

**OSG65R069HSZF\_Datasheet**

# Enhancement Mode N-Channel Power MOSFET

## Features

- ◆ Ultra-fast and robust body diode
- ◆ Low  $R_{DS(on)}$  & FOM
- ◆ Excellent low switching loss
- ◆ Excellent stability and uniformity
- ◆ Easy to drive

## Applications

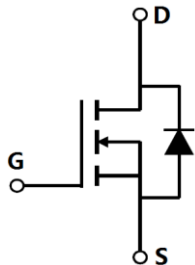
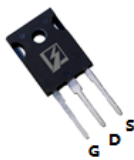
- ◆ PC power
- ◆ Server power supply
- ◆ Telecom
- ◆ Solar inverter
- ◆ Super charger for automobiles

## ■ General Description

OSG65R069HSZF use advanced GreenMOS™ technology to provide low  $R_{DS(ON)}$ , low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and super charger applications.

|                                   |        |
|-----------------------------------|--------|
| ◆ $V_{DS, min@Tjmax}$             | 700 V  |
| ◆ $I_{D, pulse}$                  | 159 A  |
| ◆ $R_{DS(ON), max @ V_{GS}=10 V}$ | 69 mΩ  |
| ◆ $Q_g$                           | 108 nC |

## ■ Schematic and Package Information

|  |   |
|--|---|
| <b>Schematic Diagram</b><br> | <b>Pin Assignment-Top View</b><br><br><b>TO247</b><br><b>OSG65R069HSZF</b> |
|--|---|

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

| Parameter   | Symbol         | Value      | Unit |
|---|----------------|------------|------|
| Drain source voltage                                      | $V_{DS}$       | 650        | V    |
| Gate source voltage                                       | $V_{GS}$       | ±30        | V    |
| Continuous drain current <sup>1)</sup>                    | $I_D$          | 53         | A    |
| Continuous drain current <sup>1)</sup> $T_j=100^{\circ}C$ |                | 33.5       |      |
| Pulsed drain current <sup>2)</sup>                        | $I_{D, pulse}$ | 159        | A    |
| Power dissipation <sup>3)</sup>                           | $P_D$          | 390        | W    |
| Single pulsed avalanche energy <sup>5)</sup>              | $E_{AS}$       | 1600       | mJ   |
| MOSFET dv/dt ruggedness, $V_{DS}=0...480 V$               | dv/dt          | 50         | V/ns |
| Reverse diode dv/dt, $V_{DS}=0...480 V, I_{SD} \leq I_D$  | dv/dt          | 50         | V/ns |
| Operation and storage temperature                         | $T_{stg}, T_j$ | -55 to 150 | °C   |

## ■ Thermal Characteristics

| Parameter  | Symbol          | Value | Unit                        |
|--|-----------------|-------|-----------------------------|
| Thermal resistance, junction-case                  | $R_{\theta JC}$ | 0.32  | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction-ambient <sup>4)</sup> | $R_{\theta JA}$ | 62    | $^{\circ}\text{C}/\text{W}$ |

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

| Parameter                        | Symbol       | Min. | Typ.  | Max.  | Unit          | Test condition  |
|----------------------------------|--------------|------|-------|-------|---------------|---|
| Drain-source breakdown voltage   | $BV_{DSS}$   | 650  |       |       | V             | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$                                  |
|                                  |              | 700  | 760   |       |               | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$<br>$T_j=150^{\circ}\text{C}$     |
| Gate threshold voltage           | $V_{GS(th)}$ | 3.0  |       | 4.5   | V             | $V_{DS}=V_{GS}, I_D=1\text{ mA}$                                      |
| Drain-source on-state resistance | $R_{DS(on)}$ |      | 0.060 | 0.069 | $\Omega$      | $V_{GS}=10\text{ V}, I_D=26.5\text{ A}$                               |
|                                  |              |      | 0.15  |       |               | $V_{GS}=10\text{ V}, I_D=26.5\text{ A},$<br>$T_j=150^{\circ}\text{C}$ |
| 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    | $\mu\text{A}$ | $V_{DS}=650\text{ V}, V_{GS}=0\text{ V}$                              |

## ■ Dynamic Characteristics

| Parameter                    | Symbol       | Min. | Typ.   | Max. | Unit | Test condition   |
|------------------------------|--------------|------|--------|------|------|--|
| Input capacitance            | $C_{iss}$    |      | 5820.4 |      | pF   | $V_{GS}=0\text{ V},$<br>$V_{DS}=50\text{ V},$<br>$f=100\text{ kHz}$                      |
| Output capacitance           | $C_{oss}$    |      | 293.2  |      | pF   |  |
| Reverse transfer capacitance | $C_{rss}$    |      | 8.0    |      | pF   |  |
| Turn-on delay time           | $t_{d(on)}$  |      | 51.2   |      | ns   | $V_{GS}=10\text{ V},$<br>$V_{DS}=400\text{ V},$<br>$R_G=2\ \Omega,$<br>$I_D=25\text{ A}$ |
| Rise time                    | $t_r$        |      | 88.2   |      | ns   |  |
| Turn-off delay time          | $t_{d(off)}$ |      | 93.5   |      | ns   |  |
| Fall time                    | $t_f$        |      | 4.3    |      | ns   |  |

## ■ Gate Charge Characteristics

| Parameter            | Symbol               | Min. | Typ.  | Max. | Unit | Test condition   |
|----------------------|----------------------|------|-------|------|------|--|
| Total gate charge    | $Q_g$                |      | 108.0 |      | nC   | $I_D=25\text{ A}$ ,<br>$V_{DS}=400\text{ V}$ ,<br>$V_{GS}=10\text{ V}$ |
| Gate-source charge   | $Q_{gs}$             |      | 27.4  |      | nC   |  |
| Gate-drain charge    | $Q_{gd}$             |      | 45.8  |      | nC   |  |
| Gate plateau voltage | $V_{\text{plateau}}$ |      | 6.7   |      | V    |  |

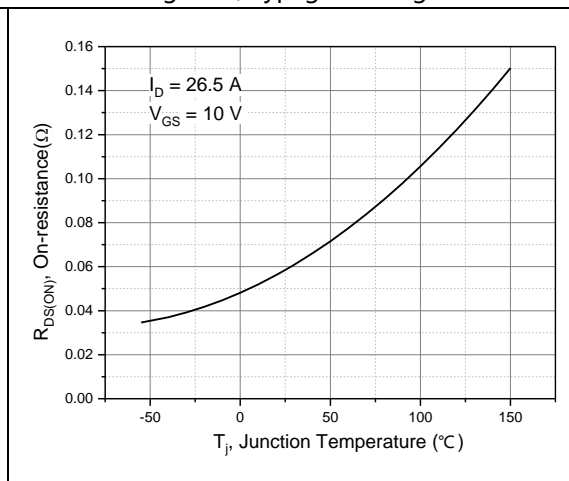
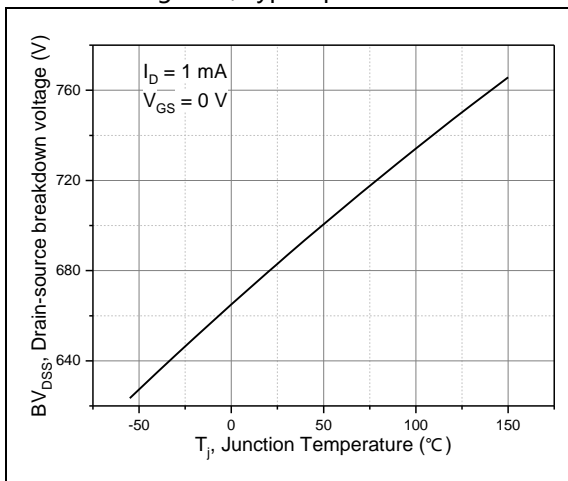
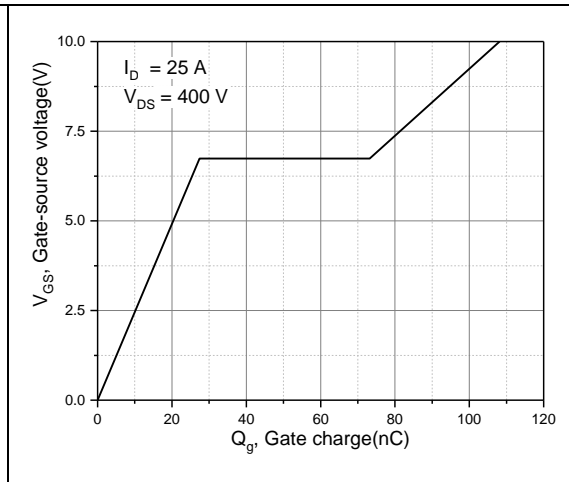
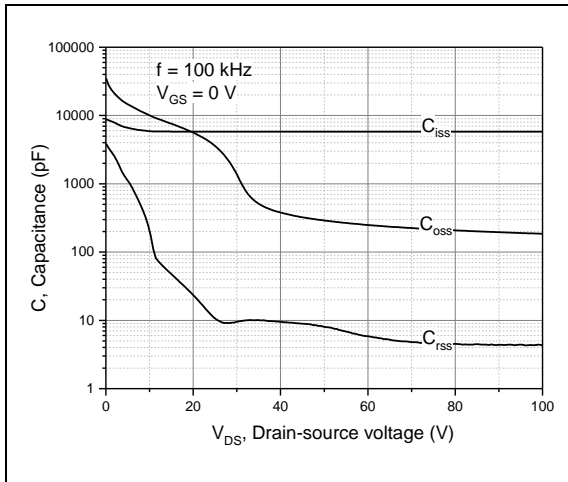
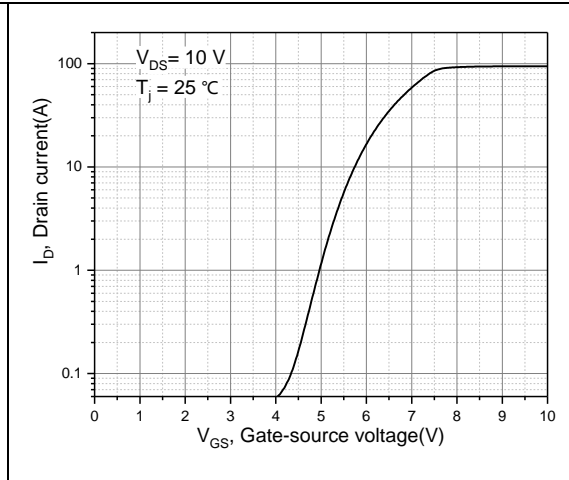
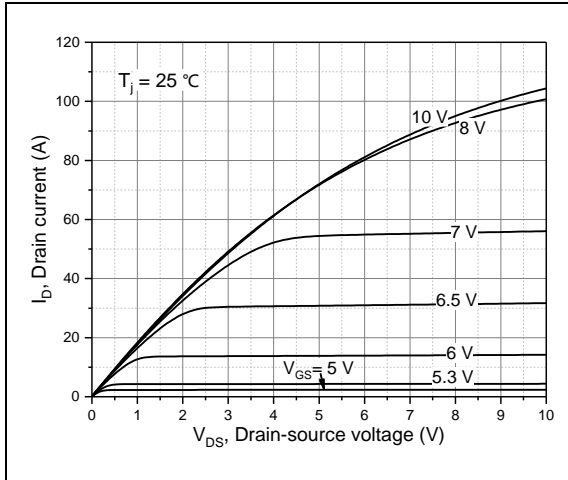
## ■ Body Diode Characteristics

| Parameter                     | Symbol    | Min. | Typ.  | Max. | Unit          | Test condition  |
|-------------------------------|-----------|------|-------|------|---------------|---|
| Diode forward current         | $I_S$     |      |       | 53   | A             | $V_{GS} < V_{th}$                                       |
| Pulsed source current         | $I_{SP}$  |      |       | 159  |               |   |
| Diode forward voltage         | $V_{SD}$  |      |       | 1.3  | V             | $I_S=53\text{ A}$ , $V_{GS}=0\text{ V}$                 |
| Reverse recovery time         | $t_{rr}$  |      | 159.5 |      | ns            | $I_S=25\text{ A}$ ,<br>$di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge       | $Q_{rr}$  |      | 1.2   |      | $\mu\text{C}$ |   |
| Peak reverse recovery current | $I_{rrm}$ |      | 14.5  |      | 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)  $V_{DD}=100\text{ V}$ ,  $R_G=50\text{ }\Omega$ ,  $L=60\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

■ **Electrical Characteristics Diagrams**



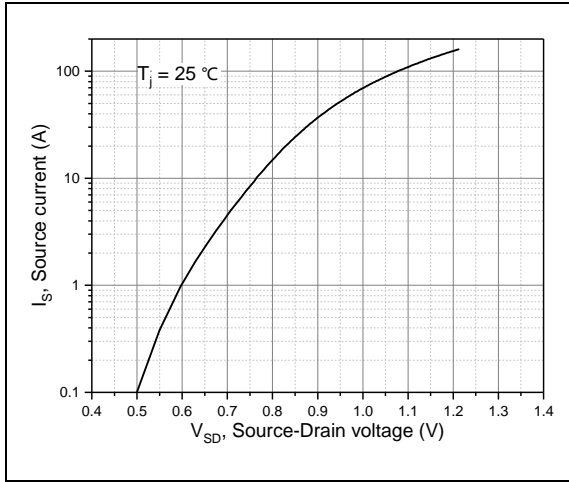


Figure 7, Forward characteristic of body diode

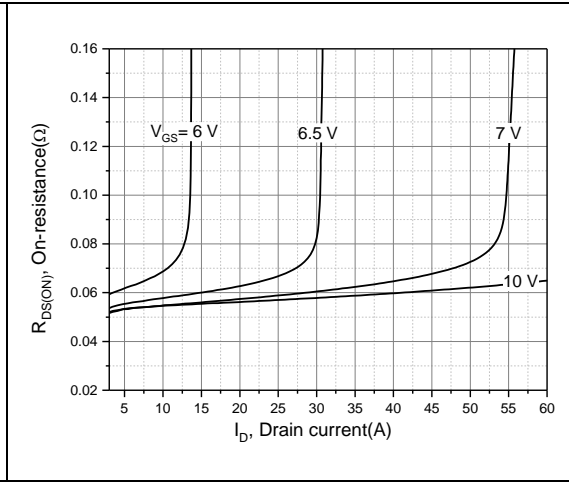


Figure 8, Drain-source on-state resistance

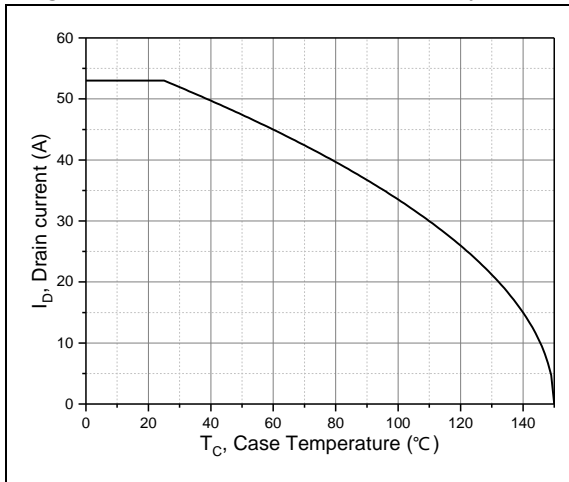


Figure 9, Drain current

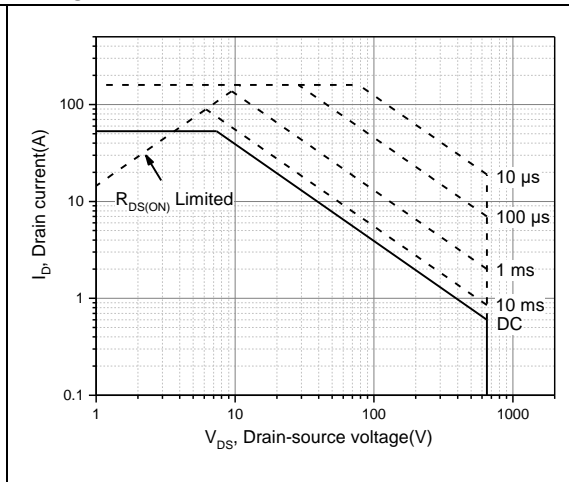


Figure 10, Safe operation area  $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

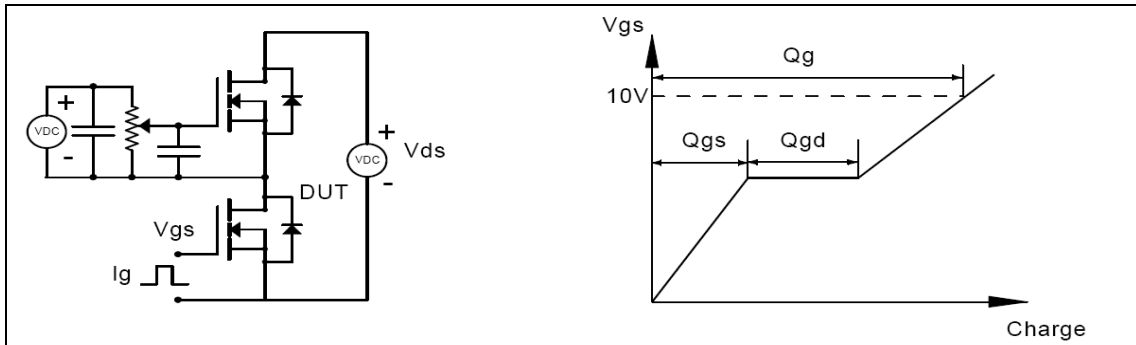


Figure 1, Gate charge test circuit & waveform

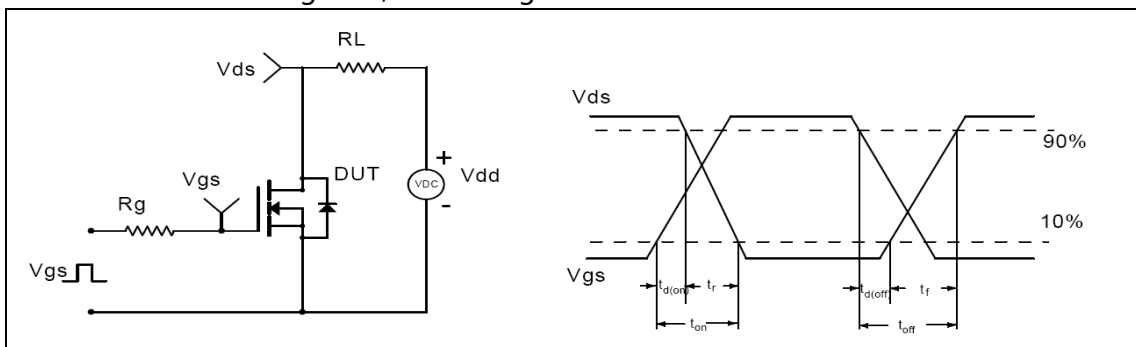


Figure 2, Switching time test circuit & waveforms

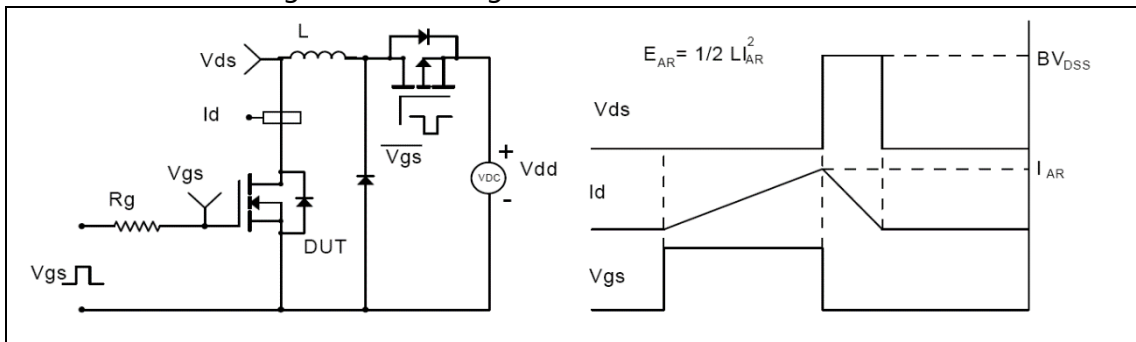


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

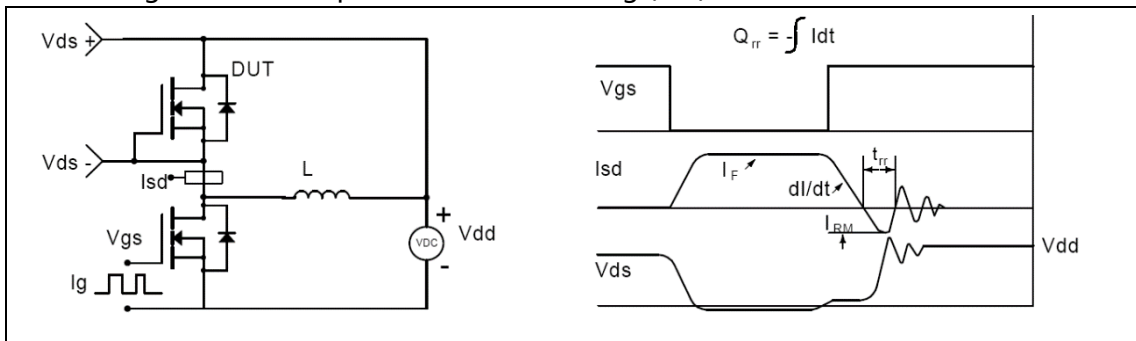
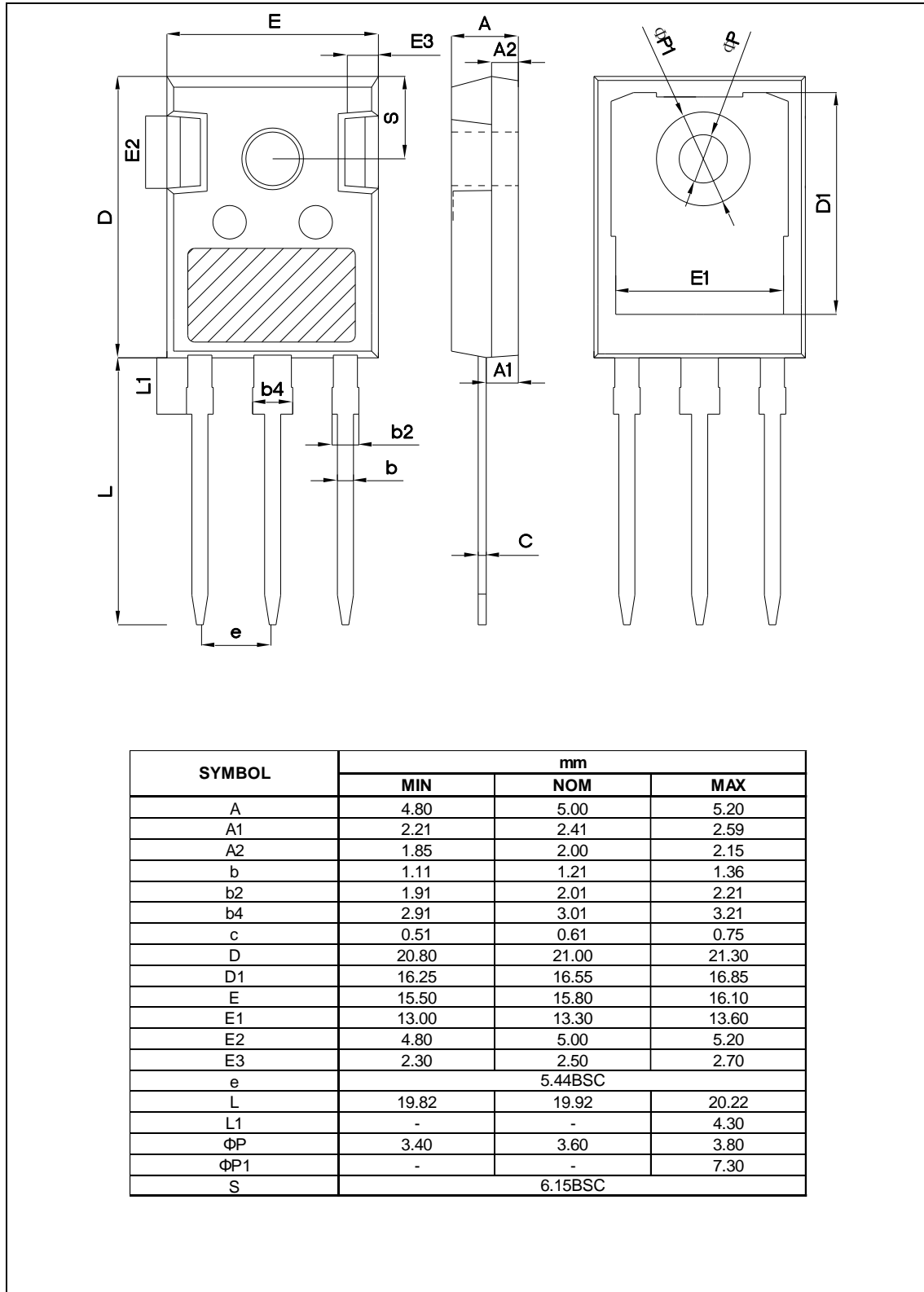


Figure 4, Diode reverse recovery test circuit & waveforms

**■ Package Information**

Figure1, TO247 package outline dimension





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**■ Ordering Information**

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

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**■ Product Information**

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| Product       | Package | Pb Free | RoHS | Halogen Free |
|---------------|---------|---------|------|--------------|
| OSG65R069HSZF | TO247   | yes     | yes  | yes          |