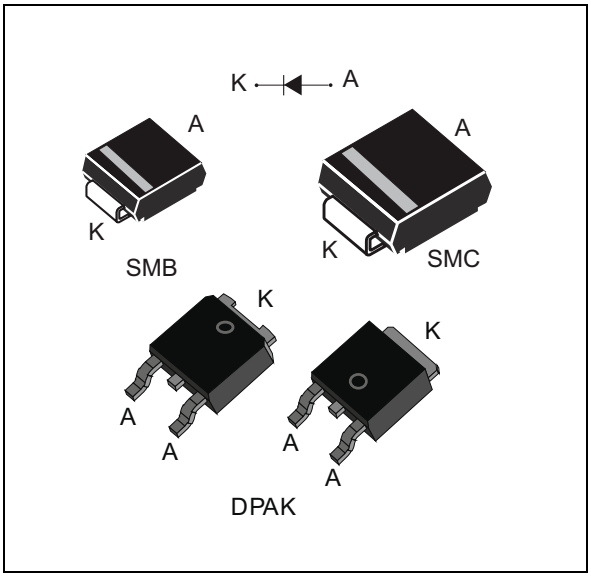
STTH4R02

Ultrafast recovery diode

Datasheet – production data



Features

- Negligible switching losses
- High junction temperature
- Very low conduction losses
- Low forward and reverse recovery times
- ECOPACK® compliant component for DPAK on demand

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

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	4 A
V_{RRM}	200 V
V_F (typ)	0.76 V
T_j (max)	175 °C
t_{rr} (typ)	16 ns

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		200	V
$I_{F(RMS)}$	Forward rms current	DPAK	70	A
		SMB, SMC		
$I_{F(AV)}$	Average forward current, δ = 0.5, square wave	DPAK, T_c = 160 °C	4	A
		SMB, SMC, T_{lead} = 95 °C		
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal	70	A
T_{stg}	Storage temperature range		-65 to +175	°C
T_j (1)	Maximum operating temperature		175	°C

1. $\frac{dPtot}{dTj} < \frac{1}{Rth(j-a)}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal parameters

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case, DPAK	3.5	°C/W
$R_{th(j-l)}$	Junction to lead, SMB and SMC	20	

Table 4. 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			2	20	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 12A		1.15	1.25	V
		T_j = 25 °C	I_F = 4 A		0.95	1.05	
		T_j = 150 °C			0.76	0.83	

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:

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

Table 5. Dynamic electrical characteristics

Symbol	Parameter	Tests conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j = 25 °C	I_F = 1 A, dI_F/dt = -50 A/µs V_R = 30 V		24	30	ns
			I_F = 1 A, dI_F/dt = -100 A/µs V_R = 30 V		16	20	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 4 A, dI_F/dt = -200 A/µs, V_R = 160 V		4.4	5.5	A
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 4 A, dI_F/dt = 50 A/µs, V_{FR} = 1.1 x V_{Fmax}		80		ns
V_{FP}	Forward recovery voltage	T_j = 25 °C	I_F = 4 A, dI_F/dt = 50 A/µs		1.6		V

Figure 1. Peak current versus duty cycle

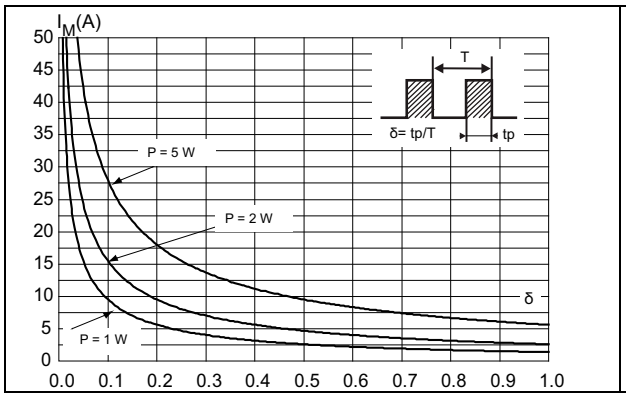


Figure 2. Forward voltage drop versus forward current (typical values)

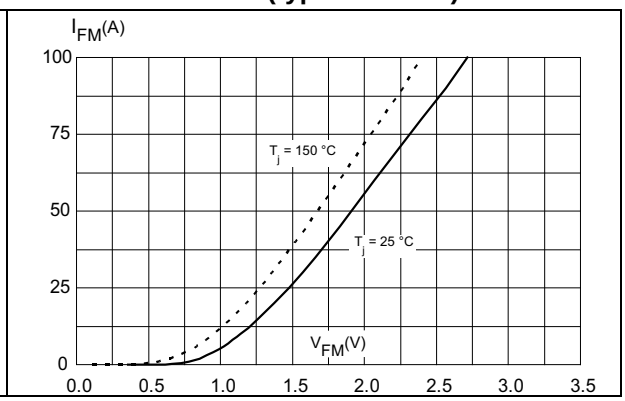


Figure 3. Forward voltage drop versus forward current (maximum values)

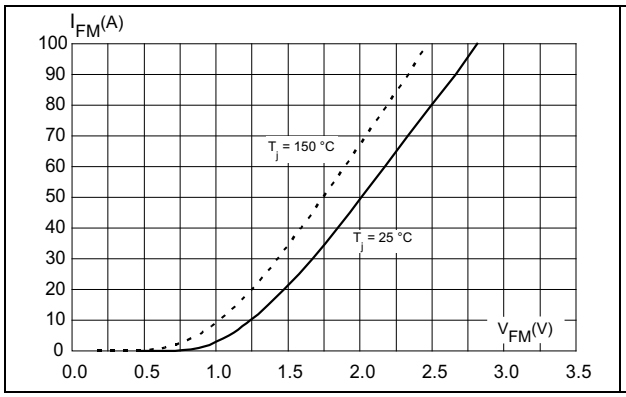


Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration

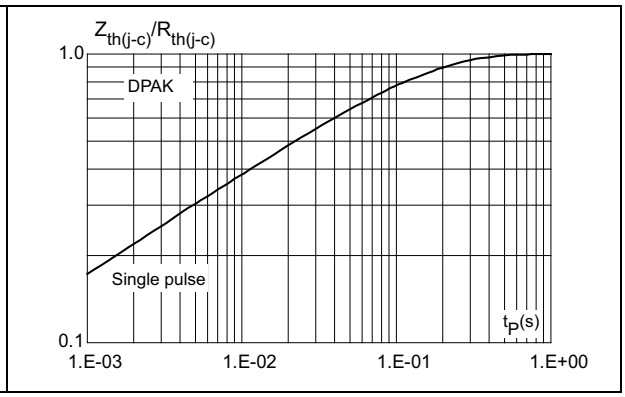


Figure 5. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMB)

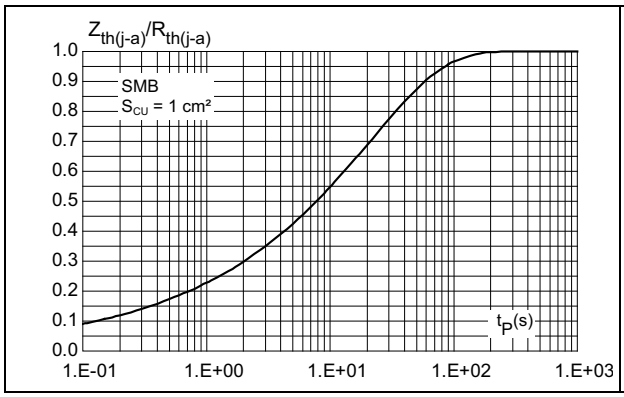


Figure 6. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMC)

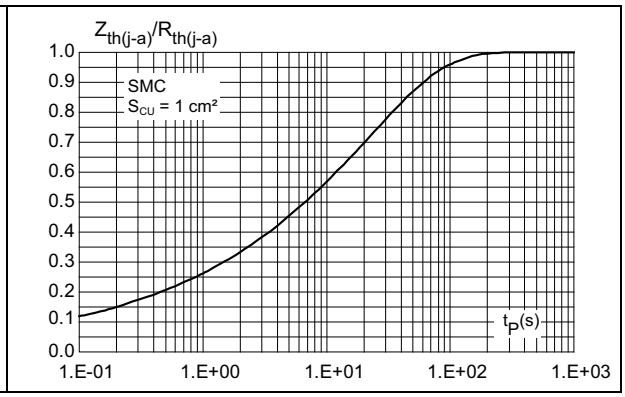


Figure 7. Junction capacitance versus reverse applied voltage (typical values)

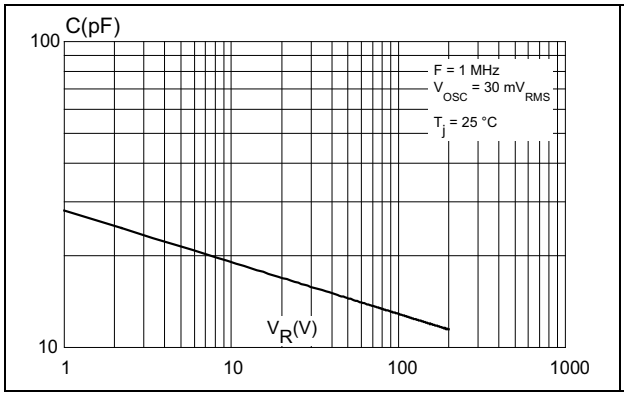


Figure 8. Reverse recovery charges versus dI_F/dt (typical values)

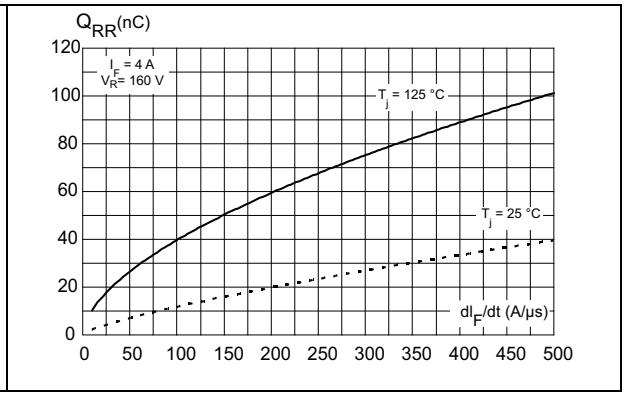


Figure 9. Reverse recovery time versus dI_F/dt (typical values)

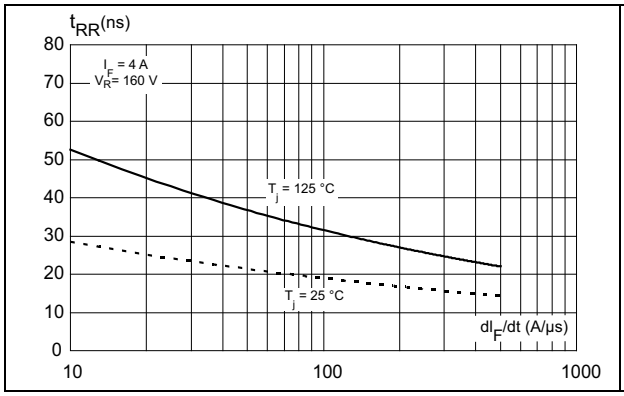


Figure 10. Peak reverse recovery current versus dI_F/dt (typical values)

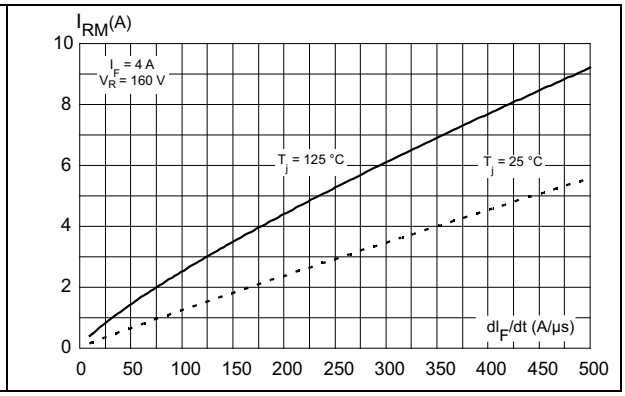


Figure 11. Dynamic parameters versus junction temperature

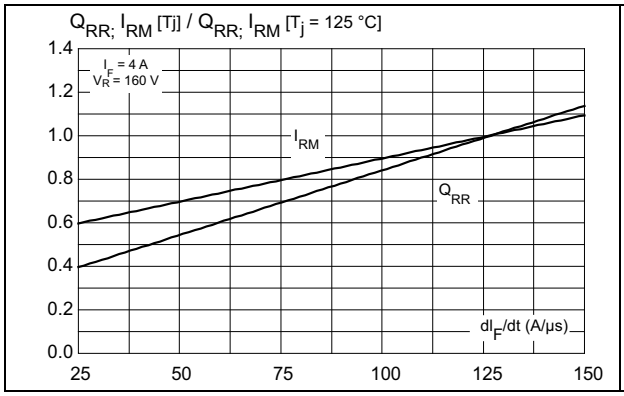


Figure 12. Thermal resistance, junction to ambient, versus copper surface under tab

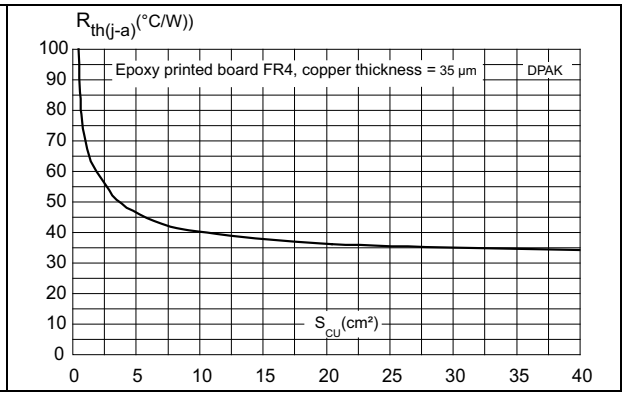


Figure 13. Thermal resistance, junction to ambient, versus copper surface under tab

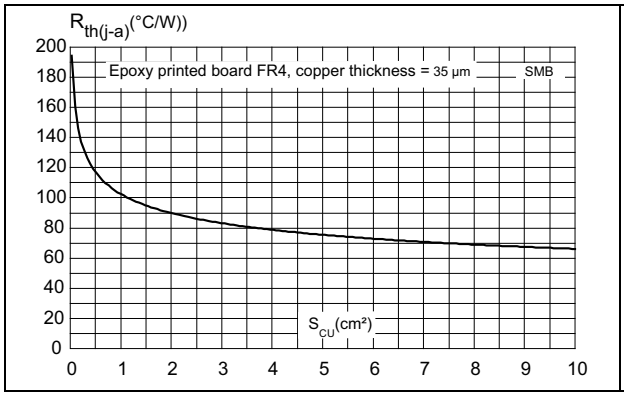
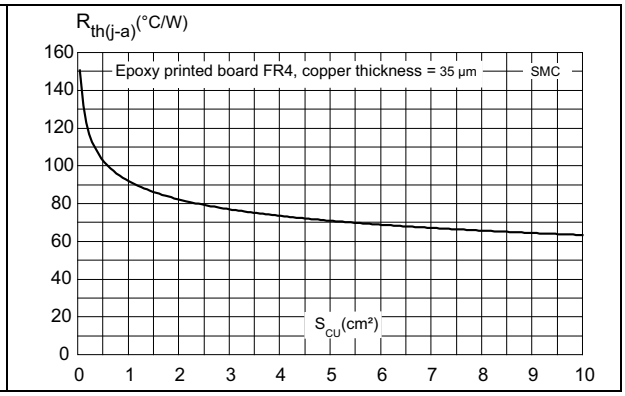


Figure 14. Thermal resistance, junction to ambient, versus copper surface under tab

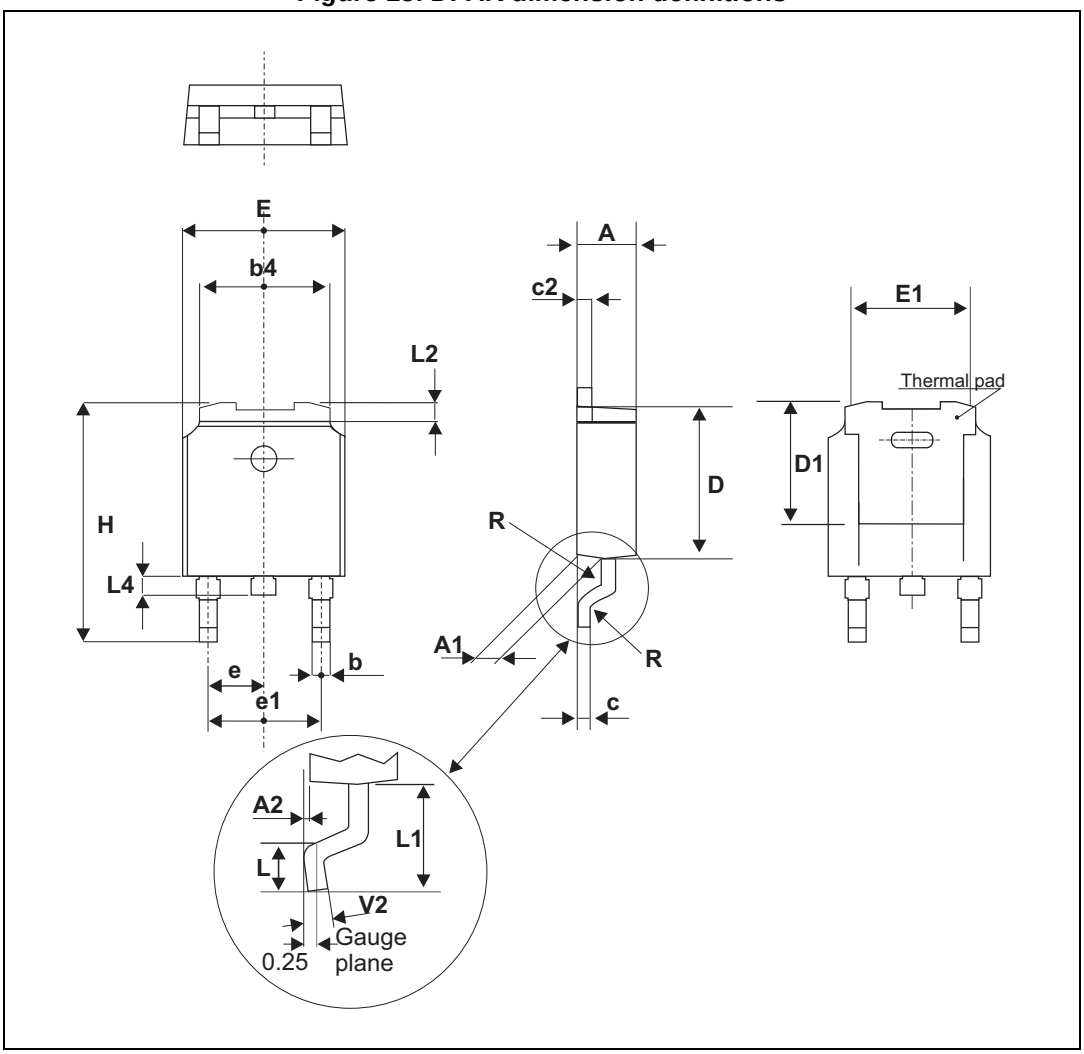


2 Package information

- Epoxy meets UL94,V0
- Cooling method: by conduction (C)
- Lead-free package
- Band indicates cathode

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.

Figure 15. DPAK dimension definitions



Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. DPAK dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		2.40	0.085		0.094
A1	0.90		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.01
b	0.64		0.90	0.025		0.035
b4	4.95		5.46	0.195		0.215
c	0.46		0.61	0.018		0.024
c2	0.46		0.60	0.018		0.024
D	5.97		6.22	0.235		0.245
D1	5.10			0.201		
E	6.35		6.73	0.250		0.265
E1	4.32			0.170		
e1	4.4		4.7	0.173		0.185
H	9.35		10.40	0.368		0.407
L	1.0		1.78	0.039		0.070
L2			1.27			0.05
L4	0.6		1.02	0.024		0.040
V2	0°		8°	0°		8°

Figure 16. DPAK footprint dimensions (in mm)

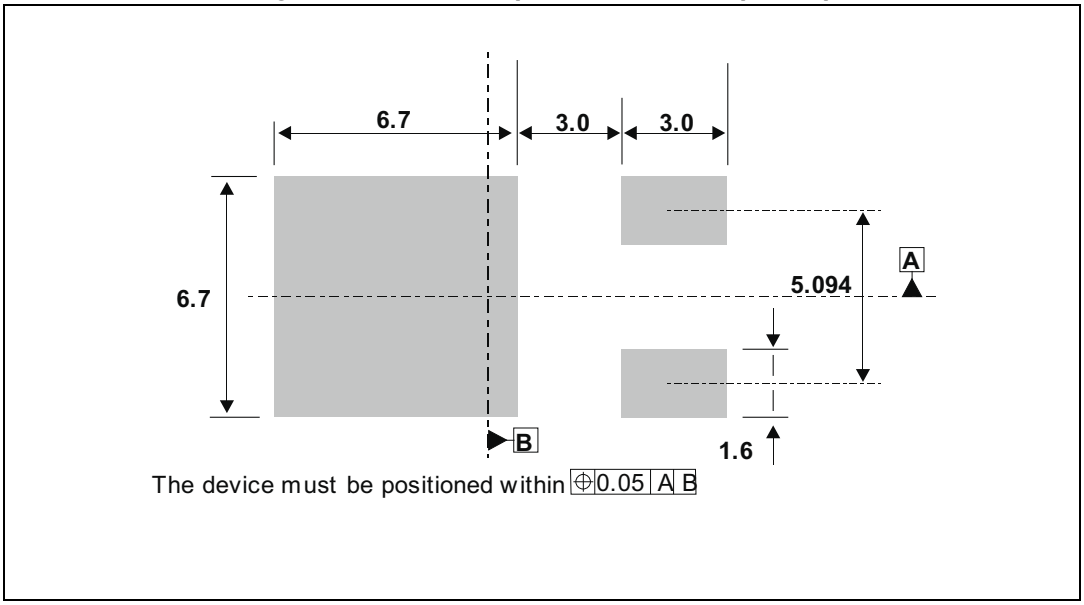


Figure 17. SMB dimensions definitions

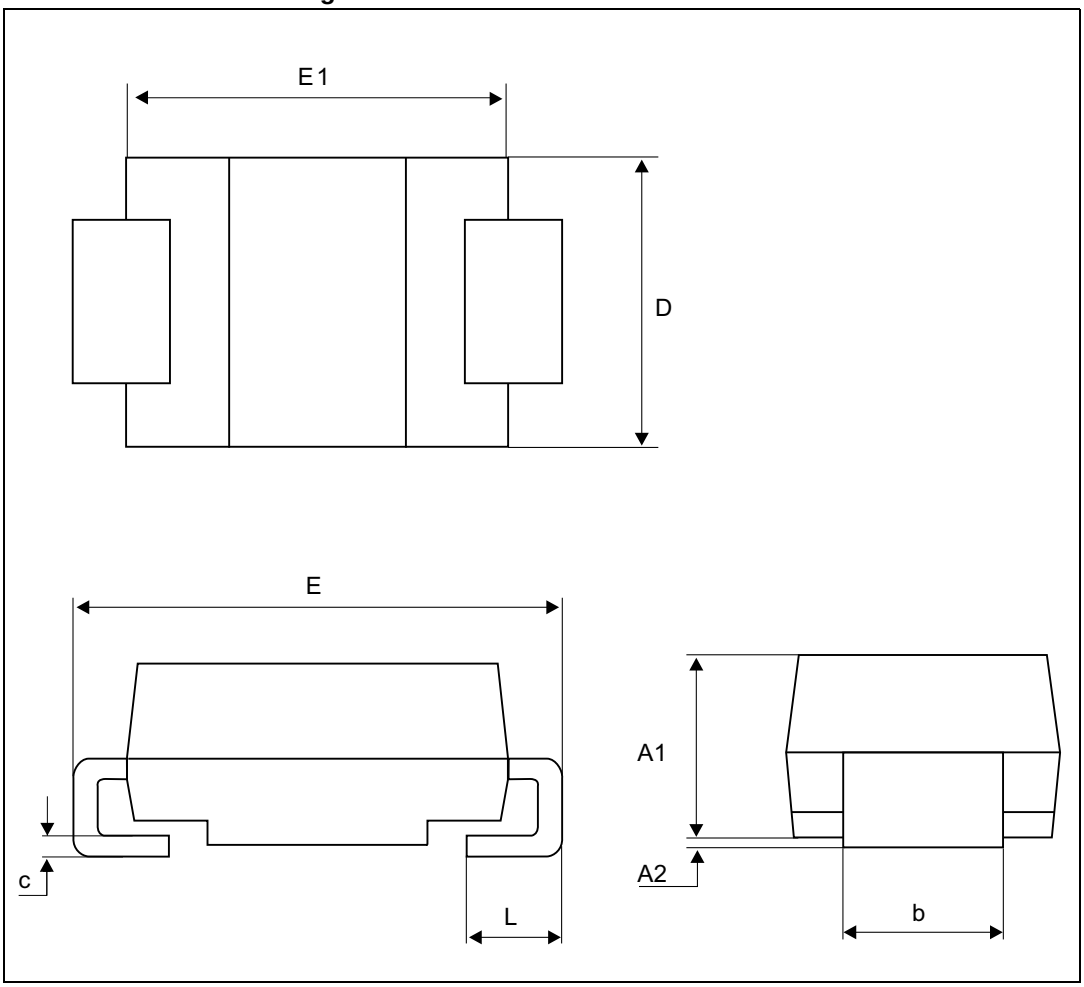


Table 7. SMB dimension values

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	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
E1	4.05	4.60	0.159	0.181
L	0.75	1.50	0.030	0.059

Figure 18. SMB footprint, dimensions in mm (inches)

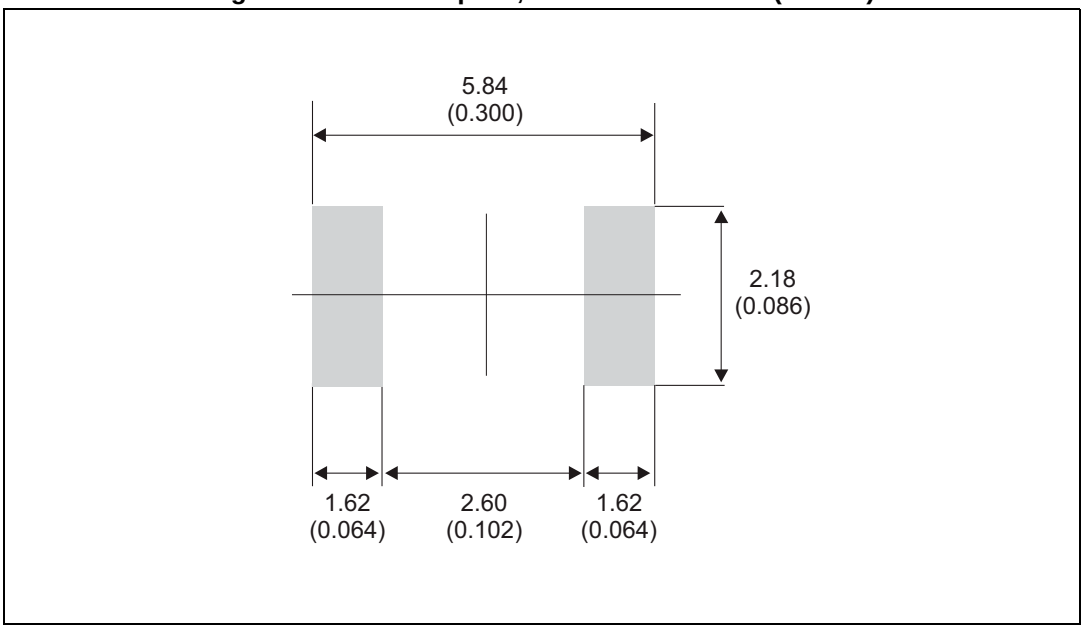


Figure 19. SMC dimensions definitions

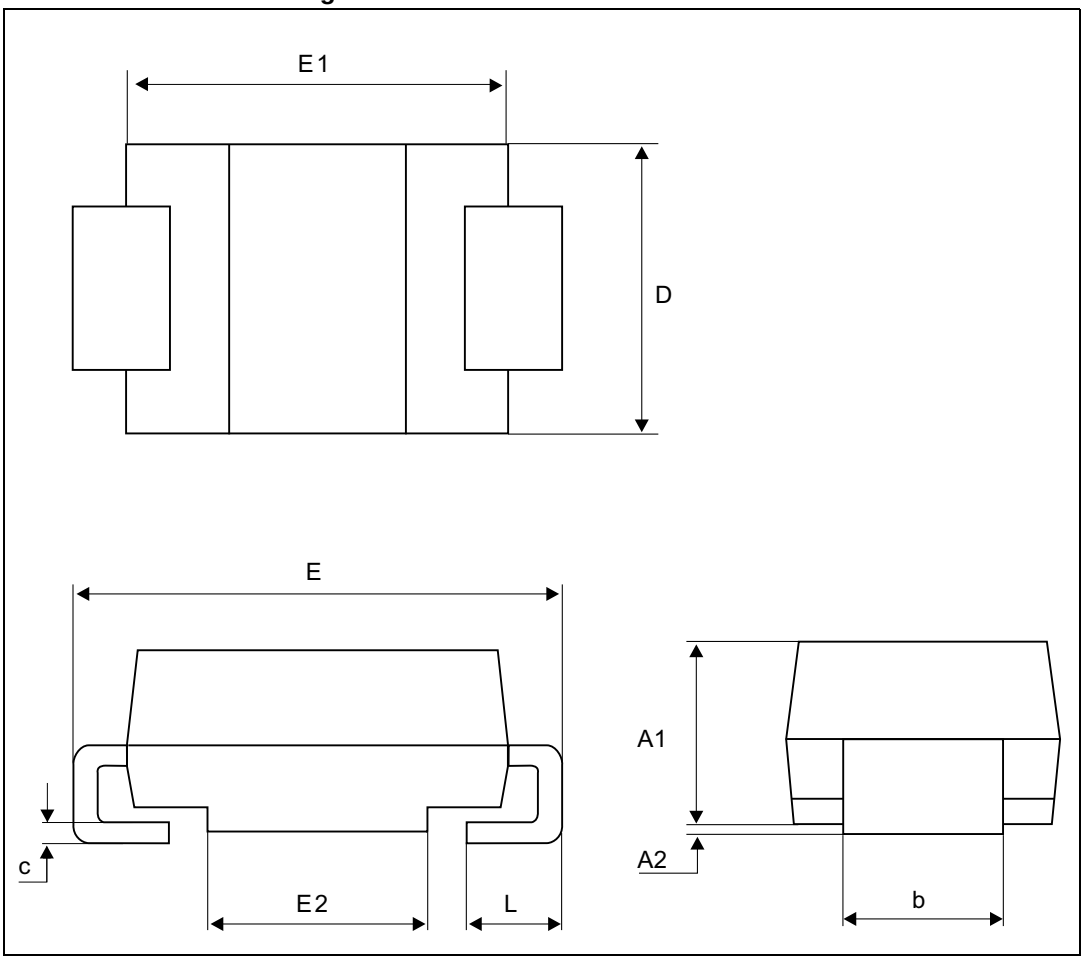
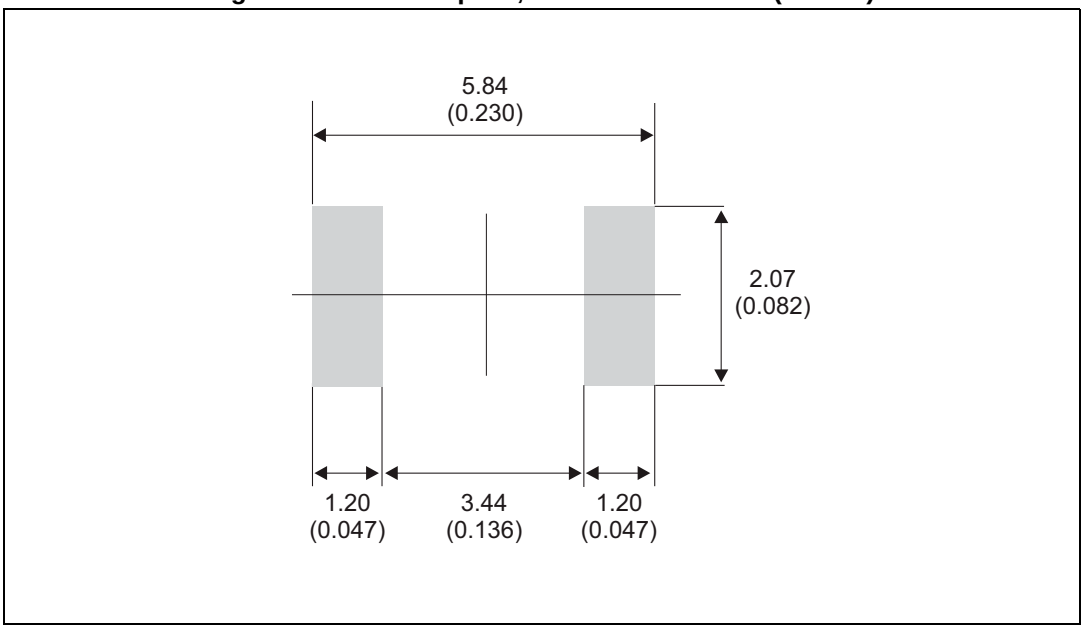


Table 8. SMC dimension values

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(1)	2.90	3.20	0.114	0.126
c(1)	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

1. Dimensions b and c apply to plated leads

Figure 20. SMC footprint, dimensions in mm (inches)



3 Ordering information

Figure 21. Ordering information scheme

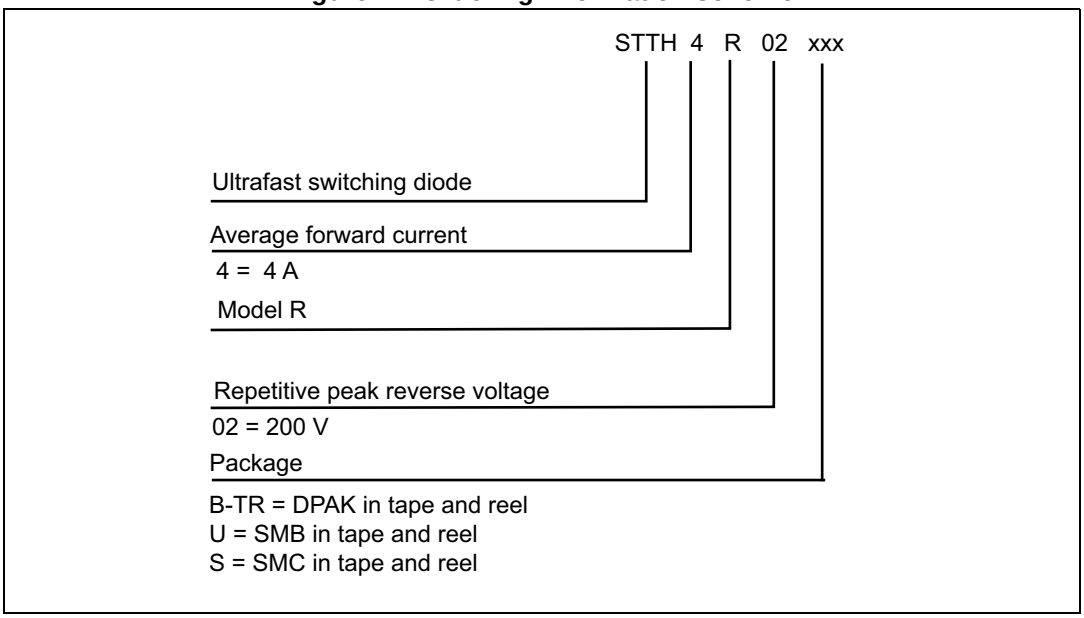


Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH4R02B-TR	STTH4R02	DPAK	0.32 g	2500	Tape and reel
STTH4R02U	4R2U	SMB	0.110 g	2500	Tape and reel
STTH4R02S	4R2S	SMC	0.243 g	2500	Tape and reel

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
03-May-2006	1	First issue.
10-Oct-2006	2	Added SMC package
13-Apr-2010	3	Updated ECOPACK statement. Updated dimensions tables for SMB and SMC.
01-Jul-2010	4	Separated junction to lead values from junction to case values in *Table 3*.
20-Nov-2014	5	Removed TO-220AC, TO-220FPAC and DO-201AB package informations.