

**STTH3R06**

## TURBO 2 ULTRAFAST HIGH VOLTAGE RECTIFIER

**Table 1: Main Product Characteristics**

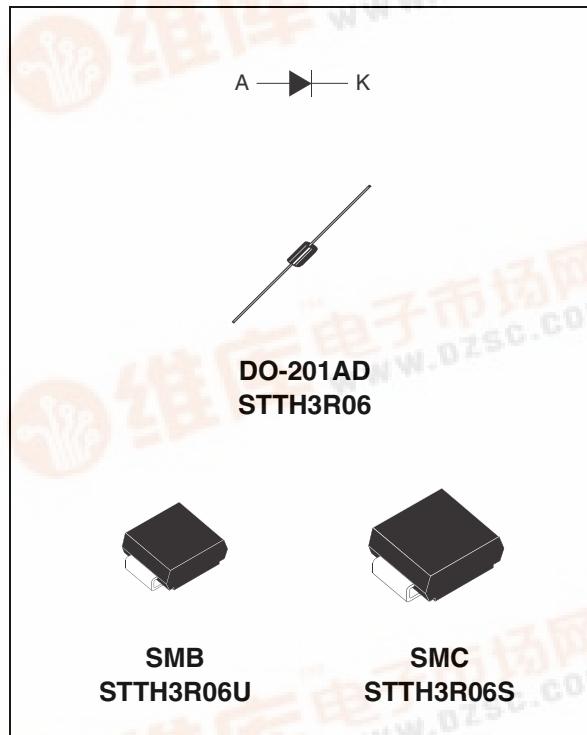
|                |             |
|----------------|-------------|
| $I_{F(AV)}$    | 3 A         |
| $V_{RRM}$      | 600 V       |
| $I_R$ (max)    | 100 $\mu$ A |
| $T_j$          | 175°C       |
| $V_F$ (typ)    | 1.0 V       |
| $t_{rr}$ (typ) | 35 ns       |

**FEATURES AND BENEFITS**

- Ultrafast switching
- Low forward voltage drop
- Low thermal resistance
- Low leakage current (platinum doping)

**DESCRIPTION**

The STTH3R06, which is using ST Turbo 2 600V technology, is specially suited for use in switching power supplies, inverters and as a free wheeling diode.

**Table 2: Order Codes**

| Part Number | Marking  |
|-------------|----------|
| STTH3R06    | STTH3R06 |
| STTH3R06RL  | STTH3R06 |
| STTH3R06U   | R06U     |
| STTH3R06S   | R6S      |

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**Table 3: Absolute Ratings (limiting values)**

| Symbol              | Parameter                                 |           |                       | Value        | Unit |
|---------------------|---|-----------|-----------------------|--------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage           |           |                       | 600          | V    |
| I <sub>F(RMS)</sub> | RMS forward voltage                       |           |                       | 10           | A    |
| I <sub>F(AV)</sub>  | Average forward current<br>$\delta = 0.5$ | DO-201AD  | T <sub>I</sub> = 80°C | 3            | A    |
|                     |   | SMB       | T <sub>I</sub> = 55°C |              |      |
|                     |   | SMC       | T <sub>I</sub> = 80°C |              |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current      | DO-201AD  | t <sub>p</sub> = 10ms | 55           | A    |
|                     |   | SMB / SMC | sinusoidal            | 45           |      |
| T <sub>stg</sub>    | Storage temperature range                 |           |                       | -65 to + 175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature    |           |                       | 175          | °C   |

**Table 4: Thermal Parameters**

| Symbol               | Parameter                         |  |                    | Maximum | Unit |
|----------------------|-----------------------------------|--|--------------------|---------|------|
| R <sub>th(j-l)</sub> | Junction to lead                  |  | DO-201AD L = 10 mm | 20      | °C/W |
|                      |                                   |  | SMB                | 25      |      |
|                      |                                   |  | SMC                | 20      |      |
| R <sub>th(j-a)</sub> | Junction to ambient (see fig. 13) |  | DO-201AD L = 10 mm | 75      | °C/W |

**Table 5: Static Electrical Characteristics**

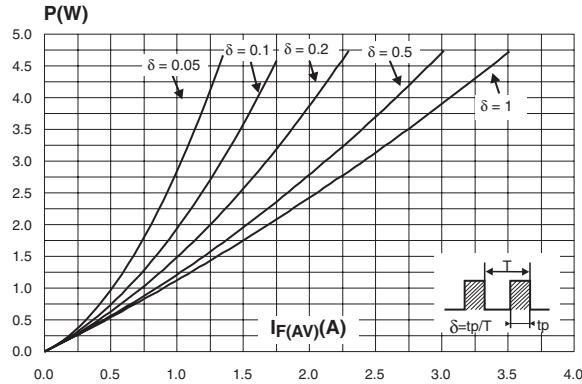
| Symbol         | Parameter               | Test conditions        |                                   | Min. | Typ | Max. | Unit |
|----------------|-------------------------|------------------------|-----------------------------------|------|-----|------|------|
| I <sub>R</sub> | Reverse leakage current | T <sub>j</sub> = 25°C  | V <sub>R</sub> = V <sub>RRM</sub> |      |     | 3    | μA   |
|                |                         | T <sub>j</sub> = 150°C |                                   |      | 15  | 100  |      |
| V <sub>F</sub> | Forward voltage drop    | T <sub>j</sub> = 25°C  | I <sub>F</sub> = 3A               |      |     | 1.7  | V    |
|                |                         | T <sub>j</sub> = 150°C |                                   |      | 1.0 | 1.25 |      |

To evaluate the conduction losses use the following equation:  $P = 1.03 \times I_{F(AV)} + 0.09 I_{F}^2(RMS)$

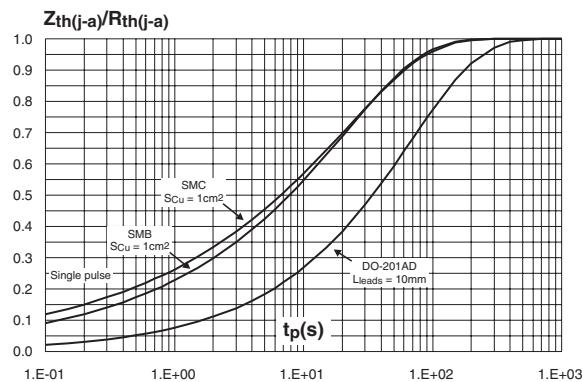
**Table 6: Dynamic Characteristics**

| Symbol          | Parameter                | Test conditions       |                       |                                | Min.                 | Typ | Max. | Unit |
|-----------------|--------------------------|-----------------------|-----------------------|--------------------------------|----------------------|-----|------|------|
| t <sub>rr</sub> | Reverse recovery time    | T <sub>j</sub> = 25°C | I <sub>F</sub> = 0.5A | I <sub>RR</sub> = 0.25A        | I <sub>R</sub> = 1A  |     | 30   | ns   |
|                 |                          |                       | I <sub>F</sub> = 1A   | dl <sub>F</sub> /dt = -50 A/μs | V <sub>R</sub> = 30V | 35  |      |      |
| t <sub>fr</sub> | Forward recovery time    | T <sub>j</sub> = 25°C | I <sub>F</sub> = 3A   | dl <sub>F</sub> /dt = 100 A/μs |                      |     | 100  | ns   |
|                 |                          |                       | V <sub>FR</sub>       | = 1.1 x V <sub>Fmax</sub>      |                      |     |      |      |
| V <sub>FP</sub> | Forward recovery voltage |                       | I <sub>F</sub> = 3A   | dl <sub>F</sub> /dt = 100 A/μs |                      |     | 10   | V    |

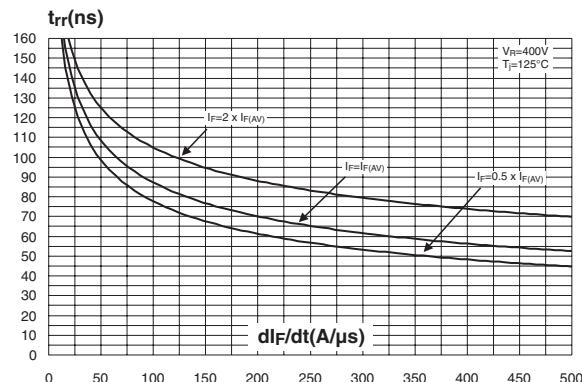
**Figure 1: Conduction losses versus average current**



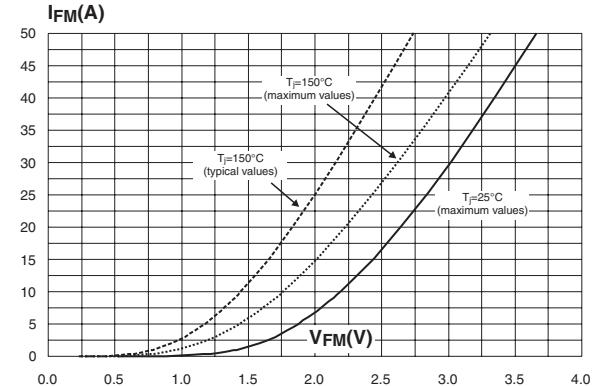
**Figure 3: Relative variation of thermal impedance junction ambient versus pulse duration (epoxy printed circuit FR4,  $L_{leads} = 10mm$ ,  $S_{Cu}=1cm^2$ )**



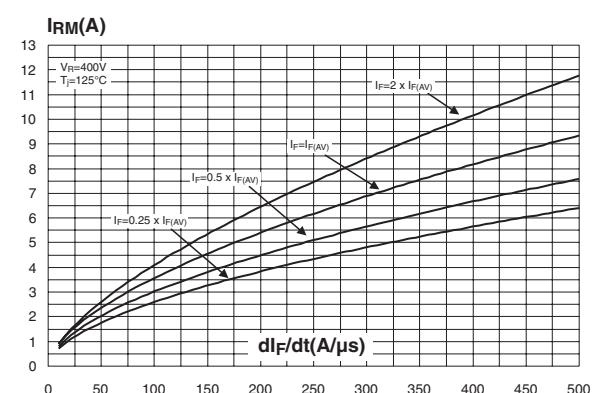
**Figure 5: Reverse recovery time versus  $dI_F/dt$  (typical values)**



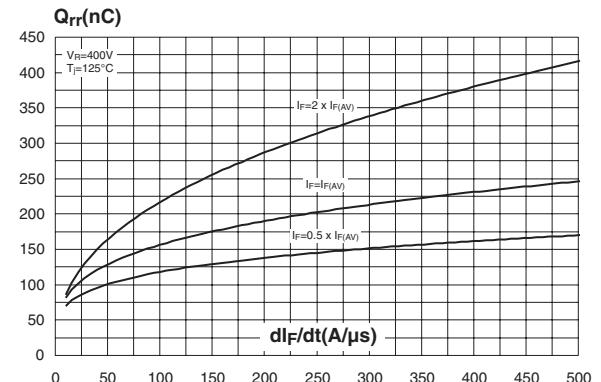
**Figure 2: Forward voltage drop versus forward current**



**Figure 4: Peak reverse recovery current versus  $dI_F/dt$  (typical values)**

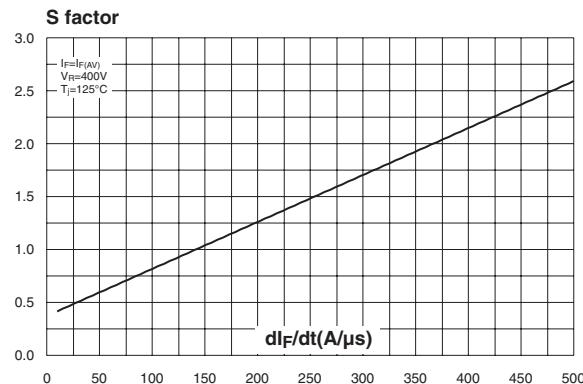


**Figure 6: Reverse recovery charges versus  $dI_F/dt$  (typical values)**

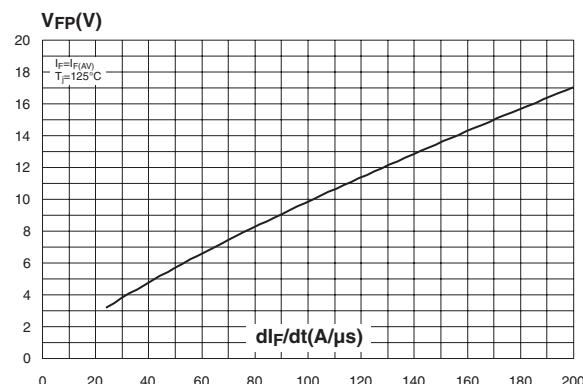


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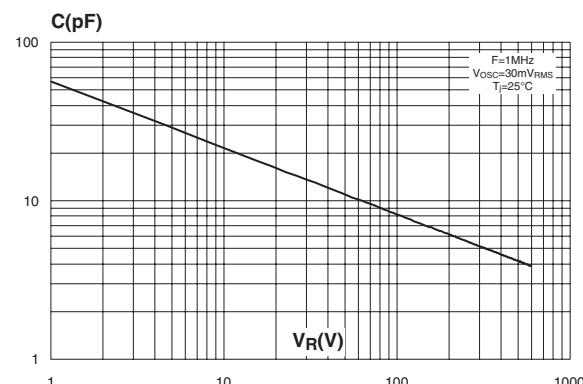
**Figure 7: Softness factor versus  $dI_F/dt$  (typical values)**



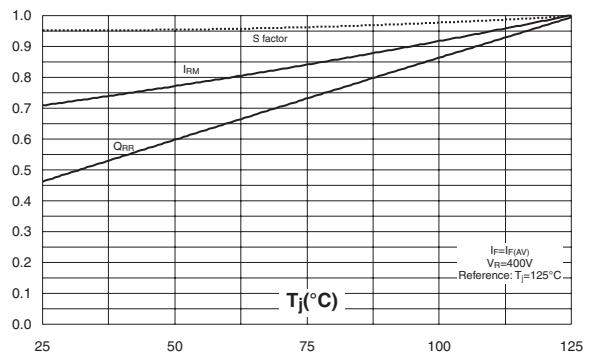
**Figure 9: Transient peak forward voltage versus  $dI_F/dt$  (typical values)**



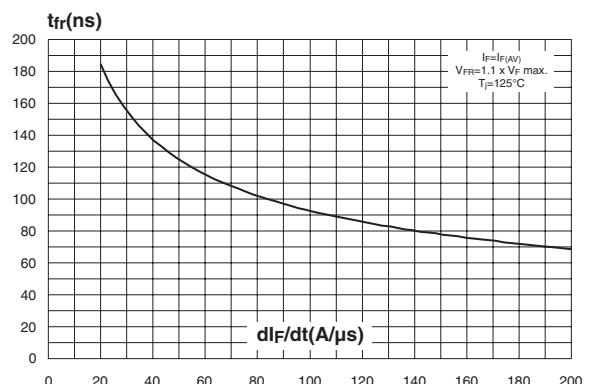
**Figure 11: Junction capacitance versus reverse voltage applied (typical values)**



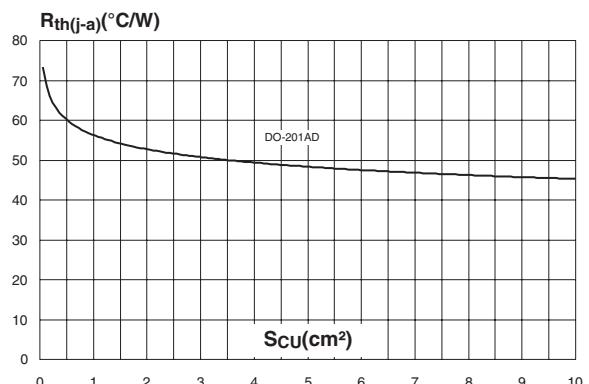
**Figure 8: Relative variations of dynamic parameters versus junction temperature**



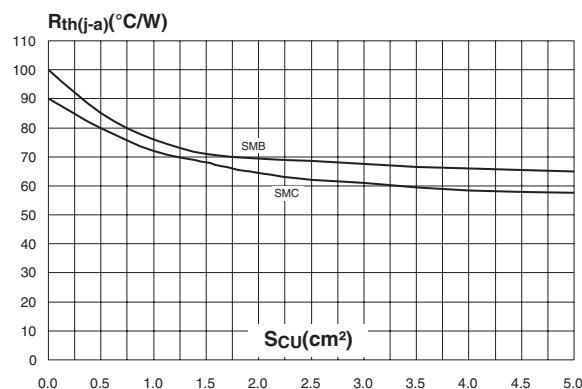
**Figure 10: Forward recovery time versus  $dI_F/dt$  (typical values)**



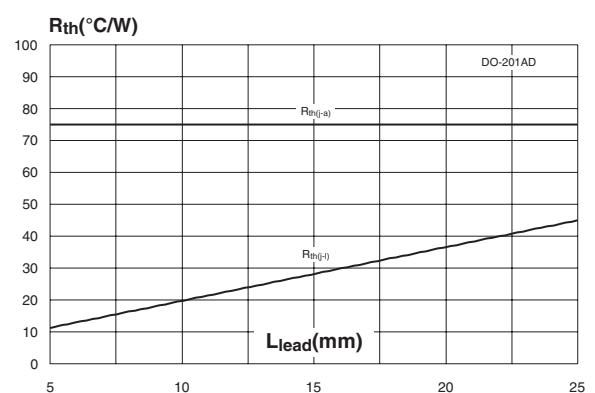
**Figure 12: Thermal resistance junction to ambient versus copper surface under lead (epoxy FR4,  $e_{Cu}=35\mu m$ ) (DO-201AD)**



**Figure 13: Thermal resistance junction to ambient versus copper surface under lead (epoxy FR4,  $e_{Cu}=35\mu m$ ) (SMB / SMC)**



**Figure 14: Thermal resistance versus lead length**

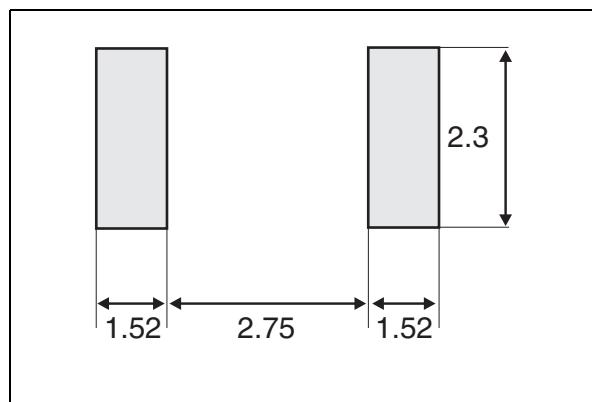


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Figure 15: SMB Package Mechanical Data

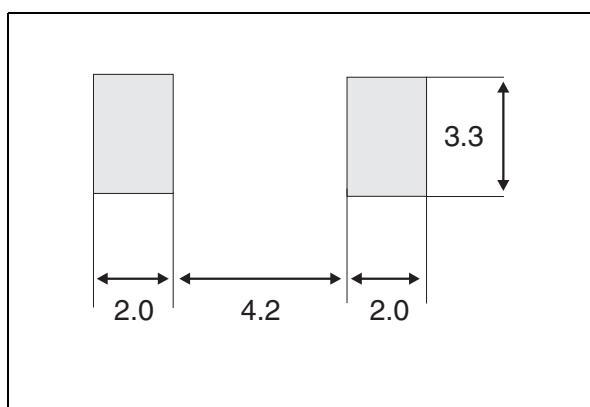
| REF. | DIMENSIONS  |      |        |       |
|------|-------------|------|--------|-------|
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A1   | 1.90        | 2.45 | 0.075  | 0.096 |
| A2   | 0.05        | 0.20 | 0.002  | 0.008 |
| b    | 1.95        | 2.20 | 0.077  | 0.087 |
| c    | 0.15        | 0.41 | 0.006  | 0.016 |
| E    | 5.10        | 5.60 | 0.201  | 0.220 |
| E1   | 4.05        | 4.60 | 0.159  | 0.181 |
| D    | 3.30        | 3.95 | 0.130  | 0.156 |
| L    | 0.75        | 1.60 | 0.030  | 0.063 |

Figure 16: SMB Foot Print Dimensions  
(in millimeters)



**Figure 17: SMC Package Mechanical Data**

| REF. | DIMENSIONS  |      |        |       |
|------|-------------|------|--------|-------|
|      | Millimeters |      | Inches |       |
|      | Min.        | Max. | Min.   | Max.  |
| A1   | 1.90        | 2.45 | 0.075  | 0.096 |
| A2   | 0.05        | 0.20 | 0.002  | 0.008 |
| b    | 2.90        | 3.2  | 0.114  | 0.126 |
| c    | 0.15        | 0.41 | 0.006  | 0.016 |
| E    | 7.75        | 8.15 | 0.305  | 0.321 |
| E1   | 6.60        | 7.15 | 0.260  | 0.281 |
| E2   | 4.40        | 4.70 | 0.173  | 0.185 |
| D    | 5.55        | 6.25 | 0.218  | 0.246 |
| L    | 0.75        | 1.60 | 0.030  | 0.063 |

**Figure 18: SMC Foot Print Dimensions**  
(in millimeters)

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Figure 19: DO-201AD Package Mechanical Data

| REF.  | DIMENSIONS   |      |        |       |
|-------|--|------|--------|-------|
|       | Millimeters  |      | Inches |       |
|       | Min.   | Max. | Min.   | Max.  |
| A     |  | 9.50 |        | 0.374 |
| B     | 25.40  |      | 1.000  |       |
| C     |  | 5.30 |        | 0.209 |
| D     |  | 1.30 |        | 0.051 |
| E     |  | 1.25 |        | 0.049 |
| NOTES | 1 - The lead diameter $\phi$ D is not controlled over zone E<br>2 - The minimum axial length within which the device may be placed with its leads bent at right angles is 0.59"(15 mm) |      |        |       |

Table 7: Ordering Information

| Ordering type | Marking  | Package  | Weight  | Base qty | Delivery mode |
|---------------|----------|----------|---------|----------|---------------|
| STTH3R06      | STTH3R06 | DO-201AD | 1.12 g  | 600      | Ammopack      |
| STTH3R06-RL   | STTH3R06 | DO-201AD | 1.12 g  | 1900     | Tape & reel   |
| STTH3R06U     | 3R6U     | SMB      | 0.11 g  | 2500     | Tape & reel   |
| STTH3R06S     | R6S      | SMC      | 0.243 g | 2500     | Tape & reel   |

- Epoxy meets UL94, V0
- Band indicated cathode (DO-201AD)
- Bending method: see application note AN1471 (DO-201AD)

Table 8: Revision History

| Date        | Revision | Description of Changes     |
|-------------|----------|----------------------------|
| March-2003  | 1        | First issue                |
| 07-Sep-2004 | 2        | SMB and SMC packages added |

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