NEC®

GENERAL PURPOSE DUAL-GATE GaAs MESFET

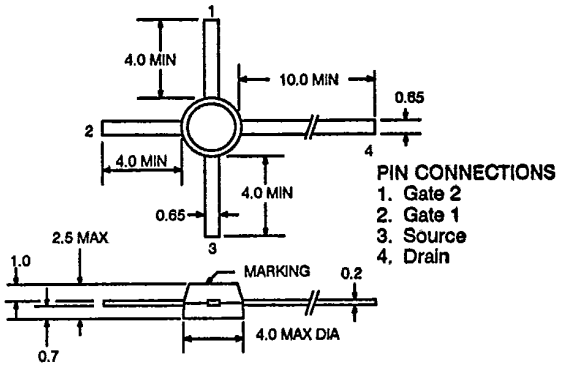
NE25137 NE25139

FEATURES

- **SUITABLE FOR USE AS RF AMPLIFIER IN UHF TUNER**
- **LOW C_{RSS}:** 0.02 pF (TYP)
- **HIGH G_{PS}:** 20 dB (TYP) AT 900 MHz
- **LOW NF:** 1.1 dB TYP AT 900 MHz
- **GATE WIDTH:** W_G = 400 MICRONS
- **ION IMPLANTATION**
- **AVAILABLE IN TAPE & REEL OR BULK**

OUTLINE DIMENSIONS (Units in mm)

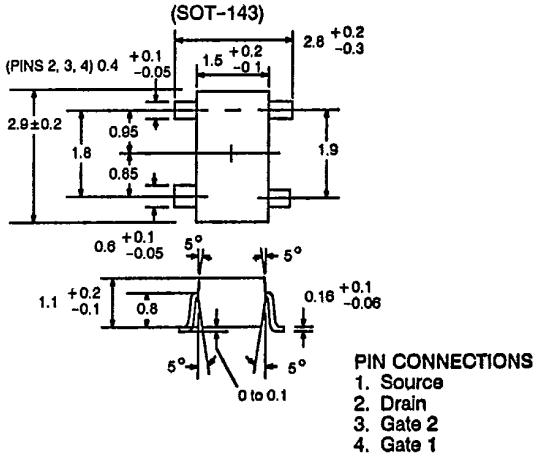
OUTLINE 37



DESCRIPTION AND APPLICATIONS

The NE251 is a dual gate GaAs FET designed to provide flexibility in its application as a mixer, AGC amplifier, or low noise amplifier. As an example, by shorting the second gate to the source, higher gain can be realized than with single gate MESFETs. This device is available in disk-mold and mini-mold (surface mount).

OUTLINE 39
(SOT-143)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DSX}	Drain to Source Voltage	V	13
V_{G1S}	Gate 1 to Source Voltage	V	−4.5
V_{G2S}	Gate 2 to Source Voltage	V	−4.5
I_D	Drain Current	mA	40
P_T	Total Power Dissipation	mW	200
T_{CH}	Channel Temperature	°C	125
T_{STG}	Storage Temperature	°C	−55 to +125

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBERS PACKAGE OUTLINE			NE25137, NE25139 37, 39		
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
BV_{DSX}	Drain to Source Breakdown Voltage at V_{G1S} = -4 V, V_{G2S} = 0, I_D = 10 µA	V	13		
I_{DSS}	Drain Current at V_{DS} = 5 V, V_{G2S} = 0 V, V_{G1S} = 0 V	mA	5	20	40
$V_{G1S(OFF)}$	Gate 1 to Source Cutoff Voltage at V_{DS} = 5 V, V_{G2S} = 0 V, I_D = 100 µA	V	-3.5		
$V_{G2S(OFF)}$	Gate 2 to Source Cutoff Voltage at V_{DS} = 5 V, V_{G1S} = 0 V, I_D = 100 µA	V	-3.5		
I_{G1SS}	Gate 1 Reverse Current at V_{DS} = 0, V_{G1S} = -4 V, V_{G2S} = 0	µA			10
I_{G2SS}	Gate 2 Reverse Current at V_{DS} = 0, V_{G2S} = -4 V, V_{G1S} = 0	µA			10
$\|Y_{FS}\|$	Forward Transfer Admittance at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 1.0 kHz	mS	18	25	35
C_{ISS}	Input Capacitance at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 1 MHz	pF	0.5	1.0	1.5
C_{RSS}	Reverse Transfer Capacitance at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 1 MHz	pF		0.02	0.03
G_{PS}	Power Gain at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 900 MHz	dB	16	20	
NF	Noise Figure at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 900 MHz	dB		1.1	2.5

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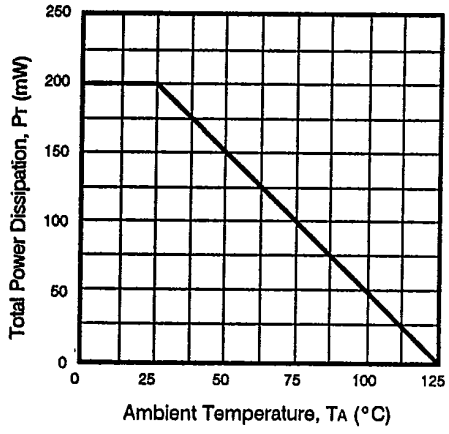
IDSS CLASSIFICATION (Units in mA)

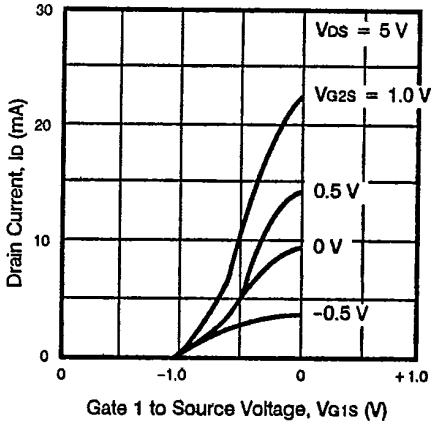
I_{DSS}	5 TO 15	10 TO 25	20 TO 35	30 TO 40
NE25137 Marking	N	M	L	K
NE25139 Marking	U71	U72	U73	U74

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

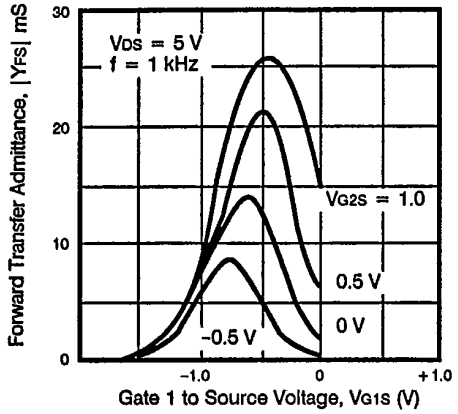


DRAIN CURRENT vs. GATE 1 TO SOURCE VOLTAGE

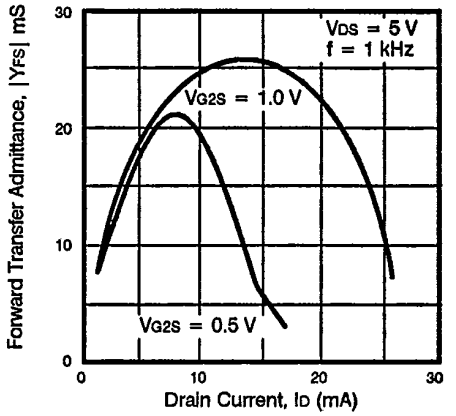


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

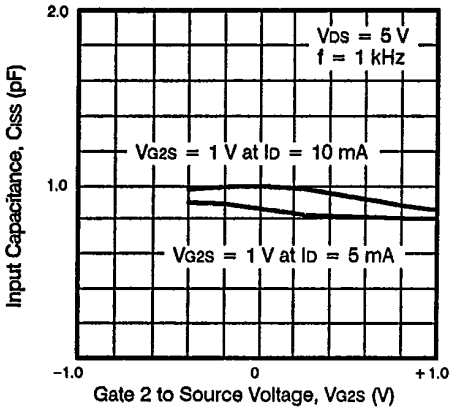
FORWARD TRANSFER ADMITTANCE vs. GATE 1 TO SOURCE VOLTAGE



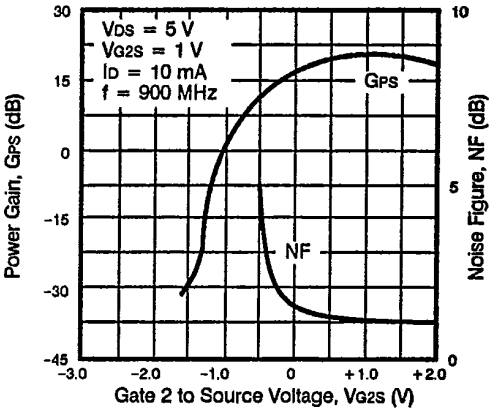
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



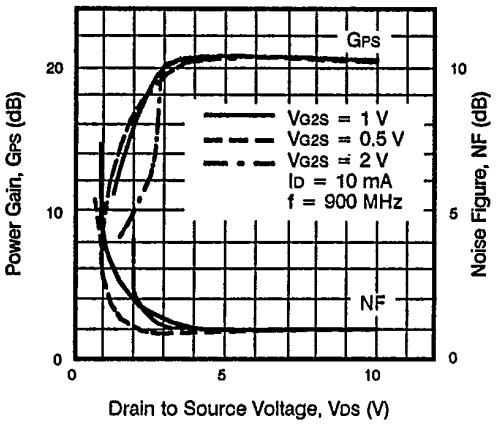
INPUT CAPACITANCE vs. GATE 2 TO SOURCE VOLTAGE



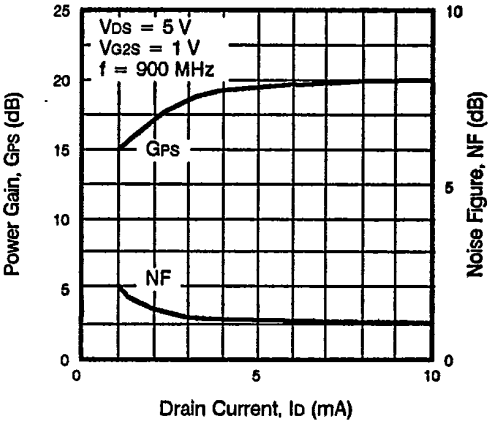
POWER GAIN AND NOISE FIGURE vs. GATE 2 TO SOURCE VOLTAGE



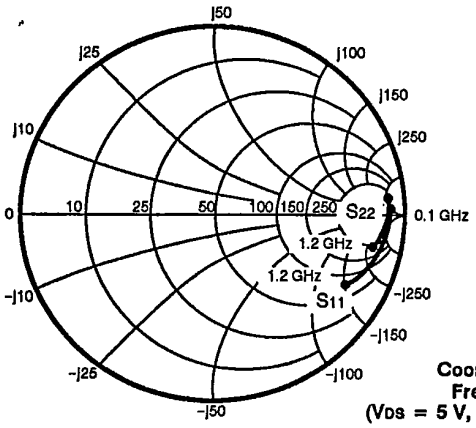
POWER GAIN AND NOISE FIGURE vs. DRAIN TO SOURCE VOLTAGE

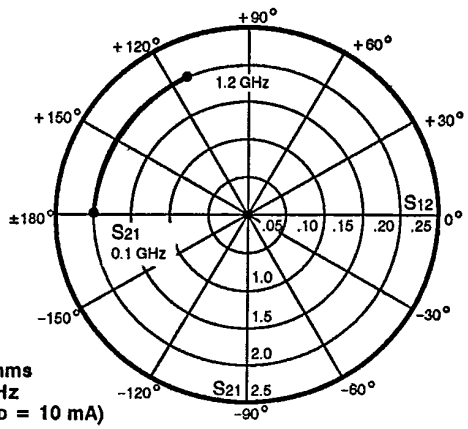


POWER GAIN AND NOISE FIGURE vs. DRAIN CURRENT



TYPICAL SCATTERING PARAMETERS

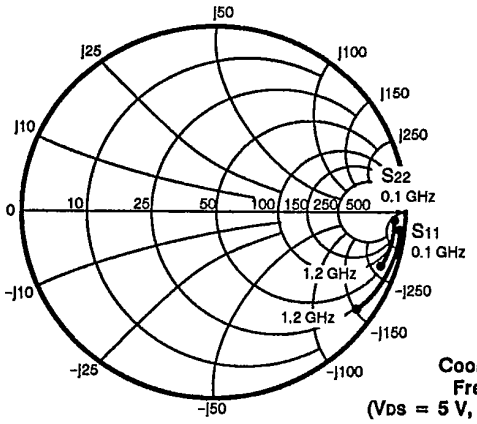


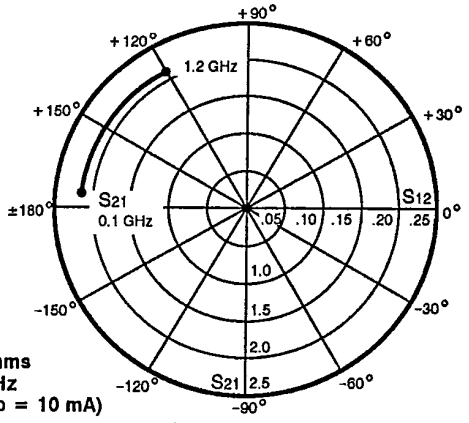


NE25137
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA)

S-MAGN AND ANGLES:
V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
100	.99	-3	2.10	177	.001	87	.97	-2
200	.99	-6	2.14	170	.001	86	.98	-4
300	.99	-9	2.09	163	.001	86	.98	-4
400	.98	-13	2.07	158	.002	85	.97	-6
500	.97	-15	2.12	157	.002	85	.98	-6
600	.95	-19	2.12	148	.003	84	.96	-9
700	.96	-20	2.07	144	.003	82	.98	-8
800	.93	-25	2.08	138	.004	81	.95	-11
900	.93	-26	2.16	136	.004	81	.98	-11
1000	.88	-30	2.12	126	.005	80	.95	-15
1100	.90	-31	2.15	123	.005	80	.98	-14
1200	.85	-35	2.19	116	.005	79	.95	-18



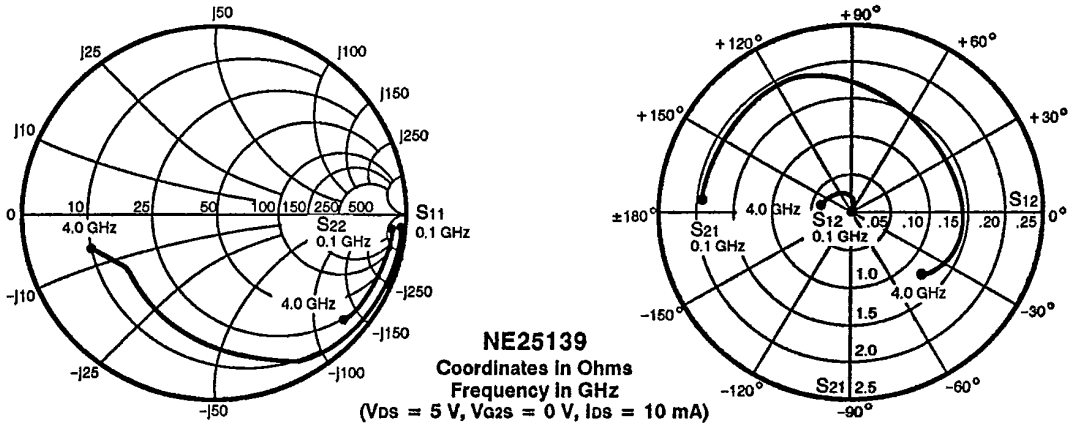


NE25139
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA)

S-MAGN AND ANGLES:
V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
100	.99	-3	2.36	177	.001	87	.97	-1
200	.99	-7	2.39	169	.001	85	.98	-3
300	.99	-9	2.31	164	.002	82	.98	-3
400	.98	-13	2.23	160	.002	82	.97	-6
500	.97	-16	2.42	158	.003	81	.99	-6
600	.97	-19	2.30	150	.003	81	.96	-8
700	.96	-22	2.33	146	.004	80	.99	-9
800	.95	-25	2.23	142	.005	79	.96	-9
900	.94	-29	2.45	137	.005	79	.99	-13
1000	.92	-29	2.30	131	.006	78	.97	-11
1100	.91	-35	2.35	126	.006	78	.98	-15
1200	.88	-35	2.37	124	.006	78	.99	-13

TYPICAL SCATTERING PARAMETERS



NE25139
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 5 V, V_{G2S} = 0 V, I_{DS} = 10 mA)

S-MAGN AND ANGLES:
V_{DS} = 5 V, V_{G2S} = 0 V, I_{DS} = 10 mA

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		k	Gma dB
100	1.0	-4	1.96	174	0.001	87	0.96	-1	-0.03	29.0
200	1.0	-8	1.92	169	0.001	85	0.96	-2	0.15	31.2
400	0.99	-15	1.91	158	0.001	82	0.95	-3	1.30	27.3
600	0.97	-23	1.90	148	0.002	81	0.94	-3	1.75	22.3
900	0.94	-35	1.90	132	0.004	80	0.94	-4	2.18	18.2
1000	0.92	-39	1.90	126	0.004	79	0.94	-5	2.35	17.2
1500	0.82	-61	1.88	99	0.006	78	0.94	-6	3.22	14.8
2000	0.69	-86	1.52	71	0.008	95	0.95	-9	2.97	14.6
2500	0.60	-110	1.41	45	0.012	118	0.96	-12	1.41	17.0
3000	0.51	-131	1.39	19	0.023	153	0.97	-18	0.43	17.8
3500	0.51	-147	1.37	-6	0.039	162	0.97	-27	0.08	15.45
4000	0.63	-167	1.20	-47	0.042	157	0.96	-42	0.01	14.56

NE76084 TYPICAL NOISE PARAMETERS[2]
(V_{DS} = 5 V, V_{G2S} = 0 V, I_{DS} = 10 mA)

FREQ. (GHz)	NF_{OPT} (dB)	G_A (dB)	Γ_{OPT} (MAG)	Γ_{OPT} (ANG)	Rn/50
0.5	0.9	18.5	0.9	18	1.9
0.9	1.2	16.0	0.82	28	1.2
1.5	1.5	14.6	0.71	45	0.9
2.0	1.9	12.5	0.55	75	0.67
3.0	2.5	11.0	0.34	116	0.5
4.0	3.3	9.5	0.25	154	0.4