



# STB50NE10L

N-CHANNEL 100V - 0.020  $\Omega$  - 50A D<sup>2</sup>PAK

STripFET™ POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STB50NE10L	100 V	<0.025 $\Omega$	50 A

- TYPICAL R<sub>DS(on)</sub> = 0.020  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE AT 100 °C
- APPLICATION ORIENTED CHARACTERIZATION
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

## 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

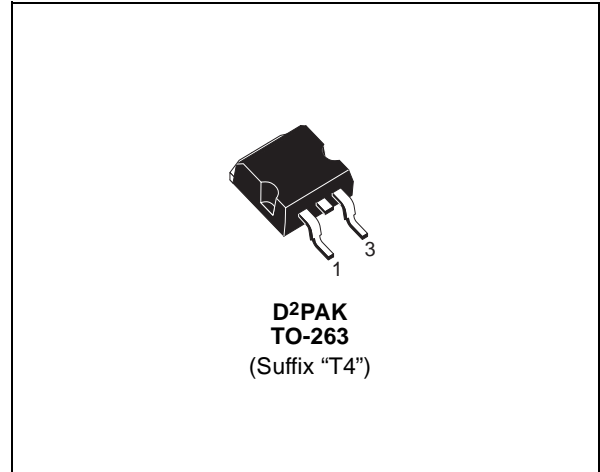
- HIGH CURRENT, HIGH SWITCHING SPEED
- SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

## ABSOLUTE MAXIMUM RATINGS

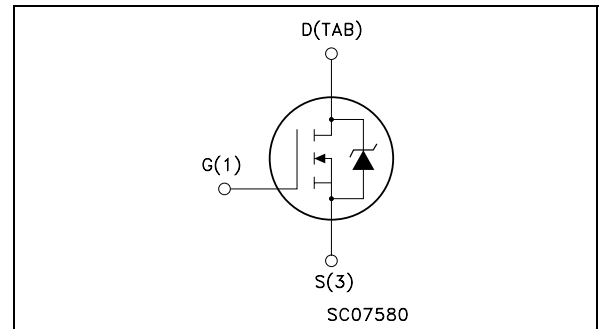
Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	100	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )	100	V
V <sub>GS</sub>	Gate- source Voltage	$\pm 20$	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	50	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	35	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	200	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	150	W
	Derating Factor	1.0	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	6	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>  $\leq$  50A, di/dt  $\leq$  275A/ $\mu$ s, V<sub>DD</sub>  $\leq$  V(BR)<sub>DSS</sub>, T<sub>j</sub>  $\leq$  T<sub>JMAX</sub>



## INTERNAL SCHEMATIC DIAGRAM



## STB50NE10L

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	1	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink	Typ	0.5	°C/W
T <sub>l</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)	50	A
EAS	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)	400	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	100			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 (\*)

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	2.5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 25 A V <sub>GS</sub> = 5 V I <sub>D</sub> = 25 A		0.020 0.024	0.025 0.030	Ω Ω

#### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)</sub> max I <sub>D</sub> = 25 A		45		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V f = 1 MHz V <sub>GS</sub> = 0		5000		pF
C <sub>oss</sub>	Output Capacitance			500		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			180		pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 50\text{ V}$ $I_D = 25\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3)		30 105		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 80\text{ V}$ $I_D = 50\text{ A}$ $V_{GS} = 5\text{ V}$		82 17 49	105	nC nC nC

**SWITCHING OFF**

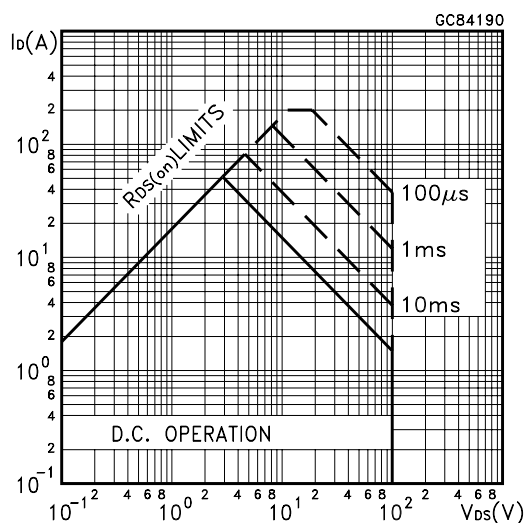
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 50\text{ V}$ $I_D = 25\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3)		135 45		ns ns
$t_r(V_{off})$ $t_f$ $t_c$	Off-Voltage Rise Time Fall Time Cross-over Time	$V_{clamp} = 80\text{ V}$ $I_D = 50\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Inductive Load, Figure 5)		45 45 85		ns ns ns

**SOURCE DRAIN DIODE**

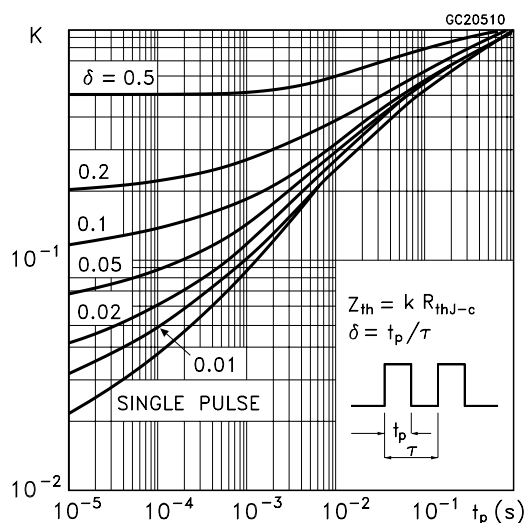
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				50 200	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 50\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 30\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		165 870 10.5		ns nC A

(\*)Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 (•)Pulse width limited by safe operating area.

**Safe Operating Area**

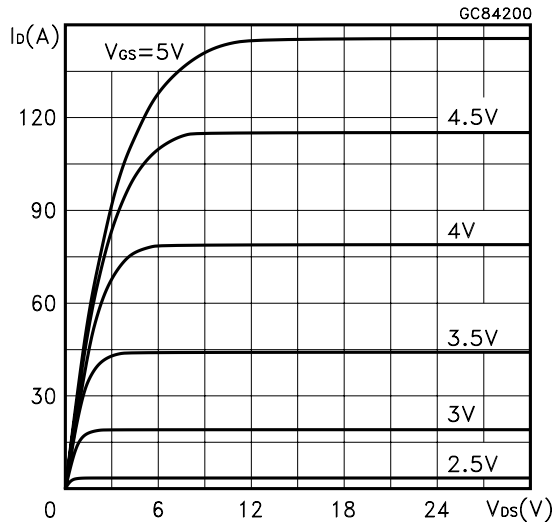


**Thermal Impedance**

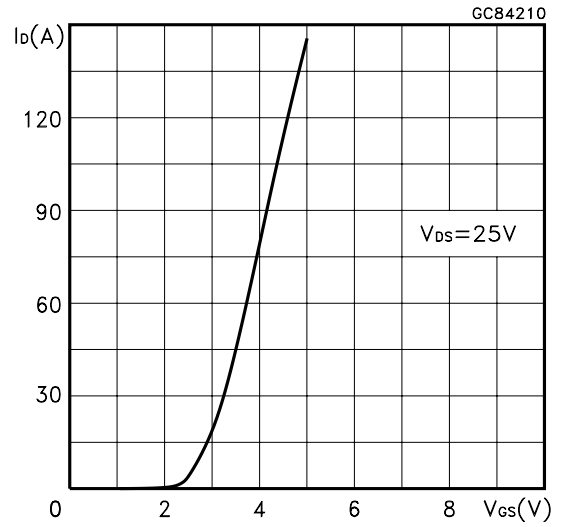


# STB50NE10L

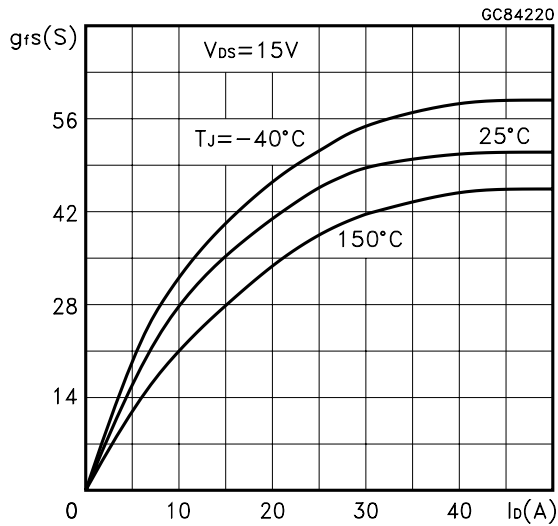
Output Characteristics



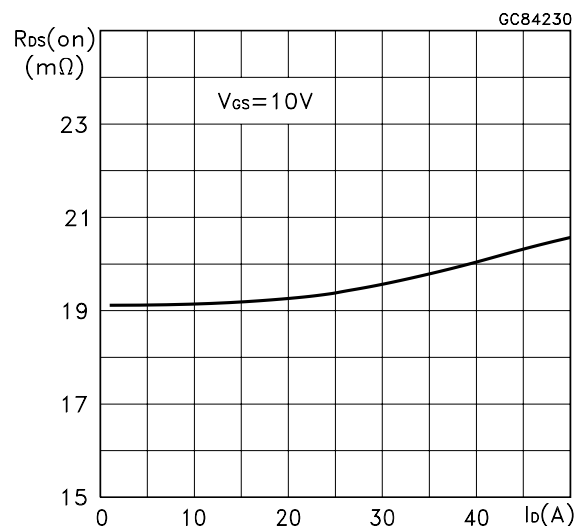
Transfer Characteristics



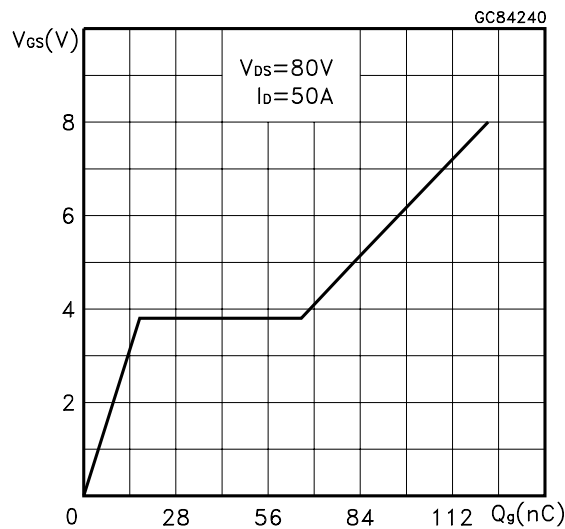
Transconductance



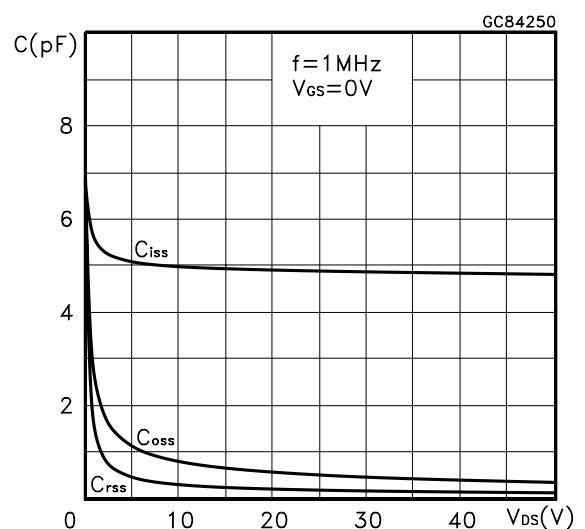
Static Drain-source On Resistance



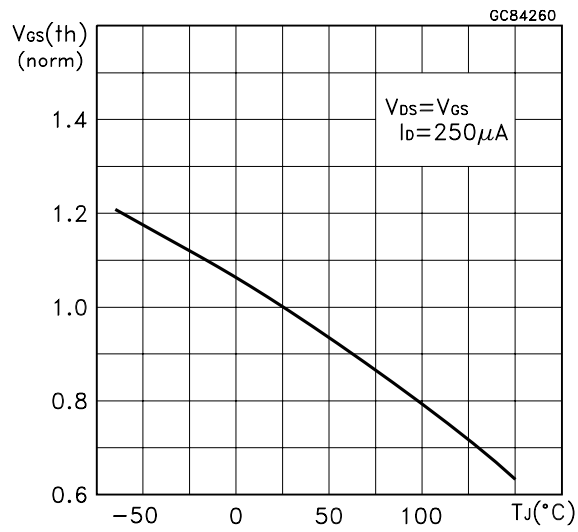
Gate Charge vs Gate-source Voltage



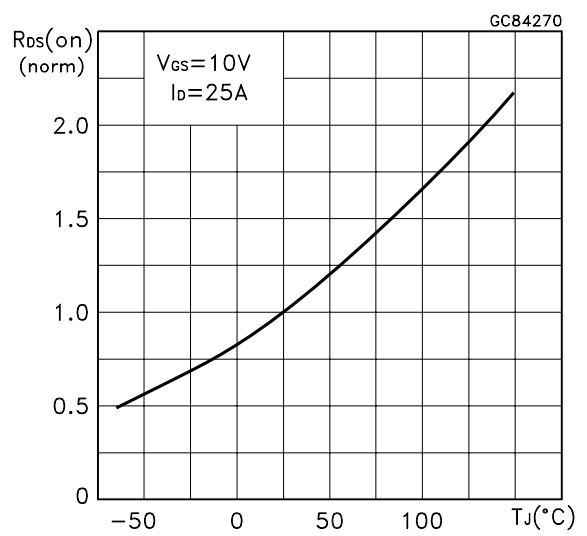
Capacitance Variations



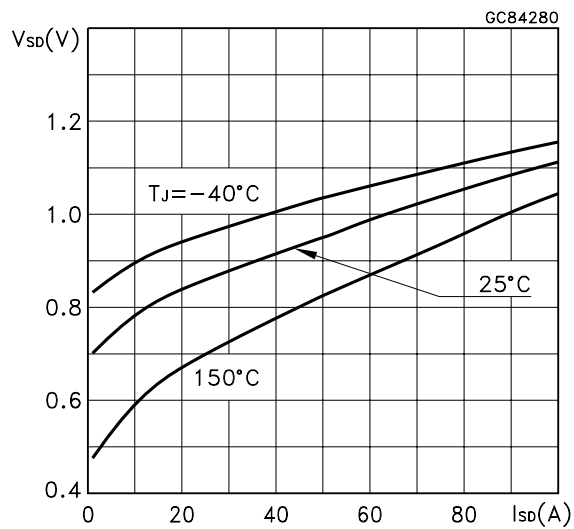
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



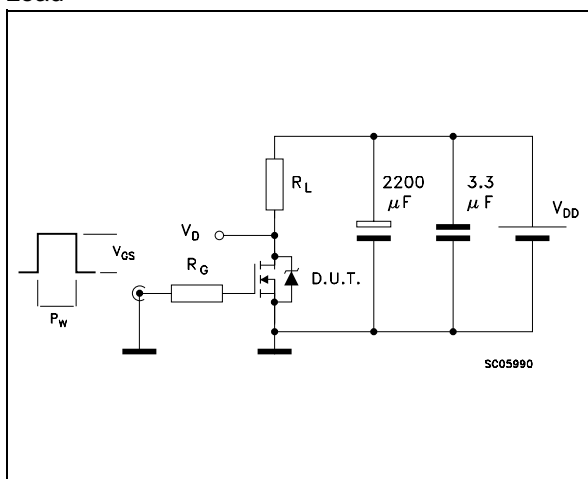
**Fig. 1: Unclamped Inductive Load Test Circuit**



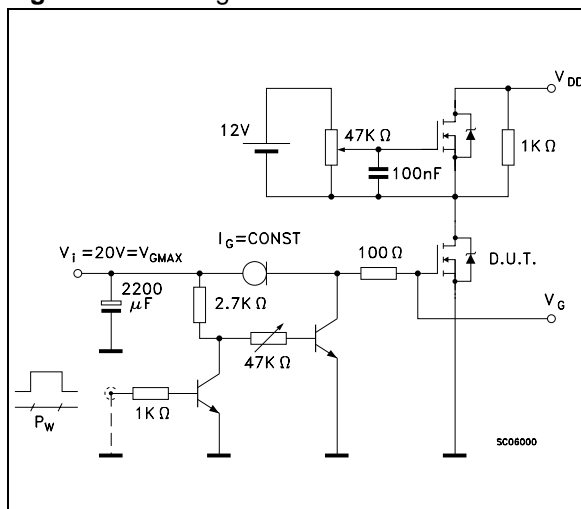
**Fig. 2: Unclamped Inductive Waveform**



**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

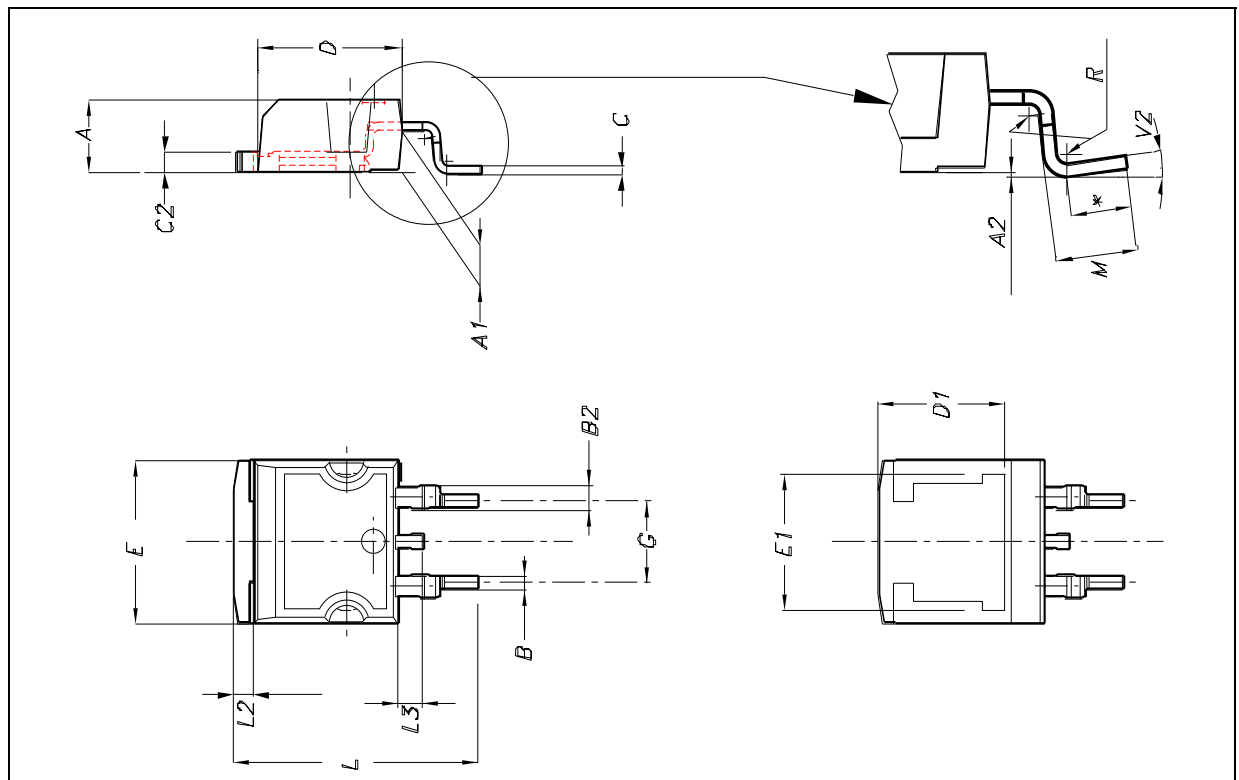


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**

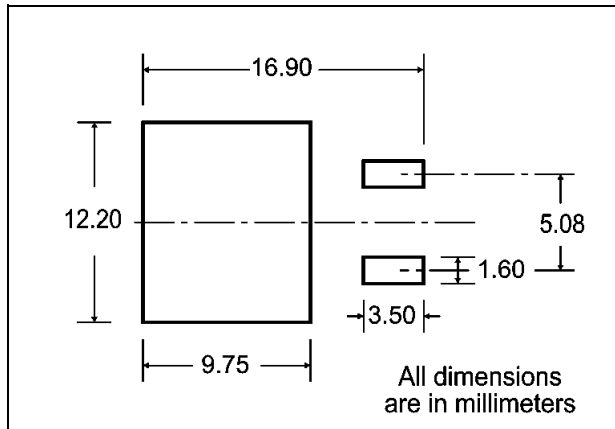


D<sup>2</sup>PAK MECHANICAL DATA

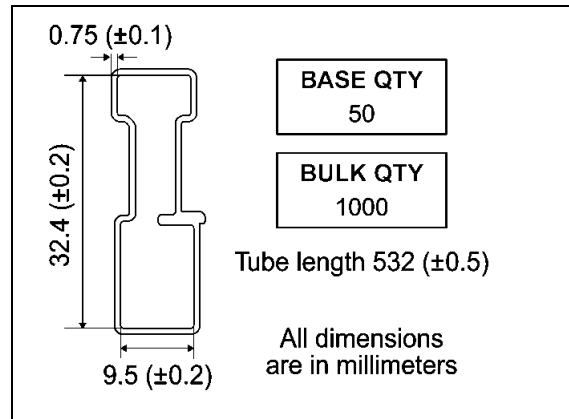
DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.028		0.037
B2	1.14		1.7	0.045		0.067
C	0.45		0.6	0.018		0.024
C2	1.21		1.36	0.048		0.054
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.394		0.409
E1	8.5				0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.591		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.069
M	2.4		3.2	0.094		0.126
R		0.4			0.016	
V2	0°		8°	0°		8°



**D2PAK FOOTPRINT**



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



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

Diagram showing the tape and reel shipment details. It includes a circular reel view with dimensions A, B, C, D, and a note: "40 mm min. Access hole at slot location". A side view shows dimensions T, C, N, and G (measured at hub). A note indicates: "Tape slot in core for tape start 2.5mm min. width".

**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. It includes a side view of the tape with dimensions K<sub>0</sub>, 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>. A note indicates: "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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