

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

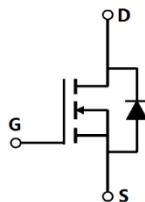
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	600	V
I_D , pulse	21	A
$R_{DS(ON)}$, max @ $V_{GS}=10V$	670	m Ω
Q_g	7.8	nC

Marking Information

Product Name	Package	Marking
OSG60R670FF	TO220F	OSG60R670F

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}	± 30	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	7	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		4.4	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, \text{ pulse}}$	21	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	7	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, \text{ pulse}}$	21	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	26	W
Single pulsed avalanche energy ⁴⁾	E_{AS}	130	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	$R_{\theta JC}$	4.8	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	62.5	$^{\circ}\text{C/W}$

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	$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	2.0		4.0	V	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		0.6	0.67	Ω	$V_{GS}=10\text{ V}$, $I_D=3.5\text{ A}$
			1.38			$V_{GS}=10\text{ V}$, $I_D=3.5\text{ A}$, $T_j=150^{\circ}\text{C}$
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	μA	$V_{DS}=600\text{ V}$, $V_{GS}=0\text{ V}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		353		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}		46.9		pF	
Reverse transfer capacitance	C_{rss}		1.9		pF	
Turn-on delay time	$t_{d(on)}$		16.9		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=25\ \Omega$, $I_D=3\text{ A}$
Rise time	t_r		7.1		ns	
Turn-off delay time	$t_{d(off)}$		32.9		ns	
Fall time	t_f		26.2		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		7.8		nC	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $I_D=3\text{ A}$
Gate-source charge	Q_{gs}		2		nC	
Gate-drain charge	Q_{gd}		3.3		nC	
Gate plateau voltage	$V_{plateau}$		5.6		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	$I_S=7\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		172		ns	$V_R=400\text{ V}$, $I_S=3\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		1.5		μC	
Peak reverse recovery current	I_{rrm}		12.8		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) $V_{DD}=50\text{ V}$, $V_{GS}=10\text{ V}$, $L=20\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Electrical Characteristics Diagrams

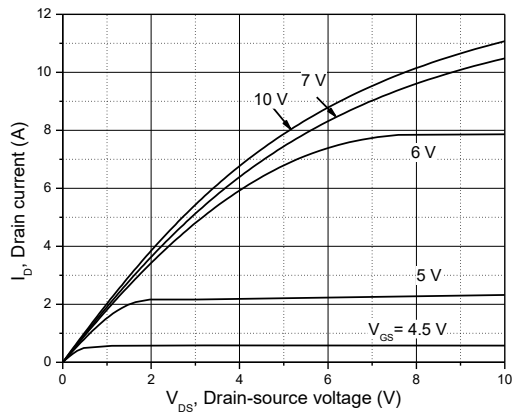


Figure 1. Typ. output characteristics

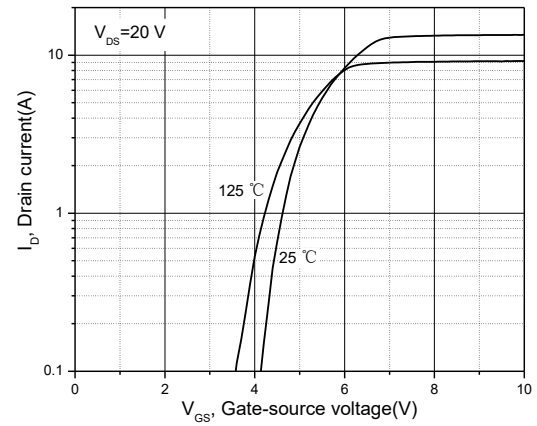


Figure 2. Typ. transfer characteristics

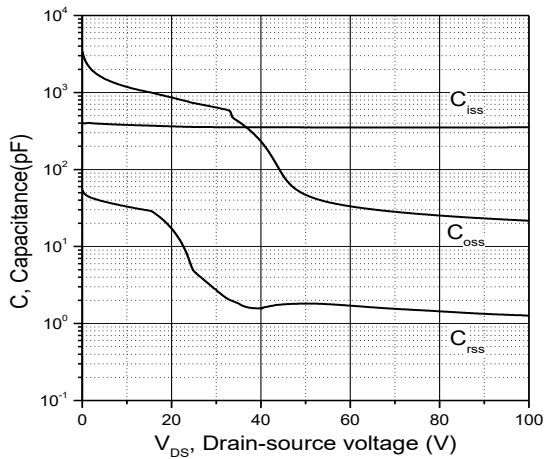


Figure 3. Typ. capacitances

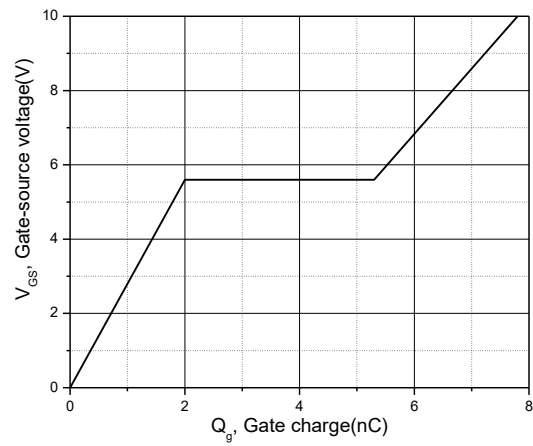


Figure 4. Typ. gate charge

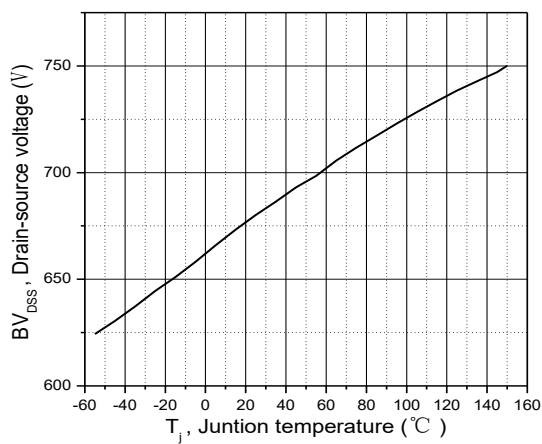


Figure 5. Drain-source breakdown voltage

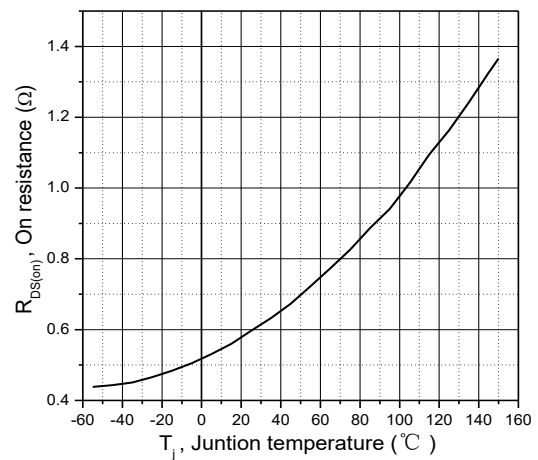


Figure 6. Drain-source on-state resistance

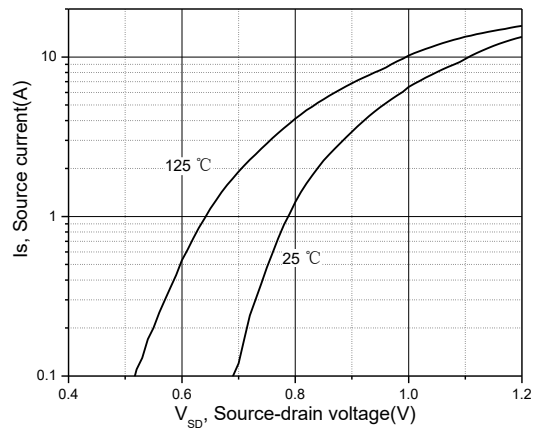


Figure 7. Forward characteristic of body diode

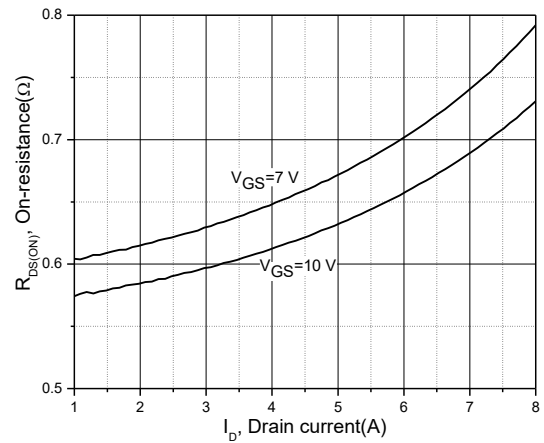


Figure 8. Drain-source on-state resistance

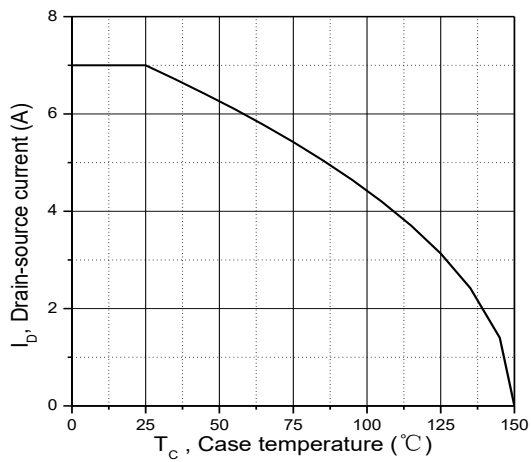


Figure 9. Drain current

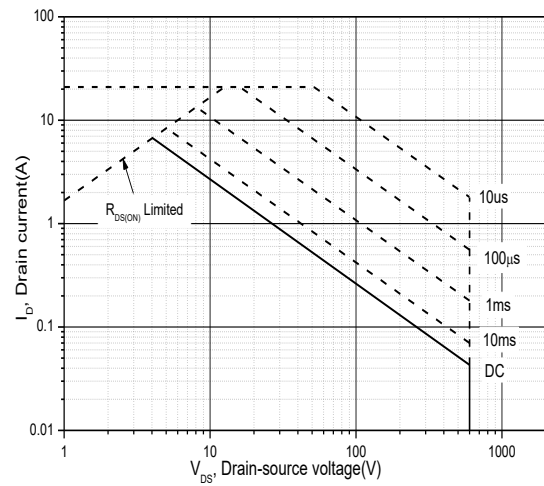


Figure 10. Safe operation area $T_C=25\text{ }^{\circ}\text{C}$

Test circuits and waveforms



Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms

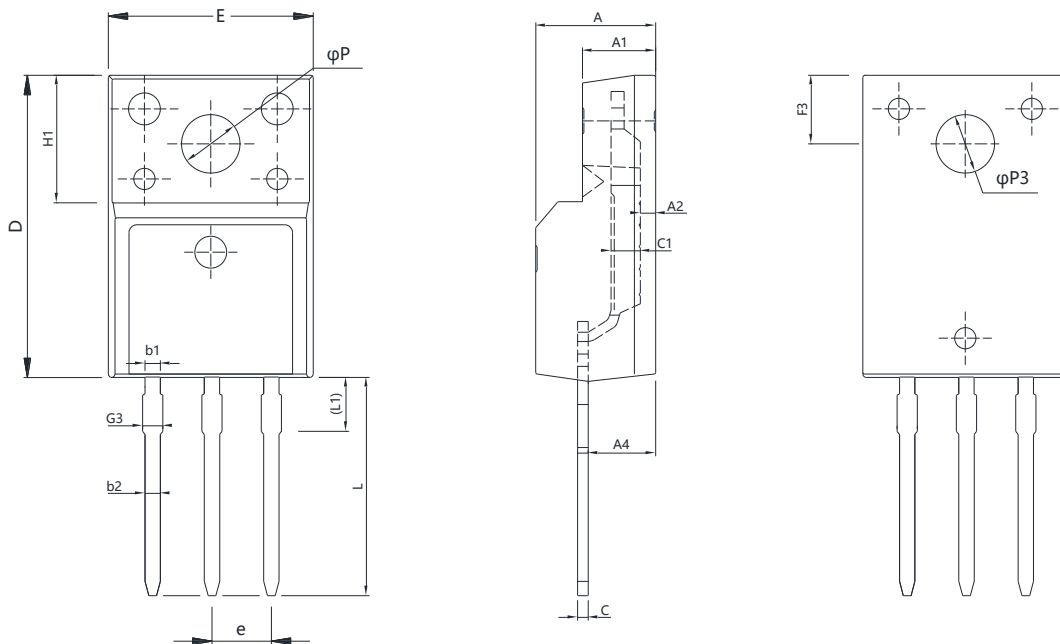


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms



Figure 4. Diode reverse recovery test circuit & waveforms

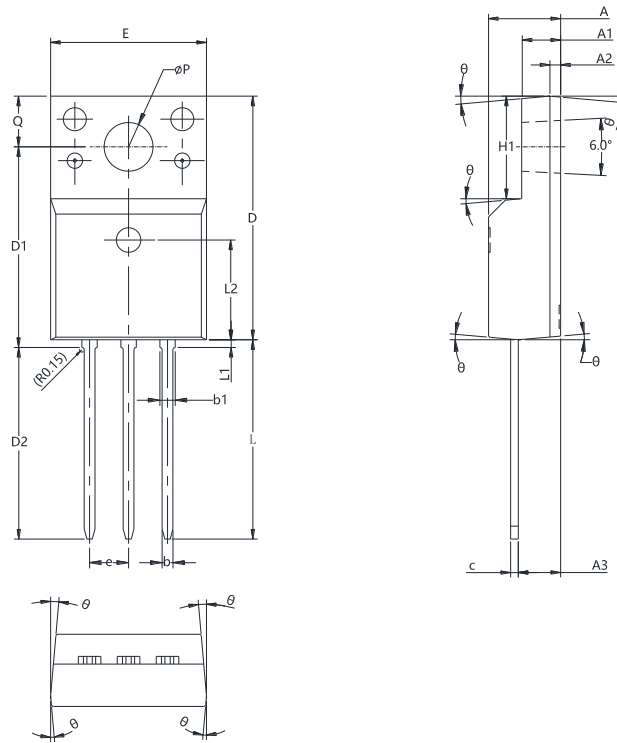
Package Information



Symbol	mm		
	Min	Nom	Max
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
C1	1.20	1.30	1.35
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.88	3.03	3.18
φP	3.03	3.18	3.38
φP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95

Version1: TO220F-P package outline dimension

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70REF		
A3	2.56	2.76	2.93
b	0.70	-	0.90
b1	1.18	-	1.38
b2	-	-	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.00
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.8
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50REF		
ΦP	3.08	3.18	3.28
Q	3.20	-	3.40
θ	1°	3°	5°

Version2: TO220-J package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220F-P	50	20	1000	6	6000
TO-220F-J	50	20	1000	5	5000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG60R670FF	TO220F	yes	yes	yes

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