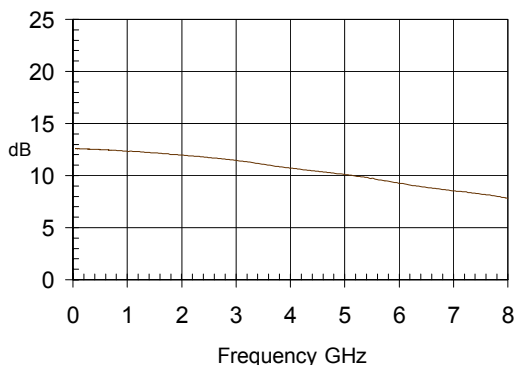


Product Description

Stanford Microdevices' NGA-186 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



NGA-186

DC-6000 MHz, Cascadable GaAs HBT MMIC Amplifier



Product Features

- 12.0dB Gain, 14.7 dBm P1dB at 1950MHz
- Cascadable 50 ohm: 1.2:1 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: $Z_0 = 50 \text{ Ohms}$, $I_D = 50 \text{ mA}$, $T = 25^\circ\text{C}$		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		14.6 14.7 14.9	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		32.9 31.7 31.1	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		12.4 12.0 11.8	
Bandwidth	3dB Bandwidth		MHz		5600	
S_{11}	Input VSWR	f = DC - 6000 MHz	-		1.2:1	
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		16.5 16.4 16.4	
NF	Noise Figure	f = 2000 MHz	dB		4.0	
V_D	Device Voltage		V		4.1	
$R_{th, j-l}$	Thermal Resistance (junction - lead)		$^\circ\text{C/W}$		120	

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Absolute Maximum Ratings

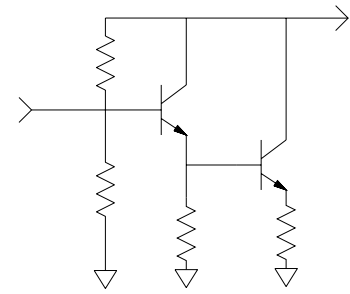
Operation of this device above any one of these parameters may cause permanent damage.

Bias Conditions should also satisfy the following expression: $I_D V_D (\text{max}) < (T_J - T_{OP})/R_{\theta j-c}$

Parameter	Value	Unit
Supply Current	110	mA
Device Voltage	6.0	V
Operating Temperature	-40 to +85	°C
Maximum Input Power	+10	dBm
Storage Temperature Range	-40 to +150	°C
Operating Junction Temperature (T _J)	+150	°C

Key parameters, at typical operating frequencies:

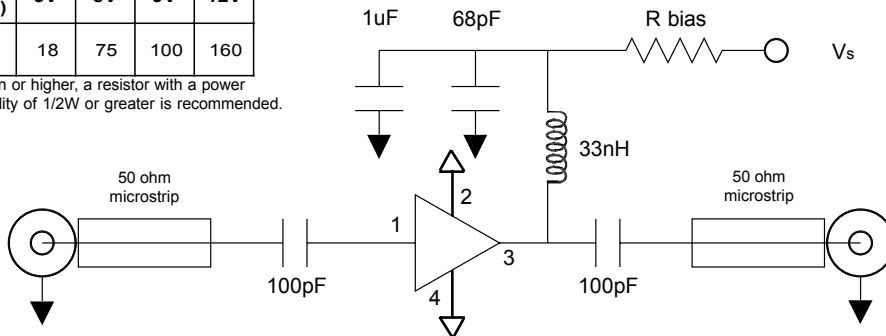
Parameter	Typical 25°C	Unit	Test Condition
			(I _b = 50mA, unless otherwise noted)
500 MHz			
Gain	12.5	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	32.6	dBm	
Output P1dB	14.7	dBm	
Input Return Loss	30.1	dB	
Isolation	16.5	dB	
850 MHz			
Gain	12.4	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	32.9	dBm	
Output P1dB	14.6	dBm	
Input Return Loss	29.9	dB	
Isolation	16.5	dB	
1950 MHz			
Gain	12.0	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	31.7	dBm	
Output P1dB	14.7	dBm	
Input Return Loss	27.6	dB	
Isolation	16.4	dB	
2400 MHz			
Gain	11.8	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	31.1	dBm	
Output P1dB	14.9	dBm	
Input Return Loss	25.3	dB	
Isolation	16.4	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.	

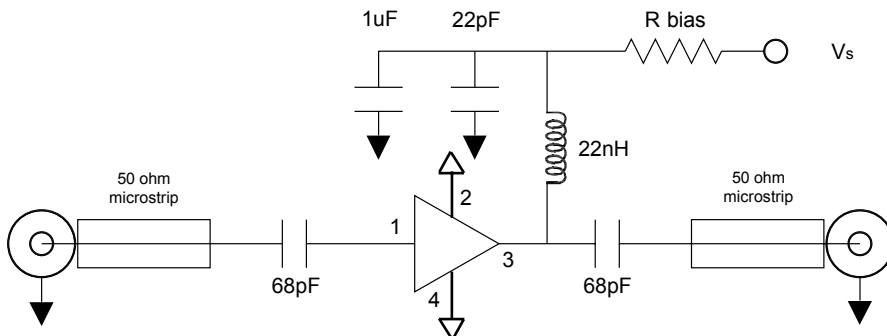
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values				
Supply Voltage(Vs)	5V	8V	9V	12V
Rbias (Ohms)	18	75	100	160

For 9V operation or higher, a resistor with a power handling capability of 1/2W or greater is recommended.

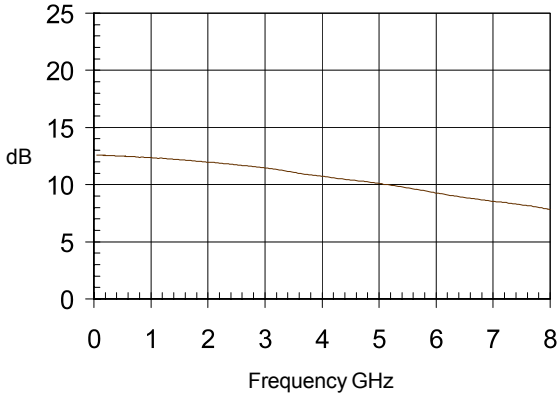


Application Schematic for Operation at 1950 MHz

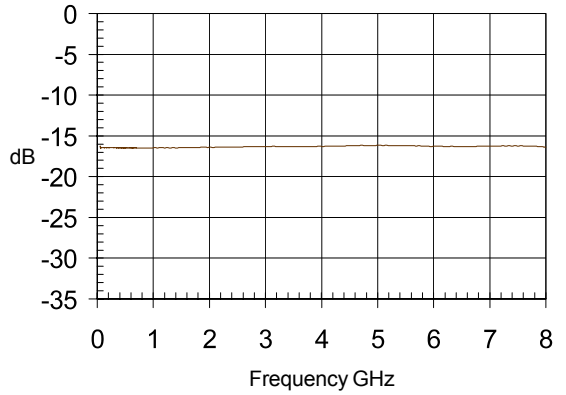


Electrical Specifications at Ta = 25°C

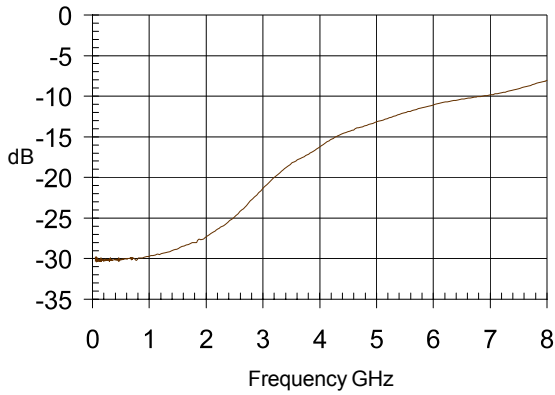
S21, I_D = 50mA, T=25°C



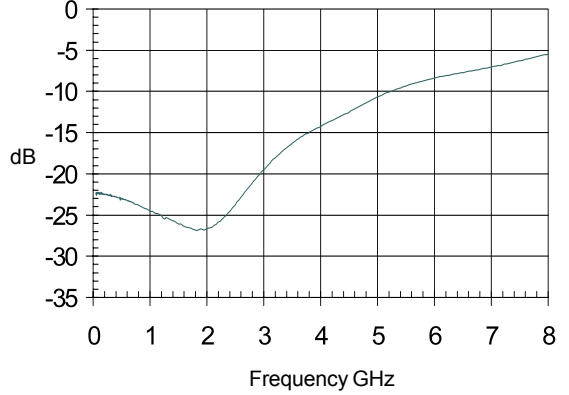
S12, I_D = 50mA, T=25°C



S11, I_D = 50mA, T=25°C



S22, I_D = 50mA, T=25°C



Typical S-Parameters, $I_D = 50\text{mA}$ (No external matching, de-embedded to device leads)

Freq GHz	S11		S21			S12			S22	
	mag	Ang	dB	mag	Ang	dB	mag	Ang	mag	Ang
0.05	0.030	-1	12.6	4.264	179	-16.4	0.152	0	0.076	-1
0.10	0.031	4	12.6	4.261	177	-16.4	0.151	0	0.076	-3
0.20	0.031	7	12.6	4.248	174	-16.4	0.151	-1	0.075	-7
0.30	0.031	11	12.5	4.237	172	-16.5	0.150	-2	0.074	-10
0.40	0.031	15	12.5	4.226	169	-16.5	0.150	-2	0.073	-13
0.50	0.031	18	12.5	4.216	166	-16.5	0.150	-3	0.071	-16
0.60	0.032	22	12.5	4.202	164	-16.5	0.150	-3	0.069	-19
0.70	0.032	25	12.4	4.190	161	-16.5	0.150	-4	0.067	-23
0.80	0.032	29	12.4	4.163	158	-16.5	0.150	-5	0.064	-28
0.90	0.032	32	12.4	4.165	156	-16.5	0.150	-5	0.062	-31
1.00	0.033	35	12.4	4.147	153	-16.5	0.150	-5	0.060	-36
1.10	0.033	39	12.3	4.131	150	-16.5	0.150	-6	0.058	-41
1.20	0.034	42	12.3	4.116	147	-16.5	0.150	-7	0.055	-48
1.30	0.034	45	12.3	4.102	145	-16.5	0.150	-7	0.054	-53
1.40	0.035	49	12.2	4.085	142	-16.5	0.150	-8	0.052	-59
1.50	0.036	52	12.2	4.064	139	-16.5	0.150	-8	0.050	-68
1.60	0.038	55	12.1	4.043	136	-16.4	0.151	-9	0.048	-77
1.70	0.039	58	12.1	4.034	134	-16.4	0.151	-9	0.047	-84
1.80	0.040	60	12.0	3.997	132	-16.4	0.151	-10	0.045	-94
1.90	0.041	65	12.0	3.983	129	-16.4	0.152	-10	0.046	-105
2.00	0.043	68	12.0	3.965	126	-16.4	0.151	-11	0.047	-117
2.20	0.048	74	11.9	3.924	121	-16.4	0.152	-12	0.051	-138
2.40	0.054	82	11.8	3.874	116	-16.4	0.152	-13	0.060	-160
2.60	0.062	88	11.7	3.828	111	-16.4	0.152	-14	0.072	-175
2.80	0.074	94	11.6	3.791	106	-16.3	0.153	-16	0.090	172
3.00	0.085	98	11.5	3.738	101	-16.3	0.153	-17	0.106	163
3.20	0.099	100	11.3	3.691	96	-16.3	0.153	-18	0.123	156
3.40	0.115	100	11.2	3.618	91	-16.3	0.153	-20	0.144	149
3.60	0.126	100	11.0	3.544	87	-16.3	0.153	-21	0.161	144
3.80	0.139	101	10.8	3.481	82	-16.3	0.153	-22	0.179	138
4.00	0.153	102	10.7	3.439	78	-16.3	0.154	-23	0.193	136
4.20	0.171	102	10.6	3.383	73	-16.3	0.154	-25	0.210	133
4.40	0.185	101	10.5	3.338	69	-16.2	0.154	-26	0.227	131
4.60	0.197	100	10.3	3.291	64	-16.2	0.155	-27	0.248	128
4.80	0.208	99	10.3	3.256	60	-16.2	0.155	-28	0.268	126
5.00	0.220	99	10.1	3.199	54	-16.2	0.155	-30	0.293	122
5.50	0.252	96	9.7	3.066	43	-16.2	0.155	-34	0.344	114
6.00	0.279	92	9.3	2.905	33	-16.2	0.154	-37	0.381	107
6.50	0.303	87	8.9	2.773	22	-16.3	0.153	-41	0.412	100
7.00	0.322	82	8.5	2.672	13	-16.3	0.154	-44	0.446	93
7.50	0.351	80	8.3	2.586	3	-16.2	0.154	-48	0.485	86
8.00	0.396	78	7.8	2.460	-8	-16.4	0.152	-53	0.531	80



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

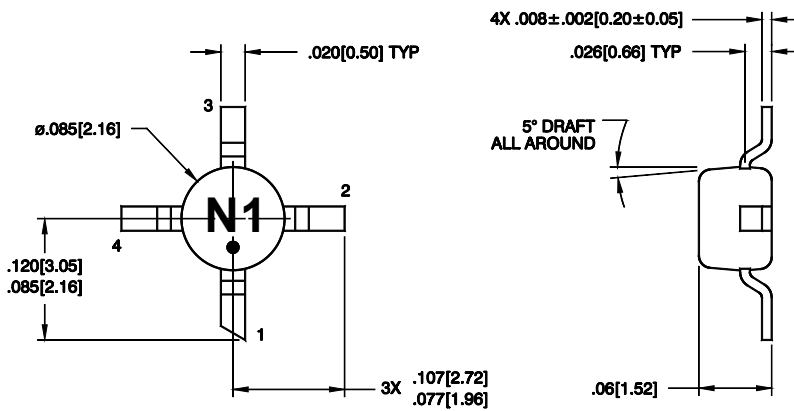
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
NGA-186	7"	1000

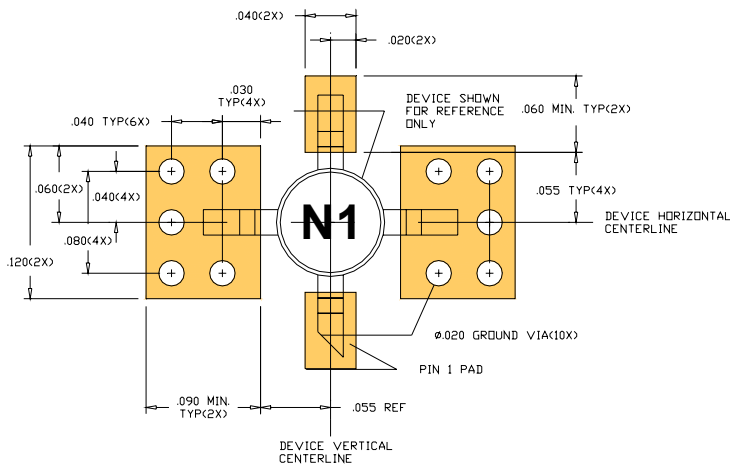
Part Symbolization

The part will be symbolized with a "N1" designator on the top surface of the package.

Package Dimensions



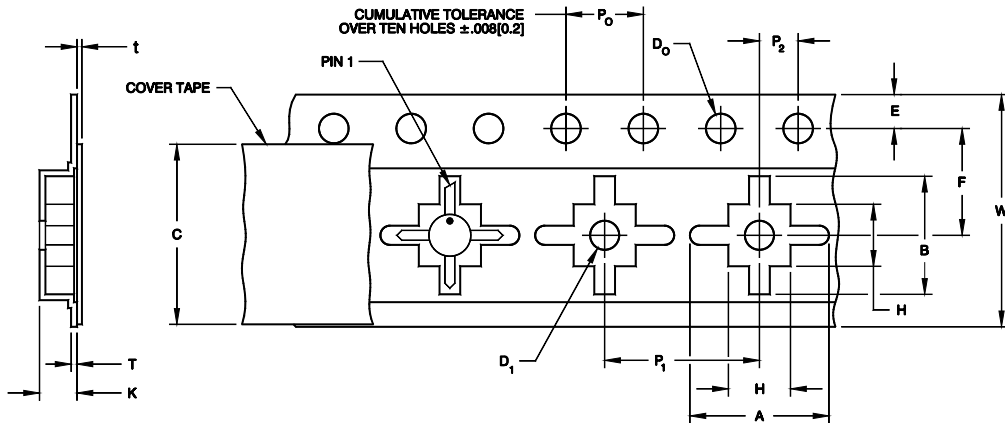
PCB Pad Layout



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 ₀	1.50 ± 0.10
	Pitch	P ₀	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