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STE70NM60

N-CHANNEL 600V - 0.050Ω - 70A ISOTOP Zener-Protected MDmesh™ Power MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STE70NM60	600V	< 0.055Ω	70 A

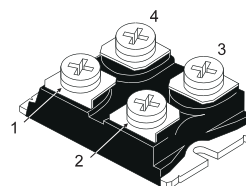
- TYPICAL R_{DS(on)} = 0.050Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- IMPROVED ESD CAPABILITY
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL
- INDUSTRY'S LOWEST ON-RESISTANCE

DESCRIPTION

The MDmesh™ is a new revolutionary MOSFET technology that associates the Multiple Drain process with the Company's PowerMESH™ horizontal layout. The resulting product has an outstanding low on-resistance, impressively high dv/dt and excellent avalanche characteristics. The adoption of the Company's proprietary strip technique yields overall dynamic performance that is significantly better than that of similar competition's products.

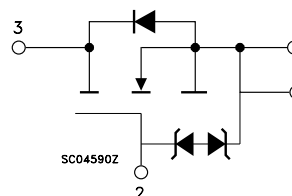
APPLICATIONS

The MDmesh™ family is very suitable for increasing power density of high voltage converters allowing system miniaturization and higher efficiencies.



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STE70NM60	E70NM60	ISOTOP	TUBE

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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage ($V_{GS} = 0$)	600	V
V_{DGR}	Drain-gate Voltage ($R_{GS} = 20\text{ k}\Omega$)	600	V
V_{GS}	Gate- source Voltage	± 30	V
I_D	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	70	A
I_D	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	44	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	280	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	600	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=15K Ω)	6	KV
	Derating Factor	4.5	W/ $^\circ\text{C}$
dv/dt (1)	Peak Diode Recovery voltage slope	15	V/ns
T_{stg}	Storage Temperature	-65 to 150	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	150	$^\circ\text{C}$

($\bullet$)Pulse width limited by safe operating area

(1) $I_{SD} \leq 70\text{A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	0.2	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient	Max	30	$^\circ\text{C}/\text{W}$
T_l	Maximum Lead Temperature For Soldering Purpose		300	$^\circ\text{C}$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	30	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 35\text{ V}$)	1.4	J

GATE-SOURCE ZENER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{GSO}	Gate-Source Breakdown Voltage	$I_{GS} = \pm 1\text{mA}$ (Open Drain)	30			V

PROTECTION FEATURES OF GATE-TO-SOURCE ZENER DIODES

The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

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ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED) ON/OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0	600			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125°C			10 100	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 20V			±10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V, I _D = 30 A		0.050	0.055	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (1)	Forward Transconductance	V _{DS} = I _{D(on)} × R _{DS(on)max} , I _D = 30 A		35		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0		7300 2000 40		pF pF pF
R _G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		1.8		Ω

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{d(on)} t _r	Turn-on Delay Time Rise Time	V _{DD} = 300 V, I _D = 30 A R _G = 4.7Ω, V _{GS} = 10 V (see test circuit, Figure 3)		55 95		ns ns
Q _g Q _{gs} Q _{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V _{DD} = 470 V, I _D = 60 A, V _{GS} = 10 V		178 44.5 95	266	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{r(Voff)} t _f t _c	Off-voltage Rise Time Fall Time Cross-over Time	V _{DD} = 400 V, I _D = 60 A, R _G = 4.7Ω, V _{GS} = 10 V (see test circuit, Figure 5)		130 76 105		ns ns ns

SOURCE DRAIN DIODE

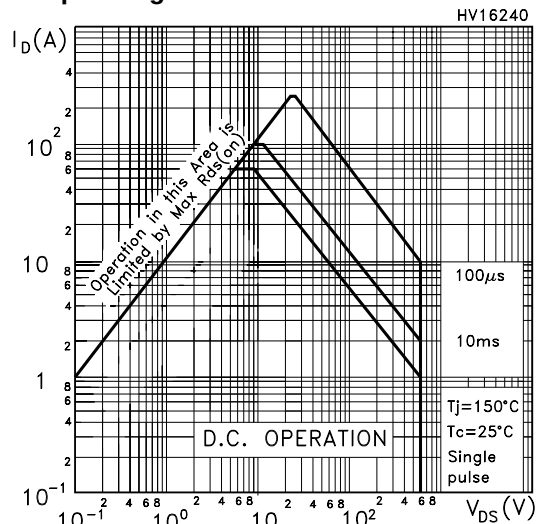
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I _{SD} I _{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V _{SD} (1)	Forward On Voltage	I _{SD} = 60 A, V _{GS} = 0			1.5	V
t _{rr} Q _{rr} I _{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I _{SD} = 60 A, di/dt = 100 A/μs, V _{DD} = 30 V, T _j = 150°C (see test circuit, Figure 5)		600 14 48		ns μC A

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

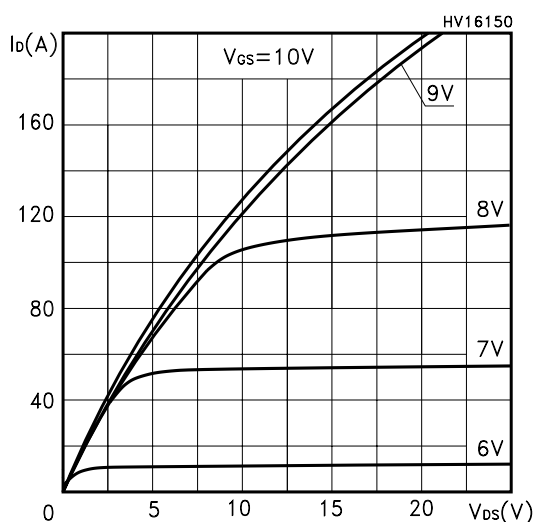
2. Pulse width limited by safe operating area.

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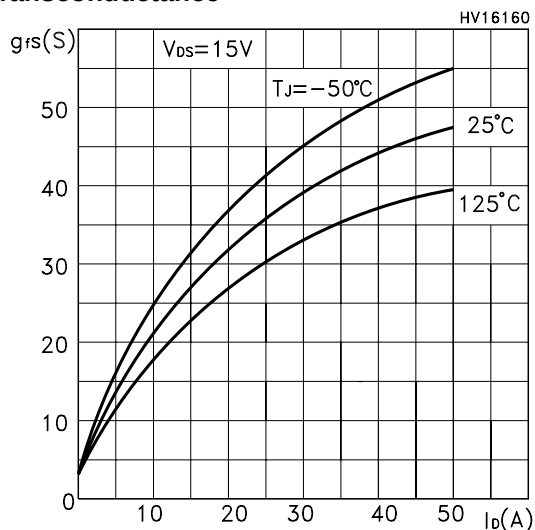
Safe Operating Area



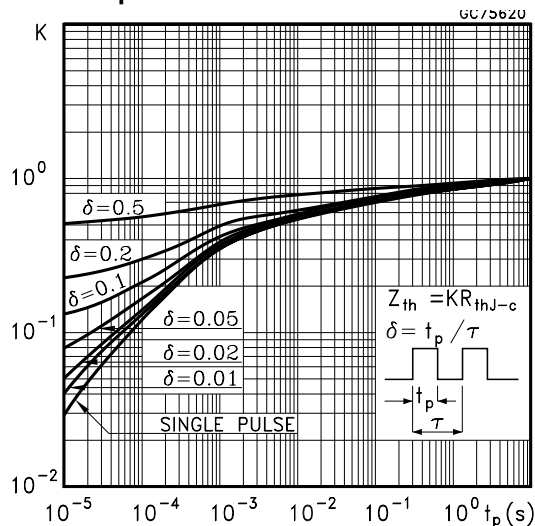
Output Characteristics



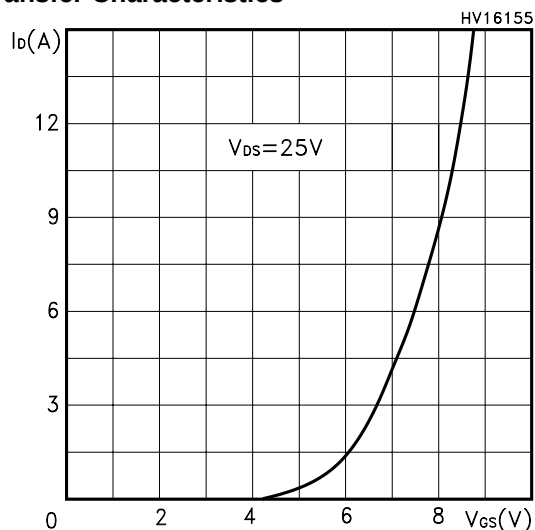
Transconductance



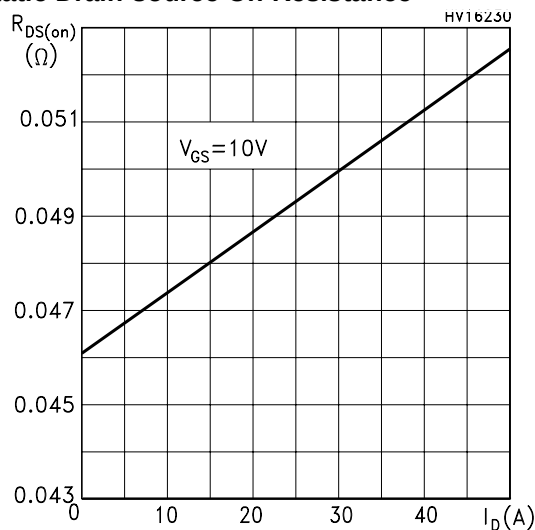
Thermal Impedance



Transfer Characteristics

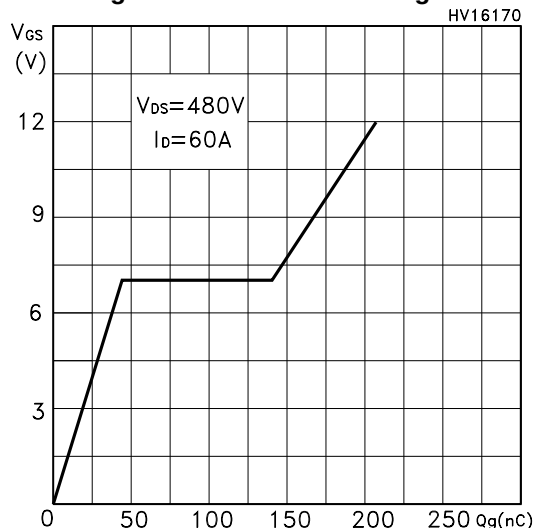


Static Drain-source On Resistance

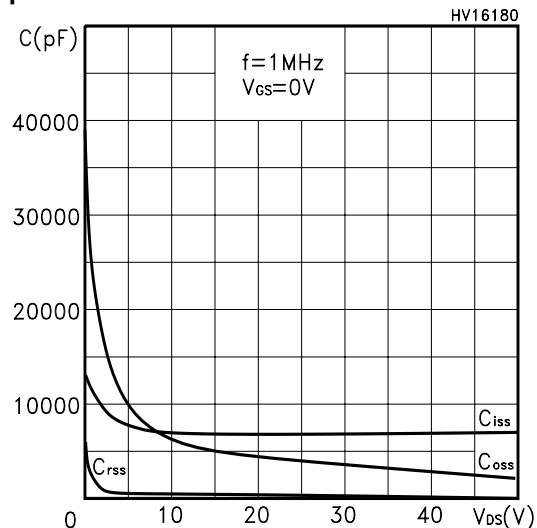


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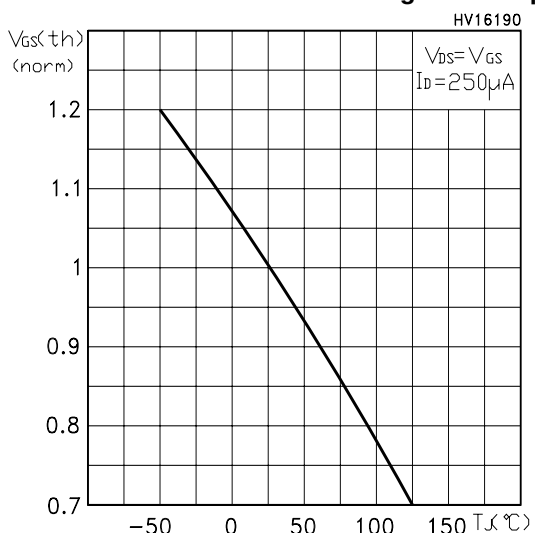
Gate Charge vs Gate-source Voltage



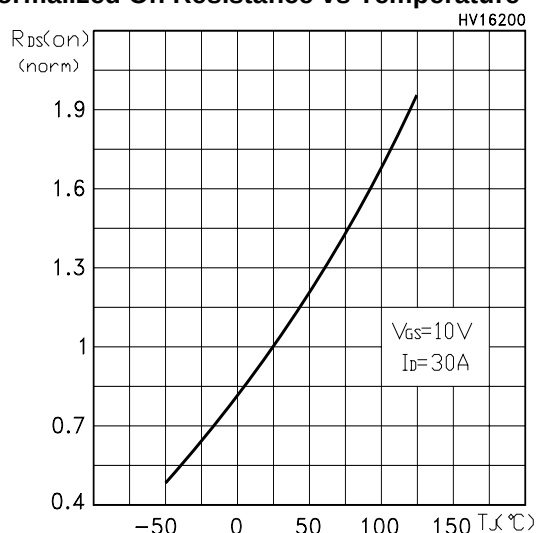
Capacitance Variations



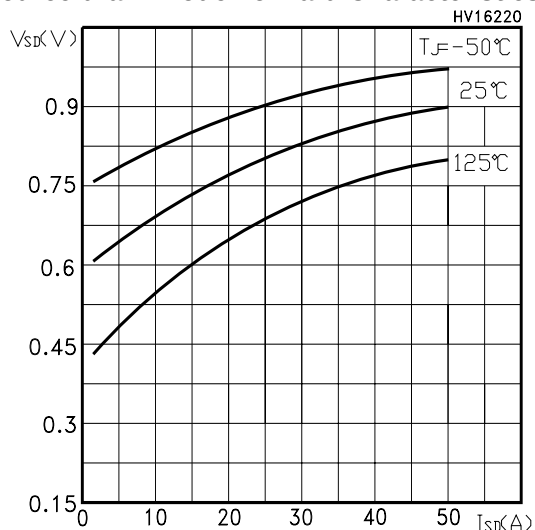
Normalized Gate Threshold Voltage vs Temp.



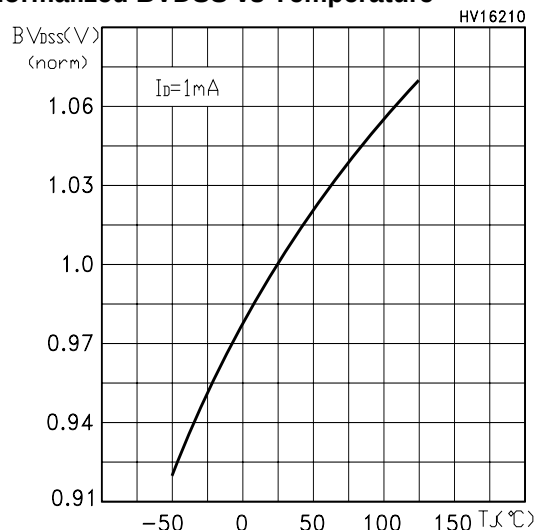
Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVDSS vs Temperature



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Fig. 1: Unclamped Inductive Load Test Circuit

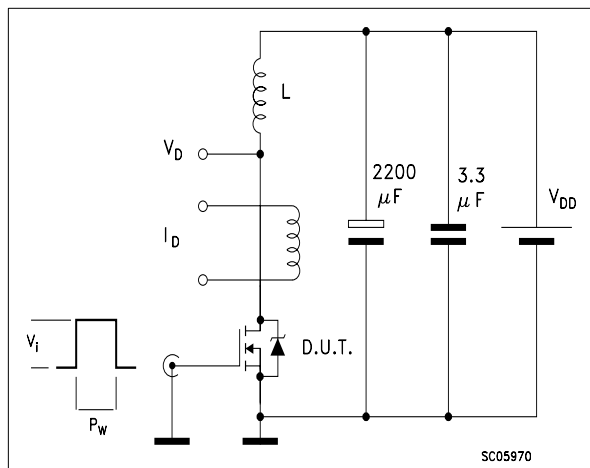


Fig. 2: Unclamped Inductive Waveform

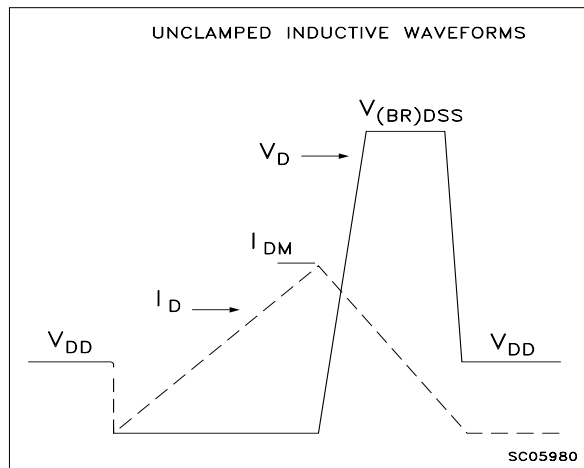


Fig. 3: Switching Times Test Circuit For Resistive Load

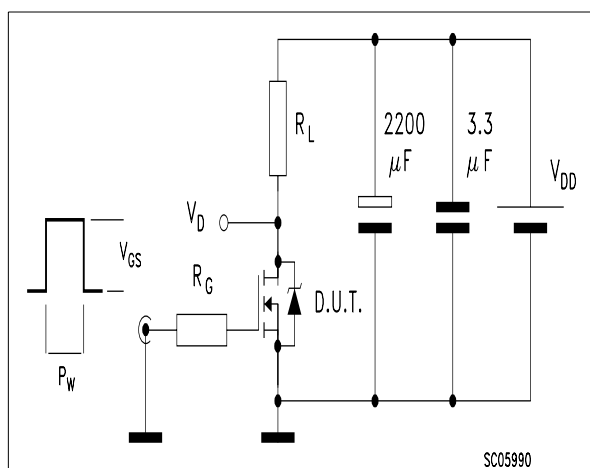


Fig. 4: Gate Charge test Circuit

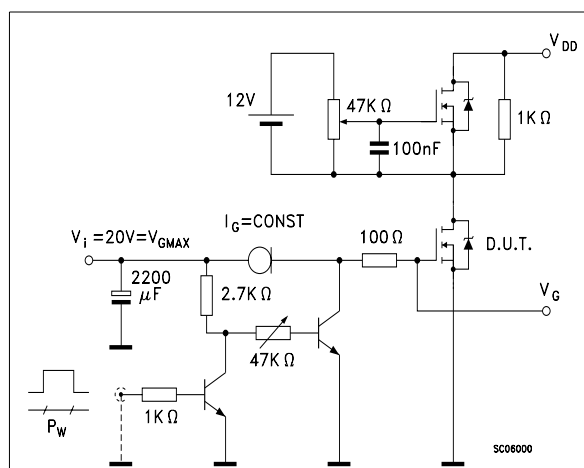
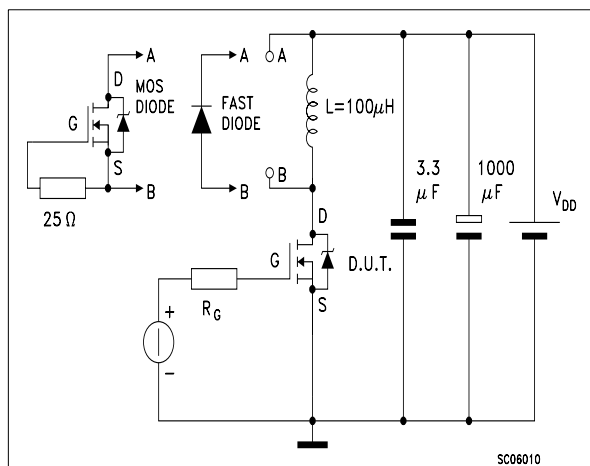


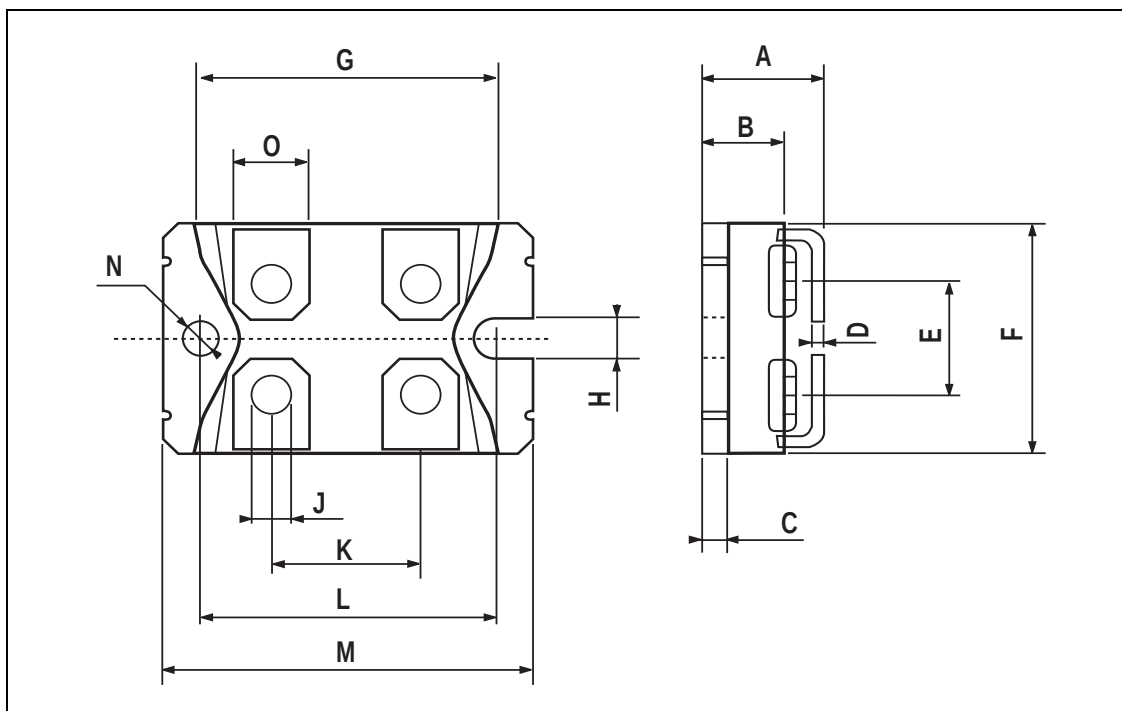
Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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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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