

## Automotive ultrafast recovery - high voltage diode

Datasheet – production data

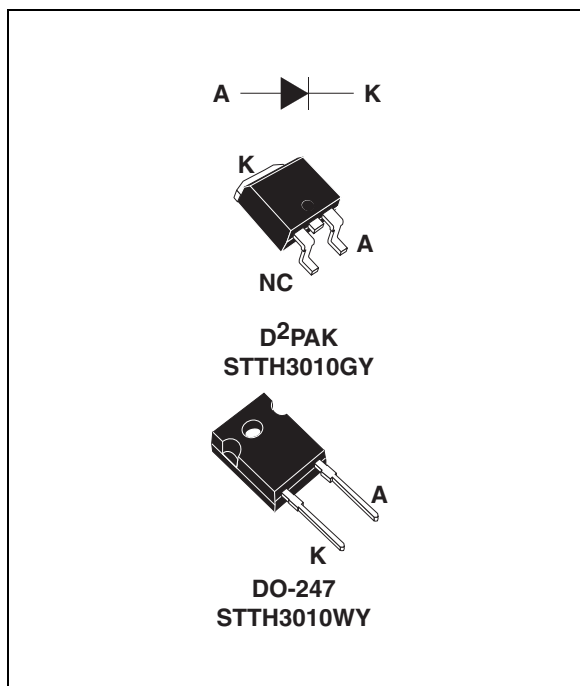
### Features

- AEC-Q101 qualified
- Ultrafast soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- ECOPACK<sup>®</sup>2 compliant component (STTH3010WY)

### Description

The high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability like automotive applications.

The improved performance in low leakage current, and therefore thermal runaway guard band, is an immediate competitive advantage for this device.



**Table 1. Device summary**

$I_{F(AV)}$	30 A
$V_{RRM}$	1000 V
$T_j$	175 °C
$V_F$ (typ)	1.30 V
$t_{rr}$ (typ)	42 ns

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		1000	V
$I_{F(RMS)}$	Forward rms current		50	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	DO-247	30	A
		D <sup>2</sup> PAK		
$I_{FRM}$	Repetitive peak forward current	$t_p = 5 \mu s, F = 5 \text{ kHz square}$	300	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10 \text{ ms Sinusoidal}$	180	A
$T_{stg}$	Storage temperature range		-65 to +175	°C
$T_j$	Operating junction temperature range		-40 to +175	°C

**Table 3. Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	DO-247	1.1	°C/W
		D <sup>2</sup> PAK		

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25 \text{ °C}$	$V_R = V_{RRM}$			15	$\mu A$
		$T_j = 125 \text{ °C}$			10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25 \text{ °C}$	$I_F = 30 \text{ A}$			2	V
		$T_j = 100 \text{ °C}$			1.4	1.8	
		$T_j = 150 \text{ °C}$			1.3	1.7	

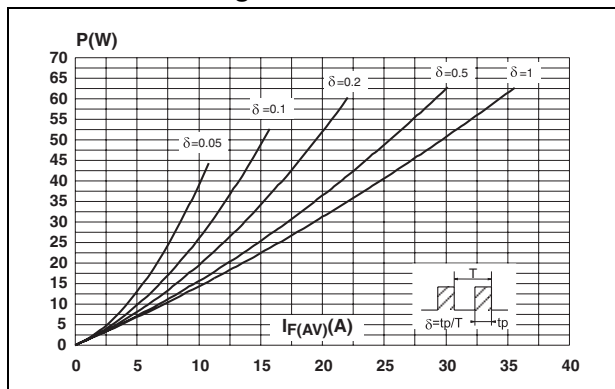
1. Pulse test:  $t_p = 5 \text{ ms}, \delta < 2\%$
2. Pulse test:  $t_p = 380 \mu s, \delta < 2\%$

To evaluate the conduction losses use the following equation:  
 $P = 1.3 \times I_{F(AV)} + 0.013 I_{F(RMS)}^2$

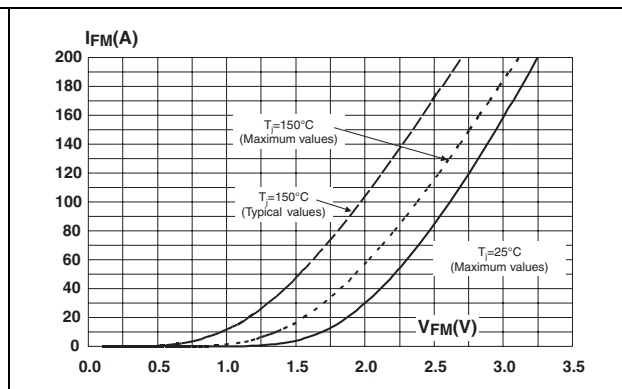
**Table 5. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$			100	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$		53	70	
		$I_F = 1\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$		42	55	
$I_{RM}$	Reverse recovery current	$I_F = 30\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$		24	32	A
S	Softness factor	$I_F = 30\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 600\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$		1		
$t_{fr}$	Forward recovery time	$I_F = 30\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \times V_{Fmax}$ , $T_j = 25\text{ }^\circ\text{C}$			450	ns
$V_{FP}$	Forward recovery voltage	$I_F = 30\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 25\text{ }^\circ\text{C}$		5		V

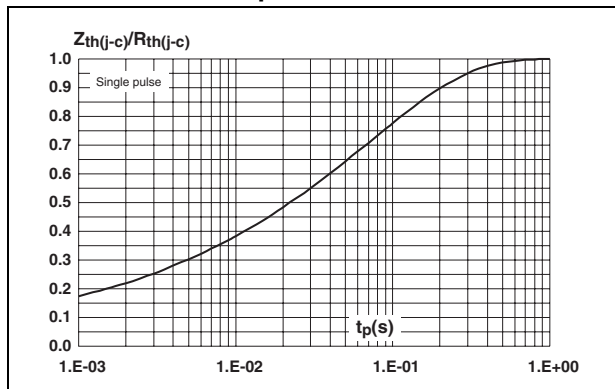
**Figure 1. Conduction losses versus average current**



**Figure 2. Forward voltage drop versus forward current**



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



**Figure 4. Peak reverse recovery current versus di\_F/dt (typical values)**

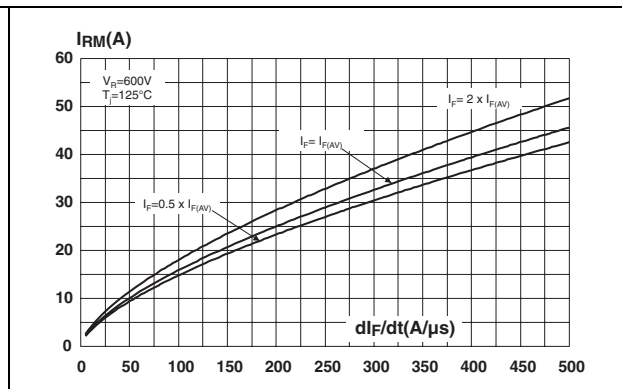


Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)

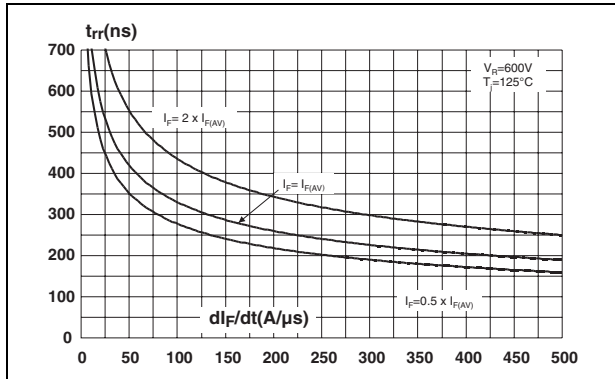


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)

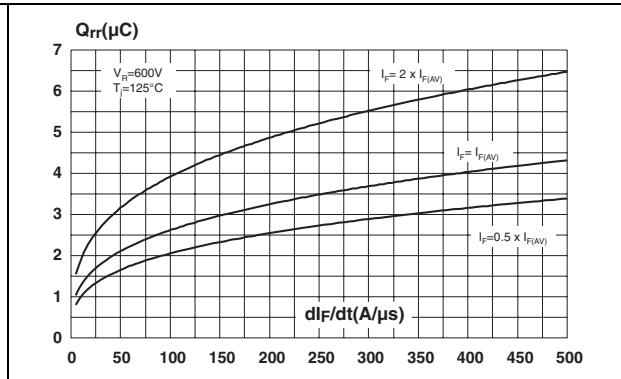


Figure 7. Softness factor versus  $di_F/dt$  (typical values)

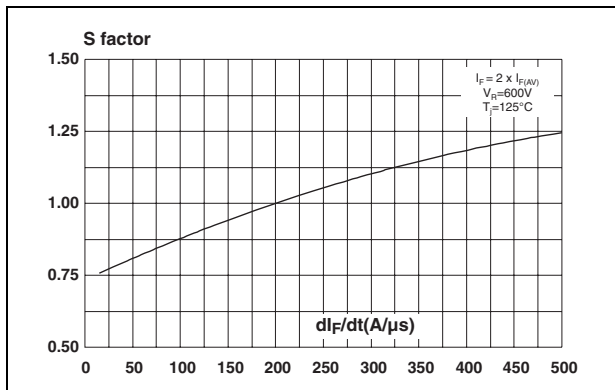
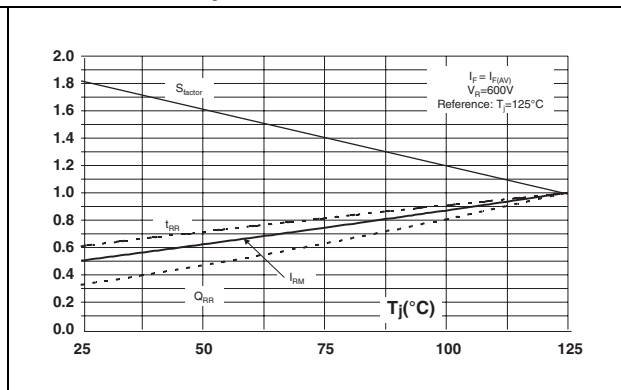
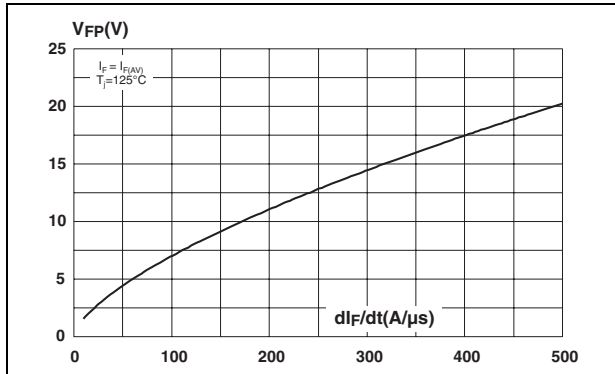


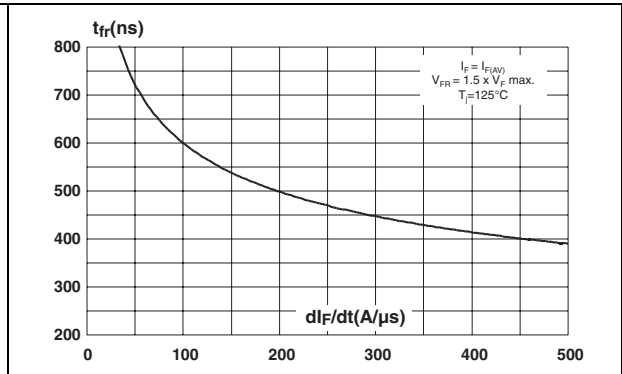
Figure 8. Relative variations of dynamic parameters versus junction temperature



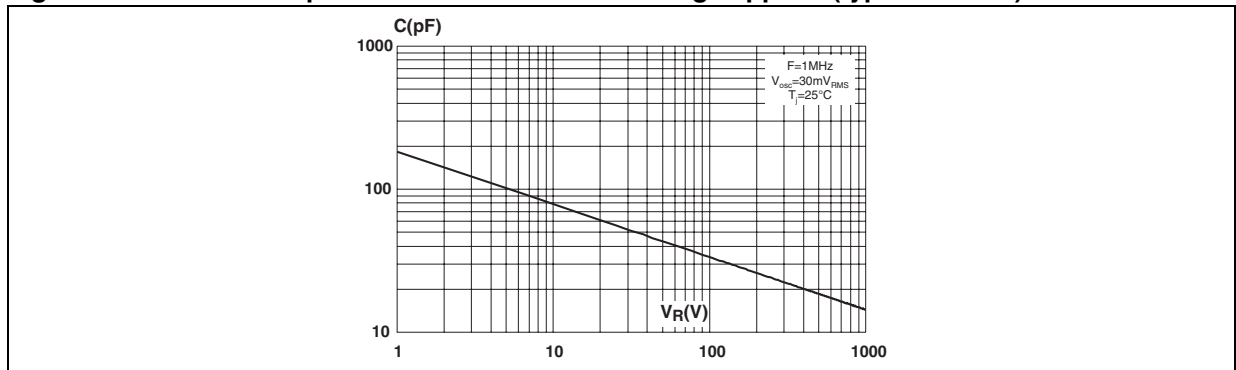
**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



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



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



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.80 N·m (DO-247)
- Maximum torque value: 1.0 N·m (DO-247)

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. DO-247 dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.		Max	Min.		Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
L4		34.60			1.362	
L5		5.50			0.216	
M	2.00		3.00	0.078		0.118
V		5°			5°	
V2		60°			60°	
Dia.	3.55		3.65	0.139		0.143

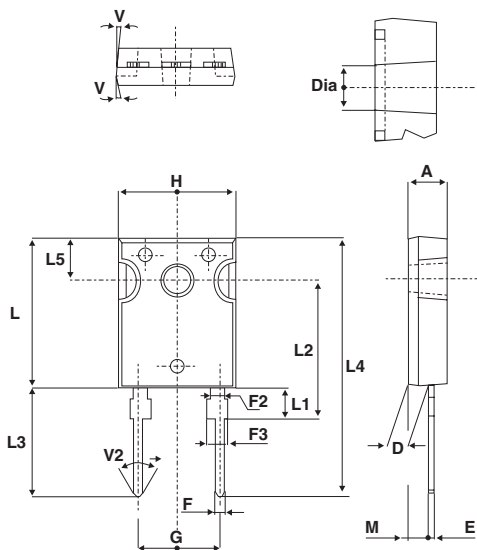
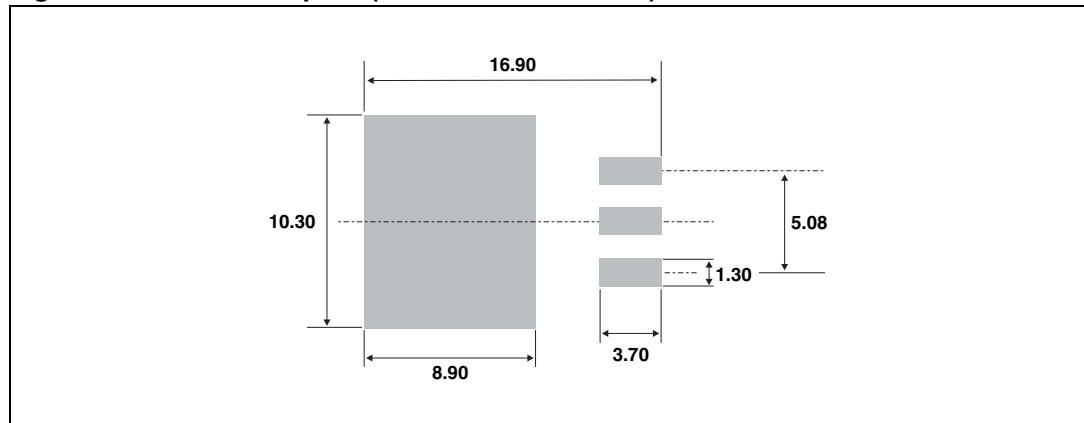


Table 7. D<sup>2</sup>PAK dimensions

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 12. D<sup>2</sup>PAK footprint (all dimensions in mm)



### 3 Ordering information

**Table 8. Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH3010WY	STTH3010WY	DO-247	4.4 g	30	Tube
STTH3010GY-TR	STTH3010GY	D <sup>2</sup> PAK	1.49 g	1000	Tape and reel

### 4 Revision history

**Table 9. Document revision history**

Date	Revision	Description of Changes
28-Jun-2012	1	First issue.

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