# OSG65R580FSF_Datasheet

# Enhancement Mode N-Channel Power MOSFET

## Features

- Low $R_{DS(on)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Easy to drive

## Applications

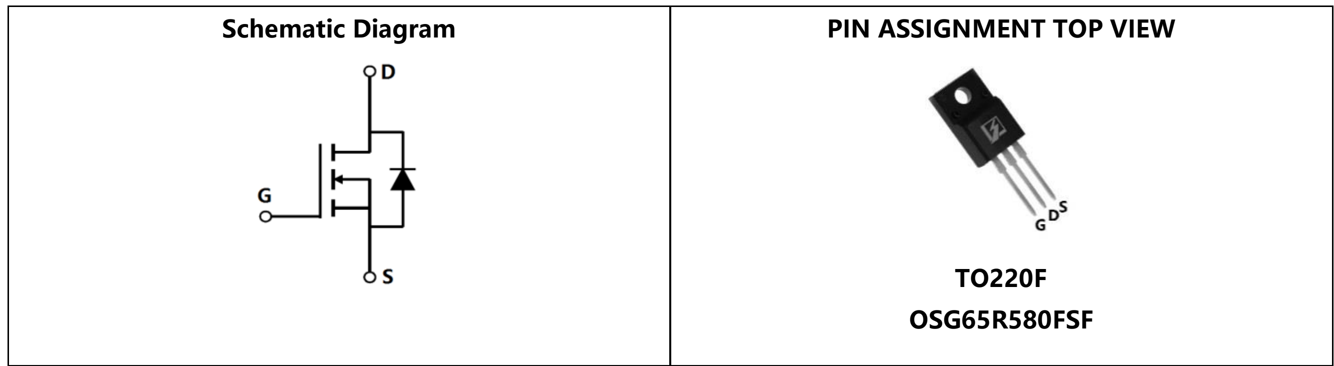
- Lighting
- Hard switching PWM
- Server power supply
- Charger

## General Description

OSG65R580FSF use advanced GreenMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is suitable for active power factor correction and switching mode power supply applications.

- $V_{DS,\ min@Tjmax}$ 700 V
- $I_{D,\ pulse}$ 24 A
- $R_{DS(ON),\ max\ @\ VGS=10\ V}$ 580 mΩ
- $Q_g$ 12.3 nC

## Schematic and Package Information




## Absolute Maximum Ratings at $T_j$=25℃ unless otherwise noted

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain source voltage | $V_{DS}$ | 650 | V |
| Gate source voltage | $V_{GS}$ | ±30 | V |
| Continuous drain current[1] | $I_D$ | 8 | A |
| Continuous drain current[1] $T_j$=100 ℃ | | 5 | |
| Pulsed drain current[2] | $I_{D,\ pulse}$ | 24 | A |
| Power dissipation[3] | $P_D$ | 28 | W |
| Single pulsed avalanche energy[5] | $E_{AS}$ | 150 | mJ |
| MOSFET dV/dt ruggedness, $V_{DS}$=0...480 V | dV/dt | 50 | V/ns |
| Reverse diode dV/dt, $V_{DS}$=0...480 V, $I_{SD} \le I_D$ | dV/dt | 10 | V/ns |
| Operation and storage temperature | $T_{stg}$ , $T_j$ | -55 to 150 | ℃ |

## ■ Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal resistance, junction-case | $R_{\theta JC}$ | 4.5 | °C/W |
| Thermal resistance, junction-ambient[4)] | $R_{\theta JA}$ | 62.5 | °C/W |

## ■ Electrical Characteristics at $T_j$=25 ℃ unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | 650 | | | V | $V_{GS}$=0 V, $I_D$=250 μA |
| | | 700 | 750 | | | $V_{GS}$=0 V, $I_D$=250 μA $T_j$=150 ℃ |
| Gate threshold voltage | $V_{GS(th)}$ | 2.9 | | 3.9 | V | $V_{DS}$=$V_{GS}$, $I_D$=250 μA |
| Drain-source on-state resistance | $R_{DS(ON)}$ | | 0.50 | 0.58 | Ω | $V_{GS}$=10 V, $I_D$=4 A |
| | | | 1.28 | | | $V_{GS}$=10 V, $I_D$=4 A, $T_j$=150 ℃ |
| Gate-source leakage current | $I_{GSS}$ | | | 100 | nA | $V_{GS}$=30 V |
| | | | | -100 | | $V_{GS}$=-30 V |
| Drain-source leakage current | $I_{DSS}$ | | | 1 | μA | $V_{DS}$=650 V, $V_{GS}$=0 V |

## ■ Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | | 535.8 | | pF | $V_{GS}$=0 V, $V_{DS}$=50 V, $f$=1 MHz |
| Output capacitance | $C_{oss}$ | | 43.4 | | pF | |
| Reverse transfer capacitance | $C_{rss}$ | | 2.3 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 27.4 | | ns | $V_{GS}$=10 V, $V_{DS}$=400 V, $R_G$=2 Ω, $I_D$=4 A |
| Rise time | $t_r$ | | 14.8 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 73.4 | | ns | |
| Fall time | $t_f$ | | 7.3 | | ns | |

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## ■ Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Total gate charge | $Q_g$ | | 12.3 | | nC | $I_D$=4 A, $V_{DS}$=400 V, $V_{GS}$=10 V |
| Gate-source charge | $Q_{gs}$ | | 2.3 | | nC | |
| Gate-drain charge | $Q_{gd}$ | | 5.7 | | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 5.9 | | V | |

## ■ Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Diode forward current[2)] | $I_S$ | | | 8 | A | $V_{GS}$<$V_{th}$ |
| Pulsed source current | $I_{SP}$ | | | 24 | | |
| Diode forward voltage | $V_{SD}$ | | | 1.2 | V | $I_S$=8 A, $V_{GS}$=0 V |
| Reverse recovery time | $t_{rr}$ | | 227.5 | | ns | $V_R$=400 V, $I_S$=4 A, di/dt=50 A/μs |
| Reverse recovery charge | $Q_{rr}$ | | 1.0 | | μC | |
| Peak reverse recovery current | $I_{rrm}$ | | 7.8 | | A | |

## ■ Note

1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating; pulse width limited by max. junction temperature.
3) Pd 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 ℃.
5) $V_{DD}$=50 V, $R_G$=50 Ω, L=60 mH, starting $T_j$=25 ℃.

## ■ 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

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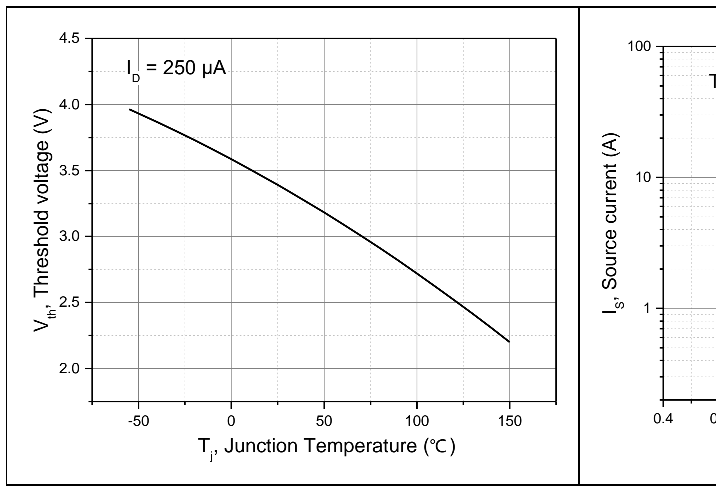


Figure 7, Threshold voltage

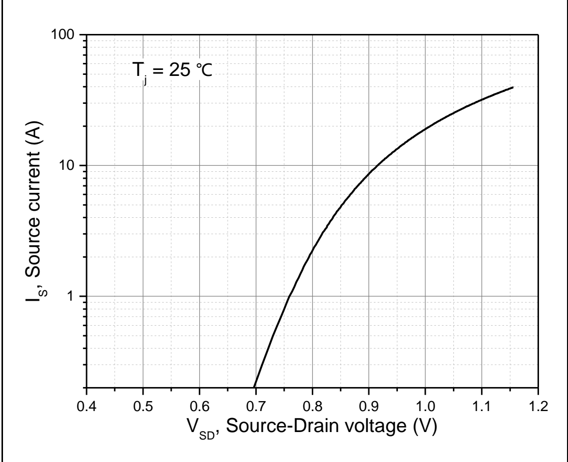


Figure 8, Forward characteristic of body diode

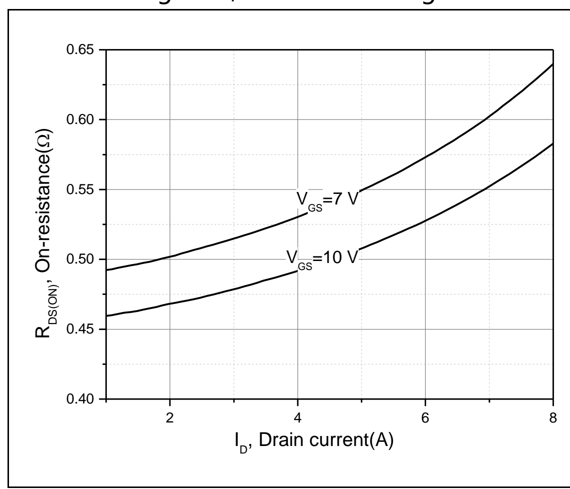


Figure 9, Drain-source on-state resistance

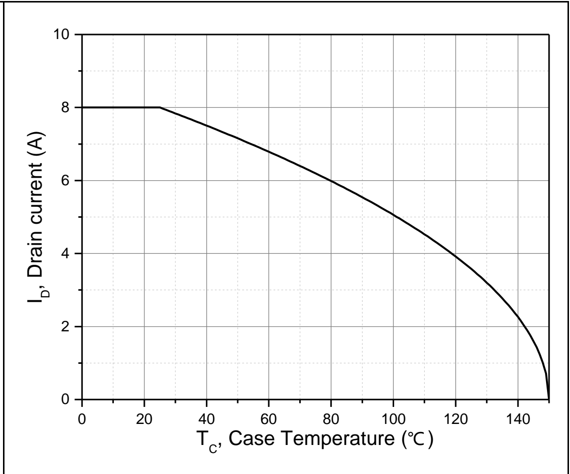


Figure 10, Drain current

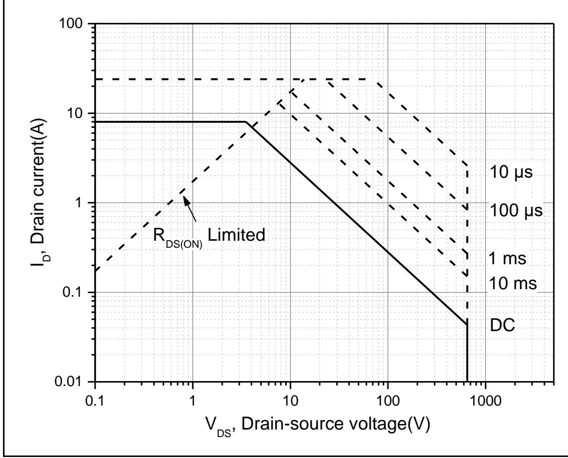


Figure 11, Safe operation area for $T_C$=25 ℃

## ■ Test circuits and waveforms

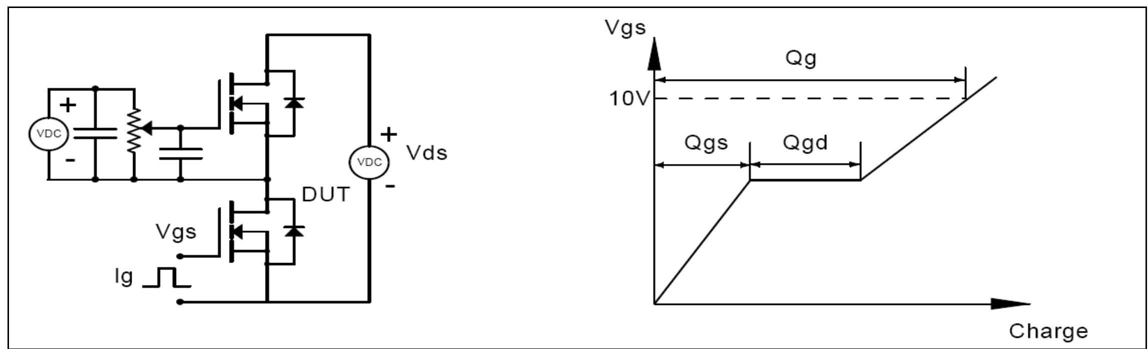


Figure 1, Gate charge test circuit & waveform

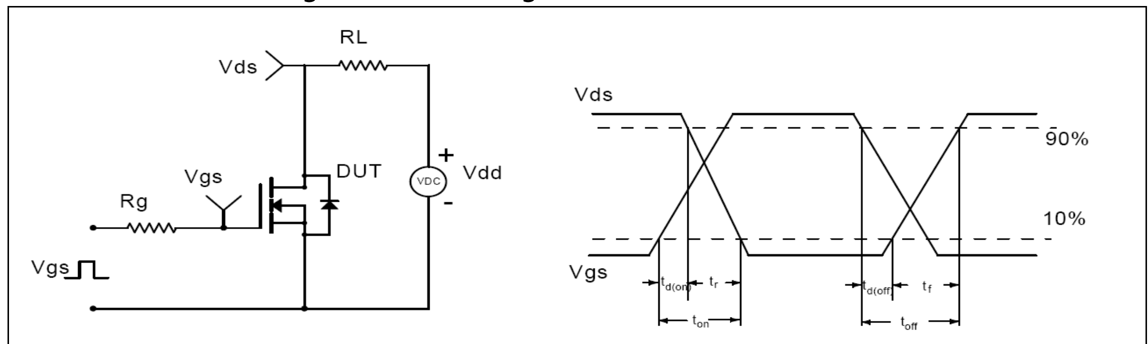


Figure 2, Switching time test circuit & waveforms

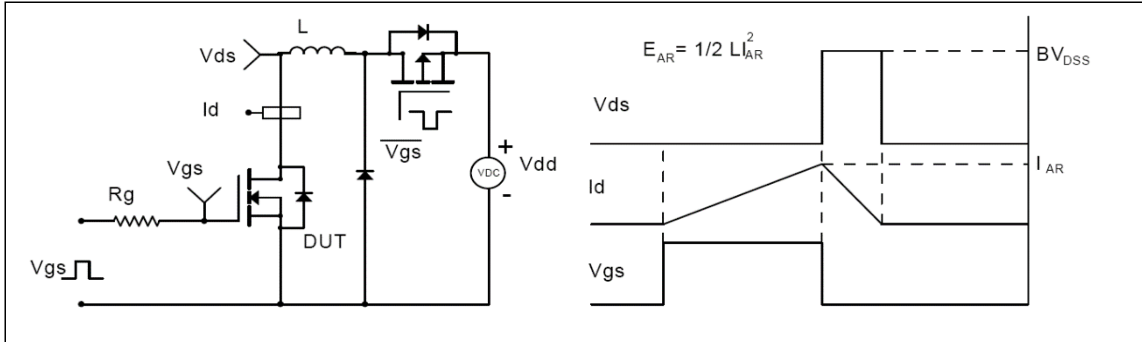


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

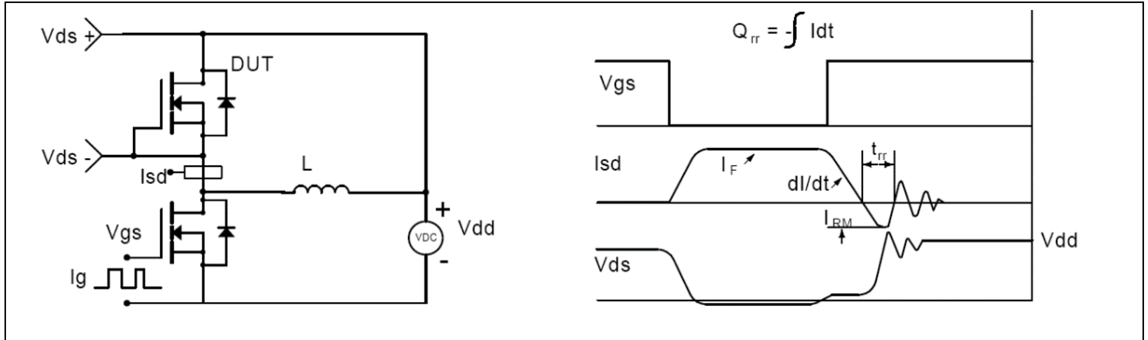


Figure 4, Diode reverse recovery test circuit & waveforms

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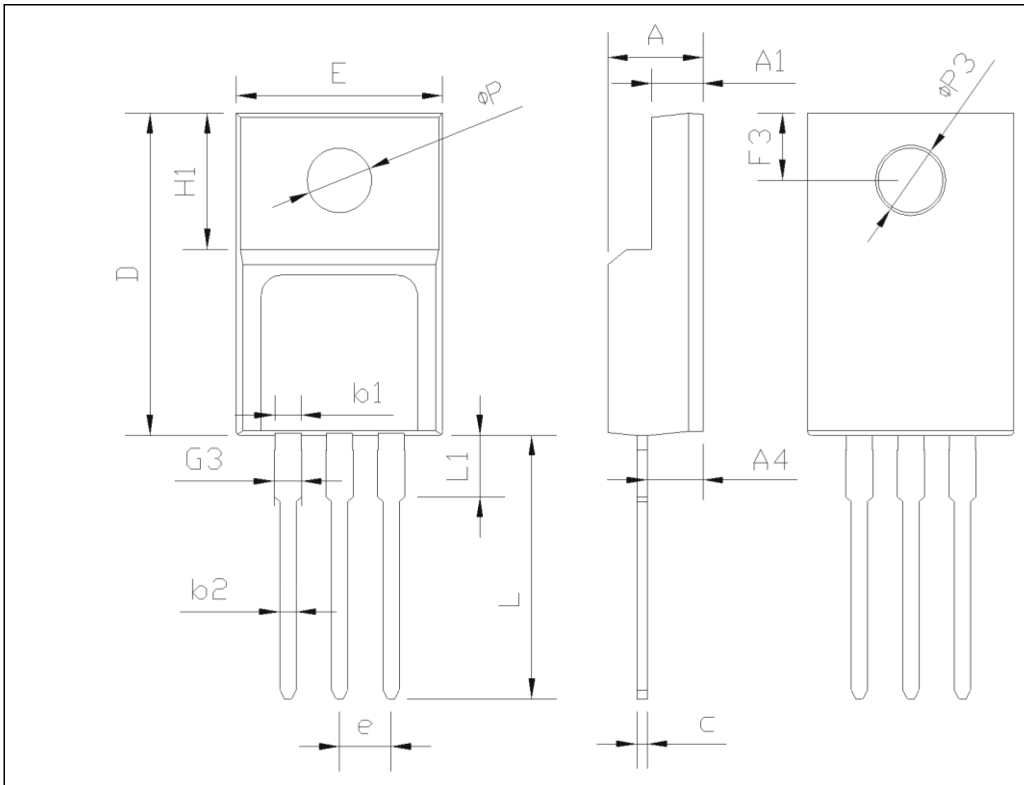
## ■ Package Information

Figure1, TO220F package outline dimension




| SYMBOL | mm | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| E | 9.96 | 10.16 | 10.36 |
| A | 4.50 | 4.70 | 4.90 |
| A1 | 2.34 | 2.54 | 2.74 |
| A4 | 2.56 | 2.76 | 2.96 |
| c | 0.40 | 0.50 | 0.65 |
| D | 15.57 | 15.87 | 16.17 |
| H1 | 6.70REF | | |
| e | 2.54BSC | | |
| L | 12.68 | 12.98 | 13.28 |
| L1 | 2.88 | 3.03 | 3.18 |
| ΦP | 3.03 | 3.18 | 3.38 |
| ΦP3 | 3.15 | 3.45 | 3.65 |
| F3 | 3.15 | 3.30 | 3.45 |
| G3 | 1.25 | 1.35 | 1.55 |
| b1 | 1.18 | 1.28 | 1.43 |
| b2 | 0.70 | 0.80 | 0.95 |

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## ■ Ordering Information

| Package | Units/Tube | Tubes/Inner Box | Units/Inner Box | Inner Box/Carton Box | Units/Carton Box |
|---|---|---|---|---|---|
| TO220F | 50 | 20 | 1000 | 6 | 6000 |

## ■ Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|---|---|---|---|---|
| OSG65R580FSF | TO220F | yes | yes | yes |

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