STD70NH02L

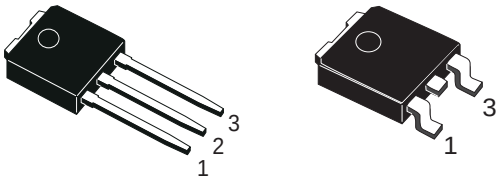
N-CHANNEL 24V - 0.0062 Ω - 60A IPAK/DPAK STripFET™ III POWER MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STD70NH02L	24 V	< 0.008 Ω	60 A(*)

- TYPICAL R_{DS}(on) = 0.0062 Ω @ 10 V
- TYPICAL R_{DS}(on) = 0.008 Ω @ 5 V
- $R_{DS(ON)}$ * Qg INDUSTRY's BENCHMARK
- CONDUCTION LOSSES REDUCED
- SWITCHING LOSSES REDUCED
- LOW THRESHOLD DEVICE
- IN COMPLIANCE WITH THE 2002/95/EC EUROPEAN DIRECTIVE
- THROUGH-HOLE IPAK (TO-251) POWER PACKAGE IN TUBE (SUFFIX "-1")
- SURFACE-MOUNTING DPAK (TO-252) POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")

Figure 1:Package



IPAK
TO-251
(Suffix "-1")

DPAK
TO-252
(Suffix "T4")

DESCRIPTION

The STD70NH02L utilizes the latest advanced design rules of ST's proprietary STripFET™ technology. This is suitable fot the most demanding DC-DC converter application where high efficiency is to be achieved.

APPLICATIONS

SPECIFICALLY DESIGNED AND OPTIMISED FOR HIGH EFFICIENCY DC/DC CONVERTES

Figure 2: Internal Schematic Diagram

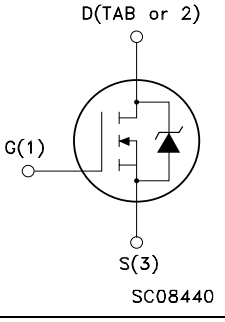


Table 2: Ordering Information

SALES TYPE	MARKING	PACKAGE	PACKAGING
STD70NH02LT4	D70NH02L	TO-252	TAPE & REEL
STD70NH02L-1	D70NH02L	TO-251	TUBE

Table 3: ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{spike(1)}$	Drain-source Voltage Rating	30	V
V_{DS}	Drain-source Voltage (V_{GS} = 0)	24	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	24	V
V_{GS}	Gate- source Voltage	± 20	V
I_D(*)	Drain Current (continuous) at T_C = 25°C	60	A
I_D	Drain Current (continuous) at T_C = 100°C	50	A
I_{DM}(2)	Drain Current (pulsed)	240	A
P_{tot}	Total Dissipation at T_C = 25°C	70	W
	Derating Factor	0.47	W/°C
E_{AS} (3)	Single Pulse Avalanche Energy	360	mJ
T_{stg}	Storage Temperature	-55 to 175	°C
T_j	Max. Operating Junction Temperature		

Table 4: THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	2.14	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	275	°C

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 = 25 mA, V_{GS} = 0	24			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = 20 V V_{DS} = 20 V T_C = 125°C			1 10	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20V			±100	nA

Table 6: ON (4)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 250 µA	1	1.8		V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 30 A V_{GS} = 5 V I_D = 15 A		0.0062 0.008	0.008 0.014	Ω Ω

Table 7: DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (4)	Forward Transconductance	V_{DS} = 10 V I_D = 18 A		27		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 16V f = 1 MHz V_{GS} = 0		2050 545 70		pF pF pF
R_G	Gate Input Resistance	f = 1 MHz Gate DC Bias = 0 Test Signal Level = 20 mV Open Drain		1		Ω

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} = 10 V I_D = 30 A R_G = 4.7 Ω V_{GS} = 5 V (Resistive Load, Figure 17)		12 200		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD}= 10 V I_D= 60 A V_{GS}= 5 V		17 7.7 3.5	22	nC nC nC
Q_{oss}(5)	Output Charge	V_{DS}= 10 V V_{GS}= 0 V		14		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} = 10 V I_D = 30 A R_G = 4.7Ω, V_{GS} = 5 V (Resistive Load, Figure 17)		18 25	33	ns ns

Table 10: SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (4)	Forward On Voltage	I_{SD} = 30 A V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 60 A di/dt = 100A/µs V_{DD} = 15 V T_j = 150°C (see test circuit, Figure 19)		36 65 3.6		ns nC A

(1) Garanted when external Rg=4.7 Ω and $t_f < t_{fmax}$.
(2) Pulse width limited by safe operating area
(3) Starting T_j = 25 °C, I_D = 25A, V_{DD} = 15V
(4) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
(5) $Q_{oss} = C_{oss}*\Delta V_{in}$, $C_{oss} = C_{gd} + C_{ds}$. See Appendix A
(*) Value limited by wire bonding

Figure 3: Safe Operating Area

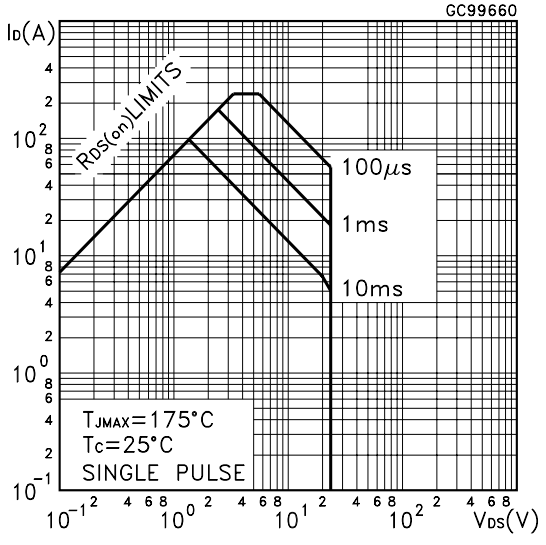


Figure 4: Thermal Impedance

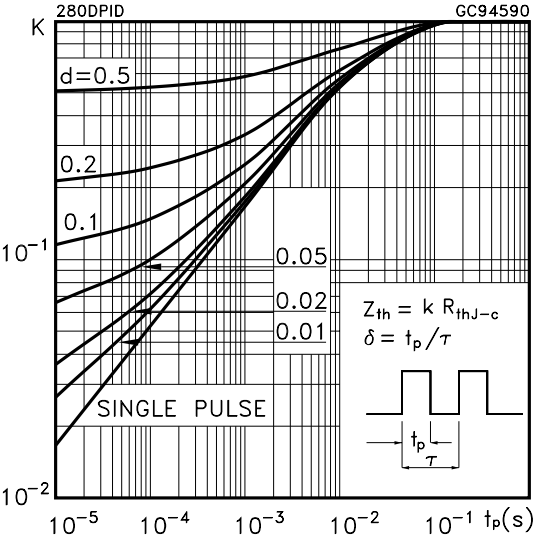


Figure 5: Output Characteristics

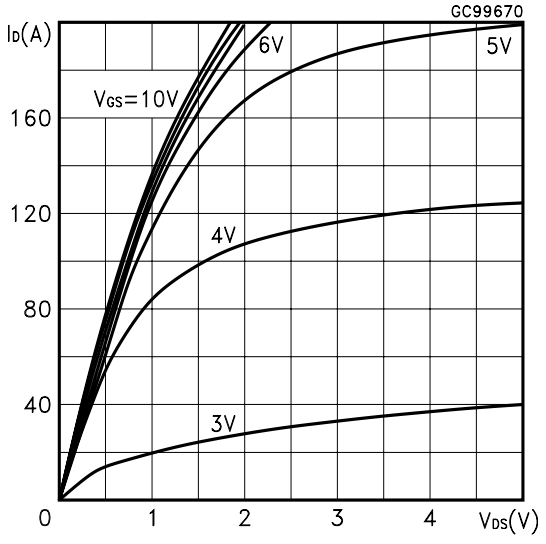


Figure 6: Transfer Characteristics

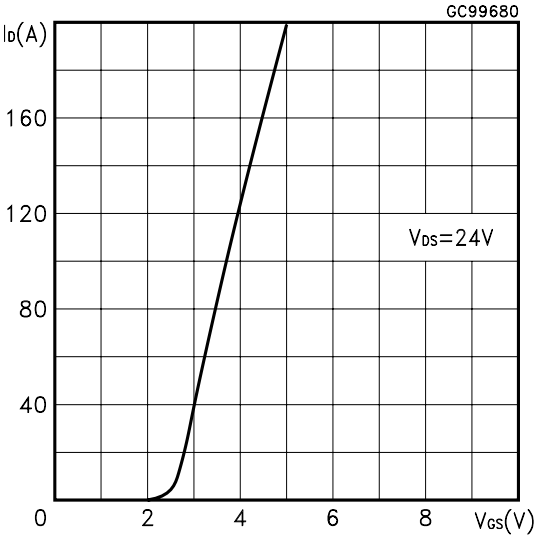


Figure 7: Transconductance

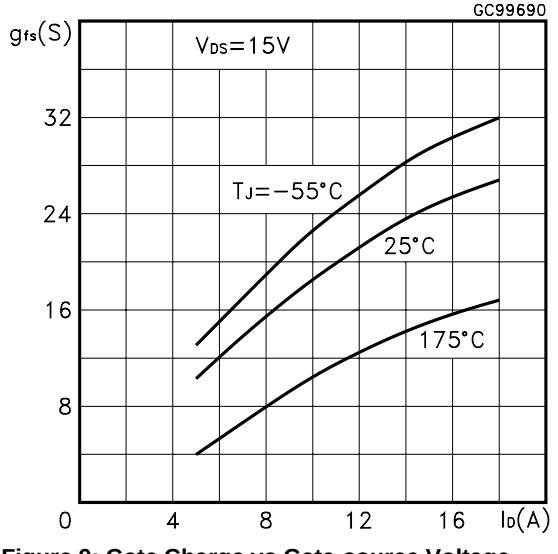


Figure 8: Static Drain-source On Resistance

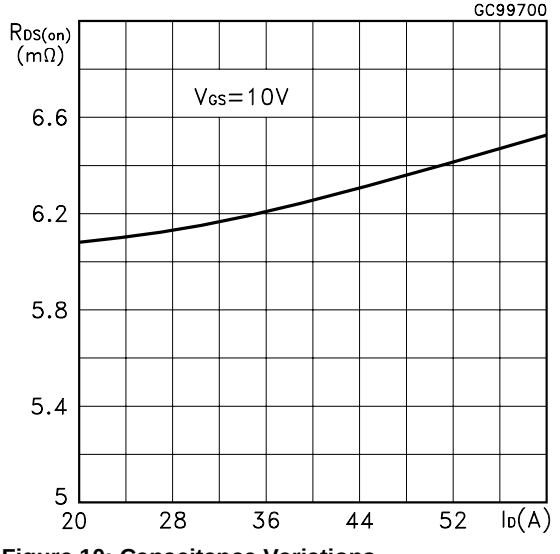


Figure 9: Gate Charge vs Gate-source Voltage

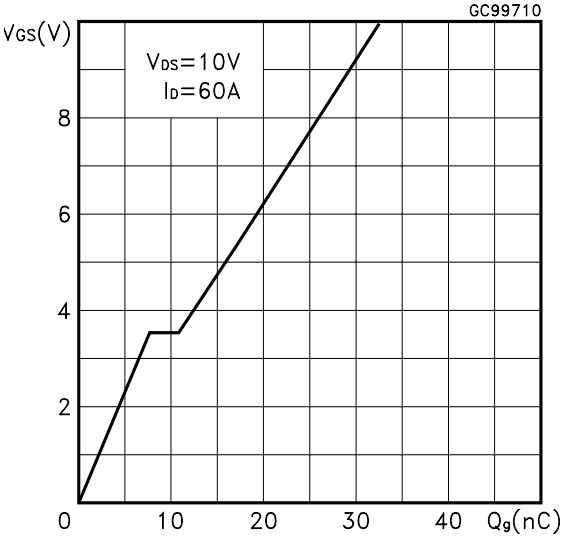


Figure 10: Capacitance Variations

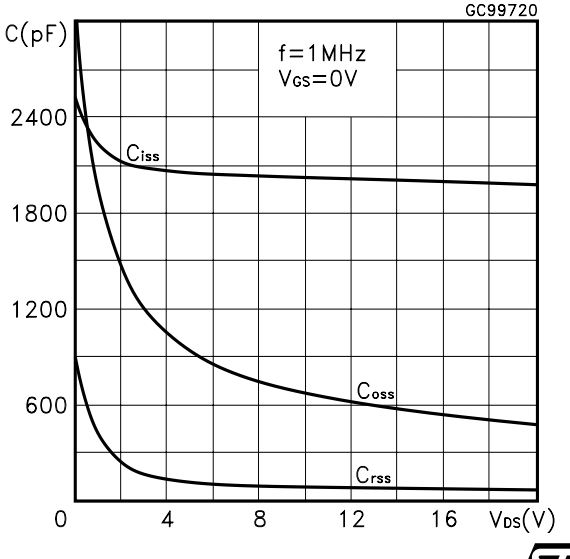


Figure 11: Normalized Gate Threshold Voltage vs Temperature

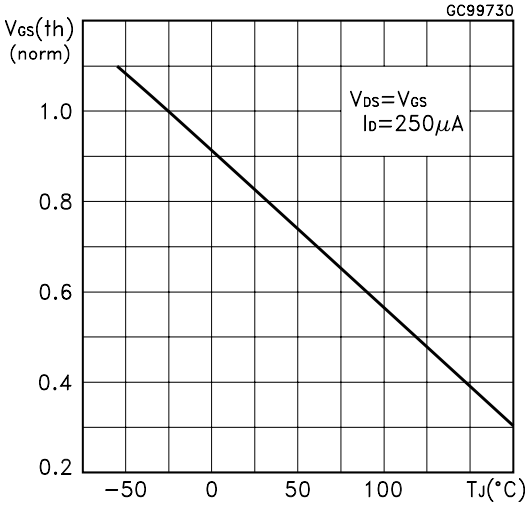


Figure 12: Normalized on Resistance vs Temperature

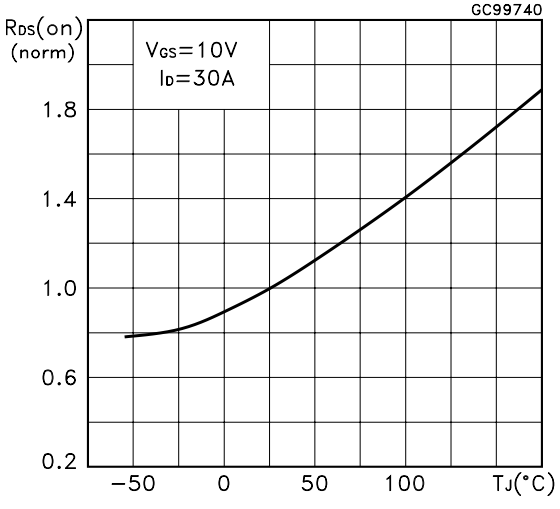


Figure 13: Source-drain Diode Forward Characteristics

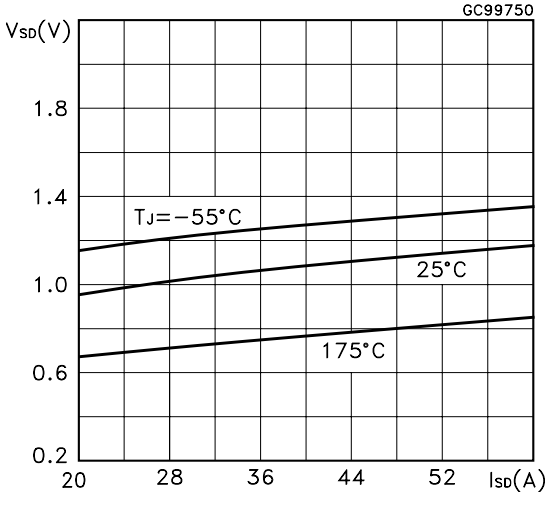


Figure 14: Normalized Breakdown Voltage vs Temperature

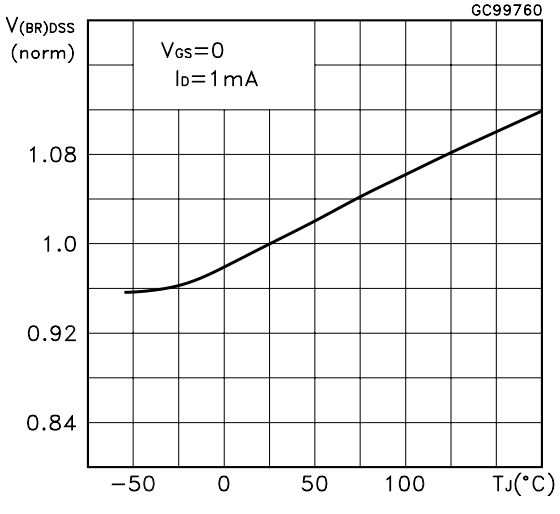


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Figure 15: Unclamped Inductive Load Test Circuit

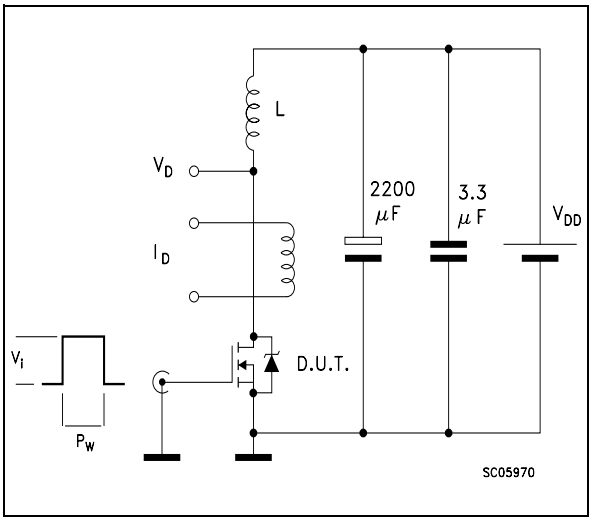


Figure 16: Unclamped Inductive Waveform

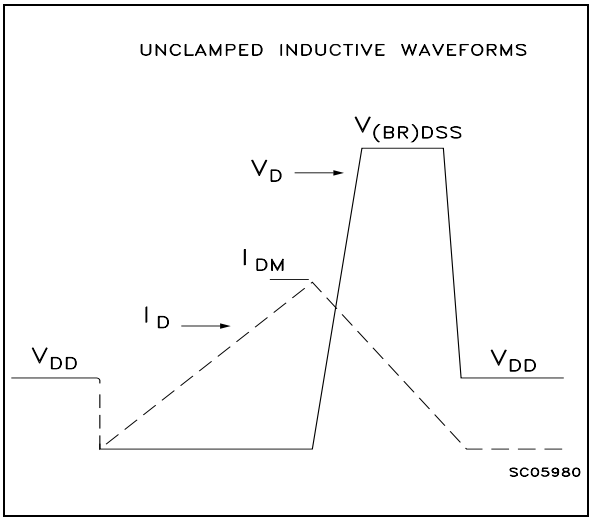


Figure 17: Switching Times Test Circuits For Resistive Load

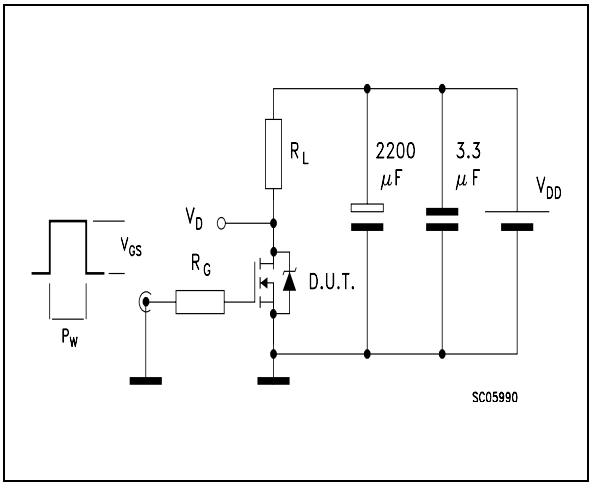


Figure 18: Gate Charge test Circuit

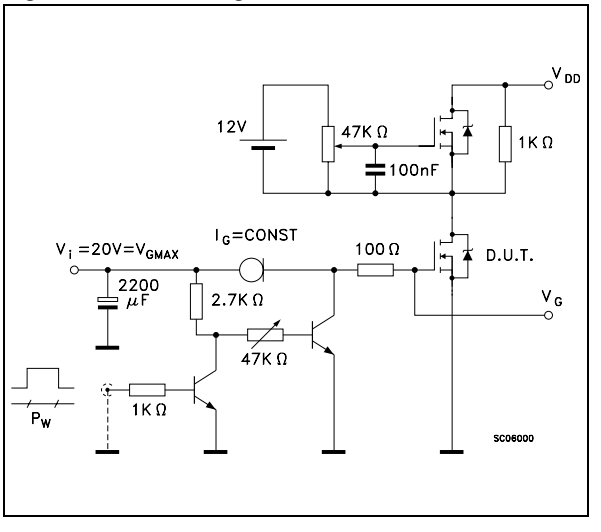
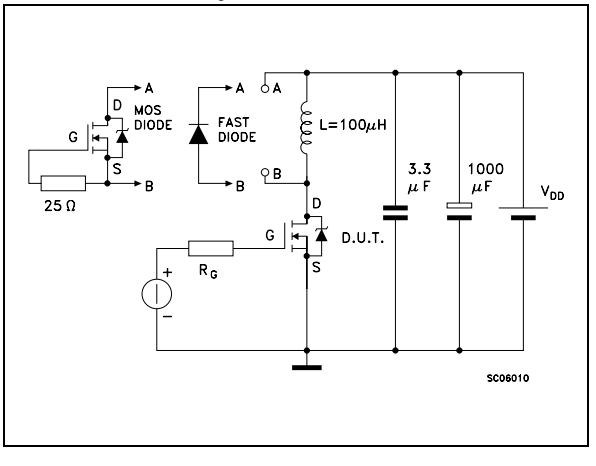
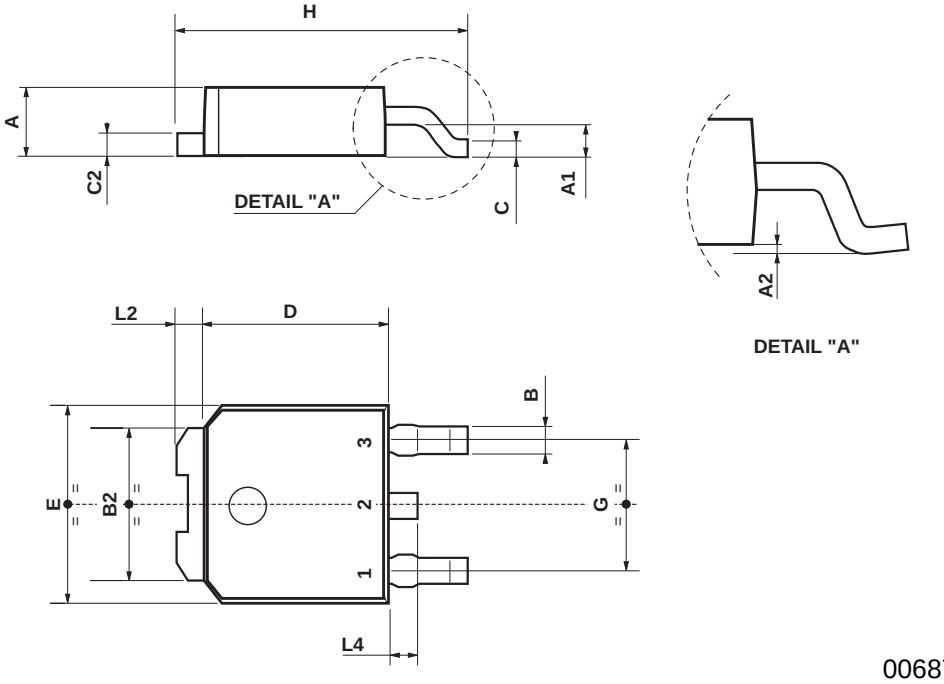


Figure 19: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-252 (DPAK) MECHANICAL DATA

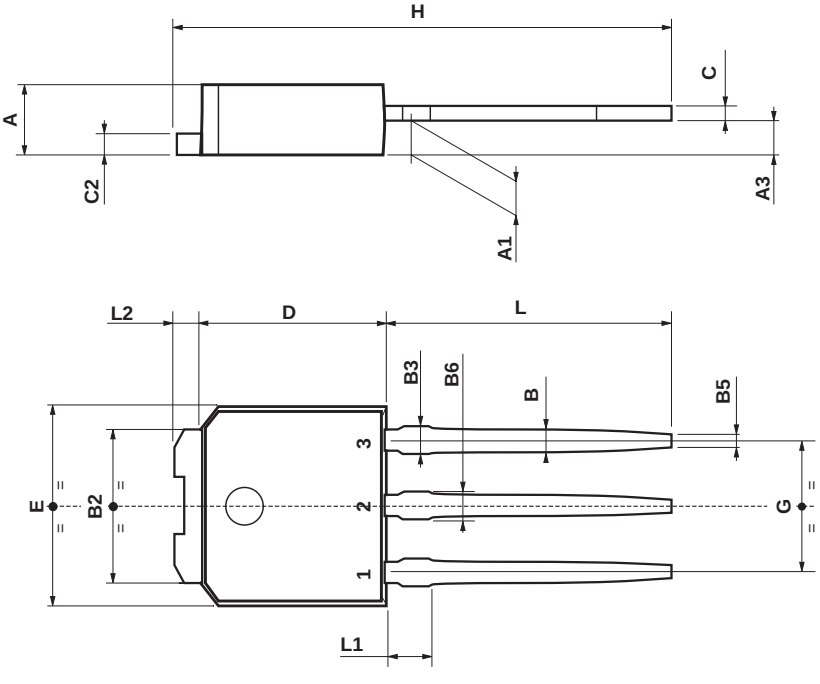
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35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



0068772-B

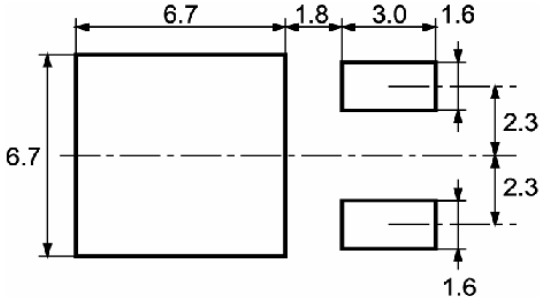
TO-251 (IPAK) MECHANICAL DATA

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



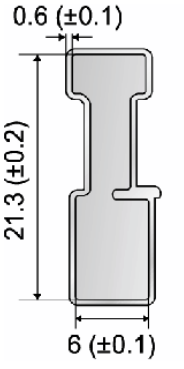
0068771-E

DPAK FOOTPRINT



All dimensions are in millimeters

TUBE SHIPMENT (no suffix)*



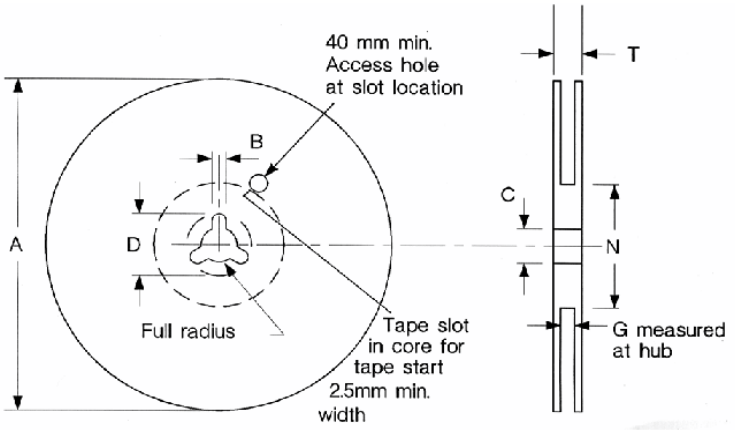
BASE QTY
75

BULK QTY
3000

Tube length 532 (±0.5)

All dimensions are in millimeters

TAPE AND REEL SHIPMENT (suffix "T4")*



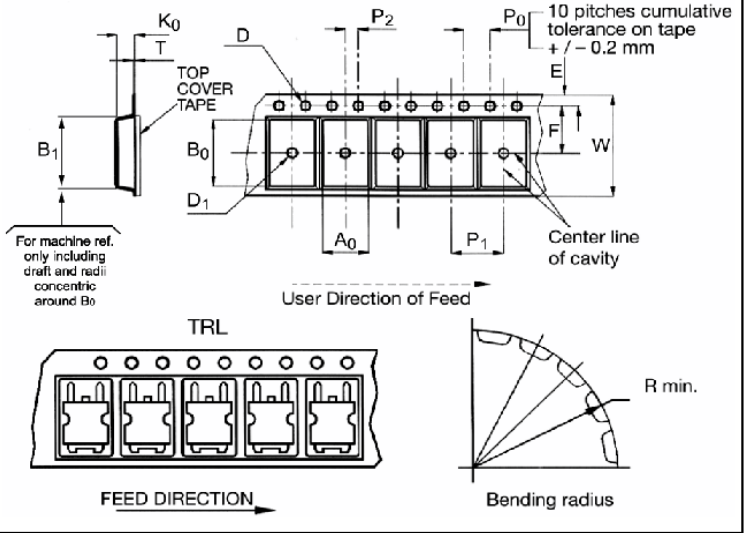
REEL MECHANICAL DATA

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



*on sales type

Table 11:Revision History

Date	Revision	Description of Changes
March 2005	4.0	ADDED PACKAGE IPAK

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