



STGD3NB60SD

N-CHANNEL 3A - 600V DPAK Power MESH™ IGBT

PRELIMINARY DATA

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGD3NB60SD	600 V	< 1.5 V	3 A

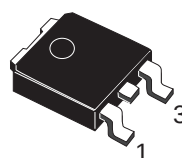
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- INTEGRATED FREEWHEELING DIODE
- SURFACE-MOUNTING DPAK (TO-252)
POWER PACKAGE IN TAPE & REEL
(SUFFIX "T4")

DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

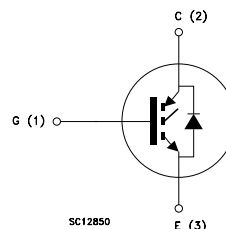
APPLICATIONS

- GAS DISCHARGE LAMP
- STATIC RELAYS
- MOTOR CONTROL



**DPAK
TO-252**
(Suffix "T4")

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{GE}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current (continuous) at T _c = 25 °C	6	A
I _C	Collector Current (continuous) at T _c = 100 °C	3	A
I _{CM} (•)	Collector Current (pulsed)	25	A
P _{tot}	Total Dissipation at T _c = 25 °C	48	W
	Derating Factor	0.32	W/°C
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

STGD3NB60SD

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	3.125	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	100	°C/W
R _{thc-sink}	Thermal Resistance Case-sink	Typ	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_j = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collector-Emitter Breakdown Voltage	I _C = 250 µA V _{GE} = 0	600			V
I _{CES}	Collector cut-off (V _{GE} = 0)	V _{CE} = Max Rating T _j = 25 °C V _{CE} = Max Rating T _j = 125 °C			10 100	µA µA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 20 V V _{CE} = 0			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} I _C = 250 µA	2.5		5	V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 15 V I _C = 1.5 A V _{GE} = 15 V I _C = 3 A V _{GE} = 15 V I _C = 3 A T _j = 125 °C		1 1.2 1.1	1.5	V V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 25 V I _C = 3 A	1.7	2.5		S
C _{ies} C _{oes} C _{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{CE} = 25 V f = 1 MHz V _{GE} = 0		255 30 5.6	330 40 7	pF pF pF
Q _G Q _{GE} Q _{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V _{CE} = 480 V I _C = 3 A V _{GE} = 15 V		18 5.4 5.5		nC nC nC
I _{CL}	Latching Current	V _{clamp} = 480 V R _G = 1kΩ T _j = 150 °C	12			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{d(on)} t _r	Delay Time Rise Time	V _{CC} = 480 V I _C = 3 A V _{GE} = 15 V R _G = 1kΩ		125 150		ns ns
(di/dt) _{on}	Turn-on Current Slope	V _{CC} = 480 V I _C = 3 A R _G = 1kΩ V _{GE} = 15 V		50		A/µs
E _{on}	Turn-on Switching Losses	T _j = 125 °C		1100		µJ

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$		1.8		μS
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 1\text{ k}\Omega$ $V_{GE} = 15\text{ V}$		1.0		μS
$t_{d(off)}$	Delay Time			3.4		μS
t_f	Fall Time			0.72		μS
$E_{off(**)}$	Turn-off Switching Loss			1.15		mJ
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$		2.8		μS
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 1\text{ k}\Omega$ $V_{GE} = 15\text{ V}$		1.45		μS
$t_{d(off)}$	Delay Time	$T_j = 125\text{ }^\circ\text{C}$		3.6		μS
t_f	Fall Time			1.2		μS
$E_{off(**)}$	Turn-off Switching Loss			1.8		mJ

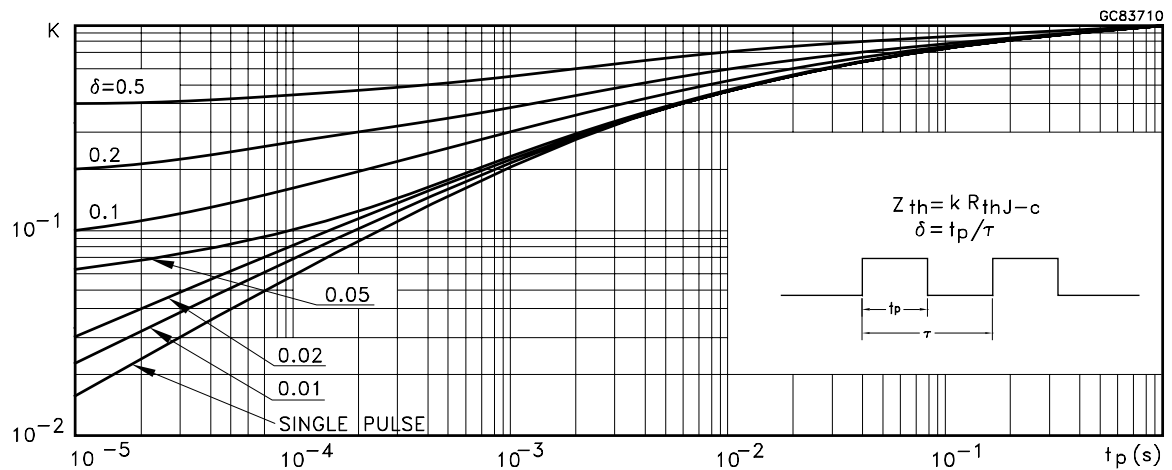
COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				3	A
I_{fm}	Forward Current pulsed				25	A
V_f	Forward On-Voltage	$I_f = 3\text{ A}$		1.55	1.9	V
		$I_f = 1\text{ A}$		1.15		V
t_{rr}	Reverse Recovery Time	$I_f = 3\text{ A}$ $V_R = 200\text{ V}$		1700		ns
Q_{rr}	Reverse Recovery Charge	$dI/dt = 100\text{ A}/\mu\text{S}$ $T_j = 125\text{ }^\circ\text{C}$		4500		nC
I_{rrm}	Reverse Recovery Current			9.5		A

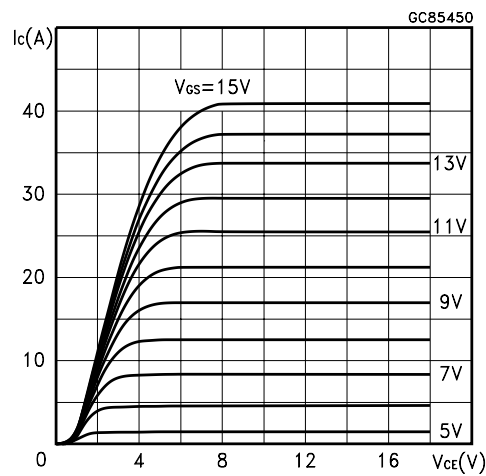
(●) Pulse width limited by max. junction temperature

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

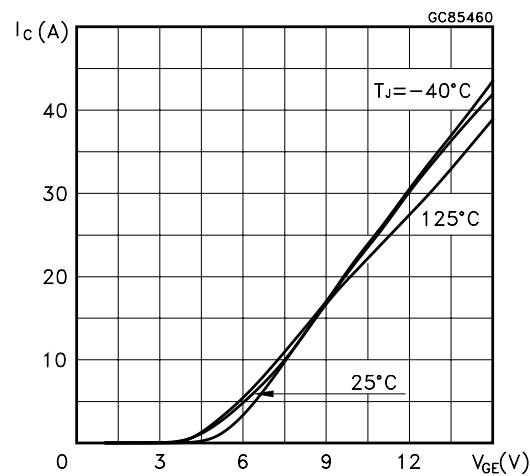
(**) Losses Include Also The Tail (Jedec Standardization)

Thermal Impedance

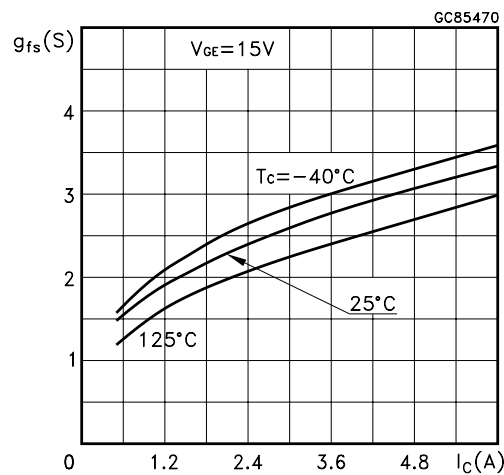
Output Characteristics



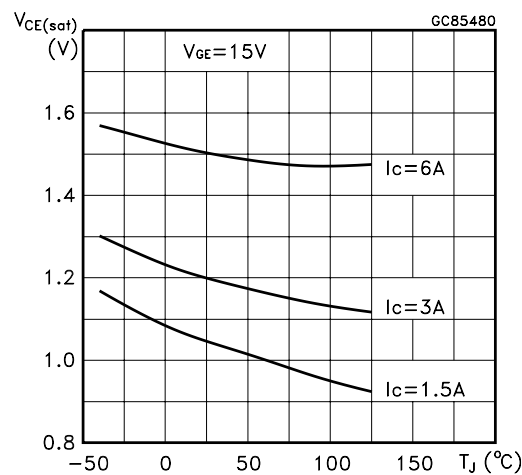
Transfer Characteristics



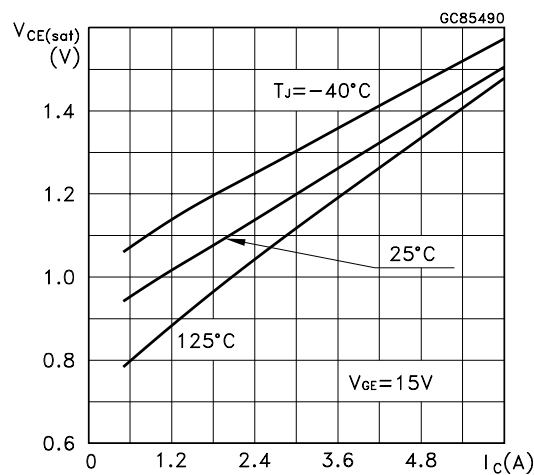
Transconductance



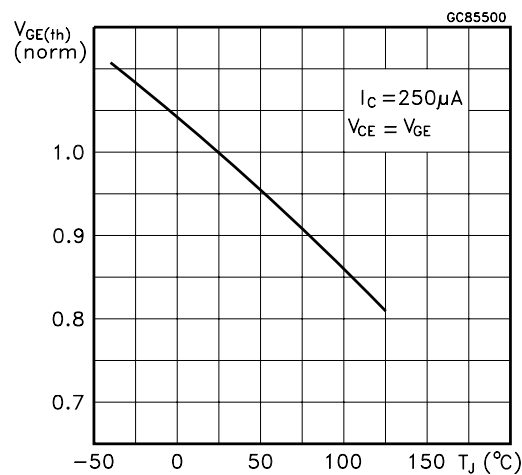
Collector-Emitter On Voltage vs Temperature



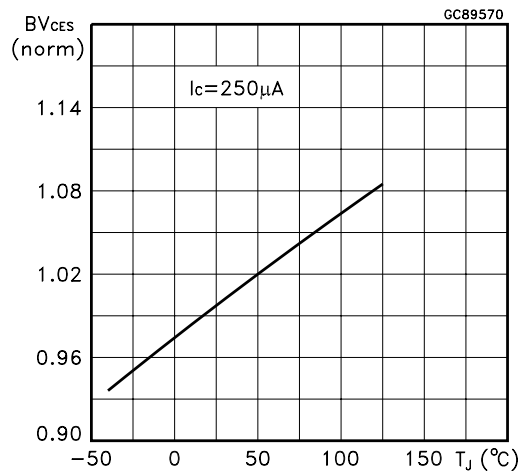
Collector-Emitter On Voltage vs Collector Current



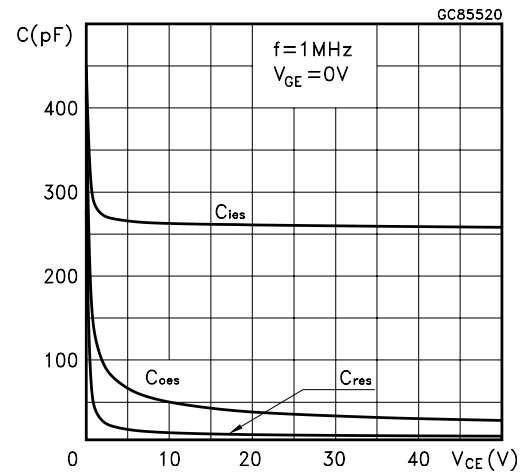
Gate Threshold vs Temperature



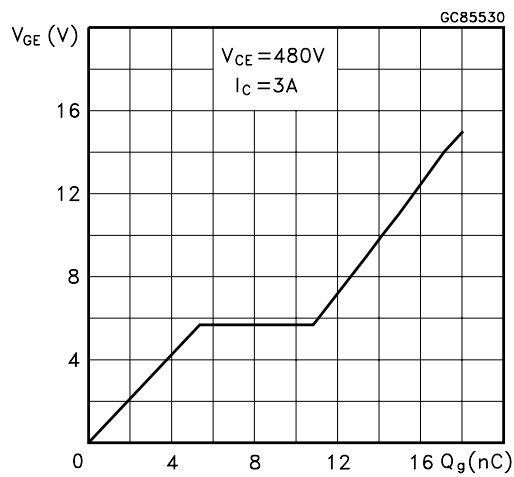
Normalized Breakdown Voltage vs Temperature



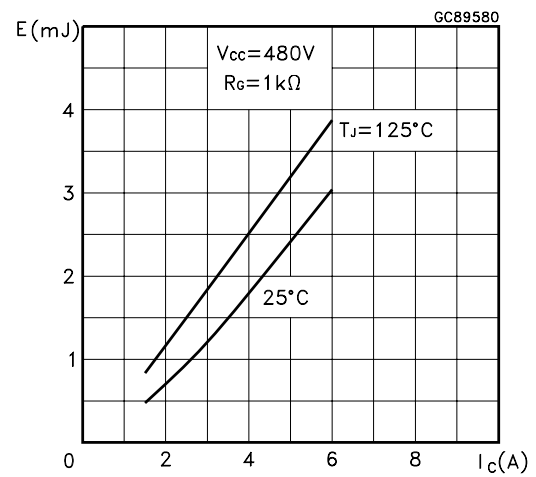
Capacitance Variations



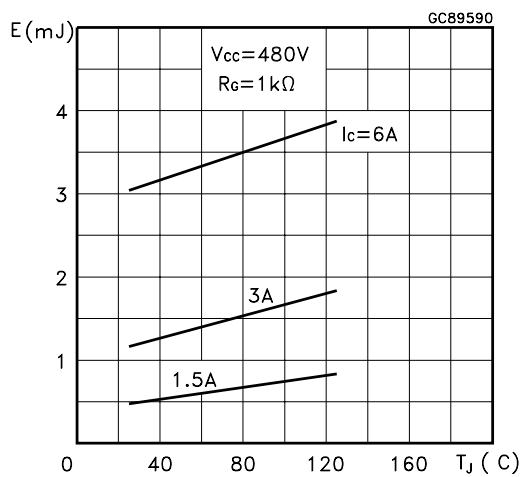
Gate Charge vs Gate-Emitter Voltage



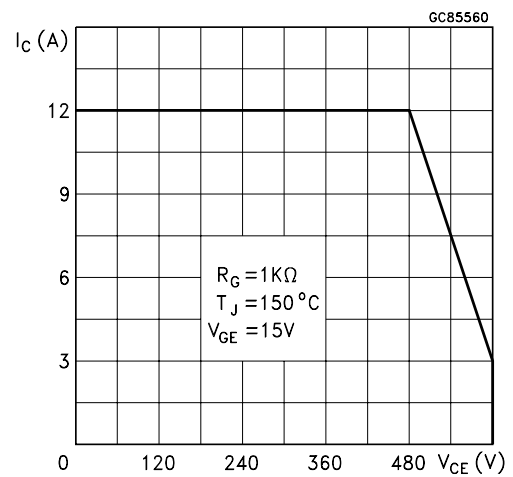
Off Switching Losses vs I_C



Off Switching Losses vs T_J



Switching Off Safe Operatin Area



Diode Forward vs Tj

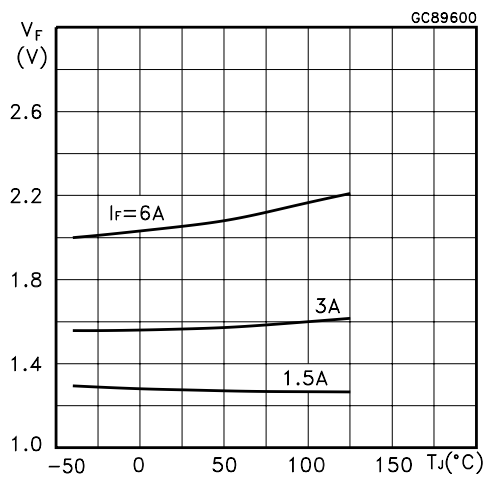


Fig. 1: Gate Charge test Circuit

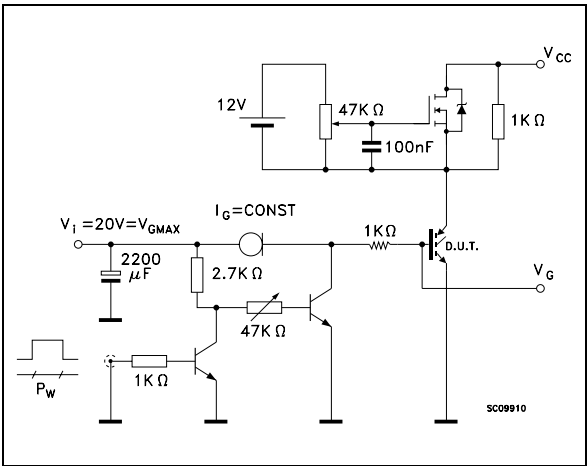
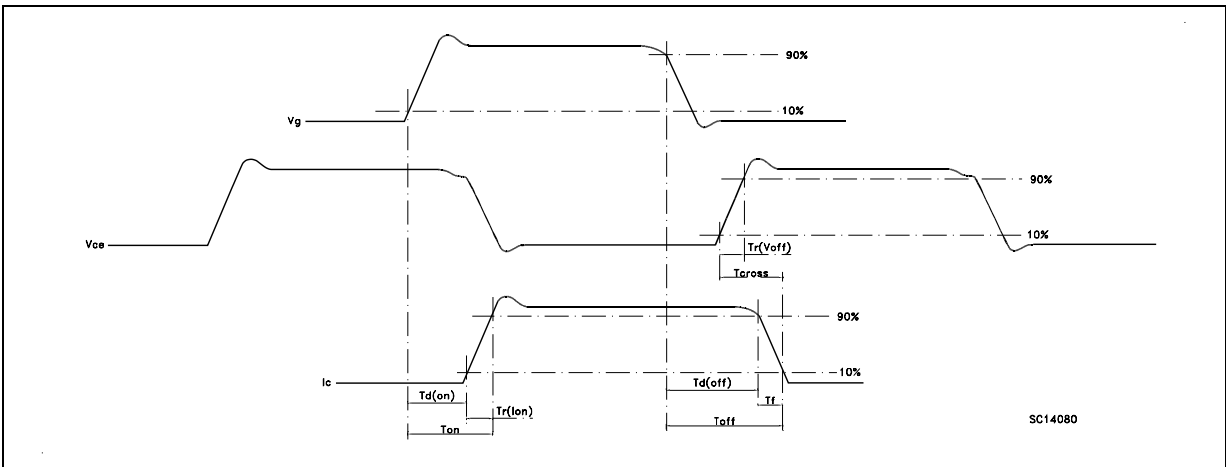


Fig. 3: Switching Waveforms



Diode Forward Voltage

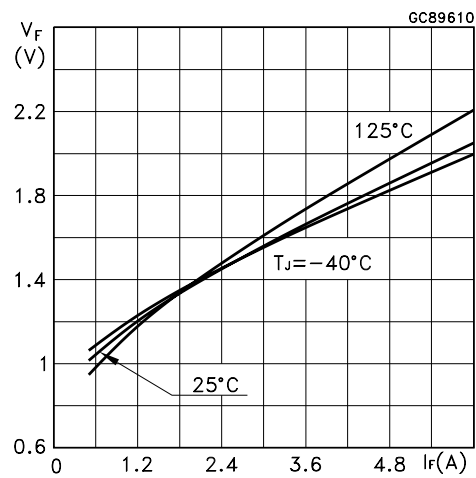
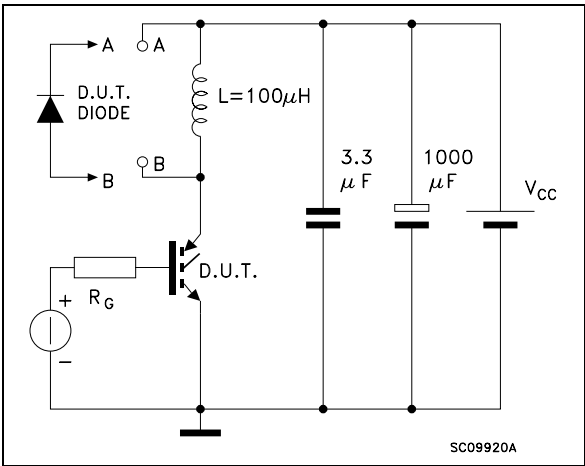
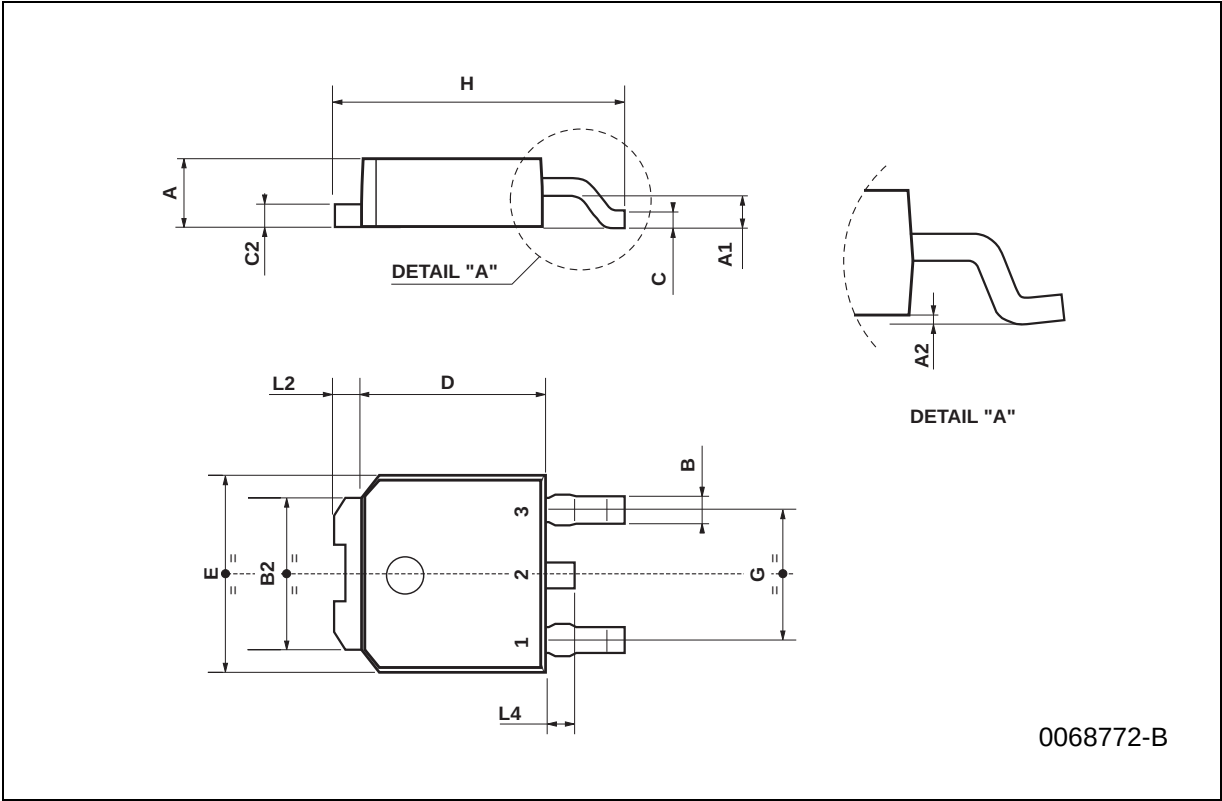


Fig. 2: Test Circuit For Inductive Load Switching



TO-252 (DPAK) 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
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
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	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039



Information furnished is believed to be accurate and reliable. However, STMicroelectronics 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 STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 1999 STMicroelectronics – Printed in Italy – All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco -
Singapore - Spain - Sweden - Switzerland - United Kingdom - U.S.A.

<http://www.st.com>