

## Ultrafast recovery - 1200 V diode

### Main product characteristics

$I_{F(AV)}$	2 x 45 A
$V_{RRM}$	1200 V
$T_j$	150° C
$V_F$ (typ)	1.20 V
$t_{rr}$ (typ)	50 ns

### Features and benefits

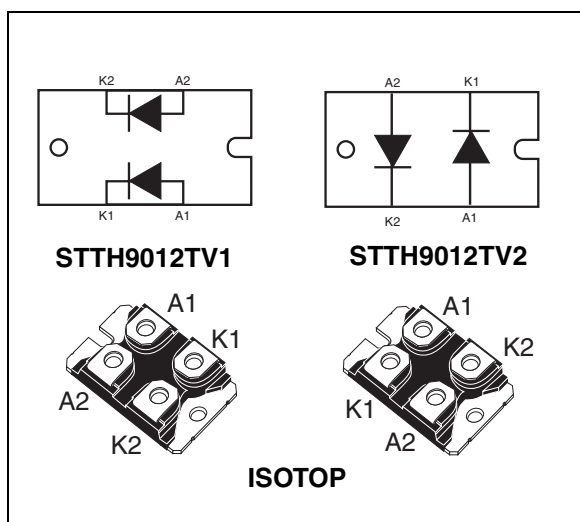
- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated package:  
Electrical insulation = 2500 V<sub>RMS</sub>  
Capacitance = 45 pF

### 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
STTH9012TV1	STTH9012TV1
STTH9012TV2	STTH9012TV2

# 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		1200	V
$I_{F(RMS)}$	RMS forward current		150	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 75^\circ\text{C}$ per diode	45	A
$I_{FRM}$	Repetitive peak forward current	$t_p = 5\ \mu\text{s}$ , $F = 5\ \text{kHz}$ square	600	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\ \text{ms}$ Sinusoidal	420	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	0.74	°C/W
		Total	0.42	
$R_{th(c)}$	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	$T_j = 25^\circ\text{C}$	$V_R = V_{RRM}$			30	$\mu\text{A}$
		$T_j = 125^\circ\text{C}$			30	300	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ\text{C}$	$I_F = 45\ \text{A}$			2.10	V
		$T_j = 125^\circ\text{C}$			1.25	1.90	
		$T_j = 150^\circ\text{C}$			1.20	1.80	

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

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

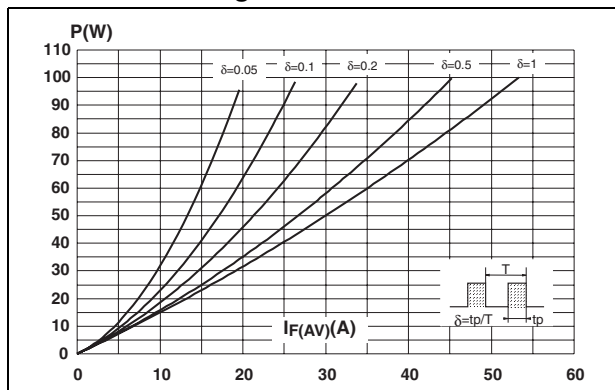
To evaluate the conduction losses use the following equation:

$$P = 1.40 \times I_{F(AV)} + 0.0089 I_{F(RMS)}^2$$

**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$			125	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$		63	85	
		$I_F = 1\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$		50	70	
$I_{RM}$	Reverse recovery current	$I_F = 45\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125^\circ\text{ C}$		32	45	A
S	Softness factor	$I_F = 45\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125^\circ\text{ C}$		1		
$t_{fr}$	Forward recovery time	$I_F = 45\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \times V_{Fmax}$ , $T_j = 25^\circ\text{ C}$			700	ns
$V_{FP}$	Forward recovery voltage	$I_F = 45\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 25^\circ\text{ C}$		4.5		V

**Figure 1. Conduction losses versus average current**



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

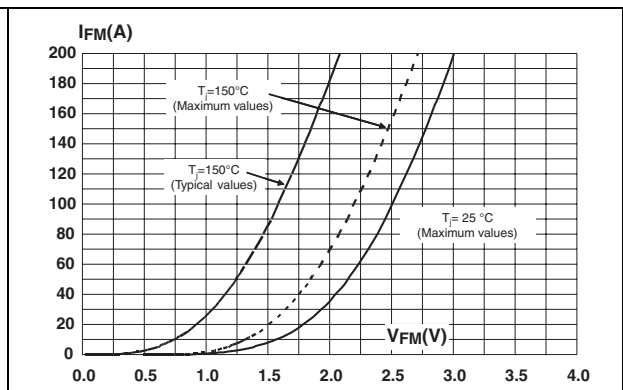


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

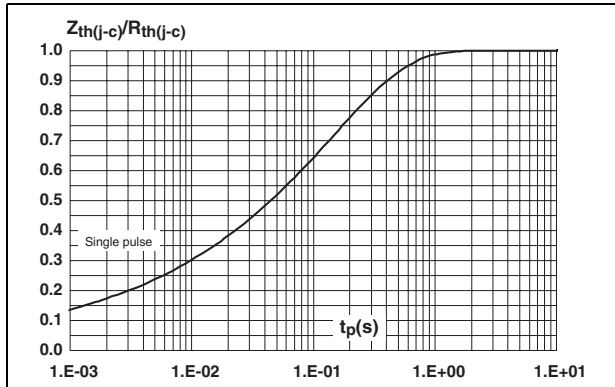


Figure 4. Peak reverse recovery current versus  $di_F/dt$  (typical values)

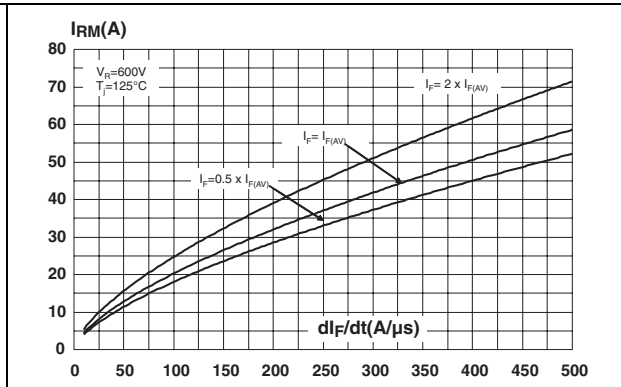


Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)

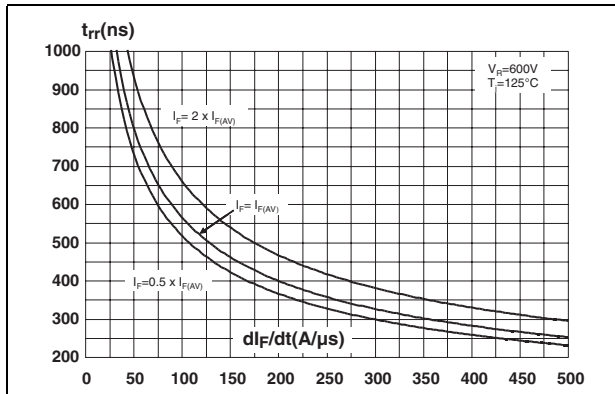


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)

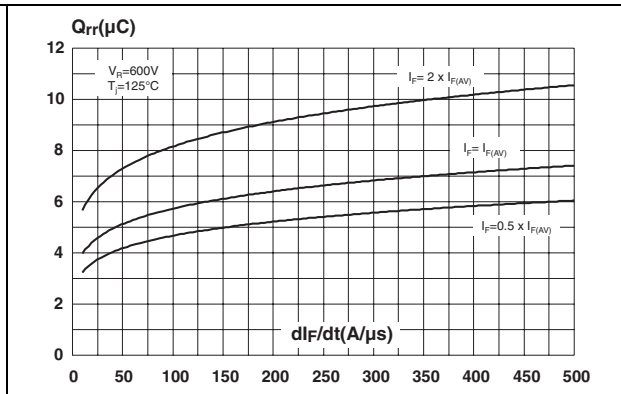


Figure 7. Softness factor versus  $di_F/dt$  (typical values)

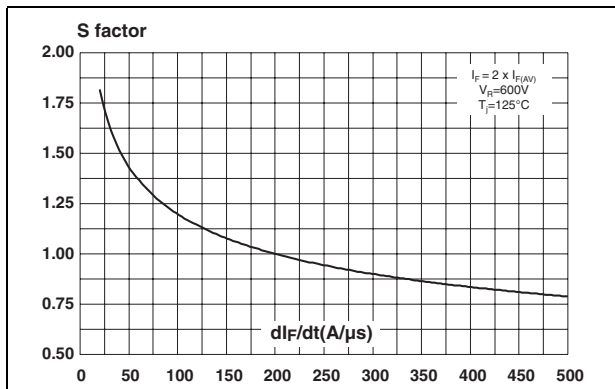
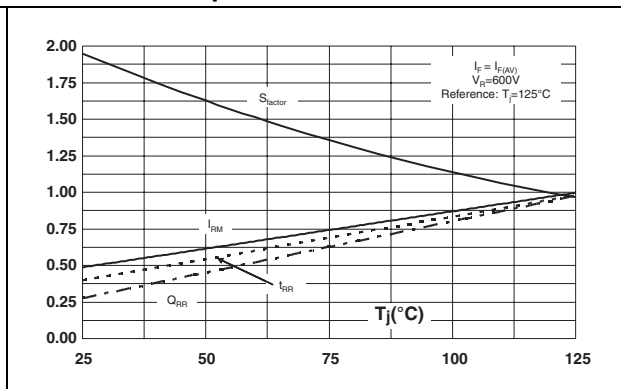
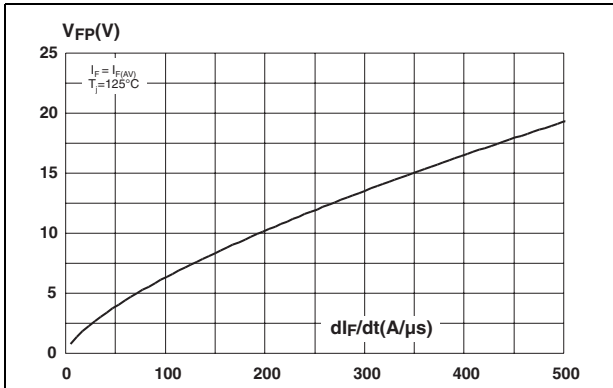


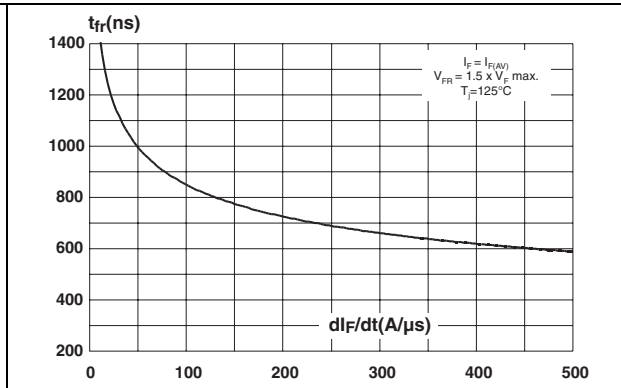
Figure 8. Relative variations of dynamic parameters versus junction temperature



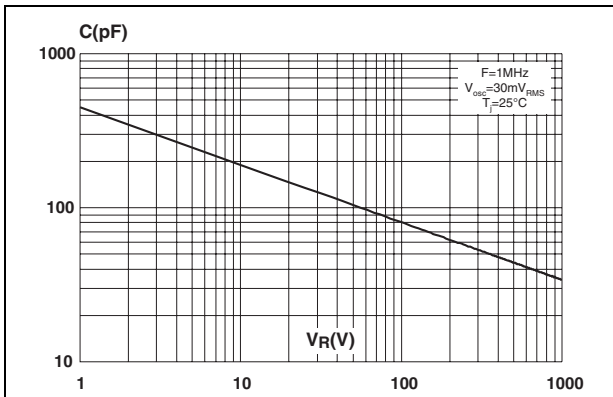
**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



**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
STTH9012TV1	STTH9012TV1	ISOTOP	27 g	10	Tube
STTH9012TV2	STTH9012TV2	ISOTOP	27 g	10	Tube

### 4 Revision history

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

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