NEC

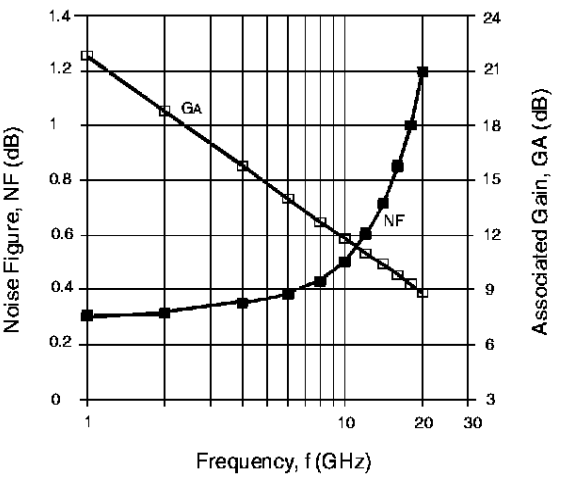
ULTRA LOW NOISE PSEUDOMORPHIC HJ FET

NE32484A

FEATURES

- **VERY LOW NOISE FIGURE:**
  0.6 dB typical at 12 GHz
- **HIGH ASSOCIATED GAIN:**
  11 dB typical at 12 GHz
- **L_G = 0.25 μm, W_G = 200 μm**
- **LOW COST METAL/CERAMIC PACKAGE**
- **TAPE & REEL PACKAGING OPTION AVAILABLE**

NOISE FIGURE & ASSOCIATED GAIN vs. FREQUENCY
V_{DS} = 2 V, I_{DS} = 10 mA



DESCRIPTION

The NE32484A is a pseudomorphic Hetero-Junction FET that uses the junction between Si-doped AlGaAs and undoped InGaAs to create very high mobility electrons. The device features mushroom shaped TiAl gates for decreased gate resistance and improved power handling capabilities. The mushroom gate also results in lower noise figure and high associated gain. This device is housed in an epoxy-sealed, metal/ceramic package and is intended for high volume consumer and industrial applications.

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE32484A 84AS		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
NF_{OPT}[1]	Noise Figure, V_{DS} = 2.0 V, I_D = 10 mA, f = 12 GHz	dB		0.6	0.7
G_A[1]	Associated Gain, V_{DS} = 2.0 V, I_D = 10 mA, f = 12 GHz	dB	10.0	11.0	
P_{1dB}	Output Power at 1 dB Gain Compression Point, f = 12 GHz V_{DS} = 2.0 V, I_{DS} = 10 mA V_{DS} = 2.0 V, I_{DS} = 20 mA	 dBm dBm		 8.5 11.0	
G_{1dB}	Gain at P_{1dB}, f = 12 GHz V_{DS} = 2.0 V, I_{DS} = 10 mA V_{DS} = 2.0 V, I_{DS} = 20 mA	 dB dB		 10.0 10.5	
I_{DSS}	Saturated Drain Current, V_{DS} = 2.0 V, V_{GS} = 0 V	mA	15	40	70
V_P	Pinch-off Voltage, V_{DS} = 2.0 V, I_{DS} = 0.1 mA	V	-2.0	-0.8	-0.2
g_m	Transconductance, V_{DS} = 2.0 V, I_D = 10 mA	mS	45	60	
I_{GSO}	Gate to Source Leakage Current, V_{GS} = -3.0 V, I_D = 0 mA	μA		0.5	10.0
$R_{TH\ (CH-A)}$	Thermal Resistance (Channel to Ambient)	°C/W		750	
$R_{TH\ (CH-C)}$	Thermal Resistance (Channel to Case)	°C/W			350

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 for 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}
I_{GRF}	Gate Current	µA	200
T_{CH}	Channel Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150
P_T	Total Power Dissipation	mW	165

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

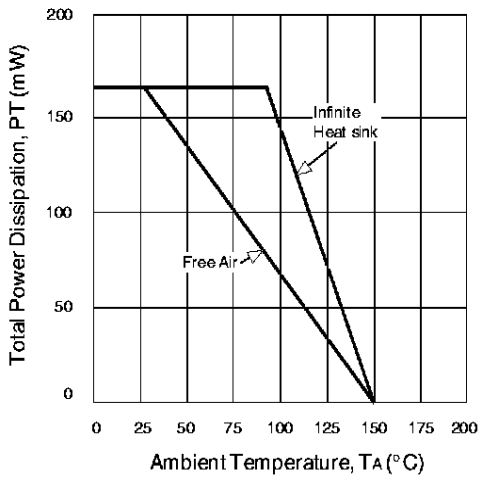
TYPICAL NOISE PARAMETERS (T_A = 25°C)

V_{DS} = 2 V, I_{DS} = 10 mA

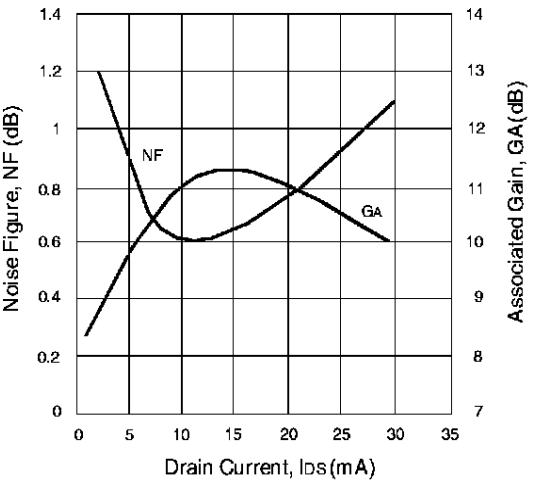
FREQ. (GHz)	NF_{OPT} (dB)	G_A (dB)	Γ_{OPT} MAG	Γ_{OPT} ANG	Rn/50
1	0.30	22.0	0.88	13	0.33
2	0.31	19.0	0.82	28	0.31
4	0.35	16.0	0.71	59	0.26
6	0.38	14.0	0.60	82	0.20
8	0.43	12.5	0.50	106	0.13
10	0.51	11.5	0.40	131	0.09
12	0.60	11.0	0.33	159	0.06
14	0.71	10.3	0.28	-166	0.05
16	0.85	9.8	0.28	-132	0.04
18	1.00	9.2	0.31	-104	0.04

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

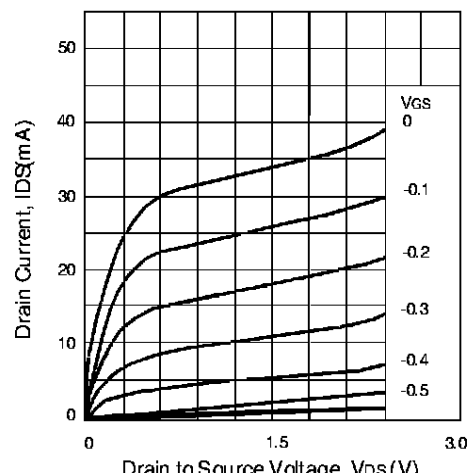
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



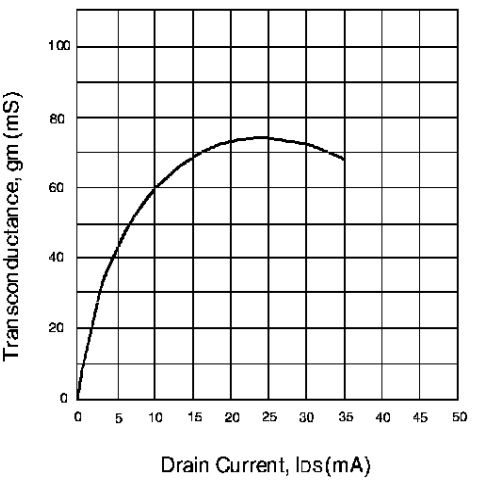
NOISE FIGURE AND ASSOCIATED GAIN vs. DRAIN CURRENT
V_{DS} = 2 V, f = 12 GHz



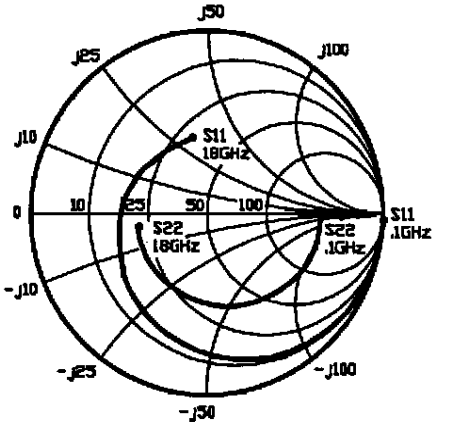
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

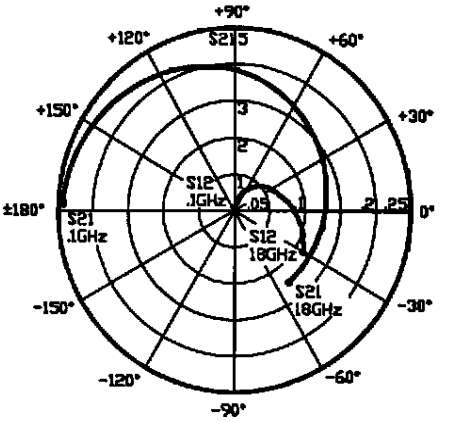


TRANSCONDUCTANCE vs. DRAIN CURRENT



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





V_{DS} = 2 V, I_{DS} = 10 mA

FREQUENCY	S11		S21		S12		S22		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.999	-2	4.89	178	0.002	89	0.647	-1	0.04	33.9
0.2	0.999	-4	4.89	176	0.003	87	0.646	-2	0.05	32.1
0.5	0.997	-9	4.87	171	0.009	83	0.645	-6	0.07	27.3
1.0	0.992	-18	4.81	162	0.018	77	0.641	-19	0.10	24.4
2.0	0.960	-35	4.65	146	0.033	67	0.632	-24	0.22	21.5
3.0	0.916	-51	4.45	130	0.046	58	0.614	-35	0.31	19.8
4.0	0.870	-66	4.23	115	0.059	49	0.590	-45	0.40	18.6
5.0	0.810	-80	4.01	101	0.069	41	0.568	-55	0.50	17.6
6.0	0.754	-94	3.78	87	0.077	34	0.550	-64	0.60	16.9
7.0	0.702	-108	3.54	74	0.082	27	0.531	-73	0.69	16.3
8.0	0.660	-120	3.31	62	0.087	22	0.513	-81	0.78	15.8
9.0	0.621	-131	3.14	51	0.090	18	0.498	-88	0.86	15.4
10.0	0.584	-142	3.03	40	0.096	14	0.485	-95	0.91	15.0
11.0	0.538	-155	2.94	29	0.102	10	0.472	-102	0.97	14.6
12.0	0.506	-168	2.83	17	0.107	5	0.458	-110	1.00	13.9
13.0	0.484	177	2.76	6	0.112	-0	0.447	-119	1.01	13.2
14.0	0.463	165	2.67	-5	0.118	-4	0.437	-127	1.02	12.6
15.0	0.445	152	2.61	-16	0.124	-9	0.427	-136	1.03	12.2
16.0	0.420	138	2.58	-27	0.133	-15	0.418	-145	1.02	11.8
17.0	0.415	122	2.53	-39	0.140	-23	0.407	-157	1.00	11.6
18.0	0.396	102	2.49	-51	0.149	-30	0.397	-169	0.94	11.0

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

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

V_{DS} = 2 V, I_{DS} = 20 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	1.000	-3	5.59	177	0.002	89	0.560	-3	0.01	34.5
0.2	0.999	-4	5.57	176	0.003	87	0.559	-4	0.04	32.7
0.5	0.997	-10	5.55	170	0.008	83	0.555	-7	0.07	28.4
1.0	0.986	-19	5.47	161	0.016	79	0.550	-13	0.14	25.3
2.0	0.950	-36	5.26	144	0.030	69	0.538	-24	0.27	22.4
3.0	0.903	-52	5.01	128	0.043	61	0.526	-34	0.37	20.7
4.0	0.848	-67	4.70	113	0.054	53	0.515	-44	0.48	19.4
5.0	0.786	-82	4.41	99	0.064	46	0.503	-53	0.58	18.4
6.0	0.727	-96	4.12	85	0.073	39	0.492	-62	0.67	17.5
7.0	0.676	-110	3.85	72	0.079	33	0.480	-71	0.75	16.9
8.0	0.628	-122	3.59	61	0.086	29	0.468	-78	0.83	16.2
9.0	0.587	-133	3.37	49	0.090	24	0.457	-85	0.91	15.7
10.0	0.551	-144	3.24	38	0.099	20	0.445	-91	0.94	15.1
11.0	0.514	-156	3.11	27	0.108	16	0.434	-97	0.96	14.6
12.0	0.477	-170	3.00	16	0.115	10	0.422	-105	0.99	14.2
13.0	0.456	176	2.91	5	0.121	4	0.410	-114	1.00	13.8
14.0	0.437	164	2.82	-5	0.129	-1	0.399	-122	1.00	13.4
15.0	0.420	151	2.75	-17	0.136	-8	0.387	-131	1.01	12.6
16.0	0.392	136	2.70	-28	0.147	-14	0.376	-141	1.00	12.2
17.0	0.390	120	2.65	-40	0.154	-23	0.364	-152	0.98	11.8
18.0	0.386	101	2.60	-51	0.163	-31	0.352	-164	0.94	11.4

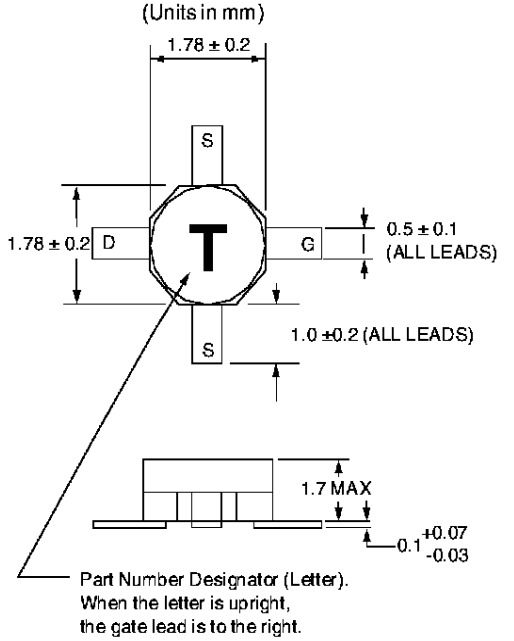
Note:
1. Gain Calculations:

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

OUTLINE DIMENSIONS (T_A = 25°C)

NE32484AS
PACKAGE OUTLINE 84AS
(Units in mm)



ORDERING INFORMATION

PART NUMBER	QTY	PACKAGE
NE32484AS	Bulk up to 1 K	84AS
NE32484A-T1	1K/Reel	84AS

Note:
Long leaded (1.7 min.) 84A package available upon request in bulk quantities up to 1000 pcs. To order specify NE32484A-SL.