



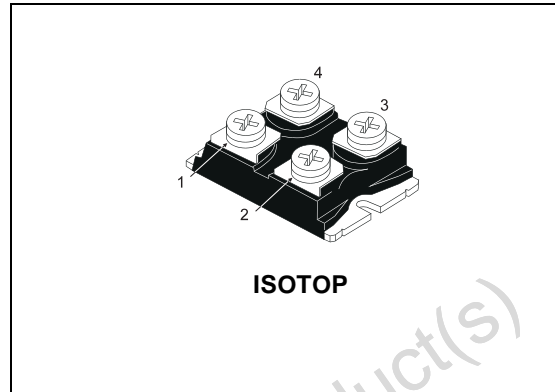
STGE50NB60HD

N-CHANNEL 50A - 600V - ISOTOP

PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGY50NB60HD	600 V	< 2.8 V	50 A

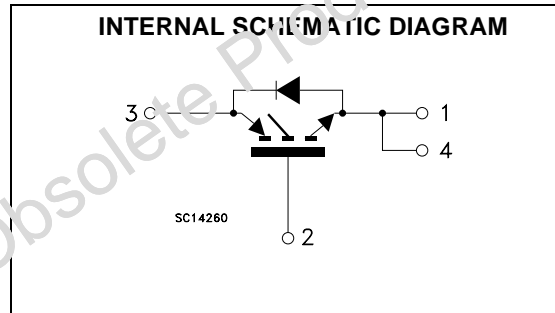
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE



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 "H" identifies a family optimized for high frequency applications (up to 120kHz) in order to achieve very high switching performances (reduced t_{fall}) maintaining a low voltage drop.



APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES

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	100	A
I _C	Collector Current (continuous) at T _C = 100°C	50	A
I _{CM} (■)	Collector Current (pulsed)	400	A
P _{TOT}	Total Dissipation at T _C = 25°C	300	W
	Derating Factor	2.4	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

STGE50NB60HD

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.416	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
Rthc-h	Thermal Resistance Case-heatsink Typ	0.1	°C/W

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collectro-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 _C = 25 °C V _{CE} = Max Rating, T _C = 125 °C			250 1000	μA μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 20V, V _{CE} = 0			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA	3		5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 50 A V _{GE} = 15V, I _C = 50 A, T _j = 125°C		2.3 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 25 V, I _C = 50 A		22		S
C _{ies}	Input Capacitance	V _{CE} = 25V, f = 1 MHz, V _{GE} = 0		4500		pF
C _{oes}	Output Capacitance			450		pF
C _{res}	Reverse Transfer Capacitance			90		pF
Q _g	Total Gate Charge	V _{CE} = 480V, I _C = 50 A, V _{GE} = 15V		260		nC
Q _{ge}	Gate-Emitter Charge			28		nC
Q _{gc}	Gate-Collector Charge			15		nC
I _{CL}	Latching Current	V _{clamp} = 480 V T _j = 150°C, R _G = 10 Ω	200			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on Delay Time	V _{CC} = 480 V, I _C = 50 A R _G = 10Ω, V _{GE} = 15 V		20		ns
t _r	Rise Time			70		ns
(di/dt) _{on}	Turn-on Current Slope	V _{CC} = 480 V, I _C = 50 A, R _G = 10Ω V _{GE} = 15 V, T _j = 125°C		350		A/μs
E _{on}	Turn-on Switching Losses			950		μJ

ELECTRICAL CHARACTERISTICS (CONTINUED)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 480 \text{ V}$, $I_C = 50 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$		166		ns
$t_r(V_{off})$	Off Voltage Rise Time			48		ns
$t_{d(off)}$	Delay Time			326		ns
t_f	Fall Time			90		ns
$E_{off(**)}$	Turn-off Switching Loss			2.1		mJ
E_{ts}	Total Switching Loss			3		mJ
t_c	Cross-over Time	$V_{CC} = 480 \text{ V}$, $I_C = 50 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$, $T_j = 125 \text{ }^\circ\text{C}$		270		ns
$t_r(V_{off})$	Off Voltage Rise Time			75		ns
$t_{d(off)}$	Delay Time			340		ns
t_f	Fall Time			200		ns
$E_{off(**)}$	Turn-off Switching Loss			2.9		mJ
E_{ts}	Total Switching Loss			3.85		mJ

COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				50	A
I_{fm}	Forward Current pulsed				400	A
V_f	Forward On-Voltage	$I_f = 50 \text{ A}$ $I_f = 50 \text{ A}$, $T_j = 125 \text{ }^\circ\text{C}$		1.65	2	V
				2		V
t_{rr}	Reverse Recovery Time	$I_f = 50 \text{ A}$, $V_R = 100 \text{ V}$, $T_j = 125 \text{ }^\circ\text{C}$, $di/dt = 100 \text{ A}/\mu\text{s}$		135		ns
Q_{rr}	Reverse Recovery Charge			500		nC
I_{rrm}	Reverse Recovery Current			7.5		A

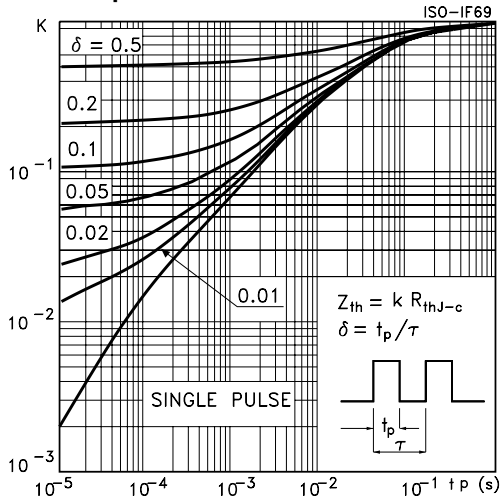
Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

2. Pulse width limited by max. junction temperature.

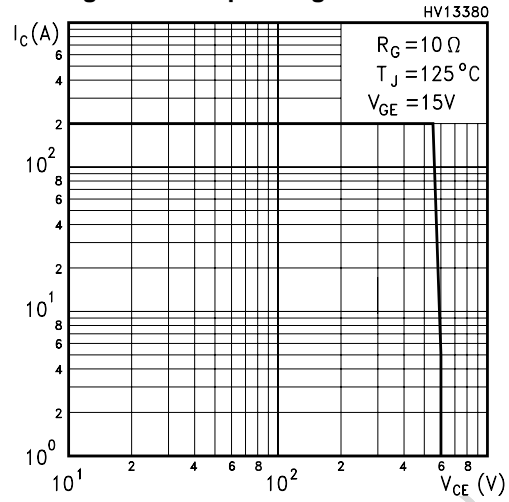
(**) Losses include Also the Tail (Jedec Standardization)

STGE50NB60HD

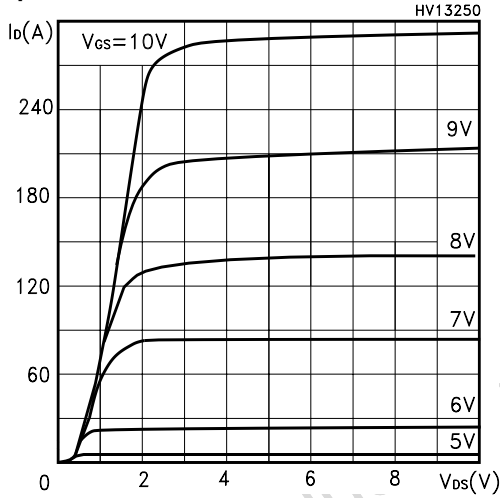
Thermal Impedance



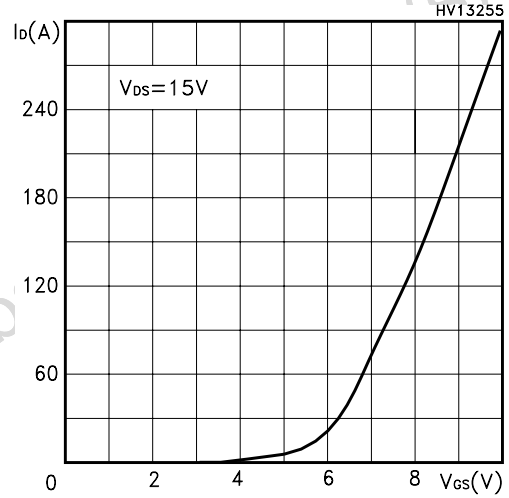
Switching Off Safe Operating Area



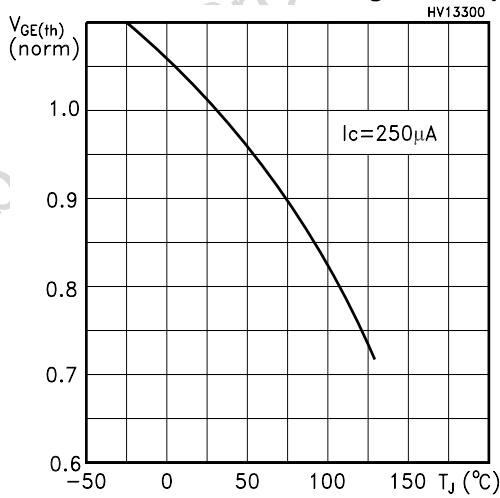
Output Characteristics



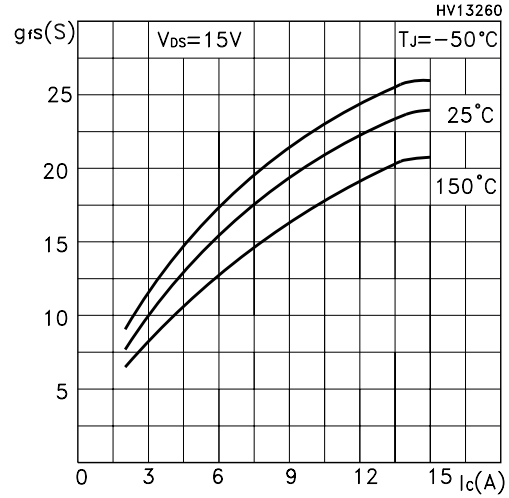
Transfer Characteristics



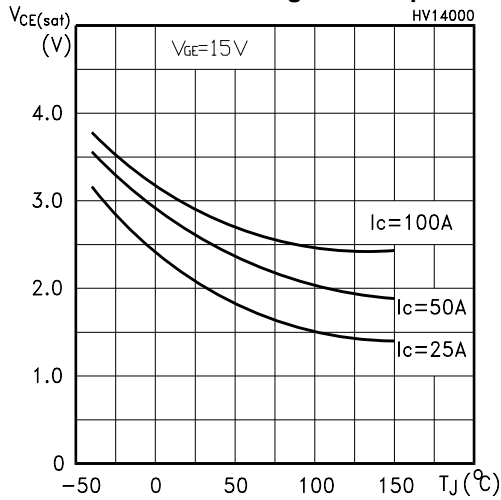
Normalized Gate Threshold Voltage vs Temp.



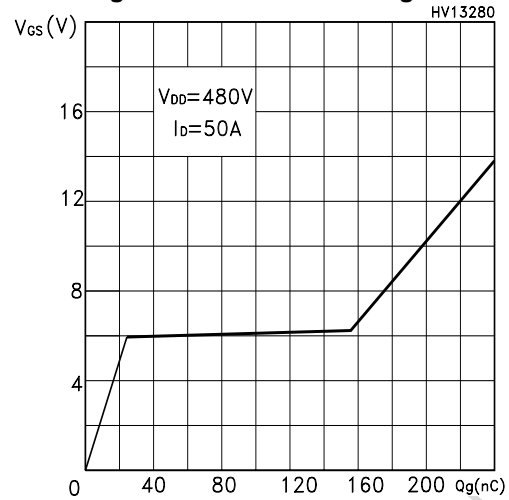
Transconductance



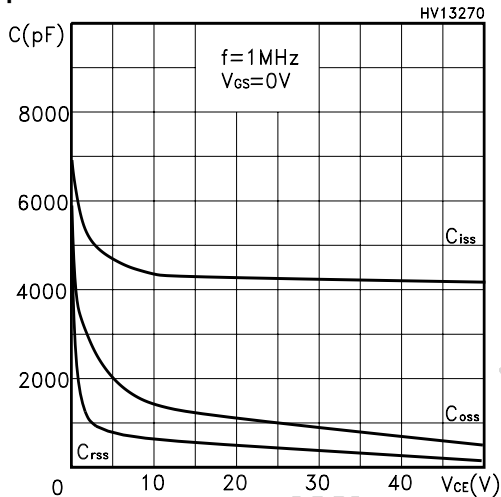
Collector-Emitter On Voltage vs Temperature



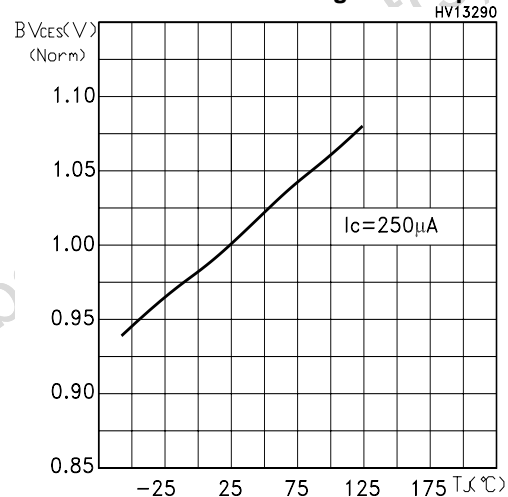
Gate-Charge vs Gate-Emitter Voltage



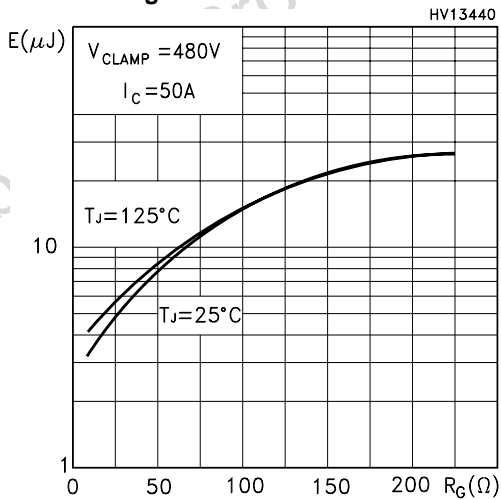
Capacitance Variations



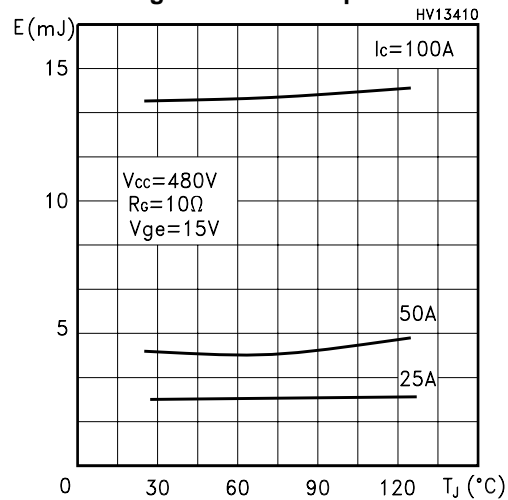
Normalized Break-down Voltage vs Temp.



Total Switching losses vs Gate Resistance

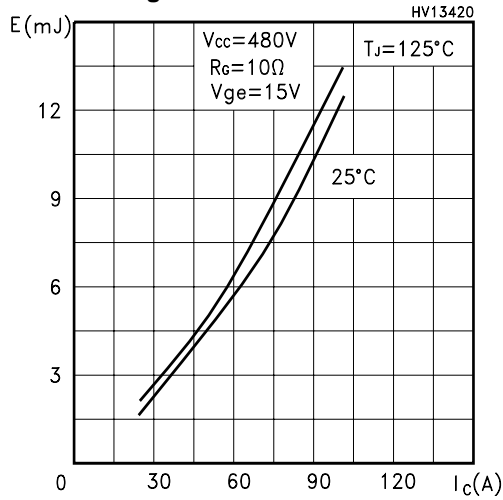


Total Switching losses vs Temperature



STGE50NB60HD

Total Switching losses vs Ic



Diode Forward Voltage

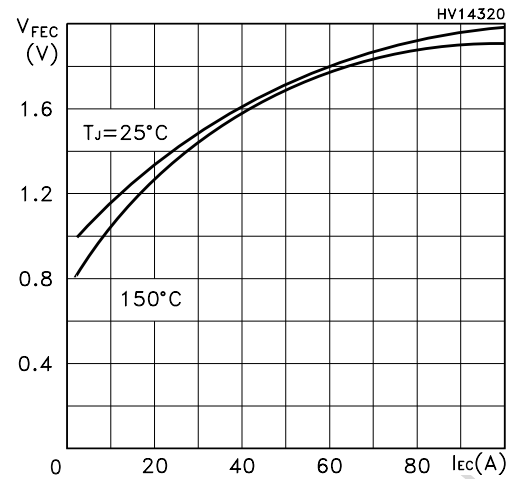


Fig. 1: Gate Charge test Circuit

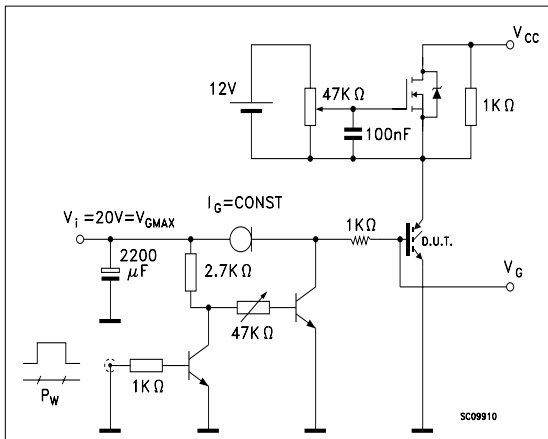
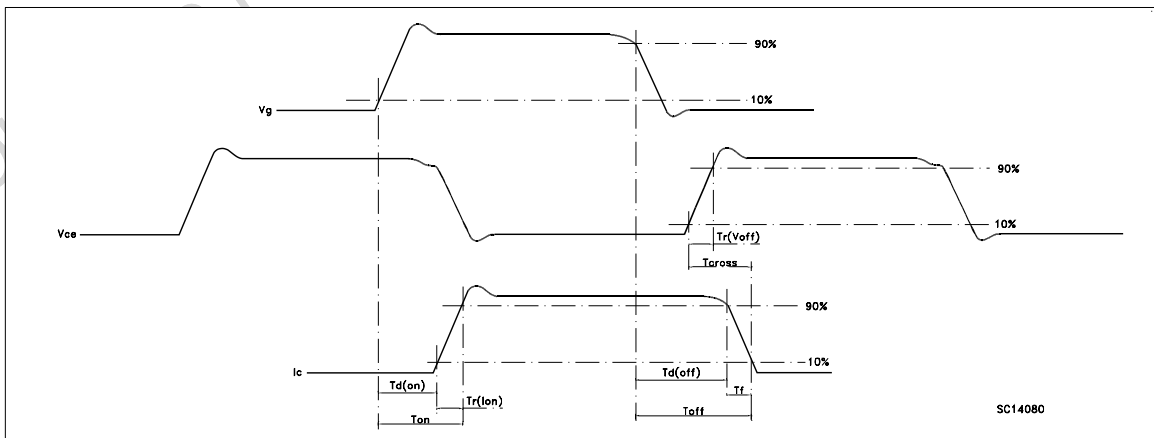
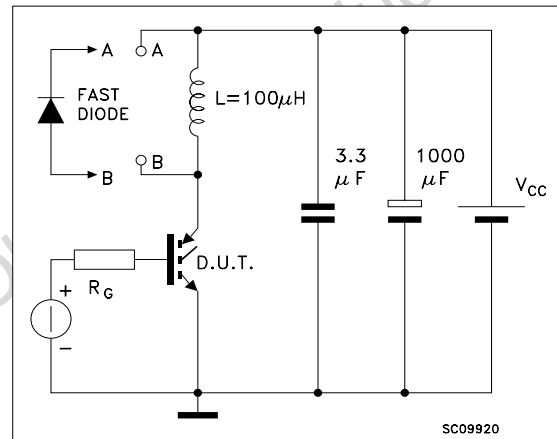
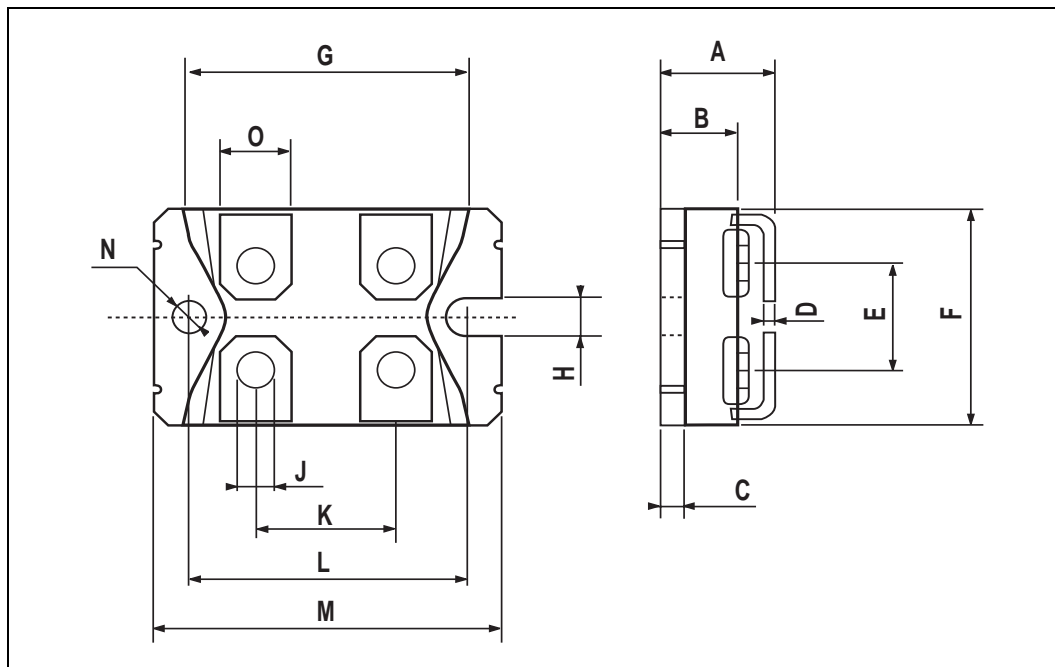


Fig. 2: Test Circuit For Inductive Load Switching



ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322





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. Specifications 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 registered trademark of STMicroelectronics

© 2003 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

© <http://www.st.com>