

Turbo2 ultrafast - high voltage rectifier for SMPS

Features

- ultrafast switching
- low reverse current
- low thermal resistance
- reduces conduction and switching losses

Description

The STTH20LCD06C uses ST Turbo2 technology. This device is specially suited for switching power supplies working with interleaved PFCs.

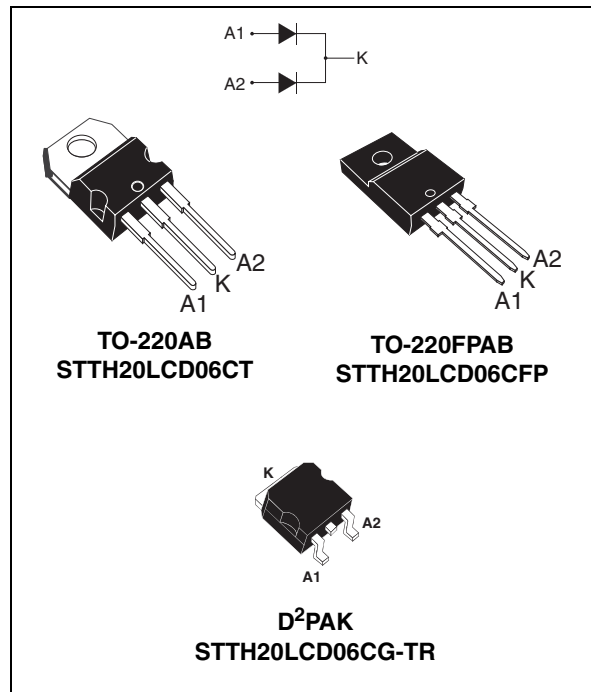


Table 1. Device summary

$I_{F(AV)}$	2 x 10 A
V_{RRM}	600 V
T_j	175 °C
V_F (typ)	1.25 V
t_{rr} (max)	50 ns

1 Characteristics

Table 2. Absolute ratings⁽¹⁾

Symbol	Parameter				Value	Unit
V _{RRM}	Repetitive peak reverse voltage				600	V
I _{F(RMS)}	Forward current rms				30	A
I _{F(AV)}	Average forward current, δ = 0.5	T _c = 105 °C	TO-220AB, D ² PAK	Per diode	10	A
				Per device	20	A
		T _c = 60 °C	TO-220FPAB	Per diode	10	A
				Per device	20	A
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms sinusoidal			80	A
T _{stg}	Storage temperature range				-65 to + 175	°C
T _j	Maximum operating junction temperature ⁽²⁾				175	°C

1. Limiting values per diode at 25 $^{\circ}\text{C}$, unless otherwise specified

2. $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AB, D ² PAK	3.5	$^{\circ}\text{C/W}$
		TO-220FPAB	5.8	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^{\circ}\text{C}$	$V_R = V_{RRM}$	-	-	1	μA
		$T_j = 150\text{ }^{\circ}\text{C}$		-	10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 10\text{ A}$	-	-	2	V
		$T_j = 150\text{ }^{\circ}\text{C}$		-	1.25	1.6	
		$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 20\text{ A}$	-	-	2.35	
		$T_j = 150\text{ }^{\circ}\text{C}$		-	1.55	2	

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:

$$P = 1.2 \times I_{F(AV)} + 0.04 \times I_{F(RMS)}^2$$

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$I_F = 0.5\text{ A}$, $I_{rr} = 0.25\text{ A}$, $I_R = 1\text{ A}$, $T_j = 25\text{ }^\circ\text{C}$			25	ns
		$I_F = 1\text{ A}$, $di_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$		35	50	
I_{RM}	Reverse recovery current	$I_F = 10\text{ A}$, $di_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 400\text{ V}$, $T_j = 125\text{ }^\circ\text{C}$		2	2.8	A
t_{fr}	Forward recovery time	$I_F = 10\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25\text{ }^\circ\text{C}$			230	ns
V_{FP}	Forward recovery voltage	$I_F = 10\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25\text{ }^\circ\text{C}$		4		V

Figure 1. Average forward power dissipation versus average forward current (per diode)

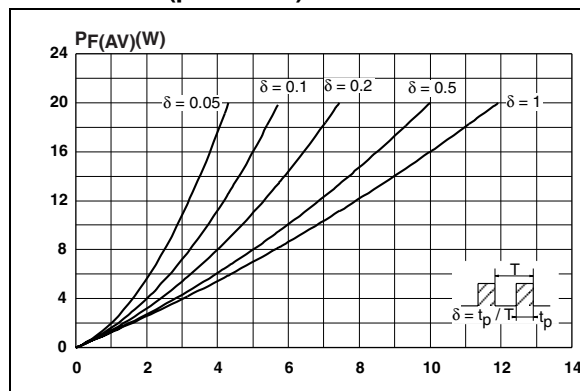


Figure 2. Forward voltage drop versus forward current (per diode)

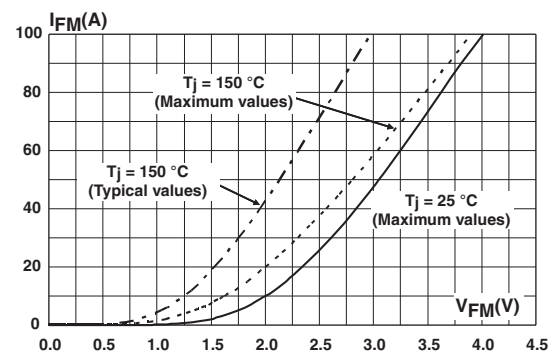
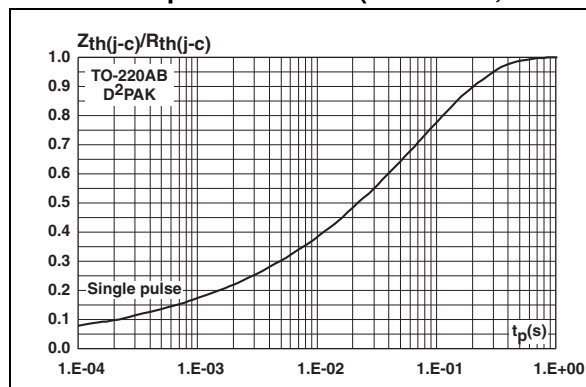
Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, D²PAK)

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

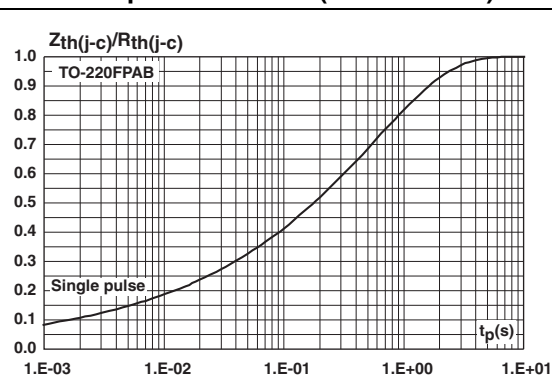


Figure 5. Peak reverse recovery current versus dl_F/dt (typical values, per diode)

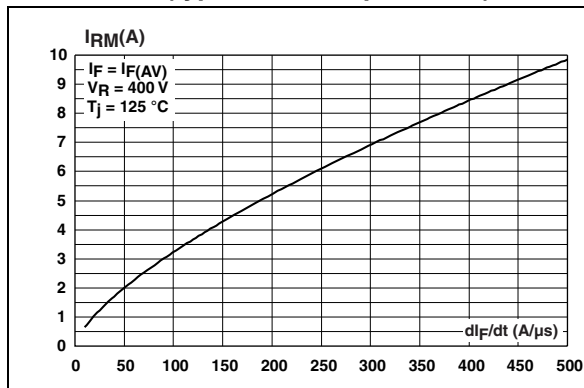


Figure 6. Reverse recovery time versus dl_F/dt (typical values, per diode)

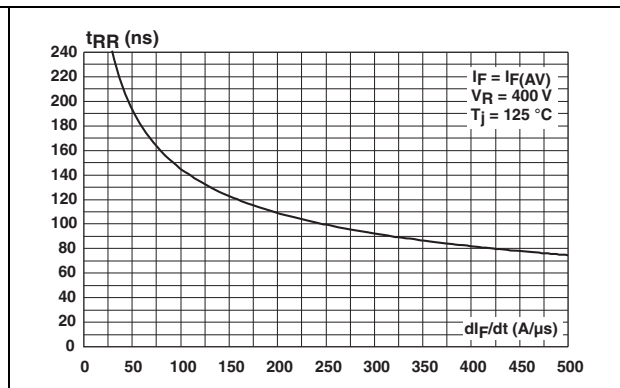


Figure 7. Reverse recovery charges versus dl_F/dt (typical values, per diode)

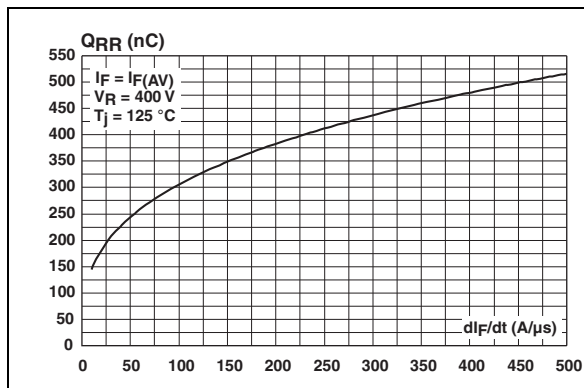


Figure 8. Reverse recovery softness factor versus dl_F/dt (typical values, per diode)

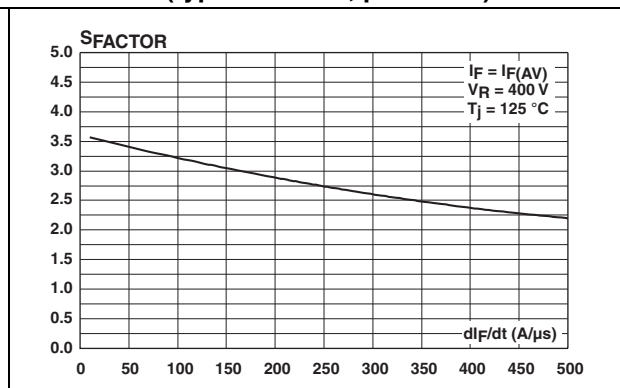


Figure 9. Relative variations of dynamic parameters versus junction temperature

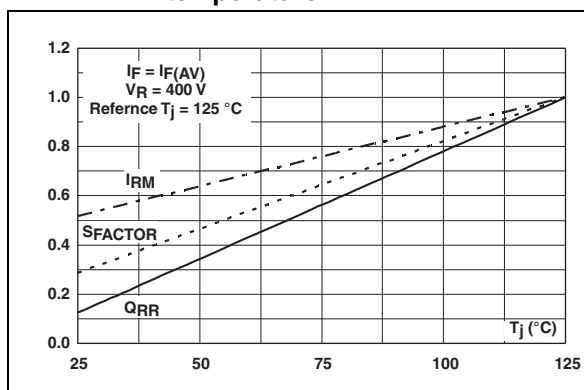


Figure 10. Transient peak forward voltage versus dl_F/dt (typical values, per diode)

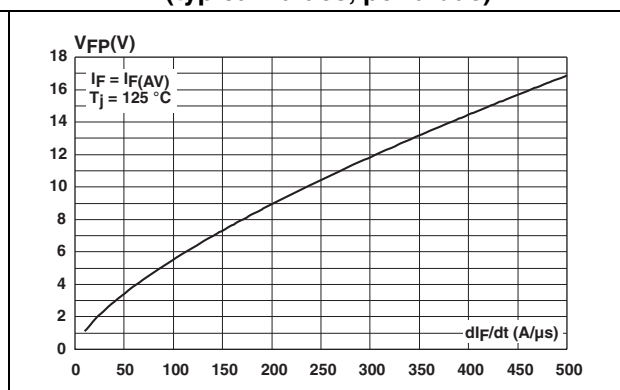


Figure 11. Forward recovery time versus dI_F/dt (typical values, per diode) Figure 12. Junction capacitance versus reverse voltage applied (typical values, per diode)

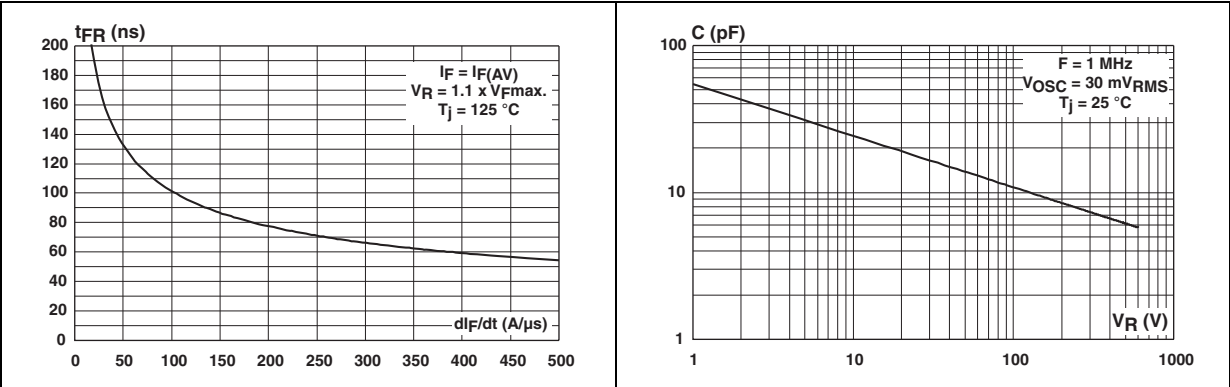
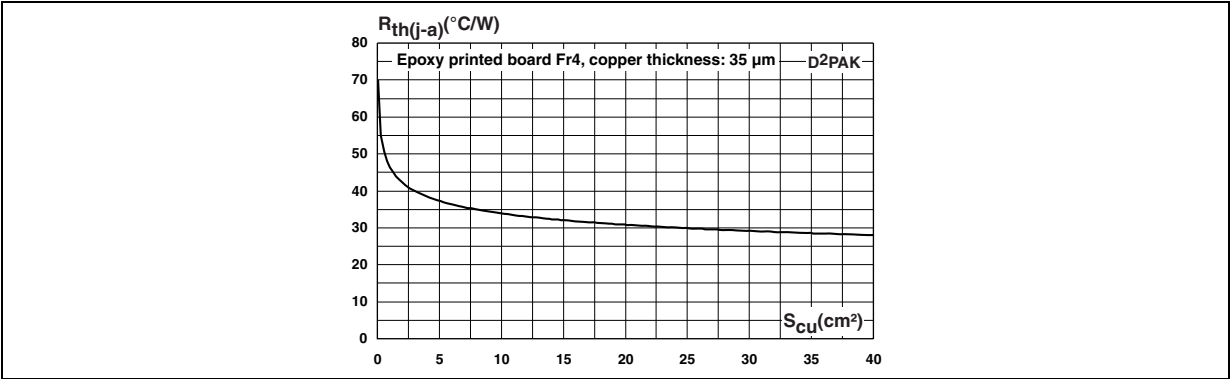


Figure 13. Thermal resistance junction to ambient versus copper surface under tab



2 Package information

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

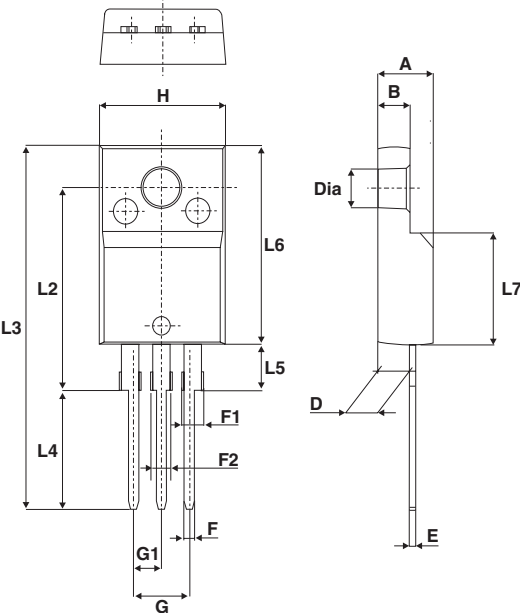
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

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

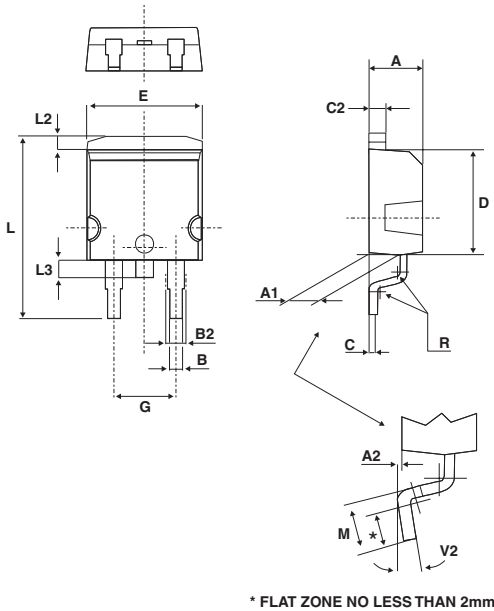
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
F2	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		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 a rectangular body with a central circular feature and four mounting holes. Dimensions L2, L3, L4, L5, L6, and L7 are indicated for the body height and lead lengths. The side view shows the package profile with dimensions A, B, D, and E. The detail view shows the mounting tab with dimensions F, F1, F2, G, and G1. The diameter of the mounting holes is labeled as Dia.

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°



3 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH20LCD06CT	STTH20LCD06CT	TO-220AB	2.23 g	50	Tube
STTH20LCD06CG-TR	STTH20LCD06CG	D ² PAK	1.48 g	1000	Tape and reel
STTH20LCD06CFP	STTH20LCD06C	TO-220FPAB	2.04 g	50	Tube

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
24-Jul-2009	1	First issue.
17-Jan-2011	2	Updated dimensions and graphic in Table 7 .

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