

## General Description

FSMOS<sup>®</sup> 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
- Switched mode power supply

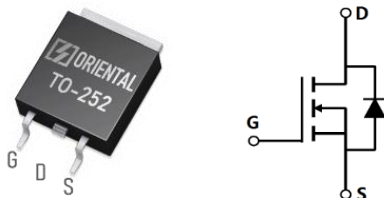
## Key Performance Parameters

Parameter	Value	Unit
$V_{DS, min} @ T_{j(max)}$	60	V
$I_{D, pulse}$	204	A
$R_{DS(ON), max} @ V_{GS}=10V$	10	m $\Omega$
$Q_g$	17.9	nC

## Marking Information

Product Name	Package	Marking
SFS06R10DF	TO252	SFS06R10D

## Package & Pin information



**Absolute Maximum Ratings** at  $T_j=25^\circ\text{C}$  unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	60	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current <sup>1)</sup> , $T_C=25^\circ\text{C}$	$I_D$	68	A
Pulsed drain current <sup>2)</sup> , $T_C=25^\circ\text{C}$	$I_{D, pulse}$	204	A
Continuous diode forward current <sup>1)</sup> , $T_C=25^\circ\text{C}$	$I_S$	68	A
Diode pulsed current <sup>2)</sup> , $T_C=25^\circ\text{C}$	$I_{S, pulse}$	204	A
Power dissipation <sup>3)</sup> , $T_C=25^\circ\text{C}$	$P_D$	81	W
Single pulsed avalanche energy <sup>5)</sup>	$E_{AS}$	91	mJ
Operation and storage temperature	$T_{stg}, T_j$	-55 to 150	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	1.54	$^\circ\text{C/W}$
Thermal resistance, junction-ambient <sup>4)</sup>	$R_{\theta JA}$	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	$BV_{DSS}$	60			V	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	1.0		2.5	V	$V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		7.5	10	$\text{m}\Omega$	$V_{GS}=10\text{ V}, I_D=20\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		10	14	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}, I_D=10\text{ A}$
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	$\mu\text{A}$	$V_{DS}=60\text{ V}, V_{GS}=0\text{ V}$

### Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	$C_{iss}$		1204		pF	$V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=100\text{ kHz}$
Output capacitance	$C_{oss}$		194		pF	
Reverse transfer capacitance	$C_{rss}$		9.9		pF	
Turn-on delay time	$t_{d(on)}$		23.9		ns	$V_{GS}=10\text{ V}$ , $V_{DS}=50\text{ V}$ , $R_G=2\ \Omega$ , $I_D=25\text{ A}$
Rise time	$t_r$		4.6		ns	
Turn-off delay time	$t_{d(off)}$		37.8		ns	
Fall time	$t_f$		6.4		ns	

### Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	$Q_g$		17.9		nC	$V_{GS}=10\text{ V}$ , $V_{DS}=50\text{ V}$ , $I_D=25\text{ A}$
Gate-source charge	$Q_{gs}$		3.8		nC	
Gate-drain charge	$Q_{gd}$		4.2		nC	
Gate plateau voltage	$V_{plateau}$		4.2		V	

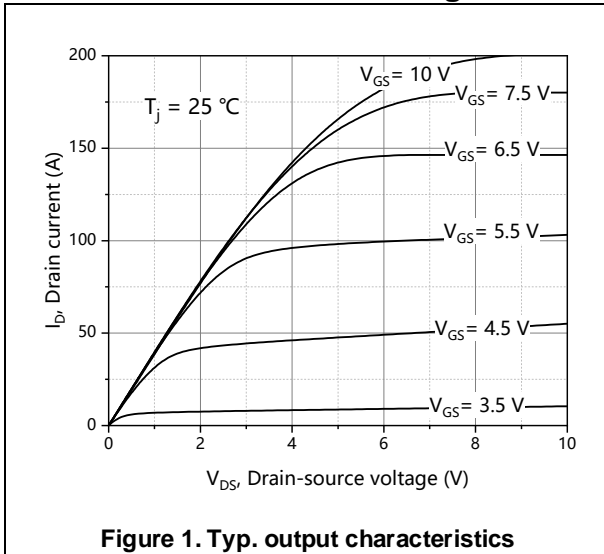
### Body Diode Characteristics

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	$t_{rr}$		42.6		ns	$V_R=50\text{ V}$ , $I_S=25\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	$Q_{rr}$		36.3		nC	
Peak reverse recovery current	$I_{rrm}$		1.4		A	

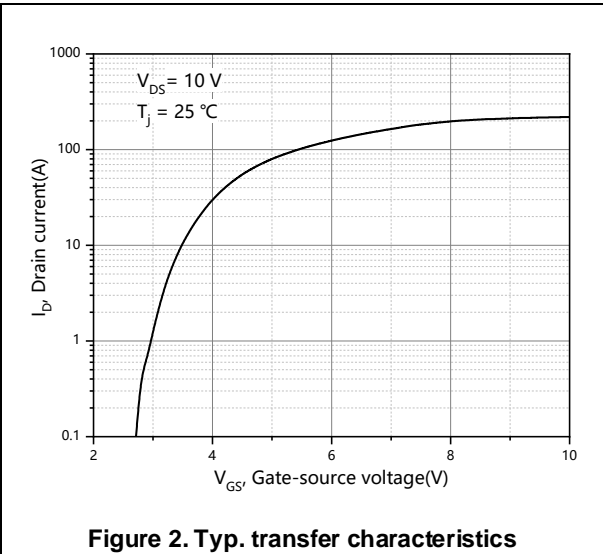
### Note

- 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 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25\text{ }^\circ\text{C}$ .
- 5)  $V_{DD}=30\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=0.3\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

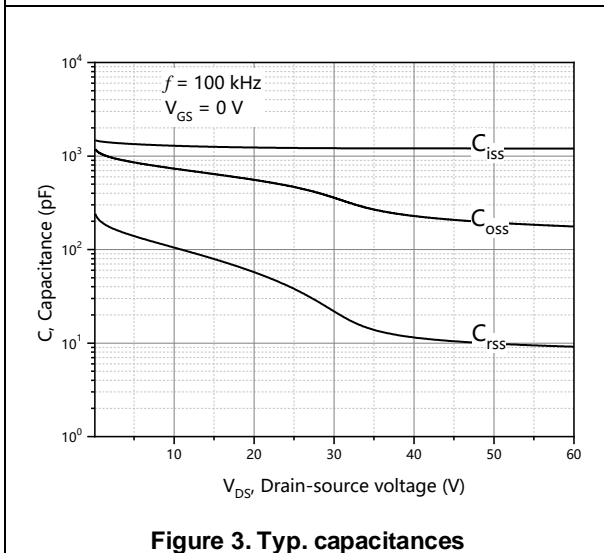
**Electrical Characteristics Diagrams**



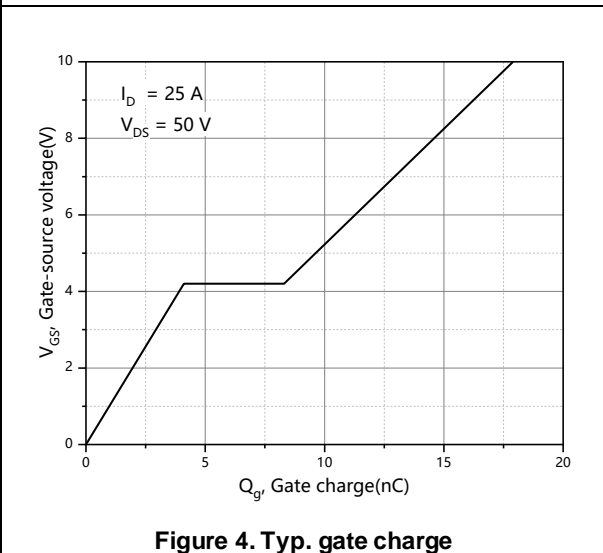
**Figure 1. Typ. output characteristics**



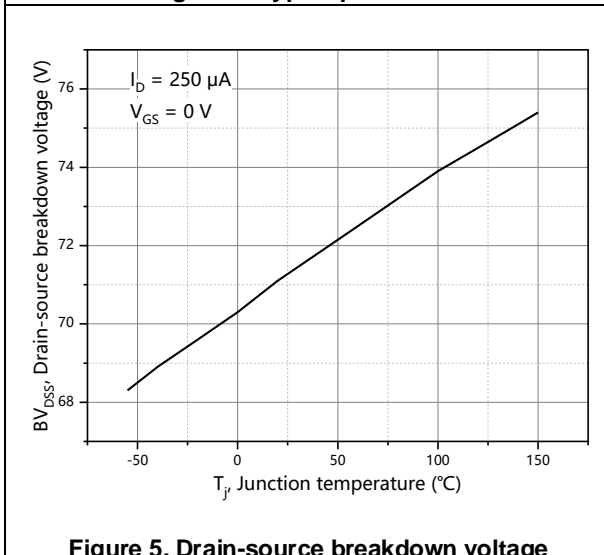
**Figure 2. Typ. transfer characteristics**



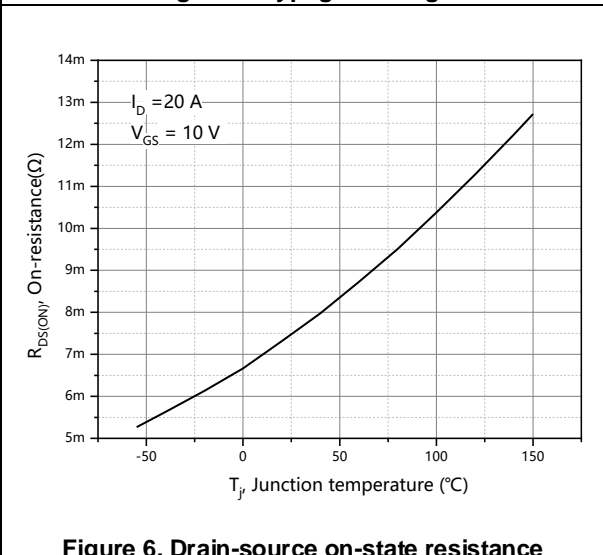
**Figure 3. Typ. capacitances**



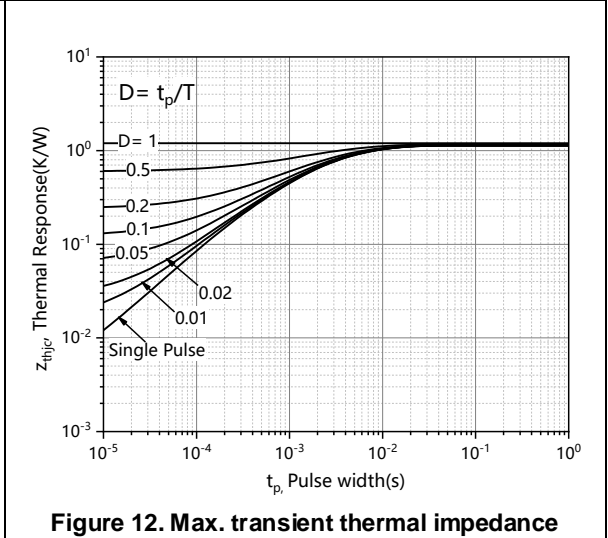
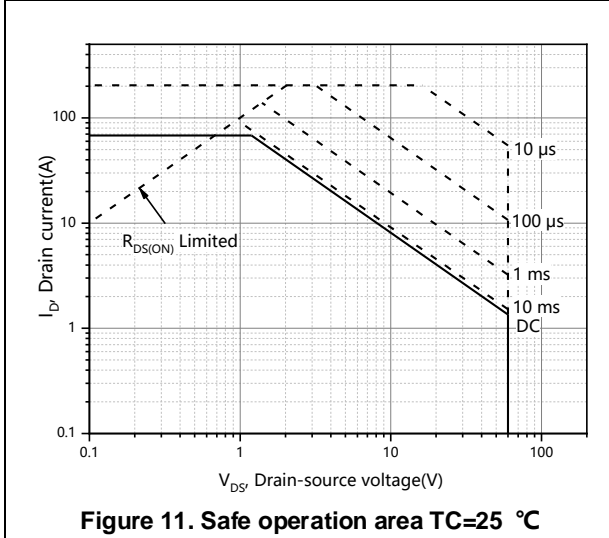
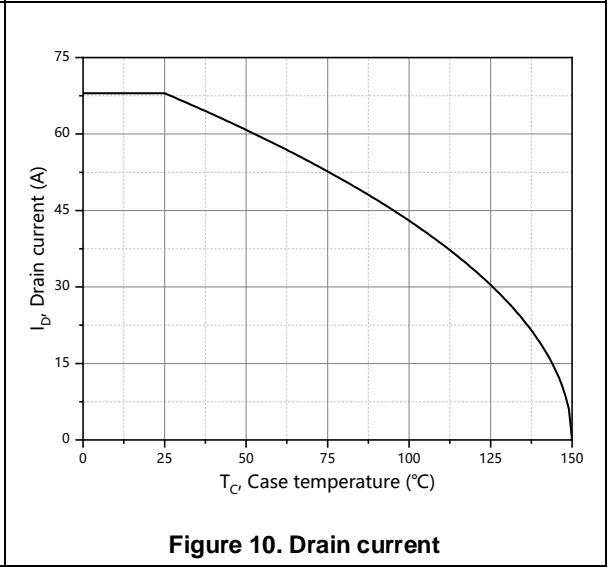
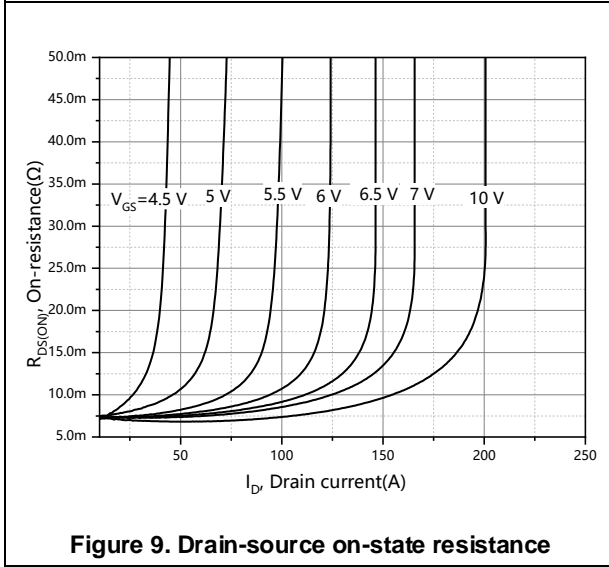
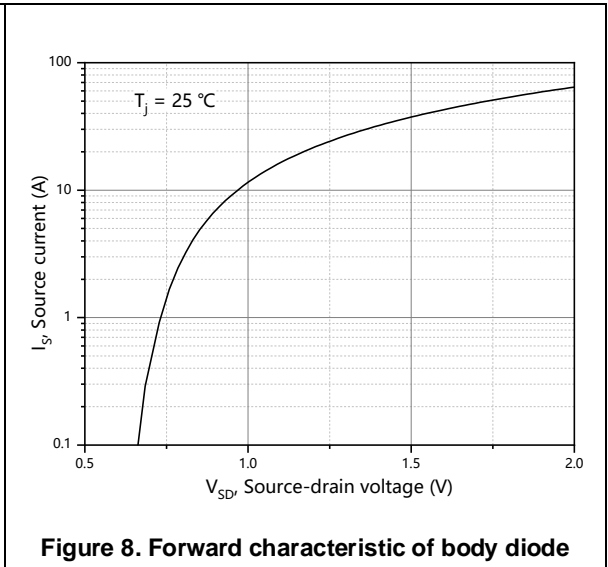
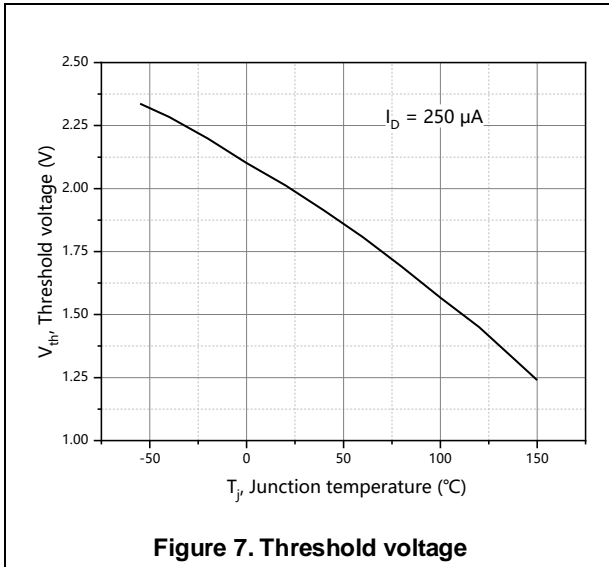
**Figure 4. Typ. gate charge**



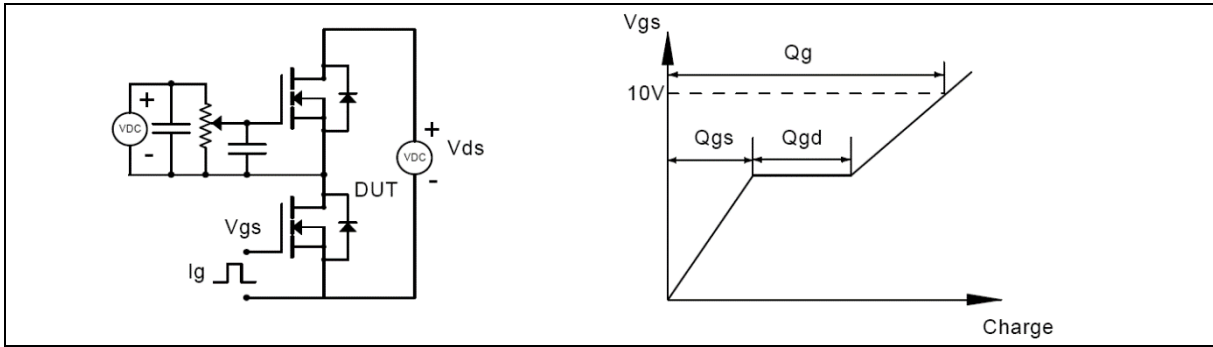
**Figure 5. Drain-source breakdown voltage**



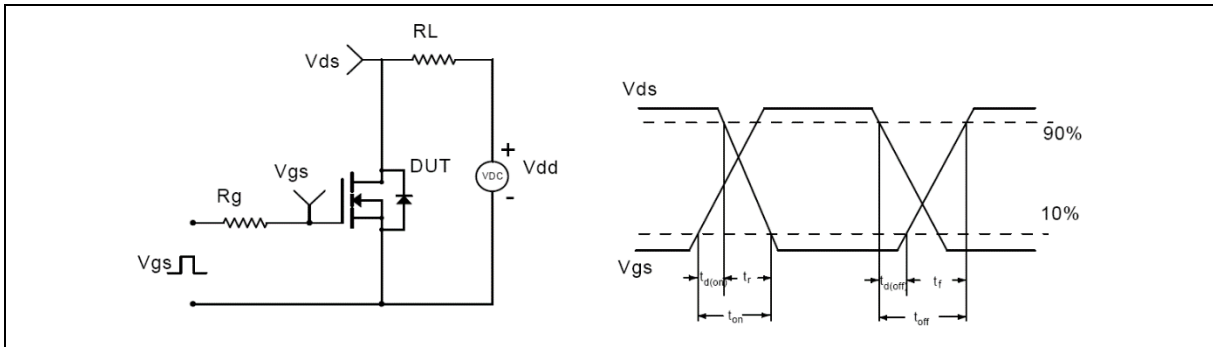
**Figure 6. Drain-source on-state resistance**



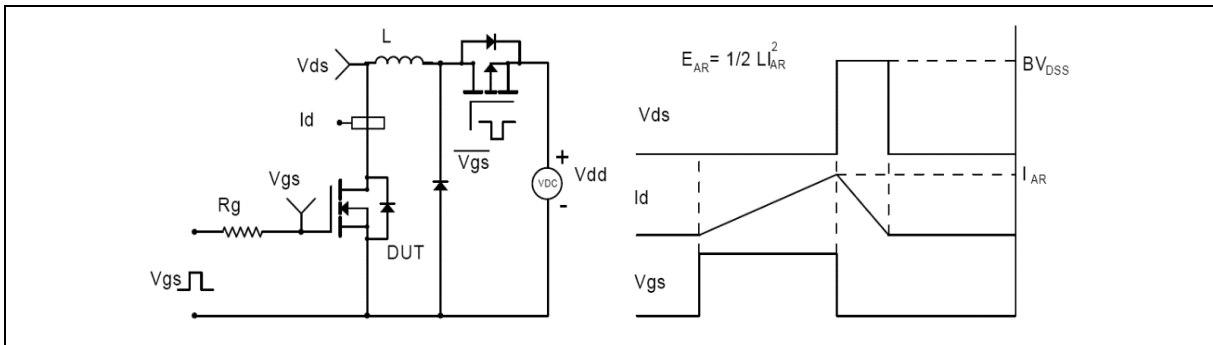
**Test circuits and waveforms**



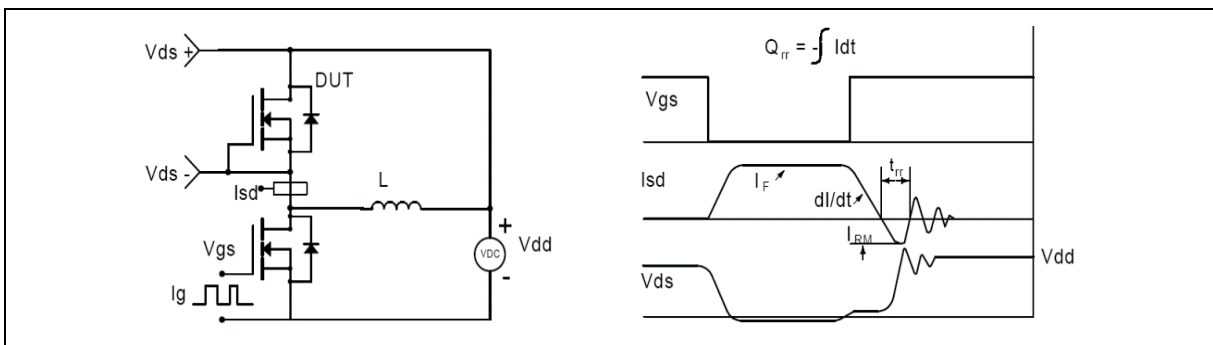
**Figure 1. Gate charge test circuit & waveform**



**Figure 2. Switching time test circuit & waveforms**

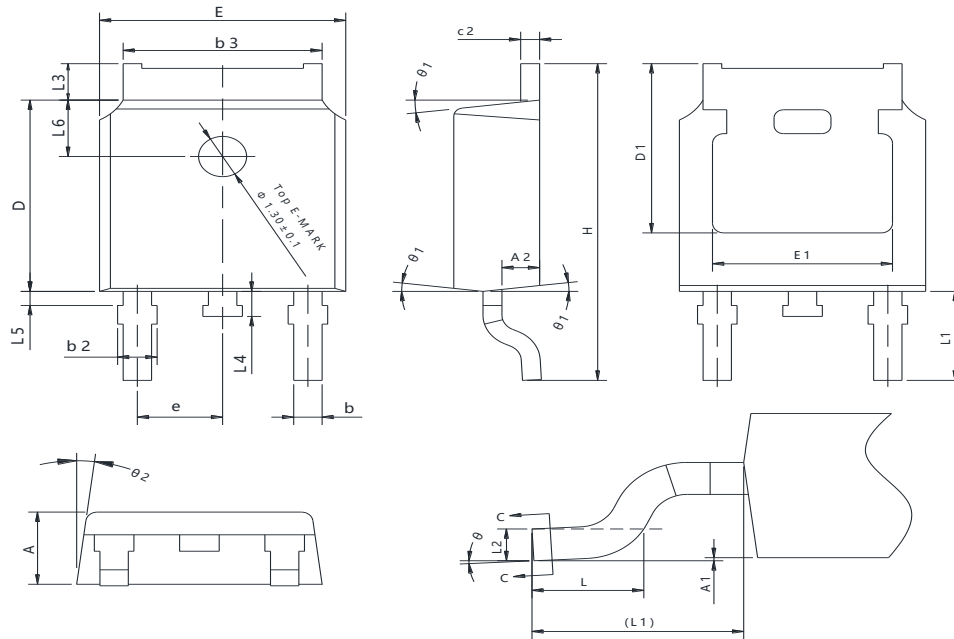


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



**Figure 4. Diode reverse recovery test circuit & waveforms**

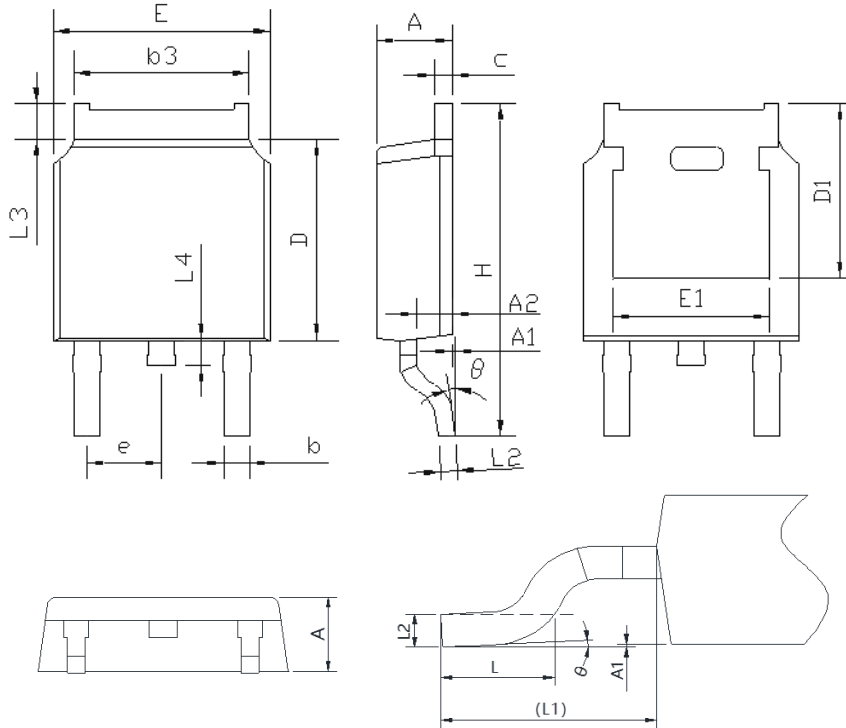
**Package Information**



Symbol	mm		
	Min	Nom	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
b1	0.71	0.76	0.81
b2	0.72	-	0.90
b3	5.13	5.33	5.46
c	0.47	-	0.60
c1	0.46	0.51	0.56
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		
$\theta$	0°	-	8°
$\theta_1$	5°	7°	9°
$\theta_2$	5°	7°	9°

Version 1: TO252-J package outline dimension

**Package Information**



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	5.30 REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286 BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90 REF		
L2	0.51 BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
θ	0°	-	8°

Version 2: TO252-P package outline dimension



## Ordering Information

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

## Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFS06R10DF	TO252	yes	yes	yes

## Legal Disclaimer

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