

## Turbo 2 ultrafast high voltage rectifier

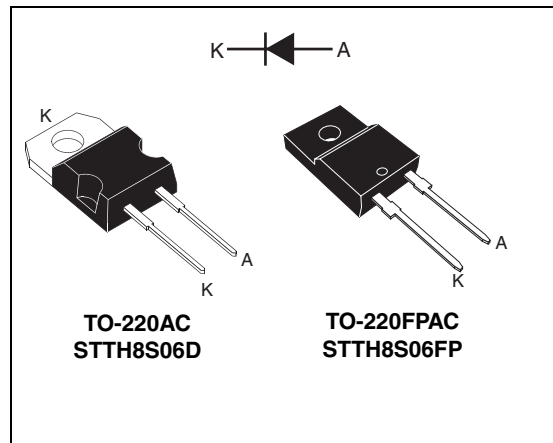
### Features

- Ultrafast recovery
- Low reverse recovery current
- Reduces losses in diode and switching transistor
- Low thermal resistance
- Higher frequency operation
- Insulated TO-220FPAC version
  - Insulation voltage = 1500 V rms
  - Package capacitance = 12 pF

### Description

ST's **STTH8S06** is a state of the art ultrafast recovery diode. By the use of **600 V Pt doping planar technology**, this diode will out-perform the power factor corrections circuits operating in hardswitching conditions. The extremely low reverse recovery current of the **STTH8S06**, reduces significantly the switching power losses of the MOSFET and thus increases the efficiency of the application. This leads designers to reduce the size of their heatsinks.

This device is also intended for applications in power supplies and power conversions systems, motor drive, and other power switching applications.



**Table 1. Device summary**

|                |        |
|----------------|--------|
| $I_{F(AV)}$    | 8 A    |
| $V_{RRM}$      | 600 V  |
| $I_{RM}(typ.)$ | 4.4 A  |
| $T_j(max)$     | 175 °C |
| $V_F(typ)$     | 1.5 V  |
| $t_{rr}(typ)$  | 12 ns  |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

| Symbol      | Parameter                              | Value         | Unit |
|-------------|--|---------------|------|
| $V_{RRM}$   | Repetitive peak reverse voltage        | 600           | V    |
| $I_{F(AV)}$ | Average forward current                | 8             | A    |
| $I_{FSM}$   | Surge non repetitive forward current   | $t_p = 10$ ms | A    |
| $T_{stg}$   | Storage temperature range              | -65 to + 175  | °C   |
| $T_j$       | Maximum operating junction temperature | 175           | °C   |

**Table 3. Thermal parameter**

| Symbol        | Parameter        | Maximum   | Unit |
|---------------|------------------|-----------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC  | °C/W |
|               |                  | TO220FPAC |      |

**Table 4. Static electrical characteristics**

| Symbol | Parameter               | Test conditions | Min.          | Typ | Max. | Unit    |
|--------|-------------------------|-----------------|---------------|-----|------|---------|
| $I_R$  | Reverse leakage current | $T_j = 25$ °C   | $V_R = 600$ V |     | 20   | $\mu$ A |
|        |                         | $T_j = 125$ °C  |               | 25  | 200  |         |
| $V_F$  | Forward voltage drop    | $T_j = 25$ °C   | $I_F = 8$ A   |     | 3.4  | V       |
|        |                         | $T_j = 125$ °C  |               | 1.5 | 1.9  |         |

To evaluate the maximum conduction losses use the following equation:

$$P = 1.20 \times I_{F(AV)} + 0.087 I_{F(RMS)}^2$$

**Table 5. Dynamic electrical characteristics**

| Symbol       | Parameter                | Test conditions  | Min. | Typ | Max. | Unit |
|--------------|--------------------------|--|------|-----|------|------|
| $t_{rr}$     | Reverse recovery time    | $I_F = 1$ A, $di_F/dt = -200$ A/ $\mu$ s, $V_R = 30$ V                       |      | 12  | 18   | ns   |
| $I_{RM}$     | Reverse current          | $T_j = 25$ °C<br>$I_F = 8$ A, $di_F/dt = -200$ A/ $\mu$ s,<br>$V_R = 200$ V  |      | 1.6 | 2.2  | A    |
| $S_{factor}$ | Softness factor          |  |      | 1   |      | -    |
| $Q_{rr}$     | Reverse recovery charges |  |      | 17  |      | nC   |
| $I_{RM}$     | Reverse current          | $T_j = 125$ °C<br>$I_F = 8$ A, $di_F/dt = -200$ A/ $\mu$ s,<br>$V_R = 200$ V |      | 4.4 | 6.0  | A    |
| $S_{factor}$ | Softness factor          |  |      | 0.3 |      | -    |
| $Q_{rr}$     | Reverse recovery charges |  |      | 90  |      | nC   |

Figure 1. Forward voltage drop versus forward current

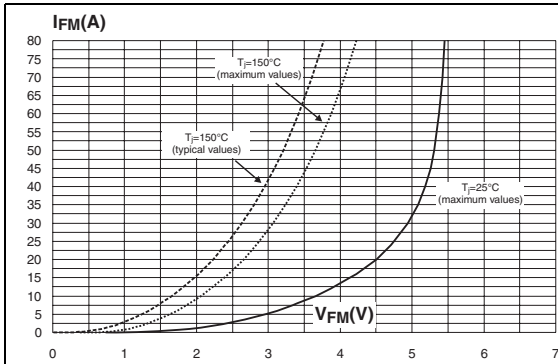


Figure 2. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC)

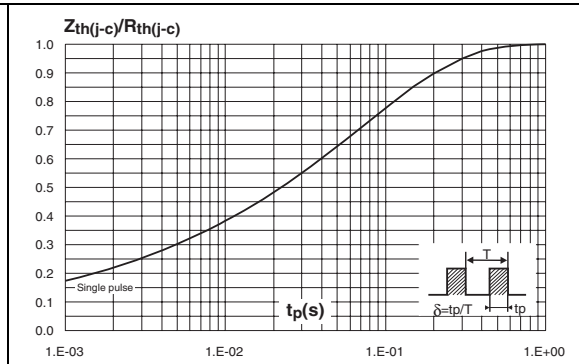


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)

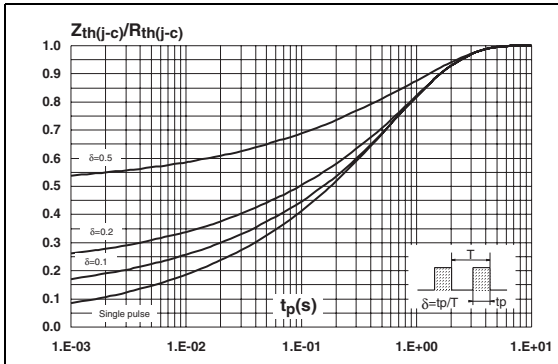
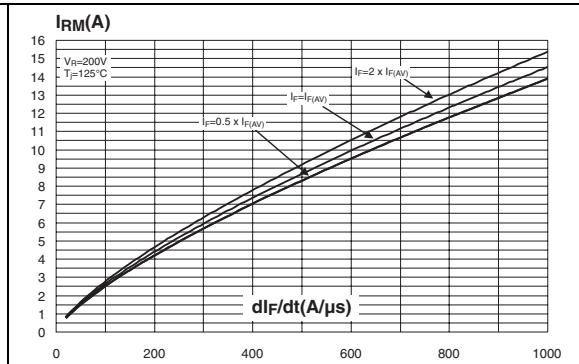
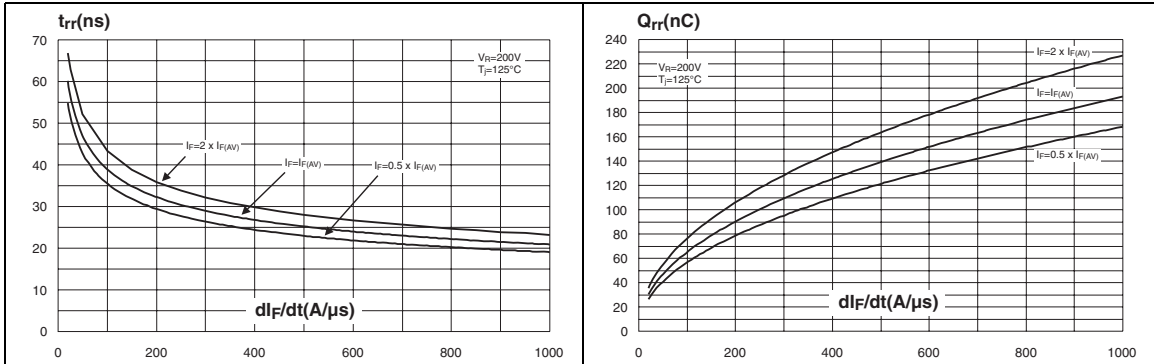


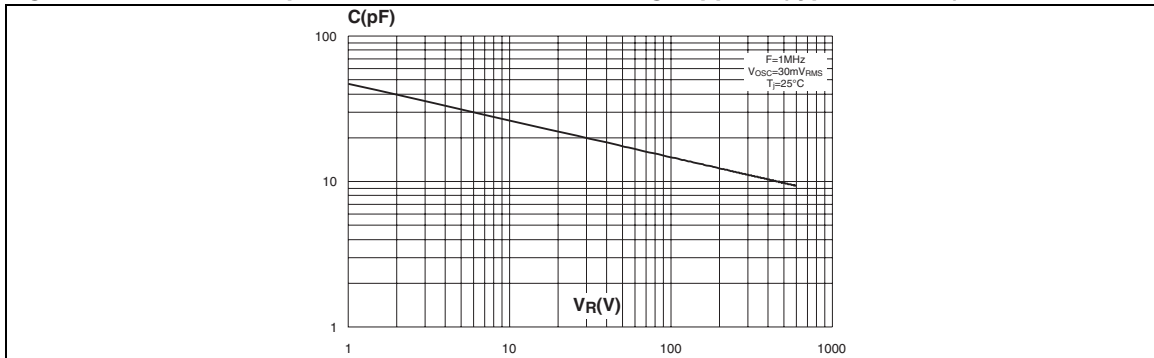
Figure 4. Peak reverse recovery current versus  $di_f/dt$  (typical values)



**Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)** **Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)**



**Figure 7. Junction capacitance versus reverse voltage applied (typical values)**



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

In order to meet environmental requirements, ST (also) offers these devices in ECOPACK® packages. ECOPACK® packages are Lead-free. The category of second level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label.

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**Table 6. TO-220AC dimensions**

| Ref.    | Dimensions  |       |            |       |
|---------|-------------|-------|------------|-------|
|         | Millimeters |       | Inches     |       |
|         | Min.        | Max.  | Min.       | Max.  |
| A       | 4.40        | 4.60  | 0.173      | 0.181 |
| C       | 1.23        | 1.32  | 0.048      | 0.051 |
| D       | 2.40        | 2.72  | 0.094      | 0.107 |
| E       | 0.49        | 0.70  | 0.019      | 0.027 |
| F       | 0.61        | 0.88  | 0.024      | 0.034 |
| F1      | 1.14        | 1.70  | 0.044      | 0.066 |
| G       | 4.95        | 5.15  | 0.194      | 0.202 |
| H2      | 10.00       | 10.40 | 0.393      | 0.409 |
| L2      | 16.40 typ.  |       | 0.645 typ. |       |
| L4      | 13.00       | 14.00 | 0.511      | 0.551 |
| L5      | 2.65        | 2.95  | 0.104      | 0.116 |
| L6      | 15.25       | 15.75 | 0.600      | 0.620 |
| L7      | 6.20        | 6.60  | 0.244      | 0.259 |
| L9      | 3.50        | 3.93  | 0.137      | 0.154 |
| M       | 2.6 typ.    |       | 0.102 typ. |       |
| Diam. I | 3.75        | 3.85  | 0.147      | 0.151 |

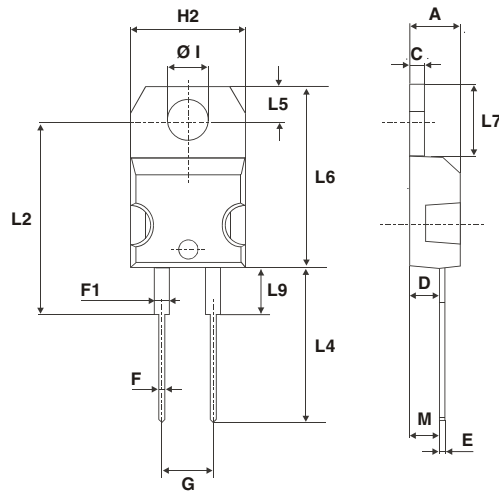


Table 7. TO-220FPAC dimensions

| Ref. | Dimensions  |      |           |       |
|------|-------------|------|-----------|-------|
|      | Millimeters |      | Inches    |       |
|      | Min.        | Max. | Min.      | Max.  |
| A    | 4.4         | 4.6  | 0.173     | 0.181 |
| B    | 2.5         | 2.7  | 0.098     | 0.106 |
| D    | 2.5         | 2.75 | 0.098     | 0.108 |
| E    | 0.45        | 0.70 | 0.018     | 0.027 |
| F    | 0.75        | 1    | 0.030     | 0.039 |
| F1   | 1.15        | 1.70 | 0.045     | 0.067 |
| G    | 4.95        | 5.20 | 0.195     | 0.205 |
| G1   | 2.4         | 2.7  | 0.094     | 0.106 |
| H    | 10          | 10.4 | 0.393     | 0.409 |
| L2   | 16 Typ.     |      | 0.63 Typ. |       |
| L3   | 28.6        | 30.6 | 1.126     | 1.205 |
| L4   | 9.8         | 10.6 | 0.386     | 0.417 |
| L5   | 2.9         | 3.6  | 0.114     | 0.142 |
| L6   | 15.9        | 16.4 | 0.626     | 0.646 |
| L7   | 9.00        | 9.30 | 0.354     | 0.366 |
| Dia. | 3.00        | 3.20 | 0.118     | 0.126 |

### 3 Ordering information

Table 8. Ordering information

| Order code | Marking    | Package    | Weight | Base qty | Delivery mode |
|------------|------------|------------|--------|----------|---------------|
| STTH8S06D  | STTH8S06D  | TO-220AC   | 1.9 g  | 50       | Tube          |
| STTH8S06FP | STTH8S06FP | TO-220FPAC | 1.64 g | 50       | Tube          |

### 4 Revision history

Table 9. Document revision history

| Date        | Revision | Description of changes |
|-------------|----------|------------------------|
| 18-Dec-2007 | 1        | First issue.           |

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