



STY25NA60

N - CHANNEL 600V - 0.225 Ω - 25A - Max247 EXTREMELY LOW GATE CHARGE POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STY25NA60 | 600 V | < 0.24 Ω | 25 A |

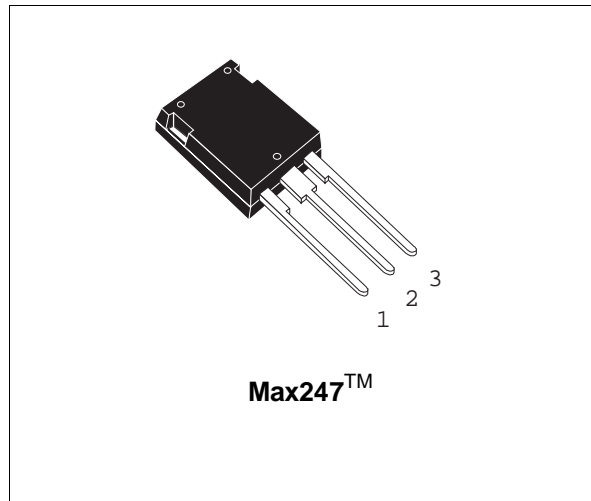
- TYPICAL R_{DS(on)} = 0.225 Ω
- EFFICIENT AND RELIABLE MOUNTING THROUGH CLIP
- $\pm 30V$ GATE TO SOURCE VOLTAGE RATING
- REPETITIVE AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- 100% AVALANCHE TESTED
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

DESCRIPTION

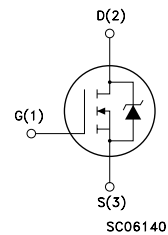
The Max247™ package is a new high volume power package exhibiting the same footprint as the industry standard TO-247, but designed to accommodate much larger silicon chips, normally supplied in bigger packages such as TO-264. The increased die capacity makes the device ideal to reduce component count 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) | 600 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 k Ω) | 600 | V |
| V _{GS} | Gate-source Voltage | ± 30 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 25 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 16.5 | A |
| I _{DM} (•) | Drain Current (pulsed) | 100 | 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

STY25NA60

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) | 25 | 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 | 600 | | | 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 = 12.5 A | | 0.225 | 0.24 | Ω Ω |
| I _{D(on)} | On State Drain Current | V _{DS} > I _{D(on)} × R _{DS(on)max} V _{GS} = 10 V | 25 | | | 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 = 12.5 A | 20 | | | S |
| C _{iss} C _{oss} C _{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | V _{DS} = 25 V f = 1 MHz V _{GS} = 0 | | 6200 690 195 | 8000 900 255 | pF pF pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Time | $V_{DD} = 300\text{ V}$ | | 45 | 60 | ns |
| t_r | Rise Time | $I_D = 12.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 70 | 90 | ns |
| Q_g | Total Gate Charge | $V_{DD} = 480\text{ V}$ $I_D = 25\text{ A}$ $V_{GS} = 10\text{ V}$ | | 240 | 315 | nC |
| Q_{gs} | Gate-Source Charge | | | 25 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 115 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|-------------------------------------------------------------------|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 480\text{ V}$ | | 70 | 90 | ns |
| t_f | Fall Time | $I_D = 25\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 25 | 210 | ns |
| t_c | Cross-over Time | | | 105 | 140 | ns |

SOURCE DRAIN DIODE

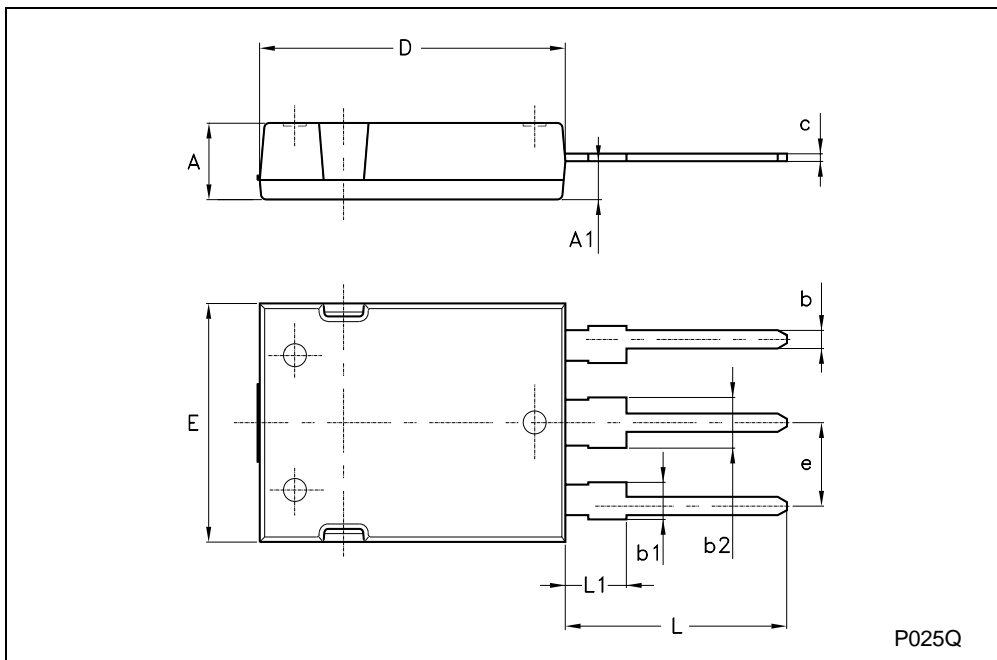
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 25 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 100 | A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 25\text{ A}$ $V_{GS} = 0$ | | | 2 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 25\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ | | 840 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 19.5 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 46.5 | | 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 | | | |



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