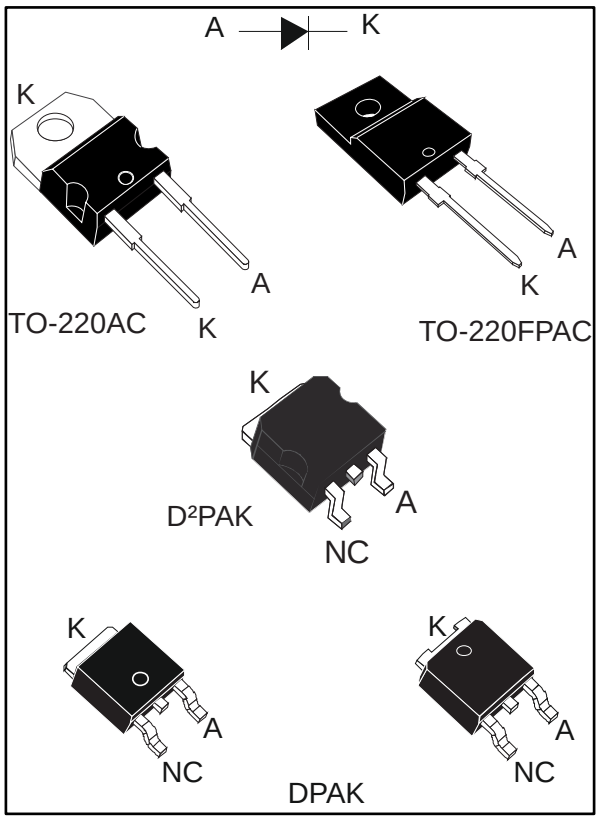
STTH5R06

Turbo 2 ultrafast high voltage rectifier

Datasheet - production data



Description

The device is developed using ST's Turbo 2 600 V technology. It is well-suited as a boost diode, especially for use in continuous mode power factor corrections and hard switching conditions.

This device is also intended for use as a free wheeling diode in power supplies and other power switching applications.

Table 1: Device summary

Symbol	Value
$I_{F(AV)}$	5 A
V_{RRM}	600 V
T_j (max.)	175 °C
V_F (typ.)	1.40 V
t_{rr} (max.)	25 ns

Features

- Ultrafast switching
- Low reverse recovery current
- Reduces switching losses
- Low thermal resistance
- Insulated package: TO-220FPAC
  - Insulation voltage: 2000 V_{RMS} sine
- ECOPACK®2 compliant component for DPAK on demand

This is information on a product in full production.

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1 Characteristics

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

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			600	V
$I_{F(RMS)}$	Forward rms current		TO-220AC TO-220FPAC D²PAK	20	A
			DPAK	10	
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	T_C = 135 °C	TO-220AC DPAK D²PAK	5	A
		T_C = 105 °C	TO-220FPAC		
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		Max. value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / DPAK / D²PAK	3.0	°C/W
		TO-220FPAC	5.5	

Table 4: Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-		20	µA
		T_j = 125 °C		-	25	250	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 5 A	-		2.9	V
		T_j = 125 °C		-	1.4	1.8	

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:

$P = 1.164 \times I_{F(AV)} + 0.128 \times I_{F^2(RMS)}$

Table 5: Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j = 25 °C	I_F = 0.5 A I_{rr} = 0.25 A I_R = 1 A	-		25	ns
			I_F = 1 A V_R = 30 V dI_F/dt = -50 A/µs	-		40	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 5 A V_R = 400 V dI_F/dt = -200 A/µs	-	5.0	6.0	A
S_{factor}	Softness factor			-	0.35		-
Q_{rr}	Reverse recovery charges			-	110		nC
t_{fr}	Forward recovery time	T_j = 25 °C	I_F = 5 A V_{FR} = 1.1 x V_F(max.) dI_F/dt = 40 A/µs	-		150	ns
V_{FP}	Forward recovery voltage			-		4.5	V

1.1 Characteristics (curves)

Figure 1: Conduction losses versus average current

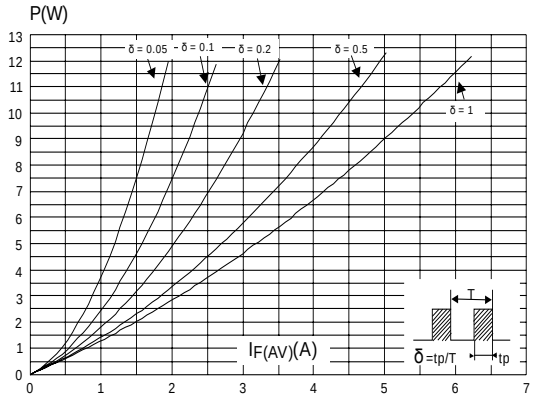


Figure 2: Forward voltage drop versus forward current

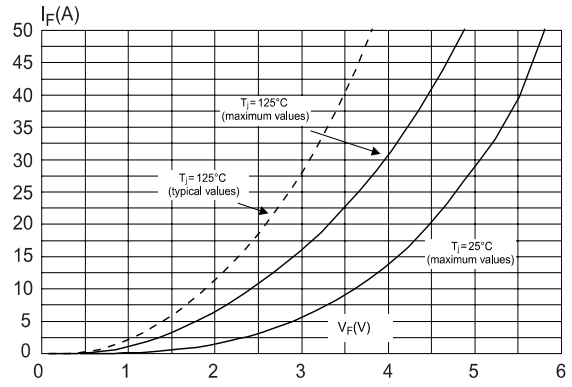


Figure 3: Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK, D²PAK)

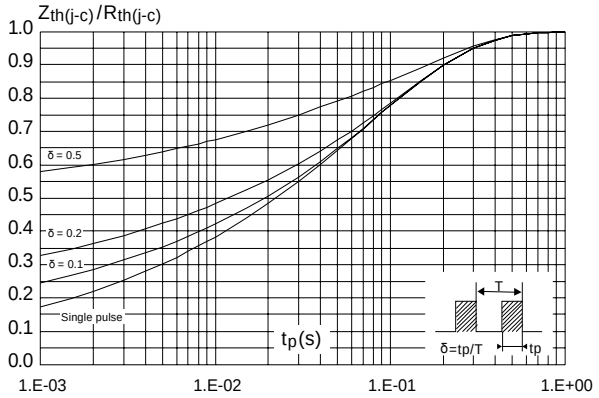


Figure 4: Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)

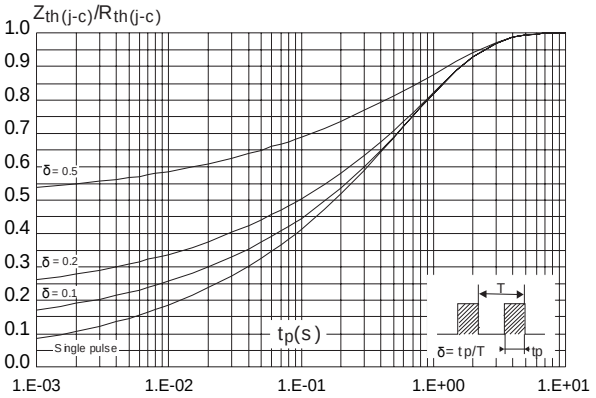


Figure 5: Peak reverse recovery current versus dI_F/dt (typical values)

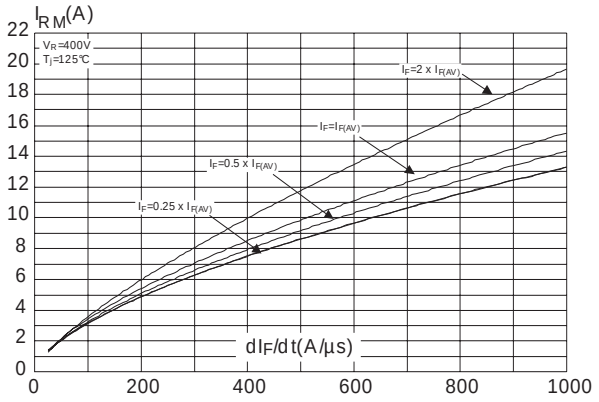


Figure 6: Reverse recovery time versus dI_F/dt (typical values)

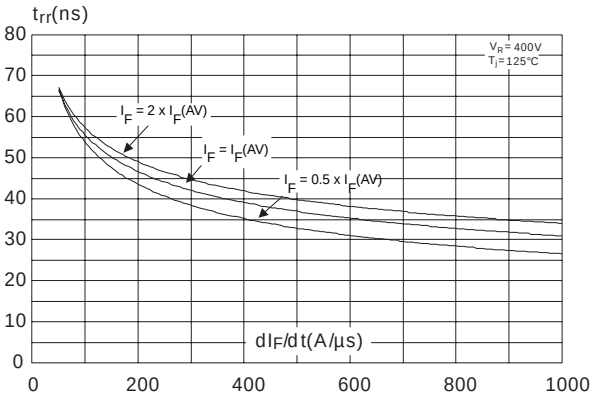


Figure 7: Reverse recovery charges versus dI_F/dt (typical values)

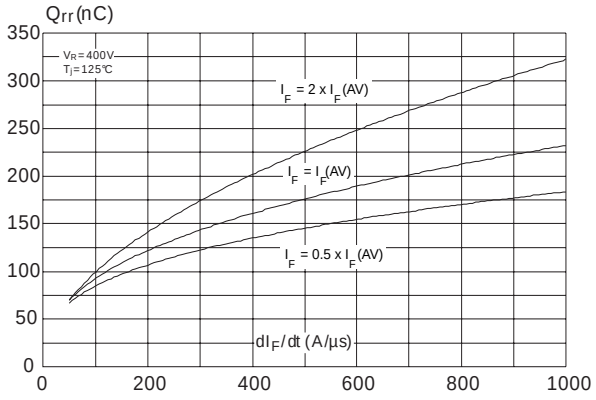


Figure 8: Softness factor versus dI_F/dt (typical values)

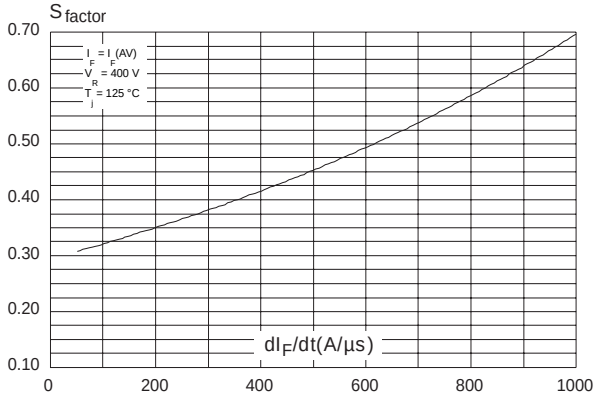


Figure 9: Relative variations of dynamic parameters versus junction temperature

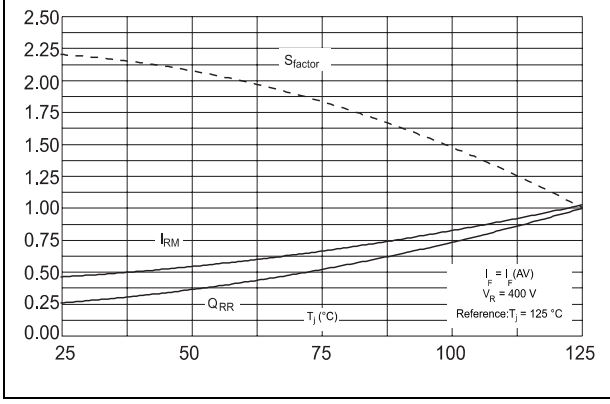


Figure 10: Transient peak forward voltage versus dI_F/dt (typical values)

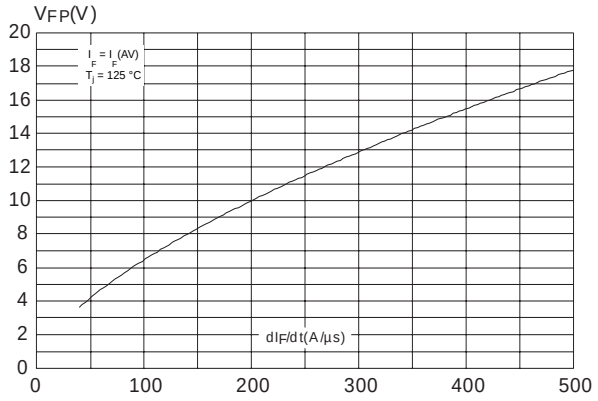


Figure 11: Forward recovery time versus dI_F/dt (typical values)

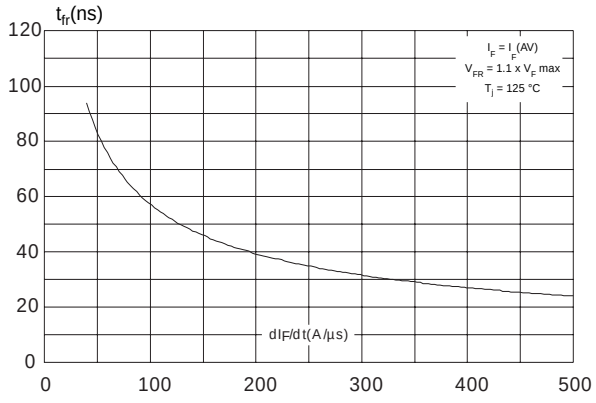


Figure 12: Junction capacitance versus reverse voltage applied (typical values)

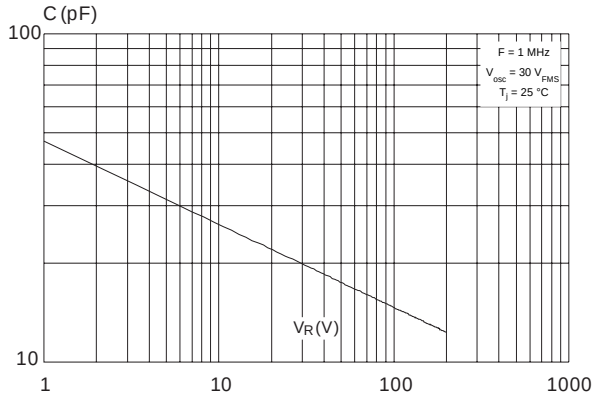


Figure 13: Thermal resistance junction to ambient versus copper surface under tab (DPAK)

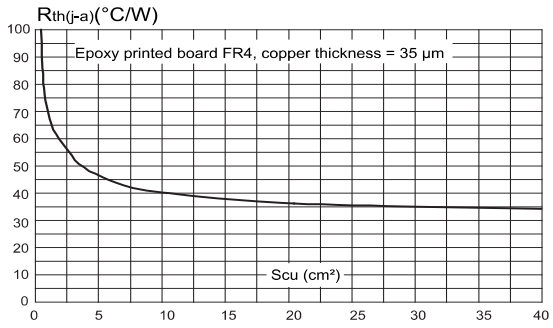
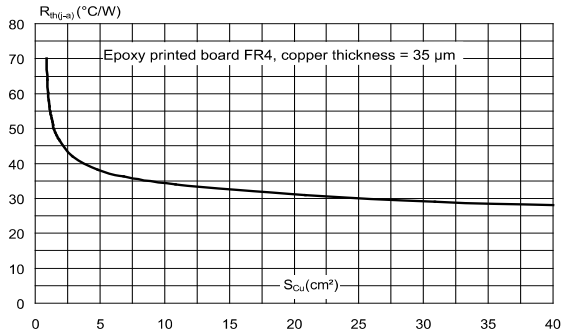


Figure 14: Thermal resistance junction to ambient versus copper surface under tab (D²PAK)



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-220FPAC / TO-220AC)
- Maximum torque value: 0.7 N·m (for TO-220FPAC / TO-220AC)

2.1 TO-220AC package information

Figure 15: TO-220AC package outline

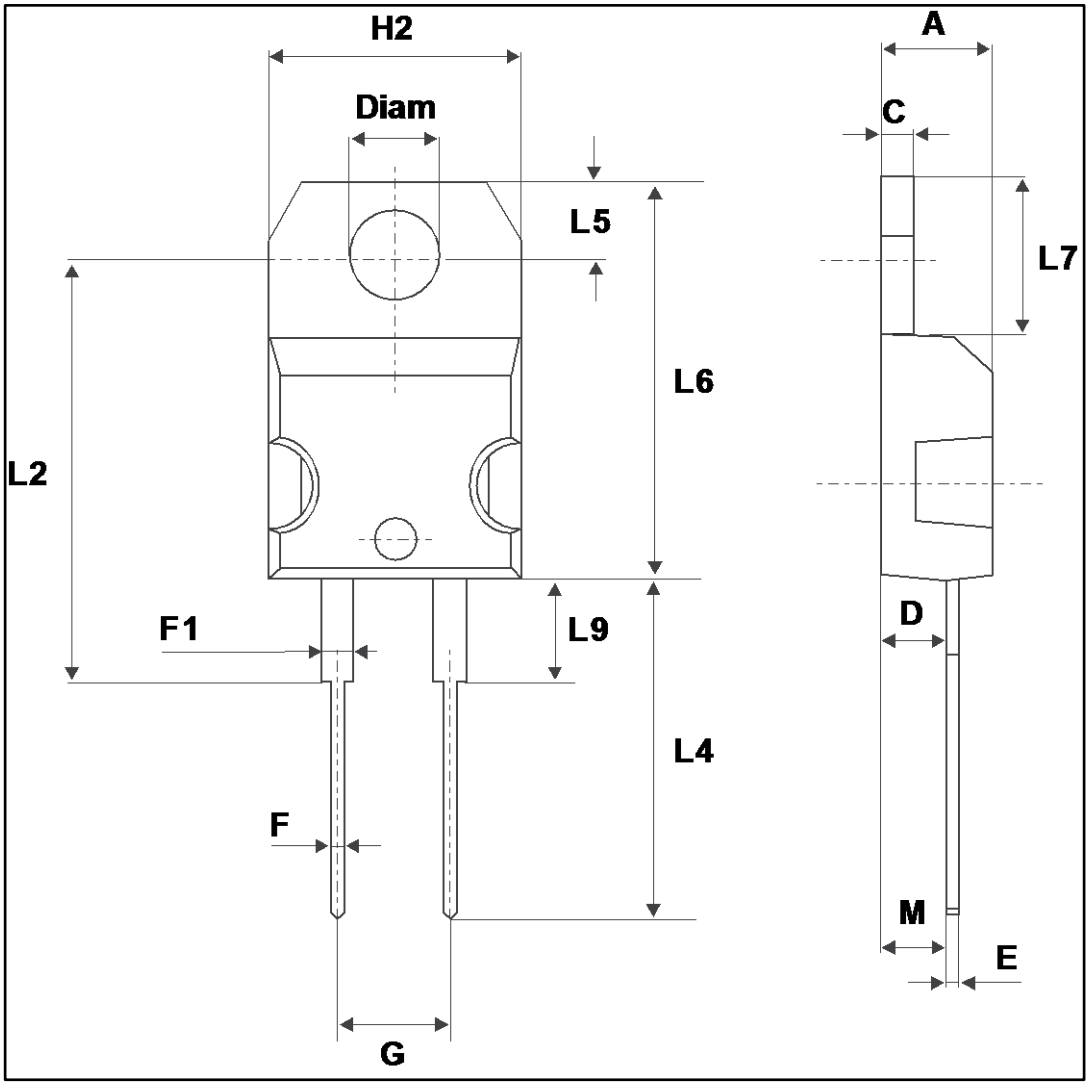


Table 6: TO-220AC package mechanical data

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.	
Diam	3.75	3.85	0.147	0.151

2.2 TO-220FPAC package information

Figure 16: TO-220FPAC package outline

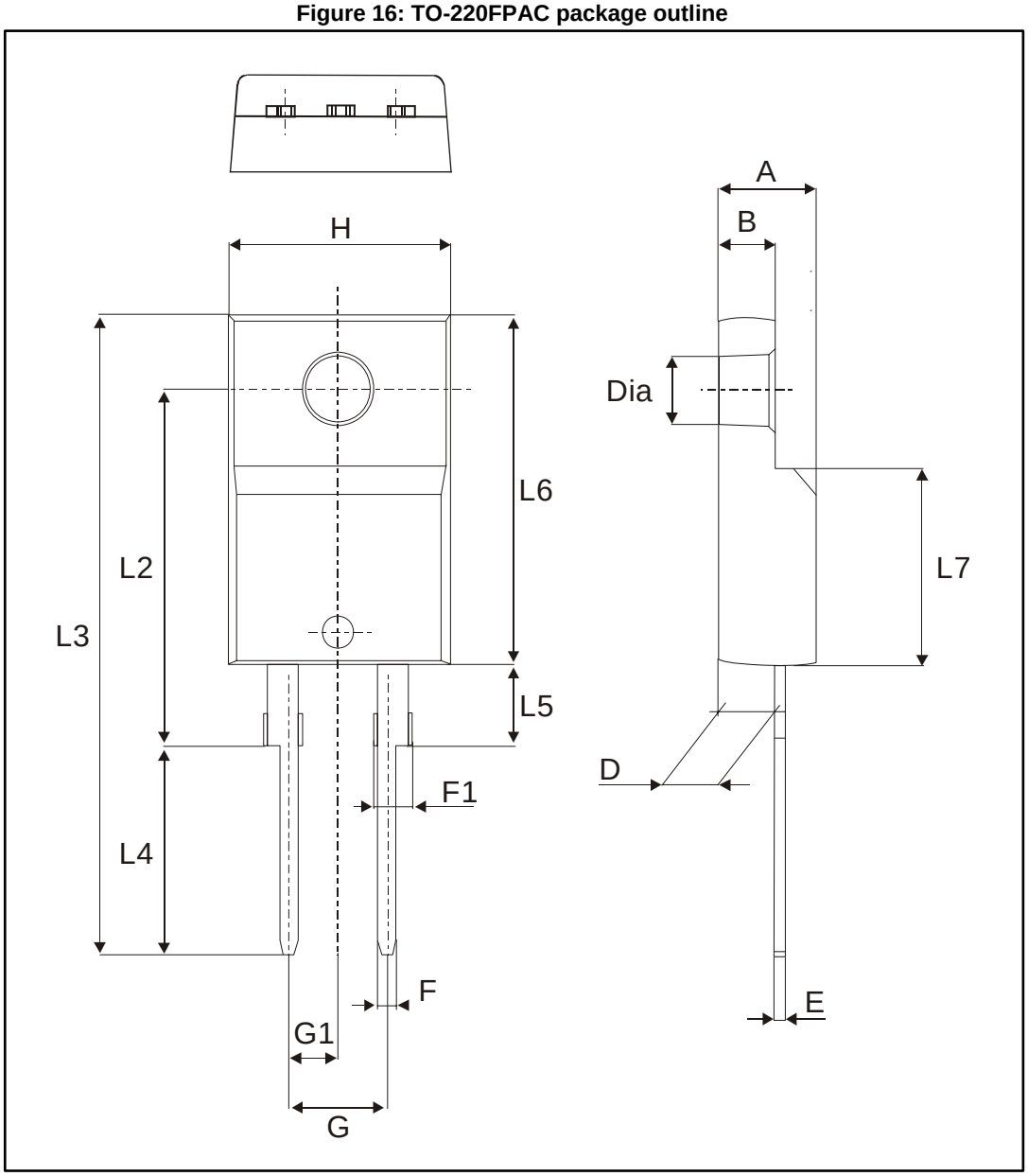
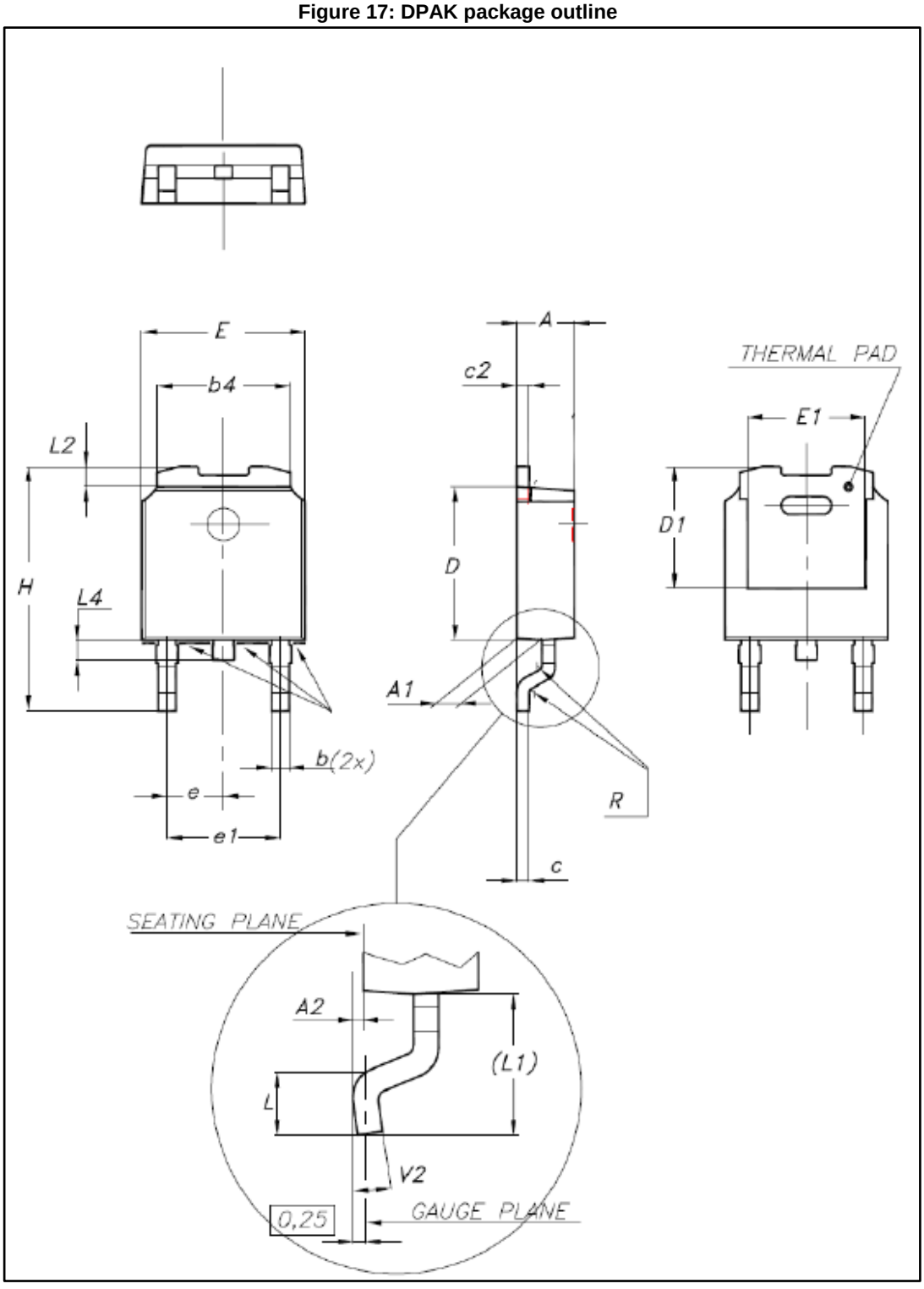


Table 7: TO-220FPAC package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
B	2.50	2.70	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	1.00	0.030	0.039
F1	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.		0.630 typ.	
L3	28.60	30.60	0.126	1.205
L4	9.80	10.60	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.	3.00	3.20	0.118	0.126

2.3 DPAK package information

Figure 17: DPAK package outline

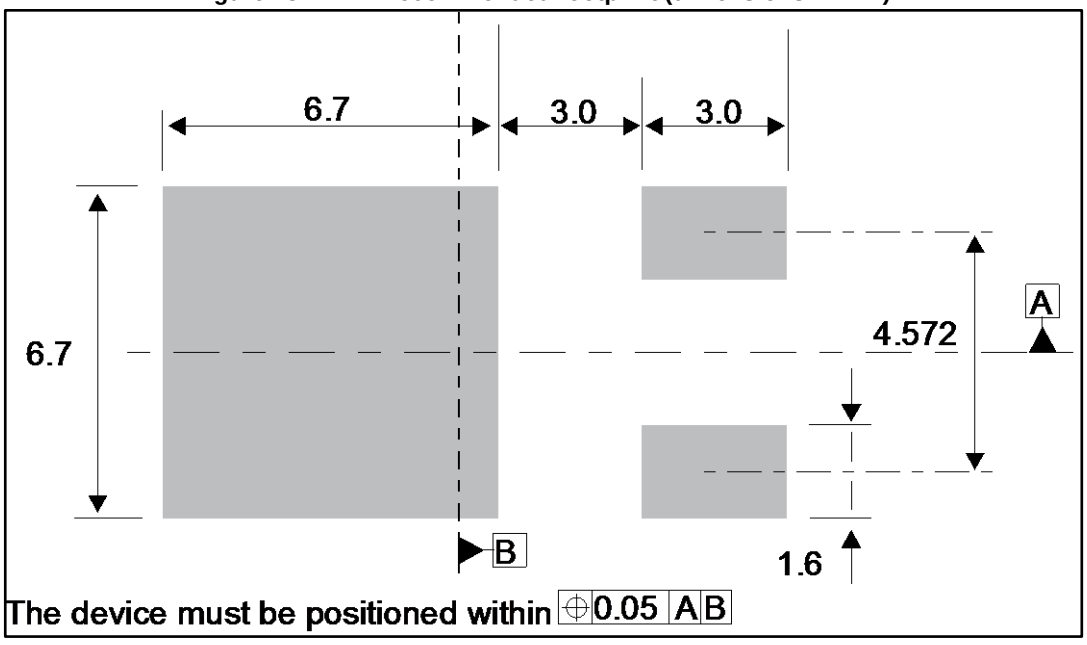


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 8: DPAK package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.18	2.40	0.085	0.094
A1	0.90	1.10	0.035	0.043
A2	0.03	0.23	0.001	0.009
b	0.64	0.90	0.025	0.035
b4	4.95	5.46	0.194	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.60	0.018	0.023
D	5.97	6.22	0.235	0.244
D1	4.95	5.60	0.194	0.220
E	6.35	6.73	0.250	0.265
E1	4.32	5.50	0.170	0.216
e	2.286 typ.		0.090 typ.	
e1	4.40	4.70	0.173	0.185
H	9.35	10.40	0.368	0.409
L	1.0	1.78	0.039	0.070
L2		1.27		0.050
L4	0.60	1.02	0.023	0.040
V2	-8°	+8°	-8°	+8°

Figure 18: DPAK recommended footprint (dimensions in mm)



2.4 D²PAK package information

Figure 19: D²PAK package outline

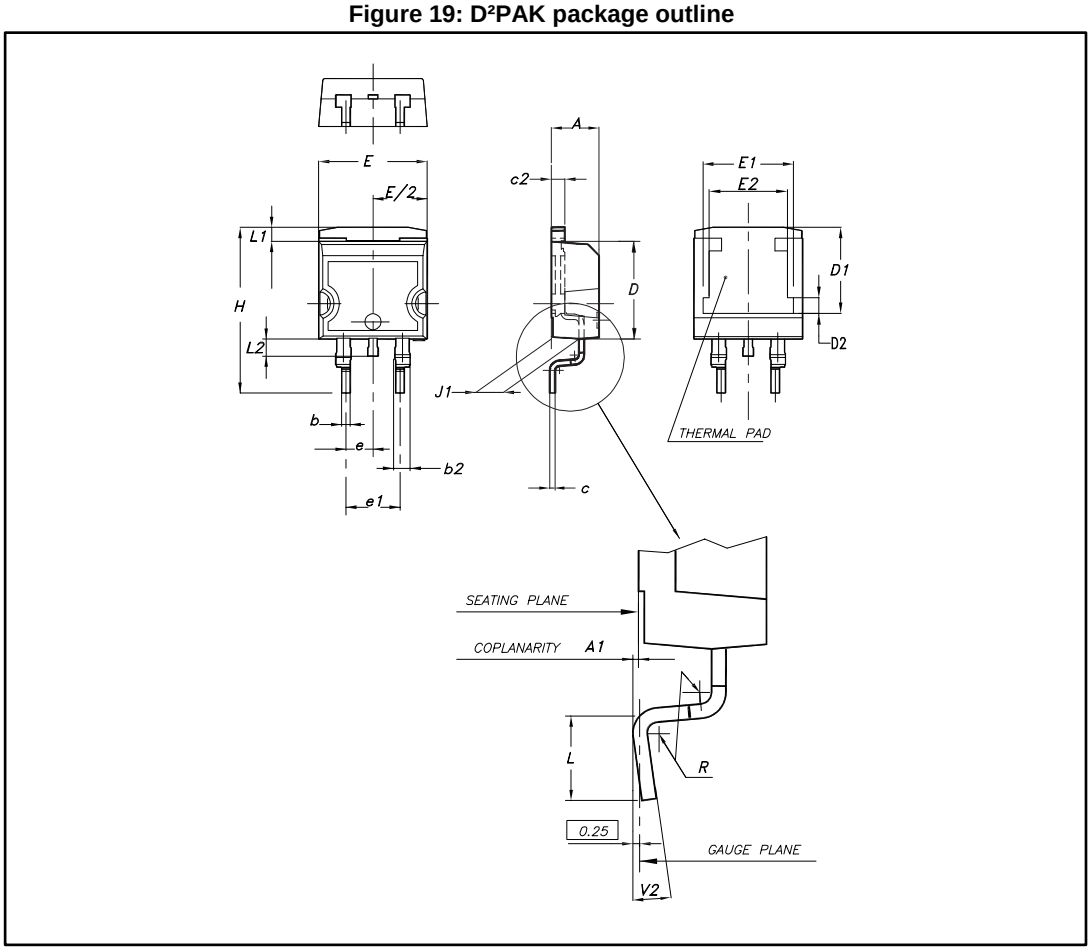
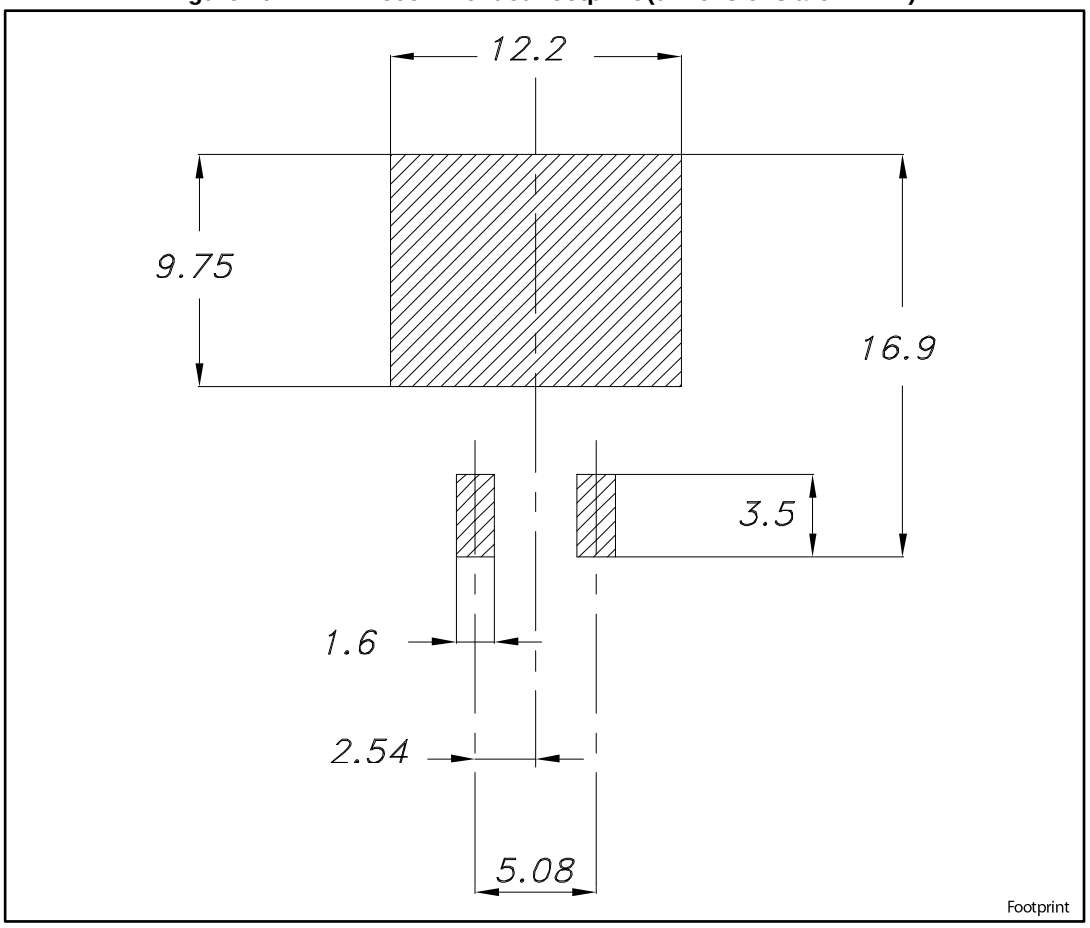


Table 9: D²PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.028		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.018		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50	7.75	8.00	0.295	0.305	0.315
D2	1.10	1.30	1.50	0.043	0.051	0.060
E	10		10.40	0.394		0.409
E1	8.50	8.70	8.90	0.335	0.343	0.346
E2	6.85	7.05	7.25	0.266	0.278	0.282
e		2.54			0.100	
e1	4.88		5.28	0.190		0.205
H	15		15.85	0.591		0.624
J1	2.49		2.69	0.097		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.049		0.055
L2	1.30		1.75	0.050		0.069
R		0.4			0.015	
V2	0°		8°	0°		8°

Figure 20: D²PAK recommended footprint (dimensions are in mm)



3 Ordering information

Table 10: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH5R06D	STTH5R06D	TO-220AC	1.90 g	50	Tube
STTH5R06G-TR	STTH5R06G	D²PAK	1.48 g	1000	Tape and reel
STTH5R06FP	STTH5R06FP	TO-220FPAC	1.90 g	50	Tube
STTH5R06B	STTH5 R06B	DPAK	0.30 g	75	Tube
STTH5R06B-TR	STTH5 R06B	DPAK	0.30 g	2500	Tape and reel

4 Revision history

Table 11: Document revision history

Date	Revision	Changes
17-Feb-2011	9	Last issue.
01-Aug-2014	10	Added insulated package text in *Features*. Corrected typographical errors in *Table 10*. Updated TO-220FPAC, D2PAK and DPAK package information and reformatted to current standard.
18-Sep-2014	11	Updated *Figure 18, Figure 19* and *Table 4*.
19-Oct-2016	12	Updated DPAK package information and reformatted to current standard.

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