NEC

C BAND SUPER LOW NOISE HJ FET | NE434S01

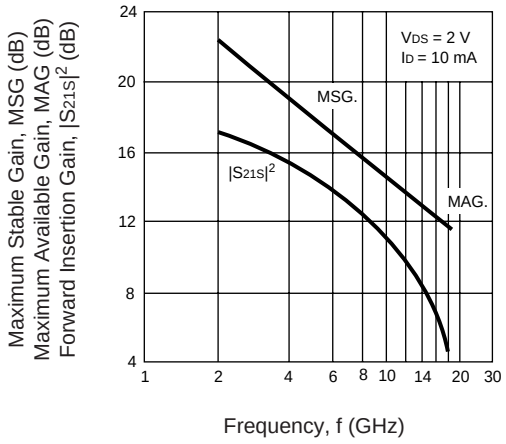
FEATURES

- **VERY LOW NOISE FIGURE:** 0.35 dB TYP at 4 GHz
- **HIGH ASSOCIATED GAIN:** 15.5 dB TYP at 4 GHz
- **GATE WIDTH:** 280 μm
- **TAPE & REEL PACKAGING OPTION AVAILABLE**
- **LOW COST PLASTIC PACKAGE**

DESCRIPTION

The NE434S01 is a Hetero-Junction FET that uses the junction between Si-doped AlGaAs and undoped InGaAs to create very high mobility electrons. Its excellent low noise and high associated gain make it suitable for TVRO and other commercial systems.

MAXIMUM AVAILABLE GAIN, FORWARD INSERTION GAIN vs. FREQUENCY



RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

SYMBOLS	CHARACTERISTIC	UNITS	MIN	TYP	MAX
V_{DS}	Drain to Source Voltage	V		2	2.5
I_D	Drain Current	mA		15	20
P_{IN}	Input Power	dBM			0

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE434S01 S01		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
I_{GSO}	Gate to Source Leak Current, V_{GS} = -3.0 V	μA		0.5	10
I_{DSS}	Saturated Drain Current, V_{DS} = 2.0 V, V_{GS} = 0 V	mA	20	80	150
$V_{GS(off)}$	Gate to Source Cutoff Voltage, V_{DS} = 2.0 V, I_D = 100 μA,	V	-0.2	-0.9	-2.5
g_m	Transconductance, V_{DS} = 2.0 V, I_D = 14 mA	mS	70	85	
NF^1	Noise Figure, V_{DS} = 2.0 V, I_D = 15 mA, f = 4 GHz	dB		0.35	0.45
G_A^1	Associated Gain, V_{DS} = 2.0 V, I_D = 15 mA, f = 4 GHz	dB	13.0	15.5	

Note:
1. Typical values of noise figures and associated gain are those obtained when 50% of the devices from a large number of lots were individually measured in a circuit with the input individually tuned to obtain the minimum value. Maximum values are criteria established on the production line as a "go-no-go" screening tuned for the "generic" type but not each specimen.

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	4.0
V_{GS}	Gate to Source Voltage	V	-3.0
I_{DS}	Drain Current	mA	I_{DSS}
T_{CH}	Channel Temperature	°C	125
T_{STG}	Storage Temperature	°C	-65 to +125
P_T	Total Power Dissipation	mW	300

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

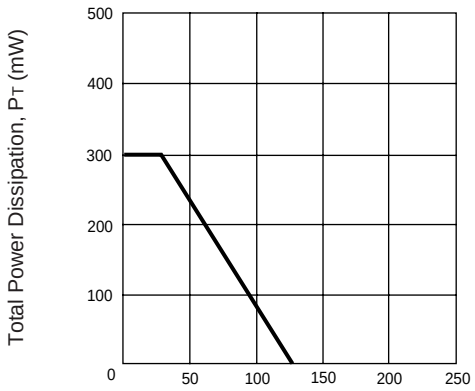
TYPICAL NOISE PARAMETERS (T_A = 25°C)

V_{DS} = 2 V, I_{DS} = 15 mA

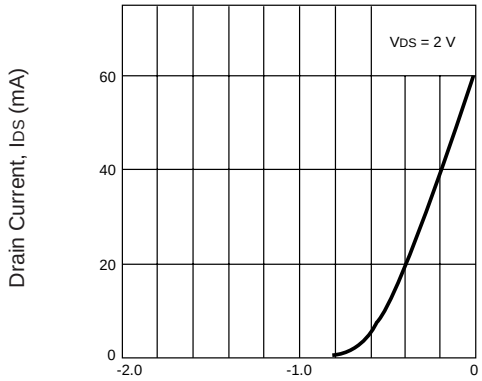
FREQ. (GHz)	NF_{MIN} (dB)	G_A (dB)	Γ_{OPT}		Rn/50
			MAG	ANG	
2	0.32	16.5	0.77	15	0.19
4	0.35	15.5	0.58	43	0.18
6	0.40	14.2	0.43	82	0.13
8	0.46	13.1	0.32	127	0.08
10	0.56	12.0	0.27	175	0.07
12	0.67	10.9	0.27	-139	0.10
14	0.80	9.9	0.34	-100	0.17
16	0.94	8.9	0.48	-70	0.29
18	1.10	8.0	0.69	-56	0.46

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

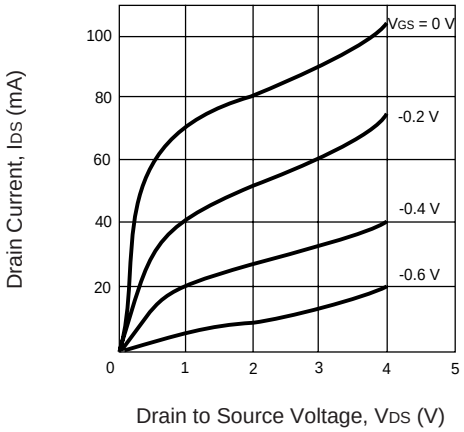
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



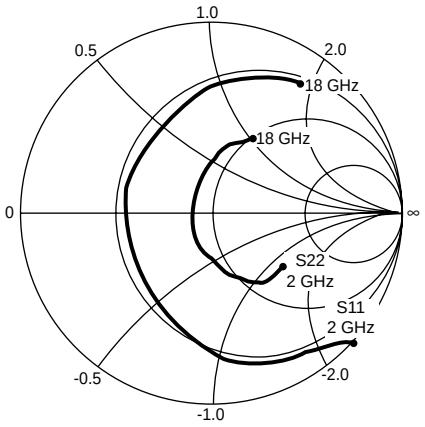
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



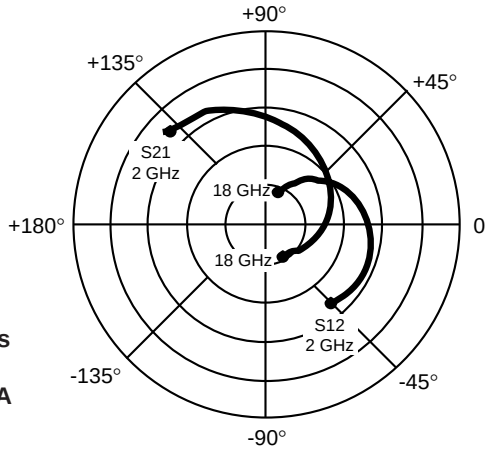
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



TYPICAL COMMON SOURCE SCATTERING PARAMETERS (T_A = 25°C)



Coordinates in Ohms
Frequency in GHz
V_{DS} = 2 V, I_{DS} = 15 mA



V_{DS} = 2 V, I_{DS} = 15 mA

FREQUENCY (GHz)	S11 MAG	S11 ANG	S21 MAG	S21 ANG	S12 MAG	S12 ANG	S22 MAG	S22 ANG	K	MAG[1] (dB)
2.0	.998	-41.7	7.162	140.1	.042	68.4	.415	-27.5	.10	41.82
2.5	.927	-47.5	6.856	133.6	.050	65.9	.479	-35.8	.23	26.36
3.0	.860	-61.3	6.603	122.0	.057	57.5	.423	-43.0	.39	23.09
3.5	.829	-69.9	6.305	114.4	.064	54.1	.429	-47.9	.42	21.91
4.0	.802	-79.2	6.033	106.8	.071	49.6	.426	-51.7	.45	20.95
4.5	.716	-87.5	5.687	98.5	.075	45.8	.406	-56.2	.60	19.00
5.0	.659	-93.9	5.415	91.6	.081	41.1	.394	-59.7	.69	17.88
5.5	.601	-99.7	5.184	84.7	.085	38.9	.374	-63.3	.78	16.89
6.0	.592	-108.5	5.050	77.6	.091	35.2	.340	-68.1	.79	16.47
6.5	.550	-118.5	4.912	70.5	.096	30.8	.311	-73.0	.84	15.83
7.0	.514	-130.2	4.774	63.0	.102	27.3	.279	-79.1	.87	15.26
7.5	.488	-144.5	4.600	55.4	.107	22.0	.232	-87.5	.91	14.68
8.0	.464	-158.9	4.401	47.9	.109	18.6	.189	-97.7	.96	14.08
8.5	.463	-171.7	4.187	41.0	.113	14.9	.155	-109.3	.98	13.59
9.0	.468	176.6	3.997	34.1	.114	11.5	.134	-126.9	1.00	15.01
9.5	.472	166.4	3.812	27.7	.118	7.7	.121	-142.8	1.02	14.21
10.0	.472	156.2	3.628	21.5	.119	4.7	.111	-156.2	1.06	13.37
10.5	.476	147.0	3.477	15.6	.122	1.0	.103	-170.1	1.08	12.86
11.0	.476	137.8	3.351	9.6	.124	-2.5	.098	174.4	1.10	12.36
11.5	.488	127.7	3.251	3.5	.125	-5.8	.093	157.9	1.12	12.06
12.0	.518	118.1	3.150	-2.9	.128	-9.2	.105	137.6	1.10	11.98
12.5	.552	109.6	3.036	-9.7	.130	-12.9	.131	121.0	1.08	11.92
13.0	.593	101.9	2.875	-16.4	.131	-16.7	.177	107.0	1.07	11.79
13.5	.635	95.2	2.714	-22.7	.129	-21.2	.223	97.8	1.06	11.70
14.0	.661	90.1	2.546	-28.1	.126	-22.5	.259	91.0	1.08	11.29
14.5	.688	86.1	2.418	-32.6	.124	-24.9	.284	87.0	1.08	11.17
15.0	.707	82.2	2.327	-37.0	.127	-27.4	.316	86.0	1.05	11.30
15.5	.719	79.7	2.240	-41.8	.126	-28.8	.332	83.3	1.04	11.20
16.0	.730	76.1	2.168	-46.8	.129	-31.6	.352	81.7	1.01	11.55
16.5	.752	71.3	2.100	-52.7	.131	-33.2	.380	77.4	.98	10.74
17.0	.771	65.5	2.021	-58.4	.130	-38.5	.398	72.4	.96	10.78
17.5	.803	60.4	1.930	-65.1	.134	-42.2	.422	66.5	.89	11.05
18.0	.817	55.7	1.814	-70.5	.128	-44.3	.445	62.9	.91	10.92

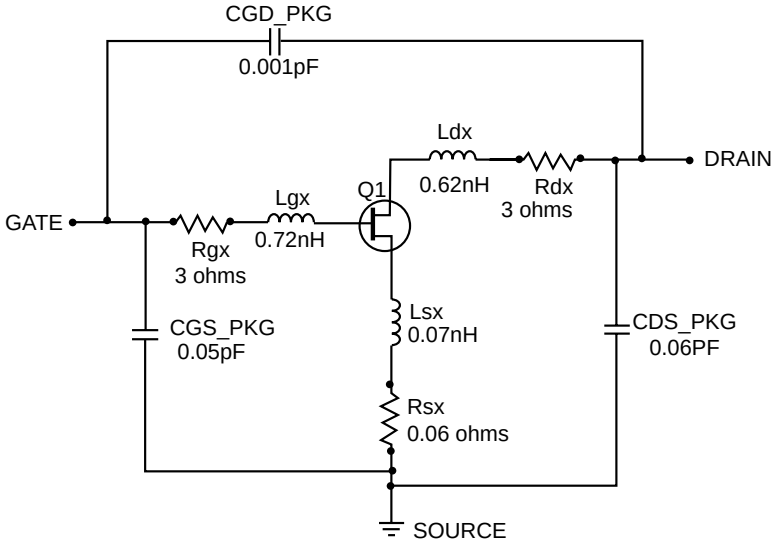
Note:
1. Gain Calculations:

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

NE434S01 NONLINEAR MODEL

SCHEMATIC



FET NONLINEAR MODEL PARAMETERS (1)

Parameters	Q1	Parameters	Q1
VTO	-0.806	RG	0.2
VTOSC	0	RD	1
ALPHA	8	RS	1
BETA	0.121	RGMET	0
GAMMA	0.085	KF	0
GAMMADC	0.067	AF	1
Q	2.2	TNOM	27
DELTA	0	XTI	3
VBI	0.5	EG	1.43
IS	1e-14	VTOTC	0
N	1	BETATCE	0
RIS	0	FFE	1
RID	0		
TAU	7e-12		
CDS	0.12e-12		
RDB	5000		
CBS	1e-9		
CGSO	0.42e-12		
CGDO	0.04e-12		
DELTA1	0.3		
DELTA2	0.25		
FC	0.5		
VBR	Infinity		

(1) Series IV Libra TOM Model

UNITS

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

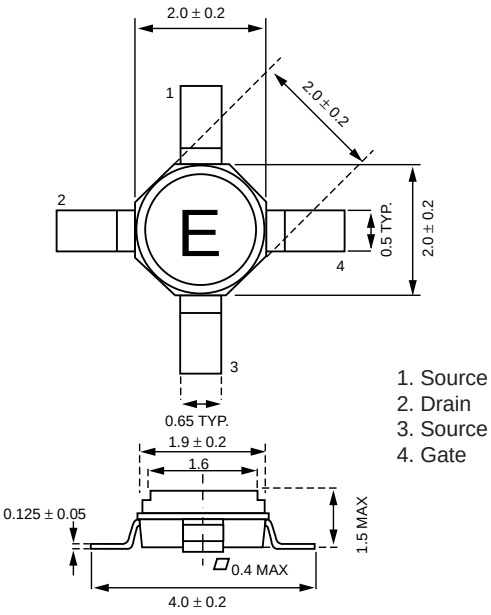
MODEL RANGE

Frequency: 0.1 to 18 GHz
Bias: V_{DS} = 1 V to 3 V, I_D = 5 mA to 20 mA
Date: 6/98

Note:
This nonlinear model utilized the latest data available. See our Design Parameter Library at **www.cel.com** for this data.

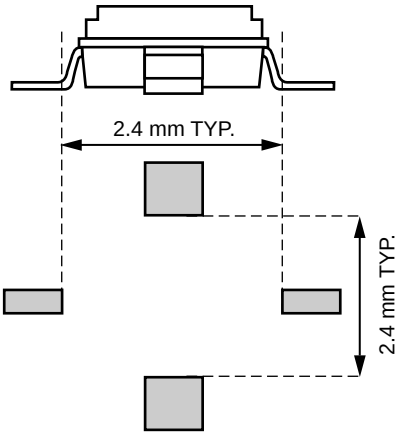
OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S01



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

TYPICAL MOUNT PAD LAYOUT (Units in mm)



ORDERING INFORMATION

PART NUMBER	AVAILABILITY	PACKAGE
NE434S01	Bulk	S01
NE434S01-T1	Tape & reel 1K/reel	S01
NE434S01-T1B	Tape & reel 4K/reel	S01