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High efficiency ultrafast diode

Main product characteristics

$I_{F(AV)}$	2 x 30 A
V_{RRM}	200 V
T_j (max)	175° C
V_F (typ)	0.75 V
t_{rr} (typ)	22 ns

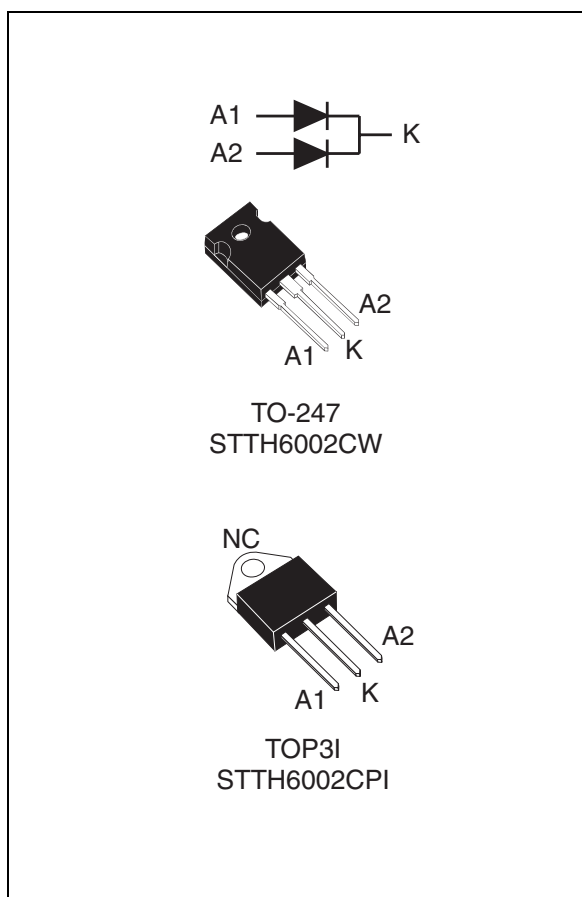
Features and benefits

- Suited for SMPS
- Low losses
- Low forward and reverse recovery times
- High surge current capability
- High junction temperature

Description

Dual center tab rectifier suited for switch mode power supplies and high frequency DC to DC converters.

Packaged in TO-247 and TOP31, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection



Order codes

Part Number	Marking
STTH6002CW	STTH6002C
STTH6002CPI	STTH6002C

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, $\delta = 0.5$	TO-247	Per diode $T_c = 140^\circ\text{C}$	30	A
			Per device $T_c = 125^\circ\text{C}$	60	
		TOP3I	Per diode $T_c = 120^\circ\text{C}$	30	
			Per device $T_c = 105^\circ\text{C}$	60	
I_{FSM}	Surge non repetitive forward current	$t_p = 10\text{ ms Sinusoidal}$	330	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	TO-247	Per diode	1.2	$^\circ\text{C/W}$
			Total	0.8	
		TOP3I	Per diode	1.8	
			Total	1.20	
$R_{th(c)}$	Coupling	TO-247	0.4		
		TOP3I	0.6		

When the two diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode 1}) = P(\text{diode 1}) \times R_{th(j-c)} (\text{Per diode}) + P(\text{diode 2}) \times R_{th(c)}$$

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ\text{C}$	$V_R = V_{RRM}$		30	μA
		$T_j = 125^\circ\text{C}$		30	300	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ\text{C}$	$I_F = 30\text{ A}$		1.05	V
			$I_F = 60\text{ A}$		1.18	
		$T_j = 150^\circ\text{C}$	$I_F = 30\text{ A}$	0.75	0.84	
			$I_F = 60\text{ A}$	0.9	0.99	

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:

$$P = 0.69 \times I_{F(AV)} + 0.005 I_{F(RMS)}^2$$

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Typ	Max.	Unit
t_{rr}	Reverse recovery time	$I_F = 1\text{ A}$, $dI_F/dt = 200\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{C}$	22	27	ns
I_{RM}	Reverse recovery current	$I_F = 30\text{ A}$, $dI_F/dt = 200\text{ A}/\mu\text{s}$, $V_R = 160\text{ V}$, $T_j = 125^\circ\text{C}$	7.6	9.5	A
t_{fr}	Forward recovery time	$I_F = 30\text{ A}$, $dI_F/dt = 200\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ\text{C}$		220	ns
V_{FP}	Forward recovery voltage	$I_F = 30\text{ A}$, $dI_F/dt = 200\text{ A}/\mu\text{s}$, $T_j = 25^\circ\text{C}$	2.5		V

Figure 1. Peak current versus duty cycle (per diode)

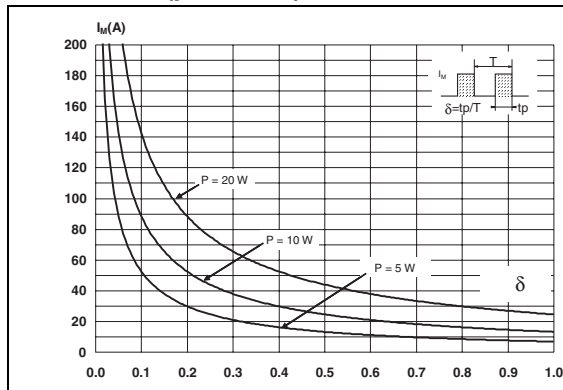


Figure 2. Forward voltage drop versus forward current (per diode)

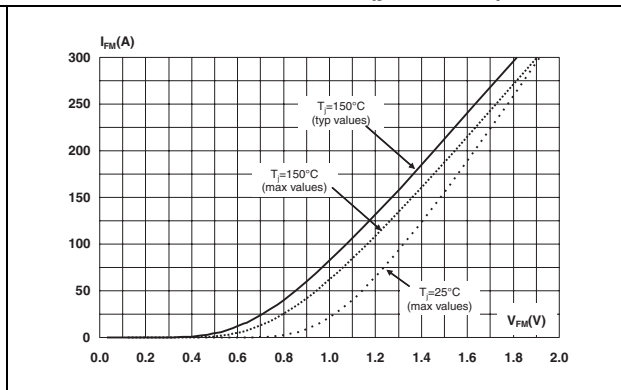


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

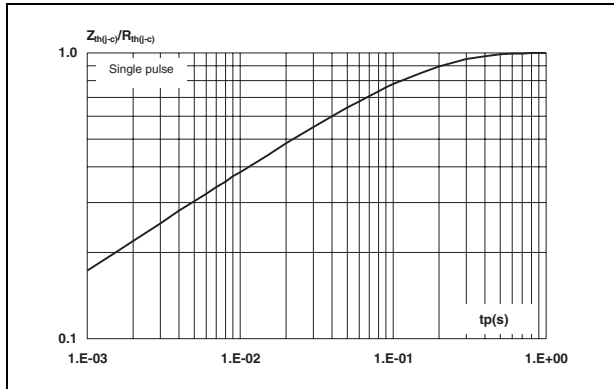


Figure 4. Junction capacitance versus reverse applied voltage (typical values)

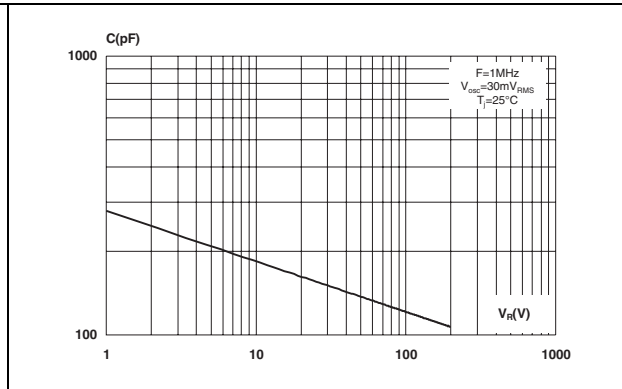


Figure 5. Reverse recovery charges versus di_F/dt (typical values)

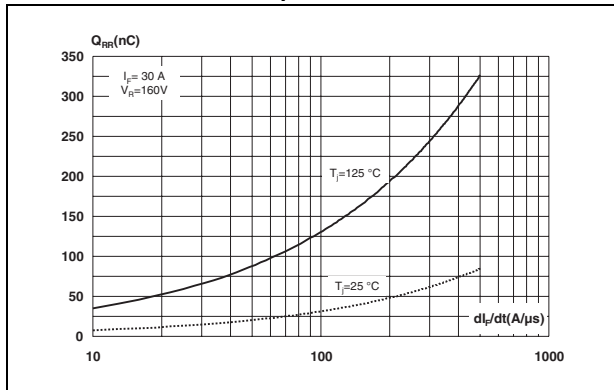


Figure 6. Reverse recovery time versus di_F/dt (typical values)

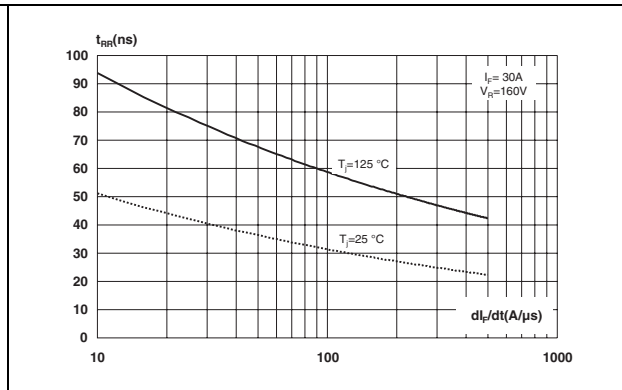


Figure 7. Peak reverse recovery current versus di_F/dt (typical values)

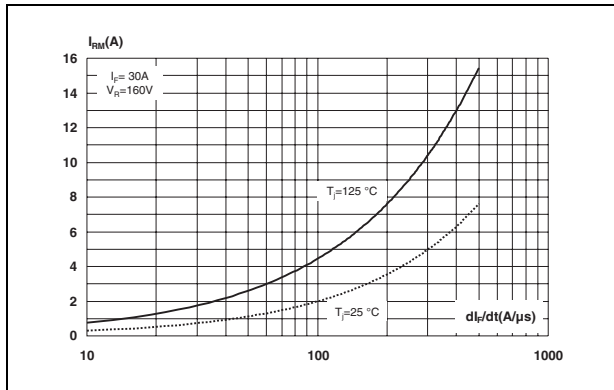
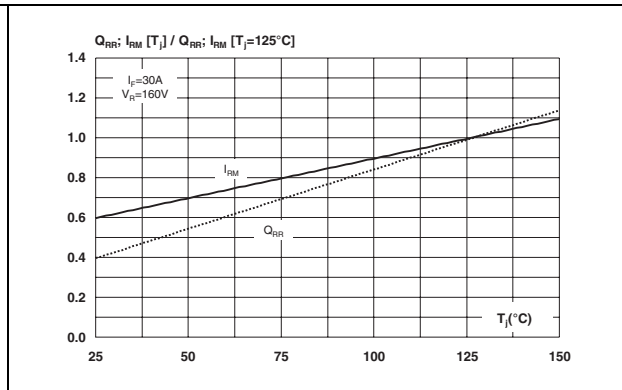
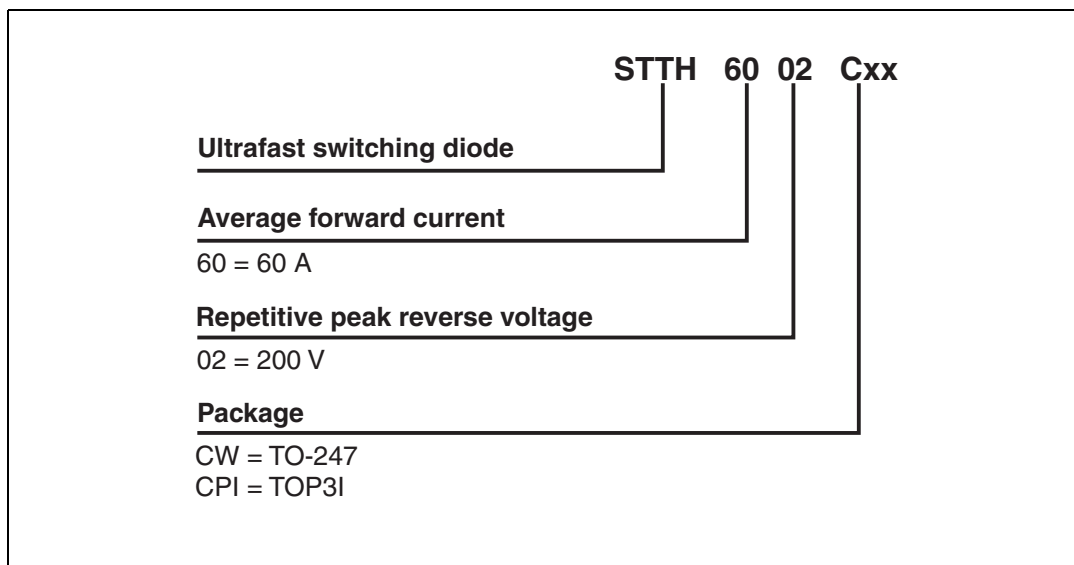


Figure 8. Dynamic parameters versus junction temperature



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. TO-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
F1		3.00			0.118	
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
F4	3.00		3.40	0.118		0.133
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

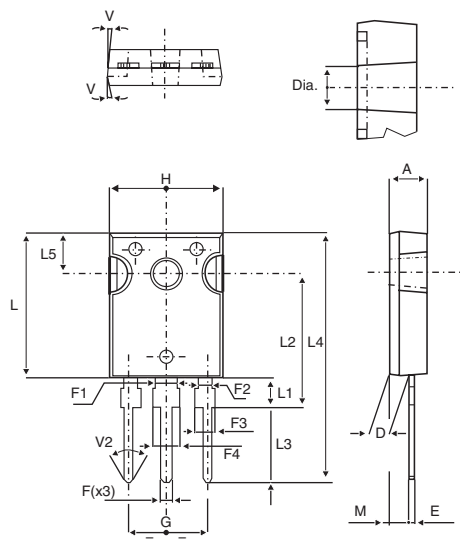


Table 6. TOP3I dimensions

REF	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	1.45	1.55	0.057	0.061
C	14.35	15.60	0.565	0.614
D	0.5	0.7	0.020	0.028
E	2.7	2.9	0.106	0.114
F	15.8	16.5	0.622	0.650
G	20.4	21.1	0.815	0.831
H	15.1	15.5	0.594	0.610
J	5.4	5.65	0.213	0.222
K	3.4	3.65	0.134	0.144
ØL	4.08	4.17	0.161	0.164
P	1.20	1.40	0.047	0.055
R	4.60 Typ.		0.181 Typ.	

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.

4 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH6002CW	STTH6002C	TO-247	4.46 g	30	Tube
STTH6002CPI	STTH6002C	TOP3I	4.7 g	30	Tube

5 Revision history

Date	Revision	Description of Changes
Feb-2004	1	First issue
05-Apr-2006	2	Reformatted to current template. Package TOP3I added.

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