

## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

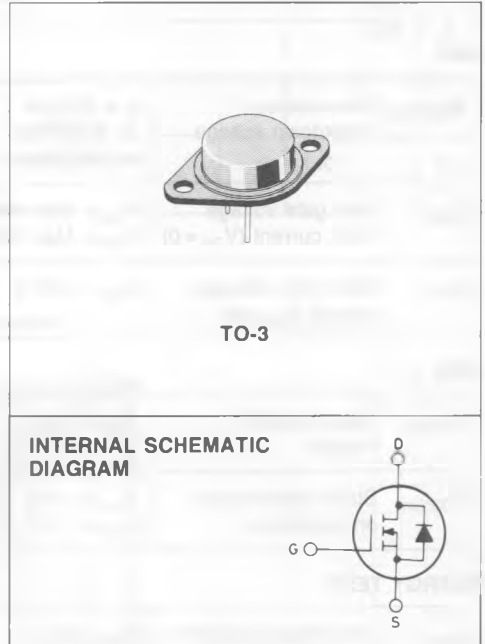
TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
SGSP591	60 V	0.033 Ω	40 A
SGSP592	50 V	0.033 Ω	40 A

- HIGH SPEED SWITCHING APPLICATIONS
- 50 - 60 VOLTS FOR INVERTERS AND UPS
- HIGH CURRENT - V<sub>DS(on)</sub> ≤ 1V at 20A
- RATED FOR UNCLAMPED INDUCTIVE SWITCHING (ENERGY TEST) ♦
- EASY DRIVE - REDUCES SIZE AND COST

### INDUSTRIAL APPLICATIONS:

- DC/DC CONVERTERS
- MOTOR CONTROLS

N - channel enhancement mode POWER MOS field effect transistors. Easy drive and very fast switching times make these POWER MOS transistors ideal for high speed switching circuits applications such as DC/DC converters, UPS, inverters, battery chargers and solar power converters.



### ABSOLUTE MAXIMUM RATINGS

	SGSP591	SGSP592	
V <sub>DS</sub>	60	50	V
V <sub>DGR</sub>	60	50	V
V <sub>GS</sub>		±20	V
I <sub>D</sub>	40		A
I <sub>D</sub>	25		A
I <sub>DM</sub> (*)	160		A
P <sub>tot</sub>	150		W
	1.2		W/°C
T <sub>stg</sub>	-65 to 150		°C
T <sub>j</sub>	150		°C

(\*) Pulse width limited by safe operating area  
 ♦ Introduced in 1988 week 44

**THERMAL DATA**

$R_{thj-case}$	Thermal resistance junction-case	max	0.83	°C/W
$T_L$	Maximum lead temperature for soldering purpose		275	°C

**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25^\circ\text{C}$  unless otherwise specified)

Parameters	Test Conditions	Min.	Typ.	Max.	Unit
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**OFF**

$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ for <b>SGSP591</b> for <b>SGSP592</b>	$V_{GS} = 0$	60 50		V V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$	$T_c = 125^\circ\text{C}$		250 1000	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\ \text{V}$			$\pm 100$	nA

**ON (\*)**

$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$	$I_D = 250\ \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\ \text{V}$ $V_{GS} = 10\ \text{V}$	$I_D = 20\ \text{A}$ $I_D = 20\ \text{A}$			33 66	m $\Omega$ m $\Omega$

**ENERGY TEST**

$I_{UIS}$	Unclamped inductive switching current (single pulse)	$V_{DD} = 30\ \text{V}$ starting $T_j = 25^\circ\text{C}$	$L = 100\ \mu\text{H}$	40			A
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**DYNAMIC**

$g_{fs}$	Forward transconductance	$V_{DS} = 25\ \text{V}$	$I_D = 20\ \text{A}$	10			mho	
$C_{iss}$	Input capacitance	$V_{DS} = 25\ \text{V}$ $V_{GS} = 0$	$f = 1\ \text{MHz}$		1900	2800	pF	
$C_{oss}$	Output capacitance					1500		pF
$C_{rss}$	Reverse transfer capacitance						850	

**SWITCHING**

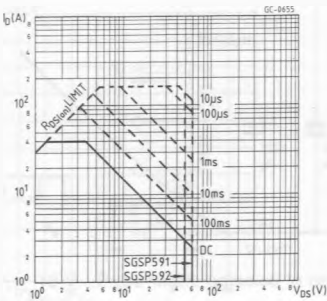
$t_{d(on)}$	Turn-on time	$V_{DD} = 25\ \text{V}$	$I_D = 20\ \text{A}$		35	45	ns
$t_r$	Rise time	$V_i = 10\ \text{V}$	$R_i = 4.7\ \Omega$		110	145	ns
$t_{d(off)}$	Turn-off delay time	(see test circuit)			90	120	ns
$t_f$	Fall time				55	70	ns

ELECTRICAL CHARACTERISTICS (Continued)

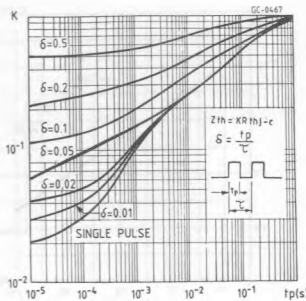
Parameters	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (*)$	Source-drain current Source-drain current (pulsed)			40 160	A A
$V_{SD}$	Forward on voltage	$I_{SD} = 40\text{ A}$	$V_{GS} = 0$	1.4	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 40\text{ A}$ $di/dt = 25\text{ A}/\mu\text{s}$	$V_{GS} = 0$	140	ns

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

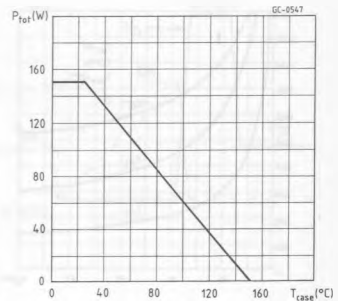
Safe operating areas



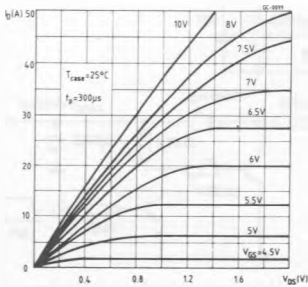
Thermal impedance



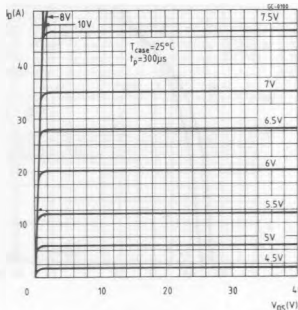
Derating curve



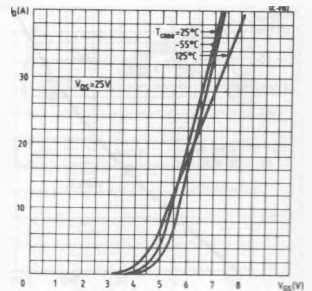
Output characteristics



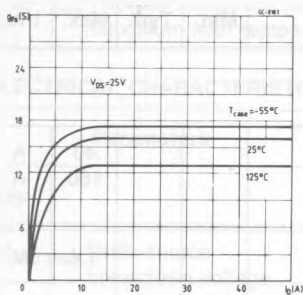
Output characteristics



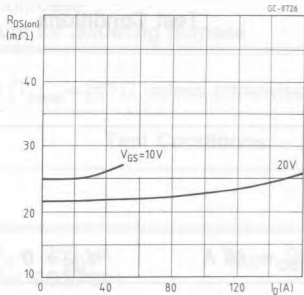
Transfer characteristics



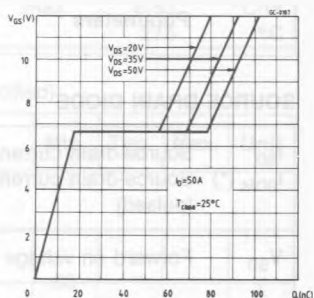
Transconductance



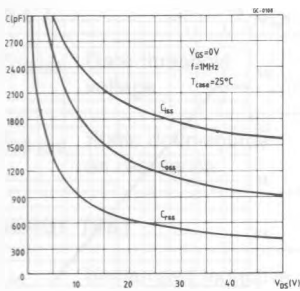
Static drain-source on resistance



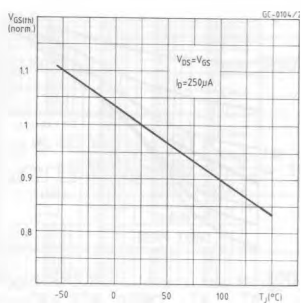
Gate charge vs gate-source voltage



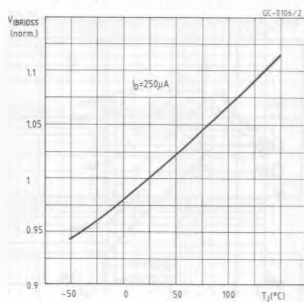
Capacitance variation



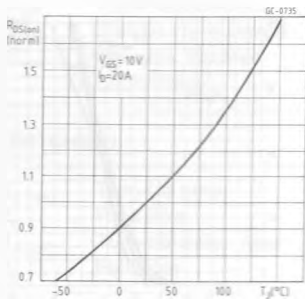
Normalized gate threshold voltage vs temperature



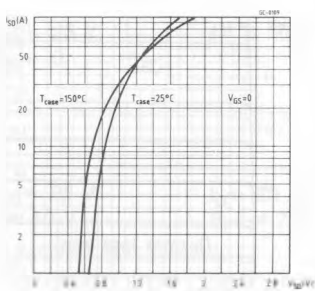
Normalized breakdown voltage vs temperature



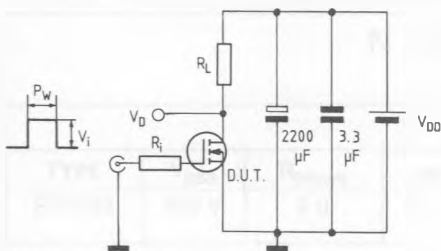
Normalized on resistance vs temperature



Source-drain diode forward characteristics



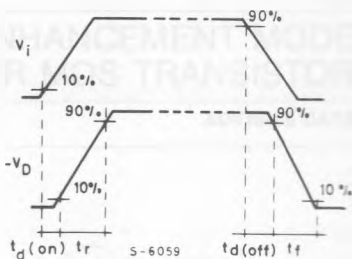
Switching times test circuit for resistive load



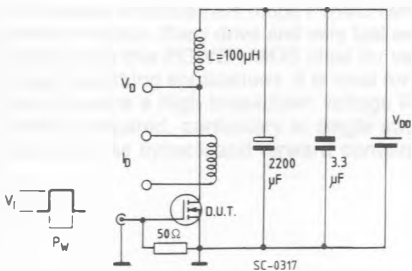
Pulse width  $\leq 100 \mu\text{s}$   
 Duty cycle  $\leq 2\%$

SC-0008/1

Switching time waveforms for resistive load



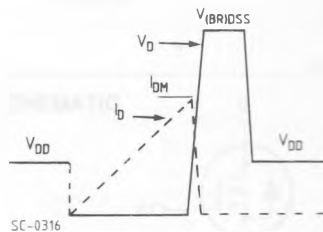
Unclamped inductive load test circuit



$V_i = 12 \text{ V}$  - Pulse width: adjusted to obtain specified  $I_{DM}$

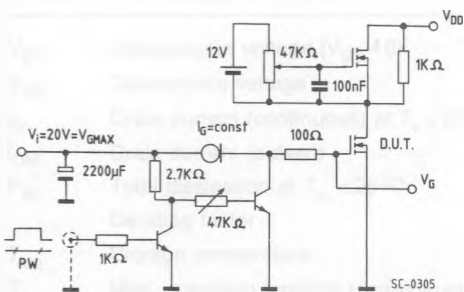
SC-0317

Unclamped inductive waveforms



SC-0316

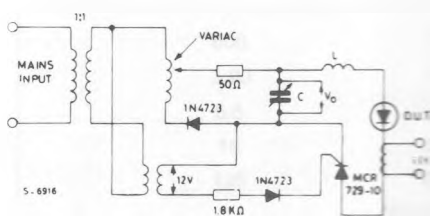
Gate charge test circuit



PW adjusted to obtain required  $V_G$

SC-0305

Body-drain diode  $t_{rr}$  measurement  
 Jedec test circuit



S-6916