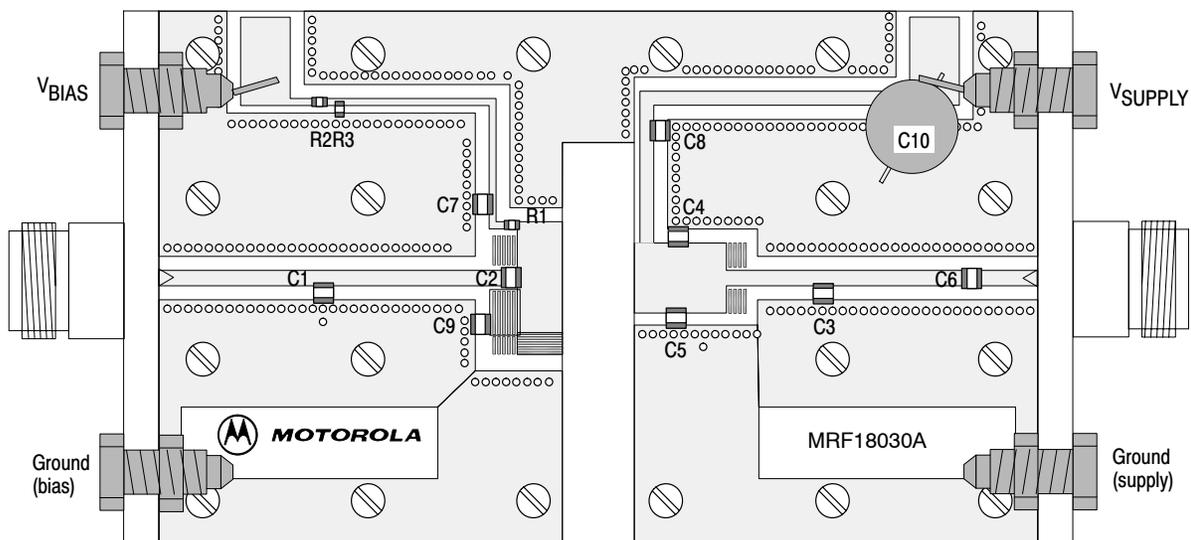
Characteristic	Symbol	Min	Typ	Max	Unit
<b>Off Characteristics</b>					
Drain-Source Breakdown Voltage ( $V_{GS} = 0 \text{ Vdc}$ , $I_D = 20 \mu\text{Adc}$ )	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 26 \text{ Vdc}$ , $V_{GS} = 0 \text{ Vdc}$ )	$I_{DSS}$	—	—	1	$\mu\text{Adc}$
Gate-Source Leakage Current ( $V_{GS} = 5 \text{ Vdc}$ , $V_{DS} = 0 \text{ Vdc}$ )	$I_{GSS}$	—	—	1	$\mu\text{Adc}$
<b>On Characteristics</b>					
Gate Threshold Voltage ( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 100 \mu\text{Adc}$ )	$V_{GS(th)}$	2	3	4	Vdc
Gate Quiescent Voltage ( $V_{DS} = 26 \text{ Vdc}$ , $I_D = 250 \text{ mAdc}$ )	$V_{GS(Q)}$	2	3.9	4.5	Vdc
Drain-Source On-Voltage ( $V_{GS} = 10 \text{ Vdc}$ , $I_D = 1 \text{ Adc}$ )	$V_{DS(on)}$	—	0.29	0.4	Vdc
Forward Transconductance ( $V_{DS} = 10 \text{ Vdc}$ , $I_D = 1 \text{ Adc}$ )	$g_{fs}$	—	2	—	S
<b>Dynamic Characteristics</b>					
Reverse Transfer Capacitance <sup>(1)</sup> ( $V_{DS} = 26 \text{ Vdc} \pm 30 \text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0 \text{ Vdc}$ )	$C_{rss}$	—	1.3	—	pF
<b>Functional Tests</b> (In Freescale Test Fixture) <sup>(2)</sup>					
Output Power, 1 dB Compression Point ( $V_{DD} = 26 \text{ Vdc}$ , $I_{DQ} = 250 \text{ mA}$ , $f = 1805 - 1880 \text{ MHz}$ )	P1dB	27	30	—	W
Common-Source Amplifier Power Gain @ 30 W ( $V_{DD} = 26 \text{ Vdc}$ , $I_{DQ} = 250 \text{ mA}$ , $f = 1805 - 1880 \text{ MHz}$ )	$G_{ps}$	13	14	—	dB
Drain Efficiency @ 30 W ( $V_{DD} = 26 \text{ Vdc}$ , $I_{DQ} = 250 \text{ mA}$ , $f = 1805 - 1880 \text{ MHz}$ )	$\eta$	46.5	50	—	%
Input Return Loss @ 30 W ( $V_{DD} = 26 \text{ Vdc}$ , $I_{DQ} = 250 \text{ mA}$ , $f = 1805 - 1880 \text{ MHz}$ )	IRL	—	-12	-9	dB

1. Part internally matched both on input and output.
2. Device specifications obtained on a Production Test Fixture.



C1	1.8 pF, 100B Chip Capacitor	Z1	0.874" x 0.087" Microstrip
C2	0.8 pF, 100B Chip Capacitor	Z2	1.094" x 0.087" Microstrip
C3	1.0 pF, 100B Chip Capacitor	Z3	0.257" x 0.633" Microstrip
C4, C5	1.2 pF, 100B Chip Capacitors	Z4	0.189" x 0.394" Microstrip
C6, C7, C8	8.2 pF, 100B Chip Capacitors	Z5	0.335" x 0.394" Microstrip
C9	0.3 pF, 100B Chip Capacitor	Z6	0.484" x 0.087" Microstrip
C10	220 $\mu$ F, 63 V Electrolytic Capacitor	Z7	0.877" x 0.087" Microstrip
R1	1.0 k $\Omega$ , 1/8 W Chip Resistor (0805)	Z8	0.366" x 0.087" Microstrip
R2, R3	10 k $\Omega$ , 1/8 W Chip Resistors (0805)	Z9	$\approx$ 0.600" x 0.087" Microstrip

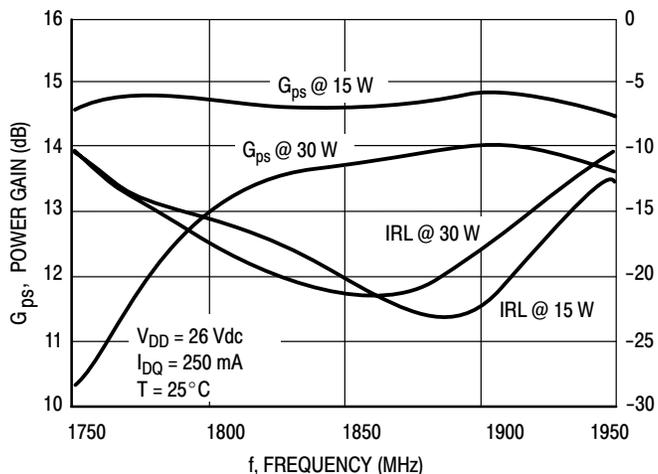
Figure 1. 1805 - 1880 MHz Test Fixture Schematic



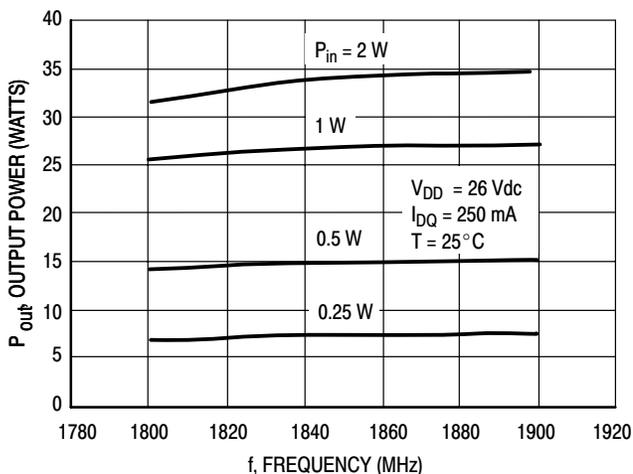
Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 2. 1805 - 1880 MHz Test Fixture Component Layout

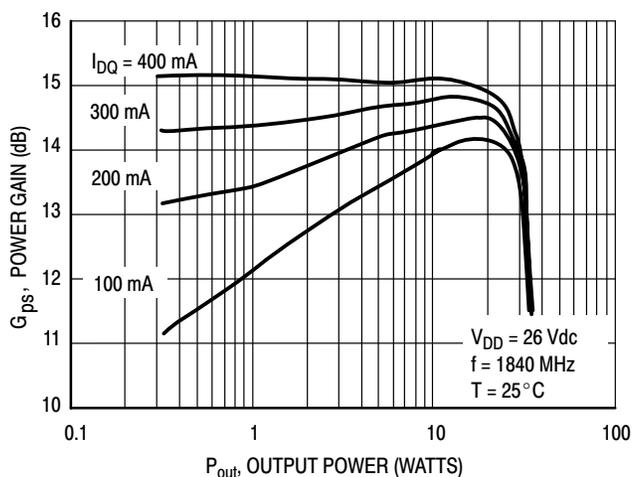
## TYPICAL CHARACTERISTICS



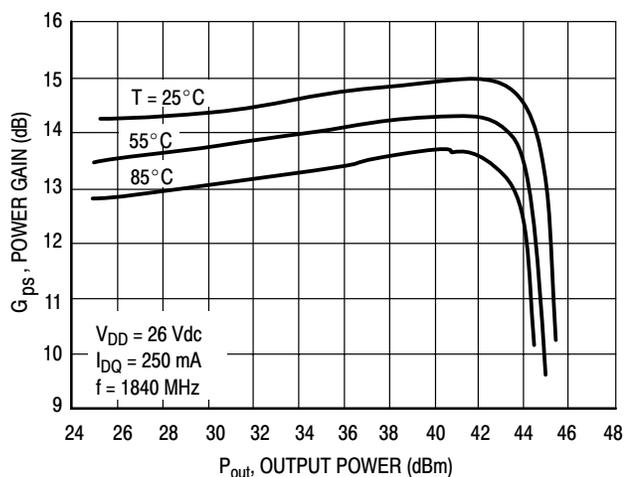
**Figure 3. Wideband Gain and IRL at 30 W and 15 W Output Power**



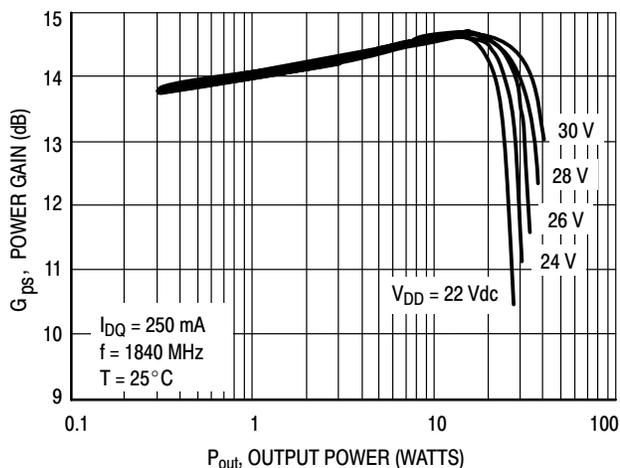
**Figure 4. Output Power versus Frequency**



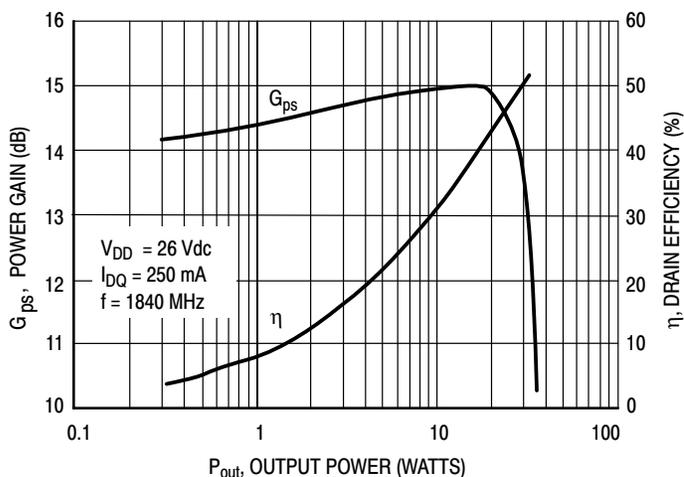
**Figure 5. Power Gain versus Output Power**



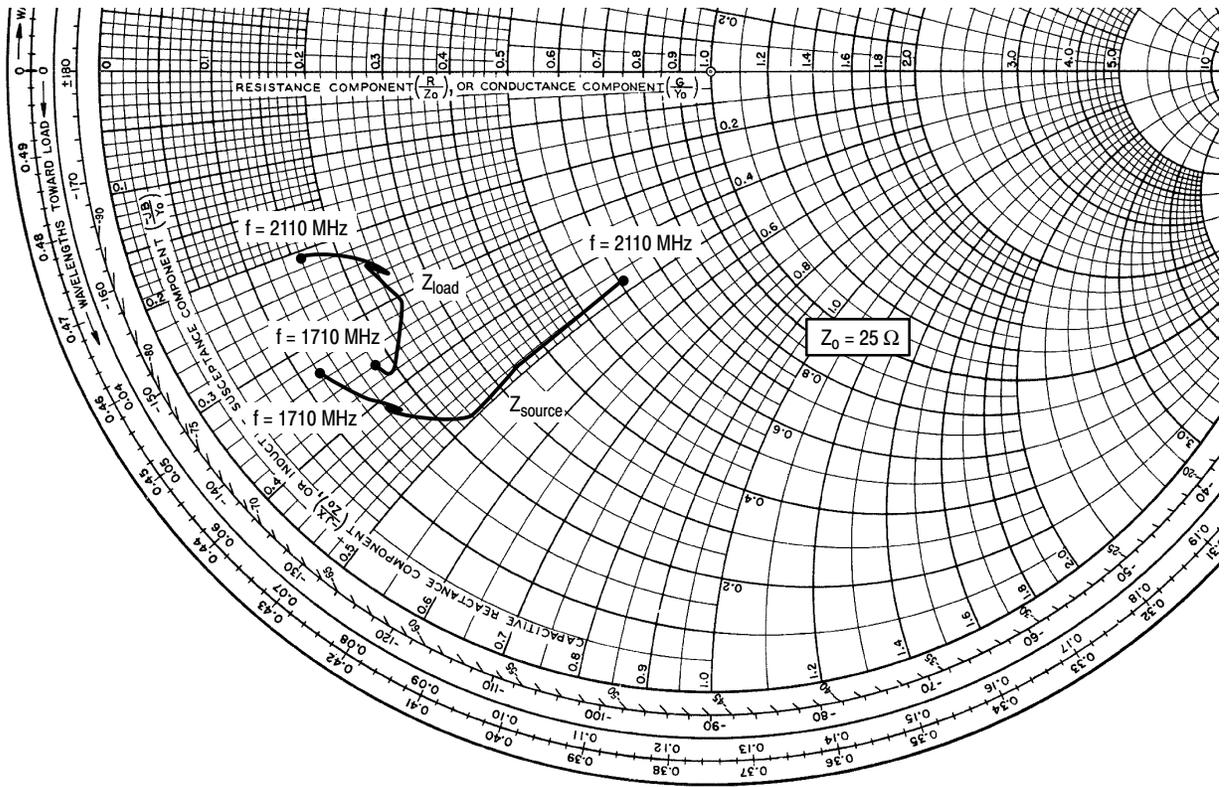
**Figure 6. Power Gain versus Output Power**



**Figure 7. Power Gain versus Output Power**



**Figure 8. Power Gain and Efficiency versus Output Power**



$V_{DD} = 26\text{ V}$ ,  $I_{DQ} = 250\text{ mA}$ ,  $P_{out} = 30\text{ W (CW)}$

f MHz	$Z_{source}$ $\Omega$	$Z_{load}$ $\Omega$
1710	$2.92 - j8.24$	$4.18 - j9.06$
1785	$3.84 - j9.75$	$4.59 - j9.46$
1805	$4.15 - j10.38$	$4.98 - j9.06$
1840	$4.04 - j10.22$	$6.10 - j7.63$
1880	$6.12 - j12.29$	$5.83 - j6.89$
1960	$6.20 - j12.29$	$5.55 - j6.33$
1990	$8.61 - j12.10$	$5.93 - j6.66$
2110	$15.19 - j11.85$	$3.82 - j5.33$

$Z_{source}$  = Test circuit impedance as measured from gate to ground.

$Z_{load}$  = Test circuit impedance as measured from drain to ground.

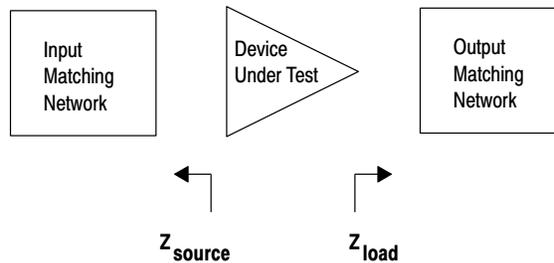


Figure 9. Series Equivalent Source and Load Impedance

# NOTES



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