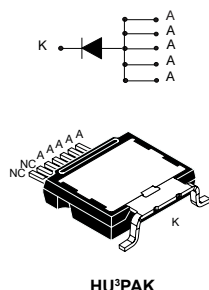


Automotive 100 V, 80 A power Schottky trench diode



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 ($T_j = -40^{\circ}\text{C}$ to $+175^{\circ}\text{C}$)		100	V
$I_{F(RMS)}$	Forward RMS current		93	A
$I_{F(AV)}$	Average forward current	$T_c = 155^{\circ}\text{C}$, $\delta = 0.8$ 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⁾	$T_j = 25^{\circ}\text{C}$, $L = 300\ \mu\text{H}$, $V_{DD} = 15\ \text{V}$	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](#): HU³PAK package mounting and thermal behavior.

Table 3. Static electrical characteristics

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

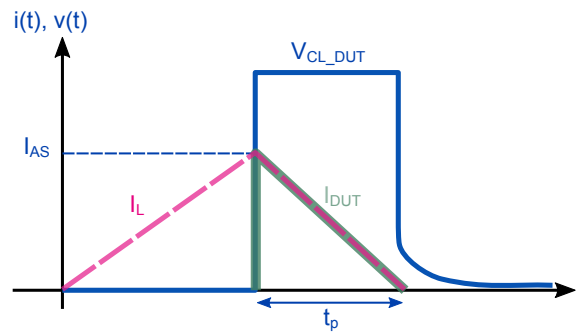
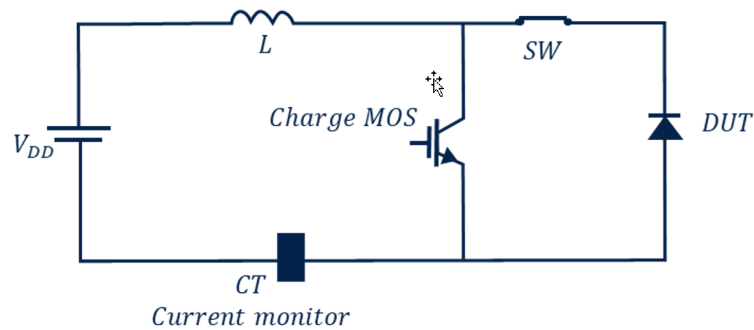
1. Pulse test: $t_p = 5\ \text{ms}$, $\delta < 2\%$
2. Pulse test: $t_p = 380\ \mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

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

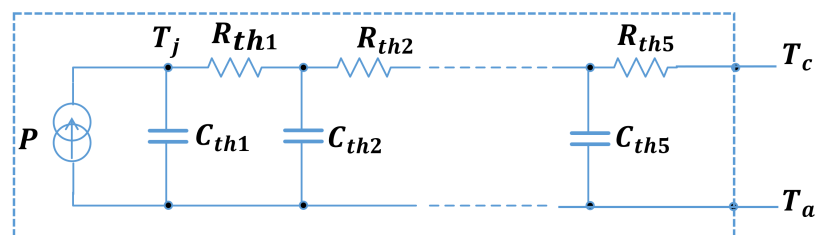
For more information, please refer to the following application notes related to the power losses :

- [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 ($\delta = 0.8$)

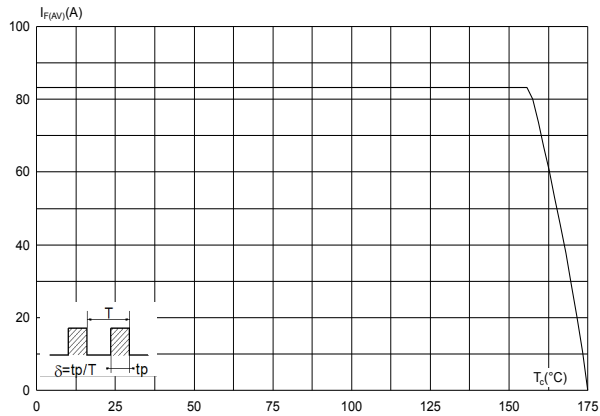


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration

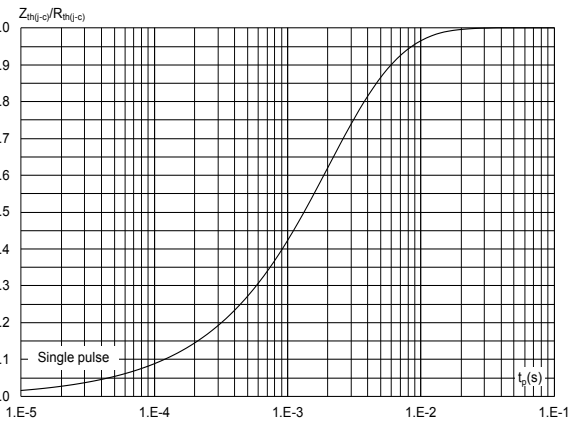


Figure 6. Reverse leakage current versus reverse voltage applied (typical values)

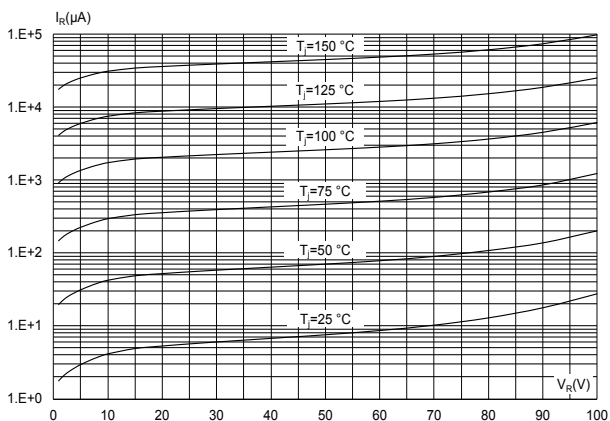


Figure 7. Junction capacitance versus reverse voltage applied (typical values)

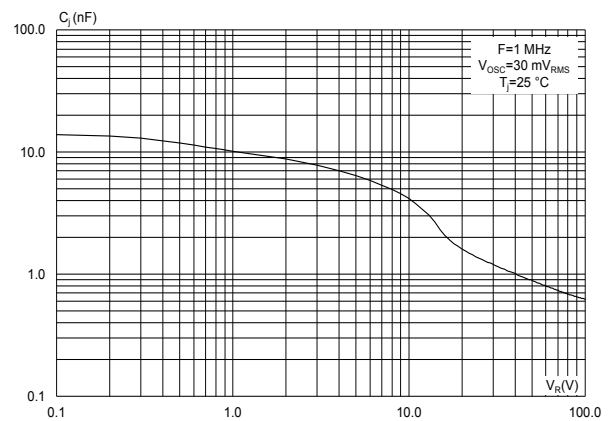
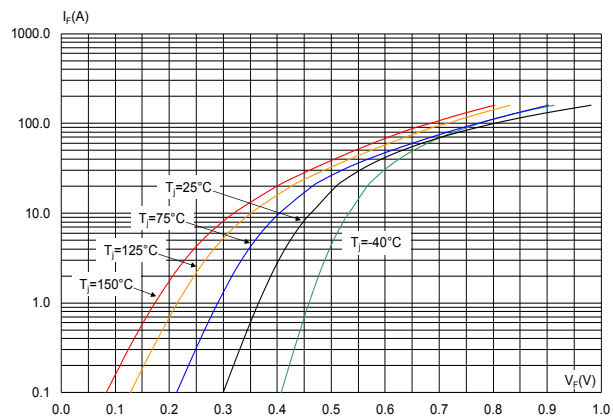


Figure 8. Forward voltage drop versus forward current (typical values)



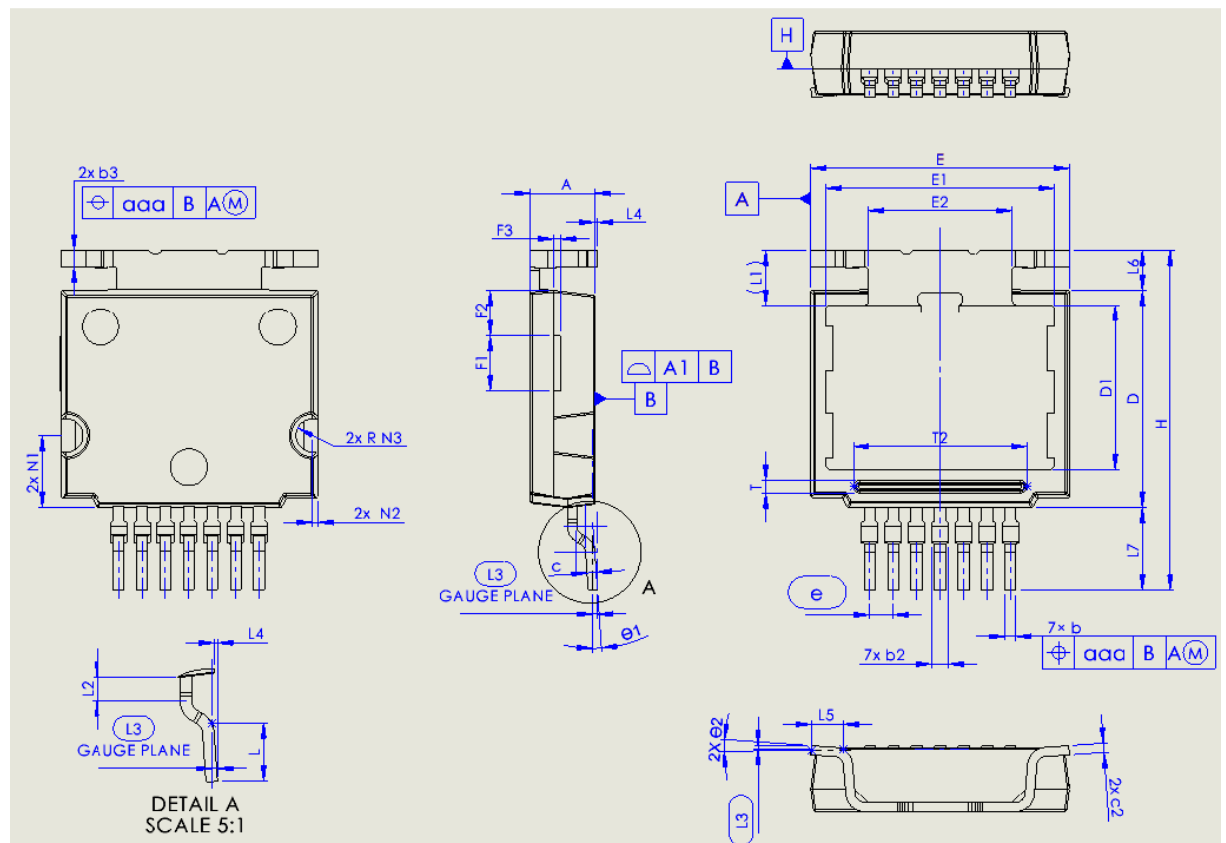
2 Package information

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 HU³PAK package information

- Epoxy meets UL94, V0

Figure 9. HU³PAK package outline



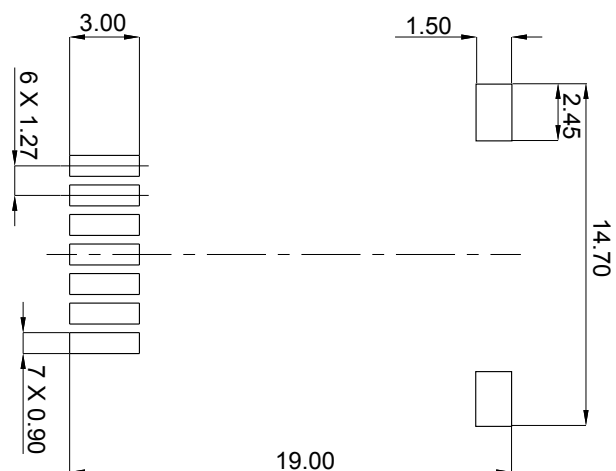
Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. HU³PAK 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. HU³PAK 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 <i>HU3PAK packing information</i> (refer to TN1173). Minor text changes.

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