

P-channel 30 V, 0.01 Ω typ., 52 A, STripFET™ H6

Power MOSFET in a DPAK package

Datasheet - preliminary data

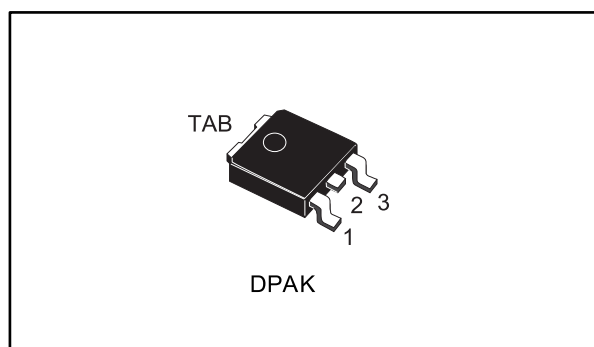
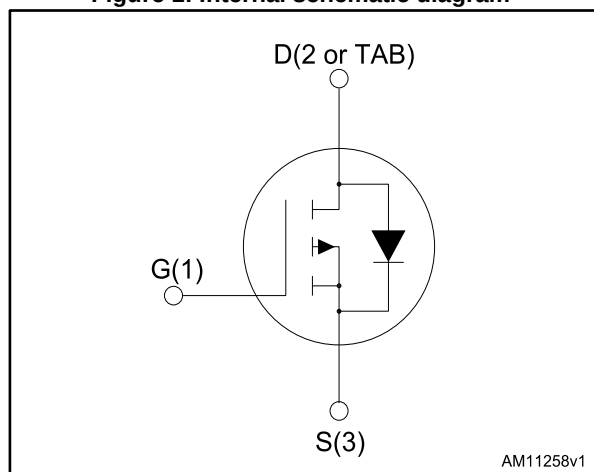


Figure 1: Internal schematic diagram



- Very low on-resistance
- Very low gate charge
- High avalanche
- Low gate drive power loss

Applications

- Switching applications

Description

This device is a P-channel Power MOSFET developed using the STripFET™ H6 technology, with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

Table 1: Device summary

Order codes	Marking	Package	Packaging
STD52P3LLH6	52P3LLH6	DPAK	Tape and reel



For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Features

Order codes	V_{DSS}	$R_{DS(on)}$ max	I_D	P_{TOT}
STD52P3LLH6	30 V	0.012 Ω	52 A	70 W

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves).....	6
3	Test circuits	8
4	Package mechanical data	9
	4.1 DPAK (TO-252) mechanical data.....	10
5	Packaging mechanical data.....	13
	5.1 DPAK (TO-252) tape and reel mechanical data.....	13
6	Revision history	15

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	52	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	37.5	A
$I_{DM}^{(1)}$	Drain current (pulsed)	208	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	70	W
T_{stg}	Storage temperature	-55 to 175	$^{\circ}\text{C}$
T_j	Max. operating junction temperature	175	$^{\circ}\text{C}$

Notes:

⁽¹⁾Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.14	$^{\circ}\text{C/W}$



For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 250 μA, V _{GS} = 0	30			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0, V _{DS} = 30 V			1	μA
		V _{GS} = 0, V _{DS} = 30 V, T _C = 125 °C			10	μA
I _{GSS}	Gate body leakage current	V _{GS} = ± 20 V, V _{DS} = 0			±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1		2.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 26 A		0.01	0.012	Ω
		V _{GS} = 4.5 V, I _D = 26 A		0.014	0.017	Ω

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	-	3350	-	pF
C _{oss}	Output capacitance		-	414	-	pF
C _{rss}	Reverse transfer capacitance		-	287	-	pF
Q _g	Total gate charge	V _{DD} = 15 V, I _D = 52 A	-	33	-	nC
Q _{gs}	Gate-source charge	V _{GS} = 4.5 V	-	14	-	nC
Q _{gd}	Gate-drain charge	(see Figure 14: "Gate charge test circuit")	-	11	-	nC
R _g	Gate input resistance	I _D = 0 Gate bias = 0 Test signal level = 20 mV f = 1MHz	-	1.5		Ω



For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Table 6: Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 24\text{ V}$, $I_D = 15\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13: "Switching times test circuit for resistive load")	-	12.8	-	ns
t_r	Rise time		-	112	-	ns
$t_{d(off)}$	Turn-off delay time		-	61	-	ns
t_f	Fall time		-	45	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 52\text{ A}$, $V_{GS} = 0$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 52\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 24\text{ V}$ (see Figure 15: "Source-drain diode forward characteristics")	-	25.2		ns
Q_{rr}	Reverse recovery charge		-	17.4		nC
I_{RRM}	Reverse recovery current		-	1.4		A

Notes:

⁽¹⁾Pulsed: pulse duration = 300 μs , duty cycle 1.5%



For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

2.1 Electrical characteristics (curves)

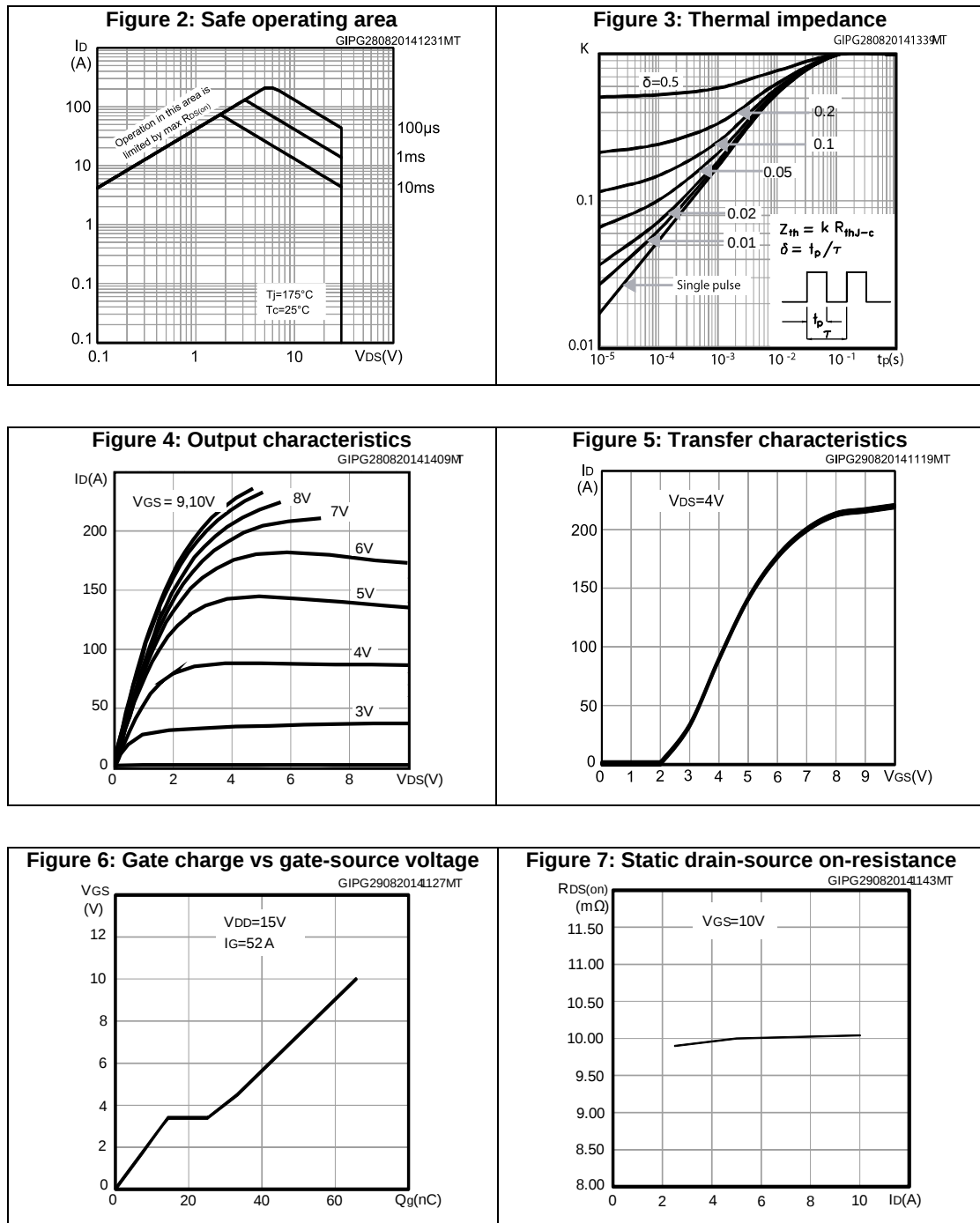


Figure 8: Capacitance variations

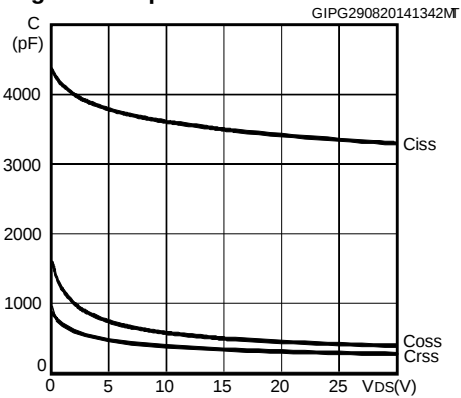


Figure 9: Normalized gate threshold voltage vs temperature

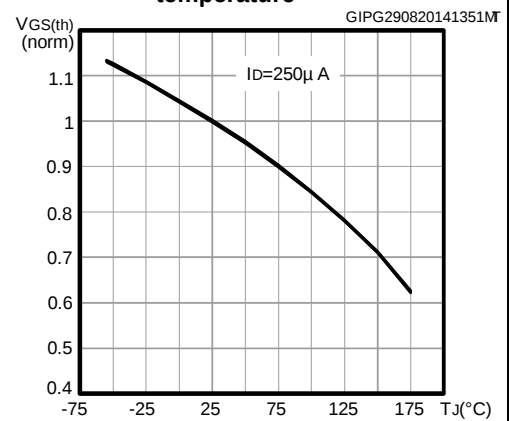


Figure 10: Normalized on-resistance vs temperature

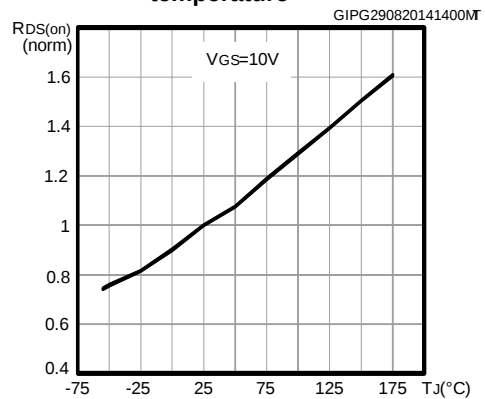


Figure 11: Normalized V(BR)DSS vs temperature

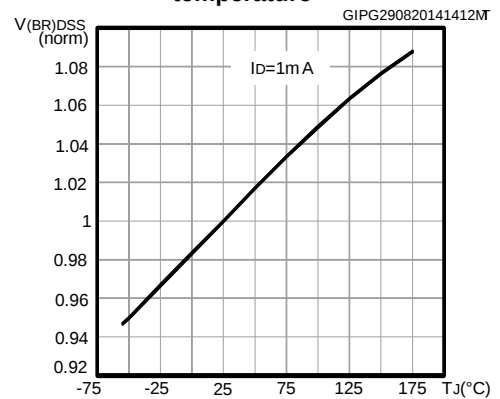
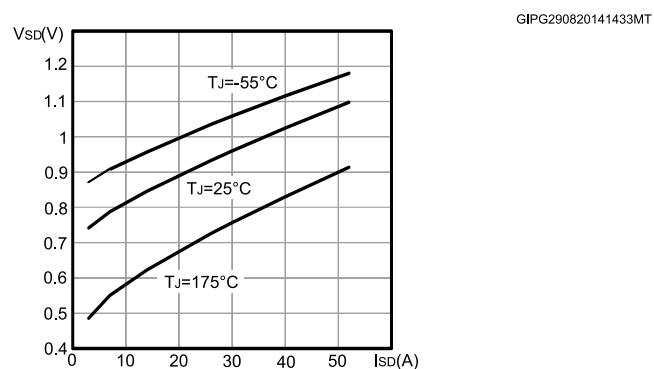


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

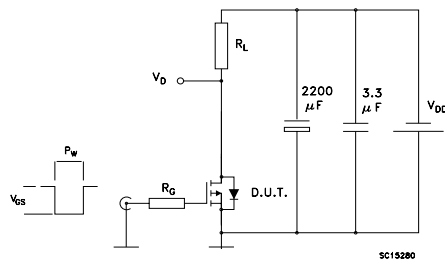


Figure 14: Gate charge test circuit

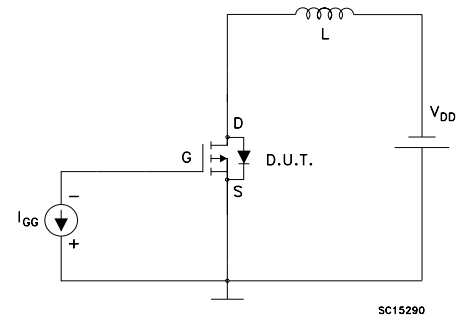
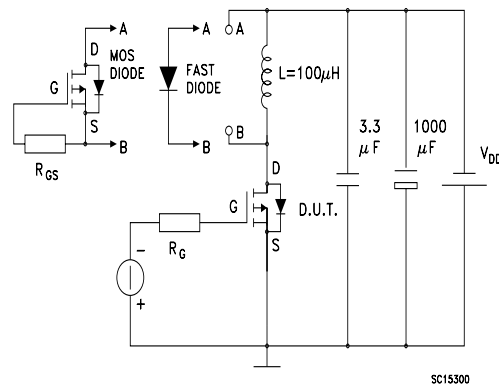


Figure 15: Source-drain diode forward characteristics



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**. ECOPACK[®] is an ST trademark.

4.1 DPAK (TO-252) mechanical data

Figure 16: DPAK (TO-252) type A drawings

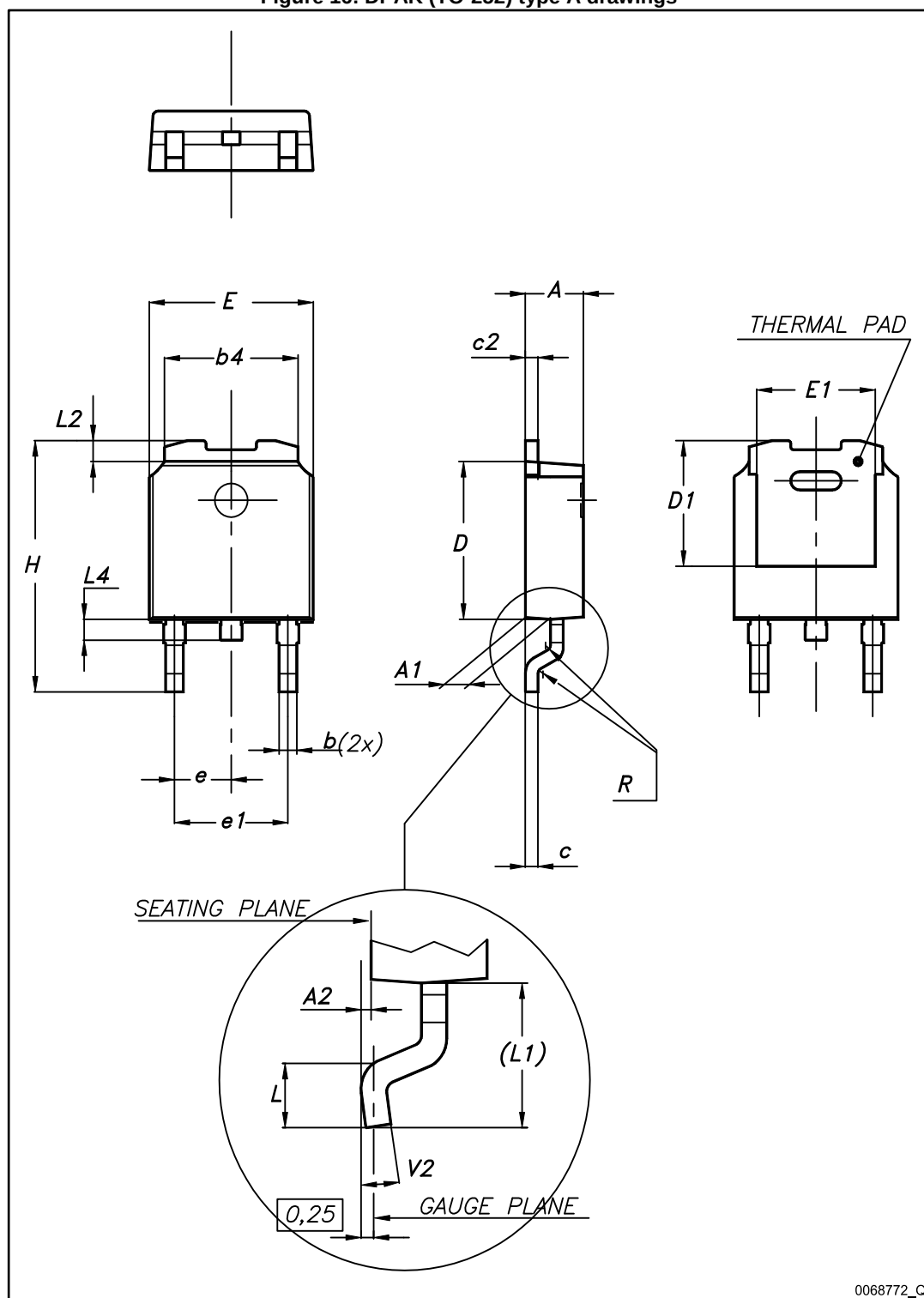
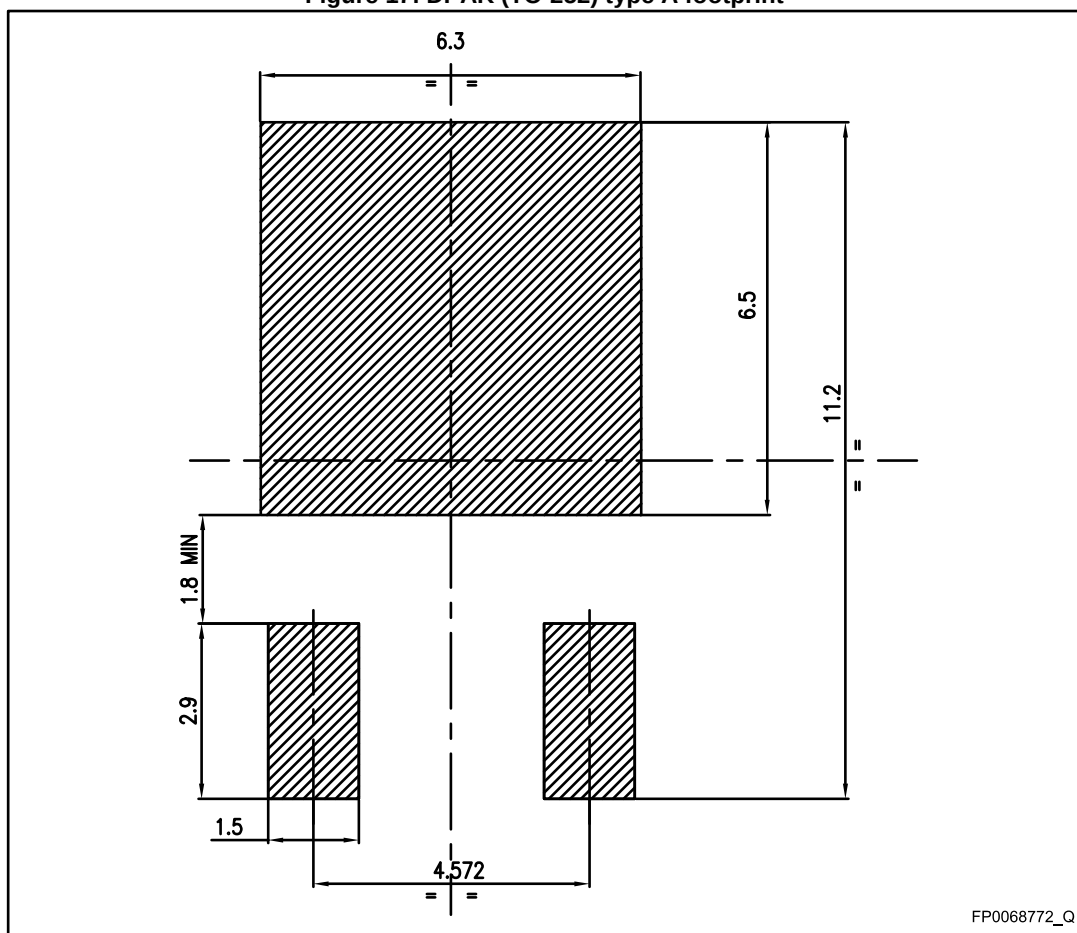


Table 8: DPAK (TO-252) type A mechanical data

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 17: DPAK (TO-252) type A footprint



All dimensions are in mm

5 Packaging mechanical data

5.1 DPAK (TO-252) tape and reel mechanical data

Figure 18: Tape for DPAK (TO-252)

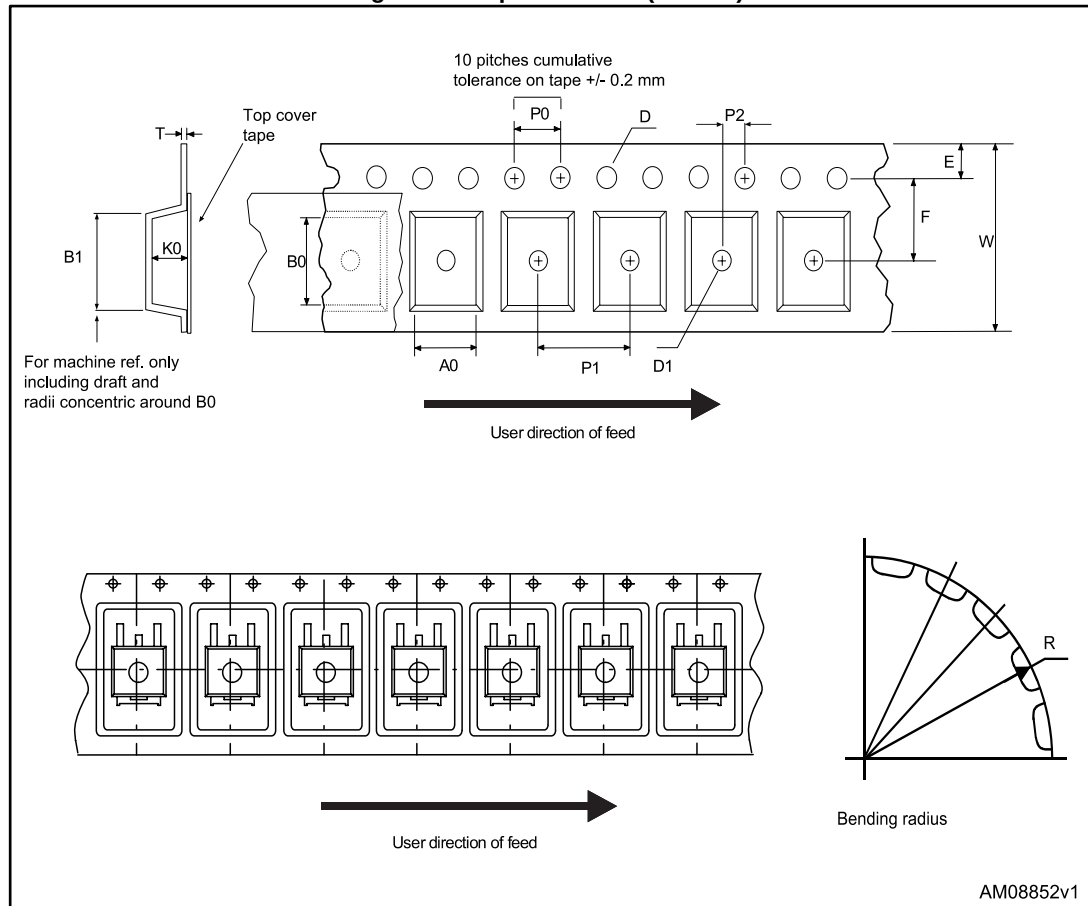


Figure 19: Reel for DPAK (TO-252)

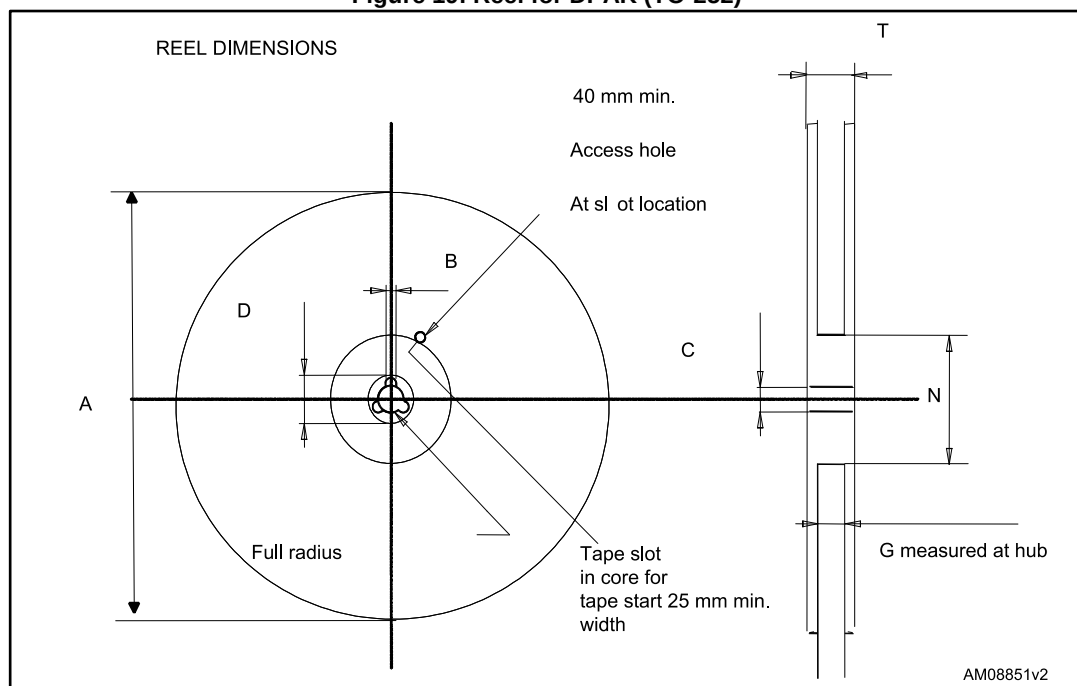


Table 9: DPAK (TO-252) tape and reel mechanical data

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			

6 Revision history

Table 10: Document revision history

Date	Revision	Changes
02-Jun-2014	1	First release
24-Sep-2014	2	Updated the title, the features and the description in cover page. Updated Table 2: "Absolute maximum ratings" , Section 2: "Electrical characteristics" . Added Section 2.1: "Electrical characteristics (curves)" . Minor text changes.

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2014 STMicroelectronics – All rights reserved

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[STD52P3LLH6](#)