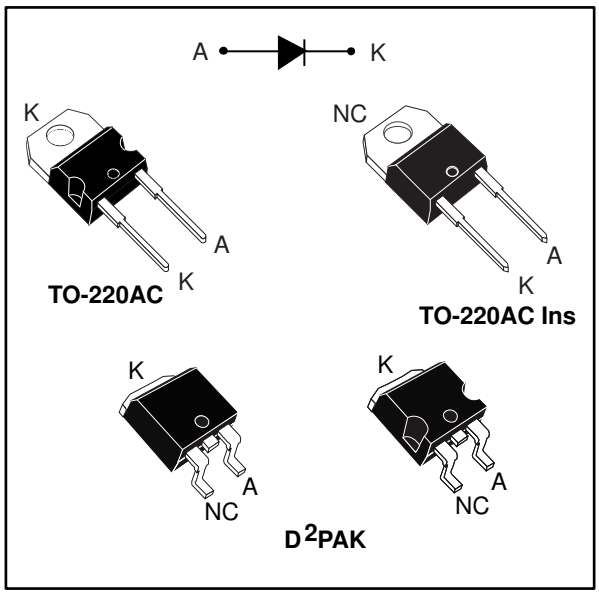
STTH2002

Ultrafast recovery diode

Datasheet - production data



Description

This single rectifier is suited for switch mode power supplies and high frequency DC to DC converters.
Packaged in D²PAK, TO-220AC and insulated TO-220AC, this device is intended for low voltage, high frequency inverters, freewheeling and polarity protection applications

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	20 A
V_{RRM}	200 V
T_j (max.)	175 °C
V_F (typ.)	0.86 V
t_{rr} (typ.)	16 ns

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- High T_j
- Insulated package: TO-220AC Ins
  - Insulating voltage = 2500 V_{RMS} sine
- ECOPACK®2 compliant component for D²PAK on demand

This is information on a product in full production.

1 Characteristics

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

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			200	V
$I_{F(RMS)}$	Forward rms current			35	A
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	TO-220AC, D^2PAK	T_C = 120 °C	20	A
		TO-220AC Ins	T_C = 60 °C		
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal		175	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature			175	°C

Table 3: Thermal parameter

Symbol	Parameter		Max. value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC, D^2PAK	2.4	°C/W
		TO-220AC Ins	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 = 20 A	-	1.00	1.10	V
		T_j = 150 °C		-	0.86	0.95	
		T_j = 25 °C	I_F = 25 A	-		1.15	
		T_j = 125 °C		-	0.94	1.05	
		T_j = 150 °C		-	0.90	1.00	

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:

$P = 0.75 \times I_{F(AV)} + 0.01 \times I_{F^2(RMS)}$

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 = -200 A/µs, V_R = 30 V	-	16	20	ns
			I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V	-	33	40	
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 20 A, dI_F/dt = 100 A/µs V_{FR} = 1.1 x V_{Fmax}	-	230		ns
V_{FP}	Forward recovery voltage			-	2		V
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 20 A, dI_F/dt = -100 A/µs, V_R = 160 V	-	8	10	A

1.1 Characteristics (curves)

Figure 1: Peak current versus duty cycle

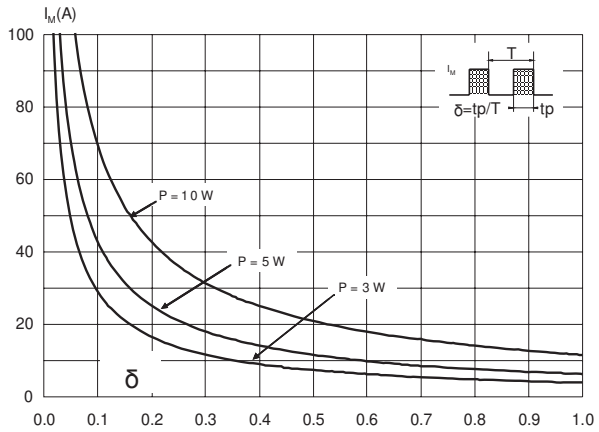


Figure 2: Forward voltage drop versus forward current (typical values)

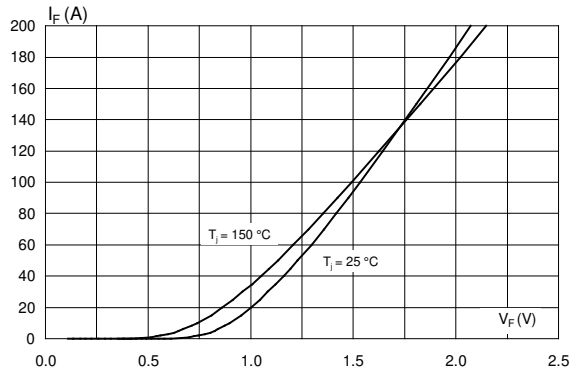


Figure 3: Forward voltage drop versus forward current (maximum values)

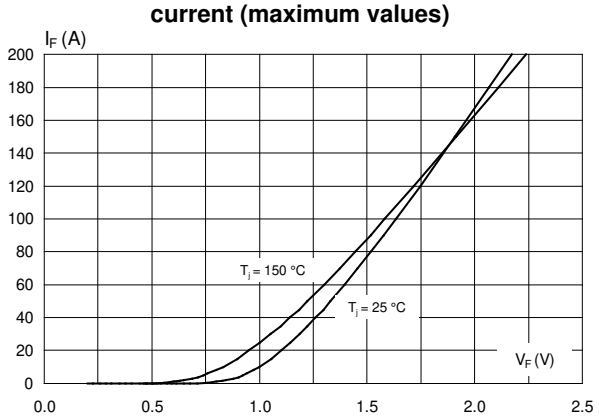


Figure 4: Relative variation of thermal impedance junction to case versus pulse duration

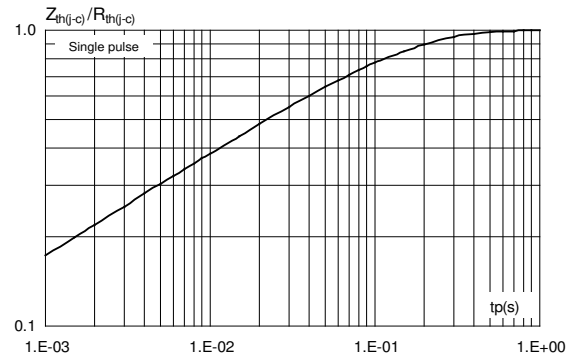


Figure 5: Junction capacitance versus reverse applied voltage (typical values)

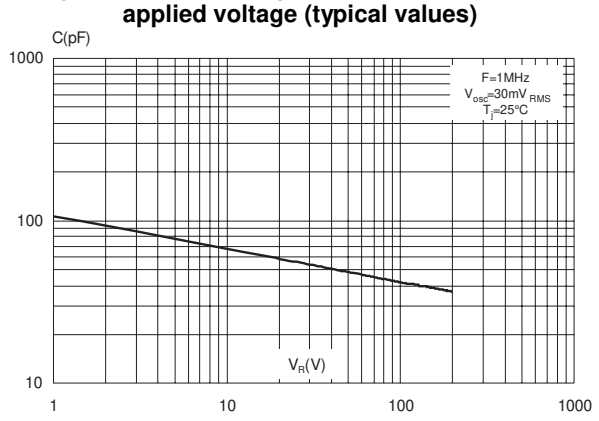


Figure 6: Reverse recovery charges versus dI_F/dt (typical values)

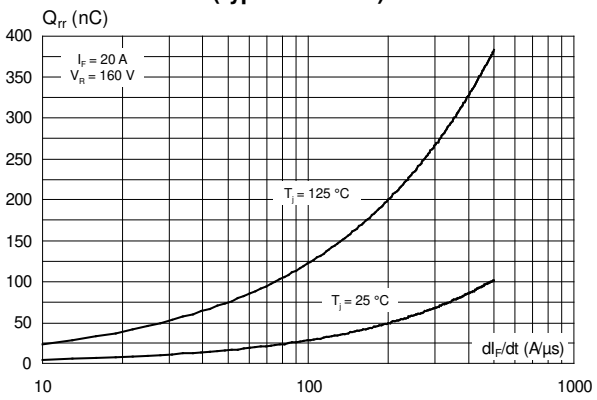


Figure 7: Reverse recovery time versus dI_F/dt (typical values)

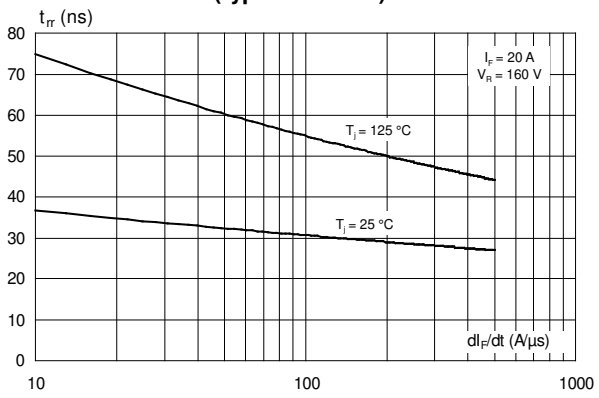


Figure 8: Peak reverse recovery current versus dI_F/dt (typical values)

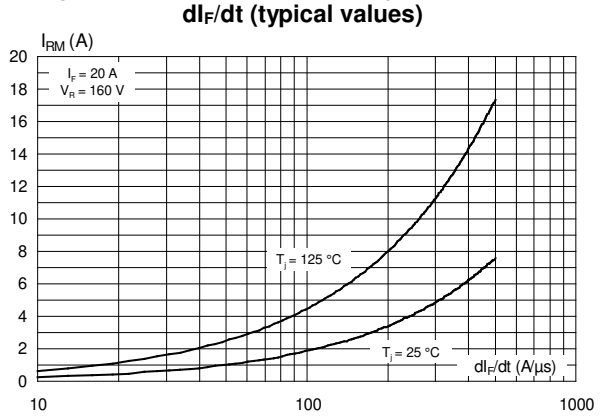


Figure 9: Relative variation of dynamic parameters versus junction temperature

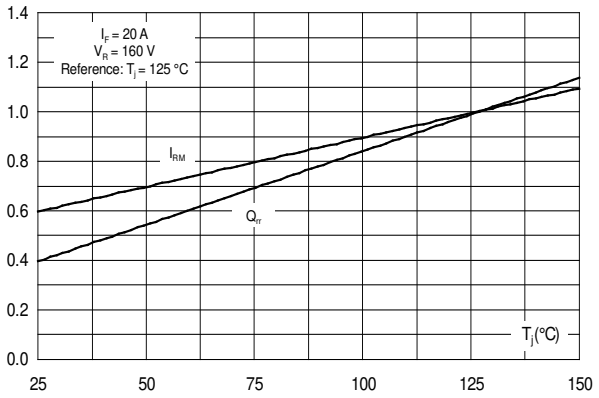
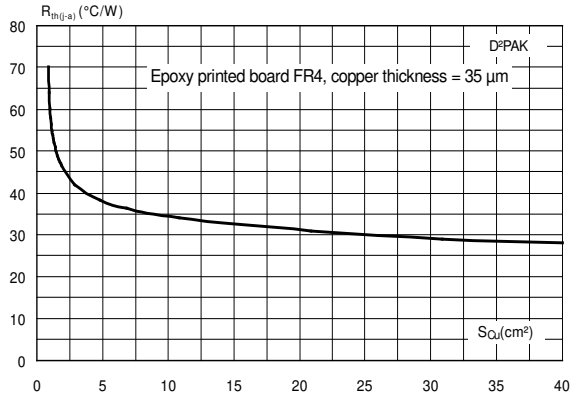


Figure 10: Thermal resistance, junction to ambient, versus copper surface under tab



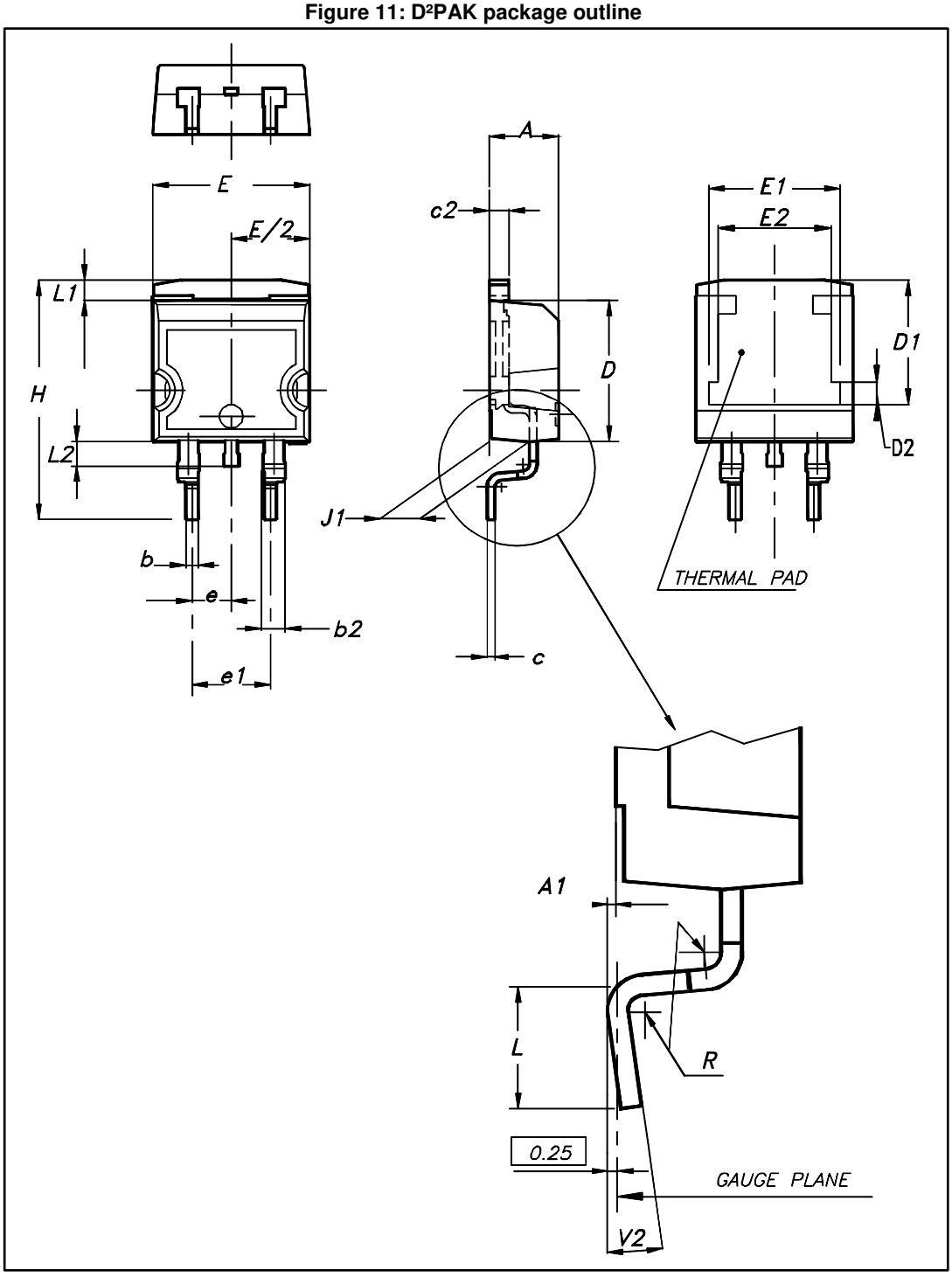
2 Package information

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 11: D²PAK package outline

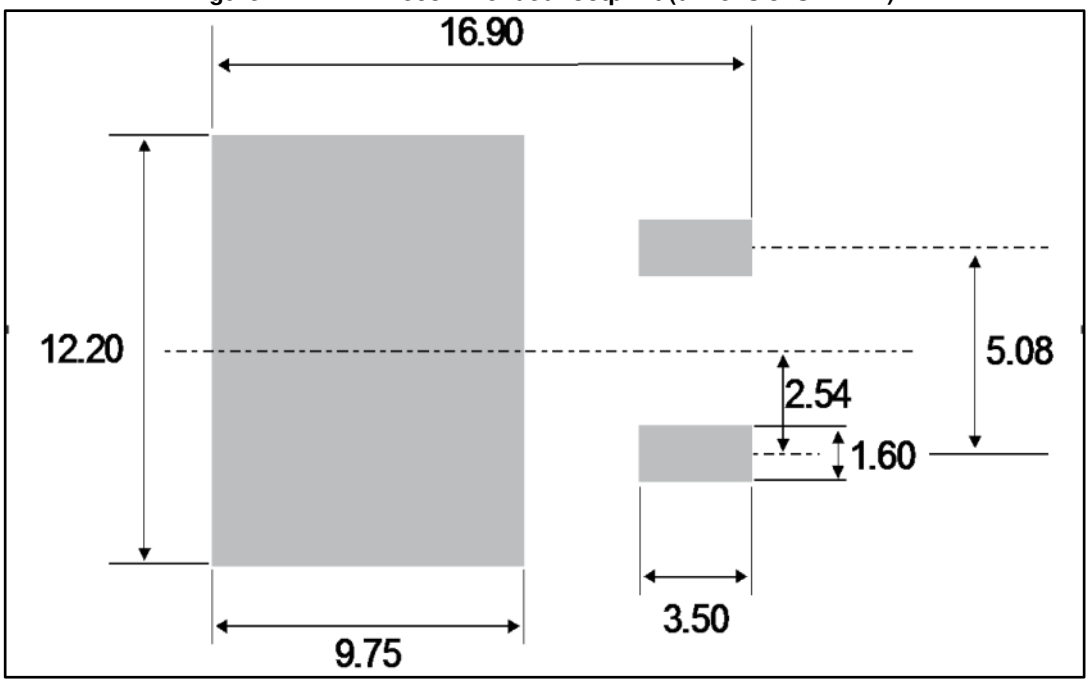


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

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 12: D²PAK recommended footprint (dimensions in mm)



2.2 TO-220AC package information

Figure 13: TO-220AC package outline

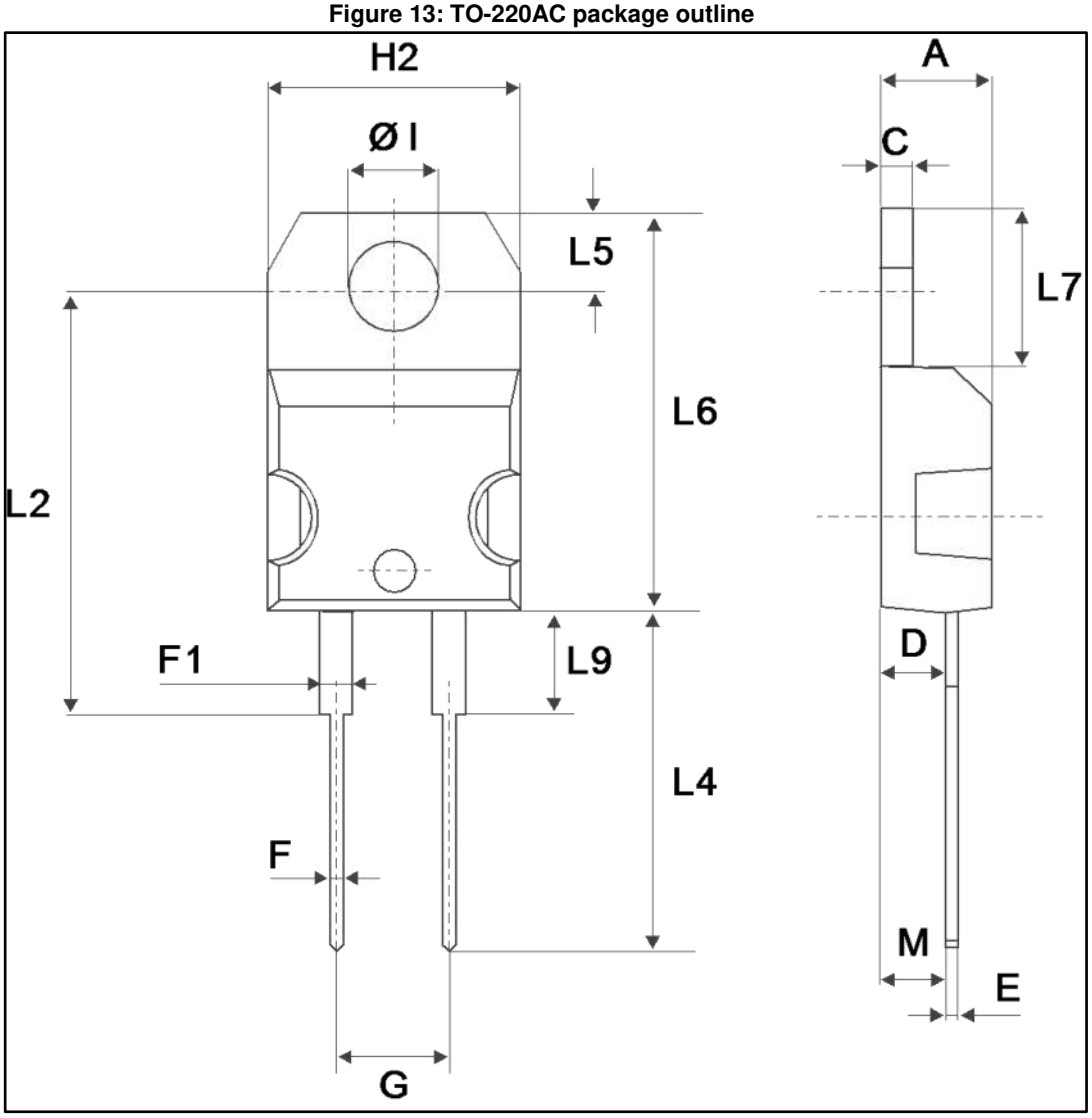


Table 7: TO-220AC package mechanical data

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-220 AC Ins package information

Figure 14: TO-220AC Ins package outline

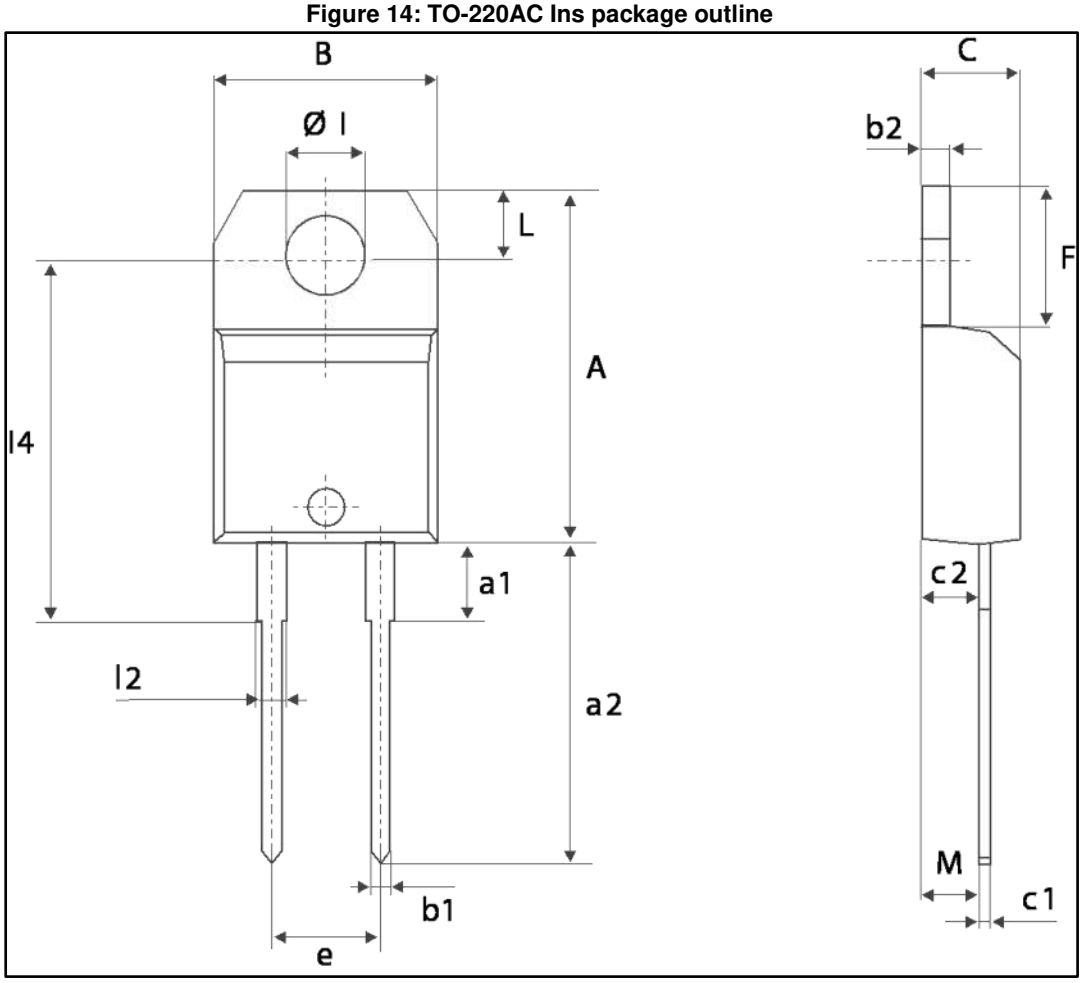


Table 8: TO-220AC Ins package mechanical data

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
STTH2002D	STTH2002	TO-220AC	1.87 g	50	Tube
STTH2002DI	STTH 2002DI	TO-220AC ins	1.76 g	50	Tube
STTH2002G-TR	STTH2002	D^2PAK	1.38 g	1000	Tape and reel

4 Revision history

Table 10: Document revision history

Date	Revision	Changes
03-May-2006	1	First issue.
05-Sep-2011	2	Updated dimension e and deleted l3 in *Table 7*.
16-Aug-2017	3	Updated features and package silhouette in cover page. Updated *Section 1: "Characteristics"*, *Figure 10: "Thermal resistance, junction to ambient, versus copper surface under tab"*, *Section 2: "Package information"* and *Section 3: "Ordering information"*.

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