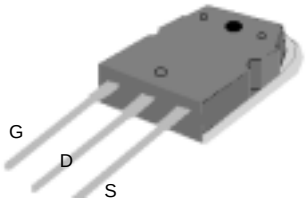
# N-channel Enhancement-mode Power MOSFET

## PRODUCT SUMMARY

| | |
|---|---|
| $BV_{DSS}$ | 900V |
| $R_{DS(ON)}$ | 1.2Ω |
| $I_D$ | 8.6A |

**Pb-free; RoHS-compliant TO-247**




TO-247 (suffix W)

## DESCRIPTION

The SSM09N90GW acheives fast switching performance with low gate charge without a complex drive circuit. It is suitable for high voltage applications such as AC/DC converters and offline power supplies.

The SSM09N90GW is in a TO-247 (TO-3P) package, which is widely used for commercial and industrial applications, where the greater pin spacing is needed to meet safety specifications. The through-hole package is suitable for vertical mounting, where a small footprint is required on the board, and/or an external heatsink is to be attached.

## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage | 900 | V |
| $V_{GS}$ | Gate-source voltage | ±30 | V |
| $I_D$ | Continuous drain current, $T_C$ = 25°C | 8.6 | A |
| | $T_C$ = 100°C | 5 | A |
| $I_{DM}$ | Pulsed drain current[1] | 30 | A |
| $P_D$ | Total power dissipation, $T_C$ = 25°C | 240 | W |
| | Linear derating factor | 1.92 | W/°C |
| $E_{AS}$ | Single pulse avalanche energy[3] | 92 | mJ |
| $I_{AS}$ | Avalanche current | 5.2 | A |
| $E_{AR}$ | Repetitive avalanche energy | 8.6 | mJ |
| $T_{STG}$ | Storage temperature range | -55 to 150 | °C |
| $T_J$ | Operating junction temperature range | -55 to 150 | °C |

## THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $R_{\Theta JC}$ | Maximum thermal resistance, junction-case | 0.52 | °C/W |
| $R_{\Theta JA}$ | Maximum thermal resistance, junction-ambient | 40 | °C/W |

**Notes:**

1. Pulse width must be limited to avoid exceeding the safe operating area.
2. Pulse width <300us, duty cycle <2%.
3. Starting Tj=25°C, $V_{DD}$=50V , L=6.8mH , $R_G$=25Ω , $I_{AS}$=5.2A.

## ELECTRICAL CHARACTERISTICS (at Tj = 25°C, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-source breakdown voltage | $V_{GS}$=0V, $I_D$=1mA | 900 | - | - | V |
| $\Delta BV_{DSS}/\Delta Tj$ | Breakdown voltage temperature coefficient | Reference to 25°C, $I_D$=1mA | - | 0.67 | - | V/°C |
| $R_{DS(ON)}$ | Static drain-source on-resistance | $V_{GS}$=10V, $I_D$=4.5A | - | - | 1.2 | Ω |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 2 | - | 4 | V |
| $g_{fs}$ | Forward transconductance | $V_{DS}$=10V, $I_D$=4.5A | - | 11.5 | - | S |
| $I_{DSS}$ | Drain-source leakage current | $V_{DS}$=900V, $V_{GS}$=0V | - | - | 10 | uA |
| | | $V_{DS}$=720V ,$V_{GS}$=0V, Tj = 125°C | - | - | 100 | uA |
| $I_{GSS}$ | Gate-source leakage current | $V_{GS}$=±30V | - | - | ±100 | nA |
| $Q_g$ | Total gate charge [2] | $I_D$=8.6A | - | 67.1 | 120 | nC |
| $Q_{gs}$ | Gate-source charge | $V_{DS}$=540V | - | 17 | - | nC |
| $Q_{gd}$ | Gate-drain ("Miller") charge | $V_{GS}$=10V | - | 19.9 | - | nC |
| $t_{d(on)}$ | Turn-on delay time [2] | $V_{DS}$=450V | - | 25.8 | - | ns |
| $t_r$ | Rise time | $I_D$=5A | - | 10.3 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | $R_G$=10Ω , $V_{GS}$=10V | - | 305 | - | ns |
| $t_f$ | Fall time | $R_D$=90Ω | - | 536 | - | ns |
| $C_{iss}$ | Input capacitance | $V_{GS}$=0V | - | 4087 | 6000 | pF |
| $C_{oss}$ | Output capacitance | $V_{DS}$=25V | - | 221 | - | pF |
| $C_{rss}$ | Reverse transfer capacitance | f=1.0MHz | - | 51 | - | pF |

## Source-Drain Diode

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Forward voltage [2] | $I_S$=8.6A, $V_{GS}$=0V | - | - | 1.5 | V |
| $I_S$ | Continuous source current ( body diode ) | $V_D$=$V_G$=0V, $V_S$=1.5V | | - | 8.6 | A |
| $I_{SM}$ | Pulsed source current (body diode )[1] | | - | - | 3 | A |

**Notes:**

1.Pulse width must be limited to avoid exceeding the maximum junction temperature of 150°C.

2.Pulse width <300us, duty cycle <2%.

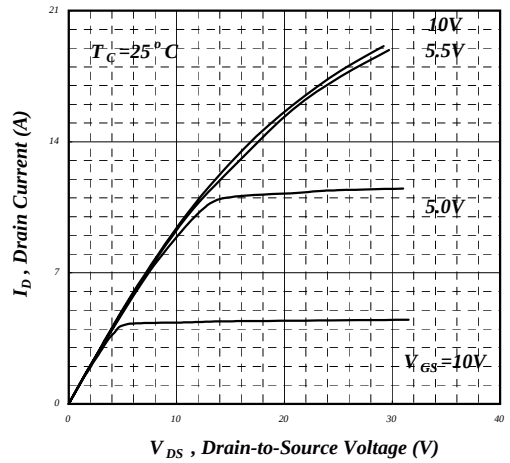



Fig 1. Typical Output Characteristics

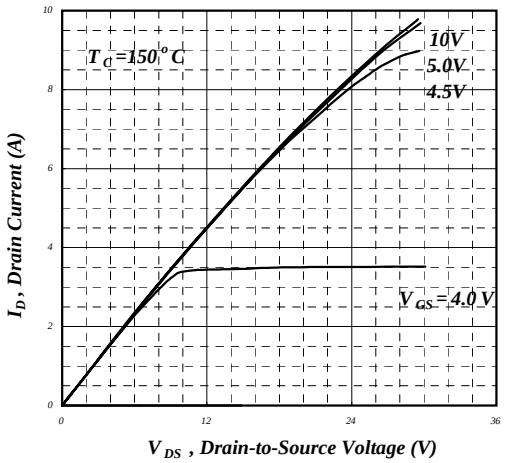



Fig 2. Typical Output Characteristics

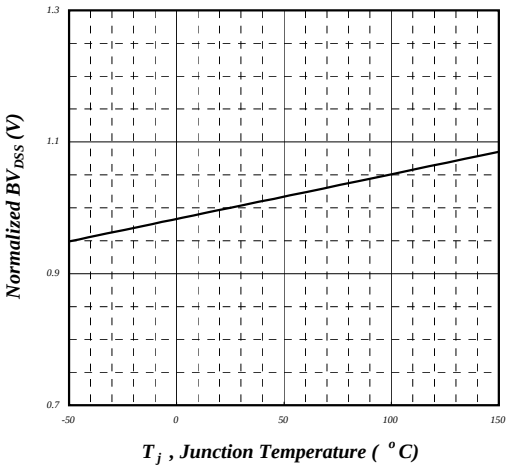



Fig 3. Normalized $BVD_{SS}$ vs. Junction Temperature

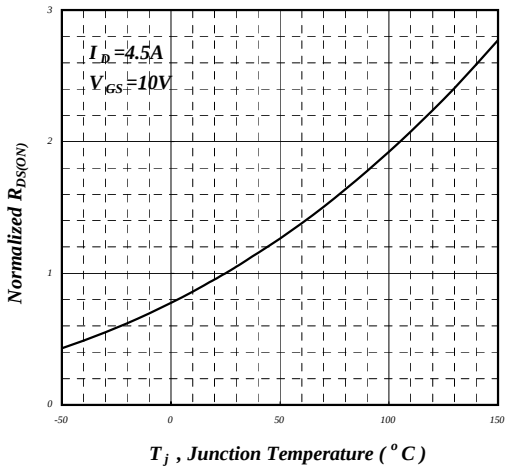



Fig 4. Normalized On-Resistance vs. Junction Temperature

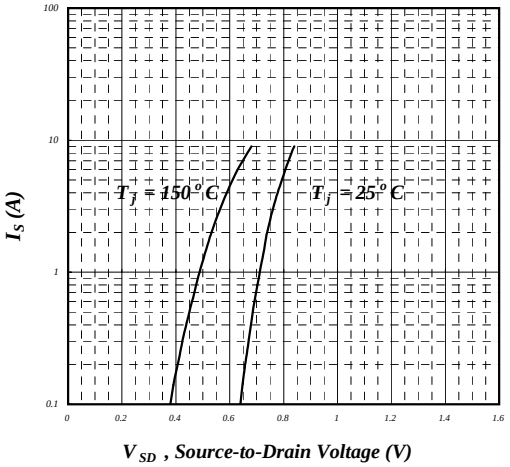



Fig 5. Forward Characteristic of Reverse Diode

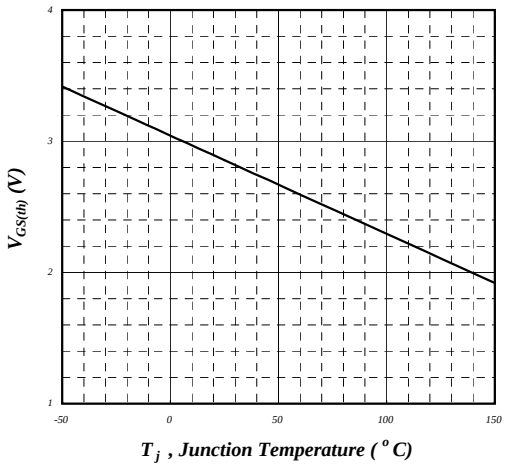



Fig 6. Gate Threshold Voltage vs. Junction Temperature

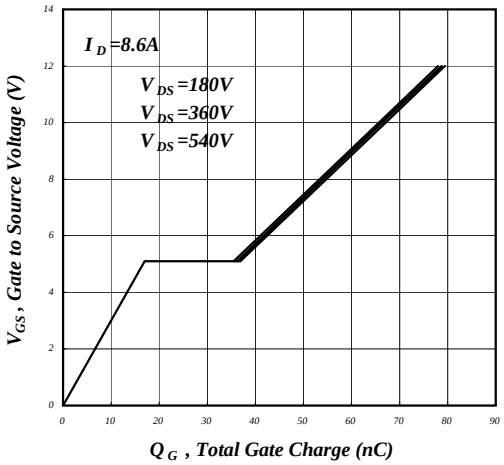



Fig 7. Gate Charge Characteristics

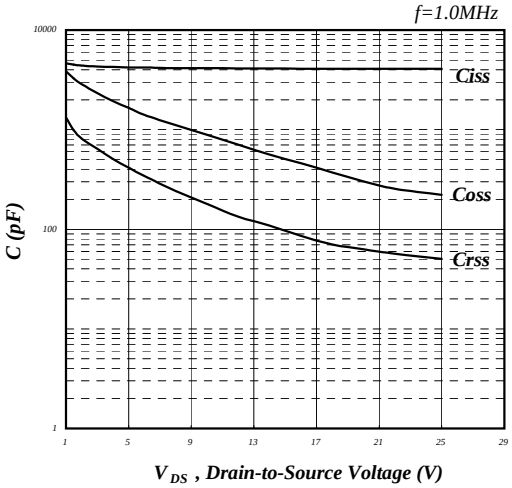



Fig 8. Typical Capacitance Characteristics

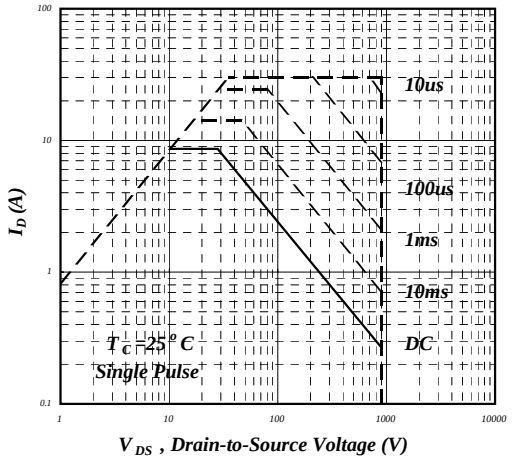



Fig 9. Maximum Safe Operating Area

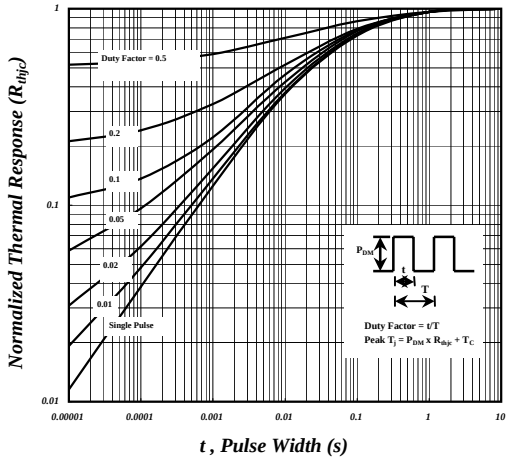



Fig 10. Effective Transient Thermal Impedance

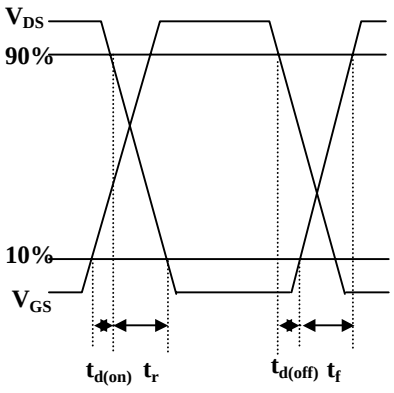



Fig 11. Switching Time Waveform

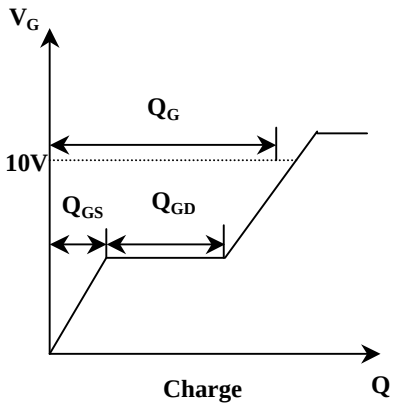
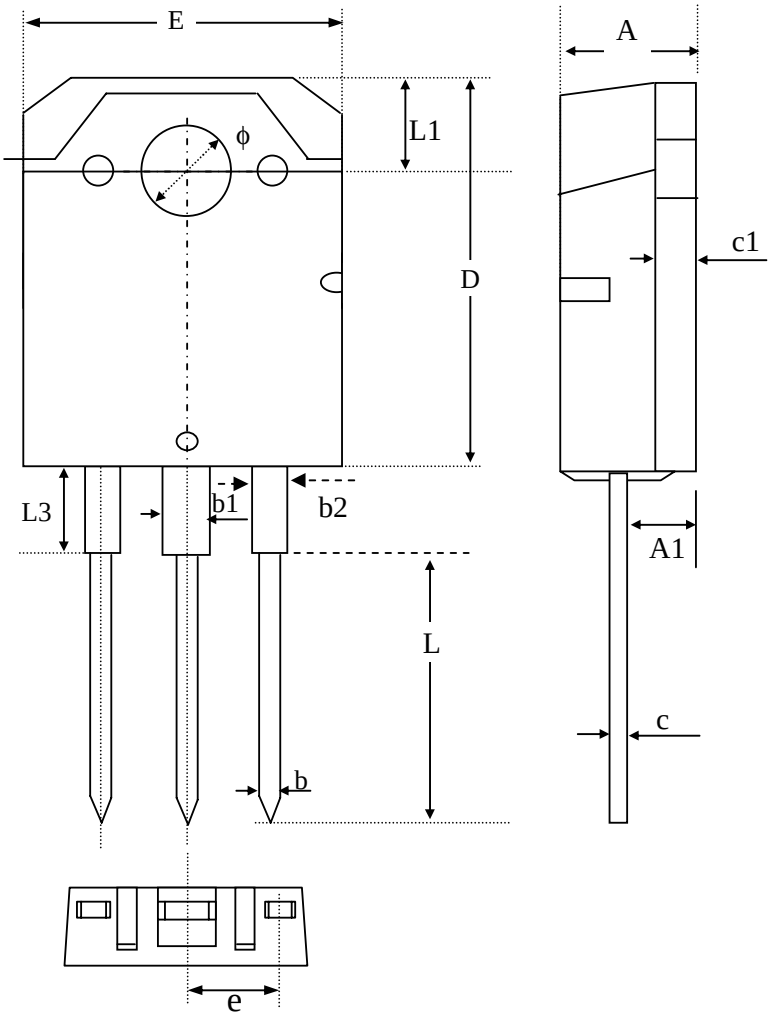



Fig 12. Gate Charge Waveform

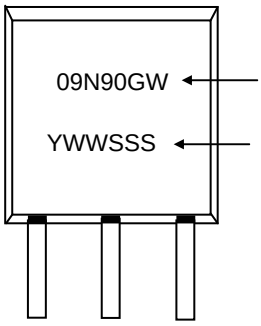
## PHYSICAL DIMENSIONS - TO-247




| SYMBOLS | Millimeters | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.60 | 4.80 | 5.00 |
| A1 | 1.20 | 1.40 | 1.60 |
| b | 0.80 | 1.00 | 1.20 |
| b1 | 2.80 | 3.00 | 3.20 |
| b2 | 1.80 | 2.00 | 2.20 |
| c | 0.55 | 0.60 | 0.75 |
| c1 | 1.45 | 1.50 | 1.65 |
| D | 19.70 | 19.90 | 20.10 |
| E | 15.40 | 15.60 | 15.80 |
| e | 5.15 | 5.45 | 5.75 |
| L | 16.20 | 16.50 | 16.80 |
| L1 | 3.60 | 3.80 | 4.00 |
| L3 | 3.30 | 3.50 | 3.70 |

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

## PART MARKING - TO-247




PART NUMBER: 09N90GW = SSM09N90GW

DATE/LOT CODE:

Y = last digit of the year

WW = work week (01 -> 52)

SSS = lot code sequence

## PACKING: Moisture sensitivity level MSL3

1000pcs in tubes packed inside a moisture barrier bag (MBB).