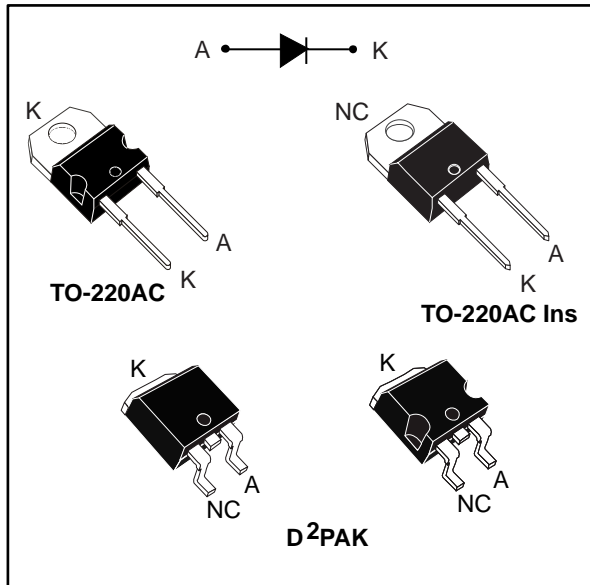


## Ultrafast recovery diode

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<sup>®</sup>2 compliant component for D<sup>2</sup>PAK on demand

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage		400	V
I <sub>F(RMS)</sub>	Forward rms current	TO-220AC, D <sup>2</sup> PAK	30	A
		TO-220AC Ins	20	
I <sub>F(AV)</sub>	Average forward current δ = 0.5, square wave	TO-220AC, D <sup>2</sup> PAK T <sub>C</sub> = 145 °C	8	A
		TO-220AC Ins T <sub>C</sub> = 115 °C		
I <sub>FRM</sub>	Repetitive peak forward current	t <sub>p</sub> = 10 μs, F = 1 kHz	165	A
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms sinusoidal	120	A
T <sub>stg</sub>	Storage temperature range		-65 to +175	°C
T <sub>j</sub>	Operating junction temperature range		-40 to +175	°C

**Table 3: Thermal parameter**

Symbol	Parameter		Max. value	Unit
R <sub>th(j-c)</sub>	Junction to case	TO-220AC, D <sup>2</sup> PAK	2.5	°C/W
		TO-220AC Ins	5.5	

**Table 4: Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-		10	μA
		T <sub>j</sub> = 125 °C		-	10	100	
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 8 A	-		1.50	V
		T <sub>j</sub> = 100 °C		-	1.05	1.30	
		T <sub>j</sub> = 150 °C		-	0.90	1.10	

**Notes:**

(1)Pulse test: t<sub>p</sub> = 5 ms, δ < 2%

(2)Pulse test: t<sub>p</sub> = 380 μs, δ < 2%

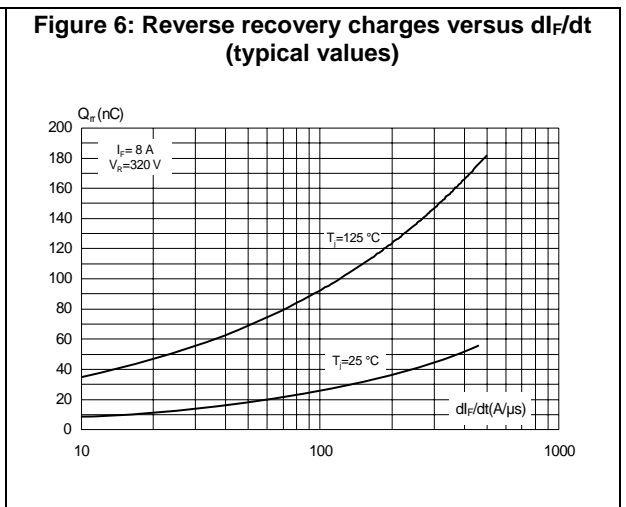
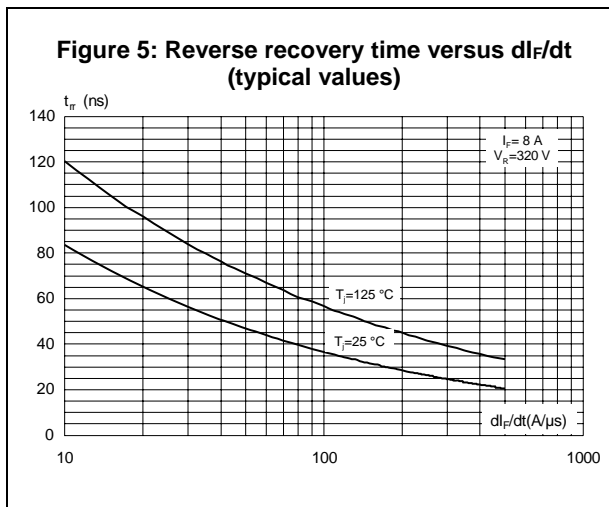
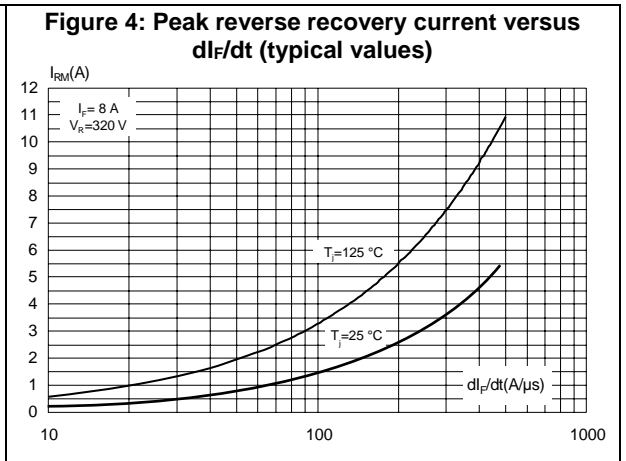
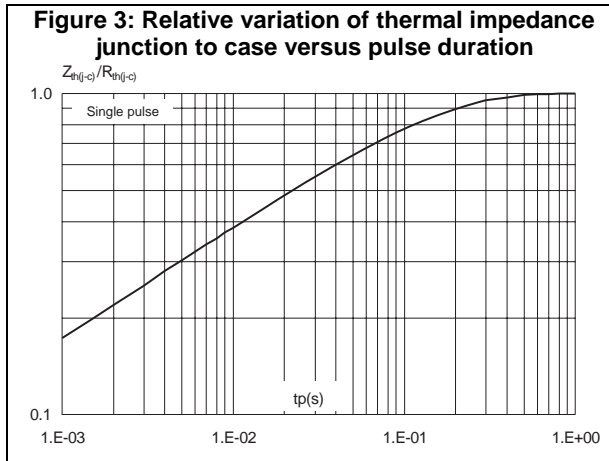
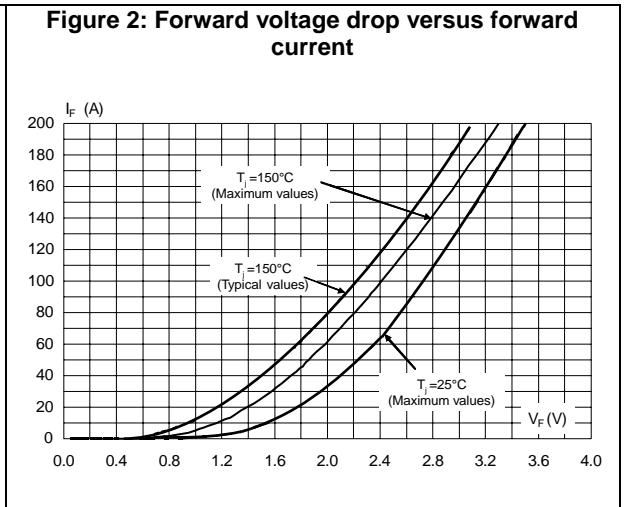
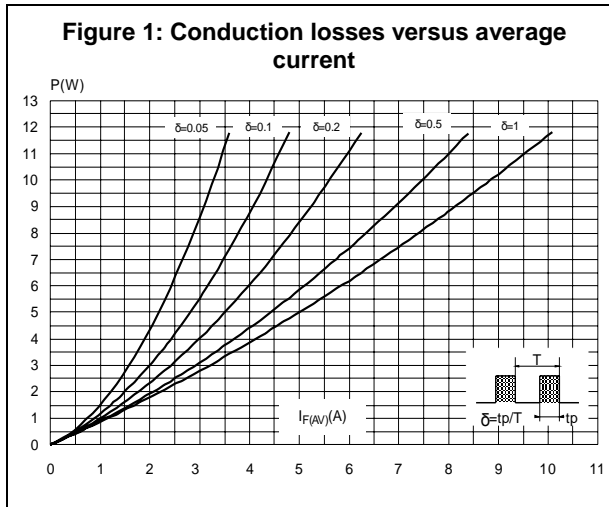
To evaluate the conduction losses, use the following equation:

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

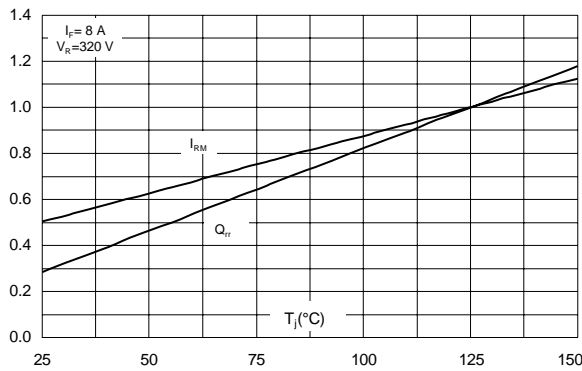
Table 5: Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t <sub>rr</sub>	Reverse recovery time	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 1 A, dI <sub>F</sub> /dt = -50 A/μs, V <sub>R</sub> = 30 V	-	35	50	ns
			I <sub>F</sub> = 1 A, dI <sub>F</sub> /dt = -100 A/μs, V <sub>R</sub> = 30 V	-	25	35	
I <sub>RM</sub>	Reverse recovery current	T <sub>j</sub> = 125 °C	I <sub>F</sub> = 8 A, dI <sub>F</sub> /dt = -200 A/μs, V <sub>R</sub> = 320 V	-	5.5	8.0	A
S <sub>factor</sub>	Softness factor			-	0.4	-	-
t <sub>fr</sub>	Forward recovery time	T <sub>j</sub> = 25 °C	I <sub>F</sub> = 8 A, dI <sub>F</sub> /dt = 100 A/μs V <sub>FR</sub> = 1.1 x V <sub>Fmax</sub>	-		150	ns
V <sub>FP</sub>	Peak forward voltage			I <sub>F</sub> = 8 A, dI <sub>F</sub> /dt = 100 A/μs	-	2.9	

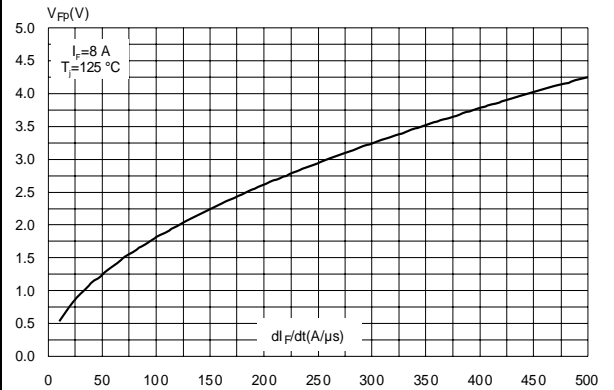
### 1.1 Characteristics (curves)



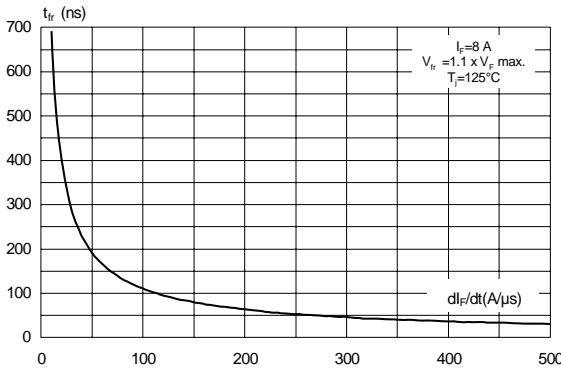
**Figure 7: Relative variation of dynamic parameters versus junction temperature (reference:  $T_j = 125^\circ\text{C}$ )**



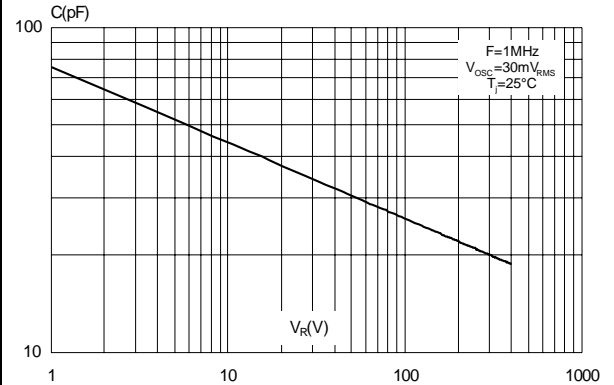
**Figure 8: Transient peak forward voltage versus  $di_F/dt$  (typical values)**



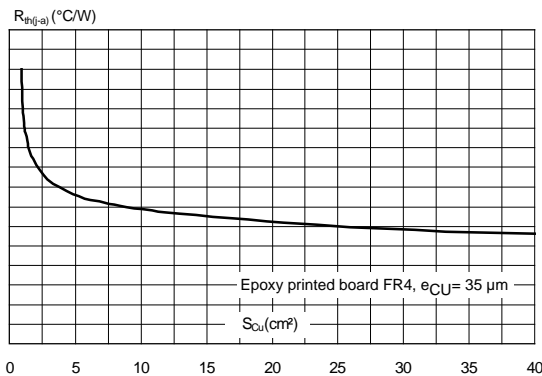
**Figure 9: Forward recovery time versus  $di_F/dt$  (typical values)**



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



**Figure 11: Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK**



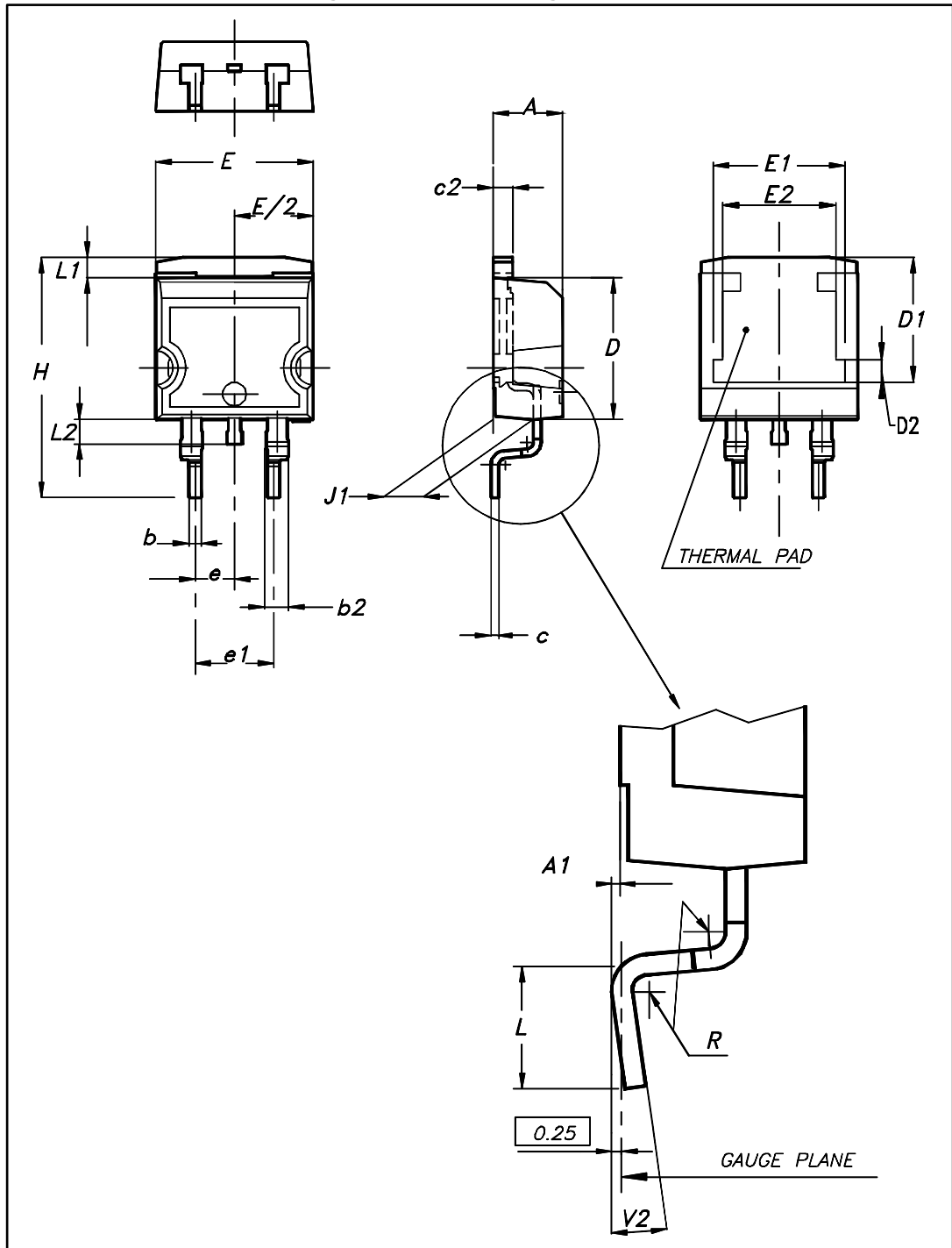
## 2 Package information

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](http://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 D<sup>2</sup>PAK package information

Figure 12: D<sup>2</sup>PAK package outline

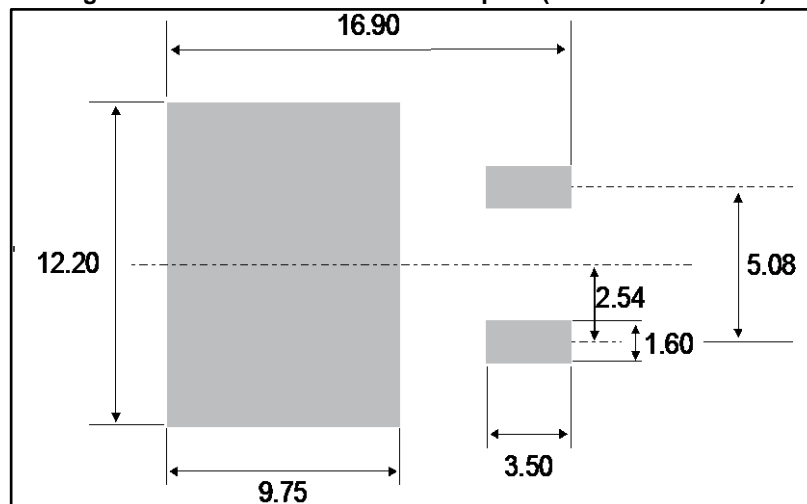


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6: D<sup>2</sup>PAK 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: D<sup>2</sup>PAK recommended footprint (dimensions in mm)





## 2.2 TO-220AC package information

Figure 14: TO-220AC package outline

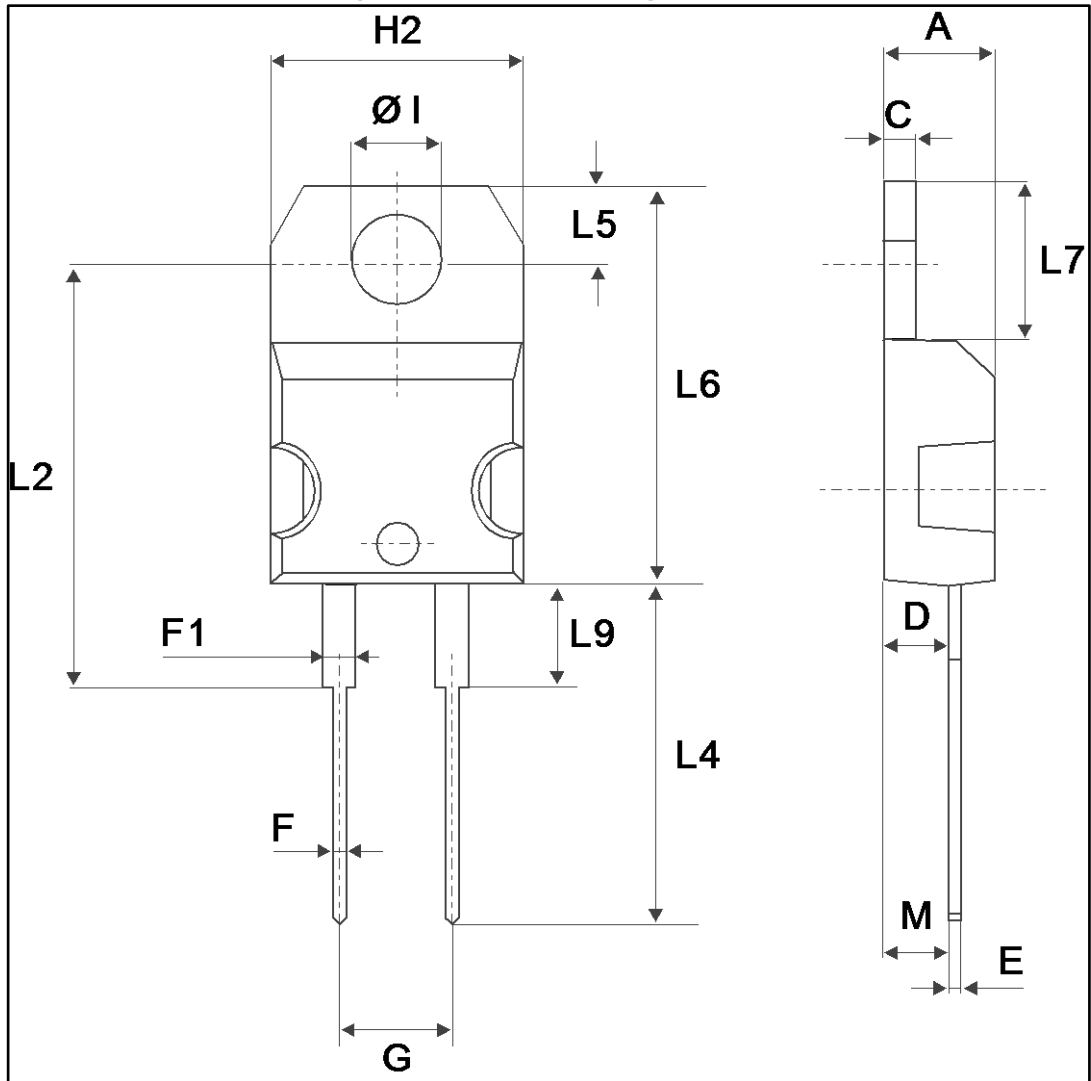


Table 7: TO-220AC package mechanical data

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

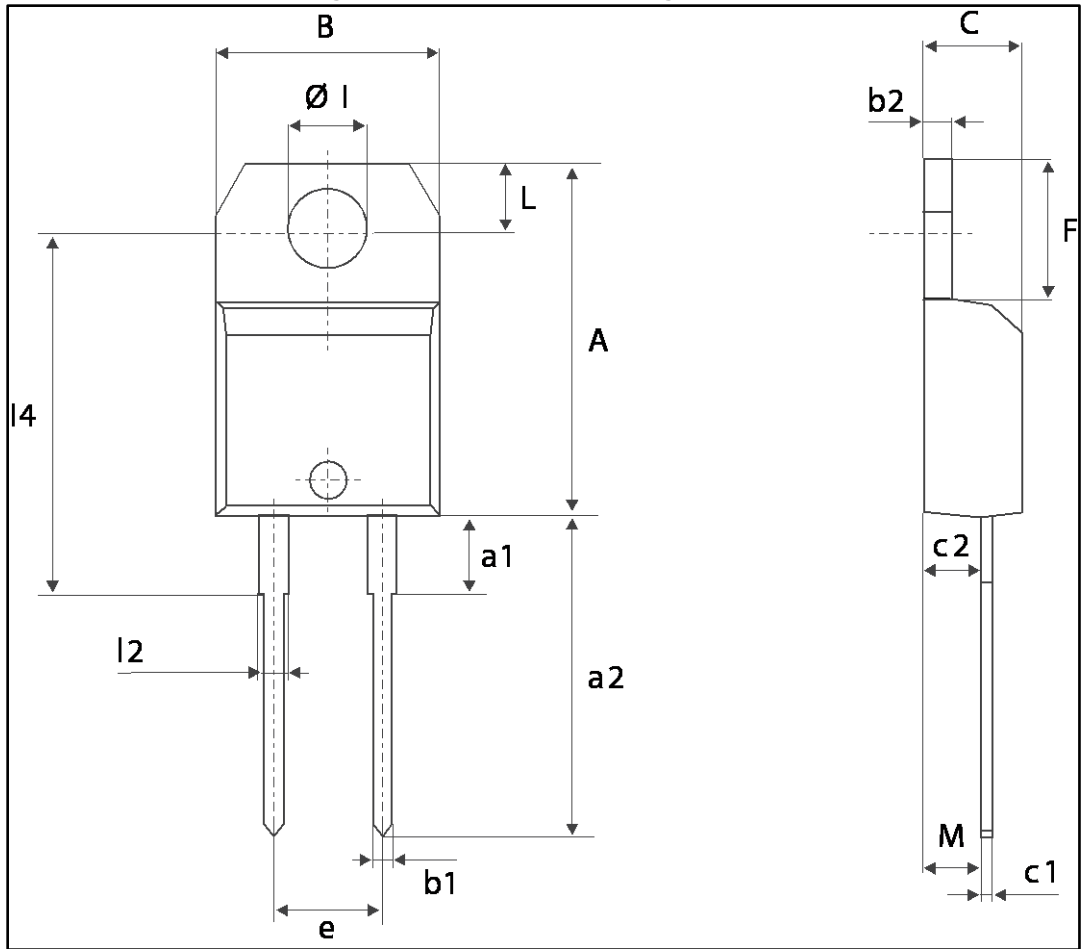


Table 8: TO-220AC Ins package mechanical data

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
l2	1.14		1.70	0.044		0.066
l4	15.80	16.40	16.80	0.622	0.645	0.661
M		2.60			0.102	
Øl	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 <sup>2</sup> PAK	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 <sup>2</sup> PAK package information.

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