

## Stripline PIN Diode Switch Modules

V5

### Features

- ◆ Broadband 50 Ohm Design Through X Band
- ◆ High Power Handling
- ◆ Voltage Ratings to 1000V
- ◆ Fast Switching Speeds
- ◆ Hermetically Sealed Package
- ◆ RoHS Compliant

### Description

These M/A-Com Technology Solutions switch modules consist of a shunt mounted, passivated, PIN diode chip in a hermetically sealed strip-line package. These modules are optimized for use in a 50 ohm micro-strip or strip-line circuit. By incorporating the appropriate series inductance to produce a matched low pass filter structure in a zero or reverse bias condition, no external matching is required. To achieve high isolation, a forward bias current between +10mA to +100mA is applied to the center conductor which changes the module's inductive impedance from a high to a low-impedance state causing the RF power to be reflected.

### Applications

The M/A-COM Technology Solutions MA47200 series modules maybe operated as a SPST reflective switch or as an attenuator by applying the appropriate forward or reverse DC bias. These broadband modules are designed to operate at frequencies from VHF through X Band. A variety of modules are available which offer a choice of breakdown voltages and switching speeds.

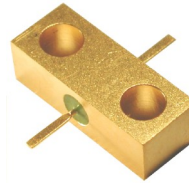
Specifications subject to change without prior notification.

### Absolute Maximum Rating<sup>1</sup> @ T<sub>A</sub> = +25°C (unless otherwise specified)

| Parameter             | Rating  |
|-----------------------|---|
| Voltage               | Voltage rating per pg. 2 table  |
| Operating Temperature | - 65°C to +150°C  |
| Storage Temperature   | -65°C to +175°C   |
| Power Dissipation     | $P_{DISS} = \frac{150^{\circ}\text{C} - T_{\text{AMBIENT}}}{\text{Thermal Resistance}}$ |

1. Operation of the device above any one of these parameters may cause permanent damage.

### Available Stripline Packages

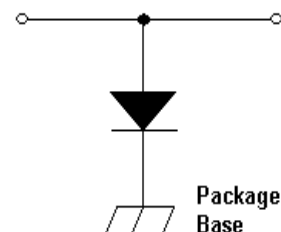


ODS-144



ODS-114

### Internal Wiring Diagram



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### All Specifications (T<sub>AMB</sub> = +25°C)

| Part Number | Maximum Reverse Voltage <sup>1</sup><br>@ I <sub>R</sub> < 10μA<br>Volts | Maximum Chip Capacitance<br>f = 1MHz<br>pF       | Maximum Series Resistance<br>Ω                                     | Maximum Series Resistance<br>Ω                                      | Maximum Thermal Resistance<br>°C/W | Nominal Characteristics             |                              |
|-------------|--|--|--|---|------------------------------------|-------------------------------------|------------------------------|
|             |  |  |  |   |                                    | Carrier Lifetime <sup>2</sup><br>nS | I-Region Width Microns<br>μm |
| MA47208     | 1000   | V <sub>R</sub> = -100V<br>C <sub>J</sub> ≤ 1.3pF | I <sub>F</sub> = 50mA<br>Freq. = 100MHz<br>R <sub>S</sub> ≤ .400 Ω | I <sub>F</sub> = 100mA<br>Freq. = 100MHz<br>R <sub>S</sub> ≤ .300 Ω | 10                                 | 1300                                | 125                          |
| MA47222     | 150  | V <sub>R</sub> = -10V<br>C <sub>J</sub> ≤ .09pF  | I <sub>F</sub> = 10mA<br>Freq. = 500MHz<br>R <sub>S</sub> ≤ 1.6 Ω  | I <sub>F</sub> = 100mA<br>Freq. = 500MHz<br>R <sub>S</sub> ≤ 1.2 Ω  | 40                                 | 160                                 | 13                           |
| MA47223     | 500  | V <sub>R</sub> = -50V<br>C <sub>J</sub> ≤ .20pF  |  | I <sub>F</sub> = 100mA<br>Freq. = 500MHz<br>R <sub>S</sub> ≤ .6 Ω   | 20                                 | 1000                                | 50                           |

**Notes:**

1. The maximum specified V<sub>R</sub> (reverse voltage) is sourced and the resultant reverse leakage current, I<sub>r</sub>, is measured to be <10μA.
2. Nominal carrier life time specified with diode biased at I<sub>F</sub> = +10mA , I<sub>REV</sub> = -6mA

| Part Number <sup>1</sup> | Package Style | Test Frequency<br>GHz | Maximum Insertion <sup>3</sup> Loss<br>dB | Minimum Isolation<br>dB                    | Nominal Switching Speed (nS) |                 |
|--------------------------|---------------|-----------------------|---|--|------------------------------|-----------------|
|                          |               |                       |   |  | RF Off to RF On              | RF On to RF Off |
| MA47208                  | 114           | 1                     | V <sub>R</sub> = 20V<br>Loss ≤ 0.25dB     | I <sub>F</sub> = 25mA<br>Isolation ≤ 30dB  | 300                          | 150             |
| MA47222                  | 144           | 8                     | V <sub>R</sub> = 0V<br>Loss ≤ 0.50dB      | I <sub>F</sub> = 100mA<br>Isolation ≤ 20dB | 100                          | 30              |
| MA47223                  | 144           | 4-8 <sup>2</sup>      | V <sub>R</sub> = 0V<br>Loss ≤ 0.50dB      | I <sub>F</sub> = 100mA<br>Isolation ≤ 20dB | 150                          | 30              |

**Notes:**

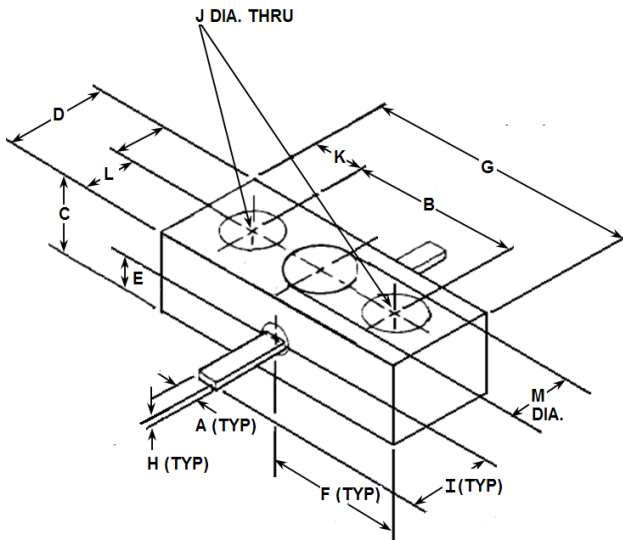
1. All models have cathode heatsink
2. Swept frequency measurement
3. Maximum VSWR is 1.5:1 at specified insertion loss condition.

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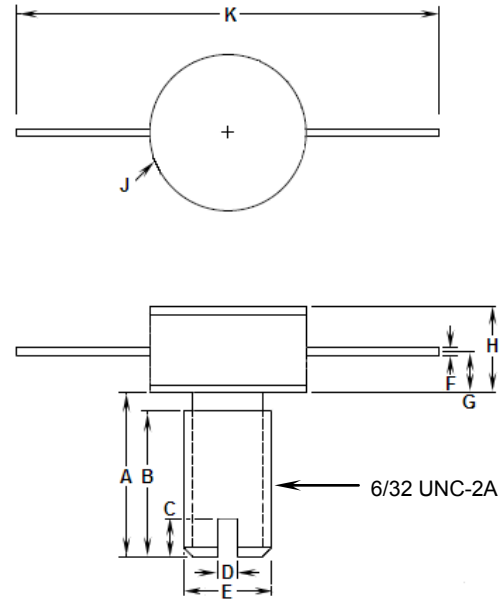
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### Outline Drawing

Package Style 144



Package Style 114



| DIMS. | MILS        |      | MILLIMETERS   |        |
|-------|-------------|------|---------------|--------|
|       | MIN.        | MAX. | MIN.          | MAX.   |
| A     | 22 NOMINAL  |      | .558 NOMINAL  |        |
| B     | 250 NOMINAL |      | 6.35 NOMINAL  |        |
| C     | 125 NOMINAL |      | 3.175 NOMINAL |        |
| D     | 155         | 165  | 3.937         | 4.191  |
| E     | 65 NOMINAL  |      | 1.651 NOMINAL |        |
| F     | 195         | 215  | 4.953         | 5.461  |
| G     | 405         | 415  | 10.287        | 10.541 |
| H     | 3           |      | 0.076         |        |
| I     | 120         |      | 3.048         |        |
| J     | 96 NOMINAL  |      | 2.438 NOMINAL |        |
| K     | 75          | 85   | 1.905         | 2.159  |
| L     | 80 NOMINAL  |      | 2.032 NOMINAL |        |
| M     | 125 NOMINAL |      | 3.175 NOMINAL |        |

| DIMS. | MILS        |          | MILLIMETERS   |           |
|-------|-------------|----------|---------------|-----------|
|       | MIN.        | MAX.     | MIN.          | MAX.      |
| A     | 255         | 265      | 6.48          | 6.73      |
| B     | 205         |          | 5.21          |           |
| C     | 60 NOMINAL  |          | 1.52 NOMINAL  |           |
| D     | 30 NOMINAL  |          | 0.76 NOMINAL  |           |
| E     | 131         | 137      | 3.33          | 3.51      |
| F     | 11          | 13       | 0.28          | 0.33      |
| G     | 58          | 72       | 1.47          | 1.73      |
| H     | 120         | 140      | 3.05          | 3.56      |
| J     |             | 255 DIA. |               | 6.48 DIA. |
| K     | 670 NOMINAL |          | 17.02 NOMINAL |           |

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### Environmental Ratings (Per MIL-STD 750)

The following table is recommended for Group B & C testing for TX and TXV level screening.

| Inspection            | Method | Condition                    |
|-----------------------|--------|------------------------------|
| Storage Temperature   | 1031   | - 65°C to +175°C             |
| Operating Temperature | —      | - 65°C to +150°C             |
| Temperature Cycling   | 1051   | 5 cycles<br>- 65° to + 150°C |
| Shock                 | 2016   | 500 g's                      |
| Vibration             | 2056   | 15 g's                       |
| Constant Acceleration | 2006   | 20,000 g's                   |
| Humidity              | 1021   | 10 days                      |

### Screened Diodes (Per MIL-STD 750)

Suggested 100% preconditioning and screening for TX level and TXV level screening.

| Inspection            | Method | Condition                             |
|-----------------------|--------|---------------------------------------|
| Internal Visual       | 2074   | See Note 1                            |
| High Temp. Storage    | 1032   | 48 hours minimum @ max. storage temp. |
| Thermal Shock         | 1051   | 10 Cycles                             |
| Constant Acceleration | 2006   | 20,000 g's, Y1                        |
| Fine Leak             | 1071   | H                                     |
| Gross Leak            | 1071   | C or E                                |
| Electrical            | —      | See Note                              |
| Burn-In               | 1038   | See Note                              |

1. Conditions and details of test depend on specific model number. Information available upon request.

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