



THE DATASHEET OF P19NB20





STP19NB20 - STP19NB20FP STB19NB20-1

N-CHANNEL 200V - 0.15Ω - 19A - TO-220/TO-220FP/I²PAK

PowerMESH™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP19NB20	200 V	< 0.18 Ω	19 A
STP19NB20FP	200 V	< 0.18 Ω	10 A
STB19NB20-1	200 V	< 0.18 Ω	19 A

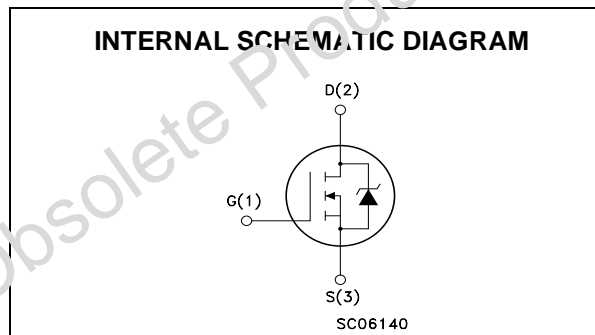
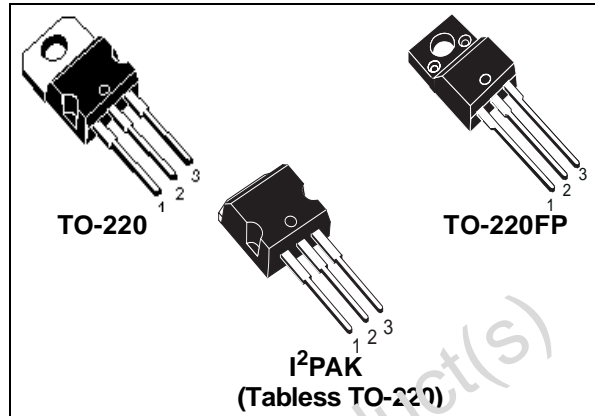
- TYPICAL R_{DS(on)} = 0.15 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- NEW HIGH VOLTAGE BENCHMARK
- GATE CHARGE MINIMIZED

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

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP(B)19NB20(-1)	STP19NB20FP	
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	19	10	A
I _D	Drain Current (continuous) at T _C = 100°C	12	6.0	A
I _{DM} (•)	Drain Current (pulsed)	76	76	A
P _{TOT}	Total Dissipation at T _C = 25°C	125	35	W
	Derating Factor	1	0.28	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	5.5		V/ns
V _{ISO}	Insulation Withstand Voltage (DC)	-	2500	V
T _{stg}	Storage Temperature	-65 to 150		°C
T _j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area
August 2002

(1) I_{SD} ≤ 19 A, di/dt ≤ 300A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

STP19NB20/FP/STB19NB20-1

THERMAL DATA

		TO-220/1 ² PAK	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	1	3.57	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
T _l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	19	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	580	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 = 9.5 A		0.15	0.18	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 = 9.5 A	3			S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		1000		pF
C _{oss}	Output Capacitance			285		pF
C _{rss}	Reverse Transfer Capacitance			45		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 100V, I_D = 9.5 A$		15		ns
t_r	Rise Time	$R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3)		15		ns
Q_g	Total Gate Charge	$V_{DD} = 160V, I_D = 19 A,$		29	40	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = 10V$		9.5		nC
Q_{gd}	Gate-Drain Charge			13		nC

SWITCHING OFF

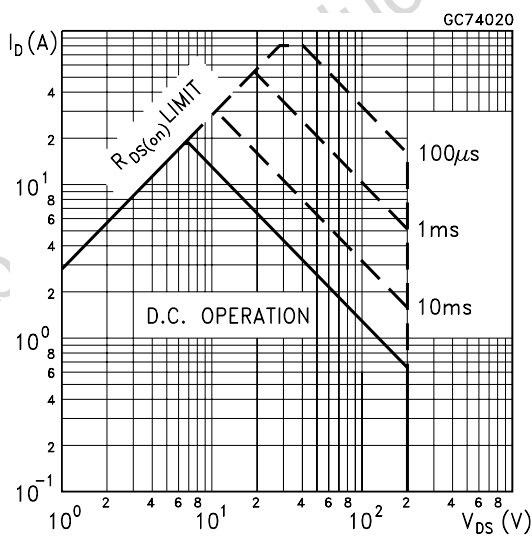
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$	Off-voltage Rise Time	$V_{DD} = 160V, I_D = 19 A,$		10		ns
t_f	Fall Time	$R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 5)		10		ns
t_c	Cross-over Time			20		ns

SOURCE DRAIN DIODE

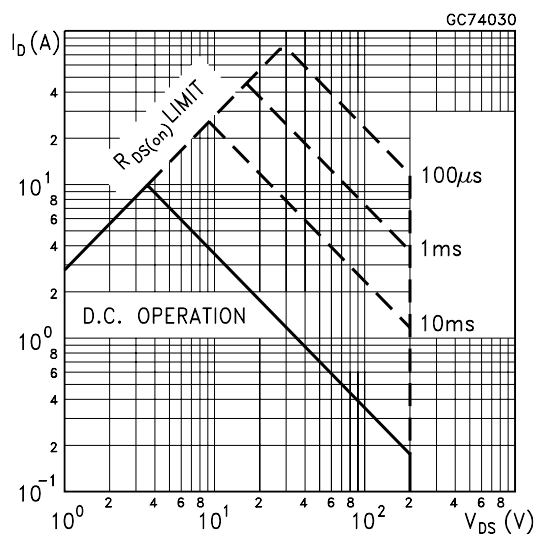
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				19	A
$I_{SDM} (2)$	Source-drain Current (pulsed)				76	A
$V_{SD} (1)$	Forward On Voltage	$I_{SD} = 19 A, V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 19 A, di/dt = 100A/\mu s,$		210		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 50V, T_j = 150^\circ C$ (see test circuit, Figure 5)		1.5		μC
I_{RRM}	Reverse Recovery Current			14.5		A

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

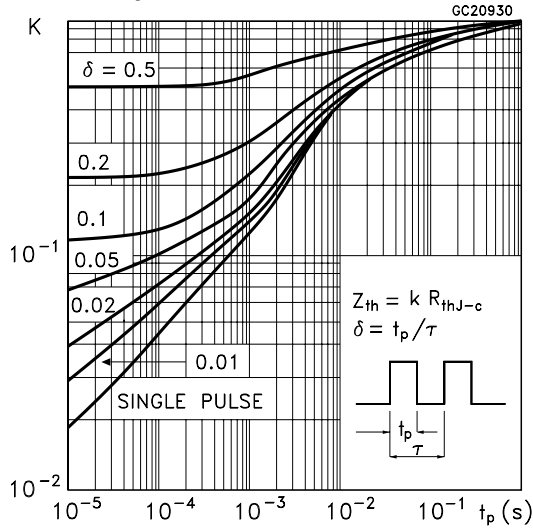
Safe Operating Area for TO-220/1²PAK



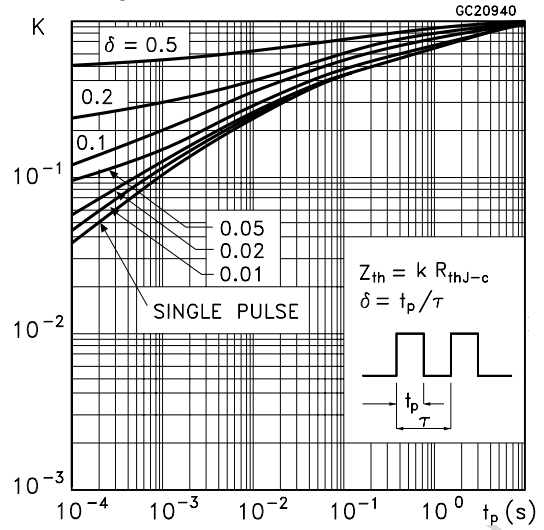
Safe Operating Area for TO-220FP



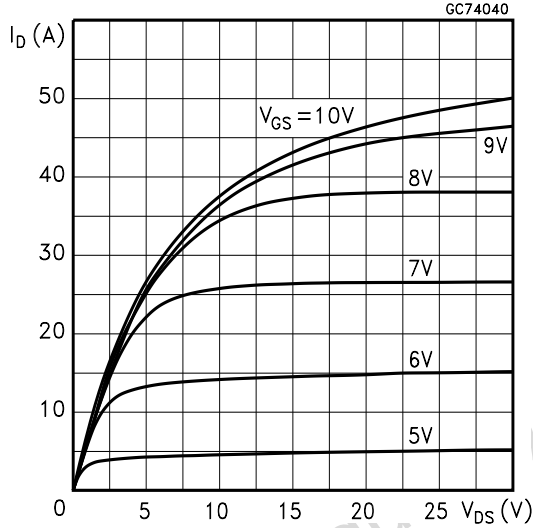
Thermal Impedance for TO-220/1²PAK



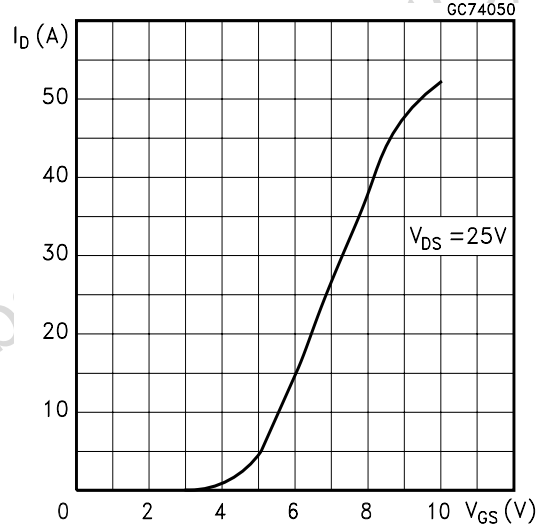
Thermal Impedance for TO-220FP



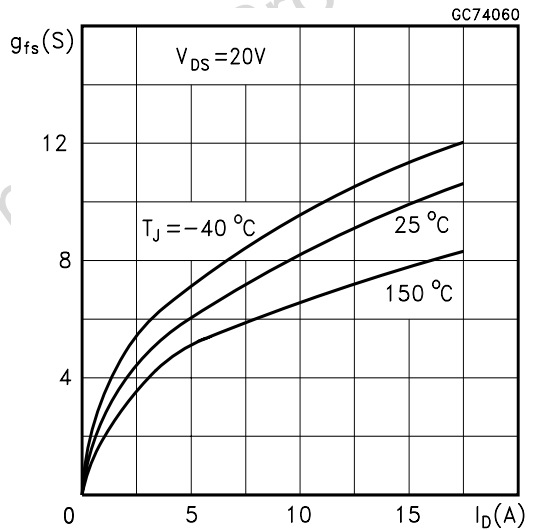
Output Characteristics



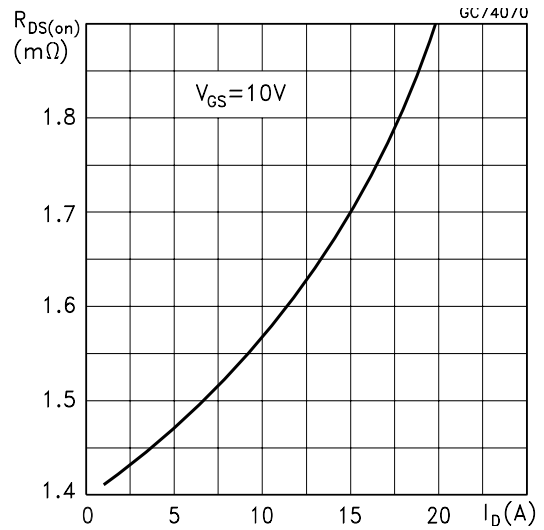
Transfer Characteristics



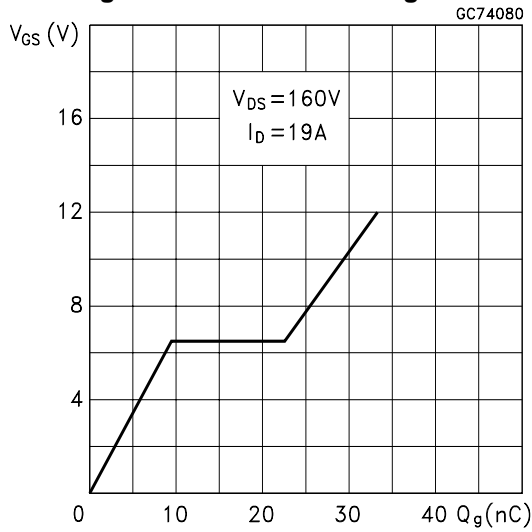
Transconductance



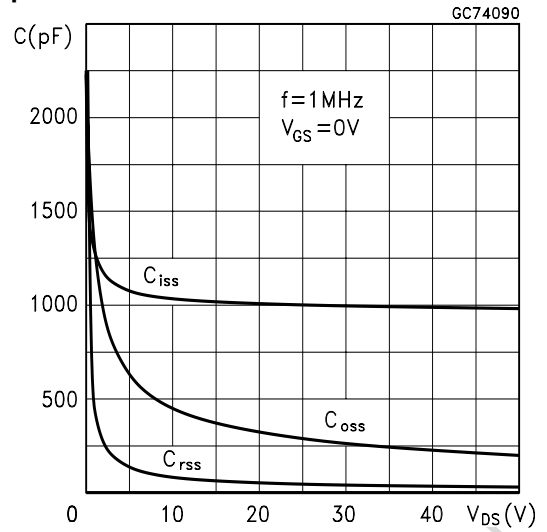
Static Drain-Source On Resistance



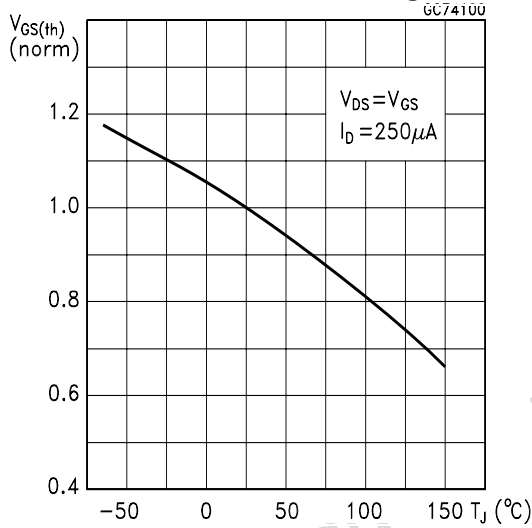
Gate Charge vs Gate-source Voltage



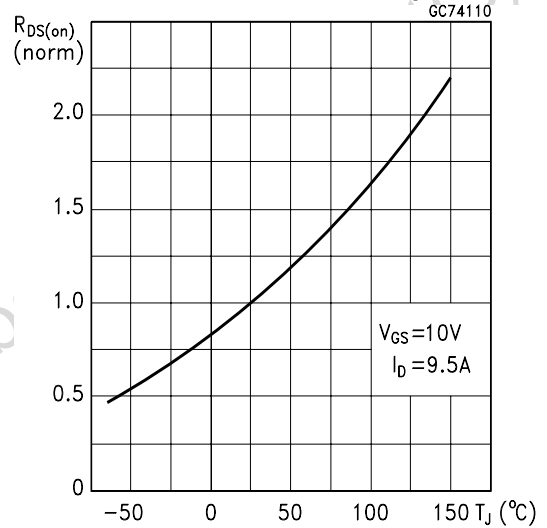
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

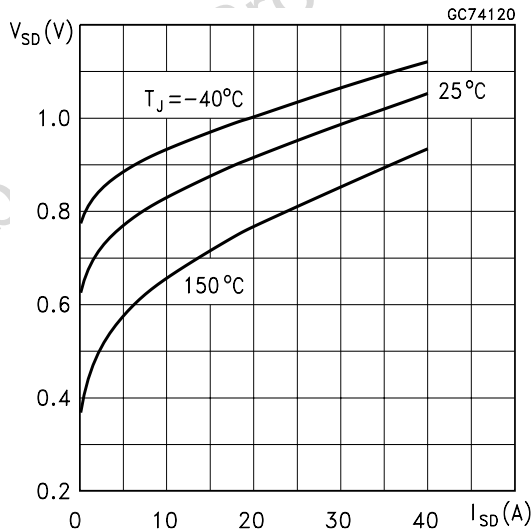


Fig. 1: Unclamped Inductive Load Test Circuit

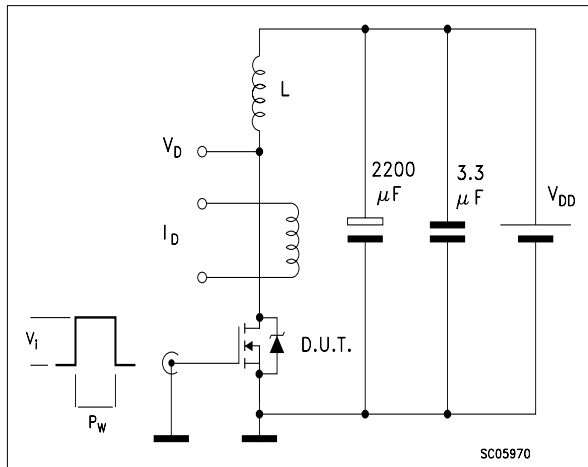


Fig. 2: Unclamped Inductive Waveform

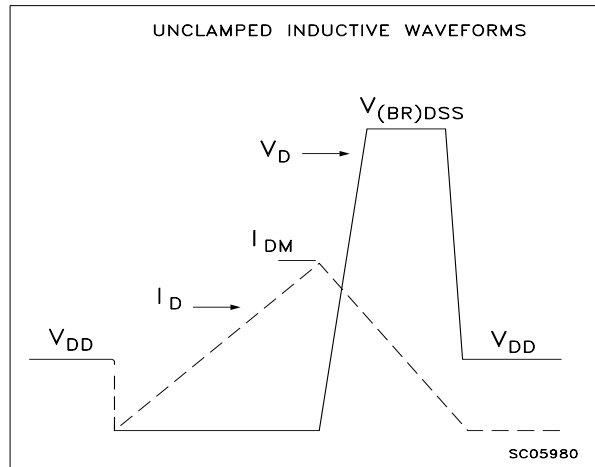


Fig. 3: Switching Times Test Circuit For Resistive Load

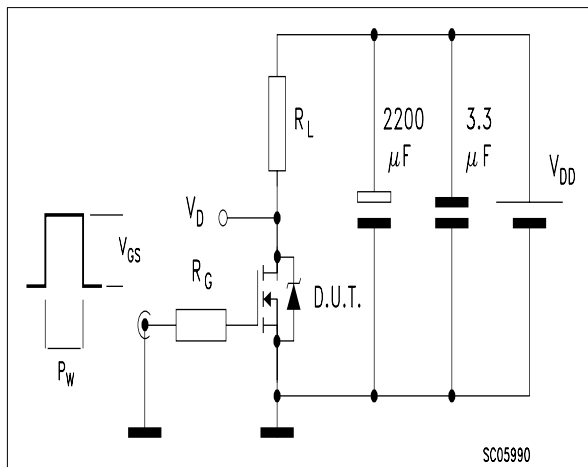


Fig. 4: Gate Charge test Circuit

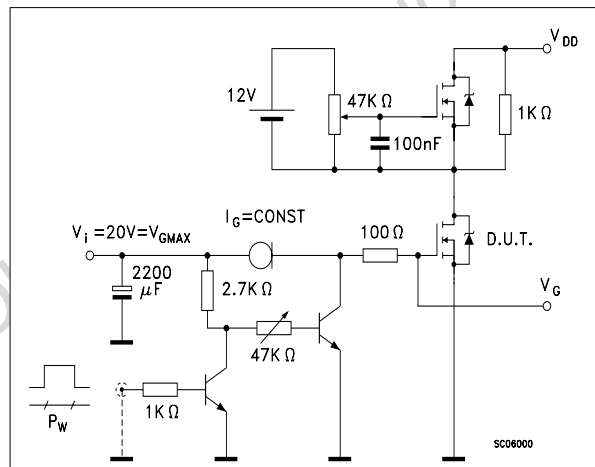
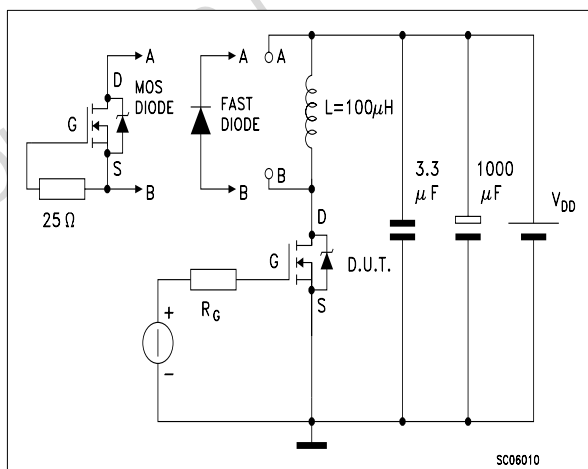
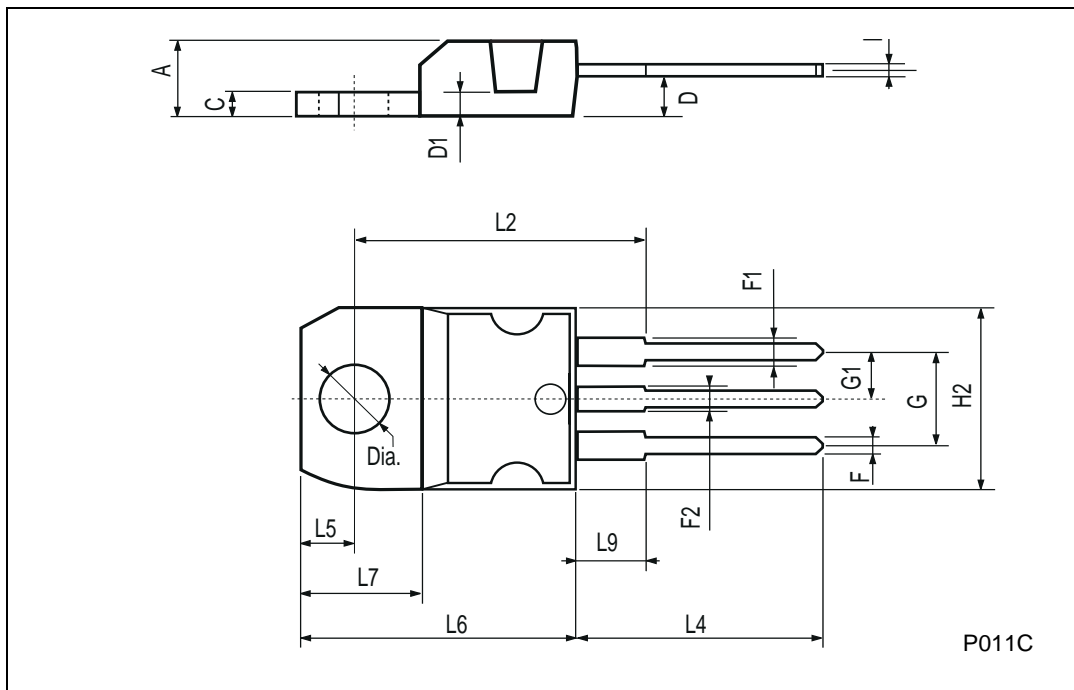


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



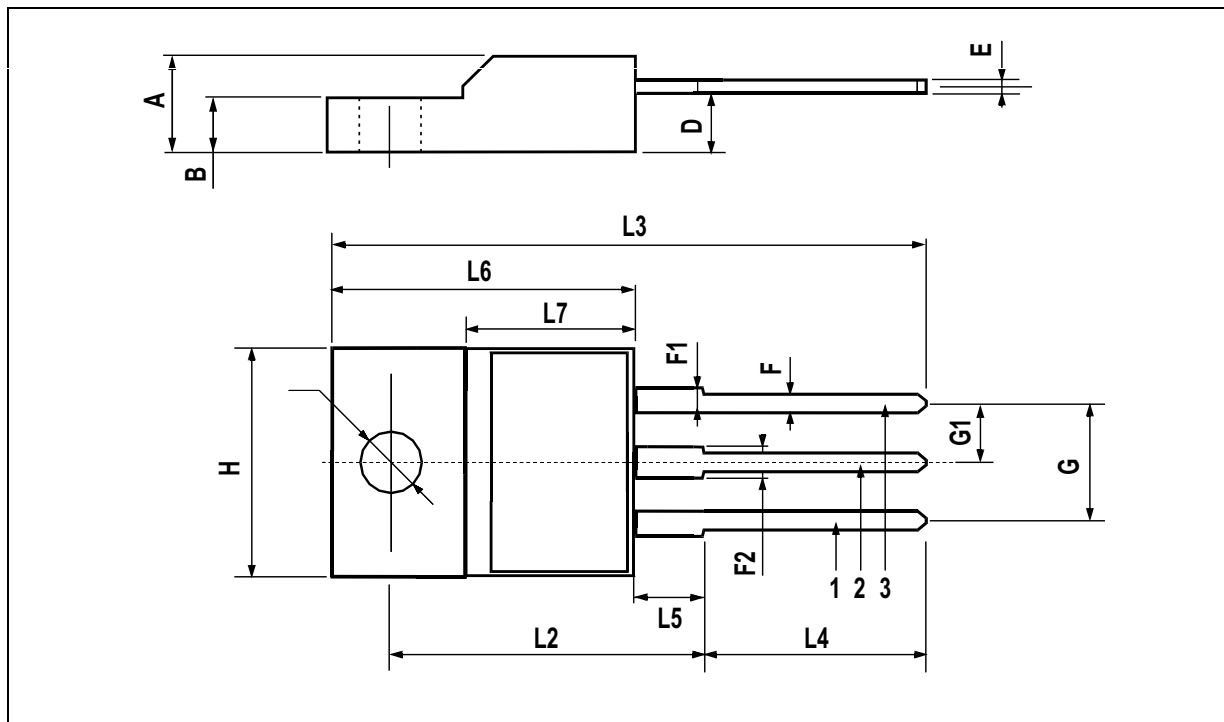
TO-220 MECHANICAL DATA

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
D1		1.27			0.050	
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		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



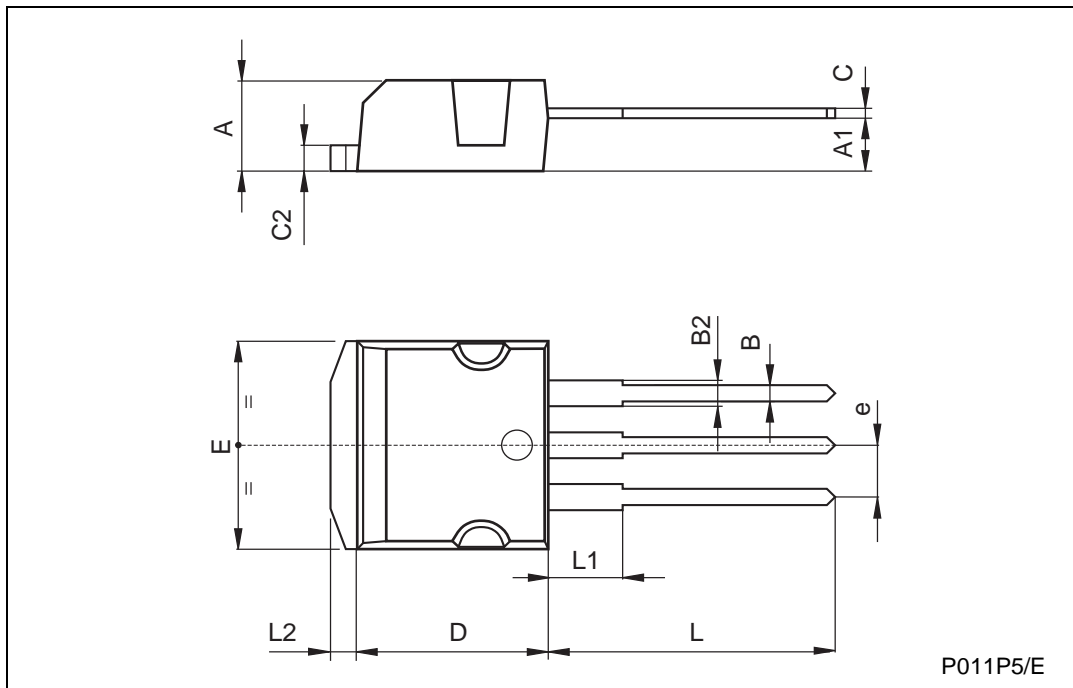
TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
∅	3		3.2	0.118		0.126



TO-262 (I²PAK) MECHANICAL DATA

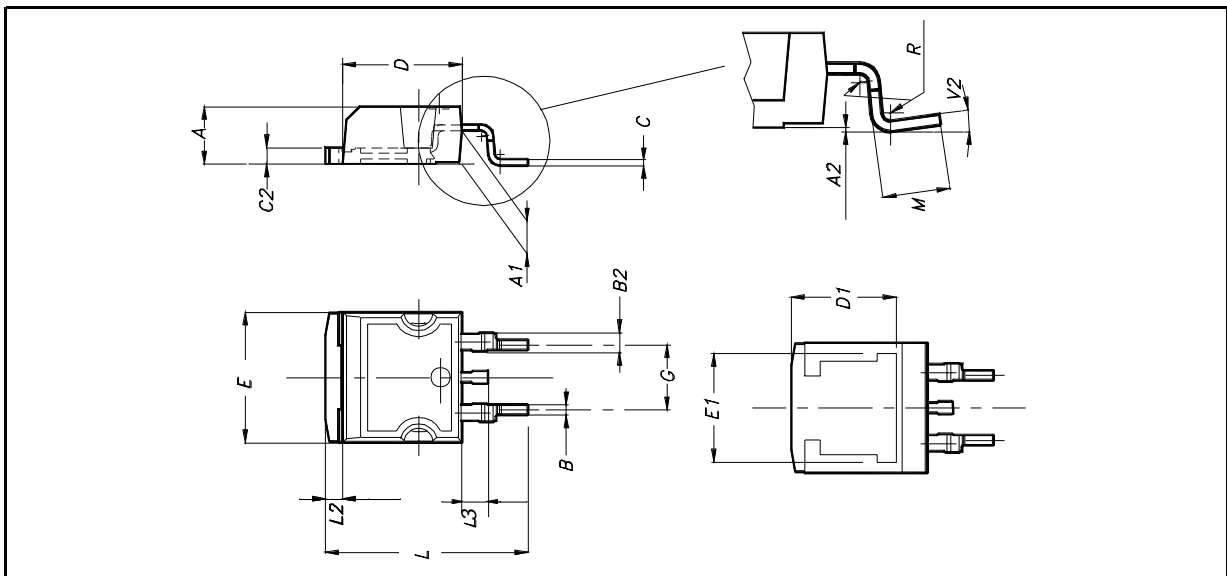
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
e	2.4		2.7	0.094		0.106
E	10		10.4	0.393		0.409
L	13.1		13.6	0.515		0.531
L1	3.48		3.78	0.137		0.149
L2	1.27		1.4	0.050		0.055



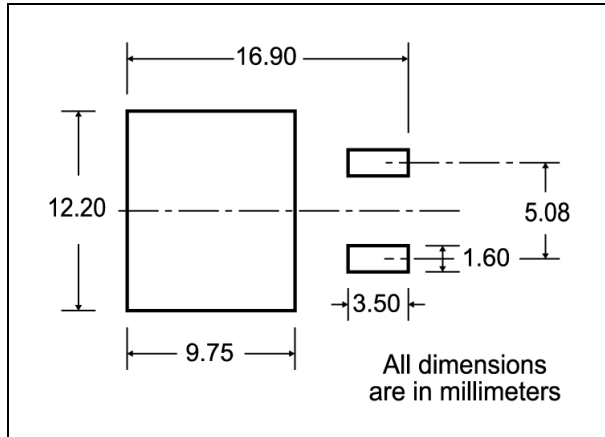
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D²PAK MECHANICAL DATA

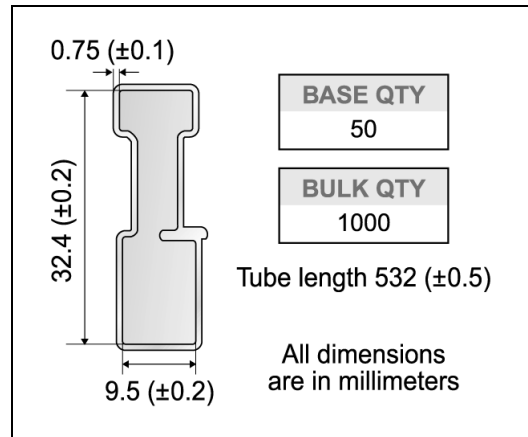
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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°			



D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

Diagram showing the tape mechanical data. The tape has a width of 40 mm min. Access hole at slot location. The distance from the center to the edge of the mounting pads is A. The distance from the center to the edge of the mounting pads is B. The distance from the center to the edge of the mounting pads is C. The distance from the center to the edge of the mounting pads is D. The distance from the center to the edge of the mounting pads is G measured at hub. The distance from the center to the edge of the mounting pads is N. The distance from the center to the edge of the mounting pads is T. The distance from the center to the edge of the mounting pads is 2.5 mm min. width. The distance from the center to the edge of the mounting pads is Full radius. The distance from the center to the edge of the mounting pads is Tape slot in core for tape start.

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

Diagram showing the tape mechanical data. The tape has a width of 40 mm min. Access hole at slot location. The distance from the center to the edge of the mounting pads is A. The distance from the center to the edge of the mounting pads is B. The distance from the center to the edge of the mounting pads is C. The distance from the center to the edge of the mounting pads is D. The distance from the center to the edge of the mounting pads is G measured at hub. The distance from the center to the edge of the mounting pads is N. The distance from the center to the edge of the mounting pads is T. The distance from the center to the edge of the mounting pads is 2.5 mm min. width. The distance from the center to the edge of the mounting pads is Full radius. The distance from the center to the edge of the mounting pads is Tape slot in core for tape start.

* on sales type



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