NEC

4 W 14 GHz INTERNALLY MATCHED POWER GaAs MESFET

NEZ1414-4E

FEATURES

- **HIGH OUTPUT POWER:** 36.5 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**

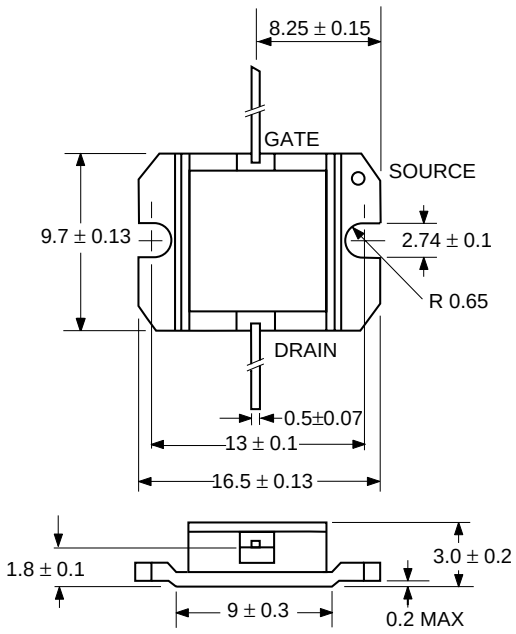
DESCRIPTION

The NEZ1414-4E 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 4 W of output power when biased with 9 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 NEZ1414-4E 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			NEZ1414-4E			
SYMBOLS	**CHARACTERISTICS**	**UNITS**	**MIN**	**TYP**	**MAX**	**TEST CONDITIONS**
P_{1dB}	Power Out at 1dB Compression	dBm	35.5	36.5		f = 14.0 to 14.5 GHz V_{DS} = 9 V I_{DSQ} = 1.0 A Rg = 100 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		1.5	2.0	
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

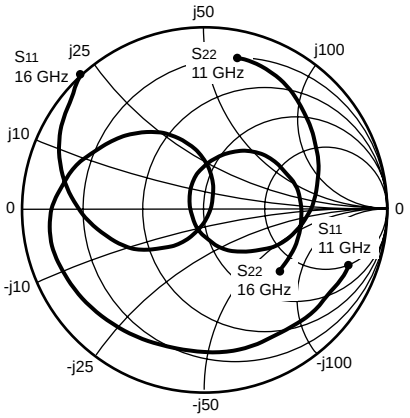
Note:

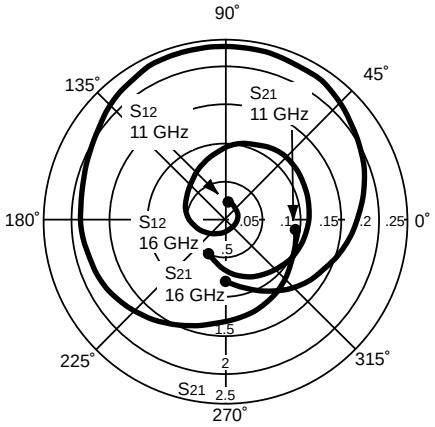
1. Operation in excess of any one of these parameters may result in permanent damage.

RECOMMENDED OPERATING LIMITS

SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{DS}	Drain to Source Voltage	V	9	9	9
T_{CH}	Channel Temperature	°C			130
G_{COMP}	Gain Compression	dB			3.0
Rg	Gate Resistance	Ω		25	50

TYPICAL SCATTERING PARAMETERS





V_{DS} = 9 V, I_{DS} = 700 mA, V_{GS} = -0.755 V

FREQUENCY	S11		S21		S12		S22		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
11.00	0.837	-22.90	0.989	-6.40	0.027	70.40	0.845	78.90	0.94	15.7
11.50	0.785	-65.40	1.181	-40.60	0.021	21.50	0.821	63.20	1.91	12.0
12.00	0.783	-108.60	1.333	-76.10	0.017	-52.60	0.749	44.50	3.48	10.6
12.50	0.829	-143.50	1.532	-110.00	0.026	-125.50	0.665	22.90	2.46	11.0
13.00	0.853	-174.30	1.874	-149.60	0.048	178.20	0.530	-8.90	1.52	11.7
13.50	0.712	154.60	2.039	166.10	0.071	129.10	0.284	-56.20	1.82	9.3
14.00	0.464	116.90	2.349	120.30	0.103	82.60	0.098	171.50	1.73	8.6
14.10	0.390	107.00	2.413	109.50	0.109	72.00	0.133	134.80	1.69	8.6
14.20	0.306	96.10	2.451	98.10	0.115	60.80	0.184	111.00	1.66	8.5
14.30	0.215	83.10	2.459	86.40	0.119	49.50	0.239	93.60	1.64	8.5
14.40	0.117	66.70	2.447	74.60	0.122	37.90	0.291	79.60	1.63	8.4
14.50	0.029	5.70	2.402	62.80	0.123	26.60	0.339	67.50	1.63	8.2
15.00	0.479	-156.50	1.939	6.20	0.111	-27.80	0.491	21.00	1.57	8.0
15.50	0.835	160.50	1.347	-44.60	0.082	-76.20	0.532	-12.00	1.05	10.9
16.00	0.996	130.90	0.876	-85.60	0.053	-115.30	0.521	-38.10	-0.12	12.2

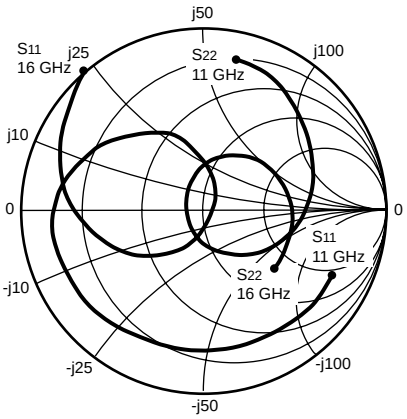
Note:

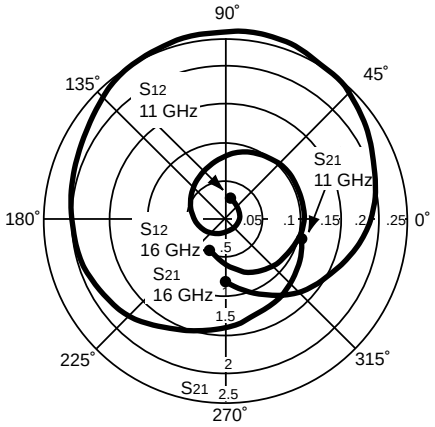
1. Gain Calculation:

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} = 9 V, I_{DS} = 1000 mA, V_{GS} = -0.610 V

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
11.00	0.825	-24.80	1.057	-7.60	0.029	73.10	0.848	78.70	0.77	15.5
11.50	0.773	-67.60	1.262	-41.90	0.024	28.60	0.827	63.10	1.49	13.1
12.00	0.774	-110.80	1.423	-77.20	0.018	-37.00	0.755	44.40	3.01	11.3
12.50	0.821	-145.70	1.641	-111.00	0.022	-115.80	0.673	22.60	2.58	11.7
13.00	0.844	-176.80	2.007	-150.90	0.042	-177.80	0.541	-9.30	1.64	11.8
13.50	0.695	151.60	2.192	164.70	0.064	130.90	0.297	-56.60	1.94	9.8
14.00	0.437	111.00	2.537	118.00	0.094	83.00	0.098	179.40	1.80	9.1
14.10	0.359	99.80	2.598	107.00	0.100	72.00	0.125	139.70	1.76	9.1
14.20	0.271	86.50	2.633	95.40	0.105	60.70	0.172	113.40	1.72	9.0
14.30	0.180	68.90	2.633	83.50	0.109	49.10	0.225	94.60	1.70	8.9
14.40	0.091	36.10	2.606	71.50	0.111	37.40	0.276	80.00	1.70	8.8
14.50	0.067	-54.80	2.545	59.70	0.112	26.00	0.323	67.70	1.70	8.7
15.00	0.521	-156.00	2.016	3.20	0.099	-28.20	0.470	21.20	1.60	8.5
15.50	0.859	159.90	1.383	-47.00	0.073	-75.80	0.515	-11.10	0.99	12.8
16.00	1.005	130.20	0.899	-87.40	0.047	-114.00	0.511	-37.00	-0.28	12.8

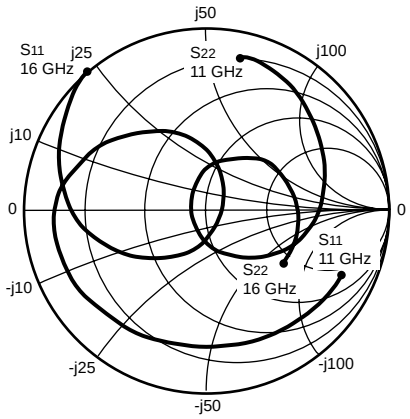
Note:

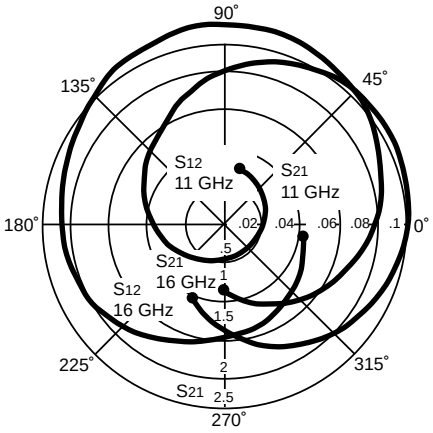
1. Gain Calculation:

$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{K^2 - 1}\right)$. When $K \leq 1$, 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} = 9 V, I_{DS} = 1300 mA, V_{GS} = -0.476 V

FREQUENCY	S11		S21		S12		S22		K	MAG[1]
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
11.00	0.816	-26.10	1.100	-8.50	0.032	75.10	0.853	78.70	0.65	15.4
11.50	0.765	-69.20	1.311	-42.80	0.026	32.50	0.834	63.00	1.22	14.2
12.00	0.767	-112.40	1.481	-78.00	0.019	-25.60	0.765	44.20	2.51	12.0
12.50	0.816	-147.30	1.714	-111.80	0.021	-104.70	0.686	22.20	2.54	12.3
13.00	0.835	-178.50	2.103	-151.80	0.037	-173.00	0.558	-10.10	1.71	12.6
13.50	0.684	149.20	2.306	163.60	0.059	133.20	0.316	-57.70	2.02	10.1
14.00	0.420	106.30	2.681	116.30	0.088	84.00	0.108	-170.40	1.84	9.5
14.10	0.338	93.70	2.743	105.10	0.094	72.70	0.124	149.00	1.80	9.5
14.20	0.250	78.10	2.772	93.30	0.099	61.20	0.164	119.70	1.77	9.4
14.30	0.161	55.40	2.766	81.20	0.103	49.30	0.212	98.80	1.75	9.3
14.40	0.090	7.90	2.727	69.10	0.104	37.60	0.261	83.00	1.74	9.2
14.50	0.106	-65.70	2.657	57.20	0.105	25.90	0.306	69.80	1.74	9.0
15.00	0.551	-156.20	2.076	0.90	0.092	-27.80	0.450	22.60	1.62	8.9
15.50	0.873	159.30	1.412	-49.00	0.068	-75.00	0.500	-9.50	0.95	13.2
16.00	1.012	129.80	0.916	-89.10	0.043	-113.30	0.503	-35.20	-0.44	13.3

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