



## STP80NF03L

N-CHANNEL 30V - 0.004  $\Omega$  - 80A TO-220

STripFET™ II MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP80NF03L	30 V	< 0.0045 $\Omega$	80 A

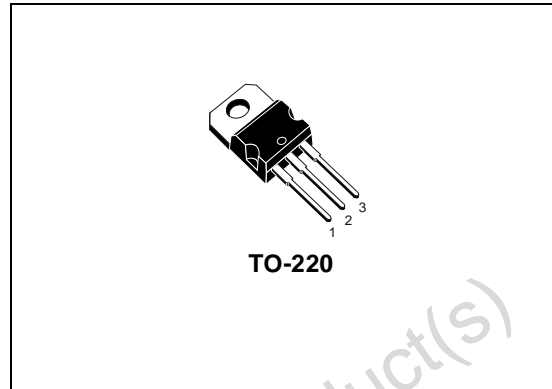
- TYPICAL R<sub>DS(on)</sub> = 0.004  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW THRESHOLD DRIVE

### DESCRIPTION

This Power MOSFET is the latest development of ST-Microelectronics 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.

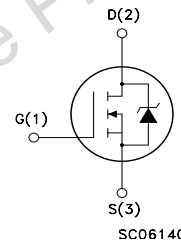
### APPLICATIONS

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



TO-220

### INTERNAL SCHEMATIC DIAGRAM



### ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP80NF03L	P80NF03L	TO-220	TUBE

## STP80NF03L

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source Voltage ( $V_{GS} = 0$ )	30	V
$V_{DGR}$	Drain-gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	30	V
$V_{GS}$	Gate-source Voltage	$\pm 20$	V
$I_D$ (#)	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	80	A
$I_D$ (#)	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	80	A
$I_{DM}$ (●)	Drain Current (pulsed)	320	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	300	W
	Derating Factor	2.0	W/ $^\circ\text{C}$
$dv/dt$ (1)	Peak Diode Recovery Voltage Slope	2.0	V/ns
$T_{stg}$	Storage Temperature	-65 to 175	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	175	$^\circ\text{C}$

(#) Current Limited by Package.

(●) Pulse width limited by safe operating area.

(1)  $I_{SD} \leq 80\text{A}$ ,  $di/dt \leq 240 \text{ A}/\mu\text{s}$ ,  $V_{DD} = 24\text{V}$ ;  $T_j \leq T_{JMAX}$ .

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.5	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	$^\circ\text{C}/\text{W}$
$T_I$	Maximum Lead Temperature For Soldering Purpose Typ	300	$^\circ\text{C}$

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)	40	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 20 \text{ V}$ )	2.3	J

### ELECTRICAL CHARACTERISTICS ( $T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

OFF/ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ , $T_C = 125^\circ\text{C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	1	1.5	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 40 \text{ A}$ $V_{GS} = 4.5 \text{ V}$ , $I_D = 40 \text{ A}$		0.004 0.0045	0.0045 0.0065	$\Omega$ $\Omega$

**ELECTRICAL CHARACTERISTICS (CONTINUED)**  
**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (1)	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		50		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$		5500		pF
$C_{oss}$	Output Capacitance			1670		pF
$C_{rss}$	Reverse Transfer Capacitance			290		pF

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 15\text{ V}, I_D = 40\text{ A}$ $R_G = 4.7\Omega, V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3)		30		ns
$t_r$	Rise Time			270		ns
$Q_g$	Total Gate Charge	$V_{DD} = 24\text{ V}, I_D = 80\text{ A},$ $V_{GS} = 4.5\text{ V}$		85	110	nC
$Q_{gs}$	Gate-Source Charge			23		nC
$Q_{gd}$	Gate-Drain Charge			40		nC

**SWITCHING OFF**

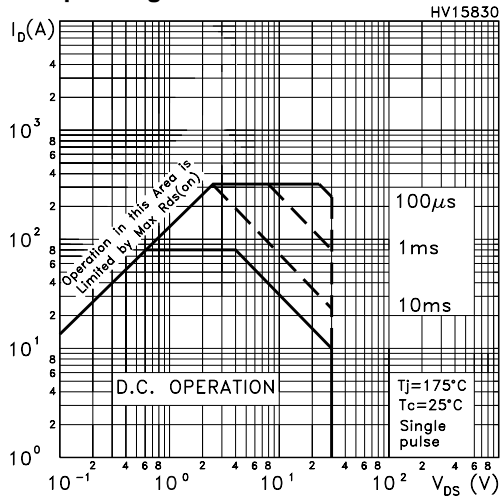
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 15\text{ V}, I_D = 40\text{ A},$ $R_G = 4.7\Omega, V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3)		110		ns
$t_f$	Fall Time			95		ns
$t_{r(voff)}$	Off-Voltage Rise Time	$V_{clamp} = 24\text{ V}, I_D = 80\text{ A},$ $R_G = 4.7\Omega, V_{GS} = 4.5\text{ V}$ (Inductive Load, Figure 5)		125		ns
$t_f$	Fall Time			75		ns
$t_c$	Cross-over Time			125		ns

**SOURCE DRAIN DIODE**

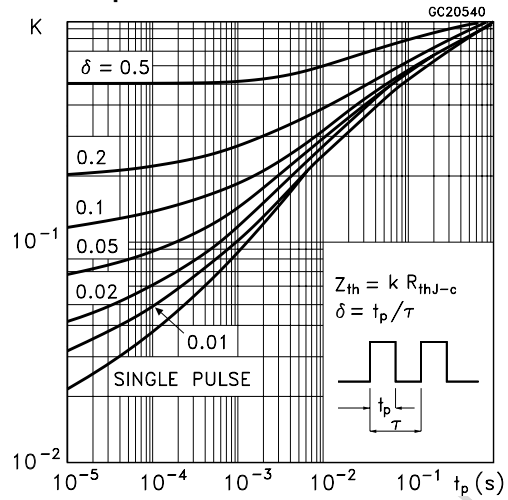
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				80	A
$I_{SDM}$ (1)	Source-drain Current (pulsed)				320	A
$V_{SD}$ (2)	Forward On Voltage	$I_{SD} = 80\text{ A}, V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 80\text{ A}, di/dt = 100\text{ A}/\mu\text{s},$ $V_{DD} = 20\text{ V}, T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		75		ns
$Q_{rr}$	Reverse Recovery Charge			0.15		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			4		A

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

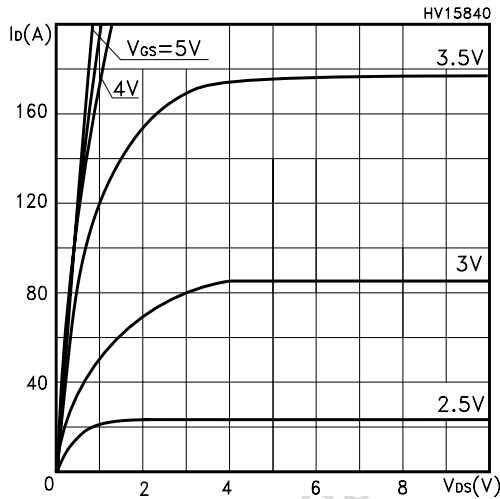
Safe Operating Area



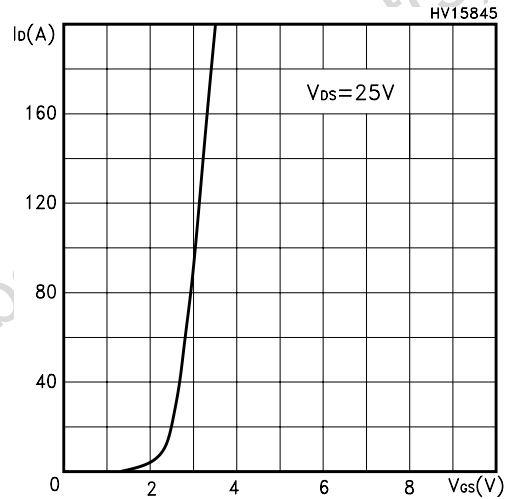
Thermal Impedance



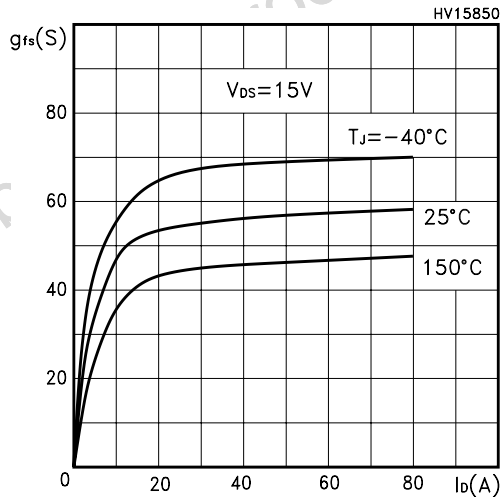
Output Characteristics



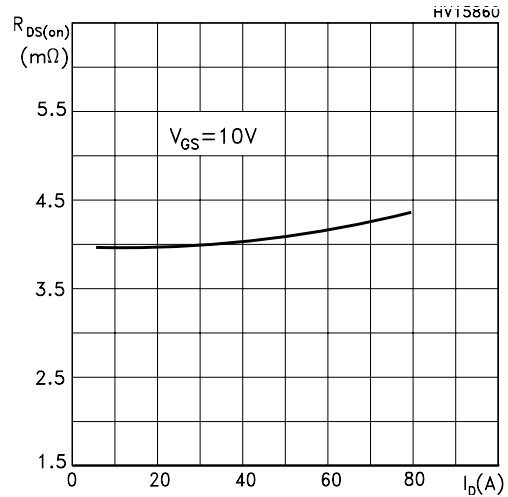
Transfer Characteristics



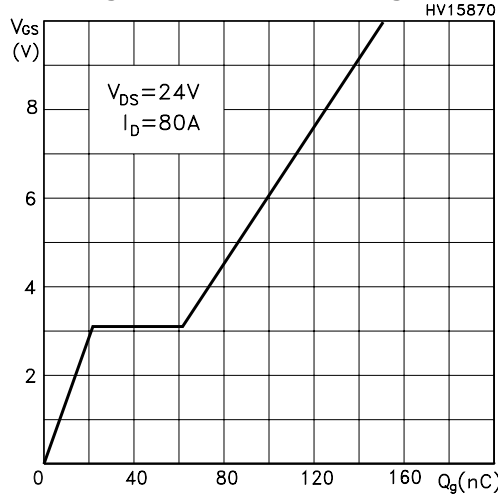
Transconductance



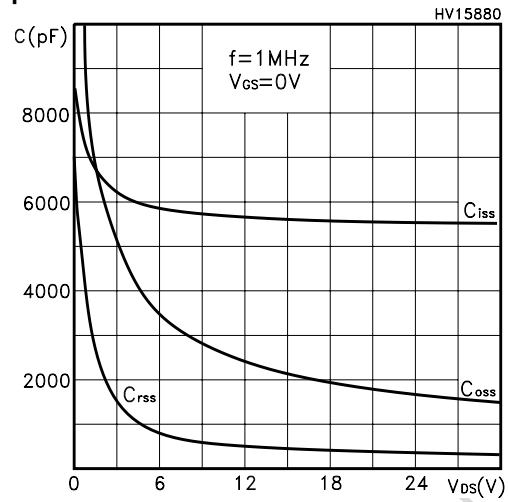
Static Drain-source On Resistance



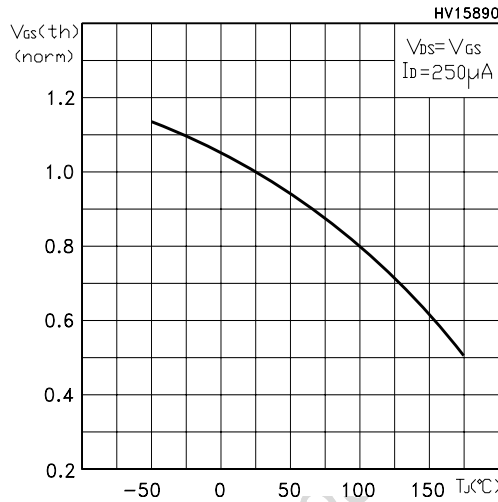
Gate Charge vs Gate-source Voltage



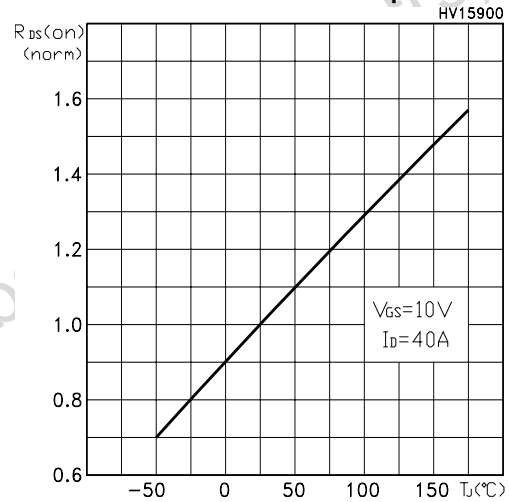
Capacitance Variations



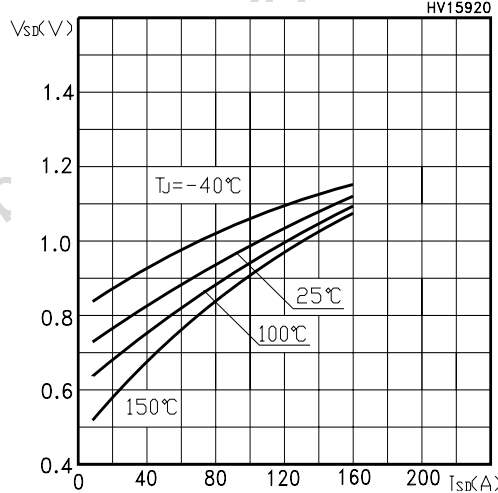
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature

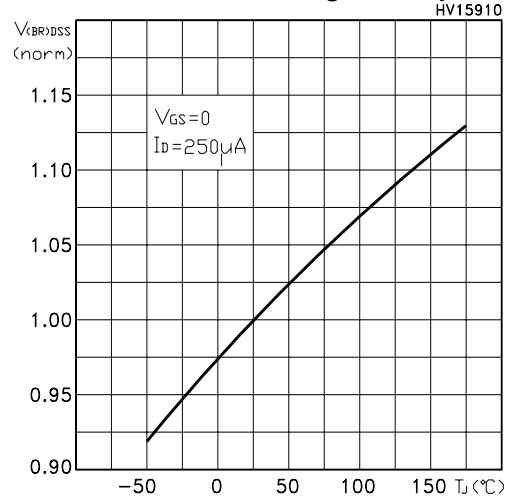


Fig. 1: Unclamped Inductive Load Test Circuit

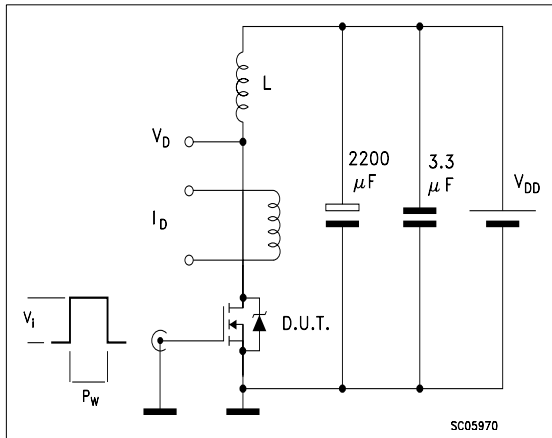


Fig. 2: Unclamped Inductive Waveform

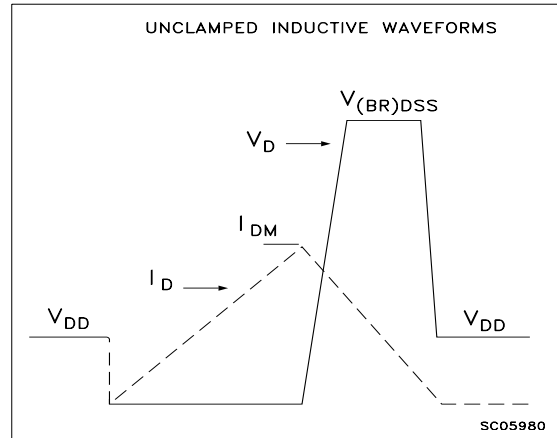


Fig. 3: Switching Times Test Circuit For Resistive Load

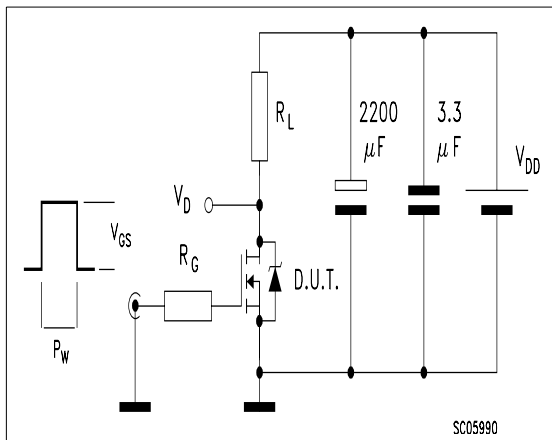


Fig. 4: Gate Charge test Circuit

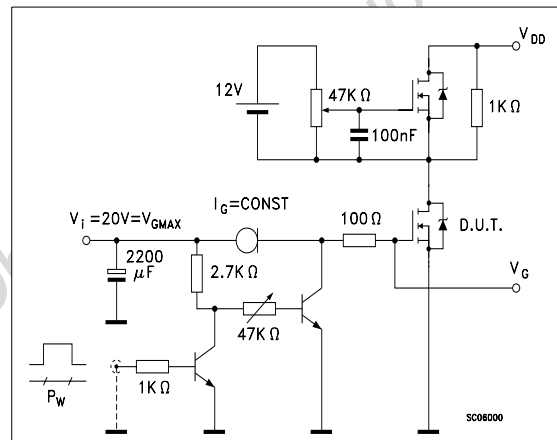
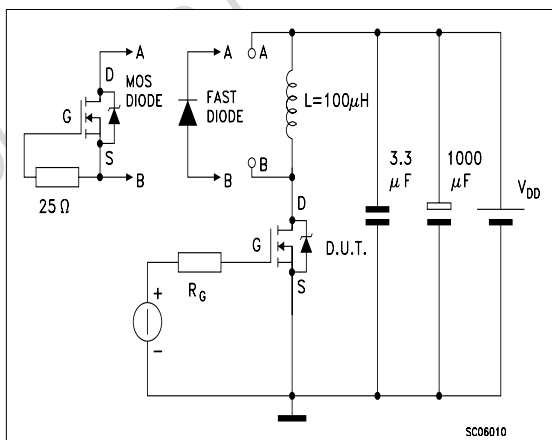
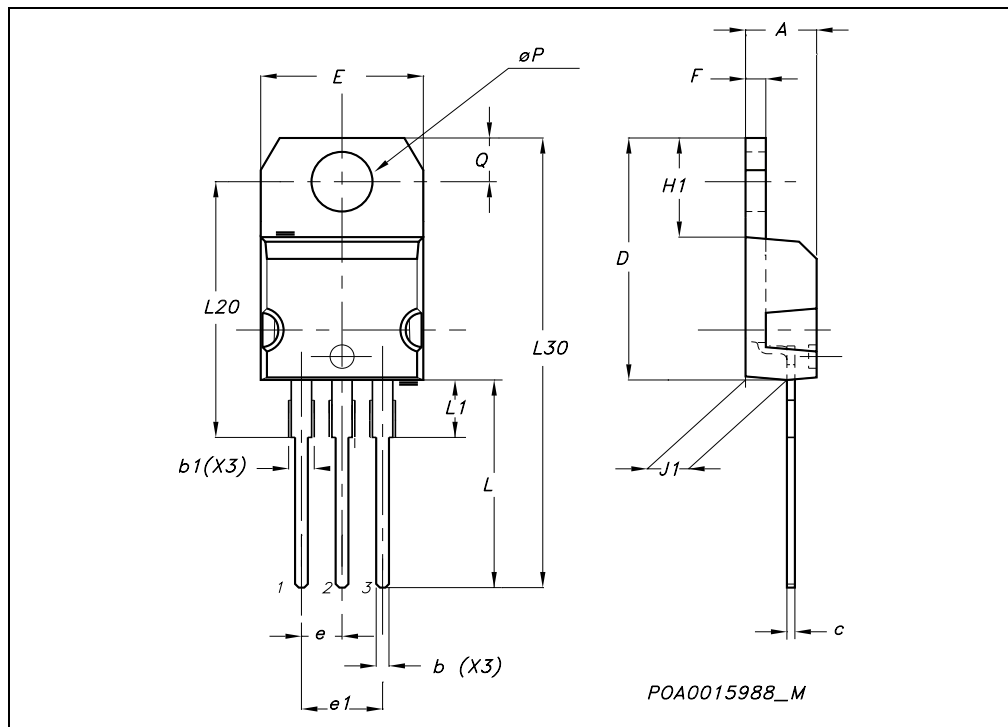


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
$\phi P$	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



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