STTH3R02

Ultrafast recovery diode

Main product characteristics

$I_{F(AV)}$	3 A
V_{RRM}	200 V
T_j (max)	175° C
V_F (typ)	0.7 V
t_{rr} (typ)	16 ns

Features and benefits

- 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.

Order codes

Part Number	Marking
STTH3R02	STTH3R02
STTH3R02RL	STTH3R02
STTH3R02Q	STTH3R02
STTH3R02QRL	STTH3R02
STTH3R02S	3R2S

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		200	V
I_{FRM}	Repetitive peak forward current(1)	t_p = 5 µs, F = 5 kHz	110	A
$I_{F(RMS)}$	RMS forward current	DO-201AD / DO-15	70	A
		SMC	70	
$I_{F(AV)}$	Average forward current, δ = 0.5	DO-15 T_{lead} = 50° C	3	A
		DO-201AD T_{lead} = 90° C		
		SMC T_c = 110° C		
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal	75	A
T_{stg}	Storage temperature range		-65 to + 175	° C
T_j	Maximum operating junction temperature(1)		175	° C
T_L	Maximum lead temperature for soldering during 10 s at 4 mm from case		230	° C

1. On infinite heatsink with 10 mm lead length

Table 2. Thermal parameters

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

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			3	µA
		T_j = 125° C			3	30	
V_F(2)	Forward voltage drop	T_j = 25° C	I_F = 9 A			1.20	V
		T_j = 25° C	I_F = 3 A		0.89	1.0	
		T_j = 100° C			0.76	0.85	
		T_j = 150° C			0.70	0.80	

1. Pulse test: t_p = 5 ms, δ < 2 %
2. Pulse test: t_p = 380 µs, δ < 2 %

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

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V, T_j = 25° C		24	30	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25° C		16	20	
I_{RM}	Reverse recovery current	I_F = 3 A, dI_F/dt = -200 A/µs, V_R = 160 V, T_j = 125° C		3.5	4.5	A
t_{fr}	Forward recovery time	I_F = 3 A, dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_{Fmax}, T_j = 25° C		40		ns
V_{FP}	Forward recovery voltage	I_F = 3 A, dI_F/dt = 100 A/µs, T_j = 25° C		1.9		V

Figure 1. peak current versus duty cycle

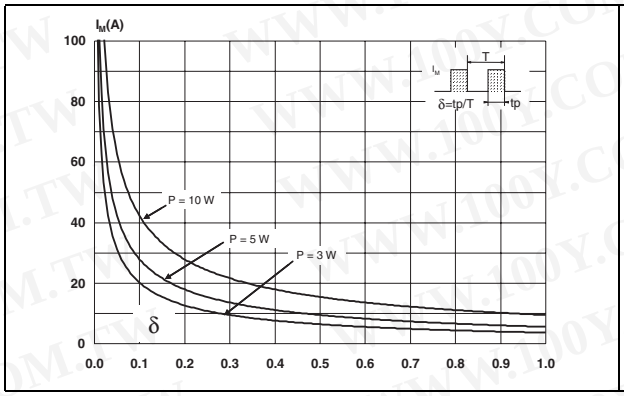


Figure 2. Forward voltage drop versus forward current (typical values)

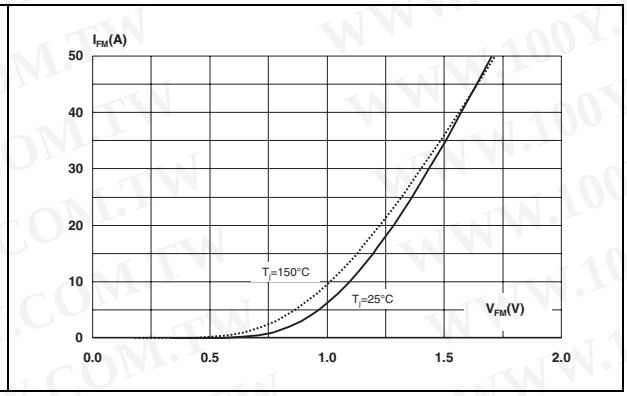


Figure 3. Forward voltage drop versus forward current (maximum values)

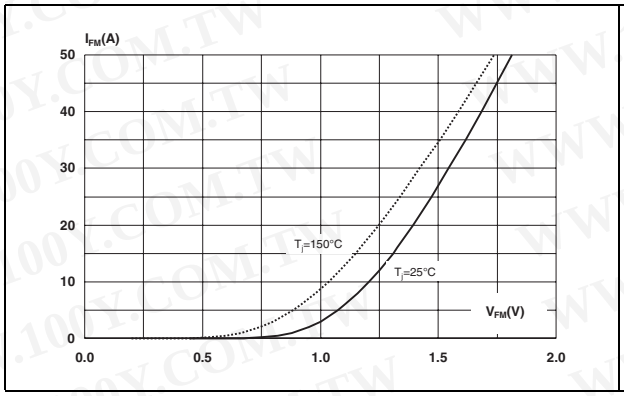


Figure 4. Relative variation of thermal impedance junction to ambient versus pulse duration - DO-201AD (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

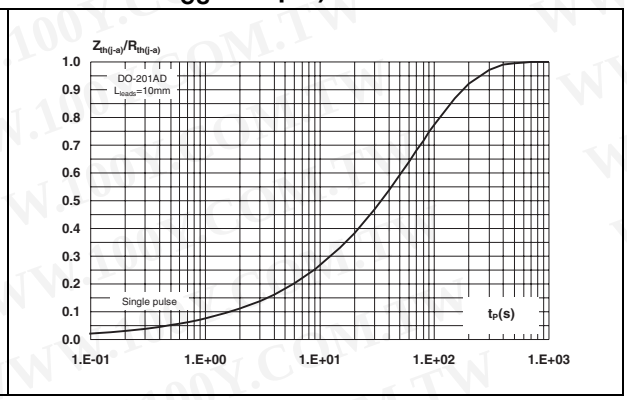


Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration - DO-15 (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

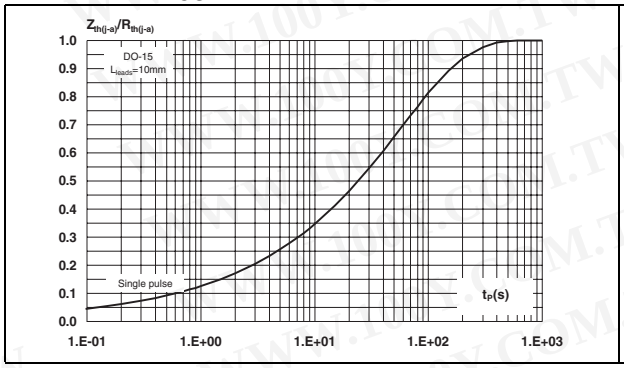


Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration - SMC (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

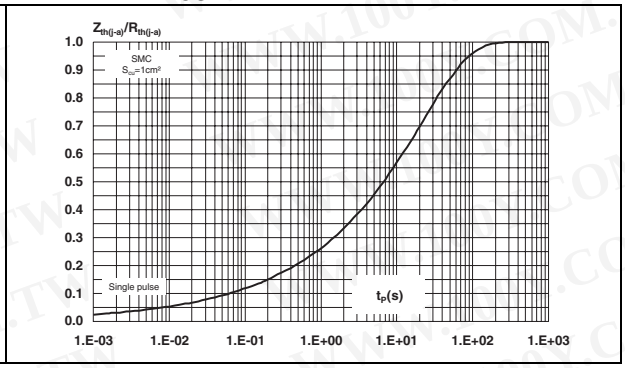


Figure 7. Junction capacitance versus reverse applied voltage (typical values)

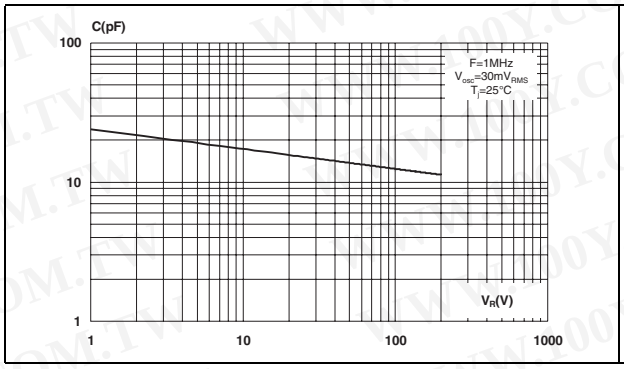


Figure 8. Reverse recovery charges versus dI_F/dt (typical values)

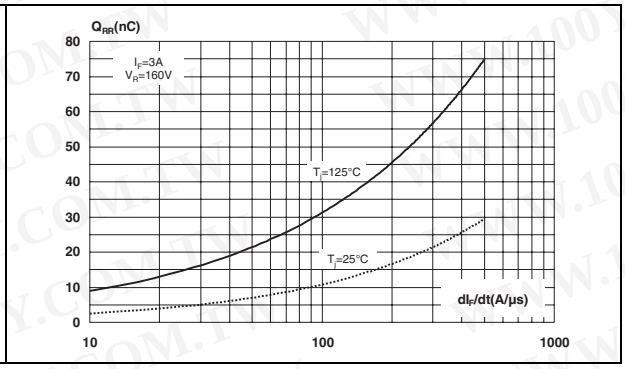


Figure 9. Reverse recovery time versus dI_F/dt (typical values)

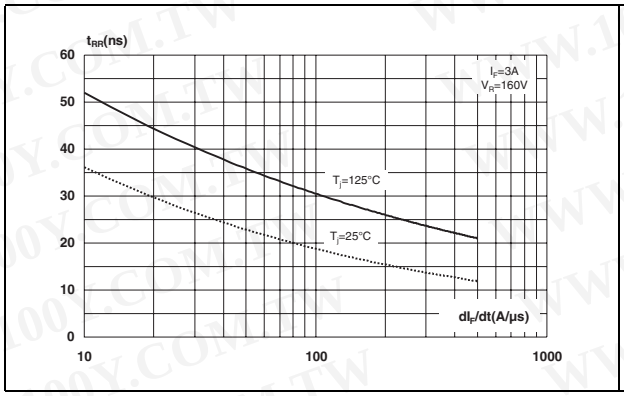


Figure 10. Peak reverse recovery current versus dI_F/dt (typical values)

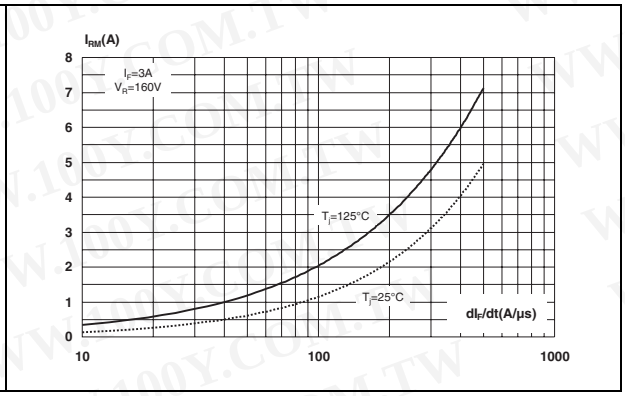


Figure 11. Dynamic parameters versus junction temperature

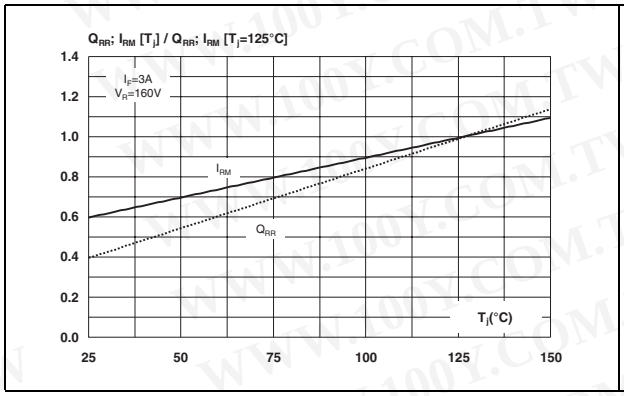


Figure 12. Thermal resistance junction to ambient versus copper surface under each lead for DO-15 and DO-201AD (Epoxy printed circuit board FR4, e_{CU} = 35µm)

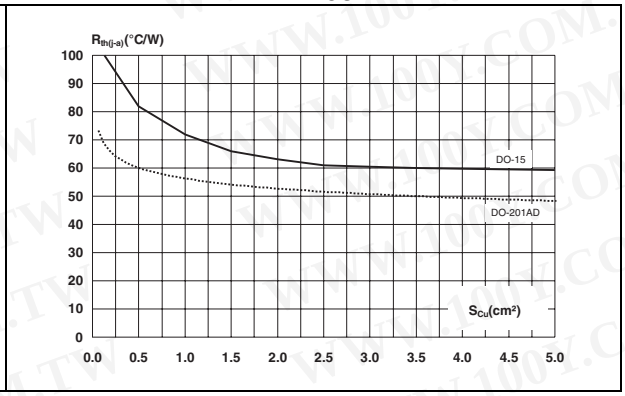


Figure 13. Thermal resistance versus copper surface under each lead for SMC (Epoxy printed circuit board FR4, e_{CU} = 35µm)

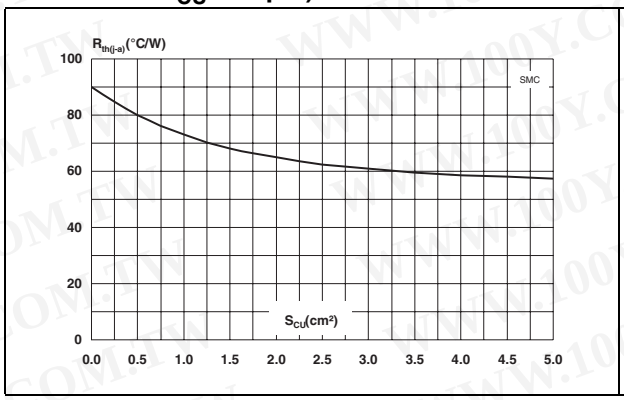
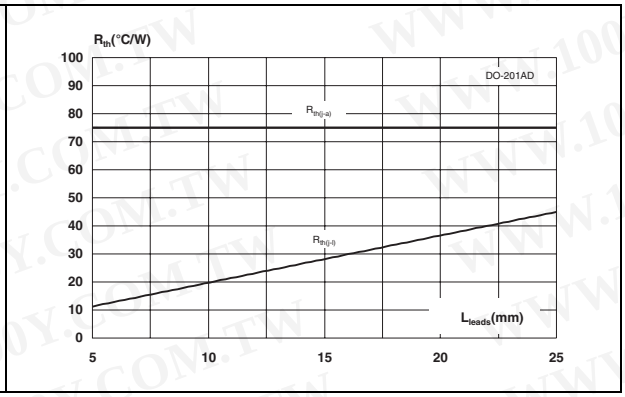


Figure 14. Thermal resistance versus lead length for DO-201AD package



2 Ordering information scheme

STTH 3 R 02 XXX

Ultrafast switching diode

Average forward current
3 = 3 A

Model R

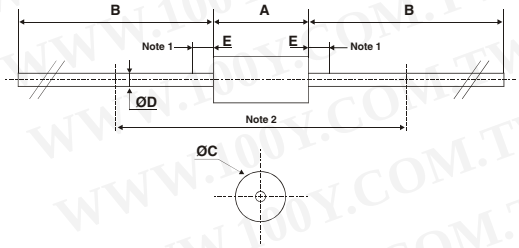
Repetitive peak reverse voltage
02 = 200 V

Package
Blank = DO-201 in Ammopack
RL = DO-201 in Tape and reel
Q = DO-15 in Ammopack
QRL = DO-15 in Tape and reel
S= SMC in Tape and reel

3 Package information

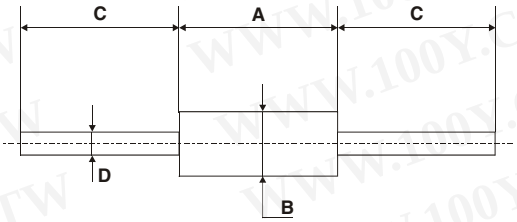
- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

Table 5. DO-201AD Dimensions



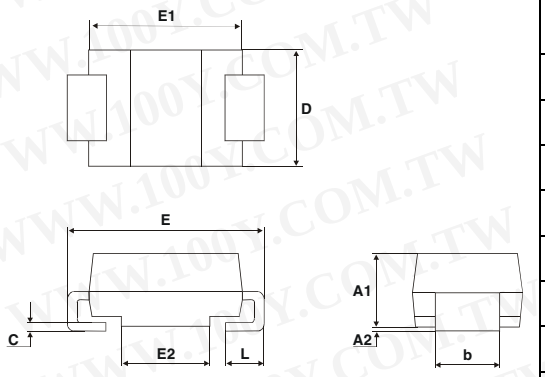
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		9.50		0.374
B	25.40		1.000	
C		5.30		0.209
D		1.30		0.051
E		1.25		0.049
Notes	1 - The lead diameter ø D is not controlled over zone E 2 - The minimum length which must stay straight between the right angles after bending is 0.59"(15mm)			

Table 6. DO-15 dimensions



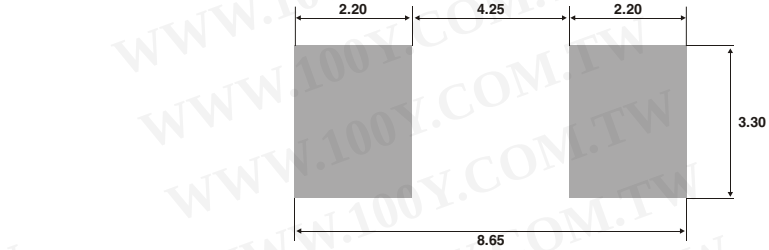
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	6.05	6.75	0.238	0.266
B	2.95	3.53	0.116	0.139
C	26	31	1.024	1.220
D	0.71	0.88	0.028	0.035

Table 7. SMC dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	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
c	0.15	0.41	0.006	0.016
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
D	5.55	6.25	0.218	0.246
L	0.75	1.60	0.030	0.063

Figure 15. SMC footprint (dimensions in mm)



In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

4 Ordering information

Part Number	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

Date	Revision	Description of Changes
03-May-2006	1	First issue
10-Oct-2006	2	Added SMC package

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