

## Ultrafast recovery - high voltage diode

### Main product characteristics

$I_{F(AV)}$	2 x 60 A
$V_{RRM}$	1000 V
$T_j$	150° C
$V_F$ (typ)	1.30 V
$t_{rr}$ (typ)	49 ns

### Features and benefits

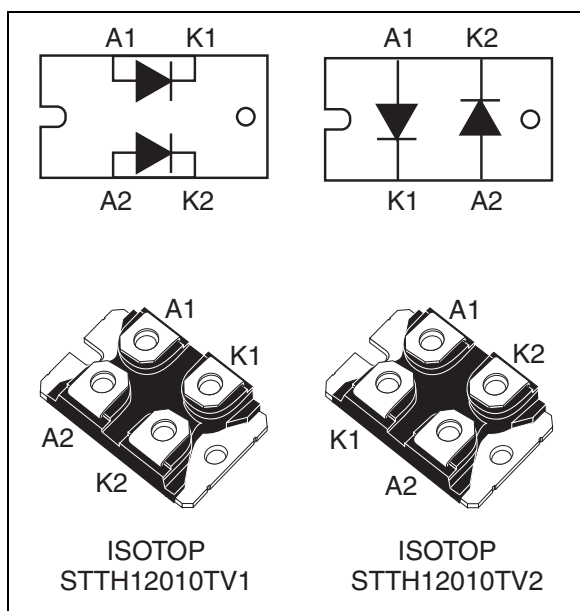
- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated package
  - Electrical insulation = 2500 V<sub>RMS</sub>
  - Capacitance = 45 pF

### Description

The compromise-free, 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.

These demanding applications include industrial power supplies, motor control, and similar industrial 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 advantage for reducing maintenance of the equipment



### Order codes

Part Number	Marking
STTH12010TV1	STTH12010TV1
STTH12010TV2	STTH12010TV2

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		1000	V
$I_{F(RMS)}$	RMS forward current		150	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	Per diode $T_c = 50^\circ\text{C}$	60	A
$I_{FRM}$	Repetitive peak forward current	$t_p = 5\ \mu\text{s}$ , $F = 5\ \text{kHz}$ square	750	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\ \text{ms}$ Sinusoidal	400	A
$T_{stg}$	Storage temperature range		-65 to + 150	°C
$T_j$	Maximum operating junction temperature		150	°C

**Table 2. Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	Per diode	0.80	°C/W
		Total	0.45	
$R_{th(c)}$	Coupling thermal resistance		0.1	

When the diodes are used simultaneously:

$$\Delta T_{j(\text{diode1})} = P_{(\text{diode1})} \times R_{th(j-c)} \text{ (per diode)} + P_{(\text{diode2})} \times R_{th(c)}$$

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ\text{C}$	$V_R = V_{RRM}$			20	$\mu\text{A}$
		$T_j = 125^\circ\text{C}$			20	200	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ\text{C}$	$I_F = 60\ \text{A}$			2.0	V
		$T_j = 100^\circ\text{C}$			1.40	1.80	
		$T_j = 150^\circ\text{C}$			1.30	1.70	

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

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

To evaluate the conduction losses use the following equation:

$$P = 1.3 \times I_{F(AV)} + 0.0067 I_{F(RMS)}^2$$

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$			115	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$		61	80	
		$I_F = 1\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$		49	65	
$I_{RM}$	Reverse recovery current	$I_F = 60\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125^\circ\text{ C}$		31	40	A
S	Softness factor	$I_F = 60\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125^\circ\text{ C}$		1		
$t_{fr}$	Forward recovery time	$I_F = 60\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \times V_{Fmax}$ , $T_j = 25^\circ\text{ C}$			750	ns
$V_{FP}$	Forward recovery voltage	$I_F = 60\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 25^\circ\text{ C}$		4		V

Figure 1. Conduction losses versus average current

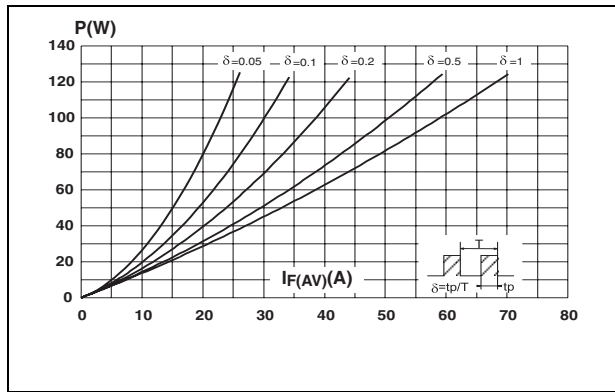


Figure 2. Forward voltage drop versus forward current

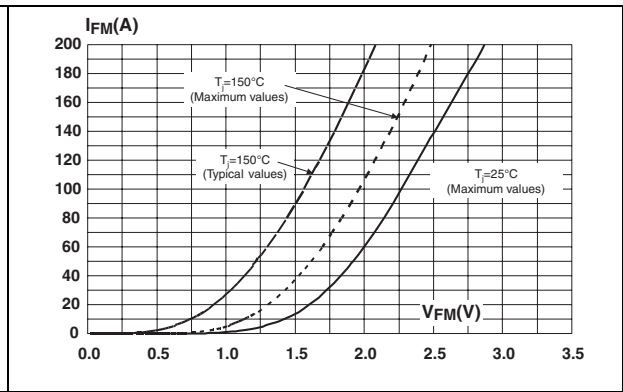


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

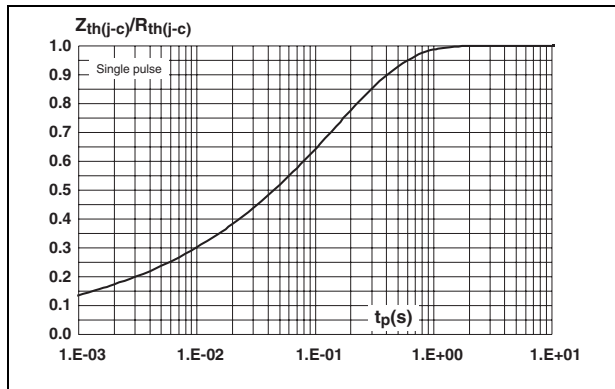


Figure 4. Peak reverse recovery current versus di\_F/dt (typical values)

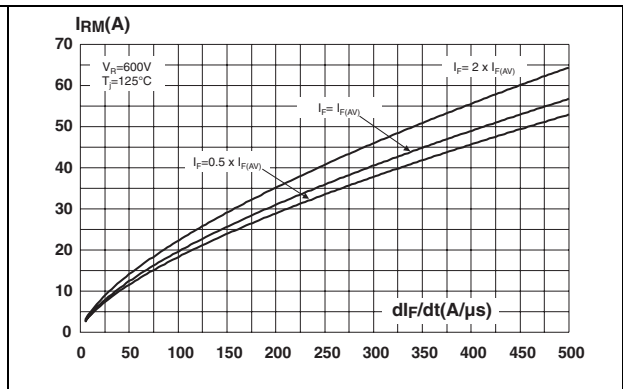


Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)

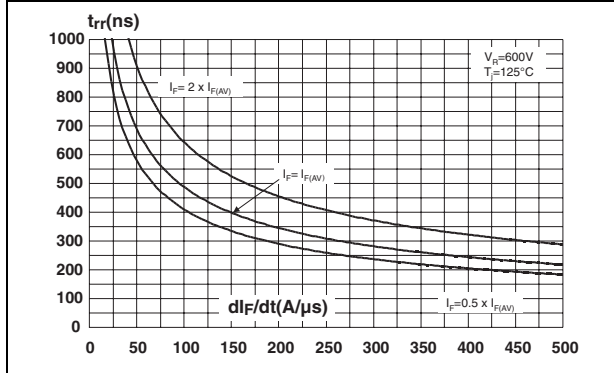


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)

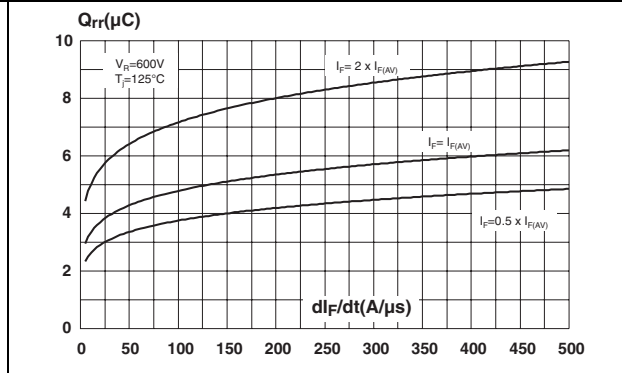


Figure 7. Softness factor versus  $di_F/dt$  (typical values)

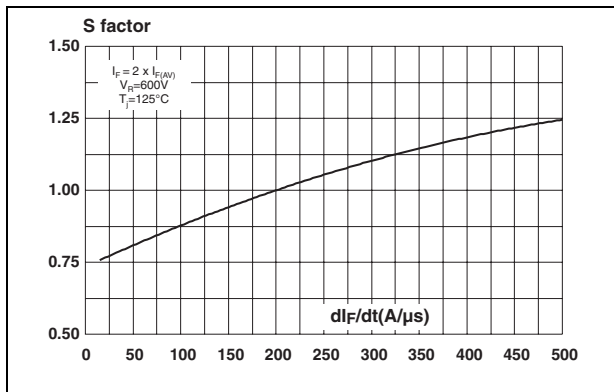
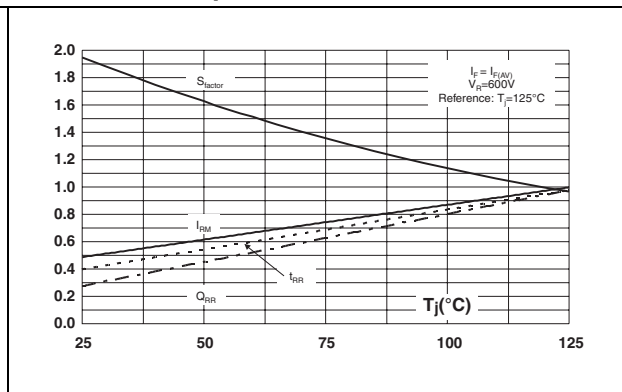
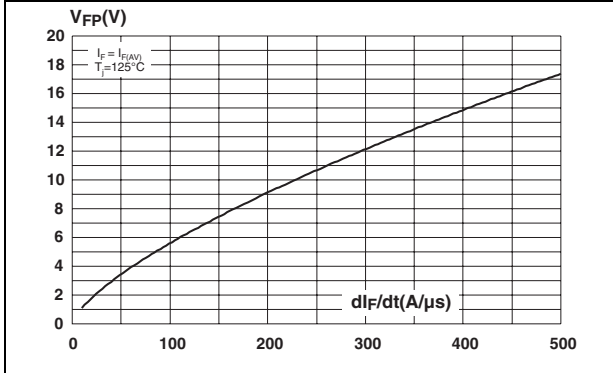


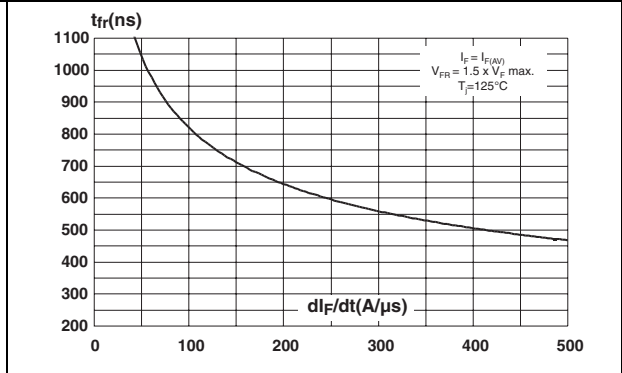
Figure 8. Relative variations of dynamic parameters versus junction temperature



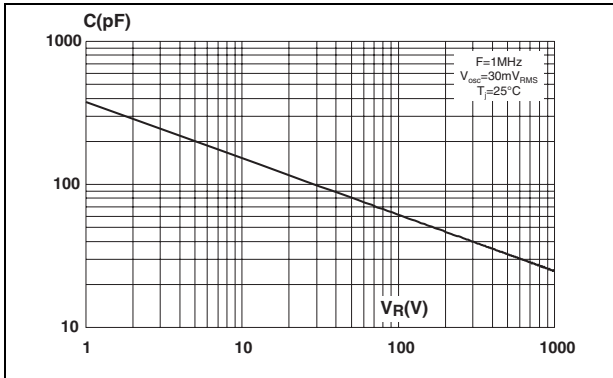
**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



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



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



## 2 Package information

Epoxy meets UL94, V0

Cooling method: by conduction (C)

Table 5. ISOTOP dimensions

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	11.80	12.20	0.465	0.480
A1	8.90	9.10	0.350	0.358
B	7.8	8.20	0.307	0.323
C	0.75	0.85	0.030	0.033
C2	1.95	2.05	0.077	0.081
D	37.80	38.20	1.488	1.504
D1	31.50	31.70	1.240	1.248
E	25.15	25.50	0.990	1.004
E1	23.85	24.15	0.939	0.951
E2	24.80 typ.		0.976 typ.	
G	14.90	15.10	0.587	0.594
G1	12.60	12.80	0.496	0.504
G2	3.50	4.30	0.138	0.169
F	4.10	4.30	0.161	0.169
F1	4.60	5.00	0.181	0.197
P	4.00	4.30	0.157	0.69
P1	4.00	4.40	0.157	0.173
S	30.10	30.30	1.185	1.193

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).

### 3 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH12010TV1	STTH12010TV1	ISOTOP	27 g	10	Tube
STTH12010TV2	STTH12010TV2	ISOTOP	27 g	10	Tube

### 4 Revision history

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

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