



IVA-04118
MagIC™ Silicon Bipolar MMIC
2.5 GHz Variable Gain Amplifier
April, 1991

Features

- Usable Gain to 4.0 GHz
- Data Rates up to 4.0 Gb/s
- High Gain: 27 dB typical
- Wide Gain Control Range: 35 dB typical
- Differential Output Capability
- 6 V Bias
- 5 V V_{gc} Control Voltage, $I_{gc} < 3$ mA typical
- Fast Gain Control Response: < 10 nsec typical
- Hermetic Glass-Metal Surface Mount Package

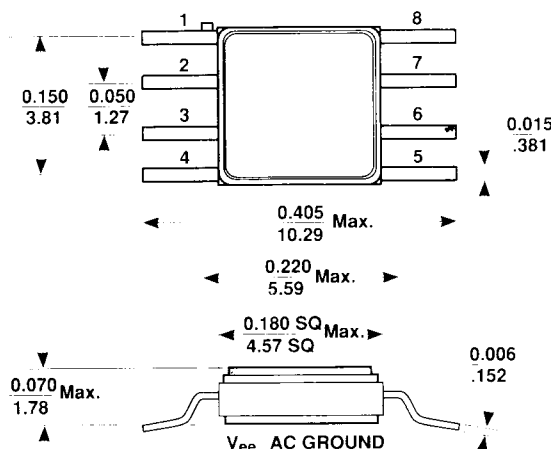
Description

Avantek's IVA-04118 is a variable gain amplifier housed in a miniature glass-metal hermetic surface mount package. It is designed for narrow or wide bandwidth commercial, industrial and military applications that require high gain and wide gain control range. The amplifier can be used in a single-ended or differential output configuration. For low frequency applications (< 50 MHz) a bypass capacitor and series resistor are connected to pin 4, the AC Input Ground lead.

Typical applications include variable gain amplification for fiber optic systems (e.g. SONET) with data rates up to 4.0 Gb/s, mobile radio and satellite receivers, millimeter wave receiver IF amplifiers, and communications receivers.

The IVA series of variable gain amplifiers is fabricated using Avantek's 10 GHz f_T , 25 GHz f_{MAX} ISOSAT™-I silicon bipolar process. This process uses nitride self-alignment, sub-micrometer 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

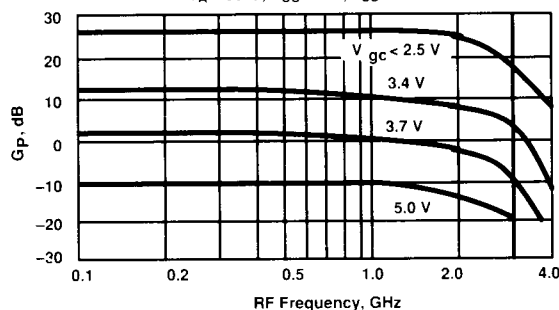


PIN DESCRIPTION	
1 Input +	8 Gain Control Voltage
2 V _{ee} - AC Ground	7 Output -
3 V _{ee} - AC Ground	6 Output +
4 AC Input Ground	5 V _{cc}
Bottom of Package is V _{ee} (AC Ground)	

Notes:
(unless otherwise specified)

1. Dimensions are in mm
2. Tolerances in .xxx = ± 0.005 mm .xx = ± 0.13

TYPICAL VARIABLE GAIN vs. FREQUENCY
 $T_A = 25^\circ\text{C}$, $V_{CC} = 6\text{ V}$, $V_{EE} = 0\text{ V}$



Electrical Specifications¹, $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions ² : $V_{CC} = 6\text{ V}$, $V_{EE} = 0\text{ V}$, $V_{gc} = 0\text{ V}$, $Z_0 = 50\ \Omega$	Units	Min.	Typ.	Max.
G _P	Power Gain $ S_{21} ^2$ $f = 1.0\text{ GHz}$	dB	23	27	
ΔG_P	Gain Flatness $f = 0.05$ to 2.5 GHz	dB		± 1.5	± 2.0
GCR	Gain Control Range $f = 1.0\text{ GHz}$, $V_{gc} = 0$ to 5 V	dB	25	35	
ISO	Reverse Isolation ($ S_{12} ^2$) $f = 1.0\text{ GHz}$, $V_{gc} = 0$ to 5 V	dB		45	
VSWR	Input VSWR $f = 0.05$ to 3.0 GHz , $V_{gc} = 0$ to 5 V			1.5:1	
	Output VSWR $f = 0.05$ to 3.0 GHz , $V_{gc} = 0$ to 5 V			2.0:1	
NF	50 Ω Noise Figure $f = 1.0\text{ GHz}$	dB		9	
P _{1 dB}	Output Power @ 1 dB Compression $f = 1.0\text{ GHz}$	dBm		-6	
V _{OUT}	Peak-to-Peak Single-Ended Output Voltage $f = 1.0\text{ GHz}$	mV _{pp}		300	
IP ₃	Output Third Order Intercept Point $f = 1.0\text{ GHz}$	dBm		4	
t _D	Group Delay $f = 1.0\text{ GHz}$	psec		350	
I _{CC}	Supply Current	mA	20	30	40

Notes: 1. The recommended operating voltage range for this device is 4.5 to 6 V. Typical performance as a function of voltage is on the following page.

2. As measured using Input Pin 1 and Output Pin 6; with Output Pin 7 terminated into 50 ohms.

IVA-04118 Silicon Bipolar MMIC 2.5 GHz Variable Gain Amplifier

Absolute Maximum Ratings

Parameter	Absolute Maximum ¹
Device Voltage ($V_{CC} - V_{EE}$)	9 V
Power Dissipation ^{2,3}	750 mW
Input Power	+14 dBm
$V_{GC} - V_{EE}$	7 V
Junction Temperature	200 C
Storage Temperature	-65 C to 200 C

Thermal Resistance²: $\theta_{JC} = 50$ C/W

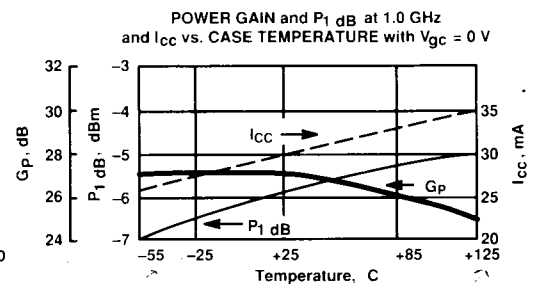
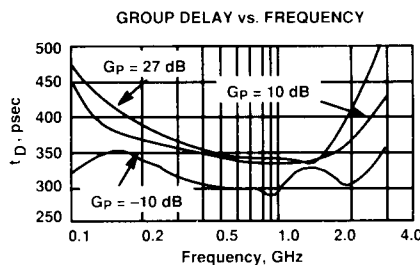
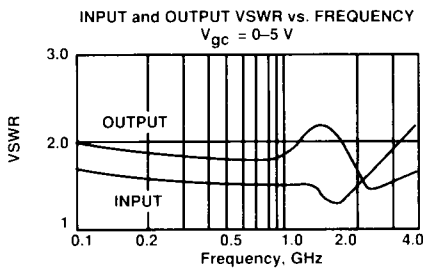
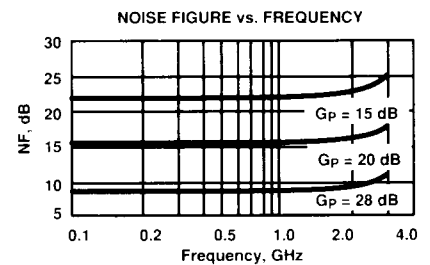
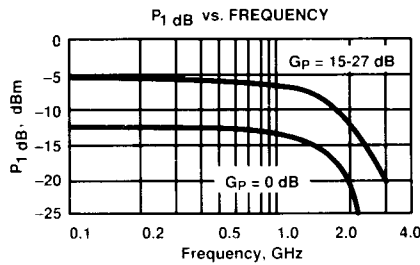
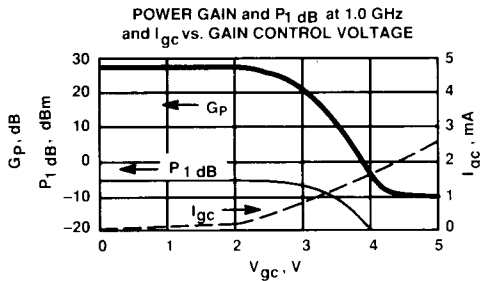
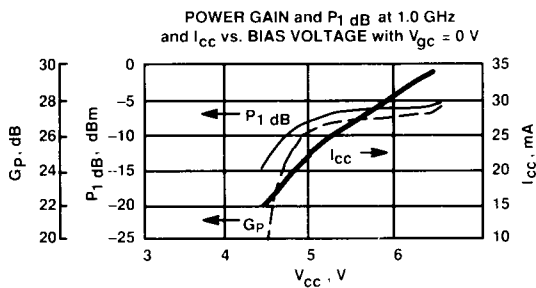
Notes:

- Permanent damage may occur if any of these limits are exceeded.
- $T_{CASE} = 25$ C
- Derate at 20 mW/ C for $T_C > 163$ C.

Typical Performance, $T_A = 25^\circ\text{C}$,

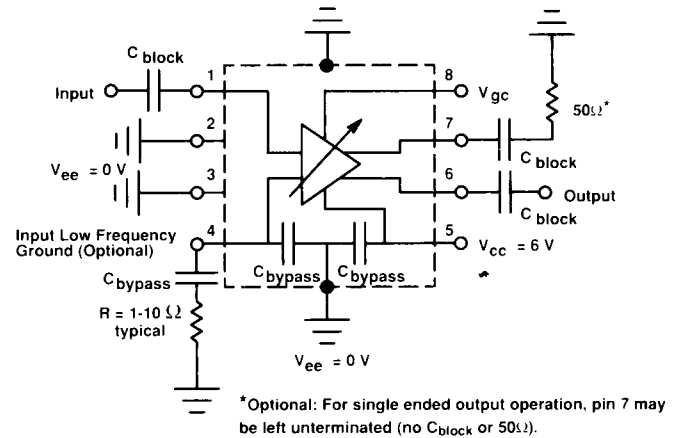
$V_{CC} = 6$ V, $V_{EE} = 0$ V

(unless otherwise noted)

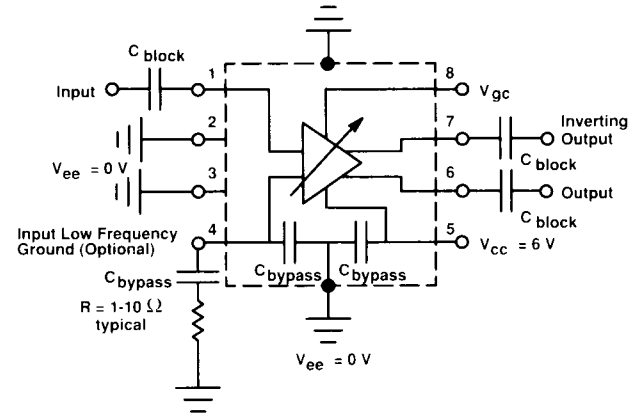


Typical Biasing Configuration and Functional Block Diagram:

Single Ended Input / Single Ended Output



Single Ended Input / Differential Output



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