

## Turbo 2 ultrafast high voltage rectifier

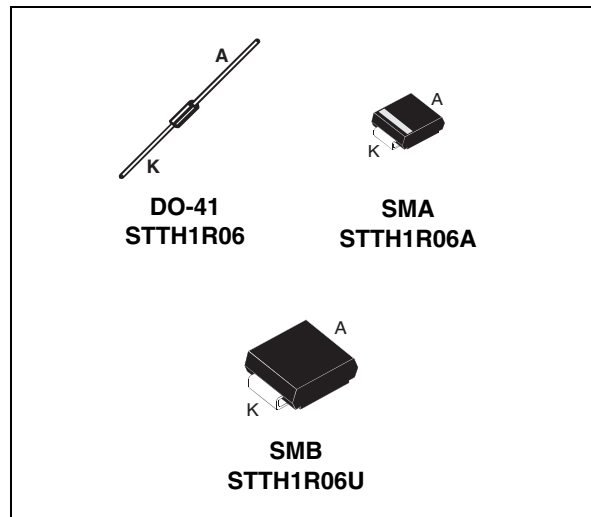
### Features

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

### Description

The STTH1R06, which is using ST Turbo 2 600 V technology, is specially suited as 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 1. Device summary**

Symbol	Value
$I_{F(AV)}$	1 A
$V_{RRM}$	600 V
$I_R$ (max)	75 $\mu$ A
$T_j$	175 °C
$V_F$ (typ)	1.0 V
$t_{rr}$ (max)	25 ns

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

Symbol	Parameter		Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage		600	V	
$I_{F(RMS)}$	Forward rms current	DO-41	10	A	
		SMA / SMB	7		
$I_{F(AV)}$	Average forward current	DO-41	1	A	
		SMA			$T_c = 100\text{ °C} \quad \delta = 0.5$
		SMB			$T_c = 125\text{ °C} \quad \delta = 0.5$
$I_{FSM}$	Surge non repetitive forward current	DO-41	25	A	
		SMA / SMB			$t_p = 10\text{ms sinusoidal}$
$T_{stg}$	Storage temperature range		-65 to + 175	°C	
$T_j$	Maximum operating junction temperature		175	°C	

**Table 3. 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 <sup>(1)</sup>	L = 10 mm	DO-41	70	°C/W

1.  $R_{th(j-a)}$  is measured with a copper area  $S = 5\text{cm}^2$  (see [Figure 14](#)).

**Table 4. Static electrical characteristics**

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

To evaluate the conduction losses use the following equation:  $P = 1.03 \times I_{F(AV)} + 0.27 I_{F(RMS)}^2$

Table 5. Dynamic characteristics

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

Figure 1. Conduction losses versus average forward current

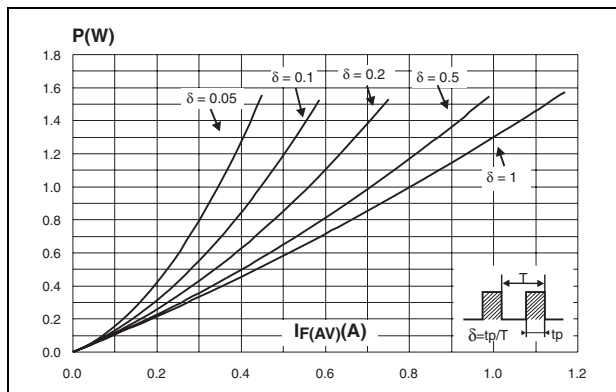


Figure 2. Forward voltage drop vs forward current

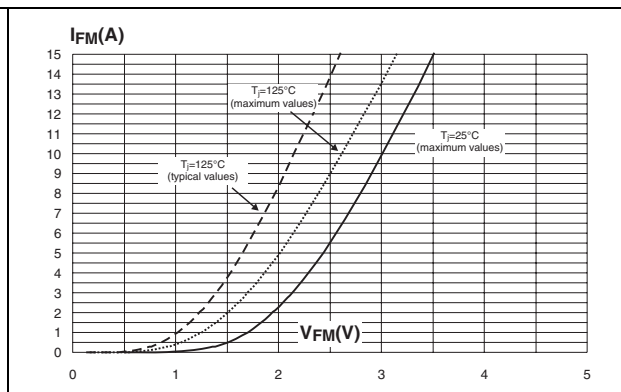


Figure 3. Relative variation of thermal impedance junction to case vs pulse duration (DO-41)

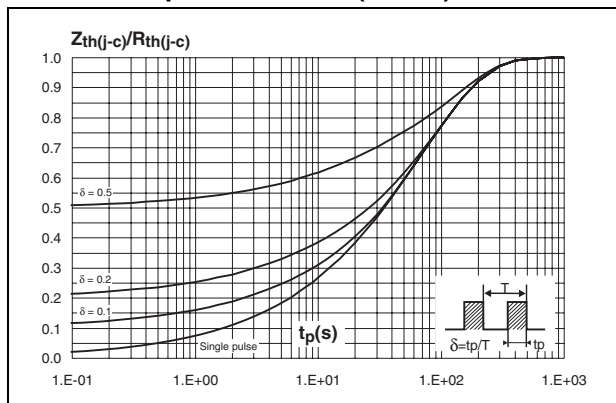
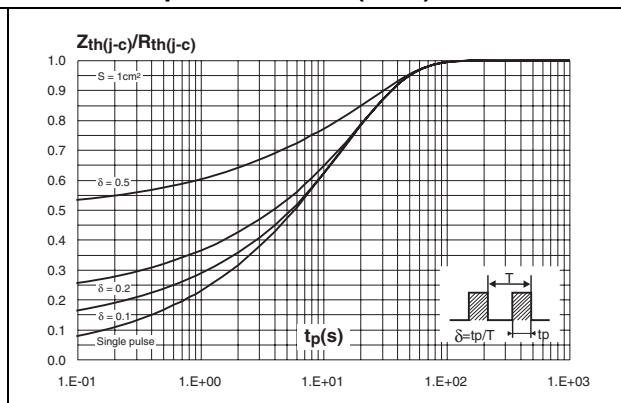
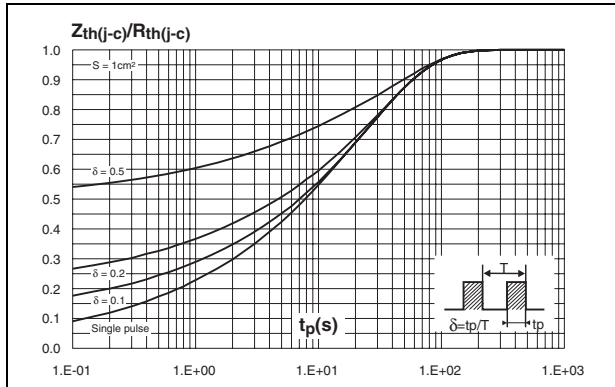


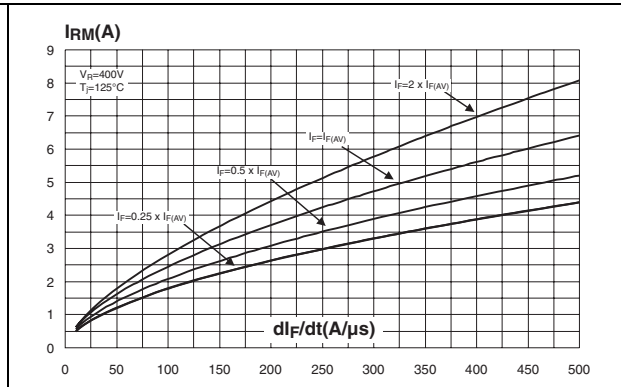
Figure 4. Relative variation of thermal impedance junction to case vs pulse duration (SMA)



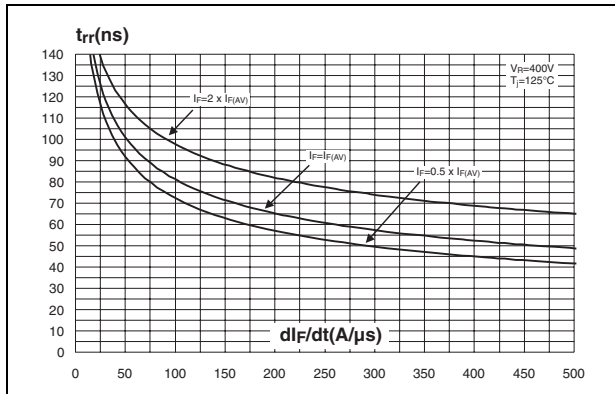
**Figure 5. Relative variation of thermal impedance junction to case vs pulse duration (SMB)**



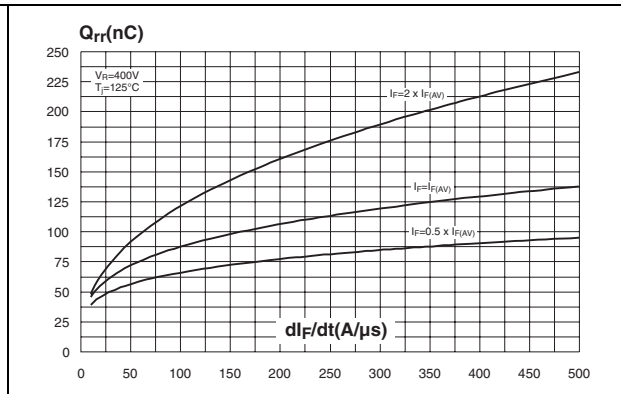
**Figure 6. Peak reverse recovery current vs  $di_F/dt$  (typical values)**



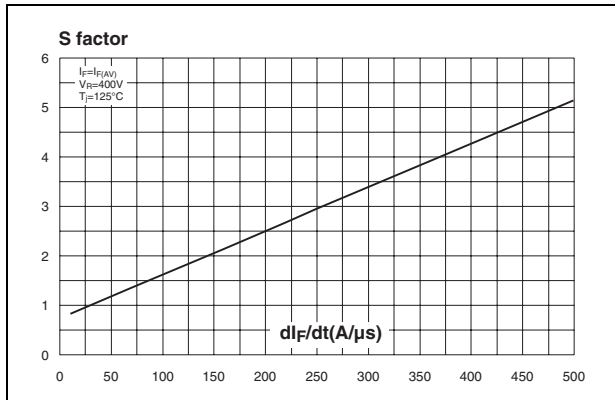
**Figure 7. Reverse recovery time versus  $di_F/dt$  (typical values)**



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



**Figure 9. Reverse recovery softness factor vs  $di_F/dt$  (typical values)**



**Figure 10. Relative variations of dynamic parameters vs junction temperature**

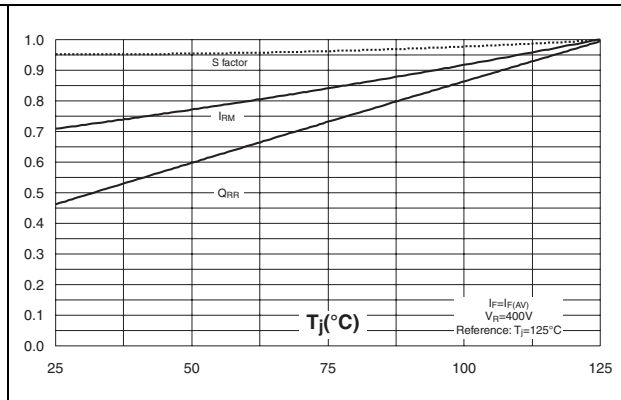


Figure 11. Transient peak forward voltage vs  $di_F/dt$  (typical values)

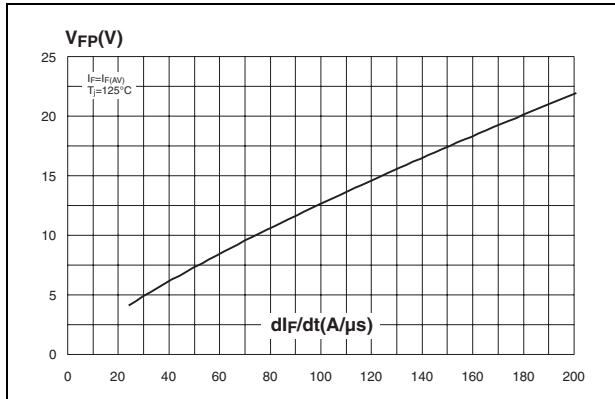


Figure 12. Forward recovery time vs  $di_F/dt$  (typical values)

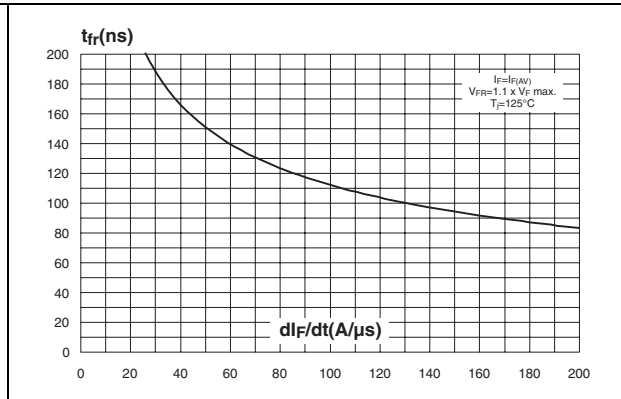


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

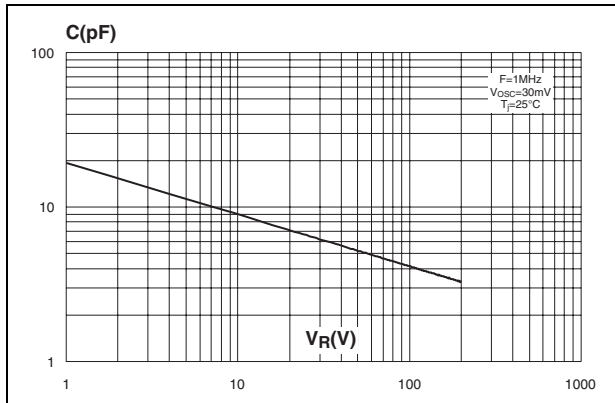


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead

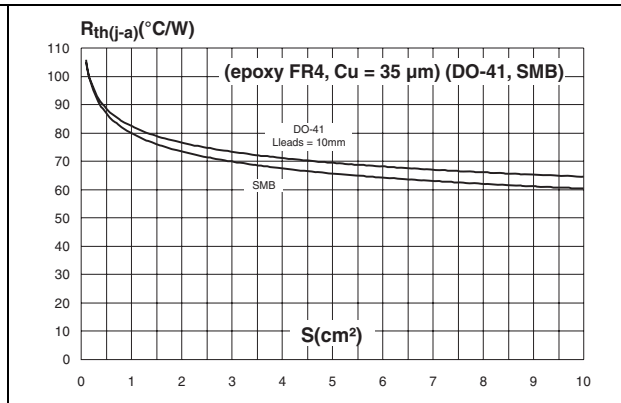
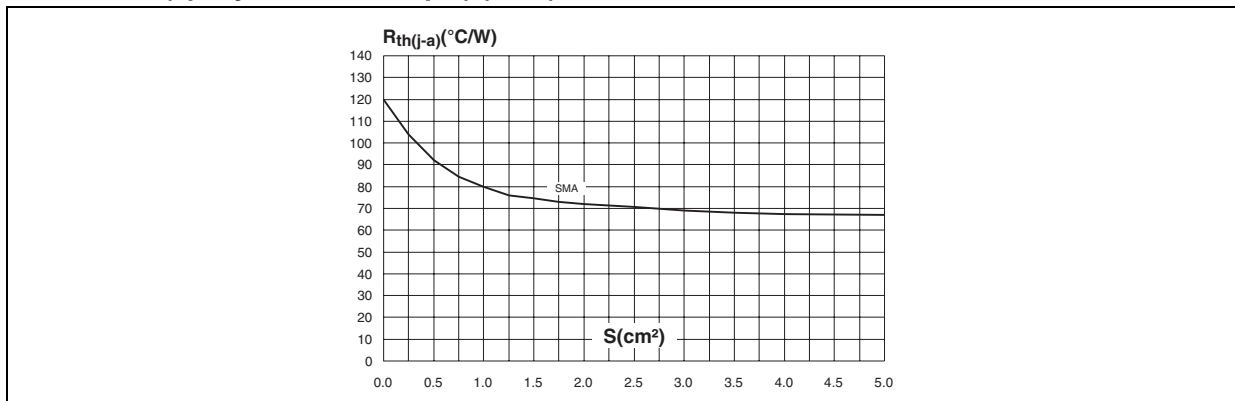


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4,  $\text{Cu} = 35 \mu\text{m}$ ) (SMA)



## 2 Package information

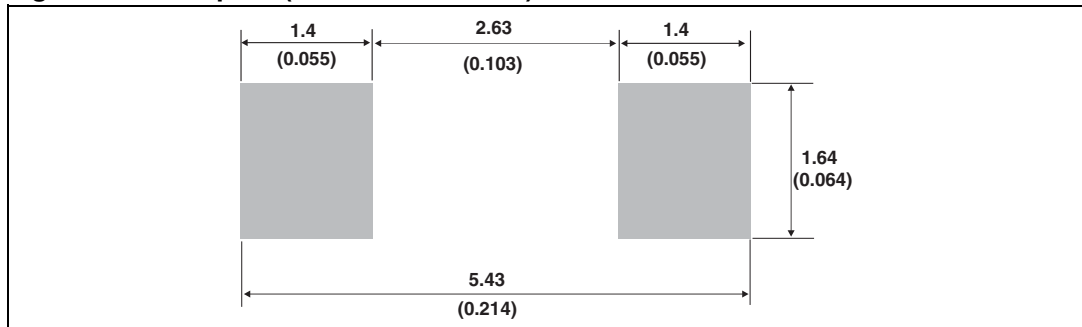
- Epoxy meets UL94, V0
- Lead-free packages

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**Table 6. 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

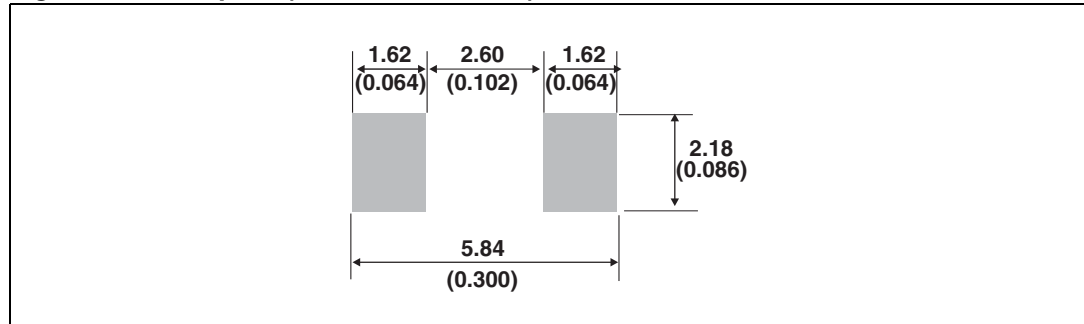
**Figure 16. Footprint (dimensions in mm)**



**Table 7. 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
E	5.10	5.60	0.201	0.220
E1	4.05	4.60	0.159	0.181
D	3.30	3.95	0.130	0.156
L	0.75	1.50	0.030	0.059

**Figure 17. Footprint (dimensions in mm)**



**Table 8. DO-41 (plastic) 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	25.4		1	
D	0.71	0.86	0.028	0.034

### 3 Ordering information

**Table 9. Ordering information**

Order code	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 10. Document revision history**

Date	Revision	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 inc.) to 2.03 mm (0.080).
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 9.
30-Sep-2009	5	Updated table 8 package dimensions.



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