



STD20NF06L

N-CHANNEL 60V - 0.032 Ω - 24A DPAK/IPAK STripFET™ II POWER MOSFET

Table 1: General Features

TYPE	V _{DSS}	R _{DS(on)}	I _D
STD20NF06L	60 V	< 0.040 Ω	24 A
STD20NF06L-1	60 V	< 0.040 Ω	24 A

- TYPICAL R_{DS(on)} = 0.032 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION
- SURFACE-MOUNTING DPAK (TO-252)
POWER PACKAGE IN TAPE & REEL
(SUFFIX "T4")

DESCRIPTION

This 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 therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- POWER TOOLS
- AUTOMOTIVE ENVIRONMENT

Figure 1: Package

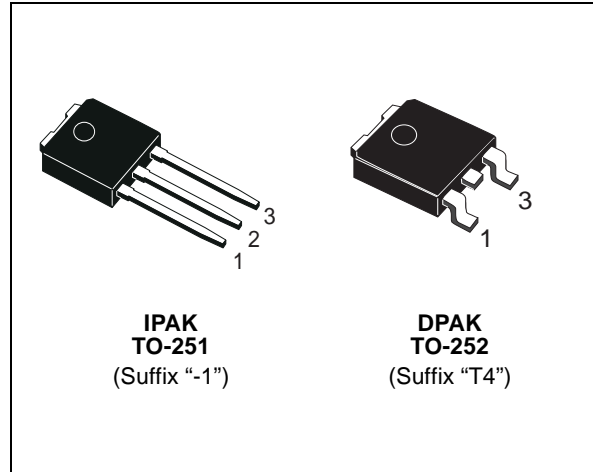


Figure 2: Internal Schematic Diagram

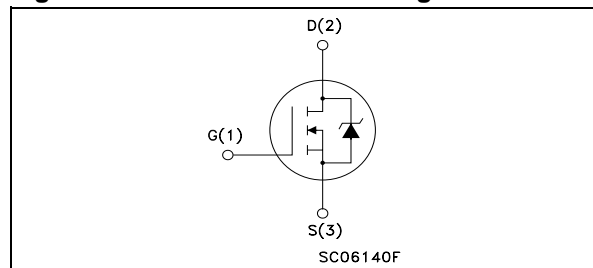


Table 2: Ordering Information

SALES TYPE	MARKING	PACKAGE	PACKAGING
STD20NF06L	D20NF06L	TO-252	TAPE & REEL
STD20NF06L-1	D20NF06L	TO-251	TUBE

Table 3: ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	60	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 k Ω)	60	V
V _{GS}	Gate- source Voltage	± 18	V
I _D	Drain Current (continuous) at T _C = 25°C	24	A
I _D	Drain Current (continuous) at T _C = 100°C	17	A
I _{DM} (•)	Drain Current (pulsed)	96	A
P _{tot}	Total Dissipation at T _C = 25°C	60	W
	Derating Factor	0.4	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	10	V/ns
E _{AS} (2)	Single Pulse Avalanche Energy	225	mJ
T _{stg}	Storage Temperature	-55 to 175	°C
T _j	Operating Junction Temperature		

(•) Pulse width limited by safe operating area.

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Table 4: THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	2.5	°C/W
Rthj-pcb	(*)Thermal Resistance Junction-PCB	Max	50	°C/W
T _l	Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10 sec)		275	°C

(*) When Mounted on 1 inch² FR-4 board, 2 oz of Cu

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED)

Table 5: OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0	60			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} = ± 18 V			±100	nA

Table 6: ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 μA	1			V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V I _D = 12 A V _{GS} = 5 V I _D = 12 A		0.032	0.040 0.050	Ω Ω

Table 7: DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} = 25 V I _D = 12 A		20		S
C _{iss}	Input Capacitance	V _{DS} = 25V f = 1 MHz V _{GS} = 0		660		pF
C _{oss}	Output Capacitance			170		pF
C _{rss}	Reverse Transfer Capacitance			70		pF

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ELECTRICAL CHARACTERISTICS (continued)

Table 8: SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 30\text{ V}$ $I_D = 10\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 17)		11 50		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 30\text{ V}$ $I_D = 20\text{ A}$ $V_{GS} = 10\text{ V}$		13 3.5 8		nC nC nC

Table 9: SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-off Delay Time Fall Time	$V_{DD} = 30\text{ V}$ $I_D = 10\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 17)		20 12		ns ns

Table 10: SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				24 96	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 20\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 20\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 19)		56 108 4		ns nC A

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

(\bullet) Pulse width limited by safe operating area.

Figure 3: Safe Operating Area

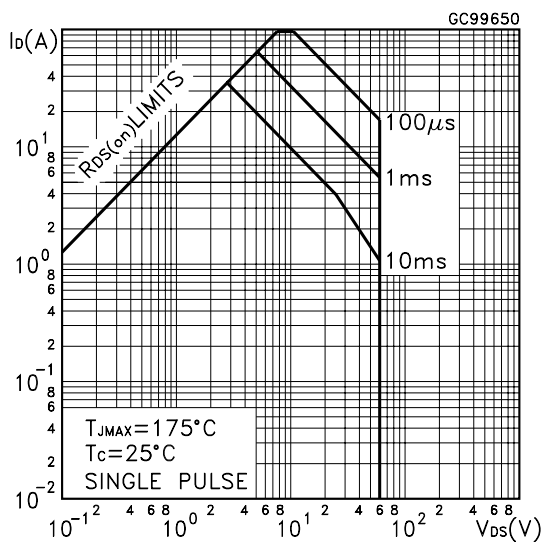


Figure 4: Thermal Impedance

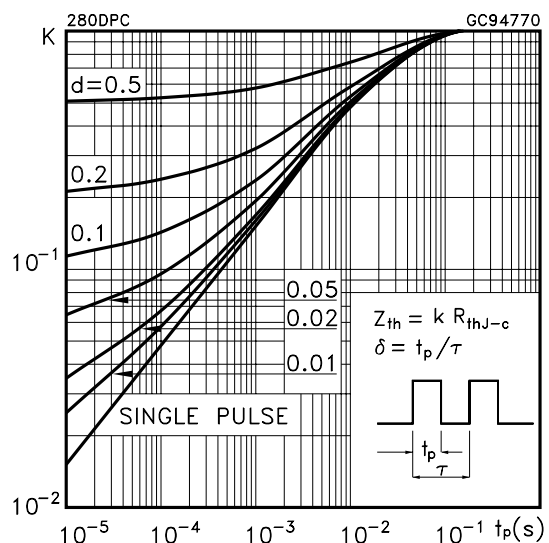


Figure 5: Output Characteristics

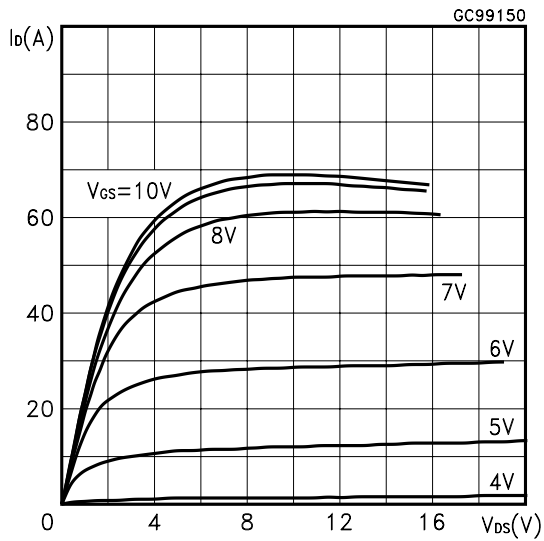


Figure 7: Transconductance

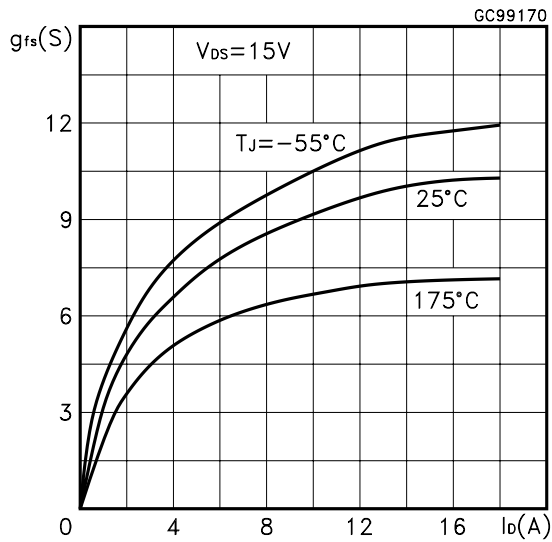


Figure 9: Gate Charge vs Gate-source Voltage

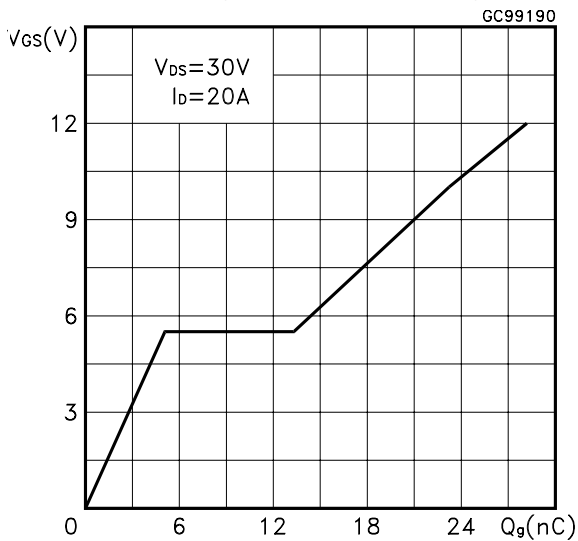


Figure 6: Transfer Characteristics

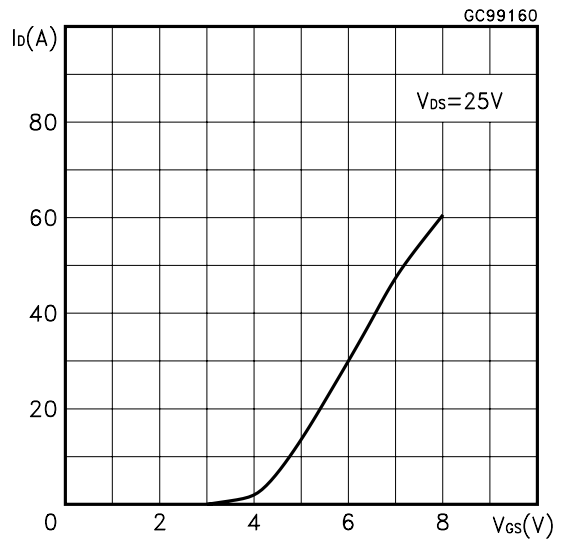


Figure 8: Static Drain-source On Resistance

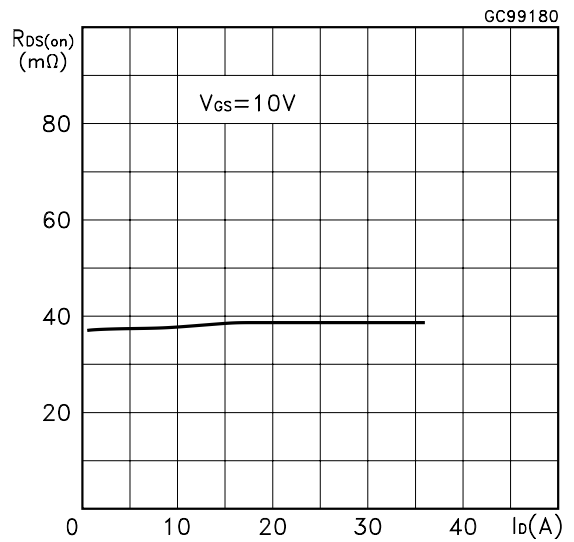


Figure 10: Capacitance Variations

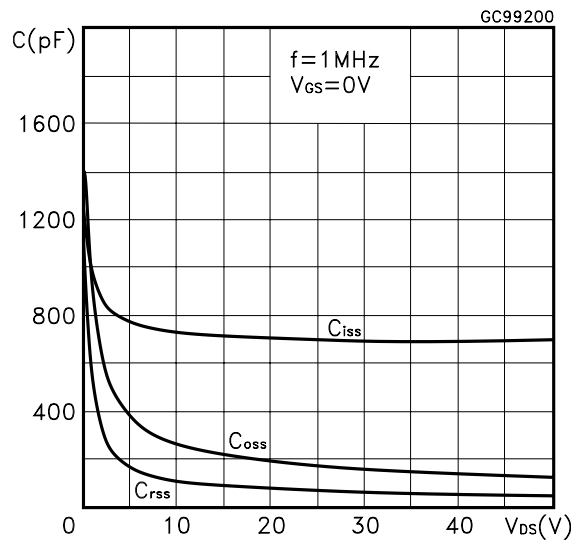


Figure 11: Normalized Gate Threshold Voltage vs Temperature

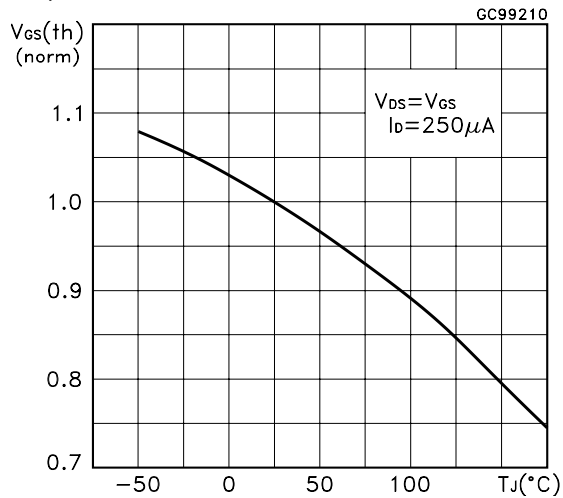


Figure 13: Source-drain Diode Forward Characteristics

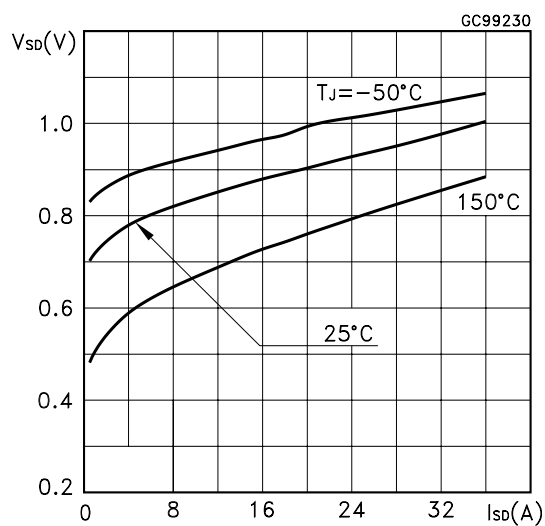


Figure 12: Normalized on Resistance vs Temperature

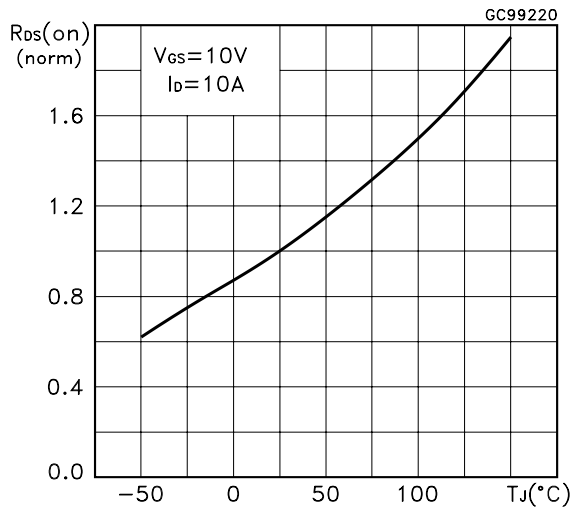


Figure 14: Normalized Breakdown Voltage vs Temperature.

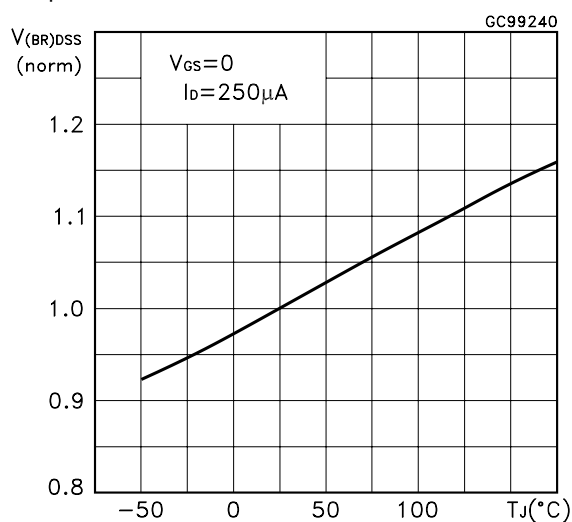


Figure 15: Unclamped Inductive Load Test Circuit

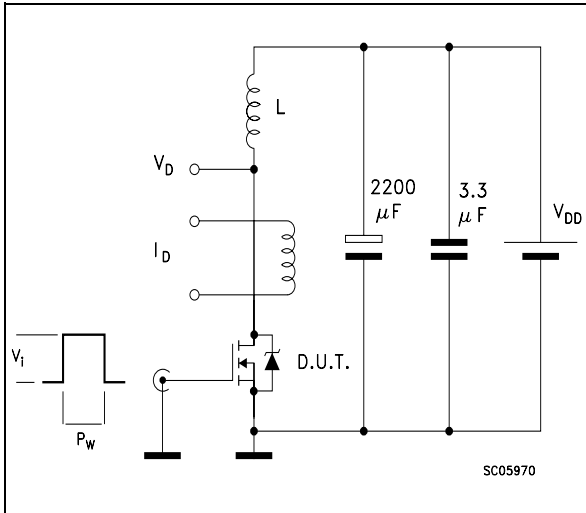


Figure 16: Unclamped Inductive Waveform

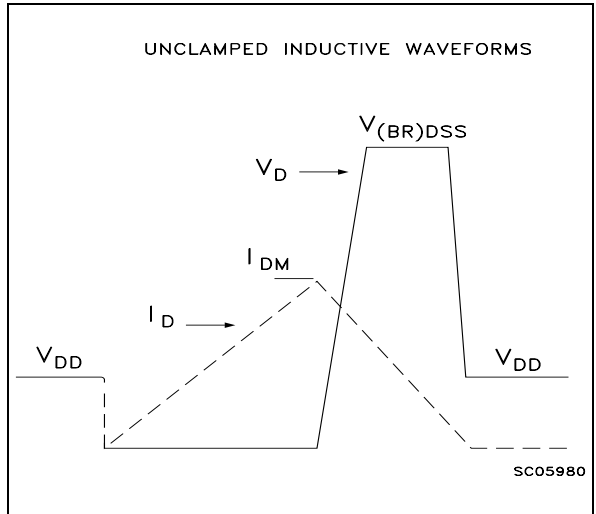


Figure 17: Switching Times Test Circuits For Resistive Load

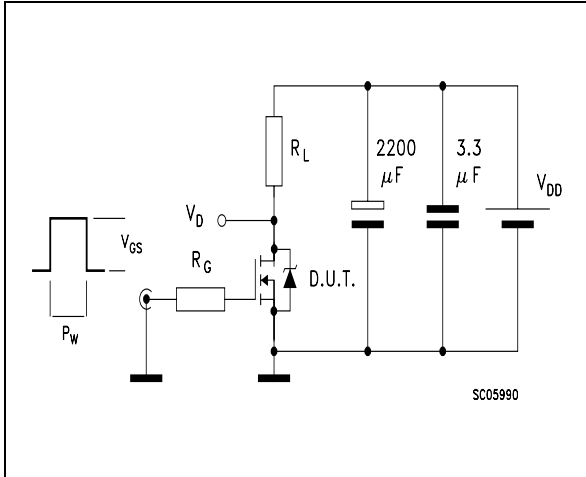


Figure 18: Gate Charge test Circuit

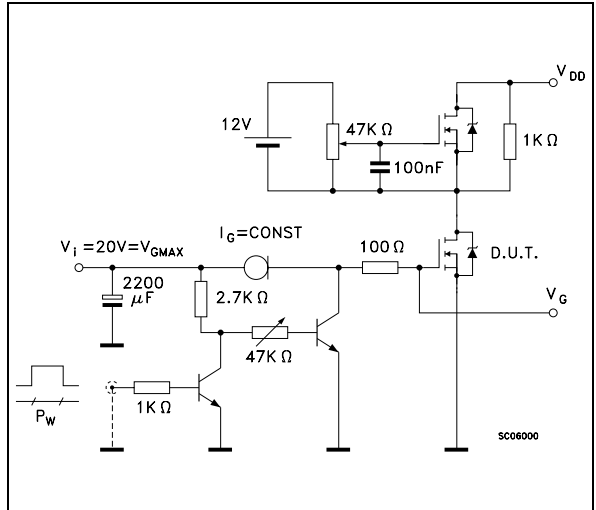
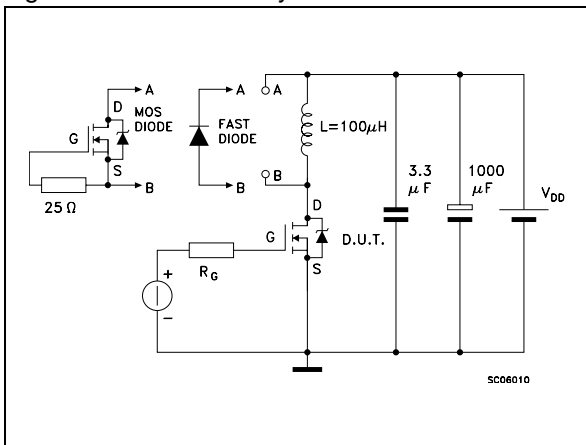
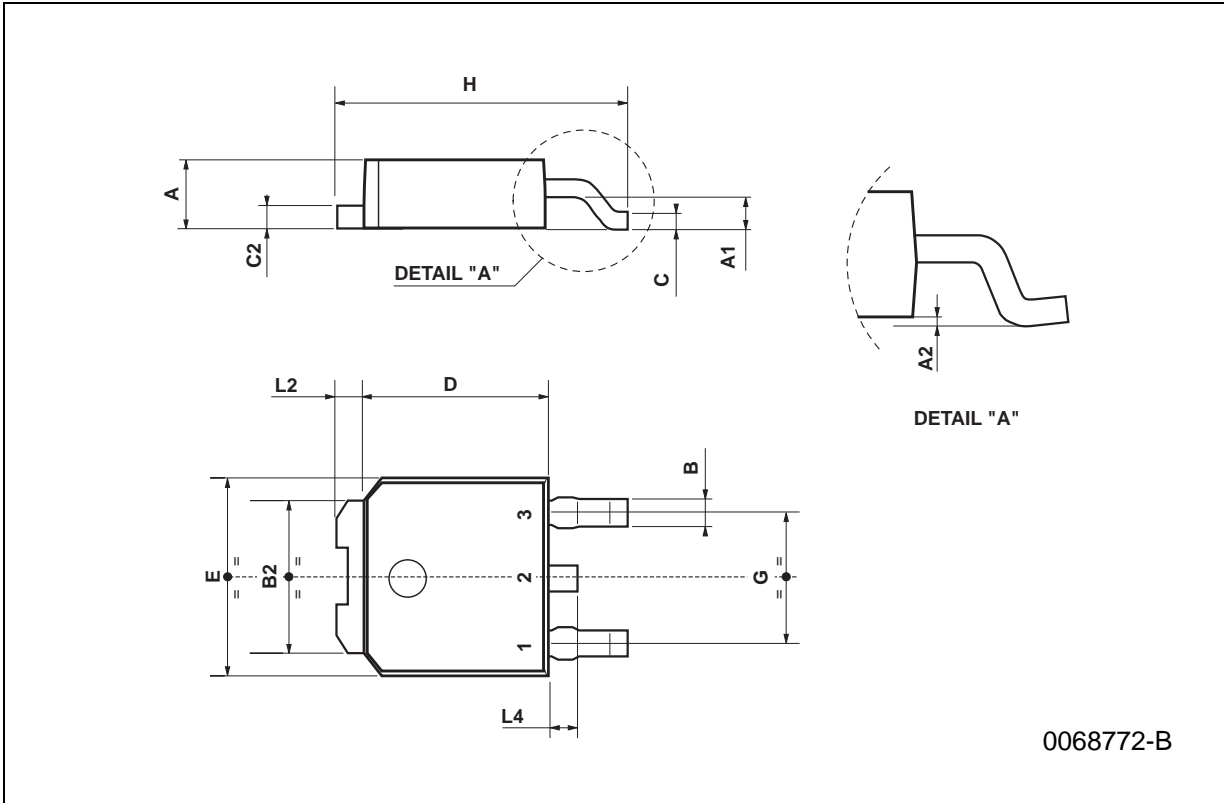


Figure 19: Test Circuit For Inductive Load Switching And Diode Recovery Times



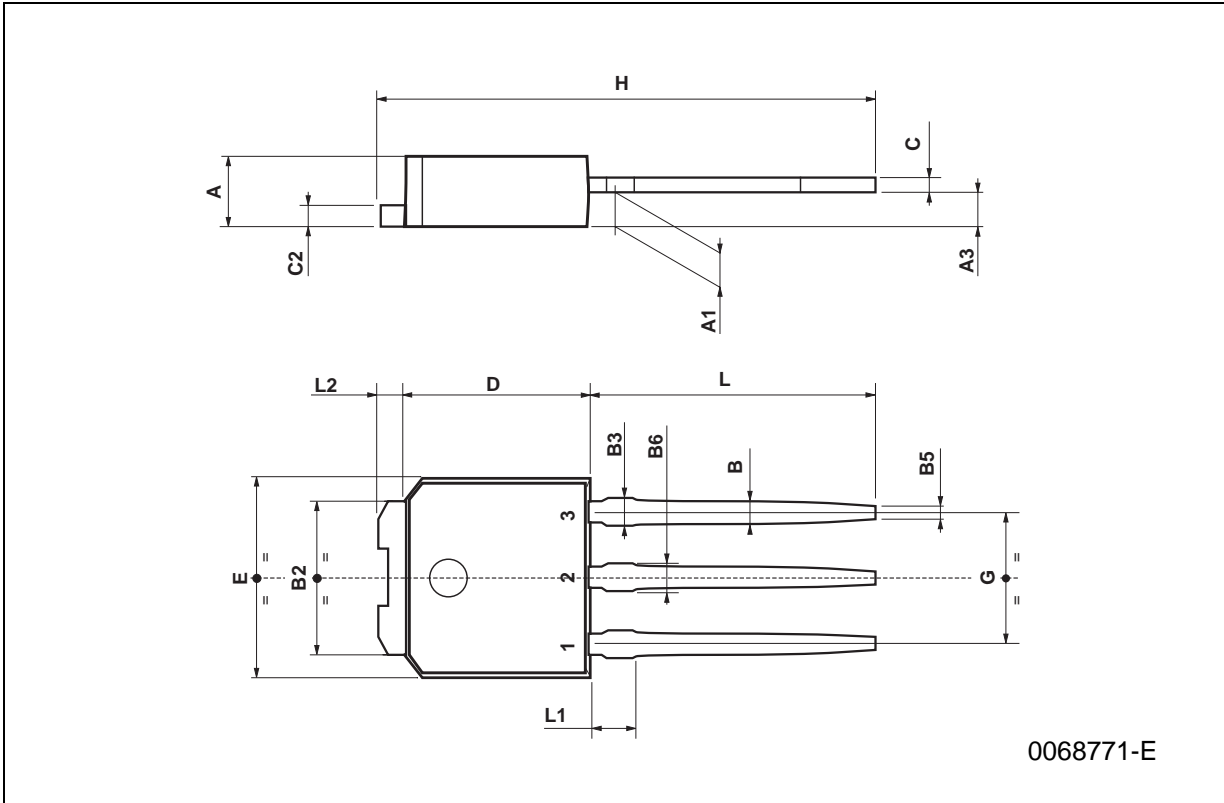
TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039

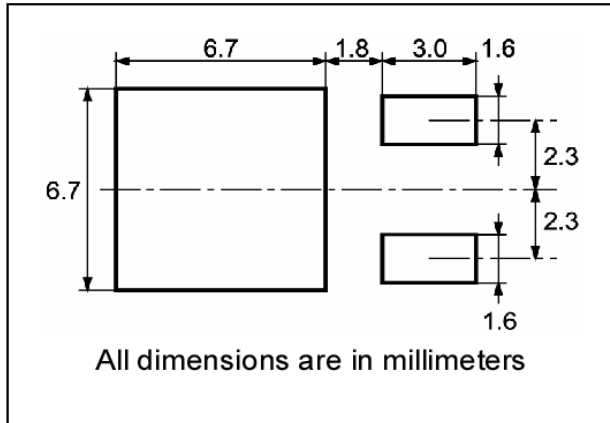


TO-251 (IPAK) MECHANICAL DATA

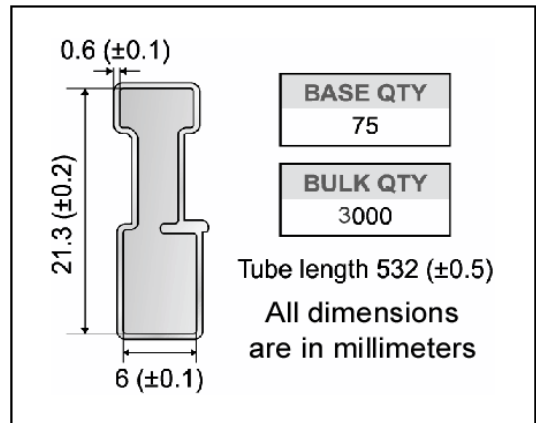
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



DPAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

40 mm min. Access hole at slot location

Full radius

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

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	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
1000	1000

TAPE MECHANICAL DATA

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

TOP COVER TAPE

User Direction of Feed

Center line of cavity

Bending radius R min.

FEED DIRECTION

For machine ref. only including draft and radii concentric around B0

*on sales type

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Table 11:Revision History

Date	Revision	Description of Changes
Friday 15 April 2005	1.0	FIRST ISSUE
April 2005	2.0	ADDED PACKAGE IPAK

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