

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
- Sever

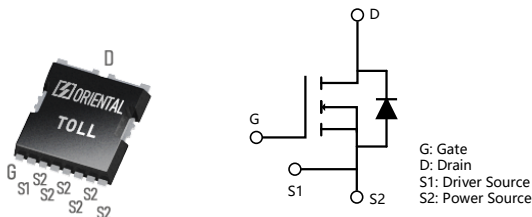
Key Performance Parameters

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

Marking Information

Product Name	Package	Marking
OSG65R099TT3ZF	TOLL	OSG65R099TT3Z

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	40	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		25.3	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, \text{pulse}}$	120	A
Continuous diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_S	40	A
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{S, \text{pulse}}$	120	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	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				$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$, $T_j=150^{\circ}\text{C}$
Gate threshold voltage	$V_{GS(th)}$	3.0		5.0	V	$V_{DS}=V_{GS}$, $I_D=1\text{ mA}$
Drain-source on-state resistance	$R_{DS(on)}$		81	99	m Ω	$V_{GS}=10\text{ V}$, $I_D=13.3\text{ A}$
			213			$V_{GS}=10\text{ V}$, $I_D=13.3\text{ A}$, $T_j=150^{\circ}\text{C}$
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	$V_{DS}=650\text{ V}$, $V_{GS}=0\text{ V}$
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	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		139		pF	
Reverse transfer capacitance	C_{rss}		3		pF	
Effective output capacitance, energy related	$C_{o(er)}$		90		pF	$V_{GS}=0\text{ V}$, $V_{DS}=0\text{ V}-400\text{ V}$
Effective output capacitance, time related	$C_{o(tr)}$		505		pF	
Turn-on delay time	$t_{d(on)}$		38		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\ \Omega$, $I_D=40\text{ A}$
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	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $I_D=40\text{ A}$
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	$I_S=40\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		155		ns	$V_R=400\text{ V}$, $I_S=40\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
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) 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 in² FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^{\circ}\text{C}$.
- 5) $V_{DD}=100\text{ V}$, $V_{GS}=10\text{ V}$, $L=75\text{ mH}$, starting $T_j=25\text{ }^{\circ}\text{C}$.

Electrical Characteristics Diagrams

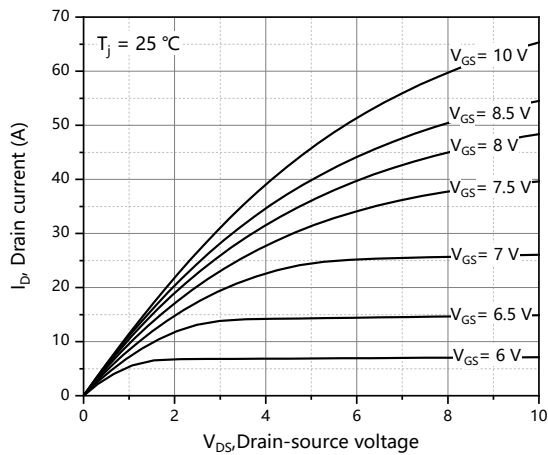


Figure 1. Typ. output characteristics

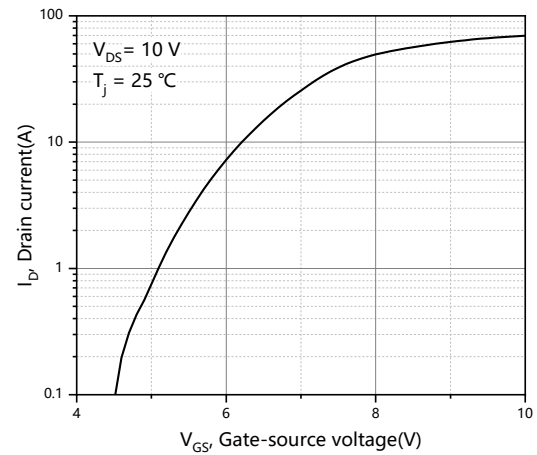


Figure 2. Typ. transfer characteristics

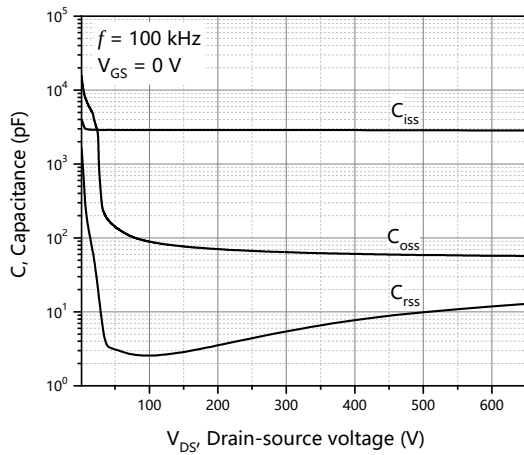


Figure 3. Typ. capacitances

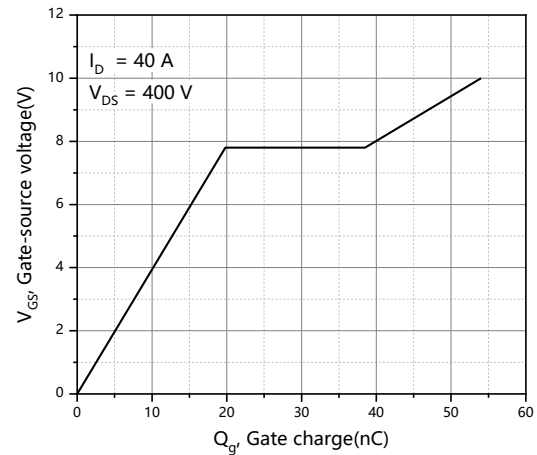


Figure 4. Typ. gate charge

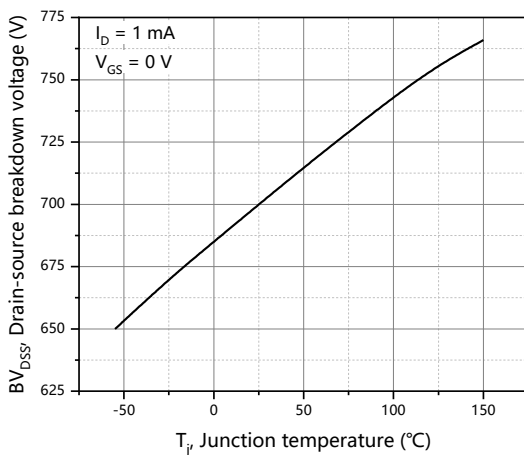


Figure 5. Drain-source breakdown voltage

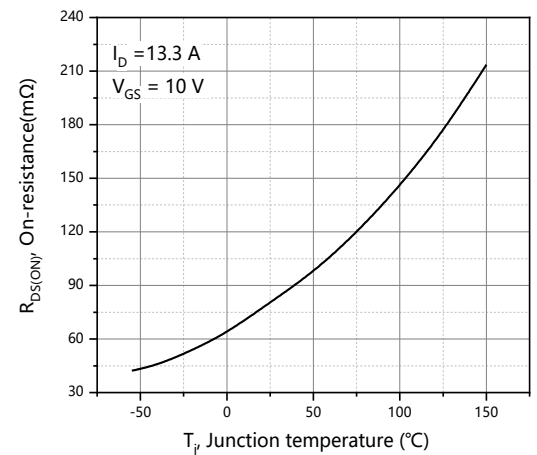


Figure 6. Drain-source on-state resistance

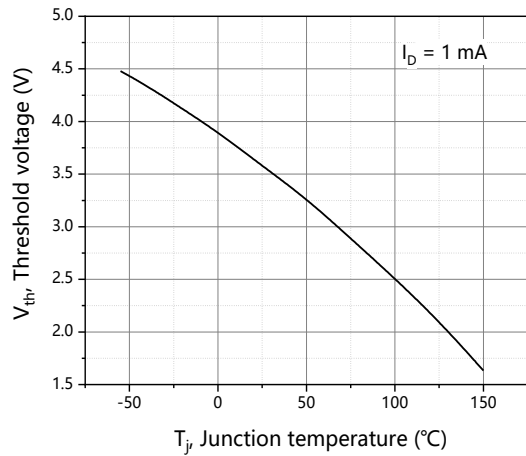


Figure 7. Threshold voltage

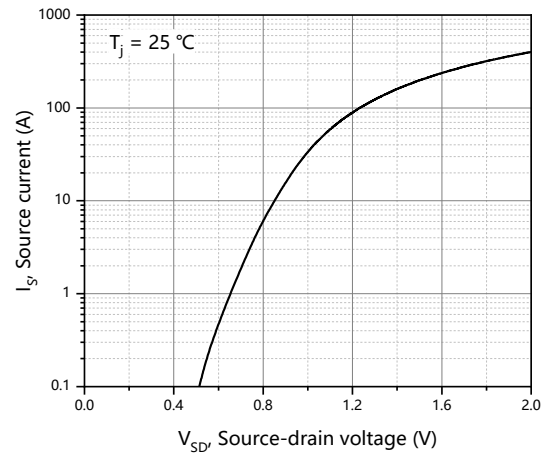


Figure 8. Forward characteristic of body diode

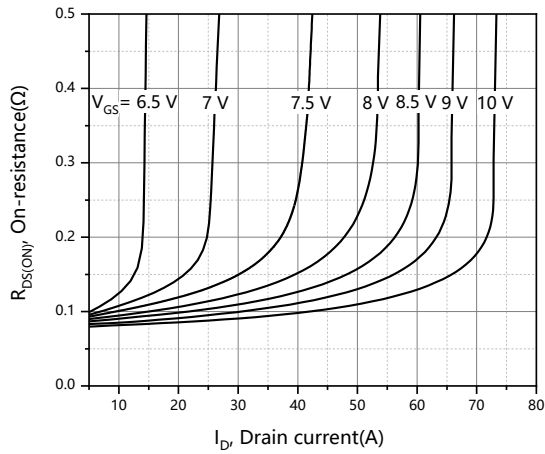


Figure 9. Drain-source on-state resistance

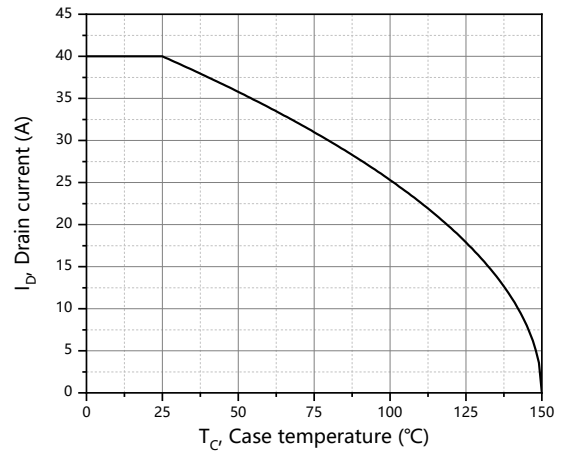


Figure 10. Drain current

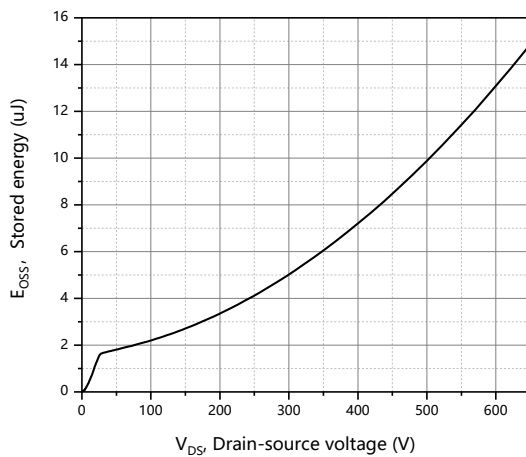


Figure 11. Typ. Coss stored energy

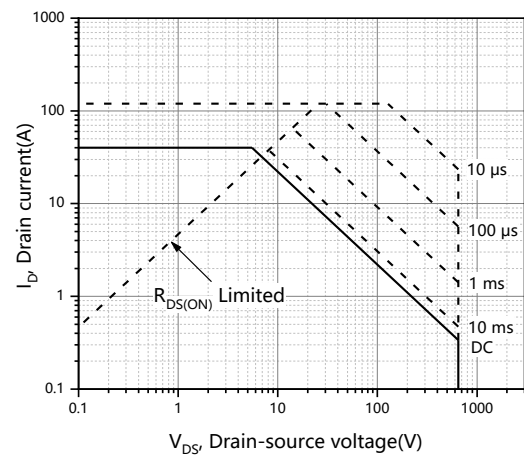


Figure 12. Safe operation area T_C=25°C

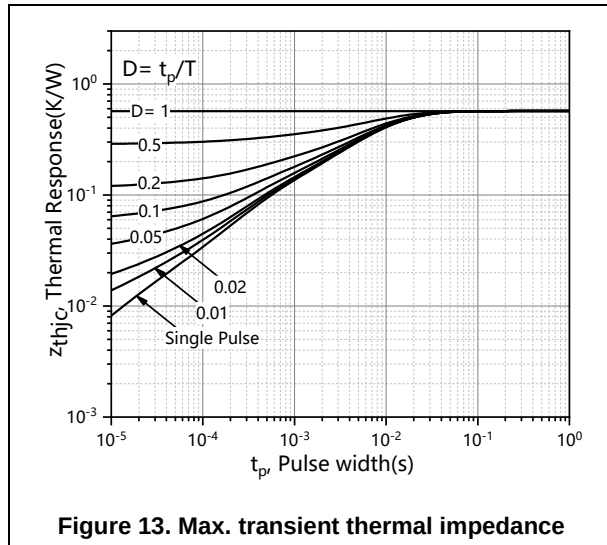


Figure 13. Max. transient thermal impedance

Test circuits and waveforms

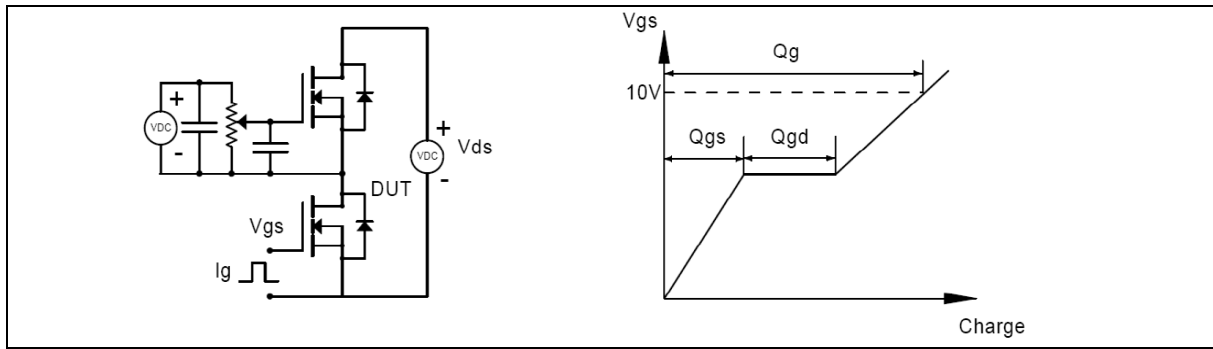


Figure 1. Gate charge test circuit & waveform

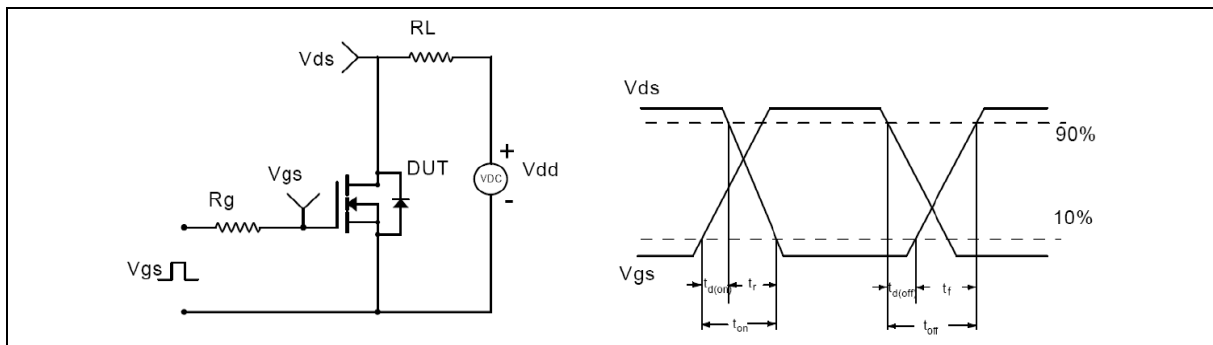


Figure 2. Switching time test circuit & waveforms

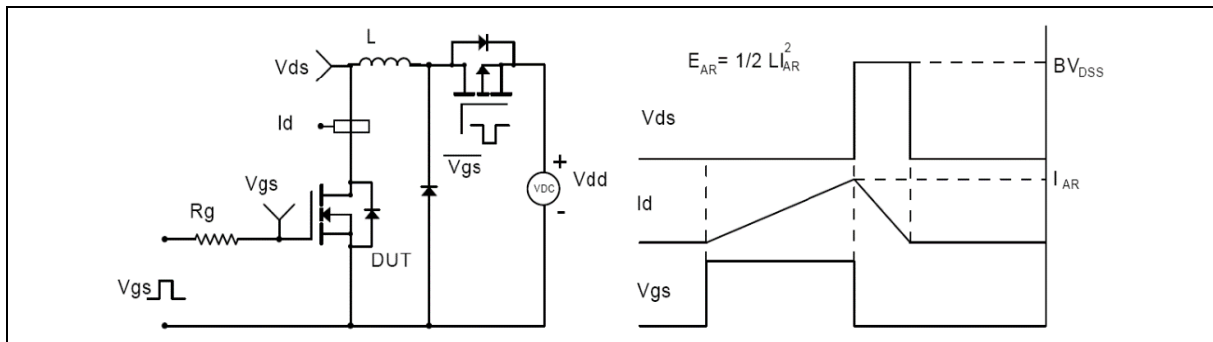


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

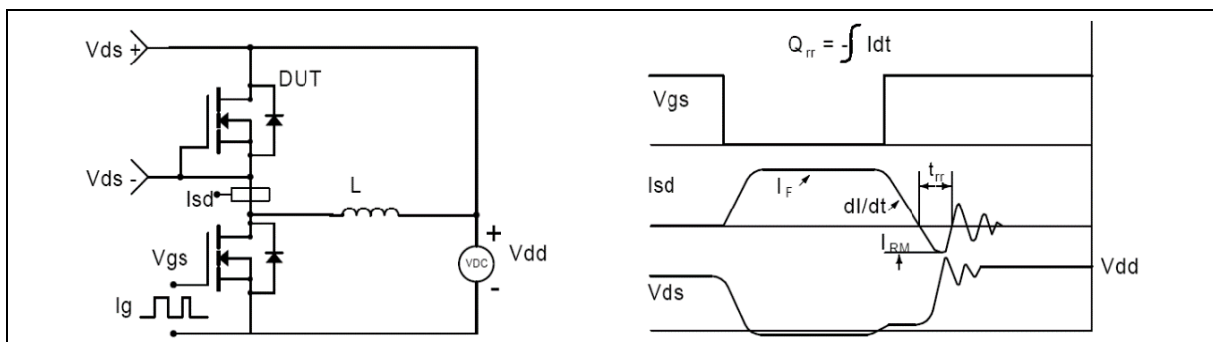
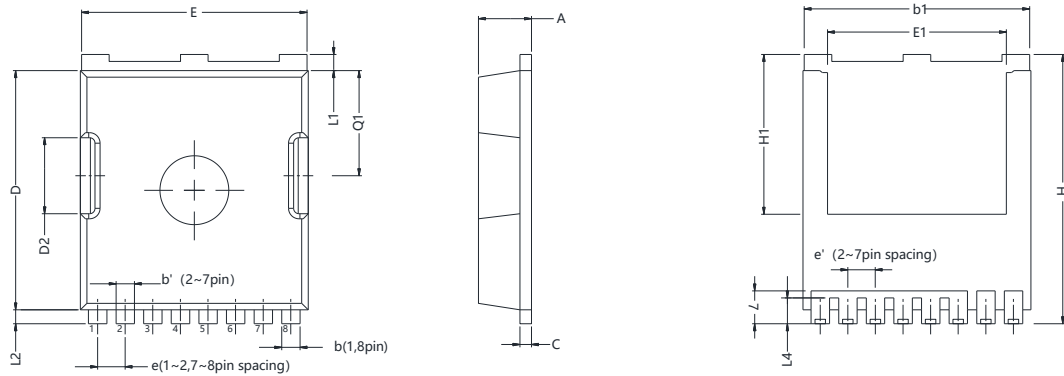


Figure 4. Diode reverse recovery test circuit & waveforms

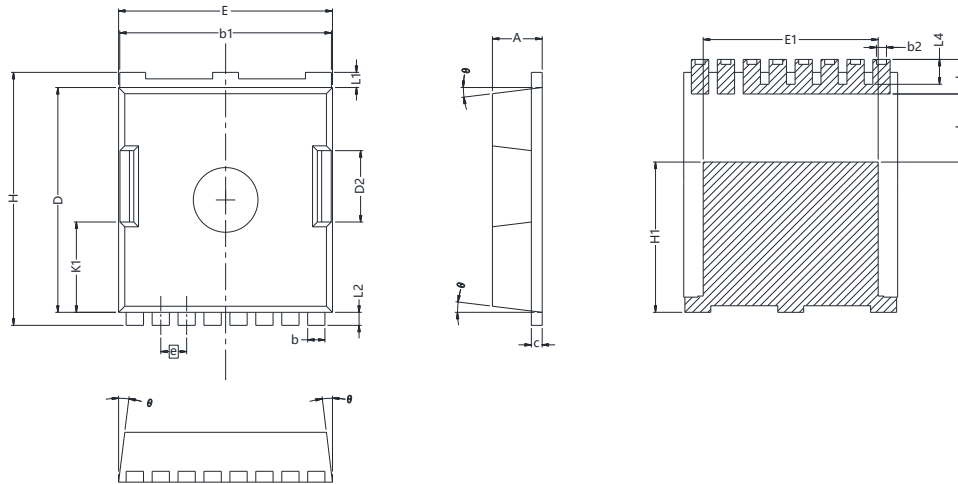
Package Information



Symbol	mm		
	Min	Nom	Max
A	2.15	2.30	2.45
b	0.75	0.75	0.85
b'	0.70	0.70	0.80
b1	9.65	9.80	9.95
C	0.45	0.50	0.60
D	10.18	10.38	10.58
D2	3.15	3.30	3.45
E	9.70	9.90	10.10
E1	7.95	8.10	8.25
e	BSC 1.225		
e'	BSC 1.20		
Q1	4.40	4.55	4.70
H	11.48	11.68	11.88
H1	6.80	6.95	7.10
L	1.60	1.80	2.00
L1	0.50	0.70	0.90
L2	0.48	0.60	0.72
L4	1.00	1.15	1.30

Version 1: TOLL-P package outline dimension

Package Information



Symbol	mm		
	Min	Nom	Max
A	2.20	-	2.40
b	0.70	-	0.90
b1	9.70	-	9.90
b2	0.42	-	0.50
c	0.40	-	0.60
D	10.28	-	10.58
D2	3.10	-	3.50
E	9.70	-	10.10
E1	7.90	-	8.30
e	1.20 BSC		
H	11.48	-	11.88
H1	6.75	-	7.15
N	8.00		
J	3.00	-	3.30
K1	3.98	-	4.38
L	1.40	-	1.80
L1	0.60	-	0.80
L2	0.50	-	0.70
L4	1.00	-	1.30
θ	4°	-	10°

Version 2: TOLL-S package outline dimension

Ordering Information

Package Type	Units/ Reel	Reels/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TOLL-P	1200	1	1200	5	6000
TOLL-S	2000	1	2000	7	14000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R099TT3ZF	TOLL	yes	yes	yes

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