

## Turbo 2 ultrafast high voltage rectifier

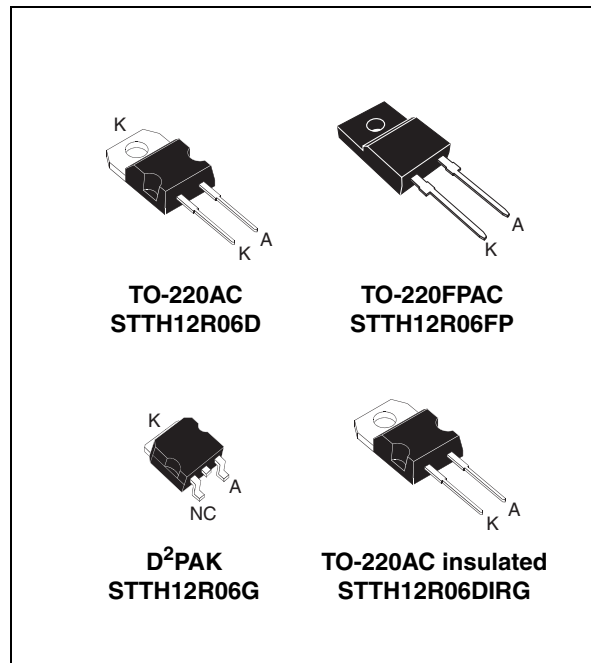
### Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses
- Package insulation voltage:  
TO220AC ins: 2500 V<sub>RMS</sub>  
TO-220FPAC: 2000 V<sub>DC</sub>

### Description

The STTH12R06 uses ST Turbo 2 600V technology and is specially suited as a boost diode in continuous mode power factor corrections and hard switching conditions.

This device is also intended for use as a free wheeling diode in power supplies and other power switching applications.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	12 A
$V_{RRM}$	600 V
$I_{RM}$ (typ)	7 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 rms current	TO-220AC / TO-220FPAC / D <sup>2</sup> PAK	30	A
		TO-220AC ins.	24	
$I_{F(AV)}$	Average forward current $\delta = 0.5$	TO-220AC / D <sup>2</sup> PAK	12	A
		TO-220FPAC		
		TO-220AC ins.		
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10$ ms sinusoidal	100	A
$T_{stg}$	Storage temperature range		-65 to + 175	°C
$T_j$	Maximum operating junction temperature		175	°C

**Table 3. Thermal resistance**

Symbol	Parameter		Value (max)	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / D <sup>2</sup> PAK	1.7	°C/W
		TO-220FPAC	4.4	
		TO-220AC ins.	3.3	

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_R$	Reverse leakage current	$T_j = 25$ °C	$V_R = V_{RRM}$		45	$\mu$ A
		$T_j = 125$ °C		50	600	
$V_F$	Forward voltage drop	$T_j = 25$ °C	$I_F = 12$ A		2.9	V
		$T_j = 125$ °C		1.4	1.8	

To evaluate the conduction losses use the following equation:

$$P = 1.16 \times I_{F(AV)} + 0.053 I_{F(RMS)}^2$$

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	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 12\text{ A}, V_R = 400\text{ V}, dI_F/dt = -200\text{ A}/\mu\text{s}$		7.0	8.4	A
S factor	Softness factor				0.2		
$Q_{rr}$	Reverse recovery charges				180		nC
$t_{fr}$	Forward recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 12\text{ A}, dI_F/dt = 96\text{ A}/\mu\text{s}, V_{FR} = 1.1 \times V_{Fmax}$			200	ns
$V_{FP}$	Forward recovery voltage					5.5	V

Figure 1. Conduction losses versus average current

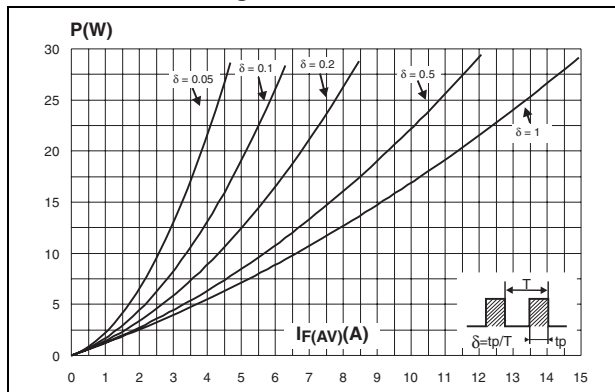


Figure 2. Forward voltage drop versus forward current

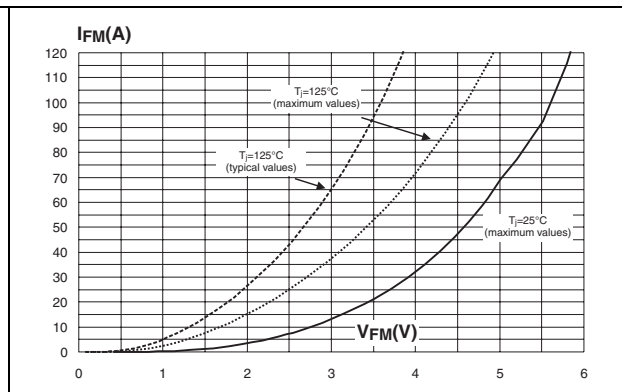


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

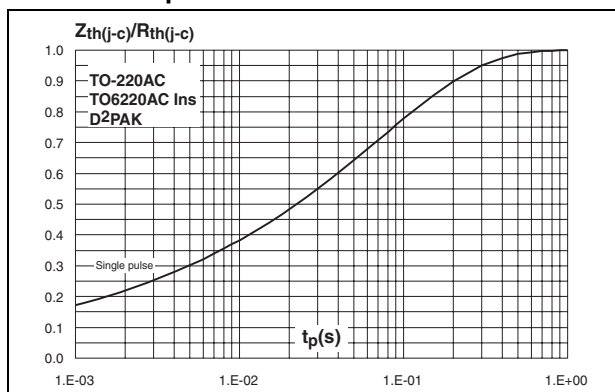
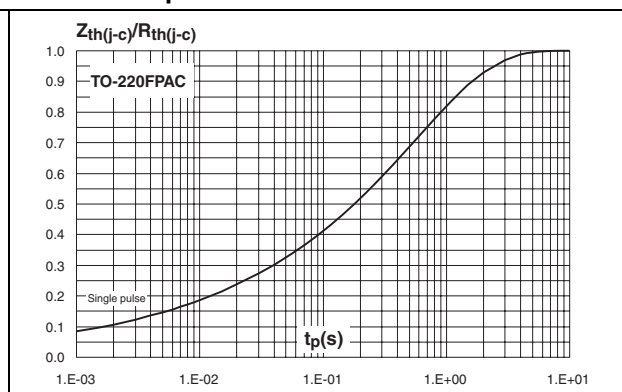
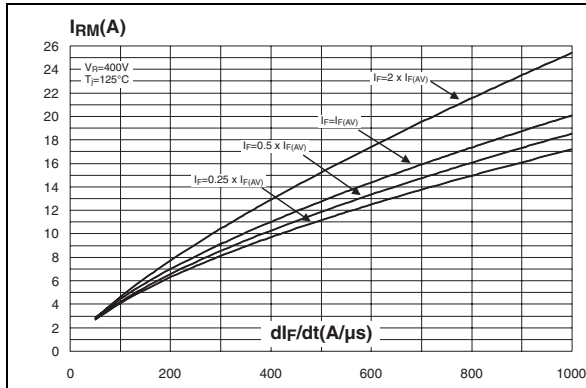


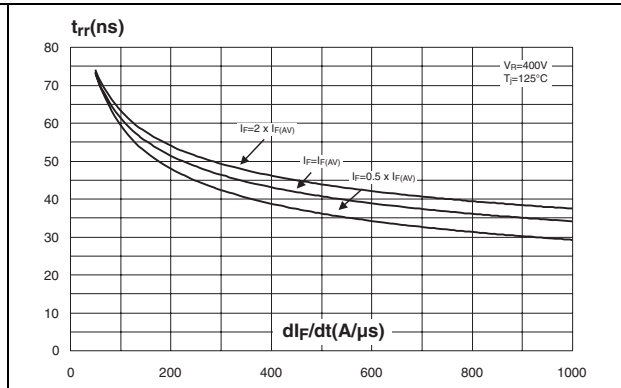
Figure 4. Relative variation of thermal impedance junction to case versus pulse duration



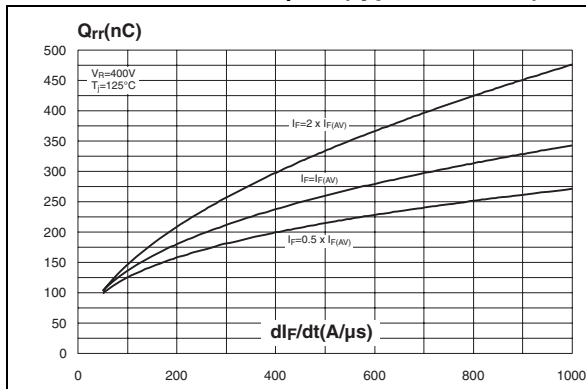
**Figure 5. Peak reverse recovery current versus  $dl_F/dt$  (typical values)**



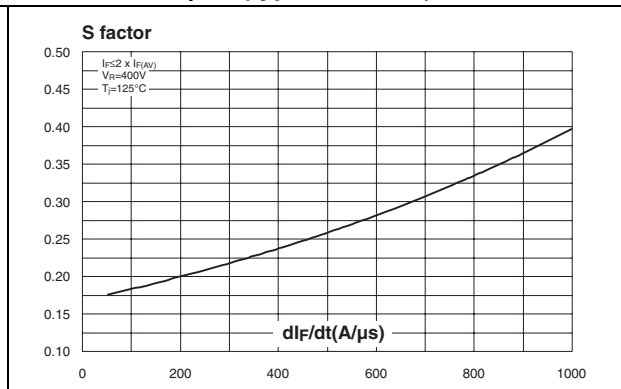
**Figure 6. Reverse recovery time versus  $dl_F/dt$  (typical values)**



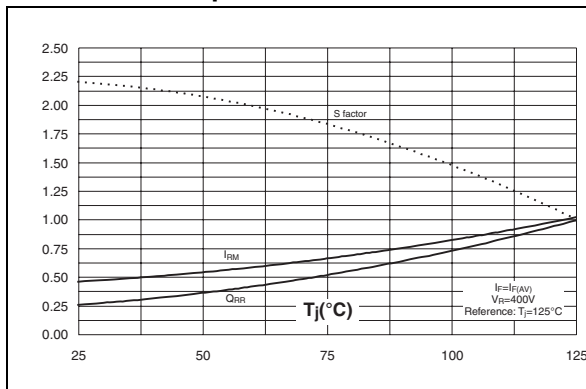
**Figure 7. Reverse recovery charges versus  $dl_F/dt$  (typical values)**



**Figure 8. Softness factor versus  $dl_F/dt$  (typical values)**



**Figure 9. Relative variations of dynamic parameters versus junction temperature**



**Figure 10. Transient peak forward voltage versus  $dl_F/dt$  (typical values)**

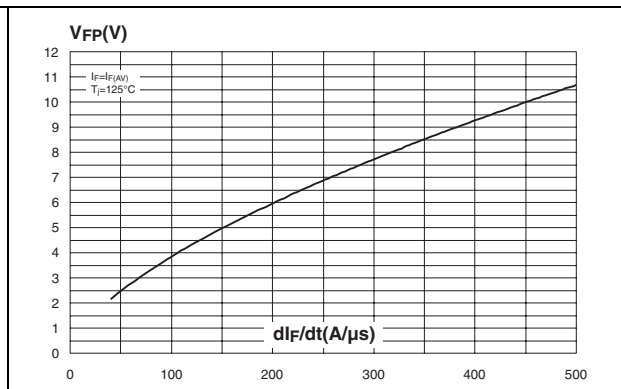


Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)

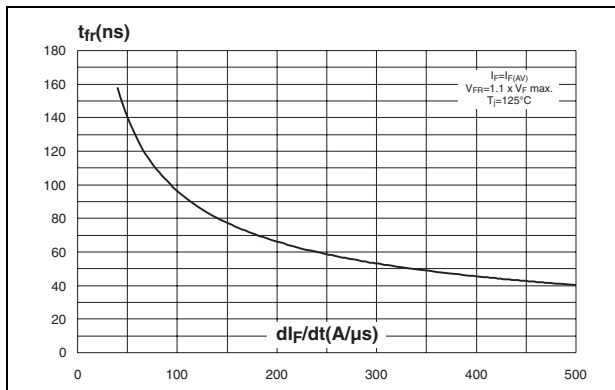


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

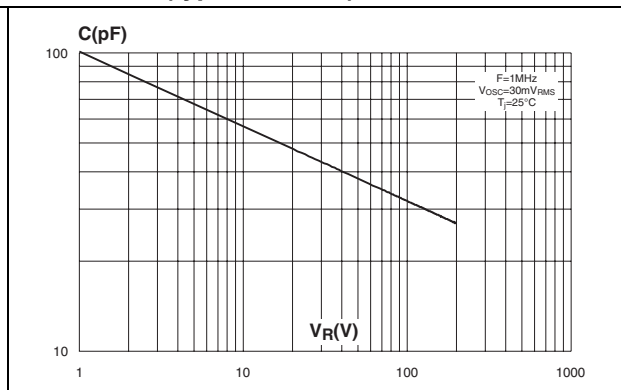
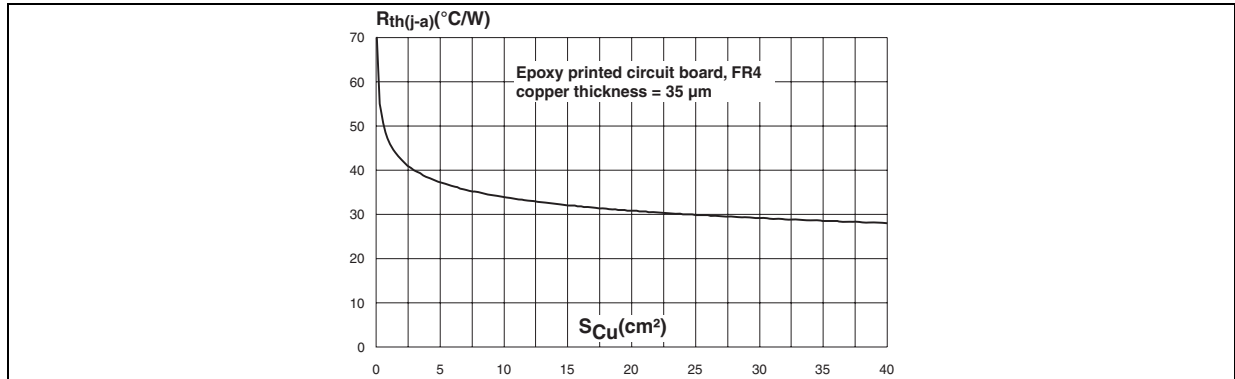


Figure 13. Thermal resistance junction to ambient versus copper surface under tab



## 2 Package information

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

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](http://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.	
Dia. I	3.75	3.85	0.147	0.151

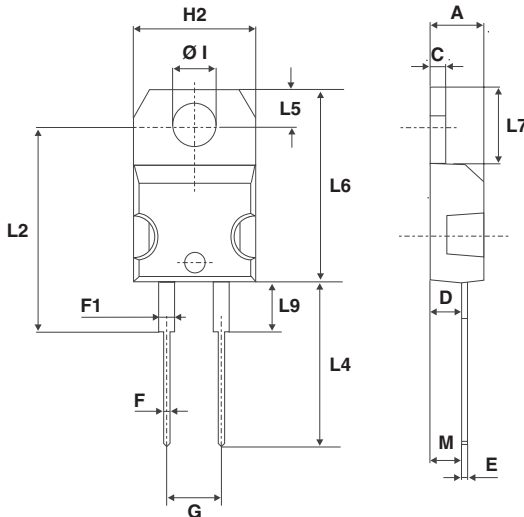
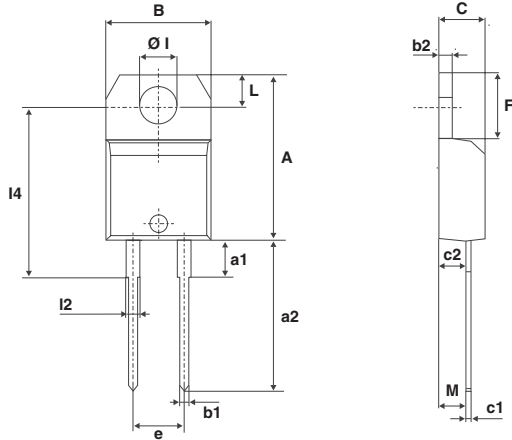


Table 7. TO-220FPAC dimensions

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



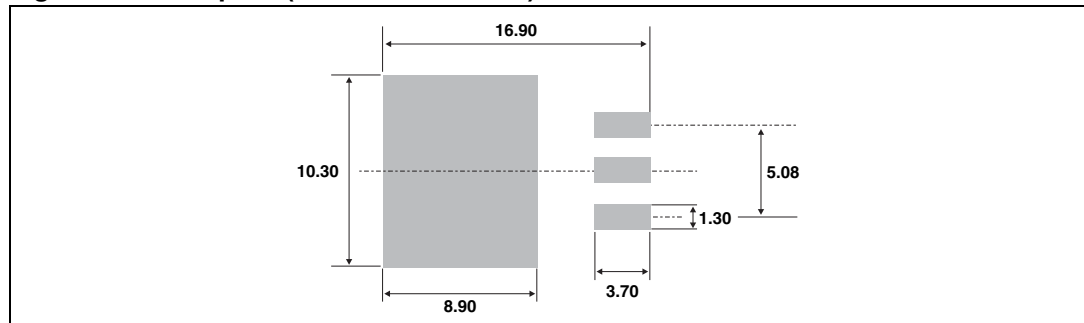
Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		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
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
M		2.60			0.102	



Table 9. 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 14. Footprint (dimensions in mm)



### 3 Ordering information

Table 10. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH12R06D	STTH12R06D	TO-220AC	1.90 g	50	Tube
STTH12R06G	STTH12R06G	D <sup>2</sup> PAK	1.48 g	50	Tube
STTH12R06G-TR	STTH12R06G	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel
STTH12R06FP	STTH12R06FP	TO-220FPAC	1.70 g	50	Tube
STTH12R06DIRG	STTH12R06DI	TO-220AC ins.	1.86 g	50	Tube

### 4 Revision history

Table 11. Document revision history

Date	Revision	Changes
January-2002	1	Initial release.
18-Oct-2004	2	D <sup>2</sup> PAK and TO-220AC insulated packages added
10-Aug-2006	3	Reformatted to current standards. Added package insulation voltages on page 1
15-Feb-2010	4	Corrected typographical error in order codes in <a href="#">Table 10</a> .

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