



## STS8DNF3LL

### DUAL N-CHANNEL 30V - 0.017 $\Omega$ - 8A SO-8 LOW GATE CHARGE STripFET™ II POWER MOSFET

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|------------|------------------|---------------------|----------------|
| STS8DNF3LL | 30 V             | <0.020 $\Omega$     | 8 A            |

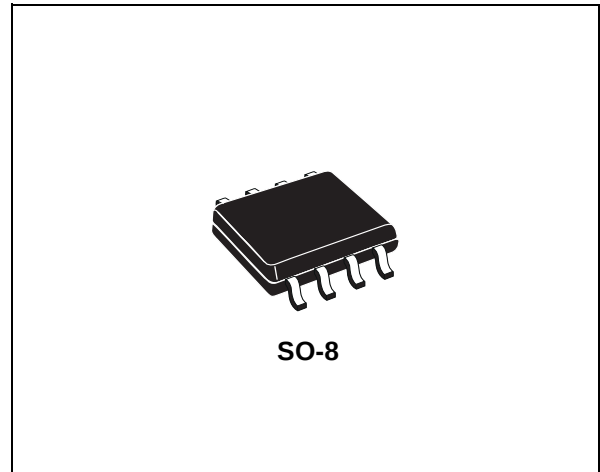
- TYPICAL R<sub>DS(on)</sub> = 0.017 $\Omega$
- OPTIMAL R<sub>DS(on)</sub> x Q<sub>g</sub> TRADE-OFF @ 4.5V
- CONDUCTION LOSSES REDUCED
- SWITCHING LOSSES REDUCED

#### DESCRIPTION

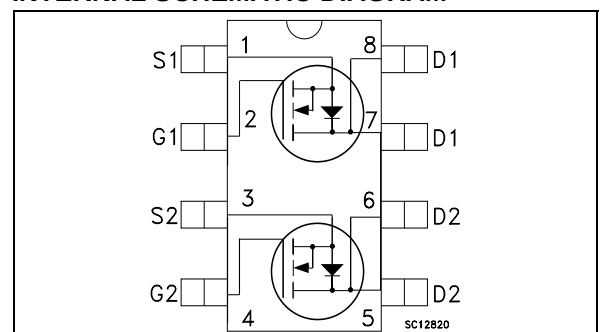
This application specific Power MOSFET is the second generation of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows the best trade-off between on-resistance and gate charge. When used as high and low side in buck regulators, it gives the best performance in terms of both conduction and switching losses. This is extremely important for motherboards where fast switching and high efficiency are of paramount importance.

#### APPLICATIONS

- SPECIFICALLY DESIGNED AND OPTIMISED FOR HIGH EFFICIENCY CPU CORE DC/DC CONVERTERS FOR MOBILE PC<sub>S</sub>



#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                                             | Value    | Unit |
|---------------------|-----------------------------------------------------------------------|----------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)                            | 30       | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )                 | 30       | 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 Single Operation  | 8        | A    |
|                     | Drain Current (continuous) at T <sub>C</sub> = 100°C Single Operation | 5        |      |
| I <sub>DM</sub> (●) | Drain Current (pulsed)                                                | 32       | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C Dual operating             | 2        | W    |
|                     | Total Dissipation at T <sub>C</sub> = 25°C Single operating           | 1.6      | W    |

(●) Pulse width limited by safe operating area.

## STS8DNF3LL

### THERMAL DATA

|                  |                                        |                  |            |      |
|------------------|----------------------------------------|------------------|------------|------|
| Rthj-amb         | (*)Thermal Resistance Junction-ambient | Single Operating | 78         | °C/W |
| T <sub>j</sub>   | Thermal Operating Junction-ambient     | Dual Operating   | 62.5       | °C/W |
| T <sub>stg</sub> | Storage Temperature                    |                  | 150        | °C   |
|                  |                                        |                  | -55 to 150 | °C   |

(\*) When mounted on FR-4 board with 0.5 in<sup>2</sup> pad of Cu.

### 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                                        | 30   |      |         | 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    |                |                | V      |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10 V I <sub>D</sub> = 4 A<br>V <sub>GS</sub> = 4.5 V I <sub>D</sub> = 4 A |      | 0.017<br>0.020 | 0.020<br>0.024 | Ω<br>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> = 4 A            |      | 12.5             |      | 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 |      | 800<br>250<br>60 |      | 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                              | $V_{DD} = 15\text{ V}$ $I_D = 4\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$<br>(Resistive Load, Figure 1) |      | 18<br>32           |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 15\text{ V}$ $I_D = 8\text{ A}$ $V_{GS} = 5\text{ V}$<br>(see test circuit, Figure 2)                        |      | 12.5<br>3.2<br>4.5 | 17   | nC<br>nC<br>nC |

**SWITCHING OFF**

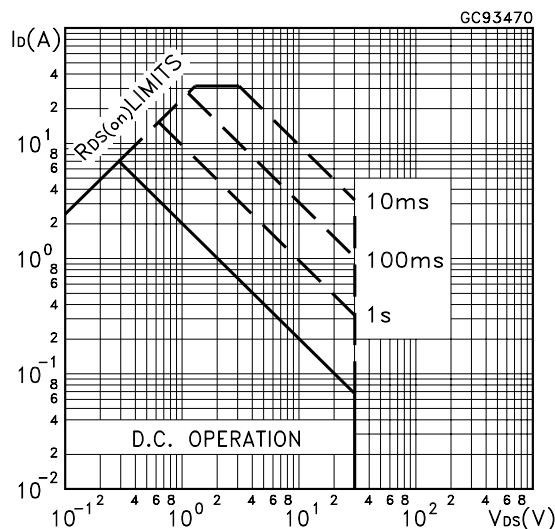
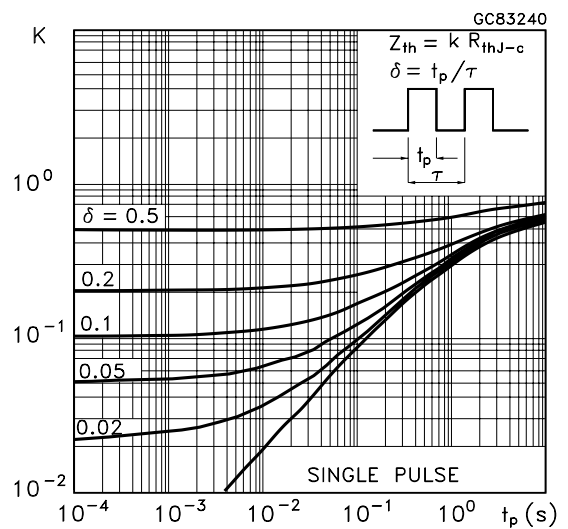
| Symbol                | Parameter                        | Test Conditions                                                                                                          | Min. | Typ.     | Max. | Unit     |
|-----------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|------|----------|------|----------|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD} = 15\text{ V}$ $I_D = 4\text{ A}$<br>$R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$<br>(Resistive Load, Figure 1) |      | 21<br>11 |      | ns<br>ns |

**SOURCE DRAIN DIODE**

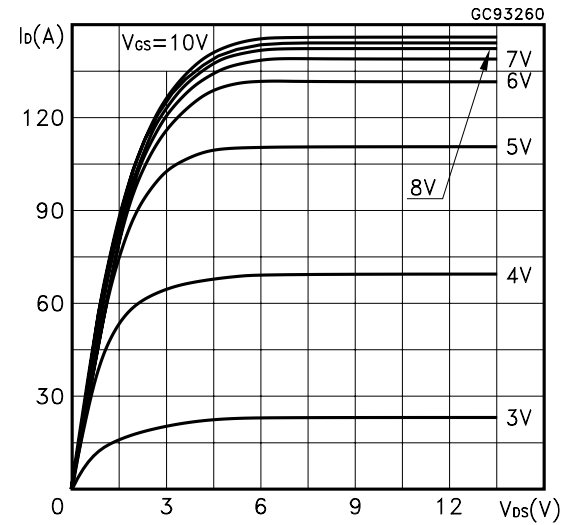
| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                              | Min. | Typ.            | Max.    | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|---------|---------------|
| $I_{SD}$<br>$I_{SDM} (\bullet)$   | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                              |      |                 | 8<br>32 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 8\text{ A}$ $V_{GS} = 0$                                                                                                           |      |                 | 1.2     | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 8\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 15\text{ V}$ $T_j = 150^\circ\text{C}$<br>(see test circuit, Figure 3) |      | 23<br>17<br>1.5 |         | ns<br>nC<br>A |

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

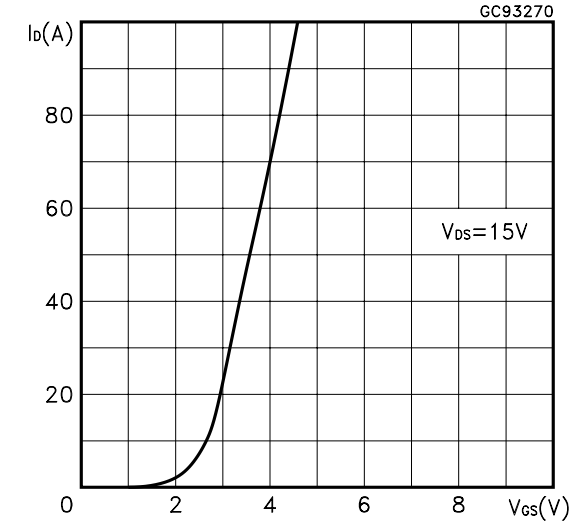
(•) Pulse width limited by safe operating area.

**Safe Operating Area****Thermal Impedance**

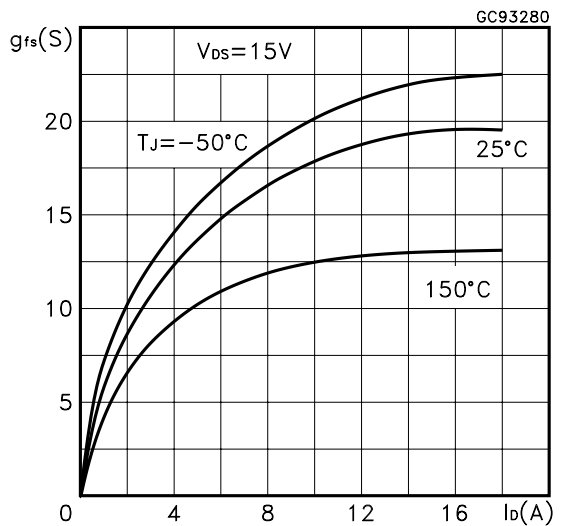
Output Characteristics



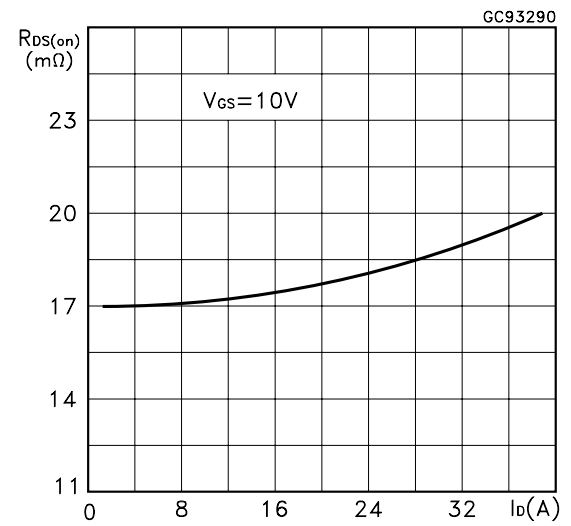
Transfer Characteristics



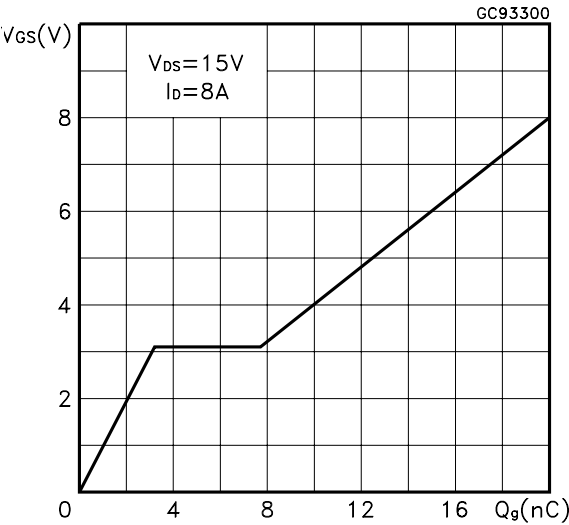
Transconductance



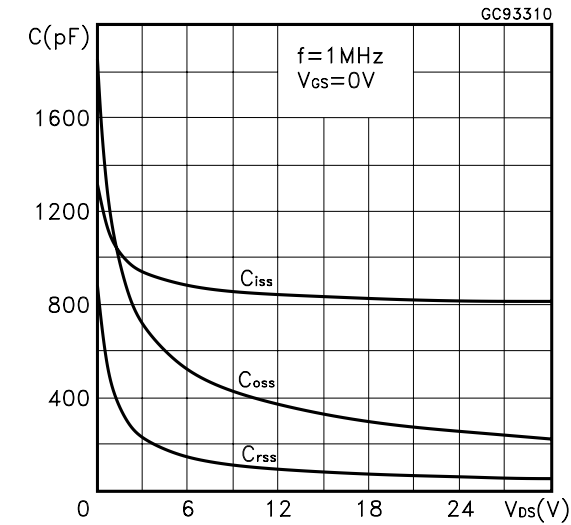
Static Drain-source On Resistance



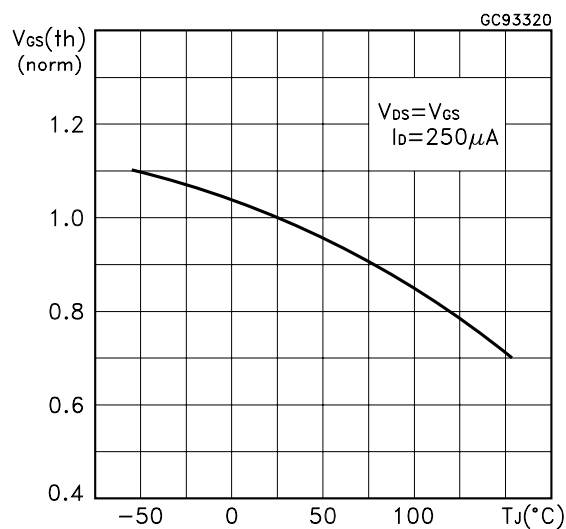
Gate Charge vs Gate-source Voltage



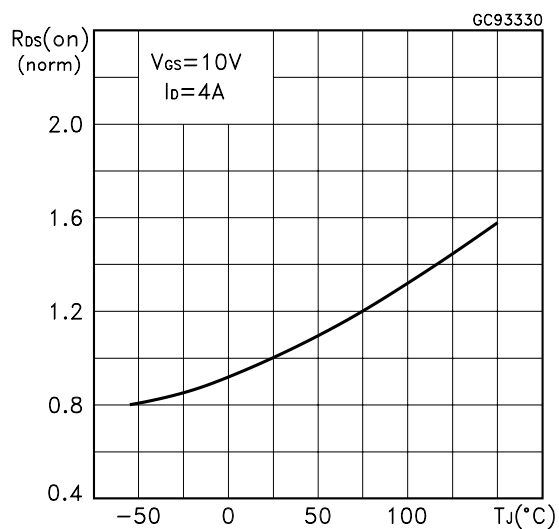
Capacitance Variations



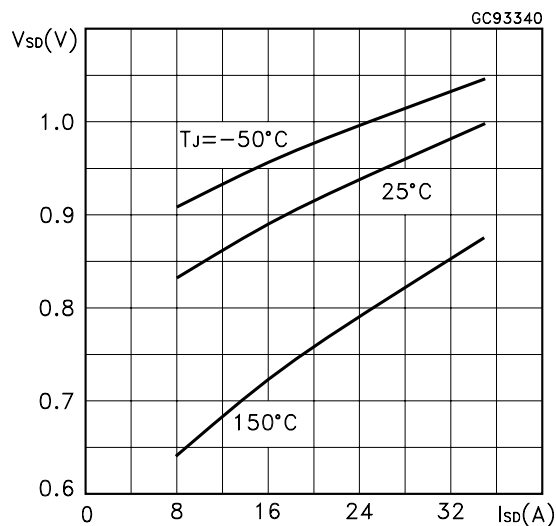
Normalized Gate Threshold Voltage vs Temperature



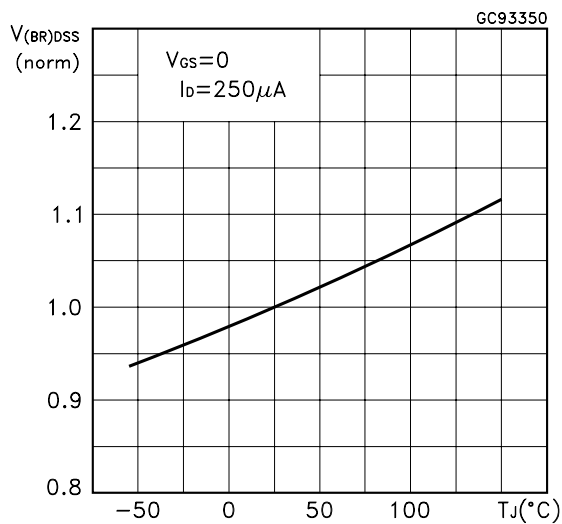
Normalized on Resistance vs Temperature



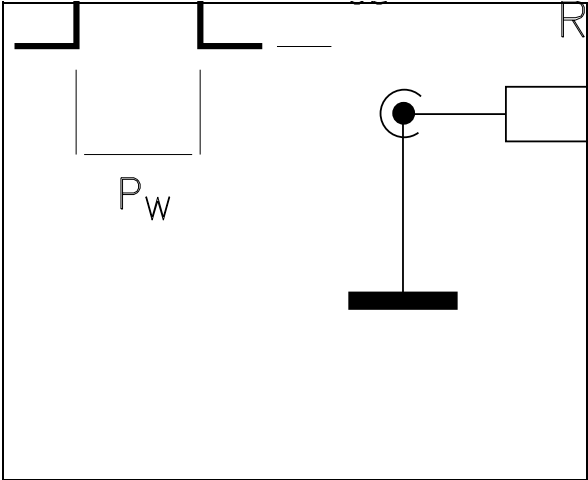
Source-drain Diode Forward Characteristics



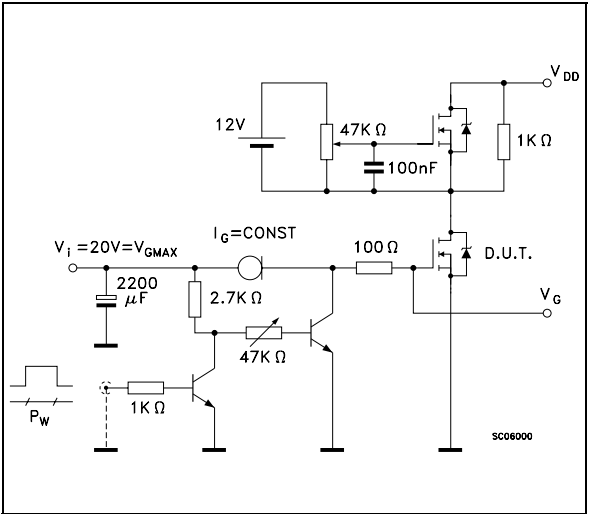
Normalized Breakdown Voltage vs Temperature.



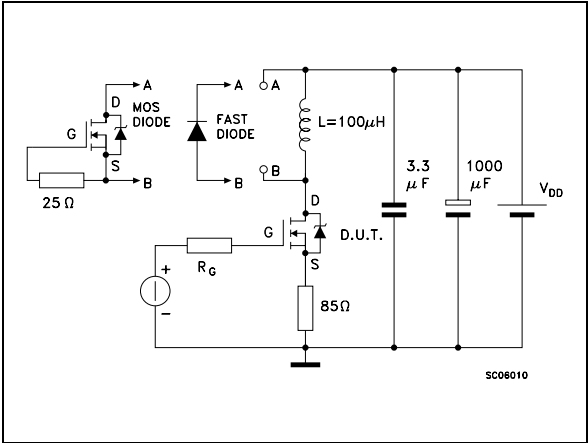
**Fig. 1:** Switching Times Test Circuits For Resistive Load



**Fig. 2:** Gate Charge test Circuit

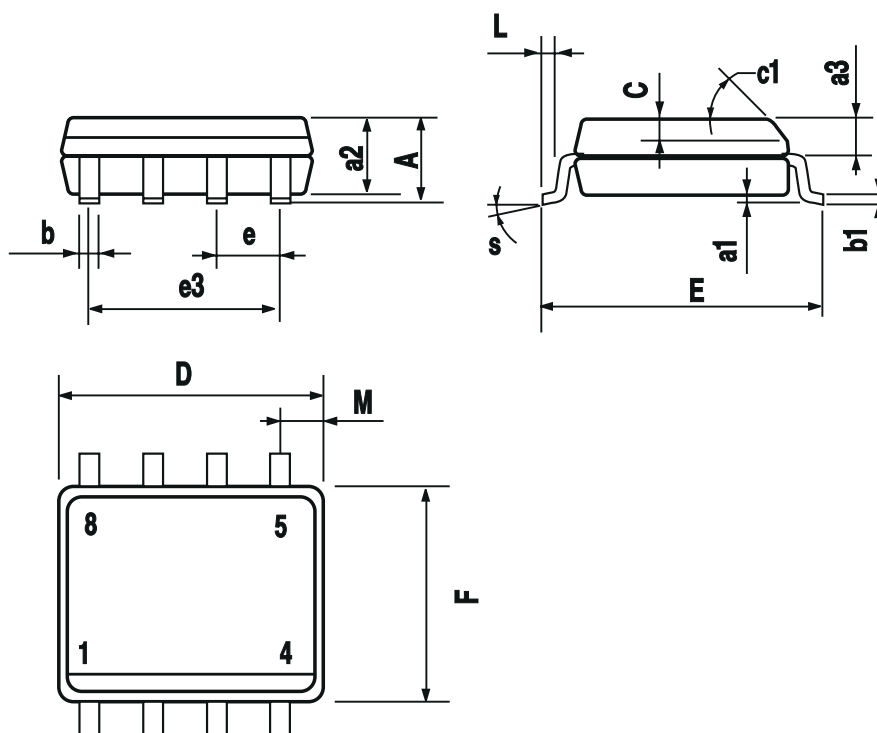


**Fig. 3:** Test Circuit For Diode Recovery Behaviour



## SO-8 MECHANICAL DATA

| DIM. | mm        |      |      | inch  |       |       |
|------|-----------|------|------|-------|-------|-------|
|      | MIN.      | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |           |      | 1.75 |       |       | 0.068 |
| a1   | 0.1       |      | 0.25 | 0.003 |       | 0.009 |
| a2   |           |      | 1.65 |       |       | 0.064 |
| a3   | 0.65      |      | 0.85 | 0.025 |       | 0.033 |
| b    | 0.35      |      | 0.48 | 0.013 |       | 0.018 |
| b1   | 0.19      |      | 0.25 | 0.007 |       | 0.010 |
| C    | 0.25      |      | 0.5  | 0.010 |       | 0.019 |
| c1   | 45 (typ.) |      |      |       |       |       |
| D    | 4.8       |      | 5.0  | 0.188 |       | 0.196 |
| E    | 5.8       |      | 6.2  | 0.228 |       | 0.244 |
| e    |           | 1.27 |      |       | 0.050 |       |
| e3   |           | 3.81 |      |       | 0.150 |       |
| F    | 3.8       |      | 4.0  | 0.14  |       | 0.157 |
| L    | 0.4       |      | 1.27 | 0.015 |       | 0.050 |
| M    |           |      | 0.6  |       |       | 0.023 |
| S    | 8 (max.)  |      |      |       |       |       |



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