

## Ultrafast recovery diode

### Main product characteristics

$I_{F(AV)}$	60 A
$V_{RRM}$	400 V
$T_j$	175° C
$V_F$ (typ)	0.95 V
$t_{rr}$ (typ)	31 ns

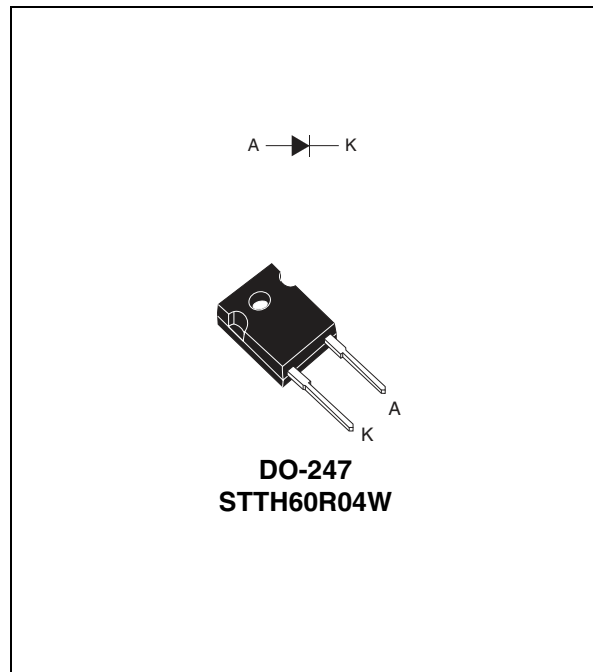
### Features and benefits

- Very low switching losses
- High frequency and/or high pulsed current operation
- High junction temperature

### Description

The STTH60R04 series uses ST's new 400 V planar Pt doping technology. The STTH60R04 is specially suited for switching mode base drive and transistor circuits.

Available in a through-the-hole package, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.



### Order codes

Part Number	Marking
STTH60R04W	STTH60R04W

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

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		400	V
$V_{RSM}$	Non repetitive peak reverse voltage		400	V
$I_{F(RMS)}$	RMS forward current		100	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 110^\circ \text{C}$	60	A
$I_{FRM}$	Repetitive peak forward current	$t_p = 5 \mu\text{s}$ F = 1 kHz square	375	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10 \text{ms}$ Sinusoidal	650	A
$T_{stg}$	Storage temperature range		-65 to +175	° C
$T_j$	Operating junction temperature range		-40 to +175	° C

# 1 Characteristics

**Table 2. Thermal parameters**

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case	0.7	°C/W

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit	
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ\text{C}$			60	$\mu\text{A}$	
		$T_j = 125^\circ\text{C}$			60		600
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ\text{C}$	$I_F = 60\text{ A}$		1.5	V	
		$T_j = 100^\circ\text{C}$			1.05		1.3
		$T_j = 150^\circ\text{C}$			0.95		1.2

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.9 \times I_{F(AV)} + 0.005 \times I_{F(RMS)}^2$$

**Table 4. Dynamic characteristics**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$			80	ns
		$I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$		40	55	
		$I_F = 1\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$		31	45	
$I_{RM}$	Reverse recovery current	$I_F = 60\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 320\text{ V}$ , $T_j = 125^\circ\text{C}$		11	16	A
S	Softness factor	$I_F = 60\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 320\text{ V}$ , $T_j = 125^\circ\text{C}$		0.4		
$t_{fr}$	Forward recovery time	$I_F = 60\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25^\circ\text{C}$		800		ns
$V_{FP}$	Forward recovery voltage	$I_F = 60\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $T_j = 25^\circ\text{C}$		3.2		V

Figure 1. Conduction losses versus average current

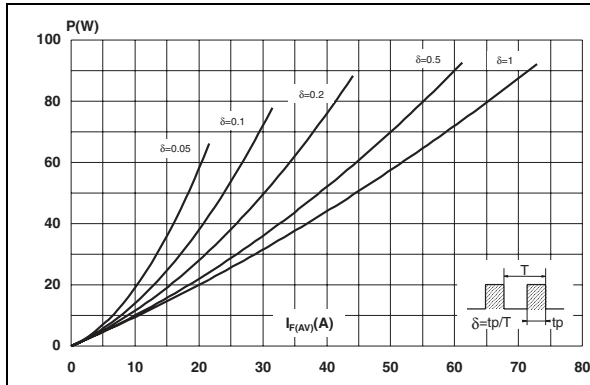


Figure 2. Forward voltage drop versus forward current

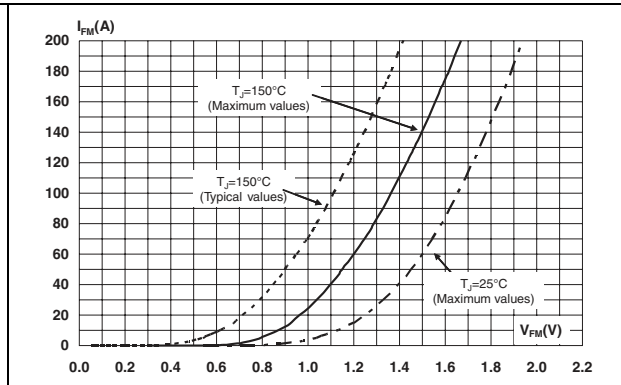


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

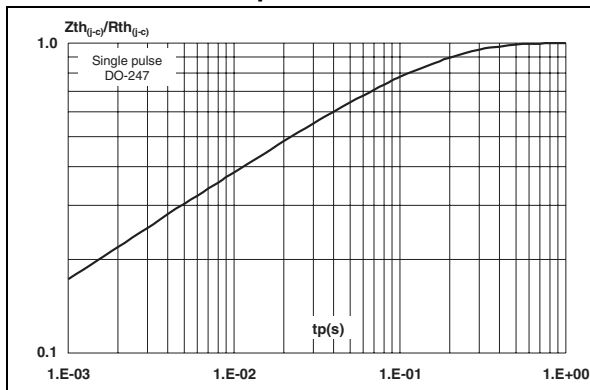


Figure 4. Peak reverse recovery current versus di\_F/dt (typical values)

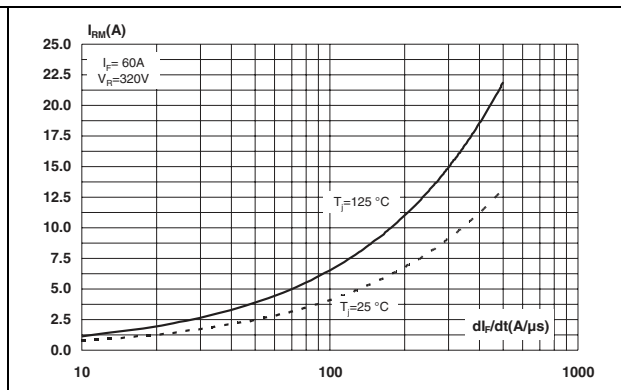


Figure 5. Reverse recovery time versus di\_F/dt (typical values)

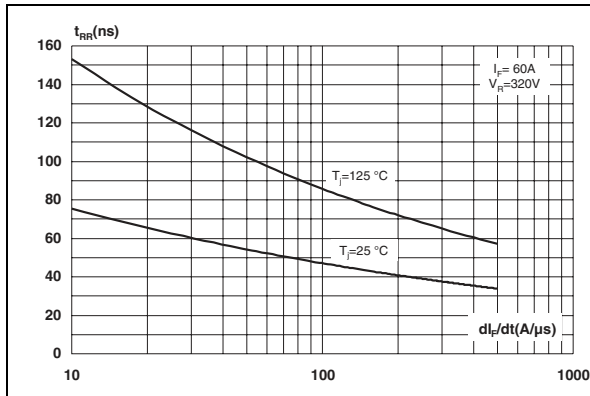
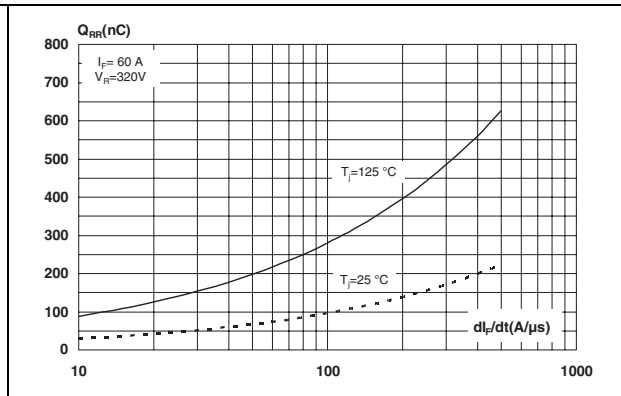
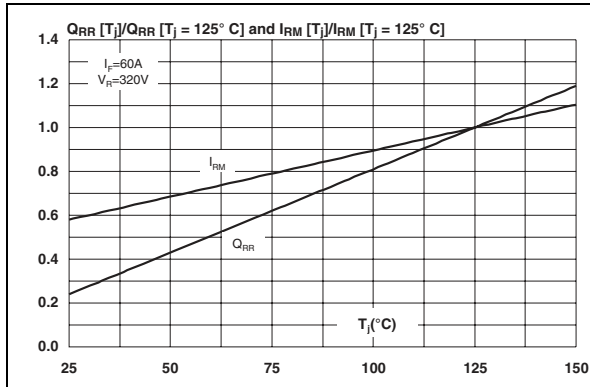


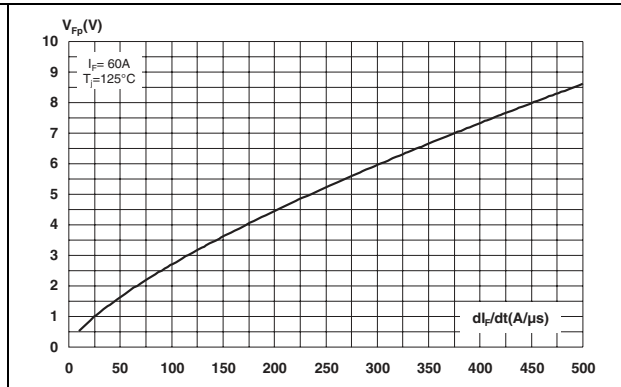
Figure 6. Reverse recovery charges versus di\_F/dt (typical values)



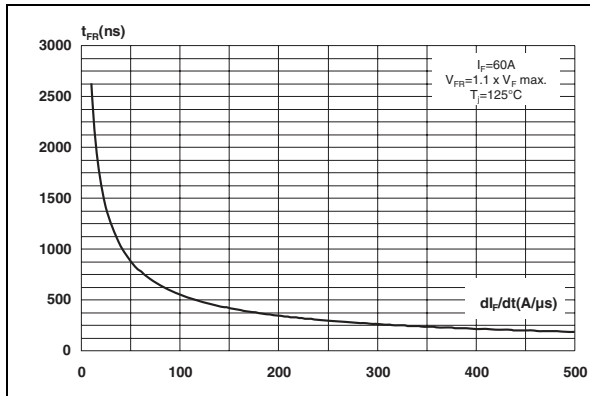
**Figure 7. Relative variations of dynamic parameters versus junction temperature**



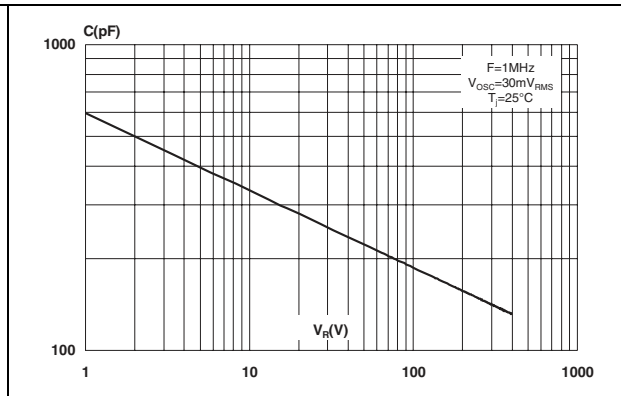
**Figure 8. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



**Figure 9. Forward recovery time versus  $di_F/dt$  (typical values)**



**Figure 10. Junction capacitance versus reverse voltage applied (typical values)**



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 Nm
- Maximum torque value: 1.0 Nm

**Table 5. DO-247 dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
L4		34.60			1.362	
L5		5.50			0.216	
M	2.00		3.00	0.078		0.118
V		5°			5°	
V2		60°			60°	
Dia.	3.55		3.65	0.139		0.143

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](http://www.st.com).

### 3 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH60R04W	STTH60R04W	DO-247	4.40 g	30	Tube

### 4 Revision history

Date	Revision	Description of Changes
31-Mar-2007	1	First issue

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