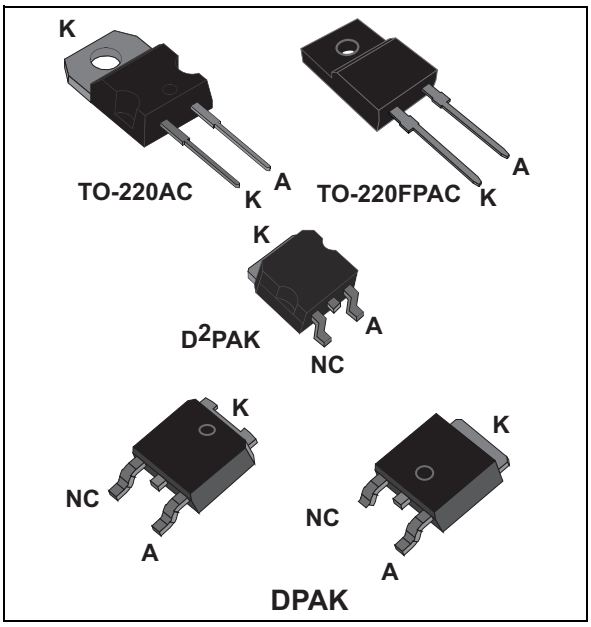
STTH5R06

Turbo 2 ultrafast high voltage rectifier

Datasheet - production data



Description

The STTH5R06 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	175 °C
V_F (typ)	1.4 V
t_{rr} (max)	40 ns

Features

- Ultrafast switching
- Low reverse recovery current
- Reduces switching losses
- Low thermal resistance
- Insulated package: TO-220FPAC
  - Insulation voltage: 2500 V rms
  - Package capacitance: 12 pF
- ECOPACK®2 compliant component for DPAK on demand

1 Characteristics

Table 2. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			600	V
$I_{F(RMS)}$	Forward rms current	TO-220AC / TO-220FPAC / D^2PAK		20	A
		DPAK		10	
$I_{F(AV)}$	Average forward current $\delta = 0.5$	TO-220AC / D^2PAK / DPAK	T_c = 135 °C	5	A
		TO-220FPAC	T_c = 105 °C	5	
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	TO-220AC / DPAK / D^2PAK	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	

1. Pulse test: t_p = 5 ms, δ < 2%
2. Pulse test: t_p = 380 µs, δ < 2%

To evaluate the maximum conduction losses use the following equation:

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

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, dI_F/dt = - 50 A/µs, V_R = 30 V			40	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 5 A, dI_F/dt = - 200 A/µs, V_R = 400 V		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 dI_F/dt = 40 A/µs V_{FR} = 1.1 x V_{Fmax}			150	ns
V_{FP}	Forward recovery voltage					4.5	V

Figure 1. Conduction losses versus average current

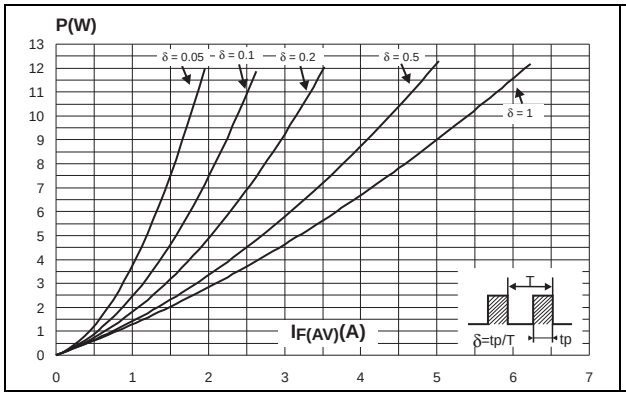


Figure 2. Forward voltage drop versus forward current

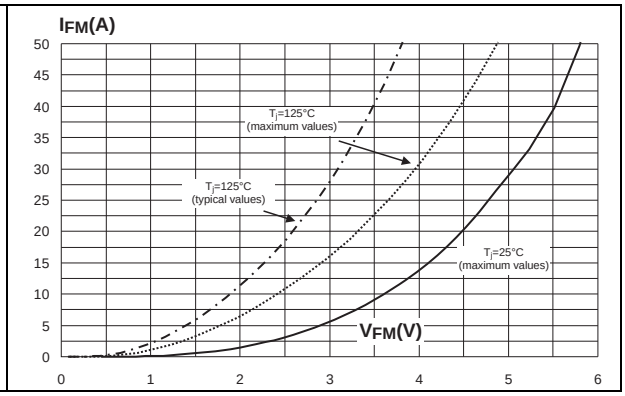


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

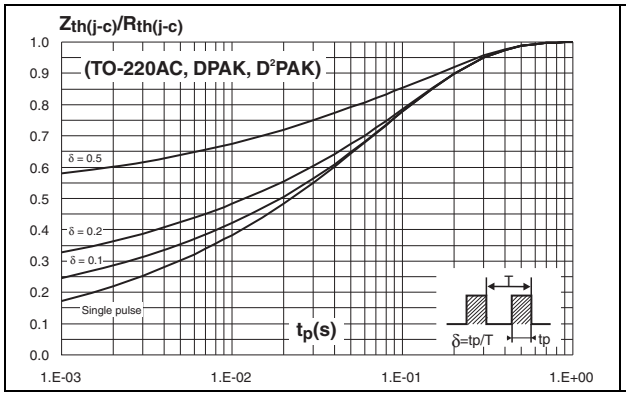


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)

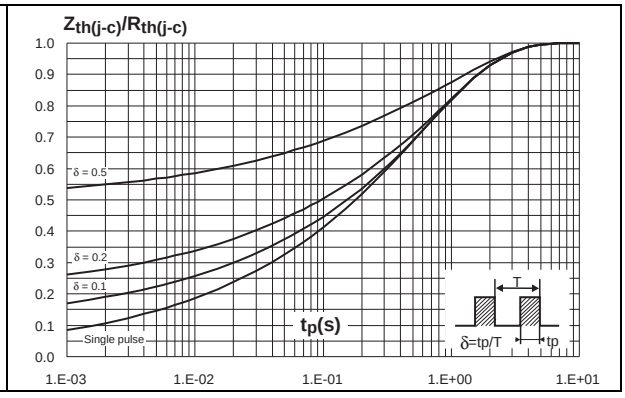


Figure 5. Peak reverse recovery current versus dI_F/dt (90% confidence)

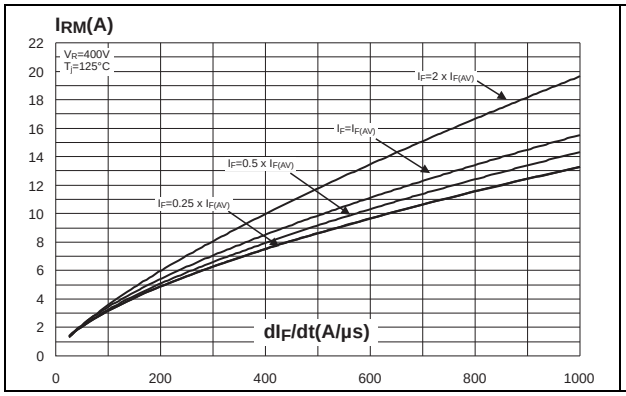


Figure 6. Reverse recovery time versus dI_F/dt (90% confidence)

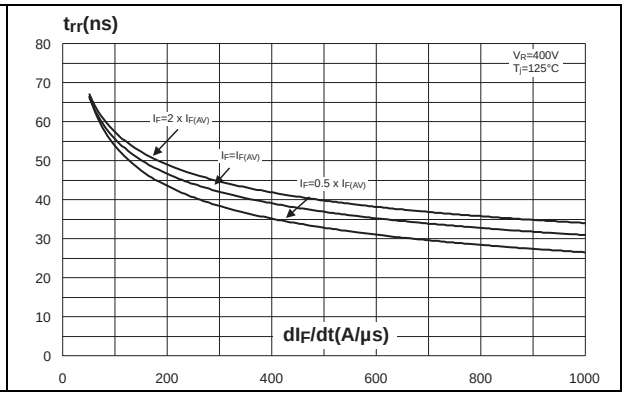


Figure 7. Reverse recovery charges versus dI_F/dt (90% confidence)

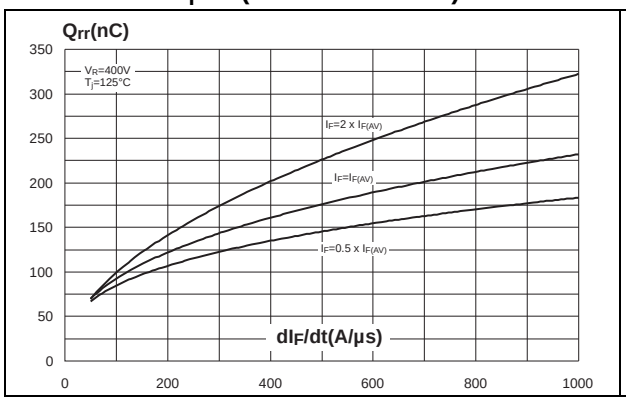


Figure 8. Softness factor versus dI_F/dt (typical values)

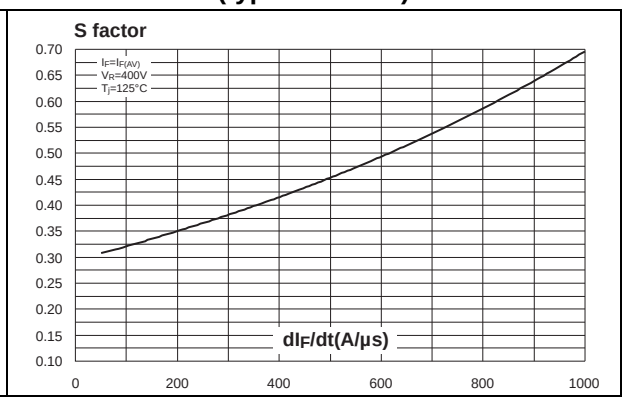


Figure 9. Relative variations of dynamic parameters versus junction temperature

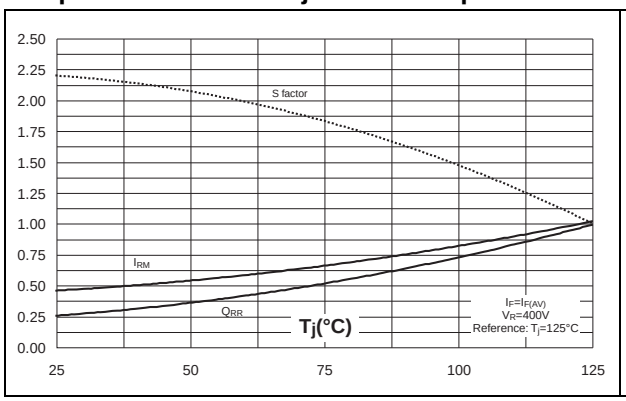


Figure 10. Transient peak forward voltage versus dI_F/dt (90% confidence)

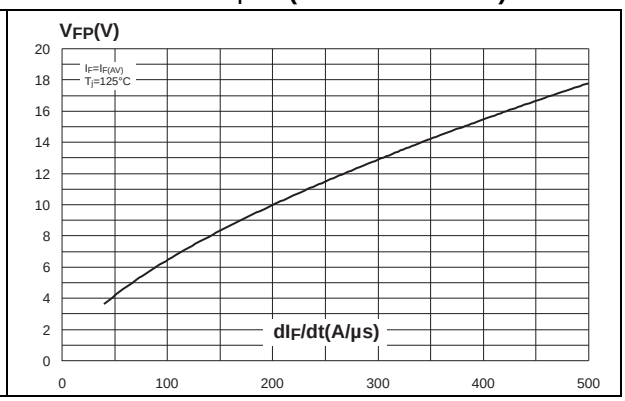


Figure 11. Forward recovery time versus dI_F/dt (90% confidence)

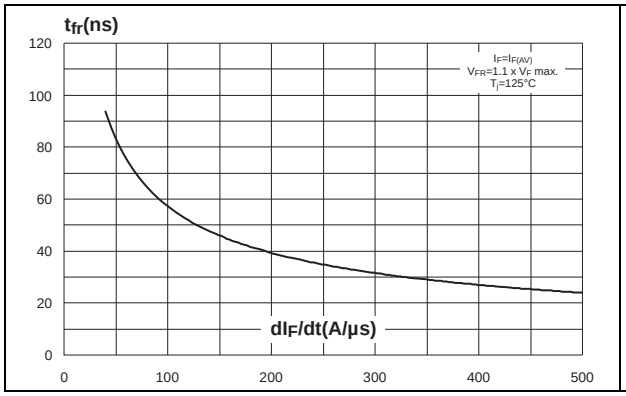


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

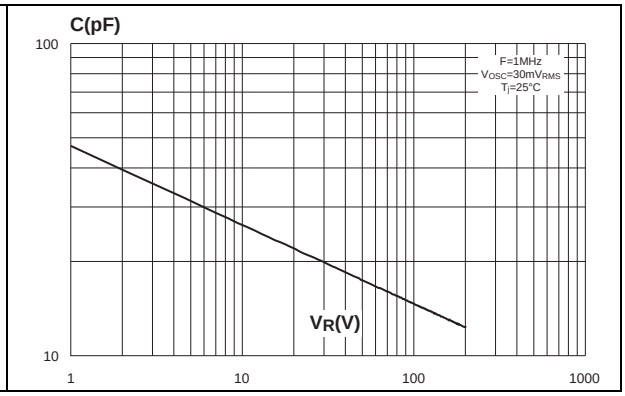
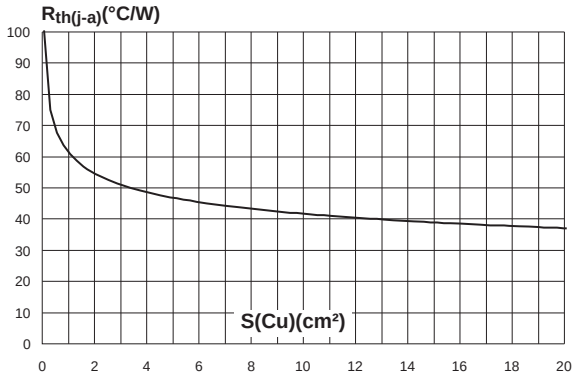


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed circuit board FR4, copper thickness = 35 µm, DPAK and D²PAK)



2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value for TO-220AC and TO-220FPAC: 0.4 N·m to 0.6 N·m

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.

Figure 14. TO-220AC dimension definitions

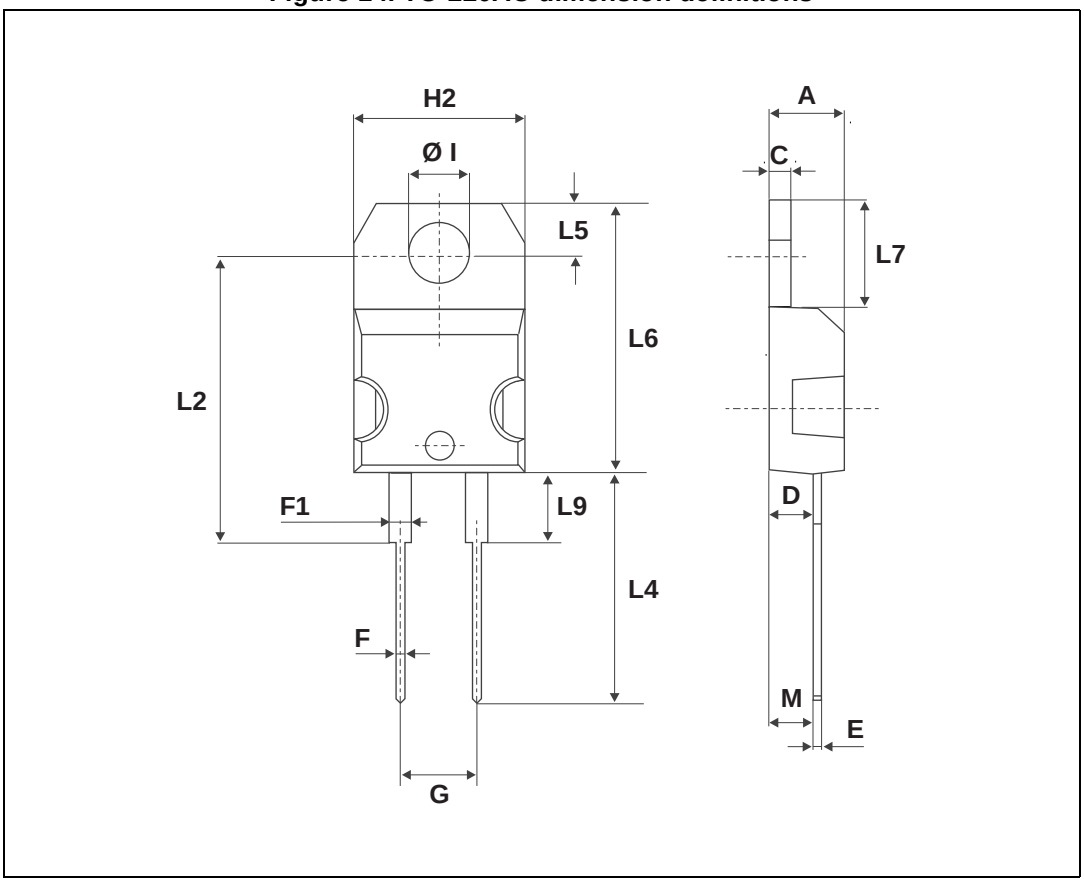


Table 6. TO-220AC dimension values

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. I	3.75	3.85	0.147	0.151

Figure 15. TO-220FPAC dimension definitions

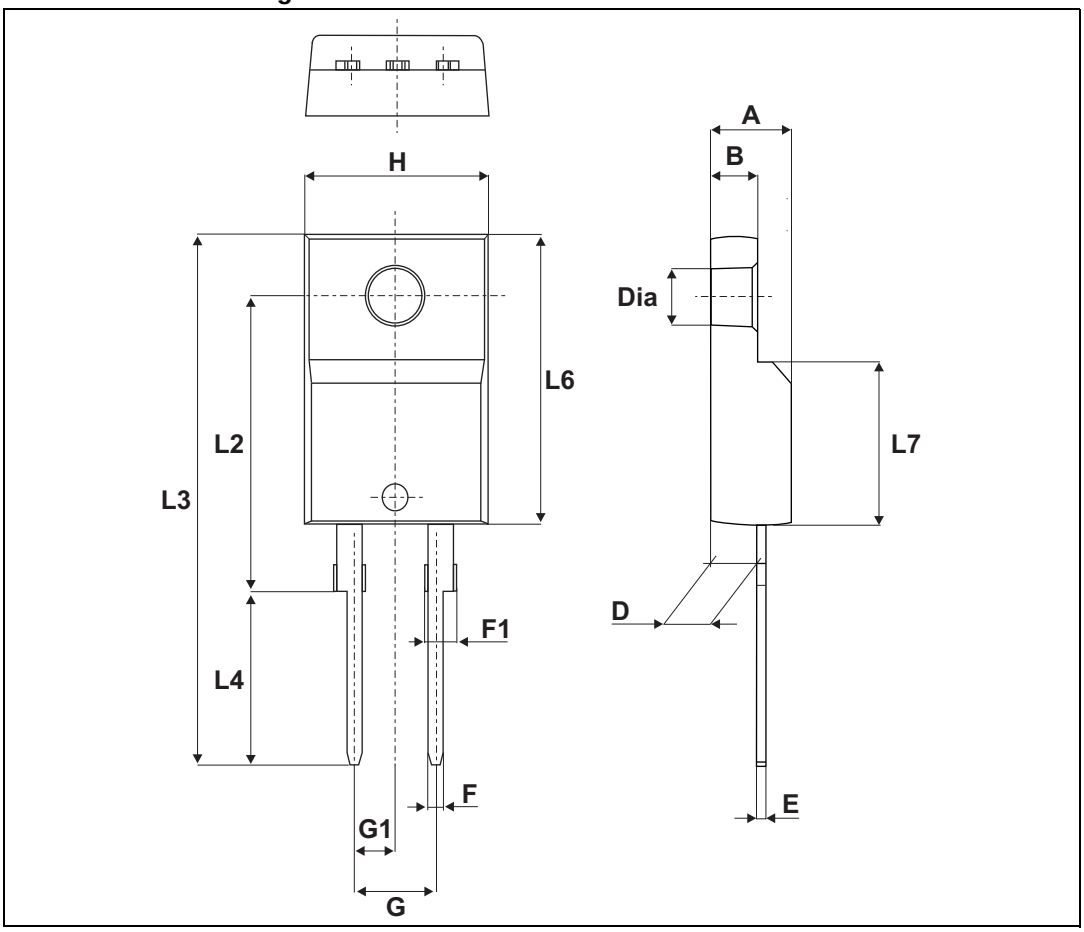


Table 7. TO-220FPAC dimension values

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
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
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Diam.	3.00	3.20	0.118	0.126

Figure 16. D^{2}PAK dimension definitions

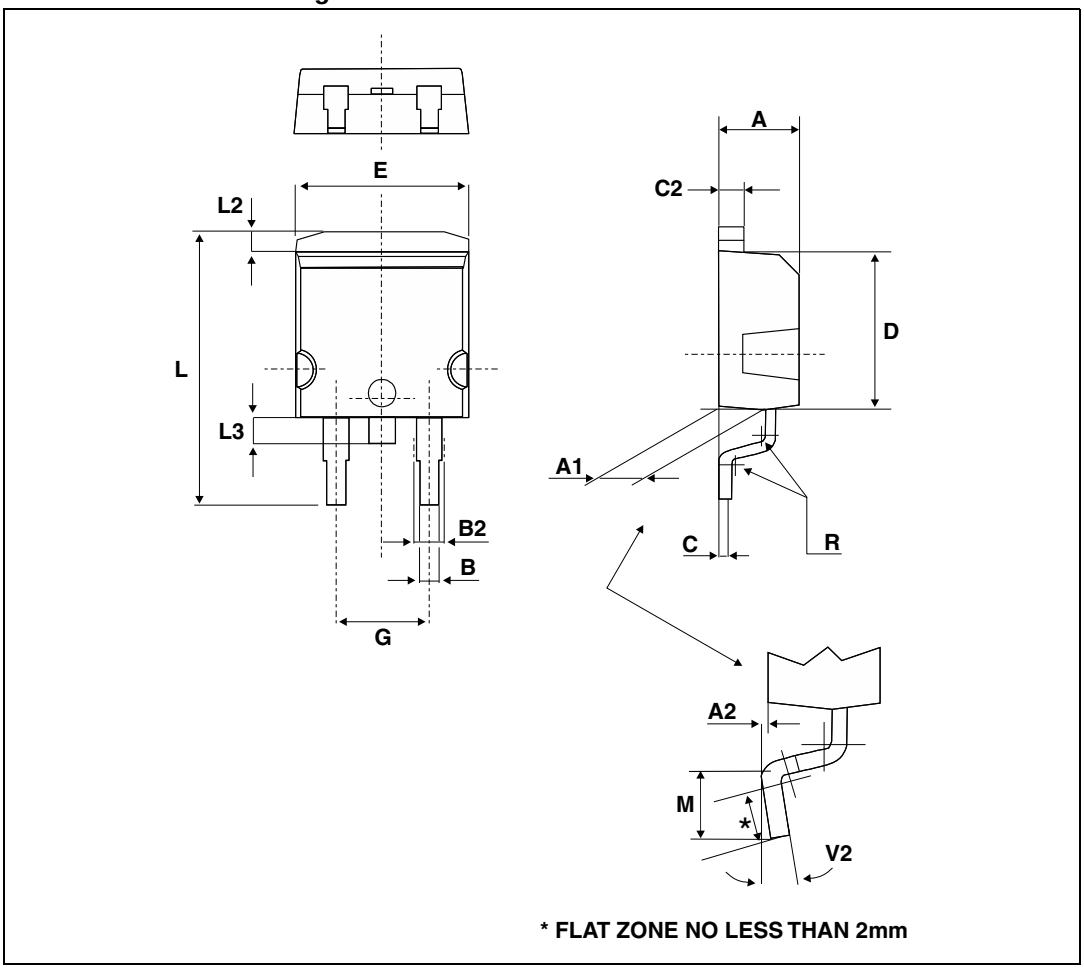


Table 8. D²PAK dimension values

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.30	1.75	0.051	0.069
M	2.29	2.79	0.090	0.110
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 17. Footprint (dimensions in mm)

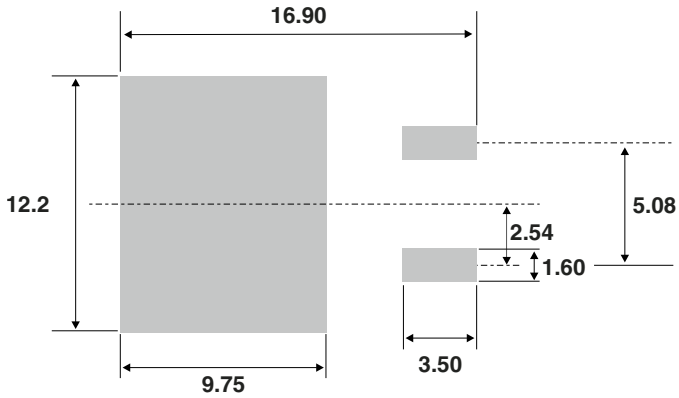
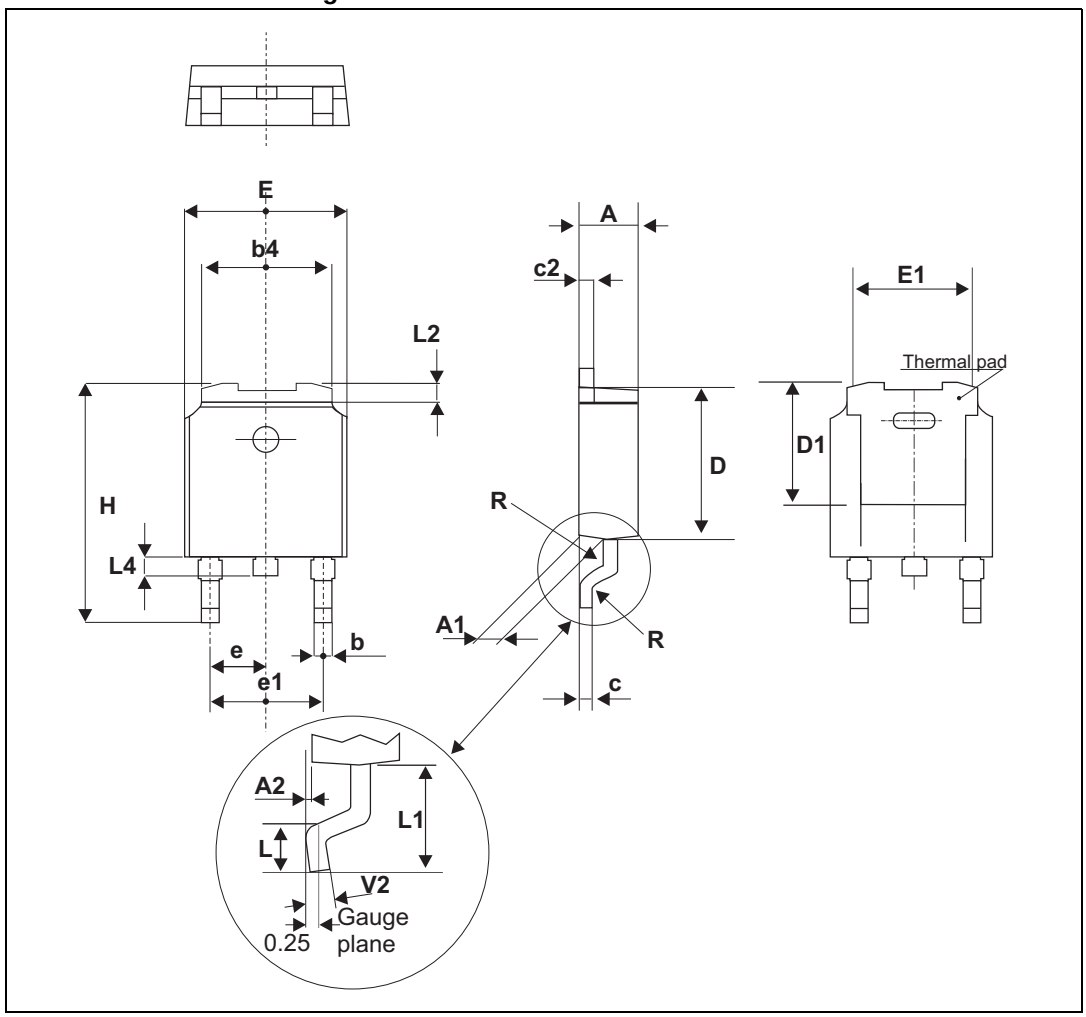


Figure 18. DPAK dimension definitions

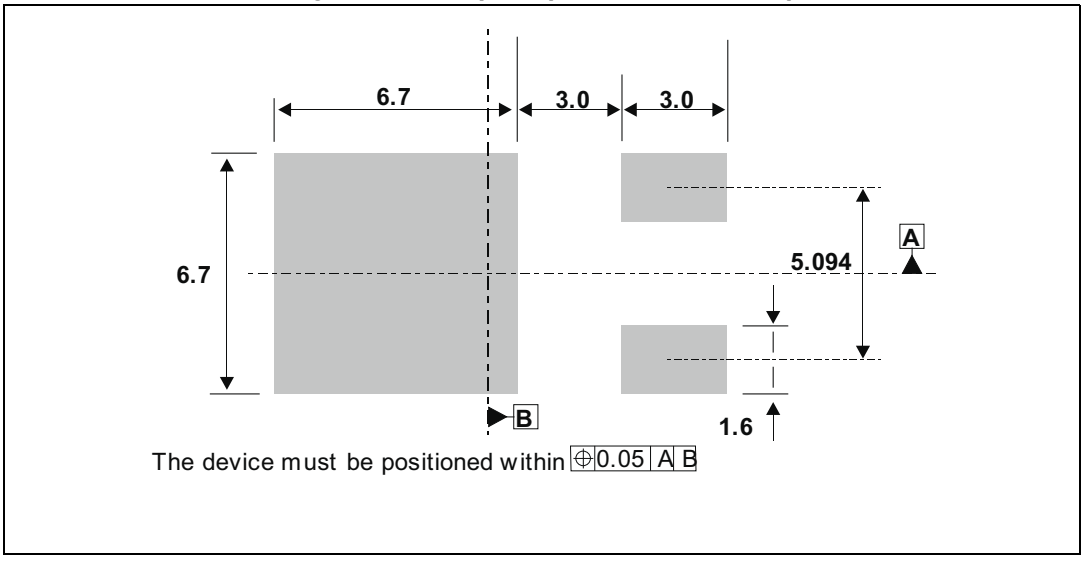


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 9. DPAK dimension values

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 19. Footprint (dimensions 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	D^2PAK	1.48 g	1000	Tape and reel
STTH5R06FP	STTH5R06FP	TO-220FPAC	1.70 g	50	Tube
STTH5R06B	STTH5R06B	DPAK	0.3 g	75	Tube
STTH5R06B-TR	STTH5R06B	DPAK	0.3 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, D^2PAK and DPAK package information and reformatted to current standard.
18-Sep-2014	11	Updated *Figure 18*, *Figure 19* and *Table 4*.