



RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

Designed for digital and analog cellular PCN and PCS base station applications with frequencies from 1000 to 2500 MHz. Characterized for operation Class A and Class AB at 26 volts in commercial and industrial applications.


- Specified Two-Tone Performance @ 1930 MHz, 26 Volts
 - Output Power — 4 Watts PEP
 - Power Gain — 11 dB
 - Efficiency — 30%
 - Intermodulation Distortion — -29 dBc
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 2000 MHz, 4 Watts CW Output Power

Features


- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- S-Parameter Characterization at High Bias Levels
- RoHS Compliant
- In Tape and Reel. R1 Suffix = 500 Units per 12 mm, 7 inch Reel.

MRF281SR1
MRF281ZR1

1930-1990 MHz, 4 W, 26 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFETs



CASE 458B-03, STYLE 1
NI-200S
MRF281SR1



CASE 458C-03, STYLE 1
NI-200Z
MRF281ZR1

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Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +65	Vdc
Gate-Source Voltage	V_{GS}	± 20	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	20 0.115	W W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$
Case Operating Temperature	T_C	150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	5.74	$^\circ\text{C}/\text{W}$

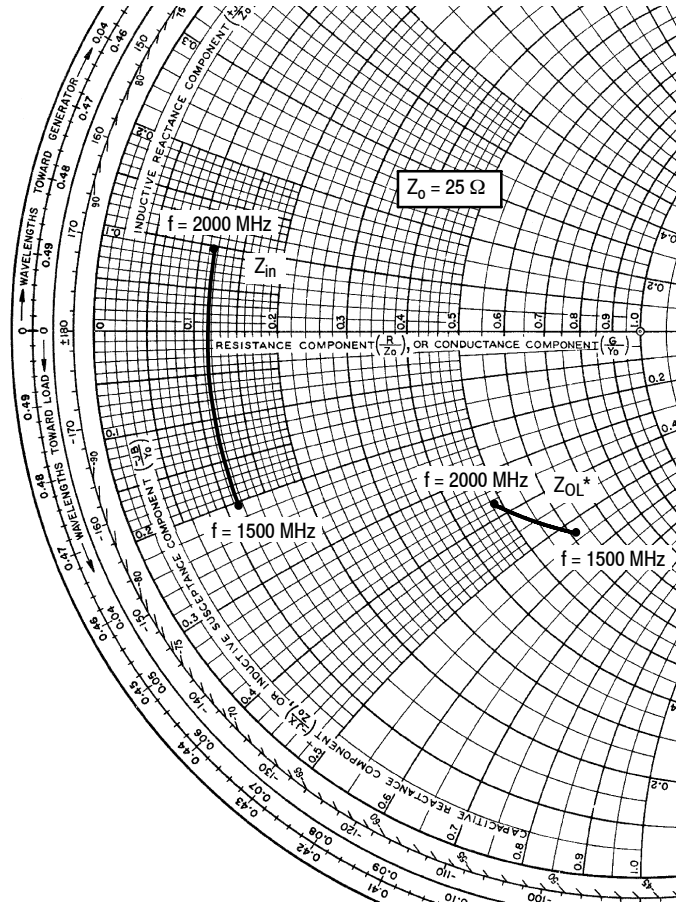
Table 3. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-Source Breakdown Voltage ($V_{GS} = 0$, $I_D = 10 \mu\text{Adc}$)	$V_{(BR)DSS}$	65	74	—	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 28 \text{ Vdc}$, $V_{GS} = 0$)	I_{DSS}	—	—	10	μAdc
Gate-Source Leakage Current ($V_{GS} = 20 \text{ Vdc}$, $V_{DS} = 0$)	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.

Table 3. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
On Characteristics					
Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 20\ \mu\text{Adc}$)	$V_{GS(th)}$	2.4	3.2	4	Vdc
Gate Quiescent Voltage ($V_{DS} = 26\text{ Vdc}$, $I_D = 25\text{ mA}$)	$V_{GS(q)}$	3	4.1	5	Vdc
Drain-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 0.1\text{ A}$)	$V_{DS(on)}$	0.18	0.24	0.30	Vdc
Dynamic Characteristics					
Input Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{iss}	—	5.5	—	pF
Output Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{oss}	—	3.3	—	pF
Reverse Transfer Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{rss}	—	0.17	—	pF
Functional Tests (In Freescale Test Fixture)					
Common-Source Amplifier Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 4\text{ W PEP}$, $I_{DQ} = 25\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	G_{ps}	11	12.5	—	dB
Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 4\text{ W}$, $I_{DQ} = 25\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	η	30	—	—	%
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 4\text{ W PEP}$, $I_{DQ} = 25\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	IRL	—	-16	-10	dB
Intermodulation Distortion ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 4\text{ W PEP}$, $I_{DQ} = 25\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	IMD	—	-31	—	dBc



$V_{DD} = 26\text{ V}$, $I_{DQ} = 25\text{ mA}$, $P_{out} = 4\text{ W (PEP)}$

f MHz	Z_{in} Ω	Z_{OL}^* Ω
1500	$3.15 - j5.3$	$15.5 - j13.6$
1600	$3.1 - j3.8$	$14.7 - j12.5$
1700	$3.1 - j2.3$	$14.0 - j11.7$
1800	$3.1 - j0.7$	$13.4 - j11.0$
1900	$3.1 + j0.9$	$12.8 - j10.1$
2000	$3.1 + j2.4$	$12.2 - j9.2$

Z_{in} = Complex conjugate of source impedance.

Z_{OL}^* = Complex conjugate of the optimum load impedance at given output power, voltage, IMD, bias current and frequency.

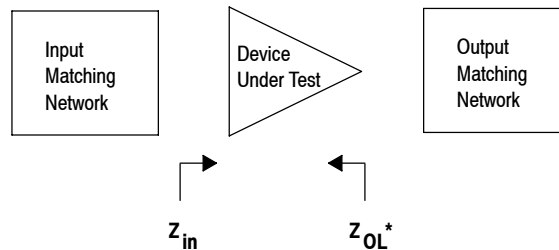


Figure 1. Series Equivalent Input and Output Impedance

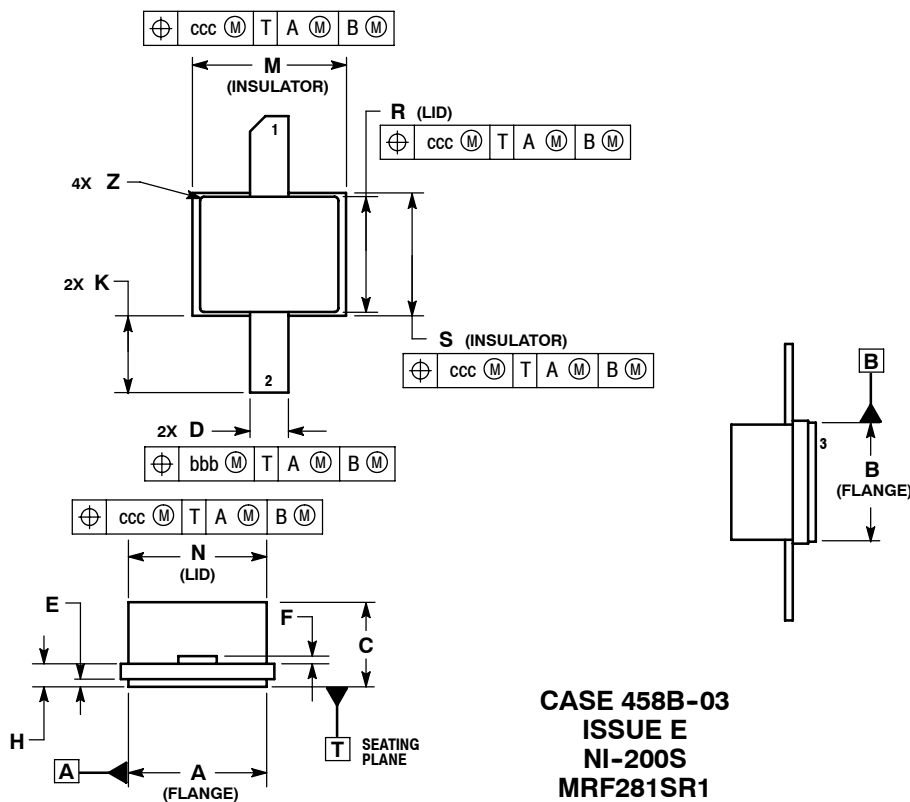
Table 4. Common Source S-Parameters at $V_{DS} = 26 \text{ Vdc}$, $I_D = 250 \text{ mAdc}$

f GHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	S ₁₁	∠ φ	dB	∠ φ	S ₁₂	∠ φ	S ₂₂	∠ φ
0.1	.982	-28	18.9	160	.008	73	.851	-13
0.2	.947	-52	17.0	143	.015	58	.811	-25
0.3	.912	-73	15.0	129	.019	45	.770	-33
0.4	.886	-90	12.9	117	.022	36	.741	-42
0.5	.859	-103	11.1	108	.022	28	.719	-47
0.6	.854	-114	9.69	100	.023	23	.718	-51
0.7	.841	-123	8.54	93	.022	18	.709	-56
0.8	.837	-131	7.57	87	.021	15	.714	-59
0.9	.838	-138	6.69	81	.019	12	.719	-62
1.0	.841	-143	6.01	76	.018	11	.728	-64
1.1	.840	-149	5.41	72	.015	12	.742	-66
1.2	.849	-153	4.91	68	.013	13	.745	-68
1.3	.848	-158	4.51	64	.012	18	.758	-69
1.4	.856	-162	4.12	60	.010	26	.769	-70
1.5	.858	-167	3.78	57	.009	36	.786	-70
1.6	.871	-170	3.50	54	.008	54	.797	-72
1.7	.868	-173	3.22	51	.009	69	.808	-71
1.8	.870	-176	3.00	49	.009	82	.823	-72
1.9	.872	-180	2.80	46	.011	95	.828	-72
2.0	.877	178	2.63	44	.013	104	.845	-72
2.1	.876	174	2.47	41	.015	109	.843	-72
2.2	.880	171	2.36	39	.018	111	.859	-71
2.3	.882	168	2.21	36	.021	114	.858	-72
2.4	.886	165	2.12	34	.024	114	.872	-70
2.5	.896	162	1.97	32	.027	115	.863	-70
2.6	.897	158	1.89	29	.029	117	.873	-69

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PACKAGE DIMENSIONS



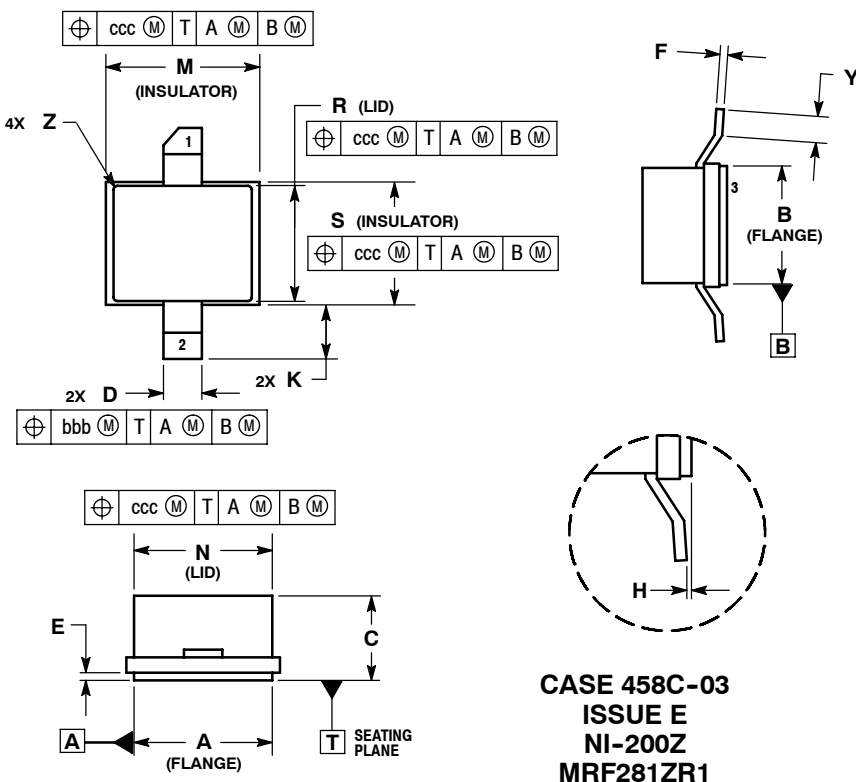
- NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
 3. ALL DIMENSIONS ARE SYMMETRICAL ABOUT CENTERLINE UNLESS OTHERWISE NOTED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.180	0.190	4.572	4.83
B	0.140	0.150	3.556	3.81
C	0.082	0.116	2.083	2.946
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
F	0.004	0.006	0.102	0.152
H	0.025	0.031	0.635	0.787
K	0.060	0.110	1.524	2.794
M	0.197	0.203	5.004	5.156
N	0.177	0.183	4.496	4.648
R	0.147	0.153	3.734	3.886
S	0.157	0.163	3.988	4.14
Z	---	0.020	---	0.508
bbb	.010 REF		0.254 REF	
ccc	.015 REF		0.381 REF	

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

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- NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
 3. DIMENSION H (PACKAGE COPLANARITY): THE BOTTOM OF LEADS AND REFERENCE PLANE T MUST BE COPLANAR WITHIN DIMENSION H.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.180	0.190	4.572	4.830
B	0.140	0.150	3.556	3.810
C	0.082	0.116	2.083	2.946
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
F	0.004	0.006	0.102	0.152
H	0.000	0.004	0.000	0.102
K	0.050	0.090	1.270	2.286
M	0.197	0.203	5.004	5.156
N	0.177	0.183	4.496	4.648
R	0.147	0.153	3.734	3.886
S	0.157	0.163	3.988	4.140
Y	0.020	0.040	0.508	1.016
Z	---	R.020	---	R.508
bbb	.010 REF		0.254 REF	
ccc	.015 REF		0.381 REF	

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

PRODUCT DOCUMENTATION

Refer to the following documents to aid your design process.

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
6	Oct. 2008	<ul style="list-style-type: none">• Modified data sheet to reflect RF Test Reduction described in Product and Process Change Notification number, PCN13232, p. 1, 2, and Product Discontinuance Notification number, PCN13420, adding applicable overlay• Added Product Documentation and Revision History, p. 6
	Dec. 2010	<ul style="list-style-type: none">• Data sheet archived. Parts no longer manufactured.

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