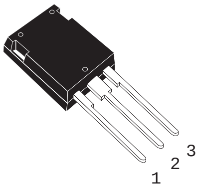
STY60NM60

N-CHANNEL 600V - 0.050Ω - 60A Max247
Zener-Protected MDmesh™Power MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STY60NM60	600V	< 0.055Ω	60 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



Max247

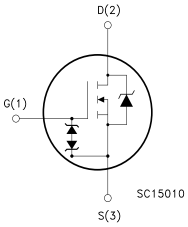
DESCRIPTION

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



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STY60NM60	Y60NM60	Max247	TUBE

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 kΩ)	600	V
V_{GS}	Gate- source Voltage	±30	V
I_D	Drain Current (continuous) at T_C = 25°C	60	A
I_D	Drain Current (continuous) at T_C = 100°C	37.8	A
I_{DM} (•)	Drain Current (pulsed)	240	A
P_{TOT}	Total Dissipation at T_C = 25°C	560	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=15KΩ)	6	KV
	Derating Factor	4.5	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) $I_{SD} \leq 60A$, di/dt ≤400 A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX.}$

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	0.22	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	30	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°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 °C, $I_D = I_{AR}$, V_{DD} = 35 V)	1.4	J

GATE-SOURCE ZENER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{GSO}	Gate-Source Breakdown Voltage	Igs=± 1mA (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.

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} = $I_{D(on)}$ x $R_{DS(on)max}$, 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

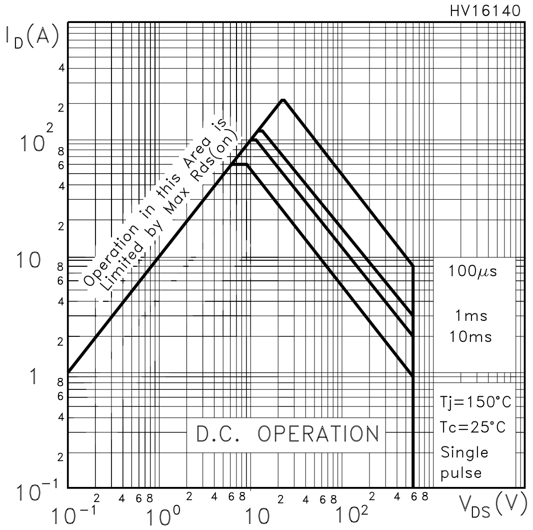
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V, I_D = 60 A, R_G = 4.7Ω, V_{GS} = 10 V (see test circuit, Figure 5)		130 76 105		ns ns ns

SOURCE DRAIN DIODE

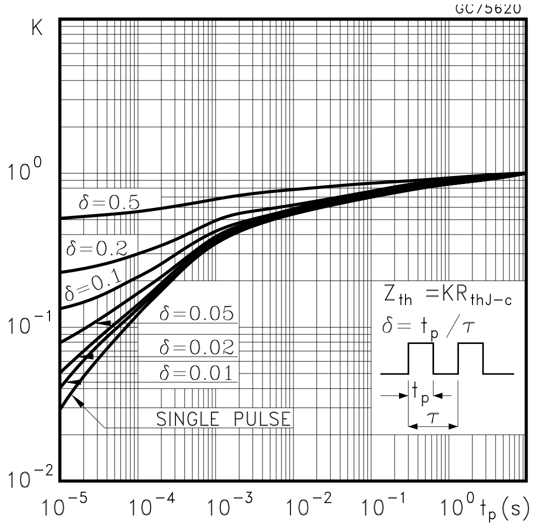
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (1)	Forward On Voltage	I_{SD} = 60 A, V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 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.

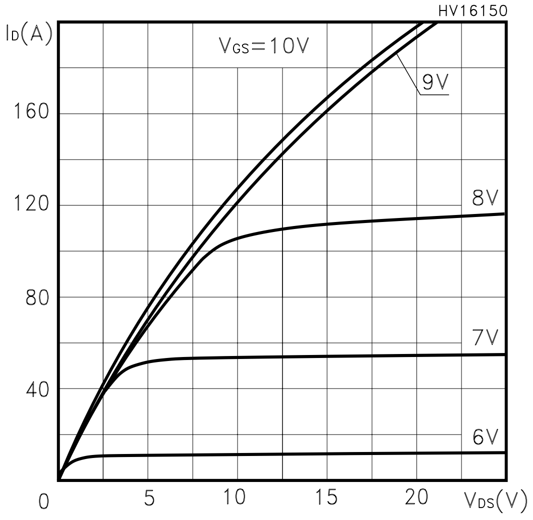
Safe Operating Area



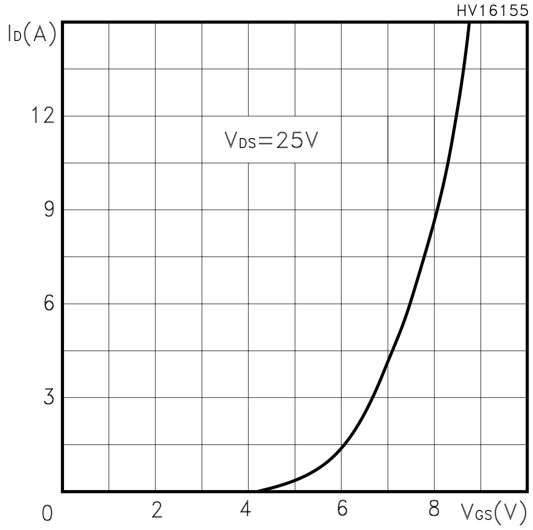
Thermal Impedance



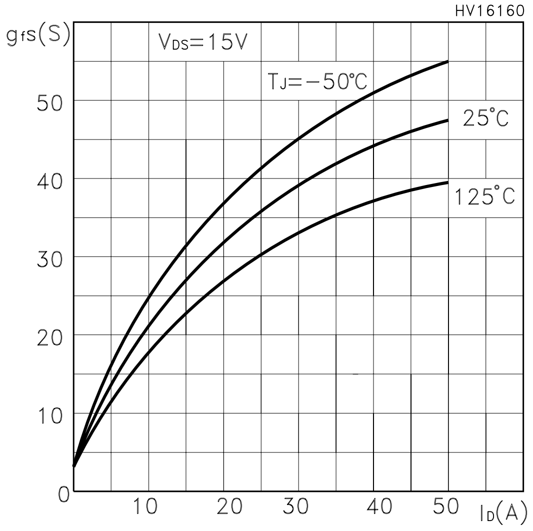
Output Characteristics



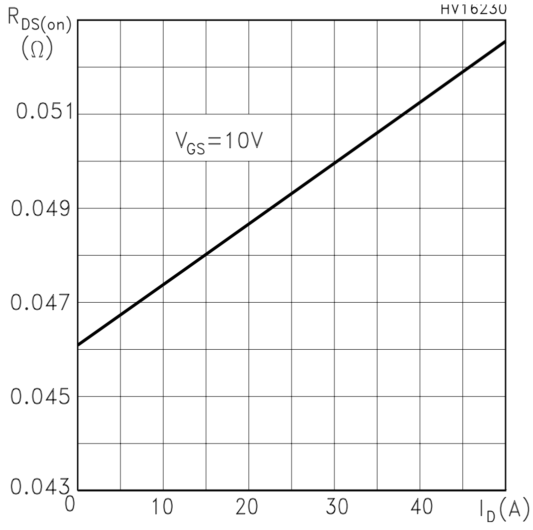
Transfer Characteristics



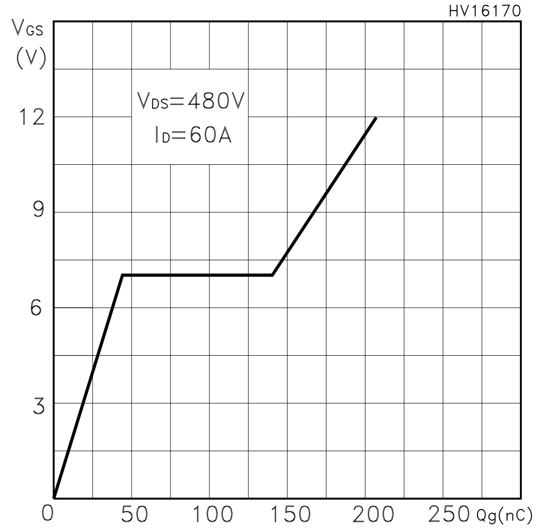
Transconductance



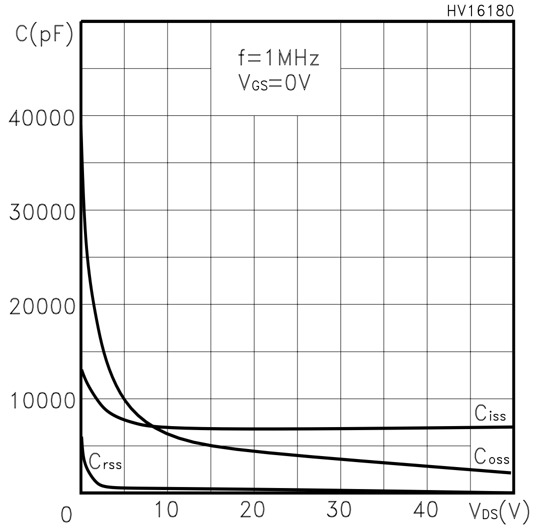
Static Drain-source On Resistance



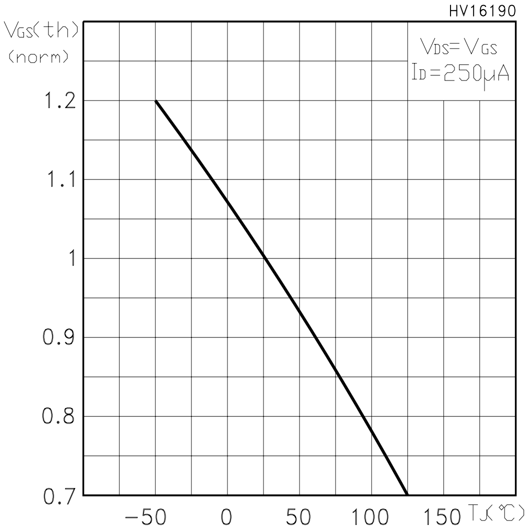
Gate Charge vs Gate-source Voltage



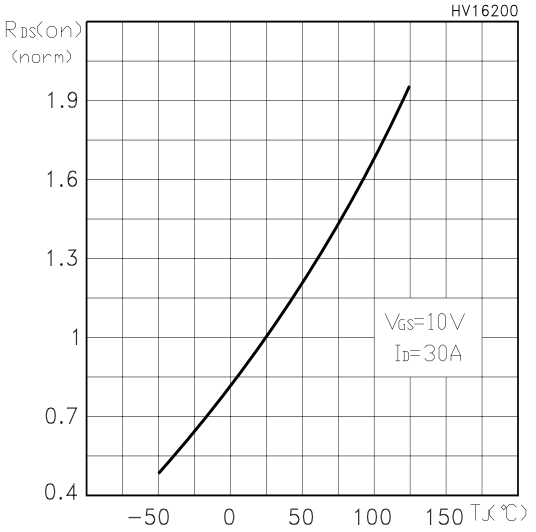
Capacitance Variations



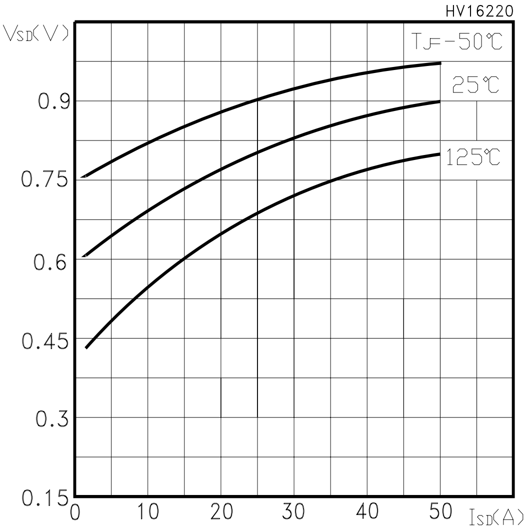
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVDSS vs Temperature

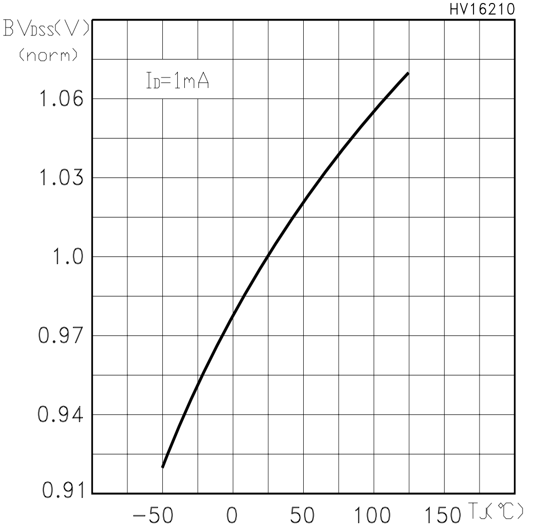


Fig. 1: Unclamped Inductive Load Test Circuit

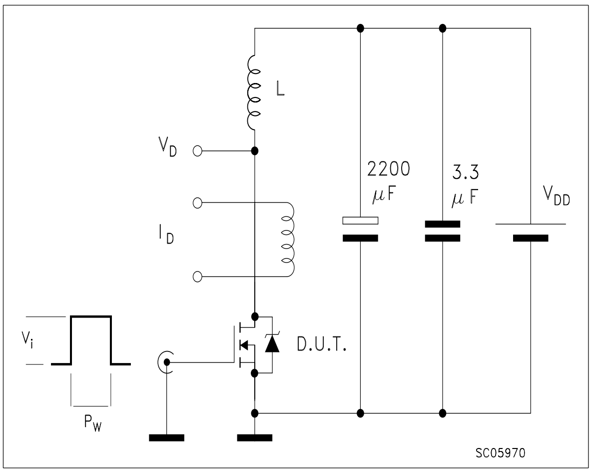


Fig. 2: Unclamped Inductive Waveform

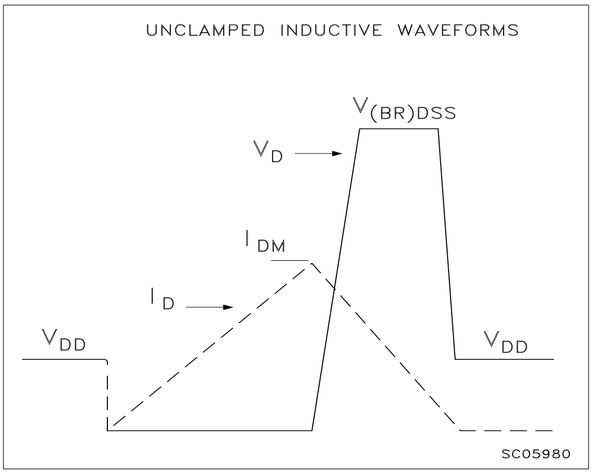


Fig. 3: Switching Times Test Circuit For Resistive Load

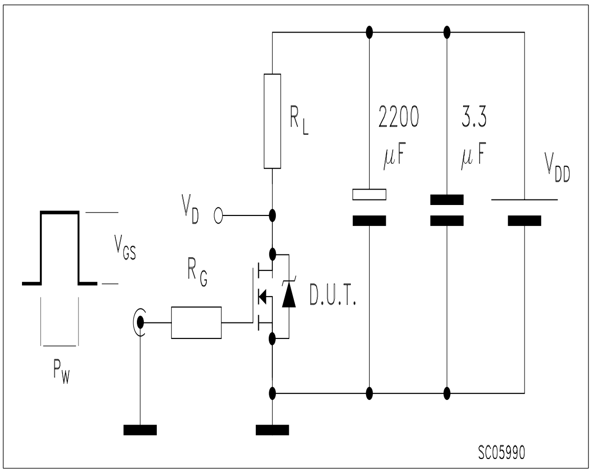


Fig. 4: Gate Charge test Circuit

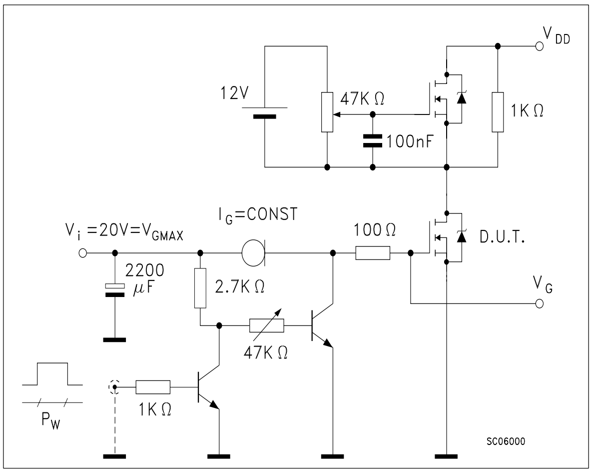
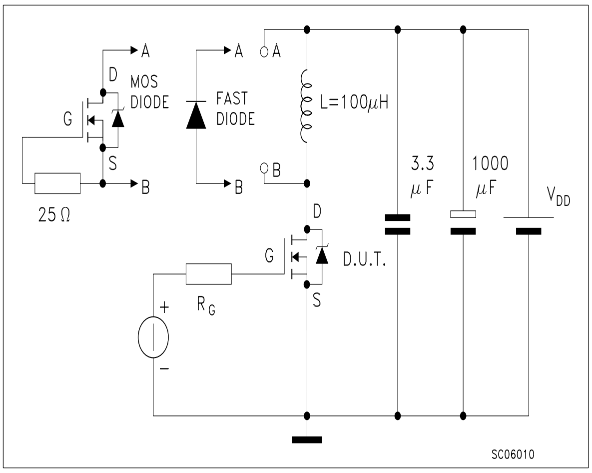
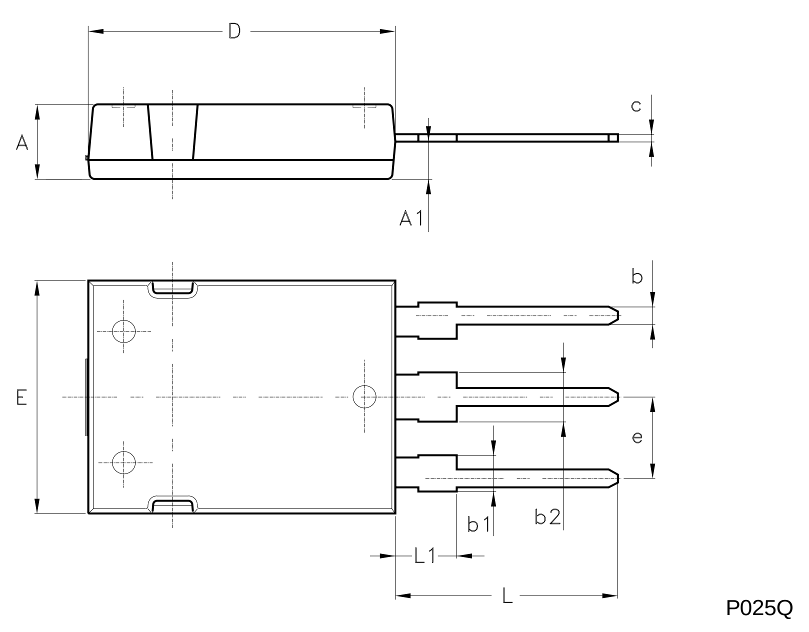


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



Max247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.70		5.30			
A1	2.20		2.60			
b	1.00		1.40			
b1	2.00		2.40			
b2	3.00		3.40			
c	0.40		0.80			
D	19.70		20.30			
e	5.35		5.55			
E	15.30		15.90			
L	14.20		15.20			
L1	3.70		4.30			



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