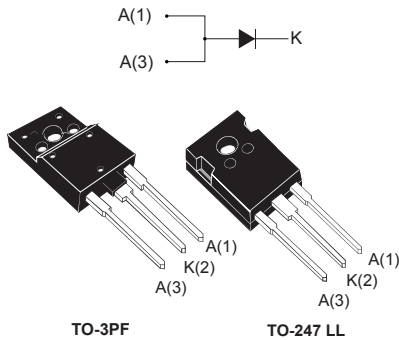


600 V, 30 A ultrafast high voltage diode



Features

- Ultrafast recovery, soft recovery
- Low power losses at high switching frequency operations
- Low leakage current
- High junction temperature
- High overcurrent capability
- ECOPACK2 compliant
- Insulated package TO-3PF:
 - Insulated voltage: 2000 V_{RMS}

Applications

- Air conditioning equipment
- Rectification diode
- Freewheeling diode

Description

The STTH31AC06S, implementing a new technology with very high softness during the reverse commutation, is suitable as a boost diode in PFC.

This device is highly recommended in air conditioning equipment for continuous mode interleaved power factor correction.

Product label



Product status

STTH31AC06S

Product summary

Symbol	Value
$I_{F(AV)}$	30 A
V_{RRM}	600 V
$t_{rr(typ.)}$	45 ns
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	1.35 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
$I_{F(RMS)}$	Forward rms current		45	A
$I_{F(AV)}$	Average forward current	$\delta = 0.5$ square	30	A
I_{FSM}	Surge non repetitive forward current	$t_p = 10$ ms sinusoidal	150	A
T_{stg}	Storage temperature range		-40 to +175	°C
T_j	Maximum operating junction temperature		+175	°C

Table 2. Maximum thermal resistance parameter

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-247 LL	1.25	°C/W
		TO-3PF	2.9	

For more information, 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	$V_R = V_{RRM}$	-		10	μA
		$T_j = 150$ °C		-	20	200	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25$ °C	$I_F = 30$ A	-	1.55	2.00	V
		$T_j = 150$ °C		-	1.35	1.75	

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

2. Pulse test: $t_p = 380$ μs , $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 1.24 \times I_{F(AV)} + 0.017 \times I_{F(RMS)}^2$$

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

- [AN604](#): Calculation of conduction losses in a power rectifier
- [AN5028](#): 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	$T_J = 25\text{ }^{\circ}\text{C}$	$I_F = 1\text{ A}$ $di_F/dt = -100\text{ A}/\mu\text{s}$ $V_R = 30\text{ V}$	-	45	65	ns
I_{RM}	Reverse recovery current	$T_J = 150\text{ }^{\circ}\text{C}$	$I_F = 30\text{ A}$ $di_F/dt = -1000\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$	-	36		A
Q_{rr}	Reverse recovery charge			-	2.5		μC
S_{factor}	Softness factor				2.2		
t_{fr}	Forward recovery time	$T_J = 25\text{ }^{\circ}\text{C}$	$I_F = 30\text{ A}$ $di_F/dt = 500\text{ A}/\mu\text{s}$ $V_{FR} = 2.5\text{ V}$			150	ns
V_{FP}	Forward recovery voltage				5.5		V

1.1 Characteristics (curves)

Figure 1. Average forward power dissipation versus average forward current

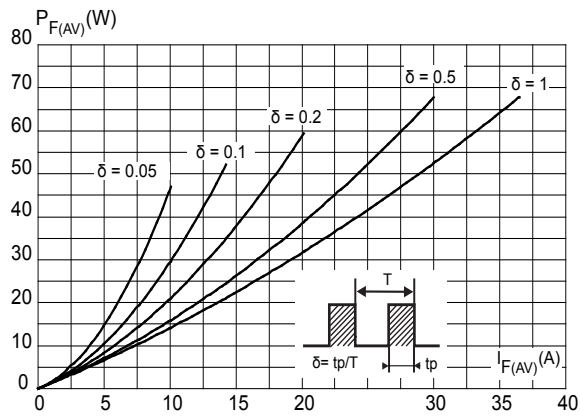


Figure 2. Forward voltage drop versus forward current (typical values)

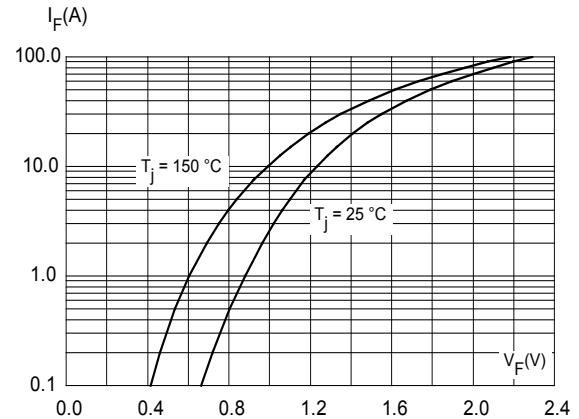


Figure 3. Forward voltage drop versus forward current (maximum values)

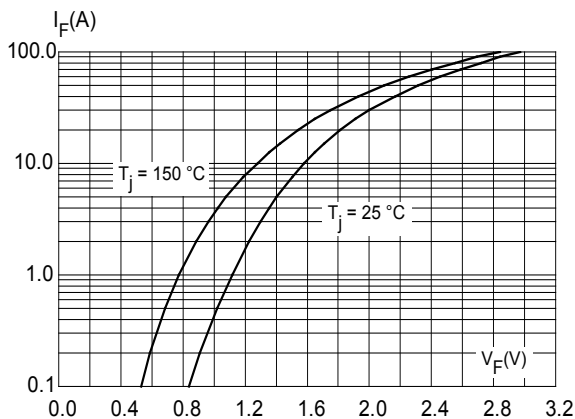


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-247 LL)

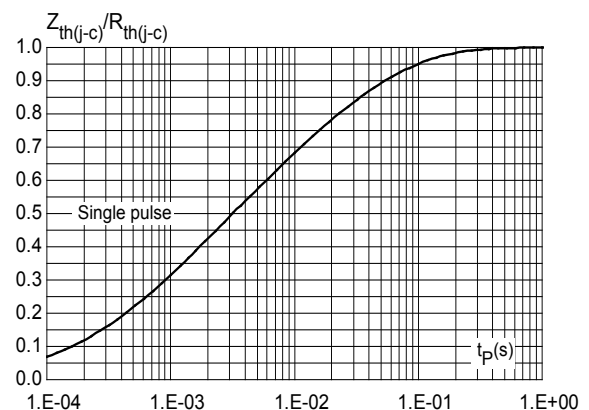


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (TO-3PF)

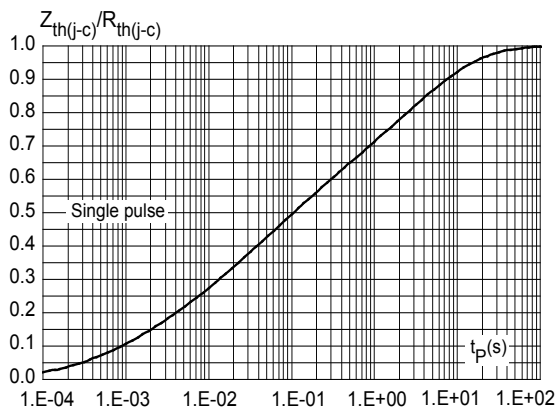
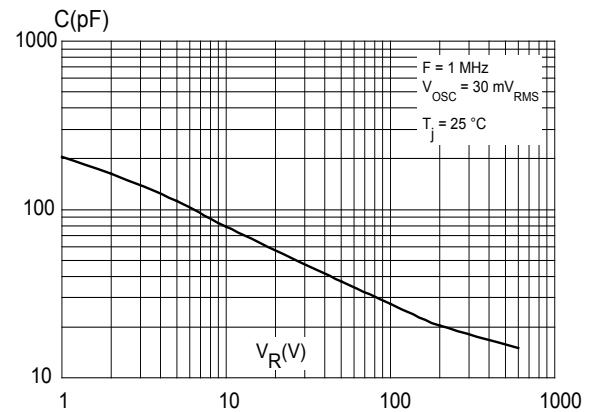


Figure 6. Junction capacitance versus reverse voltage applied (typical values)



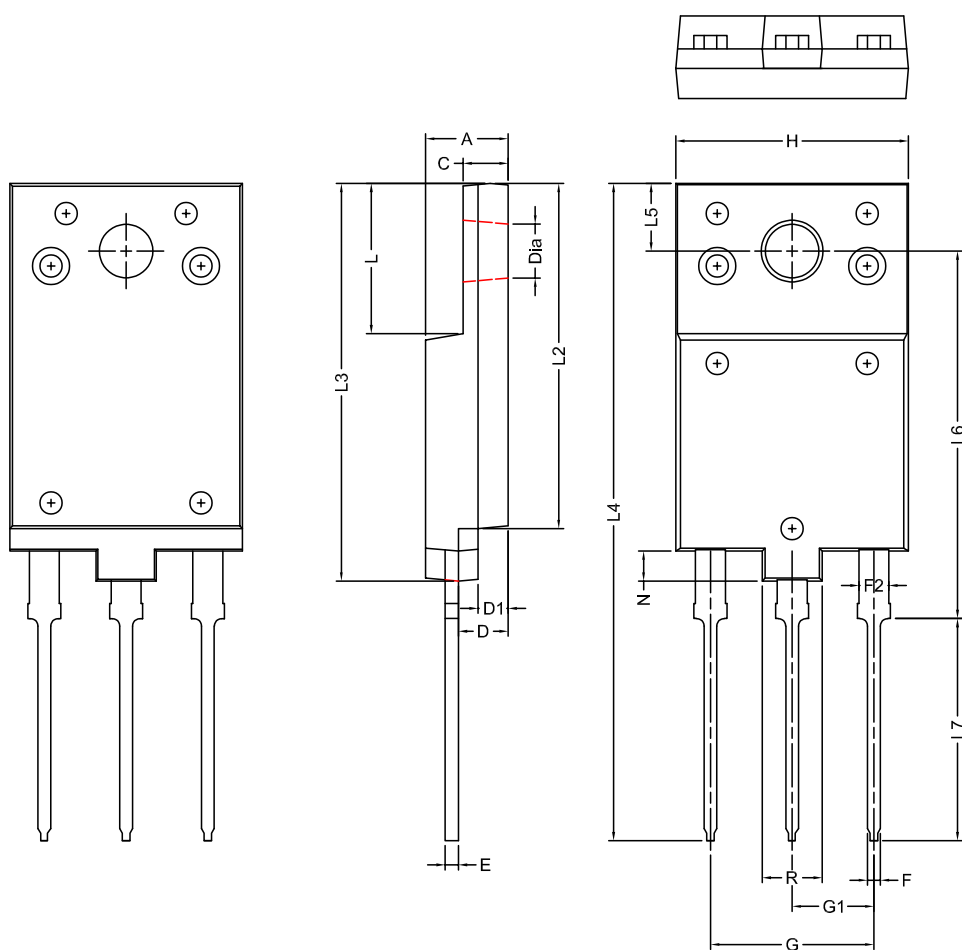
2 Package information

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 TO-3PF package information

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

Figure 7. TO-3PF package outline



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

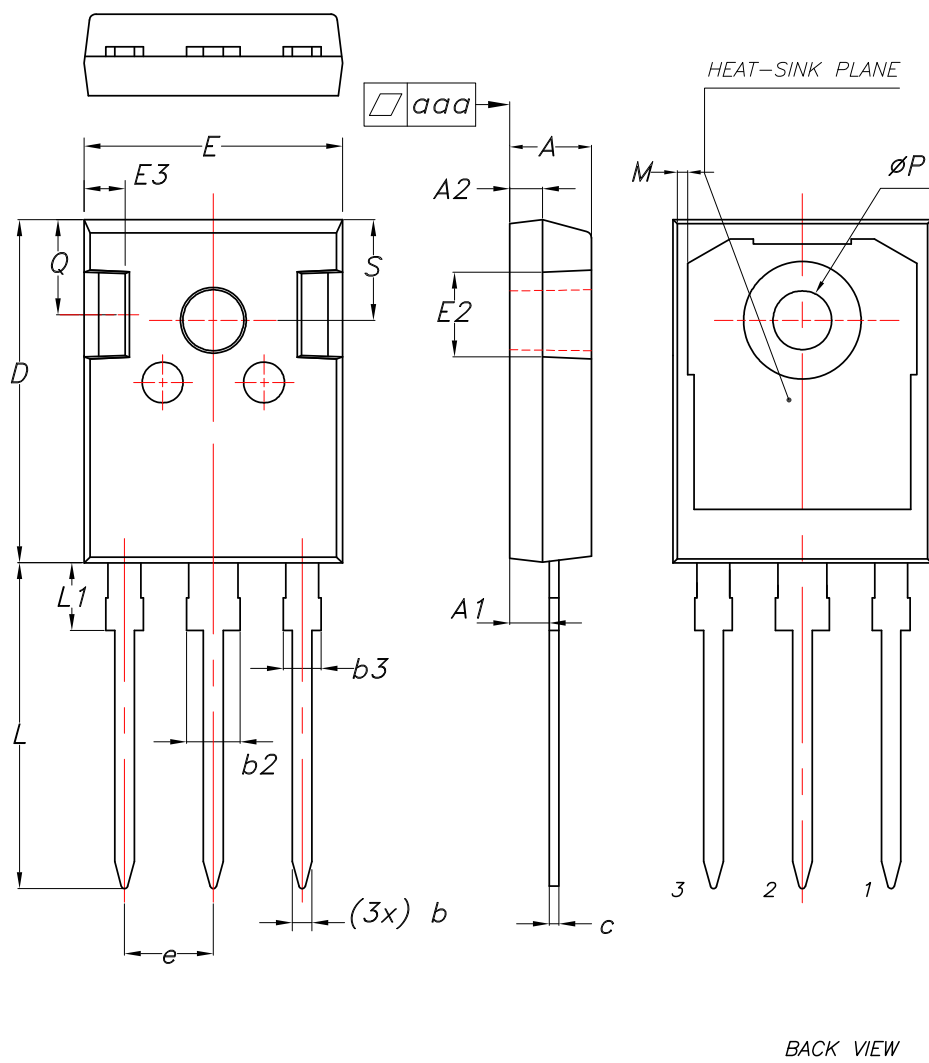
Table 5. TO-3PF mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	5.30	5.50	5.70
C	2.80	3.00	3.20
D	3.10	3.30	3.50
D1	1.80	2.00	2.20
E	0.80	0.95	1.10
F	0.65	0.80	0.95
F2	1.80	2.00	2.20
G	10.30	10.90	11.50
G1		5.45	
H	15.30	15.50	15.70
L	9.80	10.00	10.20
L2	22.80	23.00	23.20
L3	26.30	26.50	26.70
L4	43.20	43.80	44.40
L5	4.30	4.50	4.70
L6	24.30	24.50	24.70
L7	14.60	14.80	15.00
N	1.80	2.00	2.20
R	3.80	4.00	4.20
Dia	3.40	3.60	3.80

2.2 TO-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 8. TO-247 LL package outline



8463846_6

Table 6. TO-247 LL package mechanical data

Dim.	mm.			Inches (only for reference)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.90	5.00	5.10	0.192	0.196	0.200
A1	2.31	2.41	2.51	0.090	0.094	0.098
A2	1.90	2.00	2.10	0.074	0.078	0.082
b	1.16		1.26	0.045		0.049
b2			3.25			0.128
b3			2.25			0.089
c	0.59		0.66	0.0232		0.0260
D	20.90	21.00	21.10	0.8228	0.826	0.830
E	15.70	15.80	15.90	0.6181	0.622	0.626
E2	4.90	5.00	5.10	0.192	0.196	0.200
E3	2.40	2.50	2.60	0.094	0.098	0.102
e	5.34	5.44	5.54	0.2102	0.2142	0.2181
L	19.80	19.92	20.10	0.779	0.784	0.792
L1			4.30			0.170
M	0.35		0.95	0.013		0.038
P	3.50	3.60	3.70	0.137	0.141	0.145
Q	5.60		6.00	0.220		0.236
S	6.05	6.15	6.25	0.238	0.242	0.246
aaa		0.04	0.10		0.001	0.004

3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH31AC06SWL	STTH31AC06SWL	TO-247 LL	4.36 g	30	Tube
STTH31AC06SPF	TH31AC06	TO-3PF	5.6 g	50	Tube

Revision history

Table 8. Document revision history

Date	Revision	Changes
30-Sep-2014	1	First release.
23-Mar-2016	2	Added TO-3PF package information.
30-Oct-2025	3	Added Section Applications , and updated Section 2: Package information .

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