

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**

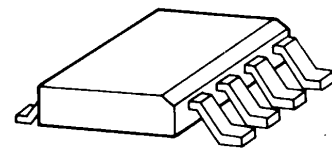
Description

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

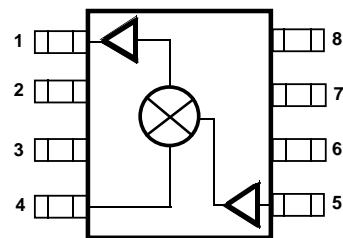
low LO power. Typical applications include frequency down-conversion, up-conversion, modulation, demodulation, and phase detection. Markets include fiber-optics, GPS satellite navigation, mobile radio, and communications transmitters and receivers.

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_{cc} , AC Ground	7 V_{CC}
3 V_{cc} , AC Ground Thermal Contact	6 LO Ground (optional)
4 RF Input	5 LO Input

Absolute Maximum Ratings^[1] ($T_A = 25^\circ\text{C}$)

Symbol	Parameter	Units	Value
V_d	Device Voltage	V	15
P_t	Total Device Dissipation ^[2]	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
θ_{jc}	Thermal Resistance Junction to Case ^[3]	$^\circ\text{C/W}$	92

Notes:

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

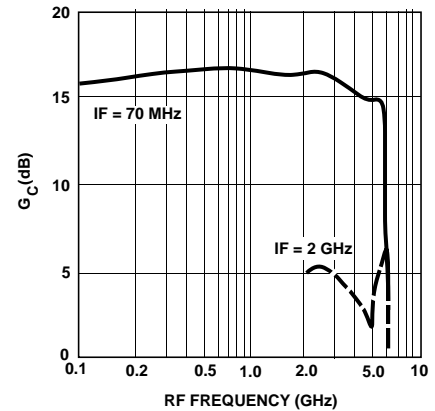


Figure 1. Typical RF to IF Conversion Gain vs. RF Frequency, $T_A = 25^\circ\text{C}$, Low Side LO.

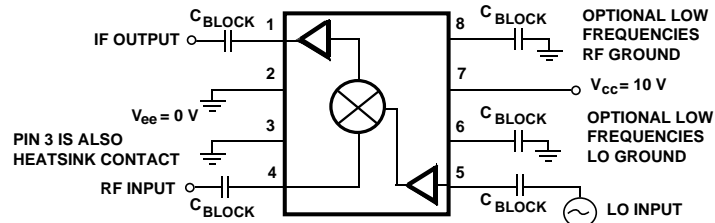
IAM-82008 Electrical Specifications

$V_{CC} = 10\text{ V}$, $Z_0 = 50\ \Omega$, 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:

- 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.

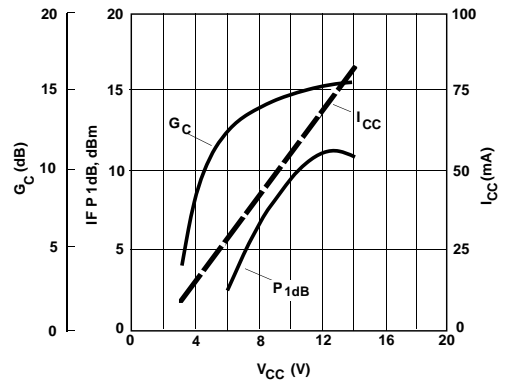


Figure 3. Typical Conversion Gain, IF P₁ dB, and I_{CC} Current vs. V_{CC} Bias Voltage, T_A = 25°C, RF: -20 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.

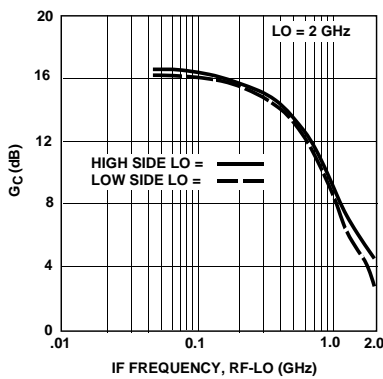


Figure 4. Typical RF to IF Conversion Gain vs. IF Frequency, T_A = 25°C, V_{CC} = 10 V, LO: 0 dBm at 2 GHz.

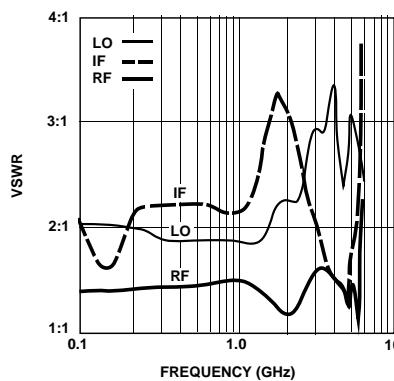


Figure 5. RF, LO, and IF Port VSWR vs. Frequency, T_A = 25°C, V_{CC} = 10 V.

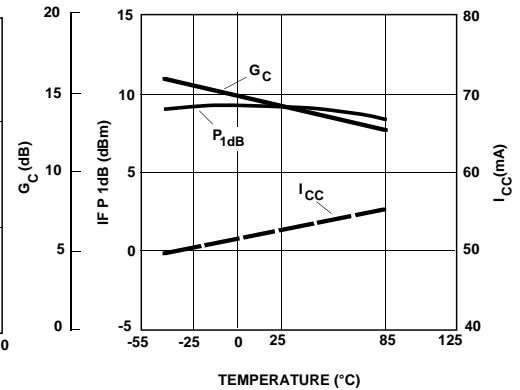


Figure 6. Typical Conversion Gain, IF P₁ dB, and I_{CC} Current vs. Case Temperature, T_A = 25°C, V_{CC} = 10 V, RF: -20 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.

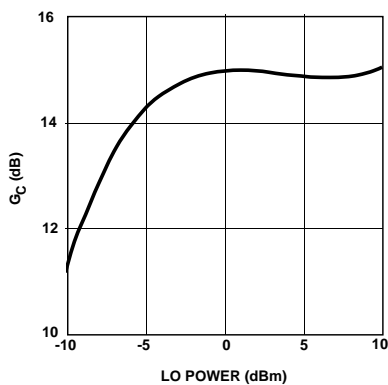


Figure 7. Typical RF to IF Conversion Gain vs. LO Power, T_A = 25°C, V_{CC} = 10 V, RF: -10 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.

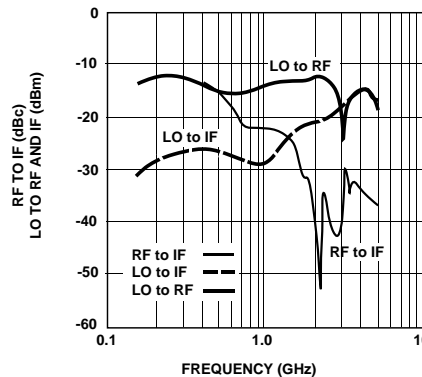


Figure 8. Typical RF Feedthrough Relative to IF Carrier, LO to RF and LO to IF Leakage vs. Frequency, T_A = 25°C, V_{CC} = 10 V, RF: -20 dBm at 2 GHz, LO: 0 dBm at 1.75 GHz.

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

HARMONIC RF ORDER
X_{mn} = P_{if} - P_(m*rf-n*lo)

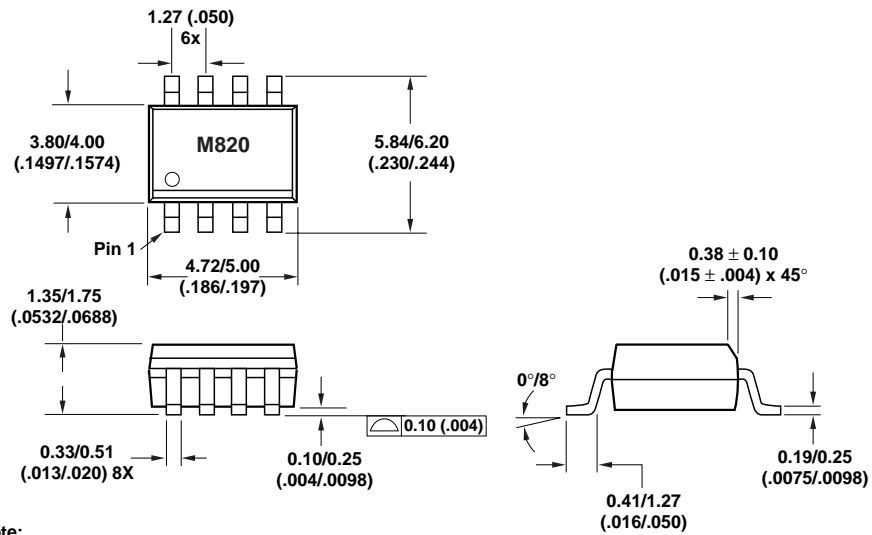
Figure 9. Harmonic Intermodulation Suppression (dB Below Desired Output) RF at 1 GHz, LO at 0.752 GHz, IF at 0.248 GHz.

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).