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## Automotive-grade N-channel 24 V, 0.95 mΩ typ., 180 A STripFET™ III Power MOSFET in a H<sup>2</sup>PAK-6 package

Datasheet – production data

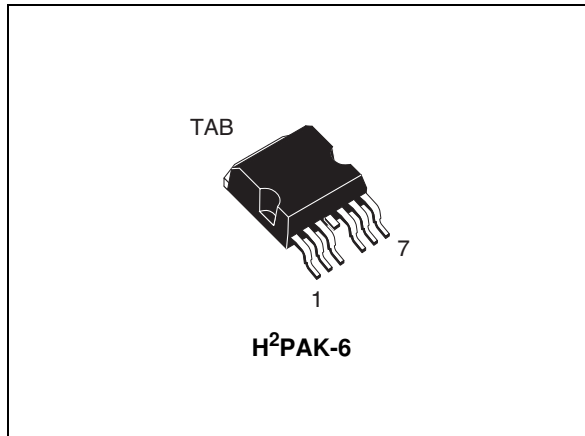
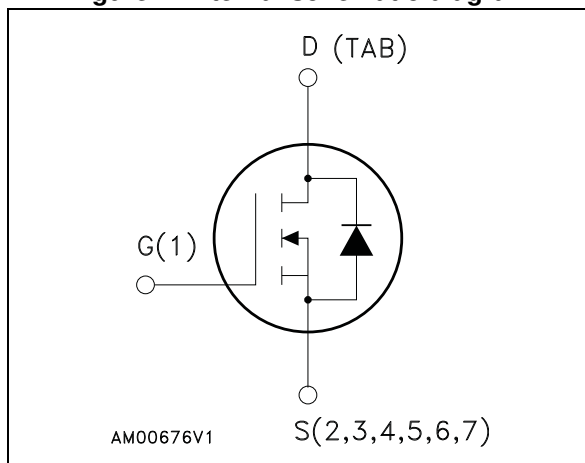


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub> <sup>(1)</sup>
STH300NH02L-6	24 V	< 1.2 mΩ	180 A

1. Current limited by package.

- Designed for automotive applications and AEC-Q101 qualified
- Conduction losses reduced
- Low profile, very low parasitic inductance, high current package

### Applications

- Switching applications

### Description

This device is an N-channel enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Package	Packaging
STH300NH02L-6	300NH02L	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	24	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	180	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	180	A
$I_{DM}^{(2)}$	Drain current (pulsed)	720	A
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2	W/ $^\circ\text{C}$
$E_{AS}^{(4)}$	Single pulse avalanche energy	1.6	J
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		

1. Current limited by package
2. Pulse width limited by safe operating area
3. This value is rated according to  $R_{thj-c}$
4. Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = 60\text{ A}$ ,  $V_{DD} = 20\text{ V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.5	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	$^\circ\text{C}/\text{W}$

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

## 2 Electrical characteristics

(T<sub>case</sub> = 25 °C unless otherwise specified)

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ( $V_{GS} = 0$ )	$I_D = 250 \mu A$	24			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 24 V$ , $V_{DS} = 24 V$ , $T_C = 125 ^\circ C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20 V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250 \mu A$	1			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10 V$ , $I_D = 80 A$ $V_{GS} = 5 V$ , $I_D = 40 A$		0.95 1.15	1.2 1.5	m $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 15 V$ , $f = 1 MHz$ , $V_{GS} = 0$	-	7050	-	pF
$C_{oss}$	Output capacitance		-	3250	-	pF
$C_{rss}$	Reverse transfer capacitance		-	307	-	pF
$Q_g$	Total gate charge	$V_{DD} = 20 V$ , $I_D = 120 A$ , $V_{GS} = 10 V$ (see Figure 14)	-	109	-	nC
$Q_{gs}$	Gate-source charge		-	30	-	nC
$Q_{gd}$	Gate-drain charge		-	26	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20 V$ , $I_D = 80 A$ $R_G = 4.7 \Omega$ , $V_{GS} = 10 V$ , (see Figure 13)	-	18	-	ns
$t_r$	Rise time		-	275	-	ns
$t_{d(off)}$	Turn-off delay time	$V_{DD} = 20 V$ , $I_D = 80 A$ $R_G = 4.7 \Omega$ , $V_{GS} = 10 V$ , (see Figure 13)	-	138	-	ns
$t_f$	Fall time		-	94.4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current	$I_{SD} = 180\text{ A}$ , $V_{GS} = 0$	-		180	A
$I_{SD}^{(2)}$	Source-drain current (pulsed)				720	A
$V_{SD}^{(3)}$	Forward on voltage				1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 120\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15)	-	65		ns
$Q_{rr}$	Reverse recovery charge		-	90		nC
$I_{RRM}$	Reverse recovery current		-	2.8		A

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



## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

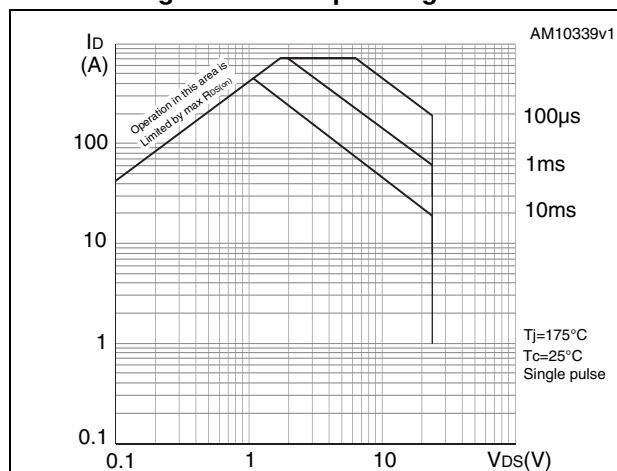


Figure 3. Thermal impedance

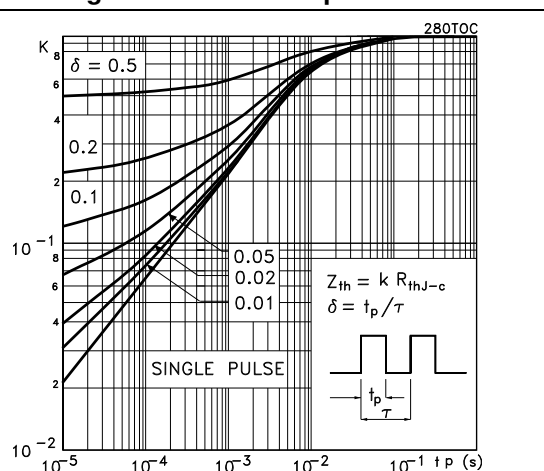


Figure 4. Output characteristics

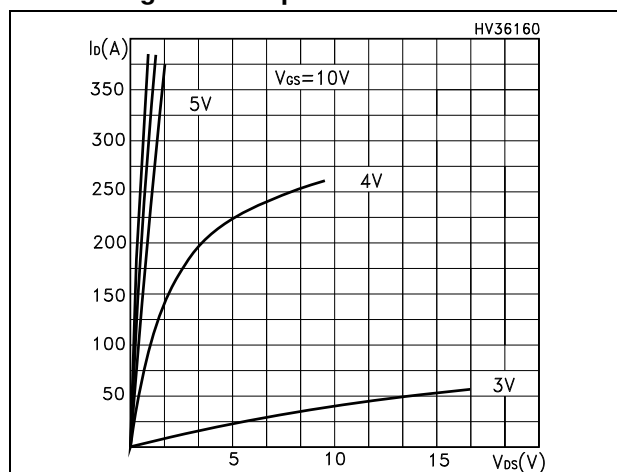


Figure 5. Transfer characteristics

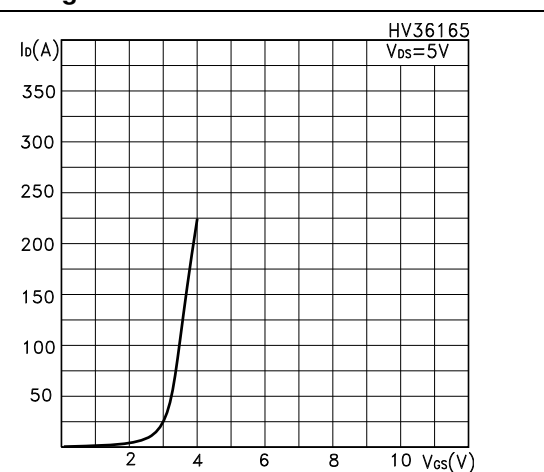
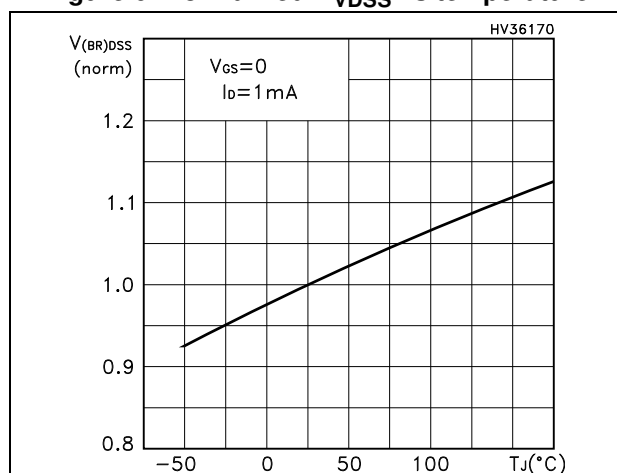
Figure 6. Normalized  $B_{VDS}$  vs temperature

Figure 7. Static drain-source on-resistance

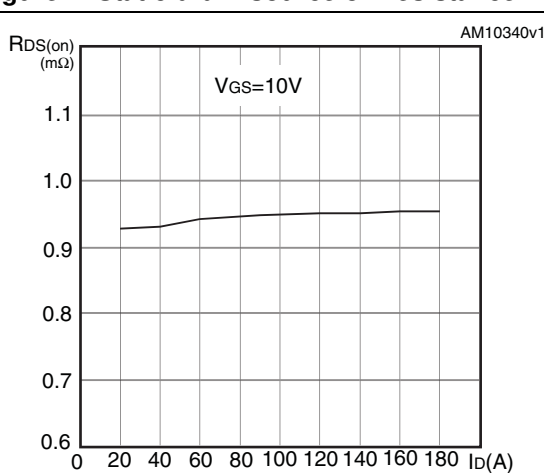


Figure 8. Gate charge vs gate-source voltage

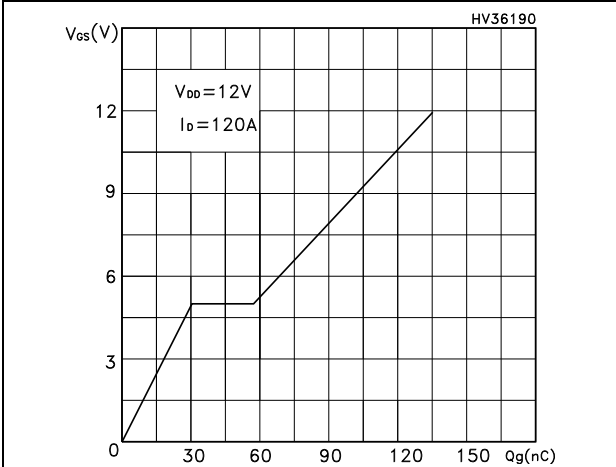


Figure 9. Capacitance variations

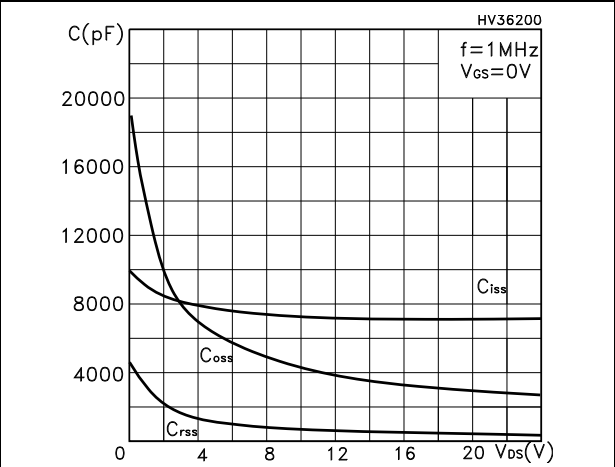


Figure 10. Normalized gate threshold voltage vs temperature

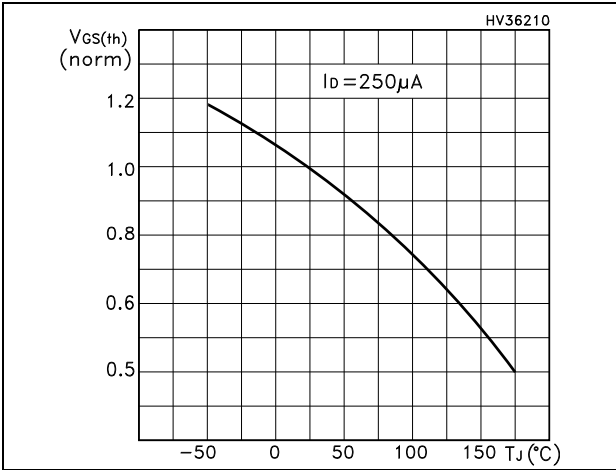


Figure 11. Normalized on resistance vs temperature

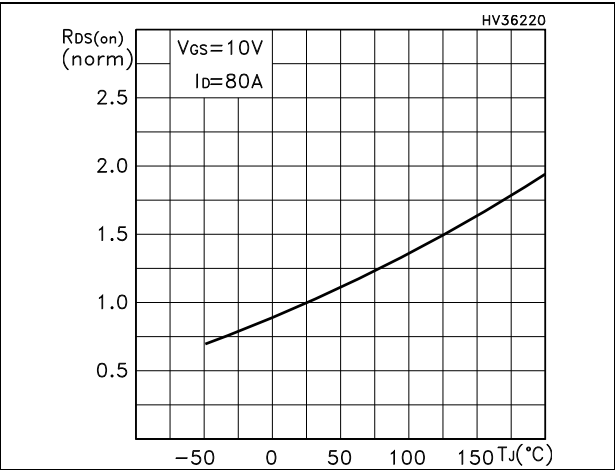
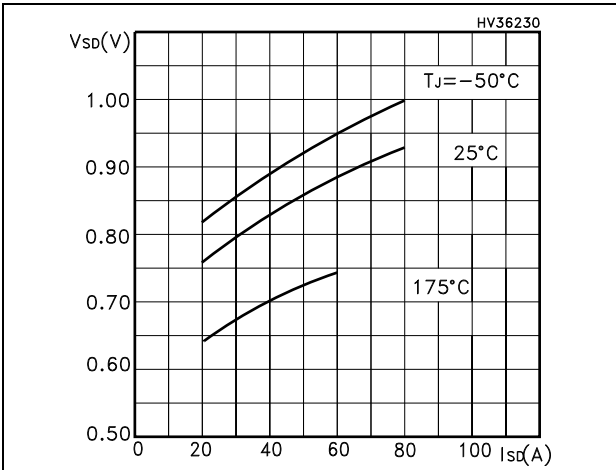


Figure 12. Source-drain diode forward characteristics







## 4 Package mechanical data

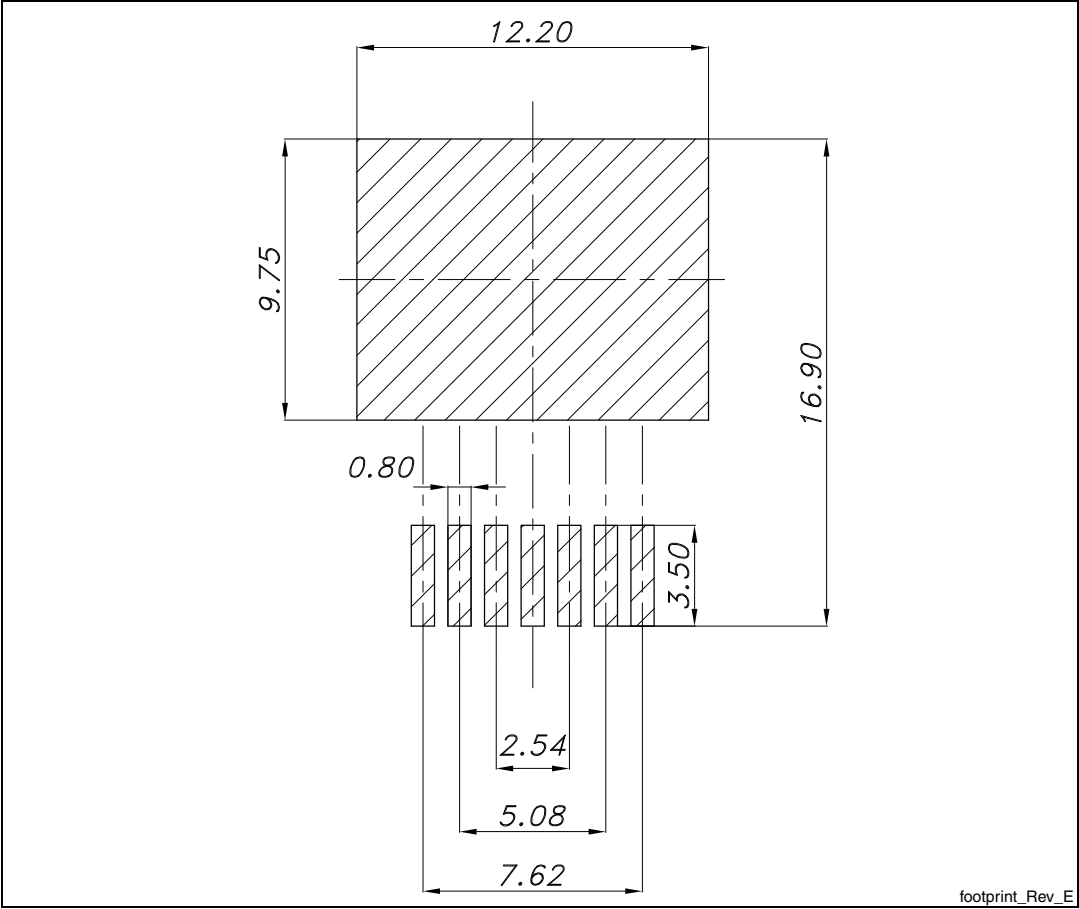
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK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

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

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	2.34		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	1.5		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 in mm)

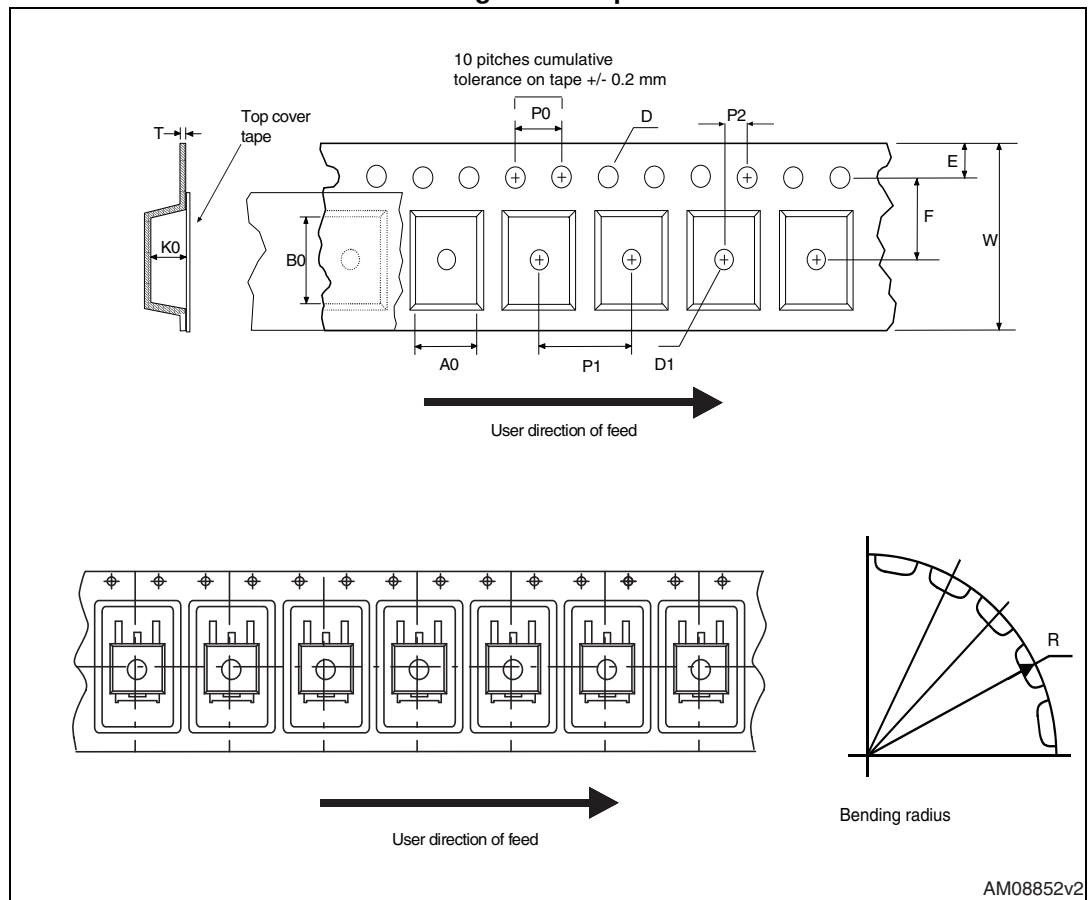


## 5 Packaging mechanical data

Table 9. Tape and reel mechanical data

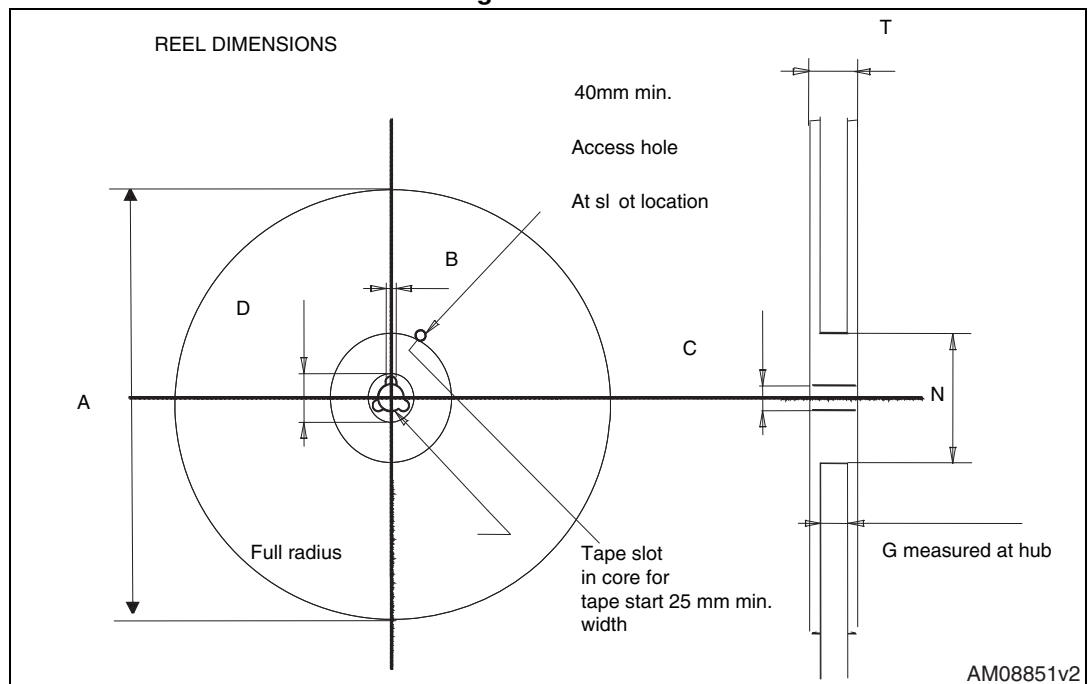
Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 21. Tape



AM08852v2

Figure 22. Reel



AM08851v2

## 6 Revision history

Table 10. Document revision history

Date	Revision	Changes
12-Jul-2011	1	initial release
24-Oct-2011	2	Updated test conditions in <a href="#">Section Table 5.: Dynamic</a> and <a href="#">Section Table 7.: Source drain diode</a> .
15-May-2013	3	<ul style="list-style-type: none"><li>– Updated: title, <a href="#">Applications</a> and <a href="#">Description</a> in cover page</li><li>– Minor text changes</li></ul>
22-Jul-2013	4	<ul style="list-style-type: none"><li>– Updated title in cover page.</li></ul>



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