NON-CATALOG

Surface Mount

Monolithic Amplifier

DC-3 GHz

Product Features

- Wideband, DC to 3 GHz
- Cascadable
- Internally Matched to 50 Ohms
- Aqueous washable
- Protected under US Patent 6,943,629

VAM-93+

CASE STYLE: MMM168
PRICE: Contact Sales Dept.

+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

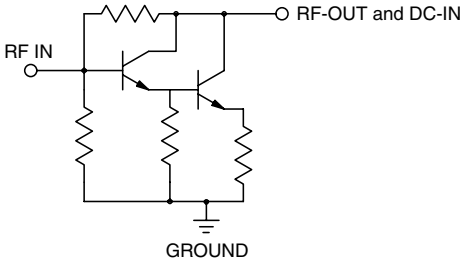
Typical Applications

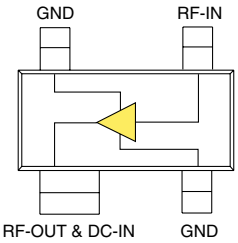
- Cellular
- PCN
- Instrumentation
- UHF/VHF

General Description

VAM-93+ (RoHS compliant) is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in an SOT143 style package. It uses Darlington configuration and is fabricated using InGaP HBT technology.

simplified schematic and pin description





Function	Pin Number	Description
RF IN	1	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
RF-OUT and DC-IN	3	RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit".
GND	2,4	Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. **2.** Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. **3.** The parts covered by this specification sheet are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp.

Electrical Specifications at 25°C and 35mA, unless noted

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range*		DC		3	GHz
Gain	0.1 1 2 3	 17	22.3 21.2 19.1 17.1		dB
Input Return Loss	DC to 2 2 to 3		14 8.1		dB
Output Return Loss	DC to 3		18		dB
Output Power @ 1 dB compression	2	10.0	12.7		dBm
Output IP3	2		+27		dBm
Noise Figure	2		3.7		dB
Recommended Device Operating Current			35		mA
Device Operating Voltage		3.0	3.2	4.1	V
Device Voltage Variation vs. Temperature at 35 mA			-2.3		mV/°C
Device Voltage Variation vs. Current at 25°C			3.6		mV/mA
Thermal Resistance, junction-to-case[1]			159		°C/W

Low frequency cut off determined by external coupling capacitors.

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature*	-45°C to 85°C
Storage Temperature	-65°C to 150°C
Operating Current	75mA
Power Dissipation	330mW
Input Power	13dBm

Note: Permanent damage may occur if any of these limits are exceeded.
These ratings are not intended for continuous normal operation.
[1]Case is defined as ground leads.
*Based on typical case temperature rise 5°C above ambient.

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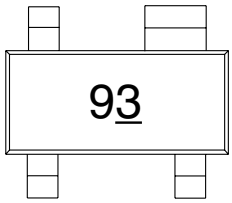
Product Marking



Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

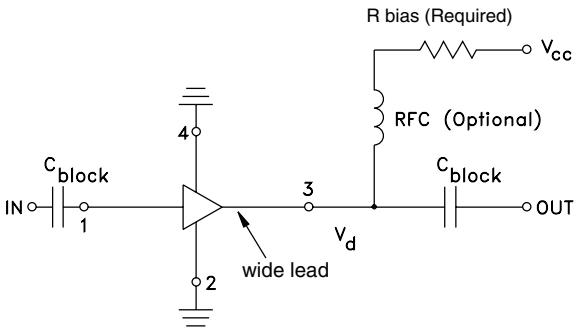
Case Style: MMM168

VAM-93+: Plastic molded SOT143 style package, lead finish: tin/silver/nickel

Tape & Reel: F59

Suggested Layout for PCB Design: PL-251

Recommended Application Circuit



R bias	
Vcc (V)	"1%" Res. Values (ohms) for Optimum Biasing
7	107
8	133
9	162
10	191
11	221
12	251
13	280
14	309
15	340
16	365
17	392
18	422
19	453
20	475

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ESD Rating

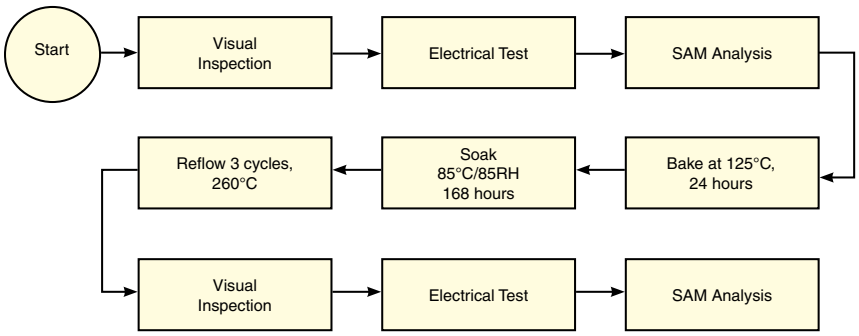
Human Body Model (HBM): Class 1A (250 v to < 500 v) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (< 100 v) in accordance with ANSI/ESD STM 5.2 - 1999

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020

MSL Test Flow Chart



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MMIC Amplifier VAM-93+

Typical Performance Data

FREQUENCY (MHz)	GAIN (dB) 35 mA	ISOLATION (dB) 35 mA	RETURN LOSS IN (dB) 35 mA	RETURN LOSS OUT (dB) 35 mA
1	22.44	24.39	25.38	19.56
3	22.43	24.10	25.45	22.75
5	22.44	24.00	25.20	24.47
7	22.46	23.97	24.98	25.46
9	22.48	23.97	24.79	26.00
10	22.48	23.92	24.74	26.15
30	22.51	24.02	23.91	25.71
50	22.48	23.96	23.39	25.67
70	22.46	23.89	22.91	25.82
90	22.42	23.94	22.46	25.58
100	22.40	23.98	22.33	25.58
200	22.16	23.72	19.44	25.10
300	21.89	23.58	17.42	24.22
400	21.57	23.41	15.93	23.48
500	21.29	23.33	14.76	22.66
600	21.02	23.15	13.92	22.09
700	20.77	22.97	13.25	21.26
800	20.54	22.94	12.60	20.59
900	20.34	22.91	12.09	20.01
1000	20.11	22.84	11.64	19.58
1200	19.70	22.87	10.80	18.72
1400	19.29	22.79	10.13	18.31
1500	19.13	22.75	9.84	18.21
1600	18.93	22.74	9.53	18.01
1700	18.74	22.79	9.32	17.93
1800	18.52	22.79	9.12	18.03
2000	18.16	22.60	8.73	18.25
2200	17.79	22.69	8.42	18.79
2400	17.45	22.44	8.25	19.52
2600	17.07	22.48	8.16	20.51
2800	16.73	22.56	8.13	21.69
3000	16.47	22.41	8.20	23.15
3200	16.20	22.49	8.28	24.46
3400	16.02	22.19	8.54	24.52
3600	15.83	22.10	8.82	23.78
3800	15.60	21.70	9.19	23.04
4000	15.38	21.26	9.55	22.09

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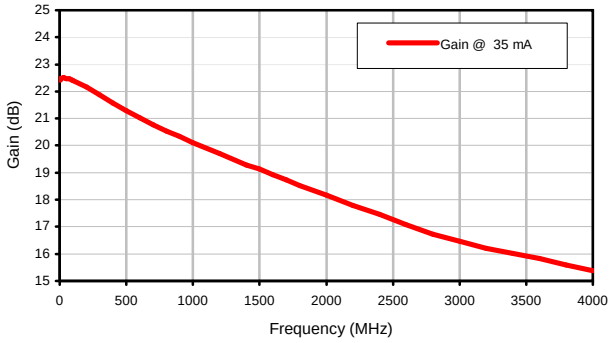
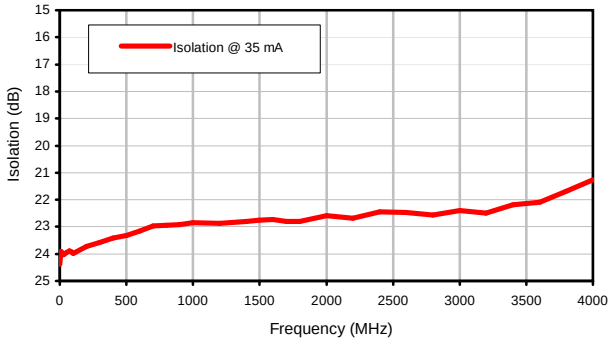
Typical Performance Curves

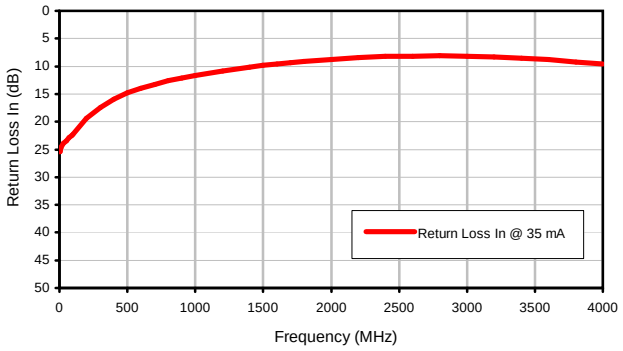
Gain



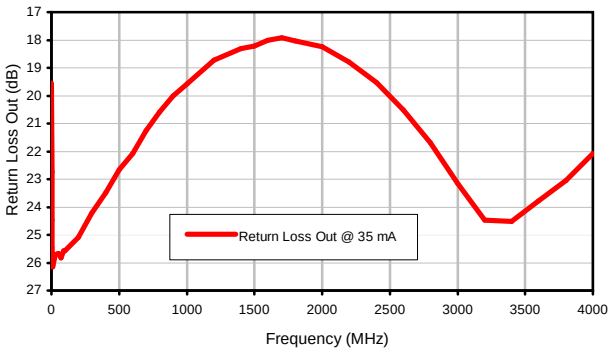
ISOLATION



Return Loss In



Return Loss Out



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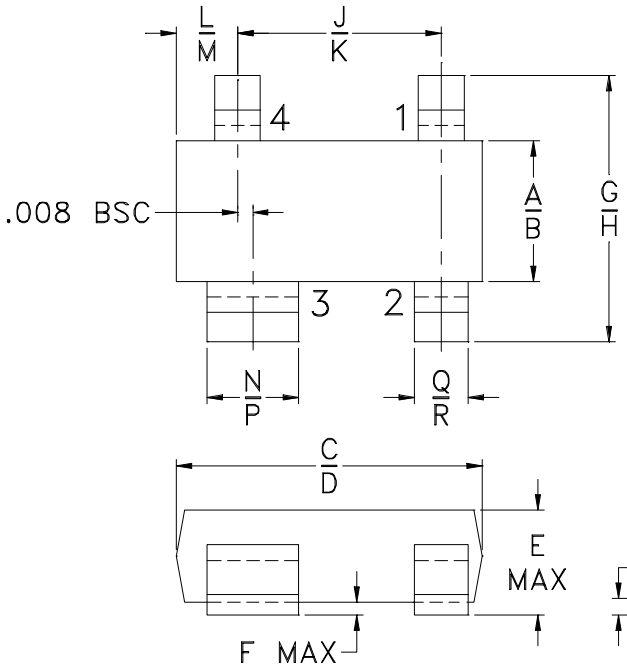
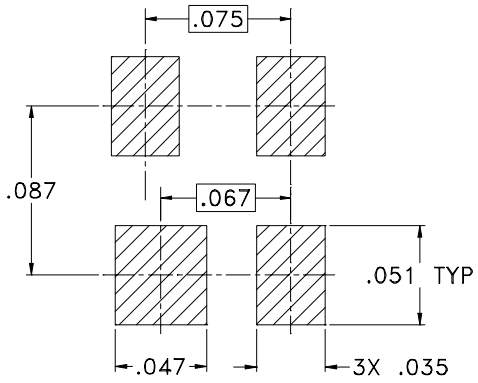
Case Style MMM

MMM168

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
MMM168	.045 (1.14)	.055 (1.40)	.105 (2.67)	.120 (3.05)	.047 (1.19)	.005 (0.13)	.083 (2.11)	.104 (2.64)	.070 (1.78)	.080 (2.03)	.018 (0.46)	.024 (0.61)	.030 (0.76)	.036 (0.91)

CASE #.	Q	R	S	T	WT, GRAM
MMM168	.015 (0.38)	.021 (0.53)	.023 (0.58)	.005 (0.13)	.01

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier.
   For RoHS-5 Case Styles: Tin-Lead plate.

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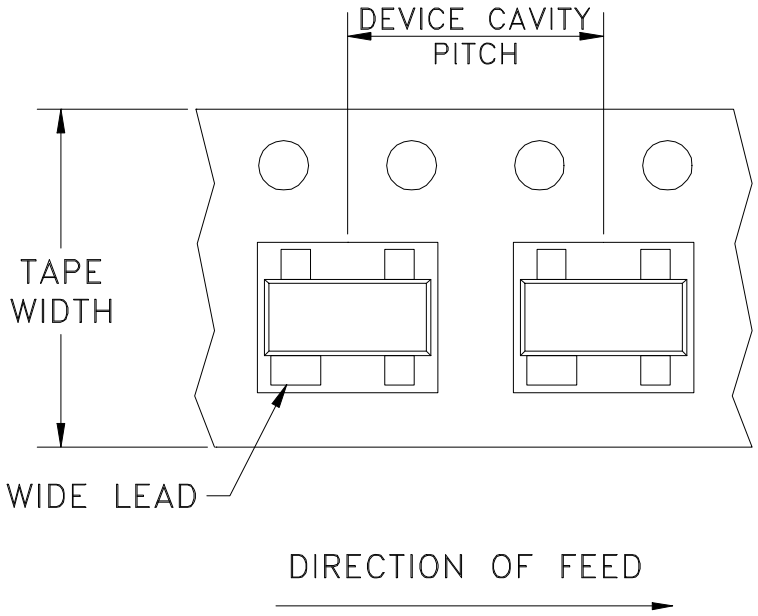
Tape & Reel Packaging TR-F8

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
8	4	7	3000

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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