

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® Z series is integrated with fast recovery diode (FRD) to minimize reverse recovery time. It is suitable for resonant switching topologies to reach higher efficiency, higher reliability and smaller form factor.

Features

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



Applications

- LED lighting
- Adapter
- Telecom
- Solar/UPS
- Server

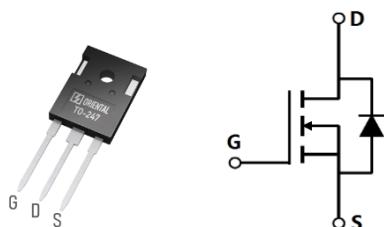
Key Performance Parameters

Parameter	Value	Unit
$V_{DS, min} @ T_j(max)$	650	V
$I_D, pulse$	120	A
$R_{DS(ON), max} @ V_{GS}=10V$	99	mΩ
Q_g	54	nC

Marking Information

Product Name	Package	Marking
OSG65R099HT3ZF	TO247	OSG65R099HT3Z

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⁾ , $T_C=25\text{ }^\circ\text{C}$	I_D	40	A
Continuous drain current ¹⁾ , $T_C=100\text{ }^\circ\text{C}$		25.3	
Pulsed drain current ²⁾ , $T_C=25\text{ }^\circ\text{C}$	$I_{D,\text{pulse}}$	120	A
Continuous diode forward current ¹⁾ , $T_C=25\text{ }^\circ\text{C}$	I_S	40	A
Diode pulsed current ²⁾ , $T_C=25\text{ }^\circ\text{C}$	$I_{S,\text{pulse}}$	120	A
Power dissipation ³⁾ , $T_C=25\text{ }^\circ\text{C}$	P_D	220	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	600	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\ldots 400\text{ V}$	dv/dt	100	V/ns
Reverse diode dv/dt, $V_{DS}=0\ldots 400\text{ V}$, $I_{SD} \leq I_D$	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	$R_{\theta JC}$	0.57	$^\circ\text{C/W}$
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	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
		700				$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$, $T_j=150\text{ }^\circ\text{C}$
Gate threshold voltage	$V_{GS(\text{th})}$	3.0		5.0	V	$V_{DS}=V_{GS}$, $I_D=1\text{ mA}$
Drain-source on-state resistance	$R_{DS(\text{ON})}$		81	99	$\text{m}\Omega$	$V_{GS}=10\text{ V}$, $I_D=20\text{ A}$
			213			$V_{GS}=10\text{ V}$, $I_D=20\text{ A}$, $T_j=150\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GS}			100	nA	$V_{GS}=30\text{ V}$
				-100		$V_{GS}=-30\text{ V}$
Drain-source leakage current	I_{DS}			10	μA	$V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$
Gate resistance	R_G		15		Ω	$f=1\text{ MHz}$, Open drain

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C _{iss}		2895		pF	V _{GS} =0 V, V _{DS} =50 V, f=100 kHz
Output capacitance	C _{oss}		139		pF	
Reverse transfer capacitance	C _{rss}		3		pF	
Effective output capacitance, energy related	C _{o(er)}		90		pF	V _{GS} =0 V, V _{DS} =0 V-400 V
Effective output capacitance, time related	C _{o(tr)}		505		pF	
Turn-on delay time	t _{d(on)}		38		ns	V _{GS} =10 V, V _{DS} =400 V, R _G =2 Ω, I _D =40 A
Rise time	t _r		136		ns	
Turn-off delay time	t _{d(off)}		66		ns	
Fall time	t _f		50		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q _g		54		nC	V _{GS} =10 V, V _{DS} =400 V, I _D =40 A
Gate-source charge	Q _{gs}		20		nC	
Gate-drain charge	Q _{gd}		18.5		nC	
Gate plateau voltage	V _{plateau}		7.8		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V _{SD}			1.3	V	I _S =40 A, V _{GS} =0 V
Reverse recovery time	t _{rr}		155		ns	
Reverse recovery charge	Q _{rr}		633		nC	
Peak reverse recovery current	I _{rrm}		7.8		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_{θJA} is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25 °C.
- 5) V_{DD}=100 V, V_{GS}=10 V, L=75 mH, starting T_j=25 °C.

Electrical Characteristics Diagrams

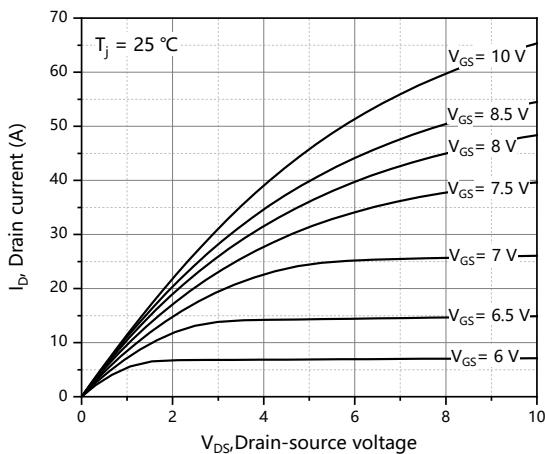


Figure 1. Typ. output characteristics

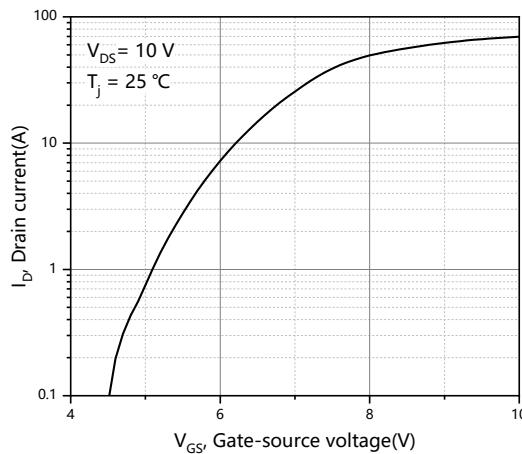


Figure 2. Typ. transfer characteristics

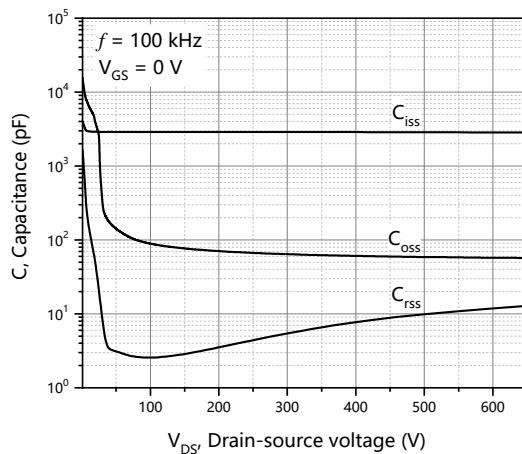


Figure 3. Typ. capacitances

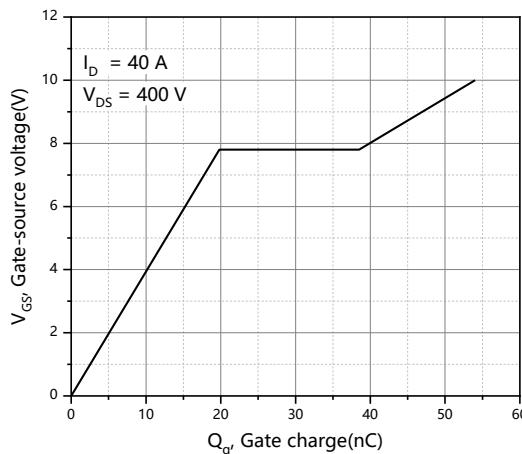


Figure 4. Typ. gate charge

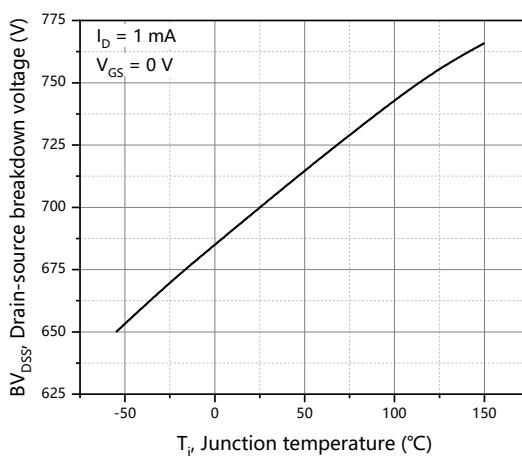


Figure 5. Drain-source breakdown voltage

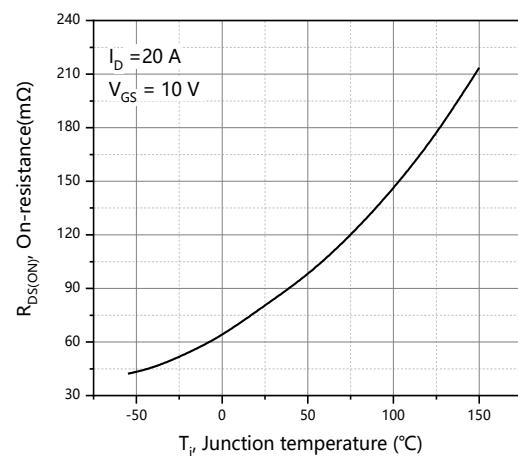
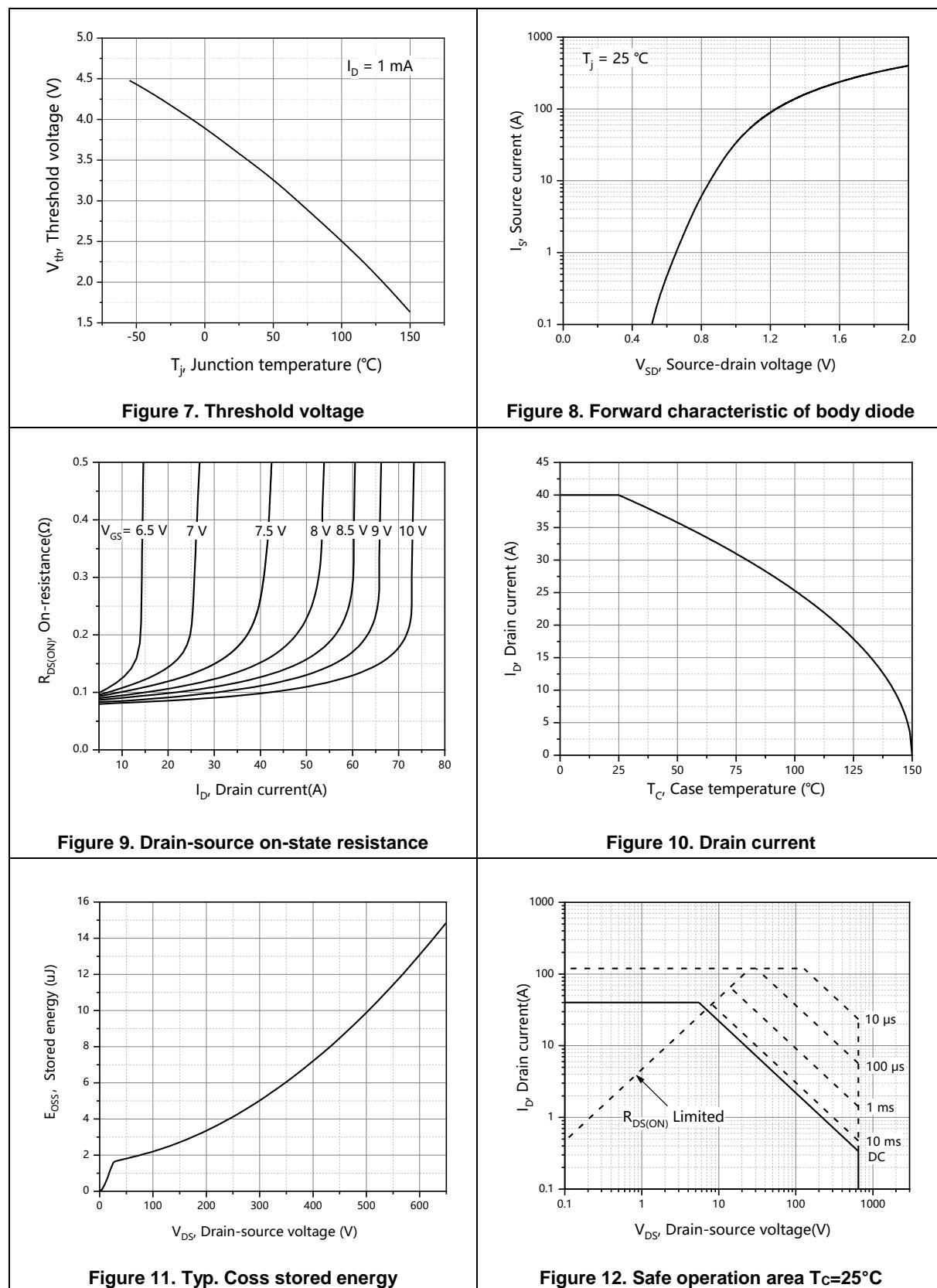


Figure 6. Drain-source on-state resistance



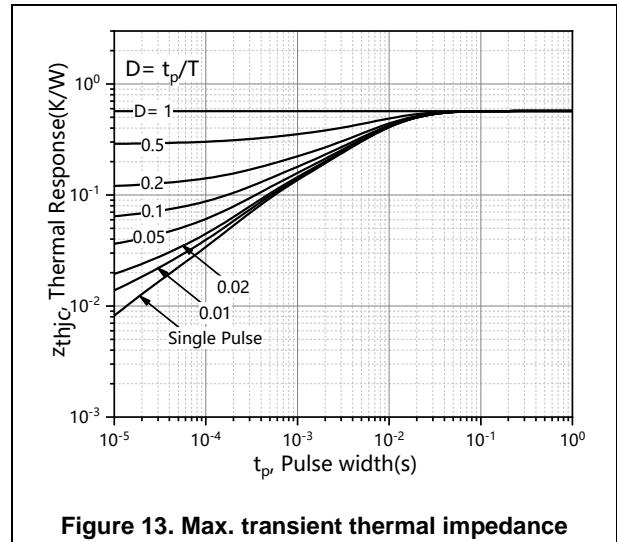


Figure 13. Max. transient thermal impedance

Test circuits and waveforms

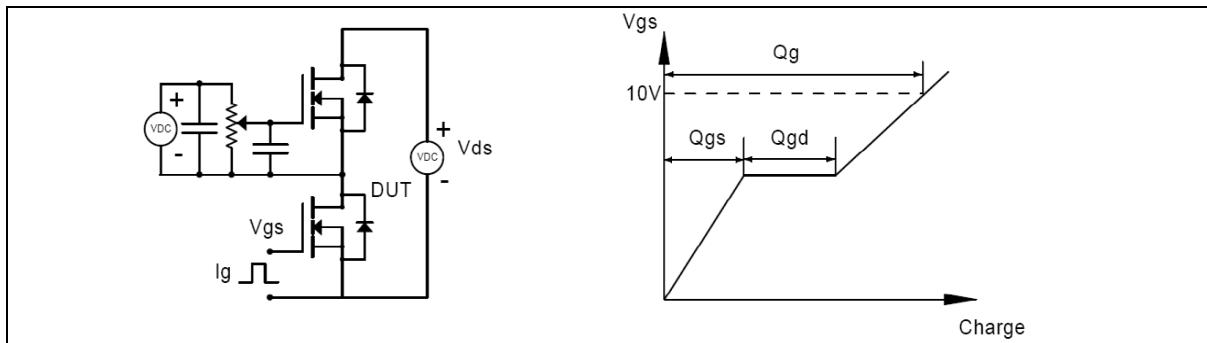


Figure 1. Gate charge test circuit & waveform

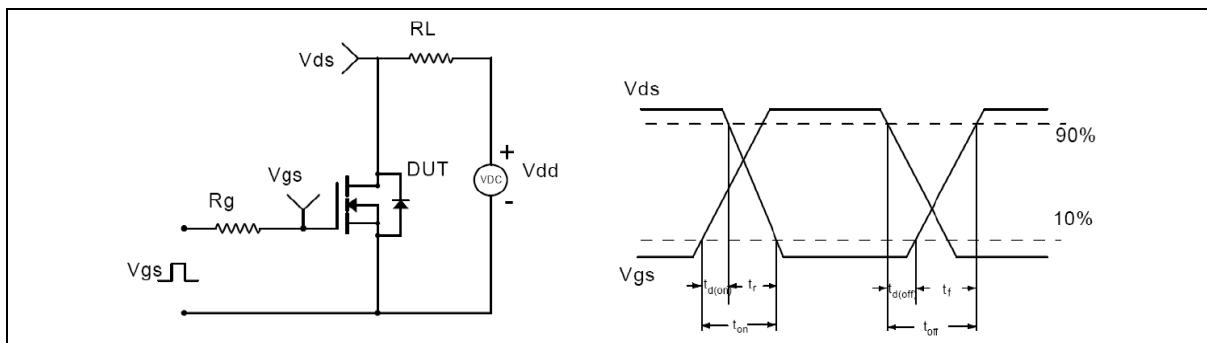


Figure 2. Switching time test circuit & waveforms

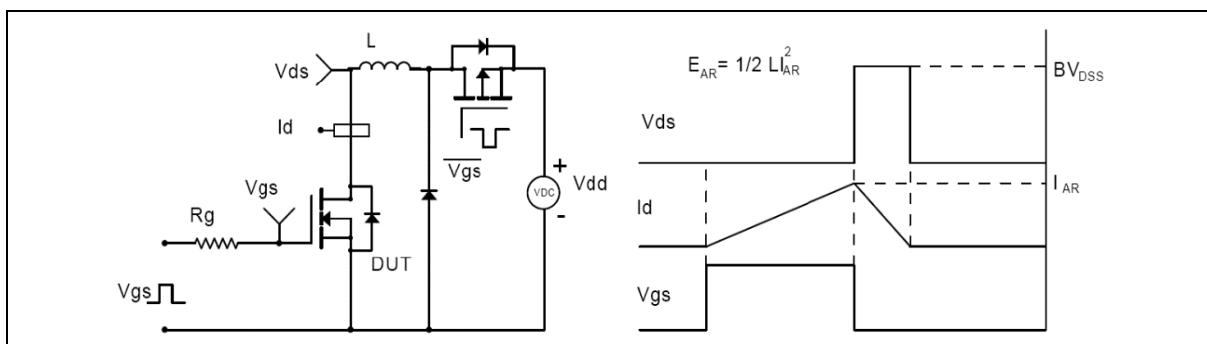


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

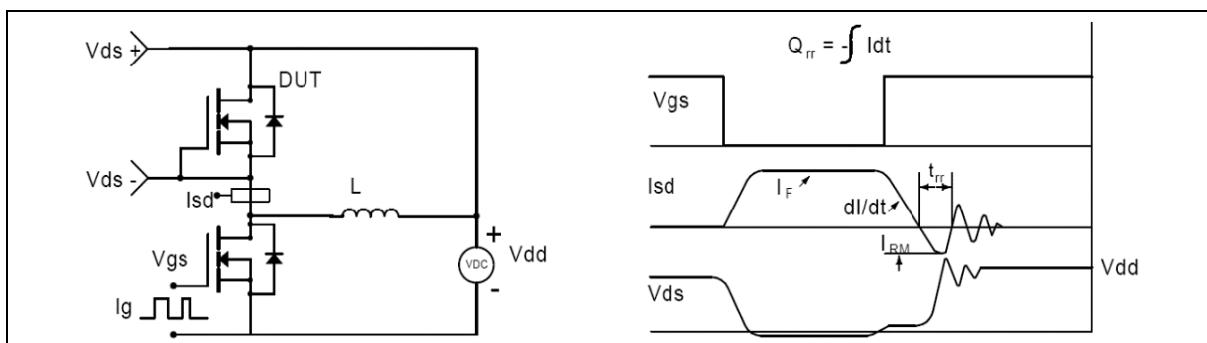
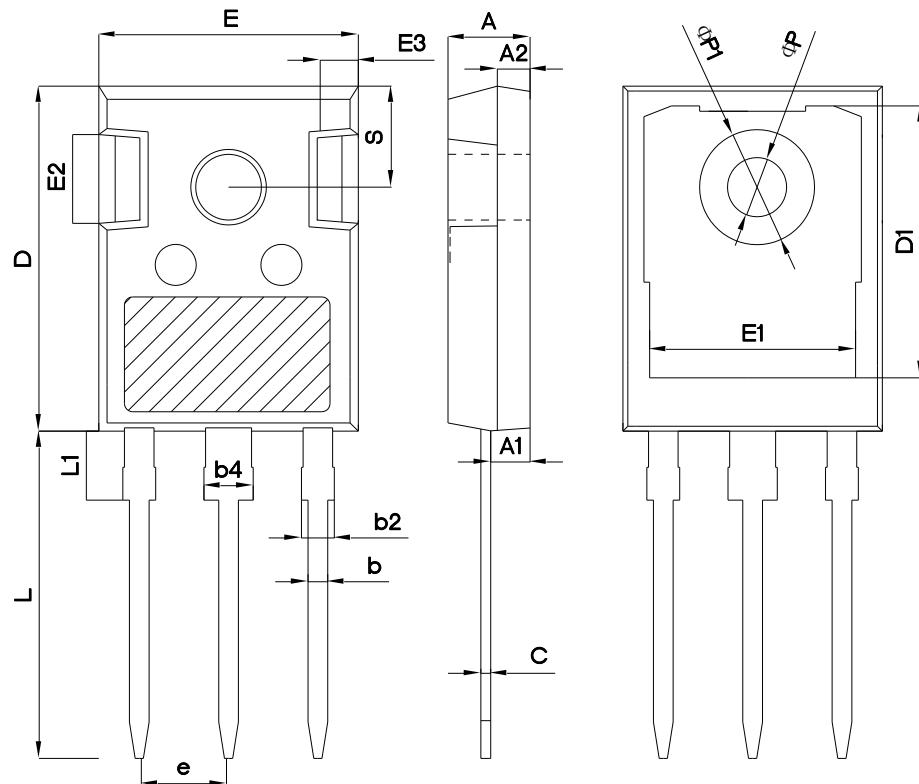


Figure 4. Diode reverse recovery test circuit & waveforms

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: 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
OSG65R099HT3ZF	TO247	yes	yes	yes

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