General Description

SFGMOS®

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 stability and uniformity
- Fast switching and soft recovery

Applications

- PD charger
- Motor driver
- Switching voltage regulator
- DC-DC convertor
- Switched mode power supply

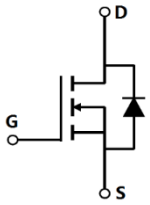
Key Performance Parameters

Parameter	Value	Unit
$V_{DS,\ min}$ @ $T_{j(max)}$	120	V
$I_{D,\ pulse}$	180	A
$R_{DS(ON),\ max}$ @ V_{GS}=10V	13	
Q_g	39.6	nC

Marking Information

Product Name	Package	Marking
SFG60N12PF	TO220	SFG60N12P

Package & Pin information



Absolute Maximum Ratings at T_j=25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	120	V
Gate source voltage	V_{GS}	±20	V
Continuous drain current[1], T_C=25 °C	I_D	60	A
Pulsed drain current[2], T_C=25 °C	$I_{D, pulse}$	180	A
Continuous diode forward current[1], T_C=25 °C	I_S	60	A
Diode pulsed current[2], T_C=25 °C	$I_{S, pulse}$	180	A
Power dissipation[3], T_C=25 °C	P_D	140	W
Single pulsed avalanche energy[5]	E_{AS}	100	mJ
Operation and storage temperature	T_{stg} T_j	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	R	0.89	°C/W
Thermal resistance, junction-ambient[4]	R	62	°C/W

Electrical Characteristics at T_j=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	120			V	V_{GS}=0 V, I_D=250 A
Gate threshold voltage	$V_{GS(th)}$	1.5		2.5	V	V_{DS}=V_{GS}, I_D=250 A
Drain-source on-state resistance	$R_{DS(ON)}$		10.6	13		V_{GS}=10 V, I_D=30 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	A	V_{DS}=120 V, V_{GS}=0 V
Gate resistance	R_G		3.4			

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		2810		pF	V_{GS}=0 V, V_{DS}=50 V, 100 kHz
Output capacitance	C_{oss}		356		pF	
Reverse transfer capacitance	C_{rss}		8.3		pF	
Turn-on delay time	$t_{d(on)}$		20.4		ns	V_{GS}=10 V, V_{DS}=50 V, R_G I_D=25 A
Rise time	t_r		5.7		ns	
Turn-off delay time	$t_{d(off)}$		45.1		ns	
Fall time	t_f		6.3		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		39.6		nC	V_{GS}=10 V, V_{DS}=50 V, I_D=25 A
Gate-source charge	Q_{gs}		6.8		nC	
Gate-drain charge	Q_{gd}		8.0		nC	
Gate plateau voltage	$V_{plateau}$		3.5		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	I_S=60 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		79.5		ns	V_R=50 V, I_S=25 A,
Reverse recovery charge	Q_{rr}		210		nC	
Peak reverse recovery current	I_{rrm}		4.4		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 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 °C.
5) V_{DD}=50 V,V_{GS}=10 V, L=0.3 mH, starting T_j=25 °C.

Electrical Characteristics Diagrams

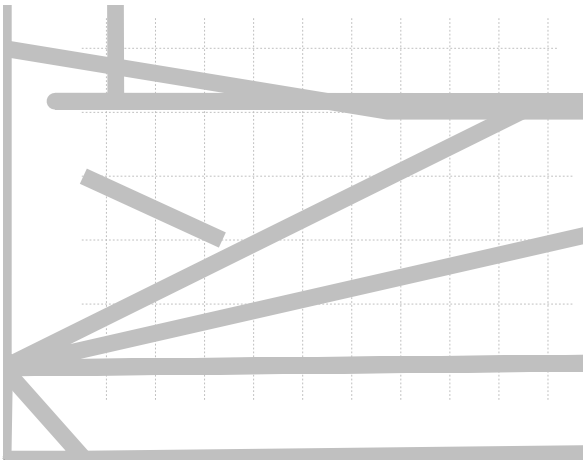


Figure 1. Typ. output characteristics

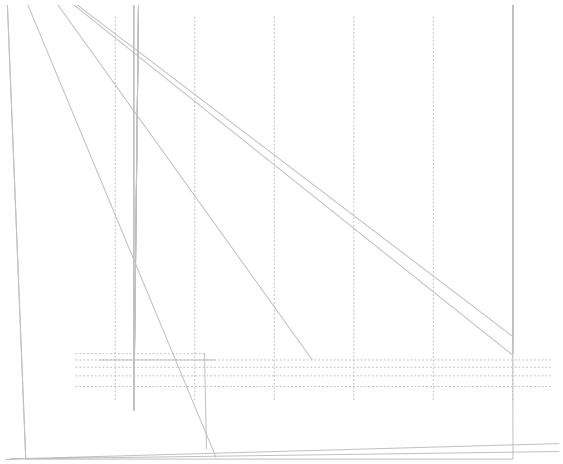


Figure 2. Typ. transfer characteristics

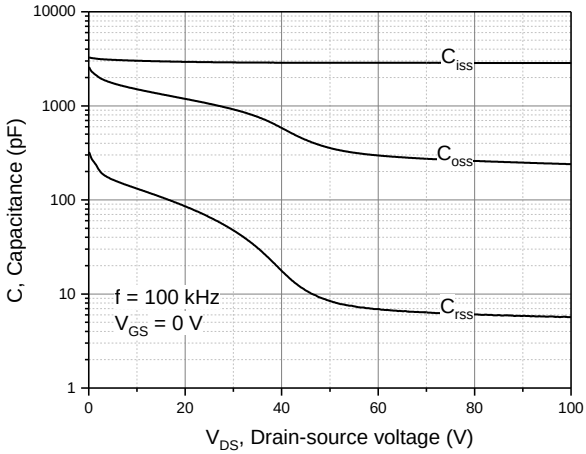


Figure 3. Typ. capacitances

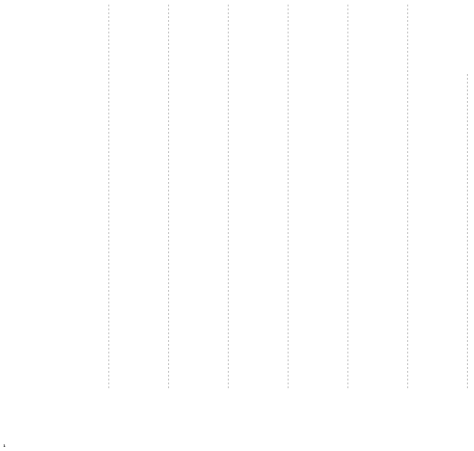


Figure 4. Typ. gate charge

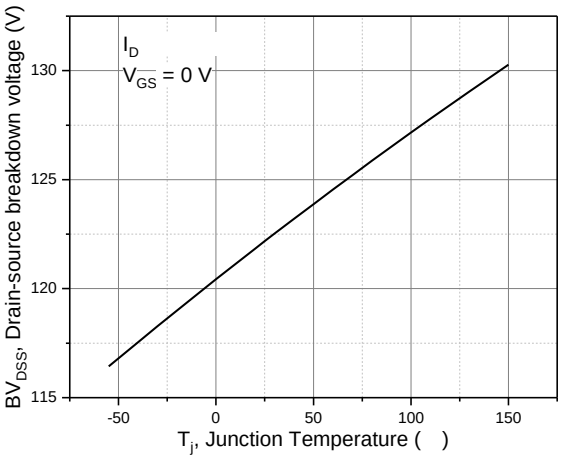


Figure 5. Drain-source breakdown voltage

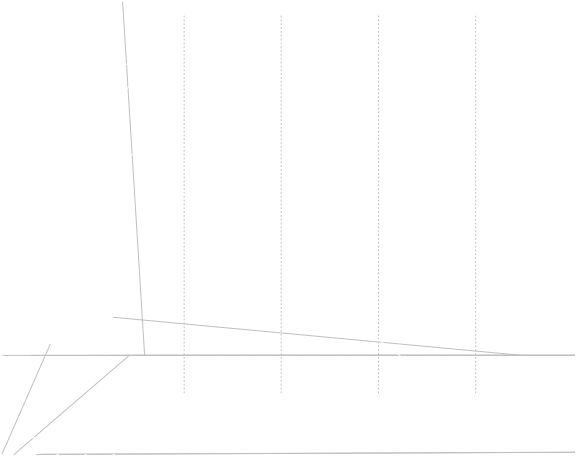


Figure 6. Drain-source on-state resistance

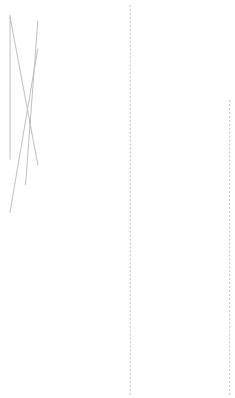


Figure 7. Forward characteristic of body diode

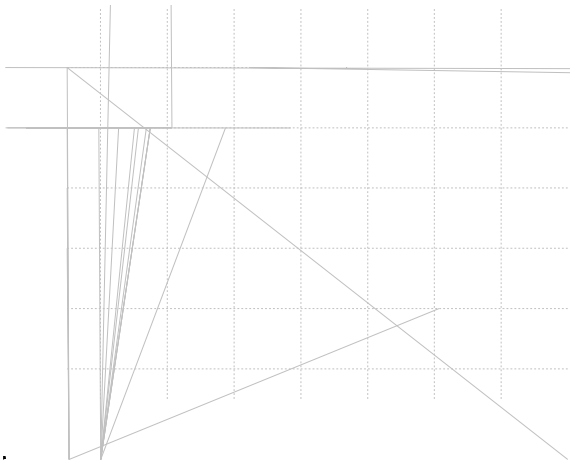


Figure 8. Drain current

Figure 9. Safe operation area T_C=25 °C

Test circuits and waveforms

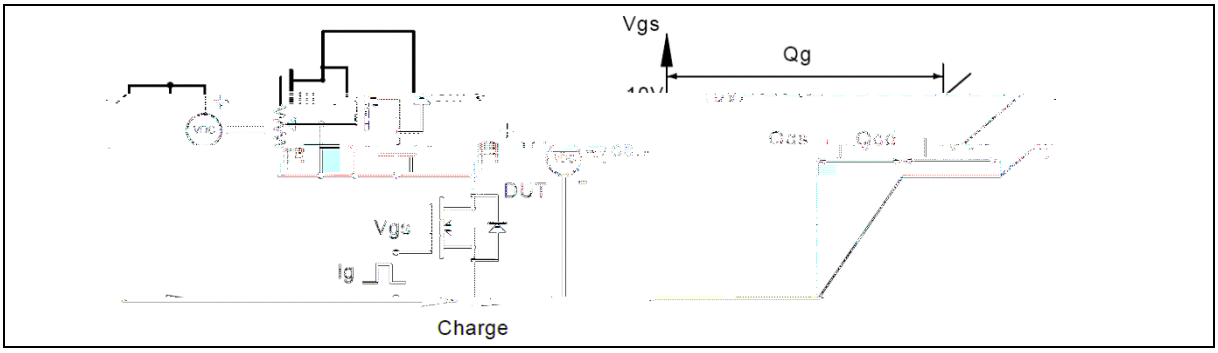


Figure 1. Gate charge test circuit & waveform

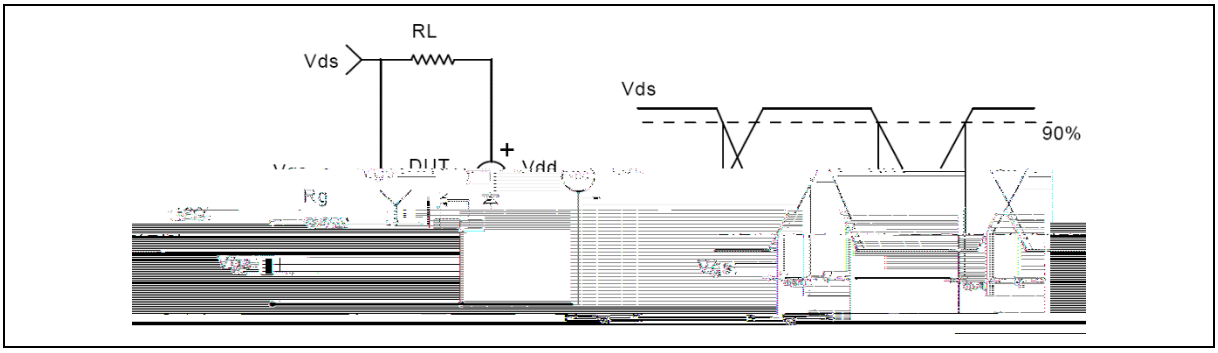


Figure 2. Switching time test circuit & waveforms

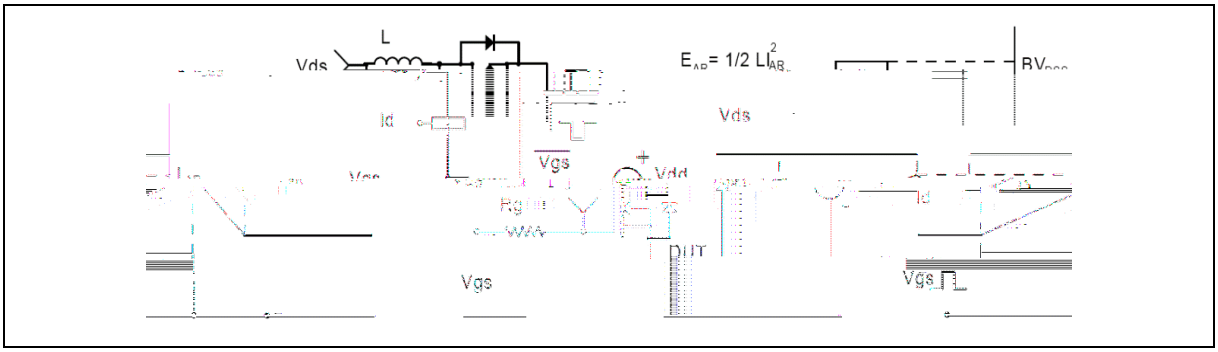


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

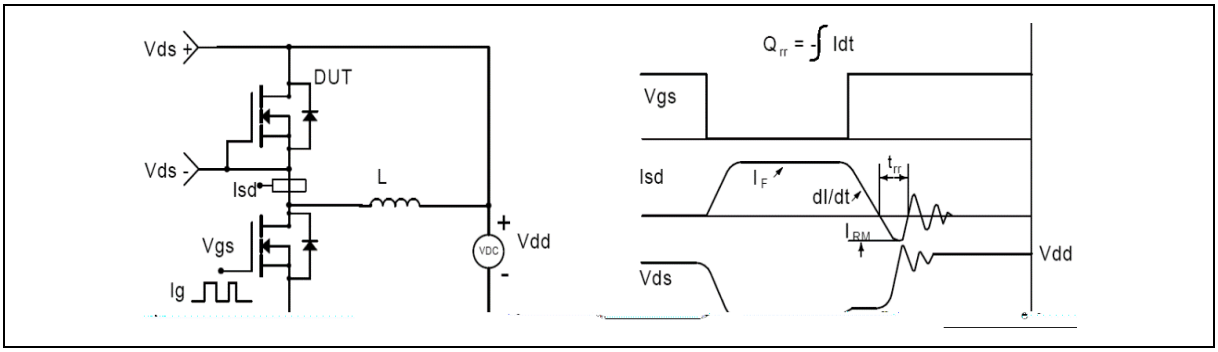


Figure 4. Diode reverse recovery test circuit & waveforms

Package Information

Ordering Information

Package Type	Units/ Tube	Tubes / Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220-J	50	20	1000	5	5000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFG60N12PF	TO220	yes	yes	yes

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