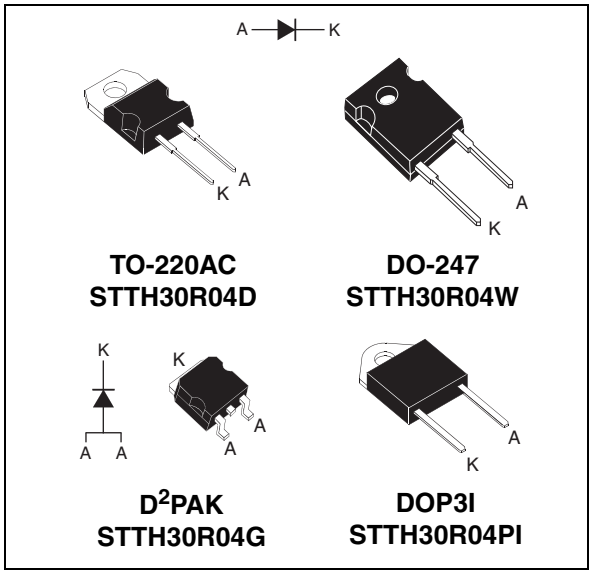
STTH30R04

Ultrafast recovery diode

Main product characteristics

$I_{F(AV)}$	30 A
V_{RRM}	400 V
T_j	175° C
V_F (typ)	0.97 V
t_{rr}	24 ns



Note: D^2PAK - 2 anode terminals must be shorted on board.

Features and benefits

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- High junction temperature
- Insulated package: DOP3I
  - Electrical insulation = 2500 V_{RMS}
    Package capacitance = 12 pF

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.

Order codes

Part Number	Marking
STTH30R04D	STTH30R04D
STTH30R04G	STTH30R04G
STTH30R04G-TR	STTH30R04G
STTH30R04W	STTH30R04W
STTH30R04PI	STTH30R04PI

Table 1. 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, $\delta = 0.5$	TO-220AC / DO-247 / D^2PAK	T_c = 120° C	30	A
		DOP3I	T_c = 90° C		
I_{FRM}	Repetitive peak forward current	t_p = 10 µs, F = 1 kHz		500	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		300	A
T_{stg}	Storage temperature range			-65 to +175	° C
T_j	Maximum 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	TO-220AC / DO-247 / D^2PAK	1.15	°C/W
		DOP3I	1.9	

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
I_R(1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			15	µA
		T_j = 100° C			3	30	
		T_j = 125° C			15	150	
V_F(2)	Forward voltage drop	T_j = 25° C	I_F = 15 A			1.26	V
		T_j = 150° C			0.8	1.0	
		T_j = 25° C	I_F = 30 A			1.45	
		T_j = 100° C				1.3	
		T_j = 150° C			0.97	1.2	

1. Pulse test: t_p = 5 ms, δ < 2 %
2. Pulse test: t_p = 380 µs, δ < 2 %

To evaluate the conduction losses use the following equation:
$P = 0.9 \times I_{F(AV)} + 0.01 \times I_F{}^2{}_{(RMS)}$

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -200 A/µs, V_R = 30 V, T_j = 25° C		24	35	ns
		I_F = 1 A, dI_F/dt = -15 A/µs, V_R = 30 V, T_j = 25° C		78	100	
		I_F = 1 A, I_R = 1 A, I_{RR} = 0.25 A, T_j = 25° C			50	
I_{RM}	Reverse recovery current	I_F = 30 A, dI_F/dt = -200 A/µs, V_R = 160 V, T_j = 125° C		10	14	A
t_{fr}	Forward recovery time	I_F = 30 A dI_F/dt = 100 A/µs $V_{FR} = 1.1 \times V_{Fmax}$, T_j = 25° C			500	ns
V_{FP}	Forward recovery voltage	I_F = 30 A dI_F/dt = 100 A/µs $V_{FR} = 1.1 \times V_{Fmax}$, T_j = 25° C		2.9		V

Figure 1. Conduction losses versus average current

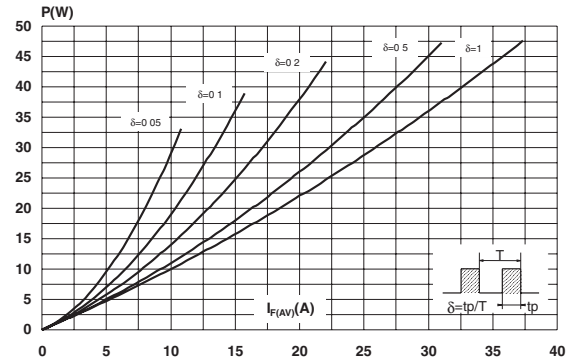


Figure 2. Forward voltage drop versus forward current

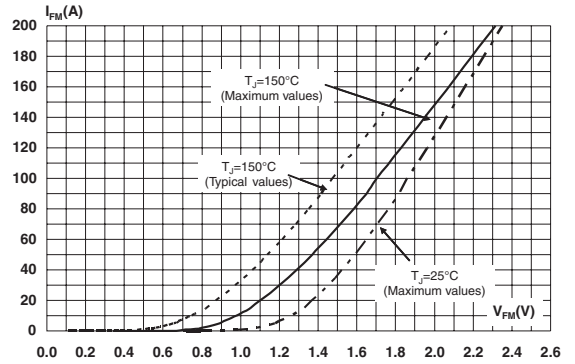


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

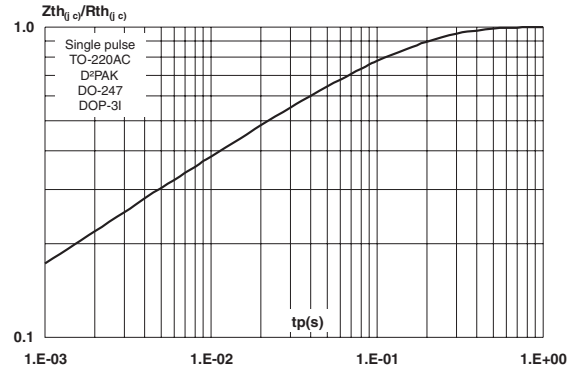


Figure 4. Peak reverse recovery current versus dI_F/dt (typical values)

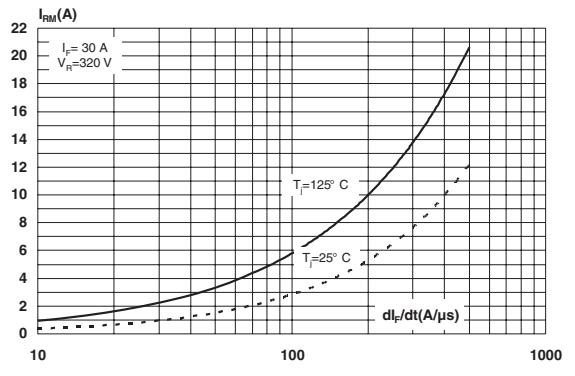


Figure 5. Reverse recovery time versus dI_F/dt (typical values)

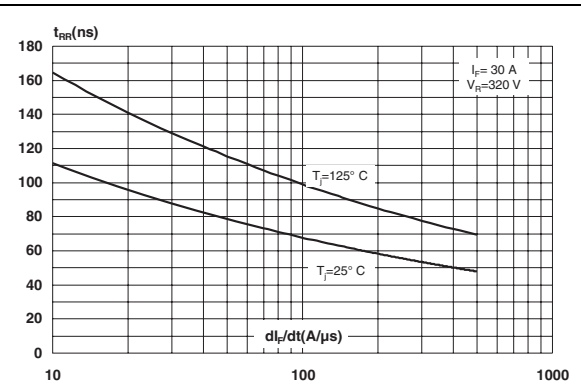


Figure 6. Reverse recovery charges versus dI_F/dt (typical values)

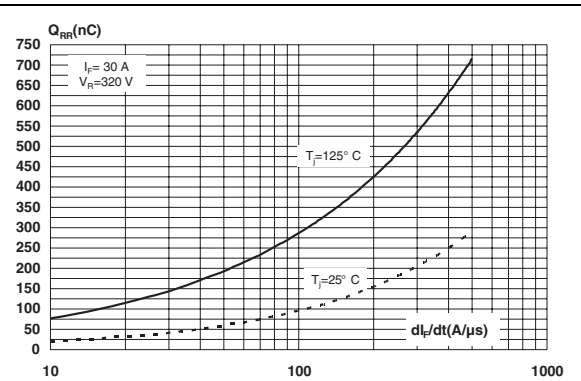


Figure 7. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

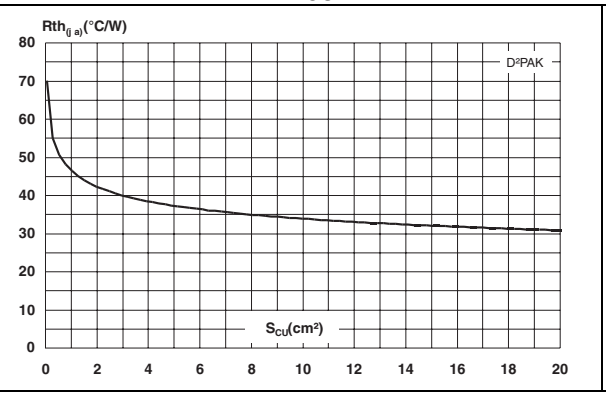


Figure 8. Relative variations of dynamic parameters versus junction temperature

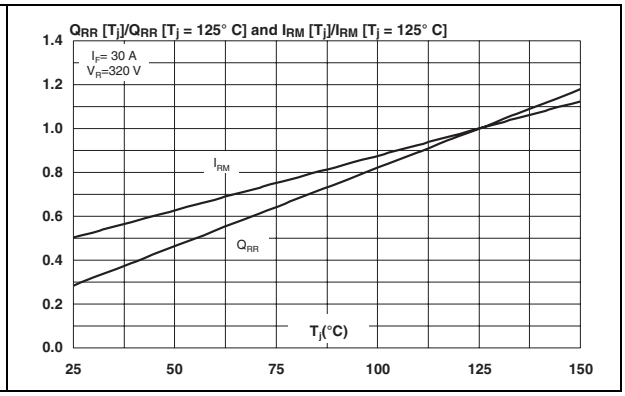


Figure 9. Transient peak forward voltage versus dI_F/dt (typical values)

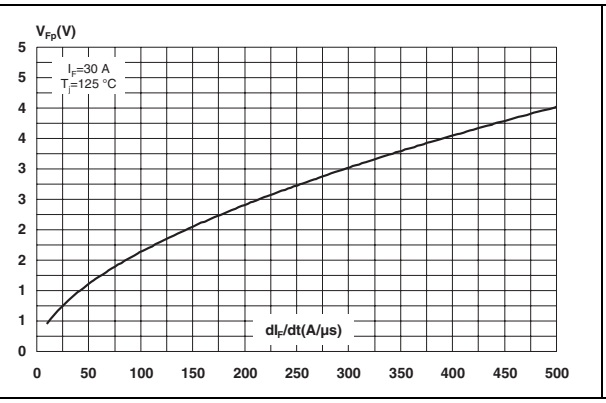


Figure 10. Forward recovery time versus dI_F/dt (typical values)

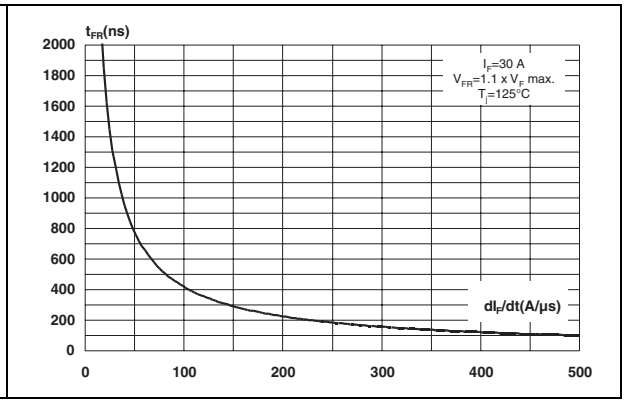
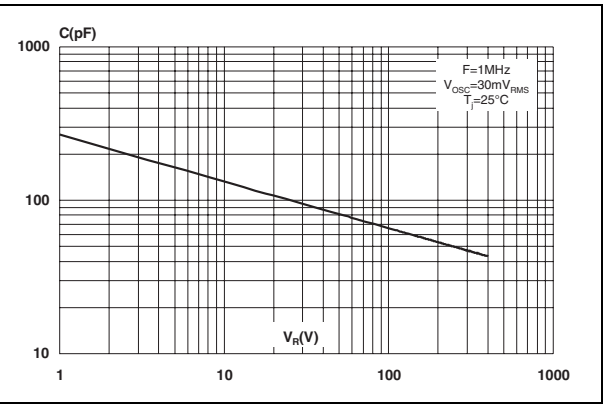


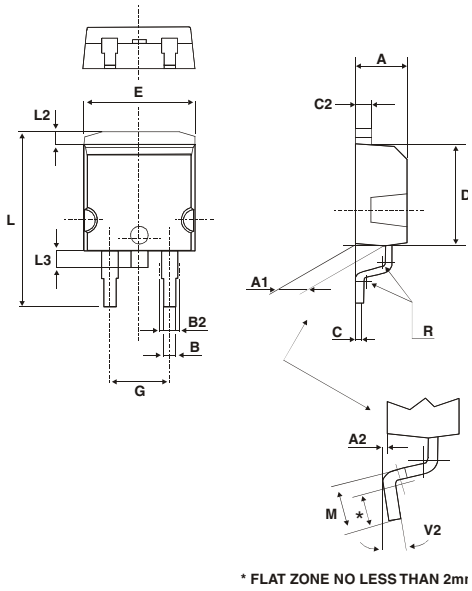
Figure 11. Junction capacitance versus reverse voltage applied (typical values)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 Nm (TO-220FPAC) / 0.55 Nm (TO-220AC, DOP3I)
- Maximum torque value: 1.0 Nm (TO-220FPAC) / 0.70 Nm (TO-220AC, DOP31)

Table 5. 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)

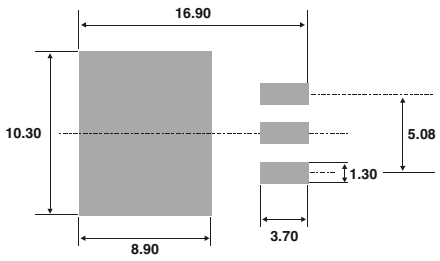
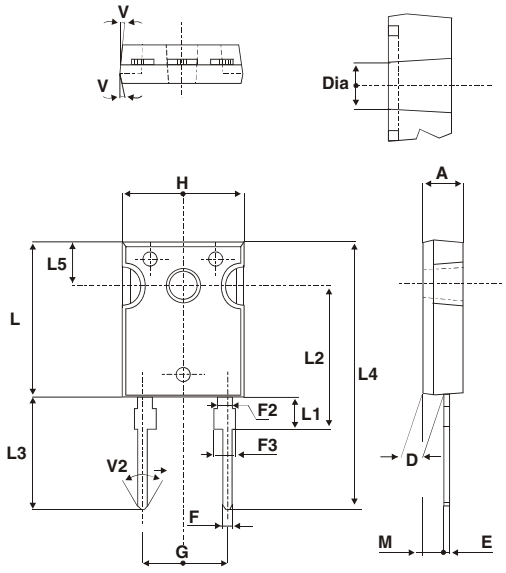
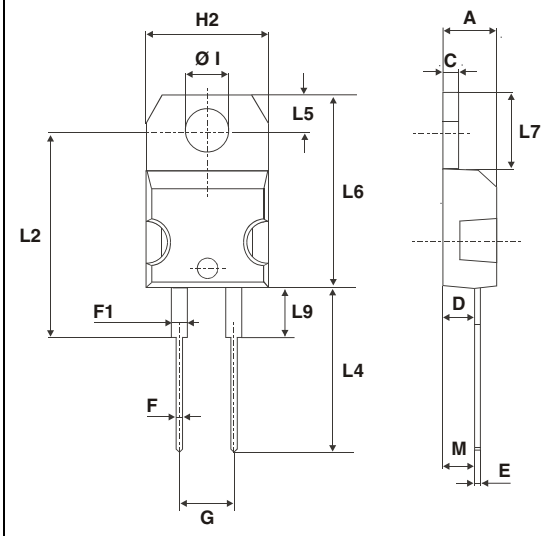


Table 6. DO-247 dimensions



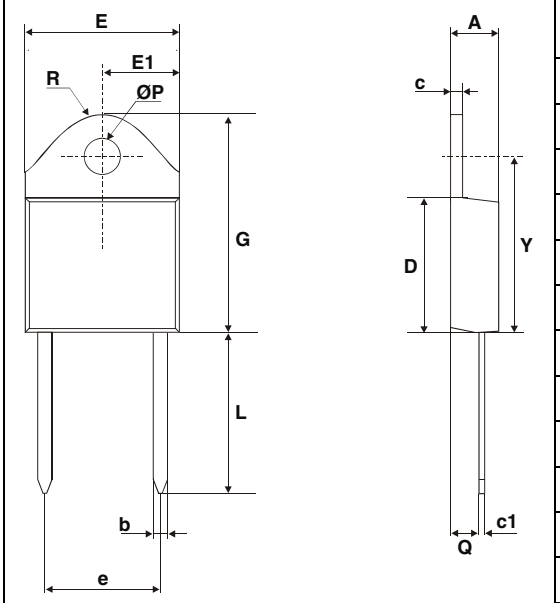
Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	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

Table 7. TO-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 8. DOP3I dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	1.20	1.40	0.047	0.055
c	1.45	1.55	0.057	0.061
c1	0.50	0.70	0.020	0.028
D	12.15	13.10	0.474	0.516
E	15.10	15.50	0.594	0.610
E1	7.55	7.75	0.297	0.305
e	10.80	11.30	0.425	0.445
G	20.4	21.10	0.815	0.831
L	14.35	15.60	0.565	0.614
P	4.08	4.17	0.161	0.164
Q	2.70	2.90	0.106	0.114
R	4.60 typ.		0.181 typ.	
Y	15.80	16.50	0.622	0.650

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.

3 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH30R04D	STTH30R04D	TO-220AC	1.86 g	50	Tube
STTH30R04G	STTH30R04G	D^2PAK	1.48 g	50	Tube
STTH30R04G-TR	STTH30R04G	D^2PAK	1.48 g	1000	Tape and reel
STTH30R04W	STTH30R04W	DO-247	4.40 g	30	Tube
STTH30R04PI	STTH30R04PI	DOP3I	4.46 g	30	Tube

4 Revision history

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

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