

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

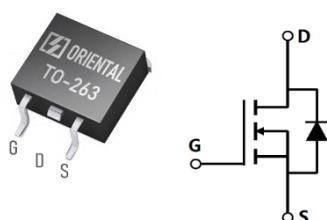
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	40	V
I_D , pulse	800	A
$R_{DS(ON)}$, max @ $V_{GS}=10V$	2.3	mΩ
Q_g	76	nC
PD	203	W

Marking Information

Product Name	Package	Marking
SFS04R02KNF	TO263	SFS04R02KN

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	210	A
Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$	$I_{D,\text{pulse}}$	800	A
Continuous diode forward current ¹⁾ , $T_C=25^\circ\text{C}$	I_S	210	A
Diode pulsed current ²⁾ , $T_C=25^\circ\text{C}$	$I_{S,\text{pulse}}$	800	A
Power dissipation ³⁾ , $T_C=25^\circ\text{C}$	P_D	203	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	240	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	$R_{\theta JC}$	0.74	$^\circ\text{C}/\text{W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	62	$^\circ\text{C}/\text{W}$

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	$V_{GS}=0 \text{ V}, I_D=250 \mu\text{A}$
Gate threshold voltage	$V_{GS(\text{th})}$	2		4	V	$V_{DS}=V_{GS}, I_D=250 \mu\text{A}$
Drain-source on-state resistance	$R_{DS(\text{ON})}$		1.9	2.3	$\text{m}\Omega$	$V_{GS}=10 \text{ V}, I_D=20 \text{ A}$
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	μA	$V_{DS}=40 \text{ V}, V_{GS}=0 \text{ V}$
Gate resistance	R_G		3.5		Ω	$f=1 \text{ MHz}, \text{Open drain}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C _{iss}		5750		pF	V _{GS} =0 V, V _{DS} =25 V, f=100 kHz
Output capacitance	C _{oss}		1460		pF	
Reverse transfer capacitance	C _{rss}		82.7		pF	
Turn-on delay time	t _{d(on)}		17.5		ns	V _{GS} =10 V, V _{DS} =40 V, R _G =2 Ω, I _D =40 A
Rise time	t _r		25.2		ns	
Turn-off delay time	t _{d(off)}		48.2		ns	
Fall time	t _f		25.7		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q _g		76		nC	V _{GS} =10 V, V _{DS} =40 V, I _D =40 A
Gate-source charge	Q _{gs}		25		nC	
Gate-drain charge	Q _{gd}		15		nC	
Gate plateau voltage	V _{plateau}		4.9		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V _{SD}			1.1	V	I _s =20 A, V _{GS} =0 V
Reverse recovery time	t _{rr}		61		ns	V _R =40 V, I _s =40 A, di/dt=100 A/μs
Reverse recovery charge	Q _{rr}		86		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_{θJA} is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25 °C.
- 5) V_{DD}=50 V, V_{GS}=10 V, L=0.3 mH, starting T_j=25 °C.

Electrical Characteristics Diagrams

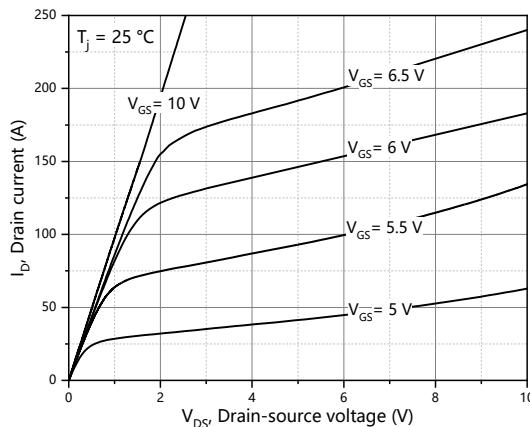


Figure 1. Typ. output characteristics

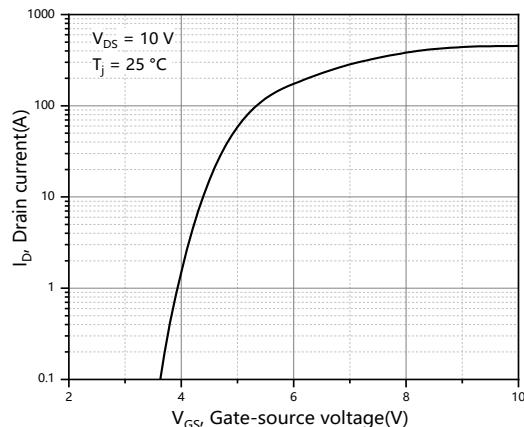


Figure 2. Typ. transfer characteristics

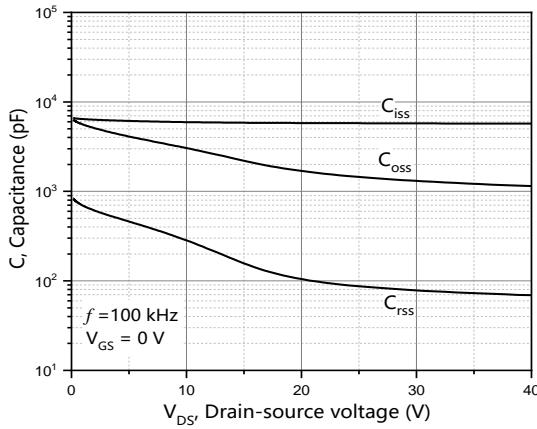


Figure 3. Typ. capacitances

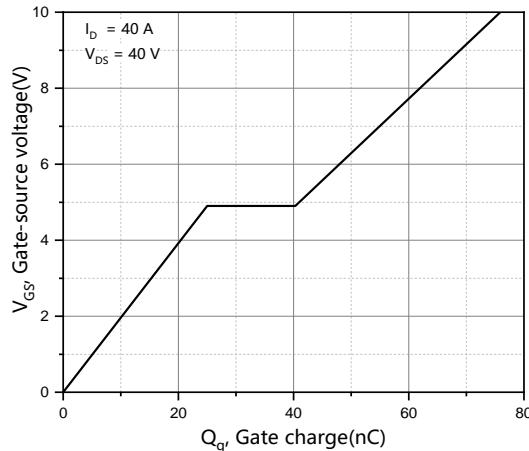


Figure 4. Typ. gate charge

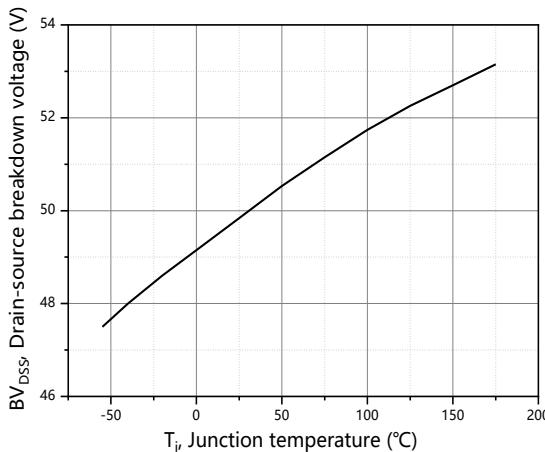


Figure 5. Drain-source breakdown voltage

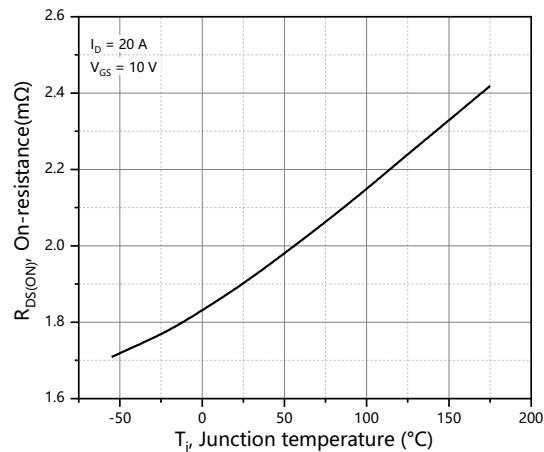
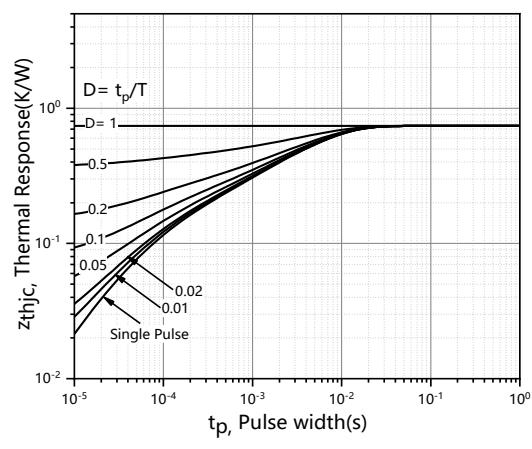
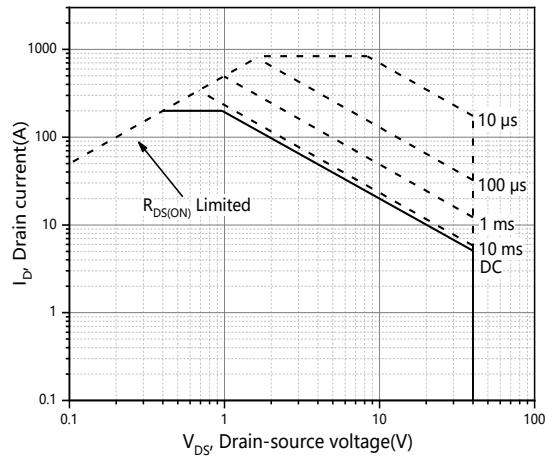
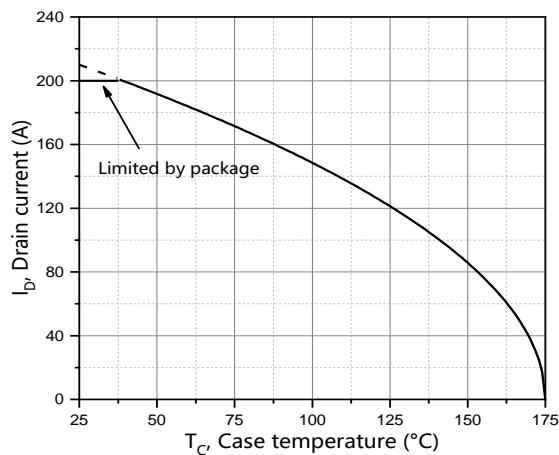
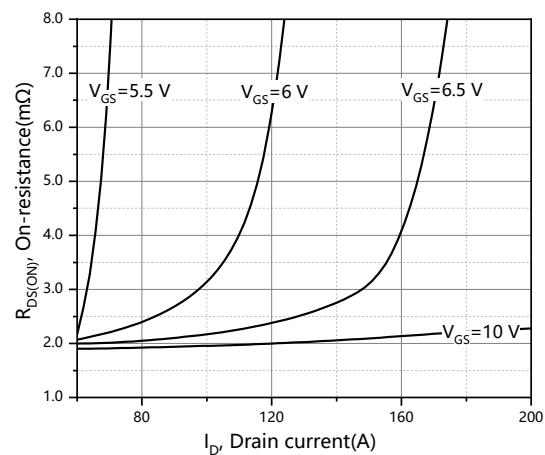
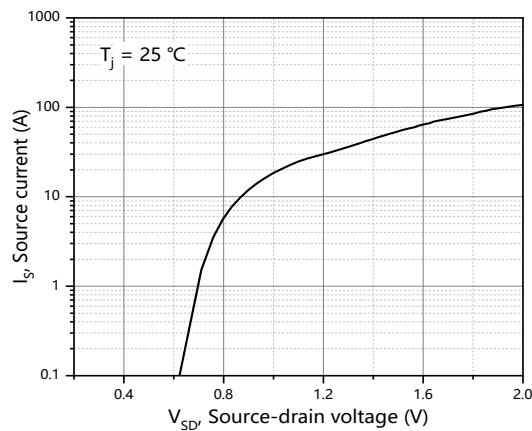
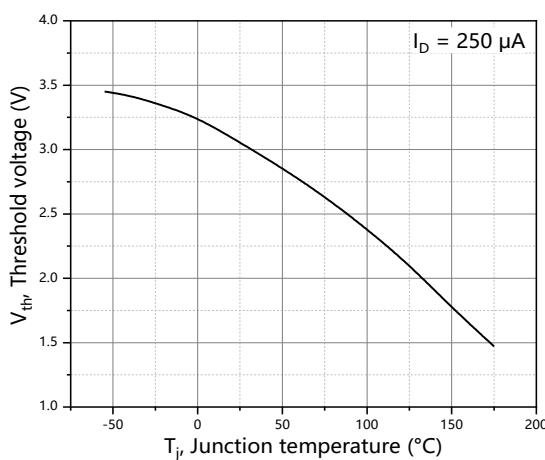


Figure 6. Drain-source on-state resistance



Test circuits and waveforms

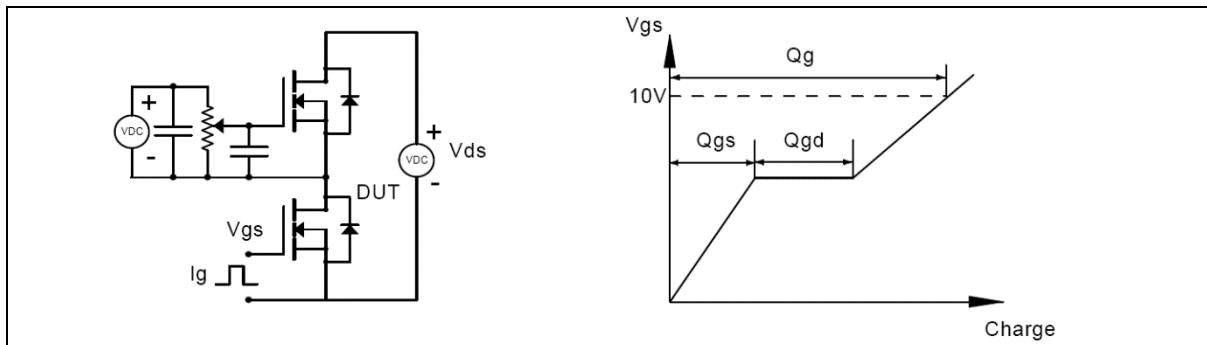


Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms



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

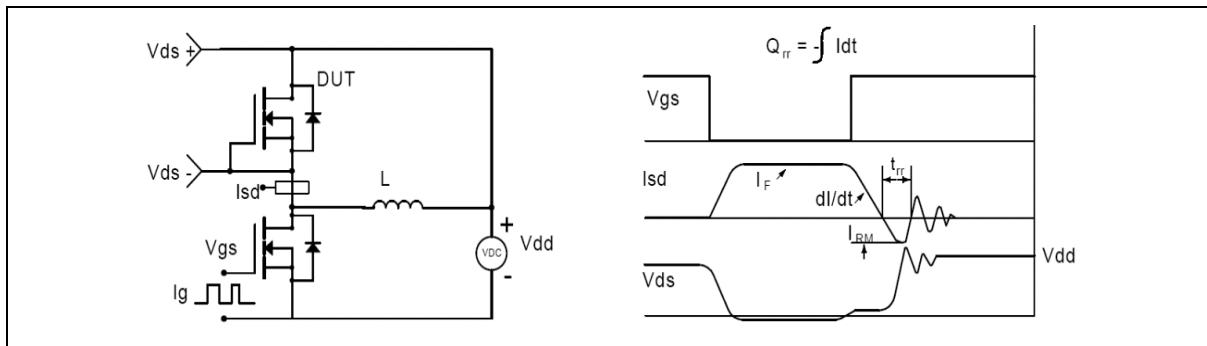
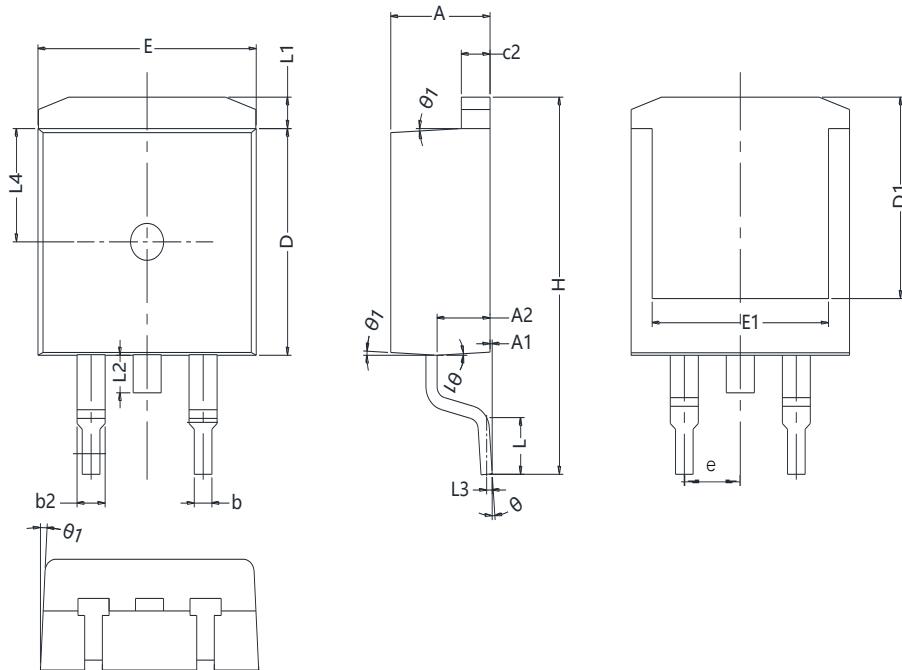


Figure 4. Diode reverse recovery test circuit & waveforms

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.40	4.50	4.60
A1	0.00	0.10	0.25
A2	2.20	2.40	2.60
b	0.76	-	0.89
b2	1.23	-	1.37
c2	1.25	1.30	1.35
D	9.10	9.20	9.30
D1	8.00	-	-
E	9.80	9.90	10.00
E1	7.80	-	-
e	2.54 BSC		
H	14.90	15.30	15.70
L	2.00	2.30	2.60
L1	1.17	1.27	1.40
L2	-	-	1.75
L3	0.25 BSC		
L4	4.60 REF		
θ	0°	-	8°
θ_1	1°	3°	5°

Version 1: TO263-J package outline dimension

Ordering Information

Package Type	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO263-J	800	1	800	10	8000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS04R02KNF	TO263	yes	yes	yes

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