



# STW80N06-10

## N - CHANNEL ENHANCEMENT MODE "ULTRA HIGH DENSITY" POWER MOS TRANSISTOR

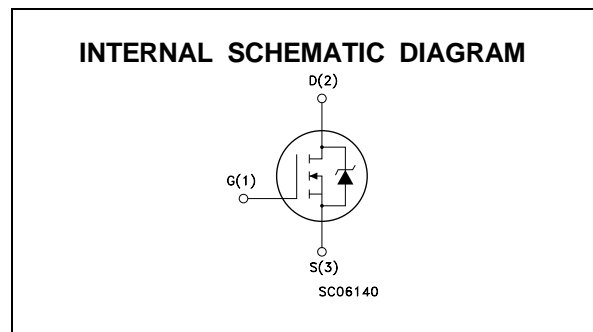
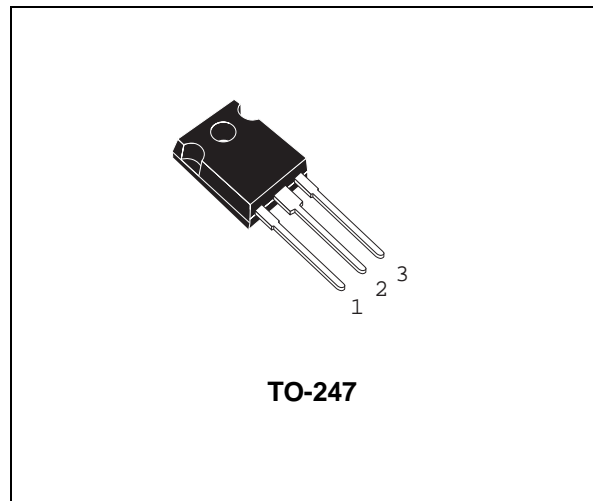
PRELIMINARY DATA

| TYPE        | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-------------|------------------|---------------------|----------------|
| STW80N06-10 | 60 V             | < 0.010 Ω           | 80 A           |

- TYPICAL R<sub>DS(on)</sub> = 0.0085 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- HIGH dV/dt RUGGEDNESS
- APPLICATION ORIENTED CHARACTERIZATION

### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- POWER MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS
- SYNCHRONOUS RECTIFICATION



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter   | Value      | Unit |
|---------------------|---|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 60         | V    |
| V <sub>DGR</sub>    | Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)         | 60         | V    |
| V <sub>GS</sub>     | Gate-source Voltage                                   | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 80         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 60         | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)                                | 320        | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C           | 180        | W    |
|                     | Derating Factor                                       | 1.2        | W/°C |
| dV/dt(1)            | Peak Diode Recovery voltage slope                     | 5          | V/ns |
| T <sub>stg</sub>    | Storage Temperature                                   | -65 to 175 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   | 175        | °C   |

(●) Pulse width limited by safe operating area

**THERMAL DATA**

|                       |  |     |      |      |
|-----------------------|--|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case               | Max | 0.83 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient            | Max | 62.5 | °C/W |
| R <sub>thc-sink</sub> | Thermal Resistance Case-sink                   | Typ | 0.5  | °C/W |
| T <sub>J</sub>        | Maximum Lead Temperature For Soldering Purpose |     | 300  | °C   |

**AVALANCHE CHARACTERISTICS**

| Symbol          | Parameter  | Max Value | Unit |
|-----------------|--|-----------|------|
| I <sub>AR</sub> | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>J</sub> max, δ < 1%)                          | 60        | A    |
| E <sub>AS</sub> | Single Pulse Avalanche Energy (starting T <sub>J</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 25 V)   | 600       | mJ   |
| E <sub>AR</sub> | Repetitive Avalanche Energy (pulse width limited by T <sub>J</sub> max, δ < 1%)  | 150       | mJ   |
| I <sub>AR</sub> | Avalanche Current, Repetitive or Not-Repetitive (T <sub>c</sub> = 100 °C, pulse width limited by T <sub>J</sub> max, δ < 1%) | 42        | A    |

**ELECTRICAL CHARACTERISTICS** (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

| Symbol               | Parameter   | Test Conditions  | Min. | Typ. | Max.      | Unit     |
|----------------------|---|--|------|------|-----------|----------|
| V <sub>(BR)DSS</sub> | Drain-source Breakdown Voltage                        | I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0  | 60   |      |           | V        |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0) | V <sub>DS</sub> = Max Rating<br>V <sub>DS</sub> = Max Rating x 0.8 T <sub>c</sub> = 125 °C |      |      | 10<br>100 | μA<br>μA |
| I <sub>GSS</sub>     | Gate-body Leakage Current (V <sub>DS</sub> = 0)       | V <sub>GS</sub> = ± 20 V   |      |      | ± 100     | nA       |

ON (\*)

| Symbol              | Parameter                         | Test Conditions   | Min. | Typ.   | Max.         | Unit   |
|---------------------|-----------------------------------|---|------|--------|--------------|--------|
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA   | 2    | 3      | 4            | V      |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10V I <sub>D</sub> = 40 A<br>V <sub>GS</sub> = 10V I <sub>D</sub> = 40 A T <sub>c</sub> = 100°C |      | 0.0085 | 0.01<br>0.02 | Ω<br>Ω |
| I <sub>D(on)</sub>  | On State Drain Current            | V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub><br>V <sub>GS</sub> = 10 V                           | 80   |        |              | A      |

**DYNAMIC**

| Symbol              | Parameter                    | Test Conditions   | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| g <sub>fs</sub> (*) | Forward Transconductance     | V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> I <sub>D</sub> = 40 A |      | 25   |      | S    |
| C <sub>iss</sub>    | Input Capacitance            | V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0                                |      | 5900 |      | pF   |
| C <sub>oss</sub>    | Output Capacitance           |   |      | 900  |      | pF   |
| C <sub>rss</sub>    | Reverse Transfer Capacitance |   |      | 230  |      | pF   |

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

| Symbol                        | Parameter  | Test Conditions  | Min. | Typ.            | Max.      | Unit             |
|-------------------------------|--|--|------|-----------------|-----------|------------------|
| $t_{d(on)}$<br>$t_r$          | Turn-on Time<br>Rise Time                                    | $V_{DD} = 30\text{ V}$ $I_D = 40\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(see test circuit, figure 3) |      | 32<br>160       | 42<br>200 | ns<br>ns         |
| $(di/dt)_{on}$                | Turn-on Current Slope  | $V_{DD} = 48\text{ V}$ $I_D = 80\text{ A}$<br>$R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$<br>(see test circuit, figure 5)  |      | 240             |           | A/ $\mu\text{s}$ |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 40\text{ V}$ $I_D = 80\text{ A}$ $V_{GS} = 10\text{ V}$  |      | 230<br>30<br>60 | 280       | nC<br>nC<br>nC   |

**SWITCHING OFF**

| Symbol                         | Parameter   | Test Conditions  | Min. | Typ.             | Max.             | Unit           |
|--------------------------------|---|--|------|------------------|------------------|----------------|
| $t_{r(off)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{DD} = 48\text{ V}$ $I_D = 40\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$<br>(see test circuit, figure 5) |      | 35<br>175<br>240 | 46<br>230<br>300 | ns<br>ns<br>ns |

**SOURCE DRAIN DIODE**

| Symbol                            | Parameter   | Test Conditions   | Min. | Typ. | Max.             | Unit                     |
|-----------------------------------|---|---|------|------|------------------|--------------------------|
| $I_{SD}$<br>$I_{SDM}(\bullet)$    | Source-drain Current<br>Source-drain Current<br>(pulsed)                              |   |      |      | 80<br>320        | A<br>A                   |
| $V_{SD} (*)$                      | Forward On Voltage  | $I_{SD} = 80\text{ A}$ $V_{GS} = 0$   |      |      | 1.5              | V                        |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery<br>Time<br>Reverse Recovery<br>Charge<br>Reverse Recovery<br>Current | $I_{SD} = 80\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$<br>(see test circuit, figure 5) |      |      | 125<br>0.6<br>10 | ns<br>$\mu\text{C}$<br>A |

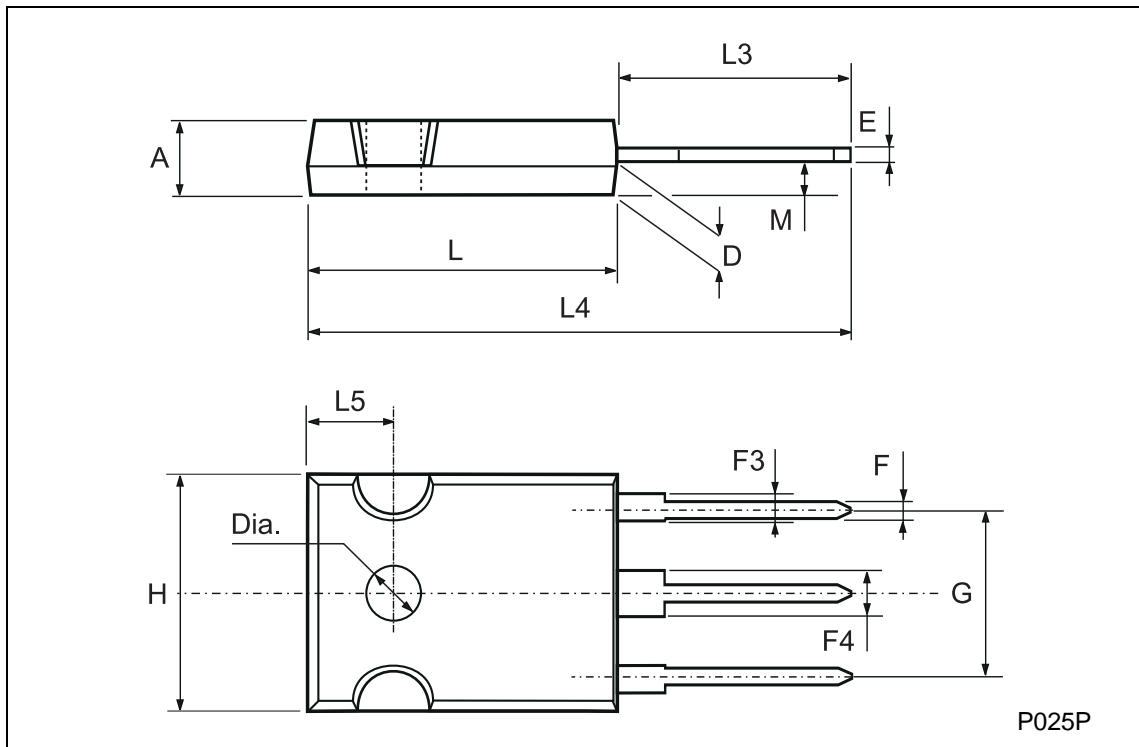
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

(1)  $I_{SD} \leq 60\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_j \leq T_{JMAX}$

TO-247 MECHANICAL DATA

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 4.7  |      | 5.3  | 0.185 |       | 0.209 |
| D    | 2.2  |      | 2.6  | 0.087 |       | 0.102 |
| E    | 0.4  |      | 0.8  | 0.016 |       | 0.031 |
| F    | 1    |      | 1.4  | 0.039 |       | 0.055 |
| F3   | 2    |      | 2.4  | 0.079 |       | 0.094 |
| F4   | 3    |      | 3.4  | 0.118 |       | 0.134 |
| G    |      | 10.9 |      |       | 0.429 |       |
| H    | 15.3 |      | 15.9 | 0.602 |       | 0.626 |
| L    | 19.7 |      | 20.3 | 0.776 |       | 0.779 |
| L3   | 14.2 |      | 14.8 | 0.559 | 0.413 | 0.582 |
| L4   |      | 34.6 |      |       | 1.362 |       |
| L5   |      | 5.5  |      |       | 0.217 |       |
| M    | 2    |      | 3    | 0.079 |       | 0.118 |
| Dia  | 3.55 |      | 3.65 | 0.140 |       | 0.144 |



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