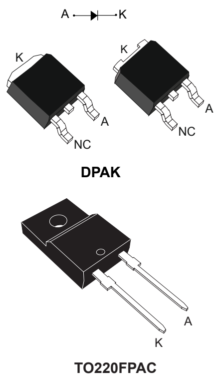
STTH25M06

Datasheet

600 V, 25 A ultrafast high voltage diode



Features

- Ultrafast recovery, soft recovery
- Low power losses at high switching frequency operations
- Low leakage current
- High junction temperature
- High overcurrent capability
- ECOPACK2 compliant

Applications

- PFC
- Boost diode
- LLC clamping diode

Description

The STTH25M06 is an ultrafast recovery power rectifier especially suited for boost or LLC clamping circuits working at high switching frequencies in heavy duty applications such as air conditioning equipment or telecom power supplies.

Designed with the latest ST's ultrafast technology, this 600 V 25 A diode in DPAK and TO-220FPAC has a robust behavior against electrostatic discharge and high overcurrent capability.

Product status
STTH25M06

Product summary	
Symbol	Value
$I_{F(AV)}$	25 A
V_{RRM}	600 V
$t_{rr(typ.)}$	25 ns
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	1.6 V

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		600	V
$I_{F(AV)}$	Average forward current		25	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal	170	A
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Maximum operating junction temperature		+175	°C

Table 2. Thermal resistance parameter

Symbol	Parameter		Typ. value	Unit
$R_{th(j-c)}$	Junction to case	DPAK	0.5	°C/W
		TO-220FPAC	2.45	

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	V_R = 600 V	-		60	µA
		T_j = 125 °C		-	70	800	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 15 A	-	2.1		V
		T_j = 150 °C		-	1.3		
		T_j = 25 °C	I_F = 25 A	-	2.5	3.4	
		T_j = 150 °C		-	1.6	2.0	

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:

$P = 1.04 \times I_{F(AV)} + 0.0385 \times I_F{}^2{}_{(RMS)}$

For more information, please refer to the following application notes related to the power losses :

- AN604: Calculation of conduction losses in a power rectifier
- AN4058: Calculation of turn-off power losses generated by an ultrafast diode

Table 4. Dynamic electrical characteristics

Symbol	Parameters	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j = 25 °C	I_F = 1 A dI_F/dt = -50 A/µs V_R = 30 V	-		50	ns
			I_F = 1 A dI_F/dt = -100 A/µs V_R = 30 V	-	25	35	
		T_j = 125 °C	I_F = 15 A dI_F/dt = -200 A/µs V_R = 400 V	-	55		
			I_F = 25 A dI_F/dt = -200 A/µs V_R = 400 V	-	60		
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 25 A dI_F/dt = -200 A/µs V_R = 400 V	-	7		A
Q_{rr}	Reverse recovery charge			-	250		nC

1.1 Characteristics (curves)

Figure 1. Average forward power dissipation versus average forward current (square waveform)

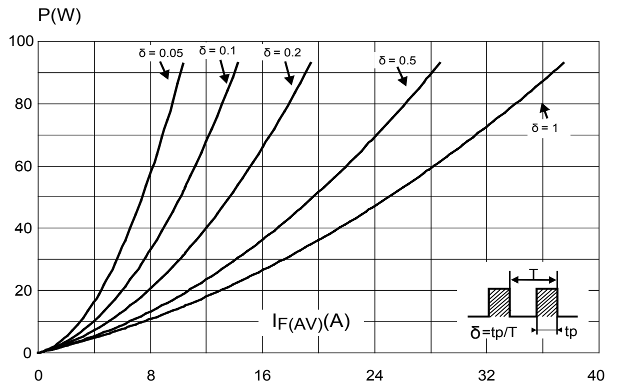


Figure 2. Forward voltage drop versus forward current (typical values)

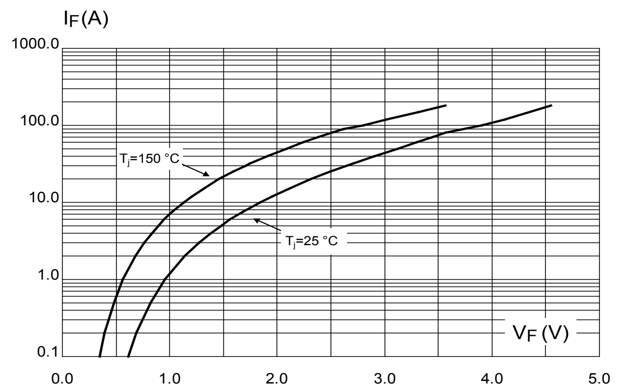


Figure 3. Forward voltage drop versus forward current (maximum values)

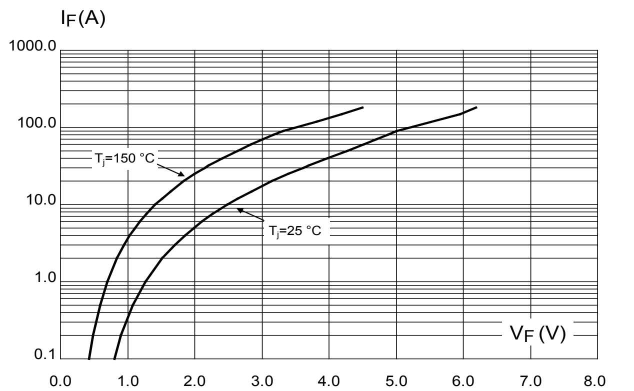


Figure 4. Relative variation of thermal impedance, junction to case versus pulse duration (DPAK)

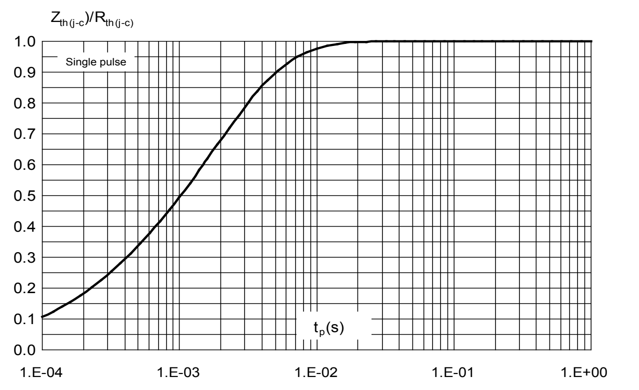


Figure 5. Relative variation of thermal impedance, junction to case versus pulse duration (TO-220FPAC)

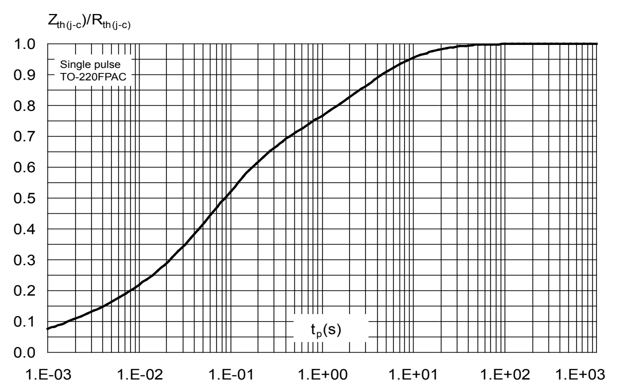


Figure 6. Peak reverse recovery current versus dI_F/dt (typical values)

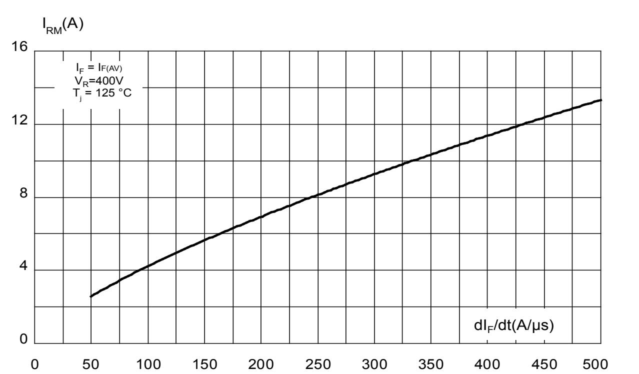


Figure 7. Reverse recovery time versus dI_F/dt (typical values)

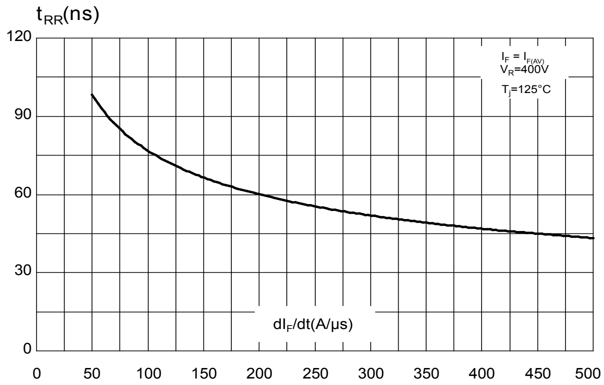


Figure 8. Reverse recovery charges versus dI_F/dt (typical values)

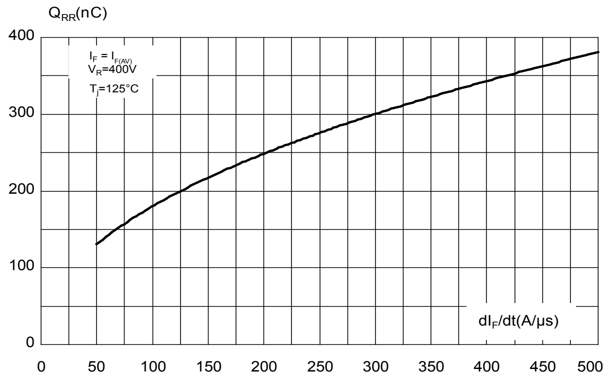


Figure 9. Reverse recovery softness factor versus dI_F/dt (typical values)

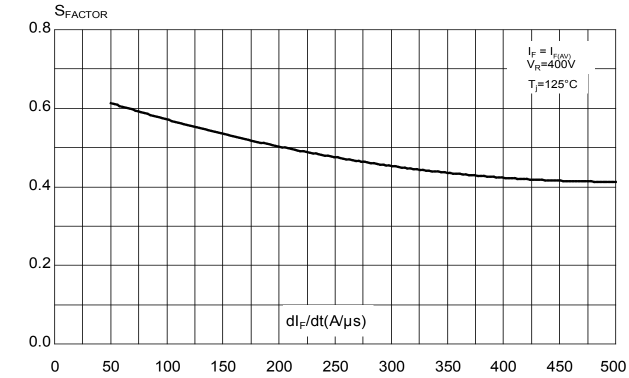


Figure 10. Relative variations of dynamic parameters versus junction temperature

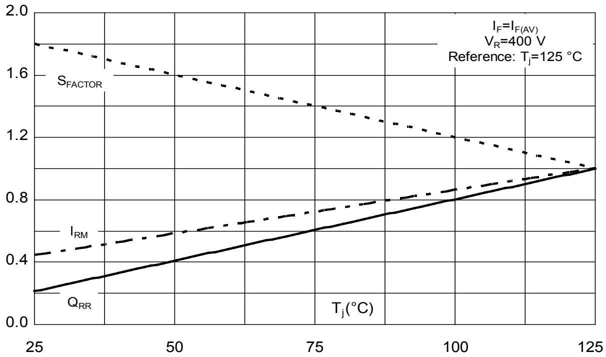


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

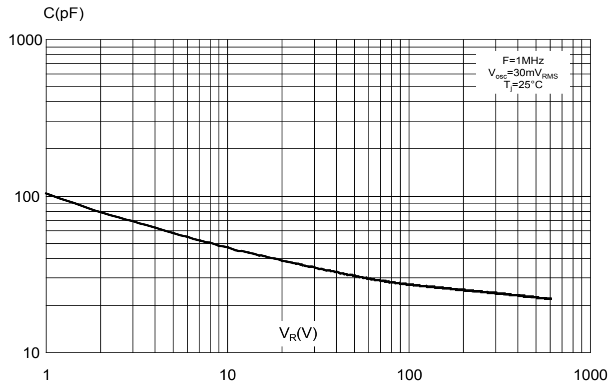


Figure 12. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, e_{Cu} = 70 µm)

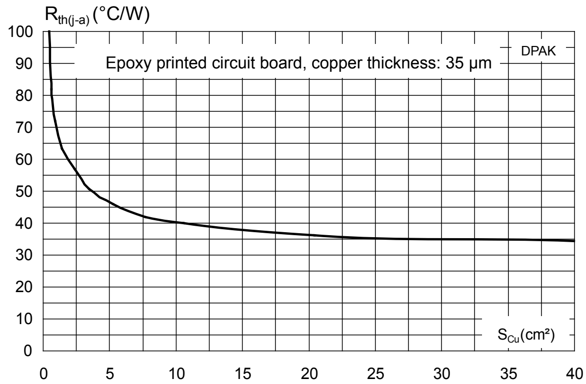


Figure 13. Relative variation of non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

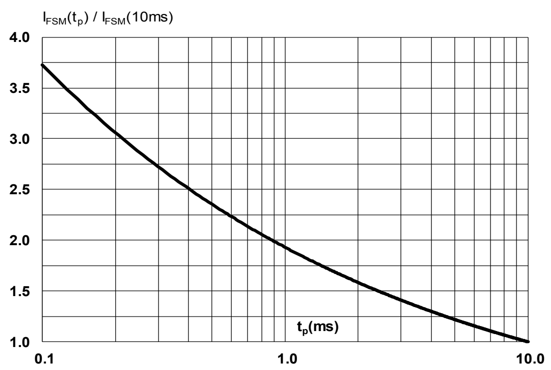
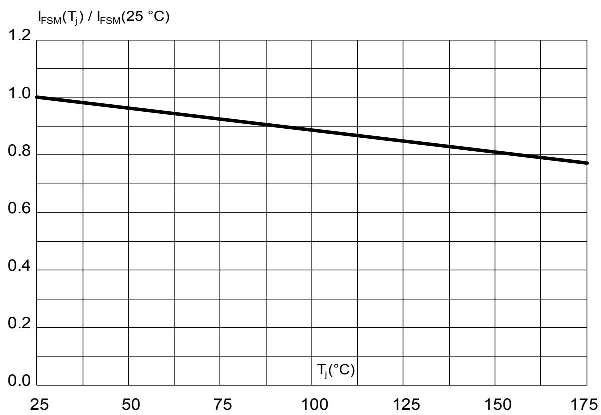


Figure 14. Relative variation of non-repetitive peak surge forward current versus initial junction temperature (sinusoidal waveform)



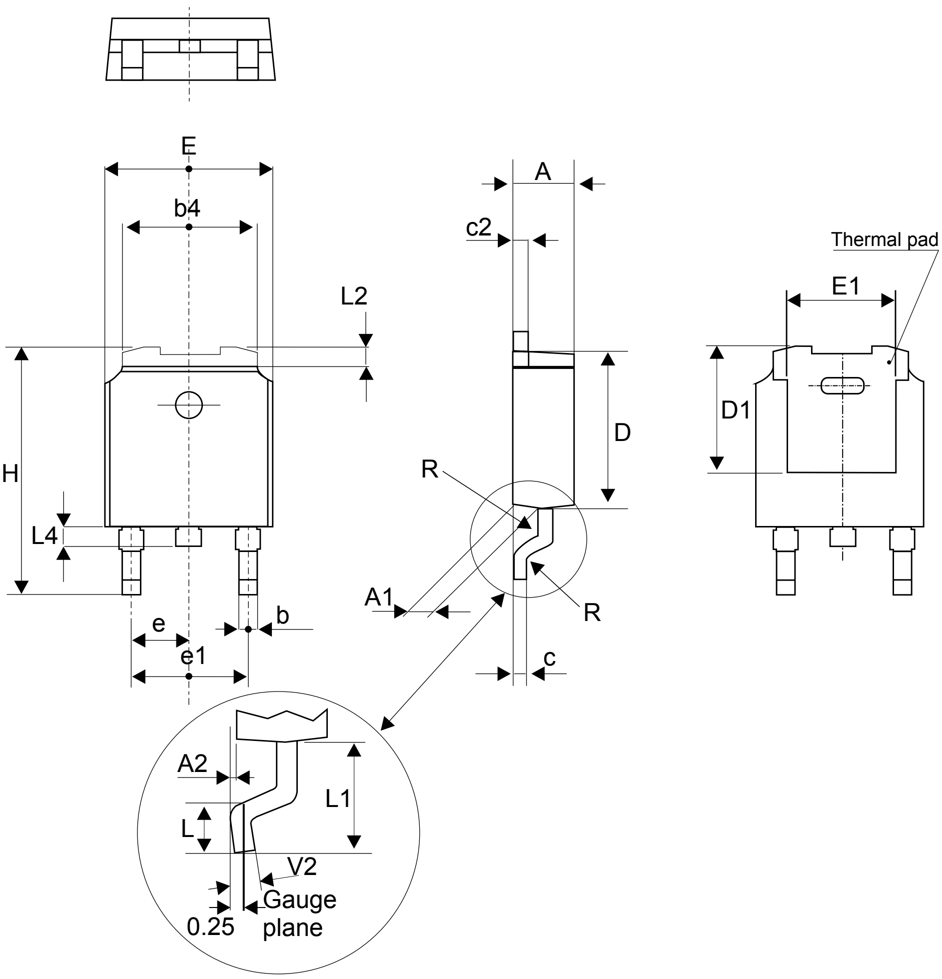
2 Package information

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.

2.1 DPAK package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)

Figure 15. DPAK package outline

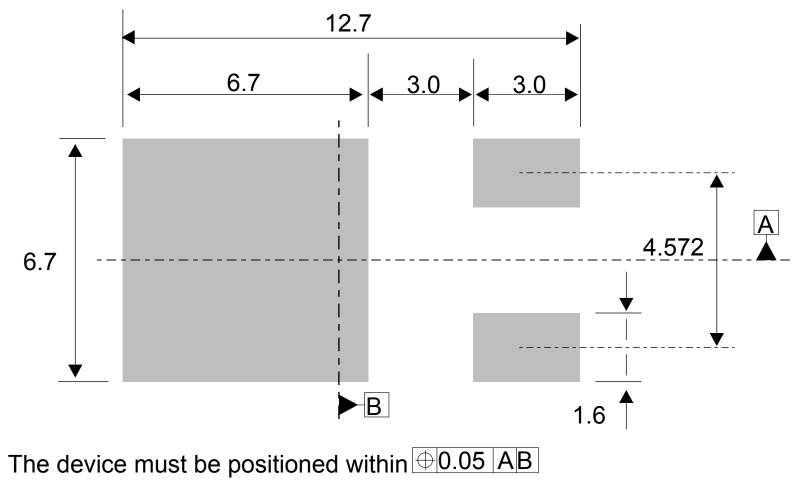


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. DPAK package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	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 16. DPAK recommended footprint (dimensions in mm)



2.2 TO-220FPAC package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 17. TO-220FPAC package outline

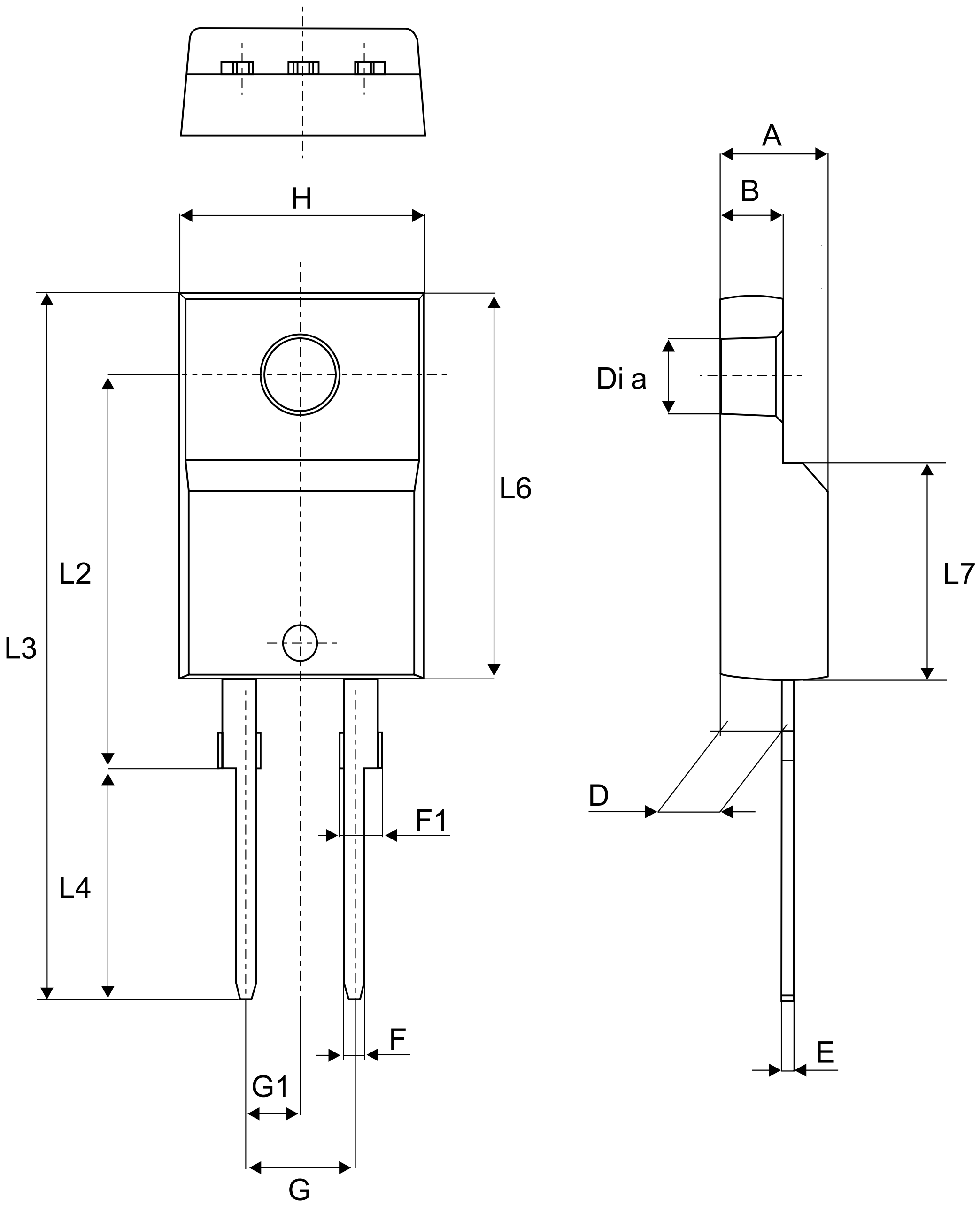


Table 6. TO-220FPAC package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A	4.40	4.60	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

3 Ordering information

Table 7. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH25M06B-TR	TH25 M06B	DPAK	0.32 g	2500	Tape and reel
STTH25M06FP	STTH25M06FP	TO-220FPAC	1.90 g	50	Tube

Revision history

Table 8. **Document revision history**

Date	Revision	Changes
09-Dec-2019	1	Initial release.
10-Feb-2020	2	Added TO-220FPAC package information.