Current Regulator Diodes

### J500 Series

Vishay Siliconix

#### PRODUCT SUMMARY

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Typ If (mA)</th>
<th>P OV (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J500</td>
<td>0.24</td>
<td>50</td>
</tr>
<tr>
<td>J501</td>
<td>0.33</td>
<td>50</td>
</tr>
<tr>
<td>J502</td>
<td>0.43</td>
<td>50</td>
</tr>
<tr>
<td>J503</td>
<td>0.56</td>
<td>50</td>
</tr>
<tr>
<td>J504</td>
<td>0.75</td>
<td>50</td>
</tr>
<tr>
<td>J505</td>
<td>1.00</td>
<td>50</td>
</tr>
<tr>
<td>J506</td>
<td>1.40</td>
<td>50</td>
</tr>
<tr>
<td>J507</td>
<td>1.80</td>
<td>50</td>
</tr>
<tr>
<td>J508</td>
<td>2.40</td>
<td>50</td>
</tr>
<tr>
<td>J509</td>
<td>3.00</td>
<td>50</td>
</tr>
<tr>
<td>J510</td>
<td>3.60</td>
<td>50</td>
</tr>
<tr>
<td>J511</td>
<td>4.70</td>
<td>50</td>
</tr>
</tbody>
</table>

#### FEATURES

- Two-Lead Plastic Package
- Guaranteed ±20% Tolerance
- Operation from 1 V (J500–J503) to 50 V
- Excellent Temperature Stability

#### BENEFITS

- Simple Series Circuitry, No Separate Voltage Source
- Tight Guaranteed Circuit Performance
- Excellent Performance in Low-Voltage/Battery Circuits and High-Voltage Spike Protection
- High Circuit Stability vs. Temperature

#### APPLICATIONS

- Constant-Current Supply
- Current-Limiting
- Timing Circuits

#### DESCRIPTION

The J500 series is a family of ±20% range current regulators designed for demanding applications in test equipment and instrumentation. These devices utilize the JFET techniques to produce a single two-leaded device which is extremely simple to operate.

With nominal current ranges from 0.24 mA to 4.7 mA, the J500 series will meet a wide array of design requirements.

The low-cost TO-226A package ensures a cost-effective design solution.

#### SCHEMATIC DIAGRAM

1. **Applications information may be obtained via FaxBack, request document #70596.**
### ABSOLUTE MAXIMUM RATINGS

- Peak Operating Voltage: 50 V
- Reverse Current: 50 mA
- Storage Temperature: -55 to 150°C

Power Dissipation: 350 mW

Notes:
- a. Derate 2.8 mW/°C above 25°C

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Operating Voltage</td>
<td>P&lt;sub&gt;OV&lt;/sub&gt;</td>
<td>IF = 1.1 IF(max)&lt;sup&gt;NO TAG&lt;/sup&gt;</td>
<td>Min: 50</td>
<td>95 V</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>V&lt;sub&gt;R&lt;/sub&gt;</td>
<td>IR = 1 mA</td>
<td>Max: 0.8</td>
<td></td>
</tr>
<tr>
<td>Capacitance</td>
<td>C&lt;sub&gt;F&lt;/sub&gt;</td>
<td>V&lt;sub&gt;F&lt;/sub&gt; = 25 V, f = 1 MHz</td>
<td>Max: 2.2</td>
<td>pF</td>
</tr>
</tbody>
</table>

### Regulator Current<sup>d</sup> (IF)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Min</th>
<th>Nom</th>
<th>Max</th>
<th>Min</th>
<th>Typ&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Typ&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Typ&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Typ&lt;sup&gt;b&lt;/sup&gt;</th>
<th>V&lt;sub&gt;F&lt;/sub&gt; = 25 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>J500</td>
<td>0.192</td>
<td>0.24</td>
<td>0.288</td>
<td>4.00</td>
<td>15</td>
<td>2.50</td>
<td>1.2</td>
<td>0.4</td>
<td>0.95%</td>
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<tr>
<td>J501</td>
<td>0.264</td>
<td>0.33</td>
<td>0.396</td>
<td>2.20</td>
<td>10</td>
<td>1.60</td>
<td>1.3</td>
<td>0.5</td>
<td>0.81%</td>
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<tr>
<td>J502</td>
<td>0.344</td>
<td>0.43</td>
<td>0.516</td>
<td>1.50</td>
<td>7</td>
<td>1.10</td>
<td>1.5</td>
<td>0.6</td>
<td>0.70%</td>
</tr>
<tr>
<td>J503</td>
<td>0.448</td>
<td>0.56</td>
<td>0.672</td>
<td>1.20</td>
<td>5</td>
<td>0.80</td>
<td>1.7</td>
<td>0.7</td>
<td>0.58%</td>
</tr>
<tr>
<td>J504</td>
<td>0.600</td>
<td>0.75</td>
<td>0.900</td>
<td>0.80</td>
<td>3.5</td>
<td>0.55</td>
<td>1.9</td>
<td>0.8</td>
<td>0.46%</td>
</tr>
<tr>
<td>J505</td>
<td>0.800</td>
<td>1.00</td>
<td>1.200</td>
<td>0.50</td>
<td>2</td>
<td>0.40</td>
<td>2.1</td>
<td>0.9</td>
<td>0.33%</td>
</tr>
<tr>
<td>J506</td>
<td>1.120</td>
<td>1.40</td>
<td>1.680</td>
<td>0.33</td>
<td>1.5</td>
<td>0.25</td>
<td>2.5</td>
<td>1.1</td>
<td>0.19%</td>
</tr>
<tr>
<td>J507</td>
<td>1.440</td>
<td>1.80</td>
<td>2.160</td>
<td>0.20</td>
<td>1</td>
<td>0.19</td>
<td>2.8</td>
<td>1.3</td>
<td>0.08%</td>
</tr>
<tr>
<td>J508</td>
<td>1.900</td>
<td>2.40</td>
<td>2.900</td>
<td>0.20</td>
<td>0.7</td>
<td>0.13</td>
<td>3.1</td>
<td>1.5</td>
<td>−0.05%</td>
</tr>
<tr>
<td>J509</td>
<td>2.400</td>
<td>3.00</td>
<td>3.600</td>
<td>0.15</td>
<td>0.5</td>
<td>0.09</td>
<td>3.5</td>
<td>1.7</td>
<td>−0.14%</td>
</tr>
<tr>
<td>J510</td>
<td>2.900</td>
<td>3.60</td>
<td>4.300</td>
<td>0.15</td>
<td>0.4</td>
<td>0.07</td>
<td>3.9</td>
<td>1.9</td>
<td>−0.22%</td>
</tr>
<tr>
<td>J511</td>
<td>3.800</td>
<td>4.70</td>
<td>5.600</td>
<td>0.12</td>
<td>0.3</td>
<td>0.05</td>
<td>4.2</td>
<td>2.1</td>
<td>−0.34%</td>
</tr>
</tbody>
</table>

Notes:
- a. T<sub>A</sub> = 25°C unless otherwise noted.
- b. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- c. Max V<sub>F</sub> where IF = 1.1 IF(max) is guaranteed.
- d. Pulse test—steady state currents may vary.
- e. Pulse test—steady state impedances may vary.
- f. Min V<sub>F</sub> required to insure IF = 0.8 IF(min).
TYPICAL CHARACTERISTICS

Output Current vs. Forward Voltage

Temperature Coefficient

Dynamic Impedance vs. Regulator Current

Limiting Voltage @ 0.8 I_F vs. Regulator Current
TYPICAL CHARACTERISTICS

Temperature Coefficient vs. Regulator Current

On-Resistance vs. Regulator Current

Capacitance vs. Forward Voltage

CURRENT REGULATOR DIODE V-1 CHARACTERISTIC