



## STB55NE06L

N-CHANNEL 60V - 0.18  $\Omega$  - 55A D<sup>2</sup>PAK

STripFET™ POWER MOSFET

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|------------|------------------|---------------------|----------------|
| STB55NE06L | 60 V             | <0.022 $\Omega$     | 55 A           |

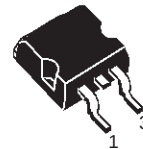
- TYPICAL R<sub>DS(on)</sub> = 0.018 $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE 100 °C
- HIGH dv/dt CAPABILITY
- LOW THRESHOLD DRIVE
- FOR THROUGH-HOLE VERSION CONTACT SALES OFFICE

### 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 avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

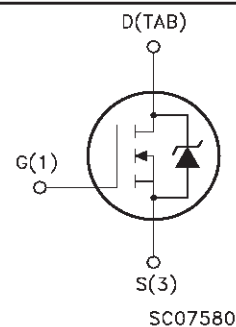
### APPLICATIONS

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



**D<sup>2</sup>PAK**  
**TO-263**  
(suffix "T4")

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol               | Parameter                                             | Value      | Unit |
|----------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>      | Drain-source Voltage (V <sub>GS</sub> = 0)            | 60         | V    |
| V <sub>DGR</sub>     | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ ) | 60         | V    |
| V <sub>GS</sub>      | Gate- source Voltage                                  | ±15        | V    |
| I <sub>D</sub>       | Drain Current (continuos) at T <sub>C</sub> = 25°C    | 55         | A    |
| I <sub>D</sub>       | Drain Current (continuos) at T <sub>C</sub> = 100°C   | 39         | A    |
| I <sub>DM</sub> (•)  | Drain Current (pulsed)                                | 220        | A    |
| P <sub>tot</sub>     | Total Dissipation at T <sub>C</sub> = 25°C            | 130        | W    |
|                      | Derating Factor                                       | 0.86       | W/°C |
| dv/dt <sup>(2)</sup> | Peak Diode Recovery voltage slope                     | 7          | V/ns |
| T <sub>stg</sub>     | Storage Temperature                                   | -60 to 175 | °C   |
| T <sub>j</sub>       | Max. Operating Junction Temperature                   | 175        | °C   |

(•) Pulse width limited by safe operating area.

I<sub>SD</sub> ≤ 55A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V(BR)DSS, T<sub>j</sub> ≤ T<sub>JMAX</sub>.

**THERMAL DATA**

|                |                                                |     |      |      |
|----------------|------------------------------------------------|-----|------|------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 1.15 | °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)                       | 55        | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$ , $I_D = I_{AR}$ , $V_{DD} = 15\text{ V}$ ) | 200       | 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                   | $I_D = 25\text{ }\mu\text{A}$ , $V_{GS} = 0$                                         | 60   |      |           | V                              |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ , $T_C = 125\text{ °C}$ |      |      | 1<br>10   | $\mu\text{A}$<br>$\mu\text{A}$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 15\text{ V}$                                                           |      |      | $\pm 100$ | nA                             |

**ON <sup>(1)</sup>**

| Symbol       | Parameter                         | Test Conditions                                                                             | Min. | Typ.           | Max.           | Unit                 |
|--------------|-----------------------------------|---------------------------------------------------------------------------------------------|------|----------------|----------------|----------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$                                            | 1    | 1.7            | 2.5            | V                    |
| $I_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 5\text{ V}$ $I_D = 27.5\text{ A}$<br>$V_{GS} = 10\text{ V}$ $I_D = 27.5\text{ A}$ |      | 0.022<br>0.019 | 0.028<br>0.022 | $\Omega$<br>$\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10\text{ V}$                         | 55   |                |                | A                    |

**DYNAMIC**

| Symbol         | Parameter                     | Test Conditions                                                      | Min. | Typ. | Max. | Unit |
|----------------|-------------------------------|----------------------------------------------------------------------|------|------|------|------|
| $g_{fs}^{(1)}$ | Forward Transconductance      | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ ,<br>$I_D = 27.5\text{ A}$ | 20   | 30   |      | S    |
| $C_{iss}$      | Input Capacitance             | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$               |      | 2800 | 3750 | pF   |
| $C_{oss}$      | Output Capacitance            |                                                                      |      | 375  | 500  | pF   |
| $C_{rss}$      | Reverse Transfer Capacitances |                                                                      |      | 100  | 140  | pF   |

## ELECTRICAL CHARACTERISTICS (continued)

## SWITCHING ON

| Symbol               | Parameter                       | Test Conditions                                                                                    | Min. | Typ.      | Max.      | Unit     |
|----------------------|---------------------------------|----------------------------------------------------------------------------------------------------|------|-----------|-----------|----------|
| $t_{d(on)}$<br>$t_r$ | Turn-on Delay Time<br>Rise Time | $V_{DD} = 30V$ $I_D = 27.5 A$<br>$R_G = 4.7 \Omega$ $V_{GS} = 5 V$<br>(see test circuit, Figure 3) |      | 40<br>100 | 55<br>140 | ns<br>ns |
| $Q_g$                | Total Gate Charge               | $V_{DD}=48V$ $I_D=55A$ $V_{GS}=5V$                                                                 |      | 40        | 55        | nC       |
| $Q_{gs}$             | Gate-Source Charge              |                                                                                                    |      | 13        |           | nC       |
| $Q_{gd}$             | Gate-Drain Charge               |                                                                                                    |      | 20        |           | nC       |

## SWITCHING OFF

| Symbol      | Parameter          | Test Conditions                                                                                   | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 48 V$ $I_D = 55 A$<br>$R_G = 4.7 \Omega$ $V_{GS} = 5 V$<br>(see test circuit, Figure 5) |      | 25   | 35   | ns   |
| $t_r$       | Fall Time          |                                                                                                   |      | 40   | 55   | ns   |
| $t_c$       | Cross-over Time    |                                                                                                   |      | 65   | 90   | ns   |

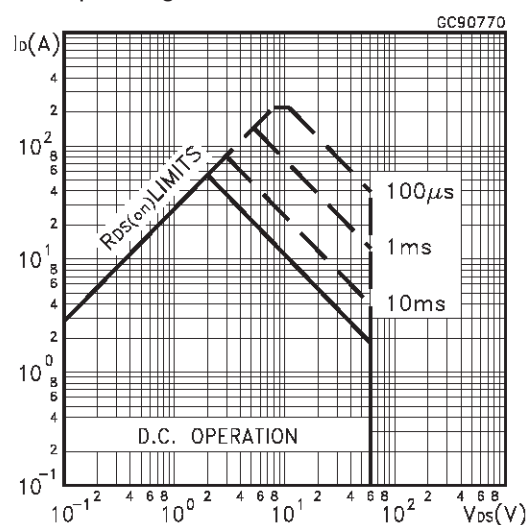
## SOURCE DRAIN DIODE

| Symbol              | Parameter                     | Test Conditions                                                                                              | Min. | Typ. | Max. | Unit    |
|---------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------|------|------|------|---------|
| $I_{SD}$            | Source-drain Current          |                                                                                                              |      |      | 55   | A       |
| $I_{SDM} (\bullet)$ | Source-drain Current (pulsed) |                                                                                                              |      |      | 220  | A       |
| $V_{SD} (*)$        | Forward On Voltage            | $I_{SD} = 55 A$ $V_{GS} = 0$                                                                                 |      |      | 1.5  | V       |
| $t_{rr}$            | Reverse Recovery Time         | $I_{SD} = 55 A$ $di/dt = 100 A/\mu s$<br>$V_{DD} = 30V$ $T_j = 150 ^\circ C$<br>(see test circuit, Figure 3) |      | 65   |      | ns      |
| $Q_{rr}$            | Reverse Recovery Charge       |                                                                                                              |      | 180  |      | $\mu C$ |
| $I_{RRM}$           | Reverse Recovery Current      |                                                                                                              |      | 5.5  |      | A       |

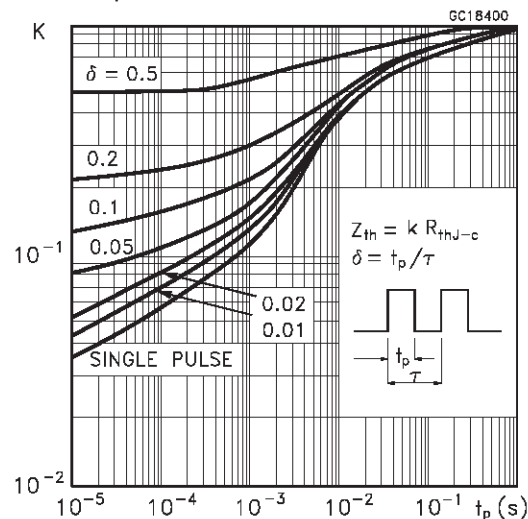
(\*) Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %.

(•) Pulse width limited by safe operating area.

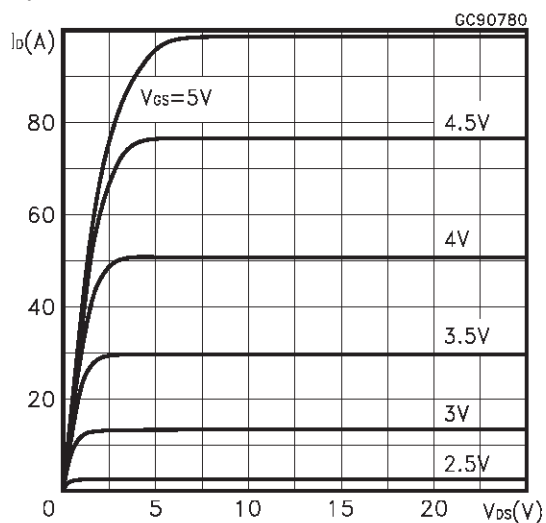
## Safe Operating Area



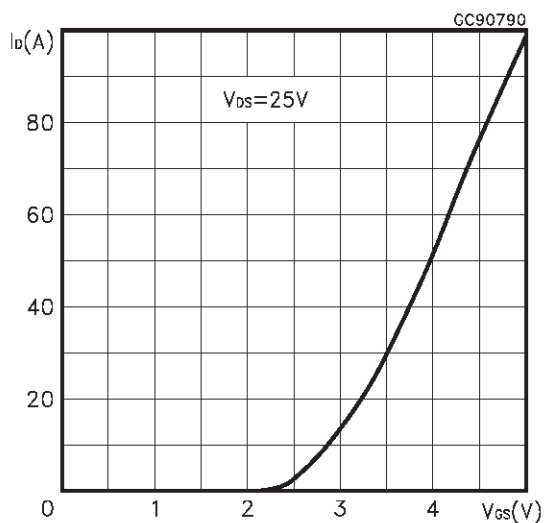
## Thermal Impedance



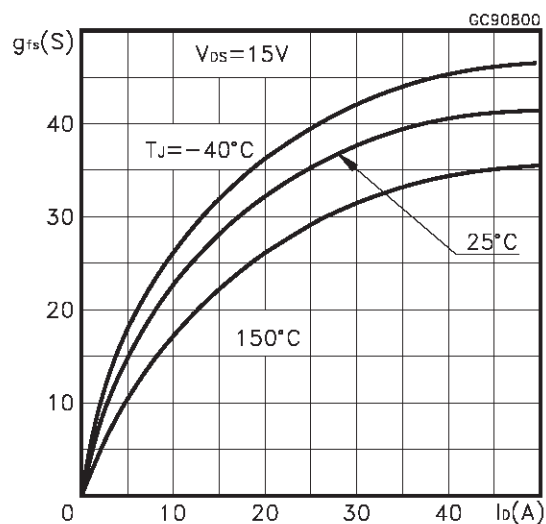
Output Characteristics



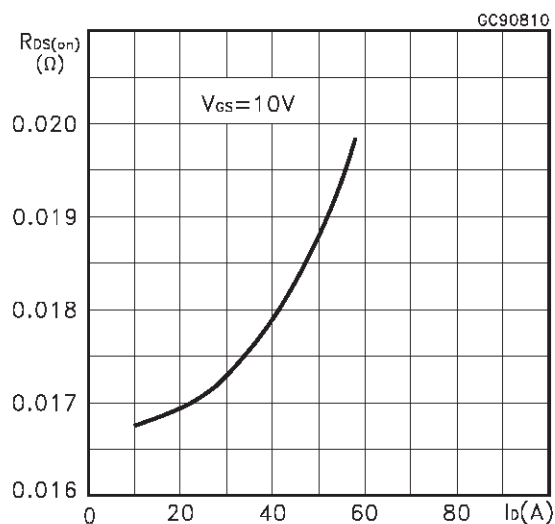
Transfer Characteristics



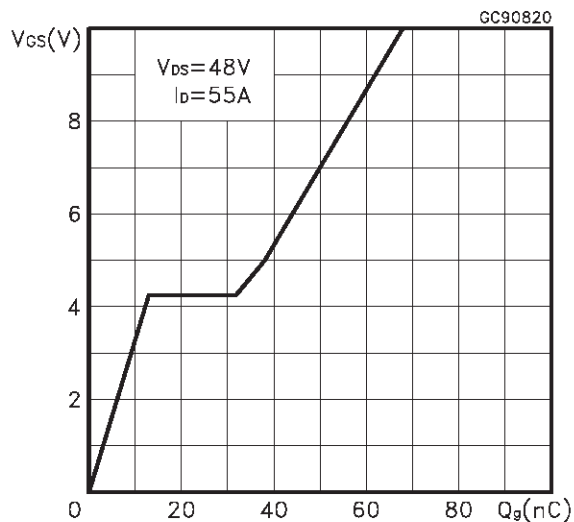
Transconductance



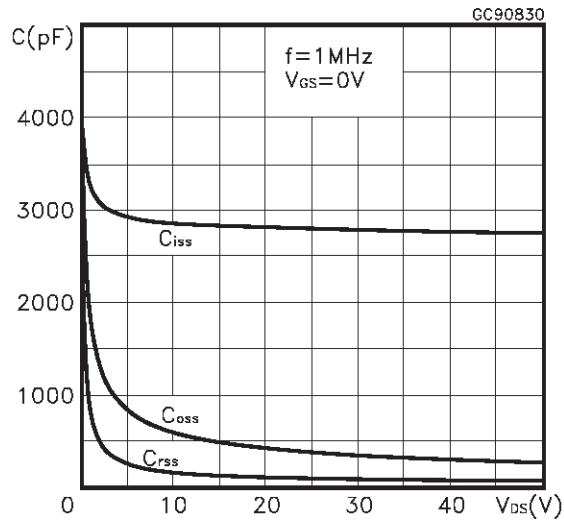
Static Drain-source On Resistance



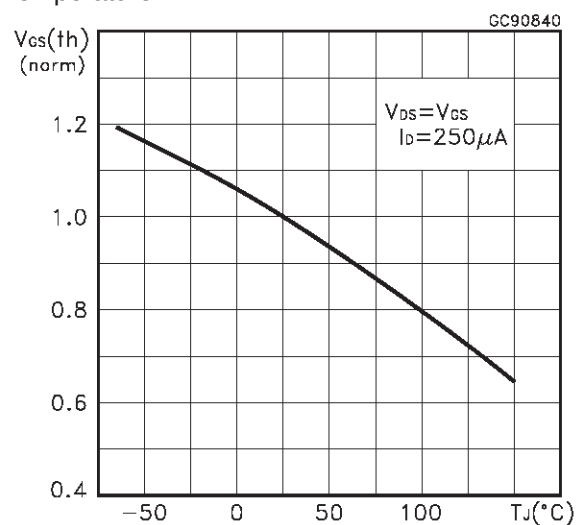
Gate Charge vs Gate-source Voltage



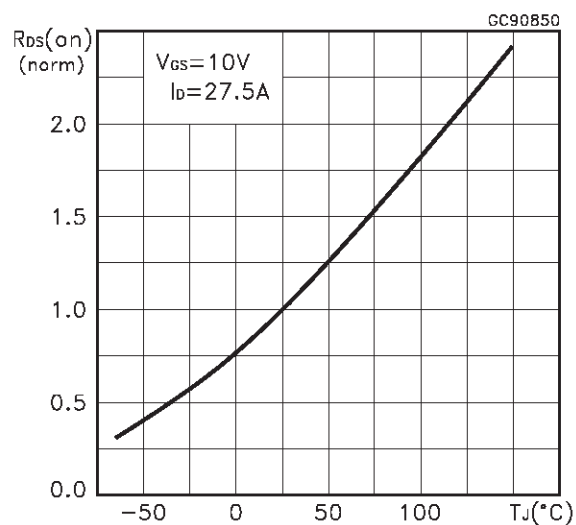
Capacitance Variations



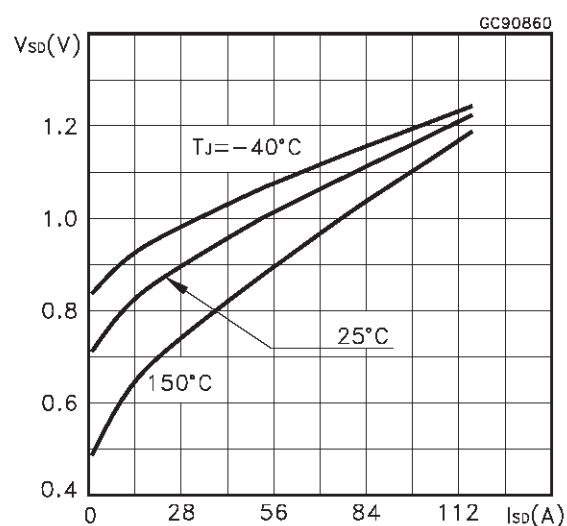
Normalized Gate Threshold Voltage vs Temperature



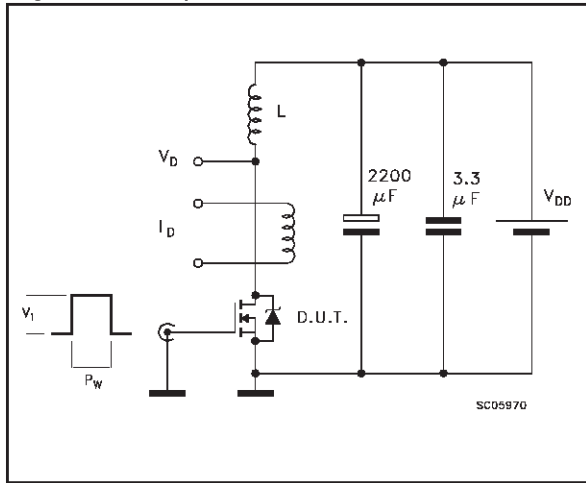
Normalized On Resistance vs Temperature



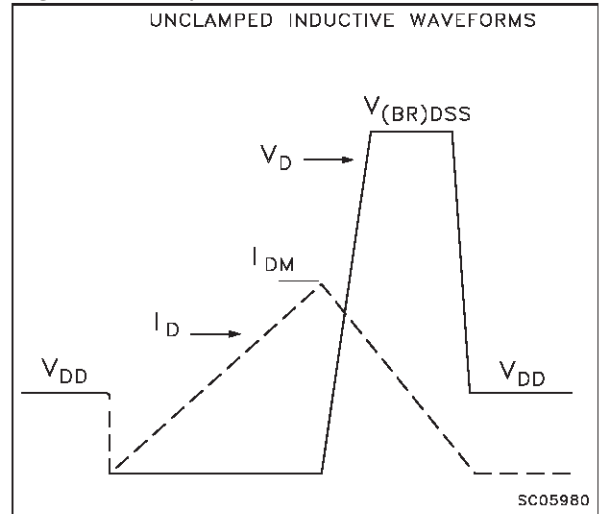
Source-drain Diode Forward Characteristics



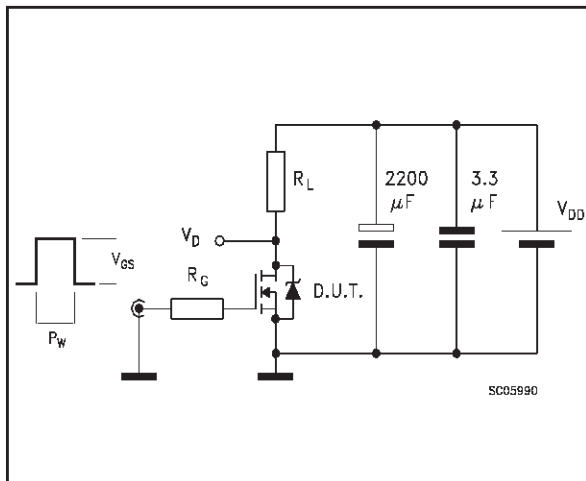
**Fig. 1: Unclamped Inductive Load Test Circuit**



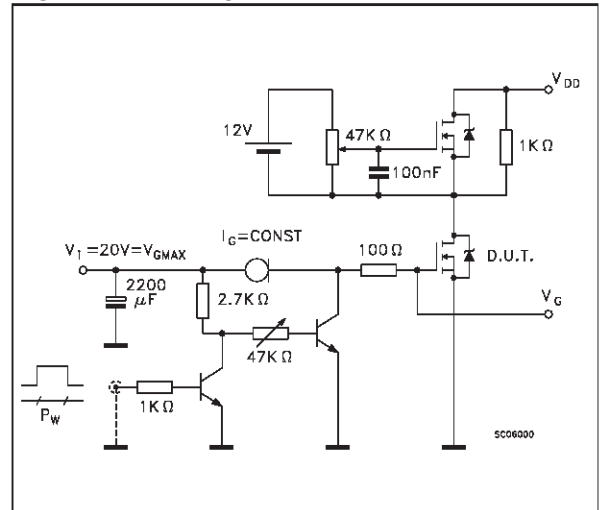
**Fig. 2: Unclamped Inductive Waveform**



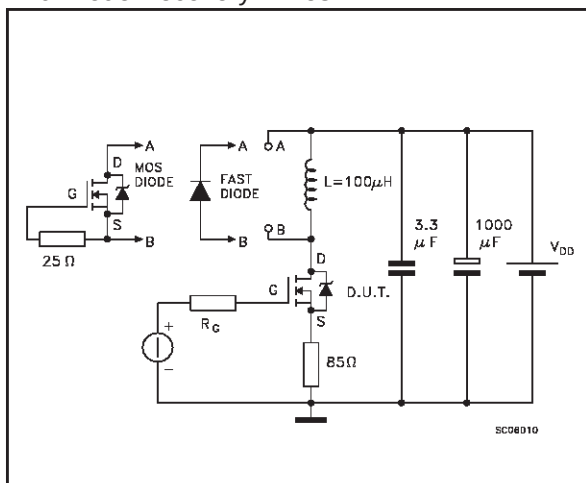
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

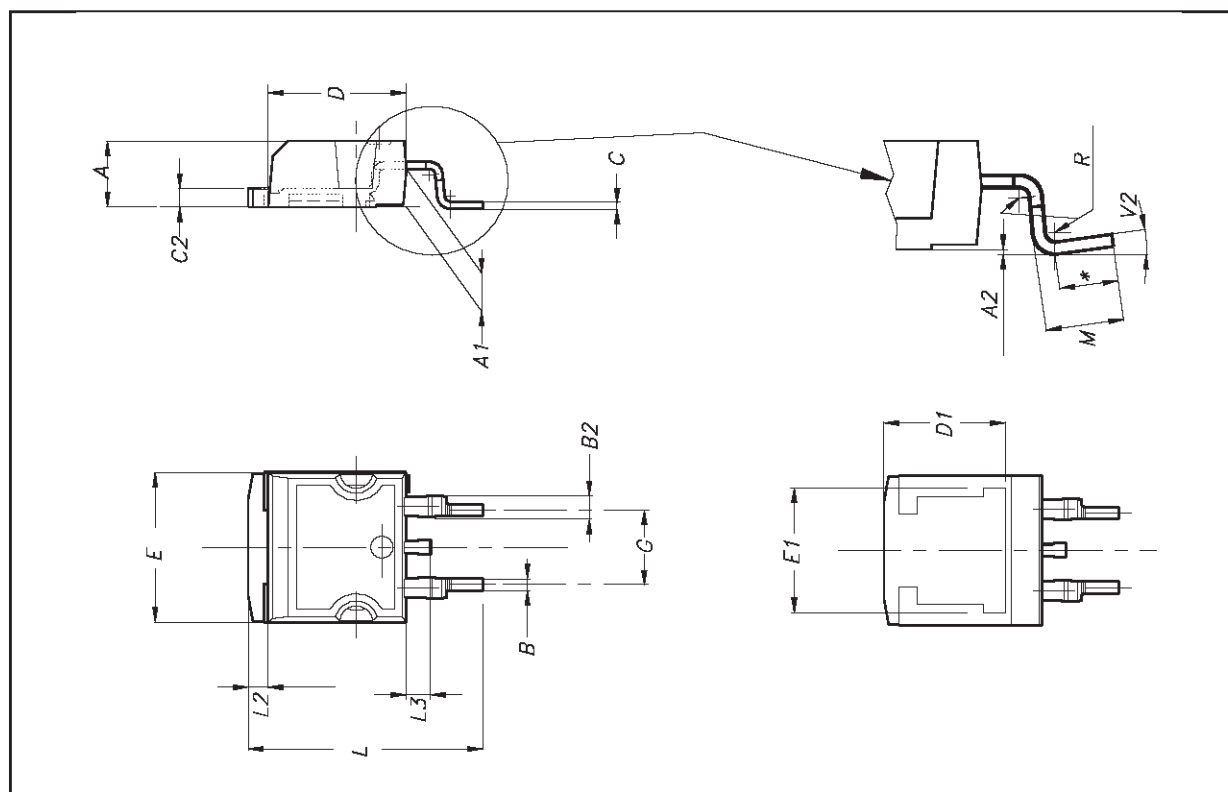


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



D<sup>2</sup>PAK 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 |
| A2   | 0.03 |     | 0.23  | 0.001 |       | 0.009 |
| 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   | 1.23 |     | 1.36  | 0.048 |       | 0.053 |
| D    | 8.95 |     | 9.35  | 0.352 |       | 0.368 |
| D1   |      | 8   |       |       | 0.315 |       |
| E    | 10   |     | 10.4  | 0.393 |       |       |
| E1   |      | 8.5 |       |       | 0.334 |       |
| G    | 4.88 |     | 5.28  | 0.192 |       | 0.208 |
| L    | 15   |     | 15.85 | 0.590 |       | 0.625 |
| L2   | 1.27 |     | 1.4   | 0.050 |       | 0.055 |
| L3   | 1.4  |     | 1.75  | 0.055 |       | 0.068 |
| M    | 2.4  |     | 3.2   | 0.094 |       | 0.126 |
| R    |      | 0.4 |       |       | 0.015 |       |
| V2   | 0°   |     | 8°    |       |       |       |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is registered trademark of STMicroelectronics  
2000 STMicroelectronics - All Rights Reserved

All other names are the property of their respective owners.

STMicroelectronics GROUP OF COMPANIES  
Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - U.S.A.

<http://www.st.com>