

### 100 V - 1 A power Schottky trench rectifier









#### **Features**

- ST trench patented process
- · High junction temperature capability
- · Low forward voltage drop
- Low recovery charges
- Reduces conduction, reverse and switching losses
- Avalanche tested
- Flat packages
- ECOPACK2 compliant

# **Applications**







- Auxiliary power supply
- Switch mode power supply (SMPS)



This 1 A, 100 V rectifier is based on ST trench technology that achieves the best-inclass  $V_F/I_R$  trade-off for a given silicon surface.

Integrated in flat and space-saving packages, this STPST1H100 trench rectifier is intended to be used in high frequency miniature switched mode power supplies. It is also an ideal candidate for auxiliary power supply in telecom, server, or smart metering. ST trench rectifiers are adapted to freewheeling, OR-ring or reverse polarity protection applications, and can be the perfect companion device to our transistors, drivers, or ST VIPer products.







#### **Product status link**

STPST1H100

Product summary				
I <sub>F(AV)</sub>	1 A			
V <sub>RRM</sub>	100 V			
T <sub>j</sub> (max.)	175 °C			
V <sub>F</sub> (typ.)	0.580 V			



#### 1 Characteristics

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

Symbol	Param	Value	Unit		
$V_{RRM}$	Repetitive peak reverse voltage			100	V
I	Average forward current, $\delta$ = 0.5, square	SOD123Flat	T <sub>L</sub> = 155 °C	1	_
record wave	SOD128Flat	T <sub>L</sub> = 155 °C	1	Α	
l	Surge non repetitive forward current	SOD123Flat	t <sub>p</sub> = 10 ms	25	А
I <sub>FSM</sub>	Surge non repetitive forward current	SOD128Flat	sinusoidal		
I <sub>AS</sub>	Single pulse avalanche current <sup>(1)</sup> $T_j = 25^{\circ}C$ , L = 300 $\mu$ H, $V_{DD} = 15 V$			2	Α
T <sub>stg</sub>	Storage temperature range	-65 to +175	°C		
Tj	Maximum operating junction temperature <sup>(2)</sup>			+175	°C

<sup>1.</sup> Please refer to Figure 1 and Figure 2 for the unclamped inductive switching test circuit, and waveform.

Table 2. Thermal resistance parameter

Sym	bol	Parameter			Typ. value	Unit
D. Limetian to lead	lunction to load		SOD123Flat	16	°C/W	
Tth(	R <sub>th(j-l)</sub> Junction to lead			SOD128Flat	15	C/VV

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 co	Min.	Тур.	Max.	Unit	
		T <sub>j</sub> = 125 °C	V <sub>R</sub> = 70 V	-	0.15	0.48	mA
I <sub>R</sub> <sup>(1)</sup>	I <sub>R</sub> <sup>(1)</sup> Reverse leakage current	T <sub>j</sub> = 25 °C	V 400.V	-		1.7	μA
		T <sub>j</sub> = 125 °C	V <sub>R</sub> = 100 V	-	0.3	1	mA
		T <sub>j</sub> = 25 °C	1 - 0 5 4	-	0.545	0.610	
V <sub>F</sub> <sup>(2)</sup> Fon	Company valle as draw	T <sub>j</sub> = 125 °C	-	0.480	0.540		
	Forward voltage drop	T <sub>j</sub> = 25 °C	1 - 4 0	-	0.650	0.725	V
		T <sub>j</sub> = 125 °C	I <sub>F</sub> = 1 A	-	0.580	0.635	5

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

To evaluate the conduction losses, use the following equation:

 $P = 0.445 \times I_{F(AV)} + 0.190 \times I_{F^{2}(RMS)}$ 

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

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<sup>2.</sup>  $(dP_{tot}/dT_j) < (1/R_{th(j-a)})$  condition to avoid thermal runaway for a diode on its own heatsink.

<sup>2.</sup> Pulse test:  $t_p = 380 \ \mu s, \ \delta < 2\%$ 

Figure 1. Current and voltage waveforms for avalanche energy test across D.U.T (device under test)

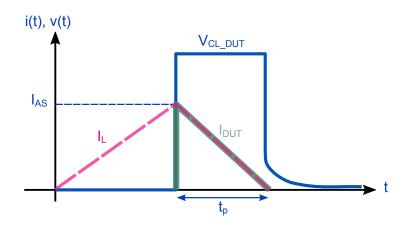
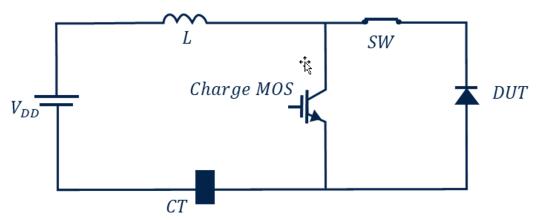


Figure 2. Unclamped Inductive Switching Test circuit



Current monitor

$$\begin{split} E_{AS} &= \frac{1}{2} \times L \times I_{AS}^2 \times \left( \frac{V_{CLDUT}}{V_{CLDUT} - V_{DD}} \right) \cong \frac{1}{2} \times L \times I_{AS}^2 \\ t_p &= \left( \frac{L \times I_{AS}}{V_{CLDUT} - V_{DD}} \right) \end{split}$$

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### 1.1 Characteristics (curves)

temperature ( $\delta = 0.5$ )

Figure 3. Average forward current versus lead

Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (SOD123Flat)

Zn(-1/Rn(-1)

1.0

2.0

0.9

0.8

0.7

0.6

0.5

0.4

0.3

0.2

Single pulse

0.1

Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration (SOD128Flat)

100

125

150

175

75

25

50

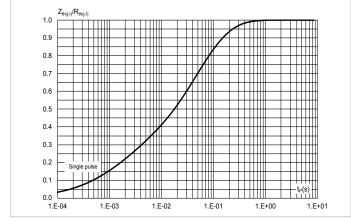


Figure 6. Reverse leakage current versus reverse voltage applied (typical values)

1.E-01

1.E+00

1.E+01

1.E-02

0.0 L 1.E-04

1.E-03

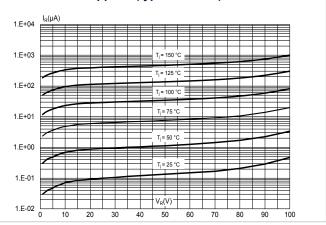


Figure 7. Junction capacitance versus reverse voltage applied (typical values)

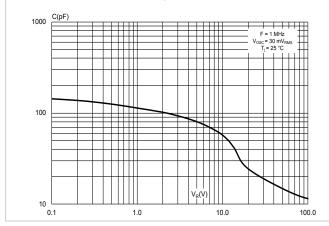
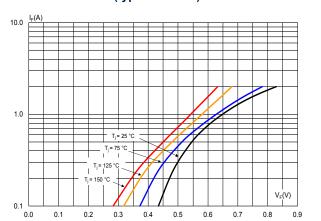


Figure 8. Forward voltage drop versus forward current (typical values)



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Figure 9. Thermal resistance junction to ambient versus copper surface under each lead (typical values, epoxy printed board FR4,  $e_{\text{Cu}}$ = 70  $\mu$ m)

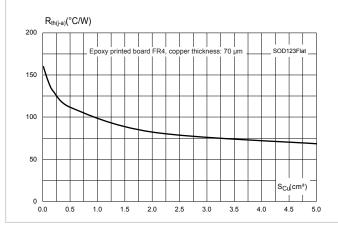
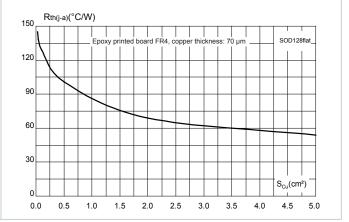


Figure 10. Thermal resistance junction to ambient versus copper surface under each lead (typical values, epoxy printed board FR4,  $e_{Cu}$ = 70  $\mu$ m)



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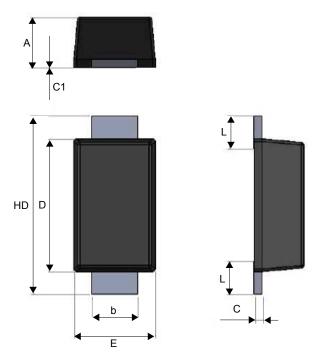


## Package information

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 SOD123Flat package information

Figure 11. SOD123Flat package outline



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

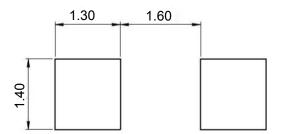
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Table 4. SOD123Flat package mechanical data

				Dimensions			
Ref.		Millimeters		Inches (for reference only)			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	0.86	0.98	1.10	0.034	0.038	0.043	
b	0.80	0.90	1.00	0.031	0.035	0.039	
С	0.08	0.15	0.25	0.003	0.006	0.009	
c1	0.00		0.10	0.000		0.004	
D	2.50	2.60	2.70	0.098	0.102	0.106	
Е	1.50	1.60	1.80	0.059	0.063	0.070	
HD	3.30	3.50	3.70	0.130	0.137	0.146	
L	0.45	0.65	0.85	0.018	0.025	0.033	

Figure 12. SOD123Flat footprint dimensions (mm)



Note: For package and tape orientation, reel and inner box dimensions and tape outline please check TN1173.

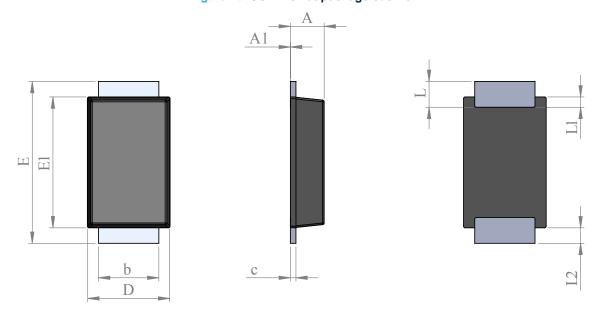
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### 2.2 SOD128Flat package information

Lead-free package

Figure 13. SOD128Flat package outline



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

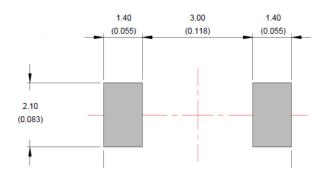
Table 5. SOD128Flat package mechanical data

	Dimensions				
Ref.	Millir	Millimeters		nes	
	Min.	Max.	Min.	Max.	
А	0.93	1.03	0.037	0.041	
b	1.69	1.81	0.067	0.071	
С	0.10	0.22	0.004	0.009	
D	2.30	2.50	0.091	0.098	
E	4.60	4.80	0.181	0.189	
E1	3.70	3.90	0.146	0.154	
L	0.55	0.85	0.026	0.033	
L1	0.30 typ.		0.012	2 typ.	
L2	0.45 typ.		0.018	B typ.	

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Figure 14. SOD128Flat footprint in mm (inches)



Note: For package and tape orientation, reel and inner box dimensions and tape outline please check TN1173.

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# 3 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPST1H100ZF	T01	SOD123 Flat	12.5 mg	3000	Tape and reel
STPST1H100AF	T1H1	SOD128 Flat	26.4 mg	3000	Tape and reel

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## **Revision history**

Table 7. Document revision history

Date	Revision	Changes
02-Jan-2023	1	Initial release.

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