



STB20NE06L

N - CHANNEL 60V - 0.06Ω - 20A TO-263 STripFET™ POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STB20NE06L | 60 V | < 0.07 Ω | 20 A |

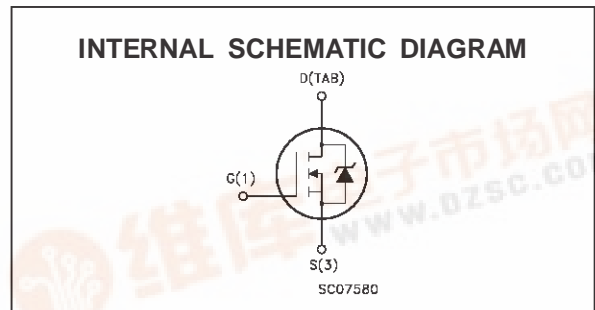
- TYPICAL R_{DS(on)} = 0.06 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE 100 °C
- LOW THRESHOLD DRIVE
- ADD SUFFIX "T4" FOR ORDERING IN TAPE & REEL

DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronis unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalance characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- DC MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS
- SYNCHRONOUS RECTIFICATION



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 60 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 kΩ) | 60 | V |
| V _{GS} | Gate-source Voltage | ± 20 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 20 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 14 | A |
| I _{DM} (●) | Drain Current (pulsed) | 80 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 70 | W |
| | Derating Factor | 0.47 | W/°C |
| dv/dt | Peak Diode Recovery voltage slope | 7 | V/ns |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | 175 | °C |

(●) Pulse width limited by safe operating area

(1) I_{SD} ≤ 20 A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}



STB20NE06L

THERMAL DATA

| | | | | |
|-----------------------|--|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 2.14 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |
| R _{thc-sink} | Thermal Resistance Case-sink | Typ | 0.5 | °C/W |
| T _J | 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) | 20 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _J = 25 °C, I _D = I _{AR} , V _{DD} = 35 V) | 100 | mJ |

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|--|------|------|---------|----------|
| V _{(BR)DSS} | Drain-source Breakdown Voltage | I _D = 250 μA V _{GS} = 0 | 60 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating T _C = 125 °C | | | 1 10 | μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 20 V | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---|------|--------------|---------------|--------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 250 μA | 1 | 1.7 | 2.0 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 5 V I _D = 10 A V _{GS} = 10 V I _D = 10 A | | 0.07 0.06 | 0.085 0.07 | Ω Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)max} V _{GS} = 10 V | 20 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} > I _{D(on)} × R _{DS(on)max} I _D = 10 A | 5 | 9 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 800 | | pF |
| C _{oss} | Output Capacitance | | | 125 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 40 | | pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 30\text{ V}$ $I_D = 10\text{ A}$ | | 20 | | ns |
| t_r | Rise Time | $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 3) | | 45 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 48\text{ V}$ $I_D = 20\text{ A}$ $V_{GS} = 5\text{ V}$ | | 14 | 20 | nC |
| Q_{gs} | Gate-Source Charge | | | 8 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 4 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 48\text{ V}$ $I_D = 20\text{ A}$ | | 10 | | ns |
| t_f | Fall Time | $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 5) | | 25 | | ns |
| t_c | Cross-over Time | | | 42 | | ns |

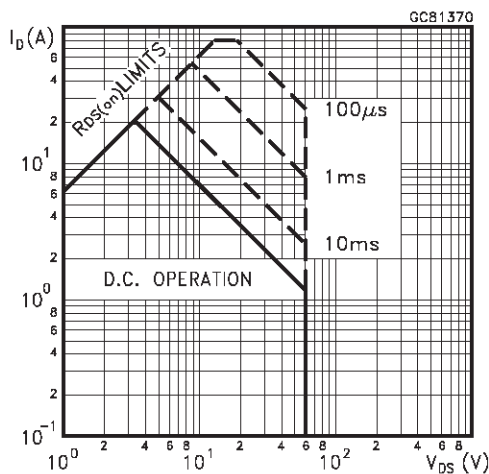
SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|---|------|------|------|------|
| I_{SD} | Source-drain Current | | | | 20 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 80 | A |
| $V_{SD}(\ast)$ | Forward On Voltage | $I_{SD} = 20\text{ A}$ $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 20\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5) | | 65 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 130 | | nC |
| I_{RRM} | Reverse Recovery Current | | | 4 | | A |

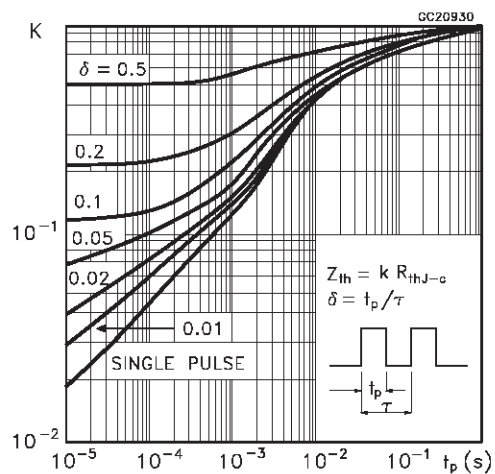
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

Safe Operating Area

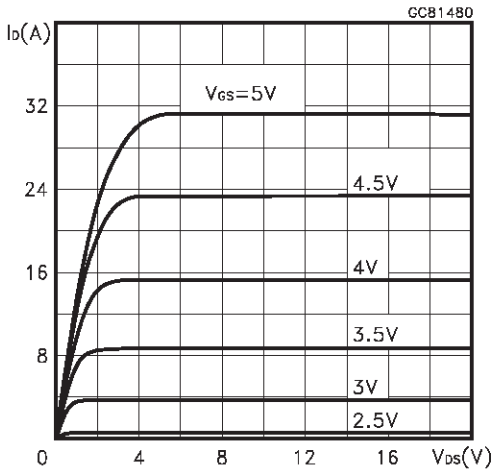


Thermal Impedance

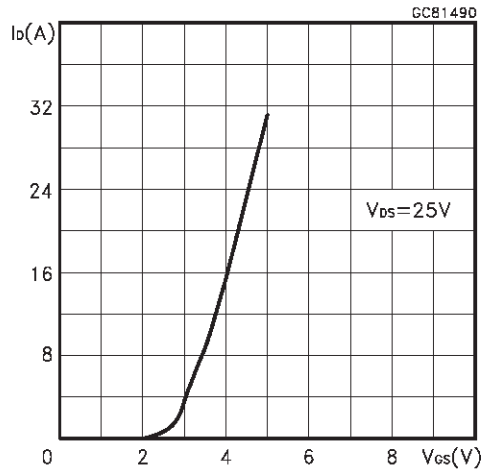


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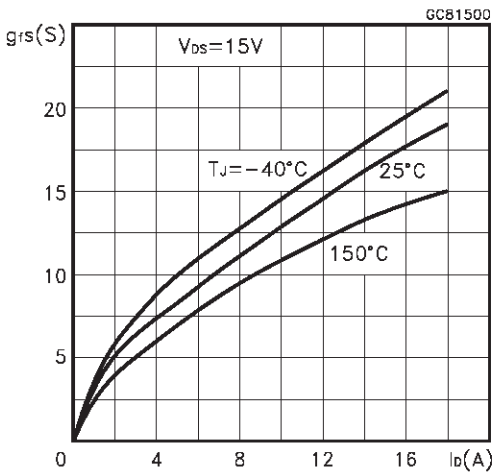
Output Characteristics



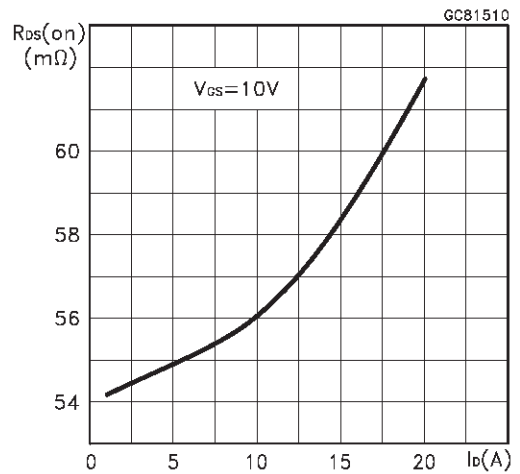
Transfer Characteristics



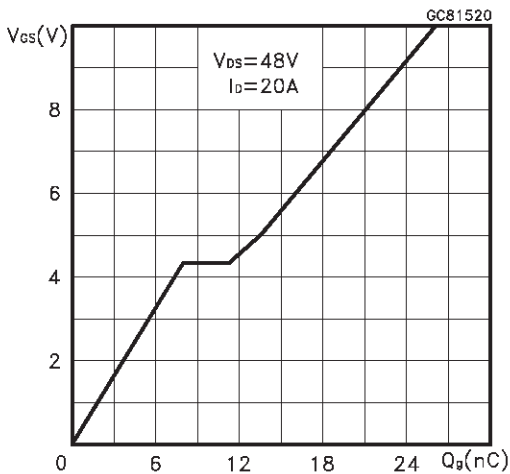
Transconductance



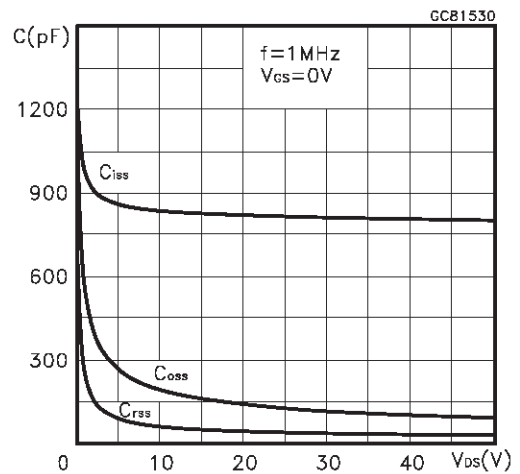
Static Drain-source On Resistance



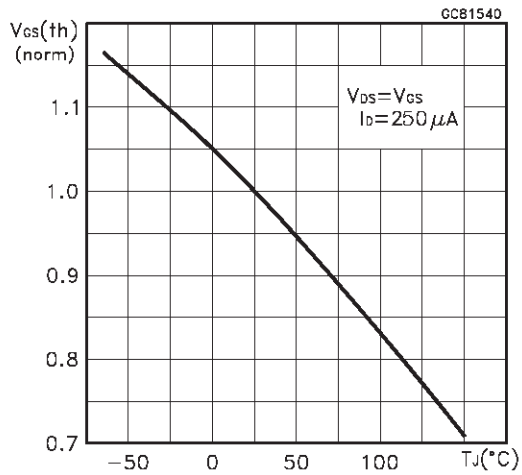
Gate Charge vs Gate-source Voltage



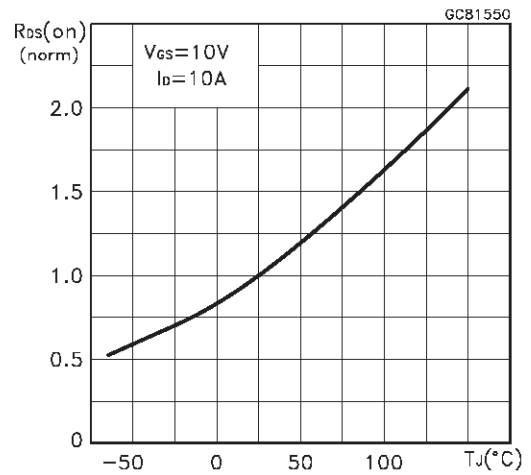
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

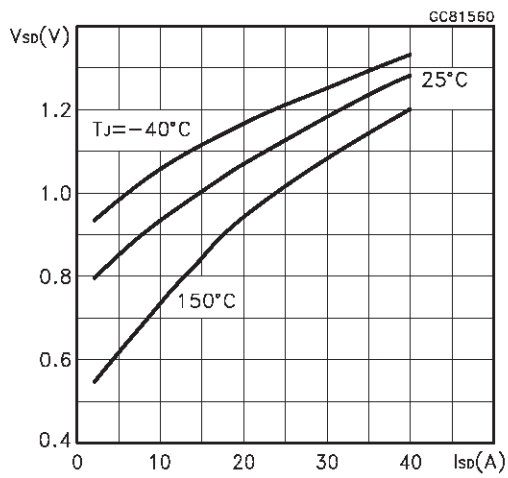


Fig. 1: Unclamped Inductive Load Test Circuit

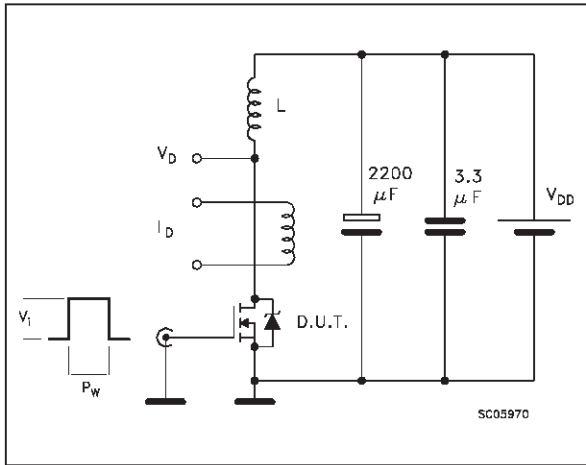


Fig. 2: Unclamped Inductive Waveform

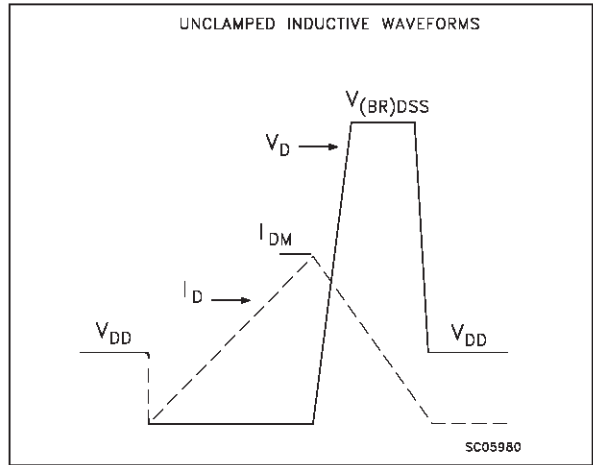


Fig. 3: Switching Times Test Circuits For Resistive Load

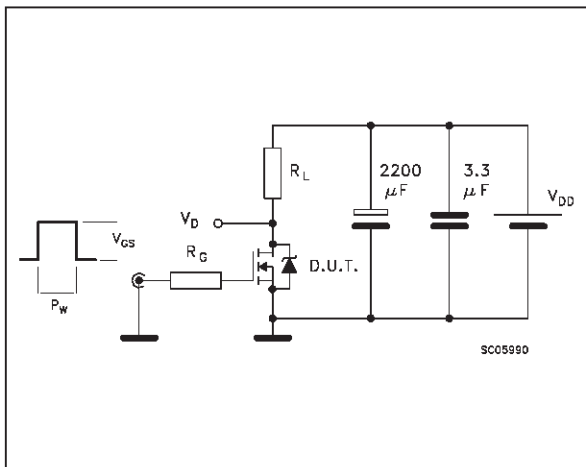


Fig. 4: Gate Charge test Circuit

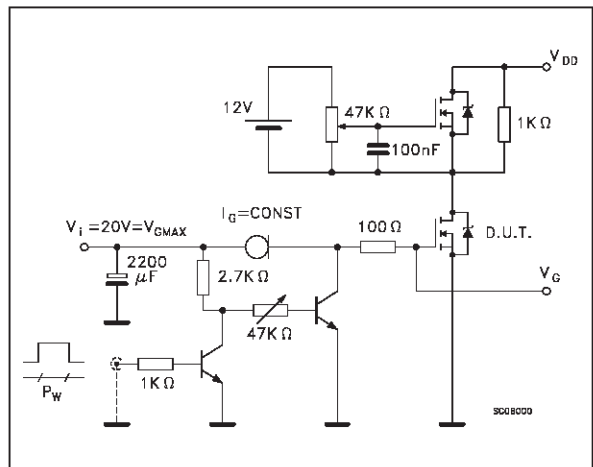
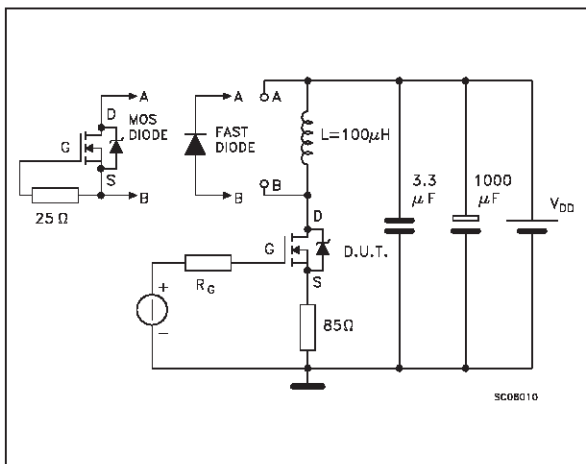
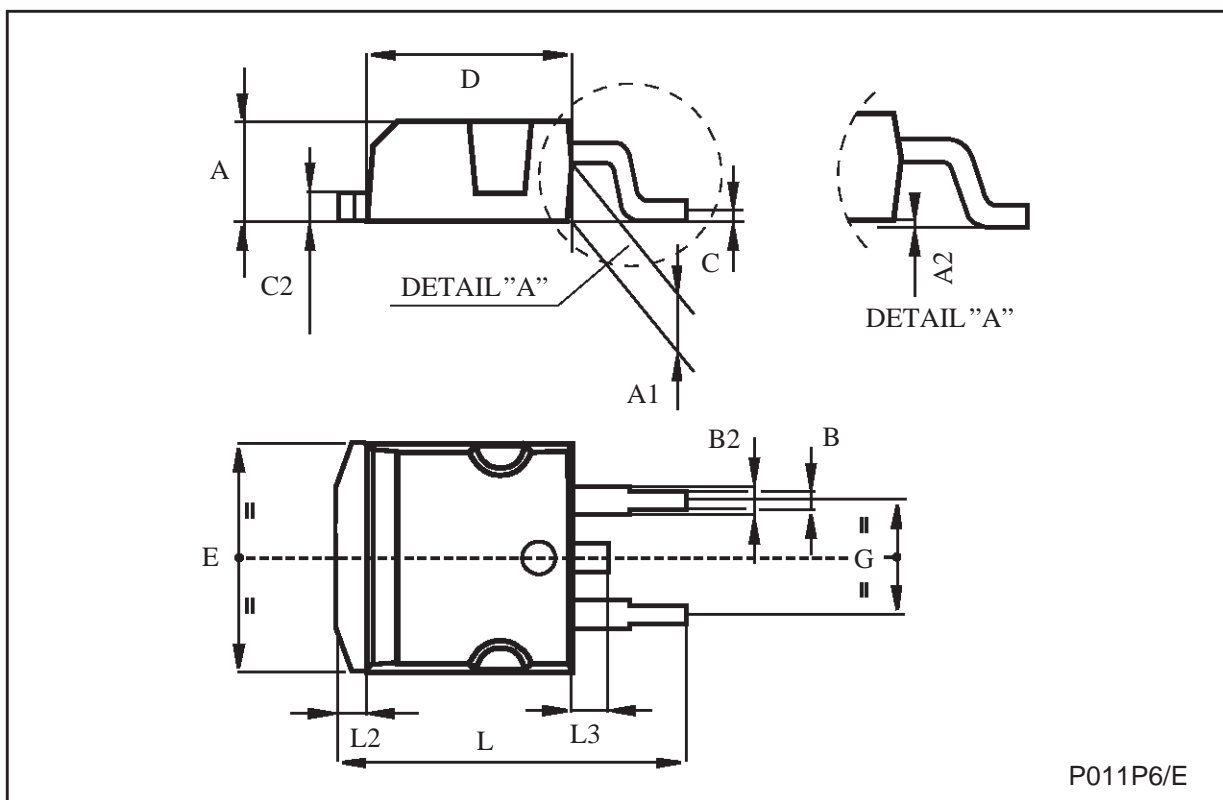


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D²PAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|-------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.21 | | 1.36 | 0.047 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| E | 10 | | 10.4 | 0.393 | | 0.409 |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.590 | | 0.624 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.068 |



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