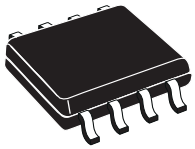
# STS4PF20V

## 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 )<br>< 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



**SO-8**

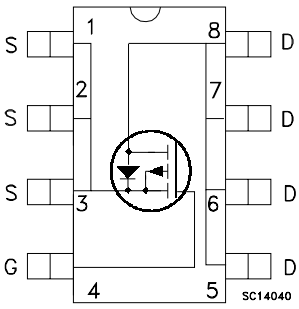
### DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronis 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

## THERMAL DATA

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

(*) When Mounted on 1 inch$^2$ FR-4 board, 2 oz of Cu and t ≤ 10 sec.

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 °C unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D$ = 250 µA, $V_{GS}$ = 0 | 20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS}$ = 0) | $V_{DS}$ = Max Rating<br>$V_{DS}$ = Max Rating $T_C$ = 125°C | | | 1<br>10 | µA<br>µA |
| $I_{GSS}$ | Gate-body Leakage Current ($V_{DS}$ = 0) | $V_{GS}$ = ± 12V | | | ±100 | nA |

ON (*)

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

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (*) | Forward Transconductance | $V_{DS}$=15V $I_D$=2 A | | 7.5 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS}$ = 15V, f = 1 MHz, $V_{GS}$ = 0 | | 500<br>140<br>30 | | 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 | $V_{DD}$ = 10 V $I_D$ = 2 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 4.5 V<br>(Resistive Load, Figure 1) | | 38<br>39 | | ns<br>ns |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD}$= 10V $I_D$= 4A $V_{GS}$=4.5V<br>(see test circuit, Figure 2) | | 6.2<br>1<br>1.4 | | nC<br>nC<br>nC |

SWITCHING OFF(*)

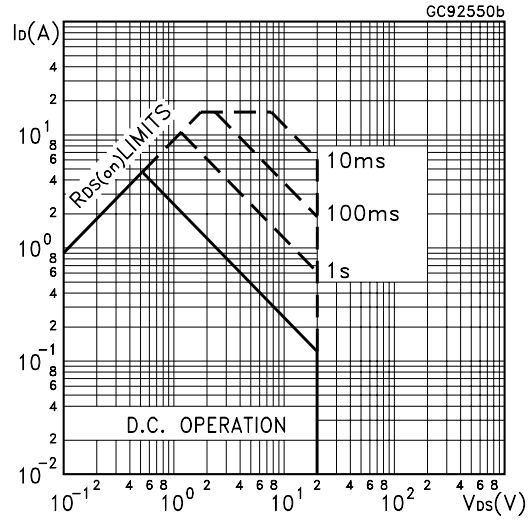
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD}$ = 10 V $I_D$ = 2 A<br>$R_G$ = 4.7Ω, $V_{GS}$ = 4.5 V<br>(Resistive Load, Figure 1) | | 54<br>12 | | ns<br>ns |
| $t_{r(Voff)}$<br>$t_f$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

SOURCE DRAIN DIODE(*)

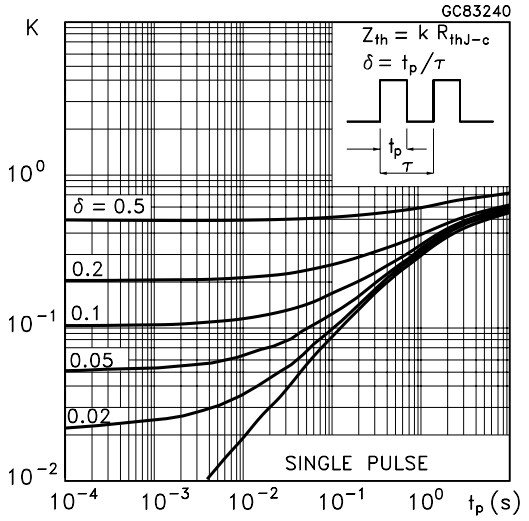
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ (•) | Source-drain Current<br>Source-drain Current (pulsed) | | | | 4<br>16 | A<br>A |
| $V_{SD}$ (*) | Forward On Voltage | $I_{SD}$ = 4 A $V_{GS}$ = 0 | | | 1.2 | V |
| $t_{rr}$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

(*)Pulse width ≤ 300 µs, duty cycle 1.5 %.
(•)Pulse width limited by $T_{JMAX}$

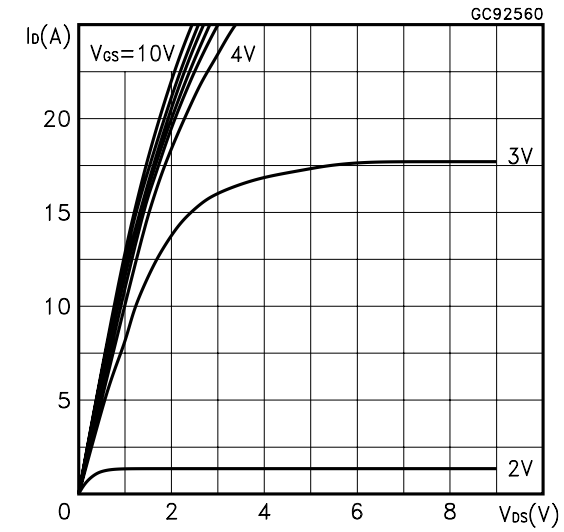
Safe Operating Area



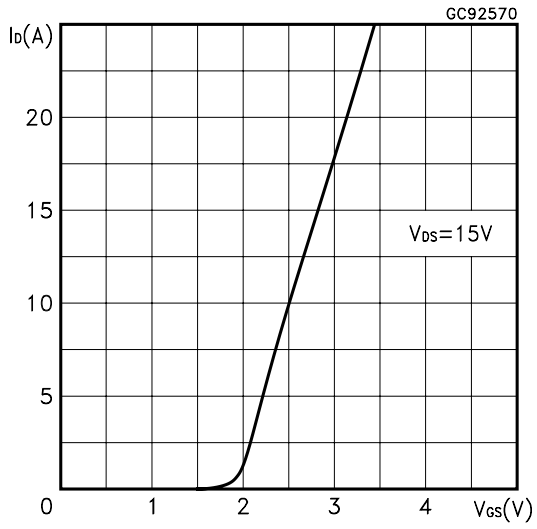

Thermal Impedance



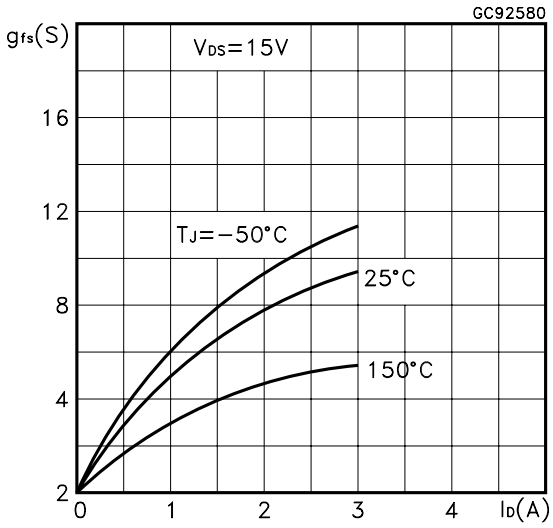
Output Characteristics



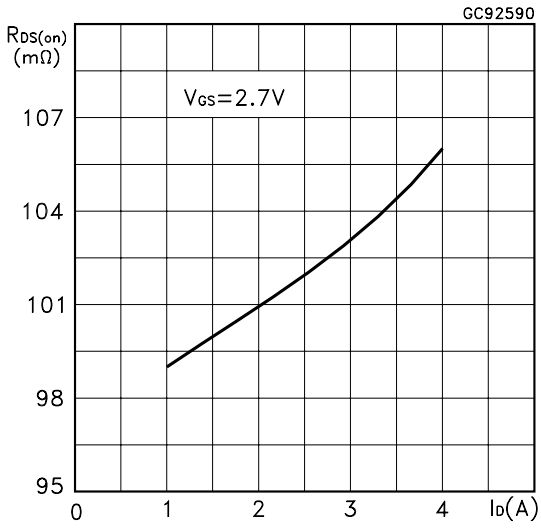

Transfer Characteristics



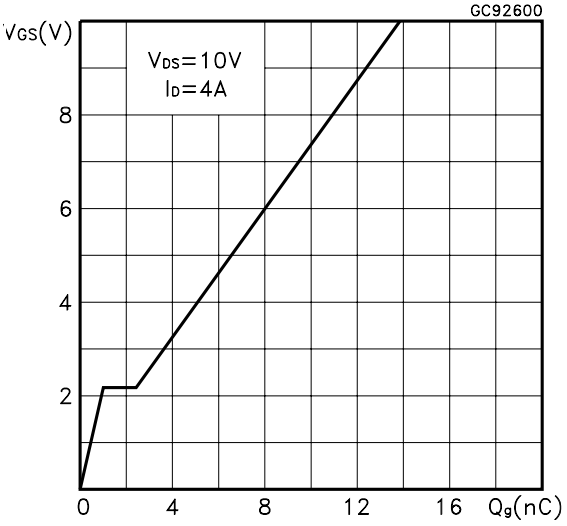

Transconductance



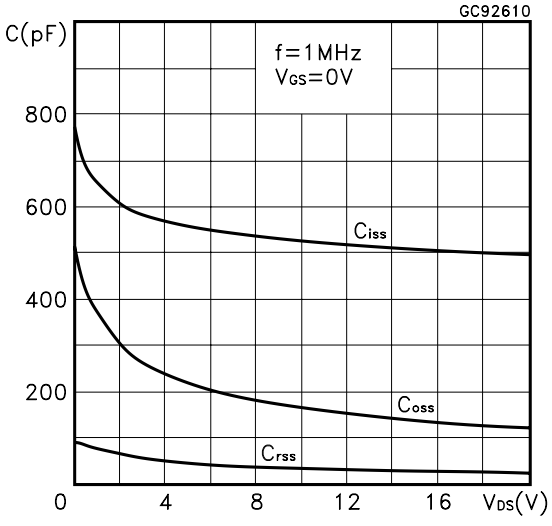

Static Drain-source On Resistance



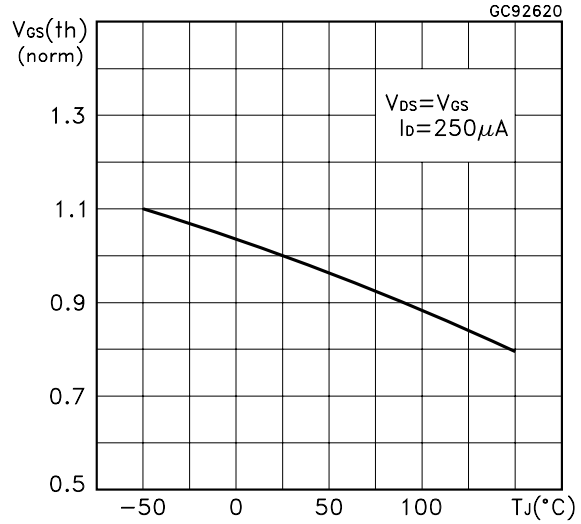

Gate Charge vs Gate-source Voltage



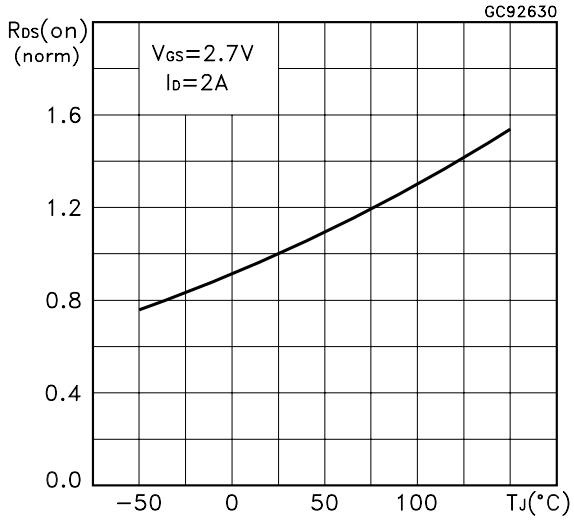

Capacitance Variations



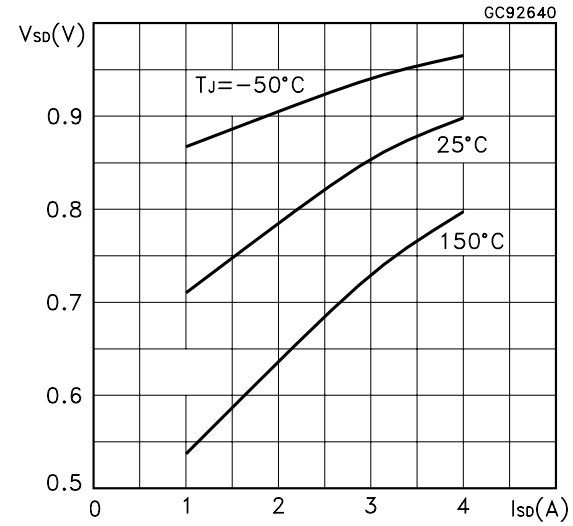
Normalized Gate Threshold Voltage vs Temperature




Normalized on Resistance vs Temperature




Source-drain Diode Forward Characteristics




Normalized Breakdown Voltage vs Temperature

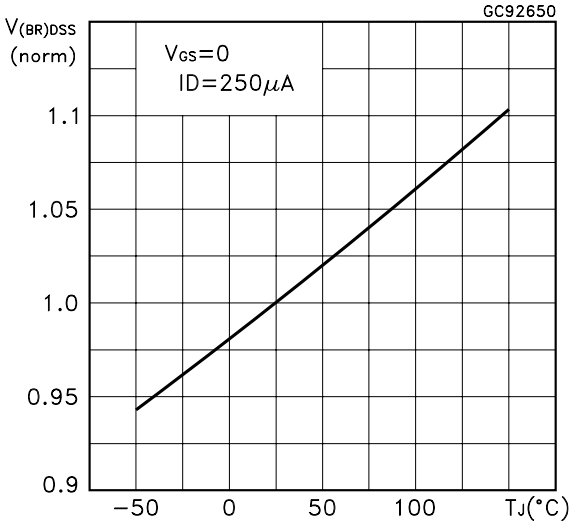


**Fig. 1:** Switching Times Test Circuits For Resistive Load

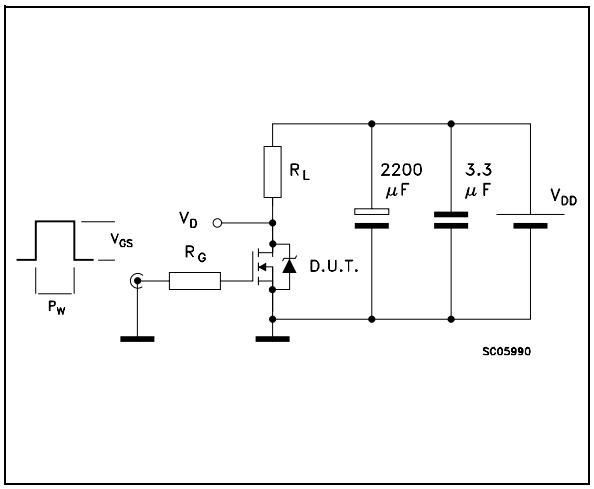



**Fig. 2:** Gate Charge test Circuit

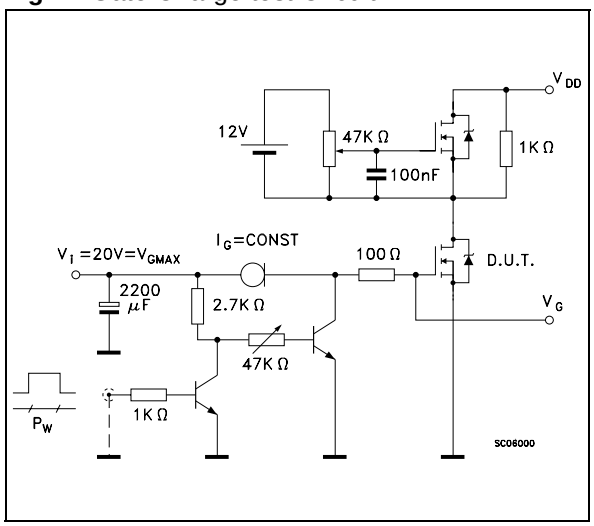
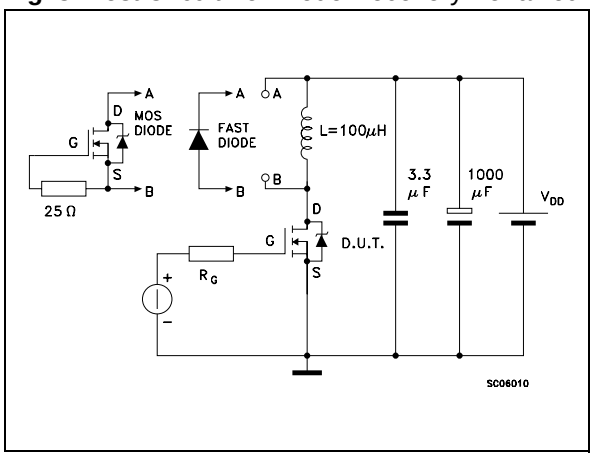
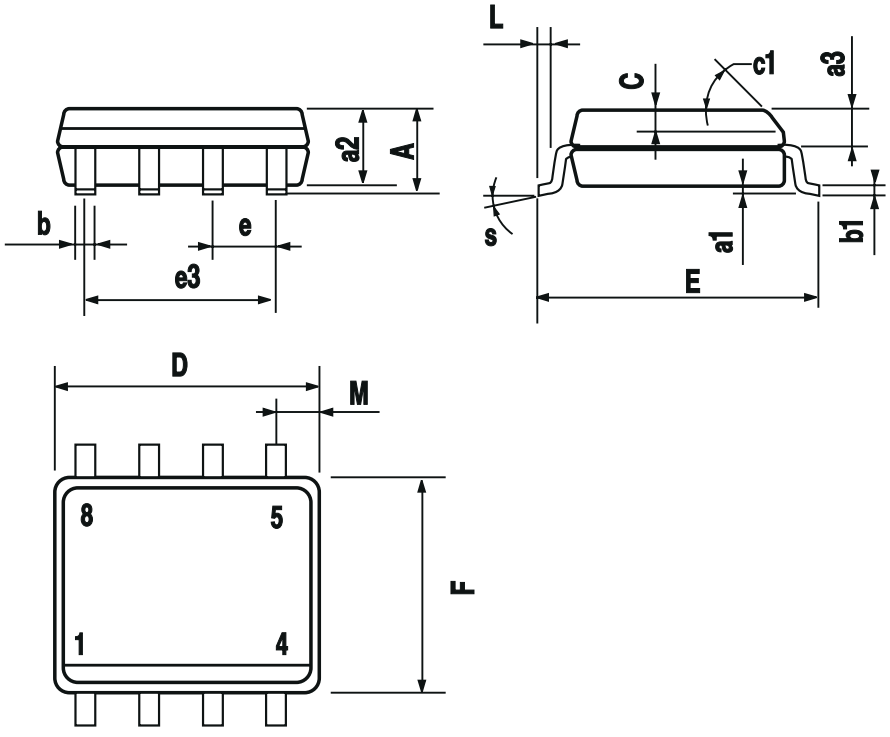



**Fig. 3:** Test Circuit For Diode Recovery Behaviour



## 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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