

NEC

3.5 V OPERATION SILICON RF POWER MOSFET FOR 1.9 GHZ TRANSMISSION AMPLIFIERS

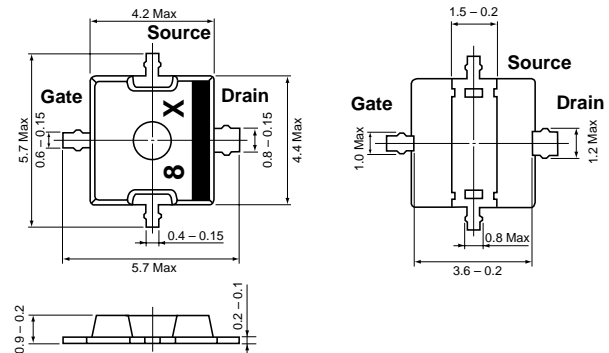
NE5510179A

FEATURES

- **HIGH OUTPUT POWER:** 29.5 dBm TYP
 $V_{DS} = 3.5\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 1.9\text{ GHz}$, $P_{IN} = 22\text{ dBm}$
- **HIGH LINEAR GAIN:** 11 dB TYP
 $V_{DS} = 3.5\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 1.9\text{ GHz}$, $P_{IN} = 5\text{ dBm}$
- **HIGH POWER ADDED EFFICIENCY:** 50% TYP
 $V_{DS} = 3.5\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 1.9\text{ GHz}$, $P_{IN} = 22\text{ dBm}$
- **SINGLE SUPPLY:** 2.8 to 6.0 V
- **SURFACE MOUNT PACKAGE:** 5.7x5.7x1.1 mm MAX

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 79A



DESCRIPTION

The NE5510179A is an N-Channel silicon power MOSFET specially designed as the transmission driver amplifier for 3.5 V GSM1800 and GSM 1900 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 50% power added efficiency at 1.9 GHz under the 3.5 V supply voltage, or can deliver 29 dBm output power at 2.8 V by varying the gate voltage as a power control function.

APPLICATIONS

- **DIGITAL CELLULAR PHONES:**
3.5 V GSM 1800/GSM 1900 Class 1 Handsets
- **OTHERS:**
1.6 - 2.0 GHz TDMA Applications

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

PART NUMBER PACKAGE OUTLINE			NE5510179A 79A			TEST CONDITIONS
SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX	
I_{GSS}	Gate-to-Source Leakage Current	nA			100	$V_{GSS} = 6.0\text{ V}$
I_{DSS}	Drain-to-Source Leakage Current	nA			100	$V_{DSS} = 8.5\text{ V}$
V_{TH}	Gate Threshold Voltage	V	1.0	1.35	2.0	$V_{DS} = 3.5\text{ V}$, $I_{DS} = 1\text{ mA}$
gm	Transconductance	S		0.82		$V_{DS} = 3.5\text{ V}$, $I_{DS1} = 300\text{ mA}$, $I_{DS2} = 500\text{ mA}$
RDS (ON)	Drain-to-Source On Resistance			0.5		$V_{GS} = 6.0\text{ V}$, $V_{DS} = 0.5\text{ V}$
BVDSS	Drain-to-Source Breakdown Voltage	V	20	24		$I_{DSS} = 10\text{ A}$

ABSOLUTE MAXIMUM RATINGS¹ (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 (continuous)		A0.5
I _D	Drain Current (Pulse Test) ²	A	1.0
P _{IN}	Input Power ³	dBm	27
P _T	Total Power Dissipation	W	1.6
T _{CH}	Channel Temperature	°C	125
T _{STG}	Storage Temperature	°C	-55 to +125

- Note:
1. Operation in excess of any one of these parameters may result in permanent damage.
 2. Duty Cycle 50%, Ton = 1ms.
 3. Freq = 1.9 GHz, V_{DS} = 3.5 V.

RECOMMENDED OPERATING CONDITIONS

SYMBOLS	PARAMETERS	UNITS	TYP	MAX
V _{DS}	Drain to Supply Voltage	V	3.5	6.0
V _{GS}	Gate Supply Voltage	V	2.0	2.5
I _{DS}	Drain Current (Pulse Test) ¹	A	–	0.5
P _{IN}	Input Power ²	dBm	22	23
freq	Operating Frequency Range	GHz	–	2.0
T _{OP}	Operating Temperature	°C	25	85

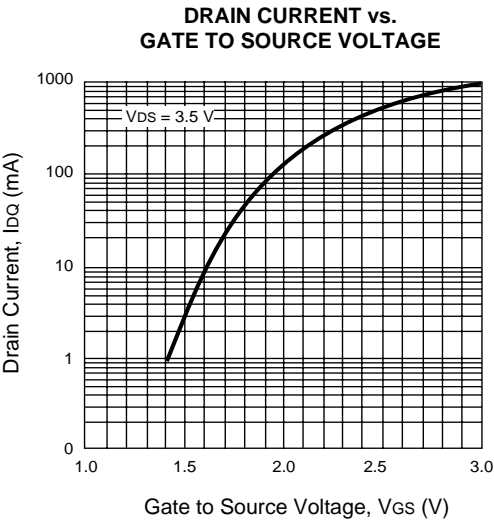
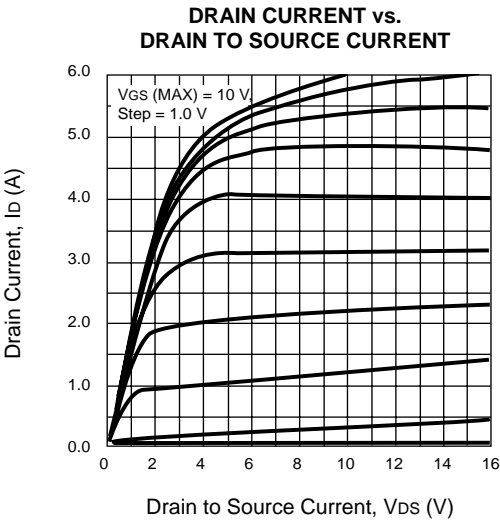
- Note:
1. Duty Cycle 50%, Ton = 1ms.
 2. Freq = 1.9 GHz, V_{DS} = 3.5 V.

ORDERING INFORMATION¹

PART NUMBER	QTY
NE5510179A-T1	1 K/Reel

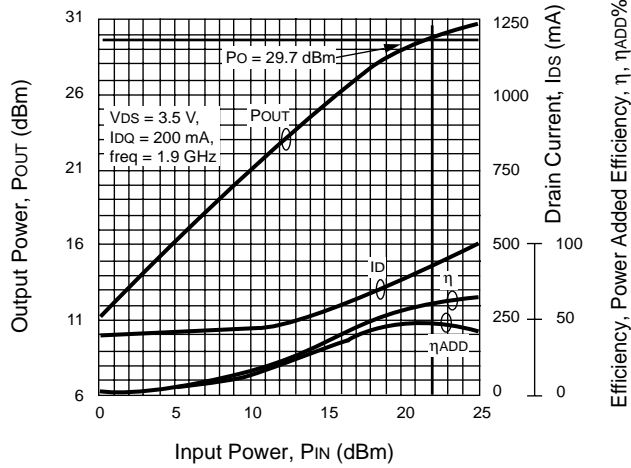
- Note:
1. Embossed tape 12 mm wide. Gate pin face to perforations side of the tape.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

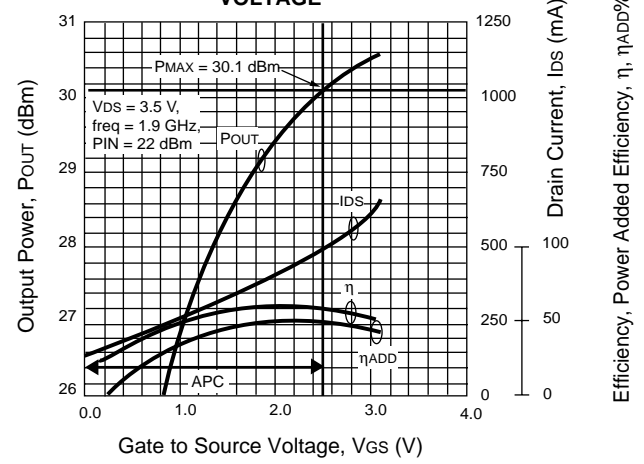


TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)

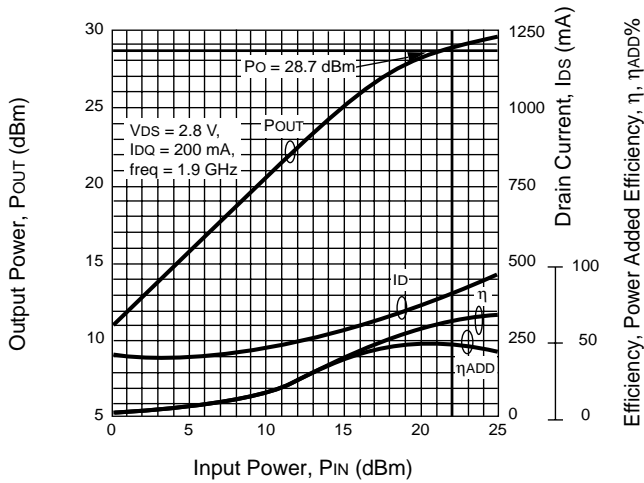
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY, AND POWER ADDED EFFICIENCY VS. INPUT POWER



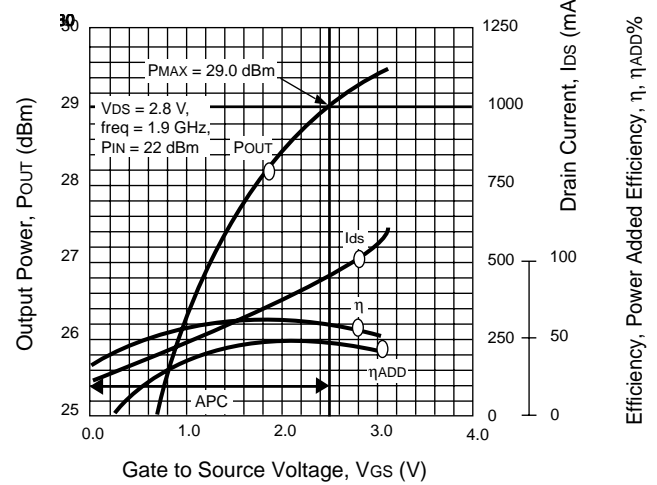
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY, AND POWER ADDED EFFICIENCY VS. GATE TO SOURCE VOLTAGE



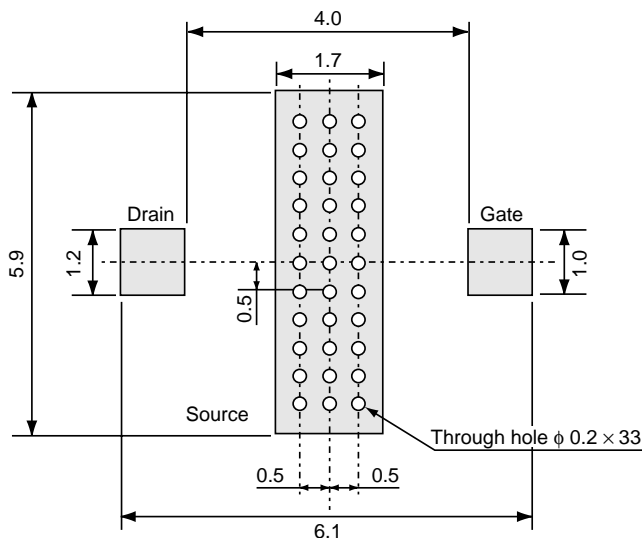
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY, AND POWER ADDED EFFICIENCY VS. INPUT POWER



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



P.C.B. LAYOUT¹ (Units in mm)



Note:

1. Use rosin or other material to prevent solder from penetrating through-holes.

TYPICAL SCATTERING PARAMETERS¹ (T_A = 25°C)

Note:

1. This file and many other s-parameter files can be downloaded from www.cel.com

NE5510179A

V_{DS} = 3.5 V, I_{DS} = 200 mA

FREQUENCY	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K	MAG ¹
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.10	0.83	-121.10	13.84	111.30	0.03	23.50	0.65	-154.00	-0.13	26.50
0.20	0.80	-148.10	7.49	93.60	0.03	6.70	0.71	-164.80	-0.12	23.60
0.30	0.80	-158.20	4.96	84.60	0.03	-2.60	0.74	-168.50	-0.04	21.80
0.40	0.81	-163.40	3.67	77.10	0.03	-8.30	0.75	-170.50	0.07	20.60
0.50	0.82	-166.80	2.90	71.20	0.03	-13.30	0.77	-171.60	0.10	19.60
0.60	0.82	-169.40	2.32	66.20	0.02	-17.20	0.79	-172.70	0.24	19.00
0.70	0.83	-171.40	1.96	61.70	0.02	-18.30	0.80	-173.40	0.34	18.60
0.80	0.85	-173.40	1.63	57.30	0.02	-22.70	0.81	-174.60	0.38	18.00
0.90	0.85	-175.00	1.43	52.60	0.02	-24.60	0.83	-175.50	0.50	17.80
1.00	0.86	-176.70	1.23	50.30	0.02	-24.60	0.84	-176.70	0.59	17.30
1.10	0.87	-178.40	1.10	46.20	0.02	-29.30	0.85	-177.50	0.61	17.20
1.20	0.88	180.00	0.96	44.30	0.01	-27.90	0.86	-178.90	0.83	17.00
1.30	0.88	178.00	0.86	39.90	0.01	-28.10	0.87	179.80	0.90	16.80
1.40	0.89	176.50	0.78	38.10	0.01	-29.10	0.88	178.40	0.91	16.60
1.50	0.89	174.90	0.71	34.20	0.01	-31.70	0.88	177.60	0.89	16.20
1.60	0.90	172.90	0.65	33.30	0.01	-35.20	0.89	175.80	1.27	13.50
1.70	0.90	170.90	0.57	29.90	0.01	-28.20	0.89	174.70	1.75	11.40
1.80	0.91	169.30	0.54	27.10	0.01	-23.90	0.90	172.50	1.66	12.20
1.90	0.90	167.00	0.49	24.40	0.01	-23.00	0.90	171.20	2.29	10.50
2.00	0.91	165.10	0.47	23.80	0.01	-15.10	0.91	169.50	1.98	11.10
2.10	0.91	162.20	0.42	20.50	0.00	-3.70	0.90	167.80	4.25	8.60
2.20	0.91	160.80	0.39	19.10	0.00	-4.10	0.91	166.00	4.63	8.50
2.30	0.92	158.30	0.35	15.20	0.00	6.00	0.92	163.50	4.77	7.90
2.40	0.91	156.10	0.35	13.40	0.00	13.90	0.92	162.00	3.34	8.30
2.50	0.91	153.50	0.31	13.00	0.00	15.10	0.92	160.60	5.26	7.00
2.60	0.92	151.50	0.30	12.20	0.00	31.80	0.92	157.90	4.70	6.60
2.70	0.91	149.10	0.26	9.50	0.00	45.00	0.91	155.70	5.87	5.00
2.80	0.92	147.10	0.27	4.80	0.01	48.10	0.94	153.50	2.45	7.60
2.90	0.92	145.00	0.24	6.40	0.00	62.00	0.92	152.40	4.02	5.30
3.00	0.92	142.90	0.24	4.80	0.01	57.70	0.93	150.20	2.75	6.60

Note:

1. Gain Calculation:

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

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

EXCLUSIVE NORTH AMERICAN AGENT FOR **NEC** RF, MICROWAVE & OPTOELECTRONIC SEMICONDUCTORS

CEL CALIFORNIA EASTERN LABORATORIES • Headquarters • 4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • Telex 34-6393 • FAX (408) 988-0279
 24-Hour Fax-On-Demand: 800-390-3232 (U.S. and Canada only) • Internet: <http://WWW.CEL.COM>

DATA SUBJECT TO CHANGE WITHOUT NOTICE

07/05/2000