

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[®] E series is optimized for its switching characteristics to achieve balance between EMI and efficiency. It is designed to enable power supply systems to reach the highest efficiency while still meeting EMI standards.

Features

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




Applications

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

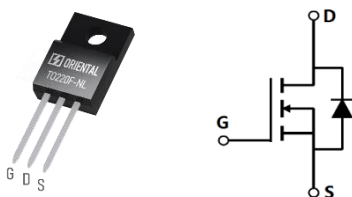
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	650	V
I_D , pulse	33	A
$R_{DS(ON)}$, max @ $V_{GS}=10V$	380	m Ω
Q_g	15	nC

Marking Information

Product Name	Package	Marking
OSG65R380FEF_NB	TO220F_NL	OSG65R380FE

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	11	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		7	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	33	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	15	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, pulse}$	45	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	31	W
Single pulsed avalanche energy ⁴⁾	E_{AS}	200	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	$R_{\theta JC}$	4	$^{\circ}\text{C/W}$
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}	650			V	$V_{GS}=0\text{ V}$, $I_D=250\ \mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	2.9		3.9	V	$V_{DS}=V_{GS}$, $I_D=250\ \mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		0.30	0.38	Ω	$V_{GS}=10\text{ V}$, $I_D=5.5\text{ A}$
			0.77			$V_{GS}=10\text{ V}$, $I_D=5.5\text{ A}$, $T_j=150^{\circ}\text{C}$
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	$V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		761.3		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}		62.0		pF	
Reverse transfer capacitance	C_{rss}		2.5		pF	
Turn-on delay time	$t_{d(on)}$		31.0		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\ \Omega$, $I_D=6\text{ A}$
Rise time	t_r		18.8		ns	
Turn-off delay time	$t_{d(off)}$		58.3		ns	
Fall time	t_f		6.5		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		15.0		nC	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $I_D=6\text{ A}$
Gate-source charge	Q_{gs}		3.7		nC	
Gate-drain charge	Q_{gd}		5.8		nC	
Gate plateau voltage	$V_{plateau}$		5.7		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	$I_S=11\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		239.7		ns	$V_R=400\text{ V}$, $I_S=6\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		2.5		μC	
Peak reverse recovery current	I_{rrm}		21.2		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

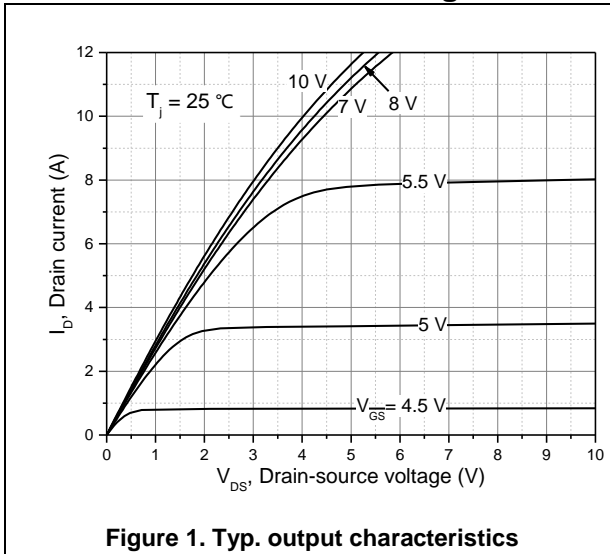


Figure 1. Typ. output characteristics

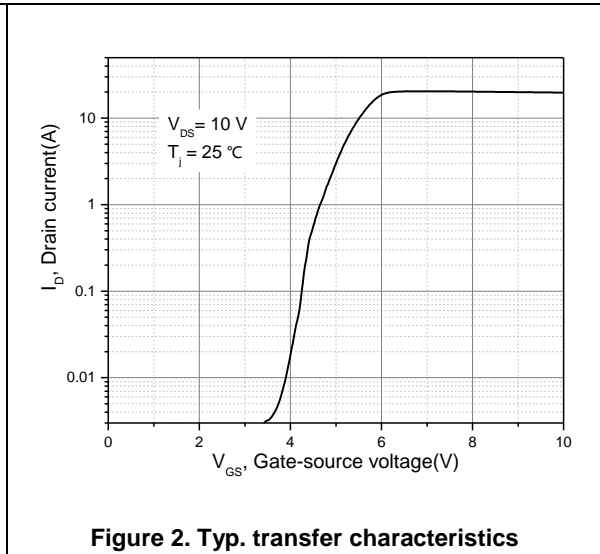


Figure 2. Typ. transfer characteristics

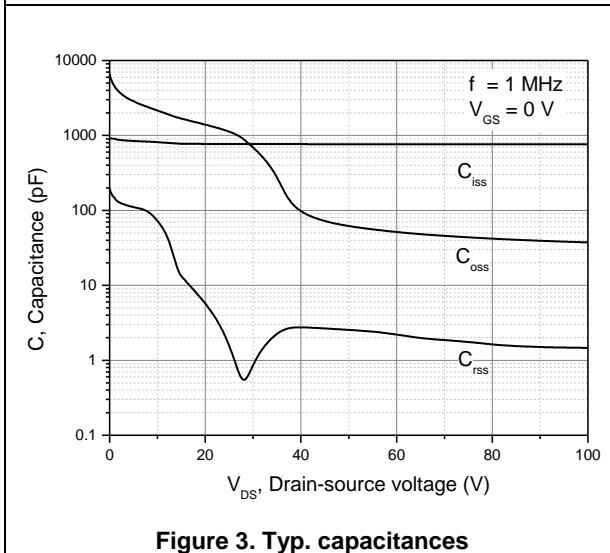


Figure 3. Typ. capacitances

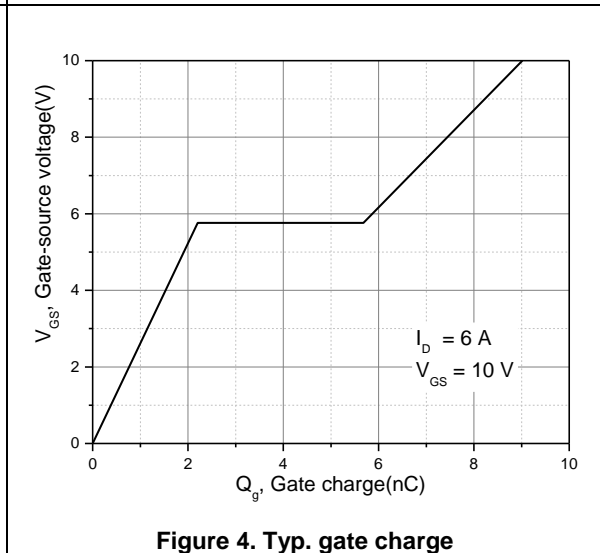


Figure 4. Typ. gate charge

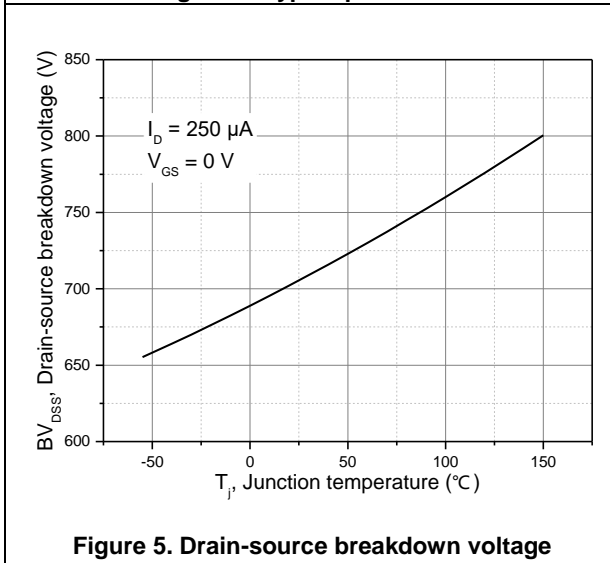


Figure 5. Drain-source breakdown voltage

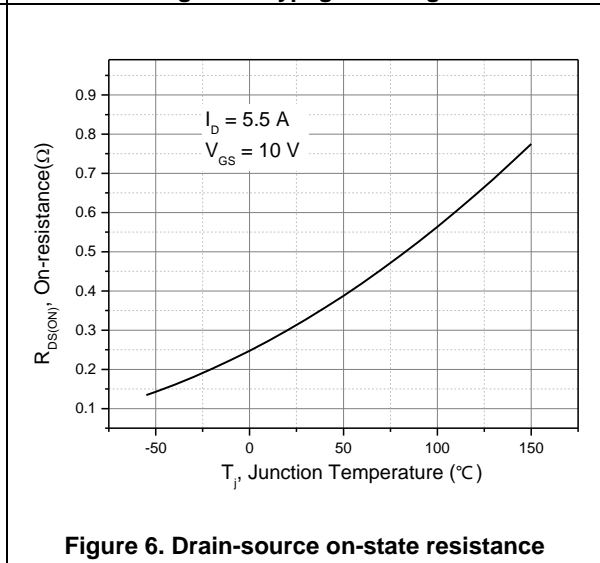
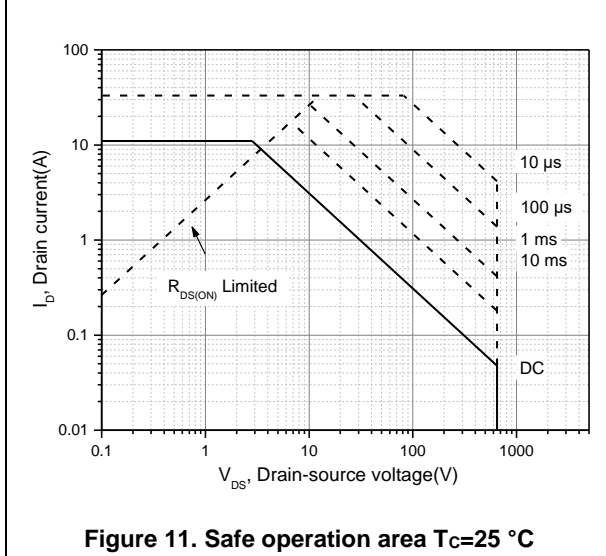
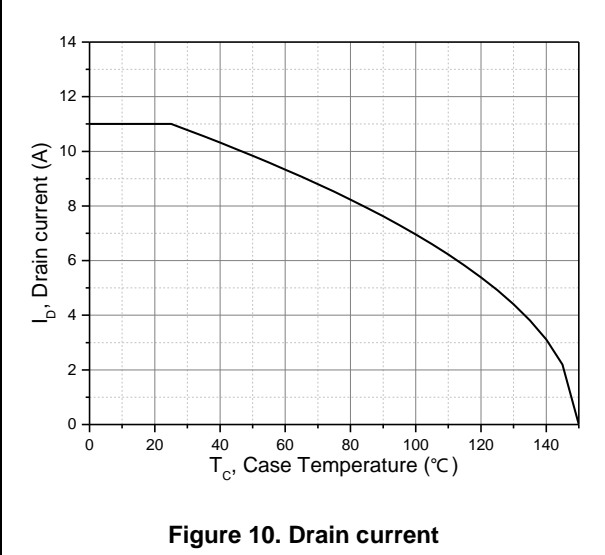
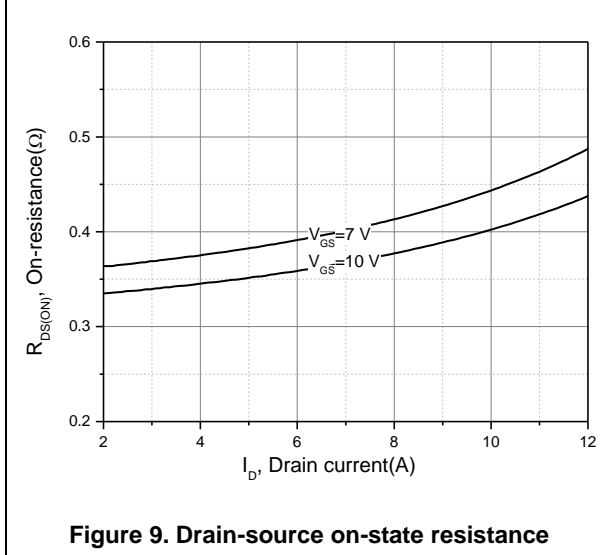
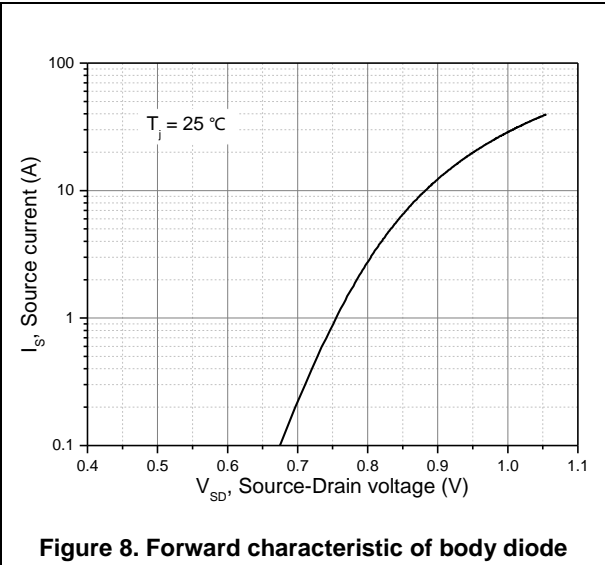
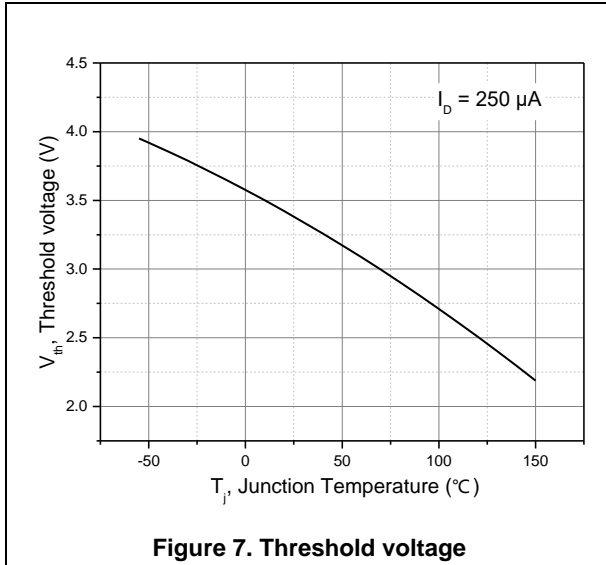


Figure 6. Drain-source on-state resistance



Test circuits and waveforms



Figure 1. Gate charge test circuit & waveform



Figure 2. Switching time test circuit & waveforms

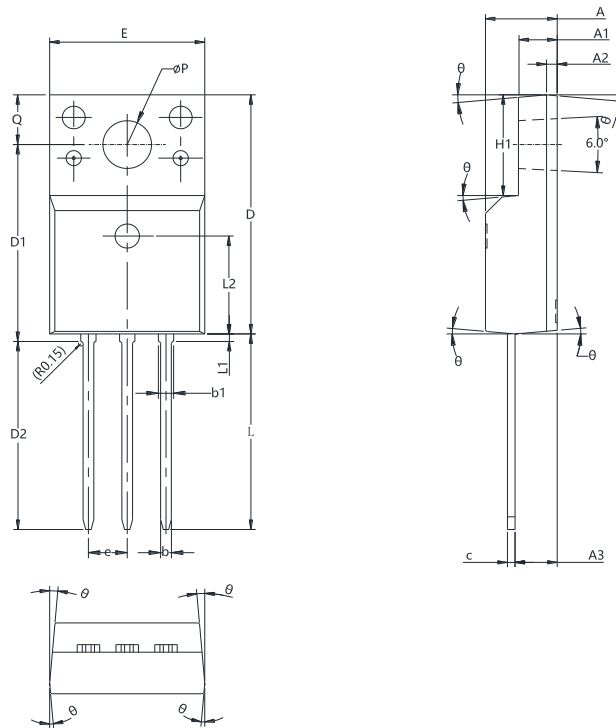


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms



Figure 4. Diode reverse recovery test circuit & waveforms

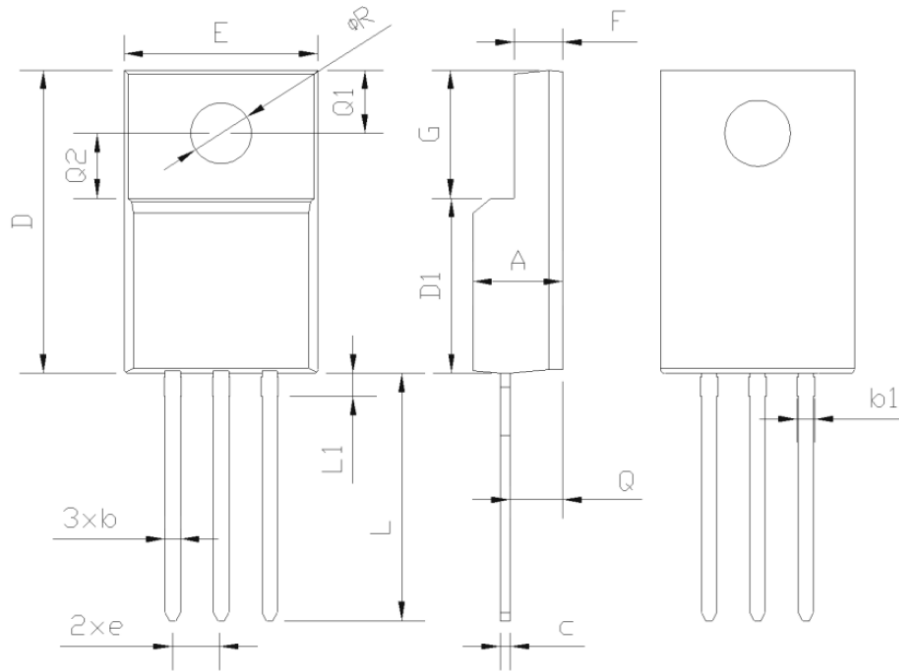
Package Information



Symbol	mm		
	Min	Nom	Max
A	4.5	4.7	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.93
b	0.6	-	0.8
b1	0.9	-	1.1
c	0.45	0.5	0.6
D	15.67	15.87	16.07
D1	12.87	13.07	13.27
D2	12.28	12.48	12.68
E	9.96	10.16	10.36
e	2.54 BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	0.85
L2	6.50 REF		
ΦP	3.08	3.18	3.28
Q	3.20	-	3.40
θ1	1°	3°	5°

Version : TO220F_NL-J package outline dimension

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.30	4.50	4.70
b	0.60	0.70	0.80
b1	0.60	0.80	0.90
c	0.45	0.50	0.60
D	14.70	15.00	15.30
D1	8.50 REF		
e	2.60 BSC		
E	9.70	10.00	10.30
F	2.50	2.70	2.90
G	6.30	6.50	6.70
L	13.40	13.60	13.80
L1	1.00	1.10	1.20
Q	2.50	2.60	2.70
Q1	2.90	3.00	3.10
Q2	3.50 REF		
ΦR	3.00	3.20	3.40

Version : TO220F_NL-M package outline dimension

Ordering Information

Package Type	Units/ Reel	Reels/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220F_NL-J	50	20	1000	5	5000
TO220F_NL-M	50	40	2000	4	8000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R380FEF_NB	TO220F_NL	yes	yes	yes

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Revision History

Version	Revision History	Date
V2.0	Initial release	2019-11-01
V2.1	Update ordering information assembly site "M"	2026-05-12