

STTH12010TV

Ultrafast recovery - high voltage diode

Datasheet - production data

Features

- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated package
 - Electrical insulation = 2500 V rms
 - 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. This diode also fits 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 equipment.

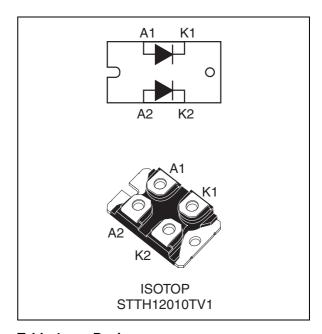


Table 1. Device summary

Symbol	Value
I _{F(AV)}	2 x 60 A
V _{RRM}	1000 V
t _{rr} (typ)	49 ns
Тј	150 °C
V _F (typ)	1.30 V

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Table 2. Absolute ratings (limiting values per diode at 25° C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage				V
I _{F(RMS)}	Forward rms current	Forward rms current			Α
I _{F(AV)}	Average forward current, $\delta = 0.5$	per diode	T _c = 50° C	60	Α
I _{FRM}	Repetitive peak forward current	$t_p = 5 \mu s$, $F = 5 kHz square$		750	Α
I _{FSM}	Surge non repetitive forward current $t_p = 10 \text{ ms sinusoidal}$			400	Α
T _{stg}	Storage temperature range			-65 to + 150	°C
T _j	Maximum operating junction temperature			150	°C

Table 3. Thermal resistance

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

When the diodes are used simultaneously:

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

Table 4. Static electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Тур	Max.	Unit
I _B ⁽¹⁾	Reverse leakage current	$T_j = 25^{\circ} C$	V- - V			20	пΛ
'R'	IR Preverse leakage current	T _j = 125° C	$V_R = V_{RRM}$		20	200	μΑ
		T _j = 25° C				2.0	
V _F ⁽²⁾ Forward voltage drop	Forward voltage drop	T _j = 100° C	I _F = 60 A		1.40	1.80	V
		T _j = 150° C			1.30	1.70	

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

To evaluate the conduction losses use the following equation: P = 1.3 x $I_{F(AV)}$ + 0.0067 $I_{F}^{2}_{(RMS)}$

$$P = 1.3 \times I_{E(\Delta V)} + 0.0067 I_{E^2(BMS)}^2$$

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

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Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
		$I_F = 1 \text{ A, } dI_F/dt = -50 \text{ A/}\mu\text{s,}$ $V_R = 30 \text{ V, } T_j = 25^{\circ} \text{ C}$			115	
t _{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -100 A/ μ s, V_R = 30 V, T_j = 25° C		61	80	ns
		$I_F = 1 \text{ A, } dI_F/dt = -200 \text{ A/}\mu\text{s,}$ $V_R = 30 \text{ V, } T_j = 25^{\circ} \text{ C}$		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	Α
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	$I_F = 60 \text{ A}$ $dI_F/dt = 100 \text{ A/}\mu\text{s}$ $V_{FR} = 1.5 \text{ x } V_{Fmax}, T_j = 25^{\circ} \text{ C}$			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

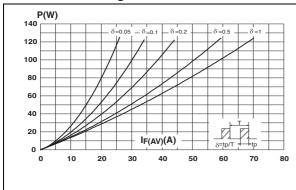


Figure 2. Forward voltage drop versus forward current

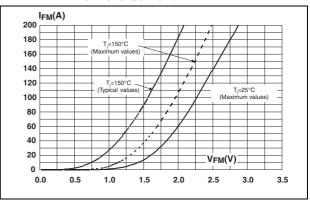


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

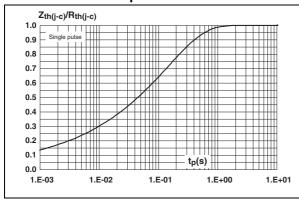
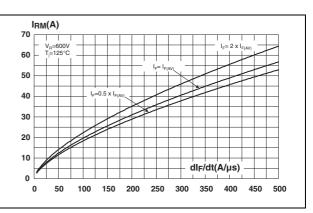


Figure 4. Peak reverse recovery current versus dl_F/dt (typical values)



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

dlf/dt(A/µs)

200 250 300 350 400 450 500

t_{rr}(ns)

1000

900 800 700

0



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

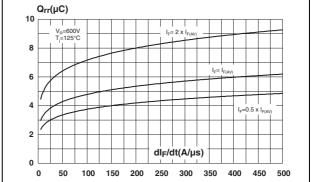
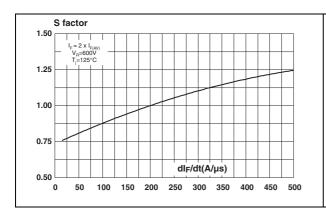
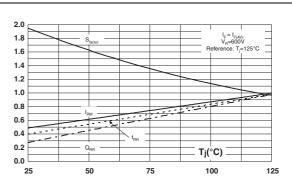


Figure 7. Softness factor versus dl_F/dt (typical values)

Figure 8. Relative variations of dynamic parameters versus junction temperature

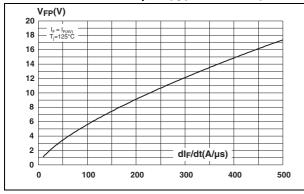




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Figure 9. Transient peak forward voltage versus dl_F/dt (typical values)

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



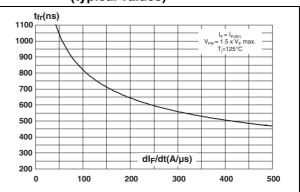
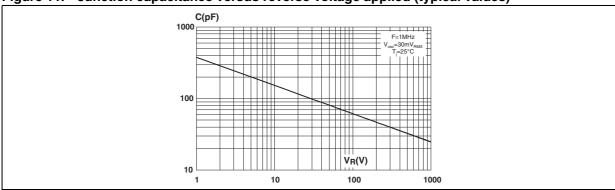


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

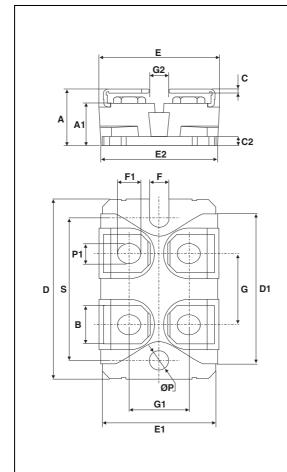


2 Package information

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

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Table 6. ISOTOP dimensions



	Dimensions				
Ref.	Millim	neters	Inc	hes	
	Min.	Max.	Min.	Max.	
Α	11.80	12.20	0.465	0.480	
A1	8.90	9.10	0.350	0.358	
В	7.8	8.20	0.307	0.323	
С	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	
Е	25.15	25.50	0.990	1.004	
E1	23.85	24.15	0.939	0.951	
E2	24.80	0 typ.	0.97	i 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	
Р	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	

3 Ordering information

Table 7. Ordering information

Part Number	Marking	Package	Weight	Base qty ⁽¹⁾	Delivery mode
STTH12010TV1	STTH12010TV1	ISOTOP	27 g	10 with screws	Tube

This product is supplied with 40 terminal screws and washers for each tube. The screws and washers are supplied in a separate pack with the order.

4 Revision history

Table 8. Document revision history

Date	Revision	Description of Changes
02-Mar-2006	1	First issue.
23-Oct-2012	2	Remove information related to TV2 product. Added footnote to <i>Table 7</i> .

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