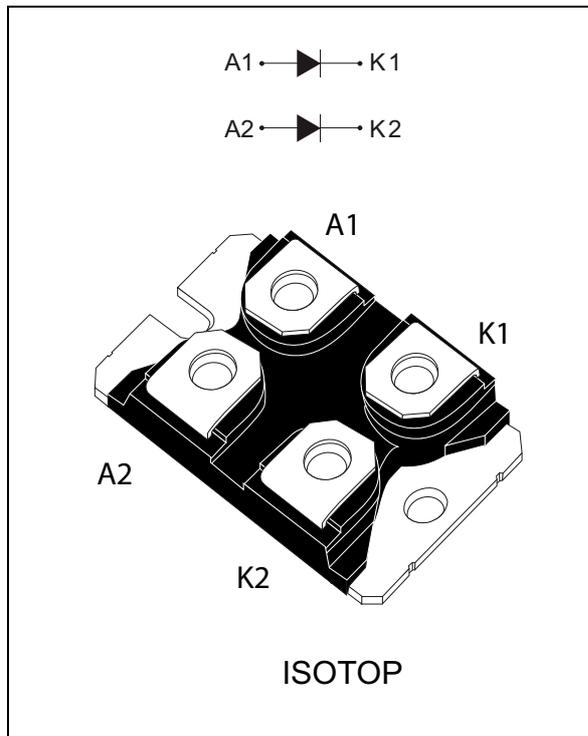


## Ultrafast high voltage rectifier

Datasheet - production data



- Package insulation voltage:
  - Terminal to case: 2500 V<sub>AC</sub> during 1 minute at T<sub>C</sub> = 125 °C
  - Diode to diode: 1500 V<sub>DC</sub> during 1 minute at T<sub>C</sub> = 125 °C
- ECOPACK<sup>®</sup>2 compliant component

**Description**

The STTH240F04 uses ST's 400 V planar technology. The STTH240F04 is especially suited for switching welding equipments.

The device, housed in ISOTOP package, has in the meantime a low thermal resistance, and a high electrical isolation, which make it particularly efficient in high power converters requiring to be safe for the end user.

**Table 1. Device summary**

Symbol	Value
I <sub>F(AV)</sub>	2 x 120 A
V <sub>RRM</sub>	400 V
T <sub>j</sub> (max)	150 °C
V <sub>F</sub> (typ)	0.90 V
t <sub>rr</sub> (typ)	70 ns

**Features**

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

# 1 Characteristics

**Table 2. Absolute ratings (limiting values per diode at 25 °C unless otherwise specified)**

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		400	V
$I_{F(RMS)}$	Forward rms current		200	A
$I_{F(AV)}$	Average forward current	$T_c = 56\text{ °C}, \delta = 0.5$	120	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms sinusoidal}$	1000	A
$T_{stg}$	Storage temperature range		-55 to + 150	°C
$T_j$	Maximum operating junction temperature <sup>(1)</sup>		150	°C

1.  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistance parameters**

Symbol	Parameter		Value (max.)	Unit
$R_{th(j-c)}$	Junction to case	Per diode	0.50	°C/W
		Total	0.30	
$R_{th(c)}$	Coupling thermal resistance		0.10	

**Table 4. Static electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$			85	$\mu\text{A}$
		$T_j = 125\text{ °C}$			85	850	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 100\text{ A}$			1.45	V
		$T_j = 125\text{ °C}$			0.95	1.20	
		$T_j = 150\text{ °C}$			0.90	1.15	
		$T_j = 25\text{ °C}$	$I_F = 200\text{ A}$			1.78	
		$T_j = 125\text{ °C}$			1.20	1.50	
		$T_j = 150\text{ °C}$			1.15	1.45	

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:

$$P = 0.85 \times I_{F(AV)} + 0.003 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics (per diode at 25 °C, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 0.5 \text{ A}, I_{rr} = 0.25 \text{ A}, I_R = 1 \text{ A}$			80	ns
		$I_F = 1 \text{ A}, dI_F/dt = -50 \text{ A}/\mu\text{s}, V_R = 30 \text{ V}$		70	95	
		$I_F = 100 \text{ A}, dI_F/dt = -200 \text{ A}/\mu\text{s}, V_R = 50 \text{ V}, T_j = 125 \text{ }^\circ\text{C}$		100	140	
$I_{RM}$	Reverse recovery current	$I_F = 100 \text{ A}, dI_F/dt = -200 \text{ A}/\mu\text{s}, V_R = 400 \text{ V}, T_j = 125 \text{ }^\circ\text{C}$		15	20	A
$Q_{RR}$	Reverse recovery charge			750		nC
S	Softness factor			0.3		
$t_{fr}$	Forward recovery time	$I_F = 100 \text{ A}, dI_F/dt = 200 \text{ A}/\mu\text{s}, V_{FR} = 1.5 \times V_{Fmax}$		500	800	ns
$V_{FP}$	Forward recovery voltage	$I_F = 100 \text{ A}, dI_F/dt = 200 \text{ A}/\mu\text{s}$		2.9		V

Figure 1. Average forward power dissipation versus average forward current (per diode)

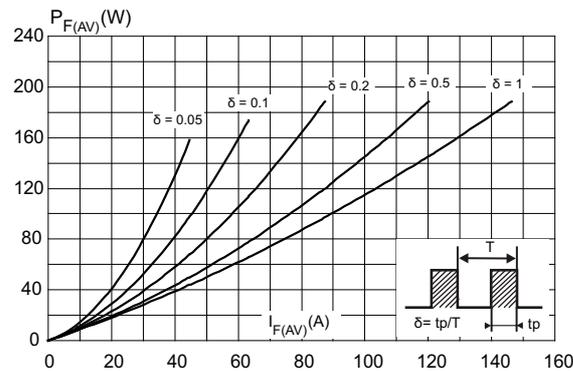


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

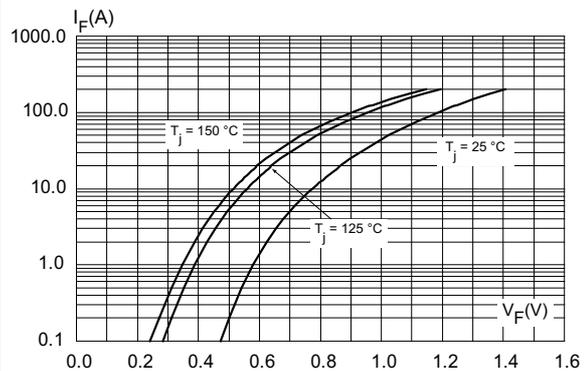


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

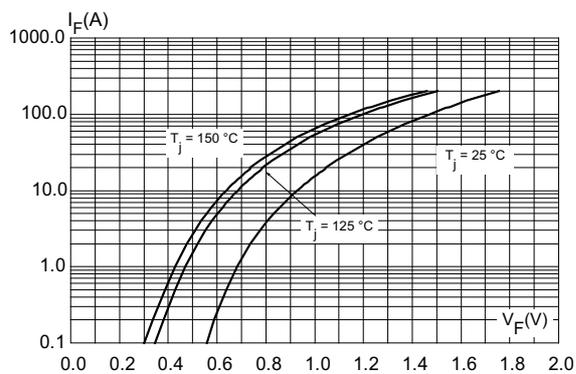
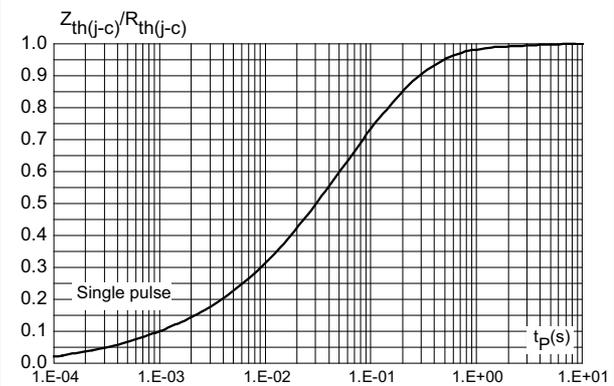
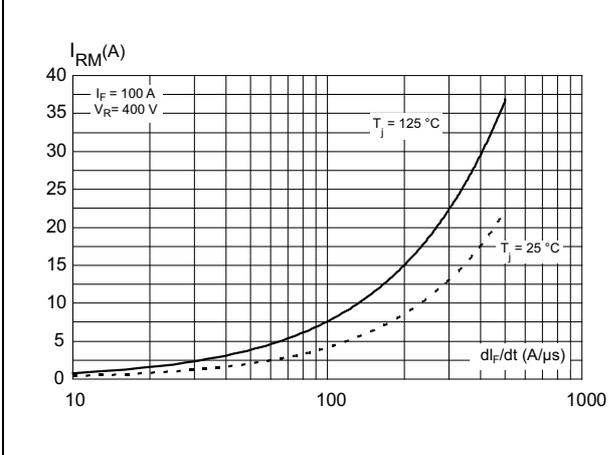


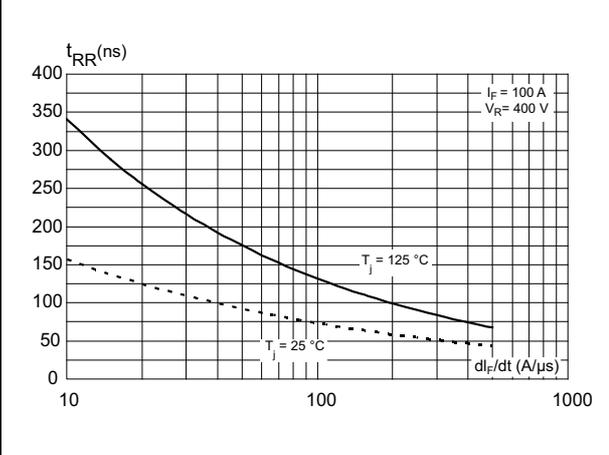
Figure 4. Relative variation of thermal impedance junction to case versus pulse duration



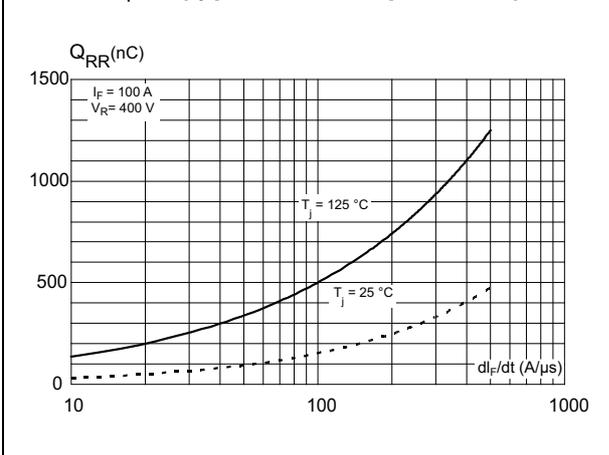
**Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values, per diode)**



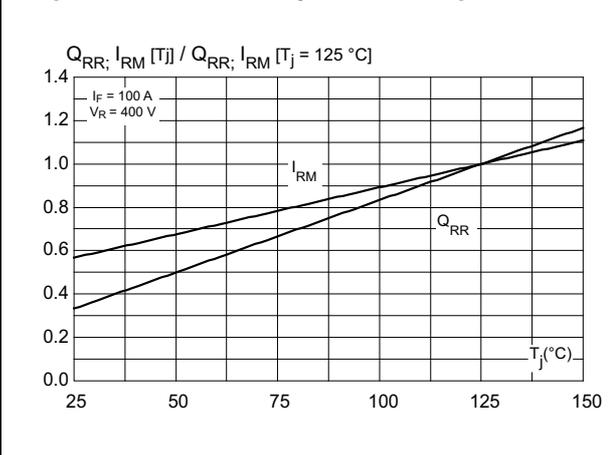
**Figure 6. Reverse recovery time versus  $di_F/dt$  (typical values, per diode)**



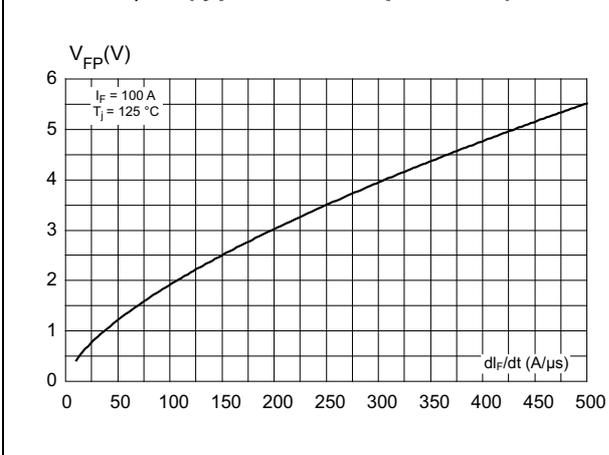
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values, per diode)**



**Figure 8. Relative variations of dynamic parameters versus junction temperature**



**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)**



**Figure 10. Forward recovery time versus  $di_F/dt$  (typical values, per diode)**

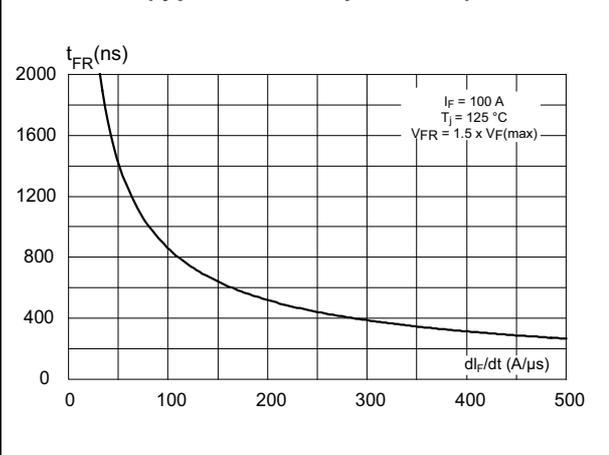
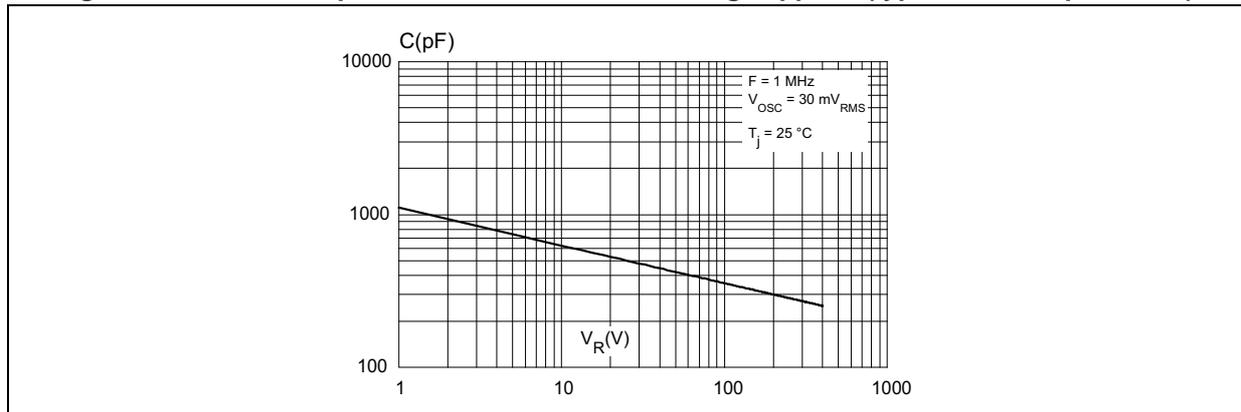


Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)



## 2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Cooling method: by conduction (C)
- Recommended torque value: 1.5 N·m (maximum torque value: 1.5 N·m)

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

### 2.1 ISOTOP package information

Figure 12. ISOTOP package outline

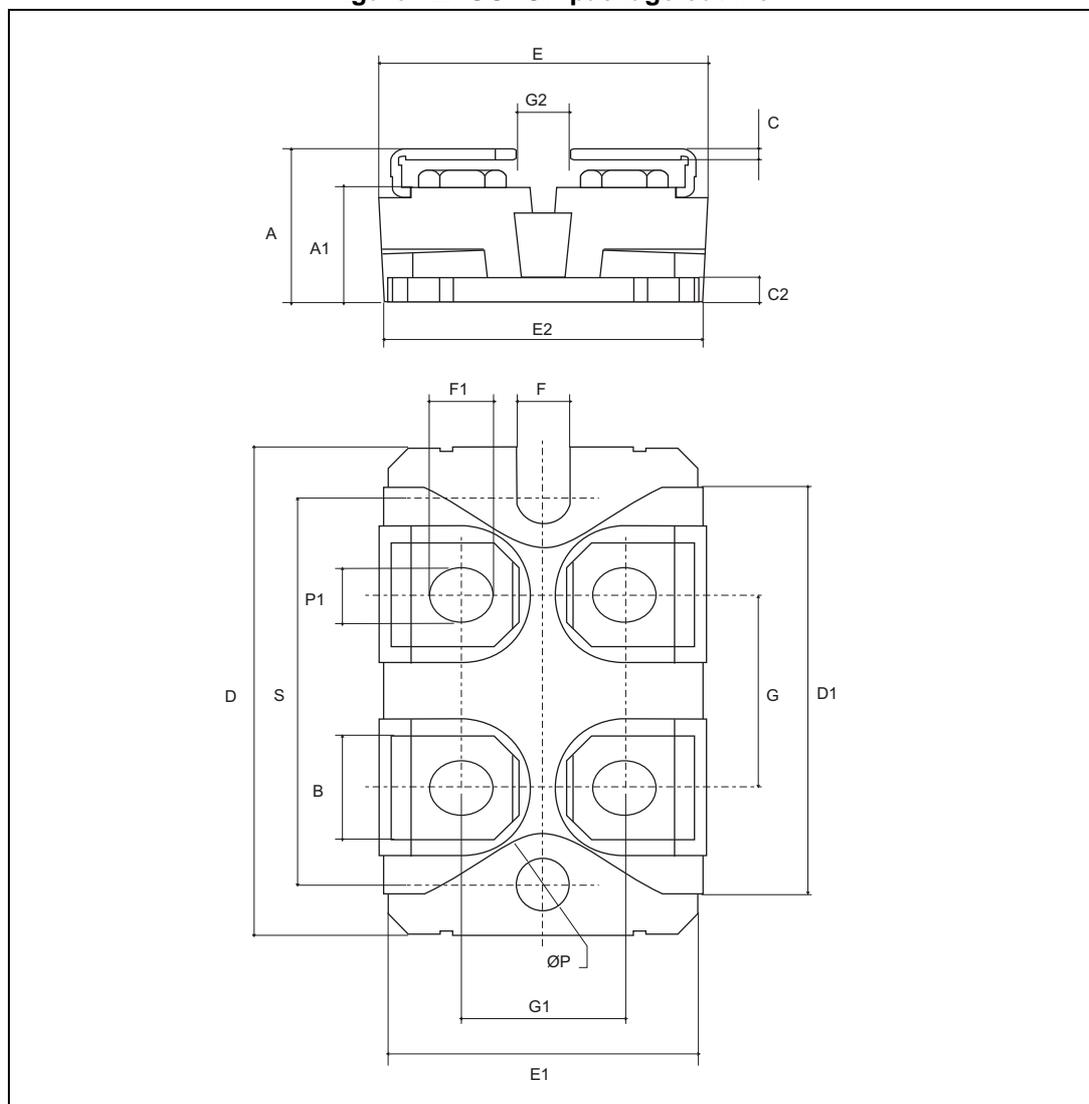


Table 6. ISOTOP package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	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			0.976	
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

### 3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH240F04TV1	STTH240F04TV1	ISOTOP	27 g (without screws)	10 (with screws)	Tube

### 4 Revision history

Table 8. Document revision history

Date	Revision	Changes
18-May-2015	1	First issue.

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