

## Ultrafast recovery - 1200 V diode

### Main product characteristics

$I_{F(AV)}$	15 A
$V_{RRM}$	1200 V
$T_j$	175° C
$V_F$ (typ)	1.20 V
$t_{rr}$ (typ)	53 ns

### Features and benefits

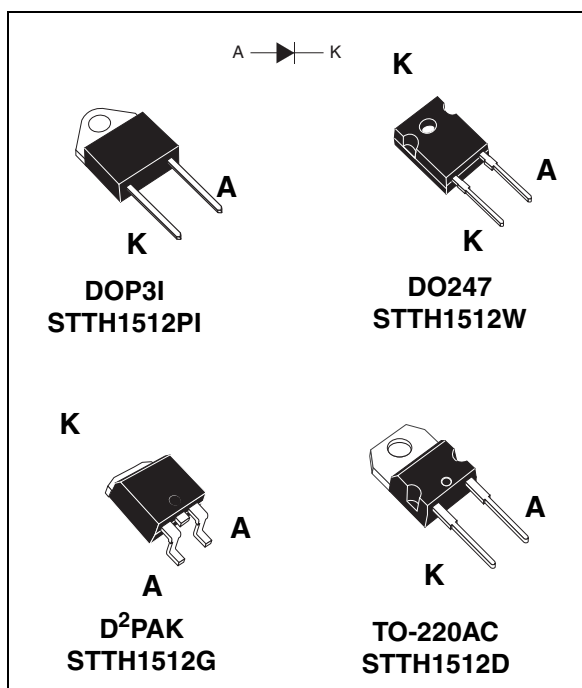
- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated packages: DOP3I  
Electrical insulation = 2500 V<sub>RMS</sub>  
Capacitance = 12 pF

### 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
STTH1512D	STTH1512D
STTH1512G	STTH1512G
STTH1512G-TR	STTH1512G
STTH1512W	STTH1512W
STTH1512PI	STTH1512PI

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		1200	V
$I_{F(RMS)}$	RMS forward current	TO-220AC / DO247 / DOP3I / D <sup>2</sup> PAK	50	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	TO-220AC / D <sup>2</sup> PAK / DO247	15	A
		DOP3I		
$I_{FRM}$	Repetitive peak forward current	$t_p = 5 \mu s, F = 5 \text{ kHz square}$	200	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10 \text{ ms Sinusoidal}$	150	A
$T_{stg}$	Storage temperature range		-65 to + 175	°C
$T_j$	Maximum operating junction temperature		175	°C

**Table 2. Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / D <sup>2</sup> PAK / DO247	1.3	°C/W
		DOP3I	2	°C/W

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ \text{ C}$	$V_R = V_{RRM}$			15	$\mu\text{A}$
		$T_j = 125^\circ \text{ C}$			10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ \text{ C}$	$I_F = 15 \text{ A}$			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:  $t_p = 380 \mu s, \delta < 2 \%$

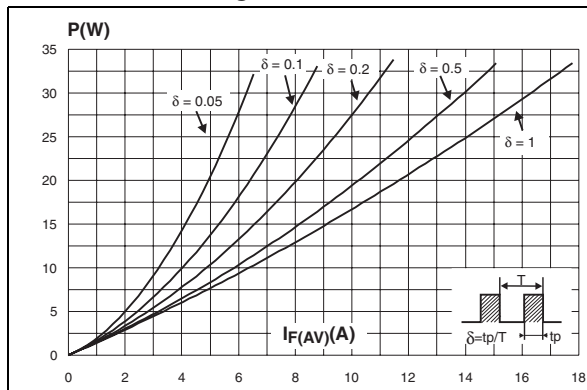
To evaluate the conduction losses use the following equation:

$$P = 1.4 \times I_{F(AV)} + 0.027 I_{F(RMS)}^2$$

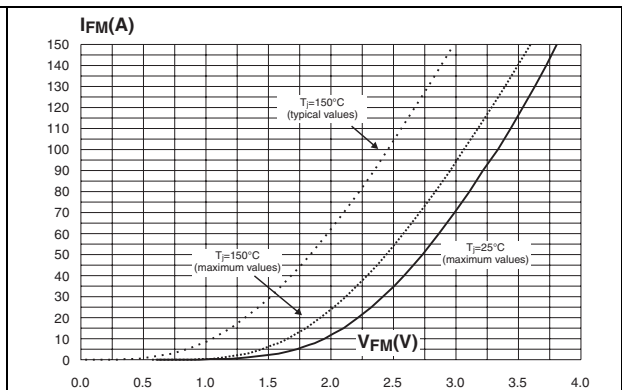
**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$			105	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{ C}$		53	75	
$I_{RM}$	Reverse recovery current	$I_F = 15\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125^\circ\text{ C}$		20	28	A
S	Softness factor	$I_F = 15\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125^\circ\text{ C}$		1.5		
$t_{fr}$	Forward recovery time	$I_F = 15\text{ A}$ $di_F/dt = 50\text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \times V_{Fmax}$ , $T_j = 25^\circ\text{ C}$			600	ns
$V_{FP}$	Forward recovery voltage	$I_F = 15\text{ A}$ , $di_F/dt = 50\text{ A}/\mu\text{s}$ , $T_j = 25^\circ\text{ C}$		5.5		V

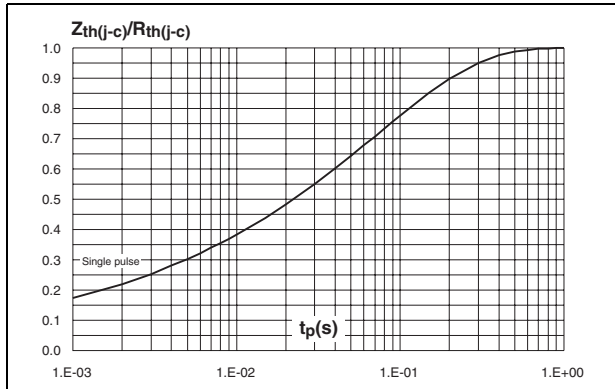
**Figure 1. Conduction losses versus average current**



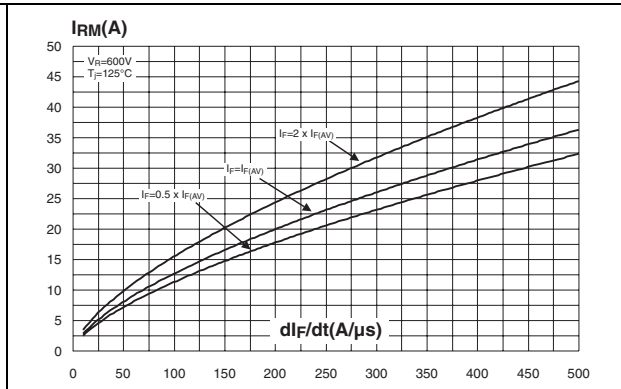
**Figure 2. Forward voltage drop versus forward current**



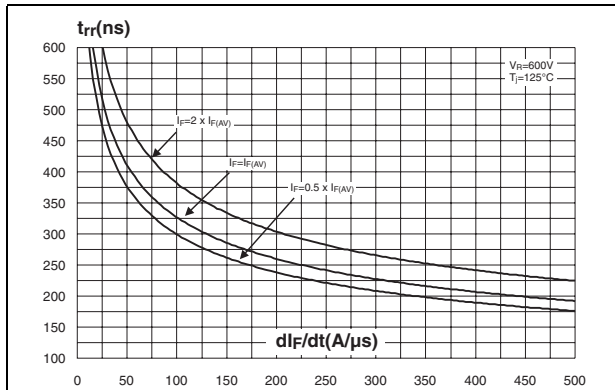
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration**



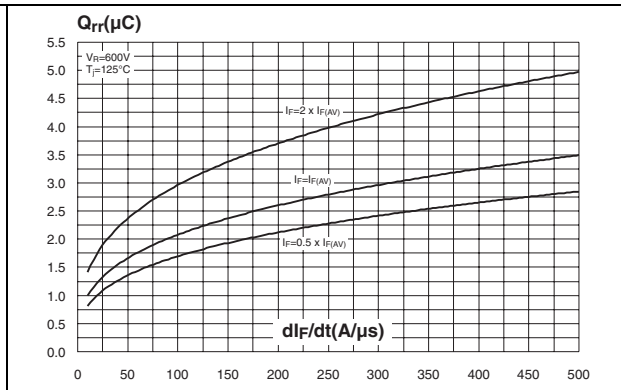
**Figure 4. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



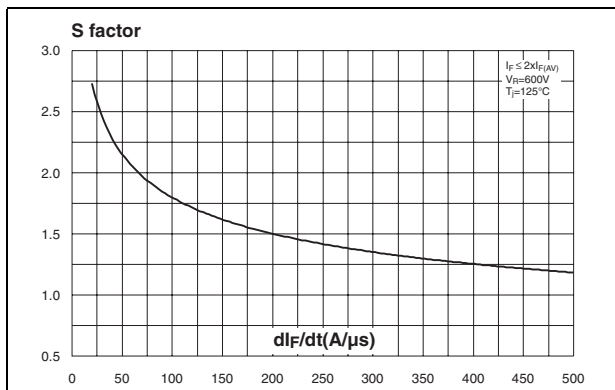
**Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)**



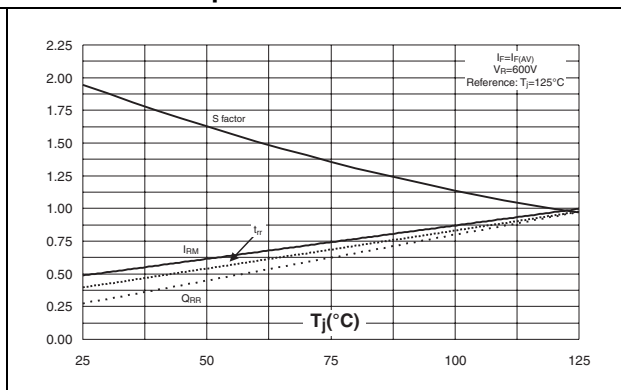
**Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)**



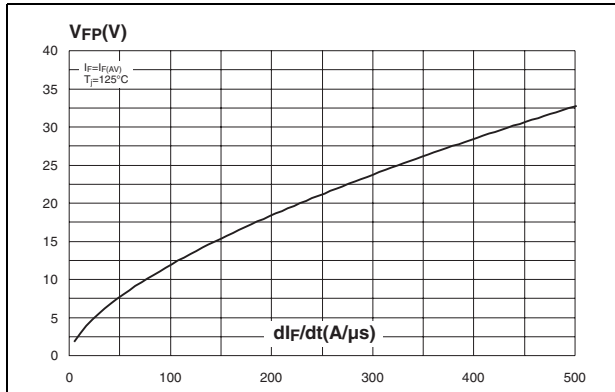
**Figure 7. Softness factor versus  $di_F/dt$  (typical values)**



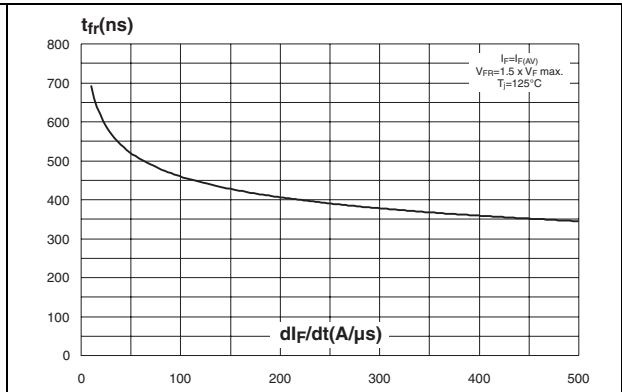
**Figure 8. Relative variations of dynamic parameters versus junction temperature**



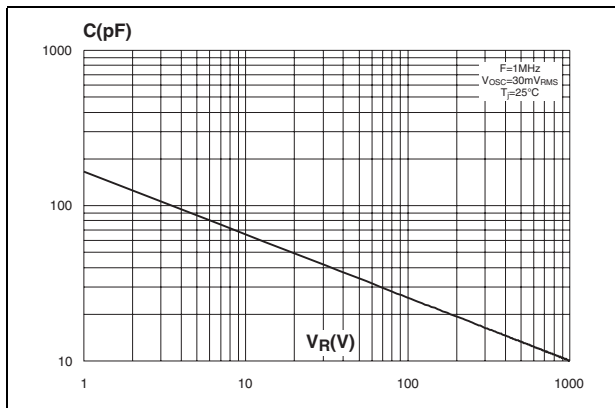
**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



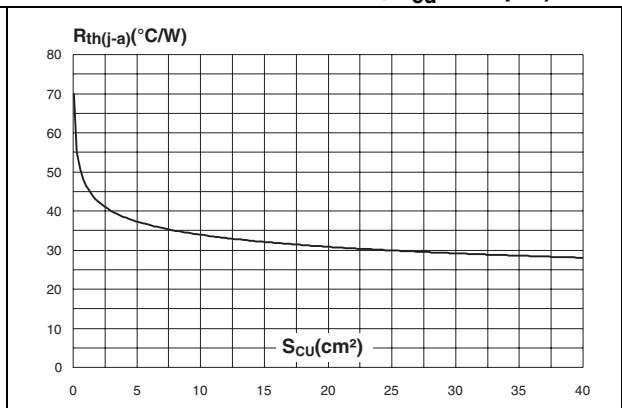
**Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)**



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



**Figure 12. Thermal resistance junction to ambient versus copper surface under each lead (Epoxy printed circuit board FR4,  $e_{Cu} = 35 \mu m$ )**



## 2 Package information

Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.55 Nm (TO-220AC)

Recommended torque value: 0.80 Nm (DOP3I)

Maximum torque value: 0.7 Nm (TO-220AC)

Maximum torque value: 1.0 Nm (DOP3I)

**Table 5. T0-220AC dimensions**

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam. I	3.75	3.85	0.147	0.151

Table 6. DO-247 dimensions

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.		Max	Min.		Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
L4		34.60			1.362	
L5		5.50			0.216	
M	2.00		3.00	0.078		0.118
V		5°			5°	
V2		60°			60°	
Dia.	3.55		3.65	0.139		0.143

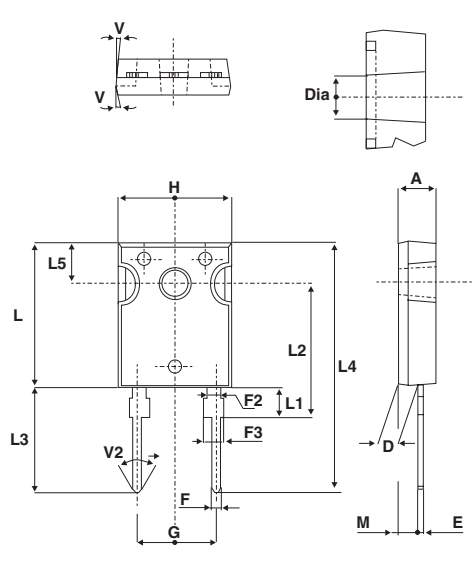


Table 7. D<sup>2</sup>PAK dimensions

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

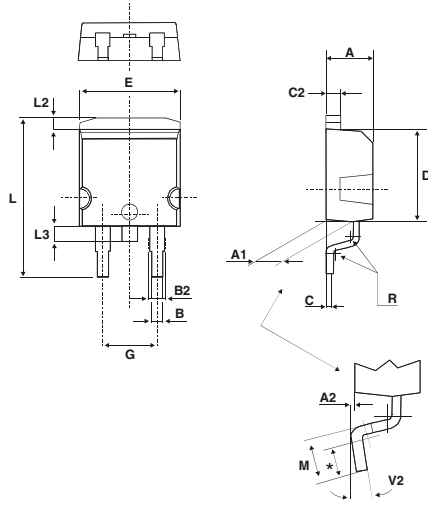


Figure 13. D<sup>2</sup>PAK footprint (dimensions in mm)

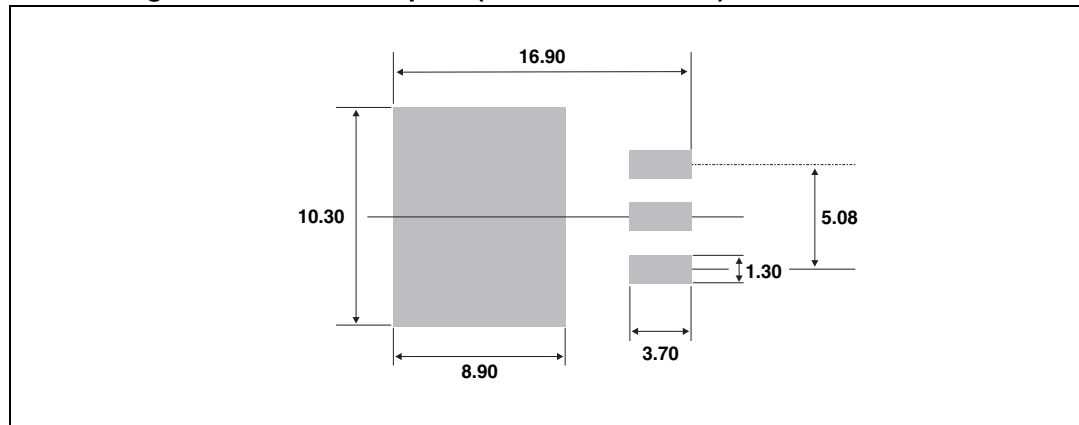




Table 8. DOP3I dimensions

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	1.20	1.40	0.047	0.055
c	1.45	1.55	0.057	0.061
c1	0.50	0.70	0.020	0.028
D	12.15	13.10	0.474	0.516
E	15.10	15.50	0.594	0.610
E1	7.55	7.75	0.297	0.305
e	10.80	11.30	0.425	0.445
G	20.4	21.10	0.815	0.831
L	14.35	15.60	0.565	0.614
P	4.08	4.17	0.161	0.164
Q	2.70	2.90	0.106	0.114
R	4.60 typ.		0.181 typ.	
Y	15.80	16.50	0.622	0.650

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
STTH1512D	STTH1512D	TO-220AC	1.86g	50	Tube
STTH1512PI	STTH1512PI	DOP3I	4.46 g	30	Tube
STTH1512W	STTH1512W	DO-247	4.4 g	30	Tube
STTH1512G	STTH1512G	D <sup>2</sup> PAK	1.48 g	50	Tube
STTH1512G-TR	STTH1512G	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel

### 4 Revision history

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

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