

General Description

The GreenMOS[®] high voltage MOSFET utilizes charge balance technology to achieve outstanding low on-resistance and lower gate charge. It is engineered to minimize conduction loss, provide superior switching performance and robust avalanche capability.

The GreenMOS[®] Z series is integrated with fast recovery diode (FRD) to minimize reverse recovery time. It is suitable for resonant switching topologies to reach higher efficiency, higher reliability and smaller form factor.

Features

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




Applications

- LED lighting
- Telecom
- Adapter
- Sever
- Solar/UPS

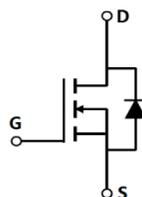
Key Performance Parameters

| Parameter | Value | Unit |
|--------------------------------|-------|------------|
| V_{DS} | 600 | V |
| $I_{D, pulse}$ | 140 | A |
| $R_{DS(ON), max} @ V_{GS}=10V$ | 35 | m Ω |
| Q_g | 106 | nC |

Marking Information

| Product Name | Package | Marking |
|----------------|---------|---------------|
| OSG60R035HT5ZF | TO247 | OSG60R035HT5Z |

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} | 600 | V |
| Gate-source voltage | V_{GS} | ± 30 | V |
| Continuous drain current ¹⁾ , $T_C=25^\circ\text{C}$ | I_D | 68 | A |
| Continuous drain current ¹⁾ , $T_C=100^\circ\text{C}$ | | 43 | |
| Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$ | $I_{D, pulse}$ | 140 | A |
| Continuous diode forward current ¹⁾ , $T_C=25^\circ\text{C}$ | I_S | 68 | A |
| Diode pulsed current ²⁾ , $T_C=25^\circ\text{C}$ | $I_{S, pulse}$ | 140 | A |
| Power dissipation ³⁾ , $T_C=25^\circ\text{C}$ | P_D | 350 | W |
| Single pulsed avalanche energy ⁵⁾ | E_{AS} | 250 | mJ |
| MOSFET dv/dt ruggedness, $V_{DS}=0\dots 480\text{ V}$ | dv/dt | 50 | V/ns |
| Reverse diode dv/dt, $V_{DS}=0\dots 480\text{ V}$, $I_{SD}\leq I_D$ | dv/dt | 50 | V/ns |
| Operation and storage temperature | T_{stg}, T_j | -55 to 150 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|--------------------|
| Thermal resistance, junction-case | $R_{\theta JC}$ | 0.36 | $^\circ\text{C/W}$ |
| 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} | 600 | | | V | $V_{GS}=0\text{ V}$, $I_D=2\text{ mA}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 3.0 | | 5.0 | V | $V_{DS}=V_{GS}$, $I_D=2\text{ mA}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | | 32 | 35 | m Ω | $V_{GS}=10\text{ V}$, $I_D=25\text{ A}$ |
| | | | 78 | | | $V_{GS}=10\text{ V}$, $I_D=25\text{ A}$, $T_j=150^\circ\text{C}$ |
| Gate-source leakage current | I_{GSS} | | | 100 | nA | $V_{GS}=30\text{ V}$ |
| | | | | -100 | | $V_{GS}=-30\text{ V}$ |
| Drain-source leakage current | I_{DSS} | | | 10 | μA | $V_{DS}=600\text{ V}$, $V_{GS}=0\text{ V}$ |
| Gate resistance | R_G | | 1.3 | | Ω | $f=1\text{ MHz}$, Open drain |

Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|--|--------------|------|------|------|------|---|
| Input capacitance | C_{iss} | | 4180 | | pF | $V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$ |
| Output capacitance | C_{oss} | | 278 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 5.3 | | pF | |
| Effective output capacitance, energy related | $C_{o(er)}$ | | 183 | | pF | $V_{GS}=0\text{ V}$, $V_{DS}=0\text{ V}-400\text{ V}$ |
| Effective output capacitance, time related | $C_{o(tr)}$ | | 1060 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 27 | | ns | $V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\ \Omega$, $I_D=20\text{ A}$ |
| Rise time | t_r | | 9 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 79 | | ns | |
| Fall time | t_f | | 2 | | ns | |

Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------|---------------|------|------|------|------|--|
| Total gate charge | Q_g | | 106 | | nC | $V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $I_D=20\text{ A}$ |
| Gate-source charge | Q_{gs} | | 22 | | nC | |
| Gate-drain charge | Q_{gd} | | 43 | | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 6.1 | | V | |

Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|-------------------------------|-----------|------|------|------|------|---|
| Diode forward voltage | V_{SD} | | | 1.3 | V | $I_S=25\text{ A}$, $V_{GS}=0\text{ V}$ |
| Reverse recovery time | t_{rr} | | 174 | | ns | $V_R=400\text{ V}$, $I_S=20\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | | 1 | | uC | |
| Peak reverse recovery current | I_{rrm} | | 11.4 | | 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) $V_{DD}=100\text{ V}$, $V_{GS}=10\text{ V}$, $L=80\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

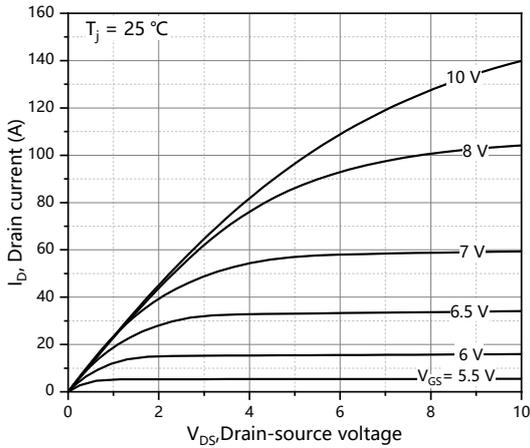


Figure 1. Typ. output characteristics T_j=25°C

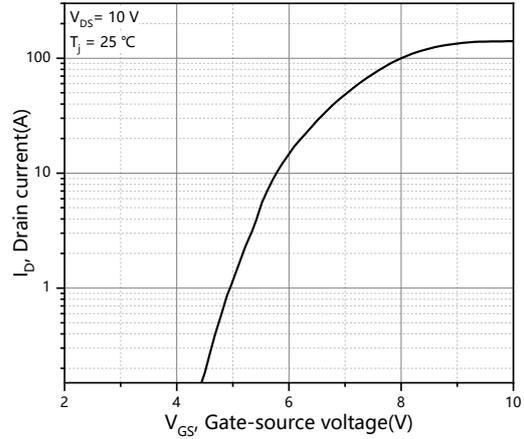


Figure 2. Typ. transfer characteristics

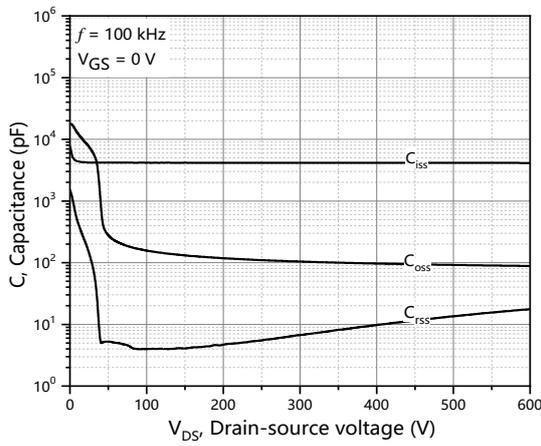


Figure 3. Typ. capacitances

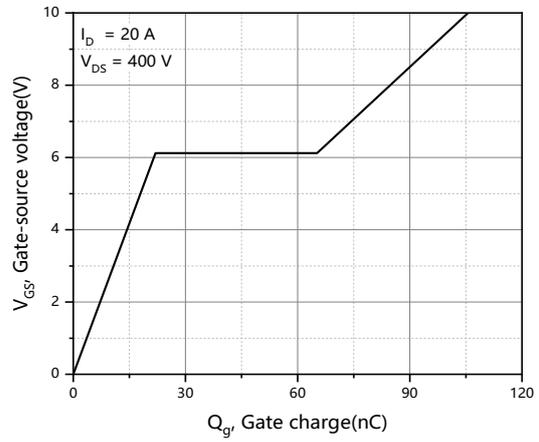


Figure 4. Typ. gate charge

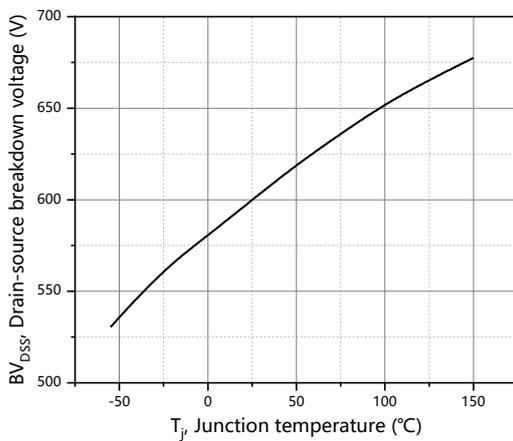


Figure 5. Drain-source breakdown voltage

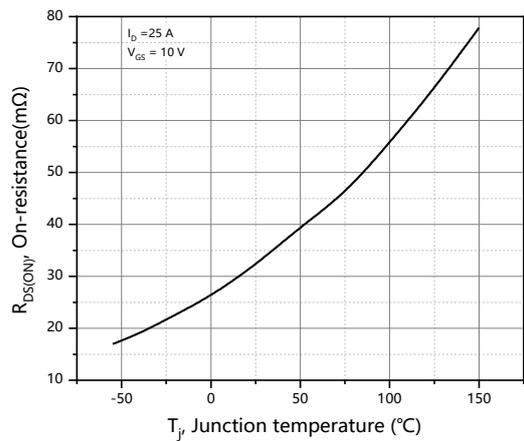
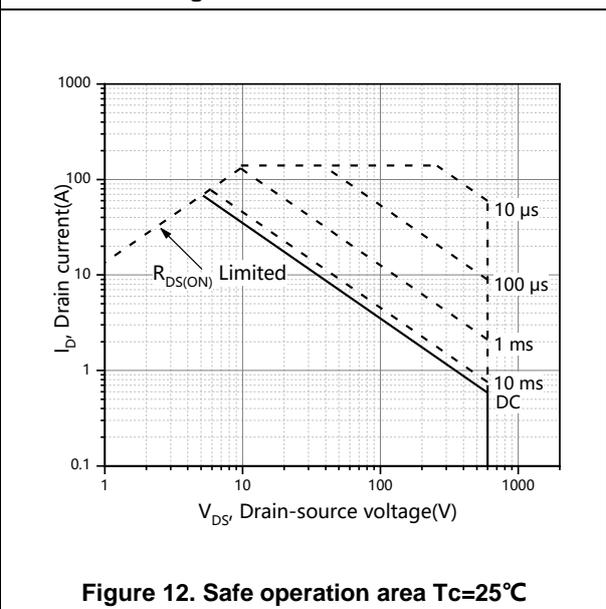
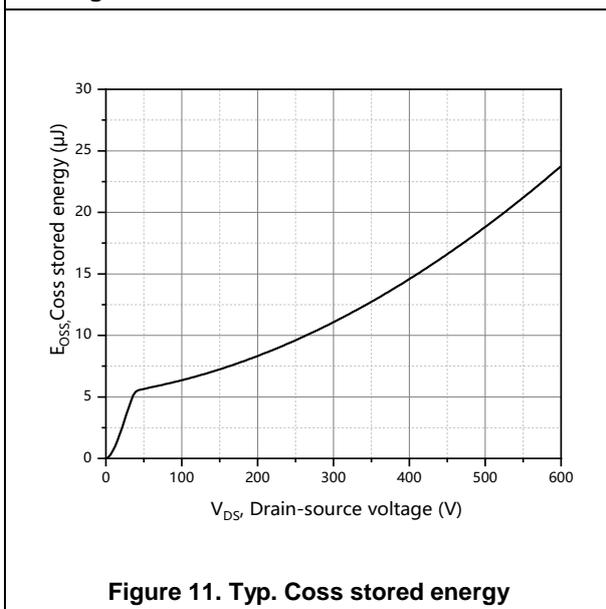
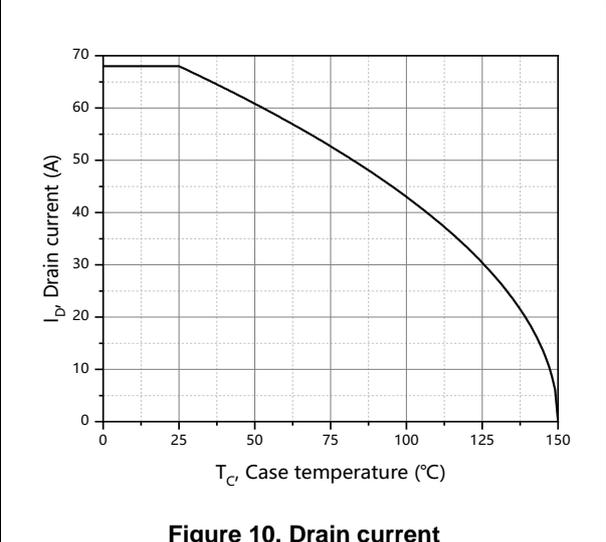
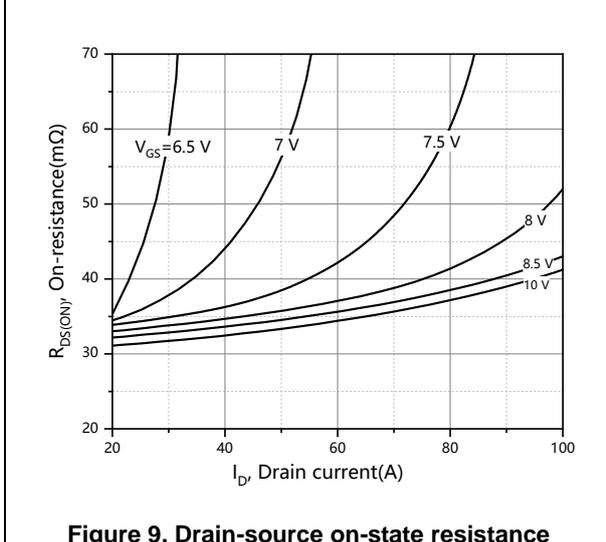
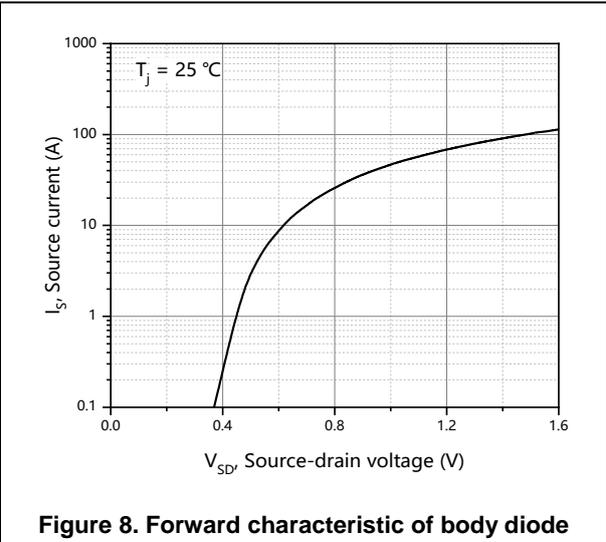
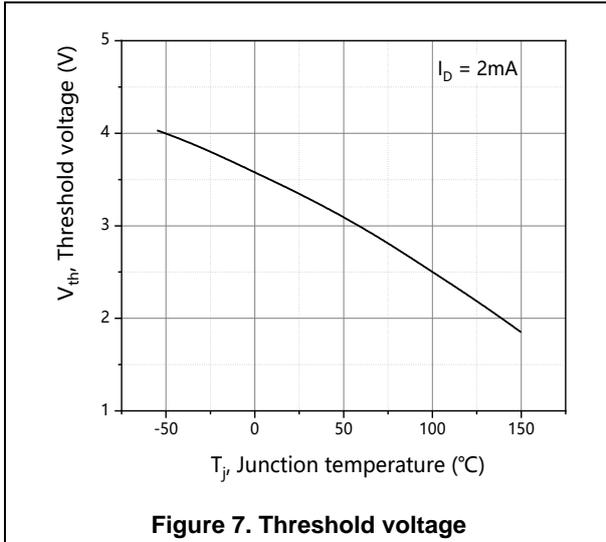
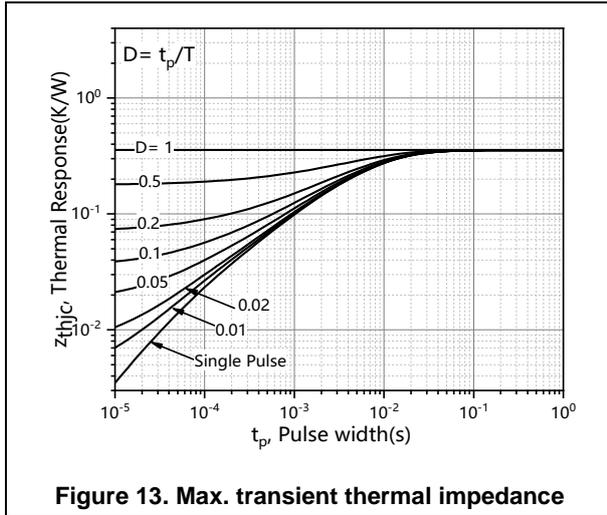


Figure 6. Drain-source on-state resistance





Test circuits and waveforms

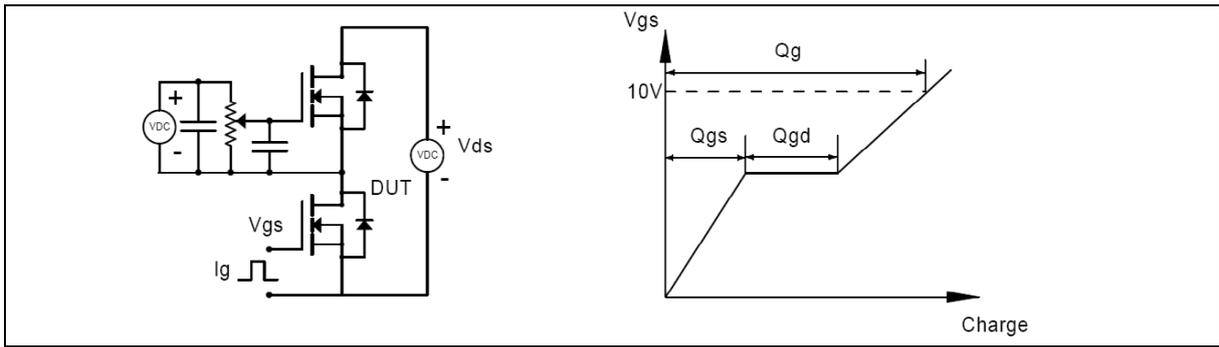


Figure 1. Gate charge test circuit & waveform

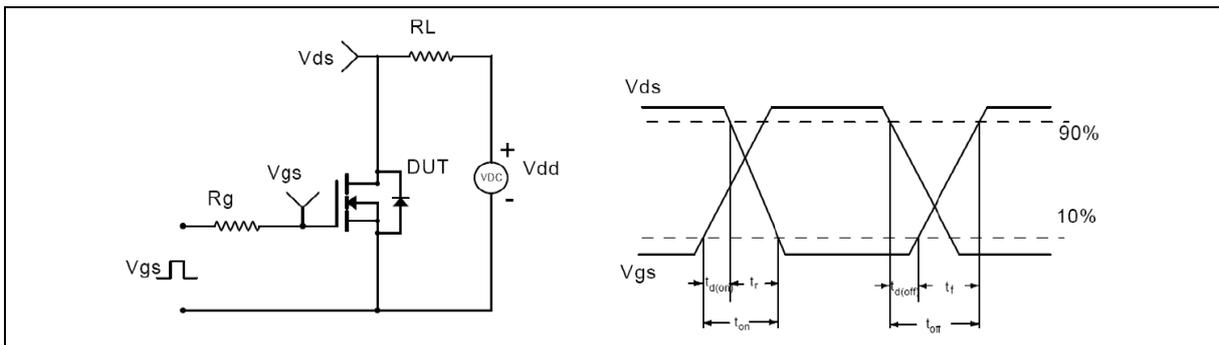


Figure 2. Switching time test circuit & waveforms

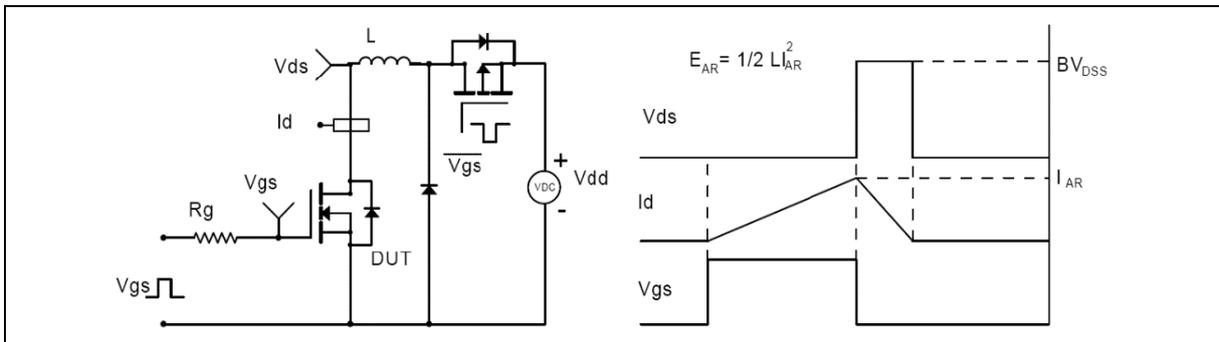


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

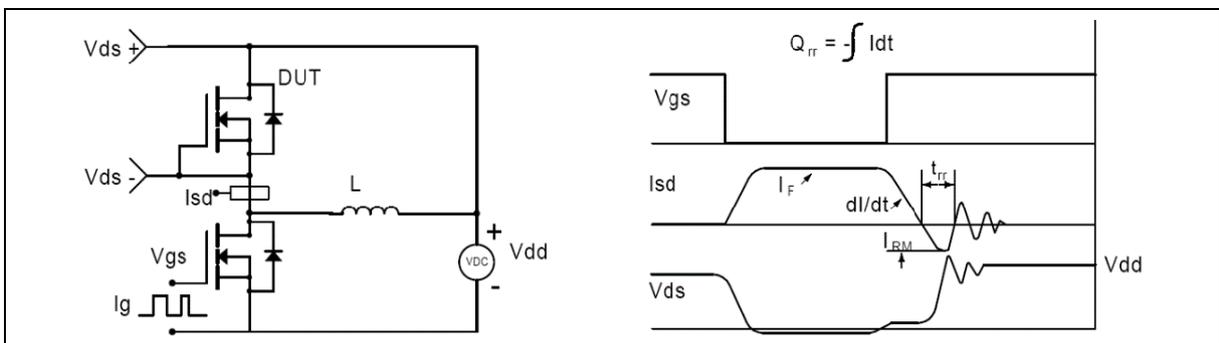
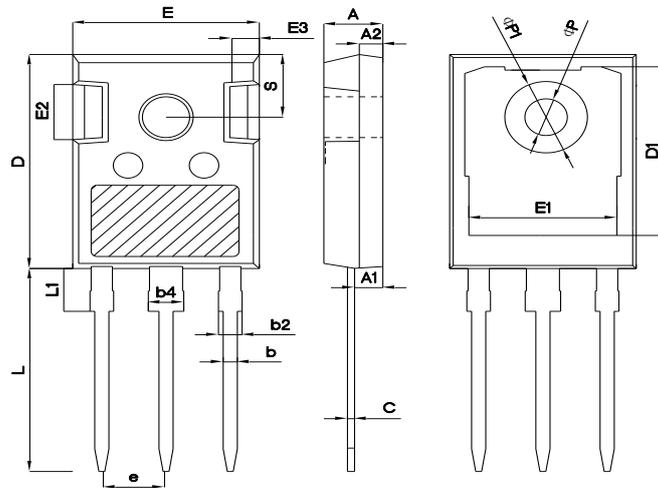


Figure 4. Diode reverse recovery test circuit & waveforms

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 | 5.44 BSC | | |
| L | 19.82 | 19.92 | 20.22 |
| L1 | - | - | 4.30 |
| ΦP | 3.40 | 3.60 | 3.80 |
| ΦP1 | - | - | 7.30 |
| S | 6.15 BSC | | |

Version 1: TO247-P package outline dimension

Ordering Information

| Package Type | Units/ Tube | Tubes/ Inner Box | Units/ Inner Box | Inner Boxes/ Carton Box | Units/ Carton Box |
|--------------|-------------|------------------|------------------|-------------------------|-------------------|
| TO247-P | 30 | 11 | 330 | 6 | 1980 |

Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|----------------|---------|---------|------|--------------|
| OSG60R035HT5ZF | TO247 | yes | yes | yes |

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