NEC

5 W 14 GHz INTERNALLY MATCHED POWER GaAs MESFET

NEZ1414-5E

FEATURES

- **HIGH OUTPUT POWER:** 37.0 dBm TYP
- **HIGH LINEAR GAIN:** 7.0 dB TYP
- **HIGH EFFICIENCY:** 30% TYP
- **INDUSTRY STANDARD PACKAGING**
- **INTERNALLY MATCHED FOR OPTIMUM PERFORMANCE IN 14.0 TO 14.5 GHz BAND**

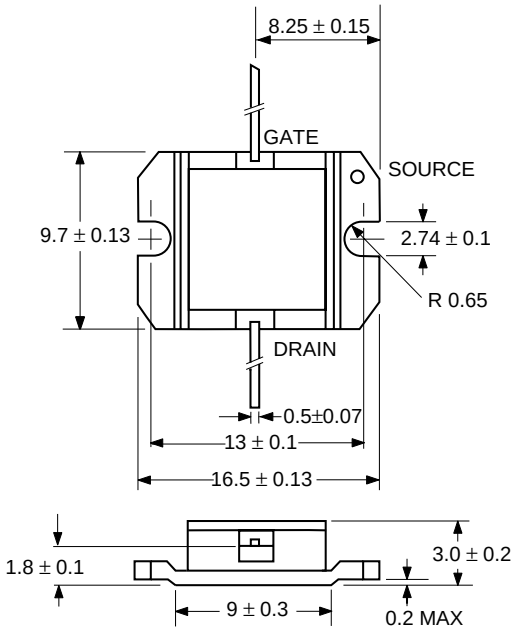
DESCRIPTION

The NEZ1414-5E is a Ku band GaAs MESFET designed for transmit amplifiers used in VSAT terminals. The device is internally matched for the 14.0 to 14.5 GHz band and can deliver 5 W of output power when biased with 10 V. The device incorporates a Wsi (tungsten silicide) gate structure for high reliability, SiO_2 glassivation for surface stability, and a plated heat sink for reduced thermal resistance.

The NEZ1414-5E transistors are manufactured to NEC's stringent quality assurance standards to ensure highest reliability and consistent superior performance.

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE X-17



ELECTRICAL CHARACTERISTICS (T_C = 25°C)

PART NUMBER			NEZ1414-5E			
SYMBOLS	**CHARACTERISTICS**	**UNITS**	**MIN**	**TYP**	**MAX**	**TEST CONDITIONS**
P_{1dB}	Power Out at 1dB Compression	dBm	36.0	37.0		f = 14.0 to 14.5 GHz V_{DS} = 10 V I_{DSQ} = 1.5 A Rg = 50 Ω
G_L	Linear Gain	dB	6.5	7.0		
η_{ADD}	Power Added Efficiency, P_{IN} = 32.0 dBM	%		30		
I_{DS}	Drain Current	A		2.0	2.3	
I_{DSS}	Saturated Drain Current	A	1.4	3.2	5.0	V_{DS} = 1.5 V, V_{GS} = 0 V
V_P	Pinch-off Voltage	V	-3.0	-1.3	-0.5	V_{DS} = 2.5 V; I_{DS} = 40 mA
BVGD	Gate-Drain Breakdown Voltage	V	15			I_{GD} = 40 mA
R_{TH}	Thermal Resistance	°C/W			5.0	Channel to Case

ABSOLUTE MAXIMUM RATINGS[1]

(T_C = 25 °C unless otherwise noted)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	15
V_{GS}	Gate to Source Voltage	V	-7
I_{DS}	Drain Current	A	5.0
I_{GF}	Gate Forward Current	mA	40
I_{GR}	Gate Reverse Current	mA	-40
P_T	Total Power Dissipation	W	30
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175

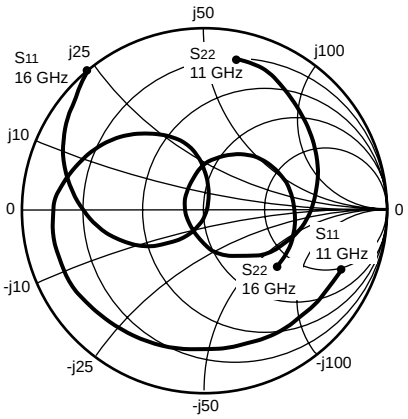
Note:

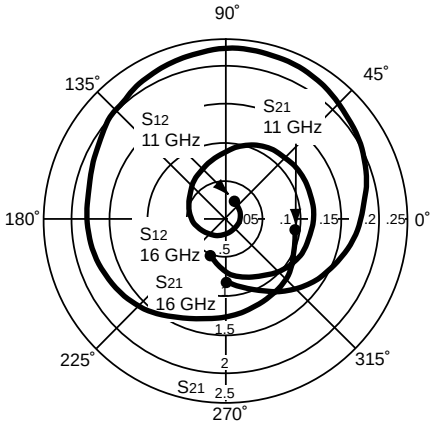
1. Operation in excess of any one of these parameters may result in permanent damage.

RECOMMENDED OPERATING LIMITS

SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{DS}	Drain to Source Voltage	V	10	10	10
T_{CH}	Channel Temperature	°C			130
G_{COMP}	Gain Compression	dB			3.0
Rg	Gate Resistance	Ω		25	50

TYPICAL SCATTERING PARAMETERS





V_{DS} = 10 V, I_{DS} = 700 mA, V_{GS} = -0.791 V

FREQUENCY	S11		S21		S12		S22		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
11.00	0.836	-23.40	0.941	-7.40	0.028	71.60	0.851	78.50	0.92	15.3
11.50	0.783	-65.90	1.126	-41.60	0.022	25.00	0.830	62.80	1.78	11.9
12.00	0.780	-108.90	1.272	-76.90	0.018	-45.60	0.760	44.00	3.40	10.4
12.50	0.826	-143.70	1.465	-110.70	0.025	-121.20	0.679	22.10	2.59	10.8
13.00	0.852	-174.10	1.792	-150.20	0.046	-178.60	0.550	-10.00	1.59	11.4
13.50	0.715	155.20	1.959	165.50	0.069	131.30	0.310	-57.70	1.91	9.0
14.00	0.476	118.70	2.268	120.00	0.100	85.00	0.108	-171.00	1.80	8.3
14.10	0.404	109.40	2.330	109.40	0.107	74.40	0.125	149.70	1.77	8.3
14.20	0.321	99.00	2.372	98.00	0.113	63.40	0.166	121.10	1.73	8.2
14.30	0.230	87.30	2.390	86.30	0.118	51.90	0.216	100.70	1.72	8.2
14.40	0.134	74.60	2.382	74.50	0.121	40.30	0.267	85.00	1.70	8.1
14.50	0.034	46.50	2.345	62.70	0.122	29.10	0.314	71.90	1.70	7.9
15.00	0.464	-157.00	1.914	5.60	0.111	-25.80	0.469	23.20	1.63	7.7
15.50	0.828	160.20	1.334	-45.70	0.083	-74.60	0.516	-10.40	1.10	10.2
16.00	0.992	130.30	0.867	-87.30	0.054	-114.20	0.508	-36.50	-0.06	12.1

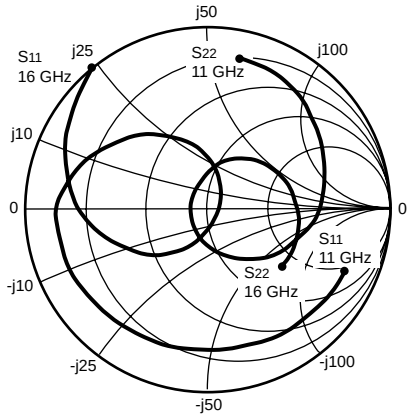
Note:

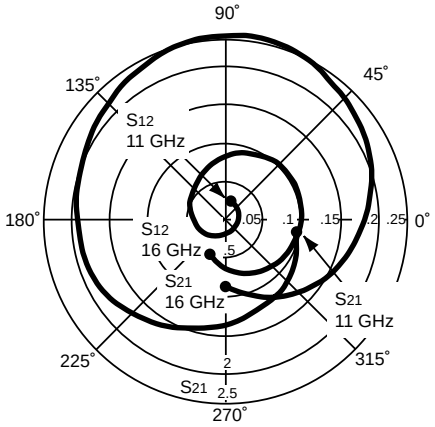
1. Gain Calculation:

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





VDS = 10 V, IDS = 1000 mA, VGS = -0.647 V

FREQUENCY	S11		S21		S12		S22		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
11.00	0.825	-25.00	1.012	-8.20	0.030	74.10	0.853	78.70	0.75	15.3
11.50	0.772	-67.80	1.206	-42.40	0.025	30.30	0.834	63.00	1.43	13.0
12.00	0.772	-110.90	1.362	-77.60	0.018	-31.90	0.765	44.20	2.92	11.2
12.50	0.818	-145.70	1.573	-111.40	0.022	-110.30	0.686	22.30	2.63	11.5
13.00	0.841	-176.40	1.929	-151.10	0.040	-174.20	0.560	-9.90	1.68	12.0
13.50	0.698	152.10	2.115	164.50	0.062	133.20	0.320	-57.20	2.01	9.5
14.00	0.445	112.60	2.456	118.00	0.093	85.40	0.109	-165.70	1.86	8.9
14.10	0.366	101.60	2.519	107.10	0.099	74.50	0.120	153.60	1.82	8.8
14.20	0.280	88.90	2.558	95.50	0.104	63.00	0.158	122.90	1.79	8.7
14.30	0.188	72.90	2.565	83.60	0.109	51.30	0.206	101.20	1.77	8.6
14.40	0.094	45.00	2.543	71.60	0.111	39.50	0.255	85.10	1.76	8.5
14.50	0.056	-47.30	2.489	59.70	0.112	28.10	0.301	71.80	1.76	8.4
15.00	0.511	-156.20	1.985	2.90	0.100	-26.20	0.451	23.50	1.65	8.2
15.50	0.853	159.80	1.364	-47.70	0.074	-74.50	0.502	-9.30	1.04	11.5
16.00	1.003	130.10	0.885	-88.60	0.047	-113.10	0.502	-35.20	-0.25	12.7

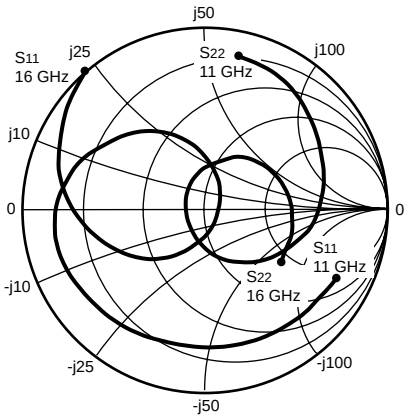
Note:

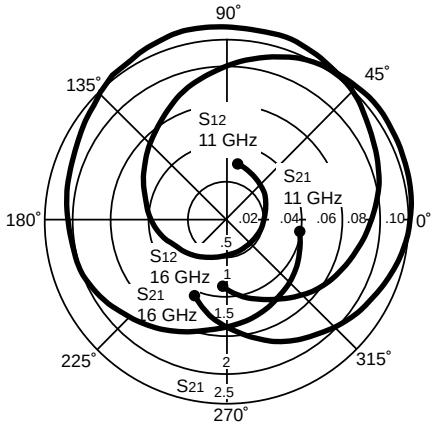
1. Gain Calculation:

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





V_{DS} = 10 V, I_{DS} = 1300 mA, V_{GS} = -0.512 V

FREQUENCY	S11		S21		S12		S22		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
11.000	0.816	-26.40	1.054	-9.20	0.033	76.10	0.859	78.60	0.62	15.1
11.500	0.763	-69.50	1.256	-43.40	0.027	33.90	0.842	62.80	1.16	14.2
12.000	0.765	-112.50	1.421	-78.50	0.020	-23.00	0.776	43.90	2.43	11.9
12.500	0.812	-147.40	1.649	-112.30	0.021	-100.40	0.699	21.70	2.55	12.1
13.000	0.833	-178.30	2.028	-152.30	0.037	-169.90	0.576	-11.00	1.73	12.4
13.500	0.683	149.70	2.232	163.10	0.058	135.40	0.338	-59.10	2.09	9.9
14.000	0.418	107.60	2.598	115.80	0.088	85.80	0.126	-160.80	1.90	9.2
14.100	0.339	95.60	2.663	104.60	0.094	74.70	0.129	161.30	1.86	9.2
14.200	0.251	80.80	2.693	92.80	0.099	63.10	0.158	129.60	1.82	9.1
14.300	0.160	59.70	2.689	80.80	0.103	51.10	0.201	106.00	1.81	9.0
14.400	0.083	14.80	2.657	68.70	0.105	39.20	0.246	88.50	1.79	8.9
14.500	0.095	-66.50	2.593	56.80	0.105	27.70	0.290	74.30	1.79	8.8
15.000	0.544	-156.80	2.034	0.20	0.093	-26.30	0.435	25.10	1.66	8.6
15.500	0.870	159.10	1.389	-50.00	0.068	-73.90	0.488	-7.50	0.98	13.1
16.000	1.010	129.60	0.900	-90.50	0.045	-112.10	0.495	-33.20	-0.41	13.0

Note:

1. Gain Calculation:

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