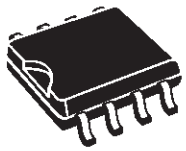
# STS7C4F30L

## N-CHANNEL 30V - 0.018Ω - 7A SO-8
## P-CHANNEL 30V - 0.070Ω - 4A SO-8
## STripFET™ POWER MOSFET

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STS7C4F30L(N-Channel) | 30 V | <0.022 Ω | 7 A |
| STS7C4F30L(P-Channel) | 30 V | <0.080 Ω | 4 A |

- TYPICAL RDS(on) (N-Channel) = 0.018 Ω
- TYPICAL RDS(on) (P-Channel) = 0.070 Ω
- 100% AVALANCHE TESTED
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY
- LOW THRESHOLD DRIVE



**SO-8**

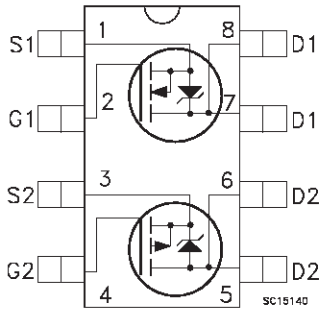
### DESCRIPTION

This Power MOSFET is the second generation 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/DC CONVERTERS
- BATTERY MANAGMENT IN NOMADIC EQUIPMENT
- POWER MANAGMENT IN CELLULAR PHONES

### INTERNAL SCHEMATIC DIAGRAM




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | N-CHANNEL | P-CHANNEL | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 30 | 30 | V |
| $V_{DGR}$ | Drain-gate Voltage ($R_{GS}$ = 20 kΩ) | 30 | 30 | V |
| $V_{GS}$ | Gate- source Voltage | ± 20 | ± 20 | V |
| $I_D$ | Drain Current (continuos) at $T_C$ = 25°C Single Operating | 7 | 4 | A |
| $I_D$ | Drain Current (continuos) at $T_C$ = 100°C Single Operating | 4.4 | 2.5 | A |
| $I_{DM}$ (•) | Drain Current (pulsed) | 28 | 16 | A |
| $P_{TOT}$ | Total Dissipation at $T_C$ = 25°C Dual Operating<br>Total Dissipation at $T_C$ = 25°C Single Operating | 2<br>1.6 | 2<br>1.6 | W<br>W |
| $T_{stg}$ | Storage Temperature | –60 to 150 | | °C |
| $T_j$ | Max. Operating Junction Temperature | 150 | | °C |

(•)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 Single Operating | 78 | °C/W |
| | Dual Operating | 62.5 | °C/W |
| $T_j$ | Maximum Lead Temperature For Soldering Purpose | 300 | °C |

## 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 | n-ch<br>p-ch | 30<br>30 | | | V<br>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) | $V_{GS}$ = ± 20 V<br>$V_{GS}$ = ± 20 V | n-ch<br>p-ch | | | ±100<br>±100 | nA<br>nA |

ON (*)

| Symbol | Parameter | Test Conditions | | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ | $I_D$ = 250 µA | n-ch<br>p-ch | 1<br>1 | 1.6<br>1.6 | 2.5<br>2.5 | V<br>V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS}$ = 10 V<br>$V_{GS}$ = 10 V<br>$V_{GS}$ = 4.5 V<br>$V_{GS}$ = 4.5 V | $I_D$ = 4 A<br>$I_D$ = 2 A<br>$I_D$ = 4 A<br>$I_D$ = 2 A | n-ch<br>p-ch<br>n-ch<br>p-ch | | 0.018<br>0.070<br>0.021<br>0.085 | 0.022<br>0.080<br>0.026<br>0.10 | Ω<br>Ω<br>Ω<br>Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $g_{fs}$ (*) | Forward Transconductance | $V_{DS}$>$I_{D(on)}$x$R_{DS(on)max}$,$V_{GS}$=3.5V<br>$V_{DS}$>$I_{D(on)}$x$R_{DS(on)max}$, $V_{GS}$=2V | n-ch<br>p-ch | | 10<br>10 | | S<br>S |
| $C_{iss}$ | Input Capacitance | | n-ch<br>p-ch | | 1050<br>1350 | | pF<br>pF |
| $C_{oss}$ | Output Capacitance Reverse Transfer | $V_{DS}$ = 25V, f = 1 MHz, $V_{GS}$ = 0A | n-ch<br>p-ch | | 250<br>490 | | pF<br>pF |
| $C_{rss}$ | Capacitances | | n-ch<br>p-ch | | 85<br>130 | | pF<br>pF |

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on Delay Time | **N-CHANNEL**<br>$V_{DD}$ = 15 V $I_D$ = 4 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 4.5 V | n-ch<br>p-ch | | 22<br>25 | | ns<br>ns |
| $t_r$ | Rise Time | **P-CHANNEL**<br>$V_{DD}$ = 15 V $I_D$ = 2 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 4.5 V<br>(Resistive Load, see fig.3) | n-ch<br>p-ch | | 60<br>35 | | ns<br>ns |
| $Q_g$ | Total Gate Charge | **N-CHANNEL**<br>$V_{DD}$=24V $I_D$=7A $V_{GS}$=5V | n-ch<br>p-ch | | 17.5<br>12.5 | 23<br>16 | nC<br>nC |
| $Q_{gs}$ | Gate-Source Charge | **P-CHANNEL**<br>$V_{DD}$=24V $I_D$=4A $V_{GS}$=5V<br>(see test circuit, Figure 5) | n-ch<br>p-ch | | 4<br>5 | | nC<br>nC |
| $Q_{gd}$ | Gate-Drain Charge | | n-ch<br>p-ch | | 7<br>3 | | nC<br>nC |

SWITCHING OFF

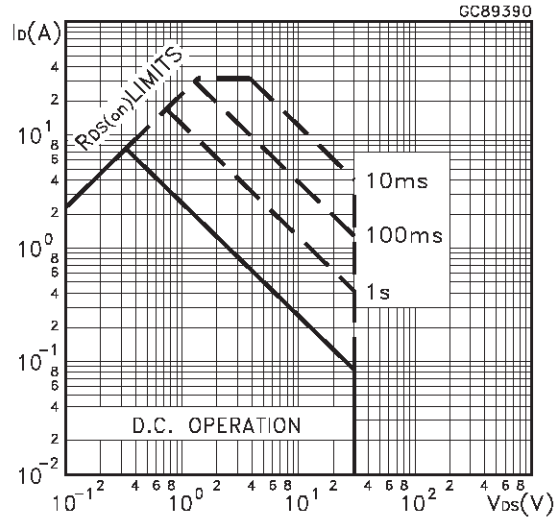
| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $t_{d(off)}$ | Turn-off Delay Time | **N-CHANNEL**<br>$V_{DD}$ = 15 V $I_D$ = 4 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 4.5 V | n-ch<br>p-ch | | 42<br>125 | | ns<br>ns |
| $t_f$ | Fall Time | **P-CHANNEL**<br>$V_{DD}$ = 15 V $I_D$ = 2 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 4.5 V<br>(Resistive Load, see fig.3) | n-ch<br>p-ch | | 10<br>35 | | ns<br>ns |

SOURCE DRAIN DIODE

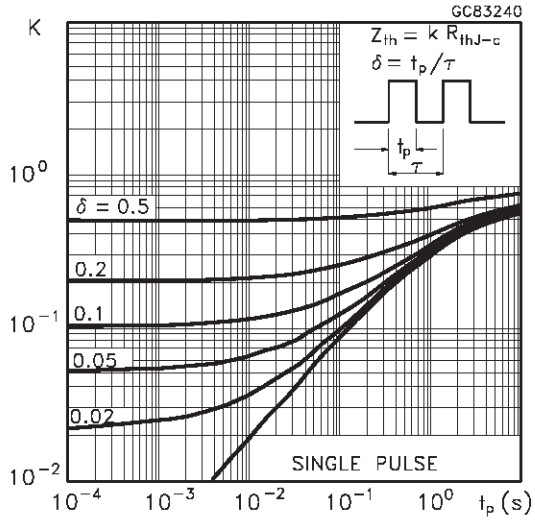
| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_{SD}$ | Source-drain Current | | n-ch<br>p-ch | | | 7<br>4 | ns<br>ns |
| $I_{SDM}$ (•) | Source-drain Current (pulsed) | | n-ch<br>p-ch | | | 28<br>16 | ns<br>ns |
| $V_{SD}$(*) | Forward On Voltage | $I_{SD}$ = 4 A, $V_{GS}$ = 0 | n-ch<br>p-ch | | | 1.2<br>1.2 | V<br>V |
| $t_{rr}$ | Reverse Recovery Time | **N-CHANNEL**<br>$I_{SD}$ = 7 A di/dt = 100 A/µs<br>$V_{DD}$ = 15 V $T_j$ = 150 °C | n-ch<br>p-ch | | 50<br>45 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | **P-CHANNEL**<br>$I_{SD}$ = 4 A di/dt = 100 A/µs<br>$V_{DD}$ = 15 V $T_j$ = 150 °C<br>(see test circuit, Figure 5) | n-ch<br>p-ch | | 40<br>36 | | nC |
| $I_{RRM}$ | Reverse Recovery Current | | n-ch<br>p-ch | | 1.6<br>1.6 | | A |

(*)Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
(•)Pulse width limited by safe operating area.

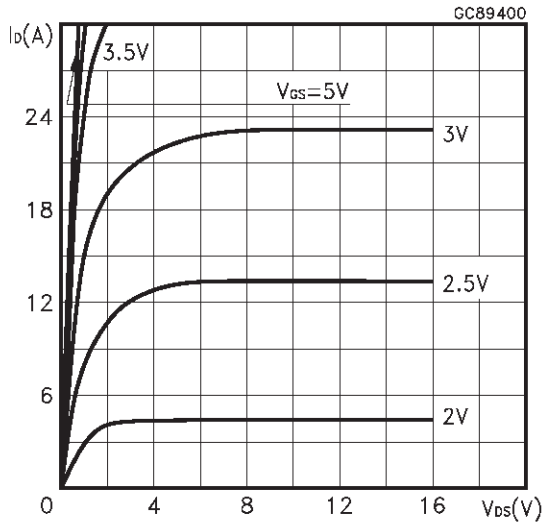
Safe Operating Area **n-ch**



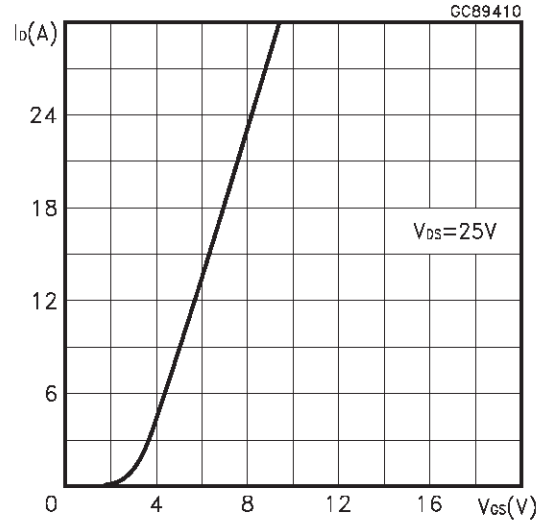

Thermal Impedance **n-ch**



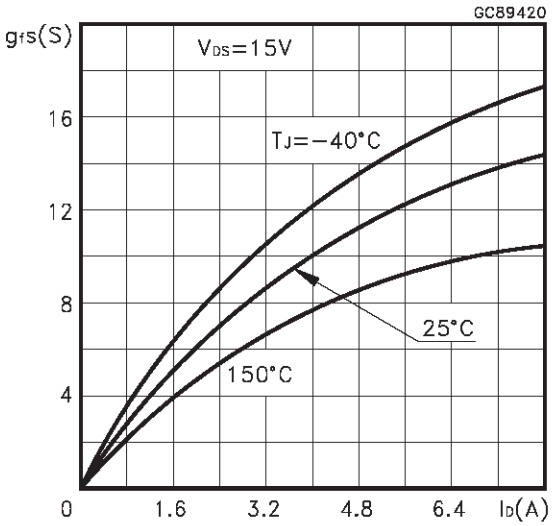

Output Characteristics **n-ch**



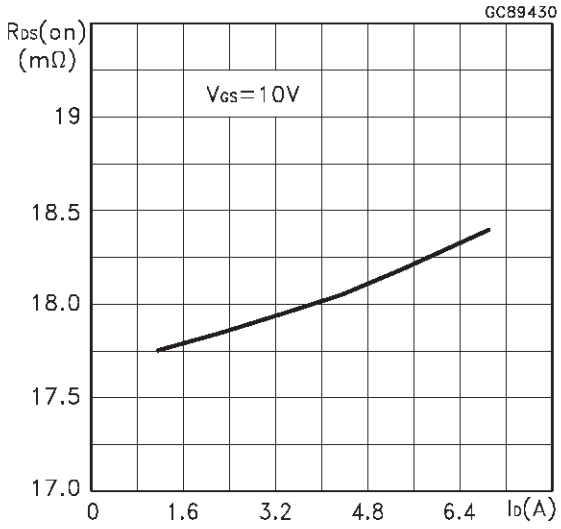

Transfer Characteristics **n-ch**



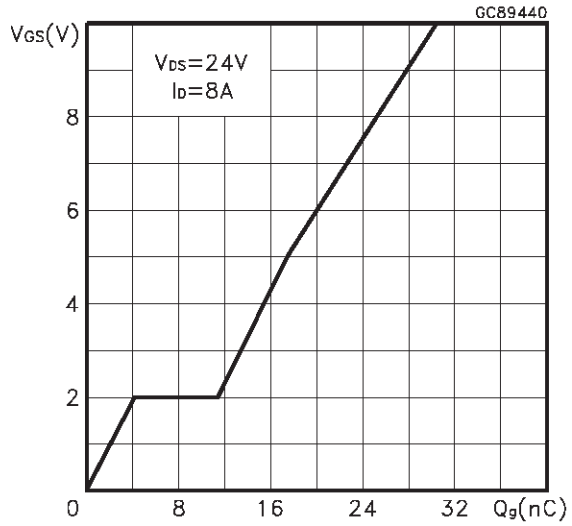

Transconductance **n-ch**



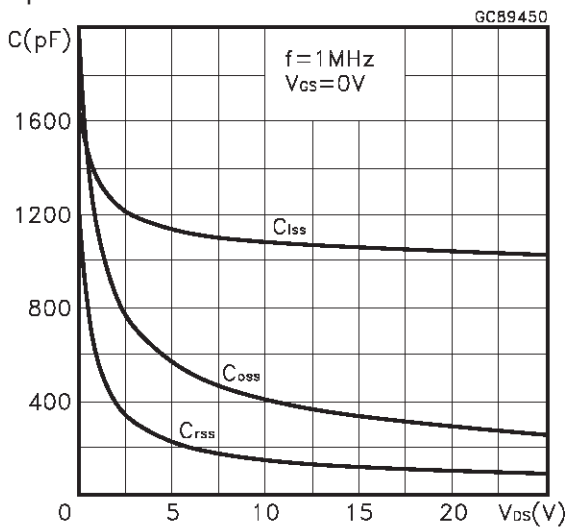

Static Drain-source On Resistance **n-ch**



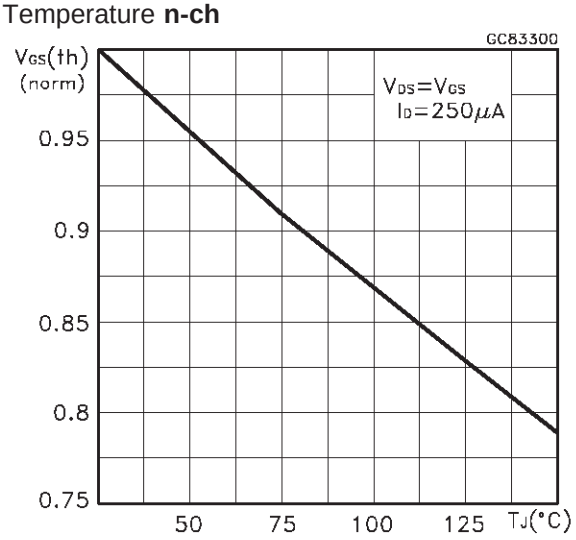
Gate Charge vs Gate-source Voltage **n-ch**



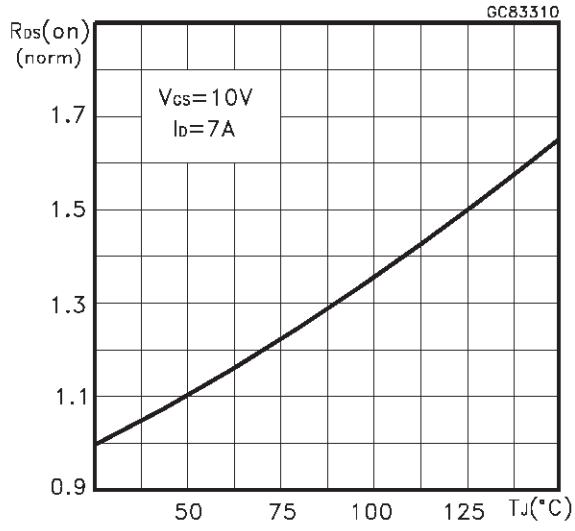

Capacitance Variations **n-ch**



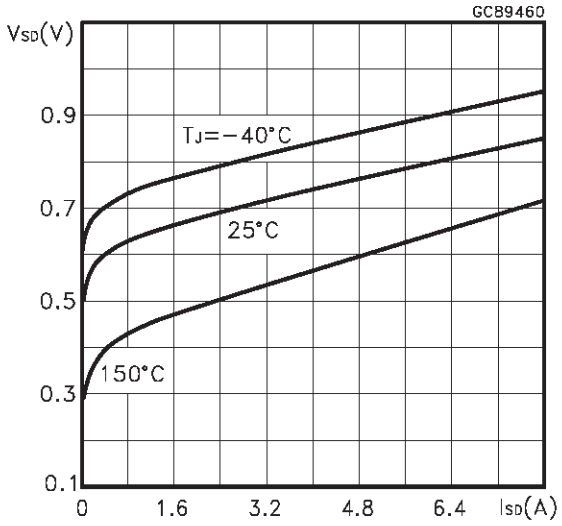

Normalized Gate Threshold Voltage vs Temperature **n-ch**



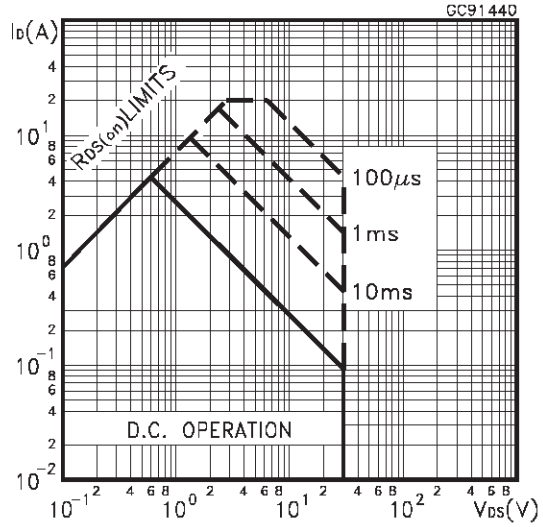

Normalized On Resistance vs Temperature **n-ch**



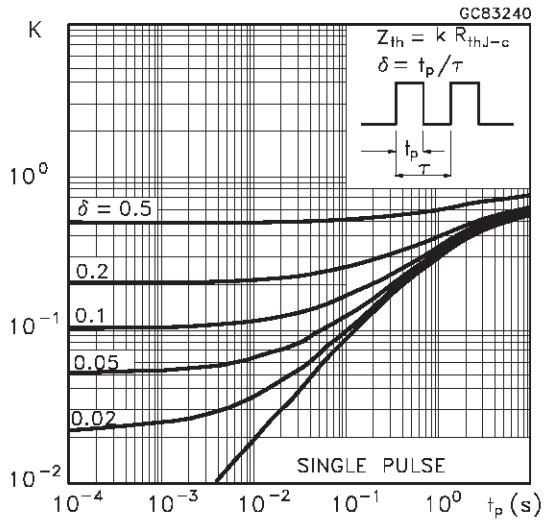

Source-drain Diode Forward Characteristics **n-ch**



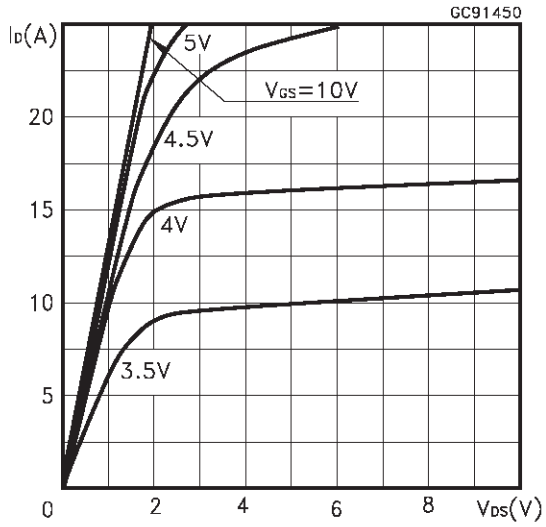
Safe Operating Area **p-ch**



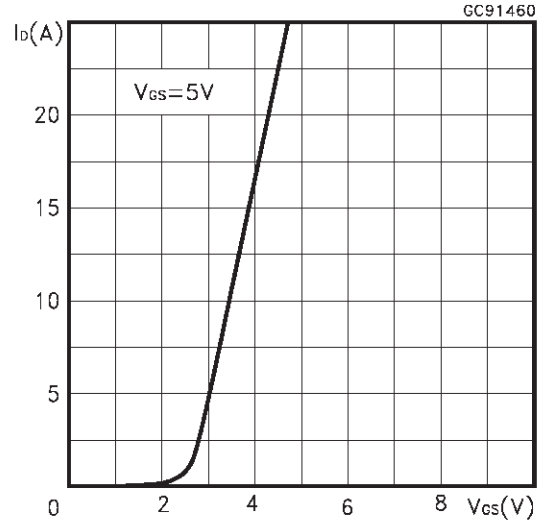

Thermal Impedance **p-ch**



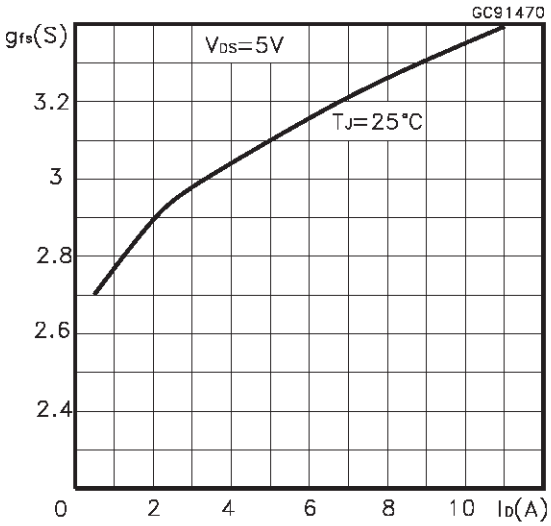

Output Characteristics **p-ch**



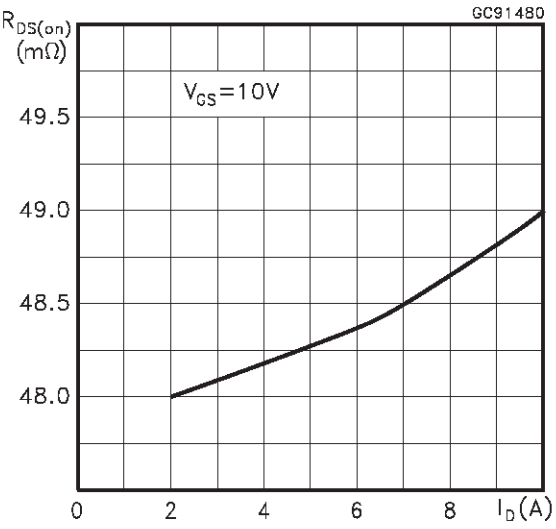

Transfer Characteristics **p-ch**



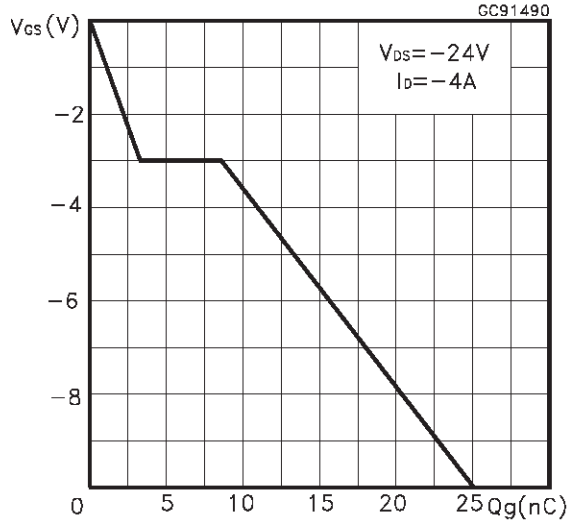

Transconductance **p-ch**



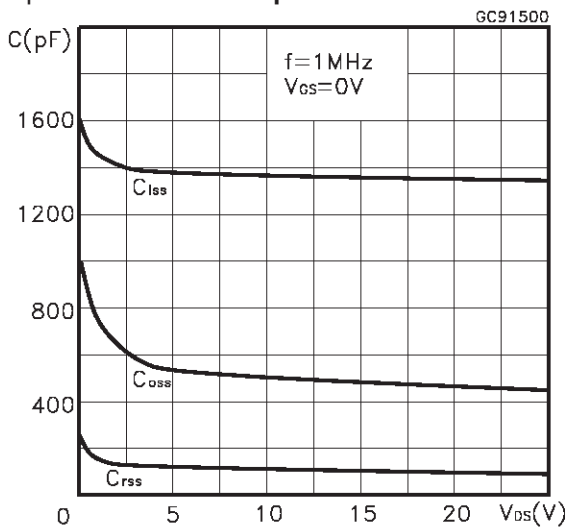

Static Drain-source On Resistance **p-ch**



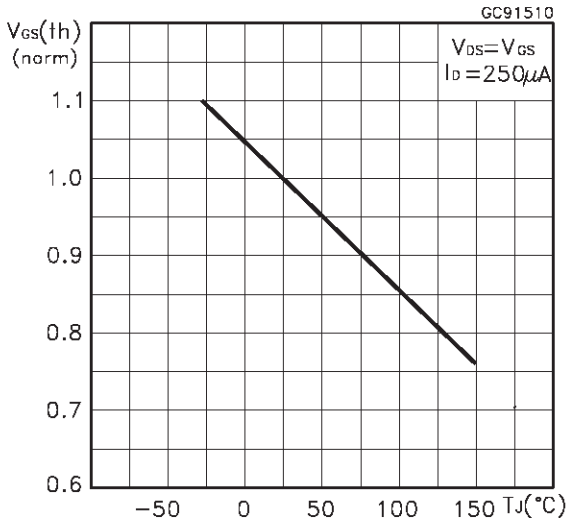
Gate Charge vs Gate-source Voltage **p-ch**



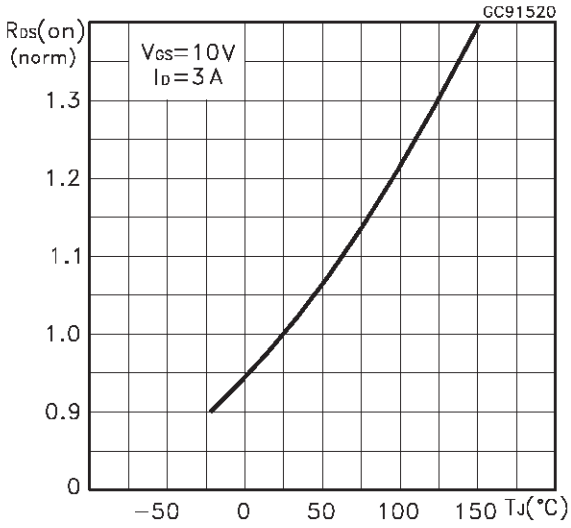

Capacitance Variations **p-ch**




Normalized Gate Threshold voltage vs Temperature **p-ch**




Static Drain-source On Resistance **p-ch**




Source-drain Diode Forward Characteristics **p-ch**

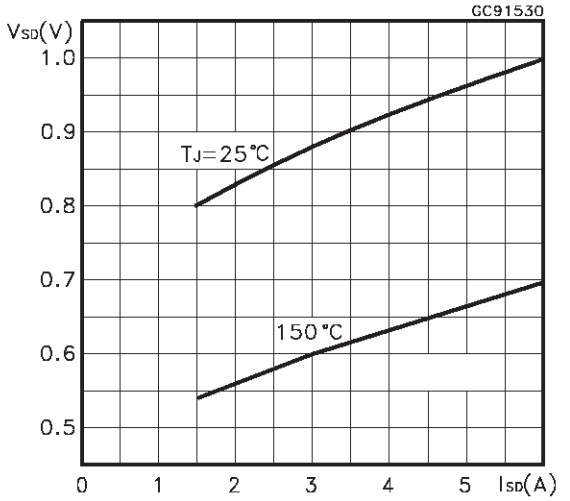


**Fig. 1:** Unclamped Inductive Load Test Circuit

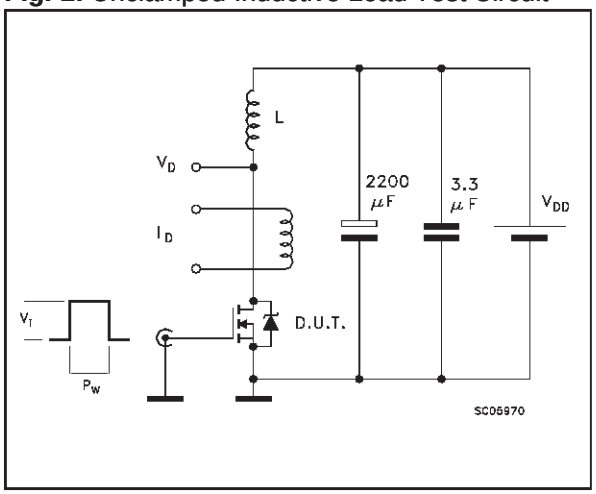



**Fig. 2:** Unclamped Inductive Waveform

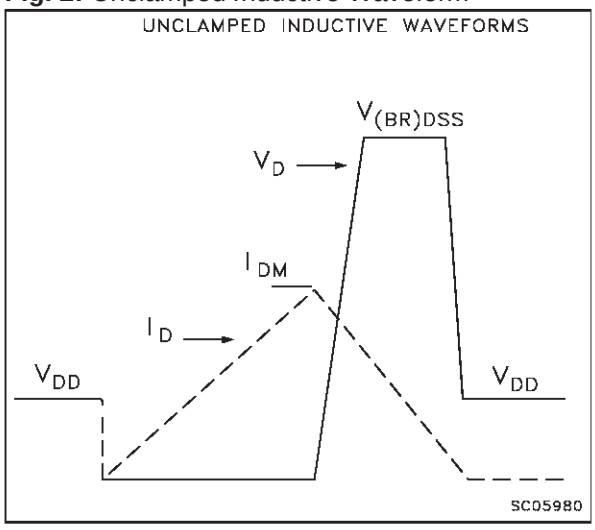



**Fig. 3:** Switching Times Test Circuits For Resistive Load

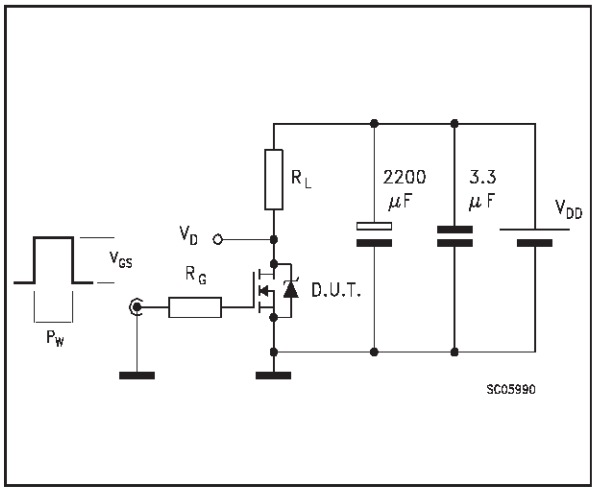



**Fig. 4:** Gate Charge test Circuit

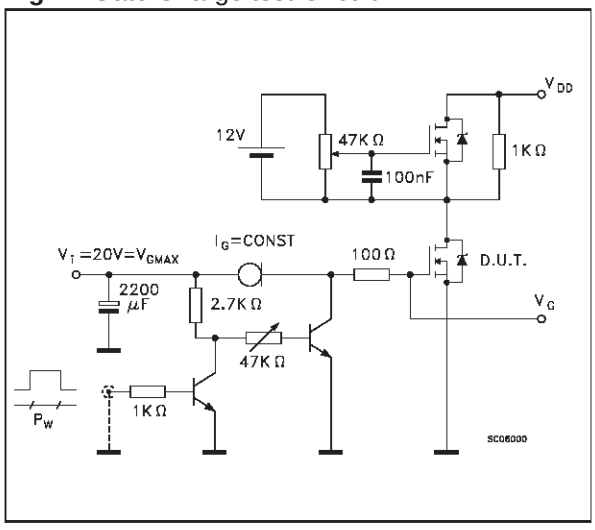
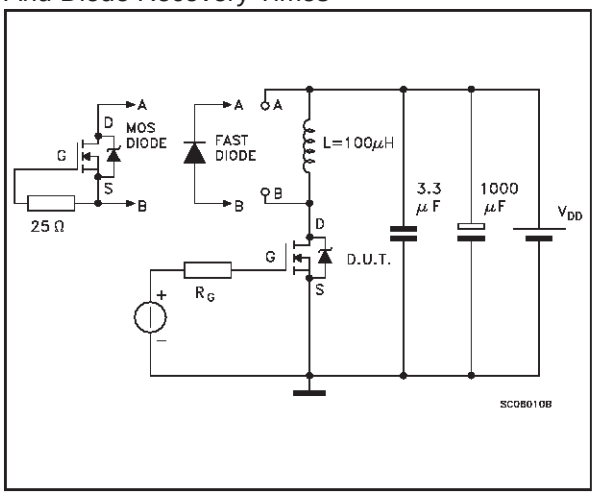
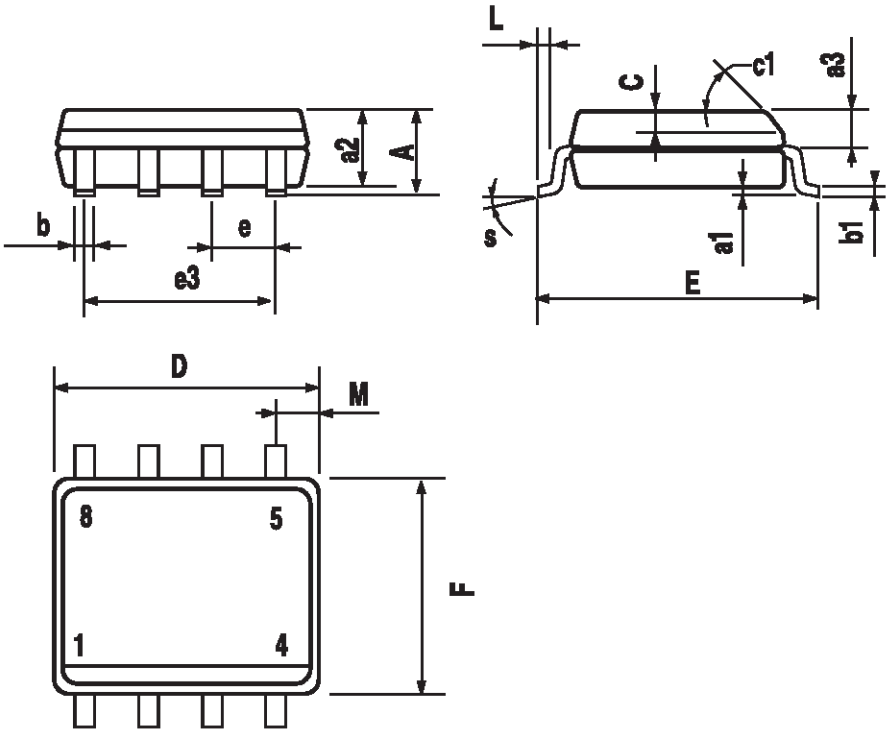



**Fig. 5:** Test Circuit For Inductive Load Switching And Diode Recovery Times



## 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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