

Ultrafast high voltage rectifier

Table 1: Main product characteristics

| | |
|----------------|-----------------|
| $I_{F(AV)}$ | 2 x 60 A |
| V_{RRM} | 400 V |
| T_j (max) | 150 °C |
| V_F (typ) | 0.83 V |
| t_{rr} (max) | 50 ns |

Features and benefits

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching & conduction losses

Description

The STTH12004TV1 uses ST 400V technology and is specially suited for use in switching power supplies, welding equipment, and industrial applications, as an output rectification diode.

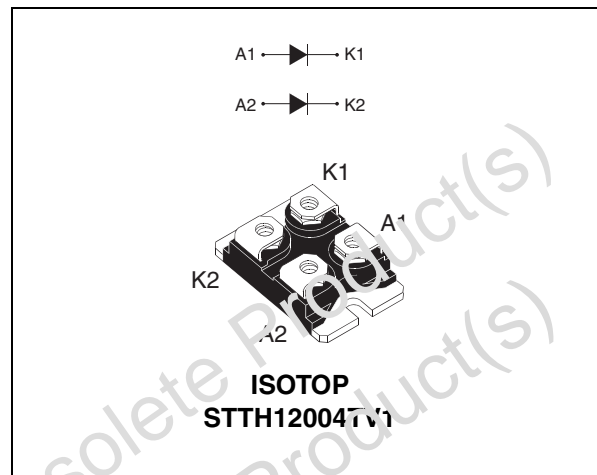


Table 2: Order codes

| Part number | Marking |
|--------------|--------------|
| STTH12004TV1 | STTH12004TV1 |

Table 3: Absolute ratings (limiting values, per diode)

| Symbol | Parameter | | Value | Unit |
|--------------|--|---|--------------|------|
| V_{RRM} | Repetitive peak reverse voltage | | 400 | V |
| $I_{F(RMS)}$ | RMS forward current | | 120 | A |
| $I_{F(AV)}$ | Average forward current | $T_c = 115\text{ °C } \delta = 0.5$ Per diode | 60 | A |
| I_{FSM} | Surge non repetitive forward current $t_p = 10\text{ ms sinusoidal}$ | | 600 | A |
| T_{stg} | Storage temperature range | | -55 to + 150 | °C |
| T_j | Maximum operating junction temperature | | 150 | °C |

Table 4: Thermal resistance

| Symbol | Parameter | | Value (max.) | Unit |
|---------------|------------------|-----------|--------------|-----------------------------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 0.5 | $^{\circ}\text{C}/\text{W}$ |
| | | Total | 0.3 | |
| $R_{th(c)}$ | Coupling | | 0.1 | $^{\circ}\text{C}/\text{W}$ |

When diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode 1}) = P(\text{diode 1}) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode 2}) \times R_{th(c)}$$

Table 5: Static electrical characteristics (per diode)

| Symbol | Parameter | Test conditions | | Min. | Typ | Max. | Unit |
|------------|-------------------------|-----------------------------|---------------------|------|------|------|---------------|
| I_R^* | Reverse leakage current | $T_j = 25^{\circ}\text{C}$ | $V_R = V_{RRM}$ | | | 50 | μA |
| | | $T_j = 125^{\circ}\text{C}$ | | | 50 | 500 | |
| V_F^{**} | Forward voltage drop | $T_j = 25^{\circ}\text{C}$ | $I_F = 60\text{ A}$ | | | 1.2 | V |
| | | $T_j = 150^{\circ}\text{C}$ | | | 0.83 | 1.0 | |

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

** $t_p = 380\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses use the following equation: $P = 0.8 \times I_F(\text{AV}) + 0.002 \times I_F^2(\text{RMS})$

Table 6: Dynamic characteristics (per diode)

| Symbol | Parameter | Test conditions | | Min | Typ | Max | Unit |
|--------------|--------------------------|-----------------------------|--|-----|-----|-----|------|
| t_{rr} | Reverse recovery time | $T_j = 25^{\circ}\text{C}$ | $I_F = 1\text{ A}$ $di_F/dt = 50\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$ | | 66 | 90 | ns |
| | | | $I_F = 1\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$ | | 36 | 50 | |
| I_{RM} | Reverse recovery current | $T_j = 125^{\circ}\text{C}$ | $I_F = 60\text{ A}$ $V_R = 200\text{ V}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ | | | 15 | A |
| S_{factor} | Softness factor | $T_j = 125^{\circ}\text{C}$ | $I_F = 60\text{ A}$ $V_R = 200\text{ V}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ | | 0.4 | | |
| t_{fr} | Forward recovery time | $T_j = 25^{\circ}\text{C}$ | $I_F = 60\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 600 | ns |
| V_{FR} | Forward recovery voltage | $T_j = 25^{\circ}\text{C}$ | $I_F = 60\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | 2.6 | | V |

Figure 1: Conduction losses versus average forward current (per diode)

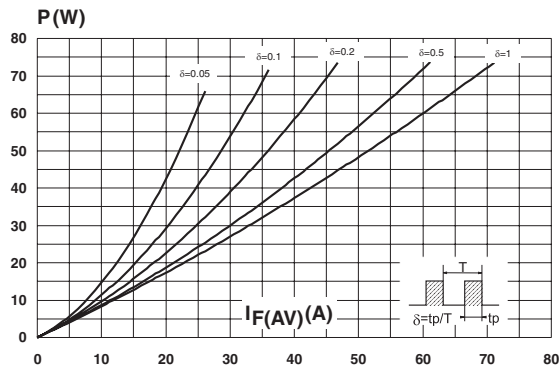


Figure 2: Forward voltage drop versus forward current (per diode)

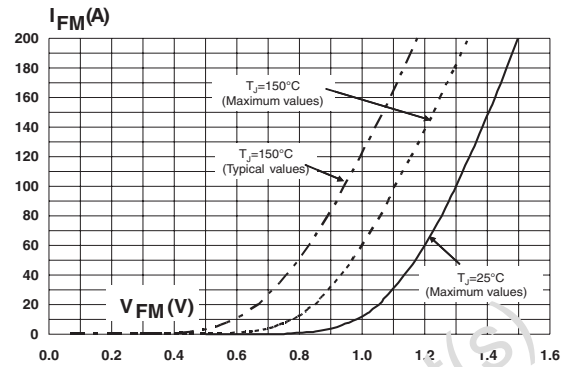


Figure 3: Relative variation of thermal impedance junction to case versus pulse duration

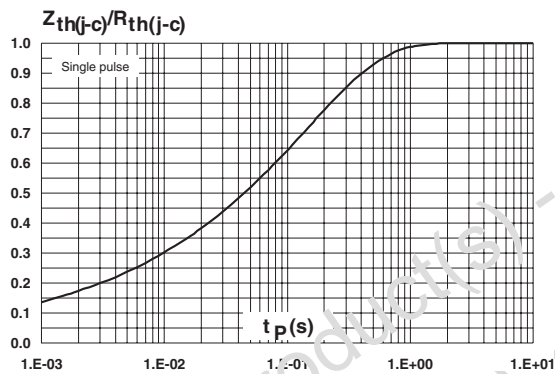


Figure 4: Peak reverse recovery current versus di/dt (typical values, per diode)

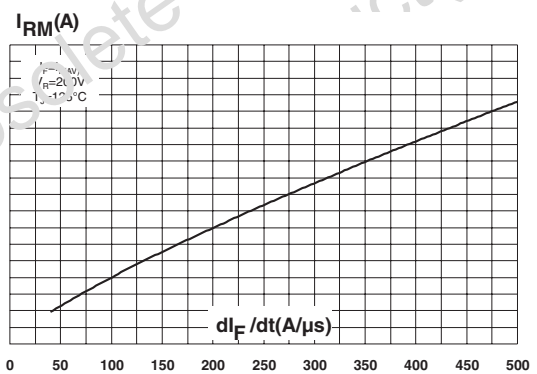


Figure 5: Reverse recovery time versus di/dt (typical values, per diode)

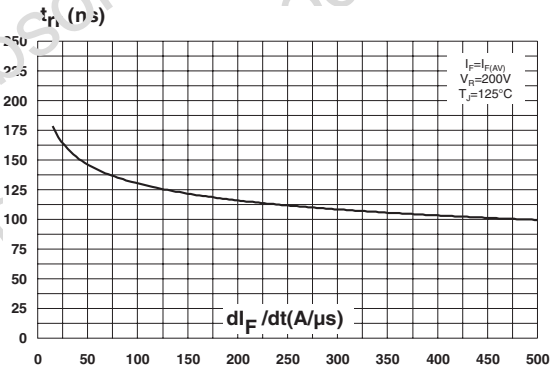


Figure 6: Reverse recovery charges versus di/dt (typical values, per diode)

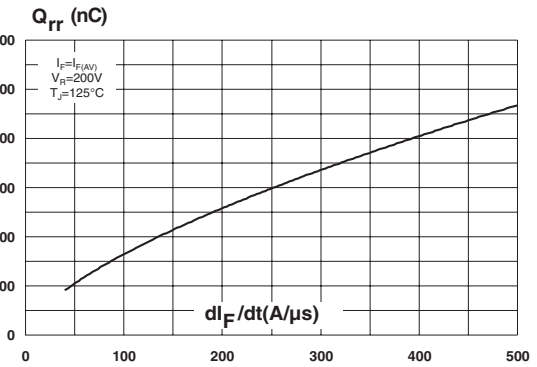


Figure 7: Reverse recovery softness factor versus di_F/dt (typical values, per diode)

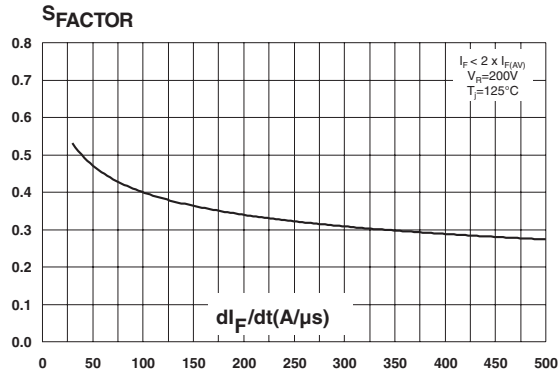


Figure 8: Relative variations of dynamic parameters versus junction temperature

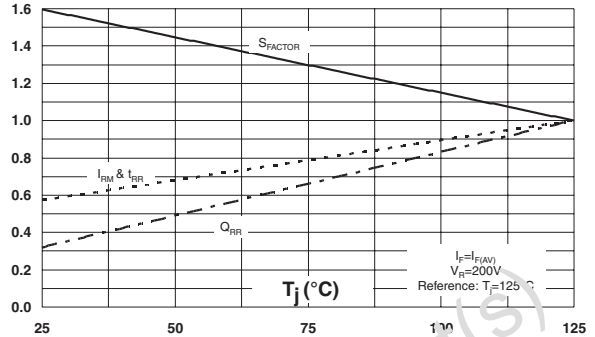


Figure 9: Transient peak forward voltage versus di_F/dt (typical values, per diode)

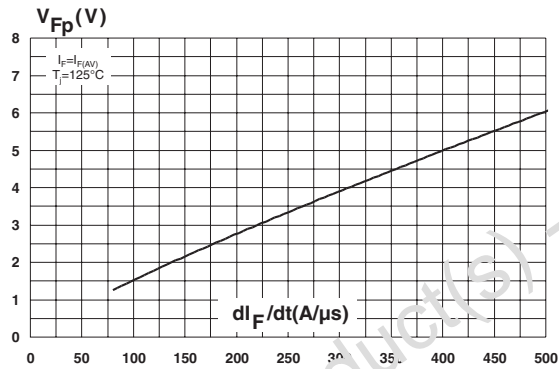


Figure 10: Forward recovery time versus di_F/dt (typical values, per diode)

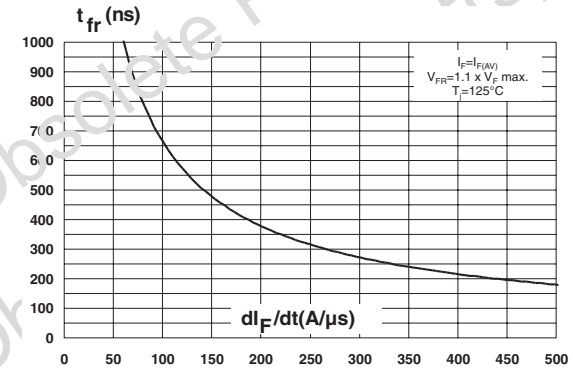


Figure 11: Junction capacitance versus reverse voltage applied (typical values, per diode)

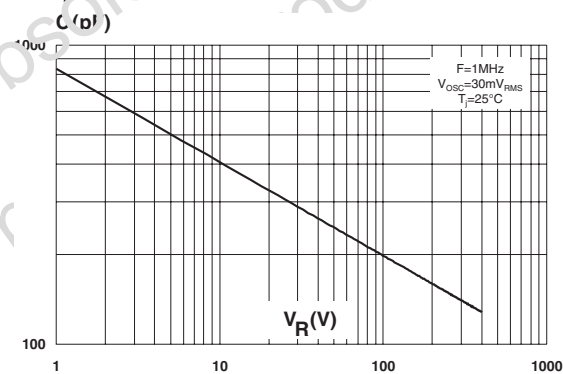
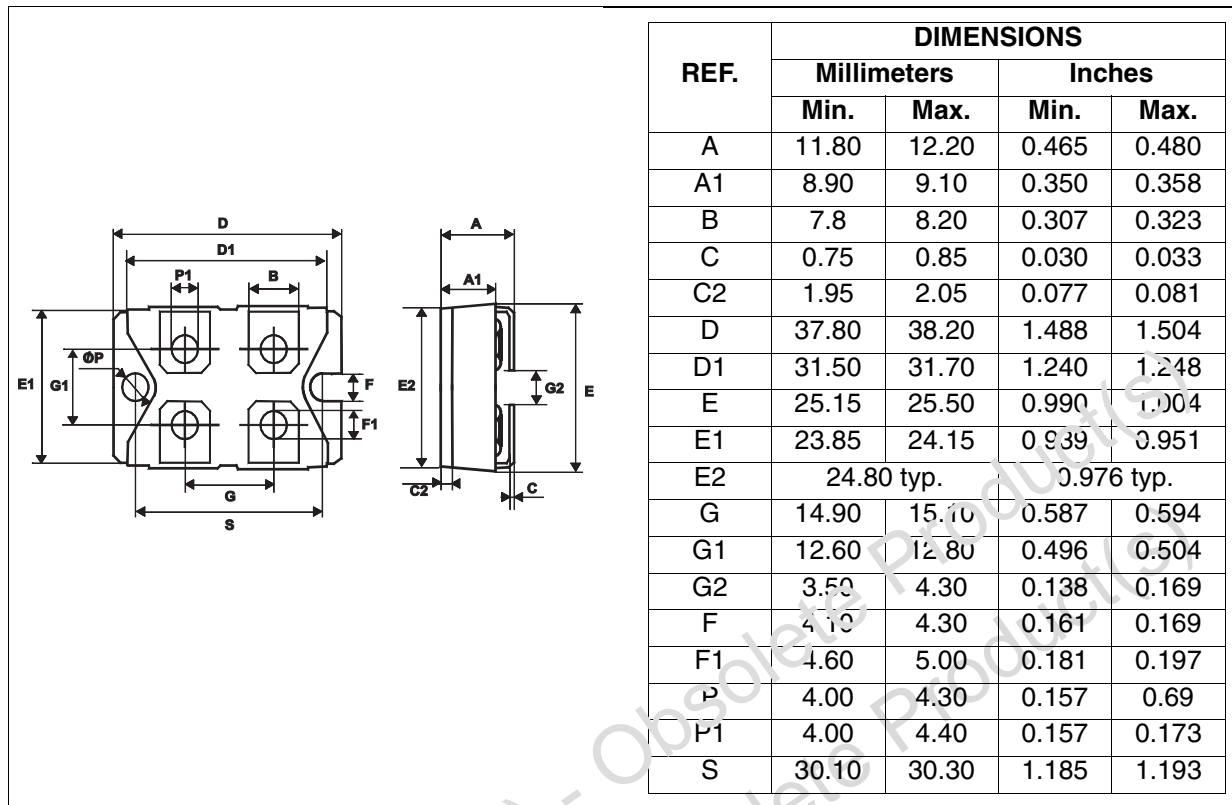


Figure 12: ISOTOP Package mechanical data



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.

Table 7: Ordering information

| Ordering type | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|--------------|---------|--------------------------|---------------------|---------------|
| STTH12004TV1 | STTH12004TV1 | ISOTOP | 27 g (without screws) | 10 (with screws) | Tube |

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

Table 8: Revision history

| Date | Revision | Description of Changes |
|-------------|----------|------------------------|
| 18-Oct-2005 | 1 | First issue |

Obsolete Product(s) - Obsolete Product(s)
Obsolete Product(s) - Obsolete Product(s)

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics.
All other names are the property of their respective owners

© 2005 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America
www.st.com

