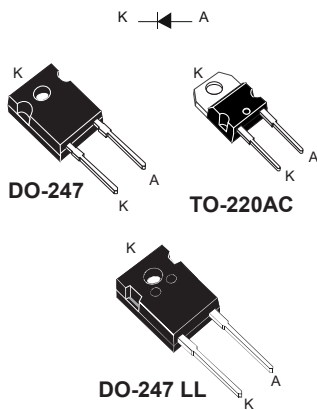


## 1200 V, 30 A ultrafast high voltage diode



## Features

- Ultrafast, soft recovery
- Low leakage current
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature capability
- ECOPACK2 compliant

## Applications

- AC-DC converter
- DC-DC stage in power supply
- DC-AC converter
- Solar inverters
- EV charging station
- Telecom power supply
- UPS

## 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.

## Product status link

[STTH3012](#)

## Product summary

$I_F(AV)$	30 A
$V_{RRM}$	1200 V
$V_F(\text{typ.})$	1.30 V
$t_{rr}(\text{typ.})$	48 ns
$T_j(\text{max.})$	175 °C

# 1 Characteristics

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

Symbol	Parameter		Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage		1200	V	
$I_{F(RMS)}$	Forward rms current		50	A	
$I_{F(AV)}$	Average forward current	DO-247	$T_C = 140\text{ °C}$ , $\delta = 0.5$ square	30	A
		DO-247 LL	$T_C = 135\text{ °C}$ , $\delta = 0.5$ square		
		TO-220AC	$T_C = 130\text{ °C}$ , $\delta = 0.5$ square		
$I_{FSM}$	Surge non repetitive forward current		$t_p = 10$ ms sinusoidal	210	A
$T_{stg}$	Storage temperature range		-65 to +175	°C	
$T_j$	Maximum operating junction temperature		175	°C	

**Table 2. Thermal parameters**

Symbol	Parameter		Typ.	Max.	Unit
$R_{th(j-c)}$	Junction to case	DO247	0.36	0.51	°C/W
		DO247-LL	0.37	0.53	
		TO-220AC	0.44	0.62	

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

- AN5088: Rectifiers thermal management, handling and mounting recommendation

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-		20	$\mu\text{A}$
		$T_j = 125\text{ °C}$		-	15	150	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 30\text{ A}$	-		2.25	V
		$T_j = 125\text{ °C}$		-	1.35	2.05	
		$T_j = 150\text{ °C}$		-	1.30	1.95	

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 1.60 \times I_{F(AV)} + 0.012 \times I_F^2 (RMS)$$

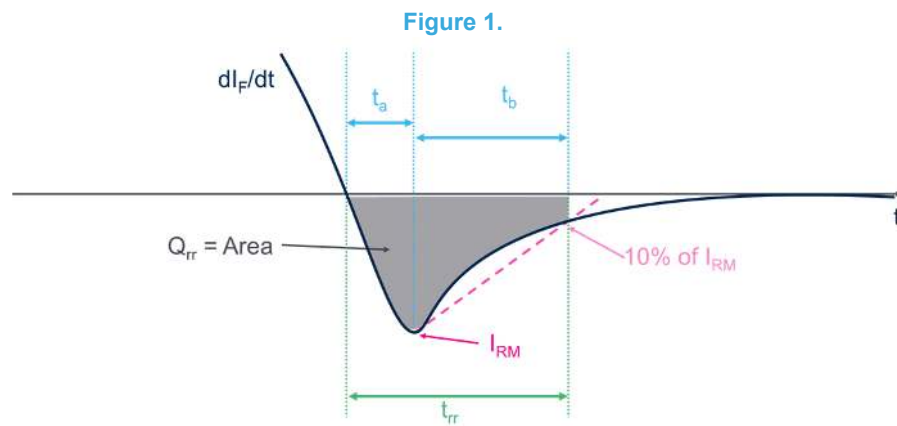
For more information, please refer to the following application notes related to the power losses:

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

**Table 4. Dynamic electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}^{(1)}$	Reverse recovery time	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}, V_R = 30\text{ V}, dI_F/dt = -50\text{ A}/\mu\text{s}$	-		115	ns
			$I_F = 1\text{ A}, V_R = 30\text{ V}, dI_F/dt = -100\text{ A}/\mu\text{s}$	-	57	80	
			$I_F = 1\text{ A}, V_R = 30\text{ V}, dI_F/dt = -200\text{ A}/\mu\text{s}$		48		
$I_{RM}^{(1)}$	Reverse recovery current	$T_J = 125\text{ }^\circ\text{C}$	$I_F = 30\text{ A}, V_R = 600\text{ V}, dI_F/dt = -200\text{ A}/\mu\text{s}$	-	25	35	A
$Q_{RR}^{(1)}$	Reverse recovery charge			-	5700		nC

1. Measurements taken at 10% of  $I_{RM}$ ,  $S = tb/ta$



## 1.1 Characteristics (curves)

Figure 2. Conduction losses versus average current

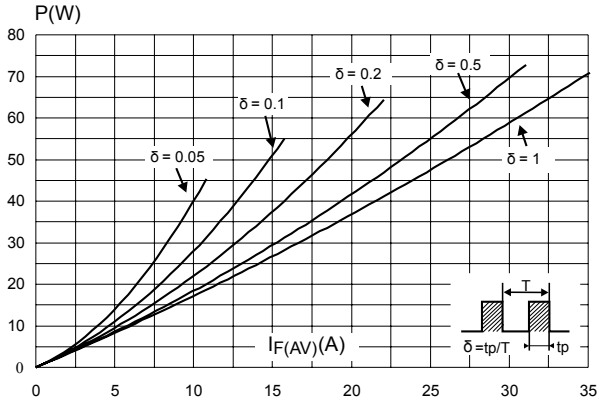


Figure 3. Forward voltage drop versus forward current

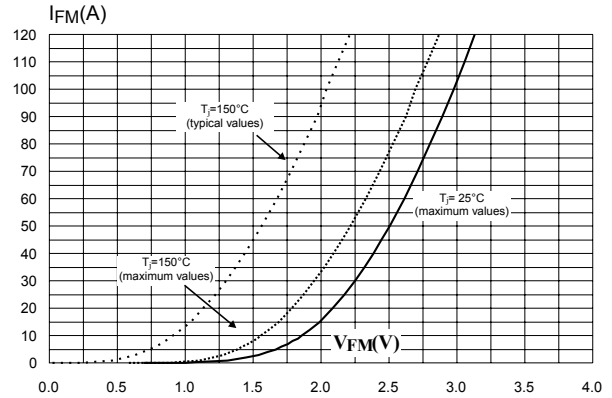


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

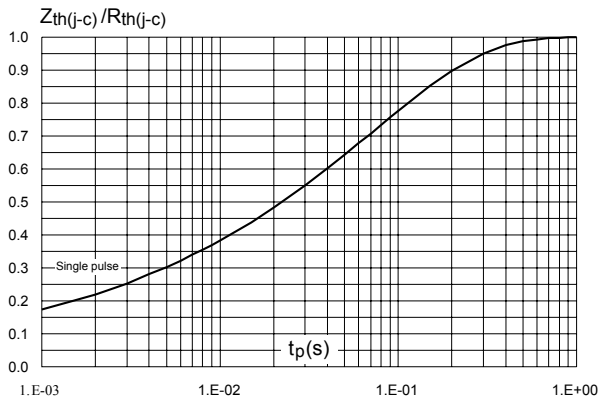


Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values)

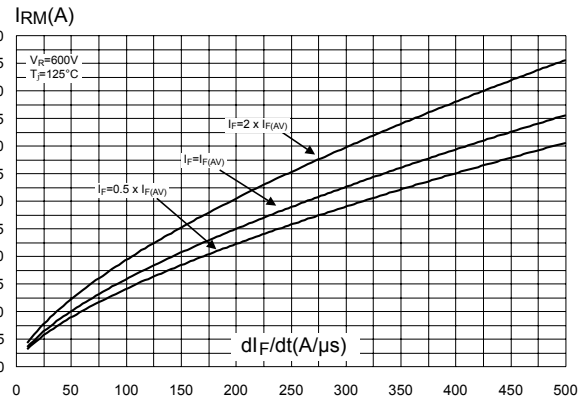


Figure 6. Reverse recovery time versus  $di_F/dt$  (typical values)

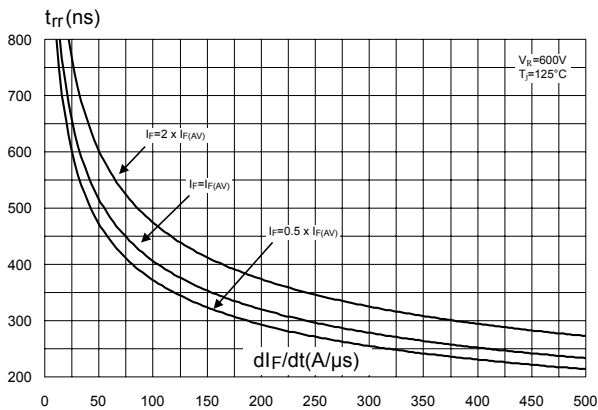


Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values)

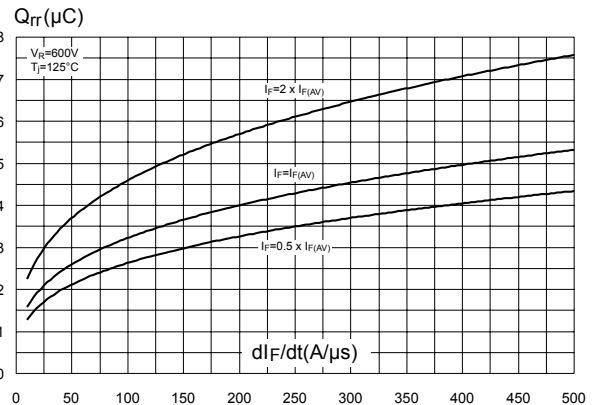


Figure 8. Softness factor versus  $di_F/dt$  (typical values)

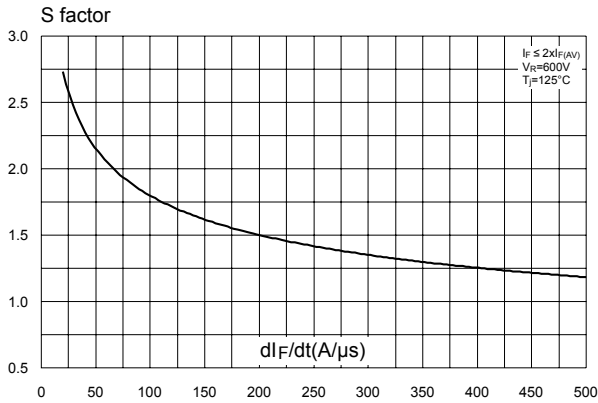


Figure 9. Relative variations of dynamic parameters versus junction temperature

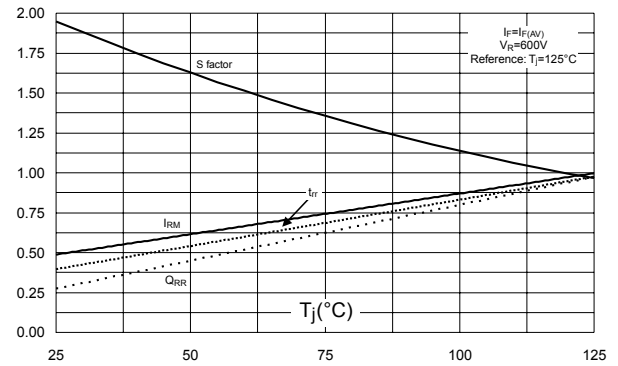


Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values)

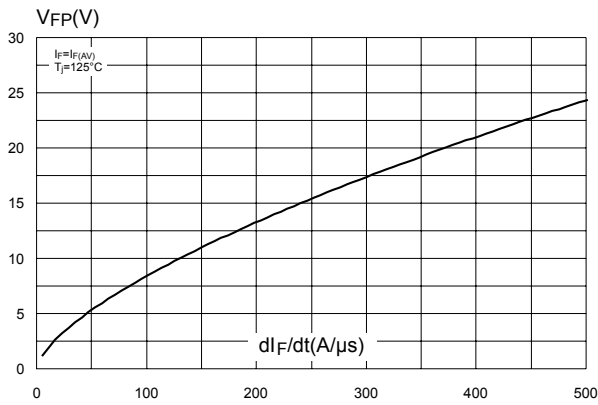


Figure 11. Forward recovery time versus  $di_F/dt$  (typical values)

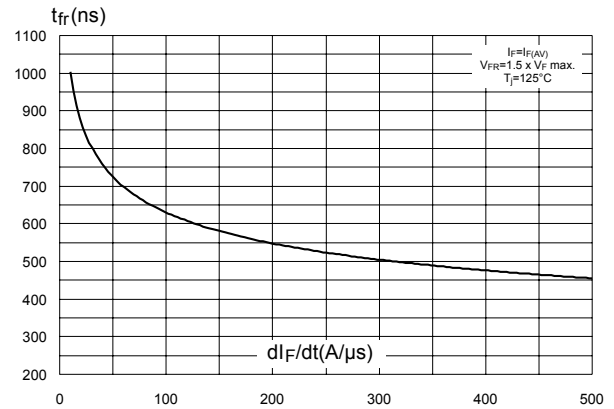
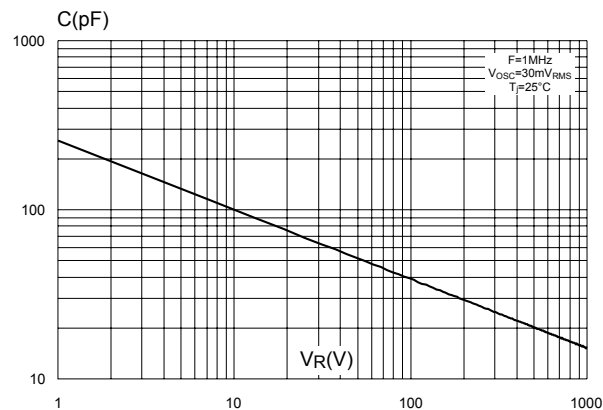


Figure 12. Junction capacitance versus reverse voltage applied (typical values)



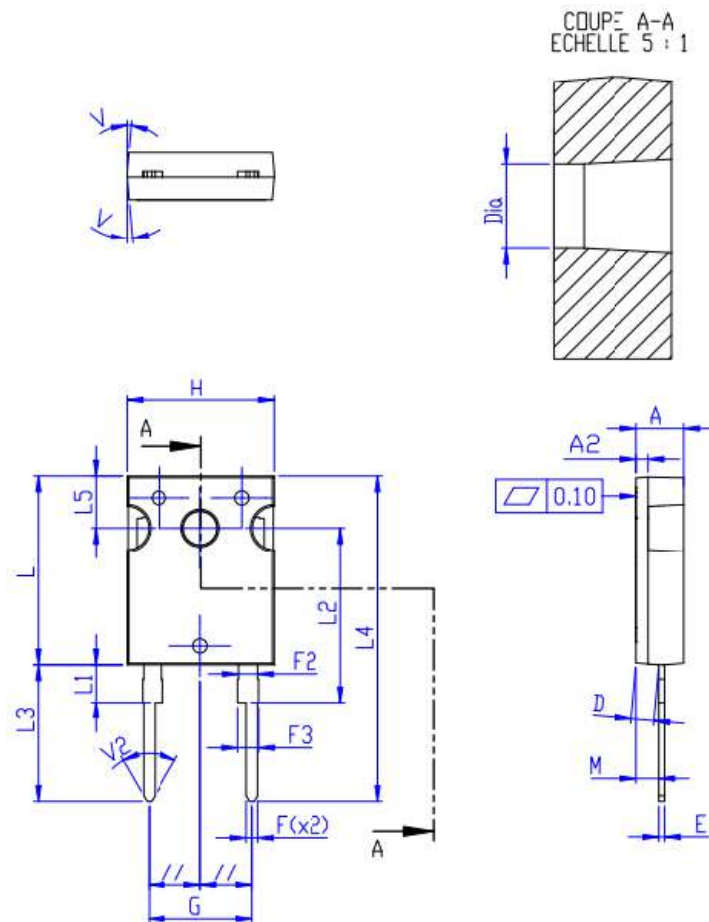
## 2 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 DO-247 package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

**Figure 13. DO-247 package outline**



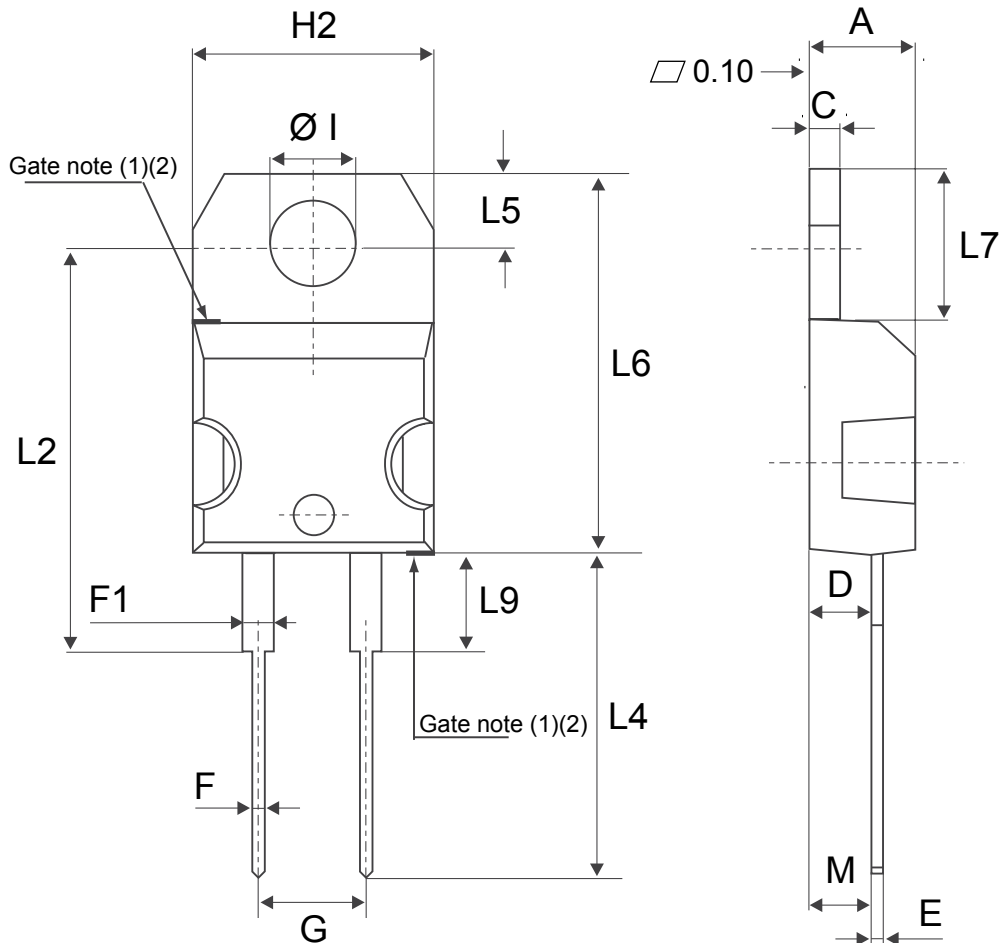
**Table 5. DO-247 package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.90		5.10	0.1920		0.2010
A2	1.17		1.37	0.0460		0.0540
D	2.2		2.6	0.0866		0.1023
E	0.4		0.8	0.0157		0.0314
F	1		1.4	0.0393		0.0551
F2		2			0.0787	
F3	2		2.4	0.0787		0.0944
G		10.9			0.4291	
H	15.45		15.75	0.6082		0.6200
L	19.85		20.15	0.7814		0.7933
L1	3.7		4.3	0.1456		0.1692
L2		18.5			0.7283	
L3	14.2		14.8	0.5590		0.5826
L4		34.6			1.3622	
L5		5.5			0.2165	
M	2		3	0.0787		0.1181
V		5°			5°	
V2		60°			60°	
Diam.	3.55		3.65	0.1397		0.1437

## 2.2 TO-220AC 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 14. TO-220AC package outline



(1) :Max resin gate protusion 0.5 mm

(2) :Resin gate position is accepted in each of the two positions shown on the drawings or their symmetrical



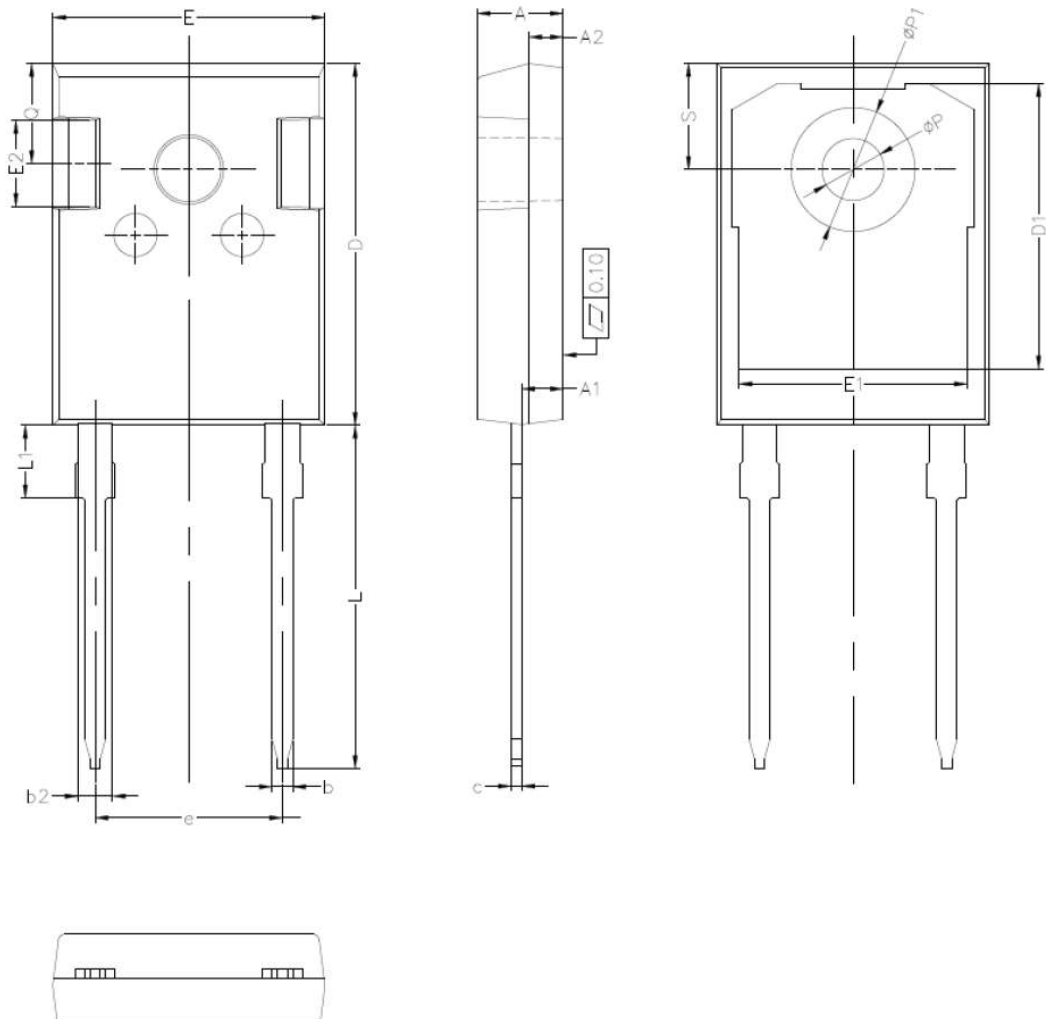
**Table 6. TO-220AC package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	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	2.60 typ.		0.102 typ.	
Diam	3.75	3.85	0.147	0.151

### 2.3 DO-247 LL package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

Figure 15. DO-247 LL package outline



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

**Table 7. DO-247 LL package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
c	0.38	0.89	0.015	0.035
D	20.80	21.46	0.819	0.845
D1	13.08		0.515	
E	15.49	16.26	0.610	0.640
e	10.88 typ.		0.428	
E1	13.06		0.514	
E2	3.43	5.10	0.135	0.200
L	19.80	20.32	0.779	0.800
L1		4.50		0.177
P	3.50	3.70	0.137	0.146
P1	7.00	7.40	0.275	0.292
Q	5.38	6.20	0.219	0.244
S	6.16 typ.		0.243	

### 3 Ordering information

**Table 8. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH3012D	STTH3012D	TO-220AC	1.86 g	50	Tube
STTH3012W	STTH3012W	DO-247	4.40 g	30	Tube
STTH3012WL	STTH3012WL	DO-247 LL	5.90 g	30	Tube

## Revision history

**Table 9. Document revision history**

Date	Revision	Changes
02-Mar-2006	1	First issue.
17-May-2022	2	Added DO-247-LL package information. Minor text changes.

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