# MINI-CIRCUITS / AVANTEK MONOLITHIC AMPLIFIERS
(DC TO 8GHz)

MARKING IDENTIFICATION / EQUIVALENT

Model	Equivalent	Equivalent	Alphanumeric	Colour
Mini-circuits	MAR/MAV	Avantek	Dot	Equivalent
MAR-1	MAV-1	MSA0185	A01	Brown
MAR-2	MAV-2	MSA0285	A02	Red
MAR-3	MAV-3	MSA0385	A03	Orange
MAR-4	MAV-4	MSA0485	A04	Yellow
MAR-6		MSA0685	A06	White
MAR-7			A07	Violet
		MSA0735		
MAR-8		MSA0885	A08	Blue
		MSA0835		
MAV-1	MAR-1	MSA0104	1	-
MAV-2	MAR-2	MSA0204	2	-
MAV-3	MAR-3	MSA0304	3	-
MAV-4	MAR-4	MSA0404	4	-
		MSA0504	5	-
		MSA0604	6	-
		MSA0704	7	-
		MSA0804	8	-
MAV-11		MSA01104	A	-
ERA-1			E1	
ERA-2			E2	
ERA-3			E3	
ERA-4			E4	
ERA-5			E5	
ERA-6			E6	

COMPONENT PINOUT

MAR / ERA / -85   (85mil Plastic)
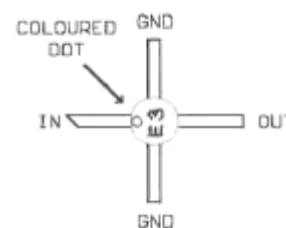
MAV / -04   (4-pac Plastic)

MINI-CIRCUITS AMPLIFIER GAIN / OUTPUT / NOISE FIGURE SELECTION

	Gain Typical dB at Freq GHz								Maximum Power Out 1dB Comp @ 1GHz	Noise Figure	IP3 dBm
Model	0.1	0.5	1	2	3	4	6	8			
MAR-1	18.5	17.5	15.5	-	-	-	-	-	+1.5dBm	5.5	+14.0
MAR-2	12.5	12.3	12.0	11.0	-	-	-	-	+4.5dBm	6.5	+17.0
MAR-3	12.5	12.2	12.0	11.5	-	-	-	-	+10.0dBm	6.0	+23.0
MAR-4	8.3	8.2	8.0	-	-	-	-	-	+12.5dBm	6.5	+25.5
MAR-6	20.0	18.5	16.0	11.0	-	-	-	-	+2.0dBm	3.0	+14.5
MAR-7	13.5	13.1	12.5	11.0	-	-	-	-	+5.5dBm	5.0	+19.0
MAR-8	32.5	28.0	22.5	-	-	-	-	-	+12.5dBm	3.3	+27.0
MAV-11	12.7	12.0	10.5	-	-	-	-	-	+17.5dBm	3.6	+30.0
ERA-1	-	-	-	11.6	11.2	-	10.5	9.6	+13dBm (2GHz)	7.0	+26.0
ERA-2	16.0	-	-	14.9	13.9	-	11.8	-	+14dBm (2GHz)	6.0	+27.0
ERA-3	22.2	-	-	20.2	18.2	-	-	-	+11dBm (2GHz)	4.5	+23.0
ERA-4	13.8	-	14.0	13.9	13.9	13.4	-	-	+19.1dBm	5.2	+36.0
ERA-5	20.4	-	20.0	19.0	17.6	15.8	-	-	+19.6dBm	4.0	+36.0
ERA-6	11.1	-	11.1	11.3	11.5	11.3	-	-	+18.5dBm	8.4	+36.5

Max Power Out (1dB comp) = The point where the amplifier starts to compress the signal & becomes unlinear

IP3 dBm = Third Order Intercept Point

Dynamic Range = The power range over which an amplifier provides linear operation, with the Lower limit dependant on the Noise Figure & the upper limit a function of the 1dB compression point

MAR-8 Potentially Unstable, Use ERA-3

SUGGESTED APPLICATIONS

Application	Model
High Freq Gain	ERA1 Usable to 10GHz
Low Noise Amp	MAR6 / MAR8 / MAV11
Medium Noise	ERA3 / ERA5
High Dynamic range	MAV11
Stable High Gain	MAR1 / ERA3
Medium Output	MAV11 / MAR3 / MAR4
High Output	MAV11 / ERA4 / 5
Multiplier	ERA3 Clean Harmonics

BIAS CONFIGURATION

SUGGESTED RESISTOR BIAS VALUES

Model	ImA	Vd	+5Vcc	+9Vcc	+12Vcc	+13.8Vcc	P / Watts Resistor (+12Vcc)
MAR-1	17	5.00	-	220ohm	470ohm	560ohm	0.119W
MAR-2	25	5.00	-	150ohm	270ohm	390ohm	0.175W
MAR-3	35	5.00	-	120ohm	200ohm	270ohm	0.245W
MAR-4	50	5.25	-	75ohm	150ohm	180ohm	0.338W
MAR-6	16	3.50	100ohm	390ohm	560ohm	680ohm	0.136W
MAR-7	22	4.00	47ohm	220ohm	390ohm	470ohm	0.176W
MAR-8	36	7.80	-	33ohm	120ohm	180ohm	0.151W
MAV-11	60	5.50	-	56ohm	120ohm	150ohm	0.390W
ERA-1	40	3.60	35ohm	130ohm	220ohm	255ohm	0.336W
ERA-2	40	3.60	35ohm	130ohm	220ohm	255ohm	0.336W
ERA-3	35	3.50	43ohm	157ohm	243ohm	300ohm	0.298W
ERA-4	65	5.00	-	62ohm	109ohm	130ohm	0.462W
ERA-5	65	4.90	-	62ohm	109hm	130ohm	0.462W
ERA-6	70	5.50	-	50ohm	93ohm	136ohm	0.455W

TYPICAL BIASING CONFIGURATION
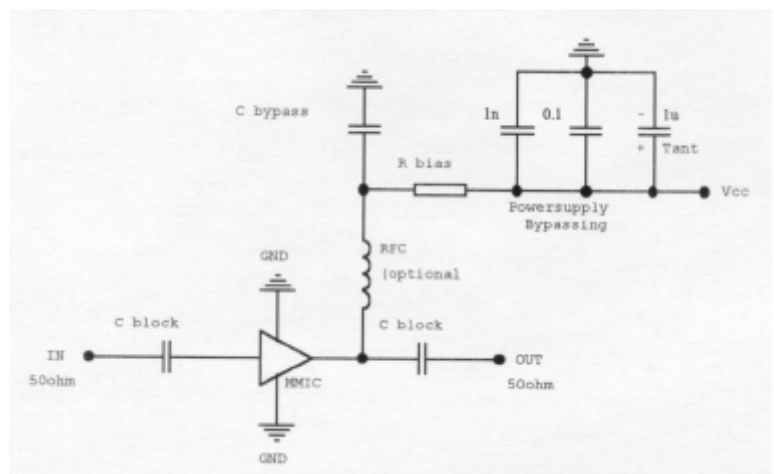
R bias $= \dfrac{Vcc - Vd}{I\ bias}$

Vcc = The supply Voltage
Vd = The Device Voltage
I bias = The Bias Current In mA (ImA)

P Watts $= V \times I$

P Watts = Power Rating Of R bias
V = Volts across R bias
I = Current Through R bias

C block: Determines the low frequency cut off of the amplifier circuit. The Capacitors value is chosen to suit the frequency that the amplifier circuit is going to be used for.

100MHz (1nF)   **400MHz (100pF)**   **1.2GHz (10pF)**   **2.5GHz (5pF)**   **10GHz (1 - 2pF)**

RFC (Optional): Is used to isolate the bias resistor so that it does not appear in parallel with the output load of the amplifier, degrading the output match of the amplifier. The impedance of the choke at the lowest frequency of operation of the amplifier plus the value of the bias resistor should be at least 500ohms

100MHz (10uH)   **400MHz (3 turns 0.315mm TCW on a FX1112 ferrite bead)**

1.2GHz (6 turns 0.315mm ECW 3mm dia closewound airspaced)   **> 2GHz (printed 1/4wave lines on PC board)**

C bypass: A Capacitor should be used in conjunction with the RFC to present a low impedance path to ground for any signal that manages to get past the RFC. The Capacitor should be connected at the junction of the R bias resistor & the RFC to ground.

100MHz (1nF)   **400MHz (100pF)**   **1.2GHz (10pF)**   **> 2.5GHz (printed on the PC board)**

Powersupply Bypassing: Suitable Capacitors should be used on the Vcc rail to effectively bypass low & high frequencies.

Suggested Values   **1uF Tantalum**   **0.1uF**   **1nF (Use all in parallel)**

MSA = Monolithic Silicon Amp
MMIC= Monolithic Microwave
         Integrated Circuit