

## Automotive high efficiency ultrafast diode

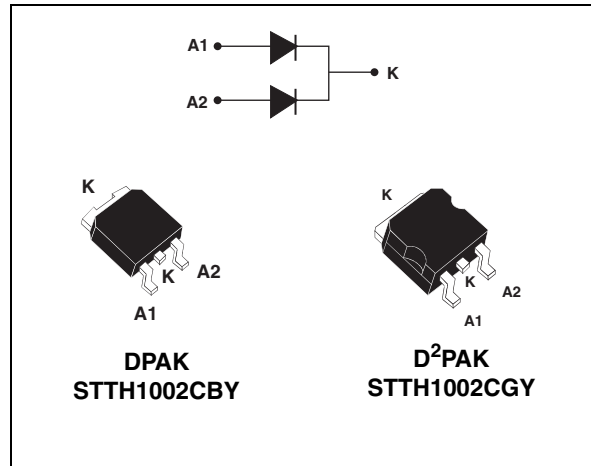
### Features

- Suited for SMPS
- Low losses
- Low forward and reverse recovery times
- High junction temperature
- Low leakage current
- AEC-Q101 qualified

### Description

Dual center tap rectifier suited for switch mode power supplies and high frequency DC to DC converters.

Packaged in DPAK and D<sup>2</sup>PAK, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection for automotive applications.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	Up to 2 x 8 A
$V_{RRM}$	200 V
$T_j$ (max)	175 °C
$V_F$ (typ)	0.78 V
$t_{rr}$ (typ)	20 ns

# 1 Characteristics

**Table 2. Absolute ratings (limiting values, per diode)**

Symbol	Parameter		Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage		200	V	
$I_{F(RMS)}$	Forward rms current	D <sup>2</sup> PAK	20	A	
		DPAK	10		
$I_{F(AV)}$	Average forward current $\delta = 0.5$	$T_c = 155\text{ }^\circ\text{C}$	Per diode	5	A
		$T_c = 150\text{ }^\circ\text{C}$	Per device	10	
		$T_c = 135\text{ }^\circ\text{C}$	Per diode	8	
		$T_c = 125\text{ }^\circ\text{C}$	Per device	16	
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal	50	A	
$T_{stg}$	Storage temperature range		-65 to + 175	$^\circ\text{C}$	
$T_j$	Operating junction temperature range		-40 to + 175	$^\circ\text{C}$	

**Table 3. Thermal parameters**

Symbol	Parameter		Value (max)	Unit
$R_{th(j-c)}$	Junction to case	Per diode	4.0	$^\circ\text{C/W}$
		Per device	2.5	
$R_{th(j-c)}$	Coupling		1.0	

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 (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^\circ\text{C}$	$V_R = V_{RRM}$			5	$\mu\text{A}$
		$T_j = 125\text{ }^\circ\text{C}$			3	40	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 5\text{ A}$			1.1	V
		$T_j = 25\text{ }^\circ\text{C}$	$I_F = 10\text{ A}$			1.25	
		$T_j = 150\text{ }^\circ\text{C}$	$I_F = 5\text{ A}$		0.78	0.89	
		$T_j = 150\text{ }^\circ\text{C}$	$I_F = 10\text{ A}$			1.05	

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

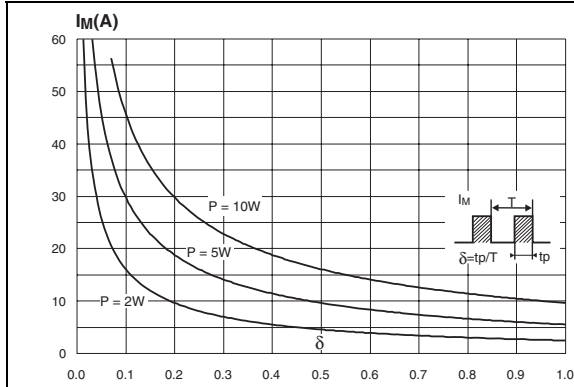
To evaluate the conduction losses use the following equation:

$$P = 0.73 \times I_{F(AV)} + 0.032 I_{F(RMS)}^2$$

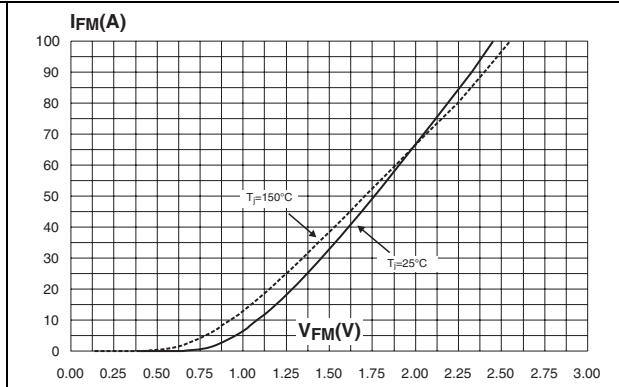
Table 5. Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ °C}$	$I_F = 1\text{ A}$ $V_R = 30\text{ V}$ $di_F/dt = 100\text{ A}/\mu\text{s}$		20	25	ns
$I_{RM}$	Reverse recovery current	$T_j = 125\text{ °C}$	$I_F = 5\text{ A}$ $V_R = 160\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$		5.9	7.6	A
$t_{fr}$	Forward recovery time	$T_j = 25\text{ °C}$	$I_F = 5\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$			110	ns
$V_{FP}$	Forward recovery voltage	$T_j = 25\text{ °C}$	$I_F = 5\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$		2.4		V

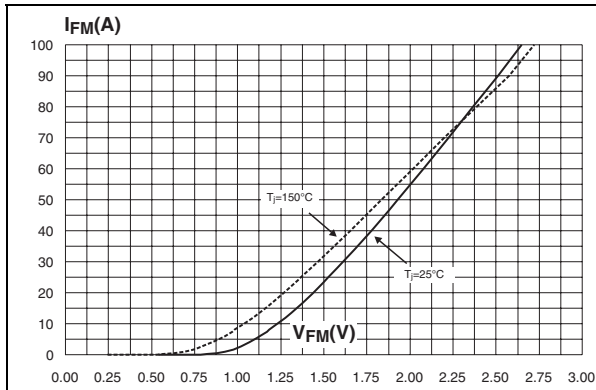
**Figure 1. Peak current versus duty cycle (per diode)**



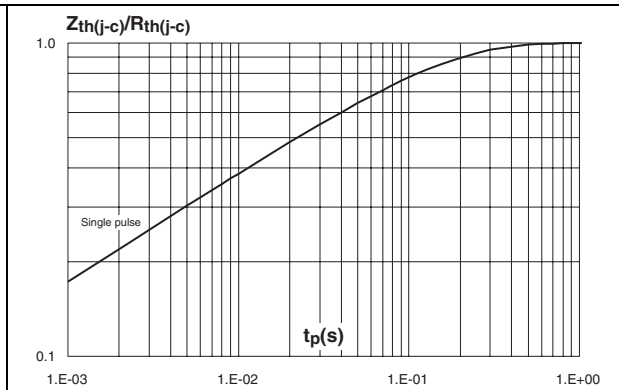
**Figure 2. Forward voltage drop versus forward current (typical values, per diode)**



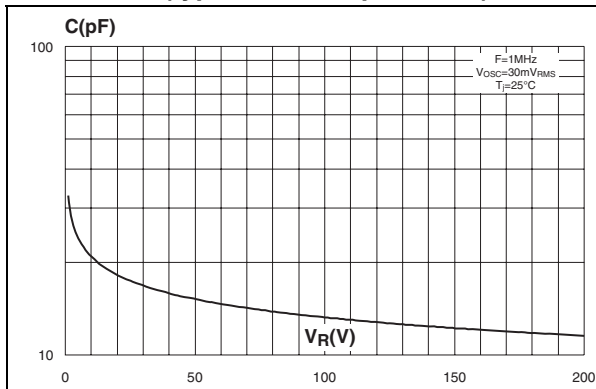
**Figure 3. Forward voltage drop versus forward current (maximum values, per diode)**



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



**Figure 5. Junction capacitance versus reverse voltage applied (typical values, per diode)**



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

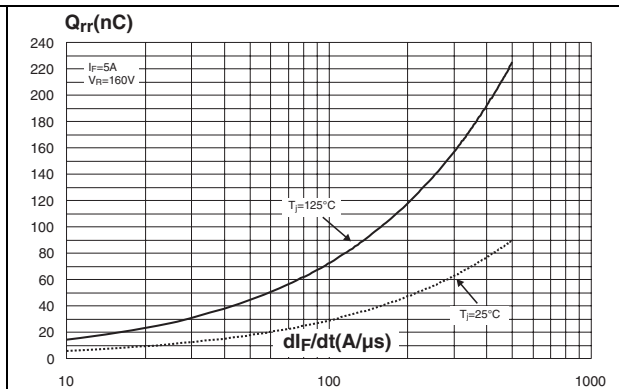


Figure 7. Reverse recovery time versus  $di_F/dt$  (typical values, per diode)

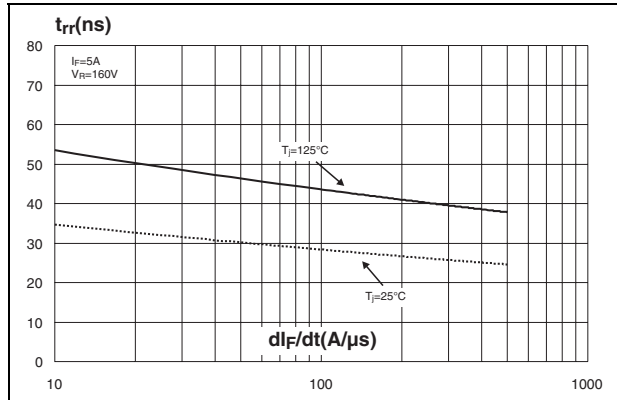


Figure 8. Peak reverse recovery current versus  $di_F/dt$  (typical values, per diode)

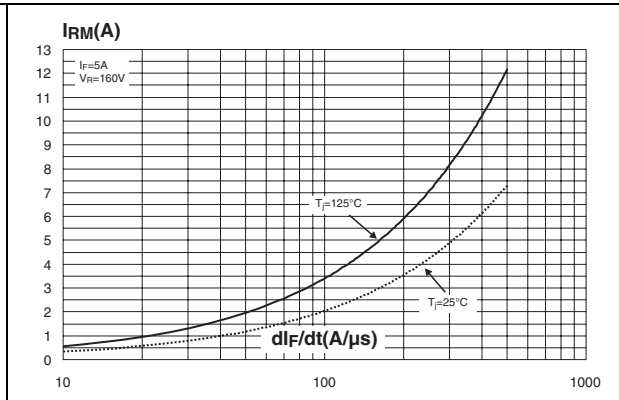


Figure 9. Dynamic parameters versus junction temperature

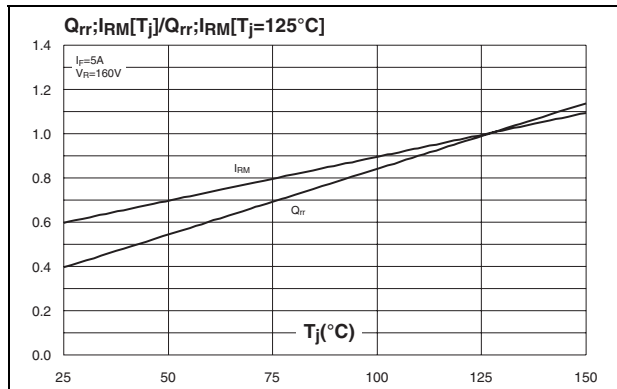


Figure 10. Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK

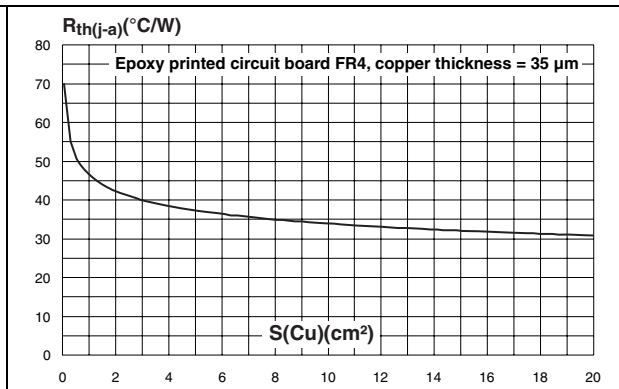
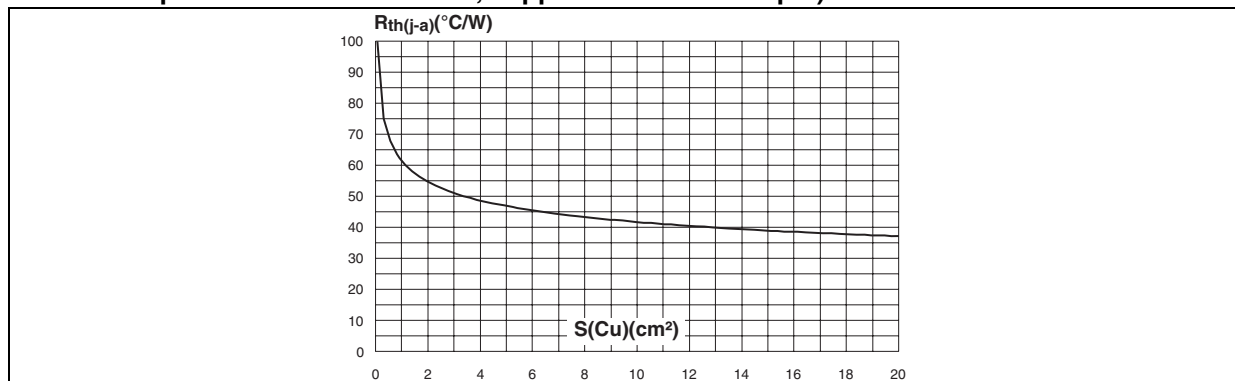


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, copper thickness = 35 µm) for DPAK



## 2 Package mechanical data

- Epoxy meets UL94, V0
- Cooling method: by conduction (method C)

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. DPAK dimensions**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.40	0.086	0.094
A1	0.90	1.10	0.035	0.043
A2	0.03	0.23	0.001	0.009
B	0.64	0.90	0.025	0.035
B2	5.20	5.40	0.204	0.212
C	0.45	0.60	0.017	0.023
C2	0.48	0.60	0.018	0.023
D	6.00	6.20	0.236	0.244
E	6.40	6.60	0.251	0.259
G	4.40	4.60	0.173	0.181
H	9.35	10.10	0.368	0.397
L2	0.80 typ.		0.031 typ.	
L4	0.60	1.00	0.023	0.039
V2	0°	8°	0°	8°

**Figure 12. Footprint (dimensions in mm)**

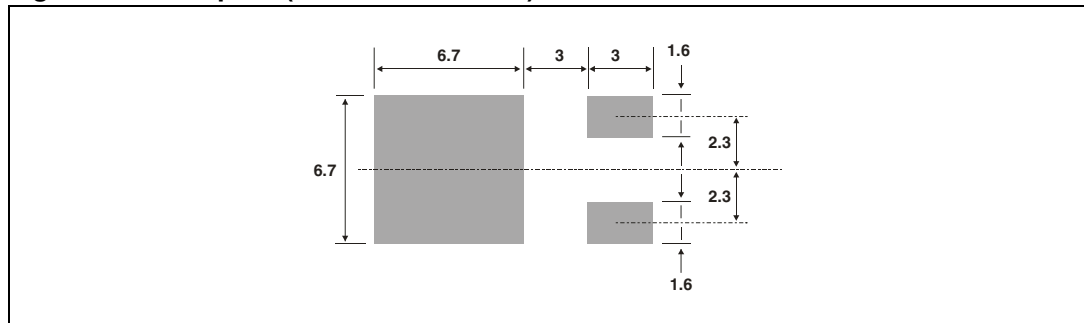
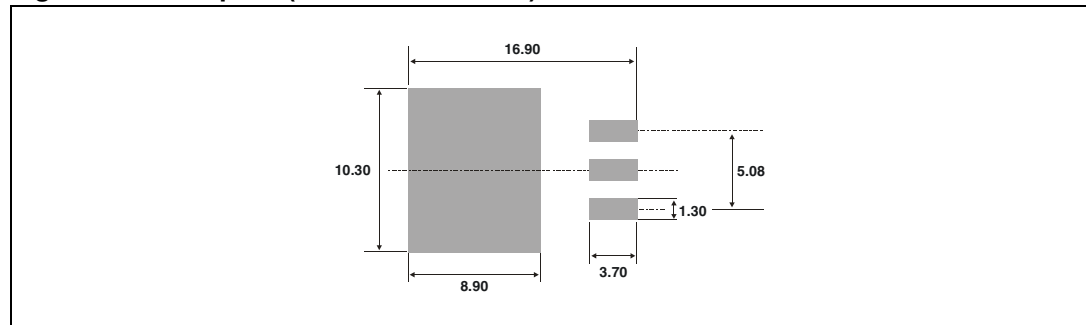


Table 7. D<sup>2</sup>PAK dimensions

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)



### 3 Ordering information

**Table 8. Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH1002CBY-TR	STTH1002CY	DPAK	0.3 g	2500	Tape and reel
STTH1002CGY-TR	STTH1002CGY	D <sup>2</sup> PAK	1.48 g	1000	

### 4 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
21-Oct-2010	1	First issue.
03-Nov-2011	2	Updated <a href="#">Table 7</a> and <a href="#">Table 8</a> .



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