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Ultrafast recovery diode

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- High T_j
- Insulating voltage: 2500 V rms
- Capacitance: 7 pF

Description

This single rectifier is suited for switch mode power supply and high frequency DC to DC converters. Packaged in D²PAK, TO-220AC and insulated TO-220AC, this device is intended for low voltage, high frequency inverters, free wheeling and polarity protection applications

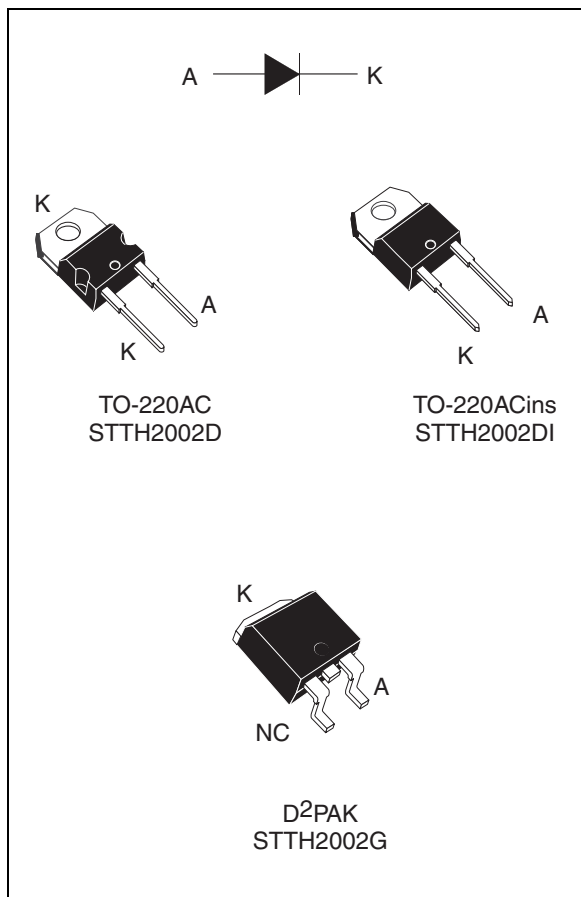


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	20 A
V_{RRM}	200 V
T_j (max)	175 °C
V_F (typ)	0.86 V
t_{rr} (typ)	16 ns

1 Characteristics

Table 2. Absolute ratings (limiting values at $T_j = 25\text{ °C}$, unless otherwise specified)

Symbol	Parameter		Value	Unit	
V_{RRM}	Repetitive peak reverse voltage		200	V	
$I_{F(RMS)}$	Forward rms current		35	A	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	TO-220AC, D ² PAK	$T_c = 120\text{ °C}$	20	A
		TO-220ACins	$T_c = 60\text{ °C}$		
I_{FSM}	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal		175	A
T_{stg}	Storage temperature range		-65 to + 175	°C	
T_j	Maximum operating junction temperature		175	°C	

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC, D ² PAK	2.4	°C/W
		TO-220ACins	5	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$			10	μA
		$T_j = 125\text{ °C}$			10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 20\text{ A}$		1	1.1	V
		$T_j = 150\text{ °C}$			0.86	0.95	
		$T_j = 25\text{ °C}$	$I_F = 25\text{ A}$			1.15	
		$T_j = 125\text{ °C}$			0.94	1.05	
		$T_j = 150\text{ °C}$			0.9	1	

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:

$$P = 0.75 \times I_{F(AV)} + 0.01 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$I_F = 1\text{ A}$, $dI_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$		16	20	ns
		$I_F = 1\text{ A}$, $dI_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$		33	40	
I_{RM}	Reverse recovery current	$I_F = 20\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 160\text{ V}$, $T_j = 125\text{ }^\circ\text{C}$		8	10	A
t_{fr}	Forward recovery time	$I_F = 20\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25\text{ }^\circ\text{C}$		230		ns
V_{FP}	Forward recovery voltage	$I_F = 20\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25\text{ }^\circ\text{C}$		2		V

Figure 1. Peak current versus duty cycle

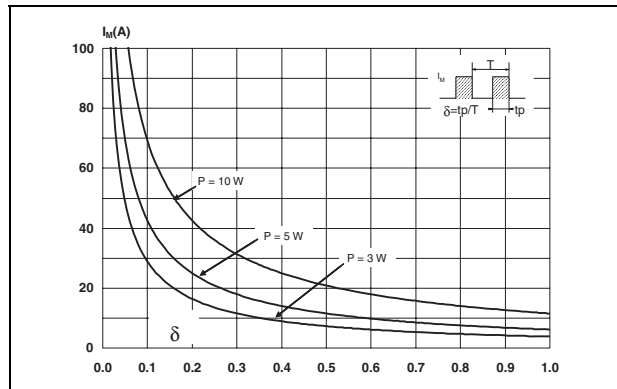


Figure 2. Forward voltage drop versus forward current (typical values)

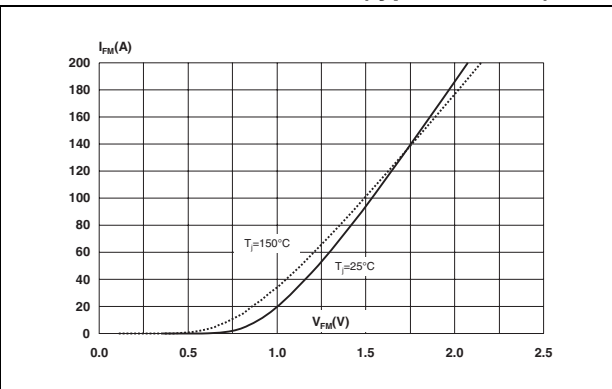


Figure 3. Forward voltage drop versus forward current (maximum values)

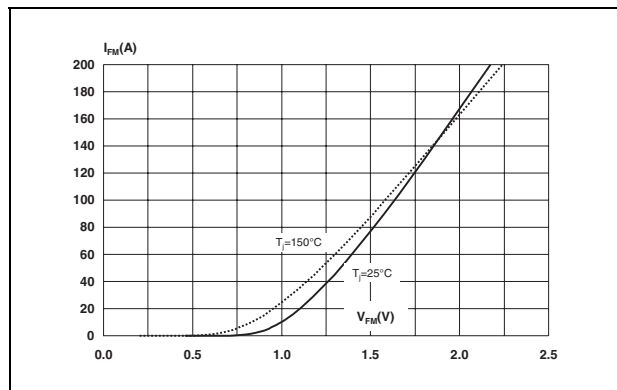


Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration

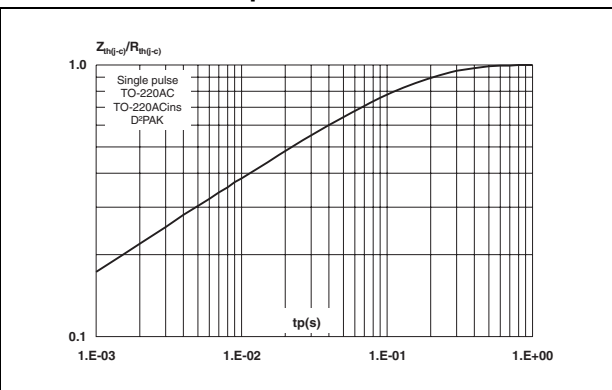


Figure 5. Junction capacitance versus reverse applied voltage (typical values)

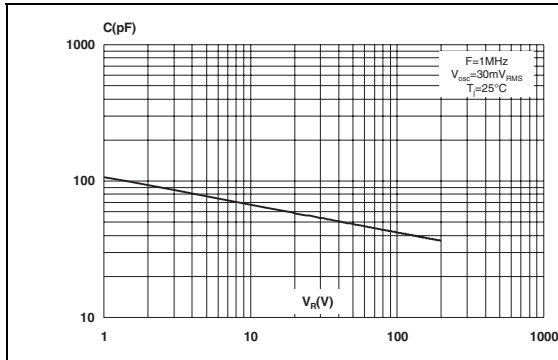


Figure 6. Reverse recovery charges versus dI_F/dt (typical values)

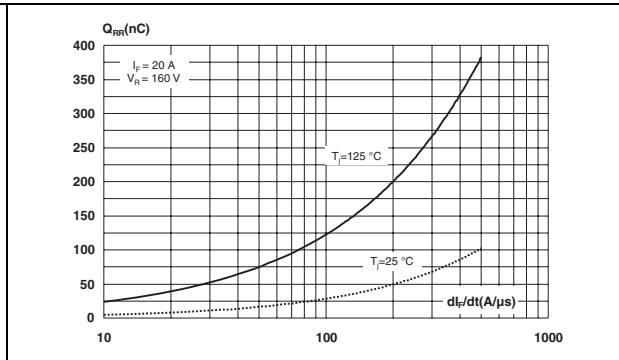


Figure 7. Reverse recovery time versus dI_F/dt (typical values)

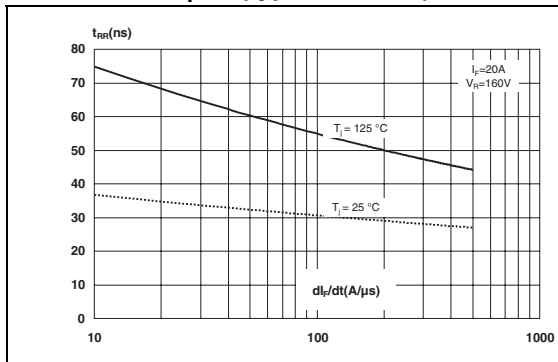


Figure 8. Peak reverse recovery current versus dI_F/dt (typical values)

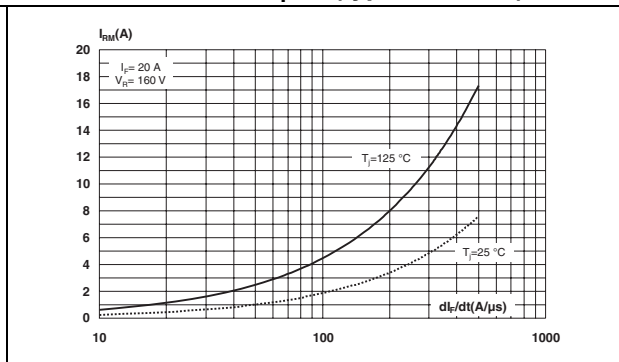


Figure 9. Dynamic parameters versus junction temperature

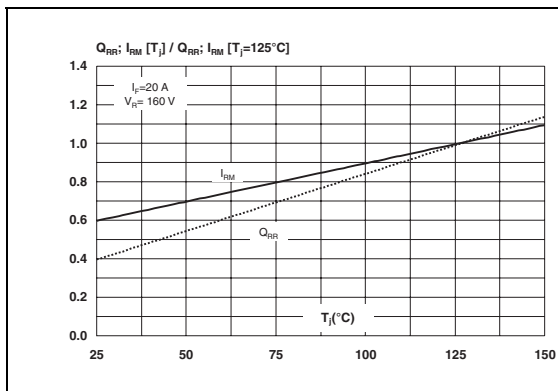
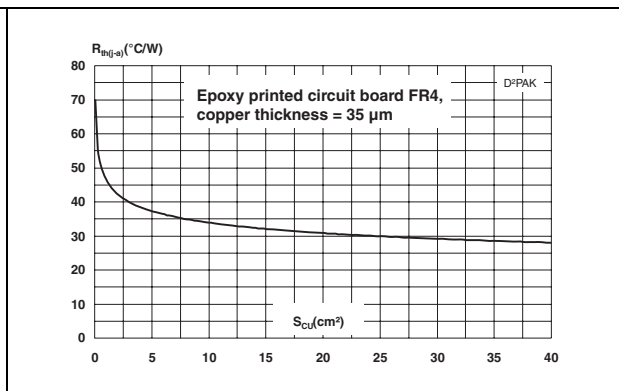
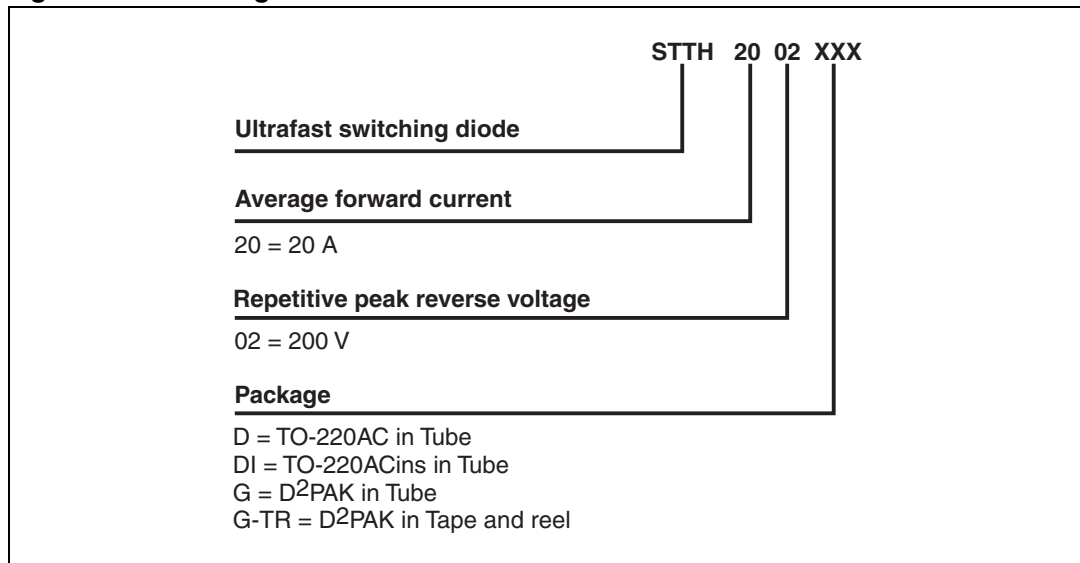


Figure 10. Thermal resistance, junction to ambient, versus copper surface under tab for D²PAK



2 Ordering information scheme

Figure 11. Ordering information scheme



3 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque: 0.4 to 0.6 N·m

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Table 6. T0-220AC dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam. I	3.75	3.85	0.147	0.151

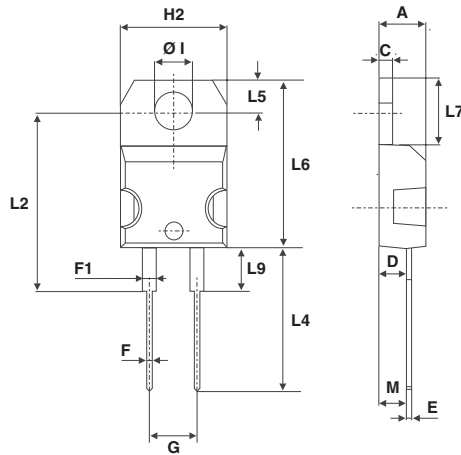


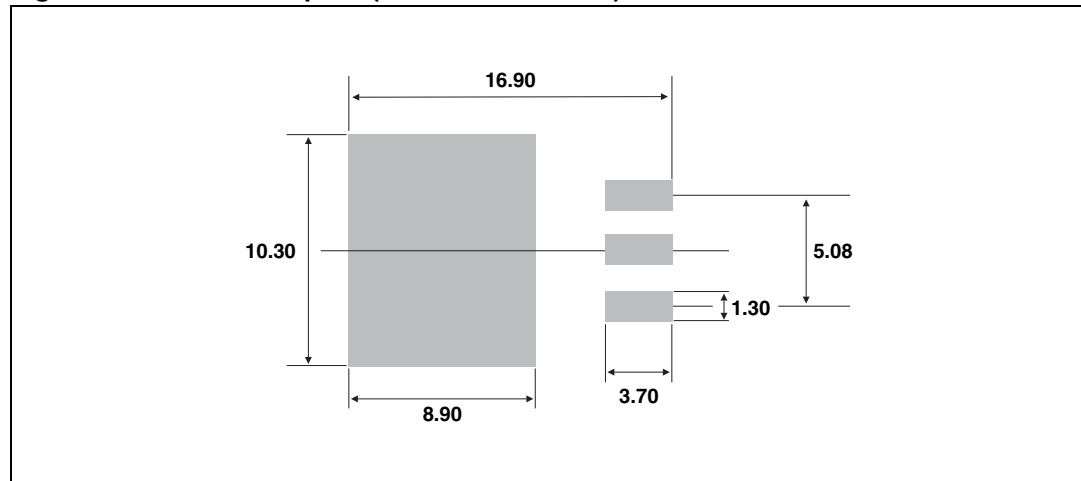
Table 7. T0-220ACins dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	4.80		5.40	0.189		0.212
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
M		2.60			0.102	

Table 8. D²PAK dimensions

REF.	Dimensions			
	Millimeters		Inches	
	Min.	Max	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 12. D²PAK footprint (dimensions in mm)



4 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH2002D	STTH2002	TO-220AC	1.90 g	50	Tube
STTH2002DI	STTH2002	TO-220ACins	2.30 g	50	Tube
STTH2002G	STTH2002	D ² PAK	1.48 g	50	Tube
STTH2002G-TR	STTH2002	D ² PAK	1.48 g	1000	Tape and reel

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
03-May-2006	1	First issue.
05-Sep-2011	2	Updated dimension e and deleted I3 in Table 7 .

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