



**SGS-THOMSON**  
MICROELECTRONICS

**TSD22N80F**  
**TSD22N80V**

SGS-THOMSON

# N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR MODULE

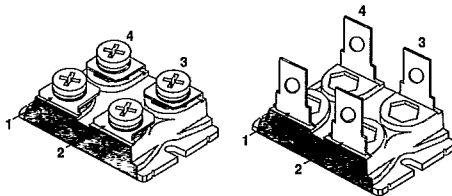
ADVANCE DATA

| TYPE        | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-------------|------------------|---------------------|----------------|
| TSD22N80F/V | 800 V            | 0.4 Ω               | 22 A           |

- HIGH VOLTAGE, HIGH CURRENT POWER MOS MODULE
- VERY LOW R<sub>th</sub> JUNCTION TO CASE
- ISOLATED CASE (2500V RMS)
- EASY TO MOUNT
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- AVALANCHE RUGGEDNESS TECHNOLOGY (SEE STH8N80 FOR RATING)

## INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT

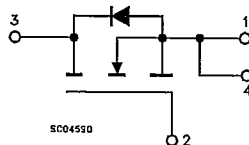


TSD22N80V

TSD22N80F

ISOTOP

## INTERNAL SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-Source Voltage (V <sub>GS</sub> = 0)            | 800        | V    |
| V <sub>DGR</sub>    | Drain-Gate Voltage (R <sub>GS</sub> = 20 kΩ)          | 800        | V    |
| V <sub>GS</sub>     | Gate-Source Voltage                                   | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 22         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 13.7       | A    |
| I <sub>DM</sub> (*) | Drain Current (pulsed)                                | 77         | 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                                   | -55 to 150 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   | 150        | °C   |
| V <sub>ISO</sub>    | Insulation Withstand Voltage (AC-RMS)                 | 2500       | V    |

(\*) Pulse width limited by safe operating area

|                  |                                                                 |     |       |                      |
|------------------|-----------------------------------------------------------------|-----|-------|----------------------|
| $R_{th(j-case)}$ | Thermal Resistance Junction-case                                | Max | 0.312 | $^{\circ}\text{C/W}$ |
| $R_{th(c-h)}$    | Thermal Resistance Case-heatsink With Conductive Grease Applied | Max | 0.05  | $^{\circ}\text{C/W}$ |

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

### OFF

| Symbol        | Parameter                                        | Test Conditions                                                                                     | Min. | Typ. | Max.       | Unit                |
|---------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------|------|------|------------|---------------------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage                   | $I_D = 2\text{ mA}$ $V_{GS} = 0$                                                                    | 800  |      |            | V                   |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}\text{C}$ |      |      | 300<br>1.5 | $\mu\text{A}$<br>mA |
| $I_{GSS}$     | Gate-Body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20\text{ V}$                                                                          |      |      | $\pm 300$  | nA                  |

### ON (\*)

| Symbol       | Parameter                         | Test Conditions                            | Min. | Typ. | Max. | Unit     |
|--------------|-----------------------------------|--------------------------------------------|------|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 1\text{ mA}$      | 2    |      | 4    | V        |
| $R_{DS(on)}$ | Static Drain-Source On Resistance | $V_{GS} = 10\text{ V}$ $I_D = 12\text{ A}$ |      |      | 0.4  | $\Omega$ |

### DYNAMIC

| Symbol                              | Parameter                                                               | Test Conditions                                        | Min. | Typ.               | Max. | Unit           |
|-------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|------|--------------------|------|----------------|
| $g_{fs}$                            | Forward Transconductance                                                | $V_{DS} = 25\text{ V}$ $I_D = 12\text{ A}$             | 9    |                    |      | mho            |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$ |      | 6000<br>800<br>350 |      | pF<br>pF<br>pF |

### SWITCHING (INDUCTIVE LOAD)

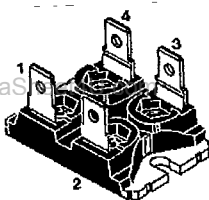
| Symbol         | Parameter             | Test Conditions                              | Min. | Typ. | Max. | Unit |
|----------------|-----------------------|----------------------------------------------|------|------|------|------|
| $t_{d(on)}$    | Turn-on Time          | $V_{DD} = V$ $I_D = A$                       |      |      |      | ns   |
| $(di/dt)_{on}$ | Turn-on Current Slope | $R_{GS} = 50\ \Omega$ $V_{GS} = 10\text{ V}$ |      |      |      | ns   |
| $t_{d(off)}$   | Turn-off Delay Time   |                                              |      |      |      | ns   |
| $t_f$          | Fall Time             |                                              |      |      |      | ns   |

### SOURCE DRAIN DIODE

| Symbol             | Parameter                     | Test Conditions                                           | Min. | Typ. | Max. | Unit          |
|--------------------|-------------------------------|-----------------------------------------------------------|------|------|------|---------------|
| $I_{SD}$           | Source-Drain Current          |                                                           |      |      | 22   | A             |
| $I_{SDM}(\bullet)$ | Source-Drain Current (pulsed) |                                                           |      |      | 77   | A             |
| $V_{SD}$           | Forward On Voltage            | $I_{SD} = 22\text{ A}$ $V_{GS} = 0$                       |      |      | 2.5  | V             |
| $t_{rr}$           | Reverse Recovery Time         | $I_{SD} = 22\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ |      |      | 2    | $\mu\text{s}$ |

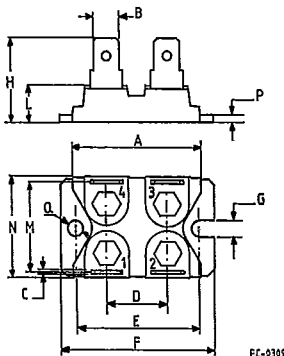
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

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



**ISOTOP**  
**Fast-on version**  
 sales types with the suffix F

## MECHANICAL DATA



FC-0309

|   | DIMENSIONS |      |        |       |
|---|------------|------|--------|-------|
|   | mm         |      | Inches |       |
|   | min.       | max  | min.   | max   |
| A | 31.5       | 31.7 | 1.240  | 1.248 |
| B | 6.2        | 6.4  | 0.244  | 0.252 |
| C | 0.75       | 0.85 | 0.029  | 0.033 |
| D | 14.9       | 15.1 | 0.586  | 0.590 |
| E | 30.1       | 30.3 | 1.185  | 1.193 |
| F | 38         | 38.2 | 1.496  | 1.503 |
| G | 4          | —    | 0.157  | —     |
| H | 20.3       | 20.7 | 0.799  | 0.815 |
| L | 8.9        | 9.1  | 0.350  | 0.358 |
| M | 22.4       | 23   | 0.881  | 0.905 |
| N | 25.2       | 25.4 | 0.992  | 1.000 |
| P | 1.95       | 2.05 | 0.076  | 0.080 |
| Q | 4          | —    | 0.157  | —     |

## PIN CONNECTIONS

### MOSFET

pin 1: Source      pin 2: Gate  
 pin 3: Drain      pin 4: Source sensing

### DARLINGTON

pin 1: Emitter      pin 2: Base1  
 pin 3: Collector      pin 4: Base 2

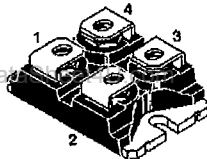
### TRANSISTOR

pin 1: Emitter      pin 2: Base  
 pin 3: Collector      pin 4: Emitter sensing

Torque: Mounting  $1.3 \pm 0.2 \text{ N} \cdot \text{m}$  (max)

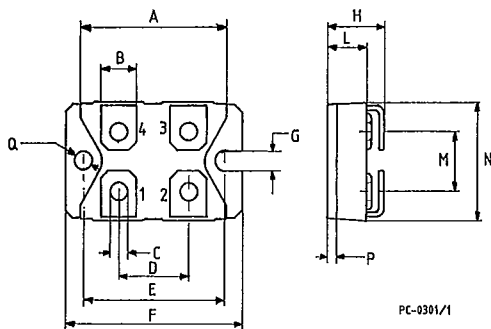
Weight: Package 25.5 g

Note: The mechanical data are the same for the 3 pin version  
 (4th pin missing)



**ISOTOP**  
**Screw version**  
 sales types with the suffix V

**MECHANICAL DATA**



PC-0301/1

|   | DIMENSIONS |      |        |       |
|---|------------|------|--------|-------|
|   | mm         |      | Inches |       |
|   | min.       | max  | min.   | max   |
| A | 31.5       | 31.7 | 1.240  | 1.248 |
| B | 7.8        | 8.2  | 0.307  | 0.322 |
| C | 4.1        | 4.3  | 0.161  | 0.169 |
| D | 14.9       | 15.1 | 0.586  | 0.590 |
| E | 30.1       | 30.3 | 1.185  | 1.193 |
| F | 38         | 38.2 | 1.496  | 1.503 |
| G | 4          | —    | 0.157  | —     |
| H | 11.8       | 12.2 | 0.464  | 0.480 |
| L | 8.9        | 9.1  | 0.350  | 0.358 |
| M | 12.6       | 12.8 | 0.496  | 0.503 |
| N | 25.2       | 25.4 | 0.992  | 1.000 |
| P | 1.95       | 2.05 | 0.076  | 0.080 |
| Q | 4          | —    | 0.157  | —     |

**PIN CONNECTIONS**

**MOSFET**

pin 1: Source      pin 2: Gate  
 pin 3: Drain      pin 4: Source sensings

**DARLINGTON**

pin 1: Emitter      pin 2: Base1  
 pin 3: Collector      pin 4: Base 2

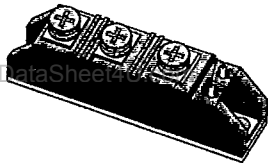
**TRANSISTOR**

pin 1: Emitter      pin 2: Base  
 pin 3: Collector      pin 4: Emitter sensing

Torque: Terminal  $1.3 \pm 0.2 \text{ N} \cdot \text{m}$  (max)  
 Mounting  $1.3 \pm 0.2 \text{ N} \cdot \text{m}$  (max)

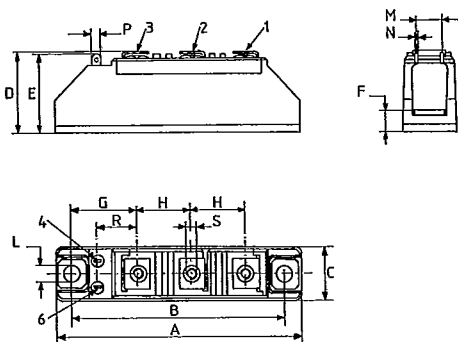
Weight: Package 29 g  
 4 Screws: 7.5 g

Note: The mechanical data are the same for the 3 pin version  
 (4th pin missing)



## TRANSPACK (TO-240)

## MECHANICAL DATA



PC-0296

Torque: Terminal  $2.2 \pm 0.5 \text{ N} \cdot \text{m}$  (max)  
 Mounting  $3.5 \pm 0.5 \text{ N} \cdot \text{m}$  (max)

Weight: Package 110 g  
 Accessory 21 g

Note: The mechanical data are the same for the 2 power pin version (either pin 1 or pin 2 missing)

|   | DIMENSIONS |       |            |       |
|---|------------|-------|------------|-------|
|   | mm         |       | Inches     |       |
|   | min.       | max   | min.       | max   |
| A | 91.5       | 92.5  | 3.602      | 3.641 |
| B | 79.75      | 80.25 | 3.140      | 3.160 |
| C | 19.5       | 20.55 | 0.767      | 0.809 |
| D | 29.00      | 31.00 | 1.141      | 1.220 |
| E | 28.8       | 30    | 1.134      | 1.181 |
| F | 8.5 typ.   |       | 0.334 typ. |       |
| G | 24.4 typ.  |       | 0.960 typ. |       |
| H | 19.5       | 20.5  | 0.767      | 0.807 |
| L | 6.2 typ.   |       | 0.244 typ. |       |
| M | 8.95       | 11.05 | 0.352      | 0.435 |
| N | 0.78       | 0.84  | 0.030      | 0.033 |
| P | 2.72       | 2.87  | 0.107      | 0.113 |
| R | 14         | —     | 0.551      | —     |
| S | M5         |       |            |       |