

## 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 power supply 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

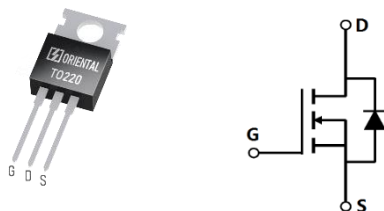
## Key Performance Parameters

Parameter	Value	Unit
$V_{DS}$	60	V
$I_D$ , pulse	540	A
$R_{DS(ON)}$ , max @ $V_{GS}=10V$	3	m $\Omega$
$Q_g$	59	nC

## Marking Information

Product Name	Package	Marking
SFS135N06PF	TO220	SFS135N06P

## Package & Pin information



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

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	60	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current <sup>1)</sup> , $T_C=25^\circ\text{C}$	$I_D$	135	A
Pulsed drain current <sup>2)</sup> , $T_C=25^\circ\text{C}$	$I_{D, pulse}$	540	A
Continuous diode forward current <sup>1)</sup> , $T_C=25^\circ\text{C}$	$I_S$	135	A
Diode pulsed current <sup>2)</sup> , $T_C=25^\circ\text{C}$	$I_{S, pulse}$	540	A
Power dissipation <sup>3)</sup> , $T_C=25^\circ\text{C}$	$P_D$	105	W
Single pulsed avalanche energy <sup>4)</sup>	$E_{AS}$	183	mJ
Operation and storage temperature	$T_{stg}, T_j$	-55 to 150	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	1.18	$^\circ\text{C/W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	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	$BV_{DSS}$	60			V	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	2		4	V	$V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		2.7	3	m $\Omega$	$V_{GS}=10\text{ V}, I_D=20\text{ A}$
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	$\mu\text{A}$	$V_{DS}=60\text{ V}, V_{GS}=0\text{ V}$
Gate resistance	$R_G$		1.8		$\Omega$	$f=1\text{ MHz}, \text{Open drain}$

### Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	$C_{iss}$		3820		pF	$V_{GS}=0\text{ V}$ , $V_{DS}=25\text{ V}$ , $f=100\text{ kHz}$
Output capacitance	$C_{oss}$		2000		pF	
Reverse transfer capacitance	$C_{rss}$		119		pF	
Turn-on delay time	$t_{d(on)}$		18		ns	$V_{GS}=10\text{ V}$ , $V_{DS}=30\text{ V}$ , $R_G=2\ \Omega$ , $I_D=50\text{ A}$
Rise time	$t_r$		11		ns	
Turn-off delay time	$t_{d(off)}$		31		ns	
Fall time	$t_f$		10		ns	

### Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	$Q_g$		59		nC	$V_{GS}=10\text{ V}$ , $V_{DS}=30\text{ V}$ , $I_D=50\text{ A}$
Gate-source charge	$Q_{gs}$		18		nC	
Gate-drain charge	$Q_{gd}$		16		nC	
Gate plateau voltage	$V_{plateau}$		5.3		V	

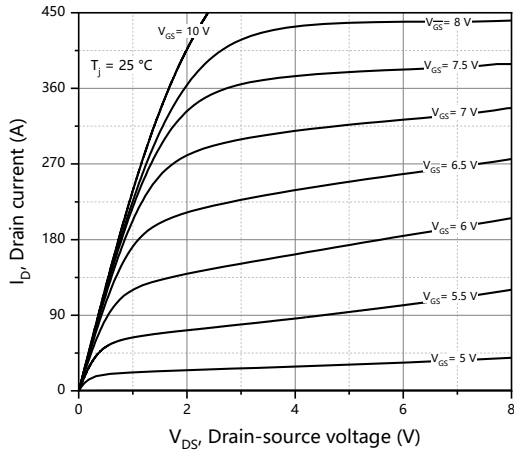
### Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	$V_{SD}$			1.3	V	$I_S=50\text{ A}$ , $V_{GS}=0\text{ V}$
Reverse recovery time	$t_{rr}$		63		ns	$V_R=40\text{ V}$ , $I_S=50\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	$Q_{rr}$		115		nC	
Peak reverse recovery current	$I_{rrm}$		3		A	

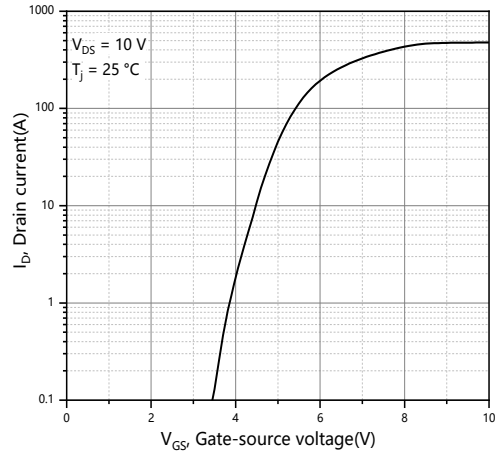
### Note

- 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)  $V_{DD}=50\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=0.3\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

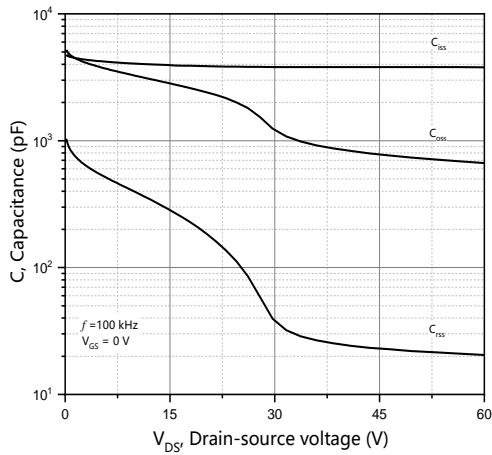
**Electrical Characteristics Diagrams**



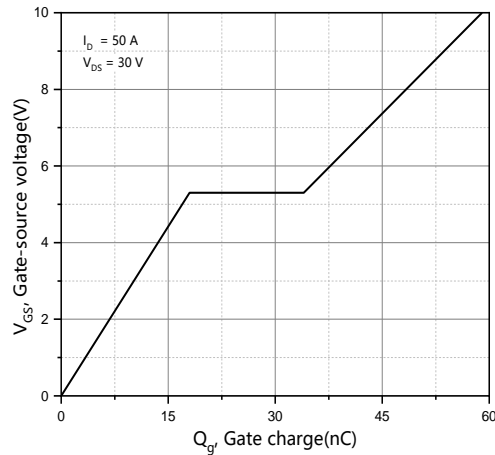
**Figure 1. Typ. output characteristics**



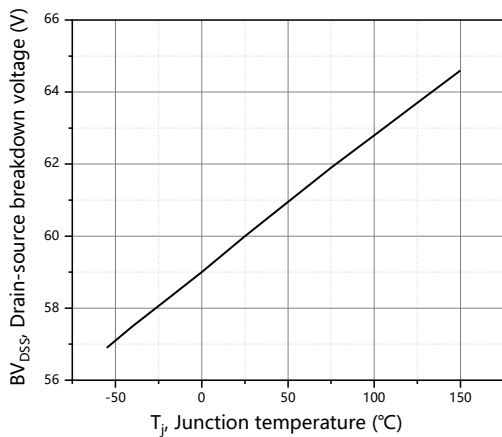
**Figure 2. Typ. transfer characteristics**



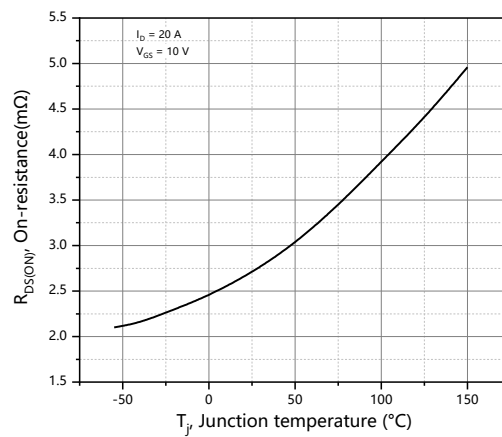
**Figure 3. Typ. capacitances**



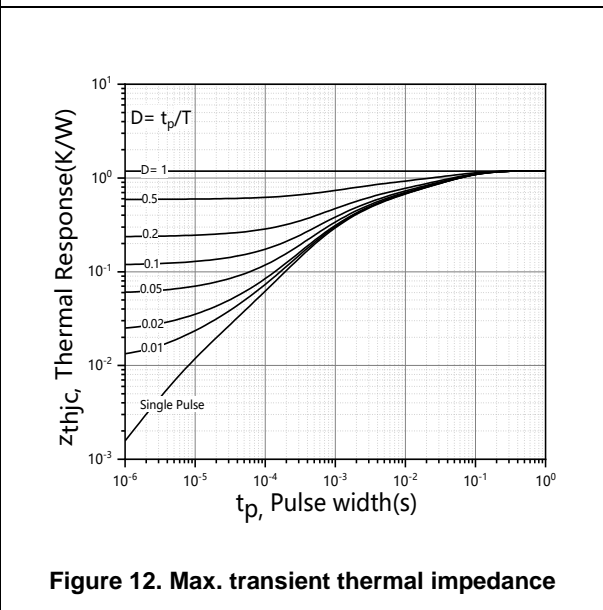
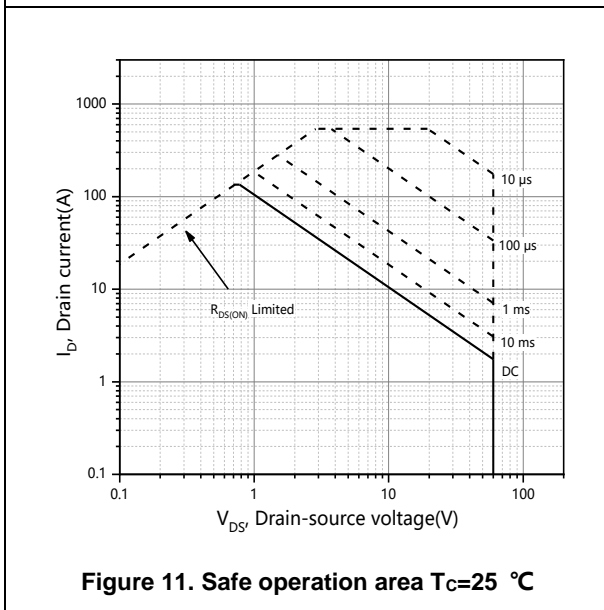
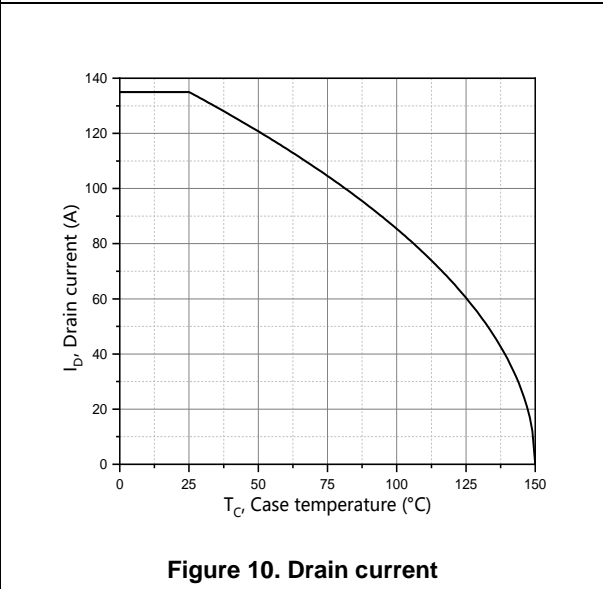
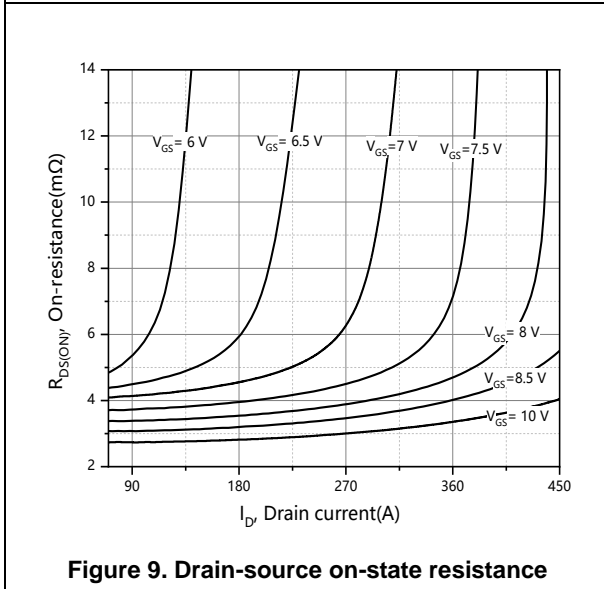
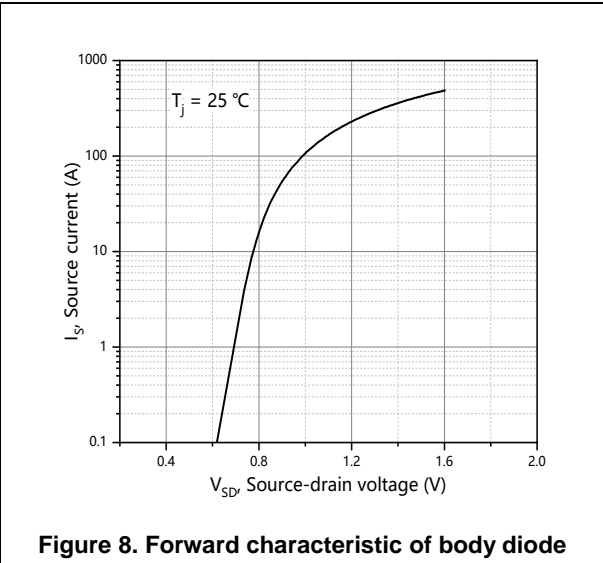
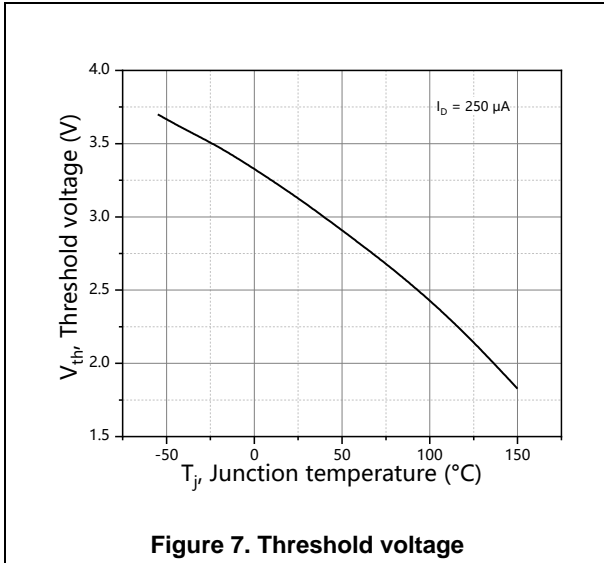
**Figure 4. Typ. gate charge**



**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**

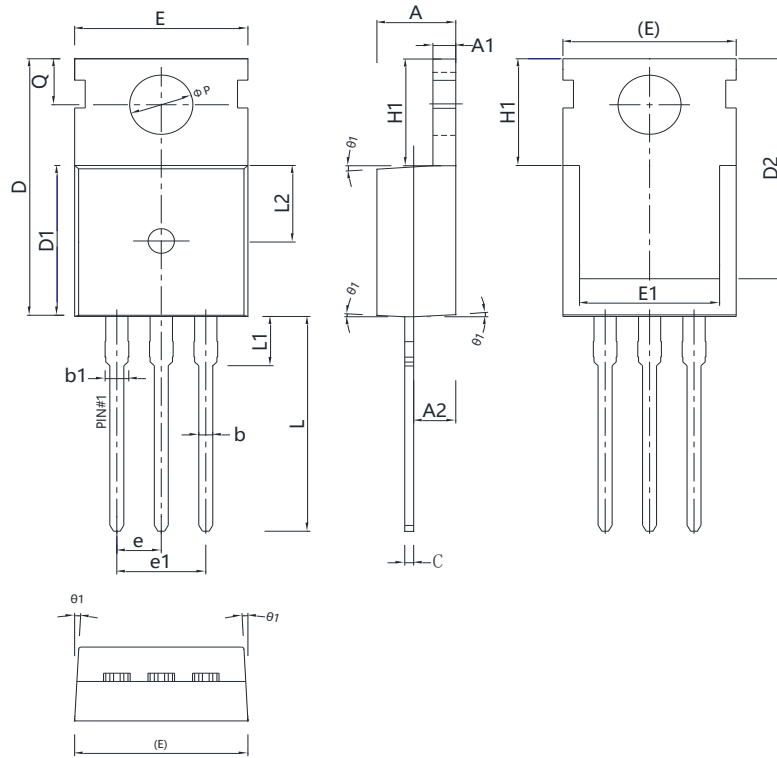


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



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

**Package Information**



	mm		
	Min	Nom	Max
A	2.15	2.30	2.45
b	0.75	0.75	0.85
b'	0.70	0.70	0.80
b1	9.65	9.80	9.95
C	0.45	0.50	0.60
D	10.18	10.38	10.58
D2	3.15	3.30	3.45
E	9.70	9.90	10.10
E1	7.95	8.10	8.25
e	BSC 1.225		
e'	BSC 1.20		
Q1	4.40	4.55	4.70
H	11.48	11.68	11.88
H1	6.80	6.95	7.10
L	1.60	1.80	2.00
L1	0.50	0.70	0.90
L2	0.48	0.60	0.72
L4	1.00	1.15	1.30

Version 1: TO220-J package outline dimension

### Ordering Information

Package Type	Units/ Tube	Tubes / Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220-J	50	20	1000	5	5000

### Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS135N06PF	TO220	yes	yes	yes

### Legal Disclaimer

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