4.8 V OPERATION SILICON RF POWER MOSFET FOR GSM1800 AND GSM1900 TRANSMISSION AMPLIFIERS

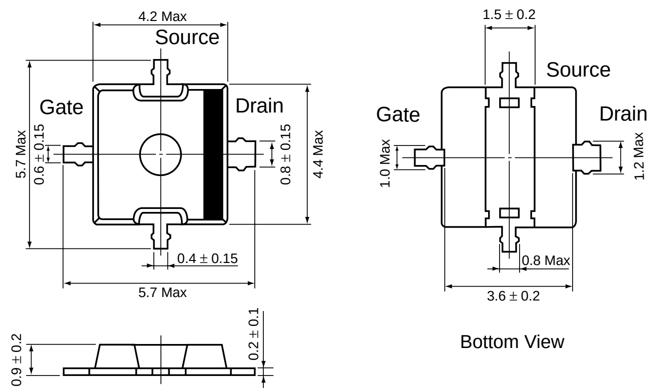
NE5500179A

FEATURES

- **HIGH OUTPUT POWER:**
  29.5 dBm TYP at V_{DS} = 4.8 V, I_{DQ} = 100 mA,
  f = 1.9 GHz, P_{IN} = 20 dBm
- **HIGH POWER ADDED EFFICIENCY:**
  55% TYP at V_{DS} = 4.8 V, I_{DQ} = 100 mA,
  f = 1.9 GHz, P_{IN} = 20 dBm
- **HIGH LINEAR GAIN:**
  14 dB TYP at V_{DS} = 4.8 V, I_{DQ} = 100 mA,
  f = 1.9 GHz, P_{IN} = 0 dBm
- **SURFACE MOUNT PACKAGE:**
  5.7 x 5.7 x 1.1 mm MAX
- **SINGLE SUPPLY:**
  3.0 to 6.0 V

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 79A



DESCRIPTION

The NE5500179A is an N-Channel silicon power MOSFET specially designed as the transmission power amplifier for 4.8 V GSM1800 and GSM1900 handsets. Dies are manufactured using NEC's NEWMOS technology (NEC's 0.6 µm WSi gate lateral MOSFET) and housed in a surface mount package. This device can deliver 29.5 dBm output power with 55% power added efficiency at 1.9 GHz under the 4.8 V supply voltage, or can deliver 27 dBm output power with 50% power added efficiency at 3.5 V by varying the gate voltage as a power control function.

APPLICATIONS

- **DIGITAL CELLULAR PHONES**
- **DIGITAL CORDLESS PHONES**
- **OTHERS**

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE5500179A 79A			
SYMBOLS	**CHARACTERISTICS**	**UNITS**	**MIN**	**TYP**	**MAX**	**TEST CONDITIONS**
I_{GSS}	Gate to Source Leakage Current	nA	-	-	100	V_{GSS} = 6.0 V
I_{DSS}	Drain to Source Leakage Current	nA	-	-	100	V_{DSS} = 8.5 V
V_{TH}	Gate Threshold Voltage	V	1.0	1.35	2.0	V_{DS} = 4.8 V, I_{DS} = 1 mA
gm	Transconductance	S	-	0.41	-	V_{DS} = 4.8 V, $I_{DS}1$ = 150 mA, $I_{DS}2$ = 250 mA
$R_{DS(ON)}$	Drain to Source On Resistance	-	-	1.00	-	V_{GS} = 6.0 V, V_{DS} = 0.5 V
BV_{DSS}	Drain to Source Breakdown Voltage	V	20	24	-	I_{DSS} = 10 A

PERFORMANCE SPECIFICATIONS (Peak measurement at Duty Cycle 1/8, 4.6 mS period, T_A = 25˚C)

SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX	TEST CONDITIONS
G_L	Linear Gain	dB	—	13.0	—	f = 1.9 GHz, P_{IN} = 0 dBm, V_{DS} = 3.0 V, I_{DQ} = 100 mA
P_{OUT}	Output Power	dBm	—	24.5	—	f = 1.9 GHz, P_{IN} = 15 dBm, V_{DS} = 3.0 V, I_{DQ} = 100 mA
I_{OP}	Operating Current	mA	—	170	—	
η_{ADD}	Power Added Efficiency	%	—	50		
G_L	Linear Gain	dB	—	13.5	—	f = 1.9 GHz, P_{IN} = 0 dBm, V_{DS} = 3.5 V, I_{DQ} = 100 mA
$P_{OUT(1)}$	Output Power	dBm	—	26.5	—	f = 1.9 GHz, P_{IN} = 18 dBm, V_{DS} = 3.5 V, I_{DQ} = 100 mA
$I_{OP(1)}$	Operating Current	mA	—	210	—	
η_{ADD}	Power Added Efficiency	%	—	52		
$P_{OUT(2)}$	Maximum Output Power	dBm	—	27.0	—	f = 1.9 GHz, P_{IN} = 18 dBm V_{DS} = 3.5 V, V_{GS} = 2.5 V
$I_{OP(2)}$	Operating Current	mA	—	260	—	
G_L	Linear Gain	dB	—	14.0	—	f = 1.9 GHz, P_{IN} = 0 dBm, V_{DS} = 4.8 V, I_{DQ} = 100 mA
$P_{OUT(1)}$	Output Power	dBm	28.5	29.5	—	f = 1.9 GHz, P_{IN} = 20 dBm, V_{DS} = 4.8 V, I_{DQ} = 100 mA
$I_{OP(1)}$	Operating Current	mA	—	300	—	
η_{ADD}	Power Added Efficiency	%	47	55	—	
$P_{OUT(2)}$	Maximum Output Power	dBm	—	30.0	—	f = 1.9 GHz, P_{IN} = 20 dBm V_{DS} = 4.8 V, V_{GS} = 2.5 V
$I_{OP(2)}$	Operating Current	mA	—	350	—	
G_L	Linear Gain	dB	—	14.5	—	f = 1.9 GHz, P_{IN} = 0 dBm, V_{DS} =6.0 V, I_{DQ} = 100 mA
P_{OUT}	Output Power	dBm	—	31.5	—	f = 1.9 GHz, P_{IN} = 22 dBm, V_{DS} =6.0 V, I_{DQ} = 100 mA
I_{OP}	Operating Current	mA	—	380	—	
η_{ADD}	Power Added Efficiency	%	—	55	—	

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25 °C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain Supply Voltage	V	8.5
V_{GS}	Gate Supply Voltage	V	6
I_D	Drain Current	A	0.25
I_D	Drain Current (Pulse Test)[2]	A	0.5
P_{IN}	Input Power[3]	dBm	25
P_T	Total Power Dissipation	W	1.6
T_{CH}	Channel Temperature	°C	125
T_{STG}	Storage Temperature	°C	-55 to +125

Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Duty Cycle 50%, T_{ON} = LMS.
3. Frequency = 1.9 GHz, V_{DS} = 4.8 V.

ORDERING INFORMATION[1]

PART NUMBER	QTY
NE5500179A-T1	1 Kpcs/Reel

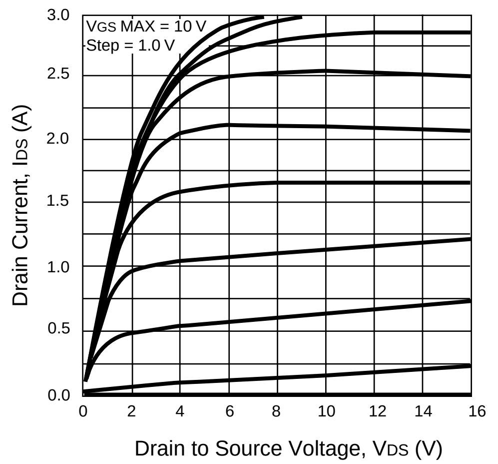
Note:
1. Embossed tape 12 mm wide. Gate pin faces perforation side of the tape.

RECOMMENDED OPERATING CONDITIONS

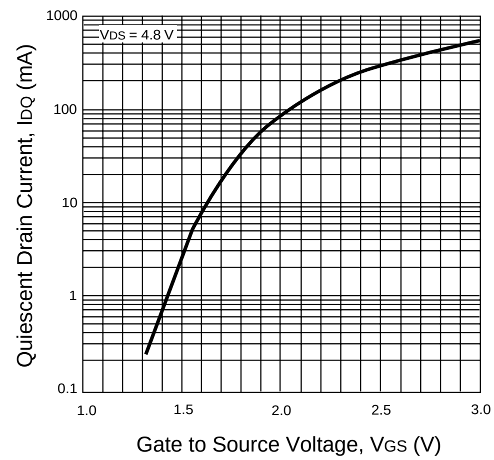
SYMBOLS	PARAMETERS	TEST CONDITIONS	UNITS	MIN	TYP	MAX
V_{DS}	Drain Supply Voltage		V	3.0	3.5	6.0
V_{GS}	Gate Supply Voltage		V	0	2.0	2.5
I_D	Drain Current (Pulse Test)	Duty Cycle 50%, Ton1ms	A	—	—	0.5
P_{IN}	Input Power	Frequency = 1.9 GHz, V_{DS} = 4.8 V	dBm	21	22	23
f	Operating Frequency Range		GHz	1.6	—	2.5
T_{OP}	Operating Temperature		˚C	-30	25	85

TYPICAL PERFORMANCE CURVES (TA = 25°C)

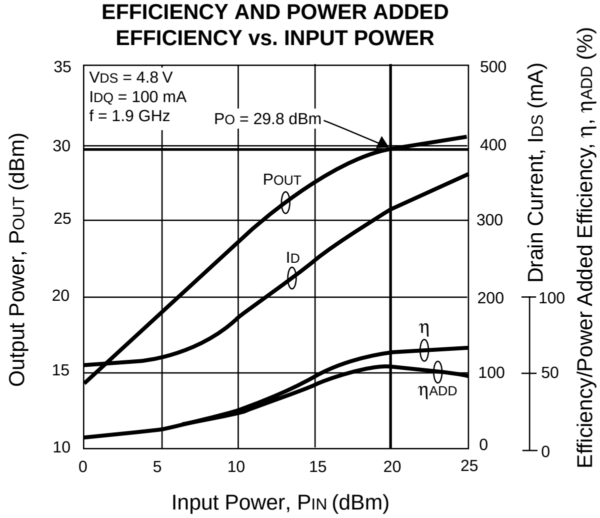
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



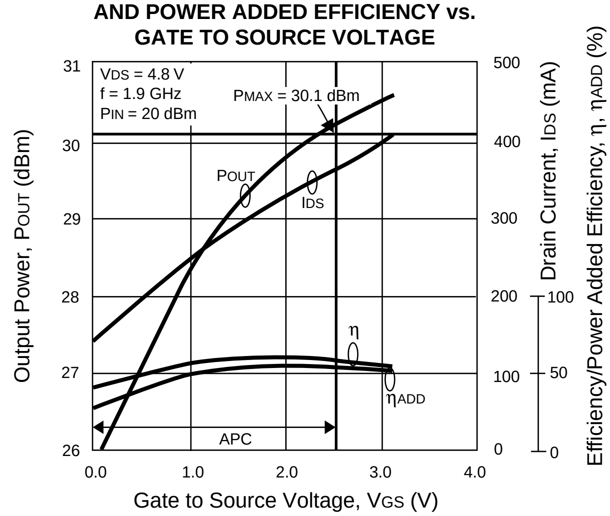
QUIESCENT DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



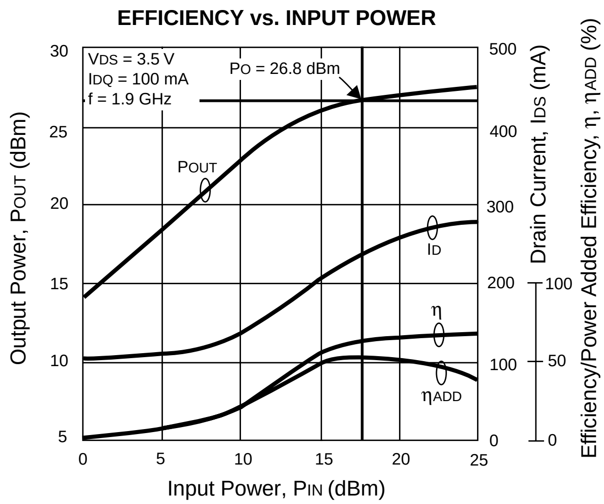
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY AND POWER ADDED EFFICIENCY vs. INPUT POWER



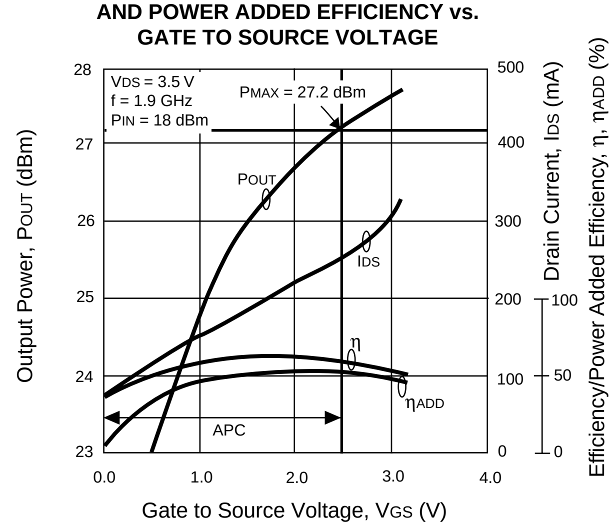
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY AND POWER ADDED EFFICIENCY vs. GATE TO SOURCE VOLTAGE



OUTPUT POWER, DRAIN CURRENT, EFFICIENCY AND POWER ADDED EFFICIENCY vs. INPUT POWER



OUTPUT POWER, DRAIN CURRENT, EFFICIENCY AND POWER ADDED EFFICIENCY vs. GATE TO SOURCE VOLTAGE



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE5500179A
V_{DS} = 4.8 V, I_{DS} = 100 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.884	-69.6	18.11	135.5	0.037	48.2	0.517	-85.0	0.00	26.8
0.2	0.792	-107.8	12.12	112.3	0.049	23.2	0.569	-120.7	0.06	23.9
0.3	0.757	-127.4	8.58	98.8	0.052	10.8	0.598	-136.5	0.08	22.1
0.4	0.747	-138.7	6.58	89.4	0.052	3.3	0.618	-144.8	0.11	21.0
0.5	0.746	-146.2	5.28	82.1	0.052	-4.1	0.641	-149.8	0.13	20.1
0.6	0.751	-151.8	4.32	76.2	0.050	-8.9	0.660	-153.4	0.18	19.3
0.7	0.756	-155.6	3.68	70.9	0.048	-12.6	0.681	-156.2	0.22	18.8
0.8	0.772	-159.5	3.12	65.9	0.048	-17.0	0.696	-158.9	0.23	18.1
0.9	0.777	-162.3	2.75	61.3	0.045	-22.1	0.715	-161.0	0.28	17.9
1.0	0.785	-165.0	2.40	58.2	0.043	-21.9	0.732	-162.9	0.33	17.4
1.1	0.796	-167.7	2.17	53.7	0.040	-26.9	0.749	-164.9	0.35	17.2
1.2	0.804	-169.9	1.91	51.4	0.038	-29.2	0.763	-166.9	0.42	17.0
1.3	0.814	-172.4	1.74	46.4	0.036	-30.5	0.776	-169.1	0.45	16.8
1.4	0.820	-174.6	1.58	44.3	0.035	-31.4	0.789	-171.0	0.48	16.5
1.5	0.827	-176.8	1.45	39.7	0.035	-36.6	0.803	-172.7	0.44	16.1
1.6	0.832	-179.6	1.33	38.4	0.031	-38.5	0.808	-175.0	0.62	16.3
1.7	0.833	177.9	1.19	34.6	0.030	-38.3	0.814	-176.7	0.78	16.0
1.8	0.846	175.6	1.13	31.6	0.028	-38.7	0.829	-179.2	0.70	16.1
1.9	0.843	172.9	1.02	28.3	0.025	-38.1	0.834	178.7	0.98	16.0
2.0	0.850	170.3	0.99	27.1	0.024	-40.9	0.840	176.5	0.97	16.1
2.1	0.851	167.1	0.89	23.3	0.021	-42.9	0.842	174.4	1.42	12.4
2.2	0.854	165.1	0.83	21.4	0.019	-48.0	0.847	172.1	1.62	11.7
2.3	0.861	162.3	0.75	16.9	0.017	-43.6	0.856	169.1	1.88	10.9
2.4	0.857	159.5	0.76	15.5	0.017	-40.8	0.866	167.0	1.68	11.5
2.5	0.870	156.6	0.67	13.8	0.015	-49.0	0.862	164.7	2.20	10.2
2.6	0.870	153.9	0.65	12.0	0.016	-36.8	0.865	162.0	2.13	10.1
2.7	0.867	151.6	0.56	9.0	0.010	-33.0	0.866	159.1	4.44	7.8
2.8	0.870	148.9	0.57	3.9	0.010	-43.4	0.879	156.7	3.96	8.6
2.9	0.873	146.5	0.52	4.7	0.007	-18.3	0.879	154.5	6.01	7.6
3.0	0.882	143.9	0.51	2.7	0.008	-15.0	0.885	152.0	4.60	8.2

Note:
1. Gain Calculation:

$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K - \sqrt{K^2 - 1}\right)$. When $K \leq 1$, MAG is undefined and MSG values are used. $MSG = \frac{|S_{21}|}{|S_{12}|}$, $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2\,|S_{12}\,S_{21}|}$, $\Delta = S_{11}\,S_{22} - S_{21}\,S_{12}$

MAG = Maximum Available Gain
MSG = Maximum Stable Gain

RECOMMENDED P.C.B. LAYOUT (Units in mm)