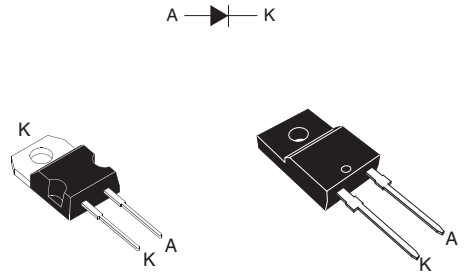
STTH8R04

Ultrafast recovery diode

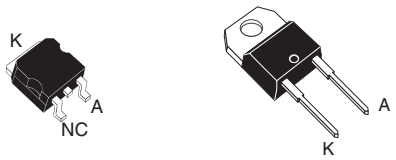
Main product characteristics

$I_{F(AV)}$	8 A
V_{RRM}	400 V
$T_{j\ (max)}$	175° C
$V_{F\ (typ)}$	0.9 V
$t_{rr\ (typ)}$	25 ns



TO-220AC
STTH8R04D

TO-220FPAC
STTH8R04FP



D²PAK
STTH8R04G

TO-220AC Ins
STTH8R04DI

Features and benefits

- Very low switching losses
- High frequency and high pulsed current operation
- High junction temperature
- Insulated packages
  - TO-220AC Ins
    Electrical insulation = 2500 V_{RMS}
    Capacitance = 7 pF
  - TO-220FPAC
    Electrical insulation = 1500 V_{RMS}
    Capacitance = 12 pF

Description

The STTH8R04 series uses ST's new 400 V planar Pt doping technology. The STTH8R04 is specially suited for switching mode base drive and transistor circuits.

Packaged in through-the-hole and surface mount packages, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.

Order codes

Part Number	Marking
STTH8R04D	STTH8R04D
STTH8R04DI	STTH8R04DI
STTH8R04FP	STTH8R04FP
STTH8R04G	STTH8R04G
STTH8R04G-TR	STTH8R04G

1 Characteristics

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

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			400	V
V_{RSM}	Repetitive peak reverse voltage			400	V
$I_{F(RMS)}$	RMS forward current	TO-220AC / D^2PAK / TO220FPAC		30	A
		TO220AC Ins		20	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	TO-220AC / D^2PAK	T_c = 145° C	8	A
		TO220FPAC	T_c = 110° C		
		TO220AC Ins	T_c = 115° C		
I_{FRM}	Repetitive peak forward current		t_p = 10 µs, F = 1 kHz	165	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		120	A
T_{stg}	Storage temperature range			-65 to +175	° C
T_j	Operating junction temperature range			-40 to +175	° C

Table 2. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / D^2PAK	2.5	°C/W
		TO220FPAC	6	
		TO220AB Ins	5.5	

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			10	µA
		T_j = 125° C			10	100	
V_F(2)	Forward voltage drop	T_j = 25° C	I_F = 8 A			1.5	V
		T_j = 100° C			1.05	1.3	
		T_j = 150° C			0.9	1.1	

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:
$P = 0.83 \times I_{F(AV)} + 0.034 \times I_F{}^2{}_{(RMS)}$

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V, T_j = 25° C		35	50	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25° C		25	35	
I_{RM}	Reverse recovery current	I_F = 8 A, dI_F/dt = -200 A/µs, V_R = 320 V, T_j = 125° C		5.5	8	A
S	Softness factor	I_F = 8 A, dI_F/dt = -200 A/µs, V_R = 320 V, T_j = 125° C		0.4		
t_{fr}	Forward recovery time	I_F = 8 A, dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_{Fmax}, T_j = 25° C			150	ns
V_{FP}	Forward recovery voltage	I_F = 8 A, dI_F/dt = 100 A/µs		2.9		V

Figure 1. Conduction losses versus average current

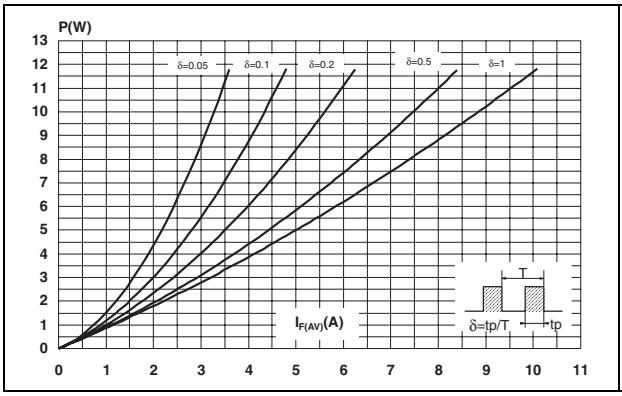


Figure 2. Forward voltage drop versus forward current

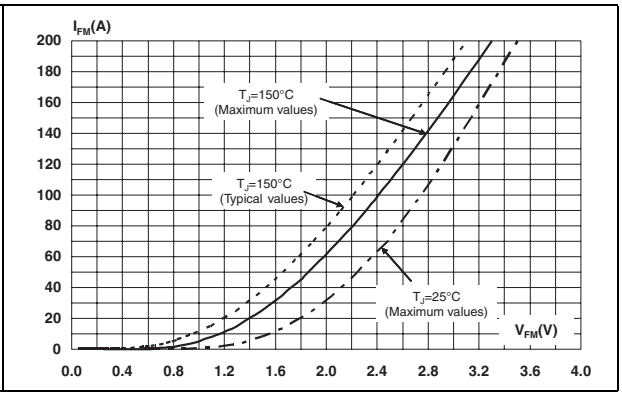


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

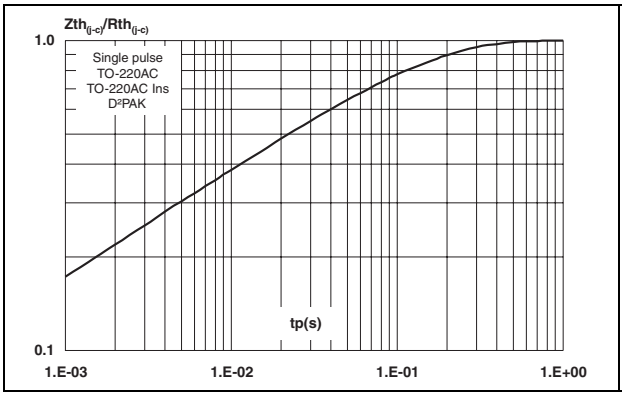


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration TO-220FPAB

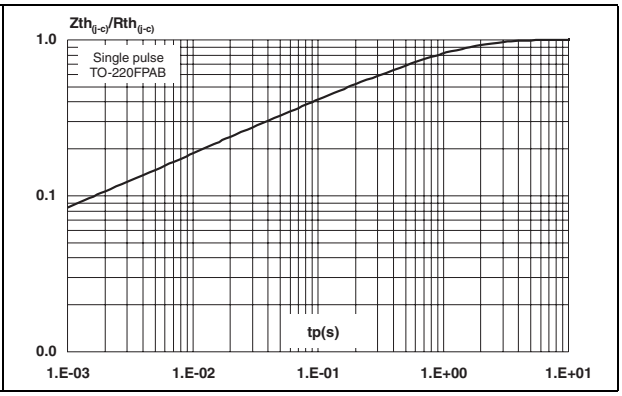


Figure 5. Peak reverse recovery current versus dI_F/dt (typical values)

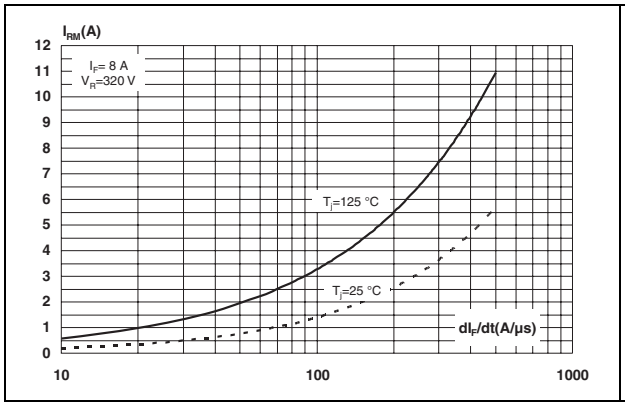


Figure 6. Reverse recovery time versus dI_F/dt (typical values)

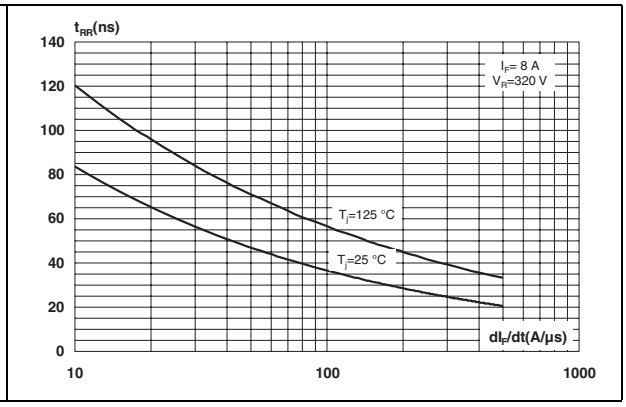


Figure 7. Reverse recovery charges versus dI_F/dt (typical values)

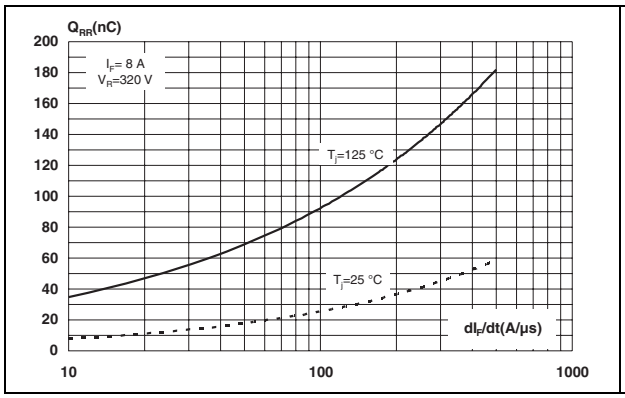


Figure 8. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, e_{CU}=35µm)

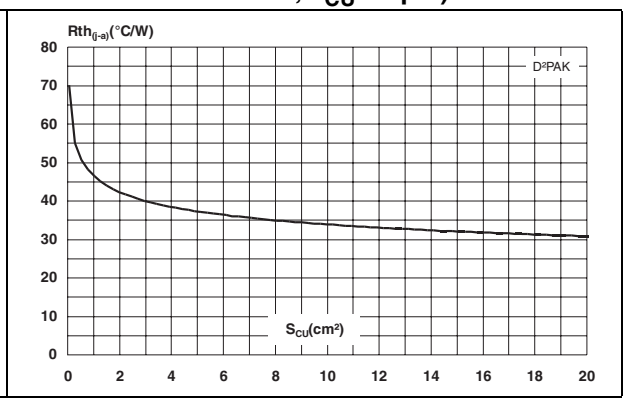


Figure 9. Relative variations of dynamic parameters versus junction temperature

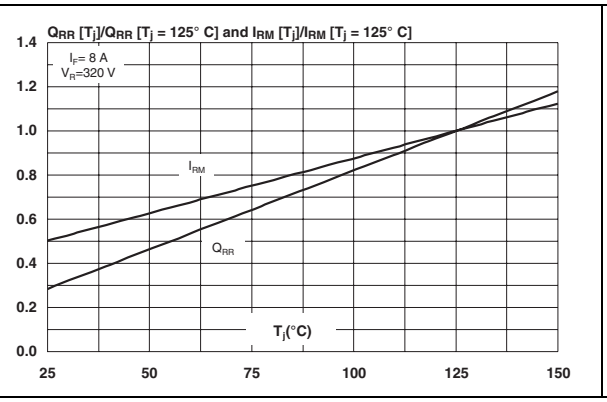


Figure 10. Transient peak forward voltage versus dI_F/dt (typical values)

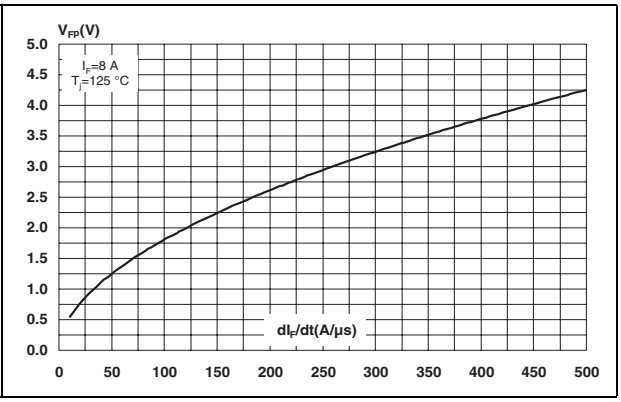


Figure 11. Forward recovery time versus dI_F/dt (typical values)

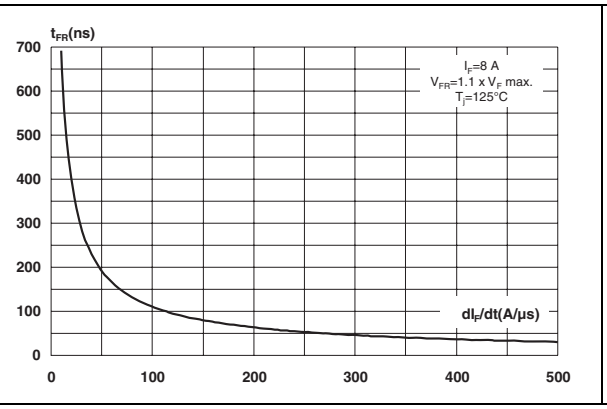
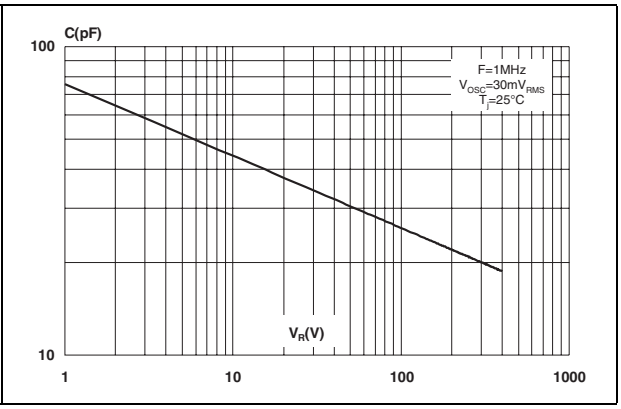


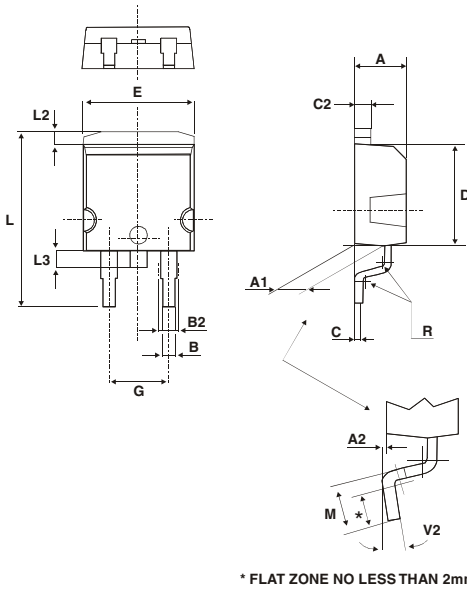
Figure 12. Junction capacitance versus reverse voltage applied (typical values)



2 Package information

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

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 13. D²PAK footprint (dimensions in mm)

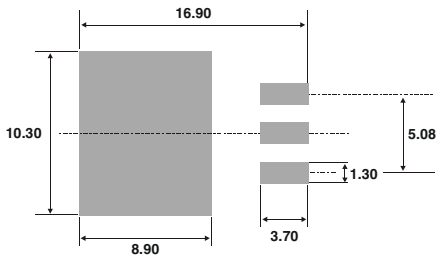
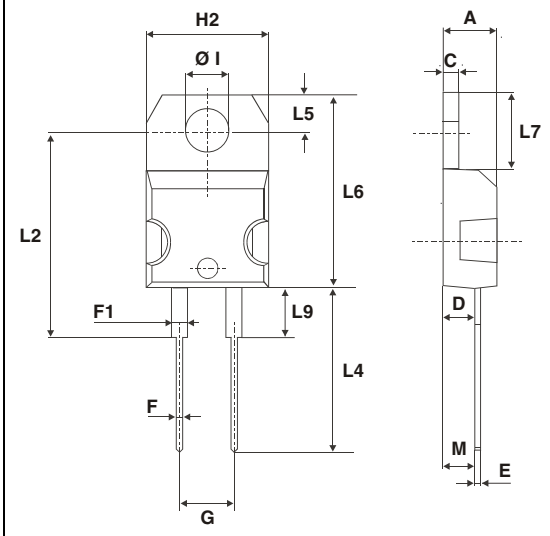
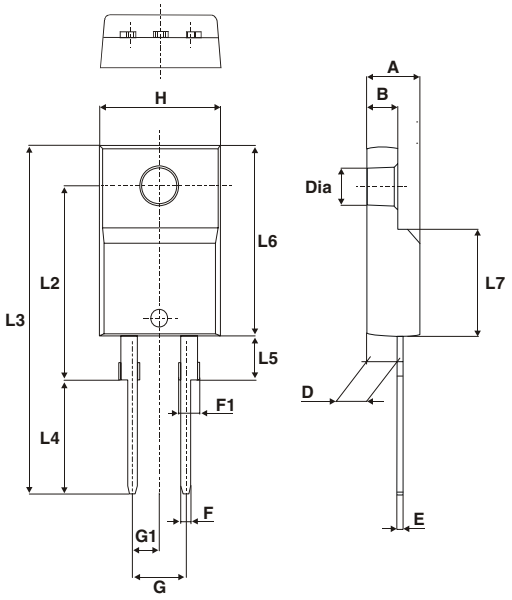


Table 6. TO-220AC dimensions



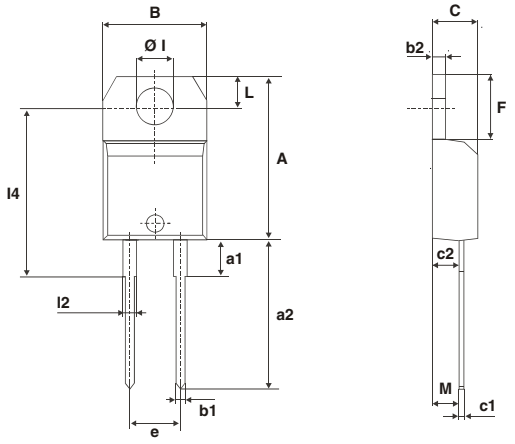
Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	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 7. TO-220FPAC dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

Table 8. TO-220AC Ins. 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
l4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
l2	1.14		1.70	0.044		0.066
M		2.60			0.102	

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
STTH8R04D	STTH8R04D	TO-220AC	1.86 g	50	Tube
STTH8R04DI	STTH8R04DI	TO-220 Ins	2.3 g	50	Tube
STTH8R04FP	STTH8R04FP	TO220FPAC	1.64 g	50	Tube
STTH8R04G	STTH8R04G	D^2PAK	1.48 g	50	Tube
STTH8R04G-TR	STTH8R04G	D^2PAK	1.48 g	1000	Tape and reel

4 Revision history

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

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