18.0-38.0 GHz GaAs MMIC Buffer Amplifier

MIMIX BROADBAND™

April 2005 - Rev 01-Apr-05

XB1006

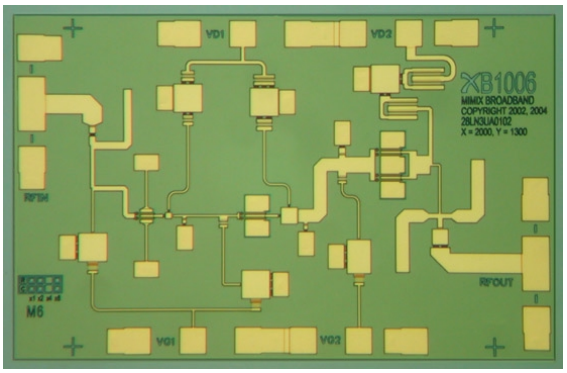
Features

- High Dynamic Range/Positive Gain Slope
- Excellent LO Driver/Buffer Amplifier
- Low Noise or Power Bias Configurations
- 21.0 dB Small Signal Gain
- 3.2 dB Noise Figure at Low Noise Bias
- +15 dBm P1dB Compression Point at Power Bias
- 100% On-Wafer RF, DC and Noise Figure Testing
- 100% Visual Inspection to MIL-STD-883 Method 2010

General Description

Mimix Broadband's three stage 18.0-38.0 GHz GaAs MMIC buffer amplifier has a small signal gain of 21.0 dB with a positive gain slope, and a noise figure of 3.2 dB across the band. This MMIC uses Mimix Broadband's 0.15 μm GaAs PHEMT device model technology, and is based upon electron beam lithography to ensure high repeatability and uniformity. The chip has surface passivation to protect and provide a rugged part with backside via holes and gold metallization to allow either a conductive epoxy or eutectic solder die attach process. This device is well suited for Millimeter-wave Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

Chip Device Layout



Absolute Maximum Ratings

Supply Voltage (Vd)	+6.0 VDC
Supply Current (Id)	120 mA
Gate Bias Voltage (Vg)	+0.3 VDC
Input Power (Pin)	+5 dBm
Storage Temperature (Tstg)	-65 to +165 °C
Operating Temperature (Ta)	-55 to MTTF Table[5]
Channel Temperature (Tch)	MTTF Table[5]

(5) Channel temperature affects a device's MTBF. It is recommended to keep channel temperature as low as possible for maximum life.

Electrical Characteristics (Ambient Temperature T = 25 °C)

Parameter	Units	Min.	Typ.	Max.
Frequency Range (f)	GHz	18.0	-	38.0
Input Return Loss (S11)[3]	dB	4.0	14.0	-
Output Return Loss (S22)[3]	dB	7.0	12.0	-
Small Signal Gain (S21)[3]	dB	19.0	21.0	27.0
Gain Flatness (ΔS21)	dB	-	+/-2.0	-
Reverse Isolation (S12)[3]	dB	40.0	50.0	-
Noise Figure (NF)[4]	dB	-	3.2	4.5
Output Power for 1 dB Compression (P1dB)[1,2,3]	dBm	-	+15.0	-
Output Third Order Intercept Point (OIP3)[1,2,3]	dBm	-	+25.0	-
Saturated Output Power (Psat)[1,2,3]	dBm	+14.0	+18.0	-
Drain Bias Voltage (Vd1,2)	VDC	-	+3.5	+5.5
Gate Bias Voltage (Vg1,2)	VDC	-1.2	-0.3	+0.1
Supply Current (Id) (Vd=3.5V, Vg=-0.3V Typical)	mA	-	50	100

(1) Optional low noise bias Vd1,2=3.5V, Id=50mA will typically yield 3-4dB decreased P1dB and OIP3.
(2) Measured using constant current.
(3) Unless otherwise indicated, min/max over 18.0-38.0 GHz and biased at Vd=5.5V, Id1=50mA, Id2=50mA.
(4) Unless otherwise indicated, min/max over 20.0-38.0 GHz and biased at Vd=3.5V, Id1=25mA, Id2=25mA.

Mimix Broadband, Inc., 10795 Rockley Rd., Houston, Texas 77099
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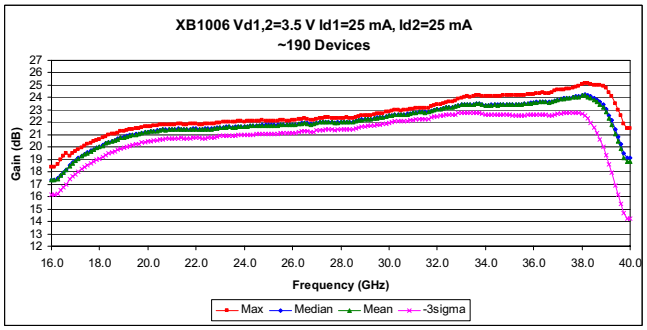
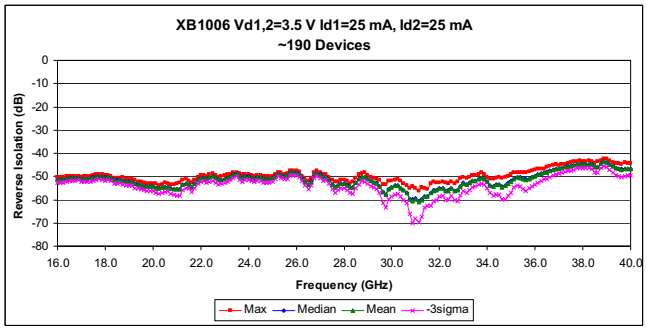
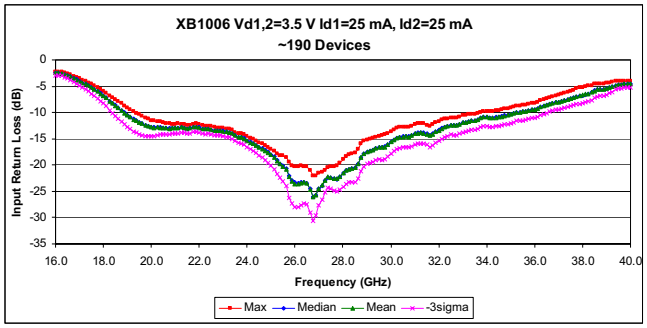
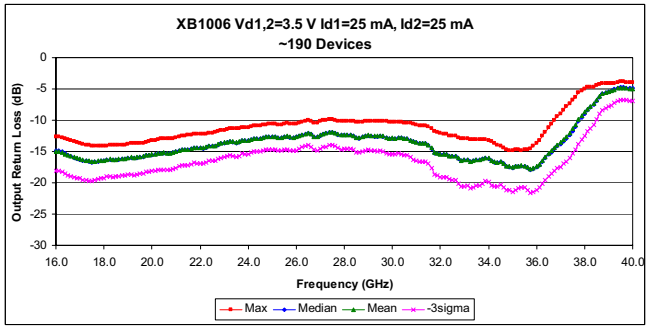
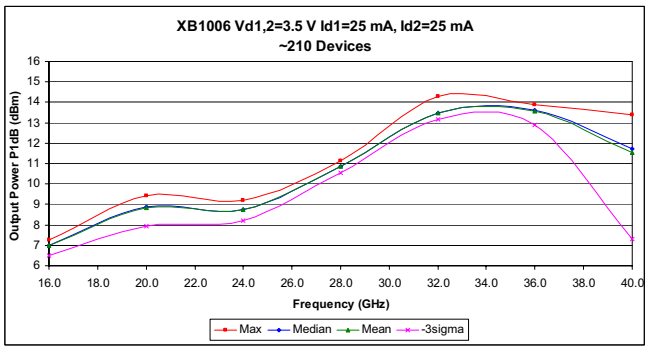
Buffer Amplifier Measurements

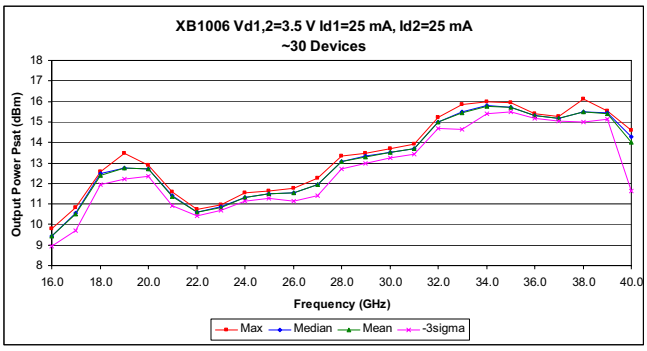


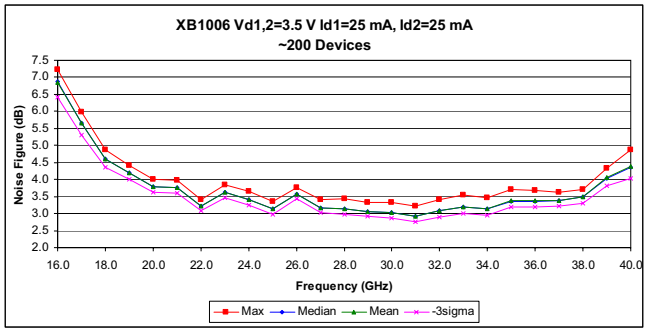












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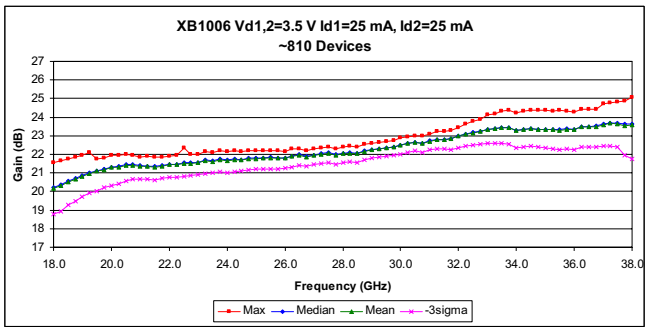
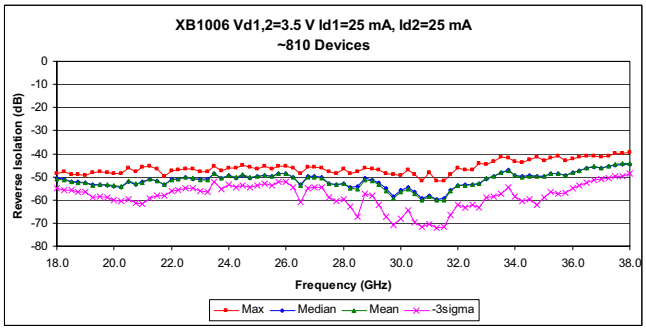
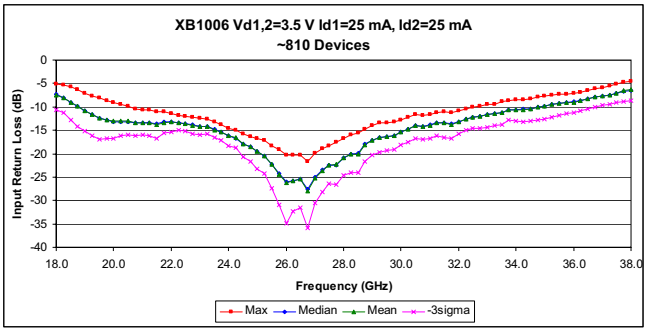
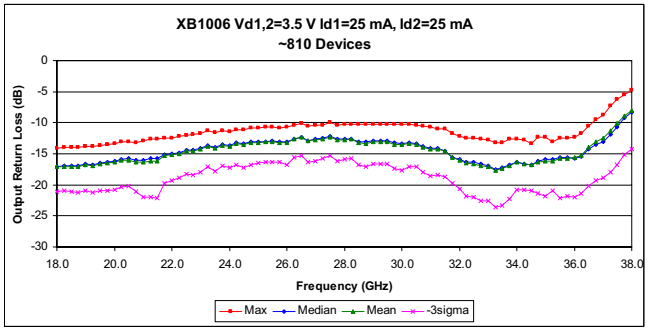
Buffer Amplifier Measurements (cont.)









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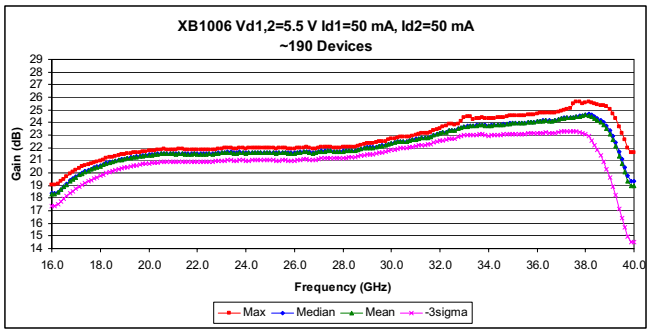
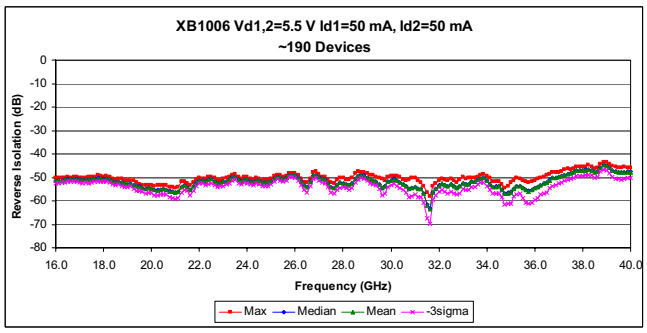
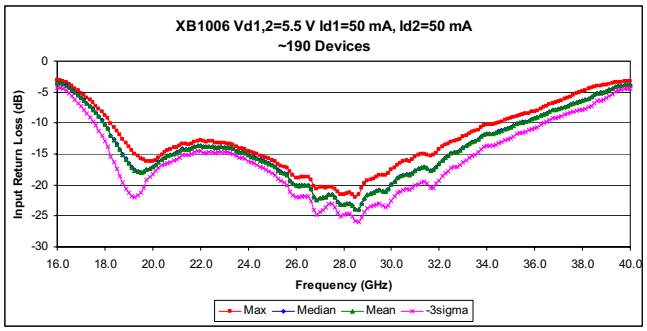
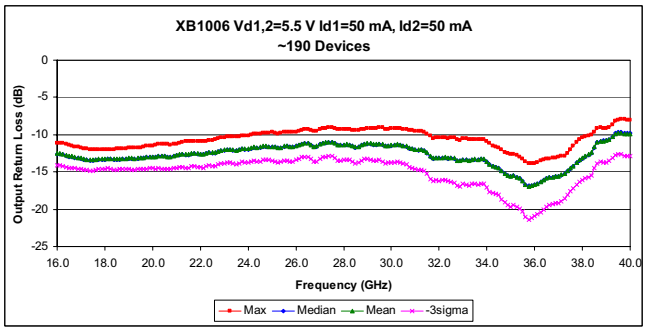
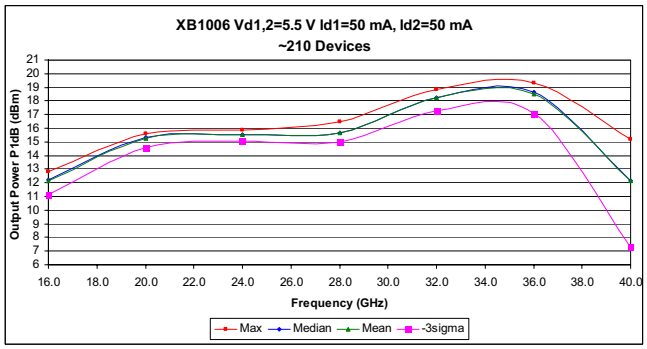
Buffer Amplifier Measurements (cont.)

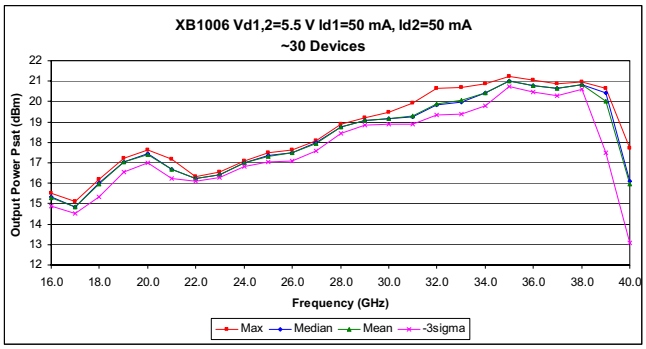


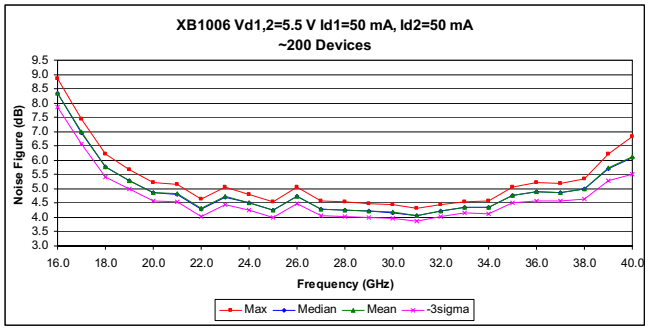












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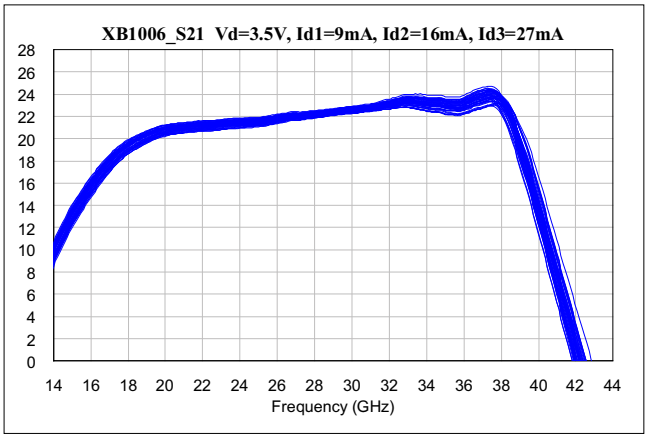
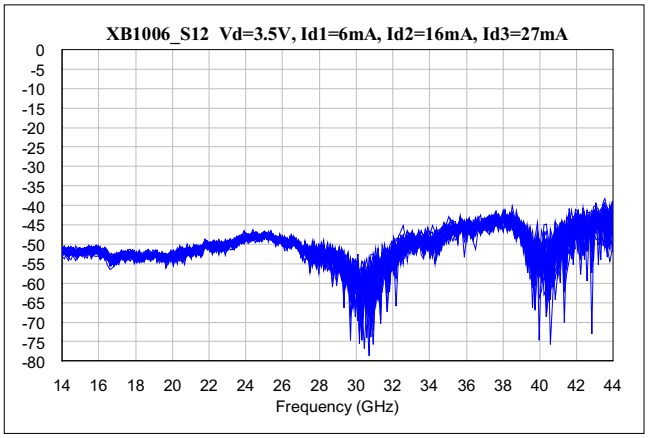
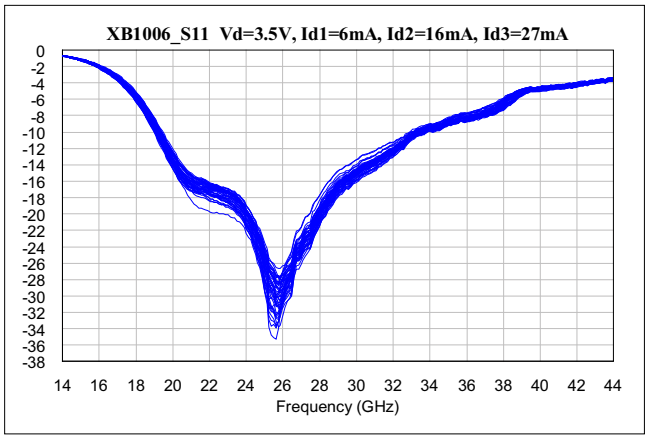
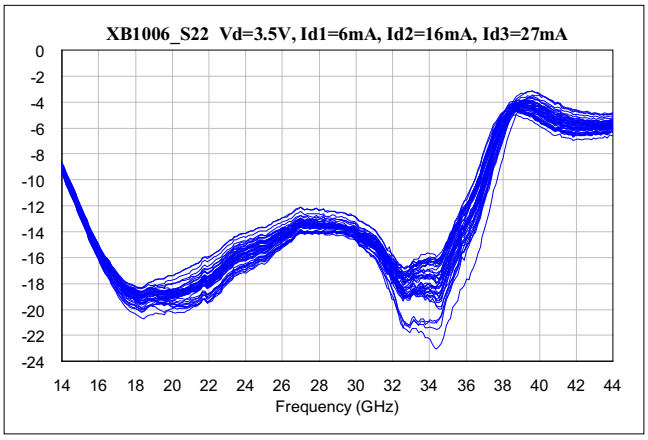
Buffer Amplifier Measurements (cont.)









S-Parameters

Typical S-Parameter Data for XB1006
Vd=3.5 V Id1=25 mA Id2=25 mA

Frequency (GHz)	S11 Mag dB	S11 Phase Ang°	S12 Mag dB	S12 Phase Ang°	S21 Mag dB	S21 Phase Ang°	S22 Mag dB	S22 Phase Ang°
18.00	-7.773806601	110.93875	-51.10986812	139.10685	20.22639513	84.969925	-17.32815226	-38.716015
18.25	-8.162747323	105.98645	-51.49522883	135.14065	20.34244897	80.260965	-17.23889907	-71.98476
18.50	-9.130519159	94.211605	-52.17691825	135.1086	20.52858812	70.446355	-17.21312958	-130.19765
18.75	-10.02790389	81.788275	-52.50009774	135.01865	20.67675717	60.82064	-17.26944122	135.5954
19.00	-10.95498978	67.86153	-52.72913708	134.78135	20.8248181	51.66703	-16.98382628	64.634375
19.25	-11.74494329	53.389425	-53.91884964	133.50715	20.97514946	42.279825	-17.1440838	-10.82046
19.50	-12.46646314	38.568515	-53.18329373	137.41785	21.09349368	33.177575	-16.88958232	-86.80098
19.75	-12.79467832	22.71995	-52.95588896	140.61805	21.15698194	24.465385	-16.79694374	-138.0544
20.00	-13.14270248	6.292512	-53.38806637	136.797	21.287821	15.5962	-16.57764791	121.56325
20.25	-13.12488683	-7.856535	-53.8705525	150.18175	21.32208872	6.8977315	-16.22096954	48.1719
20.50	-13.14723996	-23.77885	-50.95656409	147.3615	21.40545139	-1.950743	-16.15785598	-32.446515
20.75	-13.44876239	-35.24832	-52.29715539	140.4727	21.39281681	-10.7653	-16.53085465	-105.68465
21.00	-13.52084243	-46.837905	-51.39903551	138.7979	21.34517349	-19.08982	-16.64154193	147.5137
21.25	-13.5922257	-57.618795	-50.11938675	135.56395	21.30917776	-26.87138	-16.52182835	107.33095
21.50	-13.97287375	-63.98557	-51.13291392	112.8787	21.26862079	-34.241405	-16.59040735	39.155665
21.75	-13.51727823	-69.73093	-53.4636666	137.29845	21.34398378	-41.12318	-15.58802895	-34.84188
22.00	-13.4483806	-78.4264	-51.48477821	135.4175	21.41881496	-48.89947	-15.38597929	-112.24645
22.25	-13.5358511	-87.661645	-50.96277637	134.1523	21.43238058	-56.513925	-15.13983056	145.43045
22.50	-13.70280366	-94.262585	-50.45332234	133.70855	21.49123812	-63.89781	-14.683529	97.03156
22.75	-14.14391341	-100.45	-50.35491946	128.0535	21.49930107	-71.443245	-14.7185138	22.53718
23.00	-14.44812992	-104.23155	-51.39960177	122.7393	21.5230339	-78.35226	-14.44250801	-49.814175
23.25	-14.33906327	-110.20235	-51.59092697	135.94805	21.64441654	-85.662065	-13.86240665	-125.38725
23.50	-15.07247086	-121.0083	-48.34315964	121.337	21.61535654	-93.743035	-14.22712759	127.2124
23.75	-15.51049209	-121.9702	-50.72865172	124.4996	21.69825689	-100.36765	-13.7112322	85.07165
24.00	-16.43690686	-128.77055	-49.22340314	112.2295	21.66745741	-107.8524	-13.97537864	11.784975
24.25	-16.88508017	-133.52675	-50.02058269	114.94385	21.71732373	-114.79575	-13.52486386	-62.037595
24.50	-18.20792022	-139.1886	-48.60983333	104.94955	21.67390177	-121.93355	-13.71039736	-135.804
24.75	-18.83294463	-140.24175	-49.73830469	107.3189	21.75319709	-128.98265	-13.41819338	121.6335
25.00	-19.96208254	-141.17845	-49.30583589	102.85295	21.76547937	-136.1063	-13.32016951	77.39966
25.25	-20.82223024	-145.09375	-49.28286648	106.77275	21.78317594	-143.6224	-13.17482336	0.92489635
25.50	-22.79029586	-143.78405	-49.6824333	97.49384	21.79117948	-150.16325	-13.17239044	-70.638055
25.75	-24.94760788	-143.8243	-48.50064341	100.7873	21.79517237	-157.26305	-13.24128365	-127.79815
26.00	-27.10841867	-130.5347	-48.36792596	90.430805	21.78924749	-163.91555	-13.329818	134.06635
26.25	-26.38808597	-108.6829	-50.12736894	73.886185	21.88776471	-168.057	-12.76647816	71.10848
26.50	-25.99964975	-105.6947	-53.66485733	78.72533	21.96746477	-154.12085	-12.45015484	-3.951353
26.75	-28.62381019	-85.358905	-50.20618912	100.3937	21.85667908	168.80485	-13.05771689	-79.435885
27.00	-25.50145554	-72.0912	-50.23393698	80.41017	21.92911393	164.55675	-12.86769734	-130.0279
27.25	-23.80120592	-66.620625	-50.35674964	72.48015	22.00524641	161.4778	-12.71686385	134.75865
27.50	-22.42501743	-74.036545	-52.72589671	62.982355	22.04507077	154.0106	-12.41891179	62.149695
27.75	-22.20491724	-71.90979	-53.27339706	82.345675	21.94205768	147.25125	-12.94772593	-12.909965

S-Parameters (cont.)

Typical S-Parameter Data for XB1006 (cont d)
Vd=3.5 V Id1=25 mA Id2=25 mA

Frequency (GHz)	S11 Mag dB	S11 Phase Ang°	S12 Mag dB	S12 Phase Ang°	S21 Mag dB	S21 Phase Ang°	S22 Mag dB	S22 Phase Ang°
28.00	-20.66381518	-74.19205	-52.94661232	71.497485	22.03225657	141.07495	-12.87844679	-83.23196
28.25	-19.87292983	-77.176315	-54.74643355	66.575355	22.06353776	133.9532	-12.73997388	-134.3971
28.50	-19.85366645	-77.13162	-56.11457052	98.15153	22.0131024	127.3179	-13.33782149	125.6188
28.75	-17.92405155	-75.39207	-51.48487216	84.224615	22.15214193	121.28985	-13.50581312	59.033515
29.00	-17.05594411	-83.655265	-51.98067442	59.47228	22.24564578	114.034	-13.17055383	-12.35481
29.25	-16.48426215	-90.029385	-53.53555447	54.34412	22.29955836	106.9239	-13.12667704	-86.047915
29.50	-16.30096749	-93.477965	-56.80033592	33.562475	22.32444058	100.2808	-13.16645065	-138.82875
29.75	-16.05155889	-97.622545	-59.57981733	67.751485	22.38390063	93.376195	-13.61296984	125.33905
30.00	-15.32192739	-100.70355	-57.29291052	81.110745	22.44783986	86.562925	-13.7665238	53.56833
30.25	-14.77973231	-105.3531	-55.59923561	74.754005	22.54764327	79.23272	-13.54761544	-18.27387
30.50	-13.90637243	-116.67795	-57.61449182	47.392435	22.62592452	71.516505	-13.61825768	-93.348435
30.75	-14.07337425	-122.66005	-60.04382196	12.979895	22.56039662	64.592015	-14.09952685	-130.42545
31.00	-13.88922339	-126.7588	-58.0366743	73.236565	22.69293665	57.867635	-14.44023976	122.49695
31.25	-13.26397117	-133.0622	-60.14698201	37.98453	22.78062193	50.275355	-14.44422405	47.336625
31.50	-13.16452432	-140.3916	-60.46252664	-15.40174	22.80738428	42.751065	-14.80093411	-27.465895
31.75	-13.6095979	-146.25725	-56.0668128	-115.37255	22.79097583	36.00424	-15.67019476	-102.7259
32.00	-13.07285879	-150.56895	-53.29910373	-1.6911485	22.93177686	28.53505	-16.23041144	-116.98635
32.25	-12.50657954	-156.03845	-52.75608826	132.09635	23.0506993	20.88901	-16.82205653	116.41835
32.50	-12.05340239	-161.93825	-52.62143804	128.2354	23.12964032	13.03169	-16.7656923	46.14878
32.75	-11.90808314	-165.0278	-51.93862005	132.9267	23.18981148	5.3307895	-17.13767081	-24.8769
33.00	-11.59851585	-152.62485	-49.88217441	138.3007	23.29745264	-2.7497245	-17.33933361	-96.674765
33.25	-11.37942665	164.94165	-48.83793104	143.50805	23.35467821	-10.64075	-17.95718956	-138.23915
33.50	-11.07437259	163.78545	-47.14877265	140.51125	23.40612905	-19.23941	-17.67557947	125.75565
33.75	-10.47260216	159.1624	-46.26632447	128.96525	23.42824267	-27.505455	-17.12847735	53.3983
34.00	-10.50876262	153.97935	-48.27127485	115.4357	23.25587256	-35.667295	-16.45238714	-25.603715
34.25	-10.40440512	148.05495	-48.8996033	118.68215	23.2969827	-43.740335	-16.63057827	-101.2108
34.50	-10.25392234	142.59805	-48.47291046	120.31615	23.34899926	-51.635875	-16.80320123	-114.21545
34.75	-9.95351944	135.58455	-48.55630728	115.61975	23.31100204	-61.13331	-16.0578984	114.59085
35.00	-9.7801829	129.55605	-49.08089355	112.51405	23.28224291	-68.76975	-15.78850854	33.6834
35.25	-9.363796959	124.9587	-47.71441858	120.1152	23.27909272	-77.655345	-15.84393601	-42.121665
35.50	-9.044097738	119.4332	-47.52514649	111.25935	23.25129438	-86.18715	-15.30254521	-120.2415
35.75	-8.966490885	112.0195	-48.65580777	113.17645	23.28798951	-94.435785	-15.12525772	122.55345
36.00	-8.834145542	108.24685	-47.4971327	114.9663	23.25081107	-103.5089	-15.03074603	85.048915
36.25	-8.674416856	104.4234	-46.68030708	115.6489	23.42256055	-112.7956	-14.85363559	9.9108795
36.50	-8.242578634	100.66145	-45.33213483	112.5023	23.43027722	-123.8212	-13.56642284	-62.39453
36.75	-7.83220589	95.463445	-45.10567231	99.39984	23.44833736	-133.02525	-12.63325706	-124.26955
37.00	-7.608324013	91.195565	-45.86158675	100.5199	23.53872449	-143.6121	-12.26129823	125.03845
37.25	-7.326308688	88.696615	-45.09405273	103.4801	23.57787171	-154.6609	-10.88711877	66.016285
37.50	-6.893970738	83.71637	-44.29659493	94.82308	23.56362656	-150.65565	-9.680515746	-17.99208
37.75	-6.485416526	79.78105	-44.1998834	91.879195	23.4026921	148.67915	-8.60806281	-95.16823
38.00	-6.274724758	77.38159	-44.03323757	84.794345	23.39619401	153.00565	-7.935489455	-118.68685

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S-Parameters (cont.)

Typical S-Parameter Data for XB1006
Vd=5.5 V Id1=50 mA Id2=50 mA

Frequency (GHz)	S11 Mag dB	S11 Phase Ang°	S12 Mag dB	S12 Phase Ang°	S21 Mag dB	S21 Phase Ang°	S22 Mag dB	S22 Phase Ang°
16.000	-3.543334474	53.128425	-51.27268862	160.5374	18.33300577	156.1343	-12.53000719	50.020395
16.125	-3.543334474	53.128425	-51.27268862	160.5374	18.33300577	156.1343	-12.53000719	50.020395
16.250	-3.666919789	134.90655	-51.24159485	160.4555	18.44889572	153.55905	-12.61718077	116.3095
16.375	-3.947485572	172.33845	-51.01166321	160.00475	18.67314866	148.4077	-12.75722316	124.451
16.500	-4.257494299	170.6402	-50.78760653	157.76265	18.88012881	143.1932	-12.85386541	92.49176
16.625	-4.577508351	167.1688	-50.77319362	155.0547	19.07480485	138.05505	-12.92702128	58.096495
16.750	-5.091115964	161.54285	-50.7762499	152.6968	19.34568732	130.3197	-13.01542862	6.081978
16.875	-5.491460887	157.68635	-50.77786582	149.77815	19.50846536	125.16075	-13.07847526	-28.760405
17.000	-5.906604397	153.9697	-51.07813117	148.5859	19.66834861	120.0839	-13.16973847	-63.579195
17.125	-6.333462459	149.991	-51.15929092	148.4044	19.82012464	114.95805	-13.26924423	-98.20622
17.250	-6.789578866	145.82685	-51.09028607	147.74965	19.95882856	109.8493	-13.31684735	-124.79615
17.375	-7.268953371	141.5352	-51.00837934	147.10685	20.07661964	104.7852	-13.35776413	-42.379825
17.500	-7.802696376	137.24875	-50.81011296	145.7922	20.18007588	99.862865	-13.3742576	115.0005
17.625	-8.364308634	132.7571	-50.59582036	144.035	20.28295505	94.97222	-13.33387107	122.74425
17.750	-8.964887376	128.0907	-50.37964862	140.41685	20.37062253	90.12685	-13.27239878	88.302995
17.875	-9.588720546	123.48785	-50.52666423	136.2704	20.45642314	85.38763	-13.26347087	52.932595
18.000	-10.22808499	118.55875	-50.78563026	135.685	20.53801015	80.733455	-13.27010449	17.8352
18.125	-10.91442113	113.2874	-50.58982663	134.03495	20.62205856	76.116835	-13.19648893	-17.40267
18.250	-12.02372258	105.081	-50.83211097	125.38215	20.73452407	69.208555	-13.22177658	-71.090805
18.375	-12.74582521	99.0806	-51.70995112	124.2938	20.80768804	64.64094	-13.28470597	-106.27955
18.500	-13.46739057	92.226705	-51.97640046	126.2598	20.87025773	60.09046	-13.28201673	-131.26315
18.625	-14.2797117	85.032335	-51.81864148	124.83045	20.92088974	55.64265	-13.25807806	-49.504285
18.750	-15.12117876	77.60725	-52.04552408	121.56355	20.98795918	51.30391	-13.22505939	106.858
18.875	-15.84642289	69.65264	-52.60911	120.5673	21.06014387	46.879275	-13.20510367	112.4717
19.000	-16.49218438	60.693055	-52.74856383	122.5152	21.1032617	42.46012	-13.15947673	77.05159
19.125	-17.15693005	50.82941	-52.49023944	119.6957	21.15791902	38.133045	-13.15667357	40.911265
19.250	-17.62677675	41.19882	-53.27293883	115.93445	21.20279335	33.719345	-13.21481934	5.627159
19.375	-17.84214237	30.96064	-53.81520913	117.8715	21.23068794	29.44139	-13.15433031	-29.51757
19.500	-17.99257314	20.597685	-53.93814929	117.30655	21.25734418	25.18205	-13.1195674	-65.09677
19.625	-17.87177072	10.20781	-54.51897041	117.8501	21.28441134	21.04184	-13.09236673	-100.59855
19.750	-17.53401696	-5.722246	-54.72540321	121.7078	21.35122201	14.89387	-12.99568776	-111.87725
19.875	-17.37079562	-14.566025	-54.63758587	122.50805	21.37380691	10.74832	-12.98276301	44.34761
20.000	-17.0925618	-22.492715	-54.7127099	121.4324	21.40120918	6.6682405	-12.96663566	125.64495
20.125	-16.72948077	-29.131525	-55.43049852	121.60025	21.42479897	2.581418	-12.93345459	98.609815
20.250	-16.26566985	-35.77474	-55.46490214	127.51435	21.44164247	-1.4060535	-12.87591939	62.7217
20.375	-15.89813716	-42.7789	-55.14669964	128.5237	21.4661167	-5.382533	-12.87868117	26.948795
20.500	-15.57382526	-49.00786	-55.00982959	128.00225	21.50181186	-9.403233	-12.88022724	-8.7853955
20.625	-15.35480861	-54.768445	-55.09443704	125.92595	21.52008758	-13.516385	-12.94176551	-44.338
20.750	-15.19832979	-59.258895	-55.87629898	126.6779	21.50400933	-17.43509	-12.93841714	-79.39115
20.875	-14.97358474	-63.457595	-56.10702485	130.41705	21.5058218	-21.32193	-12.83635505	-114.78585
21.000	-14.78091526	-67.169825	-56.48204806	134.69955	21.50140608	-25.22435	-12.75393276	-108.1275
21.125	-14.51352789	-70.868345	-56.16099097	143.1155	21.49880598	-28.96836	-12.65618689	48.12609
21.250	-14.19641598	-77.409575	-54.09859429	146.7013	21.52488964	-34.683675	-12.59635296	119.77755
21.375	-14.19647665	-81.508425	-53.3570701	139.98635	21.51102959	-38.617655	-12.6349827	83.974185
21.500	-14.26436814	-83.784905	-54.01043617	133.97195	21.47238314	-42.242495	-12.65534316	48.72413
21.625	-14.10595825	-84.9867	-55.28507219	140.4089	21.4635233	-45.62981	-12.55914765	13.645015
21.750	-13.75735804	-88.03732	-53.85581469	152.23165	21.49371655	-49.231985	-12.48387837	-22.516115
21.875	-13.61681041	-92.36858	-52.12541735	148.7332	21.50509696	-52.99611	-12.55063454	-58.43523
22.000	-13.64557356	-96.408495	-51.33705923	142.4016	21.49447912	-56.683695	-12.60279026	-93.76673
22.125	-13.81836577	-99.26957	-51.33561566	135.13285	21.46502232	-60.32387	-12.62812969	-121.65225
22.250	-13.85349443	-100.9768	-51.81366612	134.57605	21.45927959	-63.627225	-12.49088541	-39.256035
22.375	-13.74160943	-103.1917	-51.16667546	135.53175	21.48961108	-66.98402	-12.37123679	117.06315
22.500	-13.80451768	-106.3348	-50.70036342	127.495	21.50059923	-70.574705	-12.41934776	123.7329
22.625	-13.95680758	-108.1003	-51.66101097	121.60345	21.49110727	-74.03155	-12.40563092	90.17866
22.750	-13.91883856	-110.33155	-52.55117959	125.92505	21.51251686	-79.005535	-12.21666077	37.69285
22.875	-13.85986278	-112.9094	-52.36395327	129.0922	21.55480974	-82.422955	-12.0993599	1.7223855
23.000	-13.8979534	-115.5977	-51.9397174	130.15935	21.57874948	-86.059995	-12.03596495	-34.07807
23.125	-13.97465278	-117.84515	-51.64341454	129.94485	21.58652443	-89.609445	-11.97691372	-69.87784
23.250	-14.00292799	-120.01485	-51.09797204	130.93345	21.61126464	-93.17945	-11.96206474	-106.02645
23.375	-14.14953948	-123.23065	-49.95395592	127.96625	21.61210098	-96.8759	-12.05358495	-133.1404
23.500	-14.51775974	-125.32675	-49.72214536	117.24785	21.56533191	-100.35685	-12.15870459	-50.46395
23.625	-14.72778835	-125.87575	-50.99022235	111.96855	21.57023675	-103.50015	-12.00500883	107.20185
23.750	-14.72837031	-127.48435	-51.63995526	116.8559	21.62078866	-106.9533	-11.83007995	113.39185
23.875	-14.88743634	-130.23745	-50.93850852	118.2655	21.60544716	-110.6568	-11.89467832	77.397345

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S-Parameters (cont.)

Typical S-Parameter Data for XB1006 (cont d)
Vd=5.5 V Id1=50 mA Id2=50 mA

Frequency (GHz)	S11 Mag dB	S11 Phase Ang°	S12 Mag dB	S12 Phase Ang°	S21 Mag dB	S21 Phase Ang°	S22 Mag dB	S22 Phase Ang°
24.000	-15.21920825	-131.86245	-51.07093403	112.93355	21.56763216	-113.9678	-11.9129727	42.82602
24.125	-15.38376418	-132.39535	-51.69046883	112.44155	21.58437139	-117.14405	-11.79116811	7.775024
24.250	-15.52565175	-134.541	-51.97561893	114.8329	21.6064317	-122.24715	-11.68278127	-45.64484
24.375	-15.72129284	-136.96955	-51.43043653	116.1949	21.59114026	-125.60585	-11.72120114	-81.18817
24.500	-16.0094649	-138.2525	-51.4881126	111.7	21.59342144	-128.8389	-11.68280916	-115.9288
24.625	-16.16885881	-139.343	-52.14027546	112.5103	21.60991722	-132.234	-11.56440369	-109.0967
24.750	-16.36446103	-141.2045	-52.20443082	114.9774	21.60516191	-135.66925	-11.55241248	47.009415
24.875	-16.59461366	-142.9684	-52.11892709	117.8025	21.59165979	-139.0059	-11.57332716	128.6566
25.000	-16.84448186	-144.6722	-51.60131408	121.2165	21.58847897	-142.32195	-11.59911498	102.0822
25.125	-17.14823284	-146.6045	-50.62957531	122.0531	21.57853979	-145.60285	-11.65354246	66.82758
25.250	-17.60673438	-148.0523	-49.7080152	115.8819	21.55997351	-148.7575	-11.76753225	32.32097
25.375	-17.93754552	-148.08595	-50.19345327	109.4286	21.57521603	-151.85735	-11.69672267	-1.882729
25.500	-18.13814232	-148.6903	-50.67164393	110.10145	21.59688015	-155.1494	-11.55077367	-36.986075
25.625	-18.3888716	-150.6945	-50.26237168	114.4432	21.59480557	-158.5771	-11.5202147	-72.837795
25.750	-19.34065582	-151.24565	-48.93123607	106.1648	21.55330789	-163.3257	-11.66254147	-124.79765
25.875	-19.82114464	-149.6809	-48.9405375	99.66612	21.55634356	-166.38805	-11.6364023	-116.93175
26.000	-20.11184438	-147.52895	-49.20085107	91.718585	21.56080201	-168.7218	-11.54407653	40.709015
26.125	-20.14571732	-145.9401	-50.17945699	85.456085	21.5892518	-170.10245	-11.38369733	123.1676
26.250	-20.06859892	-145.54925	-51.8526023	83.663375	21.6335216	-166.954	-11.20424851	96.39711
26.375	-20.01516588	-146.2477	-53.50343694	89.367175	21.65667397	-53.25628	-11.10965808	60.44407
26.500	-20.01355758	-148.58045	-54.11102969	104.0263	21.66609046	135.22685	-11.08488478	23.98424
26.625	-20.61467361	-153.43695	-51.98079949	117.7029	21.6230283	167.73845	-11.34160259	-12.19327
26.750	-21.88632675	-152.4749	-49.39861974	110.86695	21.56692861	170.41685	-11.63254489	-45.68579
26.875	-22.4752201	-145.64575	-48.9347224	97.547905	21.59057789	168.4559	-11.55263653	-78.43077
27.000	-22.20000412	-141.59255	-49.74543709	87.77882	21.67284912	165.3648	-11.26188447	-112.80025
27.125	-22.0435251	-141.7644	-50.65236837	86.81384	21.70944928	161.829	-11.11952664	-106.5667
27.250	-22.01451758	-138.06995	-50.93598837	80.30542	21.71008603	157.00465	-11.06284584	115.9786
27.375	-21.58694701	-139.1921	-52.56626735	76.236725	21.74042485	153.7456	-10.95943133	122.3906
27.500	-21.59866211	-142.62735	-54.21653923	83.25311	21.7309718	150.26675	-10.97958935	86.175395
27.625	-21.98942304	-145.14215	-54.48732582	95.61943	21.68422186	147.1408	-11.16182425	50.536855
27.750	-22.68261299	-144.8368	-53.29550464	101.7521	21.66334314	144.2337	-11.34038272	16.173105
27.875	-23.16643825	-141.36095	-52.31994821	98.759055	21.68525593	141.2623	-11.37188021	-17.82357
28.000	-23.14956309	-138.54815	-52.42950036	95.65802	21.71189773	138.19205	-11.32671277	-52.52055
28.125	-23.01741629	-137.5345	-52.8220425	96.34965	21.72953598	135.09555	-11.31554184	-87.548615
28.250	-22.97093629	-137.9747	-53.18703235	101.6996	21.75340366	131.95125	-11.34539996	-122.9747
28.375	-23.31577727	-138.56195	-52.39412566	109.1521	21.75153412	128.7764	-11.49311056	-115.74995
28.500	-23.91251603	-135.7644	-50.51675638	109.6703	21.75557268	125.96685	-11.64991315	42.489845
28.625	-23.93239959	-129.6261	-49.43331444	102.5751	21.81736289	123.12735	-11.59604084	126.20155
28.750	-22.96122232	-123.2153	-48.95675311	90.041645	21.90837175	118.336	-11.34277909	83.42483
28.875	-22.15695629	-122.8402	-49.24540474	81.97827	21.94986722	115.1162	-11.20193485	48.021415
29.000	-21.60678412	-125.119	-50.04941408	76.941975	21.98969938	111.8611	-11.16456693	12.34563
29.125	-21.3768034	-127.6307	-50.7813625	74.77822	22.00844191	108.47815	-11.19644082	-23.097195
29.250	-21.24150371	-128.70525	-51.21112888	75.07153	22.01191495	105.36775	-11.27075605	-58.023675
29.375	-20.93836062	-130.1043	-51.6908526	71.463965	22.05772299	102.45195	-11.27946513	-92.64542
29.500	-20.78222608	-131.6797	-52.870735	69.6356	22.12570974	99.224785	-11.22108189	-119.99525
29.625	-20.93948454	-133.53285	-54.41022383	75.68392	22.15162485	95.874185	-11.28889813	-38.721175
29.750	-21.08035706	-132.35915	-53.85511673	90.93254	22.18492046	92.943	-11.48258869	118.7528
29.875	-20.63146031	-129.92965	-51.91506378	90.976465	22.27534072	89.849635	-11.47876406	127.2755
30.000	-19.96730113	-130.2296	-51.30584388	83.92893	22.34591856	86.39127	-11.40738237	93.16464
30.125	-19.41948397	-132.5673	-50.82004066	79.53503	22.38391036	82.98848	-11.37779078	58.364235
30.250	-18.89634619	-136.90975	-51.45371015	68.004445	22.4512832	77.786155	-11.30615633	4.6119025
30.375	-18.62127546	-139.24225	-52.18642306	65.39845	22.47216469	74.2767	-11.40485693	-30.851445
30.500	-18.38143871	-142.2219	-52.87613867	62.726115	22.47482082	70.964125	-11.48629139	-66.02651
30.625	-18.24806593	-145.3159	-53.70054673	60.40257	22.5056382	67.758745	-11.55512706	-101.57275
30.750	-18.34657119	-147.14985	-55.0009651	64.649205	22.54186345	64.59571	-11.77729829	-128.2526
30.875	-18.14474165	-147.09445	-54.51274541	71.018445	22.60229675	61.424465	-11.89321464	-45.374295
31.000	-17.63705577	-149.2775	-54.18599857	65.688685	22.66853464	58.07938	-11.95631003	111.7373
31.125	-17.38021985	-153.0041	-54.88707995	62.784435	22.731925	54.59637	-12.03878816	119.4593
31.250	-17.1696383	-156.21145	-54.87215929	54.790195	22.76929727	50.955385	-11.99108572	84.28259
31.375	-17.06774448	-160.3822	-56.85707668	36.56217	22.77005222	47.51476	-12.08702924	47.75846
31.500	-17.25606603	-163.3889	-61.79889168	16.59158	22.79044742	44.34584	-12.42513486	11.793325
31.625	-17.6616551	-164.96525	-63.35414286	19.057985	22.83018041	41.252475	-12.90038372	-22.26599
31.750	-17.53645933	-161.67595	-56.46988939	124.32135	22.98212567	36.3717	-13.16933403	-70.880425
31.875	-17.01227995	-162.26915	-54.8714123	125.24015	23.08190835	32.736725	-13.09617612	-104.6979

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S-Parameters (cont.)

Typical S-Parameter Data for XB1006 (cont d)
Vd=5.5 V Id1=50 mA Id2=50 mA

Frequency (GHz)	S11 Mag dB	S11 Phase Ang°	S12 Mag dB	S12 Phase Ang°	S21 Mag dB	S21 Phase Ang°	S22 Mag dB	S22 Phase Ang°
32.000	-16.55361232	-164.26315	-53.59910684	118.83345	23.13565263	29.066855	-13.1149148	-130.26145
32.125	-16.0422466	-165.3645	-52.71391597	108.13085	23.18744402	25.49305	-13.0570875	-47.489575
32.250	-15.60784577	-167.263	-53.29241714	99.732105	23.2539218	21.958965	-13.03376276	109.5451
32.375	-15.29725309	-164.65055	-53.67478684	101.4027	23.35165397	18.239935	-13.14077898	117.2396
32.500	-14.86042907	-53.21456	-52.98950694	98.663295	23.38727814	14.268655	-13.10578719	82.80108
32.625	-14.75619454	134.36195	-53.77236342	93.21463	23.37755119	10.796945	-13.18059449	46.893205
32.750	-14.67547809	167.6909	-54.458515	99.46326	23.47577737	7.4840655	-13.44826179	12.556225
32.875	-14.34022134	167.921	-53.76853158	107.18615	23.60658809	3.619222	-13.50910347	-20.6218
33.000	-13.90397763	168.33825	-52.43178964	103.39245	23.67601541	-0.6519656	-13.33024801	-55.084845
33.125	-13.67776031	165.052	-52.75895786	97.15583	23.68995407	-4.7681985	-13.34370531	-90.77849
33.250	-13.42525005	162.74275	-52.77449459	102.4775	23.72833186	-10.86228	-13.47024964	-133.0403
33.375	-13.09896985	159.7504	-51.88785286	100.18335	23.73808113	-14.830845	-13.32052209	-50.590155
33.500	-12.95917567	156.56895	-51.813475	97.99158	23.75875835	-18.54251	-13.30077663	105.5857
33.625	-12.66828433	154.2127	-51.12870082	96.699565	23.80770464	-22.56155	-13.33209582	112.09235
33.750	-12.24111979	151.0432	-50.41224301	90.674935	23.81087263	-26.861065	-13.25679867	76.56845
33.875	-11.88207691	146.6052	-50.35291888	80.590285	23.76277716	-30.93225	-13.29972628	39.64577
34.000	-11.75042887	141.95355	-51.2991802	71.158065	23.73378191	-34.65329	-13.64688204	2.6842695
34.125	-11.77325474	138.8619	-52.82588709	68.865255	23.76212258	-38.380735	-14.03301133	-32.42778
34.250	-11.71584536	136.4474	-54.07188051	72.855275	23.78563464	-42.205995	-14.25395423	-66.79835
34.375	-11.54771639	133.8927	-54.08411908	79.91488	23.80543273	-46.144935	-14.33216888	-101.36465
34.500	-11.38496255	131.3505	-53.83467949	74.304175	23.81694686	-50.211045	-14.44608704	-128.34
34.625	-11.24423796	128.8953	-55.28860587	70.271605	23.83745835	-54.16155	-14.85397842	-46.55993
34.750	-10.97923571	125.3549	-57.08028439	85.28558	23.88273149	-60.24161	-15.23184189	127.507
34.875	-10.78857187	122.6132	-56.68814286	93.32067	23.9003334	-64.31684	-15.44116372	100.925
35.000	-10.65660524	120.5954	-56.31567648	100.98095	23.91731119	-68.412	-15.58392515	67.16339
35.125	-10.39723405	118.6365	-54.74043214	104.9856	23.92655629	-72.535225	-15.51752893	32.02474
35.250	-10.1267806	115.86785	-53.80544505	102.2271	23.92986278	-76.74997	-15.67919214	-4.0178355
35.375	-9.983034356	112.6982	-53.6553402	96.08085	23.92055753	-80.80776	-15.90342638	-39.75547
35.500	-9.887291691	110.13915	-54.40607122	91.55193	23.94103753	-84.75887	-16.21970689	-75.388445
35.625	-9.767329005	108.2422	-55.4449099	93.56856	23.98785392	-88.912315	-16.68511112	-109.6409
35.750	-9.600734247	106.4578	-55.91022796	105.67105	24.02490943	-93.34788	-16.89497413	-129.6837
35.875	-9.412012474	104.1901	-55.25120143	110.1797	24.03741036	-97.662135	-16.82499189	-46.17434
36.000	-9.276381448	102.1543	-54.68814949	111.07895	24.08243191	-101.97215	-16.73521847	111.5975
36.125	-9.121892716	100.3142	-54.16534071	113.53825	24.11349046	-106.5954	-16.55739015	115.1319
36.250	-8.817051299	97.653915	-53.20342214	116.5085	24.1286268	-113.2468	-16.30590556	62.250015
36.375	-8.594450005	95.91193	-52.61844214	116.7846	24.14666918	-117.8939	-16.03789684	25.770575
36.500	-8.397044655	94.007925	-52.28424929	117.75565	24.11803129	-122.5247	-15.82309041	-12.02527
36.625	-8.150977175	92.09762	-51.26497102	120.0553	24.10167356	-126.78575	-15.77726837	-49.44285
36.750	-7.934845041	89.523825	-50.36719617	116.10185	24.13946376	-130.9621	-15.68457684	-86.82884
36.875	-7.813810531	87.16062	-50.10525347	113.12375	24.22505876	-135.64375	-15.60433628	-119.19545
37.000	-7.699763536	85.55241	-49.88600051	112.73935	24.28830675	-140.70275	-15.58818316	-76.55073
37.125	-7.519925258	83.97945	-49.41793122	112.177	24.3309984	-145.52535	-15.38531791	78.276005
37.250	-7.365563881	82.07025	-49.00675474	110.9316	24.38233794	-150.4251	-15.19996704	118.69495
37.375	-7.21156267	80.088055	-48.64077949	108.44515	24.38183005	-154.808	-14.85331429	84.506875
37.500	-7.027691464	78.322605	-48.27017847	106.9063	24.39615113	-159.58495	-14.51197602	45.002635
37.625	-6.843721737	76.60942	-47.88932689	106.5113	24.45675557	-163.49785	-14.17850495	5.8228865
37.750	-6.626921593	73.921235	-47.2437623	101.83975	24.48645959	-134.4972	-13.70842031	-55.011715
37.875	-6.495425263	72.20138	-47.07224582	97.17918	24.51507979	51.72232	-13.38474648	-95.73996
38.000	-6.38820017	70.896075	-47.03664704	92.481345	24.58761768	137.87455	-13.11555872	-114.19505
38.125	-6.188504046	69.62816	-46.89634168	91.13333	24.56920845	162.7462	-12.82711893	-38.380095
38.250	-6.017603067	68.198445	-46.66249653	87.61776	24.46684613	159.10595	-12.66776918	108.53725
38.375	-5.785100067	67.313765	-47.00334888	82.60402	24.31720572	152.13715	-12.38210454	102.2166
38.500	-5.414625196	65.53114	-47.94291286	85.360135	24.16082835	145.31495	-11.66613717	62.658195
38.625	-5.181375211	62.73246	-47.35842592	92.64512	24.00675201	138.3325	-11.04018896	19.53351
38.750	-5.126215113	60.331595	-45.70349204	90.403615	23.80507366	130.6258	-10.850122	-24.33323
38.875	-5.035691351	58.823355	-44.89640505	80.12534	23.52228412	122.66145	-10.8530879	-66.04875
39.000	-4.864393655	57.48875	-45.23777515	70.17135	23.10547454	114.497	-10.81041217	-105.54155
39.125	-4.664607093	55.86415	-46.05534638	63.22295	22.60284593	106.89675	-10.64209679	-108.52255
39.250	-4.425280072	53.70581	-47.1245524	61.68426	22.11046082	99.582135	-10.32829878	44.01386
39.375	-4.153711186	50.01061	-47.61547811	63.372305	21.31723737	88.78947	-9.921460694	111.9158
39.500	-4.039506897	47.49095	-47.86740668	62.55165	20.71789737	81.86312	-9.782557551	73.38179
39.625	-3.971814577	45.25562	-47.93607036	63.741735	20.0855266	74.863985	-9.780442122	32.85001
39.750	-3.887051021	43.461305	-47.71706668	62.04119	19.37448474	68.129215	-9.898582648	-6.6776805
39.875	-3.84035967	42.52614	-47.67557923	60.695225	19.00412376	65.03473	-9.950866719	-25.808525
40.000	-3.84035967	42.52614	-47.67557923	60.695225	19.00412376	65.03473	-9.950866719	-25.808525

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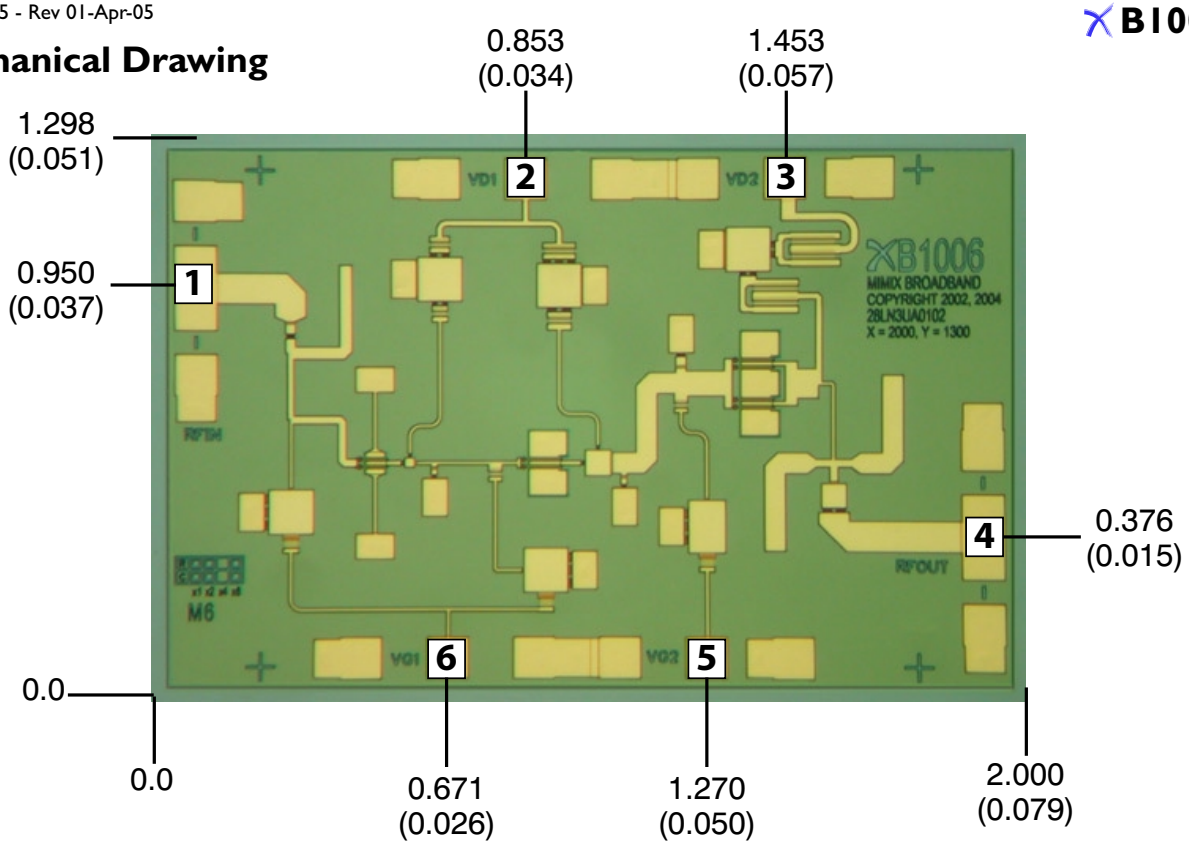
Mechanical Drawing

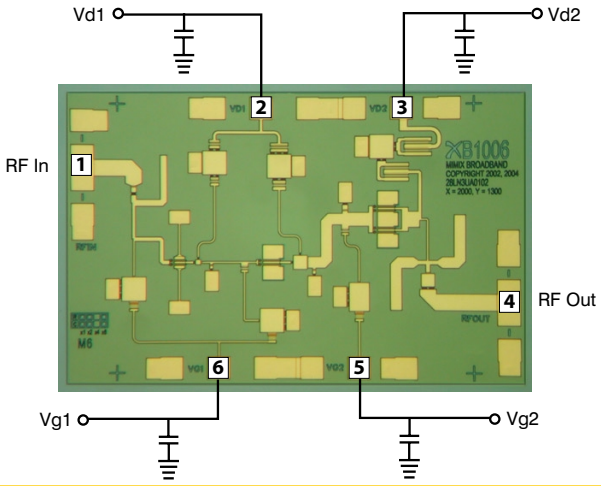


(Note: Engineering designator is 28LN3UA0102)

Units: millimeters (inches) Bond pad dimensions are shown to center of bond pad.
Thickness: 0.110 +/- 0.010 (0.0043 +/- 0.0004), Backside is ground, Bond Pad/Backside Metallization: Gold
All DC Bond Pads are 0.100 x 0.100 (0.004 x 0.004). All RF Bond Pads are 0.100 x 0.200 (0.004 x 0.008)
Bond pad centers are approximately 0.109 (0.004) from the edge of the chip.
Dicing tolerance: +/- 0.005 (+/- 0.0002). Approximate weight: 1.612 mg.

Bond Pad #1 (RF In)	Bond Pad #3 (Vd2)	Bond Pad #5 (Vg2)
Bond Pad #2 (Vd1)	Bond Pad #4 (RF Out)	Bond Pad #6 (Vg1)

Bias Arrangement



Bypass Capacitors - See App Note [2]

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App Note [1] Biasing - As shown in the bonding diagram, this device can be operated with all three stages in parallel, and can be biased for low noise performance or high power performance. Low noise bias is nominally Vd=3.5V, Id=50mA. More controlled performance will be obtained by separately biasing Vd1 and Vd2 each at 3.5V, 25mA. Power bias may be as high as Vd=5.5V, Id=100mA with all stages in parallel, or most controlled performance will be obtained by separately biasing Vd1 and Vd2 each at 5.5V, 50mA. It is also recommended to use active biasing to keep the currents constant as the RF power and temperature vary; this gives the most reproducible results. Depending on the supply voltage available and the power dissipation constraints, the bias circuit may be a single transistor or a low power operational amplifier, with a low value resistor in series with the drain supply used to sense the current. The gate of the pHEMT is controlled to maintain correct drain current and thus drain voltage. The typical gate voltage needed to do this is -0.3V. Typically the gate is protected with Silicon diodes to limit the applied voltage. Also, make sure to sequence the applied voltage to ensure negative gate bias is available before applying the positive drain supply.

App Note [2] Bias Arrangement -
For Parallel Stage Bias (Recommended for general applications) -- The same as Individual Stage Bias but all the drain or gate pad DC bypass capacitors (~100-200 pf) can be combined. Additional DC bypass capacitance (~0.01 uF) is also recommended to all DC or combination (if gate or drains are tied together) of DC bias pads.

For Individual Stage Bias (Recommended for saturated applications) -- Each DC pad (Vd1,2 and Vg1,2) needs to have DC bypass capacitance (~100-200 pf) as close to the device as possible. Additional DC bypass capacitance (~0.01 uF) is also recommended.

MTTF Tables

These numbers were calculated based on accelerated life test information and thermal model analysis received from the fabricating foundry.

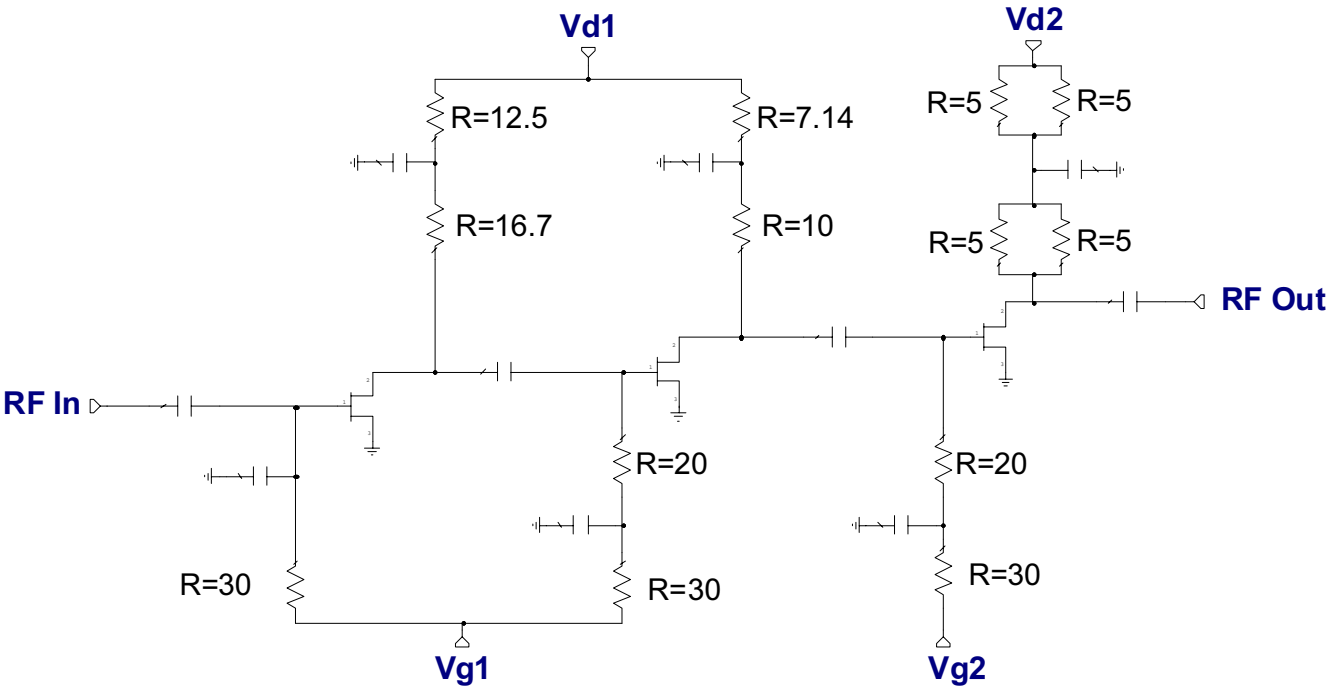
Backplate Temperature	Channel Temperature	Rth	MTTF Hours	FITs
55 deg Celsius	83.0 deg Celsius	159.9° C/W	8.28E+10	1.21E-02
75 deg Celsius	105.1 deg Celsius	171.9° C/W	5.33E+09	1.88E-01
95 deg Celsius	127.0 deg Celsius	182.6° C/W	4.75E+08	2.11E+00

Bias Conditions: Vd1=Vd2=3.5V, Id1=25 mA, Id2=25 mA

Backplate Temperature	Channel Temperature	Rth	MTTF Hours	FITs
55 deg Celsius	149.1 deg Celsius	171.2° C/W	8.14E+07	1.23E+01
75 deg Celsius	175.4 deg Celsius	182.5° C/W	7.93E+06	1.26E+02
95 deg Celsius	201.0 deg Celsius	192.8° C/W	1.04E+06	9.63E+02

Bias Conditions: Vd1=Vd2=5.5V, Id1=50 mA, Id2=50mA

Device Schematic



Handling and Assembly Information

CAUTION! - Mimix Broadband MMIC Products contain gallium arsenide (GaAs) which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- *Do not ingest.*
- *Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.*
- *Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.*

Life Support Policy - Mimix Broadband's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President and General Counsel of Mimix Broadband. As used herein: (1) Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. (2) A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ESD - Gallium Arsenide (GaAs) devices are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic containers, which should be opened in cleanroom conditions at an appropriately grounded anti-static workstation. Devices need careful handling using correctly designed collets, vacuum pickups or, with care, sharp tweezers.

Die Attachment - GaAs Products from Mimix Broadband are 0.100 mm (0.004") thick and have vias through to the backside to enable grounding to the circuit. Microstrip substrates should be brought as close to the die as possible. The mounting surface should be clean and flat. If using conductive epoxy, recommended epoxies are Ablestick 84-1LMI or 84-1LMIT cured in a nitrogen atmosphere per manufacturer's cure schedule. Apply epoxy sparingly to avoid getting any on to the top surface of the die. An epoxy fillet should be visible around the total die periphery. If eutectic mounting is preferred, then a fluxless gold-tin (AuSn) preform, approximately 0.001^2 thick, placed between the die and the attachment surface should be used. A die bonder that utilizes a heated collet and provides scrubbing action to ensure total wetting to prevent void formation in a nitrogen atmosphere is recommended. The gold-tin eutectic (80% Au 20% Sn) has a melting point of approximately 280°C (Note: Gold Germanium should be avoided). The work station temperature should be 310°C ± 10°C. Exposure to these extreme temperatures should be kept to minimum. The collet should be heated, and the die pre-heated to avoid excessive thermal shock. Avoidance of air bridges and force impact are critical during placement.

Wire Bonding - Windows in the surface passivation above the bond pads are provided to allow wire bonding to the die's gold bond pads. The recommended wire bonding procedure uses 0.076 mm x 0.013 mm (0.003" x 0.0005") 99.99% pure gold ribbon with 0.5-2% elongation to minimize RF port bond inductance. Gold 0.025 mm (0.001") diameter wedge or ball bonds are acceptable for DC Bias connections. Aluminum wire should be avoided. Thermo-compression bonding is recommended though thermosonic bonding may be used providing the ultrasonic content of the bond is minimized. Bond force, time and ultrasonics are all critical parameters. Bonds should be made from the bond pads on the die to the package or substrate. All bonds should be as short as possible.