



## STN1NF10

N-CHANNEL 100V - 0.7Ω - 1A SOT-223

STripFET™ II POWER MOSFET

| TYPE     | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|----------|------------------|---------------------|----------------|
| STN1NF10 | 100 V            | < 0.8 Ω             | 1 A            |

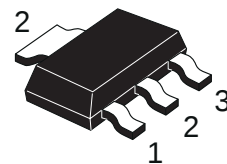
- TYPICAL R<sub>DS(on)</sub> = 0.7 Ω
- EXCEPTIONAL dv/dt CAPABILITY

### DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronics 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.

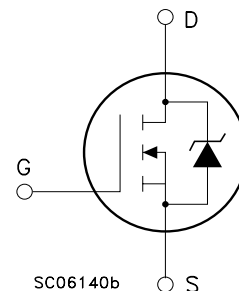
### APPLICATIONS

- DC-DC CONVERTERS
- DC MOTOR CONTROL (DISK DRIVERS, etc.)



SOT-223

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                            | Value      | Unit |
|---------------------|------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)           | 100        | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)         | 100        | V    |
| V <sub>GS</sub>     | Gate- source Voltage                                 | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 25°C  | 1          | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 100°C | 0.6        | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                               | 4          | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C           | 2.5        | W    |
|                     | Derating Factor                                      | 0.02       | W/°C |
| dv/dt (1)           | Peak Diode Recovery voltage slope                    | 20         | V/ns |
| E <sub>AS</sub> (2) | Single Pulse Avalanche Energy                        | 35         | mJ   |
| T <sub>stg</sub>    | Storage Temperature                                  | -55 to 150 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                  |            |      |

(•) Pulse width limited by safe operating area.

(1) I<sub>SD</sub> ≤ 1A, di/dt ≤ 350A/μs, V<sub>DD</sub> ≤ V(BR)<sub>DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 1A, V<sub>DD</sub> = 70V

## STN1NF10

### THERMAL DATA

|                |                                                                   |     |      |
|----------------|-------------------------------------------------------------------|-----|------|
| Rthj-pcb       | Thermal Resistance Junction-PCB(1 inch <sup>2</sup> copper board) | 50  | °C/W |
| Rthj-pcb       | Thermal Resistance Junction-PCB (min. footprint)                  | 90  | °C/W |
| T <sub>I</sub> | Maximum Lead Temperature For Soldering Purpose                    | 260 | °C   |

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

#### OFF

| Symbol               | Parameter                                             | Test Conditions                                                                     | Min. | Typ. | Max.    | Unit     |
|----------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------|------|------|---------|----------|
| V <sub>(BR)DSS</sub> | Drain-source Breakdown Voltage                        | I <sub>D</sub> = 250 µA, V <sub>GS</sub> = 0                                        | 100  |      |         | V        |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0) | V <sub>DS</sub> = Max Rating<br>V <sub>DS</sub> = Max Rating T <sub>C</sub> = 125°C |      |      | 1<br>10 | µA<br>µA |
| I <sub>GSS</sub>     | Gate-body Leakage Current (V <sub>DS</sub> = 0)       | V <sub>GS</sub> = ± 20V                                                             |      |      | ±100    | nA       |

#### ON (\*)

| Symbol              | Parameter                         | Test Conditions                                           | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|-----------------------------------------------------------|------|------|------|------|
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 µA | 2    | 3    | 4    | V    |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10 V I <sub>D</sub> = 0.5 A             |      | 0.7  | 0.8  | Ω    |

#### DYNAMIC

| Symbol                                                   | Parameter                                                               | Test Conditions                                       | Min. | Typ.           | Max. | Unit           |
|----------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------|------|----------------|------|----------------|
| g <sub>fs</sub> (*)                                      | Forward Transconductance                                                | V <sub>DS</sub> = 15 V I <sub>D</sub> = 1 A           |      | 1              |      | S              |
| C <sub>iss</sub><br>C <sub>oss</sub><br>C <sub>rss</sub> | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0 |      | 105<br>20<br>9 |      | pF<br>pF<br>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                              | $V_{DD} = 50\text{ V}$ $I_D = 0.5\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(Resistive Load, Figure 3) |      | 4<br>5.5      |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 50\text{ V}$ $I_D = 1\text{ A}$ $V_{GS} = 10\text{ V}$                                                        |      | 4<br>1<br>1.5 | 6    | nC<br>nC<br>nC |

## SWITCHING OFF

| Symbol                | Parameter                        | Test Conditions                                                                                                           | Min. | Typ.      | Max. | Unit     |
|-----------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------|------|-----------|------|----------|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD} = 50\text{ V}$ $I_D = 0.5\text{ A}$<br>$R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$<br>(Resistive Load, Figure 3) |      | 13<br>6.5 |      | ns<br>ns |

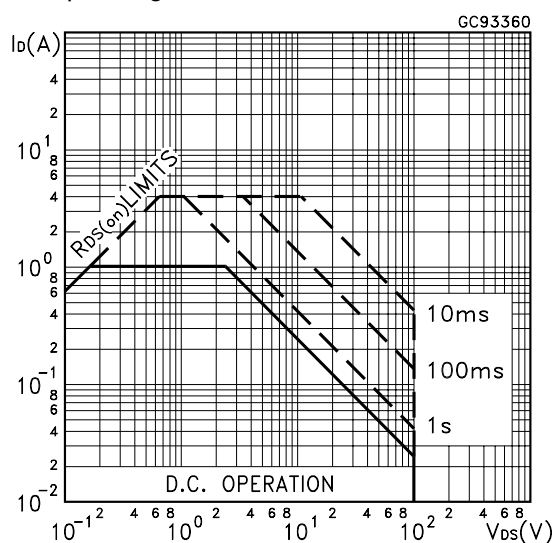
## SOURCE DRAIN DIODE

| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                              | Min. | Typ.            | Max.   | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|--------|---------------|
| $I_{SD}$<br>$I_{SDM} (\bullet)$   | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                              |      |                 | 1<br>4 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 1\text{ A}$ $V_{GS} = 0$                                                                                                           |      |                 | 1.2    | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 1\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$<br>(see test circuit, Figure 5) |      | 45<br>60<br>2.7 |        | ns<br>nC<br>A |

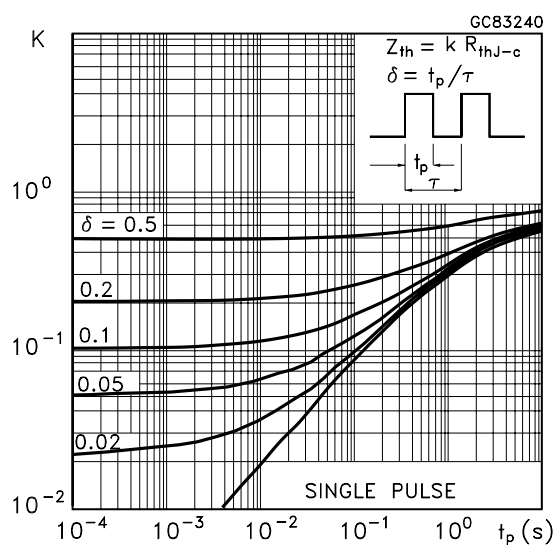
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.

(\bullet) Pulse width limited by safe operating area.

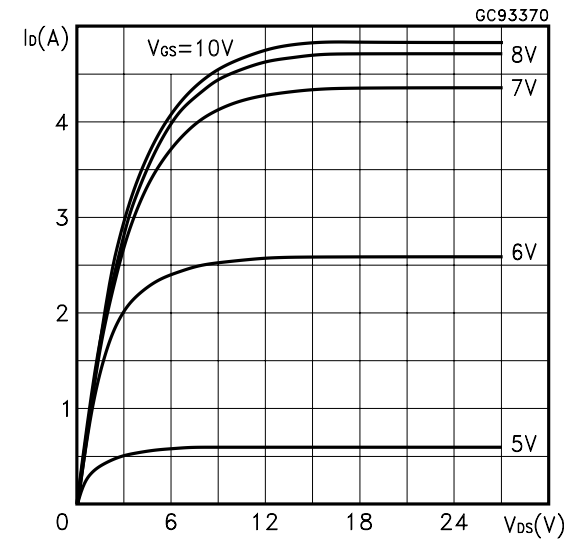
## Safe Operating Area



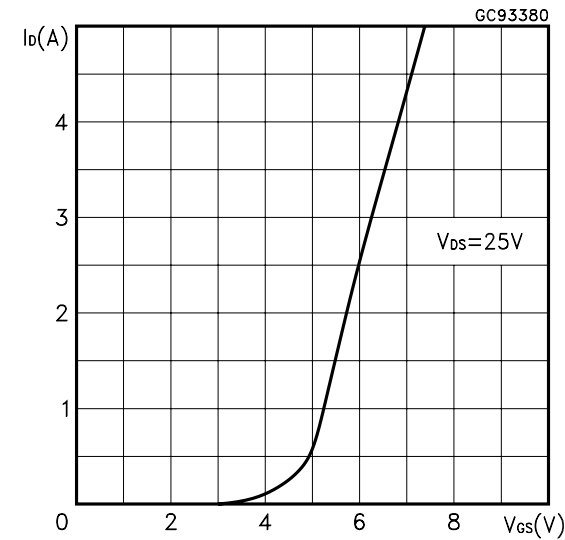
## Thermal Impedance



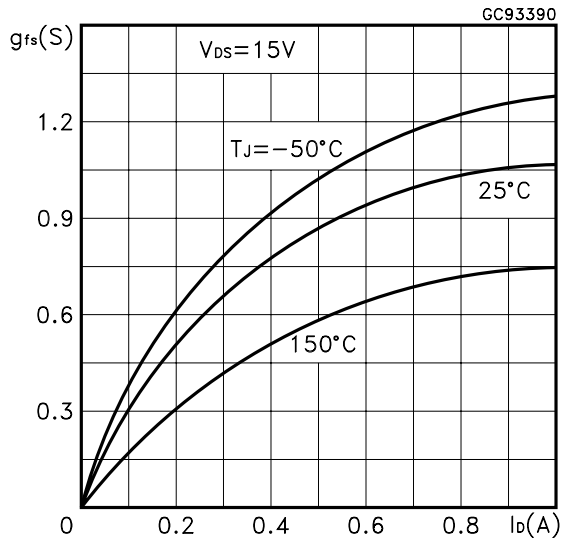
Output Characteristics



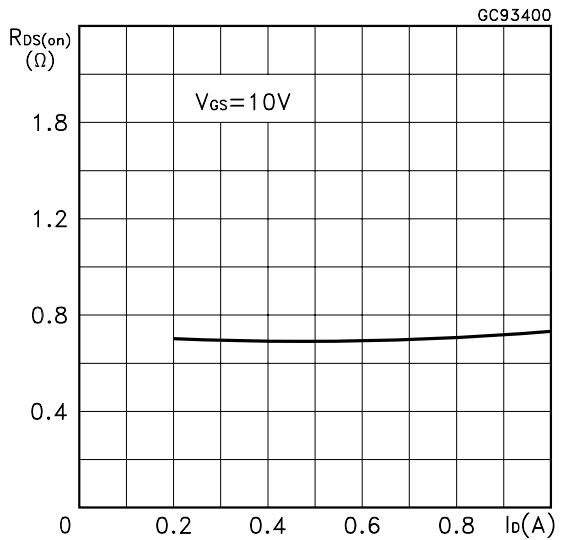
Transfer Characteristics



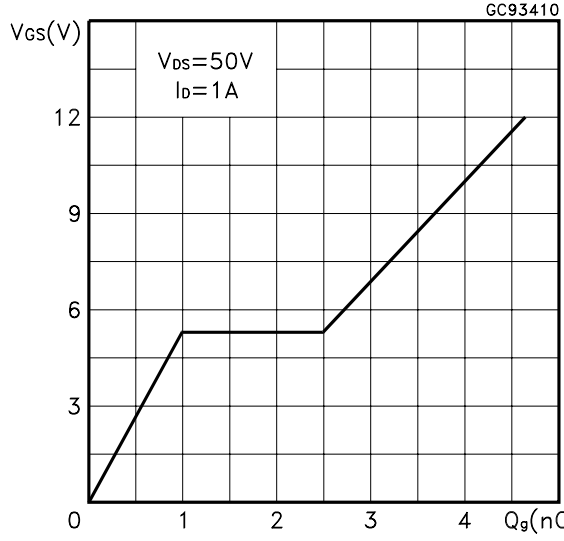
Transconductance



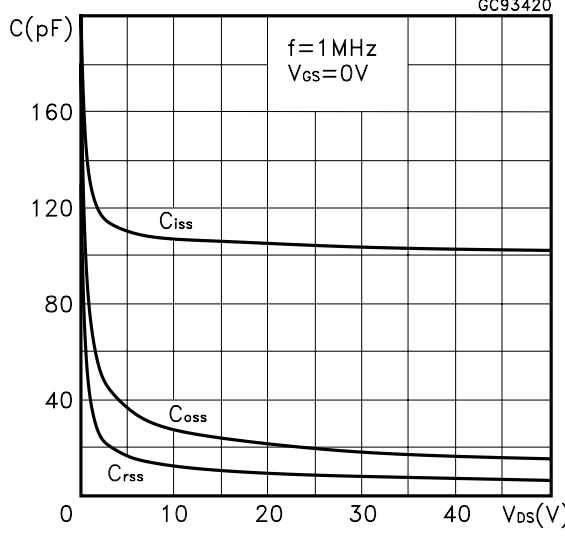
Static Drain-source On Resistance



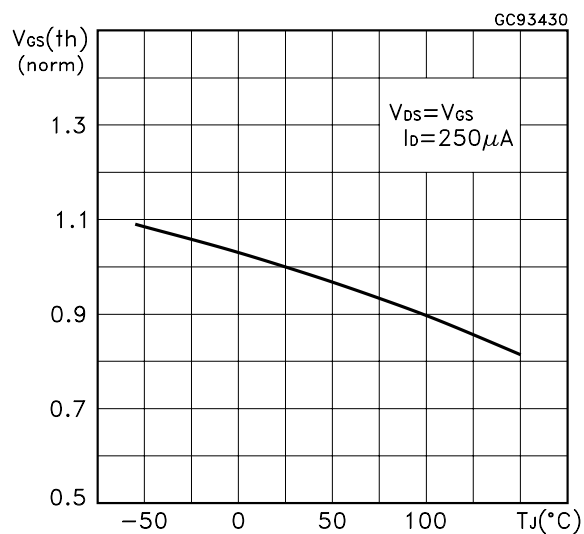
Gate Charge vs Gate-source Voltage



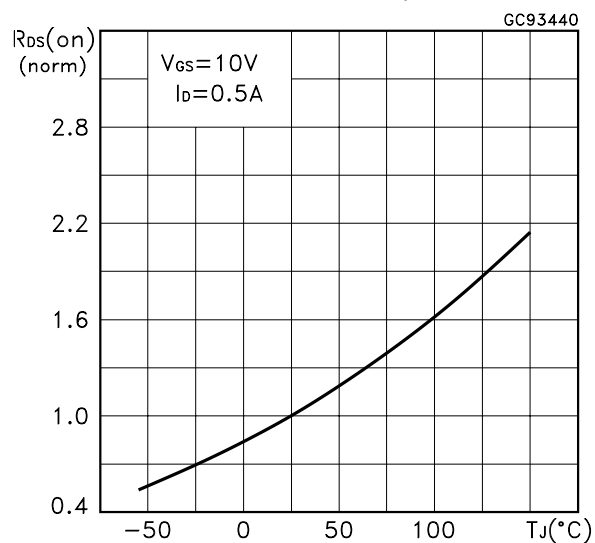
Capacitance Variations



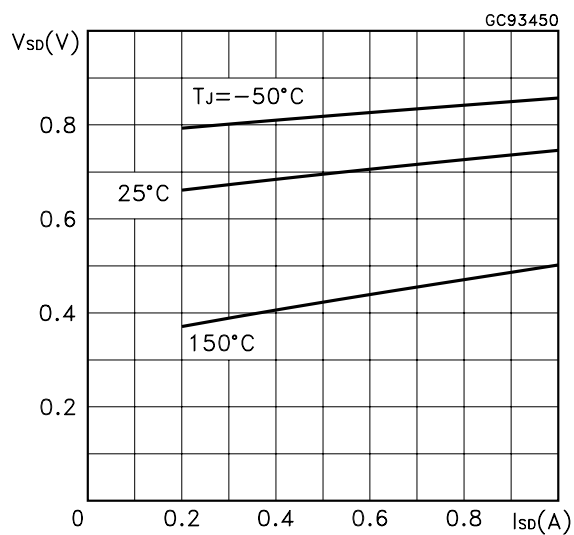
Normalized Gate Threshold Voltage vs Temperature



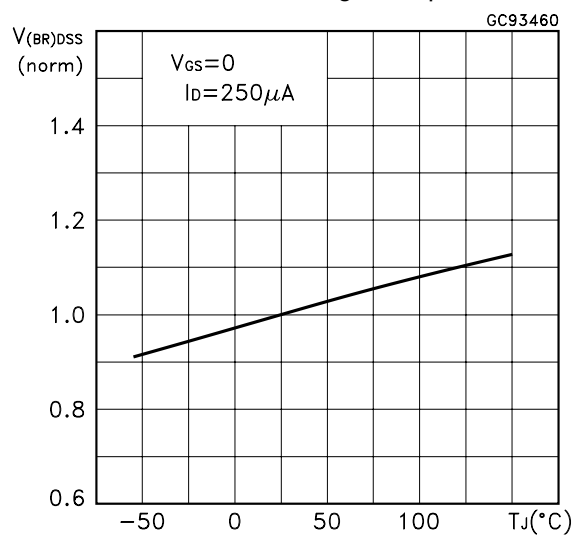
Normalized on Resistance vs Temperature



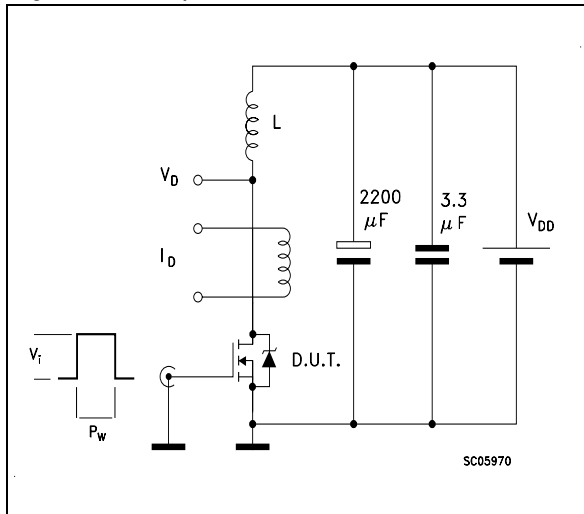
Source-drain Diode Forward Characteristics



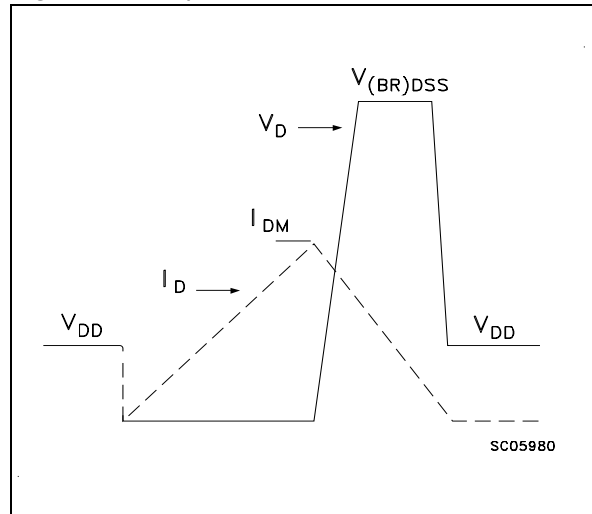
Normalized Breakdown Voltage Temperature



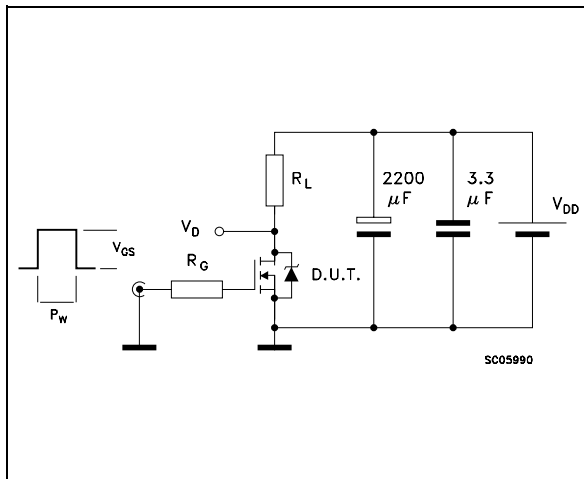
**Fig. 1: Unclamped Inductive Load Test Circuit**



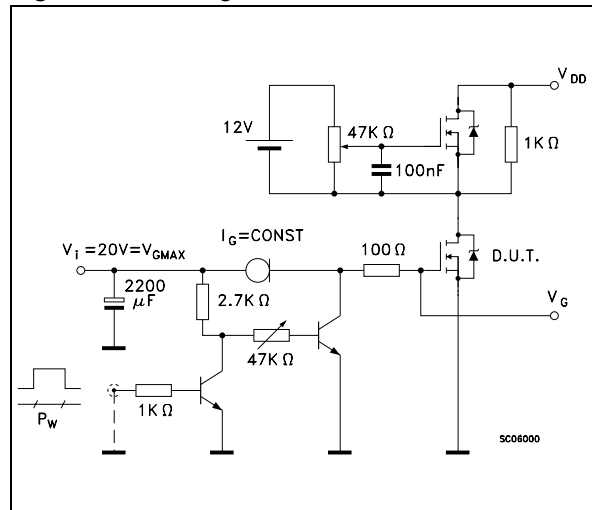
**Fig. 2: Unclamped Inductive Waveform**



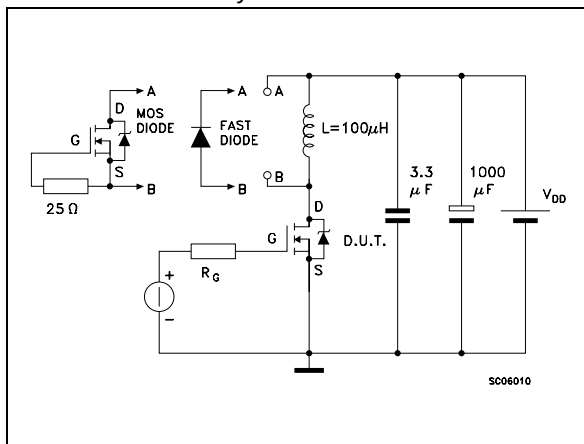
**Fig. 3: Switching Times Test Circuits For Resistive Load**



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

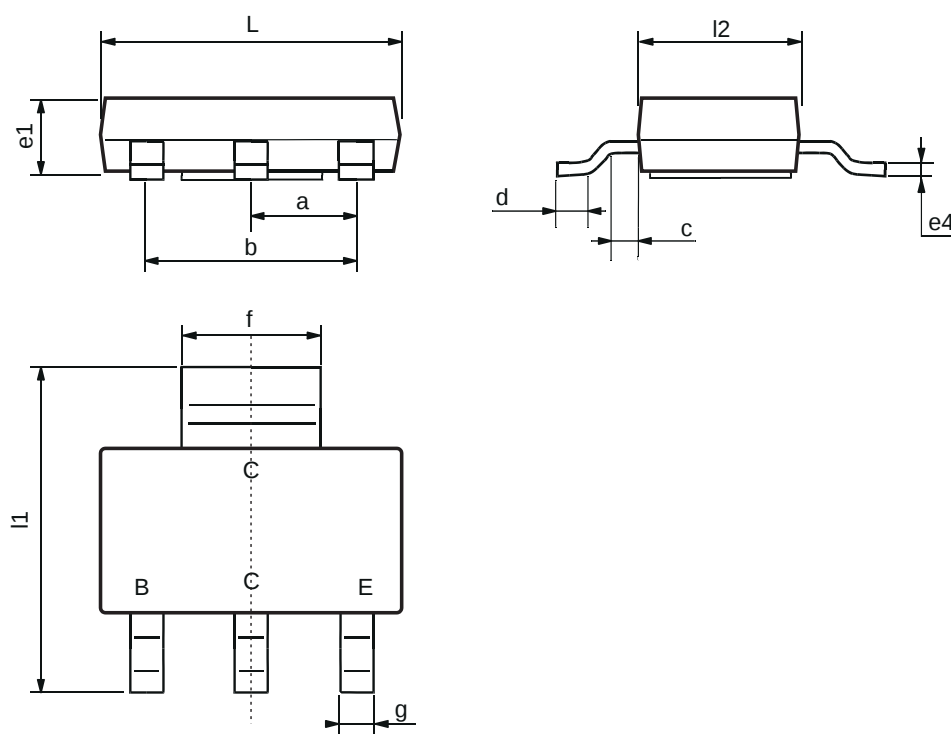


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



## SOT-223 MECHANICAL DATA

| DIM. | mm   |      |      | mils  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| a    | 2.27 | 2.3  | 2.33 | 89.4  | 90.6  | 91.7  |
| b    | 4.57 | 4.6  | 4.63 | 179.9 | 181.1 | 182.3 |
| c    | 0.2  | 0.4  | 0.6  | 7.9   | 15.7  | 23.6  |
| d    | 0.63 | 0.65 | 0.67 | 24.8  | 25.6  | 26.4  |
| e1   | 1.5  | 1.6  | 1.7  | 59.1  | 63    | 66.9  |
| e4   |      |      | 0.32 |       |       | 12.6  |
| f    | 2.9  | 3    | 3.1  | 114.2 | 118.1 | 122.1 |
| g    | 0.67 | 0.7  | 0.73 | 26.4  | 27.6  | 28.7  |
| l1   | 6.7  | 7    | 7.3  | 263.8 | 275.6 | 287.4 |
| l2   | 3.5  | 3.5  | 3.7  | 137.8 | 137.8 | 145.7 |
| L    | 6.3  | 6.5  | 6.7  | 248   | 255.9 | 263.8 |



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