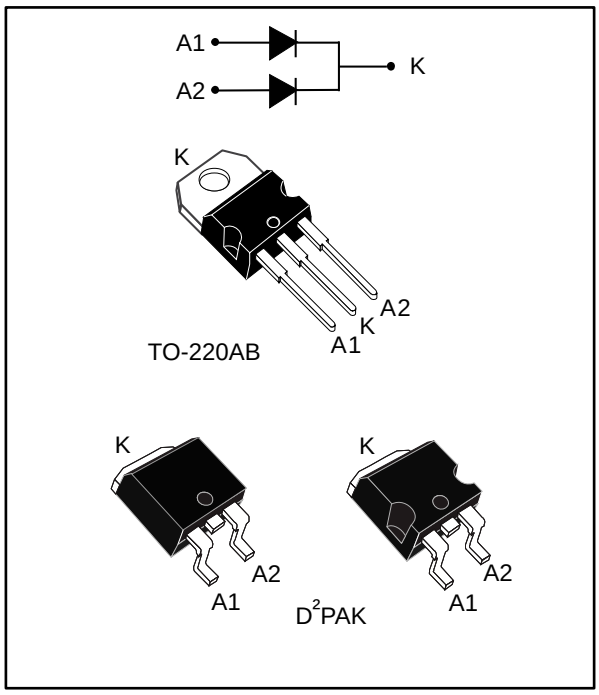
STTH16R04C

Ultrafast recovery diode

Datasheet - production data



Description

This series uses ST's new 400 V planar Pt doping technology. This device 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
$I_{F(AV)}$	2 x 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/or high pulsed current operation
- High junction temperature
- ECOPACK®2 compliant component for D²PAK on demand

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			400	V
$I_{F(RMS)}$	Forward rms current			30	A
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	T_C = 150 °C	Per diode	8	A
		T_C = 145 °C	Per device	16	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal		120	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature range			-40 to +175	°C

Table 3: Thermal parameter

Symbol	Parameter		Max. value	Unit
$R_{th(j-c)}$	Junction to case	Per diode	2	°C/W
		Per device	1.15	
$R_{th(c)}$	Coupling		0.3	°C/W

When the diodes 1 and 2 are used simultaneously:

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

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		-	10	100	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 8 A	-		1.5	V
		T_j = 100 °C		-	1.05	1.3	
		T_j = 150 °C		-	0.9	1.1	
		T_j = 25 °C	I_F = 16 A	-		1.75	
		T_j = 100 °C		-	1.25	1.55	
		T_j = 150 °C		-	1.12	1.37	

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:

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

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 = -50 A/µs	-	35	50	ns
			I_F = 1 A V_R = 30 V dI_F/dt = -100 A/µs	-	25	35	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 8 A V_R = 320 V dI_F/dt = -200 A/µs	-	5.5	8	A
S_{factor}	Softness factor			-	0.4		-
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 8 A V_{FR} = 1.1 x V_F(max) dI_F/dt = 100 A/µs	-		150	ns
V_{FP}	Forward recovery voltage		I_F = 8 A dI_F/dt = 100 A/µs	-	2.9		V

1.1 Characteristics (curves)

Figure 1: Conduction losses versus average current (per diode)

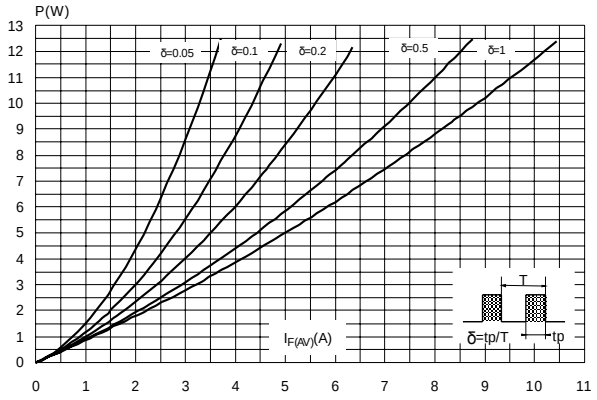


Figure 2: Forward voltage drop versus forward current (per diode)

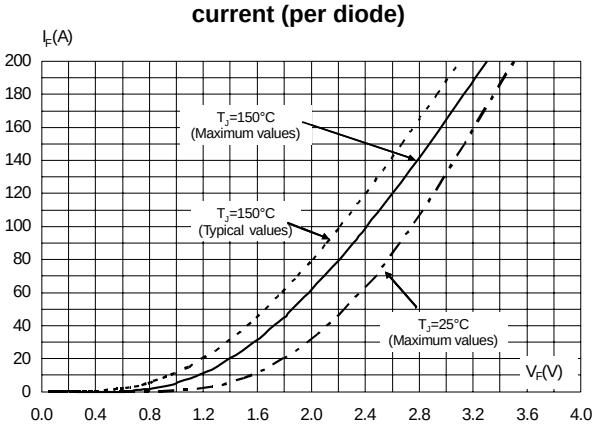


Figure 3: Relative variation of thermal impedance junction to case versus pulse duration

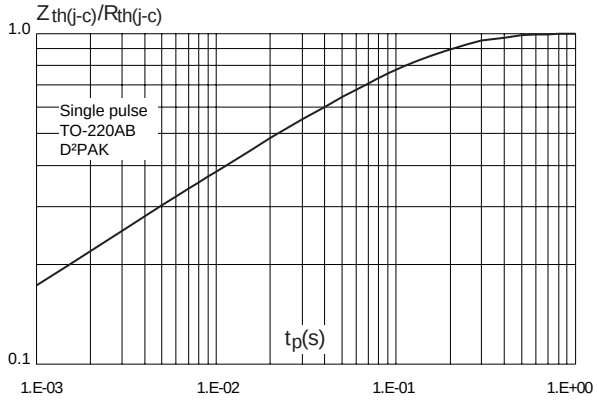


Figure 4: Peak reverse recovery current versus dI_F/dt (typical values, per diode)

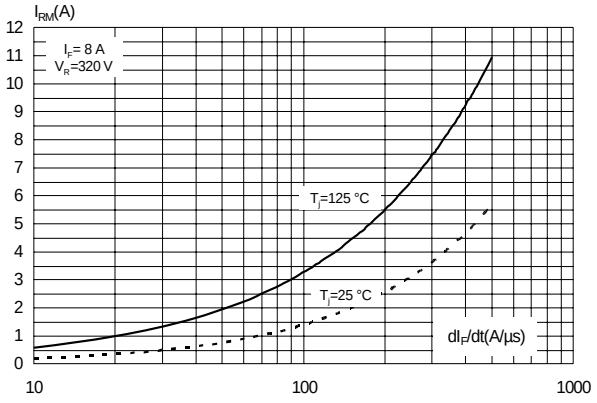


Figure 5: Reverse recovery time versus dI_F/dt (typical values, per diode)

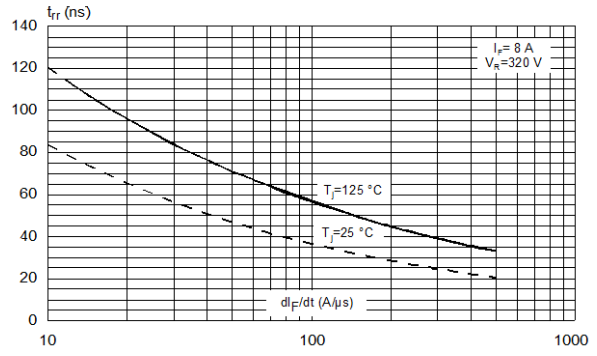


Figure 6: Reverse recovery charges versus dI_F/dt (typical values, per diode)

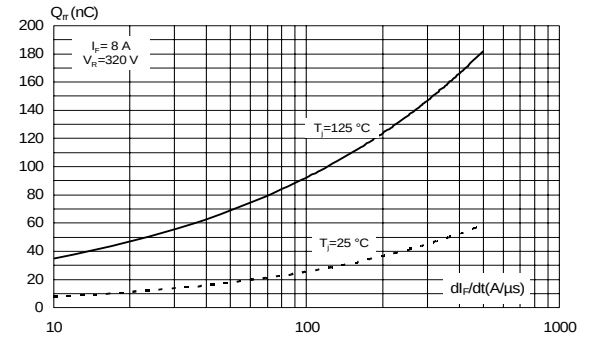


Figure 7: Relative variations of dynamic parameters versus junction temperature (reference: T_j = 125 °C)

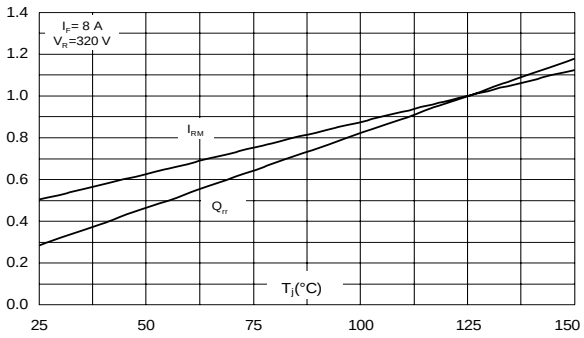


Figure 8: Transient peak forward voltage versus dI_F/dt (typical values, per diode)

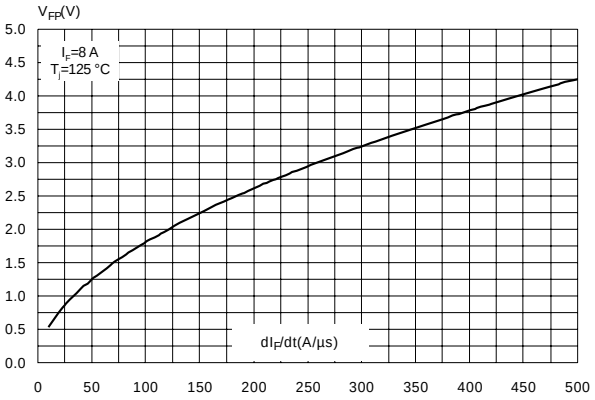


Figure 9: Forward recovery time versus dI_F/dt (typical values, per diode)

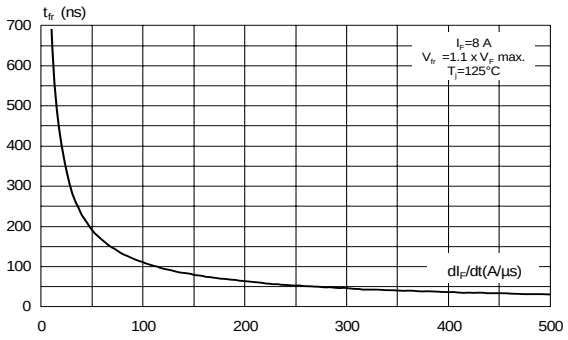


Figure 10: Junction capacitance versus reverse voltage applied (typical values, per diode)

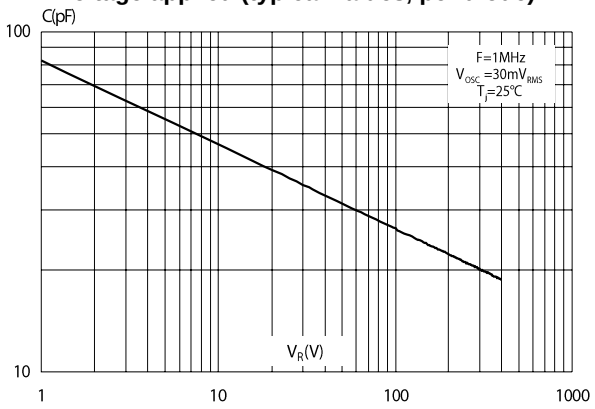
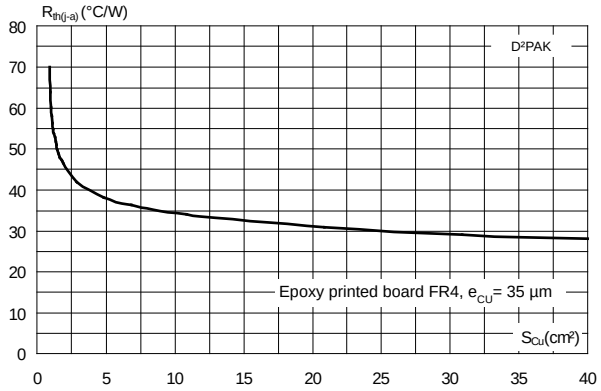


Figure 11: Thermal resistance junction to ambient versus copper surface under tab



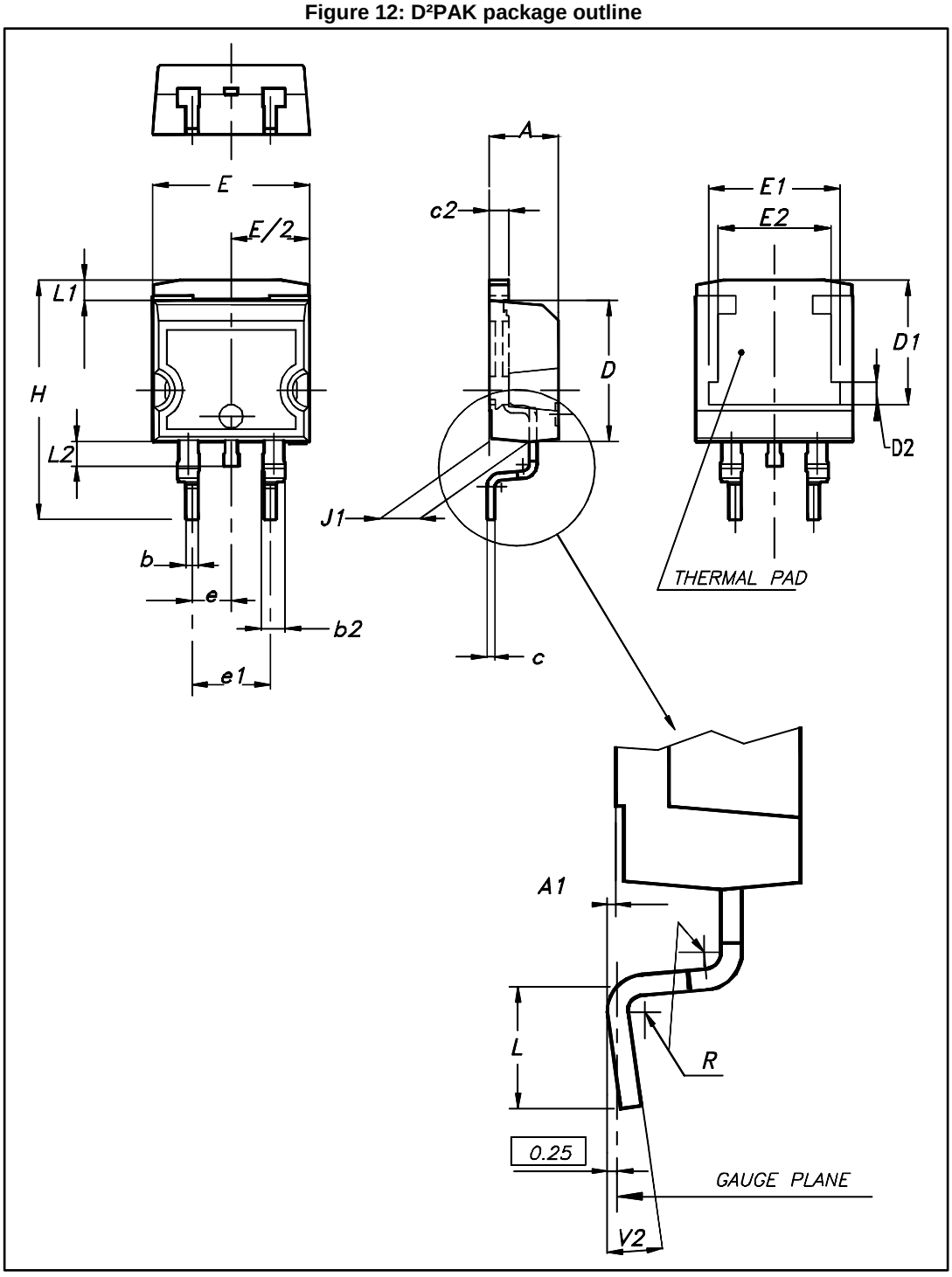
2 Package information

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 UL 94,V0
- Recommended torque value: 0.55 N·m (for TO-220AB)
- Maximum torque value: 0.7 N·m (for TO-220AB)

2.1 D²PAK package information

Figure 12: D²PAK package outline

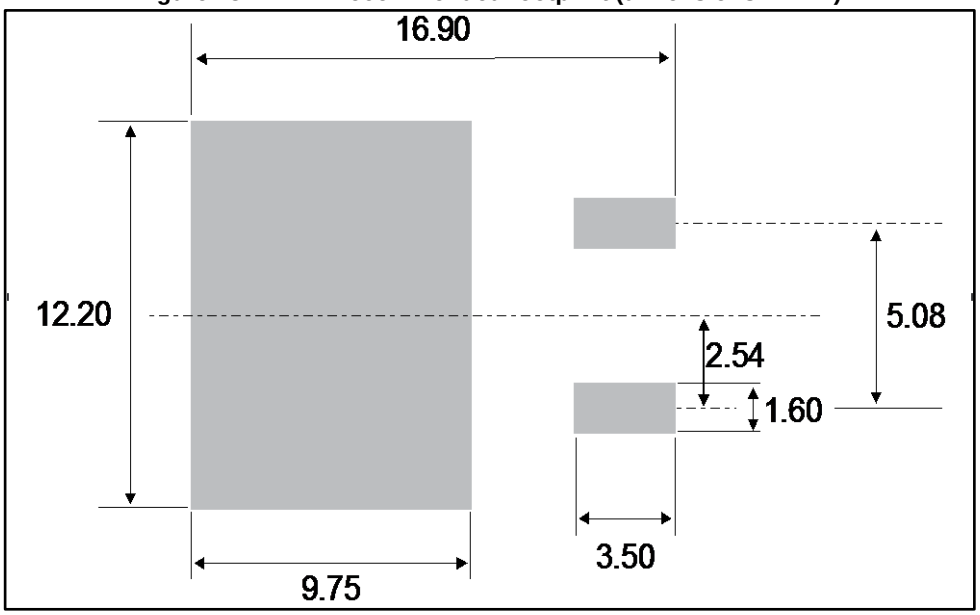


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

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 13: D²PAK recommended footprint (dimensions in mm)



2.2 TO-220AB package information

Figure 14: TO-220AB package outline

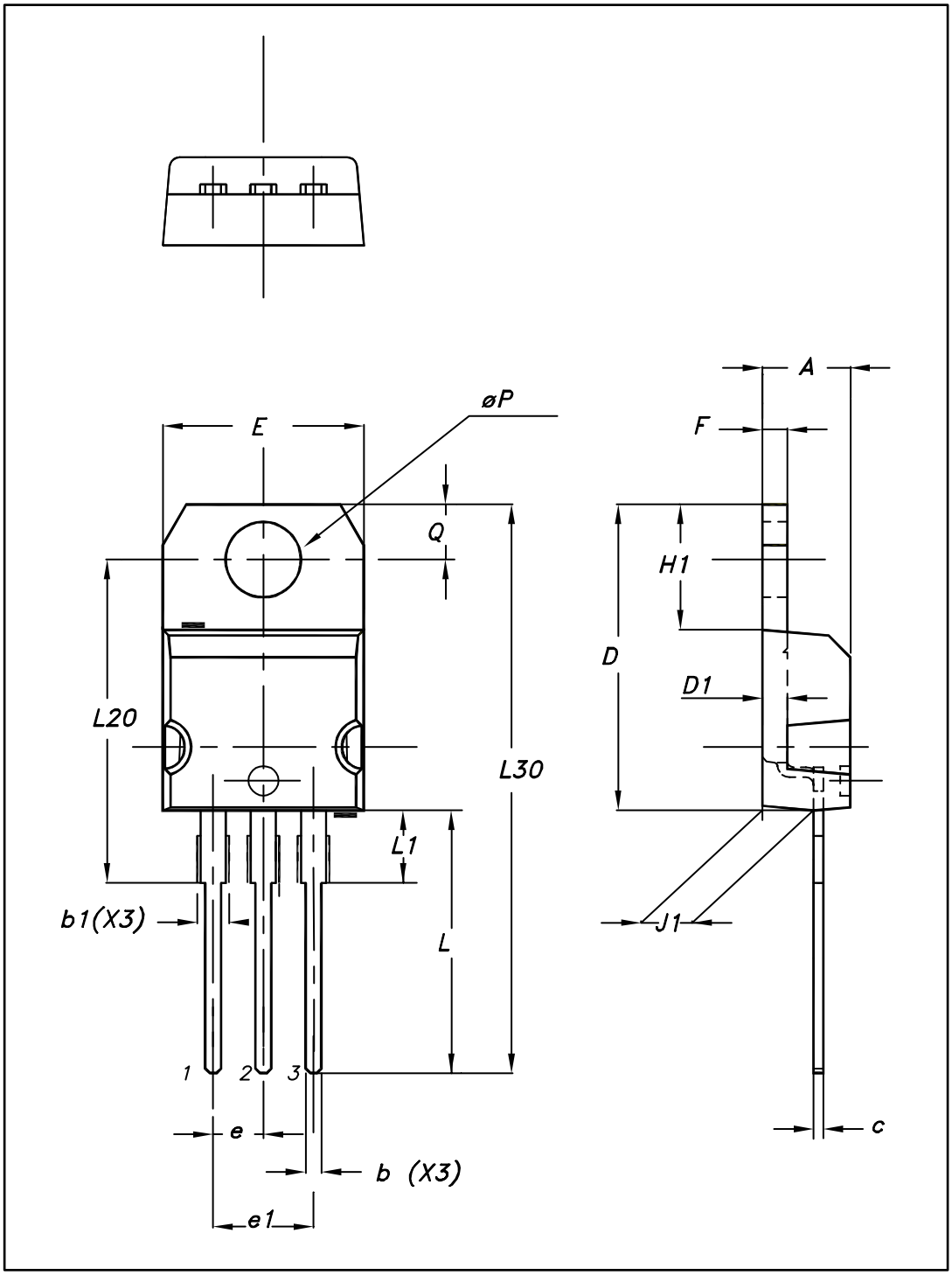


Table 7: TO-220AB package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	0.61	0.88	0.240	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	10.00	10.40	0.394	0.409
e	2.40	2.70	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	2.40	2.72	0.094	0.107
L	13.00	14.00	0.512	0.551
L1	3.50	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

3 Ordering information

Table 8: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH16R04CT	STTH16R04CT	TO-220AB	1.9 g	50	Tube
STTH16R04CG-TR	STTH16R04CG	D^2PAK	1.38 g	1000	Tape and reel

4 Revision history

Table 9: Document revision history

Date	Revision	Changes
31-Mar-2007	1	First issue.
02-Nov-2016	2	Removed device in TO-220FPAB. Updated features, *Table 1: "Device summary"* and package silhouettes in cover page. Updated *Section 1: "Characteristics"*, and *Section 3: "Ordering information"*. Updated *Section 2.1: "D²PAK package information"*.

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