

## Ultrafast recovery diode

### Main product characteristics

$I_{F(AV)}$	30 A
$V_{RRM}$	200 V
$T_j$ (max)	175° C
$V_F$ (typ)	0.77 V
$t_{rr}$ (typ)	22 ns

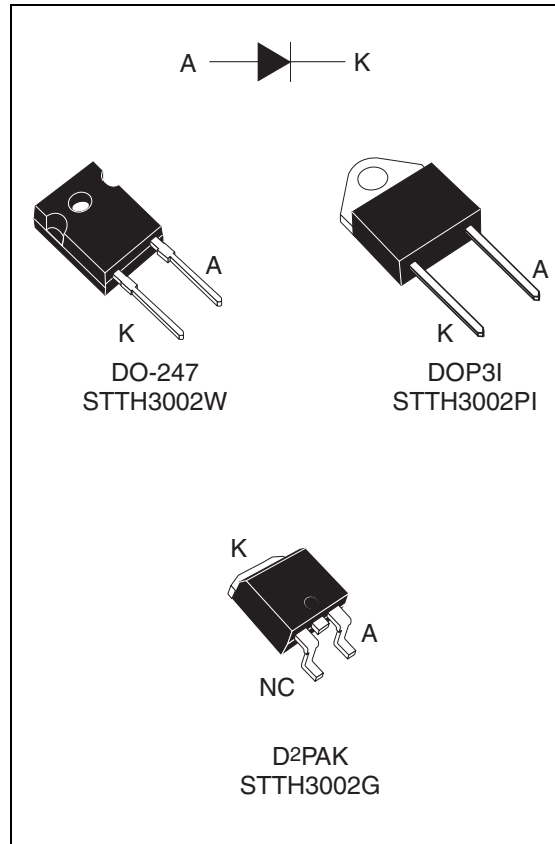
### Features and benefits

- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery time
- High junction temperature

### Description

The STTH3002 uses ST's new 200 V planar Pt doping technology, and is specially suited for switching mode base drive and transistor circuits.

Packaged in DO-247, DOP3I, and D<sup>2</sup>PAK, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.



### Order codes

Part Number	Marking
STTH3002W	STTH3002
STTH3002PI	STTH3002
STTH3002G	STTH3002
STTH3002G-TR	STTH3002

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at  $T_j = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Parameter	Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage	200	V	
$I_{F(RMS)}$	RMS forward current	50	A	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	DO-247 $T_c = 135^\circ\text{C}$	30	A
		DOP31 $T_c = 115^\circ\text{C}$		
		D <sup>2</sup> PAK $T_c = 135^\circ\text{C}$		
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ Sinusoidal	300	A
$T_{stg}$	Storage temperature range	-65 to + 175	$^\circ\text{C}$	
$T_j$	Maximum operating junction temperature	175	$^\circ\text{C}$	

**Table 2. Thermal parameters**

Symbol	Parameter	Value	Unit	
$R_{th(j-c)}$	Junction to case	DO-247	1.2	$^\circ\text{C/W}$
		DOP31	1.8	
		D <sup>2</sup> PAK	1.2	

**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	$\mu\text{A}$	
		$T_j = 150^\circ\text{C}$		20	200		
$V_F^{(2)}$	Forward voltage drop	$T_j = 125^\circ\text{C}$	$I_F = 25\text{ A}$		0.77	0.85	V
		$T_j = 25^\circ\text{C}$	$I_F = 30\text{ A}$			1.05	
		$T_j = 150^\circ\text{C}$		0.8	0.88		

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

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

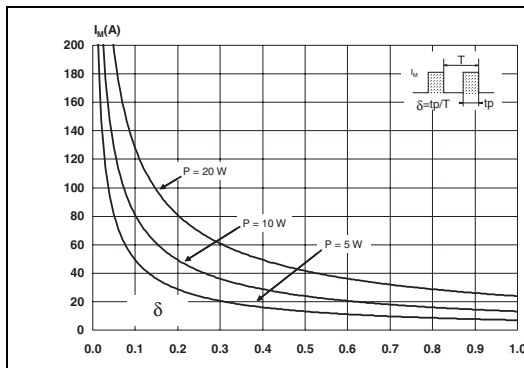
To evaluate the conduction losses use the following equation:

$$P = 0.67 \times I_{F(AV)} + 0.007 I_{F(RMS)}^2$$

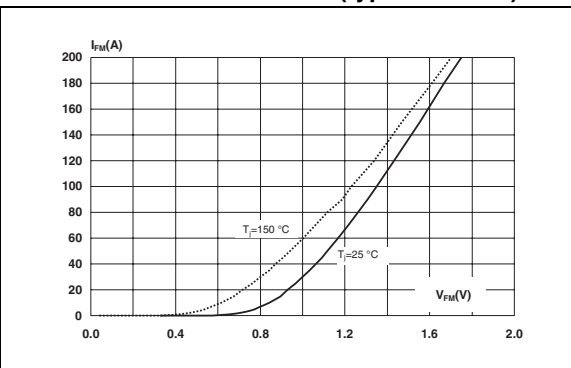
**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1 \text{ A}$ , $dI_F/dt = -200 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$ , $T_j = 25 \text{ }^\circ\text{C}$		22	27	ns
		$I_F = 1 \text{ A}$ , $dI_F/dt = -50 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$ , $T_j = 25 \text{ }^\circ\text{C}$		40	50	
$I_{RM}$	Reverse recovery current	$I_F = 30 \text{ A}$ , $dI_F/dt = 200 \text{ A}/\mu\text{s}$ , $V_R = 160 \text{ V}$ , $T_j = 125 \text{ }^\circ\text{C}$		7.6	9.5	A
$t_{fr}$	Forward recovery time	$I_F = 30 \text{ A}$ , $dI_F/dt = 200 \text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25 \text{ }^\circ\text{C}$		140		ns
$V_{FP}$	Forward recovery voltage	$I_F = 30 \text{ A}$ , $dI_F/dt = 200 \text{ A}/\mu\text{s}$ , $V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25 \text{ }^\circ\text{C}$		2.5		V

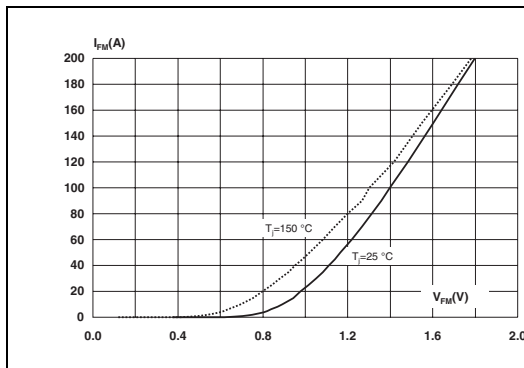
**Figure 1. Peak current versus duty cycle**



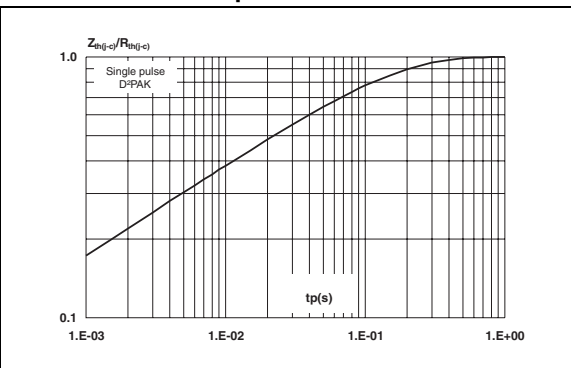
**Figure 2. Forward voltage drop versus forward current (typical values)**



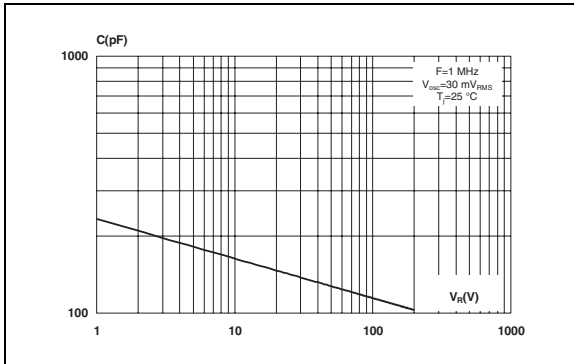
**Figure 3. Forward voltage drop versus forward current (maximum values)**



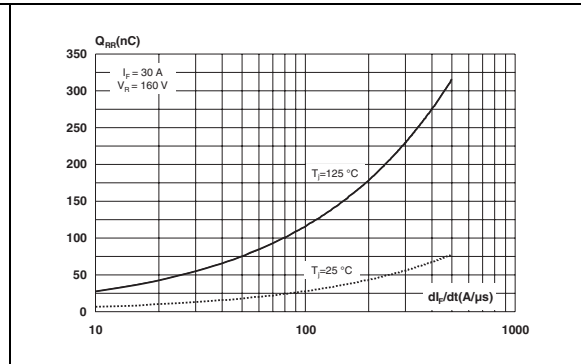
**Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration**



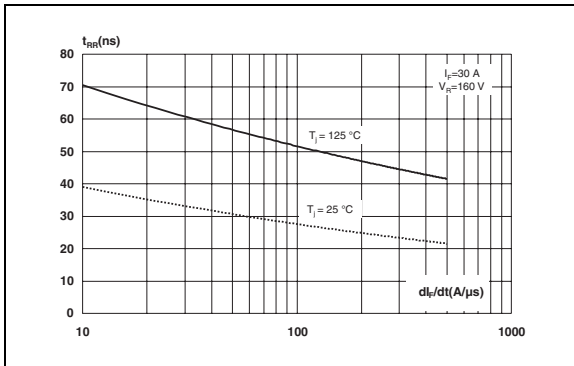
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



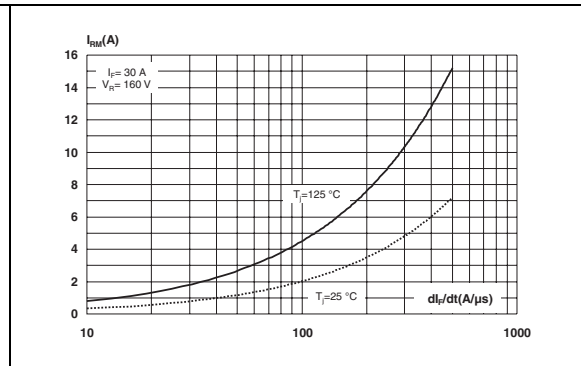
**Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)**



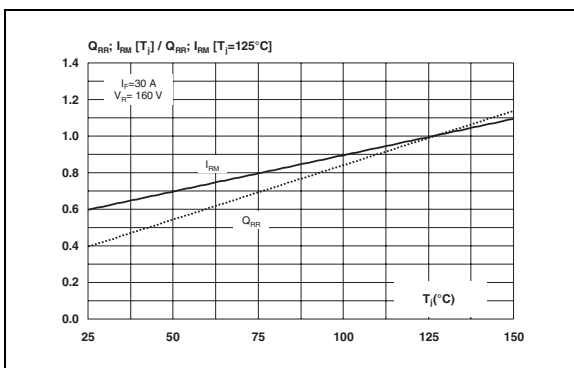
**Figure 7. Reverse recovery time versus  $di_F/dt$  (typical values)**



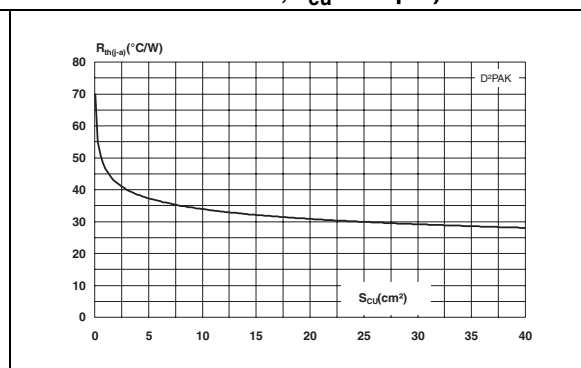
**Figure 8. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



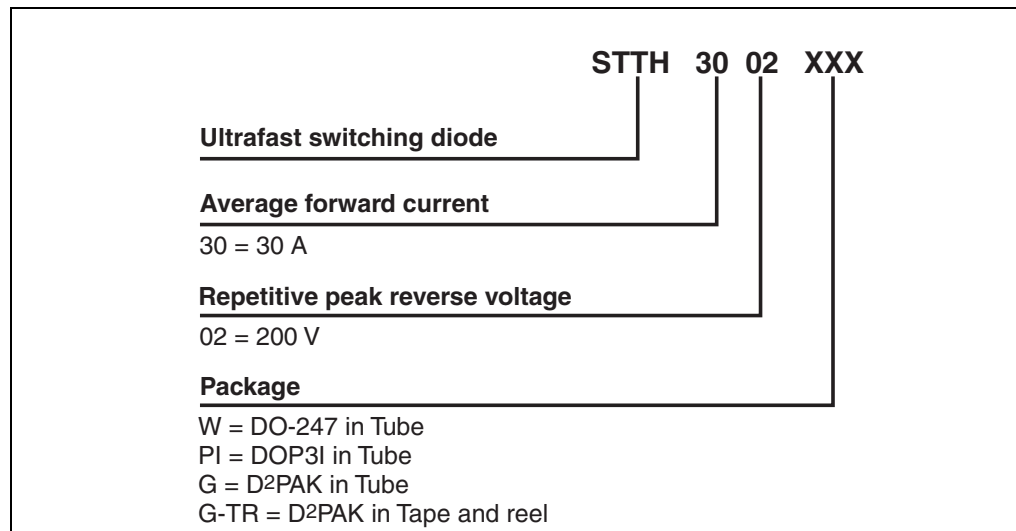
**Figure 9. Dynamic parameters versus junction temperature**



**Figure 10. Thermal resistance, junction to ambient, versus copper surface under tab (Epoxy printed circuit board FR4,  $e_{CU} = 35 \mu m$ )**



## 2 Ordering information scheme



### 3 Package information

Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.8 Nm

Maximum torque value: 1.0 Nm

**Table 5. DO-247 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

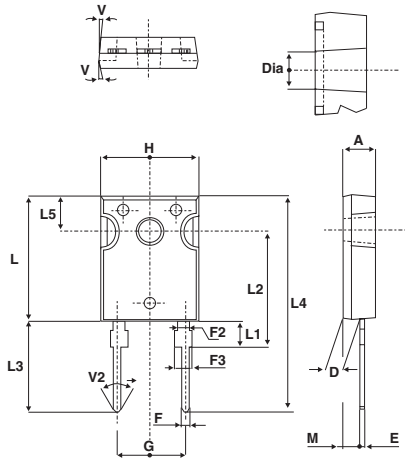


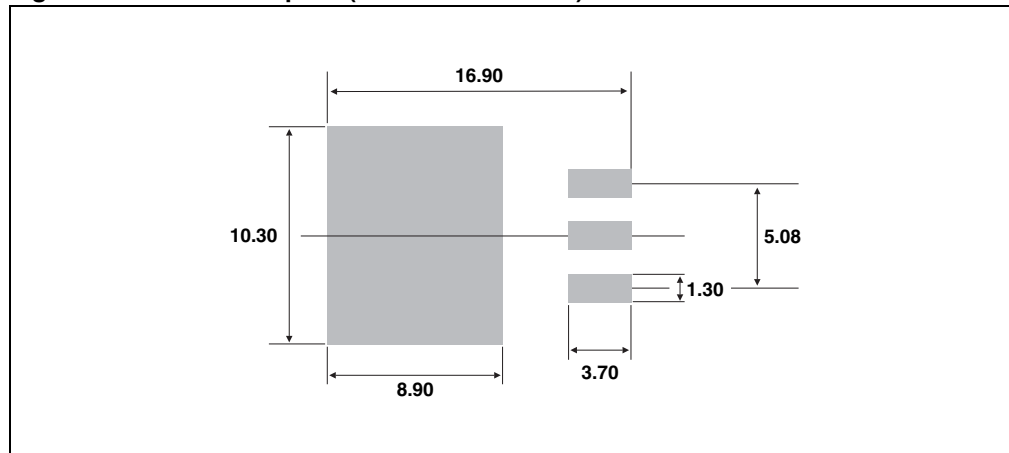
Table 6. DOP3I dimensions

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

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



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).



## 4 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH3002W	STTH3002	DO-247	4.4 g	30	Tube
STTH3002PI	STTH3002	DOP3I	4.46 g	30	Tube
STTH3002G	STTH3002	D <sup>2</sup> PAK	1.48 g	50	Tube
STTH3002G-TR	STTH3002	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel

## 5 Revision history

Date	Revision	Description of Changes
03-May-2006	1	First issue

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