

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STU10NA50 | 500 V | < 0.6 Ω | 10.2 A |

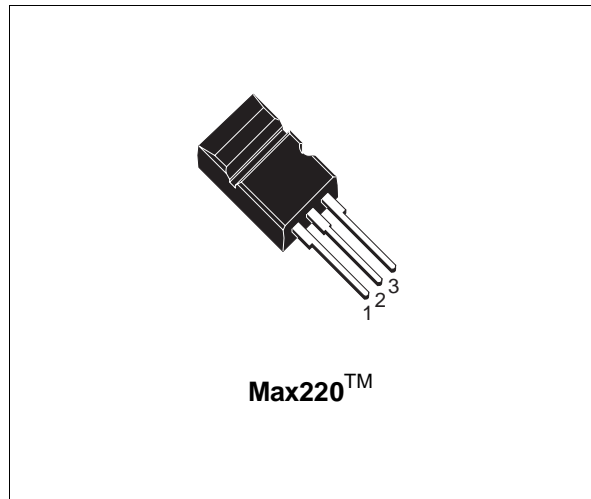
- TYPICAL R_{DS(on)} = 0.5 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- REPETITIVE AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- 100% AVALANCHE TESTED
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

DESCRIPTION

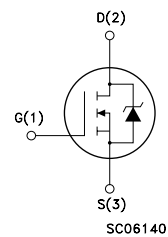
The Max220™ package is a new high volume power package exhibiting the same footprint as the industry standard TO-220, but designed to accommodate much larger silicon chips, normally supplied in bigger packages. The increased die capacity makes the device ideal to reduce component count in multiple paralleled TO-220 designs and save board space with respect to larger packages.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES (UPS)



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 500 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 kΩ) | 500 | V |
| V _{GS} | Gate-source Voltage | ± 30 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 10.2 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 6.4 | A |
| I _{DM} (●) | Drain Current (pulsed) | 40.8 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 145 | W |
| | Derating Factor | 1.16 | W/°C |
| T _{stg} | Storage Temperature | -65 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(●) Pulse width limited by safe operating area

STU10NA50

THERMAL DATA

| | | | | |
|-----------------------|--|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 0.86 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 30 | °C/W |
| R _{thc-sink} | Thermal Resistance Case-sink | Typ | 0.1 | °C/W |
| T _l | 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, δ < 1%) | 10.2 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 520 | mJ |
| E _{AR} | Repetitive Avalanche Energy (pulse width limited by T _j max, δ < 1%) | 24 | mJ |
| I _{AR} | Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, δ < 1%) | 6.8 | A |

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 | 500 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating x 0.8 T _c = 100 °C | | | 250 1000 | 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 | 2.25 | 3 | 3.75 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 5 A V _{GS} = 10 V I _D = 5 A T _c = 100°C | | 0.5 | 0.6 1.2 | Ω Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} x R _{DS(on)max} V _{GS} = 10 V | 10.2 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|--|------|------|------|------|
| g _{fs} (*) | Forward Transconductance | V _{DS} > I _{D(on)} x R _{DS(on)max} I _D = 5 A | 6 | 9 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 1750 | 2500 | pF |
| C _{oss} | Output Capacitance | | | 250 | 370 | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 80 | 130 | pF |

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|--|------|----------------|----------|------------------|
| $t_{d(on)}$ t_r | Turn-on Time Rise Time | $V_{DD} = 250\text{ V}$ $R_G = 4.7\ \Omega$ | | 20 32 | 28 45 | ns ns |
| $(di/dt)_{on}$ | Turn-on Current Slope | $V_{DD} = 400\text{ V}$ $R_G = 47\ \Omega$ | | 190 | | A/ μs |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 400\text{ V}$ $I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}$ | | 80 12 37 | 110 | nC nC nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|---|--|------|----------------|----------------|----------------|
| $t_{r(Voff)}$ t_f t_c | Off-voltage Rise Time Fall Time Cross-over Time | $V_{DD} = 400\text{ V}$ $R_G = 4.7\ \Omega$ | | 16 12 30 | 22 18 42 | ns ns ns |

SOURCE DRAIN DIODE

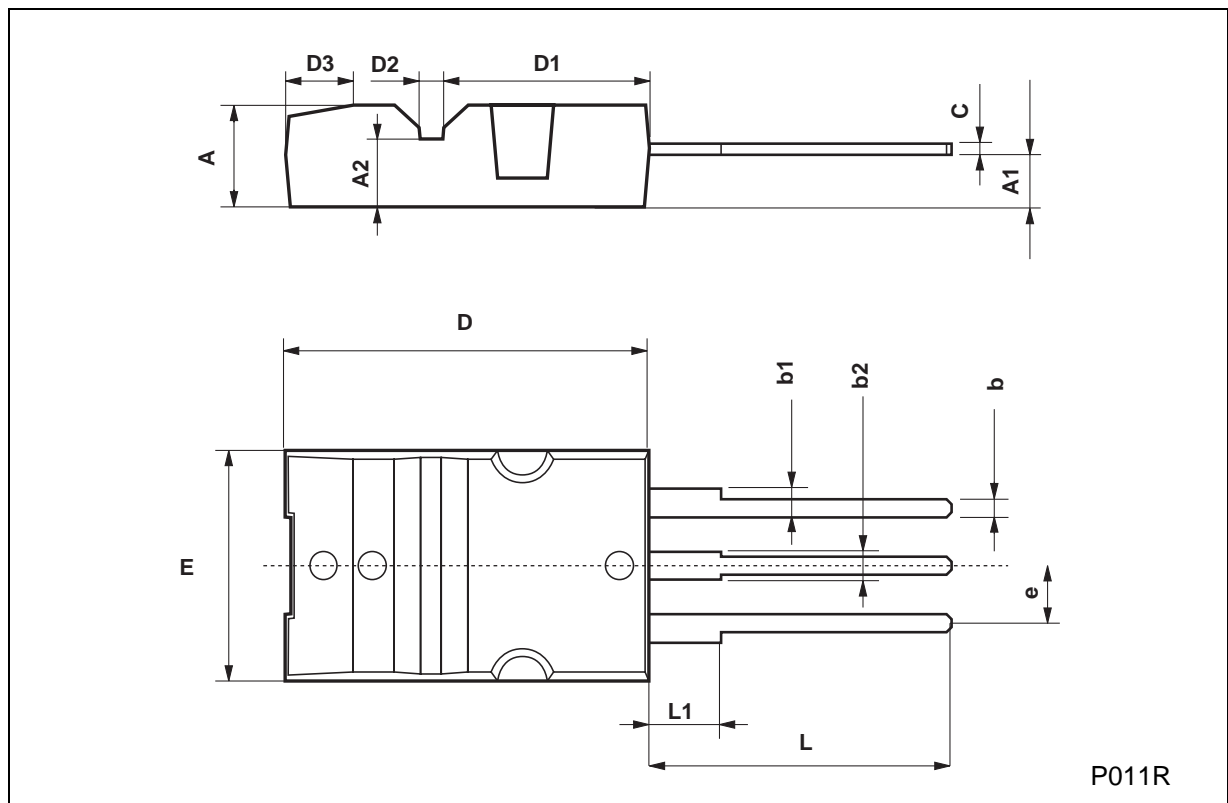
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|---|--|------|-------------------|--------------|--------------------------|
| I_{SD} $I_{SDM}(\bullet)$ | Source-drain Current Source-drain Current (pulsed) | | | | 10.2 40.8 | A A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 10\text{ A}$ $V_{GS} = 0$ | | | 1.6 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ | | 600 10.2 34 | | ns μC 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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