



Quad PIN Diode π Attenuator

5 – 3000 MHz

MA4P274-1225T

Features

- 4 PIN Diodes in SOT-25 Plastic Package
- Externally Selectable Bias and RF Match Network
- 5 – 3,000 MHz Useable Frequency Band
- + 43 dBm IP3@ 1 GHz (50 Ω)
- 1.0 dB Loss @ 1 GHz (50 Ω)
- 30 dB Attenuation @ 1 GHz (50 Ω)

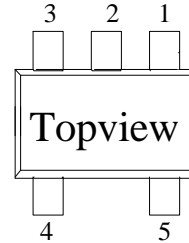
Description

M/A-COM's MA4P274-1225 is a wideband, lower insertion loss, high IP3, Quad PIN Diode π Attenuator in a low-cost, surface mount SOT-25 package. Four PIN Diodes in one package reduce design parasitics and improve circuit density.

Applications

These PIN Diode Attenuators perform well where RF Signal Amplitude Control is required in 50 Ω Handset Circuits and 75 Ω Broadband CATV Systems. Exceptional Insertion Loss, Attenuation Range, and IP3 at <10 mA bias make these devices suitable for better power level control in RF Amplifiers.

Package Outline (Topview)



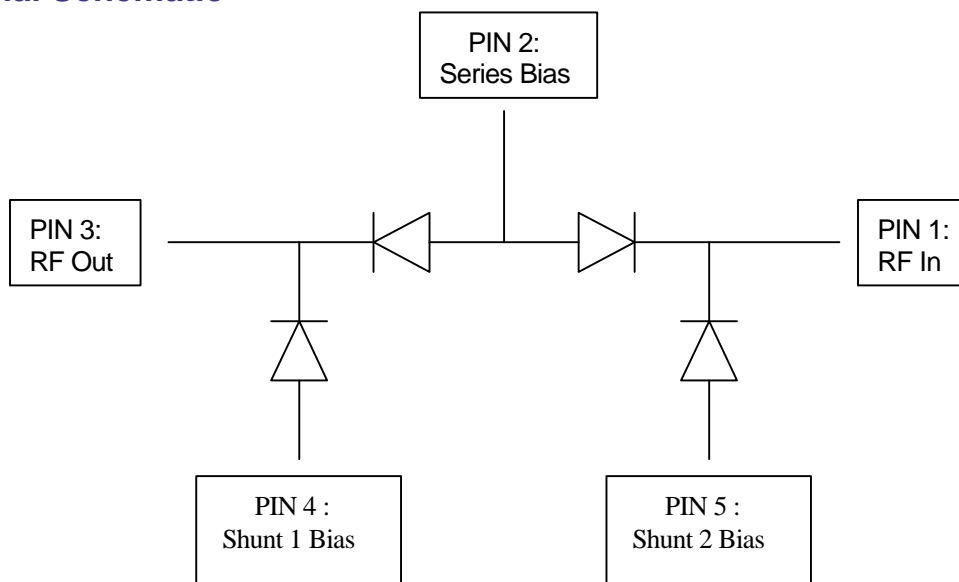
PIN Configuration

| PIN | Function | PIN | Function |
|-----|-------------|-----|--------------|
| 1 | RF In | 4 | Shunt 1 Bias |
| 2 | Series Bias | 5 | Shunt 2 Bias |
| 3 | RF Out | | |

Guaranteed Electrical Specifications: @ +25 °C

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---------------------------|---|----------|------|------|------|
| Ct @ 0 V | 100 MHz | pF | | 0.45 | 0.50 |
| Rs @ 1 mA | 100 MHz | Ω | | 13 | 18 |
| Rs @ 10 mA | 100 MHz | Ω | | 2.3 | 3.0 |
| V _b | D.C. | V | 125 | 150 | |
| Minority Carrier Lifetime | (50 % - 90 %) Voltage If = + 10mA, Ir = - 6mA Pulse @ 100 kHz Sq Wave | nS | | 1000 | 2000 |
| Power Dissipation | D.C. and F = 5 – 3,000 MHz Derate linearly to 0 mW at 125 C Using 1,000 deg-C/W Thermal Resistance | mW | | | 100 |
| RF Incident Power | F = 5 – 3,000 MHz Vshunt 1 & 2 Diode Bias = 0.75 V Vseries Diode Bias = 0 to 20 V | dBm | | | + 20 |

Functional Schematic



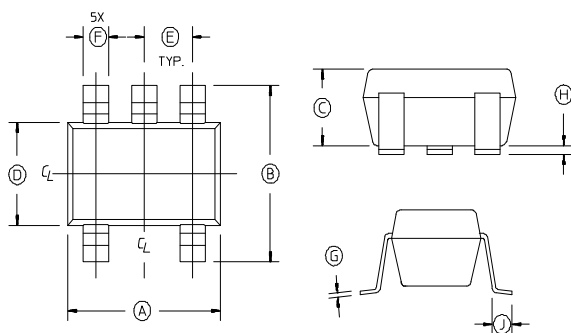
Case Style: SOT 25

| Dim | Inches | | Millimeters | |
|-----|------------|--------|-------------|------|
| | Min. | Max. | Min. | Max. |
| A | .1103 | .1181 | 2.80 | 3.10 |
| B | .1023 | .1181 | 2.6 | 3.00 |
| C | 0.0355 | .0512 | 0.9 | 1.30 |
| D | 0.0591 | .0669 | 1.5 | 1.70 |
| E | .0374 REF. | | 0.95 REF. | |
| F | .0138 | .0197 | .35 | .50 |
| G | .0031 | 0.0079 | .08 | 0.2 |
| H | .0002 | .0059 | .05 | .15 |
| J | .0138 | .0216 | .35 | .55 |

Absolute Maximum Ratings¹

| Parameter | Absolute Maximum |
|--|------------------------|
| Operating Temperature | -65 °C to +125 °C |
| Storage Temperature, No Dissipated Power | -65 °C to +150 °C |
| DC Voltage at Temperature Extremes | -100 V |
| DC Current at 25 °C | 75 mA |
| Mounting Temperature | +235 °C for 10 seconds |

1. Exceeding any one or combination of these limits may cause permanent damage.



1. Dimensions do not include mold peaks, protrusion or gate burrs which shall not exceed 0.0098 in. (.25) mm per side.
2. Leads Coplanarity should be 0.003 (0.08) mm Max.

Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

**Typical 50 W SOT-25 RF Performance @ +25 °C using Wideband RF Circuit Design
(Values Shown include Through Loss Calibrated Out of RF Test Circuit)**

| Parameter | Frequency Range | Test Conditions | Units | Min. | Typ. | Max. |
|------------------------|-----------------|--|-------|------|------|------|
| Insertion Loss | 5 – 1,000 MHz | + 3 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -2.0 | |
| Insertion Loss | 5 – 1,000 MHz | + 6.5 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -1.0 | |
| Return Loss | 5 – 1,000 MHz | + 6.5 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -10 | |
| Attenuation | 5 – 1,000 MHz | 0 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -29 | |
| Input IP3 | 5 – 1,000 MHz | 0 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F1 = 1000 MHz, F2 = 1100 MHz | dBm | | 43 | |
| Input IP3 | 5 – 1,000 MHz | + 6.5 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F1 = 1000 MHz, F2 = 1100 MHz | dBm | | 43 | |
| Input IP3 | 5 – 1,000 MHz | 0 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F1 = 100 MHz, F2 = 110 MHz | dBm | | 43 | |
| Input IP3 | 5 – 1,000 MHz | + 6.5 mA / Series Diode and 0.75 V Shunt 1 and 2 Bias F1 = 100 MHz, F2 = 110 MHz | dBm | | 33 | |
| Settling Time | 5 – 1,000 MHz | Within 1 dB of Final Attenuation Value F = 1 GHz | uS | | 3 | |
| RF C.W. Incident Power | 5 – 1,000 MHz | 0 – 20 V Series Diode Bias and 0.75 V Shunt 1 and 2 Bias | dBm | | + 20 | |

**Typical 75 W SOT-25 RF Performance @ +25 °C using Wideband RF Circuit Design
(Values Shown include Through Loss Calibrated Out of RF Test Circuit)**

| Parameter | Frequency Range | Test Conditions | Units | Min. | Typ. | Max. |
|----------------|-----------------|--|-------|------|------|------|
| Insertion Loss | 5 – 1,000 MHz | + 2 mA / Series Diode and 1.0 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -1.1 | |
| Insertion Loss | 5 – 1,000 MHz | + 4.5 mA / Series Diode and 1.0 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -0.6 | |
| Attenuation | 5 – 1,000 MHz | 0 mA / Series Diode and 1 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -27 | |
| Return Loss | 5 – 1,000 MHz | + 4.5 mA / Series Diode and 1.0 V Shunt 1 and 2 Bias F = 1 GHz | dB | | -10 | |

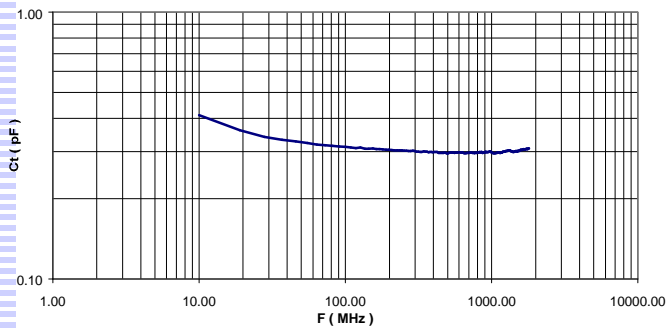
Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

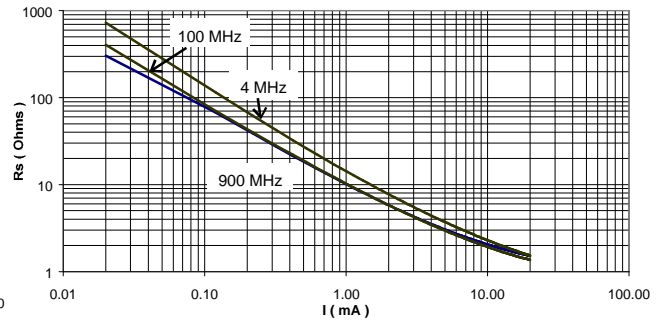
Visit www.macom.com for additional data sheets and product information.



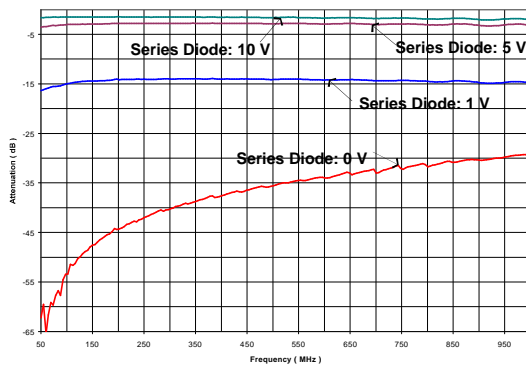
MA4P274-1225 Diode C_t vs Frequency @ 0 V



MA4P274-1225 Diode R_s vs I

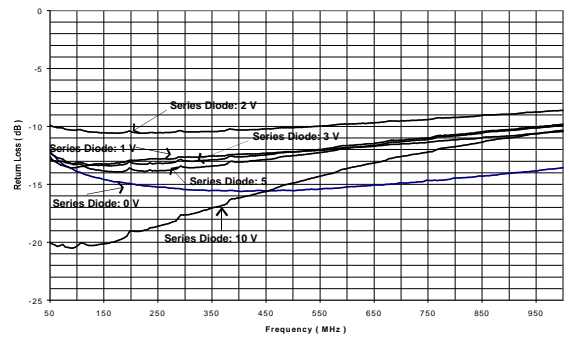


MA4P274-1225 Attenuation vs Frequency in 50 Ohms, Shunt Bias = 0.75 V



R_s vs. I_f @ 100 MHz and 1 GHz

MA4P274-1225 Return Loss vs Frequency in 50 Ohms, Shunt Bias = 0.75 V



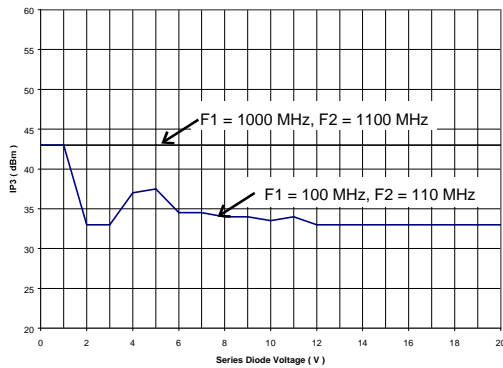
L_s vs. Frequency @ 10 mA

Specifications subject to change without notice.

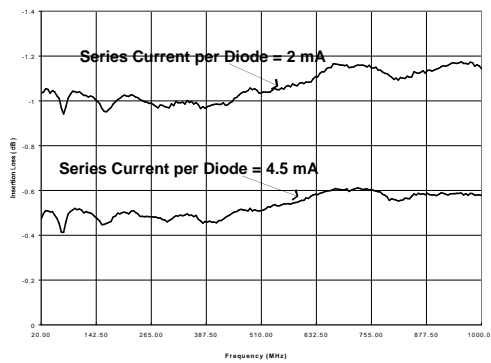
- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

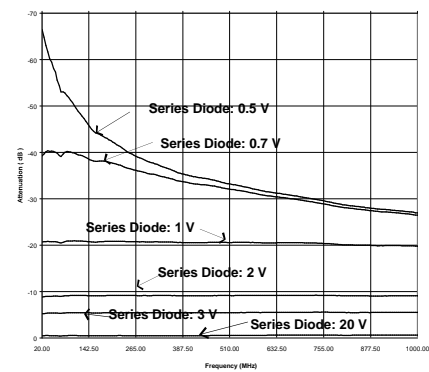
**MA4P274-1225 IP3 vs Series Voltage,
Vshunt = .075 V**



MA4P274-1225 Insertion Loss vs Frequency in 75 Ohms, Shunt Bias = 1 V



MA4P274-1225 Attenuation vs Frequency in 75 Ohms, Shunt Bias = 1 V

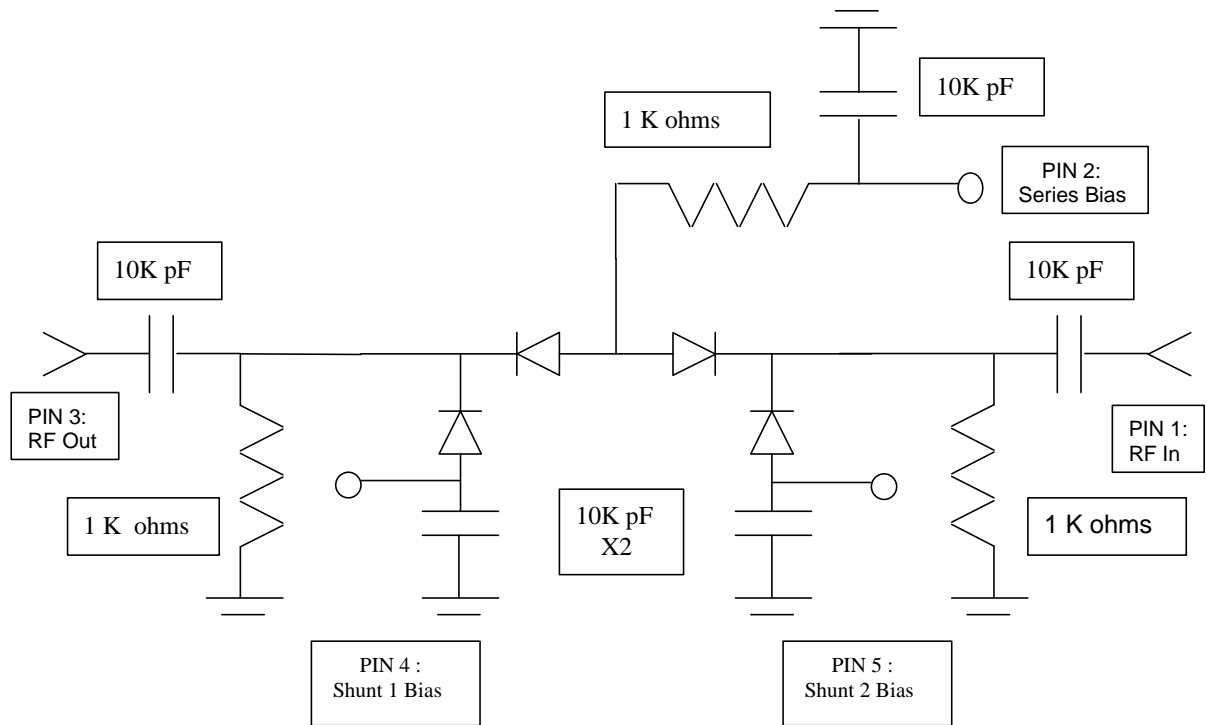


Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

5 - 1,000 MHz Wideband RF Circuit



Note : Keeping PIN 4 & PIN 5 as Separate Bias Points (Same V) reduces RF leakage (increases attenuation) through an otherwise connected Common Anode Bias Node.

10 - 1,000 MHz Wideband RF Circuit Parts List

| Item | Supplier | Supplier P/N |
|--|---|--------------------|
| 4003 or 4350 Circuit Board 4003 ($\epsilon_r = 3.38$), 4350 ($\epsilon_r = 3.48$) | Rogers Corporation www.rogers-corp.com | RO4003 , RO4350 |
| Capacitor, 10 K pF 3.2 mm L x 1.6 mm W x 1.15 mm H | Murata www.murata.com | GRM42-6COH103K25PB |
| Resistor, 1K Ω 1.0 mm L x 0.5 mm w x 0.25 mm H | Piconics www.piconics.com | C1001BC42KSA |

Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

**Series and Shunt Diode Bias Currents as a Function of Vseries and Vshunt Voltage Using Wideband RF Circuit
(Values shown are PER DIODE)**

| Vshunt Bias (V) | Vseries Bias (V) | Iseries Diode (mA) | Ishunt Diode (mA) |
|-------------------|--------------------|----------------------|---------------------|
| 0.75 | 0 | 0.000 | 0.192 |
| 0.75 | 1 | 0.106 | 0.120 |
| 0.75 | 2 | 0.443 | 0.048 |
| 0.75 | 3 | 0.773 | 0 |
| 0.75 | 4 | 1.099 | 0 |
| 0.75 | 5 | 1.426 | 0 |
| 0.75 | 6 | 1.750 | 0 |
| 0.75 | 7 | 2.092 | 0 |
| 0.75 | 8 | 2.424 | 0 |
| 0.75 | 9 | 2.756 | 0 |
| 0.75 | 10 | 3.088 | 0 |
| 0.75 | 11 | 3.421 | 0 |
| 0.75 | 12 | 3.754 | 0 |
| 0.75 | 13 | 4.087 | 0 |
| 0.75 | 14 | 4.410 | 0 |
| 0.75 | 15 | 4.743 | 0 |
| 0.75 | 16 | 5.081 | 0 |
| 0.75 | 17 | 5.406 | 0 |
| 0.75 | 18 | 5.750 | 0 |
| 0.75 | 19 | 6.079 | 0 |
| 0.75 | 20 | 6.413 | 0 |

Specifications subject to change without notice.

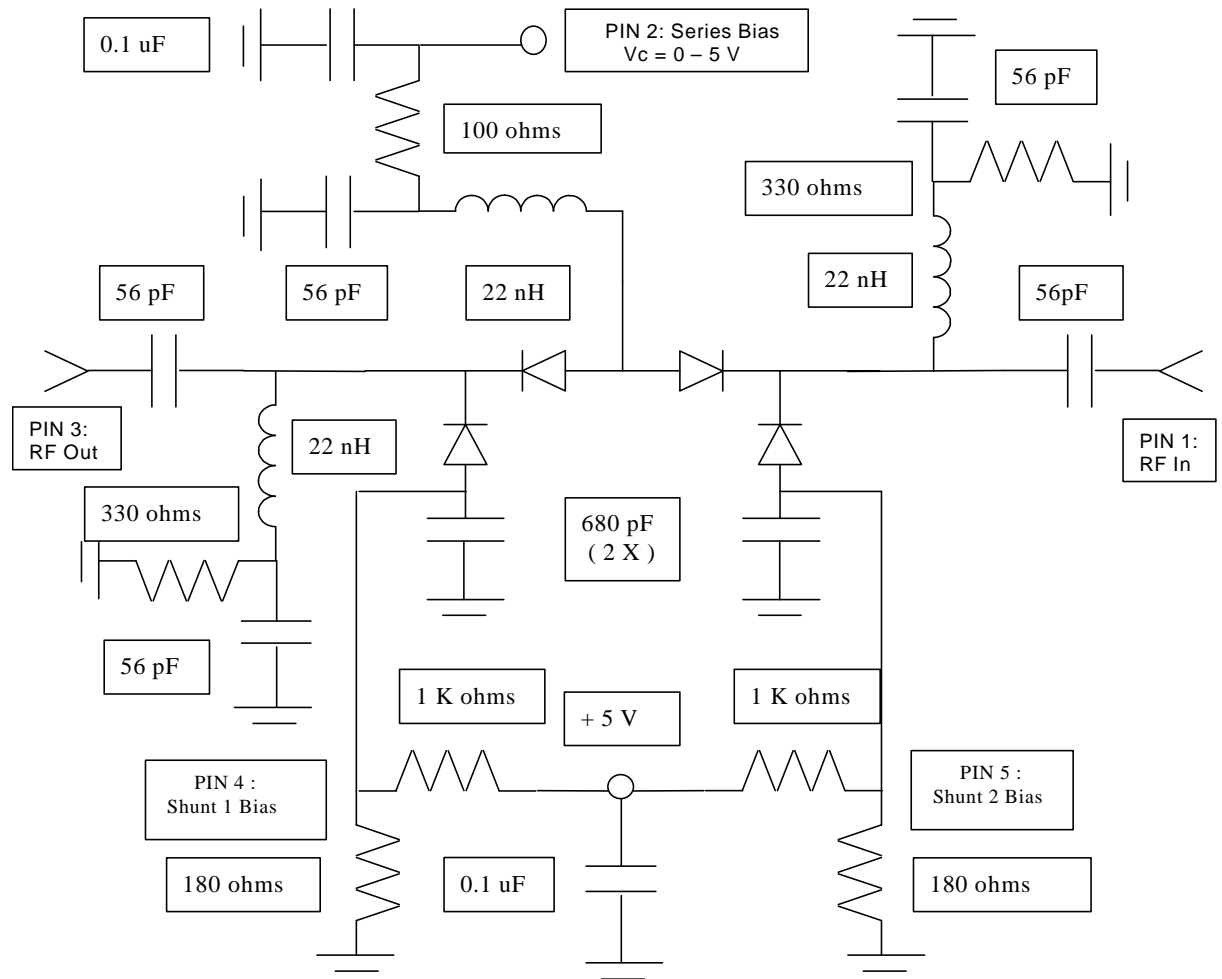
- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

tyco / Electronics

MACOM

1 – 3 GHz 50 W, Higher Frequency, Lower Tuning Voltage RF Circuit



Note : Keeping PIN 4 & PIN 5 as Separate Bias Points (Same V) reduces RF leakage through an otherwise connected Common Anode Bias Node.

Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

1 - 3 GHz Higher Frequency RF Circuit Parts List

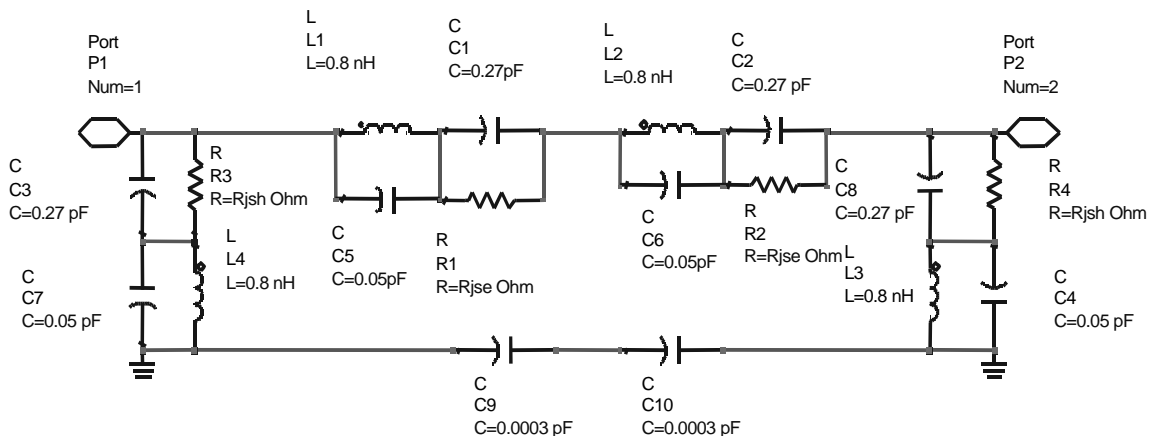
| Item | Supplier | Supplier P/N |
|--|---|------------------|
| 4003 or 4350 Circuit Board 4003 ($\epsilon_r = 3.38$), 4350 ($\epsilon_r = 3.48$) | Rogers Corporation www.rogers-corp.com | RO4003 , RO4350 |
| Capacitor, .01 uF, Power Supply Filter 1.6 mm L x 0.80 mm W x .080 mm H | Murata www.murata.com | GRM39X7R104K25PB |
| Capacitor, 680 pF, Diode RF Bypass 2.0 mm L x 1.5 mm W x .085 mm H | Murata | GRM40COG681K50PB |
| Capacitor, 56 pF, D.C. Block, RF Decoupling 1.0 mm L x 0.5 mm W x 0.5 mm H | Murata | GRM36COG560K50PB |
| Inductor, 22 nH, RF Choke | Coilcraft www.coilcraft.com | 1812SMS-22NJ |
| Resistor, 100 Ω 1.0 mm L x 0.5 mm w x 0.25 mm H | Piconics www.piconics.com | C1001BC42KSA |
| Resistor, 180 Ω 1.0 mm L x 0.5 mm w x 0.25 mm H | Piconics | C1800BC42KSA |
| Resistor, 330 Ω 1.0 mm L x 0.5 mm w x 0.25 mm H | Piconics | C3300BC42KSA |
| Resistor, 1K Ω 1.0 mm L x 0.5 mm w x 0.25 mm H | Piconics | C1001BC42KSA |

Specifications subject to change without notice.

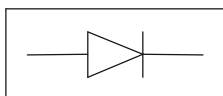
- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.

Lumped Model of SOT-25, MA4P274-1225 PIN Diode μ Quad Attenuator



MA4P274-1225 SPICE MODEL



Pin Diode Model
 NLPINM2
 Is=1E-14 A
 Vi=0 V
 Un=900 cm²/V-sec
 Wi=60 um
 Rr=1.25 Ohm
 Cmin=0.20 pF
 Tau=1.0 usec
 Rs=0.1 Ohm
 Cjo=0.27 pF
 Vj=0.7 V
 M=0.5
 Fc=0.5
 Imax=2.5E+6 A/m²
 Kf=0
 Af=1
 Ffe=1
 wBV= 150 V

Ordering Information

| Model Number | Package |
|----------------|---------------|
| MA4P274 -1225 | Tube |
| MA4P274 -1225T | Tape and Reel |

Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit www.macom.com for additional data sheets and product information.