



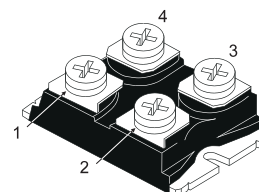
STGE50NB60HD

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



ISOTOP

DESCRIPTION

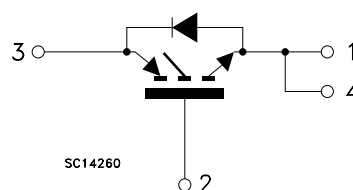
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances.

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

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	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)	Collector-Emitter Breakdown Voltage	I _C = 250 μ A, 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	μ A μ A
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = $\pm$ 20V, V _{CE} = 0			$\pm$ 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE} (th)	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250 μ A	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 Q _{ge} Q _{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V _{CE} = 480V, I _C = 50 A, V _{GE} = 15V		260 28 15		nC nC 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 = 10 Ω , V _{GE} = 15 V		20		ns
t _r	Rise Time			70		ns
(di/dt) _{on} E _{on}	Turn-on Current Slope Turn-on Switching Losses	V _{CC} = 480 V, I _C = 50 A, R _G = 10 Ω , V _{GE} = 15 V, T _J = 125°C		350 950		A/ μ s μ J

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	$V_{CC} = 480 \text{ V}$, $I_C = 50 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$ $T_j = 125^\circ \text{C}$		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

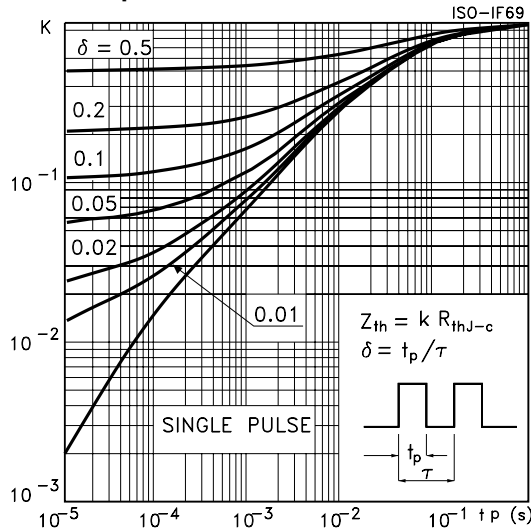
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				50	A
I_{fm}	Forward Current pulsed				400	A
V_f	Forward On-Voltage	$I_f = 50 \text{ A}$ $I_f = 50 \text{ A}$, $T_j = 125^\circ \text{C}$		1.65 2	2	V V
t_{rr}	Reverse Recovery Time	$I_f = 50 \text{ A}$, $V_R = 100 \text{ V}$,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

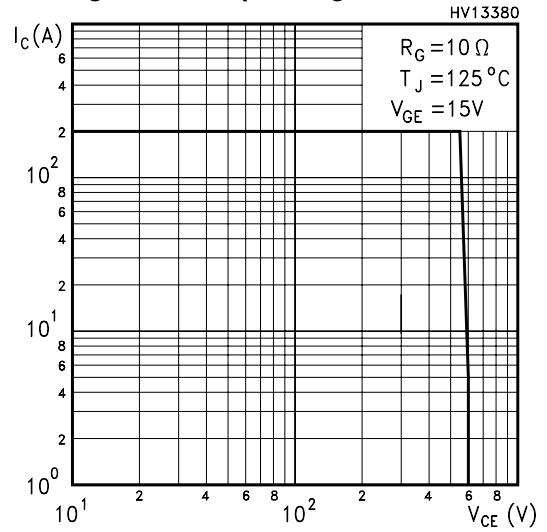
2. Pulse width limited by max. junction temperature.

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

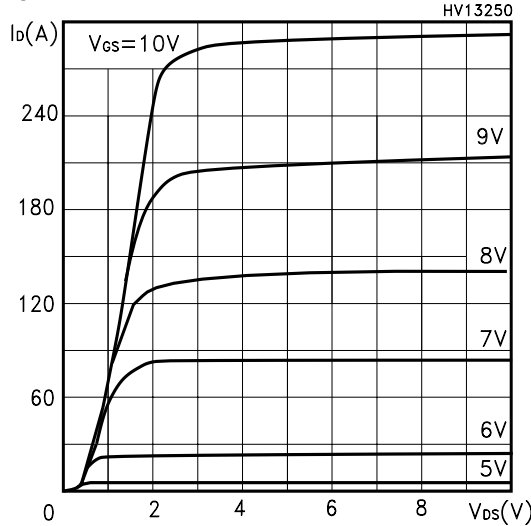
Thermal Impedance



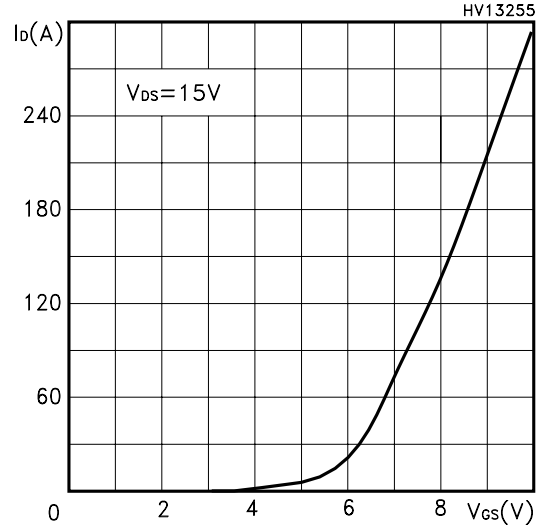
Switching Off Safe Operating Area



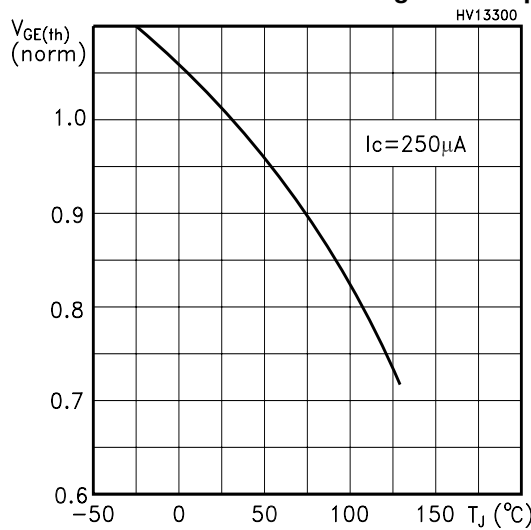
Output Characteristics



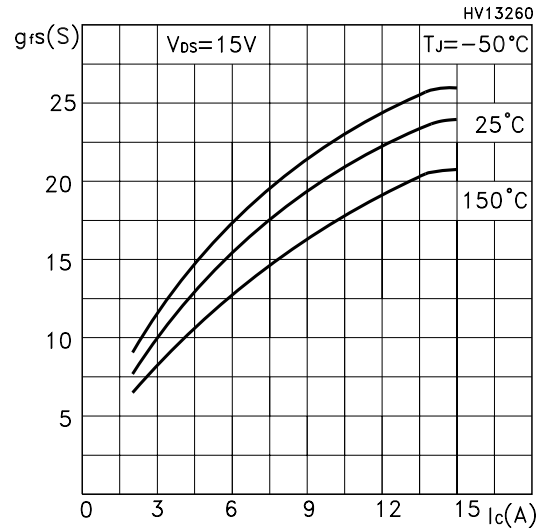
Transfer Characteristics

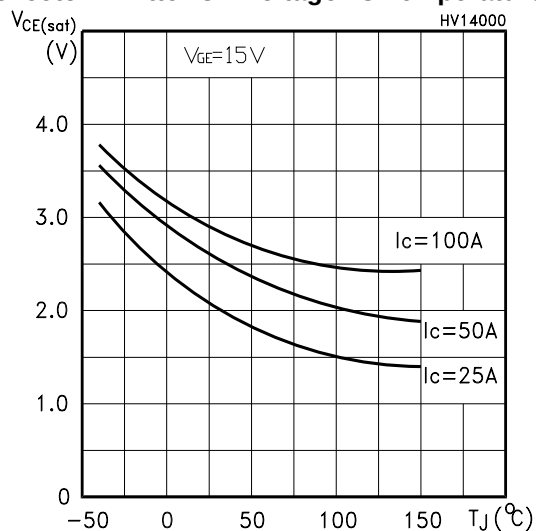
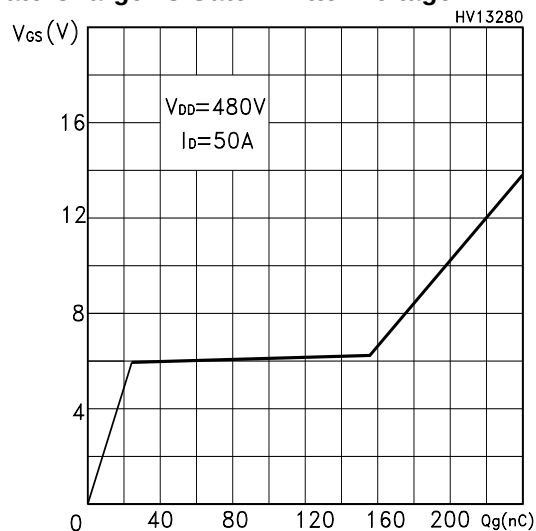
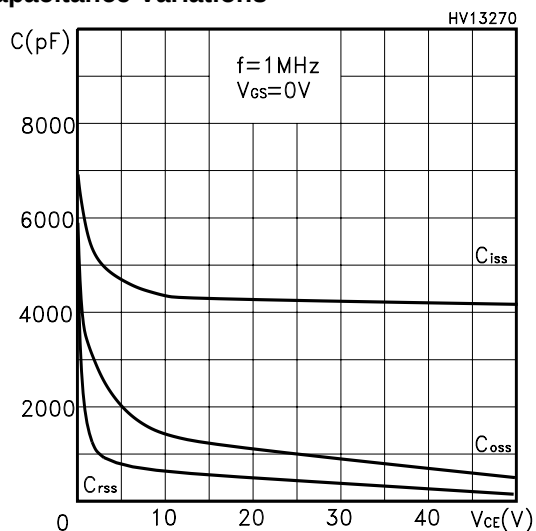
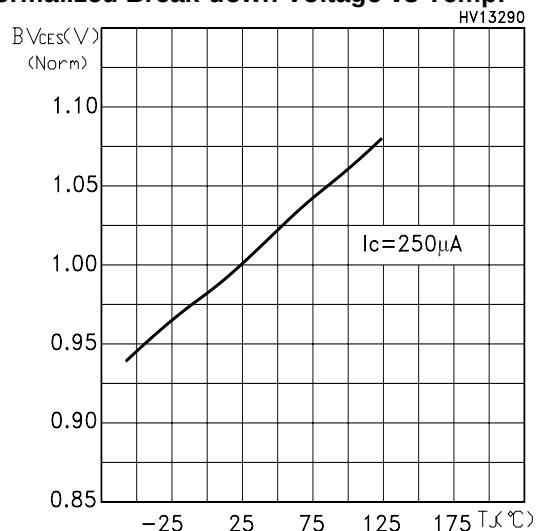
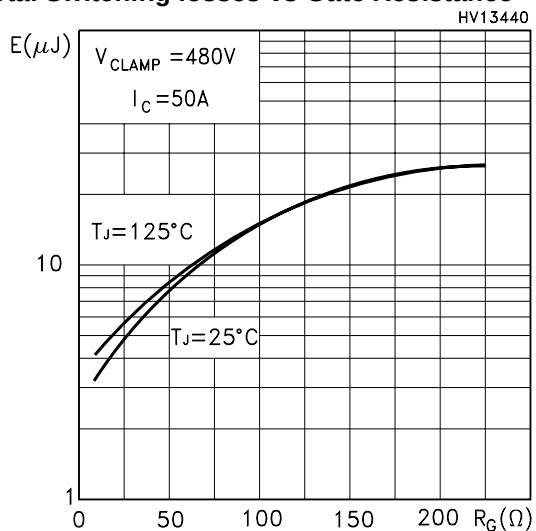
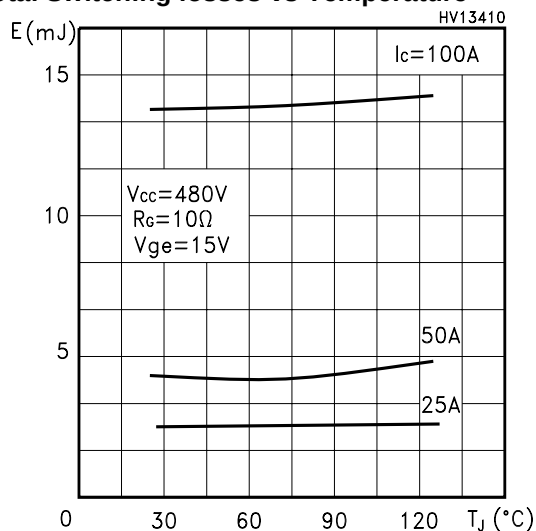


Normalized Gate Threshold Voltage vs Temp.

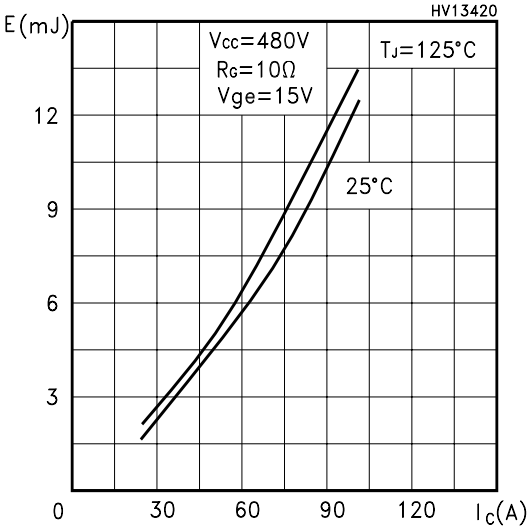


Transconductance



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**

Total Switching losses vs Ic



Diode Forward Voltage

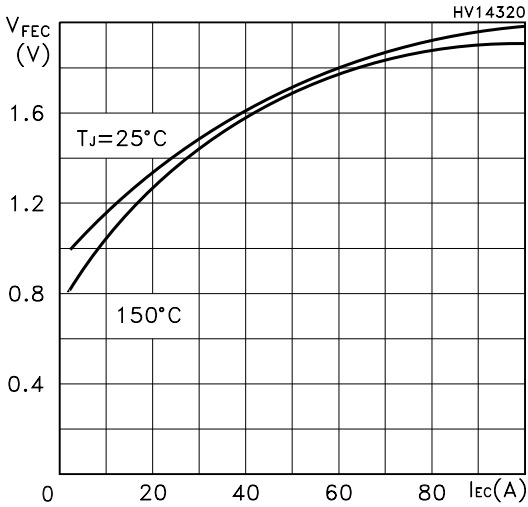


Fig. 1: Gate Charge test Circuit

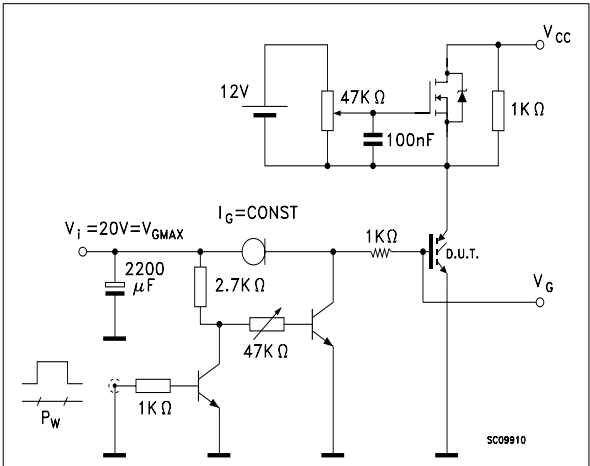
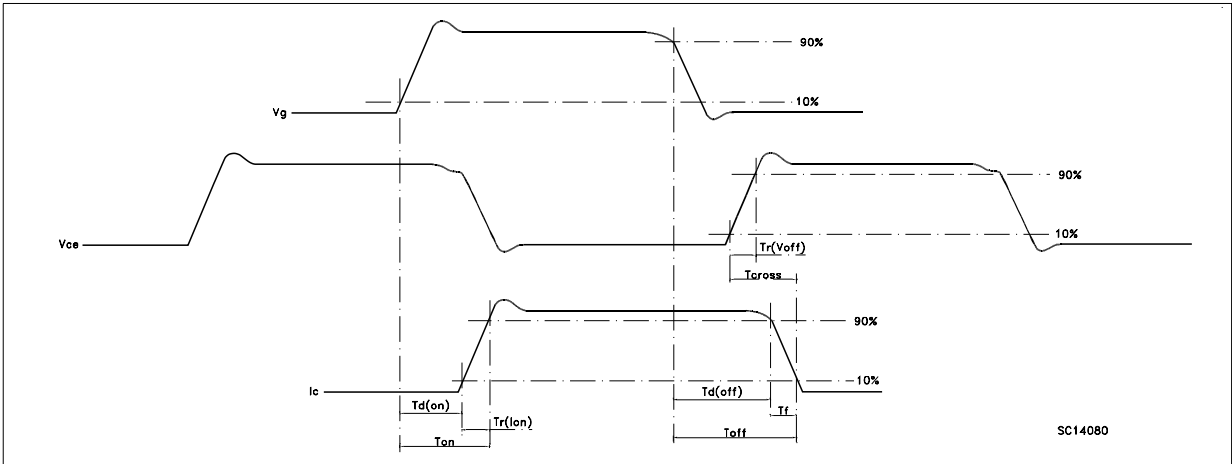
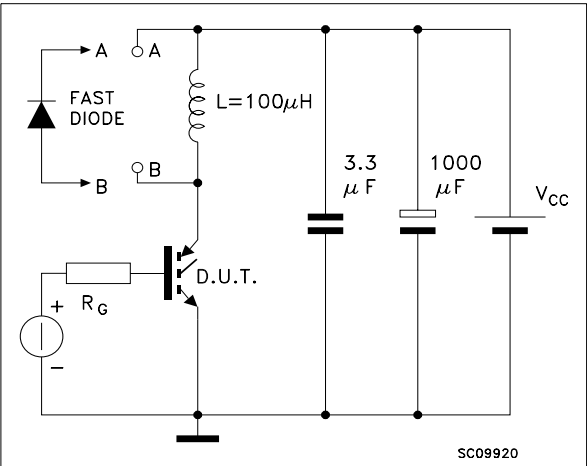
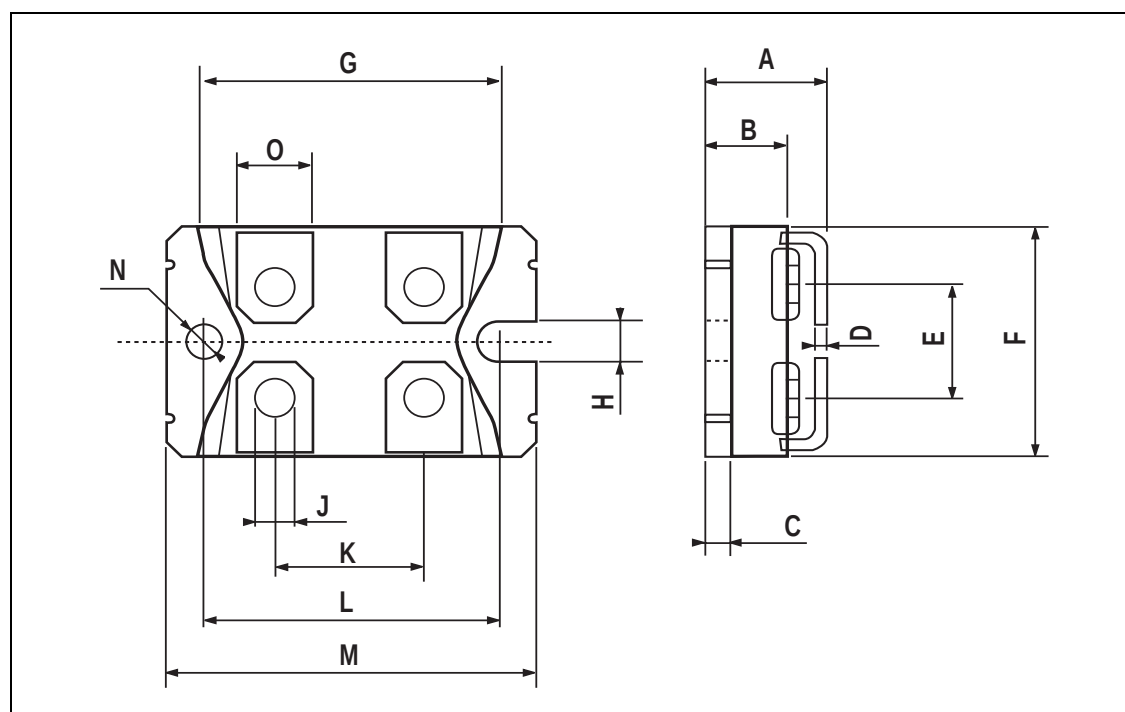


Fig. 2: Test Circuit For Inductive Load Switching



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



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