

Turbo 2 ultrafast high voltage rectifier

Technical Literature

CUSTOM ATTRIBUTES

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Rev 2.1		Initial Release
08/07/2014 AUTOMATIC REVALIDATION DATE WORKFLOW STARTED		

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DOCUMENT APPROVAL

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STTH30R06

Turbo 2 ultrafast high voltage rectifier

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses

Description

The STTH30R06, which is using ST Turbo 2 600 V technology, is specially suited for use in switching power supplies, and industrial applications, as rectification and discontinuous mode PFC boost diode.

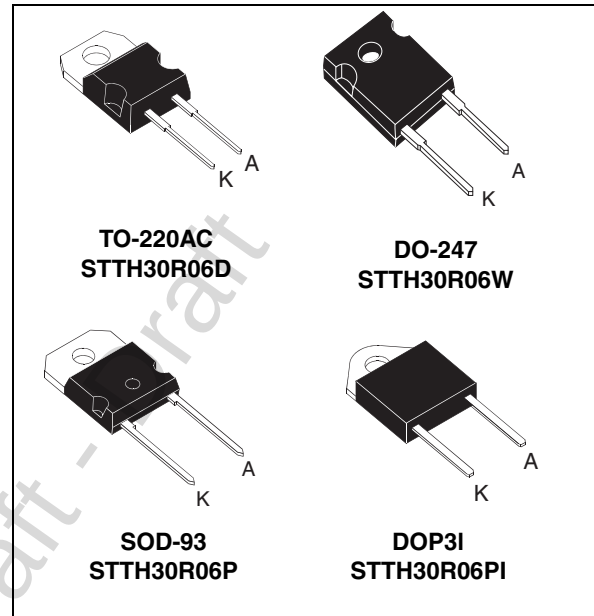


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	30 A
V_{RRM}	600 V
T_j	175 °C
V_F (typ)	1.10 V
t_{rr} (max)	50 ns

1 Characteristics

Table 2. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
V _{RRM}	Repetitive peak reverse voltage			600	V
I _{F(RMS)}	Forward rms current			50	A
I _{F(AV)}	Average forward current δ = 0.5	TO-220AC / DO-247 / SOD-93	T _c = 115 °C	30	A
		DOP3I	T _c = 85 °C		
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms sinusoidal		300	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 (max)	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / DO-247/ SOD-93	1.1	$^{\circ}\text{C/W}$
		DOP3I	1.7	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^{\circ}\text{C}$	$V_R = V_{RRM}$			25	μA
		$T_j = 125\text{ }^{\circ}\text{C}$			80	800	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 30\text{ A}$			1.85	V
		$T_j = 125\text{ }^{\circ}\text{C}$			1.10	1.40	

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 maximum conduction losses use the following equation:

$$P = 1.07 \times I_{F(AV)} + 0.011 I_{F(RMS)}^2$$

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$T_j = 25^\circ\text{C}$	$I_F = 0.5\text{ A}$, $I_{rr} = 0.25\text{ A}$, $I_R = 1\text{ A}$			50	ns
			$I_F = 1\text{ A}$, $di_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$		50	70	
I_{RM}	Reverse recovery current	$T_j = 125^\circ\text{C}$	$I_F = 30\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 400\text{ V}$		8.0	11	A
t_{fr}	Forward recovery time	$T_j = 25^\circ\text{C}$	$I_F = 30\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$			500	ns
V_{FP}	Forward recovery voltage				2.5		V

Figure 1. Conduction losses versus average current

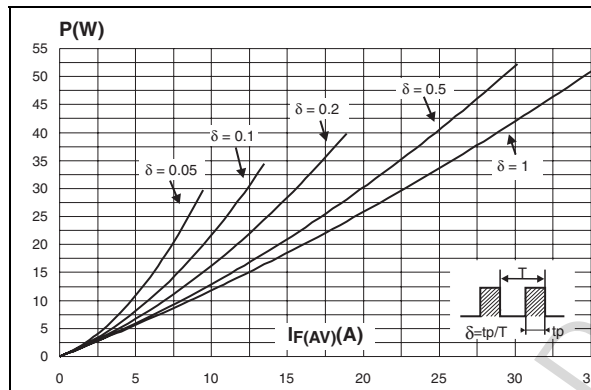


Figure 2. Forward voltage drop versus forward current

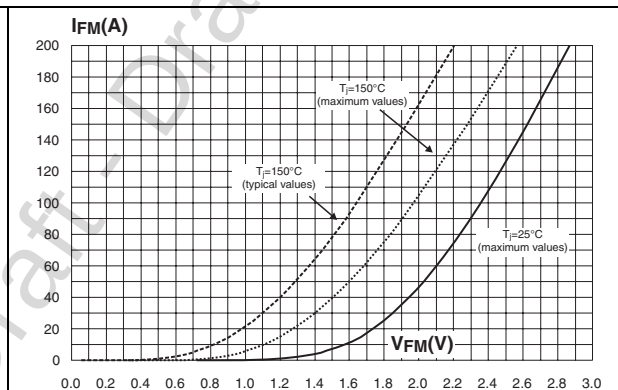


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

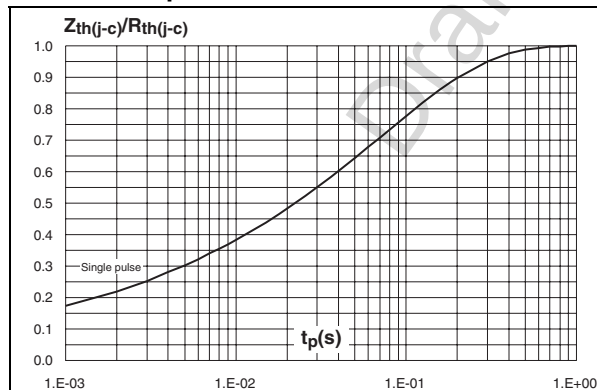


Figure 4. Peak reverse recovery current versus di_F/dt (typical values)

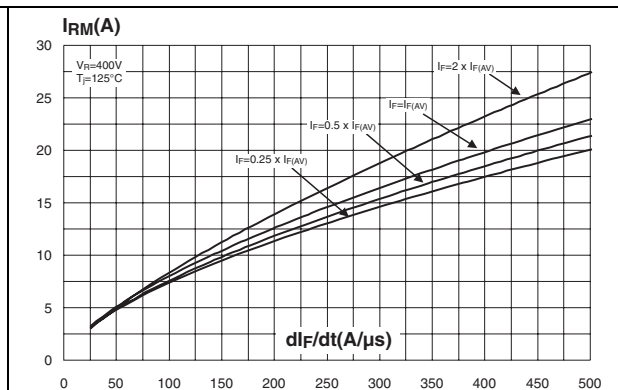


Figure 5. Reverse recovery time versus di_F/dt (typical values)

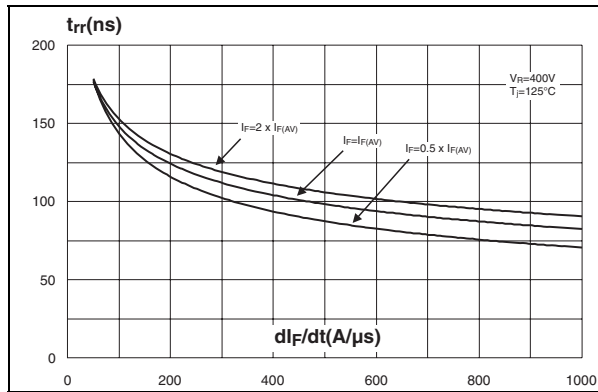


Figure 6. Reverse recovery charges versus di_F/dt (typical values)

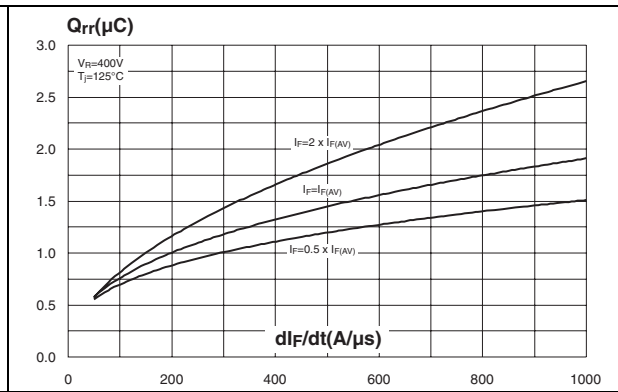


Figure 7. Softness factor versus di_F/dt (typical values)

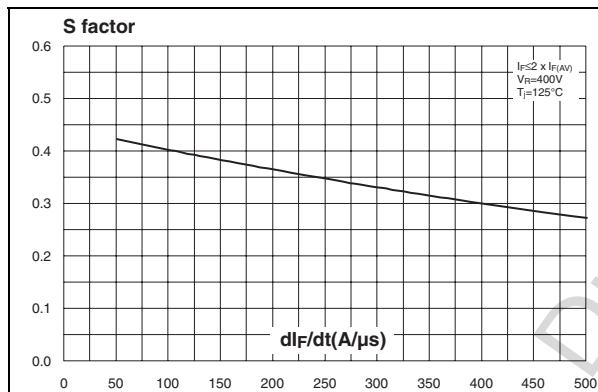


Figure 8. Relative variations of dynamic parameters versus junction temperature

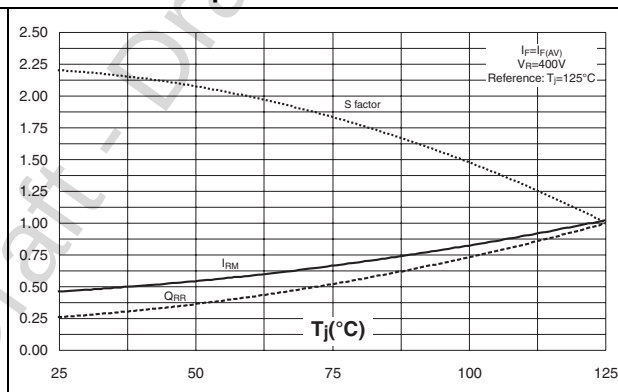


Figure 9. Transient peak forward voltage versus di_F/dt (typical values)

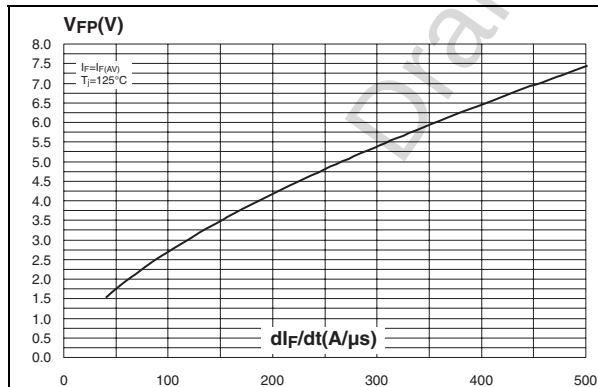


Figure 10. Forward recovery time versus di_F/dt (typical values)

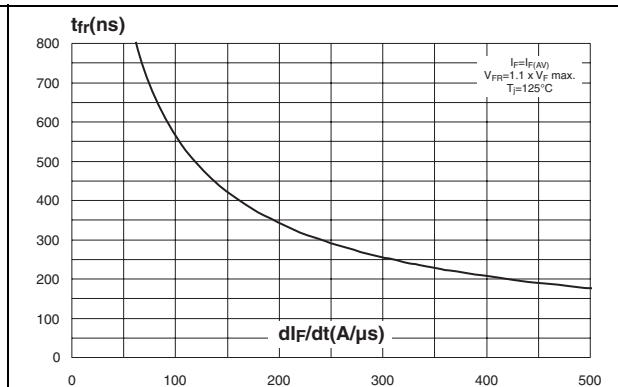
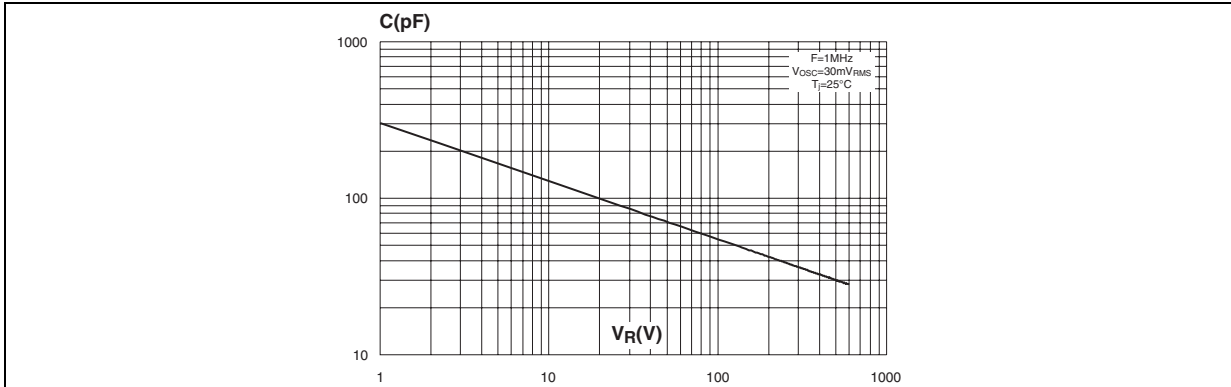


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



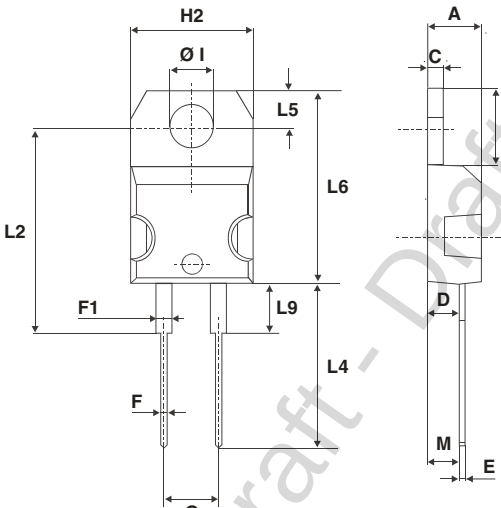
2 Package information

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

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. 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



The technical drawing shows the TO-220AC package with two views. The top view shows dimensions H2 (total width), Ø I (lead diameter), L5 (lead thickness), L6 (body width), L2 (total length), F1 (lead length), L9 (lead length), L4 (body length), F (lead length), and G (lead length). The side view shows dimensions A (total height), C (lead height), L7 (body height), D (lead height), E (lead height), M (lead height), and E (lead height).

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. SOD-93 dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.70	4.90	0.185	0.193
C	1.17	1.37	0.046	0.054
D	2.50 Typ.		0.098 Typ.	
D1	1.27 Typ.		0.050 Typ.	
E	0.50	0.78	0.020	0.031
F	1.10	1.30	0.043	0.051
F3	1.75 Typ.		0.069 Typ.	
G	10.80	11.10	0.425	0.437
H	14.70	15.20	0.578	0.598
L		12.20		0.480
L2		16.20		0.638
L3	18.0 Typ.		0.709 Typ.	
L5	3.95	4.15	0.156	0.163
L6	31.00 Typ.		1.220 Typ.	
O	4.00	4.10	0.157	0.161

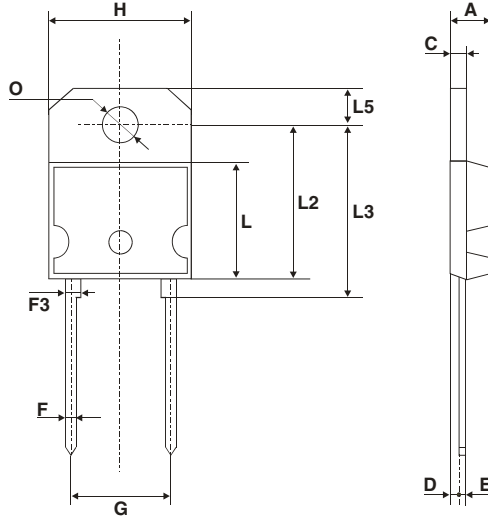


Table 9. DOP3 dimensions

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

3 Ordering information

Table 10. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH30R06D	STTH30R06D	TO-220AC	1.90 g	50	Tube
STTH30R06W	STTH30R06W	DO-247	4.40 g	30	Tube
STTH30R06P	STTH30R06P	SOD-93	3.79 g	30	Tube
STTH30R06PI	STTH30R06PI	DOP3I	4.46 g	30	Tube

4 Revision history

Table 11. Document revision history

Date	Revision	Changes
18-Oct-2004	1	First issue.
07-Sep-2011	2	Updated I_{FSM} from 160 A to 300 A.

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