



# STQ1NE10L

N-CHANNEL 100V - 0.3  $\Omega$  - 1A TO-92

STripFET™ POWER MOSFET

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STQ1NE10L | 100 V            | <0.4 $\Omega$       | 1 A            |

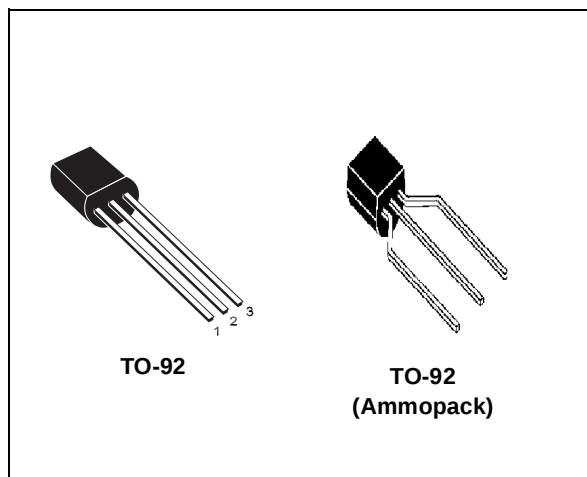
- TYPICAL R<sub>DS(on)</sub> = 0.3  $\Omega$
- EXCEPTIONAL HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- AVALANCHE RUGGED TECHNOLOGY
- LOW THRESHOLD DRIVE

## DESCRIPTION

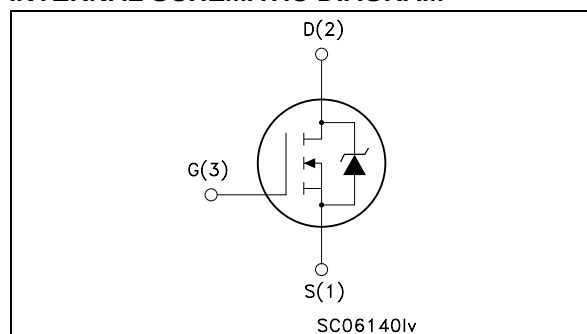
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

## APPLICATIONS

- DC MOTOR CONTROL (DISK DRIVES, etc.)
- DC-DC & DC-AC CONVERTERS
- SYNCHRONOUS RECTIFICATION



## 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 k $\Omega$ ) | 100        | V    |
| V <sub>GS</sub>      | Gate- source Voltage                                  | $\pm 16$   | 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> (1) | Total Dissipation at T <sub>C</sub> = 25°C            | 3          | W    |
|                      | Derating Factor                                       | 0.025      | W/°C |
| dv/dt (2)            | Peak Diode Recovery voltage slope                     | 6          | V/ns |
| E <sub>AS</sub> (3)  | Single Pulse Avalanche Energy                         | 400        | mJ   |
| T <sub>stg</sub>     | Storage Temperature                                   | -55 to 150 | °C   |
| T <sub>j</sub>       | Operating Junction Temperature                        |            | °C   |

(●) Pulse width limited by safe operating area.

(1) Related to R<sub>thj</sub> -1

(2) I<sub>SD</sub>  $\leq$  1A, di/dt  $\leq$  200A/ $\mu$ s, V<sub>DD</sub>  $\leq$  V(BR)DSS, T<sub>j</sub>  $\leq$  T<sub>JMAX</sub>

(3) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 1A, V<sub>DD</sub> = 50V

## STQ1NE10L

### THERMAL DATA

|                |                                                |     |     |      |
|----------------|------------------------------------------------|-----|-----|------|
| Rthj-Lead      | Thermal Resistance Junction-Lead               | Max | 40  | °C/W |
| Rthj-amb       | Thermal Resistance Junction-ambient            | Max | 125 | °C/W |
| T <sub>I</sub> | Maximum Lead Temperature For Soldering Purpose | Typ | 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> = ± 16 V                                                            |      |      | ±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                                     | 1    |              | 2.5          | V      |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10 V I <sub>D</sub> = 0.5 A<br>V <sub>GS</sub> = 5 V I <sub>D</sub> = 0.5 A |      | 0.30<br>0.35 | 0.40<br>0.45 | Ω<br>Ω |

#### DYNAMIC

| Symbol                                                   | Parameter                                                               | Test Conditions                                     | Min. | Typ.            | Max. | Unit           |
|----------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------|------|-----------------|------|----------------|
| g <sub>fs</sub> (*)                                      | Forward Transconductance                                                | V <sub>DS</sub> = 15V I <sub>D</sub> = 0.5 A        |      | 2               |      | 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 |      | 345<br>45<br>20 |      | 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 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) |      | 11<br>12        |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 80\text{ V}$ $I_D = 1\text{ A}$ $V_{GS} = 5\text{ V}$                                                         |      | 7<br>1.5<br>3.5 |      | nC<br>nC<br>nC |

**SWITCHING OFF**

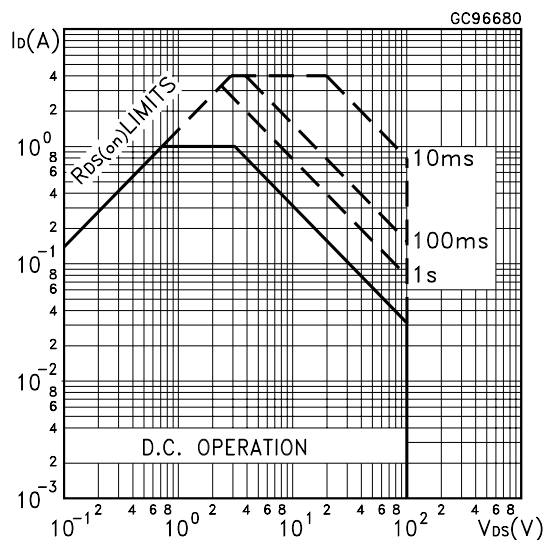
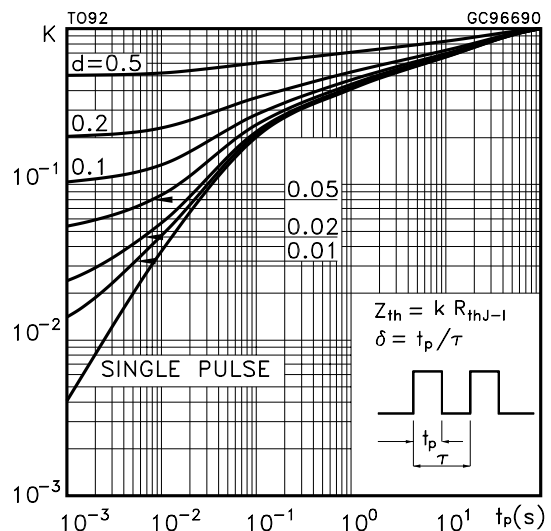
| Symbol                | Parameter                        | Test Conditions                                                                                                          | Min. | Typ.     | Max. | Unit     |
|-----------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|------|----------|------|----------|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD} = 50\text{ V}$ $I_D = 0.5\text{ A}$<br>$R_G = 4.7\ \Omega$ , $V_{GS} = 5\text{ V}$<br>(Resistive Load, Figure 3) |      | 20<br>13 |      | ns<br>ns |

**SOURCE DRAIN DIODE**

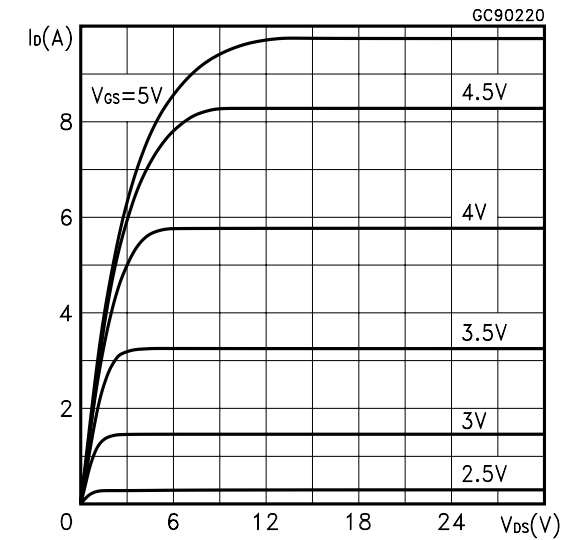
| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                              | Min. | Typ.            | Max.   | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|--------|---------------|
| $I_{SD}$<br>$I_{SDM} (\bullet)$   | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                              |      |                 | 1<br>4 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 1\text{ A}$ $V_{GS} = 0$                                                                                                           |      |                 | 1.5    | 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>$V_{DD} = 30\text{ V}$ $T_j = 150^\circ\text{C}$<br>(see test circuit, Figure 5) |      | 52<br>90<br>3.5 |        | ns<br>nC<br>A |

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

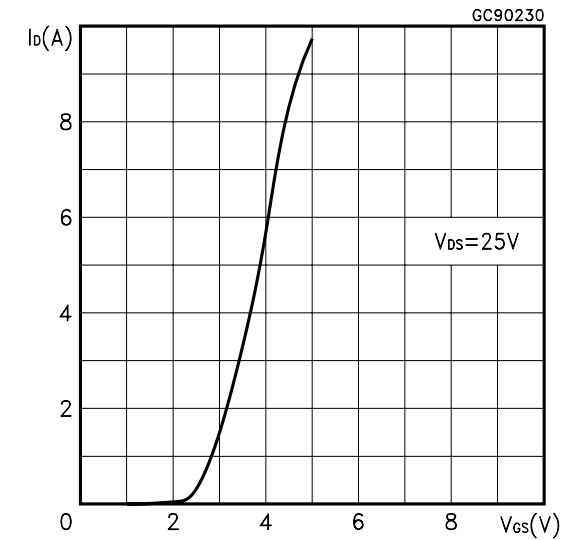
(•)Pulse width limited by safe operating area.

**Safe Operating Area****Thermal Impedance Junction-lead**

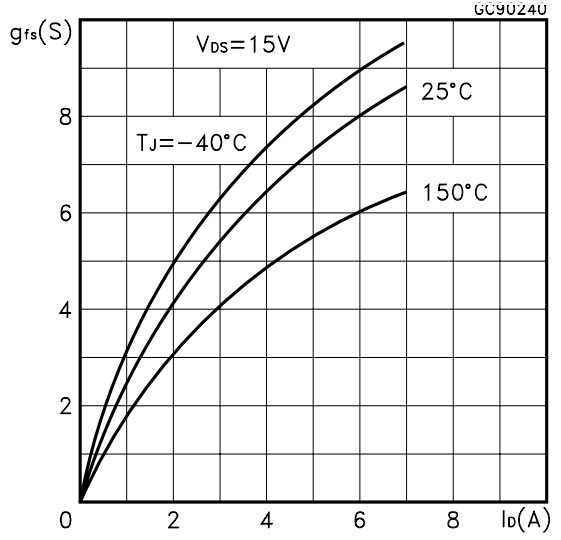
Output Characteristics



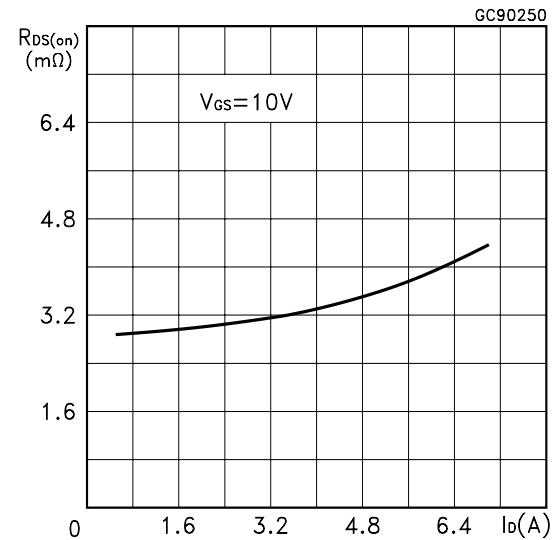
Transfer Characteristics



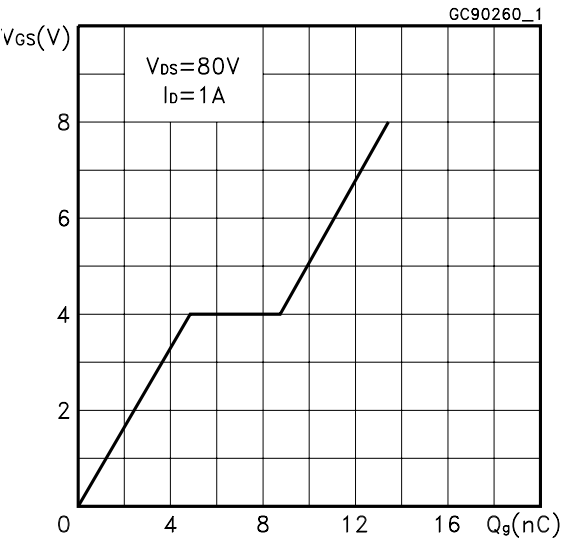
Transconductance



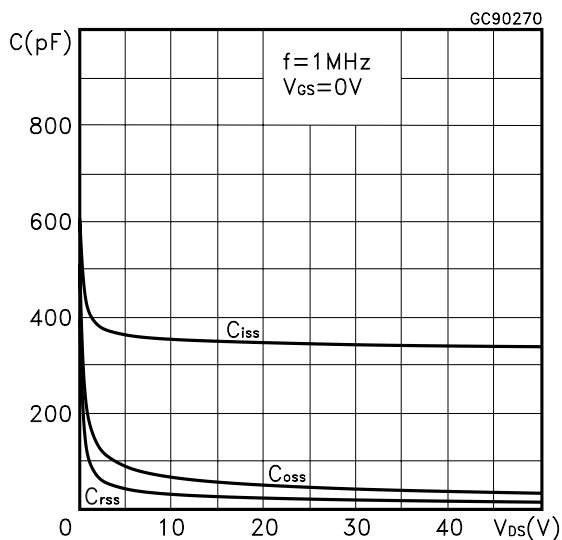
Static Drain-source On Resistance



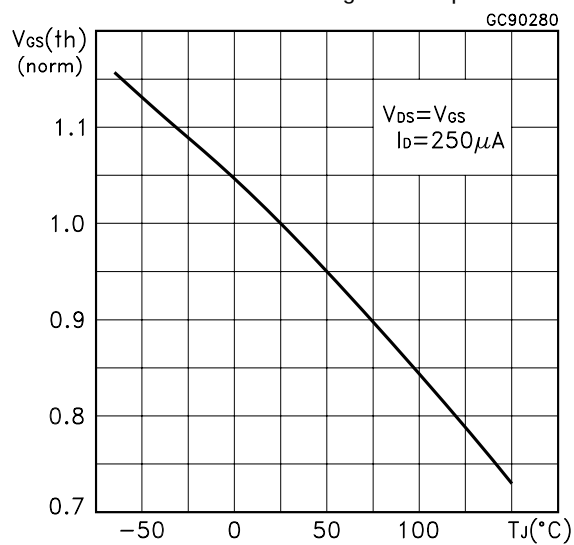
Gate Charge vs Gate-source Voltage



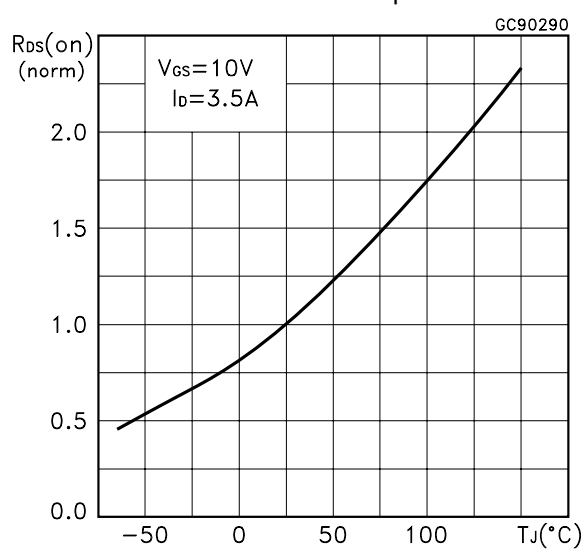
Capacitance Variations



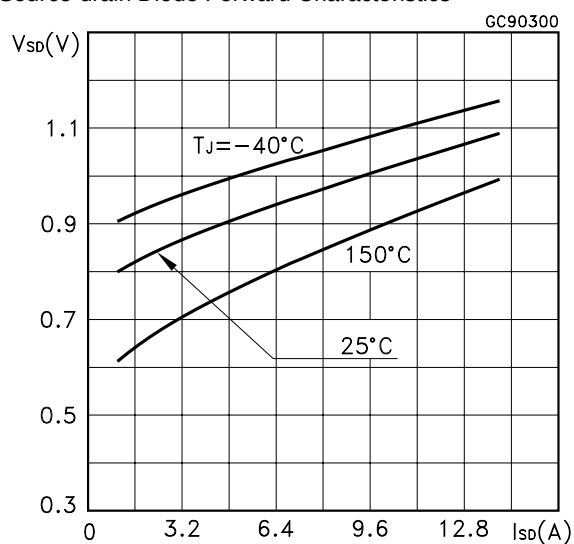
Normalized Gate Threshold Voltage vs Temperature



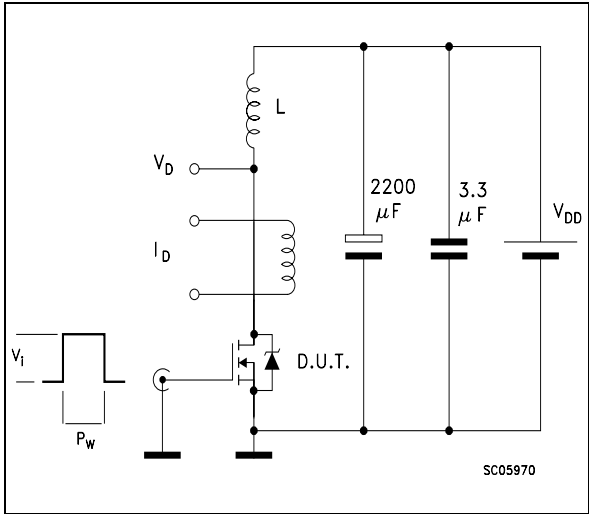
Normalized on Resistance vs Temperature



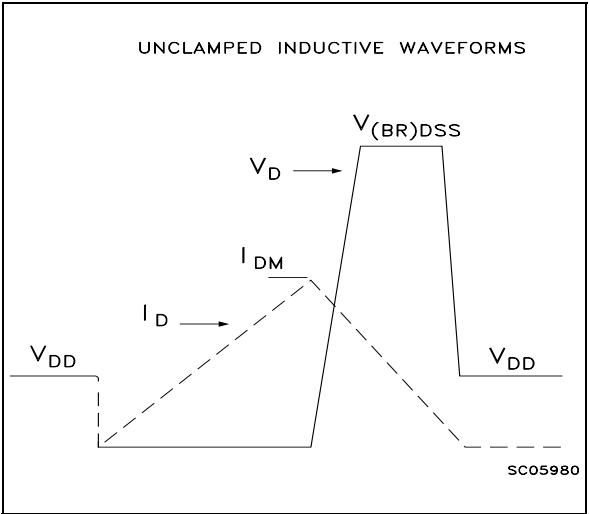
Source-drain Diode Forward Characteristics



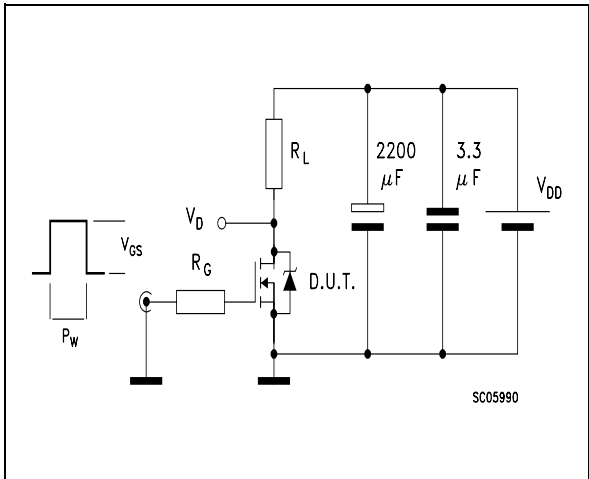
**Fig. 1: Unclamped Inductive Load Test Circuit**



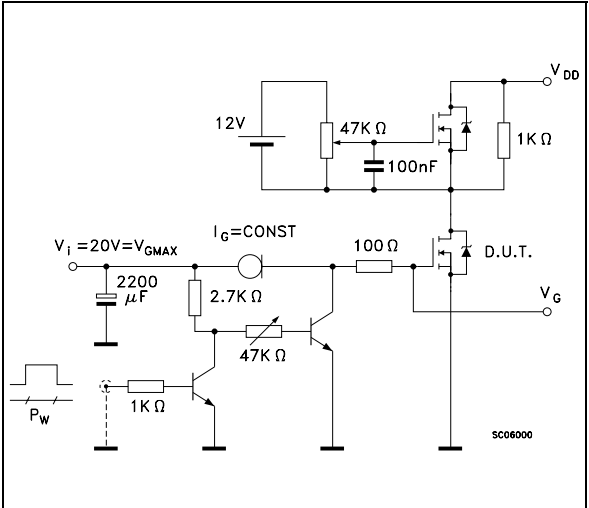
**Fig. 2: Unclamped Inductive Waveform**



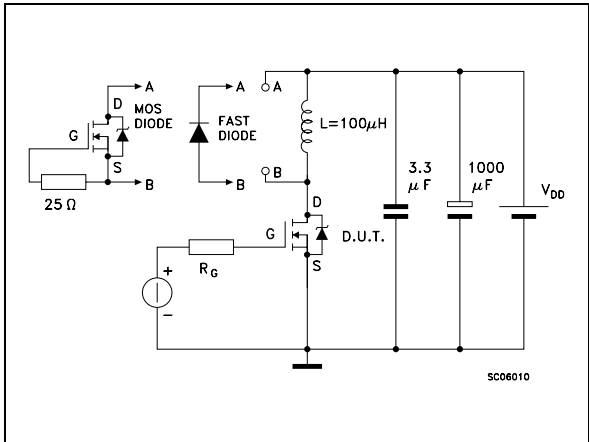
**Fig. 3: Switching Times Test Circuits For Resistive Load**



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

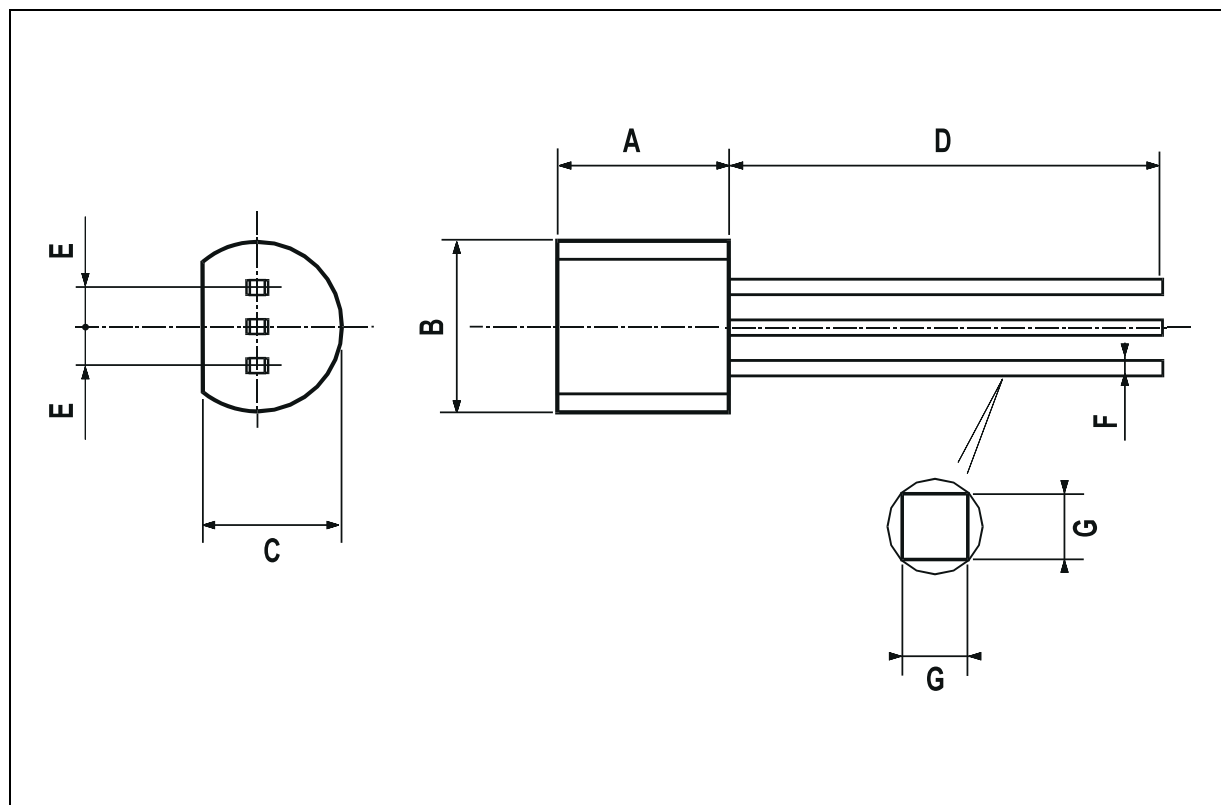


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



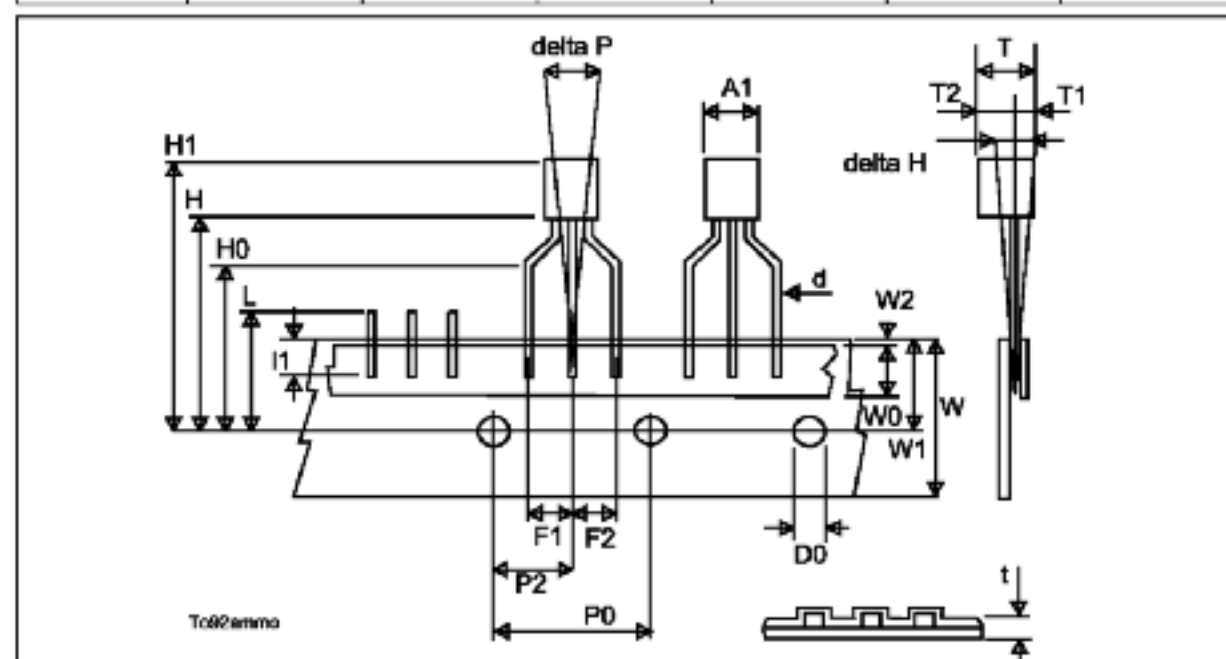
## TO-92 MECHANICAL DATA

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 4.58 |      | 5.33 | 0.180 |       | 0.210 |
| B    | 4.45 |      | 5.2  | 0.175 |       | 0.204 |
| C    | 3.2  |      | 4.2  | 0.126 |       | 0.165 |
| D    | 12.7 |      |      | 0.500 |       |       |
| E    |      | 1.27 |      |       | 0.050 |       |
| F    | 0.4  |      | 0.51 | 0.016 |       | 0.020 |
| G    | 0.35 |      |      | 0.14  |       |       |



## TO-92 AMMOPACK

| DIM.    | mm.  |      |      | inch  |       |       |
|---------|------|------|------|-------|-------|-------|
|         | MIN. | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A1      |      |      | 4.8  |       |       | 0.19  |
| T       |      |      | 3.8  |       |       | 0.15  |
| T1      |      |      | 1.6  |       |       | 0.06  |
| T2      |      |      | 2.3  |       |       | 0.09  |
| d       |      |      | 0.48 |       |       | 0.02  |
| P0      | 12.5 | 12.7 | 12.9 | 0.49  | 0.5   | 0.51  |
| P2      | 5.65 | 6.35 | 7.05 | 0.22  | 0.25  | 0.27  |
| F1, F2  | 2.44 | 2.54 | 2.94 | 0.09  | 0.1   | 0.11  |
| delta H | -2   |      | 2    | -0.08 |       | 0.08  |
| W       | 17.5 | 18   | 19   | 0.69  | 0.71  | 0.74  |
| W0      | 5.7  | 6    | 6.3  | 0.22  | 0.23  | 0.24  |
| W1      | 8.5  | 9    | 9.25 | 0.33  | 0.35  | 0.36  |
| W2      |      |      | 0.5  |       |       | 0.02  |
| H       | 18.5 |      | 20.5 | 0.72  |       | 0.80  |
| H0      | 15.5 | 16   | 16.5 | 0.61  | 0.63  | 0.65  |
| H1      |      |      | 25   |       |       | 0.98  |
| D0      | 3.8  | 4    | 4.2  | 0.15  | 0.157 | 0.16  |
| t       |      |      | 0.9  |       |       | 0.035 |
| L       |      |      | 11   |       |       | 0.43  |
| l1      | 3    |      |      | 0.11  |       |       |
| delta P | -1   |      | 1    | -0.04 |       | 0.04  |



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