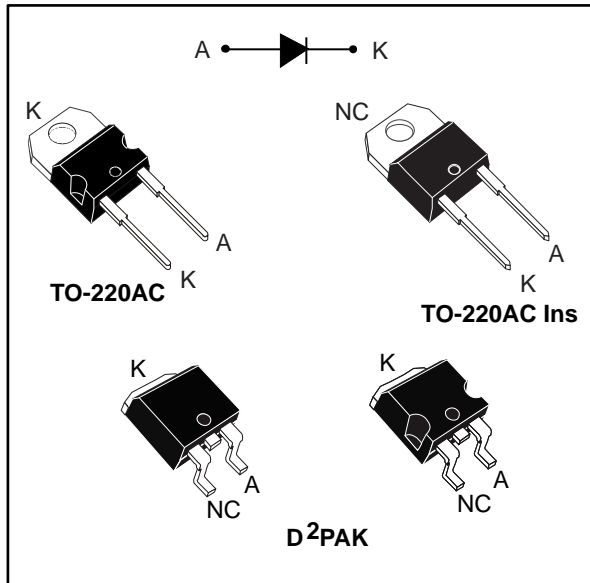


## Ultrafast recovery diode

Datasheet - production data



### Description

This single rectifier is suited for switch mode power supplies and high frequency DC to DC converters.

Packaged in D<sup>2</sup>PAK, 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<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		200	V
I <sub>F(RMS)</sub>	Forward rms current		35	A
I <sub>F(AV)</sub>	Average forward current δ = 0.5, square wave	TO-220AC, D <sup>2</sup> PAK	20	A
		TO-220AC Ins		
I <sub>FSM</sub>	Surge non repetitive forward current	T <sub>C</sub> = 120 °C	175	A
		T <sub>C</sub> = 60 °C		
T <sub>stg</sub>	Storage temperature range		-65 to +175	°C
T <sub>j</sub>	Maximum operating junction temperature		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	2.4	°C/W
		TO-220AC Ins	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> = 20 A	-	1.00	1.10	V
		T <sub>j</sub> = 150 °C		-	0.86	0.95	
		T <sub>j</sub> = 25 °C	I <sub>F</sub> = 25 A	-		1.15	
		T <sub>j</sub> = 125 °C		-	0.94	1.05	
		T <sub>j</sub> = 150 °C		-	0.90	1.00	

**Notes:**

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

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

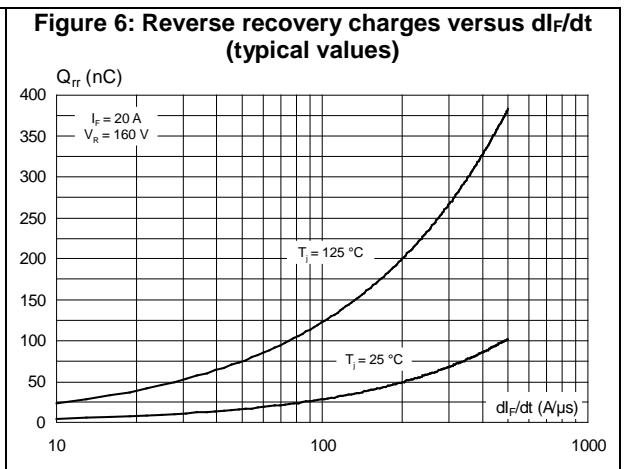
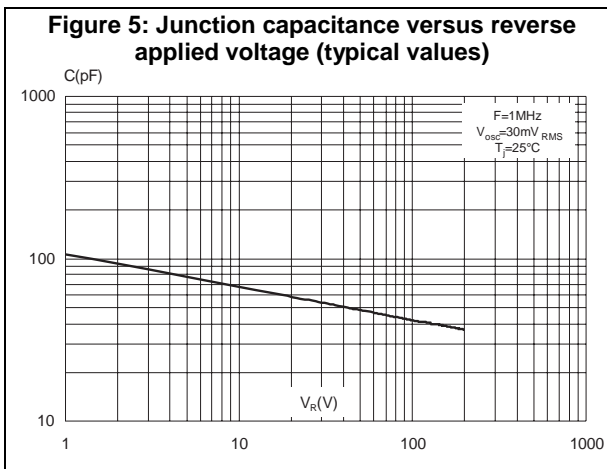
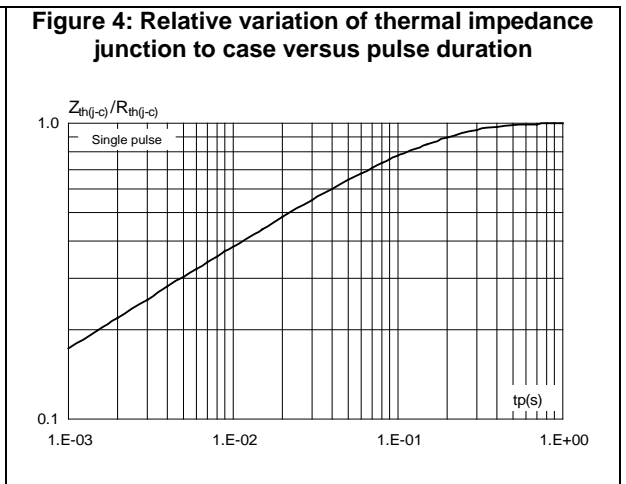
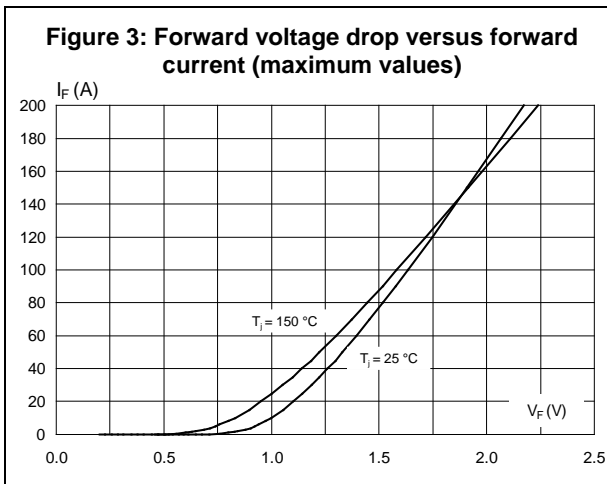
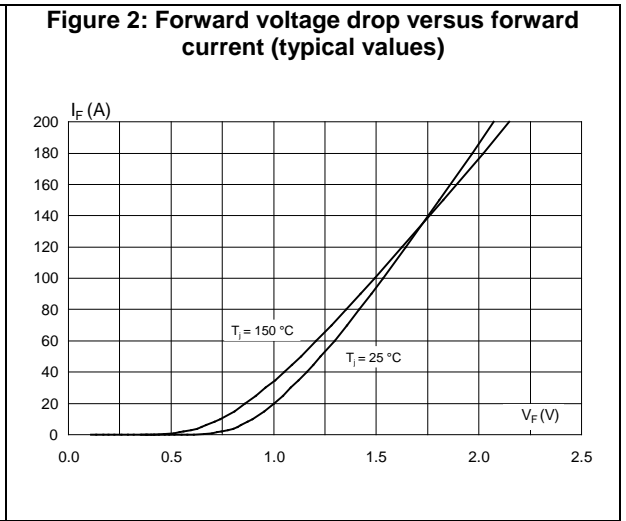
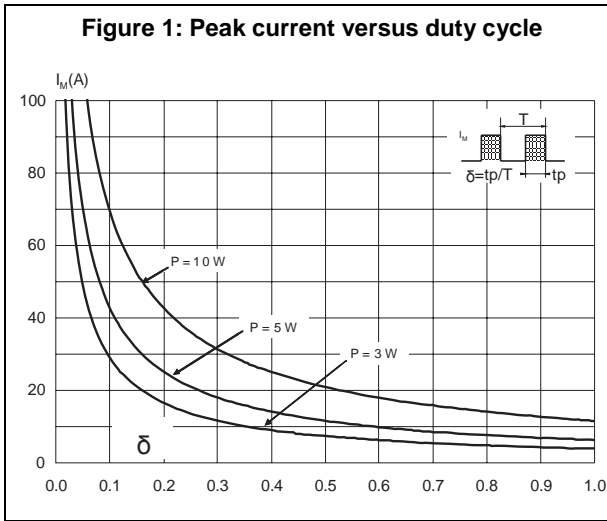
To evaluate the conduction losses use the following equation:

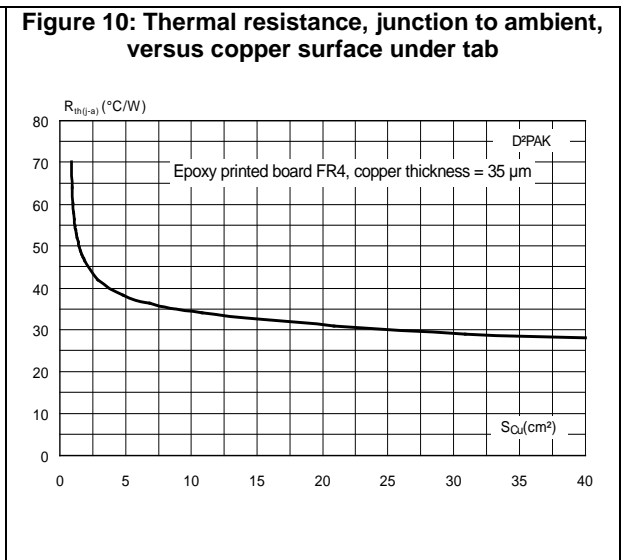
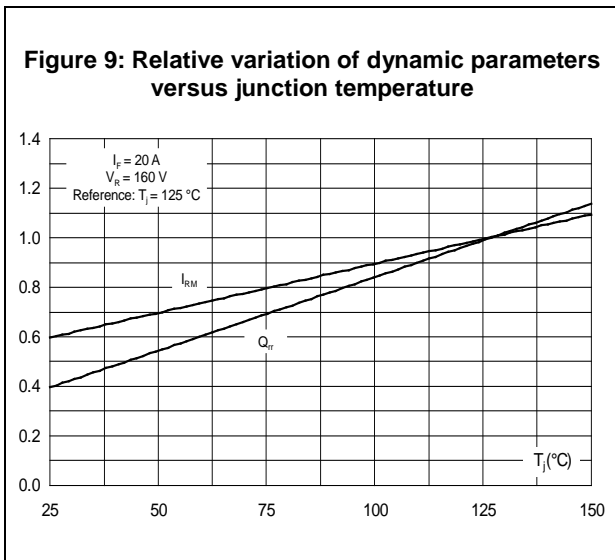
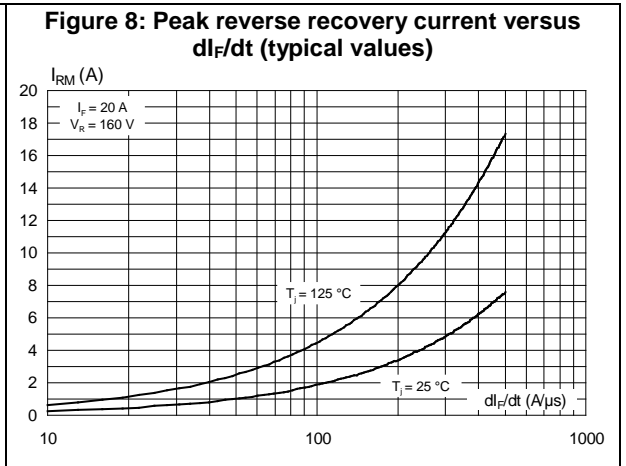
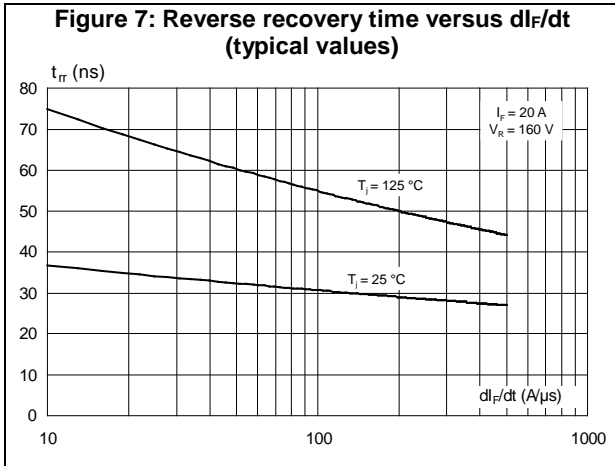
$$P = 0.75 \times I_{F(AV)} + 0.01 \times I_{F(RMS)}^2$$

Table 5: Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ °C}$	$I_F = 1\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	16	20	ns
			$I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	33	40	
$t_{fr}$	Forward recovery time	$T_j = 25\text{ °C}$	$I_F = 20\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$	-	230		ns
$V_{FP}$	Forward recovery voltage			-	2		V
$I_{RM}$	Reverse recovery current	$T_j = 125\text{ °C}$	$I_F = 20\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ , $V_R = 160\text{ V}$	-	8	10	A

### 1.1 Characteristics (curves)





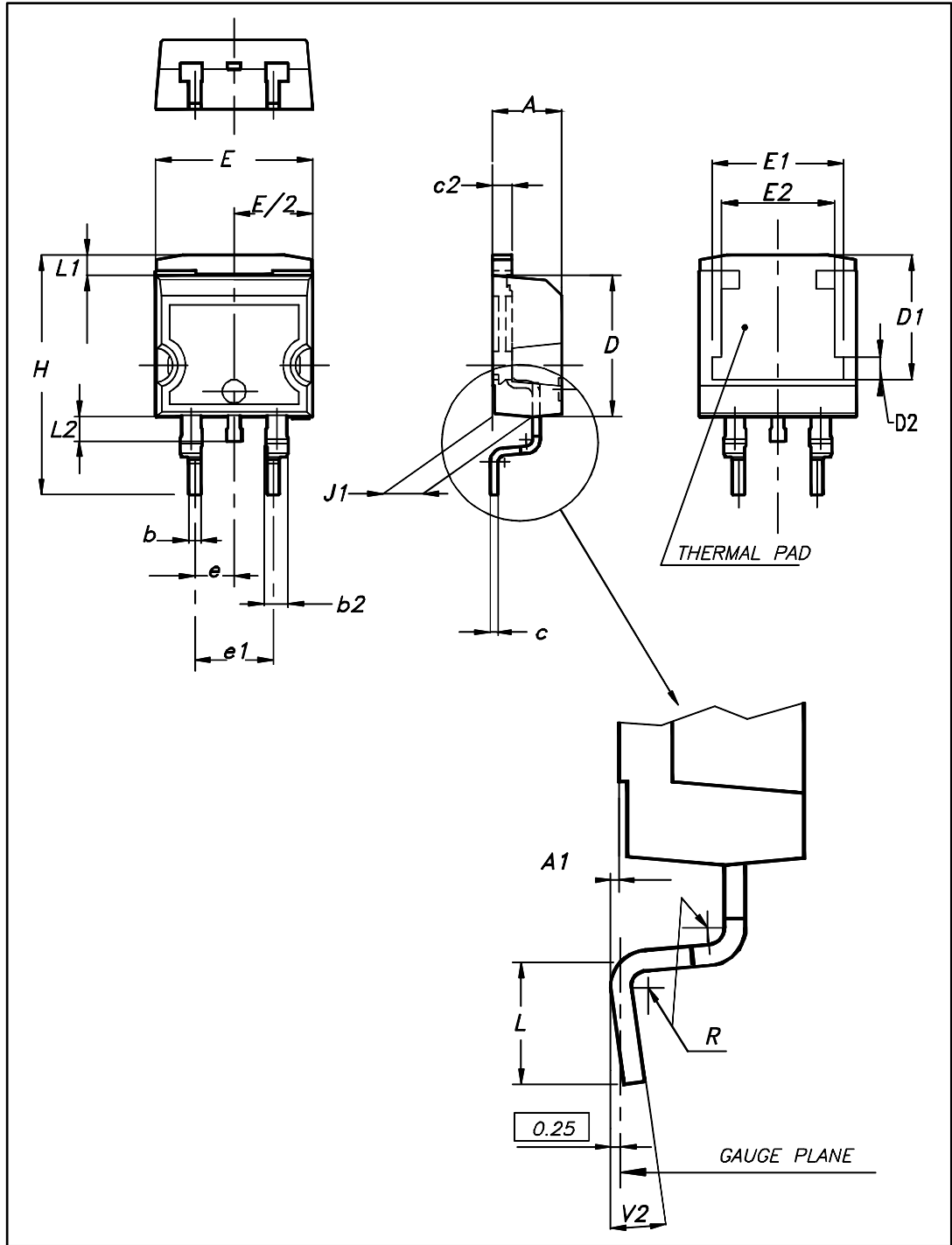
## 2 Package information

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 11: D<sup>2</sup>PAK package outline



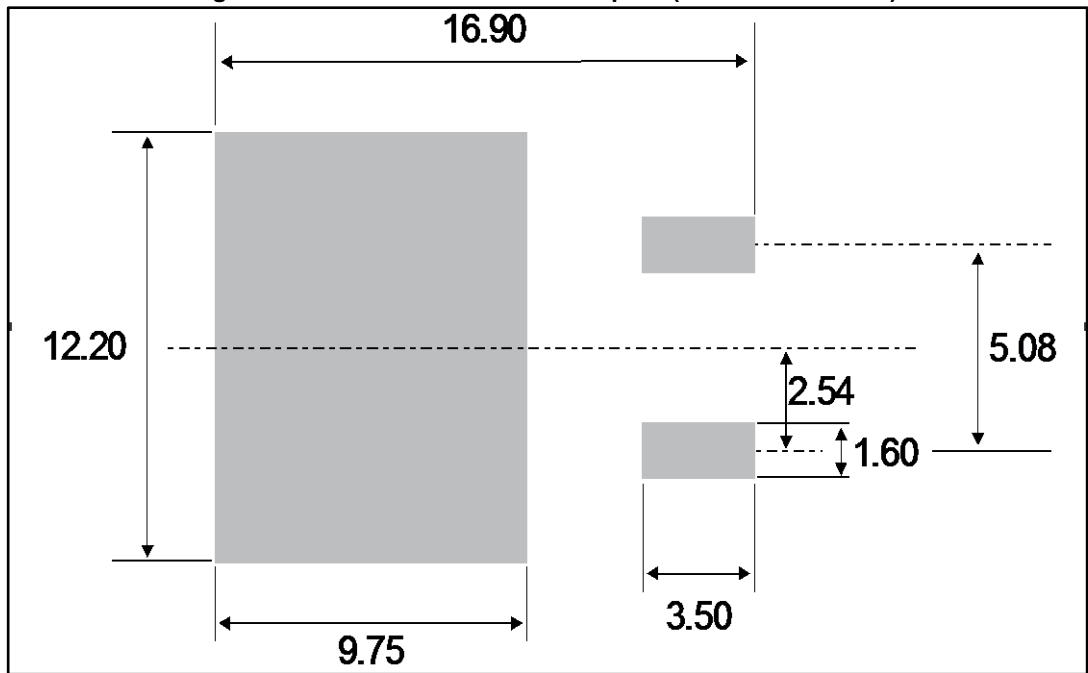
This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

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



## 2.2 TO-220AC package information

Figure 13: TO-220AC package outline

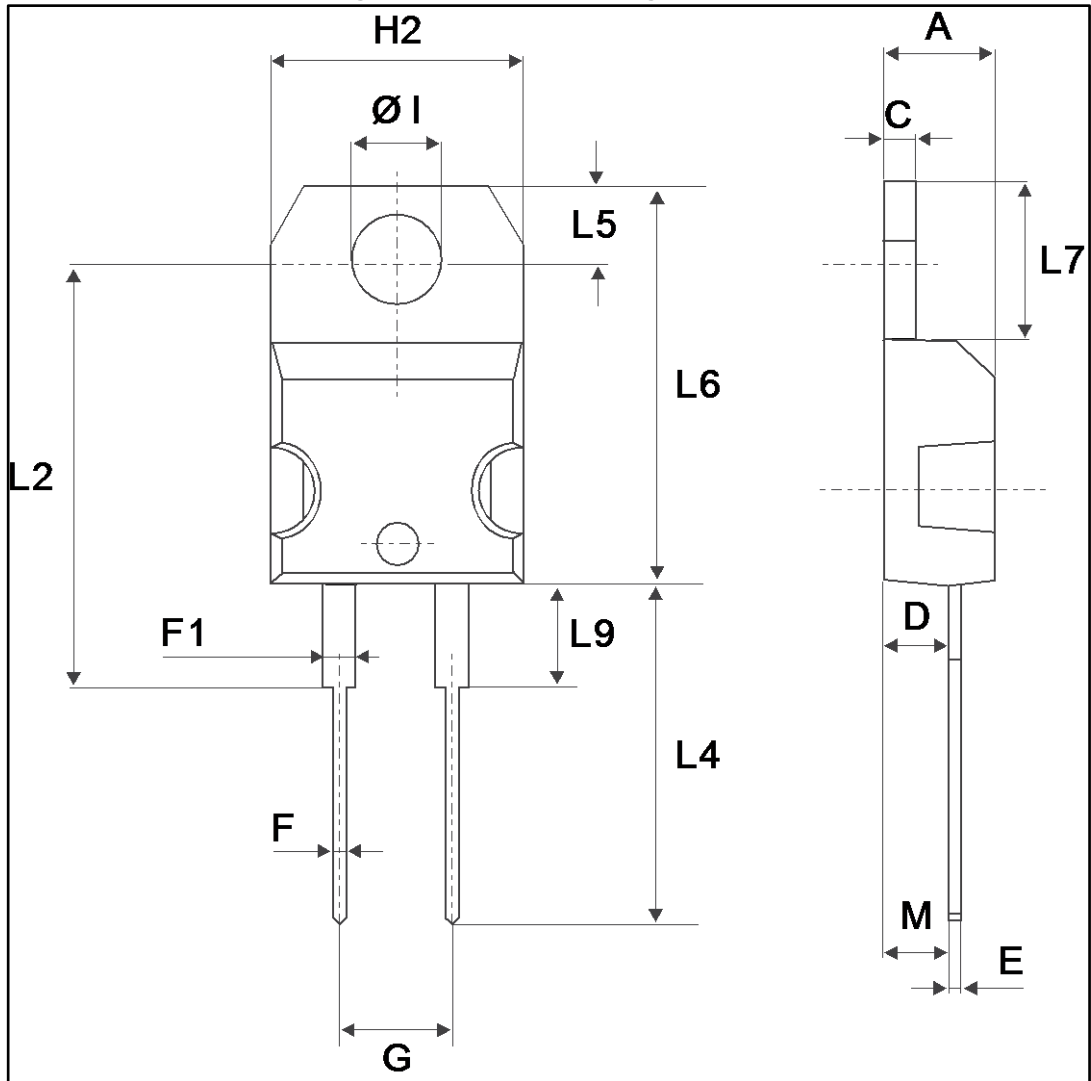


Table 7: TO-220AC package mechanical data

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

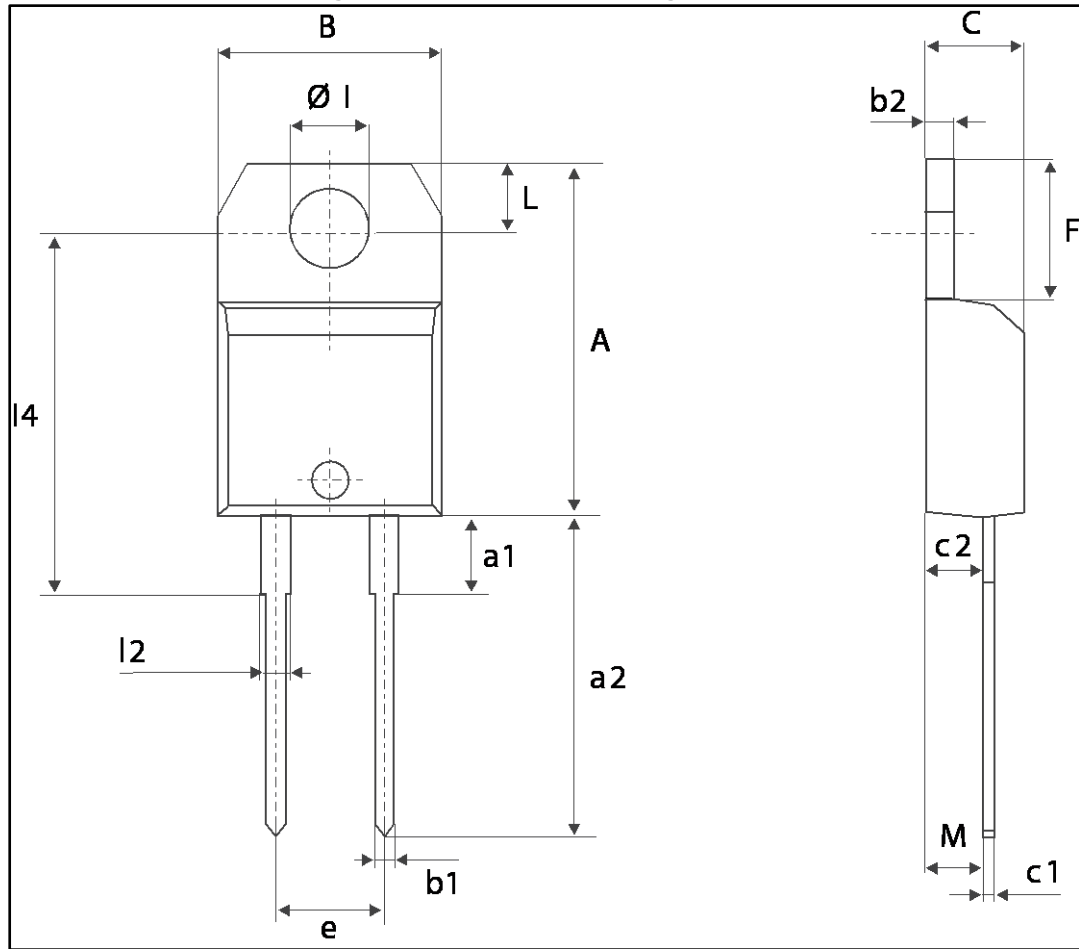


Table 8: TO-220AC Ins package mechanical data

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 <sup>2</sup> PAK	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 I3 in <i>Table 7</i> .
16-Aug-2017	3	Updated features and package silhouette in cover page. Updated <i>Section 1: "Characteristics"</i> , <i>Figure 10: "Thermal resistance, junction to ambient, versus copper surface under tab"</i> , <i>Section 2: "Package information"</i> and <i>Section 3: "Ordering information"</i> .

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2017 STMicroelectronics – All rights reserved