

## Ultrafast high voltage rectifier

**Table 1: Main product characteristics**

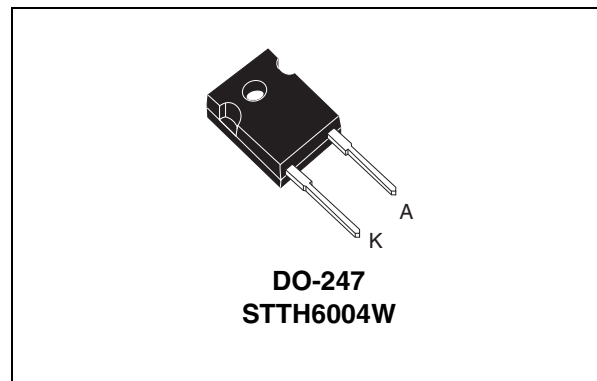
$I_{F(AV)}$	60 A
$V_{RRM}$	400 V
$T_j$ (max)	175 °C
$V_F$ (typ)	0.83 V
$t_{rr}$ (max)	50 ns

### Features and benefits

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

### Description

The STTH6004W 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
STTH6004W	STTH6004W

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

Symbol	Parameter	Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage	400	V	
$I_{F(RMS)}$	RMS forward current	90	A	
$I_{F(AV)}$	Average forward current	$T_c = 125\text{ °C} \quad \delta = 0.5$	60	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms sinusoidal}$	600	A
$T_{stg}$	Storage temperature range	-65 to + 175	°C	
$T_j$	Maximum operating junction temperature	175	°C	

**Table 4: Thermal Resistance**

Symbol	Parameter	Value (max.)	Unit
$R_{th(j-c)}$	Junction to case	0.70	°C/W

**Table 5: Static electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$I_R^*$	Reverse leakage current	$T_j = 25\text{ °C}$			50	$\mu\text{A}$
		$T_j = 150\text{ °C}$			100	
$V_F^{**}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 60\text{ A}$		1.2	V
		$T_j = 150\text{ °C}$			0.83	

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

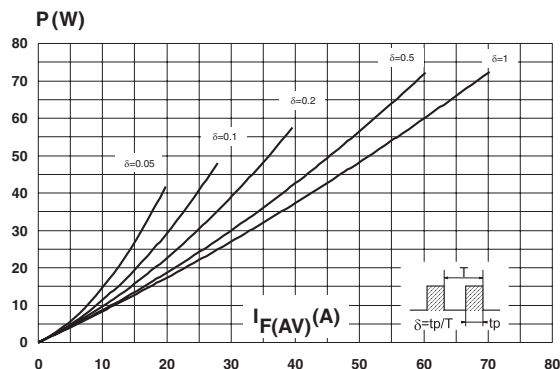
\*\*  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:  $P = 0.8 \times I_{F(AV)} + 0.0033 I_F^2(RMS)$

**Table 6: Dynamic characteristics**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit			
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ °C}$	$I_F = 1\text{ A}$	$di_F/dt = 50\text{ A}/\mu\text{s}$	$V_R = 30\text{ V}$		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	$T_j = 125\text{ °C}$	$I_F = 60\text{ A}$	$V_R = 200\text{ V}$	$di_F/dt = 100\text{ A}/\mu\text{s}$			15	A
$S_{factor}$	Softness factor	$T_j = 125\text{ °C}$	$I_F = 60\text{ A}$	$V_R = 200\text{ V}$	$di_F/dt = 100\text{ A}/\mu\text{s}$		0.4		
$t_{fr}$	Forward recovery time	$T_j = 25\text{ °C}$	$I_F = 60\text{ A}$	$di_F/dt = 200\text{ A}/\mu\text{s}$	$V_{FR} = 1.1 \times V_{Fmax}$			600	ns
$V_{FP}$	Forward recovery voltage	$T_j = 25\text{ °C}$	$I_F = 60\text{ A}$	$di_F/dt = 200\text{ A}/\mu\text{s}$	$V_{FR} = 1.1 \times V_{Fmax}$		3.2		V

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



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

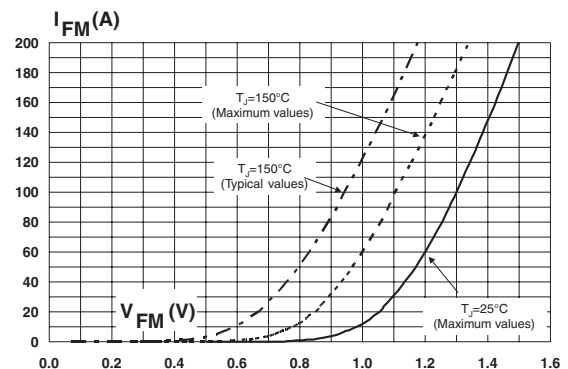


Figure 3: Relative variation of thermal impedance junction to case versus pulse duration

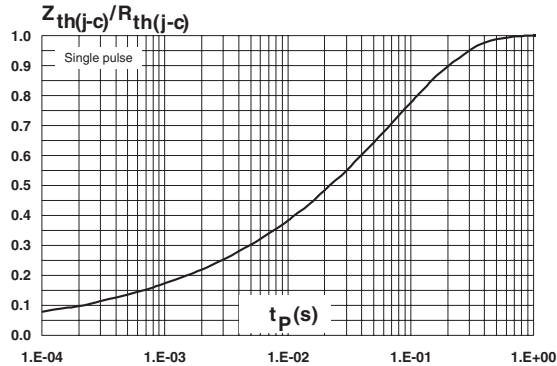


Figure 4: Peak reverse recovery current versus  $di_F/dt$  (typical values)

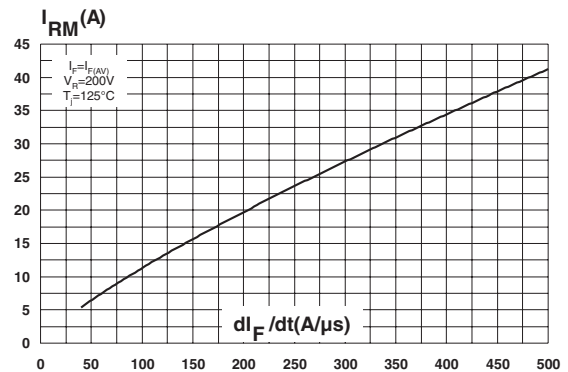


Figure 5: Reverse recovery time versus  $di_F/dt$  (typical values)

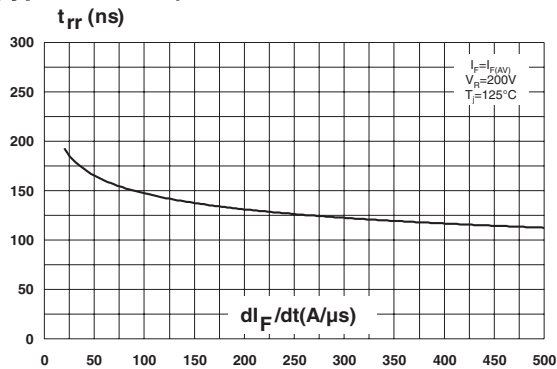


Figure 6: Reverse recovery charges versus  $di_F/dt$  (typical values)

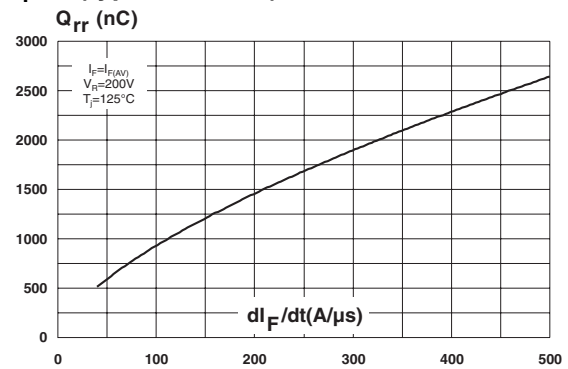


Figure 7: Reverse recovery softness factor versus  $di_F/dt$  (typical values)

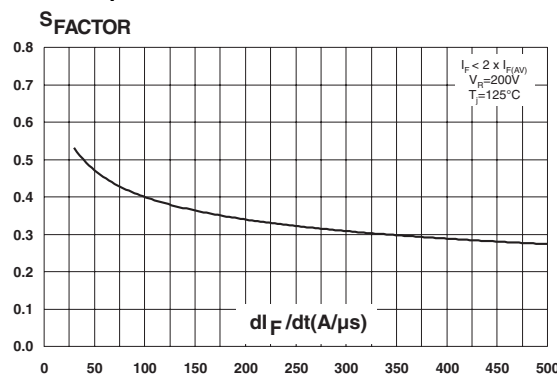


Figure 8: Relative variations of dynamic parameters versus junction temperature

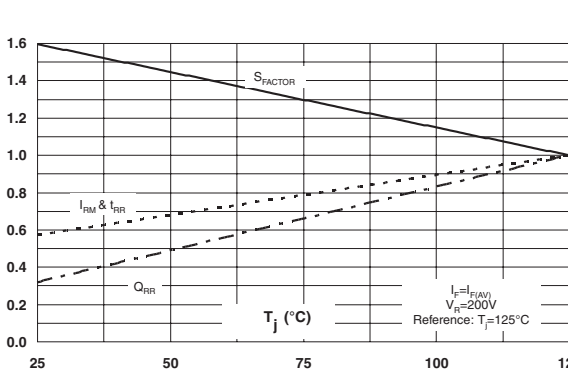


Figure 9: Transient peak forward voltage versus  $di_F/dt$  (typical values)

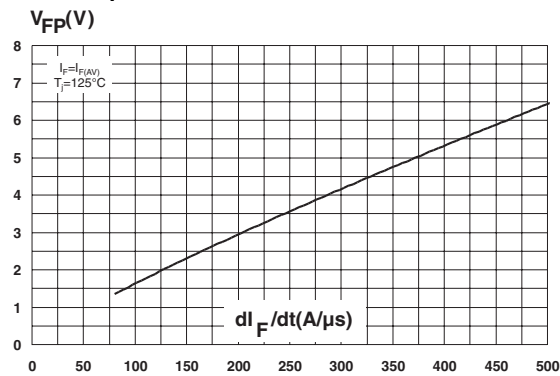


Figure 10: Forward recovery time versus  $di_F/dt$  (typical values)

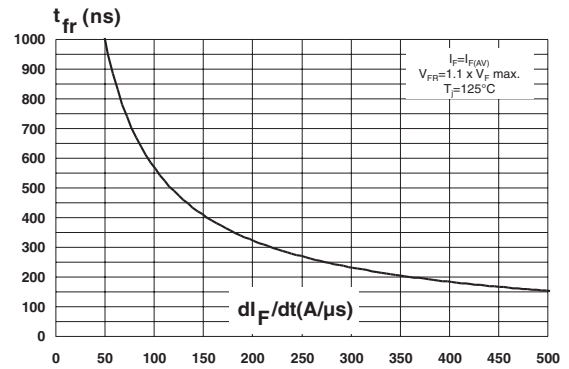


Figure 11: Junction capacitance versus reverse voltage applied (typical values)

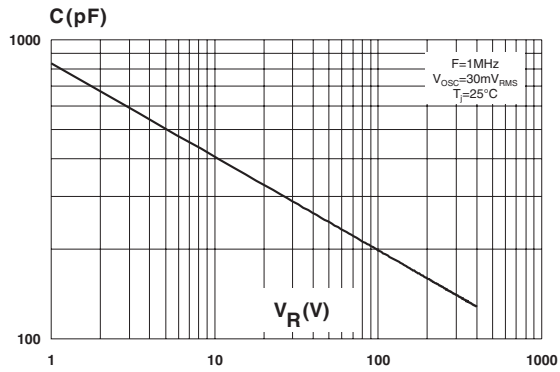
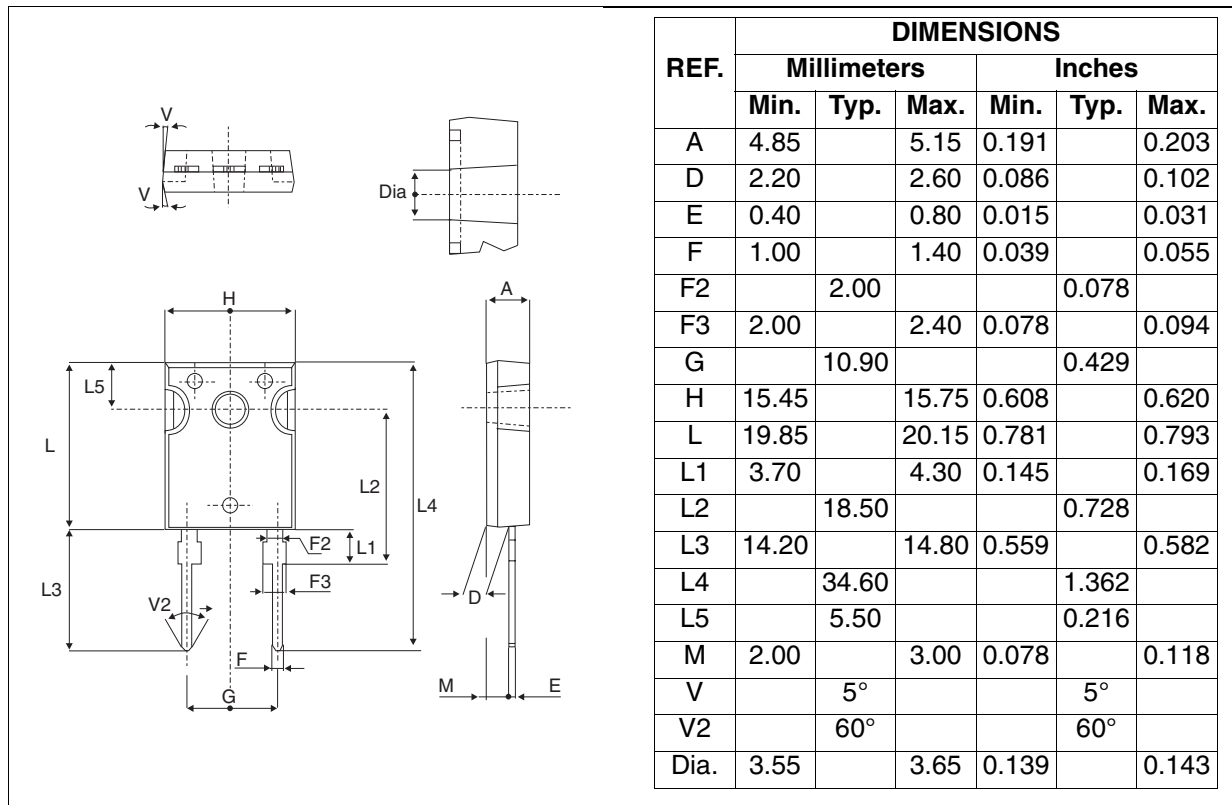


Figure 12: DO-247 Package mechanical data



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](http://www.st.com).

Table 7: Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTH6004W	STTH6004W	DO-247	4.40 g	30	Tube

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 Nm.
- Maximum torque value: 1.0 Nm.

Table 8: Revision history

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

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