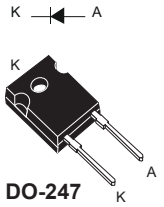
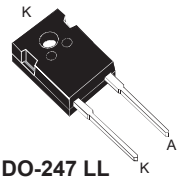
STTH6012

Datasheet

1200 V, 60 A ultrafast high voltage diode



DO-247



DO-247 LL

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
STTH6012

Product summary	
$I_{F(AV)}$	60 A
V_{RRM}	1200 V
V_F(typ.)	1.30 V
t_{rr}(typ.)	50 ns
T_j(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			80	A
$I_{F(AV)}$	Average forward current	DO-247	T_C = 135 °C, δ = 0.5 square	60	A
		DO-247 LL	T_C = 130 °C, δ = 0.5 square		
I_{FSM}	Surge non repetitive forward current		t_p = 10 ms sinusoidal	400	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	0.20	0.28	°C/W
		DO247-LL	0.22	0.31	

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 °C	$V_R = V_{RRM}$	-		30	µA
		T_j = 125 °C		-	30	300	
V_F (2)	Forward voltage drop	T_j = 25 °C	I_F = 60 A	-		2.25	V
		T_j = 125 °C		-	1.35	2.05	
		T_j = 150 °C		-	1.30	1.95	

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:

$P = 1.50 \times I_{F(AV)} + 0.0075 \times I_F{}^2{}_{(RMS)}$

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

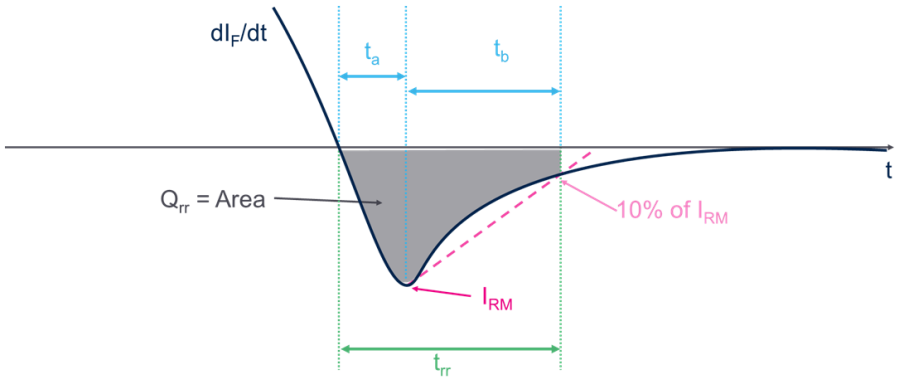
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

Table 4. Dynamic electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr} (1)	Reverse recovery time	T_j = 25 °C	I_F = 1 A, V_R = 30 V, dI_F/dt = -50 A/µs	-		125	ns
			I_F = 1 A, V_R = 30 V, dI_F/dt = -100 A/µs	-	63	85	
			I_F = 1 A, V_R = 30 V, dI_F/dt = -200 A/µs		50		
I_{RM} (1)	Reverse recovery current	T_j = 125 °C	I_F = 30 A, V_R = 600 V, dI_F/dt = -200 A/µs	-	32	45	A
Q_{RR} (1)	Reverse recovery charge			-	9700		nC

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

Figure 1.



1.1 Characteristics (curves)

Figure 2. Conduction losses versus average current

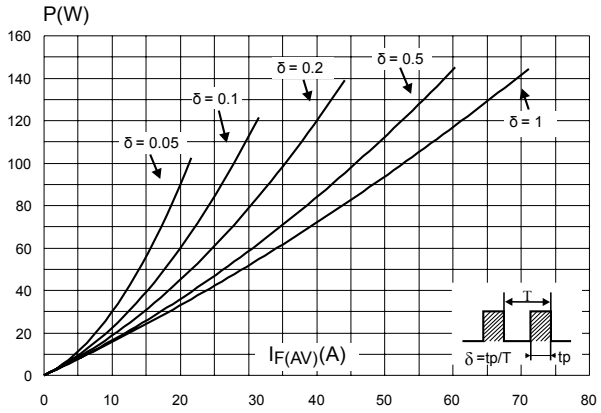


Figure 3. Forward voltage drop versus forward current

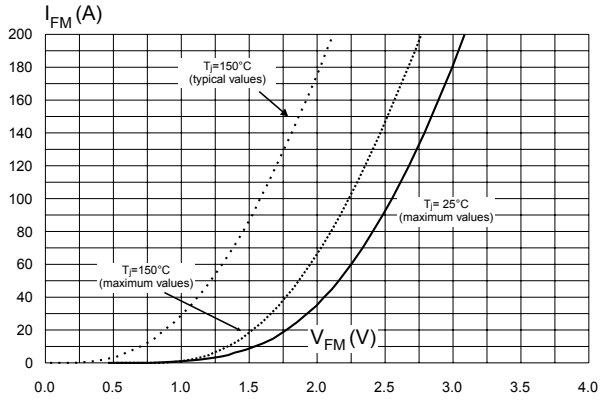


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

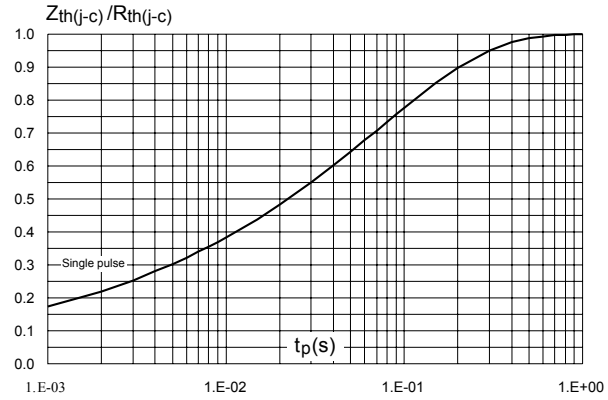


Figure 5. Peak reverse recovery current versus dI_F/dt (typical values)

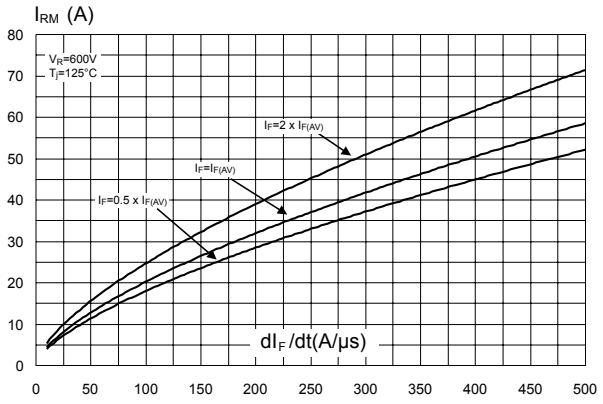


Figure 6. Reverse recovery time versus dI_F/dt (typical values)

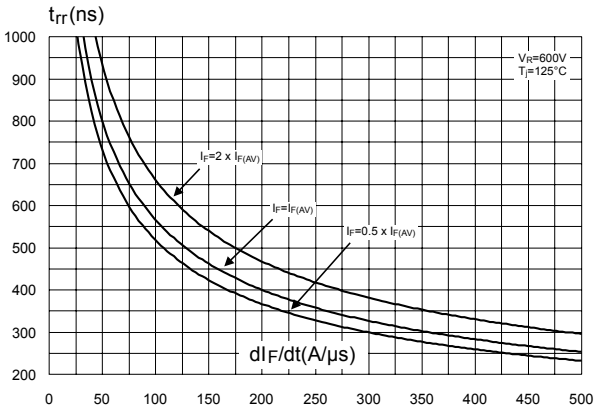


Figure 7. Reverse recovery charges versus dI_F/dt (typical values)

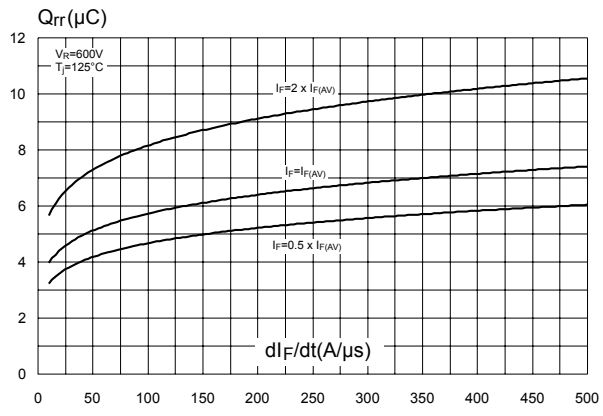


Figure 8. Softness factor versus dI_F/dt (typical values)

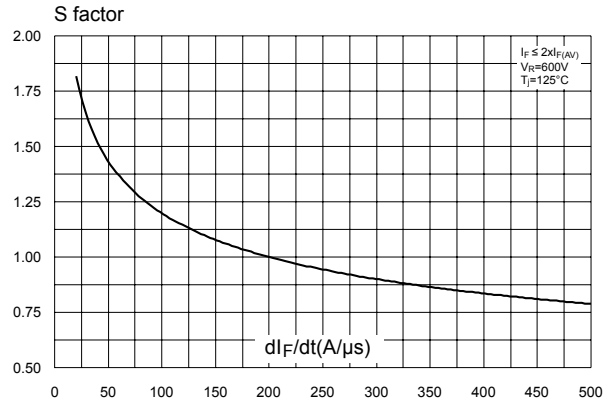


Figure 9. Relative variations of dynamic parameters versus junction temperature

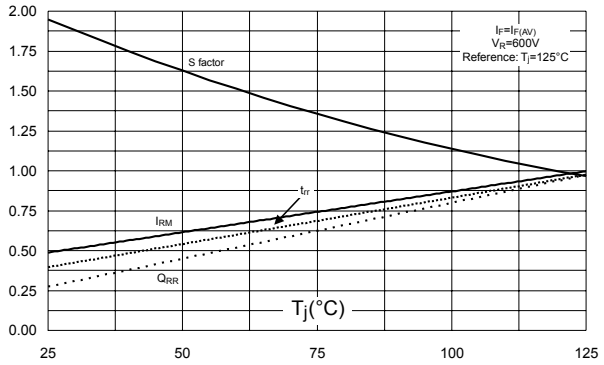


Figure 10. Transient peak forward voltage versus dI_F/dt (typical values)

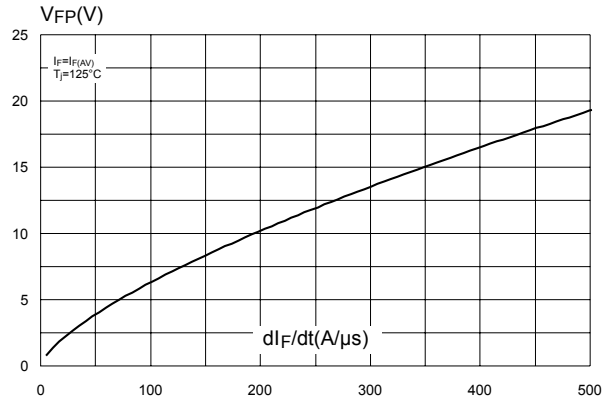


Figure 11. Forward recovery time versus dI_F/dt (typical values)

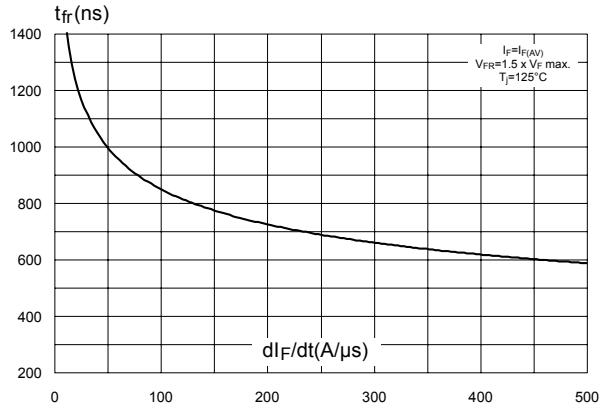
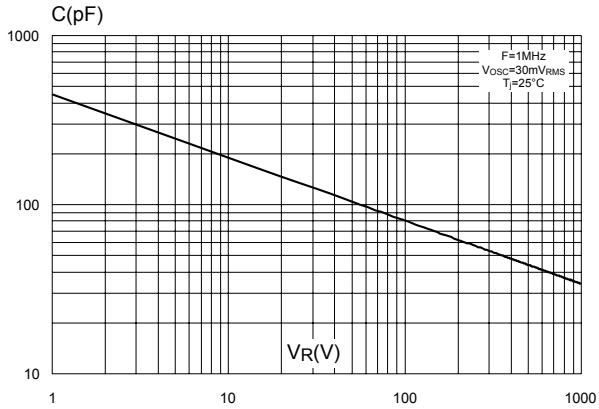


Figure 12. Junction capacitance versus reverse voltage applied (typical values)



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. 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

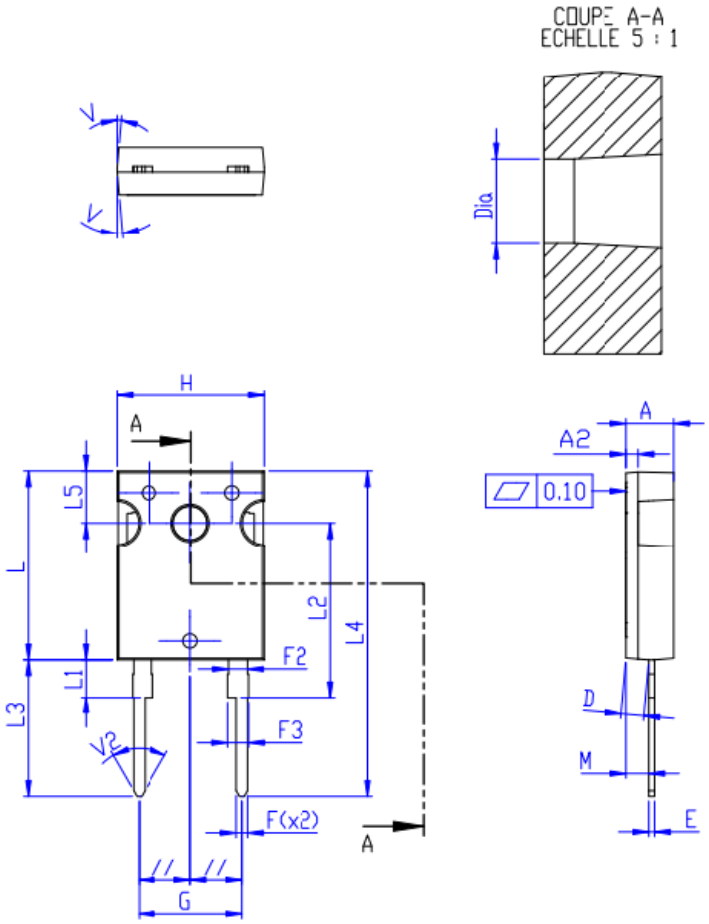


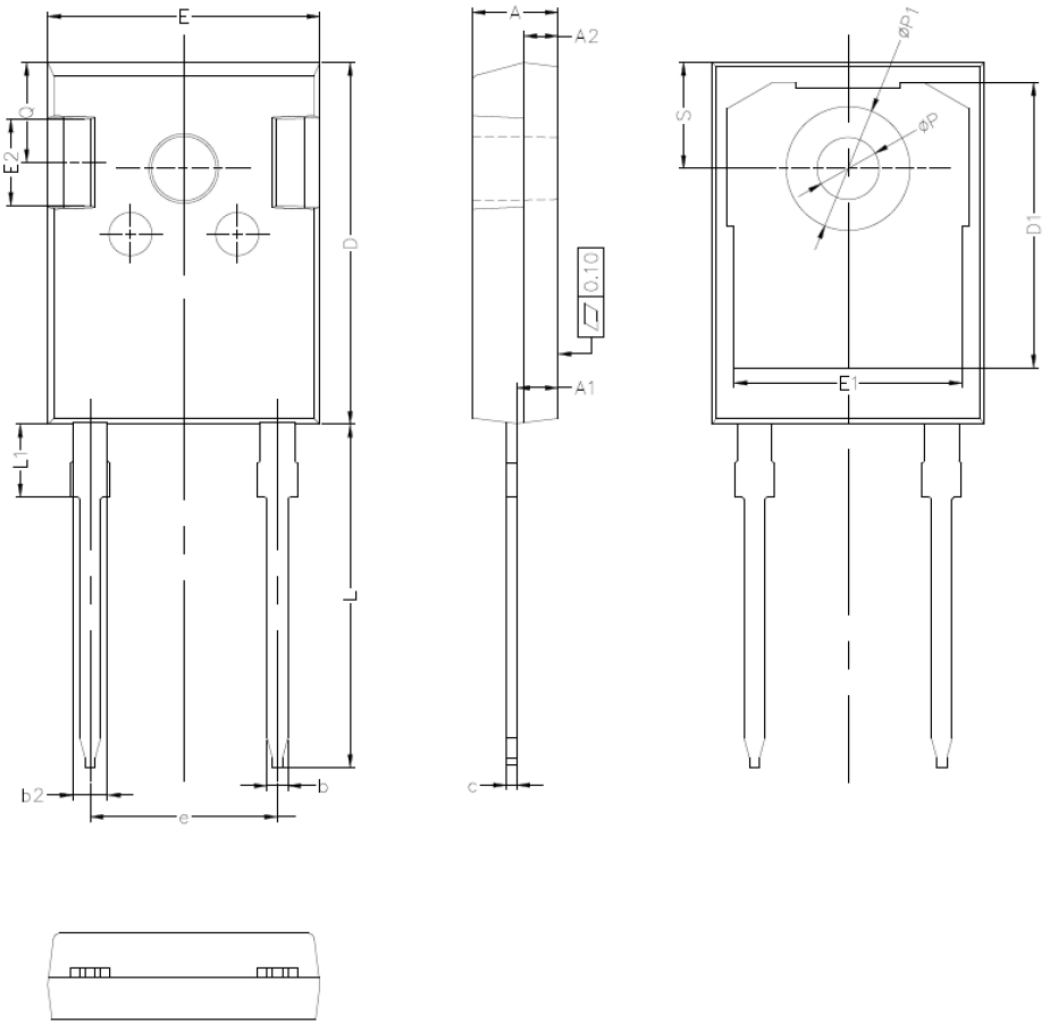
Table 5. **DO-247 package mechanical data**

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 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 14. DO-247 LL package outline



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

Table 6. **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 7. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH6012W	STTH6012W	DO-247	4.40 g	30	Tube
STTH6012WL	STTH6012WL	DO-247 LL	5.90 g	30	Tube

Revision history

Table 8. **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.