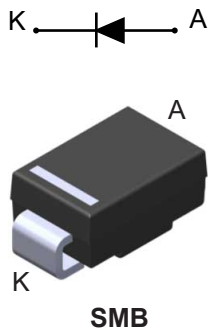



## Automotive 200 V, 2 A ultrafast recovery diode



## Features

- AEC-Q101 qualified 
- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature
- PPAP capable
- ECOPACK2 compliant

## Applications

- High frequency inverters
- Freewheeling diode
- Polarity protection
- Reverse battery protection

## Description

This 2 A, 200 V uses ST's 200 V planar Pt doping technology, and it is specially suited for switching mode base drive and transistor circuits.

Product status	
STTH2R02-Y	
Product summary	
Symbol	Value
$I_{F(AV)}$	2 A
$V_{RRM}$	200 V
$T_{j(max.)}$	175 °C
$V_F(typ.)$	0.7 V
$t_{rr}(typ.)$	15 ns

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

Symbol	Parameter	Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage ( $T_j = -40\text{ °C}$ to $+175\text{ °C}$ )	200	V
$I_{FRM}$	Repetitive peak forward current	$t_p = 5\ \mu\text{s}$ , $f = 5\ \text{kHz}$	A
$I_{F(RMS)}$	Forward rms current	60	A
$I_{F(AV)}$	Average forward current $\delta = 0.5$ , square wave	$T_L = 90\text{ °C}$	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\ \text{ms}$ sinusoidal	A
$T_{stg}$	Storage temperature range	-65 to +175	°C
$T_j$	Operating junction temperature range <sup>(1)</sup>	-40 to +175	°C

1.  $(dP_{tot}/dT_j) < (1/R_{th(j-a)})$  condition to avoid thermal runaway for a diode on its own heatsink.

**Table 2. Thermal resistance parameter**

Symbol	Parameter	Max. value	Unit
$R_{th(j-l)}$	Junction to lead	30	°C/W

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-		3	$\mu\text{A}$
		$T_j = 125\text{ °C}$		-	2	20	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 6\ \text{A}$	-		1.20	V
		$T_j = 25\text{ °C}$		-	0.89	1.00	
		$T_j = 100\text{ °C}$	$I_F = 2\ \text{A}$	-	0.76	0.85	
		$T_j = 150\text{ °C}$		-	0.70	0.80	

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:

$$P = 0.68 \times I_{F(AV)} + 0.06 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

**Table 4. Dynamic characteristics ( $T_j = 25\text{ °C}$  unless otherwise specified)**

Symbol	Parameters	Test conditions	Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	23	30	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	15	20	
$I_{RM}$	Reverse recovery current	$I_F = 2\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 160\text{ V}$ , $T_j = 125\text{ °C}$	-	3	4	A
$t_{fr}$	Forward recovery time	$I_F = 2\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.1 V_{F(max.)}$	-	40		ns
$V_{FP}$	Forward recovery voltage	$I_F = 2\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	-	2.0		V

## 1.1 Characteristics (curves)

Figure 1. Peak current versus duty cycle

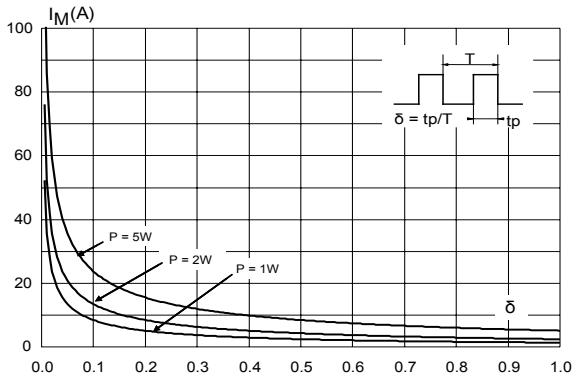


Figure 2. Average forward power dissipation versus average forward current

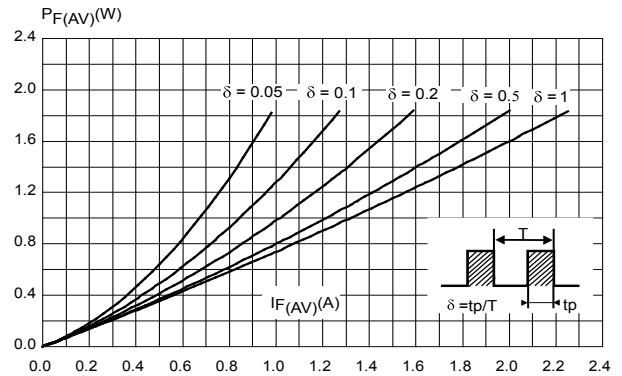


Figure 3. Forward voltage drop versus forward current (typical values)

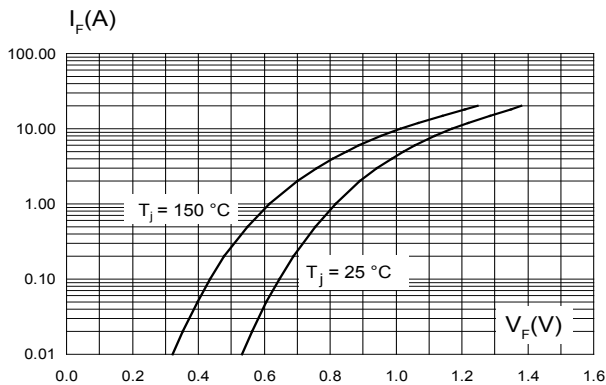


Figure 4. Forward voltage drop versus forward current (maximum values)

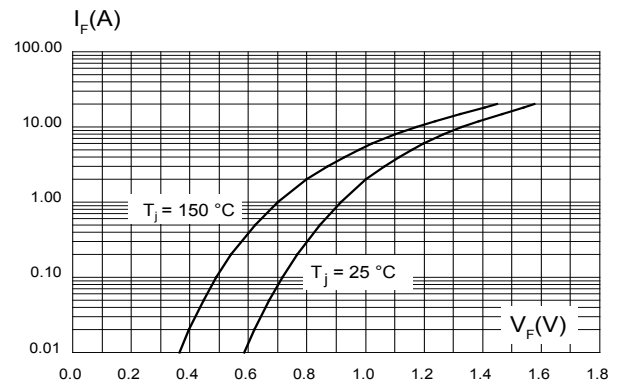


Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration (SMB)

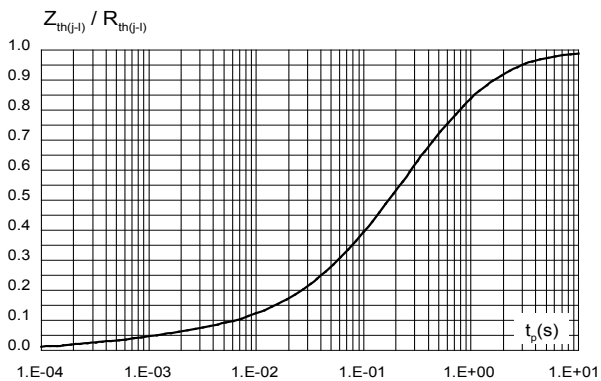


Figure 6. Junction capacitance versus reverse voltage applied (typical values)

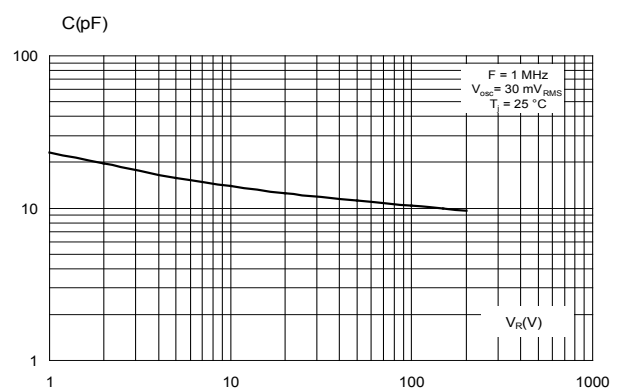


Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)

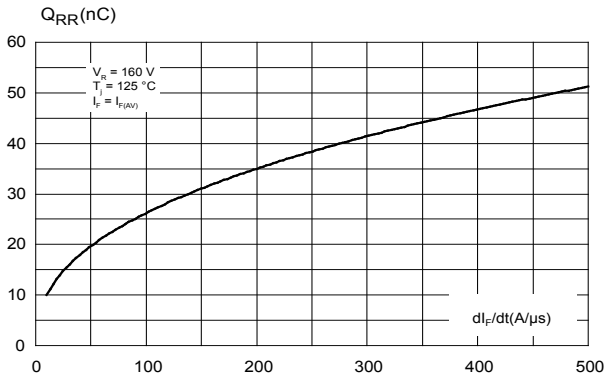


Figure 8. Reverse recovery time versus  $di_F/dt$  (typical values)

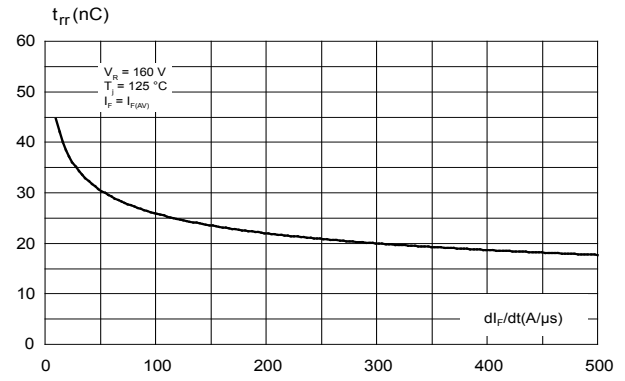


Figure 9. Peak reverse recovery current versus  $di_F/dt$  (typical values)

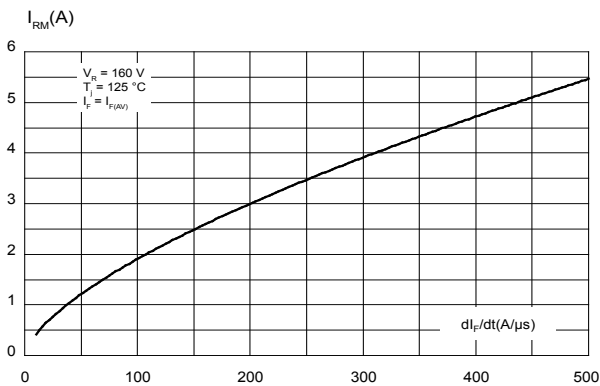


Figure 10. Relative variations of dynamic parameters versus junction temperature

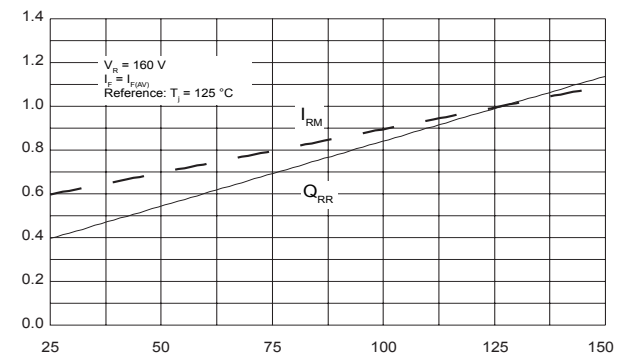
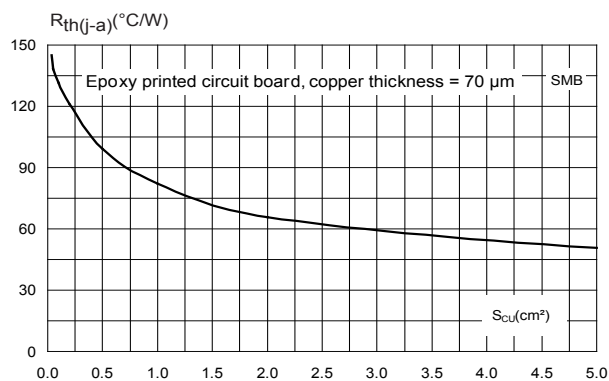


Figure 11. Thermal resistance junction to ambient versus copper surface under each lead (typical values)



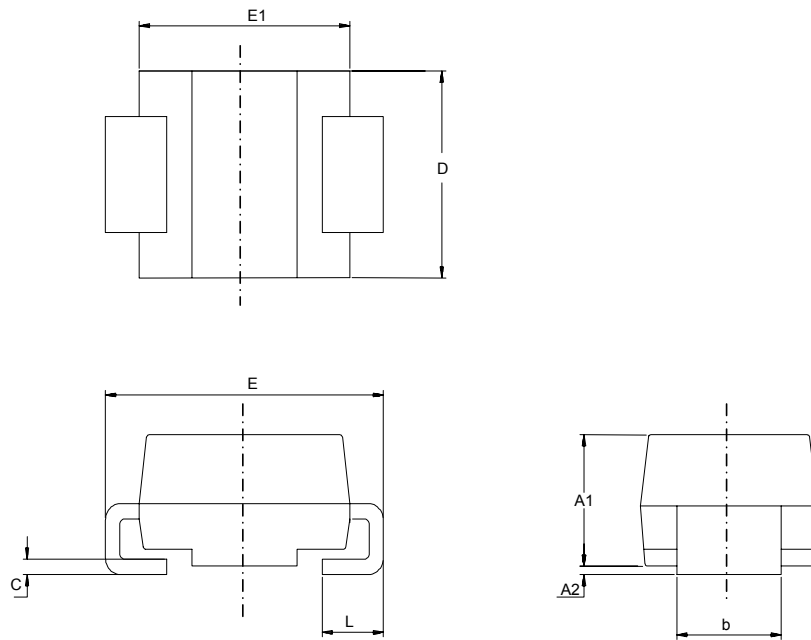
## 2 Package information

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.

### 2.1 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

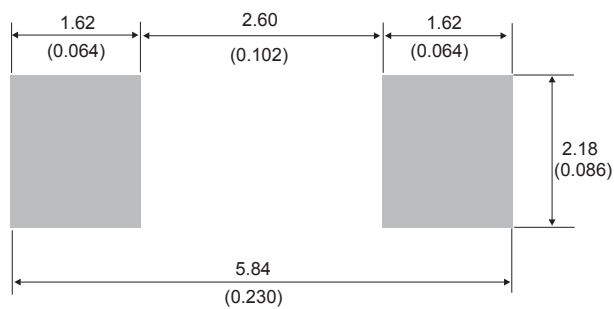
**Figure 12. SMB package outline**



**Table 5. SMB package mechanical data**

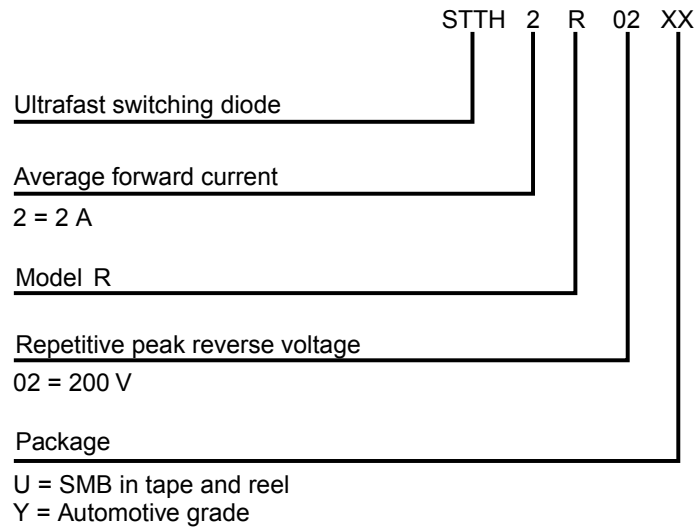
Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.097
A2	0.05	0.20	0.001	0.008
b	1.95	2.20	0.076	0.087
c	0.15	0.40	0.005	0.016
D	3.30	3.95	0.129	0.156
E	5.10	5.60	0.200	0.221
E1	4.05	4.60	0.159	0.182
L	0.75	1.50	0.029	0.060

**Figure 13. SMB recommended footprint**



### 3 Ordering information

**Figure 14. Ordering information scheme**



**Table 6. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH2R02UY	R2UY	SMB	0.110 g	2500	Tape and reel



## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
20-Oct-2010	1	First issue.
02-Feb-2017	2	Updated Figure 4: "Relative variation of thermal impedance junction to case versus pulse duration".
10-Jul-2020	3	Updated <a href="#">Section 1.1 Characteristics (curves)</a> and added <a href="#">Section Applications</a> . Minor text changes.

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