Step Recovery Diodes

Features
- Low Transition Times
- Tight Capacitance Ranges
- High Voltage and Low Thermal Resistance for Higher Input Power
- Surface Mount Package Available (SOT-23)

Description
The MA44600 series of Step Recovery diodes is designed for use in low and moderate power multipliers with output frequencies of up to 20 GHz. These Step Recovery diodes generate harmonics by storing a charge as the diode is driven to forward conductance by the positive voltage of the input signal. When the signal reverses polarity, this charge is extracted. The Step Recovery diode will appear as a low impedance current source until all the charge is extracted, then it will “snap” to a higher impedance. This causes a voltage pulse to form in the impulse circuit of the multiplier. Step Recovery diodes make excellent high order multipliers such as comb generators. They are also useful as efficient moderate power X2- X4 multipliers.

Applications
- High Order Narrow Band Moderate Power Multipliers (MA44600 series)
- Comb Generators (MA43592, MA43543)
- High Power Circuit Tested Multiplier (MA43000 Series)
- Surface Mount Low Power Multipliers (MA44700 Series)
## Step Recovery Diodes

### MA43000, MA44600, MA44700 Series

#### Electrical Specifications @ 25°C

**Snap Varactors**

<table>
<thead>
<tr>
<th>Model(^1) Number</th>
<th>Minimum(^2) Reverse Voltage (V_{R}) (Volts)</th>
<th>Junction(^3) Capacitance Range (C_j) Min./Max. (pF)</th>
<th>Minimum Lifetime (10 \text{ mA}/6 \text{ mA} ) TI (ns)</th>
<th>Transition Time (T_S)(^4) (ps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA44621A</td>
<td>20</td>
<td>0.2 / 0.3</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>MA44621B</td>
<td>20</td>
<td>0.3 / 0.4</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>MA44621C</td>
<td>20</td>
<td>0.4 / 0.5</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>MA44622A</td>
<td>20</td>
<td>0.5 / 0.7</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>MA44622B</td>
<td>20</td>
<td>0.7 / 0.9</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>MA44631A</td>
<td>30</td>
<td>0.3 / 0.5</td>
<td>8</td>
<td>70</td>
</tr>
<tr>
<td>MA44631B</td>
<td>30</td>
<td>0.5 / 0.7</td>
<td>8</td>
<td>70</td>
</tr>
<tr>
<td>MA44631C</td>
<td>30</td>
<td>0.7 / 0.9</td>
<td>8</td>
<td>70</td>
</tr>
<tr>
<td>MA44641A</td>
<td>40</td>
<td>0.4 / 0.6</td>
<td>12</td>
<td>90</td>
</tr>
<tr>
<td>MA44641B</td>
<td>40</td>
<td>0.6 / 0.8</td>
<td>12</td>
<td>90</td>
</tr>
<tr>
<td>MA44641C</td>
<td>40</td>
<td>0.8 / 1.1</td>
<td>12</td>
<td>90</td>
</tr>
<tr>
<td>MA44652A</td>
<td>50</td>
<td>0.5 / 0.7</td>
<td>15</td>
<td>150</td>
</tr>
<tr>
<td>MA44652B</td>
<td>50</td>
<td>0.7 / 0.9</td>
<td>15</td>
<td>150</td>
</tr>
<tr>
<td>MA44652C</td>
<td>50</td>
<td>0.9 / 1.1</td>
<td>15</td>
<td>150</td>
</tr>
<tr>
<td>MA44663A</td>
<td>60</td>
<td>0.7 / 0.9</td>
<td>20</td>
<td>250</td>
</tr>
<tr>
<td>MA44663B</td>
<td>60</td>
<td>0.9 / 1.1</td>
<td>20</td>
<td>250</td>
</tr>
<tr>
<td>MA44663C</td>
<td>60</td>
<td>1.1 / 1.5</td>
<td>20</td>
<td>250</td>
</tr>
<tr>
<td>MA44663D</td>
<td>60</td>
<td>1.5 / 2.0</td>
<td>20</td>
<td>250</td>
</tr>
</tbody>
</table>

**Notes:**

1. When ordering, specify the desired case style by adding the case designation as a suffix to the model number. Case styles for the MA44600 series are 30, 91 and 93. To order in chip form, add the suffix “134” to the model number. The nominal chip size for the MA44600 series is 15 mils.

2. Reverse voltage \(V_R\) is measured at a reverse bias current of 10 \(\mu\)A.

3. Junction capacitance is measured at a reverse voltage of 6 volts and a frequency of 1 MHz.

4. Transition time is measured between 20% and 80% points on the voltage recovery trace. Test conditions are +10 mA and -10 volts.

#### Case Styles

(See appendix for complete dimensions)

<table>
<thead>
<tr>
<th>Case Style</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td><img src="image" alt="Case Style 30" /></td>
</tr>
<tr>
<td>91</td>
<td><img src="image" alt="Case Style 91" /></td>
</tr>
<tr>
<td>93</td>
<td><img src="image" alt="Case Style 93" /></td>
</tr>
<tr>
<td>134</td>
<td><img src="image" alt="Case Style 134" /></td>
</tr>
</tbody>
</table>
Step Recovery Diodes

MA43000, MA44600, MA44700 Series

Electrical Specifications @ 25°C (Cont’d)
High Power Circuit Tested Step Recovery Diodes

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Case Style</th>
<th>Minimum Output Power (Watts)</th>
<th>Input Frequency (GHz)</th>
<th>Output Frequency (GHz)</th>
<th>Maximum Input Power (Watts)</th>
<th>Min./Max. 2 Reverse Voltage $V_R$ (Volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA43000</td>
<td>103</td>
<td>4.0</td>
<td>0.333</td>
<td>2.0</td>
<td>15</td>
<td>85 - 105</td>
</tr>
<tr>
<td>MA43002</td>
<td>91</td>
<td>1.5</td>
<td>2.000</td>
<td>6.0</td>
<td>5</td>
<td>45 - 70</td>
</tr>
<tr>
<td>MA43004</td>
<td>91</td>
<td>0.3</td>
<td>3.300</td>
<td>13.0</td>
<td>2</td>
<td>30 - 45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Min./Max. 3 Junction Capacitance $C_j$ (pF)</th>
<th>Min./Max. Lifetime, $T_L$ 10 mA/6 mA (ns)</th>
<th>Maximum Snap Time, $T_S$ -10V/10 mA (ps)</th>
<th>Maximum Thermal Resistance, $j_c$ (C/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA43000</td>
<td>3 - 4.50</td>
<td>250 - 500</td>
<td>600</td>
<td>12</td>
</tr>
<tr>
<td>MA43002</td>
<td>1.60 - 2.40</td>
<td>75 - 225</td>
<td>250</td>
<td>25</td>
</tr>
<tr>
<td>MA43004</td>
<td>0.45 - 0.85</td>
<td>20 - 50</td>
<td>150</td>
<td>45</td>
</tr>
</tbody>
</table>

Surface Mount Step Recovery Diodes (SOT-23)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Min./Max. Total Capacitance (pF)</th>
<th>Minimum Reverse Voltage $V_R$ (Volts)</th>
<th>Nominal Carrier Lifetime $T_L$ (ns)</th>
<th>Maximum Transition Time $T_S$ (ps sec)</th>
<th>Suggested Nominal Input Frequency (GHz)</th>
<th>Suggested Nominal Output Frequency (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA44767</td>
<td>3 - 4.5</td>
<td>30V</td>
<td>250 - 500</td>
<td>600</td>
<td>0.05 - 0.5</td>
<td>0.5 - 1.5</td>
</tr>
<tr>
<td>MA44768</td>
<td>1.6 - 2.4</td>
<td>30V</td>
<td>75 - 225</td>
<td>250</td>
<td>0.1 - 1</td>
<td>0.5 - 2.5</td>
</tr>
<tr>
<td>MA44769</td>
<td>0.8 - 1.2</td>
<td>30V</td>
<td>20 - 50</td>
<td>150</td>
<td>0.1 - 1</td>
<td>1 - 5</td>
</tr>
</tbody>
</table>

Notes:
1. The standard case styles are indicated for each model number. Other case styles are available. Consult the factory for information.
2. Reverse voltage is measured at reverse bias current of 10 µA.
3. Junction capacitance is measured at a reverse bias of 6 volts and a frequency of 1 MHz.

Case styles (See appendix for complete dimensions)
Step Recovery Diodes

MA43000, MA44600, MA44700 Series

V3.00

**Electrical Specifications @ 25°C (Cont’d)**

High Order Step Recovery Diode Varactors for Use in Comb Generation

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Case¹ Style</th>
<th>Maximum² Input Power (Watts)</th>
<th>Min./Max.³ Reverse Voltage (V_R) (Volts)</th>
<th>Min./Max.⁴ Junction Capacitance (C_j) (pF)</th>
<th>Min./Max. Carrier Lifetime, (T_L) (ps)</th>
<th>Maximum Snap Time, (T_s) -10V/10 mA (ps)</th>
<th>Maximum Thermal Resistance (j_c (C/W))</th>
<th>Nominal² Output Frequency (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA43592</td>
<td>30</td>
<td>1.0</td>
<td>25 - 40</td>
<td>0.2 - 0.30</td>
<td>9 - 27</td>
<td>90</td>
<td>70</td>
<td>1 - 12</td>
</tr>
<tr>
<td>MA43543</td>
<td>93</td>
<td>1.5</td>
<td>20 - 50</td>
<td>0.2 - 0.55</td>
<td>10 - 25</td>
<td>60</td>
<td>125</td>
<td>2 - 20</td>
</tr>
</tbody>
</table>

**Notes:**
1. The standard case styles are indicated for each model number. For other available case styles, consult the factory.
2. This is an operable output frequency range and does not imply instantaneous bandwidth.
3. Breakdown voltage is measured at a reverse bias voltage of 10 µA.
4. Junction capacitance is measured at a reverse bias voltage of 6 volts and a frequency of 1 MHz.

**Case Styles** (See appendix for complete dimensions)

![Case Styles](image)

**Absolute Maximum Ratings @ 25°C**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Range Operating Range</td>
<td>-65°C to +200°C</td>
</tr>
<tr>
<td></td>
<td>-65°C to +125°C (SOT-23 only)</td>
</tr>
<tr>
<td>Storage Range</td>
<td>-65°C to +200°C</td>
</tr>
<tr>
<td></td>
<td>-65°C to +125°C (SOT-23 only)</td>
</tr>
</tbody>
</table>

**Environmental Performance**

The MA44600 and MA43000 series of diodes in ceramic packages are capable of meeting the tests dictated by the methods and procedures of the latest revisions of MIL-S-19500, MIL-STD-202 and MIL-STD-750 which specify mechanical, electrical, thermal and other environmental tests common to military semiconductor products.