

## Automotive-grade N-channel 200 V, 0.10 $\Omega$ typ., 18 A STripFET™ Power MOSFET in a DPAK package

Datasheet - production data

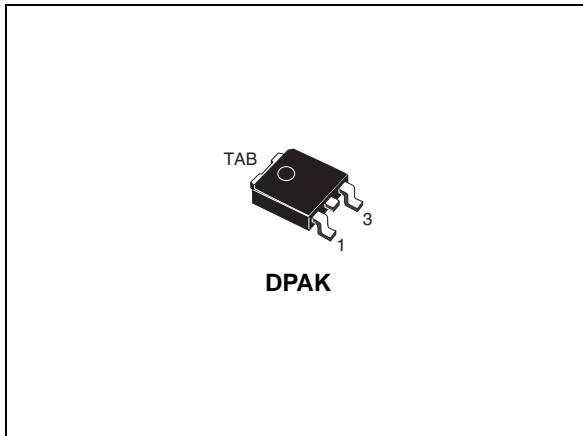
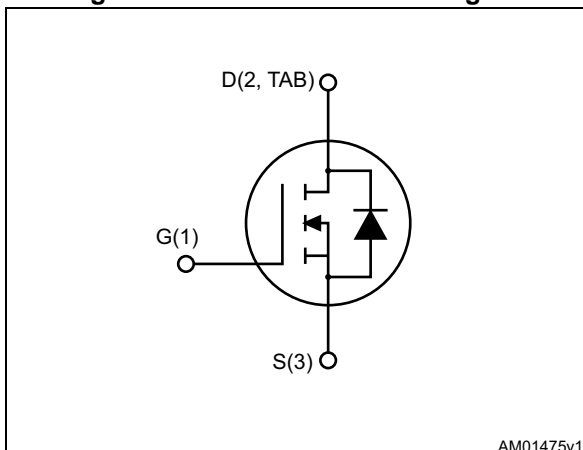


Figure 1. Internal schematic diagram



### Features

Order code	$V_{DS}$	$R_{DS(on)max}$	$I_D$	$P_{TOT}$
STD25NF20	200 V	0.125 $\Omega$	18 A	110 W

- Designed for automotive applications and AEC-Q101 qualified
- Extremely low gate charge
- Exceptional dv/dt capability
- Low gate input resistance
- 100% avalanche tested

### Applications

- Switching applications

### Description

This N-channel enhancement mode Power MOSFET benefits from the latest refinement of STMicroelectronics' unique "single feature size" strip-based process, which decreases the critical alignment steps to offer exceptional manufacturing reproducibility. The result is a transistor with extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

Table 1. Device summary

Order code	Marking	Package	Packing
STD25NF20	25NF20	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	200	V
$V_{GS}$	Gate-source voltage	$\pm 20$	
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	18	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	11	
$I_{DM}^{(1)}$	Drain current (pulsed)	72	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		

1. Pulse width limited by safe operating area.
2.  $I_{SD} \leq 18\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ;  $V_{DS\text{ peak}} < V_{(BR)DSS}$ ,  $V_{DD} = 80\% V_{(BR)DSS}$ .

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.38	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}$	Thermal resistance junction-pcb	$50^{(1)}$	

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

**Table 4. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AR}$	Avalanche current, repetitive or not repetitive (pulse width limited by $T_{jmax}$ )	18	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j=25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ ; $V_{DD}=50\text{ V}$ )	110	mJ

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified)

**Table 5. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}, V_{GS} = 0$	200			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 200\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 200\text{ V}, T_C = 125\text{ °C}$			50	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		0.10	0.125	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	940		pF
$C_{oss}$	Output capacitance		-	197		pF
$C_{riss}$	Reverse transfer capacitance		-	30		pF
$Q_g$	Total gate charge	$V_{DD} = 160\text{ V}, I_D = 20\text{ A}, V_{GS} = 10\text{ V}$ (see <a href="#">Figure 13</a> )	-	28	39	nC
$Q_{gs}$	Gate-source charge		-	5.6		nC
$Q_{gd}$	Gate-drain charge		-	14.5		nC

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_d(on)$	Turn-on delay time	$V_{DD} = 100\text{ V}, I_D = 10\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see <a href="#">Figure 14</a> and <a href="#">Figure 17</a> )	-	15	-	ns
$t_r(v)$	Voltage rise time		-	30	-	ns
$t_d(off)$	Turn-off-delay time		-	40	-	ns
$t_f(i)$	Fall time		-	10	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		18	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		72	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 20\text{ A}$ , $V_{GS} = 0$	-		1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 20\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ (see <a href="#">Figure 17</a> )	-	155		ns
$Q_{rr}$	Reverse recovery charge		-	775		nC
$I_{RRM}$	Reverse recovery current		-	10		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 20\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ (see <a href="#">Figure 17</a> )	-	183		ns
$Q_{rr}$	Reverse recovery charge		-	1061		nC
$I_{RRM}$	Reverse recovery current		-	11.6		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)

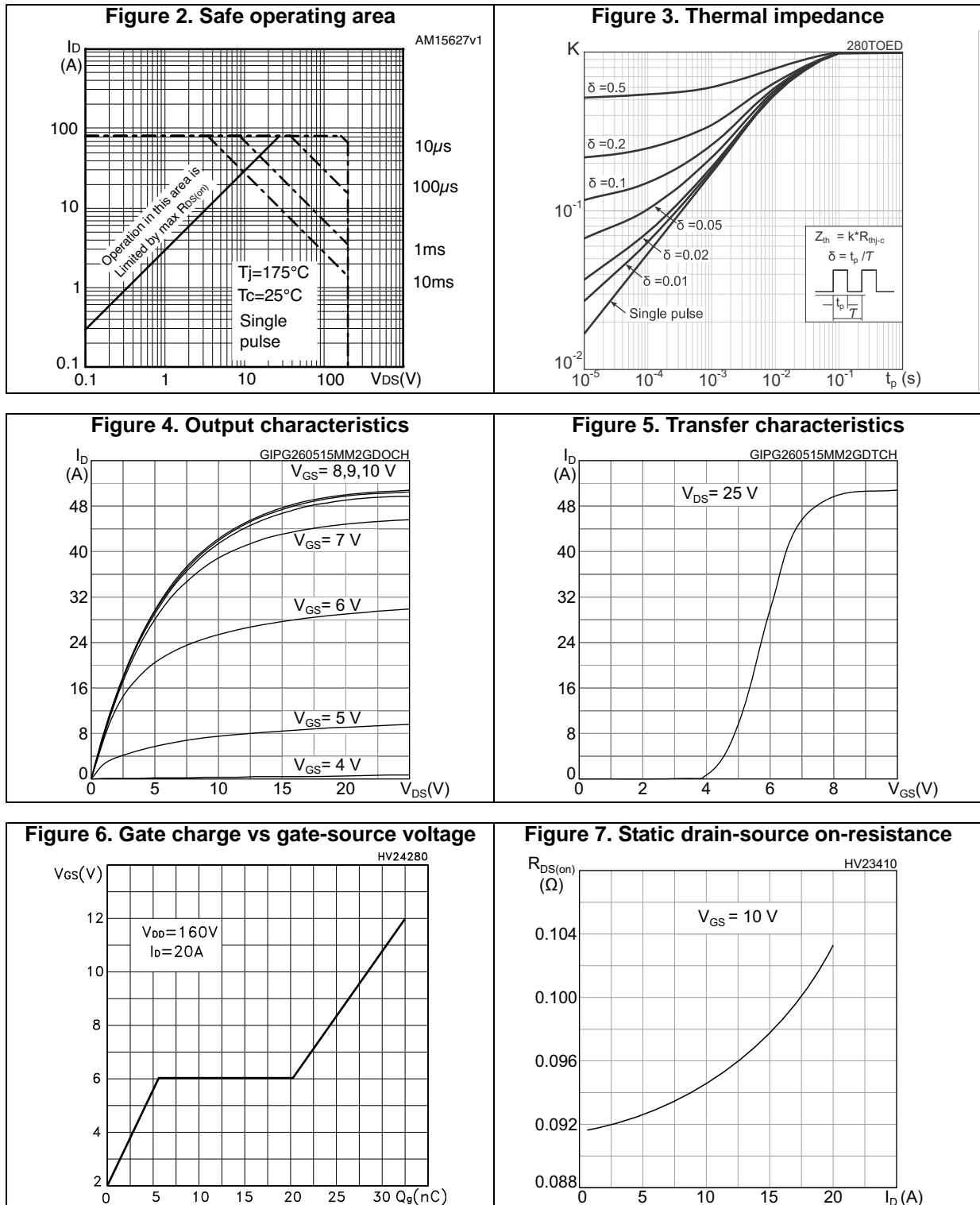


Figure 8. Capacitance variations

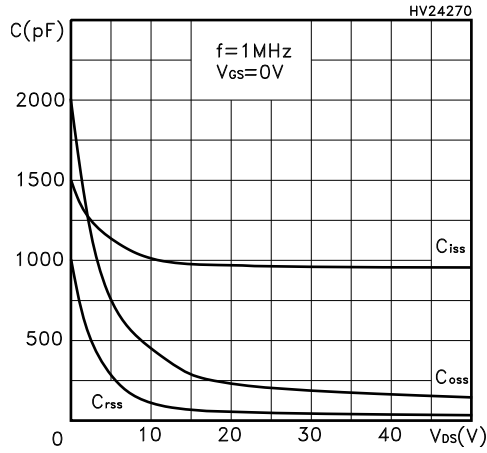


Figure 9. Source-drain diode forward characteristics

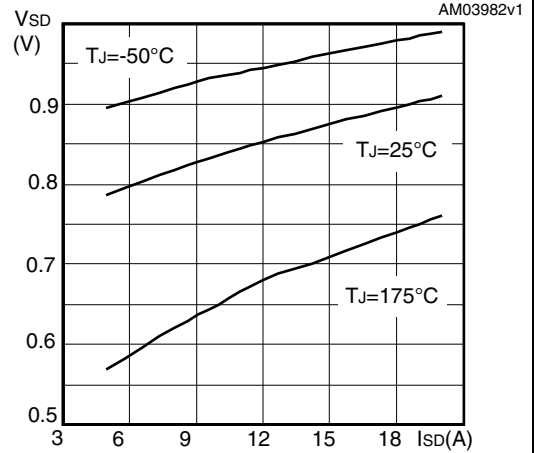


Figure 10. Normalized gate threshold voltage vs temperature

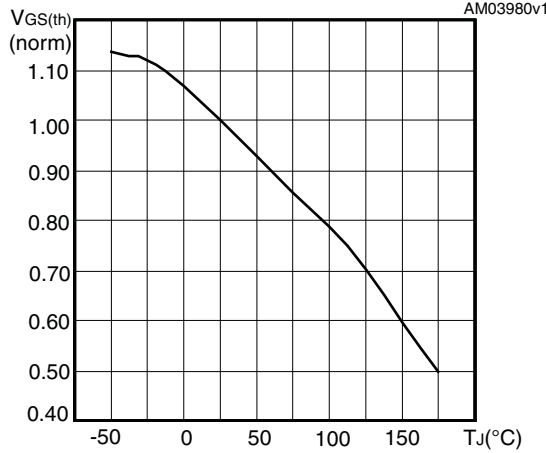
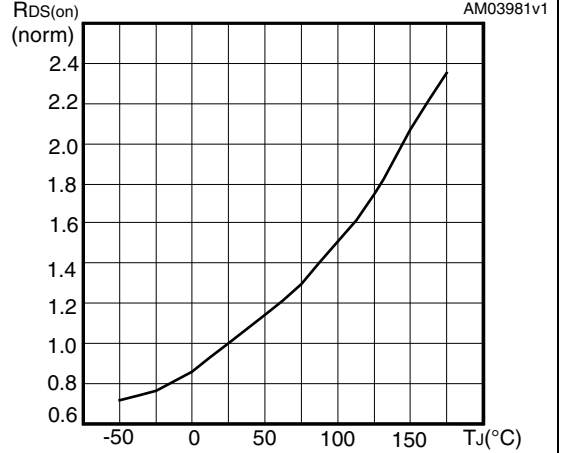
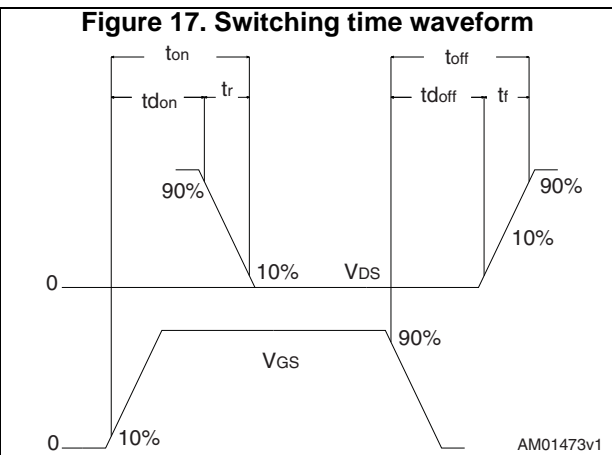
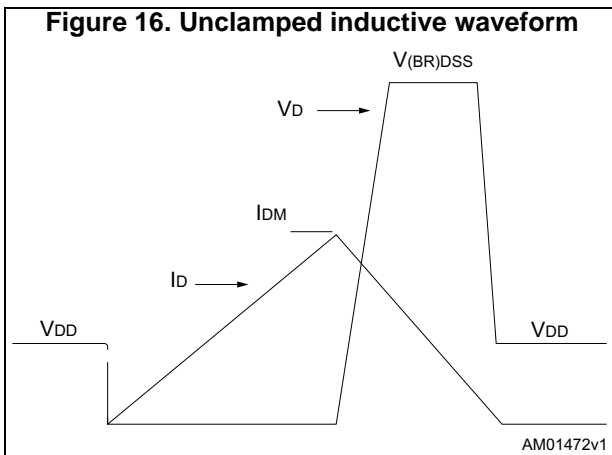
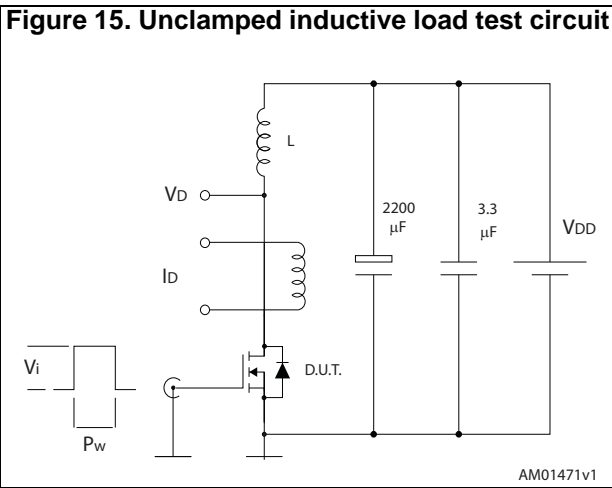
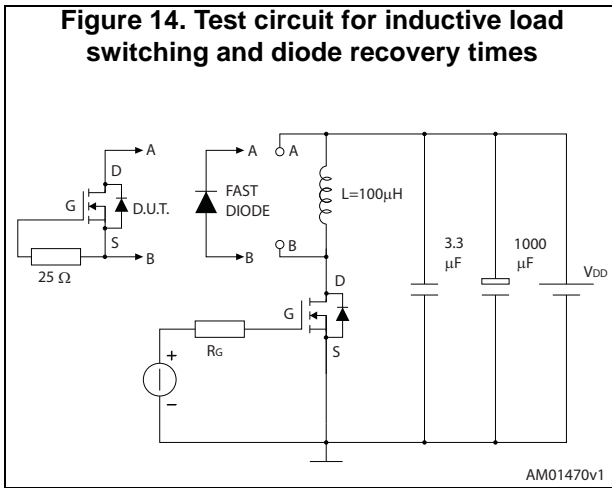
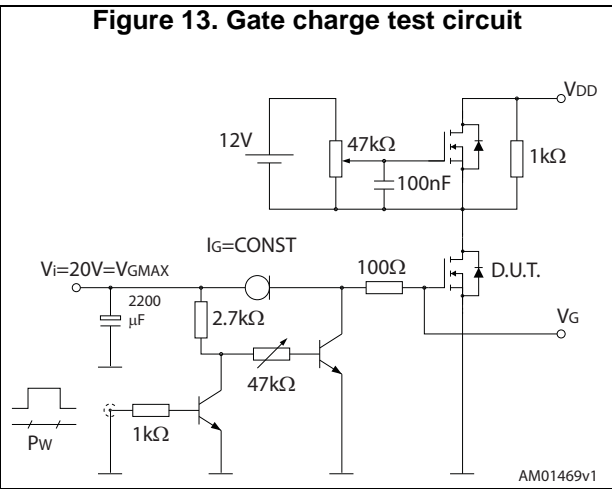
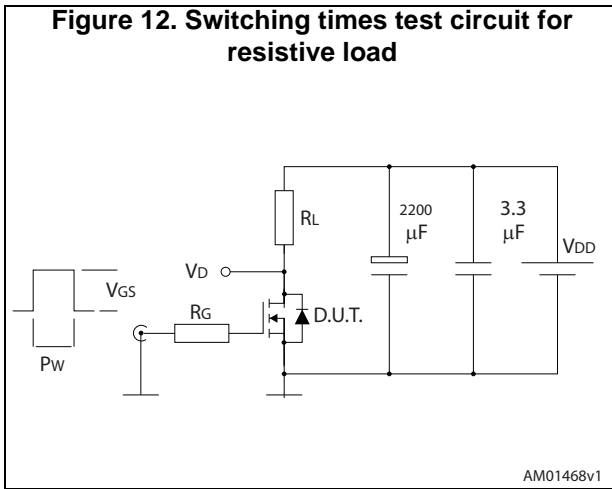


Figure 11. Normalized on-resistance vs temperature



### 3 Test circuits





## 4 Package information

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<sup>®</sup> is an ST trademark.

### 4.1 DPAK (TO-252) package information

Figure 18. DPAK (TO-252) type A2 package outline

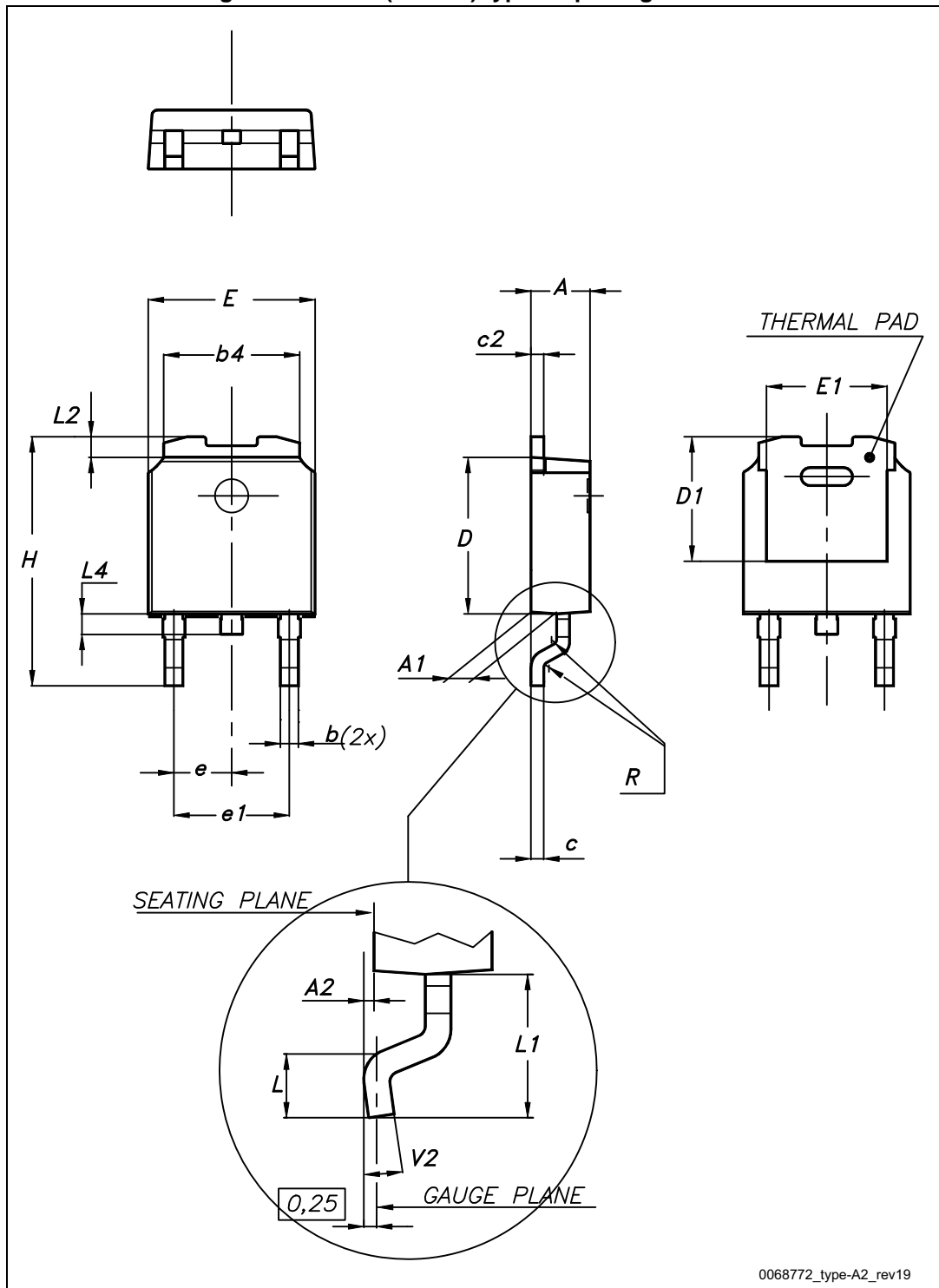
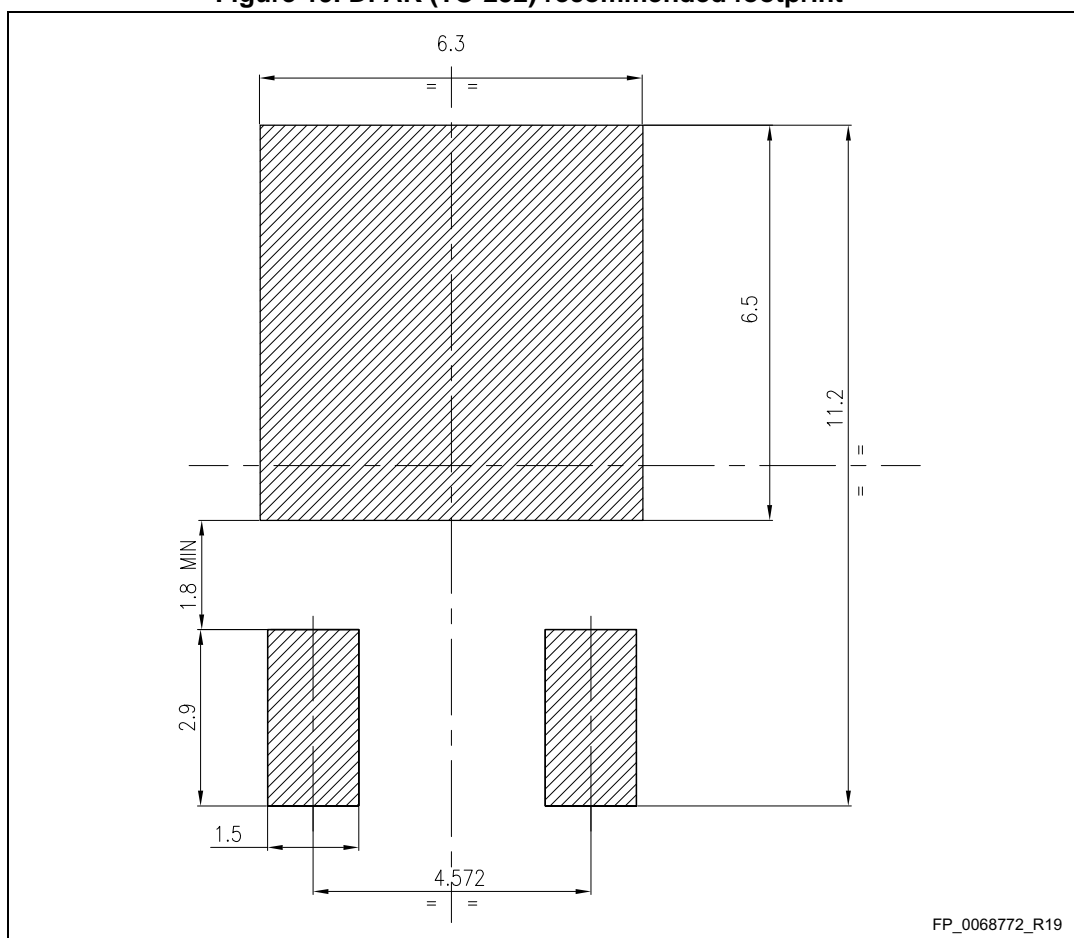


Table 9. DPAK (TO-252) type A2 mechanical data

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	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.16	2.28	2.40
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 19. DPAK (TO-252) recommended footprint (a)



a. All dimensions are in millimeters

### 4.2 Packing information

Figure 20. Tape outline for DPAK (TO-252)

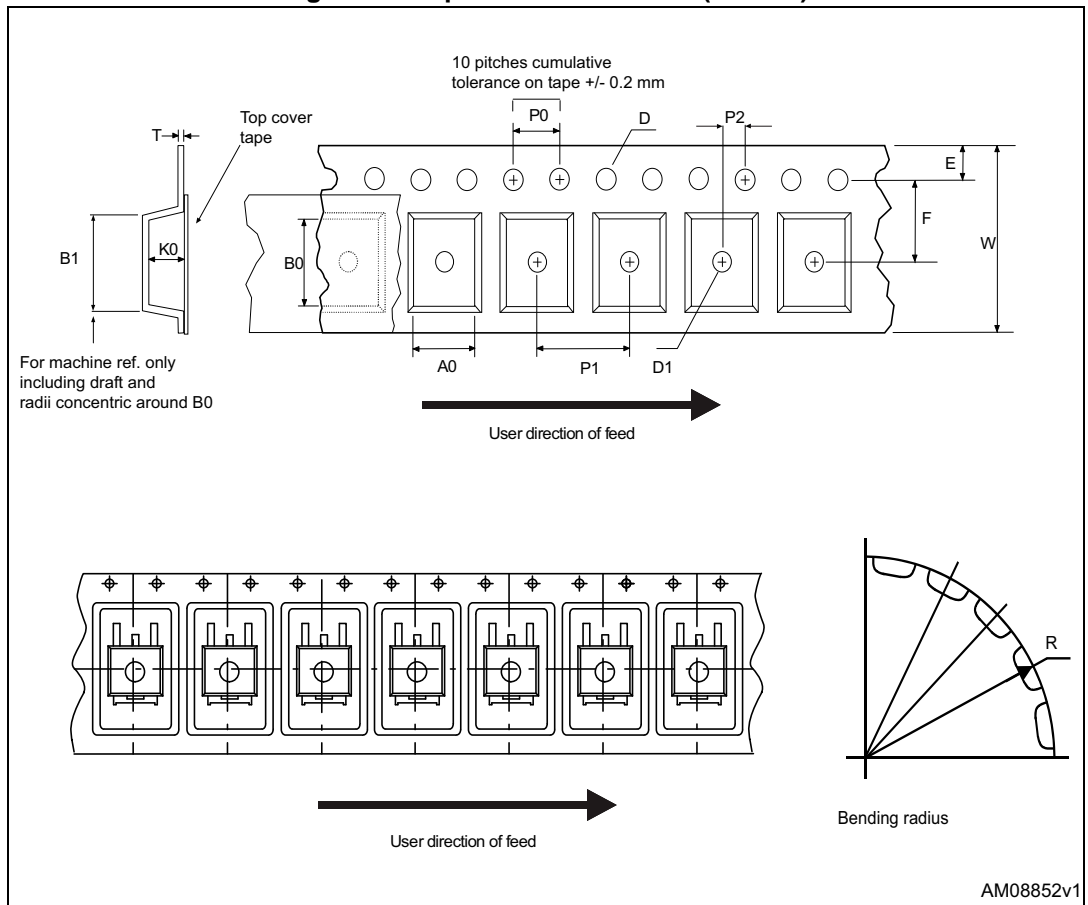


Figure 21. Reel outline for DPAK (TO-252)

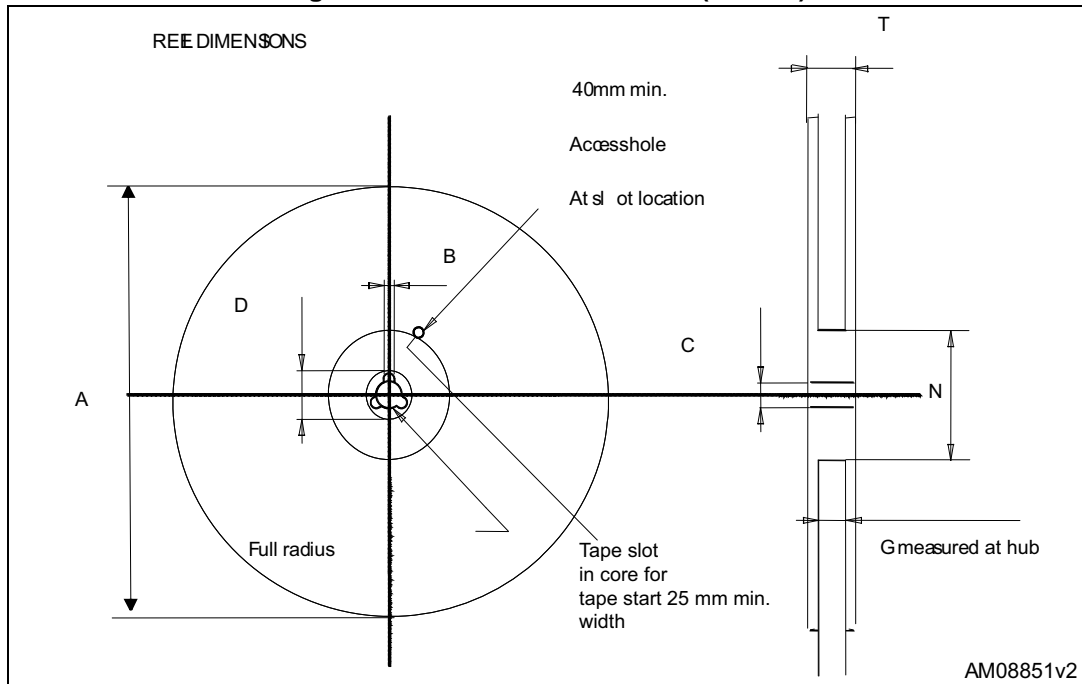


Table 10. DPAK (TO-252) tape and reel mechanical data

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			

## 5 Revision history

Table 11. Document revision history

Date	Revision	Changes
12-Mar-2013	1	First release.
03-Sep-2013	2	<ul style="list-style-type: none"><li>– Modified: title and <i>Features</i> in cover page</li><li>– Modified: <i>Figure 12, 13, 14</i> and <i>15</i></li><li>– Minor text changes</li></ul>
27-May-2015	3	<p>Text and formatting changes throughout document.</p> <p>In <i>Section 1: Electrical ratings</i>:</p> <ul style="list-style-type: none"><li>- updated <i>Table 2</i> and <i>Table 3</i></li></ul> <p>In <i>Section 1: Electrical ratings</i>:</p> <ul style="list-style-type: none"><li>- updated <i>Table 8</i></li></ul> <p>In <i>Section 2.1: Electrical characteristics (curves)</i>:</p> <ul style="list-style-type: none"><li>- updated <i>Figure 4</i> and <i>Figure 5</i></li></ul> <p>Updated <i>Section 4: Package information</i></p>

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