

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



May 2006 - Rev 23-May-06

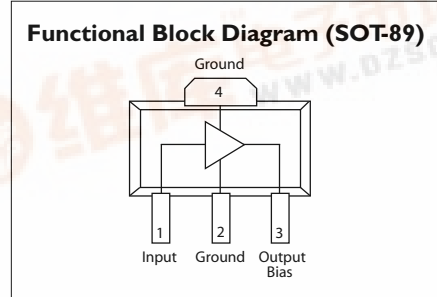
CGB7001-SC (-BD)
RoHS

Features

- ✕ Low Operating Voltage: 5V
- ✕ 28.0 dBm Output IP3 @ 850 MHz
- ✕ 3.3 dB Noise Figure @ 850 MHz
- ✕ 20.5 dB Gain @ 850 MHz
- ✕ 14.2 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: <110°C/Watt

Applications

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



Absolute Maximum Ratings

Max Device Voltage	+5.5 V
Max Device Current	110 mA
Max Device Dissipated Power	0.45 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	110° C/W
EDS (HBM)	1000 V

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

Description

The CGB7001-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

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	19.5	20.5	21.5	16.8	17.8	18.8	16.0	17.0	18.0		14.8		dB
	-40 to +85	19.2	20.5	21.8	16.5	17.8	19.1	17.0	17.0	18.3		14.8		dB
Output P1dB	+25	13.2	14.2		12.5	13.5		12.1	13.1			11.1		dBm
	-40 to +85	11.5	14.2		11.0	13.5		11.0	13.1			11.1		dBm
Output IP3	+25	26.5	28.0		25.5	27.0		25.0	26.5			24.0		dBm
	-40 to +85	25.0	28.0		24.0	27.0		24.0	26.5			24.0		dBm
Noise Figure	+25		3.3	4.1		3.5	4.3		3.6	4.4		3.8		dB
	-40 to +85		3.3	4.4		3.5	4.7		3.6	4.8		3.8		dB
Operating Current	+25	32	35	39	32	35	39	32	35	38		35		mA
	-40 to +85	28	35	43	28	35	43	28	35	42		35		mA
Input Return Loss	+25	12	16		11	15		11	15			15		dB
	-40 to +85	11	16		10	15		10	15			15		dB
Output Return Loss	+25	18	23		13	18		13	18			15		dB
	-40 to +85	17	23		12	18		12	18			15		dB
Pout @ -45 dBc, ACP IS-95, 9 Forward Channels	+25		10.0			10.0								dBm
	-40 to +85		9.0			10.0								dBm

Notes: 1. Test Conditions in Mimix eval board, Vs = 5 V, Id = 35 mA Typ., Rbias = 27 Ω, Zs = Zl = 50 Ω, OIP3 tone spacing = 1 MHz, Pout per tone = 3 dBm.
2. Values reflect performance in recommended application circuit.



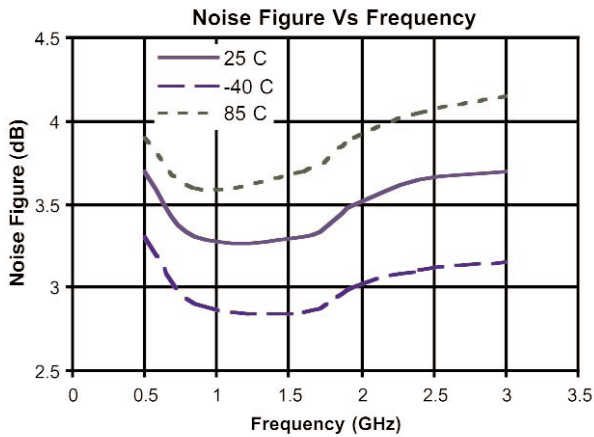
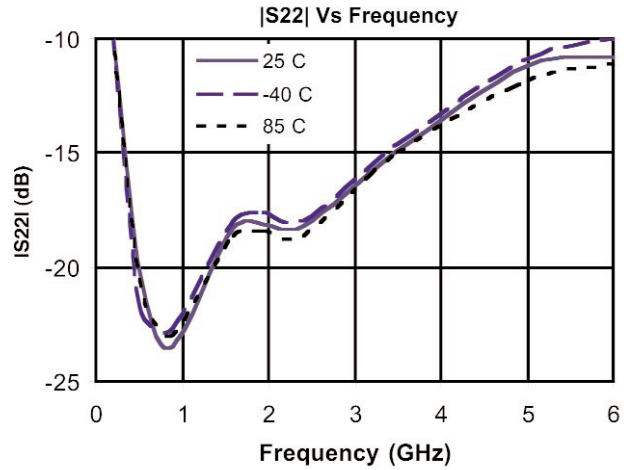
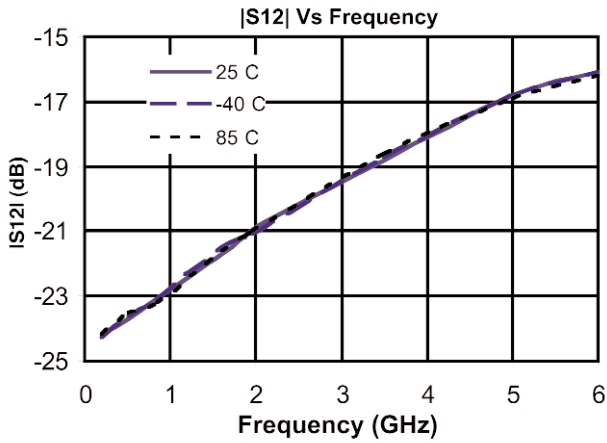
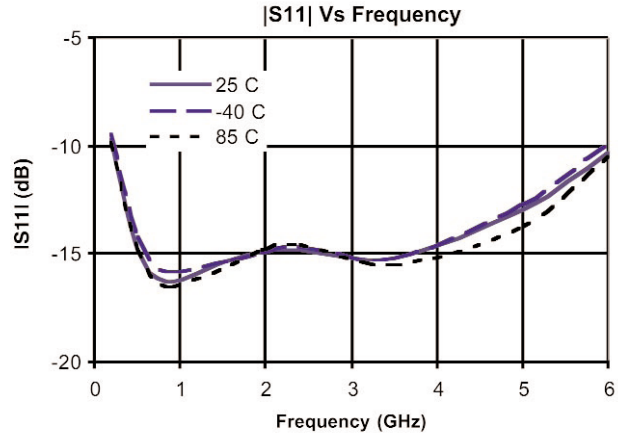
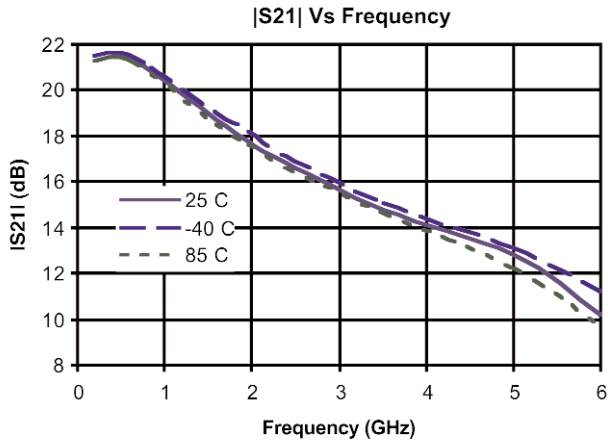
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Typical S-Parameter and Noise Performance



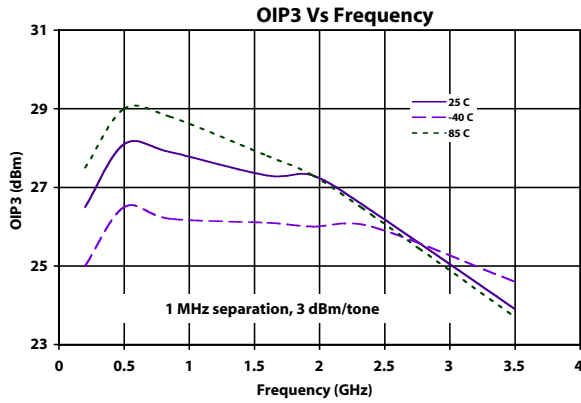
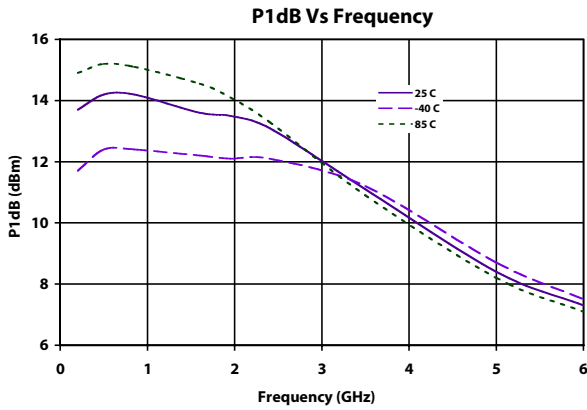
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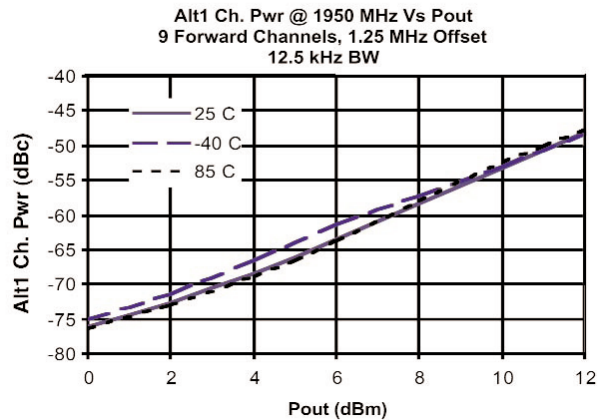
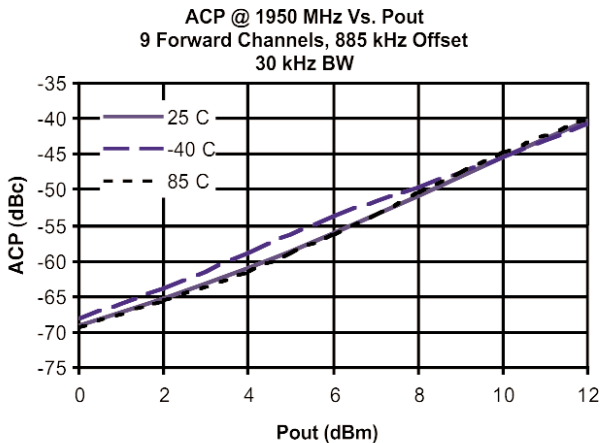
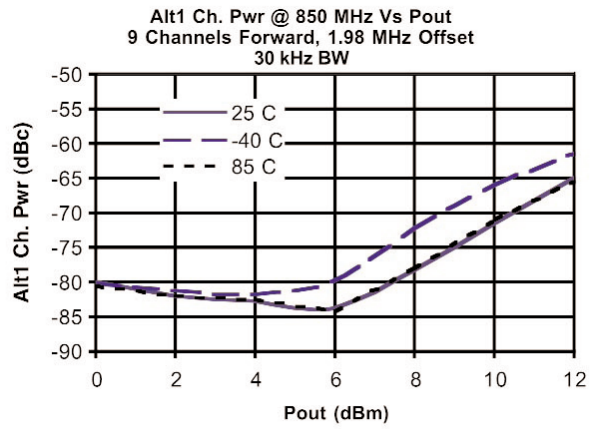
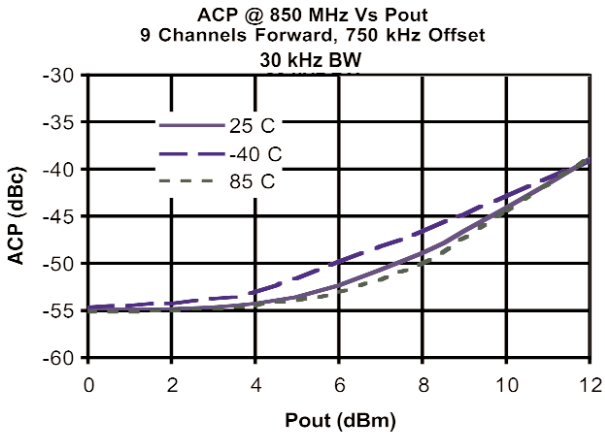
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Typical S-Parameter and Noise Performance (cont.)



Linearity Performance - Base Station ACP - IS-95



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Frequency (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)
100	0.111	-9.7	12.53	172.9	0.065	-0.5	0.141	-12.6
200	0.113	-19.0	12.42	165.8	0.065	-0.8	0.142	-25.3
300	0.115	-28.2	12.30	159.0	0.065	-1.2	0.145	-36.9
400	0.119	-36.6	12.11	152.1	0.066	-1.6	0.150	-48.0
500	0.124	-44.6	11.92	145.5	0.067	-2.2	0.155	-58.1
600	0.129	-52.2	11.70	138.9	0.067	-2.8	0.160	-68.0
700	0.134	-58.9	11.45	132.5	0.068	-3.3	0.165	-77.0
800	0.140	-65.3	11.19	126.2	0.069	-4.2	0.170	-85.1
900	0.146	-71.2	10.93	120.0	0.071	-5.0	0.174	-92.8
1000	0.152	-76.8	10.66	114.0	0.072	-6.0	0.178	-99.9
1100	0.159	-81.8	10.39	108.0	0.073	-7.0	0.182	-106.6
1200	0.165	-86.4	10.10	102.2	0.075	-8.1	0.184	-112.7
1300	0.171	-90.8	9.83	96.6	0.076	-9.4	0.186	-118.5
1400	0.178	-94.8	9.56	91.0	0.078	-10.6	0.187	-123.7
1500	0.185	-98.5	9.29	85.6	0.080	-12.0	0.188	-128.8
1600	0.191	-102.1	9.04	80.3	0.081	-13.5	0.188	-133.5
1700	0.197	-105.6	8.79	75.0	0.083	-15.0	0.187	-138.0
1800	0.203	-108.9	8.54	69.9	0.085	-16.7	0.186	-142.2
1900	0.209	-112.2	8.31	64.9	0.087	-18.3	0.184	-146.2
2000	0.215	-115.4	8.09	59.9	0.089	-20.1	0.181	-150.1
2100	0.221	-118.5	7.87	55.0	0.091	-21.9	0.179	-153.6
2200	0.227	-121.5	7.66	50.2	0.093	-23.8	0.175	-157.1
2300	0.232	-124.5	7.47	45.5	0.094	-25.7	0.172	-160.4
2400	0.238	-127.3	7.27	40.8	0.097	-27.6	0.168	-163.4
2500	0.244	-130.3	7.09	36.1	0.099	-29.7	0.164	-166.4
2600	0.248	-133.1	6.92	31.5	0.101	-31.8	0.159	-169.3
2700	0.252	-135.9	6.75	27.1	0.103	-33.9	0.154	-172.1
2800	0.256	-138.9	6.60	22.6	0.105	-36.2	0.150	-174.7
2900	0.261	-142.1	6.45	18.1	0.107	-38.5	0.145	-177.7
3000	0.265	-145.0	6.31	13.7	0.109	-40.8	0.139	179.9
3100	0.268	-147.9	6.17	9.3	0.111	-43.0	0.135	177.4
3200	0.271	-150.9	6.05	5.0	0.114	-45.4	0.129	174.7
3300	0.274	-154.2	5.93	0.7	0.116	-47.9	0.124	171.6
3400	0.276	-157.6	5.81	-3.7	0.118	-50.3	0.119	168.4
3500	0.278	-161.0	5.70	-8.0	0.120	-52.9	0.113	165.1
3600	0.279	-164.4	5.59	-12.3	0.123	-55.4	0.107	161.6
3700	0.278	-167.9	5.49	-16.6	0.125	-58.0	0.101	157.5
3800	0.278	-171.4	5.40	-20.9	0.127	-60.5	0.094	152.6
3900	0.276	-175.5	5.30	-25.2	0.130	-63.3	0.088	147.3
4000	0.275	-179.5	5.21	-29.5	0.132	-66.0	0.081	141.2
4100	0.272	176.5	5.13	-33.8	0.134	-68.8	0.075	134.0
4200	0.268	172.3	5.04	-38.1	0.137	-71.6	0.069	125.5
4300	0.264	167.9	4.97	-42.4	0.139	-74.5	0.063	114.5
4400	0.258	163.1	4.89	-46.7	0.141	-77.4	0.059	101.5
4500	0.252	158.2	4.82	-51.1	0.144	-80.4	0.057	86.9
4600	0.246	153.1	4.74	-55.4	0.146	-83.3	0.058	71.3
4700	0.238	147.7	4.67	-59.7	0.148	-86.4	0.063	55.9
4800	0.230	142.0	4.60	-64.1	0.150	-89.5	0.071	41.8
4900	0.221	135.6	4.54	-68.5	0.153	-92.7	0.082	30.1
5000	0.212	128.4	4.47	-73.0	0.155	-96.0	0.096	19.7

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

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Frequency (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)
5100	0.203	121.1	4.40	-77.5	0.157	-99.2	0.111	11.0
5200	0.195	113.4	4.34	-81.9	0.159	-102.6	0.128	3.8
5300	0.187	104.6	4.27	-86.5	0.160	-105.8	0.146	-2.6
5400	0.180	95.0	4.20	-91.0	0.162	-109.3	0.166	-8.6
5500	0.175	84.4	4.13	-95.6	0.164	-112.8	0.187	-14.1
5600	0.172	73.4	4.07	-100.2	0.165	-116.3	0.209	-19.1
5700	0.171	62.1	4.00	-104.8	0.166	-119.8	0.231	-23.7
5800	0.174	50.2	3.92	-109.5	0.168	-123.4	0.255	-28.5
5900	0.179	38.2	3.84	-114.1	0.168	-127.1	0.280	-33.1
6000	0.190	27.0	3.77	-118.8	0.169	-130.7	0.304	-37.5
6100	0.202	16.4	3.69	-123.5	0.169	-134.4	0.329	-41.7
6200	0.217	6.5	3.61	-128.2	0.169	-138.1	0.354	-45.8
6300	0.234	-2.8	3.52	-132.9	0.169	-141.8	0.379	-49.9
6400	0.252	-11.4	3.44	-137.5	0.168	-145.4	0.404	-54.0
6500	0.272	-19.4	3.35	-142.1	0.168	-149.2	0.429	-57.9
6600	0.293	-26.6	3.26	-146.7	0.167	-152.8	0.453	-61.9
6700	0.314	-33.2	3.18	-151.3	0.166	-156.4	0.477	-65.6
6800	0.335	-39.5	3.09	-155.9	0.164	-160.0	0.499	-69.3
6900	0.356	-45.6	3.00	-160.4	0.163	-163.6	0.522	-73.0
7000	0.378	-51.3	2.90	-164.8	0.161	-167.2	0.543	-76.7
7100	0.398	-56.6	2.81	-169.1	0.159	-170.6	0.564	-80.2
7200	0.419	-61.7	2.72	-173.5	0.157	-174.1	0.583	-83.7
7300	0.437	-66.6	2.64	-177.8	0.155	-177.5	0.601	-87.2
7400	0.456	-71.3	2.55	-178.1	0.153	-179.2	0.618	-90.5
7500	0.474	-75.8	2.47	-173.9	0.150	-175.9	0.635	-93.7
7600	0.491	-80.1	2.38	-169.9	0.148	-172.8	0.650	-97.0
7700	0.507	-84.2	2.30	-165.9	0.145	-169.6	0.664	-100.0
7800	0.521	-88.2	2.22	-162.0	0.143	-166.5	0.677	-103.1
7900	0.534	-92.0	2.15	-158.2	0.141	-163.6	0.689	-106.1
8000	0.547	-95.8	2.08	-154.4	0.138	-160.6	0.701	-108.9
8100	0.560	-99.3	2.00	-150.7	0.136	-157.7	0.712	-111.8
8200	0.571	-102.7	1.94	-147.0	0.133	-154.9	0.721	-114.5
8300	0.582	-106.0	1.87	-143.4	0.131	-152.1	0.729	-117.2
8400	0.591	-109.4	1.81	-139.9	0.129	-149.2	0.738	-119.8
8500	0.599	-112.6	1.75	-136.4	0.127	-146.7	0.746	-122.3
8600	0.608	-115.8	1.69	-133.0	0.125	-143.9	0.752	-124.8
8700	0.615	-118.7	1.64	-129.6	0.123	-141.2	0.760	-127.3
8800	0.622	-121.6	1.59	-126.3	0.120	-138.9	0.765	-129.7
8900	0.627	-124.4	1.54	-123.0	0.118	-136.4	0.770	-132.0
9000	0.632	-127.3	1.49	-119.7	0.117	-133.8	0.774	-134.3
9100	0.637	-130.1	1.45	-116.5	0.115	-131.4	0.779	-136.6
9200	0.641	-132.7	1.40	-113.3	0.113	-128.9	0.783	-138.8
9300	0.644	-135.3	1.36	-110.2	0.112	-126.6	0.786	-141.0
9400	0.647	-137.9	1.32	-107.1	0.110	-124.2	0.789	-143.1
9500	0.649	-140.4	1.29	-104.0	0.109	-121.9	0.791	-145.2
9600	0.651	-143.0	1.25	-101.0	0.107	-119.6	0.793	-147.2
9700	0.653	-145.4	1.22	-97.9	0.106	-117.3	0.795	-149.2
9800	0.654	-147.8	1.19	-94.9	0.105	-114.9	0.797	-151.2
9900	0.654	-150.1	1.15	-92.0	0.103	-112.5	0.799	-153.2
10000	0.654	-152.5	1.13	-89.0	0.102	-110.4	0.800	-155.1

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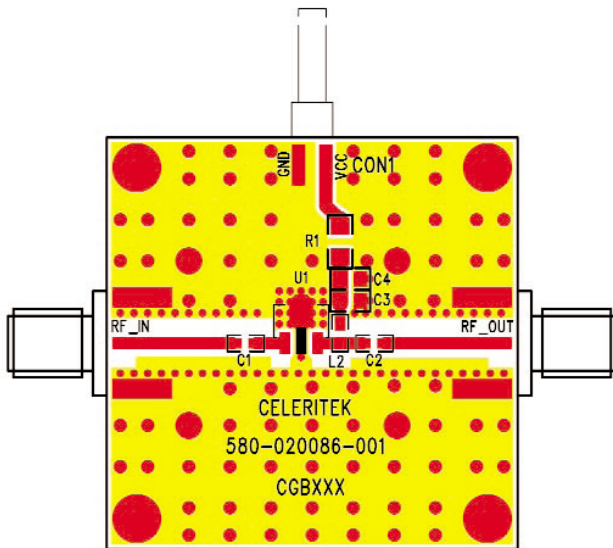
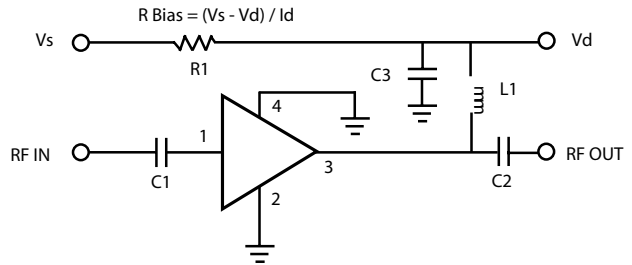
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Application Circuit

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

Recommended Bias Resistor Values for $I_D = 35 \text{ mA}$						
Supply Voltage (V)	5V	6V	7V	8V	10V	12V
Rbias (R1 Description: 0805 1/8W 1%)	27Ω	55Ω	84Ω	—	—	—
Rbias (R1 Description: 1206 1/4W 1%)	—	—	—	113Ω	169Ω	—
Rbias (R1 Description: 1210 1/2W 5%)	—	—	—	—	—	220Ω

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		$R_{Bias} = (V_s - V_d) / I_d$	0805 / 1206 / 1210
C4		DNP (Do Not Place)	N/A

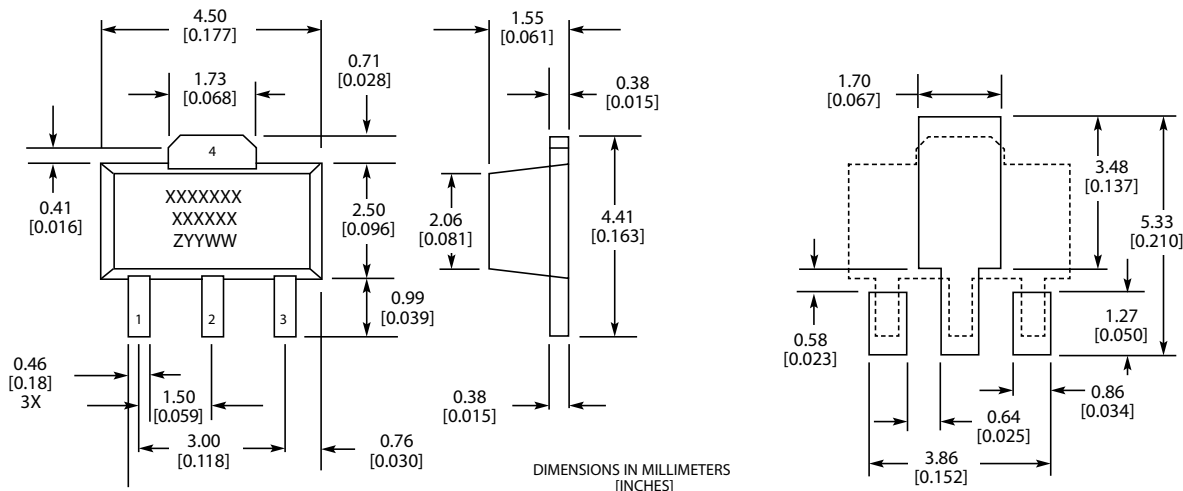
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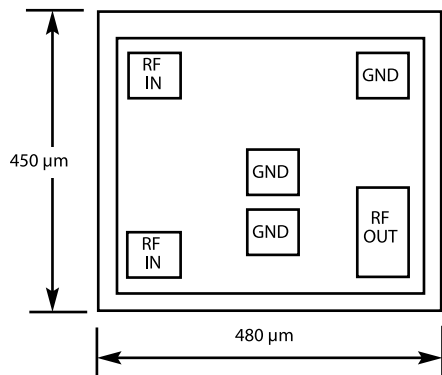
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Physical Dimensions - SC Package (SOT-89)



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

Physical Dimensions - BD (Bare Die)



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



Ordering Information

Part Number for Ordering	Description
CGB7001-BD	Bare die in GelPak
CGB7001-SC-0G00	Matte Tin plated RoHS compliant SOT-89 surface mount package in bulk quantity
CGB7001-SC-0G0T	Matte Tin plated RoHS compliant SOT-89 surface mount package in tape and reel
CGB7001-SP-0G00	Matte Tin plated RoHS compliant SOT-86 surface mount package in bulk quantity
CGB7001-SP-0G0T	Matte Tin plated RoHS compliant SOT-86 surface mount package in tape and reel
PB-CGB7001-SC-0000	Evaluation Board for SOT-89 packaged device with SMA connectors
PB-CGB7001-SP-0000	Evaluation Board for SOT-86 packaged device with SMA connectors

We also offer the plastic packages with SnPb (Tin-Lead) or NiPdAu plating. Please contact your regional sales manager for more information regarding different plating types