ORIENTAL SEMICONDUCTOR

SFS06R03xF_Datasheet

Green PRODUCT

RoHS compliant

Enhancement Mode N-Channel Power MOSFET

Features

- Low $R_{DS(on)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Fast switching and soft recovery

Applications

- Consumer electronic power supply
- Motor control
- Synchronous-rectification
- Isolated DC/DC convertor
- Invertors

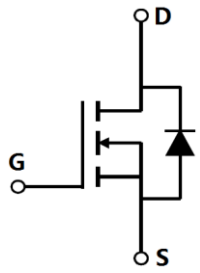
■ General Description

SFS06R03xF use advanced FSMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in Synchronous-rectification applications.

- ◆ $V_{DS,\ min}$ 60 V
- ◆ $I_{D,\ pulse}$ 390 A
- ◆ $R_{DS(ON),\ max\ @\ VGS=10\ V}$ 3.5 mΩ
- ◆ Q_g 66.1 nC

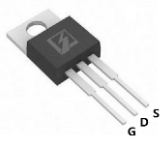
■ Schematic and Package Information

Schematic Diagram



Pin Assignment Top View

TO252
SFS06R03DF



TO220
SFS06R03PF

■ Absolute Maximum Ratings at T_j=25℃ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	60	V
Gate source voltage	V_{GS}	±20	V
Continuous drain current[1)]	I_D	130	A
Pulsed drain current[2)]	$I_{D,\ pulse}$	390	A
Power dissipation[3)]	P_D	140	W
Single pulsed avalanche energy[5)]	E_{AS}	80	mJ
Operation and storage temperature	T_{stg}, T_j	-55 to 150	℃

■ Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	0.89	°C/W
Thermal resistance, junction-ambient[4)]	$R_{\theta JA}$	62	°C/W

■ Electrical Characteristics at T_j=25 ℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	60			V	V_{GS}=0 V, I_D=250 μA
Gate threshold voltage	$V_{GS(th)}$	1.0		2.5	V	V_{DS}=V_{GS}, I_D=250 μA
Drain-source on-state resistance	$R_{DS(ON)}$		3.0	3.5	mΩ	V_{GS}=10 V, I_D=20 A
Drain-source on-state resistance	$R_{DS(ON)}$		3.5	4.5	mΩ	V_{GS}=4.5 V, I_D=10 A
Gate-source leakage current	I_{GSS}			100	nA	V_{GS}=20 V
				-100		V_{GS}=-20 V
Drain-source leakage current	I_{DSS}			1	μA	V_{DS}=60 V, V_{GS}=0 V

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		5377		pF	V_{GS}=0 V, V_{DS}=25 V, f=100 kHz
Output capacitance	C_{oss}		1666		pF	
Reverse transfer capacitance	C_{rss}		77.7		pF	
Turn-on delay time	$t_{d(on)}$		22.5		ns	V_{GS}=10 V, V_{DS}=30 V, R_G=2 Ω, I_D=25 A
Rise time	t_r		6.7		ns	
Turn-off delay time	$t_{d(off)}$		80.3		ns	
Fall time	t_f		26.8		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		66.1		nC	I_D=25 A, V_{DS}=30 V, V_{GS}=10 V
Gate-source charge	Q_{gs}		10.7		nC	
Gate-drain charge	Q_{gd}		10.9		nC	
Gate plateau voltage	$V_{plateau}$		2.9		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current	I_S			130	A	V_{GS}<V_{th}
Pulsed source current	I_{SP}			390		
Diode forward voltage	V_{SD}			1.3	V	I_S=20 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		68.3		ns	I_S=25 A, di/dt=100 A/μs
Reverse recovery charge	Q_{rr}		73.0		nC	
Peak reverse recovery current	I_{rrm}		1.9		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 $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_a=25 ℃.
5) V_{DD}=50 V, R_G=25 Ω, L=0.3 mH, starting T_j=25 ℃.

■ Electrical Characteristics Diagrams

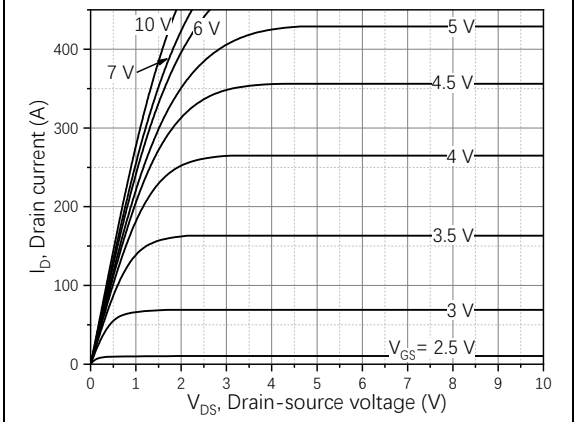


Figure 1, Typ. output characteristics

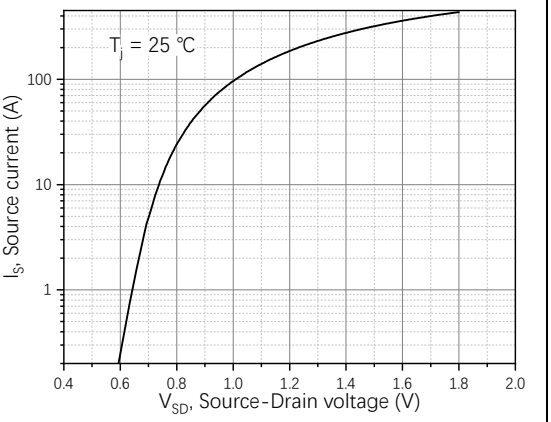


Figure 2, Typ. transfer characteristics

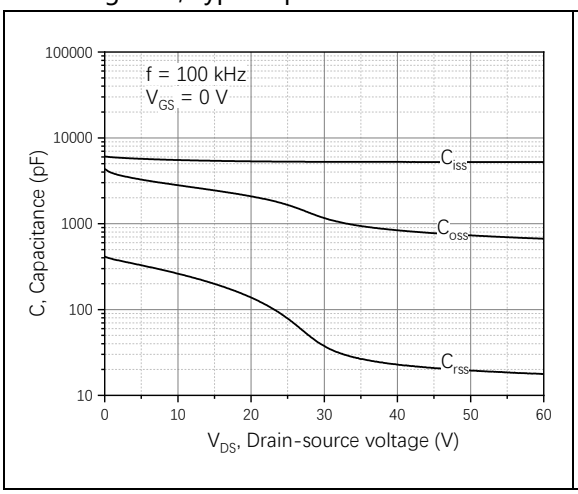


Figure 3, Typ. capacitances

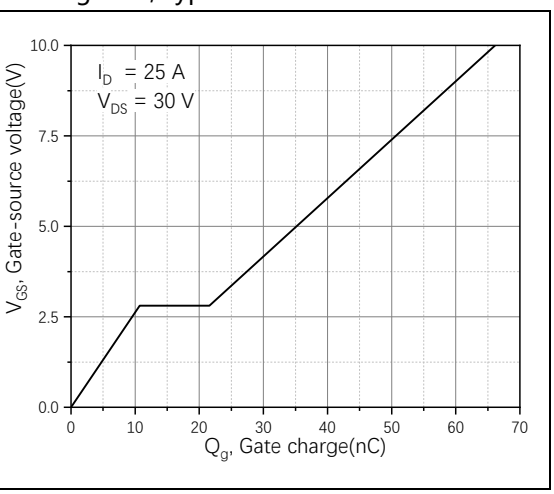


Figure 4, Typ. gate charge

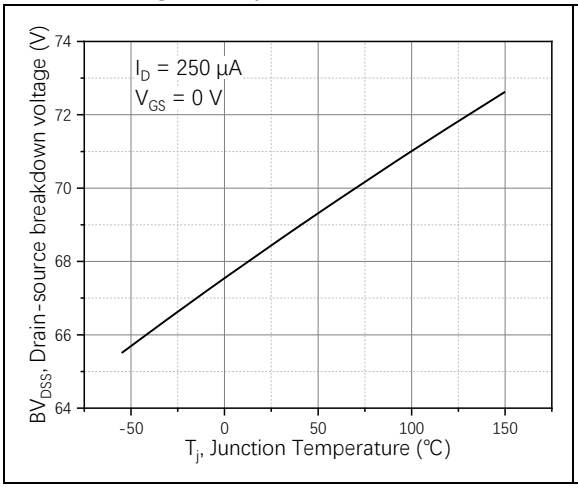


Figure 5, Drain-source breakdown voltage

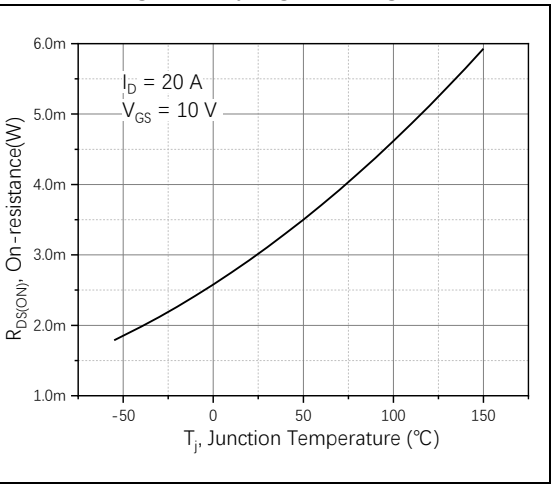


Figure 6, Drain-source on-state resistance

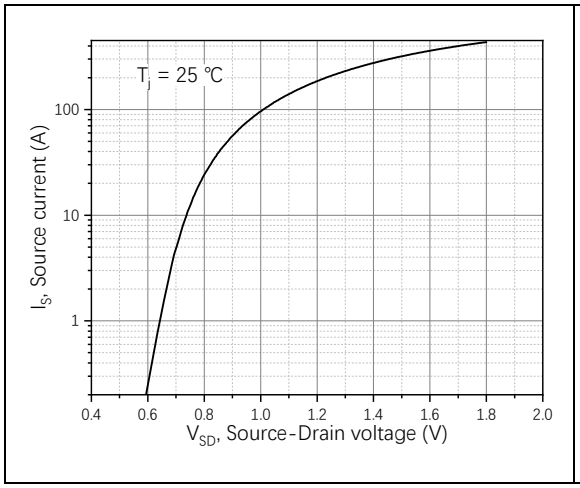


Figure 7, Forward characteristic of body diode

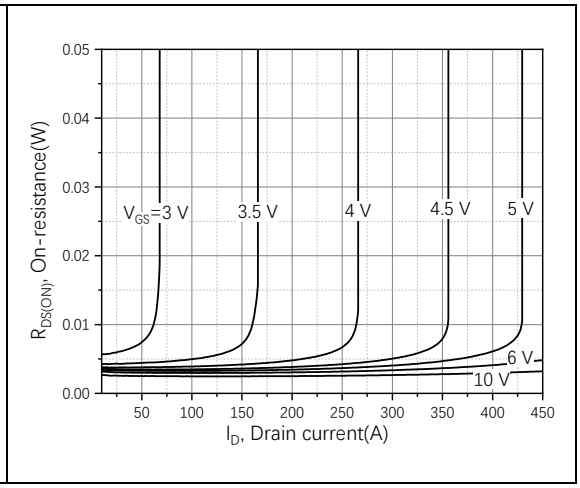


Figure 8, Drain-source on-state resistance

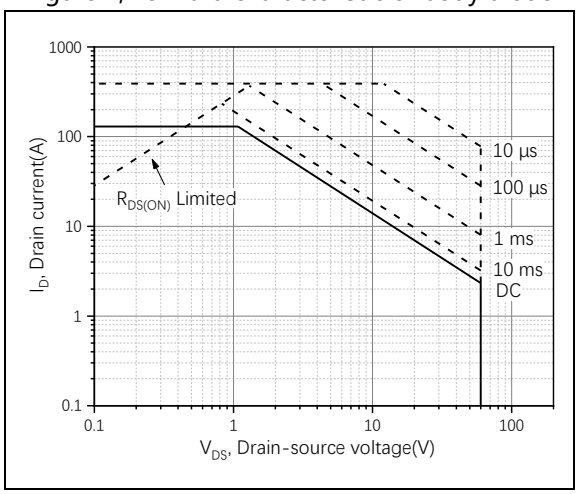


Figure 9, Safe operation area T_C=25 ℃

■ Test circuits and waveforms

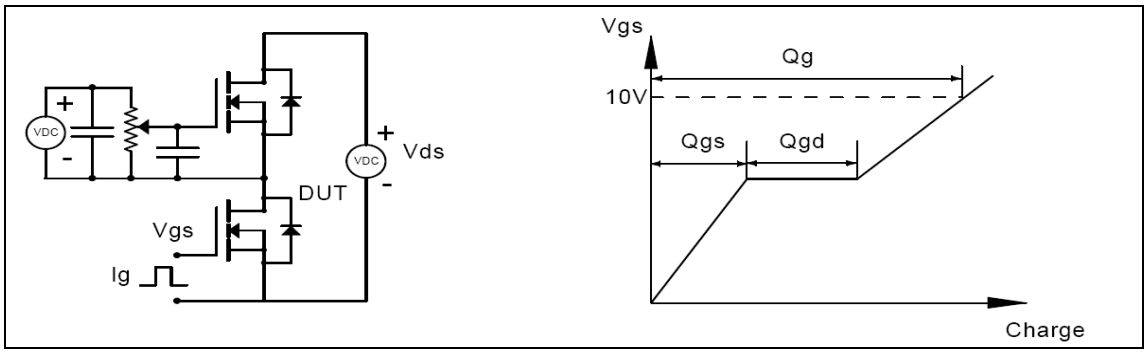


Figure 1, Gate charge test circuit & waveform

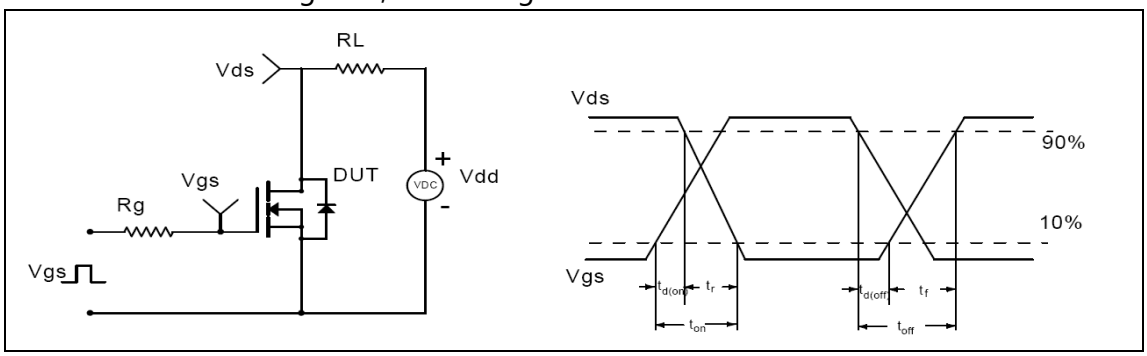


Figure 2, Switching time test circuit & waveforms

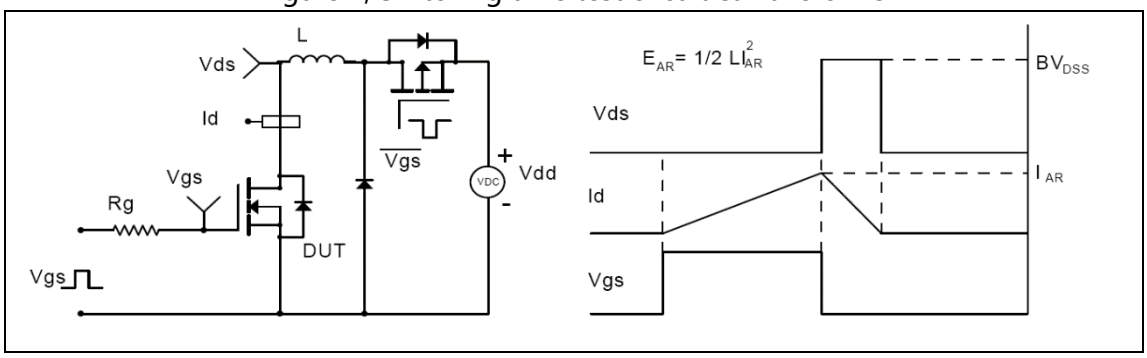


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

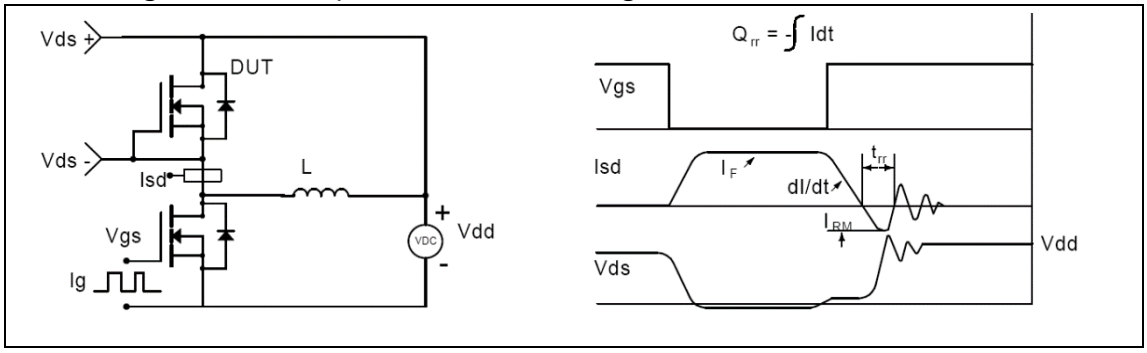
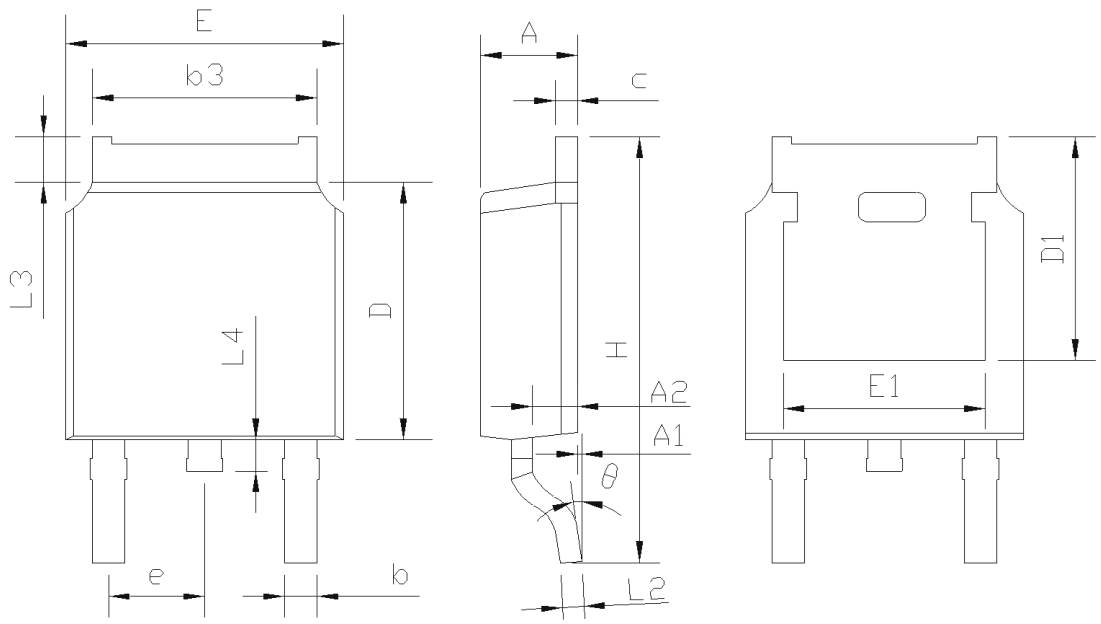


Figure 4, Diode reverse recovery test circuit & waveforms

■ Package Information

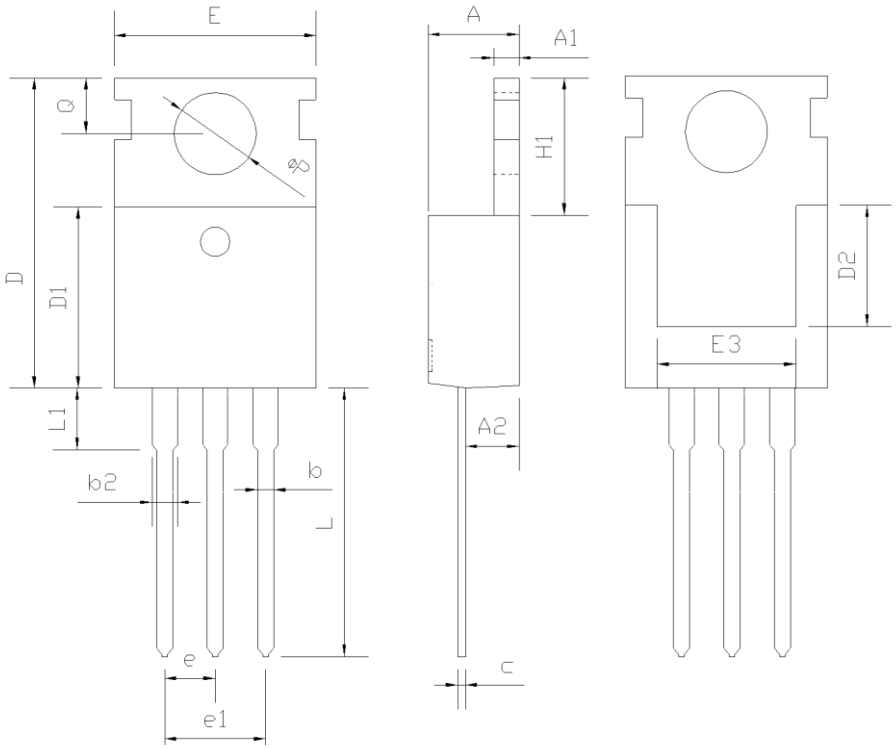
Figure1, TO252 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
θ	0°	-	8°

■ Package Information

Figure2, TO220 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

■ Ordering Information

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

Package	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO220	50	20	1000	6	6000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS06R03DF	TO252	yes	yes	yes
SFS06R03PF	TO220	yes	yes	yes