



# STS7C4F30L

N-CHANNEL 30V - 0.018  $\Omega$  - 7A SO-8

P-CHANNEL 30V - 0.070  $\Omega$  - 4A SO-8

STripFET™ POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS7C4F30L(N-Channel)	30 V	<0.022 $\Omega$	7 A
STS7C4F30L(P-Channel)	30 V	<0.080 $\Omega$	4 A

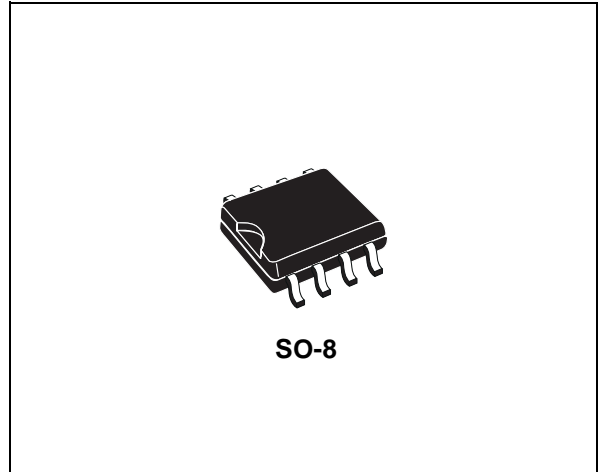
- TYPICAL R<sub>DS(on)</sub> (N-Channel) = 0.018  $\Omega$
- TYPICAL R<sub>DS(on)</sub> (P-Channel) = 0.070  $\Omega$
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY
- LOW THRESHOLD DRIVE

## DESCRIPTION

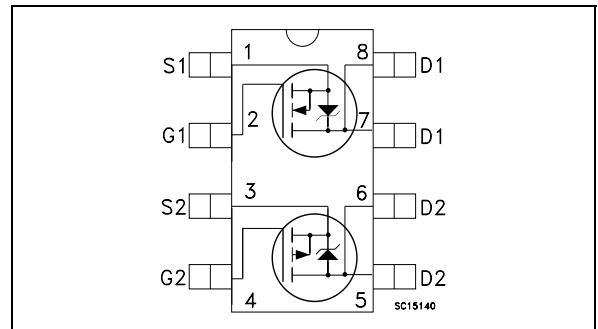
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

## APPLICATIONS

- DC/DC CONVERTERS
- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN CELLULAR PHONES



## INTERNAL SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	N-CHANNEL	P-CHANNEL	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	30	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )	30	30	V
V <sub>GS</sub>	Gate- source Voltage	$\pm 20$	$\pm 20$	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C Single Operating	7	4	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C Single Operating	4.4	2.5	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	28	16	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C Dual Operating	1.6		W
	Total Dissipation at T <sub>C</sub> = 25°C Single Operating	2		W
T <sub>stg</sub>	Storage Temperature	-60 to 150		°C
T <sub>j</sub>	Max. Operating Junction Temperature	150		°C

(\*) Pulse width limited by safe operating area.

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

# STS7C4F30L

## THERMAL DATA

Rthj-amb(1)	Thermal Resistance Junction-ambient	Single Operation	62.5	°C/W
		Dual Operating	78	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose		300	°C

(1) 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	n-ch p-ch	30 30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating T <sub>C</sub> = 125°C				1 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20V V <sub>GS</sub> = ± 20V	n-ch p-ch			±100 ±100	nA 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	n-ch p-ch	1 1	1.6 1.6	2.5 2.5	V V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 3.5 A V <sub>GS</sub> = 10 V I <sub>D</sub> = 2 A V <sub>GS</sub> = 4.5 V I <sub>D</sub> = 3.5 A V <sub>GS</sub> = 4.5 V I <sub>D</sub> = 2 A	n-ch p-ch n-ch p-ch		0.018 0.070 0.021 0.085	0.022 0.080 0.026 0.10	Ω Ω Ω 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> = 3.5 A V <sub>DS</sub> = 15 V I <sub>D</sub> = 2 A	n-ch p-ch		10 10		S S
C <sub>iss</sub>	Input Capacitance		n-ch p-ch		1050 1350		pF pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0	n-ch p-ch		250 490		pF pF
C <sub>rss</sub>	Reverse Transfer Capacitance		n-ch p-ch		85 130		pF pF

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	<b>N-CHANNEL</b> $V_{DD} = 15\text{ V}$ $I_D = 3.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$	n-ch		22		ns
			p-ch		25		ns
$t_r$	Rise Time	<b>P-CHANNEL</b> $V_{DD} = 15\text{ V}$ $I_D = 2\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1)	n-ch		60		ns
			p-ch		35		ns
$Q_g$	Total Gate Charge	<b>N-CHANNEL</b> $V_{DD} = 24\text{ V}$ $I_D = 7\text{ A}$ $V_{GS} = 5\text{ V}$	n-ch		17.5	23	nC
			p-ch		12.5	16	nC
$Q_{gs}$	Gate-Source Charge	<b>P-CHANNEL</b> $V_{DD} = 24\text{ V}$ $I_D = 4\text{ A}$ $V_{GS} = 5\text{ V}$ (see test circuit, Figure 2)	n-ch		4		nC
			p-ch		5		nC
$Q_{gd}$	Gate-Drain Charge		n-ch		7		nC
			p-ch		3		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off Delay Time	<b>N-CHANNEL</b> $V_{DD} = 15\text{ V}$ $I_D = 3.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$	n-ch		42		ns
			p-ch		125		ns
$t_f$	Fall Time	<b>P-CHANNEL</b> $V_{DD} = 15\text{ V}$ $I_D = 2\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 1)	n-ch		10		ns
			p-ch		35		ns

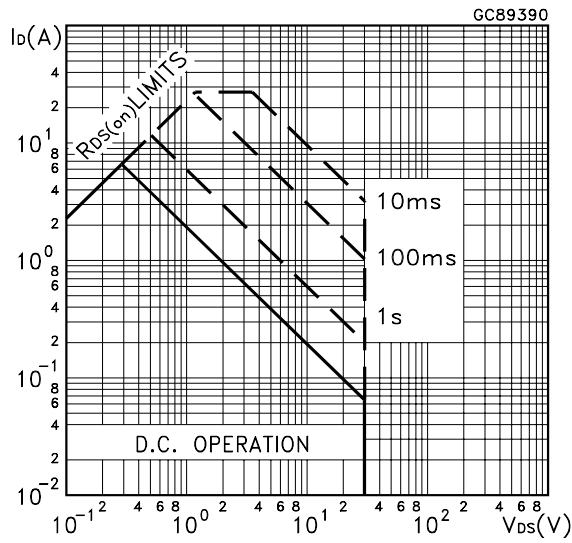
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current		n-ch			7	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)		p-ch			4	A
			n-ch			28	A
			p-ch			16	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 7\text{ A}$ $V_{GS} = 0$ $I_{SD} = 4\text{ A}$ $V_{GS} = 0$	n-ch			1.2	V
			p-ch			1.2	V
$t_{rr}$	Reverse Recovery Time	<b>N-CHANNEL</b> $I_{SD} = 7\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$	n-ch		50		ns
			p-ch		45		ns
$Q_{rr}$	Reverse Recovery Charge	<b>P-CHANNEL</b> $I_{SD} = 4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, Figure 3)	n-ch		40		nC
$I_{RRM}$	Reverse Recovery Current		p-ch		36		nC
			n-ch		1.6		A
			p-ch		1.6		A

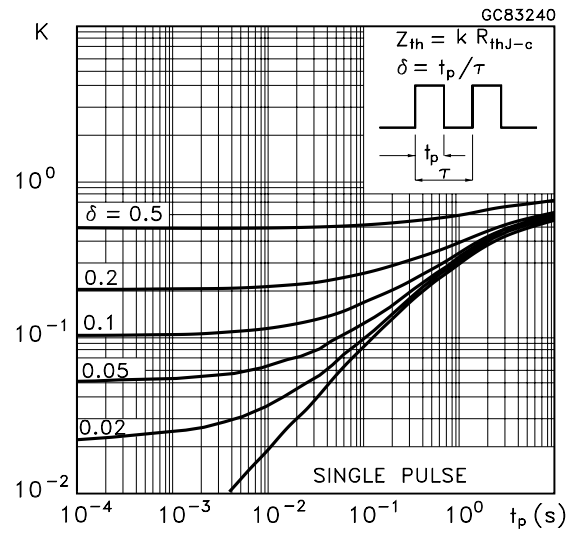
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 (•) Pulse width limited by safe operating area.

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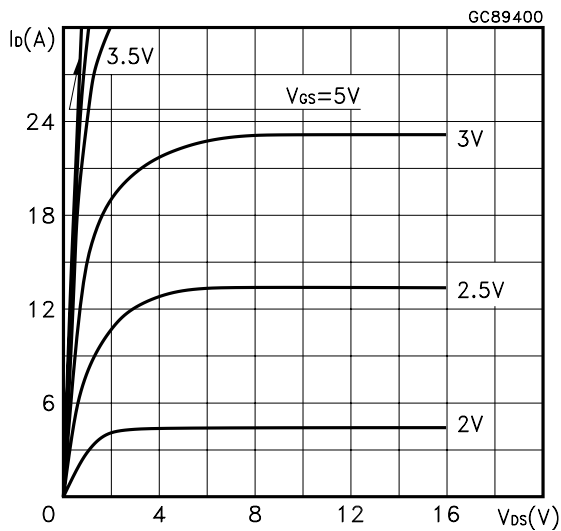
## Safe Operating Area n-ch



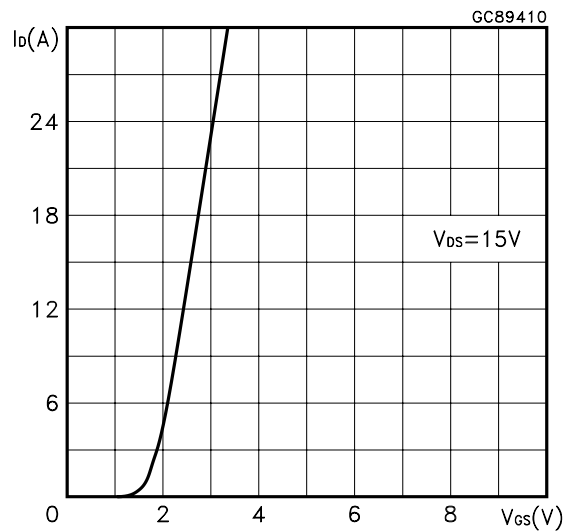
## Thermal Impedance n-ch



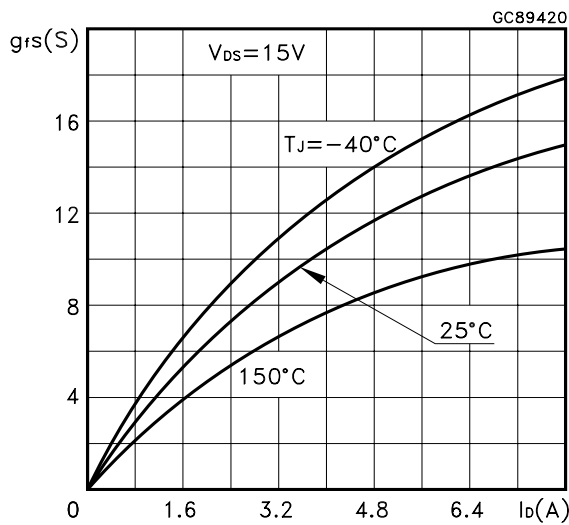
## Output Characteristics n-ch



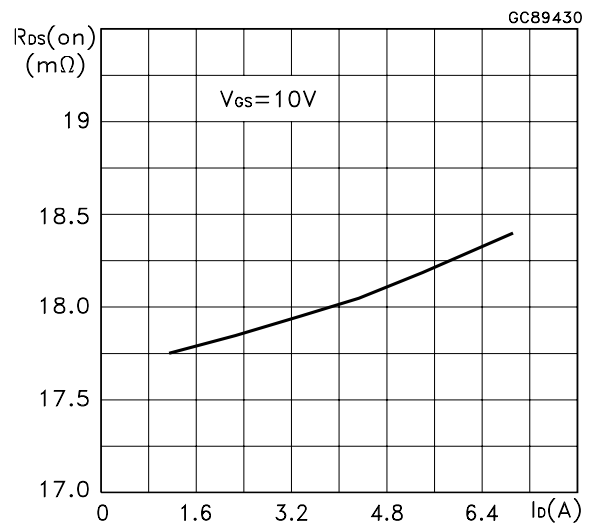
## Transfer Characteristics n-ch



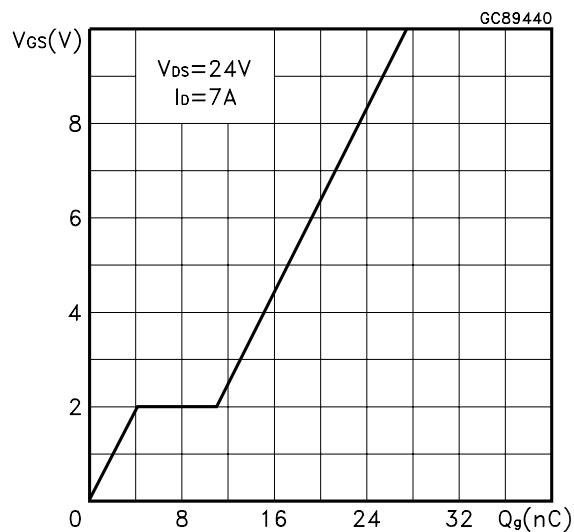
## Transconductance n-ch



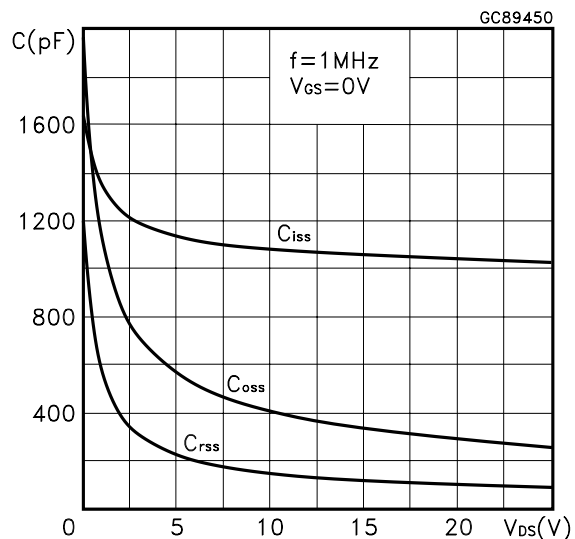
## Static Drain-source On Resistance n-ch



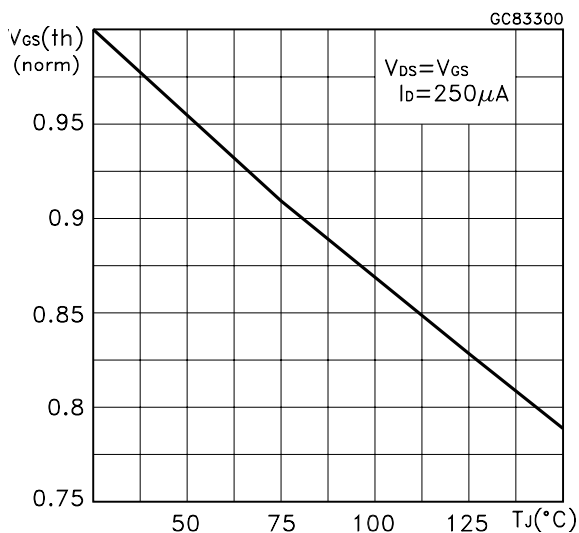
Gate Charge vs Gate-source Voltage **n-ch**



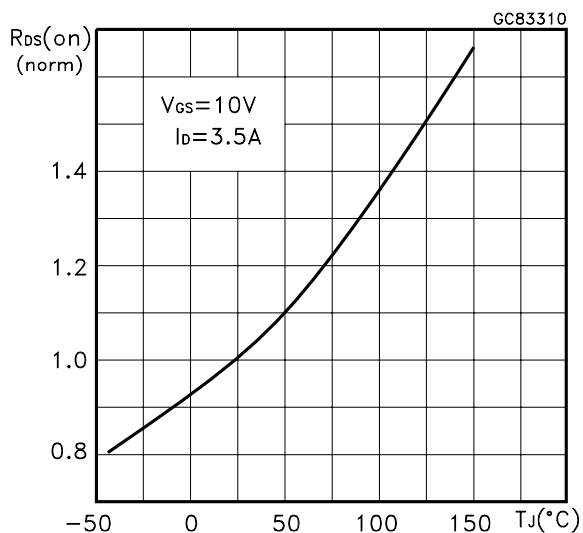
Capacitance Variations **n-ch**



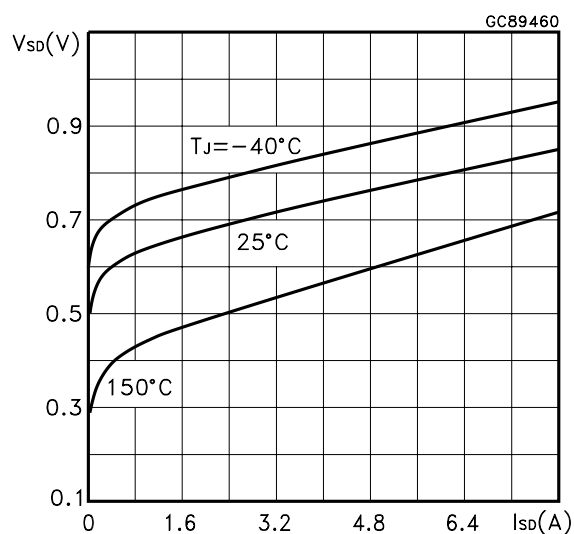
Normalized Gate Threshold Voltage vs Temperature **n-ch**



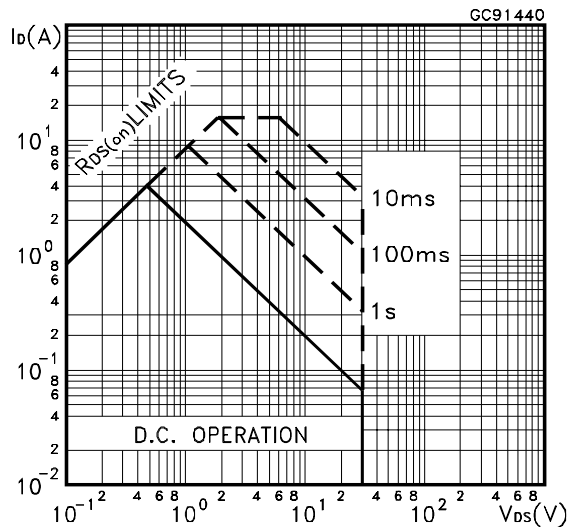
Normalized on Resistance vs Temperature **n-ch**



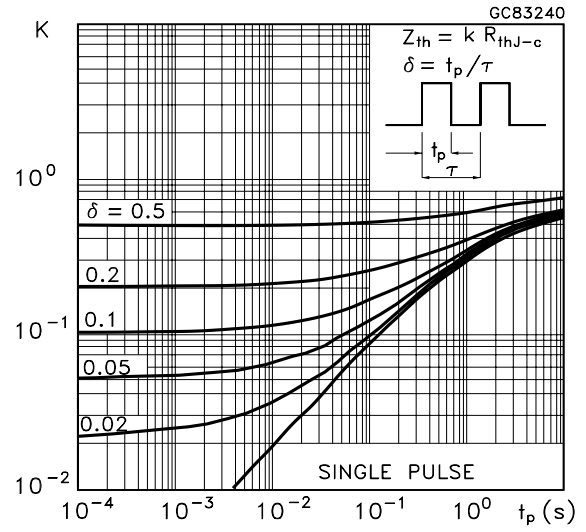
Source-drain Diode Forward Characteristics **n-ch**



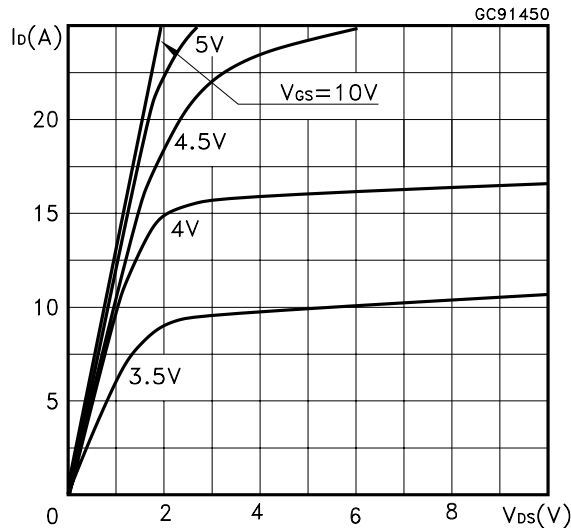
Safe Operating Area **p-ch**



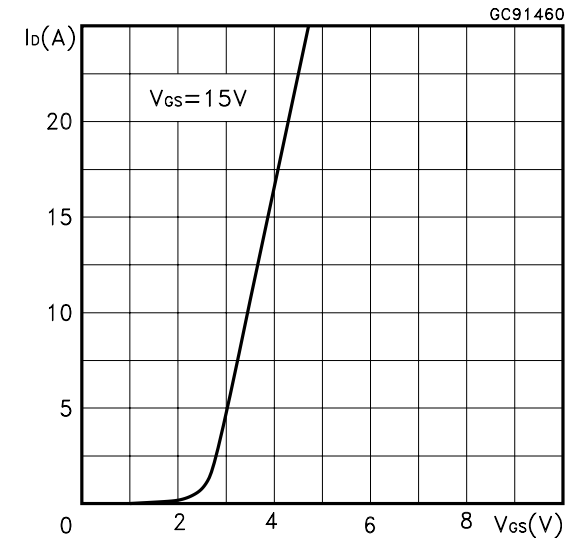
Thermal Impedance **p-ch**



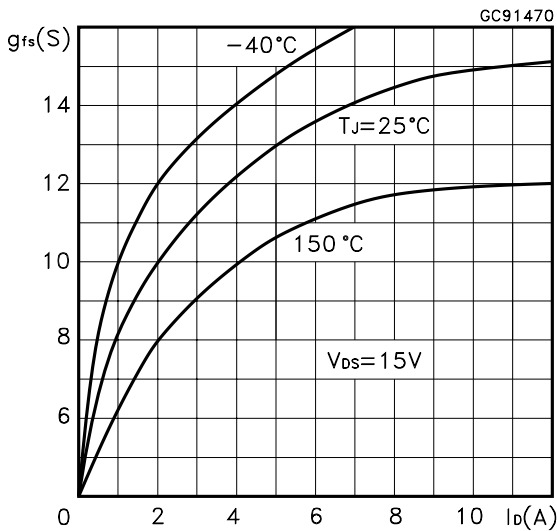
Output Characteristics **p-ch**



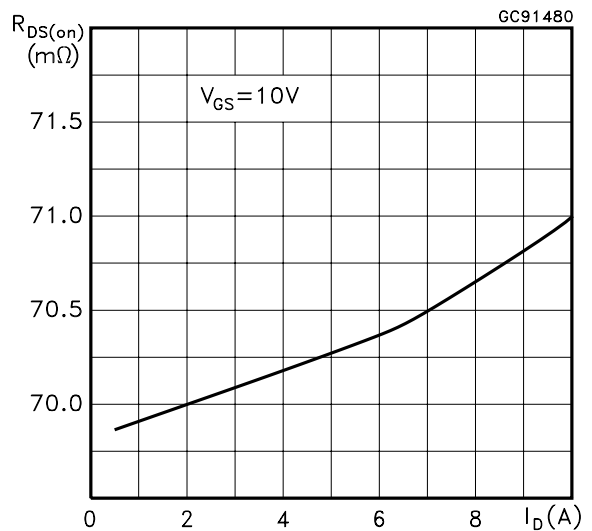
Transfer Characteristics **p-ch**



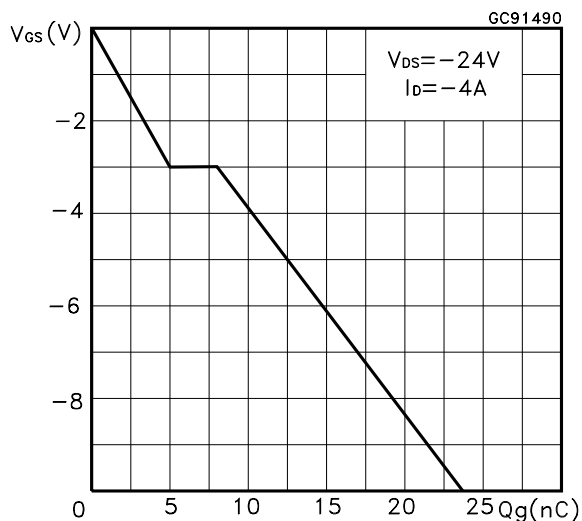
Transconductance **p-ch**



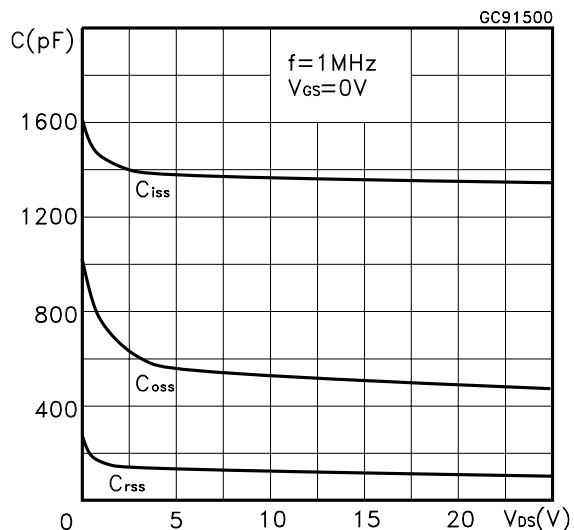
Static Drain-source On Resistance **p-ch**



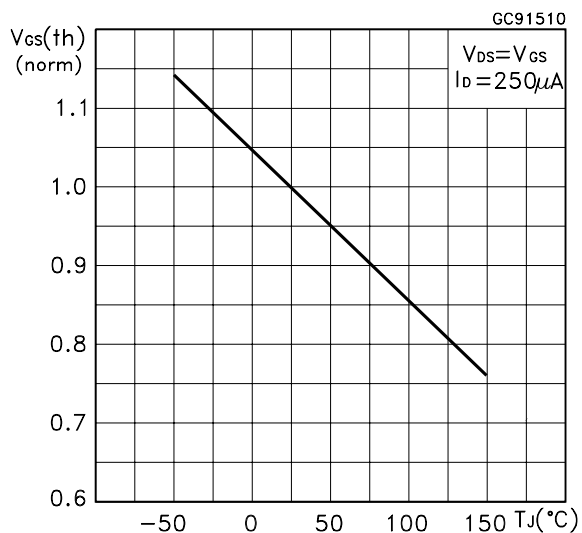
Gate Charge vs Gate-source Voltage **p-ch**



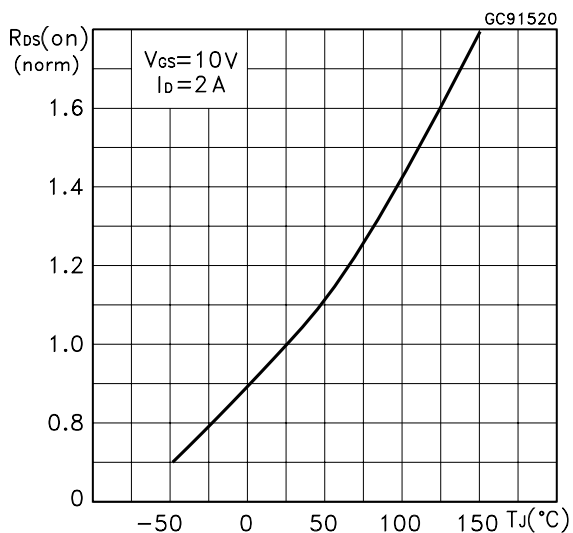
Capacitance Variations **p-ch**



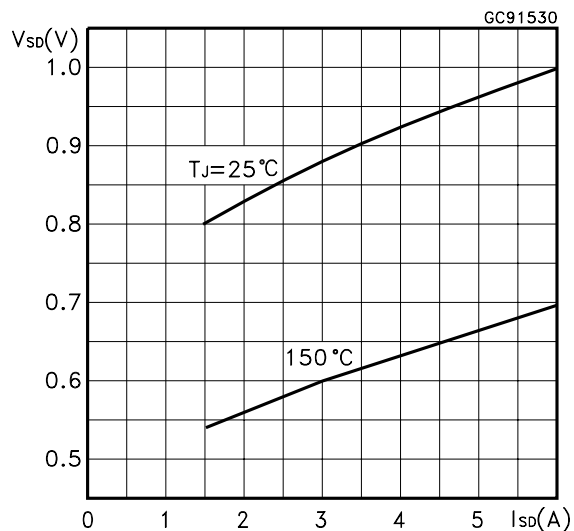
Normalized Gate Threshold Voltage vs Temperature **p-ch**



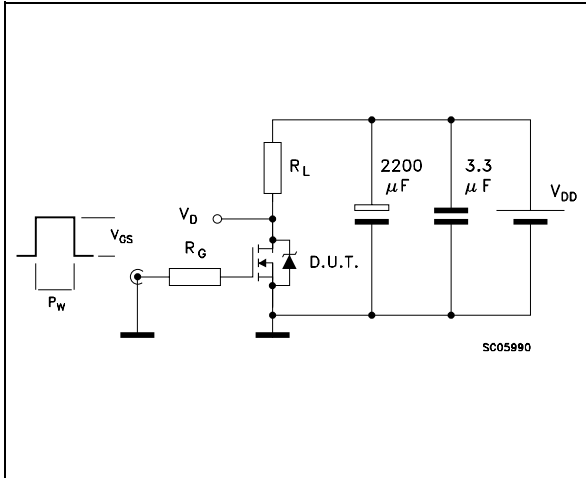
Normalized on Resistance vs Temperature **p-ch**



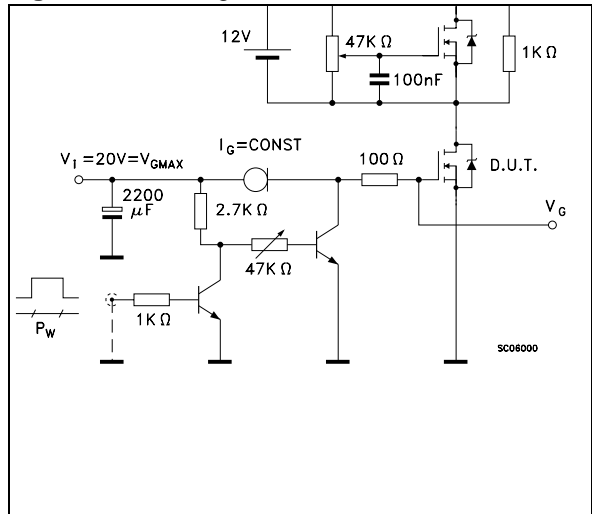
Source-drain Diode Forward Characteristics **p-ch**



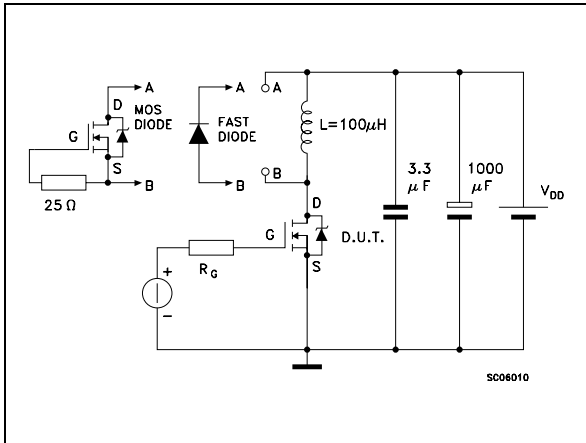
**Fig. 1: Switching Times Test Circuits For Resistive Load**



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



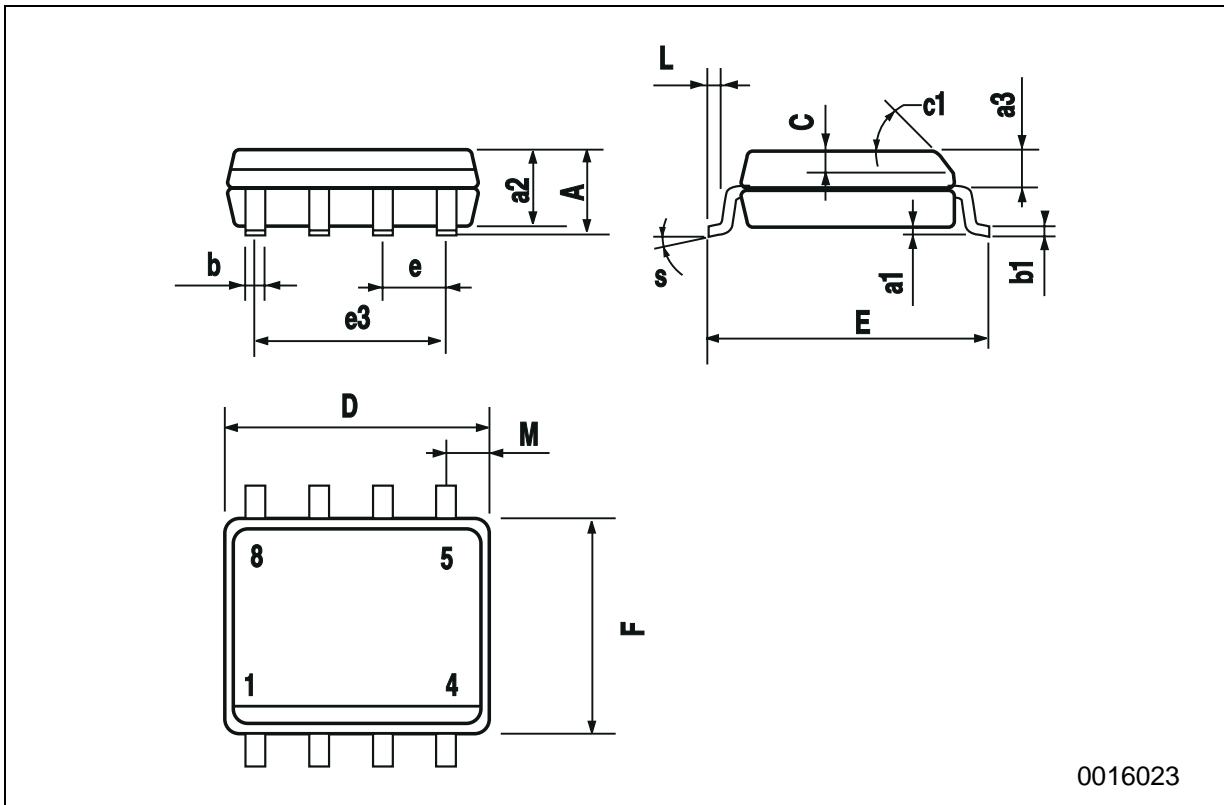
**Fig. 3: Test Circuit For Diode Recovery Behaviour**





**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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