



STQ1NC60R

N-CHANNEL 600V - 12Ω - 0.3A TO-92

PowerMESH™II Power MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STQ1NC60R	600 V	< 15 Ω	0.3 A

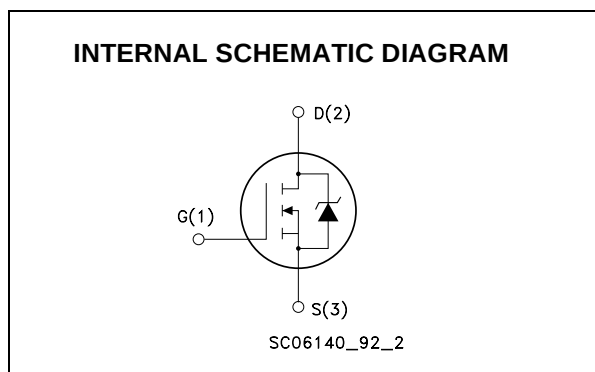
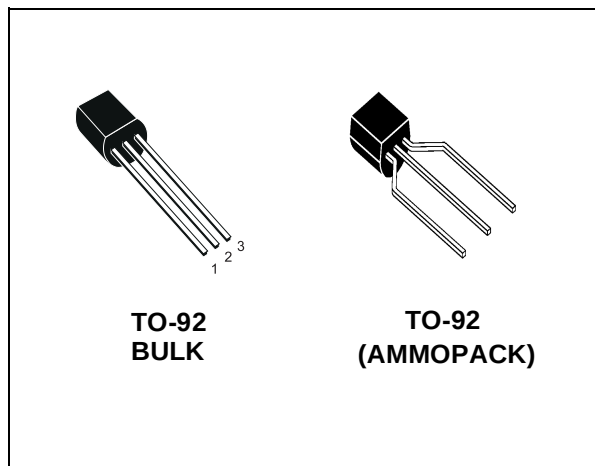
- TYPICAL R_{DS(on)} = 12 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- NEW HIGH VOLTAGE BENCHMARK
- GATE CHARGE MINIMIZED

DESCRIPTION

Using the latest high voltage MESH OVERLAY™II process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest RDS(on) per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- LOW SWITCH MODE POWER SUPPLIES (SMPS)
- BATTERY CHARGER



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STQ1NC60R	Q1NC60R	TO-92	BULK
STQ1NC60R-AP	Q1NC60R	TO-92	AMMOPACK

STQ1NC60R

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	600	V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20\text{ k}\Omega$)	600	V
V_{GS}	Gate- source Voltage	± 30	V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	0.3	A
I_D	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	0.19	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	1.2	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	3.1	W
	Derating Factor	0.025	W/ $^\circ\text{C}$
$dv/dt(1)$	Peak Diode Recovery voltage slope	3	V/ns
T_j T_{stg}	Operating Junction Temperature Storage Temperature	-65 to 150 -65 to 150	$^\circ\text{C}$ $^\circ\text{C}$

(●) Pulse width limited by safe operating area

(1) $I_{SD} \leq 0.3\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

THERMAL DATA

		TO-92	
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	120	$^\circ\text{C}/\text{W}$
$R_{thj-lead}$	Thermal Resistance Junction-lead Max	40	$^\circ\text{C}/\text{W}$
T_l	Maximum Lead Temperature For Soldering Purpose	260	$^\circ\text{C}$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	0.3	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	60	mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	600			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 50	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{V}$, $I_D = 0.3\text{ A}$		12	15	Ω

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} = 15\text{ V}$, $I_D = 0.3\text{ A}$		0.87		S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		108		pF
C_{oss}	Output Capacitance			18		pF
C_{rss}	Reverse Transfer Capacitance			2.5		pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 300\text{ V}$, $I_D = 0.5\text{ A}$ $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load see, Figure 3)		7.2		ns
t_r	Rise Time			8		ns
Q_g	Total Gate Charge	$V_{DD} = 480\text{ V}$, $I_D = 1\text{ A}$, $V_{GS} = 10\text{ V}$, $R_G = 4.7\Omega$		7.3	10	nC
Q_{gs}	Gate-Source Charge			3.4		nC
Q_{gd}	Gate-Drain Charge			2.5		nC

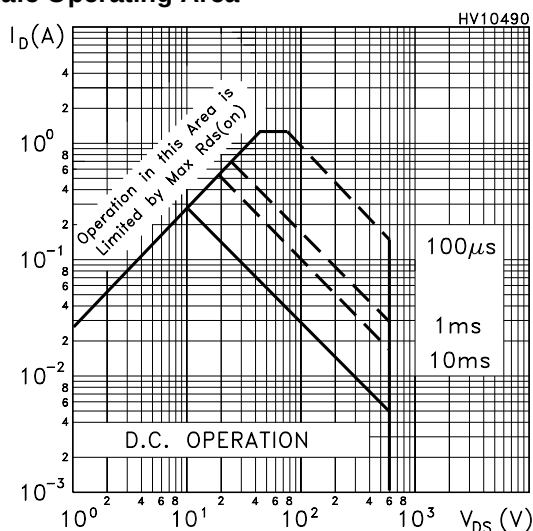
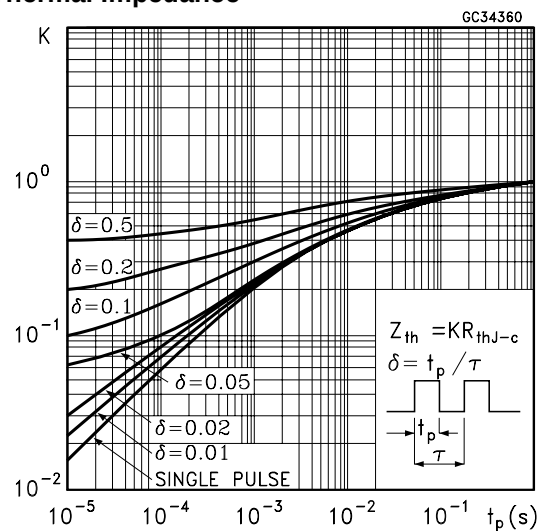
SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 480\text{ V}$, $I_D = 1\text{ A}$, $R_G = 4.7\Omega$, $V_{GS} = 10\text{ V}$ (Inductive Load see, Figure 5)		33		ns
t_f	Fall Time			11		ns
t_c	Cross-over Time			43		ns

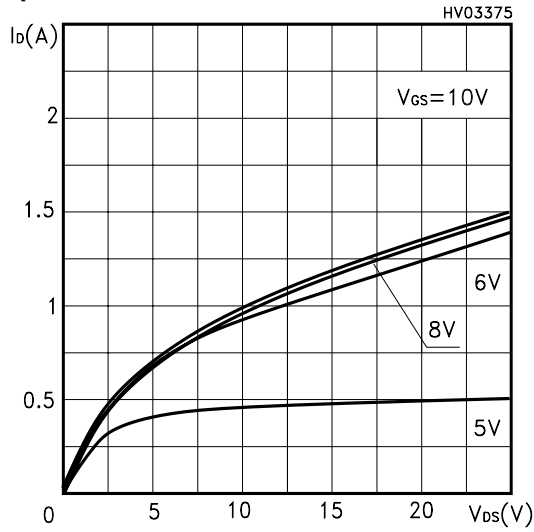
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				0.3	A
I_{SDM} (2)	Source-drain Current (pulsed)				1.2	A
V_{SD} (1)	Forward On Voltage	$I_{SD} = 0.3\text{ A}$, $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 1\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 25\text{ V}$, $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		450		ns
Q_{rr}	Reverse Recovery Charge			720		μC
I_{RRM}	Reverse Recovery Current			3.2		A

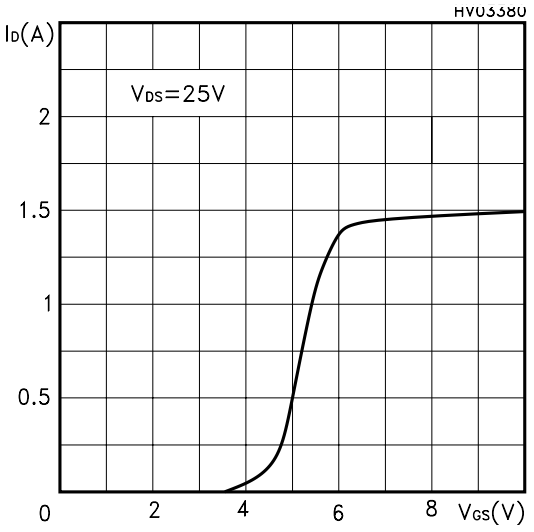
Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
 2. Pulse width limited by safe operating area.

Safe Operating Area**Thermal Impedance**

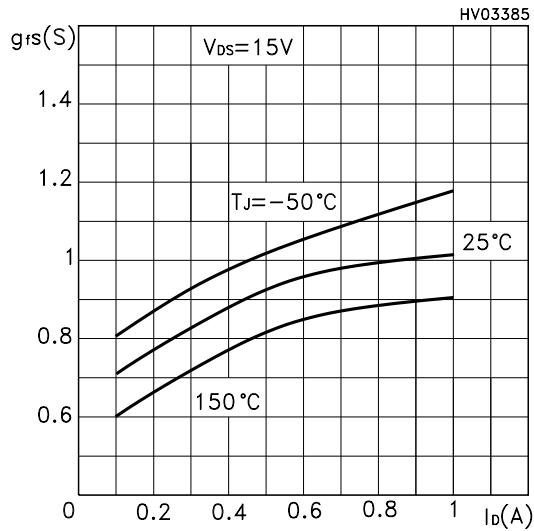
Output Characteristics



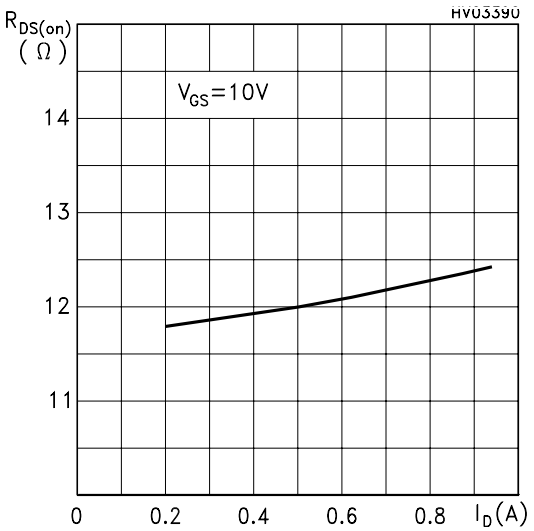
Transfer Characteristics



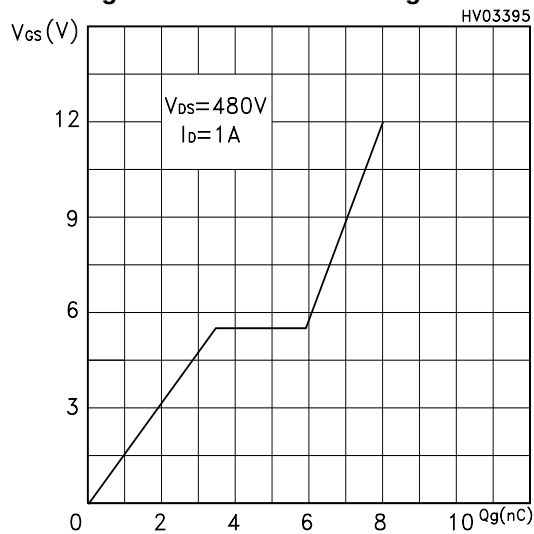
Tranconductance



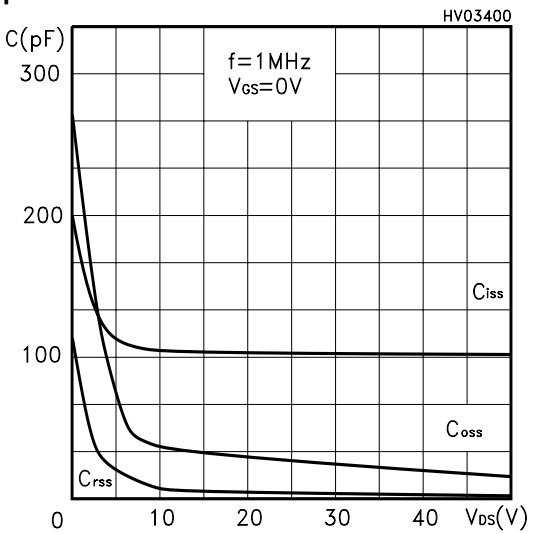
Static Drain-Source On Resistance



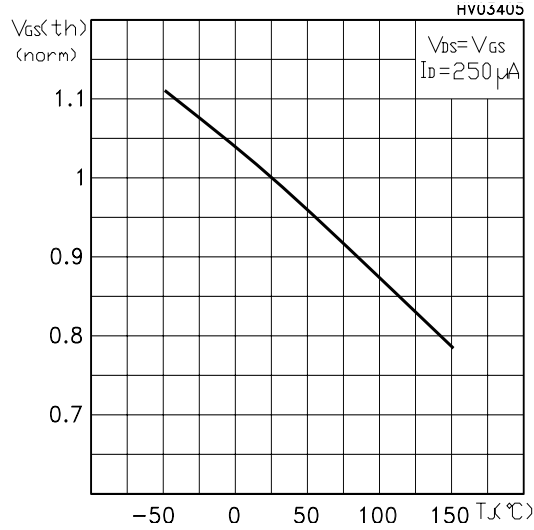
Gate Charge vs Gate-source Voltage



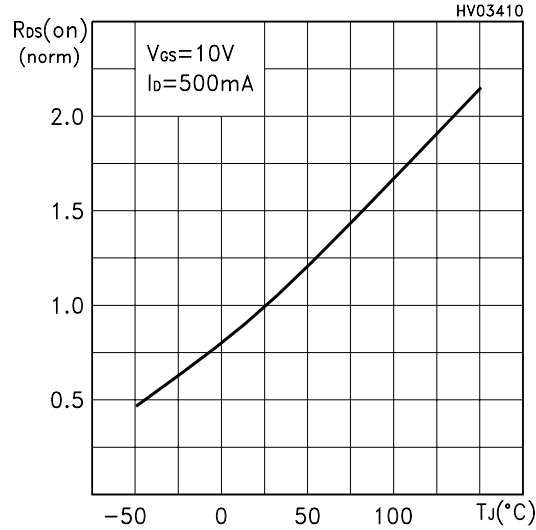
Capacitance Variations



Normalized Gate Thershold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

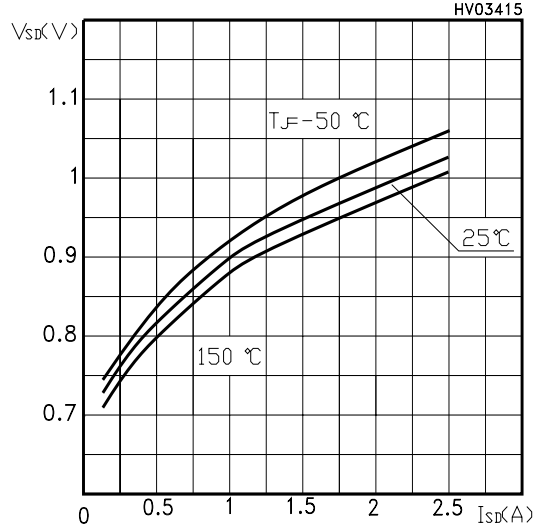


Fig. 1: Unclamped Inductive Load Test Circuit

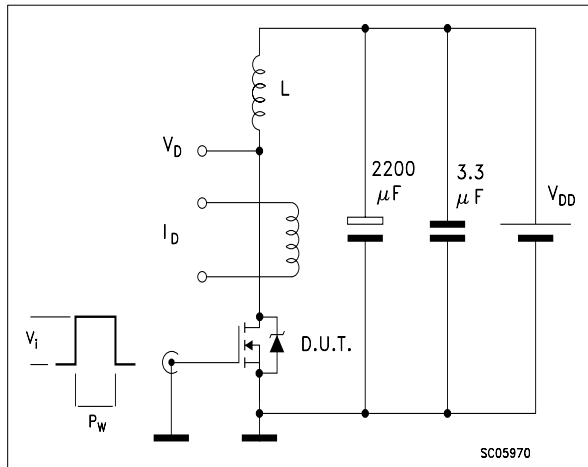


Fig. 2: Unclamped Inductive Waveform

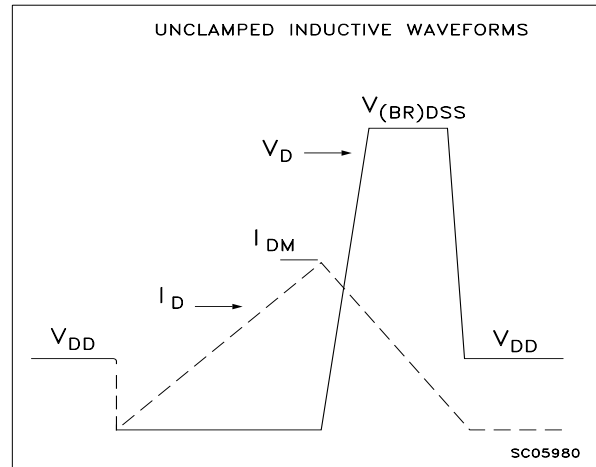


Fig. 3: Switching Times Test Circuit For Resistive Load

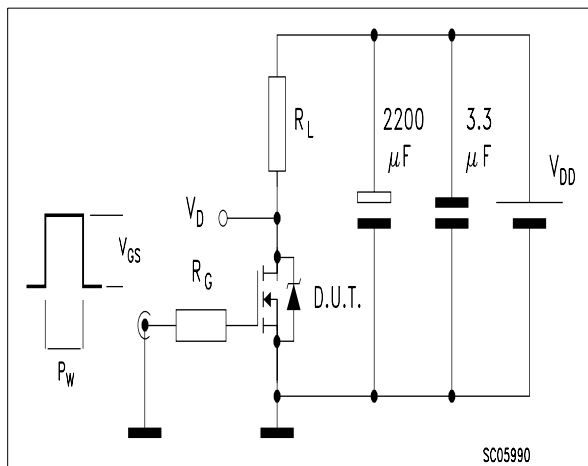


Fig. 4: Gate Charge test Circuit

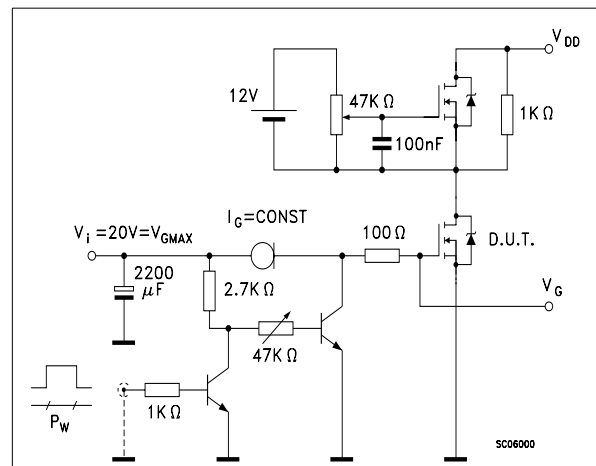
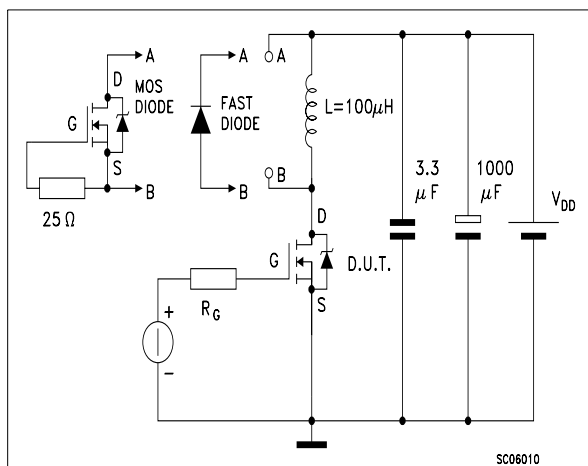
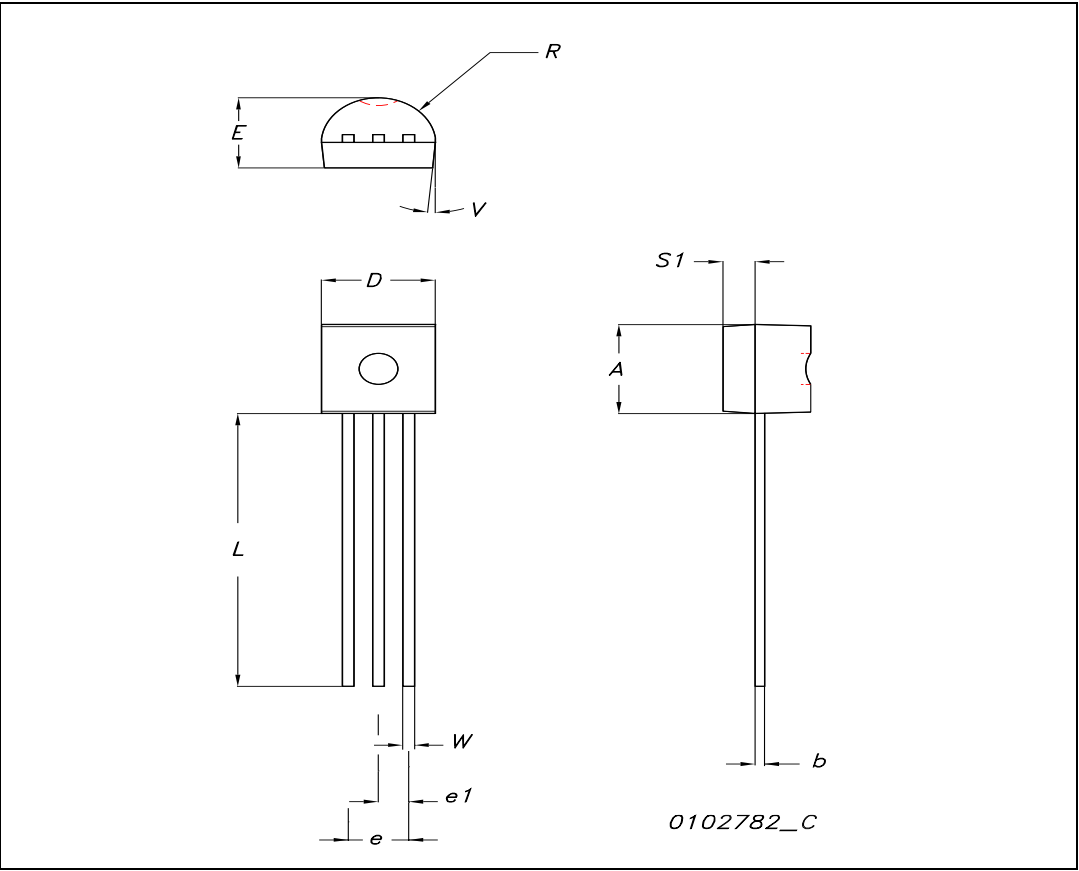


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



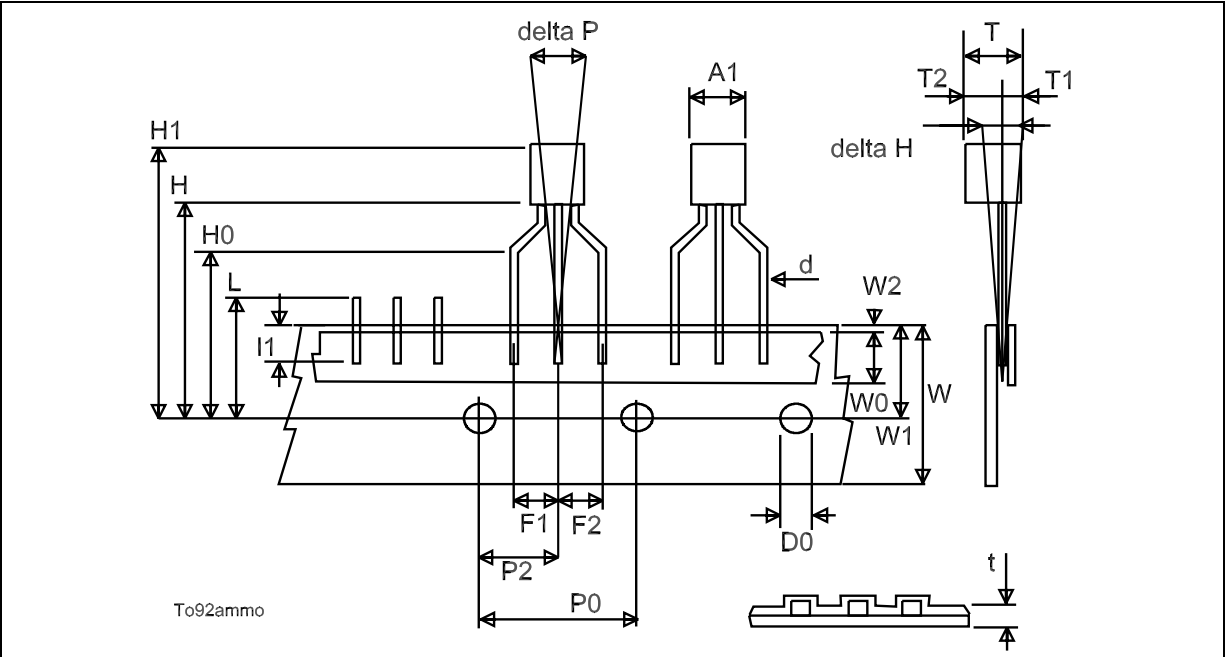
TO-92 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.32		4.95	0.170		0.194
b	0.36		0.51	0.014		0.020
D	4.45		4.95	0.175		0.194
E	3.30		3.94	0.130		0.155
e	2.41		2.67	0.094		0.105
e1	1.14		1.40	0.044		0.055
L	12.70		15.49	0.50		0.610
R	2.16		2.41	0.085		0.094
S1	0.92		1.52	0.036		0.060
W	0.41		0.56	0.016		0.022
V		5°			5°	



TO-92 AMMOPACK

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A1			4.8			0.19
T			3.8			0.15
T1			1.6			0.06
T2			2.3			0.09
d			0.48			0.02
P0	12.5	12.7	12.9	0.49	0.5	0.51
P2	5.65	6.35	7.05	0.22	0.25	0.27
F1, F2	2.44	2.54	2.94	0.09	0.1	0.11
delta H	-2		2	-0.08		0.08
W	17.5	18	19	0.69	0.71	0.74
W0	5.7	6	6.3	0.22	0.23	0.24
W1	8.5	9	9.25	0.33	0.35	0.36
W2			0.5			0.02
H	18.5		20.5	0.72		0.80
H0	15.5	16	16.5	0.61	0.63	0.65
H1			25			0.98
D0	3.8	4	4.2	0.15	0.157	0.16
t			0.9			0.035
L			11			0.43
I1	3			0.11		
delta P	-1		1	-0.04		0.04



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