

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

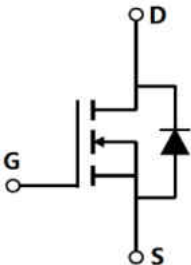

- ◆ Lighting
- ◆ Server power supply
- ◆ Telecom
- ◆ Solar inverter

■ General Description

OSG65R125FZF uses 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 power supplies.

| | |
|-----------------------------------|---------|
| ◆ $V_{DS, min@Tjmax}$ | 700 V |
| ◆ $I_{D, pulse}$ | 75 A |
| ◆ $R_{DS(ON), max @ V_{GS}=10 V}$ | 125 mΩ |
| ◆ Q_g | 40.3 nC |

■ Schematic and Package Information

| | |
|--|---|
| Schematic Diagram  | Pin Assignment-Top View  TO220F OSG65R125FZF |
|--|---|

■ 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 ¹⁾ | I_D | 25 | A |
| Continuous drain current ¹⁾ $T_j=100^{\circ}C$ | | 16 | |
| Pulsed drain current ²⁾ | $I_{D, pulse}$ | 75 | A |
| Power dissipation ³⁾ | P_D | 34 | W |
| Single pulsed avalanche energy ⁵⁾ | E_{AS} | 1000 | 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 | $R_{\theta JC}$ | 3.68 | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction-ambient ⁴⁾ | $R_{\theta JA}$ | 62.5 | $^{\circ}\text{C}/\text{W}$ |

■ 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 | | | | $V_{GS}=0\text{ V}, I_D=1\text{ mA},$ $T_j=150^{\circ}\text{C}$ |
| 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 | $R_{DS(on)}$ | | 0.115 | 0.125 | Ω | $V_{GS}=10\text{ V}, I_D=12.5\text{ A}$ |
| | | | 0.2 | | | $V_{GS}=10\text{ V}, I_D=12.5\text{ A},$ $T_j=150^{\circ}\text{C}$ |
| 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} | | | 10 | μA | $V_{DS}=650\text{ V}, V_{GS}=0\text{ V}$ |

■ Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|------------------------------|--------------|------|--------|------|------|--|
| Input capacitance | C_{iss} | | 2681.3 | | pF | $V_{GS}=0\text{ V},$ $V_{DS}=50\text{ V},$ $f=100\text{ kHz}$ |
| Output capacitance | C_{oss} | | 165.3 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 7.4 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 73.0 | | ns | $V_{GS}=10\text{ V},$ $V_{DS}=400\text{ V},$ $R_G=2\ \Omega,$ $I_D=20\text{ A}$ |
| Rise time | t_r | | 91.4 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 87.3 | | ns | |
| Fall time | t_f | | 38.4 | | ns | |

■ Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------|----------------------|------|------|------|------|--|
| Total gate charge | Q_g | | 40.3 | | nC | $I_D=20\text{ A}$, $V_{DS}=400\text{ V}$, $V_{GS}=10\text{ V}$ |
| Gate-source charge | Q_{gs} | | 13.5 | | nC | |
| Gate-drain charge | Q_{gd} | | 14.7 | | nC | |
| Gate plateau voltage | V_{plateau} | | 7.1 | | V | |

■ Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|-------------------------------|-----------|------|-------|------|---------------|--|
| Diode forward current | I_S | | | 25 | A | $V_{GS} < V_{th}$ |
| Pulsed source current | I_{SP} | | | 75 | | |
| Diode forward voltage | V_{SD} | | | 1.3 | V | $I_S=25\text{ A}$, $V_{GS}=0\text{ V}$ |
| Reverse recovery time | t_{rr} | | 131.0 | | ns | $V_R=400\text{ V}$, $I_S=20\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | | 0.8 | | μC | |
| Peak reverse recovery current | I_{rrm} | | 11.9 | | 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**

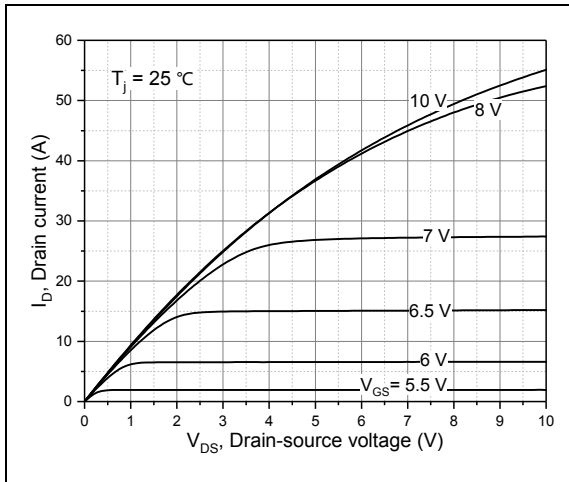


Figure 1, Typ. output characteristics

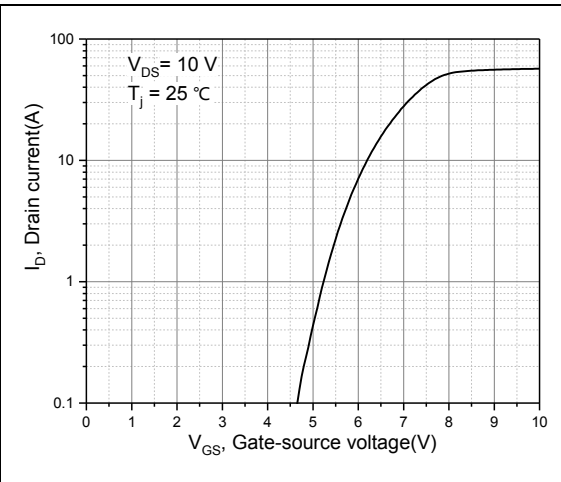


Figure 2, Typ. transfer characteristics

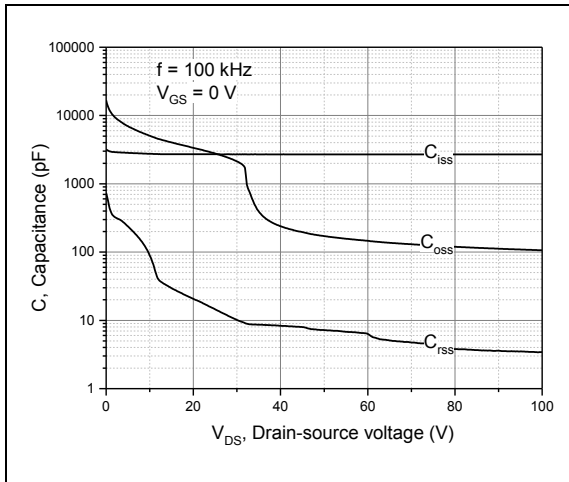


Figure 3, Typ. capacitances

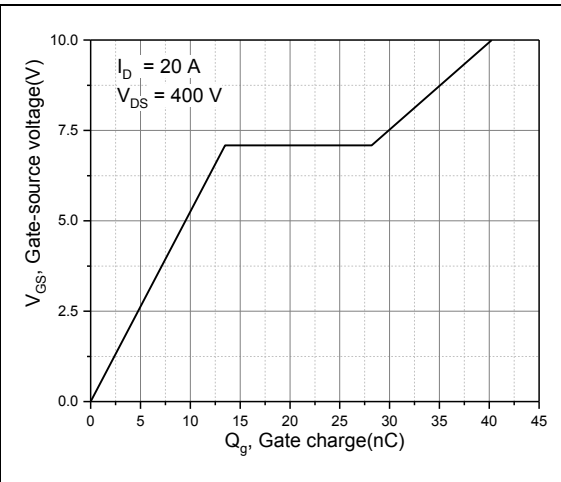


Figure 4, Typ. gate charge

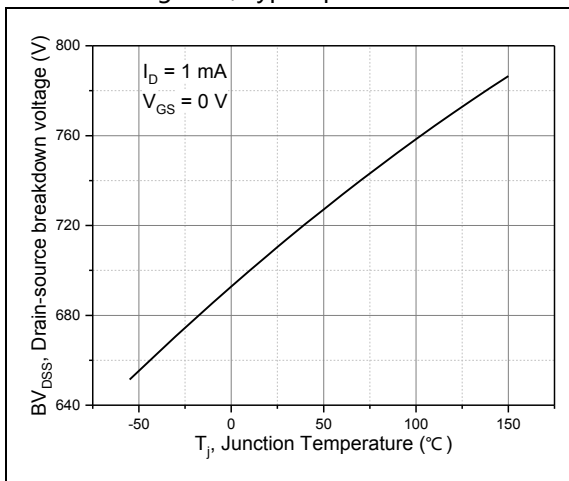


Figure 5, Drain-source breakdown voltage

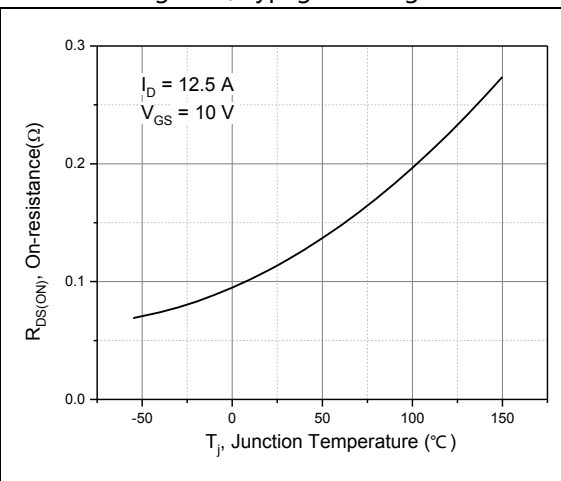


Figure 6, Drain-source on-state resistance

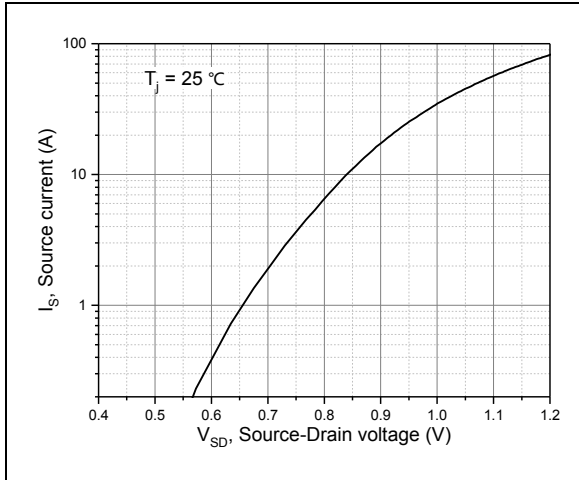


Figure 7, Forward characteristic of body diode

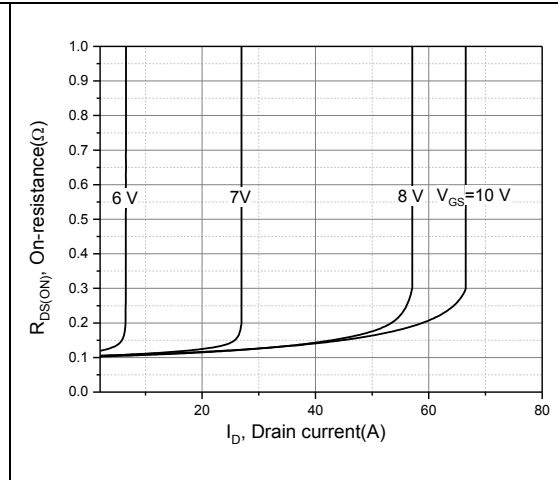


Figure 8, Drain-source on-state resistance

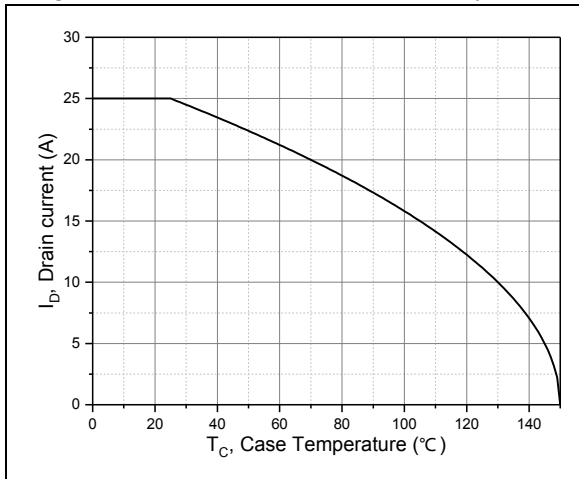


Figure 9, Drain current

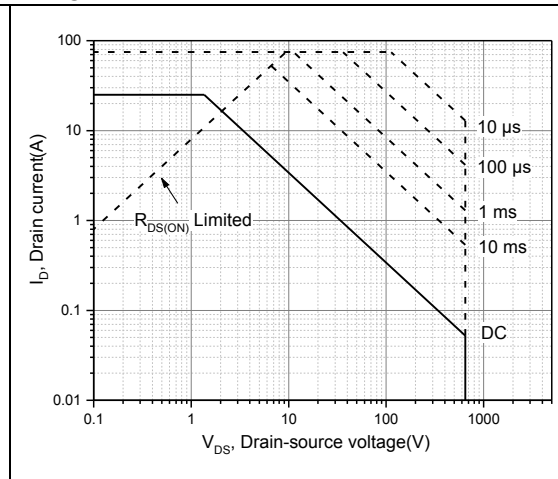


Figure 10, Safe operation area $T_C=25\text{ °C}$

■ Test circuits and waveforms

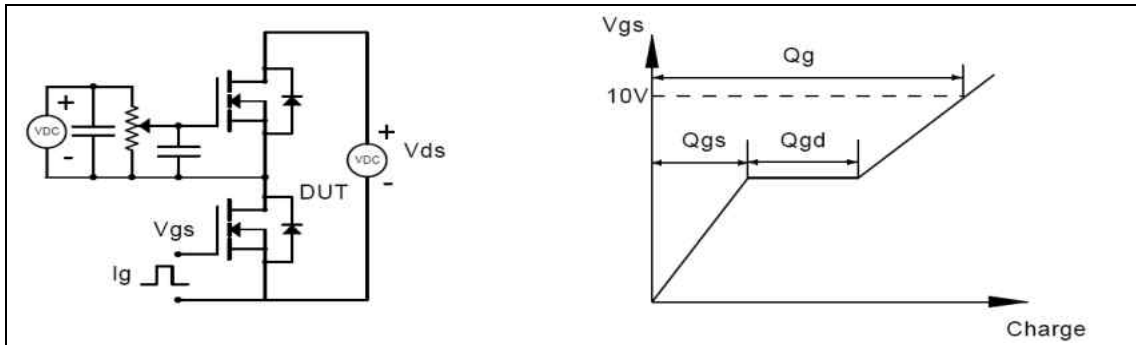


Figure 1, Gate charge test circuit & waveform

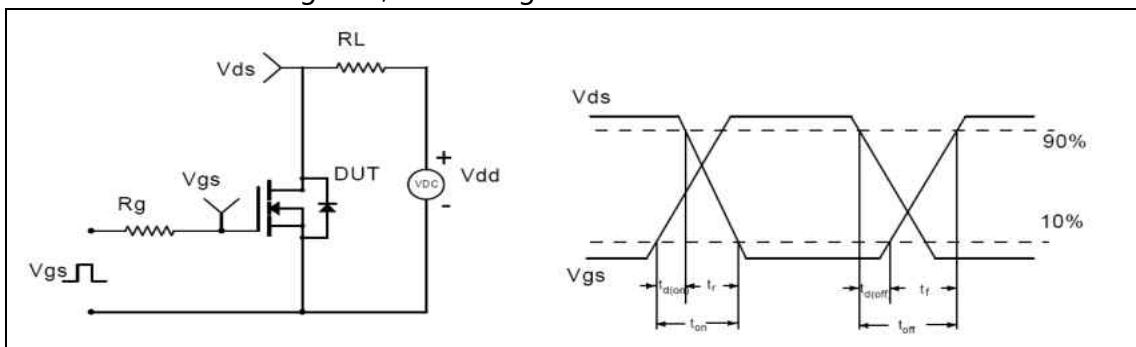


Figure 2, Switching time test circuit & waveforms

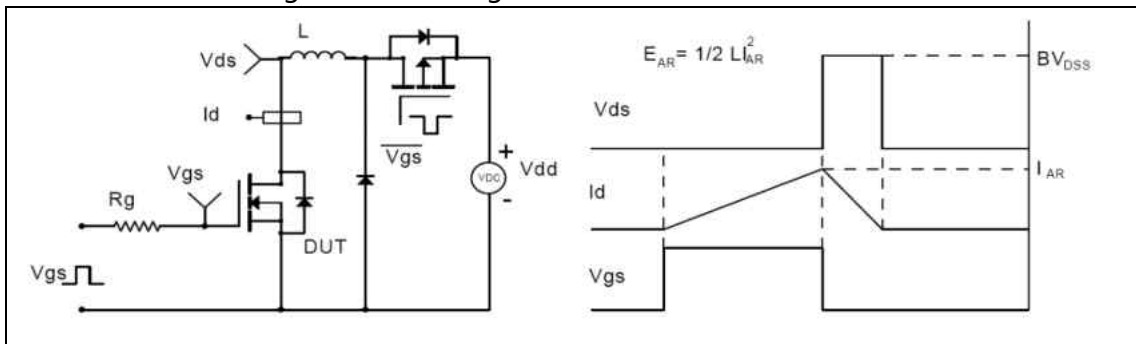


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

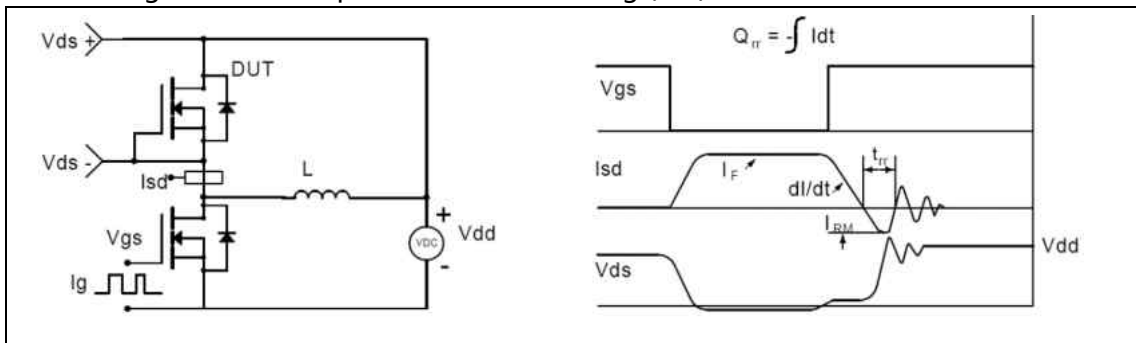
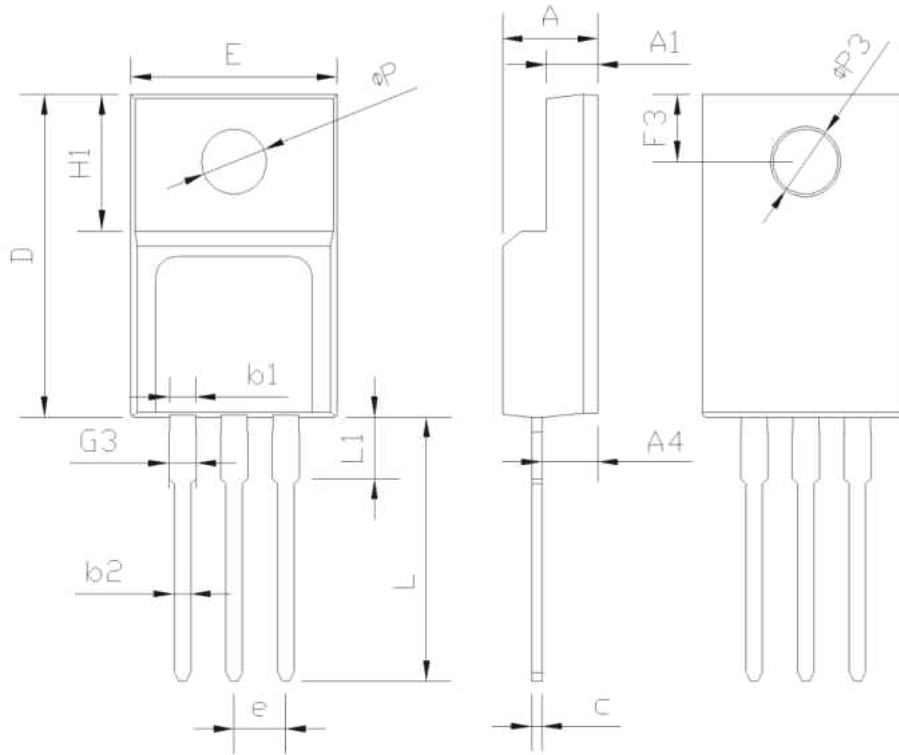


Figure 4, Diode reverse recovery test circuit & waveforms

■ Package Information

Figure1, 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 |

■ 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 |
|--------------|---------|---------|------|--------------|
| OSG65R125FZF | TO220F | yes | yes | yes |