NEC

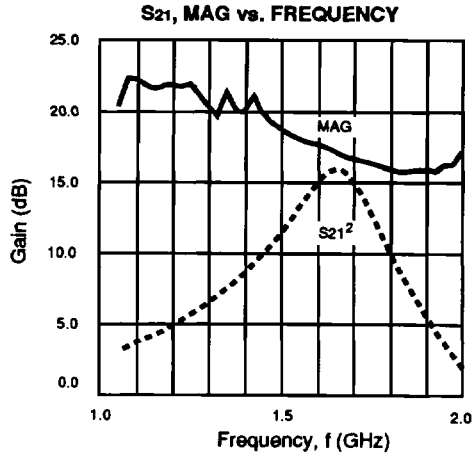
L-BAND POWER GaAs MESFET | NES1417-20B

NOT RECOMMENDED FOR NEW DESIGN

PRELIMINARY

FEATURES

- **HIGH POUT**
  20 W (43.0 dBm) Typical P_{1dB}
- **HIGH EFFICIENCY**
  44% Power Added Efficiency
- **HIGH LINEAR GAIN**
  14 dB Typical Linear Gain
- **LOW IMD**
  -40 dBc @ 32 dBm (SCL)
- **CLASS A OPERATION**
- **PARTIAL INTERNAL MATCH**



DESCRIPTION

The NES1417-20B is a high performance microwave power GaAs FET which provides high output power, high gain, high efficiency and low intermodulation distortion. Its high Q matching network makes this device ideal for instantaneous bandwidths of 80 MHz or less in the 1.4 to 1.7 GHz range.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NEZ1417-20B T40			
SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX	TEST CONDITIONS
P_{1dB}	Output Power at P_{1dB}[1] I_D = 4.0 A, RF Off	dBm	42.5	43		V_{DS} = 10 V f = 1.6 GHz I_{DSQ} = 4.0 A (RF Off)
η_{ADD}	Power Added Efficiency @ P_{1dB}	%		44		
I_{DS}	Drain Current at P_{1dB}	A		4.4	6	
G_L	Linear Gain	dB	14	15		
IM_3	3rd Order Intermodulation Distortion at P_{OUT} = 32 dBm (SCL)[2]	dBc		-40		V_{DS} = 10 V, I_{DSQ} = 4 A f1 = 1.54 GHz f2 = 1.55 GHz
I_{DSS}	Saturated Drain Current, V_{GS} = 0 V	A	8	14	18	V_{DS} = 1.5 V
V_P	Pinch-off Voltage, I_{DS} = 60 mA	V	-5.0	-3.5	-1.5	V_{DS} = 2.5 V
g_m	Transconductance I_{DS} = 4 A	mS		4000		
$R_{TH(CH-C)}$	Thermal Resistance, Channel to Case	°C/W		1.2	1.5	

Notes:
1. P_{1dB}: Output power at the 1 dB Gain Compression Point
2. SCL: Single Carrier Level

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	15
V_{GSO}	Gate to Source Voltage	V	-7
V_{GDO}	Gate to Drain Voltage	V	-18
I_{DS}	Drain Current	A	I_{DSS}
I_{GRF}	Gate Current	mA	120
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175
P_T[2]	Total Power Dissipation	W	100

Note:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. A thermal interface medium must be used between the bottom of the package and its mating surface to ensure optimum heat transfer. Each customer must choose the most appropriate method for his particular application (i.e. thermal grease, solder, etc.)

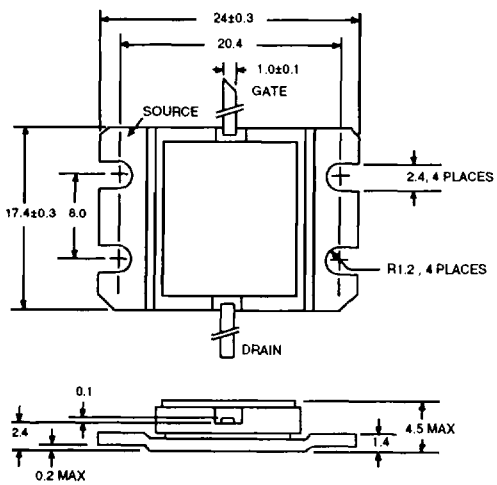
MAXIMUM OPERATING LIMITS

PART NUMBER	R_G MAX[1] Ω	I_{GRF} MAX mA	V_{DS} MAX V
NES1417-20B	50	20	10

Note:
1. R_G MAX is the maximum series resistance between the gate supply and the FET gate.

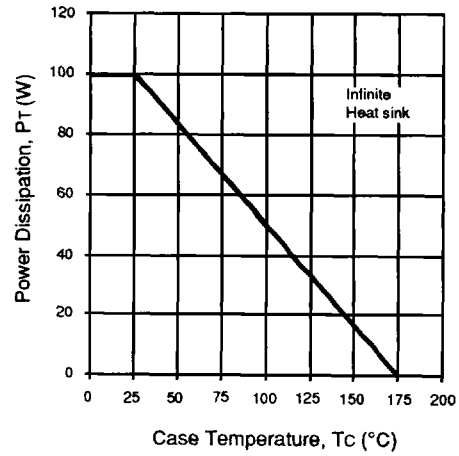
OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE T40

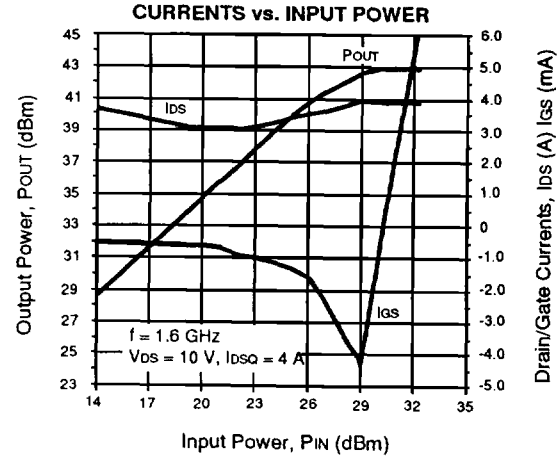


TYPICAL PERFORMANCE CURVES (T_A = 25°C)

TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



OUTPUT POWER, DRAIN AND GATE CURRENTS vs. INPUT POWER



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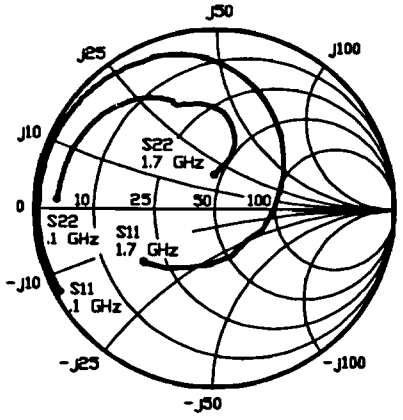
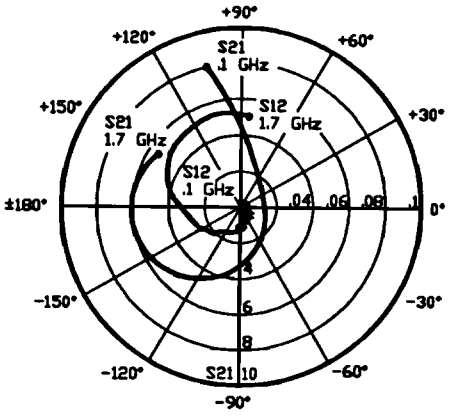
SMALL SIGNAL COMMON SOURCE SCATTERING PARAMETERS (T_A = 25°C)





V_{DS} = 10 V, I_{DS} = 4 A

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	S_{21}	MAG[1]
GHZ	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)	(dB)
0.10	0.965	-151.0	6.183	97.5	0.004	36.8	0.872	176.8	0.613	15.8	31.8
0.20	0.972	-171.6	3.265	80.1	0.003	18.6	0.865	170.2	0.862	10.2	30.3
0.50	0.973	164.8	1.511	47.0	0.004	-21.2	0.846	154.4	0.929	3.5	25.7
0.70	0.966	153.7	1.300	26.3	0.006	-23.9	0.820	143.4	1.077	2.2	21.6
0.80	0.962	148.0	1.283	15.2	0.007	-34.4	0.800	137.6	1.060	2.1	21.1
0.90	0.953	142.4	1.309	3.3	0.008	-47.6	0.774	132.1	1.207	2.3	19.3
1.10	0.943	130.4	1.528	-23.0	0.009	-71.3	0.719	120.7	1.296	3.6	19.0
1.20	0.928	122.9	1.744	-38.3	0.011	-85.2	0.680	115.9	1.324	4.8	18.5
1.30	0.908	114.6	2.066	-55.6	0.016	-109.2	0.643	111.8	1.074	6.3	19.4
1.40	0.888	105.8	2.656	-74.3	0.020	-131.6	0.609	109.9	1.022	8.4	20.3
1.42	0.881	103.2	2.783	-78.4	0.021	-132.9	0.609	108.7	0.978	8.8	21.1
1.44	0.867	99.9	2.968	-83.6	0.023	-139.6	0.609	107.5	1.008	9.4	20.5
1.46	0.847	96.1	3.180	-88.9	0.025	-148.2	0.606	106.3	1.070	10.0	19.4
1.48	0.830	92.7	3.360	-93.4	0.027	-153.5	0.601	105.5	1.098	10.5	19.0
1.50	0.798	87.1	3.658	-101.0	0.028	-158.6	0.595	102.9	1.193	11.2	18.5
1.52	0.769	82.2	3.917	-106.7	0.030	-166.4	0.593	100.8	1.237	11.8	18.2
1.54	0.724	75.1	4.266	-114.3	0.034	-175.8	0.588	98.2	1.262	12.6	17.9
1.56	0.663	66.3	4.653	-122.8	0.038	174.7	0.578	95.1	1.263	13.3	17.7
1.58	0.604	58.1	4.986	-130.6	0.043	167.0	0.566	91.9	1.251	13.9	17.6
1.60	0.490	39.9	5.492	-144.1	0.047	157.2	0.536	85.4	1.277	14.7	17.5
1.62	0.394	20.3	5.766	-154.4	0.051	145.8	0.494	81.0	1.299	15.2	17.2
1.64	0.298	-17.0	6.008	-168.4	0.054	131.1	0.427	76.2	1.325	15.5	17.0
1.66	0.275	-65.4	6.064	176.7	0.056	116.1	0.345	73.7	1.350	15.6	16.8
1.68	0.326	-107.0	5.967	164.7	0.057	104.3	0.274	74.3	1.338	15.5	16.7
1.70	0.488	-142.5	5.470	147.5	0.054	85.9	0.188	91.7	1.369	14.7	16.4

Note:
1. Gain Calculations:

$$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{K^2 - 1}\right)$$. When $K \le 1$, MAG = MSG. $$MSG = \frac{|S_{21}|}{|S_{12}|}$$, $$K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2\,|S_{12}S_{21}|}$$, $\Delta = S_{11}S_{22} - S_{21}S_{12}$

MAG = Maximum Available Gain
MSG = Maximum Stable Gain