



STY16NA90

N - CHANNEL 900V - 0.5 Ω - 16A - Max247 EXTREMELY LOW GATE CHARGE POWER MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STY16NA90 | 900 V | < 0.54 Ω | 16 A |

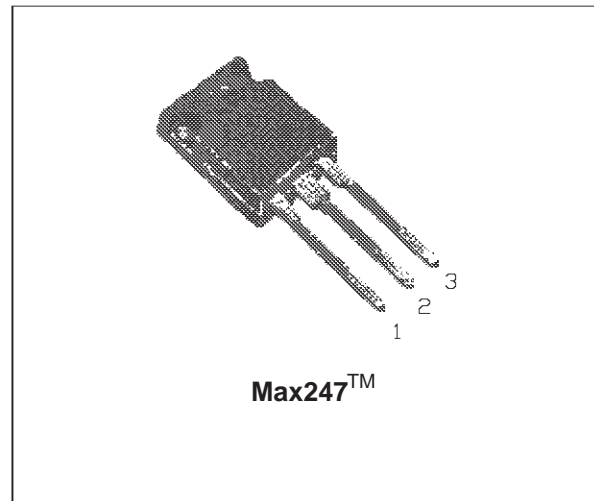
- TYPICAL R_{DS(on)} = 0.5 Ω
- EFFICIENT AND RELIABLE MOUNTING THROUGH CLIP
- ± 30 V GATE TO SOURCE VOLTAGE RATING
- REPETITIVE AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- 100% AVALANCHE TESTED
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

DESCRIPTION

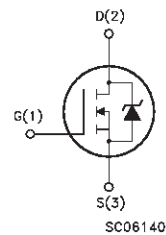
The Max247™ package is a new high volume power package exhibiting the same footprint as the industry standard TO-247, but designed to accommodate much larger silicon chips, normally supplied in bigger packages such as TO-264. The increased die capacity makes the device ideal to reduce component count in multiple paralleled 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) | 900 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 k Ω) | 900 | V |
| V _{GS} | Gate-source Voltage | ± 30 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 16 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 10 | A |
| I _{DM} (•) | Drain Current (pulsed) | 64 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 300 | W |
| | Derating Factor | 2.4 | W/°C |
| T _{stg} | Storage Temperature | -55 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(•) Pulse width limited by safe operating area

STY16NA90

THERMAL DATA

| | | | | |
|-----------------------|--|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 0.42 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 40 | °C/W |
| R _{thc-sink} | Thermal Resistance Case-Heatsink with Conductive Grease | Typ | 0.05 | |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|-----------------|---|-----------|------|
| I _{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max) | 16 | A |
| E _{AS} | Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V) | 3000 | 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 | | | 50 500 | 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 = 8 A | | 0.5 | 0.54 | Ω Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)max} V _{GS} = 10 V | 16 | | | 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 = 8 A | 15 | | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 6400 | 8300 | pF |
| C _{oss} | Output Capacitance | | | 600 | 750 | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 150 | 200 | pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Time | $V_{DD} = 450\text{ V}$ | | 30 | | ns |
| t_r | Rise Time | $I_D = 8\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 30 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 720\text{ V}$ $I_D = 16\text{ A}$ $V_{GS} = 10\text{ V}$ | | 245 | 320 | nC |
| Q_{gs} | Gate-Source Charge | | | 25 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 110 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 720\text{ V}$ | | 80 | 105 | ns |
| t_f | Fall Time | $I_D = 16\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 25 | 35 | ns |
| t_c | Cross-over Time | | | 115 | 150 | ns |

SOURCE DRAIN DIODE

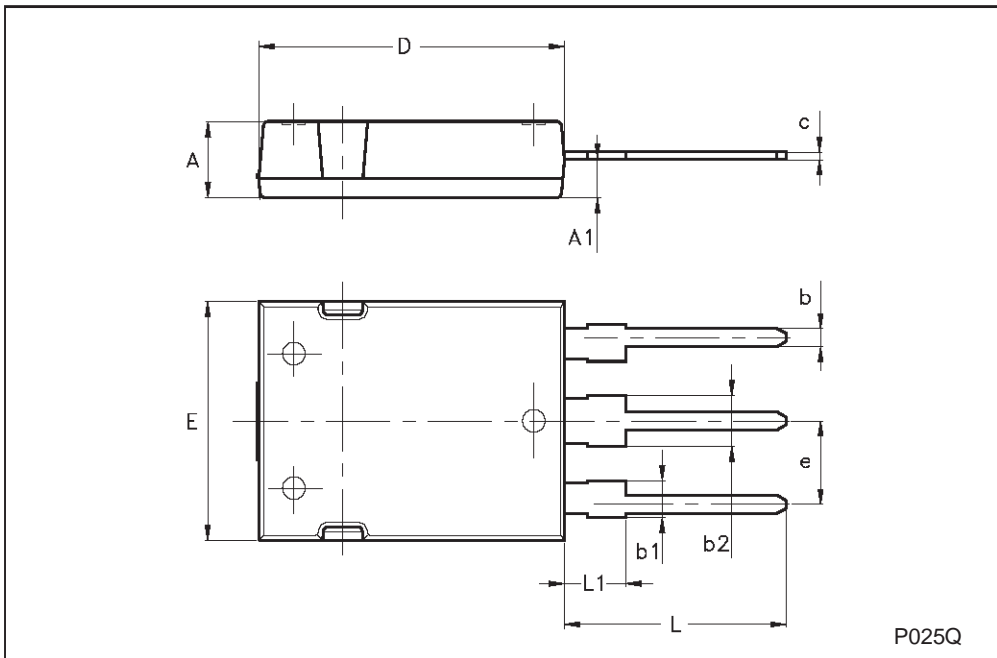
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|--|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 16 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 64 | A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 16\text{ A}$ $V_{GS} = 0$ | | | 2 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 16\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ | | 1100 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 25.3 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 46 | | A |

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

Max247 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|------|------|------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.70 | | 5.30 | | | |
| A1 | 2.20 | | 2.60 | | | |
| b | 1.00 | | 1.40 | | | |
| b1 | 2.00 | | 2.40 | | | |
| b2 | 3.00 | | 3.40 | | | |
| c | 0.40 | | 0.80 | | | |
| D | 19.70 | | 20.30 | | | |
| e | 5.35 | | 5.55 | | | |
| E | 15.30 | | 15.90 | | | |
| L | 14.20 | | 15.20 | | | |
| L1 | 3.70 | | 4.30 | | | |



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.