



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



Applications

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

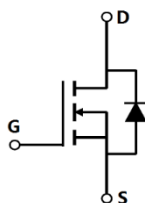
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	40	V
I_D , pulse	340	A
$R_{DS(ON)}$, max @ $V_{GS}=10V$	4.5	m Ω
Q_g	30	nC

Marking Information

Product Name	Package	Marking
SFS04R045NNF	PDFN3.3×3.3	04045N

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}	40	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	85	A
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, \text{pulse}}$	340	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	85	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, \text{pulse}}$	340	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	65	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	66	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	$R_{\theta JC}$	2.3	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	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}	40			V	$V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	2.5		3.5	V	$V_{DS}=V_{GS}, I_D=250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		4.0	4.5	m Ω	$V_{GS}=10\text{ V}, I_D=55\text{ A}$
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	μA	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}$
Gate resistance	R_G		3.0		Ω	$f=1\text{ MHz}$, Open drain

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		1982		pF	$V_{GS}=0\text{ V}$, $V_{DS}=25\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		859		pF	
Reverse transfer capacitance	C_{rss}		56		pF	
Turn-on delay time	$t_{d(on)}$		12		nS	$V_{GS}=10\text{ V}$, $V_{DS}=20\text{ V}$, $R_G=2\ \Omega$, $I_D=20\text{ A}$
Rise time	t_r		6.4		nS	
Turn-off delay time	$t_{d(off)}$		24.8		nS	
Fall time	t_f		7.2		nS	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		30		nC	$V_{GS}=10\text{ V}$, $V_{DS}=20\text{ V}$, $I_D=20\text{ A}$
Gate-source charge	Q_{gs}		8.4		nC	
Gate-drain charge	Q_{gd}		8		nC	
Gate plateau voltage	$V_{plateau}$		4.7		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	$I_S=20\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		56		nS	$V_R=32\text{ V}$, $I_S=20\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		48		nC	
Peak reverse recovery current	I_{rrm}		1.4		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 in² FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=40\text{ V}$, $V_{GS}=10\text{ V}$, $L=0.3\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

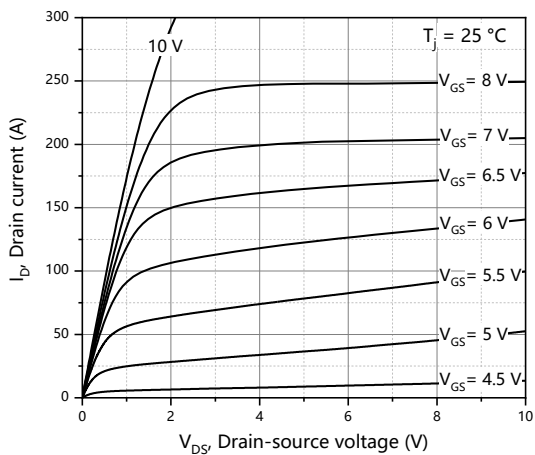


Figure 1. Typ. output characteristics

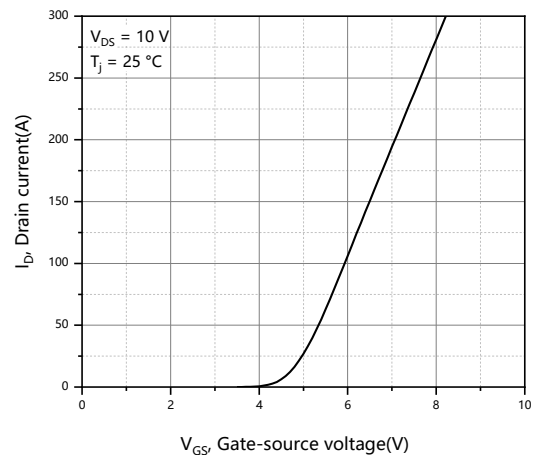


Figure 2. Typ. transfer characteristics

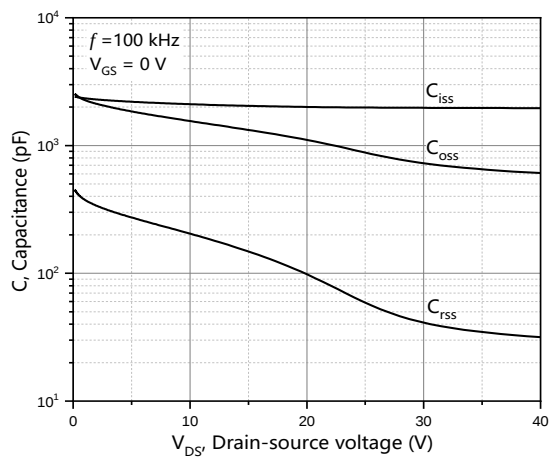


Figure 3. Typ. capacitances

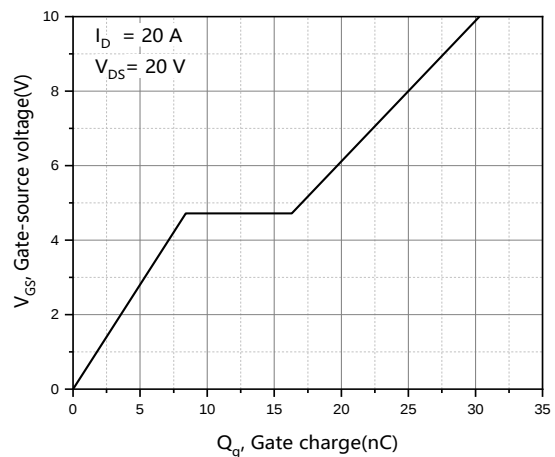


Figure 4. Typ. gate charge

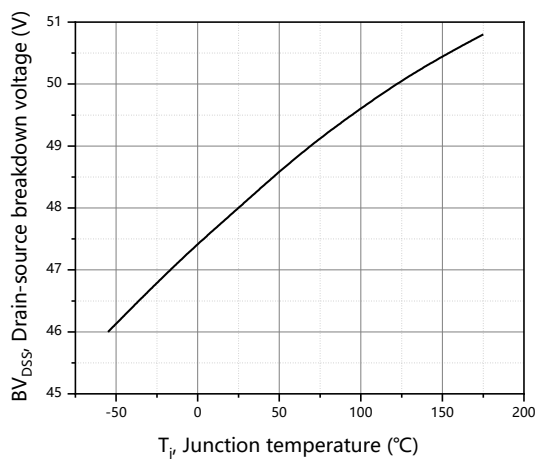


Figure 5. Drain-source breakdown voltage

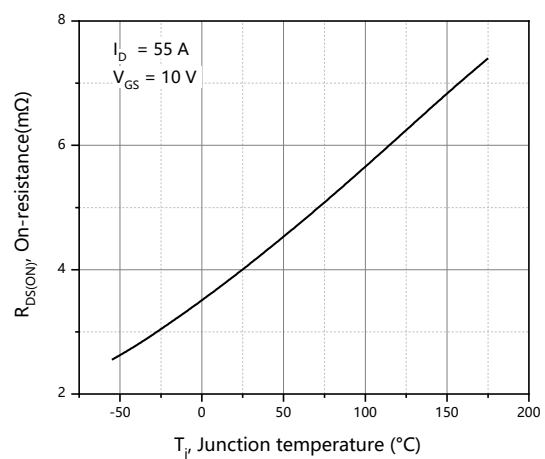


Figure 6. Drain-source on-state resistance

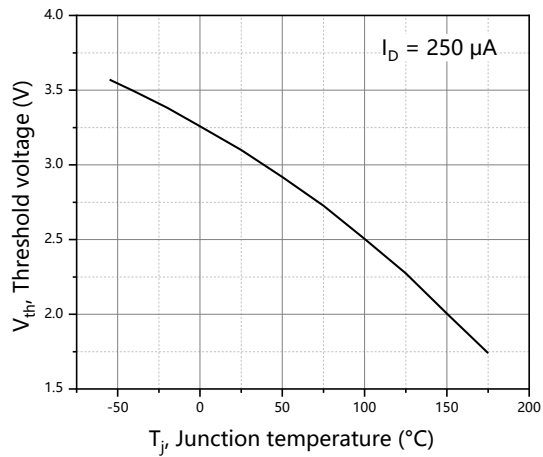


Figure 7. Threshold voltage

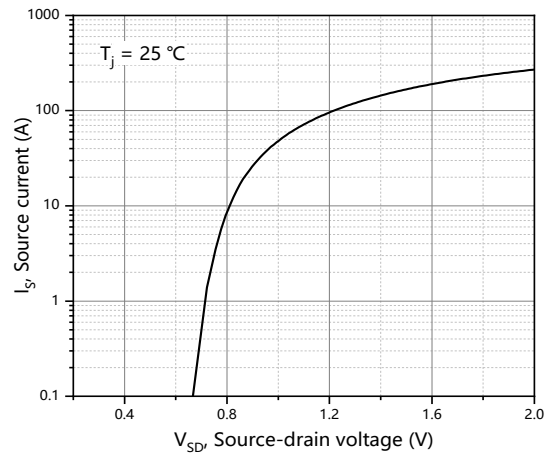


Figure 8. Forward characteristic of body diode

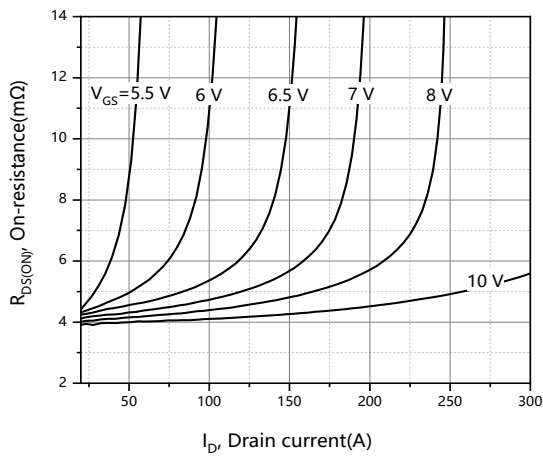


Figure 9. Drain-source on-state resistance

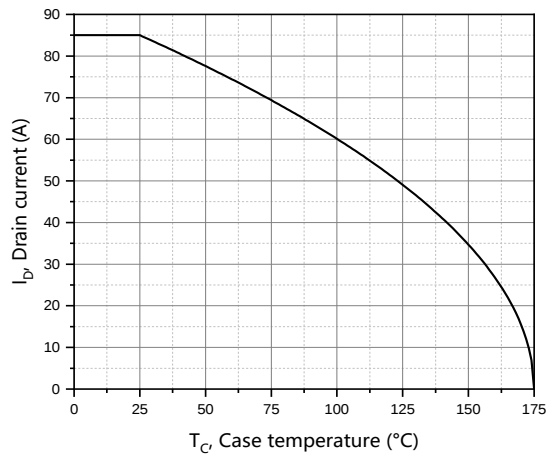


Figure 10. Drain current

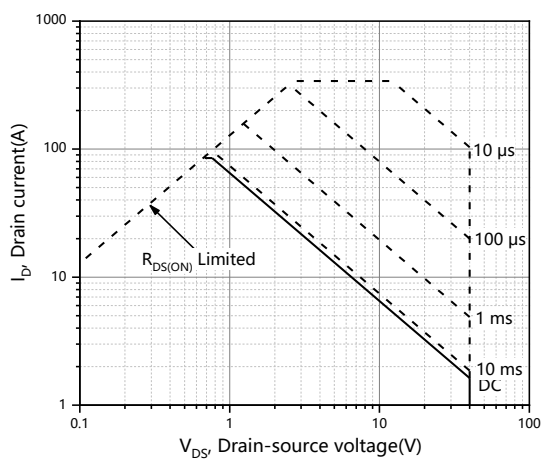


Figure 11. Safe operation area $T_C=25\text{ }^{\circ}\text{C}$

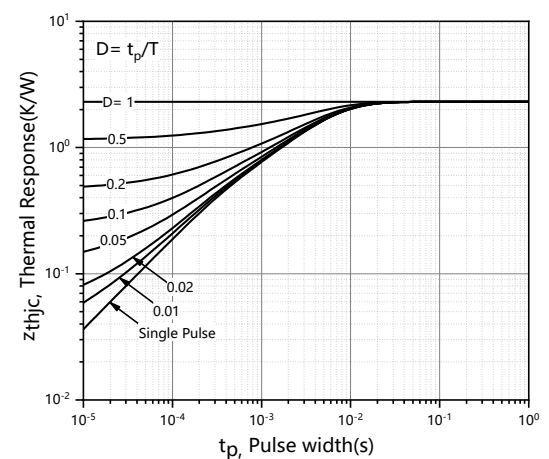


Figure 12. Max. transient thermal impedance

Test circuits and waveforms



Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms

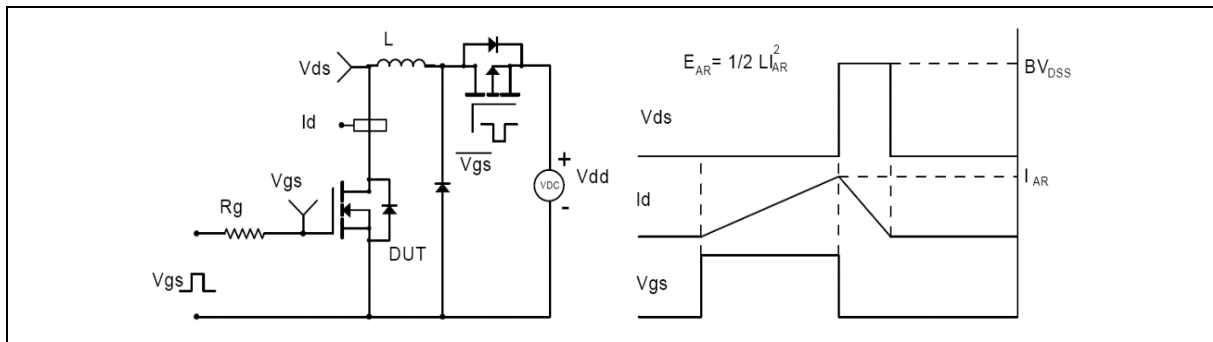
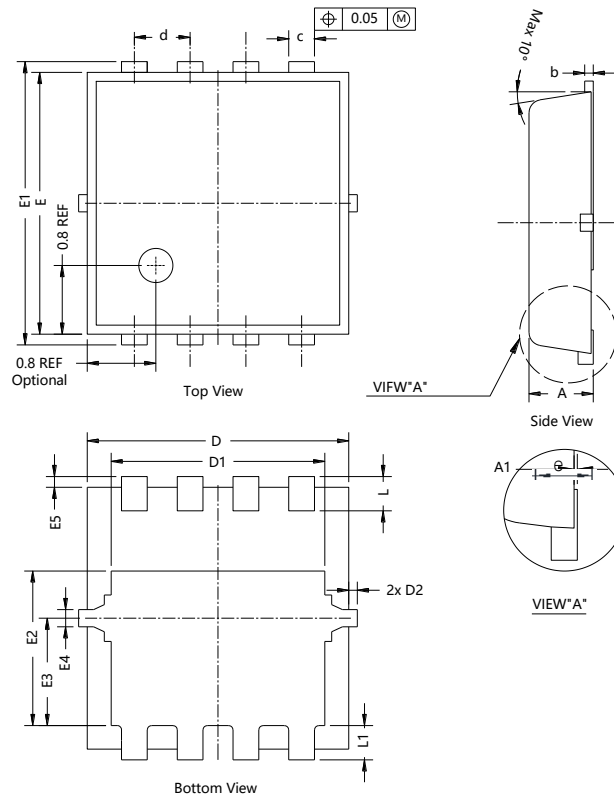


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms



Figure 4. Diode reverse recovery test circuit & waveforms

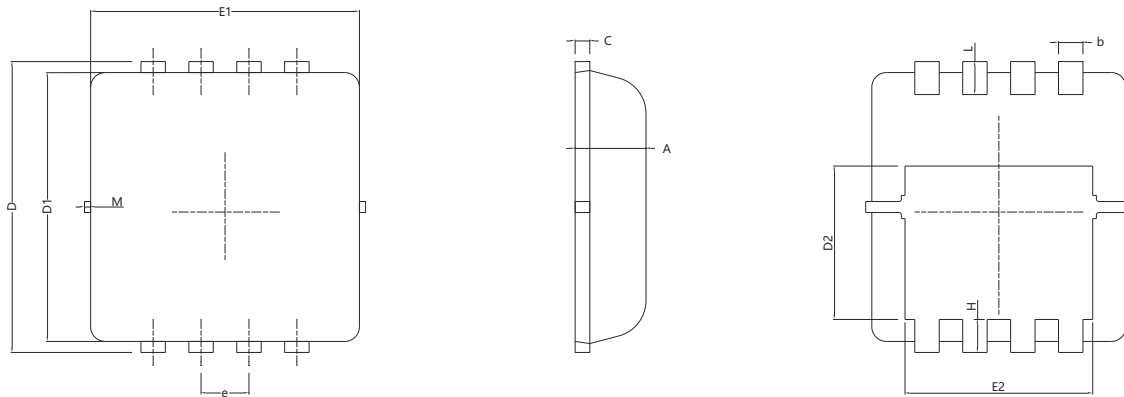
Package Information



Symbols	mm		
	Min	Nom	Max
A	0.700	0.750	0.800
A1	-	-	0.05
b	0.144	0.152	0.202
c	0.250	0.300	0.350
d	0.65 BSC		
D	2.950	3.050	3.150
D1	2.390	2.490	2.590
D2	-	-	0.125
E	2.950	3.050	3.150
E1	3.200	3.300	3.400
E2	1.700	1.800	1.900
E3	1.150	1.250	1.350
E4	0.150	0.200	0.250
E5	0.075	0.125	0.175
L	0.300	0.400	0.500
L1	0.300	0.400	0.500

Version: PDFN3.3×3.3-H package outline dimension

Package Information



Symbol	mm		
	Min	Nom	Min
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
E1	3.10	3.20	3.30
E2	2.44	2.54	2.64
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
M	\	\	0.10

Version: PDFN3.3×3.3-P package outline dimension

Ordering Information

Package Type	Units/ Reel	Reels / Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
PDFN3.3×3.3-H	5000	2	10000	5	50000
PDFN3.3×3.3-P	5000	2	10000	5	50000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS04R045NNF	PDFN3.3×3.3	yes	yes	yes

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Revision History

Version	Revision History	Date
V1.0	Initial release	2022-06-08
V1.1	Update POD	2025-08-18