NEC

3.5 V OPERATION SILICON RF POWER MOSFET FOR GSM1800 TRANSMISSION AMPLIFIERS

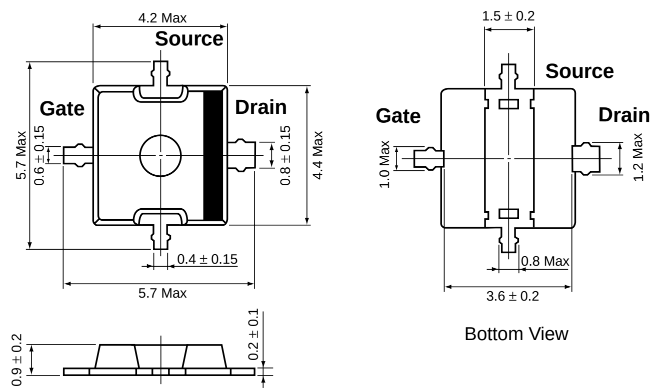
NE5510279A

FEATURES

- **HIGH OUTPUT POWER:**
  32 dBm TYP at V_{DS} = 3.5 V, I_{DQ} = 400 mA,
  f = 1.8 GHz, P_{IN} = 25 dBm
- **HIGH POWER ADDED EFFICIENCY:**
  45% TYP at V_{DS} = 3.5 V, I_{DQ} = 400 mA,
  f = 1.8 GHz, P_{IN} = 25 dBm
- **HIGH LINEAR GAIN:**
  10 dB TYP at V_{DS} = 3.5 V, I_{DQ} = 400 mA,
  f = 1.8 GHz, P_{IN} = 10 dBm
- **SURFACE MOUNT PACKAGE:**
  5.7 x 5.7 x 1.1 mm MAX
- **SINGLE SUPPLY:**
  2.8 to 6.0 V

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 79A



DESCRIPTION

The NE5510279A is an N-Channel silicon power MOSFET specially designed as the transmission power amplifier for 3.5 V GSM1800 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 32 dBm output power with 45% power added efficiency at 1.8 GHz under the 3.5 V supply voltage, or can deliver 31 dBm output power at 2.8 V by varying the gate voltage as a power control function.

APPLICATIONS

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

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER			NE5510279A			
PACKAGE OUTLINE			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	-	1.50	-	V_{DS} = 4.8 V, $I_{DS}1$ = 500 mA, $I_{DS}2$ = 700 mA
$R_{DS(ON)}$	Drain to Source On Resistance	-	-	0.27	-	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	—	10.0	—	f = 1.8 GHz, P_{IN} = 10 dBm, V_{DS} = 3.5 V, I_{DQ} = 400 mA
$P_{OUT(1)}$	Output Power	dBm	31.0	32.0	—	f = 1.8 GHz, P_{IN} = 25 dBm, V_{DS} = 3.5 V, I_{DQ} = 400 mA
$I_{OP(1)}$	Operating Current	mA	—	810	—	
$\eta_{ADD(1)}$	Power Added Efficiency	%	37	45		
$P_{OUT(2)}$	Maximum Output Power	dBm	—	32.6	—	f = 1.8 GHz, P_{IN} = 25 dBm V_{DS} = 3.5 V, V_{GS} = 2.5 V
$I_{OP(2)}$	Operating Current	mA	—	1,000	—	
$P_{OUT(3)}$	Output Power at Lower Voltage	dBm	—	31.1	—	f = 1.8 GHz, P_{IN} = 25 dBm V_{DS} = 2.8 V, V_{GS} = 2.5 V
$I_{OP(3)}$	Operating Current	mA	—	880	—	
G_L	Linear Gain	dB	—	10.0	—	f = 1.8 GHz, P_{IN} = 10 dBm, V_{DS} = 4.8 V, I_{DQ} = 400 mA
P_{OUT}	Output Power	dBm	—	35.0	—	f = 1.8 GHz, P_{IN} = 28 dBm, V_{DS} = 4.8 V, I_{DQ} = 400 mA
I_{OP}	Operating Current	mA	—	1,120	—	
η_{ADD}	Power Added Efficiency	%	—	48	—	
G_L	Linear Gain	dB	35.0	35.0	35.0	f = 1.8 GHz, P_{IN} = 10 dBm, V_{DS} =6.0 V, I_{DQ} = 400 mA
P_{OUT}	Output Power	dBm		37.0		f = 1.8 GHz, P_{IN} = 30 dBm, V_{DS} =6.0 V, I_{DQ} = 400 mA
I_{OP}	Operating Current	mA		1,400		
η_{ADD}	Power Added Efficiency	%		49		

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	1.0
I_D	Drain Current (Pulse Test)[2]	A	2.0
P_{IN}	Input Power[3]	dBm	30
P_T	Total Power Dissipation	W	2.4
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} = 1 ms.
3. Frequency = 1.8 GHz, V_{DS} = 3.5 V.

ORDERING INFORMATION

PART NUMBER	QTY
NE5510279A-T1	1 Kpcs/Reel

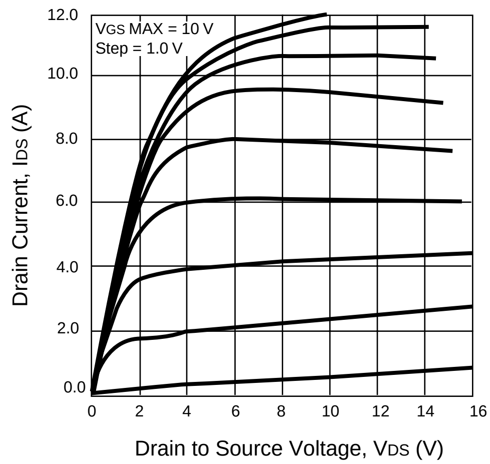
Note:
Embossed tape 12 mm wide. Gate pin faces perforation side of the tape.

RECOMMENDED OPERATING CONDITIONS

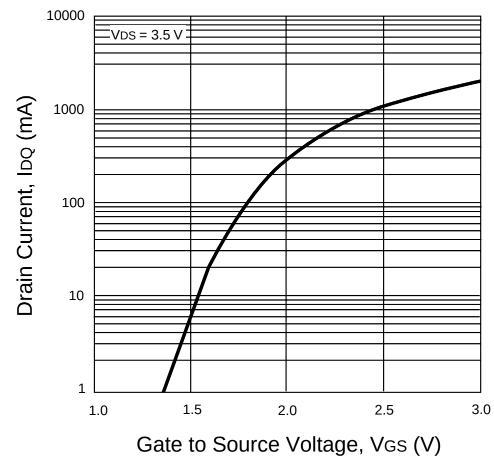
SYMBOLS	PARAMETERS	TEST CONDITIONS	UNITS	MIN	TYP	MAX
V_{DS}	Drain Supply Voltage		V	2.8	3.5	6.0
V_{GS}	Gate Supply Voltage		V	0	2.0	2.5
I_D	Drain Current (Pulse Test)	Duty Cycle 50%, Ton1ms	A	—	—	1.5
P_{IN}	Input Power	Frequency = 1.8 GHz, V_{DS} = 3.5 V	dBm	24	25	26
f	Operating Frequency Range		GHz	1.6	—	2.0
T_{OP}	Operating Temperature		˚C	-30	25	85

TYPICAL PERFORMANCE CURVES (TA = 25°C)

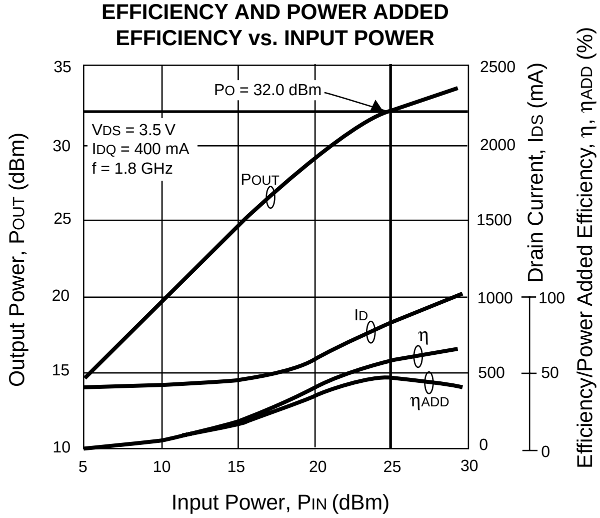
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



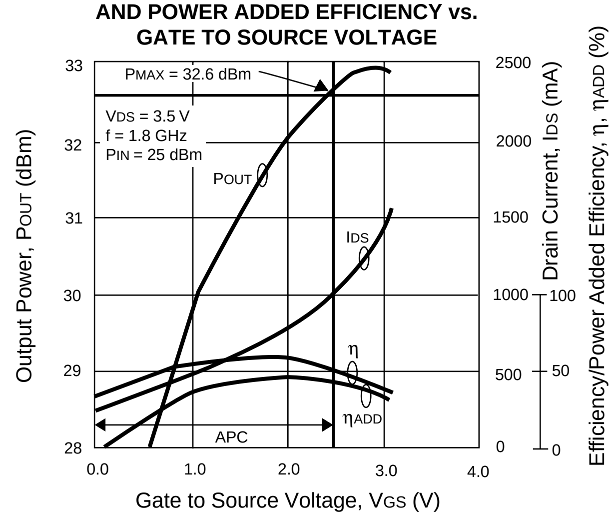
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



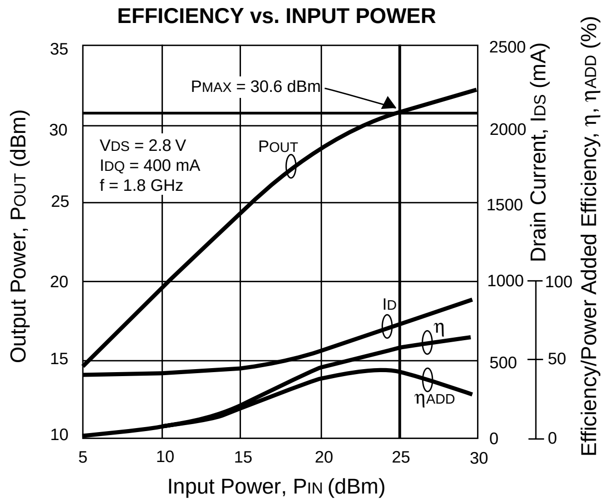
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY AND POWER ADDED EFFICIENCY vs. INPUT POWER



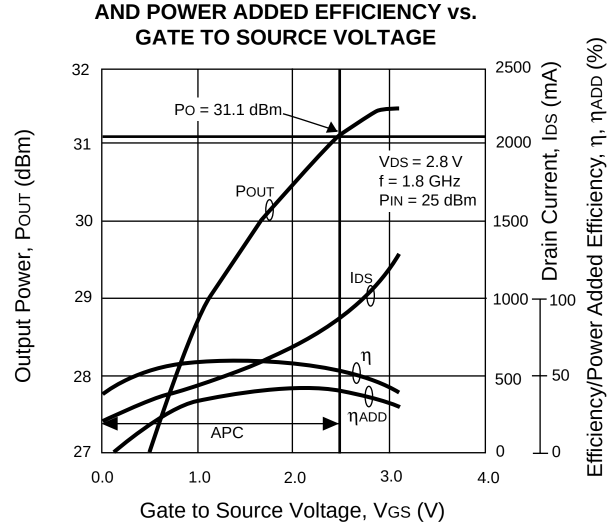
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY AND POWER ADDED EFFICIENCY vs. GATE TO SOURCE VOLTAGE



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)

NE5510279A
V_D = 3.5 V, I_{DS} = 400 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	0.889	-149.7	8.66	99.8	0.019	14.6	0.854	-173.8	-0.50	26.6
0.2	0.872	-165.4	4.41	87.5	0.020	3.4	0.861	-177.7	-0.36	23.4
0.3	0.871	-170.9	2.91	82.0	0.020	-1.8	0.875	-178.6	-0.25	21.6
0.4	0.871	-173.7	2.13	76.1	0.019	-4.1	0.869	-179.6	-0.01	20.5
0.5	0.873	-175.6	1.69	71.5	0.019	-9.5	0.886	179.7	0.04	19.5
0.6	0.880	-176.9	1.37	67.7	0.018	-11.8	0.886	179.2	0.22	18.8
0.7	0.884	-177.9	1.17	63.9	0.016	-10.6	0.893	178.9	0.40	18.6
0.8	0.897	-179.1	0.99	60.5	0.016	-10.2	0.898	178.0	0.40	17.9
0.9	0.905	-179.9	0.87	56.3	0.014	-15.0	0.914	177.8	0.41	17.9
1.0	0.919	178.1	0.77	53.8	0.014	-7.8	0.928	176.0	0.16	17.4
1.1	0.930	175.9	0.69	48.8	0.012	-13.7	0.938	174.8	0.11	17.6
1.2	0.923	174.2	0.60	46.9	0.012	-11.0	0.927	172.9	0.59	17.0
1.3	0.919	172.9	0.54	42.6	0.010	-10.5	0.923	171.8	1.29	14.1
1.4	0.918	171.8	0.48	41.0	0.010	-4.7	0.922	170.6	1.62	12.2
1.5	0.918	170.6	0.44	37.6	0.011	-8.0	0.924	170.1	1.53	11.7
1.6	0.920	168.9	0.41	36.7	0.008	-5.5	0.927	168.7	2.46	10.4
1.7	0.918	167.5	0.36	33.6	0.008	4.3	0.922	167.9	3.27	8.5
1.8	0.927	166.2	0.35	30.9	0.009	12.5	0.935	165.9	1.95	10.3
1.9	0.922	164.1	0.31	28.2	0.007	20.9	0.932	164.9	3.67	7.9
2.0	0.923	162.6	0.30	27.8	0.007	32.4	0.942	163.0	3.08	8.6
2.1	0.928	159.9	0.26	25.2	0.007	48.5	0.928	161.8	4.46	6.2
2.2	0.926	158.6	0.25	23.2	0.006	36.8	0.938	160.0	4.89	6.3
2.3	0.929	156.6	0.22	20.0	0.008	50.0	0.935	157.6	4.01	5.4
2.4	0.925	154.5	0.22	18.0	0.009	45.1	0.945	156.2	3.01	6.2
2.5	0.928	152.2	0.20	18.1	0.007	61.4	0.941	154.5	4.77	4.8
2.6	0.933	150.4	0.20	17.2	0.009	56.3	0.938	152.5	3.43	5.2
2.7	0.930	148.4	0.16	15.0	0.011	70.0	0.933	150.3	4.13	2.5
2.8	0.929	146.2	0.17	11.1	0.013	59.4	0.952	148.1	2.01	5.4
2.9	0.931	144.4	0.16	11.6	0.013	74.0	0.937	146.9	3.01	3.2
3.0	0.933	142.6	0.15	10.0	0.014	67.5	0.950	145.0	2.10	4.3

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)