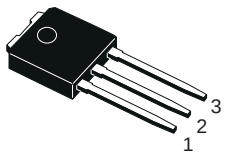
STD2NC45-1
STQ1NC45

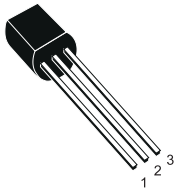
N-CHANNEL 450V - 4.1Ω - 1.5 A IPAK / TO-92
SuperMESH™Power MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D	Pw
STD2NC45-1	450 V	< 4.5 Ω	1.5 A	30 W
STQ1NC45	450 V	< 4.5 Ω	0.5 A	3.1 W

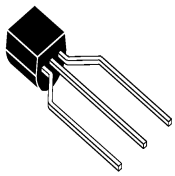
- TYPICAL $R_{DS}(on)$ = 4.1 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- GATE CHARGE MINIMIZED
- NEW HIGH VOLTAGE BENCHMARK



IPAK



TO-92

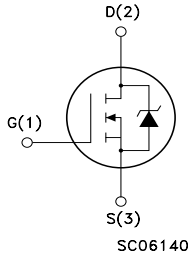


TO-92 (Ammopack)

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.

INTERNAL SCHEMATIC DIAGRAM



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
STQ1NC45	Q1NC45	TO-92	BULK
STQ1NC45-AP	Q1NC45	TO-92	AMMOPAK

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STD2NC45-1	STQ1NC45	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	450		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	450		V
V_{GS}	Gate- source Voltage	± 30		V
I_D	Drain Current (continuos) at T_C = 25°C	1.5	0.5	A
I_D	Drain Current (continuos) at T_C = 100°C	0.95	0.315	A
I_{DM} (•)	Drain Current (pulsed)	6	2	A
P_{TOT}	Total Dissipation at T_C = 25°C	30	3.1	W
	Derating Factor	0.24	0.025	W/°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		°C °C

(•) Pulse width limited by safe operating area
(1) I_{SD} ≤0.5A, di/dt ≤100A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ T_{JMAX}.

THERMAL DATA

		IPAK	TO-92	
Rthj-case	Thermal Resistance Junction-case Max	4.1		°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	120	°C/W
Rthj-lead	Thermal Resistance Junction-lead Max		40	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	275	260	°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 °C, I_D = I_{AR}, V_{DD} = 50 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 µA, V_{GS} = 0	450			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating, T_C = 125 °C			1 50	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	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} > $I_{D(on)}$ x $R_{DS(on)max}$, 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 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 = 4.7Ω 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 = 4.7Ω		7 1.3 3.2	10	nC nC nC

SWITCHING OFF

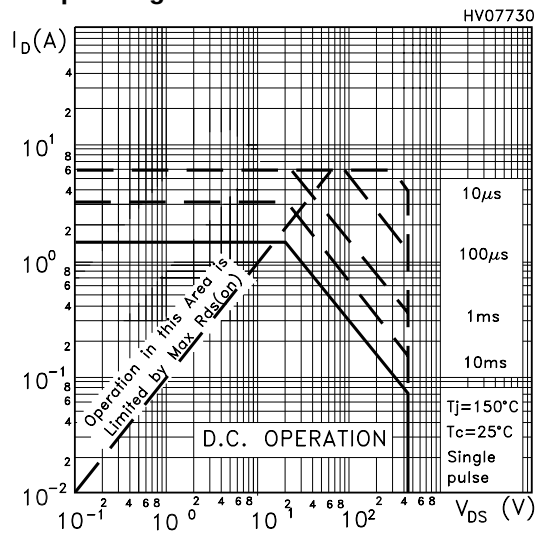
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 360V, I_D = 1.5 A, R_G = 4.7Ω, V_{GS} = 10V (Inductive Load see, Figure 5)		8.5 12 18		ns ns ns

SOURCE DRAIN DIODE

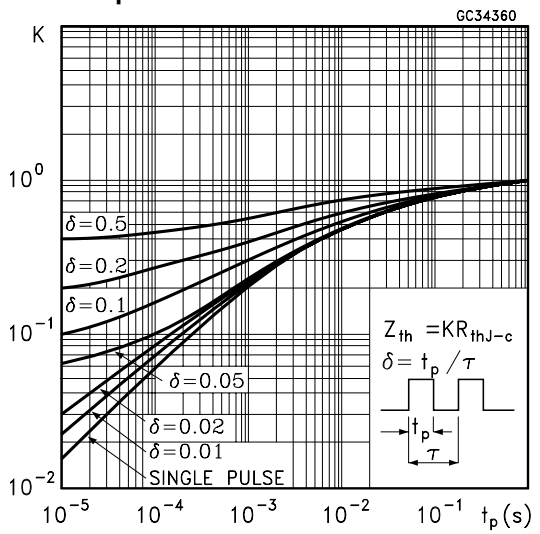
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				1.5 6.0	A A
V_{SD} (1)	Forward On Voltage	I_{SD} = 1.5 A, V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 1.5 A, di/dt = 100A/µs V_{DD} = 100V, T_j = 150°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.

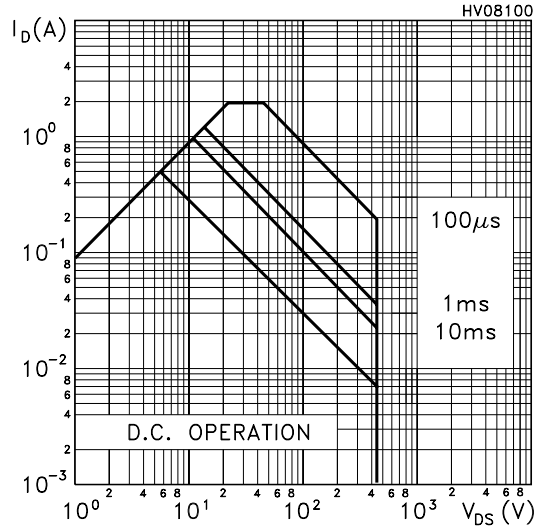
Safe Operating Area For IPAK



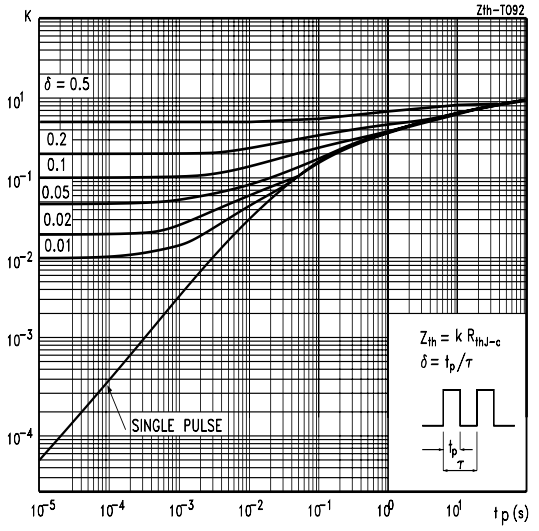
Thermal Impedance For IPAK



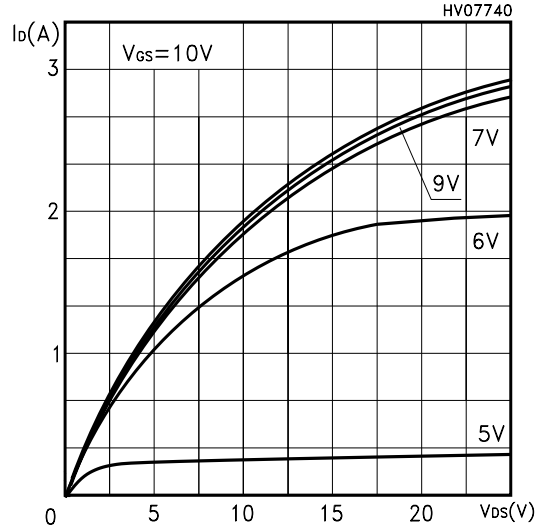
Safe Operating Area For TO-92



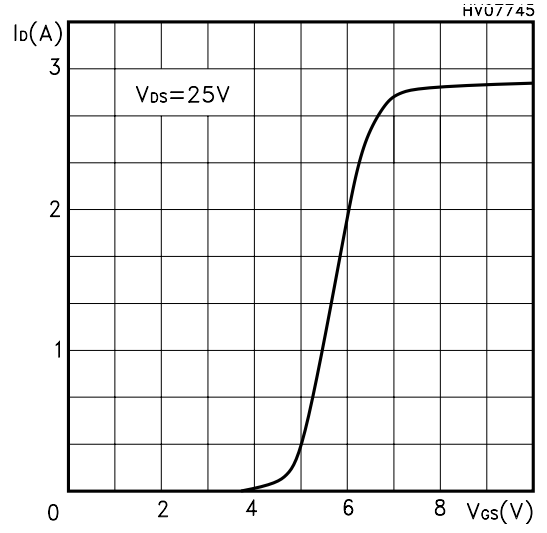
Thermal Impedance For TO-92



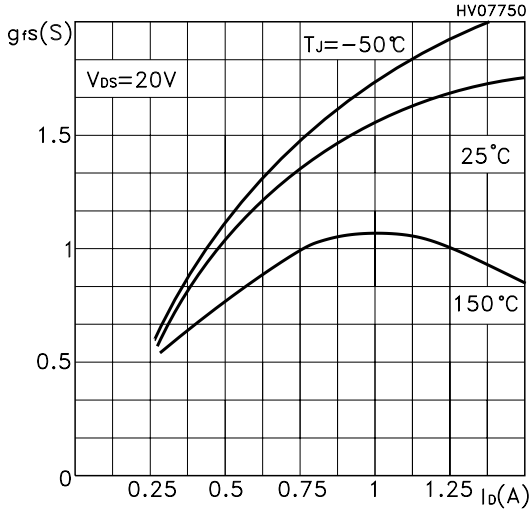
Output Characteristics



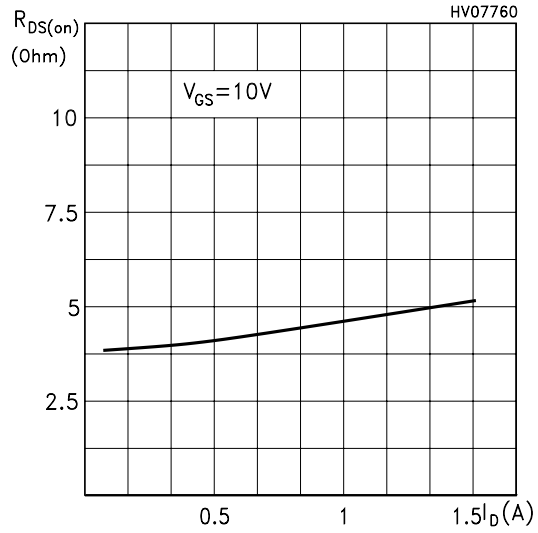
Transfer Characteristics



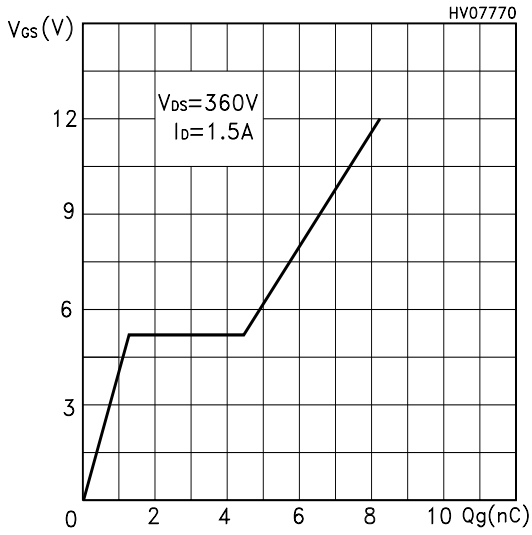
Transconductance



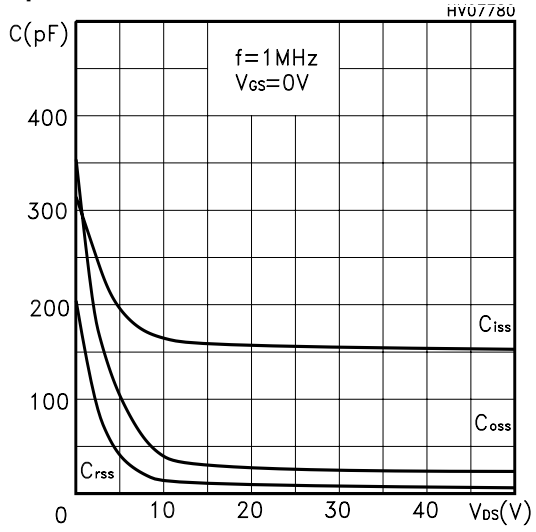
Static Drain-source On Resistance



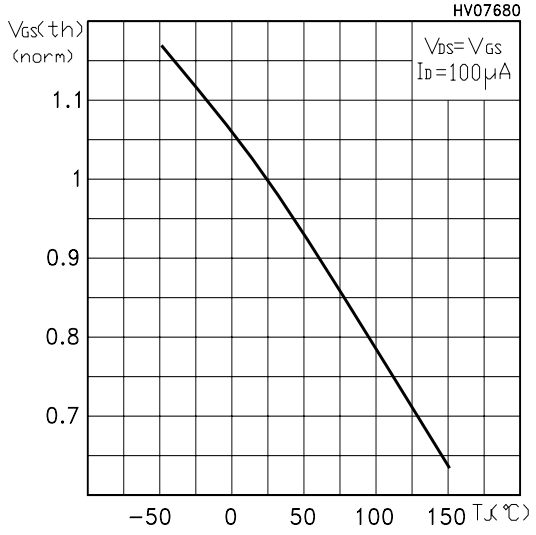
Gate Charge vs Gate-source Voltage



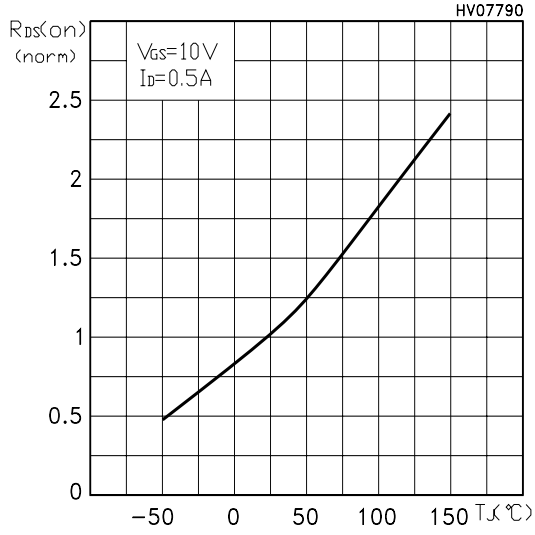
Capacitance Variations



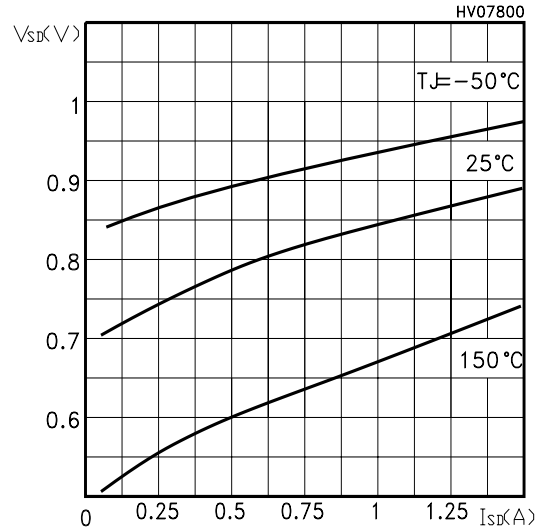
Normalized Gate Threshold Voltage vs Temp.



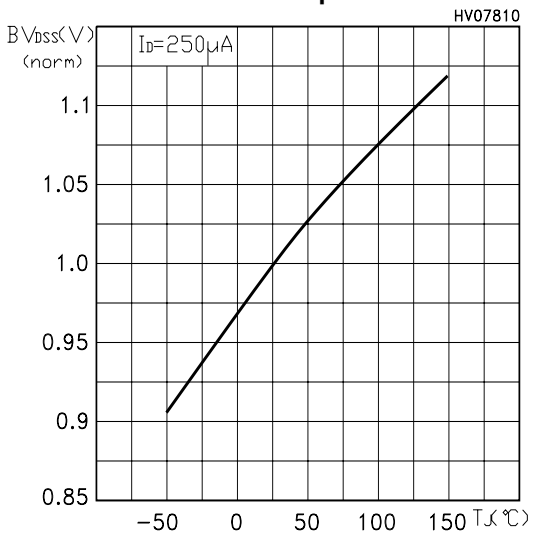
Normalized On Resistance vs Temperature



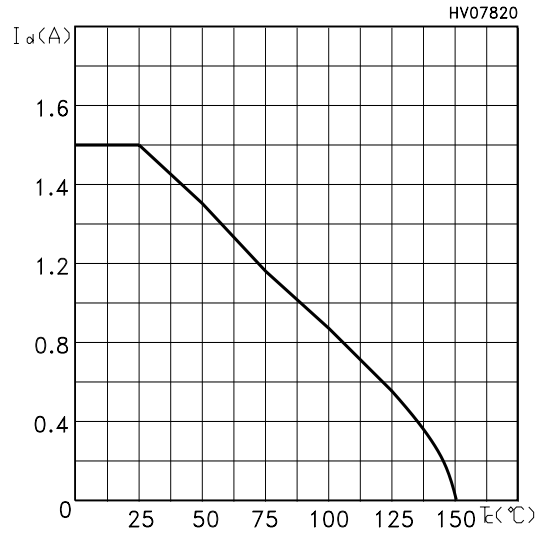
Source-drain Diode Forward Characteristics



Normalized BVDSS vs Temperature



Max Id Current vs Tc



Maximum Avalanche Energy vs Temperature

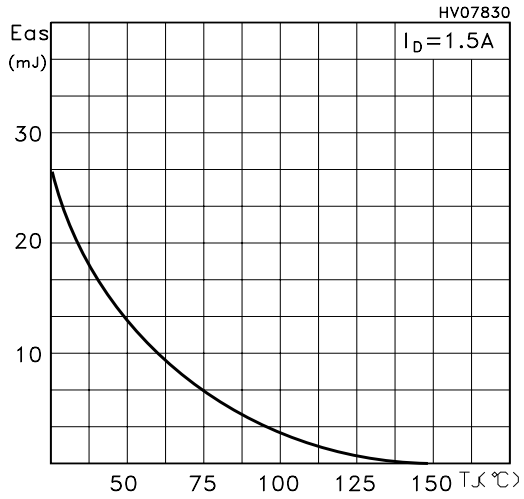


Fig. 1: Unclamped Inductive Load Test Circuit

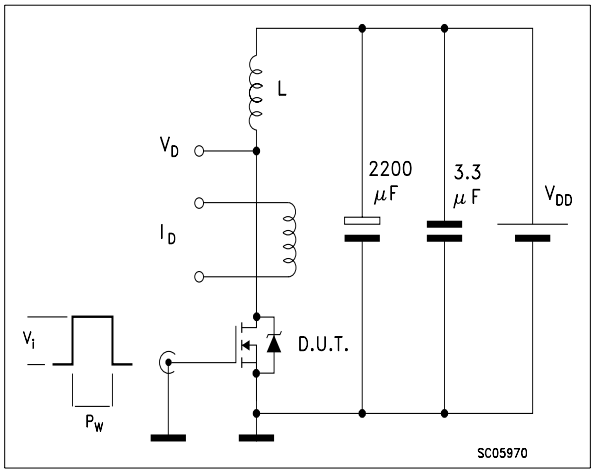


Fig. 2: Unclamped Inductive Waveform

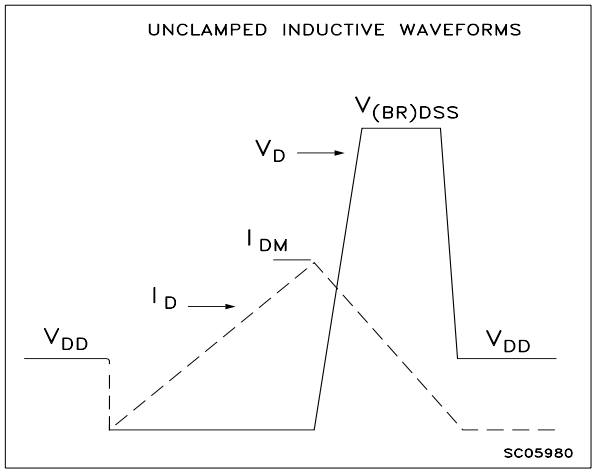


Fig. 3: Switching Times Test Circuit For Resistive Load

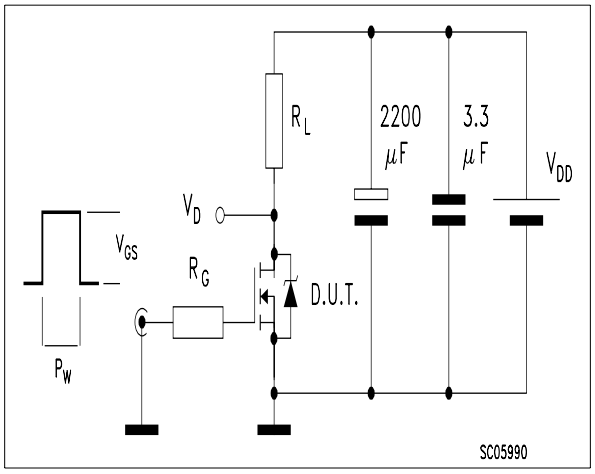


Fig. 4: Gate Charge test Circuit

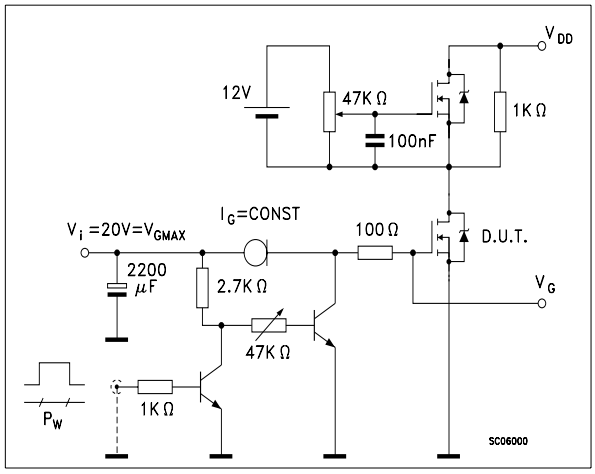
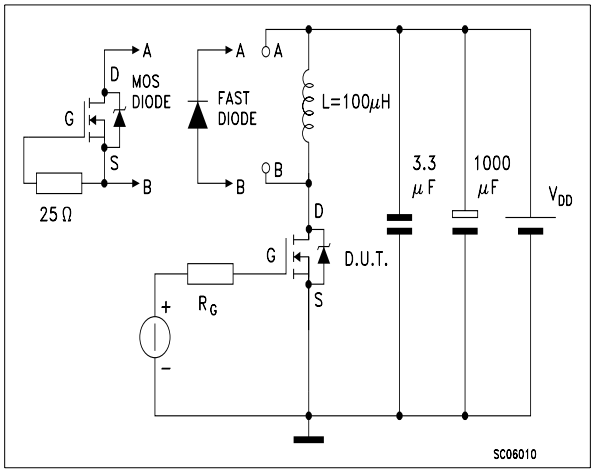
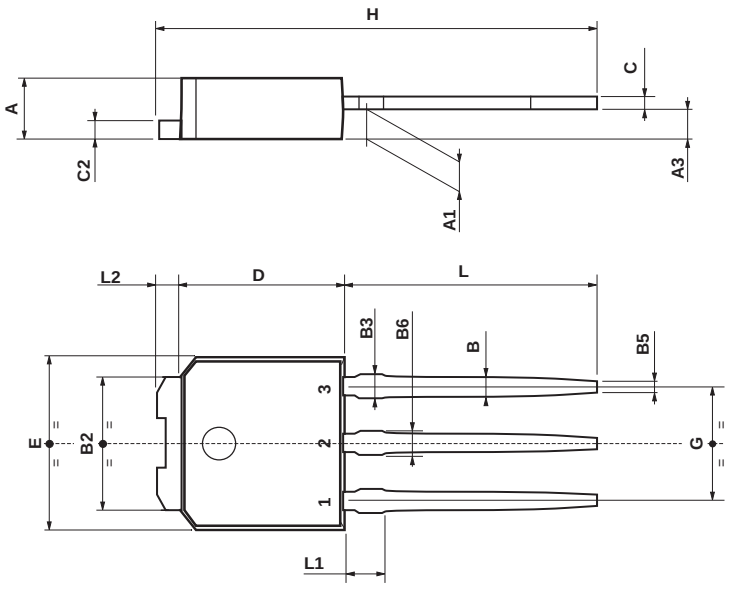


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-251 (IPAK) MECHANICAL DATA

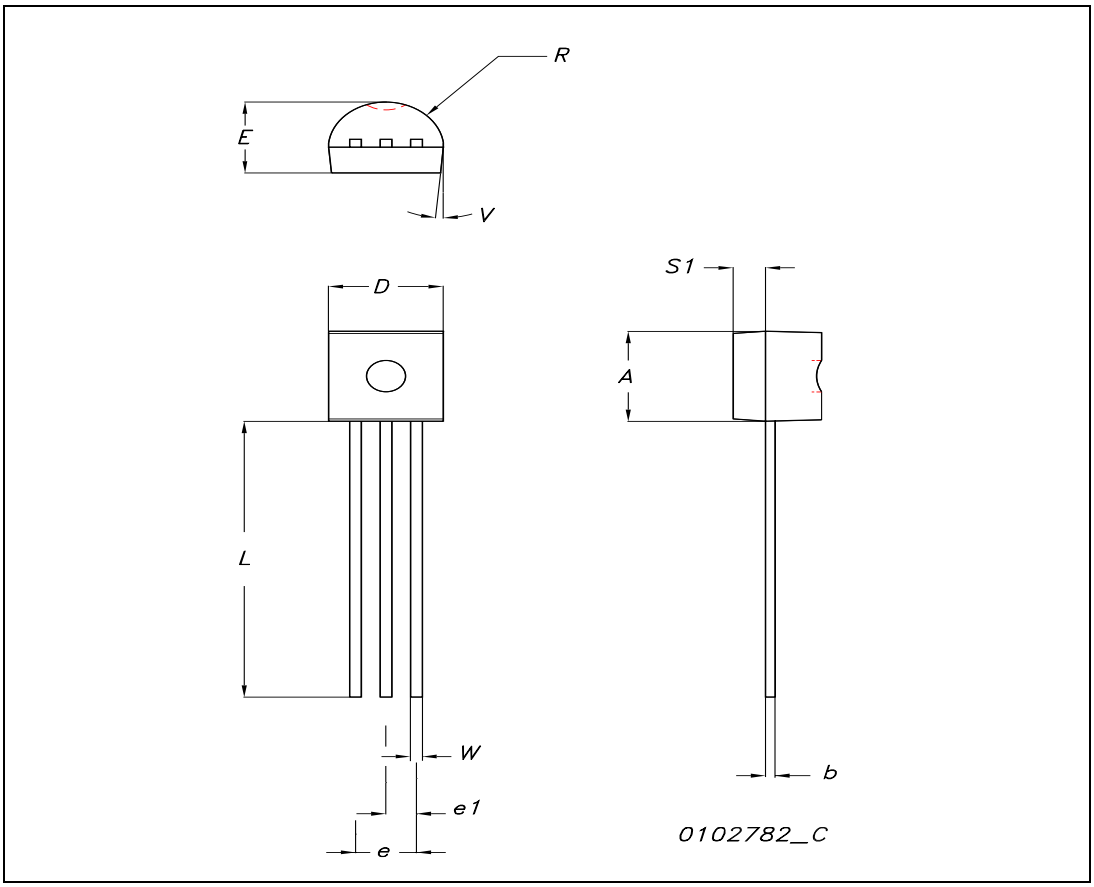
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		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



0068771-E

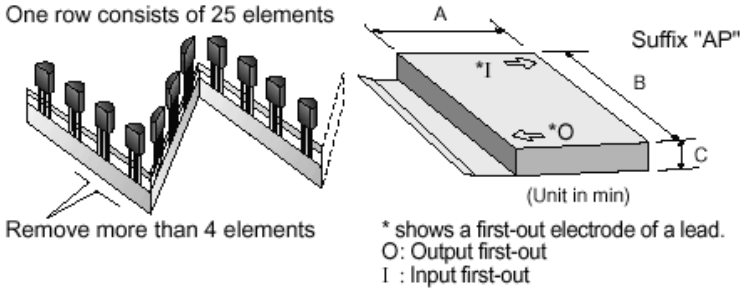
TO-92 MECHANICAL DATA

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°	

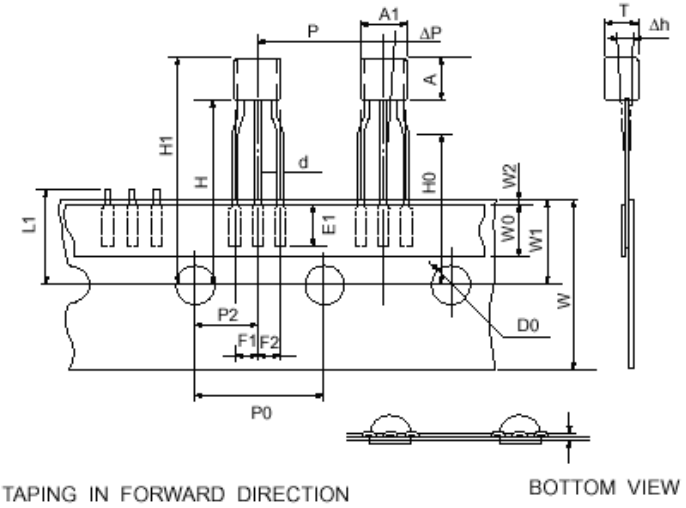


SHIPPING METHODS

TO-92 AMMOPACK (suffix"-AP")



DIM	mm	
	Min.	Max.
A	3	250
B	3	330
C	3	45



DIM	mm	
	Min.	Max.
A1	-	5
A	-	5
T	-	4
d	-	0.45
E1	2.5	-
P	11.7	13.7
P0	12.4	13
Hole Center to Device Center	5.95	6.75
F1/F2	2.4	2.8
Δh	-1	1
ΔP	-1	1
W	17.5	19
W0	5.7	6.3
W1	8.5	9.75
W2	-	0.5
H	-	20
H0	15.5	16.5
H1	-	25
D0	3.8	4.2
t	0.4	0.8
L1	-	11