NEC

GENERAL PURPOSE DUAL-GATE GaAs MESFET

NE25339

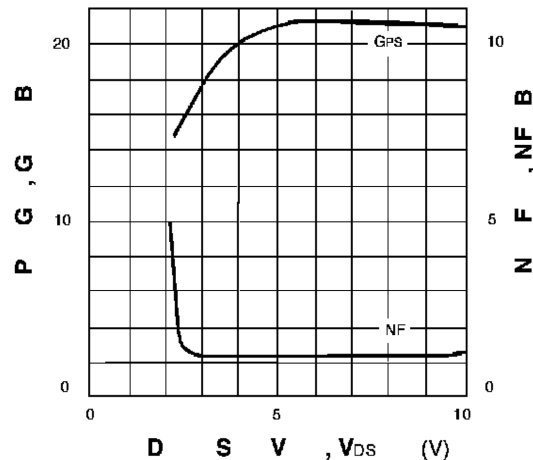
FEATURES

- **SUITABLE FOR USE AS RF AMPLIFIER AND MIXER IN UHF APPLICATIONS**
- **LOW CRSS:** 0.02 pF (TYP)
- **HIGH GPS:** 20 dB (TYP) AT 900 MHz
- **LOW NF:** 1.1 dB TYP AT 900 MHz
- **L_{G1} = 1.0 µm, L_{G2} = 1.5 µm, W_G = 800 µm**
- **ION IMPLANTATION**
- **AVAILABLE IN TAPE & REEL OR BULK**

DESCRIPTION

The NE253 is an 800 µm 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 a mini-mold (surface mount) package.

POWER GAIN AND NOISE FIGURE vs. DRAIN TO SOURCE VOLTAGE
V_{GS} = 1 V, I_{DS} = 10 mA, f = 900 MHz



ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE25339 39		
SYMBOL	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NF	Noise Figure at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 900 MHz	dB		1.1	2.5
G_{PS}	Power Gain at V_{DS} = 5 V, V_{G2S} = 1 V, I_{DS} = 10 mA, f = 900 MHz	dB	16	20	
BV_{DSX}	Drain to Source Breakdown Voltage at V_{G1S} = -4 V, V_{G2S} = 0, I_{DS} = 20 µA	V	10		
I_{DSS}	Saturated Drain Current at V_{DS} = 5 V, V_{G2S} = 0 V, V_{G1S} = 0 V	mA	10	40	80
$V_{G1S (OFF)}$	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} = -4V, V_{G2S} = 0	µA			10
I_{G2SS}	Gate 2 Reverse Current at V_{DS} = 0. V_{G2S} = -4V, V_{G1S} = 0	µA			10
$\lvert Y_{FS} \rvert$	Forward Transfer Admittance at V_{DS} = 5 V, V_{G2S} = 1 V, I_{DS} = 10 mA, f = 1.0 kHz	mS	25	35	
C_{ISS}	Input Capacitance at V_{DS} = 5 V, V_{G2S} = 1 V, I_D = 10 mA, f = 1 MHz	pF	1.0	1.5	2.0
C_{RSS}	Reverse Transfer Capacitance at V_{DS} = 5 V, V_{G2S} = 1 V, I_{DS} = 10 mA, f = 1 MHz	pF		0.02	0.035

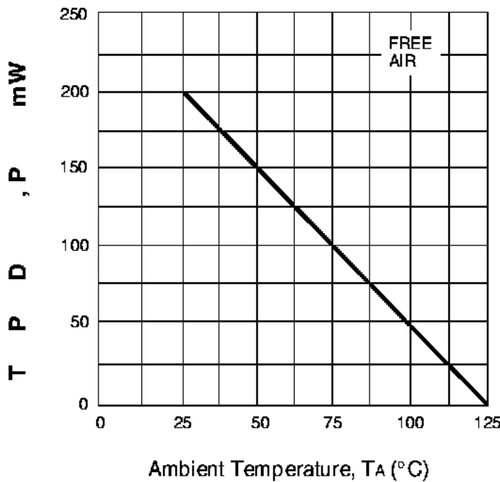
ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DSX}	Drain to Source Voltage	V	10
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	80
T_{CH}	Channel Temperature	°C	125
T_{STG}	Storage Temperature	°C	-55 to +125
P_T	Total Power Dissipation	mW	200

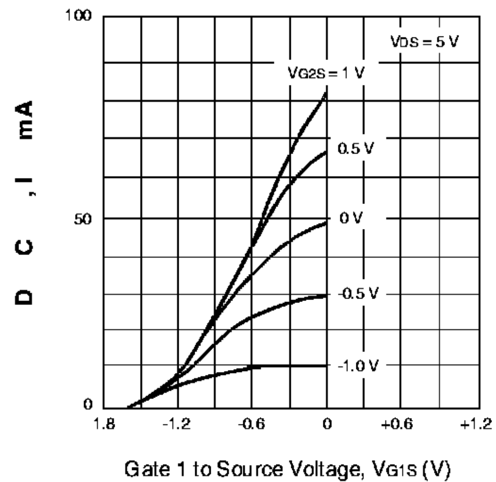
Note:
1. Operation in excess of any one of these parameters may result in permanent damage.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

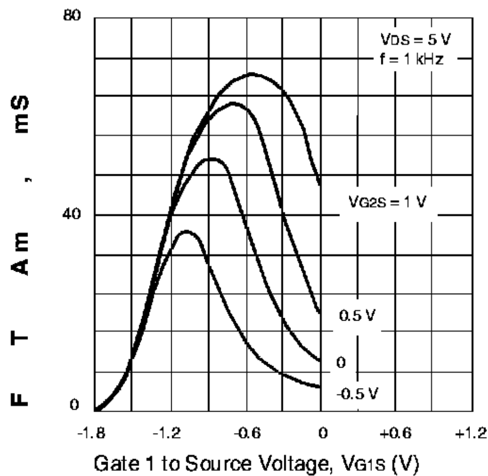
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



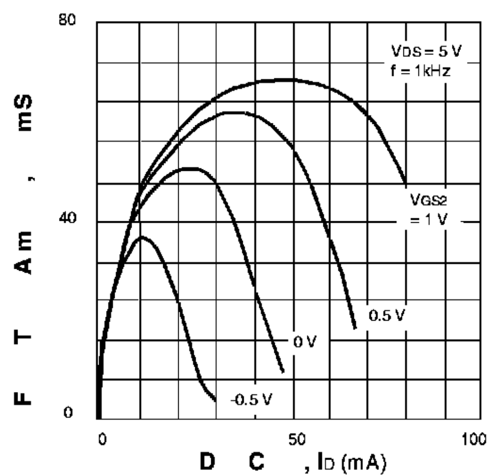
DRAIN CURRENT vs. GATE 1 TO SOURCE VOLTAGE



FORWARD TRANSFER ADMITTANCE vs. GATE 1 TO SOURCE VOLTAGE

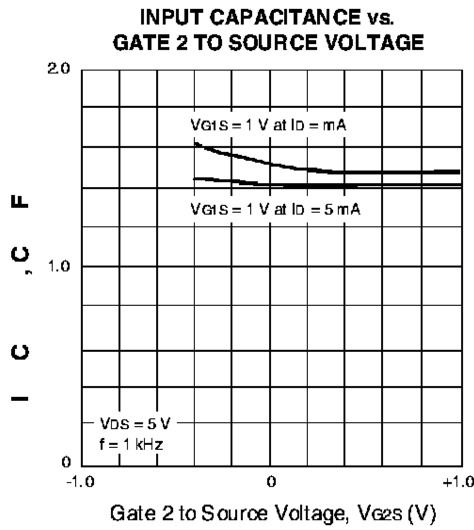


FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

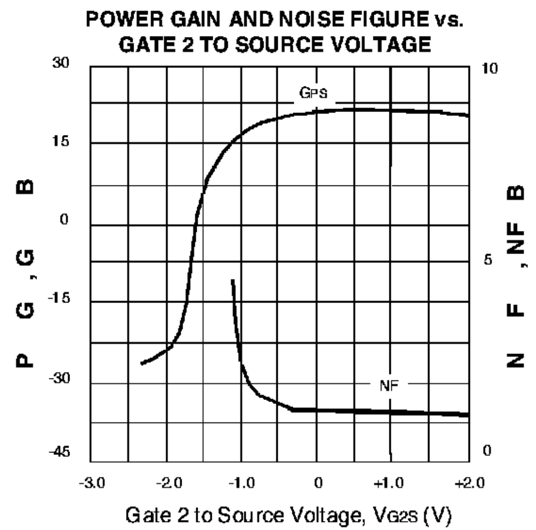


TYPICAL PERFORMANCE CURVES (T_A = 25°C)

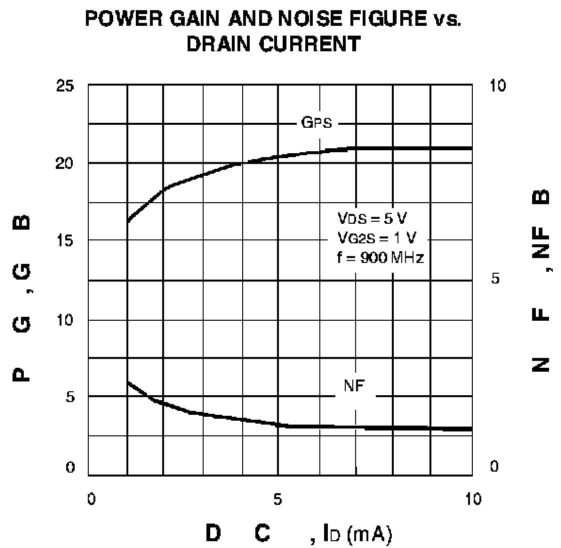
INPUT CAPACITANCE vs. GATE 2 TO SOURCE VOLTAGE



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

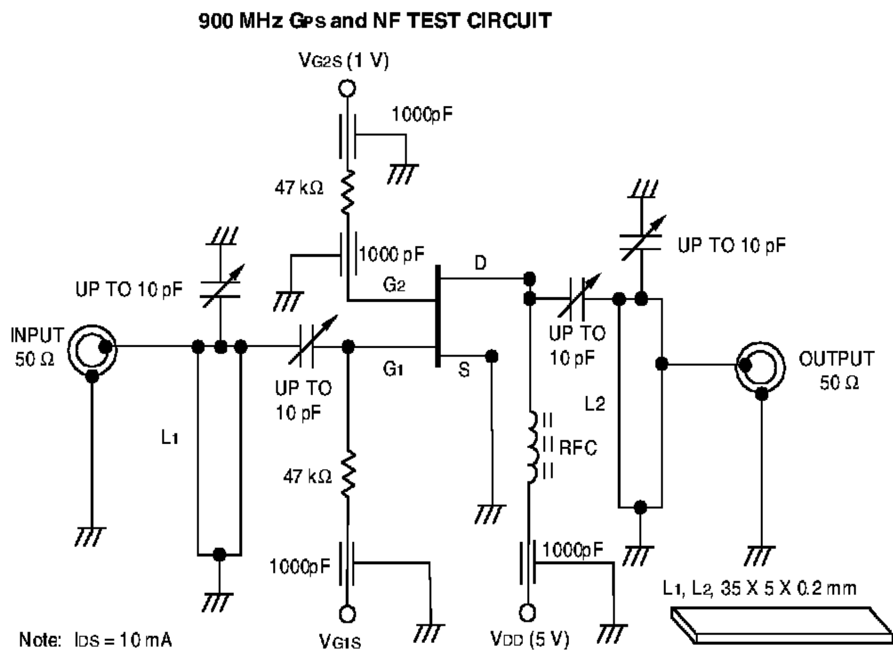


POWER GAIN AND NOISE FIGURE vs. DRAIN CURRENT



TEST CIRCUIT DIAGRAM

900 MHz GPS and NF TEST CIRCUIT



NONLINEAR MODEL

UNITS FOR MODEL PARAMETERS

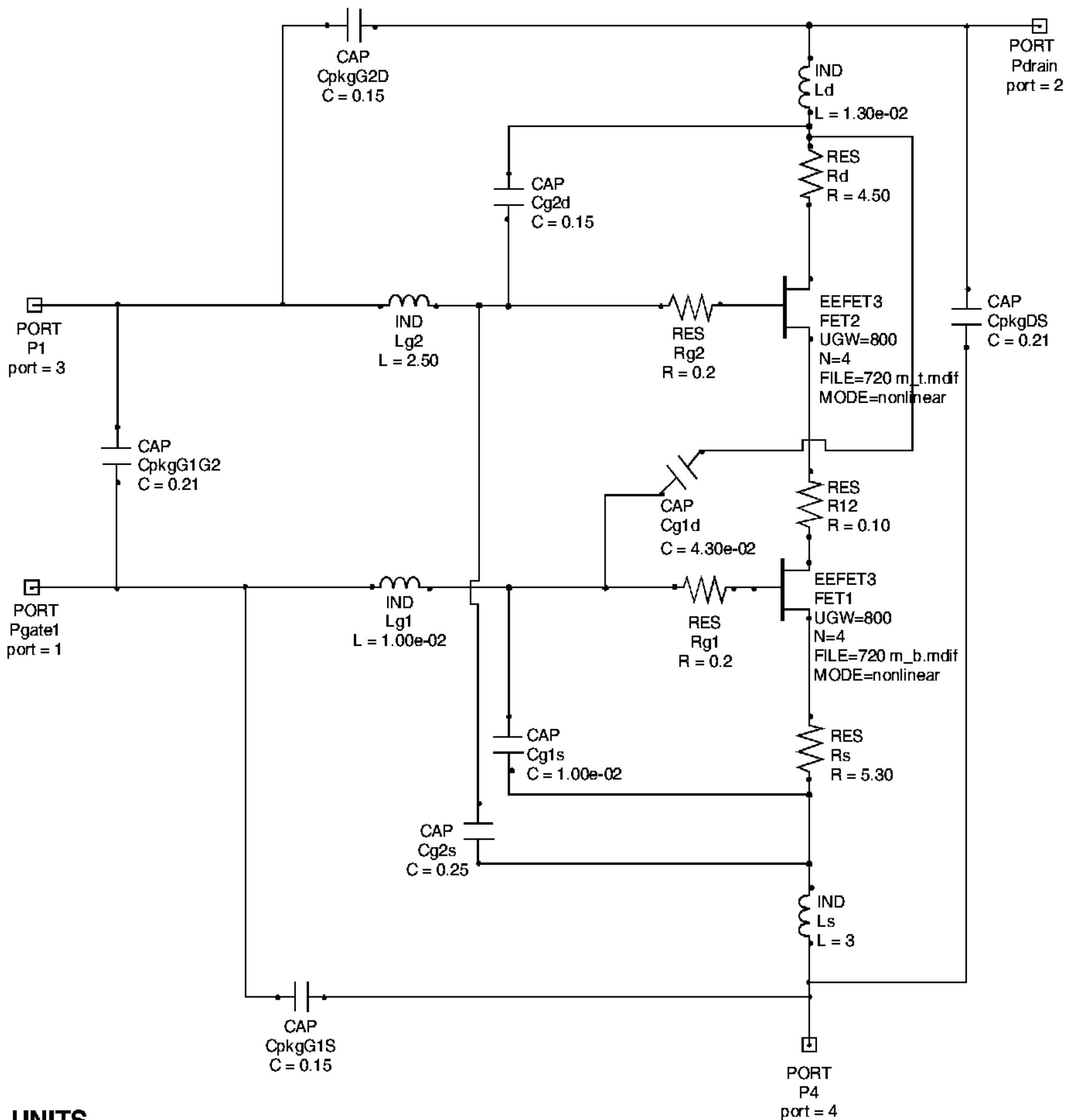
Parameter	Units
time	seconds
capacitance	farads
inductance	henries
resistance	ohms
voltage	volts
current	amps

FET NONLINEAR MODEL PARAMETERS(1)

Parameters	FET1	FET2	Parameters	FET1	FET2
UGW	100e-6	100e-6	IDSOC	0.07	0.07
NGF	4	4	RDB	1.0e9	1.0e9
IS	8.78e-10	8.78e-10	CBS	0.16e-12	0.16e-12
N	1.33	1.33	GDBM	0.00035	0
RG	0	0	KDB	0	0
RD	0	0	VDSM	1	1
RS	0	0	GMMAXAC	0.0195	0.0394
RIS	0	0	GAMMAAC	0.006	0.06
RID	0	0	KAPAAC	0.95	0.95
TAU	1.0e-12	1.0e-12	PEFFAC	1.67	2.07
CDSO	5.0e-15	5.0e-15	VTOAC	-1.895	-1.895
C11O	0.25e-12	0.5e-12	VTSOAC	-10	-10
C11TH	0.1e-12	0.1e-12	VDELTAC	3	3
VINFL	-1.12	-1.12	GMMAX	0.0294	0.0394
DELTGS	1.2	1.2	GAMMA	0.005	0.006
DELTDS	1	0.1	KAPA	0.8	0.026
LAMBDA	0.25	0.25	PEFF	1.636	1.636
C11DELT	0	0	VTO	-2	-2
C12O	0	0	VTSO	-10	-10
C12SAT	0.01e-12	0.01e-12	VDELT	1.47	1.47
CGDSAT	1.0e-15	1.0e-15	VCH	1	1
KBK	0.03	0.03	VSAT	3	3
VBR	6.5	6.5	VGO	1.47	1.47
NBR	2	2	VDSO	3	3

(1) Libra EEFET3 Model

SCHEMATIC



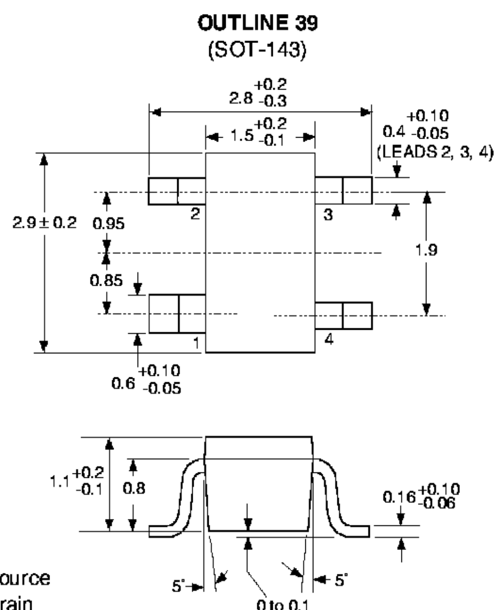
UNITS

Parameter	Units
capacitance	picofarads
inductance	nanohenries
resistance	ohms

NOTES:
1. This UGW value scales the model parameters on page 1.
2. This N value is the number of gate fingers and scales the model parameters on page 1.

Frequency: 0.1 to 1.5 GHz
Bias: V_{DS} = 3 V, V_{g1S} = -1.45 V, V_{g2S} = 1 V, I_D = 3 mA

OUTLINE DIMENSIONS (Units in mm)



1. Source
2. Drain
3. Gate 2
4. Gate 1

ORDERING INFORMATION

PART NUMBER	AVAILABILITY	IDSS RANGE (mA)	MARKING
NE25339	Bulk up to 3 K	10 - 80	-
NE25339-T1	3K/Reel	10 - 80	-
NE25339U76	Bulk up to 3K	10 - 25	U76
NE25339T1U76	3K/Reel	10 - 25	U76
NE25339U77	Bulk up to 3K	20 - 35	U77
NE25339T1U77	3K/Reel	20 - 35	U77
NE25339U78	Bulk up to 3K	30 - 50	U78
NE25339T1U78	3K/Reel	30 - 50	U78
NE25339U79	Bulk up to 3K	45 - 80	U79
NE25339T1U79	3K/Reel	45 - 80	U79

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