PRELIMINARY DATA SHEET

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

NE5510179A

FEATURES

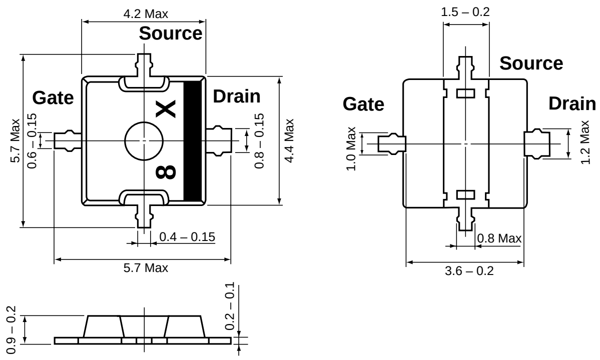
- **HIGH OUTPUT POWER:** 29.5 dBm TYP
  V_{DS} = 3.5 V, I_{DQ} = 200 mA, f = 1.9 GHz, P_{IN} = 22 dBm
- **HIGH LINEAR GAIN:** 11 dB TYP
  V_{DS} = 3.5 V, I_{DQ} = 200 mA, f = 1.9 GHz, P_{IN} = 5dBm
- **HIGH POWER ADDED EFFICIENCY:** 50% TYP
  V_{DS} = 3.5 V, I_{DQ} = 200 mA, f = 1.9 GHz, P_{IN} = 22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

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.

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 79A



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°C)

PART NUMBER PACKAGE OUTLINE			NE5510179A 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} = 3.5 V, I_{DS} = 1 mA
gm	Transconductance	S		0.82		V_{DS} = 3.5 V, I_{DS1} = 300 mA, I_{DS2} = 500 mA
$R_{DS\ (ON)}$	Drain-to-Source On Resistance			0.5		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, 4.6mS Period, T_C = 25°C)

SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX	TEST CONDITIONS
G_L	Linear Gain dB	dB	-	11.0	-	f = 1.9 GHz, Pin =5dBm, V_{DS} = 3.5 V, I_{DQ} = 200 mA
P_{OUT1}	Output Power dBm	dBm	28.5	29.5	-	f = 1.9 GHz, Pin =22dBm, V_{DS} = 3.5 V, I_{DQ} = 200 mA
I_{OP}	Operating Current	mA	-	420	-	
η_{ADD}	Power Added Efficiency	%	42	50	-	
P_{OUT2}	Maximum Output Power	dBm	-	30.0	-	f = 1.9 GHz, Pin =22dBm, V_{DS} = 3.5 V, V_{GS} = 2.5 V
I_{OP2}	Operating Current	mA	-	500	-	
P_{OUT3}	Output Power at Lower Voltage	dBm	-	29.0	-	f = 1.9 GHz, Pin =22dBm, V_{DS} = 2.8 V, V_{GS} = 2.5 V
I_{OP3}	Operating Current	mA	-	450	-	
G_L	Linear Gain	dB	-	11.3	-	f = 1.9 GHz, Pin = 5 dBm, V_{DS} = 4.8 V, I_{DQ} = 200 mA
P_{OUT}	Output Power dBm	dBm	-	32.8	-	f = 1.9 GHz, Pin = 25 dBm, V_{DS} = 4.8 V, I_{DQ} = 200 mA
I_{OP}	Operating Current	mA	-	625	-	
η_{ADD}	Power Added Efficiency	%	-	52	-	
G_L	Linear Gain dB	dB	-	11.4	-	f = 1.9 GHz, Pin = 5 dBm, V_{DS} = 6.0 V, I_{DQ} = 200 mA
P_{OUT}	Output Power dBm	dBm	-	34.8	-	f = 1.9 GHz, Pin = 27 dBm, V_{DS} = 6.0 V, I_{DQ} = 200 mA
I_{OP}	Operating Current	mA	-	790	-	
η_{ADD}	Power Added Efficiency	%	-	53	-	

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 (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 INFORMATION[1]

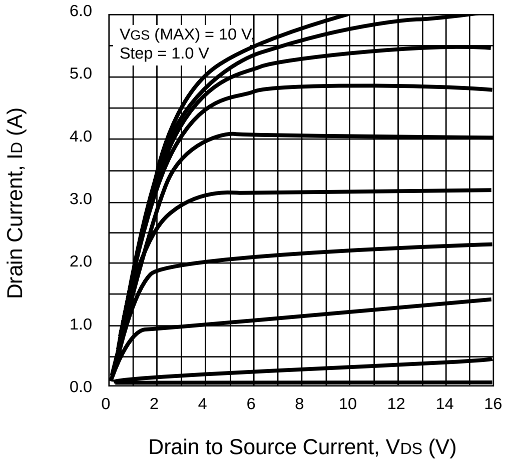
PART NUMBER	QTY
NE5510179A-T1	1 K/Reel

Note:

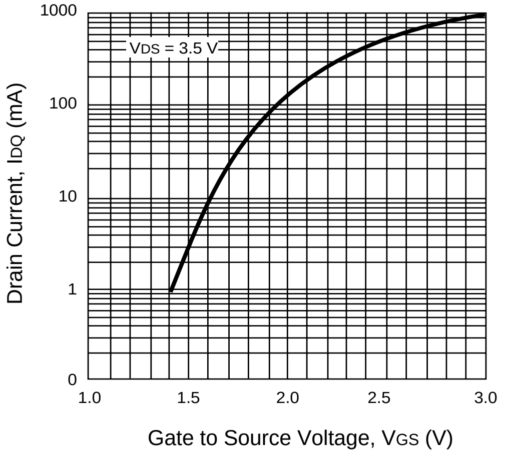
1. Embossed tape 12 mm wide. Gate pin face to perforations side of the tape.

TYPICAL PERFORMANCE CURVES (TA = 25°C)

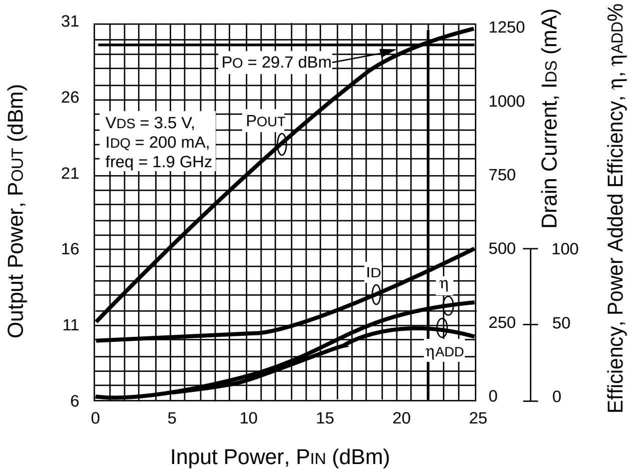
DRAIN CURRENT vs. DRAIN TO SOURCE CURRENT



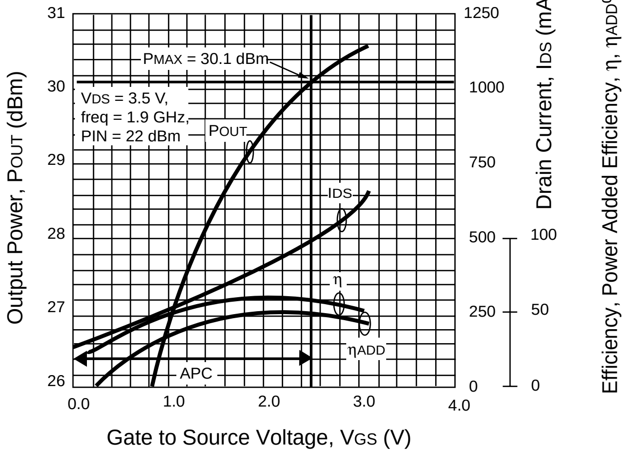
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



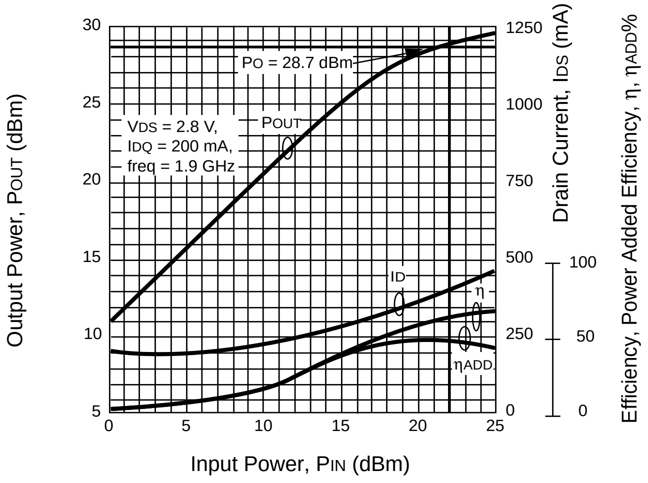
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY, AND POWER ADDED EFFICIENCY VS. INPUT POWER



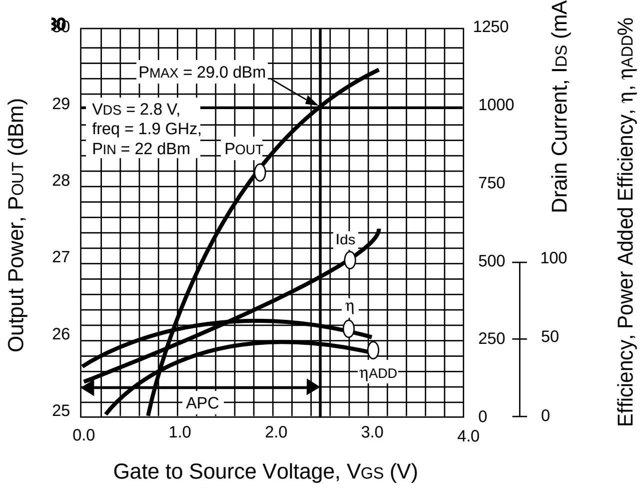
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY, AND POWER ADDED EFFICIENCY VS. GATE TO SOURCE VOLTAGE



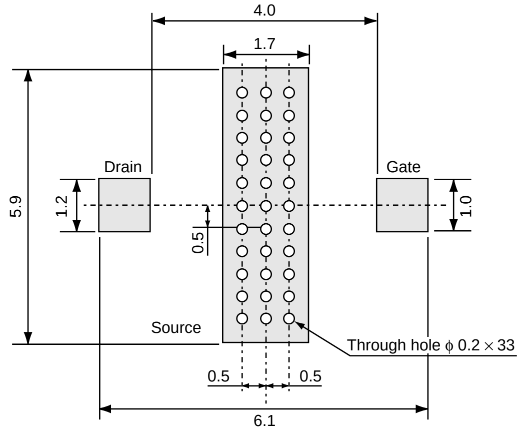
OUTPUT POWER, DRAIN CURRENT, EFFICIENCY, AND POWER ADDED EFFICIENCY VS. INPUT POWER



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



P.C.B. LAYOUT[1] (Units in mm)



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

TYPICAL SCATTERING PARAMETERS[1] (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:

$$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K - \sqrt{K^2 - 1}\right).$$ When K ≤ 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

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