

DC-6.0 GHz InGaP HBT, MMIC or Packaged, Matched Gain Block Amplifier

Mimix
BROADBAND™

May 2006 - Rev 23-May-06

CGB7006-SC (-BD)
RoHS

Features

- 33.5 dBm Output IP3 @ 850 MHz
- 4.1 dB Noise Figure @ 850 MHz
- 15.2 dB Gain @ 850 MHz
- 18.0 dBm P1dB @ 850 MHz
- Low Performance Variation Over Temperature
- Low Cost: Die Form or SOT-89 Package
- 100% DC On-Wafer Testing
- ESD Protection on All Die: >1000V HBM
- Low Thermal Resistance: <85°C/Watt

Applications

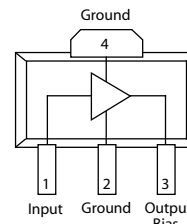
- PA Driver Amp, IF Amp, LO Buffer Amp
- Cellular, PCS, GSM, UMTS
- Wireless Data and SATCOM
- Transmit and Receive Functions
- CATV

Description

The CGB7006-SC (-BD) is a Darlington Configured, high dynamic range, utility gain block amplifier. Designed for applications operating within the DC to 6.0 GHz frequency range, Mimix's broadband, cascadable, gain block amplifiers are ideal solutions for transmit, receive and IF applications.

These MMIC amplifiers are available in bare die form or an industry standard SOT-89 package. Mimix's InGaP HBT technology and an industry low thermal resistance offers a

Functional Block Diagram (SOT-89)



Absolute Maximum Ratings

Max Device Voltage	+6.0 V
Max Device Current	130 mA
Max Device Dissipated Power	0.65 W
RF Input Power	+17 dBm
Storage Temperature	-55°C to 150°C
Junction Temperature	150°C
Operating Temperature	-40°C to +85°C
Thermal Resistance	80° C/W
EDS (HBM)	1000 V

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

thermally robust and reliable gain block solution.

The InGaP HBT die have extra pads to enable thorough DC testing. This unique test capability and the inclusion of ESD protection on all die, significantly enhances the quality, reliability and ruggedness of these products.

With a single bypass capacitor, optional RF choke and two DC blocking capacitors, this gain block amplifier offers significant ease of use in a broad range of applications.

Electrical Characteristics

Unless otherwise specified, the following specifications are guaranteed at room temperature in a Mimix test fixture.

Parameter	Temperature (°C)	850 MHz			1950 MHz			2400 MHz			3500 MHz			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Small Signal Gain	+25	14.0	15.2	16.4	13.3	14.5	15.7	13.0	14.2	15.4		13.5		dB
	-40 to +85	13.8	15.2	16.6	13.1	14.5	15.9	12.8	14.2	15.6		13.5		dB
Output P1dB	+25	17.0	18.0		16.5	17.5		15.8	16.8			15.5		dBm
	-40 to +85	16.5	18.0		16.2	17.5		15.6	16.8			15.5		dBm
Output IP3	+25	32.0	33.5		30.5	32.0		29.0	30.5			28.0		dBm
	-40 to +85	31.5	33.5		29.5	32.0		28.5	30.5			28.0		dBm
Noise Figure	+25		4.1	5.0		4.1	5.0		4.2	5.0		4.4		dB
	-40 to +85		4.1	5.3		4.1	5.3		4.2	5.4		4.4		dB
Operating Current	+25	60	64	68	60	64	68	60	64	68		64		mA
	-40 to +85	57	64	71	57	64	71	57	64	71		64		mA
Input Return Loss	+25	15	19		12	17		13	17			12		dB
	-40 to +85	14	9		11	17		12	17			12		dB
Output Return Loss	+25	18	25		12	17		11.0	17			19		dB
	-40 to +85	17	25		11	17		10.5	17			19		dB
Pout @ -45 dBc, ACP IS-95, 9 Forward Channels	+25		12			12								dBm
	-40 to +85		12			12								dBm

Notes: 1. Test Conditions in Mimix eval board, Vs = 8 V, Id = 64 mA Typ., Rbias = 47 Ω, Zs = Zl = 50 Ω, OIP3 tone spacing = 1 MHz, Pout per tone = 3 dBm.
2. Values reflect performance in recommended application circuit.

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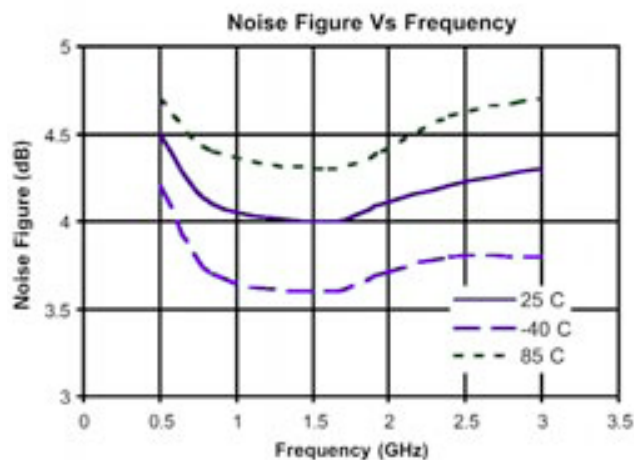
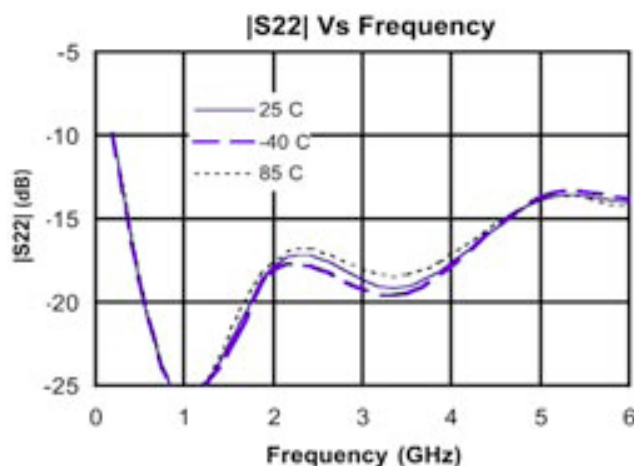
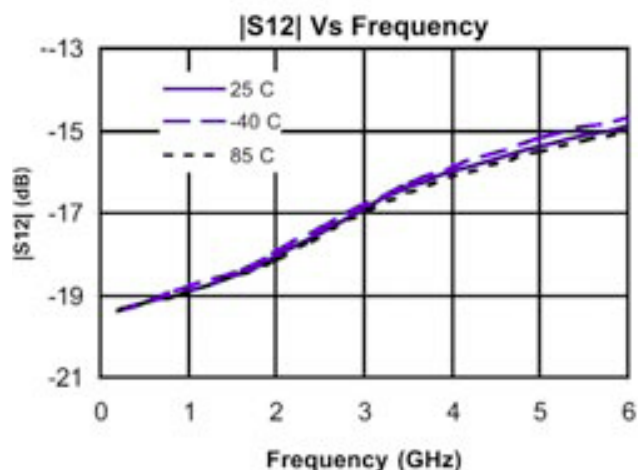
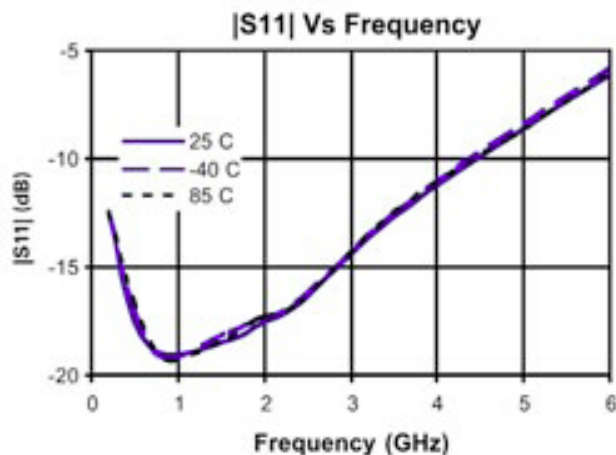
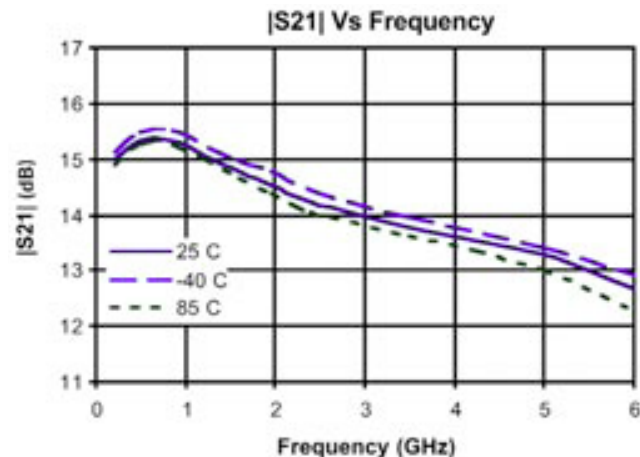
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Typical S-Parameter and Noise Performance



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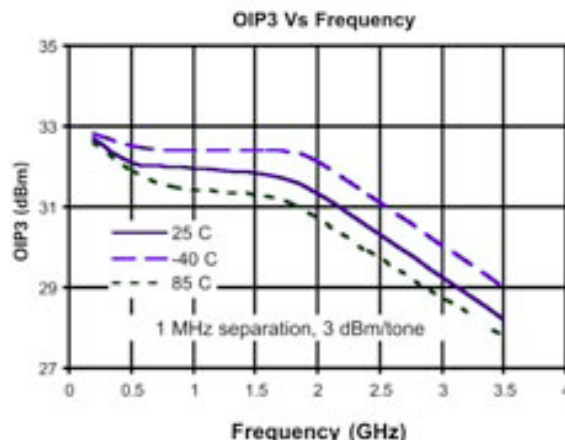
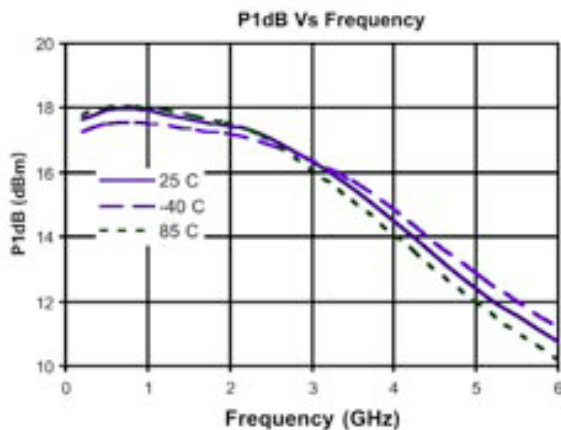
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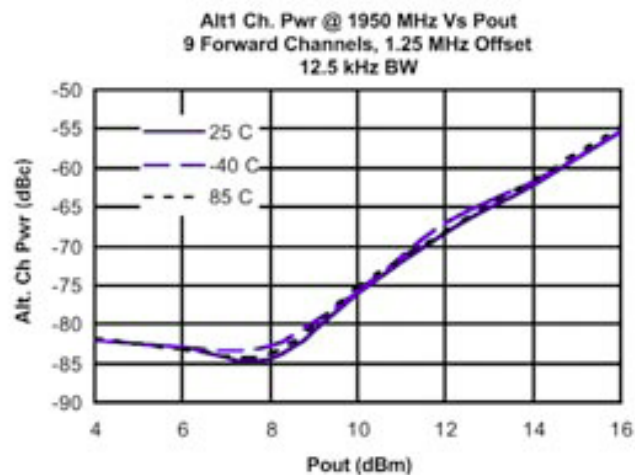
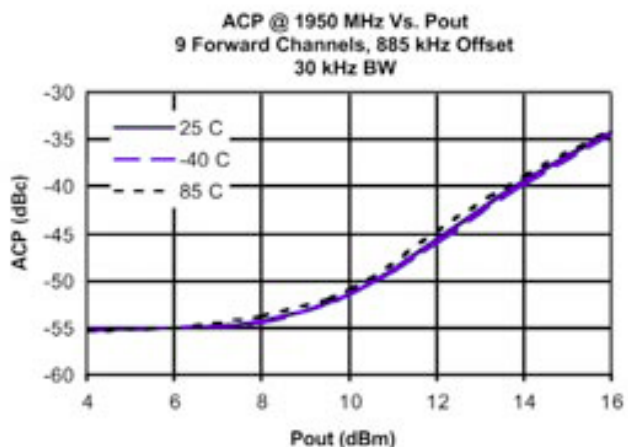
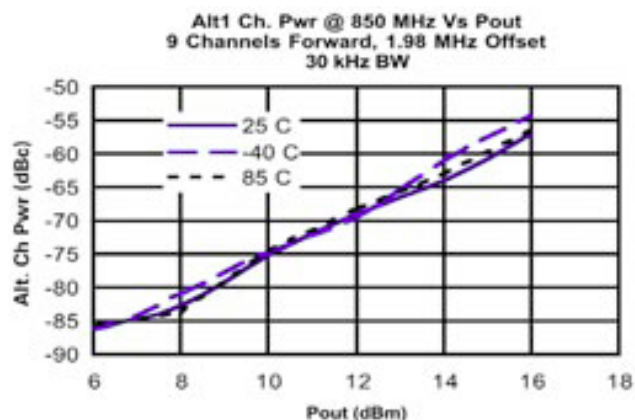
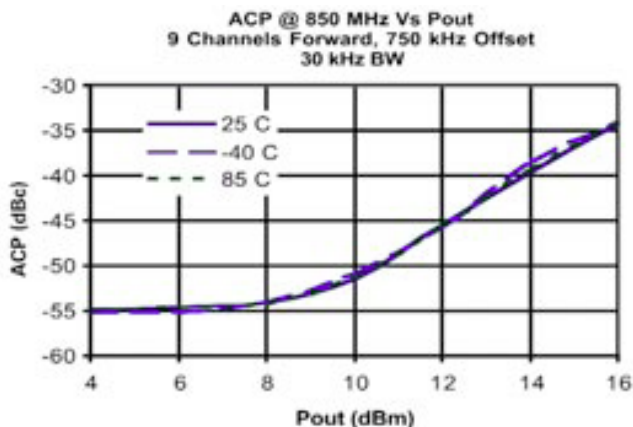
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Typical Power and Linearity Performance



Linearity Performance - Base Station ACP - IS-95



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Typical Scattering Parameters (Vd = +5.08V, Icc = 62 mA, T = 23°C, device in a 50 ohm system)

Frequency (MHz)	(Mag)	S ₁₁ (Ang)	(Mag)	S ₂₁ (Ang)	(Mag)	S ₁₂ (Ang)	(Mag)	S ₂₂ (Ang)
100	0.039	-174.5	5.99	174.90	0.114	-1.56	0.039	-10.97
200	0.041	-166.2	5.96	169.80	0.114	-3.31	0.041	-22.43
300	0.043	-160.1	5.95	164.90	0.114	-4.91	0.043	-33.03
400	0.045	-155.0	5.92	160.00	0.114	-6.50	0.046	-41.32
500	0.048	-149.6	5.90	155.10	0.114	-8.03	0.050	-48.80
600	0.052	-146.0	5.88	150.20	0.115	-9.64	0.055	-55.93
700	0.057	-143.6	5.86	145.30	0.115	-11.20	0.059	-62.24
800	0.062	-141.6	5.83	140.50	0.115	-12.75	0.063	-67.62
900	0.067	-139.6	5.81	135.70	0.116	-14.43	0.068	-72.66
1000	0.073	-138.8	5.78	130.90	0.116	-16.03	0.074	-77.48
1100	0.078	-138.3	5.75	126.10	0.117	-17.72	0.079	-81.90
1200	0.084	-138.0	5.72	121.30	0.117	-19.43	0.084	-85.36
1300	0.091	-138.1	5.69	116.50	0.118	-21.01	0.089	-89.25
1400	0.096	-138.7	5.66	111.80	0.119	-22.77	0.095	-92.61
1500	0.103	-139.2	5.62	107.00	0.120	-24.47	0.100	-95.85
1600	0.110	-140.0	5.59	102.30	0.120	-26.12	0.105	-98.76
1700	0.116	-141.1	5.55	97.63	0.121	-27.85	0.111	-101.70
1800	0.123	-142.4	5.51	92.96	0.122	-29.71	0.116	-104.70
1900	0.129	-143.7	5.48	88.36	0.123	-31.41	0.122	-107.40
2000	0.136	-145.2	5.44	83.74	0.124	-33.23	0.127	-110.20
2100	0.143	-147.0	5.41	79.10	0.125	-35.03	0.133	-112.70
2200	0.149	-148.7	5.37	74.51	0.126	-36.84	0.139	-115.50
2300	0.156	-150.7	5.33	69.96	0.128	-38.68	0.144	-118.10
2400	0.162	-152.8	5.30	65.42	0.129	-40.59	0.149	-120.90
2500	0.168	-154.9	5.26	60.88	0.130	-42.48	0.155	-123.70
2600	0.174	-157.2	5.22	56.41	0.131	-44.31	0.160	-126.20
2700	0.180	-159.5	5.19	51.95	0.133	-46.20	0.165	-129.00
2800	0.186	-162.1	5.16	47.52	0.134	-48.18	0.171	-131.90
2900	0.192	-165.0	5.13	43.08	0.136	-50.11	0.176	-135.20
3000	0.198	-167.7	5.10	38.61	0.137	-52.05	0.181	-138.20
3100	0.203	-170.6	5.08	34.22	0.139	-54.06	0.187	-141.40
3200	0.209	-173.6	5.05	29.77	0.141	-56.16	0.192	-144.70
3300	0.215	-176.9	5.03	25.36	0.142	-58.20	0.197	-148.20
3400	0.221	-179.6	5.01	20.91	0.145	-60.38	0.202	-151.80
3500	0.226	-176.1	4.98	16.48	0.146	-62.47	0.207	-155.20
3600	0.232	-172.7	4.96	12.05	0.148	-64.69	0.212	-158.90
3700	0.237	-169.0	4.94	7.66	0.151	-66.87	0.216	-162.70
3800	0.242	-165.0	4.93	3.24	0.153	-69.07	0.220	-167.00
3900	0.246	-160.6	4.91	-1.21	0.155	-71.40	0.224	-171.10
4000	0.251	-156.4	4.90	-5.64	0.157	-73.64	0.227	-175.40
4100	0.255	-152.0	4.89	-10.07	0.160	-76.03	0.231	-180.00
4200	0.258	-147.3	4.88	-14.55	0.162	-78.46	0.234	-175.20
4300	0.262	-142.2	4.88	-19.05	0.165	-80.86	0.237	-170.10
4400	0.266	-137.0	4.88	-23.58	0.168	-83.39	0.239	-164.50
4500	0.270	-131.5	4.87	-28.17	0.171	-86.02	0.241	-158.90
4600	0.273	-126.1	4.87	-32.75	0.174	-88.62	0.244	-153.00
4700	0.277	-120.5	4.87	-37.38	0.176	-91.28	0.248	-147.00
4800	0.281	-114.3	4.88	-42.06	0.180	-94.09	0.252	-140.40
4900	0.287	-107.8	4.88	-46.79	0.183	-96.98	0.256	-133.50
5000	0.292	-101.1	4.88	-51.64	0.186	-99.92	0.260	-126.10

Continues Next Page. S-Parameter Data Files are available on-line at: www.mimixbroadband.com

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Typical Scattering Parameters (Vd = +5.08V, Icc = 62 mA, T = 23°C, device in a 50 ohm system)

Frequency (MHz)	(Mag)	S ₁₁ (Ang)	(Mag)	S ₂₁ (Ang)	(Mag)	S ₁₂ (Ang)	(Mag)	S ₂₂ (Ang)
5100	0.298	94.52	4.88	-56.50	0.189	-103.0	0.265	119.00
5200	0.304	87.85	4.89	-61.36	0.192	-106.0	0.271	111.70
5300	0.312	80.74	4.89	-66.39	0.196	-109.2	0.280	103.90
5400	0.321	73.09	4.89	-71.54	0.199	-112.5	0.289	95.56
5500	0.331	65.45	4.89	-76.72	0.202	-115.9	0.298	87.18
5600	0.343	58.07	4.88	-81.88	0.205	-119.5	0.310	79.10
5700	0.356	50.40	4.88	-87.26	0.208	-123.0	0.325	71.06
5800	0.370	42.60	4.87	-92.77	0.211	-126.8	0.341	62.28
5900	0.384	34.37	4.84	-98.37	0.213	-130.8	0.359	53.49
6000	0.400	26.43	4.81	-104.00	0.215	-134.6	0.378	45.11
6100	0.418	18.66	4.77	-109.60	0.216	-138.6	0.400	36.81
6200	0.435	11.03	4.72	-115.40	0.217	-142.6	0.423	28.76
6300	0.452	3.33	4.66	-121.20	0.218	-146.8	0.446	20.96
6400	0.470	-4.49	4.59	-127.00	0.218	-151.0	0.472	13.18
6500	0.488	-12.03	4.50	-132.90	0.217	-155.2	0.496	5.55
6600	0.506	-19.24	4.40	-138.70	0.215	-159.4	0.521	-1.78
6700	0.523	-26.11	4.30	-144.50	0.214	-163.5	0.545	-8.68
6800	0.537	-32.99	4.19	-150.30	0.211	-167.7	0.569	-15.38
6900	0.551	-39.84	4.08	-156.00	0.208	-171.8	0.592	-21.94
7000	0.565	-46.61	3.95	-161.70	0.205	-175.9	0.614	-28.48
7100	0.577	-52.93	3.81	-167.20	0.200	-179.8	0.634	-34.66
7200	0.587	-58.95	3.68	-172.70	0.196	176.3	0.652	-40.64
7300	0.595	-64.82	3.55	-178.00	0.192	172.5	0.668	-46.24
7400	0.602	-70.70	3.42	176.70	0.187	168.8	0.684	-51.69
7500	0.608	-76.42	3.28	171.60	0.182	165.2	0.699	-57.04
7600	0.615	-81.75	3.14	166.60	0.177	161.9	0.712	-62.18
7700	0.619	-86.78	3.01	161.70	0.172	158.6	0.723	-67.01
7800	0.620	-91.54	2.89	157.10	0.167	155.5	0.733	-71.58
7900	0.621	-96.31	2.77	152.40	0.163	152.4	0.741	-75.96
8000	0.620	-101.10	2.65	147.80	0.158	149.6	0.749	-80.18
8100	0.622	-105.60	2.54	143.40	0.154	146.6	0.757	-84.30
8200	0.621	-109.60	2.42	139.20	0.149	143.9	0.764	-88.24
8300	0.618	-113.50	2.32	135.00	0.145	141.4	0.769	-91.84
8400	0.614	-117.30	2.23	131.00	0.141	138.8	0.773	-95.36
8500	0.609	-121.30	2.14	126.90	0.137	136.5	0.777	-98.78
8600	0.605	-125.20	2.05	122.90	0.133	133.9	0.781	-102.10
8700	0.602	-128.80	1.97	119.10	0.130	131.7	0.784	-105.30
8800	0.596	-132.00	1.89	115.30	0.126	129.6	0.787	-108.40
8900	0.588	-135.30	1.81	111.50	0.123	127.4	0.788	-111.30
9000	0.580	-138.80	1.75	107.80	0.121	125.4	0.789	-114.10
9100	0.573	-142.40	1.68	104.10	0.118	123.3	0.790	-116.90
9200	0.566	-145.70	1.61	100.40	0.115	121.1	0.792	-119.60
9300	0.559	-148.70	1.55	96.82	0.112	119.2	0.793	-122.30
9400	0.549	-151.50	1.50	93.27	0.110	117.2	0.795	-124.90
9500	0.539	-154.60	1.44	89.72	0.108	115.4	0.794	-127.30
9600	0.528	-157.90	1.39	86.22	0.106	113.5	0.794	-129.80
9700	0.520	-161.00	1.34	82.65	0.104	111.5	0.795	-132.20
9800	0.512	-163.70	1.29	79.26	0.102	109.8	0.795	-134.50
9900	0.501	-166.10	1.24	75.89	0.100	108.0	0.795	-136.70
10000	0.487	-168.60	1.20	72.49	0.098	106.5	0.795	-138.90

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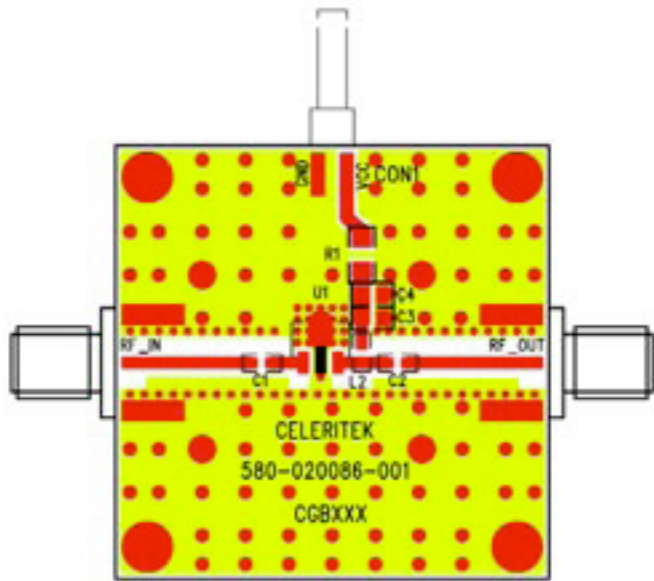
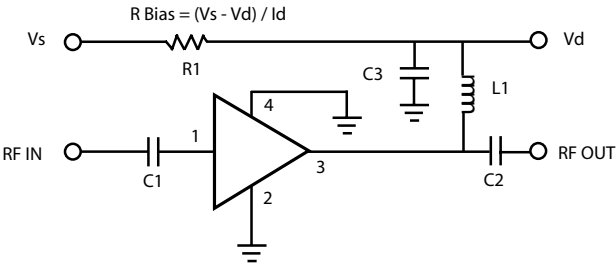
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Application Circuit

Note: This schematic represents the topology of the application circuit recommended by Mimix.

Recommended Bias Resistor Values for ID = 63 mA				
Supply Voltage (V)	7V	8V	10V	12V
Rbias (R1 Description: 1206 1/4W 1%)	31Ω	47Ω	—	—
Rbias (R1 Description: 1210 1/2W 1%)	—	—	78Ω	110Ω

Note: Rbias provides DC bias stability over temperature.



Ref Designator	Value	Description	Size
C1, C2	1000 pF	MCH185A101JK	0805
C3	1.0 μF	VITR 1.0 μF 25V CER CAP 0805 X7R 10%	0805
L1	56 nH	Coilcraft 0603 CS 10%	0603
R1		RBias = (Vs - Vd) / Id	1206 / 1210
C4		DNP (Do Not Place)	N/A

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Technical drawing of a mechanical part with dimensions in millimeters and inches. The drawing includes a top view and a side view.

Top View Dimensions:

- Overall width: 4.50 [0.177]
- Distance from left edge to center of feature 4: 1.73 [0.068]
- Distance from right edge to center of feature 4: 0.71 [0.028]
- Distance from left edge to center of feature 1: 0.41 [0.016]
- Distance from center of feature 4 to center of feature 1: 2.50 [0.096]
- Distance from center of feature 4 to center of feature 3: 0.99 [0.039]
- Distance from left edge to center of feature 2: 1.50 [0.059]
- Distance from center of feature 2 to center of feature 3: 3.00 [0.118]
- Distance from center of feature 3 to right edge: 0.76 [0.030]

Side View Dimensions:

- Overall height: 1.55 [0.061]
- Distance from top edge to center of feature 4: 0.38 [0.015]
- Distance from bottom edge to center of feature 4: 4.41 [0.163]
- Distance from top edge to center of feature 1: 2.06 [0.081]
- Distance from center of feature 1 to center of feature 3: 0.38 [0.015]

Other Features:

- Feature 4: A rectangular feature with a width of 1.73 [0.068] and a height of 0.71 [0.028].
- Feature 1: A rectangular feature with a width of 0.41 [0.016] and a height of 2.06 [0.081].
- Feature 2: A rectangular feature with a width of 1.50 [0.059] and a height of 2.06 [0.081].
- Feature 3: A rectangular feature with a width of 0.76 [0.030] and a height of 2.06 [0.081].

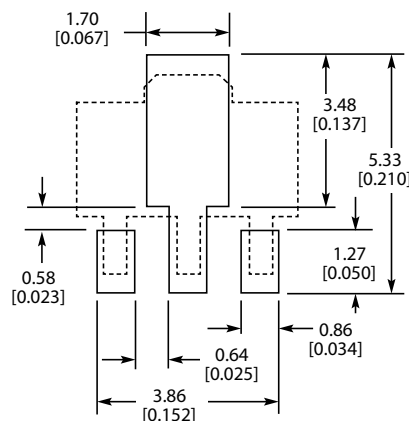
Text:

XXXXXXX
XXXXXXX
ZYYWW

0.46 [0.18]
3X

Dimensions in Millimeters [Inches]

MARKINGS:
 XXXXXXX = MIMIX MODEL NO.
 XXXXXX = WAFER LOT NO.
 ZYYWW = DATE CODE (YR/WEEK)
 FIRST LETTER COUNTRY OF ORIGIN IF OTHER THAN USA



A micrograph of the chip layout showing a rectangular die with dimensions 480 μm (width) and 450 μm (height). The layout includes several labeled components: 'RF IN' (top left), 'GND' (top right), 'GND' (center), 'RF IN' (bottom left), 'GND' (bottom center), and 'RF OUT' (bottom right). The die is mounted on a substrate with wire bonds visible at the top and bottom edges.

Notes:
RF OUT bonding pad is 75 μm x 155 μm .
All other pads are 75 μm x 75 μm .



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

Part Number for Ordering

CGB7006-BD

CGB7006-SC-0G00

CGB7006-SC-0G0T

CGB7006-SP-0G00

CGB7006-SP-0G0T

PB-CGB7006-SC-0000

PB-CGB7006-SP-0000

Description

Bare die in GelPak

Matte Tin plated RoHS compliant SOT-89 surface mount package in bulk quantity

Matte Tin plated RoHS compliant SOT-89 surface mount package in tape and reel

Matte Tin plated RoHS compliant SOT-86 surface mount package in bulk quantity

Matte Tin plated RoHS compliant SOT-86 surface mount package in tape and reel

Evaluation Board for SOT-89 packaged device with SMA connectors

Evaluation Board for SOT-86 packaged device with SMA connectors

Mimix Broadband, Inc., 10795 Rockley Rd., Houston, Texas 77099
Tel: 281.988.4600 Fax: 281.988.4615 mimixbroadband.com

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