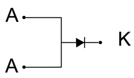
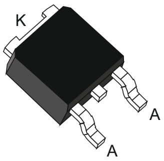
Automotive 100 V - 15 A DPAK power Schottky trench rectifier





DPAK

Features

- AEC-Q101 qualified
- PPAP capable
- ST trench patented process
- Low forward voltage drop
- Low recovery charges
- Reduces conduction, reverse and switching losses
- 100% Avalanche tested in production
- Operating T_j from -40 °C to +175 °C
- ECOPACK2 compliant

Applications

- Automotive LED lighting
- Flyback topology
- On-board DC/DC converter
- ECU power supply

Description

This 15 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 a DPAK package, this STPST15H100SB-Y trench, and automotive-graded device is intended to be used in high frequency miniature switched mode power supplies such as in automotive, DC/DC converters or ECU power supply. It is also adapted to freewheeling applications, OR-ring, or reverse polarity protection.

Product label
SUSTAINABLE TECHNOLOGY

Product status link
STPST15H100SB-Y

Product summary	
$I_{F(AV)}$	15 A
V_{RRM}	100 V
T_j (max.)	175 °C
V_F (typ.)	0.595 V

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, with 2 anode terminals short-circuited)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage (T_j = -40°C to + 175°C)		100	V
$I_{F(RMS)}$	Forward rms current		45	A
$I_{F(AV)}$	Average forward current, δ = 0.5 square wave	T_c = 165 °C	15	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal	230	A
I_{AS}	Single pulse avalanche current(1)	T_j = 25°C, L = 300 µH, V_{DD} = 15 V	16	A
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Maximum operating junction temperature range(2)		-40 to +175	°C

1. *Please refer to Figure 1 and Figure 2 for the unclamped inductive switching test circuit, and waveform.*
2. *$(dP_{tot}/dT_j) < (1/R_{th(j-a)})$ condition to avoid thermal runaway for a diode on its own heatsink.*

Table 2. Thermal resistance parameter

Symbol	Parameter	Typ. value	Unit
$R_{th(j-c)}$	Junction to case	0.6	°C/W

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 conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 125 °C	V_R = 70 V	-	2.6	7.5	mA
		T_j = 25 °C	V_R = 100 V	-		28	µA
		T_j = 125 °C		-	5	16	mA
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 7.5 A	-	0.555	0.645	V
		T_j = 125 °C		-	0.485	0.545	
		T_j = 25 °C	I_F = 15 A	-	0.665	0.740	
		T_j = 125 °C		-	0.595	0.650	

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:

$P = 0.44 \times I_{F(AV)} + 0.014 \times I_F{}^2{}_{(RMS)}$

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

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

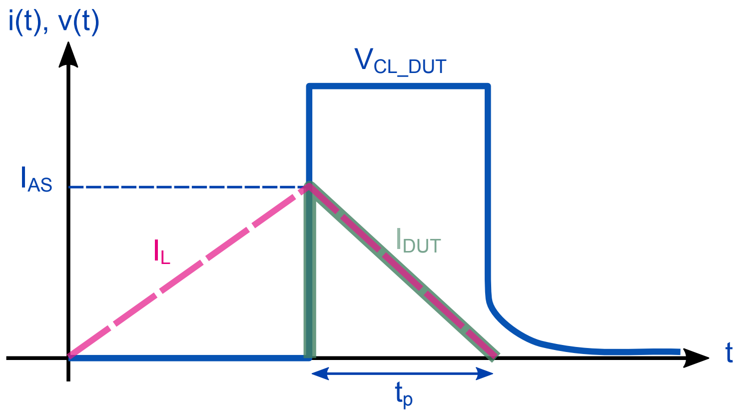
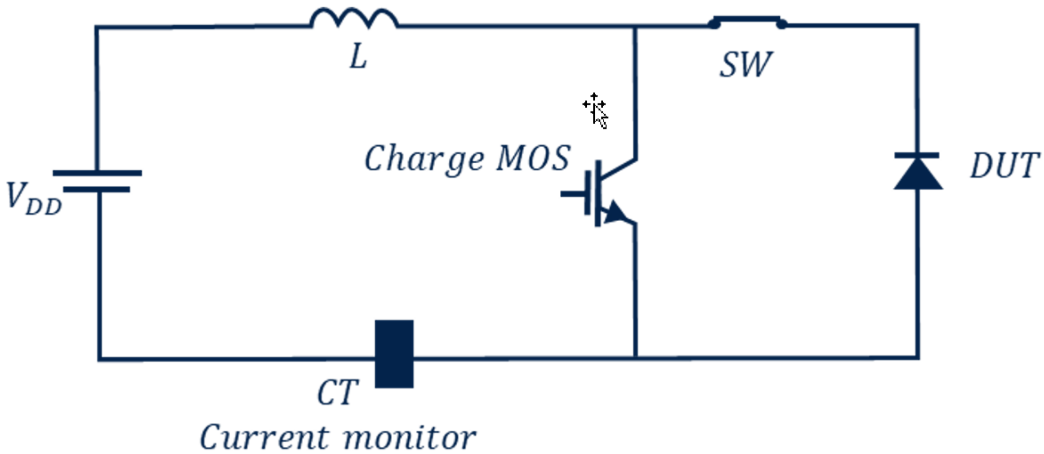


Figure 2. **Unclamped inductive switching test circuit**



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

$$t_p = \left(\frac{L \times I_{AS}}{V_{CLDUT} - V_{DD}} \right)$$

1.1 Characteristics (curves)

Figure 3. Average forward current versus case temperature (δ = 0.5)

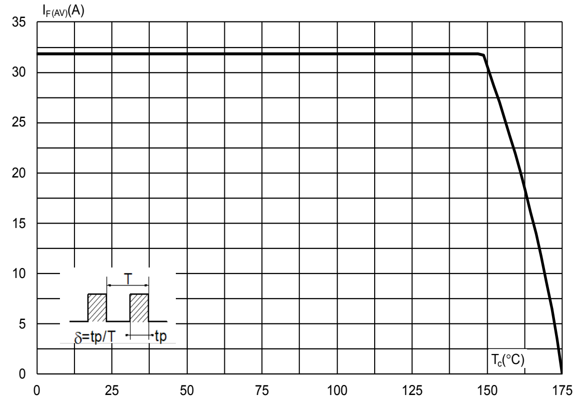


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

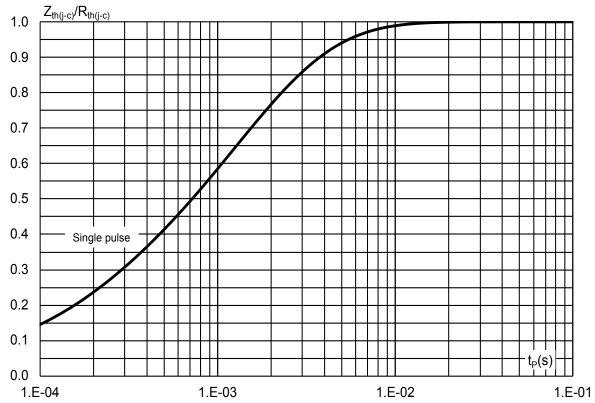


Figure 5. Reverse leakage current versus reverse voltage applied (typical values)

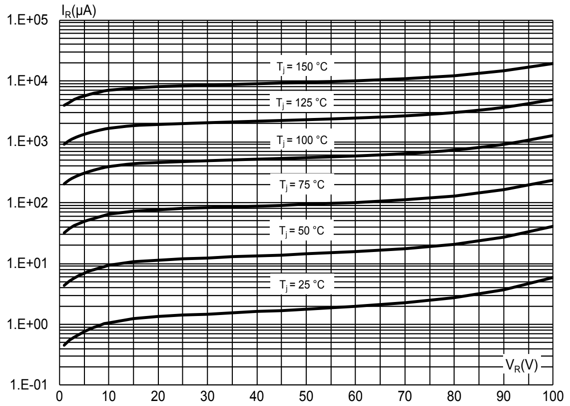


Figure 6. Junction capacitance versus reverse voltage applied (typical values)

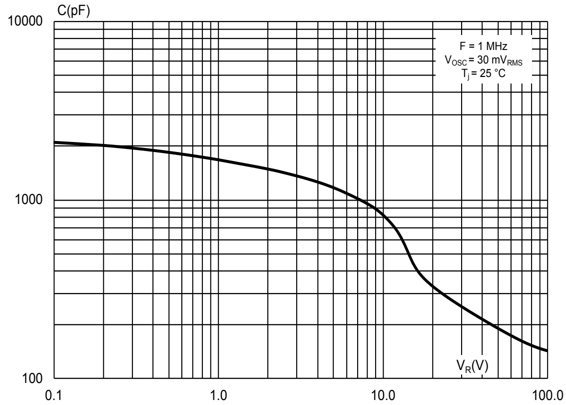


Figure 7. Forward voltage drop versus forward current (typical values)

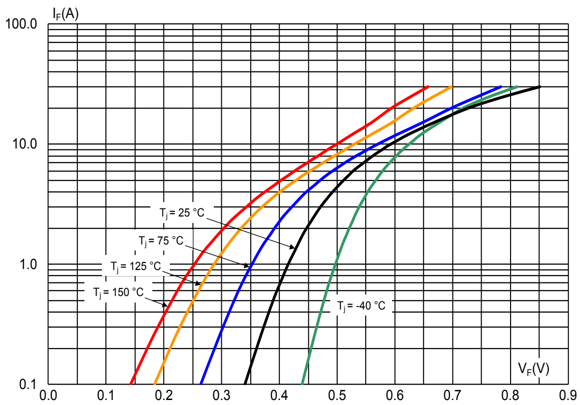
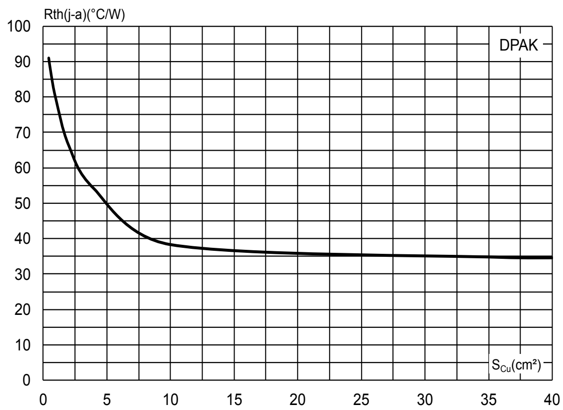


Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, e_{Cu}= 70 µm)



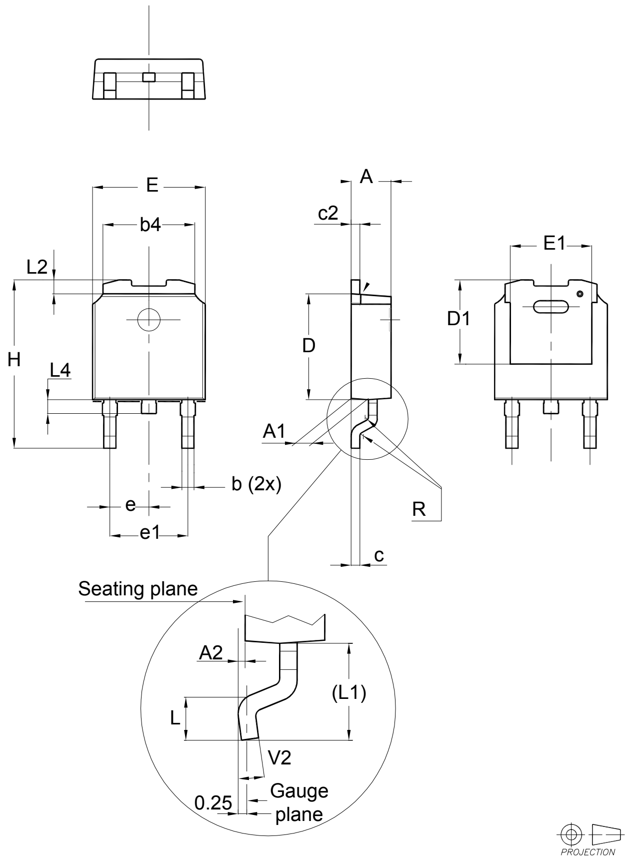
2 Package information

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 DPAK package information

- Epoxy meets UL94, V0

Figure 9. DPAK package outline



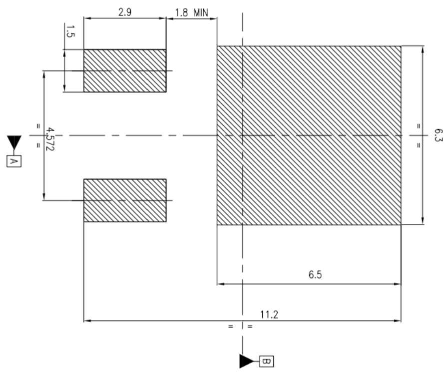
Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 4. DPAK mechanical data

Dim.	Dimensions					
	Millimeters			Inches[(1)]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
b	0.64		0.90	0.025		0.035
b4	5.20		5.40	0.205		0.213
c	0.45		0.60	0.018		0.024
c2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
D1	4.95	5.10	5.25	0.195	0.201	0.207
E	6.40		6.60	0.252		0.260
E1	4.60	4.70	4.80	0.181	0.185	0.189
e	2.159	2.286	2.413	0.085	0.090	0.095
e1	4.445	4.572	4.699	0.175	0.180	0.185
H	9.35		10.10	0.368		0.398
L	1.00		1.50	0.039		0.059
(L1)	2.60	2.80	3.00	0.102	0.110	0.118
L2	0.65	0.80	0.95	0.026	0.031	0.037
L4	0.60		1.00	0.024		0.039
R		0.20			0.008	
V2	0°		8°	0°		8°

1. *Inches dimensions given for reference only*

Figure 10. DPAK recommended footprint (dimensions are in mm)



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

3 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPST15H100SBYTR	STPST 15H1Y	DPAK	0.32 g	2500	Tape and reel

Revision history

Table 6. Document revision history

Date	Revision	Changes
16-Dec-2022	1	Initial release.