

**N - CHANNEL ENHANCEMENT MODE  
 POWER MOS TRANSISTOR MODULE**

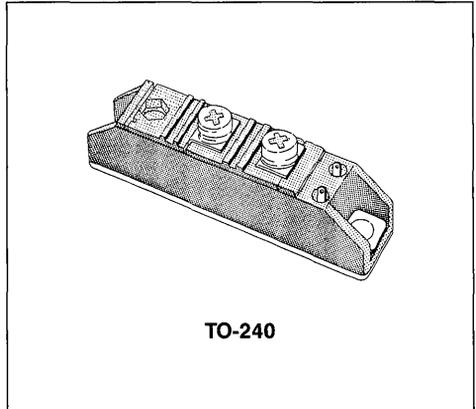
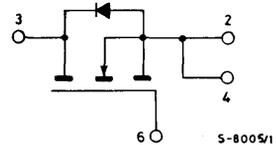
| TYPE         | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|--------------|------------------|---------------------|----------------|
| SGS30MA050D1 | 500 V            | 0.20 Ω              | 30 A           |

- ISOLATED POWERMOS MODULE
- HIGH POWER
- FAST SWITCHING
- EASY DRIVE
- EASY TO PARALLEL

**INDUSTRIAL APPLICATIONS:**

- SWITCHING MODE POWER SUPPLIES
- UNINTERRUPTIBLE POWER SUPPLIES

N - channel enhancement mode POWER MOS field effect transistor. Easy drive and fast switching of this TRANSPACK module make it ideal for high power, high speed switching applications. Typical applications include DC motor control (variable frequency control) switching mode power supplies, uninterruptible power supplies, DC/DC converters and high frequency welding equipment. The large RBSOA and absence of second breakdown in POWER MOS make this TRANSPACK module very rugged. This, together with the isolated package with its optimised thermal performance, make this module extremely effective in high power applications.


**TO-240**
**INTERNAL SCHEMATIC  
 DIAGRAM**


5-8005/1

**ABSOLUTE MAXIMUM RATINGS**

|                  |  |            |      |
|------------------|--|------------|------|
| V <sub>DS</sub>  | Drain-source voltage (V <sub>GS</sub> =0)      | 500        | V    |
| V <sub>DGR</sub> | Drain-gate voltage (R <sub>GS</sub> =20 KΩ)    | 500        | V    |
| V <sub>GS</sub>  | Gate-source voltage                            | ±20        | V    |
| I <sub>D</sub>   | Drain current (cont.) at T <sub>c</sub> =25°C  | 30         | A    |
| I <sub>D</sub>   | Drain current (cont.) at T <sub>c</sub> =100°C | 19         | A    |
| I <sub>DM</sub>  | Drain current (pulsed)                         | 120        | A    |
| P <sub>tot</sub> | Total dissipation at T <sub>c</sub> < 25°C     | 400        | W    |
|                  | Derating factor                                | 3.2        | W/°C |
| T <sub>stg</sub> | Storage temperature                            | -65 to 150 | °C   |
| T <sub>j</sub>   | Max. operating junction temperature            | 150        | °C   |
| V <sub>ISO</sub> | Insulation withstand voltage (AC)              | 2500       | V    |

**THERMAL DATA**

|                  |                                  |     |      |      |
|------------------|----------------------------------|-----|------|------|
| $R_{thj - case}$ | Thermal resistance junction-case | max | 0.31 | °C/W |
| $R_{thc - h}$    | Thermal resistance case-heatsink | max | 0.20 | °C/W |

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

| Parameters | Test Conditions | Min. | Typ. | Max. | Unit |
|------------|-----------------|------|------|------|------|
|------------|-----------------|------|------|------|------|

**OFF**

|                |  |   |              |     |           |                     |
|----------------|--|---|--------------|-----|-----------|---------------------|
| $V_{(BR) DSS}$ | Drain-source breakdown voltage                   | $I_D = 2 \text{ mA}$  | $V_{GS} = 0$ | 500 |           | V                   |
| $I_{DSS}$      | Zero gate voltage drain current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating} \times 0.8$ |              |     | 500<br>2  | $\mu\text{A}$<br>mA |
| $I_{GSS}$      | Gate-body leakage current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20 \text{ V}$   |              |     | $\pm 400$ | nA                  |

**ON\***

|               |                                   |                         |                      |   |  |      |          |
|---------------|-----------------------------------|-------------------------|----------------------|---|--|------|----------|
| $V_{GS (th)}$ | Gate threshold voltage            | $V_{DS} = V_{GS}$       | $I_D = 2 \text{ mA}$ | 2 |  | 4    | V        |
| $R_{DS (on)}$ | Static drain-source on resistance | $V_{GS} = 10 \text{ V}$ | $I_D = 15 \text{ A}$ |   |  | 0.20 | $\Omega$ |

**DYNAMIC**

|           |                              |   |                      |    |  |                     |      |    |
|-----------|------------------------------|---|----------------------|----|--|---------------------|------|----|
| $g_{fs}$  | Forward transconductance     | $V_{DS} = 25 \text{ V}$                 | $I_D = 15 \text{ A}$ | 15 |  |                     | mho  |    |
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25 \text{ V}$<br>$V_{GS} = 0$ |                      |    |  | 9100                | pF   |    |
| $C_{oss}$ | Output capacitance           |   |                      |    |  | $f = 1 \text{ MHz}$ | 1200 | pF |
| $C_{rss}$ | Reverse transfer capacitance |   |                      |    |  |                     | 850  | pF |

**SWITCHING**

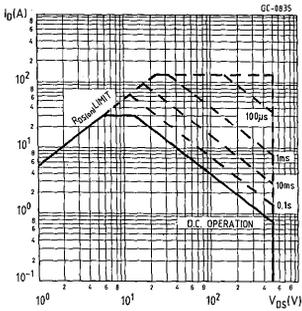
| INDUCTIVE LOAD |                       |                          |                      |  |     |                  |
|----------------|-----------------------|--------------------------|----------------------|--|-----|------------------|
| $t_{d (on)}$   | Turn-on time          | $V_{DD} = 250 \text{ V}$ | $I_D = 15 \text{ A}$ |  | 120 | ns               |
| $(di/dt)_{on}$ | Turn-on current slope | $R_i = 50 \Omega$        | $V_i = 10 \text{ V}$ |  | 100 | A/ $\mu\text{s}$ |
| $t_{d (off)}$  | Turn-off delay time   |                          |                      |  | 1.5 | $\mu\text{s}$    |
| $t_f$          | Fall time             |                          |                      |  | 300 | ns               |

ELECTRICAL CHARACTERISTICS (Continued)

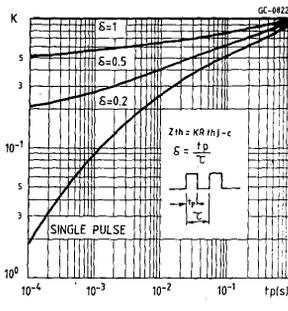
| Parameters            | Test Conditions                                       | Min.                   | Typ.                               | Max.      | Unit   |
|-----------------------|---|------------------------|------------------------------------|-----------|--------|
| $I_{SD}$<br>$I_{SDM}$ | Source-drain current<br>Source-drain current (pulsed) |                        |                                    | 30<br>120 | A<br>A |
| $V_{SD}$              | Forward on voltage                                    | $I_{SD} = 30\text{ A}$ | $V_{GS} = 0$                       | 2         | V      |
| $t_{rr}$              | Reverse recovery time                                 | $I_{SD} = 30\text{ A}$ | $di/dt = 150\text{ A}/\mu\text{s}$ | 600       | ns     |

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

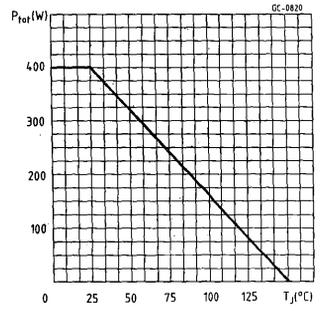
Safe operating areas



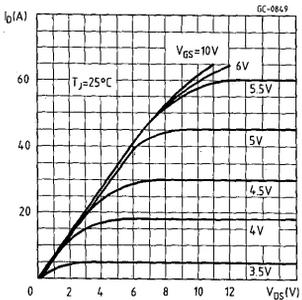
Thermal impedance



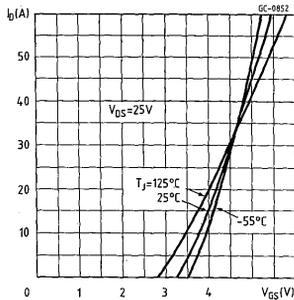
Derating curve



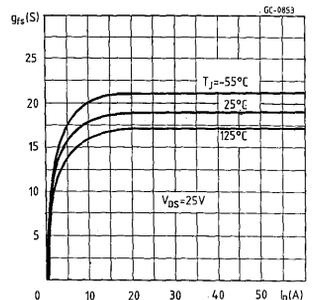
Output characteristics



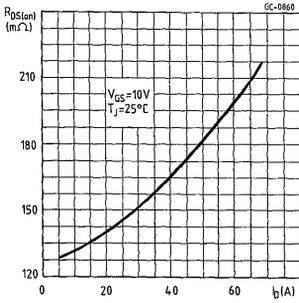
Transfer characteristics



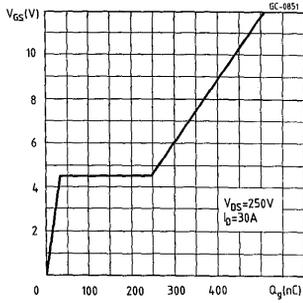
Transconductance



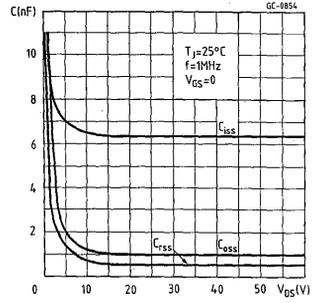
Static drain-source on resistance



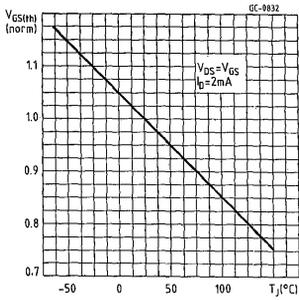
Gate charge vs gate-source voltage



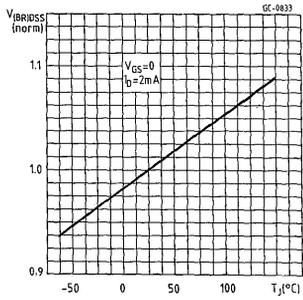
Capacitance variation



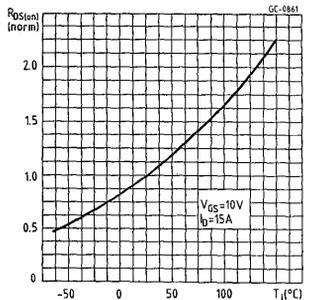
Normalized gate threshold voltage vs temperature



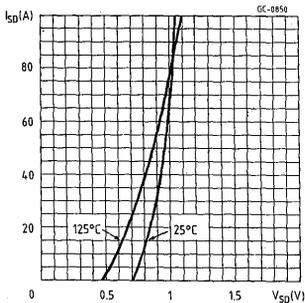
Normalized breakdown voltage vs temperature



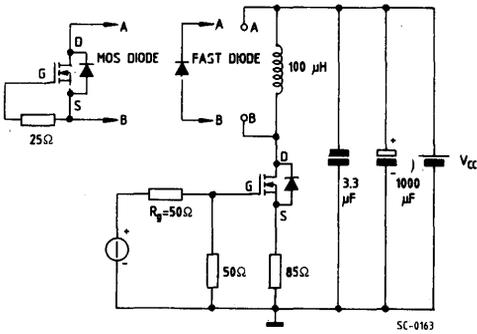
Normalized on resistance vs temperature



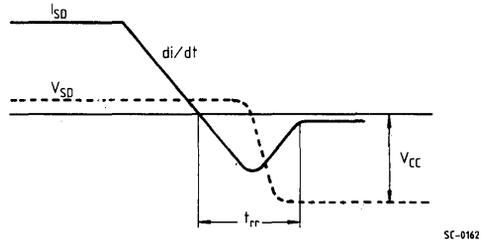
Source-drain diode forward characteristics



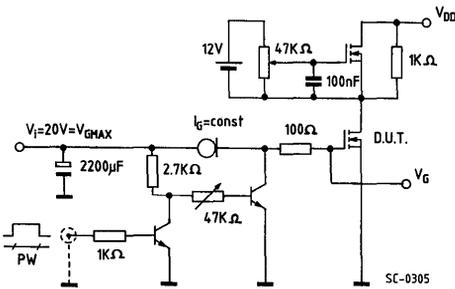
Test circuit for inductive load switching and diode reverse recovery times



Diode reverse recovery time waveform



Gate charge test circuit



PW adjusted to obtain required  $V_G$