

Enhancement Mode N-Channel Power MOSFET

Features

- ◆ Ultra-fast and robust body diode
- ◆ Low $R_{DS(on)}$ & FOM
- ◆ Excellent low switching loss
- ◆ Excellent stability and uniformity
- ◆ Easy to drive

Applications

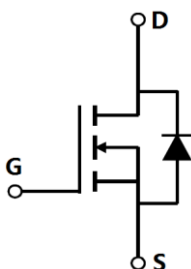

- ◆ PC power
- ◆ Server power supply
- ◆ Telecom
- ◆ Solar inverter
- ◆ Super charger for automobiles

■ General Description

OSG65R1K5DZF uses advanced GreenMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and super charger applications.

◆ $V_{DS, min@T_{jmax}}$	700 V
◆ $I_{D, pulse}$	12 A
◆ $R_{DS(ON), max @ V_{GS}=10 V}$	1.5 Ω
◆ Q_g	6.5 nC

■ Schematic and Package Information

Schematic Diagram 	Pin Assignment-Top View  TO252 OSG65R1K5DZF
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■ 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	4	A
Continuous drain current ¹⁾ , $T_C=100^\circ\text{C}$		2.5	
Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$	$I_{D, pulse}$	12	A
Power dissipation ³⁾ , $T_C=25^\circ\text{C}$	P_D	28.4	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	40	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	$R_{\theta JC}$	4.4	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	62.5	$^{\circ}\text{C}/\text{W}$

■ 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	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
		700	750			$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}, T_j=150^{\circ}\text{C}$
Gate threshold voltage	$V_{GS(th)}$	3.7		4.7	V	$V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$
Drain-source on-state resistance	$R_{DS(on)}$		1.3	1.5	Ω	$V_{GS}=10\text{ V}, I_D=2\text{ A}$
			3.4			$V_{GS}=10\text{ V}, I_D=2\text{ A}, T_j=150^{\circ}\text{C}$
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	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}		323.8		pF	$V_{GS}=0\text{ V}, V_{DS}=50\text{ V}, f=1\text{ MHz}$
Output capacitance	C_{oss}		23.5		pF	
Reverse transfer capacitance	C_{rss}		2.5		pF	
Turn-on delay time	$t_{d(on)}$		42.1		ns	$V_{GS}=10\text{ V}, V_{DS}=400\text{ V}, R_G=2\ \Omega, I_D=2\text{ A}$
Rise time	t_r		27.5		ns	
Turn-off delay time	$t_{d(off)}$		42.3		ns	
Fall time	t_f		8.6		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		6.5		nC	$I_D=2\text{ A}$, $V_{DS}=400\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		2.1		nC	
Gate-drain charge	Q_{gd}		3.0		nC	
Gate plateau voltage	V_{plateau}		7.8		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current	I_S			4	A	$V_{GS} < V_{th}$
Pulsed source current	I_{SP}			12		
Diode forward voltage	V_{SD}			1.3	V	$I_S=4\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		61.6		ns	$V_R=400\text{ V}$, $I_S=2\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		0.2		uC	
Peak reverse recovery current	I_{rrm}		5.3		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) $V_{DD}=100\text{ V}$, $R_G=50\text{ }\Omega$, $L=60\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

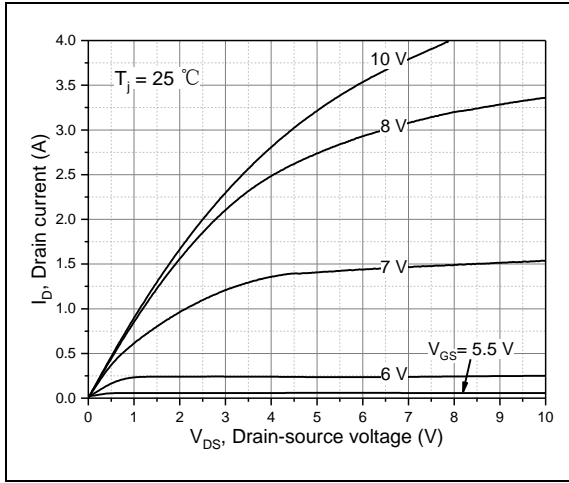


Figure 1, Typ. output characteristics

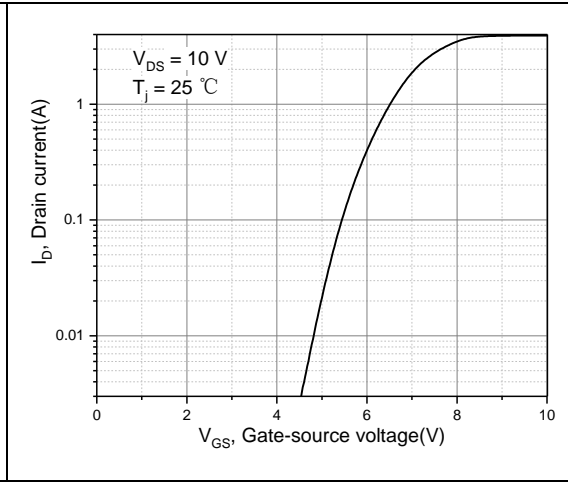


Figure 2, Typ. transfer characteristics

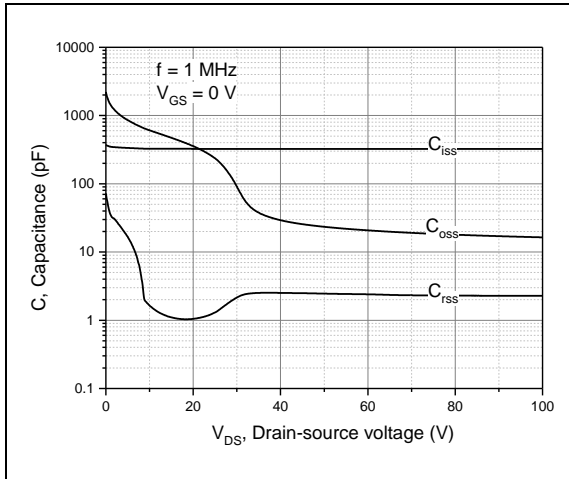


Figure 3, Typ. capacitances

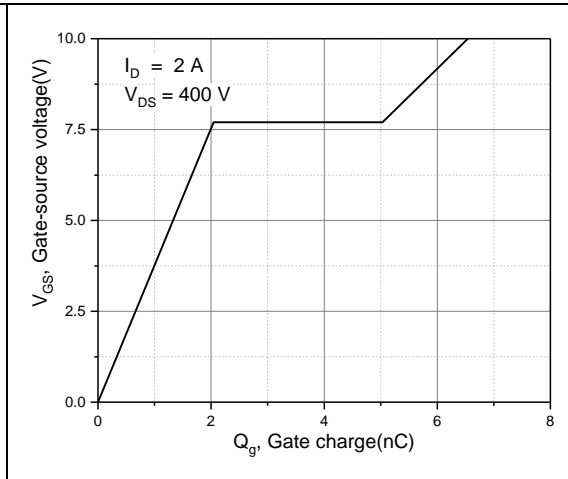


Figure 4, Typ. gate charge

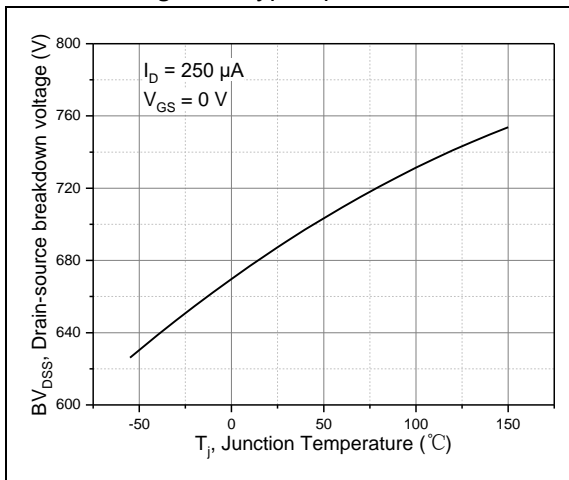


Figure 5, Drain-source breakdown voltage

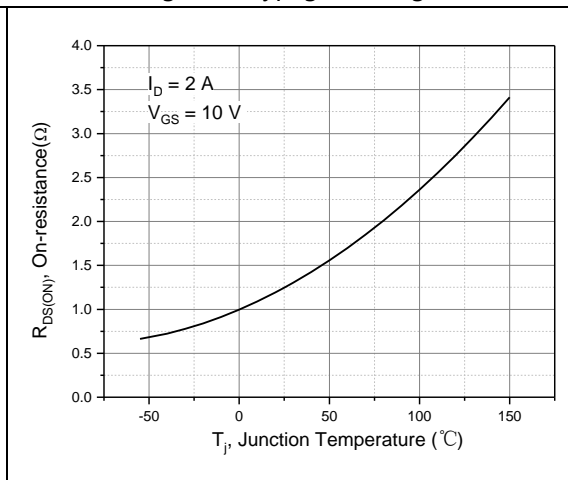


Figure 6, Drain-source on-state resistance

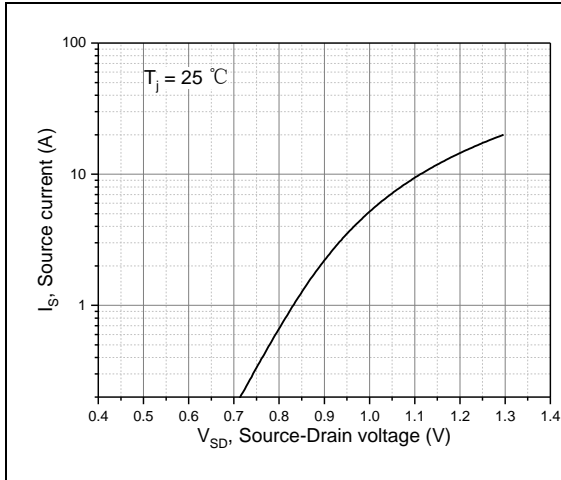


Figure 7, Forward characteristic of body diode

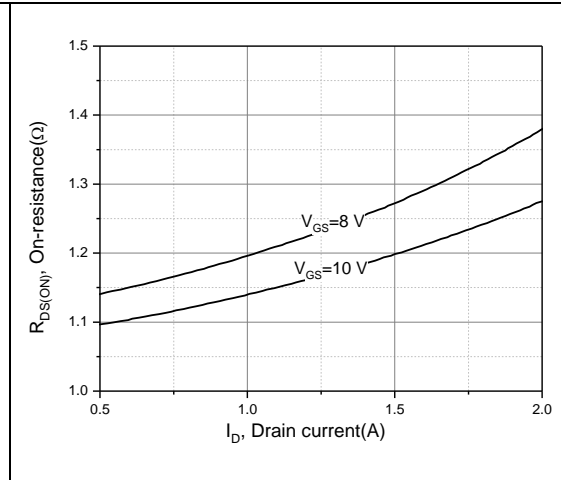


Figure 8, Drain-source on-state resistance

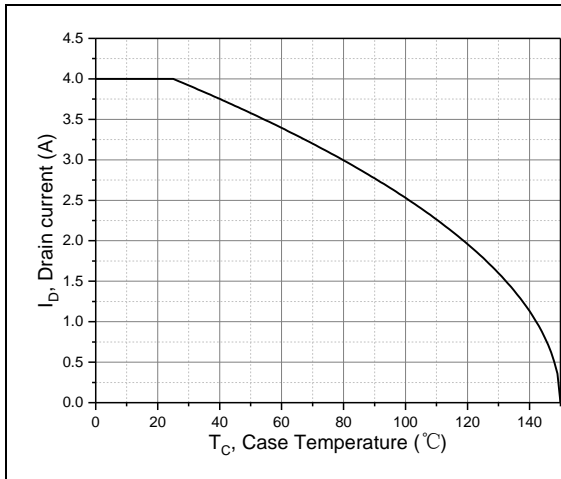


Figure 9, Drain current

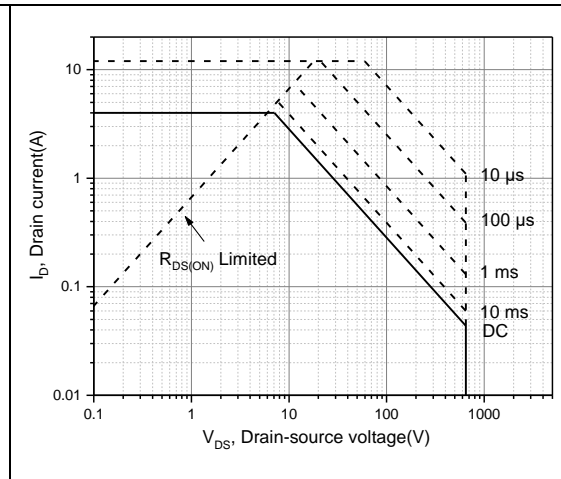


Figure 10, Safe operation area for $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

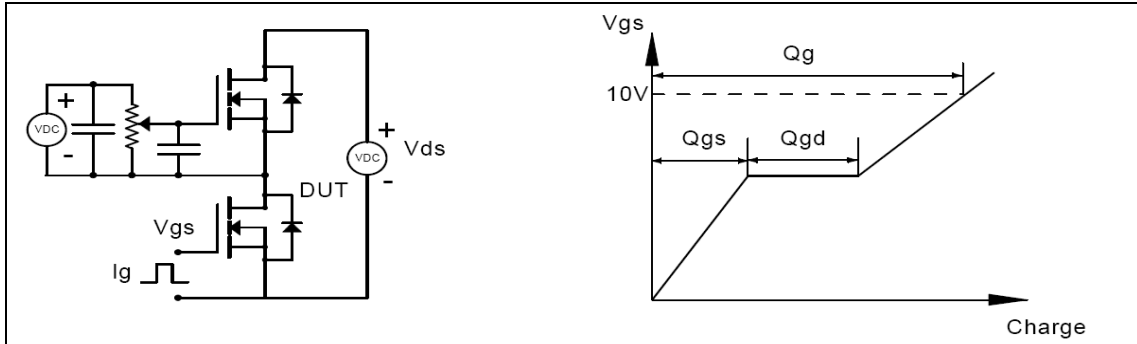


Figure 1, Gate charge test circuit & waveform

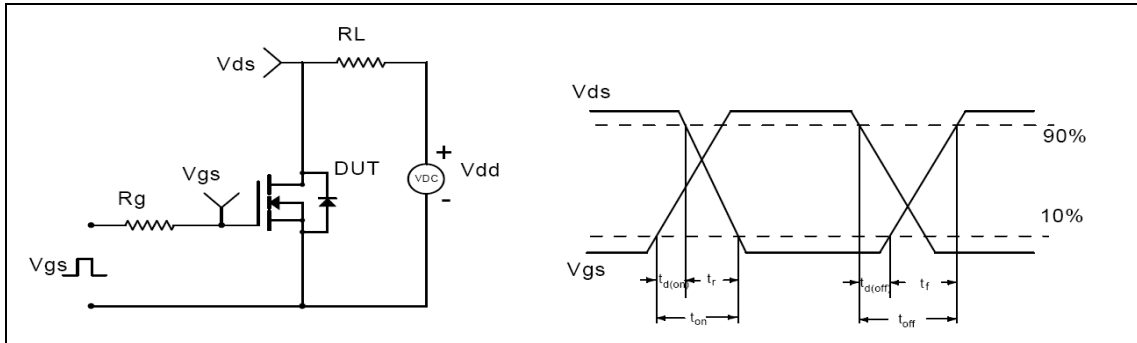


Figure 2, Switching time test circuit & waveforms

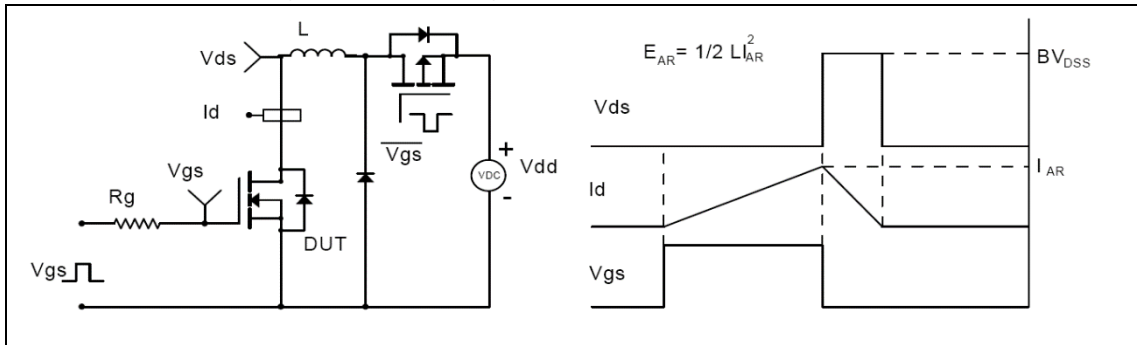


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

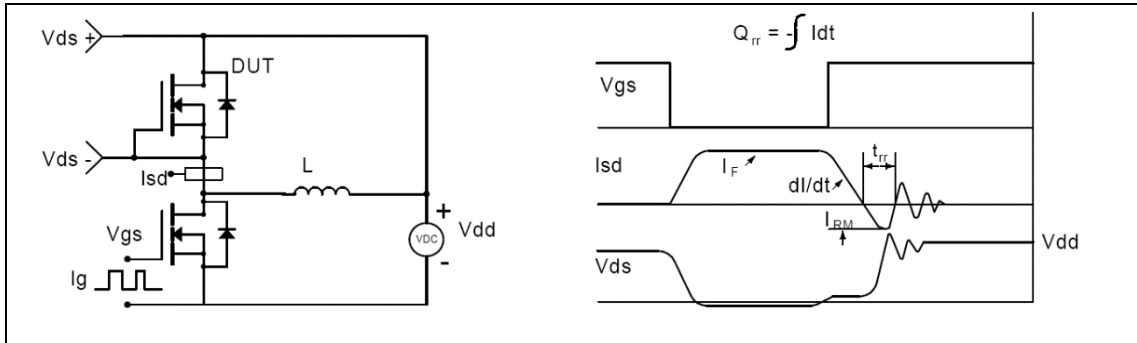
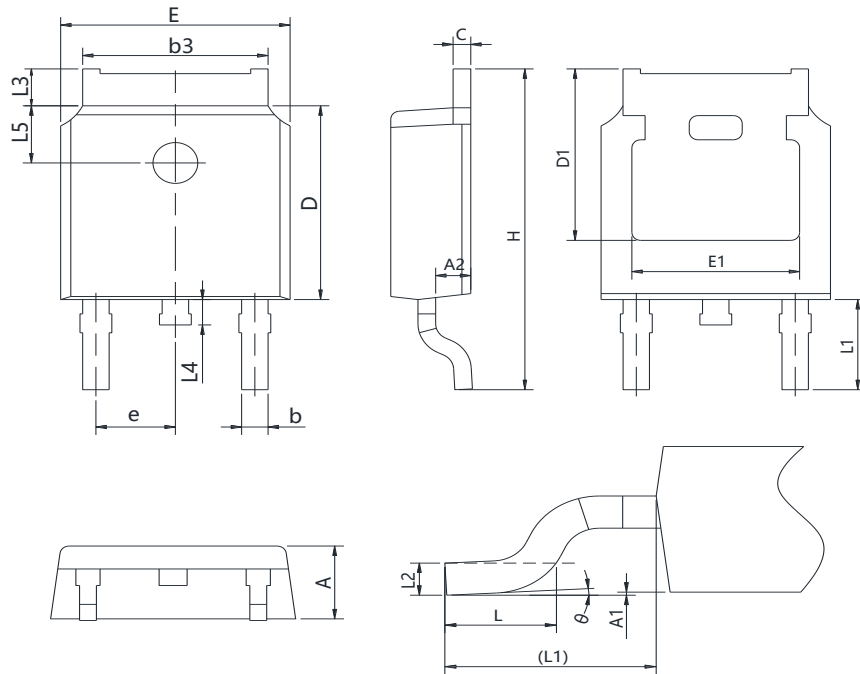


Figure 4, Diode reverse recovery test circuit & waveforms

■ Package Information

Figure1, TO252 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
L5	1.65	1.80	1.95
θ	0°	-	8°

■ Ordering Information

Package	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO252	2500	2	5000	5	25000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R1K5DZF	TO252	yes	yes	yes