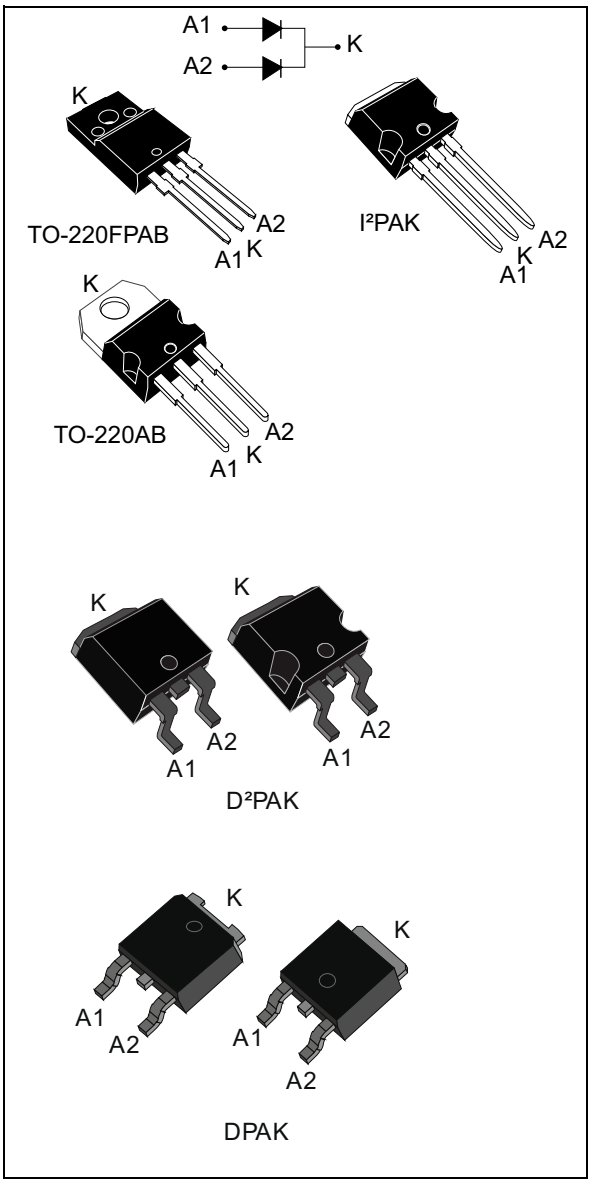
STTH1002C

High efficiency ultrafast diode

Datasheet - production data



Features

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

Description

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

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

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	Up to 2 x 8 A
V_{RRM}	200 V
T_j (max)	175 °C
V_F (typ)	0.78 V
t_{rr} (typ)	20 ns

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	I^2PAK, D^2PAK,TO-220AB, TO-220FPAB			20	A
		DPAK			10	
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	I^2PAK, DPAK, D^2PAK,TO-220AB	T_c = 155 °C	Per diode	5	A
			T_c = 150 °C	Per device	10	
			T_c = 135 °C	Per diode	8	
			T_c = 125 °C	Per device	16	
		TO-220FPAB	T_c = 140 °C	Per diode	5	
			T_c = 120 °C	Per device	10	
			T_c = 110 °C	Per diode	8	
			T_c = 75 °C	Per device	16	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal			50	A
T_{stg}	Storage temperature range				-65 to + 175	°C
T_j	Maximum operating junction temperature				175	°C

Table 3. Thermal parameter

Symbol	Parameter			Maximum	Unit
$R_{th(j-c)}$	Junction to case	I^2PAK, DPAK, D^2PAK,TO-220AB	Per diode	4.0	°C/W
			Per device	2.5	
		TO-220FPAB	Per diode	6.5	
			Per device	5	
$R_{th(c)}$	Coupling	I^2PAK, DPAK, D^2PAK,TO-220AB		1.0	
		TO-220FPAB		3.5	

When the diodes 1 and 2 are used simultaneously:

ΔT_j (diode1) = P(diode1) x $R_{th(j-c)}$ (per diode) + P(diode2) x $R_{th(c)}$

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	$V_R = V_{RRM}$			5	µA
		T_j = 125 °C			3	40	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 5 A			1.1	V
		T_j = 25 °C	I_F = 10 A			1.25	
		T_j = 150 °C	I_F = 5 A		0.78	0.89	
		T_j = 150 °C	I_F = 10 A			1.05	

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:

$P = 0.73 \times I_{F(AV)} + 0.032\ I_F{}^2{}_{(RMS)}$

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		20	25	ns
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 5 A, V_R = 160 V dI_F/dt = 200 A/µs		5.9	7.6	A
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 5 A, dI_F/dt = 100 A/µs $V_{FR} = 1.1 \times V_{Fmax}$			110	ns
V_{FP}	Forward recovery voltage	T_j = 25 °C	I_F = 5 A, dI_F/dt = 100 A/µs		2.4		V

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

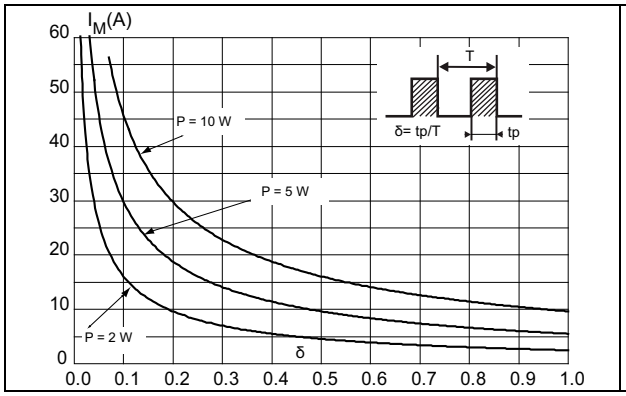


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

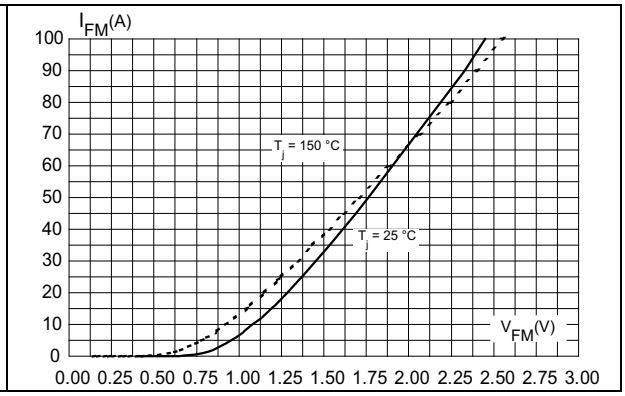


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

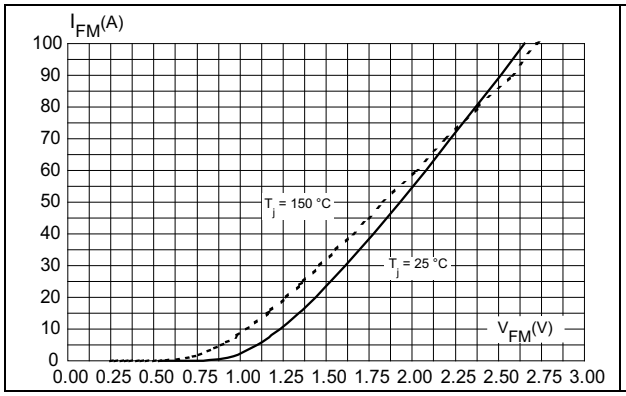


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

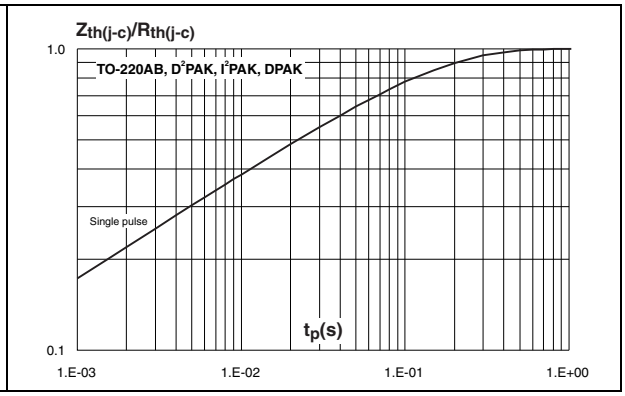


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

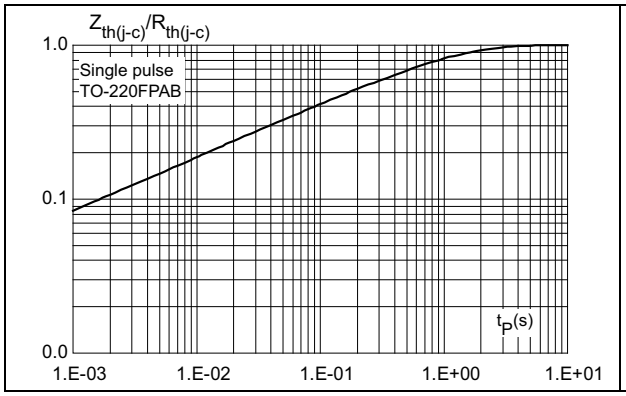


Figure 6. Junction capacitance versus reverse voltage applied (typical values, per diode)

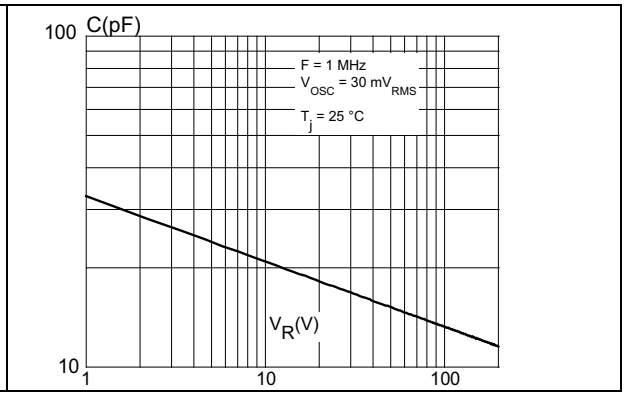


Figure 7. Reverse recovery charges versus dI_F/dt (typical values, per diode)

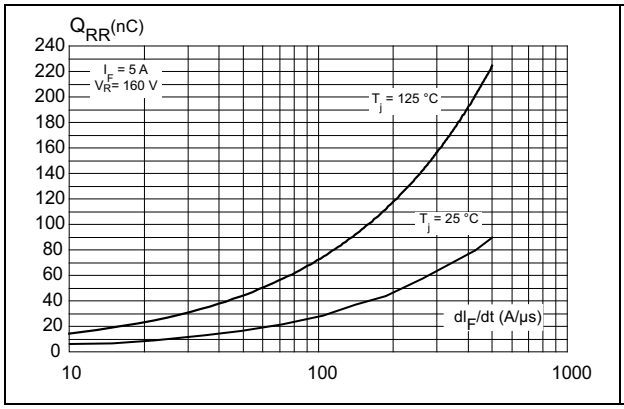


Figure 8. Reverse recovery time versus dI_F/dt (typical values, per diode)

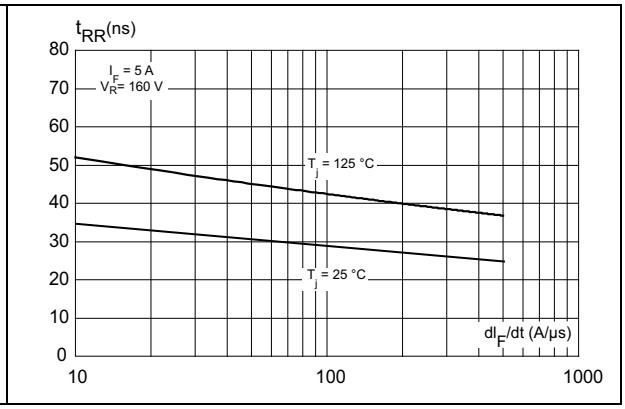


Figure 9. Peak reverse recovery current versus dI_F/dt (typical values, per diode)

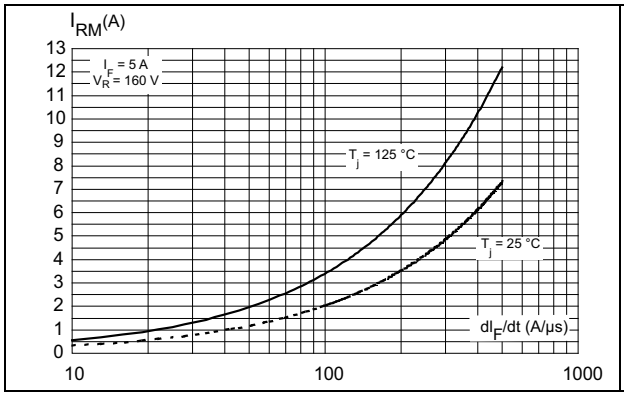


Figure 10. Dynamic parameters versus junction temperature

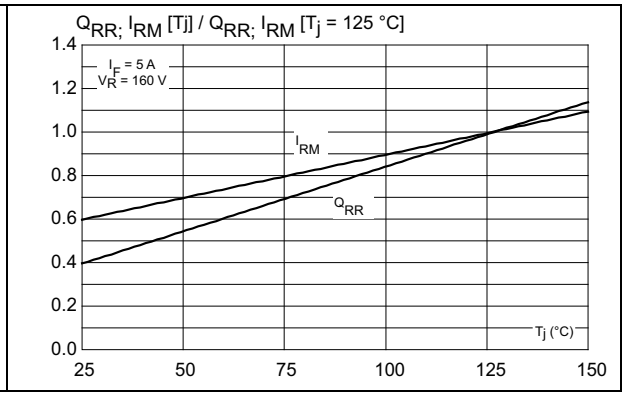


Figure 11. Thermal resistance junction to ambient versus copper surface under tab

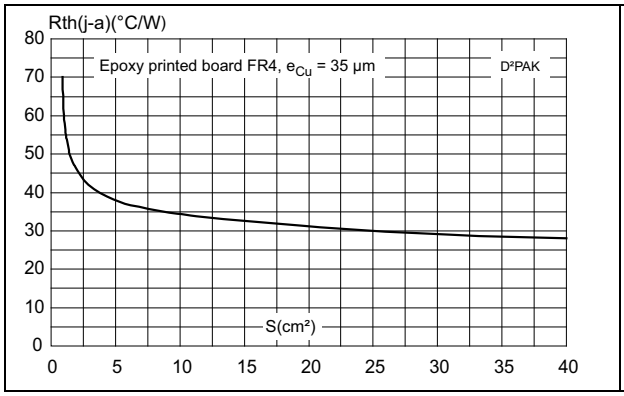
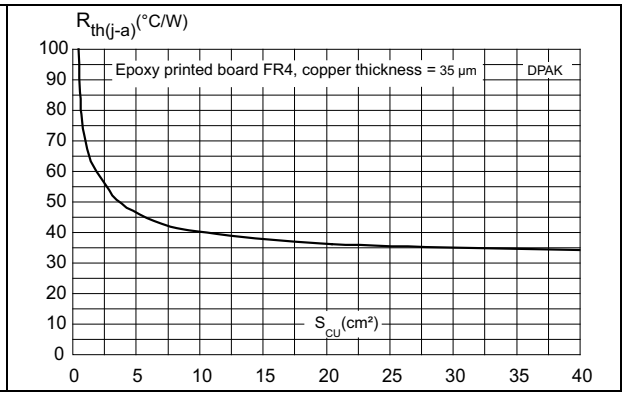


Figure 12. Thermal resistance junction to ambient versus copper surface under tab



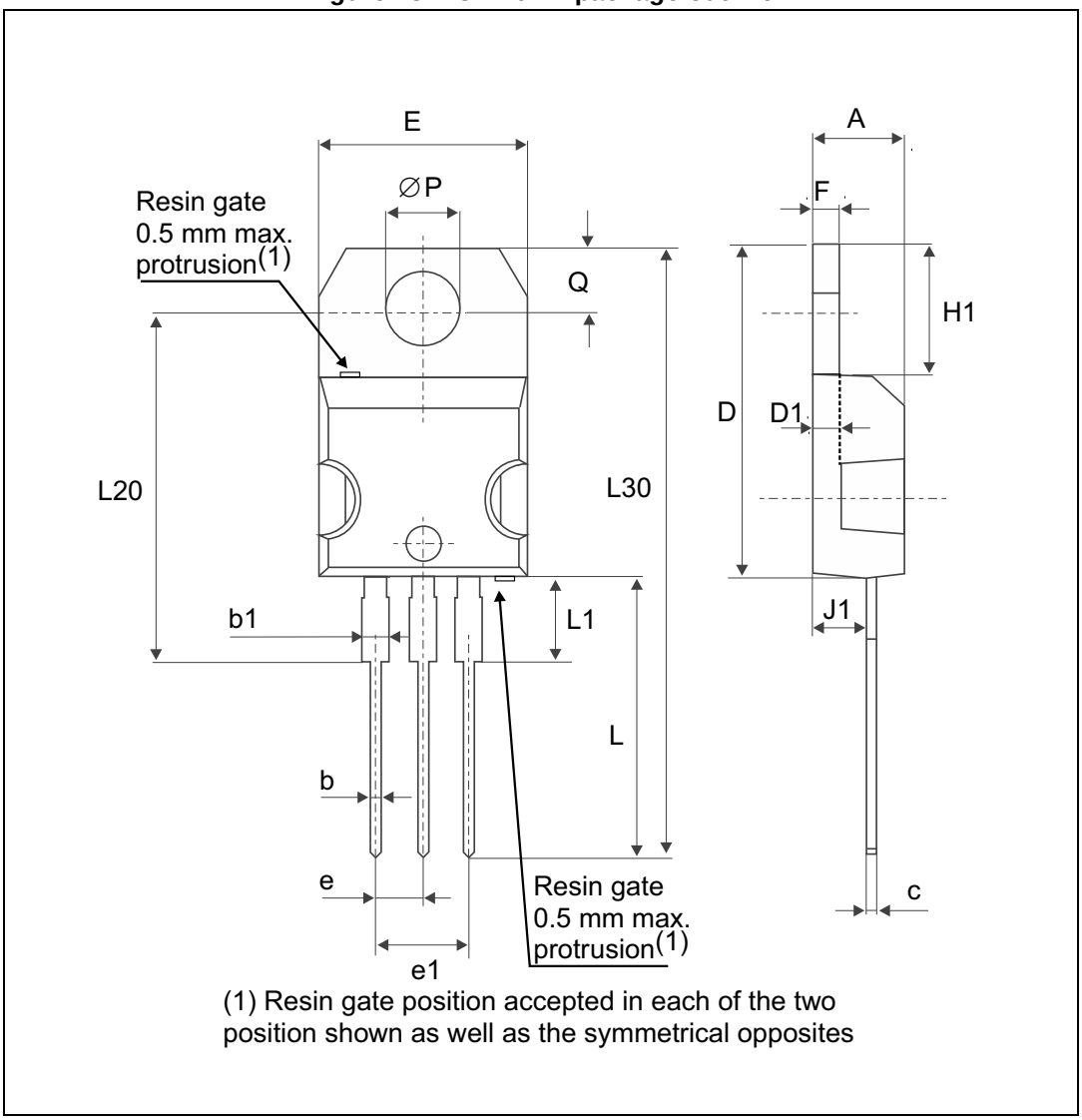
2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value for TO-220AB and TO-220FPAB: 0.55 N·m
- Maximum torque value: 0.7 N·m for TO-220AB and TO-220FPAB

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.

2.1 TO-220AB package information

Figure 13. TO-220AB package outline



(1) Resin gate position accepted in each of the two position shown as well as the symmetrical opposites

Table 6. TO-220AB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.17	0.18
b	0.61	0.88	0.024	0.035
b1	1.14	1.70	0.045	0.067
c	0.48	0.70	0.019	0.027
D	15.25	15.75	0.60	0.62
D1	1.27 typ.		0.05 typ.	
E	10	10.40	0.39	0.41
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.19	0.20
F	1.23	1.32	0.048	0.052
H1	6.20	6.60	0.24	0.26
J1	2.40	2.72	0.094	0.107
L	13	14	0.51	0.55
L1	3.50	3.93	0.137	0.154
L20	16.40 typ.		0.64 typ.	
L30	28.90 typ.		1.13 typ.	
∅P	3.75	3.85	0.147	0.151
Q	2.65	2.95	0.104	0.116

2.2 TO-220FPAB package information

Figure 14. TO-220FPAB package outline

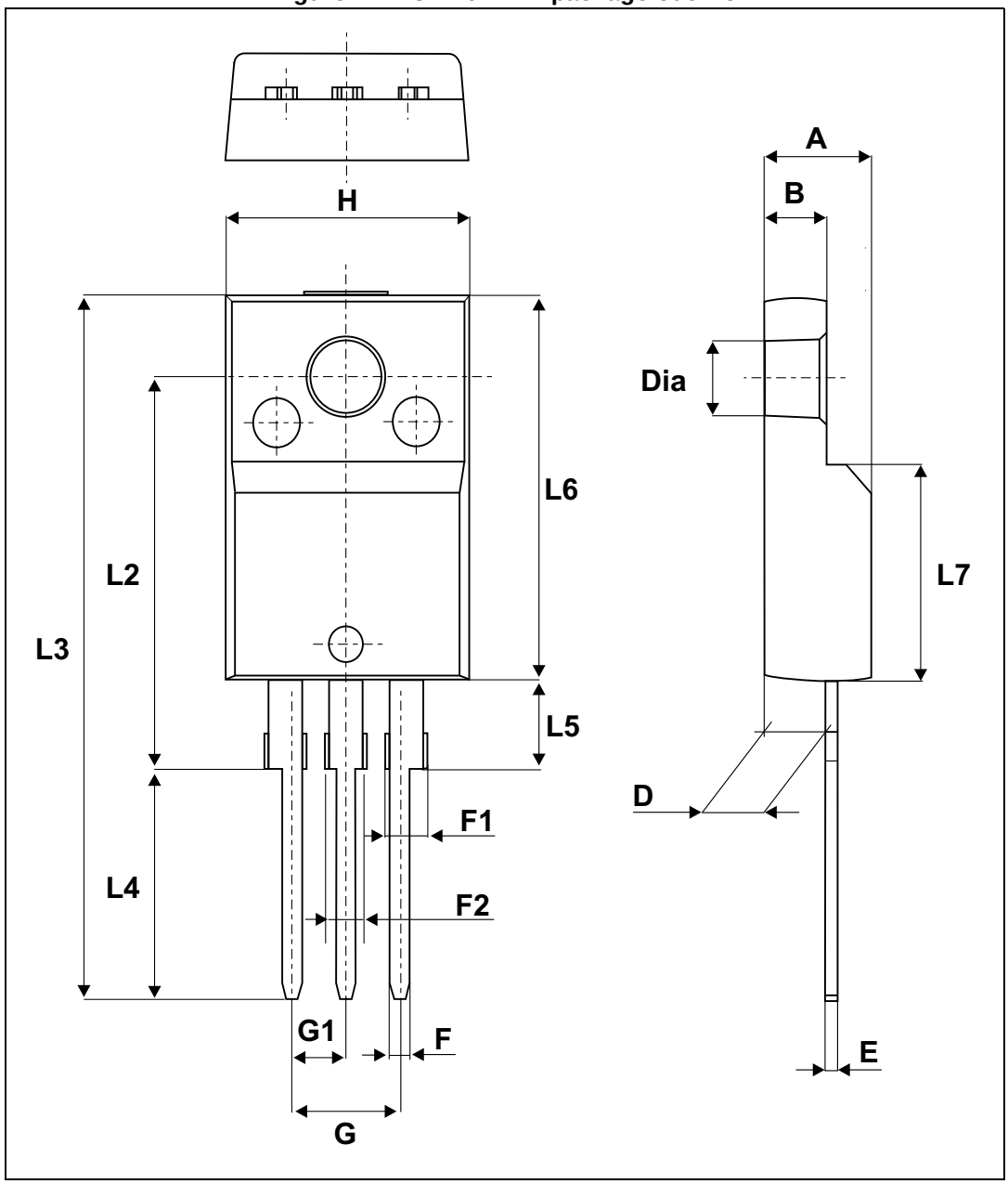
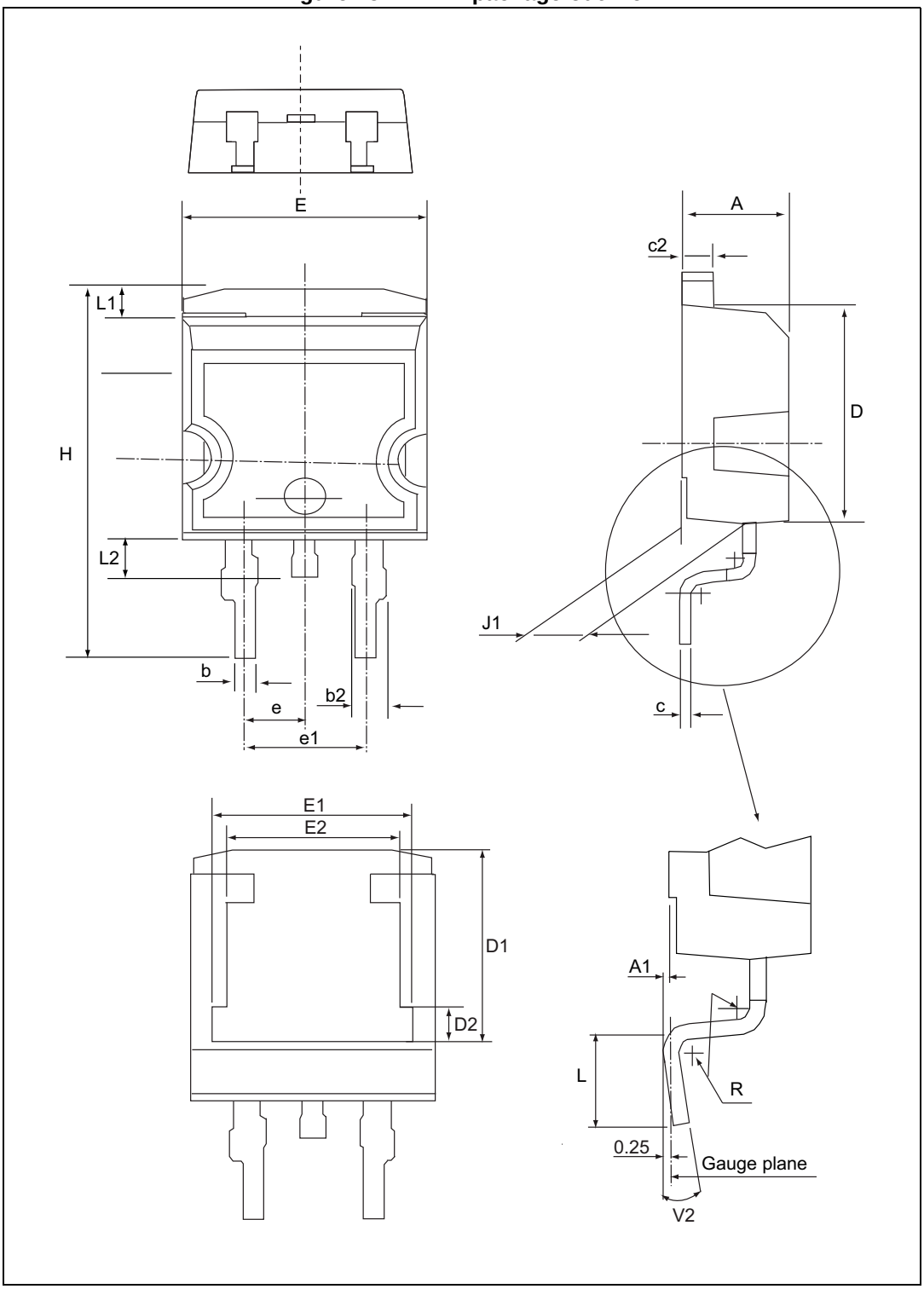


Table 7. TO-220FPAB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	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	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

2.3 D²PAK package information

Figure 15. D²PAK package outline

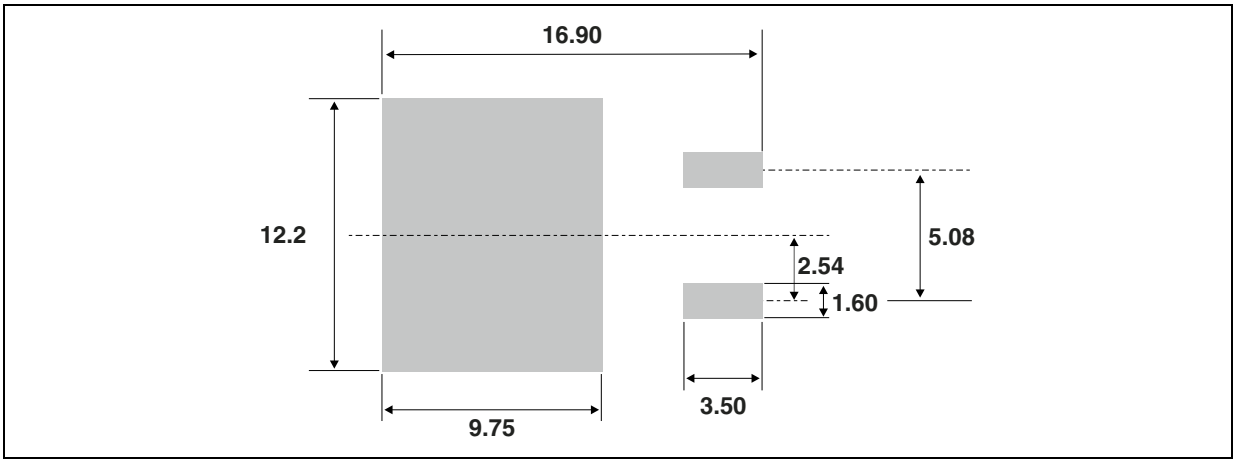


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 8. D²PAK package mechanical data

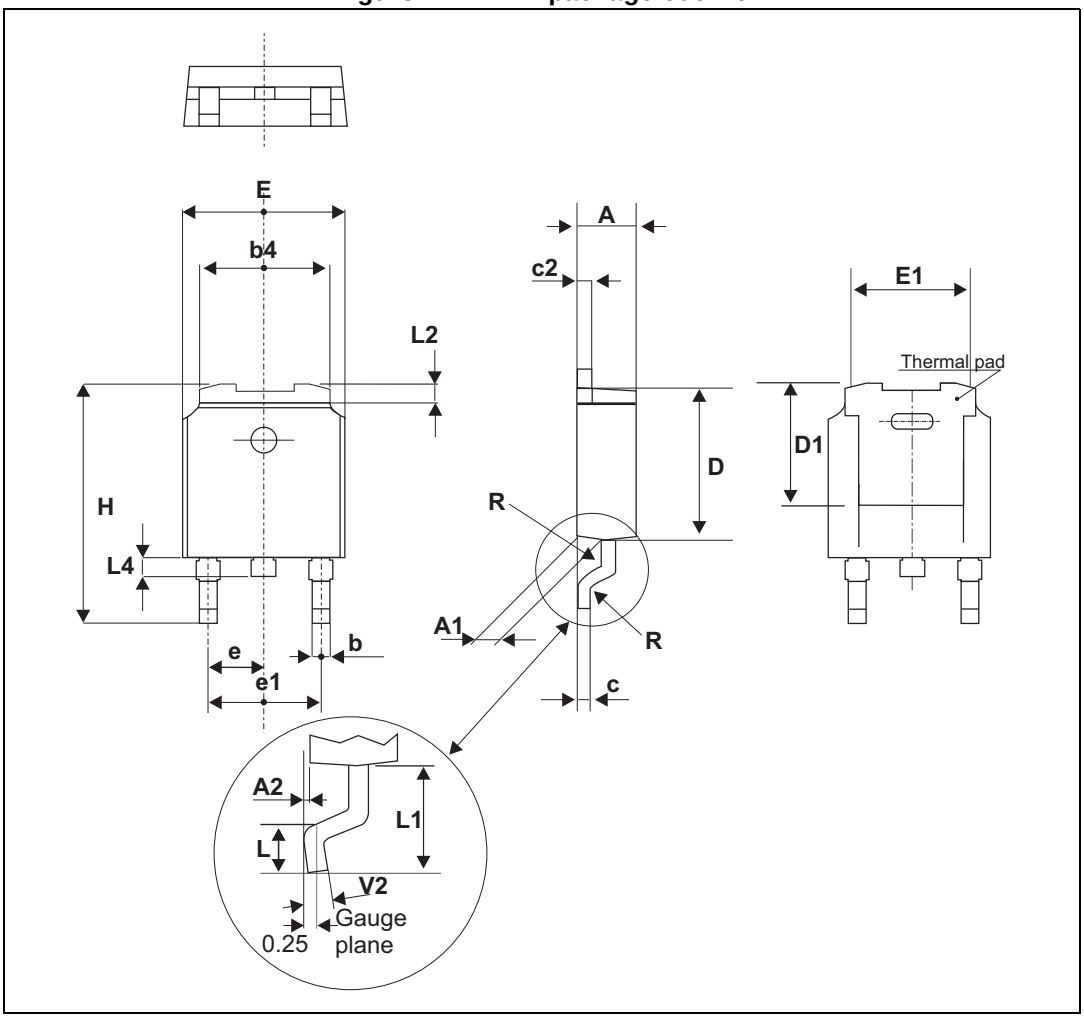
Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.36		4.60	0.171		0.181
A1	0		0.25			0.010
b	0.70		0.93	0.027		0.037
b2	1.14		1.70	0.045		0.067
c	0.38		0.69	0.014		0.027
c2	1.19		1.36	0.046		0.053
D	8.60		9.35	0.338		0.368
D1	6.90		8.0	0.271		0.315
D2	1.10		1.50	0.043		0.060
E	10.00		10.55	0.393		0.415
E1	8.10		8.90	0.318		0.350
E2	6.85		7.25	0.269		0.285
e		2.54			0.1	
e1	4.88		5.28	0.192		0.208
H	15.00		15.85	0.590		0.624
J1	2.49		2.90	0.098		0.114
L	1.9		2.79	0.074		0.110
L1	1.27		1.65	0.050		0.065
L2	1.30		1.78	0.051		0.070
R		0.40 typ.		0.016 typ.		
V2	0°		8°	0°		8°

Figure 16. Footprint (dimensions in mm)



2.4 DPAK package information

Figure 17. DPAK package outline

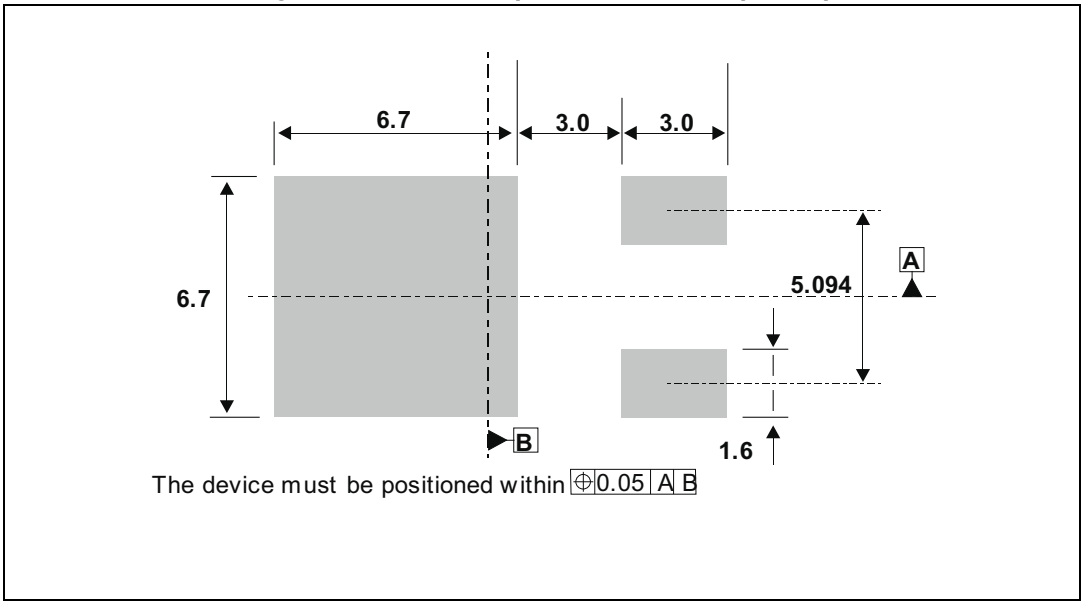


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 9. DPAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		2.40	0.085		0.094
A1	0.90		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.01
b	0.64		0.90	0.025		0.035
b4	4.95		5.46	0.195		0.215
c	0.46		0.61	0.018		0.024
c2	0.46		0.60	0.018		0.024
D	5.97		6.22	0.235		0.245
D1	5.10			0.201		
E	6.35		6.73	0.250		0.265
E1	4.32			0.170		
e1	4.4		4.7	0.173		0.185
H	9.35		10.40	0.368		0.407
L	1.0		1.78	0.039		0.070
L2			1.27			0.05
L4	0.6		1.02	0.024		0.040
V2	0°		8°	0°		8°

Figure 18. DPAK footprint dimensions (in mm)



2.5 I²PAK package information

Devices in I²PAK with nickel-plated back frame must NOT be mounted by frame soldering like SMDs. Such devices are intended to be through-hole mounted ONLY and in no circumstances shall ST be held liable for any lack of performance or damage arising out of soldering of nickel-plated back frames.

Figure 19. I²PAK package outline

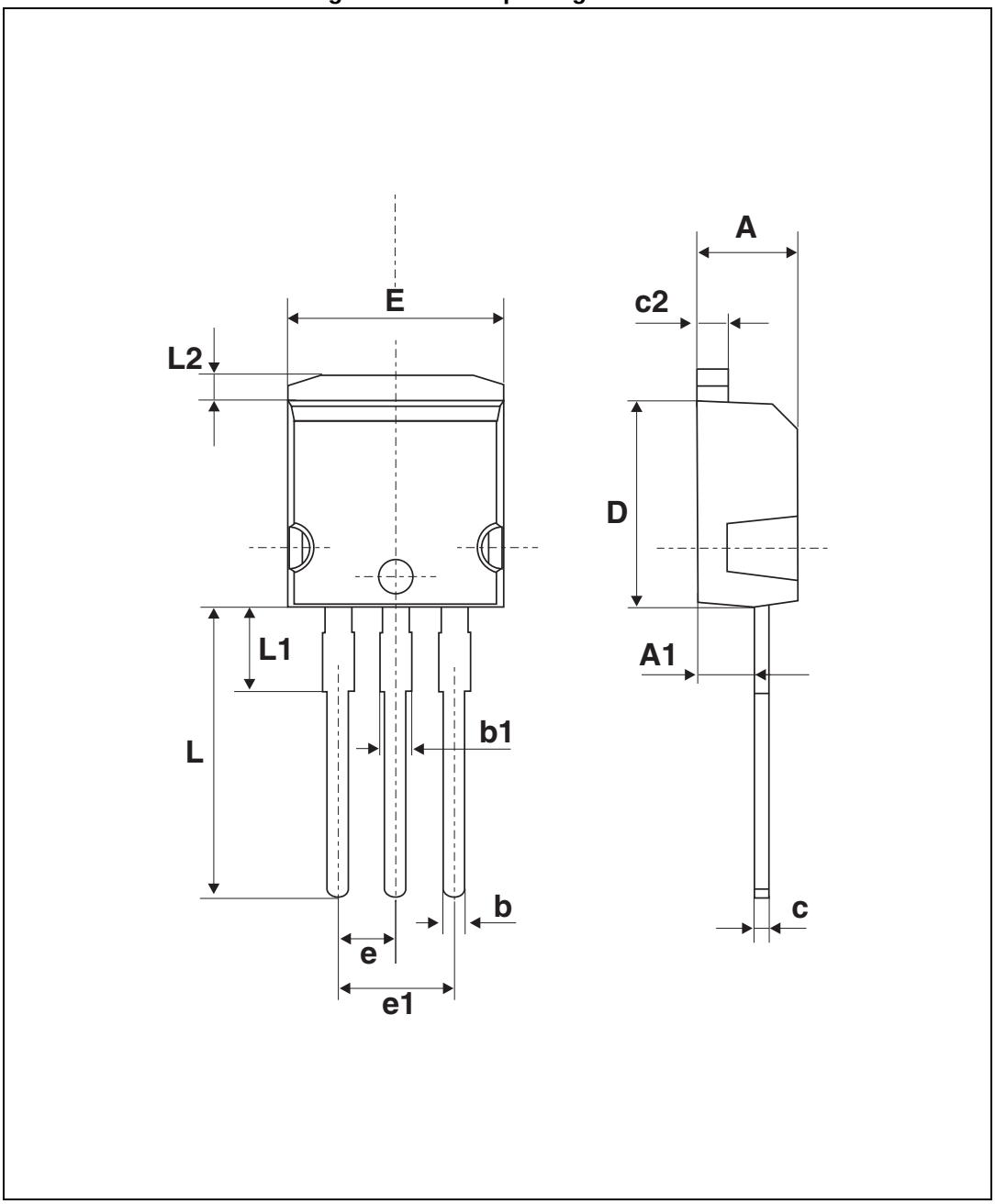


Table 10. I^2PAK package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.40	2.72	0.094	0.107
b	0.61	0.88	0.024	0.035
b1	1.14	1.70	0.044	0.067
c	0.49	0.70	0.019	0.028
c2	1.23	1.32	0.048	0.052
D	8.95	9.35	0.352	0.368
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.195	0.203
E	10	10.40	0.394	0.409
L	13	14	0.512	0.551
L1	3.50	3.93	0.138	0.155
L2	1.27	1.40	0.050	0.055

3 Ordering information

Table 11. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH1002CB	STTH1002CB	DPAK	0.32 g	75	Tube
STTH1002CB-TR	STTH1002CB	DPAK	0.32 g	2500	Tape and reel
STTH1002CT	STTH1002CT	TO-220AB	1.9 g	50	Tube
STTH1002CG-TR	STTH1002CG	D^2PAK	1.44 g	1000	Tape and reel
STTH1002CR	STTH1002CR	I^2PAK	1.5 g	50	Tube
STTH1002CFP	STTH1002CFP	TO-220FPAB	1.9 g	50	Tube

4 Revision history

Table 12. Document revision history

Date	Revision	Changes
Mar-2004	4	Last issue.
22-Mar-2013	5	Updated *Table 7.*
05-Jan-2015	6	Updated DPAK and D²PAK package information.
24-Apr-2015	7	Updated *Figure 15*.