

## Automotive-grade N-channel 100 V, 180 A, 3.9 mΩ typ., STripFET™ F3 Power MOSFET in an H<sup>2</sup>PAK-6 package

Datasheet - production data

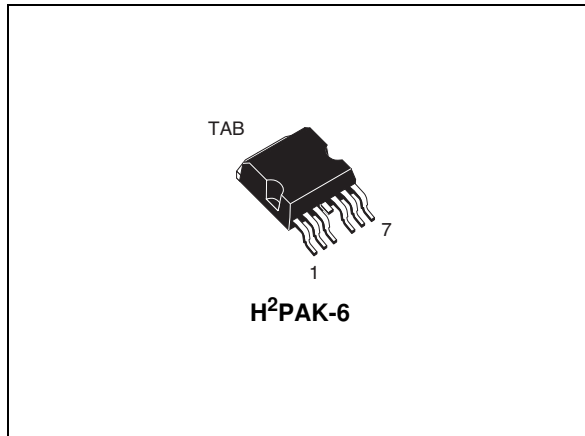
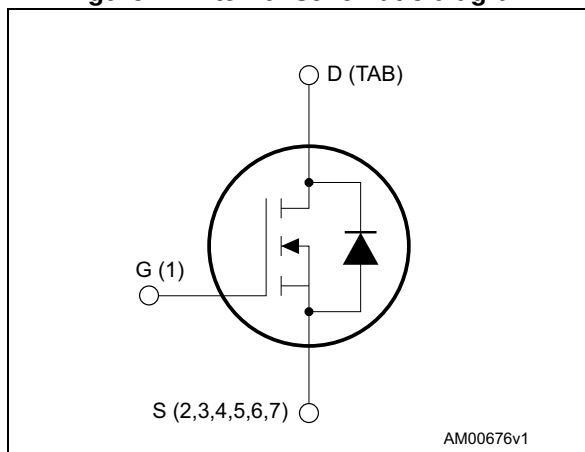


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STH185N10F3-6	100 V	4.5 mΩ	180 A



- AEC-Q101 qualified
- Ultra low on-resistance
- 100% avalanche tested

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Packages	Packing
STH185N10F3-6	185N10F3	H <sup>2</sup> PAK-6	Tape and reel

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	100	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C=100^\circ\text{C}$	120	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	315	W
dv/dt	Peak diode recovery voltage slope	20	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	350	mJ
$T_j$	Operating junction temperature range	- 55 to 175	°C
$T_{stg}$	Storage temperature range		

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting  $T_j = 25^\circ\text{C}$ ,  $I_D = 80\text{ A}$ ,  $V_{DD} = 50\text{ V}$ .

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.48	°C/W
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	35	°C/W

1. When mounted on FR-4 board, on 1inch<sup>2</sup>, 2oz Cu.

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  unless otherwise specified)

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\ \mu A$	100			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 100\ V$			10	$\mu A$
		$V_{GS} = 0, V_{DS} = 100\ V, T_C = 125\text{ °C}^{(1)}$			100	$\mu A$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0, V_{GS} = \pm 20\ V$			$\pm 200$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	2		4	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 10\ V, I_D = 60\ A$		3.9	4.5	m $\Omega$

1. Defined by design, not subject to production test.

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{GS} = 0, V_{DS} = 25\ V, f = 1\ MHz,$	-	6665	-	pF
$C_{oss}$	Output capacitance		-	786	-	pF
$C_{riss}$	Reverse transfer capacitance		-	49	-	pF
$Q_g$	Total gate charge	$V_{DD} = 50\ V, I_D = 120\ A, V_{GS} = 10\ V$ (see <a href="#">Figure 14</a> )	-	114.6	-	nC
$Q_{gs}$	Gate-source charge		-	38.8	-	nC
$Q_{gd}$	Gate-drain charge		-	31.9	-	nC

**Table 6. Switching times**

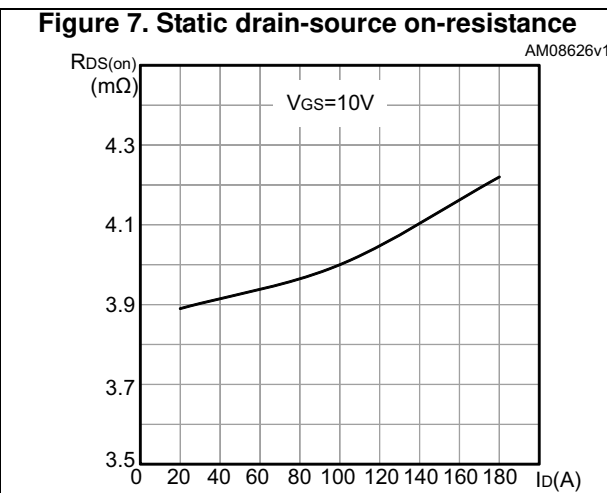
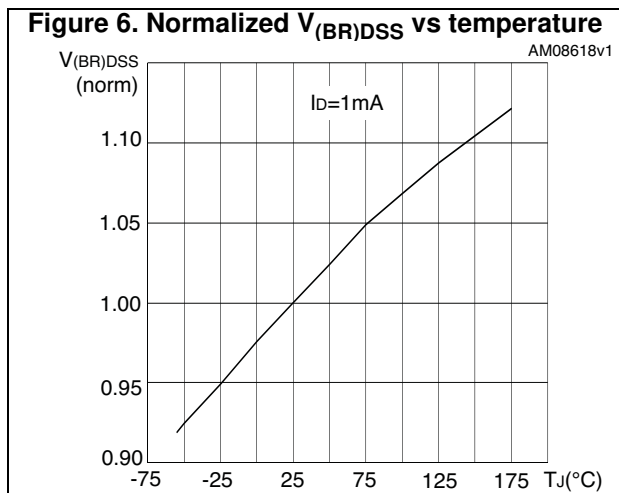
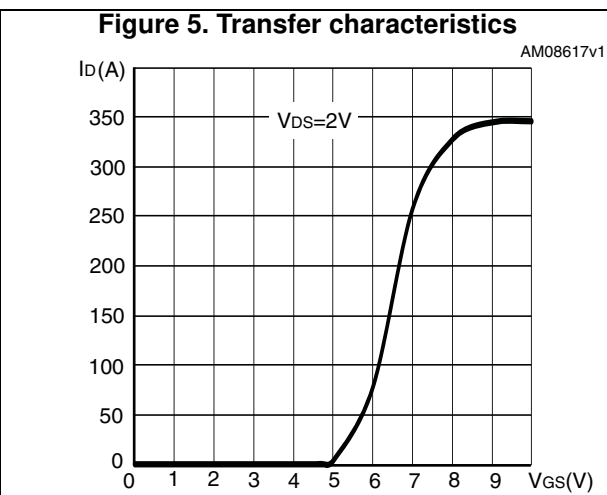
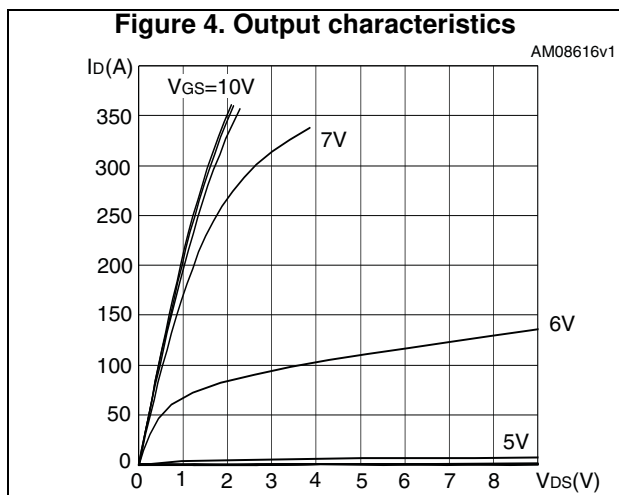
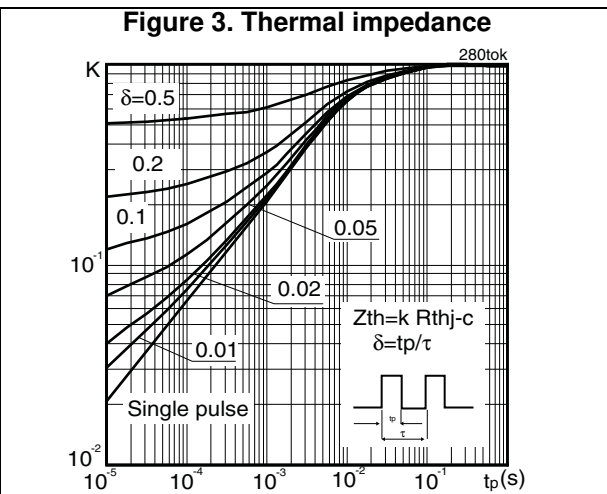
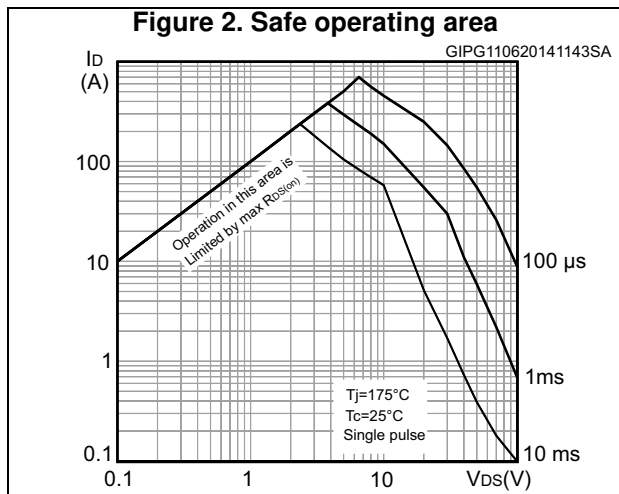
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ V, I_D = 60\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see <a href="#">Figure 13</a> , <a href="#">Figure 18</a> )	-	25.6	-	ns
$t_r$	Rise time		-	97.1	-	ns
$t_{d(off)}$	Turn-off delay time		-	99.9	-	ns
$t_f$	Fall time		-	6.9	-	ns

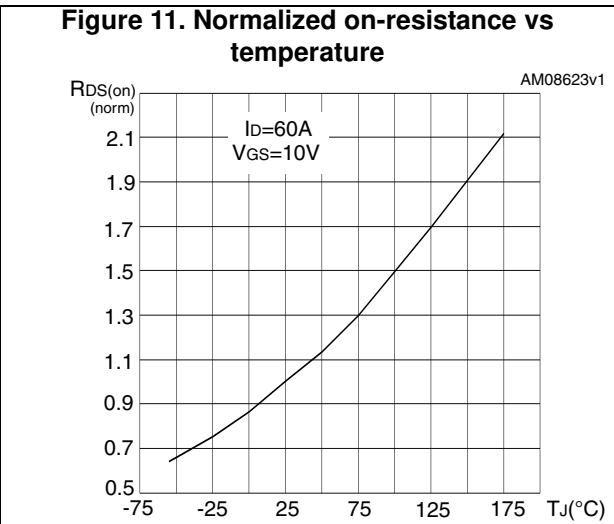
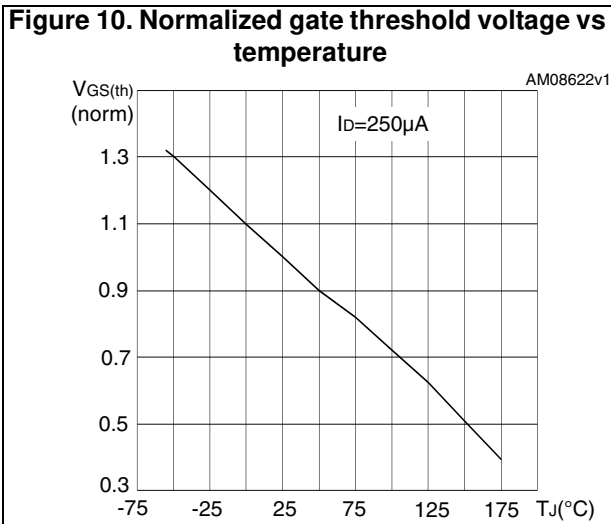
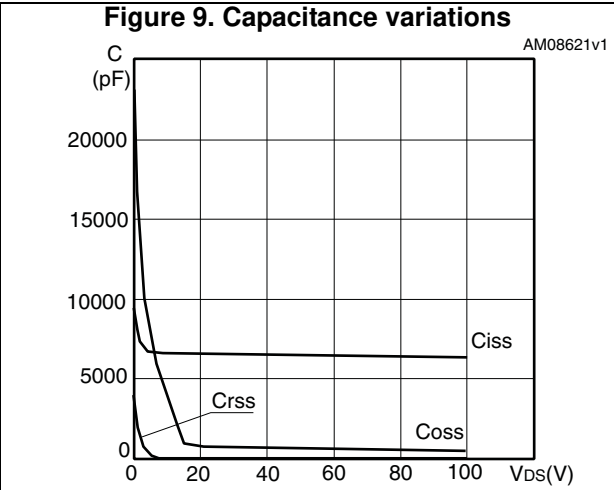
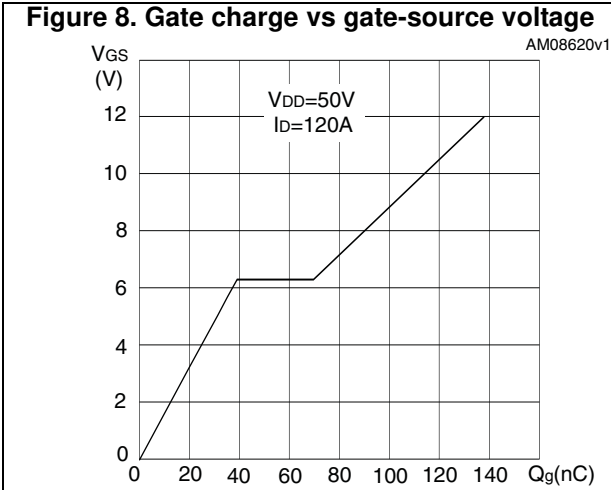
**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		180	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		720	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0, I_{SD} = 120 \text{ A}$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 120 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 80 \text{ V}, T_J = 150^\circ\text{C}$ (see <a href="#">Figure 15</a> )	-	83.4		ns
$Q_{rr}$	Reverse recovery charge		-	295.7		nC
$I_{RRM}$	Reverse recovery current		-	7.1		A

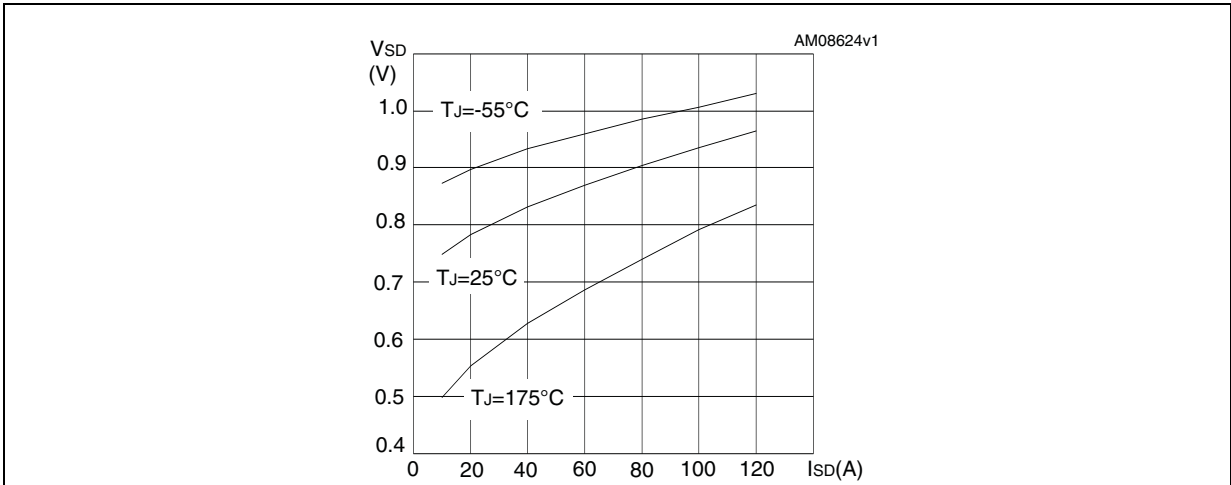
1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300 $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

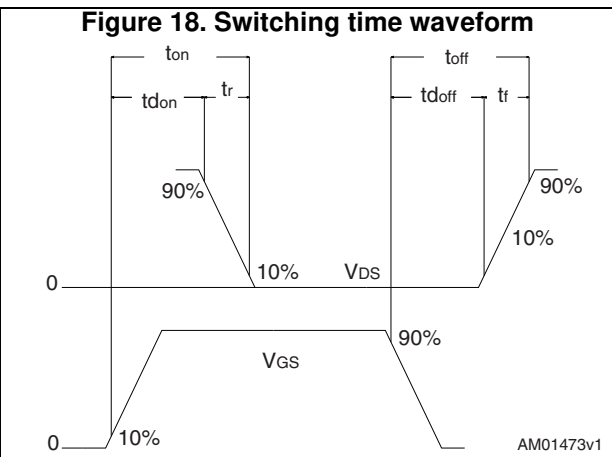
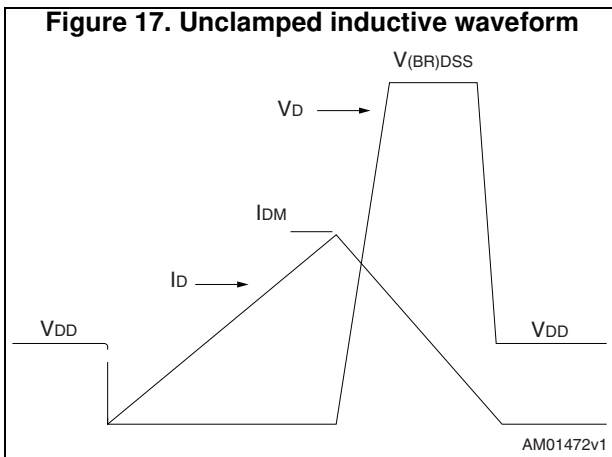
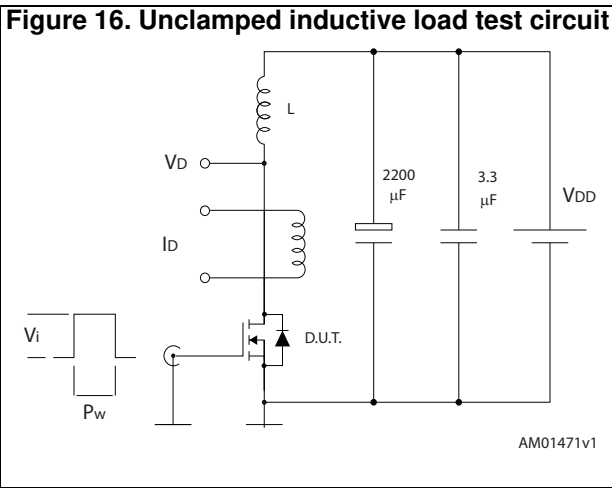
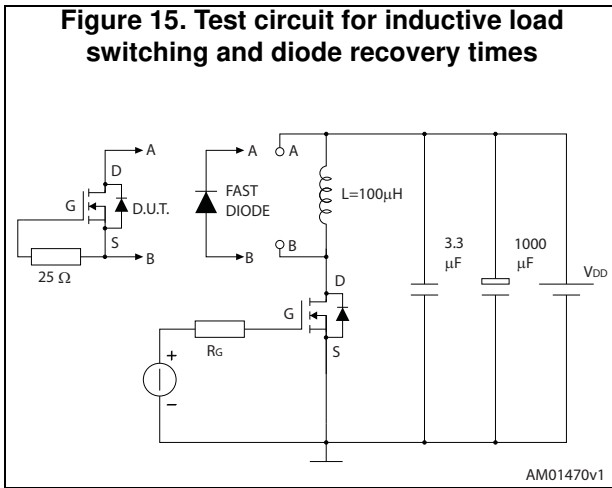
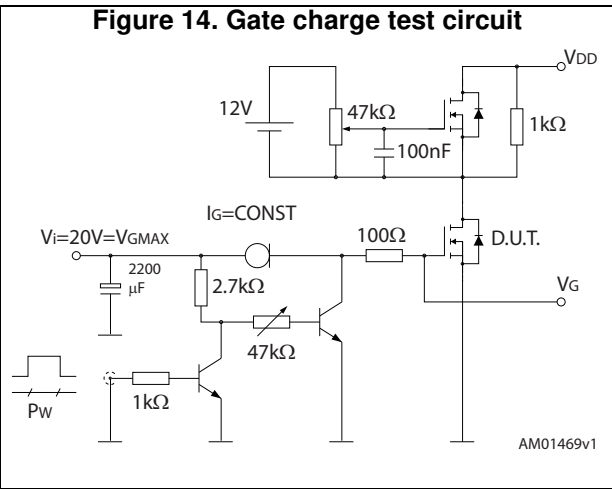
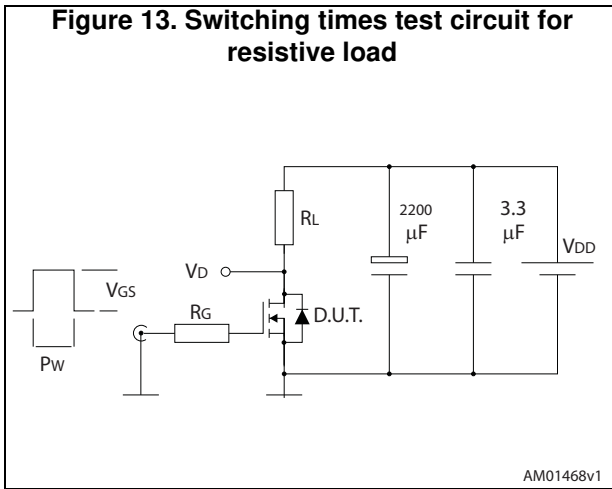




**Figure 12. Source-drain diode forward characteristics**



### 3 Test circuits



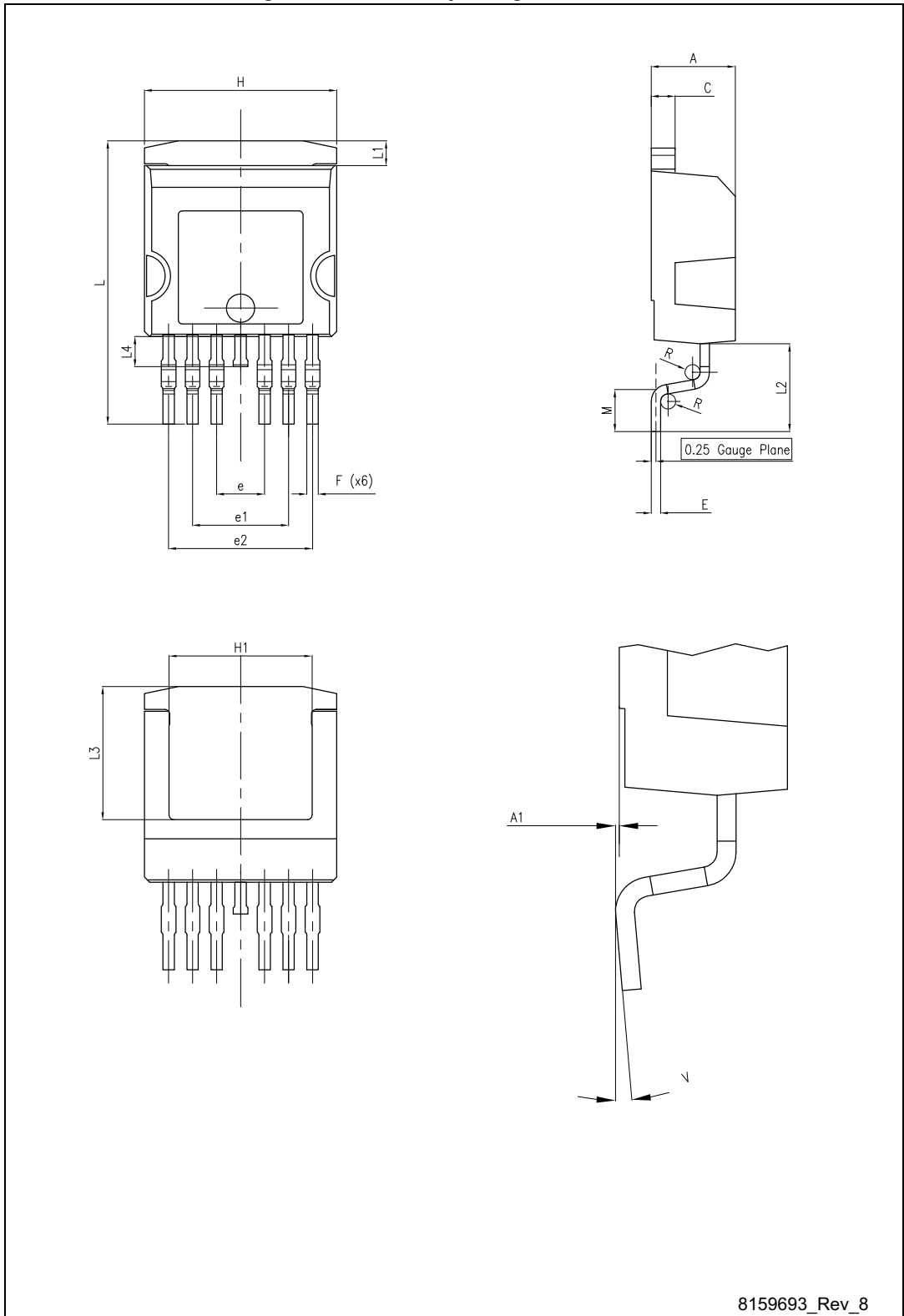


## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

### 4.1 H<sup>2</sup>PAK-6 package information

Figure 19. H<sup>2</sup>PAK-6 package information

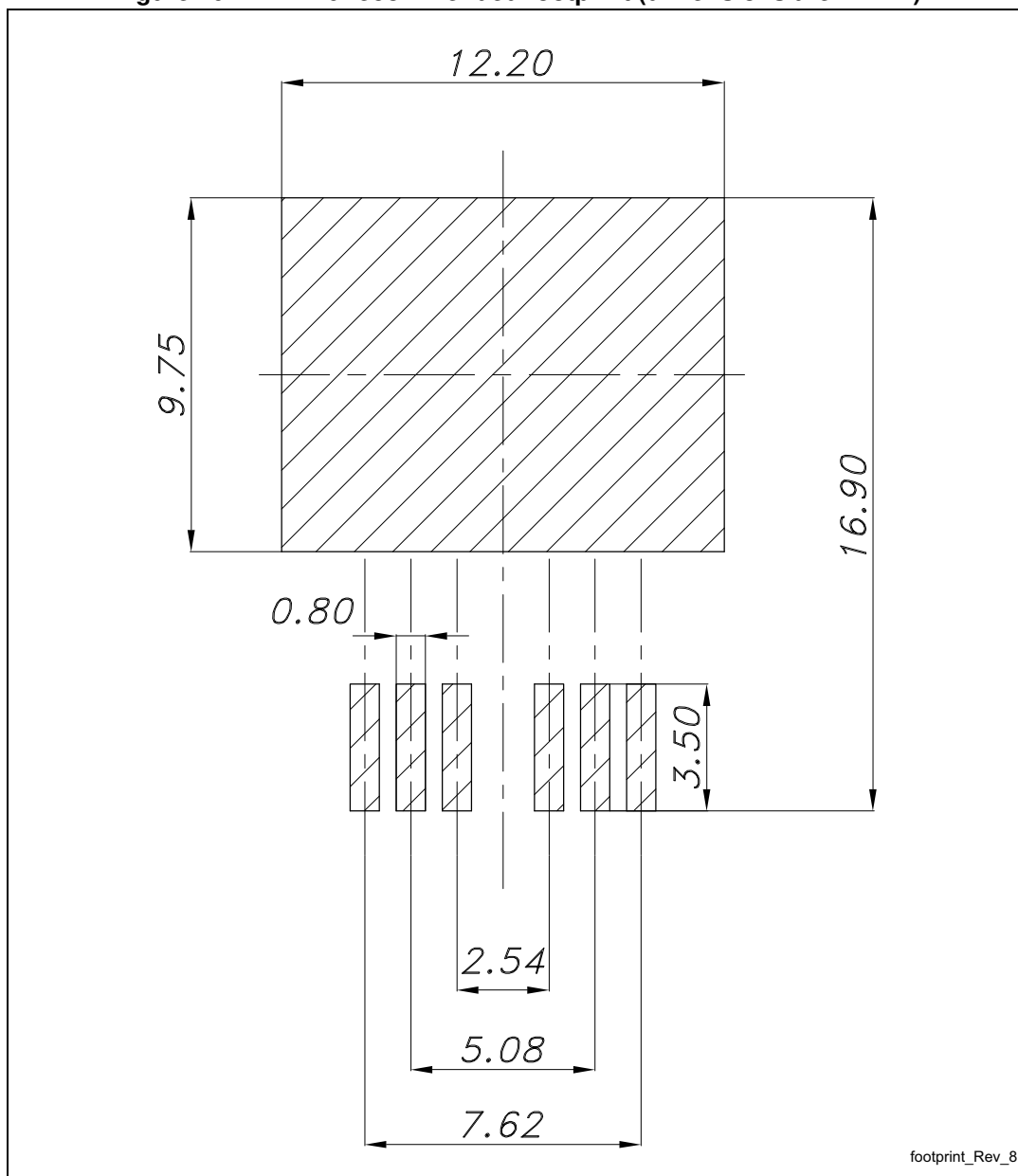


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Table 8. H<sup>2</sup>PAK-6 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.70
A1	0.03		0.20
C	1.17		1.37
e	2.34	2.54	2.74
e1	4.88		5.28
e2	7.42		7.82
E	0.45		0.60
F	0.50		0.70
H	10.00		10.40
H1	7.40		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.50		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 20. H<sup>2</sup>PAK-6 recommended footprint (dimensions are in mm)



## 4.2 H<sup>2</sup>PAK-6 packing information

Figure 21. Tape outline

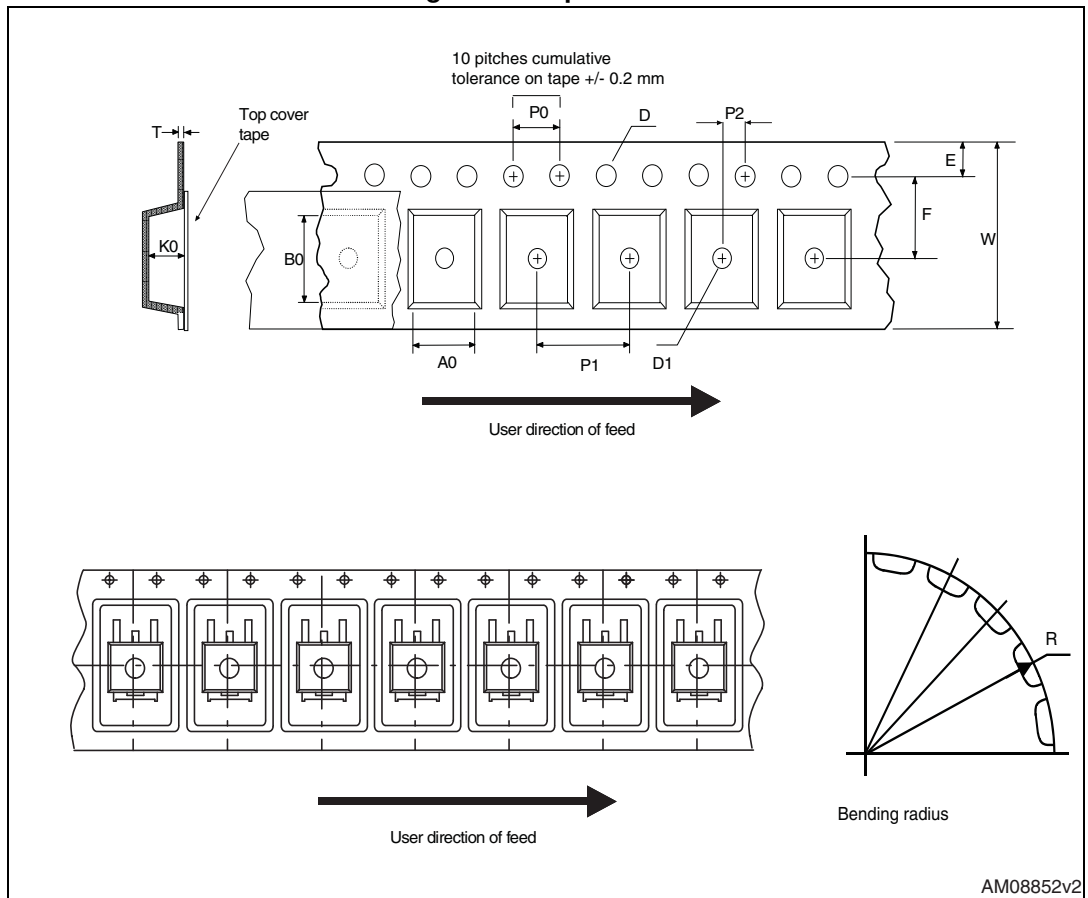


Figure 22. Reel outline

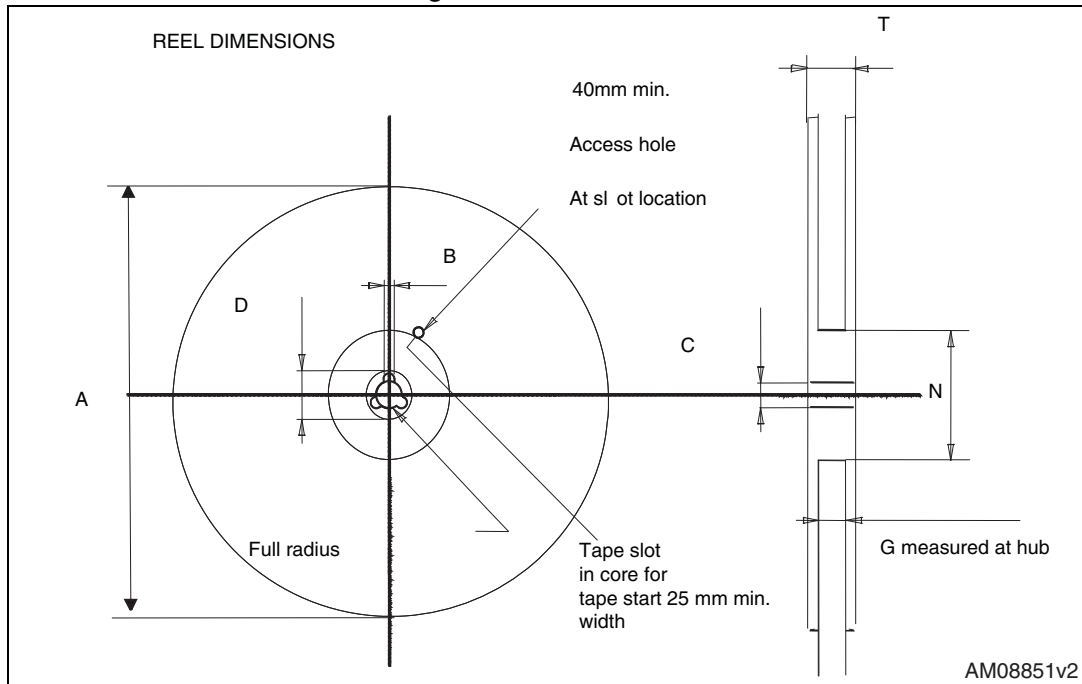


Table 9. Tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

## 5 Revision history

Table 10. Document revision history

Date	Revision	Changes
12-Dec-2014	1	First version.
14-Oct-2016	2	Updated <i>Figure 2: Safe operating area</i> . Updated <i>Section 4: Package information</i> . Minor text changes.

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