

SGSP216/P217  
SGSP316/P317  
SGSP516/P517

## N-CHANNEL POWER MOS TRANSISTORS

## HIGH SPEED SWITCHING APPLICATIONS

These products are diffused multi-cell silicon gate N-Channel enhancement mode Power-Mos field effect transistors.

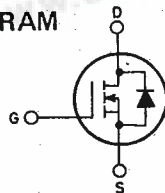
| $V_{DS}$ | $R_{DS(ON)}$  | $I_D$ |
|----------|---------------|-------|
| 200V     | 0.75 $\Omega$ | 6A    |
| 250V     | 1.2 $\Omega$  | 6A    |

## ABSOLUTE MAXIMUM RATINGS

|                    | SOT-82<br>TO-220<br>TO-3                                                                      | SGSP216<br>SGSP316<br>SGSP516           | SGSP217<br>SGSP317<br>SGSP517           |
|--------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------|
| $V_{DS}$           | Drain-source voltage ( $V_{GS} = 0$ )                                                         | 250V                                    | 200V                                    |
| $V_{DGR}$          | Drain-gate voltage ( $R_{GS} = 20\text{ K}\Omega$ )                                           | 250V                                    | 200V                                    |
| $V_{GS}$           | Gate-source voltage                                                                           | $\pm 20\text{V}$                        |                                         |
| $I_D$              | Drain current (continuous) $T_{case} = 25^\circ\text{C}$<br>at $T_{case} = 100^\circ\text{C}$ | 6A<br>3.8A                              | 6A<br>3.8A                              |
| $I_{DM}(\bullet)$  | Drain current (pulsed)                                                                        | 24A                                     | 24A                                     |
| $I_{DLM}(\bullet)$ | Drain inductive current, clamped                                                              | 24A                                     | 24A                                     |
| $P_{tot}$          | Total dissipation at $T_{case} = 25^\circ\text{C}$<br>Derating factor                         | SOT-82<br>50W<br>0.4W/ $^\circ\text{C}$ | TO-220<br>75W<br>0.6W/ $^\circ\text{C}$ |
| $T_{stg}$          | Storage temperature                                                                           | -55 to $150^\circ\text{C}$              |                                         |
| $T_j$              | Max. operating junction temperature                                                           | 150 $^\circ\text{C}$                    |                                         |

( $\bullet$ ) Pulse width limited by safe operating area

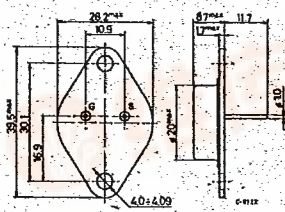
## INTERNAL SCHEMATIC DIAGRAM



## MECHANICAL DATA

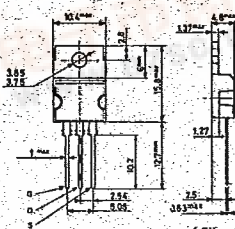
Dimensions in mm

Drain connected to case



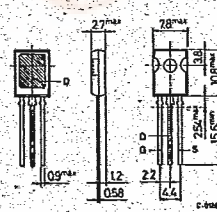
TO-3

Drain connected to tab



TO-220

Drain connected to tab



SOT-82

C-01

C-78

1896

9/85

S G S-THOMSON 07E D 7929237 0017859 3  
73C 17356 D T-39-11



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SGSP316/P317  
SGSP516/P517

# THERMAL DATA

|                 |                                                | SOT-82 | TO-220  | TO-3    |
|-----------------|------------------------------------------------|--------|---------|---------|
| $R_{th j-case}$ | Thermal resistance junction-case               | max    | 2.5°C/W | 1.6°C/W |
| $T_L$           | Maximum lead temperature for soldering purpose |        | 275     | 1.6°C/W |
|                 |                                                |        |         | °C      |

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

| Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|-----------------|------|------|------|------|
|-----------|-----------------|------|------|------|------|

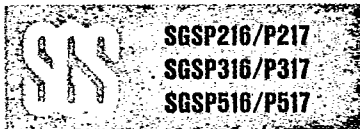
### OFF

|                |                                                  |                                                                                  |            |     |         |
|----------------|--------------------------------------------------|----------------------------------------------------------------------------------|------------|-----|---------|
| $V_{(BR) DSS}$ | Drain-source breakdown voltage                   | $I_D = 250 \mu A$ $V_{GS} = 0$<br>for SGSP216/P316/P516<br>for SGSP217/P317/P517 | 250<br>200 |     | V<br>V  |
| $I_{DSS}$      | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max. Rating}$                                                    |            | 250 | $\mu A$ |
| $I_{GSS}$      | Gate-body leakage current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20 V$                                                              |            | 100 | nA      |

### ON\*

|               |                                   |                                                                                                                                                                                                                                                                              |     |  |                                              |                            |
|---------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--|----------------------------------------------|----------------------------|
| $V_{GS (th)}$ | Gate threshold voltage            | $V_{DS} = V_{GS}$ $I_D = 250 \mu A$                                                                                                                                                                                                                                          | 2   |  | 4                                            | V                          |
| $V_{DS (on)}$ | Drain-source voltage              | $V_{GS} = 10 V$ $I_D = 3 A$<br>for SGSP216/P316/P516<br>for SGSP217/P317/P517<br>$V_{GS} = 10 V$ $I_D = 6 A$<br>for SGSP216/P316/P516<br>for SGSP217/P317/P517<br>$V_{GS} = 10 V$ $I_D = 3 A$<br>$T_{case} = 100^{\circ}C$<br>for SGSP216/P316/P516<br>for SGSP217/P317/P517 |     |  | 3.60<br>2.25<br>8.10<br>5.00<br>7.20<br>4.50 | V<br>V<br>V<br>V<br>V<br>V |
| $R_{DS (on)}$ | Static drain-source on resistance | $V_{GS} = 10 V$ $I_D = 3 A$<br>for SGSP216/P316/P516<br>for SGSP217/P317/P517                                                                                                                                                                                                |     |  | 1.20<br>0.75                                 | $\Omega$<br>$\Omega$       |
| $g_{fs}$      | Forward transconductance          | $V_{DS} = 25 V$ $I_D = 3 A$                                                                                                                                                                                                                                                  | 1.5 |  |                                              | mho                        |

73C 17357 D T-39-11



## ELECTRICAL CHARACTERISTICS (continued)

| Parameter | Test conditions | Min. | Typ. | Max. | Unit. |
|-----------|-----------------|------|------|------|-------|
|-----------|-----------------|------|------|------|-------|

## DYNAMIC

|           |                              |                                                             |     |     |    |
|-----------|------------------------------|-------------------------------------------------------------|-----|-----|----|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25 \text{ V}$ $f = 1 \text{ MHz}$<br>$V_{GS} = 0$ | 380 | 500 | pF |
| $C_{oss}$ | Output capacitance           |                                                             | 100 | 130 | pF |
| $C_{rss}$ | Reverse transfer capacitance |                                                             | 50  | 65  | pF |

## SWITCHING

|                   |                     |                                                                                                                |    |  |    |
|-------------------|---------------------|----------------------------------------------------------------------------------------------------------------|----|--|----|
| $t_d(\text{on})$  | Turn-on time        | $V_{CC} = 100 \text{ V}$ $I_D = 2.5 \text{ A}$<br>$V_I = 10 \text{ V}$ $R_i = 50 \Omega$<br>(see test circuit) | 27 |  | ns |
| $t_r$             | Rise time           |                                                                                                                | 27 |  | ns |
| $t_d(\text{off})$ | Turn-off delay time |                                                                                                                | 30 |  | ns |
| $t_f$             | Fall time           |                                                                                                                | 30 |  | ns |

## SOURCE DRAIN DIODE

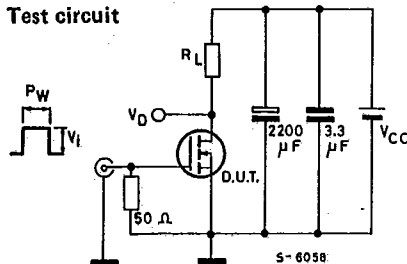
|                    |                               |                                                                            |     |     |    |
|--------------------|-------------------------------|----------------------------------------------------------------------------|-----|-----|----|
| $I_{SD}$           | Source drain current          |                                                                            |     | 6   | A  |
| $I_{SDM}(\bullet)$ | Source drain current (pulsed) |                                                                            |     | 24  | A  |
| $V_{SD}$           | Forward on voltage            | $I_{SD} = 6 \text{ A}$ $V_{GS} = 0$                                        |     | 1.3 | V  |
| $t_{on}$           | Turn-on time                  | $I_{SD} = 6 \text{ A}$ $V_{GS} = 0$<br>$di/dt = 100 \text{ A}/\mu\text{s}$ | 100 |     | ns |
| $t_{rr}$           | Reverse recovery time         |                                                                            | 180 |     | ns |

\* Pulsed: pulse duration  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ 

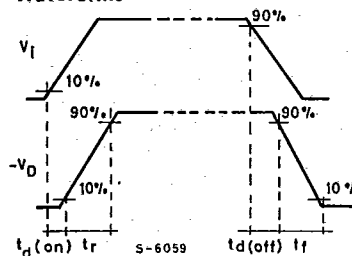
(\bullet) Pulse width limited by safe operating area.

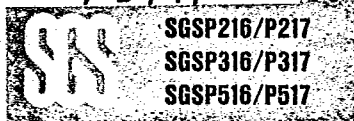
## SWITCHING TIMES RESISTIVE LOAD

Test circuit

Pulse width  $\leq 100 \mu\text{s}$ Duty cycle  $\leq 2\%$  $V_I = 10 \text{ V}$ 

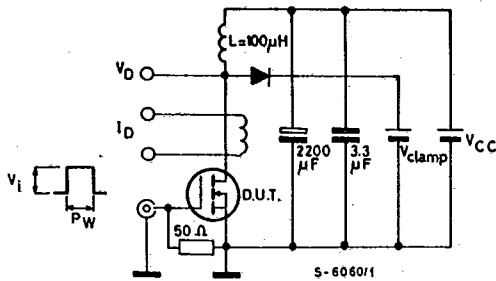
Waveforms



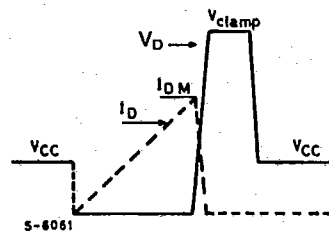


## CLAMPED INDUCTIVE LOAD

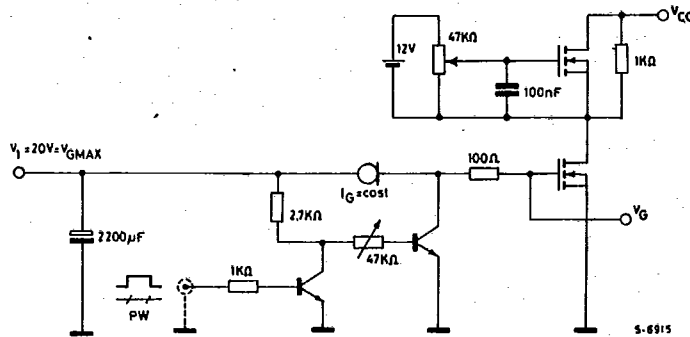
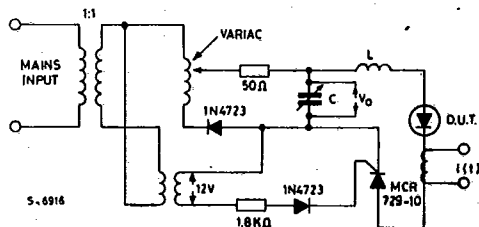
Test circuit



Waveforms

 $V_i = 12V$ Pulse width: adjusted to obtain specified  $I_{DM}$ .  $V_{clamp} = 0.75 V_{(BR) DSS}$ 

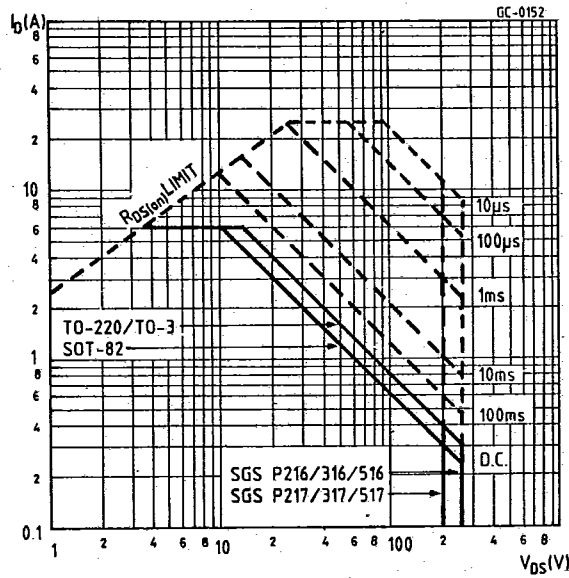
## GATE CHARGE TEST CIRCUIT

PW adjusted to obtain required  $V_G$ DIODE BODY-DRAIN  $t_{rr}$  MEASUREMENT

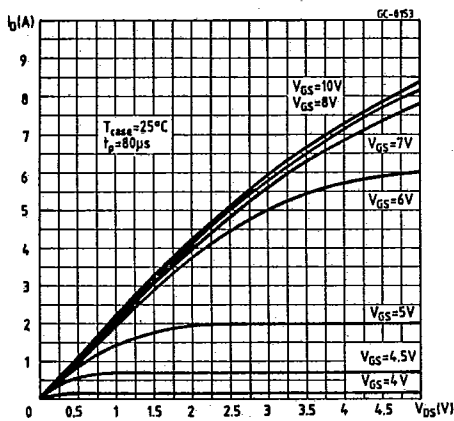
Jedec test circuit

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SGSP516/P517

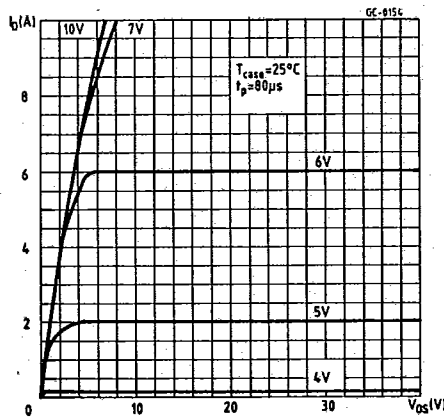
### Safe operating areas



### Output characteristics



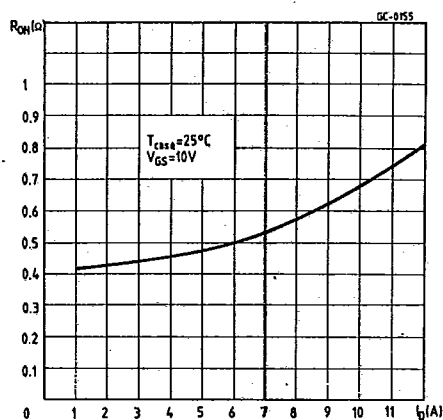
### Output characteristics



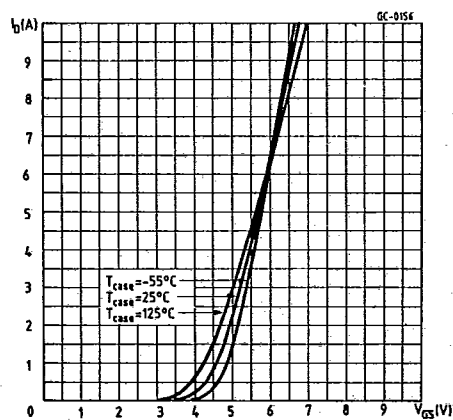


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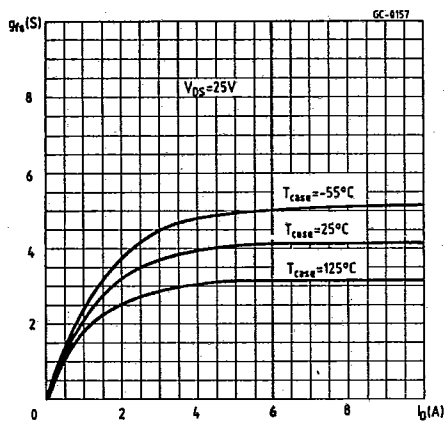
Static drain-source on resistance



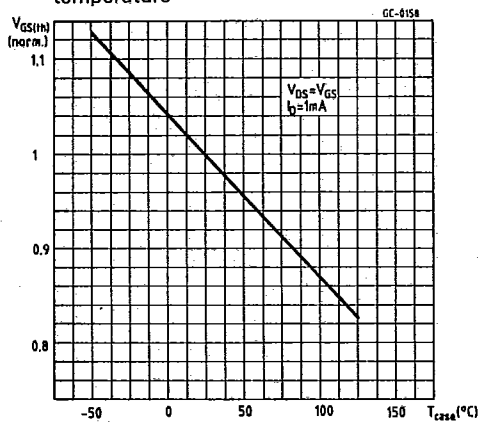
Transfer characteristics



Transconductance



Normalized gate threshold vs. temperature



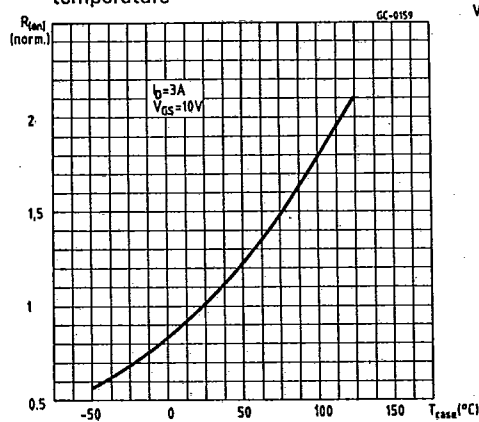


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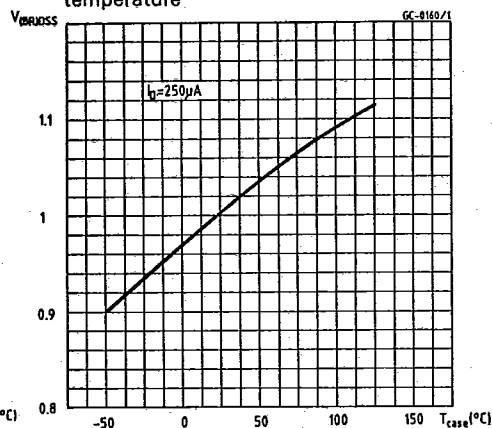
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SGSP516/P517

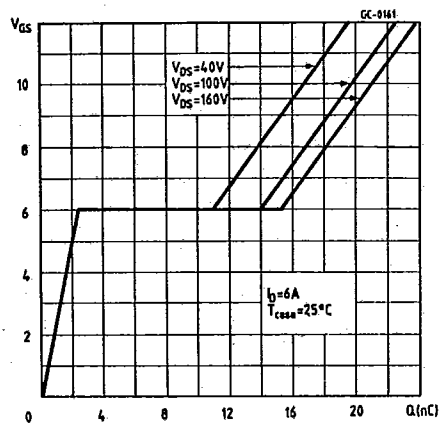
Normalized on resistance vs temperature



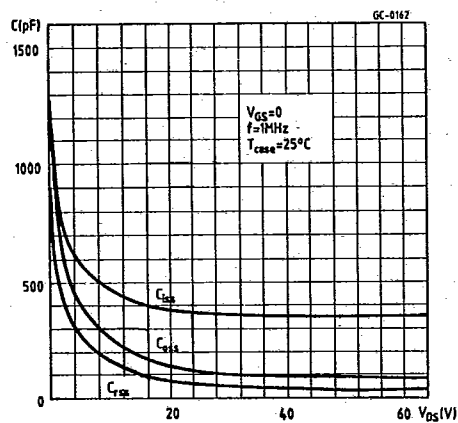
Normalized breakdown voltage vs temperature



Gate charge vs. gate to source voltage



Capacitance variation



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73C 17362 D

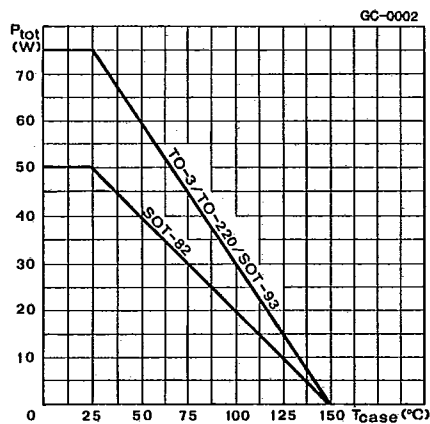
T-39-11

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Derating curve



Source-drain diode forward characteristics

