



STD7NB20 STD7NB20-1

N-CHANNEL 200V - 0.3Ω - 7A DPAK/IPAK

PowerMESH™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STD7NB20	200 V	< 0.40 Ω	7 A
STD7NB20-1	200 V	< 0.40 Ω	7 A

- TYPICAL R_{DS(on)} = 0.3 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- ADD SUFFIX "T4" FOR ORDERING IN TAPE & REEL

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

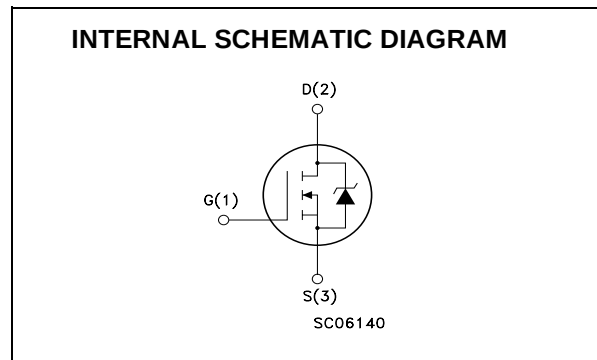
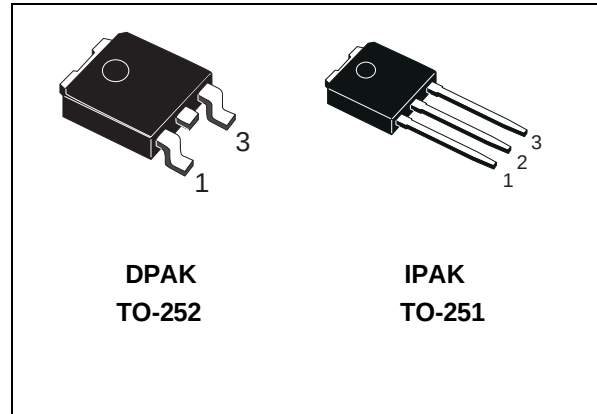
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-DC CONVERTERS FOR TELECOM, INDUSTRIAL, AND LIGHTING EQUIPMENT

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	200	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	200	V
V _{GS}	Gate- source Voltage	± 30	V
I _D	Drain Current (continuous) at T _C = 25°C	7	A
I _D	Drain Current (continuous) at T _C = 100°C	5	A
I _{DM} (•)	Drain Current (pulsed)	28	A
P _{TOT}	Total Dissipation at T _C = 25°C	55	W
	Derating Factor	0.44	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	5.5	V/ns
T _{stg}	Storage Temperature	– 65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

(1) I_{SD} ≤ 7A, di/dt ≤ 200 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{jMAX}



STD7NB20 / STD7NB20-1

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	2.27	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
T _I	Maximum Lead Temperature For Soldering Purpose	275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	7	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	100	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 µA, V _{GS} = 0	200			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} = ± 30V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250µA	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 3.5 A		0.30	0.40	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)} max, I _D = 3.5 A	2	3		S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		470	650	pF
C _{oss}	Output Capacitance			135	190	pF
C _{rss}	Reverse Transfer Capacitance			22	30	pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 100\text{ V}$, $I_D = 5\text{ A}$		10	14	ns
t_r	Rise Time	$R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ (see test circuit, Figure 3)		15	20	ns
Q_g	Total Gate Charge	$V_{DD} = 160\text{ V}$, $I_D = 10\text{ A}$, $V_{GS} = 10\text{ V}$		17	24	nC
Q_{gs}	Gate-Source Charge			7.5		nC
Q_{gd}	Gate-Drain Charge			5.5		nC

SWITCHING OFF

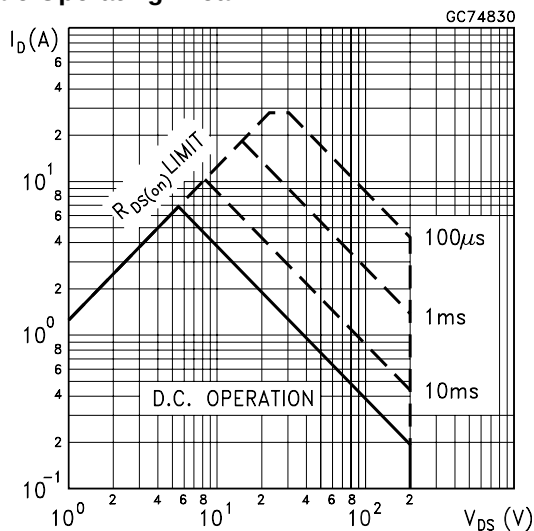
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-Voltage Rise Time	$V_{DD} = 160\text{ V}$, $I_D = 10\text{ A}$,		8	11	ns
t_f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$		10	14	ns
t_c	Cross-over Time	(see test circuit, Figure 3)		20	28	ns

SOURCE DRAIN DIODE

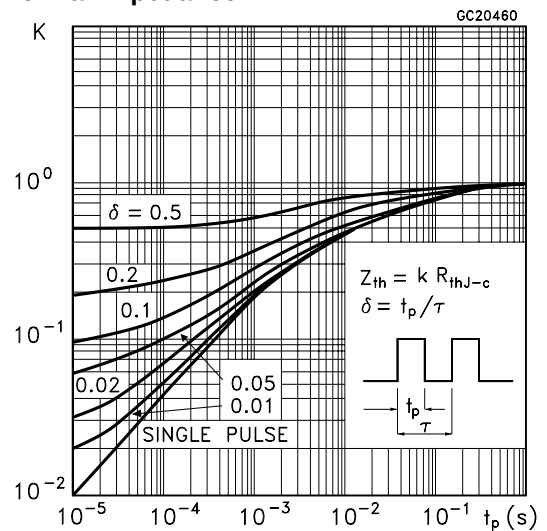
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				7	A
$I_{SDM}(2)$	Source-drain Current (pulsed)				28	A
$V_{SD}(1)$	Forward On Voltage	$I_{SD} = 7\text{ A}$, $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		170		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 50\text{ V}$, $T_J = 150^\circ\text{C}$ (see test circuit, Figure 5)		980		nC
I_{RRM}	Reverse Recovery Current			11.5		A

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

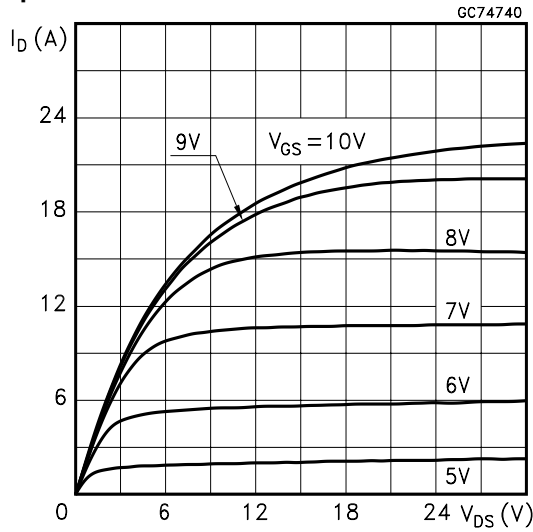
Safe Operating Area



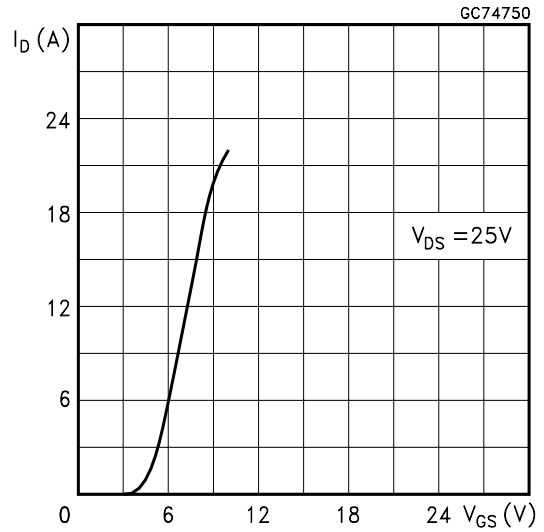
Thermal Impedance



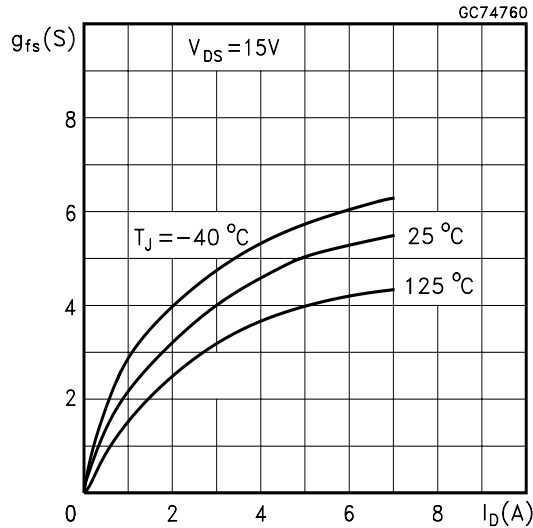
Output Characteristics



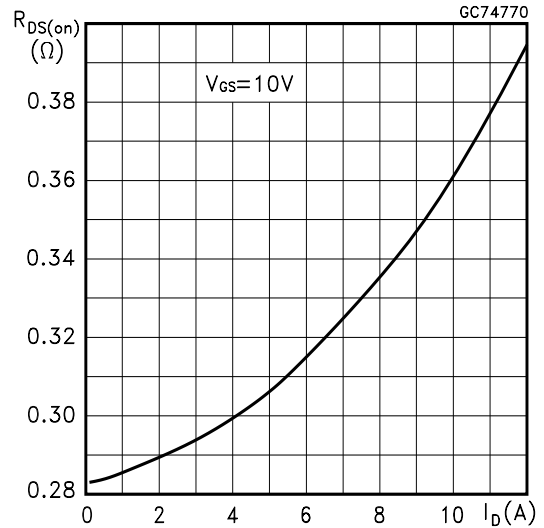
Transfer Characteristics



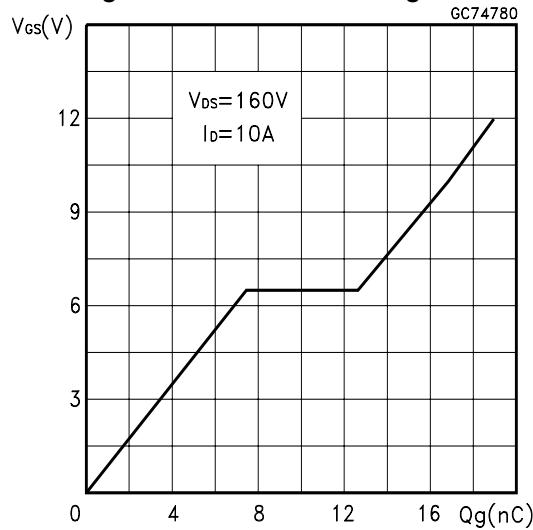
Transconductance



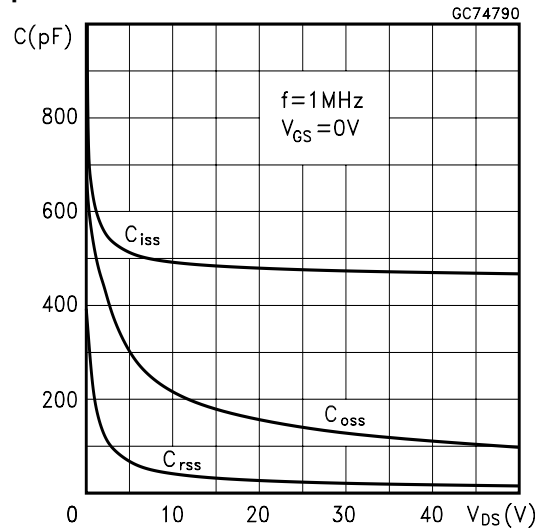
Static Drain-source On Resistance



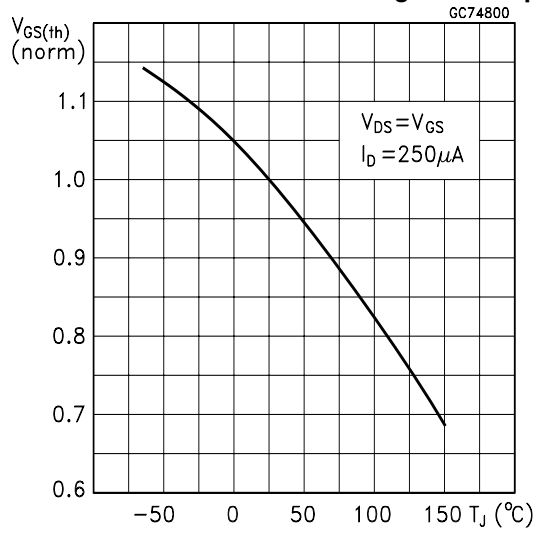
Gate Charge vs Gate-source Voltage



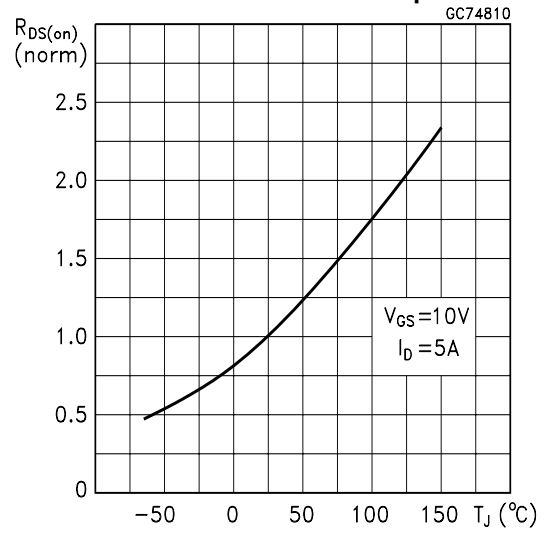
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

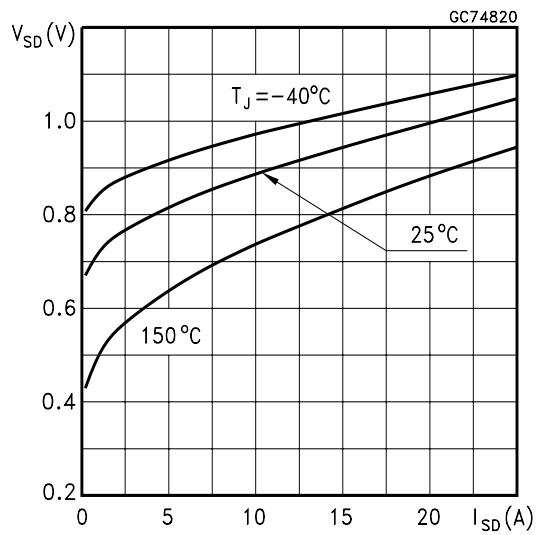


Fig. 1: Unclamped Inductive Load Test Circuit

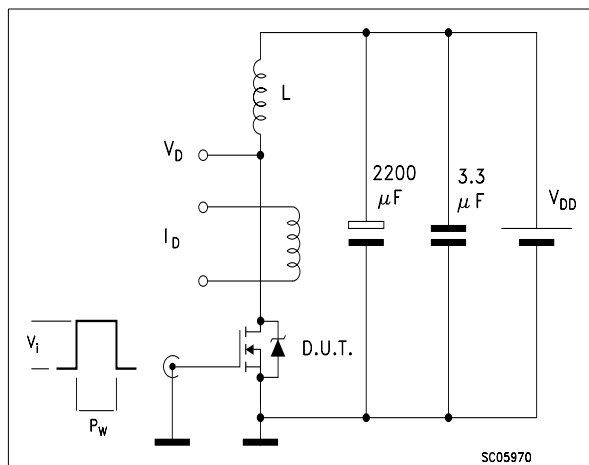


Fig. 2: Unclamped Inductive Waveform

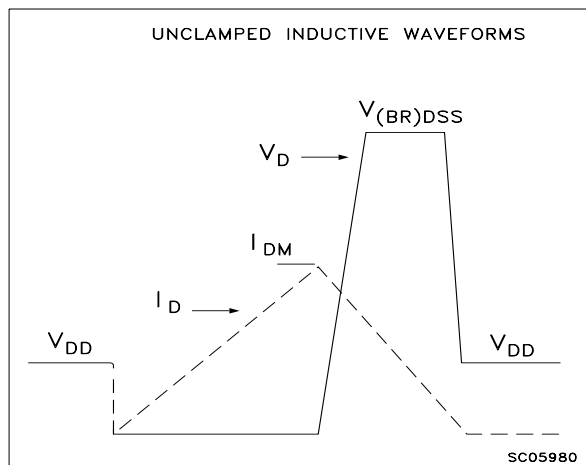


Fig. 3: Switching Times Test Circuit For Resistive Load

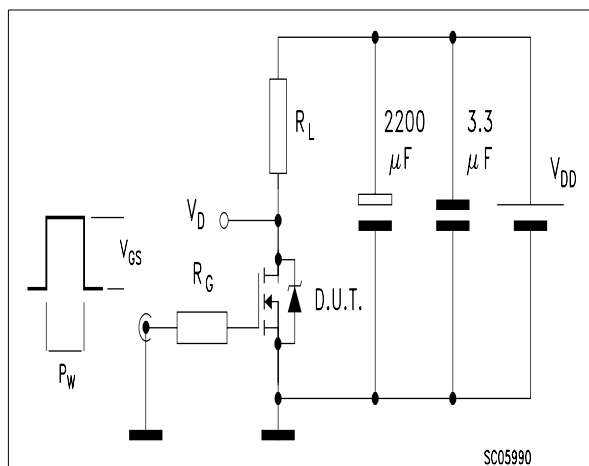


Fig. 4: Gate Charge test Circuit

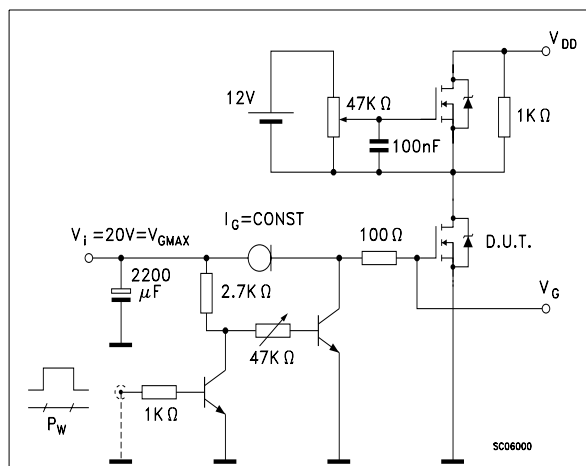
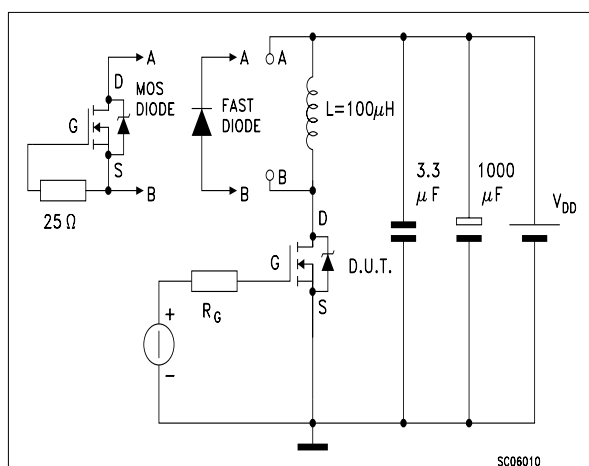
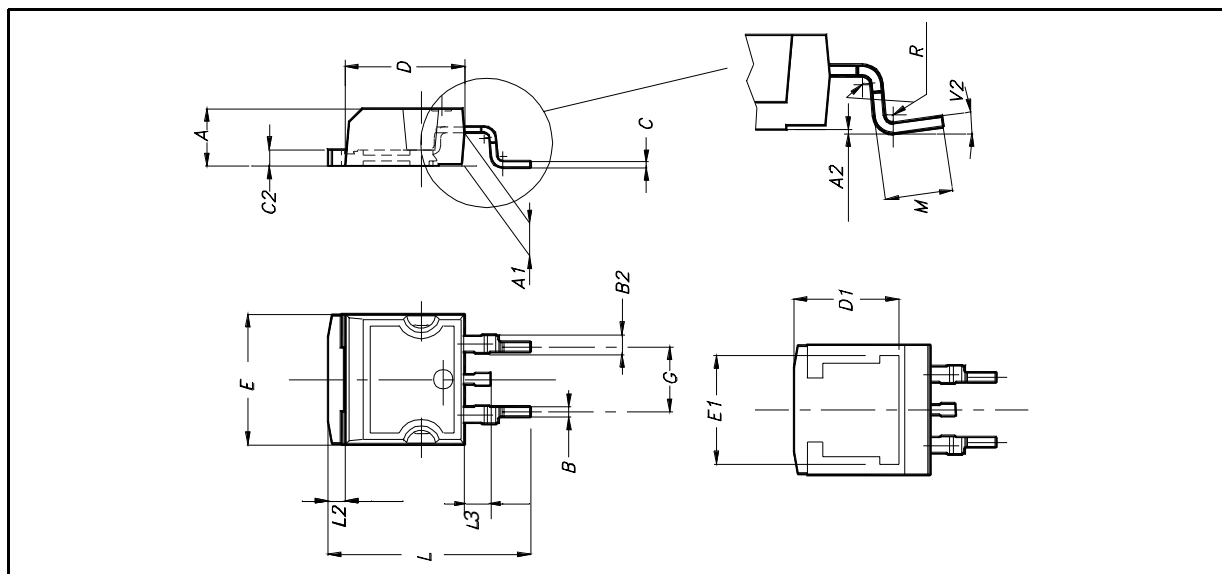


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



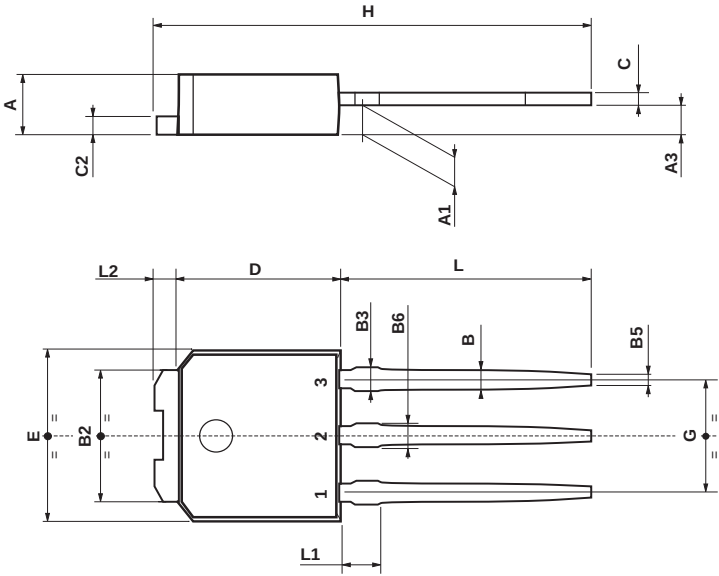
D²PAK MECHANICAL DATA

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°		8°			



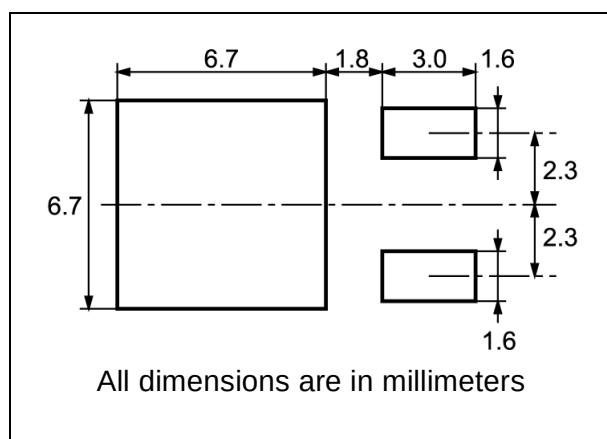
TO-251 (IPAK) MECHANICAL DATA

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

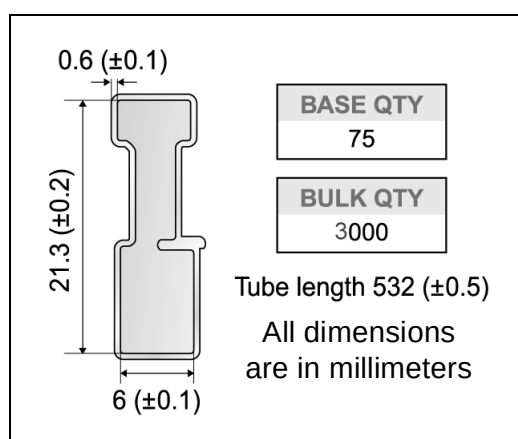


0068771-E

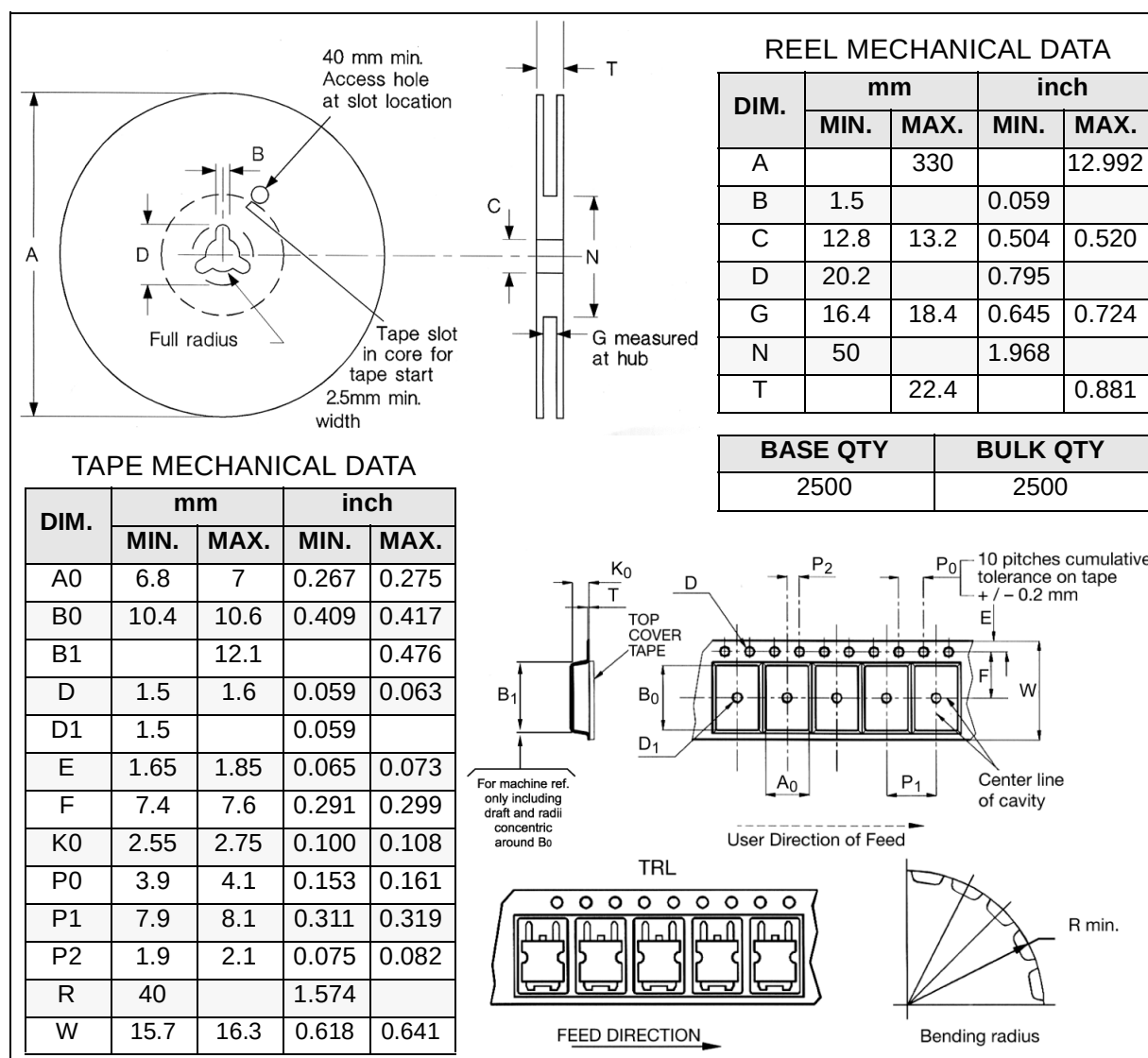
DPAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



* on sales type

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2002 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

© <http://www.st.com>