

# STTH6012

### Ultrafast recovery - 1200 V diode

### Main product characteristics

| I <sub>F(AV)</sub>    | 60 A   |
|-----------------------|--------|
| V <sub>RRM</sub>      | 1200 V |
| Тj                    | 175° C |
| V <sub>F</sub> (typ)  | 1.30 V |
| t <sub>rr</sub> (typ) | 50 ns  |

### Features and benefits

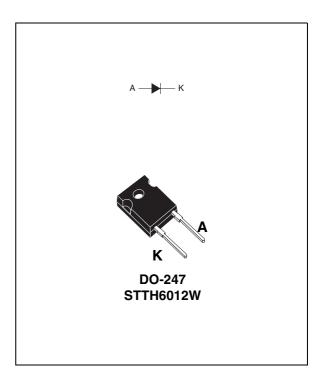
- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature

## Description

The high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

Such demanding applications include industrial power supplies, motor control, and similar mission-critical systems that require rectification and freewheeling. These diodes also fit into auxiliary functions such as snubber, bootstrap, and demagnetization applications.

The improved performance in low leakage current, and therefore thermal runaway guard band, is an immediate competitive advantage for this device.



### **Order codes**

| Part Number | Marking   |
|-------------|-----------|
| STTH6012W   | STTH6012W |

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# 1 Characteristics

#### Table 1. Absolute ratings (limiting values at 25° C, unless otherwise specified)

| Symbol              | Par  | Value  | Unit |              |    |
|---------------------|--|--|------|--------------|----|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage  |  |      | 1200         | V  |
| I <sub>F(RMS)</sub> | RMS forward current  |  |      | 80           | А  |
| I <sub>F(AV)</sub>  | Average forward current, $\delta = 0.5$                                | Average forward current, $\delta = 0.5$ $T_c = 90^{\circ} C$         |      | 60           | А  |
| I <sub>FRM</sub>    | Repetitive peak forward current  | Repetitive peak forward current $t_p = 5 \ \mu s$ , F = 5 kHz square |      |              | А  |
| I <sub>FSM</sub>    | Surge non repetitive forward current t <sub>p</sub> = 10 ms Sinusoidal |  |      | 400          | А  |
| T <sub>stg</sub>    | Storage temperature range  |  |      | -65 to + 175 | °C |
| Тj                  | Maximum operating junction temperature                                 |  |      | 175          | °C |

#### Table 2.Thermal parameter

| Symbol               | Parameter        | Value | Unit |
|----------------------|------------------|-------|------|
| R <sub>th(j-c)</sub> | Junction to case | 0.6   | °C/W |

#### Table 3. Static electrical characteristics

| Symbol                        | Parameter  | Test conditions                     |                       | Min. | Тур  | Max. | Unit |
|-------------------------------|--|-------------------------------------|-----------------------|------|------|------|------|
| I <sub>B</sub> <sup>(1)</sup> | Reverse leakage current                            | $T_j = 25^\circ C$                  | V - V                 |      |      | 30   |      |
| 'R` ´                         | neverse leakage current                            | $T_j = 125^\circ C$ $V_R = V_{RRM}$ |                       | 30   | 300  | μA   |      |
|                               |  | T <sub>j</sub> = 25° C              |                       |      |      | 2.25 |      |
| V <sub>F</sub> <sup>(2)</sup> | V <sub>F</sub> <sup>(2)</sup> Forward voltage drop | T <sub>j</sub> = 125° C             | I <sub>F</sub> = 60 A |      | 1.35 | 2.05 | V    |
|                               |  | T <sub>j</sub> = 150° C             |                       |      | 1.30 | 1.95 |      |

1. Pulse test:  $t_p$  = 5 ms,  $\delta$  < 2 %

2. Pulse test: t<sub>p</sub> = 380  $\mu$ s,  $\delta$  < 2 %

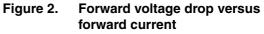
To evaluate the conduction losses use the following equation: P = 1.50 x  ${I_{F(AV)}}$  + 0.0075  ${I_{F}}^2_{(RMS)}$ 

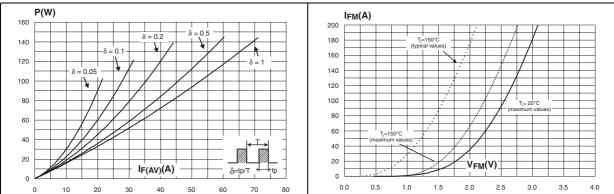


| Table 4. Dynamic characteris |
|------------------------------|
|------------------------------|

| Symbol          | Parameter  | Test conditions   | Min. | Тур | Max. | Unit |
|-----------------|--|---|------|-----|------|------|
|                 |  | $    I_F = 1 \ \text{A}, \ \text{dI}_F/\text{dt} = -50 \ \text{A}/\mu\text{s}, \\    V_R = 30 \ \text{V}, \ \text{T}_j = 25^\circ \ \text{C} $      |      |     | 125  |      |
| t <sub>rr</sub> | Reverse recovery time  | $\label{eq:IF} \begin{array}{l} I_F = 1 \mbox{ A, } dI_F/dt = -100 \mbox{ A/}\mu s, \\ V_R = 30 \mbox{ V, } T_j = 25^\circ \mbox{ C} \end{array}$   |      | 63  | 85   | ns   |
|                 | $\label{eq:IF} \begin{array}{l} I_{F} = 1 \ A, \ dI_{F}/dt = \text{-200 } A/\mus, \\ V_{R} = 30 \ V, \ T_{j} = 25^{\circ} \ C \end{array}$ |   | 50   | 70  |      |      |
| I <sub>RM</sub> | Reverse recovery current   | $    I_F = 60 \text{ A}, \ dI_F/dt = -200 \text{ A}/\mu\text{s}, \\ V_R = 600 \text{ V}, \ T_j = 125^\circ \text{ C} $                              |      | 32  | 45   | А    |
| S               | Softness factor  | $    I_F = 60 \text{ A}, \text{ d}I_F/\text{d}t = -200 \text{ A}/\mu\text{s}, \\    V_R = 600 \text{ V},  T_j = 125^\circ \text{ C} $               |      | 1   |      |      |
| t <sub>fr</sub> | Forward recovery time  | $I_F = 60 \text{ A} \qquad dI_F/dt = 100 \text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \text{ x} \text{ V}_{Fmax},   \text{T}_\text{j} = 25^\circ \text{ C}$ |      |     | 750  | ns   |
| V <sub>FP</sub> | Forward recovery voltage   | $I_F = 60 \text{ A, } dI_F/dt = 100 \text{ A/}\mu\text{s},$<br>$T_j = 25^{\circ} \text{ C}$   |      | 4.5 |      | v    |

# Figure 1. Conduction losses versus average current





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# Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

# Figure 4. Peak reverse recovery current versus dl<sub>F</sub>/dt (typical values)

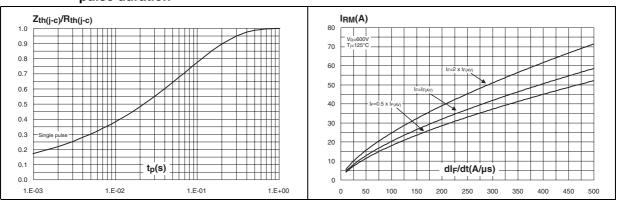


Figure 5. Reverse recovery time versus dl<sub>F</sub>/dt (typical values)

Figure 6. Reverse recovery charges versus dl<sub>F</sub>/dt (typical values)

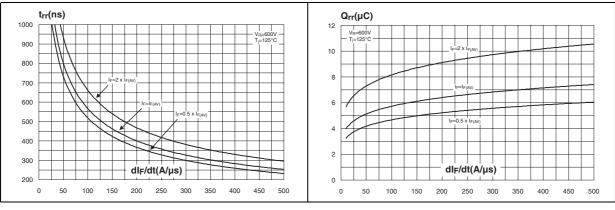
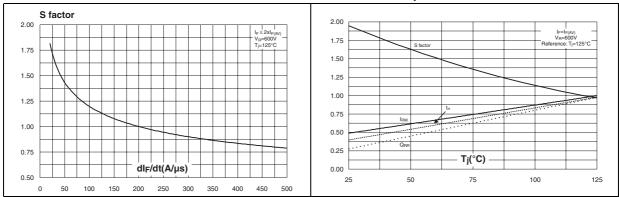


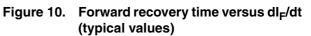
Figure 7. Softness factor versus dl<sub>F</sub>/dt (typical values)

Figure 8. Relative variations of dynamic parameters versus junction temperature





# Figure 9. Transient peak forward voltage versus dl<sub>F</sub>/dt (typical values)



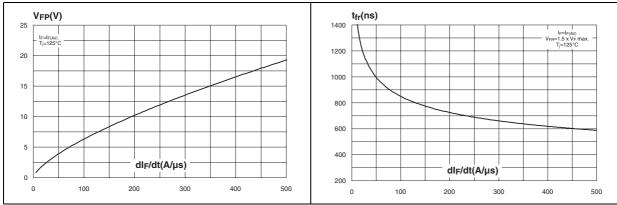
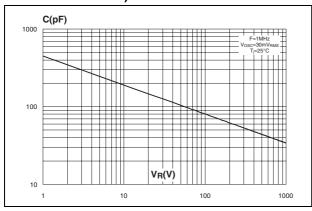


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



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## 2 Package information

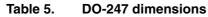
Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.80 Nm

Maximum torque value: 1.0 Nm

|  |      |       |          | DIMEN | SIONS |        |       |
|--|------|-------|----------|-------|-------|--------|-------|
|  | REF. | М     | illimete | rs    |       | Inches |       |
|  |      | Min.  |          | Max   | Min.  |        | Max.  |
|  | А    | 4.85  |          | 5.15  | 0.191 |        | 0.203 |
|  | D    | 2.20  |          | 2.60  | 0.086 |        | 0.102 |
|  | Е    | 0.40  |          | 0.80  | 0.015 |        | 0.031 |
|  | F    | 1.00  |          | 1.40  | 0.039 |        | 0.055 |
|  | F2   |       | 2.00     |       |       | 0.078  |       |
| H A  | F3   | 2.00  |          | 2.40  | 0.078 |        | 0.094 |
|  | G    |       | 10.90    |       |       | 0.429  |       |
|  | Н    | 15.45 |          | 15.75 | 0.608 |        | 0.620 |
|  | L    | 19.85 |          | 20.15 | 0.781 |        | 0.793 |
| L2 L4                                      | L1   | 3.70  |          | 4.30  | 0.145 |        | 0.169 |
|  | L2   |       | 18.50    |       |       | 0.728  |       |
| L3 $V_2 \rightarrow F_3 \rightarrow D_{-}$ | L3   | 14.20 |          | 14.80 | 0.559 |        | 0.582 |
|  | L4   |       | 34.60    |       |       | 1.362  |       |
|  | L5   |       | 5.50     |       |       | 0.216  |       |
|  | М    | 2.00  |          | 3.00  | 0.078 |        | 0.118 |
|  | V    |       | 5°       |       |       | 5°     |       |
|  | V2   |       | 60°      |       |       | 60°    |       |
|  | Dia. | 3.55  |          | 3.65  | 0.139 |        | 0.143 |



In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. 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. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.



# **3** Ordering information

| Part Number | Marking   | Package | Weight | Base qty | Delivery mode |
|-------------|-----------|---------|--------|----------|---------------|
| STTH6012W   | STTH6012W | DO-247  | 4.4 g  | 30       | Tube          |

# 4 Revision history

| Date        | Revision | Description of Changes |
|-------------|----------|------------------------|
| 02-Mar-2006 | 1        | First issue.           |



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