



# STB30NF20L

## N-channel 200 V, 0.065 $\Omega$ , 30 A STripFET™ Power MOSFET in D<sup>2</sup>PAK package

Datasheet — production data

### Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>	P <sub>TOT</sub>
STB30NF20L	200 V	0.075 $\Omega$	30 A	150 W

- Gate charge minimized
- 100% avalanche tested
- Excellent figure of merit (R<sub>DS\*</sub> Q<sub>g</sub>)
- Very good manufacturing repeatability
- Very low intrinsic capacitance

### Applications

- Automotive

### Description

This N-channel enhancement mode Power MOSFET benefits from the latest refinement of STMicroelectronics' unique "single feature size" strip-based process, which decreases the critical alignment steps to offer exceptional manufacturing reproducibility. The result is a transistor with extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

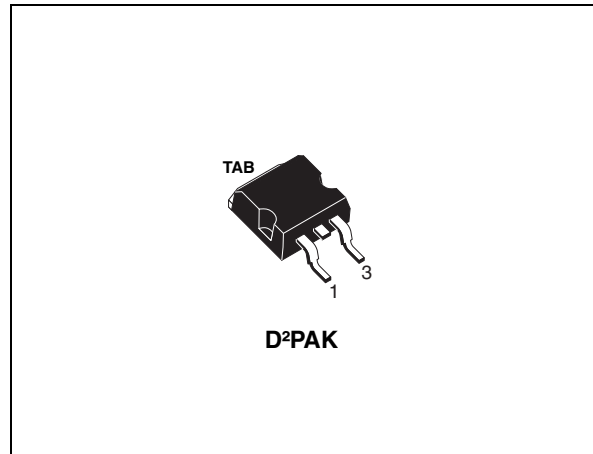


Figure 1. Internal schematic diagram

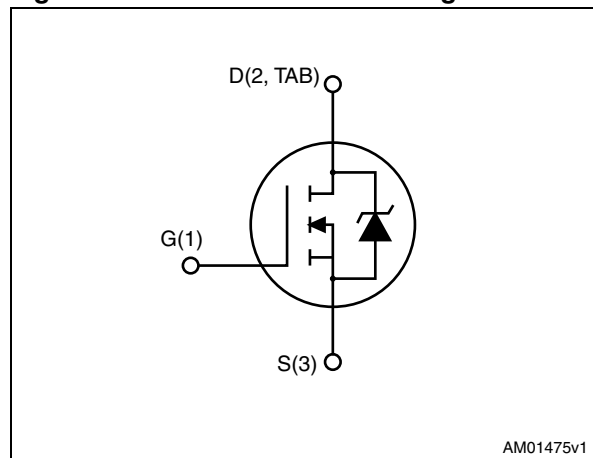


Table 1. Device summary

Order code	Marking	Package	Packaging
STB30NF20L	30NF20L	D <sup>2</sup> PAK	Tape and reel

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	200	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	30	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	19	A
$I_{DM}^{(1)}$	Drain current (pulsed)	120	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	150	W
	Derating factor	1	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	10	V/ns
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$
$T_l$	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

1. Pulse width limited by safe operating area.
2.  $I_{SD} \leq 30\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} = 80\%V_{(BR)DSS}$ .

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case max.	1	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal resistance junction-ambient max.	62.5	$^\circ\text{C}/\text{W}$

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
$I_{AR}$	Avalanche current, repetitive or not repetitive (pulse width limited by $T_{jmax}$ )	30	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	140	mJ

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified).

**Table 5. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1 \text{ mA}, V_{GS} = 0$	200			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 200 \text{ V},$ $V_{DS} = 200 \text{ V}, T_c = 125^{\circ}C$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20 \text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1	2	3	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 5 \text{ V}, I_D = 15 \text{ A}$		0.065	0.075	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}, V_{GS} = 0$	-	1990	-	pF
$C_{oss}$	Output capacitance			297		pF
$C_{rss}$	Reverse transfer capacitance			42		pF
$Q_g$	Total gate charge	$V_{DD} = 160 \text{ V}, I_D = 30 \text{ A}$	-	65	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10 \text{ V}$		7		nC
$Q_{gd}$	Gate-drain charge	(see Figure 14)		21		nC

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 100 \text{ V}, I_D = 15 \text{ A},$ $R_G = 4.7 \Omega, V_{GS} = 10 \text{ V}$ (see Figure 13)	-	14	-	ns
$t_r$	Rise time			12		ns
$t_{d(off)}$	Turn-off delay time	$V_{DD} = 100 \text{ V}, I_D = 15 \text{ A},$ $R_G = 4.7 \Omega, V_{GS} = 10 \text{ V}$ (see Figure 13)	-	68	-	ns
$t_f$	Fall time			14		ns

**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)	$V_{SD}=1.5\text{ V}$	-		30 120	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=30\text{ A}$ , $V_{GS}=0$	-		1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=30\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD}=100\text{ V}$	-	140 750 13		ns nC A
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=30\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD}=100\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$	-	170 1.1 14		ns $\mu\text{C}$ 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 2. Safe operating area

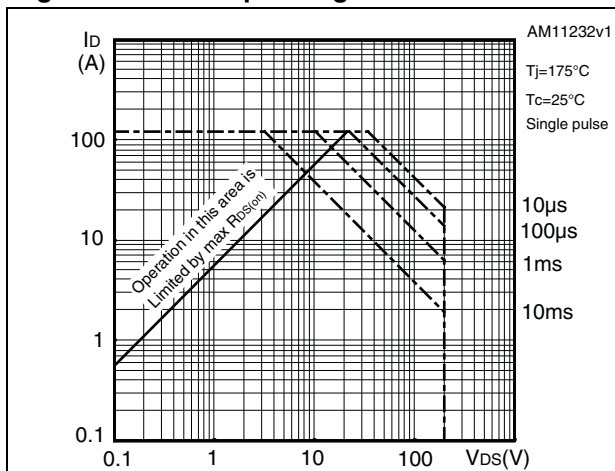


Figure 3. Thermal impedance

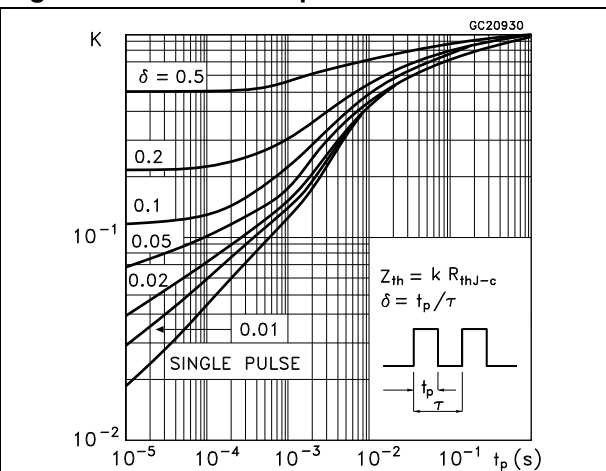


Figure 4. Output characteristics

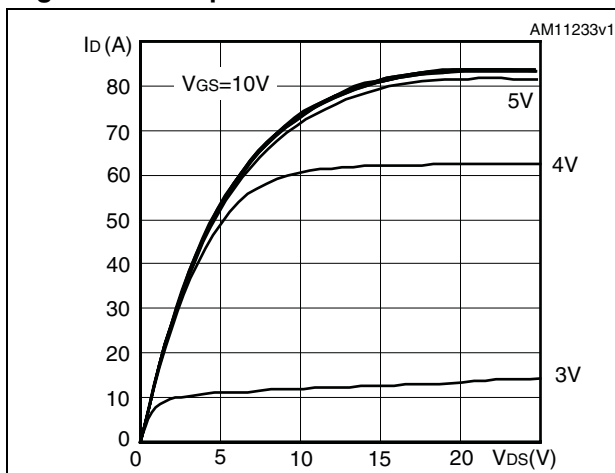


Figure 5. Transfer characteristics

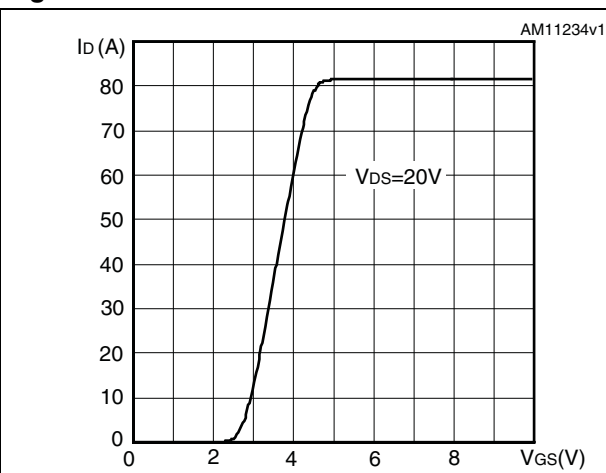


Figure 6. Normalized  $B_{V_{DS}}$  vs temperature

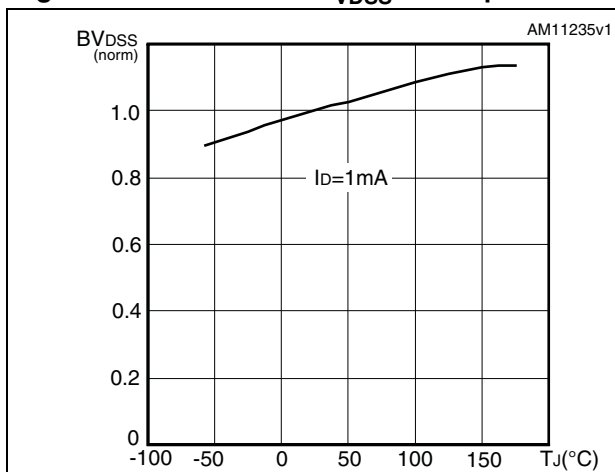


Figure 7. Static drain-source on-resistance

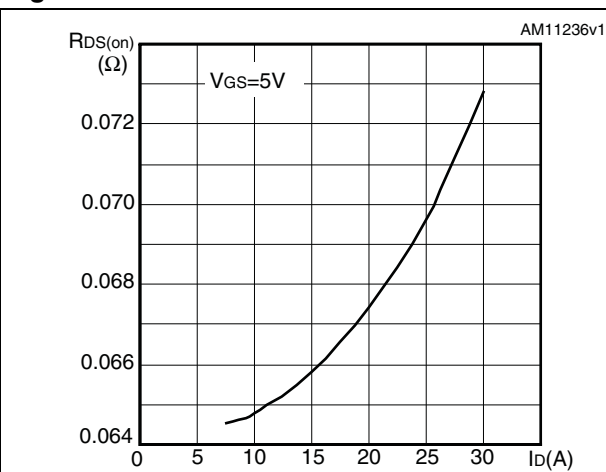


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

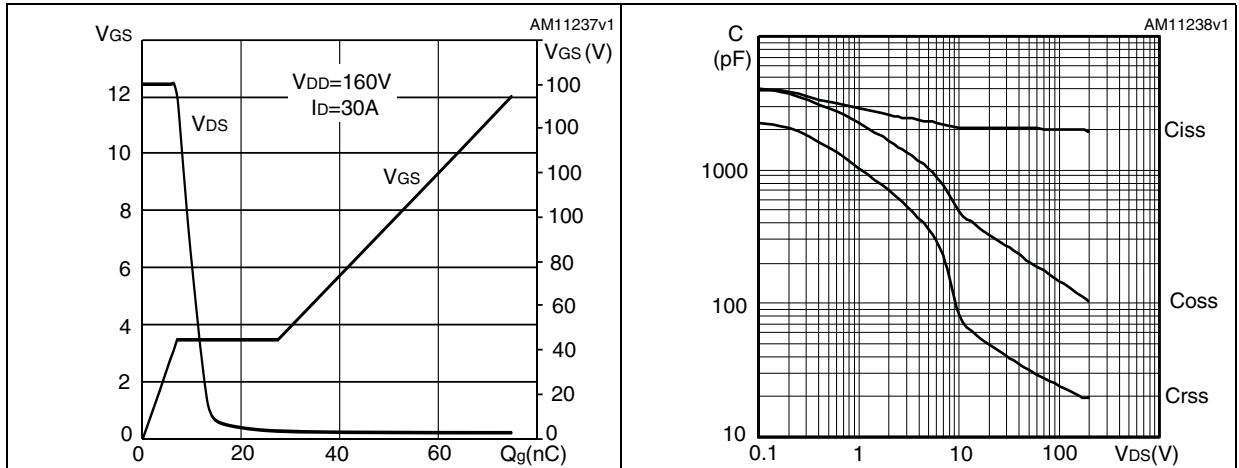


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on-resistance vs temperature

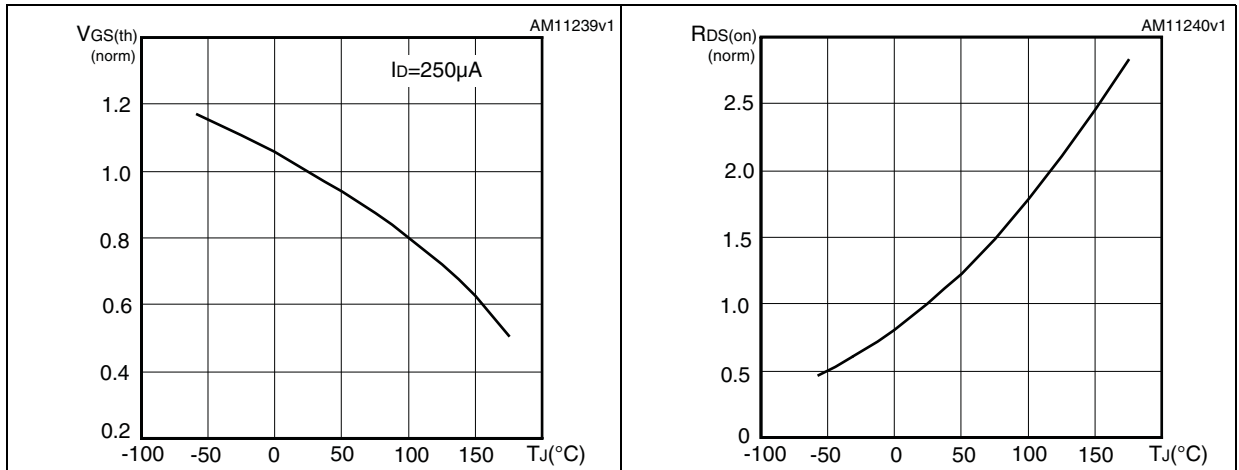
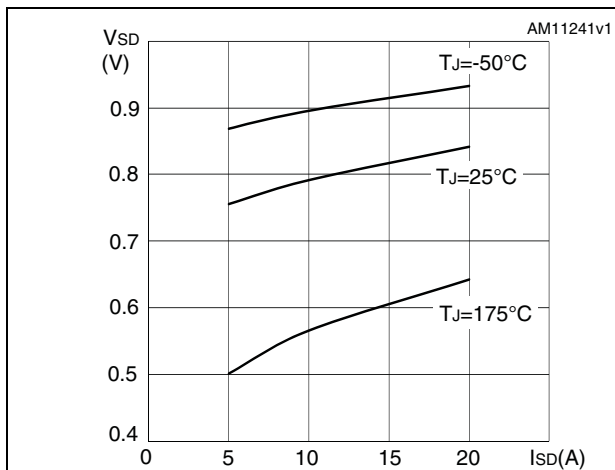


Figure 12. Source-drain diode forward characteristics







## 4 Package mechanical data

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

**Table 9. D<sup>2</sup>PAK (TO-263) mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 19. D<sup>2</sup>PAK (TO-263) drawing

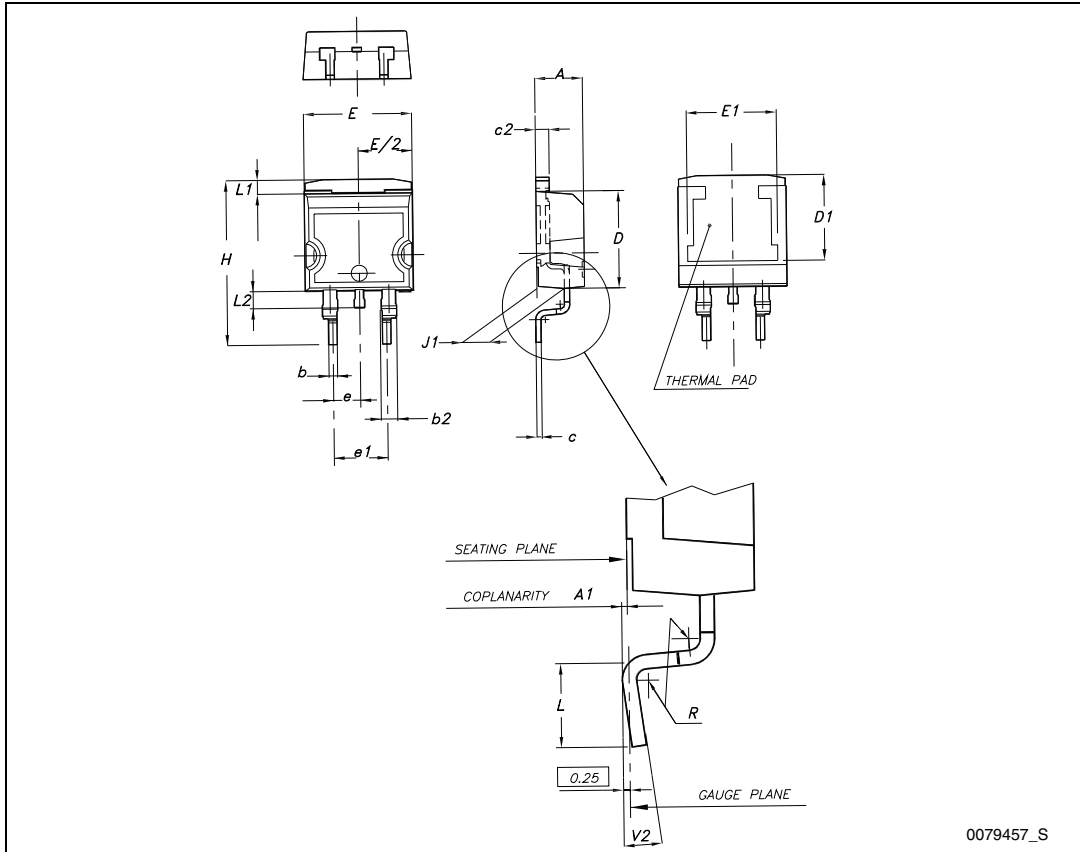
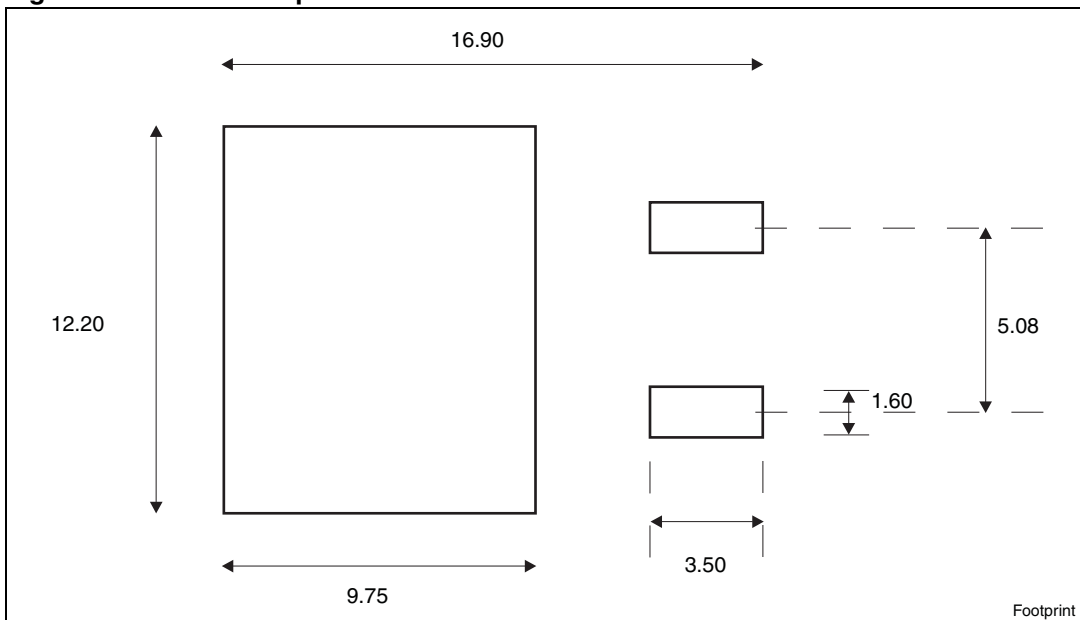


Figure 20. D<sup>2</sup>PAK footprint<sup>(a)</sup>



a. All dimensions are in millimeters.

## 5 Packaging mechanical data

Table 10. D<sup>2</sup>PAK (TO-263) 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

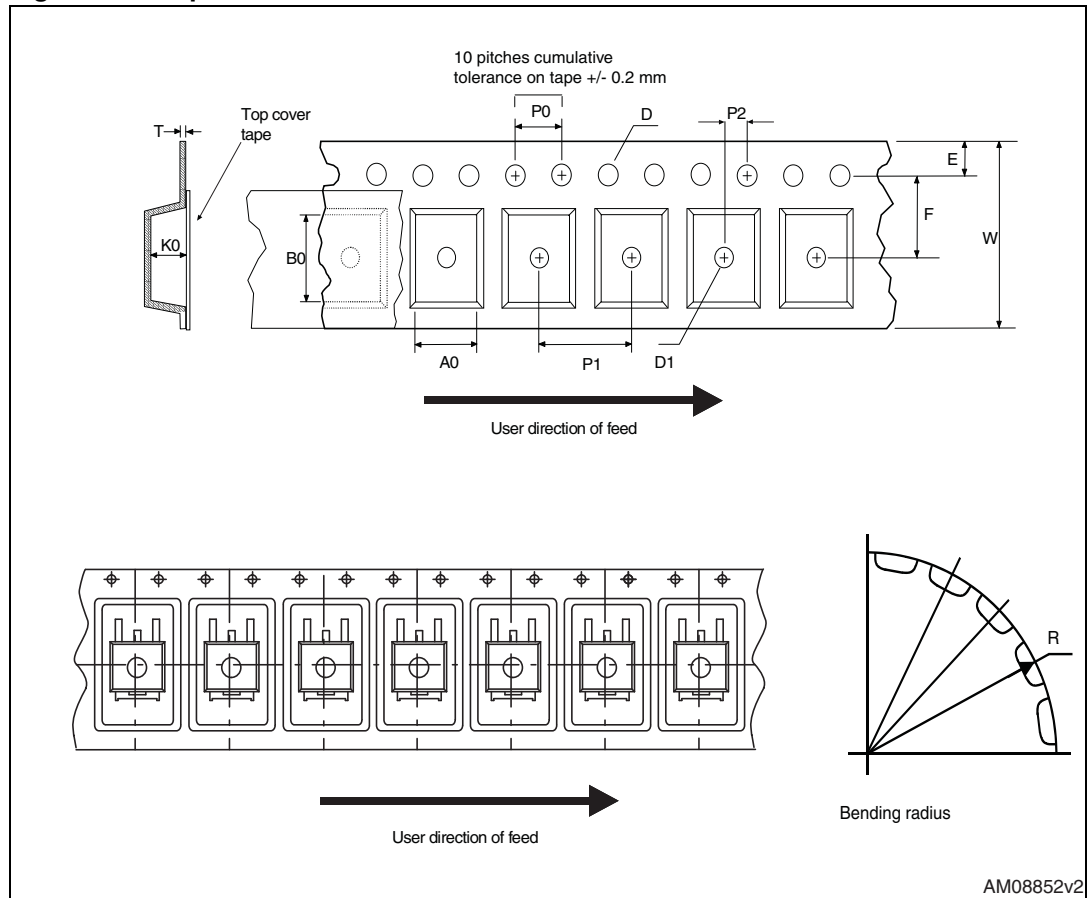
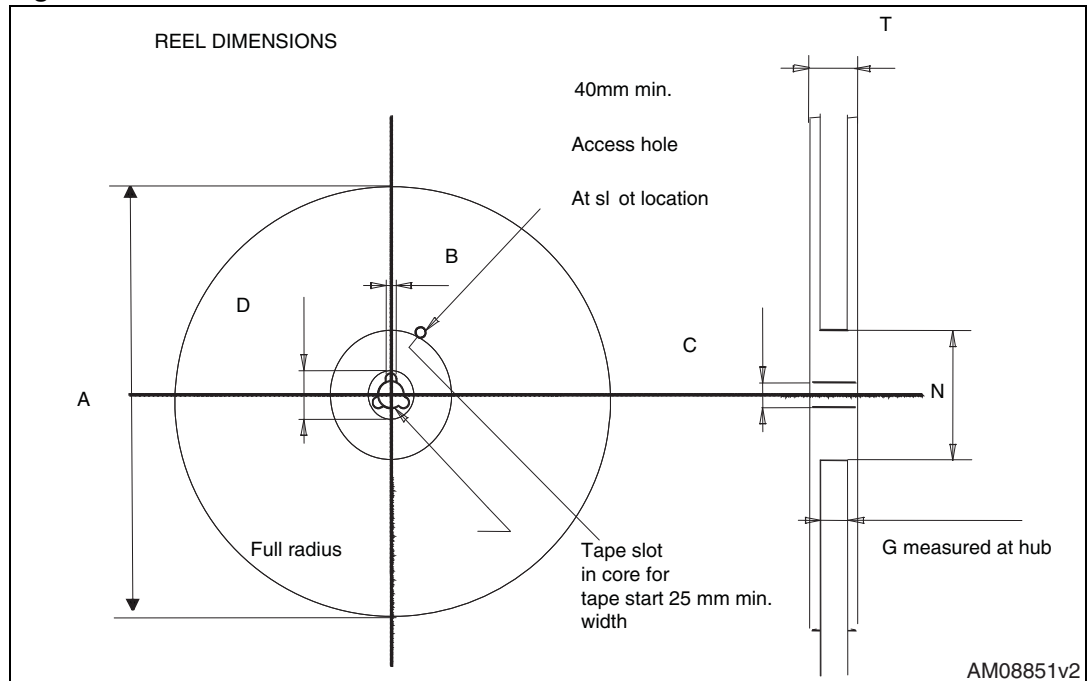


Figure 22. Reel



## 6 Revision history

Table 11. Document revision history

Date	Revision	Changes
01-Feb-2012	1	First release.
07-Mar-2012	2	$P_{TOT}$ in cover page and in <a href="#">Table 2</a> has been updated. <a href="#">Figure 2</a> , <a href="#">Figure 6</a> , <a href="#">Figure 10</a> and <a href="#">Figure 11</a> have been updated.

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