

## Turbo 2 ultrafast high voltage rectifier

### Main product characteristics

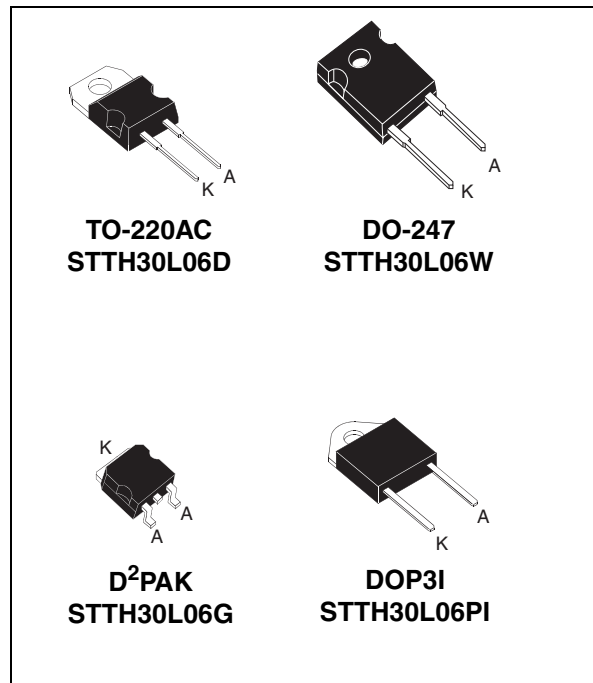
|                |       |
|----------------|-------|
| $I_{F(AV)}$    | 30 A  |
| $V_{RRM}$      | 600 V |
| $T_j$          | 175°C |
| $V_F$ (typ)    | 1.0 V |
| $t_{rr}$ (max) | 65 ns |

### Features and benefits

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching & conduction losses
- Package insulation voltage  
DOP3I: 2500 V<sub>RMS</sub>

### Description

The STTH30L06, which is using ST Turbo 2 600V technology, is specially suited for use in switching power supplies, and industrial applications, as rectification and discontinuous mode PFC boost diode.



### Order codes

| Part Number   | Marking     |
|---------------|-------------|
| STTH30L06D    | STTH30L06D  |
| STTH30L06G    | STTH30L06G  |
| STTH30L06G-TR | STTH30L06G  |
| STTH30L06W    | STTH30L06W  |
| STTH30L06PI   | STTH30L06PI |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values)**

| Symbol       | Parameter                              |  | Value                                    | Unit |   |
|--------------|--|--|--|------|---|
| $V_{RRM}$    | Repetitive peak reverse voltage        |  | 600                                      | V    |   |
| $I_{F(RMS)}$ | RMS forward voltage                    |  | 50                                       | A    |   |
| $I_{F(AV)}$  | Average forward current                | TO-220AC / TO-247 / D <sup>2</sup> PAK | $T_c = 125^\circ\text{C}$ $\delta = 0.5$ | 30   | A |
|              |  | DOP3I                                  | $T_c = 95^\circ\text{C}$ $\delta = 0.5$  |      |   |
| $I_{FSM}$    | Surge non repetitive forward current   |  | $t_p = 10\text{ ms}$ sinusoidal          | 160  | A |
| $T_{stg}$    | Storage temperature range              |  | -65 to + 175                             | °C   |   |
| $T_j$        | Maximum operating junction temperature |  | 175                                      | °C   |   |

**Table 2. Thermal resistance**

| Symbol        | Parameter        |  | Value (max.) | Unit |
|---------------|------------------|--|--------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / TO-247 / D <sup>2</sup> PAK | 1.1          | °C/W |
|               |                  | DOP3I                                  | 1.7          |      |

**Table 3. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions           |                     | Min. | Typ | Max. | Unit          |
|-------------|-------------------------|---------------------------|---------------------|------|-----|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ\text{C}$  | $V_R = V_{RRM}$     |      |     | 25   | $\mu\text{A}$ |
|             |                         | $T_j = 150^\circ\text{C}$ |                     |      | 80  | 800  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25^\circ\text{C}$  | $I_F = 30\text{ A}$ |      |     | 1.55 | V             |
|             |                         | $T_j = 150^\circ\text{C}$ |                     |      | 1.0 | 1.25 |               |

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

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:  $P = 0.95 \times I_{F(AV)} + 0.010 I_{F(RMS)}^2$

**Table 4. Dynamic Characteristics**

| Symbol   | Parameter                | Test conditions           |  | Min | Typ  | Max | Unit |
|----------|--------------------------|---------------------------|--|-----|------|-----|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25^\circ\text{C}$  | $I_F = 0.5\text{ A}$ $I_{rr} = 0.25\text{ A}$ $I_R = 1\text{ A}$                           |     |      | 65  | ns   |
|          |                          |                           | $I_F = 1\text{ A}$ $dl_F/dt = 50\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$                 |     | 65   | 90  |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125^\circ\text{C}$ | $I_F = 30\text{ A}$ $V_R = 400\text{ V}$<br>$dl_F/dt = 100\text{ A}/\mu\text{s}$           |     | 11.5 | 16  | A    |
| $t_{fr}$ | Forward recovery time    | $T_j = 25^\circ\text{C}$  | $I_F = 30\text{ A}$ $dl_F/dt = 100\text{ A}/\mu\text{s}$<br>$V_{FR} = 1.1 \times V_{Fmax}$ |     |      | 500 | ns   |
| $V_{FP}$ | Forward recovery voltage | $T_j = 25^\circ\text{C}$  | $I_F = 30\text{ A}$ $dl_F/dt = 100\text{ A}/\mu\text{s}$<br>$V_{FR} = 1.1 \times V_{Fmax}$ |     | 2.5  |     | V    |



Figure 1. Conduction losses versus average forward current

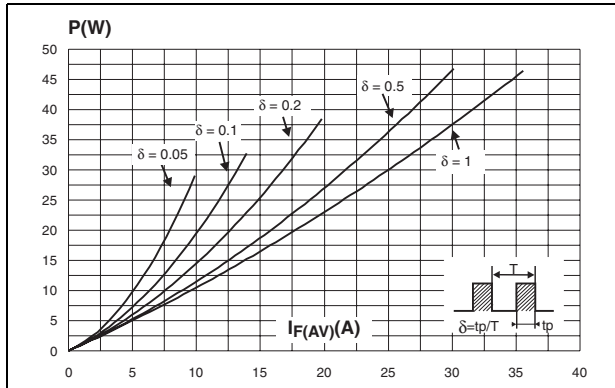


Figure 2. Forward voltage drop versus forward current

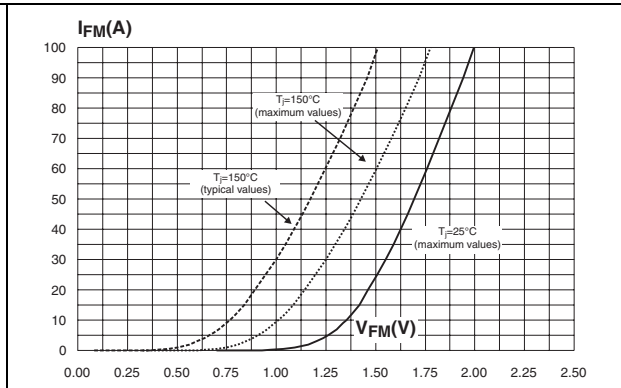


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

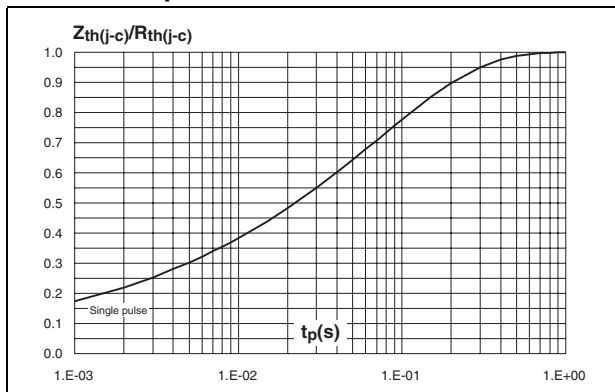


Figure 4. Peak reverse recovery current versus di\_F/dt (typical values)

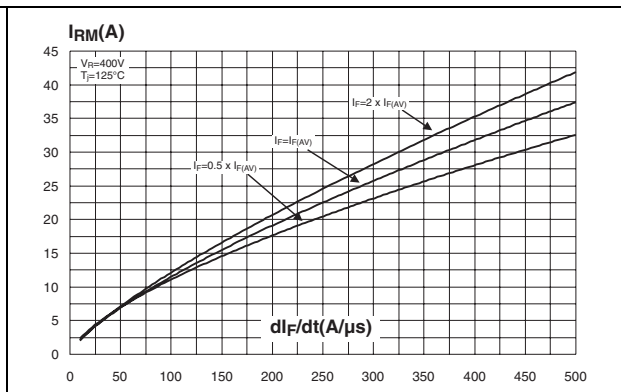


Figure 5. Reverse recovery time versus di\_F/dt (typical values)

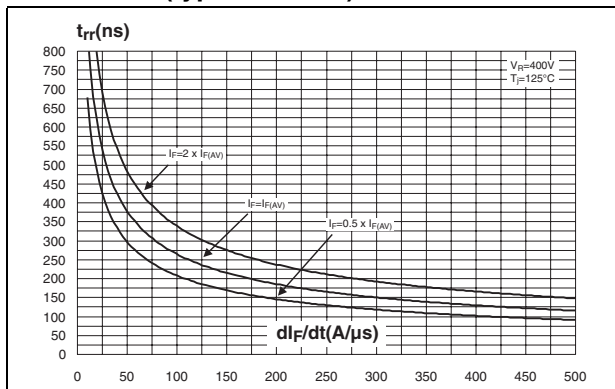


Figure 6. Reverse recovery charges versus di\_F/dt (typical values)

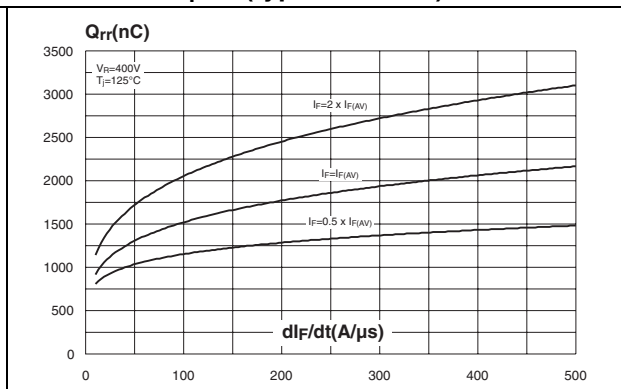


Figure 7. Reverse recovery softness factor versus  $di_F/dt$  (typical values)

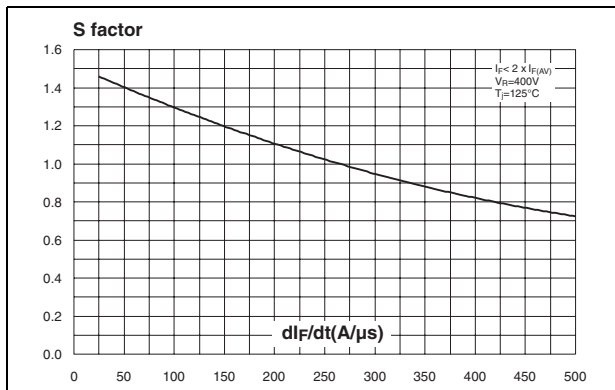


Figure 8. Relative variations of dynamic parameters versus junction temperature

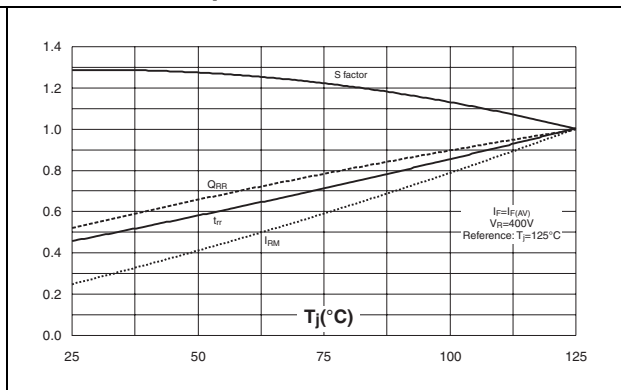


Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)

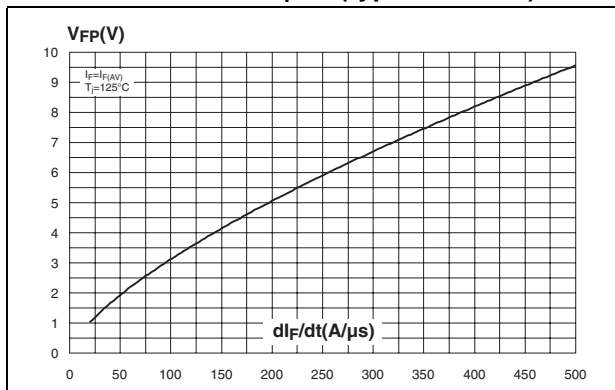


Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)

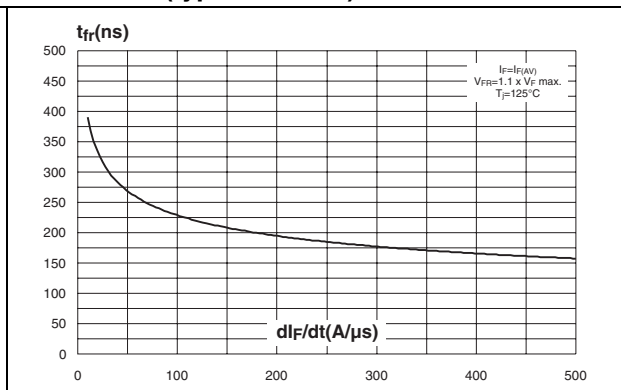


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

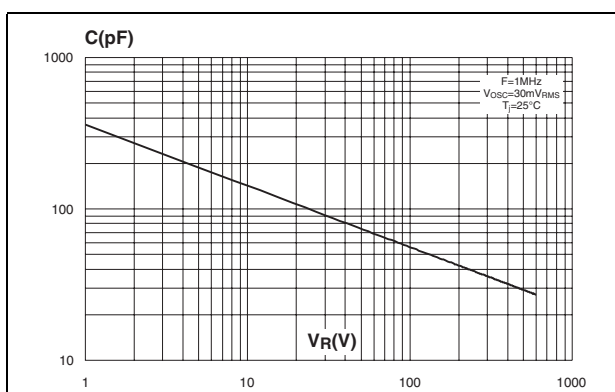
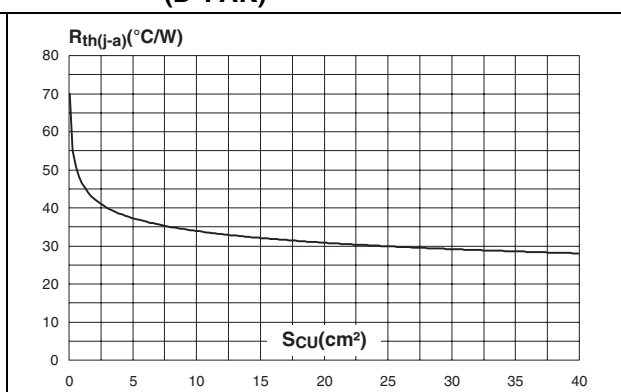


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (epoxy FR4,  $e_{CU}=35\mu m$ ) ( $D^2PAK$ )



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 Nm (TO-220FPAC) / 0.55 Nm (TO-220AC)
- Maximum torque value: 1.0 Nm (TO-220FPAC) / 0.70 Nm (TO-220AC)

Table 5. D<sup>2</sup>PAK dimensions

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| A1   | 2.49        | 2.69  | 0.098      | 0.106 |
| A2   | 0.03        | 0.23  | 0.001      | 0.009 |
| B    | 0.70        | 0.93  | 0.027      | 0.037 |
| B2   | 1.14        | 1.70  | 0.045      | 0.067 |
| C    | 0.45        | 0.60  | 0.017      | 0.024 |
| C2   | 1.23        | 1.36  | 0.048      | 0.054 |
| D    | 8.95        | 9.35  | 0.352      | 0.368 |
| E    | 10.00       | 10.40 | 0.393      | 0.409 |
| G    | 4.88        | 5.28  | 0.192      | 0.208 |
| L    | 15.00       | 15.85 | 0.590      | 0.624 |
| L2   | 1.27        | 1.40  | 0.050      | 0.055 |
| L3   | 1.40        | 1.75  | 0.055      | 0.069 |
| M    | 2.40        | 3.20  | 0.094      | 0.126 |
| R    | 0.40 typ.   |       | 0.016 typ. |       |
| V2   | 0°          | 8°    | 0°         | 8°    |

Figure 13. D<sup>2</sup>PAK footprint (dimensions in mm)

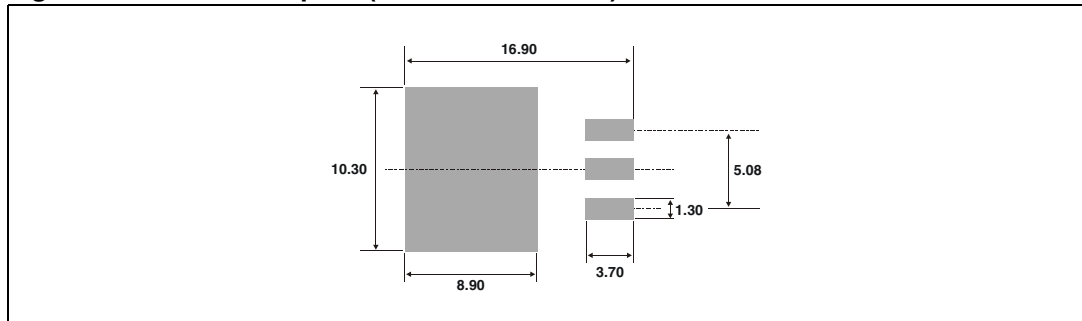
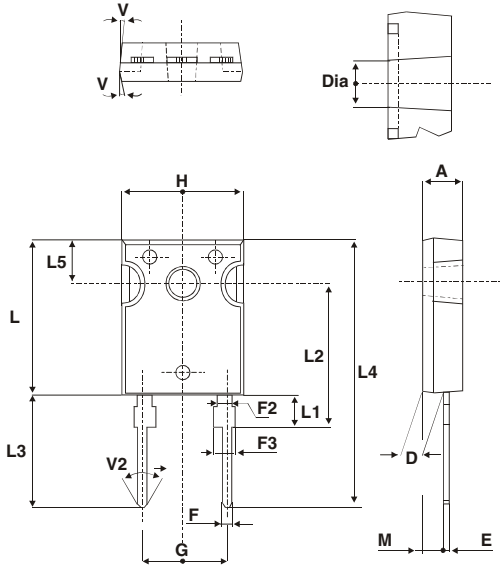


Table 6. DO247 dimensions



| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A    | 4.85        |       | 5.15  | 0.191  |       | 0.203 |
| D    | 2.20        |       | 2.60  | 0.086  |       | 0.102 |
| E    | 0.40        |       | 0.80  | 0.015  |       | 0.031 |
| F    | 1.00        |       | 1.40  | 0.039  |       | 0.055 |
| F2   |             | 2.00  |       |        | 0.078 |       |
| F3   | 2.00        |       | 2.40  | 0.078  |       | 0.094 |
| G    |             | 10.90 |       |        | 0.429 |       |
| H    | 15.45       |       | 15.75 | 0.608  |       | 0.620 |
| L    | 19.85       |       | 20.15 | 0.781  |       | 0.793 |
| L1   | 3.70        |       | 4.30  | 0.145  |       | 0.169 |
| L2   |             | 18.50 |       |        | 0.728 |       |
| L3   | 14.20       |       | 14.80 | 0.559  |       | 0.582 |
| L4   |             | 34.60 |       |        | 1.362 |       |
| L5   |             | 5.50  |       |        | 0.216 |       |
| M    | 2.00        |       | 3.00  | 0.078  |       | 0.118 |
| V    |             | 5°    |       |        | 5°    |       |
| V2   |             | 60°   |       |        | 60°   |       |
| Dia. | 3.55        |       | 3.65  | 0.139  |       | 0.143 |

Table 7. 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 8. DOP3I dimensions

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| b    | 1.20        | 1.40  | 0.047      | 0.055 |
| c    | 1.45        | 1.55  | 0.057      | 0.061 |
| c1   | 0.50        | 0.70  | 0.020      | 0.028 |
| D    | 12.15       | 13.10 | 0.474      | 0.516 |
| E    | 15.10       | 15.50 | 0.594      | 0.610 |
| E1   | 7.55        | 7.75  | 0.297      | 0.305 |
| e    | 10.80       | 11.30 | 0.425      | 0.445 |
| G    | 20.4        | 21.10 | 0.815      | 0.831 |
| L    | 14.35       | 15.60 | 0.565      | 0.614 |
| P    | 4.08        | 4.17  | 0.161      | 0.164 |
| Q    | 2.70        | 2.90  | 0.106      | 0.114 |
| R    | 4.60 typ.   |       | 0.181 typ. |       |
| Y    | 15.80       | 16.50 | 0.622      | 0.650 |



### 3 Ordering information

| Ordering type | Marking     | Package            | Weight | Base qty | Delivery mode |
|---------------|-------------|--------------------|--------|----------|---------------|
| STTH30L06D    | STTH30L06D  | TO-220AC           | 1.90 g | 50       | Tube          |
| STTH30L06G    | STTH30L06G  | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STTH30L06G-TR | STTH30L06G  | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape & reel   |
| STTH30L06W    | STTH30L06W  | DO-247             | 4.40 g | 30       | Tube          |
| STTH30L06PI   | STTH30L06PI | DOP3I              | 4.46 g | 30       | Tube          |

### 4 Revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 07-Sep-2004 | 1        | First issue.  |
| 21-Oct-2004 | 2        | DOP3I package added.  |
| 11-Jan-06   | 3        | On page 2:<br><ul style="list-style-type: none"> <li>– I<sub>F(RMS)</sub> corrected from 30 A to 50 A</li> <li>– I<sub>F(AV)</sub> corrected from 50 A to 30 A</li> </ul> |
| 10-Aug-2006 | 4        | Reformatted to current standards. SOD-93 package removed.   |

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