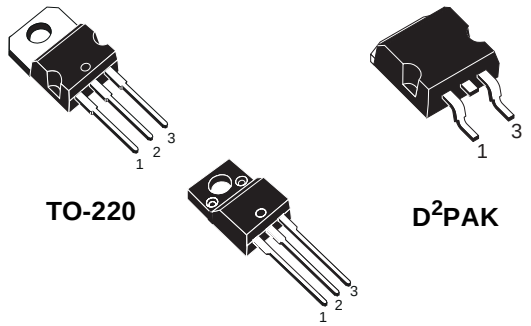
STP45NF3LL - STP45NF3LLFP
STB45NF3LL

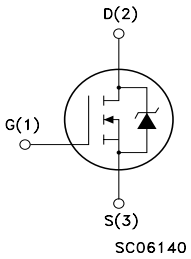
N-CHANNEL 30V - 0.014Ω - 45A TO-220 - TO220FP - D²PAK
STripFET II™ POWER MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP45NF3LL	30 V	<0.018Ω	45 A
STP45NF3LLFP	30 V	<0.018Ω	45 A
STB45NF3LL	30 V	<0.018Ω	27 A

- TYPICAL R_{DS}(on) = 0.014Ω @4.5V
- OPTIMAL RDS(ON) x Qg TRADE-OFF @ 4.5V
- CONDUCTION LOSSES REDUCED
- SWITCHING LOSSES REDUCED
- ADD SUFFIX "T4" FOR ORDERING IN TAPE & REEL



INTERNAL SCHEMATIC DIAGRAM



DESCRIPTION

This application specific Power MOSFET is the third genaration of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows the best trade-off between on-resistance ang gate charge. When used as high and low side in buck regulators, it gives the best performance in terms of both conduction and switching losses. This is extremely important for motherboards where fast switching and high efficiency are of paramount importance.

APPLICATIONS

- SPECIFICALLY DESIGNED AND OPTIMISED FOR HIGH EFFICIENCY DC/DC CONVERTERS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		TO-220/D²PAK	TO-220FP	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	30		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	30		V
V_{GS}	Gate- source Voltage	± 16		V
I_D	Drain Current (continuous) at T_C = 25°C	45	27	A
I_D	Drain Current (continuous) at T_C = 100°C	32	19	A
I_{DM} (●)	Drain Current (pulsed)	180	108	A
P_{TOT}	Total Dissipation at T_C = 25°C	70	25	W
	Derating Factor	0.46	0.167	W/°C
E_{AS} (1)	Single Pulse Avalanche Energy	241		mJ
Viso	Insulation Withstand Voltage (DC)	--	2500	V
T_{stg}	Storage Temperature	– 55 to 175		°C
T_j	Max. Operating Junction Temperature			

(●) Pulse width limited by safe operating area

(1) Starting T_j= 25°C, I_D= 22.5A, V_{DD}= 24V

THERMAL DATA

		TO-220 D^2PAK	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	2.14	6	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
T_l	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
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	30			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS} = Max Rating, T_C = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 16 V			±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	1			V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V, I_D = 22.5 A		0.014	0.018	Ω
		V_{GS} = 4.5V, I_D = 22.5 A		0.016	0.020	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} =15 V , I_D = 22.5 A		20		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		800		pF
C_{oss}	Output Capacitance			250		pF
C_{rss}	Reverse Transfer Capacitance			60		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 15 V, I_D = 22.5A		17		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 4.5V (Resistive Load, see Fig. 3)		100		ns
Q_g	Total Gate Charge	V_{DD} = 24V, I_D = 45A,		12.5	17	nC
Q_{gs}	Gate-Source Charge	V_{GS} = 5V		4.6		nC
Q_{gd}	Gate-Drain Charge			5.2		nC

SWITCHING OFF

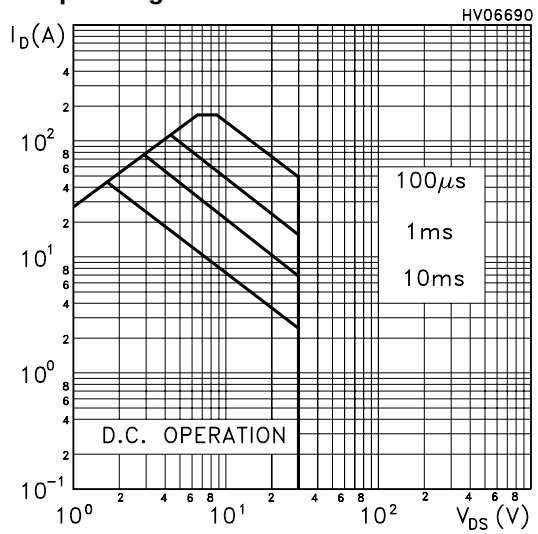
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	V_{DD} = 15V, I_D = 22.5A,		20		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 4.5V (Resistive Load, see Fig. 3)		21		ns

SOURCE DRAIN DIODE

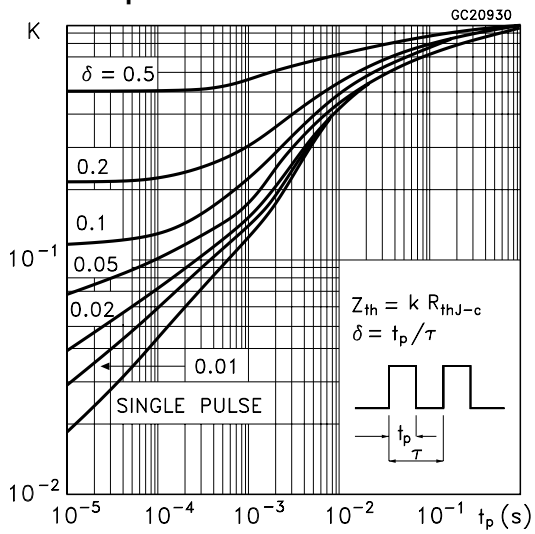
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				45	A
I_{SDM} (2)	Source-drain Current (pulsed)				180	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 45A, V_{GS} = 0			1.3	V
t_{rr}	Reverse Recovery Time	I_{SD} = 45A, di/dt = 100A/µs,		35		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 15V, T_j = 150°C		44		nC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		2.5		A

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

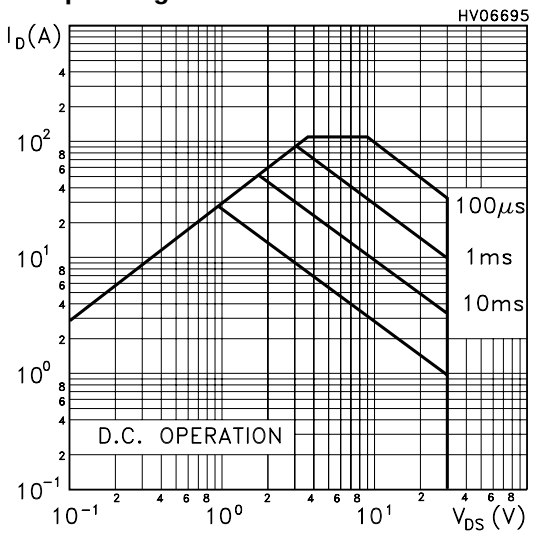
Safe Operating Area for TO-220/D2PAK



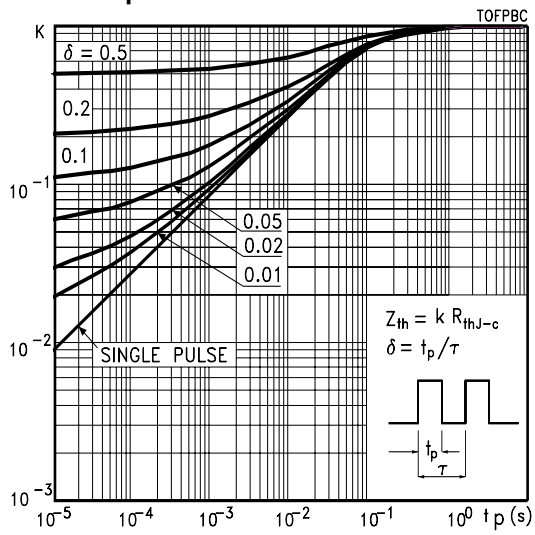
Thermal Impedance for TO-220/D2PAK



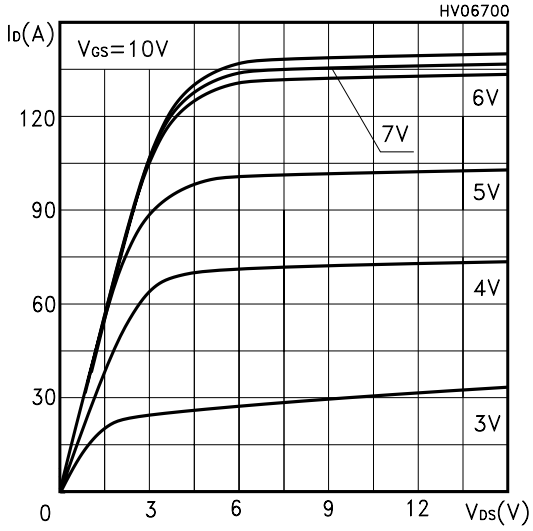
Safe Operating Area for TO-220FP



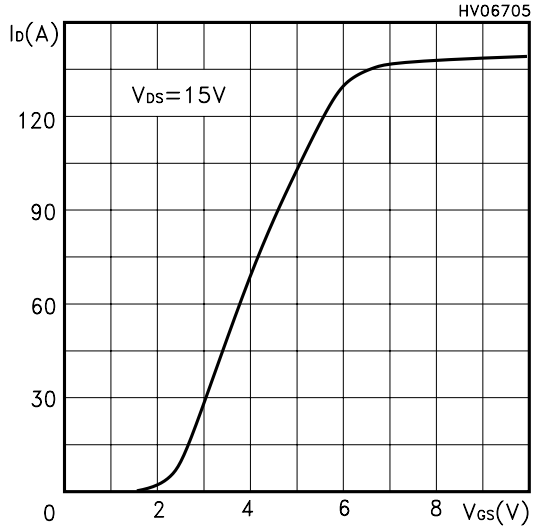
Thermal Impedance for TO-220FP



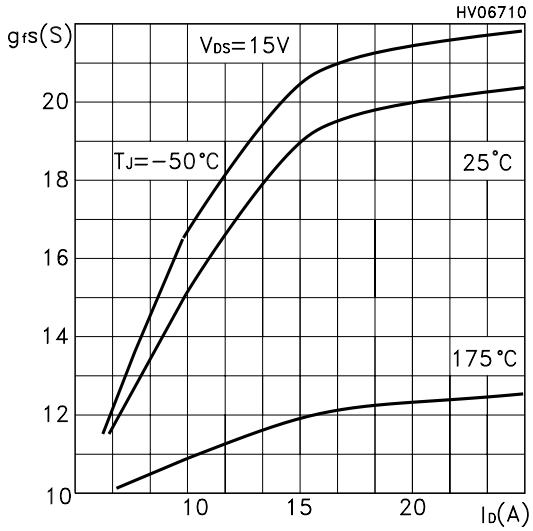
Output Characteristics



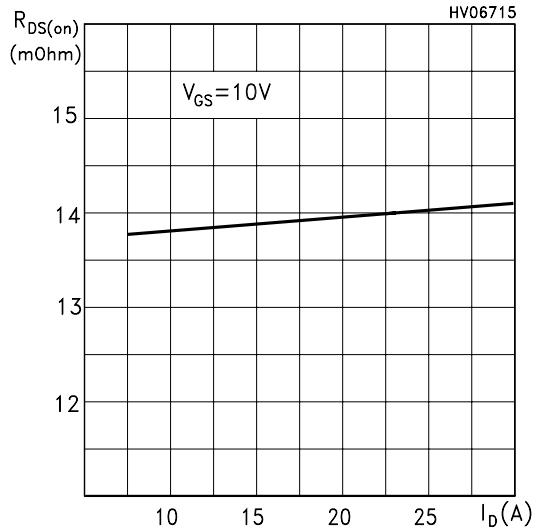
Transfer Characteristics



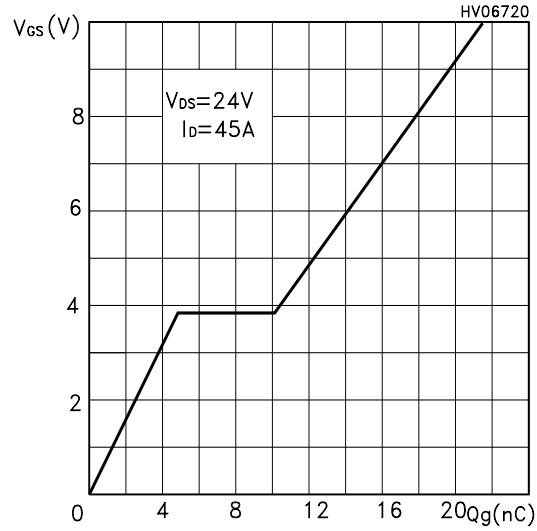
Transconductance



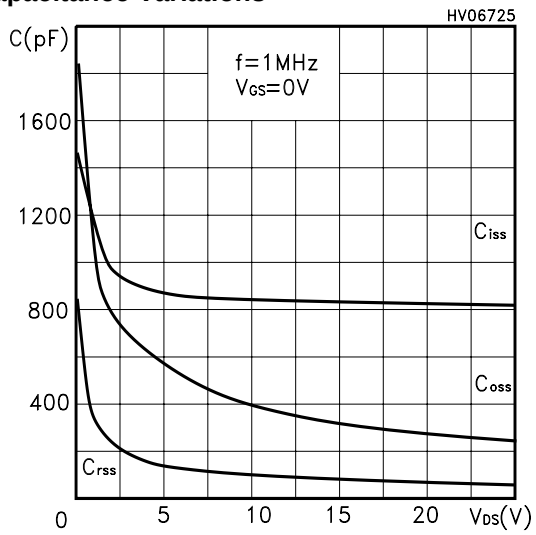
Static Drain-source On Resistance



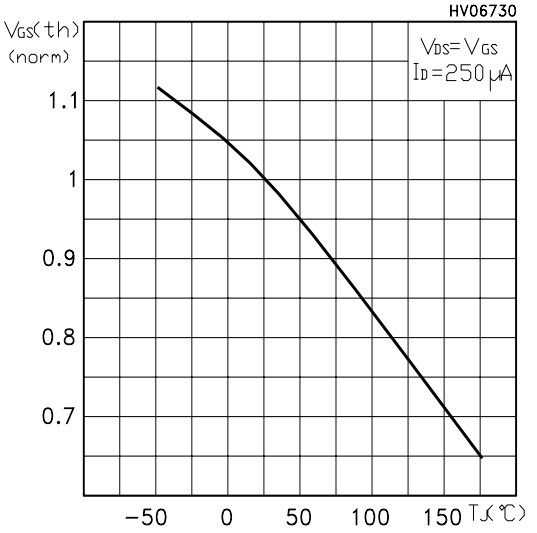
Gate Charge vs Gate-source Voltage



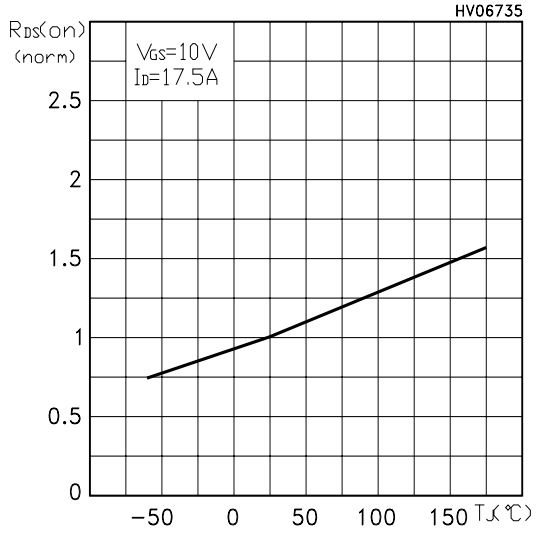
Capacitance Variations



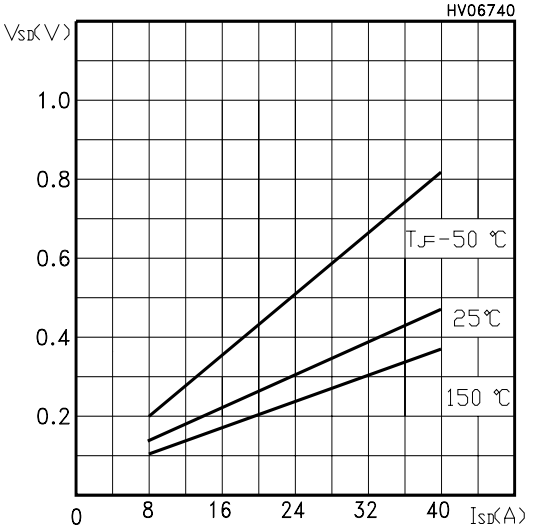
Normalized Gate Thereshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Tj

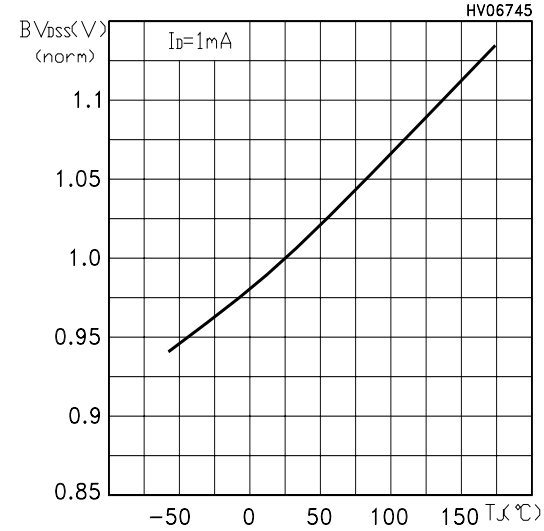


Fig. 1: Unclamped Inductive Load Test Circuit

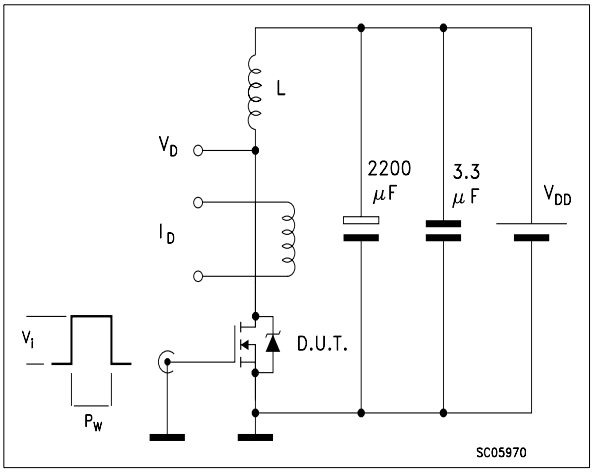


Fig. 2: Unclamped Inductive Waveform

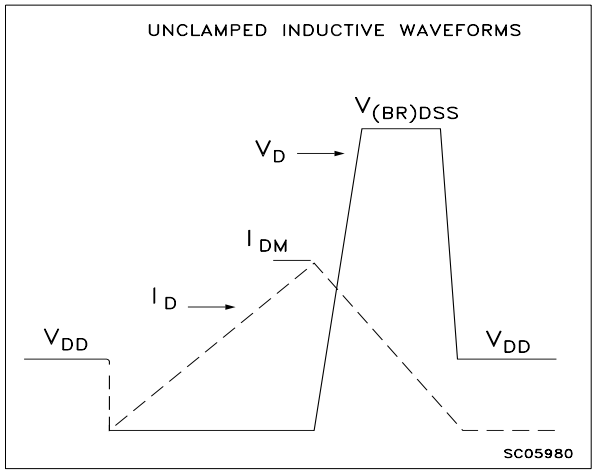


Fig. 3: Switching Times Test Circuit For Resistive Load

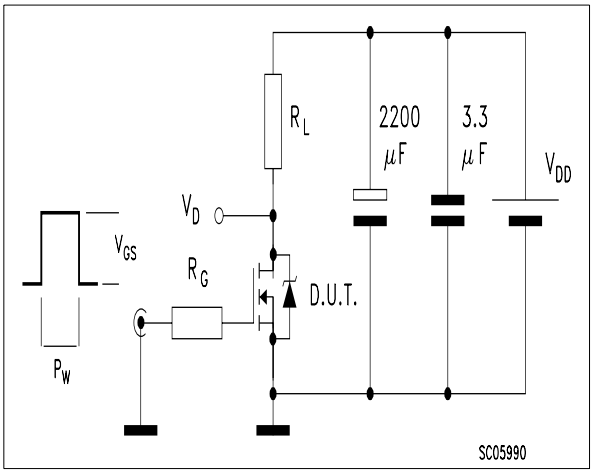


Fig. 4: Gate Charge test Circuit

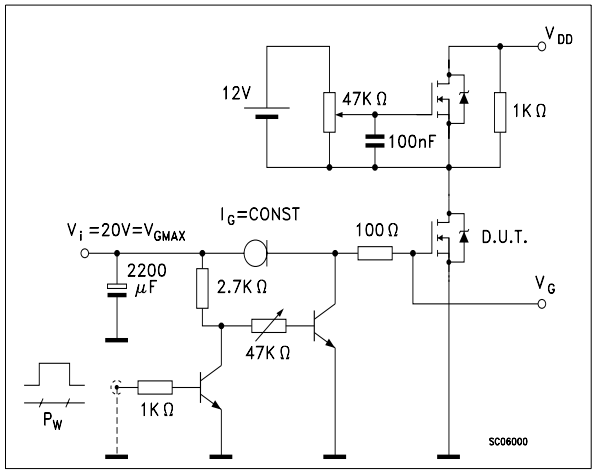
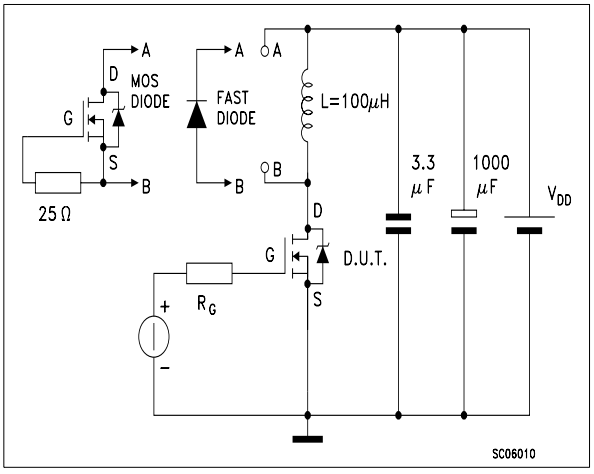
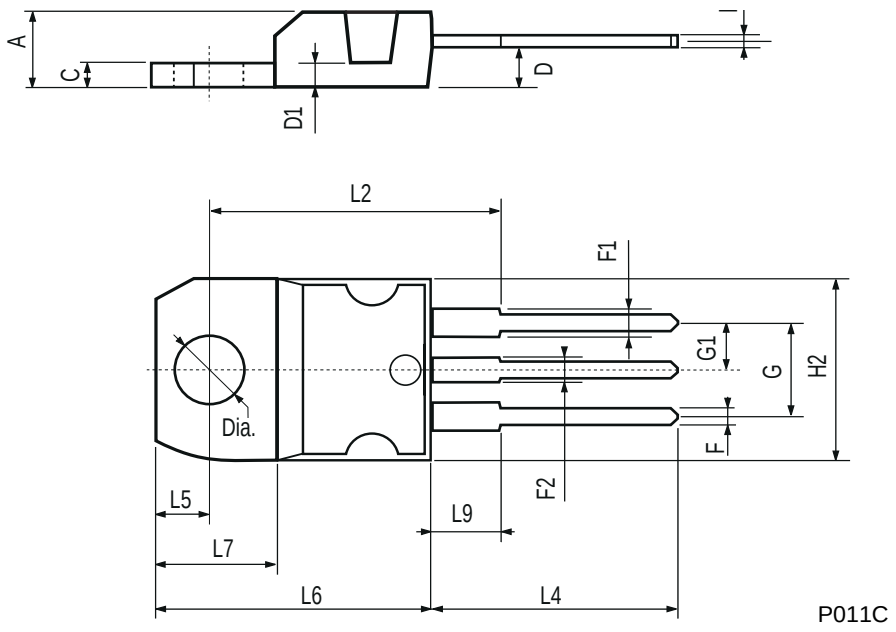


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



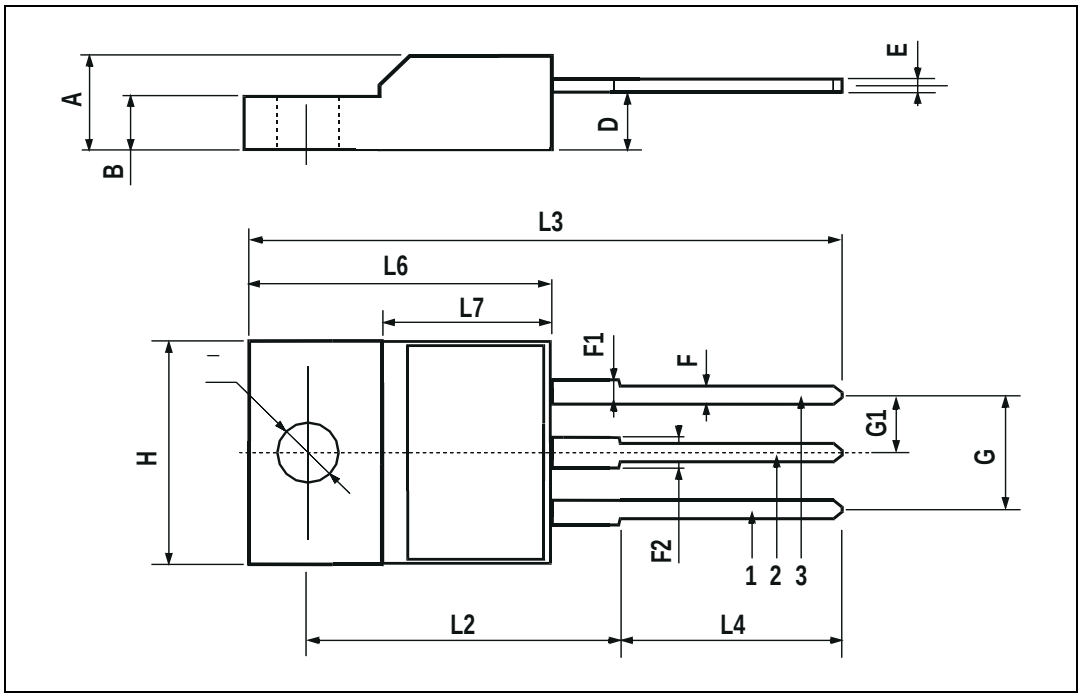
TO-220 MECHANICAL DATA

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



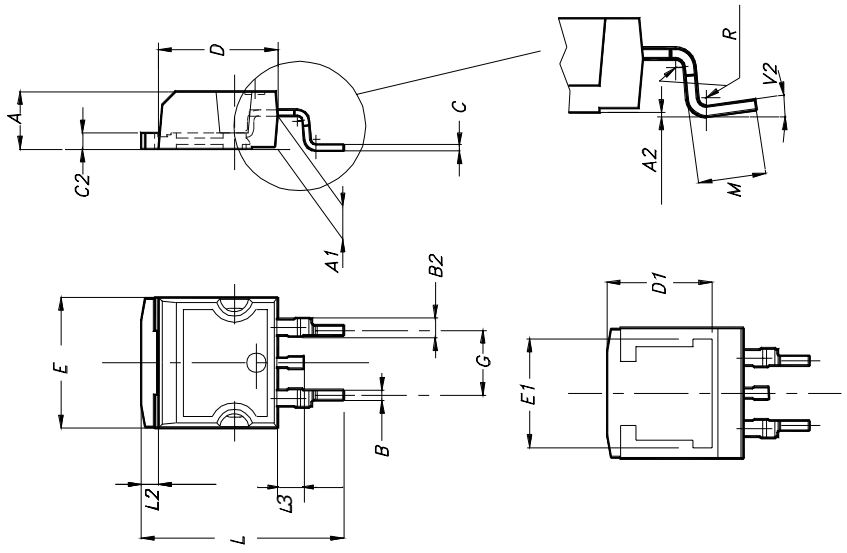
TO-220FP MECHANICAL DATA

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	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126

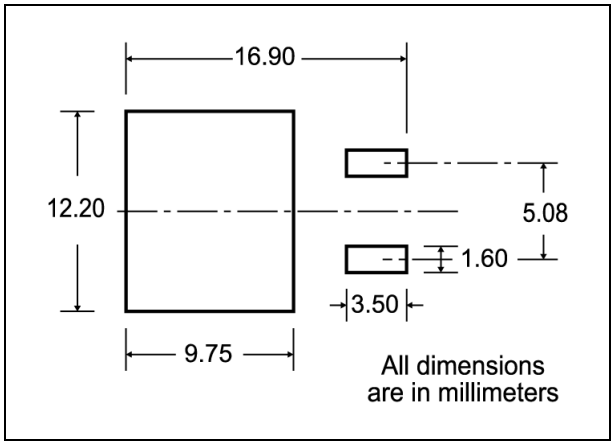


D²PAK MECHANICAL DATA

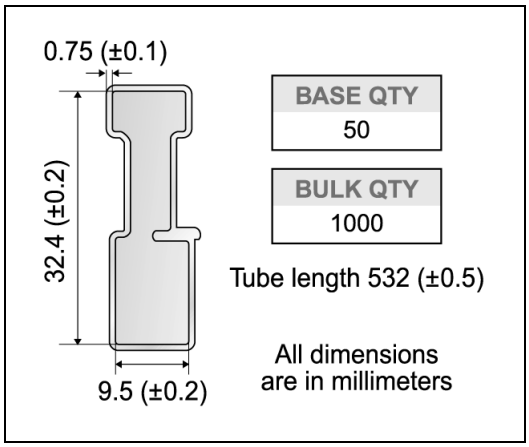
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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	0º		8º			



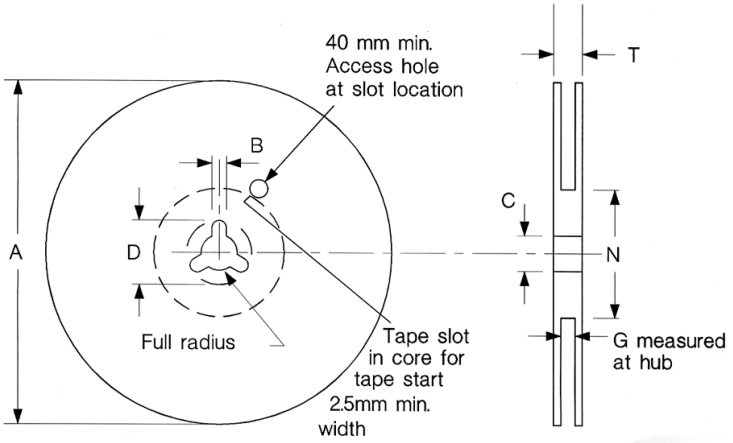
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



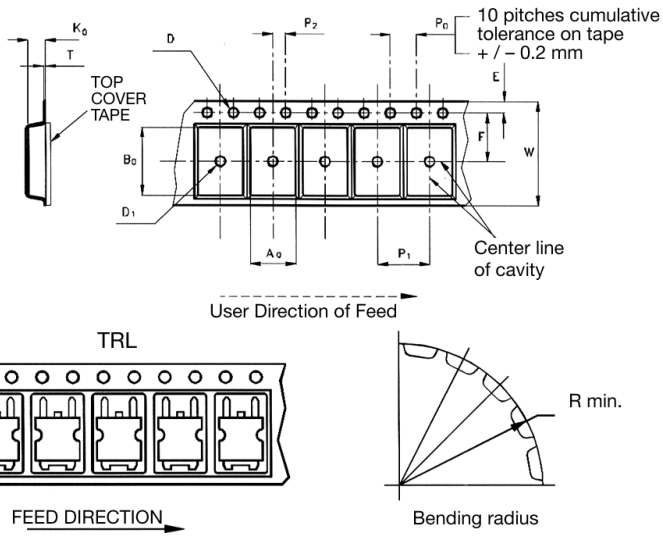
REEL MECHANICAL DATA

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		0795	
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



* on sales type

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