

Turbo 2 ultrafast high voltage rectifier

Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses
- Package insulation voltage:
TO-220AC Ins: 2500 V rms
TO-220FPAC: 2000 V dc

Description

The STTH8R06, which uses ST Turbo 2 600 V technology, is specially suited as boost diode in continuous mode power factor corrections and hard switching conditions.

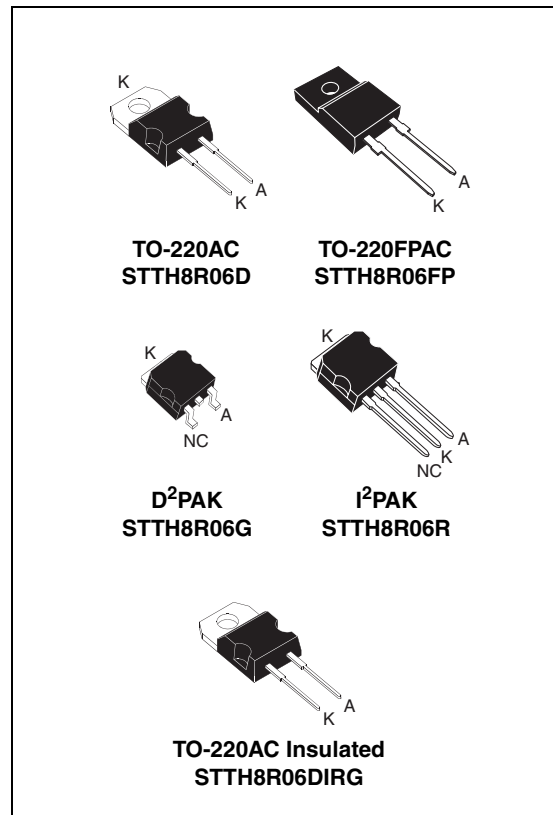


Table 1. Device summary

$I_{F(AV)}$	8 A
V_{RRM}	600 V
I_{RM} (typ)	5.5 A
T_j	175°C
V_F (typ)	1.4 V
t_{rr} (max)	25 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 current rms	TO-220AC / TO-220FPAC / D ² PAK / I ² PAK	30	A	
		TO-220AC Ins.	24		
$I_{F(AV)}$	Average forward current $\delta = 0.5$	TO-220AC / D ² PAK / I ² PAK	8	A	
		TO-220FPAC			$T_c = 130\text{ }^\circ\text{C}$
		TO-220AC Ins.			$T_c = 85\text{ }^\circ\text{C}$
I_{FSM}	Surge non repetitive forward current	$t_p = 10\text{ms}$ sinusoidal	80	A	
					$T_c = 100\text{ }^\circ\text{C}$
T_{stg}	Storage temperature range		-65 to + 175	$^\circ\text{C}$	
T_j	Maximum operating junction temperature		175	$^\circ\text{C}$	

Table 3. Thermal resistance

Symbol	Parameter		Value (max)	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / D ² PAK / I ² PAK	2.2	$^\circ\text{C/W}$
		TO-220FPAC	4.6	
		TO-220AC Ins.	3.8	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
I_R	Reverse leakage current	$T_j = 25\text{ }^\circ\text{C}$	$V_R = V_{RRM}$			30	μA
		$T_j = 125\text{ }^\circ\text{C}$			35	400	
V_F	Forward voltage drop	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 8\text{ A}$			2.9	V
		$T_j = 125\text{ }^\circ\text{C}$			1.4	1.8	

To evaluate the conduction losses use the following equation: $P = 1.16 \times I_{F(AV)} + 0.08 I_{F(RMS)}^2$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$			25	ns
			$I_F = 1\text{ A}, di_F/dt = -50\text{ A}/\mu\text{s}, V_R = 30\text{ V}$			45	
I_{RM}	Reverse recovery current	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 8\text{ A}, V_R = 400\text{ V}, di_F/dt = -200\text{ A}/\mu\text{s}$		5.5	7.2	A
S factor	Softness factor				0.3		
Qrr	Reverse recovery charges				150		nC
t_{fr}	Forward recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 8\text{ A}, di_F/dt = 64\text{ A}/\mu\text{s}$			150	ns
V_{FP}	Forward recovery voltage			$V_{FR} = 1.1 \times V_{Fmax}$			5

Figure 1. Conduction losses versus average current

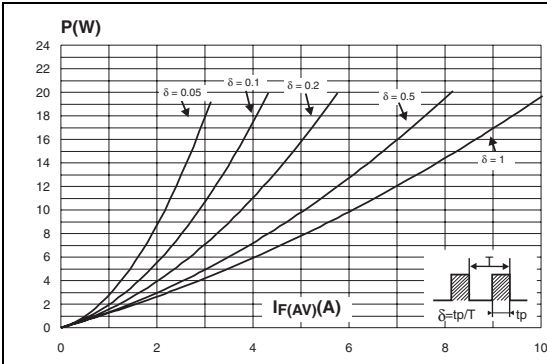


Figure 2. Forward voltage drop versus forward current

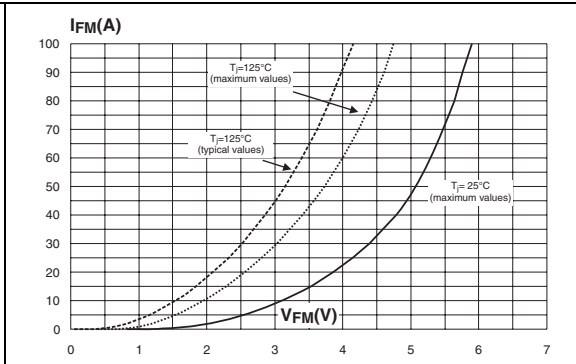


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, I²PAK, D²PAK)

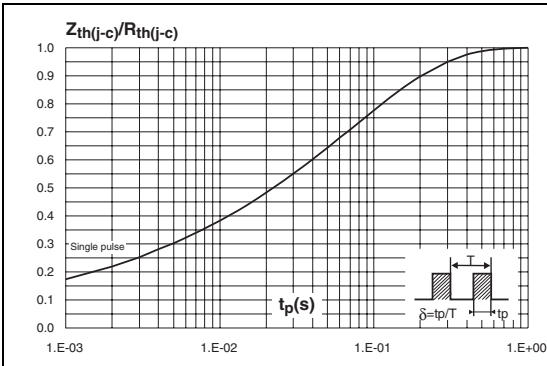


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC Insulated)

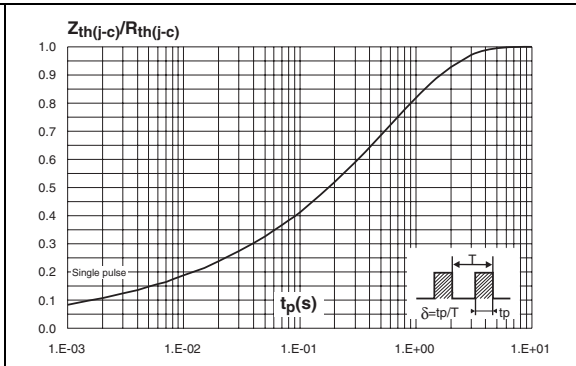


Figure 5. Peak reverse recovery current versus diF/dt (typical values)

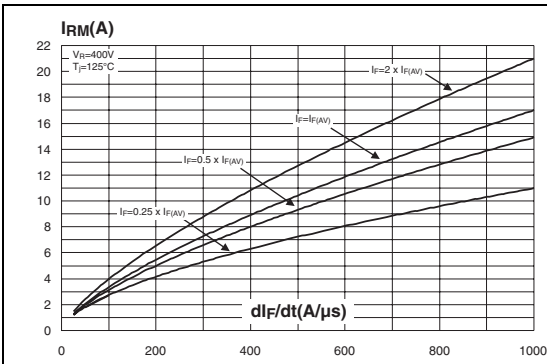


Figure 6. Reverse recovery time versus diF/dt (typical values)

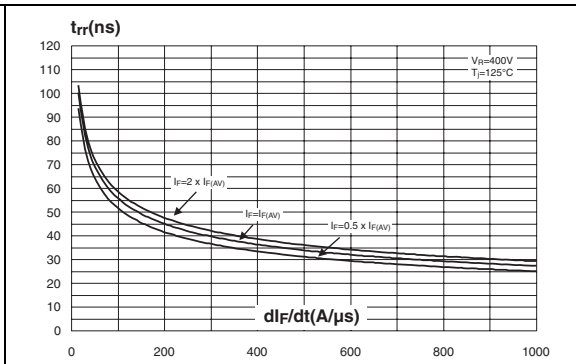


Figure 7. Reverse recovery charges versus di_F/dt (typical values)

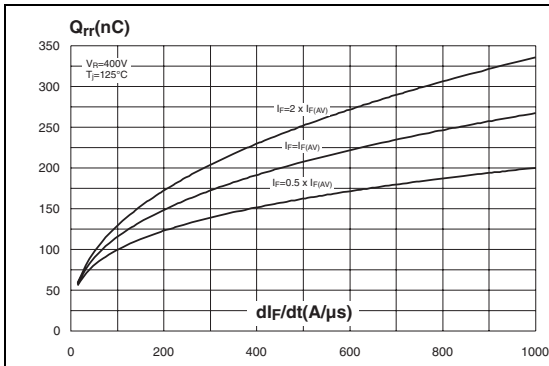


Figure 8. Softness factor versus di_F/dt (typical values)

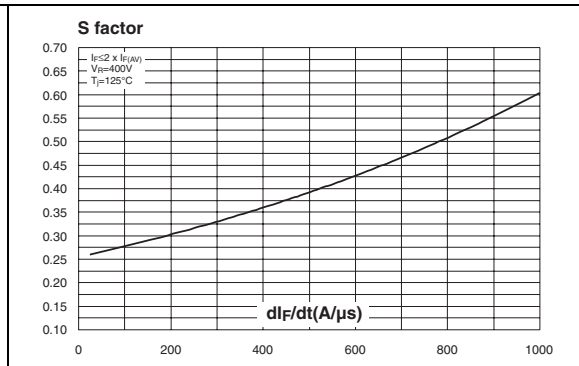


Figure 9. Relative variations of dynamic parameters versus junction temperature

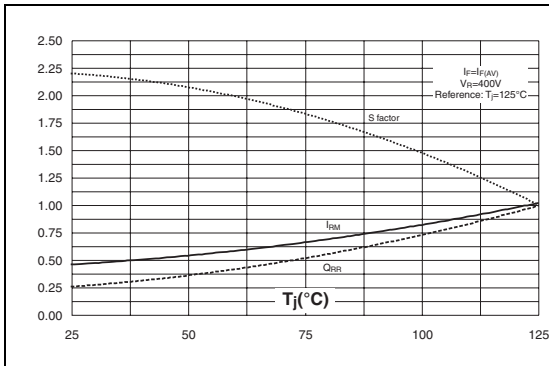


Figure 10. Transient peak forward voltage versus di_F/dt (typical values)

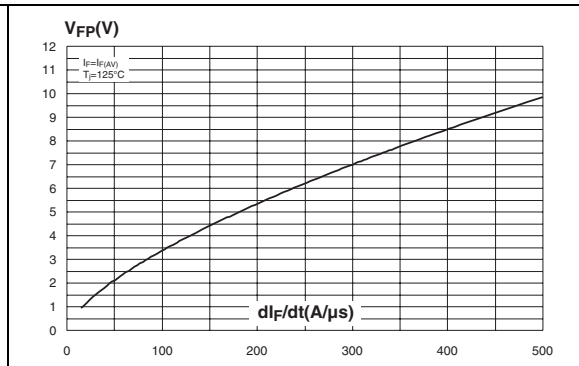


Figure 11. Forward recovery time versus di_F/dt (typical values)

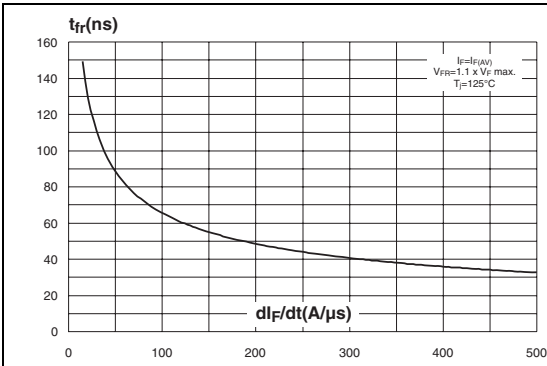


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

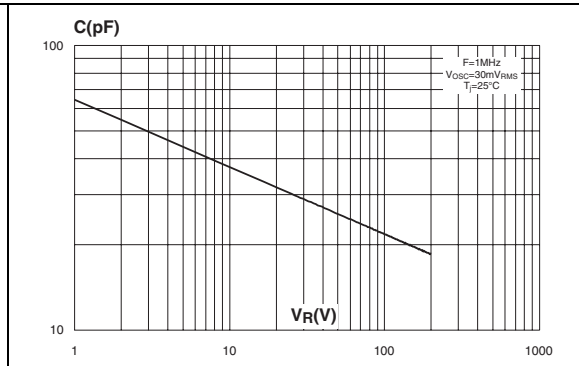
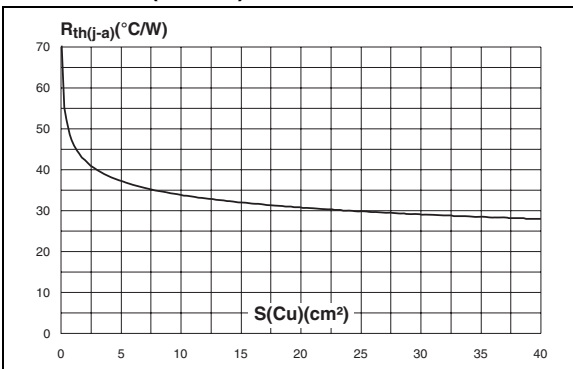


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (epoxy FR4, $e_{Cu} = 35 \mu m$) (D^2PAK)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque values: 0.8 to 1.0 N·m (TO-220FPAC), 0.4 to 0.6 N·m to (TO-220AC)

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.

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

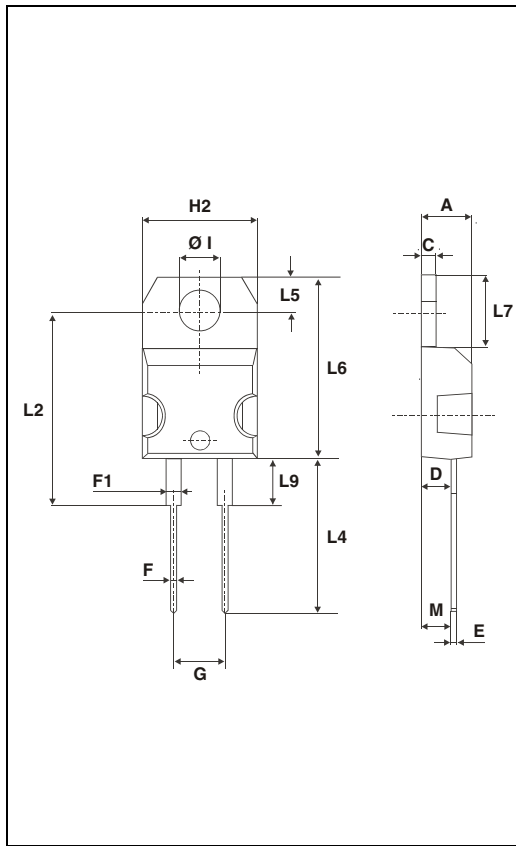
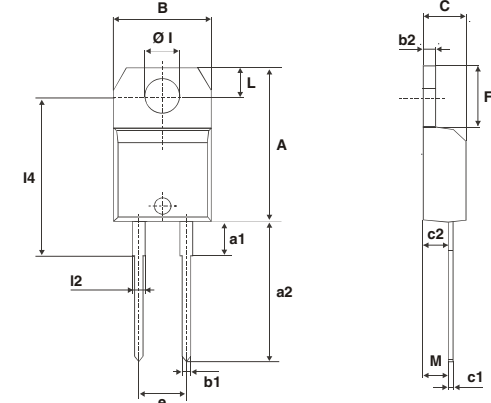


Table 7. TO-220FPAC dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

Table 8. TO-220AC (nIns. and ins. 20-up) dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	4.80		5.40	0.189		0.212
F	6.20		6.60	0.244		0.259
Ø1	3.75		3.85	0.147		0.151
l4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
l2	1.14		1.70	0.044		0.066
M		2.60			0.102	

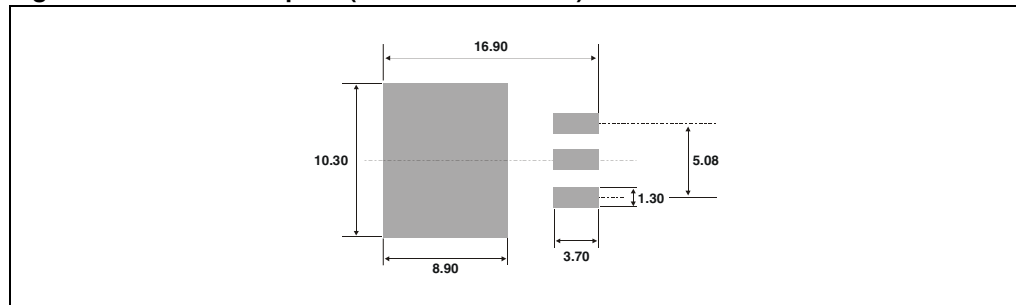
Table 9. I²PAK dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.40	2.72	0.094	0.107
b	0.61	0.88	0.024	0.035
b1	1.14	1.70	0.044	0.067
c	0.49	0.70	0.019	0.028
c2	1.23	1.32	0.048	0.052
D	8.95	9.35	0.352	0.368
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.195	0.203
E	10	10.40	0.394	0.409
L	13	14	0.512	0.551
L1	3.50	3.93	0.138	0.155
L2	1.27	1.40	0.050	0.055

Table 10. 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 14. D²PAK footprint (dimensions in mm)



3 Ordering information

Table 11. Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTH8R06D	STTH8R06D	TO-220AC	1.90 g	50	Tube
STTH8R06G	STTH8R06G	D ² PAK	1.48 g	50	Tube
STTH8R06G-TR	STTH8R06G	D ² PAK	1.48 g	1000	Tape and reel
STTH8R06FP	STTH8R06FP	TO-220FPAC	1.70 g	50	Tube
STTH8R06R	STTH8R06R	I ² PAK	1.5 g	50	Tube
STTH8R06DIRG	STTH8R06DI	TO-220AC Ins.	1.86 g	50	Tube

4 Revision history

Table 12. Document revision history

Date	Revision	Changes
May-2001	1	First issue
January-2002	2	D ² PAK and I ² PAK packages added
18-Oct-2004	3	TO-220AC Insulated package added
05-Dec-2004	4	D ² PAK foot print correction
10-Aug-2006	5	Reformatted to current standard. Added package insulation voltage data on page 1. Changed order code STTH8R06DI to STTH8R06DIRG.
16-Apr-2008	6	Reformatted to current standards. Corrected label for right hand curve in Figure 2 from T _j = 125 °C to T _j = 25 °C. Updated torque value recommendations and added ECOPACK statement in Section 2: Package information . Corrected order code in Table 11 .

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