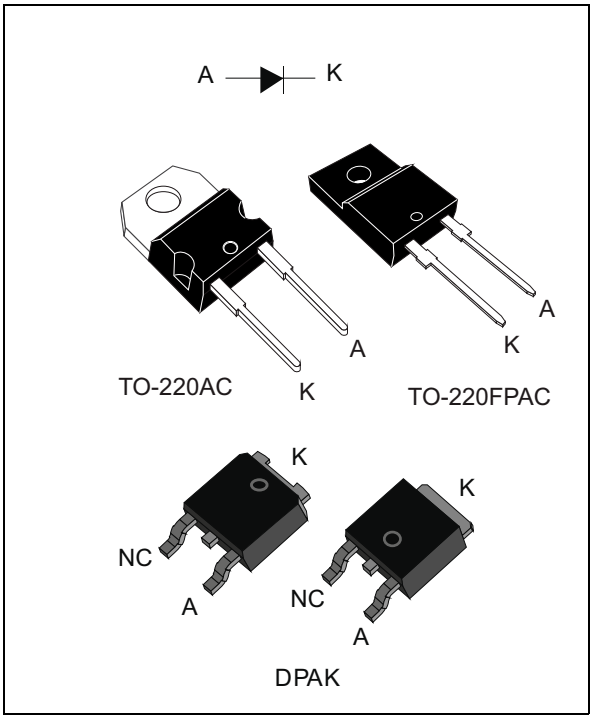
STTH512

Ultrafast recovery - 1200 V diode

Datasheet - production data



Features

- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- ECOPACK®2 compliant component for DPAK on demand
- Insulated package: TO-220FPAC
  - Insulated voltage: 2000 V_{RMS} sine

Description

The high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

Such demanding applications include industrial power supplies, motor control, and similar mission-critical systems that require rectification and freewheeling. These diodes also fit into auxiliary functions such as snubber, bootstrap, and demagnetization applications.

The improved performance in low leakage current, and therefore thermal runaway guard band, is an immediate competitive advantage for this device.

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	5 A
V_{RRM}	1200 V
T_j(max)	175 °C
V_F (typ)	1.25 V
t_{rr} (typ)	48 ns

1 Characteristics

Table 2. Absolute ratings (limiting values at 25 °C, unless otherwise stated)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			1200	V
$I_{F(RMS)}$	RMS forward current	TO-220AC / TO-220FPAC		30	A
		DPAK		10	
$I_{F(AV)}$	Average forward current, δ = 0.5, square wave	TO-220AC / DPAK	T_c = 145° C	5	A
		TO-220FPAC	T_c = 105° C		
I_{FRM}	Repetitive peak forward current	t_p = 5 µs, F = 5 kHz square		60	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		55	A
T_{stg}	Storage temperature range			-65 to + 175	°C
T_j	Maximum operating junction temperature			175	°C

Table 3. Thermal resistance

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / DPAK	2.5	°C/W
		TO-220FPAC	5.8	

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			5	µA
		T_j = 125° C			3	30	
V_F (2)	Forward voltage drop	T_j = 25° C	I_F = 5 A			2.2	V
		T_j = 125° C			1.30	2.0	
		T_j = 150° C			1.25	1.9	

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:
$P = 1.5 \times I_{F(AV)} + 0.08\ I_{F^2(RMS)}$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V, T_j = 25 °C			95	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25 °C		48	70	
I_{RM}	Reverse recovery current	I_F = 5 A, dI_F/dt = -200 A/µs, V_R = 600 V, T_j = 125 °C		11	16	A
S	Softness factor	I_F = 5 A, dI_F/dt = -200 A/µs, V_R = 600 V, T_j = 125 °C		2		
t_{fr}	Forward recovery time	I_F = 5 A dI_F/dt = 50 A/µs V_{FR} = 1.5 x V_{Fmax}, T_j = 25 °C			400	ns
V_{FP}	Forward recovery voltage	I_F = 5 A, dI_F/dt = 50 A/µs, T_j = 25 °C		9.5		V

Figure 1. Conduction losses versus average current

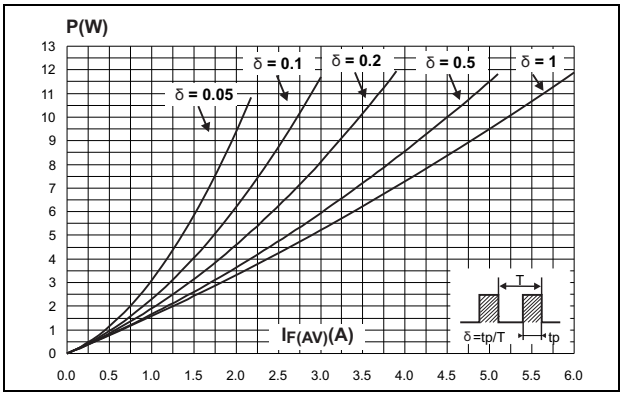


Figure 2. Forward voltage drop versus forward current

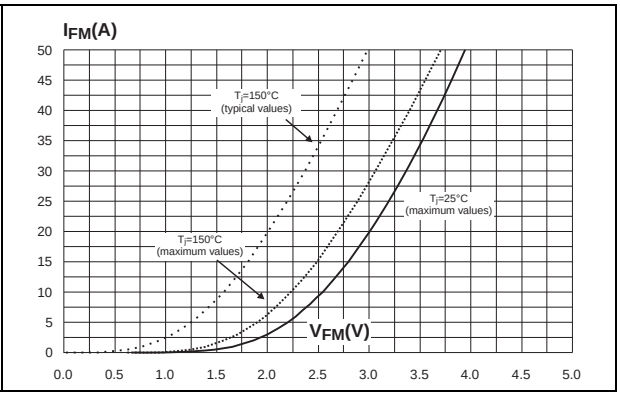


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

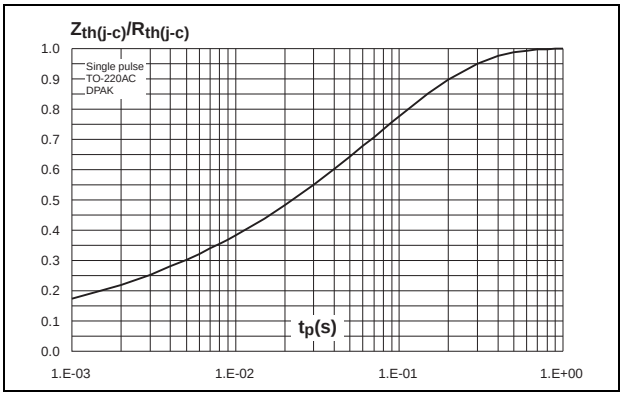


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

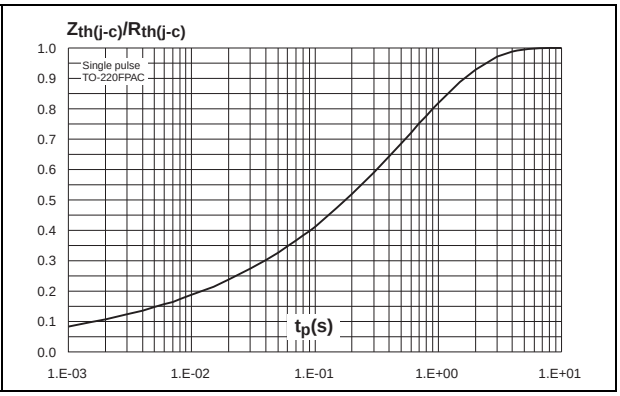


Figure 5. Peak reverse recovery current versus dI_F/dt (typical values)

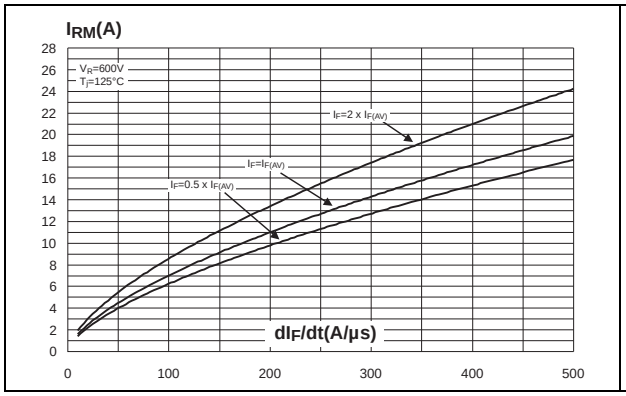


Figure 6. Reverse recovery time versus dI_F/dt (typical values)

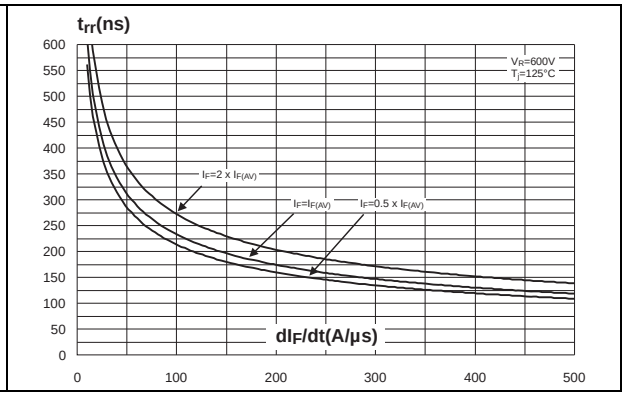


Figure 7. Reverse recovery charges versus dI_F/dt (typical values)

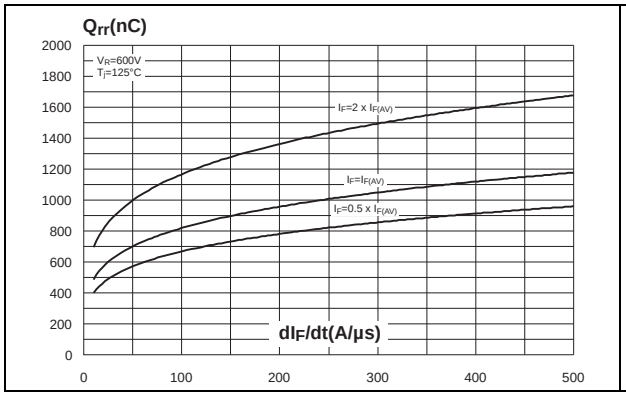


Figure 8. Softness factor versus dI_F/dt (typical values)

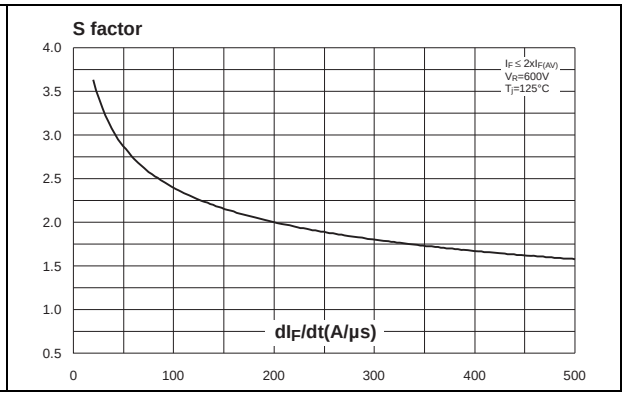


Figure 9. Relative variations of dynamic parameters versus junction temperature

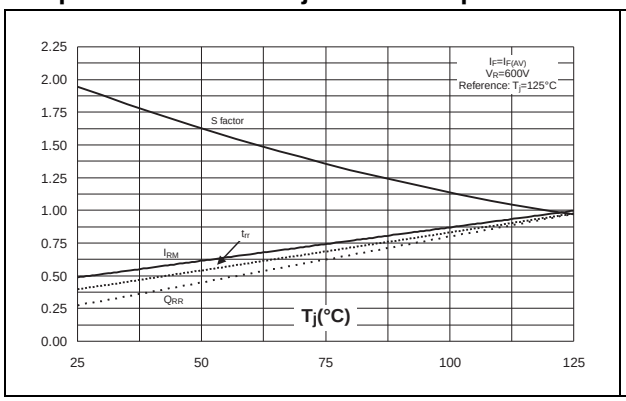


Figure 10. Transient peak forward voltage versus dI_F/dt (typical values)

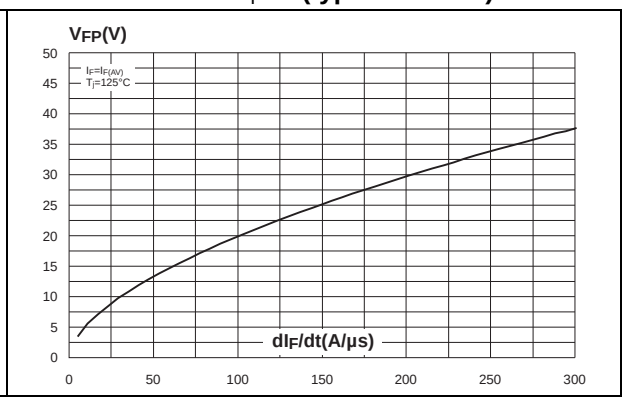


Figure 11. Forward recovery time versus dI_F/dt (typical values)

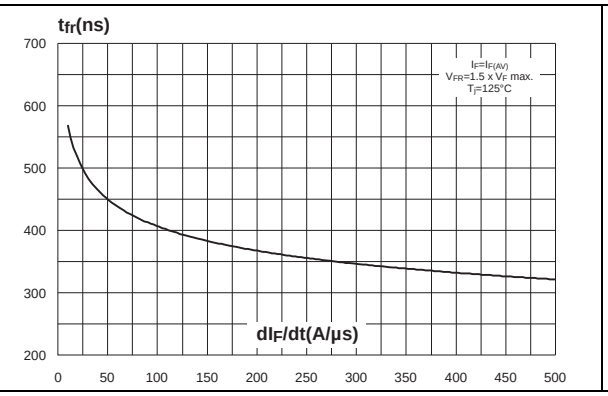


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

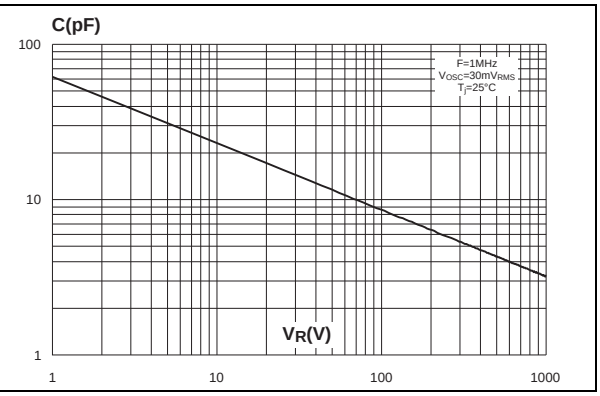
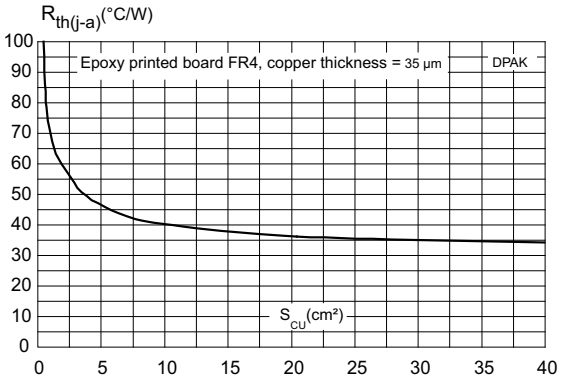


Figure 13. Thermal resistance junction to ambient versus copper surface under tab



2 Package information

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

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

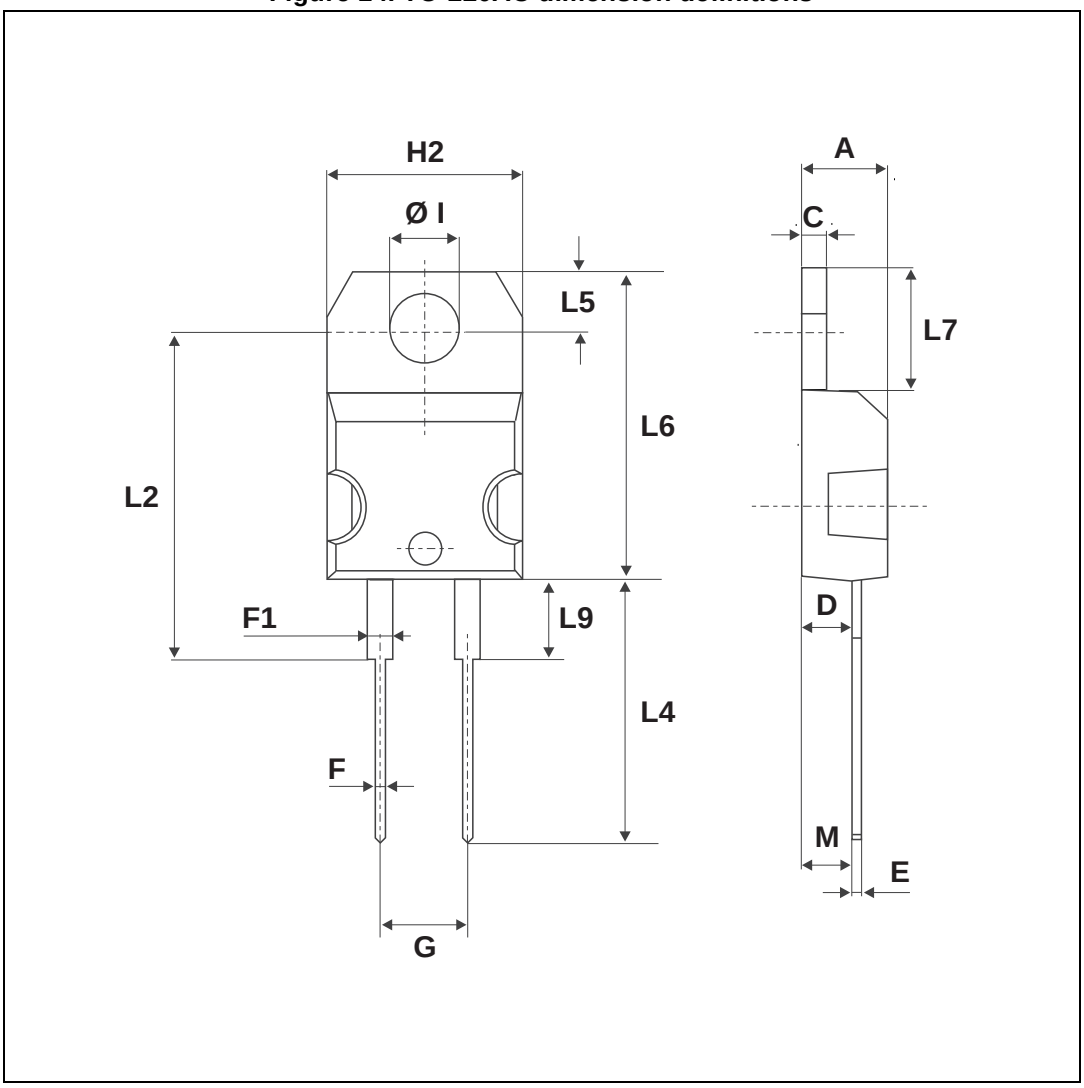


Table 6. TO-220AC dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	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

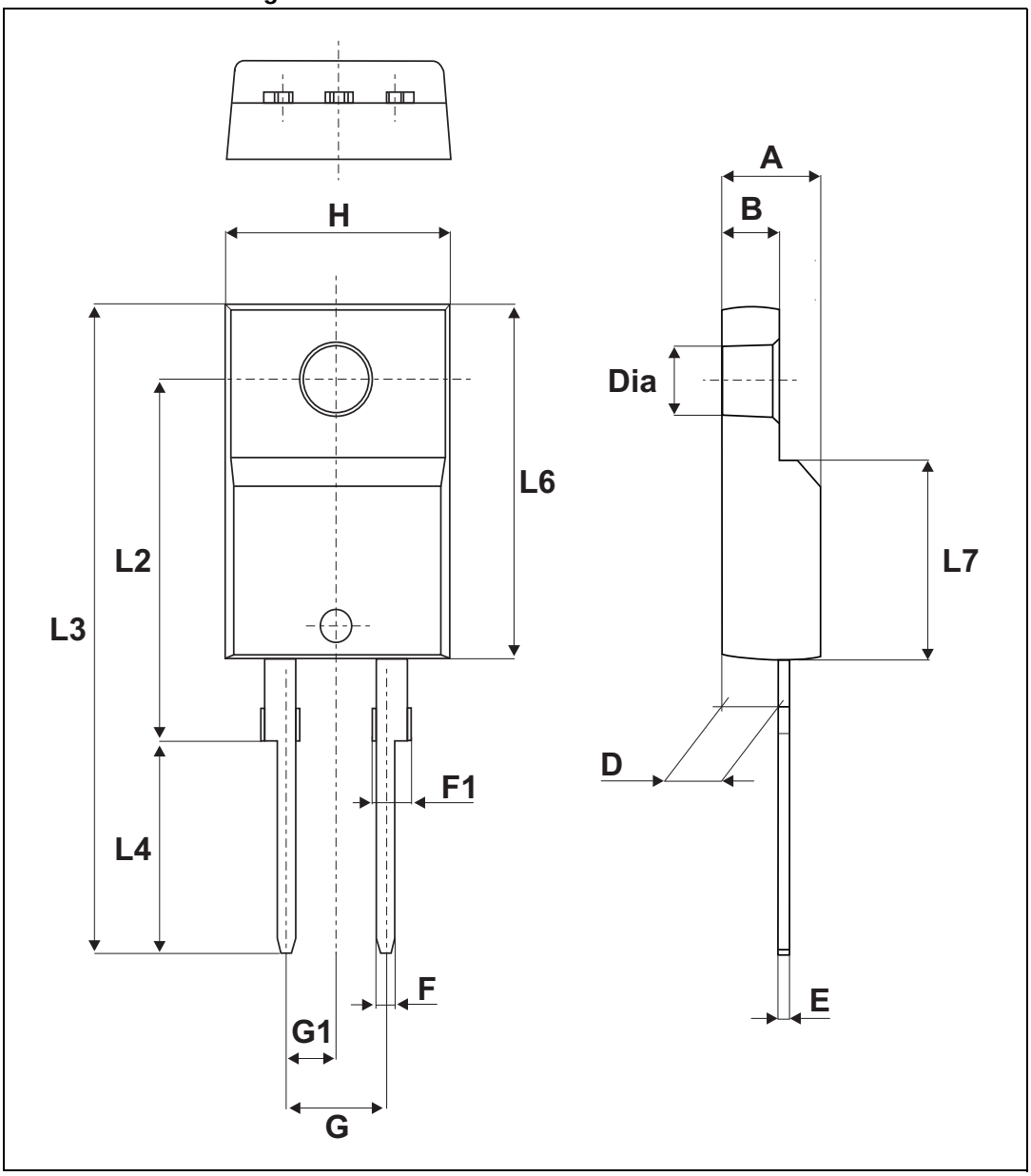
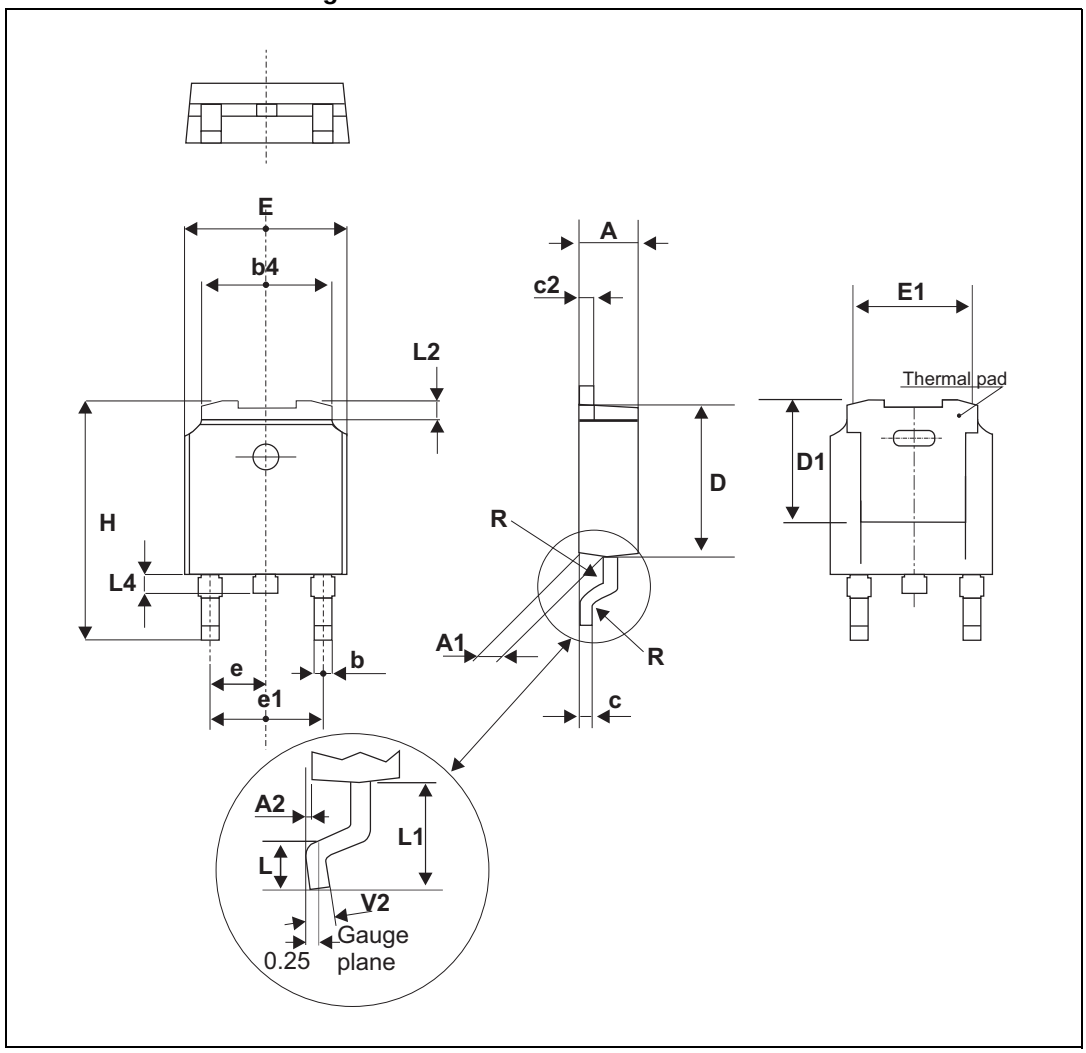


Table 7. TO-220FPAC dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	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
Dia.	3.00		3.20	0.118		0.126

Figure 16. DPAK dimension definitions

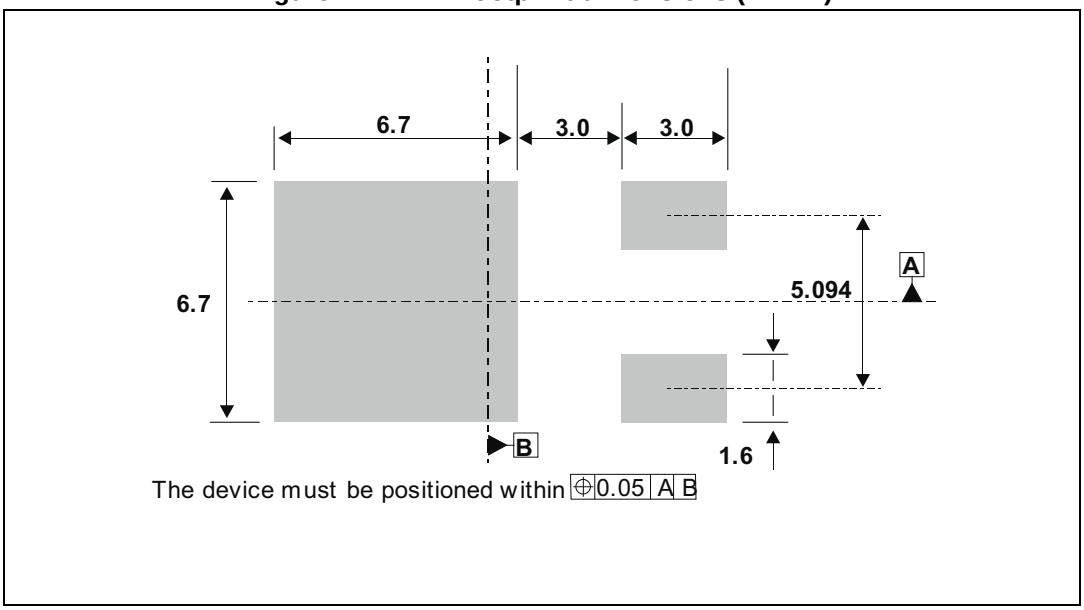


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 8. 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 17. DPAK footprint dimensions (in mm)



3 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH512D	STTH512D	TO-220AC	1.86 g	50	Tube
STTH512FP	STTH512FP	TO-220FPAC	1.9 g	50	Tube
STTH512B-TR	STTH512B	DPAK	0.32 g	2500	Tape and reel

4 Revision history

Table 10. Document revision history

Date	Revision	Changes
02-Mar-2006	1	First issue.
26-Nov-2014	2	Updated DPAK package information and reformatted to current standard.