MA46600 Series

GaAs High Q Abrupt Tuning Varactors

Features
- Constant Gamma Abrupt Junction: 0.5
- Highest Q
- Large Capacitance Variation with Voltage
- Custom Tailored Designs Available on Request
- RoHS* Compliant

Description
The MA46600 series of microwave tuning varactors is a family of abrupt junction gallium arsenide devices featuring Q factors in excess of 8000. This series is specifically designed for broadband high Q tuning performance (up to 8000 at -4 volts and 50 MHz) from L through Ka band. Characteristics such as high reliability, low leakage and close capacitance tracking between diodes are typical of these devices. Standard capacitance matching is ± 10%, but closer matching is available upon request. All diode types are available in a wide selection of ceramic packages as well as in chip form.

Applications
The MA46600 series of tuning varactors can be used for both broad and narrow band tuning through Ka-band. Typical applications include solid state tuning of VCOs using transistors or Gunns as well as voltage tunable filters and amplifier circuits. The GaAs abrupt junction tuning varactors offer the highest Q of any tuning varactors and are utilized in high frequency applications where Q is premium.

Absolute Maximum Ratings\(^1\) @ \(T_A=+25^\circ\mathrm{C}\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-65°C to +175°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +200°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td></td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td></td>
</tr>
<tr>
<td>Power Dissipation (derate linearly to zero at 200°C)</td>
<td>(C_J &lt; 1.0 \text{ pF max. @ 50 mW})  (C_J \geq 1.0 \text{ pF min. @ 100 mW})</td>
</tr>
</tbody>
</table>

1. Operation of this device above any one of these parameters may cause permanent damage. The maximum storage and operating temperature of the plastic ODS-1088 case style is 125° C.

Common Case styles

PACKAGED TUNING VARACTOR EQUIVALENT CIRCUIT

Specifications subject to change without notice.

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Electrical Specifications @ $T_A = +25 \, ^\circ\text{C}$

**Gamma 0.5 Abrupt Tuning Varactors**
- Breakdown Voltage @ $10 \, \mu\text{A} = 30 \, \text{V}$ minimum
- Reverse Current @ $24 \, \text{V} = 100 \, \text{nA}$ maximum
- Gamma = 0.48 - 0.50, $V_R = 0$ to 30 V

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Breakdown Voltage $V_b$</th>
<th>Total Capacitance $\pm10%$</th>
<th>Total Capacitance Ratio $1,2,4$</th>
<th>$Q$ Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA46600</td>
<td>30</td>
<td>0.3</td>
<td>1.9</td>
<td>8000</td>
</tr>
<tr>
<td>MA46602</td>
<td>30</td>
<td>0.5</td>
<td>2.5</td>
<td>7000</td>
</tr>
<tr>
<td>MA46603</td>
<td>30</td>
<td>0.6</td>
<td>2.8</td>
<td>6500</td>
</tr>
<tr>
<td>MA46604</td>
<td>30</td>
<td>0.8</td>
<td>3.2</td>
<td>6000</td>
</tr>
</tbody>
</table>

1. Capacitance is measured at 1 MHz on a bridge which has been balanced with shielded test holders connected in place but open circuited.
2. All GaAs tuning varactors are available in any case style shown in this bulletin as well as in chip form. When ordering, specify the desired case by adding the case designation as a suffix to the model number, i.e., MA46601-30. For example, a MA46601-30 specifies a 30 volt tuning diode in a case style 30 with a $C_t@+4\,\text{V}$ between .36 and .44 pF and a $Q$ at -4 volts and 50 MHz $\geq$7500. The capacitance values and capacitance ratios are for case style 30. Other case styles or chips will have slightly different values.
3. All junctions are abrupt i.e., $y = 0.50 \pm 0.03$.
4. Total capacitance ratios will vary with case choice due to differences in case capacitance ($C_p$). Figure 1 shows the ratio for the 30 case style.
5. Case parasitics ($C_p$ and $L_s$) are given for most case styles.
6. Breakdown voltage ($V_b$) is specified at -10 $\mu\text{A}$.

Environmental Ratings

- **Temperature, Storage**: Method 1031, Levels See Maximum Ratings
- **Temperature, Cycling**: Method 1051, Levels 5 cycles, -65 to +150 $\,^\circ\text{C}$
- **Shock**: Method 2016, Levels 500 g's
- **Vibration**: Method 2056, Levels 15 g's
- **Constant Acceleration**: Method 2006, Levels 20,000 g's
- **Moisture Resistance**: Method 1021, Levels 10 days

Typical Performance Curves

**CAPACITANCE CHANGE RATIOS FOR GaAs TUNING VARACTORS IN CASE STYLE 30**

![Typical Performance Curves](chart.png)

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