

## General Description

The GreenMOS® 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® Z series is integrated with fast recovery diode (FRD) to minimize reverse recovery time. It is suitable for resonant switching topologies to reach higher efficiency, higher reliability and smaller form factor.

## Features

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

**GreenMOS®**



## Applications

- LED lighting
- Adapter
- Telecom
- Solar/UPS
- Sever

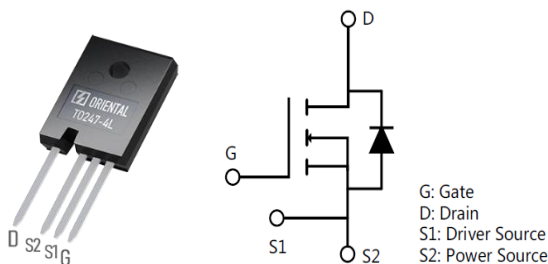
## Key Performance Parameters

Parameter	Value	Unit
$V_{DS}$	600	V
$I_D$ , pulse	156	A
$R_{DS(ON)}$ , max @ $V_{GS}=10V$	58	m $\Omega$
$Q_g$	83	nC

## Marking Information

Product Name	Package	Marking
OSG60R060H4T3ZF	TO247-4L	OSG60R060H4T3Z

## 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> , $T_C=25^{\circ}\text{C}$	$I_D$	52	A
Continuous drain current <sup>1)</sup> , $T_C=100^{\circ}\text{C}$		32.8	
Pulsed drain current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	156	A
Continuous diode forward current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$	$I_S$	52	A
Diode pulsed current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$	$I_{S, pulse}$	156	A
Power dissipation <sup>3)</sup> , $T_C=25^{\circ}\text{C}$	$P_D$	440	W
Single pulsed avalanche energy <sup>4)</sup>	$E_{AS}$	486	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	50	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	$R_{\theta JC}$	0.28	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	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	$V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	3.0		5.0	V	$V_{DS}=V_{GS}$ , $I_D=1\text{ mA}$
Drain-source on-state resistance	$R_{DS(ON)}$		52	58	m $\Omega$	$V_{GS}=10\text{ V}$ , $I_D=26\text{ A}$
			129			$V_{GS}=10\text{ V}$ , $I_D=26\text{ A}$ , $T_j=150^{\circ}\text{C}$
Gate-source leakage current	$I_{GSS}$			100	nA	$V_{GS}=30\text{ V}$
				-100		$V_{GS}=-30\text{ V}$
Drain-source leakage current	$I_{DSS}$			10	$\mu\text{A}$	$V_{DS}=600\text{ V}$ , $V_{GS}=0\text{ V}$
Gate resistance	$R_G$		2		$\Omega$	$f=1\text{ MHz}$ , Open drain

### Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	$C_{iss}$		4257		pF	$V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=100\text{ kHz}$
Output capacitance	$C_{oss}$		210		pF	
Reverse transfer capacitance	$C_{rss}$		3		pF	
Effective output capacitance, energy related	$C_{o(er)}$		181		pF	$V_{GS}=0\text{ V}$ , $V_{DS}=0\text{ V}-400\text{ V}$
Effective output capacitance, time related	$C_{o(tr)}$		783		pF	
Turn-on delay time	$t_{d(on)}$		30		ns	$V_{GS}=10\text{ V}$ , $V_{DS}=400\text{ V}$ , $R_G=5\ \Omega$ , $I_D=40\text{ A}$
Rise time	$t_r$		88		ns	
Turn-off delay time	$t_{d(off)}$		65		ns	
Fall time	$t_f$		4		ns	

### Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	$Q_g$		83		nC	$V_{GS}=10\text{ V}$ , $V_{DS}=400\text{ V}$ , $I_D=40\text{ A}$
Gate-source charge	$Q_{gs}$		27		nC	
Gate-drain charge	$Q_{gd}$		29		nC	
Gate plateau voltage	$V_{plateau}$		7.4		V	

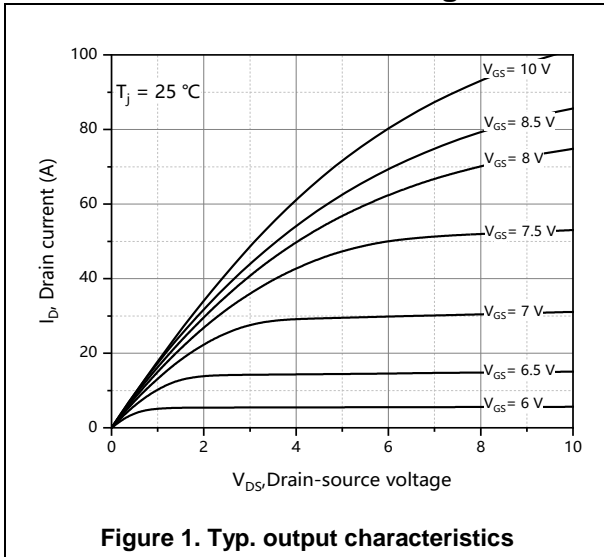
### Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	$V_{SD}$			1.3	V	$I_S=52\text{ A}$ , $V_{GS}=0\text{ V}$
Reverse recovery time	$t_{rr}$		172		ns	$V_R=400\text{ V}$ , $I_S=40\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	$Q_{rr}$		911		nC	
Peak reverse recovery current	$I_{rrm}$		9.2		A	

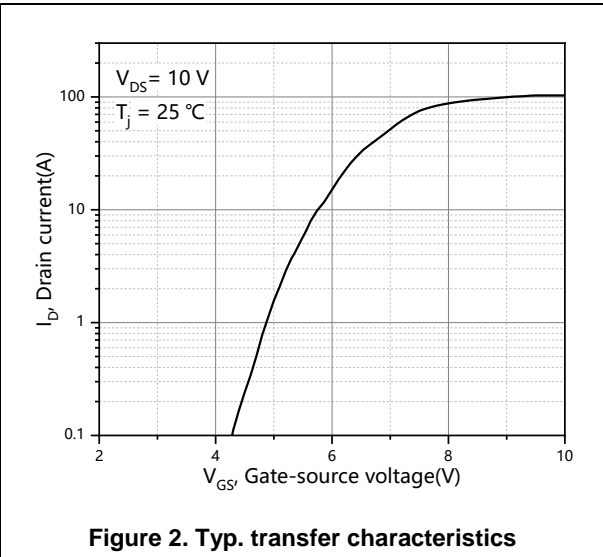
### Note

- 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)  $V_{DD}=100\text{ V}$ ,  $V_{GS}=10\text{ V}$ ,  $L=75\text{ mH}$ , starting  $T_j=25\text{ }^\circ\text{C}$ .

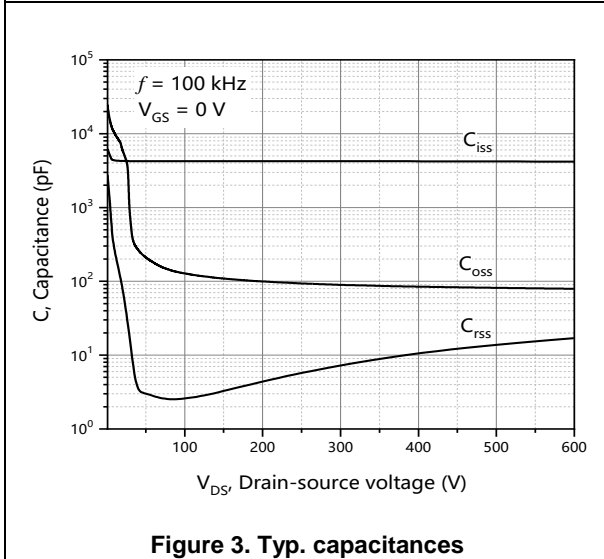
**Electrical Characteristics Diagrams**



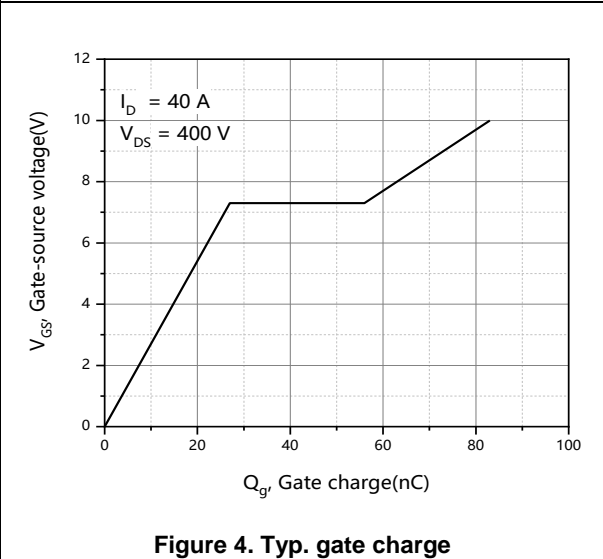
**Figure 1. Typ. output characteristics**



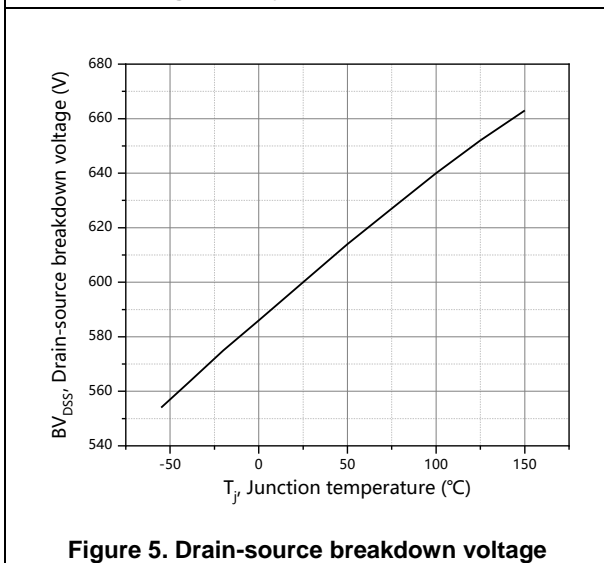
**Figure 2. Typ. transfer characteristics**



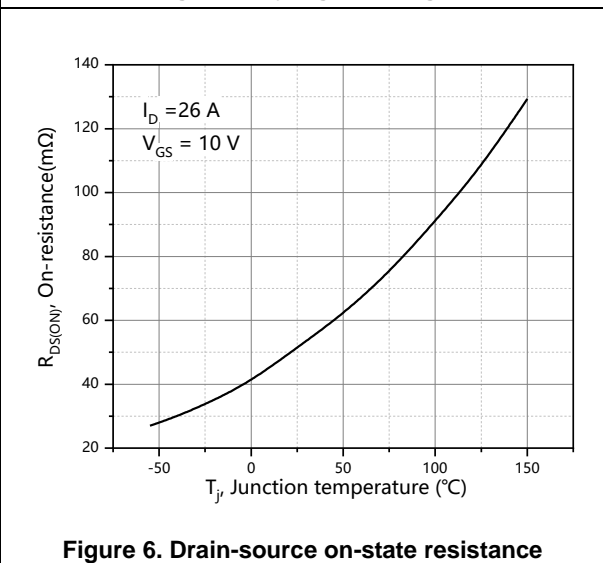
**Figure 3. Typ. capacitances**



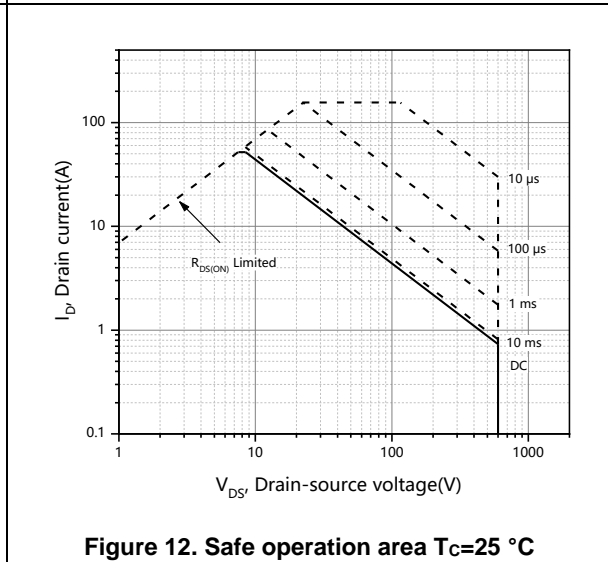
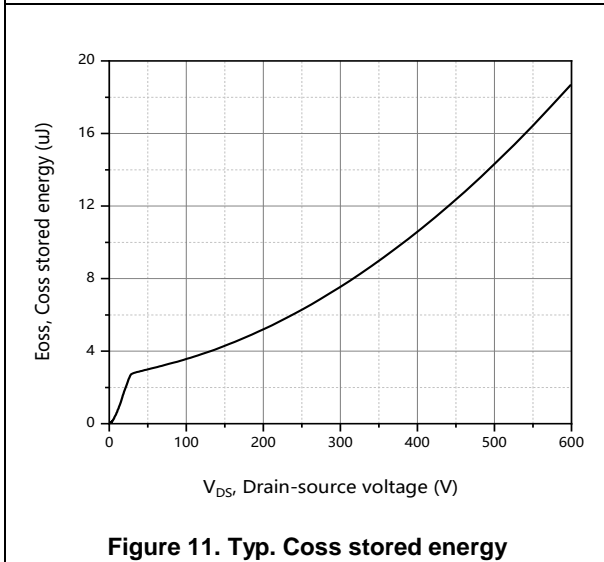
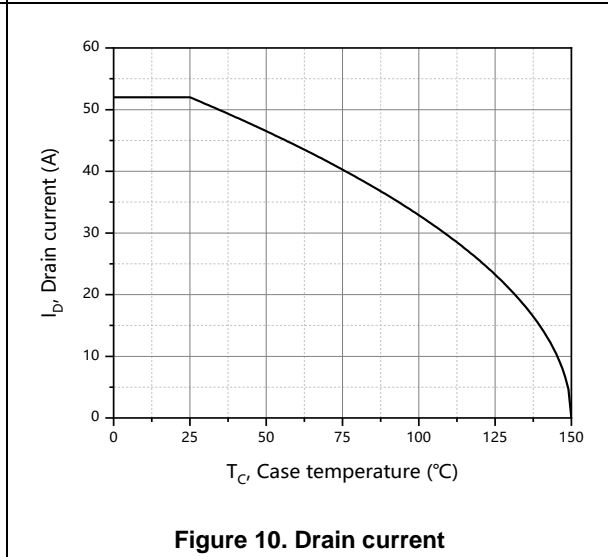
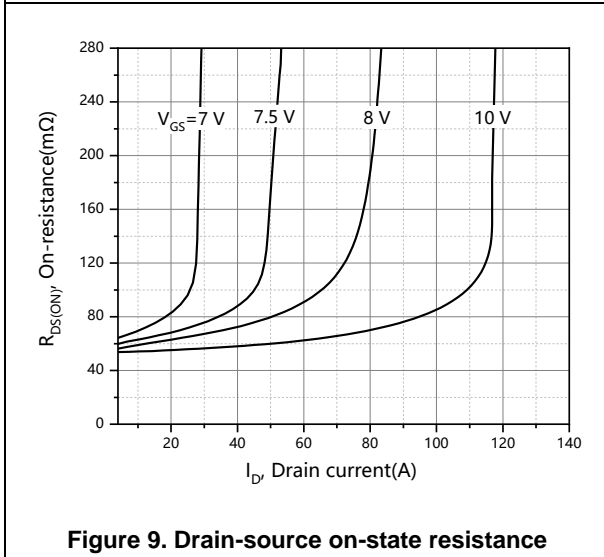
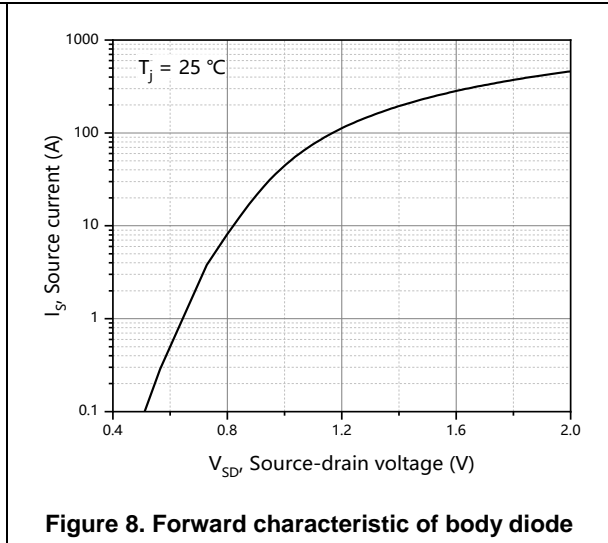
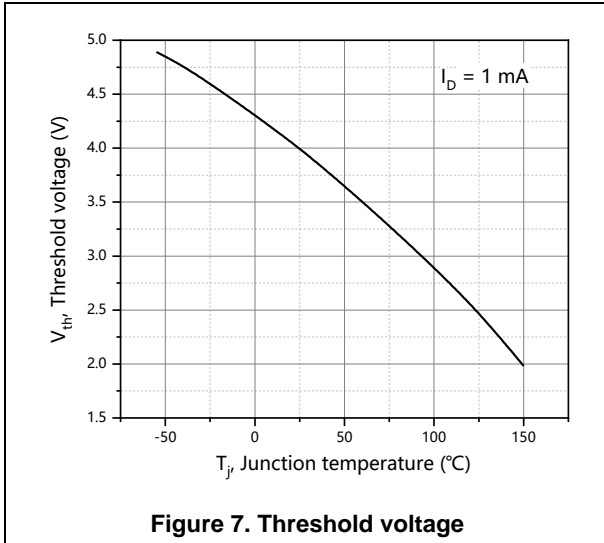
**Figure 4. Typ. gate charge**

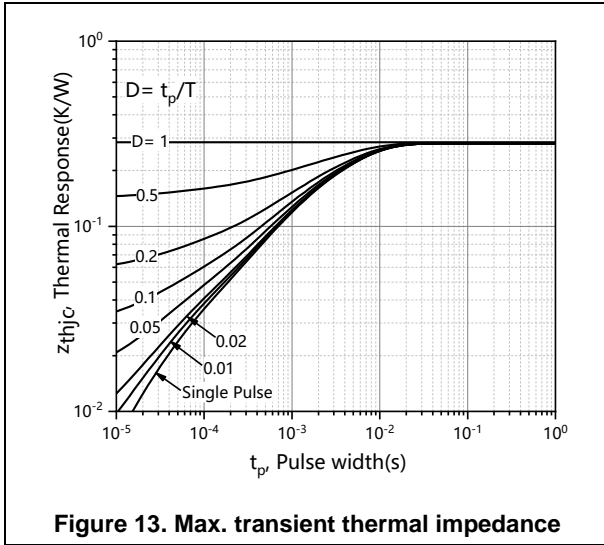


**Figure 5. Drain-source breakdown voltage**

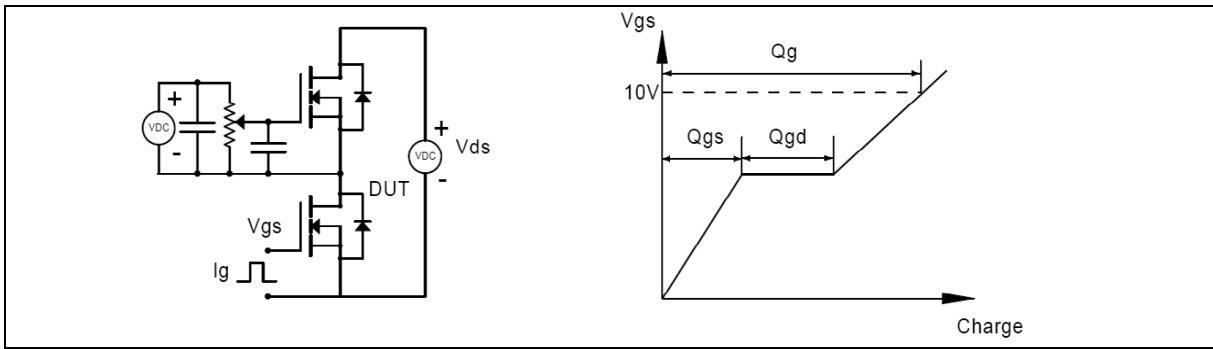


**Figure 6. Drain-source on-state resistance**

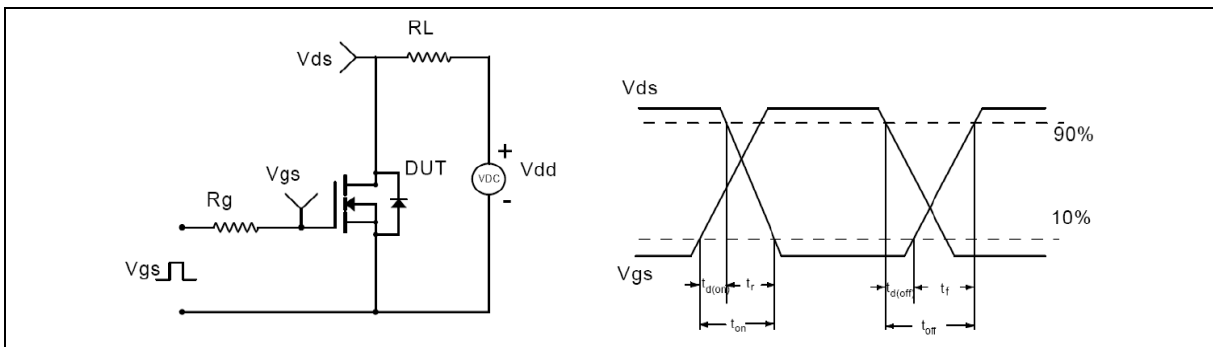




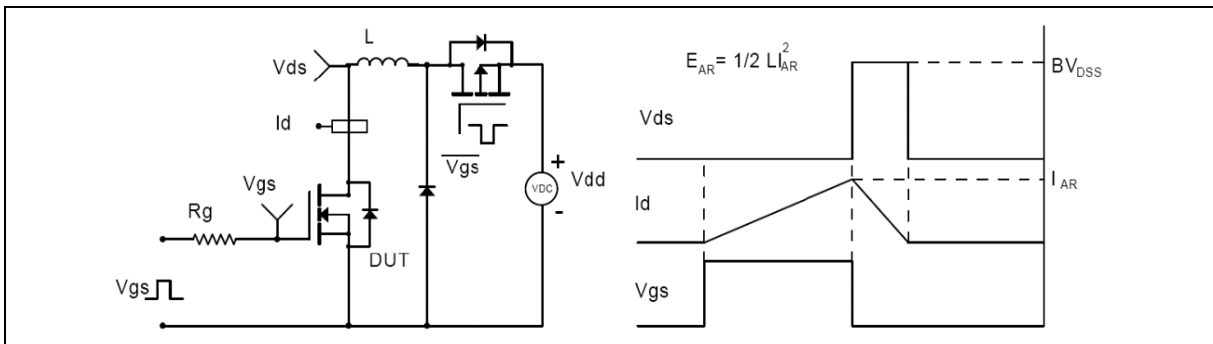
**Test circuits and waveforms**



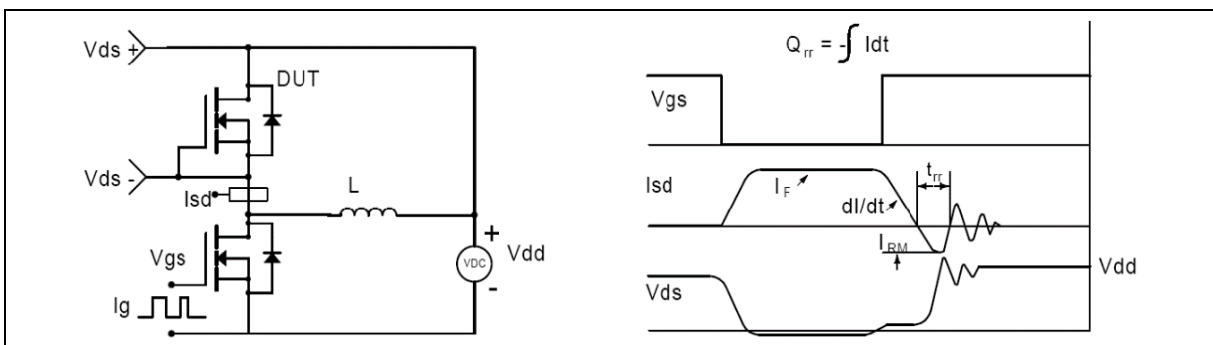
**Figure 1. Gate charge test circuit & waveform**



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

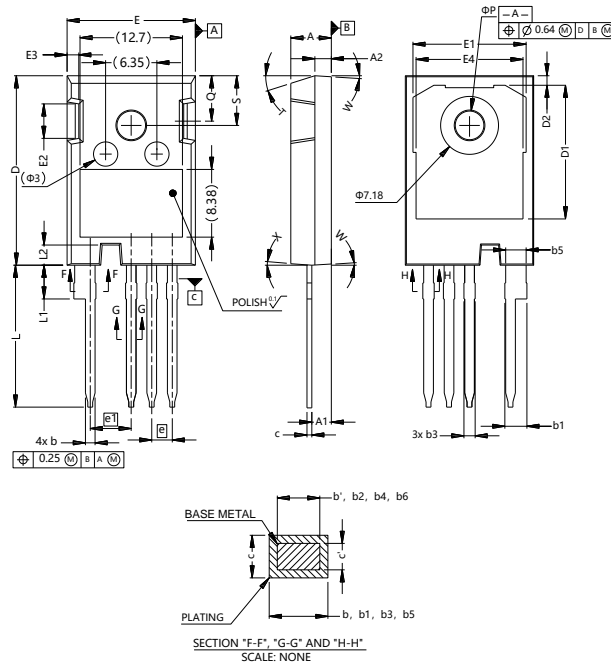


**Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms**



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

**Package Information**



Symbol	mm	
	Min	Max
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
ΦP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF	
W	3.5° REF	
X	4° REF	

Version 1: TO247-4L-S package outline dimension



## Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO247-4L-S	30	15	450	4	1800

## Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG60R060H4T3ZF	TO247-4L	yes	yes	yes

## Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Oriental Semiconductor hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

For further information on technology, delivery terms and conditions and prices, please contact the Oriental Semiconductor sales representatives ([www.orientalsemi.com](http://www.orientalsemi.com)).

© Oriental Semiconductor Co.,Ltd. All Rights Reserved 