

STB40NF10

N-channel 100V - 0.025Ω - 50A - D²PAK Low gate charge STripFET™ II Power MOSFET

General features

Туре	V _{DSS}	R _{DS(on)}	I _D
STB40NF10	100V	<0.028Ω	50A

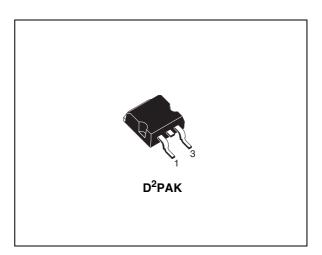
- Exceptional dv/dt capability
- Low gate charge at 100°C
- 100% avalanche tested
- Application oriented characterization

Description

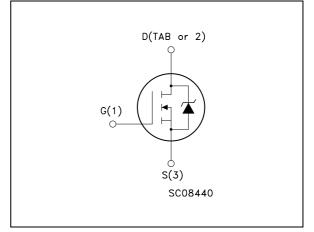
This Power MOSFET is the latest development of STMicroelectronis unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Applications

Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STB40NF10T4	B40NF10	D ² PAK	Tape & reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	6
3	Test circuit	8
4	Package mechanical data	9
5	Packing mechanical data1	1
6	Revision history1	2



1

Electrical ratings

Symbol	Parameter Value		Unit	
V _{DS}	Drain-source voltage ($V_{GS} = 0$)	100	V	
V _{DGR}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	100 V		
V _{GS}	Gate- source voltage	± 20	V	
Ι _D ⁽¹⁾	Drain current (continuous) at $T_C = 25^{\circ}C$	50	А	
۱ _D	Drain current (continuous) at T _C = 100°C	35	А	
I _{DM} ⁽²⁾	Drain current (pulsed)	200	А	
P _{tot}	Total dissipation at $T_C = 25^{\circ}C$	150	W	
	Derating Factor	1	W/°C	
dv/dt ⁽³⁾	Peak diode recovery avalanche energy	20	V/ns	
E _{AS} ⁽⁴⁾	Single pulse avalanche energy	150	mJ	
T _{stg}	Storage temperature	50 to 175		
Тj	Max. operating junction temperature	50 to 175	°C	

1. Pulse width limited by safe operating area

2. Pulse width limited by safe operating area.

3. I_{SD} \pm 0A, di/dt \pm 00A/µs, V_{DD} =V(_{BR)DSS}, T_j \leq T_{JMAX}

4. Starting $T_j = 25 \text{ °C}$, $I_D = 50A$, $V_{DD} = 25V$

Rthj-case	Thermal resistance junction-case max	1	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62.5	°C/W
Т _Ј	Maximum lead temperature for soldering purpose	300	°C

2 Electrical characteristics

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

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 250μΑ, V _{GS} =0	100			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V_{DS} = Max rating V_{DS} = Max rating, T_{C} = 125°C			1 10	μΑ μΑ
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	$V_{GS} = \pm 20V$			±100	nA
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	2	2.8	4	V
R _{DS(on)}	Static drain-source on resistance	$V_{GS} = 10V, I_D = 25A$		0.024	0.028	Ω

Table 3. On/off states

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
9 _{fs} ⁽¹⁾	Forward transconductance	$V_{DS} = 25V_{,} I_{D} = 25A$		20		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25V, f = 1MHz, V _{GS} = 0		1780 265 112		pF pF pF
t _{d(on)} t _r t _{d(off)} t _f	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD} = 50V, I_D = 25A$ $R_G = 4.7\Omega V_{GS} = 10V$ (see <i>Figure 13</i>)		28 63 84 28		ns ns ns ns
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 80V, I_D = 50A,$ $V_{GS} = 10V, R_G = 4.7\Omega$ (see <i>Figure 14</i>)		60.6 9.6 22.8	80	nC nC nC

1. Pulsed: Pulse duration = 300 μ s, duty cycle 1.5 %.



Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD} I _{SDM} ⁽¹⁾	Source-drain current Source-drain current (pulsed)				50 200	A A
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} = 50A, V _{GS} = 0			1.3	V
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 50A, di/dt = 100A/\mu s,$ $V_{DD} = 25V, T_j = 150^{\circ}C$ (see <i>Figure 15</i>)		114 456 8		ns nC A

Table 5.Source drain diode

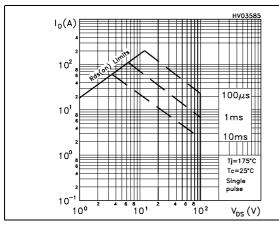
1. Pulse width limited by safe operating area.

2. Pulsed: Pulse duration = 300 μ s, duty cycle 1.5 %

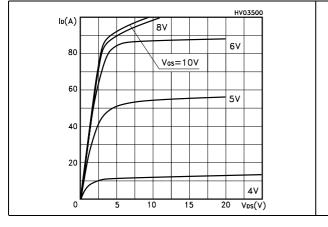


2.1 Electrical characteristics (curves)

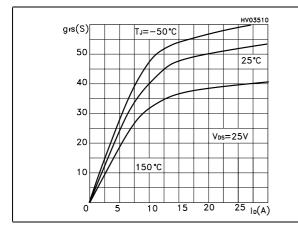
Figure 1. Safe operating area













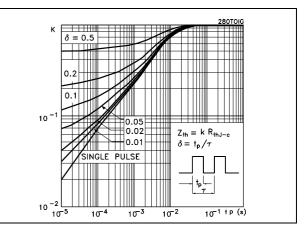


Figure 4. Transfer characteristics

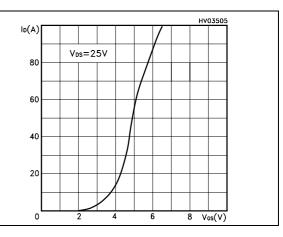
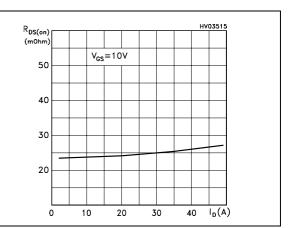


Figure 6. Static drain-source on resistance

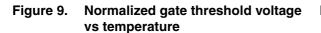


57

Figure 7.

HV03520 V_{GS}(∀) C(pF) f=1MHz Vcs=0V 3000 Vds=80V Id=40A 12 2000 6 1000 30 ó 30 50 Qg(nC) 0 10 20 20 40 10

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



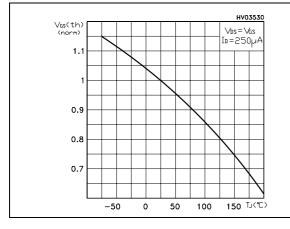


Figure 11. Source-drain diode forward characteristics

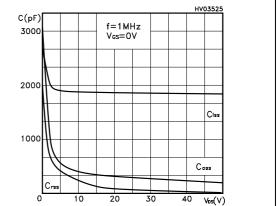


Figure 10. Normalized on resistance vs temperature

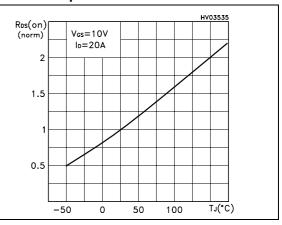
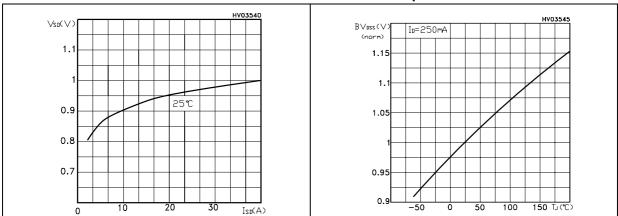


Figure 12. Normalized breakdown voltage vs temperature



3 Test circuit

Figure 13. Switching times test circuit for resistive load

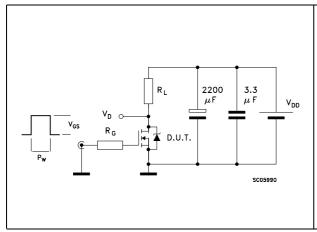
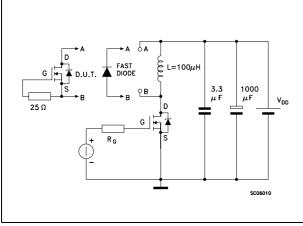


Figure 15. Test circuit for inductive load switching and diode recovery times





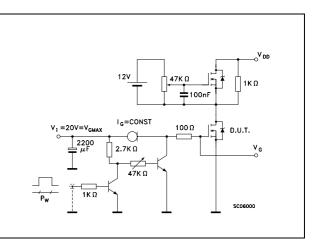


Figure 14. Gate charge test circuit

Figure 16. Unclamped Inductive load test circuit

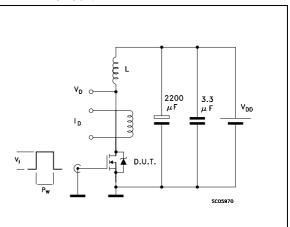
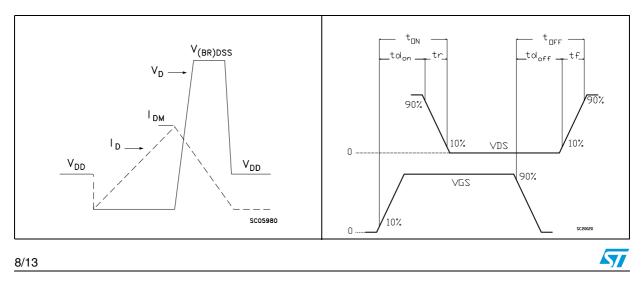


Figure 18. Switching time waveform



4 Package mechanical data

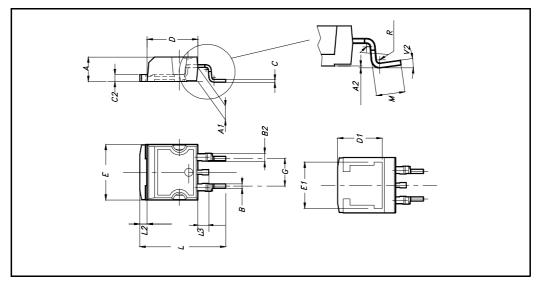
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com



57

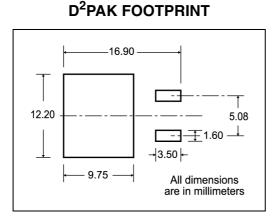
D ² PAK MECHANICAL DATA	
------------------------------------	--

DIM.	mm.			inch		
	MIN.	ТҮР	MAX.	MIN.	TYP.	MAX.
А	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
В	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
С	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
Е	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
М	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0º		4º			

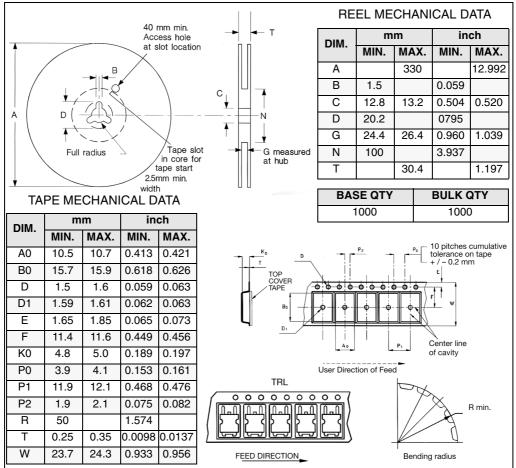


5

Packing mechanical data



TAPE AND REEL SHIPMENT



* on sales type



6 Revision history

Table 6.	Revision history
----------	-------------------------

Date	Revision	Changes
21-Jun-2004	10	Preliminary version
15-Dec-2004	11	Complete version
26-Jun-2006	12	New template, no content change



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 AUTHORIZE REPRESENTATIVE OF ST, ST PRODUCTS ARE NOT DESIGNED, 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.

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.

© 2006 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 - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

