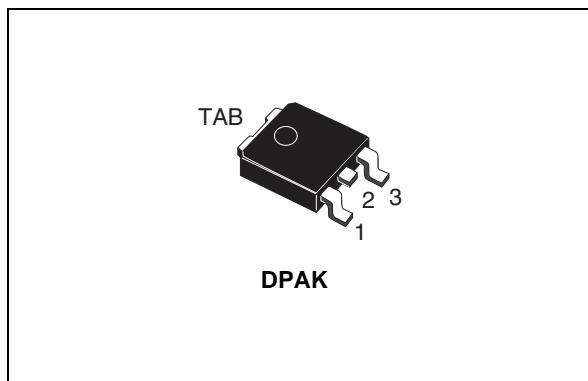
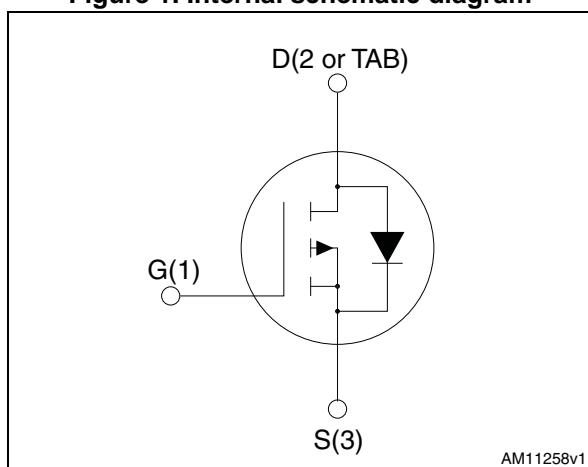


## P-channel 30 V, 0.024 Ω typ., 12 A, STripFET™ VI DeepGATE™ Power MOSFET in a DPAK package

Datasheet - production data



**Figure 1. Internal schematic diagram**



## Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>	P <sub>TOT</sub>
STD26P3LLH6	30 V	0.030 Ω <sup>(1)</sup>	12 A	40 W

1. @ V<sub>GS</sub>= 10 V

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- High avalanche ruggedness
- Low gate input resistance

## Applications

- Switching applications
- LCC converters, resonant converters

## Description

This device is a P-channel Power MOSFET developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages

**Table 1. Device summary**

Order code	Marking	Package	Packaging
STD26P3LLH6	26P3LLH6	DPAK	Tape and reel

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

## Contents

<b>1</b>	<b>Electrical ratings</b>	<b>3</b>
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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	30	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	12	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	8.5	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	48	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25^\circ\text{C}$	40	W
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature	175	$^\circ\text{C}$

1. Limited by wire bonding.
2. Pulse width limited by safe operating area.

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	3.75	$^\circ\text{C/W}$

**Table 4. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$E_{AS}$	Single pulse avalanche energy (starting $T_j=25^\circ\text{C}$ , $I_D=6\text{ A}$ , $I_{AS}=12\text{ A}$ , $V_{DD}=25\text{ V}$ , $V_{gs}=10\text{ V}$ )	350	mJ

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

## 2 Electrical characteristics

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

**Table 5. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 30 \text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 30 \text{ V}, T_c = 125^\circ\text{C}$			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{GS} = \pm 20 \text{ V}, (V_{DS} = 0)$			$\pm 100$	nA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1		2.5	V
$R_{DS(\text{on})}$	Static drain-source on-resistance	$V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}$		0.024	0.03	$\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 6 \text{ A}$		0.038	0.045	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25 \text{ V}, f=1 \text{ MHz}, V_{GS} = 0$	-	1450	-	pF
$C_{oss}$	Output capacitance		-	178	-	pF
$C_{rss}$	Reverse transfer capacitance		-	120	-	pF
$Q_g$	Total gate charge	$V_{DD} = 24 \text{ V}, I_D = 12 \text{ A}$ $V_{GS} = 4.5 \text{ V}$ (see <a href="#">Figure 14</a> )	-	12	-	nC
$Q_{gs}$	Gate-source charge		-	4.4	-	nC
$Q_{gd}$	Gate-drain charge		-	5	-	nC
$R_g$	Gate input resistance	$f = 1 \text{ MHz}, \text{gate DC Bias} = 0,$ test signal level = 20 mV, $I_D = 0$	-	1.8	-	$\Omega$

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

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

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 24 \text{ V}$ , $I_D = 1.5 \text{ A}$ , $R_G = 4.7 \Omega$ , $V_{GS} = 10 \text{ V}$ (see <i>Figure 13</i> )	-	15	-	ns
$t_r$	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
$t_f$	Fall time		-	21	-	ns

**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		12	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		48	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 12 \text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 12 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 16 \text{ V}$ (see <i>Figure 15</i> )	-	15		ns
$Q_{rr}$	Reverse recovery charge		-	6.5		nC
$I_{RRM}$	Reverse recovery current		-	0.9		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

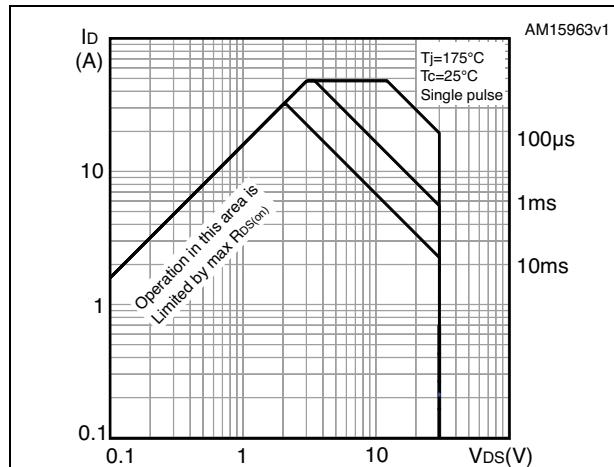


Figure 3. Thermal impedance

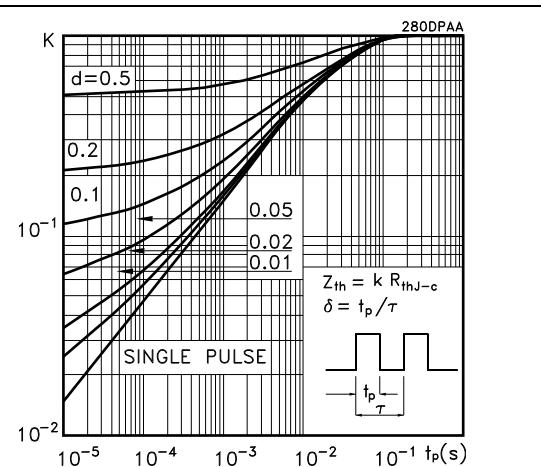


Figure 4. Output characteristics

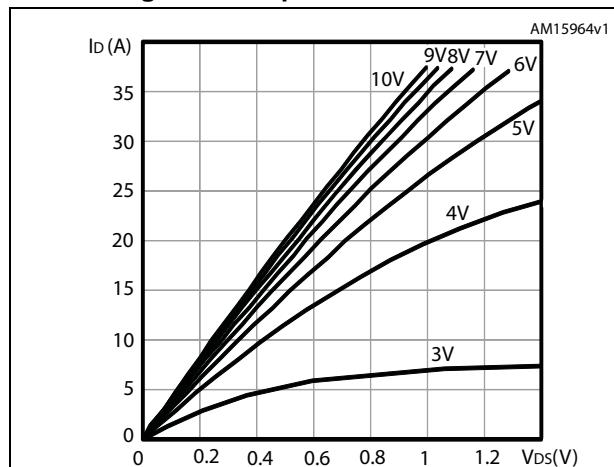


Figure 5. Transfer characteristics

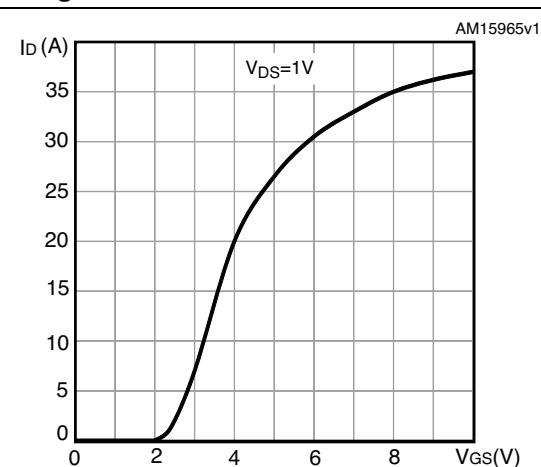


Figure 6. Gate charge vs gate-source voltage

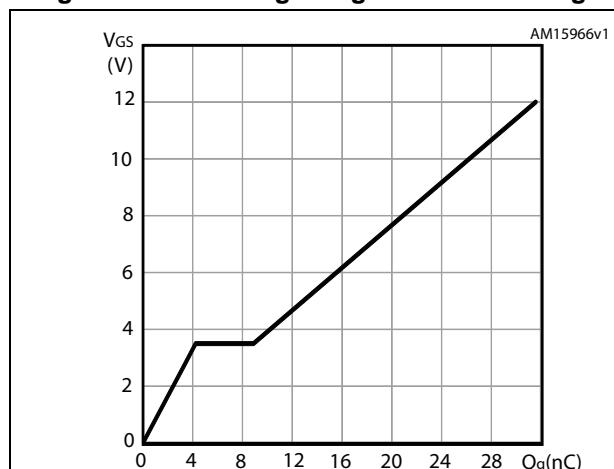
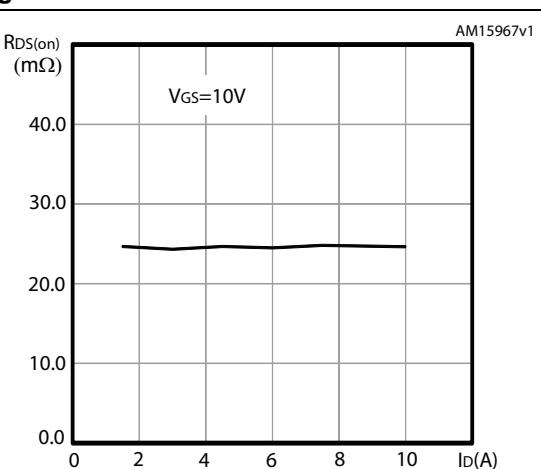
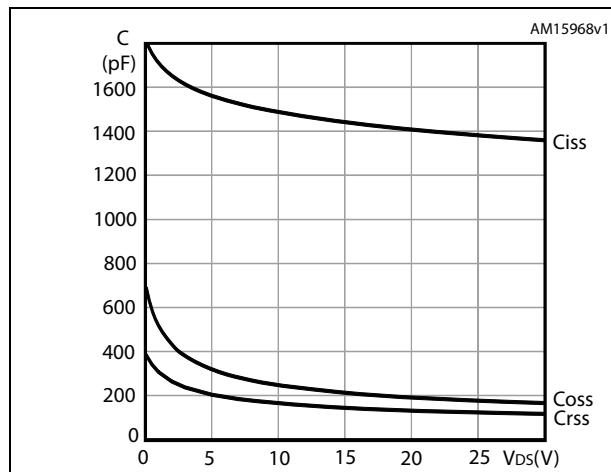
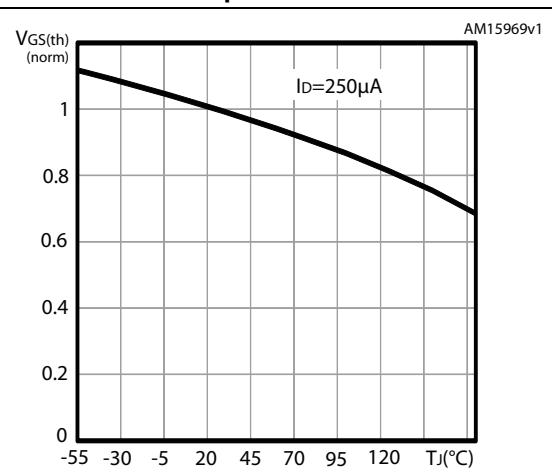
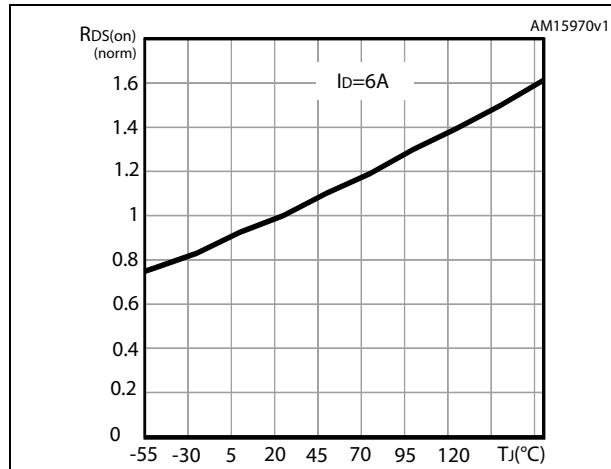
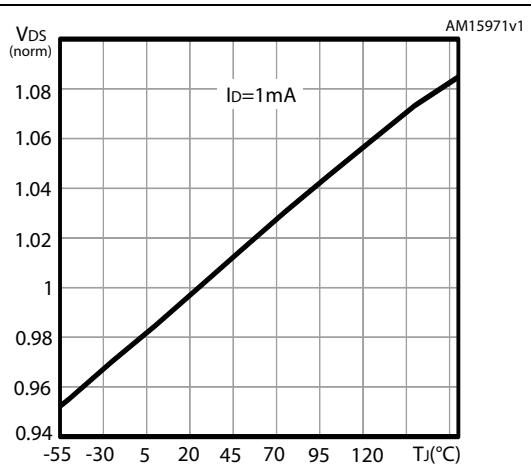
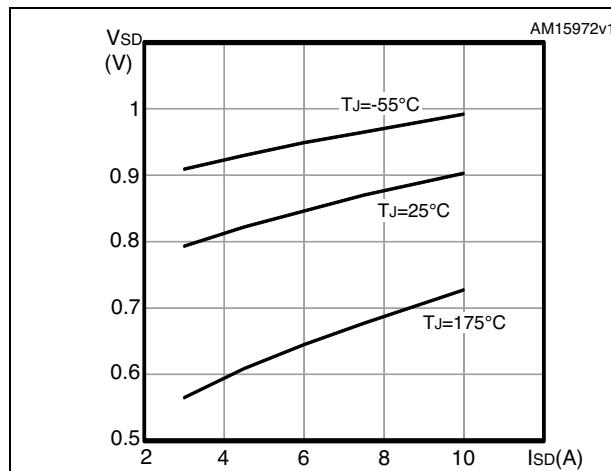


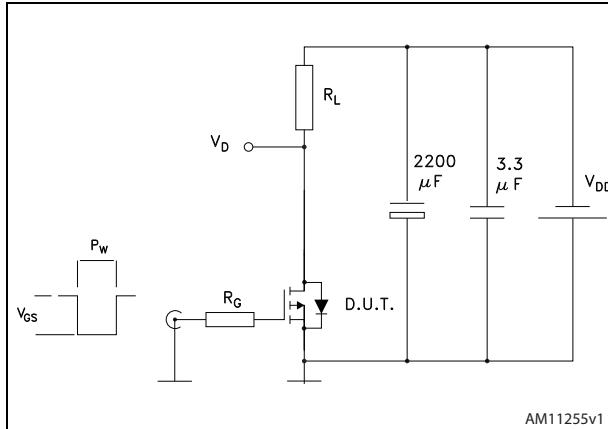
Figure 7. Static drain-source on-resistance



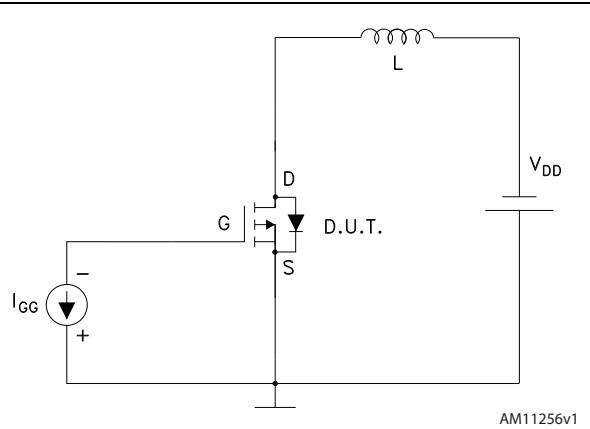
**Figure 8. Capacitance variations****Figure 9. Normalized gate threshold voltage vs temperature****Figure 10. Normalized on-resistance vs temperature****Figure 11. Normalized V<sub>DS</sub> vs temperature****Figure 12. Source-drain diode forward characteristics**

### 3 Test circuits

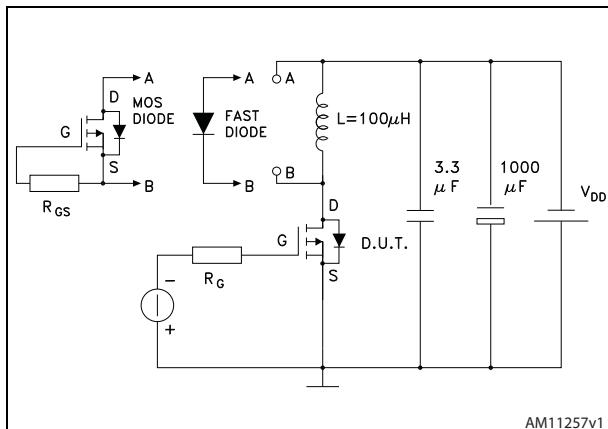
**Figure 13. Switching times test circuit for resistive load**



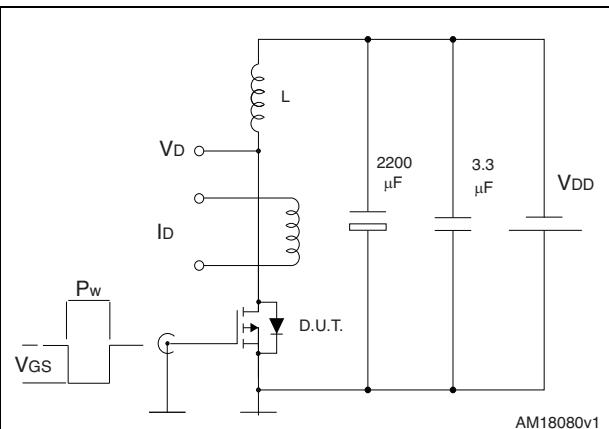
**Figure 14. Gate charge test circuit**



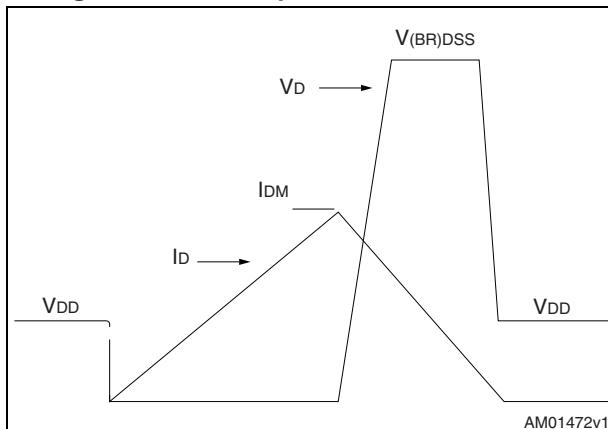
**Figure 15. Test circuit for diode recovery behavior**



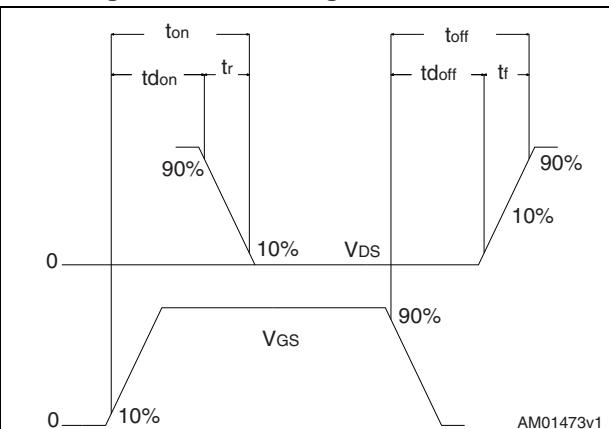
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



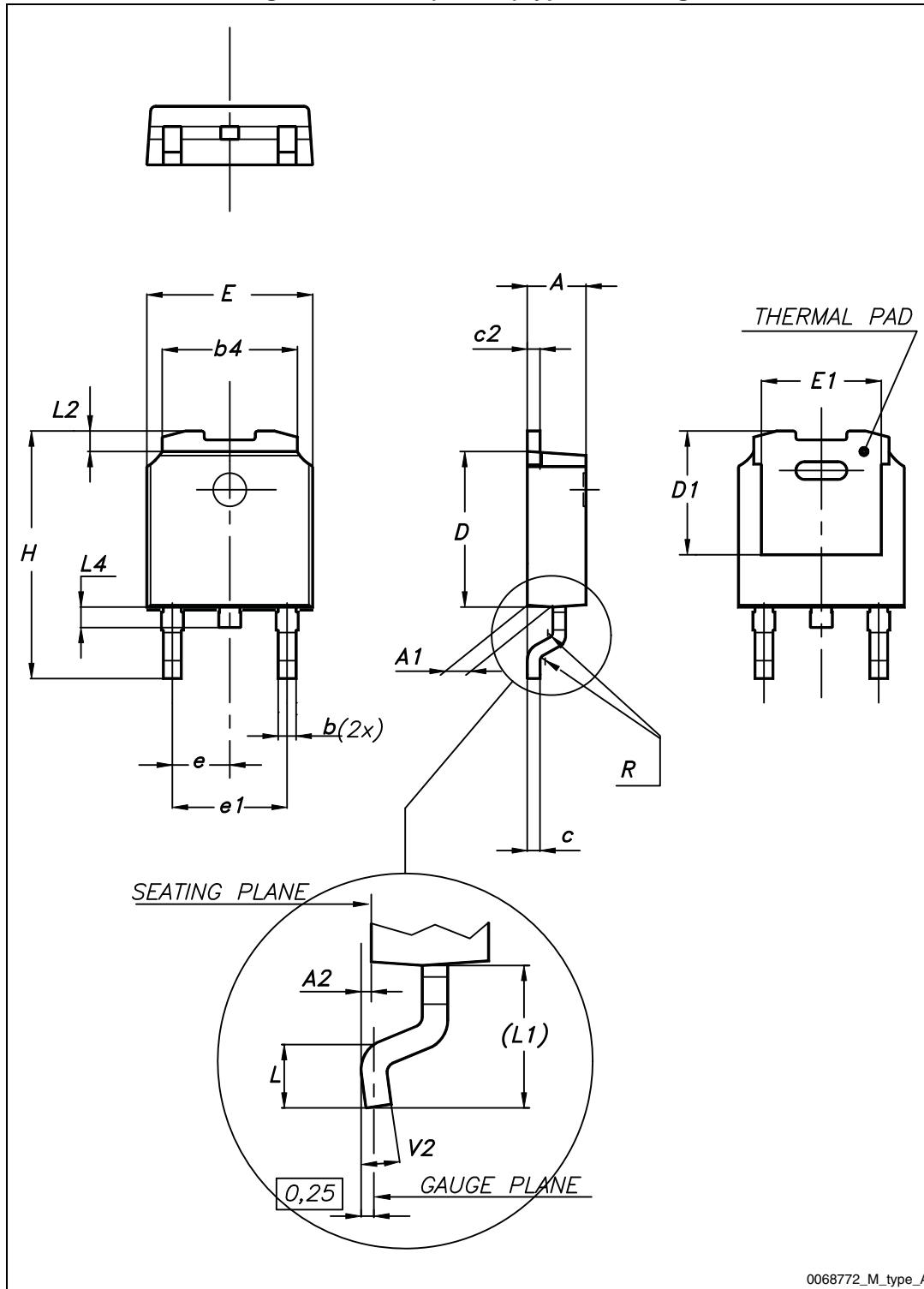
**Figure 18. Switching time waveform**



## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® 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).  
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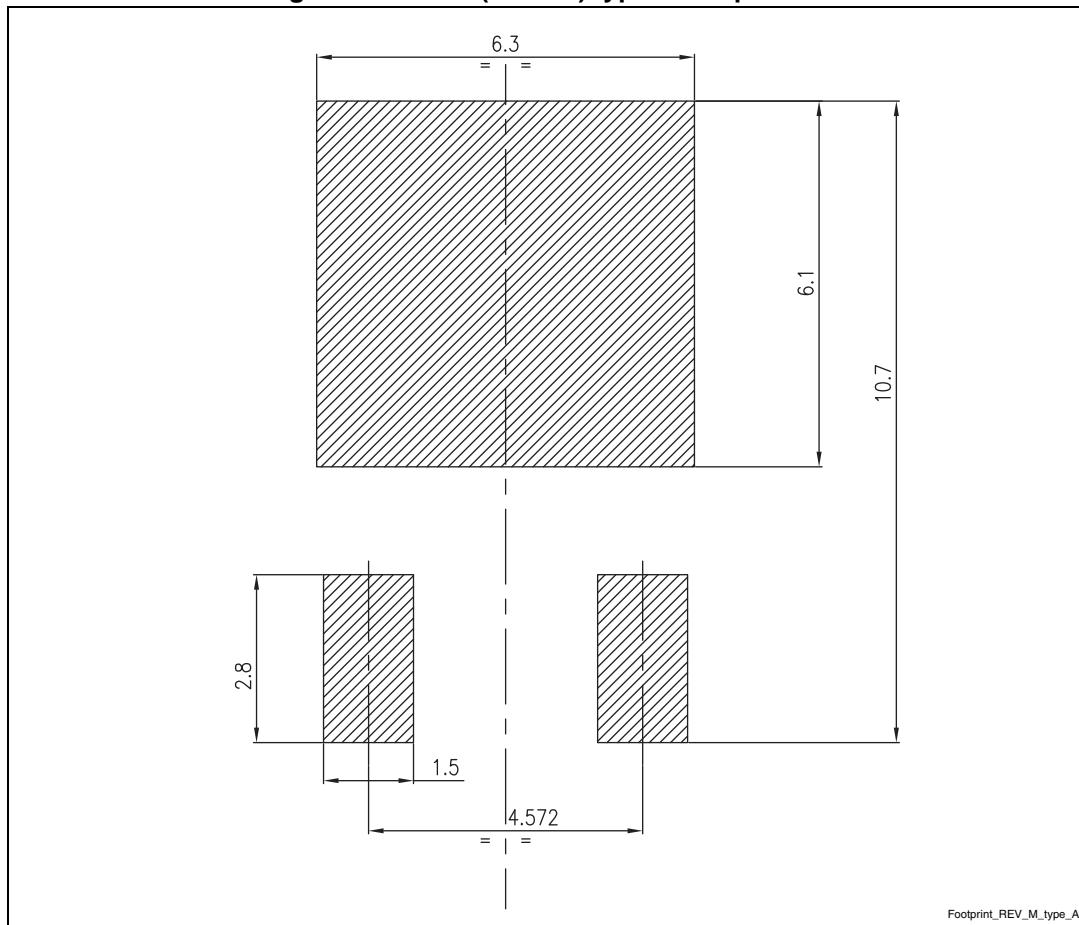
Figure 19. DPAK (TO-252) type A drawing



0068772\_M\_type\_A

**Table 9. 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 20. DPAK (TO-252) type A footprint (a)**

a. All dimensions are in millimeters

## 5 Packaging mechanical data

Figure 21. Tape for DPAK (TO-252)

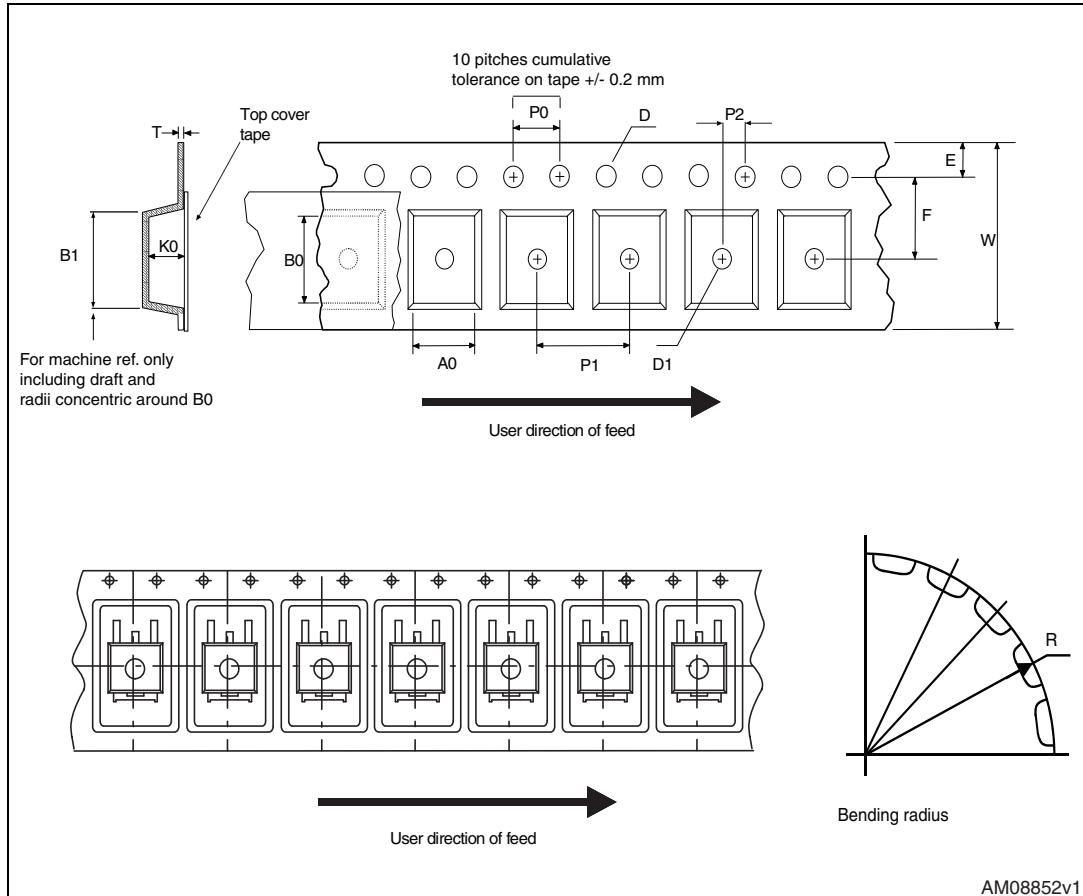


Figure 22. Reel for DPAK (TO-252)

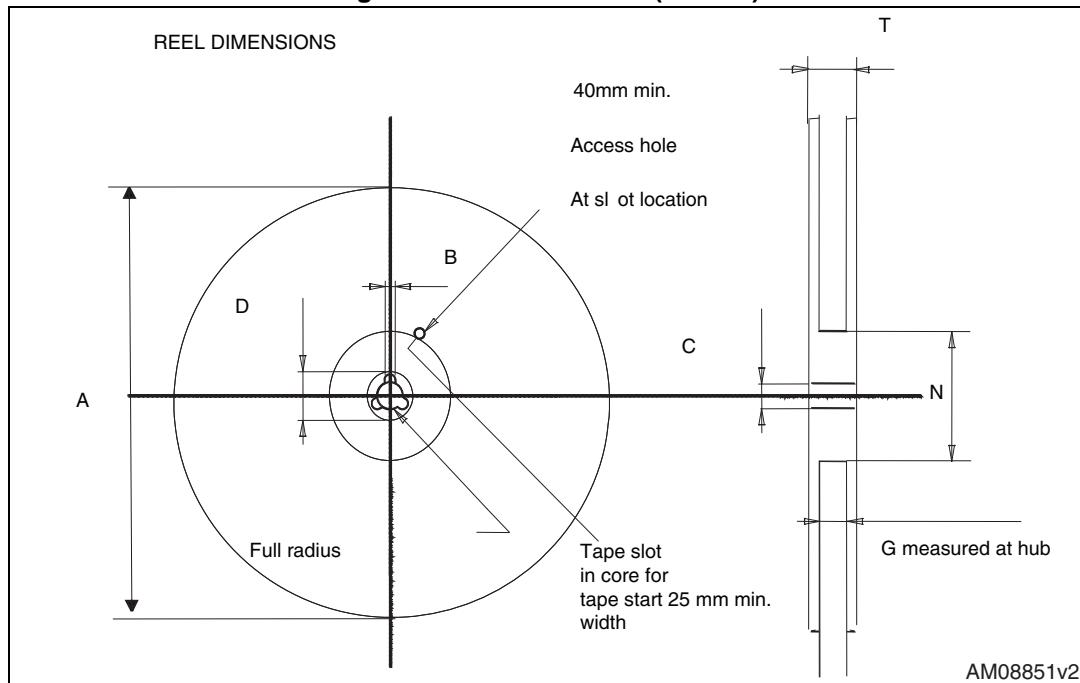


Table 10. DPAK (TO-252) tape and reel mechanical data

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			

## 6 Revision history

Table 11. Document revision history

Date	Revision	Changes
22-Aug-2012	1	First release
31-Jan-2013	2	<ul style="list-style-type: none"><li>– Modified: <math>R_{DS(on)}</math> on the title, <i>Features table</i> and <i>Table 5</i></li><li>– Modified: typical values on <i>Table 6, 7, 8</i></li><li>– Modified: <math>V_{SD}</math> max value on <i>Table 8</i></li><li>– Updated: <i>Section 4: Package mechanical data</i></li></ul>
16-Jul-2013	3	<ul style="list-style-type: none"><li>– Modified: <math>V_{GS}</math> and <math>I_D=100\text{ }^{\circ}\text{C}</math> values in <i>Table 2</i></li><li>– Modified: <math>R_{DS(on)}</math> max value in <i>Table 5, Figure 13, 14 and 15</i></li><li>– Inserted: <i>Section 2.1: Electrical characteristics (curves)</i></li></ul>
10-Sep-2013	4	<ul style="list-style-type: none"><li>– Updated <math>Q_g</math> value in <i>Table 6: Dynamic</i>.</li></ul>
06-Feb-2014	5	<ul style="list-style-type: none"><li>– Added: <i>Table 4: Avalanche characteristics</i></li><li>– Modified: <i>Figure 2, 5 and 12</i></li><li>– Updated: <i>Section 4: Package mechanical data</i></li><li>– Added: <i>Figure 16, 17 and 18</i></li><li>– Minor text changes</li></ul>

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