

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[®] Generic series is optimized for extreme switching performance to minimize switching loss. It is tailored for high power density applications to meet the highest efficiency standards.

Features

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

GreenMOS[®]



Applications

- PC power
- LED lighting
- Telecom power
- Server power
- EV Charger
- Solar/UPS

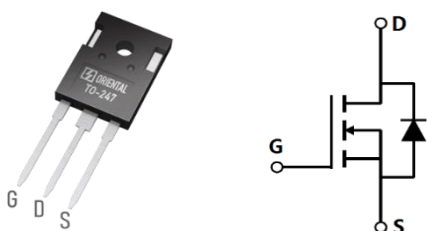
Key Performance Parameters

Parameter	Value	Unit
$V_{DS, \min} @ T_{j(max)}$	700	V
I_D, pulse	330	A
$R_{DS(ON)}, \max @ V_{GS}=10V$	20	$m\Omega$
Q_g	163	nC

Marking Information

Product Name	Package	Marking
OSG65R020HT3F	TO247	OSG65R020HT3

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}	650	V
Gate-source voltage	V_{GS}	± 30	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	110	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		70	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, \text{pulse}}$	330	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	110	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, \text{pulse}}$	330	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	637	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	1960	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\ldots 480\text{ V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\ldots 480\text{ V}$, $I_{SD}\leq I_D$	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	$R_{\theta JC}$	0.20	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	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}	650			V	$V_{GS}=0\text{ V}$, $I_D=2\text{ mA}$
		700				$V_{GS}=0\text{ V}$, $I_D=2\text{ mA}$, $T_j=150^{\circ}\text{C}$
Gate threshold voltage	$V_{GS(th)}$	3.5		4.5	V	$V_{DS}=V_{GS}$, $I_D=2\text{ mA}$
Drain-source on-state resistance	$R_{DS(ON)}$		18	20	m Ω	$V_{GS}=10\text{ V}$, $I_D=55\text{ A}$
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	μA	$V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$
Gate resistance	R_G		3.7		Ω	$f=1\text{ MHz}$, Open drain

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		10461		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		495		pF	
Reverse transfer capacitance	C_{rss}		5.3		pF	
Effective output capacitance, energy related	$C_{o(er)}$		321		pF	$V_{GS} = 0\text{ V}$, $V_{DS} = 0\text{V-}400\text{V}$
Effective output capacitance, time related	$C_{o(tr)}$		1934		pF	
Turn-on delay time	$t_{d(on)}$		40.8		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\ \Omega$, $I_D=50\text{ A}$
Rise time	t_r		63.2		ns	
Turn-off delay time	$t_{d(off)}$		119.2		ns	
Fall time	t_f		3		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		163		nC	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $I_D=50\text{ A}$
Gate-source charge	Q_{gs}		53.6		nC	
Gate-drain charge	Q_{gd}		41		nC	
Gate plateau voltage	$V_{plateau}$		5.9		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	$I_S=110\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		580		ns	$V_R=400\text{ V}$, $I_S=40\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		11		μC	
Peak reverse recovery current	I_{rrm}		33.6		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) $V_{DD}=100\text{ V}$, $V_{GS}=10\text{ V}$, $L=80\text{ mH}$, starting $T_j=25\text{ }^{\circ}\text{C}$.

Electrical Characteristics Diagrams

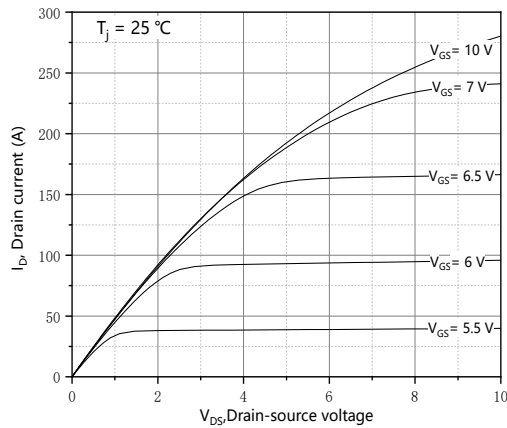


Figure 1. Typ. output characteristics

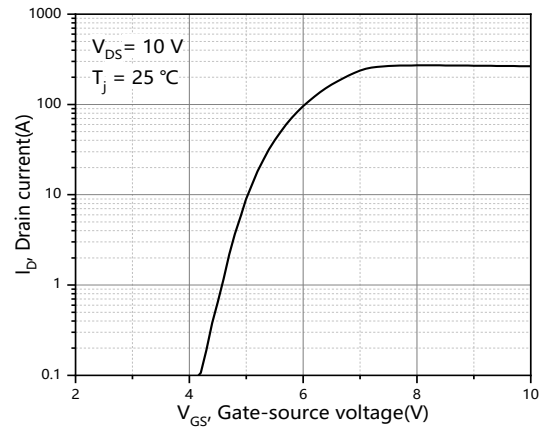


Figure 2. Typ. transfer characteristics

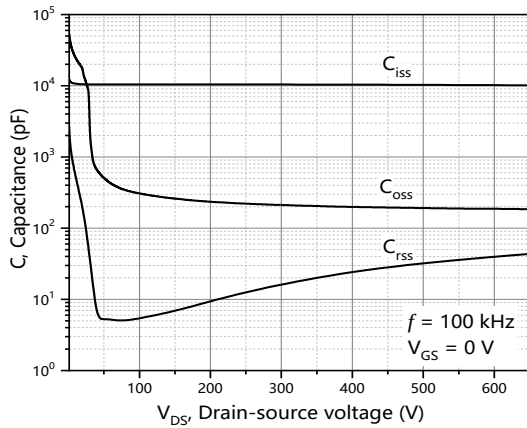


Figure 3. Typ. capacitances

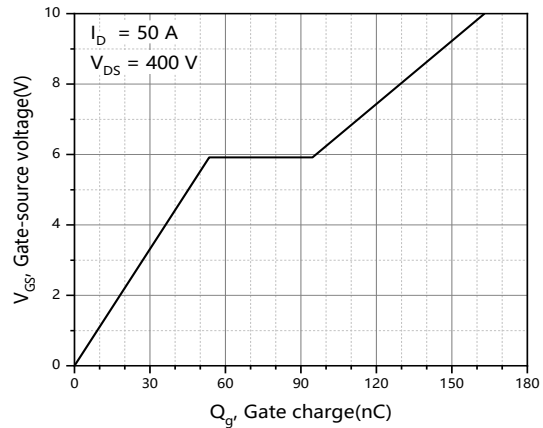


Figure 4. Typ. gate charge

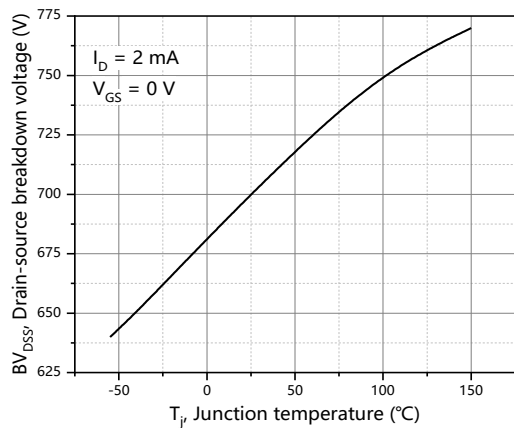


Figure 5. Drain-source breakdown voltage

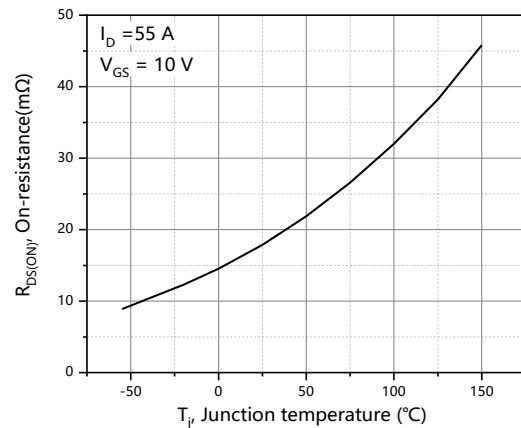


Figure 6. Drain-source on-state resistance

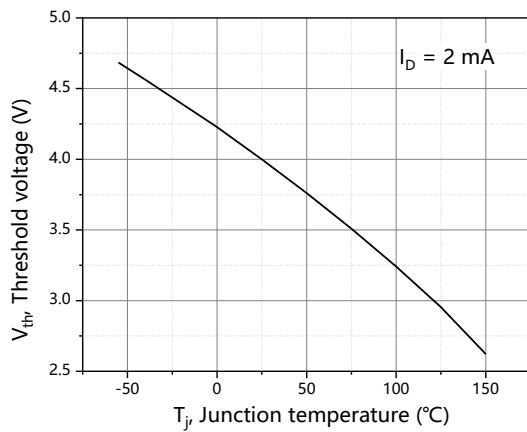


Figure 7. Threshold voltage

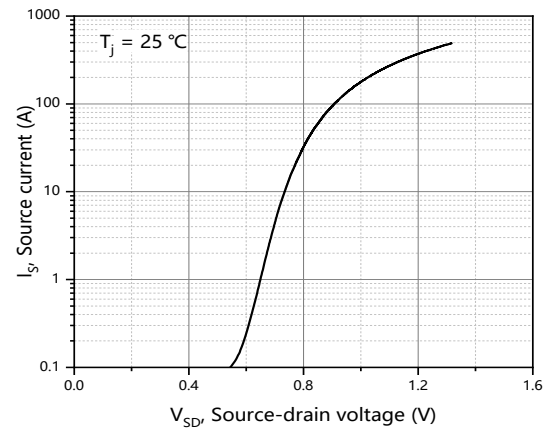


Figure 8. Forward characteristic of body diode

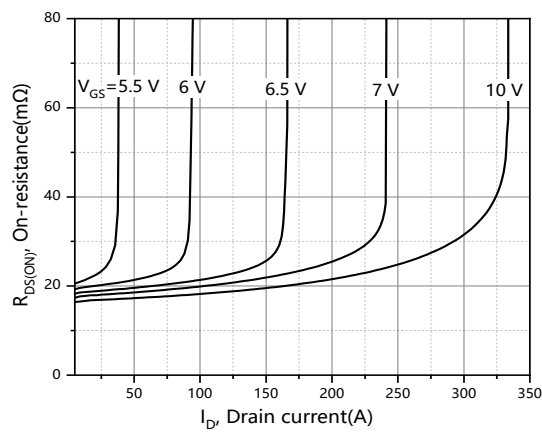


Figure 9. Drain-source on-state resistance

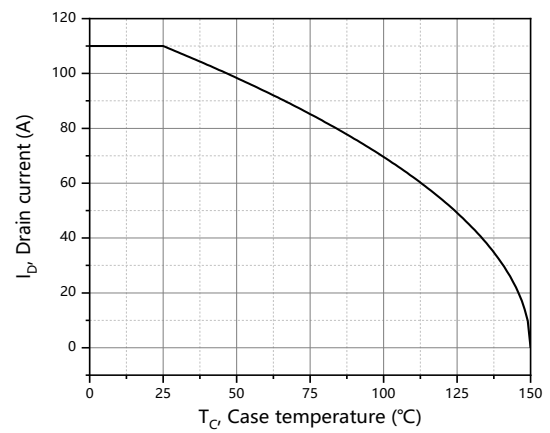


Figure 10. Drain current

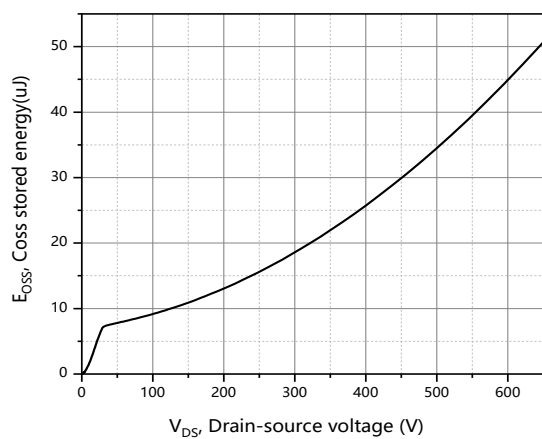


Figure 11. Typ. Coss stored energy

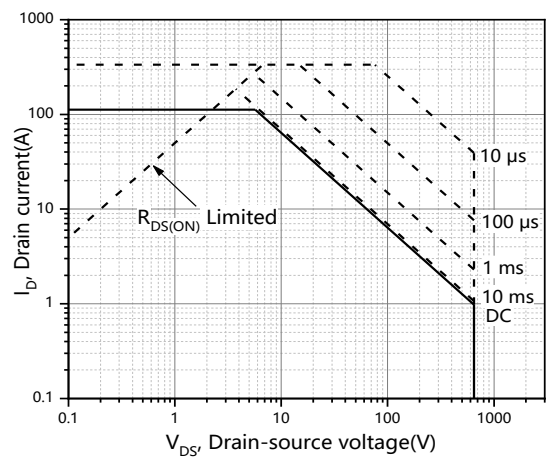
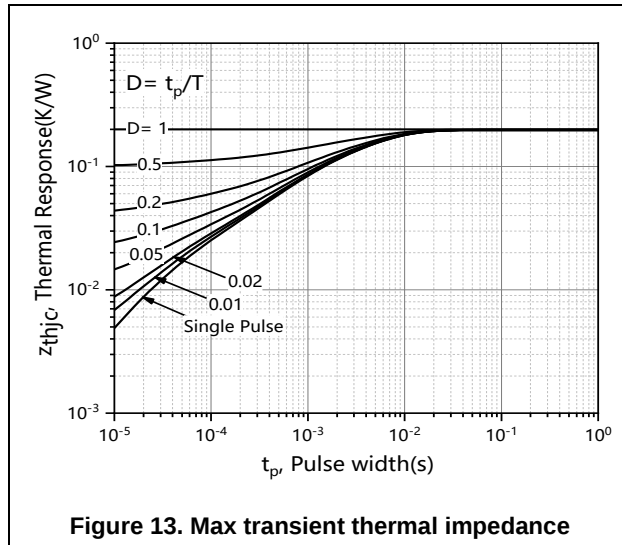


Figure 12. Safe operation area for $T_C=25^\circ\text{C}$



Test circuits and waveforms



Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms

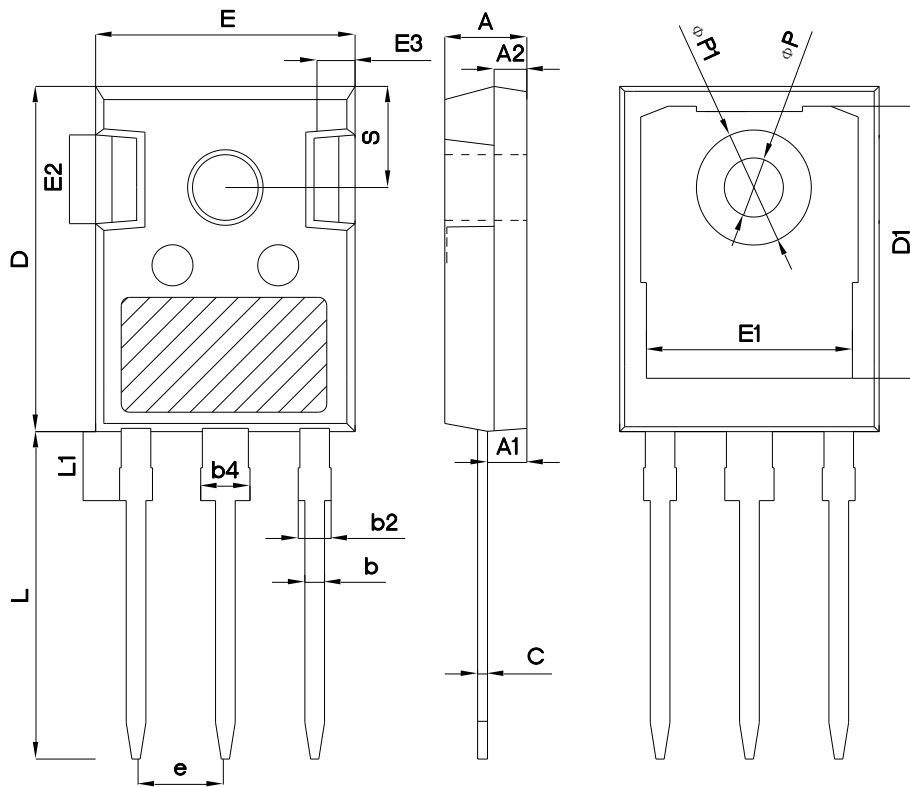


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms



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-P package outline dimension

Ordering Information

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

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R020HT3F	TO247	yes	yes	yes

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