

## Automotive-grade N-channel 60 V, 0.07 $\Omega$ typ., 12 A, StripFET™ II Power MOSFET in a DPAK package

Datasheet - production data

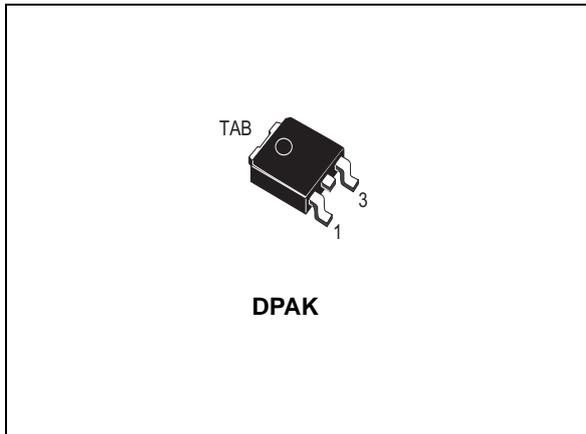
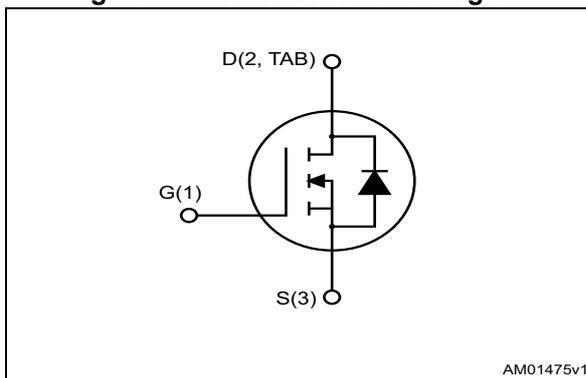


Figure 1. Internal schematic diagram



### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STD12NF06LT4	60 V	0.09 $\Omega$	12 A

- Designed for automotive applications and AEC-Q101 qualified
- Exceptional dv/dt capability
- Low gate charge

### Applications

- Switching applications

### Description

This Power MOSFET has been developed using STMicroelectronics' unique STRipFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Table 1. Device summary

Order code	Marking	Package	Packaging
STD12NF06LT4	D12NF06L	DPAK	Tape and reel

---

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Electrical characteristics (curves) .....	5
<b>3</b>	<b>Test circuit</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>9</b>
<b>5</b>	<b>Packaging mechanical data</b> .....	<b>13</b>
<b>6</b>	<b>Revision history</b> .....	<b>15</b>

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source voltage	60	V
V <sub>GS</sub>	Gate-source voltage	± 16	V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25 °C	12	A
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 100 °C	8.5	A
I <sub>DM</sub> <sup>(1)</sup>	Drain current (pulsed)	48	A
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25 °C	30	W
	Derating factor	0.2	W/°C
dv/dt <sup>(2)</sup>	Peak diode recovery voltage slope	15	V/ns
E <sub>AS</sub> <sup>(3)</sup>	Single pulse avalanche energy	100	mJ
T <sub>stg</sub>	Storage temperature	-55 to 175	°C
T <sub>J</sub>	Max. operating junction temperature		

1. Pulse width limited by safe operating area
2. I<sub>SD</sub> ≤ 12 A, di/dt ≤ 200 A/μs, V<sub>DS</sub> ≤ 40 V, T<sub>J</sub> ≤ T<sub>JMAX</sub>
3. Starting T<sub>J</sub> = 25 °C, I<sub>D</sub> = 6 A, V<sub>DD</sub> = 30 V

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case max.	5	°C/W
R <sub>thj-pcb</sub> <sup>(1)</sup>	Thermal resistance junction-pcb max.	50	°C/W

1. When mounted on FR-4 board of 1 inch<sup>2</sup>, 2 oz Cu.

## 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	$V_{GS} = 0, I_D = 250\ \mu\text{A}$ ,	60			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 60$			1	$\mu\text{A}$
		$V_{GS} = 0, V_{DS} = 60$ $T_C = 125\text{ °C}$			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0$ $V_{GS} = \pm 16\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1		2	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 6\text{ A}$		0.07	0.09	$\Omega$
		$V_{GS} = 5\text{ V}, I_D = 6\text{ A}$		0.08	0.1	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$		350		pF
$C_{oss}$	Output capacitance			75		pF
$C_{riss}$	Reverse transfer capacitance			30		pF
$Q_g$	Total gate charge	$V_{DD} = 48\text{ V}, I_D = 12\text{ A}$ $V_{GS} = 5\text{ V}$ see <a href="#">Figure 14</a>		7.5	10	nC
$Q_{gs}$	Gate-source charge			2.5		nC
$Q_{gd}$	Gate-drain charge			3.0		nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}, I_D = 6\text{ A},$ $R_G = 4.7\ \Omega, V_{GS} = 4.5\text{ V}$ see <a href="#">Figure 13</a>		10		ns	
$t_r$	Rise time			35		ns	
$t_{d(off)}$	Turn-off delay time				20		ns
$t_f$	Fall time				13		ns

Table 7. 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	$I_{SD} = 12\text{ A}$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 12\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 16\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$ see <a href="#">Figure 15</a>		50		ns
$Q_{rr}$	Reverse recovery charge			65		nC
$I_{RRM}$	Reverse recovery current			2.5		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 2. Safe operating area

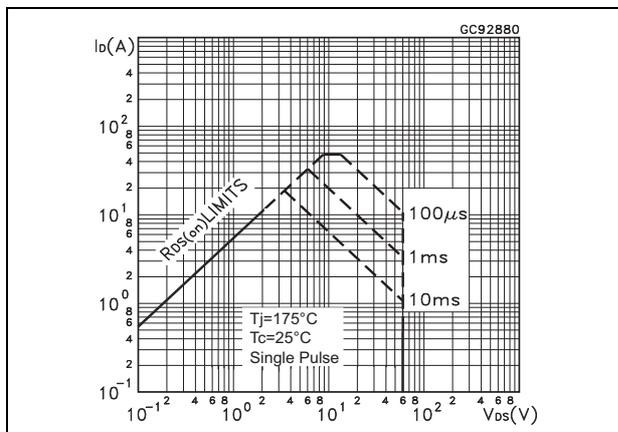


Figure 3. Thermal impedance

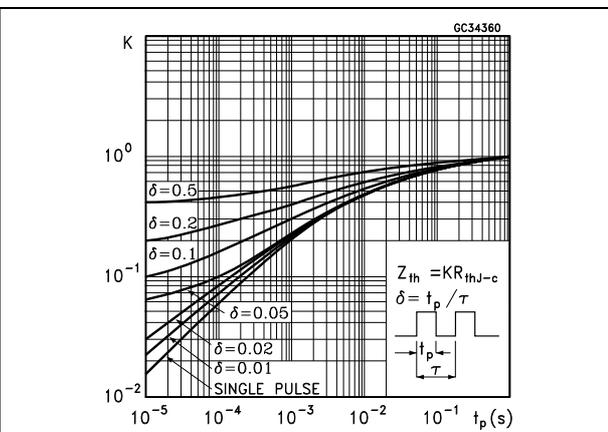


Figure 4. Output characteristics

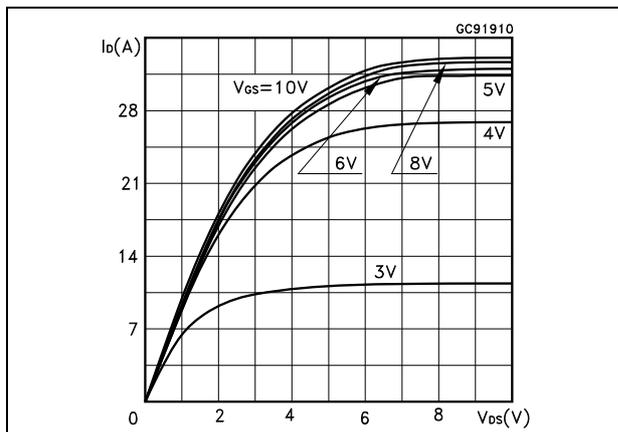


Figure 5. Transfer characteristics

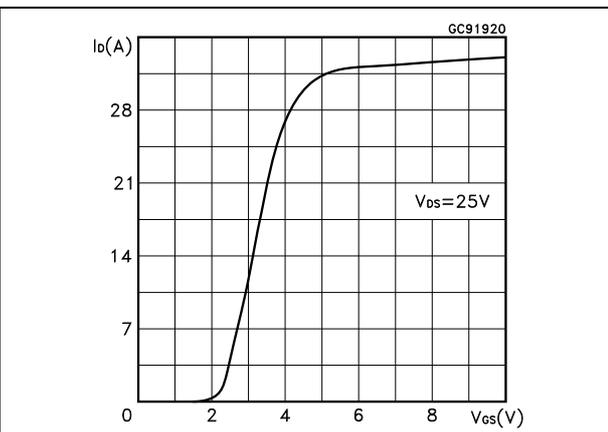


Figure 6. Normalized  $V_{(BR)DSS}$  vs. temperature

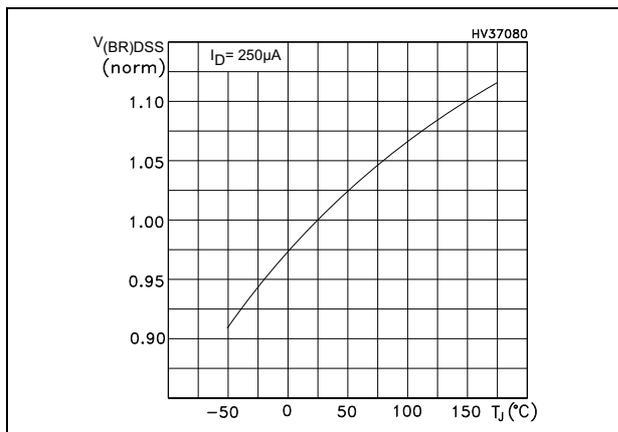


Figure 7. Static drain-source on-resistance

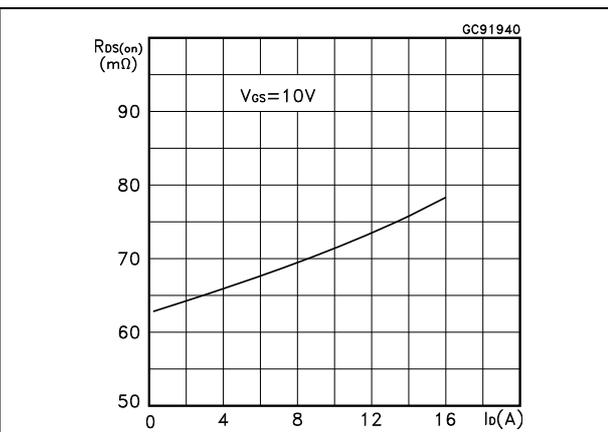


Figure 8. Gate charge vs. gate-source voltage

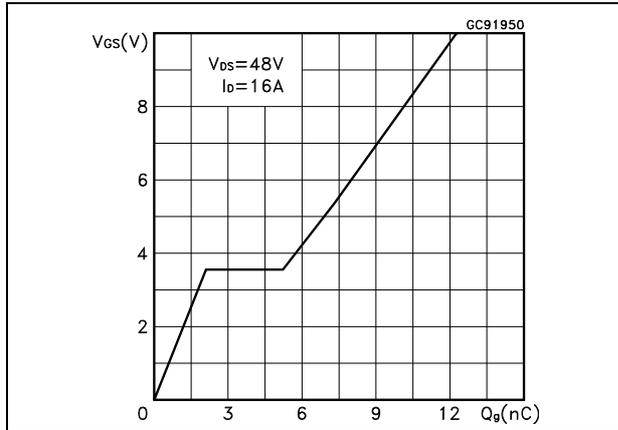


Figure 9. Capacitance variations

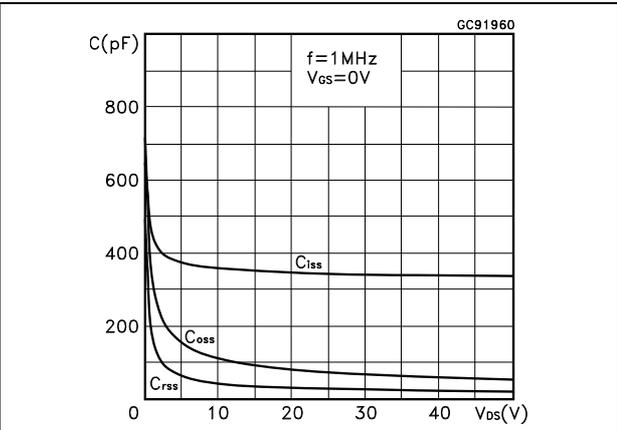


Figure 10. Normalized gate threshold voltage vs. temperature

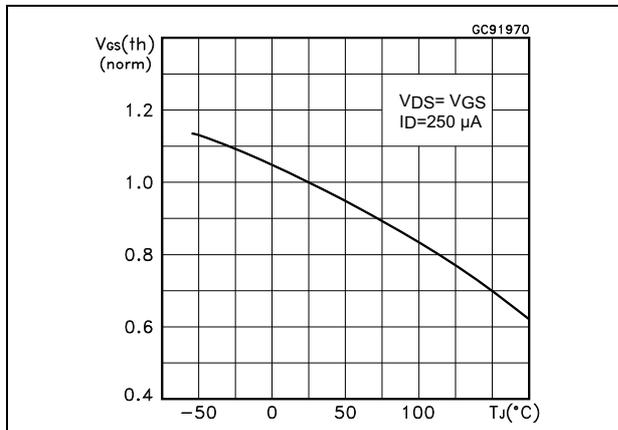


Figure 11. Normalized on-resistance vs. temperature

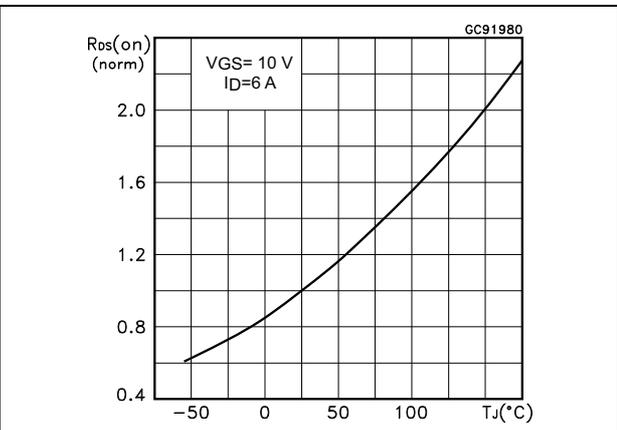
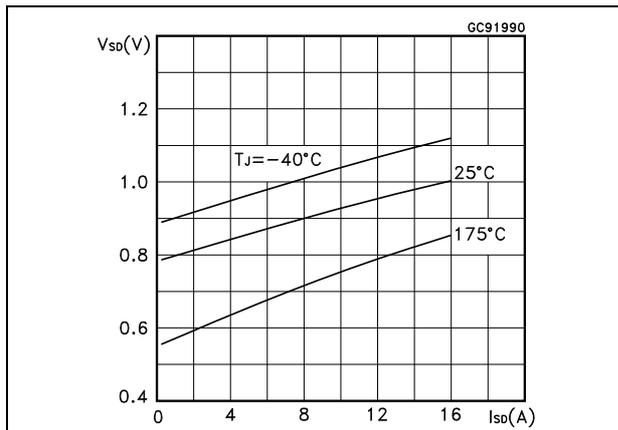


Figure 12. Source-drain diode forward characteristics



### 3 Test circuit

Figure 13. Switching times test circuit for resistive load

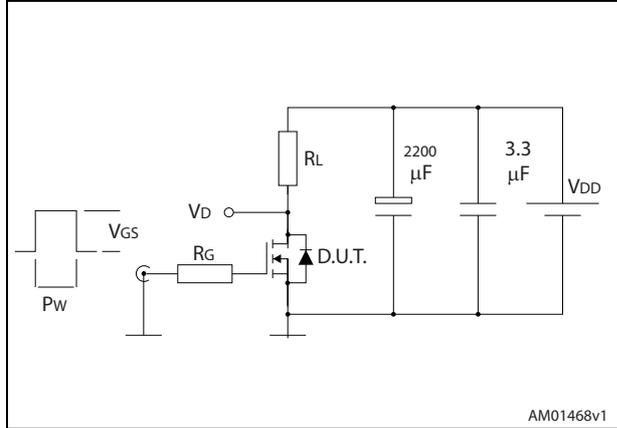


Figure 14. Gate charge test circuit

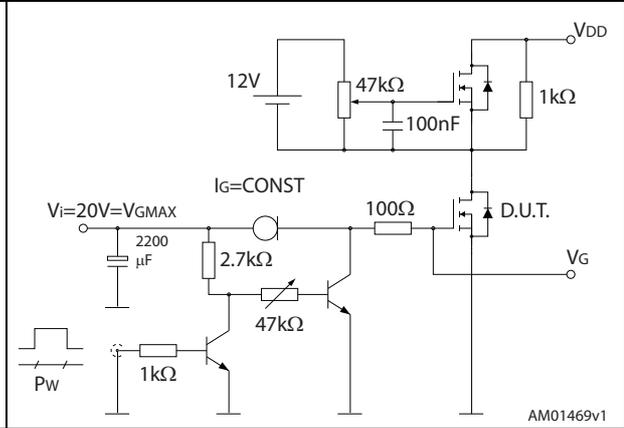


Figure 15. Test circuit for inductive load switching and diode recovery times

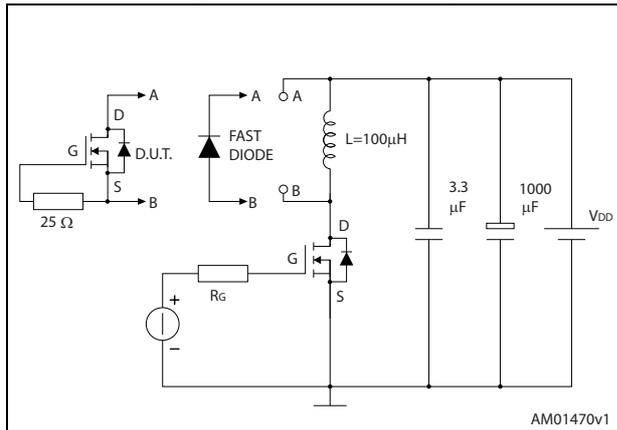


Figure 16. Unclamped inductive load test circuit

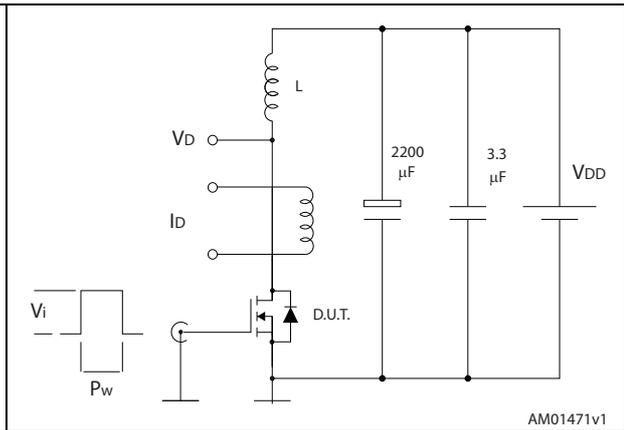


Figure 17. Unclamped inductive waveform

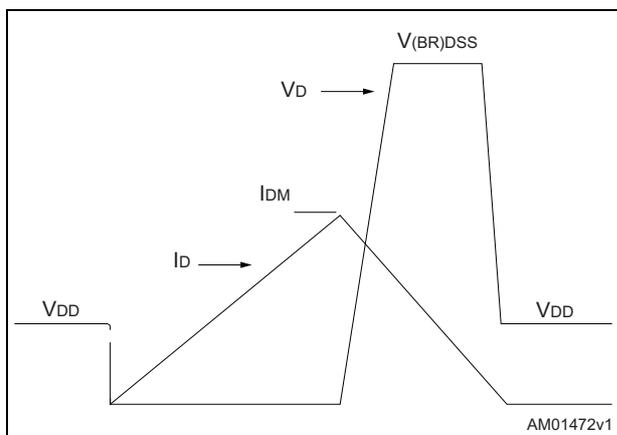
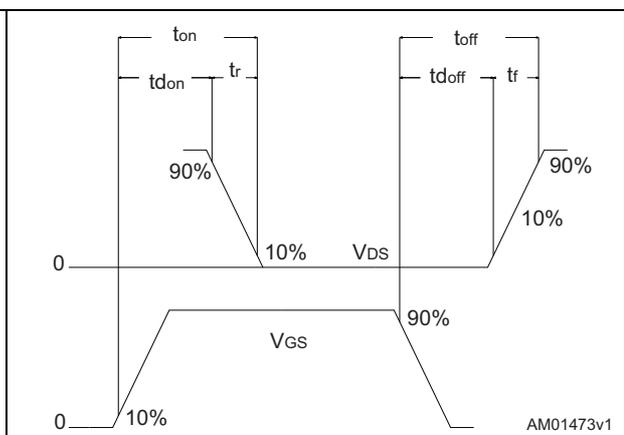


Figure 18. Switching time waveform



## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<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.

Figure 19. DPAK (TO-252) type A drawings

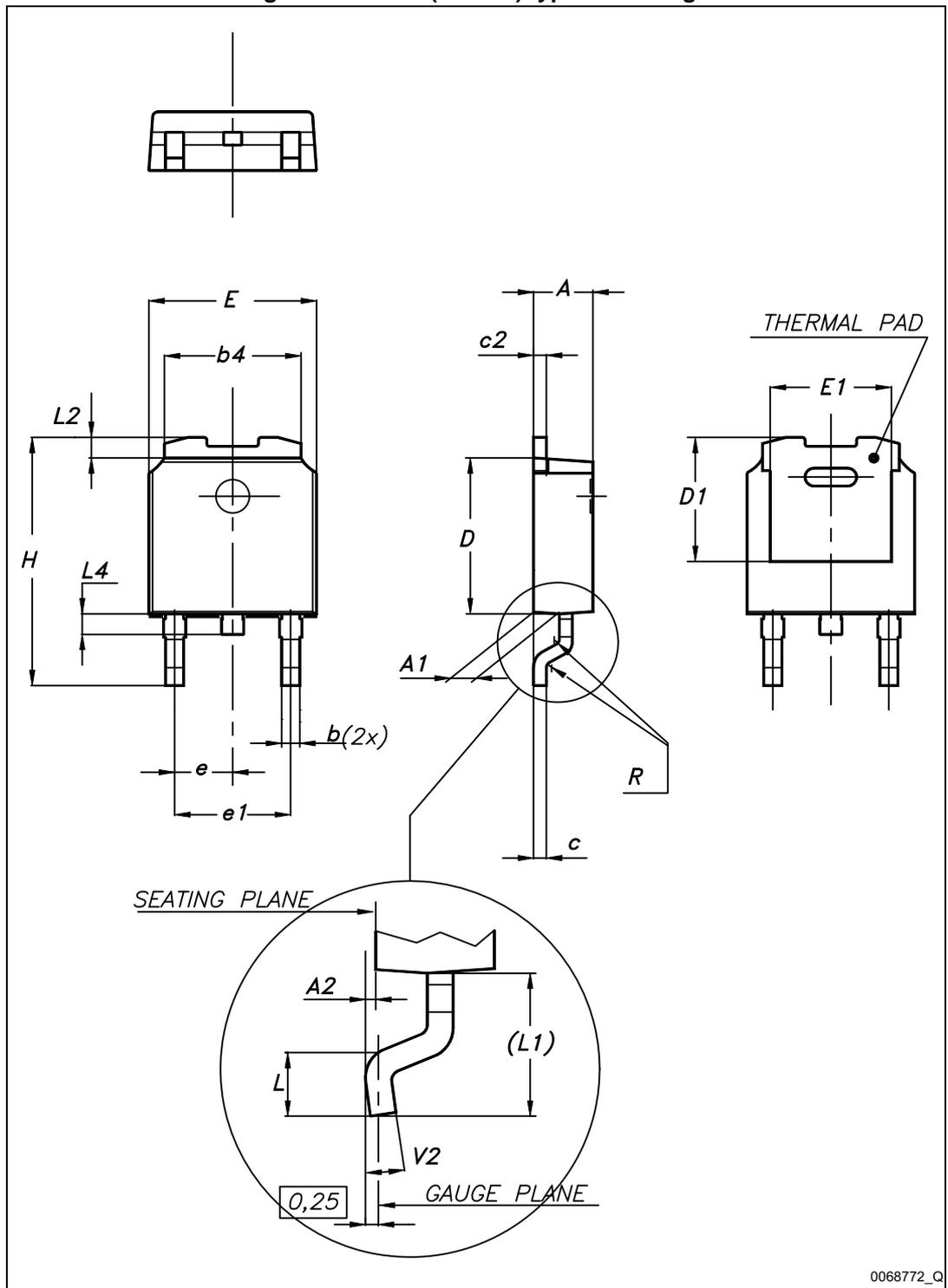
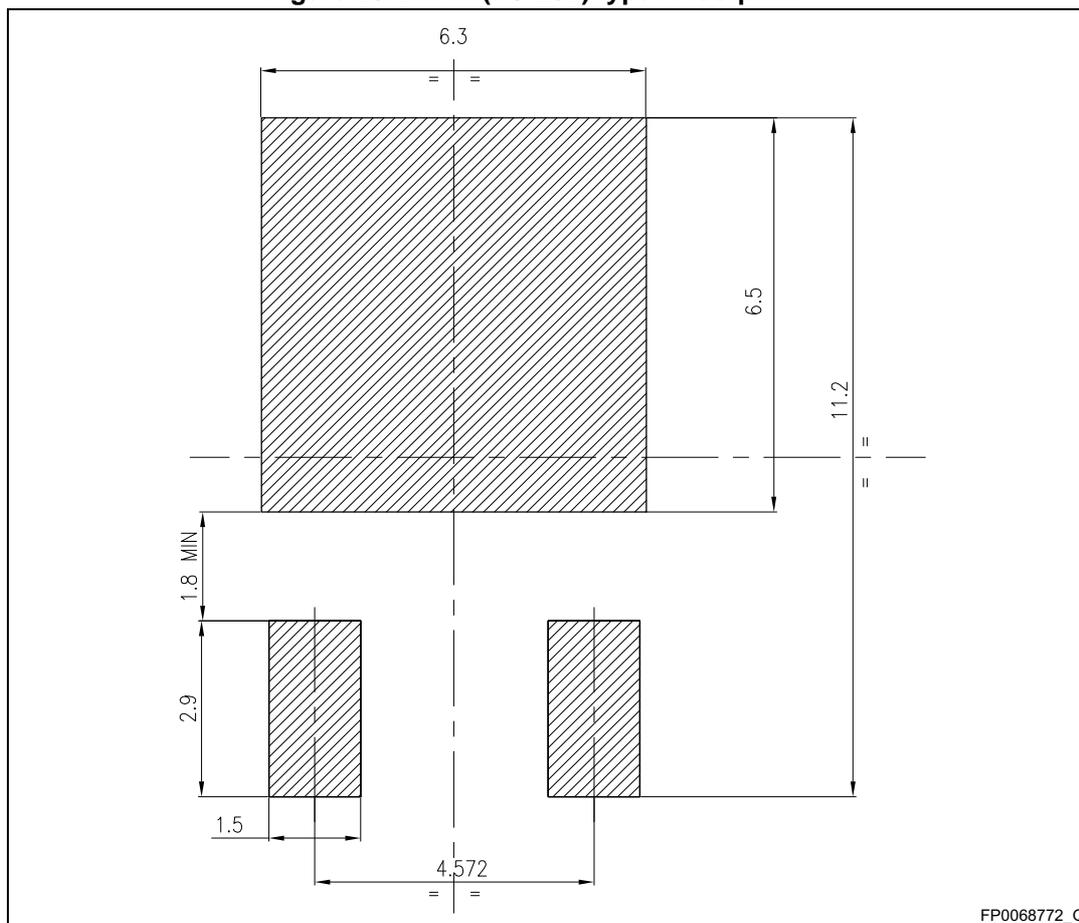


Table 8. DPAK (TO-252) type A mechanical data

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



a. All dimensions are in millimeters

# 5 Packaging mechanical data

Figure 21. Tape

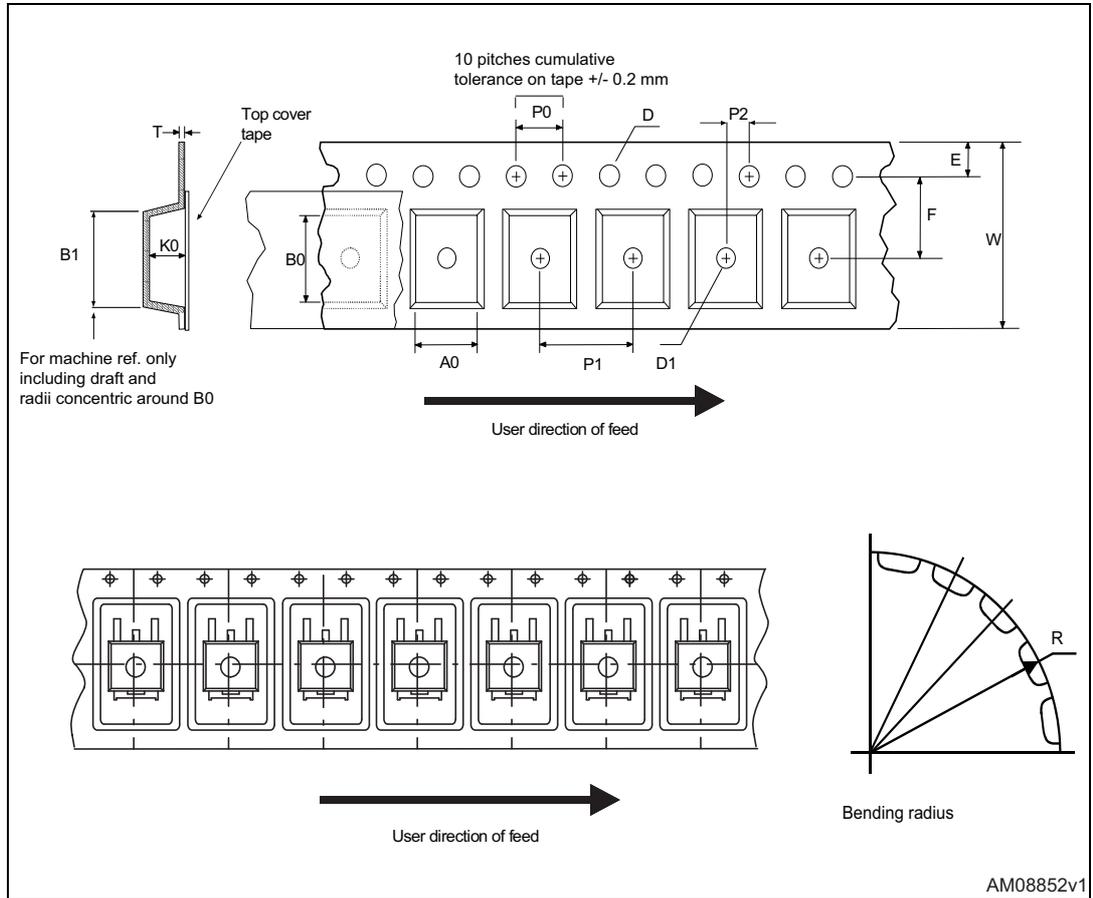


Figure 22. Reel

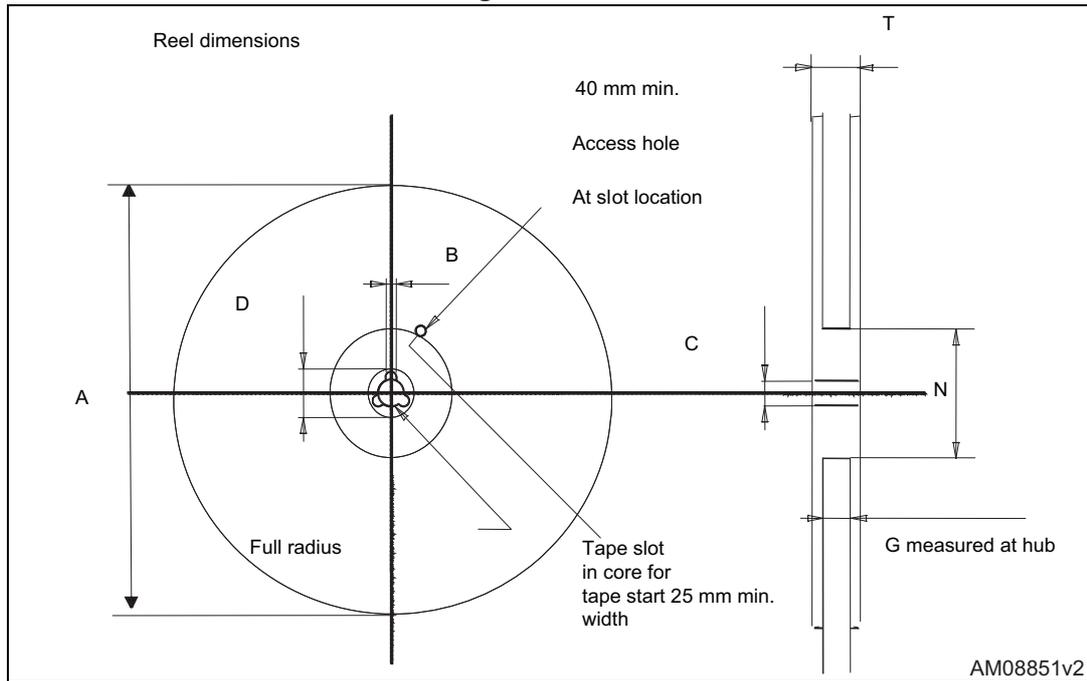


Table 9. DPAK (TO-252) tape and reel mechanical data

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
26-Jun-2014	1	First release.
14-Nov-2014	2	Updated title and features in cover page Updated <a href="#">Table 3.: Thermal data</a> , <a href="#">Table 4.: On/off states</a> and <a href="#">Table 5.: Dynamic</a> Updated <a href="#">Figure 2: Safe operating area</a> , <a href="#">Figure 3: Thermal impedance</a> , <a href="#">Figure 6.: Normalized <math>V_{(BR)DSS}</math> vs. temperature</a> , <a href="#">Figure 10.</a> , <a href="#">Figure 11.: Normalized on-resistance vs. temperature</a> and <a href="#">Section 4: Package mechanical data</a> .

**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

# AMEYA360

## Components Supply Platform

### Authorized Distribution Brand :



### Website :

Welcome to visit [www.ameya360.com](http://www.ameya360.com)

### Contact Us :

#### ➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd  
Minhang District, Shanghai , China

#### ➤ Sales :

Direct +86 (21) 6401-6692

Email [amall@ameya360.com](mailto:amall@ameya360.com)

QQ 800077892

Skype [ameyasales1](#) [ameyasales2](#)

#### ➤ Customer Service :

Email [service@ameya360.com](mailto:service@ameya360.com)

#### ➤ Partnership :

Tel +86 (21) 64016692-8333

Email [mkt@ameya360.com](mailto:mkt@ameya360.com)