



STE48NM50

N-CHANNEL 500V - 0.08Ω - 48A ISOTOP MDmesh™ Power MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STE48NM50	500V	< 0.1Ω	48 A

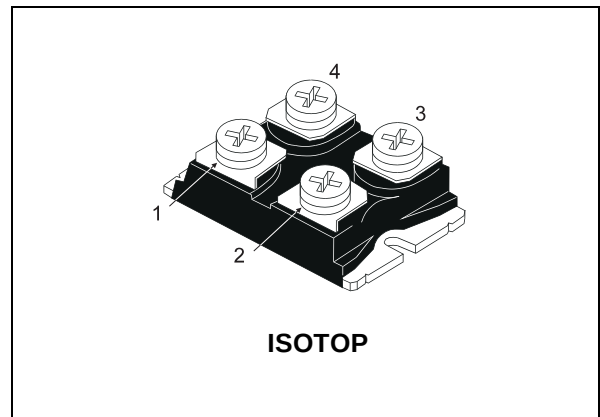
- TYPICAL R_{DS(on)} = 0.08Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL AND HIGH MANUFACTURING YIELDS

DESCRIPTION

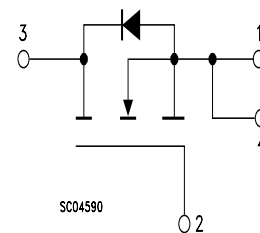
The MDmesh™ is a new revolutionary MOSFET technology that associates the Multiple Drain process with the Company's PowerMESH™ horizontal layout. The resulting product has an outstanding low on-resistance, impressively high dv/dt and excellent avalanche characteristics. The adoption of the Company's proprietary 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.



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	500	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	500	V
V _{GS}	Gate- source Voltage	±30	V
I _D	Drain Current (continuous) at T _C = 25°C	48	A
I _D	Drain Current (continuous) at T _C = 100°C	30	A
I _{DM} (•)	Drain Current (pulsed)	192	A
P _{TOT}	Total Dissipation at T _C = 25°C	450	W
	Derating Factor	3.6	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	15	V/ns
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•)Pulse width limited by safe operating area

(1) I_{SD} ≤ 48A, di/dt ≤ 400A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

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THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	0.28	°C/W
Rthc-sink (*)	Thermal Resistance Case-sink	Typ	0.05	°C/W

(*) with conductive GREASE Applies

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	15	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	810	mJ

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25\text{ °C}$ UNLESS OTHERWISE SPECIFIED) OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	500			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$, $T_C = 125\text{ °C}$			10 100	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30\text{ V}$			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 24\text{ A}$		0.08	0.1	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (1)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $I_D = 24\text{ A}$		20		S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		3700		pF
C_{oss}	Output Capacitance			610		pF
C_{rss}	Reverse Transfer Capacitance			50		pF
R_G	Gate Input Resistance	$f=1\text{ MHz}$ Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		1.7		Ω

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

ELECTRICAL CHARACTERISTICS (CONTINUED) SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 250V$, $I_D = 24 A$		40		ns
t_r	Rise Time	$R_G = 4.7\Omega$, $V_{GS} = 10 V$ (see test circuit, Figure 3)		35		ns
Q_g	Total Gate Charge	$V_{DD} = 400 V$, $I_D = 48 A$, $V_{GS} = 10 V$		87	117	nC
Q_{gs}	Gate-Source Charge			23		nC
Q_{gd}	Gate-Drain Charge			42		nC

SWITCHING OFF

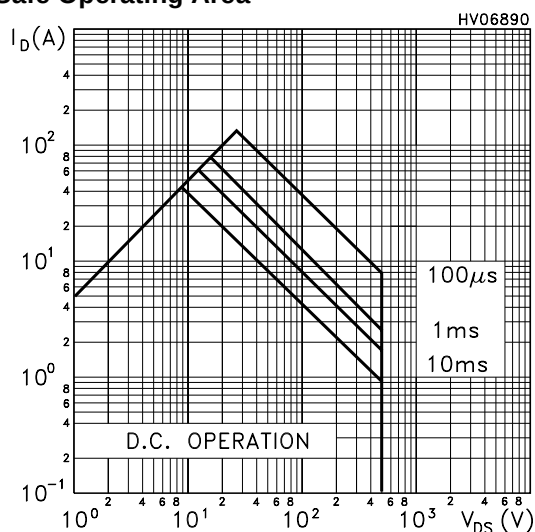
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 400 V$, $I_D = 48 A$,		18		ns
t_f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10 V$ (see test circuit, Figure 5)		23		ns
t_c	Cross-over Time			44		ns

SOURCE DRAIN DIODE

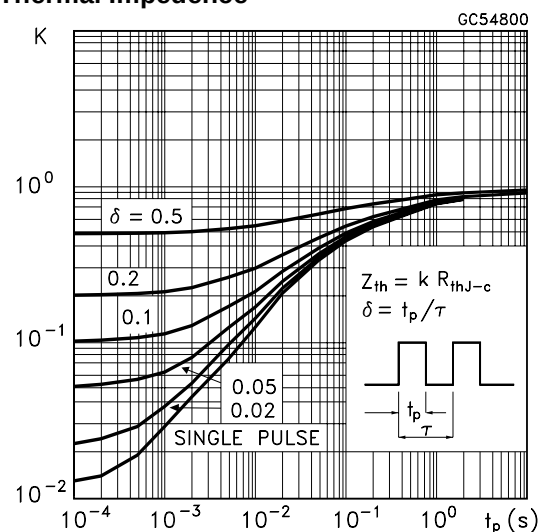
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				48	A
$I_{SDM} (2)$	Source-drain Current (pulsed)				192	A
$V_{SD} (1)$	Forward On Voltage	$I_{SD} = 48 A$, $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 40 A$, $di/dt = 100A/\mu s$,		520		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 100 V$, $T_J = 25^\circ C$		7.8		μC
I_{rrm}	Reverse Recovery Current	(see test circuit, Figure 5)		30		A
t_{rr}	Reverse Recovery Time	$I_{SD} = 40 A$, $di/dt = 100A/\mu s$,		680		ns
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 100 V$, $T_J = 150^\circ C$		11.2		μC
I_{rrm}	Reverse Recovery Current	(see test circuit, Figure 5)		33		A

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

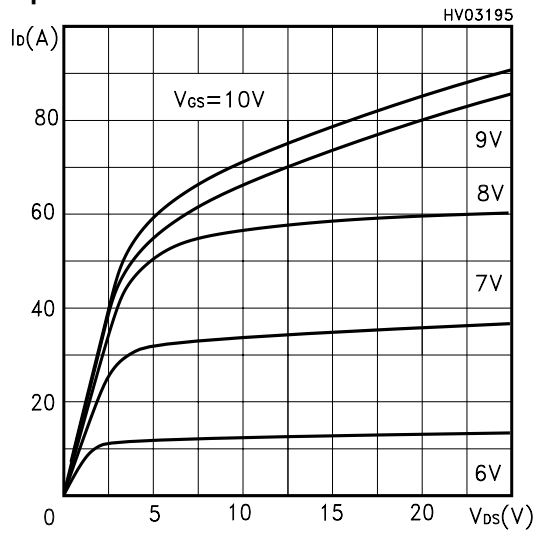
Safe Operating Area



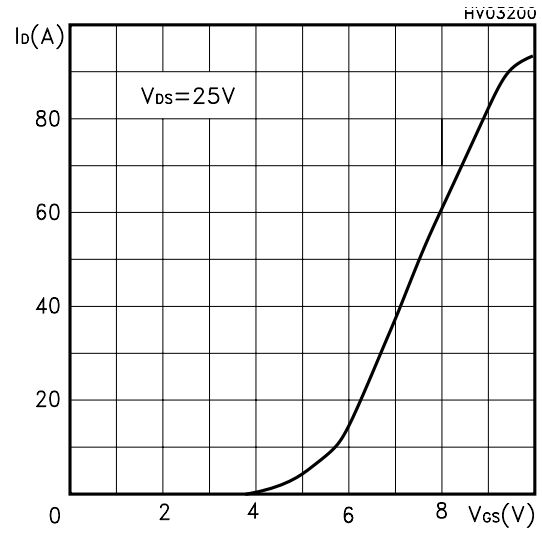
Thermal Impedance



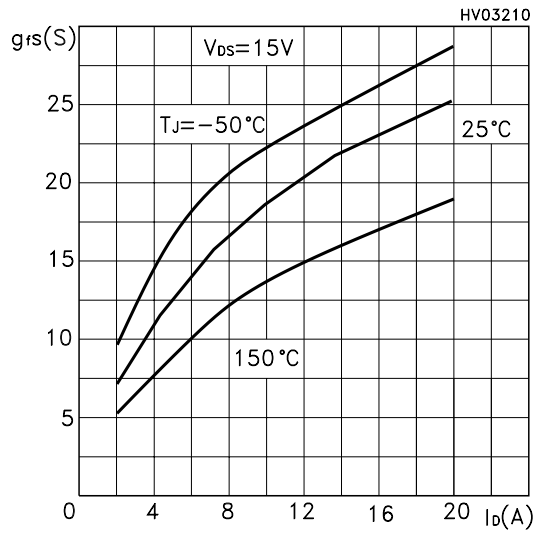
Output Characteristics



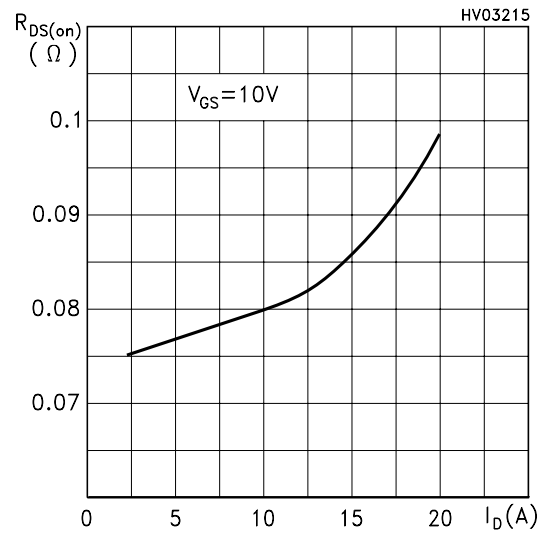
Transfer Characteristics



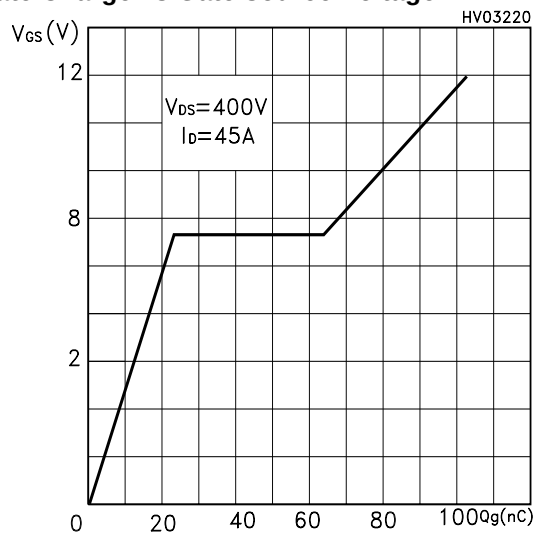
Transconductance



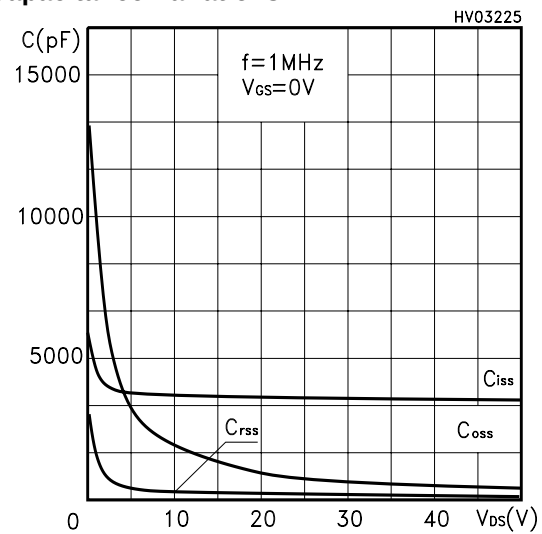
Static Drain-source On Resistance



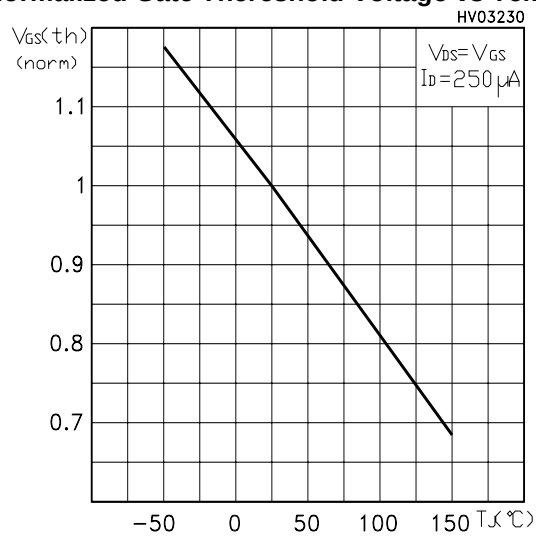
Gate Charge vs Gate-source Voltage



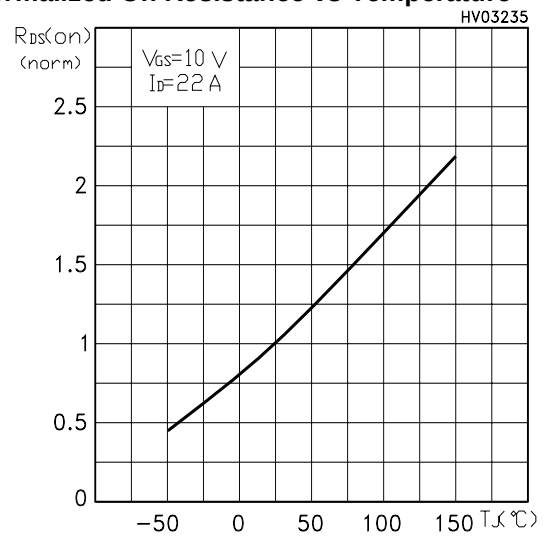
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

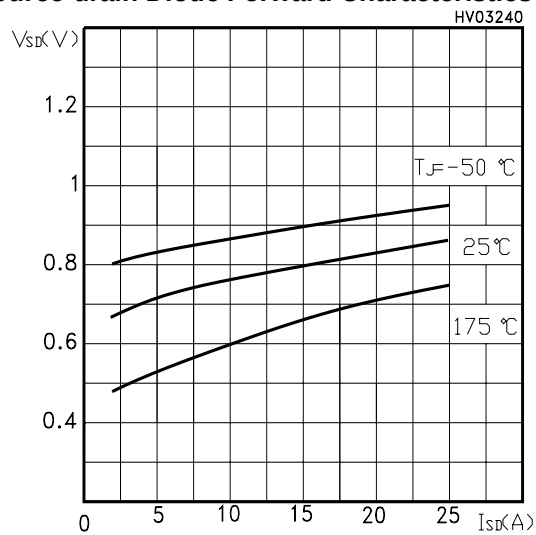


Fig. 1: Unclamped Inductive Load Test Circuit

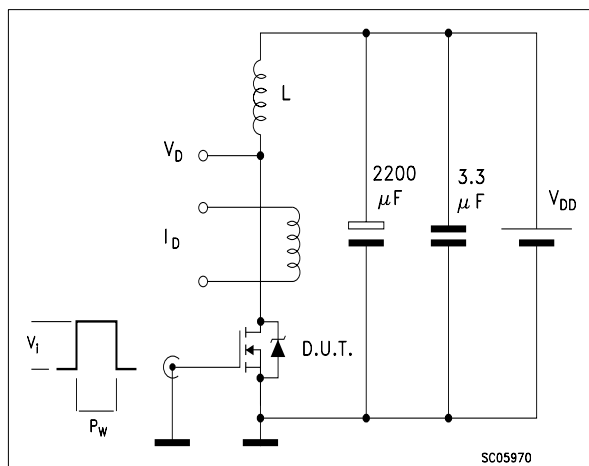


Fig. 2: Unclamped Inductive Waveform

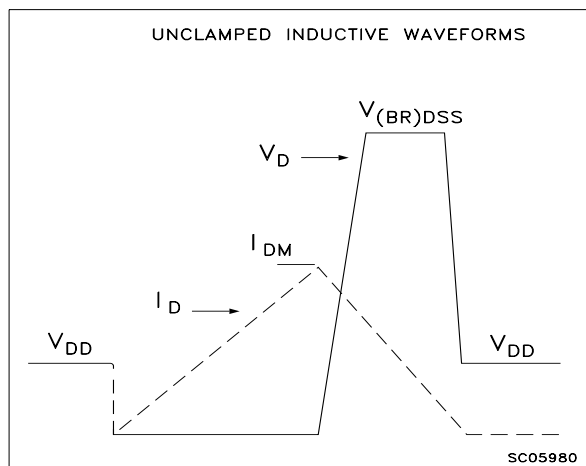


Fig. 3: Switching Times Test Circuit For Resistive Load

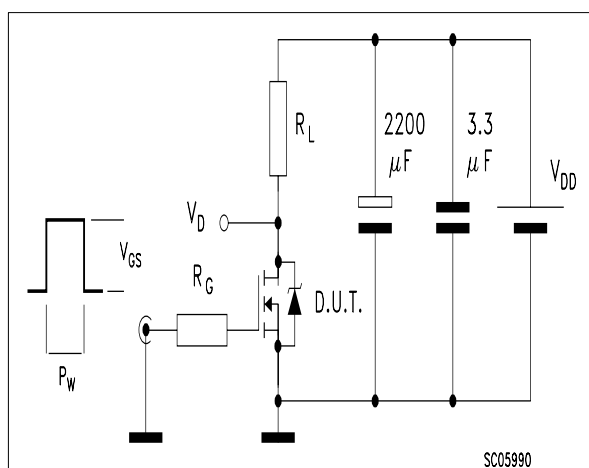


Fig. 4: Gate Charge test Circuit

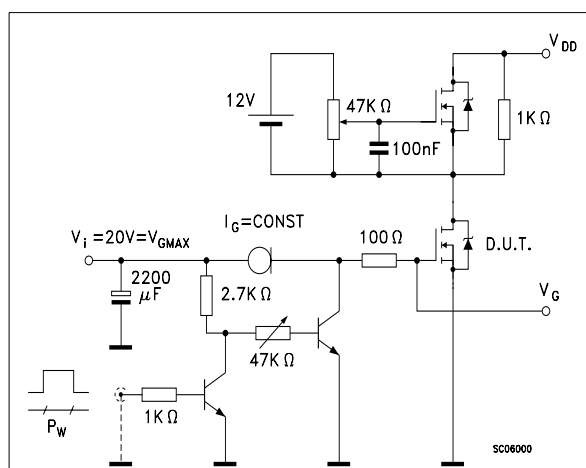
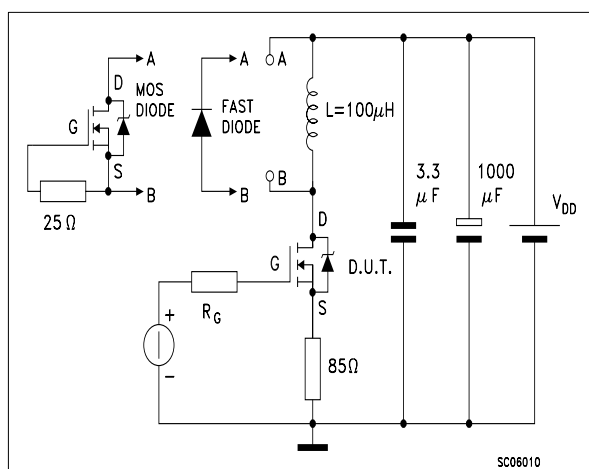
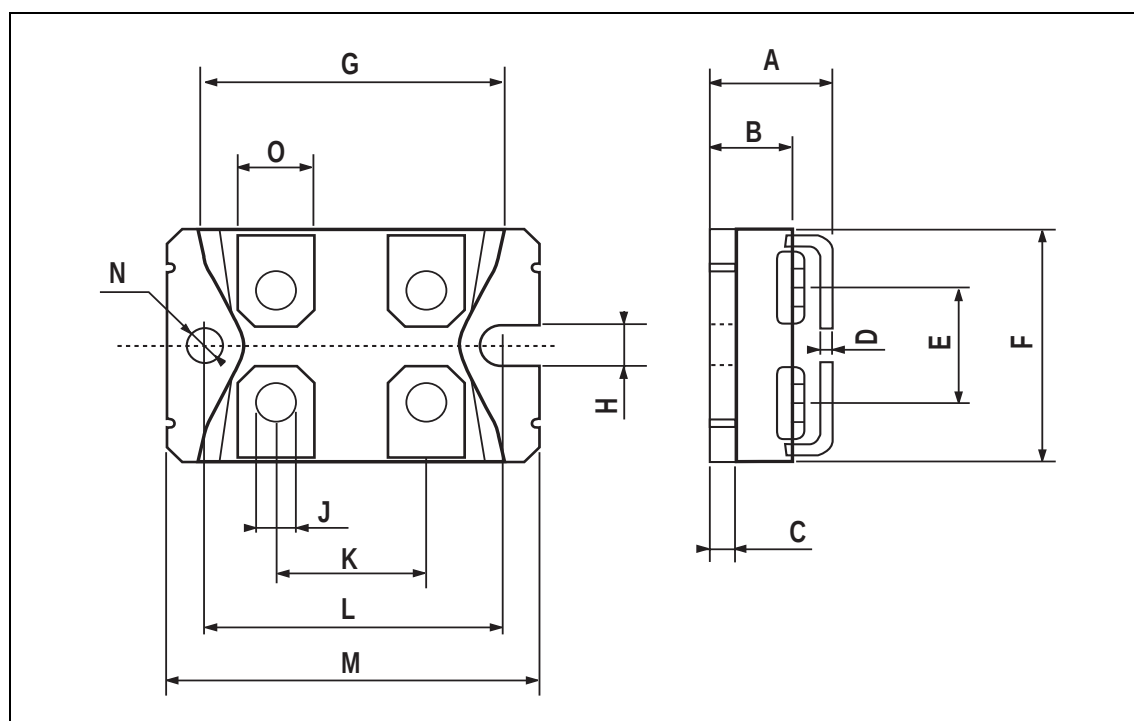


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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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