



STD2NC45-1 STQ1NC45R

N-CHANNEL 450V - 4.1Ω - 1.5 A IPAK / TO-92
SuperMESH™ Power MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D	P _w
STD2NC45-1	450 V	< 4.5 Ω	1.5 A	30 W
STQ1NC45R	450 V	< 4.5 Ω	0.5 A	3.1 W

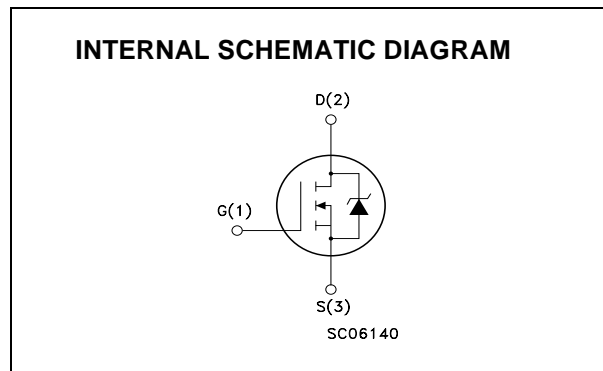
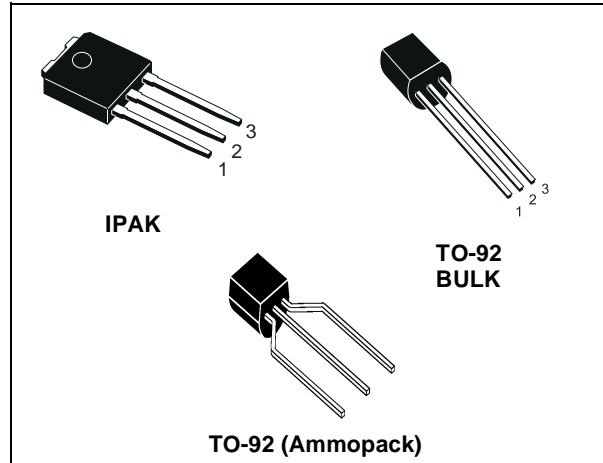
- TYPICAL R_{DS(on)} = 4.1 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- GATE CHARGE MINIMIZED
- NEW HIGH VOLTAGE BENCHMARK

DESCRIPTION

The SuperMESH™ series is obtained through an extreme optimization of ST's well established strip-based PowerMESH™ layout. In addition to pushing on-resistance significantly down, special care is taken to ensure a very good dv/dt capability for the most demanding applications. Such series complements ST full range of high voltage MOSFETs including revolutionary MDmesh™ products.

APPLICATIONS

- SWITCH MODE LOW POWER SUPPLIES (SMPS)
- LOW POWER, LOW COST CFL (COMPACT FLUORESCENT LAMPS)
- LOW POWER BATTERY CHARGERS



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STD2NC45-1	D2NC45	IPAK	TUBE
STQ1NC45R	Q1NC45R	TO-92	BULK
STQ1NC45R-AP	Q1NC45R	TO-92	AMMOPAK

STD2NC45-1, STQ1NC45R

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STD2NC45-1	STQ1NC45R	
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	450		V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20\text{ k}\Omega$)	450		V
V_{GS}	Gate- source Voltage	± 50		V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	1.5	0.5	A
I_D	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	0.95	0.315	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	6	2	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	30	3.1	W
	Derating Factor	0.24	0.025	W/ $^\circ\text{C}$
dv/dt (1)	Peak Diode Recovery voltage slope	3		V/ns
T_j	Operating Junction Temperature	-65 to 150		$^\circ\text{C}$
T_{stg}	Storage Temperature	-65 to 150		$^\circ\text{C}$

(●) Pulse width limited by safe operating area

(1) $I_{SD} \leq 0.5\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

THERMAL DATA

		IPAK	TO-92	
Rthj-case	Thermal Resistance Junction-case Max	4.1		$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	100	120	$^\circ\text{C}/\text{W}$
Rthj-lead	Thermal Resistance Junction-lead Max		40	$^\circ\text{C}/\text{W}$
T_l	Maximum Lead Temperature For Soldering Purpose	275	260	$^\circ\text{C}$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value		Unit
		IPAK	TO-92	
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	1.5		A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	25		mJ

ELECTRICAL CHARACTERISTICS (TCASE =25°C UNLESS OTHERWISE SPECIFIED)
ON/OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0$	450			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}, T_C = 125^\circ C$			1 50	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30V$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.3	3	3.7	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V, I_D = 0.5 A$		4.1	4.5	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (1)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $I_D = 0.5 A$		1.1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		160 27.5 4.7		pF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{DD} = 225 V, I_D = 0.5 A$ $R_G = 4.7\Omega, V_{GS} = 10 V$ (Resistive Load see, Figure 3)		6.7 4		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 360V, I_D = 1.5 A,$ $V_{GS} = 10V, R_G = 4.7\Omega$		7 1.3 3.2	10	nC nC nC

SWITCHING OFF

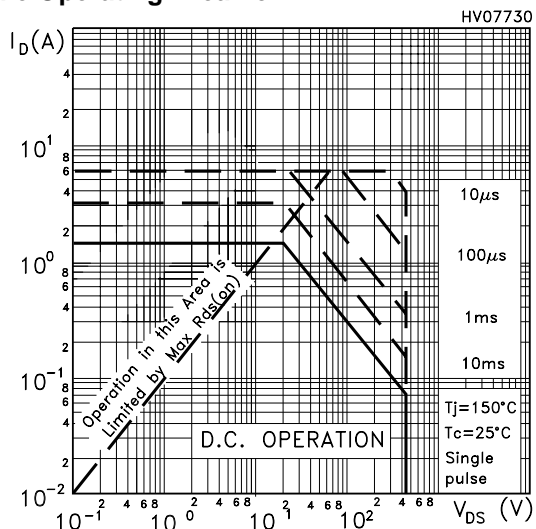
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 360V, I_D = 1.5 A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (Inductive Load see, Figure 5)		8.5 12 18		ns ns ns

SOURCE DRAIN DIODE

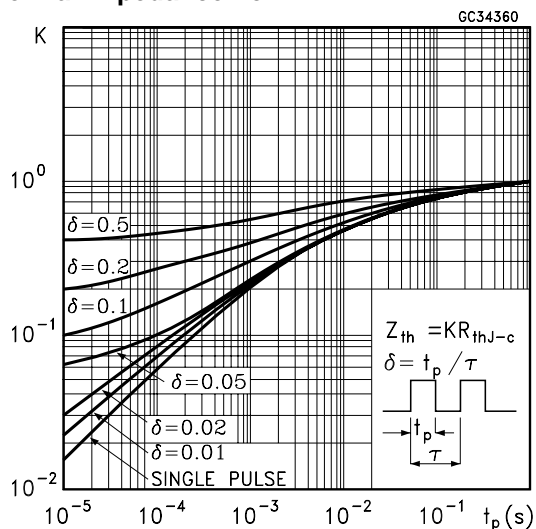
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM} (2)$	Source-drain Current Source-drain Current (pulsed)				1.5 6.0	A A
$V_{SD} (1)$	Forward On Voltage	$I_{SD} = 1.5 A, V_{GS} = 0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 1.5 A, di/dt = 100A/\mu s$ $V_{DD} = 100V, T_j = 150^\circ C$ (see test circuit, Figure 5)		225 530 4.7		ns μC A

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

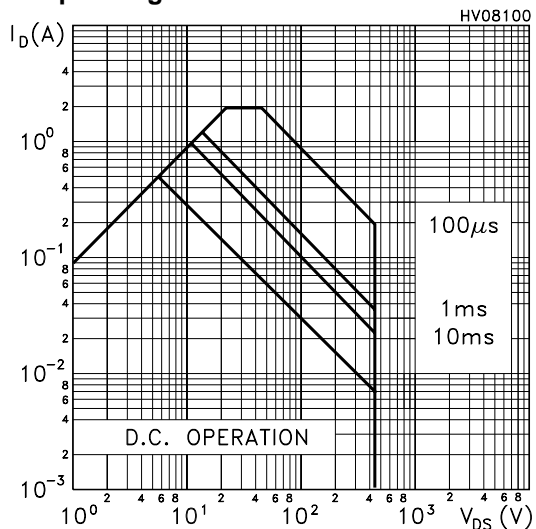
Safe Operating Area For IPAK



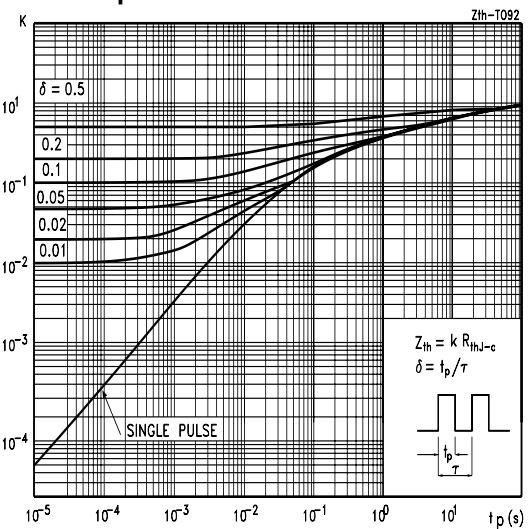
Thermal Impedance For IPAK



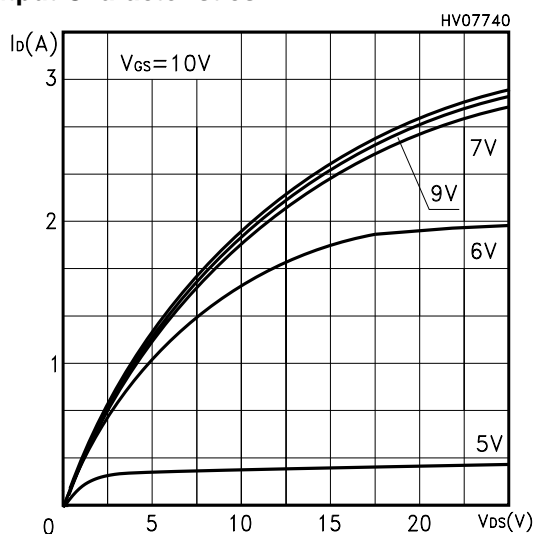
Safe Operating Area For TO-92



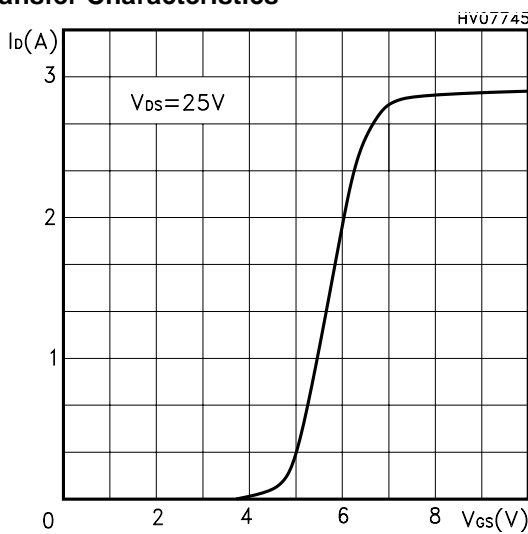
Thermal Impedance For TO-92



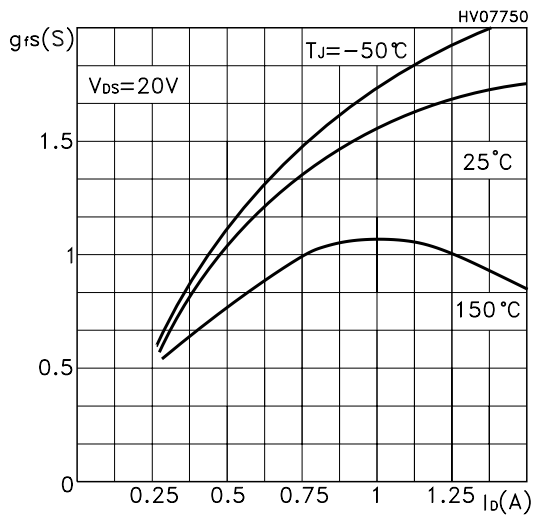
Output Characteristics



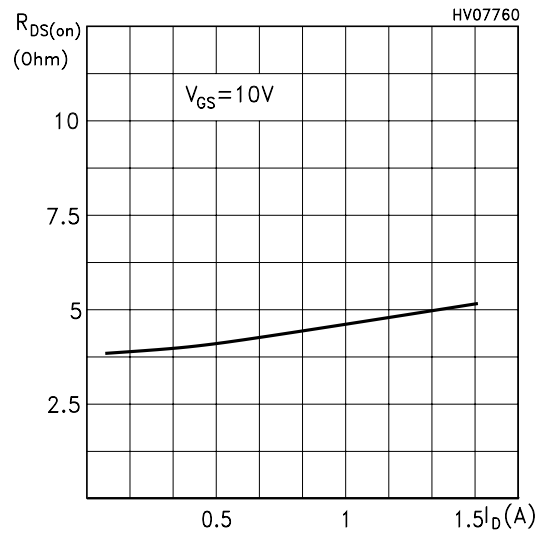
Transfer Characteristics



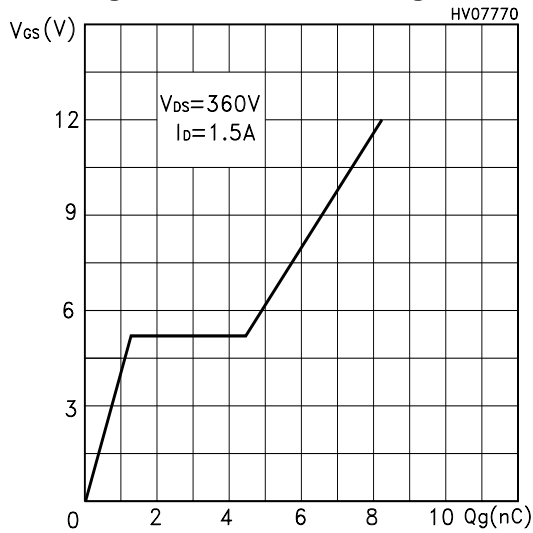
Transconductance



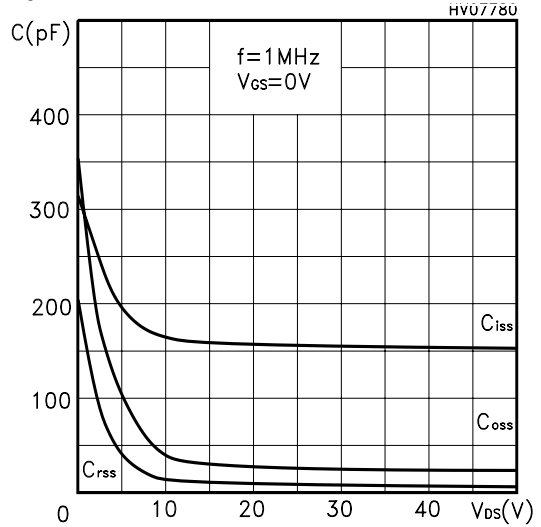
Static Drain-source On Resistance



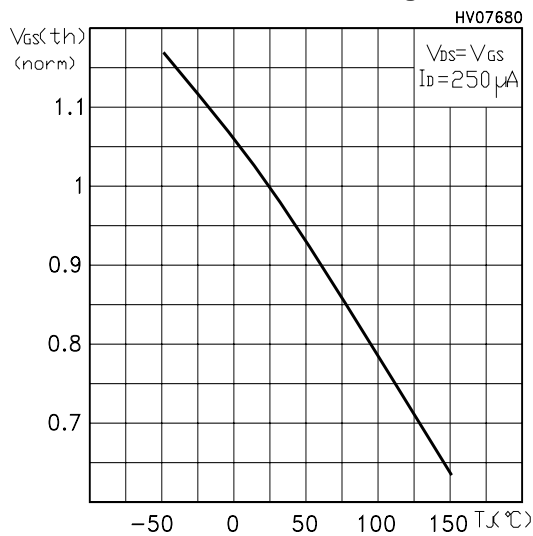
Gate Charge vs Gate-source Voltage



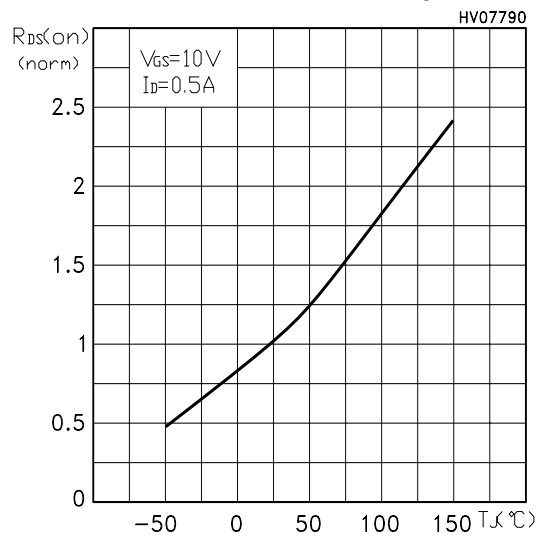
Capacitance Variations



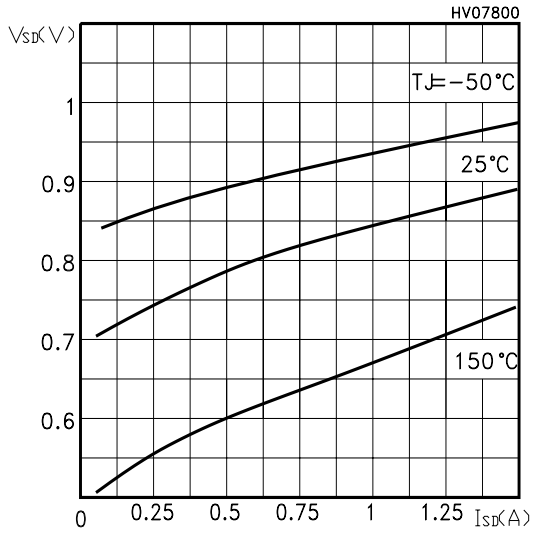
Normalized Gate Threshold Voltage vs Temp.



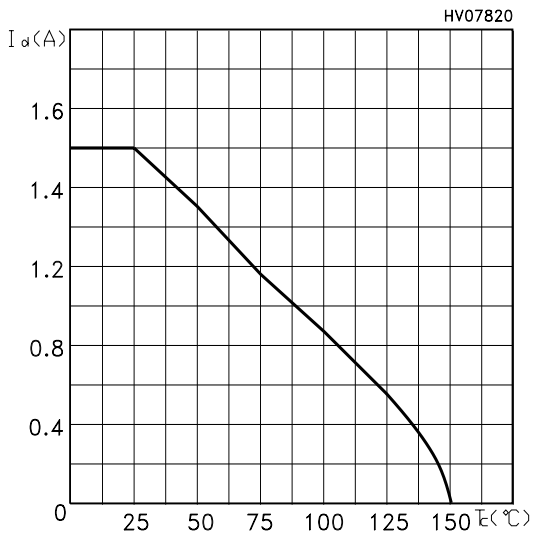
Normalized On Resistance vs Temperature



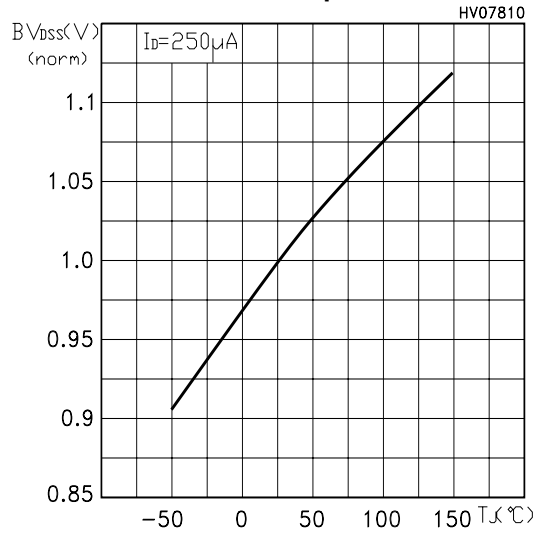
Source-drain Diode Forward Characteristics



Max Id Current vs Tc



Normalized BVDSS vs Temperature



Maximum Avalanche Energy vs Temperature

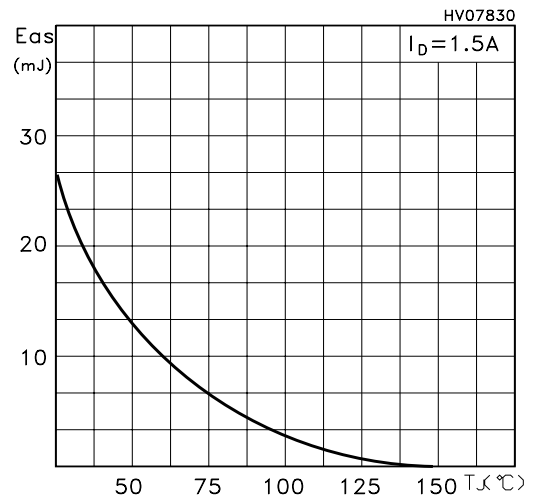


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuit For Resistive Load



Fig. 4: Gate Charge test Circuit

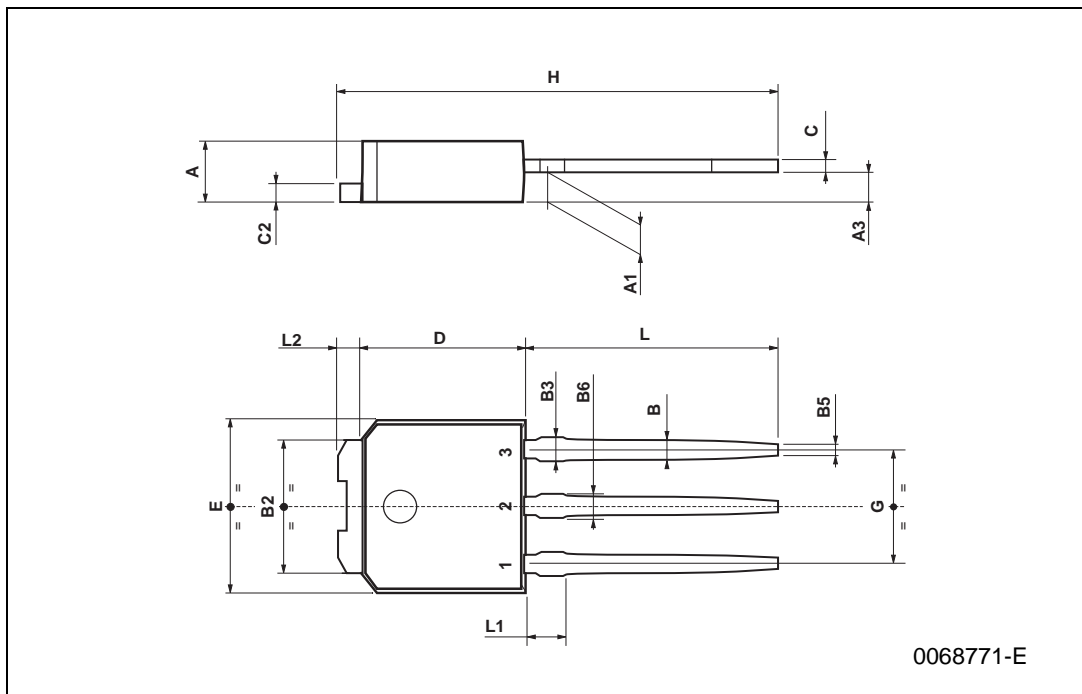


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



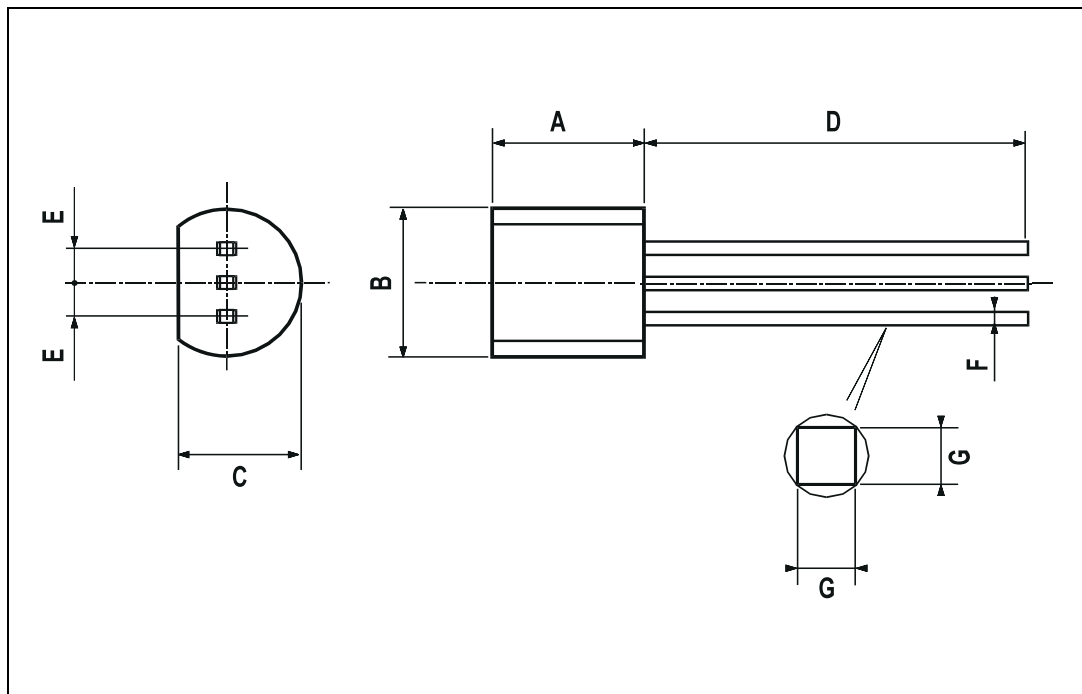
TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



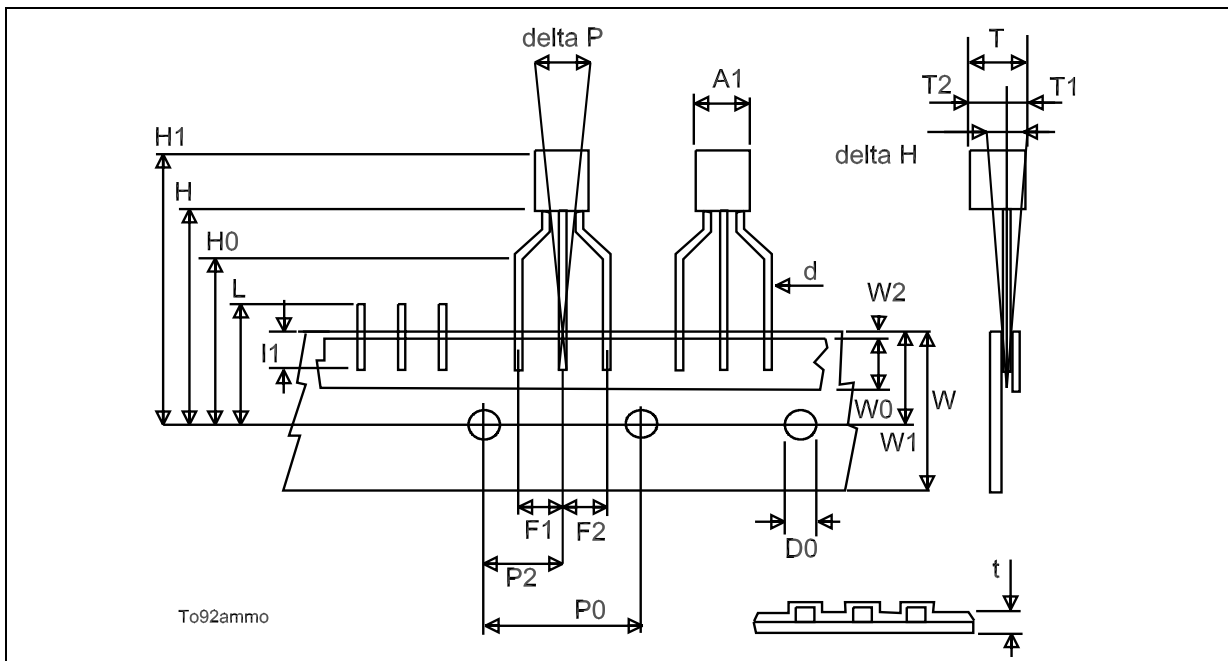
TO-92 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.58		5.33	0.180		0.210
B	4.45		5.2	0.175		0.204
C	3.2		4.2	0.126		0.165
D	12.7			0.500		
E		1.27			0.050	
F	0.4		0.51	0.016		0.020
G	0.35			0.14		



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
l1	3			0.11		
delta P	-1		1	-0.04		0.04



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