



# STU6NA100

## N - CHANNEL 1000V - 1.45Ω - 6A - Max220 FAST POWER MOS TRANSISTOR

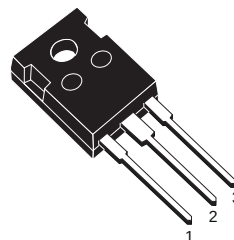
### PRELIMINARY DATA

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STU6NA100 | 1000 V           | < 1.7 Ω             | 6 A            |

- TYPICAL R<sub>DS(on)</sub> = 1.45 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

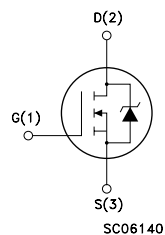
### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLY (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC CONVERTER FOR WELDING EQUIPMENT AND UNINTERRUPTABLE POWER SUPPLY (UPS)



Max220

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                             | Value      | Unit |
|---------------------|-------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)            | 1000       | V    |
| V <sub>DGR</sub>    | Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)         | 1000       | V    |
| V <sub>GS</sub>     | Gate-source Voltage                                   | ± 30       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 25 °C  | 6          | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>c</sub> = 100 °C | 3.9        | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)                                | 24         | A    |
| P <sub>tot</sub>    | Total Dissipation at T <sub>c</sub> = 25 °C           | 160        | W    |
|                     | Derating Factor                                       | 1.28       | W/°C |
| T <sub>stg</sub>    | Storage Temperature                                   | -65 to 150 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                   | 150        | °C   |

(●) Pulse width limited by safe operating area

## THERMAL DATA

|                |                                                |     |     |               |
|----------------|------------------------------------------------|-----|-----|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case               | Max | 0.8 | $^{\circ}C/W$ |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient            | Max | 62  | $^{\circ}C/W$ |
| $R_{thc-sink}$ | Thermal Resistance Case-sink                   | Typ | 0.1 | $^{\circ}C/W$ |
| $T_l$          | Maximum Lead Temperature For Soldering Purpose |     | 300 | $^{\circ}C$   |

## AVALANCHE CHARACTERISTICS

| Symbol   | Parameter                                                                                       | Max Value | Unit |
|----------|-------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)              | 6         | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 50$ V) | 800       | mJ   |

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

OFF

| Symbol        | Parameter                                        | Test Conditions                                                                   | Min. | Typ. | Max.      | Unit               |
|---------------|--------------------------------------------------|-----------------------------------------------------------------------------------|------|------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 250 \mu A$ $V_{GS} = 0$                                                    | 1000 |      |           | V                  |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ $T_c = 100^{\circ}C$ |      |      | 50<br>500 | $\mu A$<br>$\mu A$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 30$ V                                                               |      |      | $\pm 100$ | nA                 |

ON (\*)

| Symbol       | Parameter                         | Test Conditions                                              | Min. | Typ. | Max. | Unit     |
|--------------|-----------------------------------|--------------------------------------------------------------|------|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250 \mu A$                          | 2.25 | 3    | 3.75 | V        |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10$ V $I_D = 3$ A                                  |      | 1.45 | 1.7  | $\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10$ V | 6    |      |      | A        |

## DYNAMIC

| Symbol                              | Parameter                                                               | Test Conditions                                       | Min. | Typ.              | Max.              | Unit           |
|-------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------|------|-------------------|-------------------|----------------|
| $g_{fs} (*)$                        | Forward Transconductance                                                | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3$ A | 6    | 7                 |                   | S              |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$              |      | 3170<br>270<br>76 | 4100<br>351<br>99 | 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                                    | $V_{DD} = 500\text{ V}$ $I_D = 3.5\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ |      | 28<br>19        | 40<br>27 | ns<br>ns       |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD} = 800\text{ V}$ $I_D = 7\text{ A}$ $V_{GS} = 10\text{ V}$                          |      | 125<br>17<br>58 | 150      | nC<br>nC<br>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 | $V_{DD} = 800\text{ V}$ $I_D = 7\text{ A}$<br>$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ |      | 35<br>15<br>55 | 50<br>21<br>77 | ns<br>ns<br>ns |

**SOURCE DRAIN DIODE**

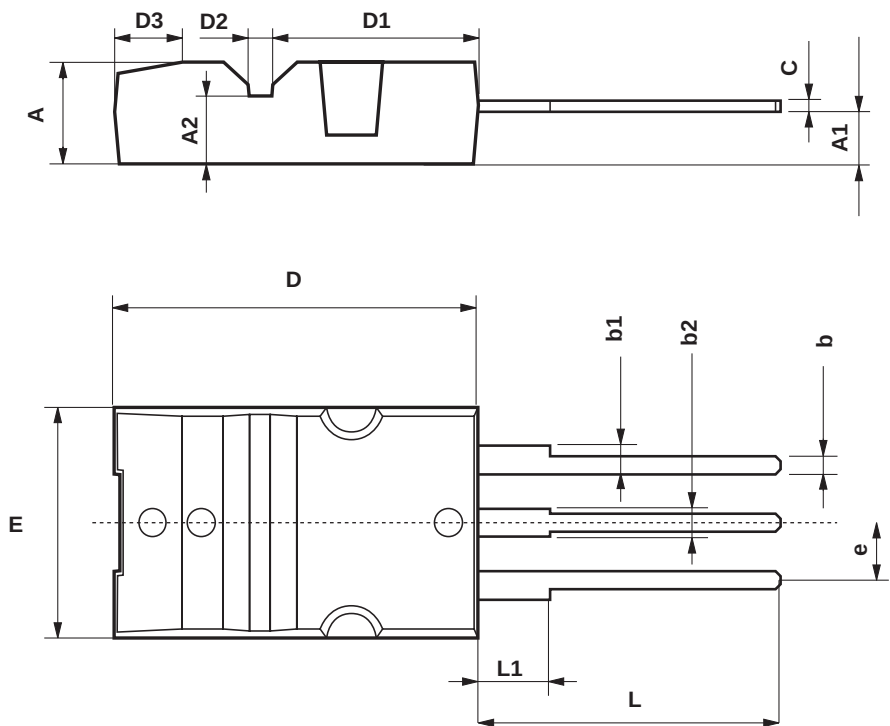
| Symbol                            | Parameter                                                                    | Test Conditions                                                                                                       | Min. | Typ.            | Max.    | Unit                     |
|-----------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------|-----------------|---------|--------------------------|
| $I_{SD}$<br>$I_{SDM}(\bullet)$    | Source-drain Current<br>Source-drain Current (pulsed)                        |                                                                                                                       |      |                 | 6<br>24 | A<br>A                   |
| $V_{SD} (*)$                      | Forward On Voltage                                                           | $I_{SD} = 6\text{ A}$ $V_{GS} = 0$                                                                                    |      |                 | 1.6     | V                        |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD} = 6\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ |      | 835<br>14<br>33 |         | 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

Max220 MECHANICAL DATA

| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.3   |      | 4.6   | 0.169 |       | 0.181 |
| A1   | 2.2   |      | 2.4   | 0.087 |       | 0.094 |
| A2   | 2.9   |      | 3.1   | 0.114 |       | 0.122 |
| b    | 0.7   |      | 0.93  | 0.027 |       | 0.036 |
| b1   | 1.25  |      | 1.4   | 0.049 |       | 0.055 |
| b2   | 1.2   |      | 1.38  | 0.047 |       | 0.054 |
| c    | 0.45  |      | 0.6   |       | 0.18  | 0.023 |
| D    | 15.9  |      | 16.3  |       | 0.626 | 0.641 |
| D1   | 9     |      | 9.35  | 0.354 |       | 0.368 |
| D2   | 0.8   |      | 1.2   | 0.031 |       | 0.047 |
| D3   | 2.8   |      | 3.2   | 0.110 |       | 0.126 |
| e    | 2.44  |      | 2.64  | 0.096 |       | 0.104 |
| E    | 10.05 |      | 10.35 | 0.396 |       | 0.407 |
| L    | 13.2  |      | 13.6  | 0.520 |       | 0.535 |
| L1   | 3     |      | 3.4   | 0.118 |       | 0.133 |



P011R

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 1998 STMicroelectronics – Printed in Italy – All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - France - Germany - Italy - Japan - Korea - Malaysia - Malta - Mexico - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A.