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

Applications

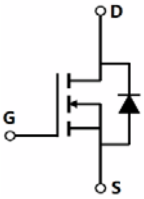
- PC power
- LED lighting
- Telecom power
- Server power
- EV Charger
- Solar/UPS

Key Performance Parameters

Parameter	Value	Unit
$V_{DS,\ min}$ @ $T_{j(max)}$	550	V
$I_{D,\ pulse}$	9	A
$R_{DS(ON)\ ,\ max}$ @ V_{GS}=10V	1.5	Ω
Q_g	4.84	

OSG50R1K5FF	TO220F	OSG50R1K5F

Package & Pin Information



Absolute Maximum Ratings at T_j=25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	500	V
Gate-source voltage	V_{GS}	±30	V
Continuous drain current[1], T_C=25 °C	I_D	3	A
Continuous drain current[1], T_C=100 °C		1.9	
Pulsed drain current[2], T_C=25 °C	$I_{D,\ pulse}$	9	A
Continuous diode forward current[1], T_C=25 °C	I_S	3	A
Diode pulsed current[2], T_C=25 °C	$I_{S,\ pulse}$	9	A
Power dissipation[3], T_C=25 °C	P_D	18	W
Single pulsed avalanche energy[5]	E_{AS}	60	mJ
MOSFET dv/dt ruggedness, V_{DS}=0…480 V	dv/dt	50	V/ns
Reverse diode dv/dt, V_{DS}=0…480 V, $I_{SD}\le I_D$	dv/dt	15	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	6.94	°C/W
Thermal resistance, junction-ambient[4]	$R_{\theta JA}$	62.5	°C/W

Electrical Characteristics at T_j=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	500			V	V_{GS}=0 V, I_D=250 μA
		550	630			V_{GS}=0 V, I_D=250 μA, T_j=150 °C
Gate threshold voltage	$V_{GS(th)}$	2.9		3.9	V	V_{DS}=V_{GS}, I_D=250 μA
Drain-source on-state resistance	$R_{DS(ON)}$		1.3	1.5	Ω	V_{GS}=10 V, I_D=1.5 A
			3			V_{GS}=10 V, I_D=1.5 A, T_j=150 °C
Gate-source leakage current	I_{GSS}			100	nA	V_{GS}=30 V
				-100		V_{GS}=-30 V
Drain-source leakage current	I_{DSS}			1	μA	V_{DS}=500 V, V_{GS}=0 V

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		130.6		pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Output capacitance	C_{oss}		51.7		pF	
Reverse transfer capacitance	C_{rss}		1		pF	
Turn-on delay time	$t_{d(on)}$		15.3		ns	V_{GS}=10 V, V_{DS}=400 V, R_G=2 Ω, I_D=2 A
Rise time	t_r		4.8		ns	
Turn-off delay time	$t_{d(off)}$		22		ns	
Fall time	t_f		7.6		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		4.84		nC	V_{GS}=10 V, V_{DS}=400 V, I_D=2 A
Gate-source charge	Q_{gs}		0.87		nC	
Gate-drain charge	Q_{gd}		1.93		nC	
Gate plateau voltage	$V_{plateau}$		5.8		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	I_S=3 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		146.1		ns	V_R=400 V, I_S=2 A, di/dt=100 A/μs
Reverse recovery charge	Q_{rr}		0.7		μC	
Peak reverse recovery current	I_{rrm}		10.1		A	

Note

1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating; pulse width limited by max. junction temperature.
3) Pd 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 °C.
5) V_{DD}=50 V, V_{GS}=10 V, L=60 mH, starting T_j=25 °C.

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Electrical Characteristics Diagrams

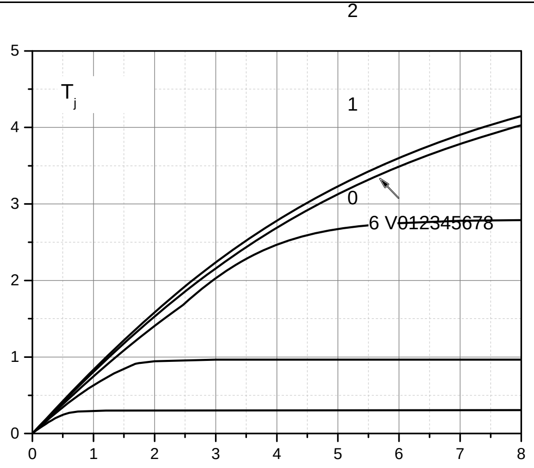


Figure 1. Typ. output characteristics

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

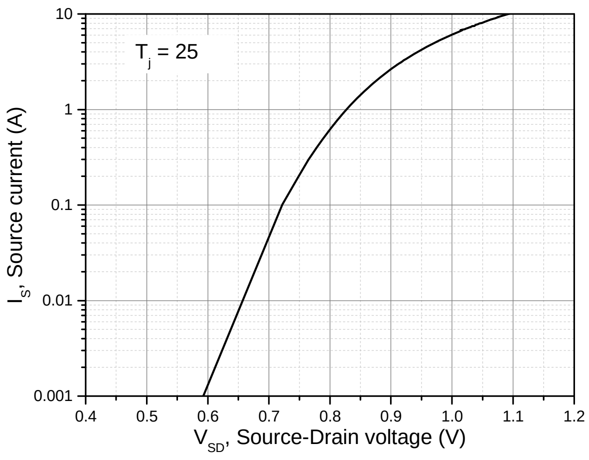


Figure 7. Forward characteristic of body diode

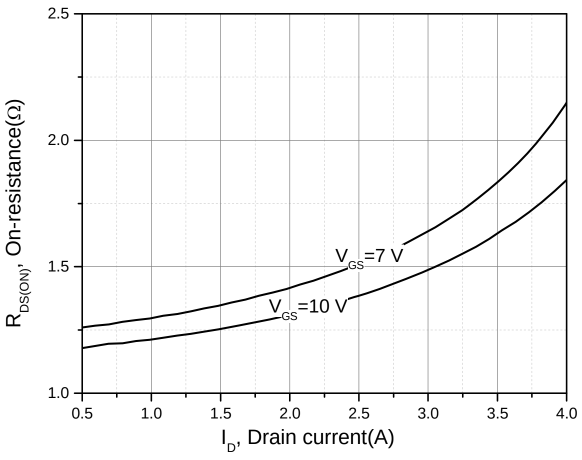


Figure 8. Drain-source on-state resistance

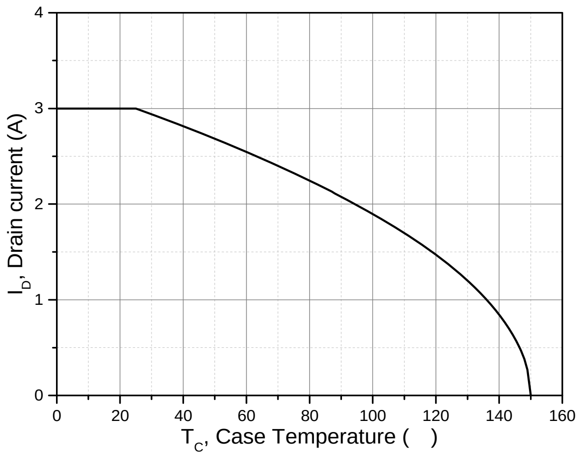


Figure 9. Drain current

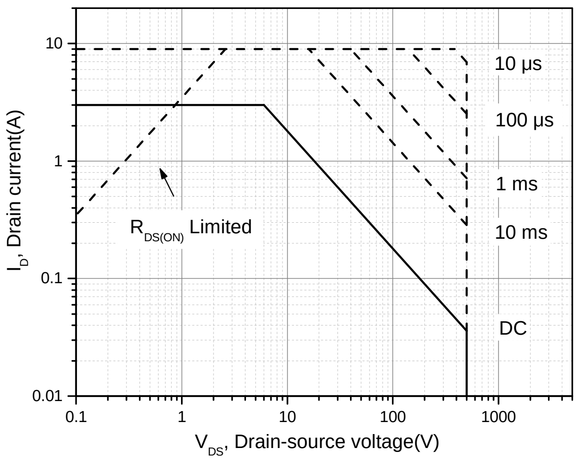


Figure 10. Safe operation area TC=25 °C

Test circuits and waveforms

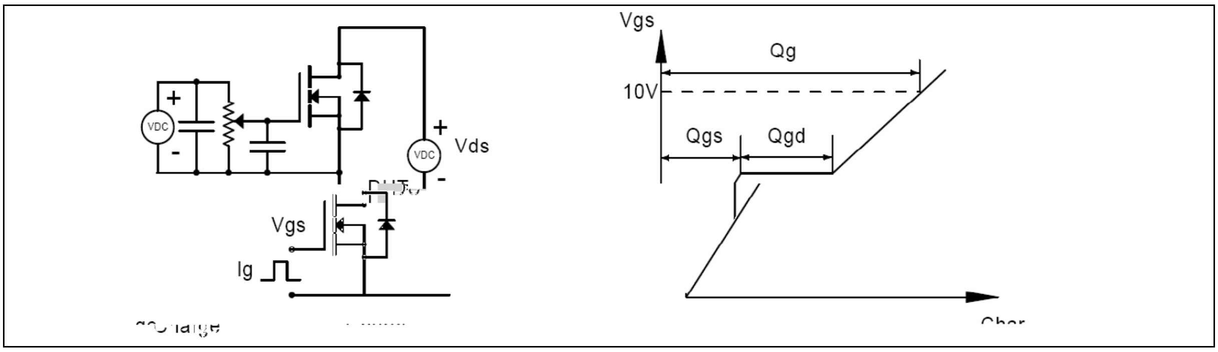


Figure 1. Gate charge test circuit & waveform

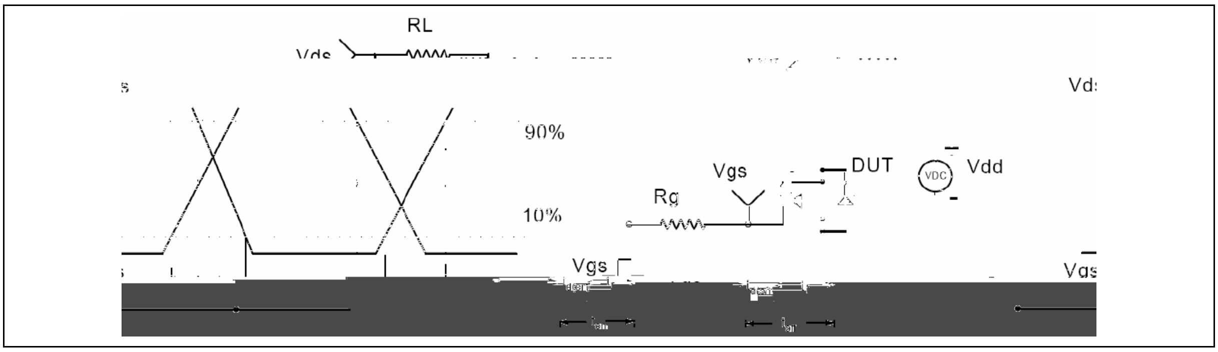


Figure 2. Switching time test circuit & waveforms

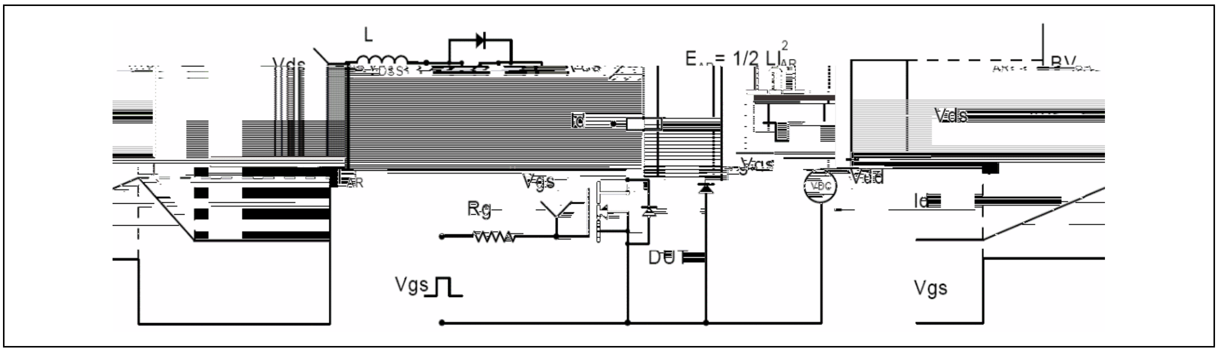


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

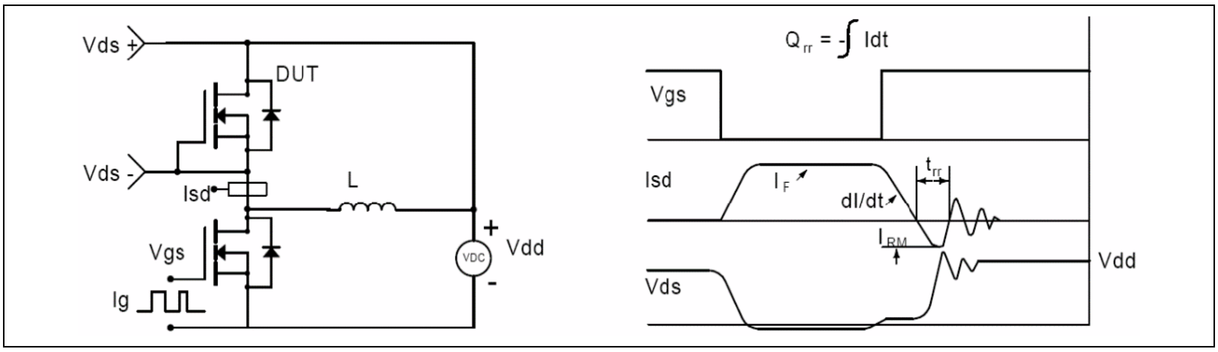
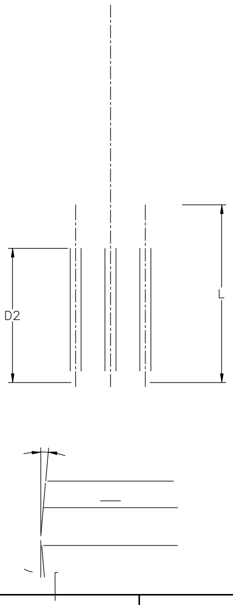


Figure 4. Diode reverse recovery test circuit & waveforms

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
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	2.54 BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50 REF		
ΦP	3.08	3.18	3.28
Q	3.20	-	3.40
θ	1º	3º	5º

Version 1: TO220F-J outline dimension