

## General Description

FSMOS<sup>®</sup> 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



## Applications

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

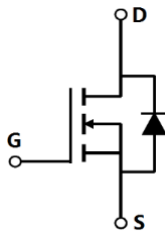
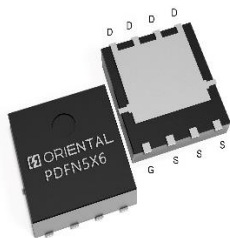
## Key Performance Parameters

| Parameter                         | Value | Unit       |
|-----------------------------------|-------|------------|
| $V_{DS}$                          | 150   | V          |
| $I_D$ , pulse                     | 248   | A          |
| $R_{DS(ON)}$ , max @ $V_{GS}=10V$ | 20    | m $\Omega$ |
| $Q_g$                             | 20.6  | nC         |

## Marking Information

| Product Name | Package | Marking    |
|--------------|---------|------------|
| SFS15R20GNF  | PDFN5*6 | SFS15R20GN |

## Package & Pin information



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

| Parameter   | Symbol         | Value      | Unit               |
|---|----------------|------------|--------------------|
| Drain-source voltage  | $V_{DS}$       | 150        | V                  |
| Gate-source voltage   | $V_{GS}$       | $\pm 20$   | V                  |
| Continuous drain current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$         | $I_D$          | 62         | A                  |
| Pulsed drain current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$             | $I_{D, pulse}$ | 248        | A                  |
| Continuous diode forward current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$ | $I_S$          | 62         | A                  |
| Diode pulsed current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$             | $I_{S, pulse}$ | 248        | A                  |
| Power dissipation <sup>3)</sup> , $T_C=25^{\circ}\text{C}$                | $P_D$          | 183        | W                  |
| Single pulsed avalanche energy <sup>5)</sup>                              | $E_{AS}$       | 108        | mJ                 |
| Operation and storage temperature   | $T_{stg}, T_j$ | -55 to 175 | $^{\circ}\text{C}$ |

**Thermal Characteristics**

| Parameter  | Symbol          | Value | Unit                 |
|--|-----------------|-------|----------------------|
| Thermal resistance, junction-case                  | $R_{\theta JC}$ | 0.83  | $^{\circ}\text{C/W}$ |
| 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   | $BV_{DSS}$   | 150  |      |      | V             | $V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$ |
| Gate threshold voltage           | $V_{GS(th)}$ | 2.5  |      | 4.5  | V             | $V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$     |
| Drain-source on-state resistance | $R_{DS(ON)}$ |      | 15.8 | 20.0 | m $\Omega$    | $V_{GS}=10\text{ V}, I_D=30\text{ A}$     |
| Gate-source leakage current      | $I_{GSS}$    |      |      | 100  | nA            | $V_{GS}=20\text{ V}$                      |
|                                  |              |      |      | -100 |               | $V_{GS}=-20\text{ V}$                     |
| Drain-source leakage current     | $I_{DSS}$    |      |      | 1    | $\mu\text{A}$ | $V_{DS}=150\text{ V}, V_{GS}=0\text{ V}$  |
| Gate resistance                  | $R_G$        |      | 1.9  |      | $\Omega$      | $f=1\text{ MHz}, \text{Open drain}$       |

### Dynamic Characteristics

| Parameter                    | Symbol       | Min. | Typ.   | Max. | Unit | Test condition   |
|------------------------------|--------------|------|--------|------|------|--|
| Input capacitance            | $C_{iss}$    |      | 1315.7 |      | pF   | $V_{GS}=0\text{ V}$ ,<br>$V_{DS}=75\text{ V}$ ,<br>$f=100\text{ kHz}$                      |
| Output capacitance           | $C_{oss}$    |      | 360.1  |      | pF   |  |
| Reverse transfer capacitance | $C_{rss}$    |      | 15.8   |      | pF   |  |
| Turn-on delay time           | $t_{d(on)}$  |      | 14.0   |      | ns   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=80\text{ V}$ ,<br>$R_G=2\ \Omega$ ,<br>$I_D=40\text{ A}$ |
| Rise time                    | $t_r$        |      | 7.2    |      | ns   |  |
| Turn-off delay time          | $t_{d(off)}$ |      | 18.0   |      | ns   |  |
| Fall time                    | $t_f$        |      | 6.4    |      | ns   |  |

### Gate Charge Characteristics

| Parameter            | Symbol        | Min. | Typ. | Max. | Unit | Test condition  |
|----------------------|---------------|------|------|------|------|---|
| Total gate charge    | $Q_g$         |      | 20.6 |      | nC   | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=80\text{ V}$ ,<br>$I_D=40\text{ A}$ |
| Gate-source charge   | $Q_{gs}$      |      | 8.3  |      | nC   |   |
| Gate-drain charge    | $Q_{gd}$      |      | 6.4  |      | nC   |   |
| Gate plateau voltage | $V_{plateau}$ |      | 6.8  |      | V    |   |

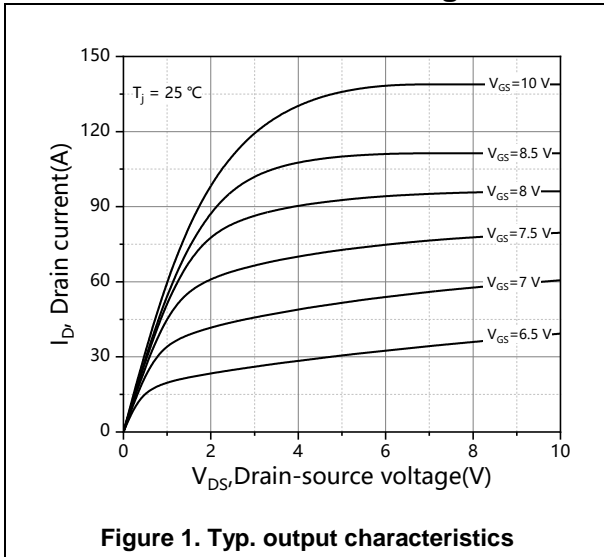
### Body Diode Characteristics

| Parameter                     | Symbol    | Min. | Typ.  | Max. | Unit | Test condition   |
|-------------------------------|-----------|------|-------|------|------|--|
| Diode forward voltage         | $V_{SD}$  |      |       | 1.1  | V    | $I_S=30\text{ A}$ ,<br>$V_{GS}=0\text{ V}$                                     |
| Reverse recovery time         | $t_{rr}$  |      | 56.9  |      | ns   | $V_R=80\text{ V}$ ,<br>$I_S=40\text{ A}$ ,<br>$di/dt=400\text{ A}/\mu\text{s}$ |
| Reverse recovery charge       | $Q_{rr}$  |      | 225.0 |      | nC   |  |
| Peak reverse recovery current | $I_{rrm}$ |      | 6.9   |      | A    |  |

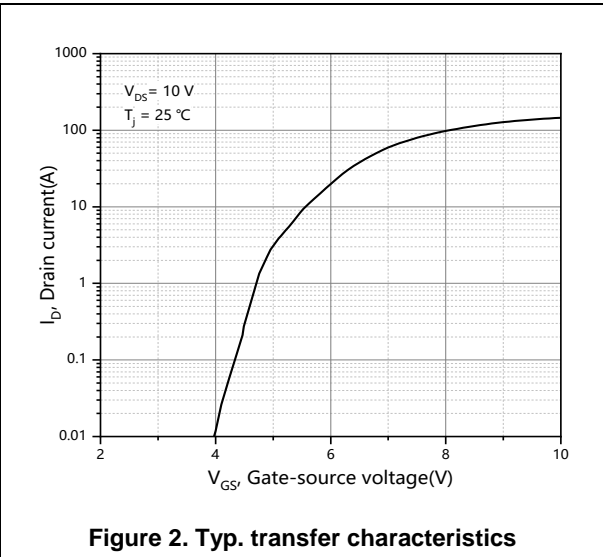
### Note

- 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<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25\text{ }^\circ\text{C}$ .
- 5)  $V_{DD}=50\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=0.3\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

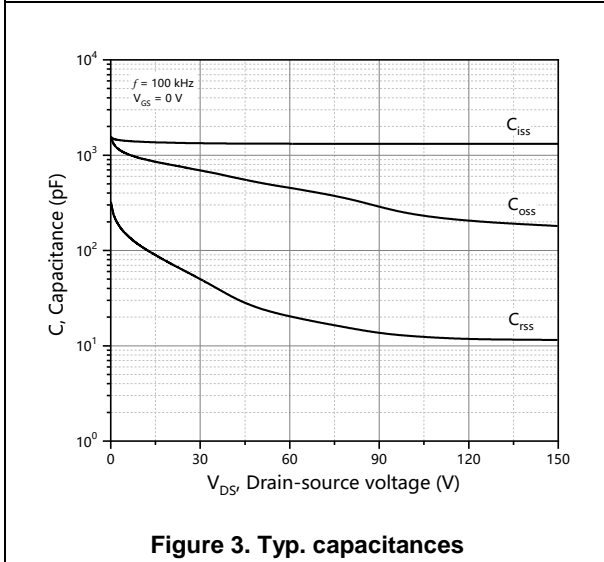
**Electrical Characteristics Diagrams**



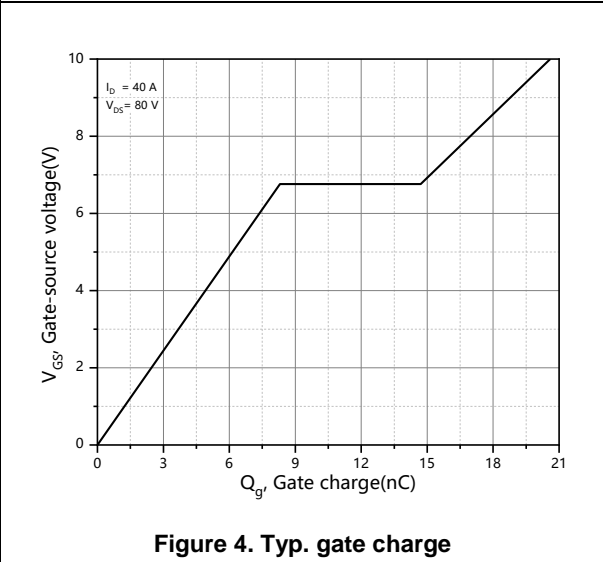
**Figure 1. Typ. output characteristics**



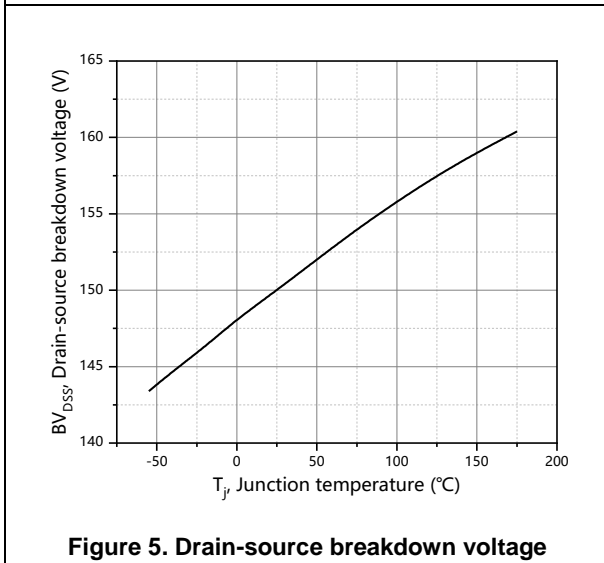
**Figure 2. Typ. transfer characteristics**



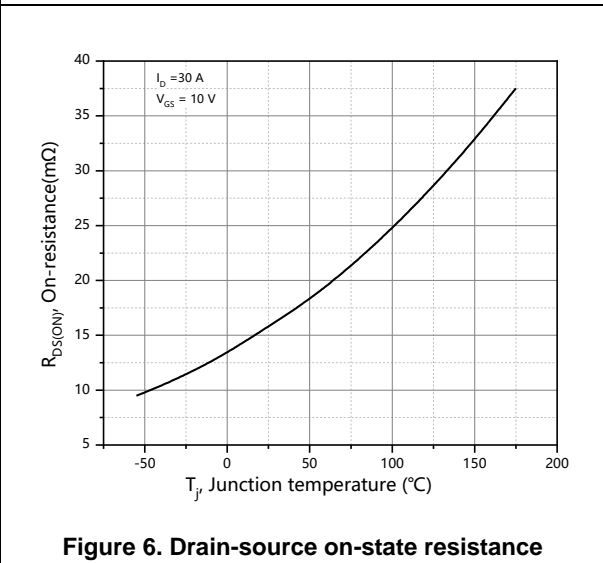
**Figure 3. Typ. capacitances**



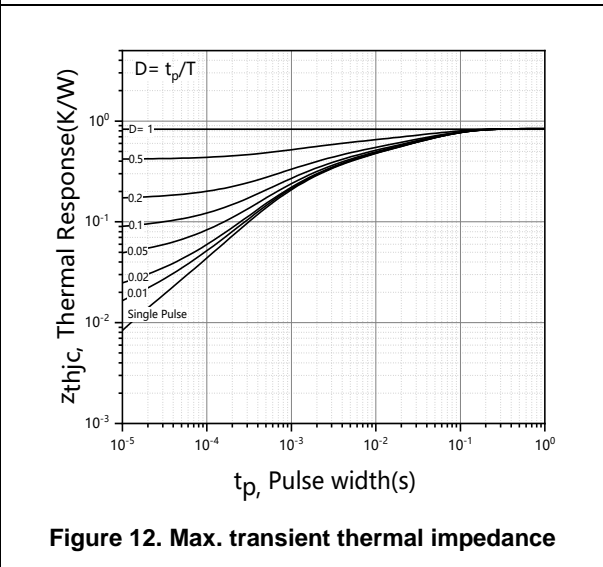
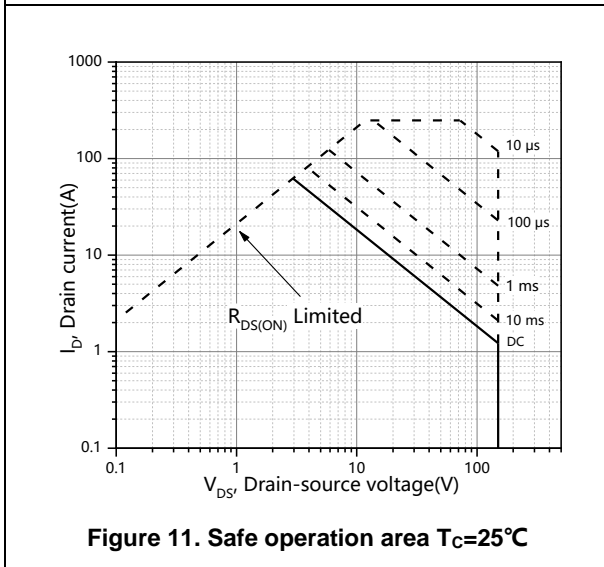
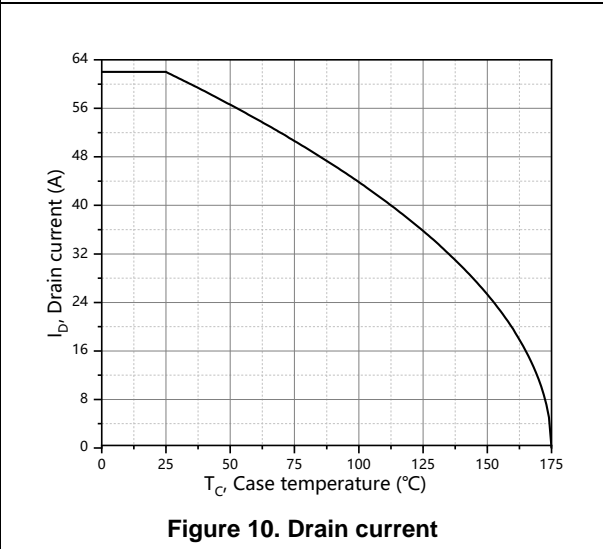
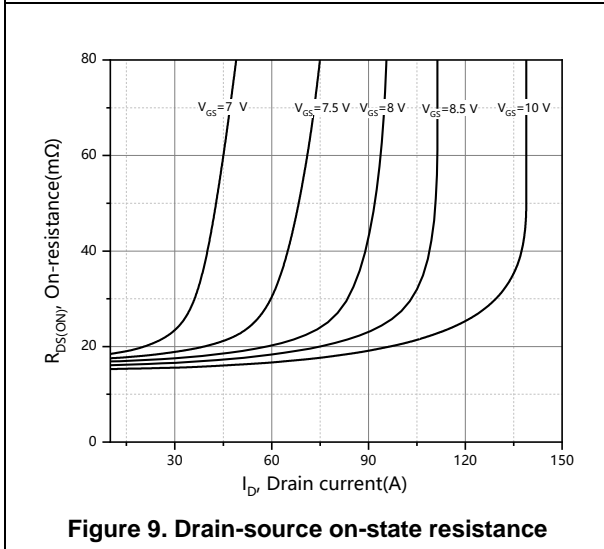
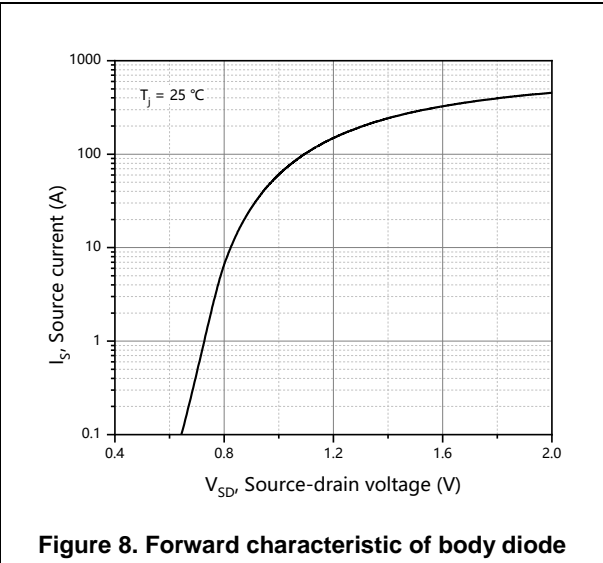
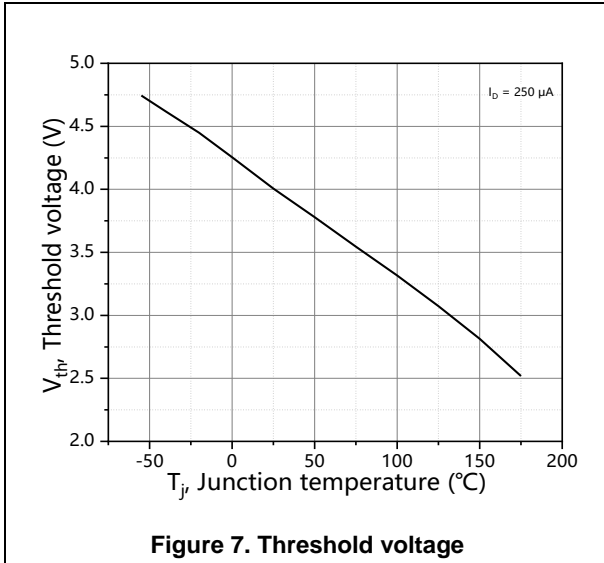
**Figure 4. Typ. gate charge**



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



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



**Test circuits and waveforms**



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



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

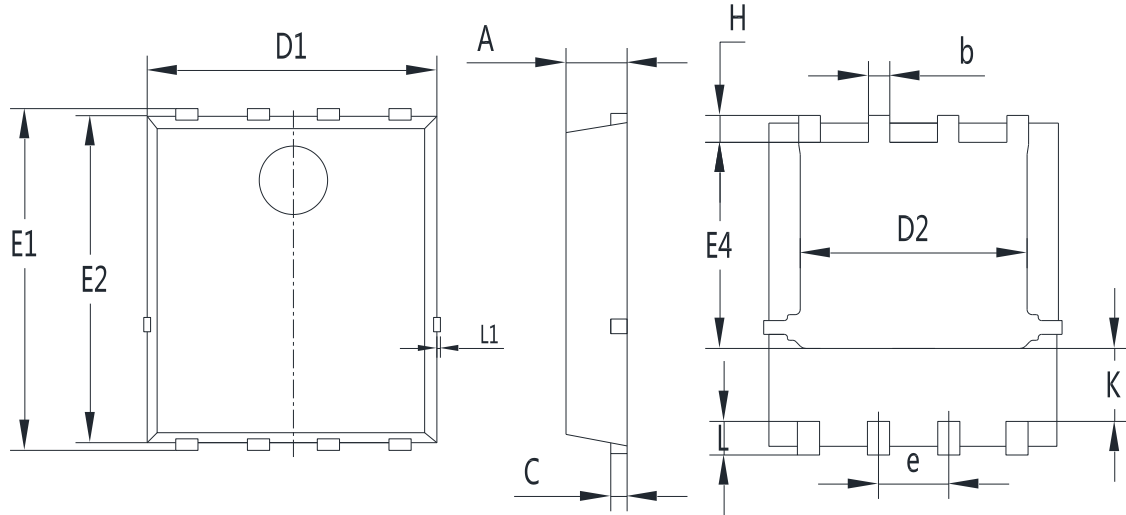


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



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

**Package Information**



| Symbol | mm       |       |       |
|--------|----------|-------|-------|
|        | Min      | Nom   | Max   |
| A      | 1.00     | 1.10  | 1.20  |
| b      | 0.30     | 0.40  | 0.50  |
| c      | 0.154    | 0.254 | 0.354 |
| D1     | 5.00     | 5.20  | 5.40  |
| D2     | 3.80     | 4.10  | 4.25  |
| e      | 1.17     | 1.27  | 1.37  |
| E1     | 5.95     | 6.15  | 6.35  |
| E2     | 5.66     | 5.86  | 6.06  |
| E4     | 3.52     | 3.72  | 3.92  |
| H      | 0.40     | 0.50  | 0.60  |
| L      | 0.30     | 0.60  | 0.70  |
| L1     | 0.12 REF |       |       |
| K      | 1.15     | 1.30  | 1.45  |

Version : PDFN5\*6-P package outline dimension

### Ordering Information

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

### Product Information

| Product     | Package | Pb Free | RoHS | Halogen Free |
|-------------|---------|---------|------|--------------|
| SFS15R20GNF | PDFN5*6 | yes     | yes  | yes          |

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## Revision History

| Version | Revision History | Date       |
|---------|------------------|------------|
| V1.0    | Initial release  | 2025-05-13 |