



STU7NB90

N - CHANNEL 900V - 1.2Ω - 7.3A - Max220 PowerMESH™ MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|----------|------------------|---------------------|----------------|
| STU7NB90 | 900 V | < 1.45 Ω | 7.4 A |

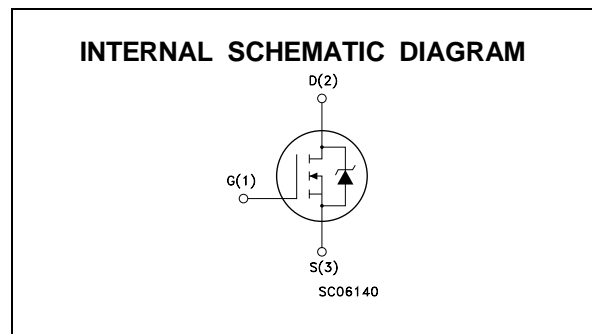
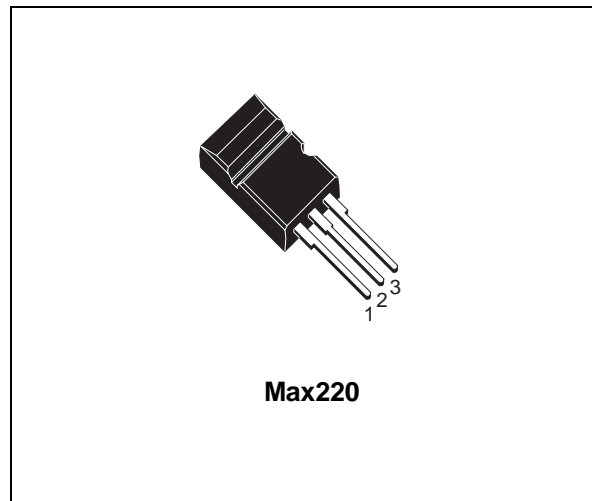
- TYPICAL R_{DS(on)} = 1.2 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLY (SMPS)
- DC-AC CONVERTER FOR WELDING EQUIPMENT AND UNINTERRUPTABLE POWER SUPPLY AND MOTOR DRIVE



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 900 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 kΩ) | 900 | V |
| V _{GS} | Gate-source Voltage | ± 30 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 7.4 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 4.7 | A |
| I _{DM} (●) | Drain Current (pulsed) | 29 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 160 | W |
| | Derating Factor | 1.28 | W/°C |
| dv/dt(1) | Peak Diode Recovery voltage slope | 4 | V/ns |
| T _{stg} | Storage Temperature | -65 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(●) Pulse width limited by safe operating area

(1) I_{SD} ≤ 7.4 A, di/dt ≤ 200 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

STU7NB90

THERMAL DATA

| | | | | |
|-----------------------|--|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 0.78 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |
| R _{thc-sink} | Thermal Resistance Case-sink | Typ | 0.5 | °C/W |
| T _I | Maximum Lead Temperature For Soldering Purpose | | 300 | °C |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|-----------------|--|-----------|------|
| I _{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max) | 7.4 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 600 | mJ |

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|--|------|------|---------|----------|
| V _{(BR)DSS} | Drain-source Breakdown Voltage | I _D = 250 μA V _{GS} = 0 | 900 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating T _c = 125 °C | | | 1 50 | μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 30 V | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---|------|------|------|------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 250 μA | 3 | 4 | 5 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 4 A | | 1.2 | 1.45 | Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)max} V _{GS} = 10 V | 7.4 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|--|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} > I _{D(on)} × R _{DS(on)max} I _D = 4 A | 1.5 | 8.9 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 2200 | | pF |
| C _{oss} | Output Capacitance | | | 230 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 25 | | pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on Time | $V_{DD} = 450\text{ V}$ $I_D = 3.5\text{ A}$ | | 35 | | ns |
| t_r | Rise Time | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 12 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 720\text{ V}$ $I_D = 7.4\text{ A}$ $V_{GS} = 10\text{ V}$ | | 51 | 72 | nC |
| Q_{gs} | Gate-Source Charge | | | 13 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 24 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|--|------|------|------|------|
| $t_{r(voff)}$ | Off-voltage Rise Time | $V_{DD} = 720\text{ V}$ $I_D = 7\text{ A}$ | | 22 | | ns |
| t_f | Fall Time | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 15 | | ns |
| t_c | Cross-over Time | | | 31 | | ns |

SOURCE DRAIN DIODE

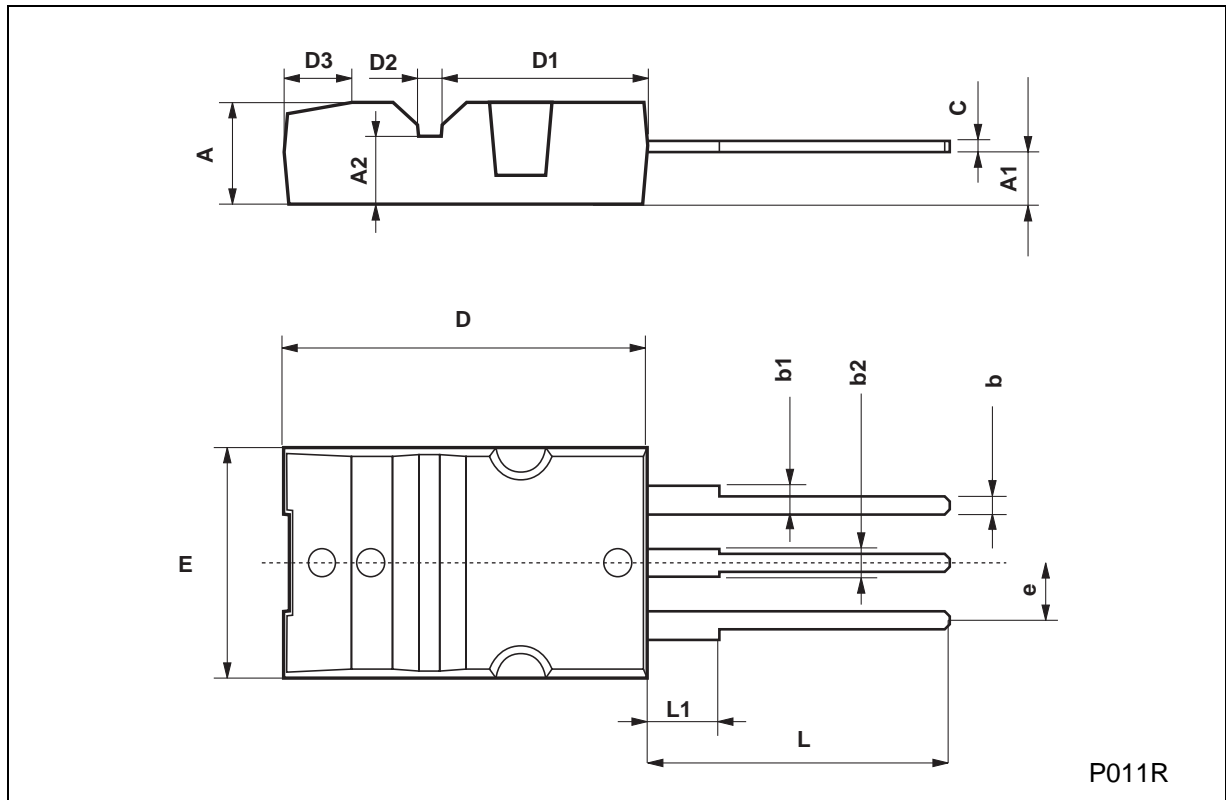
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 7.4 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 29 | A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 7.4\text{ A}$ $V_{GS} = 0$ | | | 1.6 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 7.4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ | | 700 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 6 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 18 | | A |

(*) Pulsed: Pulse duration = 300 μs , 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 |



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