



## STD35N3LH5

N-channel 30 V, 12.5 m $\Omega$  35 A, DPAK  
STripFET™ V Power MOSFET

### Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STD35N3LH5	30 V	< 16 m $\Omega$	35 A

- 100% avalanche tested
- Surface mounting DPAK (TO-252)
- Low gate drive power losses

### Applications

- Switching applications
  - Automotive

### Description

The STD35N3LH5 is a N-channel STripFET™ V. This Power MOSFET technology is among the latest improvements, which have been especially tailored to achieve very low on-state resistance providing also one of the best-in-class figure of merit (FOM).

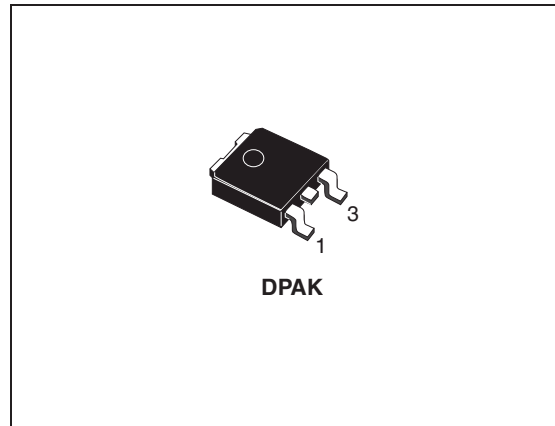
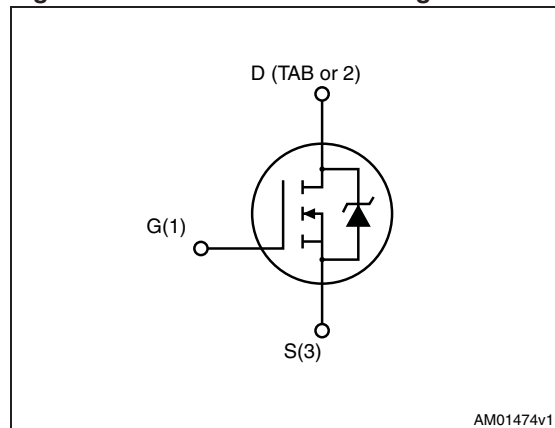


Figure 1. Internal schematic diagram



AM01474v1

Table 1. Device summary

Order code	Marking	Package	Packaging
STD35N3LH5	D35N3LH5	DPAK	Tape and reel

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS}=0$ )	30	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	35	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	22	A
$I_{DM}^{(2)}$	Drain current (pulsed)	140	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	35	W
$T_j$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. The value is rated according  $R_{thj-c}$
2. Pulse is rated according safe operating area

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	4.3	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient max	50	$^\circ\text{C/W}$

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

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
$I_{AV}$	Not-repetitive avalanche current	14	A
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$ , $I_D = I_{AV}$ , $V_{DD} = 24\text{ V}$ )	100	mJ

## 2 Electrical characteristics

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

**Table 5. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	30			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating, V <sub>DS</sub> = Max rating, T <sub>c</sub> = 125 °C			1 10	μA μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20 V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1		2.5	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 15 A		12.5 18	16 20	mΩ mΩ

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 27.5 V, f = 1 MHz, V <sub>GS</sub> = 0	-	713	-	pF
C <sub>oss</sub>	Output capacitance			135		pF
C <sub>rss</sub>	Reverse transfer capacitance			22		pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 19 A	-	5.4	-	nC
Q <sub>gs</sub>	Gate-source charge	V <sub>GS</sub> = 4.5 V		2		nC
Q <sub>gd</sub>	Gate-drain charge	<a href="#">Figure 14</a>		2.1		nC
R <sub>G</sub>	Intrinsic gate resistance	f = 1 MHz open drain	-	3.3	-	Ω

**Table 7. Switching on/off (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD}=15\text{ V}$ , $I_D=5.5\text{ A}$ , $R_G=4.7\ \Omega$ , $V_{GS}=10\text{ V}$ <i>Figure 16</i>	-	4 4	-	ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time		-	20 3.5	-	ns 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)		-		35 140	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=35\text{ A}$ , $V_{GS}=0$	-		1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=11\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$ , $V_{DD}=24\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$ <i>Figure 15</i>	-	20 10.5 1		ns nC 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

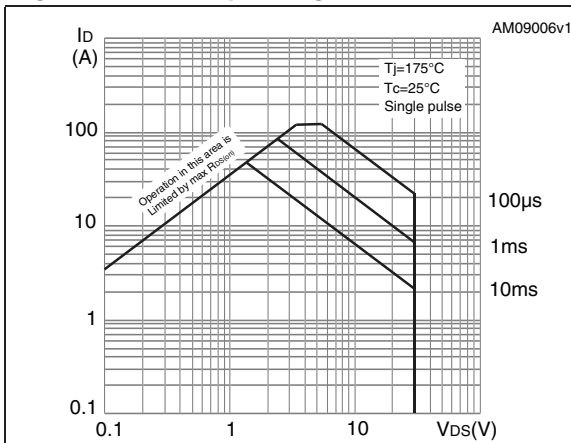


Figure 3. Thermal impedance

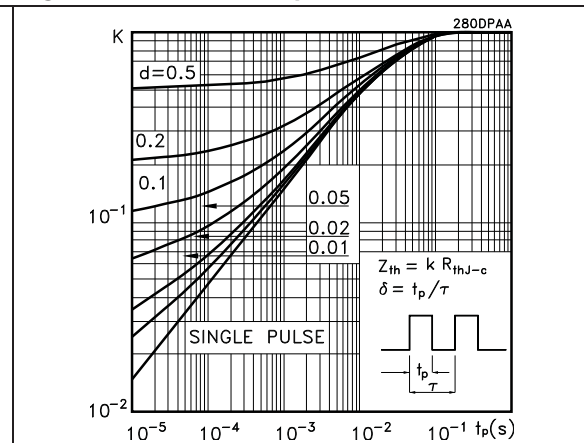


Figure 4. Output characteristics

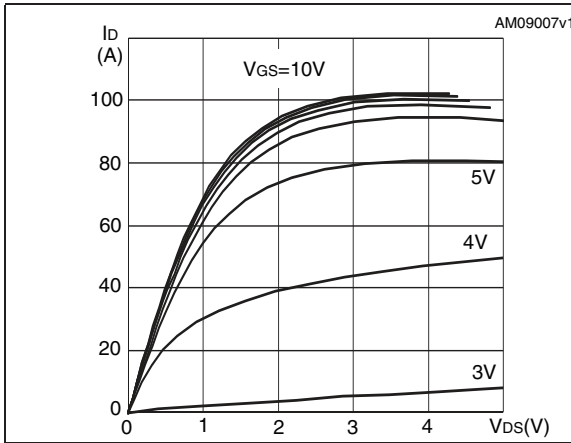


Figure 5. Transfer characteristics

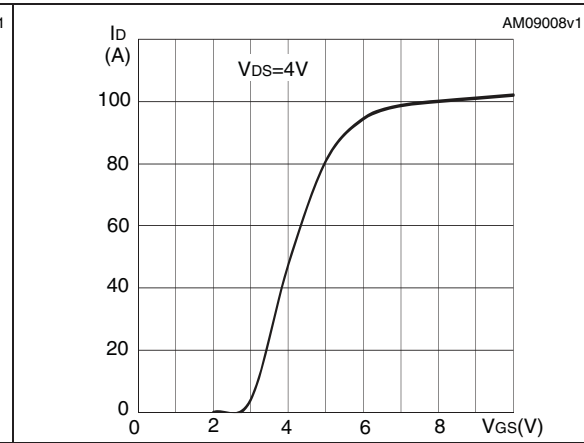


Figure 6. Normalized  $B_{V_{DSS}}$  vs temperature

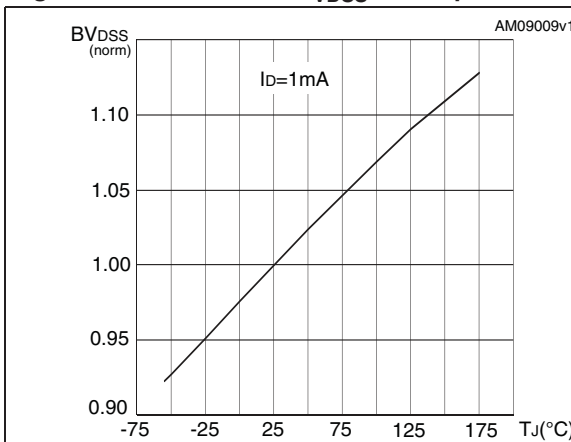


Figure 7. Static drain-source on resistance

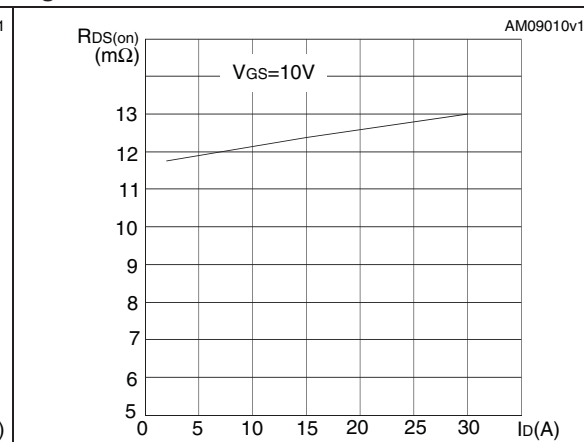


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

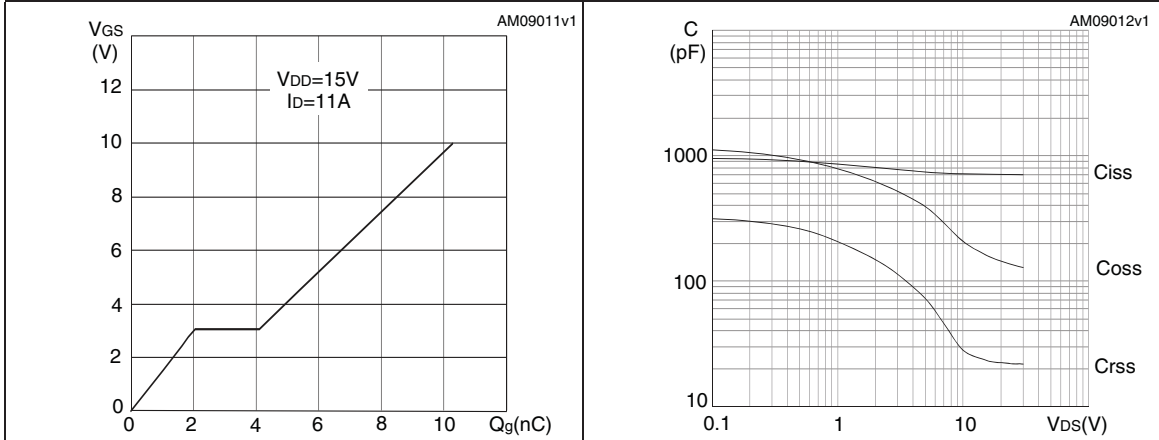


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

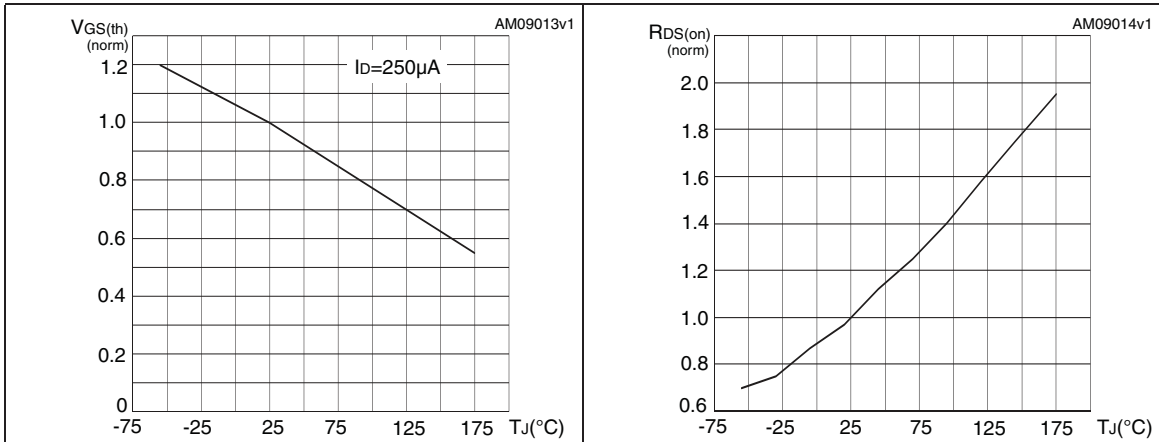
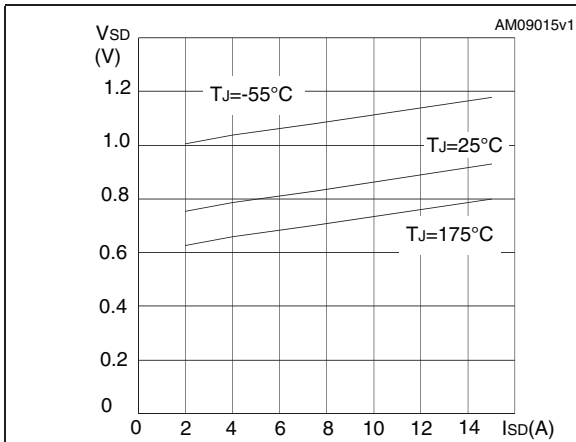


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

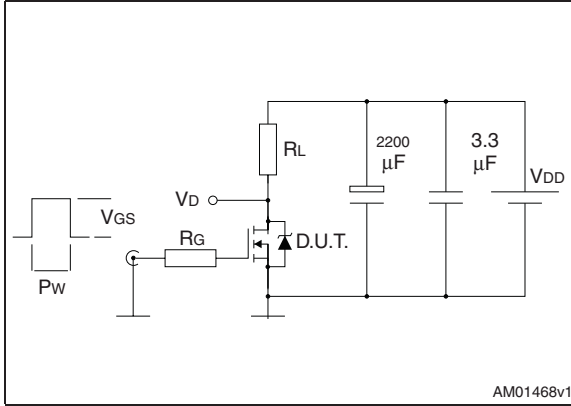


Figure 14. Gate charge test circuit

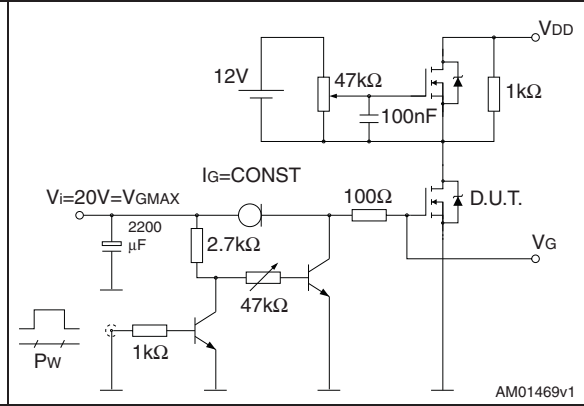


Figure 15. Test circuit for inductive load switching and diode recovery times

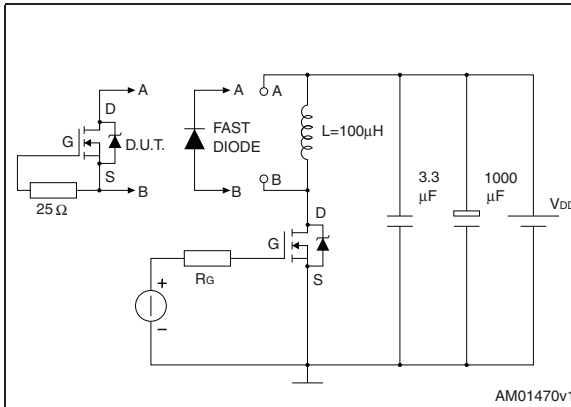


Figure 16. Unclamped inductive load test circuit

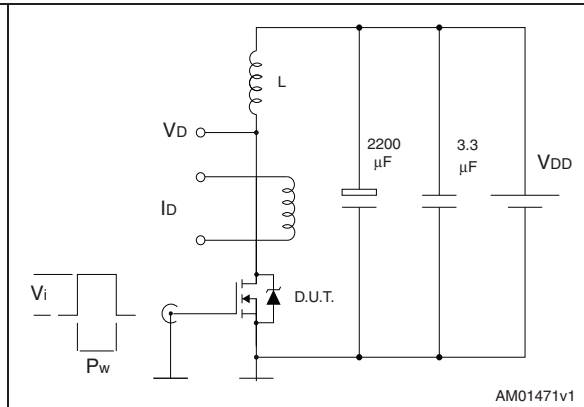


Figure 17. Unclamped inductive waveform

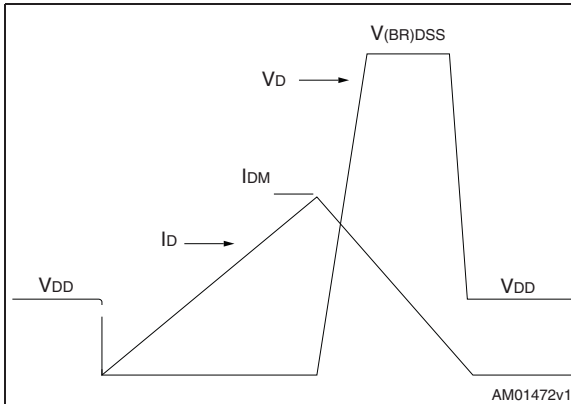
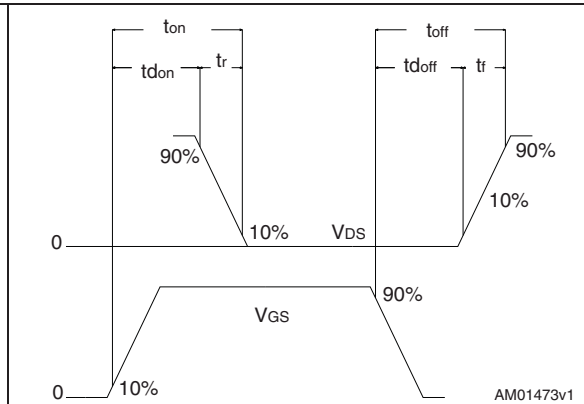


Figure 18. Switching time waveform





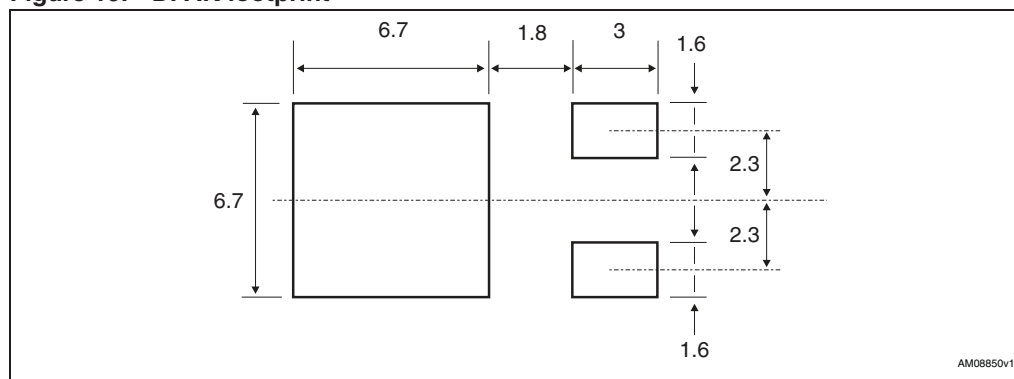
## 4 Package mechanical data

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 is an ST trademark.

Table 9. DPAK (TO-252) mechanical data

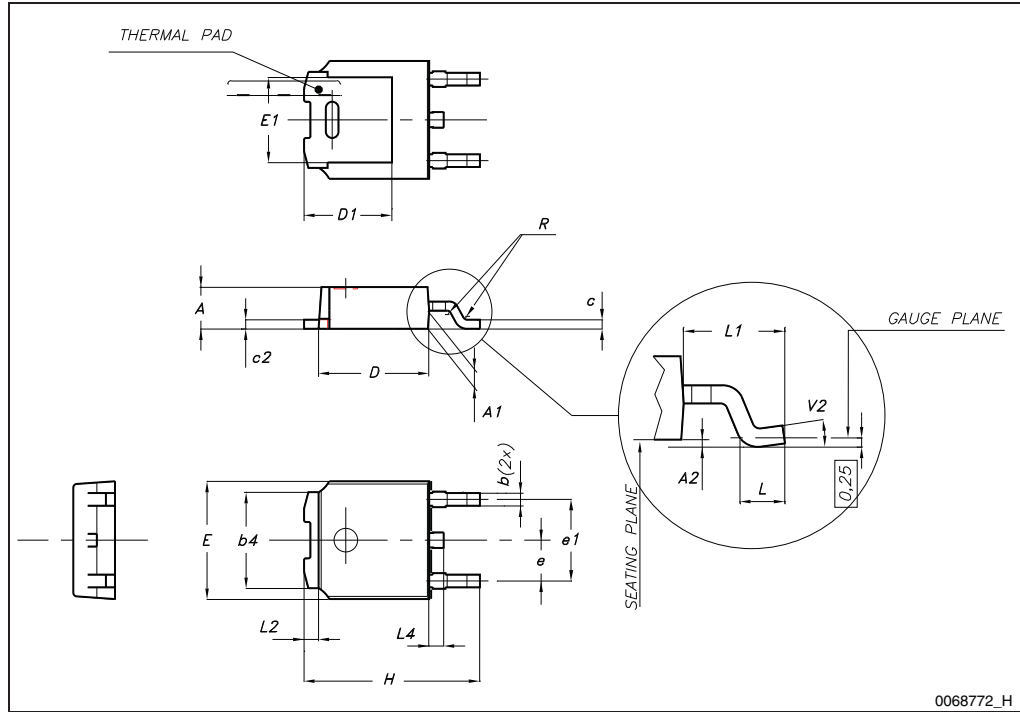
Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		1.50
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 19. DPAK footprint<sup>(a)</sup>



a. All dimension are in millimeters

Figure 20. DPAK (TO-252) drawing



## 5 Packaging mechanical data

Table 10. DPAK (TO-252) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1		Base qty.	2500
P1	7.9	8.1		Bulk qty.	2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Figure 21. Tape for DPAK (TO-252)

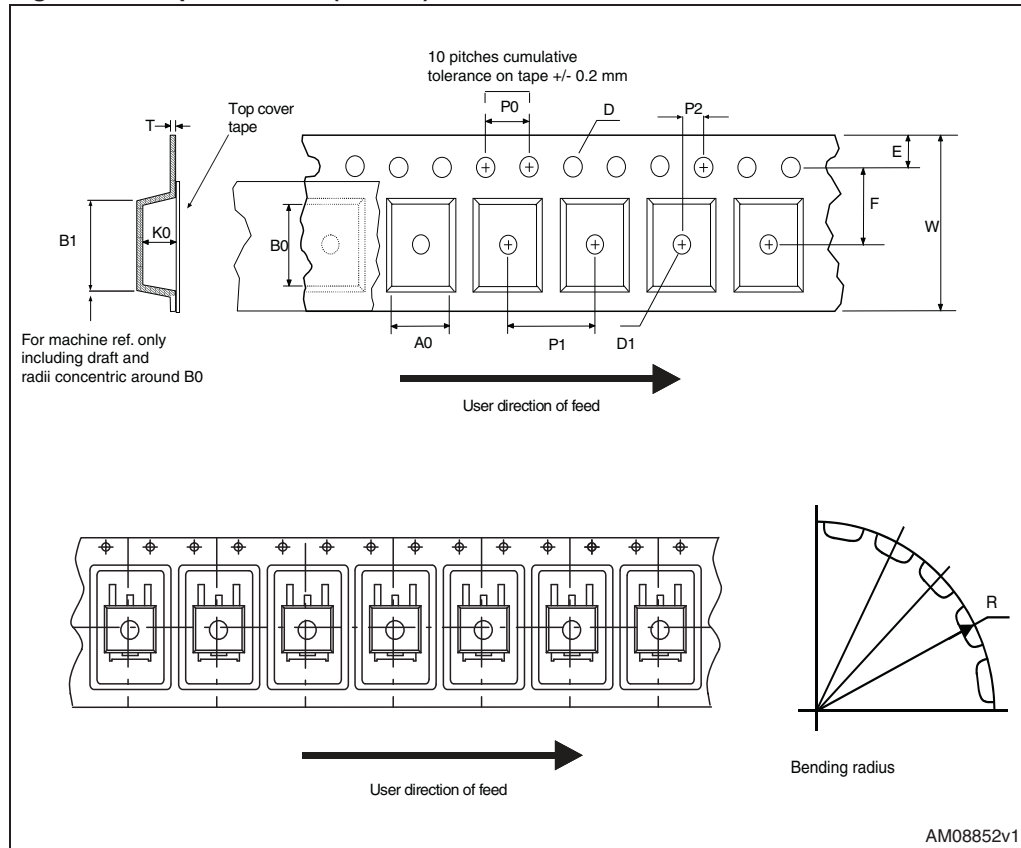
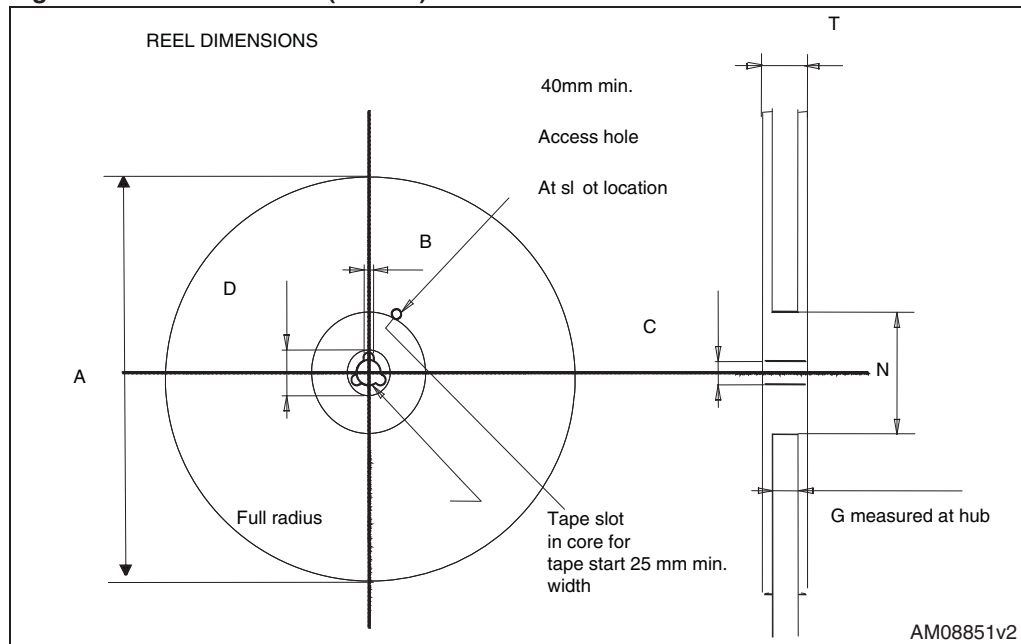


Figure 22. Reel for DPAK (TO-252)



## 6 Revision history

Table 11. Document revision history

Date	Revision	Changes
02-Oct-2009	1	First release.
18-May-2011	2	Document status promoted from preliminary data to datasheet.

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