



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 designed to use in synchronous rectification power 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

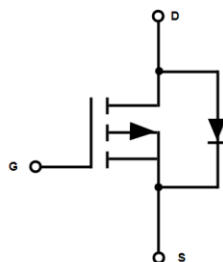
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	-40	V
I_D , pulse	-272	A
$R_{DS(ON)}$ max @ $V_{GS}=10V$	10	m Ω
Q_g	37	nC

Marking Information

Product Name	Package	Marking
SFS04P08DF	TO252	SFS04P08D

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	-68	A
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, \text{pulse}}$	-272	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	-68	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, \text{Pulse}}$	-272	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	95	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	94	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	$R_{\theta JC}$	1.56	$^{\circ}\text{C/W}$
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	$V_{GS(th)}$	-1.0		-2.5	V	$V_{DS}=V_{GS}, I_D=-250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		8.5	10	$\text{m}\Omega$	$V_{GS}=-10\text{ V}, I_D=-30\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		12	15	$\text{m}\Omega$	$V_{GS}=-4.5\text{ V}, I_D=-30\text{ A}$
				-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		7.9		Ω	$f=1\text{ MHz}$, Open drain

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		2696		pF	$V_{GS}=0\text{ V}$, $V_{DS}=-25\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		537		pF	
Reverse transfer capacitance	C_{rss}		19		pF	
Turn-on delay time	$t_{d(on)}$		7.2		ns	$V_{GS}=-10\text{ V}$, $V_{DS}=-20\text{ V}$, $R_G=2\ \Omega$, $I_D=-20\text{ A}$
Rise time	t_r		29		ns	
Turn-off delay time	$t_{d(off)}$		56		ns	
Fall time	t_f		12		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		37		nC	$V_{GS}=-10\text{ V}$, $V_{DS}=-20\text{ V}$, $I_D=-20\text{ A}$
Gate-source charge	Q_{gs}		9		nC	
Gate-drain charge	Q_{gd}		4		nC	
Gate plateau voltage	$V_{plateau}$		-3.4		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			-1.3	V	$I_S=-30\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		26		ns	$V_R=-20\text{ V}$, $I_F=-20\text{ A}$, $di/dt=-100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		10		nC	
Peak reverse recovery current	I_{rrm}		0.65		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

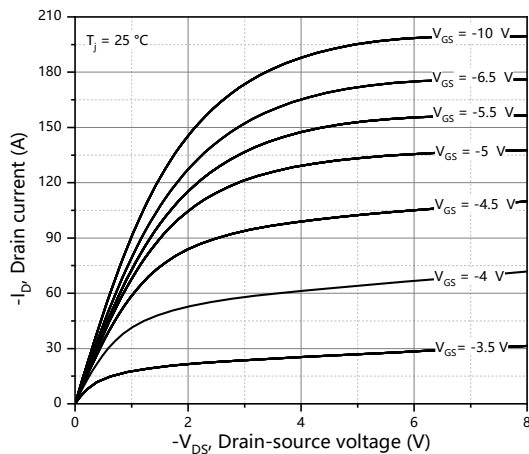


Figure 1. Typ. output characteristics

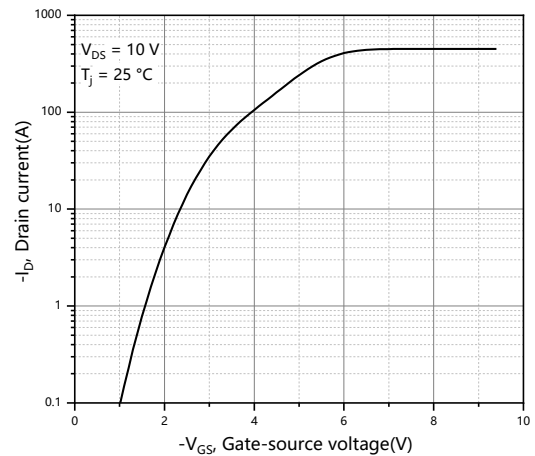


Figure 2. Typ. transfer characteristics

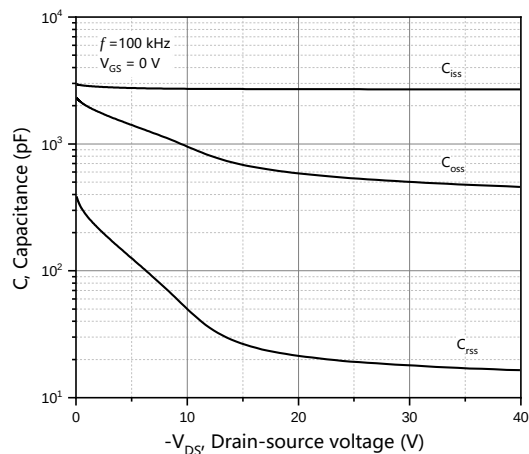


Figure 3. Typ. capacitances

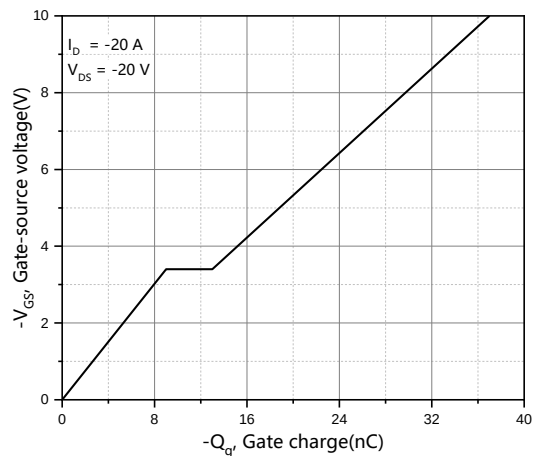


Figure 4. Typ. gate charge

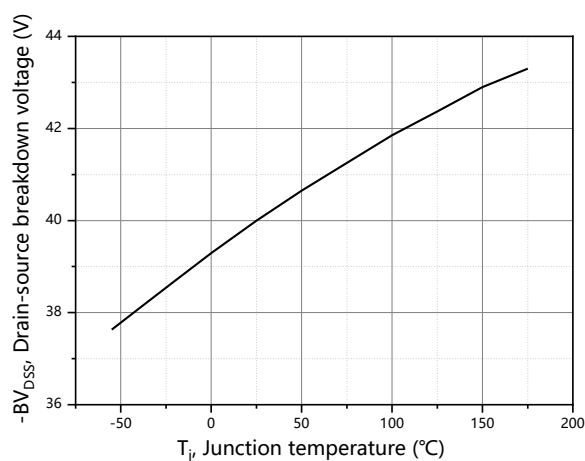


Figure 5. Drain-source breakdown voltage

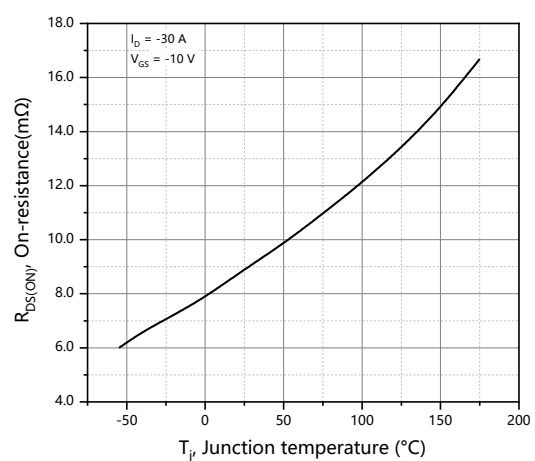


Figure 6. Drain-source on-state resistance

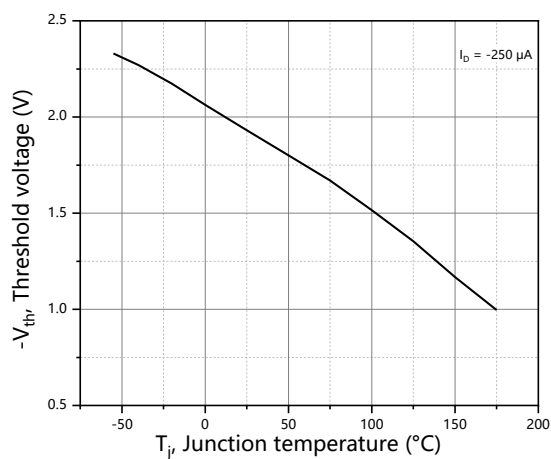


Figure 7. Threshold voltage

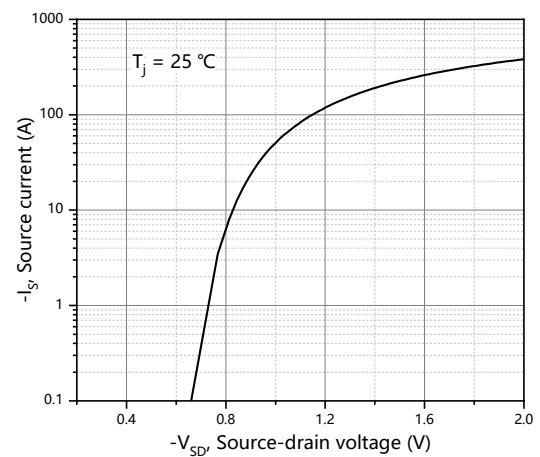


Figure 8. Forward characteristic of body diode

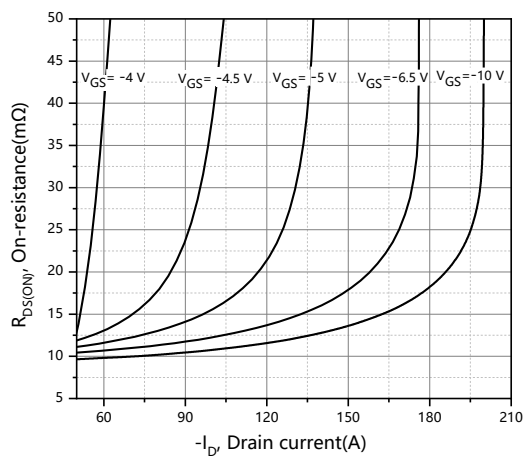


Figure 9. Drain-source on-state resistance

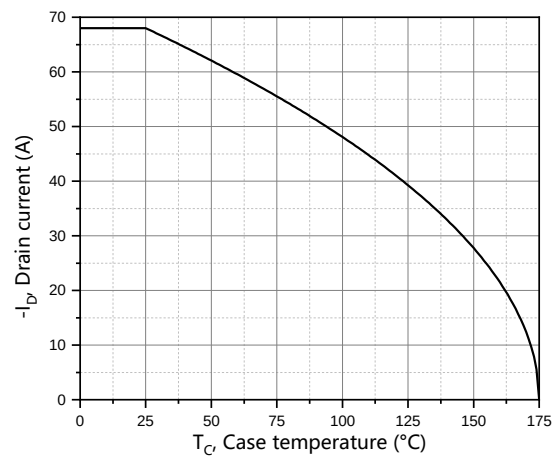


Figure 10. Drain current

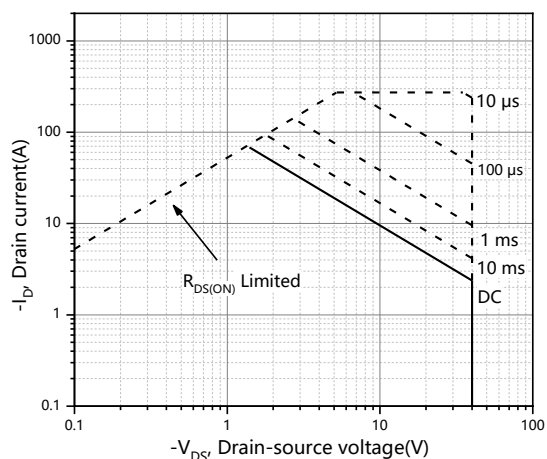


Figure 11. Safe operation area $T_C=25\text{ }^{\circ}\text{C}$

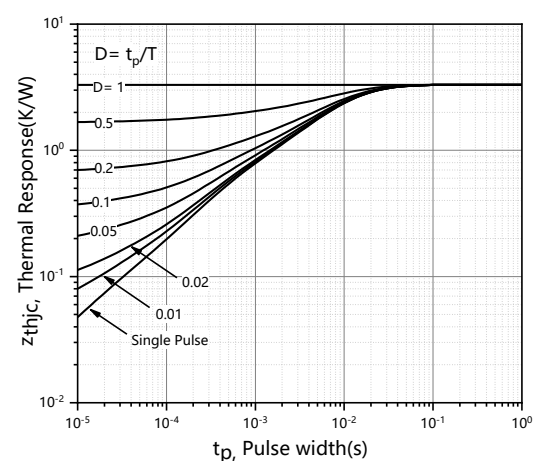


Figure 12. Max. transient thermal impedance

Test circuits and waveforms

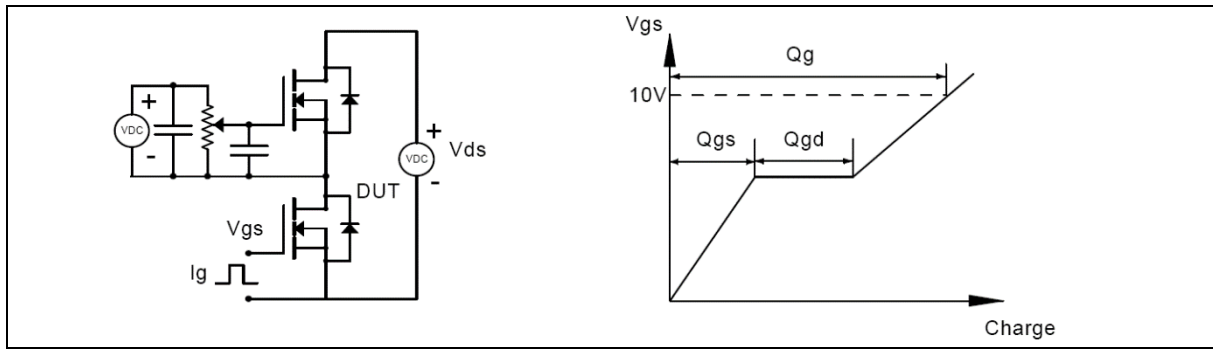


Figure 1. Gate charge test circuit & waveform

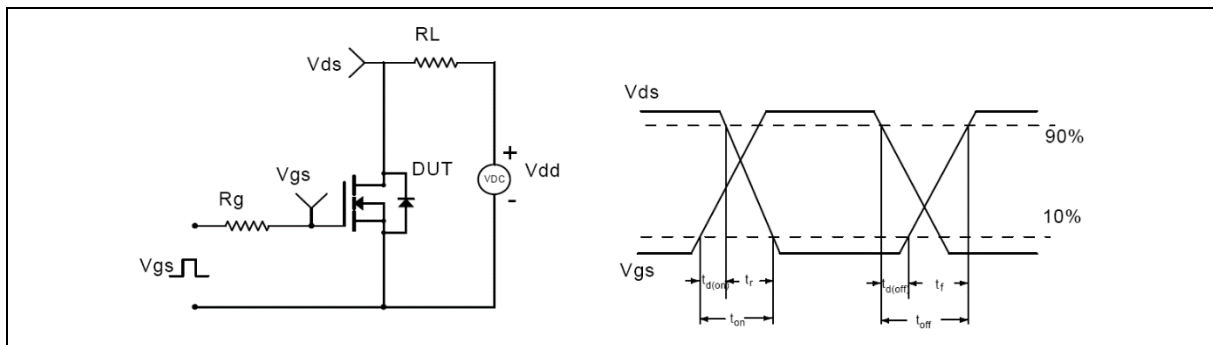


Figure 2. Switching time test circuit & waveforms

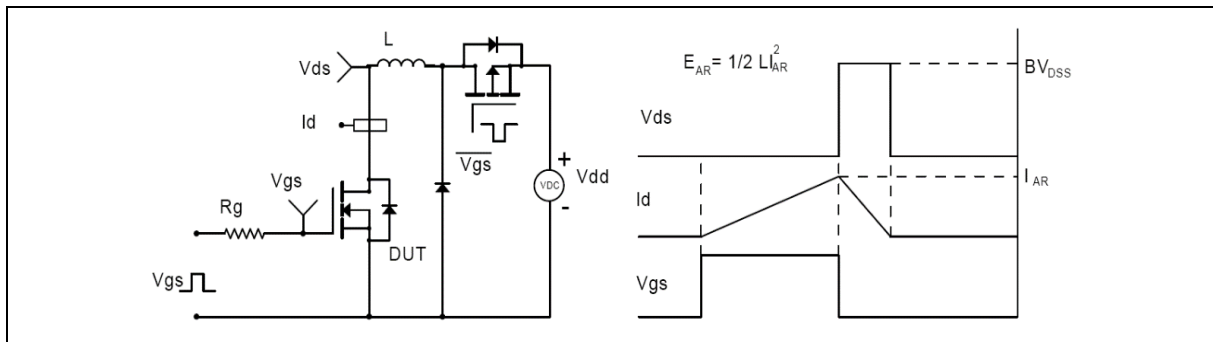


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

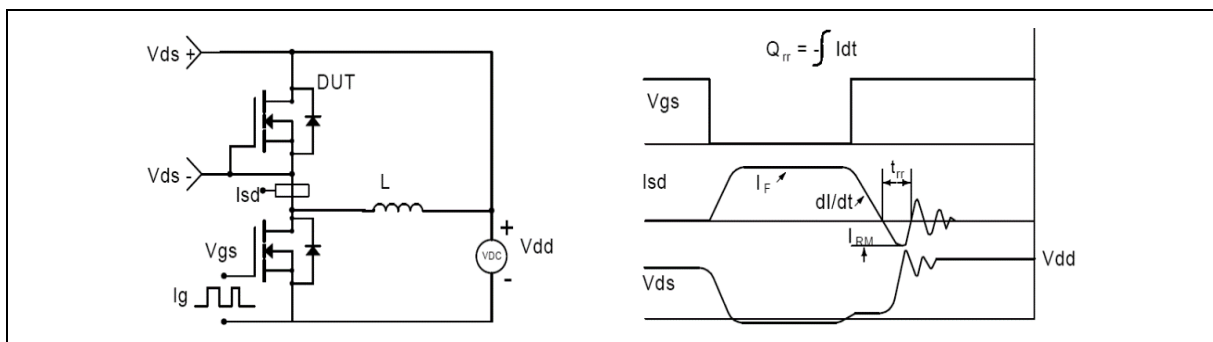
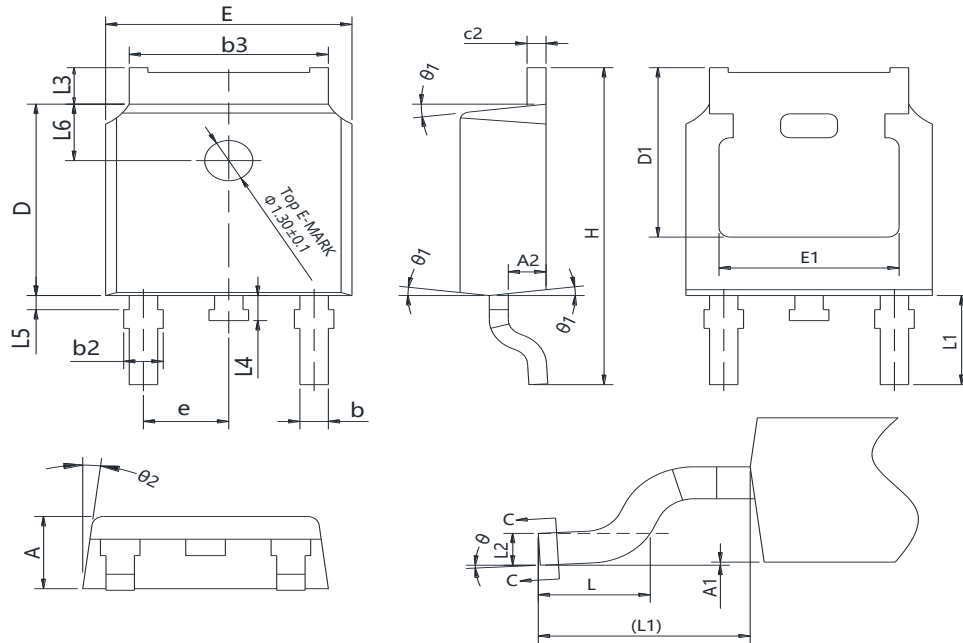


Figure 4. Diode reverse recovery test circuit & waveforms

Package Information



Symbol	mm		
	Min	Nom	Max
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b2	0.72	-	0.90
b3	5.13	5.33	5.46
c2	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25	-	-
E	6.50	6.60	6.70
E1	4.70	-	-
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	0.15	-	0.75
L6	1.80 REF		
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

Version 1: TO252-J package outline dimension

Ordering Information

Package Type	Units/ Reel	Reels / Inner Box	Units/ Inner Box	Inner Box/ Carton Box	Units/ Carton Box
TO252-J	2500	2	5000	5	25000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS04P08DF	TO252	yes	yes	yes

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