

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 low V_{th} series is specially optimized for synchronous rectification systems with low driving voltage.

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

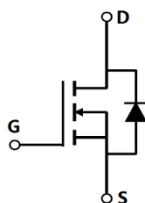
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	30	V
I_D , pulse	280	A
$R_{DS(ON)}$, max @ $V_{GS}=10V$	2.1	m Ω
Q_g	36.2	nC

Marking Information

Product Name	Package	Marking
SFS03R021UNF	PDFN3.3×3.3	03021U

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}	30	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	70	A
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	280	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	70	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, pulse}$	280	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	55	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	109	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	$R_{\theta JC}$	2.72	$^{\circ}\text{C/W}$
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}	30			V	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	1		3	V	$V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		1.9	2.1	$\text{m}\Omega$	$V_{GS}=10\text{ V}, I_D=50\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		2.8	3.0	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}, I_D=25\text{ A}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=15\text{ V}$
				-100		$V_{GS}=-15\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=30\text{ V}, V_{GS}=0\text{ V}$
Gate resistance	R_G		5.5		Ω	$f=1\text{ MHz}, \text{Open drain}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		2602		pF	$V_{GS}=0\text{ V}$, $V_{DS}=25\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		694		pF	
Reverse transfer capacitance	C_{rss}		22		pF	
Turn-on delay time	$t_{d(on)}$		7.2		ns	$V_{GS}=10\text{ V}$, $V_{DS}=30\text{ V}$, $R_G=2\ \Omega$, $I_D=30\text{ A}$
Rise time	t_r		15.6		ns	
Turn-off delay time	$t_{d(off)}$		42.2		ns	
Fall time	t_f		26		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		36.2		nC	$V_{GS}=10\text{ V}$, $V_{DS}=30\text{ V}$, $I_D=30\text{ A}$
Gate-source charge	Q_{gs}		6.8		nC	
Gate-drain charge	Q_{gd}		3.8		nC	
Gate plateau voltage	$V_{plateau}$		2.9		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}		34		ns	$V_R=30\text{ V}$, $I_S=30\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		26.8		nC	
Peak reverse recovery current	I_{rrm}		1.3		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) 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) $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $L=0.3\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

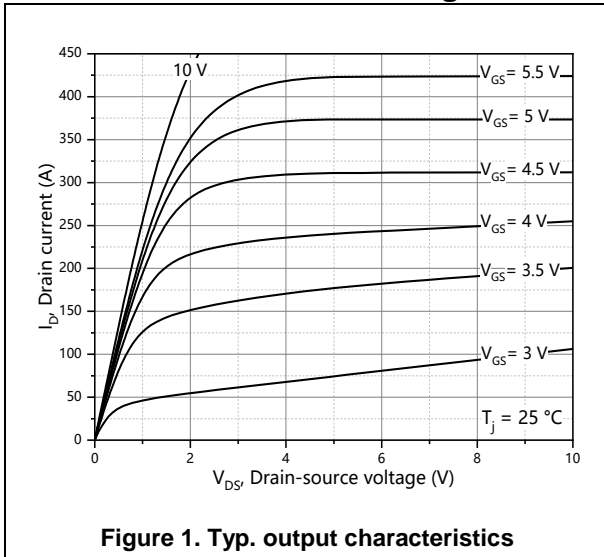


Figure 1. Typ. output characteristics

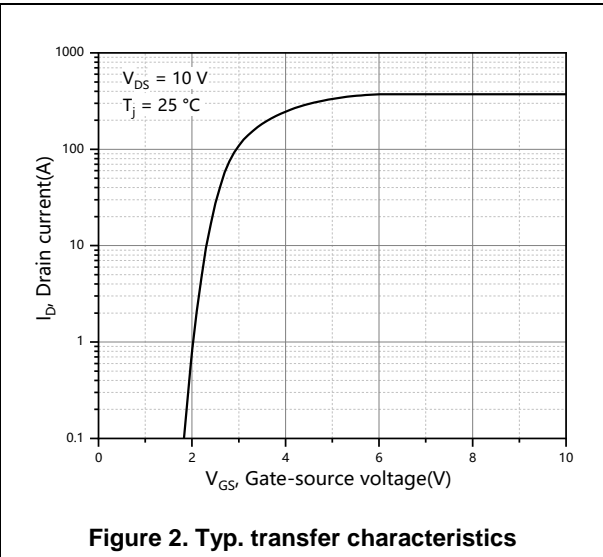


Figure 2. Typ. transfer characteristics

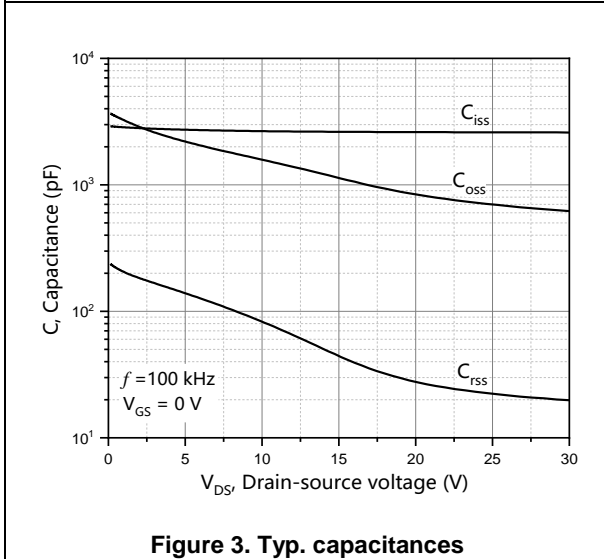


Figure 3. Typ. capacitances

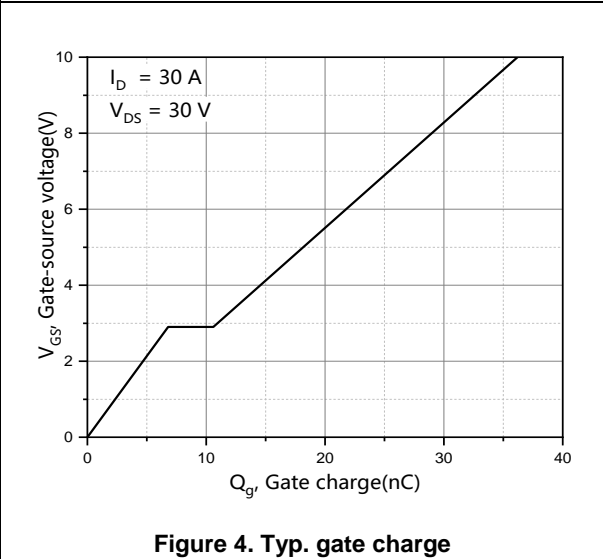


Figure 4. Typ. gate charge

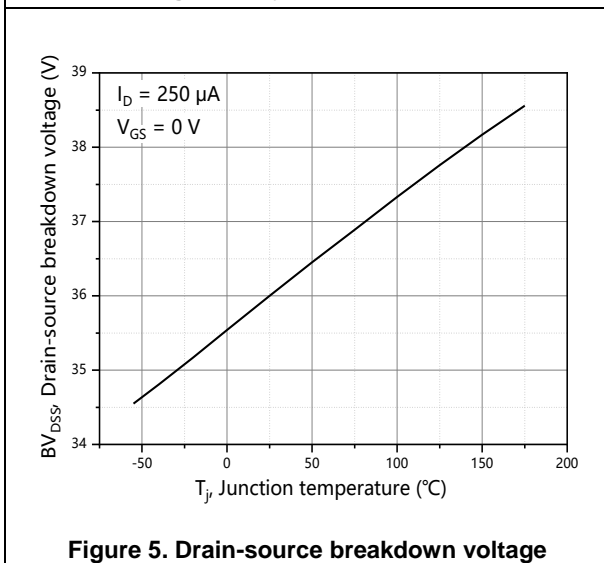


Figure 5. Drain-source breakdown voltage

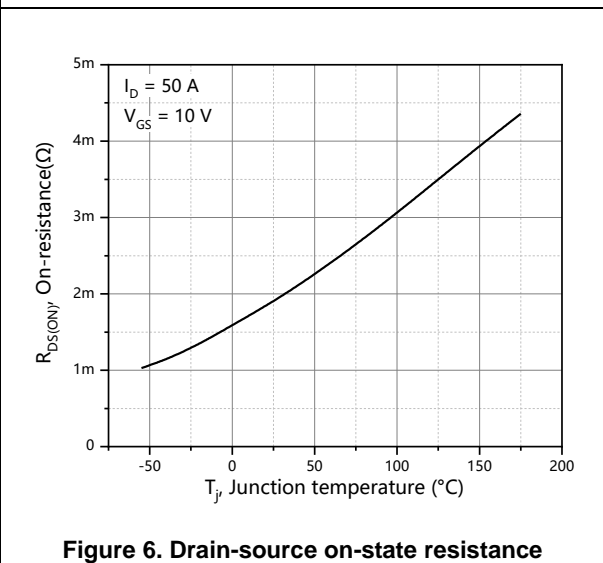
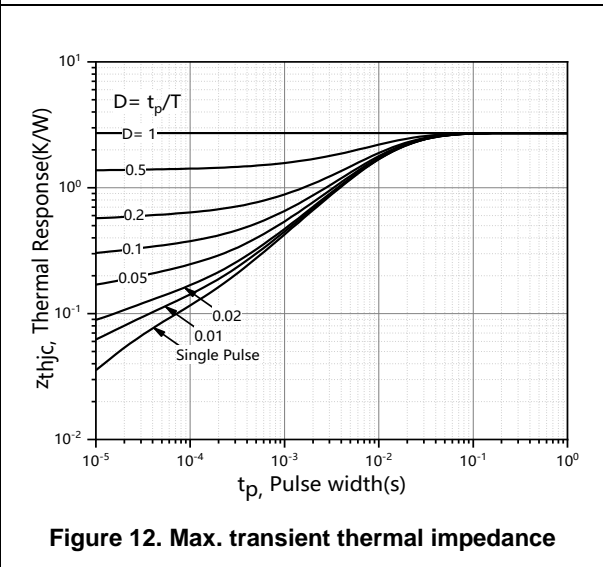
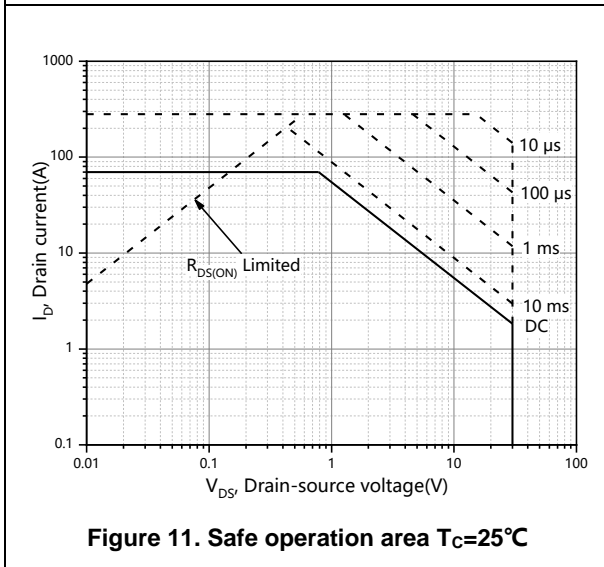
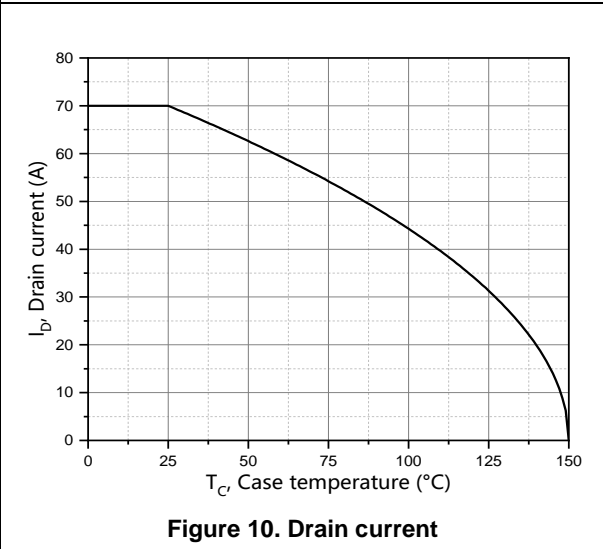
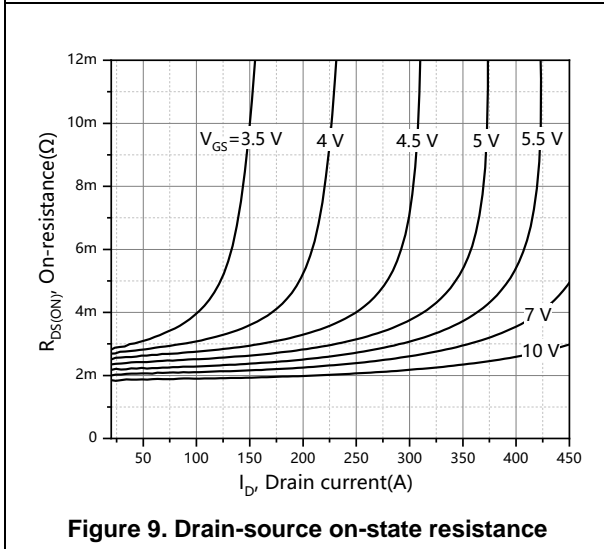
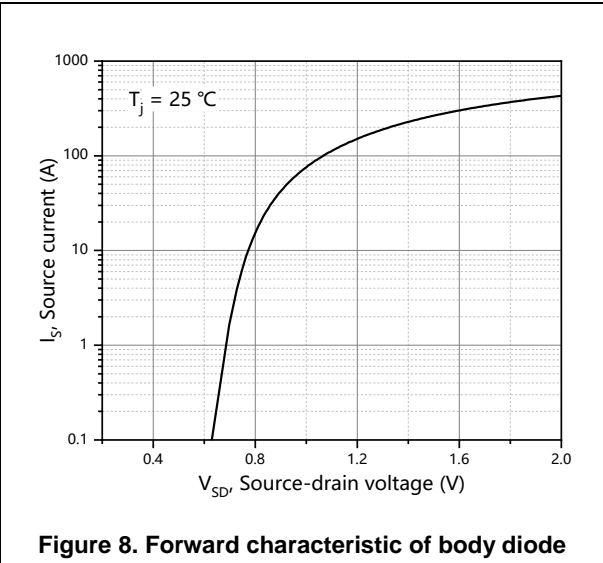
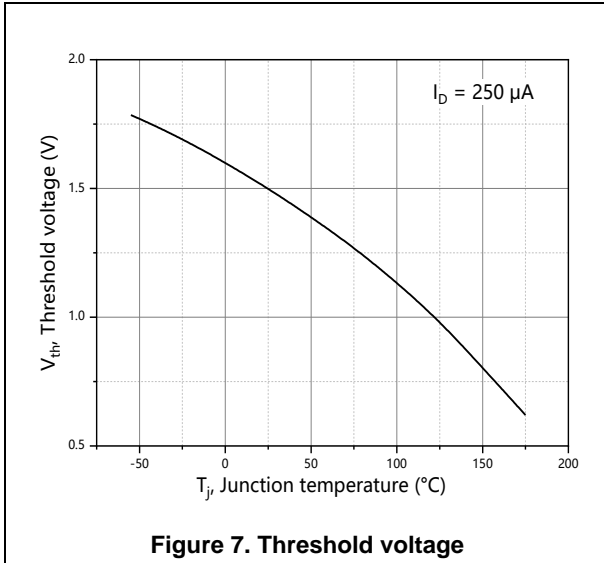


Figure 6. Drain-source on-state resistance



Test circuits and waveforms



Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms

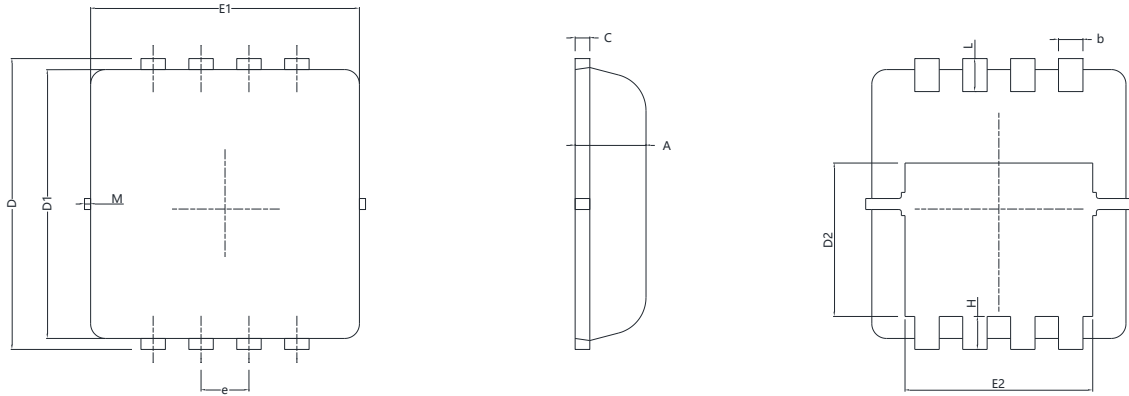


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms



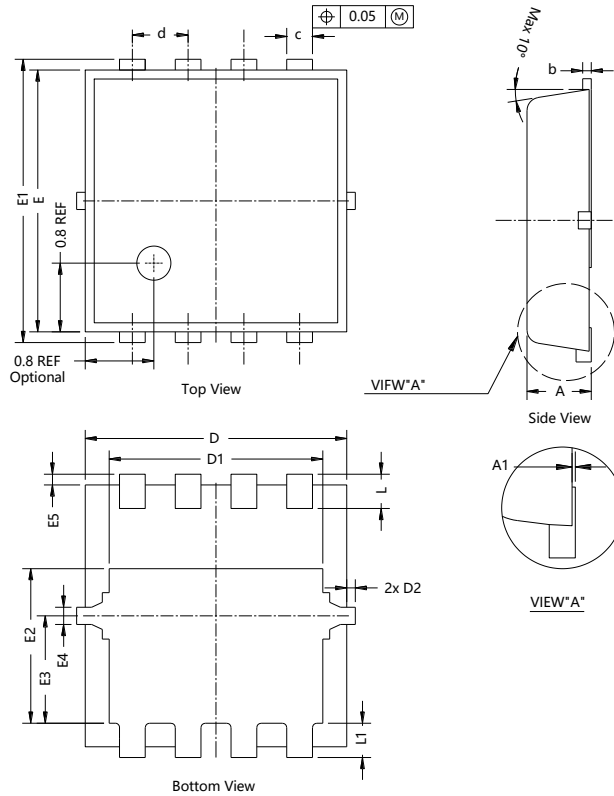
Figure 4. Diode reverse recovery test circuit & waveforms

Package Information



Symbol	mm		
	Min	Nom	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: PDFN3.3x3.3-P package outline dimension



Swmbols	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 2: PDFN3.3x3.3-H 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-S	5000	1	5000	10	50000
PDFN3.3×3.3-P	5000	2	10000	5	50000
PDFN3.3×3.3-H	5000	2	10000	5	50000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS03R021UNF	PDFN3.3×3.3	yes	yes	yes

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Revision History

Version	Revision History	Date
V1.0	Initial release	2021-03-17
V1.1	Update POD	2025-08-18