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STB70NFS03L

N-channel - 30V - 0.0075Ω - 70A D²PAK
STriP[™]FET Power MOSFET plus schottky rectifier

General features

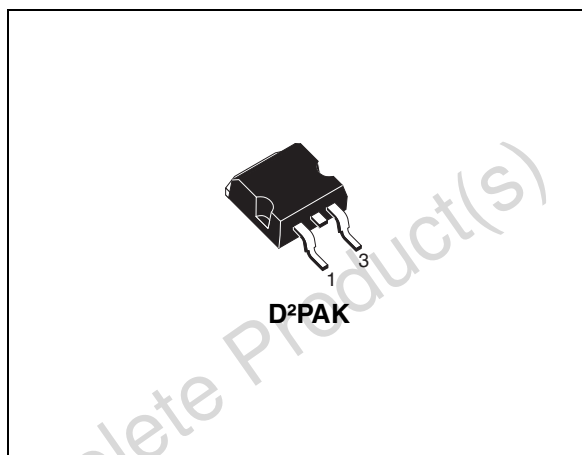
Type	V _{DSS}	R _{DS(on)}	I _D
STB70NFS03L	30V	<0.0095Ω	70A
Schottky	I _{F(AV)}	V _{RRM}	V _{F(MAX)}
	3A	30V	0.51V

Description

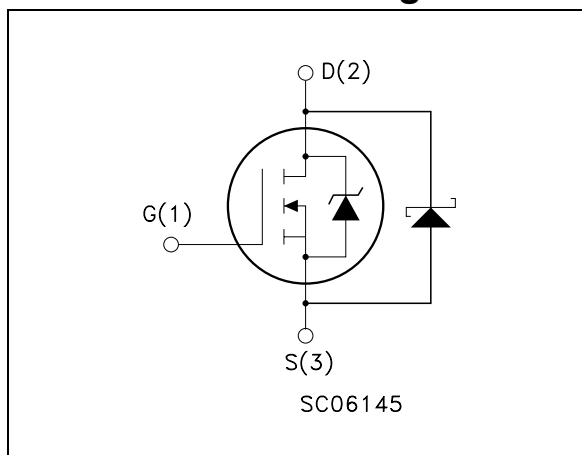
This product associates a Power MOSFET of the third generation of STMicroelectronics unique “Single Feature Size” strip-based process and a low drop schottky diode. The transistor shows the best trade-off between on-resistance and gate charge. Used as low side in buck regulators, the product is the solution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

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STB70NFS03L	B70NFS03L	D ² PAK	Tape & reel

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Obsolete Product(s) - Obsolete Product(s)

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 $T_C = 25^\circ\text{C}$	70	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	50	A
$I_{DM}^{(1)}$	Drain current (pulsed)	280	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	100	W
	Derating factor	0.67	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	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	$^\circ\text{C}$
T_J	Operating junction temperature		

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 70\text{A}$, $di/dt \leq 350\text{A}/\mu\text{s}$, $V_{DD} = 80\% V_{(BR)DSS}$
3. Starting $T_j = 25^\circ\text{C}$, $V_{DD} = 25\text{V}$

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	$T_L=125^\circ\text{C}$ $\delta=0.5$	3	A
I_{FSM}	Surge non repetitive forward current	$t_p=10\text{ms}$ Sinusoidal	75	A
dv/dt	Critical rate of rise of reverse voltage		10000	v/ μs

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-amb}$	Thermal resistance junction-amb max	1.5	$^\circ\text{C}/\text{W}$
$R_{thj-case}$	Thermal resistance junction-case max	62.5	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

2 Electrical characteristics

(T_{case} = 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)	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}	Input capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0		1440		pF
C _{oss}	Output capacitance			560		pF
C _{rss}	Reverse transfer capacitance			135		pF
Q _g	Total gate charge	V _{DD} = 15V, I _D = 70A,		22.5	30	nC
Q _{gs}	Gate-source charge	V _{GS} = 5V		9		nC
Q _{gd}	Gate-drain charge	(see Figure 11)		12		nC

Table 7. Switching times

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

Table 8. Source drain diode

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

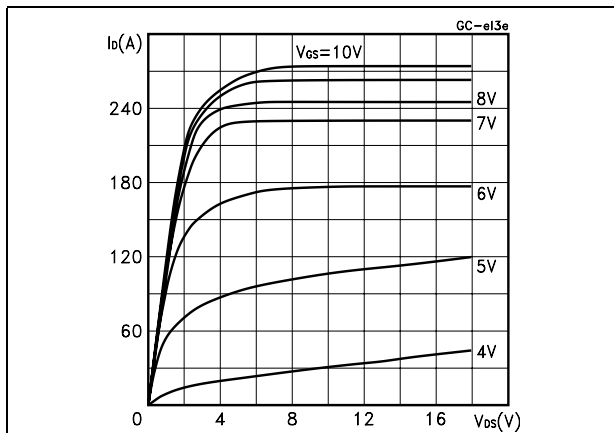


Figure 2. Transfer characteristics

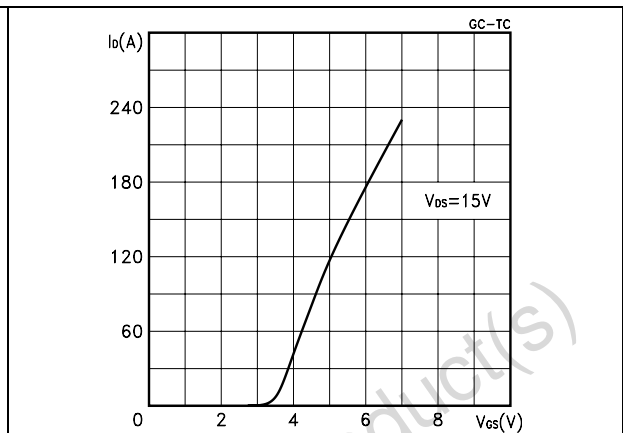


Figure 3. Source-drain diode forward characteristics

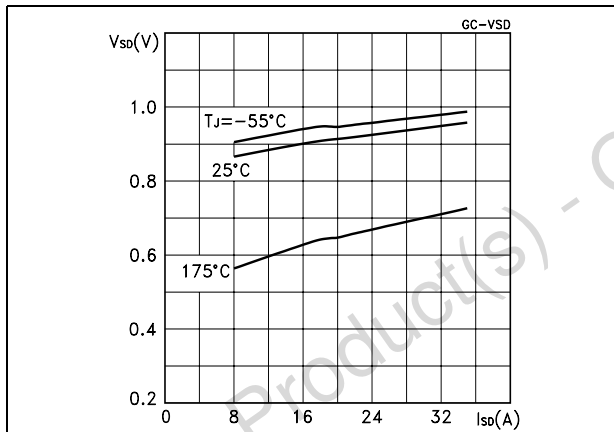


Figure 4. Static drain-source on resistance

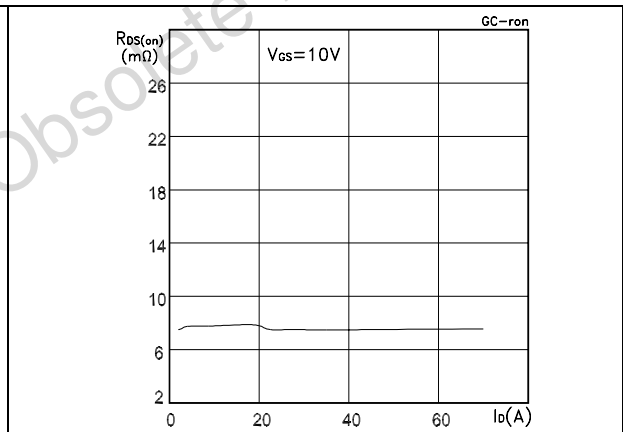


Figure 5. Gate charge vs gate-source voltage

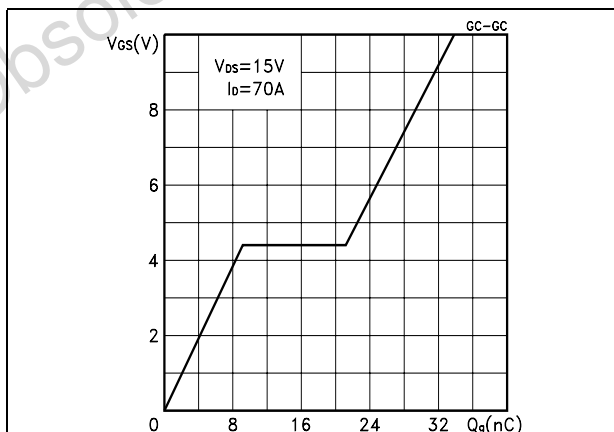


Figure 6. Capacitance variations

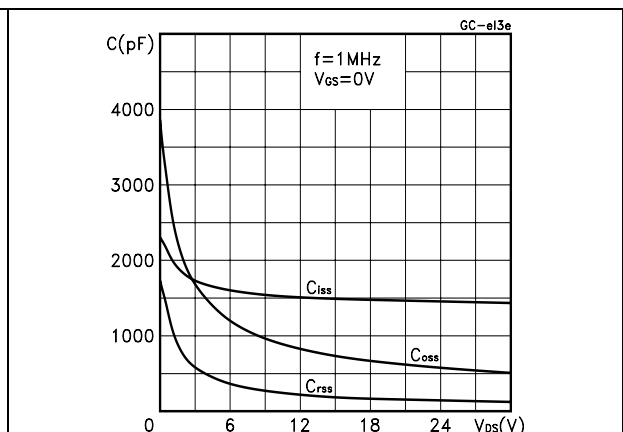


Figure 7. Normalized gate threshold voltage vs temperature

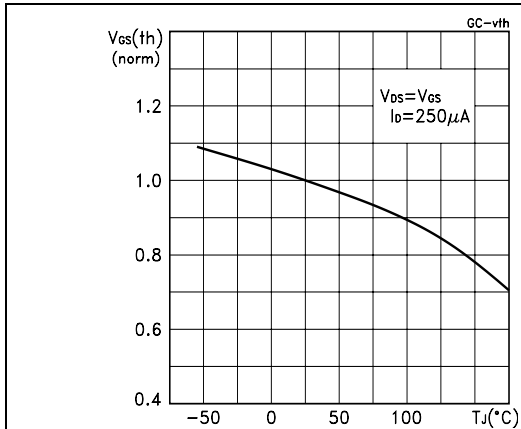


Figure 8. Normalized on resistance vs temperature

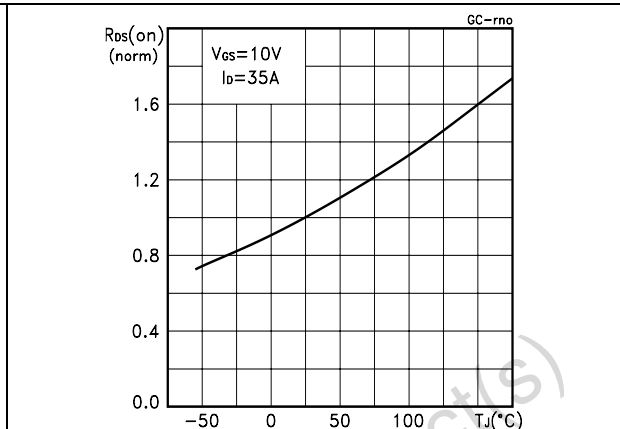
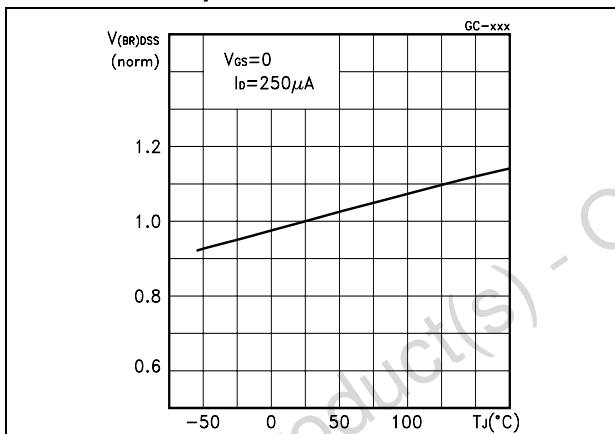


Figure 9. Normalized BV_{DSS} voltage vs temperature



3 Test circuits

Figure 10. Switching times test circuit for resistive load

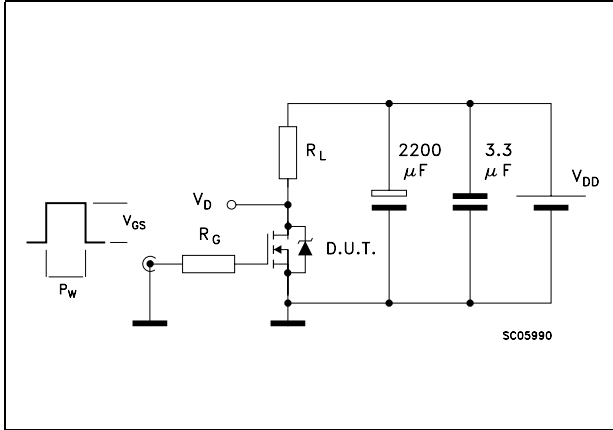


Figure 11. Gate charge test circuit

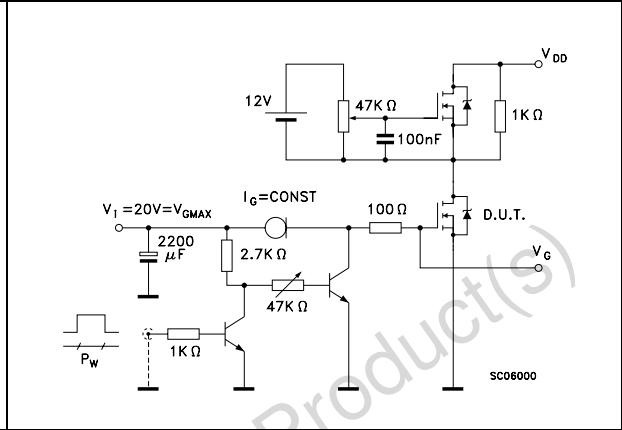


Figure 12. Test circuit for inductive load switching and diode recovery times

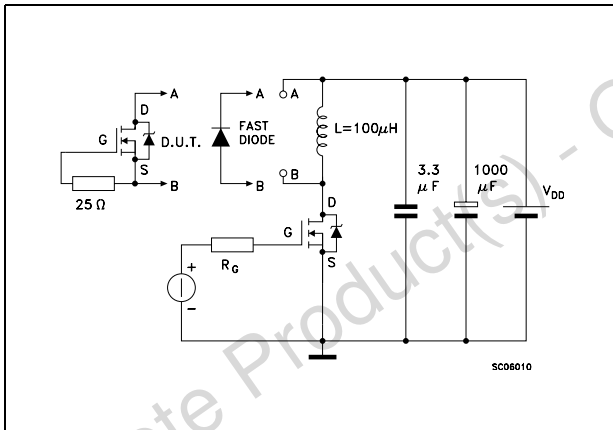


Figure 13. Unclamped inductive load test circuit

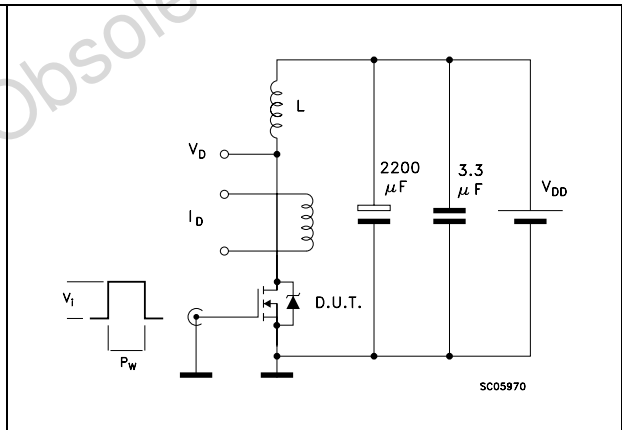


Figure 14. Unclamped inductive waveform

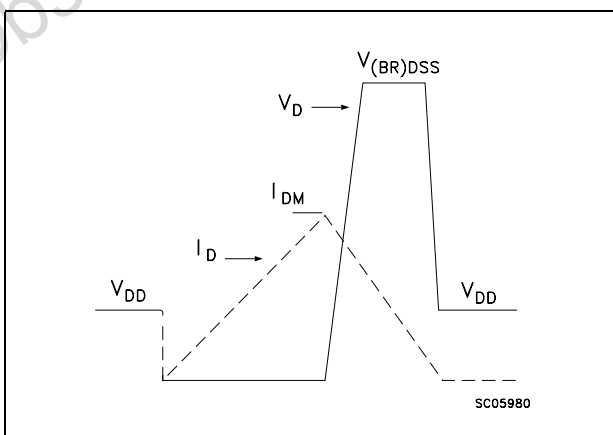
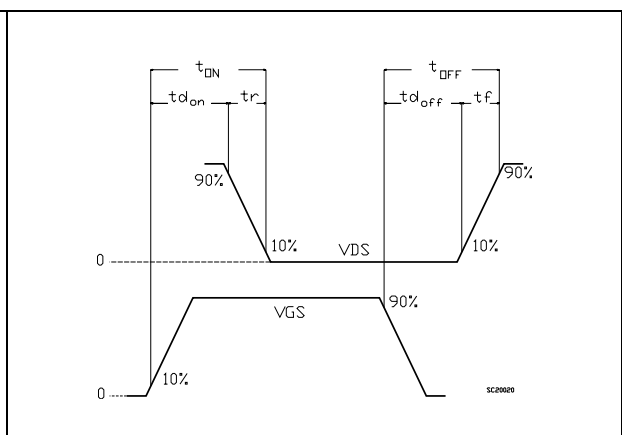


Figure 15. Switching time waveform



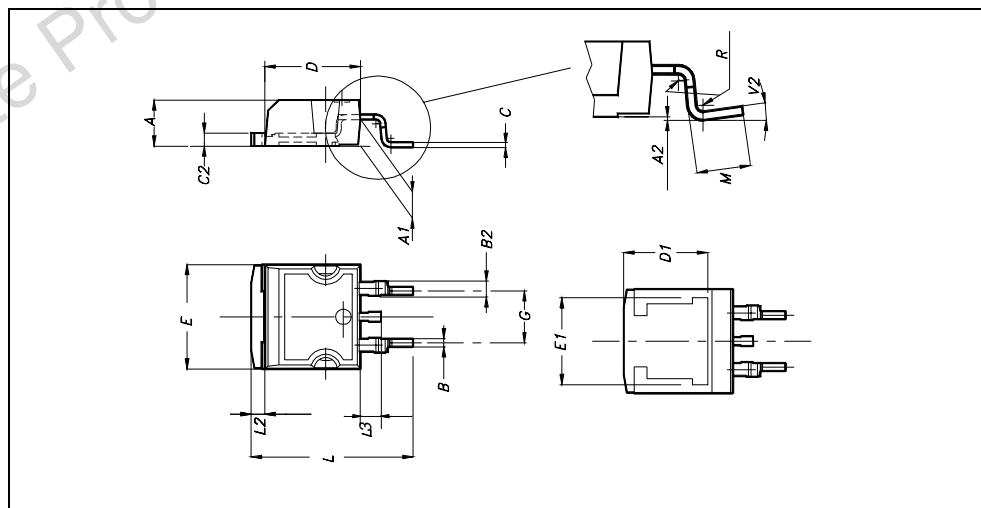
4 Package mechanical data

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

Obsolete Product(s) - Obsolete Product(s)

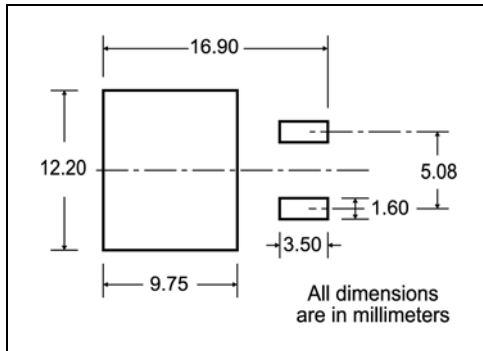
D²PAK MECHANICAL DATA

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	0°		4°			



5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

TR

C

N

D

B

A

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		0.795	
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

10 pitches cumulative tolerance on tape +/- 0.2 mm

TOP COVER TAPE

Center line of cavity

User Direction of Feed

TRL

FEED DIRECTION

Bending radius R min.

* 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: STB70NFS03L@
05-Jul-2006	9	New template, new value on Table 4.: <i>On /off states</i>

Obsolete Product(s) - Obsolete Product(s)

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