

DC-6.0 GHz InGaP HBT Packaged Matched Gain Block Amplifier

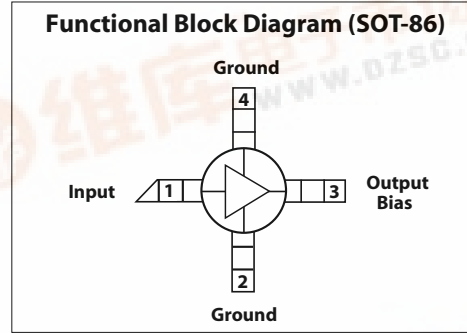


March 2007 - Rev 20-Mar-07

CGB7001-SP

Features

- ✕ Low Operating Voltage: 5V
- ✕ 27.8 dBm Output IP3 @ 850 MHz
- ✕ 3.2 dB Noise Figure @ 850 MHz
- ✕ 20.2 dB Gain @ 850 MHz
- ✕ 14.0 dBm P1dB @ 850 MHz
- ✕ Low Performance Variation Over Temperature
- ✕ 100% DC On-Wafer Testing
- ✕ ESD Protection on All Die: >1000V HBM
- ✕ Low Thermal Resistance: <150°C/Watt



Description

The CGB7001-SP is a Darlington Configured, high dynamic range, utility gain block amplifier. Designed for applications operating within the 0.1 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-86 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.

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	150° C/W
EDS (HBM)	1000 V

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

Applications

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

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	19.2	20.2	21.2	15.7	16.7	17.7	14.4	15.4	16.4		13.0		dB
	-40 to +85	18.9	20.2	21.5	15.4	16.7	18.0	14.1	15.4	16.7		13.0		dB
Output P1dB	+25	13.0	14.0		12.4	13.4		11.5	12.5			10.2		dBm
	-40 to +85	11.0	14.0		11.2	13.4		11.0	12.5			10.2		dBm
Output IP3	+25	26.3	27.8		25.8	27.3		24.4	25.9			22.4		dBm
	-40 to +85	24.8	27.8		25.3	27.3		23.9	25.9			22.4		dBm
Noise Figure	+25		3.2	4.0		3.4	4.2		3.6	4.4		3.8		dB
	-40 to +85		3.2	4.4		3.4	4.6		3.6	4.8		3.8		dB
Operating Current	+25	32	35	38	32	35	38	32	35	38		35		mA
	-40 to +85	28	35	42	28	35	42	28	35	42		35		mA
Input Return Loss	+25	11	15		9.0	12.5		8.5	12			15		dB
	-40 to +85	10	15		8.5	12.5		8.0	12			15		dB
Output Return Loss	+25	13	18		12	17		11.5	16.5			20		dB
	-40 to +85	12	18		11	17		10.5	16.5			20		dB
Pout @ -45 dBc, ACP IS-95, 9 Forward Channels	+25		10.0			10.0								dBm
	-40 to +85		10.0			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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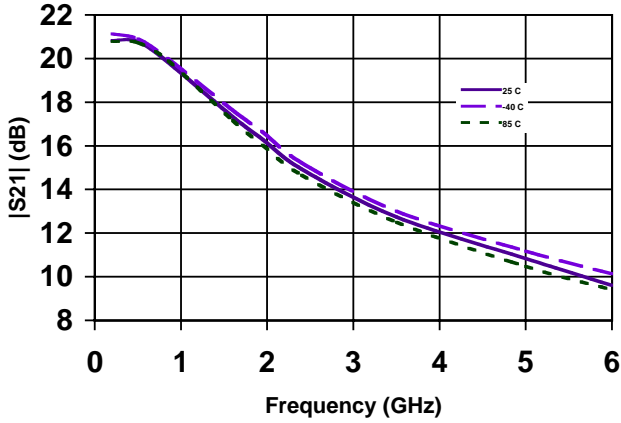


March 2007 - Rev 20-Mar-07

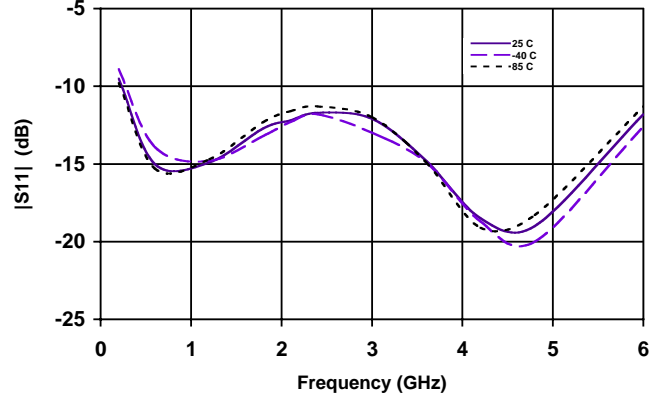
CGB700I-SP

Typical S-Parameter and Noise Performance

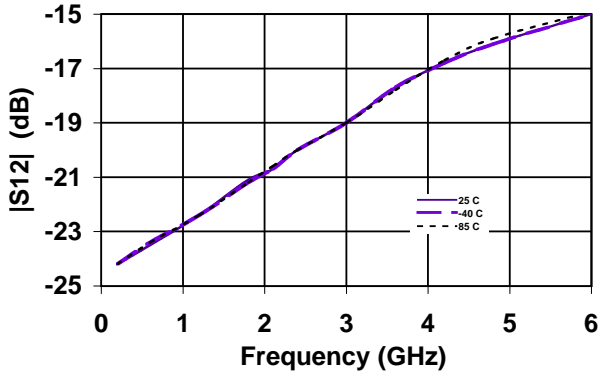
|S21| Vs Frequency



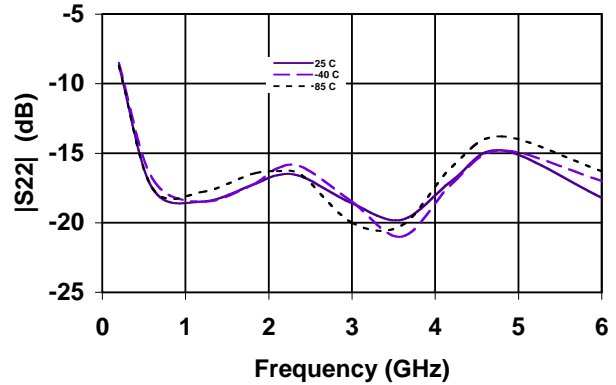
|S11| Vs Frequency



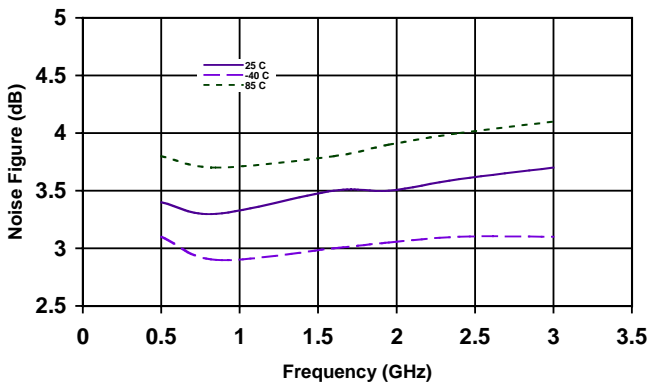
|S12| Vs Frequency



|S22| Vs Frequency



Noise Figure Vs Frequency



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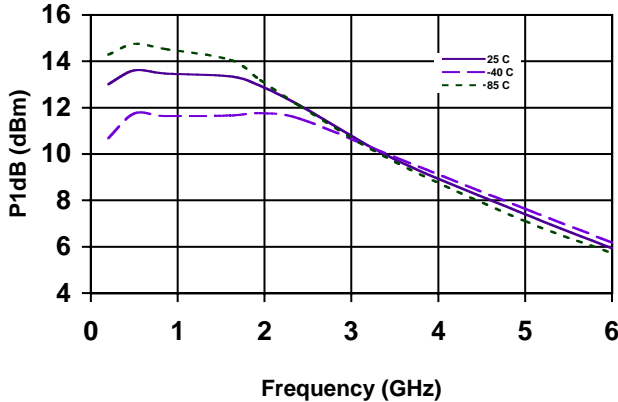


March 2007 - Rev 20-Mar-07

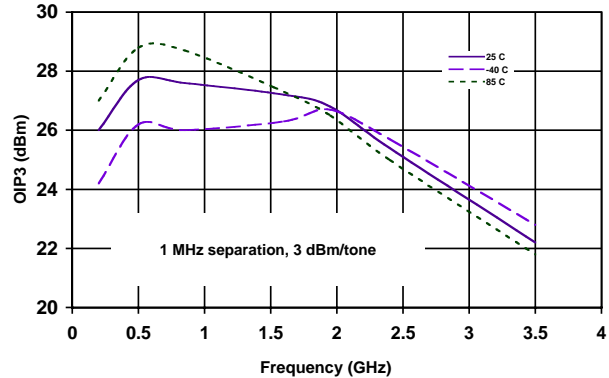
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Typical Power and Linearity Performance

P1dB Vs Frequency

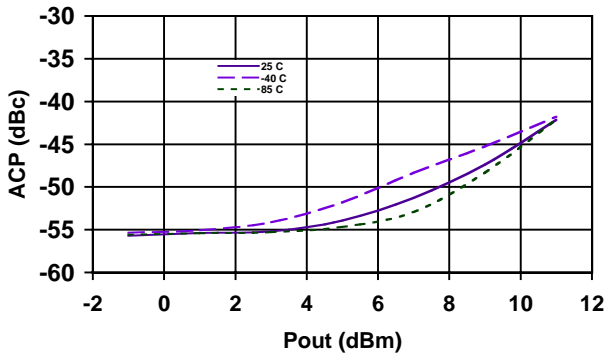


OIP3 Vs Frequency

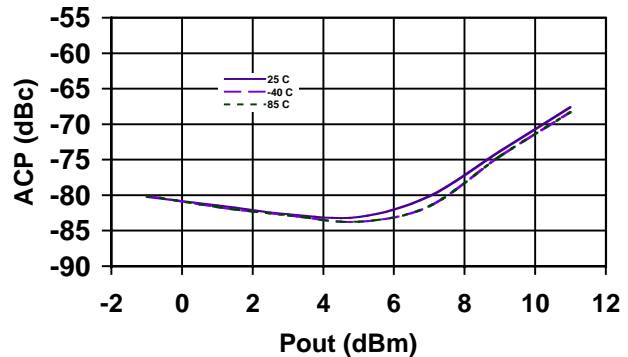


Linearity Performance - Base Station ACP - IS-95

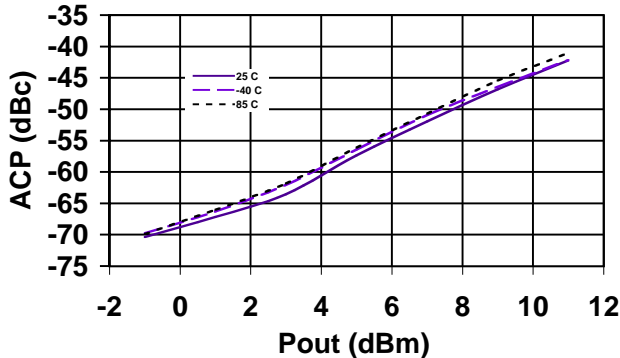
ACP @ 850 MHz Vs Pout
9 Channels Forward, 750 kHz Offset
30 kHz BW



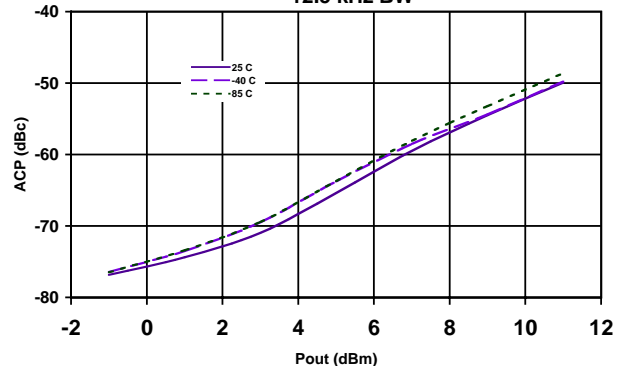
Alt1 Ch. Pwr @ 850 MHz Vs Pout
9 Channels Forward, 1.98 MHz Offset
30 kHz BW



ACP @ 1950 MHz Vs. Pout
9 Forward Channels, 885 kHz Offset
30 kHz BW



Alt1 Ch. Pwr @ 1950 MHz Vs Pout
9 Channels Forward, 1.25 MHz Offset
12.5 kHz BW



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March 2007 - Rev 20-Mar-07

CGB700I-SP

Typical Scattering Parameters (Vd = +4.1V, Icc = 36 mA, T = 23°C, device in a 50 ohm system)

Frequency (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)
100	0.132	-2	12.40	173	0.065	1	0.156	-8
200	0.133	-4	12.26	166	0.065	2	0.155	-14
300	0.135	-6	12.08	159	0.066	3	0.154	-21
400	0.137	-9	11.85	153	0.066	4	0.152	-28
500	0.139	-11	11.58	147	0.067	5	0.150	-35
600	0.141	-14	11.28	140	0.068	6	0.147	-42
700	0.143	-17	10.95	134	0.069	6	0.144	-48
800	0.145	-20	10.62	129	0.070	7	0.141	-54
900	0.147	-23	10.28	123	0.072	7	0.138	-60
1000	0.149	-27	9.94	118	0.073	8	0.135	-66
1200	0.153	-33	9.27	107	0.077	8	0.128	-76
1400	0.156	-40	8.63	98	0.081	8	0.123	-86
1600	0.159	-47	8.05	89	0.085	8	0.118	-95
1800	0.162	-54	7.52	81	0.090	7	0.113	-104
2000	0.163	-60	7.04	73	0.094	6	0.109	-113
2200	0.165	-67	6.61	65	0.099	4	0.106	-120
2400	0.167	-74	6.23	58	0.104	3	0.103	-128
2600	0.168	-80	5.88	51	0.109	1	0.100	-134
2800	0.169	-87	5.58	44	0.114	-2	0.099	-141
3000	0.170	-93	5.30	37	0.119	-4	0.097	-148
3200	0.171	-99	5.06	31	0.125	-6	0.097	-154
3400	0.172	-106	4.84	24	0.130	-9	0.098	-160
3600	0.172	-113	4.64	18	0.135	-12	0.098	-167
3800	0.172	-120	4.46	12	0.141	-15	0.099	-174
4000	0.171	-126	4.29	6	0.146	-18	0.101	180
4200	0.170	-133	4.14	0	0.151	-21	0.103	173
4400	0.168	-140	4.01	-6	0.156	-24	0.105	166
4600	0.167	-147	3.88	-12	0.161	-27	0.108	159
4800	0.165	-154	3.76	-18	0.166	-31	0.111	153
5000	0.163	-162	3.66	-24	0.171	-34	0.115	145
5200	0.160	-169	3.56	-30	0.175	-38	0.120	138
5400	0.158	-177	3.47	-36	0.180	-41	0.126	131
5600	0.155	175	3.39	-42	0.185	-45	0.131	124
5800	0.154	166	3.31	-47	0.189	-48	0.139	117
6000	0.152	157	3.24	-53	0.194	-52	0.146	110
6500	0.151	134	3.08	-68	0.204	-61	0.171	93
7000	0.158	109	2.95	-83	0.214	-71	0.203	77
7500	0.171	83	2.83	-98	0.223	-81	0.241	60
8000	0.191	60	2.72	-113	0.230	-91	0.283	45
8500	0.221	38	2.61	-129	0.236	-102	0.333	30
9000	0.251	18	2.49	-145	0.239	-113	0.385	16
9500	0.283	1	2.37	-161	0.239	-124	0.440	2
10000	0.313	-15	2.23	-178	0.238	-135	0.497	-11

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

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March 2007 - Rev 20-Mar-07

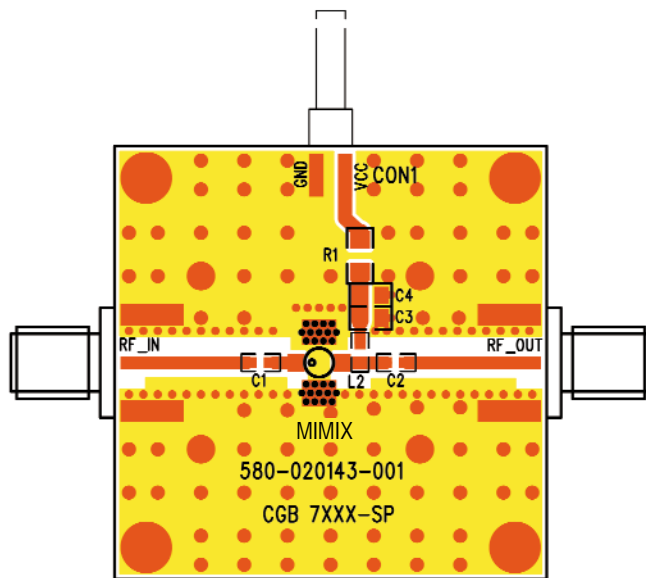
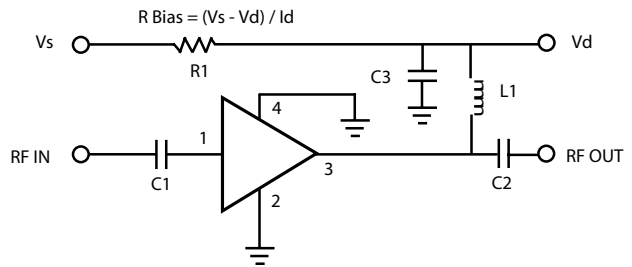
CGB700I-SP

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%)	27 Ω	55 Ω	84 Ω	—	—	—
Rbias (R1 Description: 1206 1/4W 1%)	—	—	—	113 Ω	169 Ω	—
Rbias (R1 Description: 1210 1/2W 5%)	—	—	—	—	—	220 Ω

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

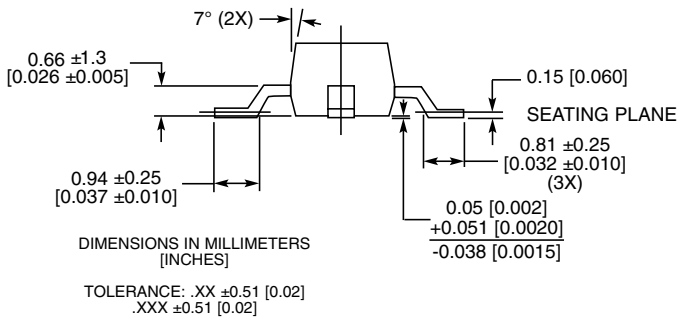
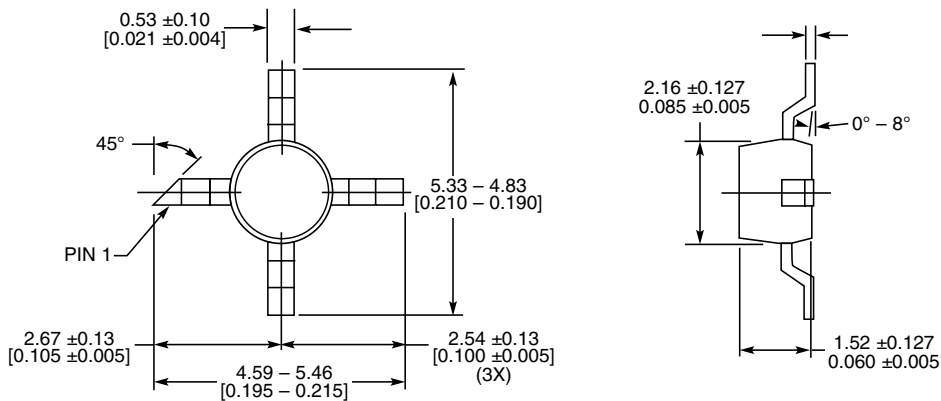
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CGB700I-SP

Physical Dimensions - SP Package (SOT-86)



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

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CGB7001-SP

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.

Package Attachment - This packaged product from Mimix Broadband is provided as a rugged surface mount package compatible with high volume solder installation. Care should be taken not to apply heavy pressure to the top or base material to avoid package damage. Vacuum tools or other suitable pick and place equipment may be used to pick and place this part. Care should be taken to ensure that there are no voids or gaps in the solder connection so that good RF, DC and ground connections are maintained. Voids or gaps can eventually lead not only to RF performance degradation, but reduced reliability and life of the product due to thermal stress.

Mimix Lead-Free RoHS Compliant Program - Mimix has an active program in place to meet customer and governmental requirements for eliminating lead (Pb) and other environmentally hazardous materials from our products. All Mimix RoHS compliant components are form, fit and functional replacements for their non-RoHS equivalents. Lead plating of our RoHS compliant parts is 100% matte tin (Sn) over copper alloy and is backwards compatible with current standard SnPb low-temperature reflow processes as well as higher temperature (260°C reflow) "Pb Free" processes.

Ordering Information

Part Number for Ordering	Description
CGB7001-SP-0G00	SOT-86 surface mount package in bulk
CGB7001-SP-0G0T	SOT-86 surface mount package in tape and reel
PB-CGB7001-SP-0000	Evaluation Board with SMA connectors for CGB7001-SP