

## Turbo 2 ultrafast high voltage rectifier

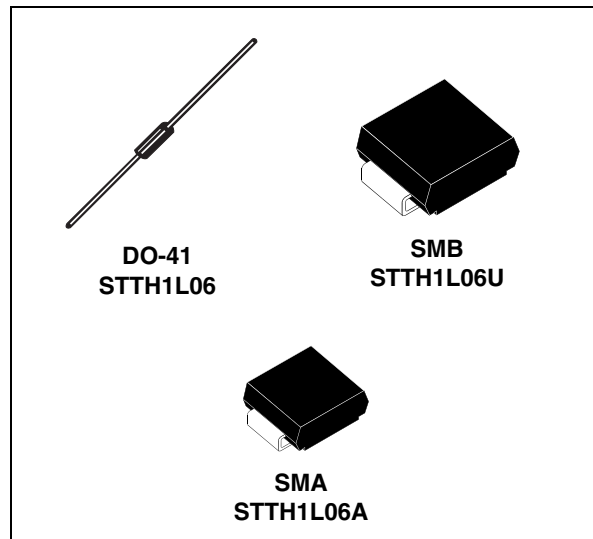
### Features

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

### Description

The STTH1L06/U/A, which is using ST Turbo 2 600 V technology, is specially suited as boost diode in discontinuous or critical mode power factor corrections.

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
$T_j$ (max)	175 °C
$V_F$ (max)	1.05 V
$t_{rr}$ (max)	80 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 voltage	DO-41	10	A	
		SMA / SMB	7		
$I_{F(AV)}$	Average forward current $\delta = 0.5$	DO-41	1	A	
		SMA			$T_c = 120\text{ }^\circ\text{C}$
		SMB			$T_c = 135\text{ }^\circ\text{C}$
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal DO-41	30	A	
		$t_p = 10\text{ ms}$ sinusoidal SMA / SMB			20
$T_{stg}$	Storage temperature range		-65 to + 175	$^\circ\text{C}$	
$T_j$	Maximum operating junction temperature		175	$^\circ\text{C}$	

**Table 3. Thermal parameters**

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

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	$T_j = 25\text{ }^\circ\text{C}$	$V_R = 600\text{ V}$			1	$\mu\text{A}$
		$T_j = 150\text{ }^\circ\text{C}$			10	75	
$V_F$	Forward voltage drop	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}$			1.3	V
		$T_j = 150\text{ }^\circ\text{C}$			0.85	1.05	

To evaluate the conduction losses use the following equation:

$$P = 0.89 \times I_{F(AV)} + 0.165 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}$ , $dI_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$		55	80	ns
$t_{fr}$	Forward recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 3.5\text{ V}$			50	ns
$V_{FP}$	Forward recovery voltage	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$			10	V

Figure 1. Conduction losses versus average current

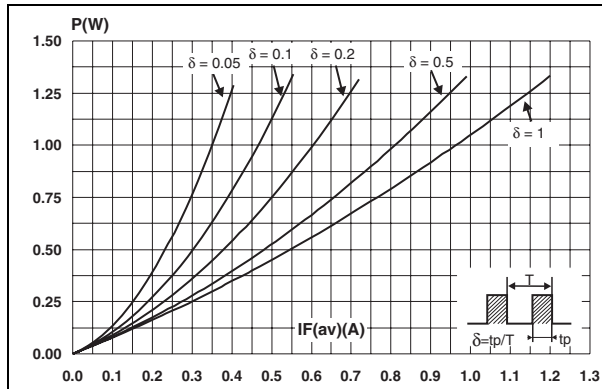


Figure 2. Forward voltage drop versus forward current

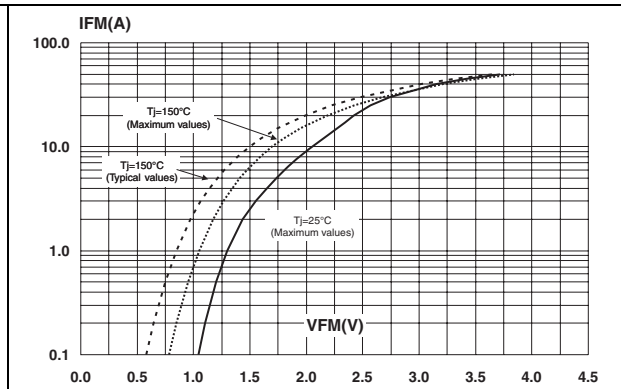


Figure 3. Relative variation of thermal impedance junction ambient versus pulse duration

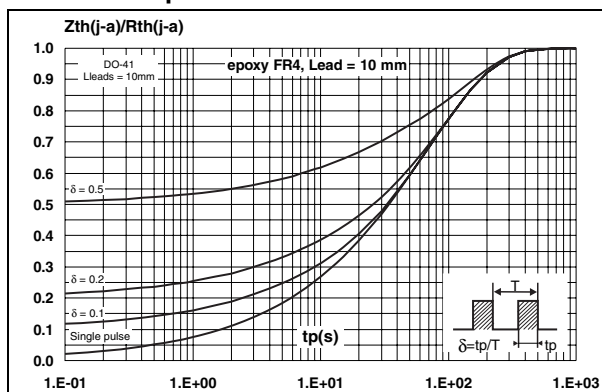
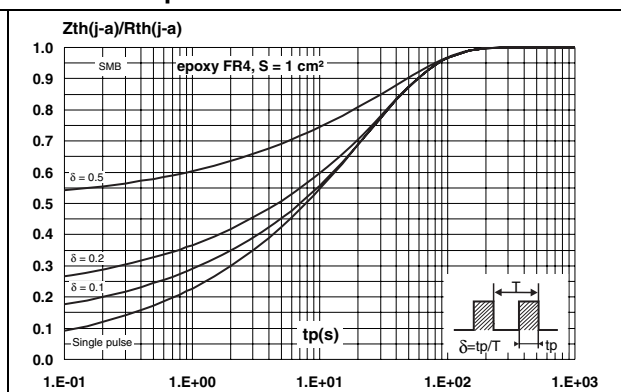
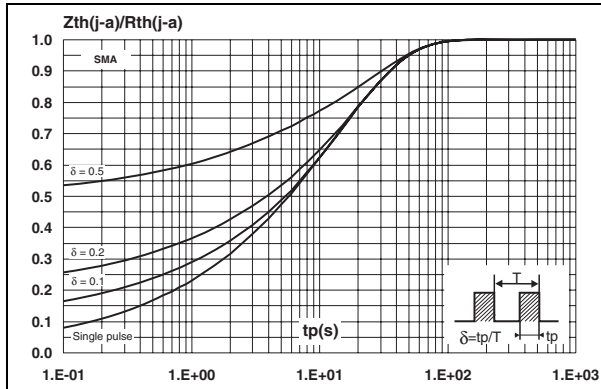


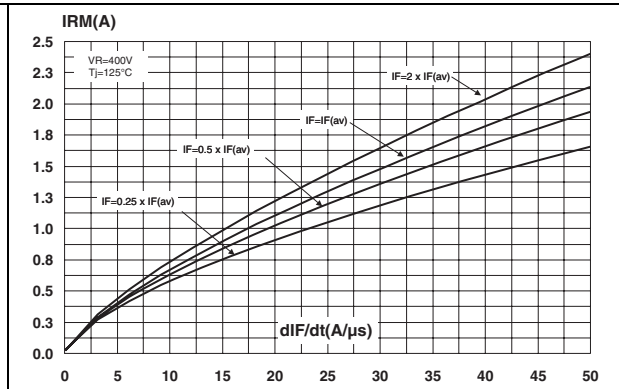
Figure 4. Relative variation of thermal impedance junction ambient versus pulse duration



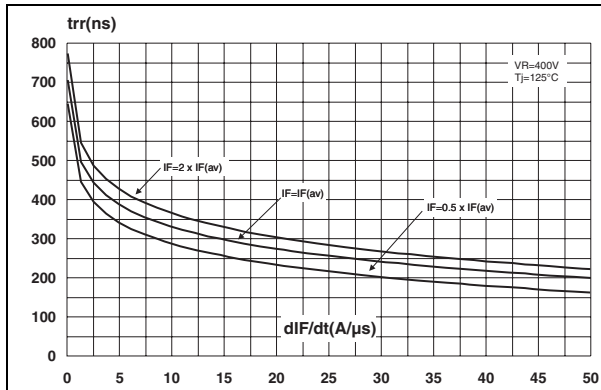
**Figure 5. Relative variation of thermal impedance junction ambient versus pulse duration (epoxy FR4)**



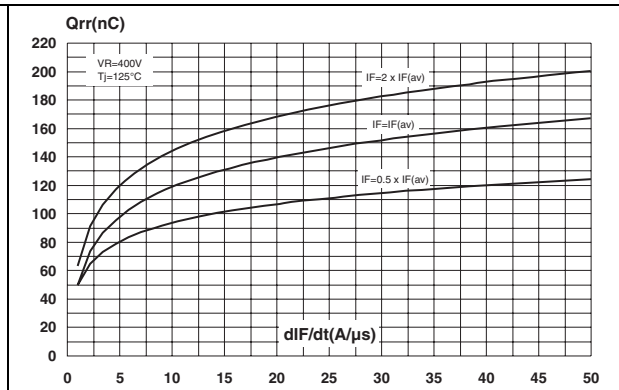
**Figure 6. Peak reverse recovery current versus  $dI_F/dt$  (90% confidence)**



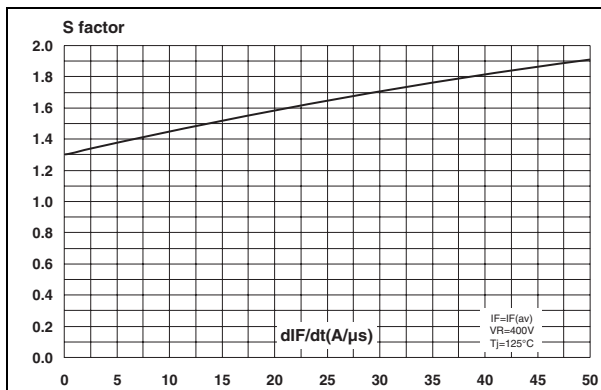
**Figure 7. Reverse recovery time versus  $dI_F/dt$  (90% confidence)**



**Figure 8. Reverse recovery charges versus  $dI_F/dt$  (90% confidence)**



**Figure 9. Softness factor versus  $dI_F/dt$  (typical values)**



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

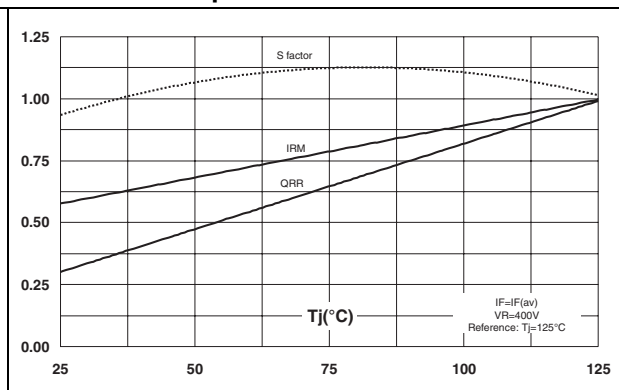


Figure 11. Transient peak forward voltage versus  $dI_F/dt$  (90% confidence)

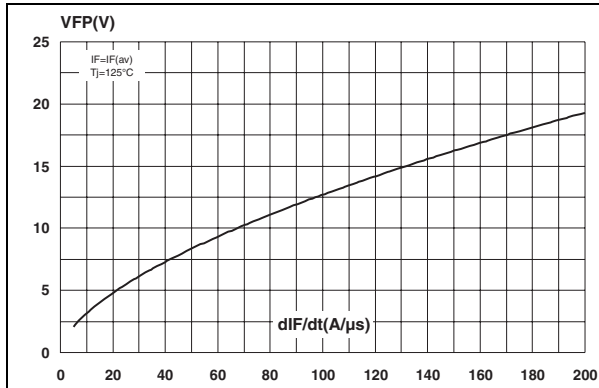


Figure 12. Forward recovery time versus  $dI_F/dt$  (90% confidence)

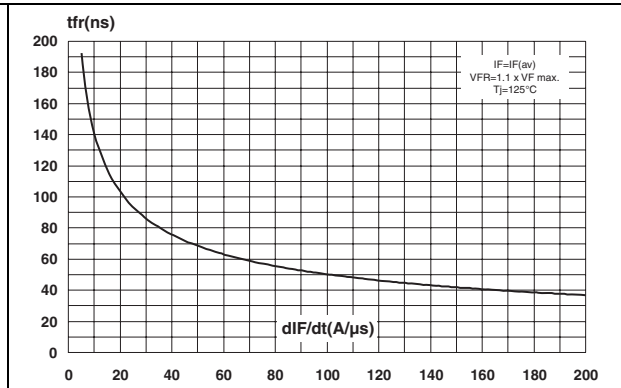


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

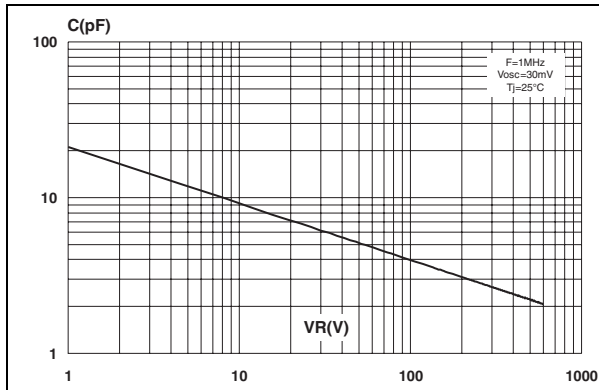


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead

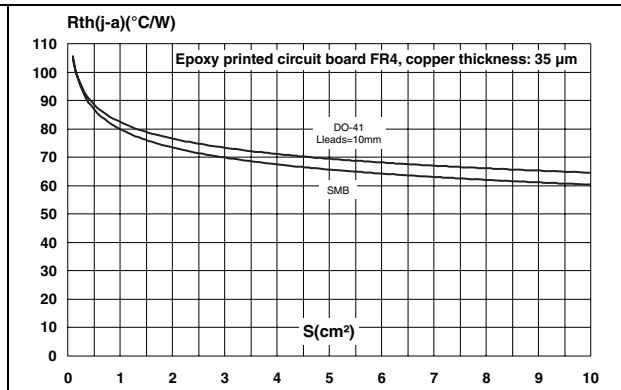
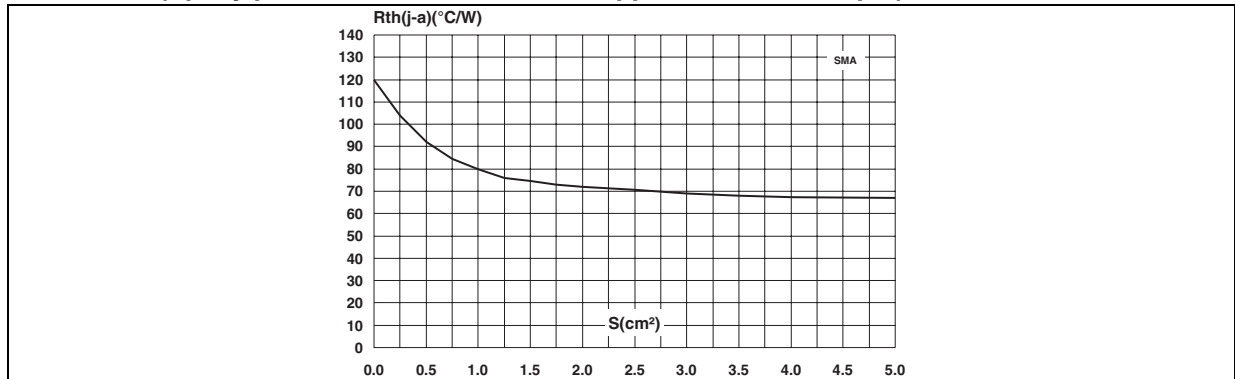


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (Epoxy printed circuit board FR4, copper thickness: 35  $\mu$ m)



## 2 Package information

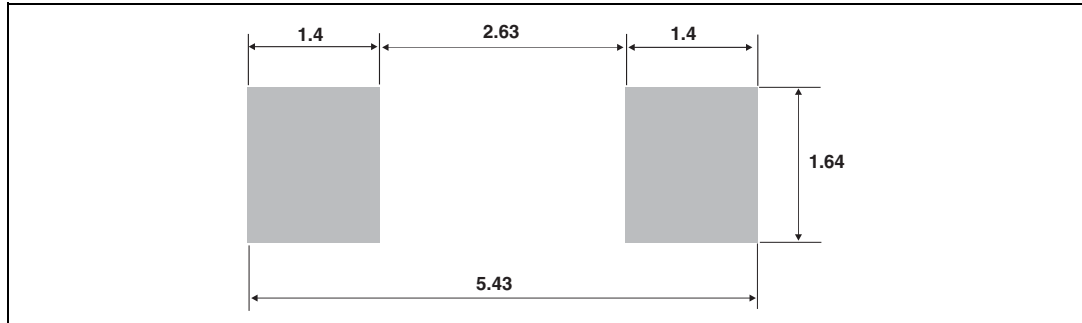
- Epoxy meets UL 94, V0
- Band indicates cathode
- Bending method (DO-41): see Application note AN1471

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**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

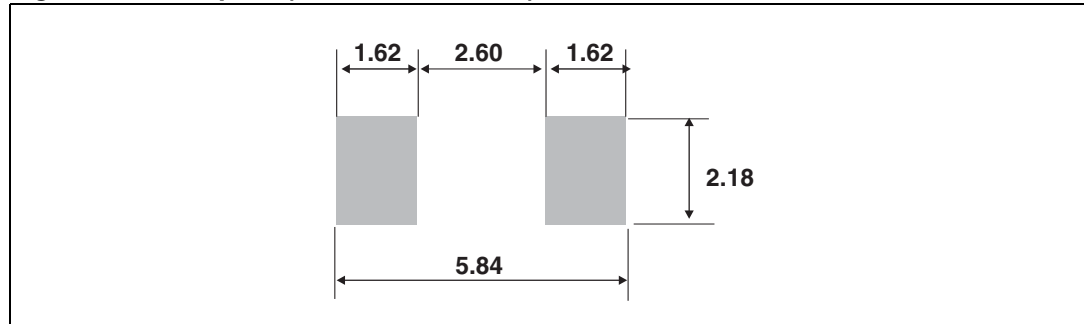
**Figure 16. Footprint (dimensions in mm)**



**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
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)**



**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
STTH1L06	STTH1L06	DO-41	0.34 g	2000	Ammopack
STTH1L06RL	STTH1L06	DO-41	0.34 g	5000	Tape and reel
STTH1L06U	BL6	SMB	0.11 g	2500	Tape and reel
STTH1L06A	HL6	SMA	0.068 g	5000	Tape and reel

### 4 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
Jul-2002	3C	Last issue.
30-Sep-2009	4	Updated table 8 package dimensions.



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