STANFORD MICRODEVICES

Preliminary

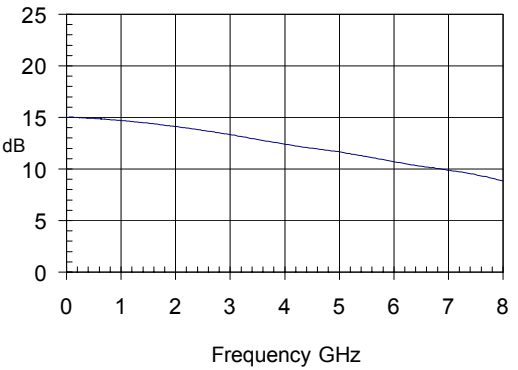
NGA-486

DC-6000 MHz, Cascadable GaAs HBT MMIC Amplifier

Product Description

Stanford Microdevices' NGA-486 is a high performance Gallium Arsenide Heterojunction Bipolar Transistor MMIC Amplifier. Designed with InGaP process technology for improved reliability, a Darlington configuration is utilized for broadband performance up to 6 Ghz. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products.

Small Signal Gain vs. Frequency



Product Features

- **High Gain: 14.1dB at 1950Mhz**
- **Cascadable 50 ohm: 1.3:1 VSWR**
- **Patented GaAs HBT Technology**
- **Operates from Single Supply**
- **Low Thermal Resistance Package**
- **Unconditionally Stable**

Applications

- **Cellular, PCS, CDPD**
- **Wireless Data, SONET**

Symbol	Parameters: Test Conditions: Z_0 = 50 Ohms, I_D = 80 mA, T = 25°C		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		18.3 18.2 17.8	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		39.5 34.9 33.5	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		14.8 14.1 13.8	
Bandwidth	3dB Bandwidth		MHz		4500	
S_{11}	Input VSWR	f = DC - 6000 MHz	-		1.3:1	
S_{22}	Output VSWR	f = DC - 6000 MHz	-		1.2:1	
S_{12}	Reverse Isolation	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		18.4 18.4 18.4	
NF	Noise Figure	f = 2000 MHz	dB		4.0	
V_D	Device Voltage		V		5.0	
R_{th}, j-l	Thermal Resistance (junction - lead)		°C/W		118	

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Absolute Maximum Ratings

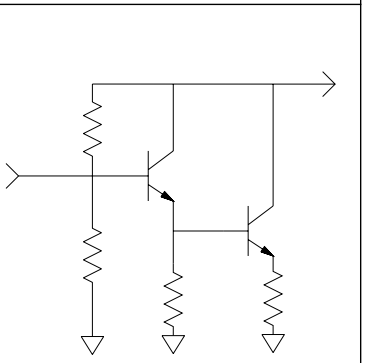
Operation of this device above any one of these parameters may cause permanent damage.

Bias Conditions should also satisfy the following expression: $I_D V_D$ (max) < (T_J - T_{OP})/R_{th},j-l

Parameter	Value	Unit
Supply Current	120	mA
Device Voltage	6.0	V
Operating Temperature	-40 to +85	ºC
Maximum Input Power	+13	dBm
Storage Temperature Range	-40 to +150	ºC
Operating Junction Temperature	+150	ºC

Key parameters, at typical operating frequencies:

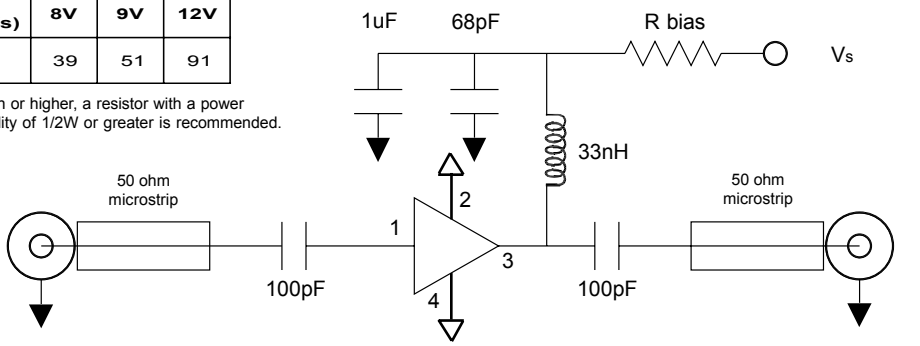
Parameter	Typical 25ºC	Unit	Test Condition (I_D = 80mA, unless otherwise noted)
500 MHz			
Gain	14.9	dB	
Output IP3	40.2	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	18.4	dBm	
Input Return Loss	21.3	dB	
Isolation	18.4	dB	
850 MHz			
Gain	14.8	dB	
Output IP3	39.5	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	18.3	dBm	
Input Return Loss	18.2	dB	
Isolation	18.4	dB	
1950 MHz			
Gain	14.1	dB	
Output IP3	34.9	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	18.2	dBm	
Input Return Loss	18.2	dB	
Isolation	18.4	dB	
2400 MHz			
Gain	13.8	dB	
Output IP3	33.5	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	17.8	dBm	
Input Return Loss	17.1	dB	
Isolation	18.4	dB	

Pin #	Function	Description	Device Schematic
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
2	GND	Connection to ground. For best performance use via holes (as close to ground leads as possible) to reduce lead inductance.	
3	RF OUT/ BIAS	RF output and bias pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation.	
4	GND	Same as Pin 2.	

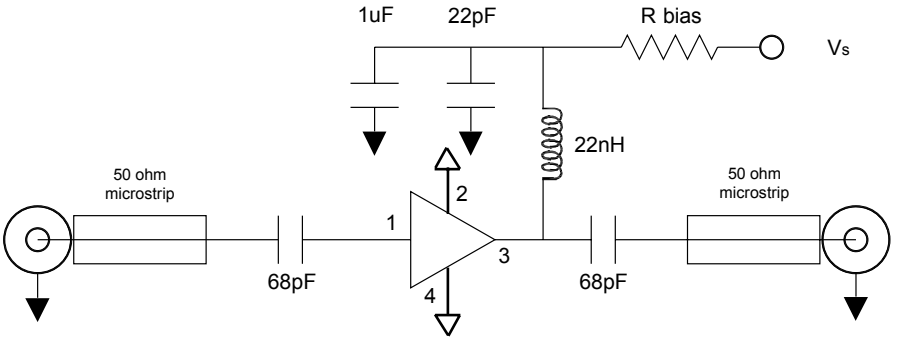
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values			
Supply Voltage(Vs)	8V	9V	12V
Rbias (Ohms)	39	51	91

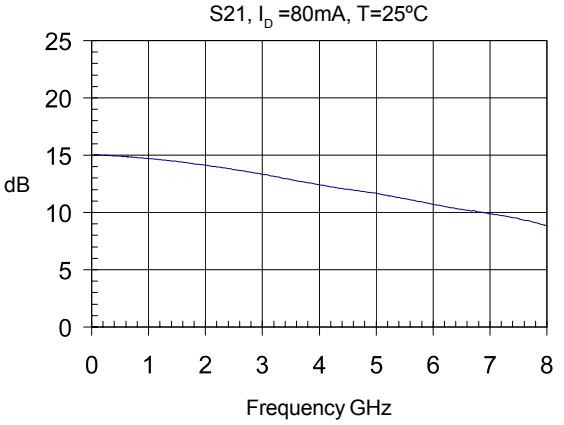
For 8V operation or higher, a resistor with a power handling capability of 1/2W or greater is recommended.

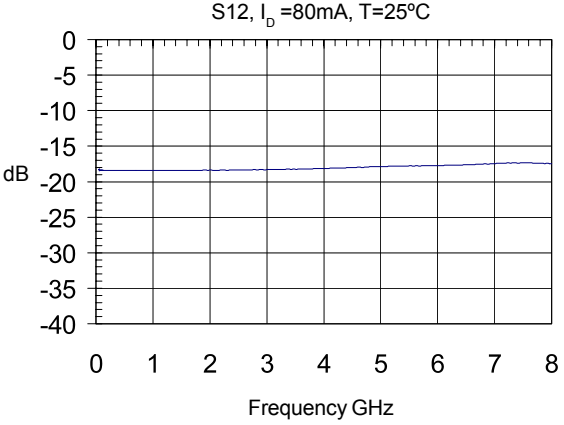


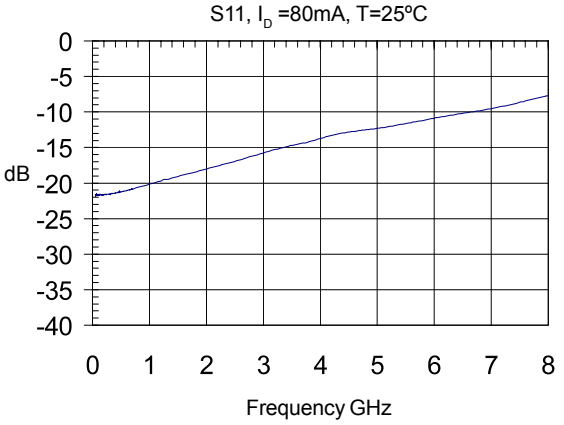
Application Schematic for Operation at 1950 MHz

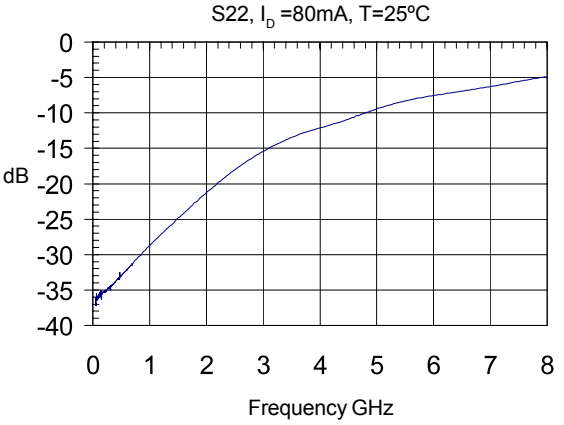


S-parameters over frequency, at 25Cº









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NGA-486 DC-6.0 GHz 5.0V GaAs HBT

Typical S-Parameters, I_D = 80mA (No external matching, de-embedded to device leads)

	S11		S21			S12			S22	
Freq GHz	mag	Ang	dB	mag	Ang	dB	mag	Ang	mag	Ang
0.05	0.083	178	15.0	5.648	178	-18.3	0.122	0	0.015	178
0.10	0.082	174	15.0	5.644	177	-18.4	0.120	-1	0.016	-175
0.20	0.083	168	15.0	5.618	174	-18.4	0.120	-1	0.017	-173
0.30	0.084	163	15.0	5.602	171	-18.4	0.120	-1	0.019	-170
0.40	0.085	157	14.9	5.582	168	-18.4	0.120	-2	0.020	-170
0.50	0.087	153	14.9	5.564	165	-18.4	0.120	-2	0.022	-169
0.60	0.088	148	14.9	5.541	162	-18.4	0.120	-2	0.025	-169
0.70	0.091	143	14.8	5.516	159	-18.4	0.120	-3	0.027	-169
0.80	0.093	138	14.8	5.476	155	-18.4	0.120	-4	0.030	-170
0.90	0.095	135	14.8	5.473	153	-18.4	0.120	-4	0.033	-171
1.00	0.098	131	14.7	5.434	150	-18.4	0.120	-4	0.036	-172
1.10	0.101	127	14.7	5.404	147	-18.4	0.120	-5	0.040	-172
1.20	0.104	123	14.6	5.372	144	-18.4	0.120	-5	0.044	-173
1.30	0.106	121	14.6	5.347	142	-18.4	0.120	-6	0.047	-173
1.40	0.109	118	14.5	5.307	139	-18.4	0.120	-6	0.051	-175
1.50	0.111	115	14.4	5.269	136	-18.4	0.120	-7	0.057	-177
1.60	0.114	112	14.4	5.231	132	-18.4	0.120	-7	0.063	-179
1.70	0.116	110	14.3	5.209	130	-18.4	0.120	-7	0.067	-180
1.80	0.119	108	14.3	5.159	127	-18.4	0.120	-8	0.074	178
1.90	0.122	106	14.2	5.117	124	-18.4	0.121	-8	0.080	176
2.00	0.126	103	14.1	5.075	121	-18.4	0.121	-9	0.087	173
2.20	0.132	100	14.0	5.000	116	-18.4	0.121	-10	0.101	168
2.40	0.139	97	13.8	4.906	110	-18.4	0.121	-11	0.118	161
2.60	0.146	96	13.7	4.818	106	-18.4	0.121	-11	0.133	156
2.80	0.155	94	13.5	4.733	100	-18.3	0.121	-12	0.153	150
3.00	0.163	93	13.3	4.640	95	-18.3	0.122	-13	0.169	146
3.20	0.171	92	13.2	4.561	90	-18.3	0.122	-14	0.185	142
3.40	0.180	92	13.0	4.444	85	-18.2	0.123	-15	0.204	138
3.60	0.187	91	12.8	4.347	80	-18.2	0.123	-16	0.219	134
3.80	0.195	91	12.6	4.256	75	-18.2	0.123	-17	0.235	131
4.00	0.205	91	12.4	4.183	71	-18.1	0.124	-17	0.247	129
4.20	0.217	91	12.2	4.093	66	-18.1	0.125	-19	0.261	126
4.40	0.224	90	12.1	4.029	62	-18.1	0.125	-19	0.275	125
4.60	0.231	89	11.9	3.952	57	-18.0	0.126	-21	0.296	123
4.80	0.236	89	11.8	3.896	53	-17.9	0.127	-21	0.314	121
5.00	0.242	88	11.6	3.823	47	-17.8	0.128	-23	0.339	118
5.50	0.263	88	11.2	3.635	35	-17.8	0.129	-26	0.385	111
6.00	0.285	86	10.7	3.434	25	-17.7	0.130	-29	0.418	105
6.50	0.309	82	10.3	3.259	14	-17.6	0.131	-32	0.451	99
7.00	0.334	79	9.9	3.117	3	-17.5	0.134	-35	0.486	92
7.50	0.369	76	9.5	2.973	-7	-17.4	0.135	-39	0.525	86
8.00	0.412	72	8.9	2.771	-18	-17.5	0.134	-44	0.568	79

Preliminary

NGA-486 DC-6.0 GHz 5.0V GaAs HBT

Caution: ESD sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.

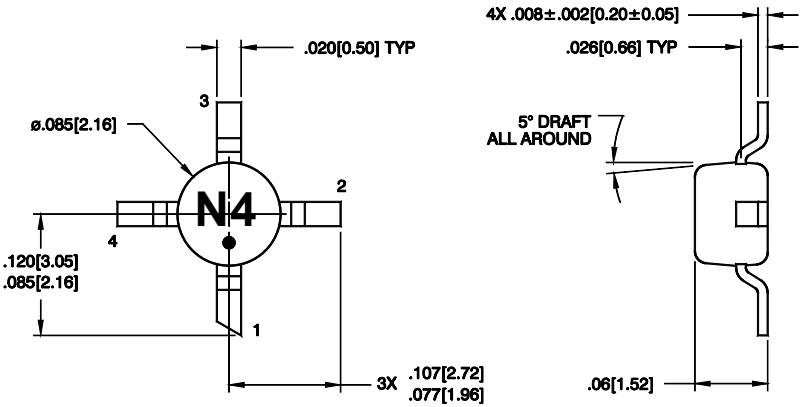
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
NGA-486	7"	1000

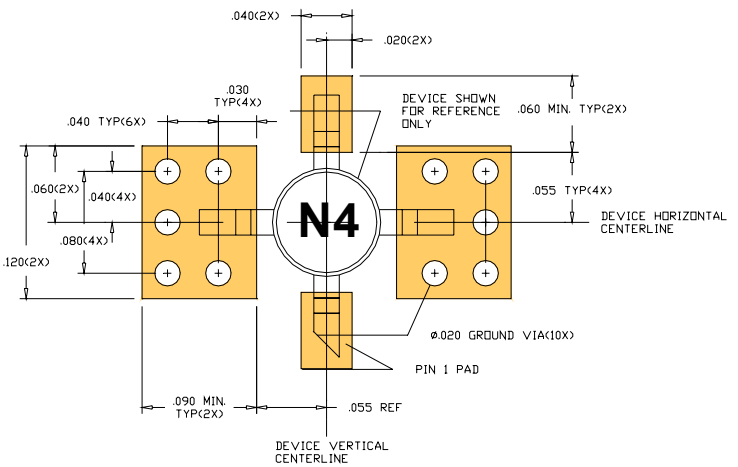
Part Symbolization

The part will be symbolized with a "N4" designator on the top surface of the package.

Package Dimensions



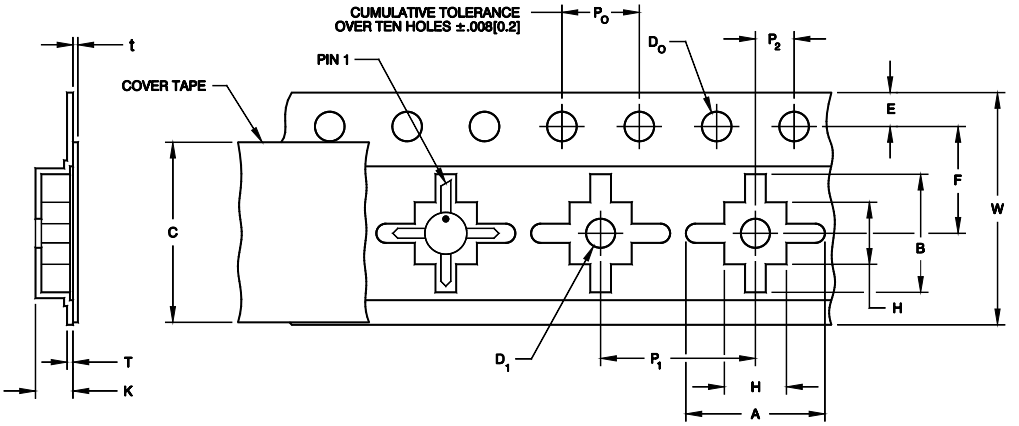
PCB Pad Layout



Component Tape and Reel Packaging

Tape Dimensions

For 86 Outline



Description		Symbol	Size (mm)
Cavity	Length	A	6.10 ± 0.10
	Width	B	6.20 ± 0.10
	Socket	H	3.10 ± 0.10
	Depth	K	2.00 ± 0.10
	Pitch	P	8.00 ± 0.10
	Bottom Hole diameter	D_1	1.50 min.
Perforation	Diameter	D_o	1.50 ± 0.10
	Pitch	P_o	4.00 ± 0.10
	Position	E	1.75 ± 0.10
Cover Tape	Width	C	9.10 ± 0.25
	Tape Thickness	t	0.05 ± 0.01
Carrier Tape	Width	W	12.00 ± 0.30
	Tape Thickness	T	0.30 ± 0.05
Distance	Cavity to Perforation (Width Direction)	F	5.50 ± 0.05
	Cavity to Perforation (Length Direction)	P_2	2.00 ± 0.05