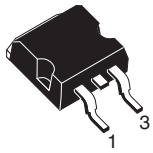
STB70NFS03L

N-channel - 30V - 0.0075Ω - 70A D²PAK
STripFET™ Power MOSFET plus schottky rectifier

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STB70NFS03L	30V	<0.0095Ω	70A
Schottky	$I_{F(AV)}$	V_{RRM}	$V_{F(MAX)}$
	3A	30V	0.51V



D²PAK

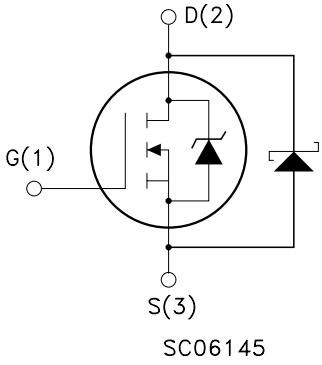
Description

This product associates a Power MOSFET of the third genaration of STMicroelectronics unique "Single Feature Size" strip-based process and a low drop schottky diode. The transistor shows the best trade-off between on-resistance and gate charge. Used as low side in buck regulators, the product is the solution in terms of conduction losses and space saving.

Applications

- Switching application

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STB70NFS03L	B70NFS03L	D²PAK	Tape & reel

Contents

1 Electrical ratings

Table 1. Mosfet absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	30	V
V_{GS}	Gate- source voltage	± 18	V
I_D	Drain current (continuous) at T_C = 25°C	70	A
I_D	Drain current (continuous) at T_C = 100°C	50	A
I_{DM} (1)	Drain current (pulsed)	280	A
P_{TOT}	Total dissipation at T_C = 25°C	100	W
	Derating factor	0.67	W/°C
dv/dt (2)	Peak diode recovery voltage slope	5.5	V/ns
E_{AS} (3)	Single pulse avalanche energy	500	mJ
T_{stg}	Storage temperature	-55 to 175	°C
T_J	Operating junction temperature		

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 70A$, di/dt ≤ 350A/µs, V_{DD} = 80% $V_{(BR)DSS}$
3. Starting Tj = 25°C, V_{DD} = 25V

Table 2. Schottky absolute maximum ratings

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		30	V
$I_{F(RMS)}$	RMS forward current		20	A
$I_{F(AV)}$	Average forward current	T_L=125°C δ=0.5	3	A
I_{FSM}	Surge non repetitive forward current	tp=10ms Sinusoidal	75	A
dv/dt	Critical rate of rise of reverse voltage		10000	v/µs

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-amb	Thermal resistance junction-amb max	1.5	°C/W
Rthj-case	Thermal resistance junction-case max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

2 Electrical characteristics

(Tcase =25°C unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 250µA, V_{GS} = 0	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0) Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating V_{DS} = Max rating, T_C=125°C			200 20	µA mA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 18V			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250µA	1			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10V, I_D = 35A V_{GS} = 5V, I_D = 18A		0.0075 0.0135	0.0095 0.018	Ω Ω

Table 5. Shottcky static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_R	Reverse leakage current	T_j = 25°C V_R = 30V T_j = 100°C V_R = 30V		 0.03	0.2 100	mA mA
V_F	Zero gate voltage drain current (V_{GS} = 0)	T_j = 25°C I_F = 3A T_j = 125°C I_F = 3A		 0.425	0.51 0.46	V V

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	V_{DS} = 25V, I_D = 35A		25		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0		1440 560 135		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 15V, I_D = 70A, V_{GS} = 5V (see *Figure 11*)		22.5 9 12	30	nC nC nC

Table 7. Switching times

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 15V, I_D = 35A, R_G = 4.7Ω, V_{GS} = 5V (see *Figure 10*)		22 165		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD} = 15V, I_D = 35A, R_G = 4.7Ω, V_{GS} = 5V (see *Figure 10*)		21 25		ns ns

Table 8. Source drain diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)				70 280	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 70A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 70A, di/dt = 100A/µs V_{DD} = 20V, T_j = 150°C (see *Figure 15*)		42 52 2.5		ns nC A

1. Pulse width limited by safe operating area
2. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

2.1 Electrical characteristics (curves)

Figure 1. Output characterisics

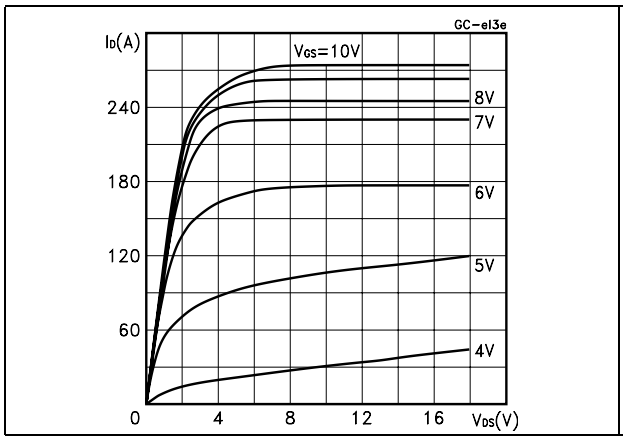


Figure 2. Transfer characteristics

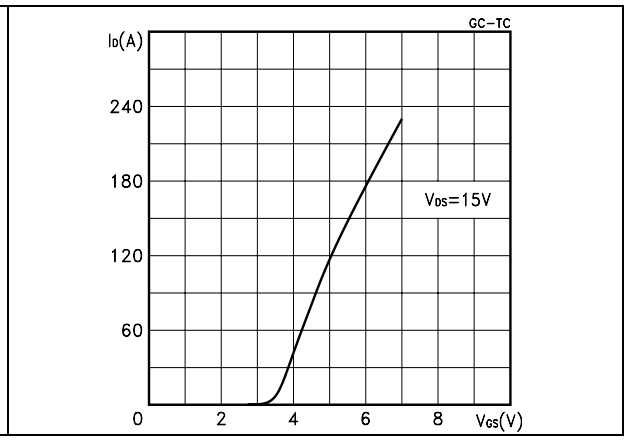


Figure 3. Source-drain diode forward characteristics

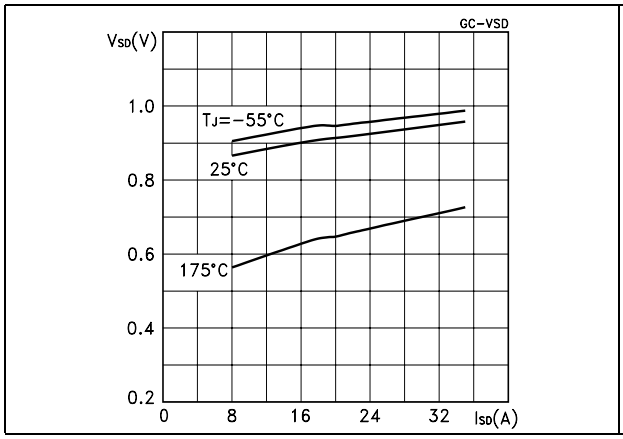


Figure 4. Static drain-source on resistance

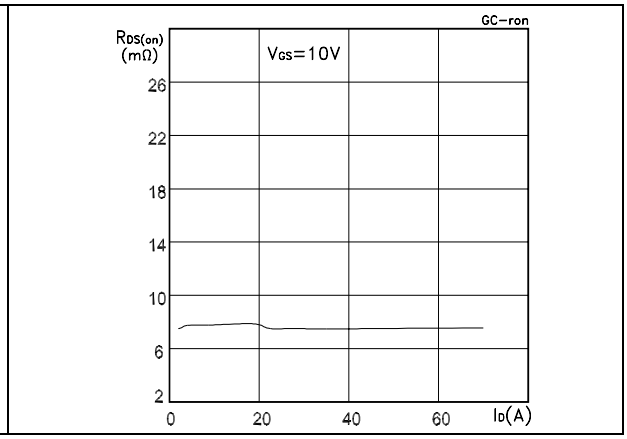


Figure 5. Gate charge vs gate-source voltage

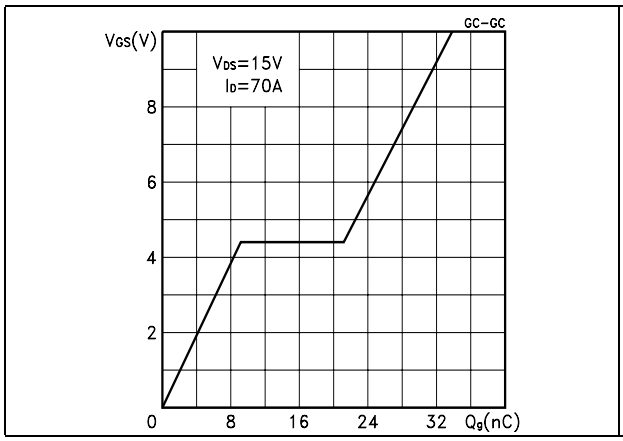


Figure 6. Capacitance variations

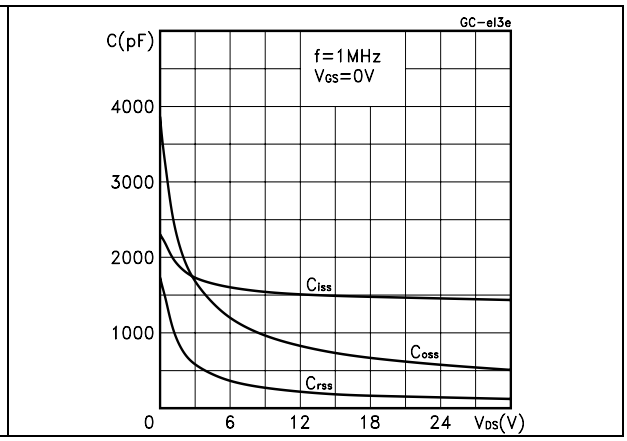


Figure 7. Normalized gate threshold voltage vs temperature

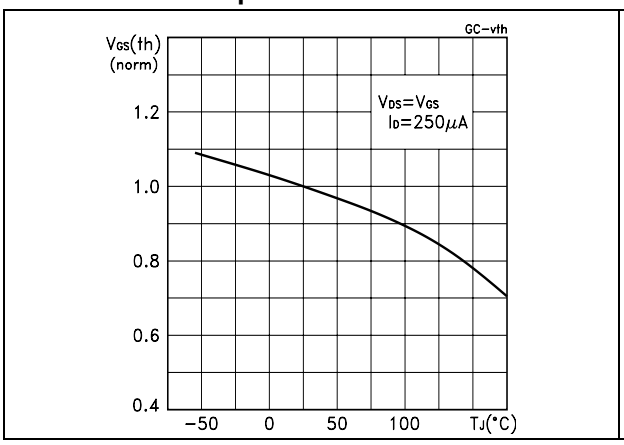


Figure 8. Normalized on resistance vs temperature

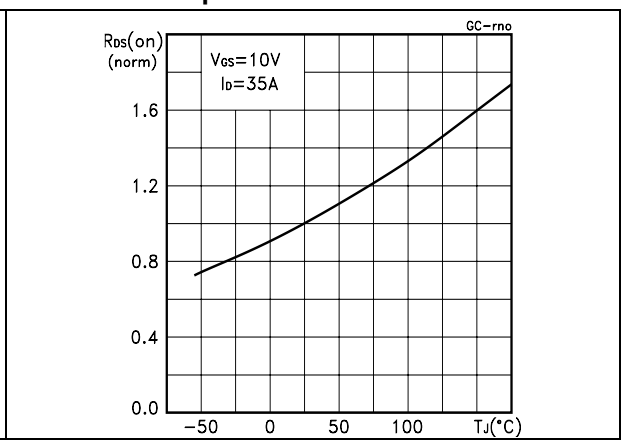
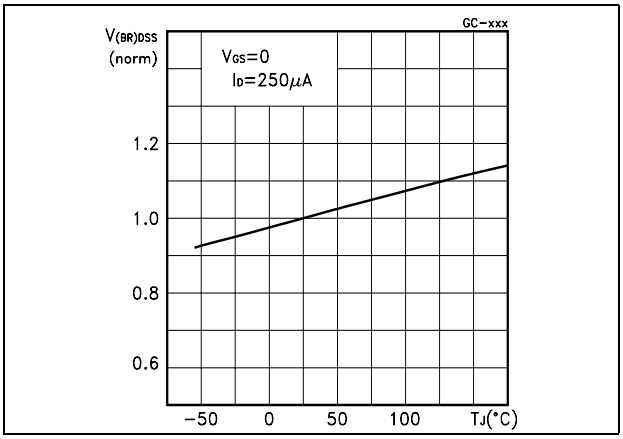


Figure 9. Normalized BV_{DSS} voltage vs temperature



3 Test circuits

Figure 10. Switching times test circuit for resistive load

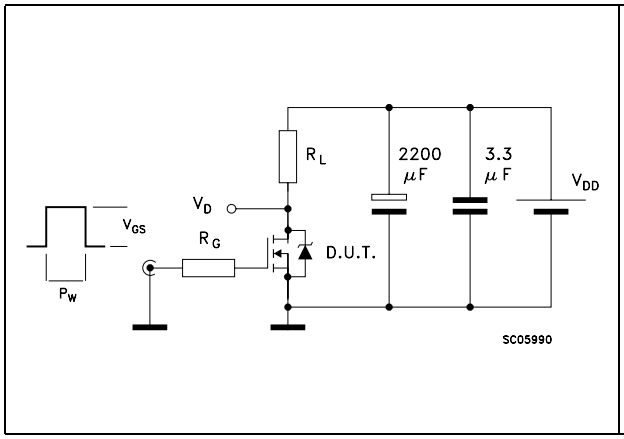


Figure 11. Gate charge test circuit

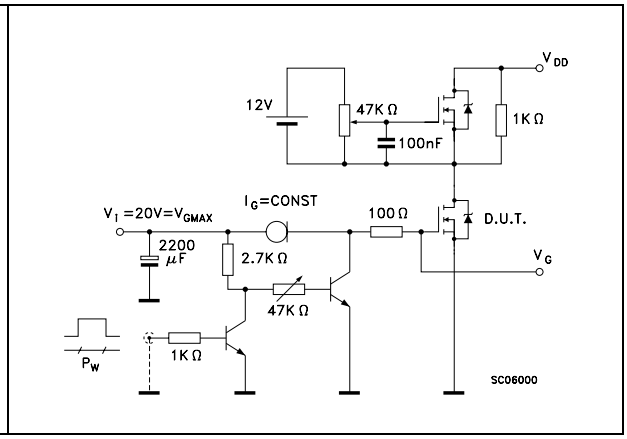


Figure 12. Test circuit for inductive load switching and diode recovery times

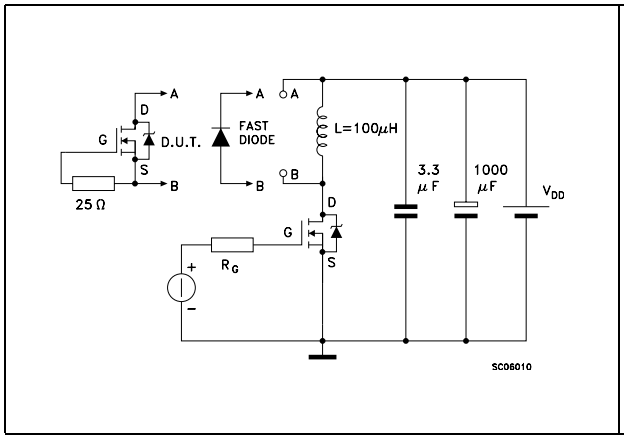


Figure 13. Unclamped inductive load test circuit

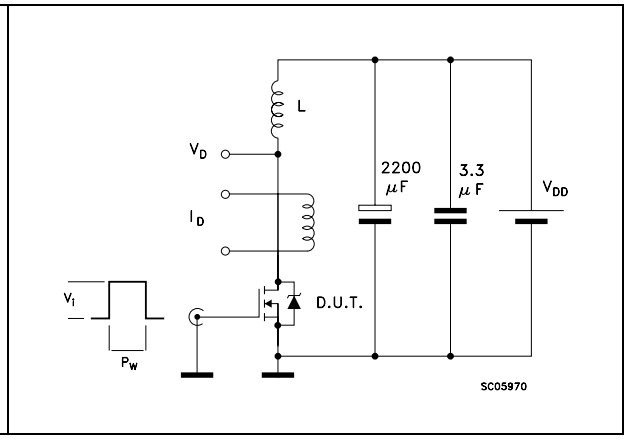


Figure 14. Unclamped inductive waveform

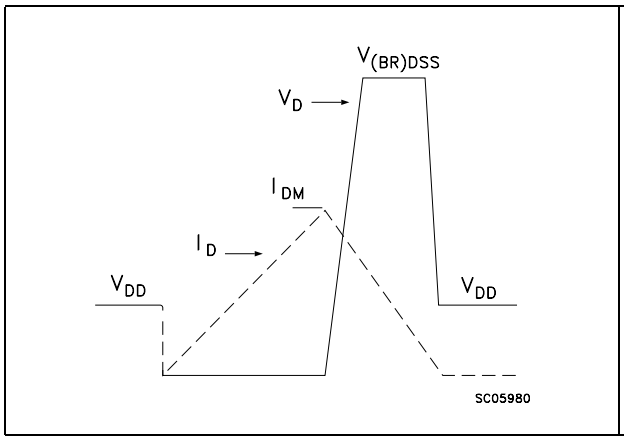
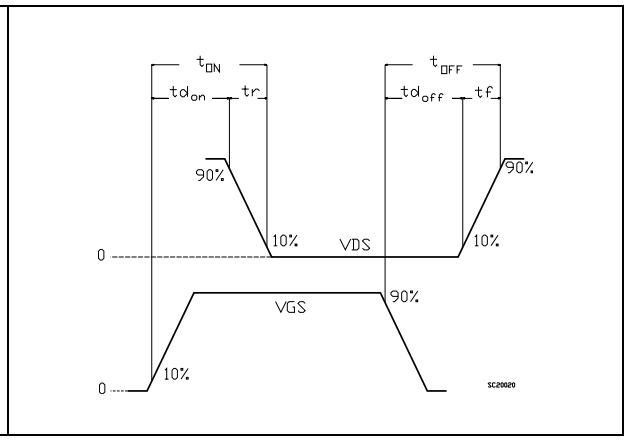


Figure 15. Switching time waveform

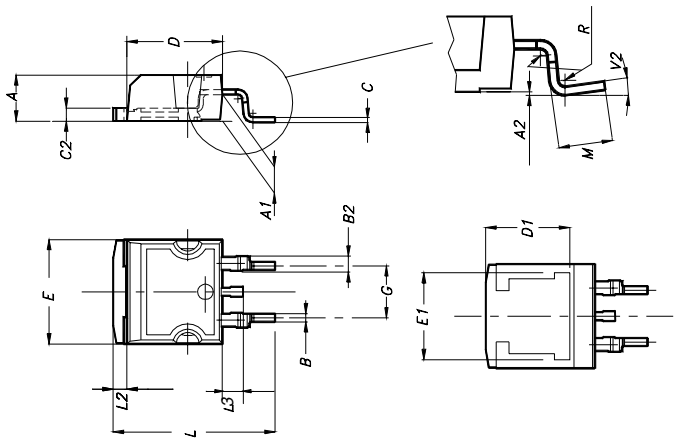


4 Package mechanical data

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*

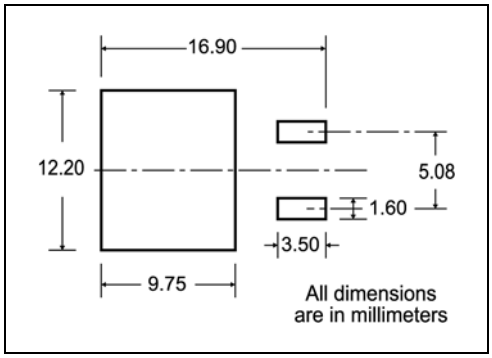
D^2PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	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
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	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	
E	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
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0º		4º			

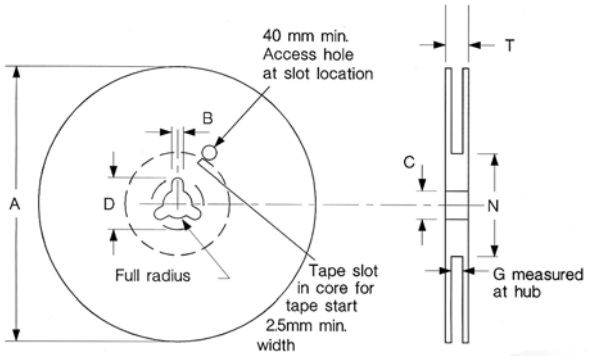


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



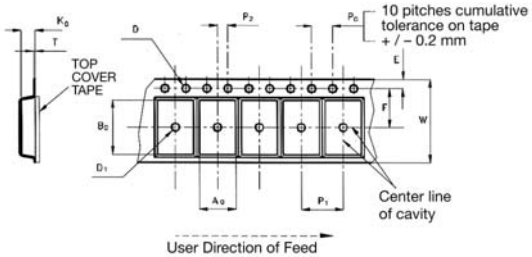
REEL MECHANICAL DATA

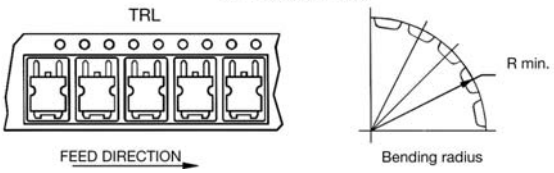
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956





* on sales type

6 Revision history

Table 9. Revision history

Date	Revision	Changes
09-Sep-2004	8	New datasheet according to PCN DSG/CT/2C13 marking: STB70NFS03I@
05-Jul-2006	9	New template, new value on *Table 4.: On /off states*

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.

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