

Automotive-grade N-channel 60 V, 4.4 mΩ typ., 80 A STripFET™ VI DeepGATE™ Power MOSFET in a DPAK package

Datasheet - production data

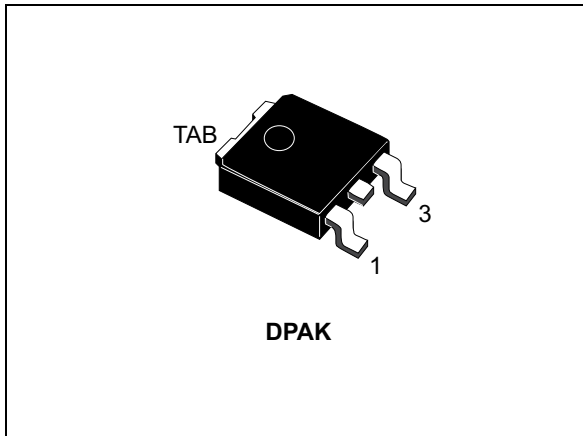
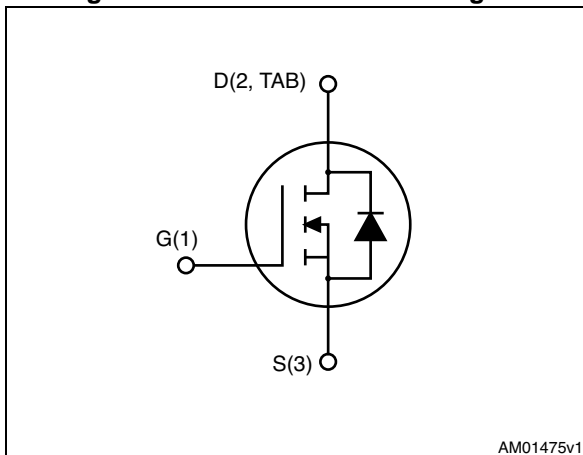


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STD80N6F6	60 V	5 mΩ	80 A ⁽¹⁾

1. Current limited by package

- Designed for automotive applications and AEC-Q101 qualified
- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STD80N6F6	80N6F6	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	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	80	A
$I_{DM}^{(1)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	120	W
	Derating factor	0.8	W/ $^\circ\text{C}$
T_{stg}	Storage temperature	- 55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature		

1. Current limited by package

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.25	$^\circ\text{C}/\text{W}$
R_{thj-a}	Thermal resistance junction-ambient max	50	$^\circ\text{C}/\text{W}$

2 Electrical characteristics

(T_{CASE} = 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 μA	60			V
I _{DSS}	Zero gate voltage Drain current (V _{GS} = 0)	V _{DS} = 60 V			1	μA
		V _{DS} = 60 V, T _C =125 °C			100	μA
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	V _{GS} = ± 20 V			± 100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	3		4.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 40 A		4.4	5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0	-	8325	-	pF
C _{oss}	Output capacitance		-	500	-	pF
C _{rss}	Reverse transfer capacitance		-	400	-	pF
Q _g	Total gate charge	V _{DD} = 30 V, I _D = 80 A, V _{GS} = 10 V	-	147	-	nC
Q _{gs}	Gate-source charge		-	44	-	nC
Q _{gd}	Gate-drain charge		-	46	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 30 V, I _D = 40 A R _G = 4.7 Ω V _{GS} = 10 V	-	40	-	ns
t _r	Rise time		-	71	-	ns
t _{d(off)}	Turn-off-delay time		-	132	-	ns
t _f	Fall time		-	40	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-		80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80 \text{ A}$, $V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 80 \text{ A}$, $V_{DD} = 48 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s}$, $T_j = 150 \text{ }^\circ\text{C}$	-	46		ns
Q_{rr}	Reverse recovery charge		-	65		nC
I_{RRM}	Reverse recovery current		-	2.8		A

1. Current limited by package.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

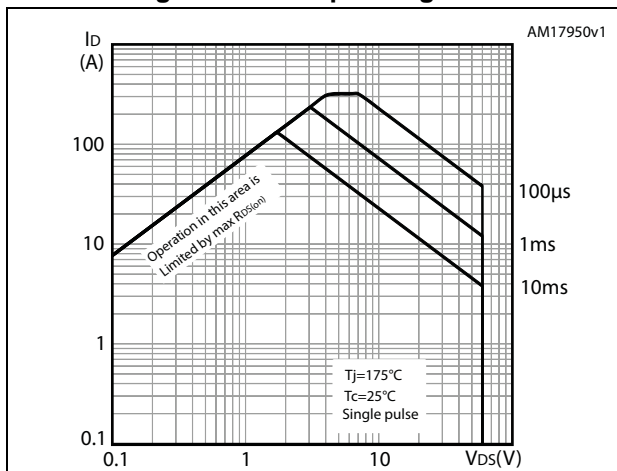


Figure 3. Thermal impedance

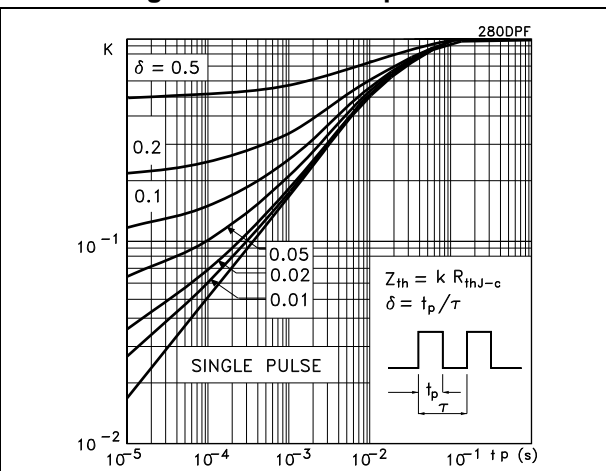


Figure 4. Output characteristics

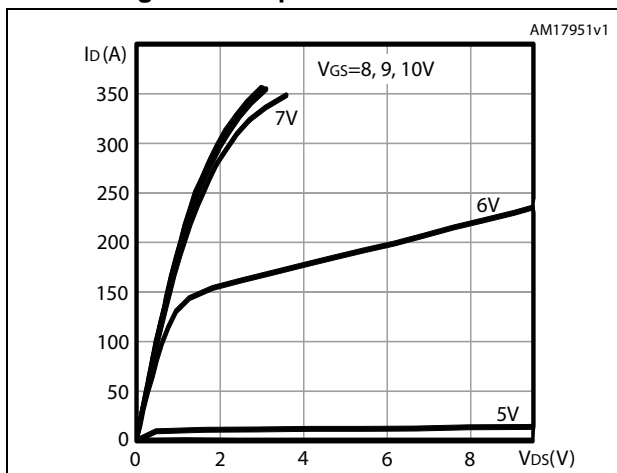


Figure 5. Transfer characteristics

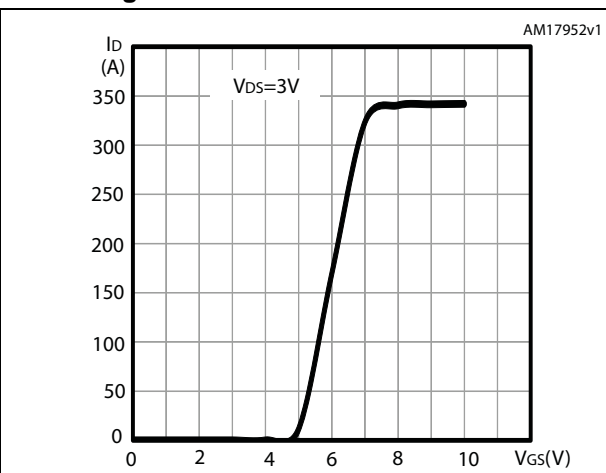


Figure 6. Gate charge vs gate-source voltage

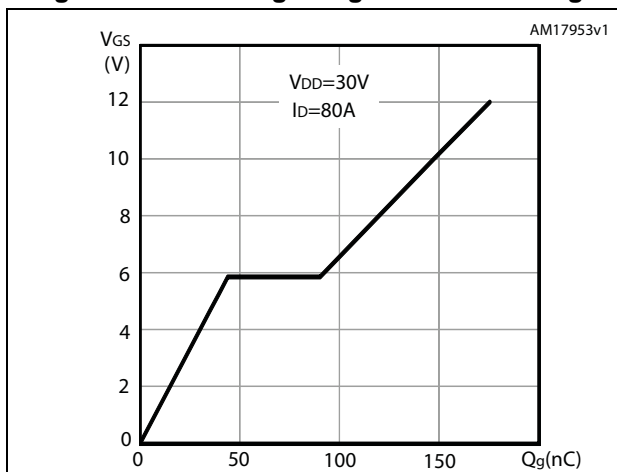


Figure 7. Static drain-source on-resistance

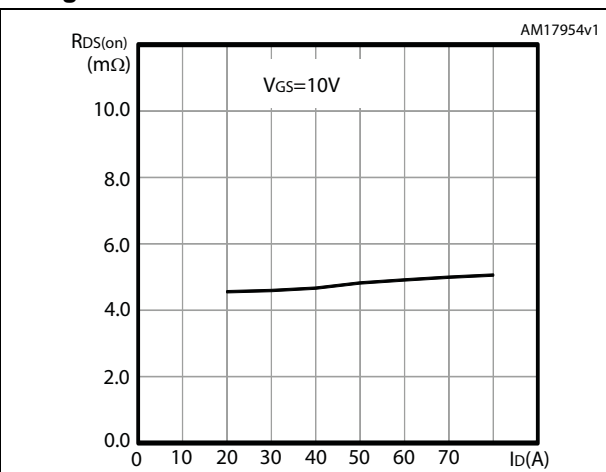


Figure 8. Capacitance variations

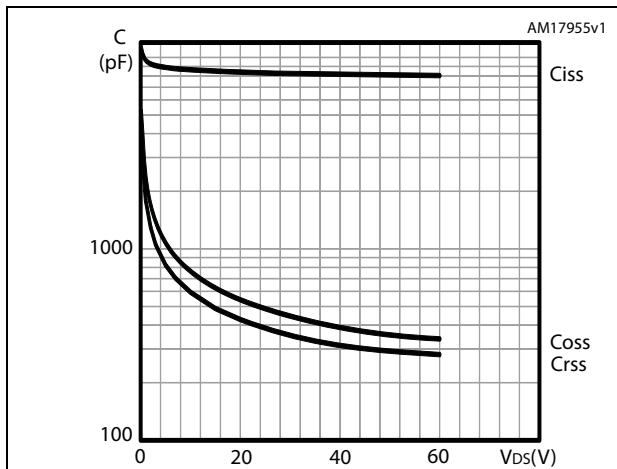


Figure 9. Normalized gate threshold voltage vs temperature

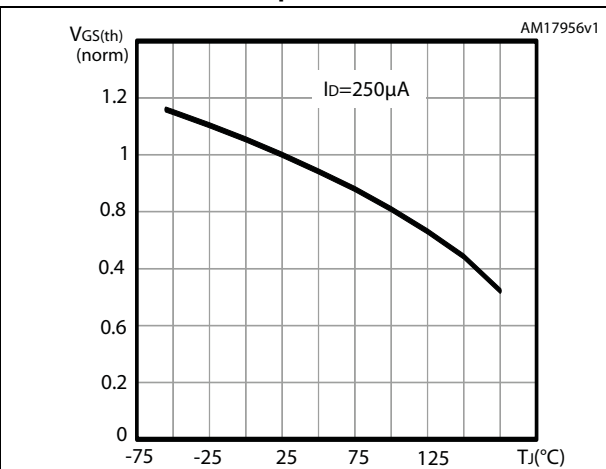


Figure 10. Normalized on-resistance vs temperature

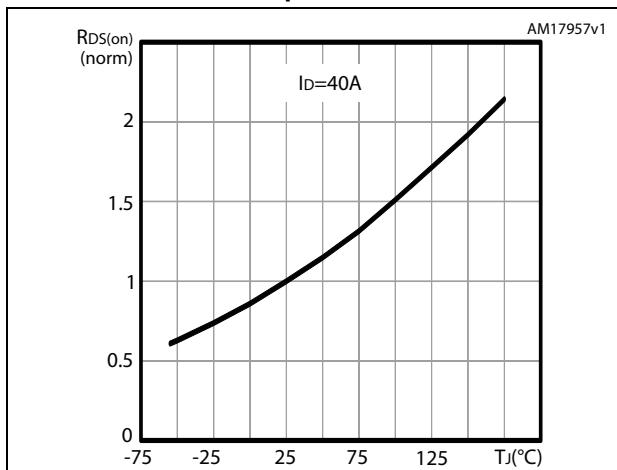


Figure 11. Normalized VDS vs temperature

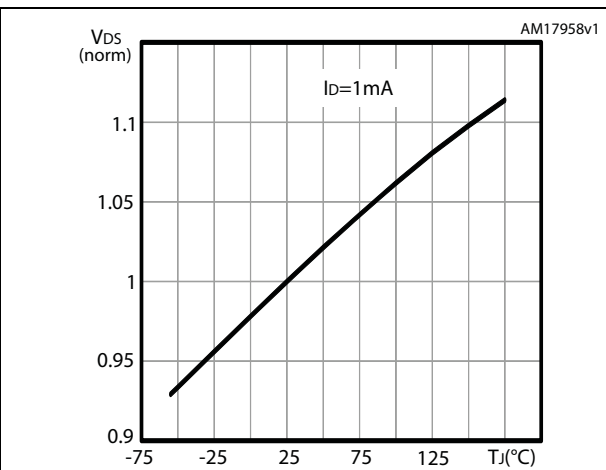
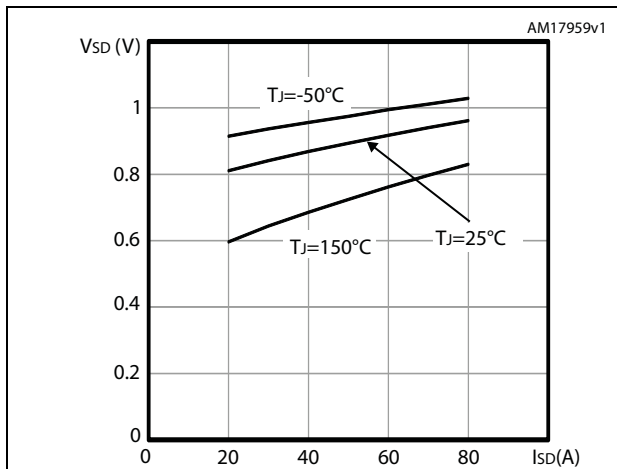


Figure 12. Source-drain diode forward characteristics



3 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.

Figure 13. DPAK (TO-252) type A drawing

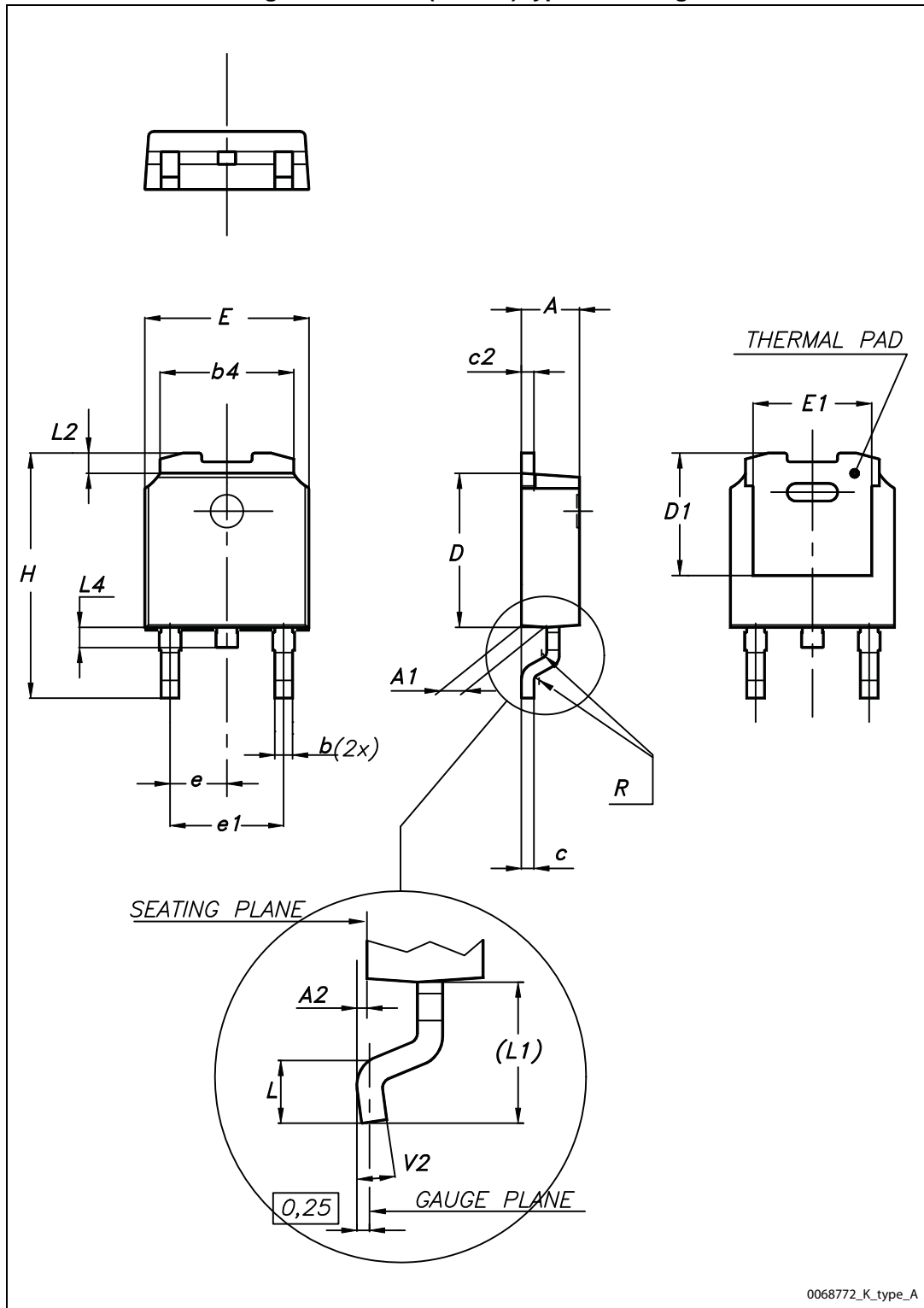
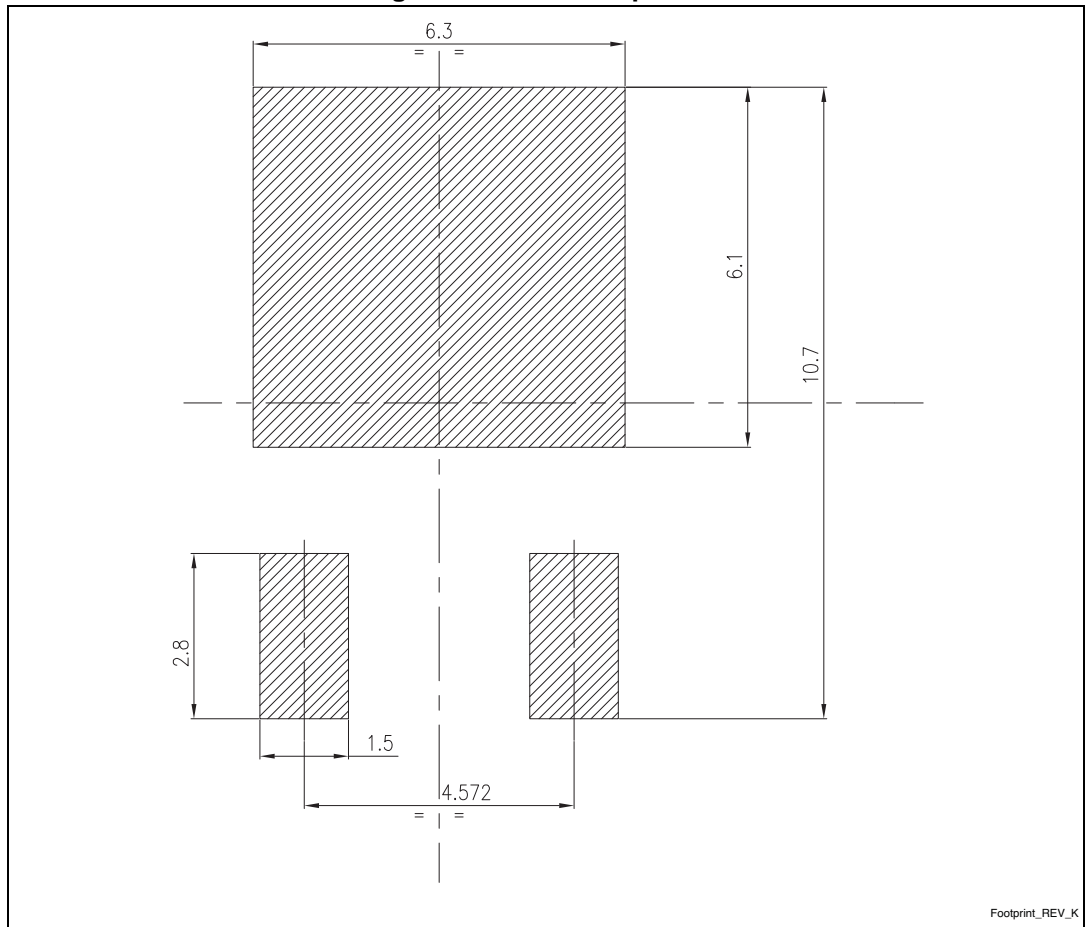


Table 8. DPAK (TO-252) type A mechanical data

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	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 14. DPAK footprint (a)



a. All dimensions are in millimeters

4 Packaging mechanical data

Figure 15. Tape for DPAK (TO-252)

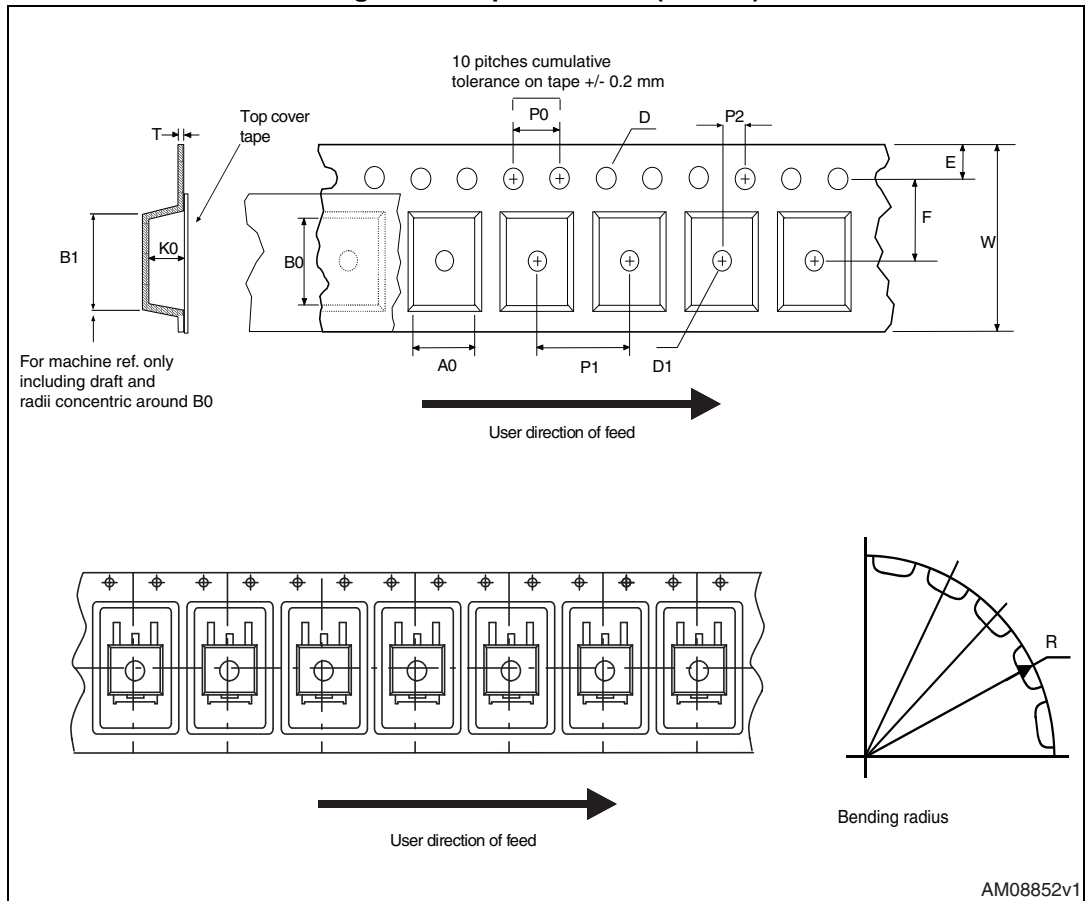


Figure 16. Reel for DPAK (TO-252)

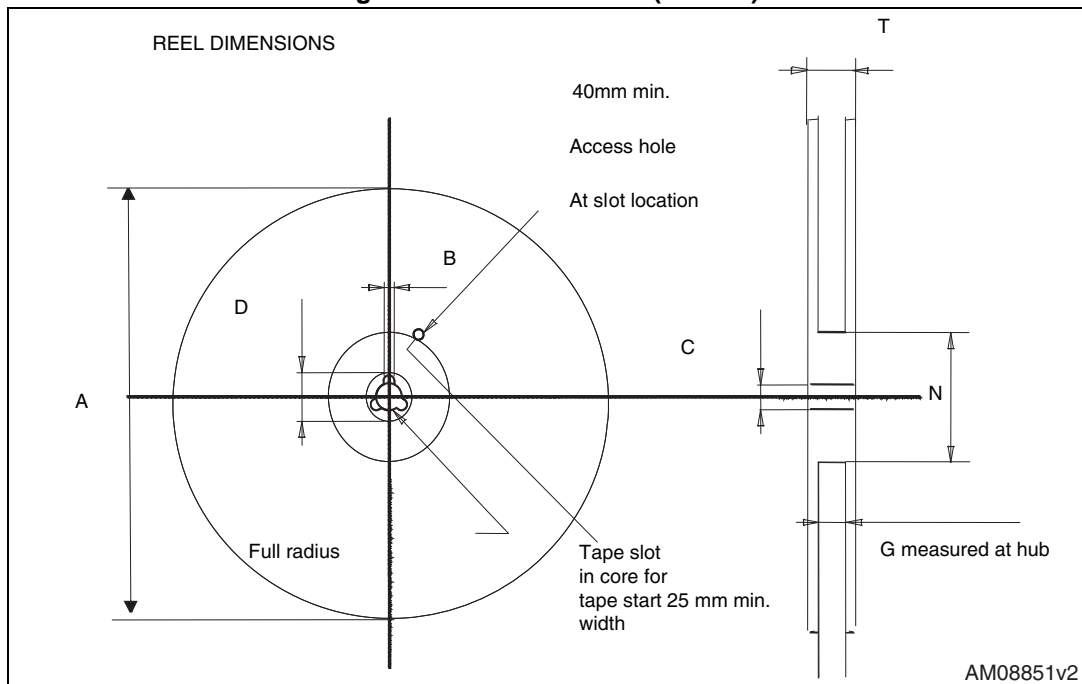


Table 9. DPAK (TO-252) tape and reel mechanical data

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			

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
08-Aug-2012	1	Initial release.
17-Jan-2014	2	<ul style="list-style-type: none">– Document status promoted from preliminary to production data– Modified: title– Modified: Features– Added: note 1 in cover page– Modified: $R_{DS(on)max}$ and I_D values in cover page– Modified: Derating factor value in Table 2– Modified: $R_{DS(on)}$ values in Table 4– Modified: I_D and the entire typical values in Table 5, 6 and 7– Added: Section 2.1: Electrical characteristics (curves)– Updated: Section 3: Package mechanical data– Minor text changes

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