

## General Description

The GreenMOS<sup>®</sup> high voltage MOSFET utilizes charge balance technology to achieve outstanding low on-resistance and lower gate charge. It is engineered to minimize conduction loss, provide superior switching performance and robust avalanche capability.

The GreenMOS<sup>®</sup> S series is optimized for its switching characteristics to achieve aggressive EMI standards. It is easy to use for smaller power supply systems to meet the both efficiency and EMI standards.

## Features

- Low  $R_{DS(ON)}$  & FOM
- Extremely low switching loss
- Excellent stability and uniformity





## Applications

- LED lighting
- Charger
- Adapter
- Telecom power
- Server power
- Solar/UPS

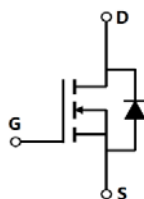
## Key Performance Parameters

Parameter	Value	Unit
$V_{DS, min} @ T_{j(max)}$	650	V
$I_D, pulse$	141	A
$R_{DS(ON), max} @ V_{GS}=10V$	69	$\Omega$
$Q_g$	86.7	nC

## Marking Information

Product Name	Package	Marking
OSG60R069HSF	TO247	OSG60R069HS

## Package & Pin Information



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

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	600	V
Gate-source voltage	$V_{GS}$	$\pm 30$	V
Continuous drain current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$	$I_D$	47	A
Continuous drain current <sup>1)</sup> , $T_C=100^{\circ}\text{C}$		29.7	
Pulsed drain current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	141	A
Continuous diode forward current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$	$I_S$	47	A
Diode pulsed current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$	$I_{S, pulse}$	141	A
Power dissipation <sup>3)</sup> , $T_C=25^{\circ}\text{C}$	$P_D$	342	W
Single pulsed avalanche energy <sup>5)</sup>	$E_{AS}$	1345	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\dots 480\text{ V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\dots 480\text{ V}$ , $I_{SD}\leq I_D$	dv/dt	15	V/ns
Operation and storage temperature	$T_{stg}, T_j$	-55 to 150	$^{\circ}\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	0.37	$^{\circ}\text{C/W}$
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	$BV_{DSS}$	600			V	$V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$
		650				$V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$ , $T_j=150^{\circ}\text{C}$
Gate threshold voltage	$V_{GS(th)}$	2.9		3.9	V	$V_{DS}=V_{GS}$ , $I_D=1\text{ mA}$
Drain-source on-state resistance	$R_{DS(on)}$		62	69	$\Omega$	$V_{GS}=10\text{ V}$ , $I_D=23.5\text{ A}$
			148			$V_{GS}=10\text{ V}$ , $I_D=23.5\text{ A}$ , $T_j=150^{\circ}\text{C}$
Gate-source leakage current	$I_{GSS}$			100	nA	$V_{GS}=30\text{ V}$
				-100		$V_{GS}=-30\text{ V}$
Drain-source leakage current	$I_{DSS}$			1	$\mu\text{A}$	$V_{DS}=600\text{ V}$ , $V_{GS}=0\text{ V}$
Gate resistance	$R_G$		4.8		$\Omega$	$f=1\text{ MHz}$ , Open drain

### Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	$C_{iss}$		4141		pF	$V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=100\text{ KHz}$
Output capacitance	$C_{oss}$		295		pF	
Reverse transfer capacitance	$C_{rss}$		2.1		pF	
Effective output capacitance, energy related	$C_{o(er)}$		160.7		pF	$V_{GS} = 0\text{V}$ , $V_{DS} = 0\text{V}-400\text{V}$
Effective output capacitance, time related	$C_{o(tr)}$		831		pF	
Turn-on delay time	$t_{d(on)}$		33.7		ns	$V_{GS}=10\text{ V}$ , $V_{DS}=400\text{ V}$ , $R_G=2\ \Omega$ , $I_D=20\text{ A}$
Rise time	$t_r$		6.7		ns	
Turn-off delay time	$t_{d(off)}$		120.9		ns	
Fall time	$t_f$		63.5		ns	

### Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	$Q_g$		86.7		nC	$V_{GS}=10\text{ V}$ , $V_{DS}=400\text{ V}$ , $I_D=20\text{ A}$
Gate-source charge	$Q_{gs}$		22.9		nC	
Gate-drain charge	$Q_{gd}$		27.9		nC	
Gate plateau voltage	$V_{plateau}$		5.5		V	

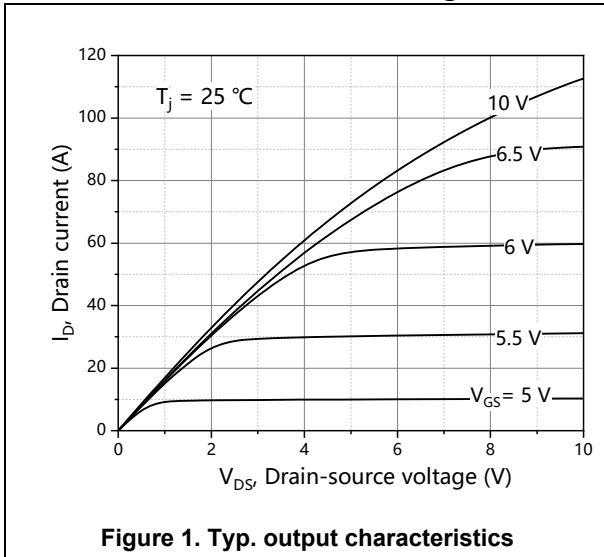
### Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	$V_{SD}$			1.4	V	$I_S=20\text{ A}$ , $V_{GS}=0\text{ V}$
Reverse recovery time	$t_{rr}$		394.4		ns	$V_R=400\text{ V}$ , $I_S=1\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	$Q_{rr}$		6.9		$\mu\text{C}$	
Peak reverse recovery current	$I_{rrm}$		33.3		A	

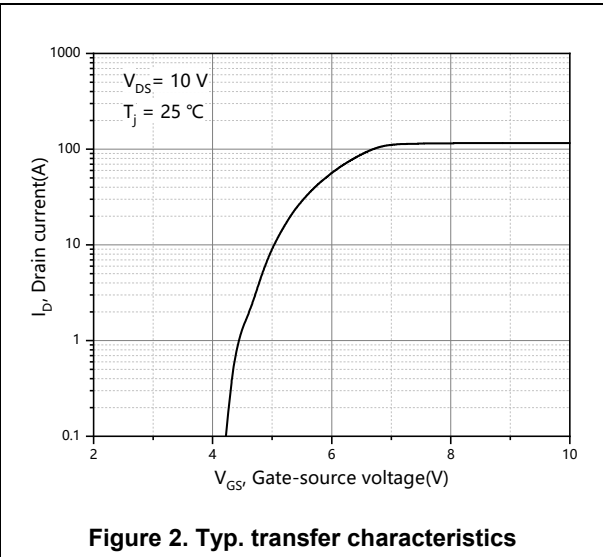
### Note

- 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)  $V_{DD}=50\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=80\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

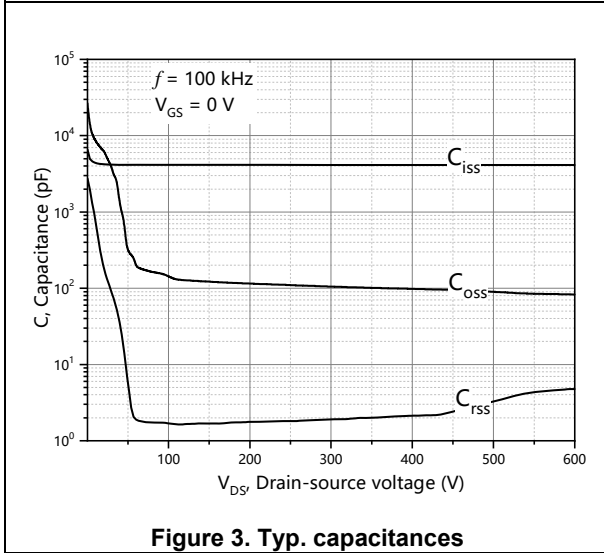
**Electrical Characteristics Diagrams**



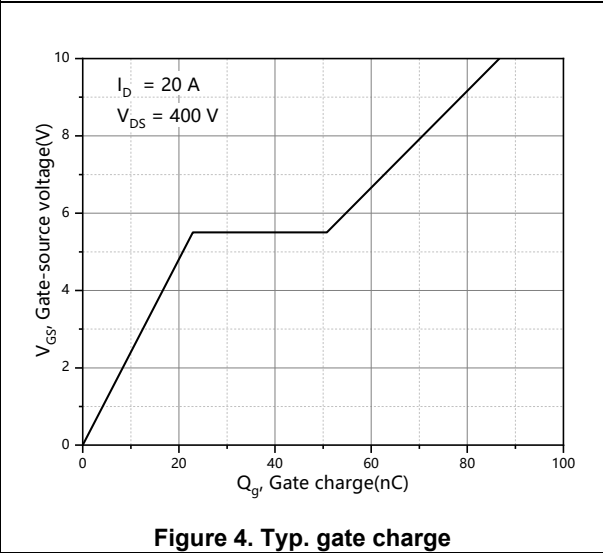
**Figure 1. Typ. output characteristics**



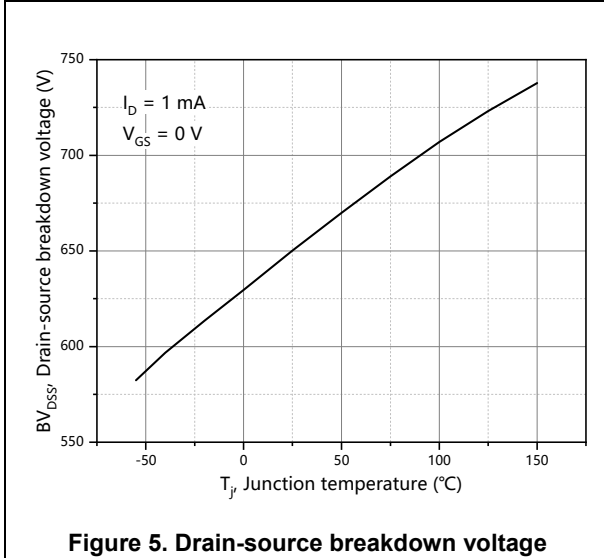
**Figure 2. Typ. transfer characteristics**



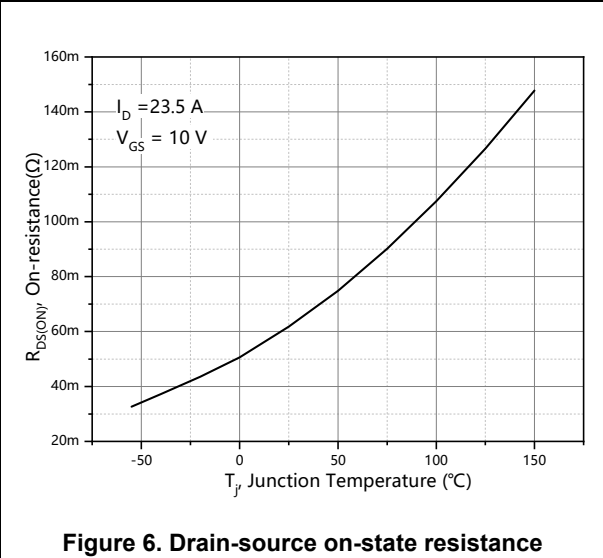
**Figure 3. Typ. capacitances**



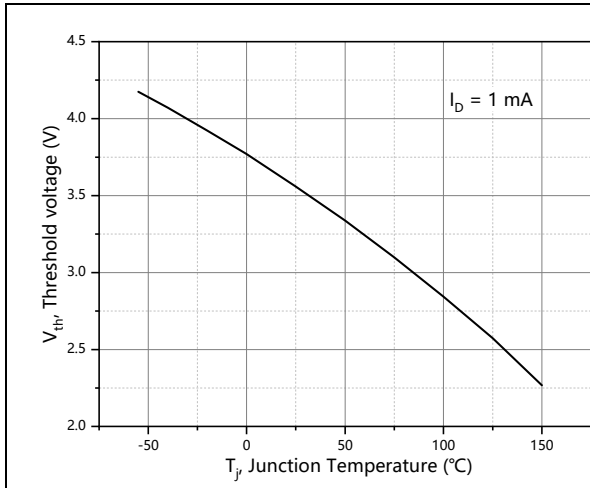
**Figure 4. Typ. gate charge**



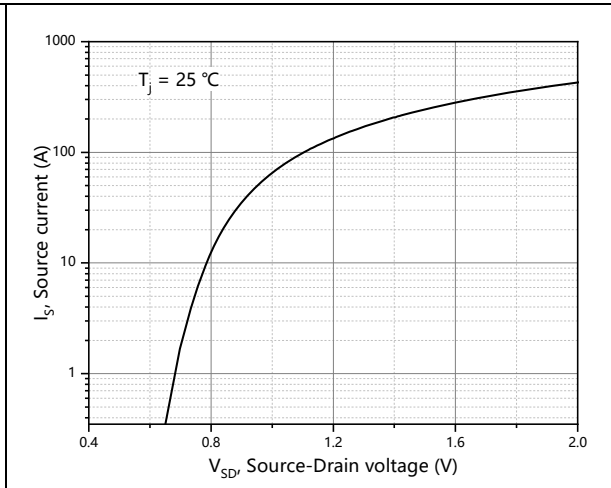
**Figure 5. Drain-source breakdown voltage**



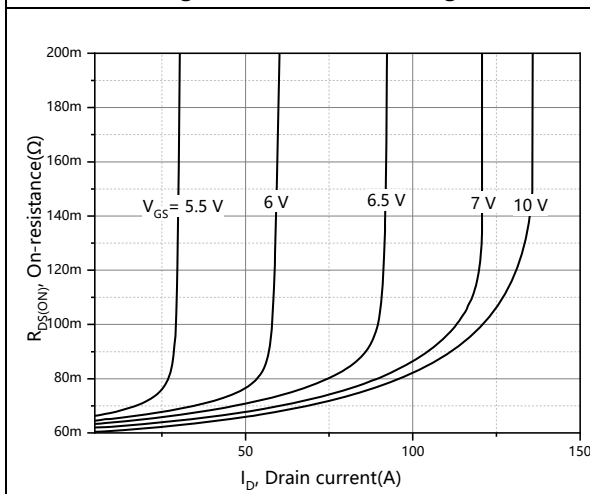
**Figure 6. Drain-source on-state resistance**



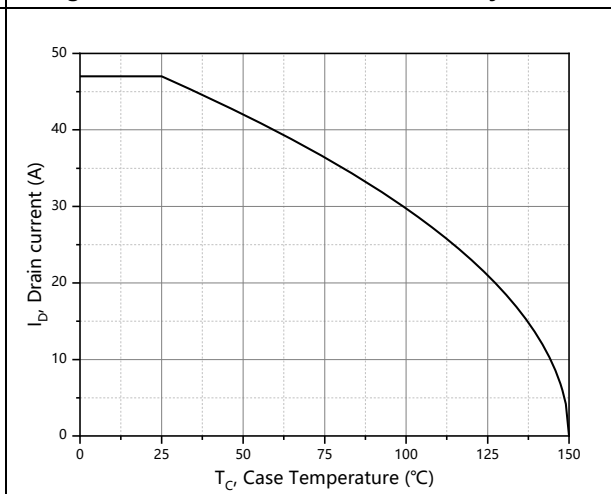
**Figure 7. Threshold voltage**



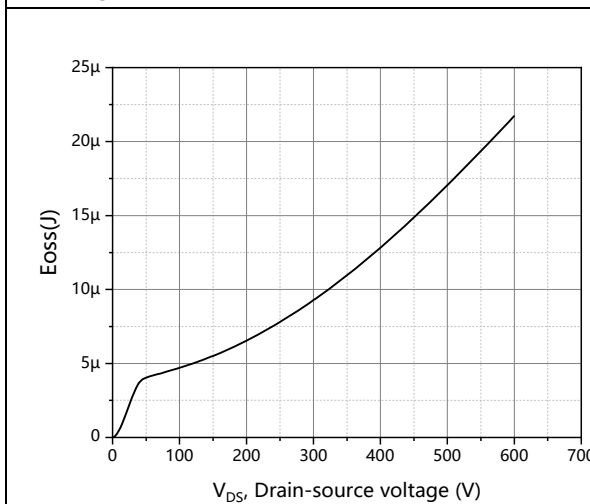
**Figure 8. Forward characteristic of body diode**



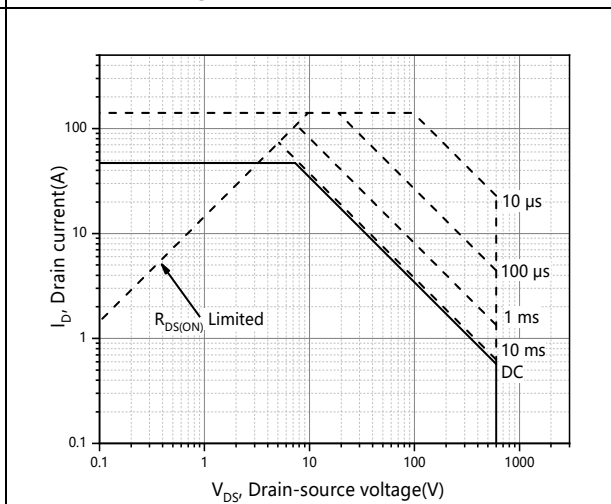
**Figure 9. Drain-source on-state resistance**



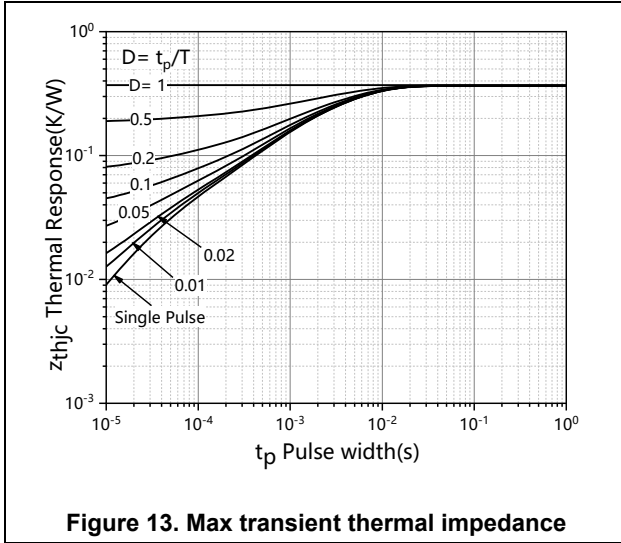
**Figure 10. Drain current**



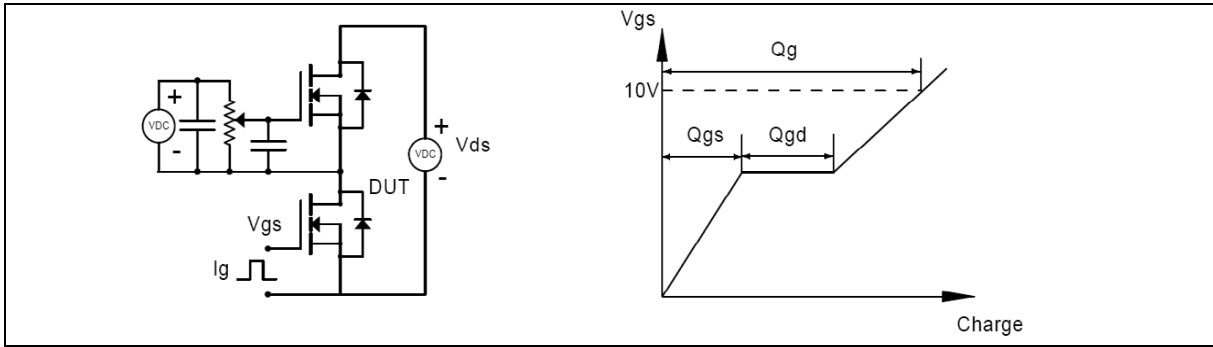
**Figure 11. Typ. Coss stored energy**



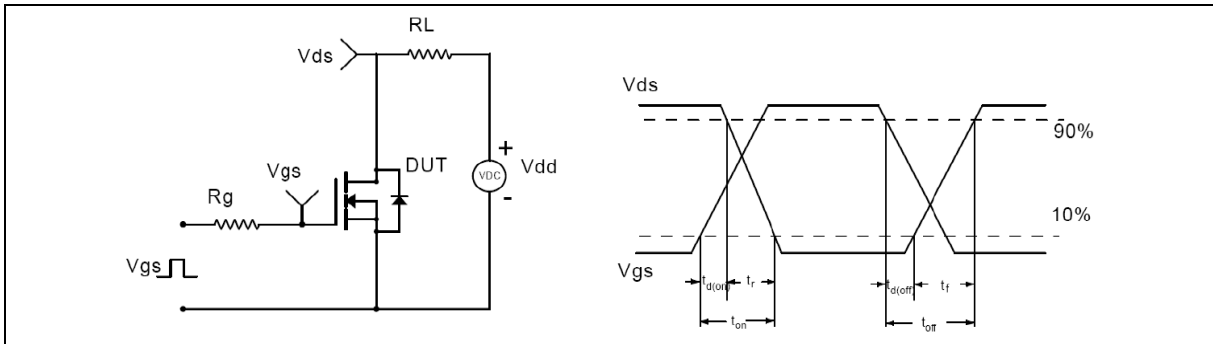
**Figure 12. Safe operation area for TC=25 °C**



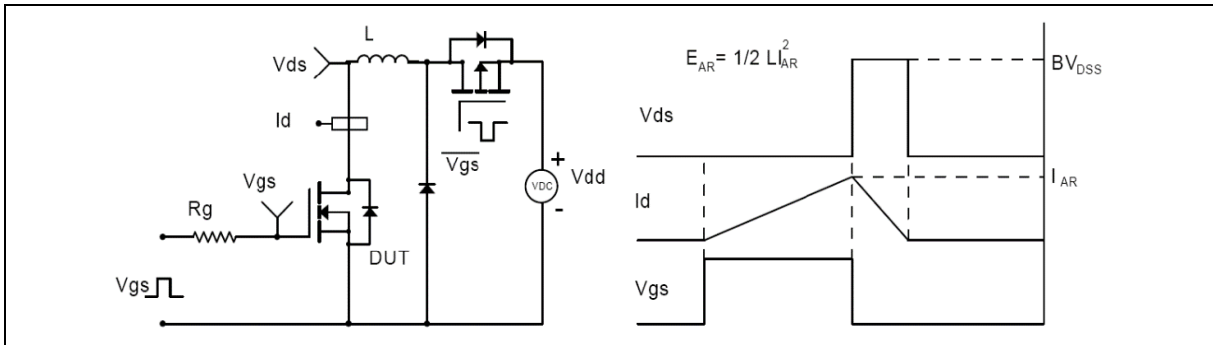
**Test circuits and waveforms**



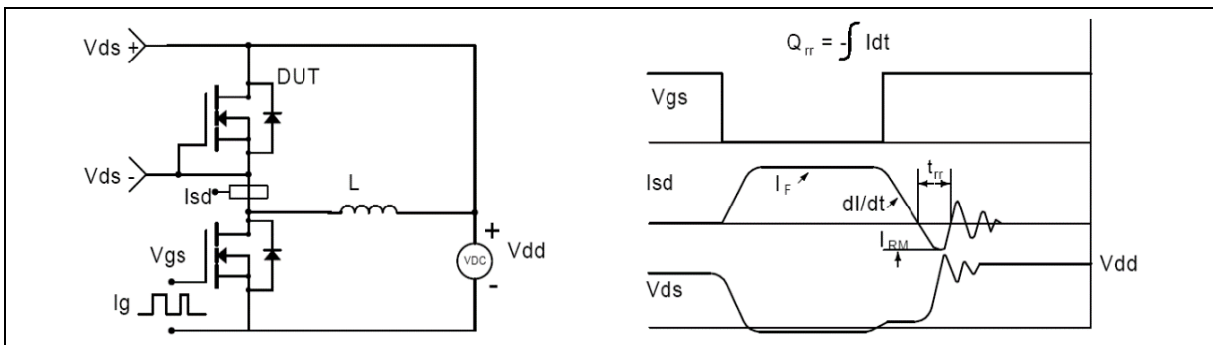
**Figure 1. Gate charge test circuit & waveform**



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

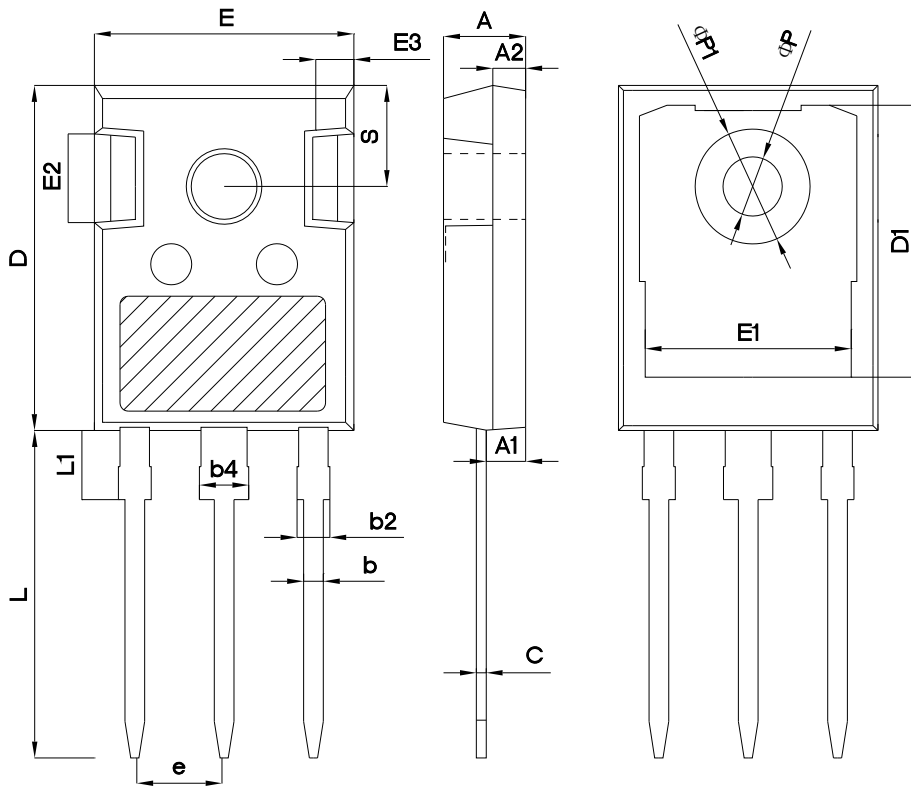


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



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

**Package Information**



Symbol	mm		
	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.80	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44 BSC		
L	19.82	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15 BSC		

Version 1; TO247-C package outline dimension



## Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO247-C	30	11	330	6	1980

## Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG60R069HSF	TO247	yes	yes	yes

## Legal Disclaimer

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