

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

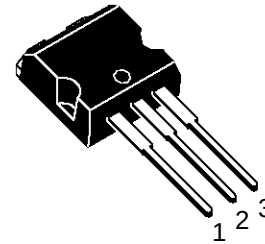
PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
STB3NA60-1	600 V	< 4 Ω	2.9 A

- TYPICAL R_{DS(on)} = 0.7 Ω
- AVALANCHE RUGGED TECHNOLOGY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

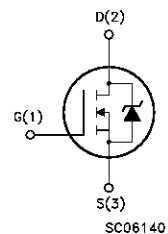
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



I2PAK
TO-262

INTERNAL SCHEMATIC DIAGRAM



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 kΩ)	600	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (continuous) at T _c = 25 °C	2.9	A
I _D	Drain Current (continuous) at T _c = 100 °C	1.8	A
I _{DM} (•)	Drain Current (pulsed)	11.6	A
P _{tot}	Total Dissipation at T _c = 25 °C	80	W
	Derating Factor	0.64	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

STB3NA60-1

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	1.56	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R _{thj-amb}	Thermal Resistance Case-sink	Typ	0.5	°C/W
T _l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max, $\delta < 1\%$)	2.9	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	42	mJ
E _{AR}	Repetitive Avalanche Energy (pulse width limited by T _j max, $\delta < 1\%$)	1.6	mJ
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, $\delta < 1\%$)	1.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μ A V _{GS} = 0	600			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating x 0.8 T _c = 125 °C			250 1000	μ A μ A
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 30 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 μ A	2.25	3	3.75	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V I _D = 1.5 A V _{GS} = 10 V I _D = 1.5 A T _c = 100 °C		3.3	4 8	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} x R _{DS(on)max} V _{GS} = 10 V	2.9			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} x R _{DS(on)max} I _D = 1.5 A	1	2		S
C _{iss}	Input Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		380	500	pF
C _{oss}	Output Capacitance			57	75	pF
C _{rss}	Reverse Transfer Capacitance			17	23	pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 300\text{ V}$ $I_D = 1.5\text{ A}$		14	20	ns
t_r	Rise Time	$R_G = 18\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		25	35	ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 400\text{ V}$ $R_G = 18\ \Omega$ (see test circuit, figure 5)		300		A/ μs
Q_g	Total Gate Charge	$I_D = 3\text{ A}$ $V_{GS} = 10\text{ V}$		22	30	nC
Q_{gs}	Gate-Source Charge	$V_{DD} = \text{Max Rating} \times 0.8$		6		nC
Q_{gd}	Gate-Drain Charge			9		nC

SWITCHING OFF

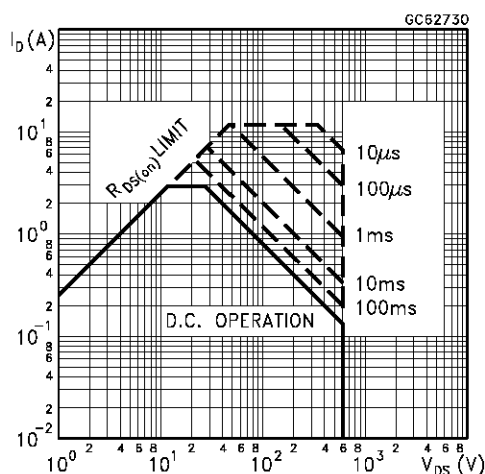
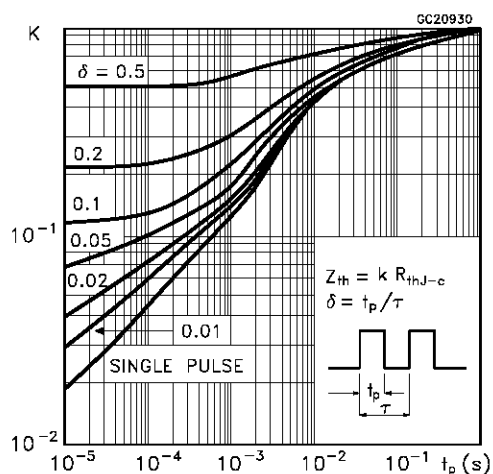
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$	Off-voltage Rise Time	$V_{DD} = 480\text{ V}$ $I_D = 3\text{ A}$		13	18	ns
t_f	Fall Time	$R_G = 18\ \Omega$ $V_{GS} = 10\text{ V}$		24	34	ns
t_c	Cross-over Time	(see test circuit, figure 5)		12	17	ns

SOURCE DRAIN DIODE

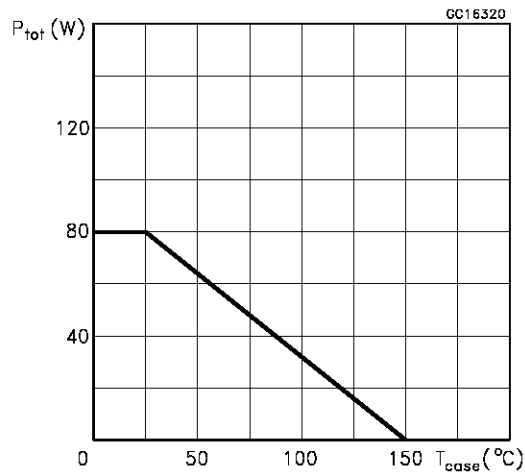
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				2.9	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				11.6	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 2.9\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 3\text{ A}$ $V_{DD} = 100\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$ $T_J = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		460		ns
Q_{rr}	Reverse Recovery Charge			5.6		μC
I_{RRM}	Reverse Recovery Current			24		A

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

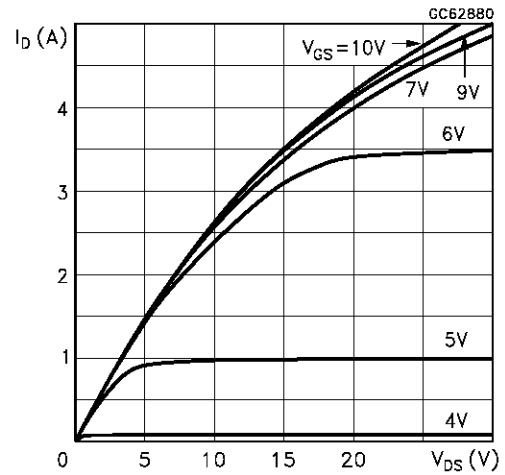
(•) Pulse width limited by safe operating area

Safe Operating Area**Thermal Impedance**

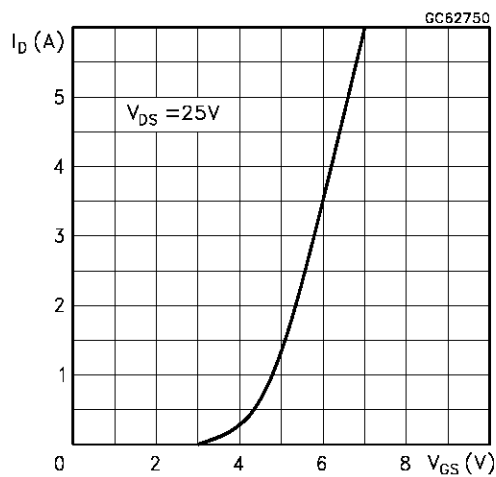
Derating Curve



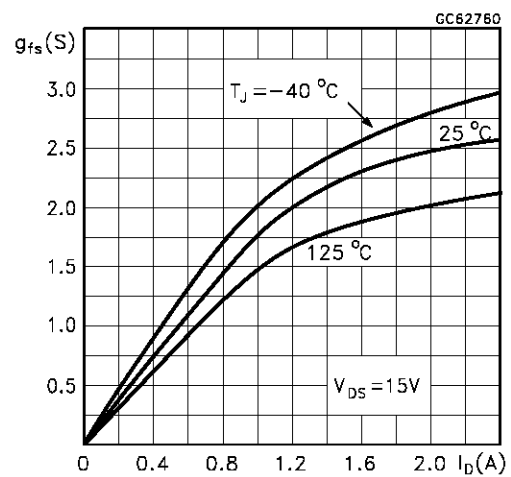
Output Characteristics



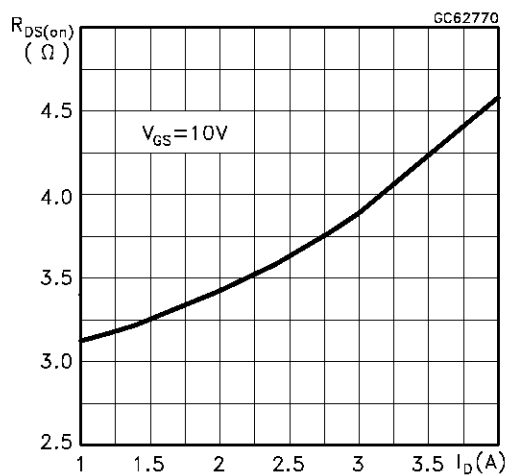
Transfer Characteristics



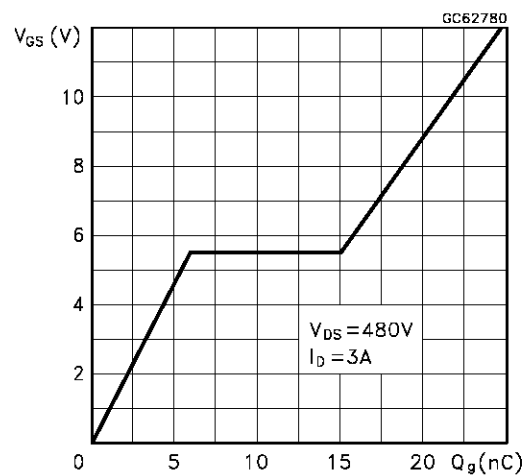
Transconductance



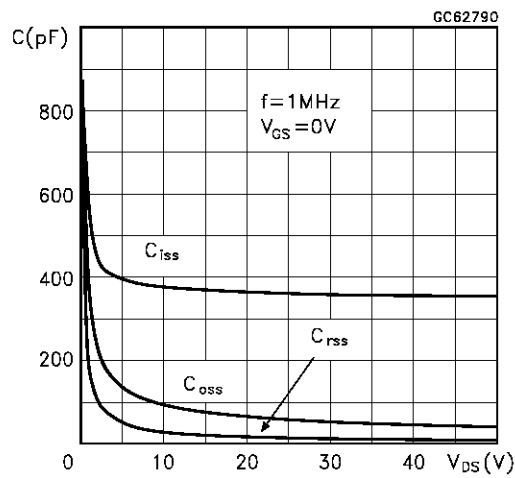
Static Drain-source On Resistance



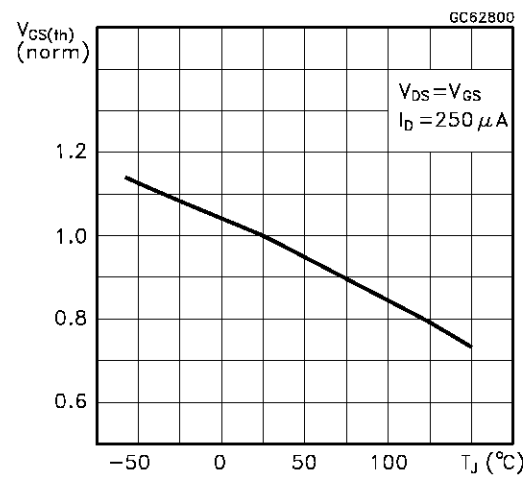
Gate Charge vs Gate-source Voltage



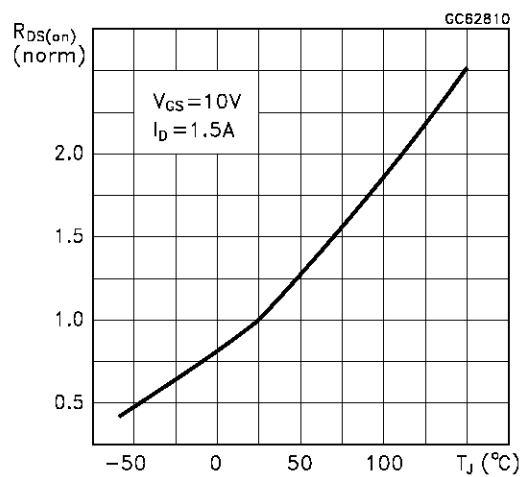
Capacitance Variations



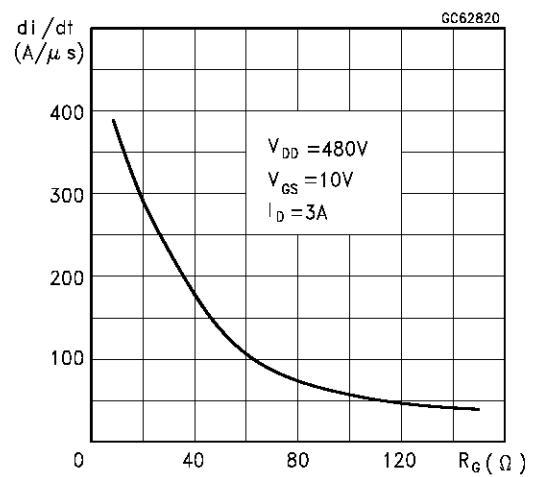
Normalized Gate Threshold Voltage vs Temperature



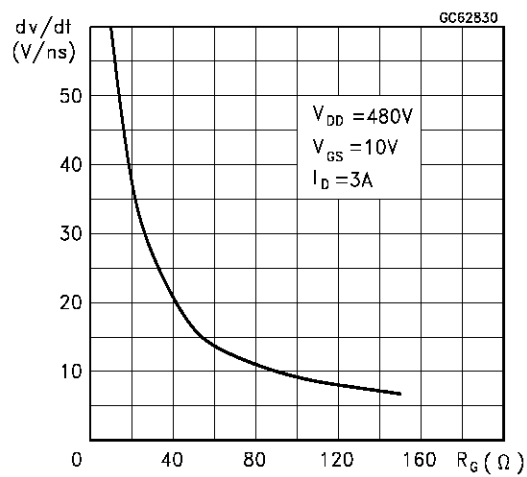
Normalized On Resistance vs Temperature



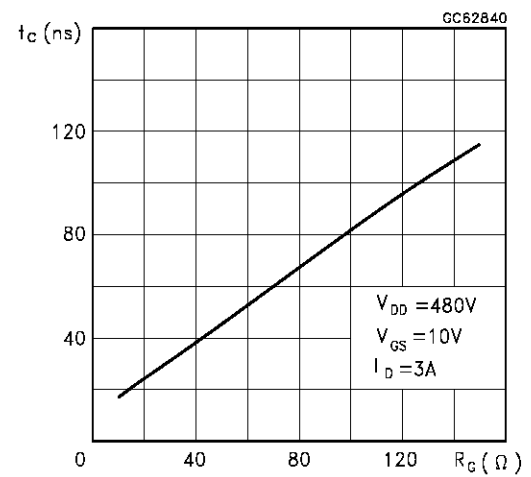
Turn-on Current Slope



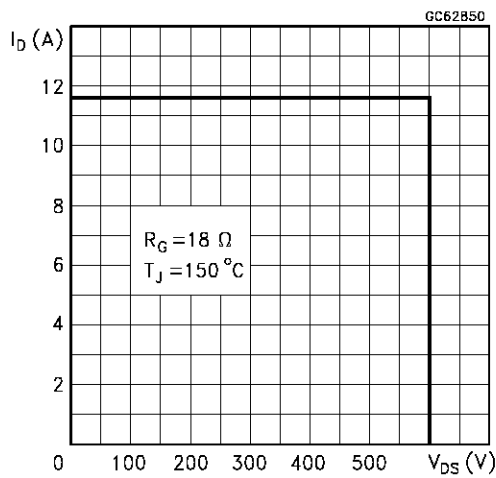
Turn-off Drain-source Voltage Slope



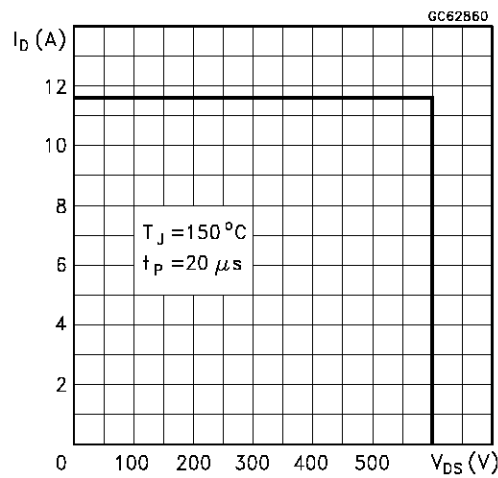
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

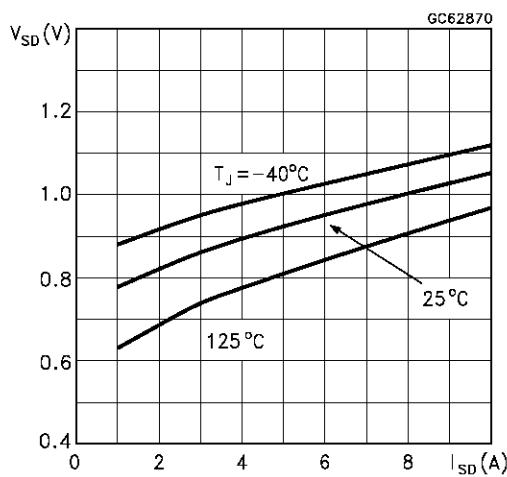


Fig. 1: Unclamped Inductive Load Test Circuit

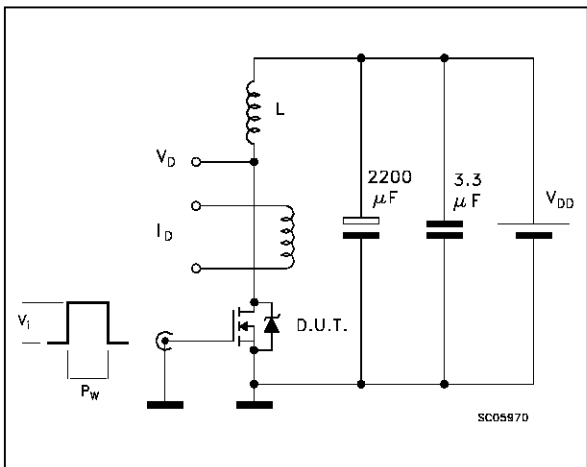


Fig. 2: Unclamped Inductive Waveform

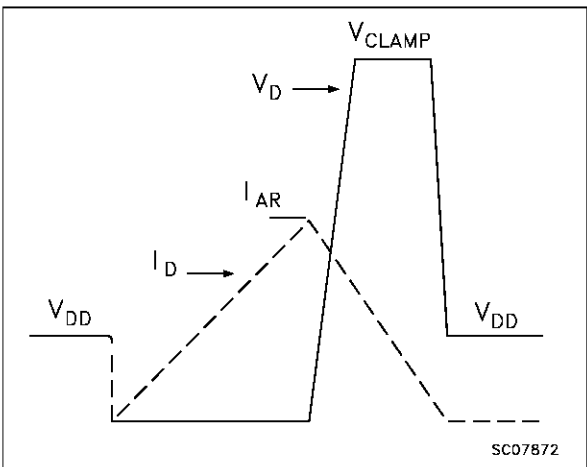
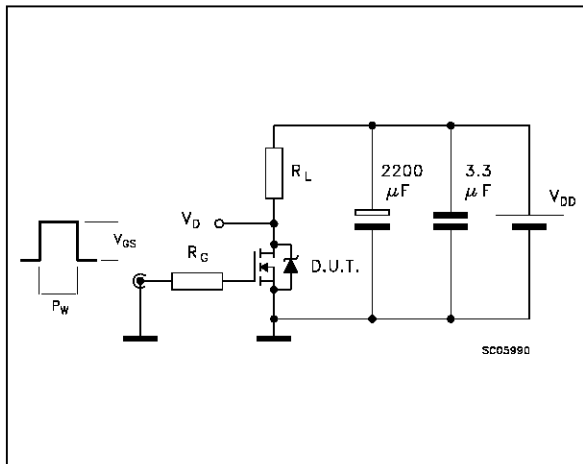
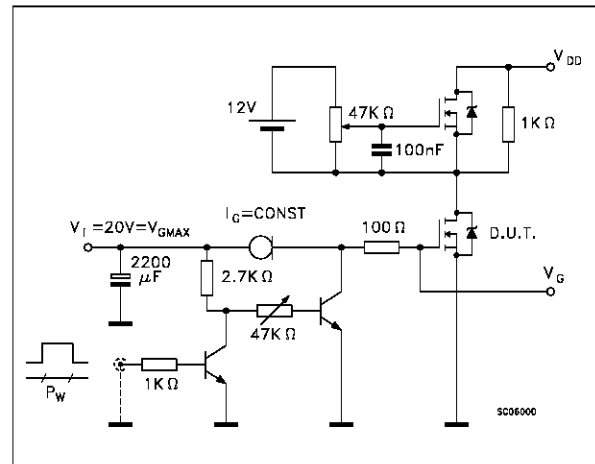
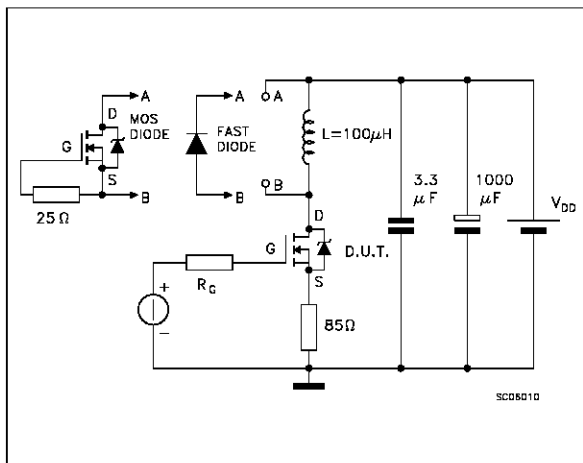
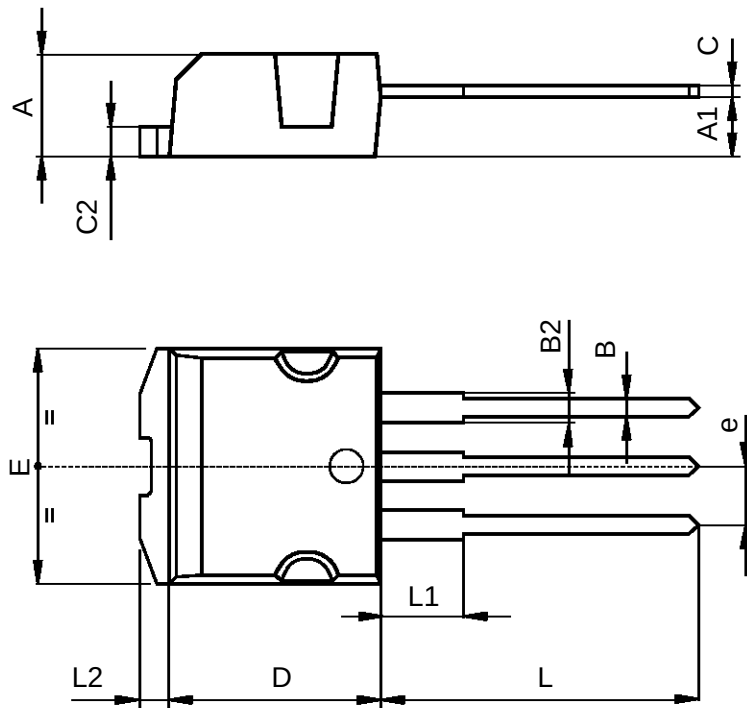


Fig. 3: Switching Times Test Circuits For Resistive Load**Fig. 4: Gate Charge test Circuit****Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**

TO-262 (I2PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.3		4.6	0.169		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B1	1.2		1.38	0.047		0.054
B2	1.25		1.4	0.049		0.055
C	0.45		0.6	0.017		0.023
C2	1.21		1.36	0.047		0.053
D	9		9.35	0.354		0.368
e	2.44		2.64	0.096		0.104
E	10		10.28	0.393		0.404
L	13.2		13.5	0.519		0.531
L1	3.48		3.78	0.137		0.149
L2	1.27		1.37	0.050		0.054



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1995 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

...