

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 high pulsed current operation
- High reverse voltage capability
- High junction temperature

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.

These diodes also fit into auxiliary functions such as snubber, bootstrap, and demagnetization applications.

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

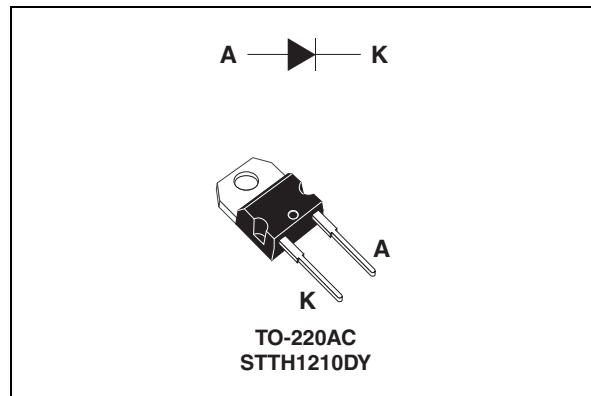


Table 1. Device summary

$I_{F(AV)}$	12 A
V_{RRM}	1000 V
T_j	175 °C
V_F (typ)	1.30 V
t_{rr} (typ)	48 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	30	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 125\text{ °C}$ 12	A
I_{FRM}	Repetitive peak forward current	$t_p = 5\ \mu\text{s}$, $F = 5\ \text{kHz}$ square	120 A
I_{FSM}	Surge non repetitive forward current	$t_p = 10\ \text{ms}$ Sinusoidal	80 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	1.9	°C/W

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$		10	μA
		$T_j = 125\text{ °C}$		3	30	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 12\ \text{A}$		2.0	V
		$T_j = 100\text{ °C}$		1.40	1.8	
		$T_j = 150\text{ °C}$		1.30	1.7	

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

To evaluate the conduction losses use the following equation:

$$P = 1.3 \times I_{F(AV)} + 0.033 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
t_{rr}	Reverse recovery time	$I_F = 1 \text{ A}$, $di_F/dt = -50 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$, $T_j = 25 \text{ }^\circ\text{C}$		67	90	ns
		$I_F = 1 \text{ A}$, $di_F/dt = -100 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$, $T_j = 25 \text{ }^\circ\text{C}$		48	65	
I_{RM}	Reverse recovery current	$I_F = 12 \text{ A}$, $di_F/dt = -200 \text{ A}/\mu\text{s}$, $V_R = 600 \text{ V}$, $T_j = 125 \text{ }^\circ\text{C}$		15	20	A
S	Softness factor	$I_F = 12 \text{ A}$, $di_F/dt = -200 \text{ A}/\mu\text{s}$, $V_R = 600 \text{ V}$, $T_j = 125 \text{ }^\circ\text{C}$		2		
t_{fr}	Forward recovery time	$I_F = 12 \text{ A}$, $di_F/dt = 50 \text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \times V_{Fmax}$, $T_j = 25 \text{ }^\circ\text{C}$			400	ns
V_{FP}	Forward recovery voltage	$I_F = 12 \text{ A}$, $di_F/dt = 50 \text{ A}/\mu\text{s}$, $T_j = 25 \text{ }^\circ\text{C}$		5		V

Figure 1. Conduction losses versus average current

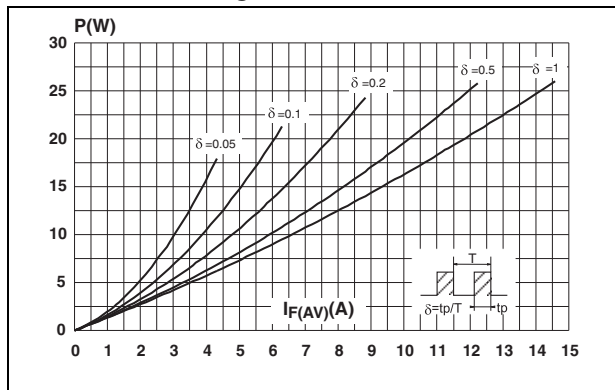


Figure 2. Forward voltage drop versus forward current

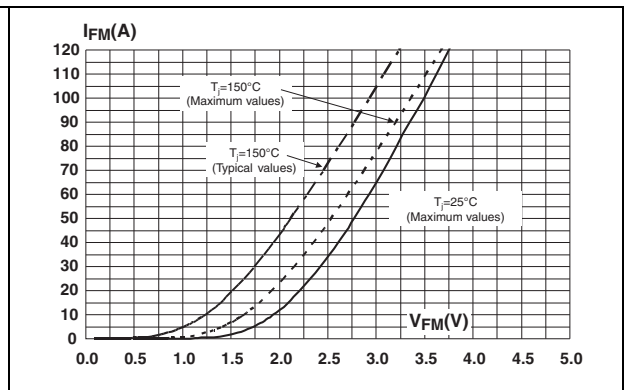


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

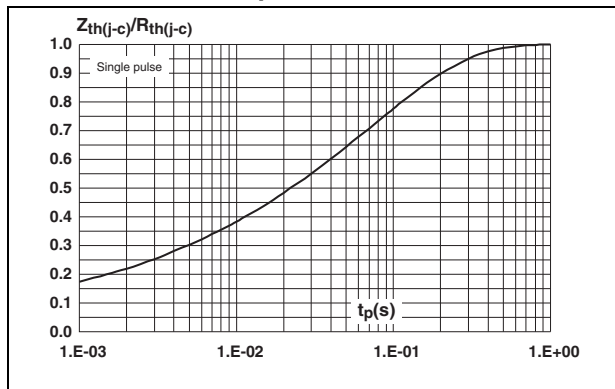


Figure 4. Peak reverse recovery current versus di_F/dt (typical values)

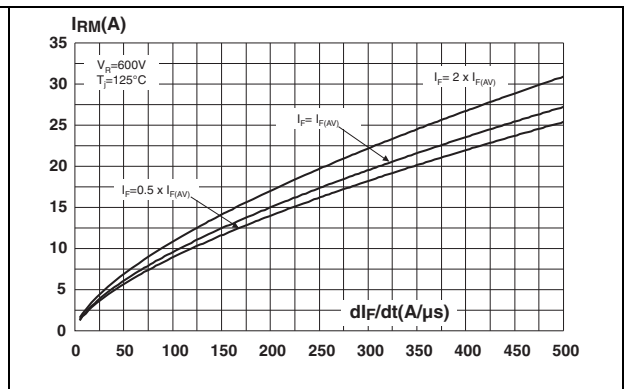


Figure 5. Reverse recovery time versus di_F/dt (typical values)

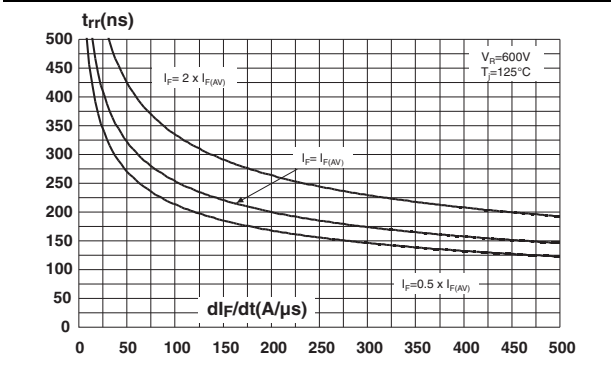


Figure 6. Reverse recovery charges versus di_F/dt (typical values)

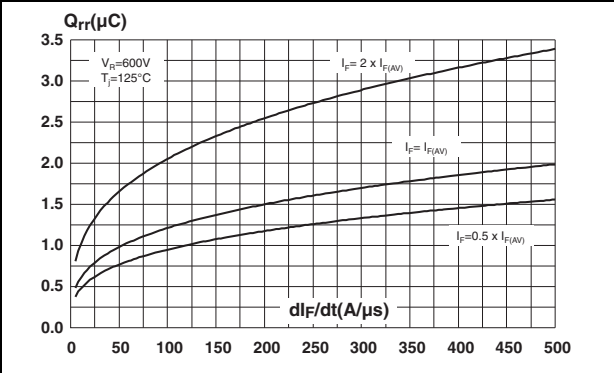


Figure 7. Softness factor versus di_F/dt (typical values)

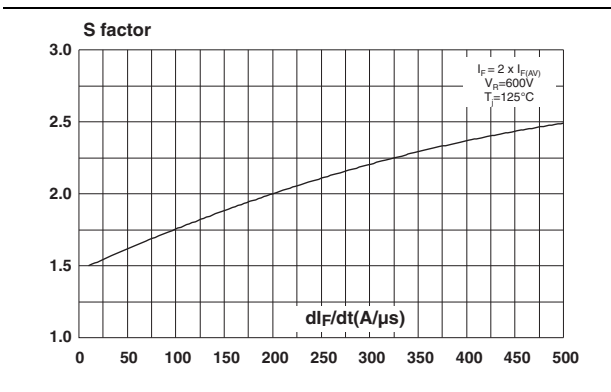


Figure 8. Relative variations of dynamic parameters versus junction temperature

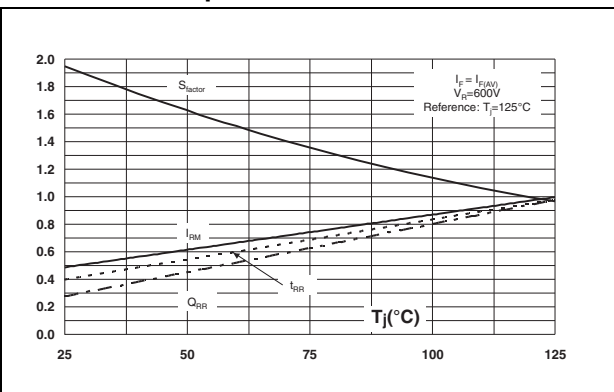


Figure 9. Transient peak forward voltage versus di_F/dt (typical values)

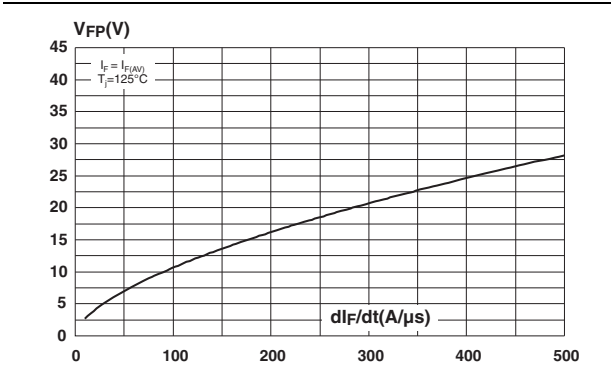


Figure 10. Forward recovery time versus di_F/dt (typical values)

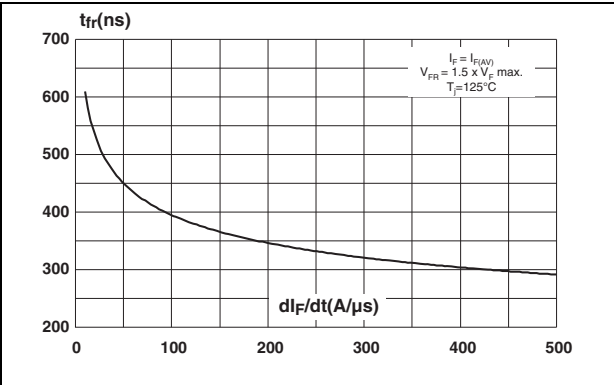
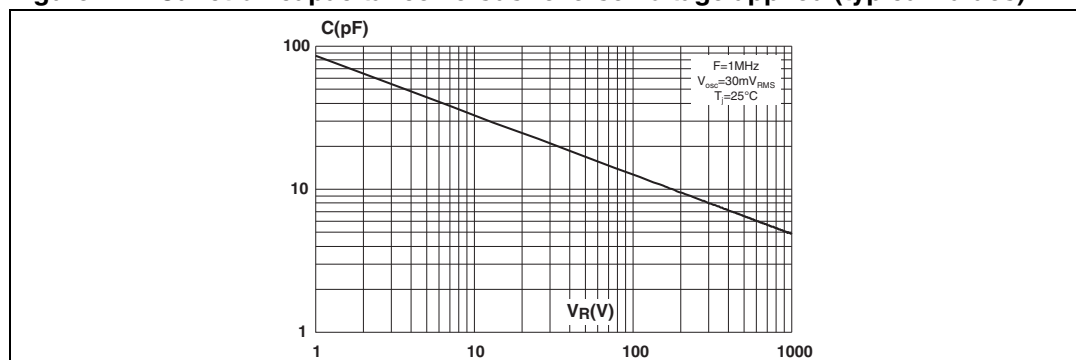


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



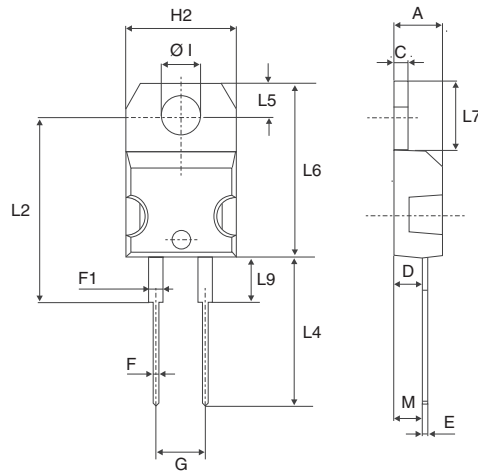
2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 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. T0-220AC 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
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	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. I	3.75	3.85	0.147	0.151



3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH1210DY	STTH1210DY	TO-220AC	1.86 g	50	Tube

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
24-Oct-2012	1	First issue.