

## General Description

The GreenMOS<sup>®</sup> 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<sup>®</sup> Generic series is optimized for extreme switching performance to minimize switching loss. It is tailored for high power density applications to meet the highest efficiency standards.

## Features

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

GreenMOS<sup>®</sup>



## Applications

- PC power
- LED lighting
- Telecom power
- Server power
- EV Charger
- Solar/UPS

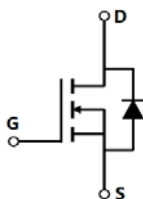
## Key Performance Parameters

| Parameter                       | Value | Unit       |
|---------------------------------|-------|------------|
| $V_{DS, \min} @ T_{j(max)}$     | 600   | V          |
| $I_D, \text{pulse}$             | 33    | A          |
| $R_{DS(ON)}, \max @ V_{GS}=10V$ | 380   | m $\Omega$ |
| $Q_g$                           | 12.5  | nC         |

## Marking Information

| Product Name | Package | Marking    |
|--------------|---------|------------|
| OSG55R380DF  | TO252   | OSG55R380D |

## Package & Pin Information



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

| Parameter                                                                 | Symbol                | Value      | Unit               |
|---------------------------------------------------------------------------|-----------------------|------------|--------------------|
| Drain-source voltage                                                      | $V_{DS}$              | 550        | V                  |
| Gate-source voltage                                                       | $V_{GS}$              | $\pm 30$   | V                  |
| Continuous drain current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$         | $I_D$                 | 11         | A                  |
| Continuous drain current <sup>1)</sup> , $T_C=100^{\circ}\text{C}$        |                       | 7          |                    |
| Pulsed drain current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$             | $I_{D, \text{pulse}}$ | 33         | A                  |
| Continuous diode forward current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$ | $I_S$                 | 11         | A                  |
| Diode pulsed current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$             | $I_{S, \text{pulse}}$ | 33         | A                  |
| Power dissipation <sup>3)</sup> , $T_C=25^{\circ}\text{C}$                | $P_D$                 | 63         | W                  |
| Single pulsed avalanche energy <sup>5)</sup>                              | $E_{AS}$              | 200        | mJ                 |
| MOSFET dv/dt ruggedness, $V_{DS}=0\ldots 480\text{ V}$                    | dv/dt                 | 50         | V/ns               |
| Reverse diode dv/dt, $V_{DS}=0\ldots 480\text{ V}$ , $I_{SD}\leq I_D$     | dv/dt                 | 15         | 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                  | $R_{\theta JC}$ | 1.98  | $^{\circ}\text{C/W}$ |
| Thermal resistance, junction-ambient <sup>4)</sup> | $R_{\theta JA}$ | 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   | $BV_{DSS}$   | 550  |      |      | V             | $V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$                             |
|                                  |              | 600  |      |      |               | $V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$ , $T_J=150^{\circ}\text{C}$ |
| Gate threshold voltage           | $V_{GS(th)}$ | 2.0  |      | 4.0  | V             | $V_{DS}=V_{GS}$ , $I_D=250\text{ }\mu\text{A}$                                 |
| Drain-source on-state resistance | $R_{DS(on)}$ |      | 0.30 | 0.38 | $\Omega$      | $V_{GS}=10\text{ V}$ , $I_D=5.5\text{ A}$                                      |
|                                  |              |      | 0.79 |      |               | $V_{GS}=10\text{ V}$ , $I_D=5.5\text{ A}$ , $T_J=150^{\circ}\text{C}$          |
| Gate-source leakage current      | $I_{GSS}$    |      |      | 100  | nA            | $V_{GS}=30\text{ V}$                                                           |
|                                  |              |      |      | -100 |               | $V_{GS}=-30\text{ V}$                                                          |
| Drain-source leakage current     | $I_{DSS}$    |      |      | 1    | $\mu\text{A}$ | $V_{DS}=550\text{ V}$ , $V_{GS}=0\text{ V}$                                    |

### Dynamic Characteristics

| Parameter                    | Symbol       | Min. | Typ.  | Max. | Unit | Test condition                                                                             |
|------------------------------|--------------|------|-------|------|------|--------------------------------------------------------------------------------------------|
| Input capacitance            | $C_{iss}$    |      | 549.3 |      | pF   | $V_{GS}=0\text{ V}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$f=1\text{ MHz}$                        |
| Output capacitance           | $C_{oss}$    |      | 63.1  |      | pF   |                                                                                            |
| Reverse transfer capacitance | $C_{rss}$    |      | 2.1   |      | pF   |                                                                                            |
| Turn-on delay time           | $t_{d(on)}$  |      | 28    |      | ns   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=400\text{ V}$ ,<br>$R_G=2\ \Omega$ ,<br>$I_D=6\text{ A}$ |
| Rise time                    | $t_r$        |      | 22.8  |      | ns   |                                                                                            |
| Turn-off delay time          | $t_{d(off)}$ |      | 60.3  |      | ns   |                                                                                            |
| Fall time                    | $t_f$        |      | 18    |      | ns   |                                                                                            |

### Gate Charge Characteristics

| Parameter            | Symbol        | Min. | Typ. | Max. | Unit | Test condition                                                        |
|----------------------|---------------|------|------|------|------|-----------------------------------------------------------------------|
| Total gate charge    | $Q_g$         |      | 12.5 |      | nC   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=400\text{ V}$ ,<br>$I_D=6\text{ A}$ |
| Gate-source charge   | $Q_{gs}$      |      | 2.6  |      | nC   |                                                                       |
| Gate-drain charge    | $Q_{gd}$      |      | 5.7  |      | nC   |                                                                       |
| Gate plateau voltage | $V_{plateau}$ |      | 5.8  |      | V    |                                                                       |

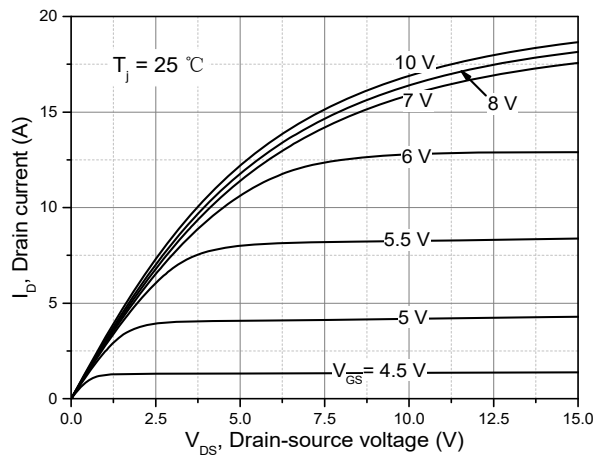
### Body Diode Characteristics

| Parameter                     | Symbol    | Min. | Typ. | Max. | Unit          | Test condition                                                                 |
|-------------------------------|-----------|------|------|------|---------------|--------------------------------------------------------------------------------|
| Diode forward voltage         | $V_{SD}$  |      |      | 1.3  | V             | $I_S=11\text{ A}$ ,<br>$V_{GS}=0\text{ V}$                                     |
| Reverse recovery time         | $t_{rr}$  |      | 199  |      | ns            | $V_R=400\text{ V}$ ,<br>$I_S=6\text{ A}$ ,<br>$di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge       | $Q_{rr}$  |      | 1.7  |      | $\mu\text{C}$ |                                                                                |
| Peak reverse recovery current | $I_{rrm}$ |      | 17.4 |      | A             |                                                                                |

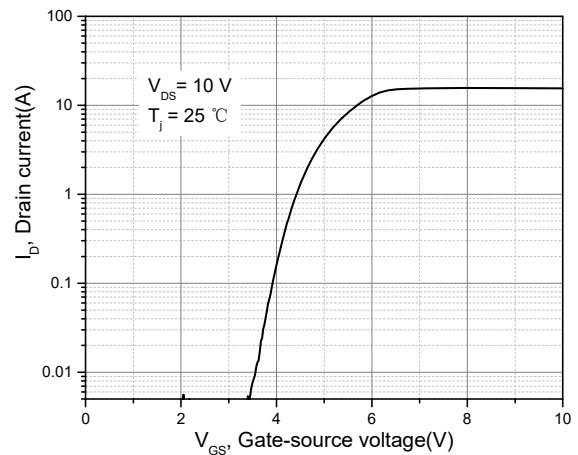
### Note

- 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) 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)  $V_{DD}=100\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=10\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

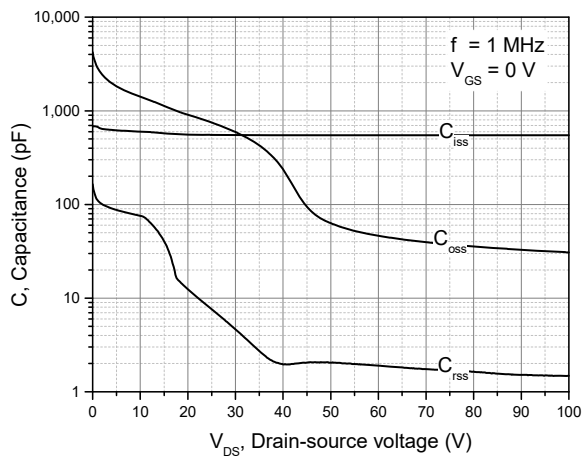
## Electrical Characteristics Diagrams



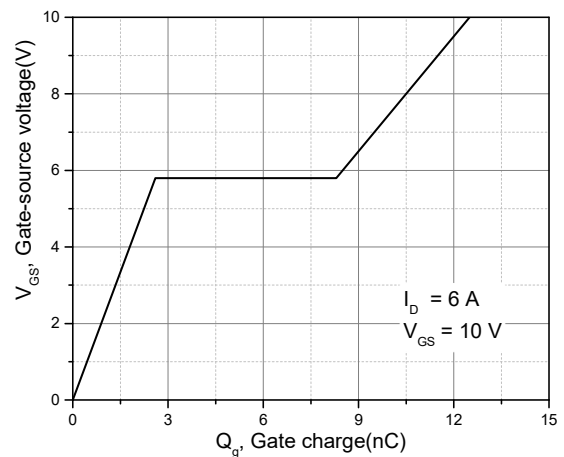
**Figure 1. Typ. output characteristics**



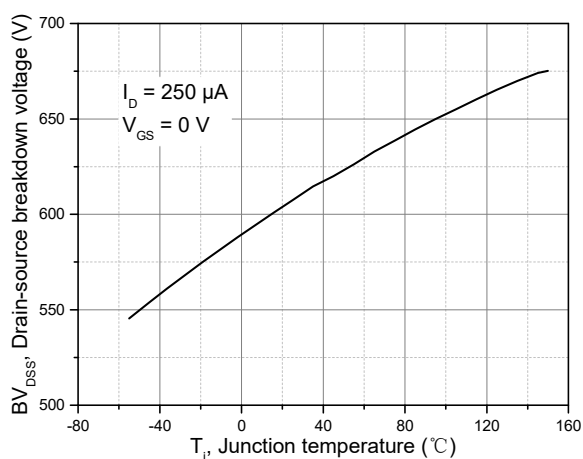
**Figure 2. Typ. transfer characteristics**



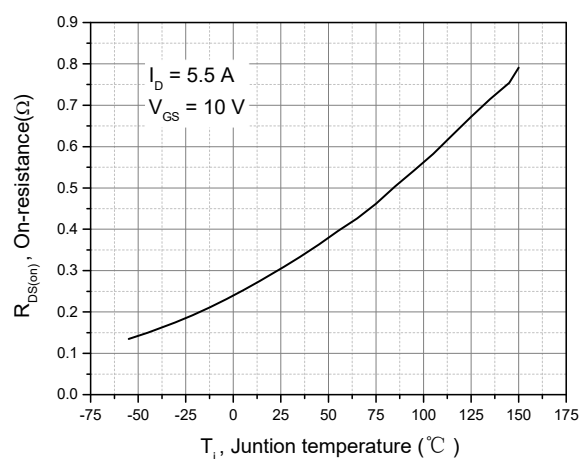
**Figure 3. Typ. capacitances**



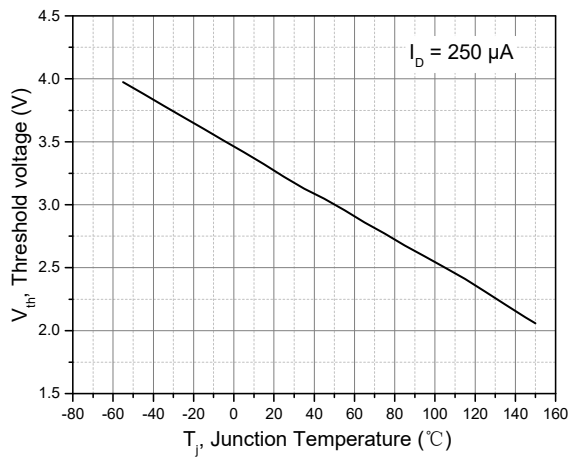
**Figure 4. Typ. gate charge**



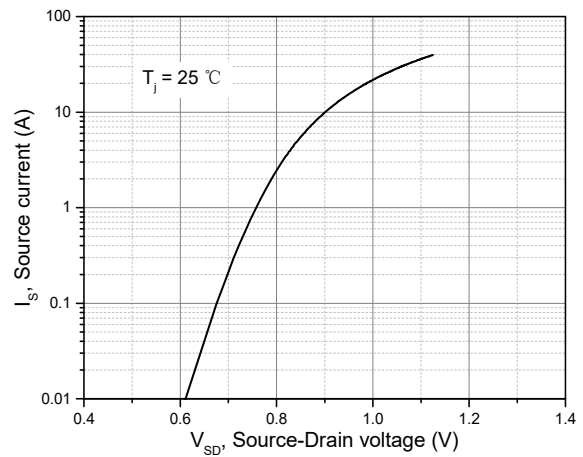
**Figure 5. Drain-source breakdown voltage**



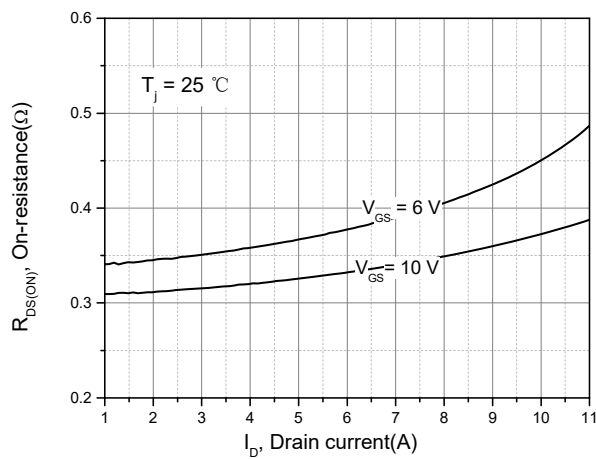
**Figure 6. Drain-source on-state resistance**



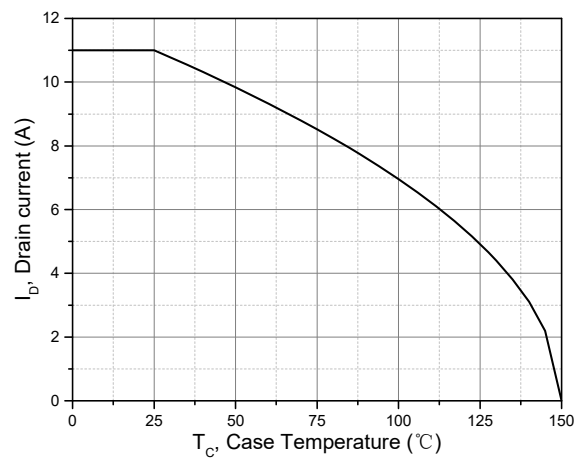
**Figure 7. Threshold voltage**



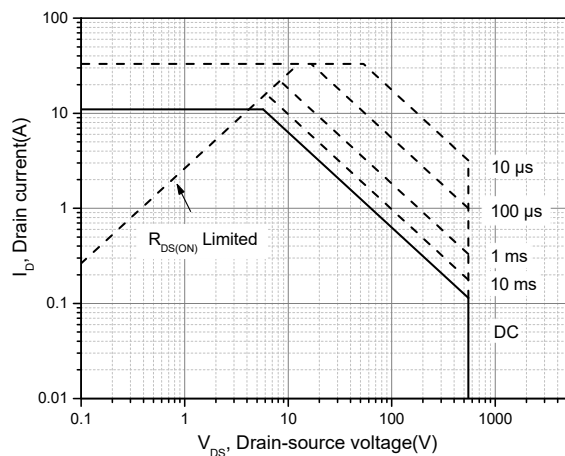
**Figure 8. Forward characteristic of body diode**



**Figure 9. Drain-source on-state resistance**

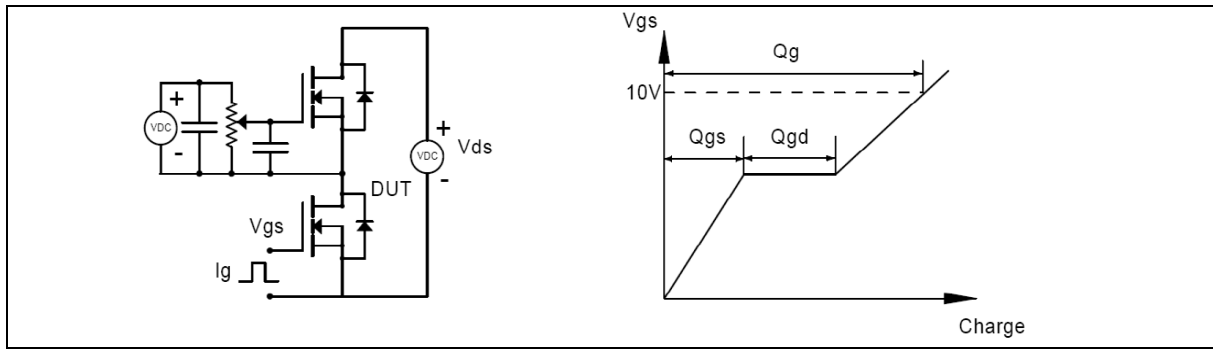


**Figure 10. Drain current**

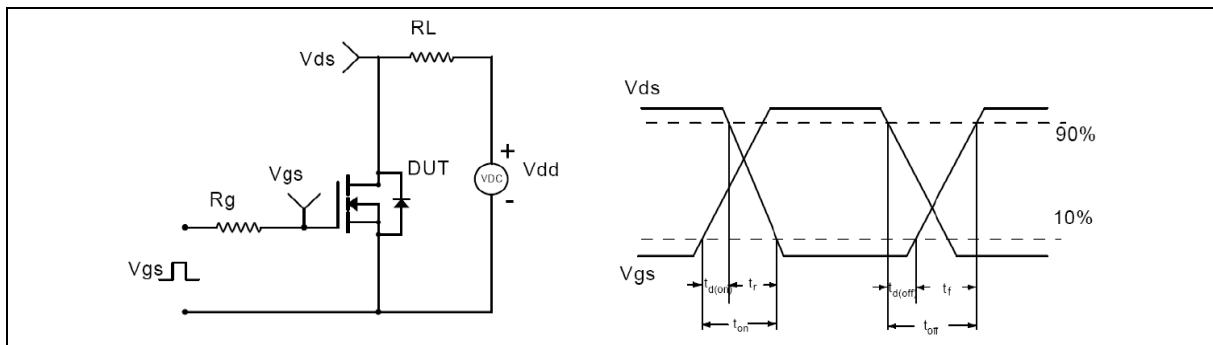


**Figure 11. Safe operation area  $T_c=25\text{ }^{\circ}\text{C}$**

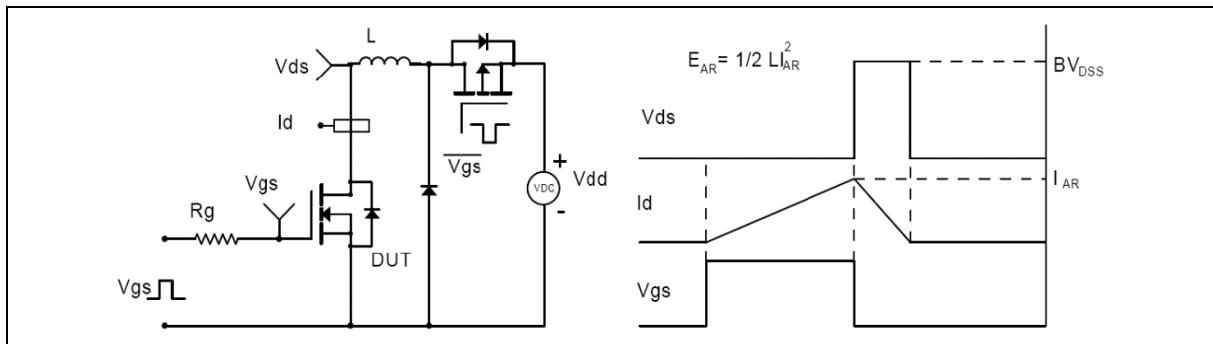
## Test circuits and waveforms



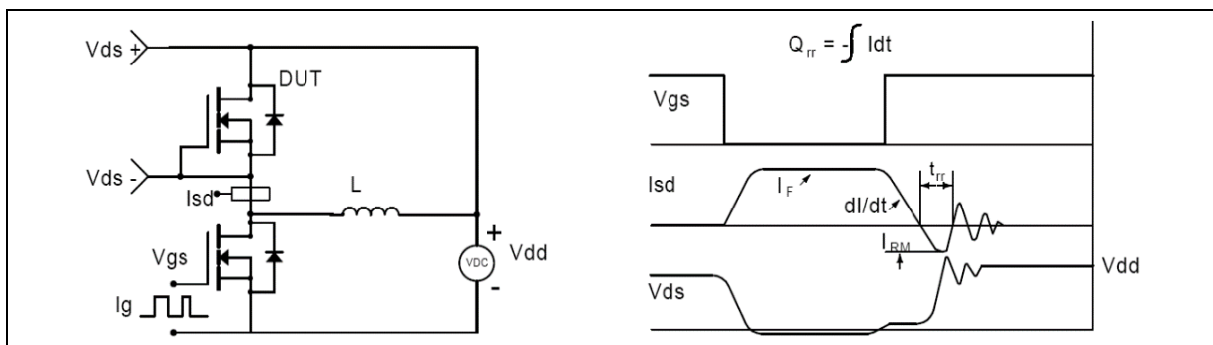
**Figure 1. Gate charge test circuit & waveform**



**Figure 2. Switching time test circuit & waveforms**

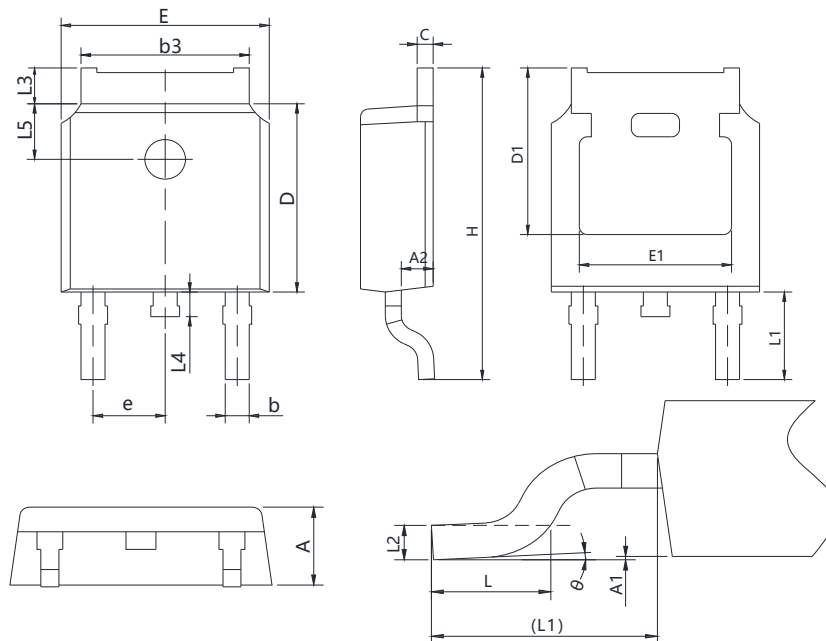


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



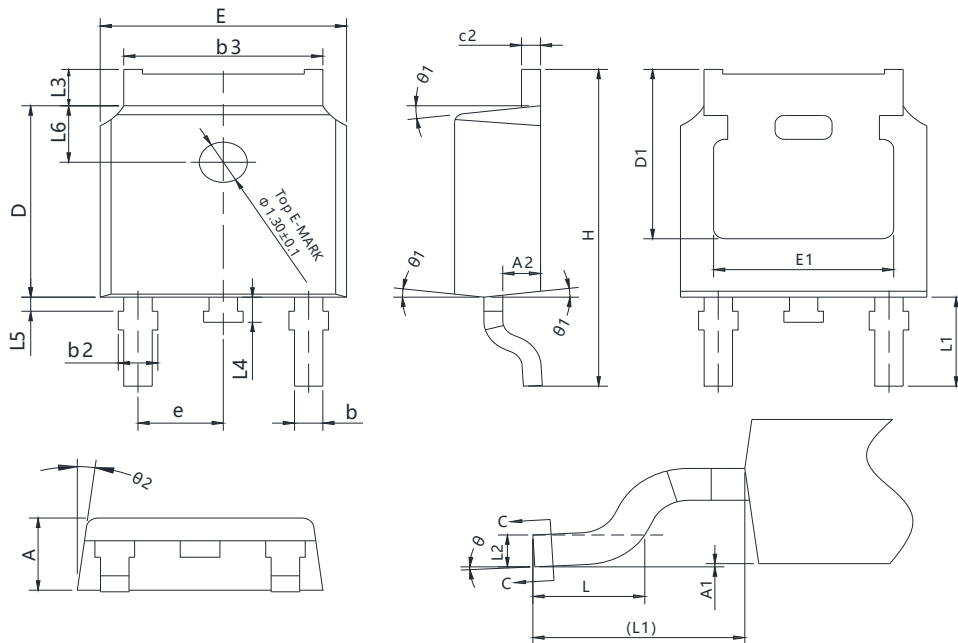
**Figure 4. Diode reverse recovery test circuit & waveforms**

## Package Information



| Symbol | mm       |       |       |
|--------|----------|-------|-------|
|        | Min      | Nom   | Max   |
| A      | 2.20     | 2.30  | 2.38  |
| A1     | 0.00     | -     | 0.20  |
| A2     | 0.97     | 1.07  | 1.17  |
| b      | 0.68     | 0.78  | 0.90  |
| b3     | 5.20     | 5.33  | 5.46  |
| c      | 0.43     | 0.53  | 0.61  |
| D      | 5.98     | 6.10  | 6.22  |
| D1     | 5.30REF  |       |       |
| E      | 6.40     | 6.60  | 6.73  |
| E1     | 4.63     | -     | -     |
| e      | 2.286BSC |       |       |
| H      | 9.40     | 10.10 | 10.50 |
| L      | 1.38     | 1.50  | 1.75  |
| L1     | 2.90REF  |       |       |
| L2     | 0.51BSC  |       |       |
| L3     | 0.88     | -     | 1.28  |
| L4     | 0.50     | -     | 1.00  |
| θ      | 0°       | -     | 8°    |

Version 1: TO252-C package outline dimension

**Package Information**


| Symbol | mm       |       |       |
|--------|----------|-------|-------|
|        | Min      | Nom   | Max   |
| A      | 2.20     | 2.30  | 2.38  |
| A1     | 0.00     | -     | 0.10  |
| A2     | 0.90     | 1.01  | 1.10  |
| b      | 0.72     | -     | 0.85  |
| b1     | 0.71     | 0.76  | 0.81  |
| b2     | 0.72     | -     | 0.90  |
| b3     | 5.13     | 5.33  | 5.46  |
| c      | 0.47     | -     | 0.60  |
| c1     | 0.46     | 0.51  | 0.56  |
| c2     | 0.47     | -     | 0.60  |
| D      | 6.00     | 6.10  | 6.20  |
| D1     | 5.25     | -     | -     |
| E      | 6.50     | 6.60  | 6.70  |
| E1     | 4.70     | -     | -     |
| e      | 2.186    | 2.286 | 2.386 |
| H      | 9.80     | 10.10 | 10.40 |
| L      | 1.40     | 1.50  | 1.70  |
| L1     | 2.90REF  |       |       |
| L2     | 0.508BSC |       |       |
| L3     | 0.90     | -     | 1.25  |
| L4     | 0.60     | 0.80  | 1.00  |
| L5     | 0.15     | -     | 0.75  |
| L6     | 1.80REF  |       |       |
| θ      | 0°       | -     | 8°    |
| θ1     | 5°       | 7°    | 9°    |
| θ2     | 5°       | 7°    | 9°    |

Version 2: TO252-J package outline dimension



**Ordering Information**

| Package Type | Units/ Reel | Reels / Inner Box | Units/ Inner Box | Inner Box/ Carton Box | Units/ Carton Box |
|--------------|-------------|-------------------|------------------|-----------------------|-------------------|
| TO252-C      | 2500        | 2                 | 5000             | 5                     | 25000             |
| TO252-J      | 2500        | 2                 | 5000             | 5                     | 25000             |

**Product Information**

| Product     | Package | Pb Free | RoHS | Halogen Free |
|-------------|---------|---------|------|--------------|
| OSG55R380DF | TO252   | yes     | yes  | yes          |

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