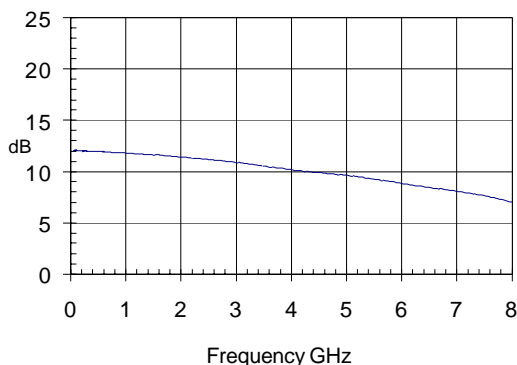


Product Description

Stanford Microdevices' NGA-686 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-686

DC-6000 MHz, Cascadable GaAs HBT MMIC Amplifier



Product Features

- 11.4dB Gain, 19.2 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: $Z_0 = 50 \text{ Ohms}$, $I_D = 80 \text{ mA}$, $T = 25^\circ\text{C}$		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		19.8 19.2 17.9	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		38.4 34.9 32.7	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		11.9 11.4 11.2	
Bandwidth	3dB Bandwidth		MHz		5800	
S_{11}	Input VSWR	f = DC - 6000 MHz	-		1.2:1	
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		19.8 19.7 19.7	
NF	Noise Figure	f = 2000 MHz	dB		6.1	
V_D	Device Voltage		V		5.9	
$R_{th, j-l}$	Thermal Resistance (junction - lead)		$^\circ\text{C/W}$		121	

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Absolute Maximum Ratings

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

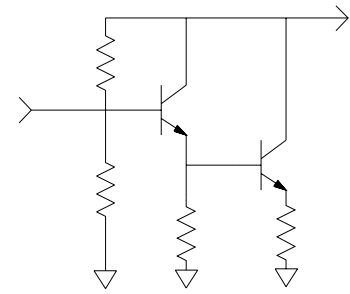
Bias Conditions should also satisfy the following expression: $I_D V_D (\text{max}) < (T_J - T_{OP})/R_{th,j-l}$

Parameter	Value	Unit
Supply Current	120	mA
Device Voltage	6.7	V
Operating Temperature	-40 to +85	°C
Maximum Input Power	+13	dBm
Storage Temperature Range	-40 to +150	°C
Operating Junction Temperature	+150	°C

Key parameters, at typical operating frequencies:

Parameter	Typical 25°C		Test Condition
		Unit	($I_b = 80\text{mA}$, unless otherwise noted)
500 MHz			
Gain	11.9	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	38.5	dBm	
Output P1dB	19.9	dBm	
Input Return Loss	21.4	dB	
Isolation	19.7	dB	
850 MHz			
Gain	11.9	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	38.4	dBm	
Output P1dB	19.8	dBm	
Input Return Loss	20.7	dB	
Isolation	19.8	dB	
1950 MHz			
Gain	11.4	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	34.9	dBm	
Output P1dB	19.2	dBm	
Input Return Loss	18.4	dB	
Isolation	19.7	dB	
2400 MHz			
Gain	11.2	dB	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output IP3	32.7	dBm	
Output P1dB	17.9	dBm	
Input Return Loss	17.6	dB	
Isolation	19.7	dB	

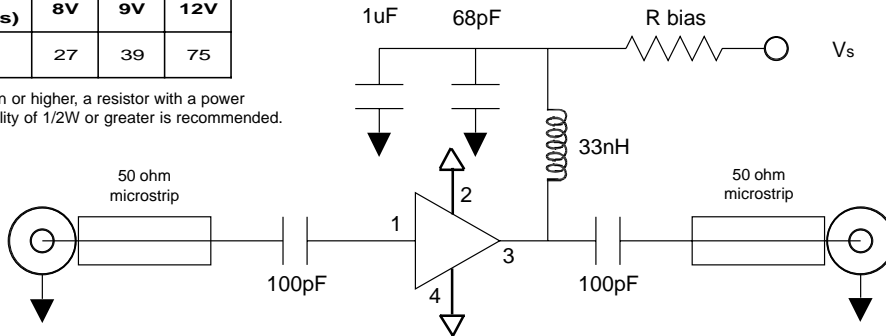
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Pin #	Function	Description	Device Schematic
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
2	GND	Connection to ground. For best performance use via holes (as close to ground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

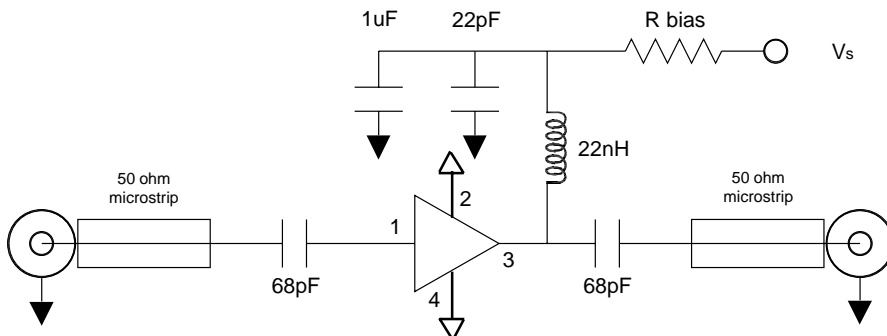
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values			
Supply Voltage(Vs)	8V	9V	12V
Rbias (Ohms)	27	39	75

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

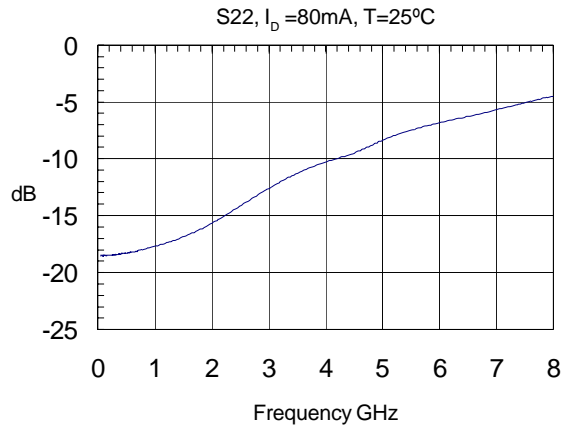
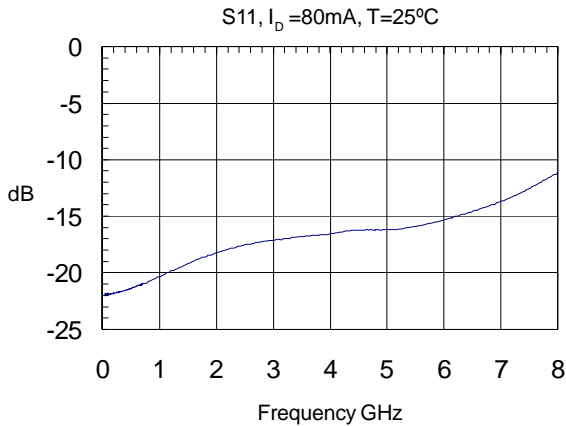
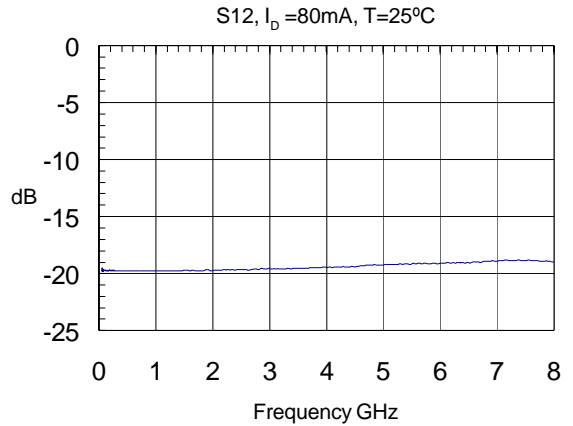
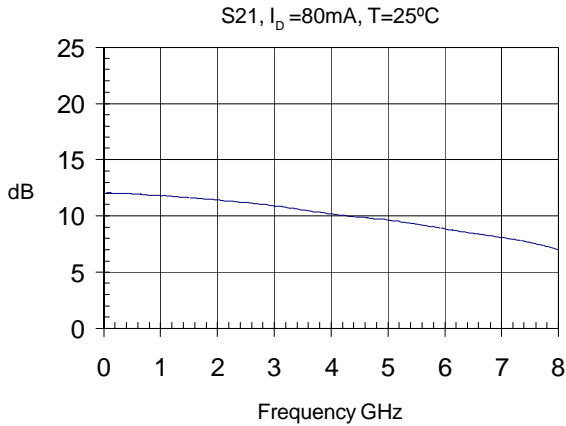


Application Schematic for Operation at 1950 MHz



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S-parameters over frequency, at 25°C



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Typical S-Parameters, $I_D = 80mA$ (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	0.080	0	12.1	4.010	178	-19.7	0.103	0	0.118	178
0.10	0.081	3	12.1	4.005	177	-19.7	0.103	0	0.118	178
0.20	0.081	6	12.0	3.987	174	-19.7	0.103	-1	0.119	176
0.30	0.082	9	12.0	3.979	171	-19.7	0.103	-1	0.120	174
0.40	0.083	12	12.0	3.968	168	-19.7	0.103	-1	0.120	172
0.50	0.085	14	11.9	3.957	166	-19.7	0.103	-2	0.122	170
0.60	0.087	16	11.9	3.945	163	-19.7	0.103	-2	0.123	169
0.70	0.089	19	11.9	3.934	160	-19.7	0.103	-2	0.124	167
0.80	0.091	20	11.9	3.916	157	-19.8	0.103	-3	0.127	165
0.90	0.093	22	11.8	3.909	155	-19.7	0.103	-4	0.128	164
1.00	0.096	23	11.8	3.891	152	-19.8	0.103	-4	0.130	162
1.10	0.099	24	11.8	3.879	149	-19.7	0.103	-4	0.133	160
1.20	0.102	25	11.7	3.862	146	-19.7	0.103	-5	0.135	159
1.30	0.104	26	11.7	3.851	144	-19.7	0.103	-5	0.137	158
1.40	0.107	27	11.7	3.830	141	-19.7	0.103	-6	0.140	156
1.50	0.110	28	11.6	3.805	138	-19.7	0.103	-6	0.144	155
1.60	0.113	28	11.6	3.796	135	-19.7	0.103	-6	0.148	153
1.70	0.115	29	11.6	3.787	133	-19.7	0.103	-6	0.150	152
1.80	0.117	29	11.5	3.760	130	-19.7	0.103	-7	0.155	151
1.90	0.120	30	11.5	3.741	127	-19.7	0.104	-7	0.160	149
2.00	0.123	30	11.4	3.720	124	-19.7	0.104	-8	0.165	147
2.20	0.127	31	11.3	3.684	119	-19.7	0.104	-8	0.176	145
2.40	0.132	32	11.2	3.632	113	-19.7	0.104	-9	0.190	141
2.60	0.134	33	11.1	3.597	108	-19.7	0.104	-10	0.204	138
2.80	0.137	35	11.0	3.553	103	-19.6	0.104	-11	0.220	134
3.00	0.140	37	10.9	3.504	98	-19.6	0.105	-11	0.235	131
3.20	0.142	39	10.8	3.460	93	-19.6	0.105	-12	0.249	128
3.40	0.144	41	10.6	3.393	88	-19.6	0.105	-13	0.266	125
3.60	0.145	42	10.5	3.332	83	-19.5	0.106	-14	0.279	123
3.80	0.146	45	10.3	3.279	78	-19.5	0.106	-15	0.294	120
4.00	0.148	47	10.2	3.231	73	-19.4	0.107	-16	0.306	118
4.20	0.152	49	10.0	3.178	68	-19.4	0.107	-17	0.317	115
4.40	0.154	50	9.9	3.138	64	-19.4	0.107	-17	0.327	114
4.60	0.154	52	9.8	3.098	59	-19.3	0.108	-18	0.344	113
4.80	0.154	53	9.7	3.063	54	-19.3	0.109	-19	0.361	111
5.00	0.155	55	9.6	3.028	49	-19.2	0.110	-21	0.382	109
5.50	0.161	60	9.3	2.904	36	-19.1	0.111	-23	0.424	103
6.00	0.172	63	8.8	2.768	25	-19.1	0.111	-26	0.456	97
6.50	0.187	64	8.5	2.647	14	-19.0	0.112	-29	0.487	91
7.00	0.207	65	8.1	2.530	3	-18.9	0.114	-32	0.521	84
7.50	0.236	66	7.7	2.414	-9	-18.8	0.114	-36	0.558	78
8.00	0.276	66	7.0	2.240	-20	-19.0	0.113	-40	0.596	72

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

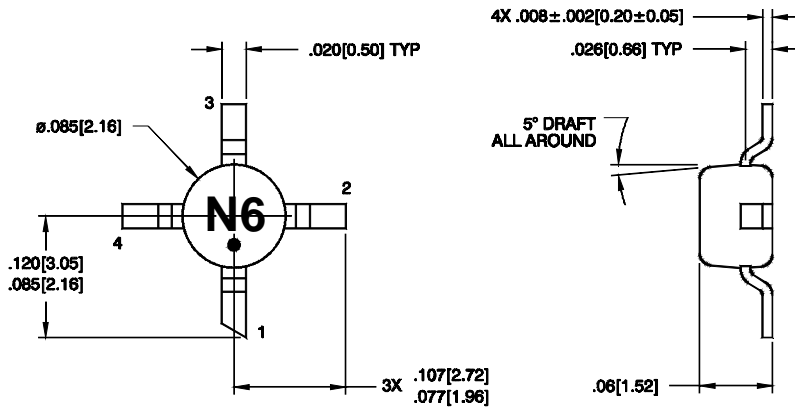
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
NGA-686	7"	1000

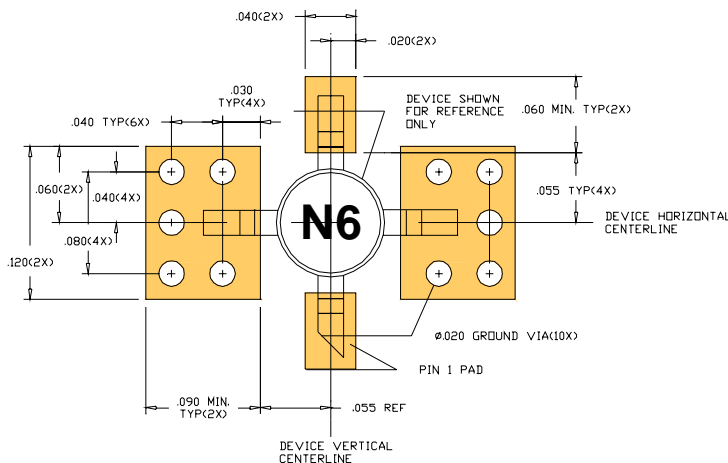
Part Symbolization

The part will be symbolized with a "N6" designator on the top surface of the package.

Package Dimensions



PCB Pad Layout

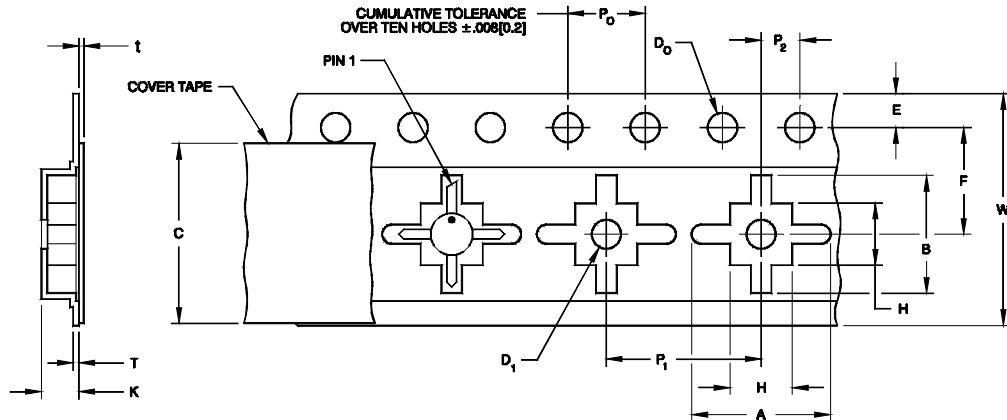


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Component Tape and Reel Packaging

Tape Dimensions

For 86 Outline



DESCRIPTION		SYMBOL	SIZE (MM)
Cavity	Length	A	6.10 ± 0.10
	Width	B	6.20 ± 0.10
	Socket Depth	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
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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