

## High frequency secondary rectifier

Datasheet – production data

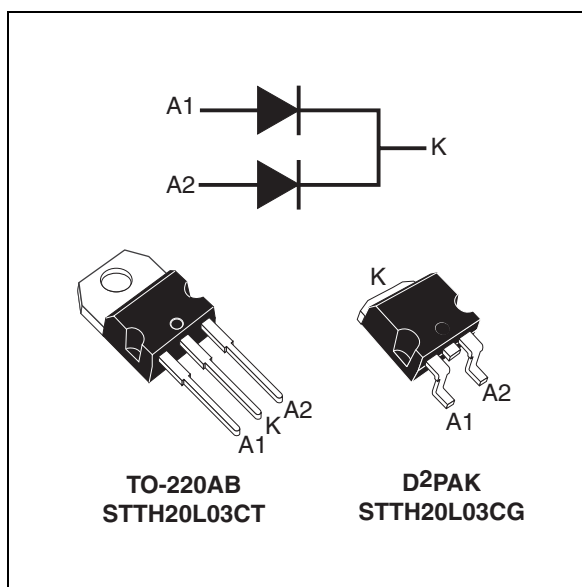
### Features

- Ultrafast, soft and noise-free recovery
- Low forward voltage drop

### Description

Dual center tap fast recovery epitaxial diodes suited for switch mode power supply and high frequency DC/DC converters.

Packaged in TO-220AB or D<sup>2</sup>PAK, this device is especially intended for secondary rectification inside SMPS with high space and power-density.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	2 x 10 A
$V_{RRM}$	300 V
$T_j$	-40 to +175 °C
$V_F(max)$	0.95 V
$t_{rr} (typ)$	26 ns

# 1 Characteristics

**Table 2. Absolute ratings (limiting values, per diode, at 25 °C, unless otherwise specified)**

Symbol	Parameter		Value	Unit	
V <sub>RRM</sub>	Repetitive peak reverse voltage		300	V	
I <sub>F(RMS)</sub>	Forward rms current		30	A	
I <sub>F(AV)</sub>	Average forward current, δ = 0.5	T <sub>c</sub> = 155 °C	Per diode	10	A
		T <sub>c</sub> = 150 °C	Per device	20	
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms sinusoidal	150	A	
T <sub>stg</sub>	Storage temperature range		-65 to + 175	°C	
T <sub>j</sub>	Operating junction temperature range		-40 to +175	°C	

**Table 3. Thermal resistance**

Symbol	Parameter		Value (max)	Unit
R <sub>th(j-c)</sub>	Junction to case	Per diode	1.5	°C/W
		Total	1.0	
R <sub>th(c)</sub>	Coupling		0.5	

When diodes 1 and 2 are used simultaneously:

$$T_{j(\text{diode } 1)} = P_{(\text{diode } 1)} \times R_{th(j-c)}(\text{Per diode}) + P_{(\text{diode } 2)} \times R_{th(c)}$$

**Table 4. Static electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>			10	µA
		T <sub>j</sub> = 125 °C			10	100	
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 10 A		0.95	1.2	V
		T <sub>j</sub> = 125 °C			0.8	0.95	

1. Pulse test: t<sub>p</sub> = 5 ms, δ < 2%

2. Pulse test: t<sub>p</sub> = 380 µs, δ < 2%

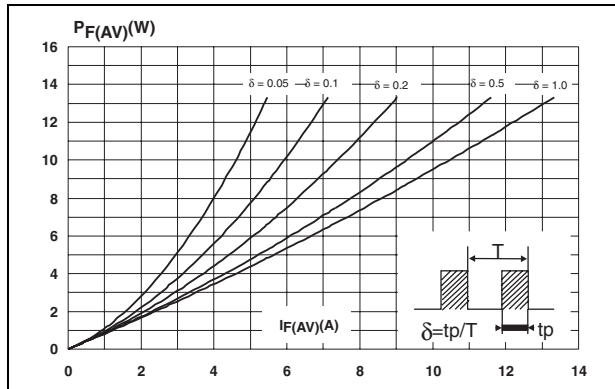
To evaluate the conduction losses use the following equation:

$$P = 0.8 \times I_{F(AV)} + 0.015 I_{F(RMS)}^2$$

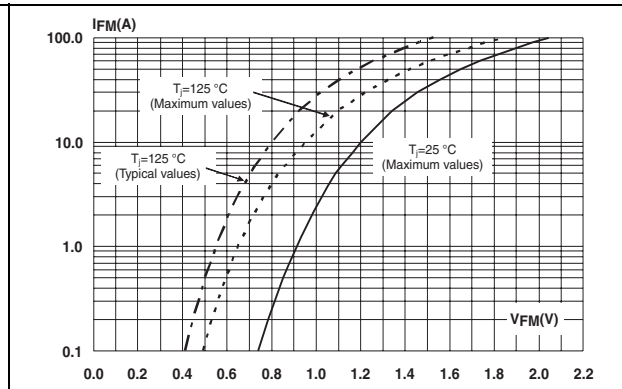
**Table 5. Dynamic electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}, V_R = 30\text{ V}$ $di_F/dt = -100\text{ A}/\mu\text{s}$		26	35	ns
		$T_j = 125\text{ }^\circ\text{C}$	$I_F = 10\text{ A}, V_R = 200\text{ V}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		55	72	
$I_{RM}$	Reverse recovery current	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 10\text{ A}, V_R = 200\text{ V}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		9	12	A
$S_{factor}$	Softness factor				0.3		
$Q_{RR}$	Reverse recovery charges	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 10\text{ A}, V_R = 200\text{ V}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		250	375	nC
$t_{fr}$	Forward recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 10\text{ A}, V_{FR} = 1.05\text{ V}$ $di_F/dt = 100\text{ A}/\mu\text{s}$			200	ns
$V_{FP}$	Forward recovery voltage				2.5	3.5	V

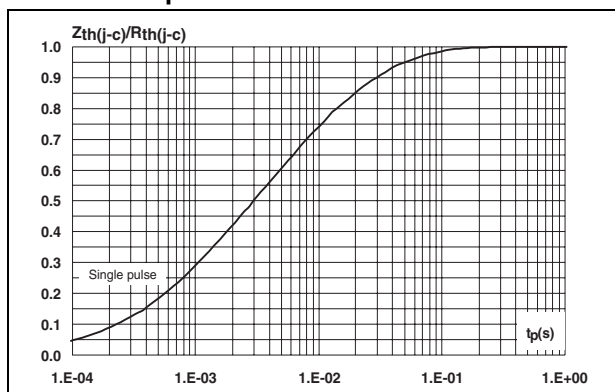
**Figure 1. Conduction losses versus average forward current (per diode)**



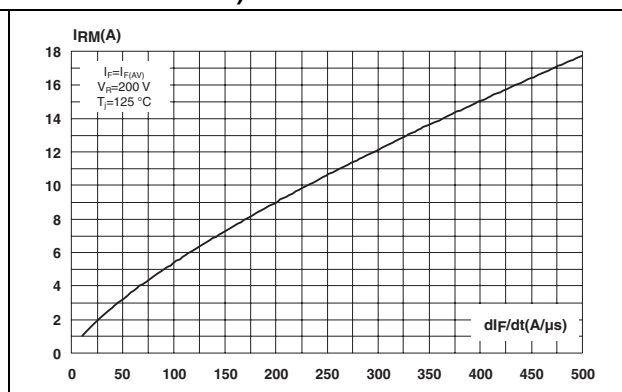
**Figure 2. Forward voltage drop versus forward current (per diode)**



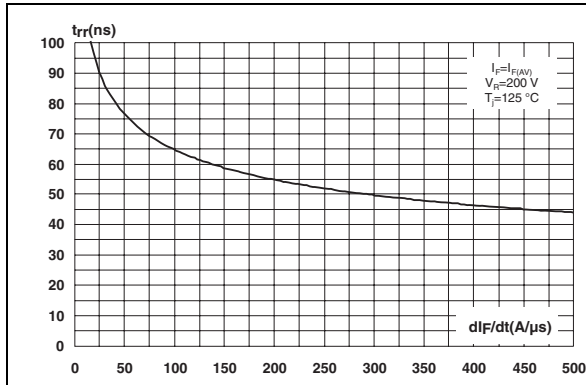
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration**



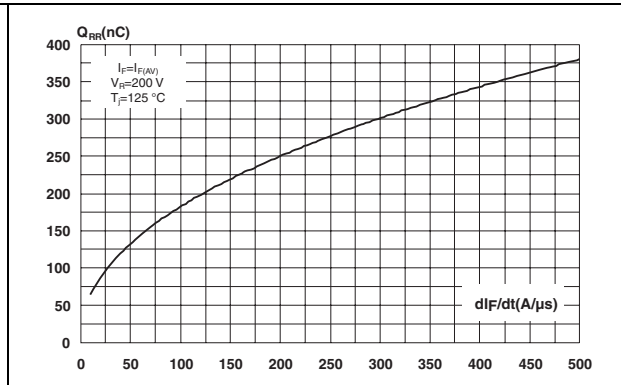
**Figure 4. Peak reverse recovery current versus di/dt (typical values, per diode)**



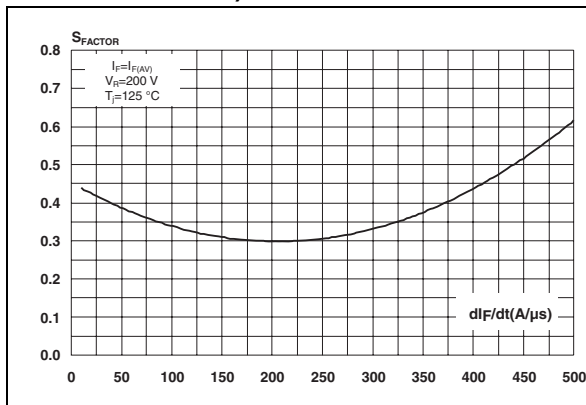
**Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values, per diode)**



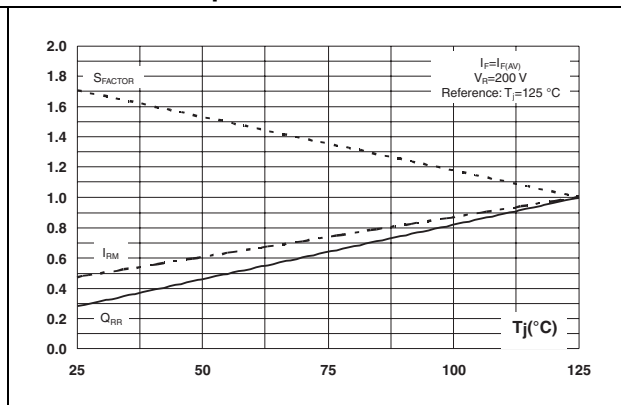
**Figure 6. Reverse recovery charge versus  $di_F/dt$  (typical values, per diode)**



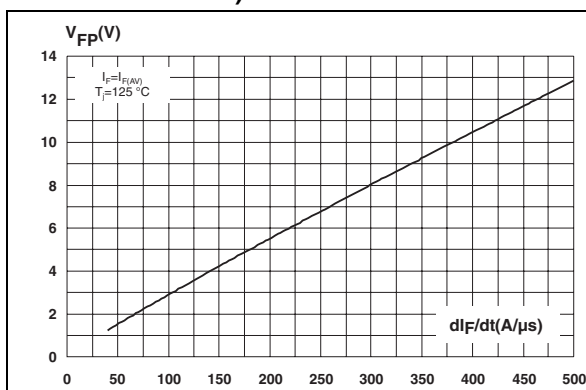
**Figure 7. Reverse recovery softness factor versus  $di_F/dt$  (typical values, per diode)**



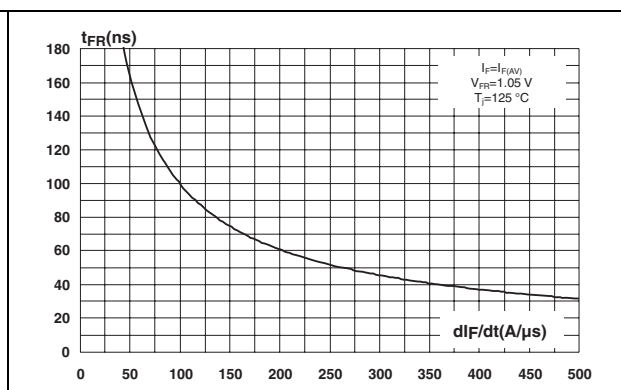
**Figure 8. Relative variation of dynamic parameters versus junction temperature**



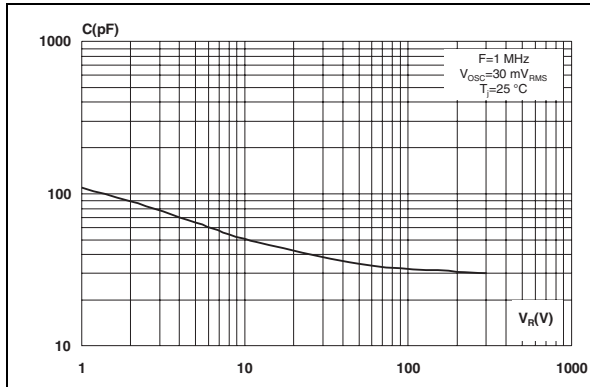
**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)**



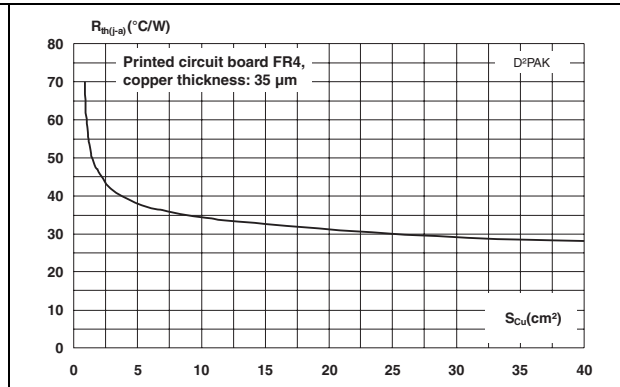
**Figure 10. Forward recovery time versus  $di_F/dt$  (typical values, per diode)**



**Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)**



**Figure 12. Thermal resistance, junction to ambient, versus copper surface under tab (D<sup>2</sup>PAK)**



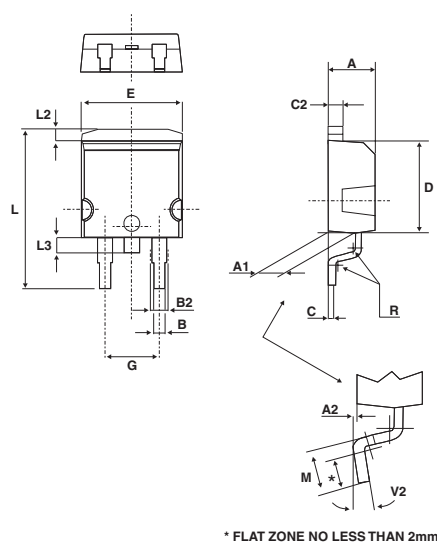
## 2 Package information

- 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<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**Table 6. 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 13. Footprint (dimensions in mm)**

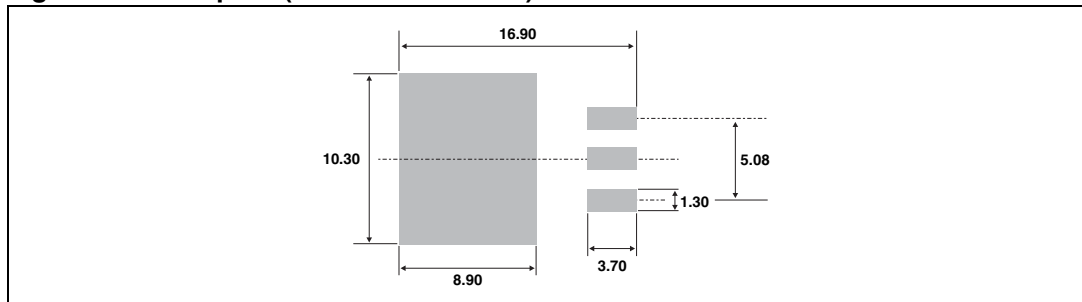
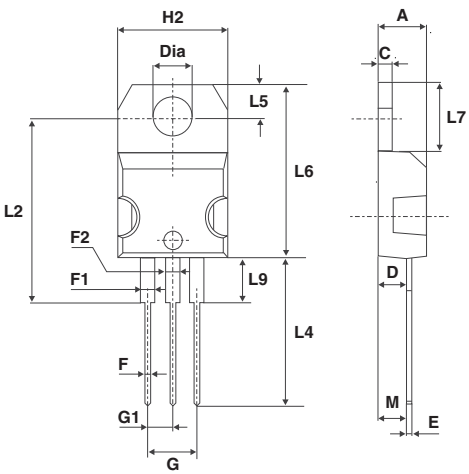


Table 7. TO-220AB dimensions



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

### 3 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH20L03CT	STTH20L03CT	TO-220AB	1.9 g	50	Tube
STTH20L03CG-TR	STTH20L03CG	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel

### 4 Revision history

Table 9. Document revision history

Date	Revision	Changes
22-Jun-2012	1	Initial release.

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