



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

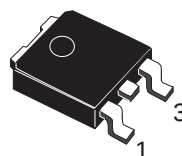
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- INTEGRATED FREEWHEELING DIODE
- SURFACE-MOUNTING DPAK (TO-252)
POWER PACKAGE IN TAPE & REEL
(SUFFIX "T4")

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).

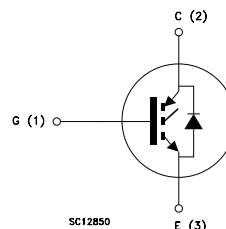
APPLICATIONS

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

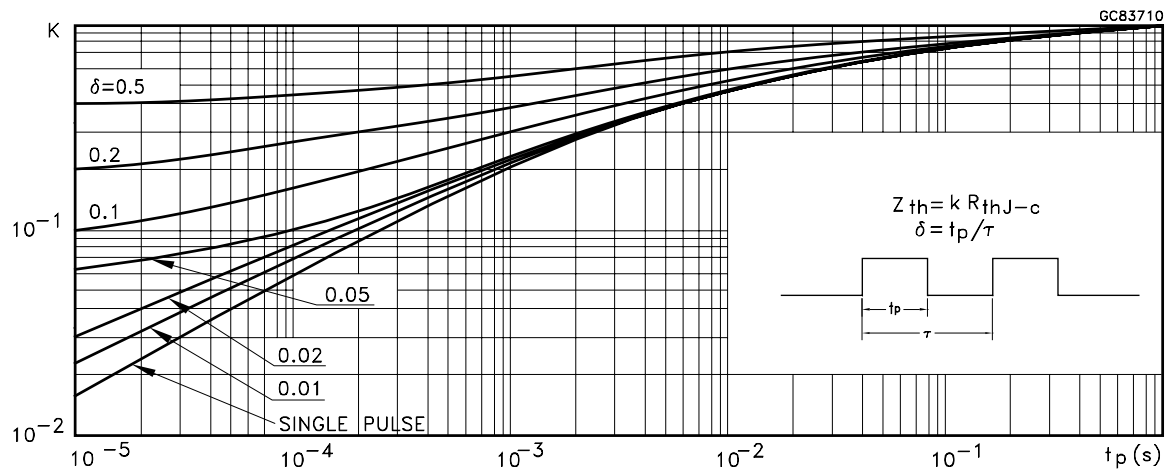
COLLECTOR-EMITTER DIODE

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	$I_f = 3\text{ A}$		1700		ns
Q_{rr}	Reverse Recovery Charge	$dI/dt = 100\text{ A}/\mu\text{S}$		4500		nC
I_{rrm}	Reverse Recovery Current	$V_R = 200\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		9.5		A

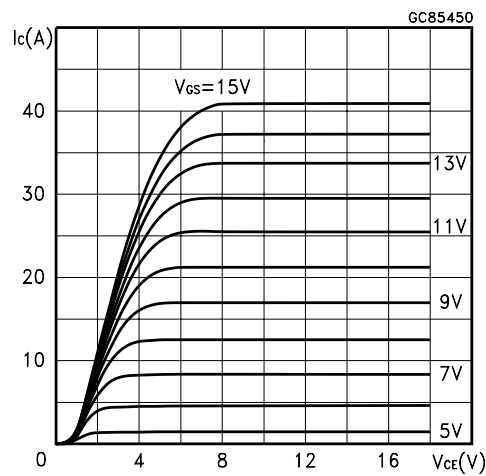
(●) Pulse width limited by max. junction temperature

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

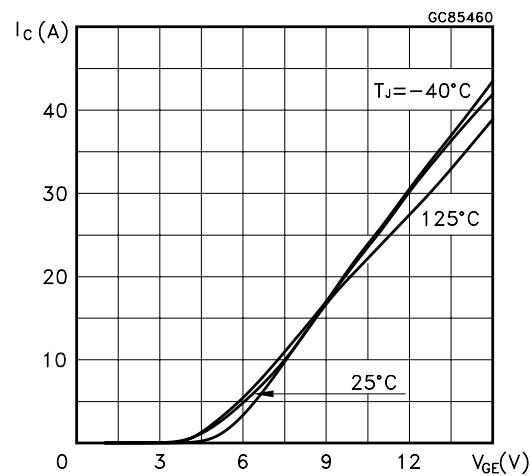
(**) Losses Include Also The Tail (Jedec Standardization)

Thermal Impedance

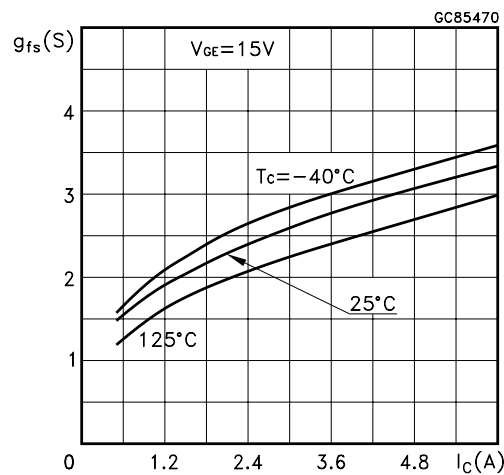
Output Characteristics



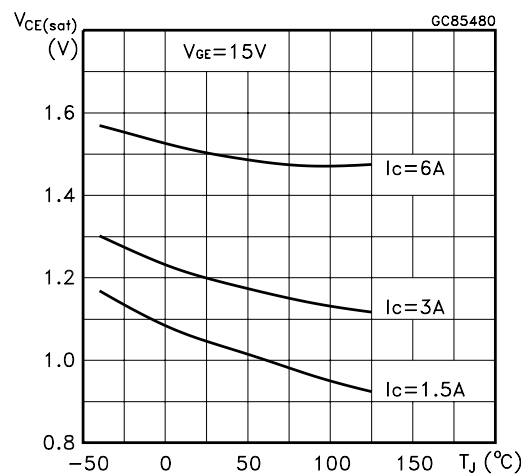
Transfer Characteristics



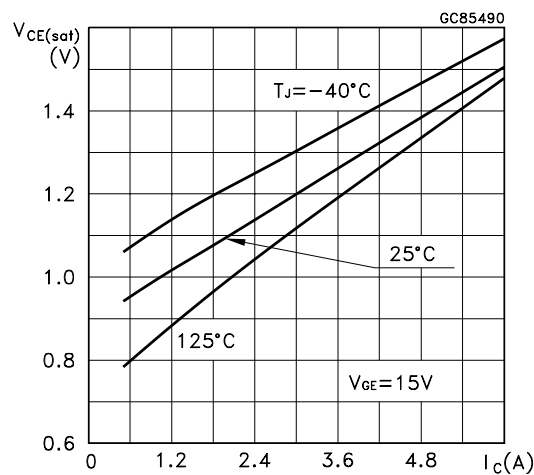
Transconductance



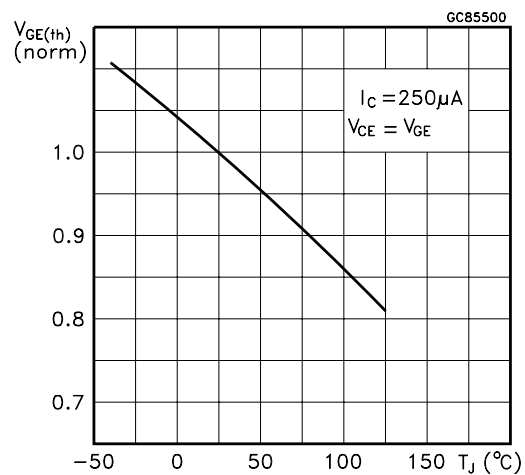
Collector-Emitter On Voltage vs Temperature



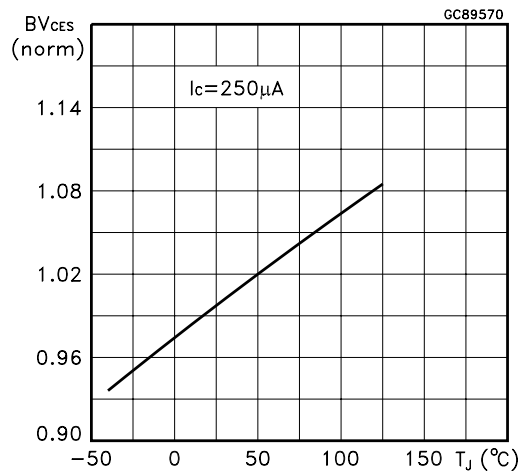
Collector-Emitter On Voltage vs Collector Current



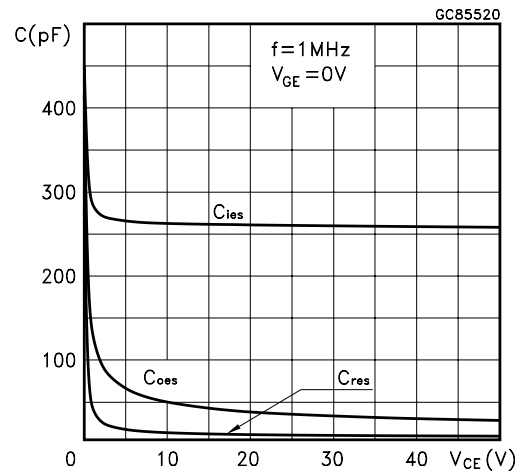
Gate Threshold vs Temperature



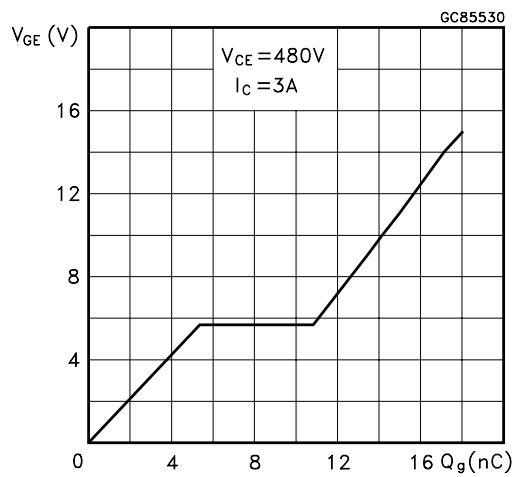
Normalized Breakdown Voltage vs Temperature



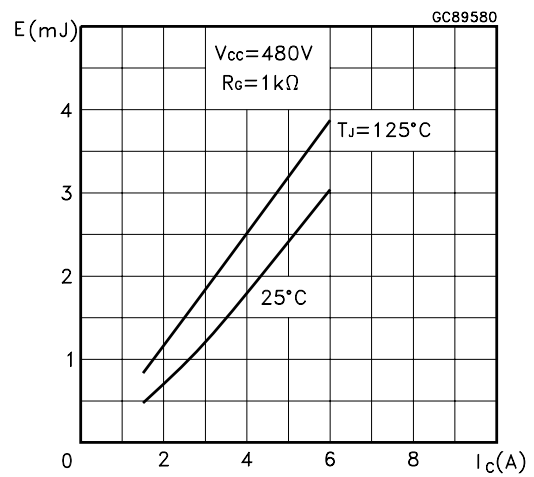
Capacitance Variations



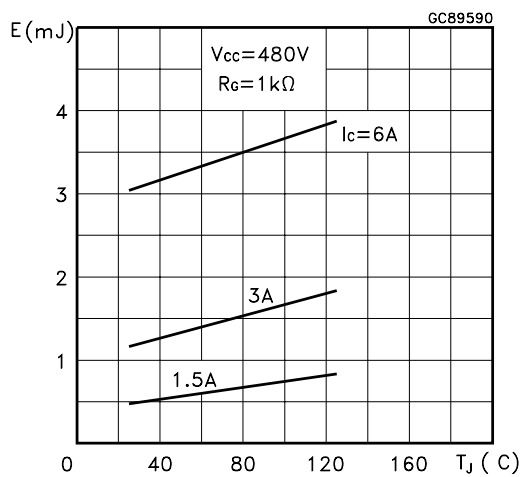
Gate Charge vs Gate-Emitter Voltage



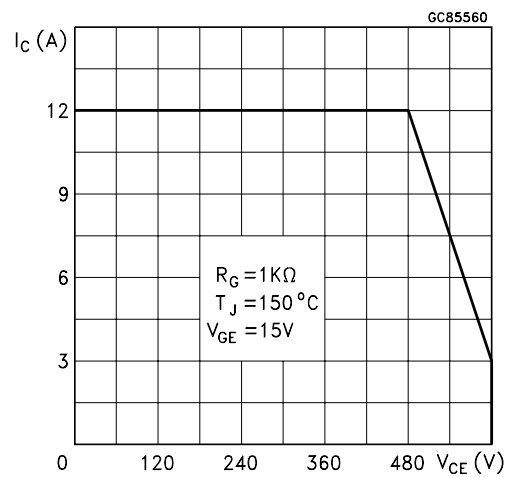
Off Switching Losses vs I_C



Off Switching Losses vs T_J



Switching Off Safe Operatin Area



Diode Forward vs Tj

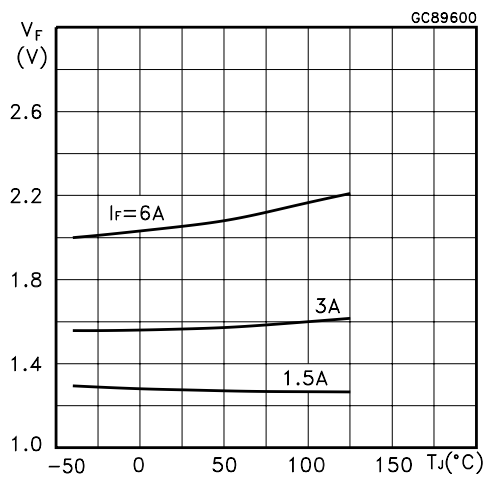


Fig. 1: Gate Charge test Circuit

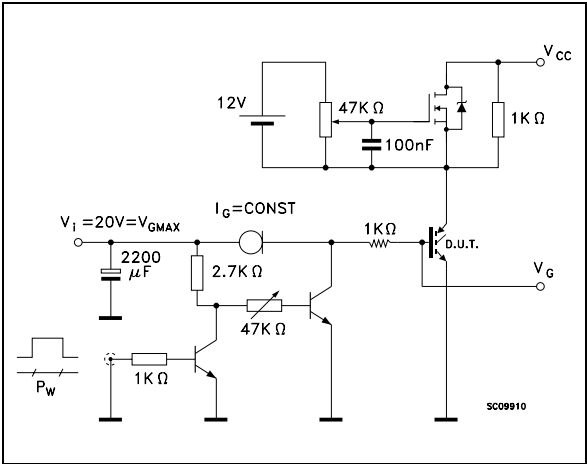
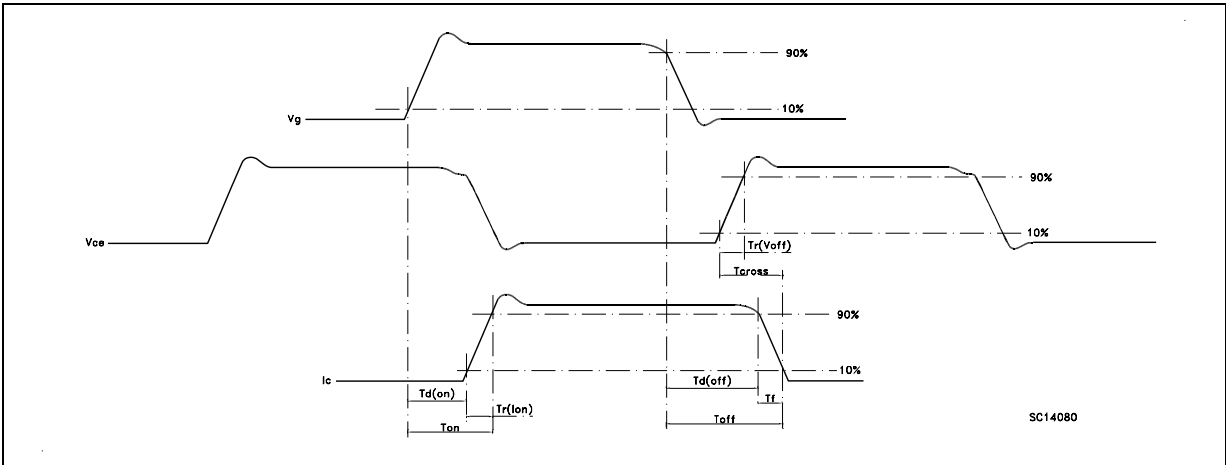


Fig. 3: Switching Waveforms



Diode Forward Voltage

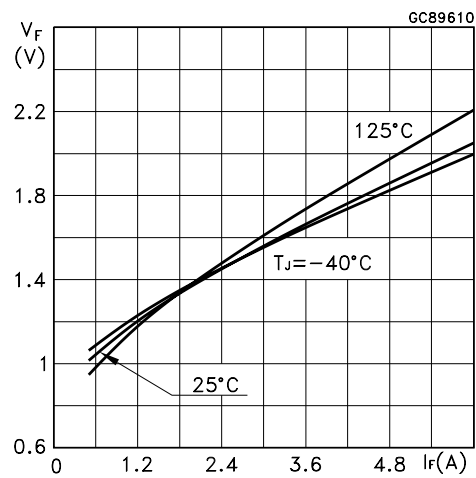
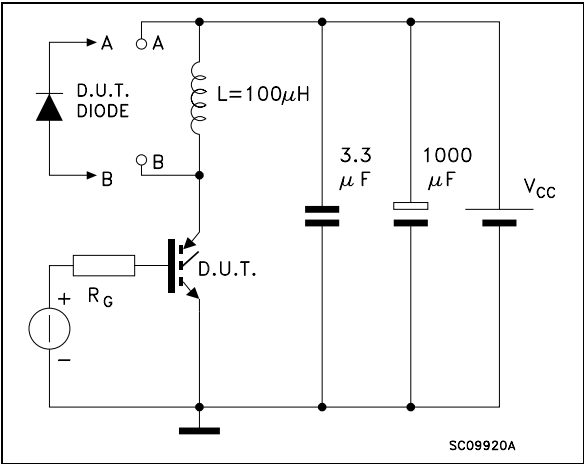
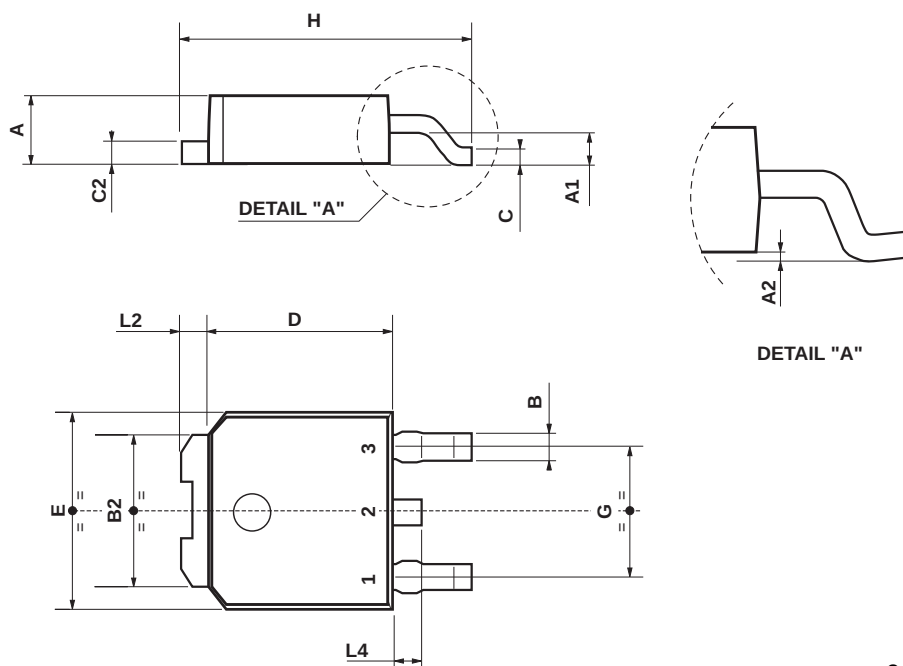


Fig. 2: Test Circuit For Inductive Load Switching



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



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