



STS4PF20V

P-CHANNEL 20V - 0.090 Ω - 4A SO-8 2.7V-DRIVE STripFET™ II POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---|----------------|
| STS4PF20V | 20 V | < 0.11 Ω (@ 4.5 V) < 0.135 Ω (@ 2.7 V) | 4 A |

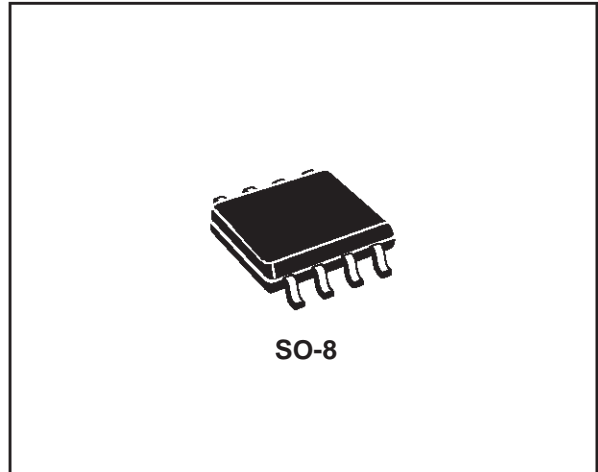
- TYPICAL R_{DS(on)} = 0.090 Ω @ 4.5 V
- TYPICAL R_{DS(on)} = 0.100 Ω @ 2.7 V
- ULTRA LOW THRESHOLD GATE DRIVE (2.7 V)
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY

DESCRIPTION

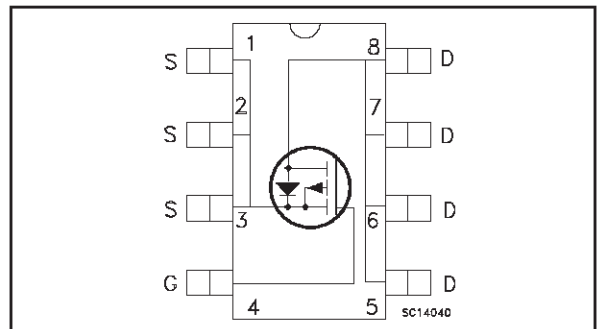
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

APPLICATIONS

- MOBILE PHONE APPLICATIONS
- DC-DC CONVERTERS
- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|-------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 20 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 20 | V |
| V _{GS} | Gate- source Voltage | ± 12 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 4 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 2.5 | A |
| I _{DM} (●) | Drain Current (pulsed) | 16 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 2.5 | W |

(●) Pulse width limited by safe operating area.

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

STS4PF20V

THERMAL DATA

| | | | | |
|--------------------------------|---|-----|-------------------------|------------------|
| Rthj-amb T_j T_{stg} | (*)Thermal Resistance Junction-ambient Maximum Operating Junction Temperature storage temperature | Max | 50 150 -55 to 150 | °C/W °C °C |
|--------------------------------|---|-----|-------------------------|------------------|

(*) When Mounted on 1 inch² FR-4 board, 2 oz of Cu and t [10 sec.

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 | $I_D = 250\ \mu\text{A}$, $V_{GS} = 0$ | 20 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_C = 125\text{ °C}$ | | | 1 10 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 12\text{V}$ | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|--|------|----------------|----------------|----------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 250\ \mu\text{A}$ | 0.6 | | | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 4.5\ \text{V}$ $I_D = 2\ \text{A}$ $V_{GS} = 2.7\ \text{V}$ $I_D = 2\ \text{A}$ | | 0.090 0.100 | 0.110 0.135 | Ω Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|--|------|------------------|------|----------------|
| g_{fs} (*) | Forward Transconductance | $V_{DS} = 15\text{V}$ $I_D = 2\ \text{A}$ | | 7.5 | | S |
| C_{iss} C_{oss} C_{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | $V_{DS} = 15\text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0$ | | 500 140 30 | | pF pF pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON(*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|--|------|-----------------|------|----------------|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{DD} = 10\text{ V}$ $I_D = 2\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1) | | 38 39 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 10\text{ V}$ $I_D = 4\text{ A}$ $V_{GS} = 4.5\text{ V}$ (see test circuit, Figure 2) | | 6.2 1 1.4 | | nC nC nC |

SWITCHING OFF(*)

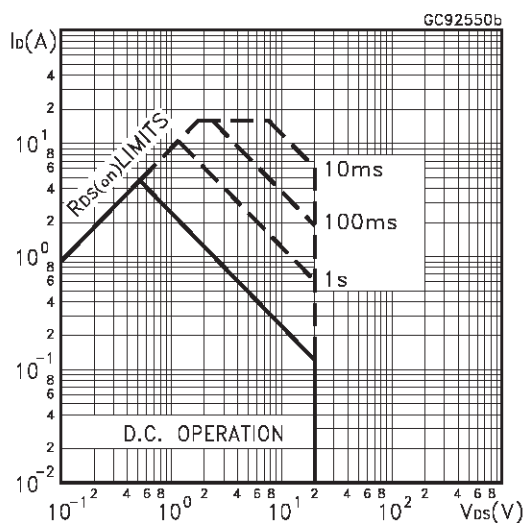
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|---|---|------|----------------|------|----------------|
| $t_{d(off)}$ t_f | Turn-off Delay Time Fall Time | $V_{DD} = 10\text{ V}$ $I_D = 2\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1) | | 54 12 | | ns ns |
| $t_r(V_{off})$ t_f t_c | Off-voltage Rise Time Fall Time Cross-over Time | $V_{clamp} = 16\text{ V}$ $I_D = 4\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\text{ V}$ (Inductive Load, Figure 3) | | 46 11 15 | | ns ns ns |

SOURCE DRAIN DIODE(*)

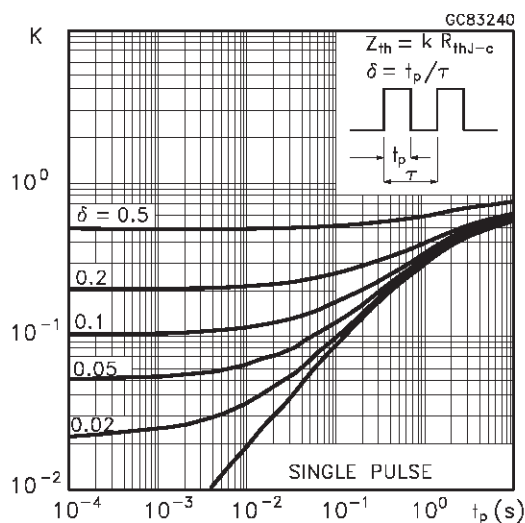
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|-----------------|---------|---------------|
| I_{SD} $I_{SDM} (\bullet)$ | Source-drain Current Source-drain Current (pulsed) | | | | 4 16 | A A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 4\text{ A}$ $V_{GS} = 0$ | | | 1.2 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150^\circ\text{C}$ (Inductive Load, Figure 3) | | 20 13 1.3 | | ns nC A |

(*)Pulse width $\leq 300\ \mu\text{s}$, duty cycle 1.5 %.
 (●)Pulse width limited by T_{JMAX}

Safe Operating Area

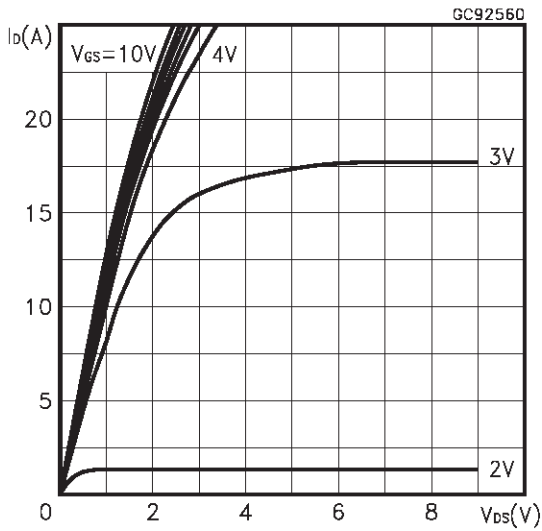


Thermal Impedance

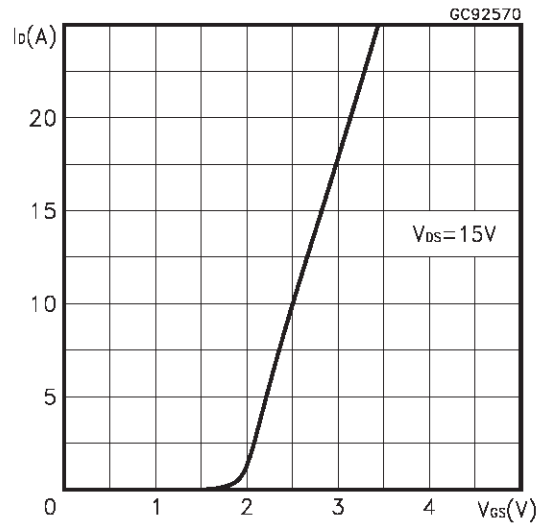


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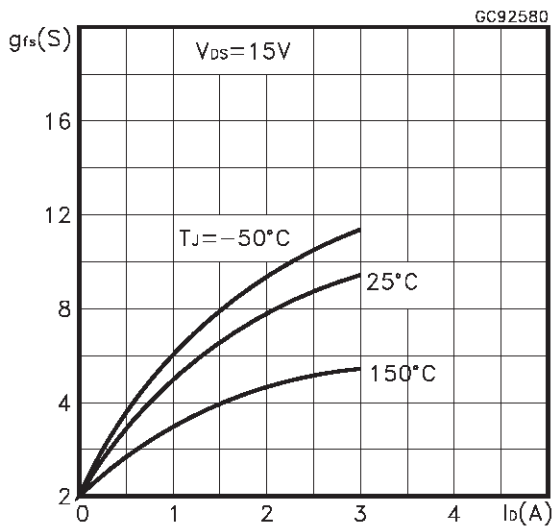
Output Characteristics



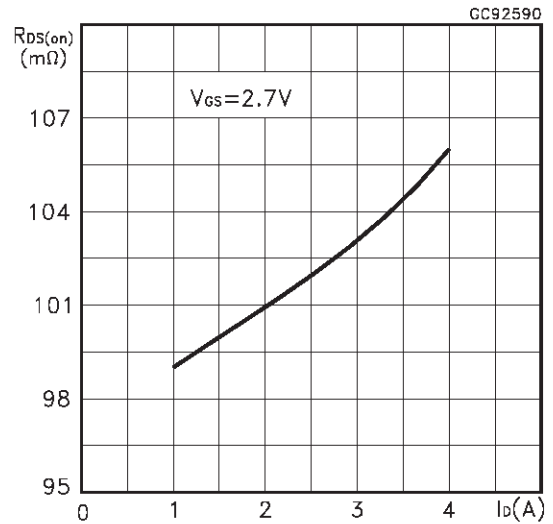
Transfer Characteristics



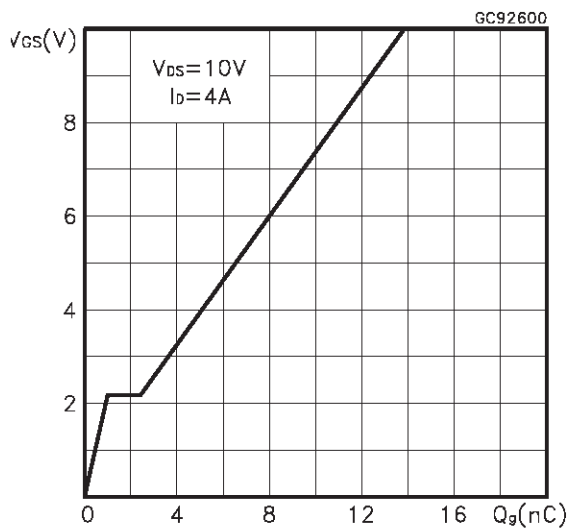
Transconductance



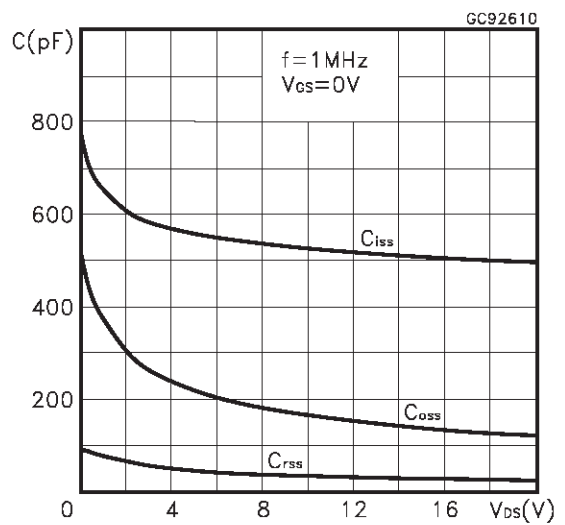
Static Drain-source On Resistance



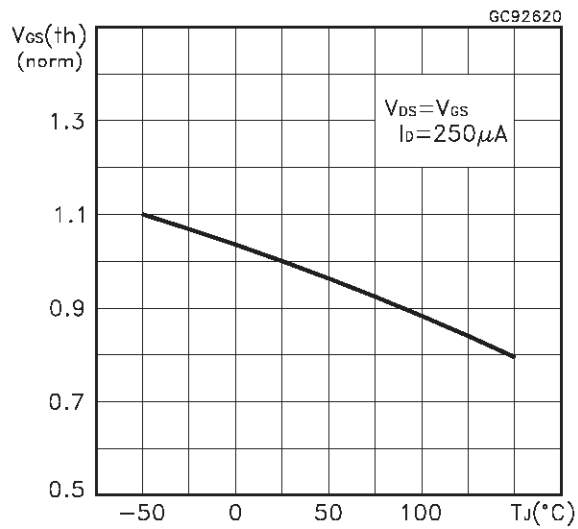
Gate Charge vs Gate-source Voltage



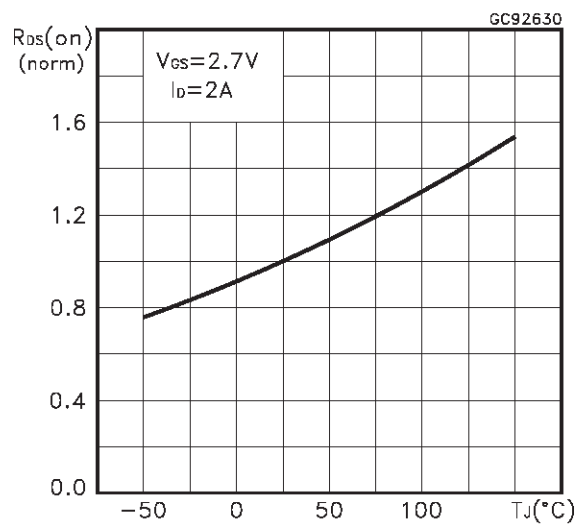
Capacitance Variations



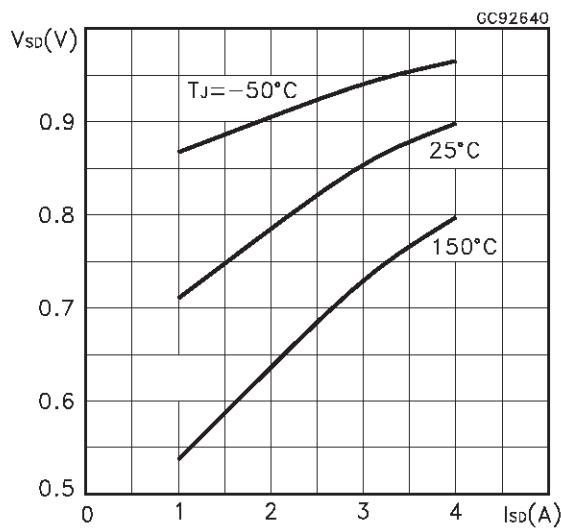
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature

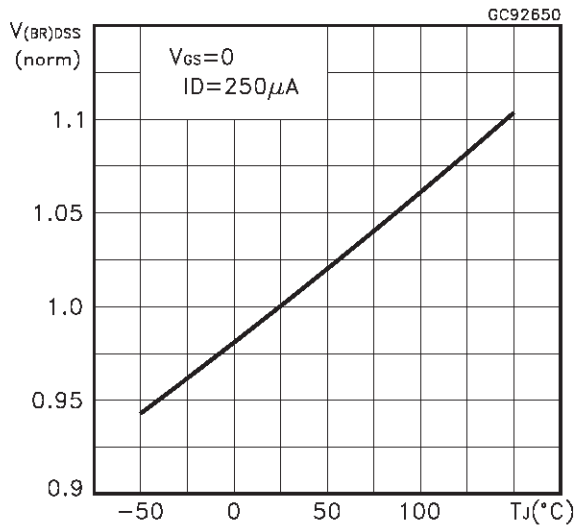


Fig. 1: Switching Times Test Circuits For Resistive Load

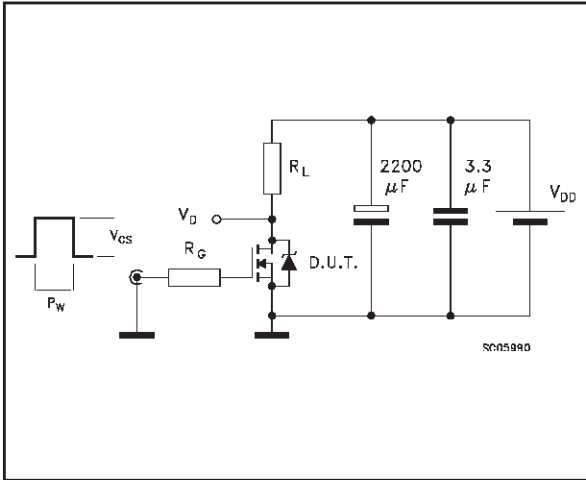


Fig. 2: Gate Charge test Circuit

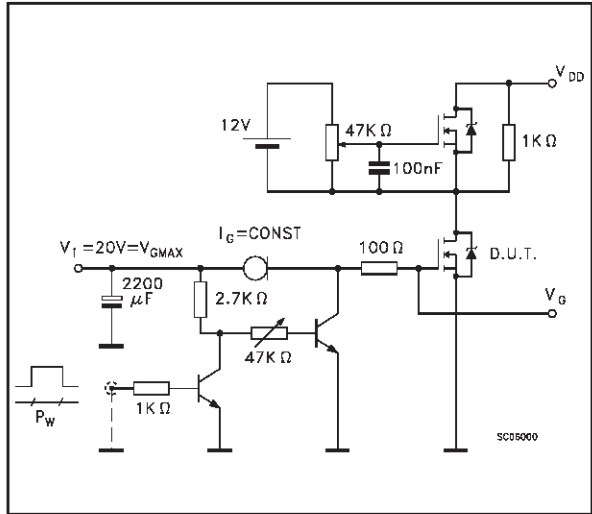
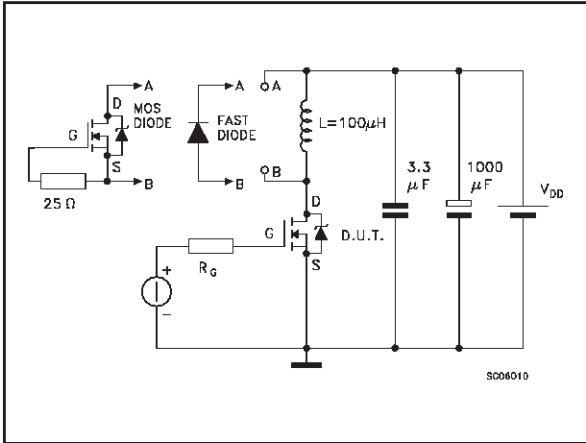
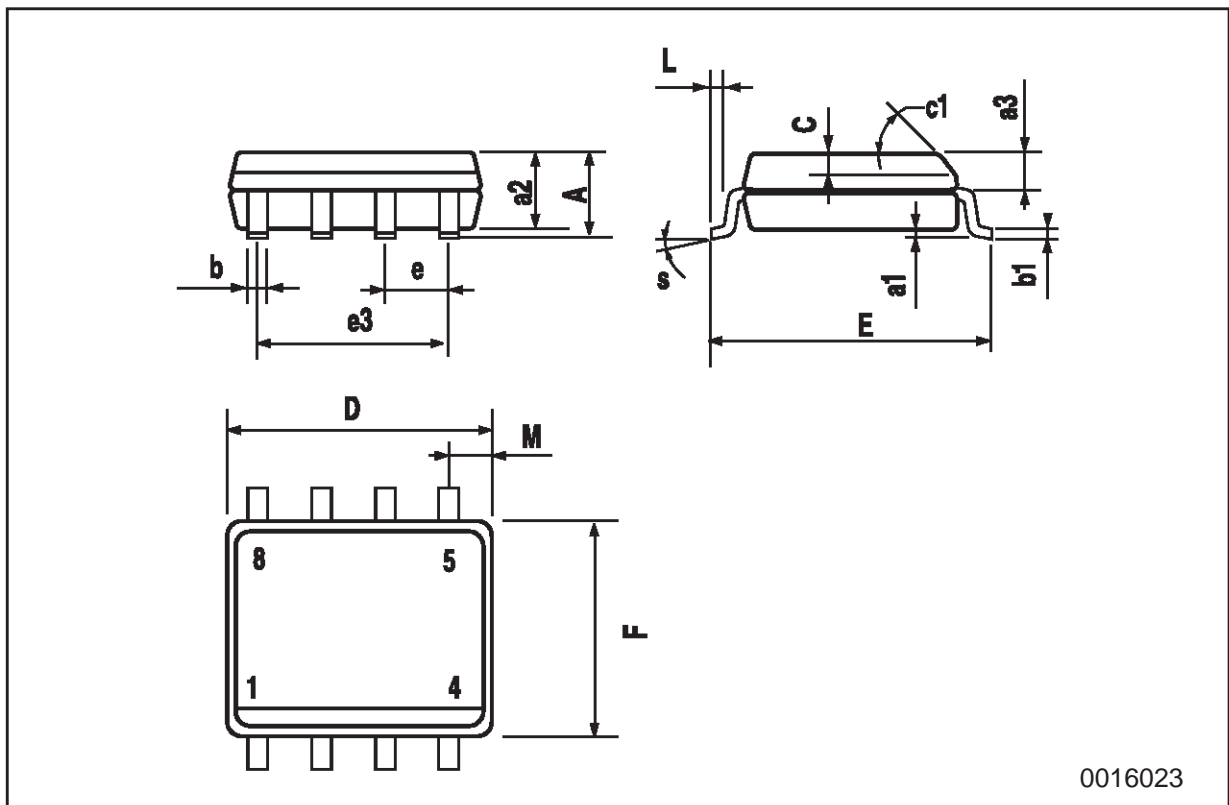


Fig. 3: Test Circuit For Diode Recovery Behaviour



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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