

# Silicon Bipolar MMIC 5 GHz Active Double Balanced Mixer/ IF Amp

## Technical Data

IAM-82008

### Features

- **RF-IF Conversion Gain:**  
15 dB from 0.05-5 GHz
- **IF Conversion Gain from DC to 2 GHz**
- **IF Output  $P_{1dB}$ :**  
+8 dBm Typical
- **Single Polarity Bias Supply:**  
 $V_{CC} = 7$  to 13 V
- **Load Insensitive Performance**
- **Conversion Gain Flat over Temperature**

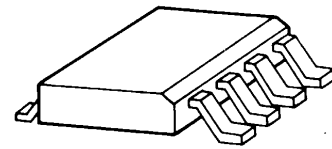
### Description

Hewlett-Packard's IAM-82008 is a complete moderate-power double-balanced active mixer housed in a miniature low cost surface mount package. It is designed for narrow or wide bandwidth commercial and industrial applications having RF inputs up to 5 GHz. Operation of RF and LO frequencies below 50 MHz can be achieved using optional external capacitors to ground. The IAM-82008 is particularly well suited for applications that require load-insensitive conversion gain and good spurious signal suppression and moderate dynamic range with

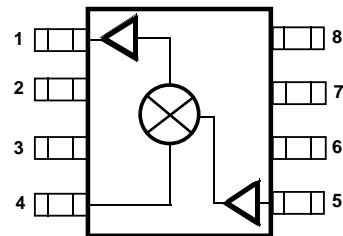
low LO power. Typical applications include frequency down-conversion, up-conversion, modulation, demodulation, and phase detection. Markets include fiber-optics, GPS satellite navigation, mobile radio, and communications transmitters and receivers.

The IAM series of Gilbert multiplier-based frequency converters is fabricated using Hewlett Packard's 10 GHz  $f_T$  25 GHz  $f_{MAX}$  ISOSAT™-1 silicon bipolar process. This process uses nitride self-alignment, submicrometer lithography, trench isolation, ion implantation, gold metallization, and polyimide inter-metal dielectric and scratch protection to achieve excellent performance, uniformity and reliability.

### Plastic SO-8 Package



### Functional Block Diagram and Pin Configuration



Pin Description	
1 IF Output	8 RF Ground (optional)
2 $V_{ee}$ , AC Ground	7 $V_{CC}$
3 $V_{ee}$ , AC Ground Thermal Contact	6 LO Ground (optional)
4 RF Input	5 LO Input

## Absolute Maximum Ratings<sup>[1]</sup> ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Units	Value
$V_d$	Device Voltage	V	15
$P_t$	Total Device Dissipation <sup>[2]</sup>	mW	1200
$P_{in\text{ RF}}$	RF Input Power	dBm	+14
$P_{in\text{ LO}}$	LO Input Power	dBm	+14
$T_j$	Junction Temperature	$^\circ\text{C}$	150
$T_{STG}$	Storage Temperature	$^\circ\text{C}$	-65 to +150
$\theta_{jc}$	Thermal Resistance Junction to Case <sup>[3]</sup>	$^\circ\text{C/W}$	92

### Notes:

1. Operation in excess of any one of these conditions may result in permanent damage to this device.
2. Derate at 10.9 mW/ $^\circ\text{C}$  for  $T_{PIN3} > 40^\circ\text{C}$ .
3.  $T_j = 150^\circ\text{C}$ .

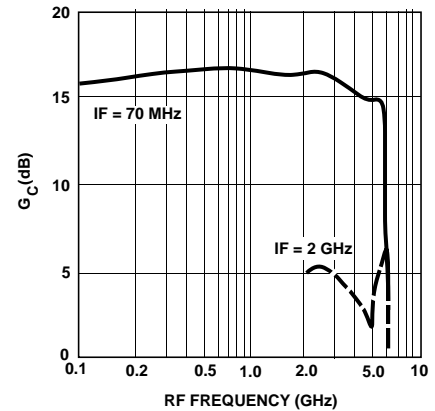


Figure 1. Typical RF to IF Conversion Gain vs. RF Frequency,  $T_A = 25^\circ\text{C}$ , Low Side LO.

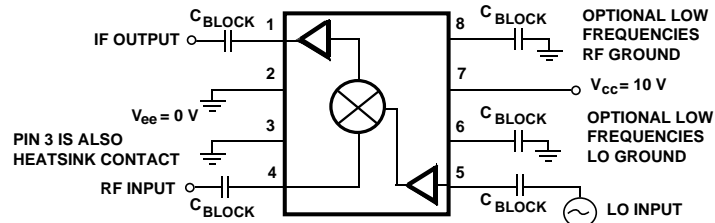
## IAM-82008 Electrical Specifications

$V_{CC} = 10\text{ V}$ ,  $Z_0 = 50\ \Omega$ , LO = 0 dBm, RF = -20 dBm,  $T_A = 25^\circ\text{C}$

Symbol	Parameter	Units	Minimum	Typical	Maximum
$G_C$	Conversion Gain, RF = 2 GHz, LO = 1.75 GHz	dB	13	15	17
$f_{3\text{ dB RF}}$	RF Bandwidth ( $G_C$ 3 dB down), IF = 250 MHz	GHz		5.5	
$f_{3\text{ dB IF}}$	IF Bandwidth ( $G_C$ 3 dB down), LO = 2 GHz	GHz		0.5	
$P_{1\text{ dB}}$	Output Power at 1 dB Gain Compression, RF = 2 GHz, LO = 1.75 GHz	dBm		8	
$IP_3$	Third Order Intercept Point, RF = 2 GHz, LO = 1.75 GHz	dBm		18	
NF	SSB Noise Figure	dB		19	
VSWR	RF Port VSWR			1.5:1	
	LO Port VSWR			2.0:1	
	IF Port VSWR			2.5:1	
$RF_{if}$	RF Feedthrough at IF Port	dBc		-30	
$LO_{if}$	LO Leakage at IF Port	dBm		-15	
$LO_{rf}$	LO Leakage at RF Port	dBm		-22	
$I_{CC}$	Supply Current	mA	40	55	65

### Note:

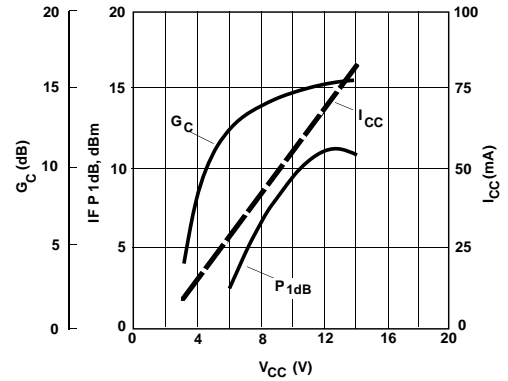
1. The recommended operating voltage range for this device is 7 to 13 V. Typical performance as a function of voltage is shown on the following page.



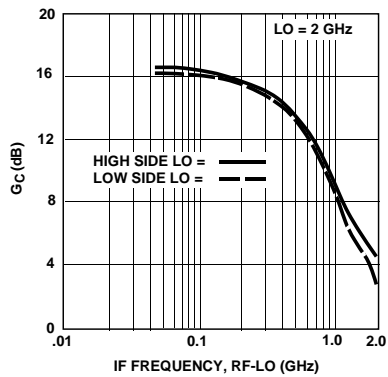
**Notes:**

1. No external baluns are required.
2. Good heatsinking required on Pin 3 for specified performance.

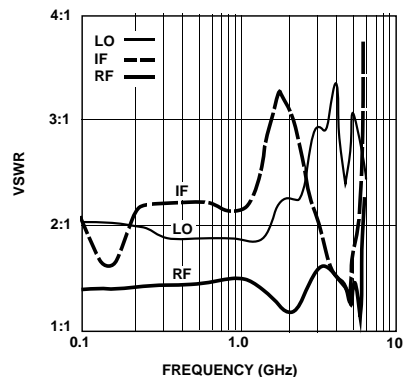
**Figure 2. IAM-82008 Typical Biasing Configuration.**



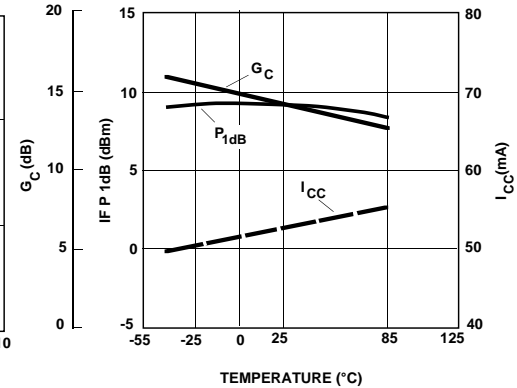
**Figure 3. Typical Conversion Gain, IF P<sub>1</sub> dB, and I<sub>CC</sub> Current vs. V<sub>CC</sub> Bias Voltage, T<sub>A</sub> = 25°C, RF: -20 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.**



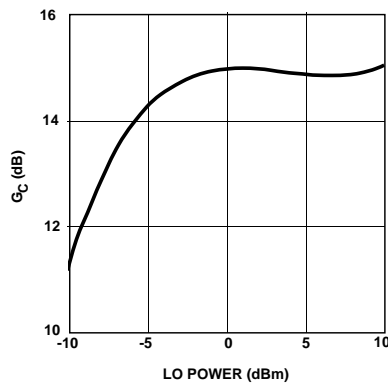
**Figure 4. Typical RF to IF Conversion Gain vs. IF Frequency, T<sub>A</sub> = 25°C, V<sub>CC</sub> = 10 V, LO: 0 dBm at 2 GHz.**



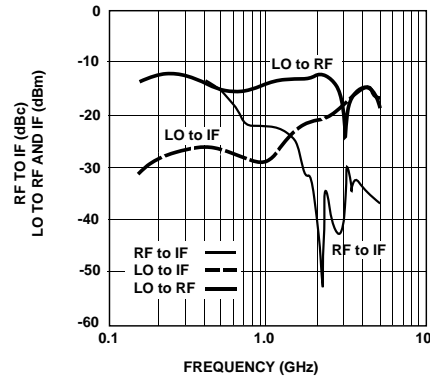
**Figure 5. RF, LO, and IF Port VSWR vs. Frequency, T<sub>A</sub> = 25°C, V<sub>CC</sub> = 10 V.**



**Figure 6. Typical Conversion Gain, IF P<sub>1</sub> dB, and I<sub>CC</sub> Current vs. Case Temperature, T<sub>A</sub> = 25°C, V<sub>CC</sub> = 10 V, RF: -20 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.**



**Figure 7. Typical RF to IF Conversion Gain vs. LO Power, T<sub>A</sub> = 25°C, V<sub>CC</sub> = 10 V, RF: -10 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.**



**Figure 8. Typical RF Feedthrough Relative to IF Carrier, LO to RF and LO to IF Leakage vs. Frequency, T<sub>A</sub> = 25°C, V<sub>CC</sub> = 10 V, RF: -20 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.**

HARMONIC LO ORDER	0	1	2	3	4	5
0	-	21	40	73	>75	>75
1	12	0	51	60	>75	>75
2	6	22	41	>75	>75	>75
3	24	18	40	74	>75	>75
4	22	33	52	75	>75	>75
5	41	36	55	>75	>75	>75

$X_{mn} = P_{if} - P(m^{*}rf - n^{*}lo)$

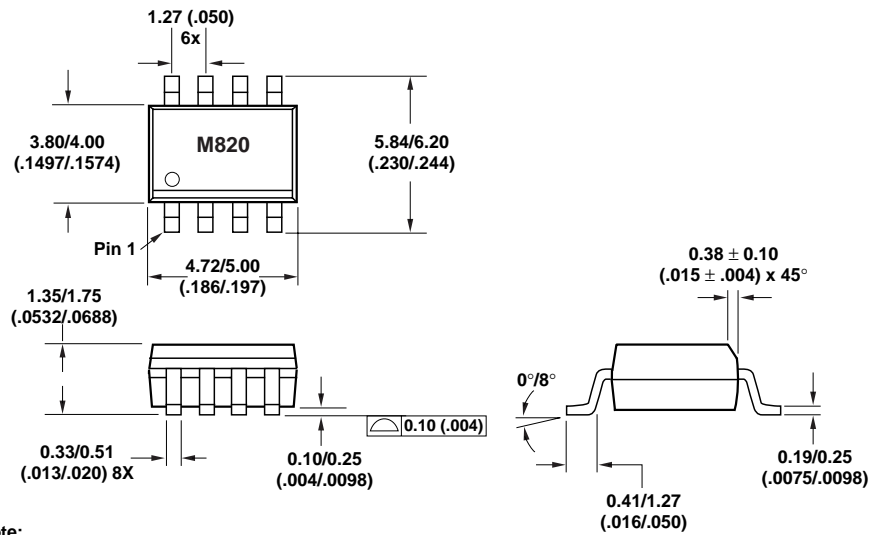
**Figure 9. Harmonic Intermodulation Suppression (dB Below Desired Output) RF at 1 GHz, LO at 0.752 GHz, IF at 0.248 GHz.**

## Part Number Ordering Information

Part Number	No. of Devices	Container
IAM-82008-TR1	1000	7" Reel
IAM-82008-STR	10	Strip

## Package Dimensions

### SO-8 Plastic Package



**Note:**

1. Dimensions are shown in millimeters (inches).