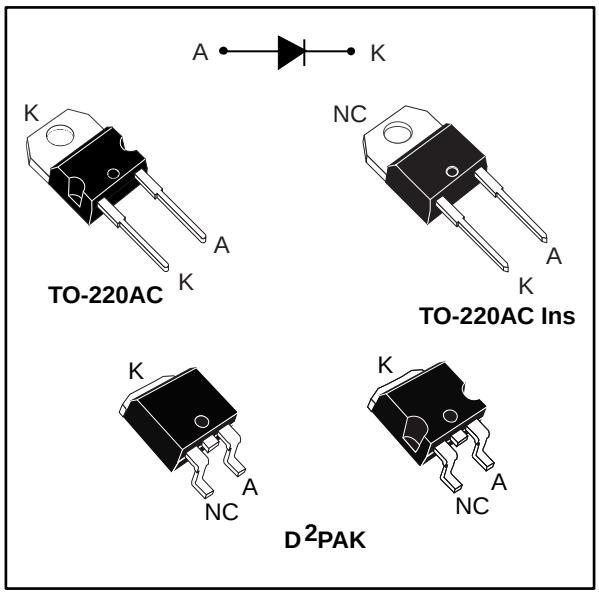
STTH8R04

Ultrafast recovery diode

Datasheet - production data



Description

This device uses ST's new 400 V planar Pt doping technology. It 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, freewheeling and polarity protection.

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	8 A
V_{RRM}	400 V
T_j (max)	175 °C
V_F (typ)	0.9 V
t_{rr} (typ)	25 ns

Features

- Very low switching losses
- High frequency and high pulsed current operation
- High junction temperature
- Insulated package: TO-220AC Ins
  - Insulating voltage = 2500 V_{RMS} sine
- ECOPACK®2 compliant component for D²PAK on demand

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
$I_{F(RMS)}$	Forward rms current	TO-220AC, D²PAK		30	A
		TO-220AC Ins		20	
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	TO-220AC, D²PAK	T_C = 145 °C	8	A
		TO-220AC 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 3: Thermal parameter

Symbol	Parameter		Max. value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC, D²PAK	2.5	°C/W
		TO-220AC Ins	5.5	

Table 4: 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	-		1.50	V
		T_j = 100 °C		-	1.05	1.30	
		T_j = 150 °C		-	0.90	1.10	

Notes:

(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 5: Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j = 25 °C	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V	-	35	50	ns
			I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V	-	25	35	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 8 A, dI_F/dt = -200 A/µs, V_R = 320 V	-	5.5	8.0	A
S_{factor}	Softness factor			-	0.4		-
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 8 A, dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_{Fmax}	-		150	ns
V_{FP}	Peak forward voltage		I_F = 8 A, dI_F/dt= 100 A/µs	-	2.9		V

1.1 Characteristics (curves)

Figure 1: Conduction losses versus average current

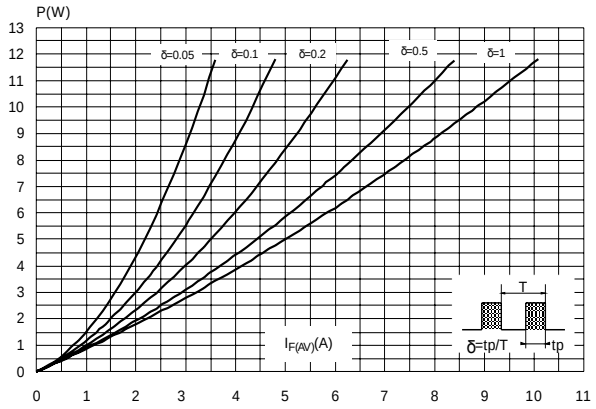


Figure 2: Forward voltage drop versus forward current

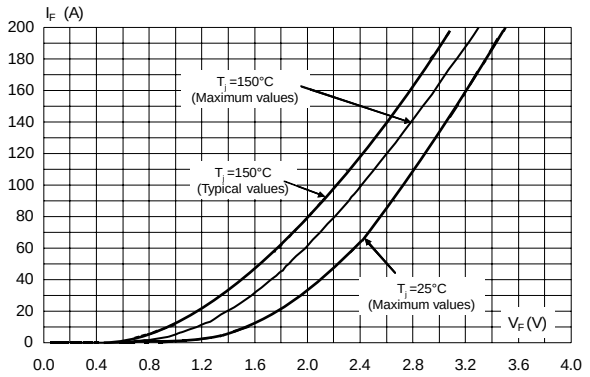


Figure 3: Relative variation of thermal impedance junction to case versus pulse duration

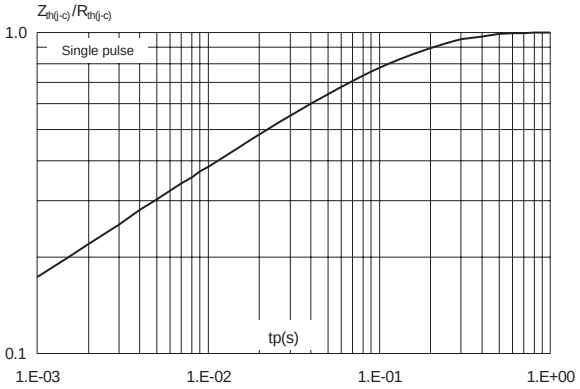


Figure 4: Peak reverse recovery current versus dI_F/dt (typical values)

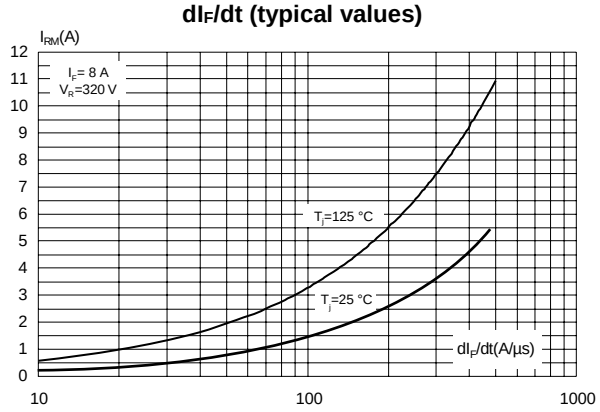


Figure 5: Reverse recovery time versus dI_F/dt (typical values)

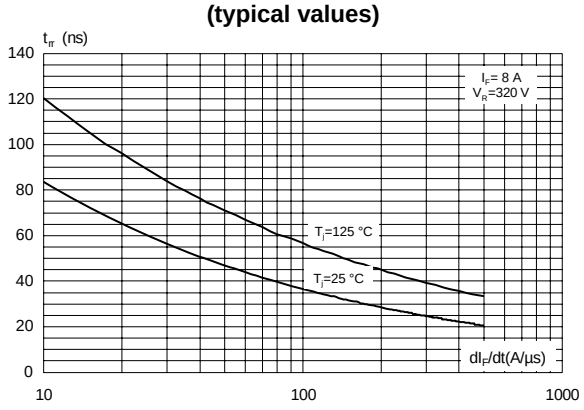


Figure 6: Reverse recovery charges versus dI_F/dt (typical values)

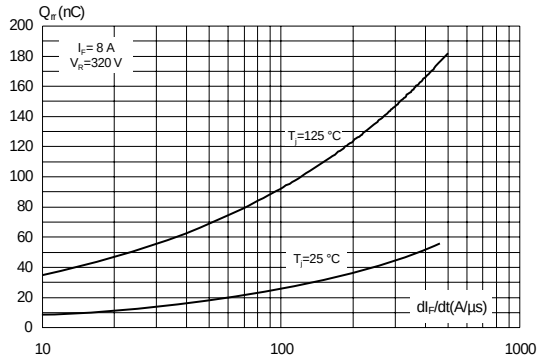


Figure 7: Relative variation of dynamic parameters versus junction temperature (reference: T_j = 125 °C)

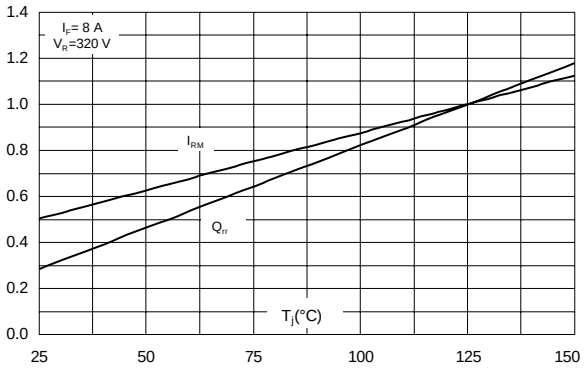


Figure 8: Transient peak forward voltage versus dI_F/dt (typical values)

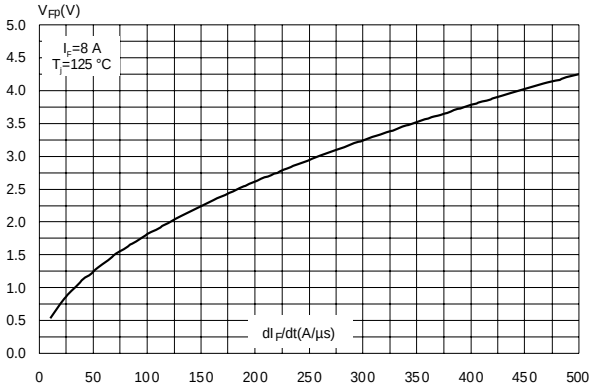


Figure 9: Forward recovery time versus dI_F/dt (typical values)

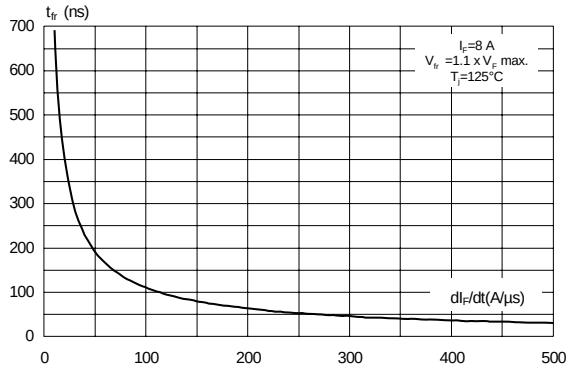


Figure 10: Junction capacitance versus reverse voltage applied (typical values)

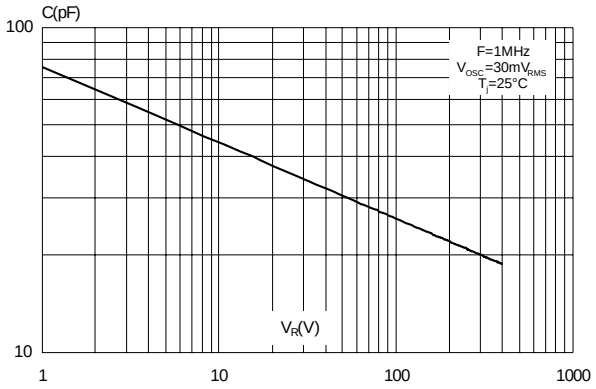
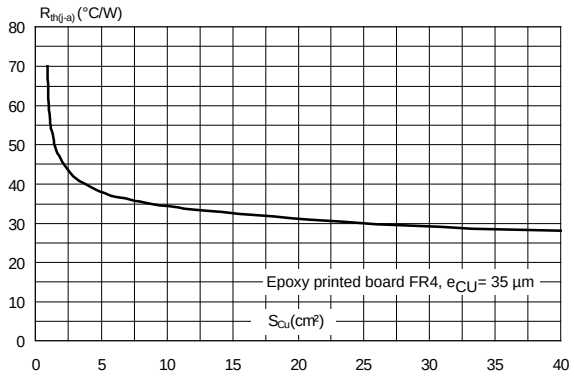


Figure 11: Thermal resistance junction to ambient versus copper surface under tab for D²PAK



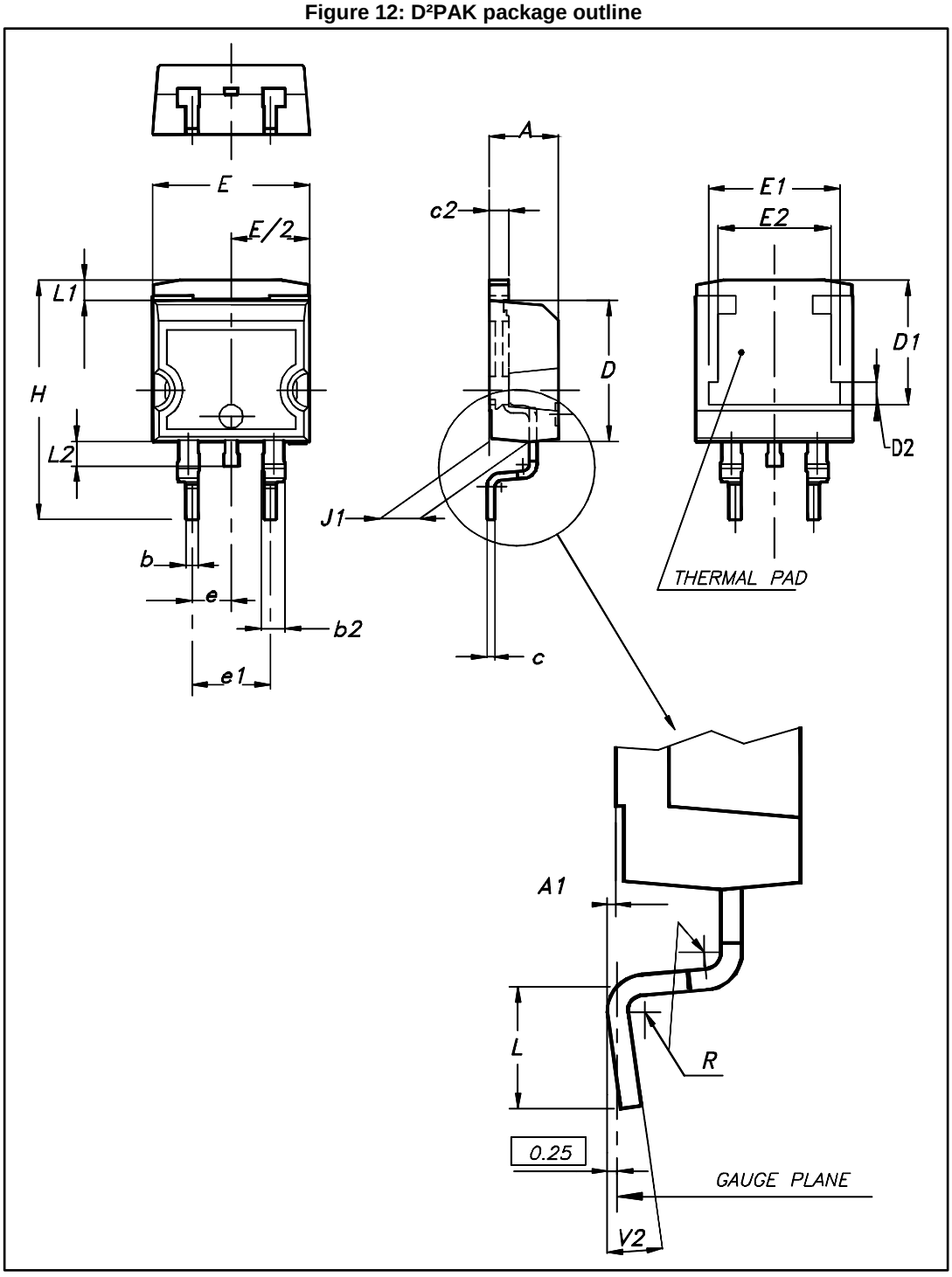
2 Package information

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.

- Cooling method: by conduction (C)
- Epoxy meets UL94,V0
- Recommended torque value: 0.55 N·m (for TO-220AC and TO-220AC Ins)
- Maximum torque value: 0.70 N·m (for TO-220AC and TO-220AC Ins)

2.1 D²PAK package information

Figure 12: D²PAK package outline

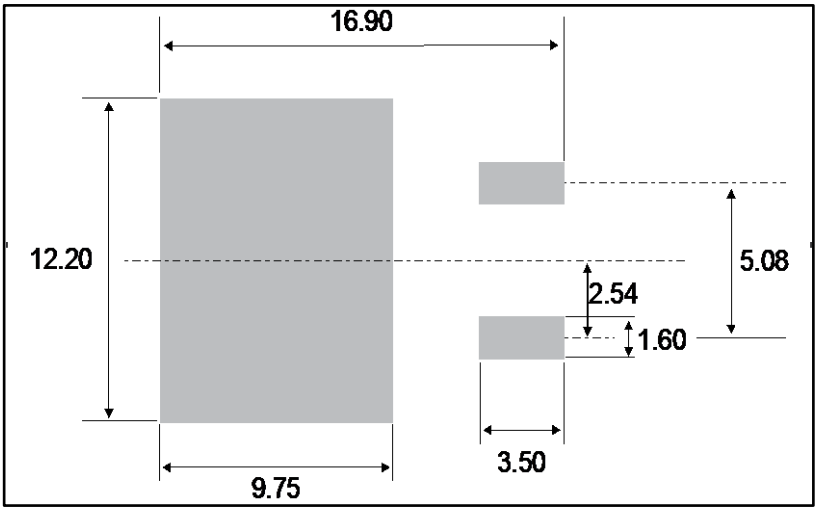


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6: D²PAK package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.36	4.60	0.172	0.181
A1	0.00	0.25	0.000	0.010
b	0.70	0.93	0.028	0.037
b2	1.14	1.70	0.045	0.067
c	0.38	0.69	0.015	0.027
c2	1.19	1.36	0.047	0.053
D	8.60	9.35	0.339	0.368
D1	6.90	8.00	0.272	0.311
D2	1.10	1.50	0.043	0.060
E	10.00	10.55	0.394	0.415
E1	8.10	8.90	0.319	0.346
E2	6.85	7.25	0.266	0.282
e	2.54 typ.		0.100	
e1	4.88	5.28	0.190	0.205
H	15.00	15.85	0.591	0.624
J1	2.49	2.90	0.097	0.112
L	1.90	2.79	0.075	0.110
L1	1.27	1.65	0.049	0.065
L2	1.30	1.78	0.050	0.070
R	0.4 typ.		0.015	
V2	0°	8°	0°	8°

Figure 13: D²PAK recommended footprint (dimensions in mm)



2.2 TO-220AC package information

Figure 14: TO-220AC package outline

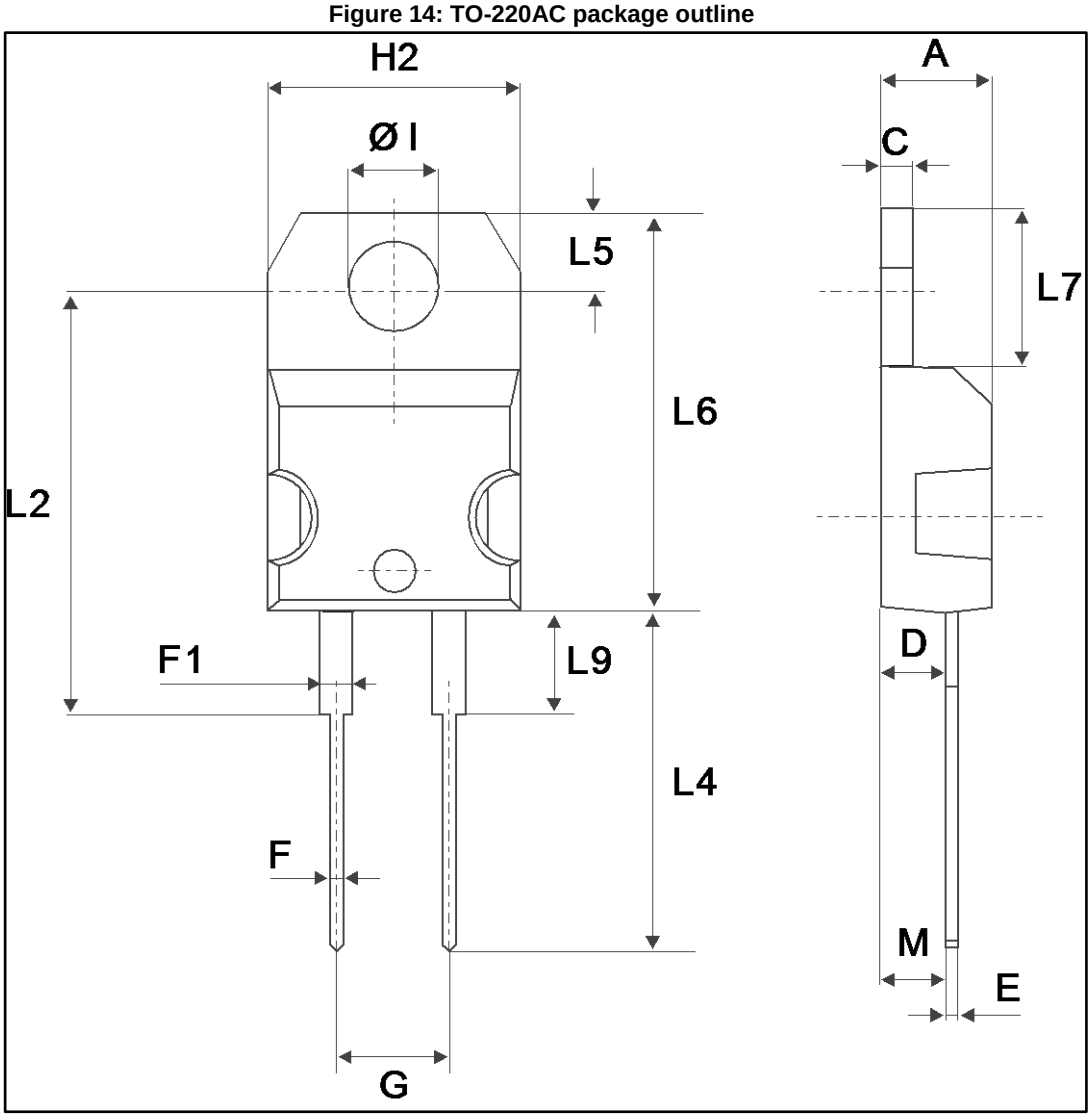


Table 7: TO-220AC package mechanical data

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.	
ØI	3.75	3.85	0.147	0.151

2.3 TO-220AC Ins package information

Figure 15: TO-220AC Ins package outline

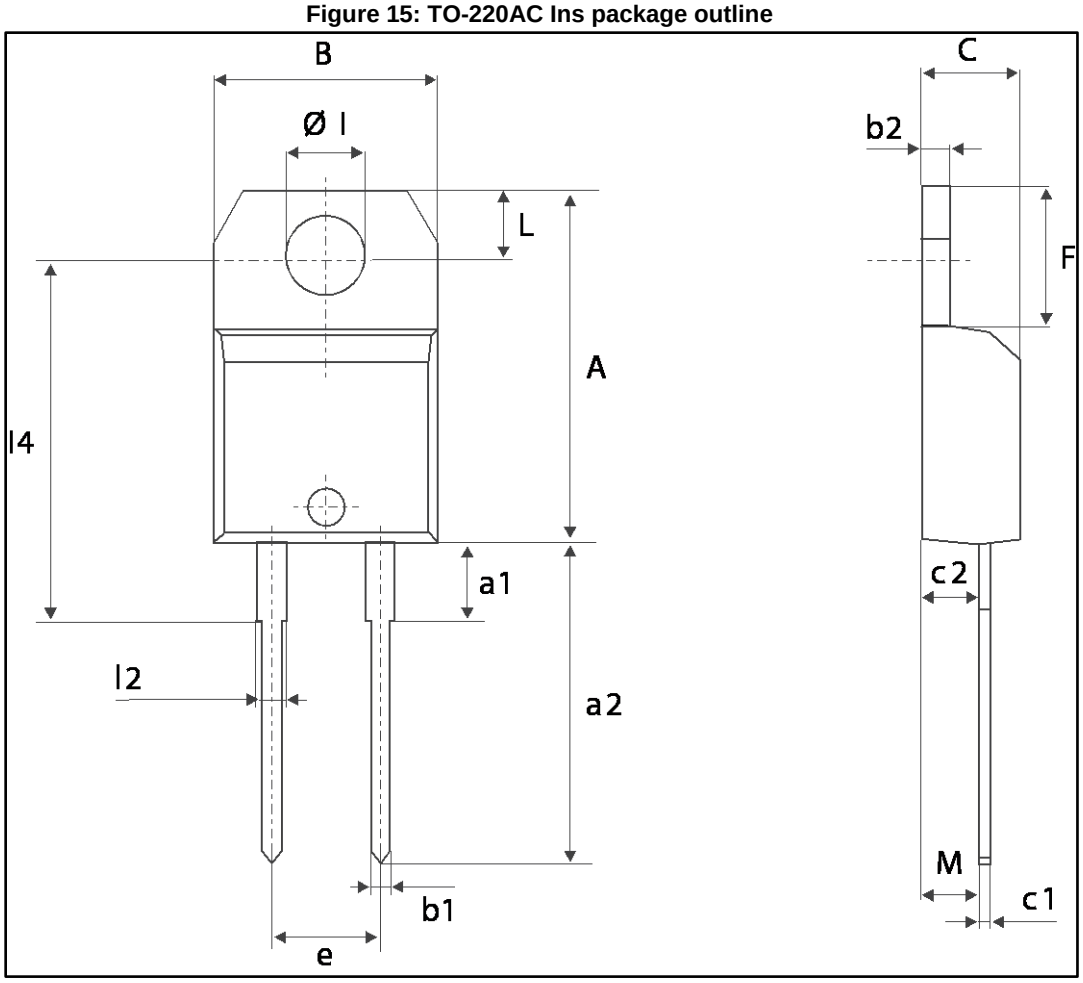


Table 8: TO-220AC Ins package mechanical data

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
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I4	15.80	16.40	16.80	0.622	0.645	0.661
M		2.60			0.102	
ØI	3.75		3.85	0.147		0.151

3 Ordering information

Table 9: Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH8R04D	STTH8R04D	TO-220AC	1.9 g	50	Tube
STTH8R04DI	STTH 8R04DI	TO-220AC Ins	1.8 g	50	Tube
STTH8R04G-TR	STTH8R04G	D^2PAK	1.4 g	1000	Tape and reel

4 Revision history

Table 10: Document revision history

Date	Revision	Changes
11-Mar-2007	1	First issue.
01-Aug-2016	2	Updated D^2PAK package information.

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