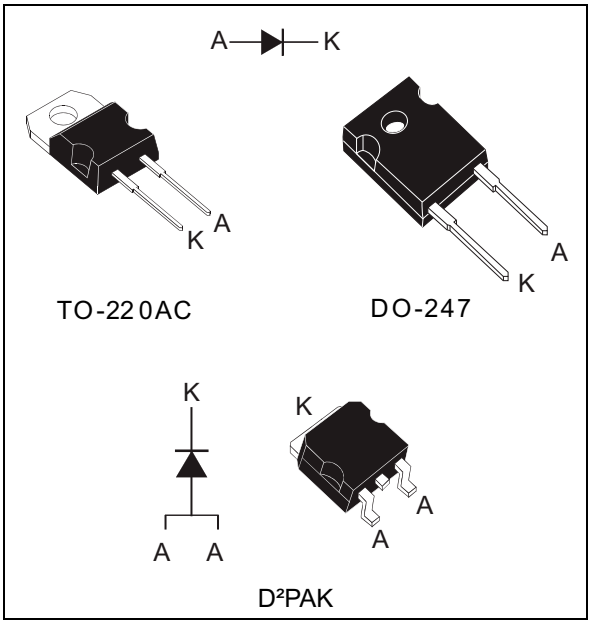
STTH30R04

Ultrafast recovery diode

Datasheet - production data



Description

The compromise-free, 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.

Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	30 A
V_{RRM}	400 V
$T_{j\ (max)}$	175° C
$V_{F\ (typ)}$	0.97 V
$t_{rr\ (typ)}$	24 ns

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- High junction temperature
- ECOPACK®2 compliant component

1 Characteristics

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

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			400	V
$I_{F(RMS)}$	RMS forward current			50	A
$I_{F(AV)}$	Average forward current, δ = 0.5	TO-220AC / DO-247 / D²PAK	T_c = 120 °C	30	A
I_{FRM}	Repetitive peak forward current	t_p = 10 ms, F = 1 KHz		500	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		300	A
T_{stg}	Storage temperature range			-65 to +175	° C
T_j	Operating junction temperature range			-40 to +175	° C

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / DO-247 / D²PAK	1.15	°C/W

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
I_R(1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			15	µA
		T_j = 100° C			3	30	
		T_j = 125° C			15	150	
V_F(2)	Forward voltage drop	T_j = 25° C	I_F = 15 A			1.26	V
		T_j = 150° C			0.8	1.0	
		T_j = 25° C	I_F = 30 A			1.45	
		T_j = 100° C				1.3	
		T_j = 150° C			0.97	1.2	

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:
$P = 0.9 \times I_{F(AV)} + 0.01 \times I_F{}^2{}_{(RMS)}$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -200 A/µs, V_R = 30 V, T_j = 25° C		24	35	ns
		I_F = 1 A, dI_F/dt = -15 A/µs, V_R = 30 V, T_j = 25° C		78	100	
		I_F = 1 A, I_R = 1 A, I_{RR} = 0.25 A, T_j = 25° C			50	
I_{RM}	Reverse recovery current	I_F = 30 A, dI_F/dt = -200 A/µs, V_R = 320 V, T_j = 125° C		10	14	A
t_{fr}	Forward recovery time	I_F = 30 A, dI_F/dt = 100 A/µs, V_{FR} = 1.1 x V_{Fmax}, T_j = 25° C			500	ns
V_{FP}	Forward recovery voltage	I_F = 30 A, dI_F/dt = 100 A/µs, V_{FR} = 1.1 x V_{Fmax}, T_j = 25° C		2.9		V

Figure 1. Conduction losses versus average current

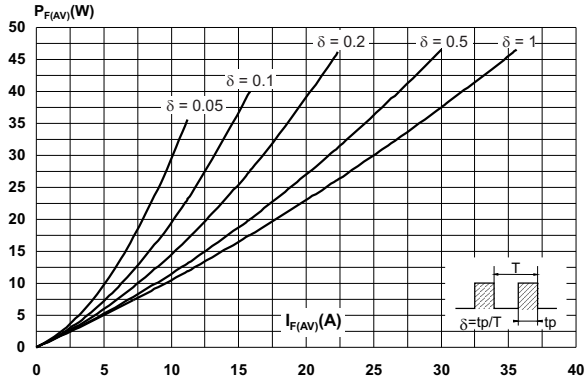


Figure 2. Forward voltage drop versus forward current

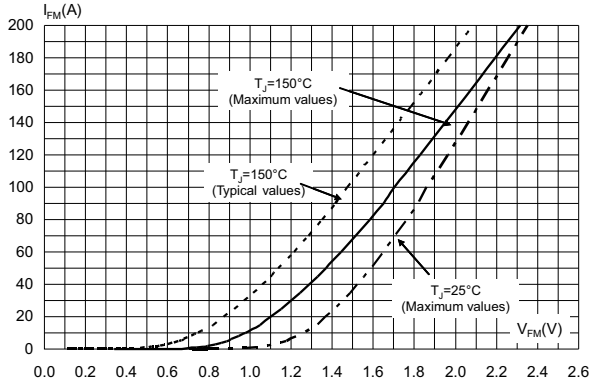


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

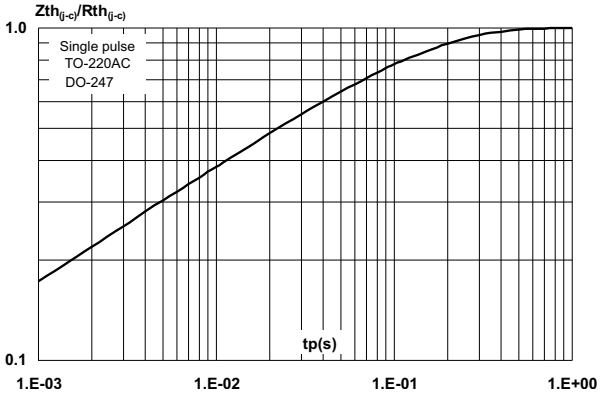


Figure 4. Peak reverse recovery current versus dI_F/dt (typical values)

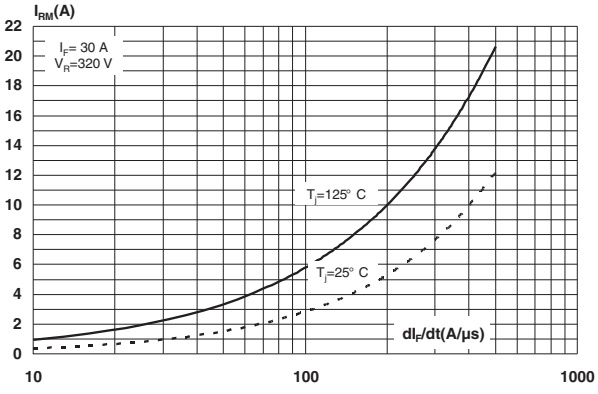


Figure 5. Reverse recovery time versus dI_F/dt (typical values)

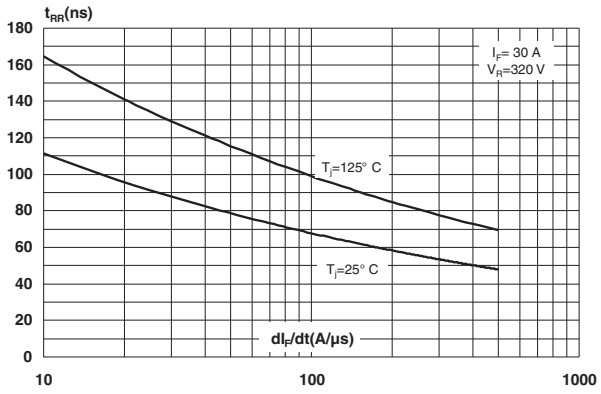


Figure 6. Reverse recovery charges versus dI_F/dt (typical values)

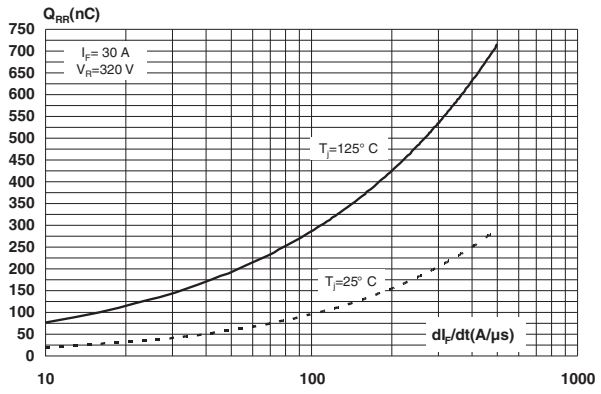


Figure 7. Relative variations of dynamic parameters versus junction temperature

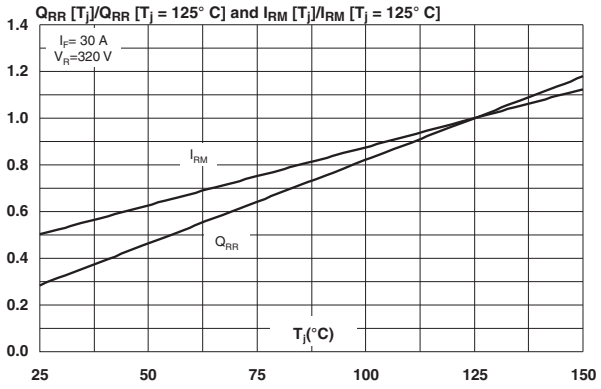


Figure 8. Transient peak forward voltage versus dI_F/dt (typical values)

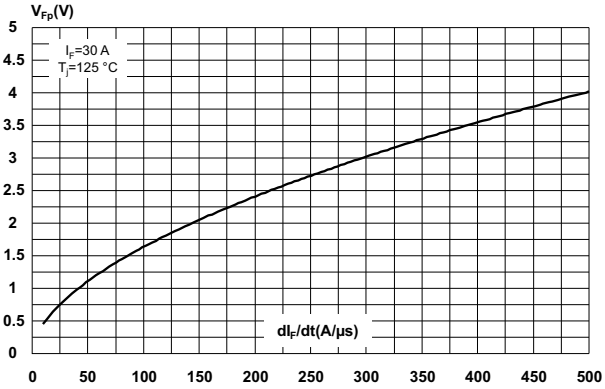


Figure 9. Forward recovery time versus dI_F/dt (typical values)

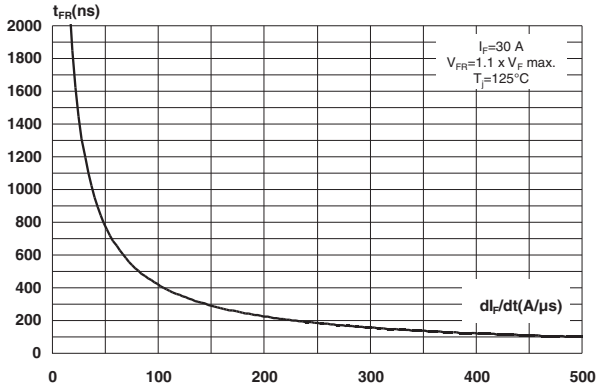


Figure 10. Junction capacitance versus reverse voltage applied (typical values)

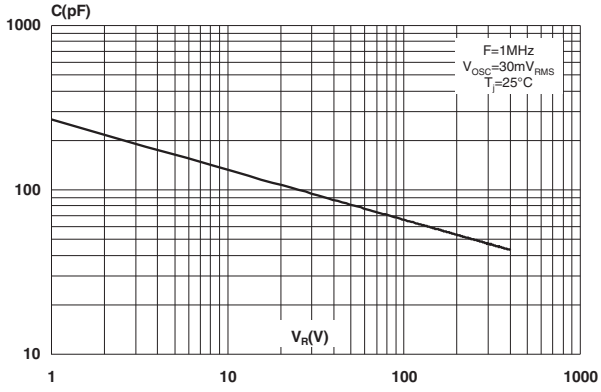
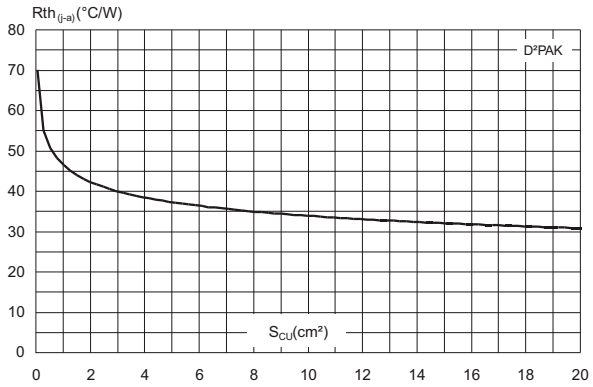


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (D²PAK)



2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m (TO-220AC)
- Maximum torque value: 0.7 N·m (TO-220AC)

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 D²PAK package information

Figure 12. D²PAK package outline

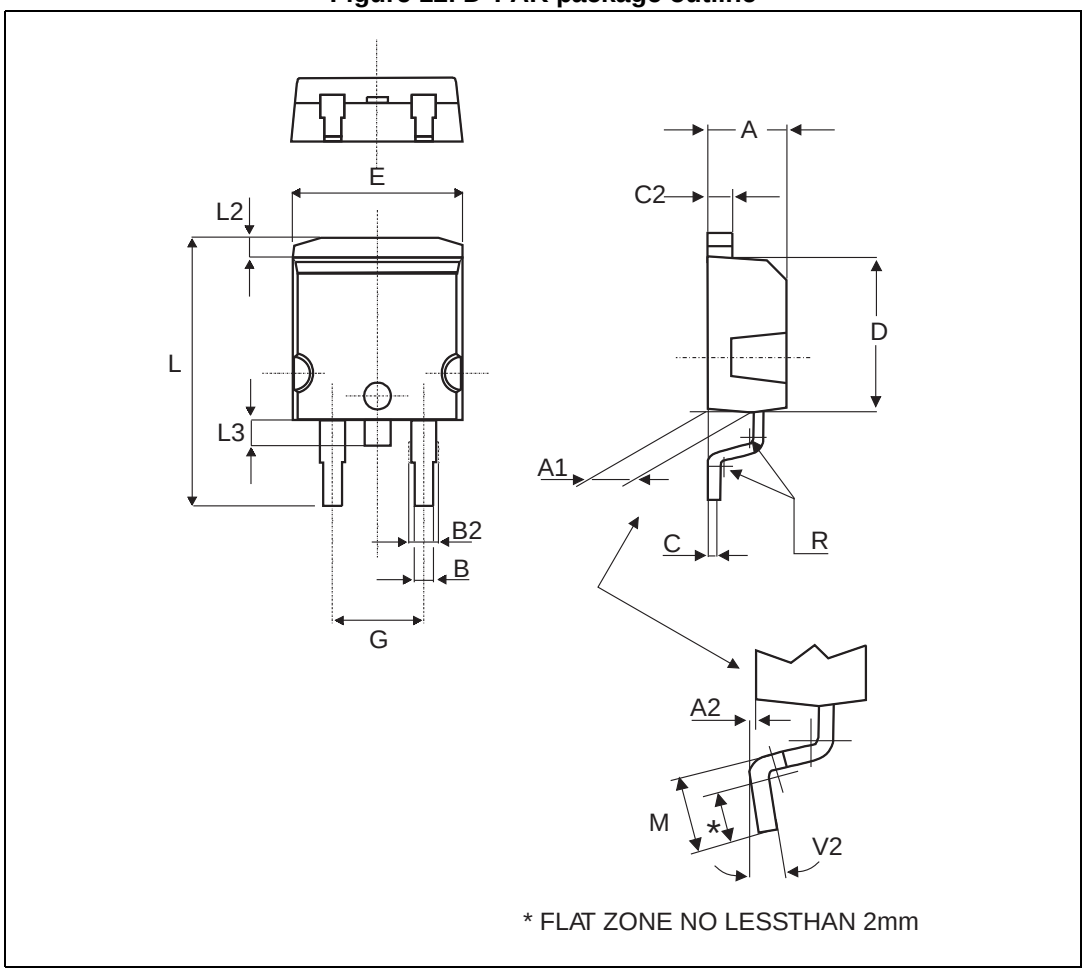
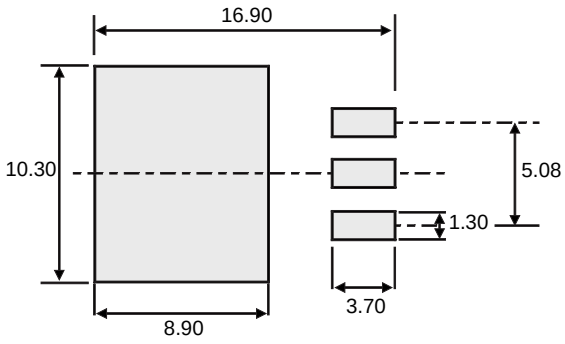


Table 6. D^2PAK package mechanical data

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	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 13. Footprint (dimensions in mm)



2.2 DO-247 package information

Figure 14. DO-247 package outline

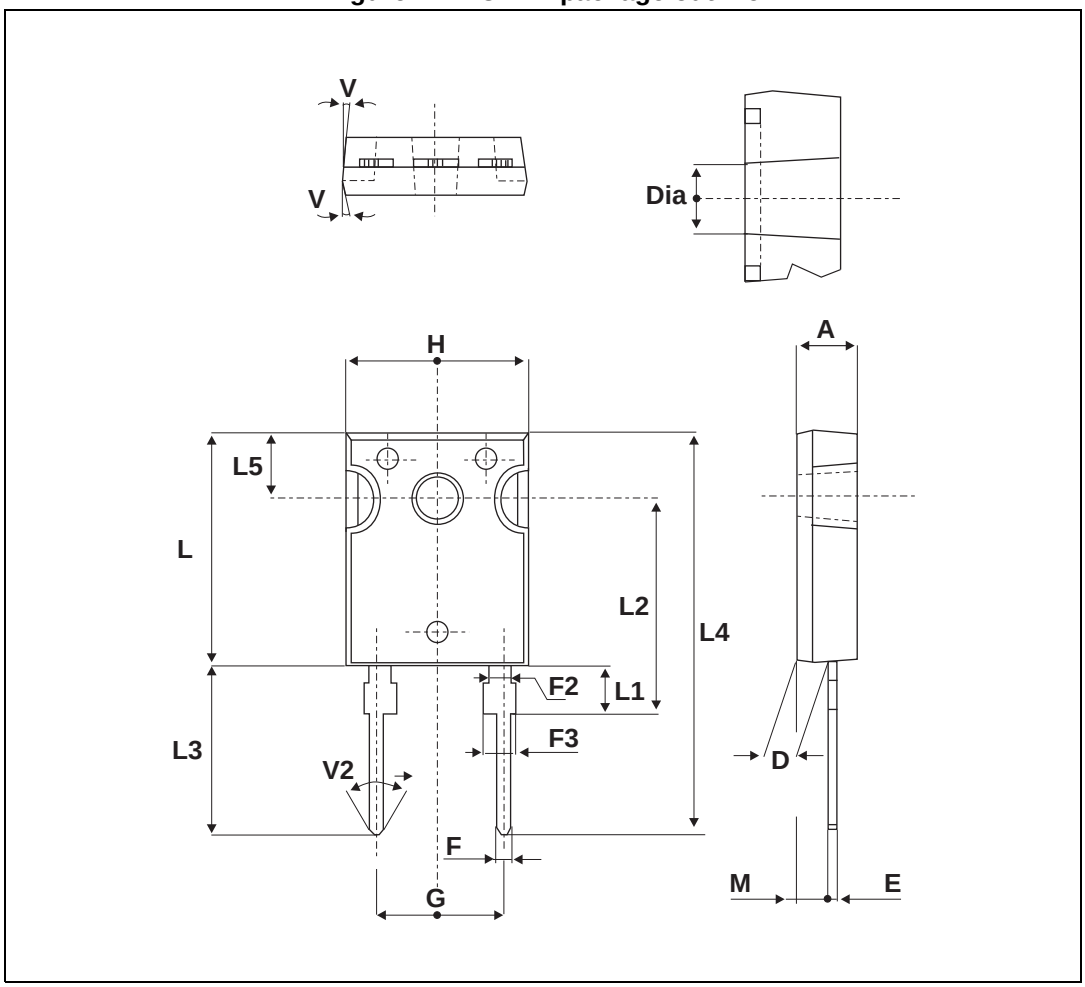


Table 7. DO-247 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
L4		34.60			1.362	
L5		5.50			0.216	
M	2.00		3.00	0.078		0.118
V		5°			5°	
V2		60°			60°	
Dia.	3.55		3.65	0.139		0.143

2.3 TO-220AC package information

Figure 15. TO-220AC package outline

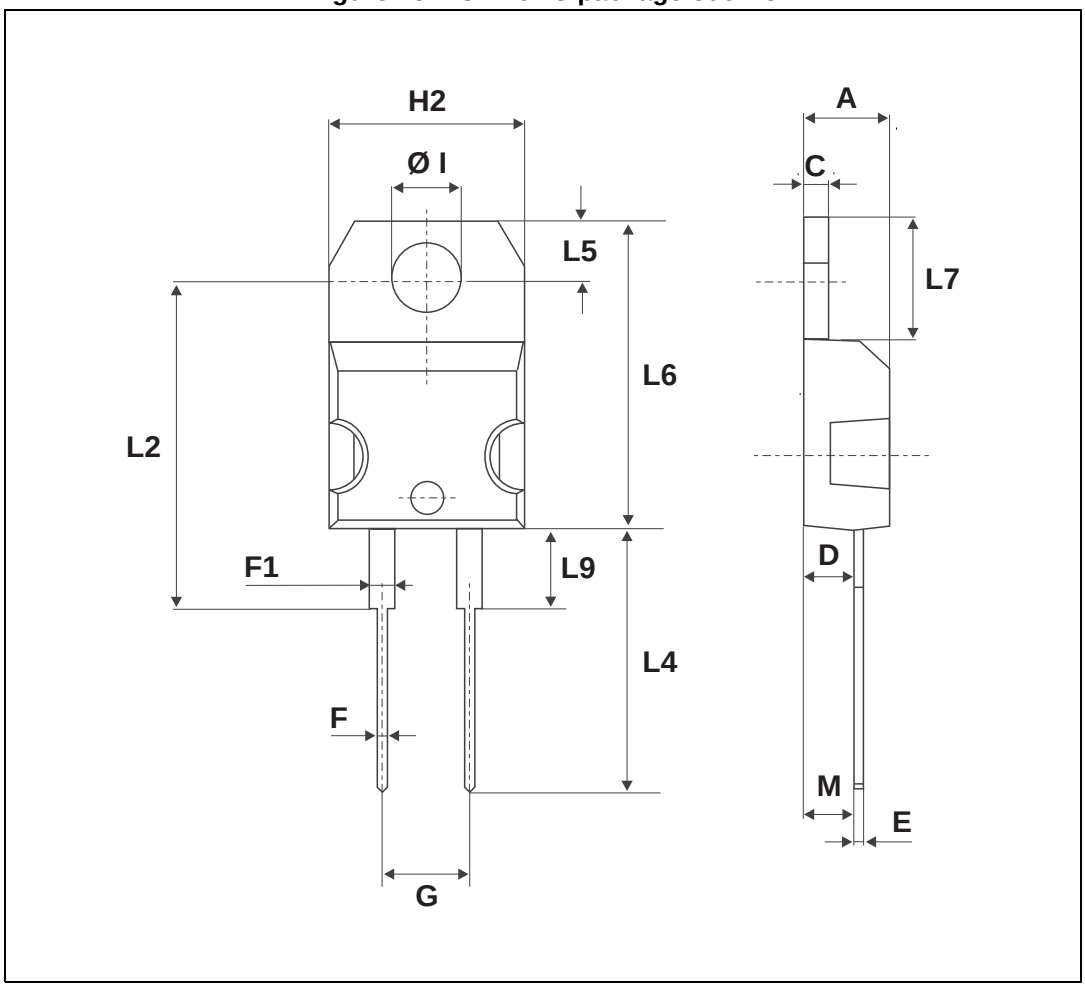


Table 8. TO-220AC package mechanical data

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		16.4			0.645	
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			0.102	
Diam. I	3.75		3.85	0.147		0.151

3 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH30R04D	STTH30R04D	TO-220AC	1.86 g	50	Tube
STTH30R04G	STTH30R04G	D²PAK	1.48 g	50	Tube
STTH30R04G-TR	STTH30R04G	D²PAK	1.48 g	1000	Tape and reel
STTH30R04W	STTH30R04W	DO-247	4.40 g	30	Tube

4 Revision history

Table 10. Document revision history

Date	Revision	Description of changes
31-Mar-2007	1	First issue.
11-Dec-2015	2	Updated *Table 4* and reformatted to current standard. Removed DOP3I package information.