

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®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.

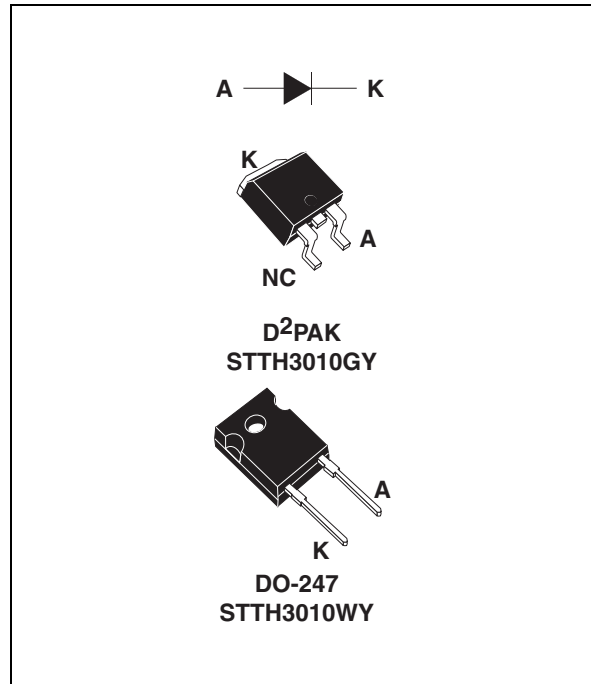


Table 1. Device summary

$I_{F(AV)}$	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, δ = 0.5	DO-247	T _c = 105 °C	30	A
		D ² PAK	T _c = 105 °C		
I _{FRM}	Repetitive peak forward current	t _p = 5 μs, F = 5 kHz square		300	A
I _{FSM}	Surge non repetitive forward current	t _p = 10 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 ² 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	μA
		$T_j = 125\text{ °C}$			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: $t_p = 380\text{ }\mu\text{s}$, $\delta < 2\%$

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

Figure 1. Conduction losses versus average current

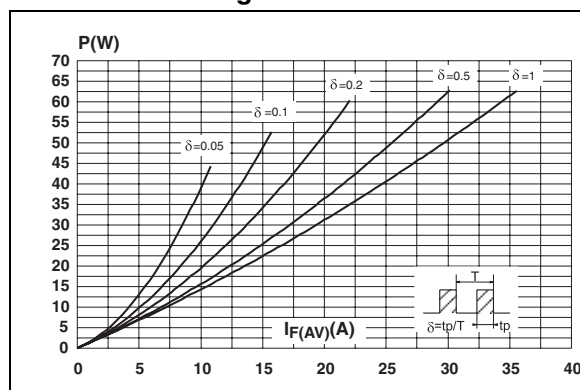


Figure 2. Forward voltage drop versus forward current

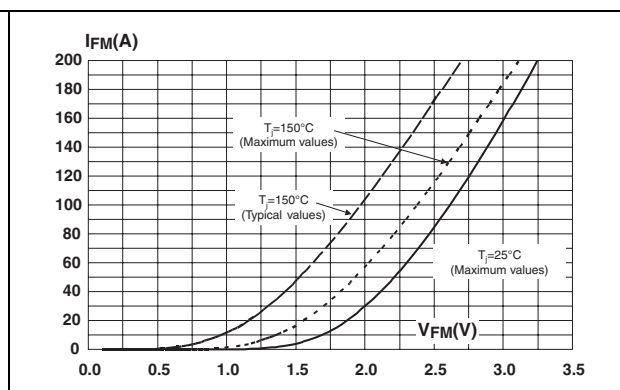


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

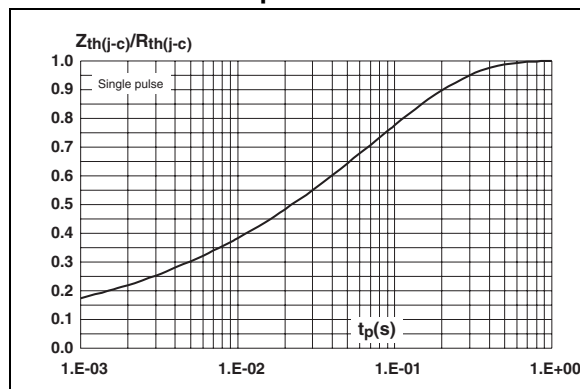
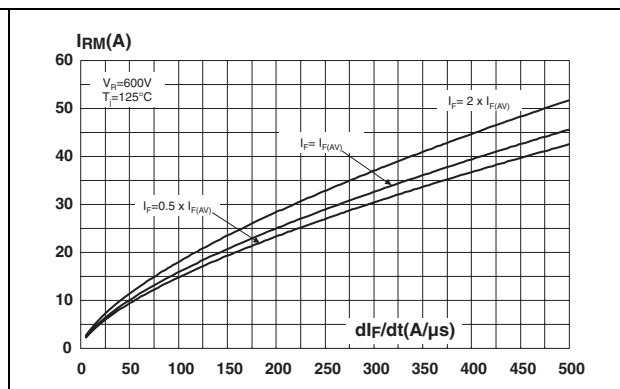
Figure 4. Peak reverse recovery current versus dl_F/dt (typical values)

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

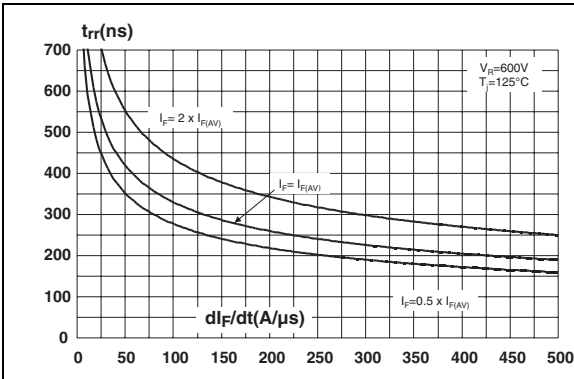


Figure 6. Reverse recovery charges versus di_F/dt (typical values)

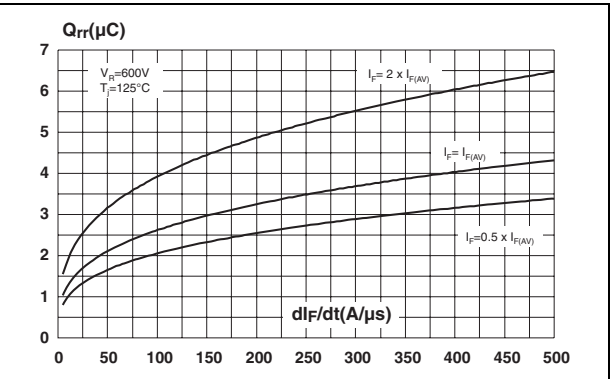


Figure 7. Softness factor versus di_F/dt (typical values)

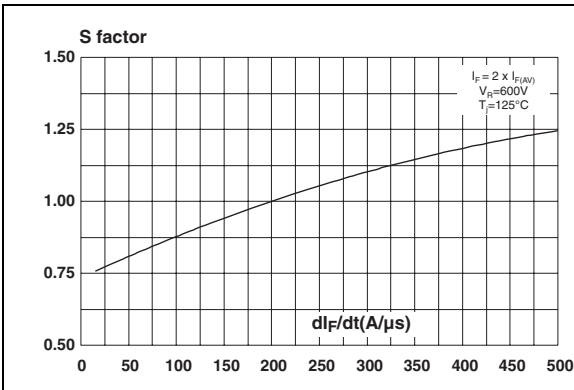


Figure 8. Relative variations of dynamic parameters versus junction temperature

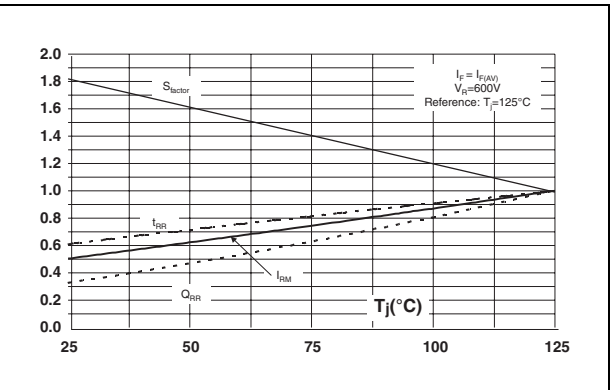


Figure 9. Transient peak forward voltage versus di_F/dt (typical values)

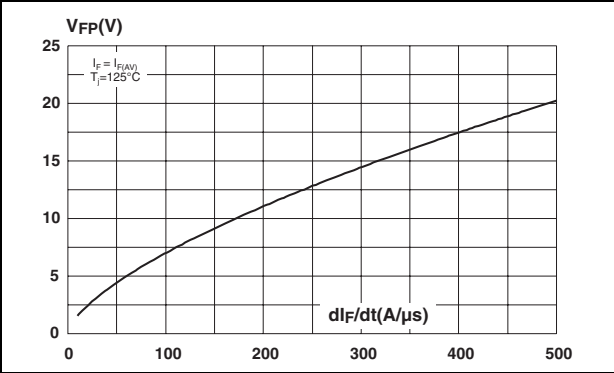


Figure 10. Forward recovery time versus di_F/dt (typical values)

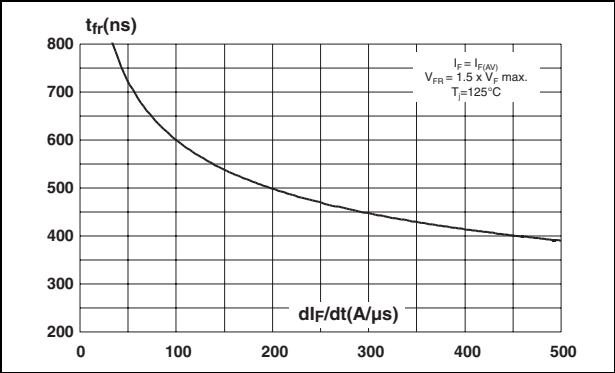
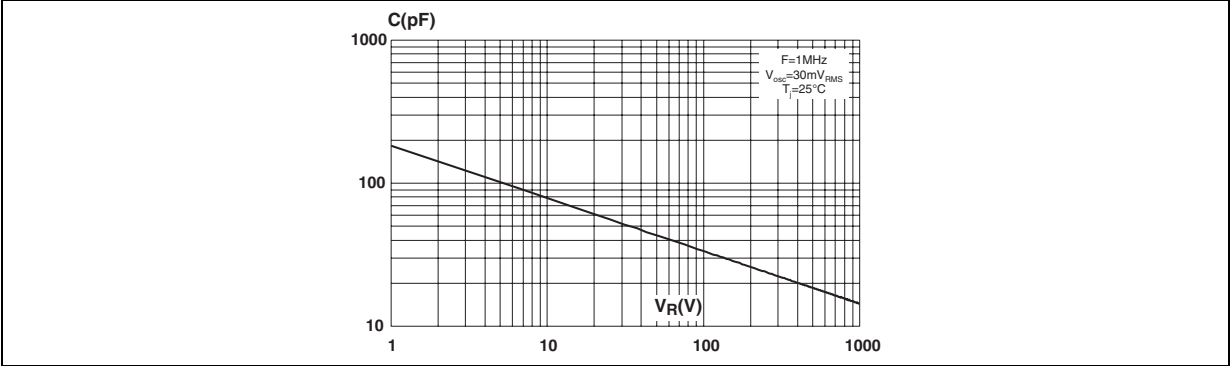


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



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. 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. D²PAK dimensions

Technical drawing of a 1/2" NPT x 1/2" NPT Tee. The drawing includes a top view, a side view, and a detail view of the branch connection. Dimensions are labeled as follows:

- Top View:** L (Overall Length), L2 (Distance from end to branch center), L3 (Distance from branch center to end), E (Branch Width), G (Branch Length), B (Branch Thickness), B2 (Branch Width).
- Side View:** A (Overall Height), C2 (Distance from top to branch center), D (Distance from branch center to bottom), R (Radius of branch connection).
- Detail View:** A1 (Distance from branch center to end), A2 (Distance from branch center to end), V2 (Angle of branch connection), 2mm min. FLAT ZONE (Flat zone on branch connection).

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. D²PAK footprint (all dimensions in mm)

Technical drawing showing a stepped profile with dimensions:

- Overall width: 16.90
- Overall height: 10.30
- Width of the first step: 8.90
- Width of the second step: 3.70
- Height of the second step: 1.30
- Height of the third step: 5.08

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 ² 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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