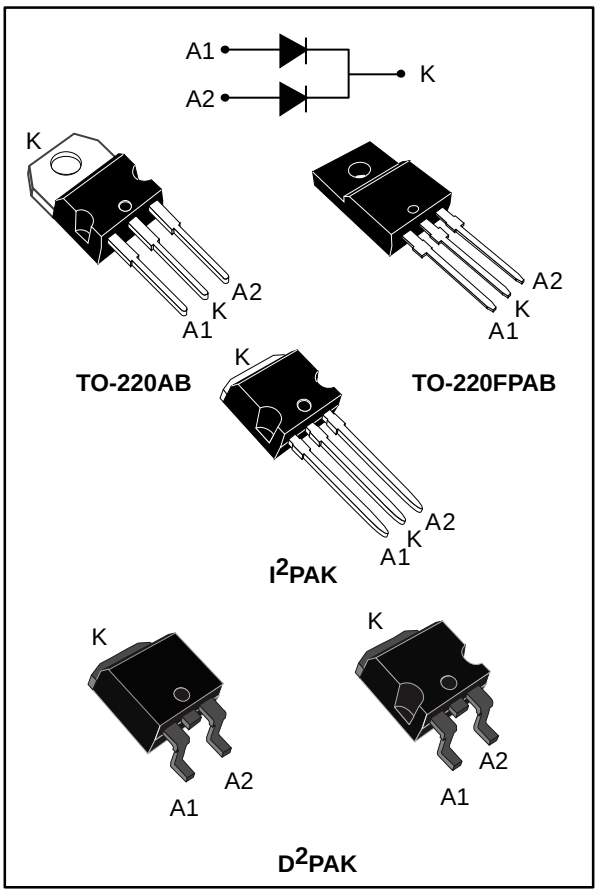
STTH2002C

High efficiency ultrafast diode

Datasheet - production data



Features

- Suited for SMPS
- Low losses
- Low forward and reverse recovery times
- Low leakage current
- High junction temperature
- Insulated package: TO-220FPAB
  - Insulating voltage = 2000 V_{RMS} sine
- ECOPACK®2 compliant component for D²PAK on demand

Description

Dual center tap rectifier suited for switch mode power supplies and high frequency DC/DC converters.

Packaged in TO-220AB, TO-220FPAB, I²PAK or D²PAK, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	2 x 10 A
V_{RRM}	200 V
T_j (max)	175 °C
V_F (typ)	0.78 V
t_{rr} (typ)	22 ns

This is information on a product in full production.

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1 Characteristics

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

Symbol	Parameter				Value	Unit
V_{RRM}	Repetitive peak reverse voltage				200	V
$I_{F(RMS)}$	Forward rms current				30	A
$I_{F(peak)}$	Average forward current δ = 0.5, square wave	TO-220AB, D^2PAK, I^2PAK	T_C = 150 °C	Per diode	10	A
			T_C = 140 °C	Per device	20	
			T_C = 130 °C	Per diode	15	
			T_C = 115 °C	Per device	30	
		TO-220FPAB	T_C = 120 °C	Per diode	10	
			T_C = 85 °C	Per device	20	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal			90	A
T_{stg}	Storage temperature range				-65 to + 175	°C
T_j	Maximum operating junction temperature (1)				175	°C

Notes:

(1)$(dP_{tot}/dT_j) < (1/R_{th(j-a)})$ condition to avoid thermal runaway for a diode on its own heatsink.

Table 3: Thermal parameter

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AB, D^2PAK, I^2PAK	Per diode	2.5	°C/W
			Per device	1.6	
		TO-220FPAB	Per diode	5	
			Per device	3.8	
$R_{th(c)}$	Coupling	TO-220AB, D^2PAK, I^2PAK	-	0.7	°C/W
		TO-220FPAB		2.5	

When the diodes 1 and 2 are used simultaneously:

$\Delta T_{j(diode1)} = P_{(diode1)} \times R_{th(j-c)\ (per\ diode)} + P_{(diode2)} \times R_{th(c)}$

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Table 4: Static electrical characteristics (per diode)

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		-	6	100	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 10 A	-		1.1	V
			I_F = 20 A	-		1.25	
		T_j = 150 °C	I_F = 10 A	-	0.78	0.89	
			I_F = 20 A	-		1.05	

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:

$P = 0.73 \times I_{F(AV)} + 0.020\ I_F{}^2{}_{(RMS)}$

Table 5: Dynamic electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j= 25 °C	I_F= 1 A, V_R= 30 V, dI_F/dt= 100 A/µs	-	22	27	ns
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 10 A, dI_F/dt = 100 A/µs, V_{FR} = 1.1 x V_{Fmax},	-		200	ns
V_{FP}	Forward recovery voltage	T_j = 25 °C	I_F = 10 A, dI_F/dt = 100 A/µs	-	2.4		V
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 10 A, V_R = 160 V, dI_F/dt = 200 A/µs	-	7.0	9.0	A

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1.1 Characteristics (curves)

Figure 1: Peak current versus duty cycle (per diode)

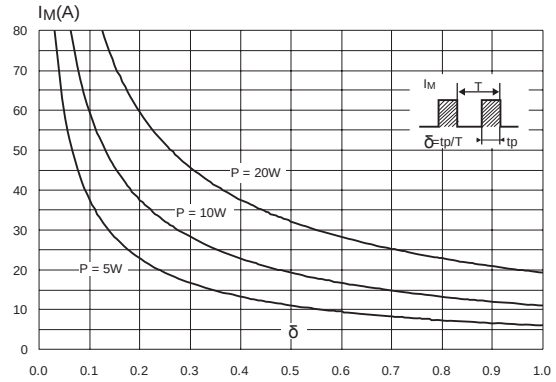


Figure 2: Forward voltage drop versus forward current (typical values, per diode)

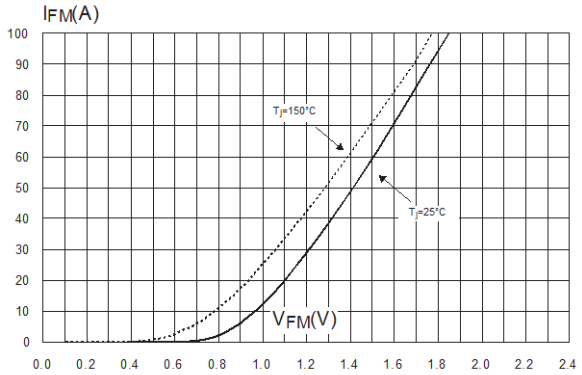


Figure 3: Forward voltage drop versus forward current (maximum values, per diode)

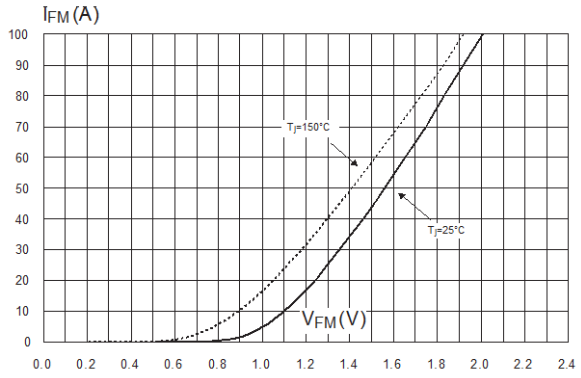


Figure 4: Relative variation of thermal impedance junction to case versus pulse duration

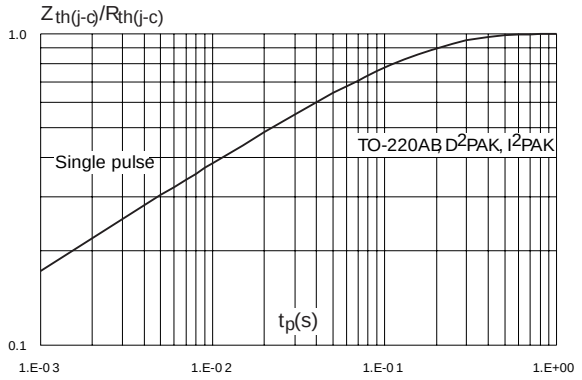


Figure 5: Relative variation of thermal impedance junction to case versus pulse duration

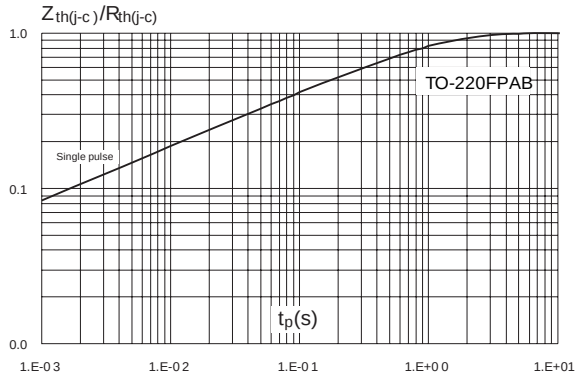
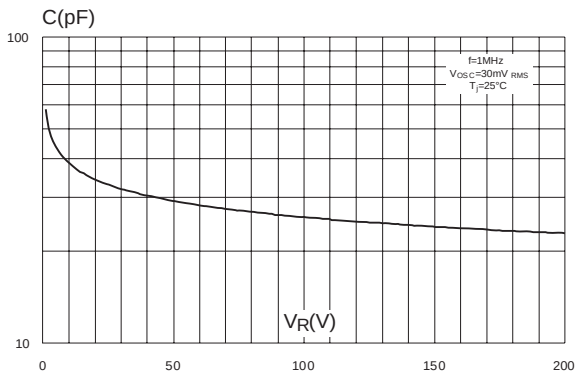


Figure 6: Junction capacitance versus reverse voltage applied (typical values, per diode)



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Figure 7: Reverse recovery charges versus dIF/dt (typical values, per diode)

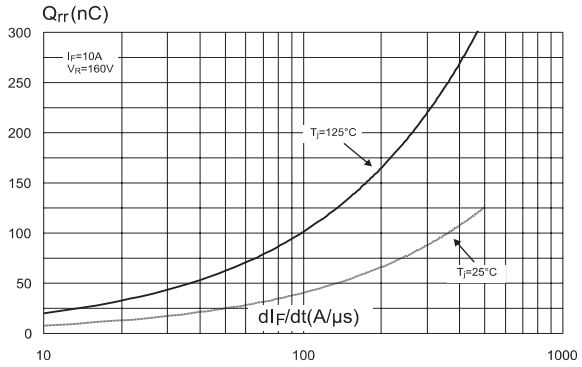


Figure 8: Reverse recovery time versus dIF/dt (typical values, per diode)

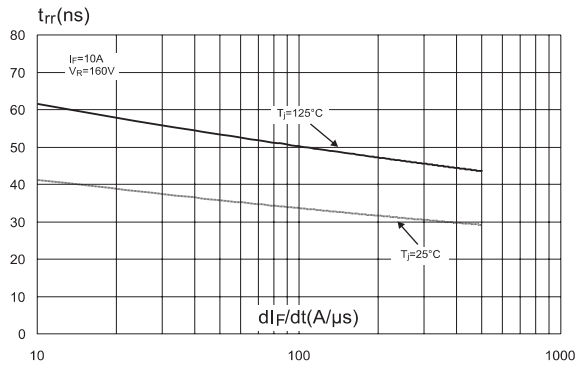


Figure 9: Peak reverse recovery current versus dIF/dt (typical values, per diode)

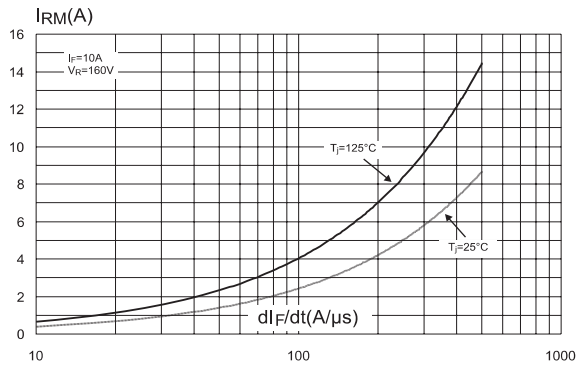


Figure 10: Dynamic parameters versus junction temperature

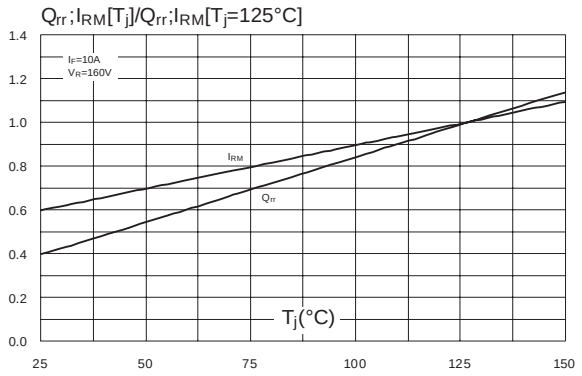
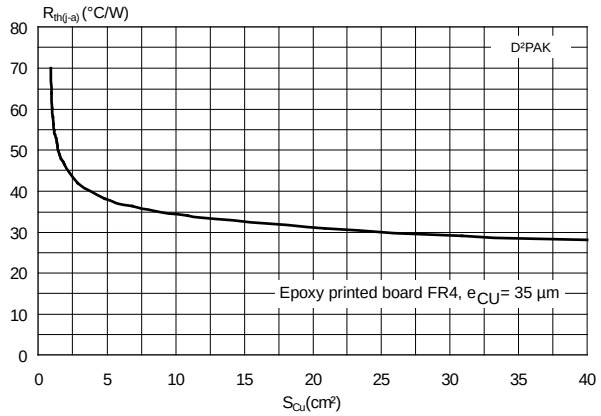


Figure 11: Thermal resistance junction to ambient versus copper surface under tab



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2 Package information

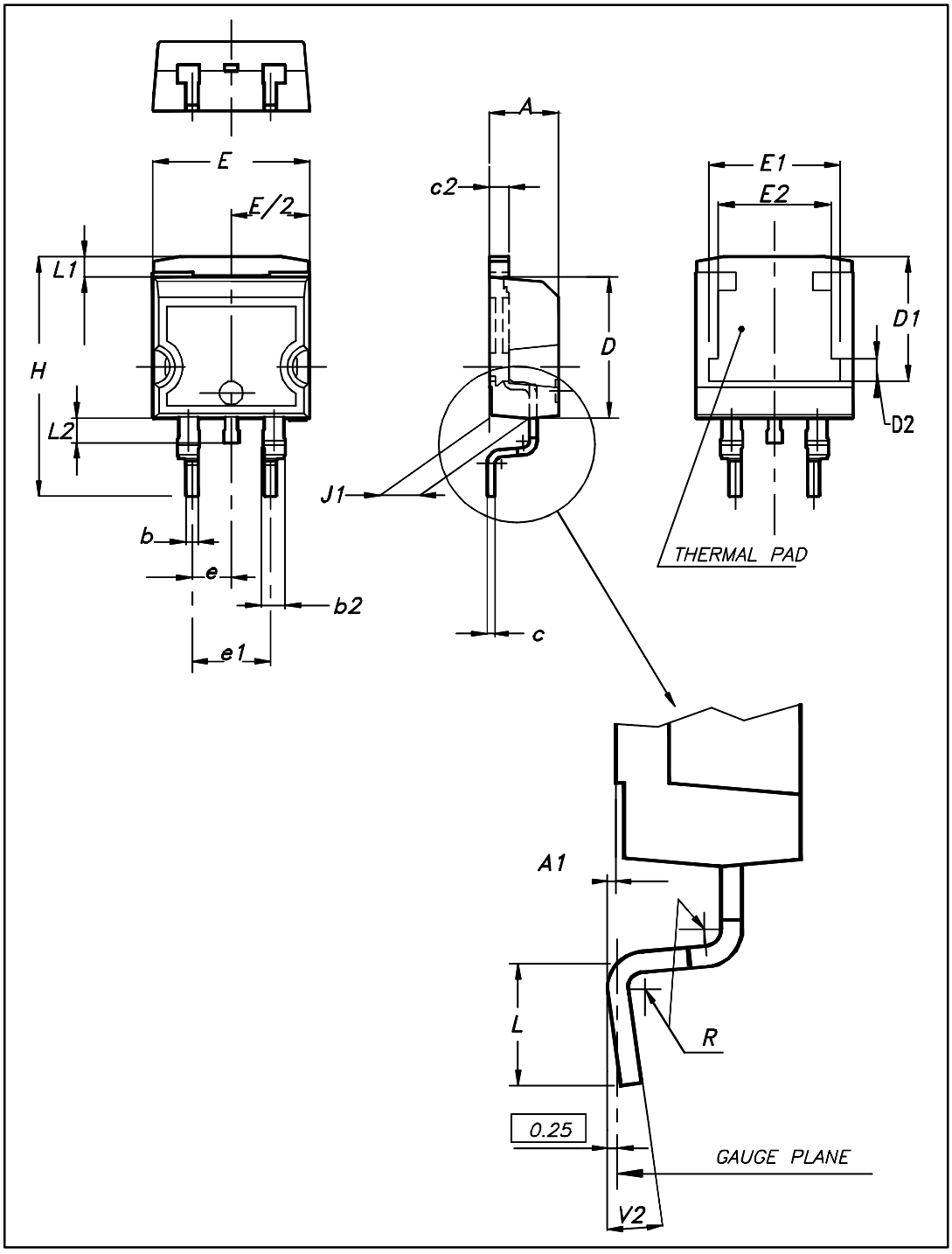
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: ***www.st.com***. ECOPACK® is an ST trademark.

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m (for TO-220AB and TO-220FPAB)
- Maximum torque value: 0.7 N·m (for TO-220AB and TO-220FPAB)

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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.

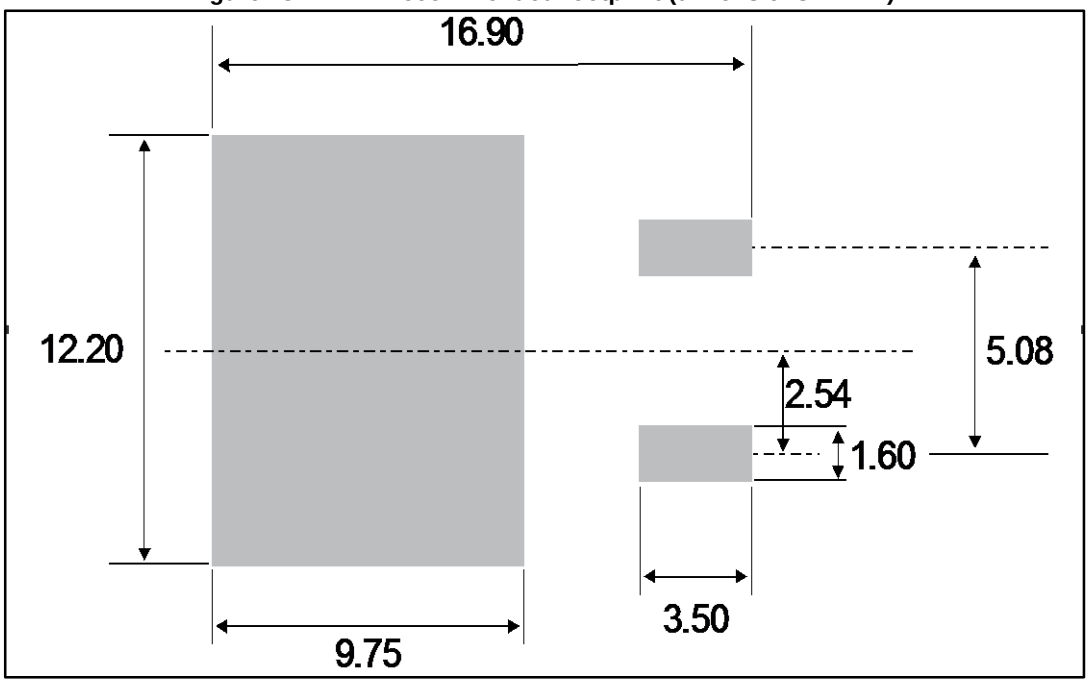
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Table 6: D²PAK package mechanical data

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°

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Figure 13: D²PAK recommended footprint (dimensions in mm)



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2.2 I²PAK package information

Figure 14: I²PAK package outline

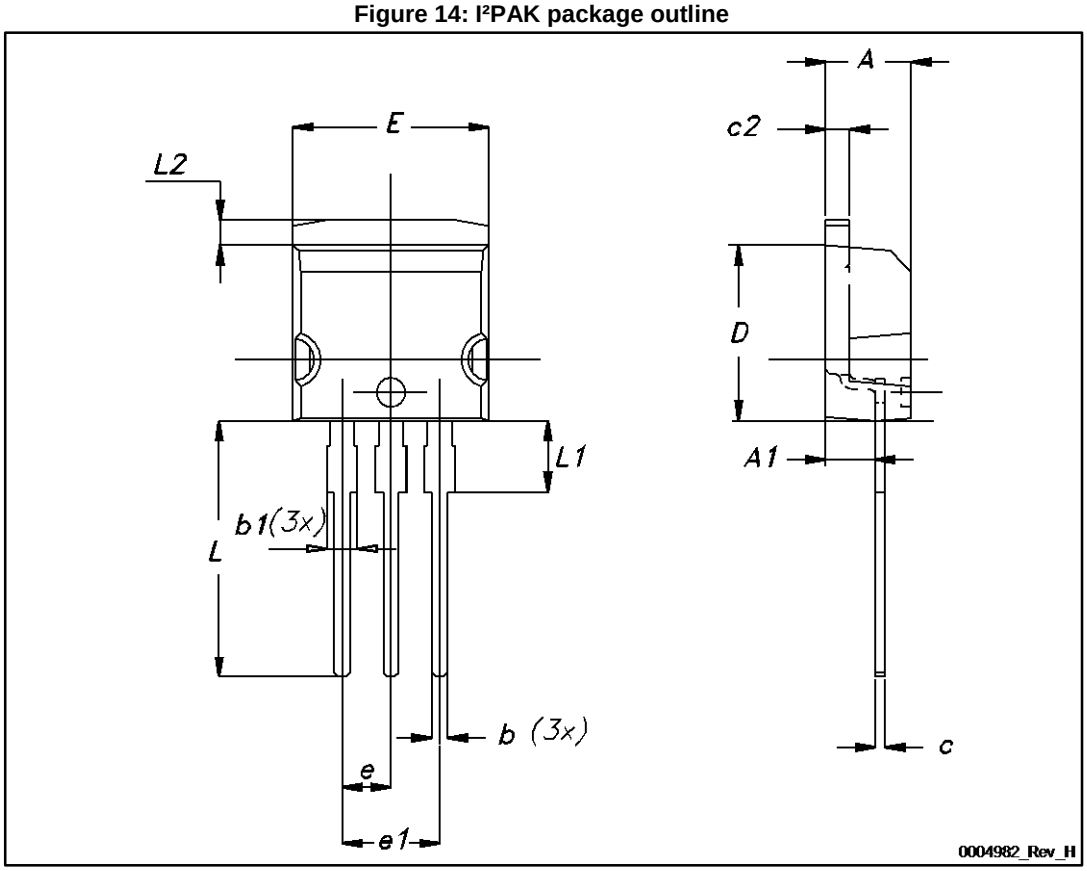


Table 7: I²PAK package mechanical data

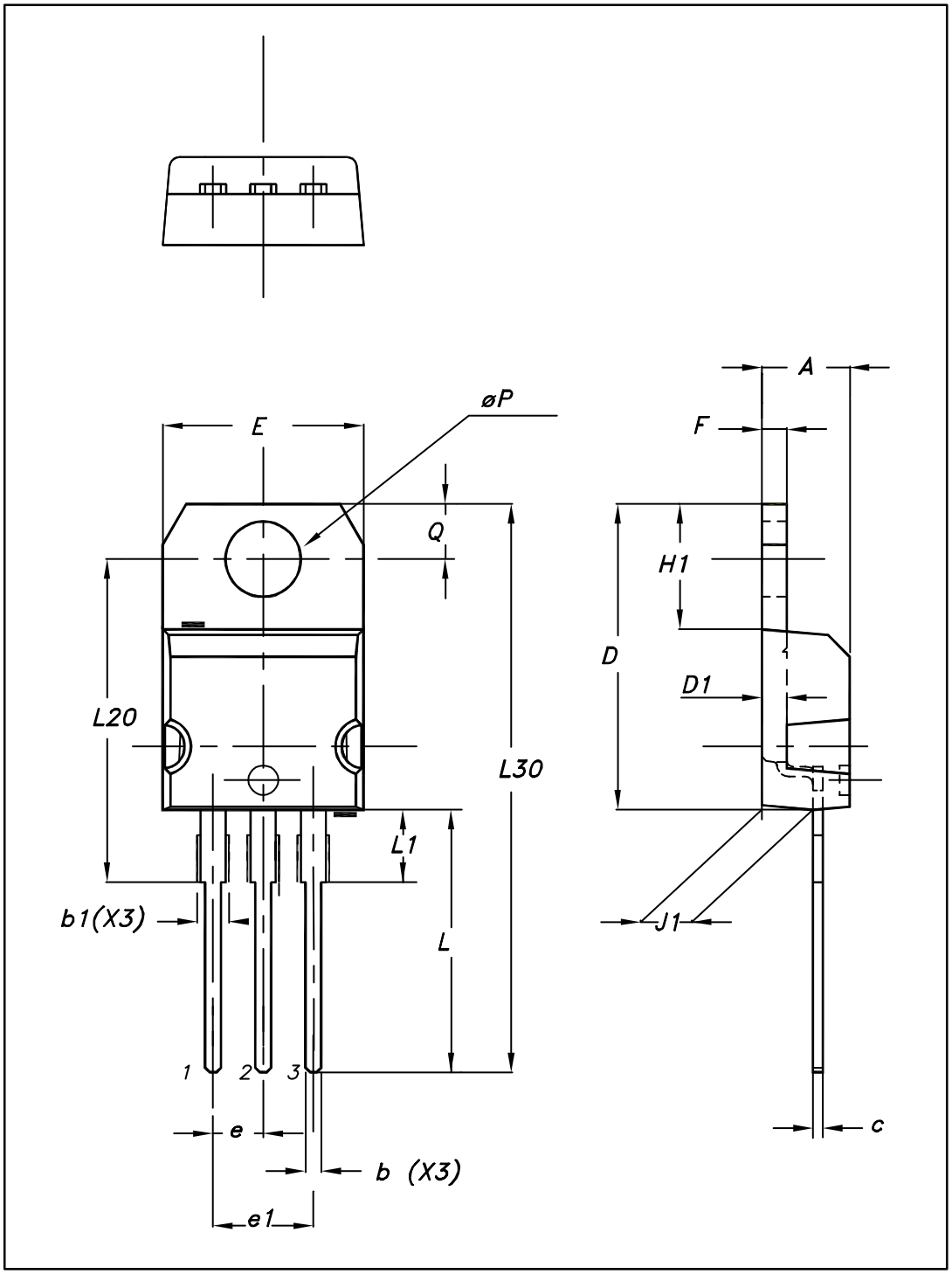
Dim.	mm		
	Min.	Typ.	Max.
A	4.40	–	4.60
A1	2.40	–	2.72
b	0.61	–	0.88
b1	1.14	–	1.70
c	0.49	–	0.70
c2	1.23	–	1.32
D	8.95	–	9.35
e	2.40	–	2.70
e1	4.95	–	5.15
E	10	–	10.40
L	13	–	14
L1	3.50	–	3.93
L2	1.27	–	1.40

Mounting (soldering) the I²PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

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2.3 TO-220AB type A (DZ) package information

Figure 15: TO-220AB package outline



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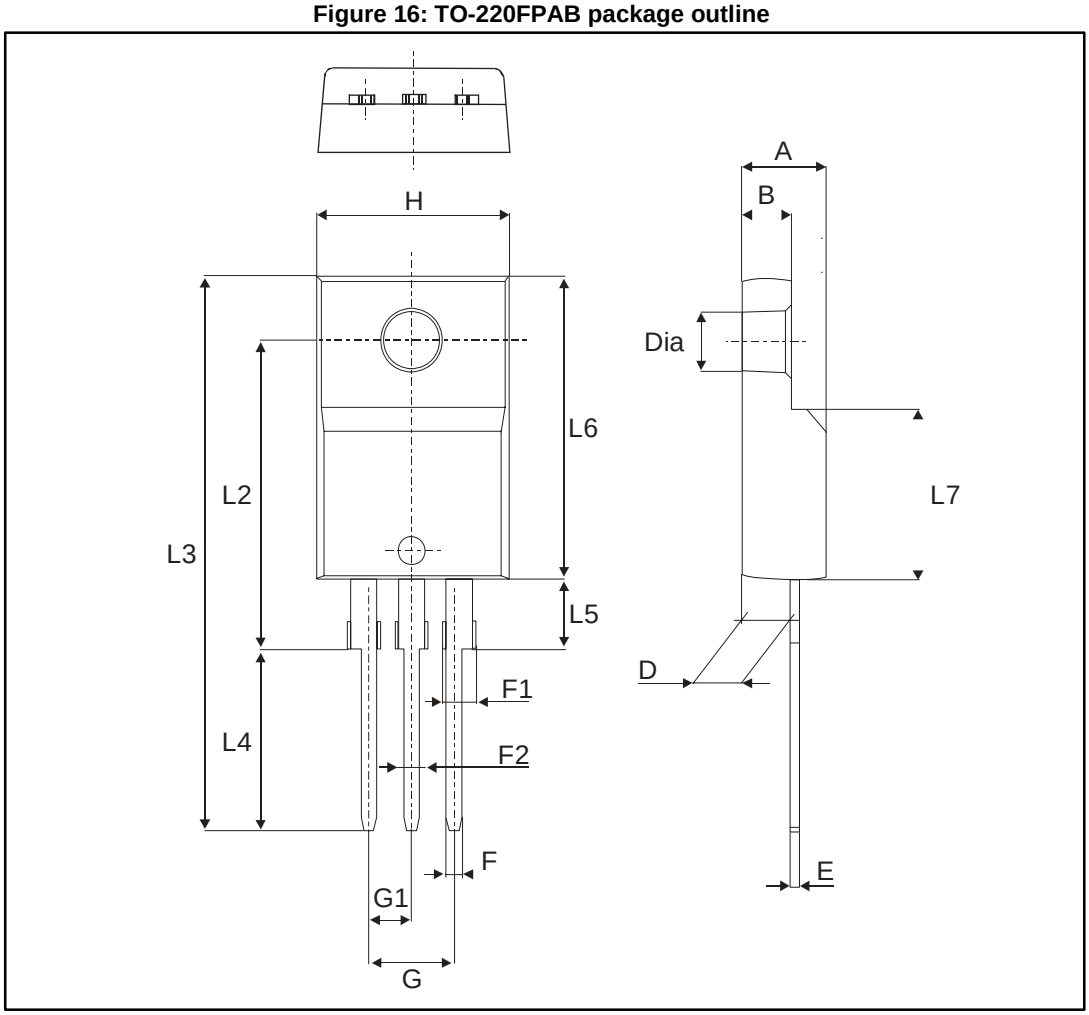
Table 8: TO-220AB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	0.61	0.88	0.24	0.035
b1	1.14	1.70	0.045	0.067
c	0.48	0.70	0.019	0.028
D	15.25	15.75	0.600	0.620
D1	1.27 typ.		0.050 typ.	
E	10	10.40	0.394	0.409
e	2.4	2.7	0.094	0.106
e1	4.95	5.15	0.195	0.203
F	1.23	1.32	0.048	0.052
H1	6.20	6.60	0.244	0.260
J1	2.4	2.72	0.094	0.107
L	13.0	14.0	0.512	0.551
L1	3.5	3.93	0.138	0.155
L20	16.40 typ.		0.646 typ.	
L30	28.90 typ.		1.138 typ.	
θP	3.75	3.85	0.148	0.152
Q	2.65	2.95	0.104	0.116

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2.4 TO-220FPAB package information

Figure 16: TO-220FPAB package outline



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Table 9: TO-220FPAB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.50	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1.0	0.03	0.039
F1	1.15	1.70	0.045	0.067
F2	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.40	2.70	0.094	0.106
H	10.00	10.40	0.393	0.409
L2	16.00 typ.		0.63 typ.	
L3	28.60	30.60	1.126	1.205
L4	9.80	10.6	0.386	0.417
L5	2.90	3.60	0.114	0.142
L6	15.90	16.40	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia	3.0	3.20	0.118	0.126

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3 Ordering information

Table 10: Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH2002CT	STTH2002CT	TO-220AB	1.9g	50	Tube
STTH2002CG	STTH2002CG	D^2PAK	1.38g	50	Tube
STTH2002CG-TR	STTH2002CG	D^2PAK	1.38g	1000	Tape and reel
STTH2002CR	STTH2002CR	I^2PAK	1.5g	50	Tube
STTH2002CFP	STTH2002CFP	TO-220FPAB	1.9g	50	Tube

4 Revision history

Table 11: Document revision history

Date	Revision	Changes
Feb-2004	1	First issue.
23-Jun-2010	2	Updated Table 1. Updated ECOPACK statement.
14-Dec-2015	3	Updated features, *Table 1: "Device summary"* and packages silhouette in cover page. Updated *Section 1: "Characteristics"* and *Table 10: "Ordering information"* Updated *Section 2.2: "D²PAK package information"*.

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