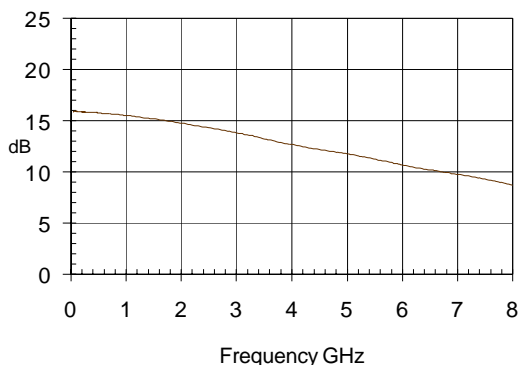


Product Description

Stanford Microdevices' NGA-286 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-286

DC-6000 MHz, Cascadable GaAs HBT MMIC Amplifier



Product Features

- High Gain: 14.8dB 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: $Z_0 = 50 \text{ Ohms}$, $I_D = 50 \text{ mA}$, $T = 25^\circ\text{C}$		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		15.2 15.2 15.5	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		32.0 31.4 30.9	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		15.6 14.8 14.4	
Bandwidth	3dB Bandwidth		MHz		3800	
S_{11}	Input VSWR	f = DC - 6000 MHz	-		1.3:1	
S_{22}	Output VSWR	f = DC - 6000 MHz	-		1.3:1	
S_{12}	Reverse Isolation	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		18.8 18.7 18.6	
NF	Noise Figure	f = 2000 MHz	dB		3.4	
V_D	Device Voltage		V		4.0	
$R_{th,j-l}$	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.

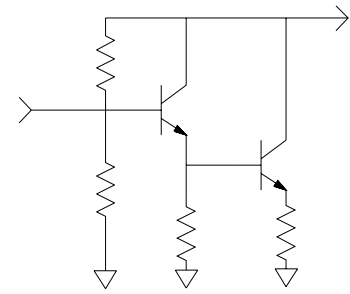
Bias Conditions should also satisfy the following expression: $I_D V_D (\text{max}) < (T_J - T_{OP})/R_{\theta j-l}$

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	+150	°C

Key parameters, at typical operating frequencies:

Parameter	Typical 25°C	Unit	Test Condition
			($I_b = 50\text{mA}$, unless otherwise noted)
500 MHz			
Gain	15.8	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	31.8	dBm	
Output P1dB	15.3	dBm	
Input Return Loss	21.0	dB	
Isolation	18.8	dB	
850 MHz			
Gain	15.6	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	32.0	dBm	
Output P1dB	15.2	dBm	
Input Return Loss	20.0	dB	
Isolation	18.8	dB	
1950 MHz			
Gain	14.8	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	31.4	dBm	
Output P1dB	15.2	dBm	
Input Return Loss	17.1	dB	
Isolation	18.7	dB	
2400 MHz			
Gain	14.4	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	30.9	dBm	
Output P1dB	15.5	dBm	
Input Return Loss	16.0	dB	
Isolation	18.6	dB	

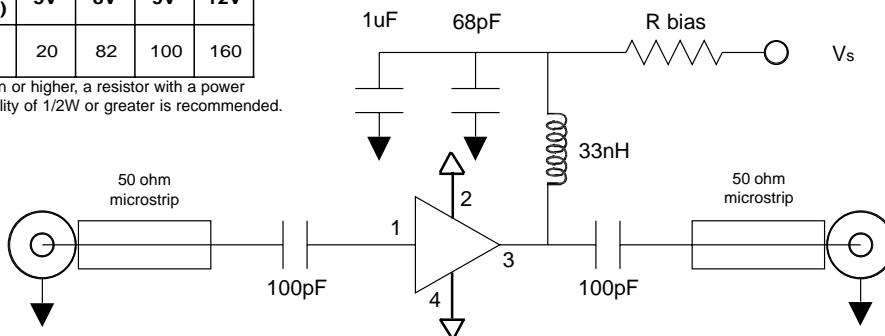
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Pin #	Function	Description	Device Schematic
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
2	GND	Connection to ground. For best performance use via holes (as close to ground 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.	

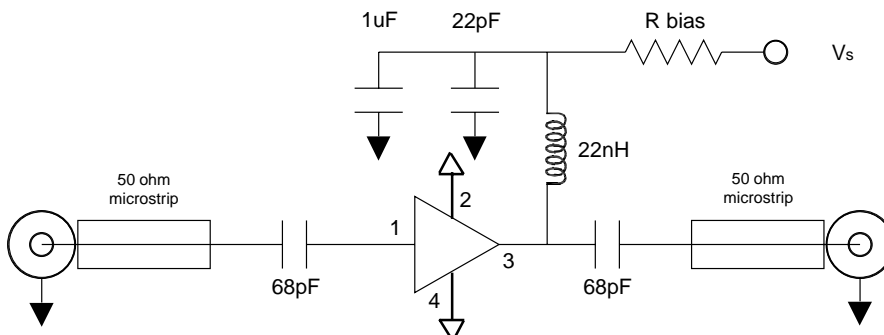
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values				
Supply Voltage(Vs)	5V	8V	9V	12V
Rbias (Ohms)	20	82	100	160

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

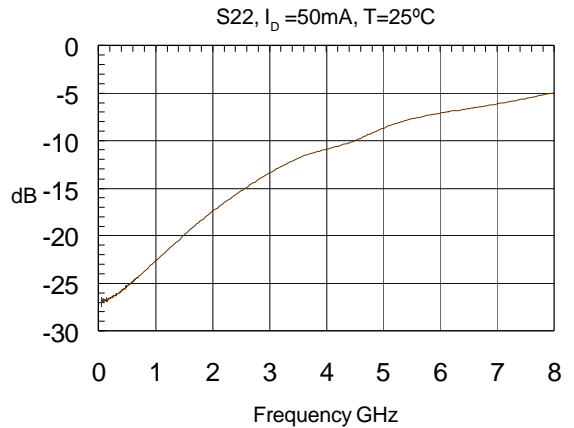
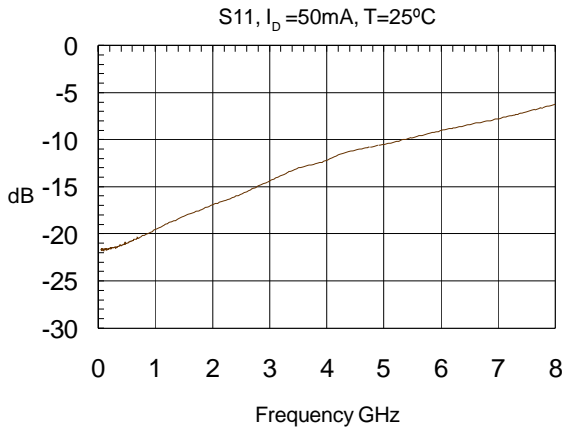
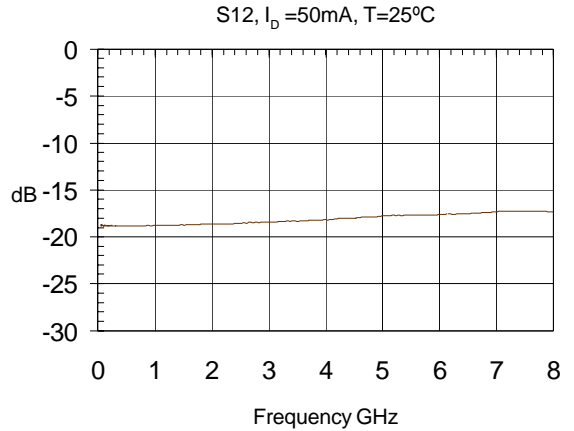
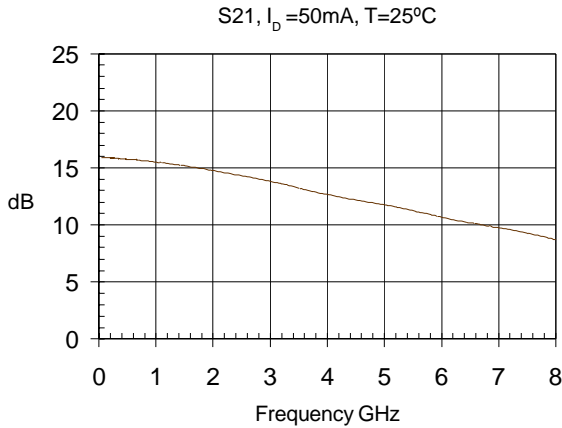


Application Schematic for Operation at 1950 MHz



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S-parameters over frequency, at 25°C



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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	0.084	178	15.9	6.244	178	-18.7	0.117	0	0.045	-179
0.10	0.082	174	15.9	6.238	177	-18.8	0.115	0	0.046	-176
0.20	0.084	168	15.9	6.209	174	-18.8	0.115	-1	0.047	-174
0.30	0.086	162	15.8	6.190	170	-18.8	0.115	-1	0.049	-171
0.40	0.087	156	15.8	6.164	167	-18.8	0.115	-1	0.051	-169
0.50	0.089	150	15.8	6.140	164	-18.8	0.115	-2	0.054	-168
0.60	0.092	145	15.7	6.109	161	-18.8	0.115	-2	0.057	-167
0.70	0.095	140	15.7	6.079	158	-18.8	0.115	-2	0.061	-166
0.80	0.098	135	15.6	6.031	155	-18.8	0.115	-3	0.065	-166
0.90	0.101	132	15.6	6.004	152	-18.8	0.115	-3	0.068	-166
1.00	0.105	128	15.5	5.966	149	-18.8	0.115	-4	0.073	-166
1.10	0.109	124	15.5	5.924	146	-18.8	0.115	-4	0.078	-166
1.20	0.113	121	15.4	5.876	143	-18.8	0.115	-4	0.084	-166
1.30	0.116	118	15.3	5.845	140	-18.8	0.115	-5	0.088	-166
1.40	0.120	115	15.3	5.793	137	-18.8	0.115	-5	0.094	-168
1.50	0.124	112	15.2	5.727	134	-18.7	0.116	-5	0.101	-169
1.60	0.128	109	15.1	5.680	131	-18.7	0.116	-6	0.108	-171
1.70	0.131	107	15.0	5.646	129	-18.7	0.116	-6	0.113	-172
1.80	0.134	105	14.9	5.574	126	-18.7	0.116	-6	0.120	-175
1.90	0.138	104	14.8	5.520	123	-18.7	0.117	-7	0.127	-176
2.00	0.143	101	14.8	5.464	120	-18.6	0.117	-7	0.135	-179
2.20	0.150	99	14.6	5.358	115	-18.6	0.117	-8	0.149	176
2.40	0.159	97	14.4	5.234	109	-18.6	0.118	-9	0.165	170
2.60	0.167	96	14.2	5.142	104	-18.5	0.118	-9	0.180	166
2.80	0.180	94	14.0	5.023	99	-18.5	0.119	-10	0.198	160
3.00	0.191	94	13.8	4.906	94	-18.4	0.120	-11	0.213	156
3.20	0.203	93	13.6	4.808	89	-18.4	0.120	-12	0.229	151
3.40	0.216	92	13.4	4.659	84	-18.3	0.121	-13	0.247	146
3.60	0.226	91	13.1	4.525	79	-18.3	0.122	-14	0.261	143
3.80	0.235	90	12.9	4.394	74	-18.3	0.122	-15	0.275	138
4.00	0.244	91	12.7	4.307	70	-18.2	0.123	-15	0.284	135
4.50	0.278	88	12.2	4.068	59	-18.0	0.126	-18	0.315	130
5.00	0.298	87	11.8	3.872	47	-17.8	0.129	-21	0.367	124
5.50	0.326	86	11.2	3.650	36	-17.7	0.131	-25	0.412	115
6.00	0.352	83	10.7	3.422	26	-17.6	0.132	-28	0.440	108
6.50	0.380	80	10.2	3.222	16	-17.5	0.133	-31	0.466	101
7.00	0.408	76	9.7	3.068	6	-17.3	0.136	-35	0.495	93
7.50	0.443	73	9.3	2.914	-4	-17.3	0.137	-39	0.525	86
8.00	0.487	70	8.7	2.715	-14	-17.4	0.135	-44	0.564	79

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Caution: ESD sensitive

Appropriate precautions in handling, packaging and testing devices must be observed.

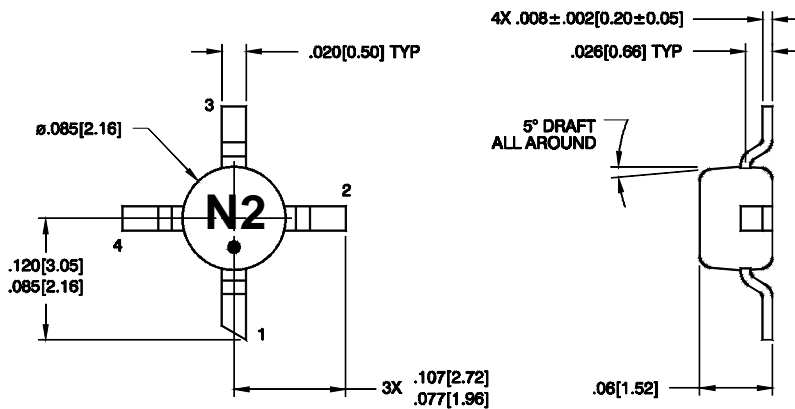
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
NGA-286	7"	1000

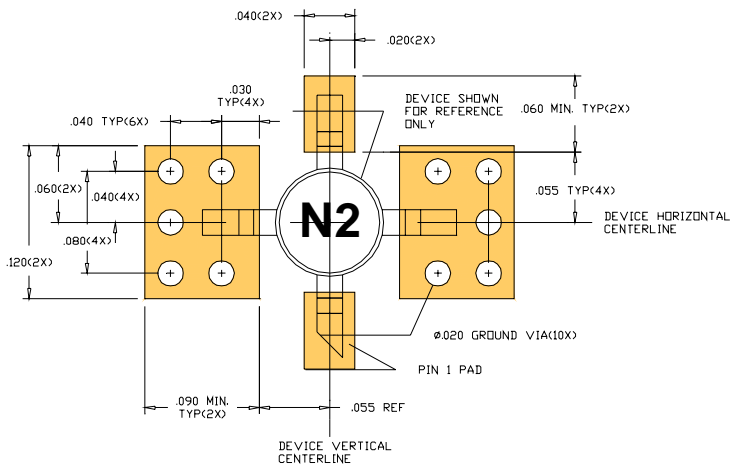
Part Symbolization

The part will be symbolized with a "N2" designator on the top surface of the package.

Package Dimensions



PCB Pad Layout

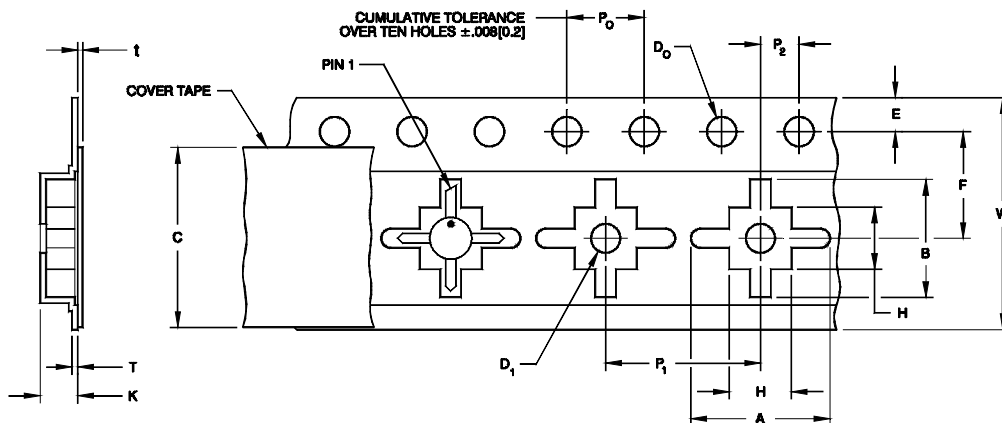


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Component Tape and Reel Packaging

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

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