

# MA4E2200 Series



## Surface Mount Zero Bias Schottky Detector Diodes

M/A-COM Products

Rev. V6

### Features

- Designed for High Volume, Low Cost Detector Applications
- Available in Single, Series Pair and Unconnected Pair Configurations
- Small Profile Surface Mount Packages
- Tape and Reel Deliverable
- Lead Free (RoHS Compliant) Equivalents Available With 260 Deg. C Reflow Capability

### Description and Applications

The MA4E2200 series are Silicon zero bias P-type detector diodes assembled in low cost surface mount plastic packages. They are designed for usage in a wide variety of detector applications.

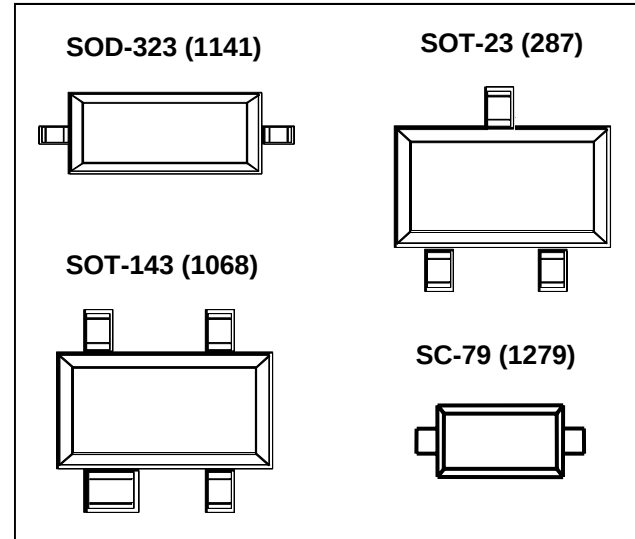
The MA4E2200 series of zero bias detector diodes are available in the SOT-23 (case style 287) in series pair configurations, SOD-323 (case style 1141), SC-79 (1279) in a single configuration, and the SOT-143 (case style 1068) in a reverse unconnected pair configuration.

The part number consists of the base number MA4E2200, followed by the wiring configuration (A, B, D, E), the package style (287, 1068, 1141) and a "T" for tape and reel. The SC-79 part number is MADS-002200-12790T.

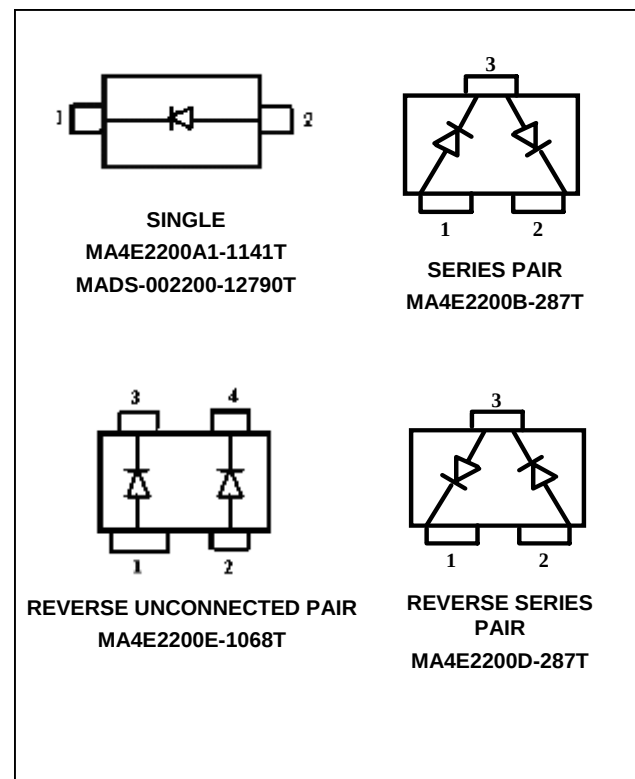
These parts are offered with Sn/Pb plating, as well as with 100 % matte Sn plating on the RoHS compliant part numbers.

The small diode package size and moderate parasitics make these parts attractive for Low Leakage Limiters and RF Temperature Compensated Envelope Detectors for RF ID Tags Applications up to 4 GHz.

### Package Outlines (Topviews)



### Configurations (Topviews)



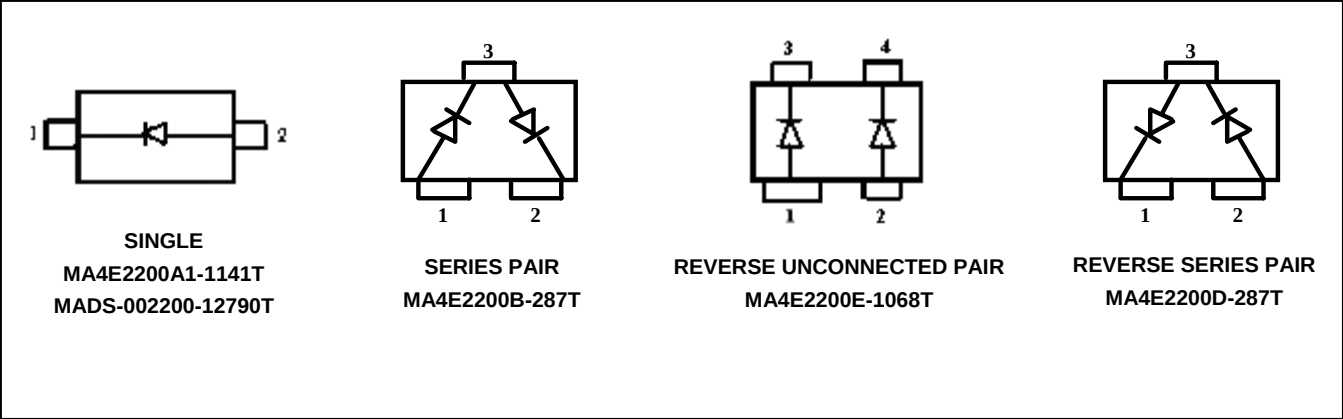
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### Configurations (Top View)



### Standard Part Numbers and RoHS Equivalents

| Standard Part Number | RoHS Compliant Part Number | Package Style |
|----------------------|----------------------------|---------------|
| N/A                  | MA4E2200A1-1141T           | SOD-323       |
| MA4E2200B-287T       | MA4E2200B1-287T            | SOT-23        |
| MA4E2200D-287T       | MA4E2200D1-287T            | SOT-23        |
| MA4E2200E-1068T      | MA4E2200E1-1068T           | SOT-143       |
| N/A                  | MADS-002200-12790T         | SC-79         |

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### Maximum Ratings @ +25 °C (Unless Otherwise Defined) <sup>1,2</sup>

| Parameter                                                   | Unit | Maximum Ratings |
|-------------------------------------------------------------|------|-----------------|
| Operating Temperature                                       | °C   | -65 to +125     |
| Storage Temperature                                         | °C   | -65 to +150     |
| Junction Temperature                                        | °C   | +175            |
| RF Incident Power (CW)                                      | mW   | 75              |
| Reverse Voltage @ 25 °C                                     | V    | 1.5 V           |
| Electrostatic Discharge ( ESD ) Classification <sup>3</sup> | -    | Class 0         |

1. Operation above any one of the above parameters may cause permanent damage.
2. Please refer to Application Note M538 for Surface Mounting Instructions
3. Human Body Model

### Electrical Specifications @ +25 °C

| Parameter                 | Condition              | Symbol       | Specification         |
|---------------------------|------------------------|--------------|-----------------------|
| Reverse Voltage Breakdown | $I_R = 100 \mu A$      | $V_b$        | 1.5 V min.            |
| Forward Voltage           | $I_F = 0.1 \text{ mA}$ | $V_F$        | 60 – 120 mV max.      |
| Forward Voltage           | $I_F = 1 \text{ mA}$   | $V_F$        | 150 - 220 mV max.     |
| Total Capacitance         | $V_R = 0.15 \text{ V}$ | $\Delta C_T$ | .25 pF typical        |
| Delta Forward Voltage     | $I_F = 1 \text{ mA}$   | $V_F$        | 10 mV max.            |
| Video Resistance          |                        | $R_V$        | 7000 $\Omega$ typical |

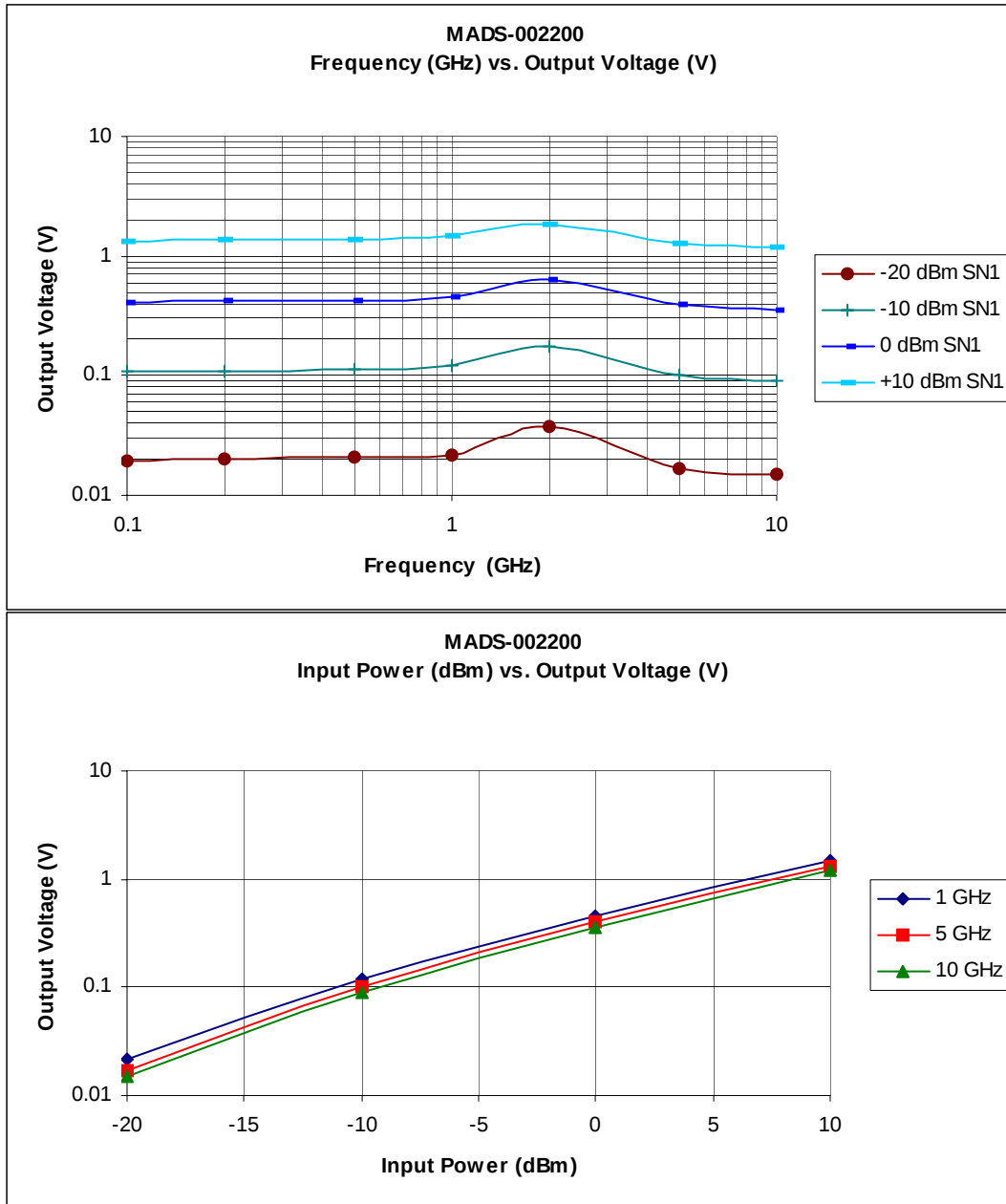
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## Applications Section

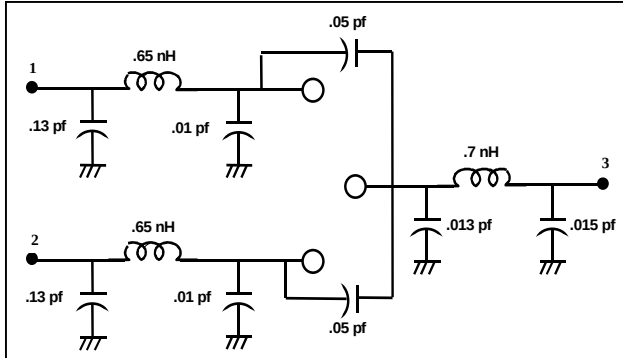


The MADS-002200 in an SC-79 Package Style was evaluated in a detector circuit in which the Schottky diode terminates a 50 Ohm transmission line on a duroid substrate. The SC-79 packaged diode was attached to the terminal of a 3.5mm connector and the output voltage was measured through a bias tee on a voltmeter. Matching was not attempted.

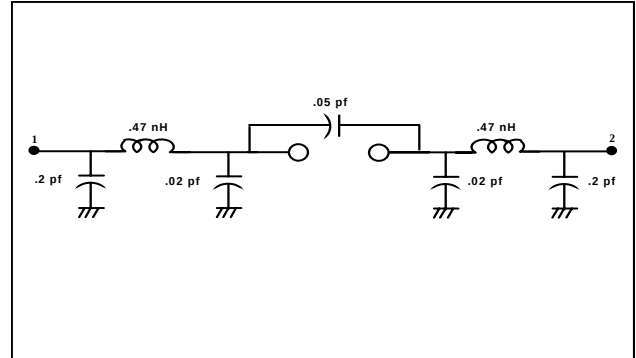
The voltage peak at 2 GHz is due to a resonance of the SC-79 package inductance with the diode junction capacitance. This condition results in higher RF voltage across the diode junction.

### Equivalent Circuit Parasitics

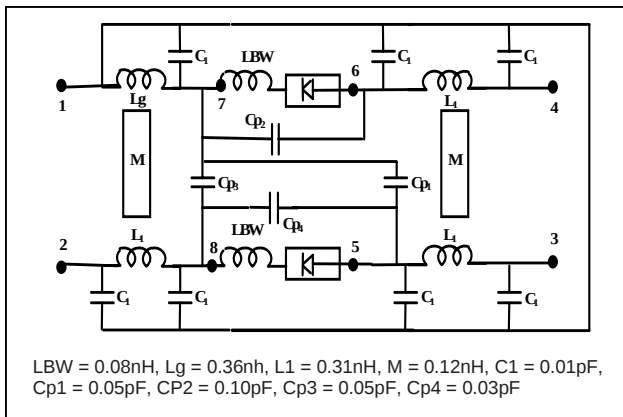
#### SOT-23



#### SOD-323

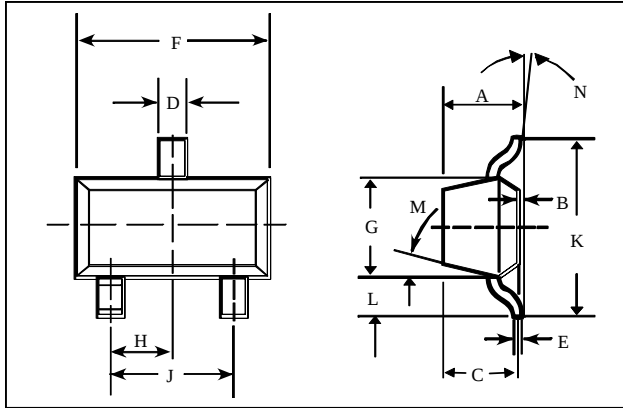


#### SOT-143



### Case Styles

#### SOT-23

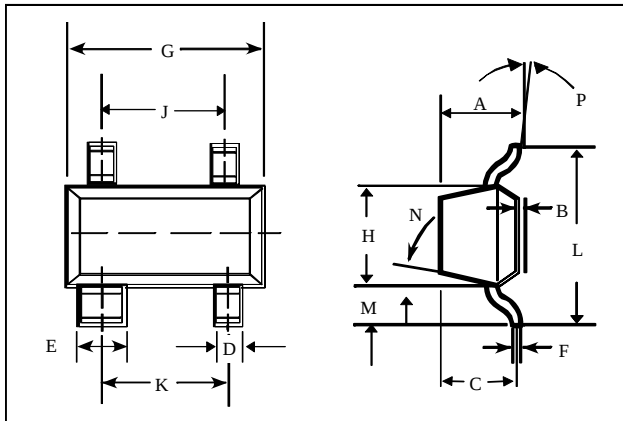


#### SOT-23 (Case Style 287)

| DIM. | INCHES                |       | MILLIMETERS  |      |
|------|-----------------------|-------|--------------|------|
|      | MIN.                  | MAX.  | MIN.         | MAX. |
| A    | —                     | 0.048 | —            | 1.22 |
| B    | —                     | 0.008 | —            | 0.20 |
| C    | —                     | 0.040 | —            | 1.00 |
| D    | 0.013                 | 0.020 | 0.35         | 0.50 |
| E    | 0.003                 | 0.006 | 0.08         | 0.15 |
| F    | 0.110                 | 0.119 | 2.80         | 3.00 |
| G    | 0.047                 | 0.056 | 1.20         | 1.40 |
| H    | 0.037 typical         |       | 0.95 typical |      |
| J    | 0.075 typical         |       | 1.90 typical |      |
| K    | —                     | 0.103 | —            | 2.60 |
| L    | —                     | 0.024 | —            | 0.60 |
| DIM. | GRADIENT              |       |              |      |
| M    | 10° max. <sup>3</sup> |       |              |      |
| N    | 2° . . . 30°          |       |              |      |

3. Applicable on all sides

#### SOT-143



#### SOT-143 (Case Style 1068)

| DIM. | INCHES                |       | MILLIMETERS  |      |
|------|-----------------------|-------|--------------|------|
|      | MIN.                  | MAX.  | MIN.         | MAX. |
| A    | -                     | 0.044 | -            | 1.10 |
| B    | -                     | 0.004 | -            | 0.10 |
| C    | -                     | 0.040 | -            | 1.00 |
| D    | 0.013                 | 0.020 | 0.35         | 0.50 |
| E    | 0.030                 | 0.035 | 0.75         | 0.90 |
| F    | 0.003                 | 0.006 | 0.08         | 0.15 |
| G    | 0.110                 | 0.119 | 2.80         | 3.00 |
| H    | 0.047                 | 0.056 | 1.20         | 1.40 |
| J    | 0.075 typical         |       | 1.90 typical |      |
| K    | 0.075 typical         |       | 1.90 typical |      |
| L    | -                     | 0.103 | -            | 2.6  |
| M    | -                     | 0.024 | -            | 0.6  |
| DIM. | GRADIENT              |       |              |      |
| N    | 10° max. <sup>4</sup> |       |              |      |
| P    | 2° . . . 30°          |       |              |      |

4. Applicable on all sides

# MA4E2200 Series

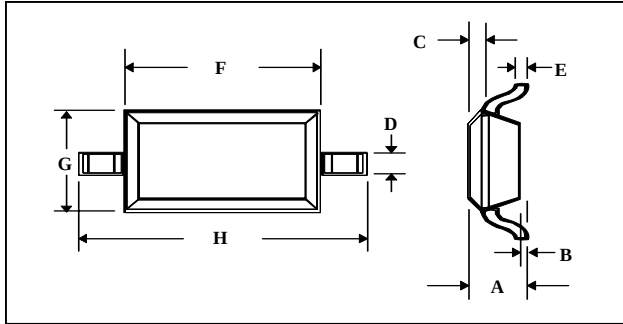


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### Case Styles (Cont'd)

#### SOD-323

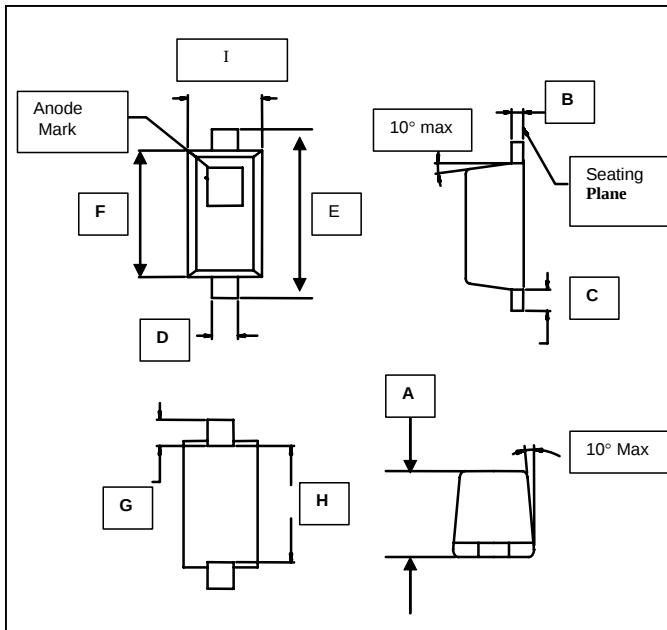


#### SOD-323 (Case Style 1141)

| DIM. | INCHES |       | MILLIMETERS |      |
|------|--------|-------|-------------|------|
|      | MIN.   | MAX.  | MIN.        | MAX. |
| A    | –      | 0.043 | –           | 1.1  |
| B    | –      | 0.004 | –           | 0.1  |
| C    | –      | 0.008 | –           | 0.2  |
| D    | 0.010  | 0.016 | 0.25        | 0.4  |
| E    | 0.003  | 0.006 | 0.08        | 0.15 |
| F    | 0.063  | 0.075 | 1.6         | 1.9  |
| G    | 0.045  | 0.057 | 1.15        | 1.45 |
| H    | 0.091  | 0.106 | 2.3         | 2.7  |

#### SC-79

#### Top View



#### SC-79 (Case Style 1279)

| DIM. | INCHES |       | MILLIMETERS |      |
|------|--------|-------|-------------|------|
|      | MIN.   | MAX.  | MIN.        | MAX. |
| A    | 0.020  | 0.028 | 0.50        | 0.71 |
| B    | 0.003  | 0.008 | 0.08        | 0.20 |
| C    | 0.006  | 0.010 | 0.15        | 0.25 |
| D    | 0.010  | 0.014 | 0.25        | 0.36 |
| E    | 0.059  | 0.067 | 0.08        | 0.15 |
| F    | 0.043  | 0.051 | 1.10        | 1.30 |
| G    | 0.011  | 0.012 | 0.28        | 0.30 |
| H    | 0.037  | 0.043 | 0.94        | 1.09 |
| I    | 0.027  | 0.035 | 0.68        | 0.96 |