

General Description

SFGMOS[®] MOSFET is based on Oriental Semiconductor's unique device design to achieve low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. The high V_{th} series is specially optimized for high systems with gate driving voltage greater than 10V.

Features

- Low $R_{DS(ON)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Fast switching and soft recovery



Applications

- Switched mode power supply
- Motor driver
- Battery protection
- DC-DC convertor
- Solar inverter
- UPS and energy inverter

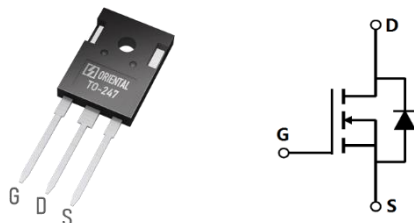
Key Performance Parameters

| Parameter | Value | Unit |
|--------------------------------|-------|------------|
| $V_{DS, min} @ T_{j(max)}$ | 100 | V |
| $I_{D, pulse}$ | 540 | A |
| $R_{DS(ON), max} @ V_{GS}=10V$ | 3 | m Ω |
| Q_g | 158.8 | nC |

Marking Information

| Product Name | Package | Marking |
|--------------|---------|------------|
| SFG180N10HF | TO247 | SFG180N10H |

Package & Pin information



Absolute Maximum Ratings at $T_j=25^{\circ}\text{C}$ unless otherwise noted

| Parameter | Symbol | Value | Unit |
|---|----------------|------------|--------------------|
| Drain source voltage | V_{DS} | 100 | V |
| Gate source voltage | V_{GS} | ± 20 | V |
| Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$ | I_D | 180 | A |
| Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$ | $I_{D, pulse}$ | 540 | A |
| Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$ | I_S | 180 | A |
| Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$ | $I_{S, pulse}$ | 540 | A |
| Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$ | P_D | 375 | W |
| Single pulsed avalanche energy ⁵⁾ | E_{AS} | 1000 | mJ |
| Operation and storage temperature | T_{stg}, T_j | -55 to 150 | $^{\circ}\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|----------------------|
| Thermal resistance, junction-case | $R_{\theta JC}$ | 0.33 | $^{\circ}\text{C/W}$ |
| Thermal resistance, junction-ambient ⁴⁾ | $R_{\theta JA}$ | 62 | $^{\circ}\text{C/W}$ |

Electrical Characteristics at $T_j=25^{\circ}\text{C}$ unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------------------|--------------|------|------|------|---------------|---|
| Drain-source breakdown voltage | BV_{DSS} | 100 | | | V | $V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 2.0 | | 4.0 | V | $V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$ |
| Drain-source on-state resistance | $R_{DS(ON)}$ | | 2.5 | 3.0 | m Ω | $V_{GS}=10\text{ V}, I_D=20\text{ A}$ |
| Gate-source leakage current | I_{GSS} | | | 100 | nA | $V_{GS}=20\text{ V}$ |
| | | | | -100 | | $V_{GS}=-20\text{ V}$ |
| Drain-source leakage current | I_{DSS} | | | 1 | μA | $V_{DS}=100\text{ V}, V_{GS}=0\text{ V}$ |
| Gate resistance | R_G | | 3.5 | | Ω | $f=1\text{ MHz}, \text{Open drain}$ |

Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|------------------------------|--------------|------|-------|------|------|--|
| Input capacitance | C_{iss} | | 10953 | | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$ |
| Output capacitance | C_{oss} | | 1402 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 33.3 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 40.7 | | ns | $V_{GS}=10\text{ V}$, $V_{DS}=50\text{ V}$, $R_G=2.2\ \Omega$, $I_D=25\text{ A}$ |
| Rise time | t_r | | 31.4 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 75.4 | | ns | |
| Fall time | t_f | | 16.2 | | ns | |

Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------|---------------|------|-------|------|------|---|
| Total gate charge | Q_g | | 158.8 | | nC | $V_{GS}=10\text{ V}$, $V_{DS}=50\text{ V}$, $I_D=25\text{ A}$ |
| Gate-source charge | Q_{gs} | | 38.4 | | nC | |
| Gate-drain charge | Q_{gd} | | 41.6 | | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 4.6 | | V | |

Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|-------------------------------|-----------|------|------|------|------|--|
| Diode forward voltage | V_{SD} | | | 1.3 | V | $I_S=20\text{ A}$, $V_{GS}=0\text{ V}$ |
| Reverse recovery time | t_{rr} | | 99.2 | | ns | $V_R=50\text{ V}$, $I_S=25\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | | 402 | | nC | |
| Peak reverse recovery current | I_{rrm} | | 6.7 | | A | |

Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $L=0.3\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

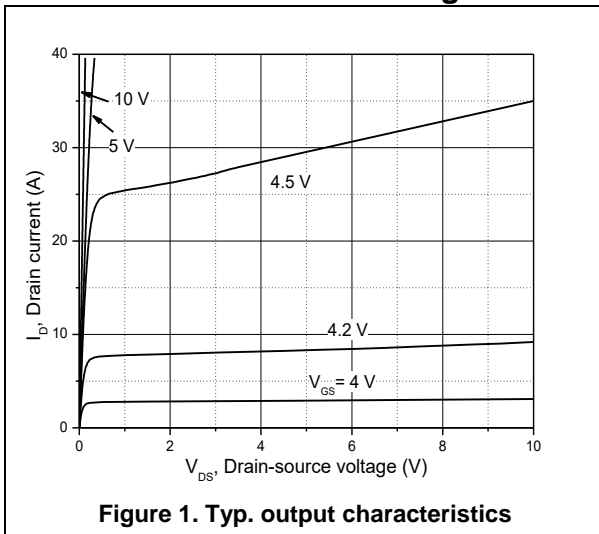


Figure 1. Typ. output characteristics

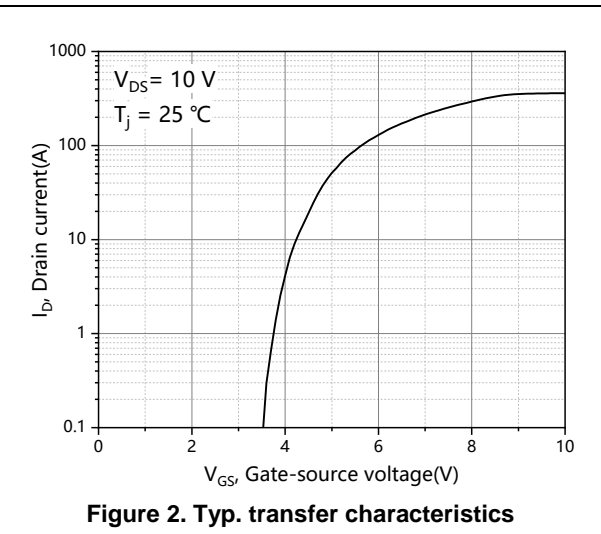


Figure 2. Typ. transfer characteristics

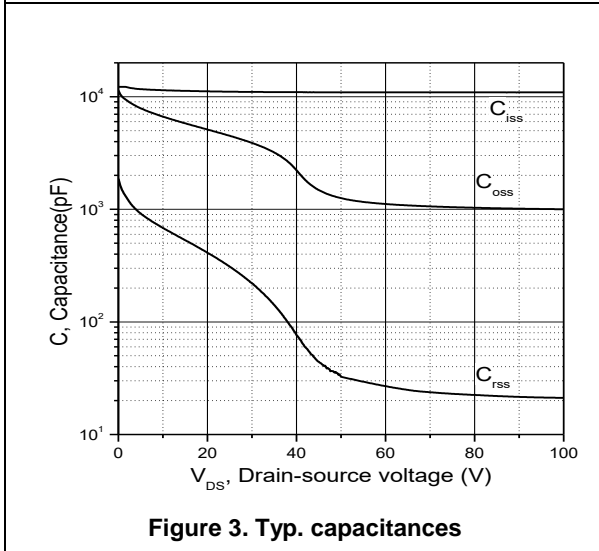


Figure 3. Typ. capacitances

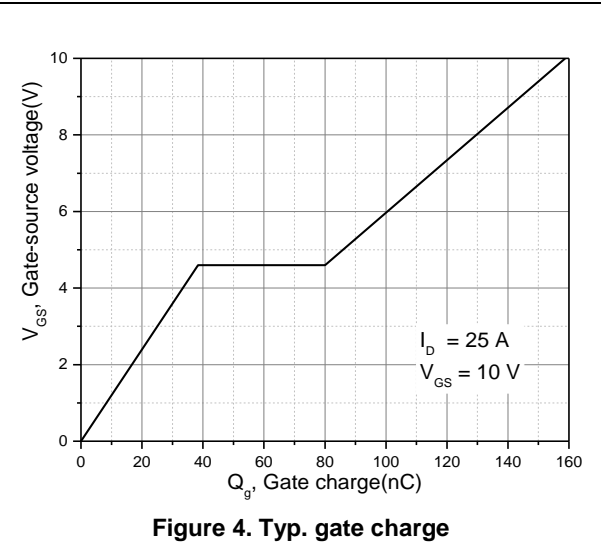


Figure 4. Typ. gate charge

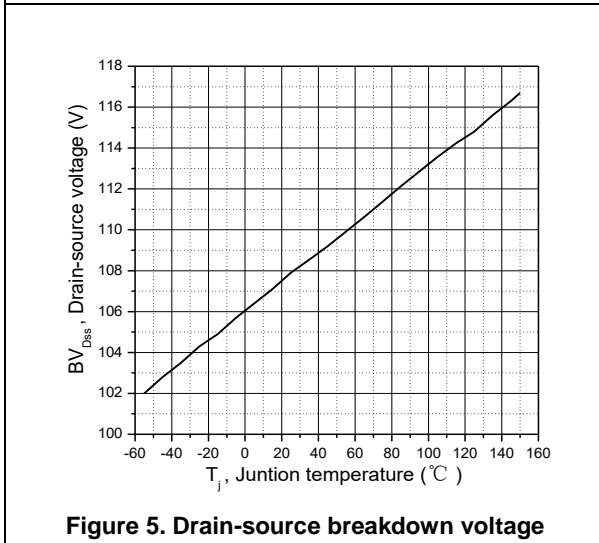


Figure 5. Drain-source breakdown voltage

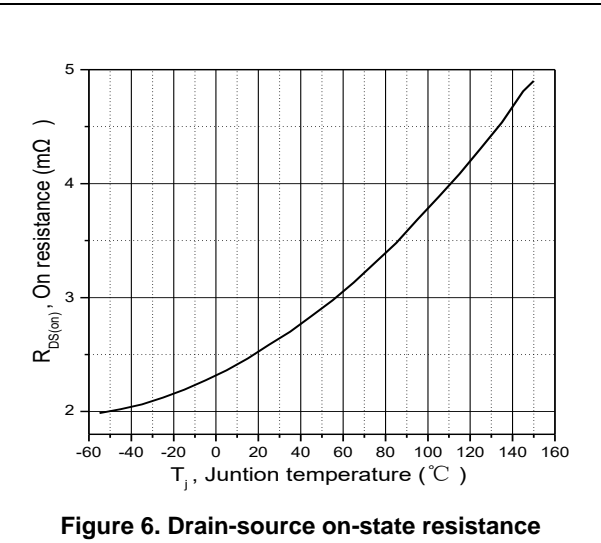
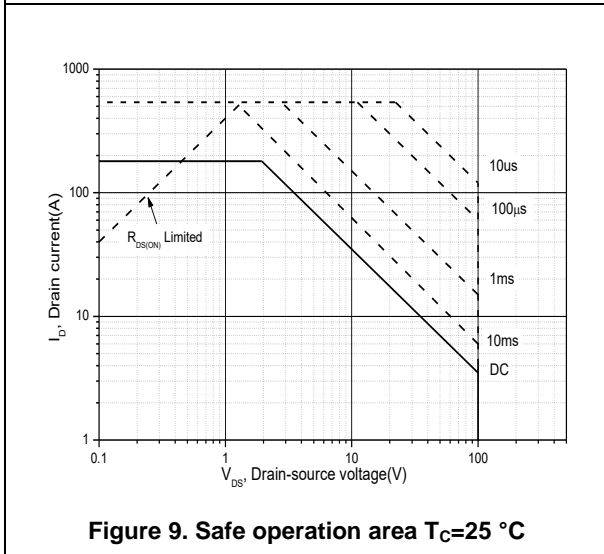
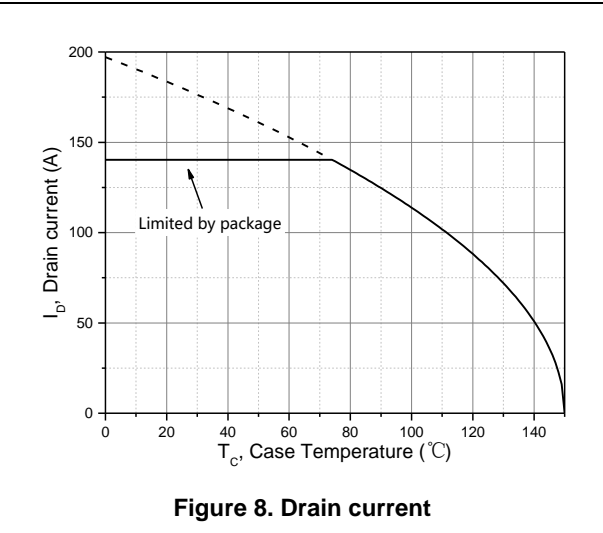
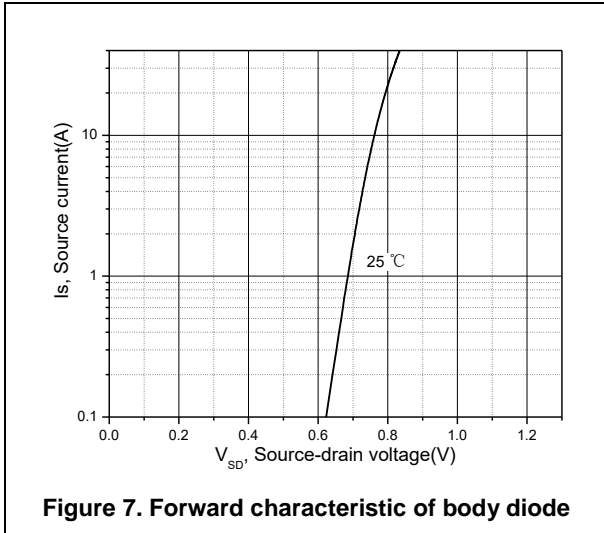


Figure 6. Drain-source on-state resistance



Test circuits and waveforms



Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms

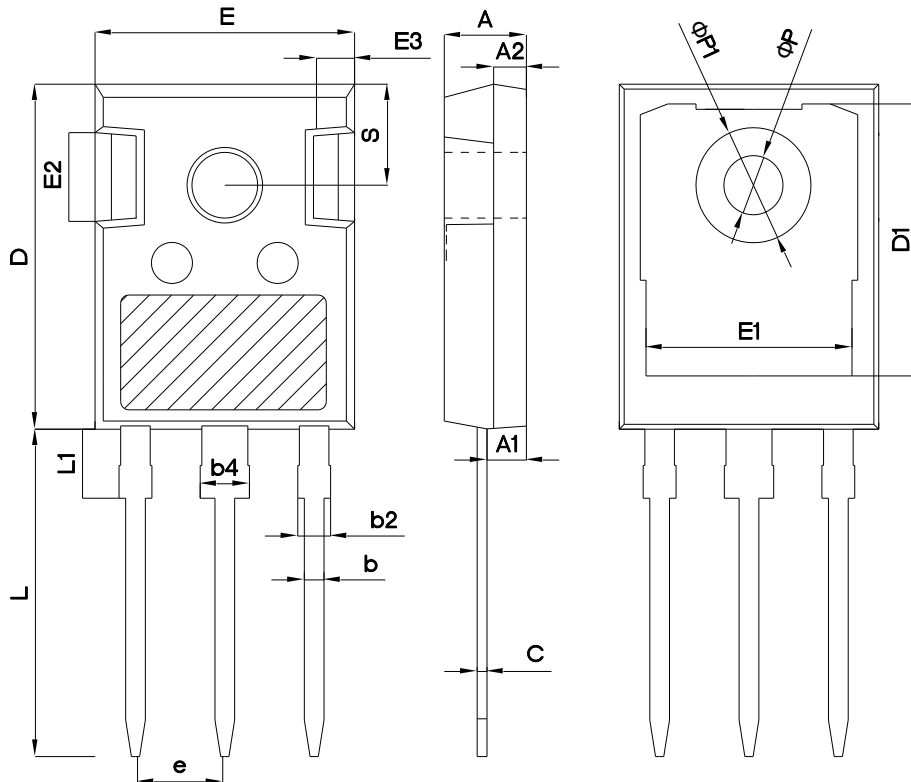


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms



Figure 4. Diode reverse recovery test circuit & waveforms

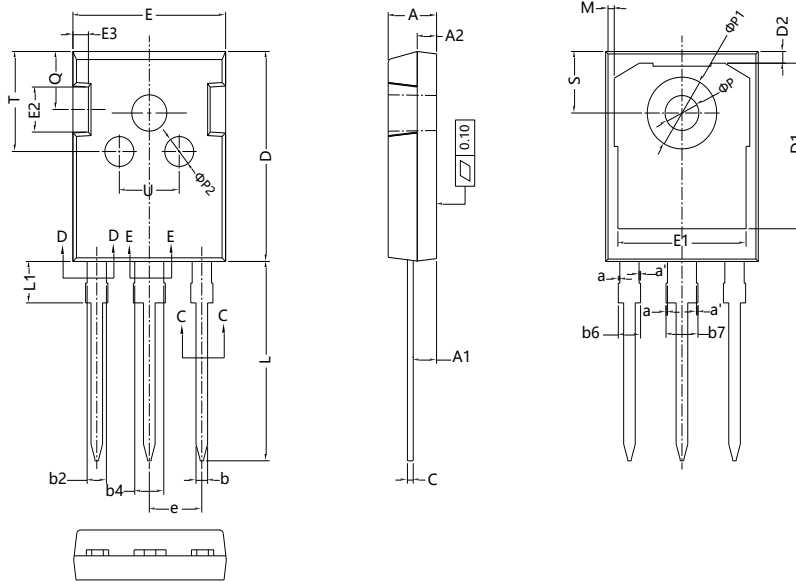
Package Information



| Symbol | mm | | |
|--------|---------|-------|-------|
| | Min | Nom | Max |
| A | 4.80 | 5.00 | 5.20 |
| A1 | 2.21 | 2.41 | 2.59 |
| A2 | 1.85 | 2.00 | 2.15 |
| b | 1.11 | 1.21 | 1.36 |
| b2 | 1.91 | 2.01 | 2.21 |
| b4 | 2.91 | 3.01 | 3.21 |
| c | 0.51 | 0.61 | 0.75 |
| D | 20.80 | 21.00 | 21.30 |
| D1 | 16.25 | 16.55 | 16.85 |
| E | 15.50 | 15.80 | 16.10 |
| E1 | 13.00 | 13.30 | 13.60 |
| E2 | 4.80 | 5.00 | 5.20 |
| E3 | 2.30 | 2.50 | 2.70 |
| e | 5.44BSC | | |
| L | 19.82 | 19.92 | 20.22 |
| L1 | - | - | 4.30 |
| ΦP | 3.40 | 3.60 | 3.80 |
| ΦP1 | - | - | 7.30 |
| S | 6.15BSC | | |

Version 1: TO247-C package outline dimension

Package Information



| Symbol | mm | | |
|--------|-----------|-------|-------|
| | Min | Nom | Max |
| A | 4.90 | 5.00 | 5.10 |
| A1 | 2.31 | 2.41 | 2.51 |
| A2 | 1.90 | 2.00 | 2.10 |
| a | 0.00 | - | 0.15 |
| a' | 0.00 | - | 0.15 |
| b | 1.16 | - | 1.26 |
| b1 | 1.15 | 1.2 | 1.22 |
| b2 | 1.96 | - | 2.06 |
| b3 | 1.95 | 2.00 | 2.02 |
| b4 | 2.96 | - | 3.06 |
| b5 | 2.96 | 3.00 | 3.02 |
| b6 | - | - | 2.25 |
| b7 | - | - | 3.25 |
| c | 0.59 | - | 0.66 |
| c1 | 0.58 | 0.60 | 0.62 |
| D | 20.90 | 21.00 | 21.10 |
| D1 | 16.25 | 16.55 | 16.85 |
| D2 | 1.05 | 1.17 | 1.35 |
| E | 15.70 | 15.80 | 15.90 |
| E1 | 13.10 | 13.30 | 13.50 |
| E2 | 4.40 | 4.50 | 4.60 |
| E3 | 2.40 | 2.50 | 2.60 |
| e | 5.436 BSC | | |
| L | 19.80 | 19.92 | 20.10 |
| L1 | - | - | 4.30 |
| M | 0.35 | - | 0.95 |
| P | 3.40 | 3.50 | 3.60 |
| P1 | 7.00 | - | 7.40 |
| P2 | 2.40 | 2.5 | 2.6 |
| Q | 5.60 | - | 6.0 |
| S | 6.05 | 6.15 | 6.25 |
| T | 9.8 | - | 10.20 |
| U | 6.00 | - | 6.40 |

Version 2: TO247-J package outline dimension

Ordering Information

| Package Type | Units/ Tube | Tubes / Inner Box | Units/ Inner Box | Inner Boxes/ Carton Box | Units/ Carton Box |
|--------------|-------------|-------------------|------------------|-------------------------|-------------------|
| TO247-C | 30 | 11 | 330 | 6 | 1980 |
| TO247-J | 30 | 20 | 600 | 5 | 3000 |

Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|-------------|---------|---------|------|--------------|
| SFG180N10HF | TO247 | yes | yes | yes |

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