

# STTH4R02-Y

### Automotive ultrafast recovery diode

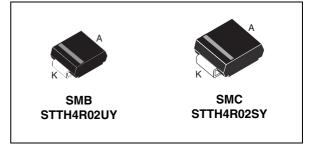
### Features

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

### Description

The STTH4R02 uses ST's new 200 V planar Pt doping technology, and it is specially suited for switching mode base drive and transistor circuits.

Packaged SMB, SMC, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection in automotive applications.



#### Table 1. Device summary

Symbol	Value
I <sub>F(AV)</sub>	4 A
V <sub>RRM</sub>	200 V
T <sub>j</sub> (max)	175 °C
V <sub>F</sub> (typ)	0.76 V
t <sub>rr</sub> (typ)	16 ns

### 1 Characteristics

#### Table 2. Absolute ratings (limiting values at T<sub>i</sub> = 25 °C, unless otherwise specified)

Symbol	Parameter	Value	Unit		
V <sub>RRM</sub>	Repetitive peak reverse voltage	200	V		
I <sub>F(RMS)</sub>	Forward rms current	70	А		
I <sub>F(AV)</sub>	Average forward current, $\delta = 0.5$	4	А		
I <sub>FSM</sub>	Surge non repetitive forward current $t_p = 10 \text{ ms sinusoidal}$			70	А
T <sub>stg</sub>	Storage temperature range	-65 to +175	°C		
Тj	Operating junction temperature range			-40 to +175	°C

#### Table 3. Thermal parameters

Symbol	Parameter	Value	Unit
R <sub>th(j-c)</sub>	Junction to case	20	°C/W

#### Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
I <sub>B</sub> <sup>(1)</sup>	Reverse leakage	T <sub>j</sub> = 25 °C	VV			3	μA
'R'	current	T <sub>j</sub> = 125 °C	125 °C		2	20	μΑ
		T <sub>j</sub> = 25 °C	I <sub>F</sub> = 12 A		1.15	1.25	
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25 °C	1 - 1 0		0.95	1.05	V
		T <sub>j</sub> = 150 °C	I <sub>F</sub> = 4 A		0.76	0.83	

1. Pulse test:  $t_p$  = 5 ms,  $\delta$  < 2 %

2. Pulse test:  $t_p$  = 380 µs,  $\delta$  < 2 %

To evaluate the conduction losses use the following equation: P = 0.67 x  $I_{F(AV)}$  + 0.04  $I_{F}^{2}(RMS)$ 

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
+	Reverse recovery	$I_F = 1 \text{ A}, dI_F/dt = -50 \text{ A}/\mu\text{s},$ $V_R = 30 \text{ V}, T_j = 25 \text{ °C}$		24	30	ns
time		$I_F = 1 \text{ A}, dI_F/dt = -100 \text{ A}/\mu\text{s},$ $V_R = 30 \text{ V}, T_j = 25 \text{ °C}$		16	20	115
I <sub>RM</sub>	Reverse recovery current	I <sub>F</sub> = 4 A, dI <sub>F</sub> /dt = -200 A/µs, V <sub>R</sub> = 160 V, T <sub>j</sub> = 125 °C		4.4	5.5	А
t <sub>fr</sub>	Forward recovery time	$\label{eq:IF} \begin{array}{l} I_F = 4 \ A, \ dI_F/dt = 50 \ A/\mus \\ V_FR = 1.1 \ x \ V_Fmax, \ T_j = 25 \ ^\circC \end{array}$		80		ns
V <sub>FP</sub>	Forward recovery voltage	$I_F = 4$ A, $dI_F/dt = 50$ A/µs, T <sub>j</sub> = 25 °C		1.6		V



Figure 1.

#### I<sub>M</sub>(A) 50 45 40 δ=tp/T 35 30 = 5 W 25 20 : 2 W 15 P = 1 10 δ 5 0 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

Peak current versus duty cycle



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

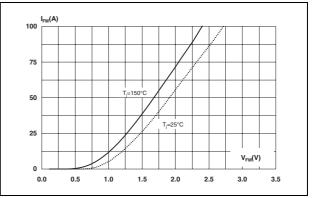


Figure 4. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMB)

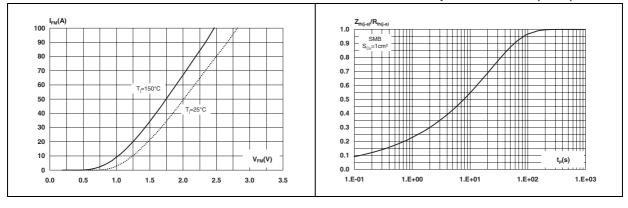
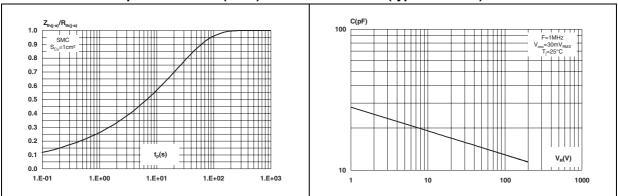


Figure 5. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMC)

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





I<sub>RM</sub>(A)

. I\_=44

160\

10

8

6

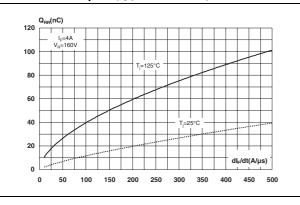
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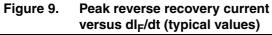
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0 50

#### Figure 7. Reverse recovery charges versus dl<sub>F</sub>/dt (typical values)





=125°C

200 250

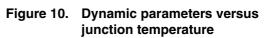
150

100

T,=25°C

300 350

400



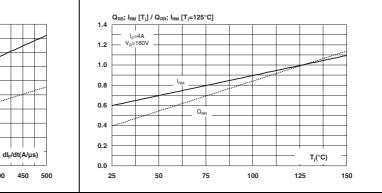
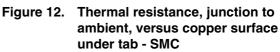
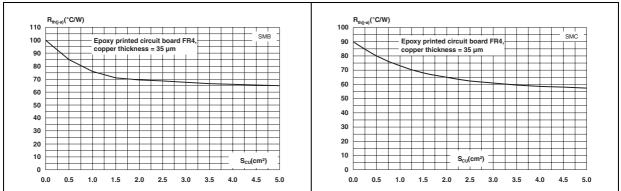
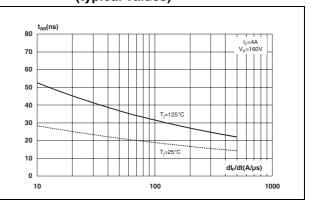


Figure 11. Thermal resistance, junction to ambient, versus copper surface under tab - SMB



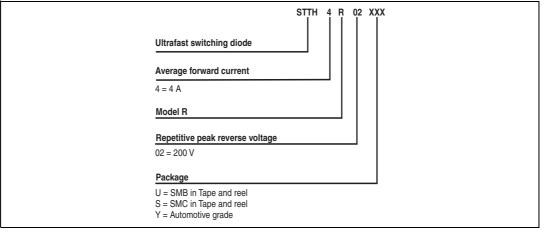


#### ersus Figure 8. Reverse recovery time versus dl<sub>F</sub>/dt (typical values)



### 2 Ordering information scheme

#### Figure 13. Ordering information scheme





### 3 Package information

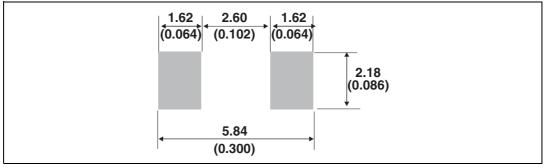
- Epoxy meets UL94, V0
- Band indicates cathode on SMB and SMC

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <u>www.st.com</u>. ECOPACK<sup>®</sup> is an ST trademark.

Table 6. SMB dimensions

			Dimer	nsions	
E1	Ref.	Millin	neters	eters Inches	
		Min.	Max.	Min.	Max.
	A1	1.90	2.45	0.075	0.096
	A2	0.05	0.20	0.002	0.008
	b	1.95	2.20	0.077	0.087
	c	0.15	0.40	0.006	0.016
	D	3.30	3.95	0.130	0.156
	— 🖻 🛛 E	5.10	5.60	0.201	0.220
ित्त <u>े</u> वित्ते वित्त	• E1	4.05	4.60	0.159	0.181
	L	0.75	1.50	0.030	0.059

Figure 14. Footprint, dimensions in mm (inches)



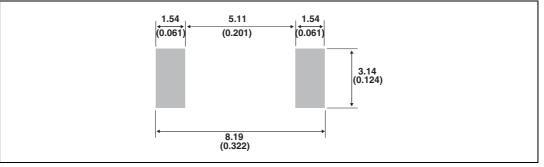


		Dimensions			
	Ref.	Millimeters		Inches	
<b>€1</b>		Min.	Max.	Min.	Max.
	A1	1.90	2.45	0.075	0.096
D	A2	0.05	0.20	0.002	0.008
	b <sup>(1)</sup>	2.90	3.20	0.114	0.126
	c <sup>(1)</sup>	0.15	0.40	0.006	0.016
	D	5.55	6.25	0.218	0.246
	E	7.75	8.15	0.305	0.321
	E1	6.60	7.15	0.260	0.281
	E2	4.40	4.70	0.173	0.185
	L	0.75	1.50	0.030	0.059

Table 7.SMC dimensions

1. Dimensions b and c apply to plated leads

#### Figure 15. Footprint, dimensions in mm (inches)





### 4 Ordering information

### Table 8.Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH4R02UY	4R2UY	SMB	0.107 g	2500	Tape and reel
STTH4R02SY	4R2SY	SMC	0.243 g	2500	Tape and Teel

## 5 Revision history

#### Table 9.Document revision history

Date	Revision	Changes
03-Dec-2010	1	First issue.



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