

## 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> 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
- Ultra-fast and robust body diode

## Applications

- PC power
- Telecom power
- Server power
- EV Charger
- Motor driver

GreenMOS<sup>®</sup>



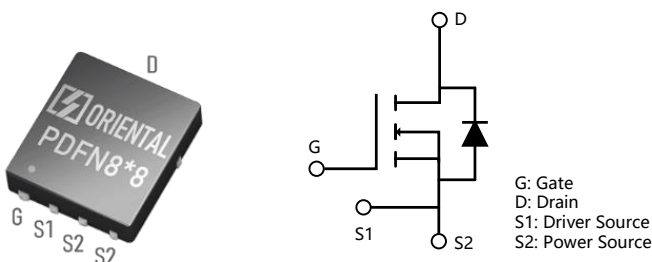
## Key Performance Parameters

| Parameter                         | Value | Unit       |
|-----------------------------------|-------|------------|
| $V_{DS}$                          | 600   | V          |
| $I_D$ , pulse                     | 90    | A          |
| $R_{DS(ON)}$ , max @ $V_{GS}=10V$ | 108   | m $\Omega$ |
| $Q_g$                             | 37.1  | nC         |

## Marking Information

| Product Name | Package  | Marking     |
|--------------|----------|-------------|
| OSG60R108JZF | PDFN 8×8 | OSG60R108JZ |

## 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                                                       | $V_{GS}$              | $\pm 30$   | V                  |
| Continuous drain current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$         | $I_D$                 | 30         | A                  |
| Continuous drain current <sup>1)</sup> , $T_C=100^{\circ}\text{C}$        |                       | 19         |                    |
| Pulsed drain current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$             | $I_{D, \text{pulse}}$ | 90         | A                  |
| Continuous diode forward current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$ | $I_S$                 | 30         | A                  |
| Diode pulsed current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$             | $I_{S, \text{pulse}}$ | 90         | A                  |
| Power dissipation <sup>3)</sup> , $T_C=25^{\circ}\text{C}$                | $P_D$                 | 181        | W                  |
| Single pulsed avalanche energy <sup>5)</sup>                              | $E_{AS}$              | 1000       | 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                  | $R_{\theta JC}$ | 0.69  | $^{\circ}\text{C/W}$ |
| 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   | $BV_{DSS}$   | 600  |       |       | V             | $V_{GS}=0 \text{ V}$ , $I_D=1 \text{ mA}$                              |
| Gate threshold voltage           | $V_{GS(th)}$ | 3    |       | 4.5   | V             | $V_{DS}=V_{GS}$ , $I_D=1 \text{ mA}$                                   |
| Drain-source on-state resistance | $R_{DS(on)}$ |      | 0.085 | 0.108 | $\Omega$      | $V_{GS}=10 \text{ V}$ , $I_D=15 \text{ A}$                             |
|                                  |              |      | 0.2   |       |               | $V_{GS}=10 \text{ V}$ , $I_D=15 \text{ A}$ , $T_j=150^{\circ}\text{C}$ |
| 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    | $\mu\text{A}$ | $V_{DS}=600 \text{ V}$ , $V_{GS}=0 \text{ V}$                          |

### Dynamic Characteristics

| Parameter                    | Symbol       | Min. | Typ.   | Max. | Unit | Test condition                                                                              |
|------------------------------|--------------|------|--------|------|------|---------------------------------------------------------------------------------------------|
| Input capacitance            | $C_{iss}$    |      | 2674.5 |      | pF   | $V_{GS}=0\text{ V}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$f=100\text{ KHz}$                       |
| Output capacitance           | $C_{oss}$    |      | 246.0  |      | pF   |                                                                                             |
| Reverse transfer capacitance | $C_{rss}$    |      | 9.6    |      | pF   |                                                                                             |
| Turn-on delay time           | $t_{d(on)}$  |      | 67.4   |      | ns   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=400\text{ V}$ ,<br>$R_G=2\ \Omega$ ,<br>$I_D=16\text{ A}$ |
| Rise time                    | $t_r$        |      | 71.1   |      | ns   |                                                                                             |
| Turn-off delay time          | $t_{d(off)}$ |      | 103.9  |      | ns   |                                                                                             |
| Fall time                    | $t_f$        |      | 33.4   |      | ns   |                                                                                             |

### Gate Charge Characteristics

| Parameter            | Symbol        | Min. | Typ. | Max. | Unit | Test condition                                                         |
|----------------------|---------------|------|------|------|------|------------------------------------------------------------------------|
| Total gate charge    | $Q_g$         |      | 37.1 |      | nC   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=400\text{ V}$ ,<br>$I_D=16\text{ A}$ |
| Gate-source charge   | $Q_{gs}$      |      | 11.0 |      | nC   |                                                                        |
| Gate-drain charge    | $Q_{gd}$      |      | 13.8 |      | nC   |                                                                        |
| Gate plateau voltage | $V_{plateau}$ |      | 6.7  |      | V    |                                                                        |

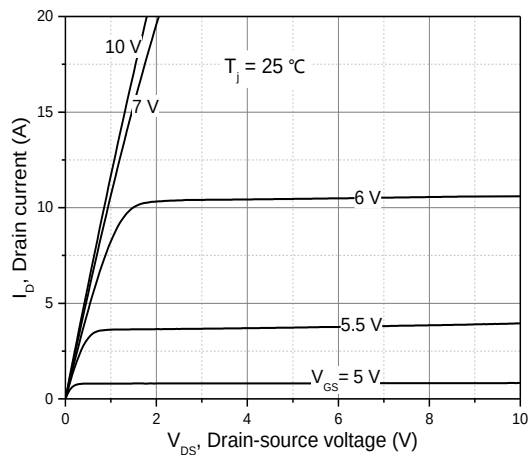
### Body Diode Characteristics

| Parameter                     | Symbol    | Min. | Typ. | Max. | Unit          | Test condition                                          |
|-------------------------------|-----------|------|------|------|---------------|---------------------------------------------------------|
| Diode forward voltage         | $V_{SD}$  |      |      | 1.4  | V             | $I_S=30\text{ A}$ ,<br>$V_{GS}=0\text{ V}$              |
| Reverse recovery time         | $t_{rr}$  |      | 123  |      | ns            | $I_S=16\text{ A}$ ,<br>$di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge       | $Q_{rr}$  |      | 0.73 |      | $\mu\text{C}$ |                                                         |
| Peak reverse recovery current | $I_{rrm}$ |      | 11   |      | A             |                                                         |

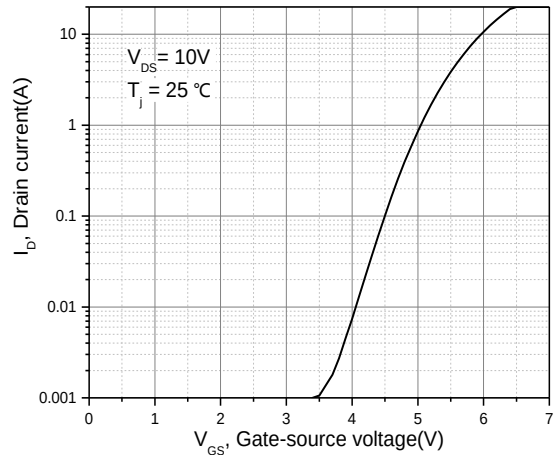
### Note

- 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<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25\text{ }^{\circ}\text{C}$ .
- 5)  $V_{DD}=100\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=80\text{ mH}$ , starting  $T_j=25\text{ }^{\circ}\text{C}$ .

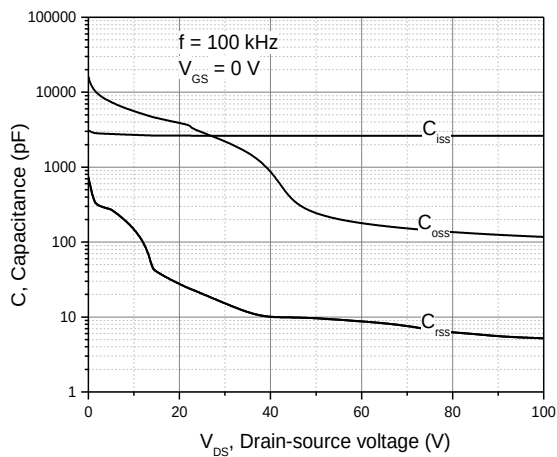
## Electrical Characteristics Diagrams



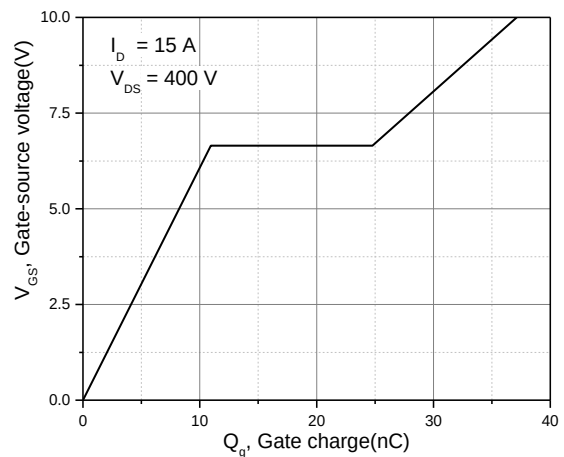
**Figure 1. Typ. output characteristics**



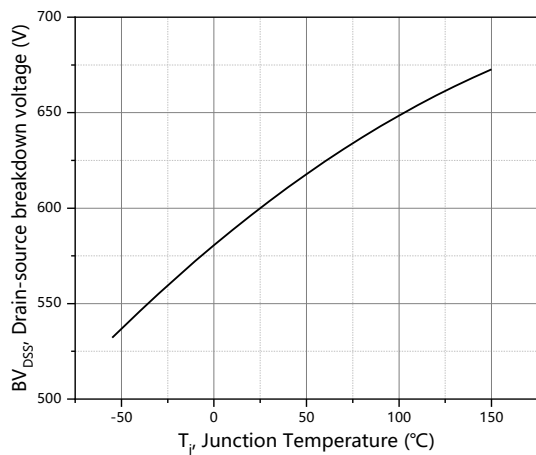
**Figure 2. Typ. transfer characteristics**



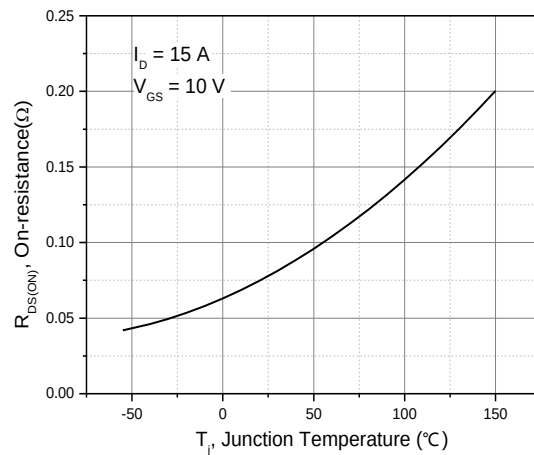
**Figure 3. Typ. capacitances**



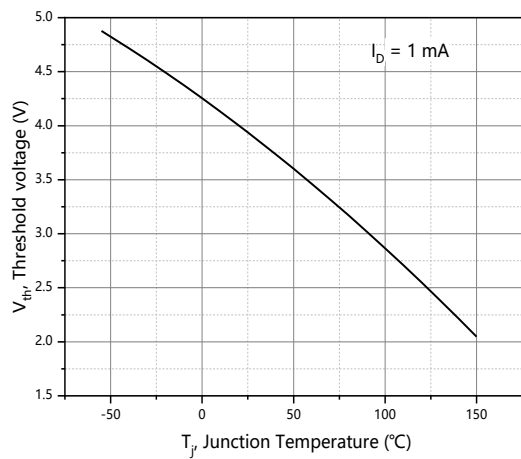
**Figure 4. Typ. gate charge**



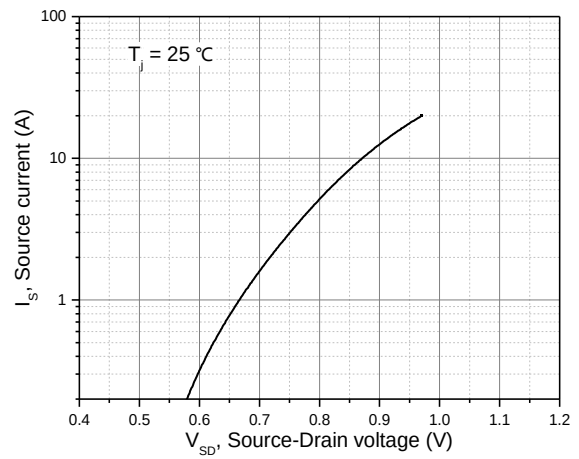
**Figure 5. Drain-source breakdown voltage**



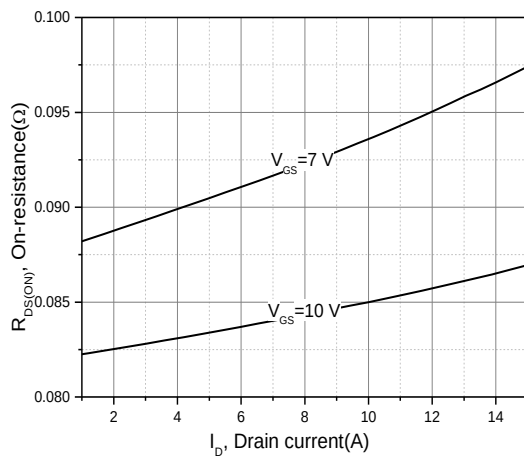
**Figure 6. Drain-source on-state resistance**



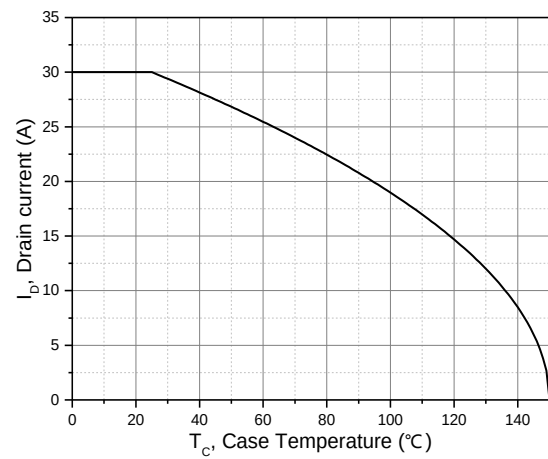
**Figure 7. Threshold voltage**



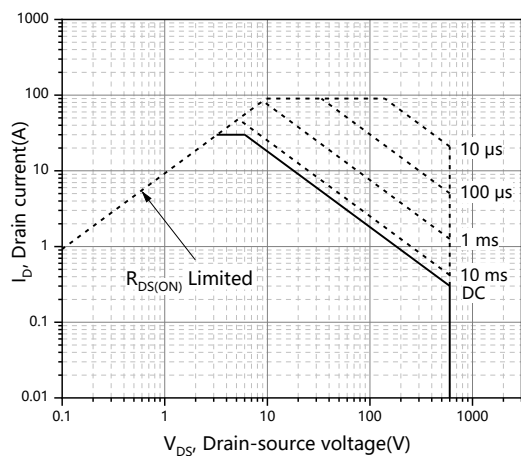
**Figure 8. Forward characteristic of body diode**



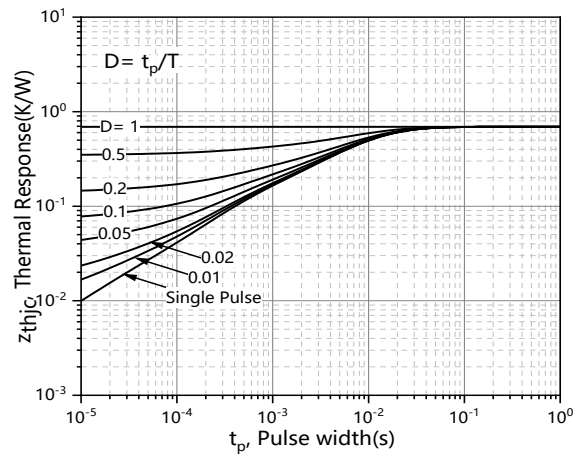
**Figure 9. Drain-source on-state resistance**



**Figure 10. Drain current**

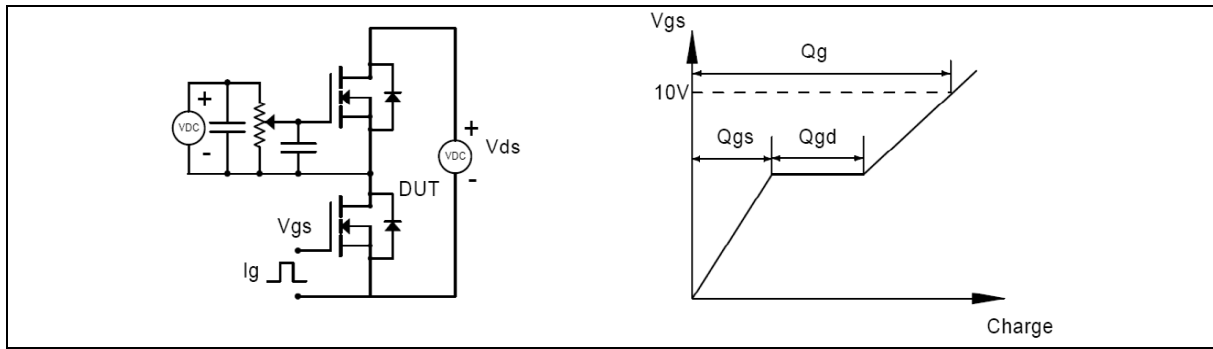


**Figure 10. Safe operation area for  $T_C=25$  °C**

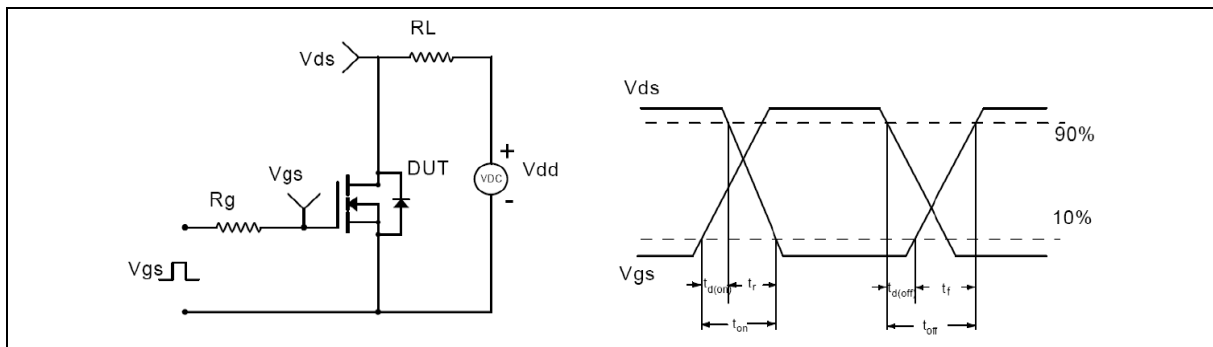


**Figure 12. Max. transient thermal impedance**

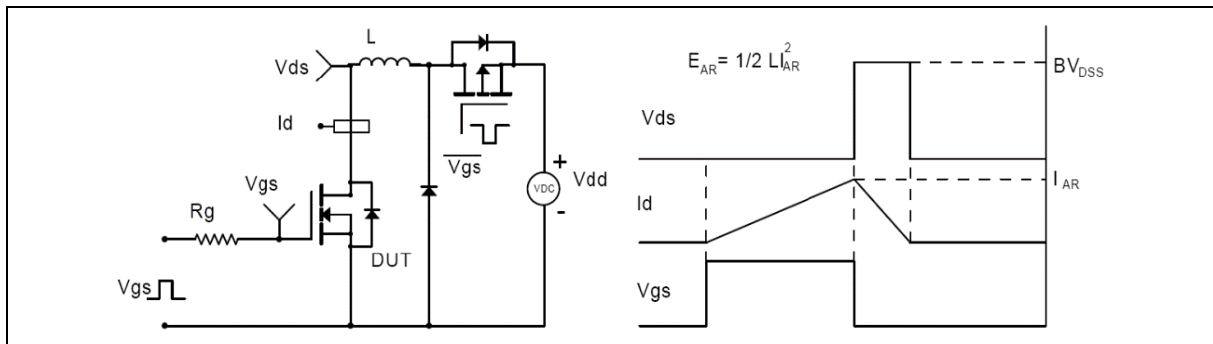
## Test circuits and waveforms



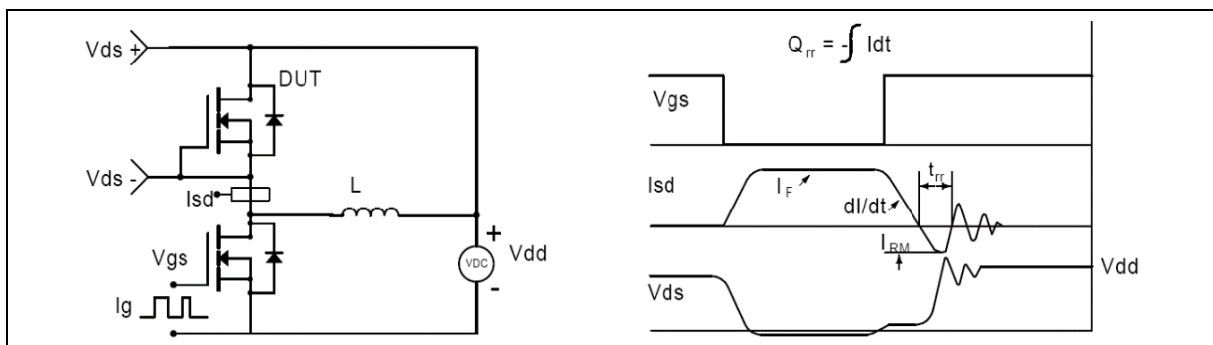
**Figure 1. Gate charge test circuit & waveform**



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

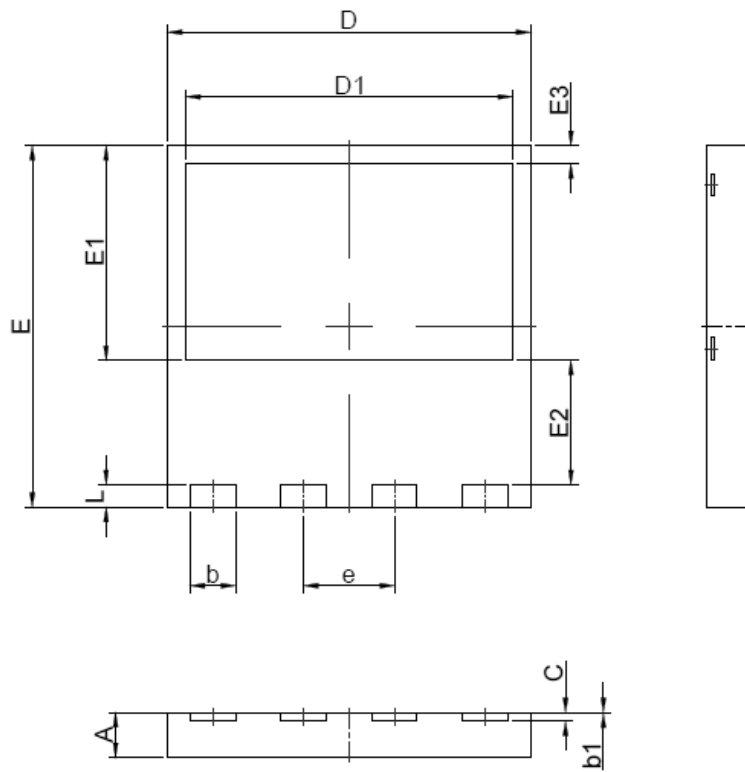


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



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

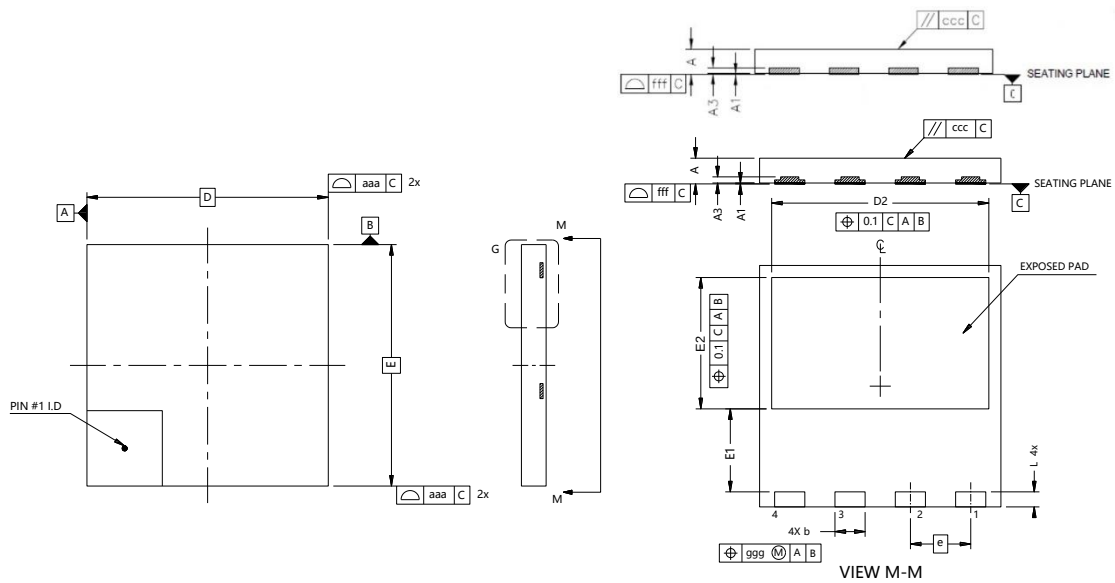
## Package Information



| Symbol | mm      |      |      |
|--------|---------|------|------|
|        | Min     | Nom  | Max  |
| A      | 0.90    | 1.00 | 1.10 |
| b      | 0.90    | 1.00 | 1.10 |
| b1     | 0.00    | 0.02 | 0.05 |
| C      | 0.2 REF |      |      |
| D      | 7.90    | 8.00 | 8.10 |
| D1     | 7.10    | 7.20 | 7.30 |
| E      | 7.90    | 8.00 | 8.10 |
| E1     | 4.65    | 4.75 | 4.85 |
| E2     | 2.65    | 2.75 | 2.85 |
| E3     | 0.3     | 0.4  | 0.5  |
| e      | 2.0 BSC |      |      |
| L      | 0.4     | 0.5  | 0.6  |

Version 1: PDFN 8×8-L package outline dimension

## Package Information



| Symbol | mm      |      |
|--------|---------|------|
|        | Min     | Max  |
| A      | 0.75    | 0.95 |
| A1     | 0.00    | 0.05 |
| A3     | 0.10    | 0.30 |
| b      | 0.90    | 1.10 |
| D      | 7.90    | 8.10 |
| E      | 7.90    | 8.10 |
| D2     | 7.10    | 7.30 |
| E1     | 2.65    | 2.85 |
| E2     | 4.25    | 4.45 |
| e      | 2.0 BSC |      |
| L      | 0.40    | 0.60 |
| aaa    | 0.1     |      |
| ggg    | 0.05    |      |
| ccc    | 0.05    |      |
| fff    | 0.05    |      |

Version 2: PDFN 8×8-S package outline dimension



## Ordering Information

| Package Type | Units/ Reel | Reels/ Inner Box | Units/ Inner Box | Inner Boxes/ Carton Box | Units/ Carton Box |
|--------------|-------------|------------------|------------------|-------------------------|-------------------|
| PDFN 8×8-L   | 2500        | 1                | 2500             | 10                      | 25000             |
| PDFN 8×8-S   | 3000        | 1                | 3000             | 10                      | 30000             |

## Product Information

| Product      | Package  | Pb Free | RoHS | Halogen Free |
|--------------|----------|---------|------|--------------|
| OSG60R108JZF | PDFN 8×8 | yes     | yes  | yes          |

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