

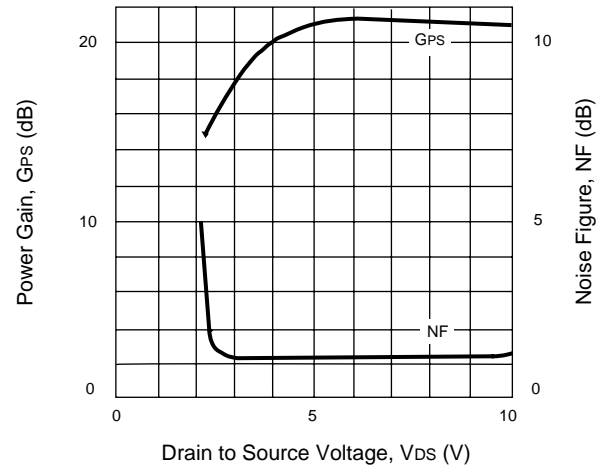
FEATURES

- 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
- $L_{G1} = 1.0 \mu\text{m}$, $L_{G2} = 1.5 \mu\text{m}$, $W_G = 800 \mu\text{m}$
- 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
 $V_{GS} = 1 \text{ V}$, $I_{DS} = 10 \text{ mA}$, $f = 900 \text{ MHz}$



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

PART NUMBER PACKAGE OUTLINE			NE25339 39		
SYMBOL	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NF	Noise Figure at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 1 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 900 \text{ MHz}$	dB		1.1	2.5
GPS	Power Gain at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 1 \text{ V}$, $I_{DS} = 10 \text{ mA}$, $f = 900 \text{ MHz}$	dB	16	20	
BV_{DSX}	Drain to Source Breakdown Voltage at $V_{G1S} = -4 \text{ V}$, $V_{G2S} = 0$, $I_{DS} = 20 \mu\text{A}$	V	10		
I_{DSS}	Saturated Drain Current at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 0 \text{ V}$, $V_{G1S} = 0 \text{ V}$	mA	10	40	80
$V_{G1S}(\text{OFF})$	Gate 1 to Source Cutoff Voltage at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 0 \text{ V}$, $I_D = 100 \mu\text{A}$	V			-3.5
$V_{G2S}(\text{OFF})$	Gate 2 to Source Cutoff Voltage at $V_{DS} = 5 \text{ V}$, $V_{G1S} = 0 \text{ V}$, $I_D = 100 \mu\text{A}$	V			-3.5
I_{G1SS}	Gate 1 Reverse Current at $V_{DS} = 0$, $V_{G1S} = -4\text{V}$, $V_{G2S} = 0$	μA			10
I_{G2SS}	Gate 2 Reverse Current at $V_{DS} = 0$, $V_{G2S} = -4\text{V}$, $V_{G1S} = 0$	μA			10
$ Y_{FS} $	Forward Transfer Admittance at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 1 \text{ V}$, $I_{DS} = 10 \text{ mA}$, $f = 1.0 \text{ kHz}$	mS	25	35	
C_{ISS}	Input Capacitance at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 1 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 1 \text{ MHz}$	pF	1.0	1.5	2.0
CRSS	Reverse Transfer Capacitance at $V_{DS} = 5 \text{ V}$, $V_{G2S} = 1 \text{ V}$, $I_{DS} = 10 \text{ mA}$, $f = 1 \text{ MHz}$	pF		0.02	0.035

ABSOLUTE MAXIMUM RATINGS¹ ($T_A = 25^\circ\text{C}$)

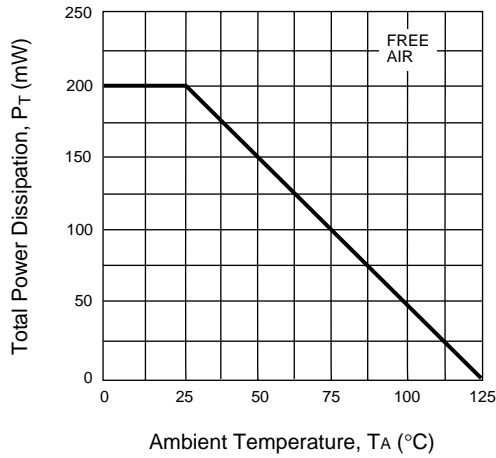
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{DSX}	Drain to Source Voltage	V	10
V _{G1S}	Gate 1 to Source Voltage	V	-4.5
V _{G2S}	Gate 2 to Source Voltage	V	-4.5
I _D	Drain Current	mA	80
T _{CH}	Channel Temperature	°C	125
T _{STG}	Storage Temperature	°C	-55 to +125
P _T	Total Power Dissipation	mW	200

Note:

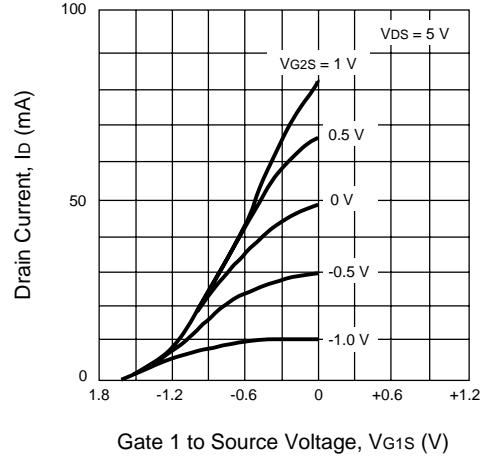
1. Operation in excess of any one of these parameters may result in permanent damage.

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

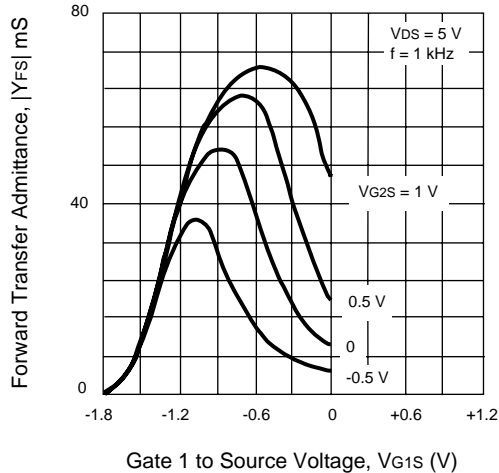
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



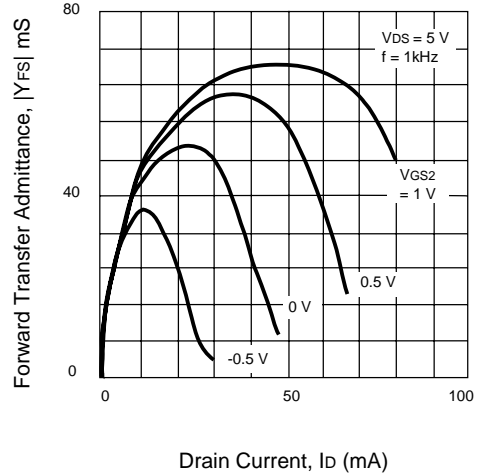
DRAIN CURRENT vs. GATE 1 TO SOURCE VOLTAGE



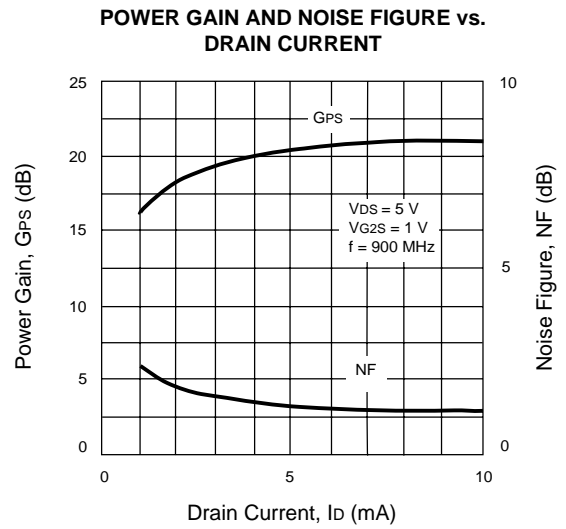
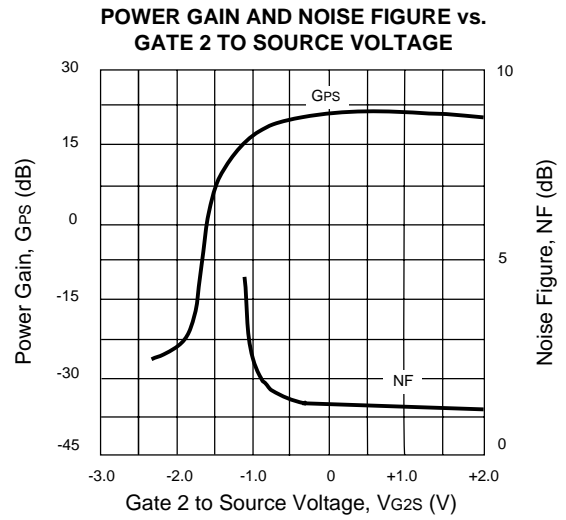
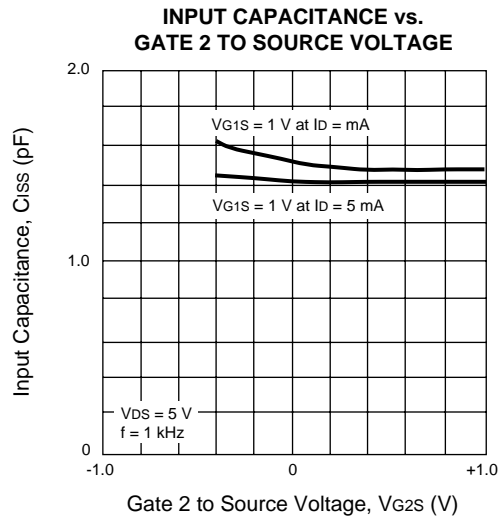
FORWARD TRANSFER ADMITTANCE vs. GATE 1 TO SOURCE VOLTAGE



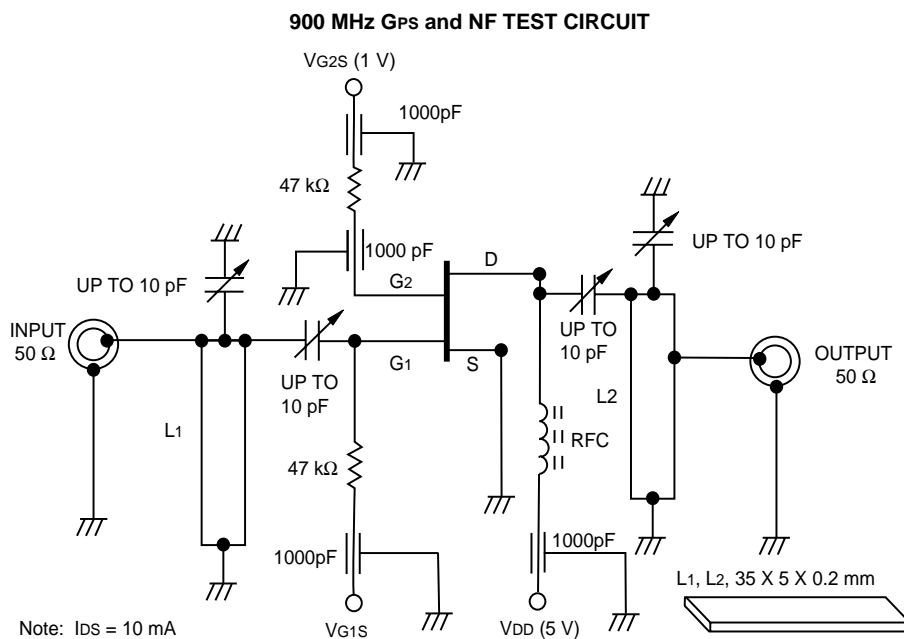
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



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



TEST CIRCUIT DIAGRAM



NONLINEAR MODEL

UNITS FOR MODEL PARAMETERS

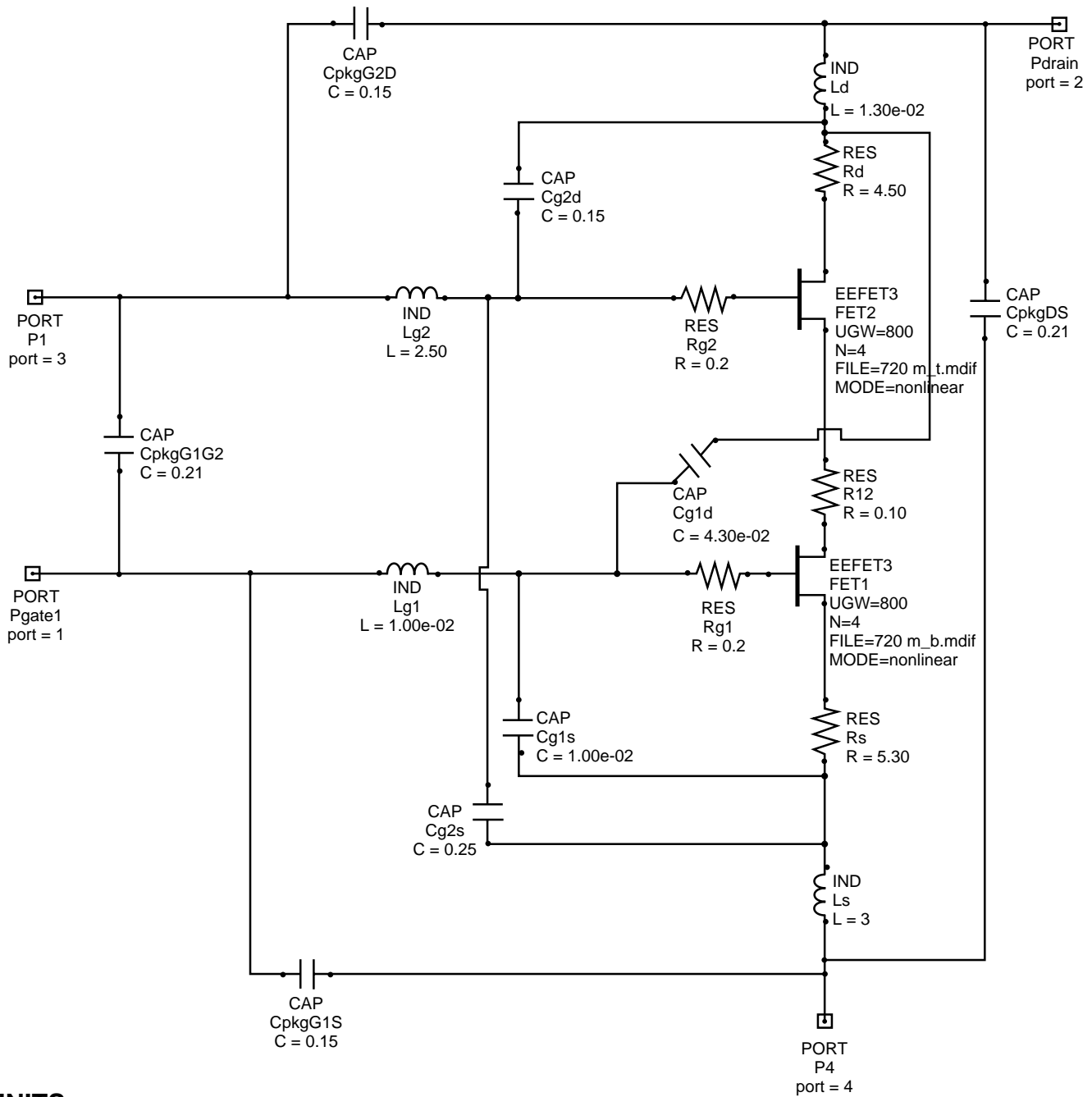
Parameter	Units
time	seconds
capacitance	farads
inductance	henries
resistance	ohms
voltage	volts
current	amps

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	VDELTAAC	3	3
VINFL	-1.12	-1.12	GMMAX	0.0294	0.0394
DELTGS	1.2	1.2	GAMMA	0.005	0.006
DELTD	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	VDELTA	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

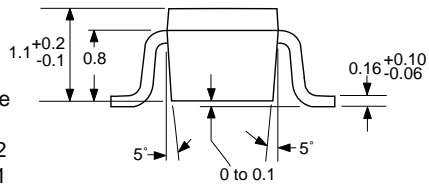
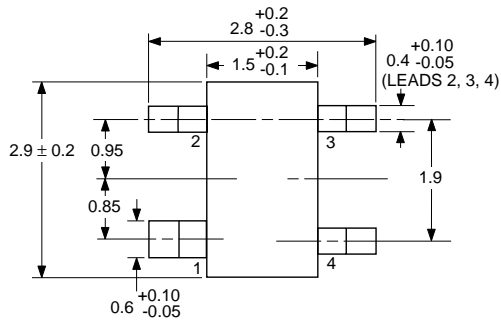
NOTES:

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: $V_{DS} = 3\text{ V}$, $V_{G1S} = -1.45\text{ V}$, $V_{G2S} = 1\text{ V}$, $I_D = 3\text{ mA}$

OUTLINE DIMENSIONS (Units in mm)

OUTLINE 39
(SOT-143)



- 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	-

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