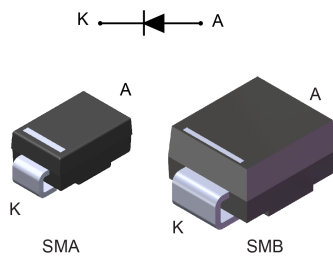


## 200 V - 2 A ultrafast recovery diode



### Features

- Very low conduction losses
- Negligible switching losses
- Low forward voltage drop
- High junction temperature
- ECOPACK<sup>®</sup>2 compliant

### Applications

- Switching diode
- LED Lighting
- Auxiliary power supply
- Flyback diode

### Description

The **STTH2R02** uses ST's patented 200 V planar Pt doping technology, and it is specially suited for switching mode base drive and transistor circuits.

Packaged in SMA, SMB, the **STTH2R02** is optimized for use low voltage, high frequency inverters, free wheeling and polarity protection

Product status	
STTH2R02	
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		200	V	
$I_{F(AV)}$	Average forward current $\delta = 0.5$ , square wave	SMA $T_L = 90\text{ °C}$	2	A	
		SMB $T_L = 90\text{ °C}$			
$I_{FSM}$	Surge non repetitive forward current		$t_p = 10\text{ ms}$ sinusoidal	75	A
$T_{stg}$	Storage temperature range		-65 to +175	°C	
$T_j$	Operating junction temperature		+175	°C	

**Table 2. Thermal resistance parameter**

Symbol	Parameter		Max. value	Unit
$R_{th(j-l)}$	Junction to lead	SMA / SMB	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
		$T_j = 25\text{ °C}$	$I_F = 2\text{ A}$	-	0.89	1.00	
		$T_j = 100\text{ °C}$		-	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:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

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

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

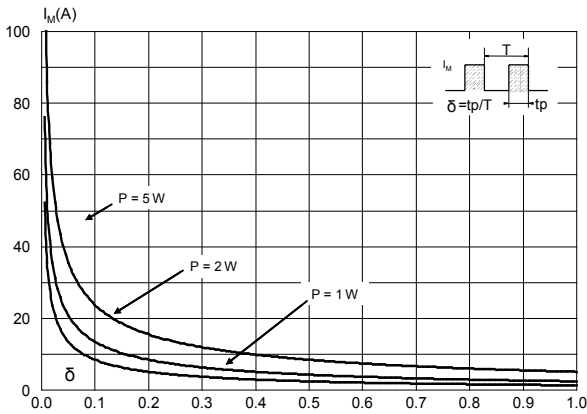


Figure 2. Forward voltage drop versus forward current (typical values)

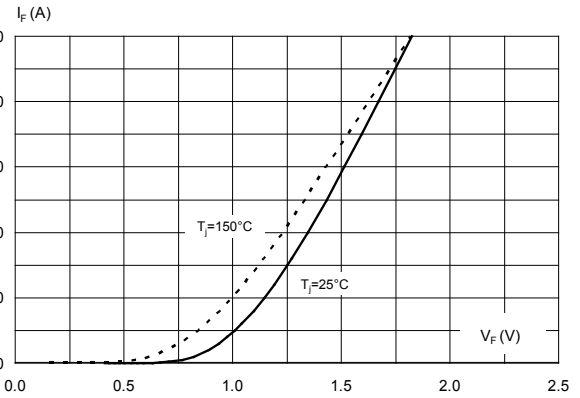


Figure 3. Forward voltage drop versus forward current (maximum values)

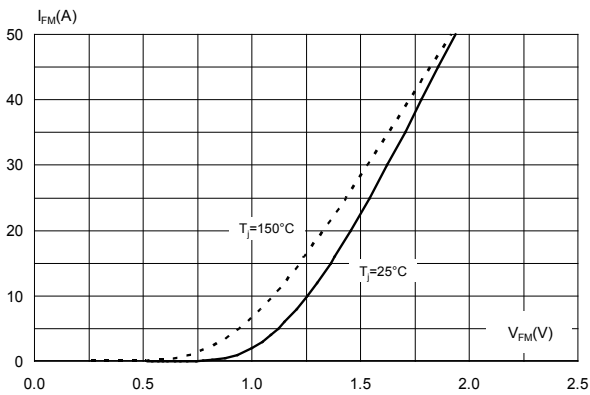
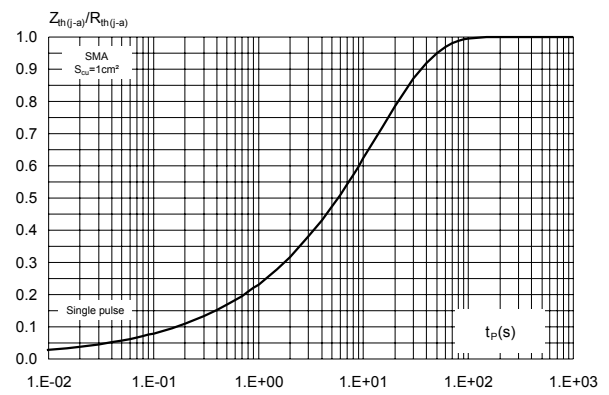
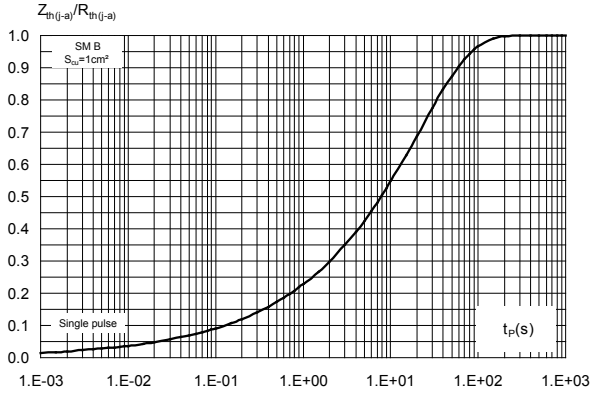


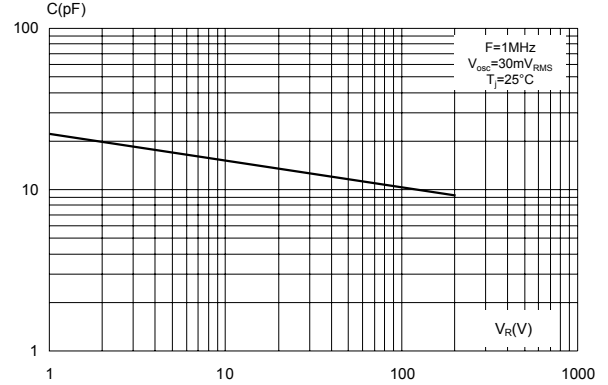
Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (SMA)



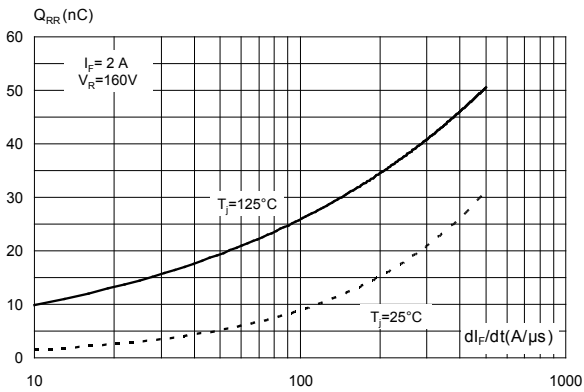
**Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration (SMB)**



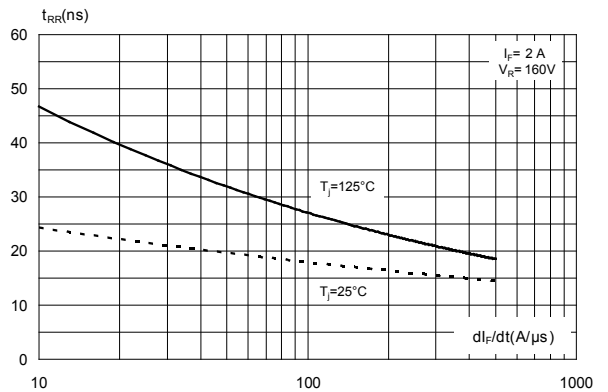
**Figure 6. Junction capacitance versus reverse voltage applied (typical values)**



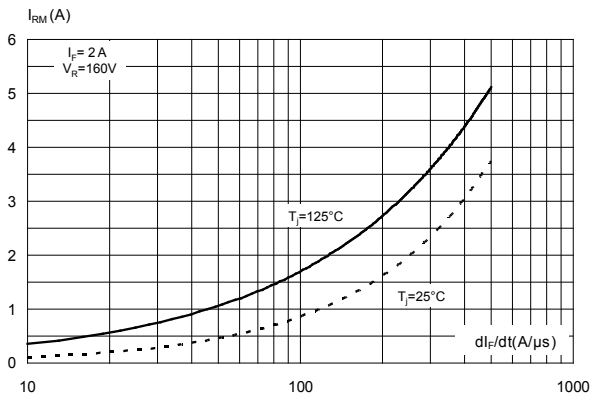
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)**



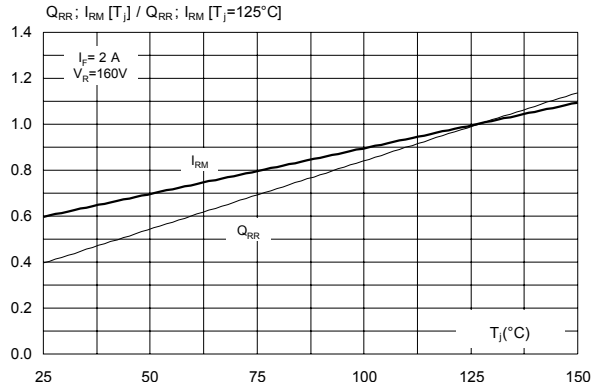
**Figure 8. Reverse recovery time versus  $di_F/dt$  (typical values)**



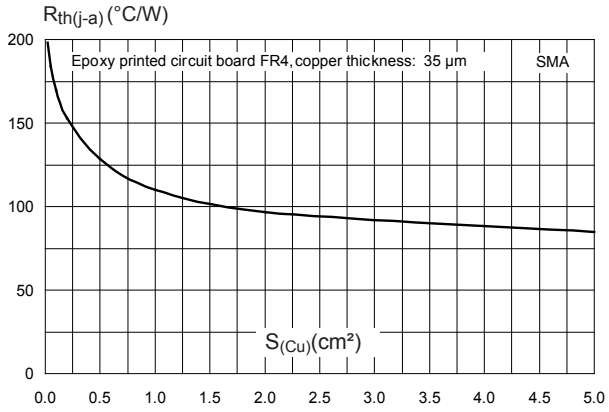
**Figure 9. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



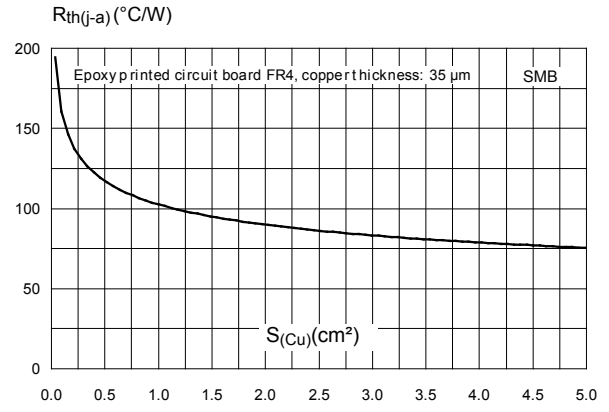
**Figure 10. Relative variations of dynamic parameters versus junction temperature**



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



**Figure 12. Thermal resistance junction to ambient versus copper surface under each lead (typical values)**



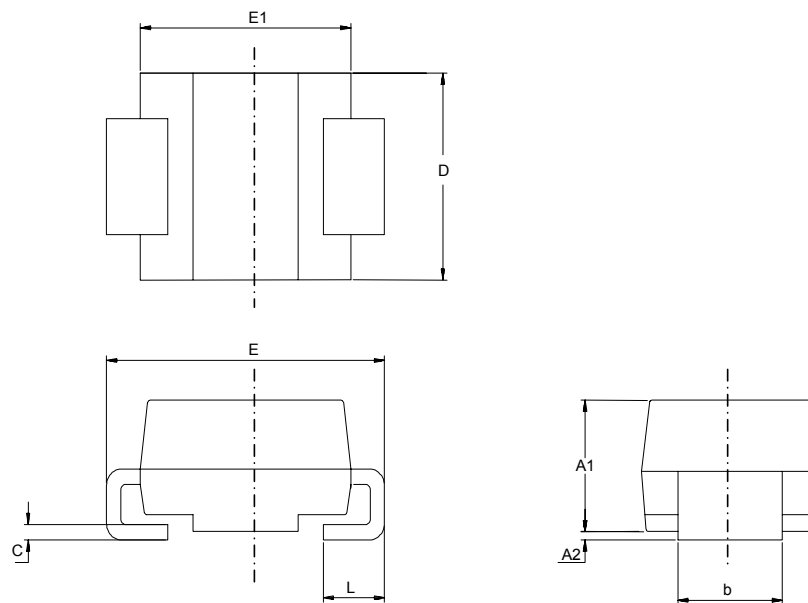
## 2 Package information

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 SMA package information

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

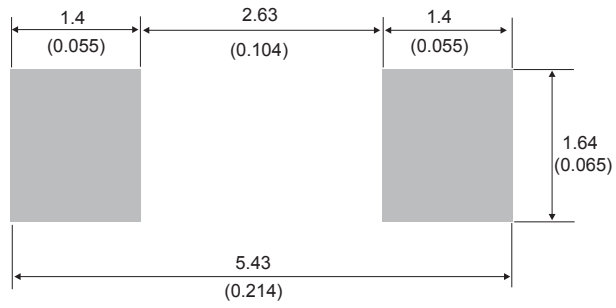
**Figure 13. SMA package outline**



**Table 5. SMA 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	1.25	1.65	0.049	0.065
c	0.15	0.40	0.005	0.016
D	2.25	2.90	0.088	0.115
E	4.80	5.35	0.188	0.211
E1	3.95	4.60	0.155	0.182
L	0.75	1.50	0.029	0.060

**Figure 14. SMA recommended footprint in mm (inches)**

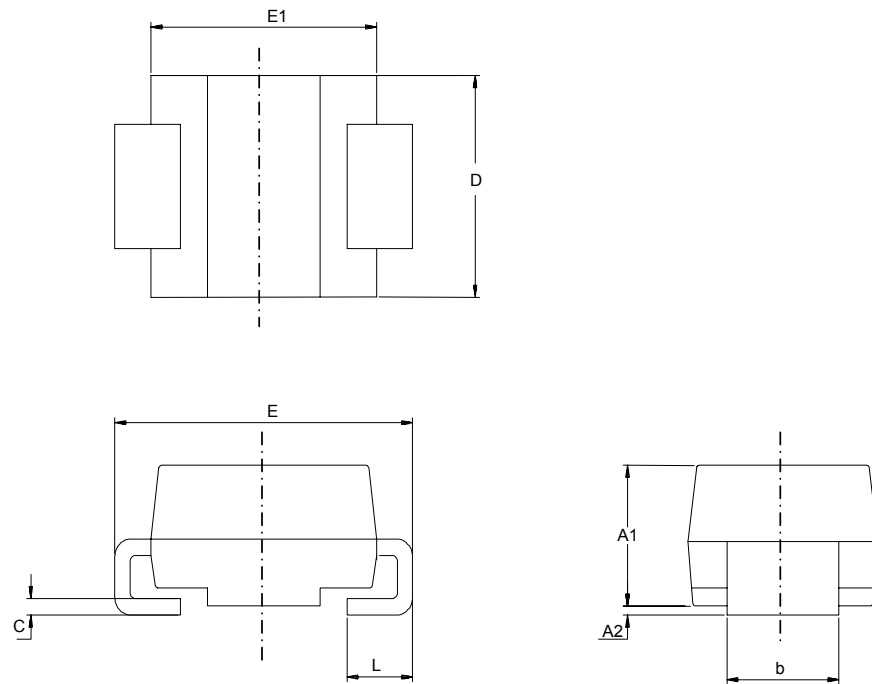




## 2.2 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

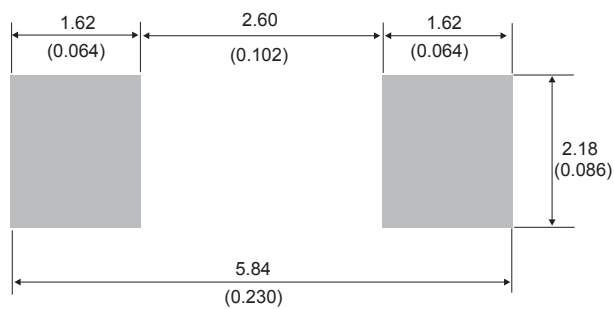
Figure 15. SMB package outline



**Table 6. 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 16. SMB recommended footprint**



### 3 Ordering information

**Table 7. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH2R02A	R2A	SMA	0.068 g	5000	Tape and reel
STTH2R02U	R2U	SMB	0.107 g	2500	Tape and reel

## Revision history

**Table 8. Document revision history**

Date	Revision	Changes
03-May-2006	1	First issue.
13-Oct-2006	2	Maximum $T_j$ set to 175° C for all packages in Table 1.
11-Dec-2018	3	Removed DO-15 package information.

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