



STL6NK55Z

N-CHANNEL 550V - 1.2Ω - 5.2A PowerFLAT™ Zener-Protected SuperMESH™ Power MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D (1)	P _w (1)
STL6NK55Z	550 V	< 1.4 Ω	5.2 A	75 W

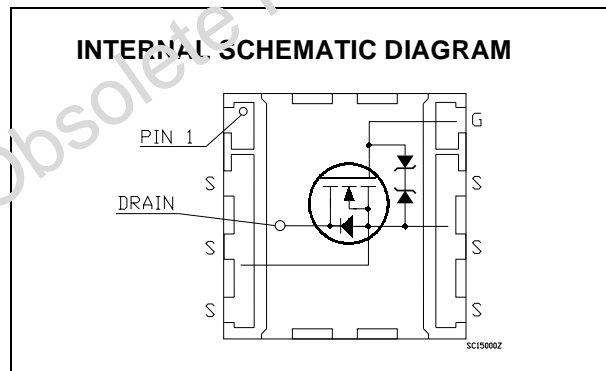
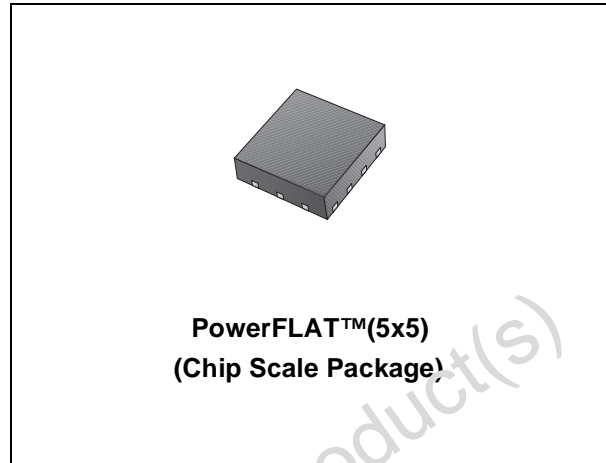
- TYPICAL R_{DS(on)} = 1.2 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- IMPROVED ESD CAPABILITY
- 100% AVALANCHE RATED
- GATE CHARGE MINIMIZED
- VERY LOW INTRINSIC CAPACITANCES
- VERY GOOD MANUFACTURING REPEATABILITY

DESCRIPTION

The SuperMESH™ series is obtained through an extreme optimization of ST's well established strip-based PowerMESH™ layout. In addition to pushing on-resistance significantly down, special care is taken to ensure a very good dv/dt capability for the most demanding applications. Such series complements ST full range of high voltage MOSFETs including revolutionary MDmesh™ products.

APPLICATIONS

- LIGHTING
- IDEAL FOR OFF-LINE POWER SUPPLIES, ADAPTORS AND PFC



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STL6NK55Z	L6NK55Z	PowerFLAT™ (5x5)	TAPE & REEL

STL6NK55Z

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	550	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	550	V
V _{GS}	Gate- source Voltage	± 30	V
I _D (2)	Drain Current (continuous) at T _C = 25°C (Steady State) Drain Current (continuous) at T _C = 100°C	0.86 0.54	A A
I _{DM} (2)	Drain Current (pulsed)	3.44	A
P _{TOT} (2)	Total Dissipation at T _C = 25°C (Steady State)	2.5	W
P _{TOT} (1)	Total Dissipation at T _C = 25°C (Steady State)	75	W
	Derating Factor (2)	0.02	W/°C
V _{ESD(G-S)}	Gate source ESD(HBM-C=100pF, R=1.5KΩ)	3000	V/ns
dv/dt (4)	Peak Diode Recovery voltage slope	4.5	V/ns
T _{stg}	Storage Temperature	-55 to 150	°C
T _j	Max. Operating Junction Temperature		

THERMAL DATA

Symbol	Parameter	Max.	Unit
R _{thj-F}	Thermal Resistance Junction-Foot (Drain)	1.67	°C/W
R _{thj-amb} (2)	Thermal Resistance Junction-ambient	50	°C/W

Note: 1. The value is rated according to R_{thj-F}.
2. When Mounted on FR-4 Board of 1inch², 2 oz Cu
3. Pulse width limited by safe operating area
4. I_{SD}<5.7A, di/dt<300A/μs, V_{DD}<V_{(BR)DSS}, T_J<T_{JMAX}

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	5.2	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	160	mJ

GATE-SOURCE ZENER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV _{GSO}	Gate-Source Breakdown Voltage	I _{gs} =± 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 (TCASE =25°C UNLESS OTHERWISE SPECIFIED)
ON/OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 1 \text{ mA}, V_{GS} = 0$	550			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}, T_C = 125 \text{ }^\circ\text{C}$			1 50	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 50\mu\text{A}$	3	3.75	4.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{V}, I_D = 2.6 \text{ A}$		1.2	1.4	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (1)$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 2.6 \text{ A}$		3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\text{V}, f = 1 \text{ MHz}, V_{GS} = 0$		695 88 20		pF pF pF
$C_{oss \text{ eq.}} (3)$	Equivalent Output Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V to } 440 \text{ V}$		48		pF
R_G	Gate Input Resistance	$f=1 \text{ MHz}$ Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		3		Ω

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Delay Time Rise time Turn-off Delay Time Fall Time	$V_{DD} = 275 \text{ V}, I_D = 2.6 \text{ A}$ $R_G = 4.7\Omega, V_{GS} = 10 \text{ V}$ (Resistive Load see, Figure 3)		14 20 31.5 18		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 440\text{V}, I_D = 5.2 \text{ A},$ $V_{GS} = 10\text{V}$		25 4.5 14	35	nC nC nC

SOURCE DRAIN DIODE

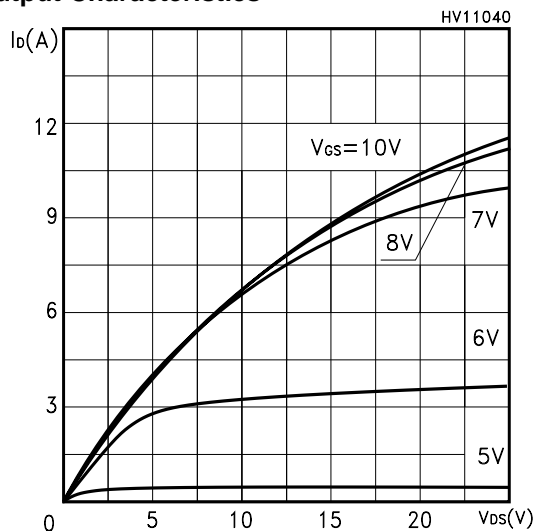
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM} (2)$	Source-drain Current Source-drain Current (pulsed)				0.86 3.44	A A
$V_{SD} (1)$	Forward On Voltage	$I_{SD} = 5.2 \text{ A}, V_{GS} = 0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5.2 \text{ A}, di/dt = 100\text{A}/\mu\text{s}$ $V_{DD} = 40\text{V}, T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		350 2.2 12.5		ns μC A

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

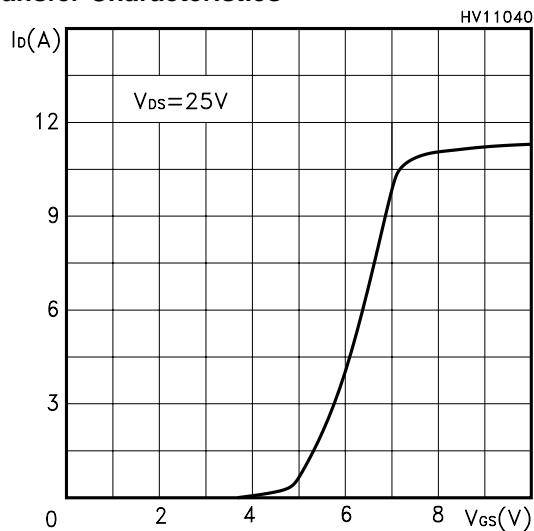
2. Pulse width limited by safe operating area.

3. $C_{oss \text{ eq.}}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS} .

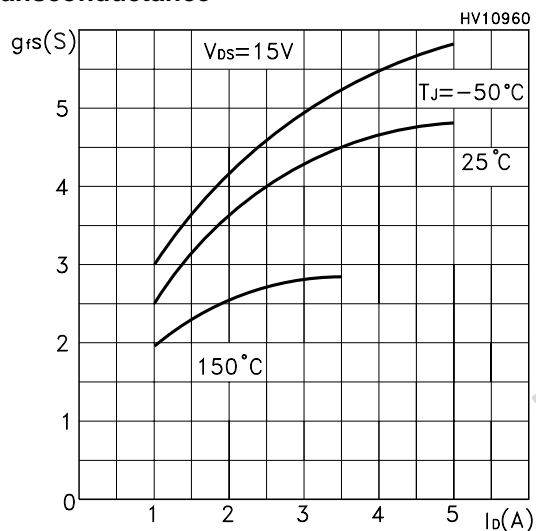
Output Characteristics



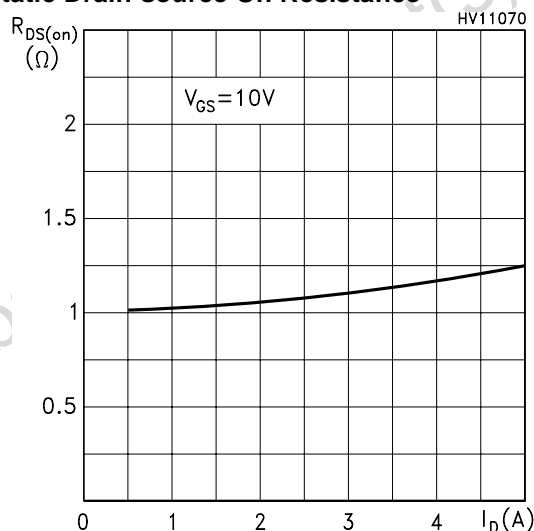
Transfer Characteristics



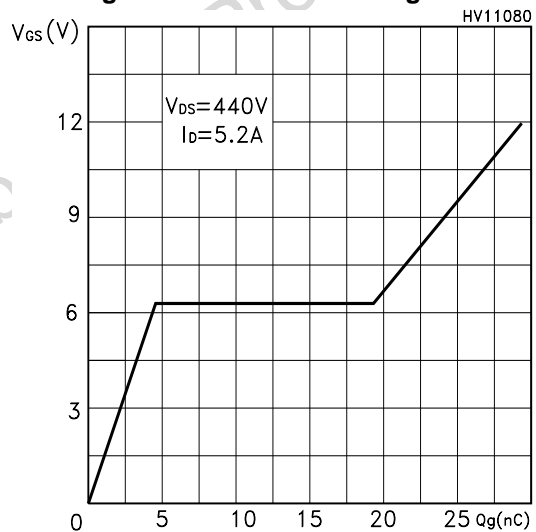
Transconductance



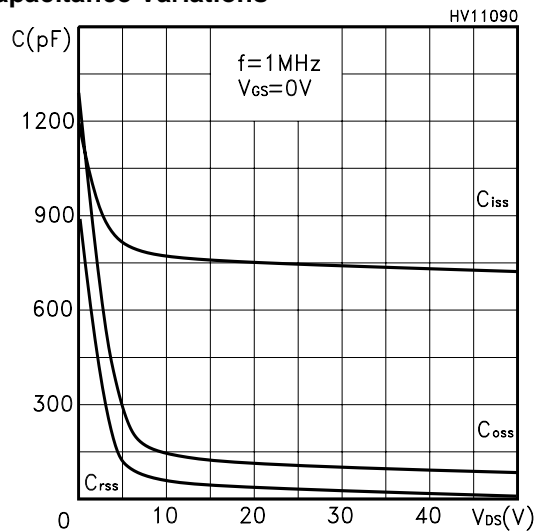
Static Drain-source On Resistance



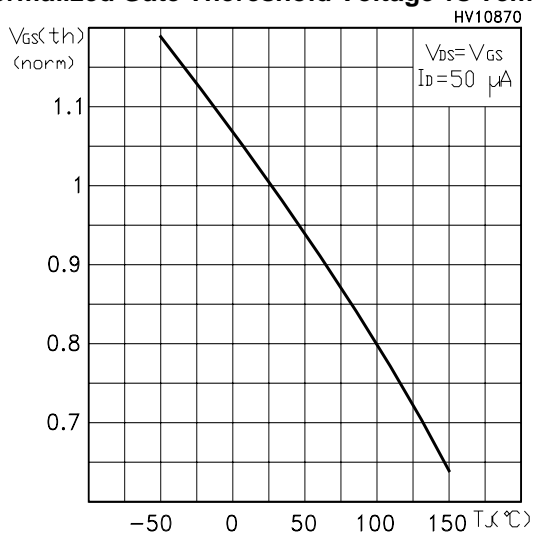
Gate Charge vs Gate-source Voltage



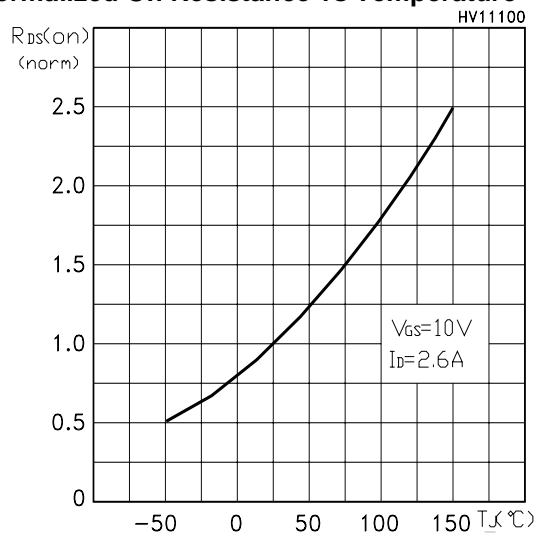
Capacitance Variations



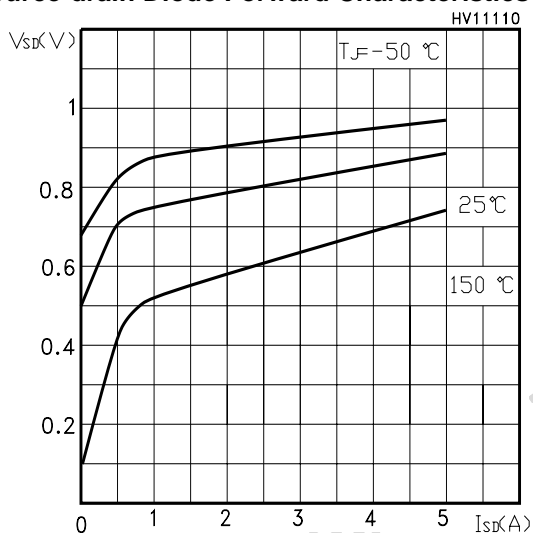
Normalized Gate Threshold Voltage vs Temp.



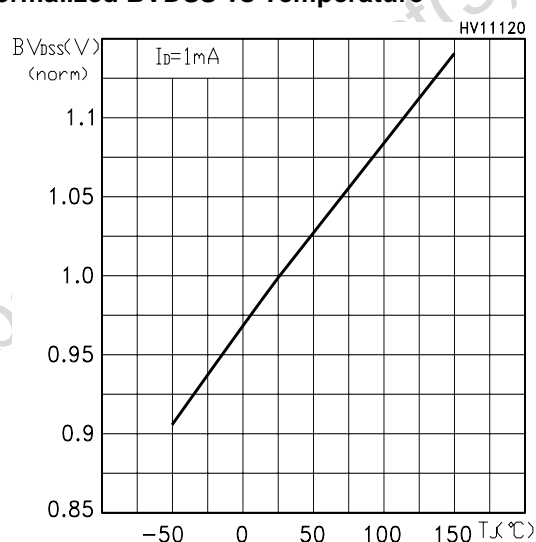
Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVDSS vs Temperature



Obsolete Product - Ob

Fig. 1: Unclamped Inductive Load Test Circuit

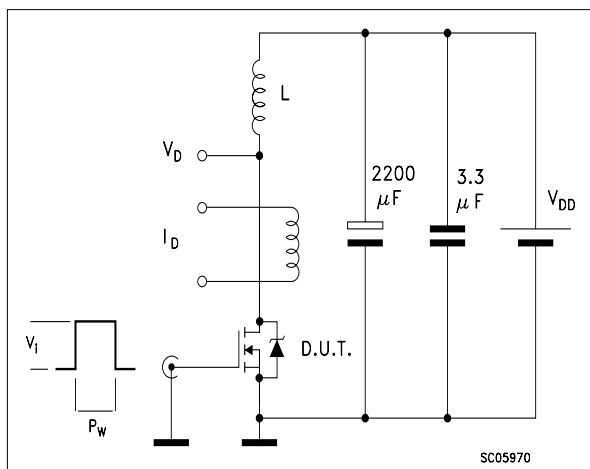


Fig. 2: Unclamped Inductive Waveform

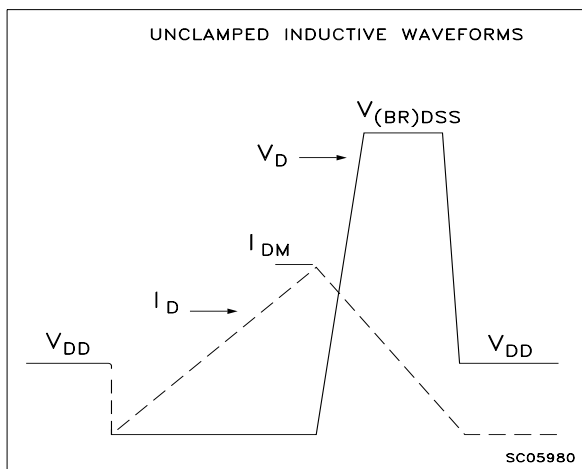


Fig. 3: Switching Times Test Circuit For Resistive Load

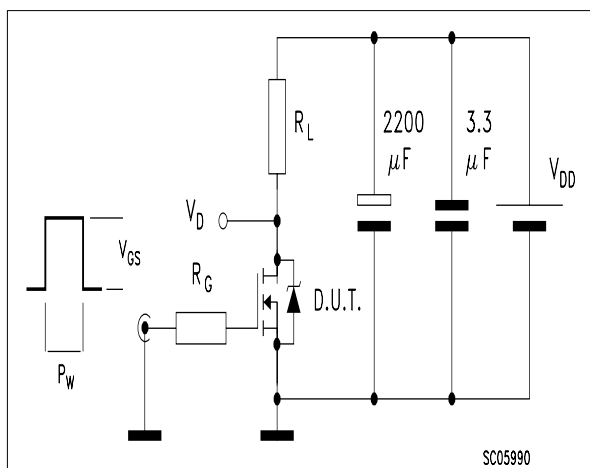


Fig. 4: Gate Charge test Circuit

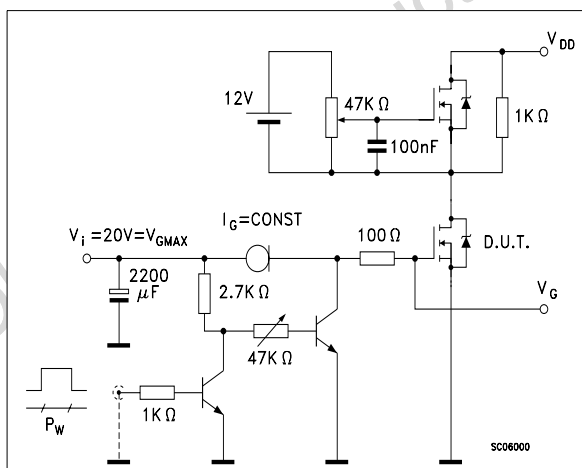
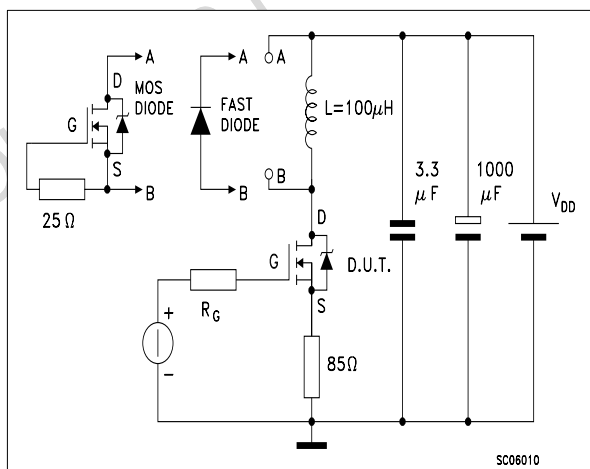
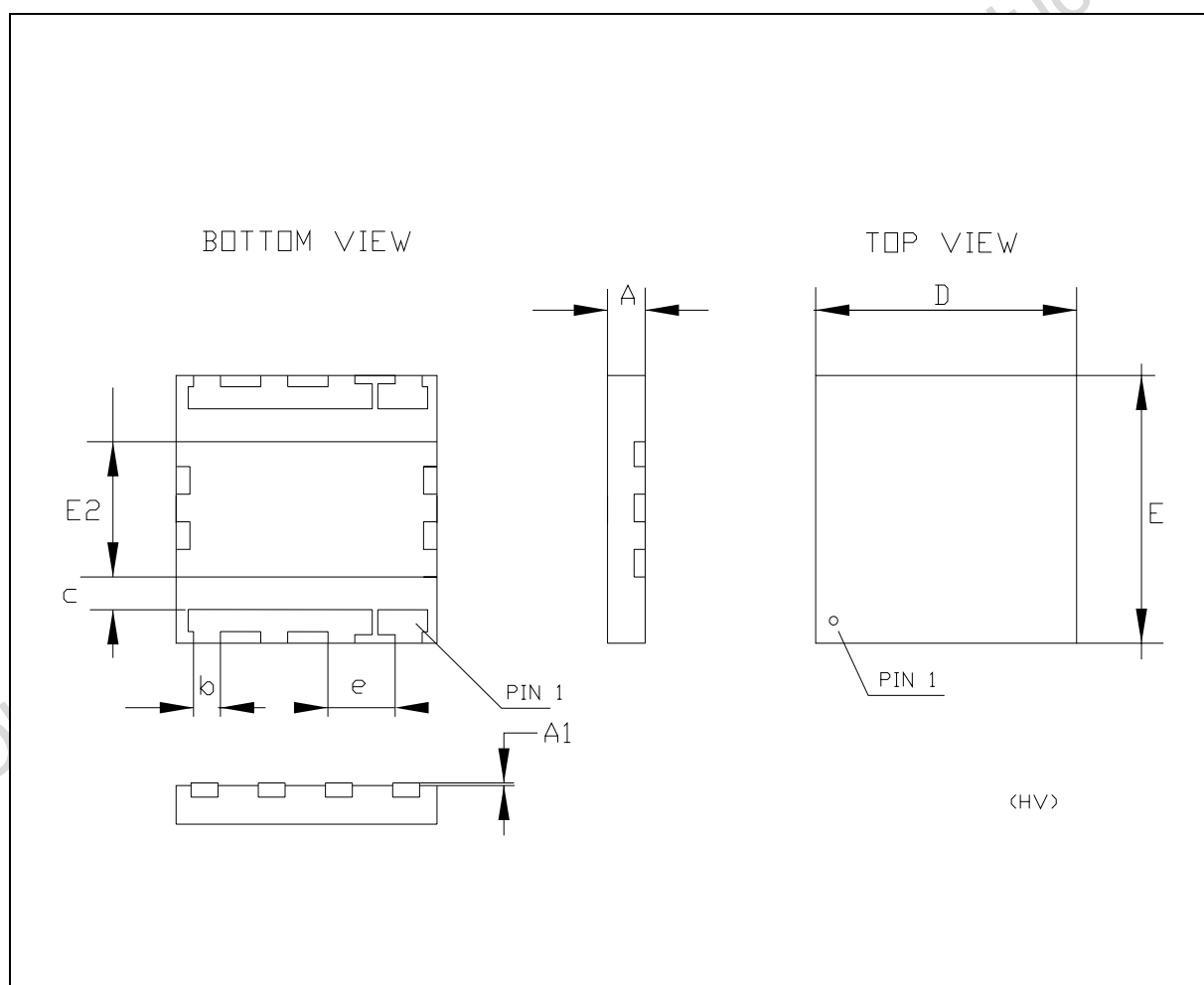


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



PowerFLAT™(5x5) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		0.90	1.00		0.035	0.039
A1		0.02	0.05		0.001	0.002
b	0.43	0.51	0.58	0.017	0.020	0.023
c	0.64	0.71	0.79	0.025	0.028	0.031
D		5.00			0.197	
E		5.00			0.197	
E2	2.49	2.57	2.64	0.098	0.101	0.104
e		1.27			0.050	



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