



# STD40NF10

N-channel 100 V, 0.025  $\Omega$ , 50 A DPAK  
low gate charge STripFET™ II Power MOSFET

## Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STD40NF10	100 V	< 0.028 $\Omega$	50 A

- Exceptional dv/dt capability
- Low gate charge
- 100% avalanche tested

## Application

Switching applications

## Description

This N-channel 100 V Power MOSFET is the latest development of STMicroelectronics unique single feature size strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps allowing remarkable manufacturing reproducibility.

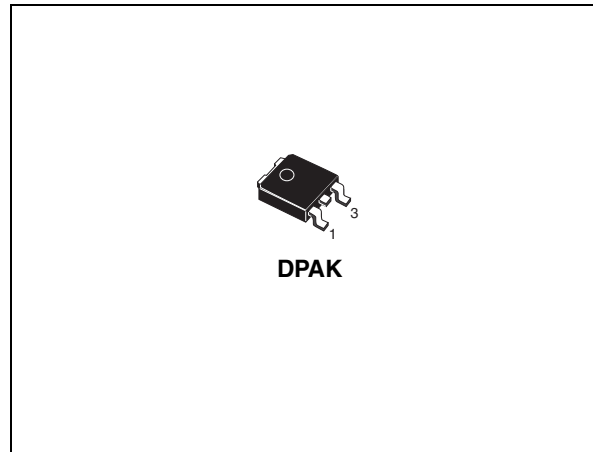


Figure 1. Internal schematic diagram

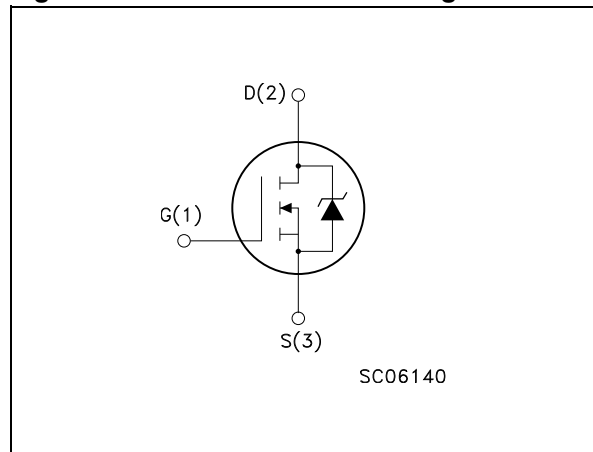


Table 1. Device summary

Order code	Marking	Package	Packaging
STD40NF10	D40NF10	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) .....	6
<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>11</b>
<b>6</b>	<b>Revision history</b> .....	<b>12</b>

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $v_{GS} = 0$ )	100	V
$V_{GS}$	Gate- source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	50	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	35	A
$I_{DM}^{(2)}$	Drain current (pulsed)	200	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	125	W
	Derating factor	0.83	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	Peak diode recovery voltage slope	27	V/ns
$E_{AS}^{(4)}$	Single pulse avalanche energy	385	mJ
$T_{stg}$	Storage temperature	- 55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature		

1. Limited by wire bonding
2. Pulse width limited by safe operating area
3.  $I_{SD} \leq 50\text{ A}$ ,  $di/dt \leq 600\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_j \leq T_{JMAX}$ .
4. Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = 50\text{ A}$ ,  $V_{DD} = 25\text{ V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.2	$^\circ\text{C}/\text{W}$
$R_{thj-a}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$

## 2 Electrical characteristics

(T<sub>CASE</sub> = 25 °C unless otherwise specified)

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	100			V
I <sub>DSS</sub>	Zero gate voltage Drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating V <sub>DS</sub> =Max rating, T <sub>C</sub> =125°C			1 10	μA μA
I <sub>GSS</sub>	Gate-body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2	3	4	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A		0.025	0.028	Ω

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> <sup>(1)</sup>	Forward transconductance	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 28 A		22		S
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0		2180		pF
C <sub>oss</sub>	Output capacitance			298		pF
C <sub>rss</sub>	Reverse transfer capacitance			83.7		pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 40 A, V <sub>GS</sub> = 10 V <i>(see Figure 15)</i>		46.5	62	nC
Q <sub>gs</sub>	Gate-source charge			13.3		nC
Q <sub>gd</sub>	Gate-drain charge			17.5	22.5	nC

1. Pulsed: Pulse duration = 300 μs, duty cycle 1.5.

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 25 A R <sub>G</sub> = 4.7 Ω V <sub>GS</sub> = 10 V <i>(see Figure 14)</i>		21		ns
t <sub>r</sub>	Rise time			46		ns
t <sub>d(off)</sub>	Turn-off-delay time				54	
t <sub>f</sub>	Fall time			13		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	$I_{SD} = 50 \text{ A}$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 50 \text{ A}$ , $V_{DD} = 25 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s}$ , $T_j = 150 \text{ }^\circ\text{C}$ <i>(see Figure 16)</i>		80		ns
$Q_{rr}$	Reverse recovery charge			250		nC
$I_{RRM}$	Reverse recovery current			6.4		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

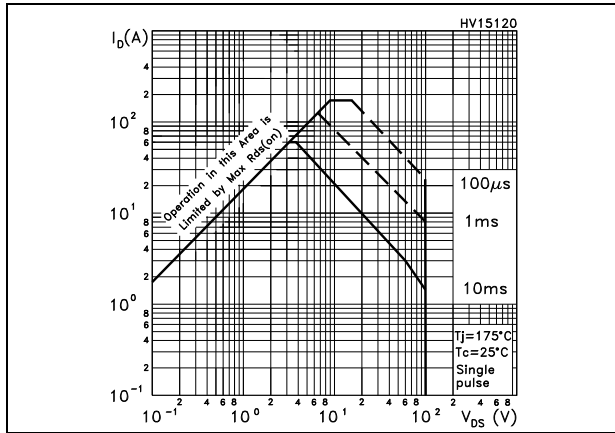


Figure 3. Thermal impedance

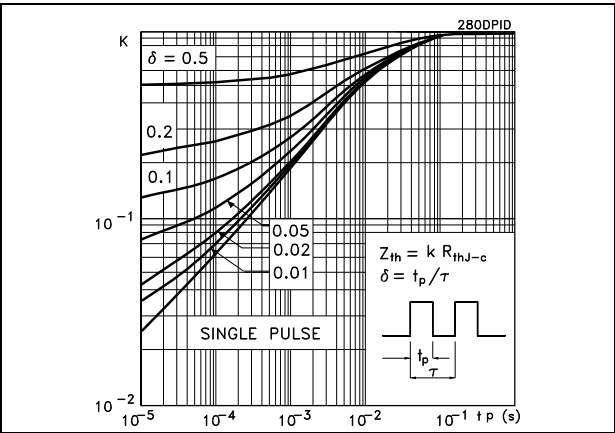


Figure 4. Output characteristics

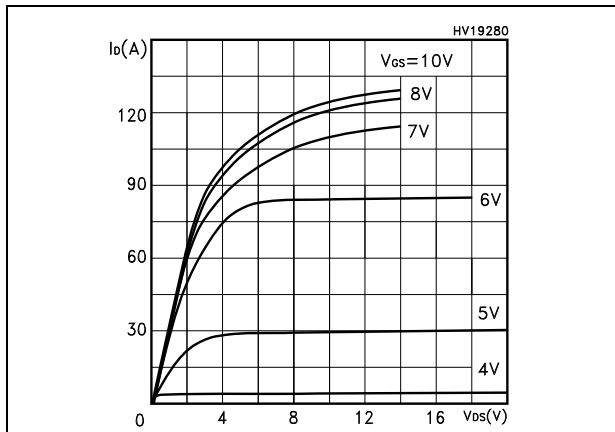


Figure 5. Transfer characteristics

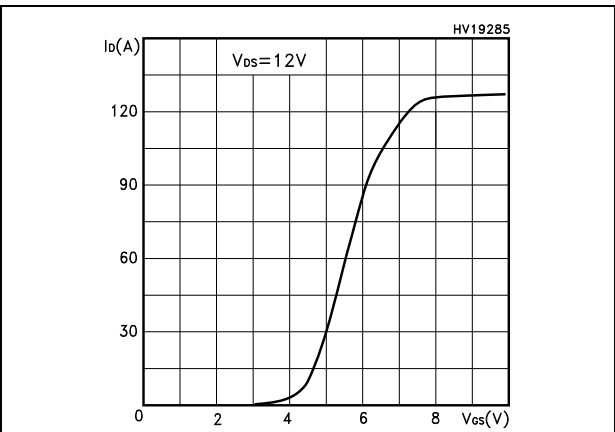


Figure 6. Transconductance

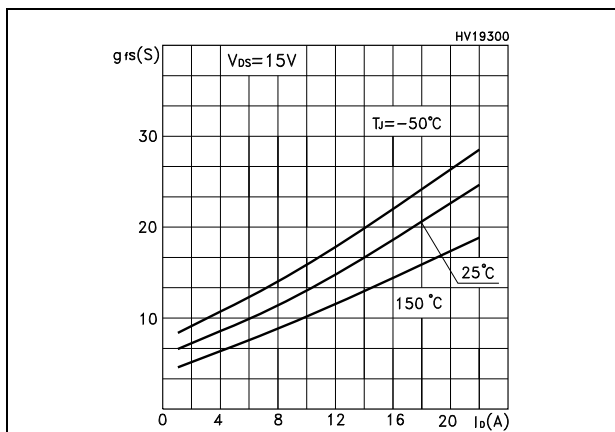


Figure 7. Static drain-source on resistance

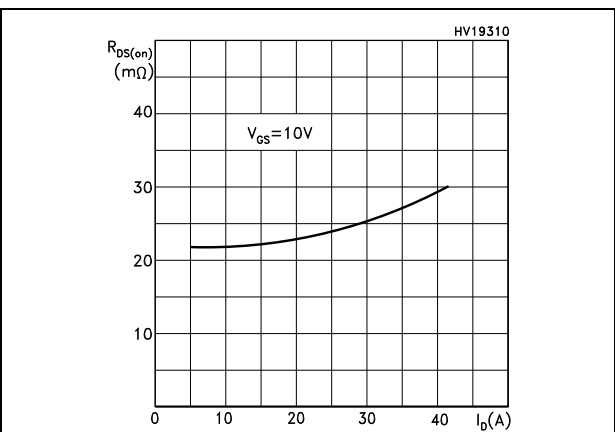


Figure 8. Gate charge vs. gate-source voltage Figure 9. Capacitance variations

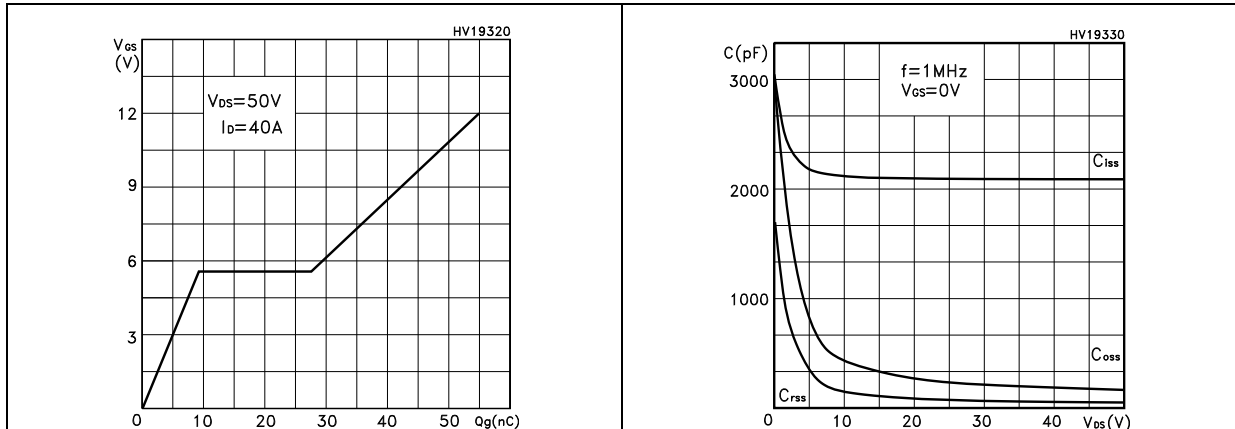


Figure 10. Normalized gate threshold voltage vs. temperature

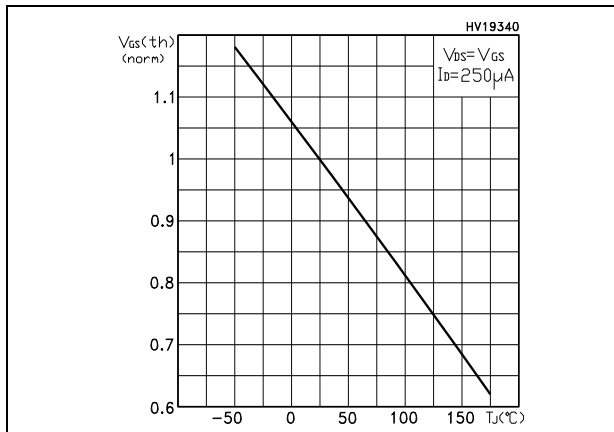


Figure 11. Normalized on resistance vs. temperature

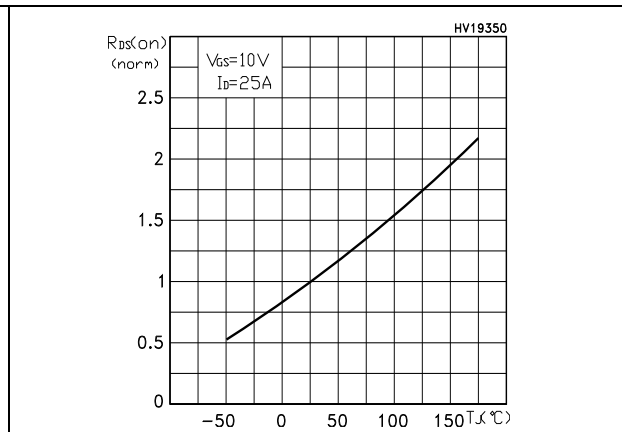


Figure 12. Source-drain diode forward characteristics

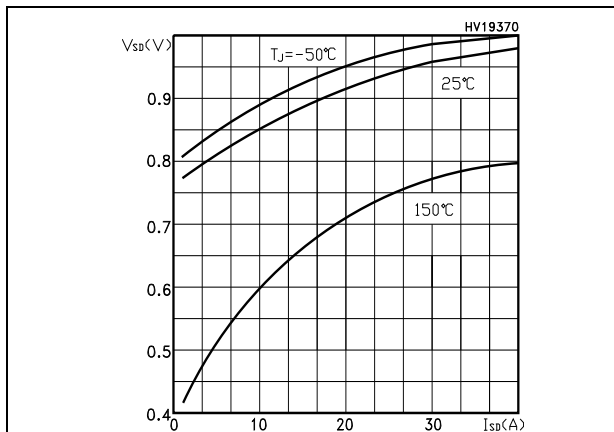
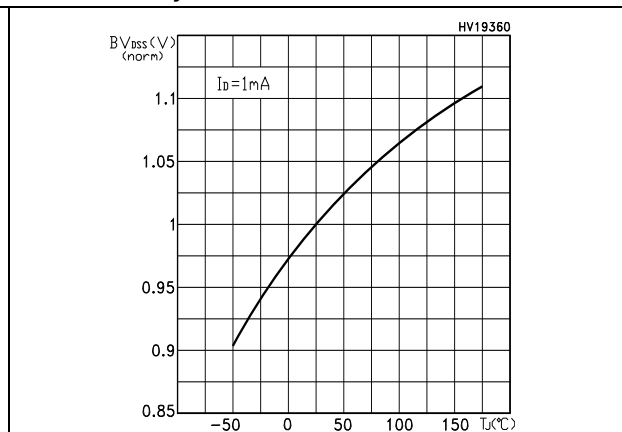


Figure 13. Normalized breakdown voltage vs.  $t_j$



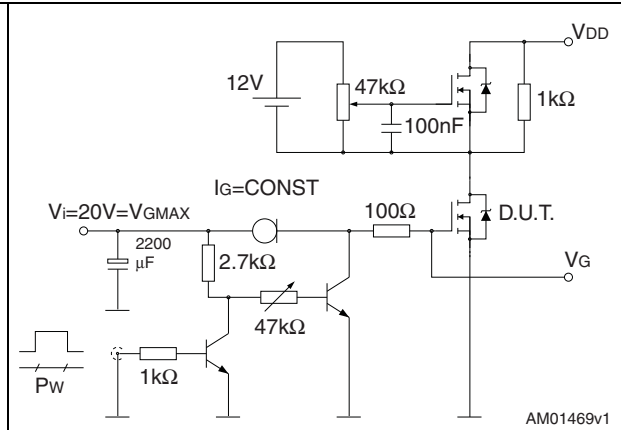
### 3 Test circuit

Figure 14. Switching times test circuit for resistive load



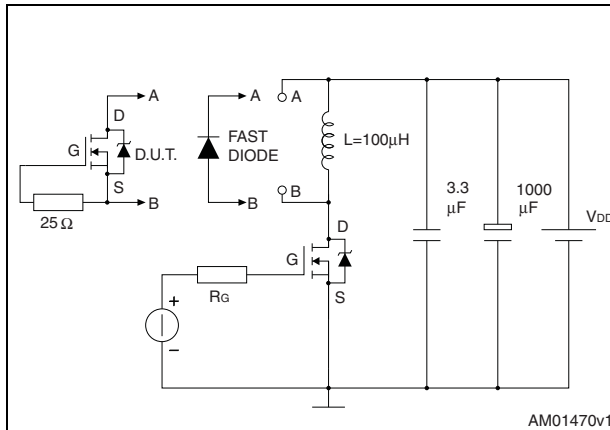
AM01468v1

Figure 15. Gate charge test circuit



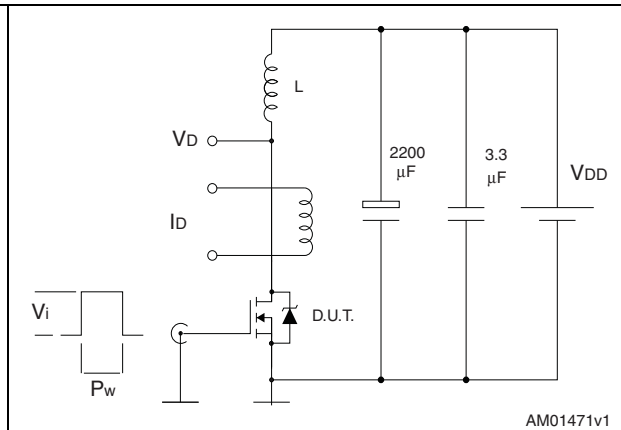
AM01469v1

Figure 16. Test circuit for inductive load switching and diode recovery times



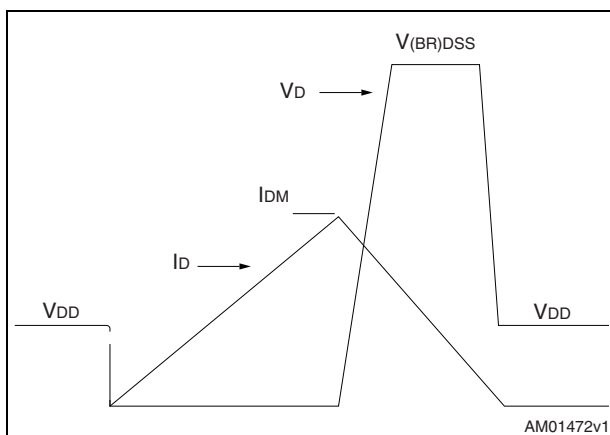
AM01470v1

Figure 17. Unclamped Inductive load test circuit



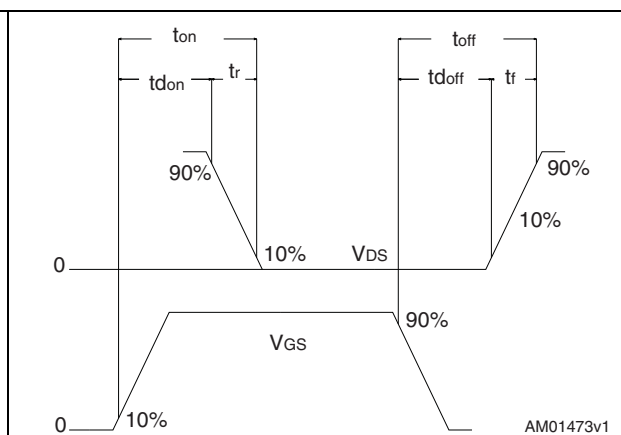
AM01471v1

Figure 18. Unclamped inductive waveform



AM01472v1

Figure 19. Switching time waveform



AM01473v1

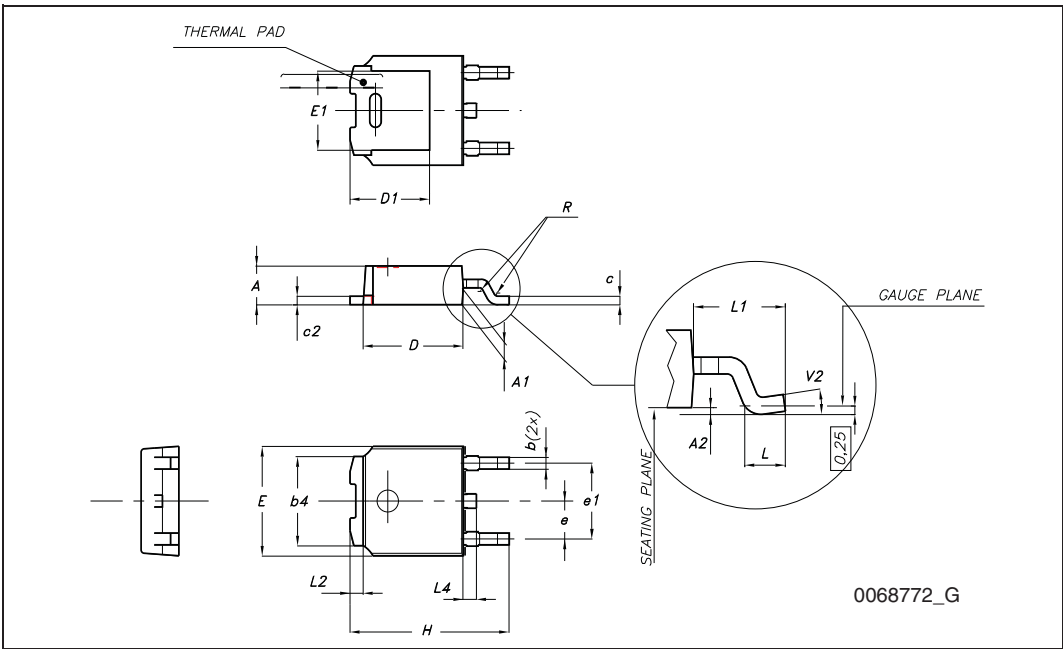


## 4 Package mechanical data

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). ECOPACK is an ST trademark.

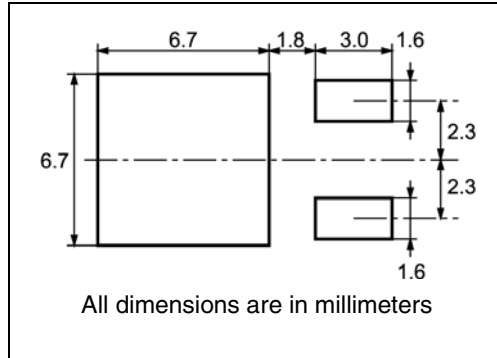
TO-252 (DPAK) mechanical data

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		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°



# 5 Packaging mechanical data

## DPAK FOOTPRINT



## TAPE AND REEL SHIPMENT

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

BASE QTY		BULK QTY	
2500		2500	

## 6 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
19-Nov-2010	1	First issue.

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2010 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)



# Mouser Electronics

Authorized Distributor

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

[STMicroelectronics:](#)

[STD40NF10](#)