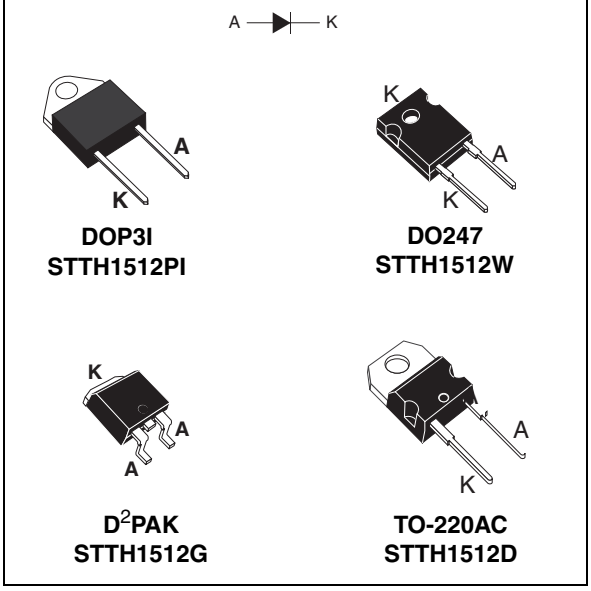
STTH1512

1200 V ultrafast recovery diode

Features

- 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: DOP3I
  - Electrical insulation = 2500 V rms
  - 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.

Table 1. Device summary

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

1 Characteristics

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

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			1200	V
$I_{F(RMS)}$	Forward rms current	TO-220AC / DO247 / DOP3I / D^2PAK		50	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	TO-220AC / D^2PAK / DO247	T_c = 130 °C	15	A
		DOP3I	T_c = 105 °C		
I_{FRM}	Repetitive peak forward current	t_p = 5 µs, F = 5 kHz square		200	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		200	A
T_{stg}	Storage temperature range			-65 to + 175	°C
T_j	Maximum operating junction temperature			175	°C

Table 3. Thermal parameters

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

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$			15	µA
		T_j = 125 °C			10	100	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 15 A			2.10	V
		T_j = 125 °C			1.25	1.90	
		T_j = 150 °C			1.20	1.80	

1. Pulse test: t_p = 5 ms, δ < 2 %
2. Pulse test: t_p = 380 µs, δ < 2 %

To evaluate the conduction losses use the following equation:
$P = 1.4 \times I_{F(AV)} + 0.027\ I_F{}^2{}_{(RMS)}$

Table 5. Dynamic characteristics

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

Figure 1. Conduction losses versus average current

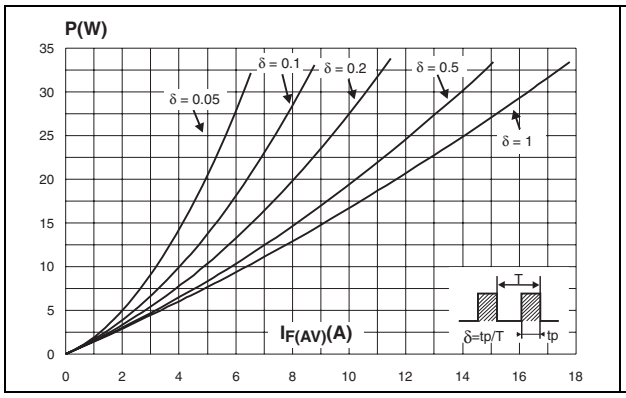


Figure 2. Forward voltage drop versus forward current

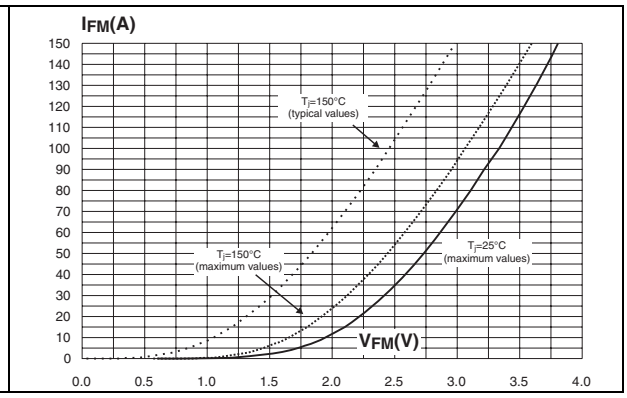


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

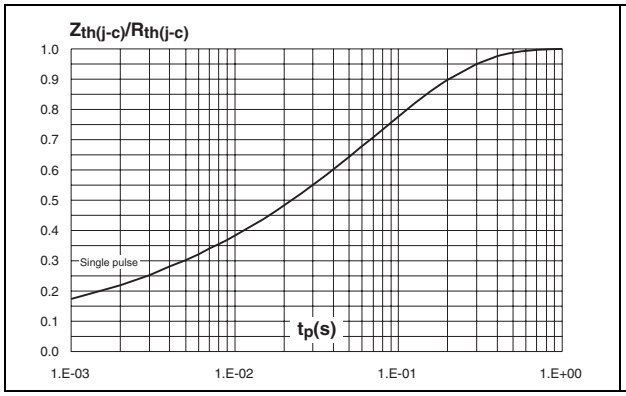


Figure 4. Peak reverse recovery current versus dI_F/dt (typical values)

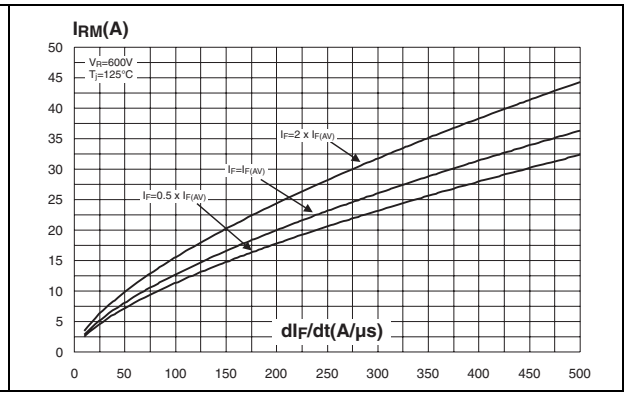


Figure 5. Reverse recovery time versus dI_F/dt (typical values)

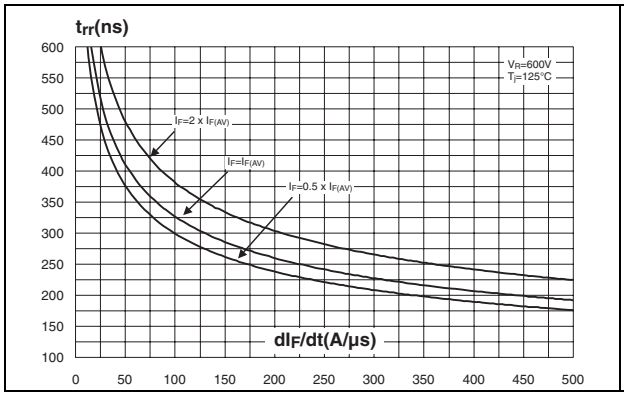


Figure 6. Reverse recovery charges versus dI_F/dt (typical values)

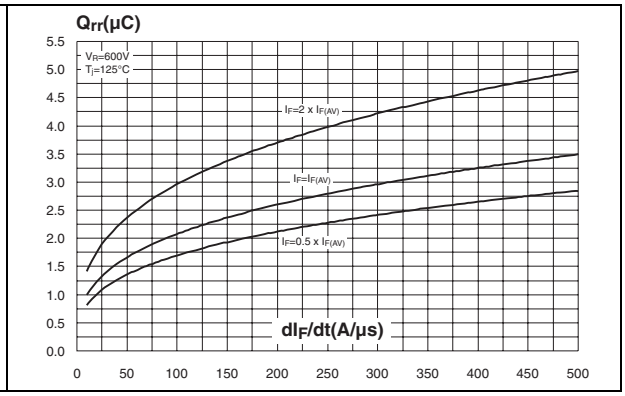


Figure 7. Softness factor versus dI_F/dt (typical values)

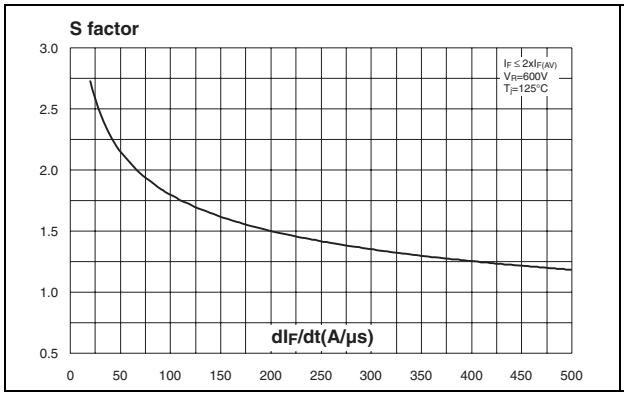


Figure 8. Relative variations of dynamic parameters versus junction temperature

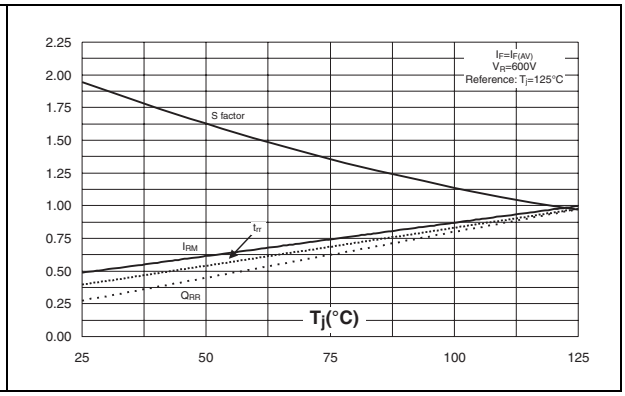


Figure 9. Transient peak forward voltage versus dI_F/dt (typical values)

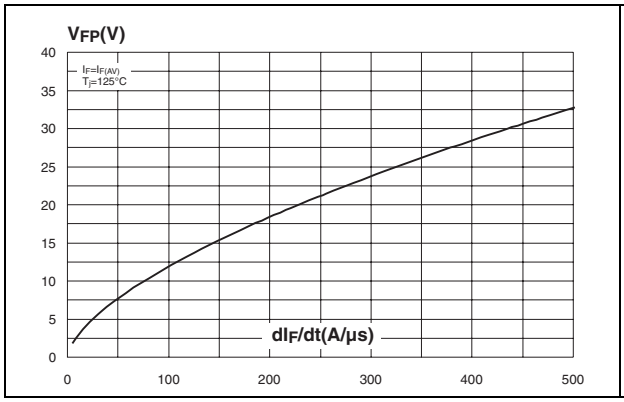


Figure 10. Forward recovery time versus dI_F/dt (typical values)

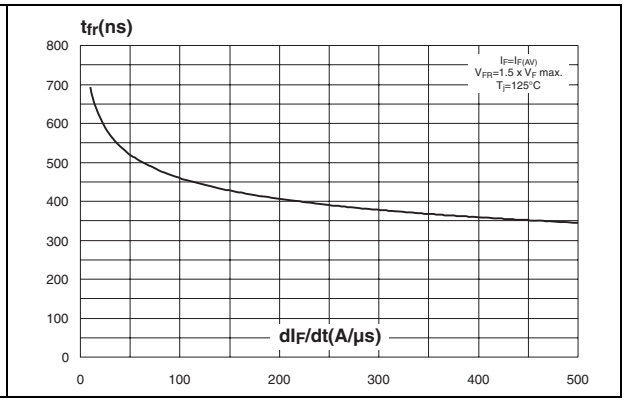


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

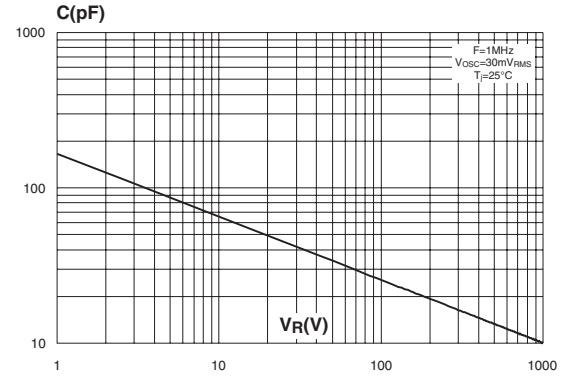
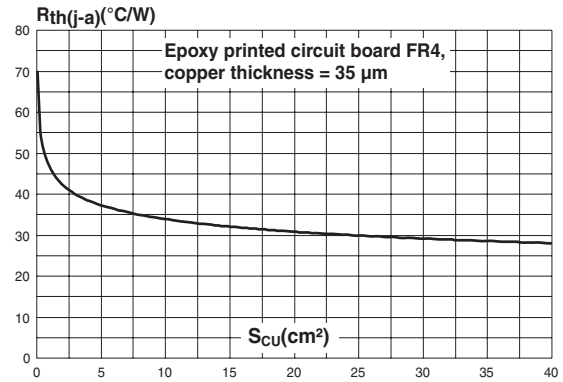


Figure 12. Thermal resistance junction to ambient versus copper surface under each lead

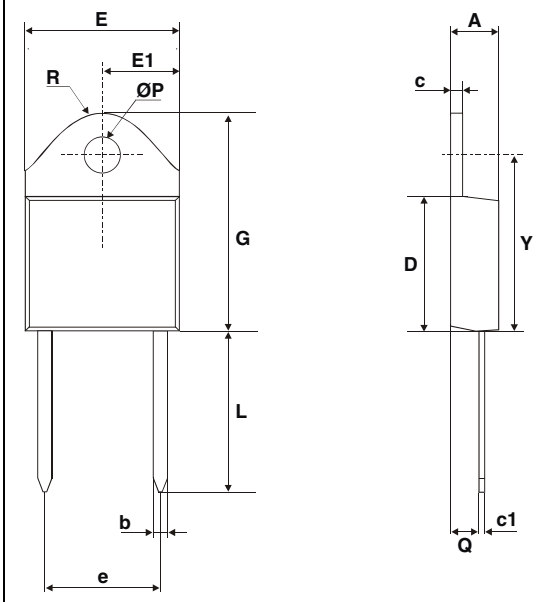


2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m (TO-220AC)
- Recommended torque value: 0.80 N·m (DOP3I)
- Maximum torque value: 1.0 N·m (DOP3I)

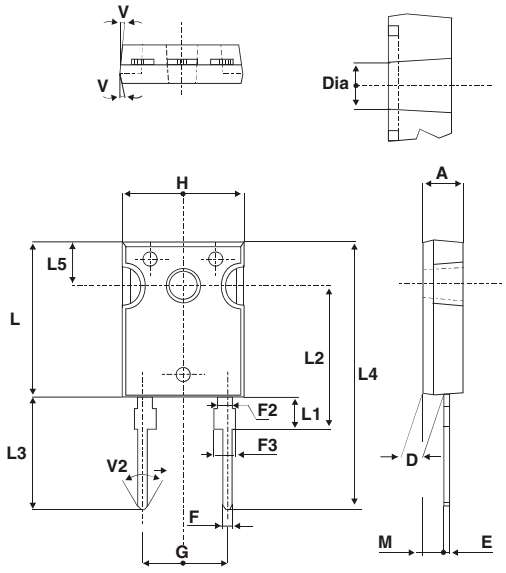
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 6. DOP3 dimensions



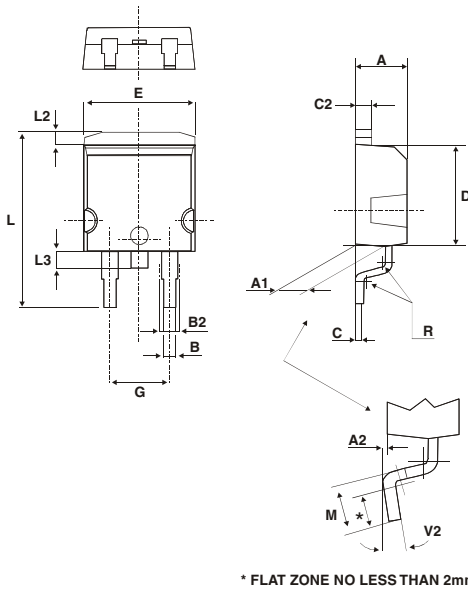
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	1.20	1.40	0.047	0.055
c	1.45	1.55	0.057	0.061
c1	0.50	0.70	0.020	0.028
D	12.15	13.10	0.474	0.516
E	15.10	15.50	0.594	0.610
E1	7.55	7.75	0.297	0.305
e	10.80	11.30	0.425	0.445
G	20.4	21.10	0.815	0.831
L	14.35	15.60	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

Table 7. DO247 dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	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 8. D²PAK 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. Footprint (dimensions in mm)

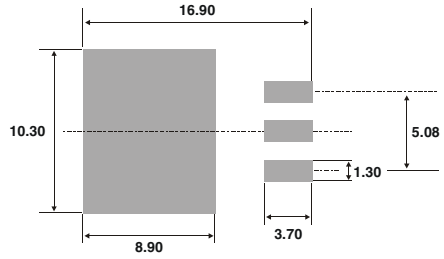
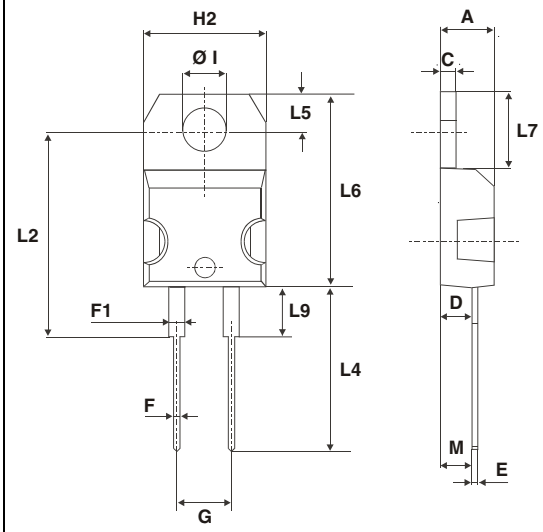


Table 9. TO-220AC dimensions



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

3 Ordering information

Table 10. Ordering information

Order code	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^2PAK	1.48 g	50	Tube
STTH1512G-TR	STTH1512G	D^2PAK	1.48 g	1000	Tape and reel

4 Revision history

Table 11. Document revision history

Date	Revision	Changes
02-Mar-2006	1	Initial release.
19-Apr-2010	2	Updated I_{FSM} in *Table 2* from 150 A to 200 A. Updated ECOPACK statement.