

Turbo 2 ultrafast high voltage rectifier

Table 1. Main product characteristics

I_F (AV)	1 A
V_{RRM}	600 V
I_R (max)	75 μ A
T_j	175° C
V_F (typ)	1.0 V
t_{rr} (max)	25 ns

Features and benefits

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching and conduction losses

Description

The STTH1R06, which uses ST Turbo 2 600 V technology, is especially suited as a boost diode in power factor correction circuitry.

The device is also intended for use as a free wheeling diode in power supplies and other power switching applications.

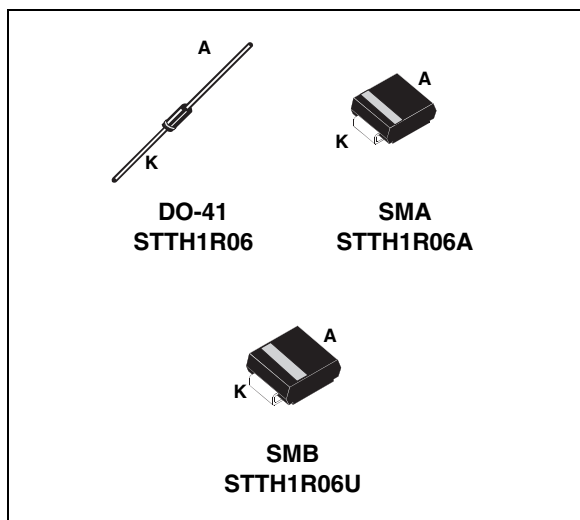


Table 2. Order codes

Part number	Marking
STTH1R06	STTH1R06
STTH1R06RL	STTH1R06
STTH1R06A	HR6
STTH1R06U	BR6

Table 3. Absolute ratings (limiting values)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		600	V
$I_{F(RMS)}$	RMS forward current	DO-41	10	A
		SMA / SMB	7	
$I_{F(AV)}$	Average forward current	DO-41	$T_c = 100^\circ \text{C} \quad \delta = 0.5$	A
		SMA	$T_c = 125^\circ \text{C} \quad \delta = 0.5$	
		SMB	$T_c = 135^\circ \text{C} \quad \delta = 0.5$	
I_{FSM}	Surge non repetitive forward current	DO-41	$t_p = 10\text{ms sinusoidal}$	A
		SMA / SMB		
T_{stg}	Storage temperature range		-65 to + 175	° C
T_j	Maximum operating junction temperature		175	° C

1 Characteristics

Table 4. Thermal resistance

Symbol	Parameter			Value (max)	Unit
$R_{th(j-l)}$	Junction to lead	L = 10 mm	DO-41	45	°C/W
			SMA	30	
			SMB	25	
$R_{th(j-a)}$	Junction to ambient ⁽¹⁾	L = 10 mm	DO-41	70	°C/W

1. $R_{th(j-a)}$ is measured with a copper area $S = S \text{ cm}^2$ (see [Figure 14](#)).

Table 5. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R	Reverse leakage current	$T_J = 25^\circ \text{C}$	$V_R = V_{RRM}$			1	μA
		$T_J = 150^\circ \text{C}$			10	75	
V_F	Forward voltage drop	$T_J = 25^\circ \text{C}$	$I_F = 1 \text{ A}$			1.7	V
		$T_J = 150^\circ \text{C}$			1.0	1.25	

To evaluate the conduction losses use the following equation:

$$P = 1.03 \times I_{F(AV)} + 0.27 I_F^2 (RMS)$$

Table 6. Dynamic characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$T_J = 25^\circ \text{C}$	$I_F = 0.5 \text{ A}$ $I_{rr} = 0.25 \text{ A}$ $I_R = 1 \text{ A}$			25	ns
			$I_F = 1 \text{ A}$ $dI_F/dt = -50 \text{ A}/\mu\text{s}$ $V_R = 30 \text{ V}$		30	45	
t_{fr}	Forward recovery time	$T_J = 25^\circ \text{C}$	$I_F = 1 \text{ A}$ $dI_F/dt = 100 \text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$			100	ns
V_{FP}	Forward recovery voltage	$T_J = 25^\circ \text{C}$	$I_F = 1 \text{ A}$ $dI_F/dt = 100 \text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$			10	V

Figure 1. Conduction losses versus average forward current

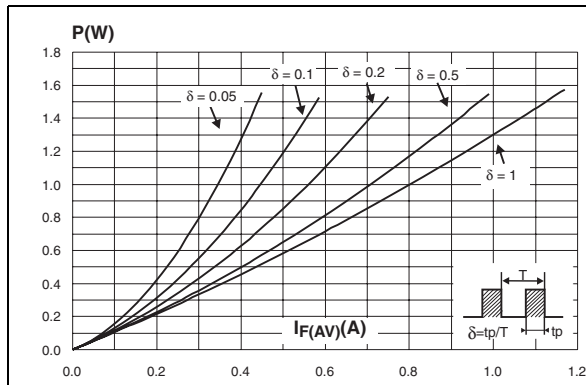


Figure 2. Forward voltage drop versus forward current

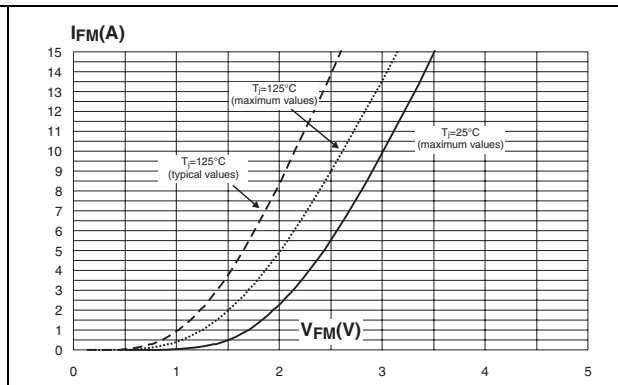


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (DO-41)

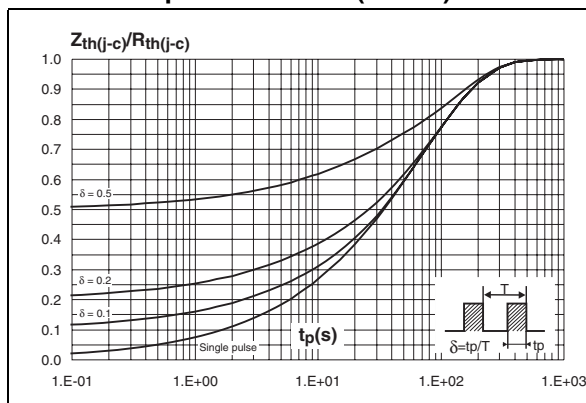


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (SMA)

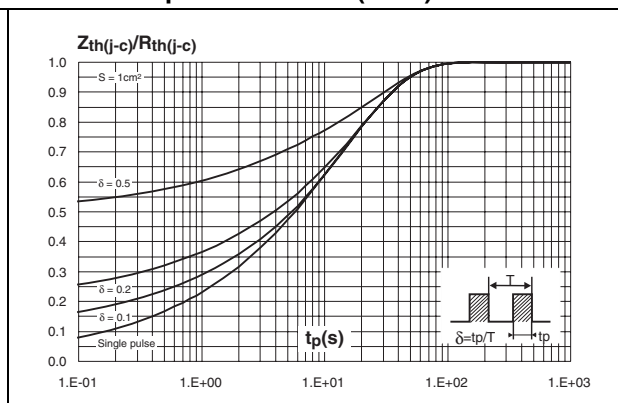


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (SMB)

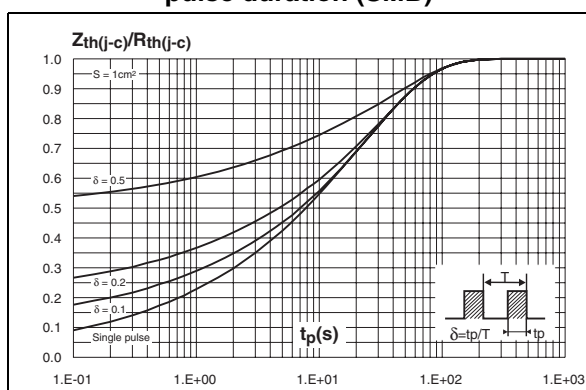


Figure 6. Peak reverse recovery current versus di_F/dt (typical values)

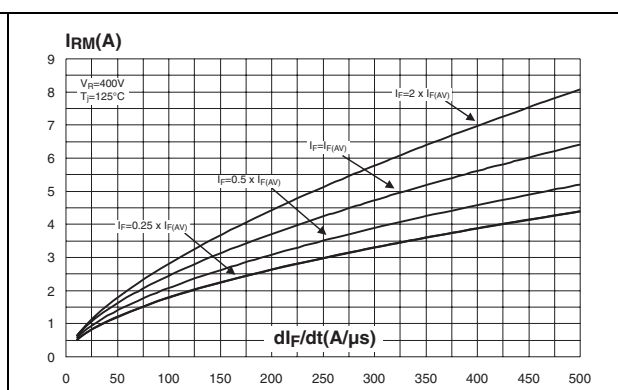


Figure 7. Reverse recovery time versus di_F/dt (typical values)

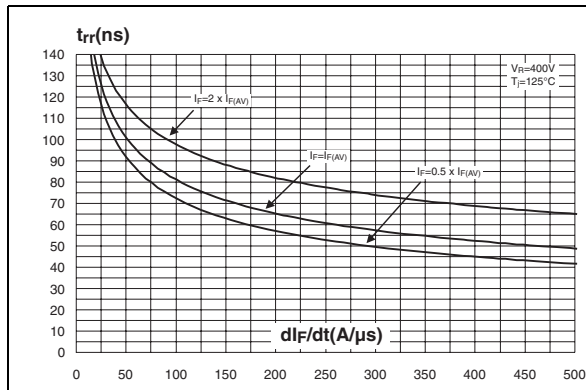


Figure 8. Reverse recovery charges versus di_F/dt (typical values)

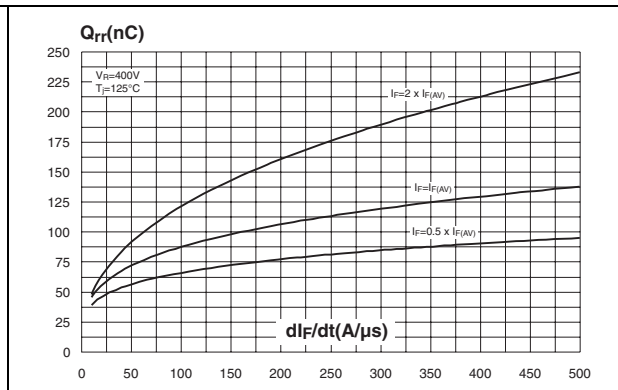


Figure 9. Reverse recovery softness factor versus di_F/dt (typical values)

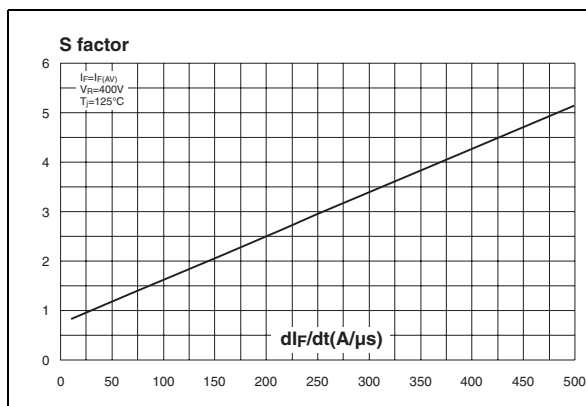


Figure 10. Relative variations of dynamic parameters versus junction temperature

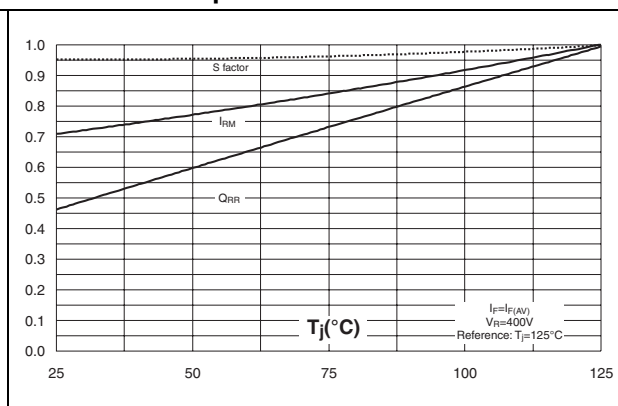


Figure 11. Transient peak forward voltage versus di_F/dt (typical values)

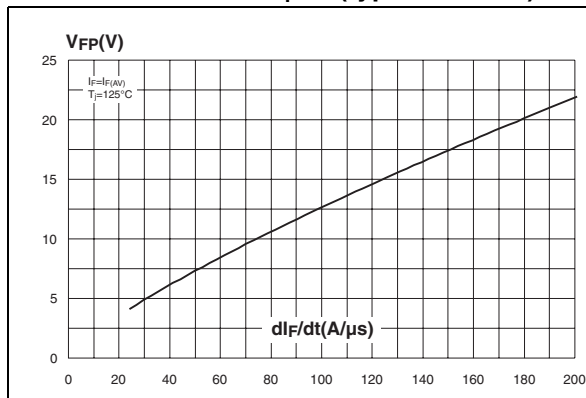


Figure 12. Forward recovery time versus di_F/dt (typical values)

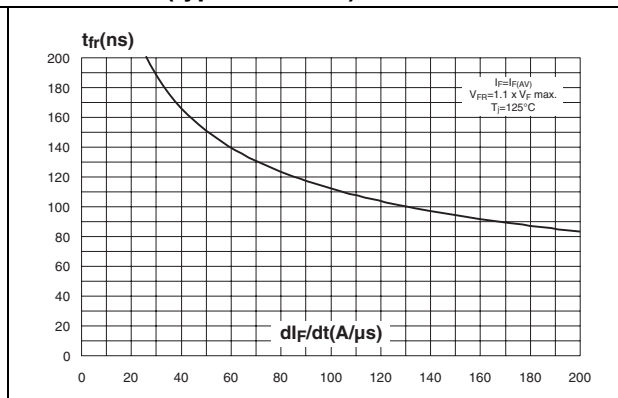


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

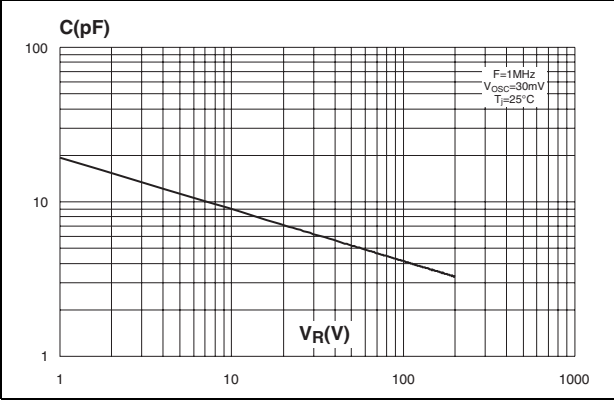


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4, copper thickness = 35 μm) (DO-41, SMB)

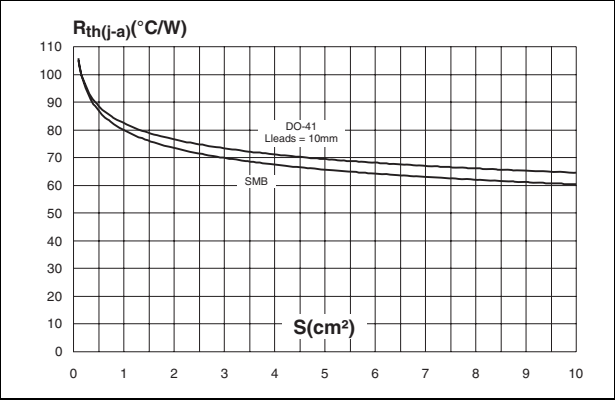
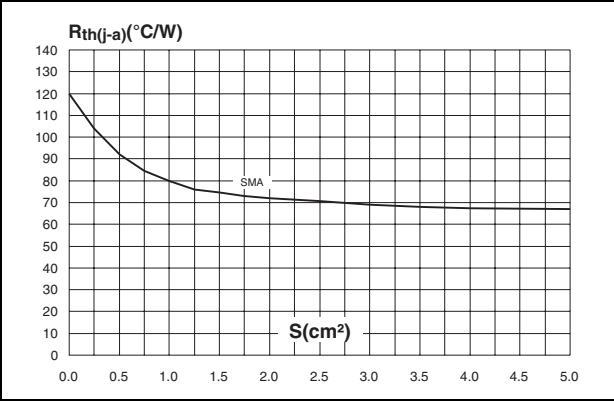


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4, copper thickness = 35 μm) (SMA)



2 Package information

- Epoxy meets UL94, V0

Table 7. SMA dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.094
A2	0.05	0.20	0.002	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.006	0.016
D	2.25	2.90	0.089	0.114
E	4.80	5.35	0.189	0.211
E1	3.95	4.60	0.156	0.181
L	0.75	1.50	0.030	0.059

Figure 16. Footprint, dimensions in mm (inches)

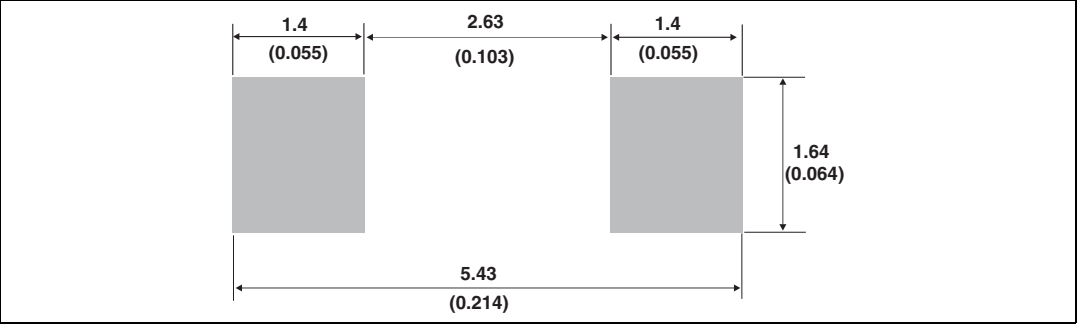
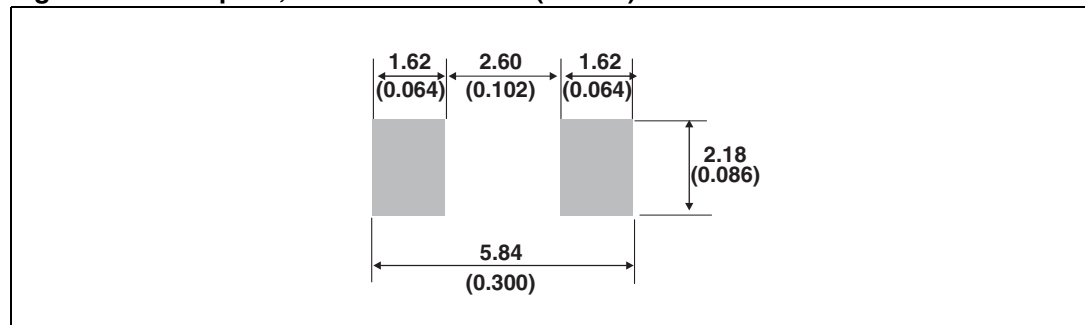


Table 8. SMB dimensions

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	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 17. Footprint, dimensions in mm (inches)**Table 9. DO-41 (glass) dimensions**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.07	5.20	0.160	0.205
B	2.04	2.71	0.080	0.107
C	28		1.102	
D	0.712	0.863	0.028	0.034

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.

3 Ordering information

Table 10. Ordering information

Part number	Marking	Package	Weight	Base qty	Delivery mode
STTH1R06	STTH1R06	DO-41	0.34 g	2000	Ammopack
STTH1R06RL	STTH1R06	DO-41	0.34 g	5000	Tape and reel
STTH1R06A	HR6	SMA	0.068 g	5000	Tape and reel
STTH1R06U	BR6	SMB	0.11 g	2500	Tape and reel

4 Revision history

Table 11. Revision history

Date	Revision	Description of changes
Apr-2003	1	First issue
07-Sep-2004	2	DO-41 and SMA packages added
24-Feb-2005	3	SMA package dimensions update. Reference A1 max. changed from 2.70 mm (0.106 inches) to 2.03 mm (0.080 inches).
02-Jul-2007	4	Reformatted to current standards. Added cathode bars to cover illustrations. Updated dimensions and footprint illustrations for SMA and SMB packages. Corrected part number in Table 10.

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