

## 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.

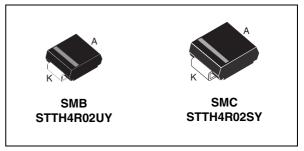


Table 1. Device summary

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

Characteristics STTH4R02-Y

## 1 Characteristics

Table 2. Absolute ratings (limiting values at  $T_i = 25$  °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	Α
I <sub>F(AV)</sub>	Average forward current, $\delta = 0.5$ $T_c = 95 ^{\circ}\text{C}$			4	Α
I <sub>FSM</sub>	Surge non repetitive forward current t <sub>p</sub> = 10 ms sinusoidal			70	Α
T <sub>stg</sub>	Storage temperature range			-65 to +175	°C
T <sub>j</sub>	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>R</sub> <sup>(1)</sup>	Reverse leakage	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>			3	μΑ
<sup>IR</sup> curre	current	T <sub>j</sub> = 125 °C	VR = VRRM		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> F	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 4 A		0.95	1.05	V
		T <sub>j</sub> = 150 °C			0.76	0.83	

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

To evaluate the conduction losses use the following equation:

 $P = 0.67 \times I_{F(AV)} + 0.04 I_{F^{2}(RMS)}^{2}$ 

Table 5. Dynamic characteristics

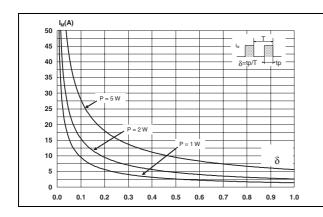
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Reverse recovery		$I_F = 1 \text{ A, } dI_F/dt = -50 \text{ A/}\mu\text{s,}$ $V_R = 30 \text{ V, } T_j = 25 \text{ °C}$		30	ns	
		$I_F = 1 \text{ A, } dI_F/dt = -100 \text{ A/µs,}$ $V_R = 30 \text{ V, } T_j = 25 \text{ °C}$		16	20	113
I <sub>RM</sub>	Reverse recovery current	$I_F = 4 \text{ A, } dI_F/dt = -200 \text{ A/µs,} $ $V_R = 160 \text{ V, } T_j = 125 \text{ °C}$		4.4	5.5	Α
t <sub>fr</sub>	Forward recovery time	$I_F = 4 \text{ A}, dI_F/dt = 50 \text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \text{ x } V_{Fmax}, T_j = 25 \text{ °C}$		80		ns
V <sub>FP</sub>	Forward recovery voltage	$I_F = 4 \text{ A, } dI_F/dt = 50 \text{ A/}\mu\text{s,}$ $T_j = 25 ^{\circ}\text{C}$		1.6		V

<sup>2.</sup> Pulse test:  $t_p$  = 380  $\mu$ s,  $\delta$  < 2 %

STTH4R02-Y Characteristics

Figure 1. Peak current versus duty cycle

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



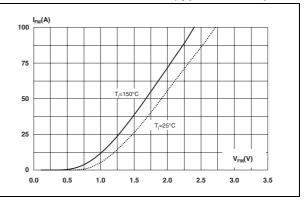
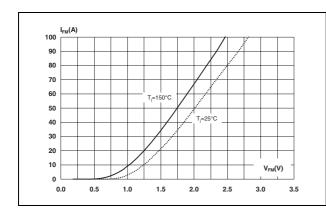


Figure 3. Forward voltage drop versus forward current (maximum values)

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



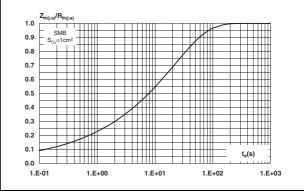
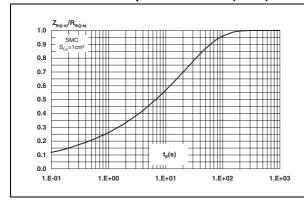
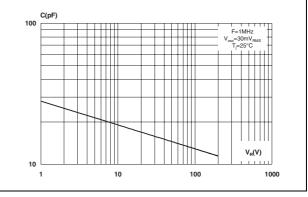


Figure 5. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMC)

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





Characteristics STTH4R02-Y

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

120 Q<sub>RR</sub>(nC)

100

40

20



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

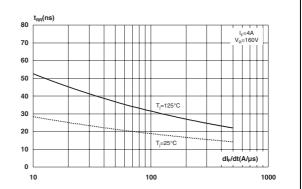


Figure 9. Peak reverse recovery current versus dl<sub>F</sub>/dt (typical values)

300 350 400 450

100 150 200

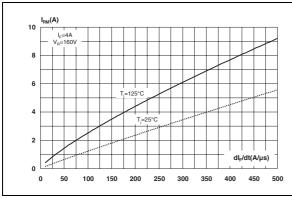


Figure 10. Dynamic parameters versus junction temperature

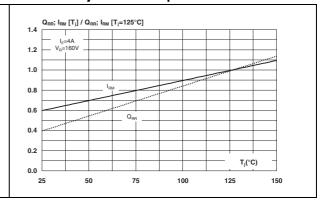


Figure 11. Thermal resistance, junction to ambient, versus copper surface under tab - SMB

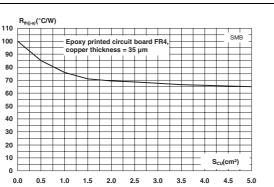
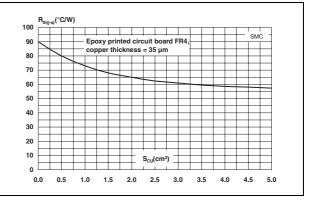
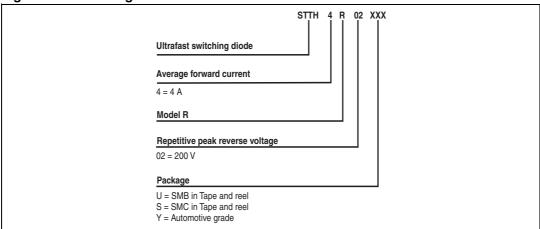


Figure 12. Thermal resistance, junction to ambient, versus copper surface under tab - SMC



## 2 Ordering information scheme

Figure 13. Ordering information scheme



Package information STTH4R02-Y

## 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: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

Table 6. SMB dimensions

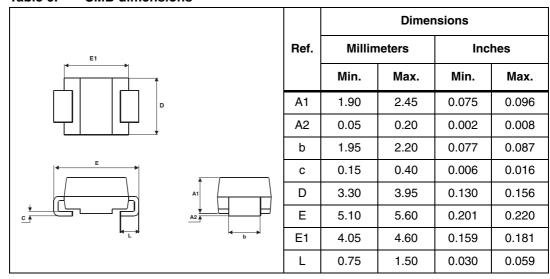
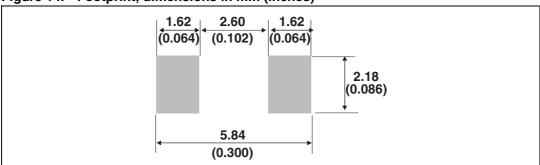
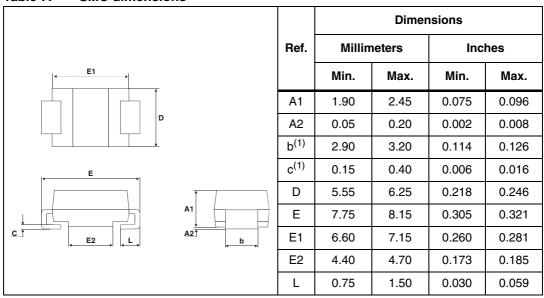


Figure 14. Footprint, dimensions in mm (inches)



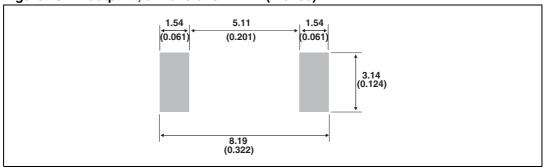
STTH4R02-Y Package information

Table 7. SMC dimensions



<sup>1.</sup> Dimensions b and c apply to plated leads

Figure 15. Footprint, dimensions in mm (inches)



Ordering information STTH4R02-Y

# 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 reel

# 5 Revision history

Table 9. Document revision history

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

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