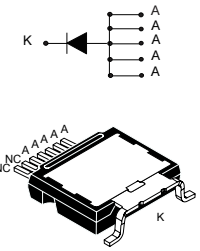
STPST80H100-Y

Datasheet

Automotive 100 V, 80 A power Schottky trench diode



HU³PAK

Product label

Product status

STPST80H100-Y

Product summary

$I_{F(AV)}$	80 A
V_{RRM}	100 V
T_j (max.)	175 °C
V_F (typ.)	0.66 V

Features

- AEC-Q101 qualified
- PPAP capable
- None or negligible reverse recovery
- V_{RRM} guaranteed from -40 °C up to 175 °C
- High junction temperature capability
- Low forward voltage drop
- Reduces conduction, reverse and switching losses
- 100% Avalanche tested in production
- SMD with top side cooling package (HU³PAK)
- ECOPACK2 compliant

Applications

- DC/DC converter
- Freewheeling function
- LLC topology
- Electrical vehicles (EV) and hybrid electrical (HEV) vehicles

Description

This 80 A, 100 V rectifier is based on ST trench technology that achieves the best-in-class V_F/I_R trade-off for a given silicon surface, optimizing the efficiency of the power converters.

It has been designed for high frequency switched-mode power supply applications for DC/DC converters used in electrical cars.

Packaged in HU³PAK, this 80 A, 100 V trench diode provides a high level of performance in a flat and topside cooling package.

1 Characteristics

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

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		93	A
$I_{F(AV)}$	Average forward current	T_c = 155 °C, δ = 0.8 square wave	80	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms sinusoidal	900	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	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	0.20	°C/W

For more information you can refer to:

- TN1378: HU^{3}PAK package mounting and thermal behavior.

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-		100	µA
		T_j = 125 °C		-	25	65	mA
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 40 A	-		0.650	V
		T_j = 125 °C		-	0.535	0.590	
		T_j = 25 °C	I_F = 80 A	-		0.810	
		T_j = 125 °C		-	0.660	0.710	

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:

$P = 0.47 \times I_{F(AV)} + 0.003 \times I_F{}^2{}_{(RMS)}$

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)

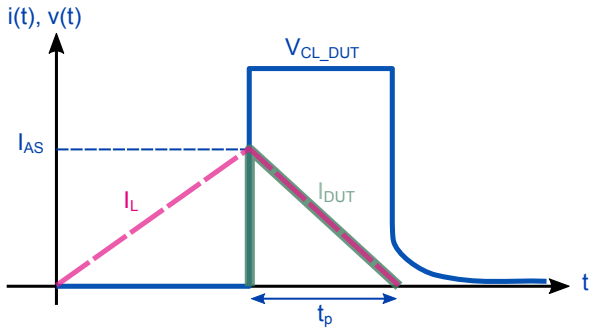
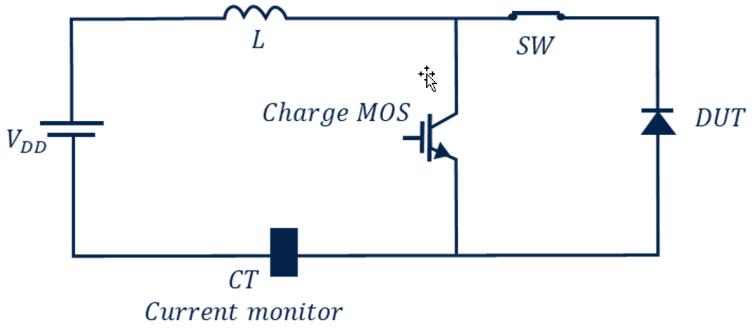


Figure 2. Unclamped inductive switching test circuit



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

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

Figure 3. Thermal transient impedance model circuit of the diode – $Z_{th(j-c)}$

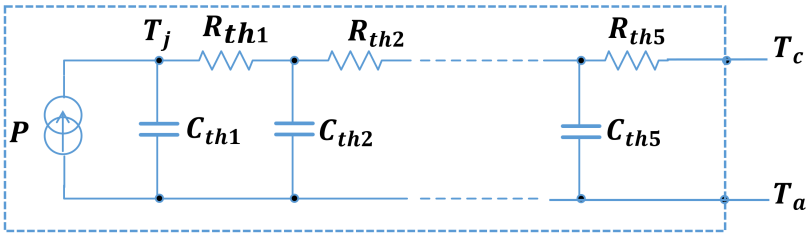


Table 4. Components typical values of the diode thermal transient impedance model $Z_{th(j-c)}$

Ref.	Value (mK/W)	Ref.	Value (mJ/K)
R_{th1}	5.07	C_{th1}	2.06
R_{th2}	24.79	C_{th2}	2.91
R_{th3}	80.63	C_{th3}	4.7
R_{th4}	71.13	C_{th4}	11.05
R_{th5}	18.59	C_{th5}	201.31

1.1 Characteristics (curves)

Figure 4. Average forward current versus case temperature (δ = 0.8)

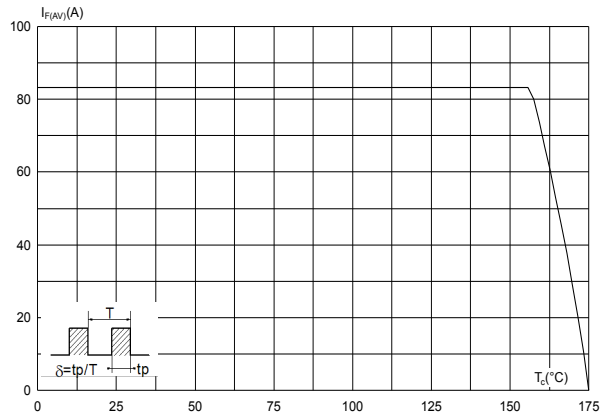


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

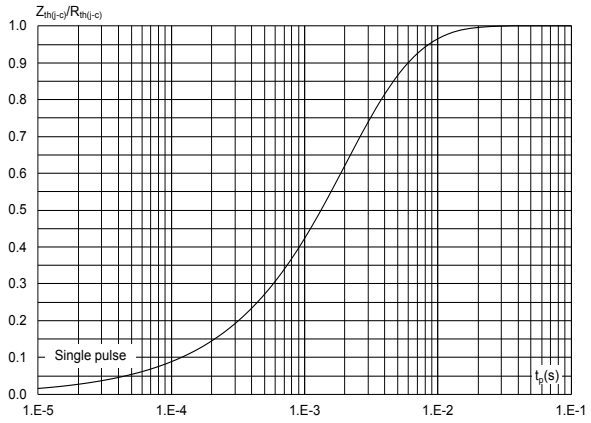


Figure 6. Reverse leakage current versus reverse voltage applied (typical values)

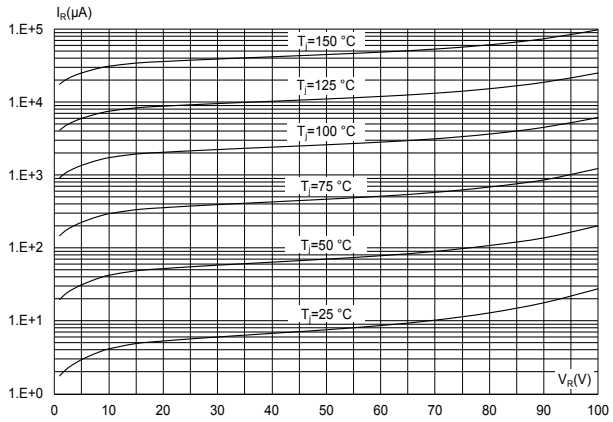


Figure 7. Junction capacitance versus reverse voltage applied (typical values)

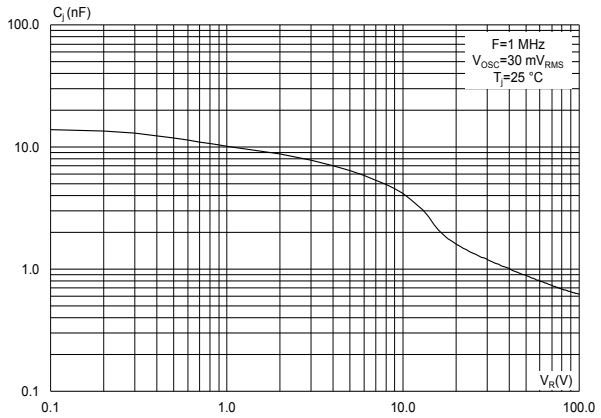
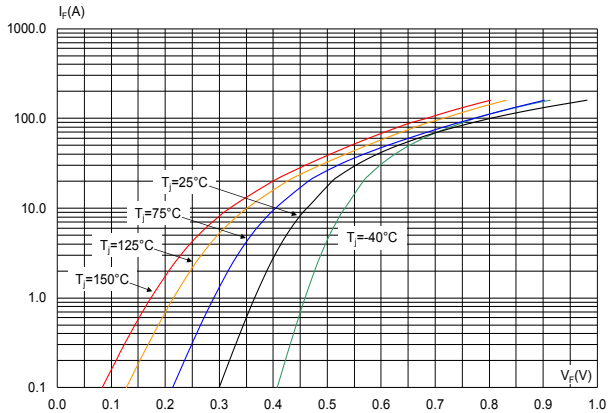


Figure 8. Forward voltage drop versus forward current (typical values)



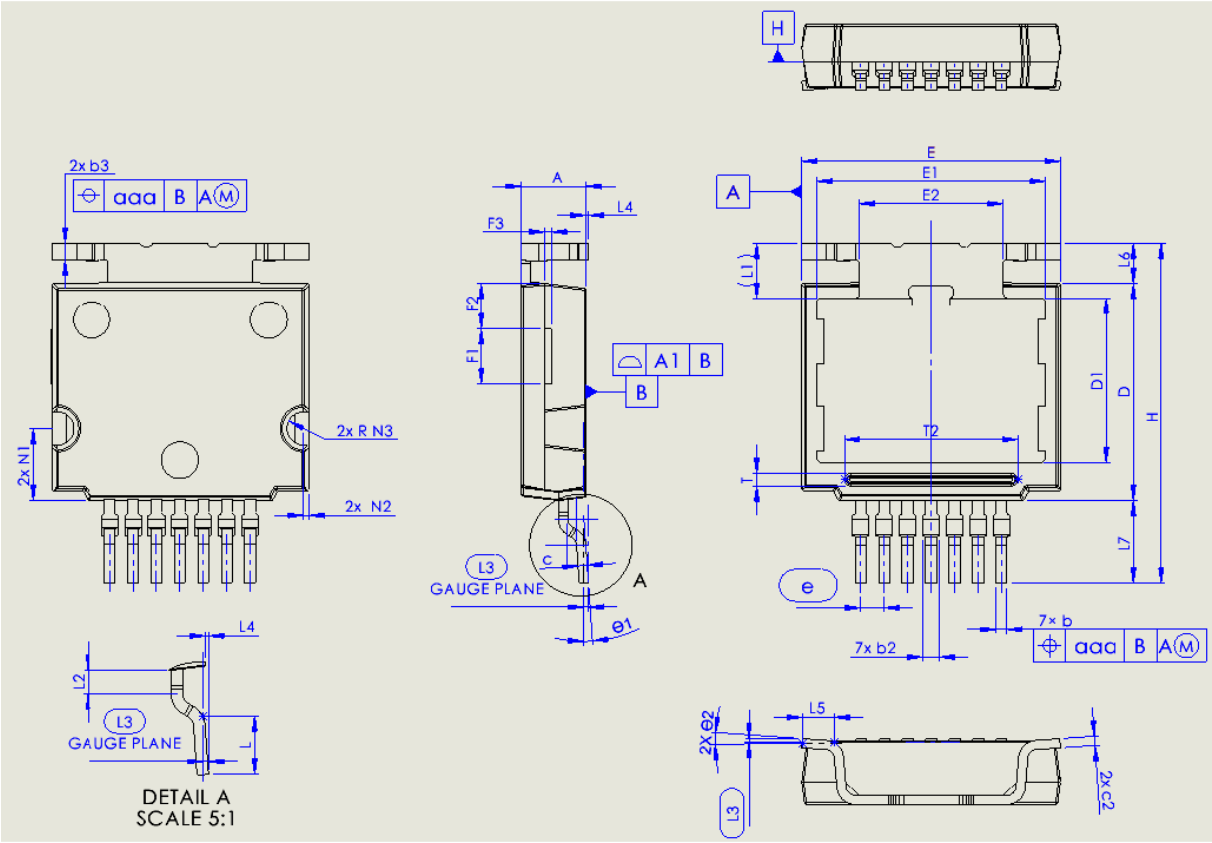
2 Package information

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 HU^{3}PAK package information

- Epoxy meets UL94, V0

Figure 9. HU^{3}PAK package outline



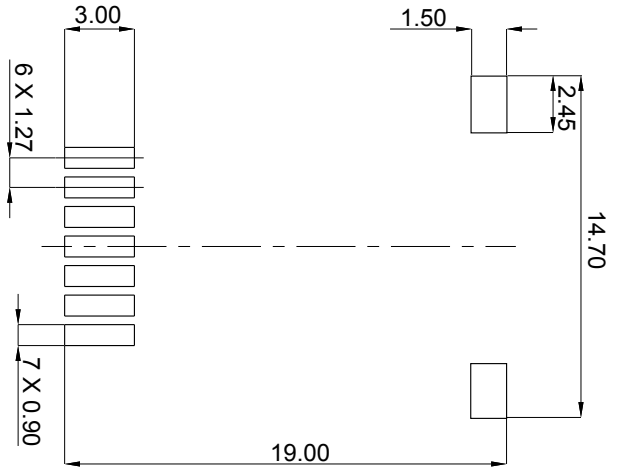
Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. HU^{3}PAK package mechanical data

Ref.	Dimensions		
	mm		
	Min.	Typ.	Max.
A	3.40	3.50	3.60
A1		0.05	
b	0.50	0.60	0.70
b2	0.50	0.70	1.00
b3	0.80	0.90	1.00
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	8.80	8.955	9.10
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	7.75	7.80	7.85
e		BSC 1.27	
H	18.00	18.58	19.00
L	2.40	2.52	2.60
L1		3.05	
L2	0.90	1.00	1.10
L3		BSC 0.26	
L4	0.075	0.125	0.175
L5	1.83	1.93	2.03
L6	2.14	2.24	2.34
L7	4.44	4.54	4.64
aaa		0.10	
F1	2.90	3.00	3.10
F2	2.40	2.50	2.60
F3	0.25	0.35	0.45
N1	3.80	3.90	4.00
N2	0.25	0.30	0.45
N3	0.80	0.90	1.00
T	0.50	0.67	0.70
T2	9.18	9.38	9.43
θ1		0°	8°
θ2		0°	8°

1. Package outline exclusive of any mold flashes dimensions.
2. Package outline exclusive of burr dimensions.
3. Max resin gate protrusion: 0.25 mm.
4. The planarity of the package backside 50 micron max.
5. BSC: basic spacing between centers

Figure 10. HU^{3}PAK recommended footprint (dimensions are in mm)



Note: For packing details you can see technical note TN1173: Packing information for IPAD, protection, rectifiers, thyristors and AC Switches.

3 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPST80H100L2Y	PST80H100L2Y	HU^{3}PAK	2.32 g	600	Tape and reel

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
26-Aug-2024	1	Initial release.
18-Oct-2024	2	Removed *HU3PAK packing information*(refer to TN1173). Minor text changes.

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.