

Automotive ultrafast recovery diode

Datasheet - production data

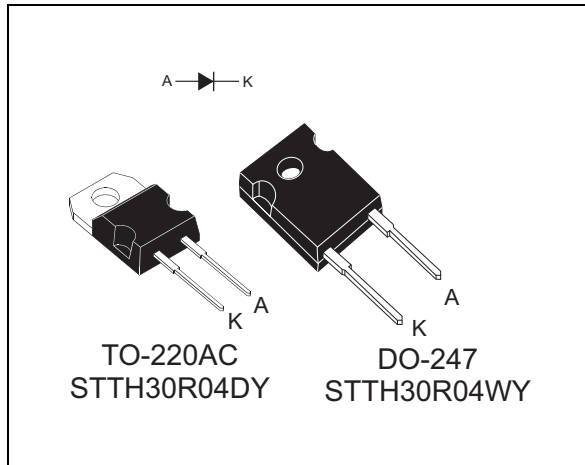


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	30 A
V_{RRM}	400 V
$T_j (max)$	175° C
$V_F (typ)$	1.0 V
$t_{rr} (typ)$	24 ns

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- High junction temperature
- AEC-Q101 qualified
- ECOPACK®2 compliant component

Description

The compromise-free, high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

1 Characteristics

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

Symbol	Parameter			Value	Unit
V _{RRM}	Repetitive peak reverse voltage			400	V
I _{F(RMS)}	RMS forward current			50	A
I _{F(AV)}	Average forward current, δ = 0.5	TO-220AC / DO-247	T _C = 135° C	30	A
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms Sinusoidal		280	A
T _{stg}	Storage temperature range			-65 to +175	° C
T _j	Operating junction temperature range			-40 to +175	° C

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / DO-247	0.8	°C/W

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ \text{C}$	$V_R = V_{RRM}$			15	μA
		$T_j = 100^\circ \text{C}$			3	30	
		$T_j = 125^\circ \text{C}$			15	150	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ \text{C}$	$I_F = 15 \text{ A}$			1.35	V
		$T_j = 150^\circ \text{C}$			0.83	1.04	
		$T_j = 25^\circ \text{C}$	$I_F = 30 \text{ A}$			1.55	
		$T_j = 100^\circ \text{C}$				1.32	
		$T_j = 150^\circ \text{C}$			1.0	1.25	

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:

$$P = 0.95 \times I_{F(AV)} + 0.01 \times I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	$I_F = 1\text{ A}$, $di_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{C}$		24	35	ns
		$I_F = 1\text{ A}$, $di_F/dt = -15\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{C}$		73	100	
		$I_F = 1\text{ A}$, $I_R = 1\text{ A}$, $I_{RR} = 0.25\text{ A}$, $T_j = 25^\circ\text{C}$			45	
I_{RM}	Reverse recovery current	$I_F = 30\text{ A}$, $di_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 320\text{ V}$, $T_j = 125^\circ\text{C}$		10	14	A
t_{fr}	Forward recovery time	$I_F = 30\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ\text{C}$			500	ns
V_{FP}	Forward recovery voltage	$I_F = 30\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ\text{C}$		2.9		V

Figure 1. Conduction losses versus average current

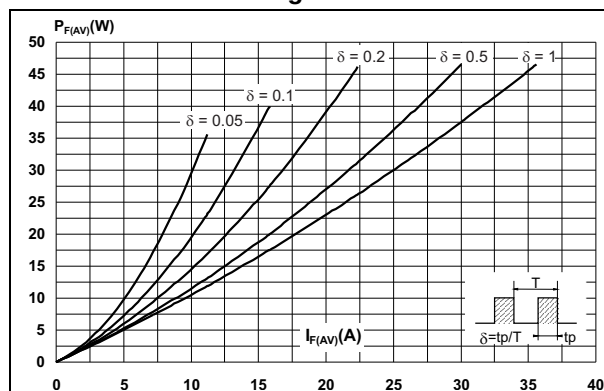


Figure 2. Forward voltage drop versus forward current

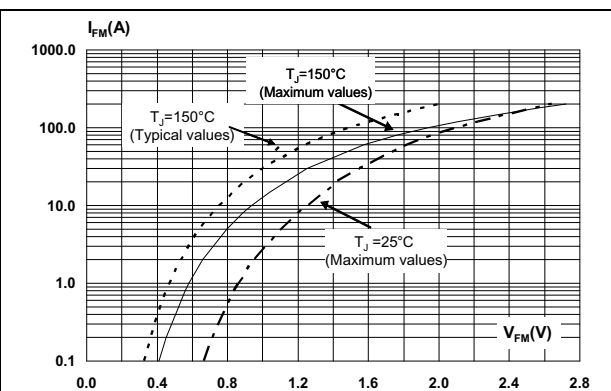


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

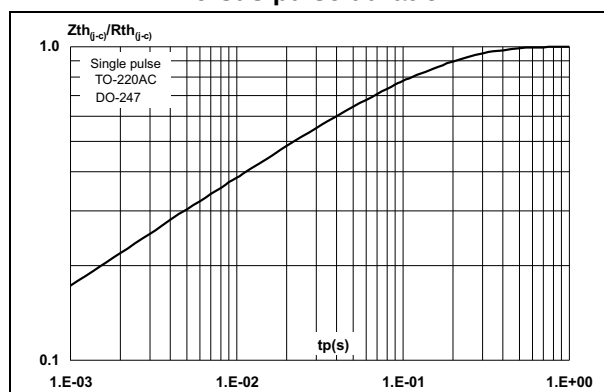
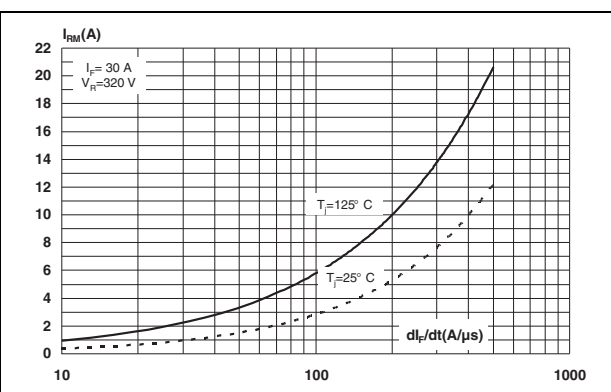
Figure 4. Peak reverse recovery current versus di_F/dt (typical values)

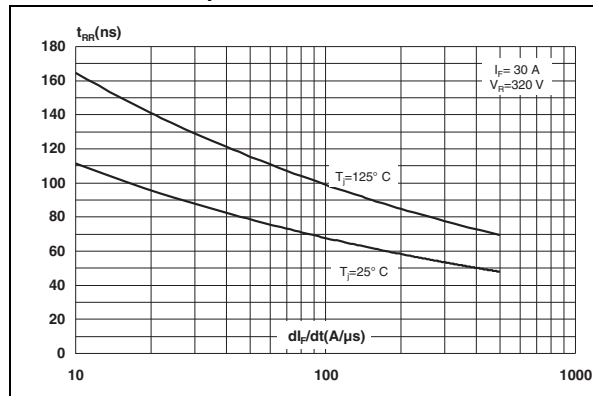
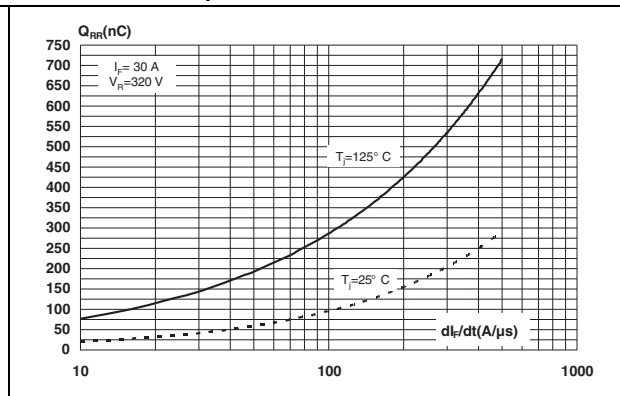
Figure 5. Reverse recovery time versus di_F/dt (typical values)Figure 6. Reverse recovery charges versus di_F/dt (typical values)

Figure 7. Relative variations of dynamic parameters versus junction temperature

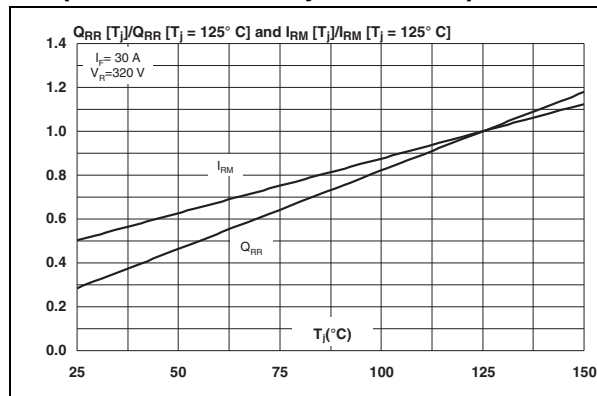
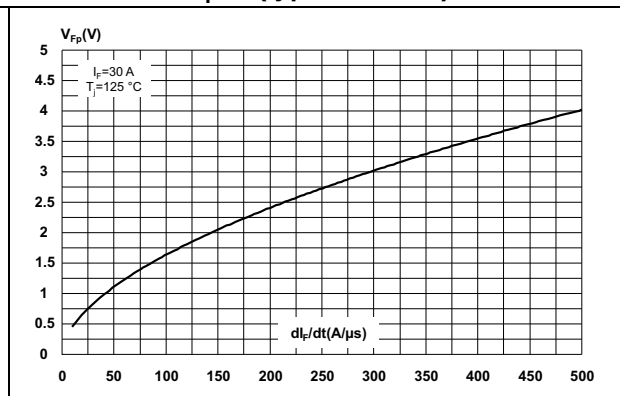
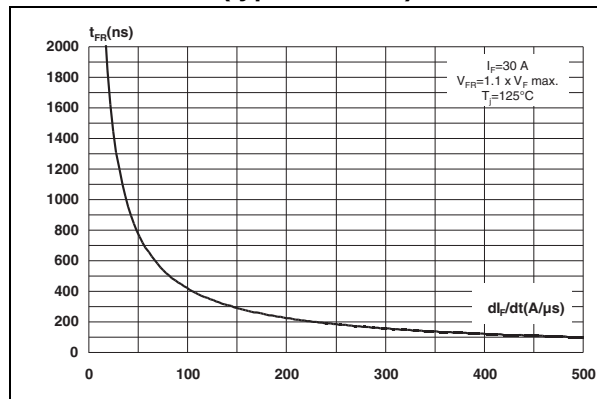
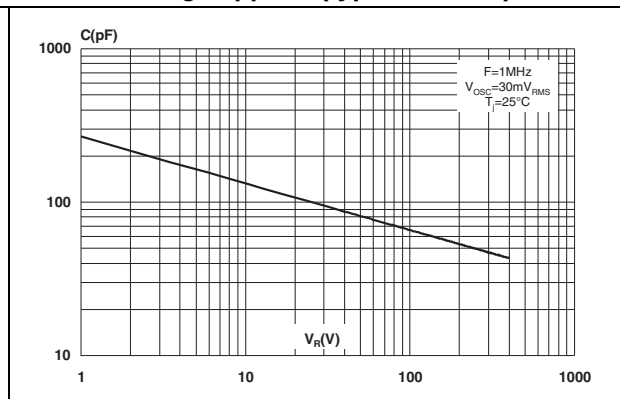
Figure 8. Transient peak forward voltage versus di_F/dt (typical values)Figure 9. Forward recovery time versus di_F/dt (typical values)

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



2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 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. ECOPACK® is an ST trademark.

Figure 11. DO-247 dimension definitions

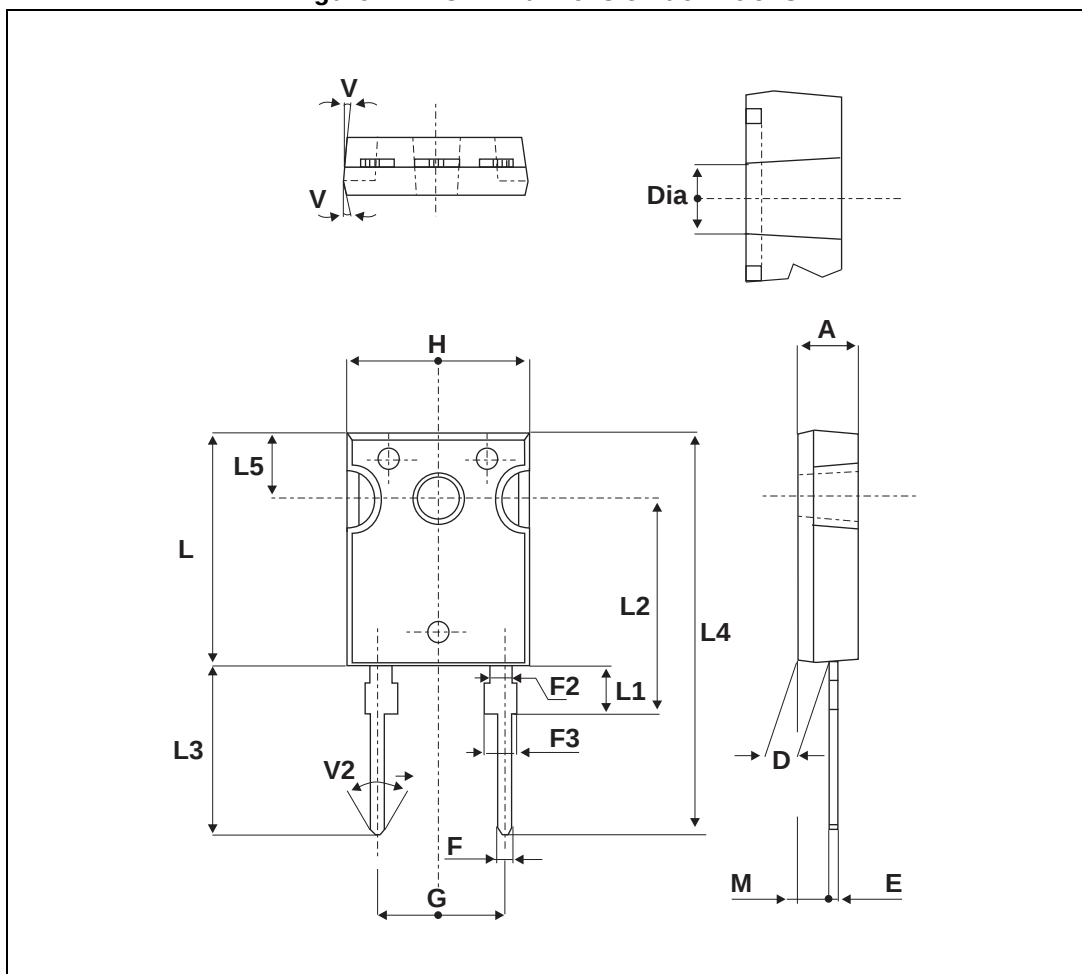


Table 6. DO-247 dimension values

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

Figure 12. TO-220AC dimension definitions

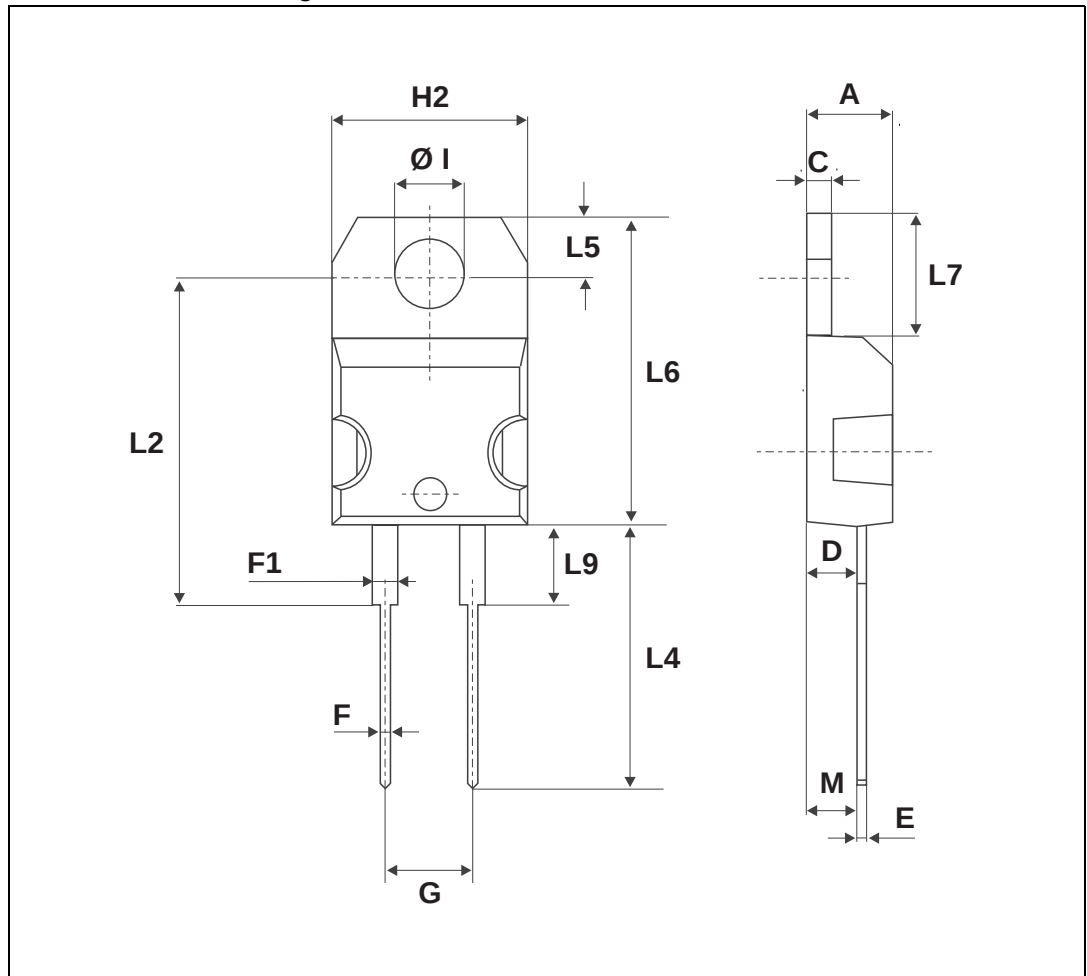


Table 7. TO-220AC dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	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		16.4			0.645	
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			0.102	
Diam. I	3.75		3.85	0.147		0.151

3 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH30R04DY	STTH30R04DY	TO-220AC	1.86 g	50	Tube
STTH30R04WY	STTH30R04WY	DO-247	4.40 g	30	Tube

4 Revision history

Table 9. Document revision history

Date	Revision	Description of changes
30-Sep-2013	1	First issue

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