



# STP55NF06L - STP55NF06LFP STB55NF06L - STB55NF06L-1

N-CHANNEL 60V - 0.014Ω - 55A TO-220/FP/D<sup>2</sup>PAK/I<sup>2</sup>PAK  
STripFET™II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP55NF06L	60 V	<0.018 Ω	55 A
STP55NF06LFP	60 V	<0.018 Ω	55 A
STB55NF06L	60 V	<0.018 Ω	55 A
STB55NF06L-1	60 V	<0.018 Ω	55 A

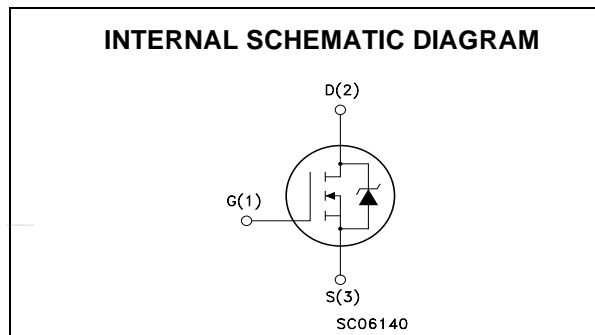
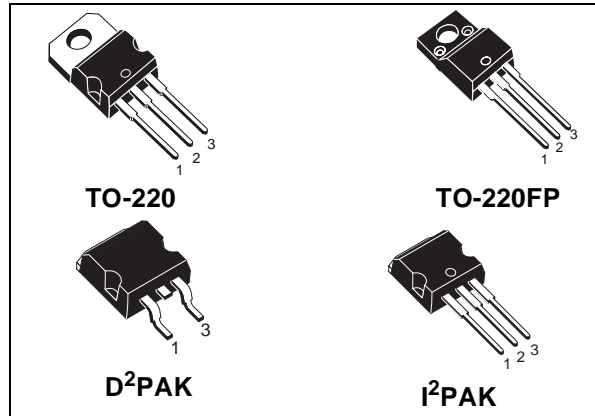
- TYPICAL R<sub>DS(on)</sub> = 0.014Ω
- EXCEPTIONAL dv/dt CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

## 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

- HIGH CURRENT, HIGH SPEED SWITCHING
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP55NF06L STB55NF06L/-1	STP55NF06LFP	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	60		V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	60		V
V <sub>GS</sub>	Gate- source Voltage	± 16		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	55	30	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	39	21	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	220	120	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	95	30	W
	Derating Factor	0.63	0.2	W/°C
dv/dt (2)	Peak Diode Recovery voltage slope	20		V/ns
E <sub>AS</sub> (1)	Single Pulse Avalanche Energy	300		mJ
V <sub>ISO</sub>	Insulation Withstand Voltage (DC)	-	2500	V
T <sub>stg</sub>	Storage Temperature	- 55 to 175		°C
T <sub>j</sub>	Max. Operating Junction Temperature			

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

(1) Starting T<sub>j</sub>=25°C, I<sub>D</sub>=27.5A, V<sub>DD</sub>=30V

(2) I<sub>SD</sub> ≤ 55 A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>. 1/12

**STP55NF06L - STP55NF06LFP - STB55NF06L - STB55NF06L-1**

**THERMAL DATA**

		TO-220 D <sup>2</sup> PAK I <sup>2</sup> PAK	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	1.58	5.0	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	300		°C

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	60			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating, T <sub>C</sub> = 125 °C			1 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 16 V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1	1.7		V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 5 V, I <sub>D</sub> = 27.5 A V <sub>GS</sub> = 10V, I <sub>D</sub> = 27.5 A		0.016 0.014	0.020 0.018	Ω Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> = 15V, I <sub>D</sub> = 27.5 A		30		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		1700		pF
C <sub>oss</sub>	Output Capacitance			300		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			105		pF

**STP55NF06L - STP55NF06LFP - STB55NF06L - STB55NF06L-1**

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 30\text{ V}$ , $I_D = 27.5\text{ A}$		20		ns
$t_r$	Rise Time	$R_G = 4.7\Omega$ , $V_{GS} = 10\text{ V}$ (see test circuit, Figure 3)		100		ns
$Q_g$	Total Gate Charge	$V_{DD} = 48\text{ V}$ , $I_D = 55\text{ A}$ ,		27	37	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} = 4.5\text{ V}$		7		nC
$Q_{gd}$	Gate-Drain Charge			10		nC

**SWITCHING OFF**

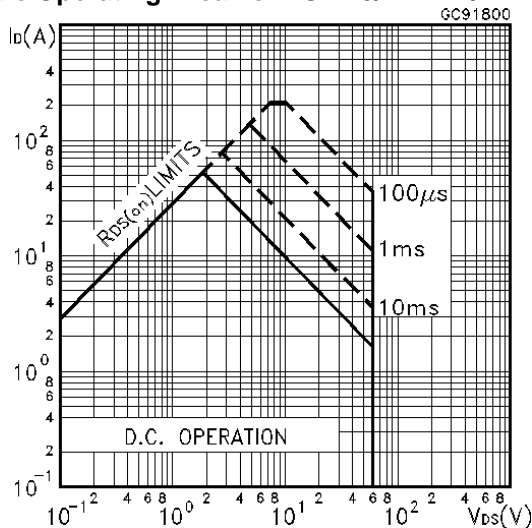
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 30\text{ V}$ , $I_D = 27.5\text{ A}$ ,		40		ns
$t_f$	Fall Time	$R_G = 4.7\Omega$ , $V_{GS} = 4.5\text{ V}$ (see test circuit, Figure 5)		20		ns

**SOURCE DRAIN DIODE**

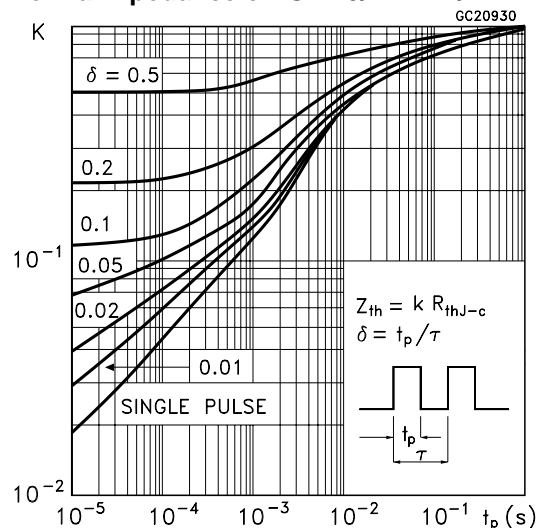
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				55	A
$I_{SDM(2)}$	Source-drain Current (pulsed)				220	A
$V_{SD(1)}$	Forward On Voltage	$I_{SD} = 55\text{ A}$ , $V_{GS} = 0$			1.3	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 55\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,		80		ns
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 30\text{ V}$ , $T_j = 150^\circ\text{C}$		200		nC
$I_{RRM}$	Reverse Recovery Current	(see test circuit, Figure 5)		5		A

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
2. Pulse width limited by safe operating area.

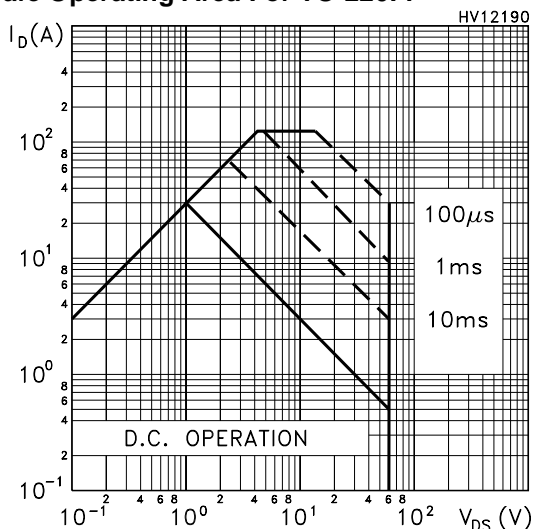
**Safe Operating Area For TO-220/D2PAK/I2PAK**



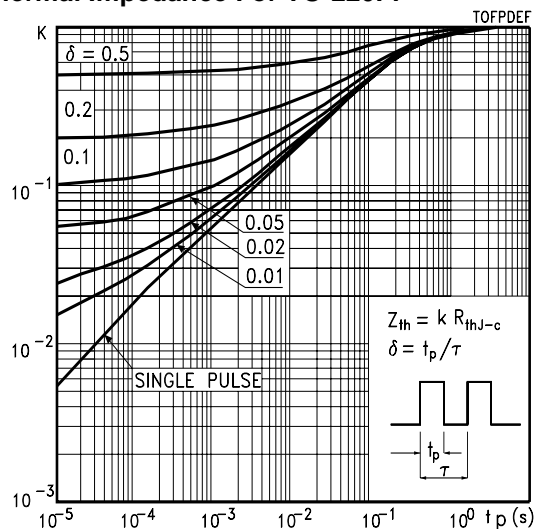
**Thermal Impedance for TO-220/D2PAK/I2PAK**



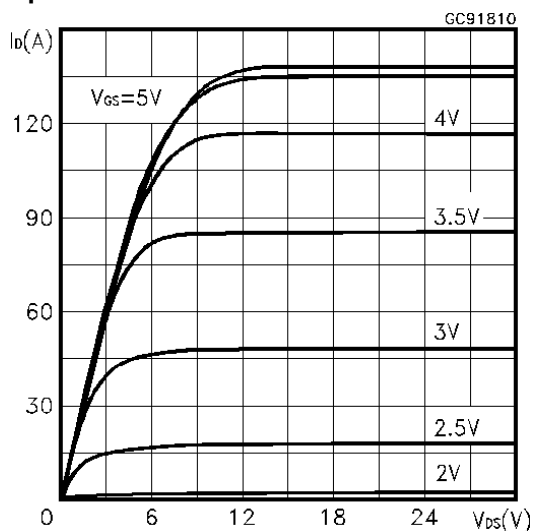
Safe Operating Area For TO-220FP



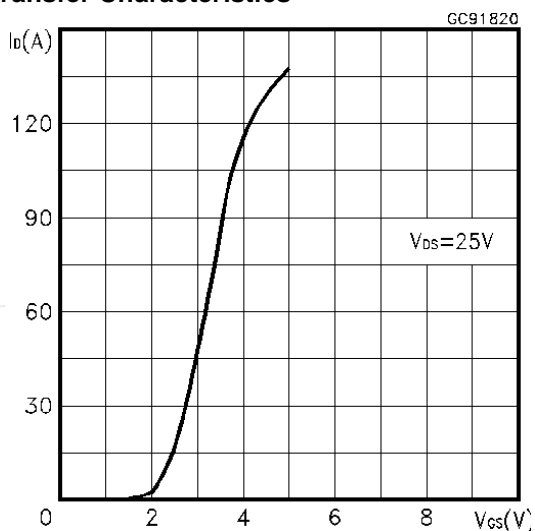
Thermal Impedance For TO-220FP



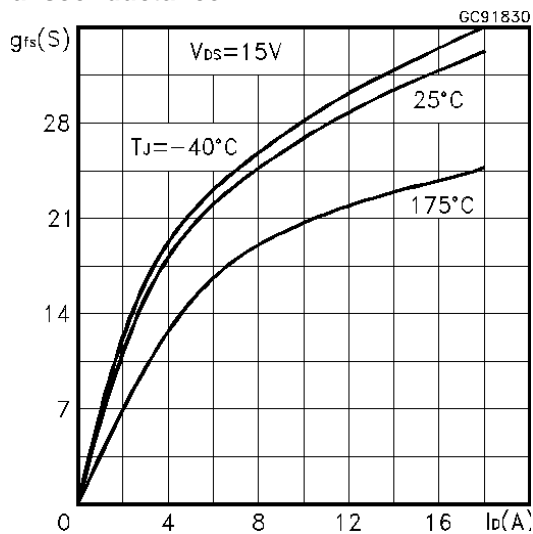
Output Characteristics



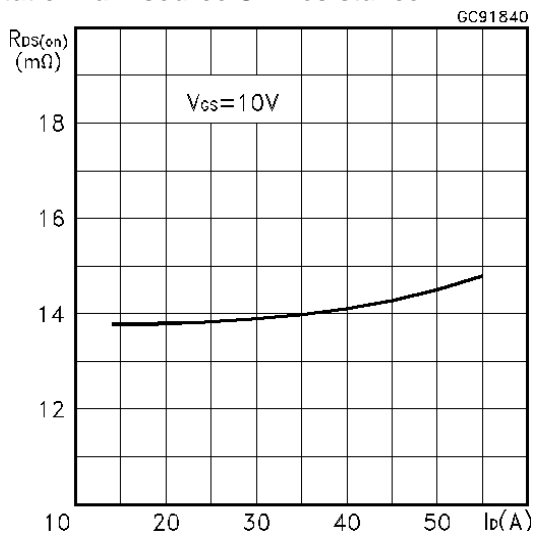
Transfer Characteristics



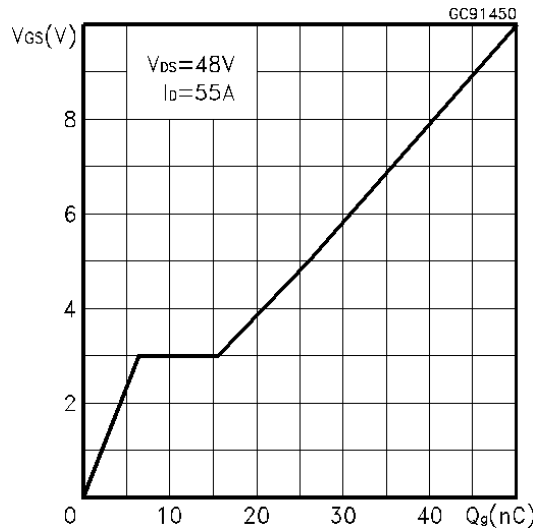
Transconductance



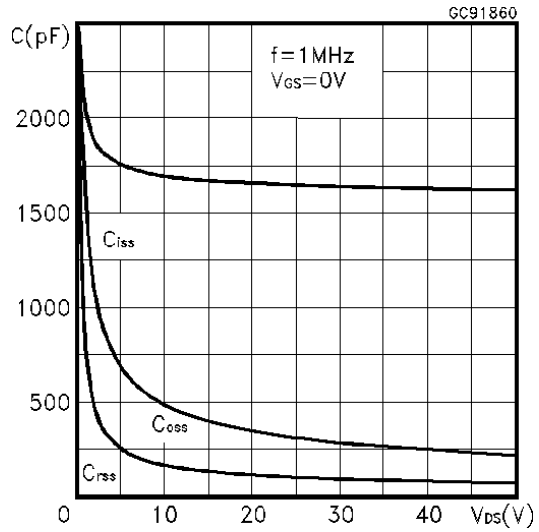
Static Drain-source On Resistance



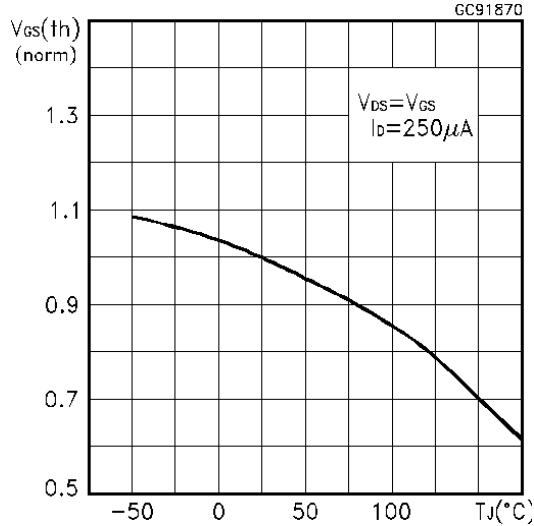
Gate Charge vs Gate-source Voltage



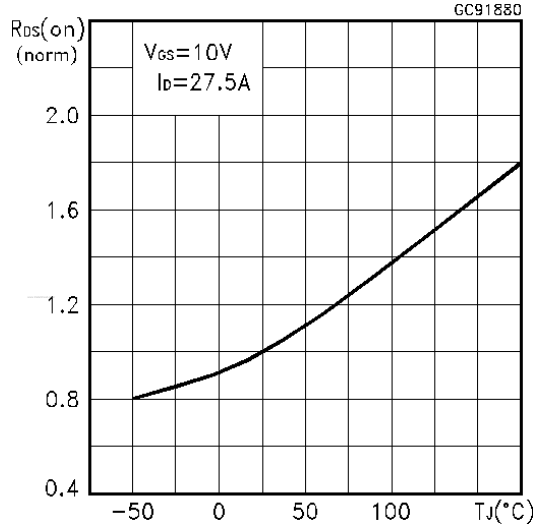
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

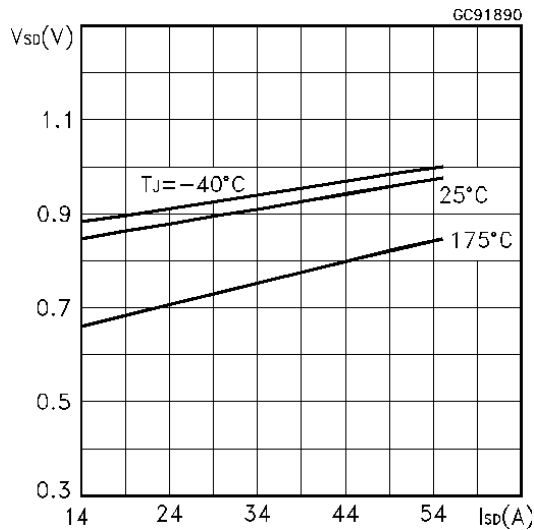


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform

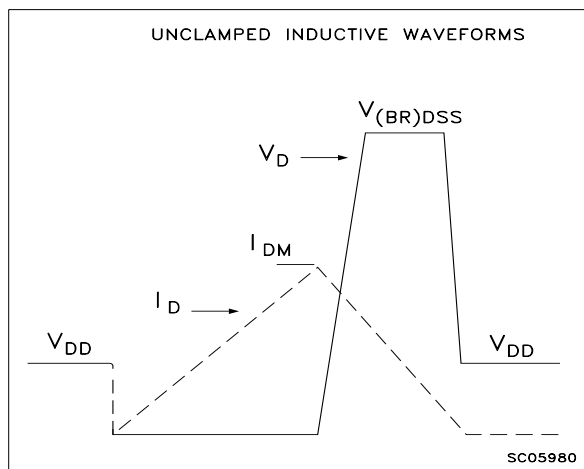


Fig. 3: Switching Times Test Circuit For Resistive Load

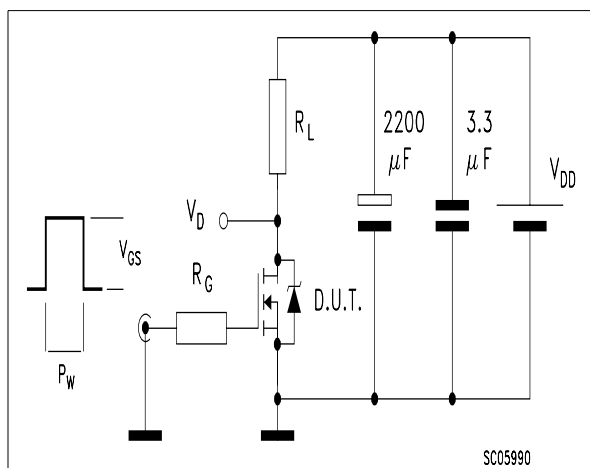


Fig. 4: Gate Charge test Circuit

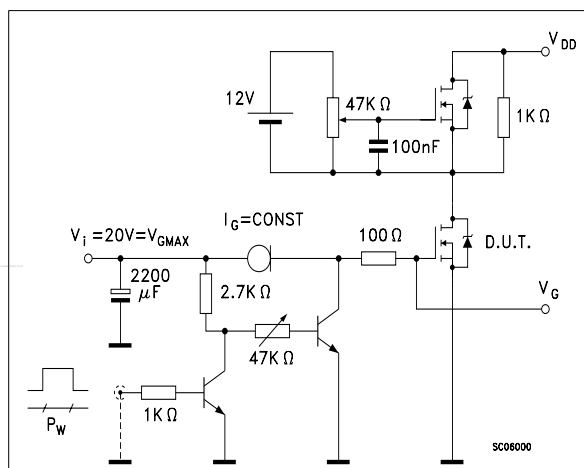
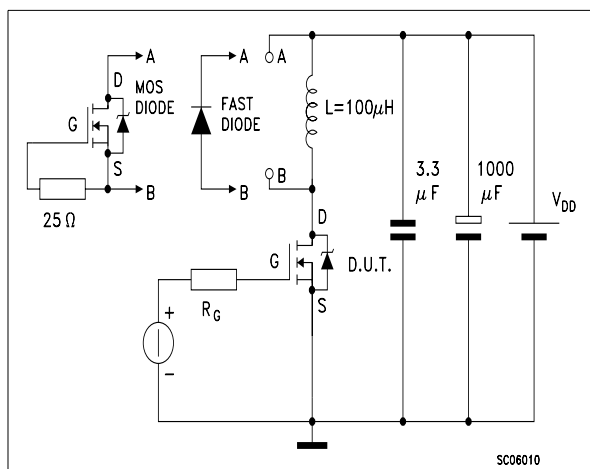
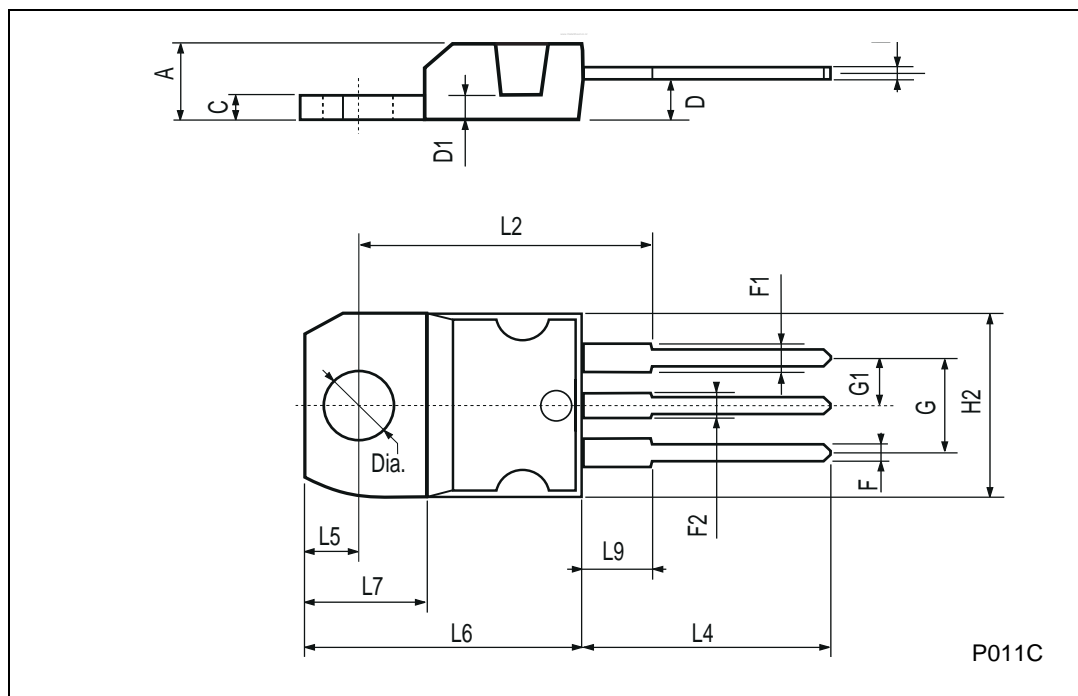


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



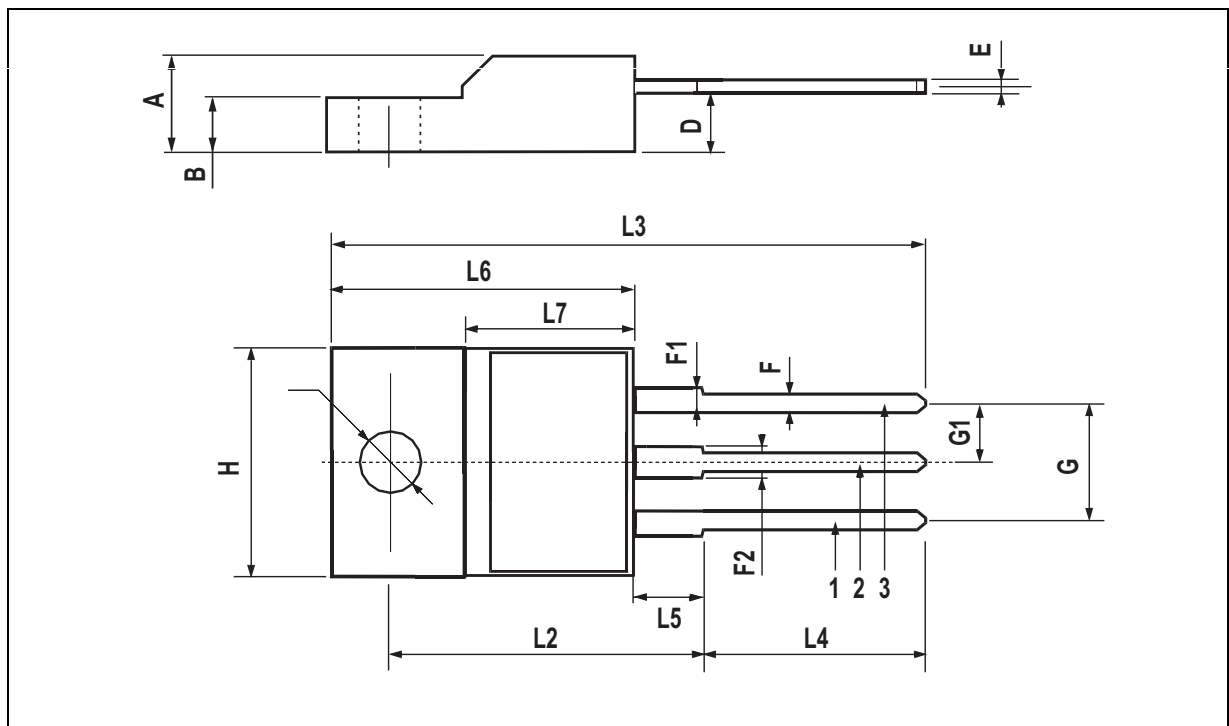
TO-220 MECHANICAL DATA

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**

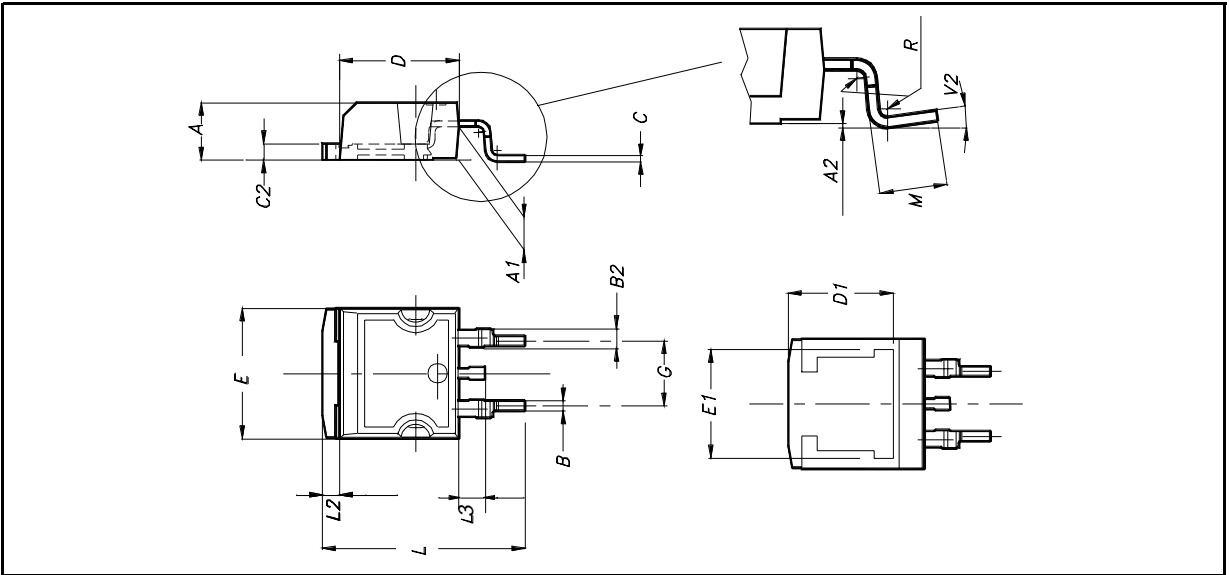
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			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





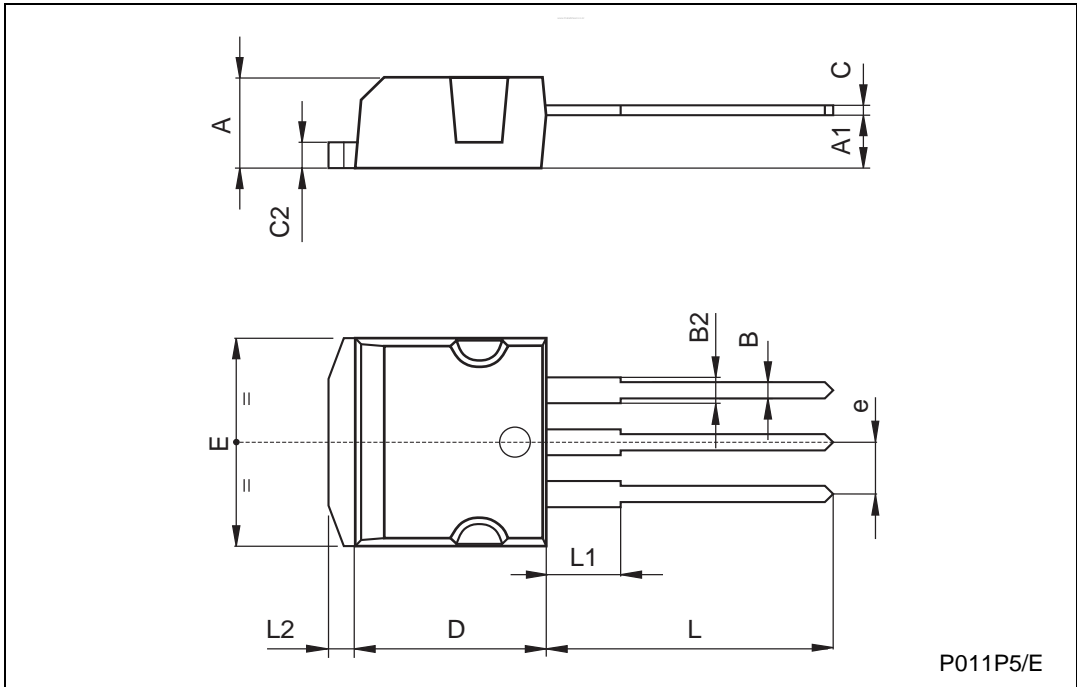
**D<sup>2</sup>PAK MECHANICAL DATA**

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°			

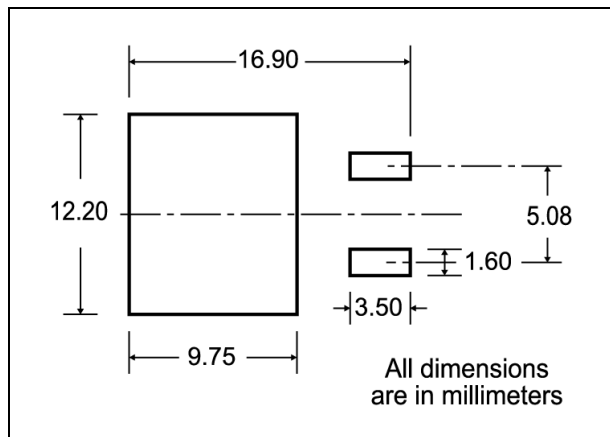


TO-262 (I<sup>2</sup>PAK) MECHANICAL DATA

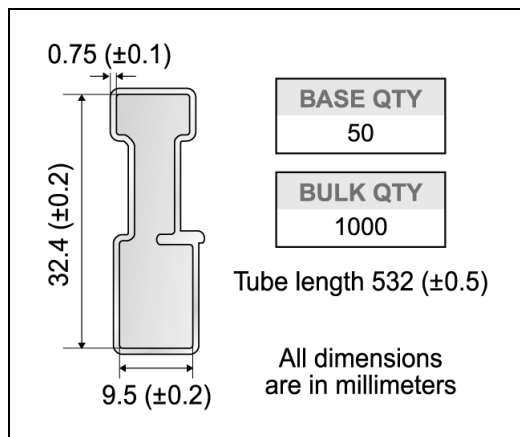
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
e	2.4		2.7	0.094		0.106
E	10		10.4	0.393		0.409
L	13.1		13.6	0.515		0.531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



**D<sup>2</sup>PAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

Diagram showing the tape mechanical data. It includes a circular view of the tape with dimensions A, B, C, D, and a note for a 40 mm min. access hole at the slot location. A side view shows dimensions T, C, N, and G (measured at the hub). A note indicates a 'Tape slot in core for tape start 2.5mm min. width' and 'Full radius'.

**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

**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

<b>BASE QTY</b>	<b>BULK QTY</b>
1000	1000

Diagram showing the reel mechanical data. It includes a side view of the reel with dimensions K<sub>0</sub>, T, D, P<sub>2</sub>, P<sub>0</sub>, E, F, W, B<sub>0</sub>, D<sub>1</sub>, A<sub>0</sub>, P<sub>1</sub>, and a note for '10 pitches cumulative tolerance on tape +/- 0.2 mm'. A top view shows the 'TOP COVER TAPE' and 'Center line of cavity'. A bottom view shows the 'FEED DIRECTION' and 'User Direction of Feed'. A bending radius diagram shows 'R min.'.

\* on sales type



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