



# STS4DPF20L

DUAL P-CHANNEL 20V - 0.07  $\Omega$  - 4A SO-8

STripFET™ POWER MOSFET

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|------------|------------------|---------------------|----------------|
| STS4DPF20L | 20 V             | <0.08 $\Omega$      | 4 A            |

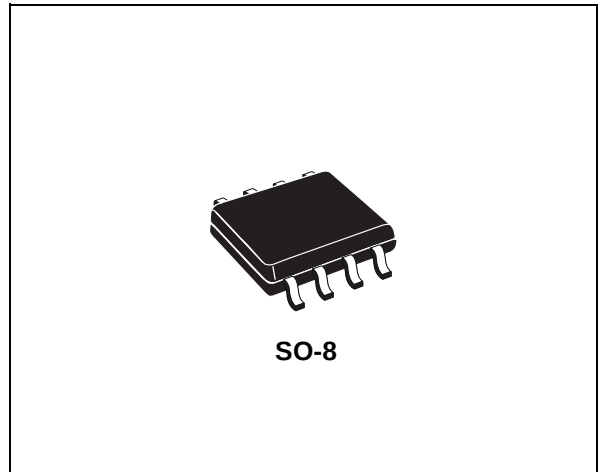
- TYPICAL R<sub>DS(on)</sub> = 0.07  $\Omega$
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY
- LOW THRESHOLD DRIVE

## DESCRIPTION

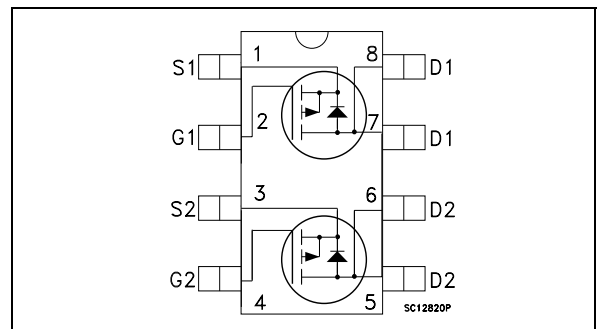
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

## APPLICATIONS

- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN CELLULAR PHONES



## INTERNAL SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                                             | Value    | Unit |
|---------------------|-----------------------------------------------------------------------|----------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)                            | 20       | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )                 | 20       | 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  | 4        | A    |
|                     | Drain Current (continuous) at T <sub>C</sub> = 100°C Single Operation | 2.5      | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)                                                | 16       | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>C</sub> = 25°C Dual Operation             | 1.6      | W    |
|                     | Total Dissipation at T <sub>C</sub> = 25°C Single Operation           | 2        | W    |

(●) Pulse width limited by safe operating area.

Note: For the P-CHANNEL MOSFET actual polarity of voltages and current has to be reversed

## STS4DPF20L

### THERMAL DATA

|                  |                                        |                                    |            |              |
|------------------|----------------------------------------|------------------------------------|------------|--------------|
| Rthj-amb         | (*)Thermal Resistance Junction-ambient | Single Operation<br>Dual Operating | 62.5<br>78 | °C/W<br>°C/W |
| T <sub>j</sub>   | Thermal Operating Junction-ambient     |                                    | -55 to150  | °C           |
| T <sub>stg</sub> | Storage Temperature                    |                                    | -55 to 150 | °C           |

(\*) When Mounted on 0.5 in<sup>2</sup> pad of 2 oz.copper

### 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                                        | 20   |      |         | 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    | 1.6            | 2.5          | V      |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10 V I <sub>D</sub> = 2 A<br>V <sub>GS</sub> = 4.5 V I <sub>D</sub> = 2 A |      | 0.070<br>0.085 | 0.08<br>0.10 | 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> = 2 A            |      | 10                 |      | 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 |      | 1350<br>490<br>130 |      | 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                              | $V_{DD} = 15\text{ V}$ $I_D = 2\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$<br>(Resistive Load, Figure 1) |      | 25<br>35       |      | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 24\text{ V}$ $I_D = 4\text{ A}$ $V_{GS} = 5\text{ V}$<br>(See test circuit, Figure 2)                        |      | 12.5<br>5<br>3 | 16   | nC<br>nC<br>nC |

**SWITCHING OFF**

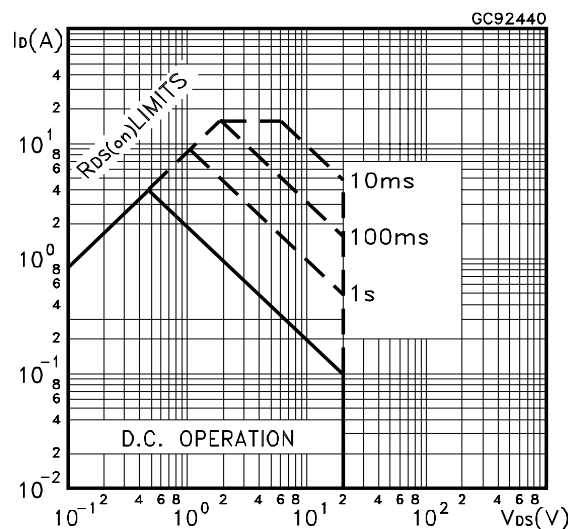
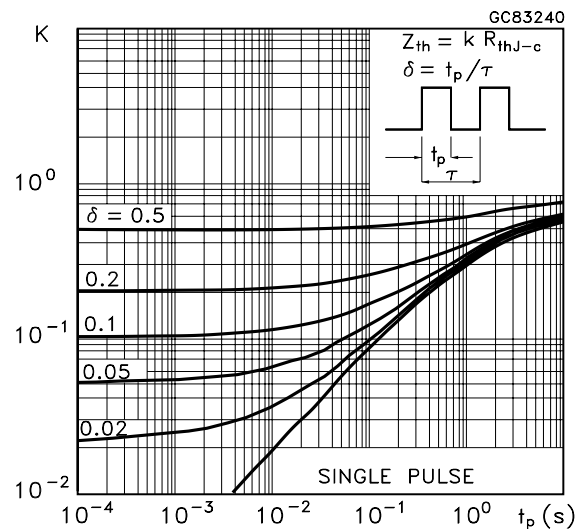
| Symbol                | Parameter                        | Test Conditions                                                                                                          | Min. | Typ.      | Max. | Unit     |
|-----------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|------|-----------|------|----------|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD} = 15\text{ V}$ $I_D = 2\text{ A}$<br>$R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$<br>(Resistive Load, Figure 1) |      | 125<br>35 |      | ns<br>ns |

**SOURCE DRAIN DIODE**

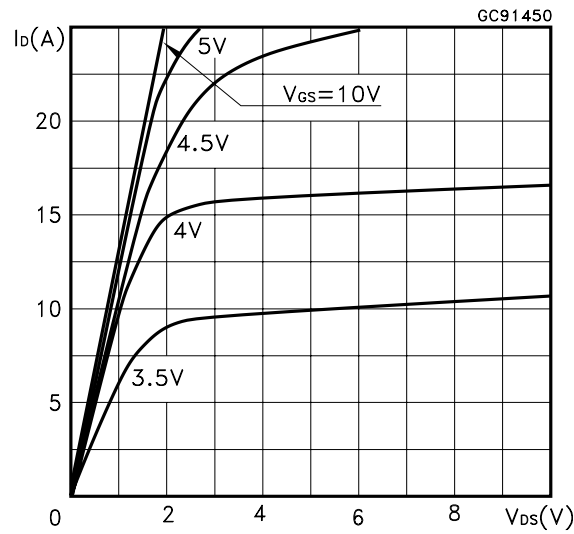
| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                                              | Min. | Typ.            | Max.    | Unit          |
|-----------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|---------|---------------|
| $I_{SD}$<br>$I_{SDM} (\bullet)$   | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                                              |      |                 | 4<br>16 | A<br>A        |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 4\text{ A}$ $V_{GS} = 0$                                                                                                           |      |                 | 1.2     | V             |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 15\text{ V}$ $T_j = 150^\circ\text{C}$<br>(See test circuit, Figure 3) |      | 45<br>36<br>1.6 |         | ns<br>nC<br>A |

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

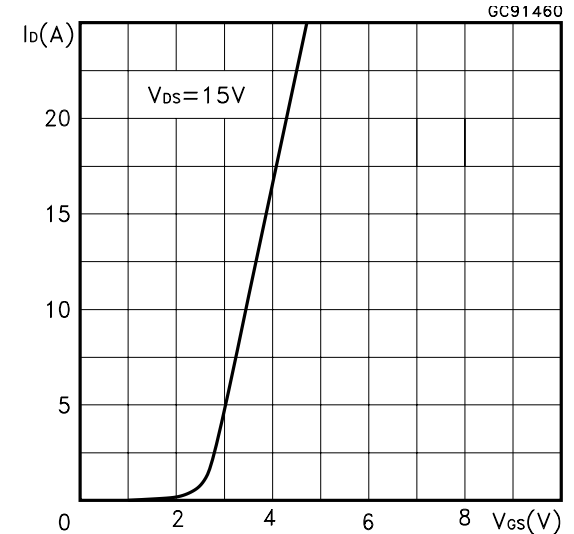
(•) Pulse width limited by safe operating area.

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

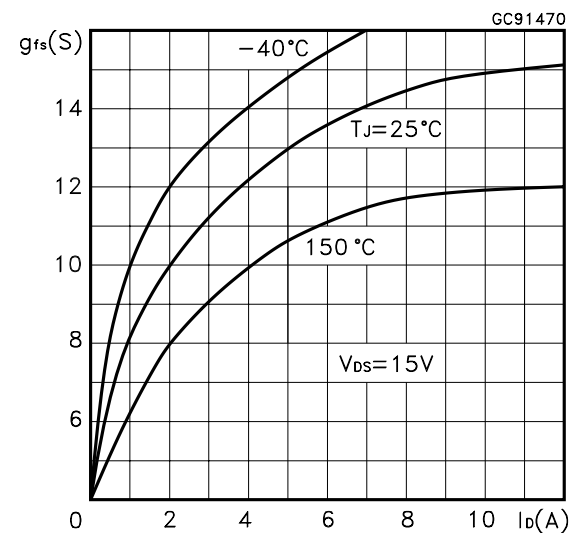
Output Characteristics



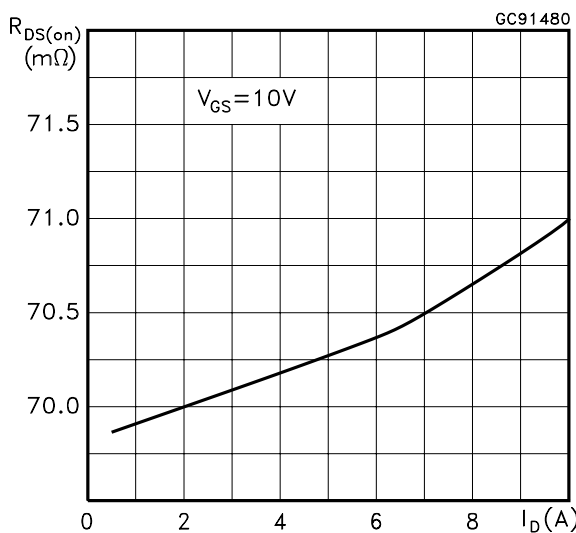
Transfer Characteristics



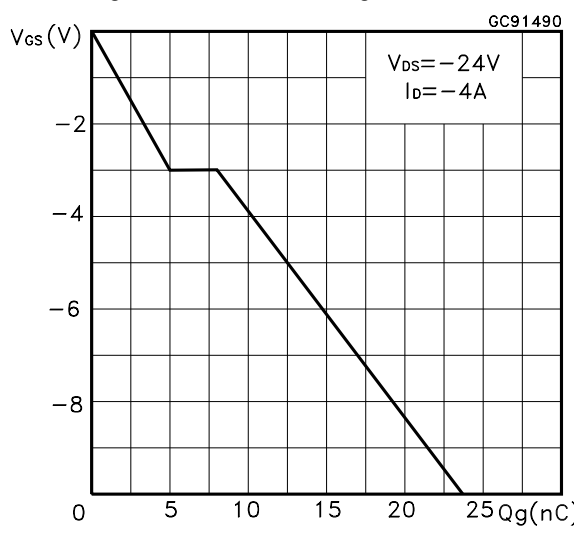
Transconductance



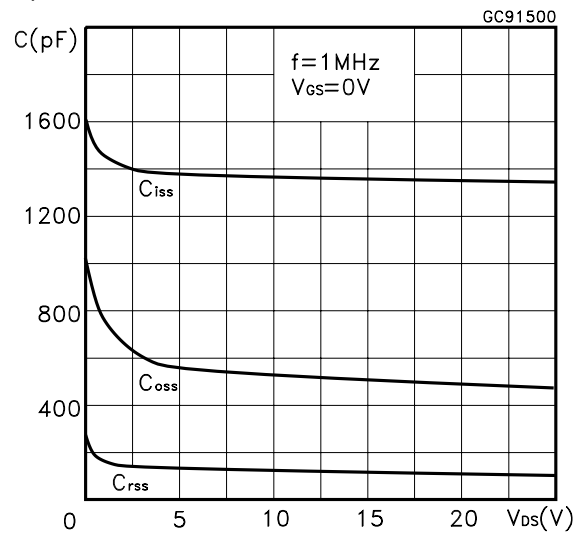
Static Drain-source On Resistance



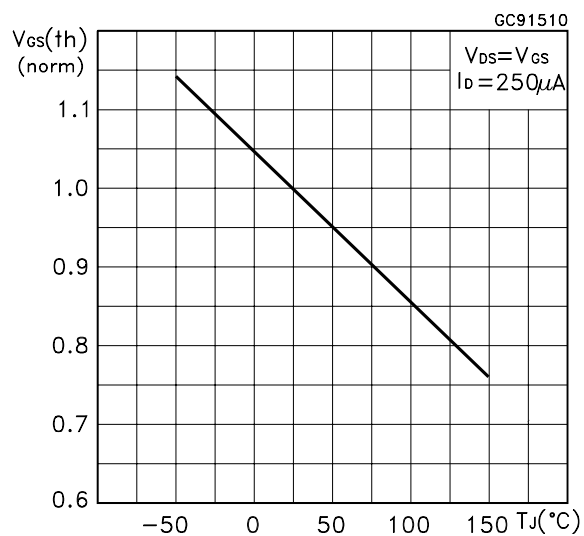
Gate Charge vs Gate-source Voltage



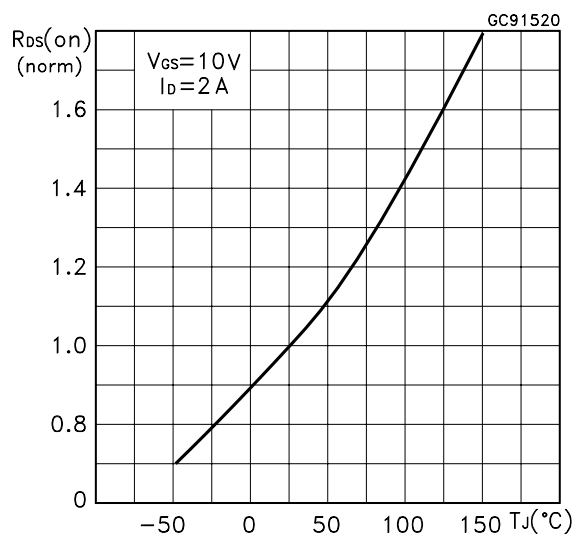
Capacitance Variations



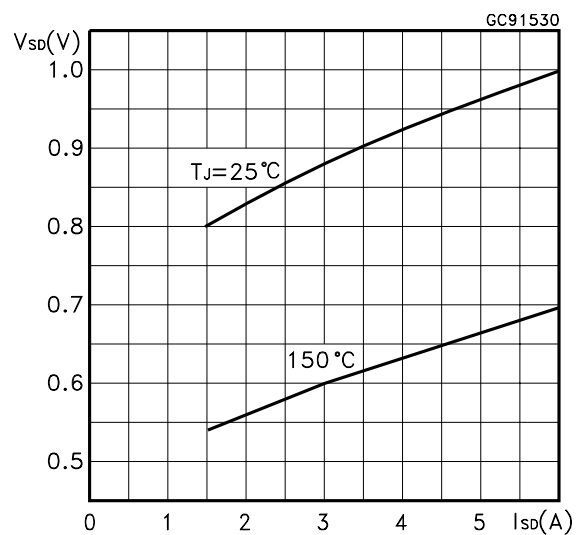
Normalized Gate Threshold Voltage vs Temperature



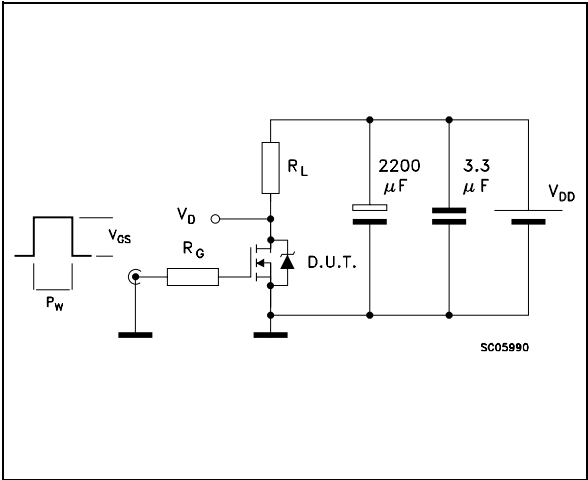
Normalized on Resistance vs Temperature



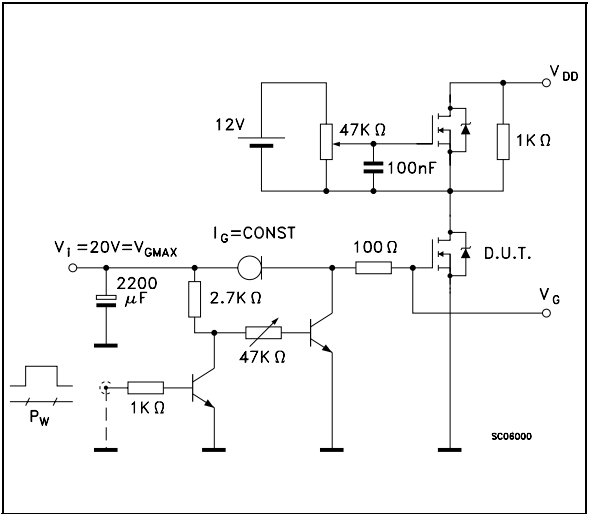
Source-drain Diode Forward Characteristics



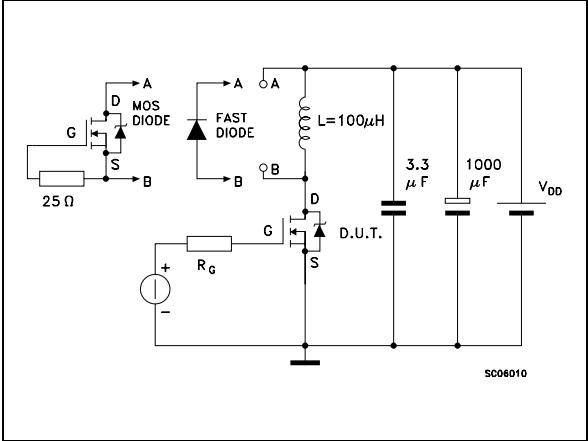
**Fig. 1:** Switching Times Test Circuits For Resistive Load



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

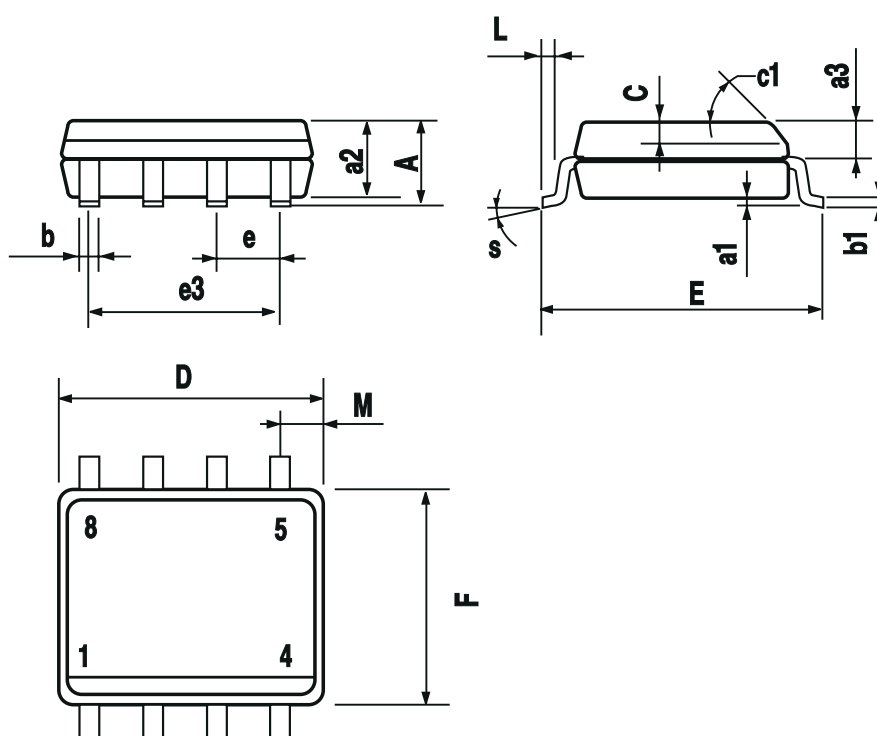


**Fig. 3:** Test Circuit For Diode Recovery Behaviour



## 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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