



STD95N4LF3

N-channel 40 V, 5.0 mΩ typ., 80 A STripFET™ III Power MOSFET in a DPAK package

Datasheet — production data

Features

Type	V _{DSS}	R _{DS(on) max}	I _D	P _D
STD95N4LF3	40 V	< 6.0 mΩ	80 A ⁽¹⁾	110 W

1. Value limited by wire bonding

- 100% avalanche tested
- Logic level drive

Applications

- Switching application
 - Automotive

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.

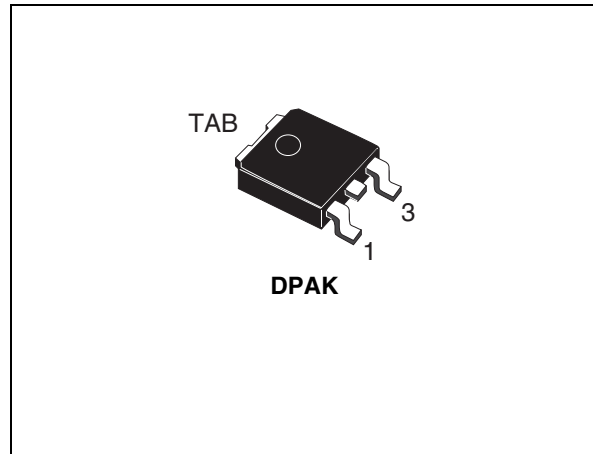


Figure 1. Internal schematic diagram

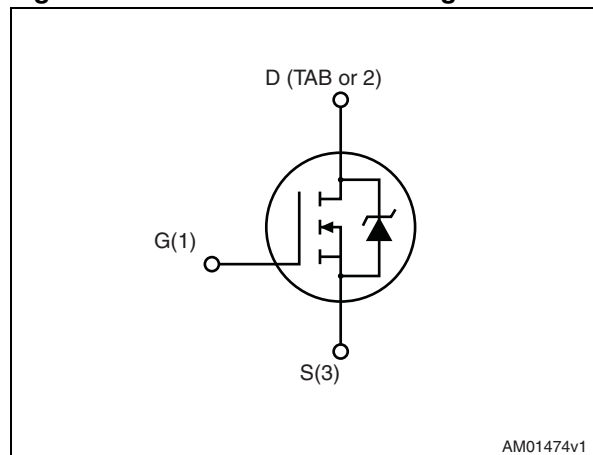


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD95N4LF3	95N4LF3	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	40	V
V_{GS}	Gate-source voltage	± 16	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	65	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
	Derating factor	0.73	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	8	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	400	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Value limited by wire bonding
2. Pulse width limited by safe operating area
3. $I_{SD} \leq 80\text{ A}$, $di/dt \leq 40\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$
4. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 40\text{ A}$, $V_{DD} = 35\text{ V}$ [Figure 16](#) and [Figure 17](#)

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.36	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	50	$^\circ\text{C}/\text{W}$

1. When mounted on 1inch² FR-4 2Oz Cu board

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	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	40			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 40\ \text{V}$ $V_{DS} = 40\ \text{V}$, $T_C = 125\text{ °C}$			10 100	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 16\ \text{V}$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 40\ \text{A}$ $V_{GS} = 5\ \text{V}$, $I_D = 40\ \text{A}$		5.0	6.0 9.0	$\text{m}\Omega$ $\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0$	-	2500		pF
C_{oss}	Output capacitance			560		pF
C_{rss}	Reverse transfer capacitance			50		pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20\ \text{V}$, $I_D = 40\ \text{A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\ \text{V}$ (see Figure 13 and Figure 18)	-	7.5		ns
t_r	Rise time			45		ns
$t_{d(off)}$	Turn-off delay time			45		ns
t_f	Fall time			11		ns
Q_g	Total gate charge	$V_{DD} = 20\ \text{V}$, $I_D = 80\ \text{A}$, $V_{GS} = 10\ \text{V}$ (see Figure 14)	-	50	70	nC
Q_{gs}	Gate-source charge			7		nC
Q_{gd}	Gate-drain charge			9.5		nC

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		80 320	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15 and Figure 19)	-	40 55 3		ns nC A

1. Pulse width limited by safe operating area.
2. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

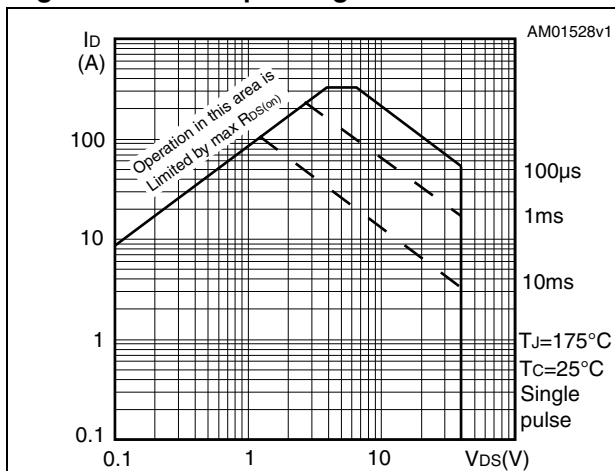


Figure 3. Thermal impedance

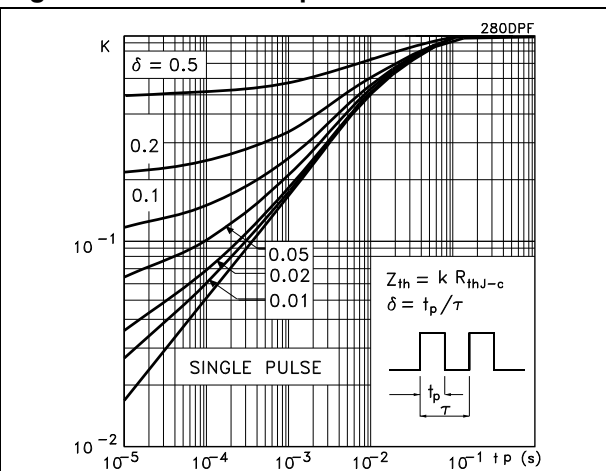


Figure 4. Output characteristics

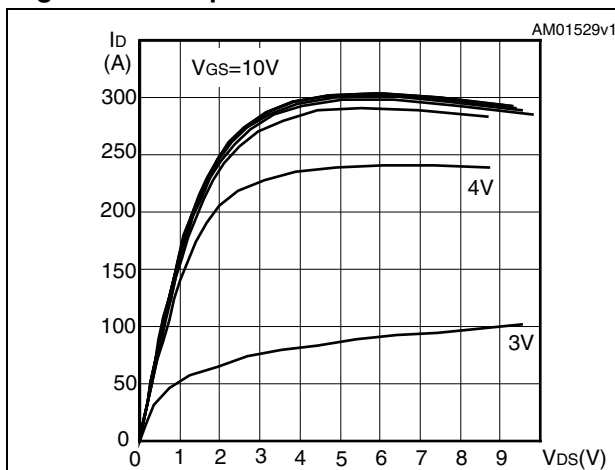


Figure 5. Transfer characteristics

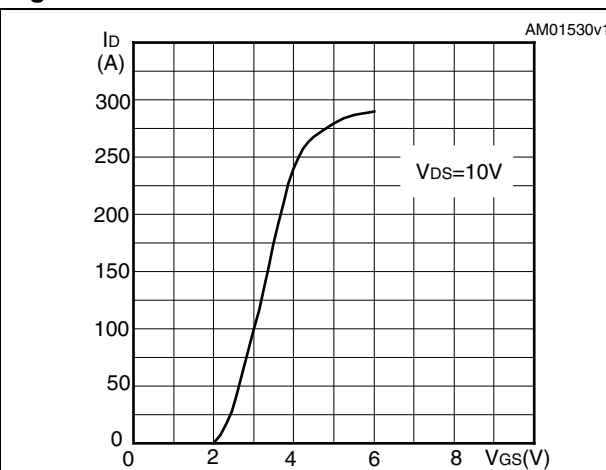


Figure 6. Static drain-source on-resistance

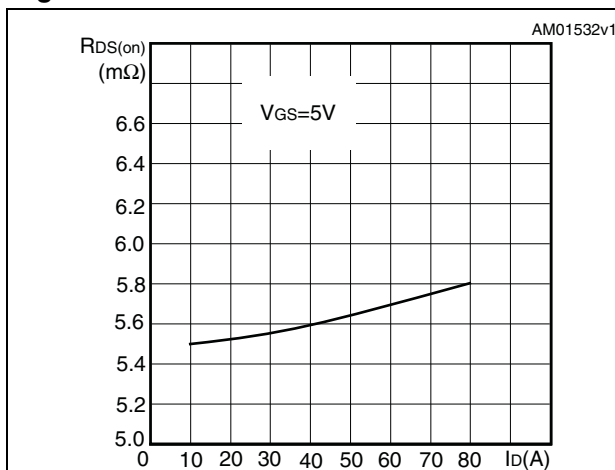


Figure 7. Normalized B_{VDSS} vs temperature

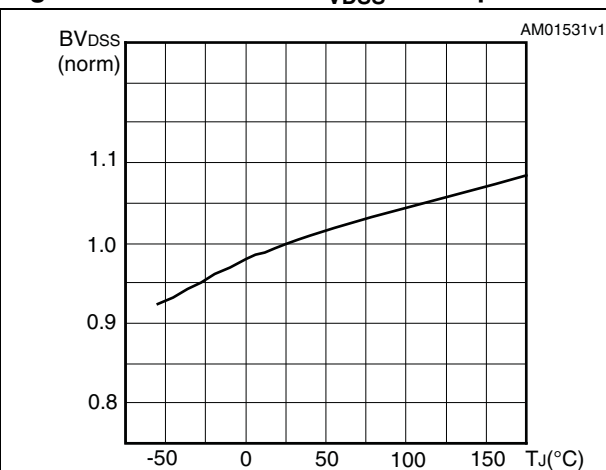


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

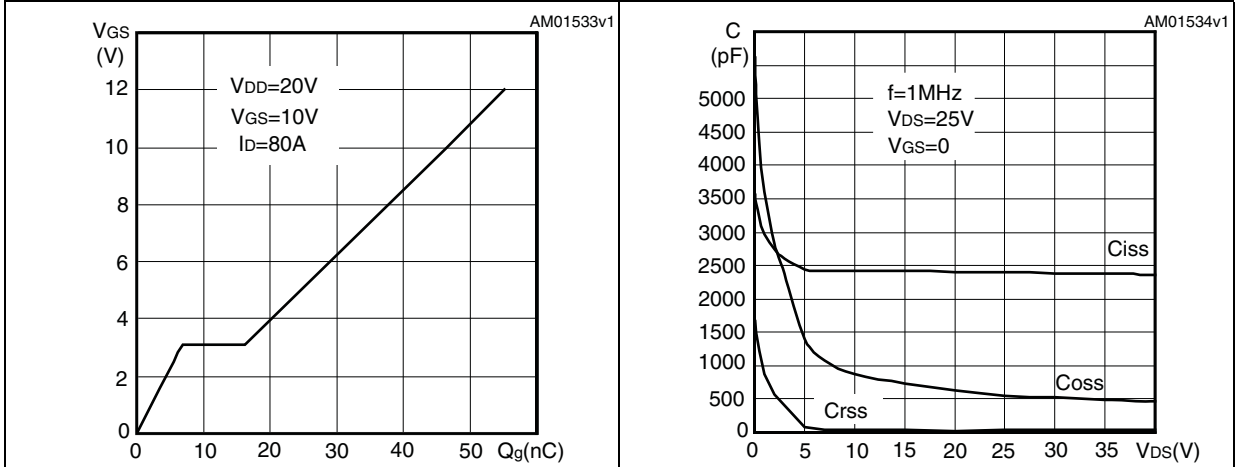


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

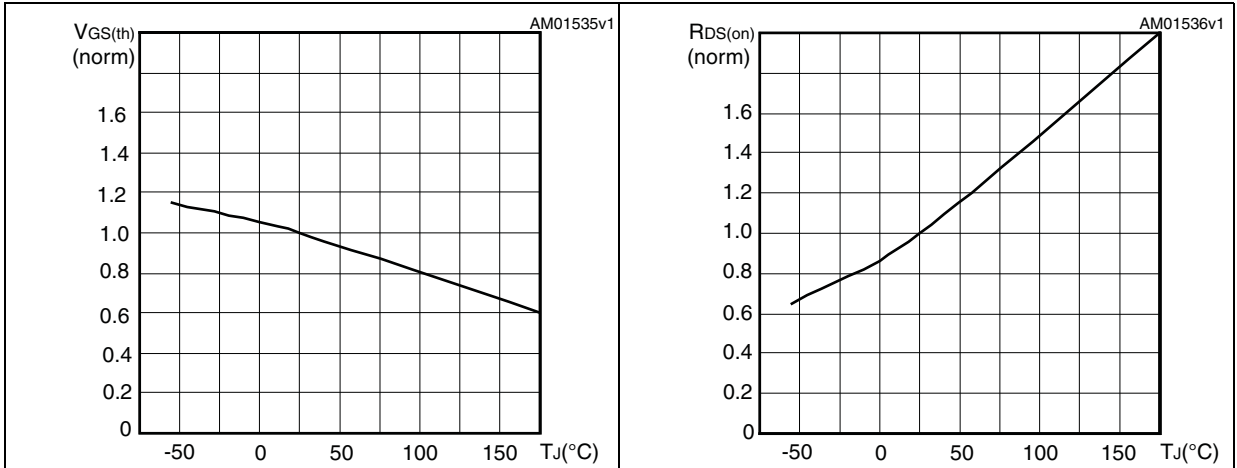
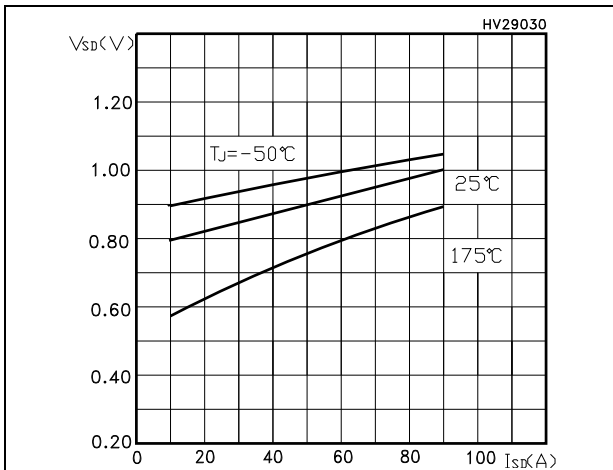


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load



AM01468v1

Figure 14. Gate charge test circuit



AM01469v1

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



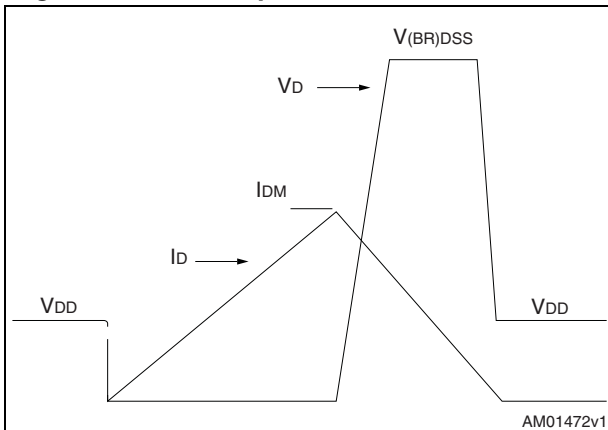
AM01470v1

Figure 16. Unclamped inductive load test circuit



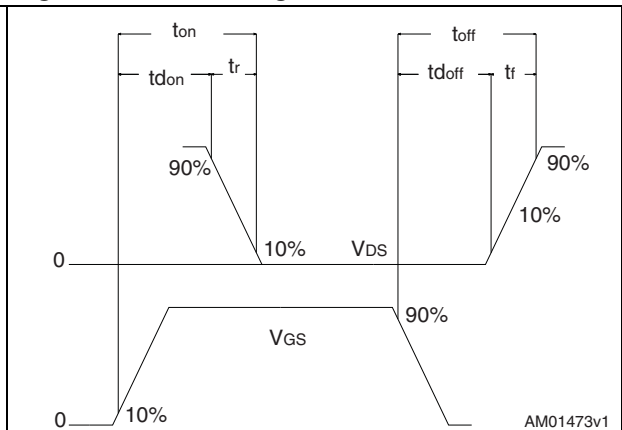
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Figure 17. Unclamped inductive waveform



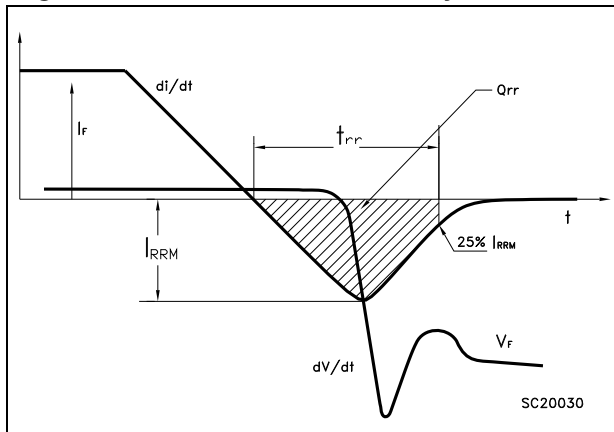
AM01472v1

Figure 18. Switching time waveform



AM01473v1

Figure 19. Diode reverse recovery waveform



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. ECOPACK is an ST trademark.

Table 7. 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		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 20. DPAK (TO-252) drawing

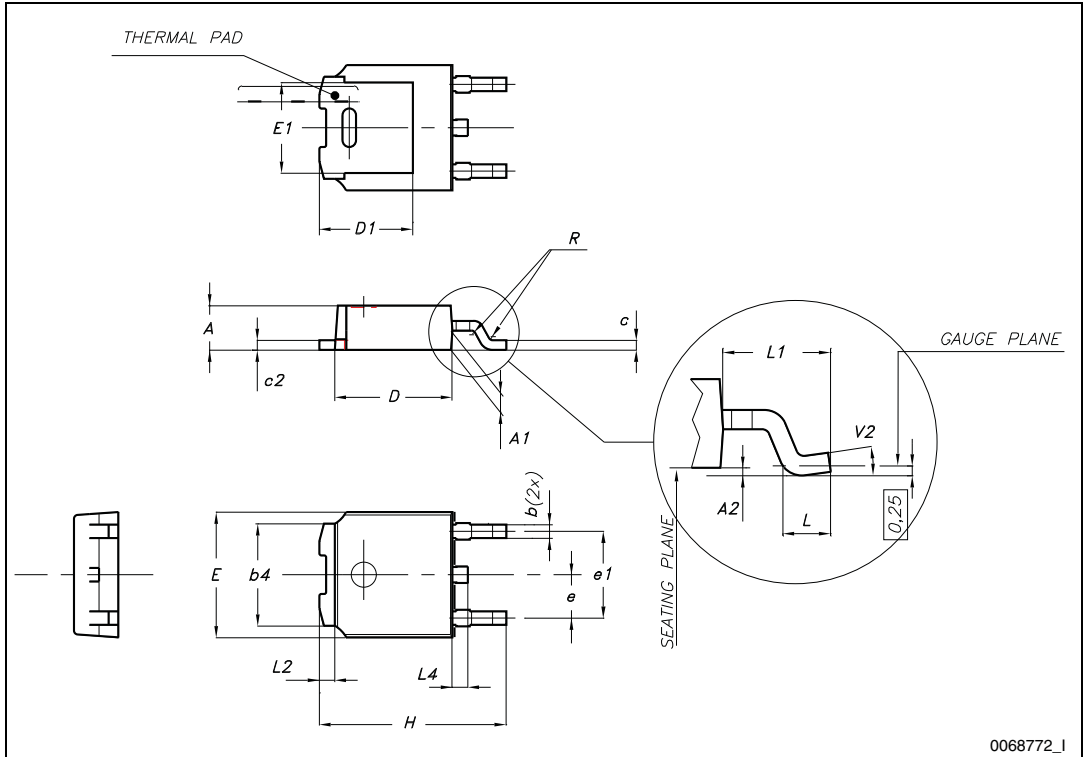
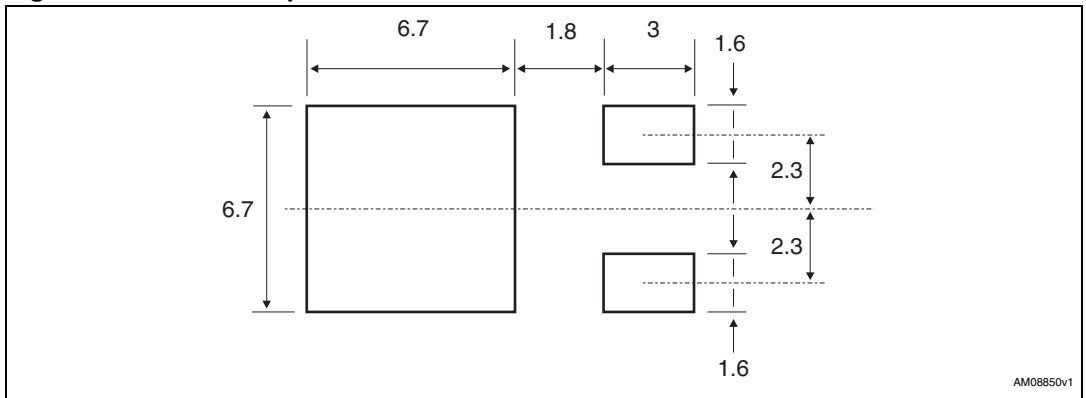


Figure 21. DPAK footprint^(a)



a. All dimensions are in millimeters

5 Packing mechanical data

Table 8. 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 22. Tape for DPAK (TO-252)

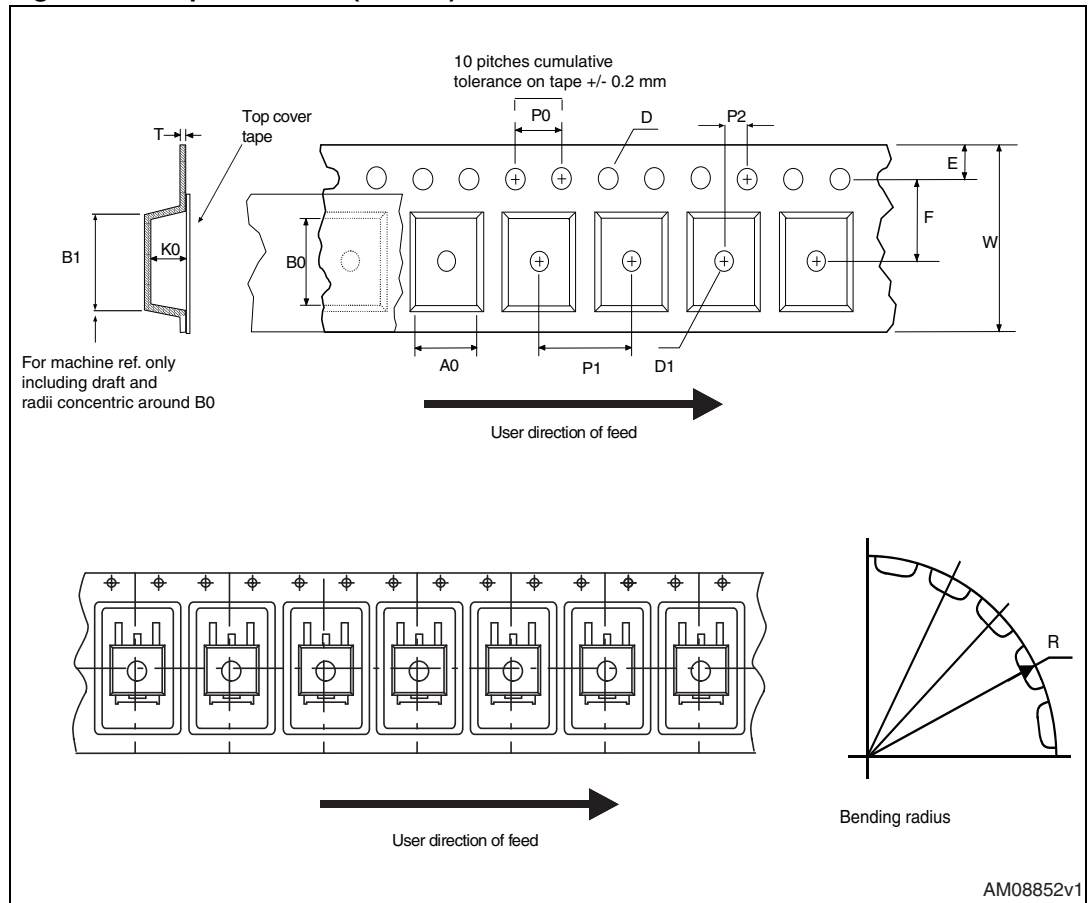
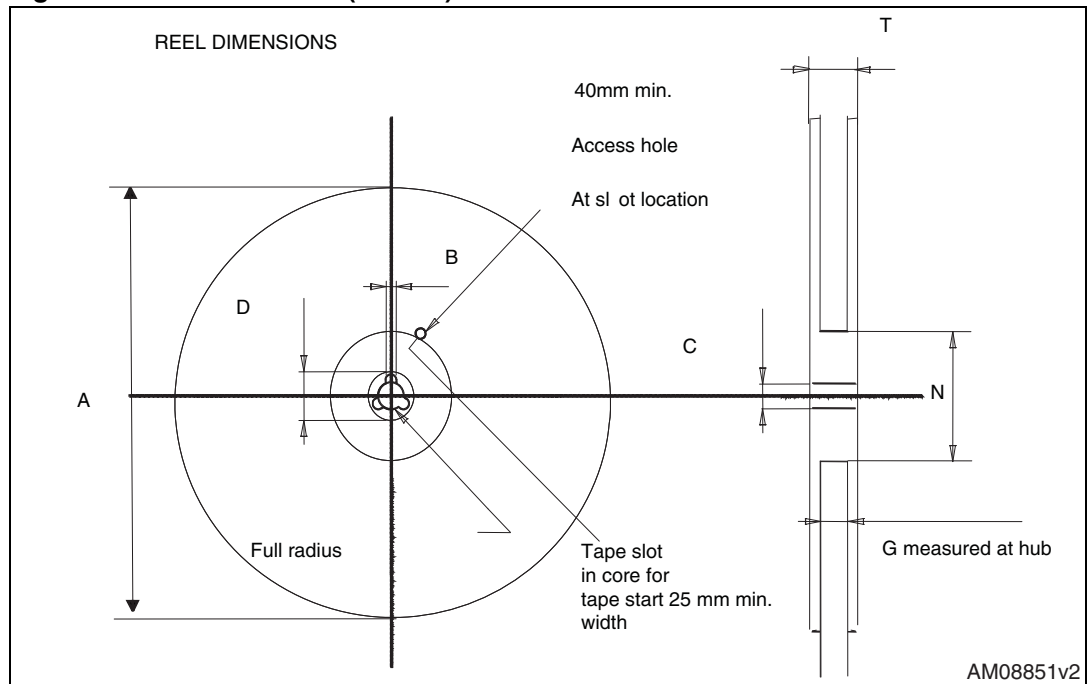


Figure 23. Reel for DPAK (TO-252)



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
11-Feb-2009	1	First release
23-Jul-2009	2	Marking on device summary has been corrected.
13-Jul-2012	3	Updated title on the cover page. Minor text changes. Updated <i>Section 4: Package mechanical data</i> and <i>Section 5: Packing mechanical data</i> .

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