

Ultrafast recovery diode

Datasheet - production data

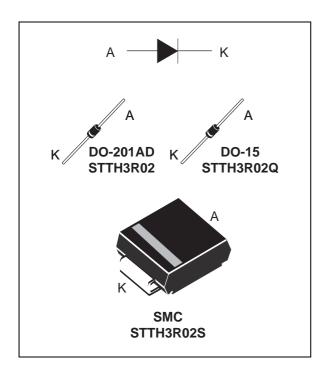


Table 1. Device summary

I _{F(AV)}	3 A
V_{RRM}	200 V
T _j (max)	175 °C
V _F (typ)	0.7 V
t _{rr} (typ)	16 ns

Features

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

Description

The STTH3R02 uses ST's new 200 V planar Pt doping technology, and it is specially suited for switching mode base drive and transistor circuits.

Packaged in DO-201AD, DO-15, and SMC, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.

Characteristics STTH3R02

Characteristics 1

Table 2. Absolute ratings (limiting values at $T_i = 25$ °C, unless otherwise specified)

Symbol	Paramete	Value	Unit	
V_{RRM}	Repetitive peak reverse voltage	200	V	
I _{FRM}	Repetitive peak forward current	$t_p = 5 \mu s, F = 5 \text{ kHz}$	110	Α
	Forward rma aurrent	DO-201AD / DO-15	70	۸
I _{F(RMS)} Forward rms current	Forward mis current	SMC	70	Α
		DO-15 T _{lead} = 50 °C		А
I _{F(AV)}	Average forward current, $\delta = 0.5$	DO-201AD T _{lead} = 90 °C	3	
		SMC T _c = 110 °C		
I _{FSM}	Surge non repetitive forward current $t_p = 10 \text{ ms Sinusoidal}$		75	Α
T _{stg}	Storage temperature range	-65 to + 175	°C	
Tj	Maximum operating junction tempera	175	°C	
T _L	Maximum lead temperature for solder case	230	°C	

Table 3. Thermal parameters

Symbol		Parameter			
P	Junction to lead	Lead Length = 10 mm on infinite	DO-15	45	
R _{th(j-l)}	Junction to lead	heatsink	DO-201AD	30	°C/W
R _{th(j-c)}	Junction to case		SMC	20	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
ı_ (1)	I _R ⁽¹⁾ Reverse leakage current	T _j = 25 °C	$V_R = V_{RRM}$			3	μA
'R'		T _j = 125 °C			3	30	μΛ
		T _j = 25 °C	I _F = 9 A			1.20	
\/_(2)	V _F ⁽²⁾ Forward voltage drop	T _j = 25 °C			0.89	1.0	V
V F		T _j = 100 °C	I _F = 3 A		0.76	0.85	V
		T _j = 150 °C			0.70	0.80	

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

To evaluate the conduction losses use the following equation: P = 0.68 x $I_{F(AV)}$ + 0.04 $I_{F}^{2}_{(RMS)}$

$$P = 0.68 \text{ x } I_{F(AV)} + 0.04 I_{F^2(RMS)}$$

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^{2.} Pulse test: t_p = 380 μ s, δ < 2 %

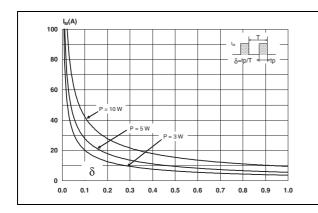
STTH3R02 Characteristics

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
+	Reverse recovery time	$I_F = 1 \text{ A, } dI_F/dt = -50 \text{ A/}\mu\text{s,}$ $V_R = 30 \text{ V, } T_j = 25 \text{ °C}$		24	30	ns
t _{rr}	Theverse recovery 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	113
I _{RM}	Reverse recovery current	$I_F = 3 \text{ A, } dI_F/dt = -200 \text{ A/}\mu\text{s,}$ $V_R = 160 \text{ V, } T_j = 125 \text{ °C}$		3.5	4.5	Α
t _{fr}	Forward recovery time	vitime $I_F = 3 \text{ A}, dI_F/dt = 100 \text{ A/}\mu\text{s}$ $V_{FR} = 1.1 \text{ x } V_{Fmax}, T_j = 25 \text{ °C}$		40		ns
V _{FP}	Forward recovery voltage	$I_F = 3 \text{ A, } dI_F/dt = 100 \text{ A/}\mu\text{s,}$ $T_j = 25 \text{ °C}$		1.9		V

Figure 1. peak current versus duty cycle

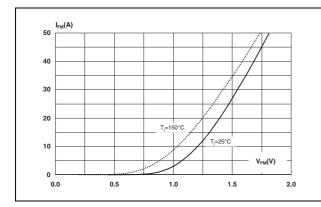
Figure 2. Forward voltage drop versus forward current (typical values)

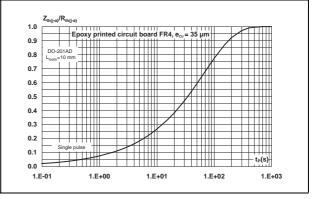


10 T_{=150°C} V_{FM}(V) - 0.0 0.5 1.0 1.5 2.0

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

Figure 4. Relative variation of thermal impedance junction to ambient versus pulse duration - DO-201AD

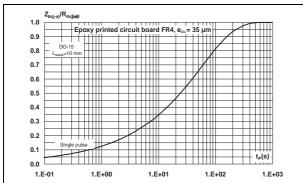




Characteristics STTH3R02

Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration - DO-15

Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration - SMC



1.0 Z_{m(1-m)}/R_{m(1-m)}

1.0 Epoxy printed circuit board FR4, e_{cu} = 35 µm

0.8 S_{MC}

0.7 S_{cr} = 1 cm²

0.6 0.5

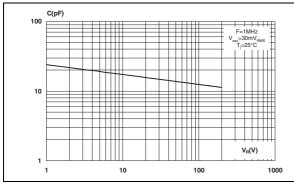
0.4 0.3

0.2 0.1 Single pulse

0.0 1.E-03 1.E-02 1.E-01 1.E+00 1.E+01 1.E+02 1.E+03

Figure 7. Junction capacitance versus reverse applied voltage (typical values)

Figure 8. Reverse recovery charges versus dl_F/dt (typical values)



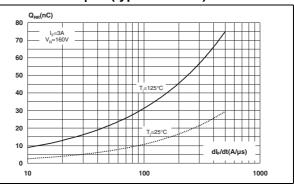
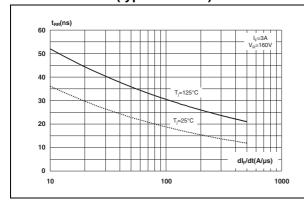
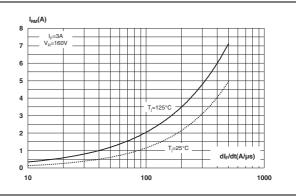


Figure 9. Reverse recovery time versus dI_F/dt (typical values)

Figure 10. Peak reverse recovery current versus dl_F/dt (typical values)



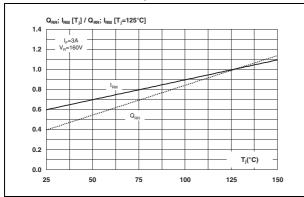
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Figure 11. Dynamic parameters versus junction temperature

Figure 12. Thermal resistance junction to ambient versus copper surface under each lead



R_{m(j-a)}(*C/W)

Epoxy printed circuit board FR4, e_{co} = 35 μm

DO-15

DO-201AD

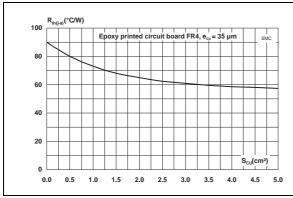
DO-201AD

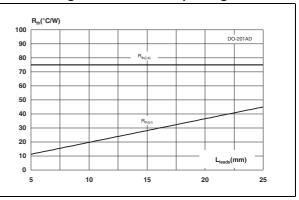
Sc_o(cm²)

O.O. 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

Figure 13. Thermal resistance versus copper surface under each lead for SMC

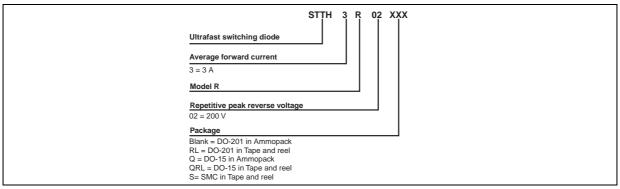
Figure 14. Thermal resistance versus lead length for DO-201AD package





2 Ordering information scheme

Figure 15. Ordering information scheme





Package information STTH3R02

3 Package information

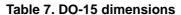
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- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

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.

Dimensions Ref. **Millimeters** Inches Min. Max. Min. Max. Α 9.50 0.374 В 25.40 1.000 С 5.30 0.209 D 1.30 0.051 Ε 1.25 0.049 1 - The lead diameter ø D is not controlled over zone E 2 - The minimum length which must stay Notes straight between the right angles after bending is 0.59"(15mm)

Table 6. DO-201AD dimensions



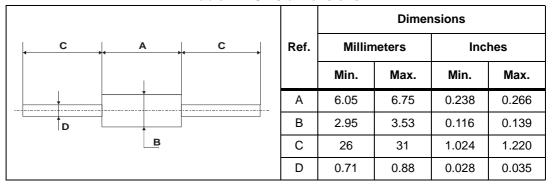
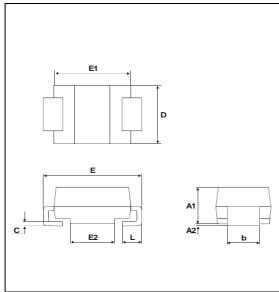
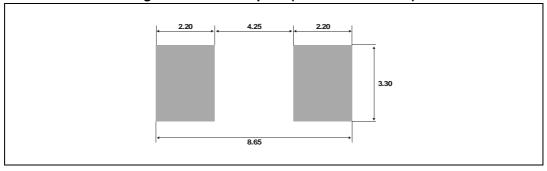


Table 8. SMC dimensions



	Dimensions				
Ref.	Millin	Millimeters		hes	
	Min.	Max.	Min.	Max.	
A1	1.90	2.45	0.075	0.096	
A2	0.05	0.20	0.002	0.008	
b	2.90	3.2	0.114	0.126	
С	0.15	0.41	0.006	0.016	
Е	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	
D	5.55	6.25	0.218	0.246	
L	0.75	1.60	0.030	0.063	

Figure 16. SMC footprint (dimensions in mm)



Ordering information STTH3R02

4 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH3R02	STTH3R02	DO-201AD	1.16 g	600	Ammopack
STTH3R02RL	STTH3R02	DO-201AD	1.16 g	1900	Tape and reel
STTH3R02Q	STTH3R02	DO-15	0.4 g	1000	Ammopack
STTH3R02QRL	STTH3R02	DO-15	0.4 g	6000	Tape and reel
STTH3R02S	3R2S	SMC	0.243 g	2500	Tape and reel

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
03-May-2006	1	First issue.
10-Oct-2006	2	Added SMC package.
17-Apr-2014	3	Updated ECOPACK statement. Reformatted to current standards.

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