

## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

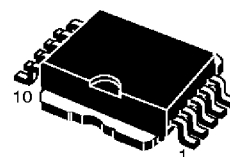
PRELIMINARY DATA

| TYPE         | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|--------------|------------------|---------------------|----------------|
| STV60N03L-10 | 30 V             | < 0.01 Ω            | 60 A           |

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

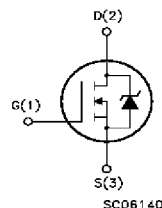
### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



PowerSO-10

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 30         | V    |
| V <sub>DGR</sub>    | Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)         | 30         | V    |
| V <sub>GS</sub>     | Gate-source Voltage                                   | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 60         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 42         | A    |
| I <sub>DM</sub> (•) | Drain Current (pulsed)                                | 240        | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C           | 150        | W    |
|                     | Derating Factor                                       | 1          | W/°C |
| 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

|                |                                                |     |      |                      |
|----------------|------------------------------------------------|-----|------|----------------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 1    | $^{\circ}\text{C/W}$ |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient            | Max | 62.5 | $^{\circ}\text{C/W}$ |
| $R_{thj-amb}$  | Thermal Resistance Case-sink                   | Typ | 0.5  | $^{\circ}\text{C/W}$ |
| $T_l$          | Maximum Lead Temperature For Soldering Purpose |     | 300  | $^{\circ}\text{C}$   |

## AVALANCHE CHARACTERISTICS

| Symbol   | Parameter                                                                                                                          | Max Value | Unit |
|----------|------------------------------------------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max, $\delta < 1\%$ )                                | 60        | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 25\text{ V}$ )                     | 600       | mJ   |
| $E_{AR}$ | Repetitive Avalanche Energy (pulse width limited by $T_j$ max, $\delta < 1\%$ )                                                    | 150       | mJ   |
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive ( $T_c = 100^{\circ}\text{C}$ , pulse width limited by $T_j$ max, $\delta < 1\%$ ) | 42        | A    |

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                   | $I_D = 250\text{ }\mu\text{A}$ $V_{GS} = 0$                                                         | 30   |      |             | V                              |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}\text{C}$ |      |      | 250<br>1000 | $\mu\text{A}$<br>$\mu\text{A}$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20\text{ V}$                                                                          |      |      | $\pm 100$   | nA                             |

ON (\*)

| Symbol       | Parameter                         | Test Conditions                                                                                                                                                                                                                                                       | Min. | Typ.             | Max.                          | Unit                                         |
|--------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|-------------------------------|----------------------------------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$                                                                                                                                                                                                                      | 1    | 1.7              | 2.5                           | V                                            |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\text{ V}$ $I_D = 30\text{ A}$<br>$V_{GS} = 10\text{ V}$ $I_D = 30\text{ A}$ $T_c = 100^{\circ}\text{C}$<br>$V_{GS} = 5\text{ V}$ $I_D = 30\text{ A}$ $T_c = 25^{\circ}\text{C}$<br>$V_{GS} = 5\text{ V}$ $I_D = 30\text{ A}$ $T_c = 100^{\circ}\text{C}$ |      | 0.0085<br>0.0012 | 0.01<br>0.02<br>0.015<br>0.03 | $\Omega$<br>$\Omega$<br>$\Omega$<br>$\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10\text{ V}$                                                                                                                                                                                                   | 60   |                  |                               | A                                            |

## DYNAMIC

| Symbol                              | Parameter                                                               | Test Conditions                                               | Min. | Typ.                | Max. | Unit           |
|-------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------|------|---------------------|------|----------------|
| $g_{fs} (*)$                        | Forward Transconductance                                                | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 30\text{ A}$ | 30   | 50                  |      | S              |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$        |      | 3500<br>1200<br>450 |      | pF<br>pF<br>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                                    | $V_{DD} = 15\text{ V}$ $I_D = 38\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ |      | 40<br>400 |      | ns<br>ns         |
| $(di/dt)_{on}$                | Turn-on Current Slope                                        | $V_{DD} =$ $I_D =$<br>$R_G = \Omega$ $V_{GS} = \text{V}$                                |      |           |      | A/ $\mu\text{s}$ |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 10\text{ V}$ $I_D = 60\text{ A}$ $V_{GS} = 15\text{ V}$                       |      | 130       |      | nC               |

**SWITCHING OFF**

| Symbol                             | Parameter                                             | Test Conditions                                                                                                         | Min. | Typ.             | Max. | Unit           |
|------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------|------------------|------|----------------|
| $t_{r(V_{off})}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{DD} = 24\text{ V}$ $I_D = 75\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$<br>(see test circuit, figure 5) |      | 60<br>240<br>310 |      | 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)                              |                                                                                                                     |      |                  | 60<br>240 | A<br>A                   |
| $V_{SD} (*)$                      | Forward On Voltage                                                                    | $I_{SD} = 60\text{ A}$ $V_{GS} = 0$                                                                                 |      |                  | 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 | $I_{SD} = 75\text{ A}$ $di/dt = 10\text{ A}/\mu\text{s}$<br>$V_{DD} = 0\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ |      | 100<br>0.25<br>5 |           | 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

Power SO-10 MECHANICAL DATA

| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 3.35  |      | 3.65  | 0.132 |       | 0.144 |
| A1   | 0.00  |      | 0.10  | 0.000 |       | 0.004 |
| B    | 0.40  |      | 0.60  | 0.016 |       | 0.024 |
| c    | 0.35  |      | 0.55  | 0.013 |       | 0.022 |
| D    | 9.40  |      | 9.60  | 0.370 |       | 0.378 |
| D1   | 7.40  |      | 7.60  | 0.291 |       | 0.300 |
| E    | 9.30  |      | 9.50  | 0.366 |       | 0.374 |
| E1   | 7.20  |      | 7.40  | 0.283 |       | 0.291 |
| E2   | 7.20  |      | 7.40  | 0.283 |       | 0.300 |
| E3   | 6.10  |      | 6.35  | 0.240 |       | 0.250 |
| E4   | 5.90  |      | 6.10  | 0.232 |       | 0.240 |
| e    |       | 1.27 |       |       | 0.050 |       |
| F    | 1.25  |      | 1.35  | 0.049 |       | 0.053 |
| H    | 13.80 |      | 14.40 | 0.543 |       | 0.567 |
| h    |       | 0.50 |       |       | 0.002 |       |
| L    | 1.20  |      | 1.80  | 0.047 |       | 0.071 |
| q    |       | 1.70 |       |       | 0.067 |       |
| α    | 0°    |      | 8°    |       |       |       |

