



# STTH120R04TV

Ultrafast recovery diode

## Main product characteristics

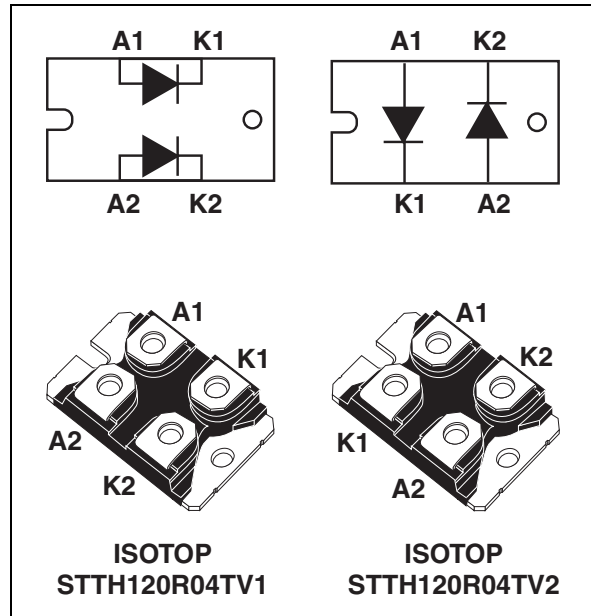
$I_{F(AV)}$	2 x 60 A
$V_{RRM}$	400 V
$T_j$	150° C
$V_F$ (typ)	0.95 V
$t_{rr}$ (typ)	31 ns

## Features and benefits

- Ultrafast
- Very low switching losses
- High frequency and high pulsed current operation
- Low leakage current
- Insulated package:
  - ISOTOP  
Electrical insulation = 2500 V<sub>RMS</sub>  
Capacitance = 45 pF

## Description

The STTH120R04TV series uses ST's new 400 V planar Pt doping technology. The STTH120R04 is specially suited for switching mode base drive and transistor circuits, such as welding equipment.



## Order codes

Part Number	Marking
STTH120R04TV1	STTH120R04TV1
STTH120R04TV2	STTH120R04TV2

# 1 Characteristics

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

Symbol	Parameter			Value	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage			400	V
V <sub>RSM</sub>	Non repetitive peak reverse voltage			400	V
I <sub>F(RMS)</sub>	RMS forward current	Per diode		140	A
I <sub>F(AV)</sub>	Average forward current, δ = 0.5	Per diode	T <sub>C</sub> = 75° C	60	A
		Per package	T <sub>C</sub> = 70° C	120	A
I <sub>FRM</sub>	Repetitive peak forward current	t <sub>p</sub> = 5 μs, F = 1 kHz square		1800	A
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms Sinusoidal		700	A
T <sub>stg</sub>	Storage temperature range			-65 to + 150	°C
T <sub>j</sub>	Maximum operating junction temperature			150	°C

**Table 2. Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	Per diode	0.8	$^\circ \text{C/W}$
		Total	0.45	
$R_{th(c)}$	Coupling thermal resistance		0.1	

When the diodes are used simultaneously:

$$\Delta T_{j(\text{diode1})} = P_{(\text{diode1})} \times R_{th(j-c)} \text{ (per diode)} + P_{(\text{diode2})} \times R_{th(c)}$$

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ \text{C}$	$V_R = V_{RRM}$			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:  $t_p = 380 \mu\text{s}$ ,  $\delta < 2 \%$

To evaluate the conduction losses use the following equation:

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

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1\text{ A}$ , $dl_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$			80	ns
		$I_F = 1\text{ A}$ , $dl_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$		40	55	
		$I_F = 1\text{ A}$ , $dl_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$		31	45	
$I_{RM}$	Reverse recovery current	$I_F = 60\text{ A}$ , $dl_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 320\text{ V}$ , $T_j = 125^\circ\text{C}$		11	16	A
S	Softness factor	$I_F = 60\text{ A}$ , $dl_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 320\text{ V}$ , $T_j = 125^\circ\text{C}$		0.4		
$t_{fr}$	Forward recovery time	$I_F = 60\text{ A}$ , $dl_F/dt = 100\text{ A}/\mu\text{s}$ , $V_{FR} = 1.5 \times V_{Fmax}$ , $T_j = 25^\circ\text{C}$		600		ns
$V_{FP}$	Forward recovery voltage	$I_F = 60\text{ A}$ , $dl_F/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 25^\circ\text{C}$		3.2		V

Figure 1. Conduction losses versus average current

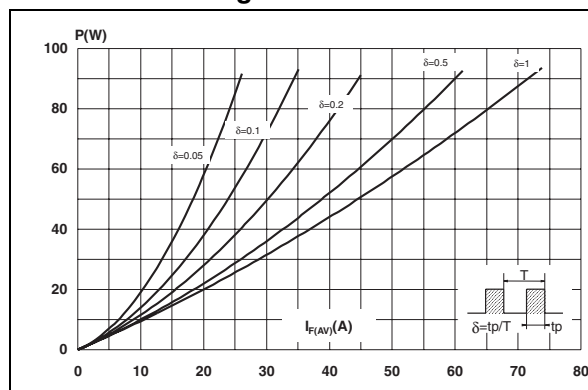


Figure 2. Forward voltage drop versus forward current

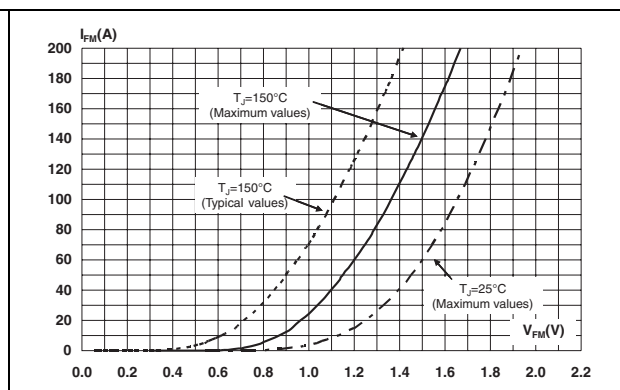
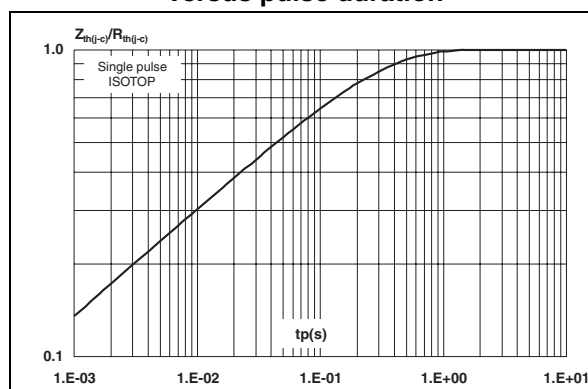
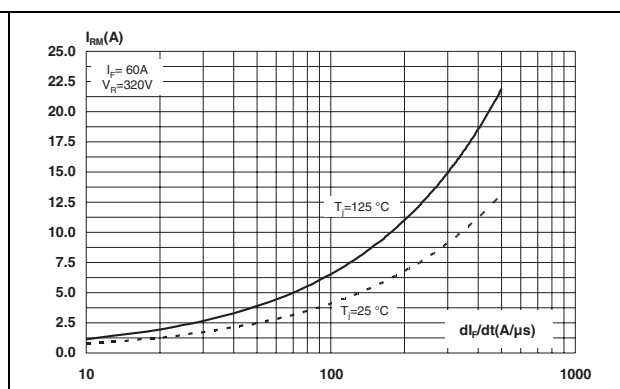
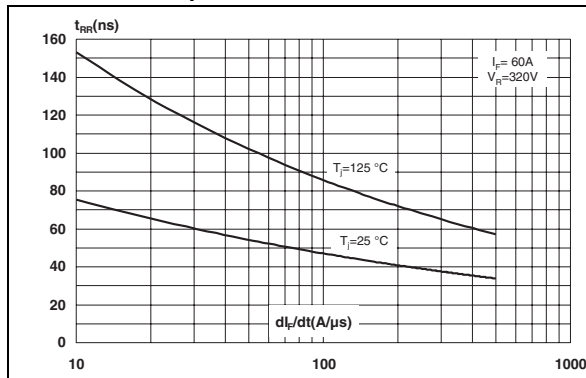
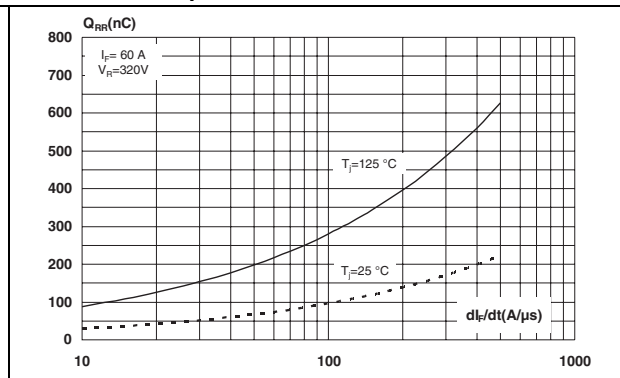
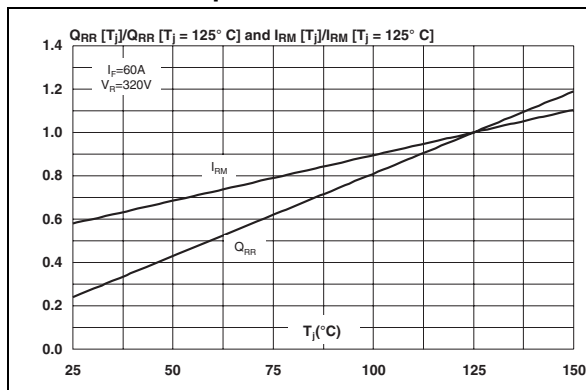
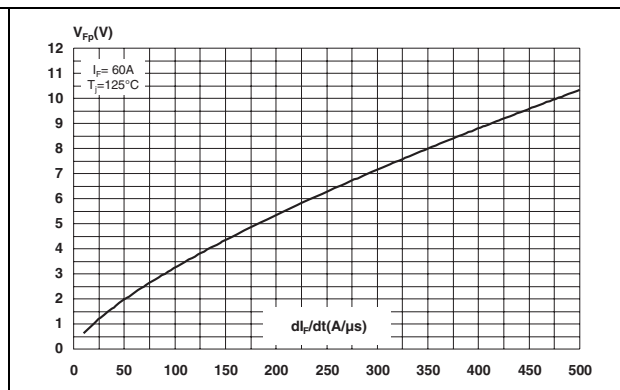
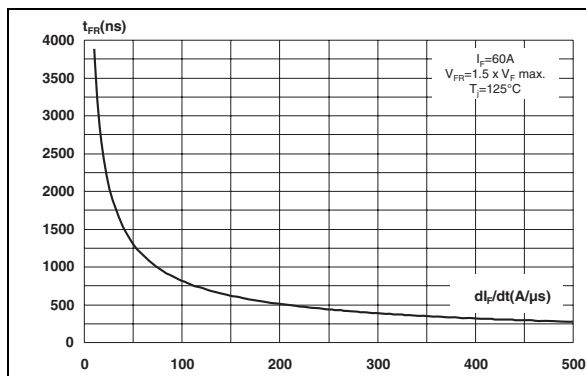
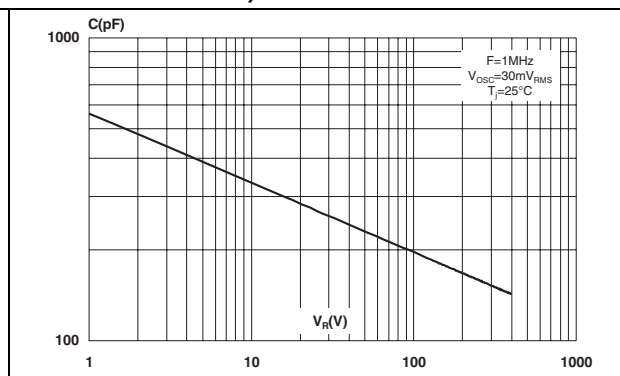


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

Figure 4. Peak reverse recovery current versus  $dl_F/dt$  (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)

**Table 5. ISOTOP dimensions**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	11.80	12.20	0.465	0.480
A1	8.90	9.10	0.350	0.358
B	7.8	8.20	0.307	0.323
C	0.75	0.85	0.030	0.033
C2	1.95	2.05	0.077	0.081
D	37.80	38.20	1.488	1.504
D1	31.50	31.70	1.240	1.248
E	25.15	25.50	0.990	1.004
E1	23.85	24.15	0.939	0.951
E2	24.80 typ.		0.976 typ.	
G	14.90	15.10	0.587	0.594
G1	12.60	12.80	0.496	0.504
G2	3.50	4.30	0.138	0.169
F	4.10	4.30	0.161	0.169
F1	4.60	5.00	0.181	0.197
P	4.00	4.30	0.157	0.69
P1	4.00	4.40	0.157	0.173
S	30.10	30.30	1.185	1.193

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
STTH120R04TV1	STTH120R04TV1	ISOTOP	27 g	10	Tube
STTH120R04TV2	STTH120R04TV2	ISOTOP	27 g	10	Tube

### 4 Revision history

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

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