## General Description

FSMOS® MOSFET is based on Oriental Semiconductor's unique device design to achieve low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. The high $V_{th}$ series is specially designed to use in motor control systems with driving voltage of more than 10V.

## Features

- Low $R_{DS(ON)}$ & FOM
- Extremely low switching loss
- Excellent reliability and uniformity
- Fast switching and soft recovery

RoHS compliant

## Applications

- PD charger
- Motor driver
- Switching voltage regulator
- DC-DC convertor
- Switching mode power supply

## Key Performance Parameters

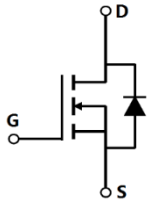
| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 100 | V |
| $I_{D,\ pulse}$ | 800 | A |
| $R_{DS(ON),\ max}$ @ $V_{GS}$=10V | 3 | mΩ |
| $Q_g$ | 62 | nC |

## Marking Information

| Product Name | Package | Marking |
|---|---|---|
| SFS10R03UGNF | PDFN5×6 | SFS10R03UGN |

## Package & Pin information

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 100 | V |
| Gate-source voltage | $V_{GS}$ | ±20 | V |
| Continuous drain current[1], $T_C$=25 °C | $I_D$ | 200 | A |
| Pulsed drain current[2], $T_C$=25 °C | $I_{D,\ pulse}$ | 800 | A |
| Continuous diode forward current[1], $T_C$=25 °C | $I_S$ | 200 | A |
| Diode pulsed current[2], $T_C$=25 °C | $I_{S,\ pulse}$ | 800 | A |
| Power dissipation[3], $T_C$=25 °C | $P_D$ | 180 | W |
| Single pulsed avalanche energy[5] | $E_{AS}$ | 240 | mJ |
| Operation and storage temperature | $T_{stg}$, $T_j$ | -55 to 175 | °C |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal resistance, junction-case | $R_{\theta JC}$ | 0.83 | °C/W |
| Thermal resistance, junction-ambient[4] | $R_{\theta JA}$ | 62 | °C/W |

## Electrical Characteristics at $T_j$=25°C unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | 100 | | | V | $V_{GS}$=0 V, $I_D$=250 μA |
| Gate threshold voltage | $V_{GS(th)}$ | 2 | | 4 | V | $V_{DS}$=$V_{GS}$, $I_D$=250 μA |
| Drain-source on-state resistance | $R_{DS(ON)}$ | | 2.6 | 3 | mΩ | $V_{GS}$=10 V, $I_D$=30A |
| Gate-source leakage current | $I_{GSS}$ | | | 100 | nA | $V_{GS}$=20 V |
| | | | | -100 | | $V_{GS}$=-20 V |
| Drain-source leakage current | $I_{DSS}$ | | | 1 | μA | $V_{DS}$=100 V, $V_{GS}$=0 V |
| Gate resistance | $R_G$ | | 2.4 | | Ω | $f$=1 MHz, Open drain |

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## Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | | 4190 | | pF | $V_{GS}$=0 V, $V_{DS}$=25 V, $f$=100 kHz |
| Output capacitance | $C_{oss}$ | | 2150 | | pF | |
| Reverse transfer capacitance | $C_{rss}$ | | 150 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 17 | | ns | $V_{GS}$=10 V, $V_{DS}$=50V, $R_G$=2 Ω, $I_D$=25 A |
| Rise time | $t_r$ | | 12 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 40 | | ns | |
| Fall time | $t_f$ | | 14 | | ns | |

## Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Total gate charge | $Q_g$ | | 62 | | nC | $V_{GS}$=10 V, $V_{DS}$=50 V, $I_D$=25 A |
| Gate-source charge | $Q_{gs}$ | | 17 | | nC | |
| Gate-drain charge | $Q_{gd}$ | | 15 | | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 4.6 | | V | |

## Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Diode forward voltage | $V_{SD}$ | | | 1.3 | V | $I_S$=20A, $V_{GS}$=0 V |
| Reverse recovery time | $t_{rr}$ | | 82 | | ns | $V_R$=50 V, $I_S$=25 A, di/dt=100 A/μs |
| Reverse recovery charge | $Q_{rr}$ | | 111 | | nC | |
| Peak reverse recovery current | $I_{rrm}$ | | 2.7 | | 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 °C.
5) $V_{DD}$=30 V,$V_{GS}$=10 V, L=0.3 mH, starting $T_j$=25 °C.

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## Electrical Characteristics Diagrams

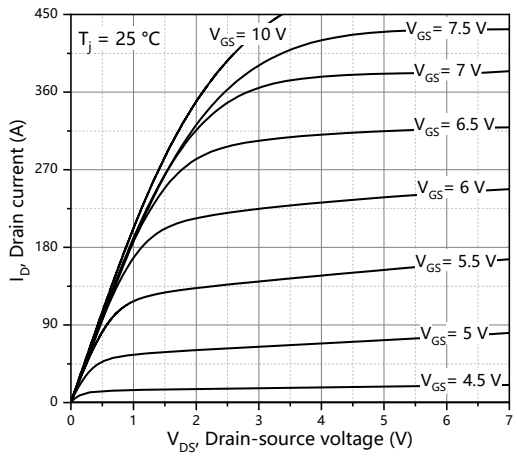


**Figure 1. Typ. output characteristics**

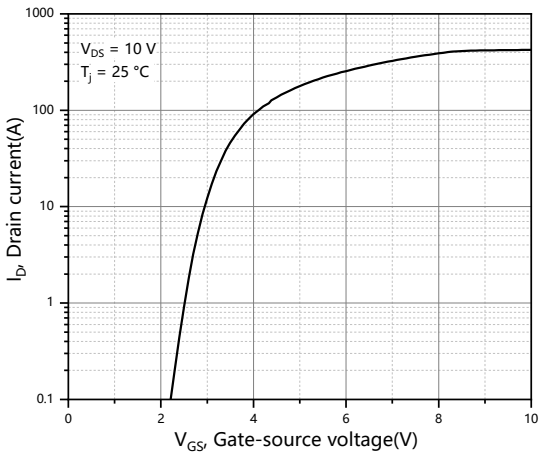


**Figure 2. Typ. transfer characteristics**

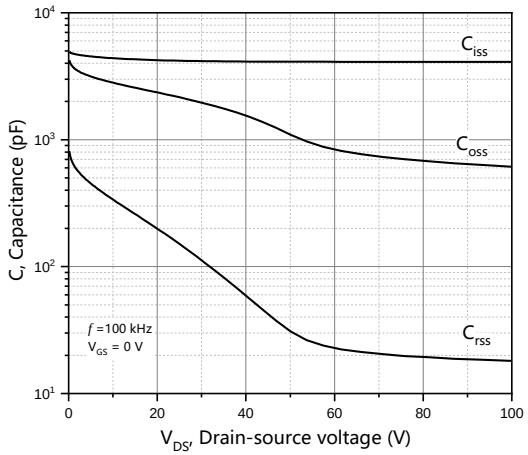


**Figure 3. Typ. capacitances**

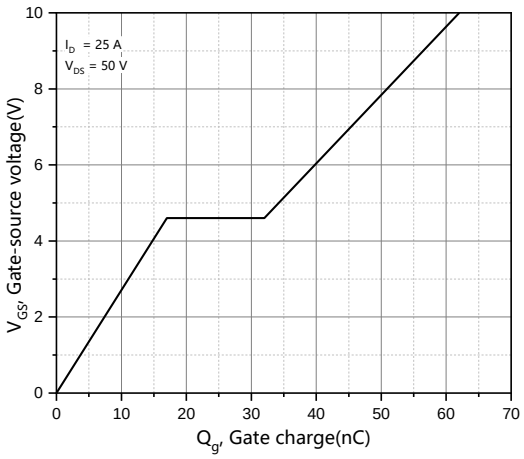


**Figure 4. Typ. gate charge**

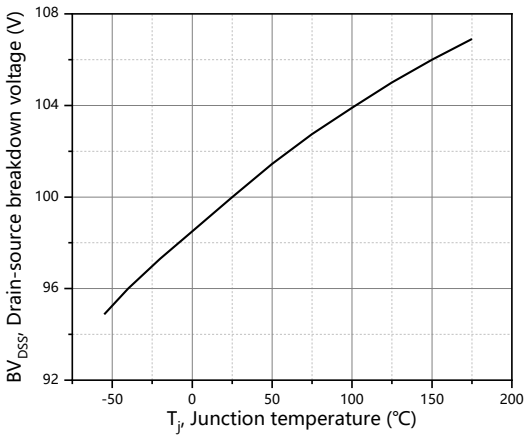


**Figure 5. Drain-source breakdown voltage**

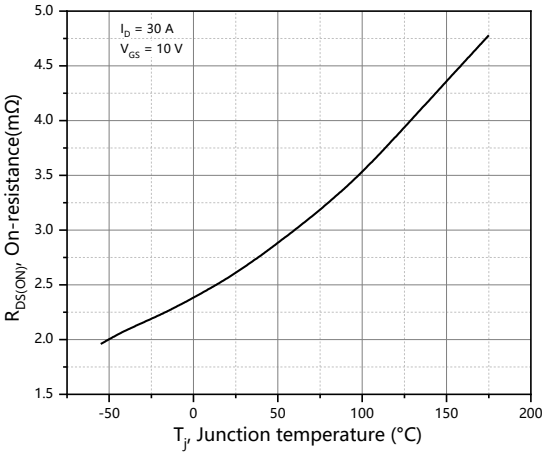


**Figure 6. Drain-source on-state resistance**

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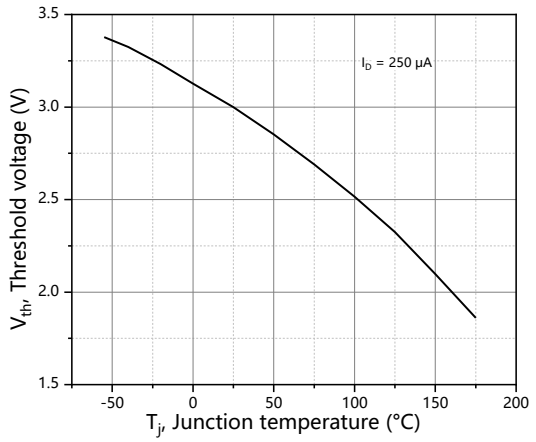


**Figure 7. Threshold voltage**

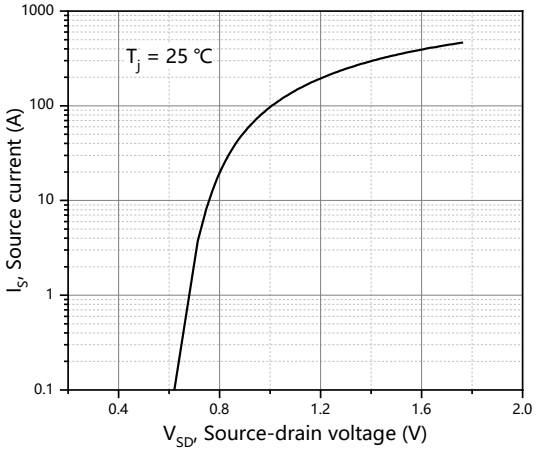


**Figure 8. Forward characteristic of body diode**

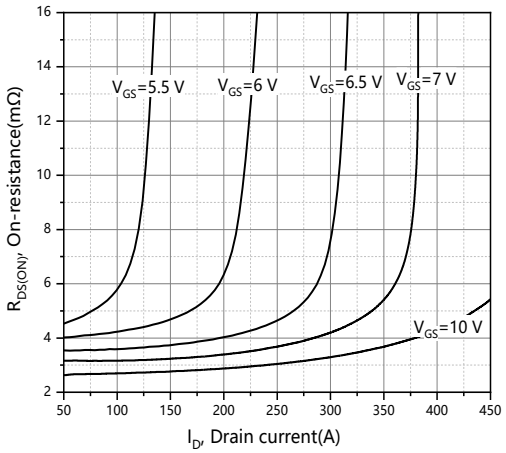


**Figure 9. Drain-source on-state resistance**

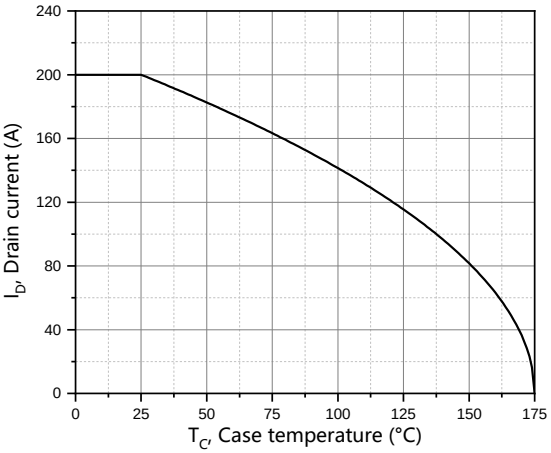


**Figure 10. Drain current**

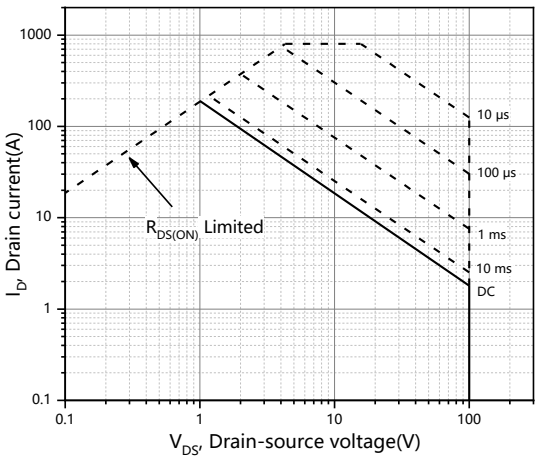


**Figure 11. Safe operation area $T_C$=25℃**

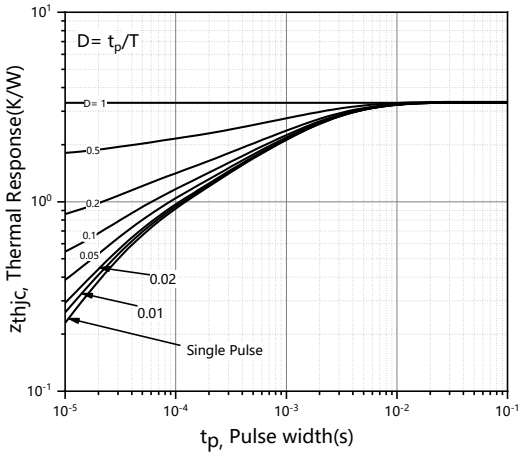


**Figure 12. Max. transient thermal impedance**

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## Test circuits and waveforms

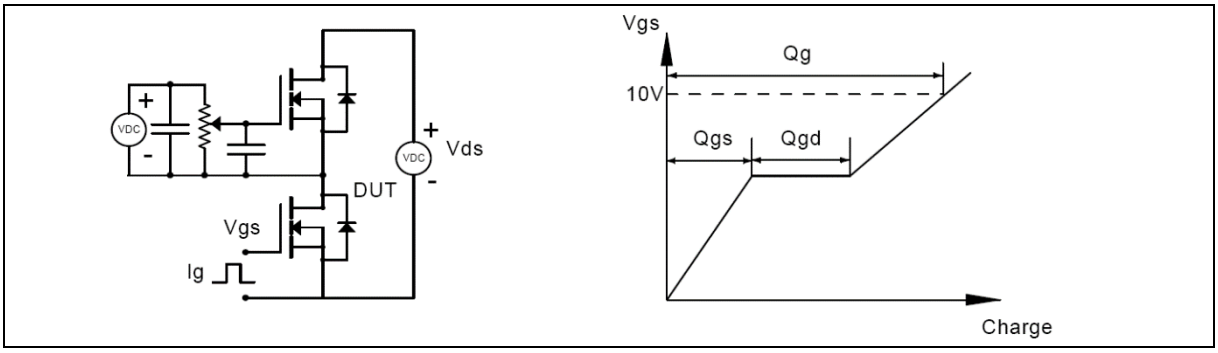



**Figure 1. Gate charge test circuit & waveform**

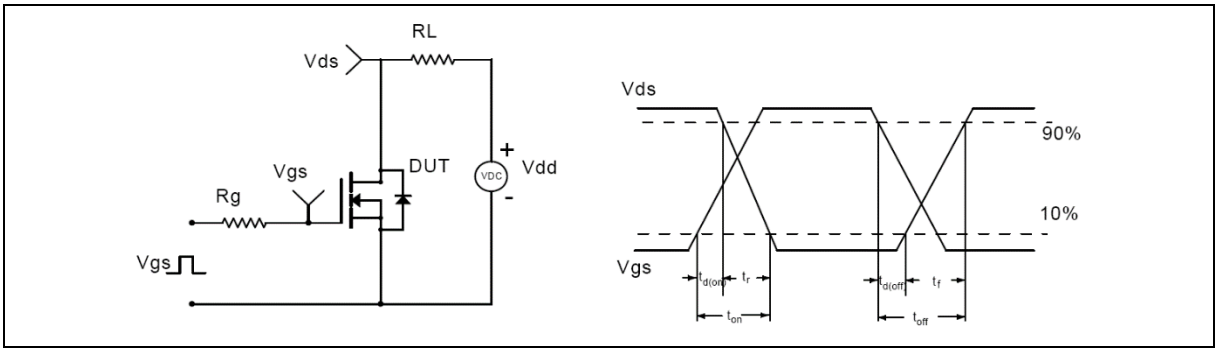



**Figure 2. Switching time test circuit & waveforms**

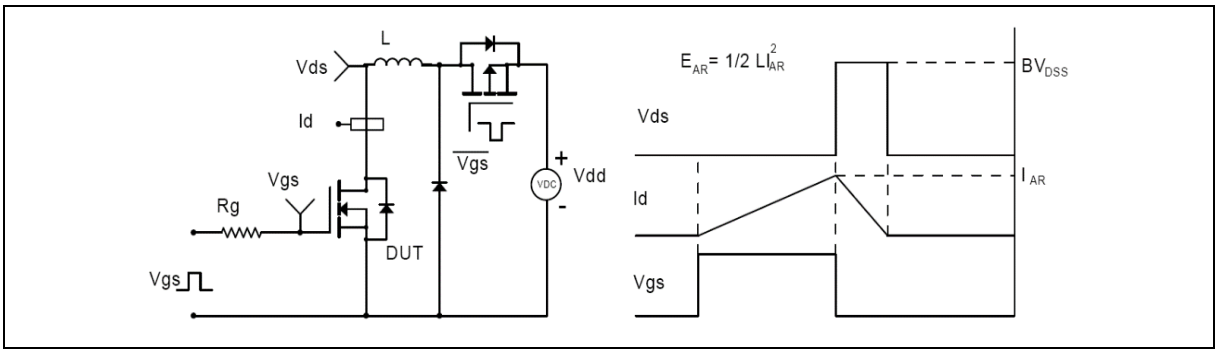



**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**

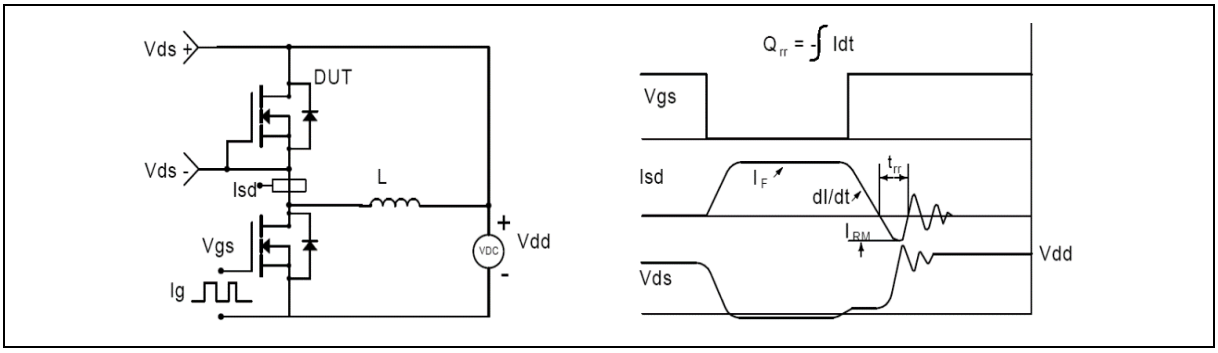
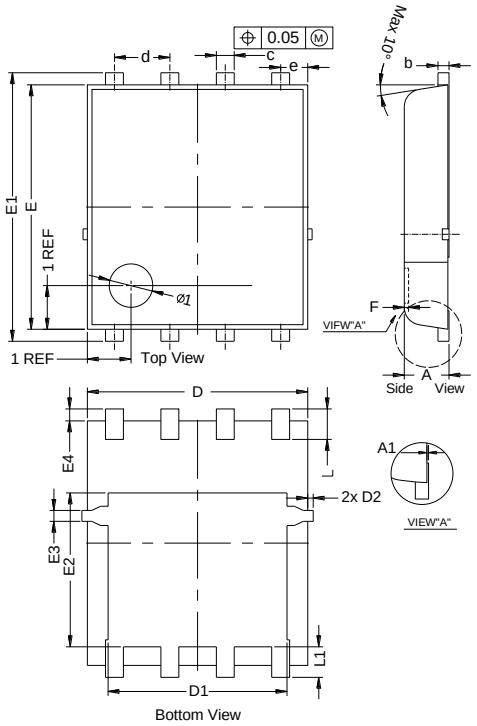



**Figure 4. Diode reverse recovery test circuit & waveforms**

## Package Information




| Symbol | mm | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | - | 0.05 |
| b | 0.246 | 0.254 | 0.312 |
| c | 0.31 | 0.41 | 0.51 |
| d | 1.27 BSC | | |
| D | 4.95 | 5.05 | 5.15 |
| D1 | 4.00 | 4.10 | 4.20 |
| D2 | - | - | 0.125 |
| e | 0.62 BSC | | |
| E | 5.50 | 5.60 | 5.70 |
| E1 | 6.05 | 6.15 | 6.25 |
| E2 | 3.425 | 3.525 | 3.625 |
| E3 | 0.15 | 0.25 | 0.35 |
| E4 | 0.175 | 0.275 | 0.375 |
| F | - | - | 0.10 |
| L | 0.50 | 0.60 | 0.70 |
| L1 | 0.60 | 0.70 | 0.80 |
| K | 1.125 | 1.225 | 1.325 |

Version 1: PDFN5×6-H package outline dimension

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## Ordering Information

| Package Type | Units/ Reel | Reels/ Inner Box | Units/ Inner Box | Inner Boxes/ Carton Box | Units/ Carton Box |
|---|---|---|---|---|---|
| PDFN5×6-H | 5000 | 2 | 10000 | 5 | 50000 |

## Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|---|---|---|---|---|
| SFS10R03UGNF | PDFN5×6 | yes | yes | yes |

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