

Turbo 2 ultrafast high voltage rectifier

Features

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

Description

The STTH16L06, 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.

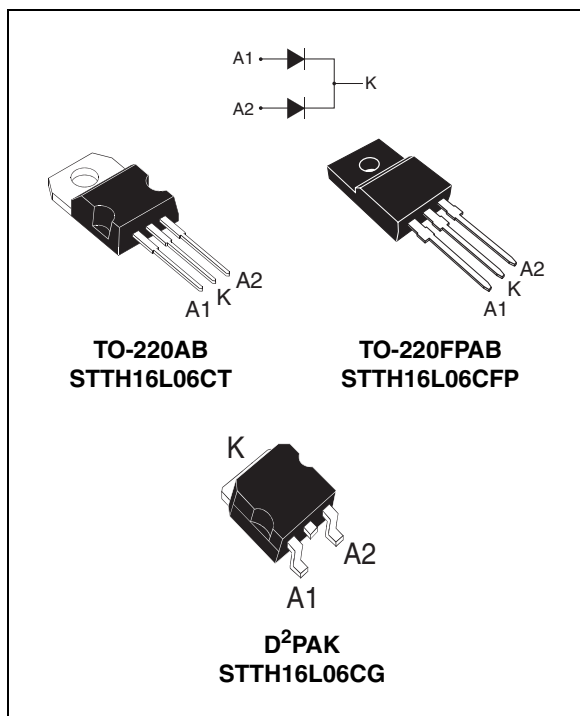


Table 1. Device summary

$I_{F(AV)}$	Up to 2 x 10 A
V_{RRM}	600 V
T_j	175 °C
V_F (typ)	1.05 V
t_{rr} (max)	35 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				30	A
I _{F(AV)}	Average forward current δ = 0.5	TO-220AB / D ² PAK	T _C = 140 °C	Per diode	8	A
			T _C = 135 °C	Per device	16	
			T _C = 130 °C	Per diode	10	
			T _C = 120 °C	Per device	20	
		TO-220FPAB	T _C = 110 °C	Per diode	8	
			T _C = 80 °C	Per device	16	
I _{FSM}	Surge non repetitive forward current		t _p = 10 ms sinusoidal		120	A
T _{stg}	Storage temperature range				-65 to + 175	°C
T _j	Maximum operating junction temperature				175	°C

Table 3. Thermal resistance

Symbol	Parameter			Maximum	Unit
$R_{th(j-c)}$	Junction to case	TO-220AB / D ² PAK	Per diode	2.5	$^{\circ}\text{C}/\text{W}$
		TO-220FPAB	Per diode	5	
		TO-220AB / D ² PAK	Total	1.6	
		TO-220FPAB	Total	3.8	
$R_{th(c)}$	Coupling	TO-220AB / D ² PAK		0.7	$^{\circ}\text{C}/\text{W}$
		TO-220FPAB		2.5	

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j (\text{diode1}) = P_{(\text{diode1})} \times R_{th(j-c)} (\text{per diode}) + P_{(\text{diode2})} \times R_{th(c)}$$

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^{\circ}\text{C}$	$V_R = V_{RRM}$			8	μA
		$T_j = 150\text{ }^{\circ}\text{C}$			25	240	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 8\text{ A}$			1.8	V
		$T_j = 150\text{ }^{\circ}\text{C}$			1.05	1.35	
		$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 16\text{ A}$			2.08	
		$T_j = 150\text{ }^{\circ}\text{C}$			1.28	1.64	

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:

$$P = 1.06 \times I_{F(AV)} + 0.036 I_{F(RMS)}^2$$

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
t_{rr}	Reverse recovery time	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$			35	ns
			$I_F = 1\text{ A}, dI_F/dt = 50\text{ A}/\mu\text{s}, V_R = 30\text{ V}$		40	55	
I_{RM}	Reverse recovery current	$T_j = 125\text{ }^{\circ}\text{C}$	$I_F = 8\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		4.5	6.5	A
t_{fr}	Forward recovery time	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 8\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}, V_{FR} = 1.1 \times V_{Fmax}$			200	ns
V_{FP}	Forward recovery voltage				3.5		V

Figure 1. Conduction losses versus average current

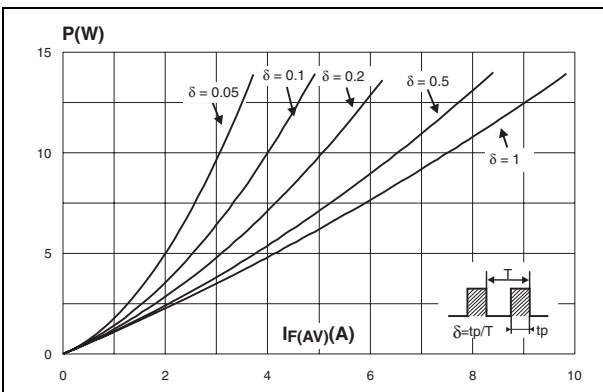


Figure 2. Forward voltage drop versus forward current

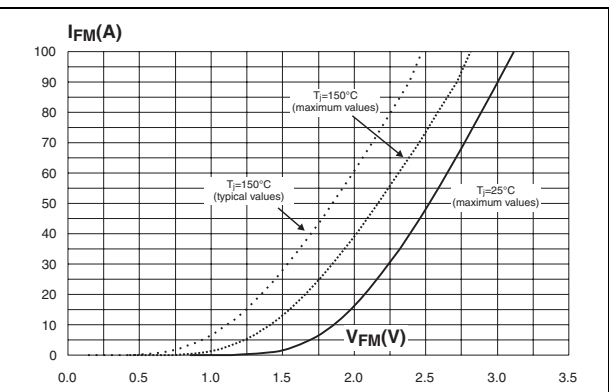


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, D²PAK)

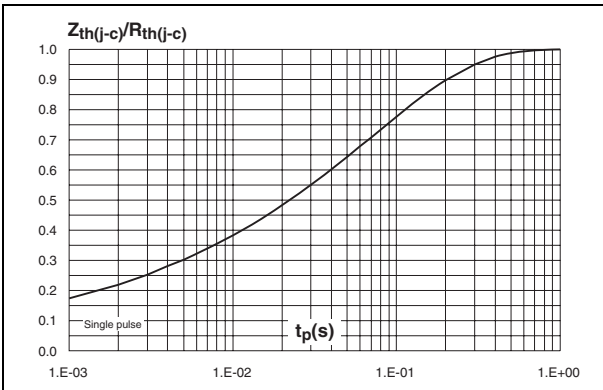


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)

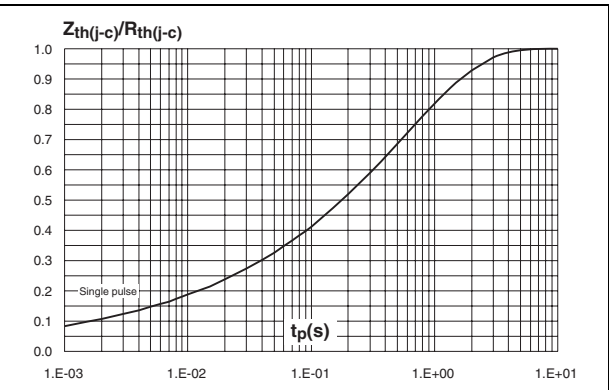


Figure 5. Peak reverse recovery current versus dl_F/dt (typical values, per diode)

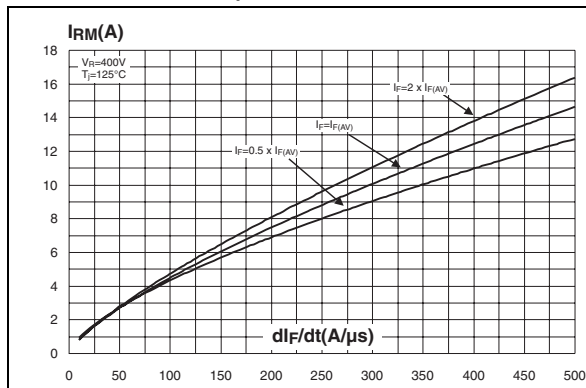


Figure 6. Reverse recovery time versus dl_F/dt (typical values, per diode)

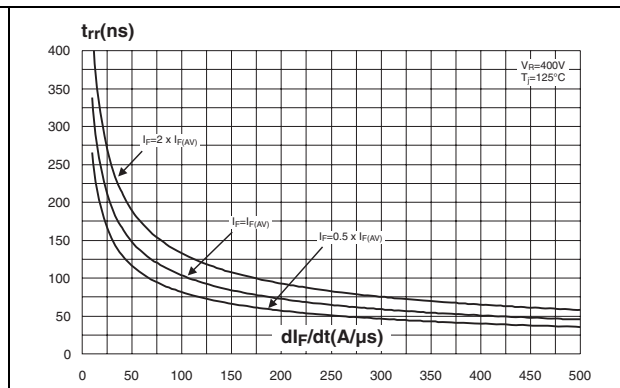


Figure 7. Reverse recovery charges versus dl_F/dt (typical values, per diode)

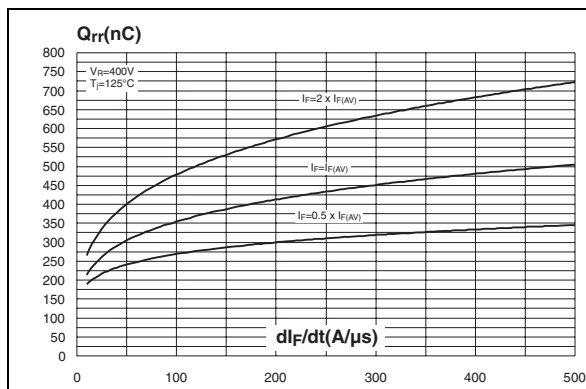


Figure 8. Reverse recovery softness factor versus dl_F/dt (typical values, per diode)

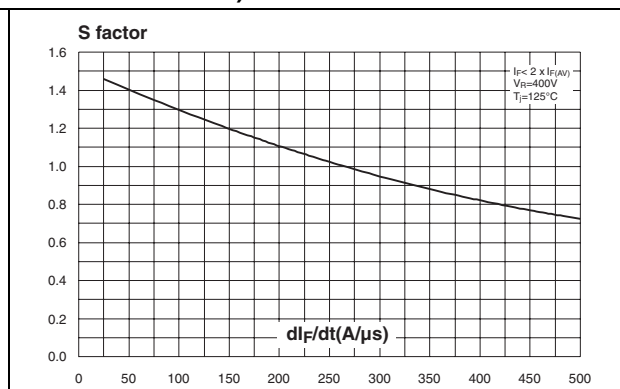


Figure 9. Relative variations of dynamic parameters versus junction temperature

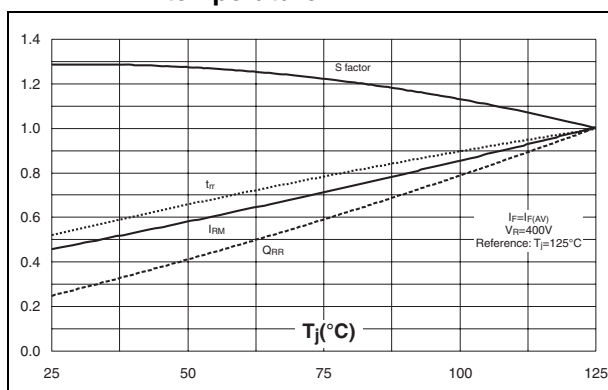


Figure 10. Transient peak forward voltage versus dl_F/dt (typical values, per diode)

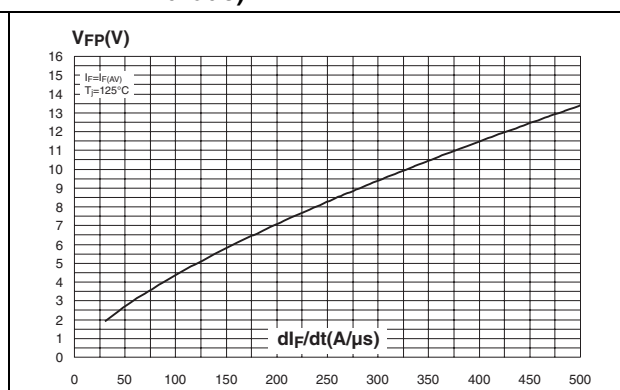


Figure 11. Forward recovery time versus di_F/dt (typical values, per diode)

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

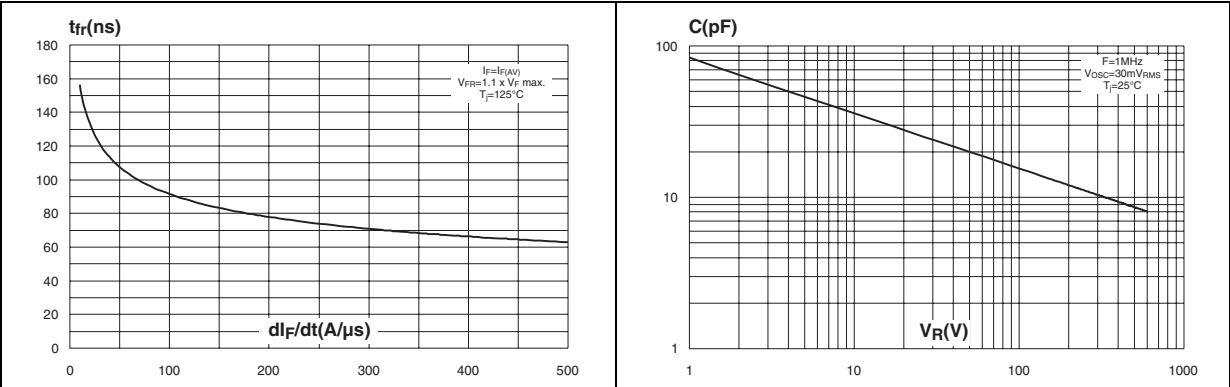
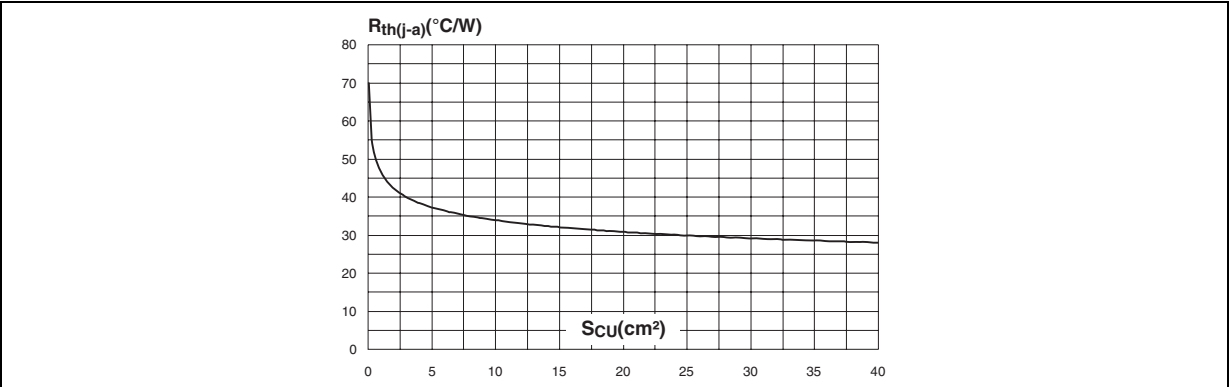


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (epoxy FR4, copper thickness = 35 μ m) (D²PAK)



2 Package mechanical data

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

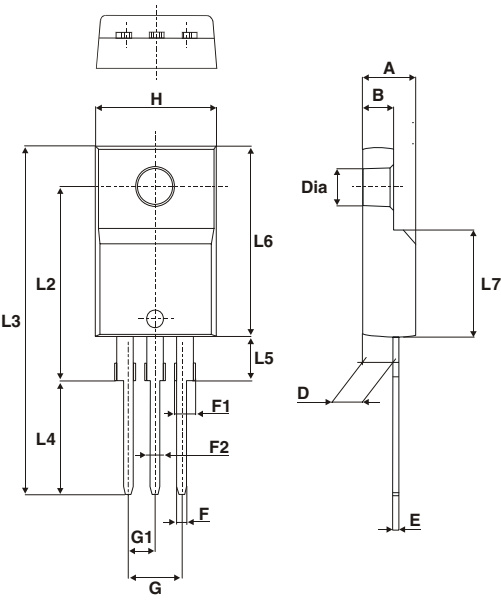
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Table 6. TO-220AB 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
F2	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
G1	2.40	2.70	0.094	0.106
H2	10	10.40	0.393	0.409
L2	16.4 typ.		0.645 typ.	
L4	13	14	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.	3.75	3.85	0.147	0.151

Table 7. TO-220FPAB 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
F2	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

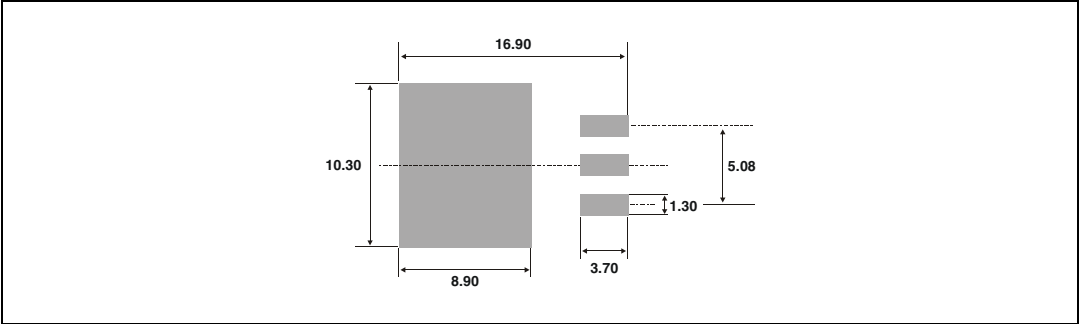


The technical drawing illustrates the TO-220FPAB package in three views: top, side, and a detail of the mounting tab. The top view shows the package body with dimensions H (width), L2 (lead length), L3 (total length), L4 (lead length to mounting tab), L5 (tab length), L6 (body length), and L7 (lead length to mounting tab). The side view shows the package height A, mounting tab width B, mounting tab thickness D, mounting tab length E, and mounting tab width F. The detail view shows the mounting tab with dimensions F1, F2, F, G, and G1. The dimension Dia. indicates the diameter of the mounting tab hole.

Table 8. 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. Footprint (dimensions in mm)



3 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH16L06CT	STTH16L06CT	TO-220AB	2.23 g	50	Tube
STTH16L06CG	STTH16L06CG	D ² PAK	1.48 g	50	Tube
STTH16L06CG-TR	STTH16L06CG	D ² PAK	1.48 g	1000	Tape and reel
STTH16L06CFP	STTH16L06CFP	TO-220FPAB	1.70 g	50	Tube

4 Revision history

Table 10. Document revision history

Date	Revision	Description of Changes
07-Sep-2004	1	First issue
07-Apr-2011	2	Updated ECOPACK statement.

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