AVANTEK

IAM-81018
MagIC™ Silicon Bipolar MMIC 5 GHz Active Double Balanced Mixer/IF Amp
November, 1990

Features

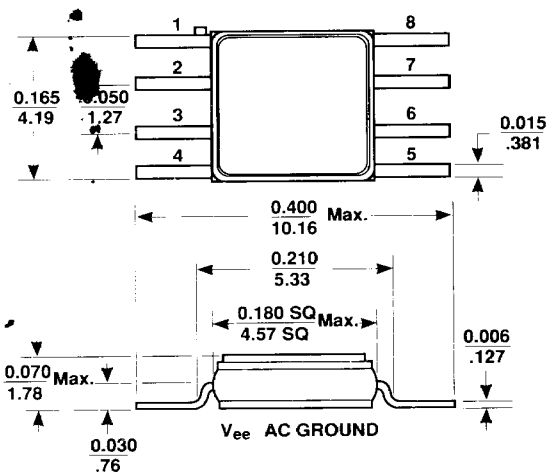
- 8 dB RF-IF Conversion Gain From 0.05 - 5 GHz
- IF Output From DC to 1 GHz
- Low Power Dissipation: 60 mW at V_{cc} = 5 V typ.
- Single Polarity Bias Supply: V_{cc} = 4 to 8 V
- Load-insensitive Performance
- Conversion Gain Flat Over Temperature
- Low LO Power Requirements: -5 dBm typical
- Low RF to IF Feedthrough, Low LO Leakage
- Hermetic Glass-Metal Surface Mount Package

Description

Avantek's IAM-81018 is a complete low-power-consumption double-balanced active mixer housed in a miniature glass-metal hermetic surface mount package. It is designed for narrow or wide bandwidth commercial, industrial and military applications having RF inputs up to 5 GHz and IF outputs from DC to 1 GHz. Operation at RF and LO frequencies less than 50 MHz can be achieved using optional external capacitors to ground. The IAM-81018 is particularly well suited for applications that require load-insensitive conversion gain and good spurious signal suppression with minimum LO and bias power consumption. Typical applications include frequency down conversion, modulation, demodulation and phase detection for fiber-optic, GPS satellite navigation, mobile radio, and battery powered communications receivers.

The IAM series of Gilbert multiplier-based frequency converters is fabricated using Avantek's 10 GHz f_T, 25 GHz f_{MAX} ISOSAT™-I 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.

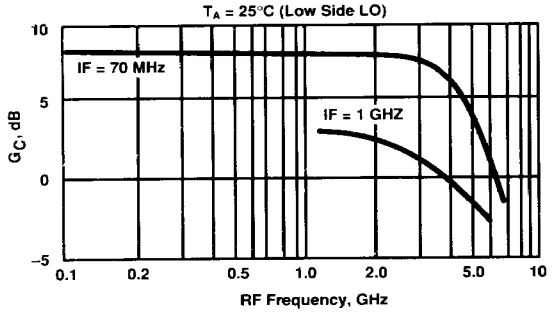
Avantek 180 mil Package



PIN DESCRIPTION			
1	IF Output	8	RF Ground (optional)
2	V_{ee}, AC Ground	7	V_{cc}
3	V_{ee}, AC Ground	6	LO Ground (optional)
4	RF Input	5	LO Input
Bottom of Package is V_{ee} (AC Ground)			

Notes:
(unless otherwise specified)
1. Dimensions are in / mm
2. Tolerances
in .xxx = ±.005
mm .xx = ±.13

TYPICAL RF to IF CONVERSION GAIN vs. RF FREQUENCY
T_A = 25°C (Low Side LO)



Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: V_{cc} = 5 V, Z_O = 50 Ω, LO = -5 dBm, RF = -20 dBm		Units	Min.	Typ.	Max.
G_C	Conversion Gain	RF = 2 GHz, LO = 1.75 GHz	dB	7.0	8.5	10
$f_{3\ dB RF}$	RF Bandwidth (G_C 3 dB Down)	IF = 250 MHz	GHz		4.5	
$f_{3\ dB IF}$	IF Bandwidth (G_C 3 dB Down)	LO = 2 GHz	GHz		0.6	
$P_{1\ dB}$	IF Output Power at 1 dB Gain Compression	RF = 2 GHz, LO = 1.75 GHz	dBm		−6	
IP_3	IF Output Third Order Intercept Point	RF = 2 GHz, LO = 1.75 GHz	dBm		3	
NF	SSB Noise Figure	RF = 2 GHz, LO = 1.75 GHz	dB		15	
VSWR	RF Port VSWR	f = 0.05 to 5 GHz			1.5:1	
	LO Port VSWR	f = 0.05 to 5 GHz			1.5:1	
	IF Port VSWR	f < 1 GHz			1.5:1	
RF_{if}	RF Feedthrough at IF Port	RF = 2 GHz, LO = 1.75 GHz	dBc		−25	
LO_{if}	LO Leakage at IF Port	LO = 1.75 GHz	dBm		−25	
LO_{rf}	LO Leakage at RF Port	LO = 1.75 GHz	dBm		−35	
I_{cc}	Supply Current		mA	10	12.5	16

Note: 1. The recommended operating voltage range for this device is 4 to 8 V. Typical performance as a function of voltage is on the following page.

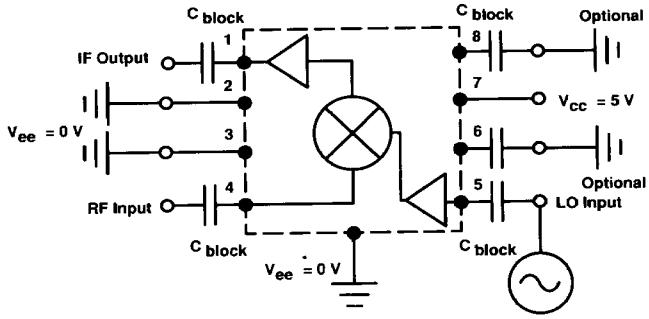
Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Voltage	10 V
Power Dissipation[2,3]	300 mW
RF Input Power	+14 dBm
LO Input Power	+14 dBm
Junction Temperature	200°C
Storage Temperature	–65°C to 200°C

Thermal Resistance[2]: θ_{jc} = 50°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C
3. Derate at 20 mW/°C for T_C >185°C

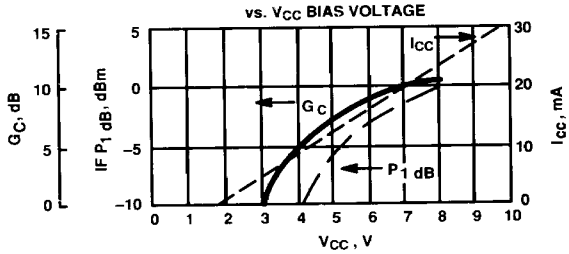
Typical Biasing Configuration and Functional Block Diagram



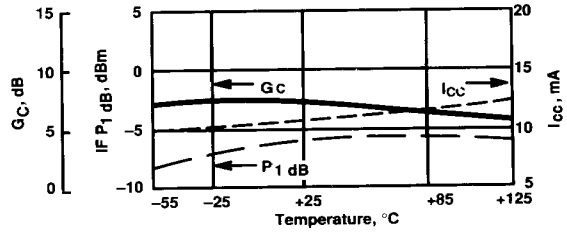
Note: No external BALUNs are required.

Typical Performance, T_A = 25°C, V_{CC} = 5 V
RF: -20 dBm at 2 GHz, LO: -5 dBm at 1.75 GHz
(unless otherwise noted)

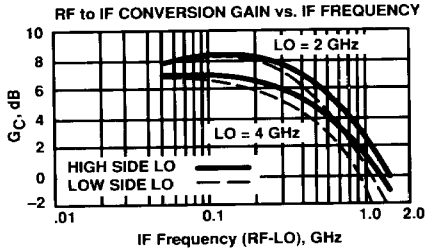
CONVERSION GAIN, IF $P_{1\,dB}$ and I_{CC} CURRENT vs. V_{CC} BIAS VOLTAGE



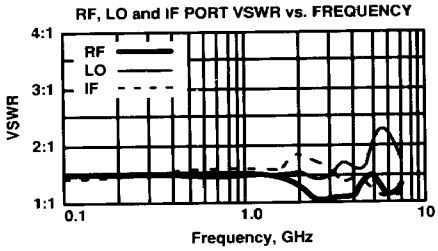
CONVERSION GAIN, IF P_1 dB and I_{CC} CURRENT vs. CASE TEMPERATURE



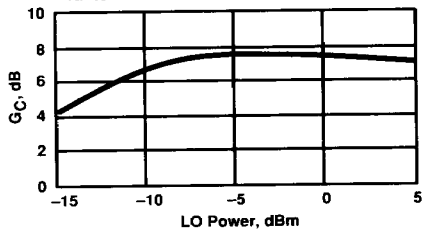
RF to IF CONVERSION GAIN vs. IF FREQUENCY



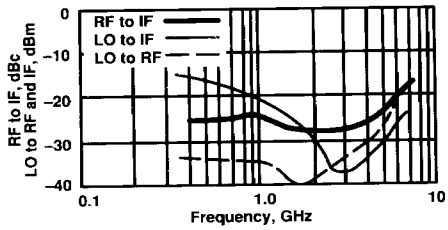
RF, LO and IF PORT VSWR vs. FREQUENCY



RF to IF CONVERSION GAIN vs. LO POWER



RF FEEDTHROUGH RELATIVE to IF CARRIER, dBm LO to RF and IF LEAKAGE vs. FREQUENCY



HARMONIC INTERMODULATION SUPPRESSION (dB BELOW DESIRED OUTPUT)
RF at 1 GHz, LO at 0.752 GHz, IF at 0.248 GHz

Harmonic LO Order	0	1	2	3	4	5
0	–	21	35	>75	>75	>75
1	12	0	48	48	>75	>75
2	13	41	39	71	>75	>75
3	36	28	53	57	>75	>75
4	27	49	49	72	>75	>75
5	45	35	63	62	>75	>75

Harmonic RF Order
Xmn = Pif-P(m*rf-n*lo)

AVANTEK

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