STANFORD MICRODEVICES

Preliminary

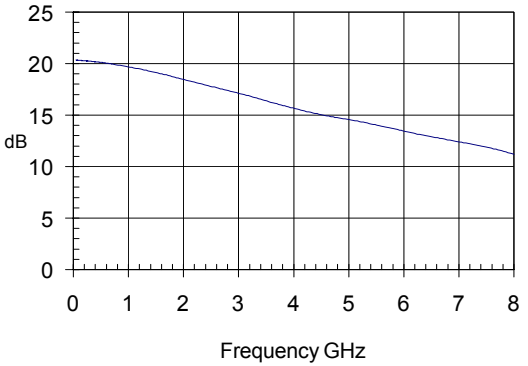
NGA-586

DC-6000 MHz, Cascadable GaAs HBT MMIC Amplifier

Product Description

Stanford Microdevices' NGA-586 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: 18.6dB 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 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		18.9 18.5 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		39.6 34.8 32.8	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		19.8 18.6 17.9	
Bandwidth	3dB Bandwidth		MHz		2800	
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		22.4 22.3 22.1	
NF	Noise Figure	f = 2000 MHz	dB		3.8	
V_D	Device Voltage		V		5.0	
R_{th}, j-l	Thermal Resistance (junction - lead)		°C/W		121	

The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions.
Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

522 Almanor Ave., Sunnyvale, CA 94086 Phone: (800) SMI-MMIC http://www.stanfordmicro.com

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	110	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

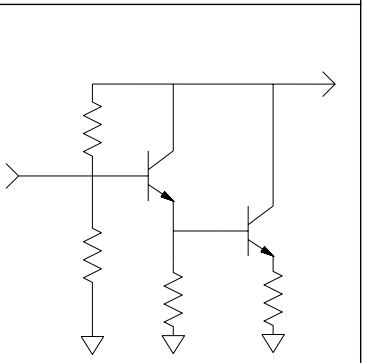
Key parameters, at typical operating frequencies:

Parameter	Typical 25ºC	Unit	Test Condition (I_D = 80mA, unless otherwise noted)
500 MHz			
Gain	20.1	dB	
Output IP3	38.6	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	19.0	dBm	
Input Return Loss	25.5	dB	
Isolation	22.5	dB	
850 MHz			
Gain	19.8	dB	
Output IP3	39.6	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	18.9	dBm	
Input Return Loss	21.7	dB	
Isolation	22.4	dB	
1950 MHz			
Gain	18.6	dB	
Output IP3	34.8	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	18.5	dBm	
Input Return Loss	17.0	dB	
Isolation	22.3	dB	
2400 MHz			
Gain	17.9	dB	
Output IP3	32.8	dBm	Tone spacing = 1 MHz, Pout per tone = 0dBm
Output P1dB	17.9	dBm	
Input Return Loss	16.3	dB	
Isolation	22.1	dB	

The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions.
Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

Preliminary

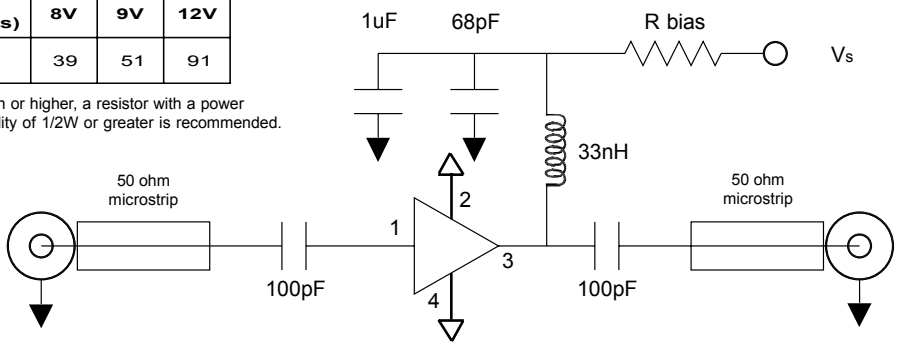
NGA-586 DC-6.0 GHz 5.0V GaAs HBT

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.	

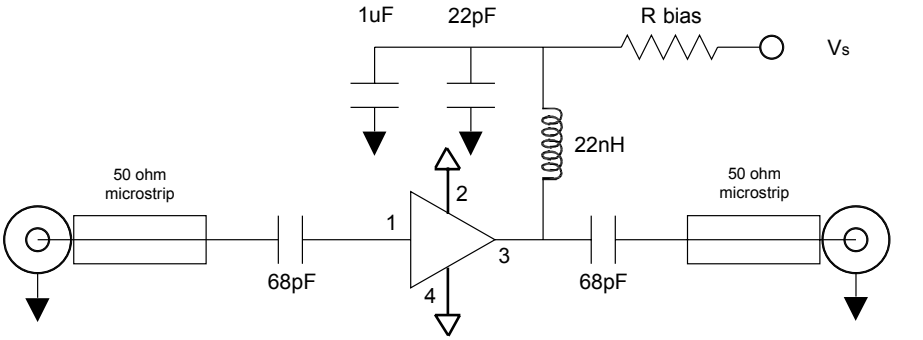
Application Schematic for Operation at 850 MHz

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.

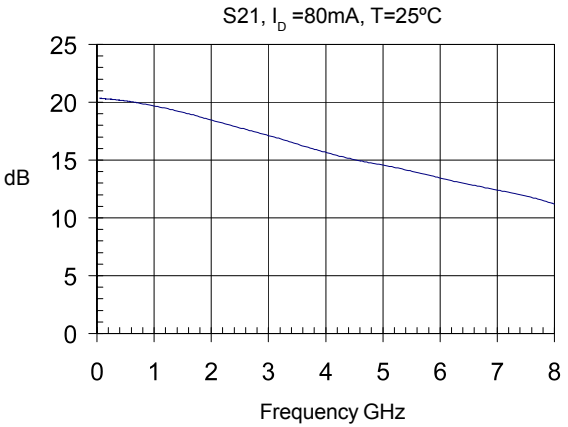


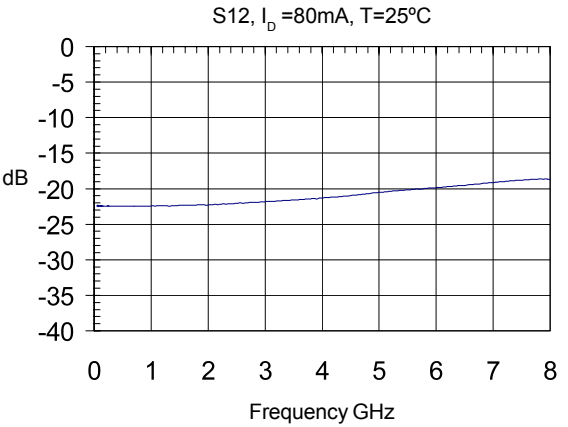
Application Schematic for Operation at 1950 MHz

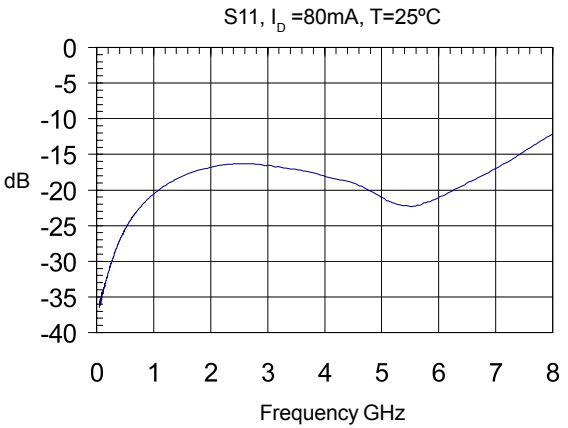


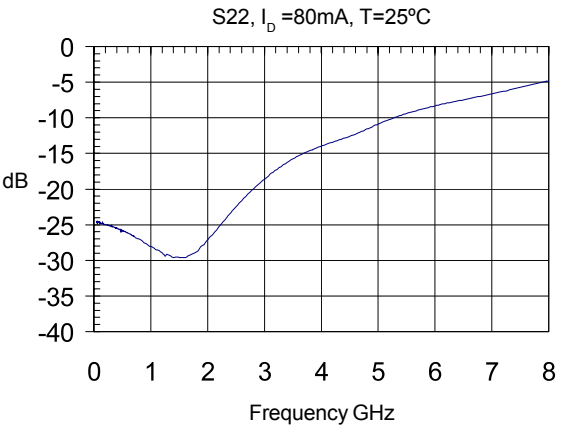
The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions. Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

S-parameters over frequency, at 25ºC









The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions.
Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

Preliminary

NGA-586 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	0.015	8	20.3	10.403	178	-22.5	0.075	0	0.059	-1
0.10	0.019	30	20.3	10.384	176	-22.4	0.076	0	0.058	-4
0.20	0.026	48	20.3	10.320	172	-22.5	0.075	0	0.056	-8
0.30	0.034	56	20.2	10.274	169	-22.4	0.075	0	0.055	-13
0.40	0.044	59	20.2	10.206	165	-22.4	0.076	0	0.053	-16
0.50	0.053	60	20.1	10.138	162	-22.5	0.075	0	0.051	-20
0.60	0.062	60	20.0	10.054	158	-22.4	0.075	0	0.049	-24
0.70	0.071	59	20.0	9.966	155	-22.4	0.076	0	0.047	-29
0.80	0.079	58	19.9	9.836	151	-22.4	0.075	0	0.044	-35
0.90	0.085	56	19.8	9.768	148	-22.5	0.075	0	0.042	-39
1.00	0.093	55	19.7	9.657	145	-22.4	0.076	-1	0.040	-47
1.10	0.101	53	19.6	9.530	141	-22.4	0.076	-1	0.037	-55
1.20	0.108	51	19.5	9.406	137	-22.4	0.076	-1	0.036	-64
1.30	0.113	50	19.4	9.314	135	-22.4	0.076	0	0.035	-72
1.40	0.119	47	19.3	9.189	131	-22.4	0.076	0	0.033	-82
1.50	0.124	45	19.1	9.027	128	-22.4	0.076	0	0.033	-96
1.60	0.131	43	19.0	8.902	125	-22.3	0.076	-1	0.033	-108
1.70	0.134	42	18.9	8.822	122	-22.3	0.077	-1	0.034	-118
1.80	0.138	40	18.7	8.644	119	-22.3	0.077	0	0.036	-131
1.90	0.141	38	18.6	8.504	116	-22.3	0.077	-1	0.040	-142
2.00	0.145	37	18.5	8.367	113	-22.3	0.077	0	0.044	-153
2.20	0.149	34	18.2	8.129	107	-22.2	0.078	0	0.054	-170
2.40	0.153	31	17.9	7.854	101	-22.1	0.079	-1	0.069	175
2.60	0.153	30	17.7	7.640	97	-22.0	0.079	-1	0.083	165
2.80	0.152	29	17.4	7.399	91	-21.9	0.080	-1	0.101	156
3.00	0.149	28	17.1	7.176	86	-21.8	0.081	-1	0.117	150
3.20	0.146	28	16.9	6.986	81	-21.8	0.082	-1	0.134	144
3.40	0.141	28	16.5	6.708	76	-21.6	0.083	-2	0.154	139
3.60	0.138	29	16.2	6.482	71	-21.6	0.084	-2	0.170	135
3.80	0.131	29	15.9	6.258	66	-21.4	0.085	-2	0.186	131
4.00	0.126	30	15.7	6.093	62	-21.3	0.086	-2	0.199	128
4.20	0.119	32	15.4	5.890	57	-21.2	0.087	-3	0.213	126
4.40	0.115	34	15.2	5.735	53	-21.1	0.088	-3	0.226	125
4.60	0.107	34	14.9	5.579	49	-20.9	0.090	-3	0.243	124
4.80	0.099	37	14.7	5.463	45	-20.7	0.092	-4	0.262	123
5.00	0.089	41	14.5	5.339	40	-20.5	0.094	-5	0.287	121
5.50	0.077	62	14.0	5.027	28	-20.1	0.098	-7	0.341	114
6.00	0.088	80	13.5	4.712	18	-19.9	0.102	-9	0.383	108
6.50	0.112	89	12.9	4.413	7	-19.6	0.105	-12	0.424	102
7.00	0.143	92	12.4	4.167	-3	-19.1	0.111	-15	0.468	95
7.50	0.185	93	11.9	3.940	-14	-18.8	0.115	-19	0.516	88
8.00	0.247	90	11.2	3.633	-25	-18.7	0.117	-24	0.573	82

The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions.
Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

Preliminary

NGA-586 DC-6.0 GHz 5.0V GaAs HBT

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

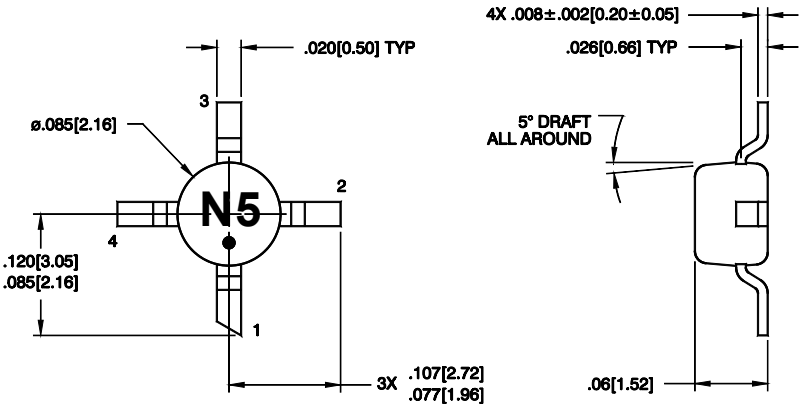
Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
NGA-586	7"	1000

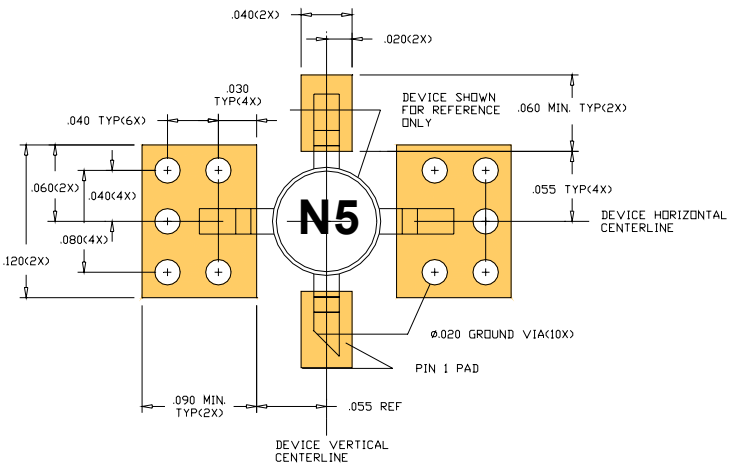
Part Symbolization

The part will be symbolized with a "N5" designator on the top surface of the package.

Package Dimensions



PCB Pad Layout

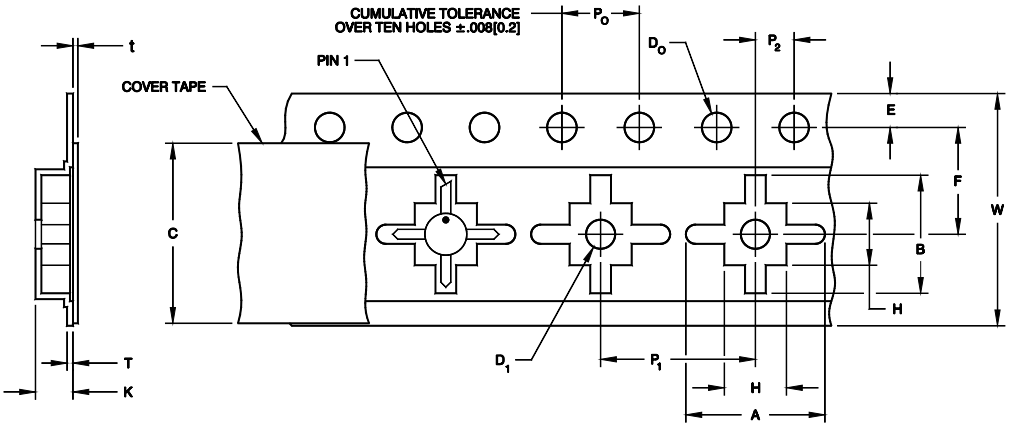


The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions.
Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.

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

The information provided herein is believed to be reliable at press time. Stanford Microdevices assumes no responsibility for inaccuracies or omissions. Stanford Microdevices assumes no responsibility for the use of this information, and all such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. Stanford Microdevices does not authorize or warrant any Stanford Microdevices product for use in life-support devices and/or systems.
Copyright 2000 Stanford Microdevices, Inc. All worldwide rights reserved.