SGS-THOMSON MICROELECTRONICS

SGSP311

## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
SGSP311	100 V	0.3 Ω	11 A

- HIGH SPEED SWITCHING APPLICATIONS
- 100V FOR DC/DC CONVERTERS
- RATED FOR UNCLAMPED INDUCTIVE SWITCHING (ENERGY TEST) ◆
- ULTRA FAST SWITCHING
- EASY DRIVE FOR REDUCED COST AND SIZE

INDUSTRIAL APPLICATIONS:
- SWITCHING MODE POWER SUPPLIES
- STEPPER MOTOR CONTROL

N - channel enhancement mode POWER MOS field effect transistor. Easy drive and very fast switching times make this POWER MOS transistor ideal for high speed switching applications. Typical uses include DC/DC converters, stepper motors and solenoid drives.
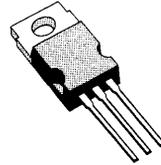
TO-220

INTERNAL SCHEMATIC DIAGRAM
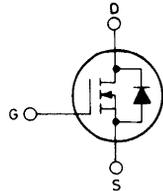
ABSOLUTE MAXIMUM RATINGS

V_{DS}	Drain-source voltage ($V_{GS} = 0$)	100	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20$ KΩ)	100	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current (cont.) at $T_c = 25°C$	11	A
I_D	Drain current (cont.) at $T_c = 100°C$	7	A
I_{DM} (*)	Drain current (pulsed)	30	A
P_{tot}	Total dissipation at $T_c < 25°C$	75	W
	Derating factor	0.6	W/°C
T_{stg}	Storage temperature	− 65 to 150	°C
T_j	Max. operating junction temperature	150	°C

(*) Pulse width limited by safe operating area
◆ Introduced in 1989 week 1

THERMAL DATA

$R_{thj - case}$	Thermal resistance junction-case	max	1.67	°C/W
T_L	Maximum lead temperature for soldering purpose		275	°C

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

Parameters	Test Conditions	Min.	Typ.	Max.	Unit

OFF

$V_{(BR)\,DSS}$	Drain-source breakdown voltage	I_D = 250 μA $\qquad$ V_{GS} = 0	100			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $\quad$ T_c = 125°C			250 1000	μA μA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ±20 V			±100	nA

ON (*)

$V_{GS\,(th)}$	Gate threshold voltage	V_{DS} = V_{GS} $\qquad$ I_D = 250 μA	2		4	V
$R_{DS\,(on)}$	Static drain-source on resistance	V_{GS} = 10 V $\quad$ I_D = 5.5 A V_{GS} = 10 V $\quad$ I_D = 5.5 A $\quad$ T_c = 100°C			0.3 0.6	Ω Ω

ENERGY TEST

I_{UIS}	Unclamped inductive switching current (single pulse)	V_{DD} = 30 V $\qquad$ L = 100 μH starting T_j = 25°C	11			A

DYNAMIC

g_{fs}	Forward transconductance	V_{DS} = 25 V $\qquad$ I_D = 5.5 A	2			mho
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V $\qquad$ f = 1 MHz V_{GS} = 0		375	480 230 110	pF pF pF

SWITCHING

$t_{d\,(on)}$ t_r $t_{d\,(off)}$ t_f	Turn-on time Rise time Turn-off delay time Fall time	V_{DD} = 50 V $\qquad$ I_D = 5.5 A V_i = 10 V $\qquad$ R_i = 4.7 Ω (see test circuit)		15 40 40 20	20 55 55 30	ns ns ns ns

SGS-THOMSON MICROELECTRONICS

ELECTRICAL CHARACTERISTICS (Continued)

Parameters		Test Conditions	Min.	Typ.	Max.	Unit

SOURCE DRAIN DIODE

	Parameters	Test Conditions		Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (•)	Source-drain current Source-drain current (pulsed)					11 44	A A
V_{SD}	Forward on voltage	$I_{SD} = 11$ A	$V_{GS} = 0$			1.35	V
t_{rr}	Reverse recovery time	$I_{SD} = 11$ A di/dt = 25 A/μs	$V_{GS} = 0$		140		ns

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

Safe operating areas
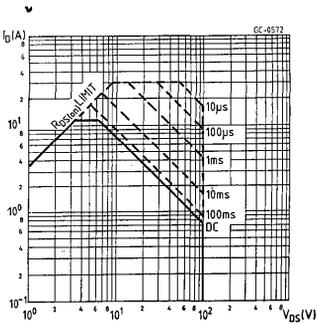
Thermal impedance
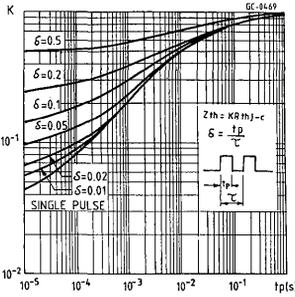
Derating curve
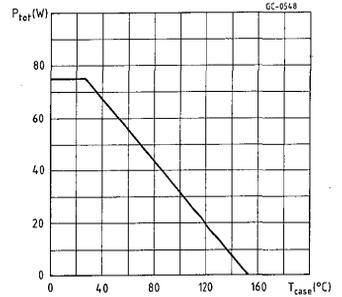
Output characteristics
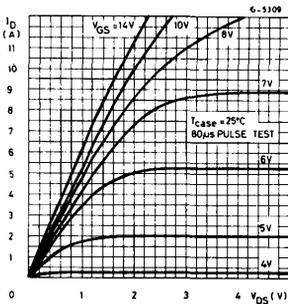
Output characteristics
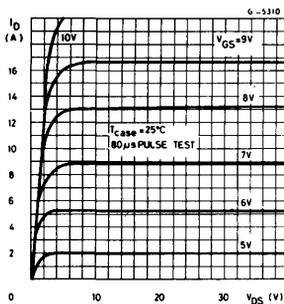
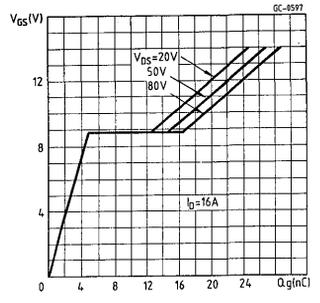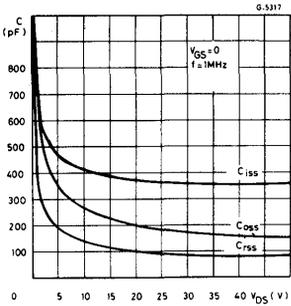Transfer characteristics
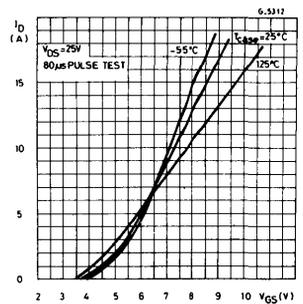
Transconductance
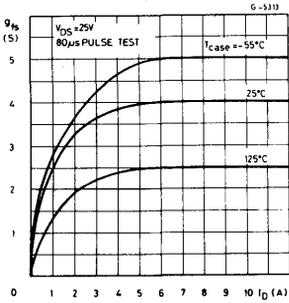
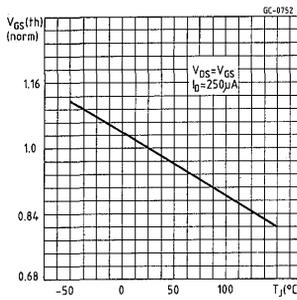## Static drain-source on resistance
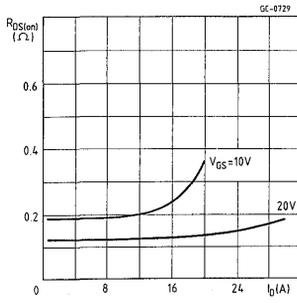
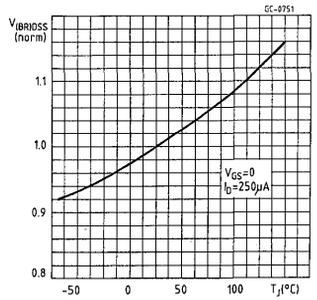## Gate charge vs gate-source voltage
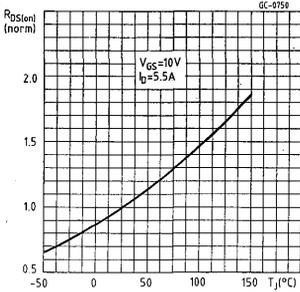

Capacitance variation
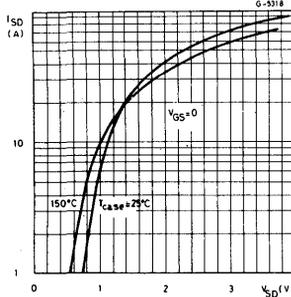

Normalized gate threshold voltage vs temperature

Normalized breakdown voltage vs temperature

Normalized on resistance vs temperature
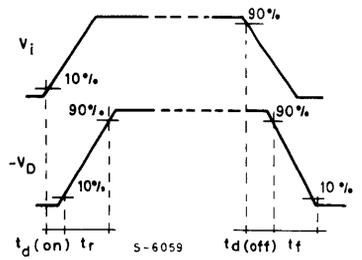

Source-drain diode forward characteristics

SGS-THOMSON
MICROELECTRONICS

Switching times test circuit for resistive load

P_W

R_L

V_D

R_i

V_i

D.U.T.

2200 μF

3.3 μF

V_{DD}

SC-0008/1
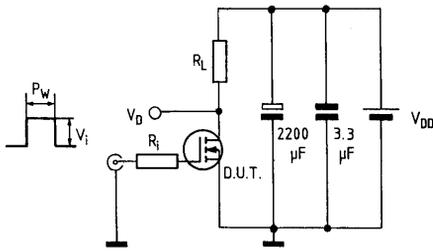
Pulse width ⩽ 100 μs
Duty cycle ⩽ 2%

Switching time waveforms for resistive load

V_i

90%

10%

90%

$-V_D$

90%

10%

90%

10%

$t_d(on)$ t_r S-6059 $t_d(off)$ t_f

Unclamped inductive load test circuit

L=100μH

V_D

I_D

V_i

P_W

50Ω

D.U.T.

2200 μF

3.3 μF

V_{DD}

SC-0317
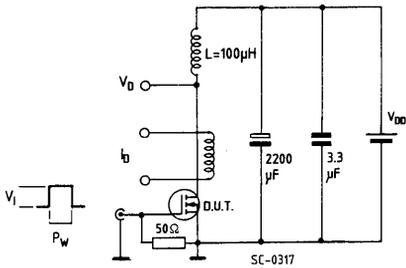
V_i = 12 V - Pulse width: adjusted to obtain
specified I_{DM}

Unclamped inductive waveforms

$V_{(BR)DSS}$

V_D

I_{DM}

I_D

V_{DD}

V_{DD}

SC-0316
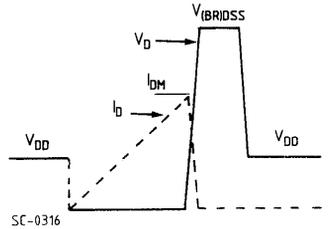
Gate charge test circuit

V_{DD}

12V

47KΩ

1KΩ

100nF

$V_i=20V=V_{GMAX}$

$I_G=const$

100Ω

D.U.T.

2200μF

2.7KΩ

V_G

47KΩ

PW

1KΩ

SC-0305
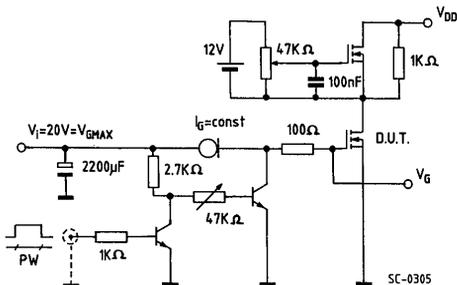
PW adjusted to obtain required V_G

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

1:1

VARIAC

MAINS INPUT

50Ω

L

C

V_0

1N4723

D.U.T.

i(t)

12V

1N4723

MCR 729-10

1.8KΩ

S-6916