



## STB45NF06

N-CHANNEL 60V - 0.022Ω - 38A D<sup>2</sup>PAK

STripFET™ II MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STB45NF06	60V	<0.028Ω	38A

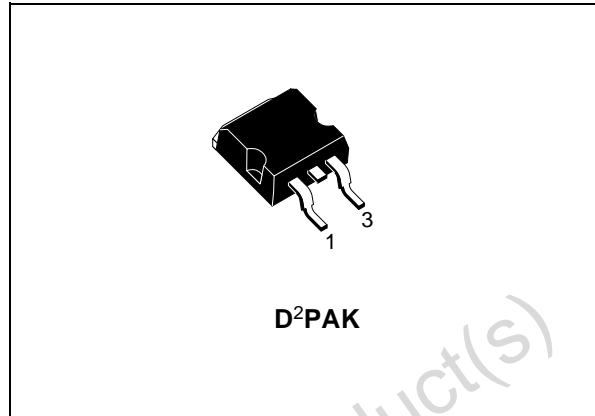
- TYPICAL R<sub>DS(on)</sub> = 0.022Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- STANDARD THRESHOLD DRIVE

### DESCRIPTION

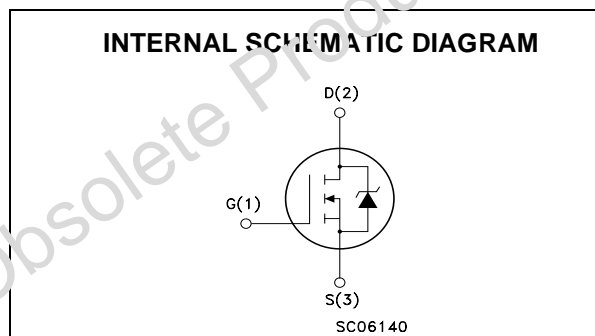
This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- SOLENOID AND RELAY DRIVERS
- DC-DC & DC-AC CONVERTERS



D<sup>2</sup>PAK



### ORDER CODES

PART NUMBER	MARKING	PACKAGE	PACKAGING
STB45NF06T4	B45NF06	D <sup>2</sup> PAK	TAPE & REEL

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
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	±20	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	38	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	26	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	152	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	80	W
	Derating Factor	0.53	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	7	V/ns
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area  
 (1) I<sub>SD</sub> ≤ 38A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.

**THERMAL DATA**

R <sub>thj-case</sub>	Thermal Resistance Junction-case Max	1.87	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient Max	62.5	°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

**AVALANCHE CHARACTERISTICS**

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max)	38	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	135	mJ

**ELECTRICAL CHARACTERISTICS (T<sub>CASE</sub> = 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> = ±20V			±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> = 250μA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 19 A		0.022	0.028	Ω

## ELECTRICAL CHARACTERISTICS (CONTINUED)

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ , $I_D = 19\text{ A}$		24		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$		1730		pF
$C_{oss}$	Output Capacitance			215		pF
$C_{rss}$	Reverse Transfer Capacitance			63		pF

## SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 30\text{V}$ , $I_D = 19\text{A}$ $R_G = 4.7\Omega$ , $V_{GS} = 10\text{V}$ (see test circuit, Figure 3)		20		ns
$t_r$	Rise Time			100		ns
$Q_g$	Total Gate Charge	$V_{DD} = 48\text{V}$ , $I_D = 38\text{A}$ , $V_{GS} = 10\text{V}$		43	58	nC
$Q_{gs}$	Gate-Source Charge			9		nC
$Q_{gd}$	Gate-Drain Charge			15		nC

## SWITCHING OFF

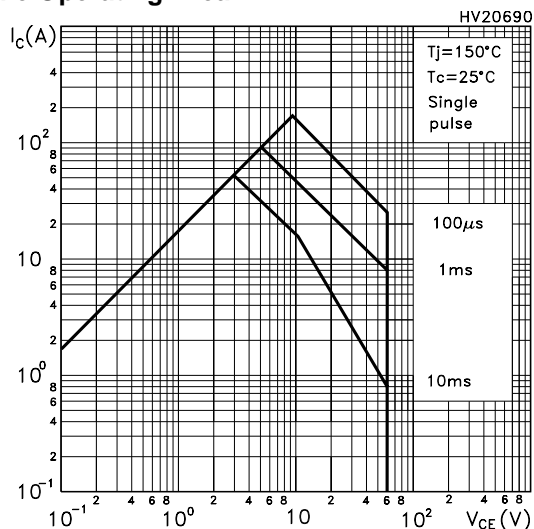
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 30\text{V}$ , $I_D = 19\text{A}$ , $R_G = 4.7\Omega$ , $V_{GS} = 10\text{V}$ (see test circuit, Figure 3)		50		ns
$t_f$	Fall Time			20		ns
$t_{d(off)}$	Off-voltage Rise Time	$V_{clamp} = 48\text{V}$ , $I_D = 38\text{A}$ $R_G = 4.7\Omega$ , $V_{GS} = 10\text{V}$ (see test circuit, Figure 5)		45		ns
$t_f$	Fall Time			42		ns
$t_c$	Cross-over Time			60		ns

## SOURCE DRAIN DIODE

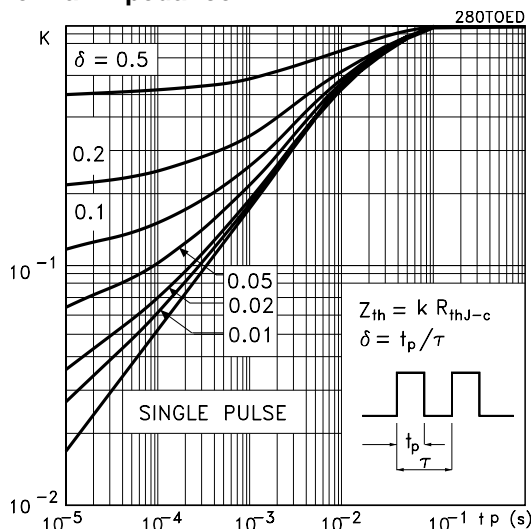
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				38	A
$I_{SDM}$ (1)	Source-drain Current (pulsed)				152	A
$V_{SD}$ (2)	Forward On Voltage	$I_{SD} = 38\text{A}$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 38\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ , $V_{DD} = 100\text{V}$ , $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		95		ns
$Q_{rr}$	Reverse Recovery Charge			260		nC
$I_{RRM}$	Reverse Recovery Current			5.5		A

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

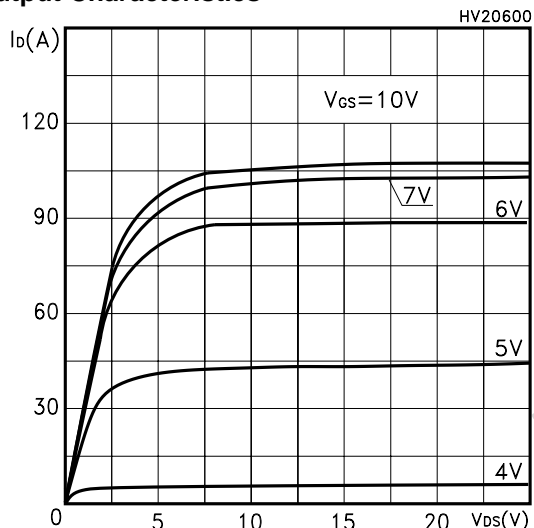
Safe Operating Area



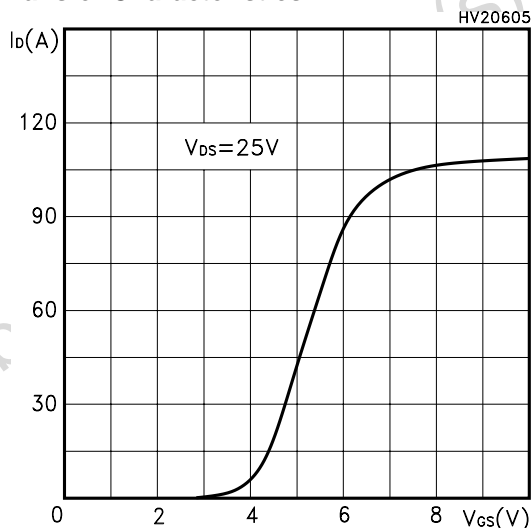
Thermal Impedance



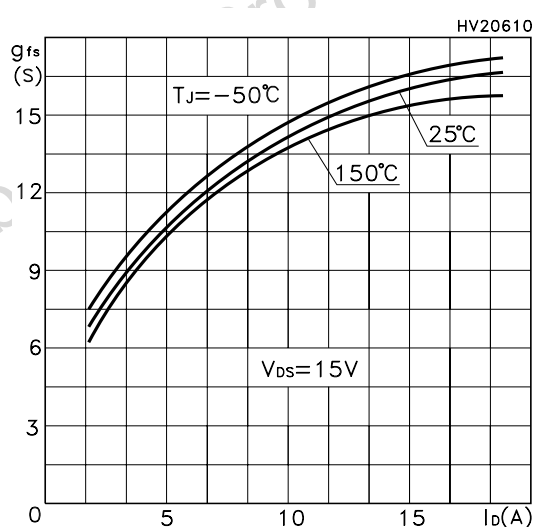
Output Characteristics



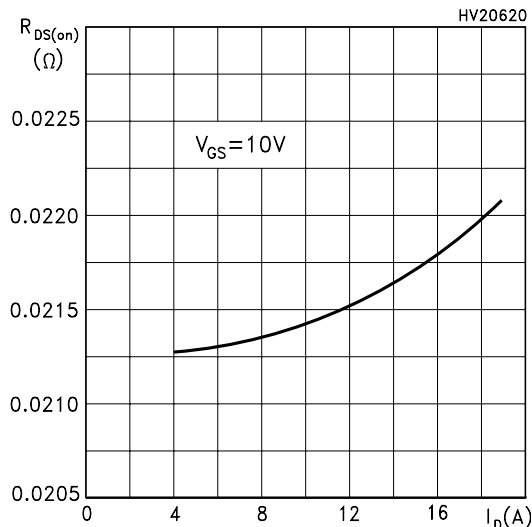
Transfer Characteristics



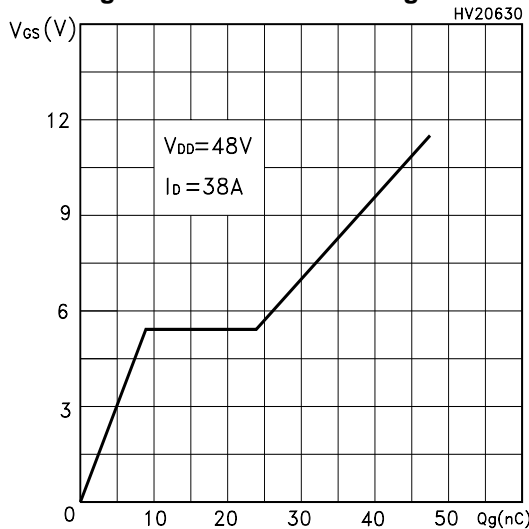
Transconductance



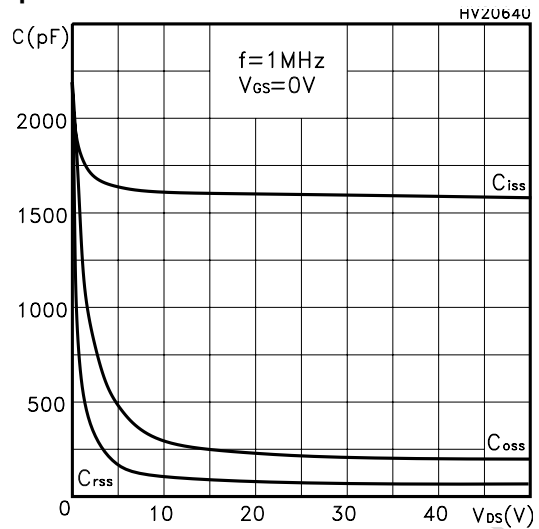
Static Drain-source On Resistance



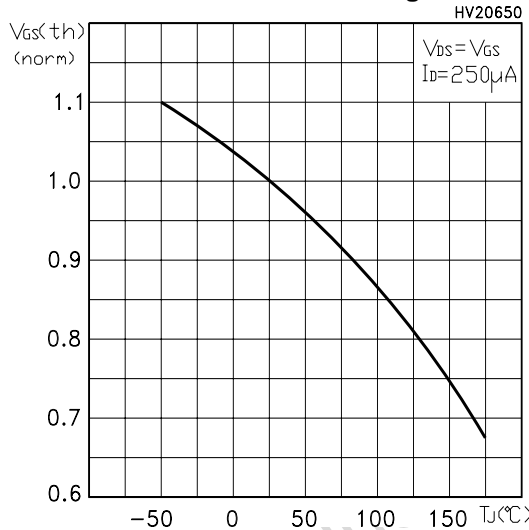
**Gate Charge vs Gate-source Voltage**



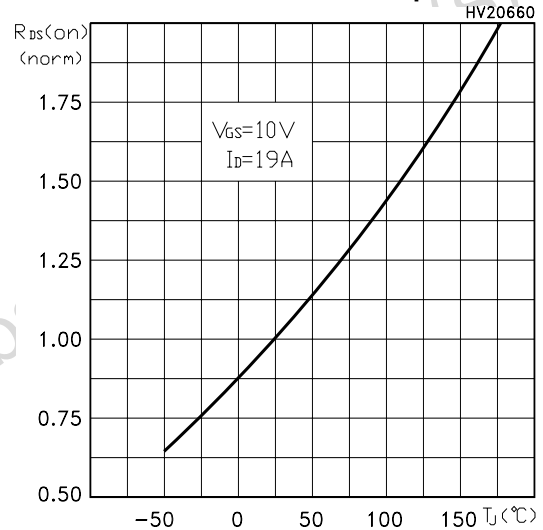
**Capacitance Variations**



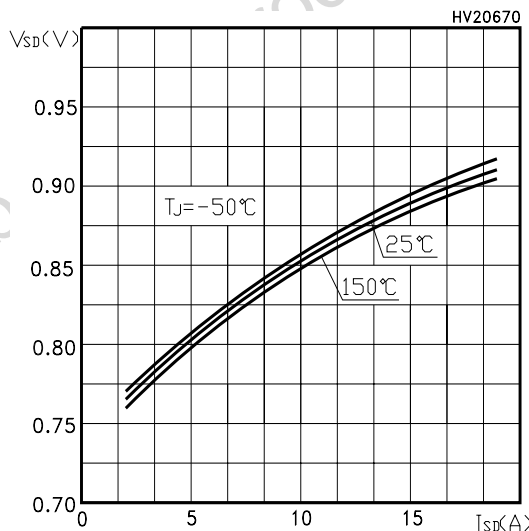
**Normalized Gate Threshold Voltage vs Temp.**



**Normalized On Resistance vs Temperature**



**Source-drain Diode Forward Characteristics**



**Normalized BVDSS vs Temperature**

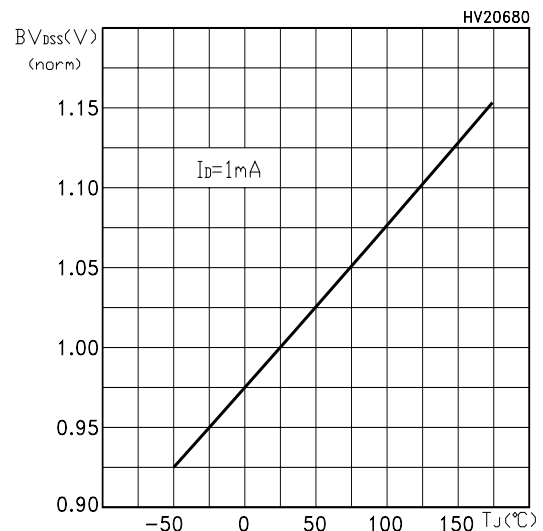


Fig. 1: Unclamped Inductive Load Test Circuit

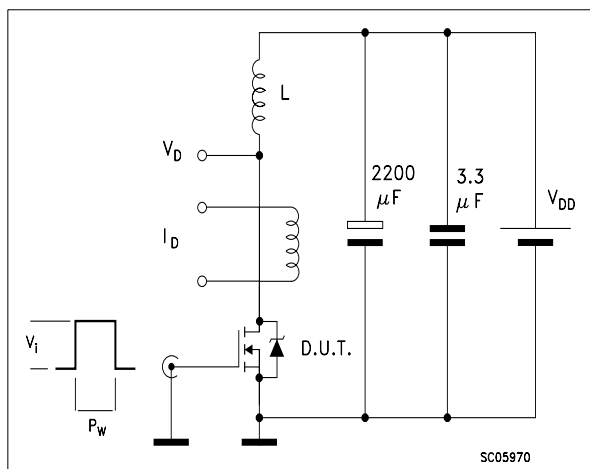


Fig. 2: Unclamped Inductive Waveform

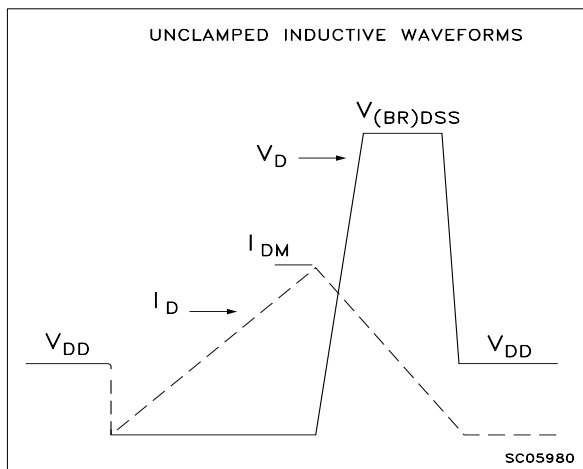


Fig. 3: Switching Times Test Circuit For Resistive Load

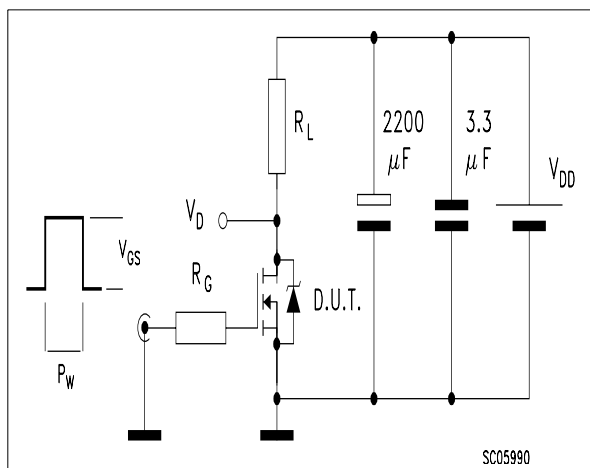


Fig. 4: Gate Charge test Circuit

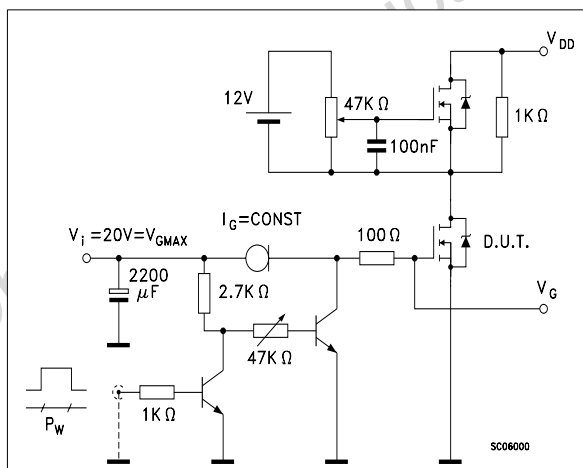
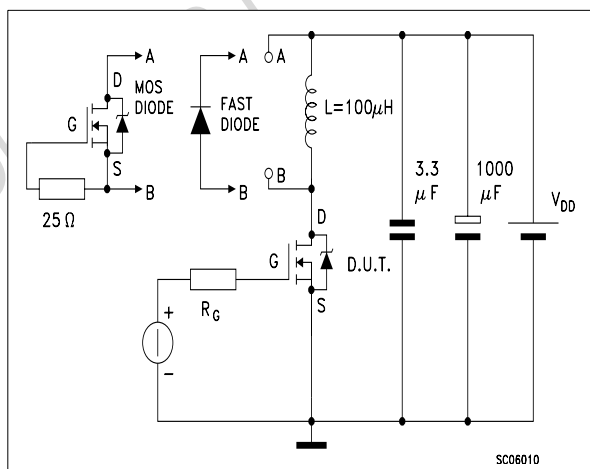
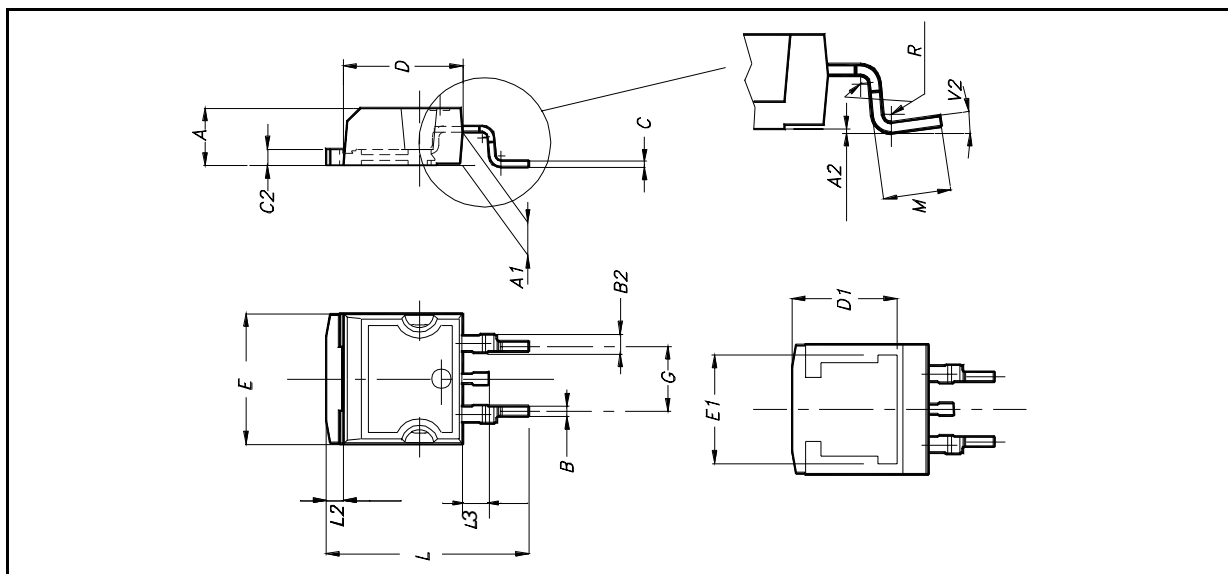


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

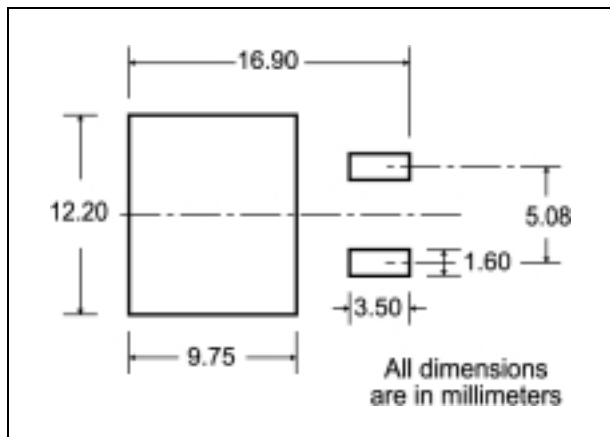


D<sup>2</sup>PAK MECHANICAL DATA

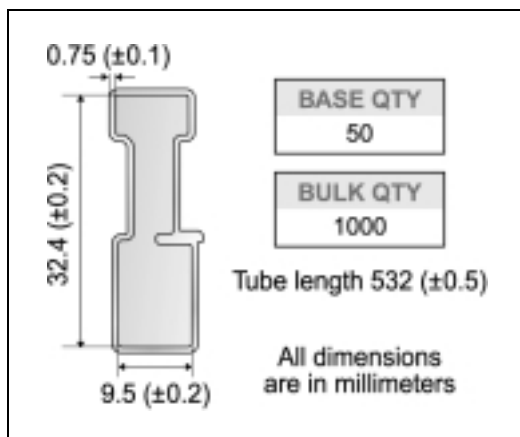
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



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



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



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

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

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

BASE QTY	BULK QTY
1000	1000

10 pitches cumulative tolerance on tape +/- 0.2 mm

TOP COVER TAPE

User Direction of Feed

FEED DIRECTION

Bending radius R min.

\* on sales type





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