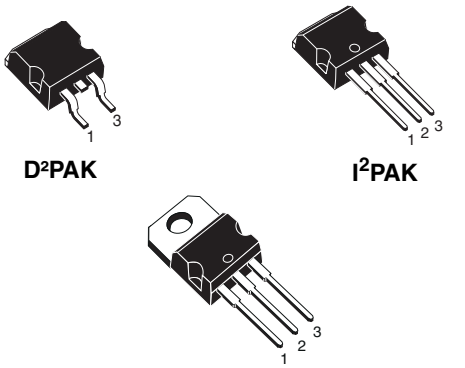
STB70NF03L
STP70NF03L - STB70NF03L-1

N-channel 30V - 0.0075Ω - 70A - D²PAK - I²PAK - TO-220
Low gate charge STripFET™ II Power MOSFET

General features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STB70NF03L	30V	< 0.0095Ω	70A
STP70NF03L	30V	< 0.0095Ω	70A
STB70NF03L-1	30V	< 0.0095Ω	70A

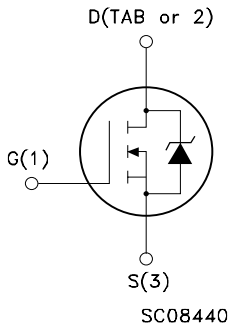
- Conduction losses reduced
- Switching losses reduced



Description

This application specific Power MOSFET is the third genaration of STMicroelectronis unique "Single Feature Size™" strip-based process. The resulting transistor shows the best trade-off between on-resistance and gate charge. When used as high and low side in buck regulators, it gives the best performance in terms of both conduction and switching losses. This is extremely important for motherboards where fast switching and high efficiency are of paramount importance.

Internal schematic diagram



Applications

- Switching application

Order codes

Part number	Marking	Package	Packaging
STB70NF03L	B70NF03L	D²PAK	Tape & reel
STP70NF03L	P70NF03L	TO-220	Tube
STB70NF03L-1	B70NF03L	I²PAK	Tube

Contents

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	30	V
V_{DGR}	Drain-gate voltage (R_{GS} = 20kΩ)	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. Current limited by the package
2. $I_{SD} \leq 70A$, di/dt ≤350A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$
3. Starting T_J = 25 °C, I_D = 35A, V_{DD} = 25V

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case Max	1.5	°C/W
R_{thJA}	Thermal resistance junction-ambient Max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

2 Electrical characteristics

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

Table 3. 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			1 10	µA µA
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} = 10 V I_D = 35A V_{GS} = 5 V I_D = 18A		0.0075 0.0135	0.0095 0.018	W W

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
g_{fs} (*)	Forward transconductance	V_{DS} = 15V I_D = 35A		25		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25V f = 1 MHz V_{GS} = 0		1440 560 135		pF pF pF

Table 5. 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 *Figure 16.*		22 165		ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}= 15V I_D= 70A V_{GS}= 5V		22.5 9 12	30	nC nC nC
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD} = 15V I_D = 35A R_G = 4.7Ω, V_{GS} = 5V *Figure 16.*		21 25		ns ns

Table 6. 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 *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. Safe operating area

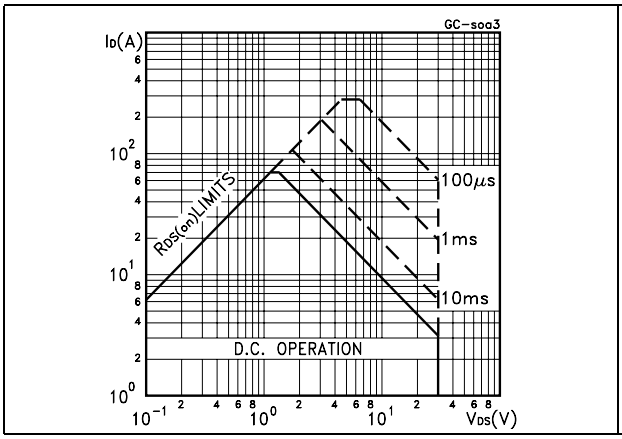


Figure 2. Thermal impedance

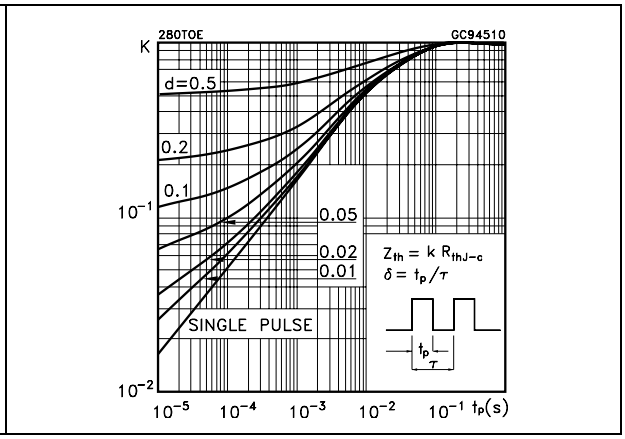


Figure 3. Output characterisics

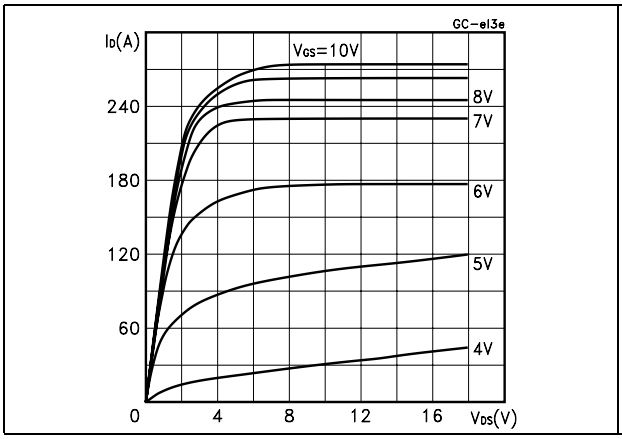


Figure 4. Transfer characteristics

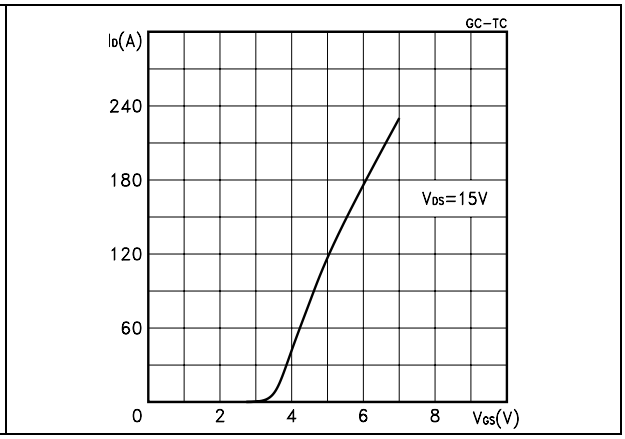


Figure 5. Transconductance

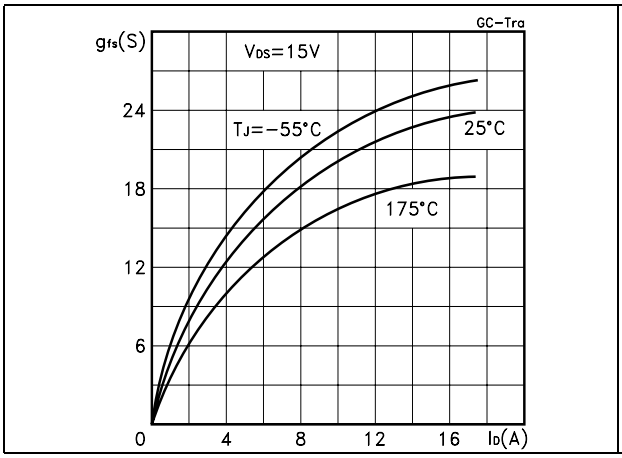


Figure 6. Static drain-source on resistance

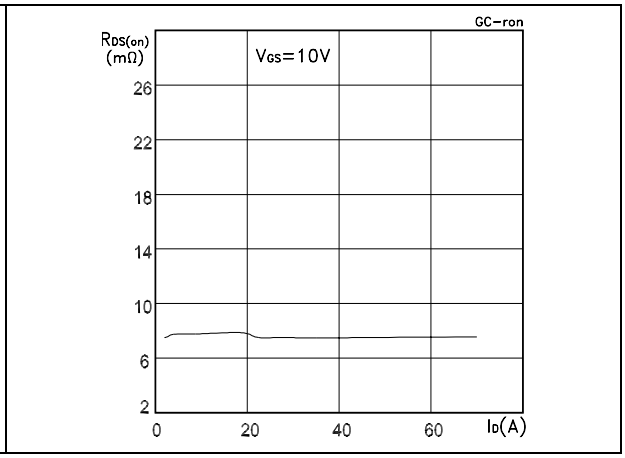


Figure 7. Gate charge vs gate-source voltage

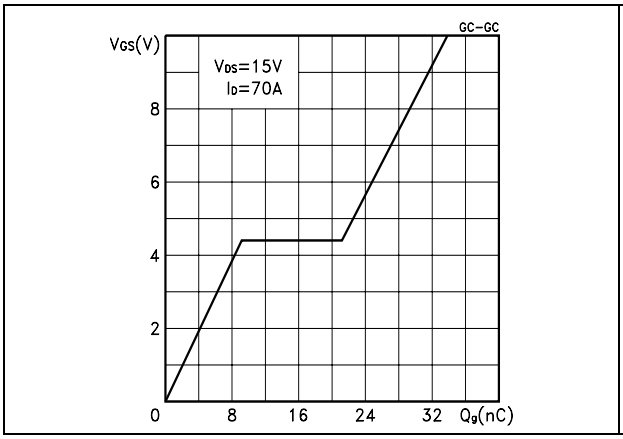


Figure 8. Capacitance variations

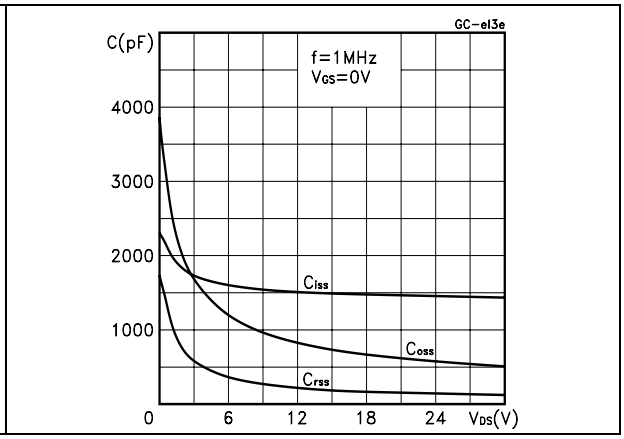


Figure 9. Normalized gate threshold voltage vs temperature

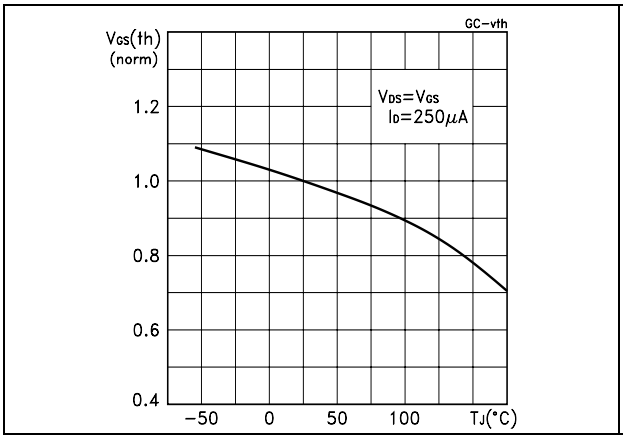


Figure 10. Normalized on resistance vs temperature

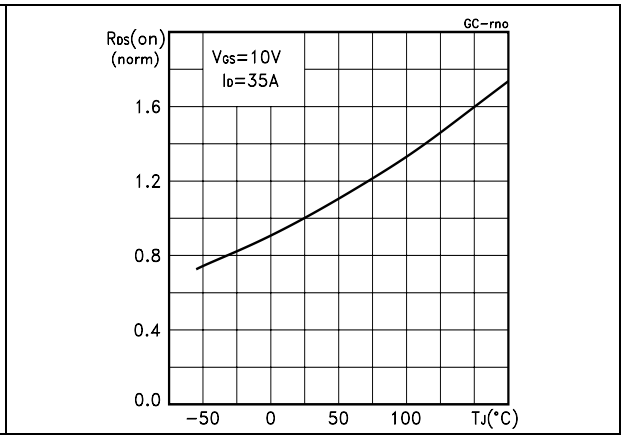


Figure 11. Source-drain diode forward characteristics

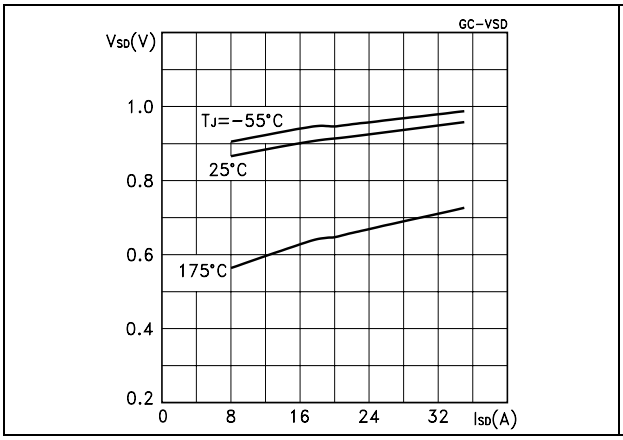
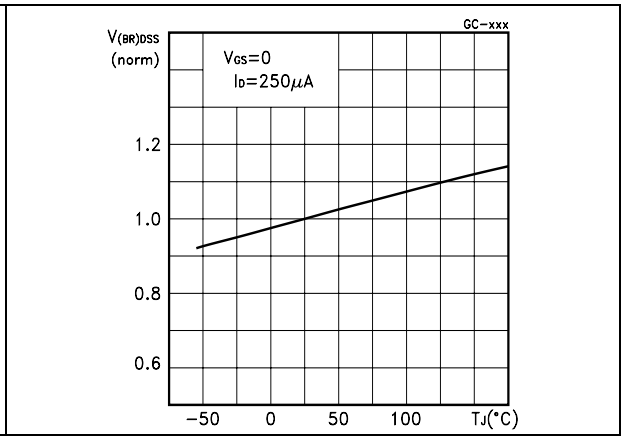


Figure 12. Normalized Breakdown vs temperature



3 Test circuit

Figure 13. Switching times test circuit for resistive load

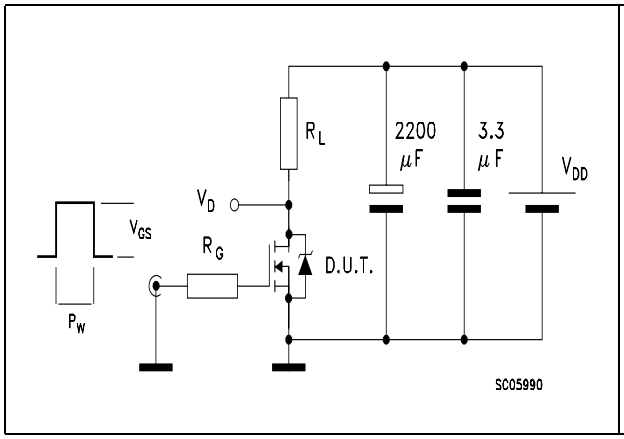


Figure 14. Gate charge test circuit

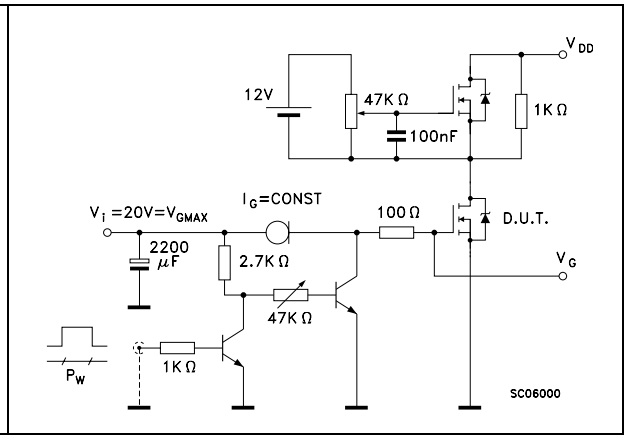


Figure 15. Test circuit for inductive load switching and diode recovery times

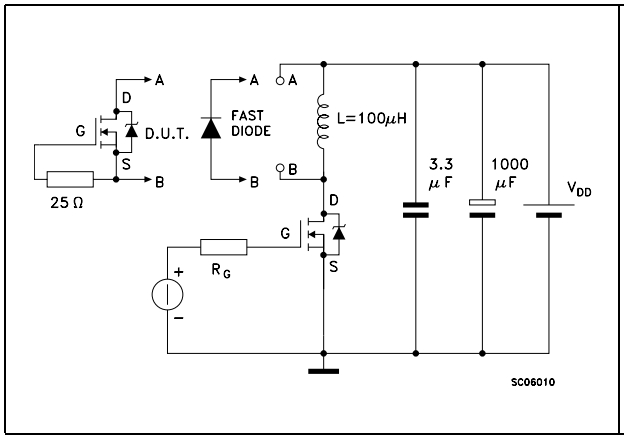


Figure 16. Unclamped Inductive load test circuit

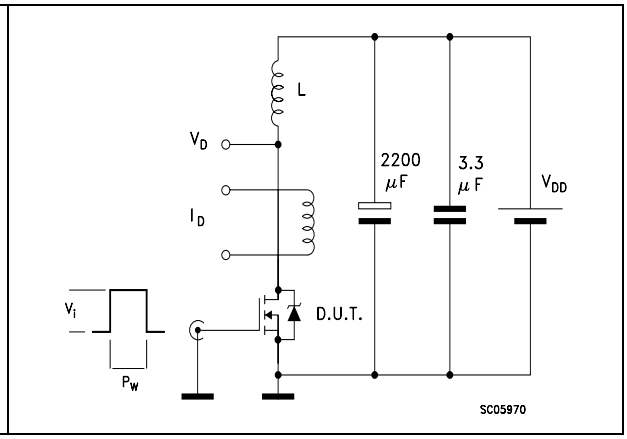
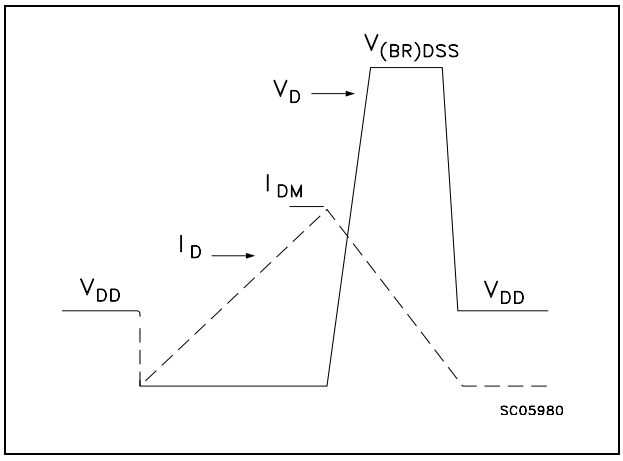


Figure 17. Unclamped inductive waveform

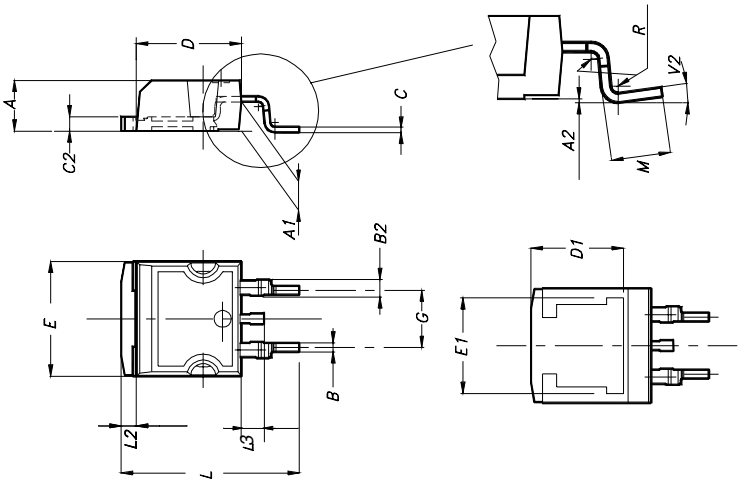


4 Package mechanical data

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

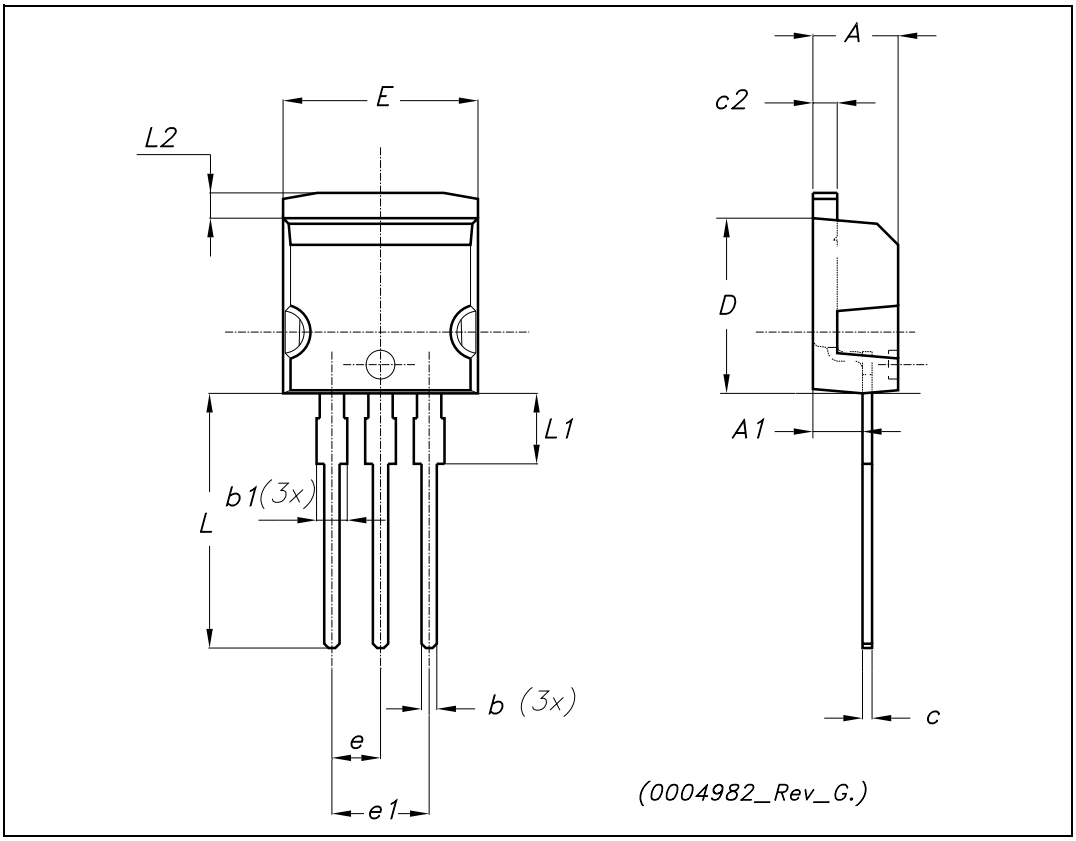
D^2PAK MECHANICAL DATA

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			



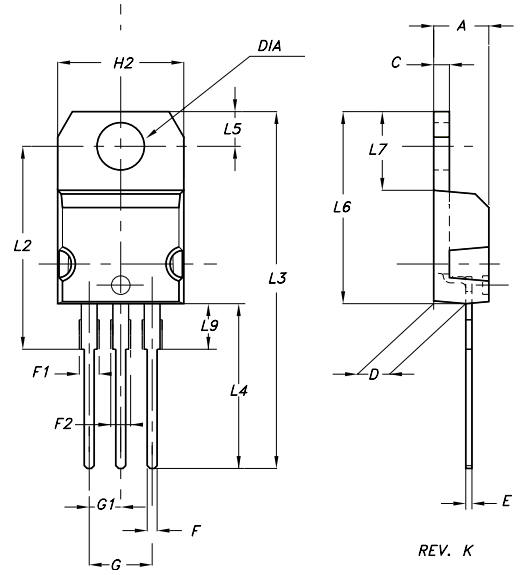
TO-262 (I^2PAK) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055



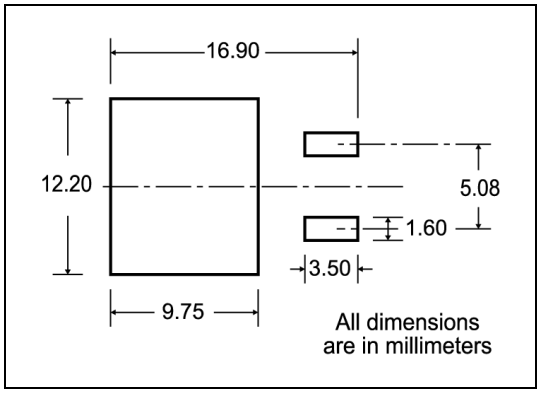
TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.066
F2	1.14		1.70	0.044		0.066
G	4.95		5.15	0.194		0.202
G1	2.40		2.70	0.094		0.106
H2	10		10.40	0.393		0.409
L2		16.40			0.645	
L3		28.90			1.137	
L4	13		14	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.259
L9	3.50		3.93	0.137		0.154
DIA	3.75		3.85	0.147		0.151

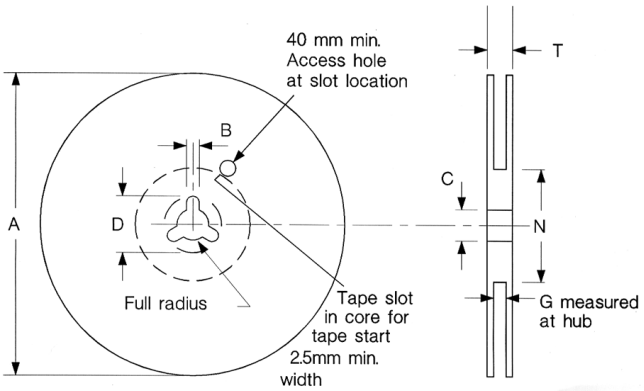


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



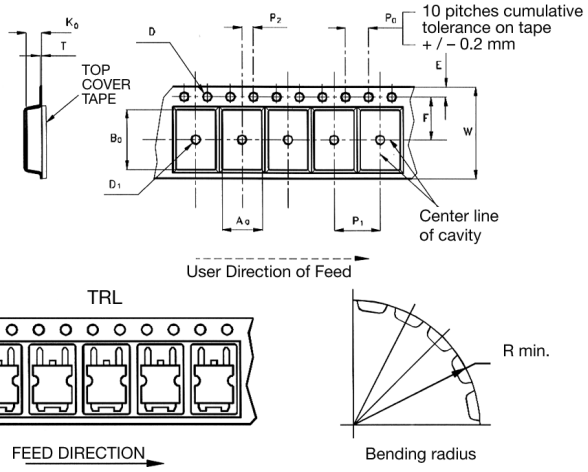
REEL MECHANICAL DATA

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 7. Revision history

Date	Revision	Changes
21-Jun-2004	9	Preliminary version
25-Jul-2006	10	New template, no content change

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